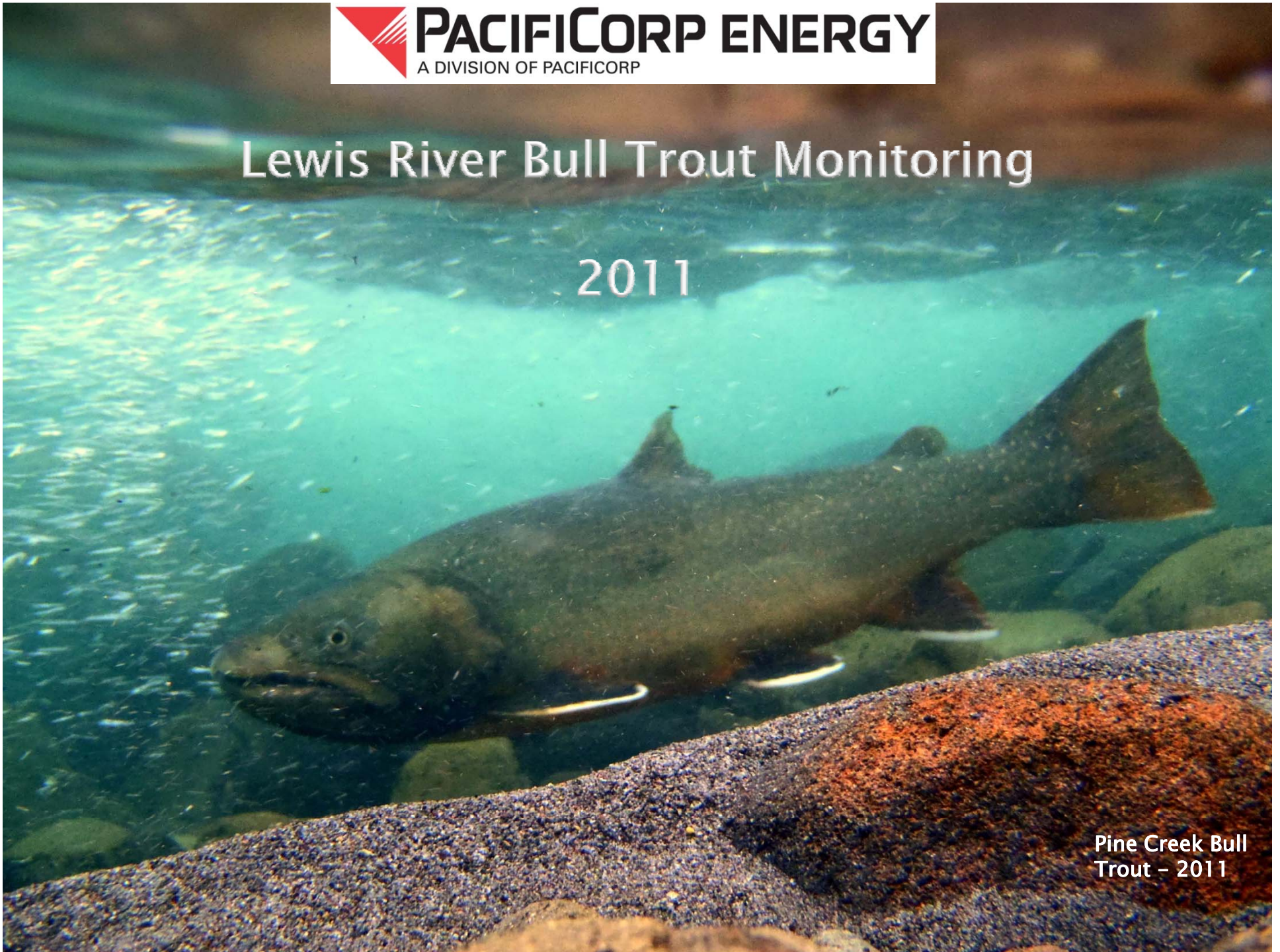


# Lewis River Bull Trout Monitoring

2011

Pine Creek Bull  
Trout - 2011



# Bull Trout Annual Operating Plan Programs Completed in 2011

1. Swift Reservoir adult migration estimate
2. Half-duplex Passive Integrated Transponder (PIT) tag antenna arrays in Pine and Rush Creeks
3. Yale tailrace collection and transport
4. Swift Bypass Reach collection and transport
5. Swift No. 2 power canal collection and transport
6. Cougar Creek spawner surveys and half-duplex PIT tag antenna array
7. Bull trout redd surveys of Pine Creek tributary P8 and redd surveys of an index area in Pine Creek mainstem to establish “redd-life”
8. Lewis River genetic baseline sample collection



# Swift Reservoir Adult Bull Trout Migration Estimate

- ▶ Per the FERC Swift No. 1 Project license Article 402(b) and Lewis River Settlement Agreement Section 9.6, The Utility must evaluate the Swift Reservoir bull trout population annually.
- ▶ Current estimate is a mark/recapture of bull trout staging in the Eagle Cliffs area of Swift Reservoir during the spring and early summer that subsequently migrate upstream to areas of the North Fork Lewis River during the late summer early fall.
- ▶ Bull trout are captured with tangle nets in and around the Eagle Cliffs area and marked with a visual Floy® tag.
- ▶ To recapture migrating bull trout, snorkel surveys are performed on portions of the North Fork Lewis River mainstem, Rush, and Pine Creeks. All observed bull trout are enumerated and a distinction is made between Floy® tagged (marked) bull trout and unmarked bull trout.
- ▶ Proportion of tagged to non-tagged bull trout is the driver for the mark/recapture migration estimate.

- ▶ 99 bull trout were captured during twelve netting days in the Eagle Cliffs area of Swift Reservoir. Of these 99 captures, 86 were tagged with white colored Floy® tags.
- ▶ Historical Rush and Pine Creek snorkel index areas were each surveyed three times in August and September. During these surveys a total of 116 unmarked bull trout and 31 white Floy® tagged bull trout were observed.
- ▶ New in 2011, confluence areas of the North Fork Lewis River with the Muddy River, Pine, and Rush Creeks were each snorkeled on eight occasions August–October. During these surveys a total of 305 unmarked bull trout and 68 white Floy® tagged bull trout were observed.



