

Spring Chinook Salmon Spawning Surveys in the Upper Willamette River Basin in 2018

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Objectives



Provide spawning surveys related to the mitigation, production, and release of spring Chinook into the upper Willamette Basin

- Carcass Collections
- Redd Counts

Project Locations

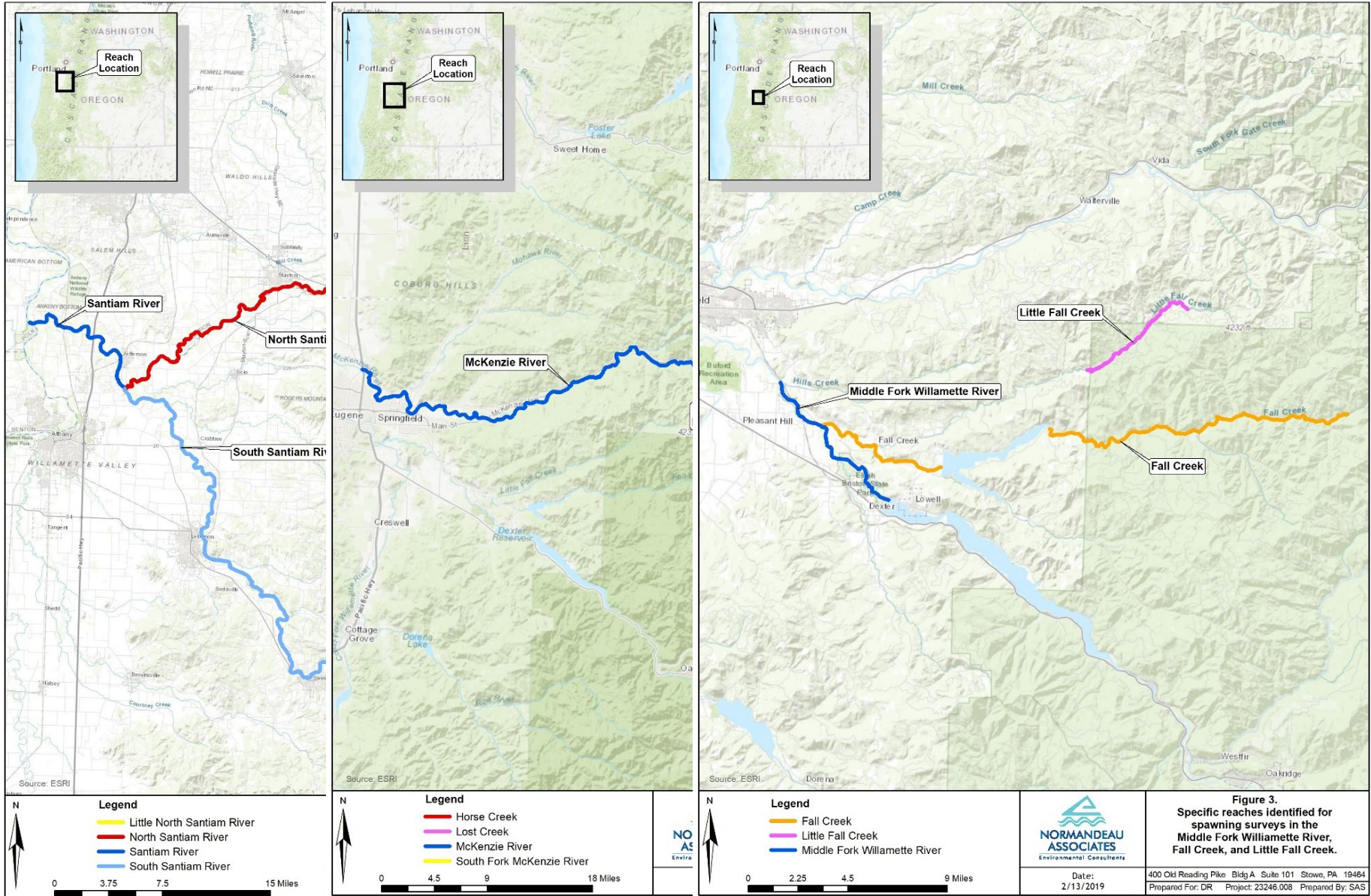


Figure 3.
Specific reaches identified for spawning surveys in the Middle Fork Willamette River, Fall Creek, and Little Fall Creek.



