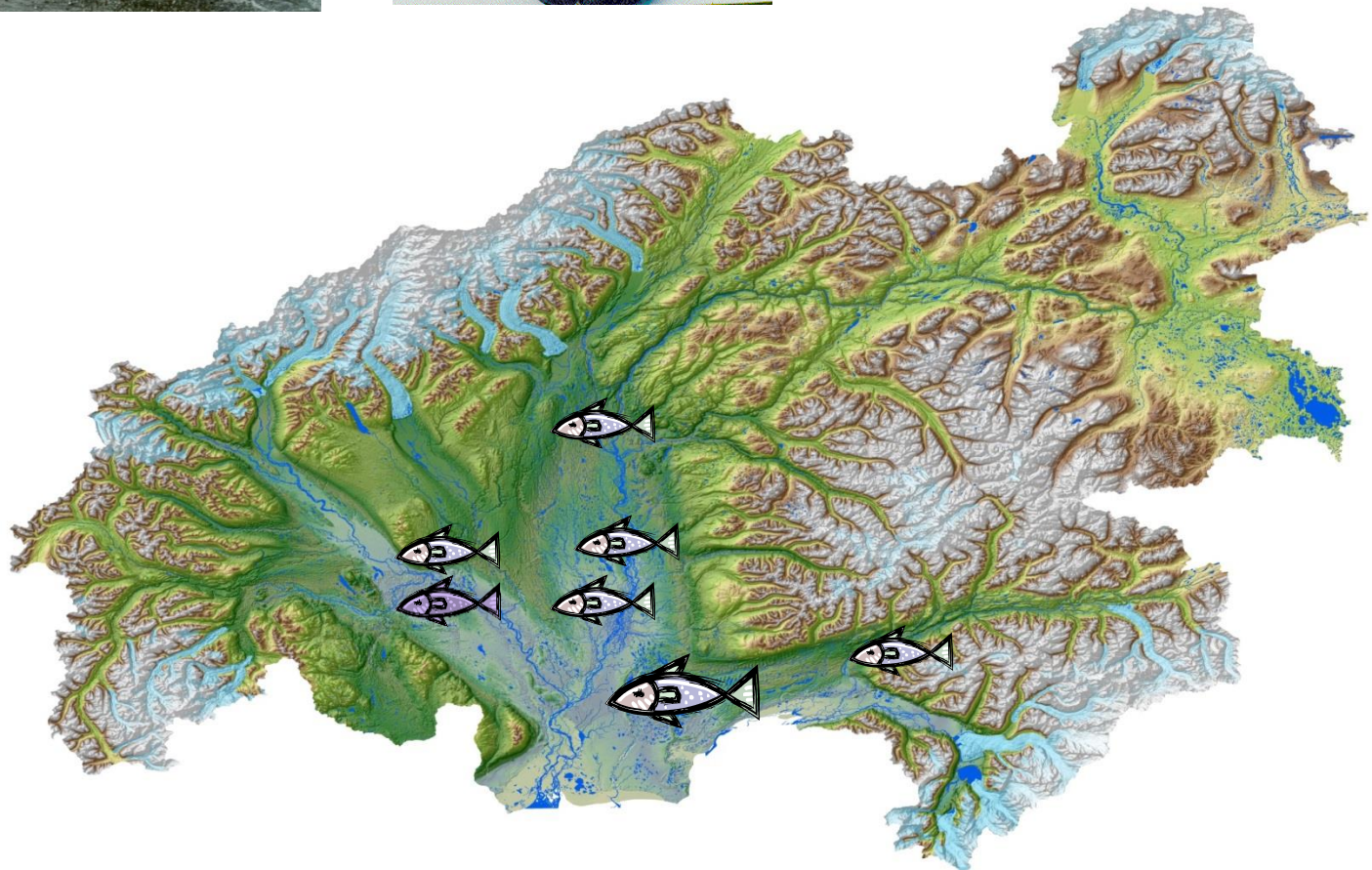
Salmon Habitat Mapping in the Mat-Su Basin

