

# Kootenai River Burbot Aquaculture Program: Update Presented to KVRl

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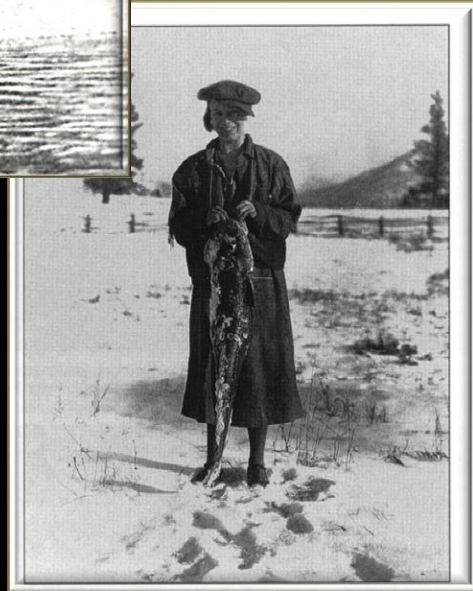
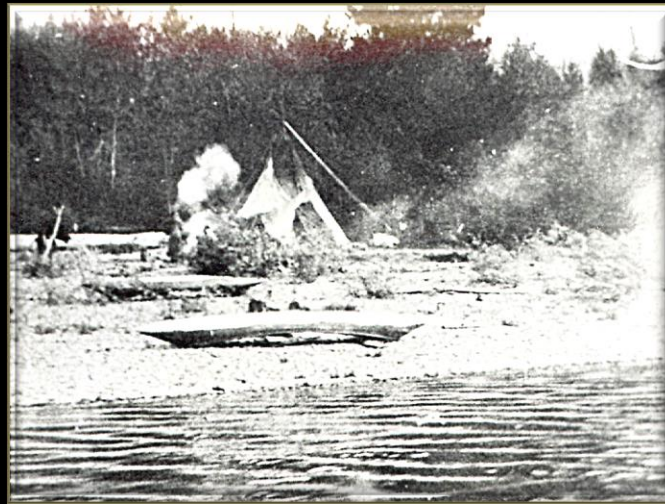
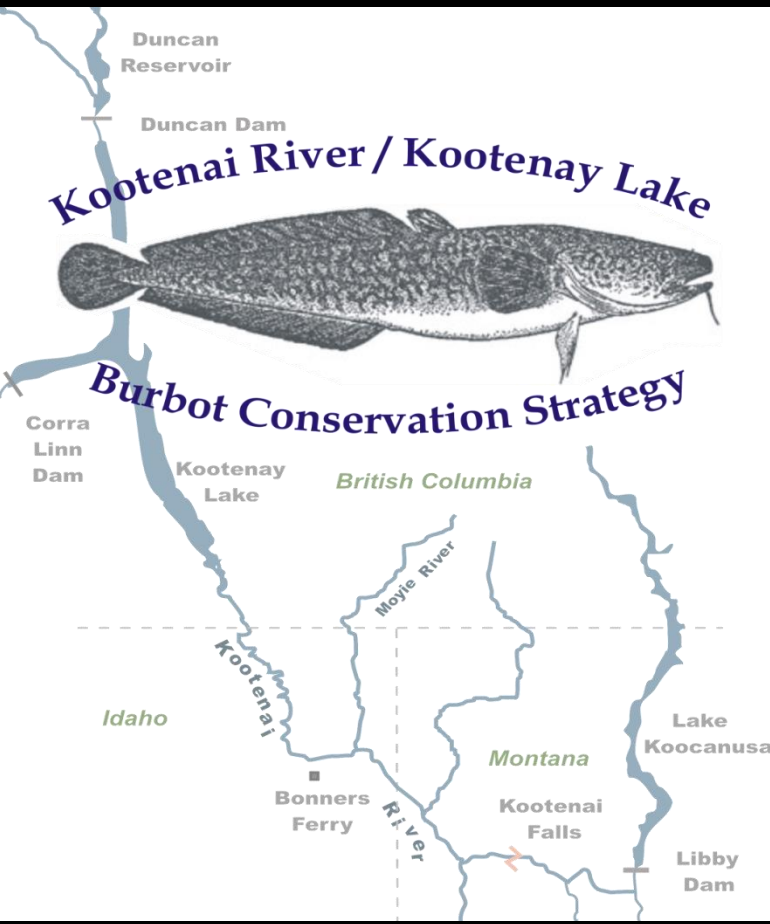
Presentation to KVRl

July 20, 2015



# Burbot Restoration

**Goal:** Restore a viable and self-sustaining harvestable burbot population in the Lower Kootenai River.



# Burbot Conservation Strategy

- Conservation Aquaculture
- Monitoring and Evaluation
- Alternative Hydro-operations Plan
- Habitat Restoration
- Education and Outreach



# Monitoring & Evaluation Plan

## Section 8.0 - Conservation and Restoration Strategies of the KVRI BCS:

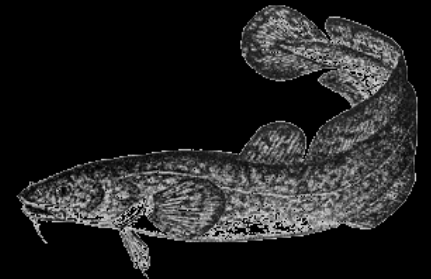
“Employ conservation aquaculture methods as a key near-term component for burbot protection and restoration.”

“Maintain a strong adaptive management scientific monitoring and evaluation program to guide implementation of population conservation and recovery activities.”

“Implement an aggressive adaptive program of experimental recovery measures.”

# Burbot Conservation Strategy

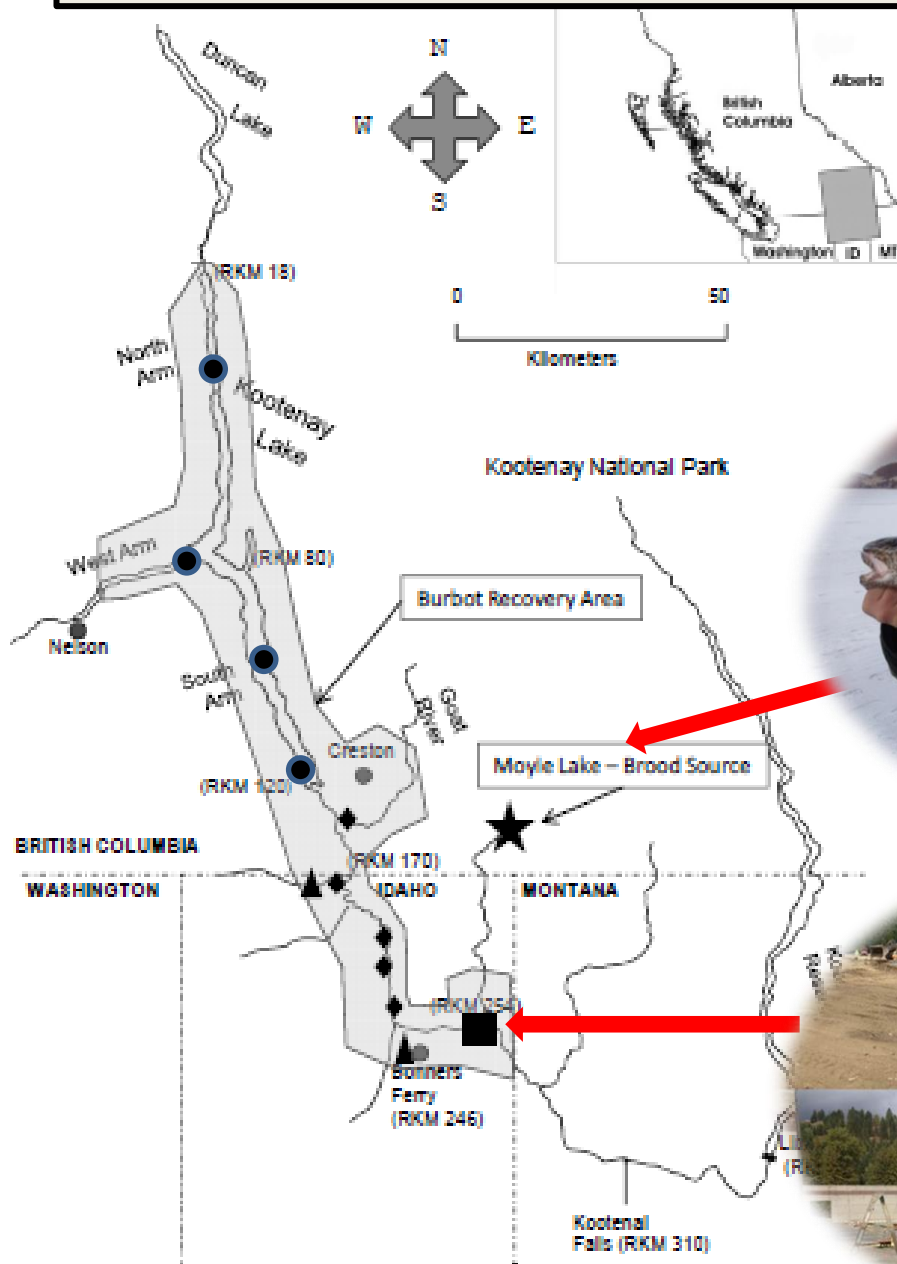
- Completed and signed in 2005.
- In effect for a 10-year period.
- Does the BCS need a formal extension or renewal?