Project Locations

River & Reach	River & Reach	River & Reach
MF Willamette	McKenzie cont.	Santiam
<i>Dexter Dam to Pengra Landing</i>	<i>South Fork McKenzie to Forest Glen</i>	<i>Confluence to Jefferson</i>
<i>Pengra Landing to Jasper</i>	<i>Forest Glen to Rosboro Bridge</i>	<i>Jefferson to I-5 Bridge</i>
Fall Creek	<i>Rosboro Bridge to Ben Kay</i>	<i>I-5 Bridge to Mouth</i>
<i>Falls to Gold Creek</i>	<i>Helfrich to Leaburg Lake</i>	North Santiam
<i>Gold Creek to 1833 Bridge</i>	<i>Leaburg Dam to Leaburg Landing</i>	<i>Big Cliff Dam to Minto</i>
<i>1833 to Hehe Creek</i>	<i>Leaburg Landing to Deerhorn</i>	<i>Minto Dam to Packsaddle</i>
<i>Hehe Creek to 1828</i>	<i>Deerhorn to Hendricks</i>	<i>Packsaddle to Gates Bridge</i>
<i>1828 to Portland Creek</i>	<i>Hendricks to Bellingier</i>	<i>Gates Bridge to Mill City</i>
<i>Portland Creek to Bedrock</i>	<i>Bellingier to Hayden</i>	<i>Mill City to Fisherman's Bend</i>
<i>Bedrock to Johnny Creek Bridge</i>	<i>Hayden to Armitage</i>	<i>Fisherman's Bend to Mehama</i>
<i>Johnny Creek to Release</i>	South Fork McKenzie	<i>Mehama to Powerlines</i>
<i>Release Site to Reservoir</i>	<i>Cougar to Bridge</i>	<i>Powerlines to Upper Bennett</i>
<i>Fall Creek Dam to Pengra Bridge</i>	<i>Bridge to Upstream Habitat Restoration</i>	<i>North Channel Stayton Is to Stayton</i>
<i>Pengra Bridge to Fall Creek Mouth</i>	<i>Upstream Habitat Restoration to Mouth</i>	<i>Stayton to Shelburn</i>
Little Fall Creek	Lost Creek	<i>Shelburn to Green's Bridge</i>
<i>Trib Below NFD 400 to NFD 1806</i>	<i>Spring to Cascade</i>	<i>Green's Bridge to Mouth</i>
<i>NFD 1806 Bridge to NFD 1818</i>	<i>Cascade to Limberlost CG</i>	Little North Santiam
<i>NFD 1818 Bridge to Fish Ladder</i>	<i>Limberlost CG to Split Point</i>	<i>Elkhorn Bridge to Salmon Falls</i>
McKenzie	<i>Split Pt to Hwy 126 Bridge</i>	<i>Salmon Falls to Camp Cascade</i>
<i>Spawning Channel to Olallie</i>	Horse Creek	<i>Camp Cascade to Narrows</i>
<i>Olallie to Belknap</i>	<i>Pothole Creek to Trail Bridge</i>	<i>Narrows to Golf Bridge</i>
<i>Belknap to Paradise</i>	<i>Trail Bridge to Separation Creek</i>	<i>Golf Bridge to Bear Creek Bridge</i>
<i>Paradise to McKenzie Trail</i>	<i>Separation Creek to Road Access</i>	<i>Bear Creek Bridge to Lomkers Bridge</i>
<i>McKenzie Trail to McKenzie Bridge</i>	<i>Road Access to Braids</i>	<i>Lomkers Bridge to NF Park</i>
<i>McKenzie Bridge to Hamlin</i>	<i>Braids to Avenue Creek</i>	<i>NF Park to HWY 22 Bridge</i>
<i>Hamlin to S.F. McKenzie</i>	<i>Avenue Creek to Horse Creek Bridge</i>	<i>Hwy 22 Bridge to Mouth</i>
	<i>Horse Creek Bridge to Mouth</i>	South Santiam
		<i>Foster Dam to Pleasant Valley</i>
		<i>Pleasant Valley to McDowell Creek</i>
		<i>McDowell Creek to Waterloo</i>
		<i>Gill's Landing to Sanderson's</i>
		<i>Sanderson's to Mouth/Jefferson</i>

- 12 Rivers
- 76 "Reaches"
- Nearly 400 river kilometers

Methods



Carcass Collection

Crews floated/walked reaches and collected the data from carcasses

- Fork Length
- Sex
 - Egg Retention %
- Clipped/Unclipped
 - Otoliths of unclipped fish
- Scales (Aging by ODFW)
- DNA Sample
- Coded Wire Tags