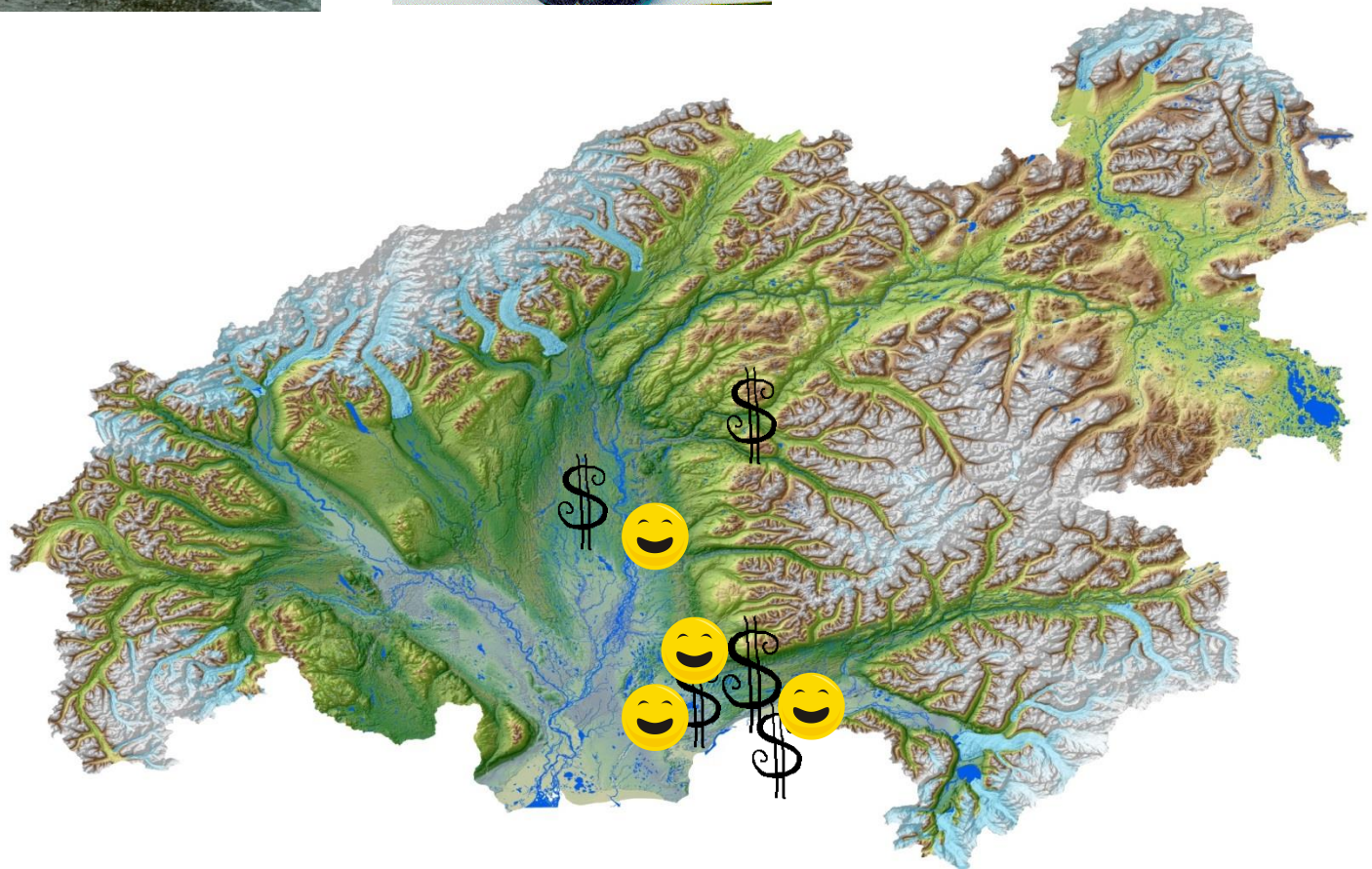
Understanding resource values

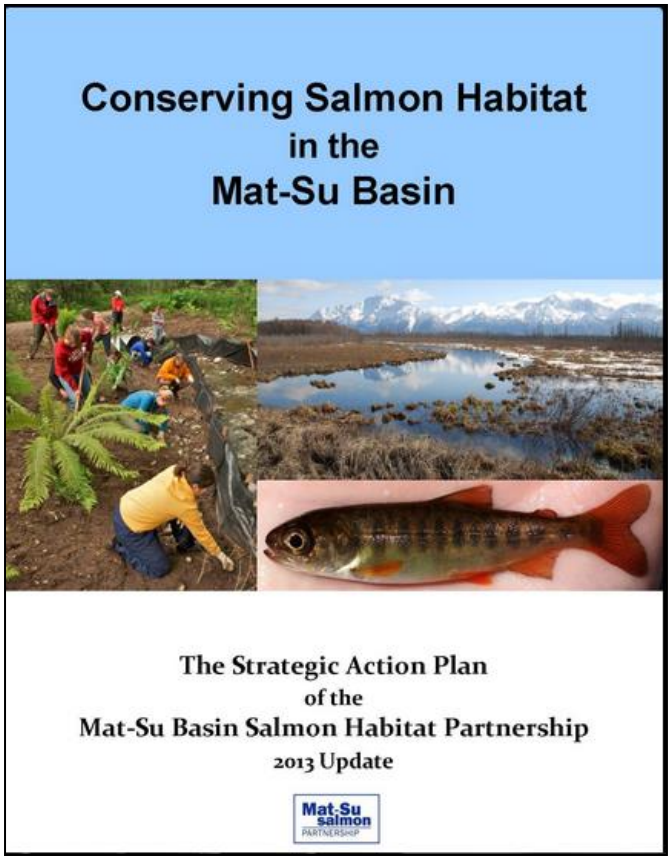
Landscape-scale planning and prioritizing for sustainable development, conservation, and restoration **requires spatially explicit, landscape-scale information on distribution and abundance of resources.**

