Skagit Estuary Recovery Plan Implementation Progress: What's Been Completed, How It's Working, & Some Thoughts For The Future Review some highlights

> Presentation to the Skagit Watershed Council September 22, 2022

> > Eric Beamer & Greg Hood Skagit River System Cooperative

June 8 Presentation Outline

- Reminder of the Skagit Chinook Recovery Plan (SRP) Chapter
- Our monitoring approach (project, population/system)
- Results:
 - What's been restored
 - Juvenile Chinook salmon
 - Project effectiveness
 - Population response
 - Thoughts on the future
 - Habitat
 - Project effectiveness
 - System response
 - Thoughts on the future
 - Questions

Today's (Review) Content

- Reminder of the Skagit Chinook Recovery Plan (SRP) Chapter
- Our monitoring approach (project, population/system)
- Results:
 - Habitat
 - What's measured
 - Project effectiveness (what's been restored)
 - System response
 - Thoughts on the future
 - Juvenile Chinook salmon
 - What's measured
 - Project effectiveness
 - Population response
 - Thoughts on the future
 - **Questions (last agenda item)**

Habitat: What's Measured

Tidal Delta Habitat Extent (TDHE)

- Synonymous with PSP Common Indicator = functional estuary surface area
- Uses:
 - Track progress on SRP objectives (SRSC, Lead Entity)
 - Treatment effect variable for Skagit IMW analyses (IMW Pis – NOAA NWFSC, WDFW, SRSC)

• Prime Rearing Area (PRA)

- Consistent with habitat variable used in original Skagit SRP estuarine Chinook analyses
- Uses:
 - Treatment effect variable in Skagit IMW analyses
 - Consistent with estuarine Chinook analyses across Puget Sound (e.g., numerous ESRP studies).

Tidal Delta Habitat

Distributary channel

Tidal (blind) channel

Vegetated wetlands

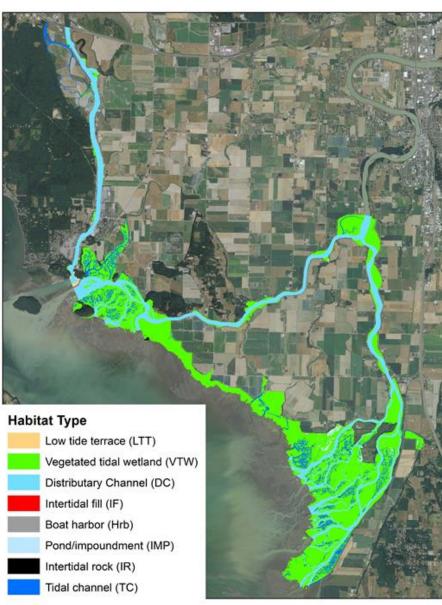
Tidal Delta Habitat Extent (TDHE)

- Digitized from high resolution orthophotos
- TDHE is the sum area of water, vegetated wetlands, and other intertidal/subtidal habitat polygons within the vegetated Skagit tidal delta of the following habitat types:
 - Water
 - Blind channel
 - Distributary channel
 - Impoundment
 - Boat harbor
 - Vegetated Tidal Wetlands
 - Tidal marsh
 - Tidal scrub shrub
 - Riverine tidal forest
 - Other intertidal
 - Intertidal wood
 - Low tide terrace

Skagit Estuary Sub-delta Polygons







Prime Rearing Area (PRA)

- Calculated from TDHE polygons
- PRA is the sum of:
 - Total area of blind channels and impoundments
 - a 2-meter-wide area of the perimeter of distributary channels and boat harbors