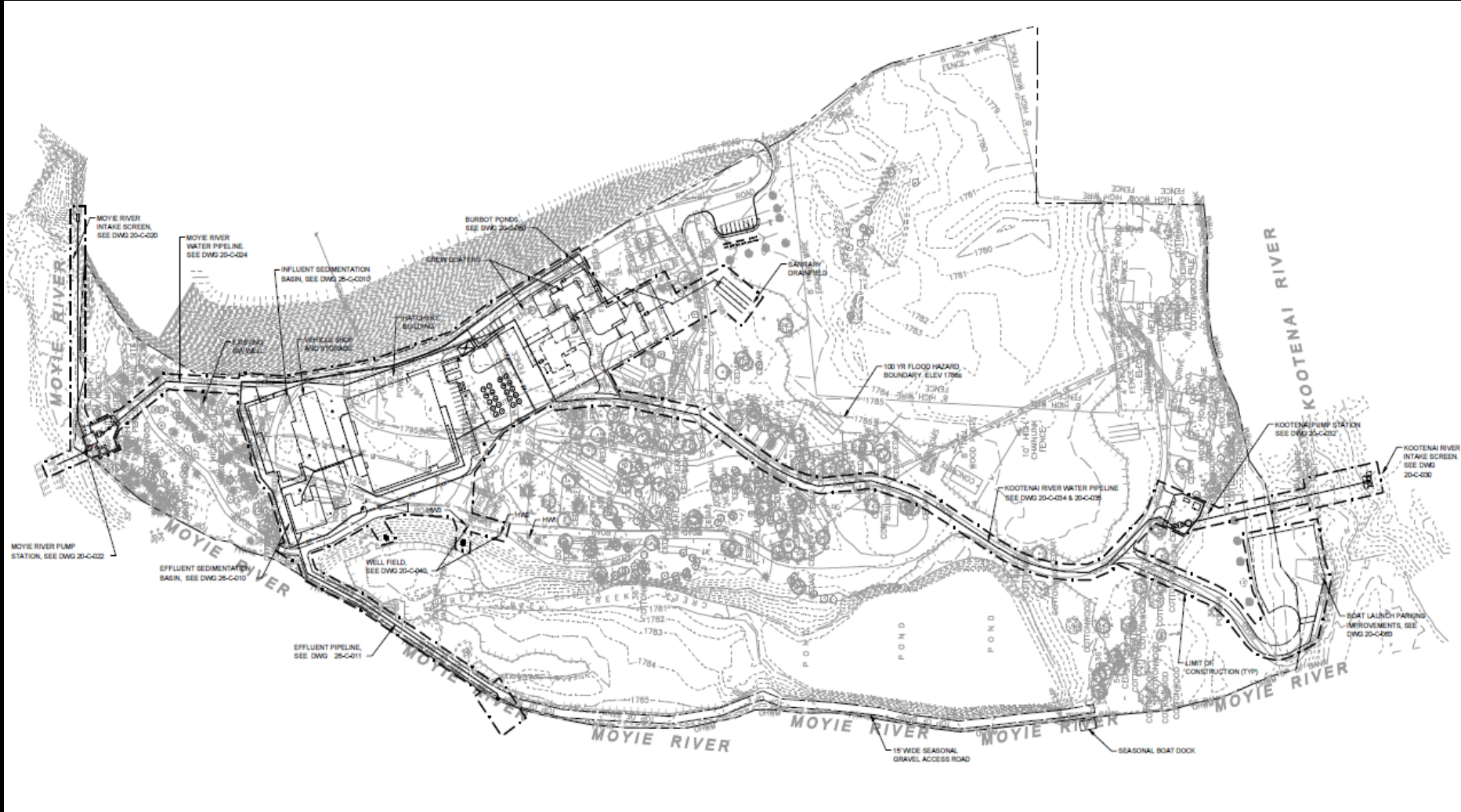
# Burbot Program - 2015



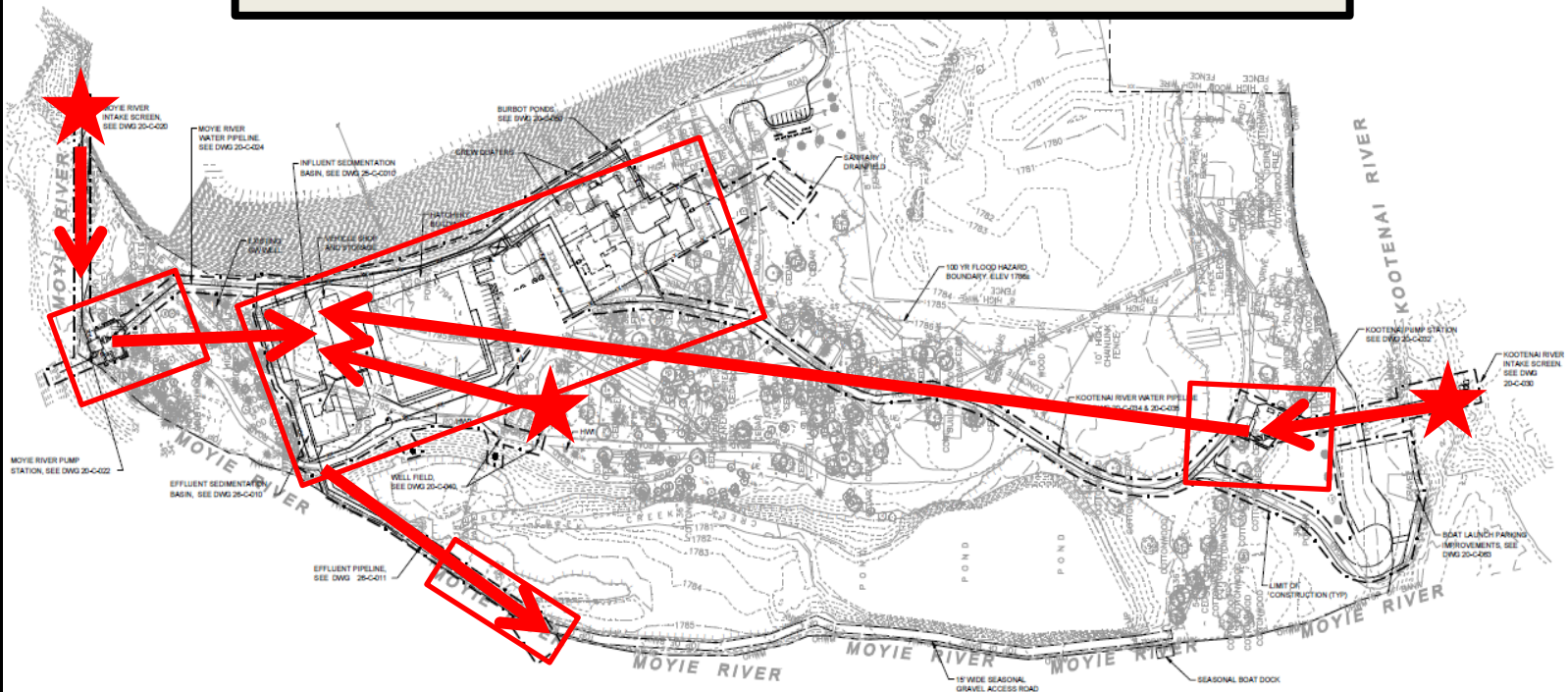
# Sites



## Twin Rivers Hatchery

[illegible]

# Twin Rivers Hatchery



(3) Water sources and (6) different water options

INFLUENT SEDIMENTATION  
BASIN, SEE DWG 25-C-0010

