October 2, 2018

MEMORANDUM

TO: **Council Members**

FROM: **Laura Robinson**

SUBJECT: **Presentation by Mid-Columbia Public Utility Districts on Predator Management Efforts**

BACKGROUND:

Presenter: Chelan PUD: Lance Keller, Senior Fisheries Biologist
Douglas PUD: Tom Kahler, Fisheries Biologist
Grant PUD: Tom Dresser; Fish, Wildlife, Water Quality Manager

Summary: At the October Council meeting, representatives from each of the three Mid-Columbia Public Utility Districts (Mid-C PUDs) will provide a presentation on their organization's predation control actions. The Mid-C PUDs monitor avian predation and suppress avian predators, such as cormorants, herons, pelicans, gulls, and terns. The Mid-C PUDs also monitor predatory fish such as pikeminnow and northern pike.

Lance Keller is a senior fisheries biologist that has been with Chelan PUD for 10 years. Over that time, Lance has worked on the evaluation of both juvenile and adult salmon and steelhead survival at Rocky Reach and Rock Island Dams under Chelan's Habitat Conservation Plan, as well as Chelan's northern pikeminnow predation control program. Lance also implements Chelan's White Sturgeon Management Plan for the Rocky Reach project.

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Tom Kahler is a Fisheries Biologist for Douglas PUD, which owns and operates the Wells Hydroelectric Project. Tom is directly responsible for implementation of the passage-survival and habitat-mitigation components of the Wells Habitat Conservation Plan (HCP) and supports the hatchery-mitigation component. He also serves on the Upper Columbia Regional Technical Team. Tom has a B.S. (Zoology) and M.S. (Fisheries and Aquatic Sciences) degrees from the University of Washington.

Tom Dresser is the Fish and Wildlife Manager for Grant PUD. Tom has over 25 years of experience in developing and implementing programs to protect and enhance anadromous fish populations in the Columbia River Basin. As the Fish and Wildlife Manager, Tom is responsible for ensuring that Grant PUD is implementing, achieving, and maintaining its various anadromous fish requirements contained within its Federal Energy Regulatory Commission License Order, 2008 NMFS Biological Opinion, Priest Rapids Salmon and Steelhead Settlement Agreement, 401 Certification, and Hanford Reach Fall Chinook Protection Plan for the Priest Rapids Project (FERC Project No. 2114).

Relevance: The 2014 Fish and Wildlife Program identified as one of the seven emerging priorities the need to, “preserve program effectiveness by supporting expanded management of predators… and aggressively addressing non-native and invasive species.”

In the 2014 Program’s Predator Management Strategy, the Council states that, “The Council will encourage more aggressive efforts by the Corps and others to make the fullest possible use of their existing authority to remove or manage avian predation that is impacting wild fish populations.”

Workplan: Predation Presentations in preparation for the Program amendments

Background: **Chelan County PUD:** Chelan PUD (CPUD) will present an overview of their efforts related to predation management within the project areas of Rocky Reach and Rock Island Dam. The overview will describe CPUD predation management efforts relative to meeting the objectives of their Habitat Conservation Plan and other project license requirements.

Douglas County PUD: Douglas PUD operates the Wells Hydroelectric Project under license by the Federal Energy Regulatory Commission (FERC). The 2012 FERC license for the Wells Project includes measures for control of predators on anadromous salmonids as described in the Wells HCP, and control of invasive species as described in the Wells Aquatic Nuisance Species Management Plan. Douglas PUD funds annual contracts for removal of Northern Pikeminnow and hazing of piscivorous birds in the Wells reservoir and tailrace. The bird-hazing contractor also hazes birds at the Wells and Methow hatcheries. Douglas PUD also maintains an array of wires across the Wells tailrace to discourage bird predation.

Recent exploratory surveys scanning for PIT tags at the cormorant and heron rookery at Cassimer Bar at the mouth of the Okanogan River reveal predation on all species of fish tagged by local management entities within an approximately 30-mile radius. Douglas PUD will refine sampling methods around the rookery to allow inferential analysis of detection data. Also of interest is a local population of white pelicans that congregate seasonally at Cassimer Bar south of the cormorant rookery and routinely forage in the Wells Project during the summer.

Finally, anticipating downstream movement or entrainment of Northern Pike from upstream populations, Douglas PUD conducted gill-net surveys intended to capture Northern Pike in areas with suitable spawning habitat, and collected water samples for e-DNA analysis. Neither measure detected Northern Pike, and the gill-netting captured a Bull Trout. Therefore, though Douglas PUD will continue with systematic e-DNA sampling, they are exploring alternative methods for physically capturing Northern Pike in suitable spawning habitat around Wells Reservoir.

Grant County PUD: Grant PUD supports regional recovery and enhancement efforts for anadromous fish listed under the Endangered Species Act (Upper Columbia River spring Chinook and steelhead), as well as non-listed species (summer Chinook, sockeye, and Coho) by achieving and maintaining its No-Net-Impact environmental stewardship responsibilities through a three-pronged approach; hydroelectric operations and improvements, hatchery production, and habitat restoration and enhancement. These enhancement and protection efforts cover a broad area of the Columbia River Basin; extending from Penticton, British Columbia downstream to the Hanford Reach.

One of the many programs implemented by Grant PUD to improve the downstream survival of juvenile salmonids through the Priest Rapids Project is implementing an avian and northern pikeminnow predator control program and a non-native fish predator removal and monitoring program.

Grant PUD conducts annual removal activities for northern pikeminnow and non-native fish predators within the Priest Rapids Project Area. Using a myriad of sampling techniques, Grant PUD can encounter and remove multiple life history stages of fish predators (young-of-year, juvenile, sub-adult, and adult) over a wide range of habitat types and seasons.

Grant PUD also implements an avian predator (gulls and Caspian terns) hazing program at the Priest Rapids Project. Evaluations conducted in 2008-2010 indicated that predation by Caspian terns nesting outside the Priest Rapids Project Area are a substantial source of smolt mortality within the Priest Rapids Project.

Recent management actions which include both passive (matrix of ropes and flagging) and active nest dissuasion measures (hazing, walk-throughs, boat-based activities, kites, lasers, etc.) indicate that tern nest dissuasion measures have been successful where implemented, but a long-term regional approach is necessary to ensure that predation on juvenile salmonids by Caspian terns is minimized.

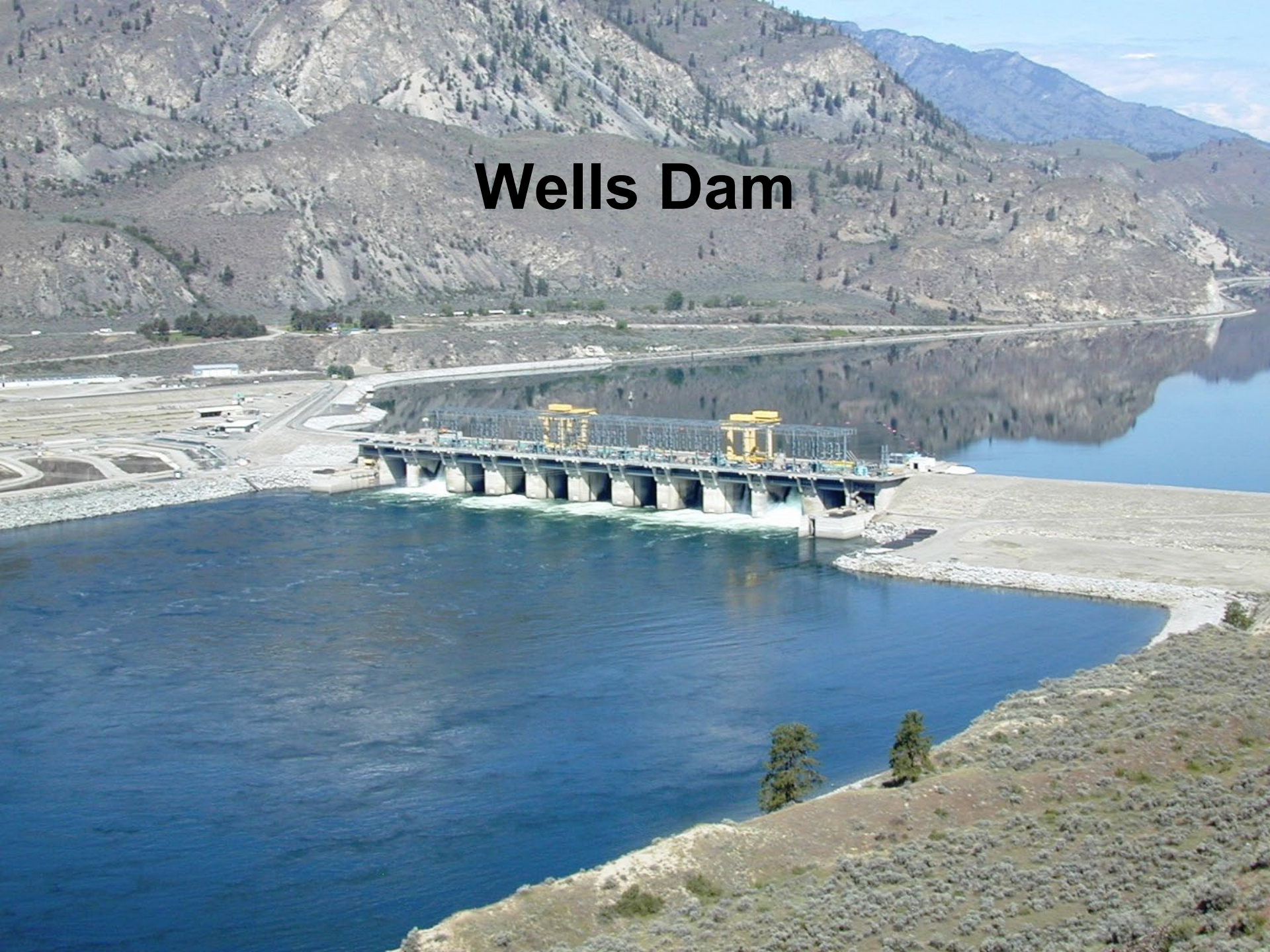
More Info: This panel is part of a series of presentations to the Council in preparation for the Program amendments. At the September Council meeting, Dan Roby presented to the Council on the long-term avian predation study funded by BPA and the Corps to investigate the impact of avian predators on the survival of juveniles salmonids in the lower Columbia River. The slides for that presentation can be found here. At the October Council meeting there are two predation presentations in addition to this one: Joe Maroney will be presenting on the Kalispel Tribe's work to suppress Northern Pike in the Pend Oreille River, and staff will discuss with the full Council a committee recommendation to pursue a science and economics review of predation in the Basin.

Douglas PUD's Predator Control Programs for the Wells Hydroelectric Project

Tom Kahler
Douglas PUD

Northwest Power and Conservation Council
October 9, 2018
Wenatchee, WA


Mica
Revelstoke
Arrow Lakes
Duncan
Keenleyside
Kootenay Lake
Canada
U.S.
Grand Coulee
Chief Joseph
Wells
Albeni Falls
Libby
Hungry Horse
Noxon
Rocky Reach
Columbia R.
Pend Oreille Lake
Flathead Lake
Rock Island
Kerr
Seattle
Little Goose
Lower Monumental
Montana
Wanapum
Lower Granite
Priest Rapids
Dworshak
Washington
Ice Harbor
The Dalles
Portland
McNary
Bonneville
John Day
Hells Canyon
Oxbow
Idaho
Brownlee
Willamette R.
Oregon
Jackson Lake
Boise Projects
Snake R.
Corps of Engineers Dams
Dams owned by Others


Wells Dam

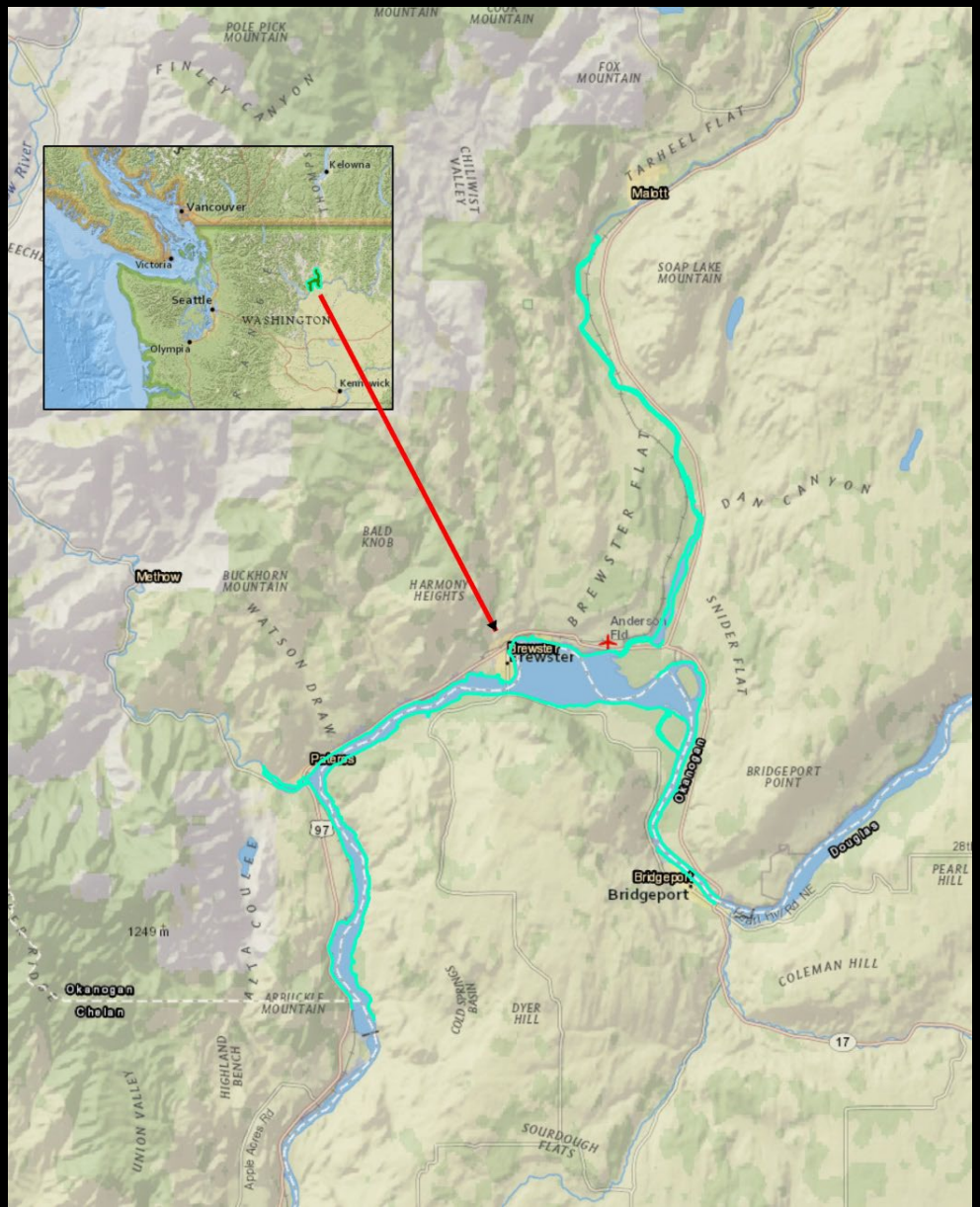

Google Earth

Wells Surface Bypass System

Passage Efficiency

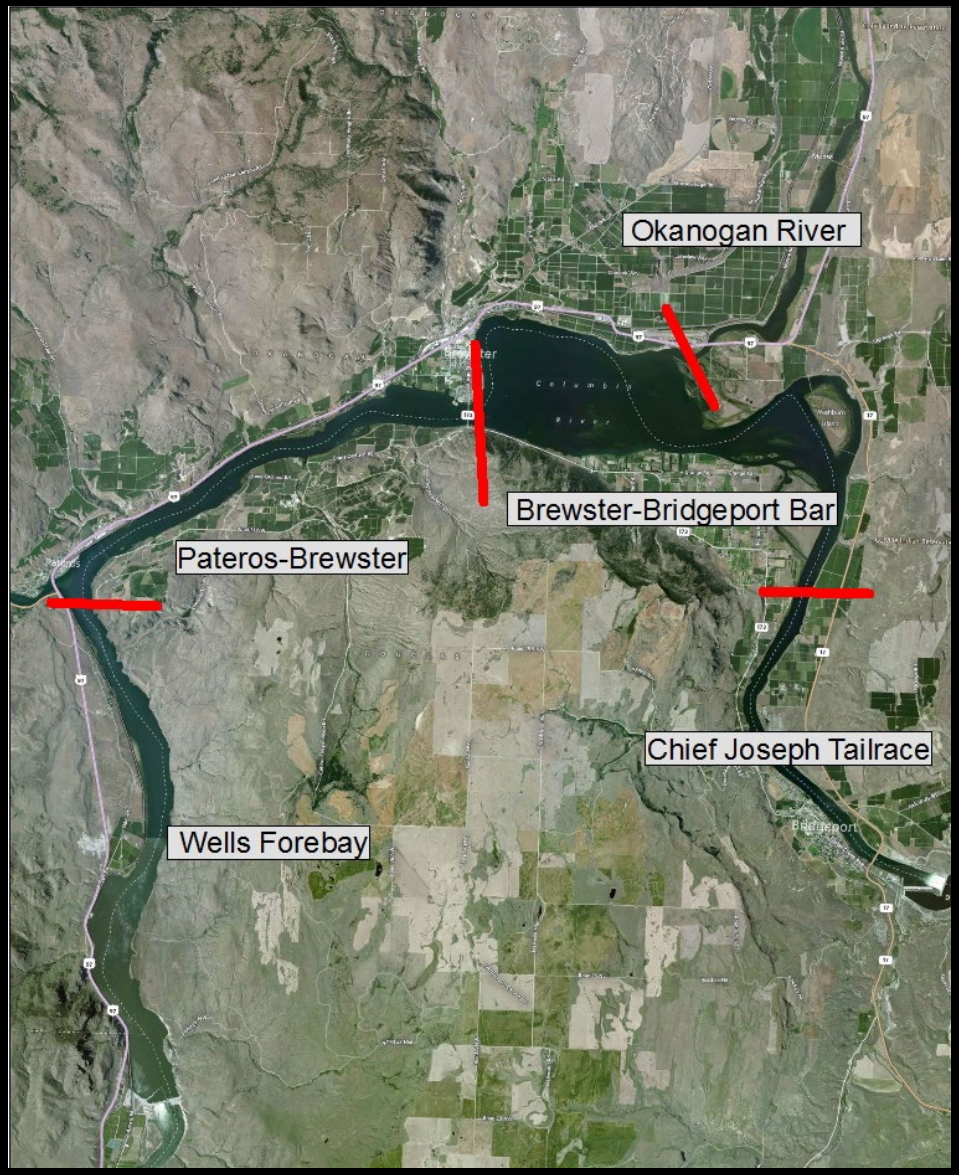
- Fish Guidance Efficiency (3-year hydroacoustic study):
  - 92.0% for spring Chinook and steelhead
  - 95.3% sockeye
  - 96.2% subyearling Chinook
- Balloon-tag studies: no measurable injury or mortality through the Bypass System

