Surface Collection and Passage of Juvenile Salmonids at the Two Deepwater Reservoirs of the Baker River Hydroelectric Project, Northwest Washington

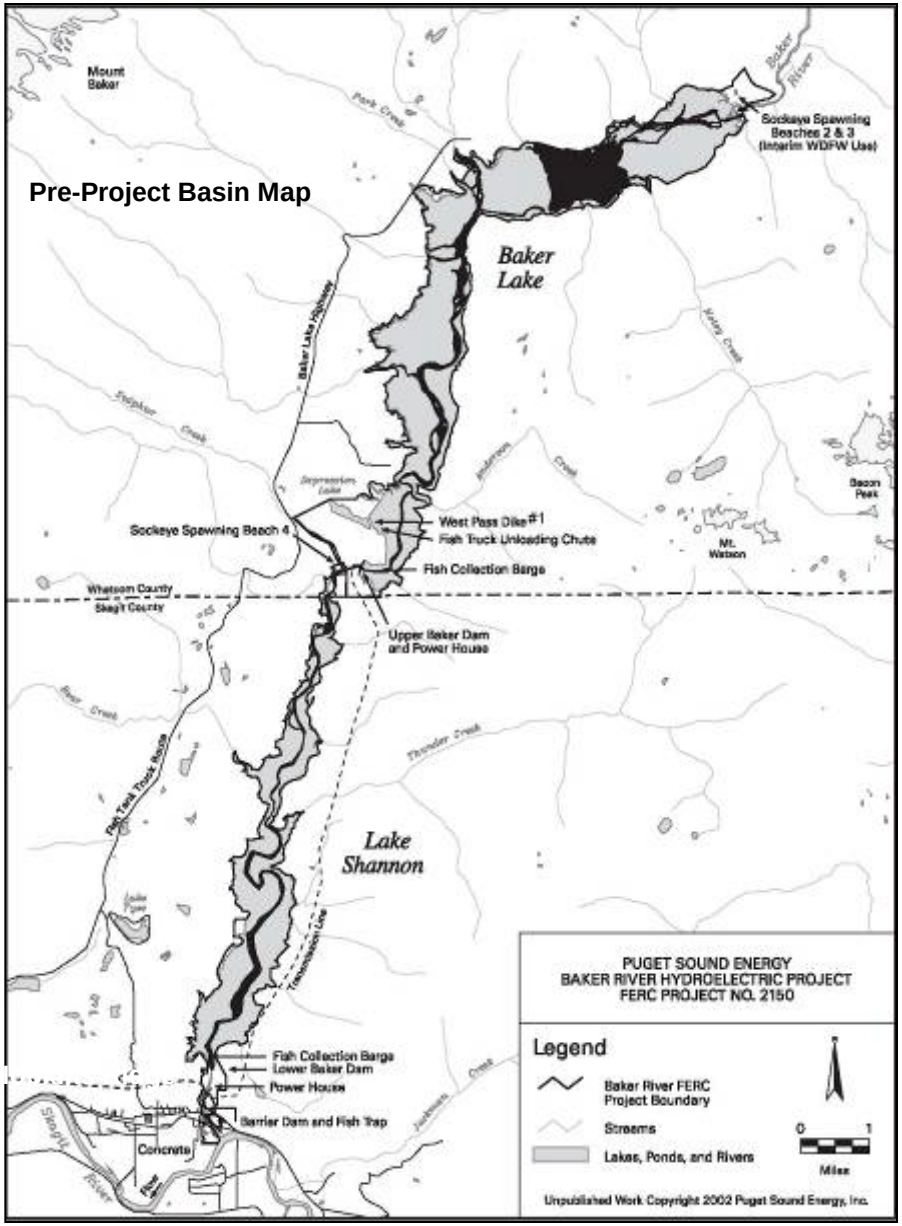
Tim Brush
Normandeau Associates

Nick Verretto
Puget Sound Energy

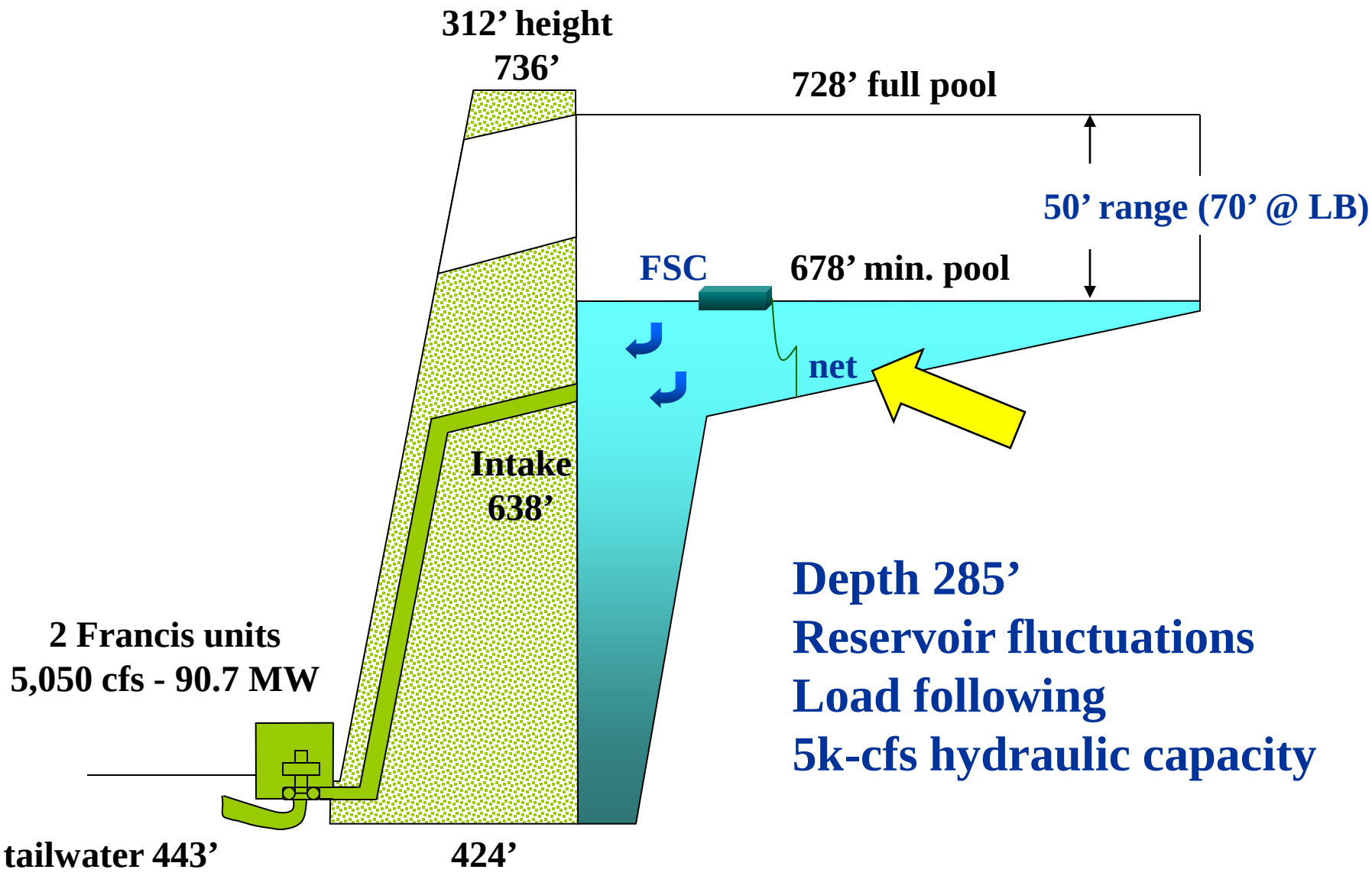
April 22, 2013

Baker River Project Area
Port Alberni
Richmond
Surrey
BRITISH COLUMBIA
Bellingham
Pasayten Wilderness
Oliver
Osoyoos
Grand Forks
Trail
Creston
Bonners Ferry
Republic
Colville
Winthrop
Saanich
Victoria
Anacortes
Mount Vernon
Oak Harbor
Newport
Sandpo
Forks
Port Townsend
Everett
Olympic N.P.
Shoreline
Kirkland
Seattle
Chelan
Electric City
Spokane I.R.
Spokane
Post Falls
Coeur d'Alene
Opportunity
Waterville
WASHINGTON
Renton
Tacoma
Federal Way