## CELEBRATIONS

## HATCHING BUILDING

**LAST NO  
GAMBLER**

## VEHICLE SHOW AND STORAGE

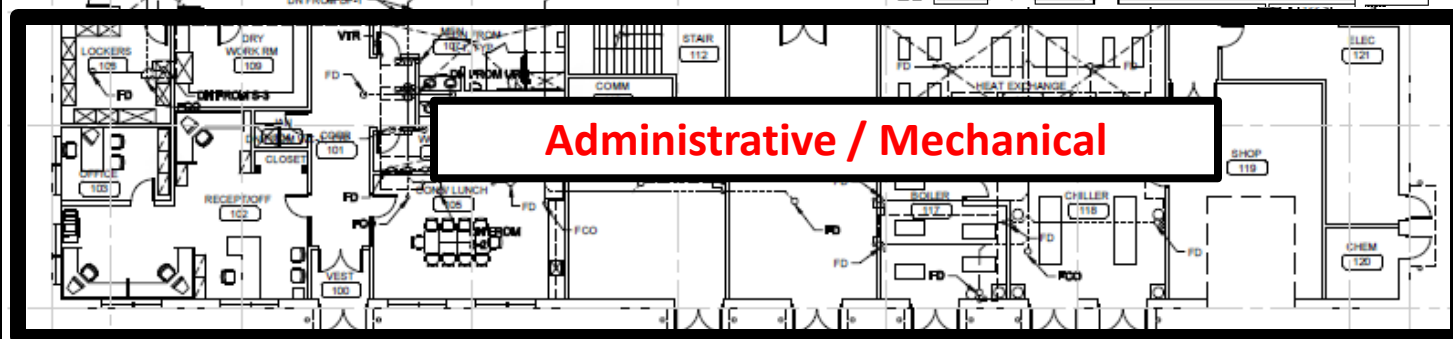
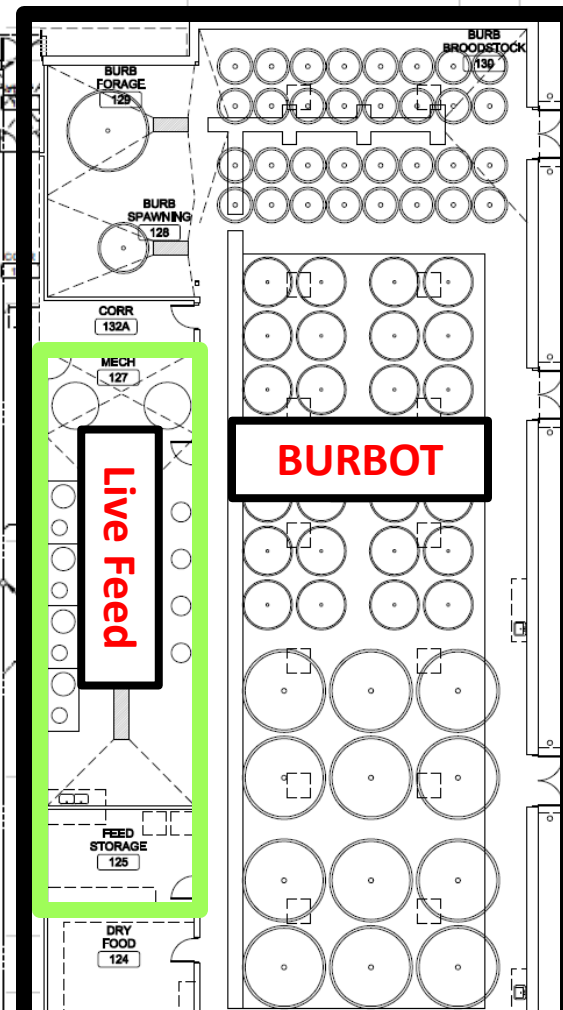
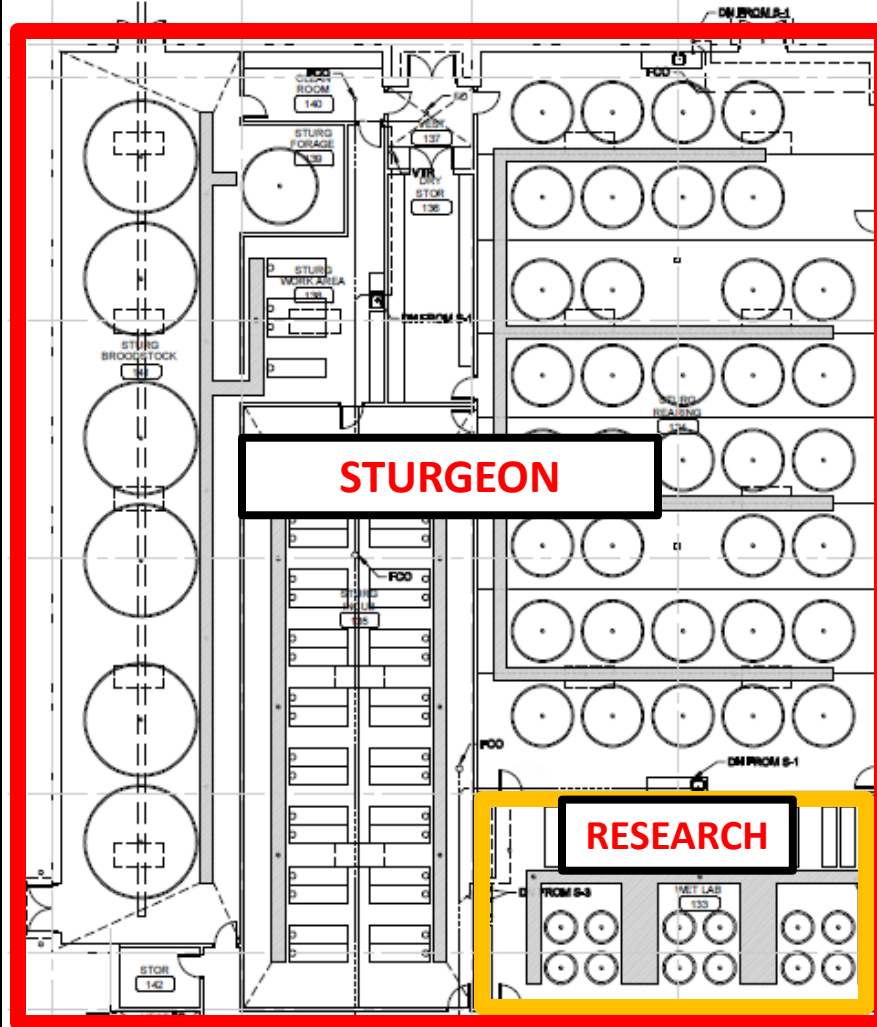
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WILLIAMS