Wells Reservoir



Resident Fish Studies

2014 Resident Fish Sample Zones



Total catch and relative abundance (%) of resident fish captured by electrofishing, beach seine, and snorkel observation by sampling zone

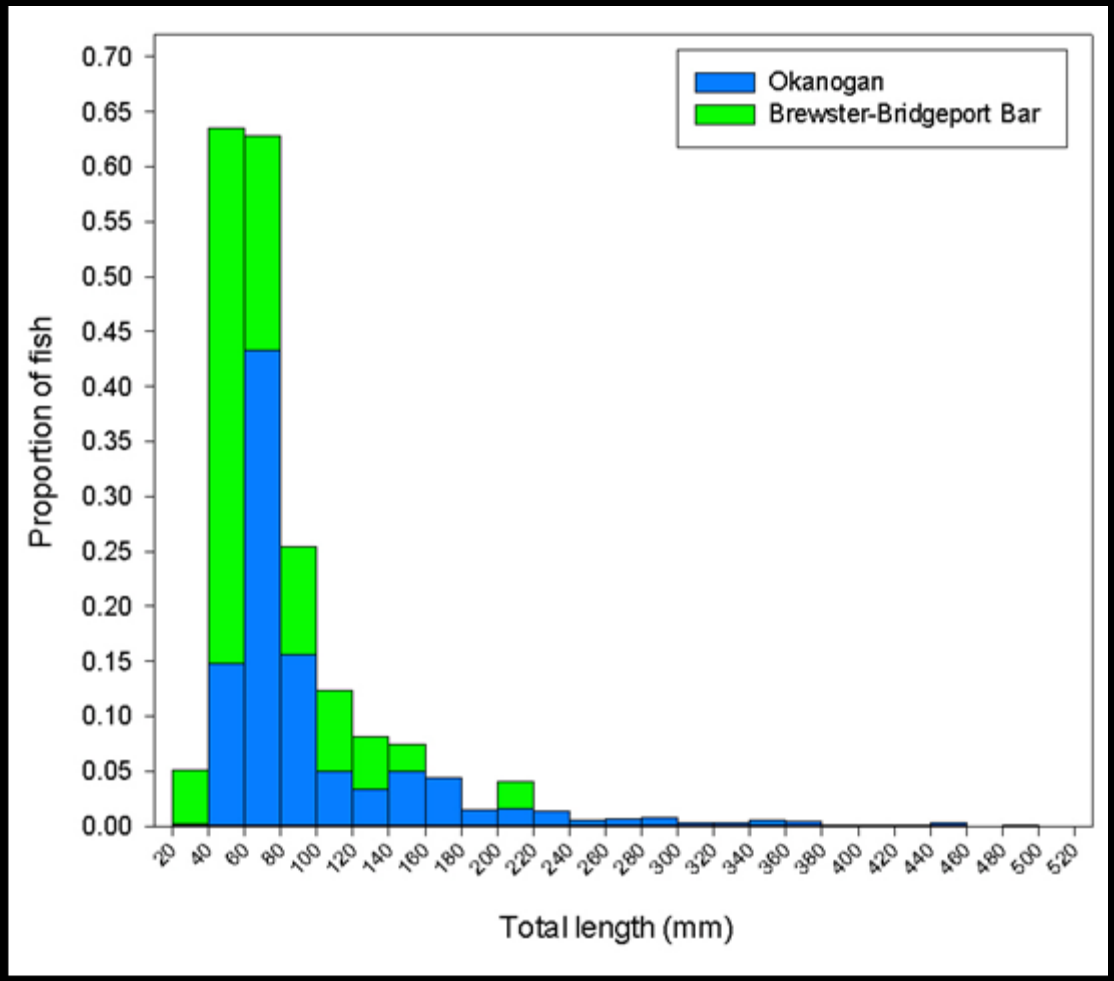
	Sample Zone					
Species	Brewster-Bridgeport Bar	Chief Joseph Tailrace	Okanogan*	Pateros-Brewster	Wells Forebay	All Zones
Bluegill	3 (0.12)	0 (--)	48 (4.54)	0 (--)	4 (0.2)	55 (0.43)
Brown Bullhead	0 (--)	0 (--)	5 (0.47)	0 (--)	0 (--)	5 (0.04)
Largemouth Bass	0 (--)	0 (--)	21 (1.94)	0 (--)	1 (0.05)	22 (0.17)
Northern Pikeminnow	462 (19.06)	63 (1.18)	94 (8.81)	151 (7.02)	98 (4.92)	868 (6.69)
Pumpkinseed	0 (--)	0 (--)	15 (1.41)	2 (0.09)	0 (--)	17 (0.13)
Smallmouth Bass	16 (0.66)	0 (--)	265 (24.86)	5 (0.23)	1 (0.05)	287 (2.21)
Tench	0 (--)	0 (--)	1 (0.09)	0 (--)	0 (--)	1 (0.01)
Walleye	0 (--)	0 (--)	2 (0.21)	0 (--)	0 (--)	2 (0.02)
Yellow Bullhead	0 (--)	0 (--)	9 (0.84)	0 (--)	0 (--)	9 (0.07)
Yellow Perch	0 (--)	2 (0.04)	163 (15.31)	0 (--)	0 (--)	165 (1.27)
Total Predators	**481 (19.84)**	**65 (1.22)**	**623 (58.55)**	**158 (7.35)**	**104 (5.23)**	**1,431 (11.03)**

Relative abundance (% of observed) of resident predator species observed in 1974, 1979, 1999, and 2014

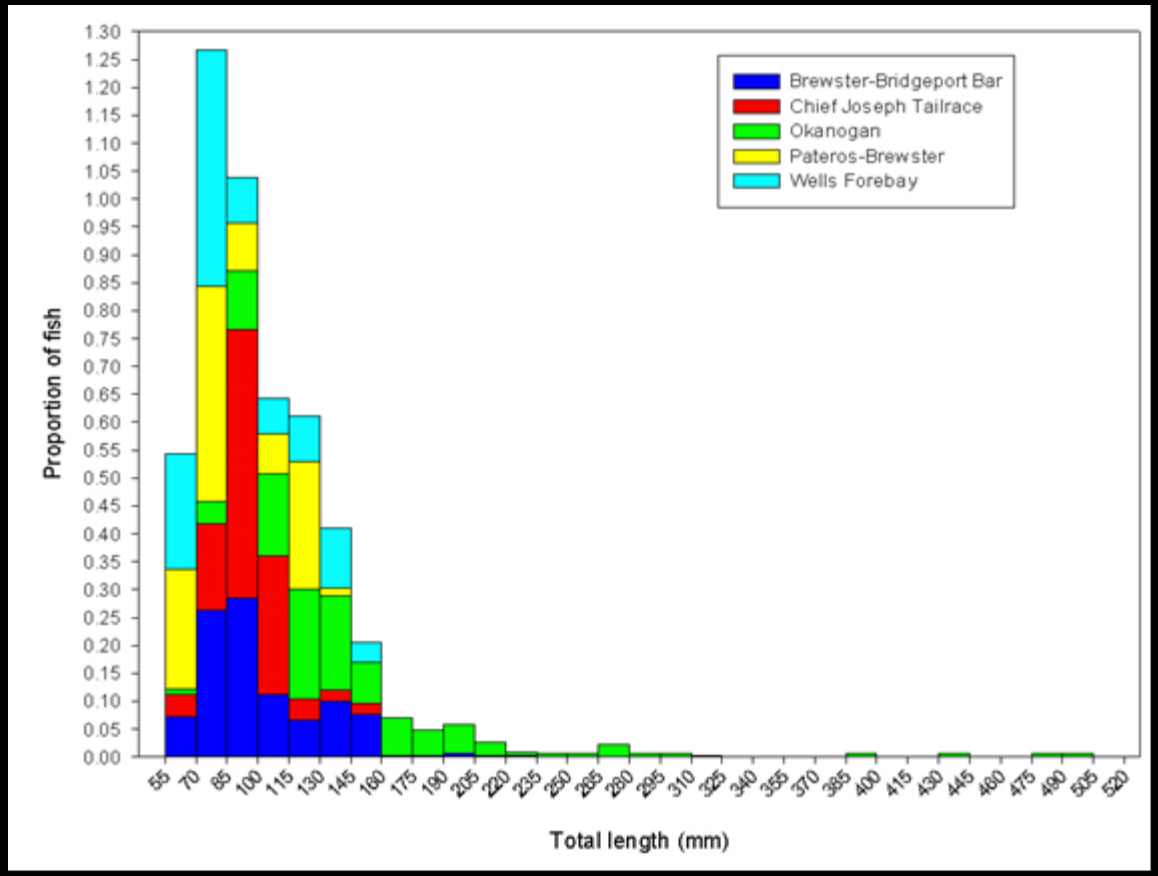
Species	1974	1979	1999	2014*
Largemouth bass	0.20	0.00	1.00	0.34
Northern pikeminnow	21.10	8.10	2.20	13.73
Smallmouth bass	0.00	0.50	0.80	4.53
Walleye	0.20	0.00	0.70	0.04
Yellow Perch	0.90	0.10	0.10	2.61

*Excluding threespine stickleback, which were not collected in previous years

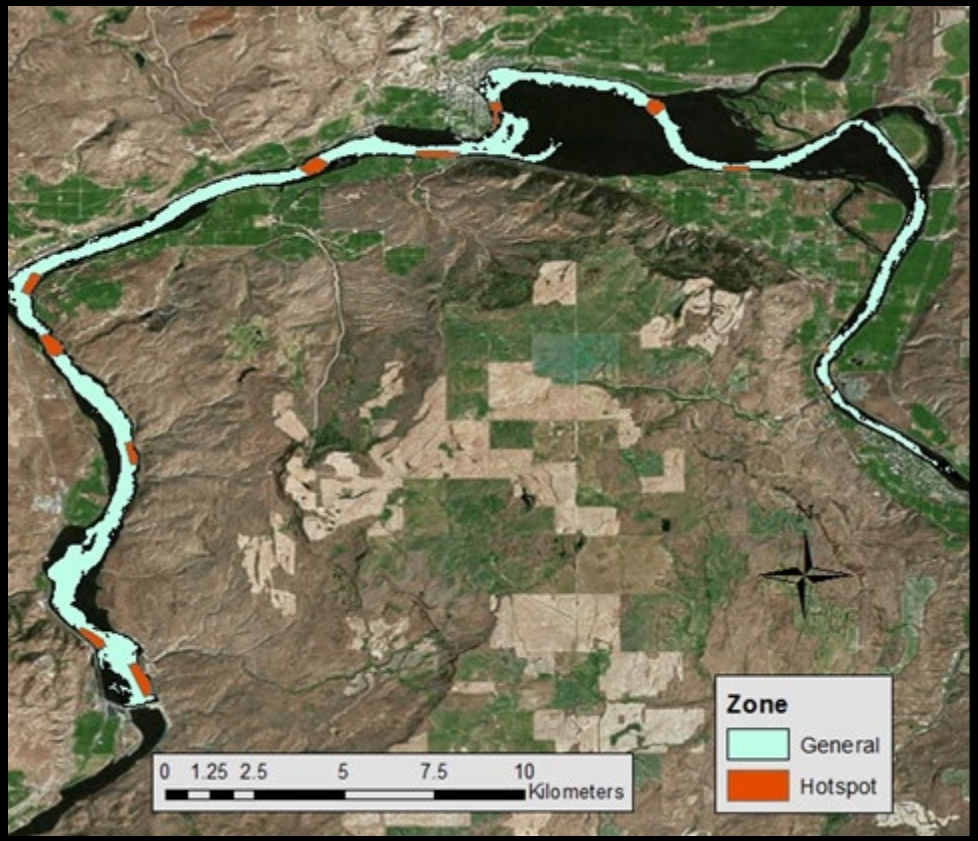
Length-frequency histogram of smallmouth bass captured by electrofishing and beach seine



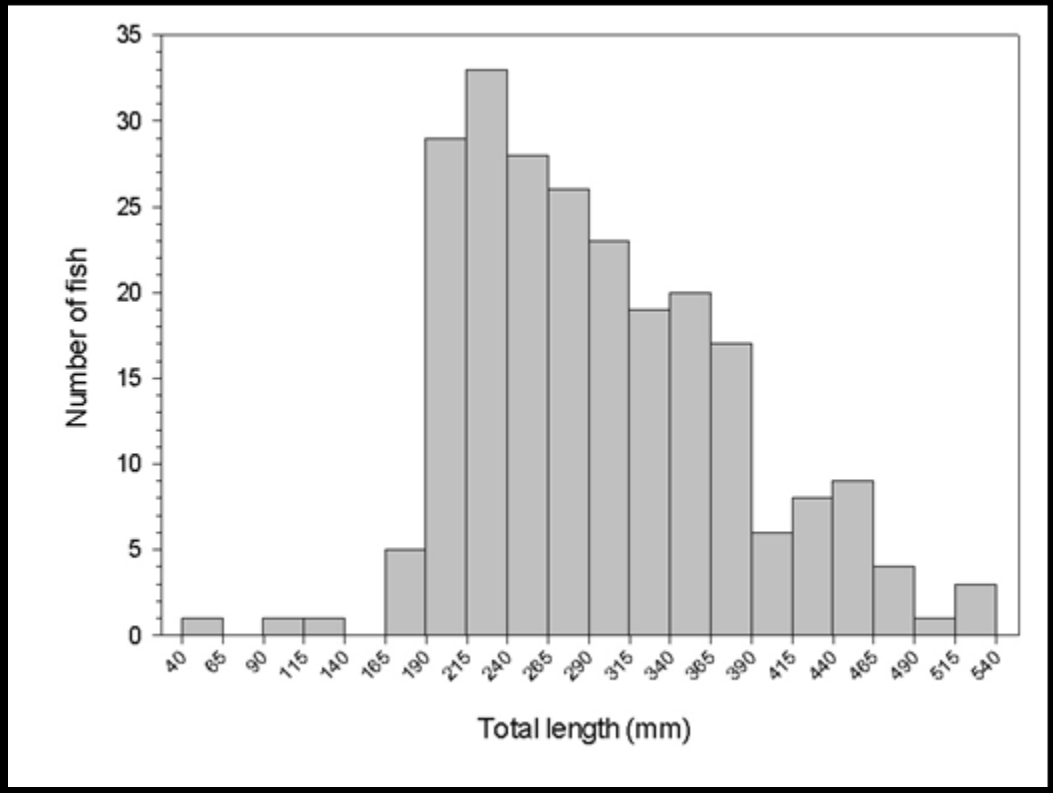
Length-frequency histogram of northern pikeminnow captured by electrofishing and beach seine



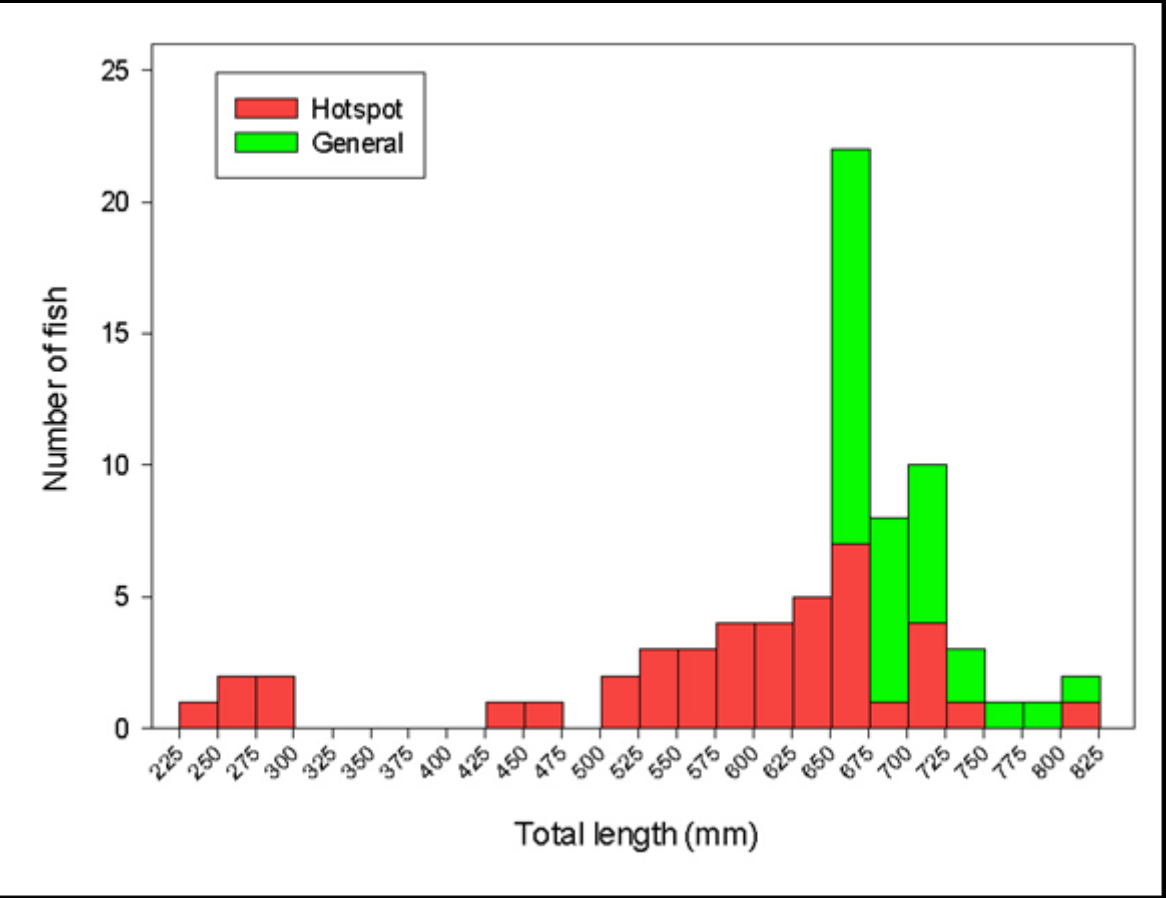
Burbot setline sampling zones in Wells Reservoir



Length-frequency histogram of northern pikeminnow captured by setline in burbot sampling zones



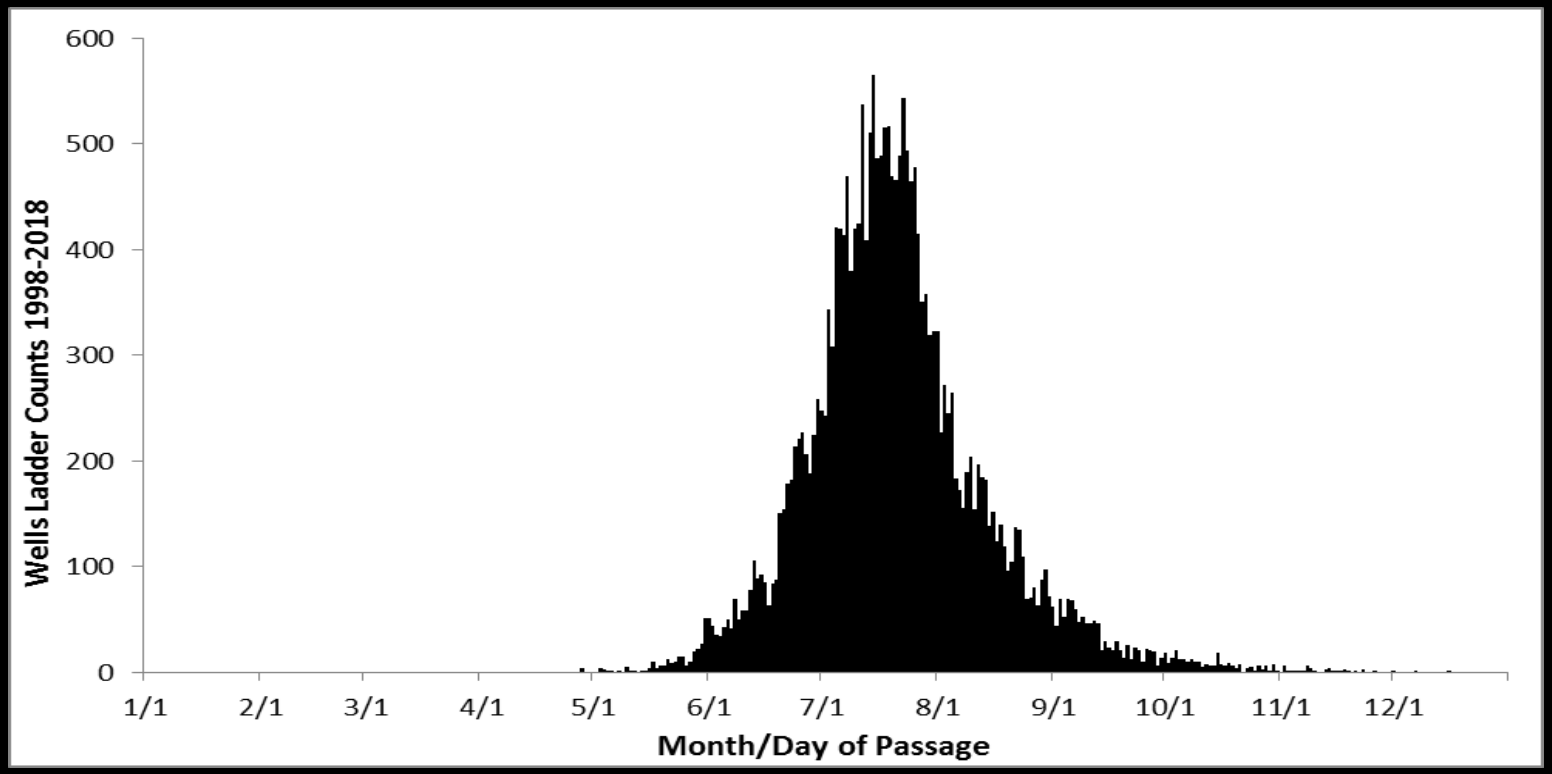
Length-frequency histogram of burbot captured by setline in Hotspot and General burbot sample zones.