Analysis



Carcass Collection

- Prespawn Mortality (females)
 - >50% egg retention
- Proportion Hatchery Origin Spawners
 - Clipped fish + thermal marked unclipped fish/total fish

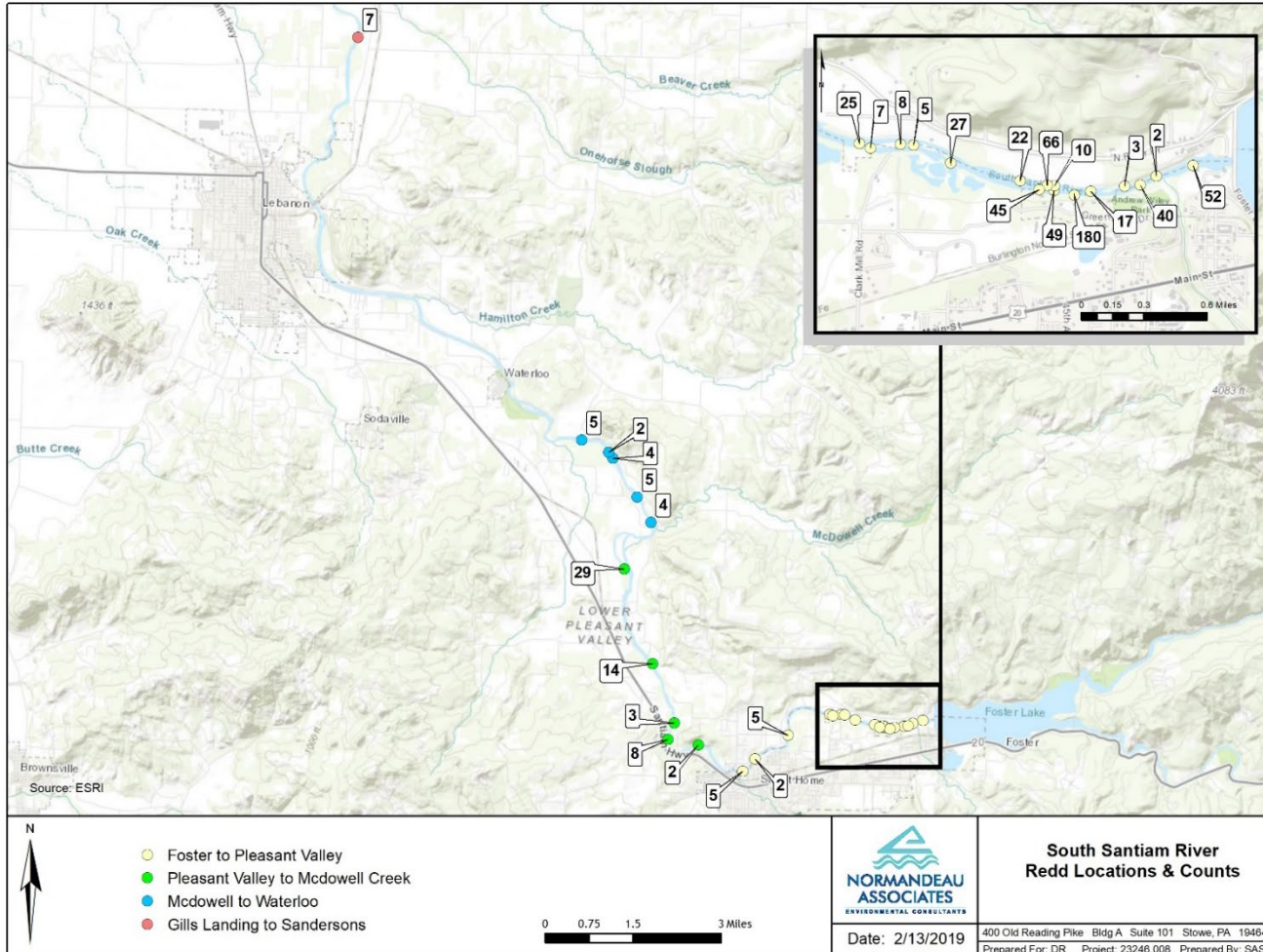
Methods



Redd Counts

- Training after spawning initiation
- Crews saw redd construction and counted redds during carcass surveys
- Conducted final redd counts after live fish were no longer visible in river reaches
- Collected GPS location of spawning areas