Pine Creek

Muddy River

Lewis River

Rush Creek

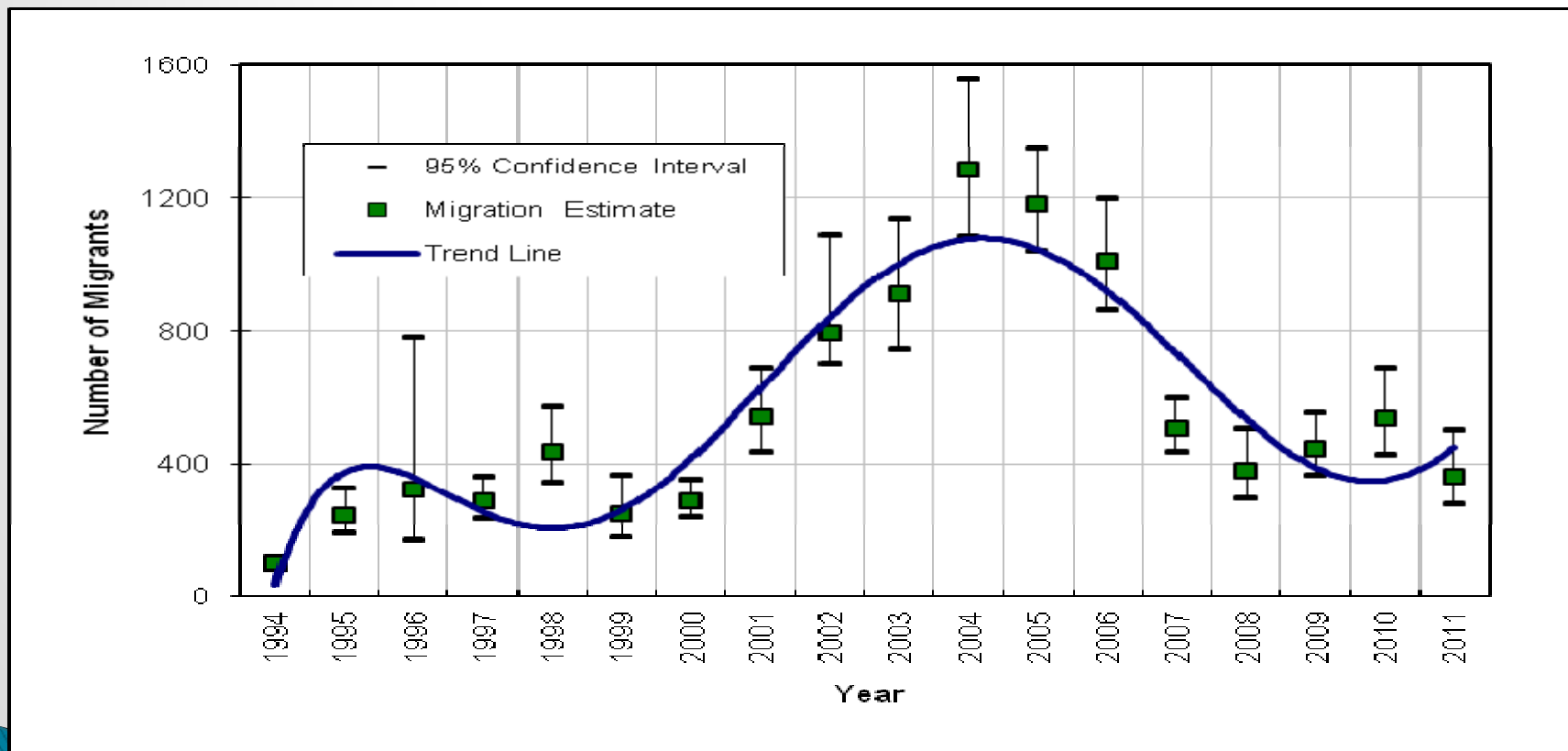
Swift Res.

Confluence snorkel areas

Pine and Rush snorkel index breaks



Graph representing historical and current migration estimate and associated trend line. An estimated 364 bull trout migrated upstream from the Eagle Cliffs area of Swift Reservoir during the 2011 migration period (Aug–Oct). Estimates on this graph are derived from marked fish at Eagle Cliffs and subsequent recaptures during snorkel surveys of historical index areas within Rush and Pine Creeks.



Tabular data from previous slides graph. Previous graph represents only an estimate derived from tributary surveys, 2011 data below also incorporates a migration estimate utilizing data from confluence surveys, and from a tributary and confluence area combination (bold).