# Basis of Design – Program Targets

**Table 2.** Past, current, and expected outcomes for each phase of the burbot conservation aquaculture program.

	Outcomes	Phase 1 2004-2008	Phase 2 2009-2013	Phase 3 2014-2018	Phase 4 2019 - Beyond
<b>Hatchery</b>	Average egg take	Feasibility	(353,000 – 4,500,000)	6 million	6 million
	Average larval release	Feasibility	(12,355 – 350,000)	TBD	TBD
	Average 6-mo. juvenile release	Feasibility	(247 – 20,183)	20,000 – 100,000	Up to 125,000
	Average Age-1+ release	Feasibility	50 - 100	TBD	TBD
<b>In-river</b>	Average annual Ages 1-3 abundance	Feasibility	6,000 (starting 2012)	32,000	63,000
	Average annual mature adults Ages 4 - 10+	Feasibility	~200	~8,000	17,500
<b>Harvest</b>	Idaho	None	None	None	TBD
	British Columbia	None	None	None	TBD

Note: Future estimates are based upon Age-0 6-month juvenile releases and no contribution from natural recruitment.

# Basis of Design – Program Targets

**Table 6. Initial KRNFCAP - Burbot Decision Guidelines for the phases of the program. Twin Rivers is expected to start production in Phase 3 (shaded).**

Metrics	Phase 1 2004-2008	Phase 2 2009-2013	Phase 3 2014-2018	Phase 4 2019 +
Donor Source	Moyie Lake	Moyie Lake	Moyie Lake	Moyie Lake
Percent Broodstock from Donor Source	100	100	50-100	0-100
Percent KR Natural-origin Broodstock	0	0	0-50	0-100
Families Produced	-	Up to 36	Up to 60	Up to 60
Larvae Released	-	0 – 350,000	TBD	TBD
Age-0+ 6 mo.-old Juveniles Released	-	5,000 - 20,000	20,000 - 100,000	Up to 125,000
Age-1 Released	-	100 - 500	TBD	TBD
Minimum Number Mature Adults (Ages 4+)	-	-	2,500	17,500
Minimum Number of Spawning Areas	-	-	3	3
Natural Recruitment	-	Possible	Probable	Significant
<b>Harvest</b>				
Fishing Mortality	-	0	0	TBD

# Twin Rivers Hatchery 2015 - Burbot

## 53 Families

Life stage	Numbers
Eggs (fertilized / delivered)	7,300,000
Eggs Viable 10-d	5,400,000
Larvae - Hatched	5,400,000
Larvae – First Feeding (20% deformed)	4,300,000
Feeding Larvae	500,000
Fry	
6-mo juveniles	

60 Families		Survival Rate - Hatchery			
Life Stage	Numbers	Hatch	Larvae	Fry	Age-0 Juv
Eggs	6,000,000	0.6			
Hatched Larvae	3,600,000		0.2		
Feeding Larvae	720,000			0.25	
Fry	180,000				0.7
6-mo Juveniles <sup>a</sup>	126,000				

<sup>a</sup> Current releases consist mainly of larvae and 6-month old juveniles. This strategy is anticipated for the future.

FEBRUARY



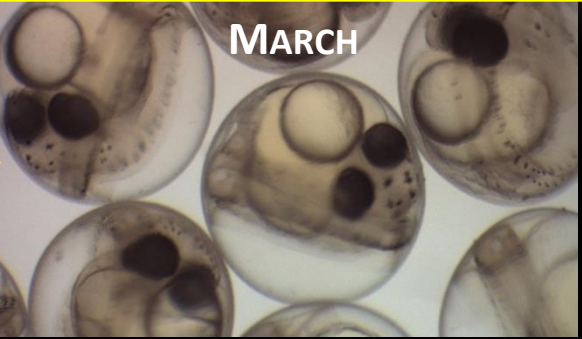
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# BURBOT