Analysis



Redd Counts

- Generated redd maps utilizing GIS
- Redd density
- Spawner abundance estimates (redds*2.5)

Results

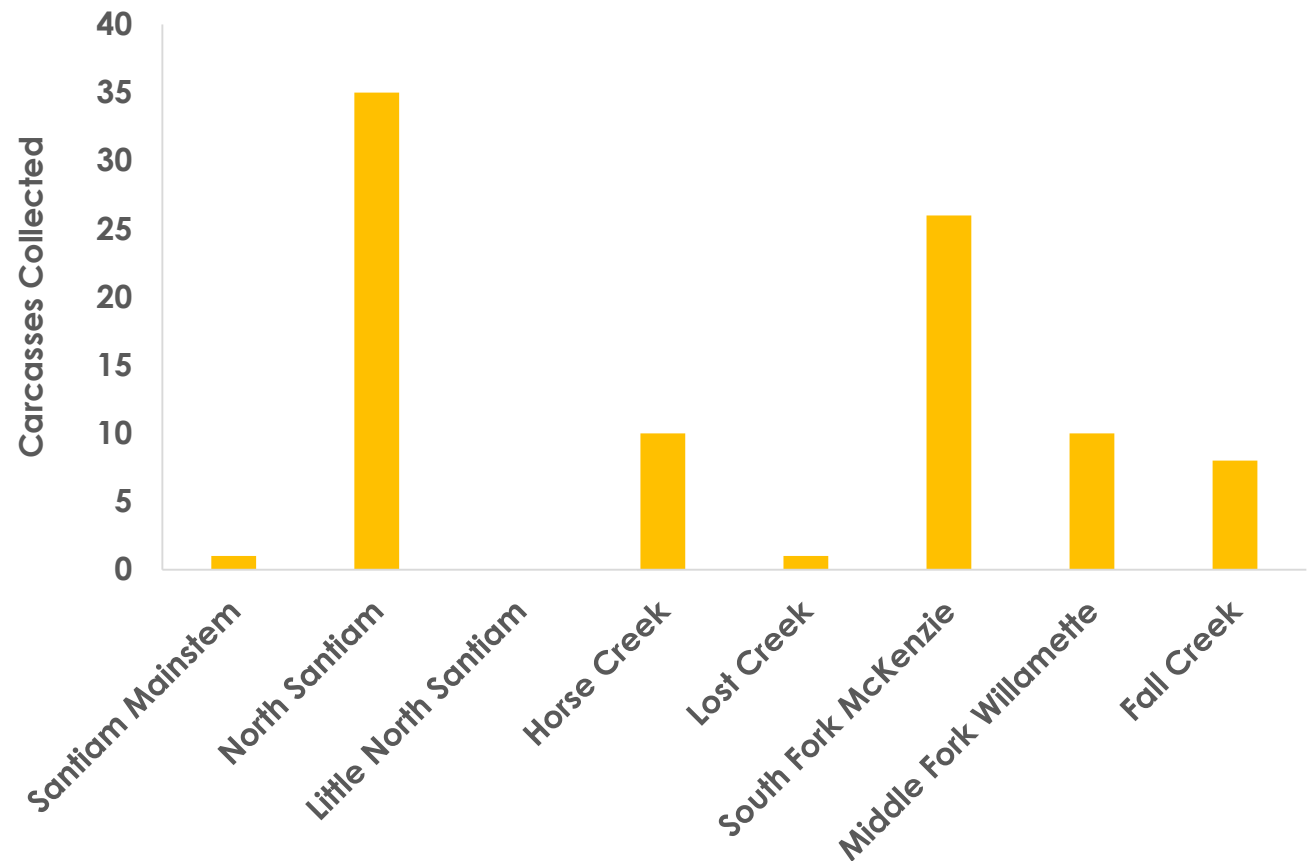
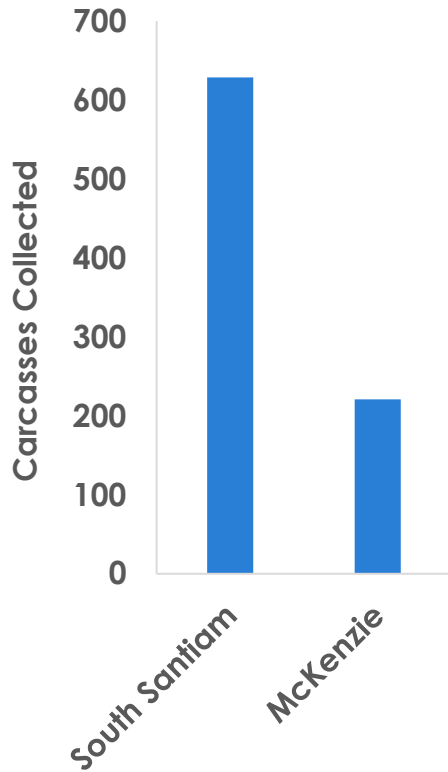