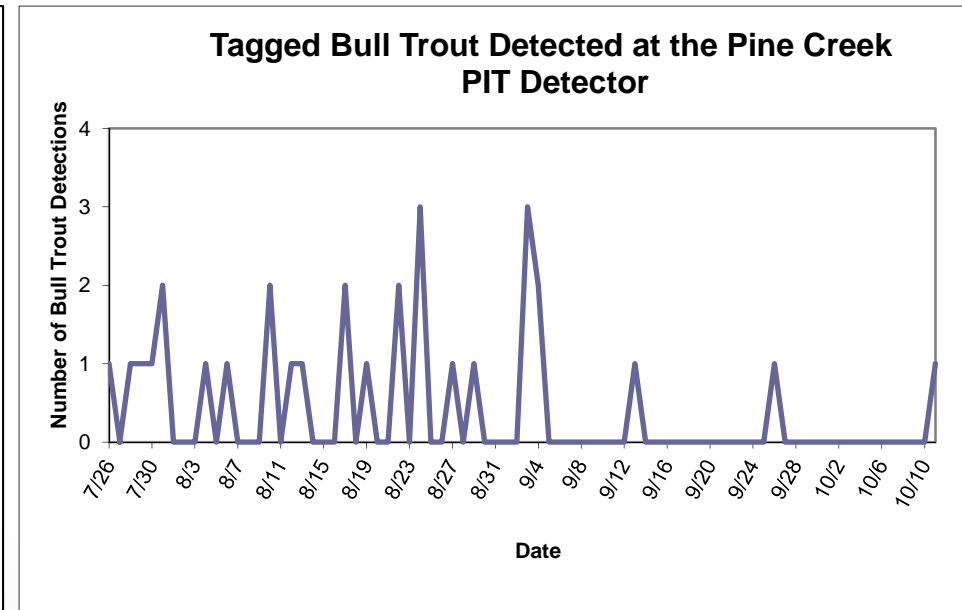
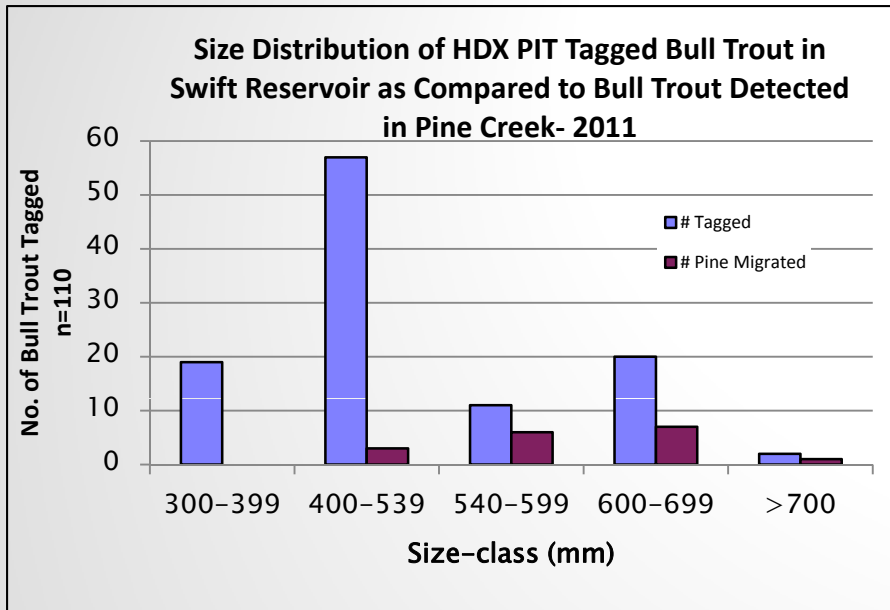
Year	Lower Bound (95% CL)	Upper Bound (95% CL)	Migration Estimate
1994	85	118	101
1995	193	326	246
1996	173	782	325
1997	235	361	287
1998	345	571	437
1999	181	365	248
2000	242	352	288
2001	439	689	542
2002	701	1092	792
2003	745	1140	911
2004	1084	1556	1287
2005	1042	1354	1181
2006	865	1198	1011
2007	436	596	505
2008	298	507	380
2009	367	554	445
2010	430	690	536
<b>2011 (tribs.)</b>	<b>278</b>	<b>502</b>	<b>364</b>
<b>2011 (confluences)</b>	<b>362</b>	<b>539</b>	<b>436</b>
<b>2011 (tribs and conflu. combined)</b>	<b>354</b>	<b>493</b>	<b>414</b>

# Half-Duplex PIT Tag Antennas in Rush and Pine Creeks

- ▶ PIT tag antenna in Pine Creek was stream-spanning and located in a shallow riffle approximately 300 meters upstream from the mouth
- ▶ Rush Creek antenna was stream-spanning and located in a shallow run approximately 250 meters upstream from the mouth.
- ▶ A total of 110 HDX PIT tags were inserted into bull trout in Swift Reservoir and the fish then released. 89 were Eagle Cliffs captures, 15 were captured and transported from the Swift Bypass Reach, 5 were captured and transported from the Swift Power Canal, and 1 was captured and tagged at Swift Creek.
- ▶ Of the 89 HDX tagged Eagle Cliffs captures, 20 were already previously tagged with a full-duplex PIT tag.
- ▶ Currently, the 2011 Swift Reservoir PIT tag and detection data is being analyzed using the population structure software program MARK for estimates of the following:
  - Probability of participating in a spawning migration
  - Probability of detection during spawning
  - Annual Survival

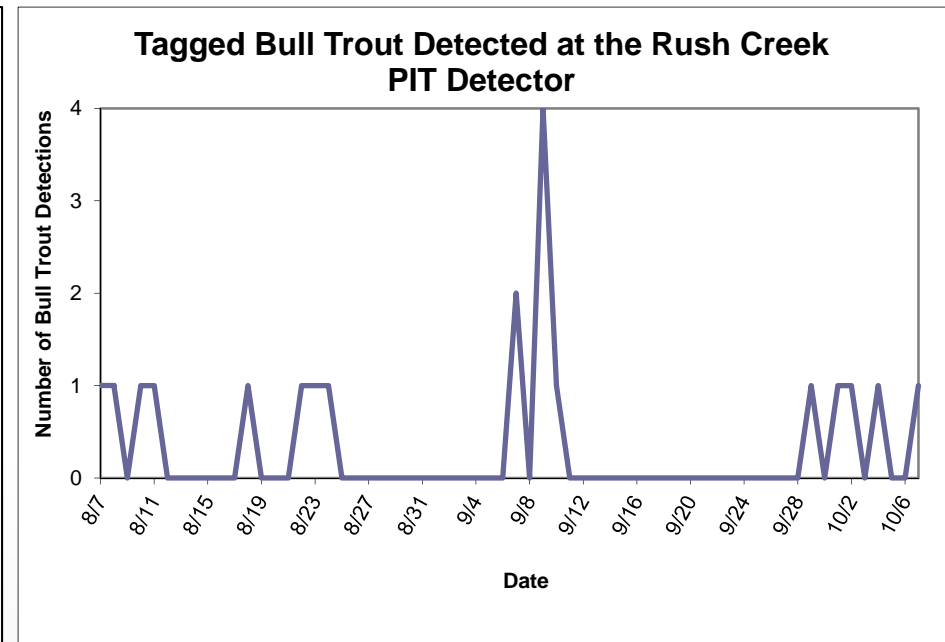
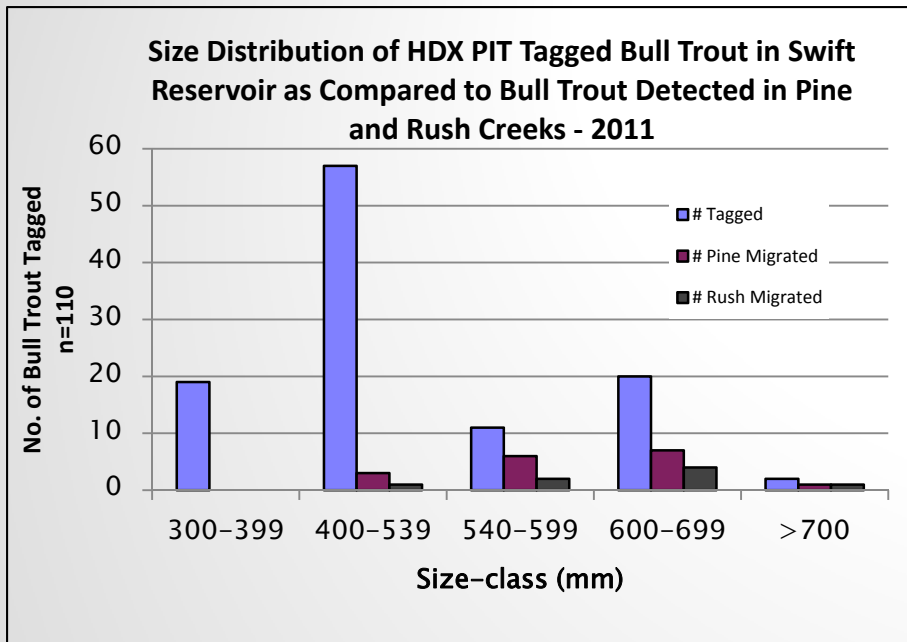