Wenatchee
Ephrata
Quincy
Moses Lake
Lakewood
Hoquiam
Aberdeen
Olympia
Ellensburg
Royal City
Ritzville
Colfax
Othello
La Crosse
Centralia
Moscow
Pacific Ocean
South Bend
Chehalis
Yakima
Connell
Pullman
Pomeroy
UNITED STATES
Lewiston
Yakama Indian Reservation
Sunnyside
Richland
Walla Walla
Kennewick
Astoria
Longview
Seaside
Hermiston
Milton-Freewater
Hood River
Goldendale
Stevenson
Portland
The Dalles
Pendleton
Hillsboro
Enterprise
St. Ma

Project Description



Upper Baker Dam

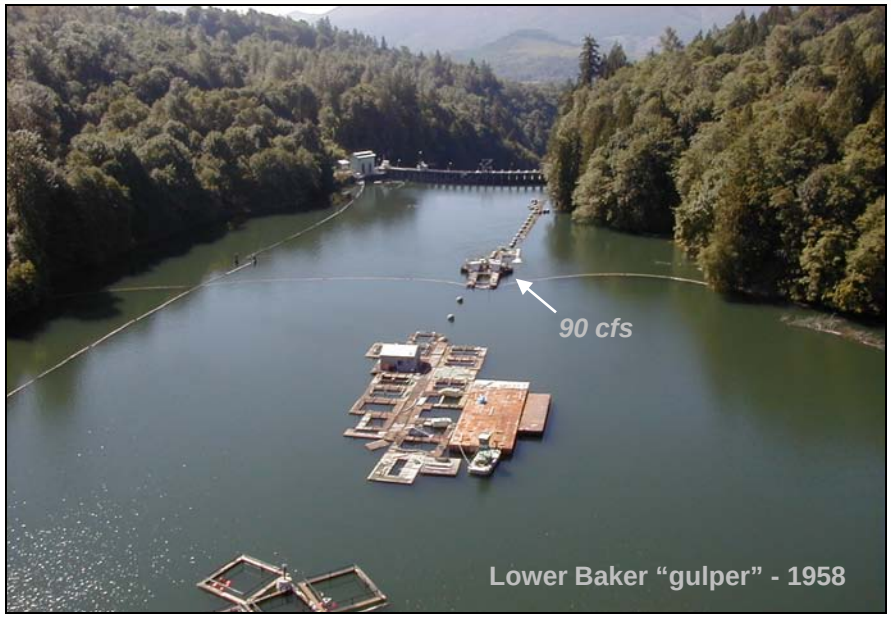


Depth 285’
Reservoir fluctuations
Load following
5k-cfs hydraulic capacity

Original Collectors

LB "gulper" installed 1958

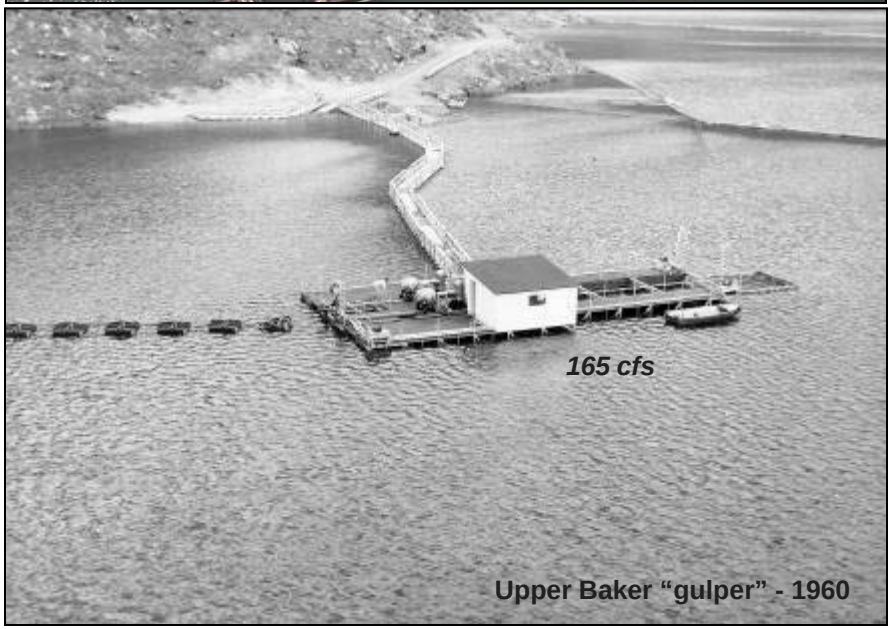
- Tested two years
- 90-cfs flow
- 36' x 68'
- Bypass pipeline to tailrace