Carcass Collection

- June 27 – October 24
 - First carcass 6/27, last carcass 10/20
- 541 reaches surveyed
- 941 carcasses collected

Results

Carcass Collection



Results

Prespawn Mortality

- Most fish either retained nearly all of their eggs, or spawned completely
- 2% of carcasses had 30-70% egg retention

PSM by Drainage*	PSM	Spawned	Total	PSM %
Middle Fork Willamette	5	2	7	71%
McKenzie	18	130	148	12%
South Santiam	74	332	406	18%
North Santiam	7	12	19	37%



Results



PSM vs. 2015/2016

Increased in 2018

- South Santiam
 - 2018 (18%), 2015 (12%), 2016 (4%)
- McKenzie above Leaburg Dam
 - 2018 (16%), 2015 (5%)

Decreased in 2018

- McKenzie below Leaburg Dam
 - 2018 (14%), 2015 (35%), 2016 (17%)
- Middle Fork Willamette
 - 2018 (50%), 2015 (99%), 2016 (96%)

Results

Prespawn Mortality

- Another study (Bowerman et al. 2017) of 14 years of data in the basin indicated that hatchery fish may experience higher levels of PSM.
- Compared proportions of PSM for hatchery and wild origin fish using Fisher's Exact Test
- All Rivers PSM – Hatchery 18.0%, Wild 17.8%, $p = 1.0$
- S. Santiam PSM – Hatchery 18.4%, Wild 15.6%, $p = 0.66$
- McKenzie + tributaries PSM – Hatchery 6.8%, Wild 17.3%, $p = 0.07$
 - Below Leaburg Dam PSM – Hatchery 8.7%, Wild 44.4% $p = 0.016$
 - Above Leaburg Dam + tributaries PSM – Hatchery 0%, Wild 13.6% $p = 0.194$
- Our data, from only a single year, do not appear to support higher PSM rates in hatchery fish

Results

River	Hatchery	Wild	pHOS
Middle Fork Willamette	8	2	0.80
Fall Creek	4	4	0.50
McKenzie	102	118	0.46
South Fork McKenzie	5	21	0.19
Lost Creek	0	1	0
Horse Creek	0	10	0
Santiam	1	0	1
North Santiam	18	17	0.51
Little North Santiam	0	0	-
South Santiam	564	62	0.90

Proportion Hatchery Origin Spawners

- Highest on the S. Santiam
- Lowest on the tributaries of the McKenzie above Leaburg Dam