Pikeminnow Study

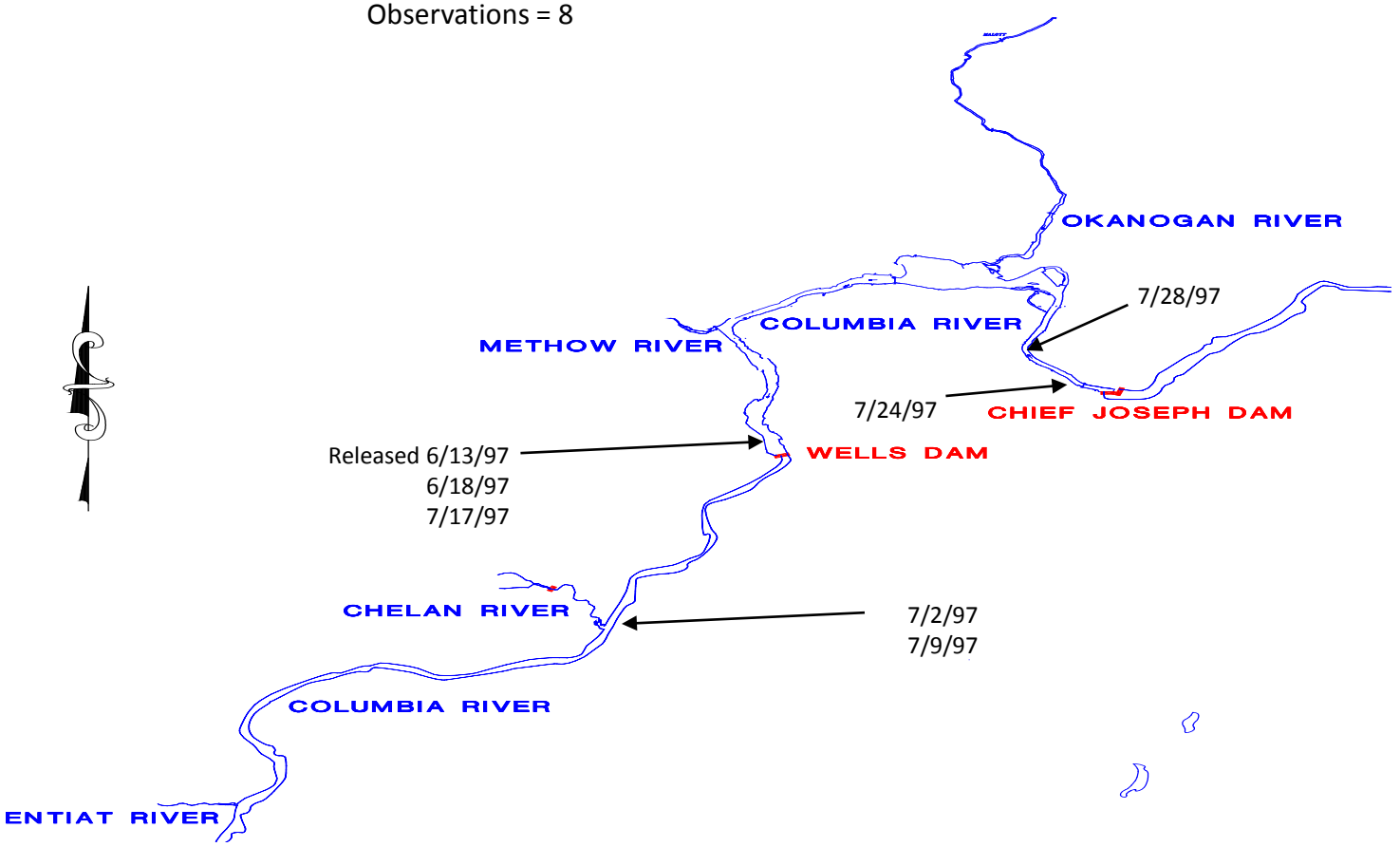

Google Earth


Google Earth

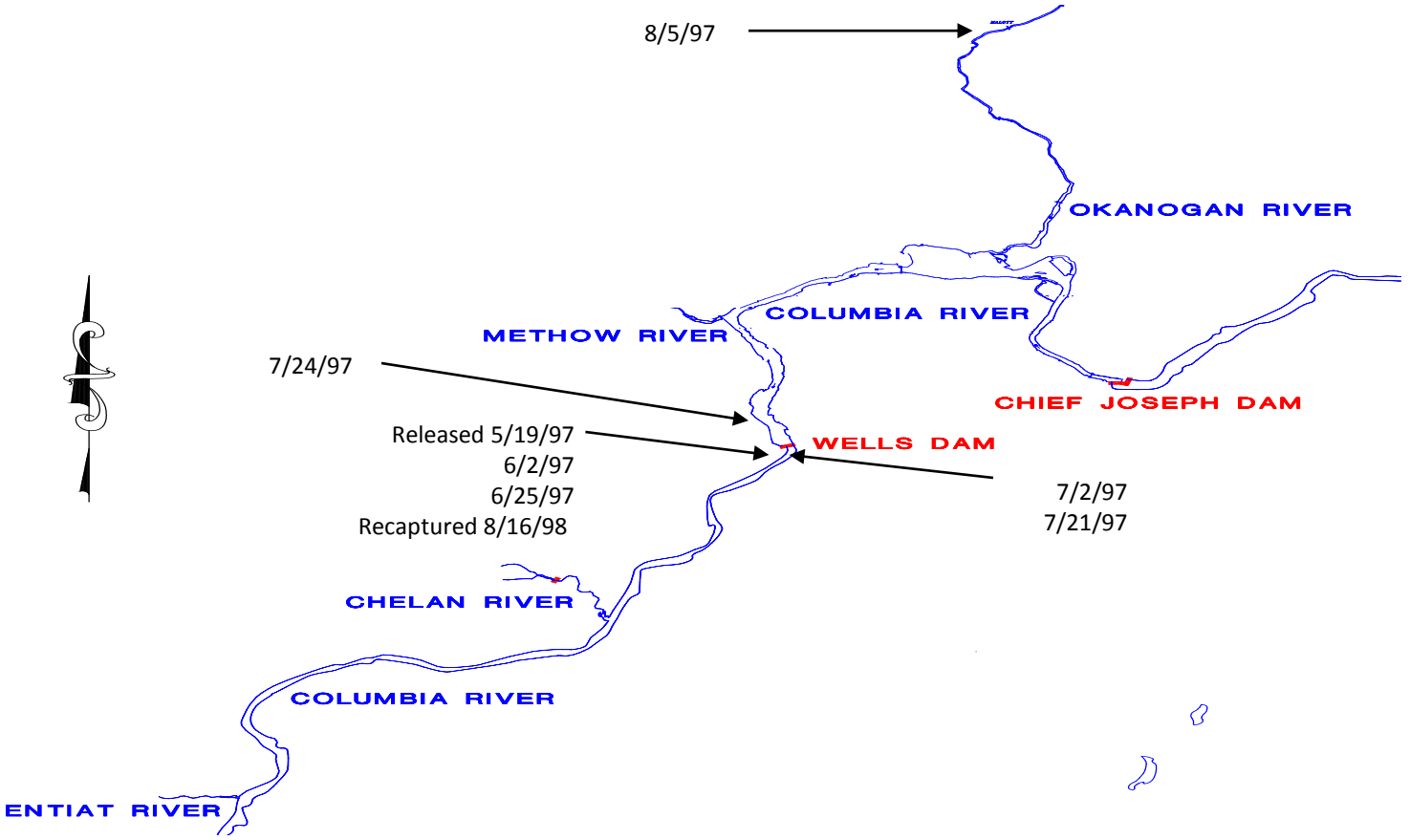

Wells Ladder Counts 1998-2018
600
500
400
300
200
100
0
1/1
2/1
3/1
4/1
5/1
6/1
7/1
8/1
9/1
10/1
11/1
12/1
Month/Day of Passage