Salmon values



Salmon values





"identify important habitats for salmon and other fish species in the Mat-Su Basin"

"help identify critical habitat for salmon at each life stage."

Objectives

- Describe and synthesize spatially explicit information on salmon spawning habitat distribution and abundance
- Use new digital elevation models, landscape –based mapping tools, and local fish-habitat studies to improve mapping of juvenile salmon habitat
- Identify information gaps and describe potential future research activities

Spawning abundance and distribution

- Anadromous Waters Catalog
- Catch and Escapement Data
- Indexes of Productivity
- Spawning surveys

Spawning abundance

- What scale are data available?
- Which estimates of abundance are least biased?
- Do different populations covary over time?
- How variable are estimates?

Table 38.–Eastside and westside Susitna River drainage coho salmon escapement counts, 1981–2012.

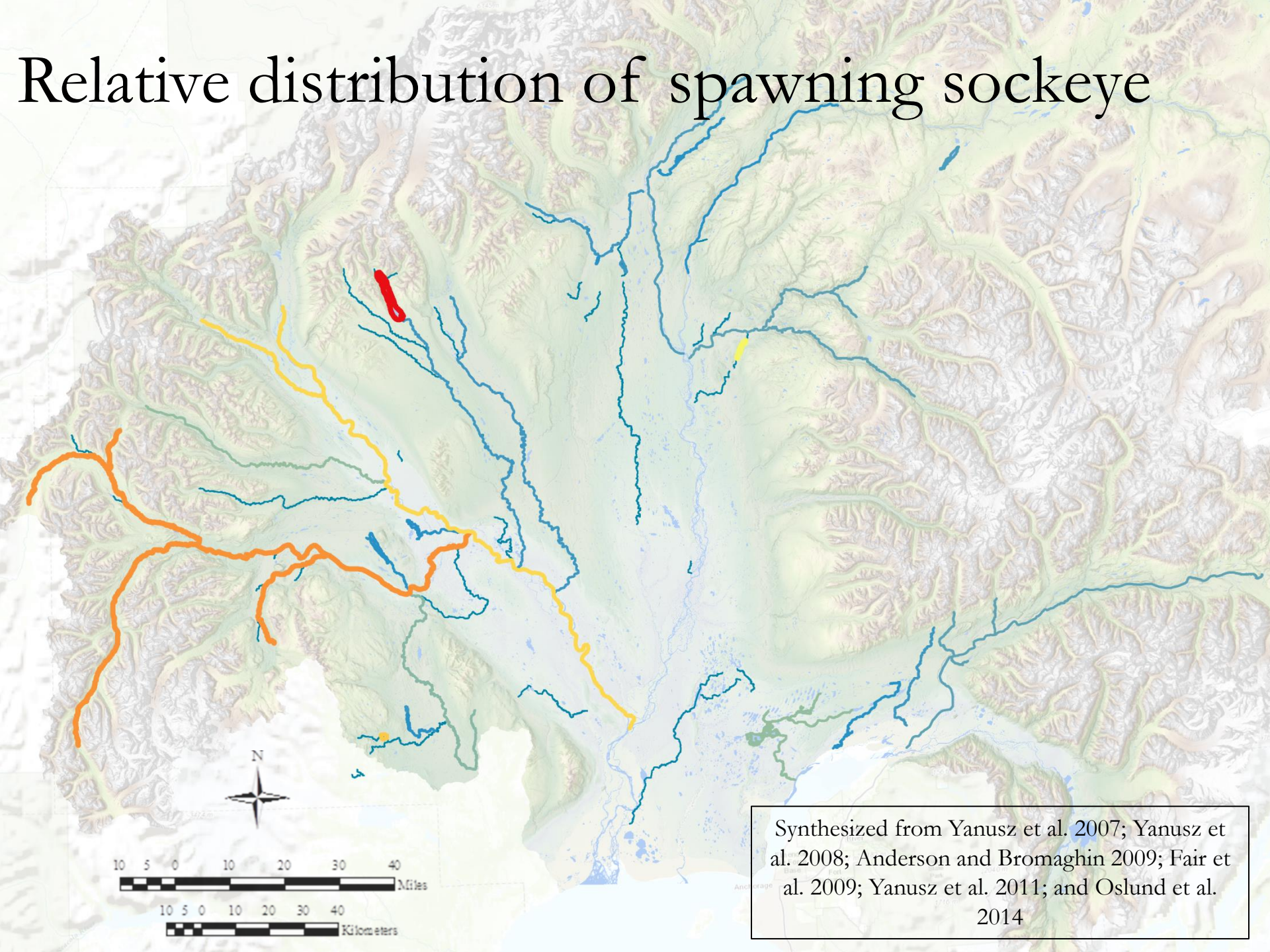
	Westside Susitna Management Unit				Eastside Susitna Management Unit[a]					
Year	Yentna River	Deshka River	Rabideux Creek index	Total	Birch Creek index	Question Creek index	Answer Creek index	Total	Susitna River[d]	Total
1981	17,017		[e]	17,017	[e]	[e]	[e]	[e]	37,000	54,017
1982	34,089		[e]	34,089	[e]	[e]	[e]	[e]	80,000	114,089
1983	8,867		[e]	8,867	[e]	[e]	[e]	[e]	24,000	32,867
1984	18,172		480	18,652	236	60	57	353	[e]	19,005
1985	9,181		82	9,263	30	89	9	128	[e]	9,391
1986	23,457		[e]	23,457	25	[e]	[e]	[illegible]	[e]	23,482
1987	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[e]	6,534
1988	12,173		230	12,403	63	337	160	560	[e]	12,963
1989	25,695		20	25,715	180	31	66	277	[e]	25,992
1990	21,346		20	21,366	36	41	6	83	[e]	21,449
1991	57,275		185	57,460	300	492	51	843	[e]	58,303
1992	29,073		[e]	29,073	167	227	181	575	[e]	29,648