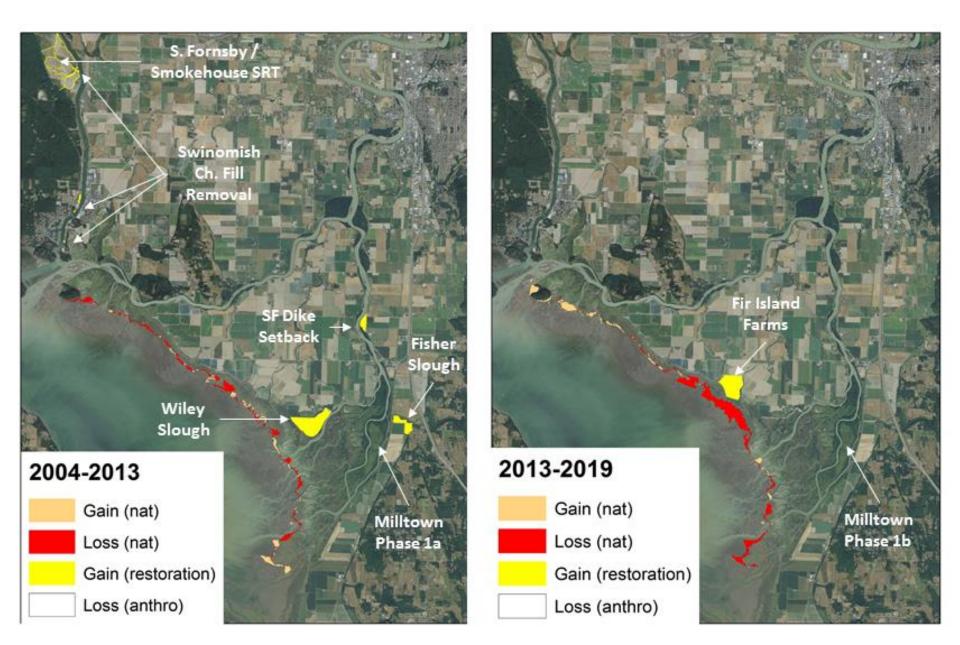
Skagit Estuary Restoration Projects: Built & Planned

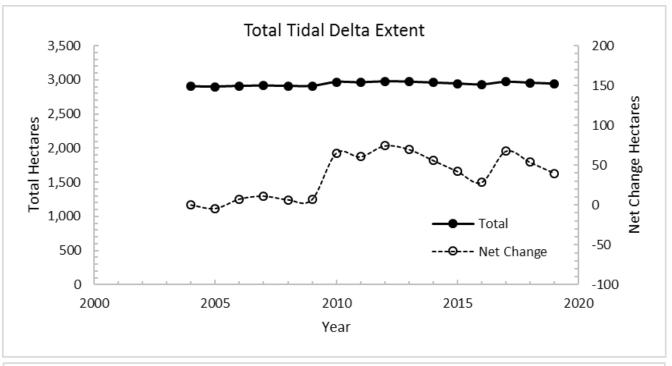
	Site	Year	Benefit to salmon	Tidal	Monitoring design,
Not	SRP Project but great for	complete	(connectivity, capacity, or	Footprint	years monitored
	ning (more from Greg)	d	both)	Acres	
	Deepwater Slough	2000	Both	221	PT, 2001-2003
653 acres	Smokehouse Floodplain	2005-8	Capacity	67	BACI, 2004-2011
	Milltown Island	2006-7	Capacity	0*	PT, 2012-2013
	South Fork Dike Setback	2007	Capacity	21	PT, 2012, 2014
	Swinomish Ch Fill Removal	2008	Capacity	8	PT, 2009-2013
	Wiley Slough	2009	Capacity	160	Partial BACI, 2003, 2012-
					2013
	Fisher Slough	2010-11	Capacity	46	BACI, 2009-2013 & 2015
	Fir Island Farms	2016	Capacity	130	BACI, 2015-2018
	Britt Slough	2021	Connectivity	0*	BACI, 2021-2023
402.4 acres	Milltown Island Phase 2	2023	Both	0*	Not designed or funded
	Smokehouse Floodplain 2	2023	Capacity	120	Planned BACI, 2005-
					present
	Deepwater Phase 2	2023	Capacity	268	Not designed or funded
	North Leque Island	2022	Connectivity	0*	Not designed or funded
	S Fork Dike Setback Phase 2	2022	Both	0*	BACI, 2012,2014,2023-24
	Swinomish Ch. Phase 3	2023/4	Capacity	4.4	Not designed or funded
	(Dunlap)				
	McGlinn Island Causeway	<5 years	Connectivity	10	Planned BACI, 2005-
					present
	TOTAL			1055.4	-