Results

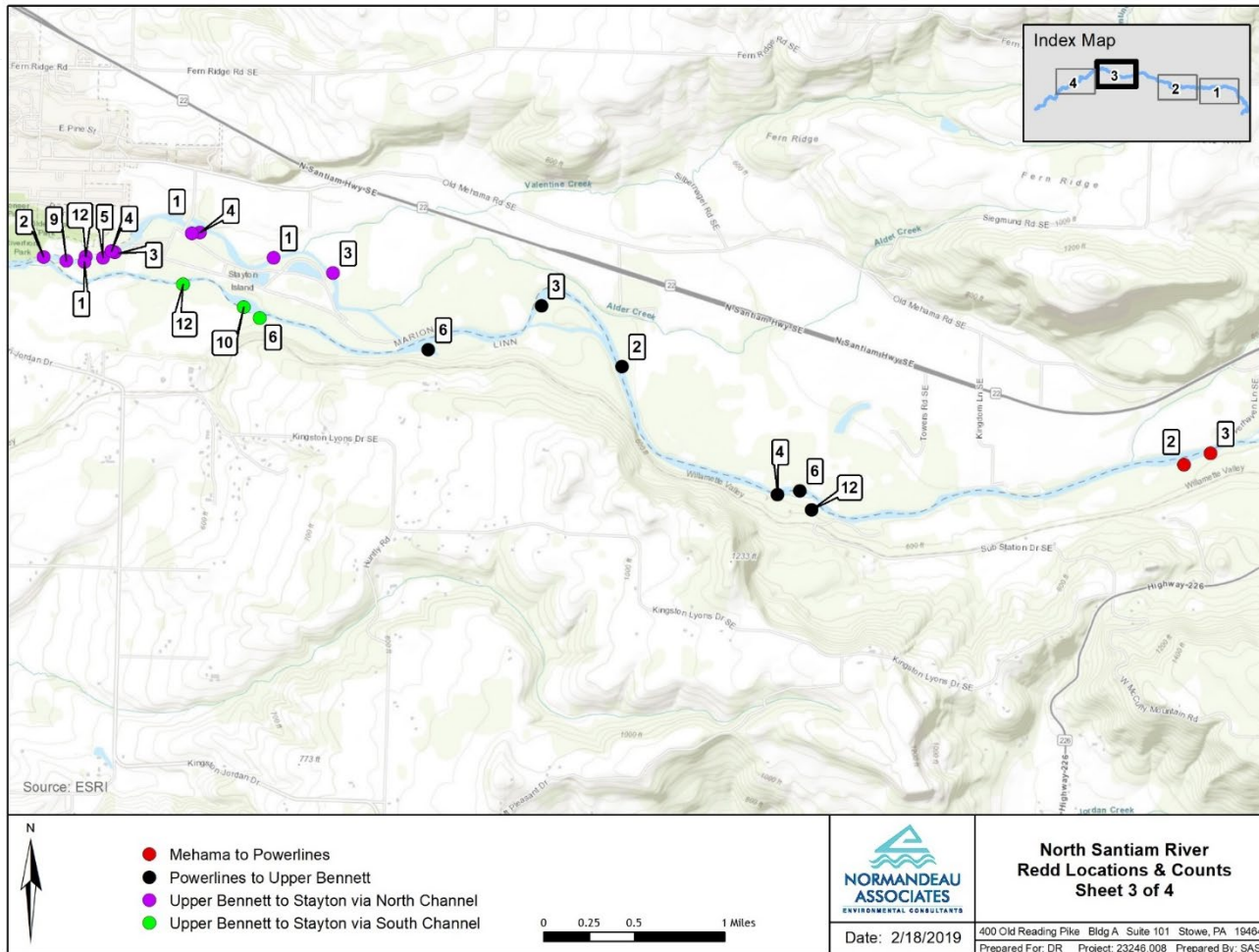
Redd Counts and Density

- Initiation of spawning September 5, peak last week of September, final carcass October 20

River	Surveyed Length (km)	# of Redds	Redds/km
Middle Fork Willamette	12.71	0	0.00
Fall Creek	34.92	1	0.03
Little Fall Creek	14.16	not surveyed	
McKenzie	115.53	374	3.24
South Fork McKenzie	7.08	55	7.77
Lost Creek	7.72	24	3.11
Horse Creek	21.72	90	4.14
Santiam	19.47	0	0.00
North Santiam	74.17	284	3.83
Little North Santiam	27.84	2	0.07
South Santiam	54.55	653	11.97

Results

Redd Maps



Results

Spawner Abundance by Origin

Sections	Redd Count	Spawner Abundance (Redds*2.5)	pHOS	Hatchery-origin Abundance Estimate	Natural-origin Abundance Estimate
Fall Creek above Fall Creek Dam	0	0	0	0	0
MF Willamette and Fall Creek below Fall Creek Dam	1	3	0.75	2	1
McKenzie above Leaburg Dam (including SF McKenzie, Horse Creek, and Lost Creek)	431	1078	0.17	183	895
McKenzie below Leaburg Dam	112	280	0.82	229	51
North Santiam below Minto Dam and Little North Santiam	267	668	0.57	381	286
North Santiam above Minto Dam	19	48	0.29	14	34
South Santiam	653	1633	0.90	1471	162
Santiam	0	0	1.00	0	0

Discussion



Fall Creek Redd Counts

- 94 fish outplanted in 2018
 - 424 in 2016
- No redds above Fall Creek Dam
- Portion of Fall Creek not surveyed due to fire
 - Area surveyed in 2018 contained 40% of the redds in 2016

Discussion



Little North Santiam

- Low water may have impeded fish passage, resulting in low redd counts and no carcass collections

Discussion



South Fork McKenzie Habitat Restoration

- Received assistance with redd counts and carcass collection

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Questions?



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