Pikeminnow # 229

Observations = 8

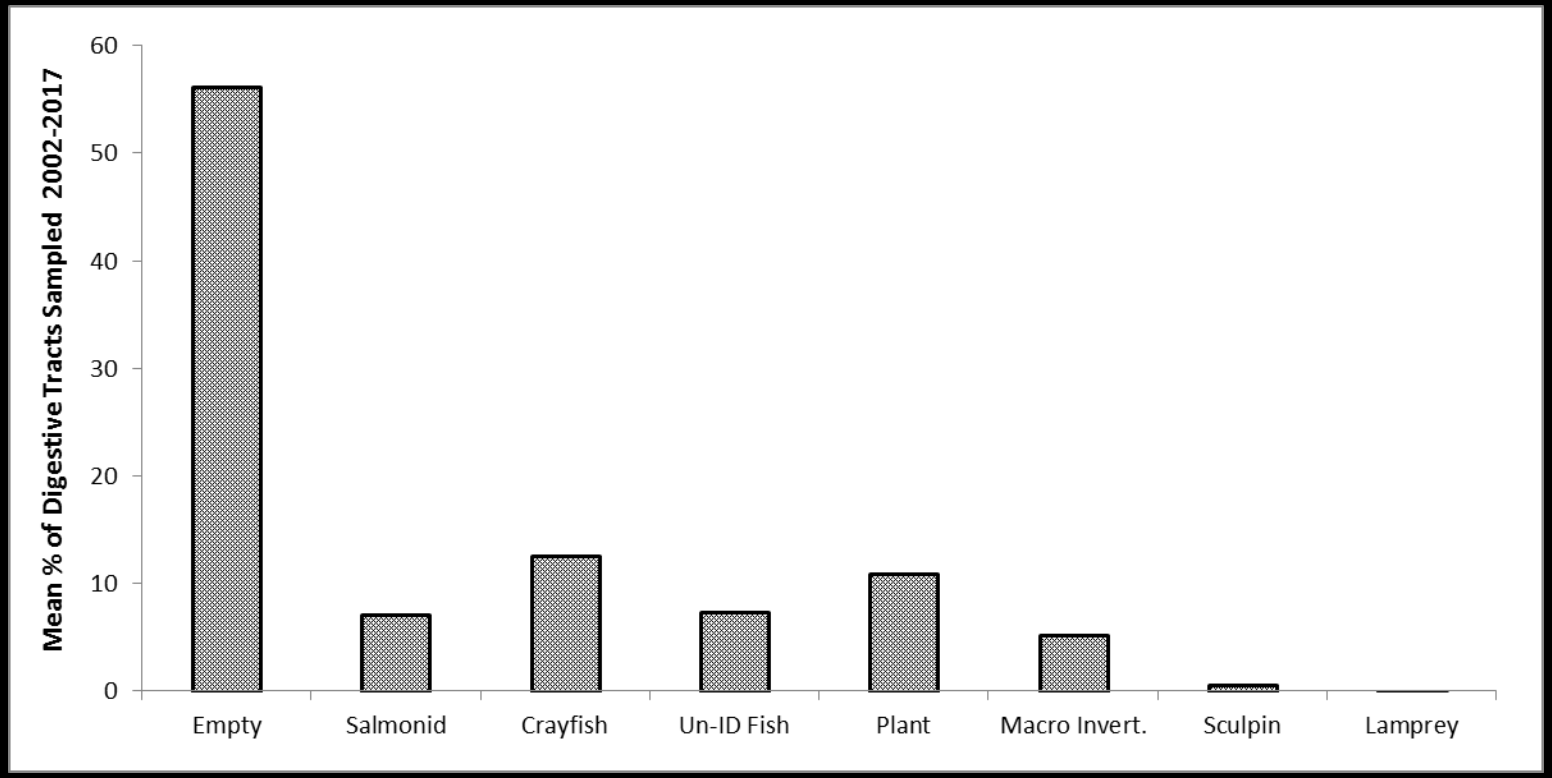


Pikeminnow # 123

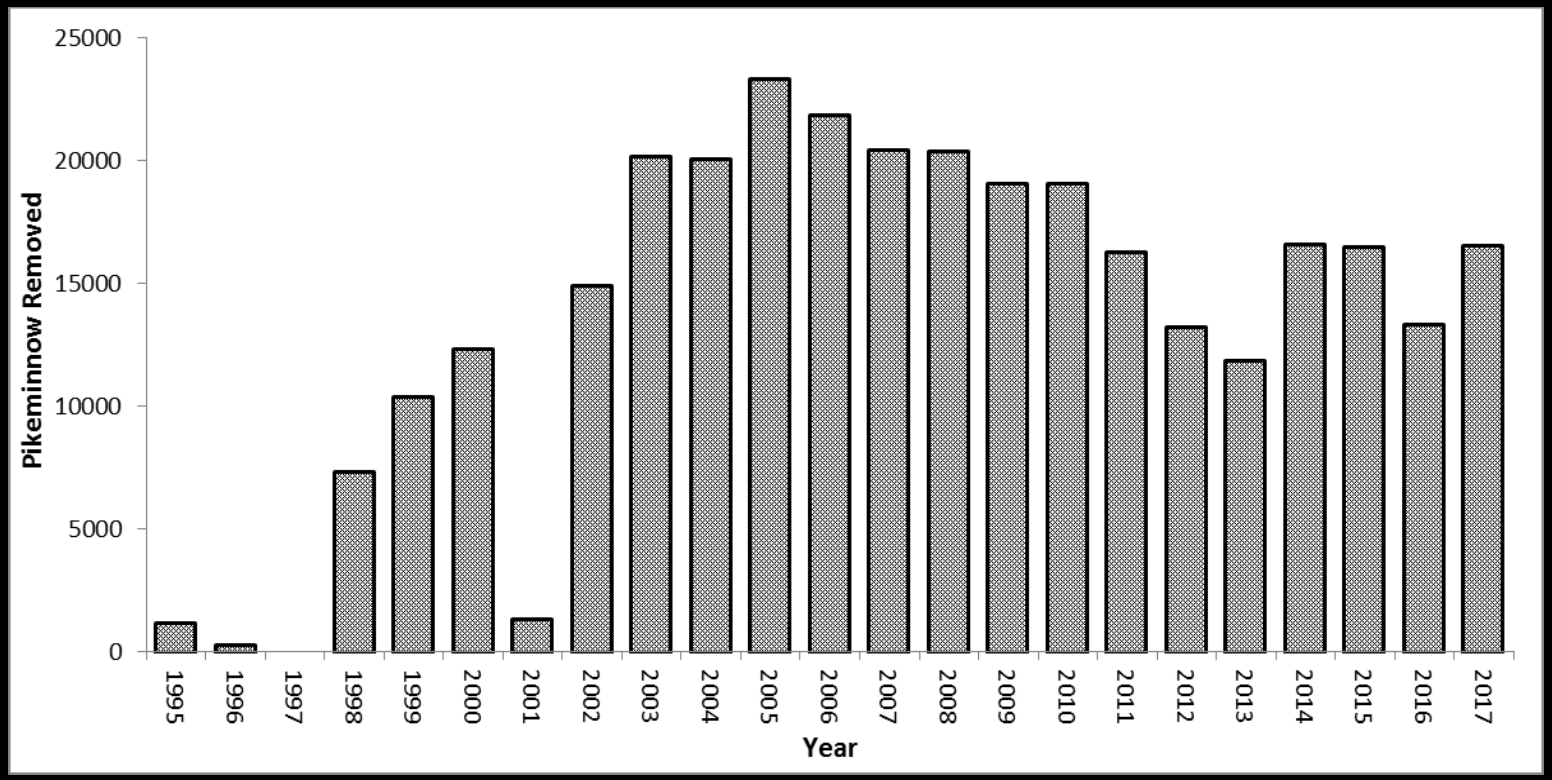


Pikeminnow Removal

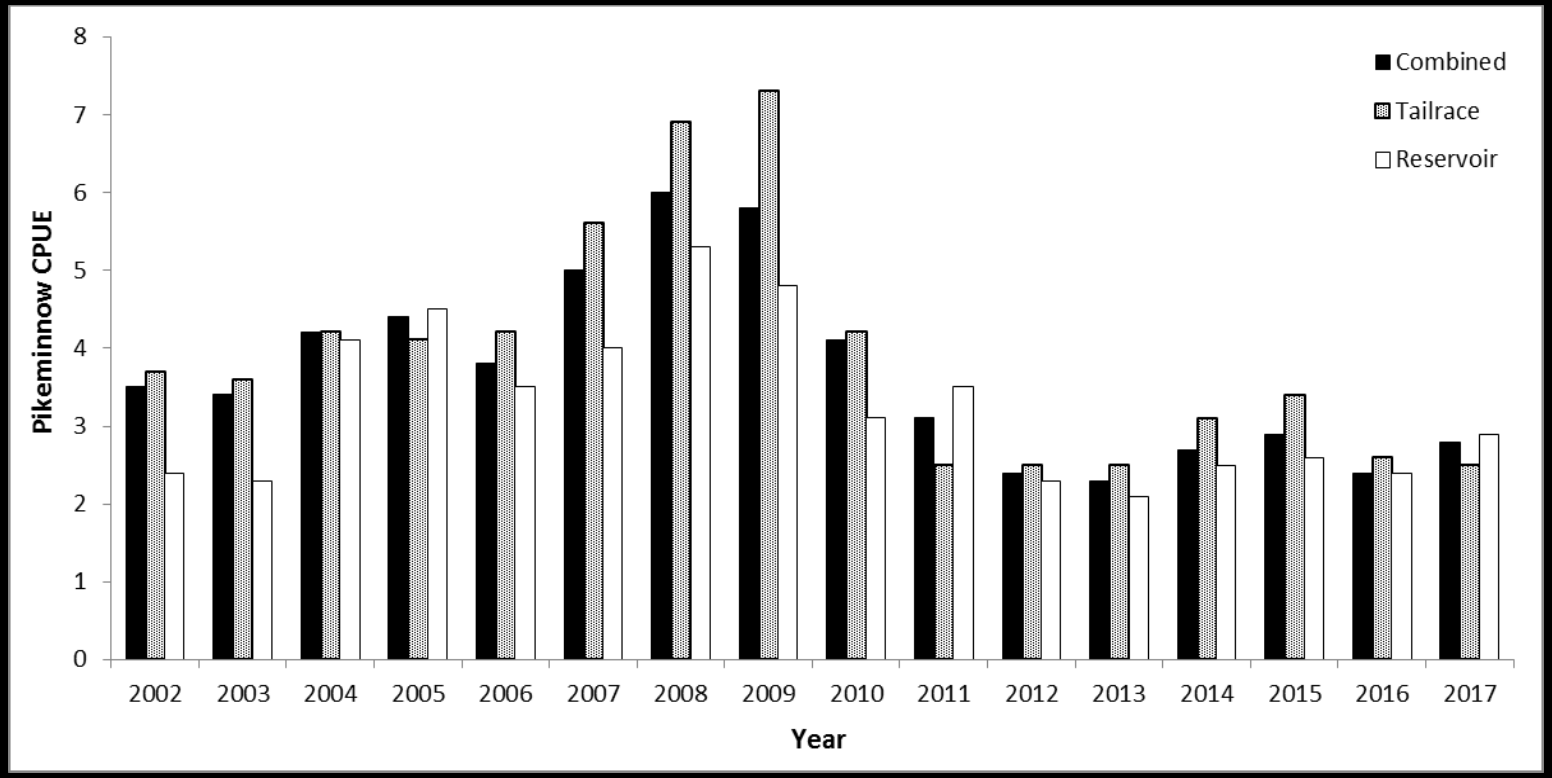
Wells Pikeminnow Diet 2002-2017



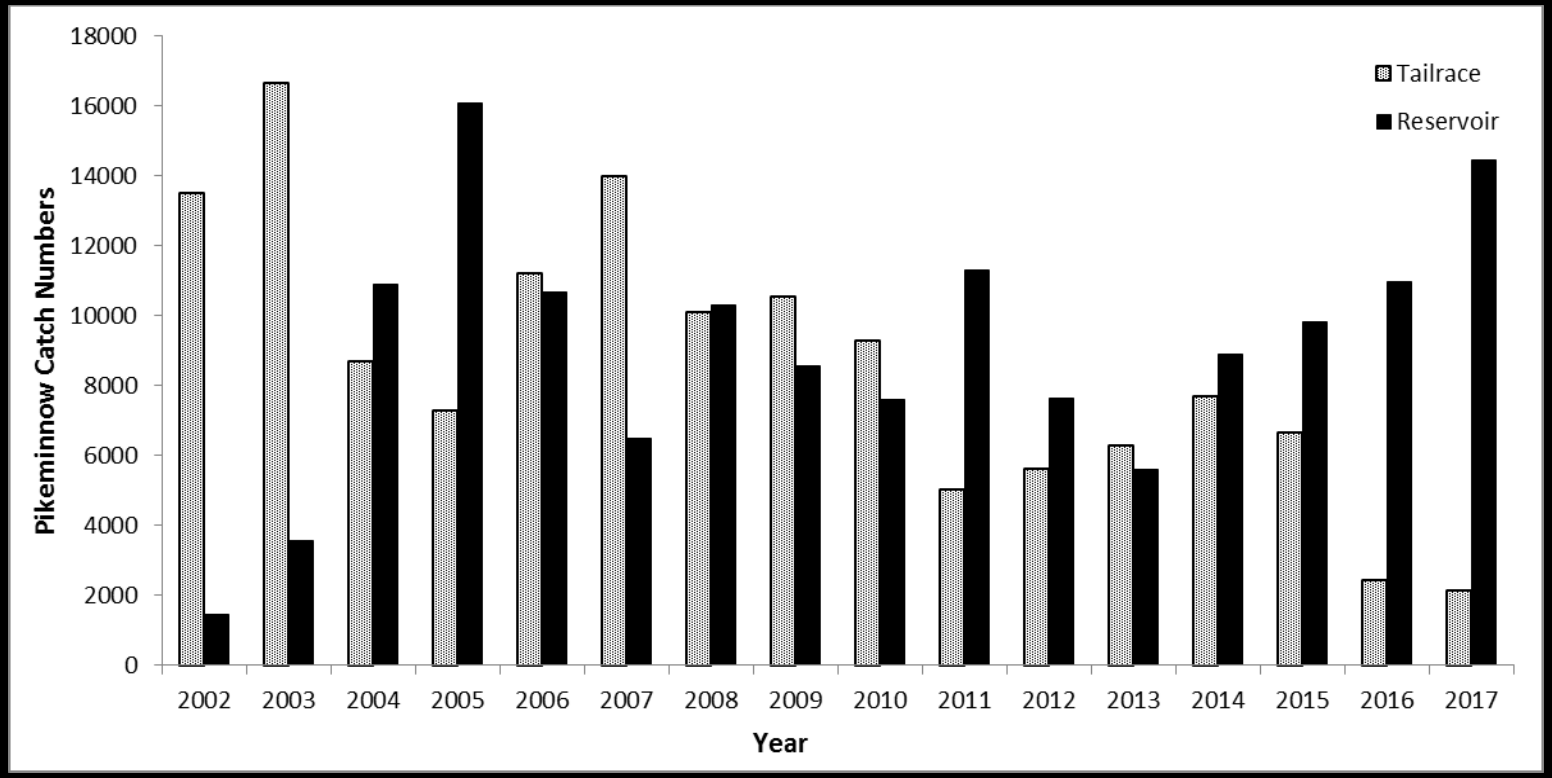
Wells Project Pikeminnow Catches 1995-2017



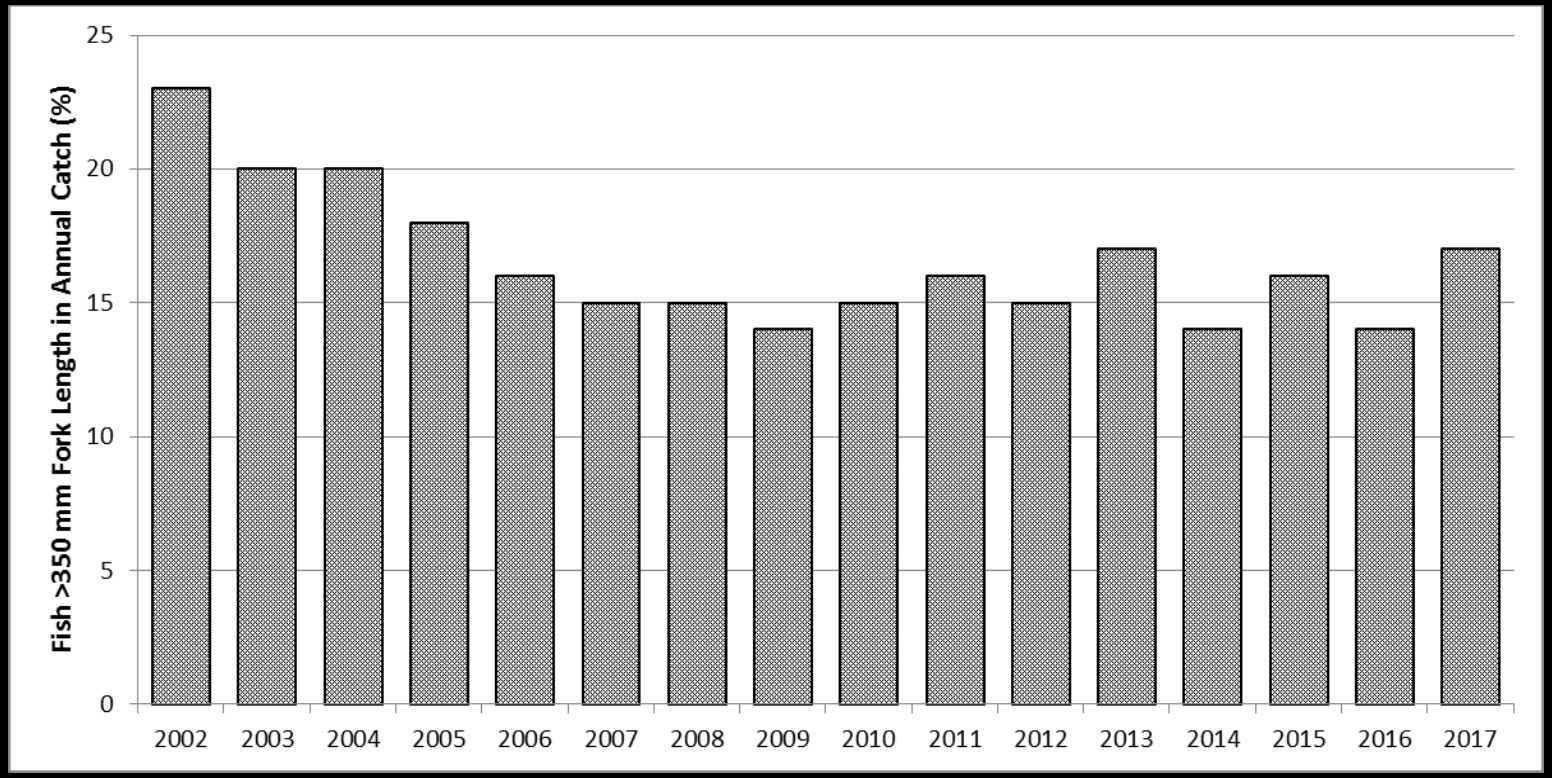
Pikeminnow Catch Per Unit Effort by Location 2002-2017



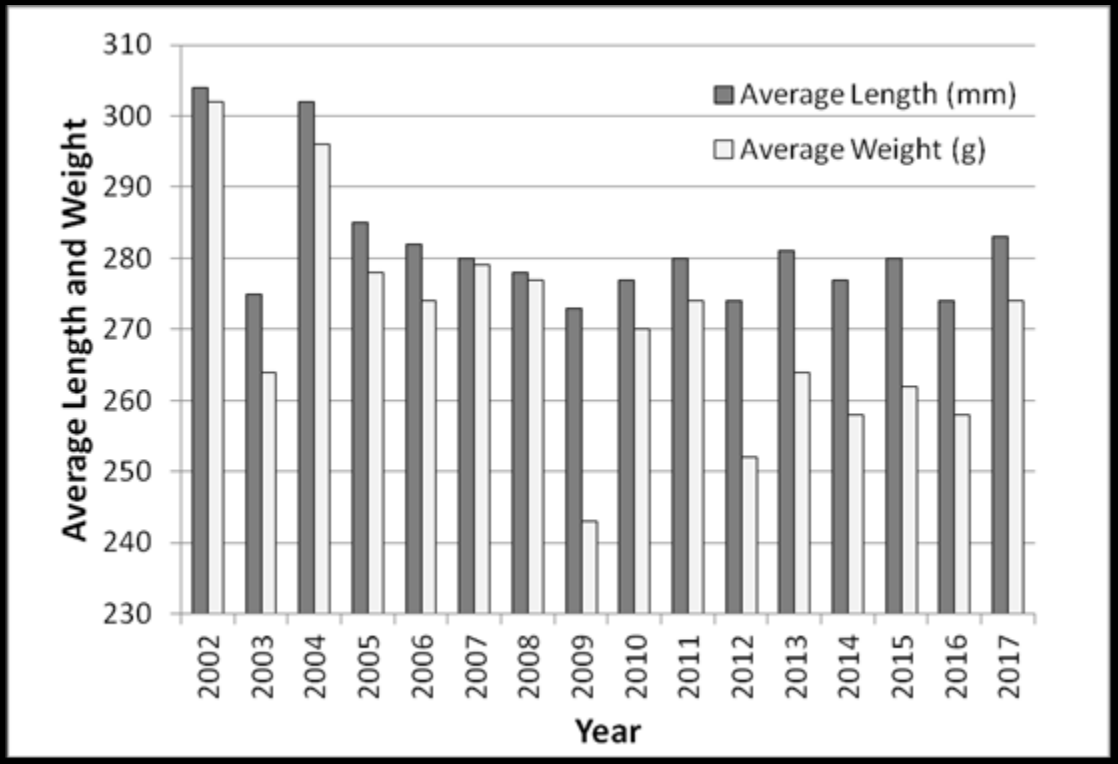
Wells Pikeminnow Catch by Location 2002-2017



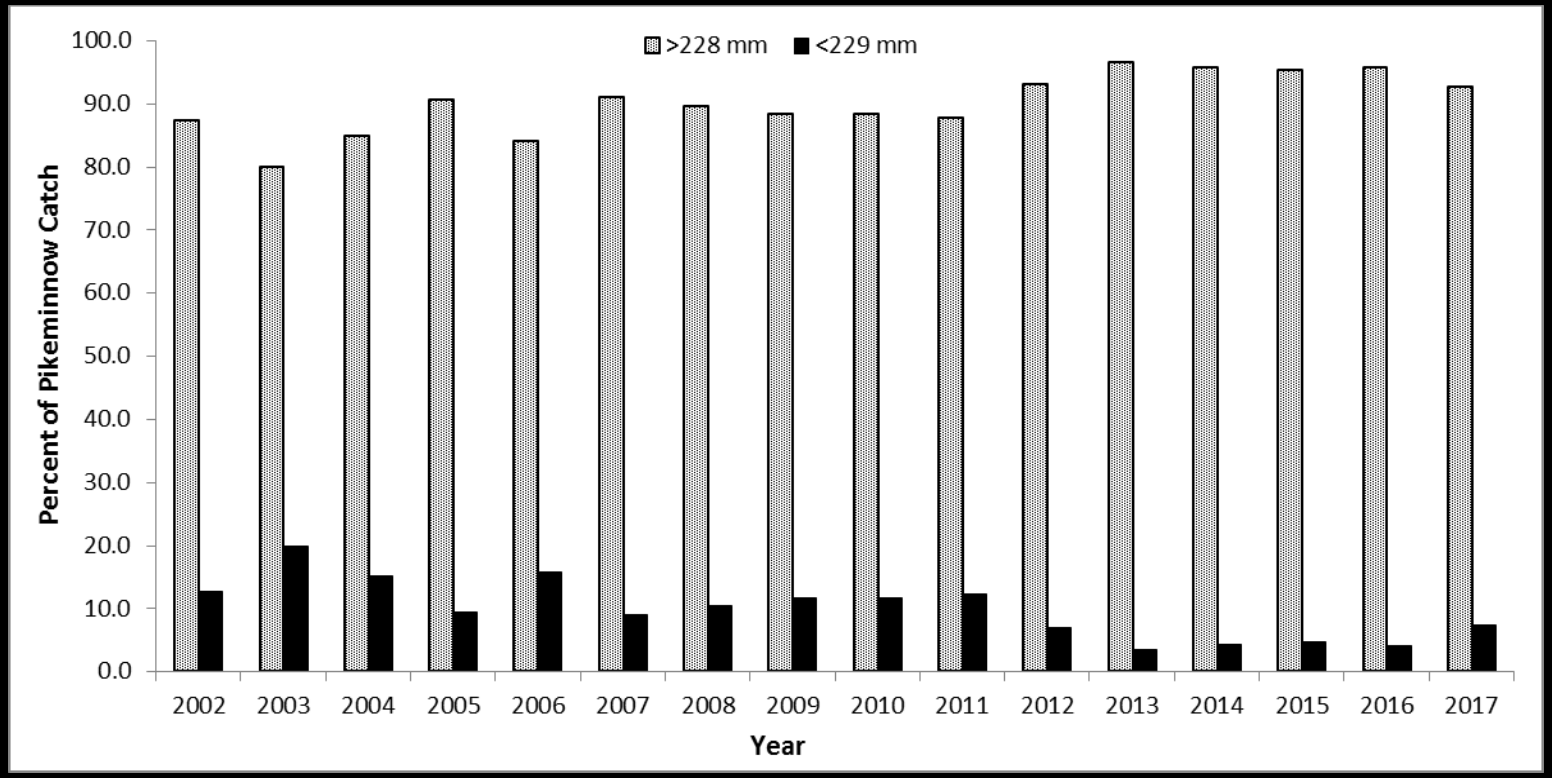
Proportion of Large Fish in Catches 2002-2017