# Pine Creek PIT Antenna



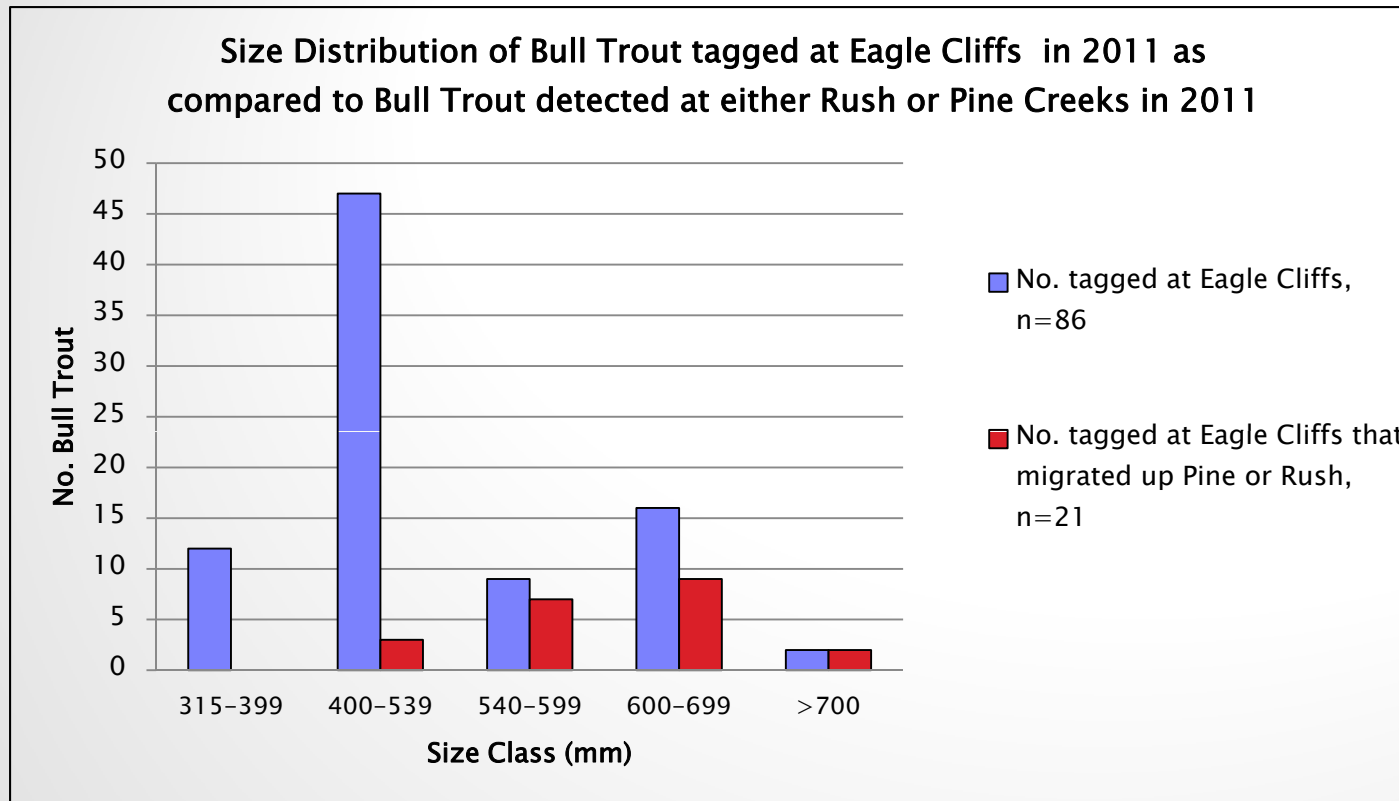
- Pine Creek antenna was constructed and powered up on July 26<sup>th</sup>. The antenna ran continuous, except for a 53 hour power loss from Sep 6<sup>th</sup>–9<sup>th</sup>, until taken out of the creek on Nov 4<sup>th</sup>.
- 17 individual bull trout were detected moving past the Pine Creek antenna, 14 were from capture and tagging efforts in the Eagle Cliffs area while the remaining three were captured and tagged in the Swift Bypass Reach and transported upstream and released into Swift Reservoir.
- Of the 17 individuals detected, four were tagged in the dorsal sinus with both a full-duplex and a half-duplex PIT tag.

# Rush Creek PIT Antenna



- Rush Creek antenna was constructed and powered up on August 5<sup>th</sup>. The antenna ran continuous, except for a 32.5 hour power loss from Sep 15<sup>th</sup>–16<sup>th</sup>, until taken out of the creek on Oct 27<sup>th</sup>.
- 8 individual bull trout were detected moving past the Rush Creek PIT antenna, 7 were captured and tagged in the Eagle Cliffs area while the remaining one was captured and tagged in the Swift Bypass Reach and transported upstream and released into Swift Reservoir.
- Of the 8 individuals detected, five were tagged in the dorsal sinus with both a full-duplex and a half-duplex PIT tag.