FEBRUARY



MARCH

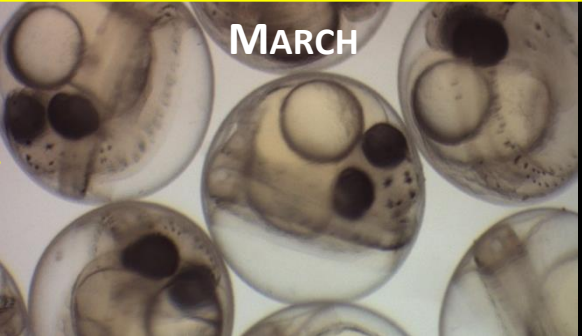


# BURBOT

FEBRUARY



MARCH



APRIL - JUNE

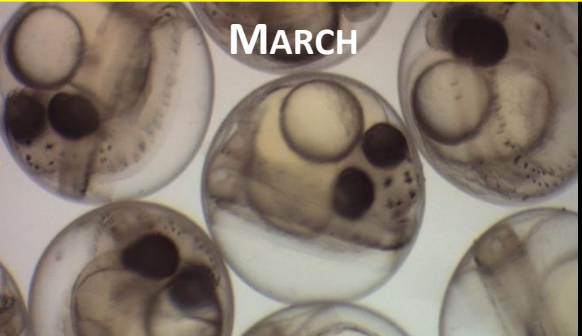


# BURBOT

FEBRUARY



MARCH



APRIL - MAY



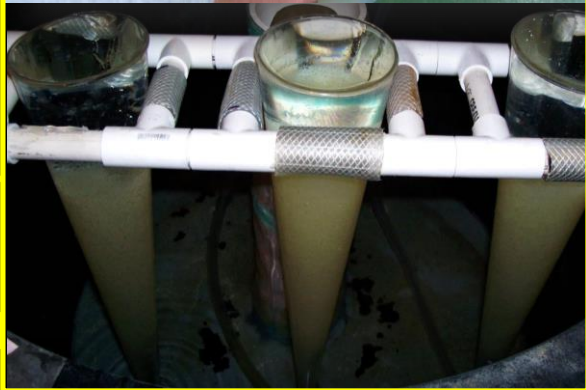
APRIL - JUNE

MAY - JUNE

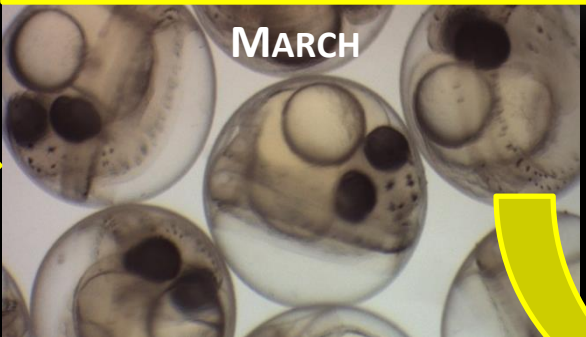


# B U R B O T

FEBRUARY



MARCH



JULY



APRIL - MAY



MAY - JUNE

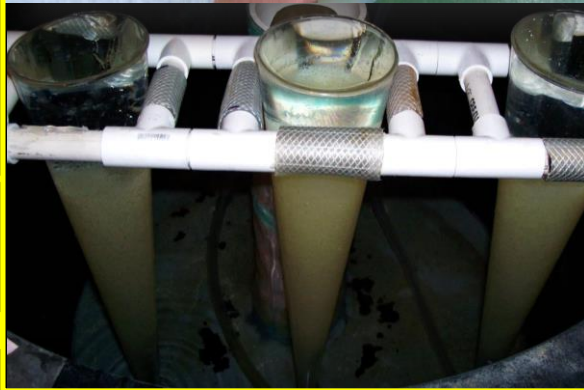


APRIL - JUNE

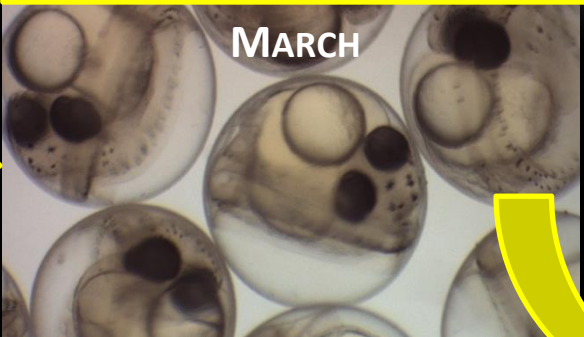


# BURBOT

FEBRUARY



MARCH



APRIL - MAY



APRIL - JUNE

AUGUST - OCTOBER



JULY



MAY - JUNE



**TAGGED**

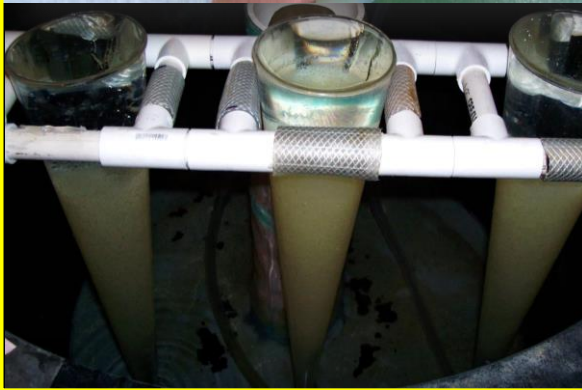


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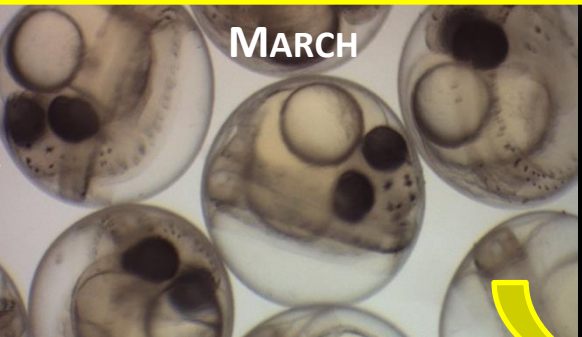


# B U R B O T

FEBRUARY



MARCH



APRIL - MAY



APRIL - JUNE

5 - 10 YEARS



OCTOBER



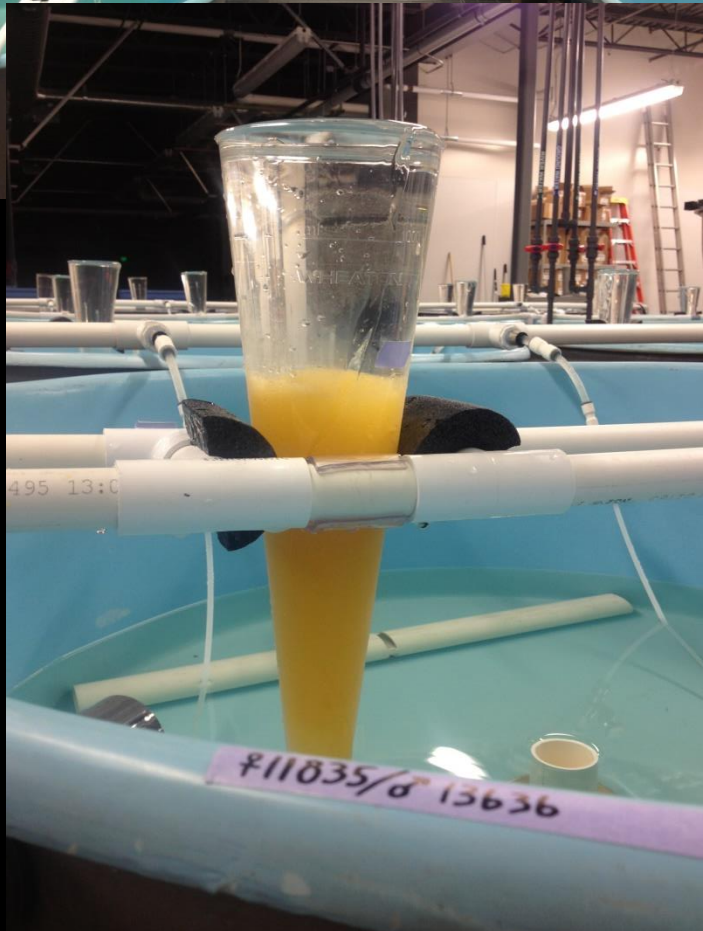
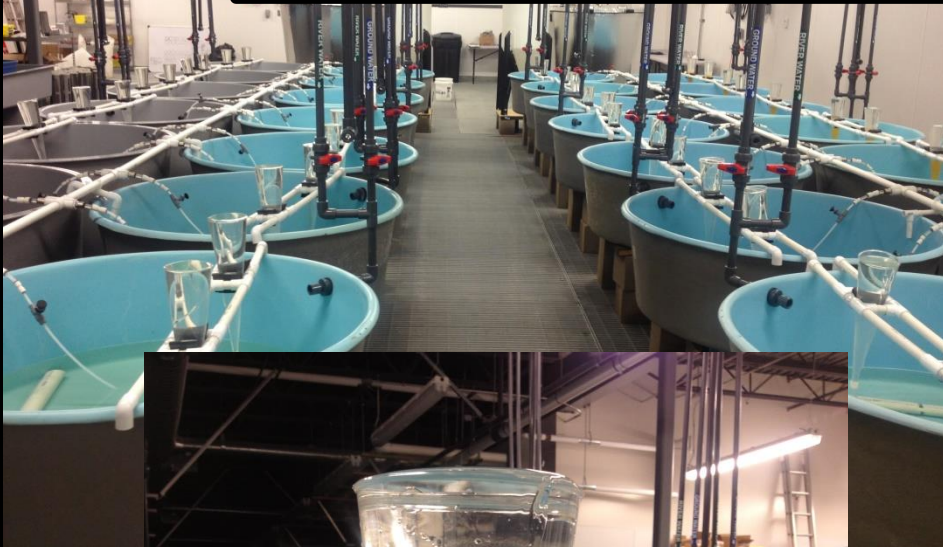
JULY