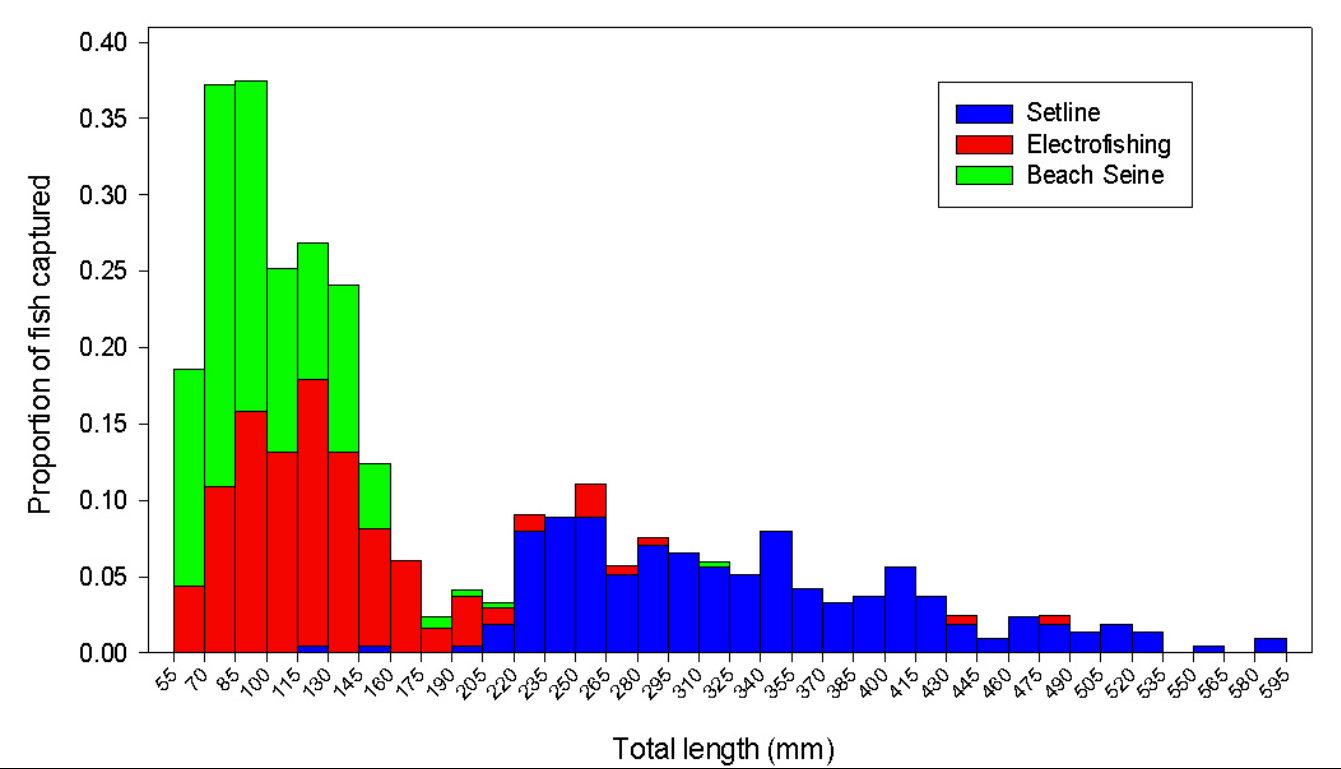
Average Pikeminnow Size in Catches 2002-2017



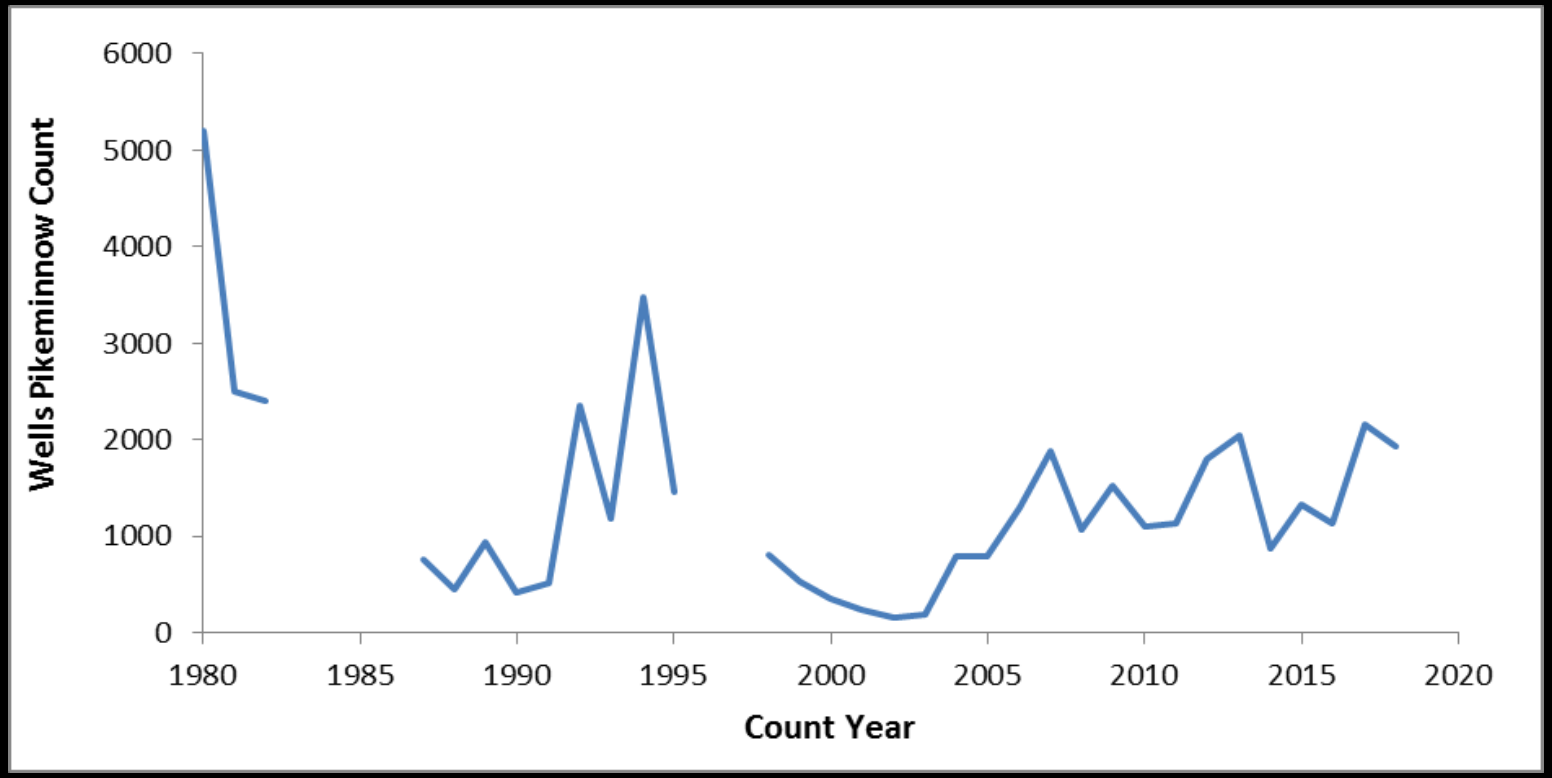
Wells Catch Proportions by Length 2002-2017

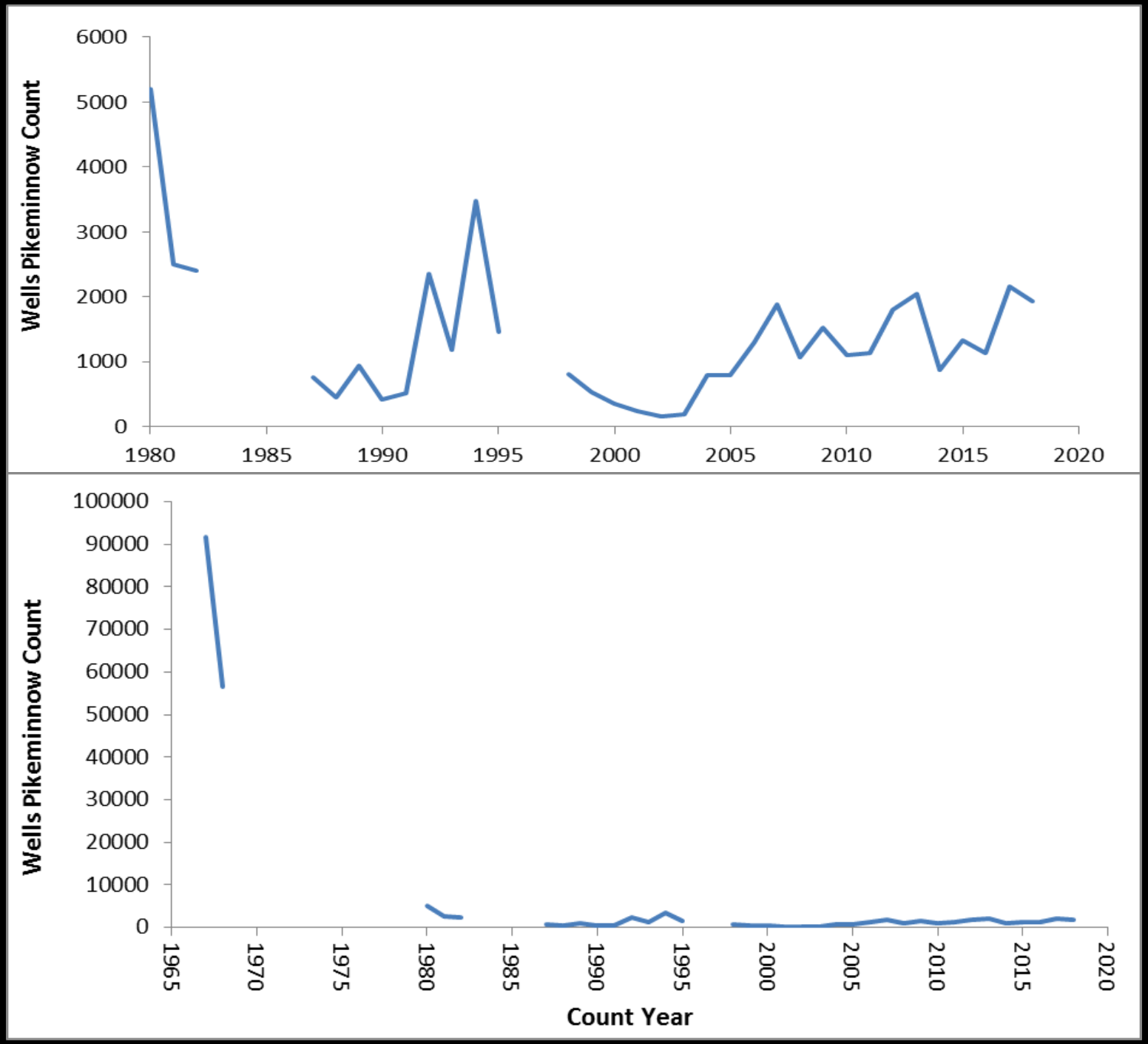


Catches Proportioned by Size and Capture Method from 2014 Study

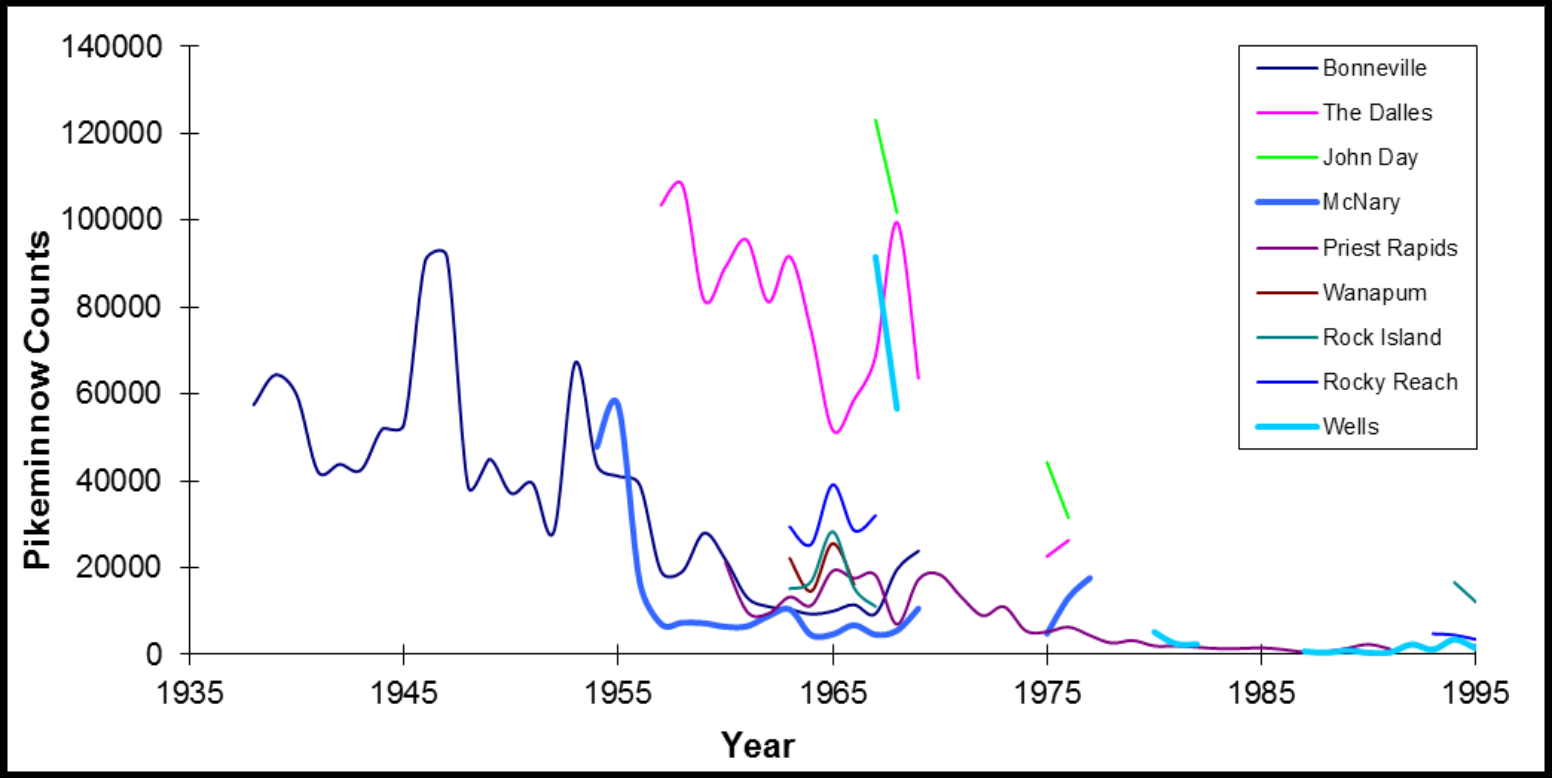


Wells Ladder Counts 1980-2018



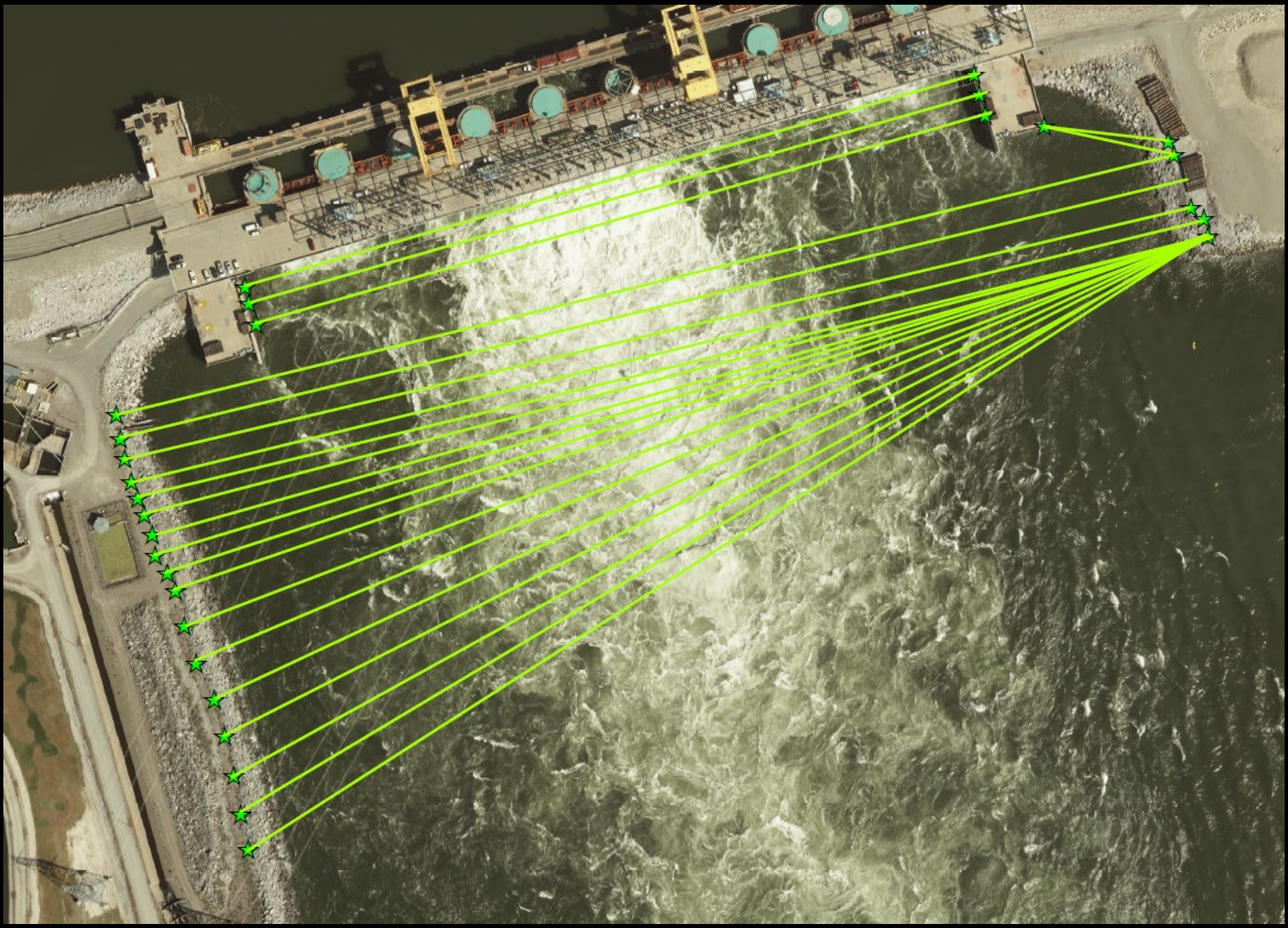

Wells Pikeminnow Count
6000
5000
4000
3000
2000
1000
0
1980
1985
1990
1995
2000
2005
2010
2015
2020
Wells Pikeminnow Count
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
Count Year

Historic Ladder Counts From Multiple Dams



Bird Hazing

Bird Wires



Northern Pike

Focused Monitoring – Northern Pike

- Identify Habitat
- Gillnet Survey – 2017
- eDNA – Started in 2018

Habitat

Wells Reservoir

- The Wells Reservoir, or Lake Pateros, is a 30-mile long mainstem, Columbia River reservoir impounded by Wells Dam at river mile 515.6

Morphometric characteristics

- Area (acres): 9,740
- Shoreline length (miles): 98
- Retention Time: 1.0-1.5 days

Potential Northern Pike Habitat (spawning/rearing)

- Okanogan River
- Bridgeport Bar Island sloughs

Gillnet Survey 2017

- April 2017
- 24 sites – in areas with suitable pike habitat
  - Experimental gill nets
    - 80ft length X 6ft depth
    - 8 panels: 0.75”to 2.25” mesh
  - Set overnight

Gillnet Survey 2017

- No Northern Pike captured
- Bycatch
  - Suckers
  - Pikeminnow
  - Yellow Perch

Problem:

ESA-listed species

Bull Trout – 1 sub-adult captured

Chinook – 5 hatchery smolts captured

Discontinued – explore other sampling options

Environmental DNA Sampling (eDNA)

- 5 Locations
  - 10 samples; 2 per site each side of river
  - Samples collected each month March-October

- Samples sent to USFS Rocky Mountain Research Station for analysis
  - Also anlayzed for Dreissenids (zebra/quagga)
  - Awaiting results

Response Plan (Under Development)

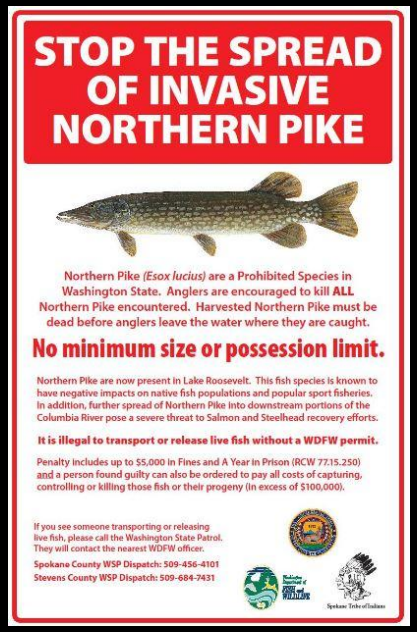
- Continue eDNA sampling as primary detection method.