## Size Comparison between Bull Trout Tagged at Eagle Cliffs with a White Floy® and HDX PIT Tag, and Bull Trout that Migrated up Pine or Rush Creeks



- 86 total bull trout were tagged with a white Floy® during Eagle Cliffs collection activities in 2011. Of the total tagged, 59 were <539mm (69% of total); of these, only three were detected moving up a spawning trib (Pine Creek).
- 27 of the total tagged (n=86) were >540mm (31% of total); of these, 18 were detected moving up a spawning trib.
- The 86 white Floy® tagged bull trout were the “mark” group from which the Swift Upstream Migration Estimate was derived. Historical “recapture” areas are index sites within the spawning tribs (Pine and Rush) as well as Rush Creek Hole in the Lewis River mainstem. This data suggests that the smaller size-class tagged fish simply do not migrate, or they migrate at a much lesser rate than the larger size-class bull trout. If what was observed in 2011 is the norm, then the Swift Migration Estimate is positively skewed as it does not account for the absence of smaller fish in the recapture areas.



# Yale Tailrace Collection and Transport

- ▶ Required per the Project's FERC license Article 402(a) and the Lewis River SA section 4.9.1 & 4.9.2
- ▶ Sampled six times in June–August
- ▶ A total of six bull trout were captured. Of these six, five were transported and held at Speelyai Hatchery to await genetic assignment and one was a capture mortality.
- ▶ All five genotyped Yale Tailrace captures had Likelihood of Origin scores less than 99% for a Swift population (Rush or Pine) and so were transported and released into Yale Reservoir.
- ▶ All five were later interrogated passing the Cougar Creek HDX PIT tag detector.

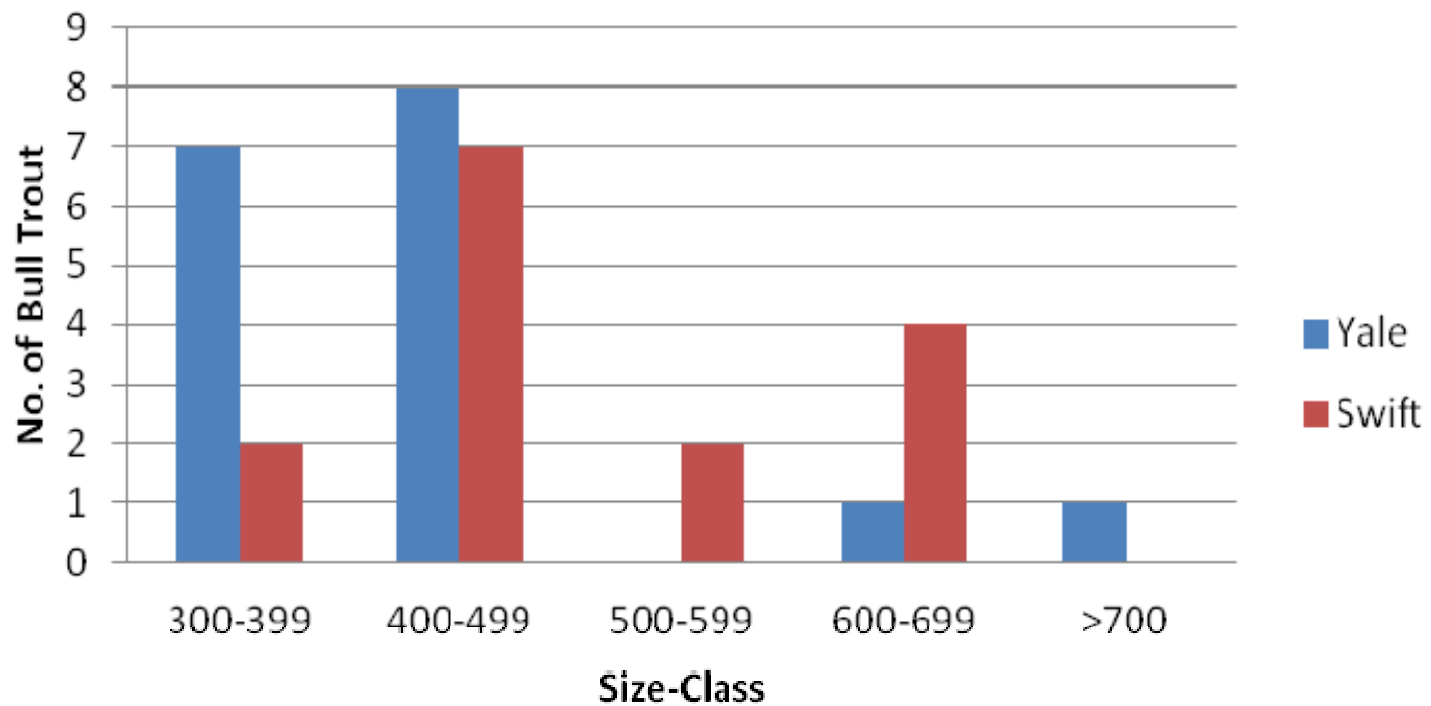
# Bull Trout Capture and Transport Activities from within the Swift Bypass Reach

- ▶ Per the Swift No. 1 and No. 2 FERC licenses' Article 402(a) and the Lewis River SA section 4.9.1 & 4.9.2. Required to sample areas of the Swift No. 2 tailrace for bull trout; capture location changed in 2007 to the Swift Bypass Reach.
- ▶ The bypass reach was sampled seven times from June 8–August 8.
- ▶ A total of 32 bull trout were captured from areas within the Swift Bypass Reach and transported to Speelyai Hatchery to be held while awaiting genetic assignment.
- ▶ The longest a bull trout was held while awaiting genetic assignment was 72 hours, average time held was <48 hours.
- ▶ 17 of the 32 bull trout were genotyped as either endemic to the Cougar Creek population, or did not score high enough in the Likelihood of Origin category to a Swift population (Rush or Pine) and so were transported and released back into Yale Reservoir.
- ▶ The remaining 15 of the 32 bypass reach bull trout captures in 2011 scored high enough in the Likelihood of Origin analysis to either the Rush or Pine population (>99%), and as such were transported and released into Swift Reservoir.
- ▶ Of the 15 fish transported to Swift, three were detected moving past the PIT antenna in Pine Creek and one past the PIT antenna in Rush Creek.
- ▶ Of the three detected in Pine Creek, 2 had Likelihood of Origin scores to Pine Creek at 100% and the other scored to Pine Creek at 89% and Rush Creek at 11%.
- ▶ The transported bull trout detected at Rush Creek scored 100% to the Rush population in the Likelihood of Origin analysis.