Lower Baker "gulper" - 1958

UB "gulper" installed 1960

- 165-cfs flow
- Bypass pipeline to tailrace

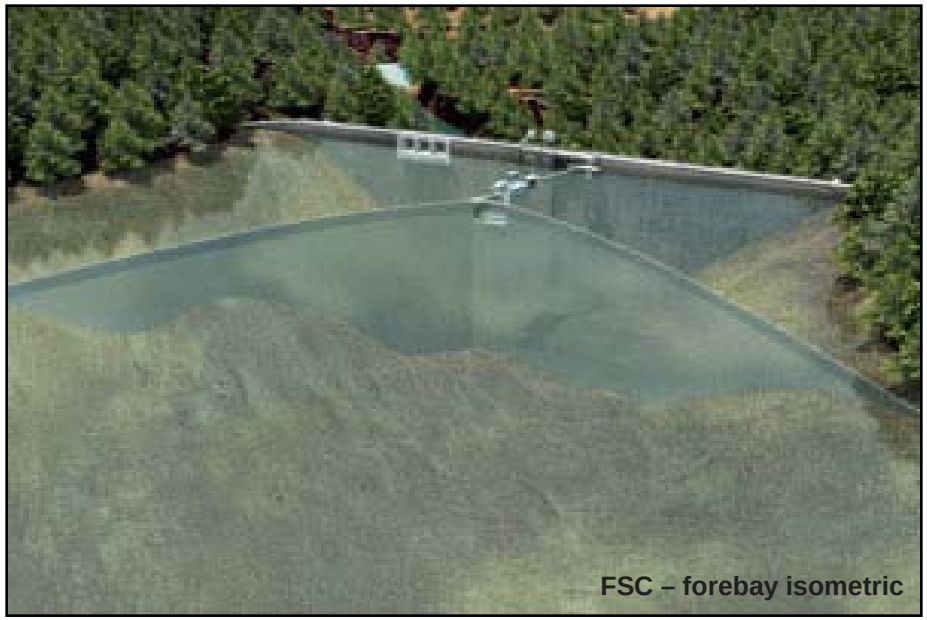


Upper Baker "gulper" - 1960

New Collector, Upper Baker

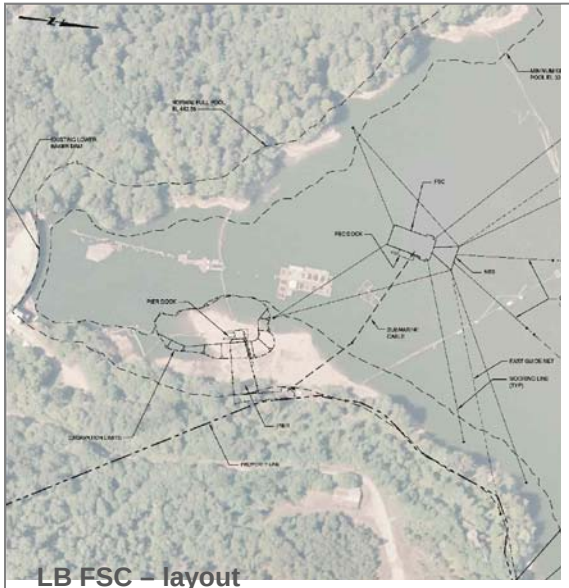
- “Dry-dock” configuration
- Four primary pumps
- Four secondary pumps
- 500/1,000-cfs flow
- Trap-&-haul
- NTS & full net