Project	Sub- delta area	Yr complete	Yr 1 st fish response	TDHE	PRA	Juvenile Chinook monioring result	Reference
S. Fornsby / Smokehouse SRT	SC	2005	2006	16.34	14.80	density much lower than reference sites (SRT)	Greene et al 2012
SF Dike Setback Phase 1	SF	2006	2007	8.35	0.26	density lower than reference sites (hydraulic connection)	Beamer 2015
Milltown Island Phase 1a	SF	2007/8	2009	0.00	1.09		Unpublished SRSC data, presented to WDFW
Swinomish Channel Fill Removal	SC	2008	2009	4.69	0.47	density equal to reference sites	Unpublished SRSC data
Wiley Slough – Wiley Lobe	BF	2009	2010	26.54	10.14	density equal to reference sites	Beamer et al 2015
Wiley Slough – Teal Lobe	SF	2009	2010	36.57	18.89	density equal to reference sites	Beamer et al 2015
Fisher Slough	SF	2011	2012	18.34	7.45	density equal to reference sites	Beamer et al 2017
Milltown Island Phase 1b	SF	2014	2015	0.00	0.49	density equal to reference sites	Unpublished SRSC data, presented to WDFW
Fir Island Farms	BF	2016	2017	53.06	2.60	density equal to reference sites	Beamer et al 2018

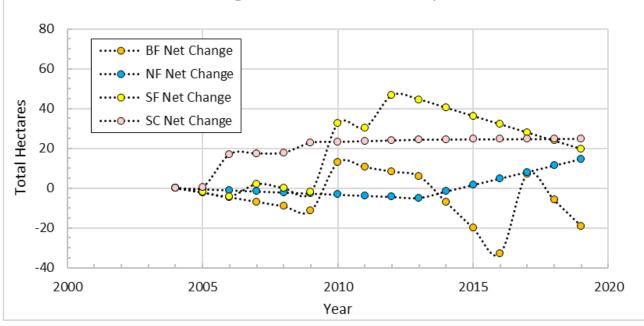
Total 163.89 56.18

Status changes of TDHE during SRP Implementation

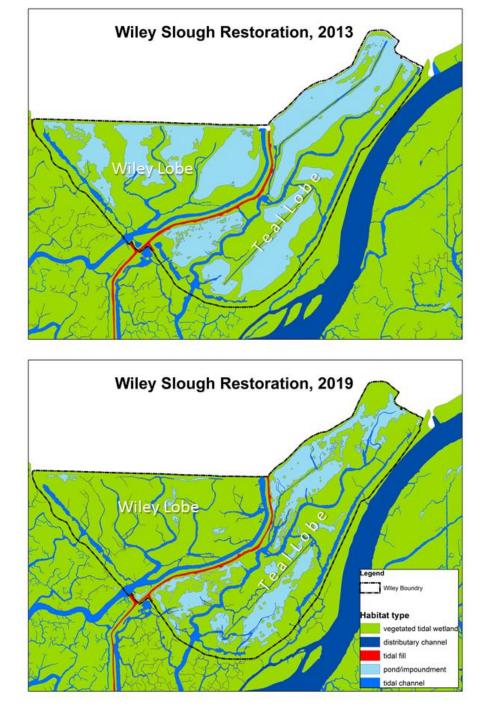




Net Change in Tidal Delta Extent by Sub-delta Area



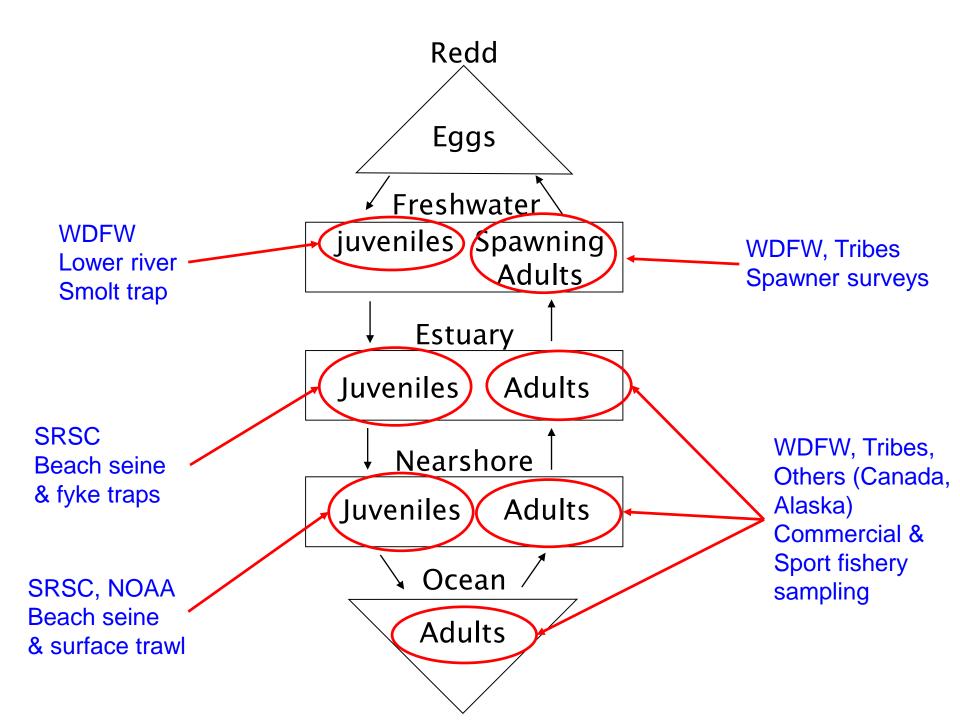
Sub-delta area themes: BF – seaward erosion; transition of impoundments NF – no restoration yet but habitat gains in response to avulsion/sediment dynamics SF – focus of most restoration; seaward erosion SC – majority of tidal channel "behind" SRT but soon to be dike setback; lack of tidal marsh