If detected then what?

- Coordination
  - Notify WDFW, ACOE, CCPUD, Tribes
- Seek and Destroy
  - Boat Electrofishing
    - Non-lethal (usually) for bycatch - minimize impact on ESA-listed species
  - Gillnets
    - Explore use of different mesh size, soak duration, timing to avoid non-target species

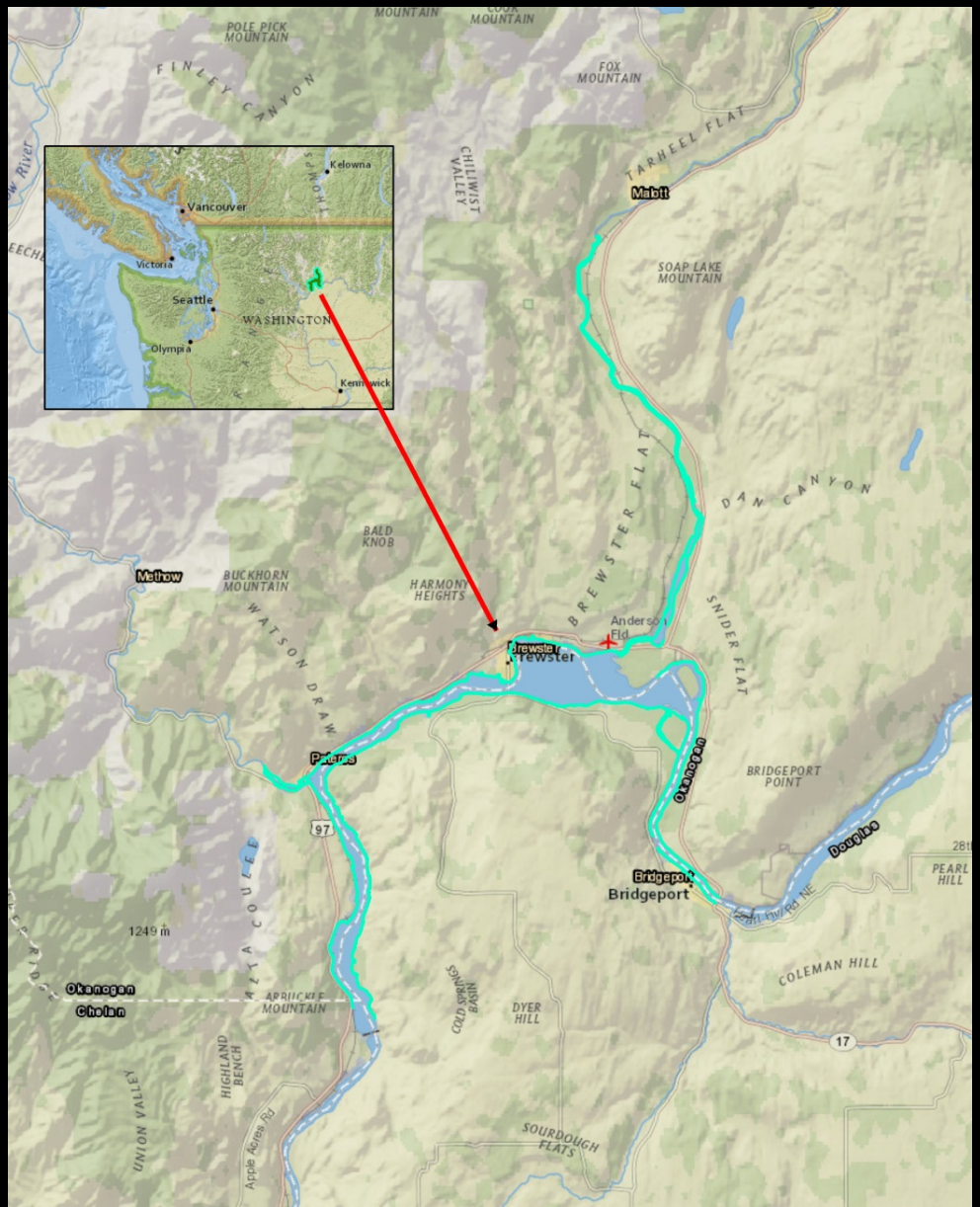
Response Plan (Under Development)

- Other Actions
  - Reservoir operations?
    - Reduce spawning habitat
  - Outreach/Inform Public
    - Signs
    - Angler surveys

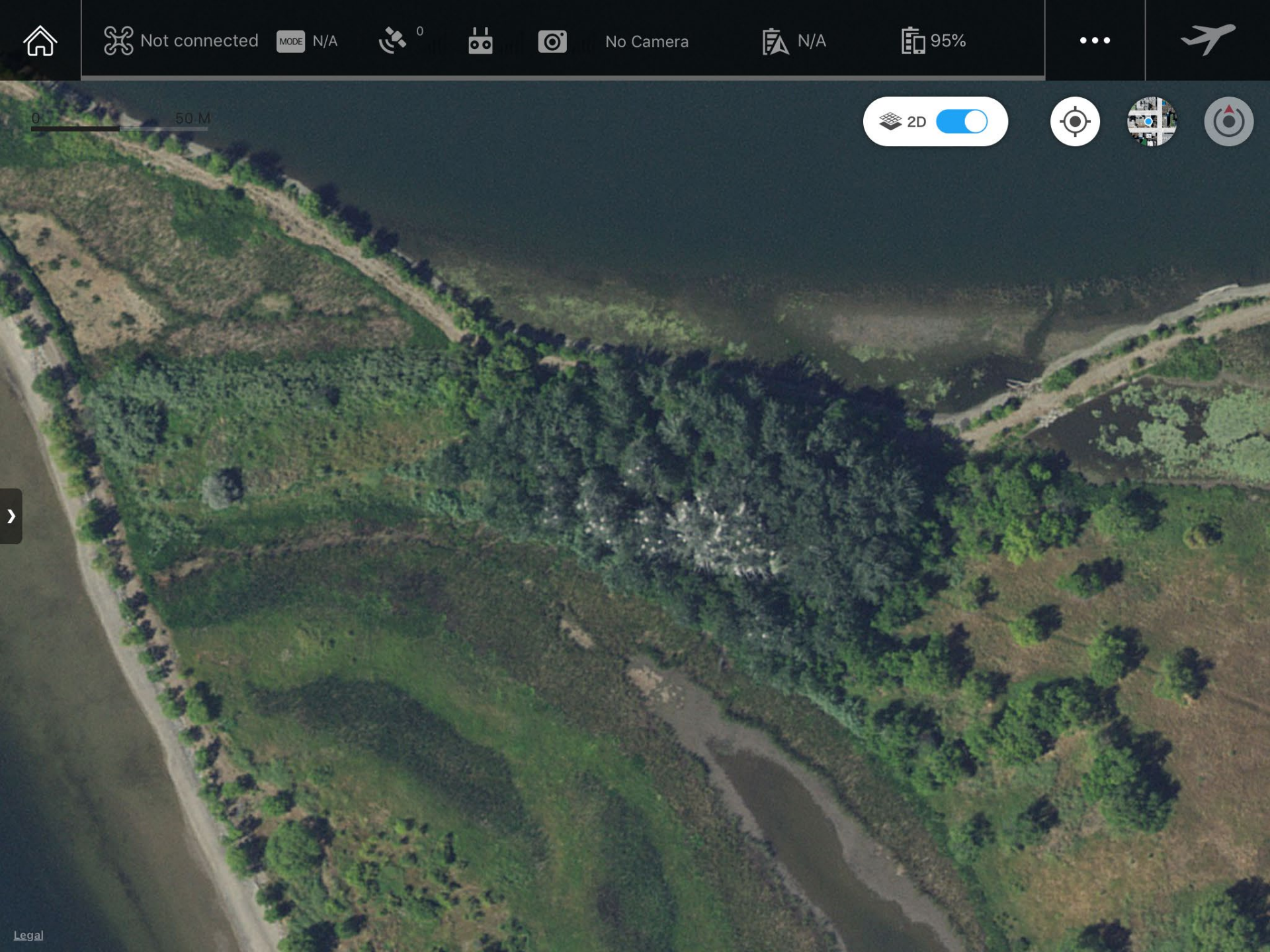


Cassimer Bar Cormorant/Heron Rookery

Wells Reservoir



Cassimer Bar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Cormorant
Rookery
Washburn Island
Release Site
Conklin Landing
Release Site
Wells Dam
Chief Joseph
Dam
Google Earth

Sturgeon PIT Tags Detected at the Cormorant/Heron Rookery

Year	Release # (+/-150)	Release Location	Tags Detected as of Spring 2018	% Detected at Rookery	Mean/*Median* Fish Size Detected	Median Fish Size Stocked	Note
2014	5044	Washburn Island	48	1.0	*313.5*	281.9	Measured 1 month before release
2015	5009	Washburn Island	167	3.3	234.2	234.2	Measured days before release
2016	5289	Washburn Island	176	3.3	273.3	276.4	Measured days before release
2017	5131	Conklin Landing	28	0.5	*258.5*	256.6	Measured days before release
2018	337	Conklin Landing	(not scanned since release)	TBD	TBD	344.7	Measured days before release
Total	20810						

Spring Chinook PIT Tags Detected at the Cormorant/Heron Rookery

Release Site	2000	2001	2003	2004	2005	2008	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total
Biddle Accl. Pond (Methow)								10								10
Chewuch Accl. Pond (Methow)				1						3		19	10	1		34
Chewuch River (Methow)								3	2	3	2					10
Chief Joseph Hatchery												14	14			28
Goat Wall Accl. Pond (Methow)														1		1
Mid-Valley Accl. Pond (Methow)									10	6						16
Methow Hatchery			1				1	1	5	6	3	6	14	1	1	39
Methow River							1	3	2	2		3				11
Nason Creek (Wenatchee)												2				2
Riverside Accl. Pond (Okanogan)												1	16	4		21
Twisp Accl. Pond (Methow)				2						6	1	9	7		1	26
Twisp River (Methow)			3			2				1	2					8
Winthrop NFH (Methow)	1	2		1	1		3	2	7	9	2	1	25	1		55
Back Channel Pond at WNFH								8	7	7						22
Wolf Creek (Methow)							5									5
Grand Total	**1**	**2**	**4**	**4**	**1**	**2**	**10**	**27**	**33**	**43**	**10**	**55**	**86**	**8**	**2**	**288**

Coho PIT Tags Detected at the Cormorant/Heron Rookery

Release Site	2000	2001	2004	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total
Biddle Pond (Methow)												2		1	3
Gold Cr. (Methow)									37	15	54	5		2	113
Leavenworth NFH (Wenatchee)												1			1
Methow River				1		1			1		4				7
Twisp Pond (MSRF)							19	13	28	9	41		10		120
Twisp River (Methow)										2					2
Winthrop NFH (Methow)	1	3	2	13	4	4	6	7	17	12	66	6	1	2	144
WNFH Back Channel Pond					5	12	21	20	16	6			8		88
Grand Total	**1**	**3**	**2**	**14**	**9**	**17**	**46**	**40**	**99**	**44**	**165**	**14**	**19**	**5**	**478**

Summer Chinook PIT Tags Detected at the Cormorant/Heron Rookery

Release Site	2000	2001	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total
Carlton Pond (Methow)										1	4			4	16	3		2	30
Chief Joseph Hatchery															47	17	7	1	72
Hanford Reach		1																	1
Wells Reservoir											38	91	69	13	20	92	26		349
Methow River Mouth				2	1					1									4
Okanogan River										10	4			1	3	2	1		21
Omak Pond (Okanogan)															27	17	4		48
Rock Island Tailrace			1																1
Similkameen River											1		9						10
Wells Forebay												1							1
Wells Hatchery	6	1	1	5	3		9	8	3	2	5	9	7	4	7	3	7		80
Wells Tailrace				4		3				4									11
Grand Total	**6**	**2**	**2**	**11**	**4**	**3**	**9**	**8**	**3**	**18**	**52**	**101**	**85**	**22**	**120**	**134**	**45**	**3**	**628**

Steelhead PIT Tags Detected at the Cormorant/Heron Rookery

Release Site	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Grand Total
Unknown (Wells Hat.)											29	16		12				57
Beaver Creek (Methow)						1	2	1	1	1	1							7
Chewuch River (Methow)			3	1	9				4		12	1	2					32
Entiat River												1						1
Libby Creek (Methow)							1				1							2
Loup Loup Cr. (Okanogan)														1	1			2
Mad River (Entiat River)														1				1
Methow Hatchery											14	8		7	4			33
Methow River			8	23	9			3	7	2	99	6	2	2	2			163
Okanogan River			1	2							2		45	27				77
Omak Cr. (Okanogan)			2	4	2	3		7	25	26	49	18	25	75	19	2		257
Salmon Cr. (Okanogan)											16		4	3	2	11		36
Sanpoil River (Lake FDR)															1			1
S. Fk. Gold Cr. (Methow)								1										1
Similkameen P (Okanogan)																1		1
Similkameen R (Okanogan)			2	2	7													11
Stapaloop Ck(Okanogan)				1	4													5
Twisp Pond (MSRF)			1	2	3													6
Twisp Pond (DPUD)											6	7	11	19	9			52
Twisp River (Methow)			4	5	12			4		2	8	2	2	2	1	2	1	45
Wells Hatchery		5										21		16	4	1		47
Wells Ladders												1						1
Wells Tailrace	3				6						5							14
Winthrop NFH			7	20			2	9	17	53	43	59	43	62	15	5	1	336
Grand Total	**3**	**5**	**28**	**60**	**52**	**4**	**5**	**25**	**54**	**84**	**285**	**140**	**134**	**227**	**58**	**22**	**2**	**1188**

Questions?

Chelan PUD Habitat Conservation Plan Predation Control Program Overview

Lance Keller, Chelan PUD

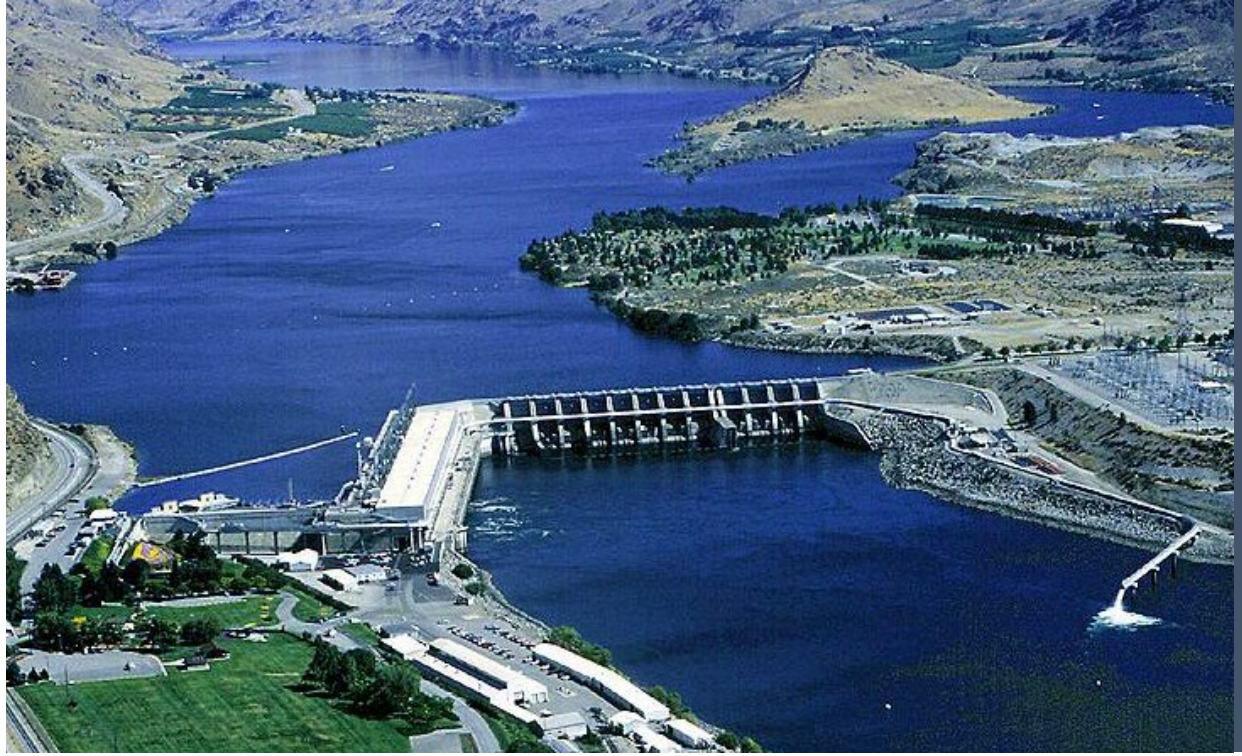
P.U.D.
CHELAN COUNTY

Outline

- Intro
  - Project location
  - Habitat Conservation Plan
- Predation Control Program
  - Northern pikeminnow
  - Piscivorous birds
  - Northern Pike


MAP KEY
Corps of Engineers Dams
Bureau of Reclamation Dams
Dams owned by Others
Dams owned by Canada
Mica
Revelstoke
Duncan
Arrow (Keenleyside)
Corra Linn
Canada
U.S.
Boundary
Box Canyon
Libby
Hungry Horse
Chief Joseph
Grand Coulee
Chelan
Wells
Albeni Falls
Noxon Rapids
Cabinet Gorge
Rocky Reach
WASHINGTON
Post Falls
Thompson Falls
Kerr
Seattle
Rock Island
Wanapum
Little Goose
Lower Granite
MONTANA
5 Yakima Projects
Lower Monumental
Cowlitz River
Priest Rapids
Dworshak
Ice Harbor
Lewis River
McNary
Portland
Bonneville
The Dalles
John Day
Hells Canyon
Oxbow
IDAHO
Brownlee
Cascade
Deadwood
OREGON
Willamette R.
Willamette Projects
Jackson Lake
Arrowrock
Lucky Peak
Anderson Ranch
Palisades
American Falls
Minidoka
North

www.usbr.gov



Rocky Reach Hydroelectric Project

(1300 MW)
43 Mile Reservoir
Juvenile Fish Bypass System
Upstream - Wells Hydro
Downstream – Rock Island Hydro
License expires 2052

Rock Island Hydroelectric Project

(624 MW)
20 Mile Reservoir
Juvenile Fish Spill Program
Upstream – Rocky Reach
Downstream - Wanapum Hydro
License expires 2028

Habitat Conservation Plans

Collaborative Approach to ESA Protection

- 50-year Agreements (signed 2002, approved 2004)
- No surprise clause
- Unanimous decision making
- Adaptive approach to achieving no-net impact for salmon and steelhead
- “Tools” used to achieve survival standards remain in implementation