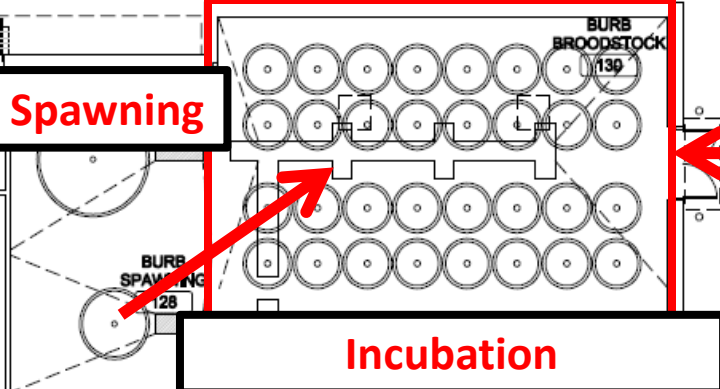


MAY - JUNE



# Twin Rivers Hatchery 2015





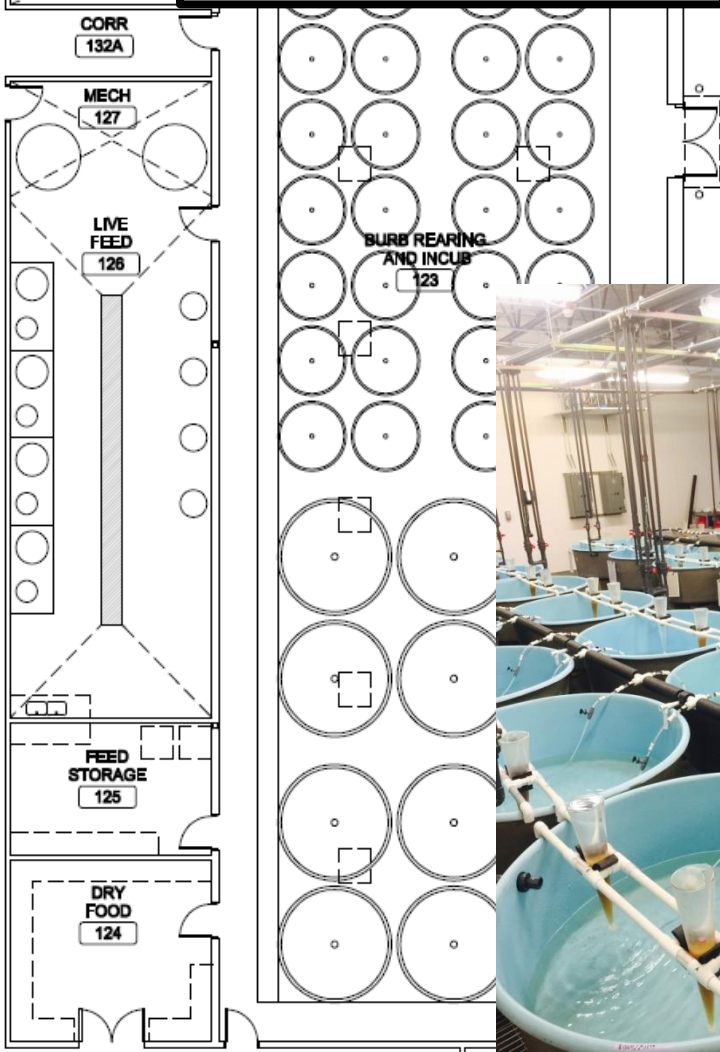
Field Collection of Gametes / Captive Broodstock

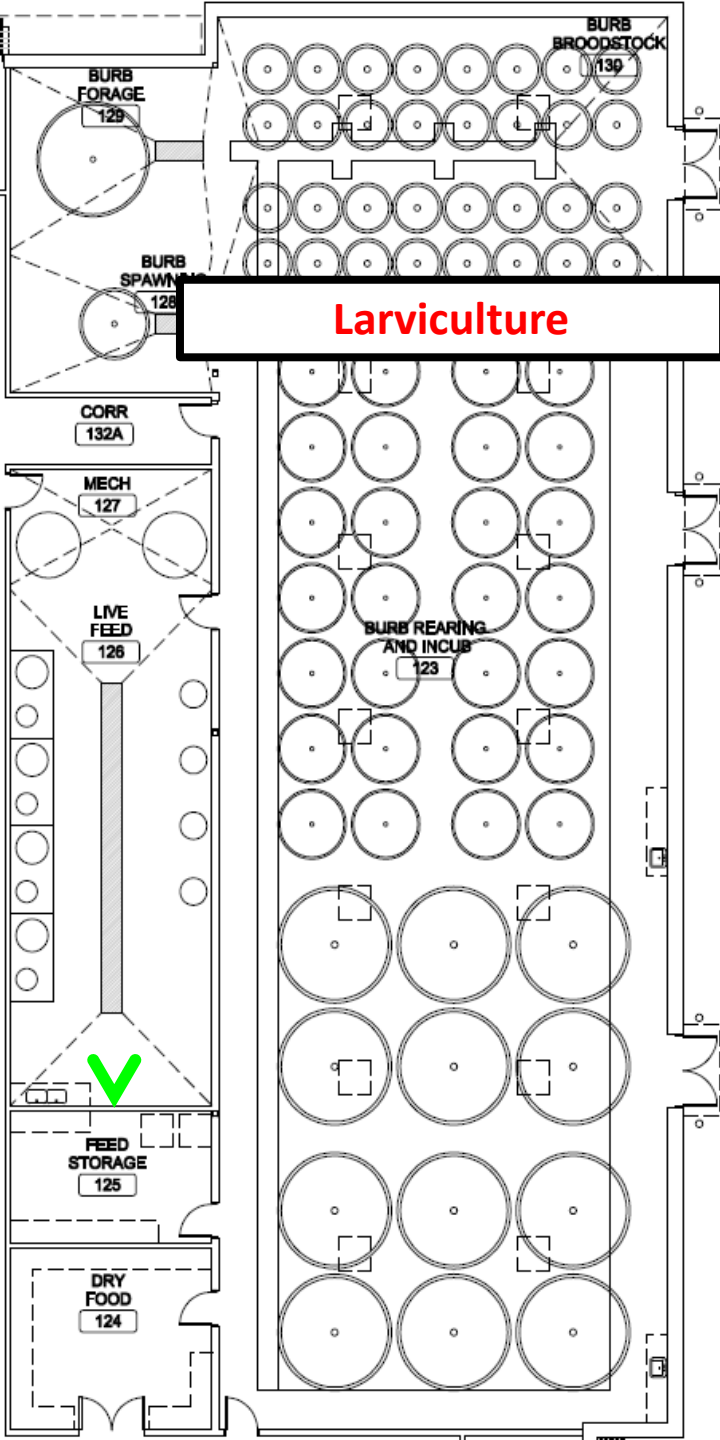
53 Families (28 females x 53 males)

7.2 million eggs

100,000 – 150,000 eggs per family

45 days @ 3.0°C



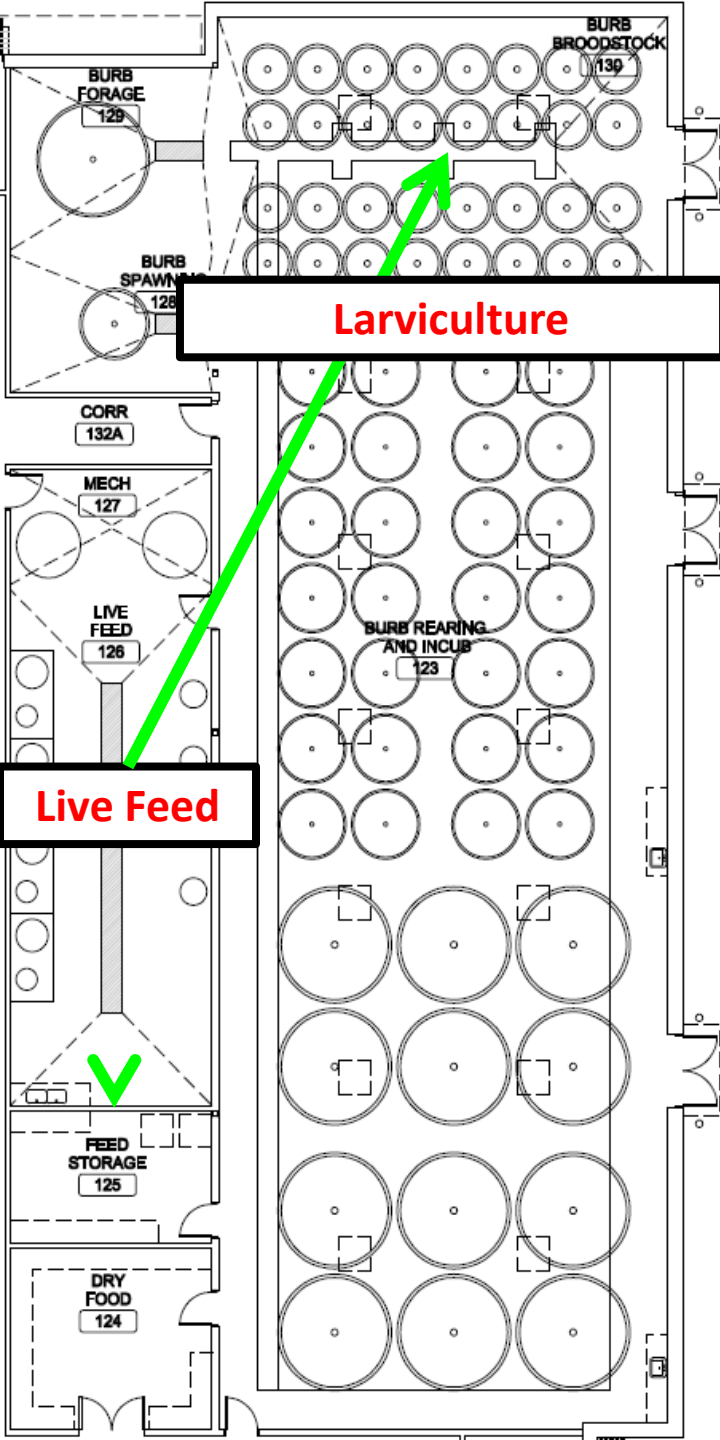


Hatch occurred 40 – 60 days post-fertilization at 2-5 C.