Transition of impoundment to blind channel and vegetated tidal wetlands

Skagit Chinook Salmon: What's Measured

- Abundance (or density), timing, body size (sometimes more: age, diet, etc.)
- Across multiple life stages
- Collaborative effort since the 1990s



Is Skagit estuary restoration working for Chinook Salmon?

Local (restoration project) Response

- If you build it they will come. Juvenile Chinook used restored habitat generally consistent with reference sites.
- Some restoration designs work better than others for fish. Projects using dike setback, dike breach, or fill removal worked best

Population Response

- Juvenile Chinook salmon become less crowded in the estuary as restoration increased habitat opportunity
- Length of fish residence in the estuary increased as restoration increased
- Reduced frequency of fry migrants in marine habitats and higher smolt-adult return (SAR) rates as restored area increased

From Greene et al. 2016

References

- Beamer, E. 2015. Technical Memo to Jeff McGowan (Skagit County) on May 14, 2015 regarding South Fork Dike Setback restoration project area juvenile Chinook salmon use and carrying capacity. Skagit River System Cooperative, La Conner, WA 98257. <u>http://skagitcoop.org/wp-</u> content/uploads/SF Dikesetback 2012 2014.pdf
- Beamer, E., R. Henderson, and B. Brown. 2015. Juvenile Chinook salmon utilization of habitat associated with the Wiley Slough Restoration Project, 2012-2013. Skagit River System Cooperative, LaConner, WA. http://skagitcoop.org/wp-content/uploads/Wiley-Slough-2012-2013.
- Beamer, E., R. Henderson, C. Ruff, and K. Wolf. 2017. Juvenile Chinook salmon utilization of habitat associated with the Fisher Slough Restoration Project, 2009 - 2015. Report prepared for The Nature Conservancy, Washington. <u>http://skagitcoop.org/wp-content/uploads/2015-FisherSl-Chinook-04-26-17 Final.pdf</u>
- Beamer, E., R. Henderson, K. Wolf, J. Demma, and W. G. Hood 2018. Juvenile Chinook salmon response to dike setback restoration at Fir Island Farms in the Skagit River tidal delta, 2015 – 2018. Report to Washington Department of Fish and Wildlife under Interagency Agreement Number 15-02641. Skagit River System Cooperative, La Conner, WA 98257. <u>http://skagitcoop.org/wp-</u> <u>content/uploads/JuvenileChinookSalmonResponsetoDikeSetbackRestorationatFirIslandFarmsintheSkagitRi</u> <u>verTidalDelta.pdf</u>
- Greene, C., E. Beamer, and J. Anderson. 2016. Skagit River Estuary Intensively Monitored Watershed Annual Report. NOAA Northwest Fisheries Science Center, Seattle. <u>http://skagitcoop.org/wpcontent/uploads/EB2918_Greene-et-al_2016.pdf</u>
- Greene, C., J. Hall, E. Beamer, R. Henderson, and B. Brown. 2012. Biological and Physical Effects of "Fish-Friendly" Tide Gates. Report to the Estuary and Salmon Restoration Program. Final Report for the Washington State Recreation and Conservation Office, January 2012. <u>https://salishsearestoration.org/images/4/4a/Greene_et_al_2012_effects_of_tidegates_on_fish.pdf</u>