Washington Department of FISH and WILDLIFE

CHELAN COUNTY

A Three-Pronged Approach to Reaching No-Net Impact

7% Hatchery Production

91% Combined Adult/Juvenile Survival
93% Juvenile Survival

2% Tributary Projects

10 Year Project Survival Achievement

Rocky Reach

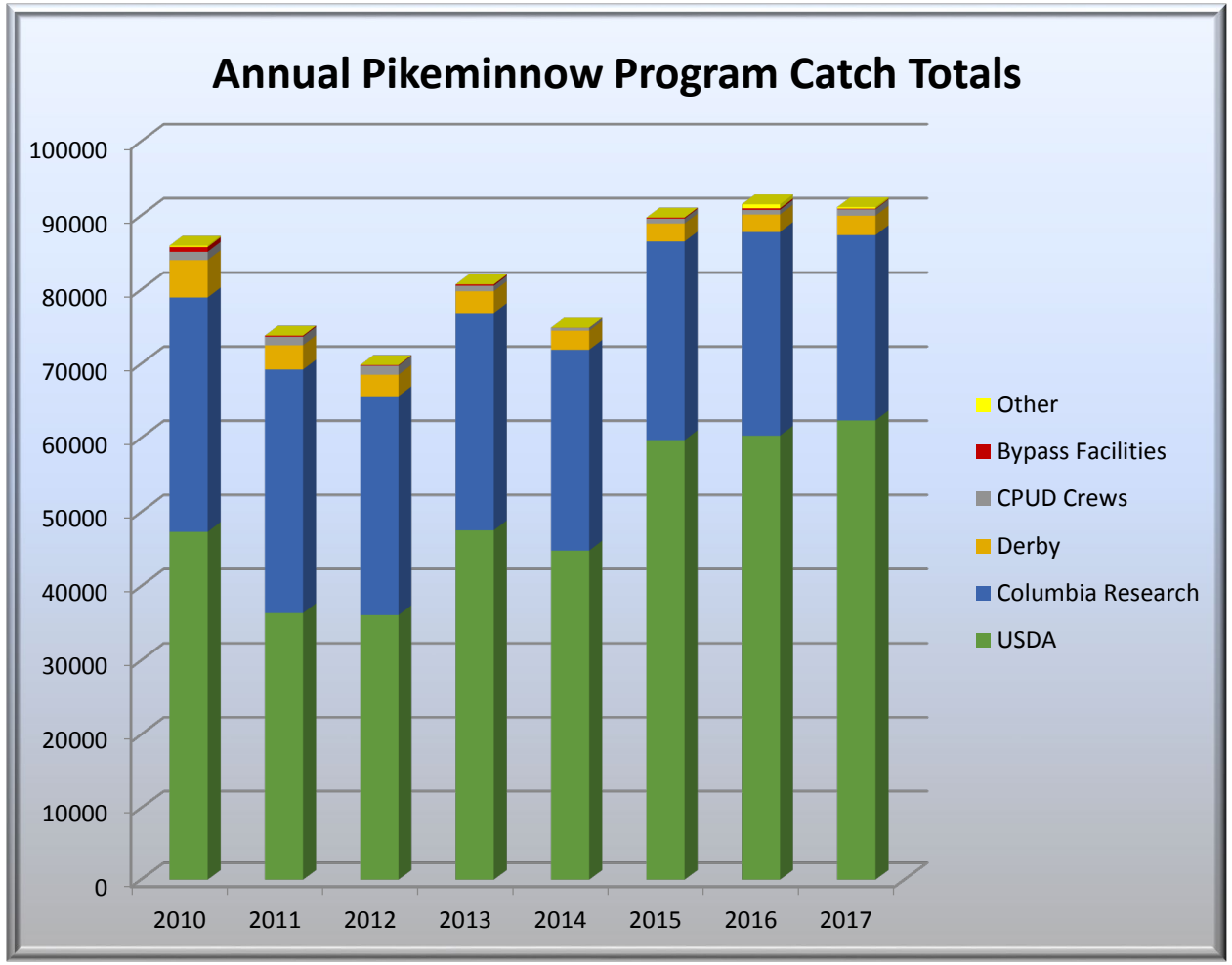
Species	Juvenile Survival	Combined Survival	Standard Achieved?
Sockeye	**93.6%**	**92.6%**	**Yes**
Spring Chinook	**92.3%**	**92.3%**	**Yes**
Steelhead	**95.8%**	**94.8%**	**Yes**

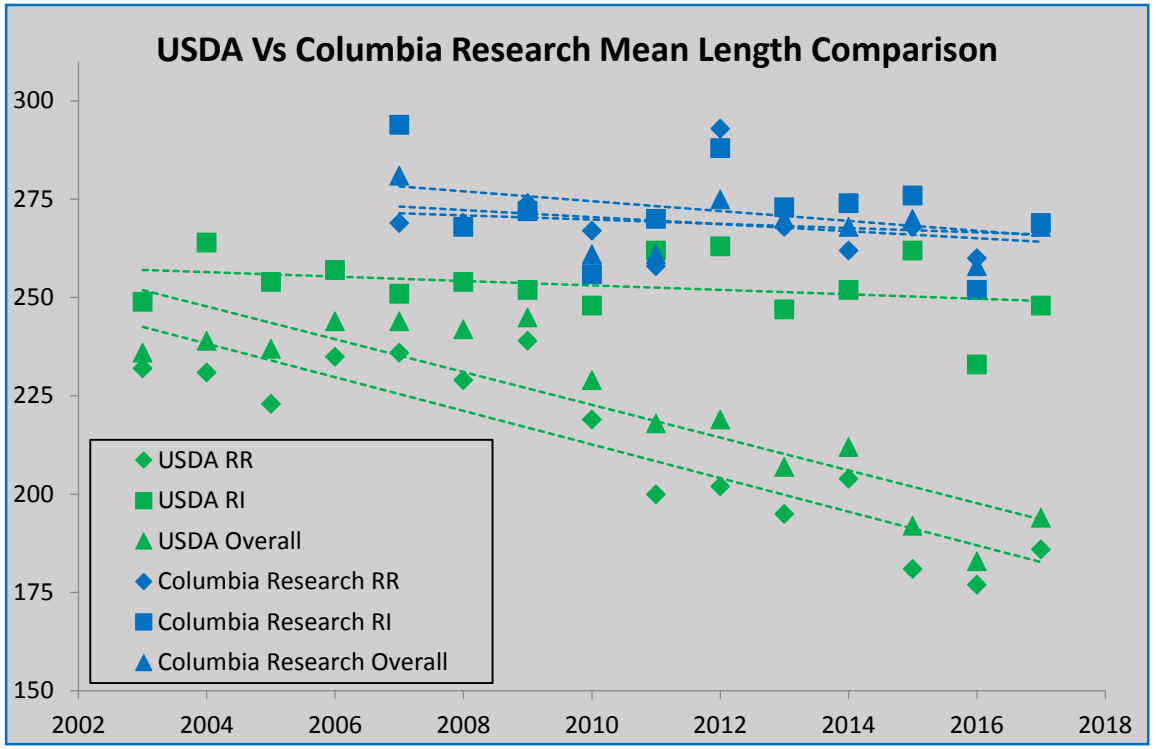
Rock Island

Species	Juvenile Survival	Combined Survival	Standard Achieved?
Sockeye	**93.3**	**91.8%**	**Yes**
Spring Chinook	**93.8**	**93.7%**	**Yes**
Steelhead	**96.8**	**96.1%**	**Yes**

Northern Pikeminnow

- 1994-Present, February-October Annually
  - 1,289,963 fish total, 82,915 10 year average
    - Estimated 2.6 million smolts saved annually
  - Columbia Research – Long Line Removal
    - 2018: 25,412 fish removed during 6,086,088 hook hours
  - USDA WS – Active Angling at Dams and Project Reservoirs
    - 2018: 52,696 fish removed during 10,603 hook hours
  - East Wenatchee Rotary Club Pikeminnow Derby – 2 Day Event
    - 2018: 3,209 fish removed over 2 days, 67 participants


Annual Pikeminnow Program Catch Totals
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
2010
2011
2012
2013
2014
2015
2016
2017
Other
Bypass Facilities
CPUD Crews
Derby
Columbia Research
USDA


USDA Vs Columbia Research Mean Length Comparison
300
275
250
225
200
175
150
2002
2004
2006
2008
2010
2012
2014
2016
2018
USDA RR
USDA RI
USDA Overall
Columbia Research RR
Columbia Research RI
Columbia Research Overall

Piscivorous Bird Management

- Piscivorous Bird Surveys
  - April-August
  - Monthly Boat Survey of Both Rocky Reach and Rock Island Projects
  - Daily Tailrace Surveys At Juvenile Sampling Facilities
- Tailrace Wire Arrays
  - Installed in Late 1990's, Updated in Early 2000's

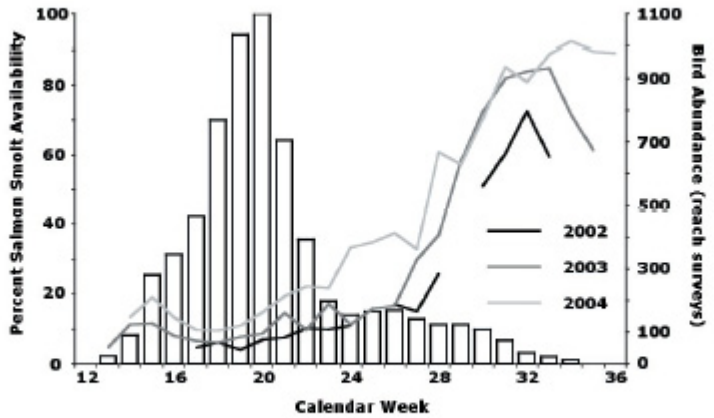
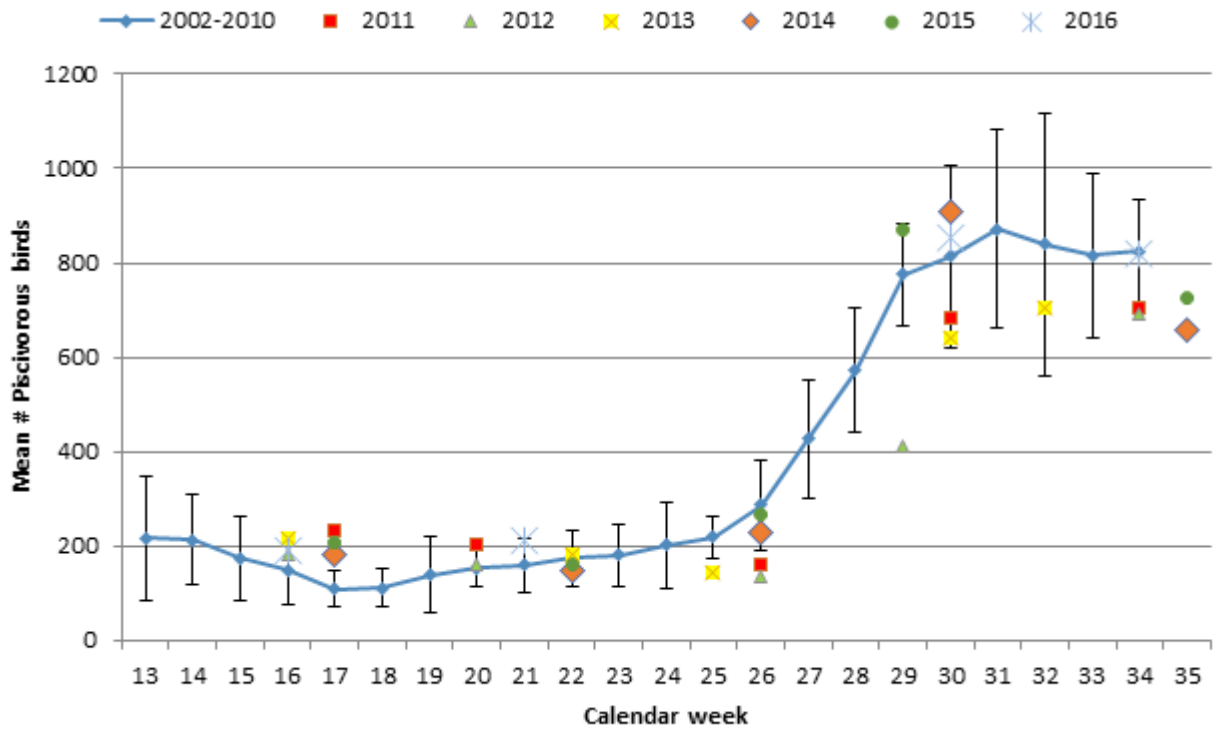
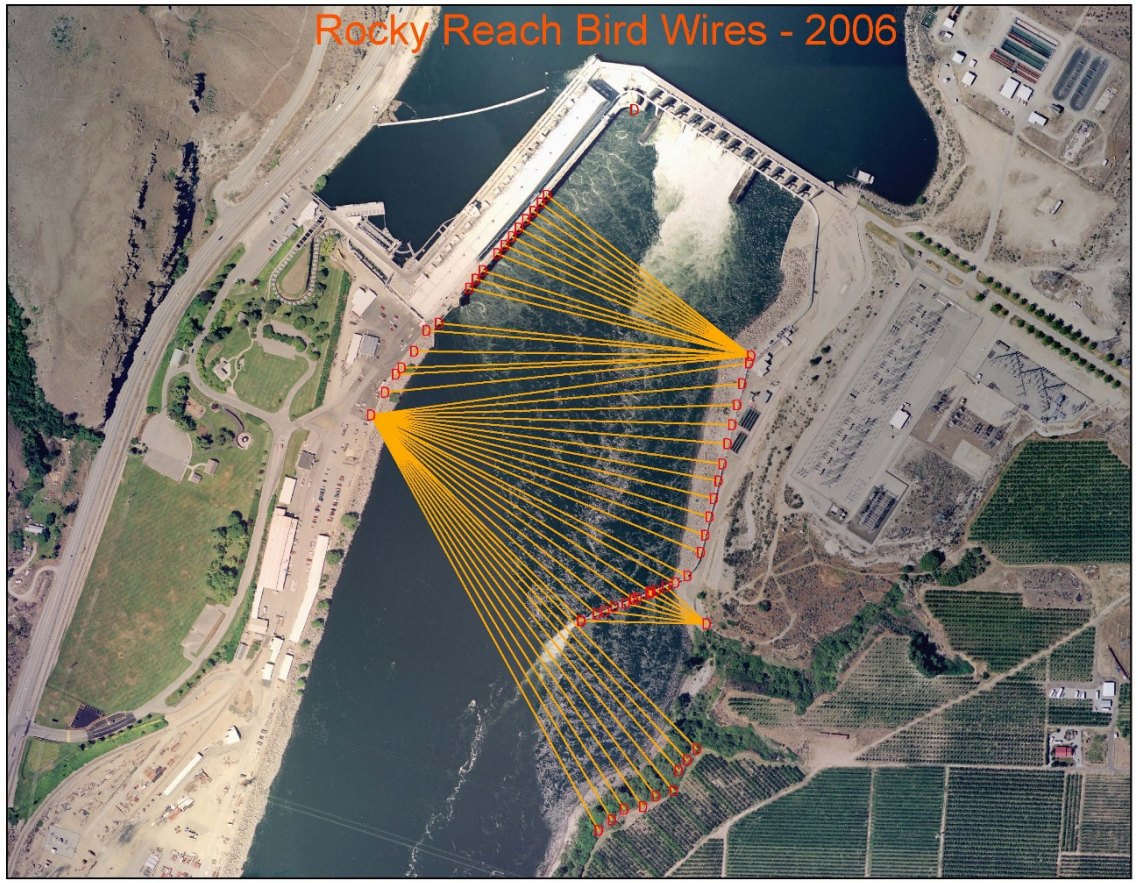
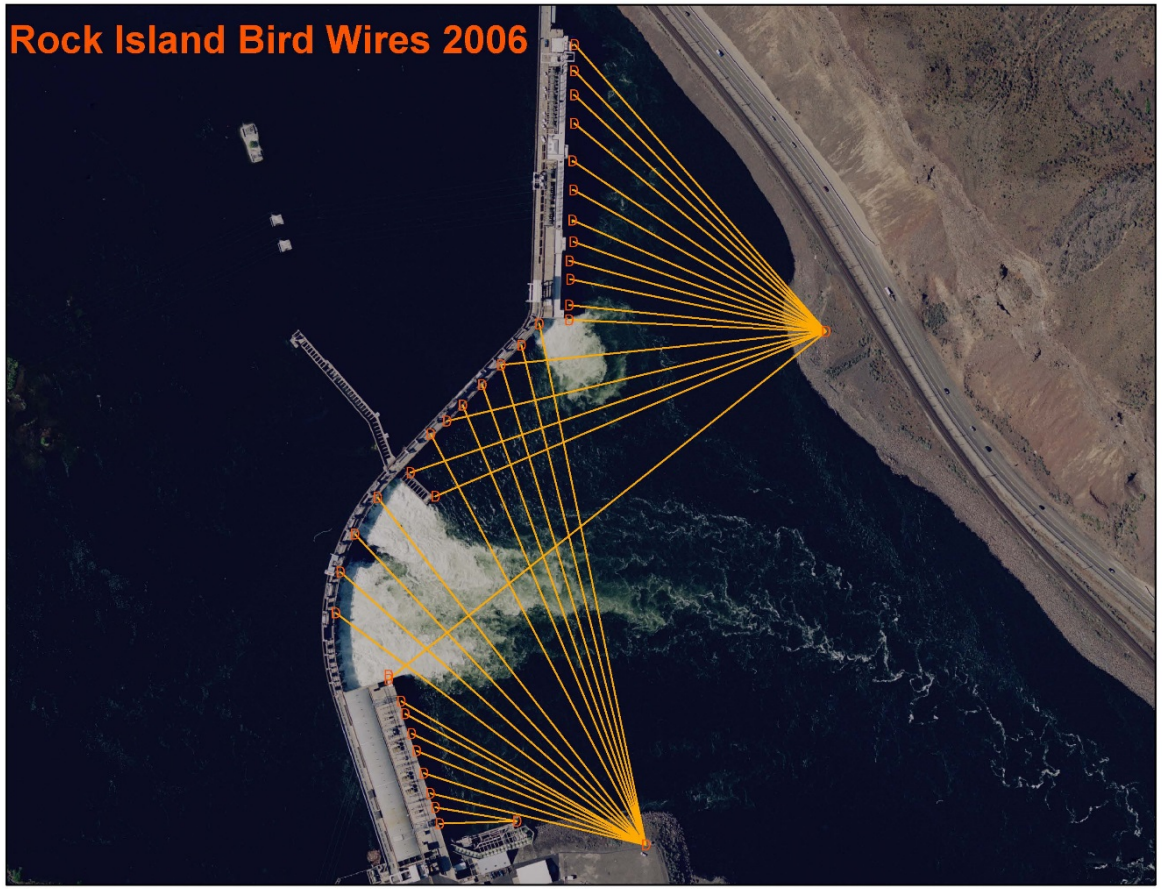


Fig. 2. Salmon smolt availability index from Rock Island Dam daily bypass counts, summed to weekly values, averaged over years (2002-2004), and standardized to percent of maximum week (bars); and weekly bird abundance (summed over all species) from reach surveys between Rock Island and Wells dams, 2002-2004 (lines).