UB FSC – in operation

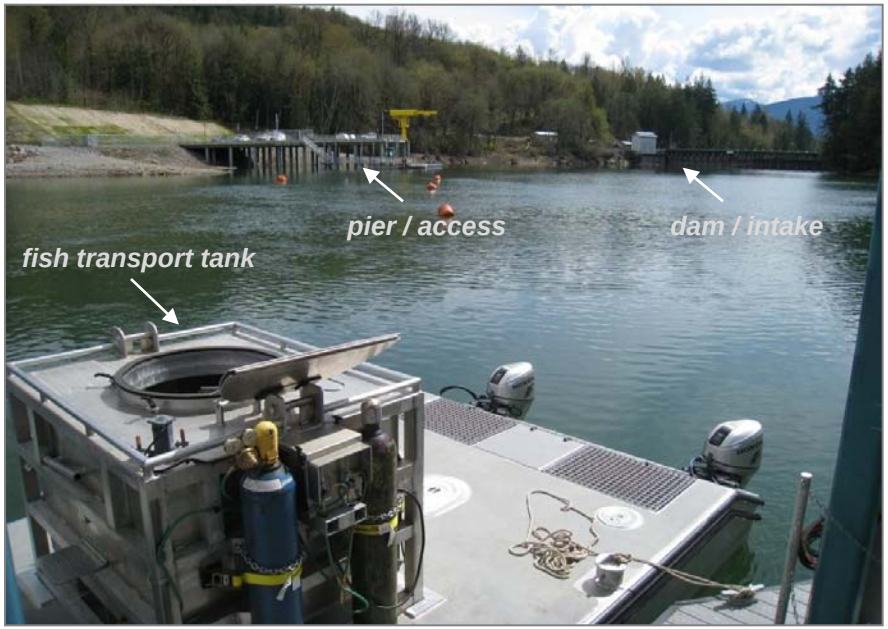

FSC – forebay isometric

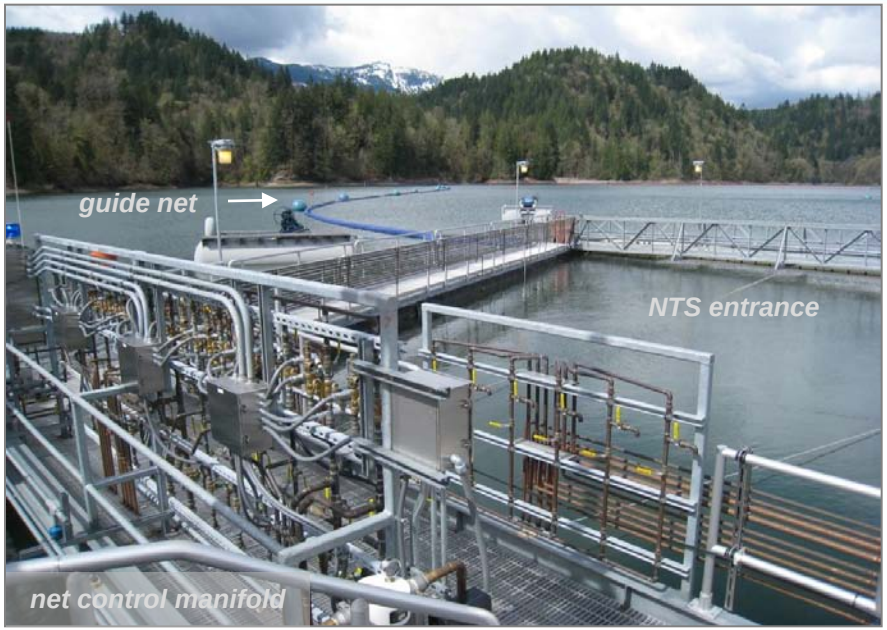
NTS – launch

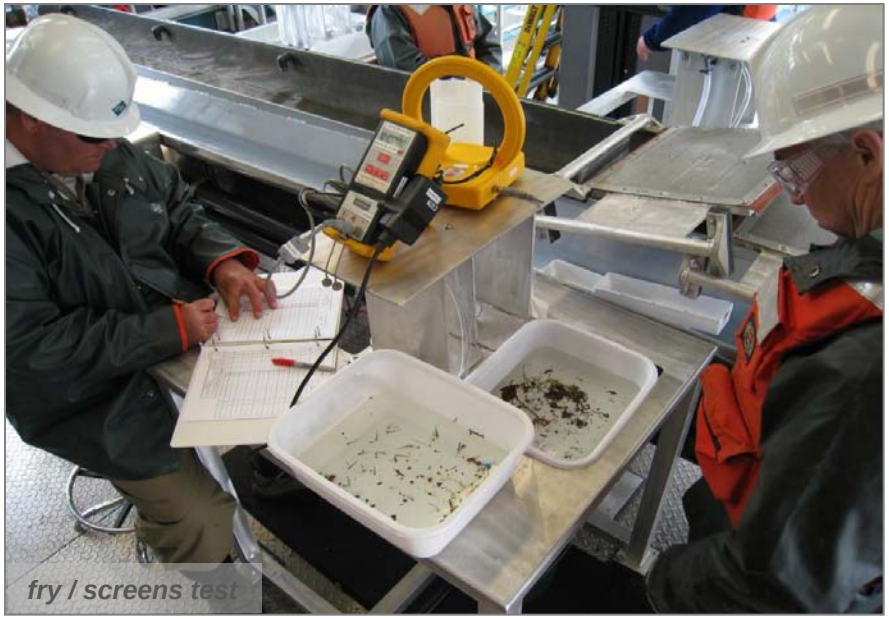
New Collector, Lower Baker



New Collector, Lower Baker





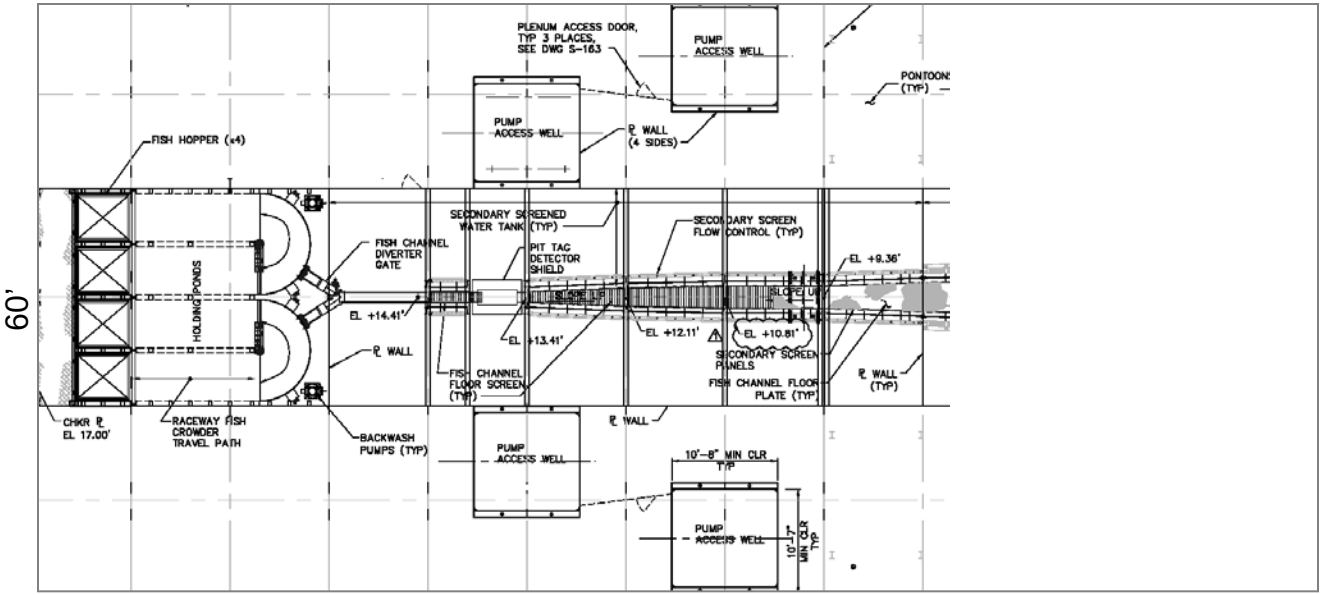