### Size Distribution of Transported Bull Trout from the Swift Bypass Reach - 2011



# Bull Trout Collection and Transport from within the Swift Power Canal

- ▶ Surveyed four times from March - August.
- ▶ Five bull trout were captured from within the power canal and transported upstream for release into Swift Reservoir.
- ▶ None of these fish were encountered at Eagle Cliffs during collection activities or interrogated at a stream PIT detector

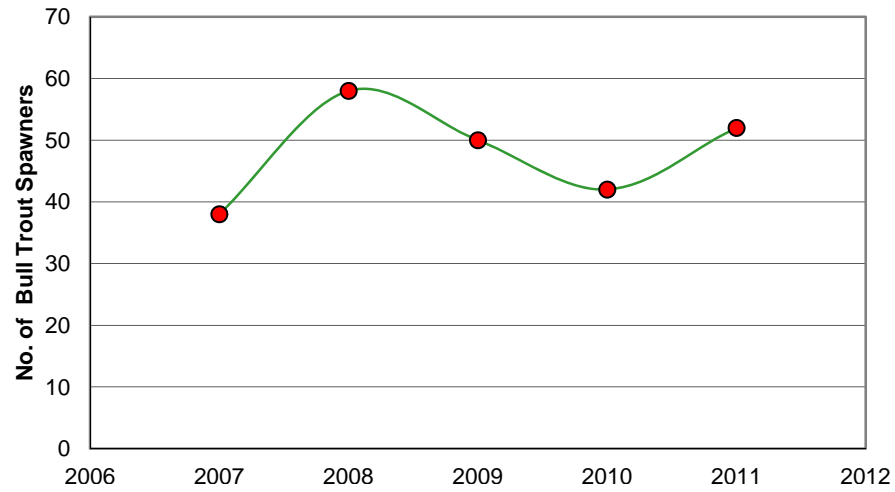
Date	FL(mm)	Genetic vial	Weight (grams)	HDX PIT Tag
7/27/2011	367	2030-058	580	A89AF47
7/27/2011	379	2030-057	680	A89AF46
7/29/2011	542	2030-055	2200	A89AF44
7/29/2011	525	2030-054	1800	A89AF43
8/2/2011	410	n/a	1010	A89AF3F

# Bull Trout Spawning Surveys

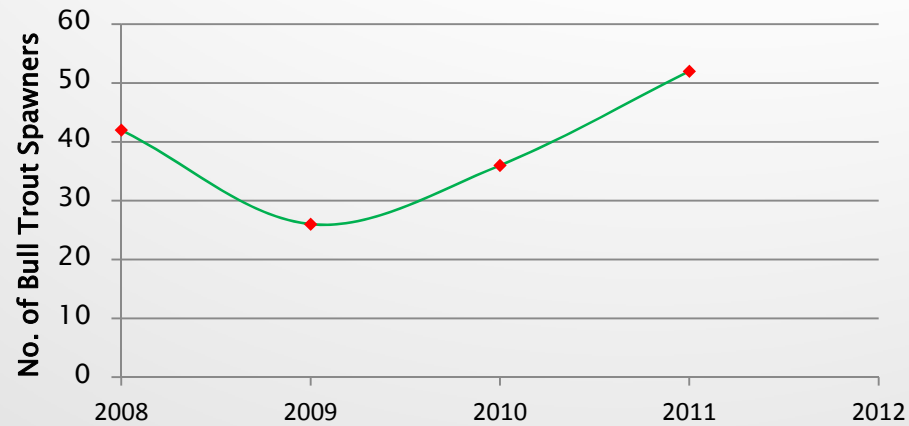
- ▶ The Yale Project FERC license Article 402(b) and Lewis River SA section 9.6 require the Cougar Creek bull trout population to be monitored annually.
- ▶ **Cougar Creek** surveyed six times, weekly Sep 19<sup>th</sup> – Oct 24<sup>th</sup>.
- ▶ 26 total bull trout redds observed, peak of nine new redds recorded on Oct 3<sup>rd</sup> survey.
  
- ▶ **P8** surveyed four times, weekly Sep 20<sup>th</sup> – Oct 14.
- ▶ 26 total bull trout redds observed, peak of eleven new redds recorded on Sep 27<sup>th</sup> survey.
  
- ▶ **Pine mainstem** 400 meter index area surveyed three times, weekly Sep 27<sup>th</sup> – Oct 14.
- ▶ Five total bull trout redds observed, all five redds remained visible for no less than two weeks.