Rocky Reach Bird Wires - 2006


Rock Island Bird Wires 2006

Northern Pike

- Chelan PUD Currently Supporting Suppression Above GCD
  - CCT/STOI, WDFW
  - Removal, Abundance, Bounty Program, eDNA
  - Involved in Mid and Upper Columbia Interagency Pike Forum
- Early Detection in Chelan PUD Project Area
  - Juvenile Bypass Systems
  - Northern Pikeminnow Program
  - Recreational Anglers
- Current HCP Predation Program could Integrate Northern Pike Control

Conclusion

- Chelan PUD has achieved NNI for Spring Plan Species
- Predation Control Program supports NNI achievement & 10 year check in study
  - Robust pikeminnow removal - 1,289,963 pikeminnow removed since 1994
  - Piscivorous bird monitoring
- Chelan PUD providing regional support to northern pike removal
  - Monitoring for early detection
  - Northern pike control could be integrated into existing program

Fish & Avian Predator Management

Priest Rapids Project
FERC No. 2114

Operate Responsibly by Attaining Environmental, Cultural Resource and Regulatory Compliance

Grant PUD

Powering our way of life.

Presentation to the Northwest Power Conservation Council
October 9, 2018

Priest Rapids Project FERC 2114

- Owned and operated by the Public Utility District No. 2 of Grant County, Washington State and is comprised of Priest Rapids and Wanapum dams;

- The Priest Rapids Project (PRP) encompasses 58 miles of the Mid-Columbia River extending from Rock Island Tailrace (Rivermile 453.0) to the rivermile 395.0 below Priest Rapids Dam;

Washington State

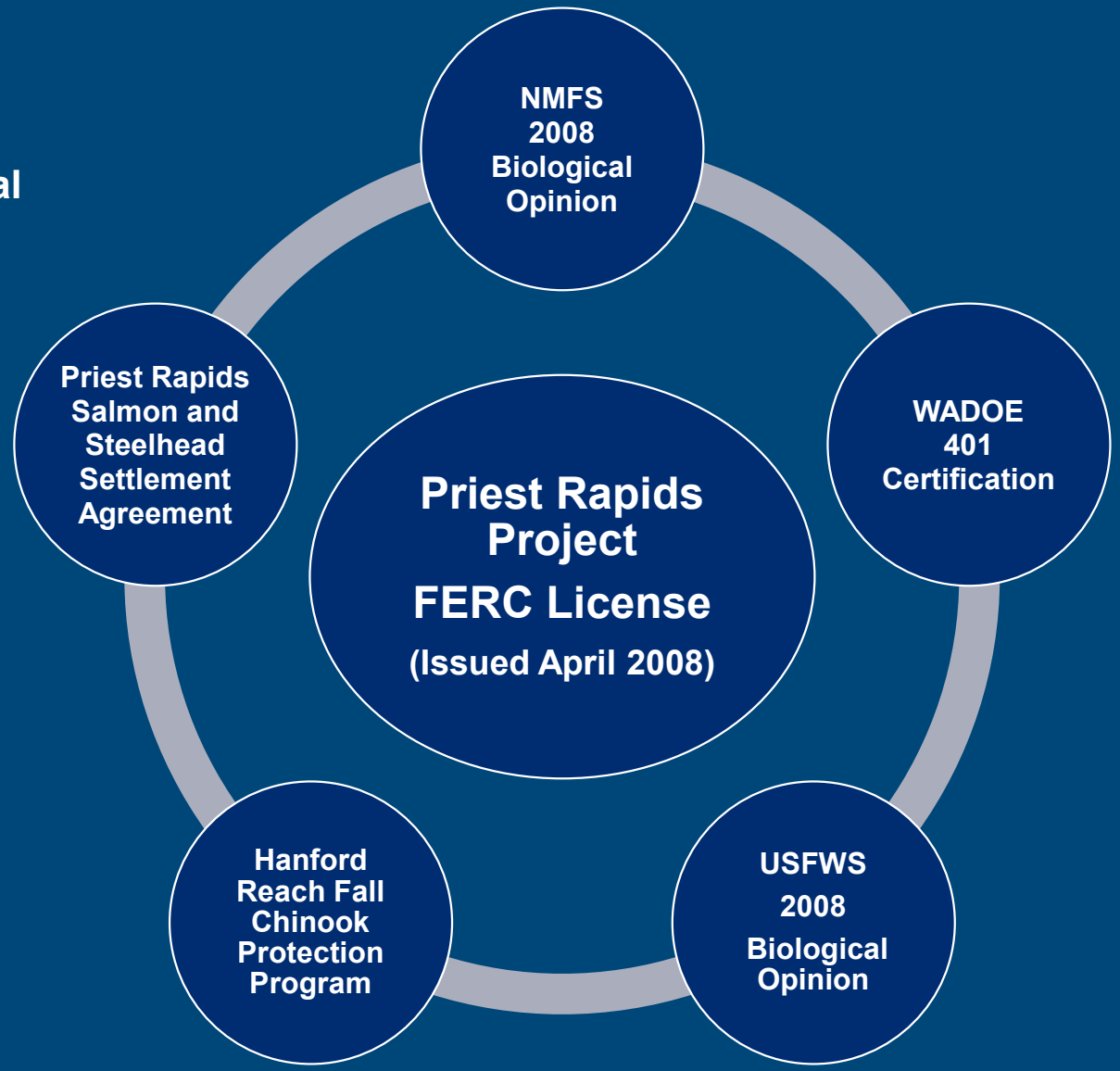
Vicinity

- Priest Rapids Project Boundary
- Open Water
- City Limits
- River
- Interstate or Highway
- Map Area

Environmental Stewardship Requirements

- Extensive consultation with Priest Rapids Coordinating Committee (PRCC). Members of PRCC include NMFS, USFWS, WDFW, Yakama Nation, Confederated Tribes of the Colville Reservation, Confederated Tribes of the Umatilla Indian Reservation (via Columbia River Intertribal Fish Commission), the Wanapum and Grant PUD.

- Important to note that the PRCC (and other required committees) decision making process requires 100% consensus.



Three-Pronged Approach to Reaching No-Net Impact

7% Hatchery Production

91% Combined Adult & Juvenile Survival or 93% Juvenile Survival

2% Habitat Contributions

Avian & Northern Pikeminnow Control Programs

Under Term and Conditions 1.10 and 1.18 of the 2008 NMFS Biological Opinion for the Priest Rapids Project (PRP), Grant PUD is required to continue control and monitor northern pikeminnow in the Priest Rapids Project to improve juvenile salmonid passage survival.

Under Term and Conditions 1.9 and 1.7 of the 2008 NMFS Biological Opinion for the PRP, Grant PUD is required to fund an overall programmatic approach to the reduction of avian-related mortalities to salmon and steelhead populations affected by the Priest Rapids Project.

Northern Pikeminnow in the Mid-Columbia

- First fish predation indexing completed in Mid-Columbia was conducted by Burley and Poe (1994).

  - ✓ Grant, Chelan, and Douglas PUD's funded this work: smolt predation evaluation to determine the relative abundance of northern pikeminnow and other smolt predators in the Columbia River from Priest Rapids tailrace upstream to the tailrace of Chief Joseph Dam.

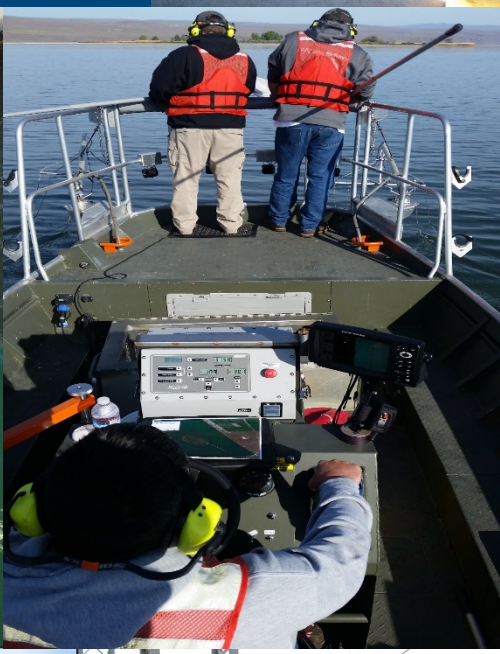
  - ✓ General Findings
    - ❑ Pikeminnow density (index) was similar to that estimated for the lower Columbia and Snake rivers.
    - ❑ Consumption index estimates were very low in many forebay and mid-reservoir areas. Highest in the tailraces of hydroelectric facilities.
    - ❑ Comparisons of predation index values among the mid-Columbia, lower Columbia and Snake Reservoirs indicated that mid-Columbia values were similar to the lower Snake and lower than those from the lower Columbia River.

  - ✓ Grant PUD implements a pikeminnow removal program in 1995.

Northern Pikeminnow Removal in PRP

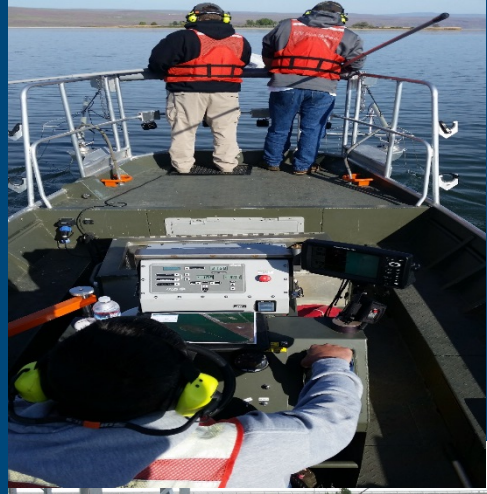
- **Since 1995, Grant PUD has employed a suite of fish removal methodologies to reduce predation on juvenile salmonids.**

- ✓ A total of 533,527 pikeminnow are removed annually from the PRP (based on 2012-2017 data);
- ✓ Removal target all life history stages (young-of-year, juvenile, sub-adult, and adult pikeminnow);
- ✓ Young-of-year and juvenile pikeminnow make up number collected;
- ✓ Over 830 different locations within the PRP are sampled annually;
- ✓ Average cost of program (O&M & Labor) approximately $477,000/year;
- ✓ Extremely difficult to assess number of smolts saved.



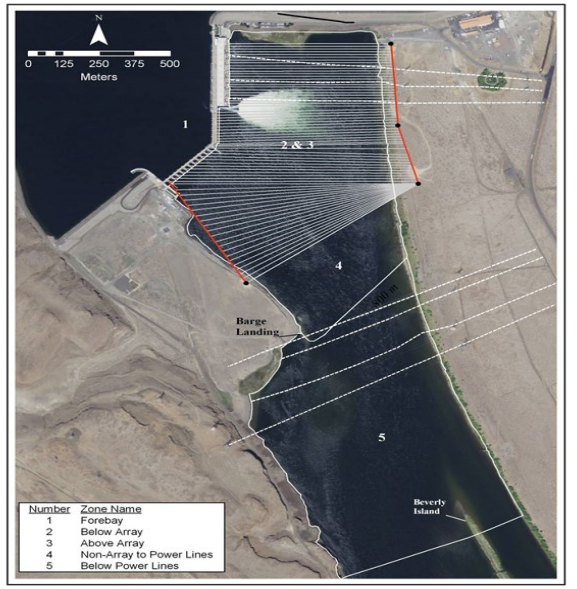
Non-native Fish Predator Removal and Monitoring Program

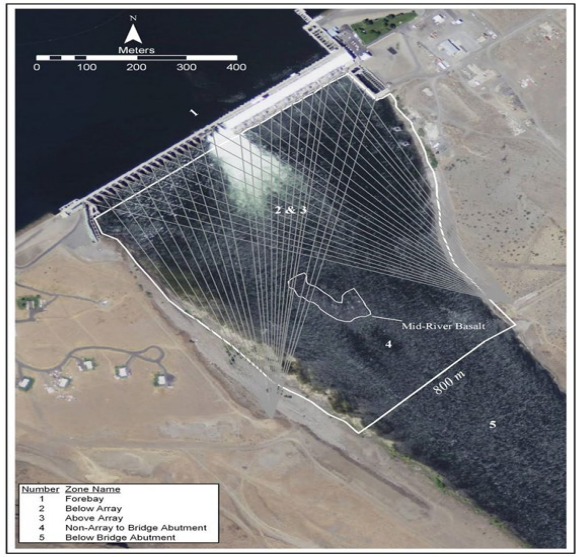
- **Increased focus on the removal of non-native fish predators and monitoring for the presence of northern pike.**
  - ✓ Daytime electrofishing and angling used (2016 and 2017) to remove a total of 1,453 non-native fish predators (smallmouth bass, walleye and channel catfish);
  - ✓ Over 830 different locations within the PRP are sampled annually throughout the season using a variety of gear types (beach seines, setlines, angling and electrofishing);
  - ✓ Expanded electrofishing efforts in 2018 to include areas that one could expect to encounter northern pike if they were present. No northern pike have been sampled within the PRP to date;
  - ✓ May other activities support monitoring activities to detect the presence/absence of non-native fish predators (video fish counting systems, fish salvage activities, juvenile white sturgeon indexing program, northern pikeminnow derby and a resident fish inventory conducted every 5 years throughout the PRP area).



Avian Predator Control Program

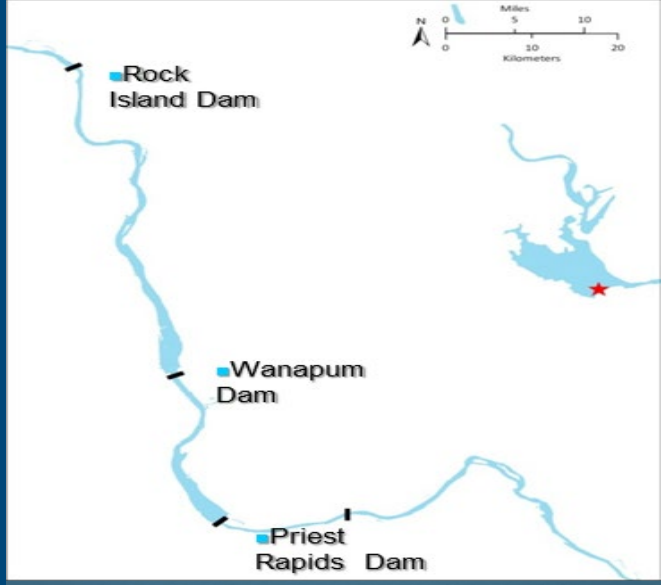
- **Since 1987, Grant PUD has utilized USDA-Wildlife Services to minimize avian predation on juvenile salmonids.**
  - ✓ **Annual contracts with USDA-Wildlife Services to lethally remove "problem" gulls and haze Caspian terns under existing permit terms and conditions;**
  - ✓ **Extensive avian wire arrays installed in the tailraces of Wanapum and Priest Rapids Dams to deter avian predation (2008-2009);**
  - ✓ **3,819 gulls are hazed annually at the PRP (2012-2017 data);**
  - ✓ **Lethal removal of gulls has steadily decreased from a high of 1,105 in 2012 to 175 gulls in 2017.**
  - ✓ **5,785 Caspian terns are hazed annually at the PRP (2012-2017 data);**



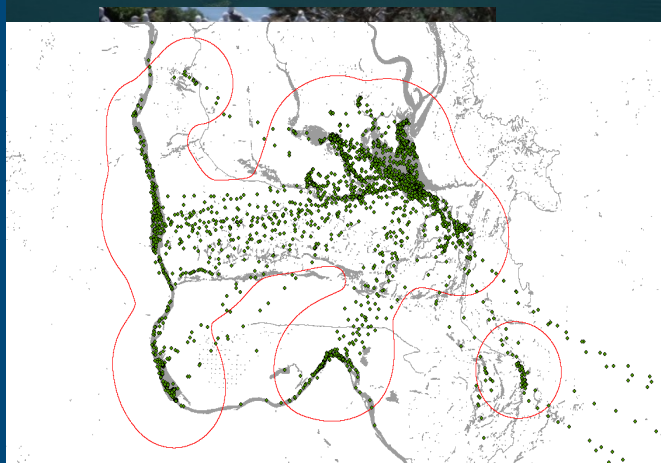


Caspian Terns

- Gulls and terns identified as an impediment in achieving juvenile steelhead survival standards for the PRP (2005-2007);
- PRCC has funded research activities to determine the impacts of tern predation on juvenile salmonids via the No-Net-Impact Fund. Current funding allocated totals nearly ~$4,1 million.
- Key Findings
  - ✓ Estimated predation rates by terns on steelhead smolts averaged 15.7% (2008-2010; Evans et al. 2013);
  - ✓ Research and monitoring activities have greatly contributed to the knowledge base on tern predation impacts on juvenile salmonids migrating through the Columbia River Plateau;
  - ✓ In 2014, management activities were implemented to eliminate the 2 largest tern colonies (Goose and Crescent Island).



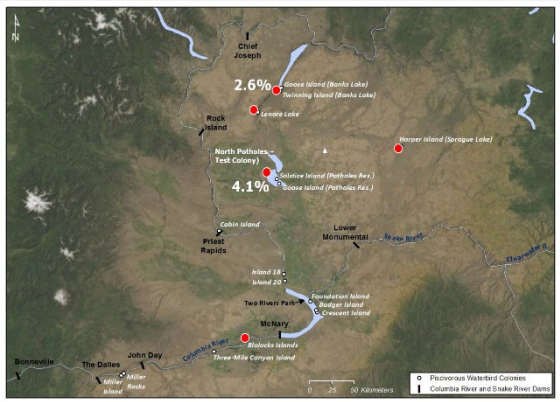
Goose Island - Potholes Reservoir



Caspian Terns – Management

- A suite of dissuasion activities (passive & active) implemented on Goose Island (and Crescent) has reduced predation on juvenile steelhead and changed nesting distribution and colony size in Columbia River Plateau region;
- No tern nesting at Goose or Crescent Islands;
- A 44% decline in the tern population in the CRP;
- At-risk sites still existing within the Columbia River Plateau (North Potholes, Lake Lenore, Twining, Blalock, etc.);

Species	Pre-management 2008-2013*	Post-management 2014 (Phase I)	Change
Steelhead	15.7% (14.1-18.9)	2.9% (1.9-5.1)	- 12.7% (12.2-13.8)



Summary

- An extensive and comprehensive northern pikeminnow and non-native fish predator removal program is being employed within the Priest Rapids Project Area;
- An early detection and monitoring program is in place to determine the presence/absence of non-native fish predators (such as northern pike);
- An effective avian predation control program is in place to deter gulls in the immediately vicinity of the Wanapum and Priest Rapids dams;
- Funding provided by the PRCC (via the NNI Fund) has greatly contributed to the knowledge base and resulted in positive efforts to reduce tern predation on juvenile salmonids migrating through the Columbia River plateau;
- Federal action agencies need to continue to continue to play a major role in addressing the long-term management avian predation issues and and non-native fish predators basin-wide.





Powering our way of life.