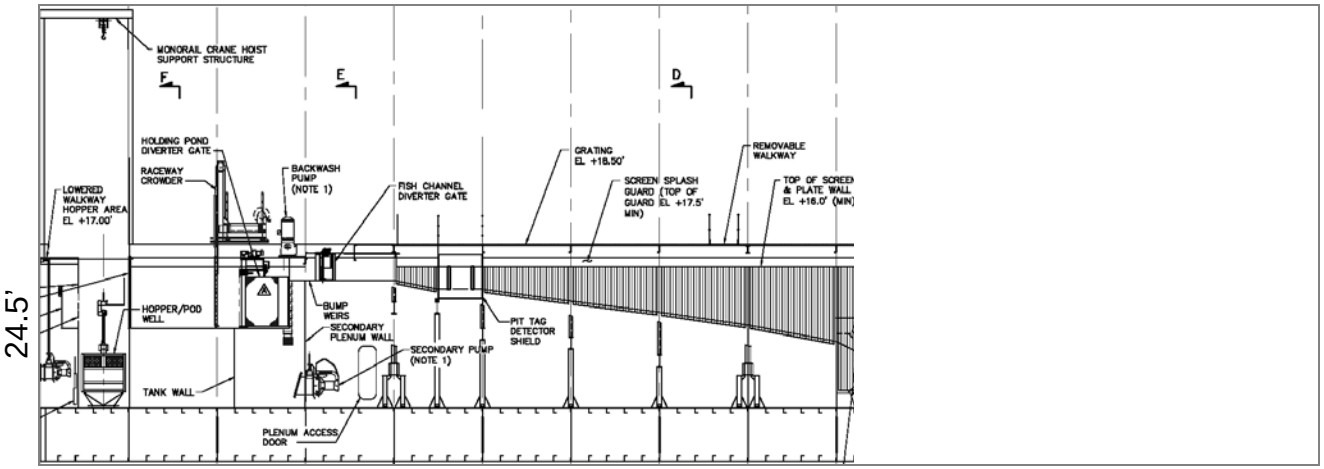
Modifications

Hydraulics
- radius screens
- perf plate baffles
- improved control
- reduced wave

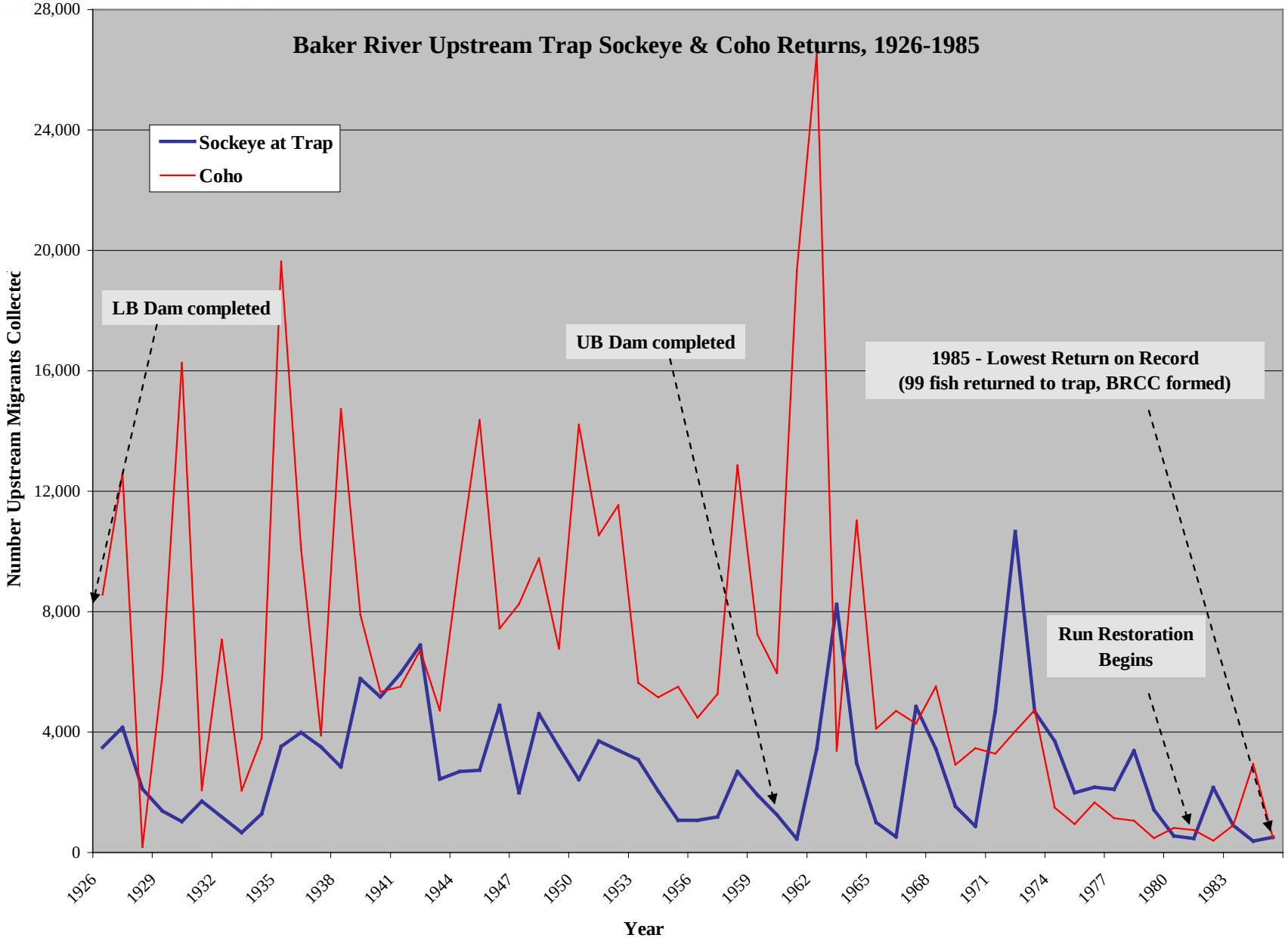
Access
- deck
- pier

Maintenance
- standardize
- crane access
- deck access
- load handling
- ballast controls