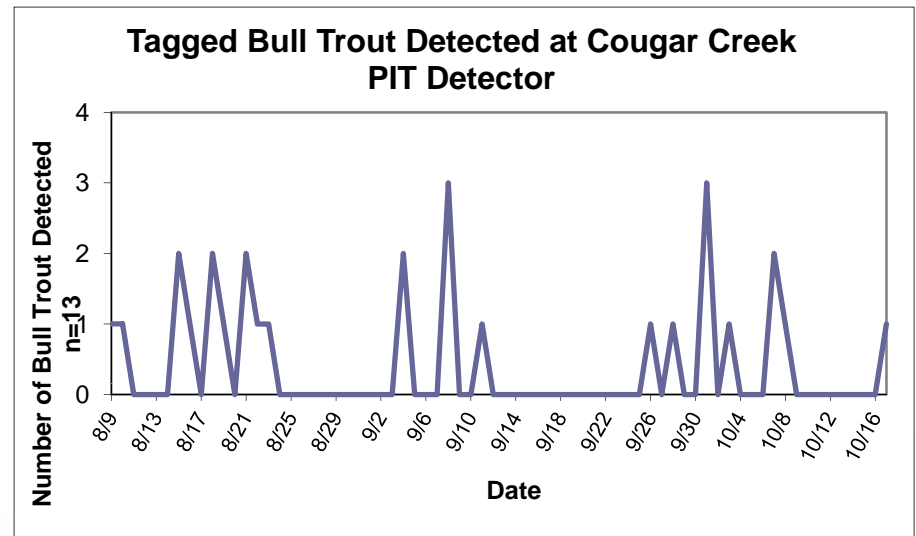
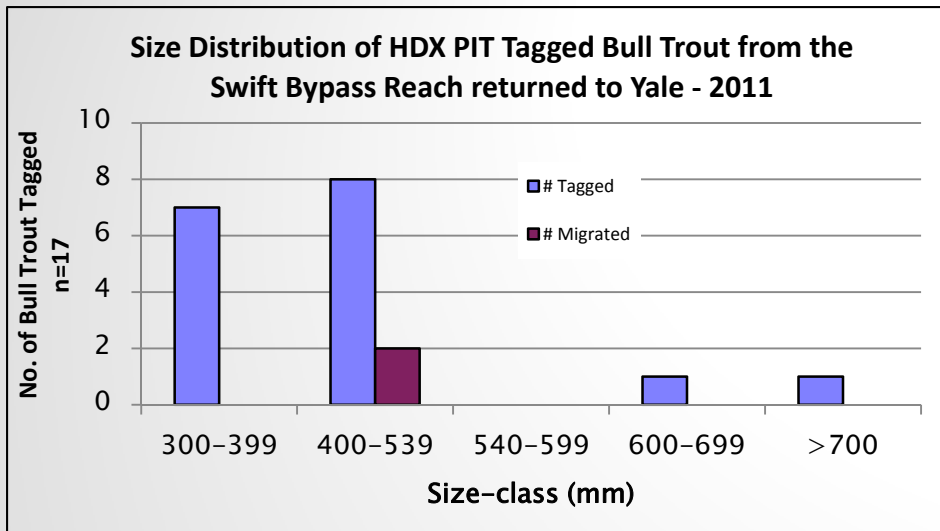
**Cougar Creek Bull Trout Spawner Population Estimate**



**Pine Creek Tributary P8 Bull Trout Spawner Population Estimate**

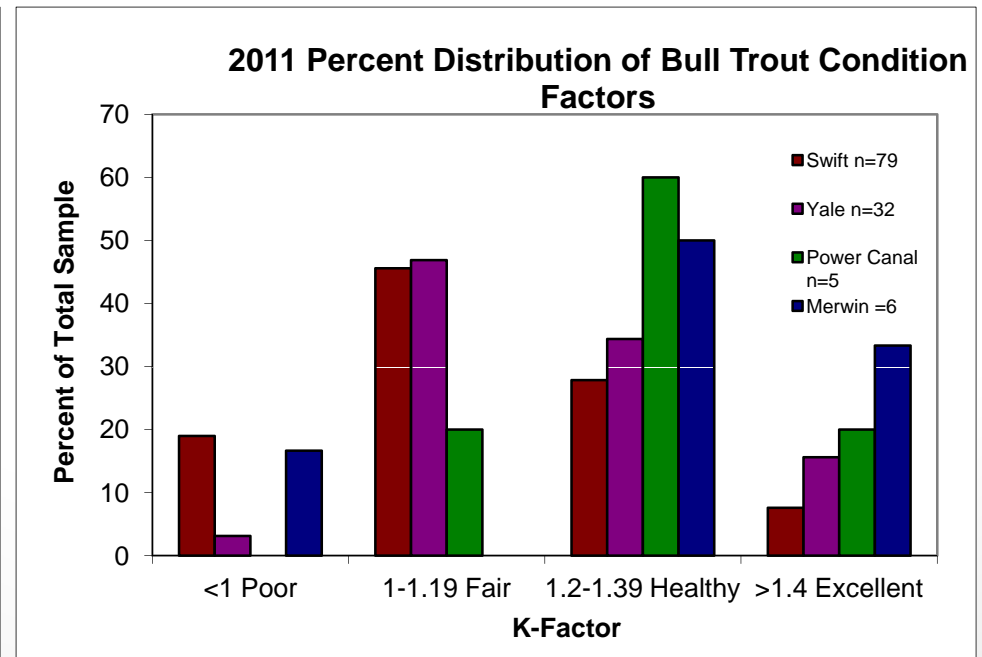
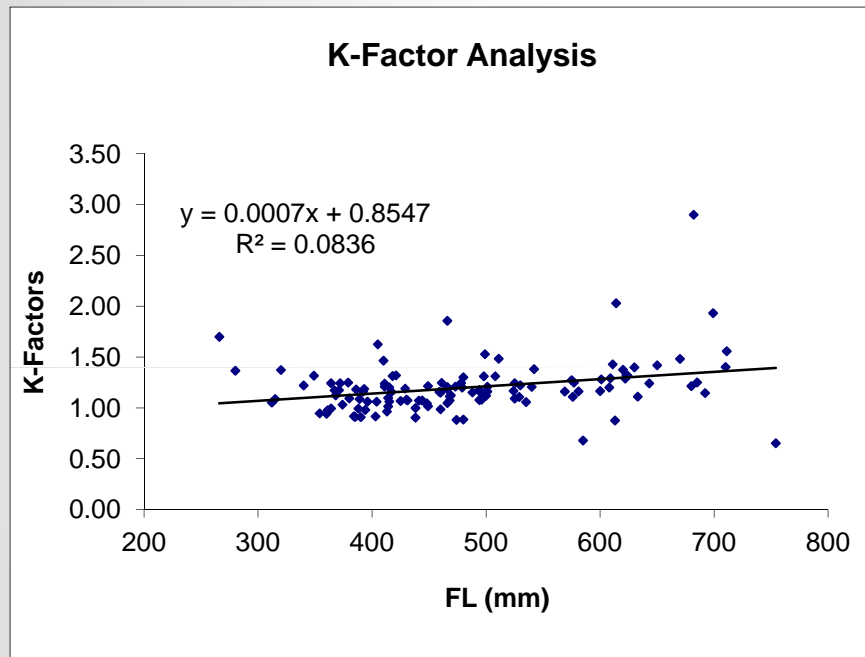