In 2015, larval burbot were kept at ambient or below source water temps.

Feeding of rotifers was initiated 7 dph when first mouth and gut formation was observed.





First feeding starts 7 – 10 days after hatch.

### Live Feed Progression:

- ✓ Rotifers provided 30 – 45 days total.
- ✓ ~ 300 million rotifers per day.
- ✓ Then, start to co-feed San Francisco Bay Artemia (smaller) with rotifers when gape size allows diet shift.
- ✓ Discontinue rotifers; and co-feed Great Salt Lake Artemia (larger) with SF Bay Artemia.
- ✓ Discontinue SF Bay Artemia, GSL artemia until conversion to dry feeds.



APRIL - MAY

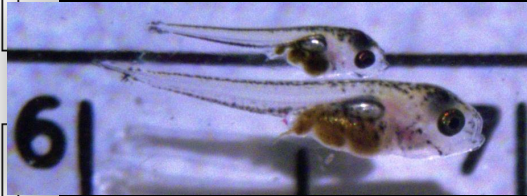


MAY - JUNE



**Spawning**

**APRIL - JUNE**



- Transition to dry feed.
- Pathogen control.

**Incubation / Larviculture**

**JULY**



- Controlling cannibalism.

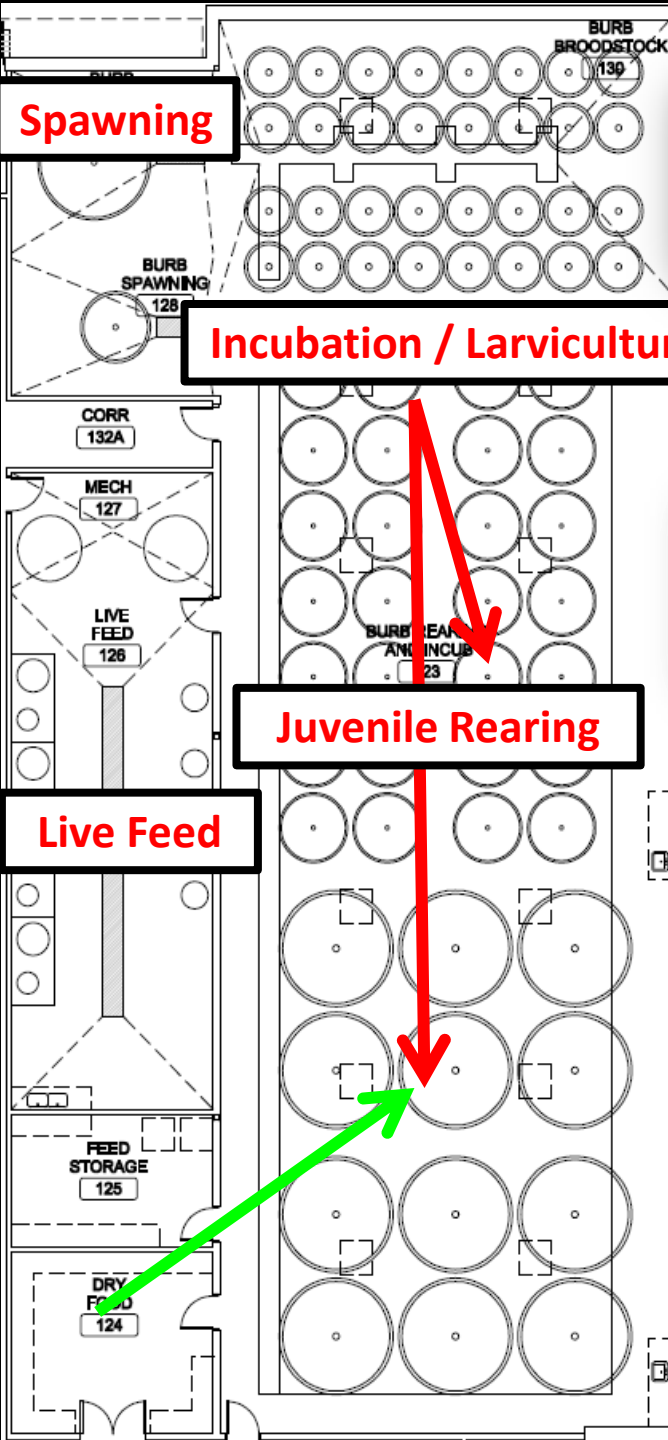
**Juvenile Rearing**

**AUGUST -OCTOBER**



- Density and water quality.