Sockeye Trend

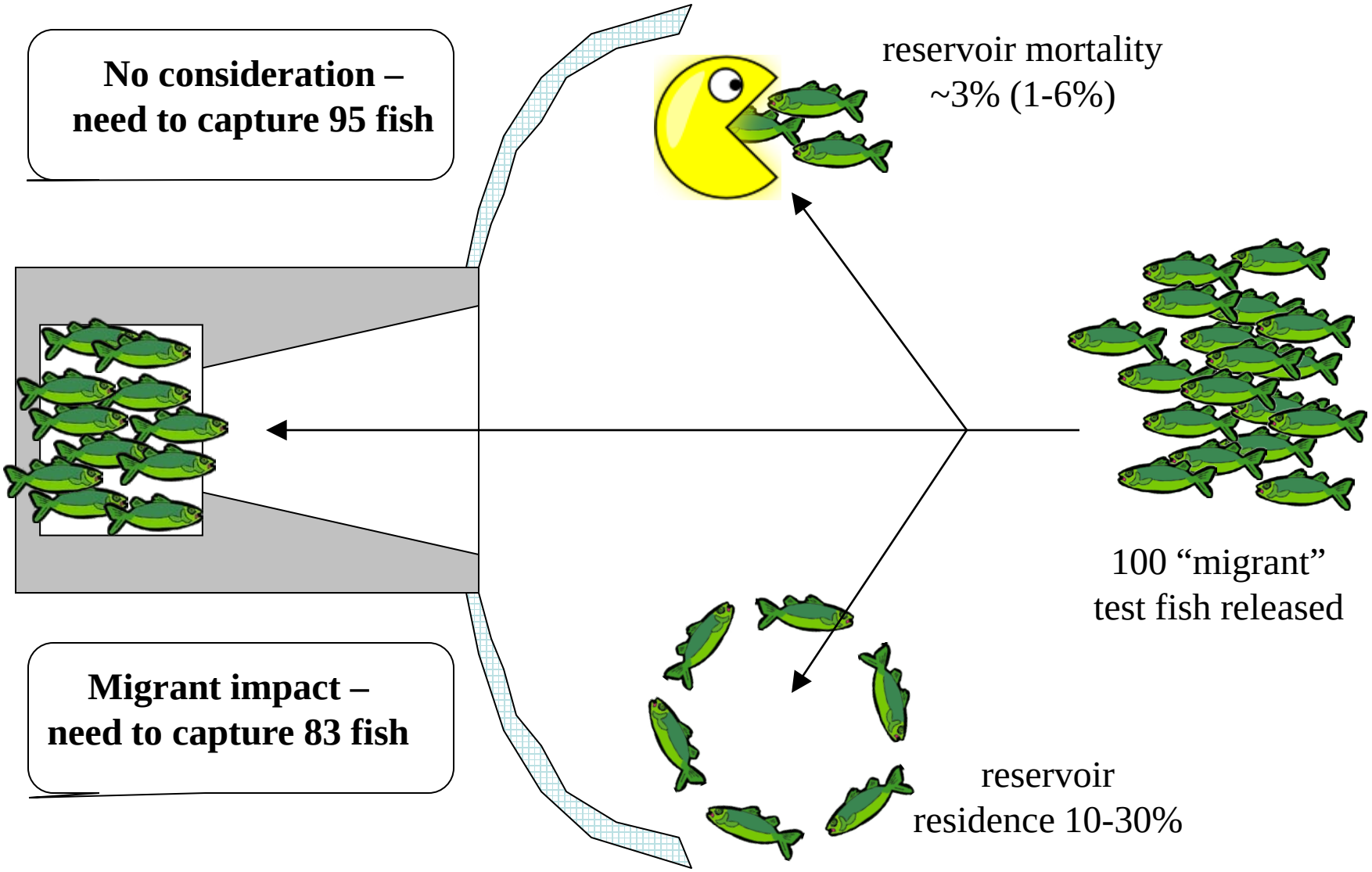


Performance Criteria

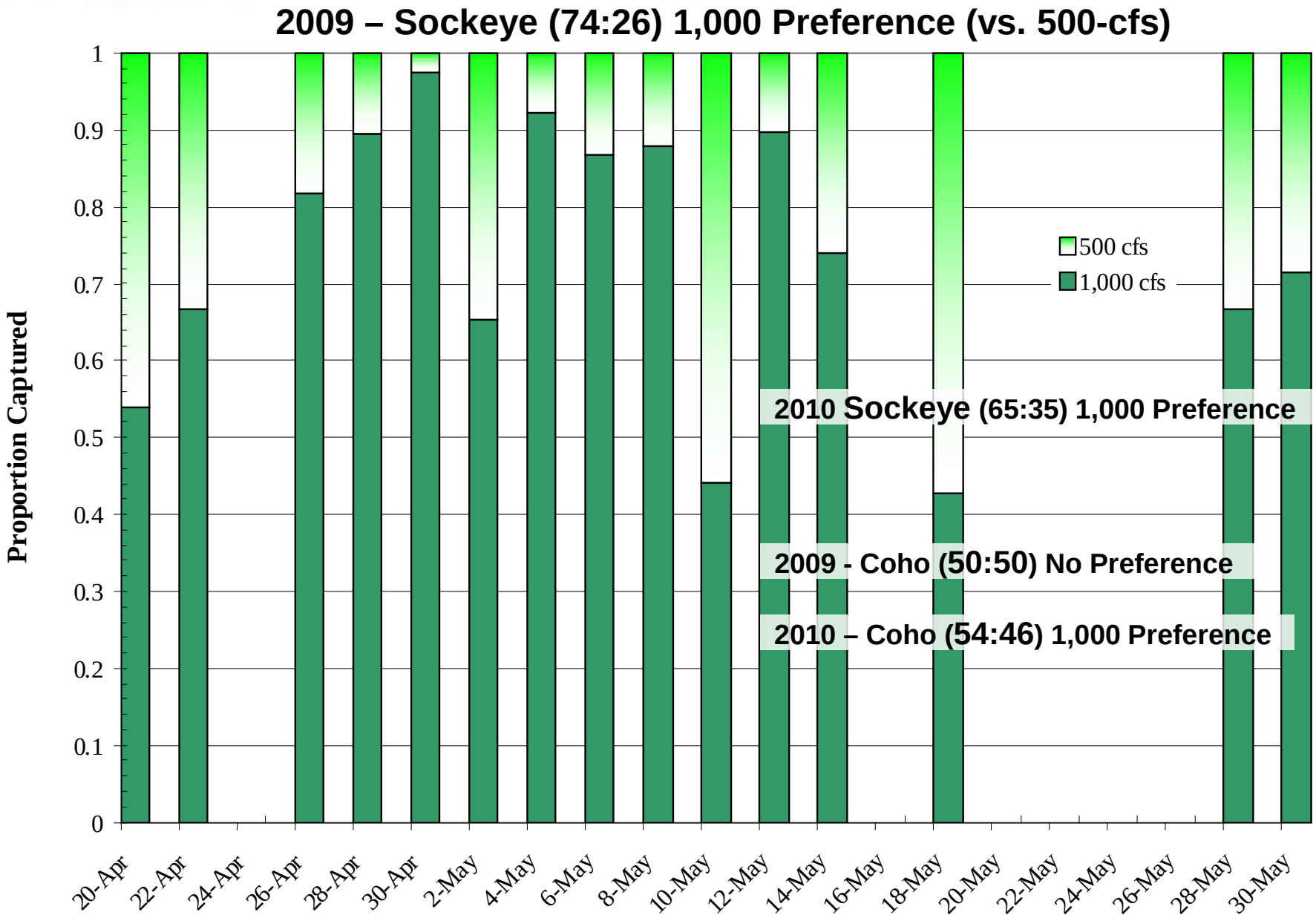
Description	Standard
Collection *(C)*	95%
Survival (within the facilities) *(S)*	98%
Reservoir passage *(R)*	80%
Efficiency (overall survival) *(CxSxR)*	75%