# Cougar Creek PIT Antenna



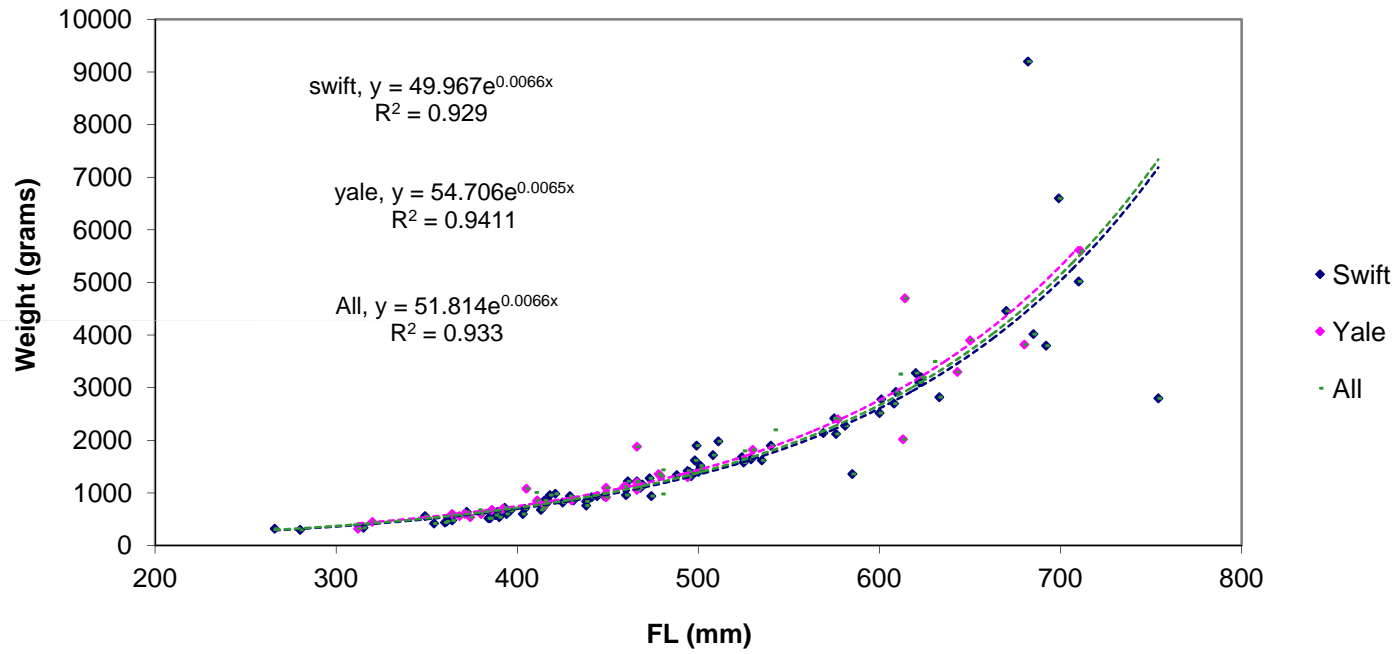
- The Cougar Creek antenna was constructed in early summer 2010. It was powered up and ran continuous until taken out of the creek the third week of November 2011.
- 13 individual bull trout were detected moving past the Cougar Creek PIT antenna in 2011, five were captured, tagged, and transported from within the Yale Tailrace in 2011, six were captured and tagged from areas within the Swift Bypass Reach in 2010 and two were captured and tagged from areas within the Swift Bypass Reach in 2011.
- Only two of the 17 bypass reach captures returned to Yale Reservoir after being held for rapid response genetic analysis in 2011 were detected moving up Cougar Creek in 2011.

# Condition Factors (K) of Bull Trout from Merwin, Yale, and Swift Reservoirs – 2011



- 122 total bull trout weighed from all areas combined in 2011. 79 from Swift Res., 32 from Yale Res., 6 from Merwin Res., and 5 from the Swift Power Canal.
- Median K-factors for Swift bull trout dropped slightly in 2011 (1.15) from 2010 (1.23).
- Median K-factors for bull trout residing in Yale increased in 2011 (1.19) from 2010 (1.13).
- Overall condition factors in 2011 (1.19) remained consistent to what was observed overall in 2010 (1.20).

### 2011 Bull Trout Length to Weight Relation





# 2011 Bull Trout Genetic Tissue Sampling

- ▶ On-going work by the USFWS's Abernathy Conservation Genetics Lab to further refine Lewis River bull trout genetic structure.
- ▶ Pine, Rush, and Cougar Creek were electrofished for juvenile bull trout in 2011. 12 juveniles (48 -66mm) were captured and sampled from Cougar Creek, 11 juveniles (44 - 101mm) were captured and sampled from Rush Creek, and 8 juveniles (69 -154mm) were captured and sampled from Pine Creek.
- ▶ Samples taken from 80 adults during Eagle Cliffs collection activities.

## Utility Proposed 2012 Monitoring

- ▶ Evaluate Swift migration population by means of historical Mark/Recap (trib snorkels). Given success of confluence snorkels, continue to incorporate recaps from these areas (SA 9.6).
- ▶ Generate an estimate of Survival for the Swift Reservoir bull trout population by means of program MARK and detections of tagged bull trout during spring/summer Eagle Cliffs collection activities and at remote PIT antenna locations in Pine, Rush, Muddy, Swift Creek, and the Floating Surface Collector (SA 9.6).
- ▶ Capture and transport bull trout for rapid response genetic analysis from within the Swift Bypass Reach (SA 4.9.1 & 4.9.2).
- ▶ Capture and transport bull trout for rapid response genetic analysis from within the Yale Tailrace (SA 4.9.1 & 4.9.2).
- ▶ Capture and transport bull trout from within the Swift Power Canal.
- ▶ Cougar Creek spawning estimate and PIT tag detector (SA 9.6).
- ▶ Genetic tissue sampling from Pine, Rush, and Cougar Creeks.



The End

Cougar Creek bull trout pair 2009