**Live Feed**



**Spawning**

**Incubation / Larviculture**

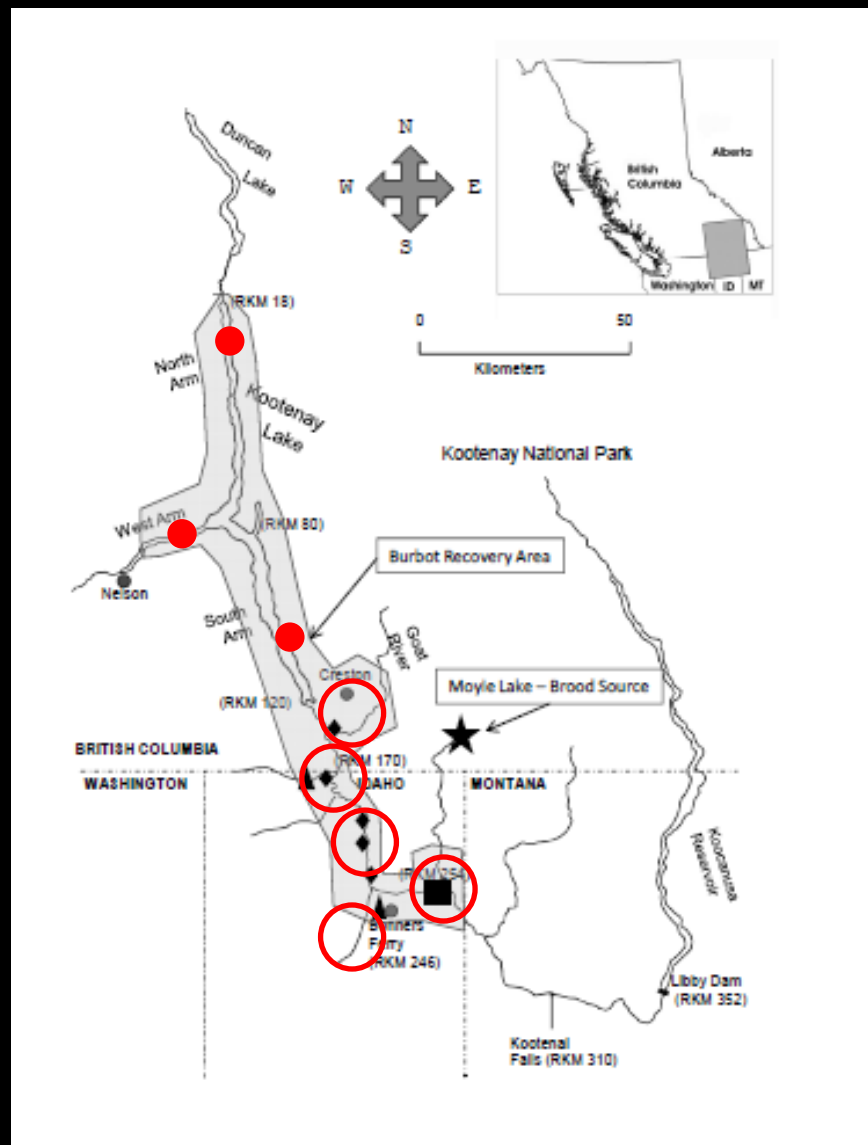
**Juvenile Rearing**

**Live Feed**



**Release to Kootenai River, Lake, and tributaries**

# Burbot Release Sites



## Releases to River / Lake

Life Stage	2009	2010	2011	2012	2013	2014	Totals
Larvae*	-	-	49,000	265,000	500,000	-	814,000
Juv*(2 mo.)	-	-	-	15,000	-	-	15,000
<b>Juv** (6 mo.)</b>	-	1,576	21,133	16,000	11,000	3,467	53,176
1 year	179	551	90	653	600	224	2,297
2 year	23	18	62	82	71	16	272
3 year	7	5	-	-	-	-	12
4 year	-	-	-	-	-	16	16
<b>Totals</b>	209	2,150	70,285	296,735	511,671	3,723	884,773

All burbot rearing through 2014 was completed at University of Idaho – Aquaculture Research Institute.

## Projected Age Structure from 2009 - 2014 Releases

Approximately 4,000 – 6,000 sexually mature adult burbot (> Age-2).

This approximation would be a very good start to population re-building; however, it would not meet the long-term restoration goals of 17,000 adults.

## Future Burbot Releases

The goal with Twin Rivers Hatchery is to release more burbot and expand release sites.

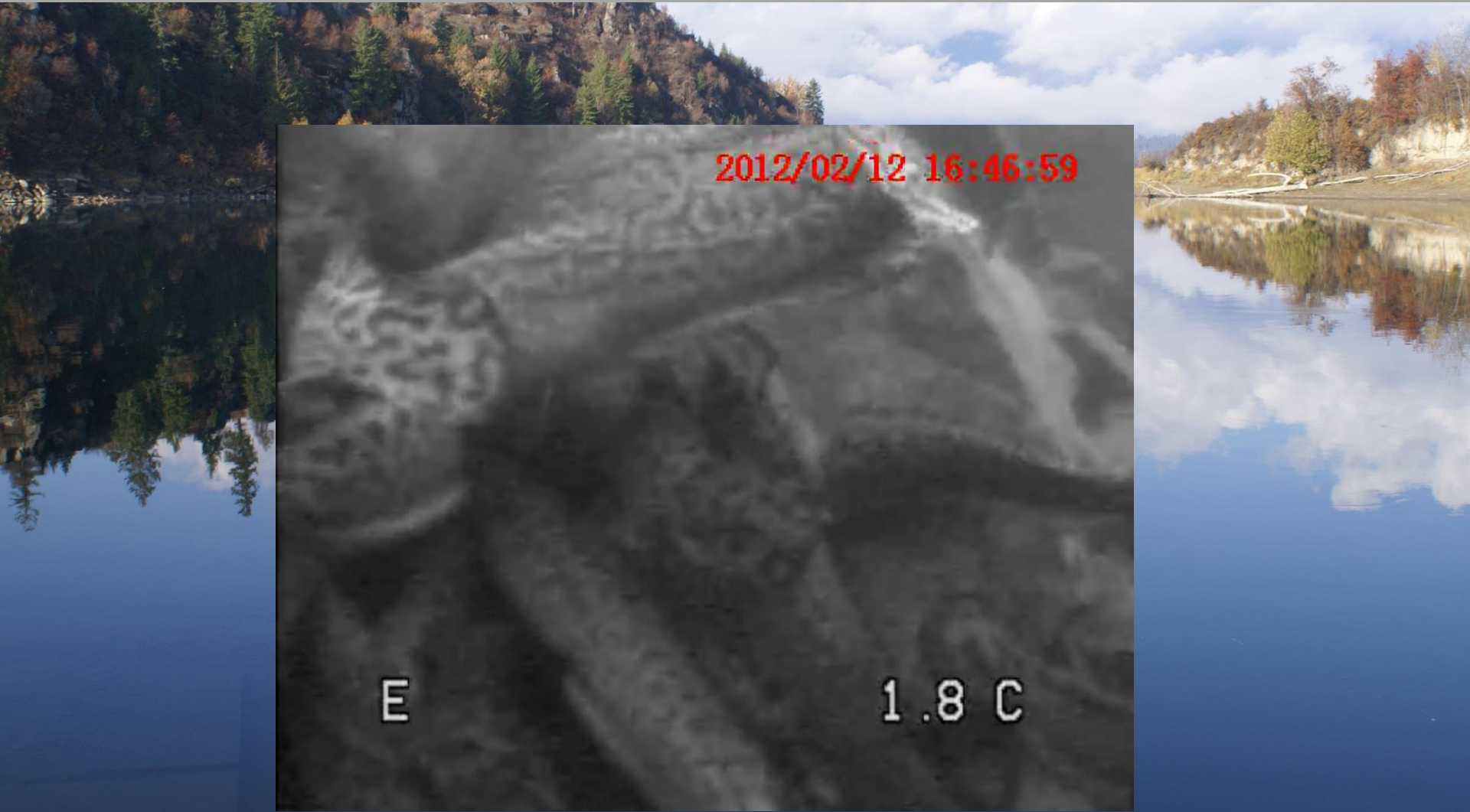
Proposed expansion:

- Up to 125,000 6-month juveniles per year class.
- A combination of 6-month old and 1-year old burbot per year class.
- South, West, and North Arms of Kootenay Lake.
- Increase number of receiving tributaries in Idaho and BC.
- Montana below Kootenai Falls.
- Wider dispersal in main river.
- Habitat restoration sites.
- Keep families separate for tracking genetic contributions.

# SUMMARY

- Twin Rivers Hatchery is operational, and staff are currently rearing both burbot and sturgeon.
- To date, burbot culturing has progressed very well.
- An experimental release of 600,000 feeding-larvae was completed mid-May 2015. Larval burbot that were successfully feeding on live zooplankton in the hatchery were transported to Ambush Rock and Porthill. Those (2) sites were selected because those areas have been supporting survival of hatchery-reared and wild fish.
- Currently, approx. 325,000 juvenile burbot have survived the transition to dry fish feeds.

Results indicate hatchery-reared burbot are surviving, growing, and spawning in-river. This is very encouraging; however, the ultimate goal is to restore natural recruitment to levels sustaining a harvestable population.



# Thanks to all our partners for continued support of the Kootenai River Restoration Program!



**Bonneville Power Administration (FUNDING)**  
**Northwest Power and Conservation Council**  
**Idaho Department of Fish and Game**  
**BC Ministry of Forests Land Natural Resource Operations**  
**Montana Fish Wildlife and Parks**  
**U.S. Army Corp of Engineers**  
**U.S. Fish and Wildlife Service**  
**U.S. Geological Survey**  
**Kootenai Valley Resource Initiative**  
**Boundary County**  
**City of Bonners Ferry**  
**Idaho Department of Environmental Quality**  
**Idaho Department of Water Resources**  
**Idaho Office of Species Conservation**  
**Natural Resource Conservation Service**  
**Local Landowners**  
**U.S. Forest Service**  
**Bureau of Land Management**  
**AND MORE!!!**