- *Install dates: UB – 2008, LB – 2013*
- *Evaluate 500-cfs & 1,000-cfs flow*
- *Expand to 1000 cfs screens if FSC fails to meet performance criteria*

Non-Migrant Effect



Flow Preference Testing

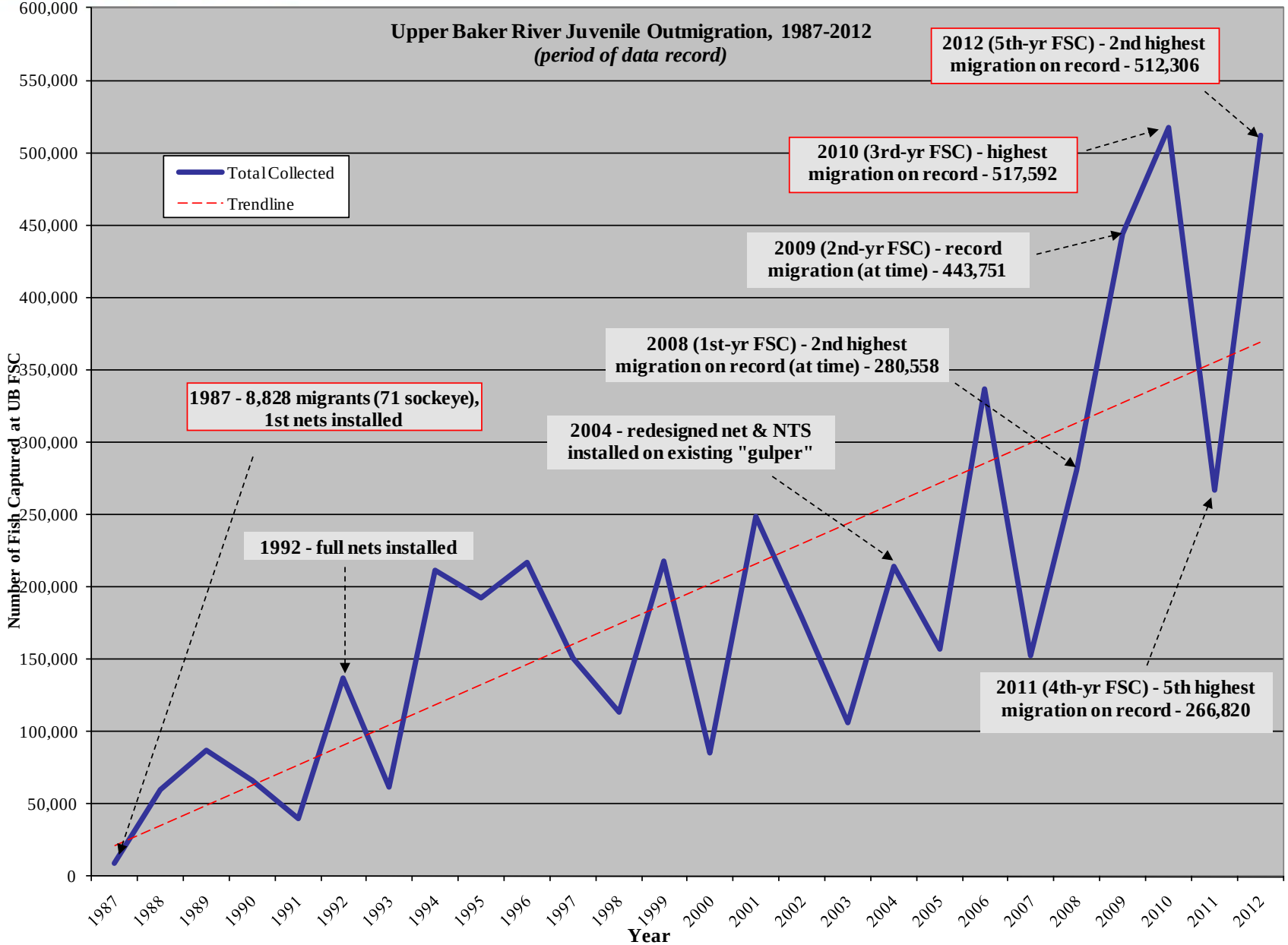


Summary Performance

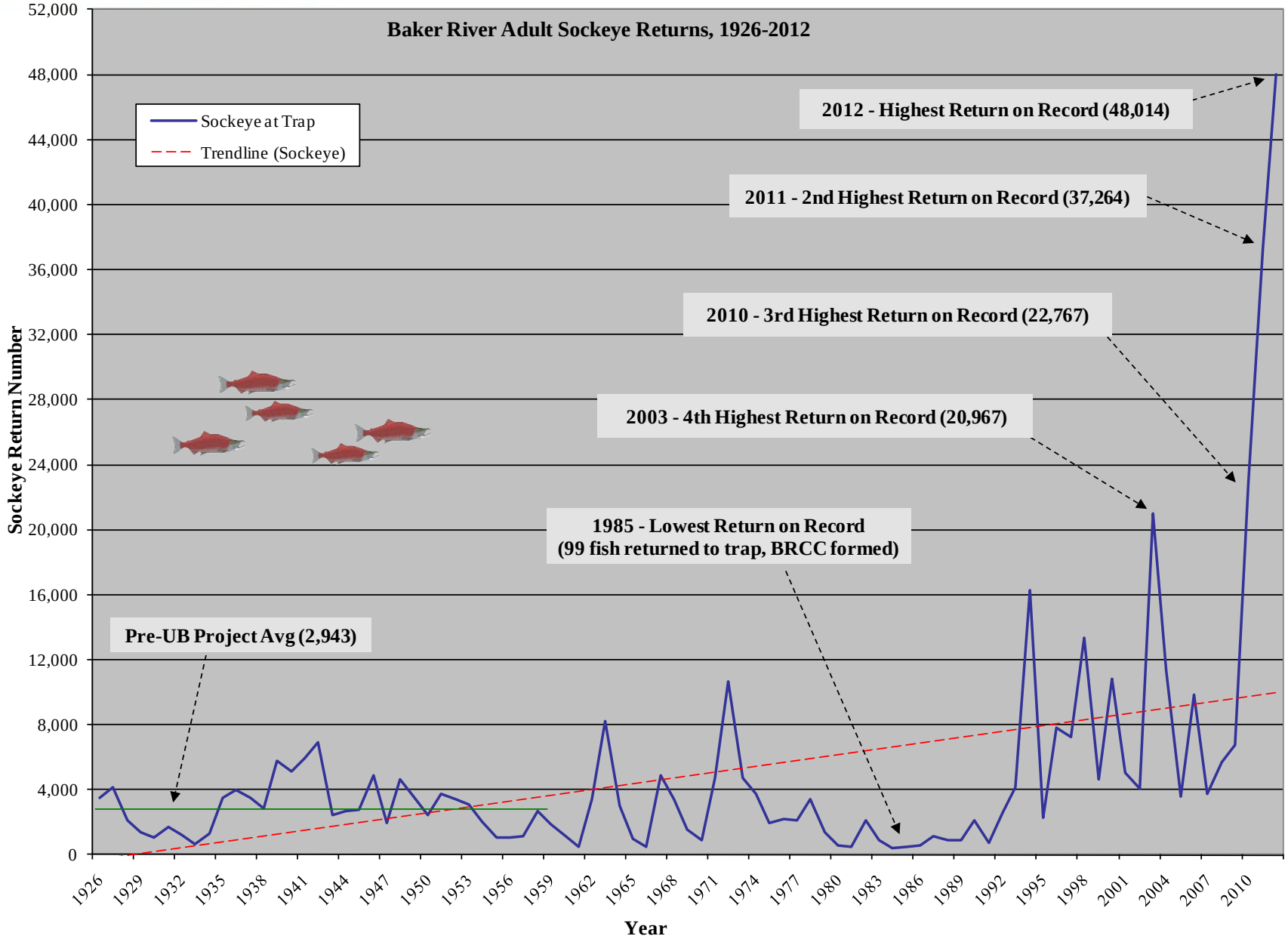
Metric	2007	2008	2009	2010	2011
Performance Recapture Rate (PIT tag, %)					
Coho Mean / Peak	55.5 / 62.0	79.7 / 97.0	87.0 / 89.5	-	70.6 / 71.7
Sockeye Mean / Peak	53.7 / 79.0	71.3 / 89.3	71.8 / 73.5	-	84.8 / 85.3
Preference Capture Ratio					
Coho 500:1,000-cfs	-	-	50%:50%	46%:54%	-
Sock. 500:1,000-cfs	-	-	26%:74%	35%:65%	-
Non-migrant Proportion					
Coho Mean	10.0	10.0	10.0	-	10.0
Sockeye Mean	30.0	10.0	10.0	-	10.0
Predation Proportion	-	3.0	2.0	-	2.0
Performance (w/non-migrants & predation)					
Coho Mean	65.5	92.7	99.0	-	82.6
Sockeye Mean	63.7	84.3	83.8	-	96.8

- Not in study year objectives

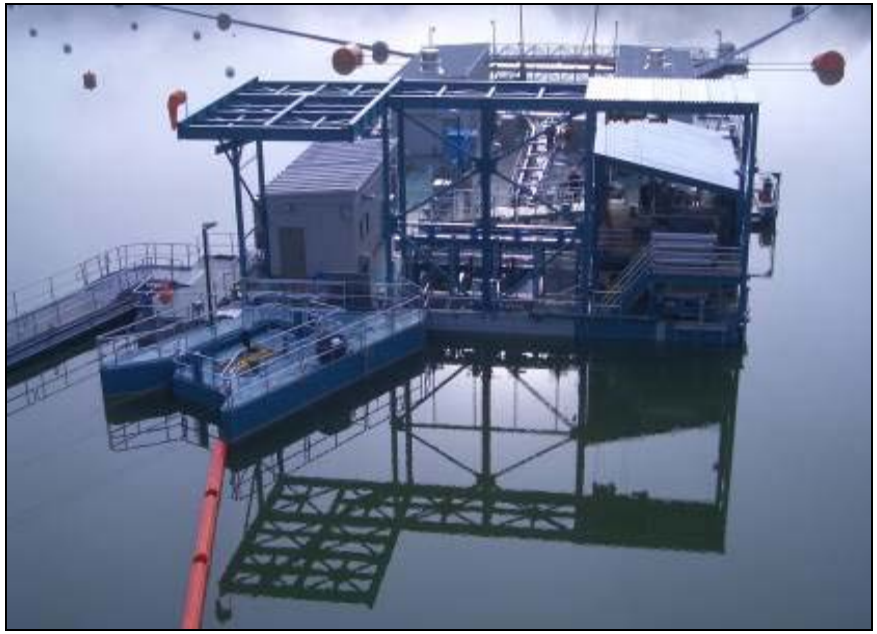
Response

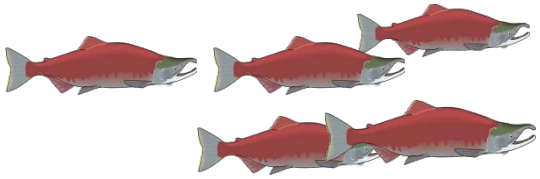

Upper Baker River Juvenile Outmigration, 1987-2012
(period of data record)
Total Collected
Trendline
2012 (5th-yr FSC) - 2nd highest migration on record - 512,306
2010 (3rd-yr FSC) - highest migration on record - 517,592
2009 (2nd-yr FSC) - record migration (at time) - 443,751
2008 (1st-yr FSC) - 2nd highest migration on record (at time) - 280,558
1987 - 8,828 migrants (71 sockeye), 1st nets installed
2004 - redesigned net & NTS installed on existing "gulper"
1992 - full nets installed
2011 (4th-yr FSC) - 5th highest migration on record - 266,820
Number of Fish Captured at UB FSC
600,000
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Year

Response


Baker River Adult Sockeye Returns, 1926-2012
Sockeye at Trap
Trendline (Sockeye)
2012 - Highest Return on Record (48,014)
2011 - 2nd Highest Return on Record (37,264)
2010 - 3rd Highest Return on Record (22,767)
2003 - 4th Highest Return on Record (20,967)
1985 - Lowest Return on Record
(99 fish returned to trap, BRCC formed)
Pre-UB Project Avg (2,943)
Sockeye Return Number
52,000
48,000
44,000
40,000
36,000
32,000
28,000
24,000
20,000
16,000
12,000
8,000
4,000
0
1926
1929
1932
1935
1938
1941
1944
1947
1950
1953
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
1986
1989
1992
1995
1998
2001
2004
2007
2010
Year

For More Information



Contacts:

- Tim Brush, 603-355-2333
- Nick Verretto, 425-462-3441
- Doug Bruland, 360-424-2920