1993	37,752		[e]	37,752	178	370	34	582	[e]	38,334
1994	[illegible]		105	[illegible]	[illegible]	[illegible]	[illegible] [g]	563	[e]	25,841
1995	[illegible]	12,824	39	87,269	127	[illegible]	35	317	[e]	87,586
1996	34,420		[e]	34,420	458	238	43	739	[e]	35,159
1997	13,670	8,063	114	21,847	217	186	57	460	[e]	22,307
1998	24,769	6,773 [c]	56	31,598	356	519	45	920	[e]	32,518
1999	37,933	4,563 [c]	169	42,665	153	128	470	751	[e]	43,416
2000	40,921	26,387	354	67,662	809	1,040	899	2,748	[e]	70,410
2001	47,077	29,927	656	77,660	1,470	450	371	2,291	[e]	79,951
2002	[illegible]	[illegible]	[e]	99,702	1,158	1,010	249	2,417	[e]	102,119
2003	45,222	17,305	344	62,871	[e]	407	131	538	[e]	63,409
2004	92,343	62,940	[e]	155,283	[e]	822	111	933	[e]	156,216
2005	76,890	47,887	[e]	124,777	1,014	537	35	1,586	[e]	126,363
2006	132,889	59,419 [c]	3063	195,371	883	299	270	1,452	[e]	196,823
2007	39,957	10,575	[e]	50,532	167	241	26	434	[e]	50,966
2008	33,934	12,724	10,043	56,701	798	273	382	1,453	[e]	58,154
2009	[j]	27,348	345 [i]	27,693	219 [i]	9 [i]	166 [i]	394	[e]	28,087
2010		10,393	161	10,554	117	41	2	160	[e]	10,714
2011		7,508 [c]	58	7,566	76	94	116	286	[e]	7,852
2012		6,825	[e]	6,825	276	75 [f]	[e]	351		7,176
Averages										
1981-2010	39,110	24,216	869	49,111	377	327	149	807	47,000	54,537
2001-2010	70,904	27,387	2,435	86,114	728	409	174	1,166		87,280
2006-2010	-	15,260	3,403	68,170	437	173	169	779		68,949

[a] Survey conducted by walking portions of the creek.

[b] Sonar counts, dates of assessment vary; estimates for 1981-1984 encompass the entire coho salmon migration (Davis 2000). All estimates from 1985-2008 are partial because Yentna River sonar shut down before the end of the coho run. Yentna River 2005 and 2006 coho salmon estimates reported by Westerman and Willette (2007a-b).

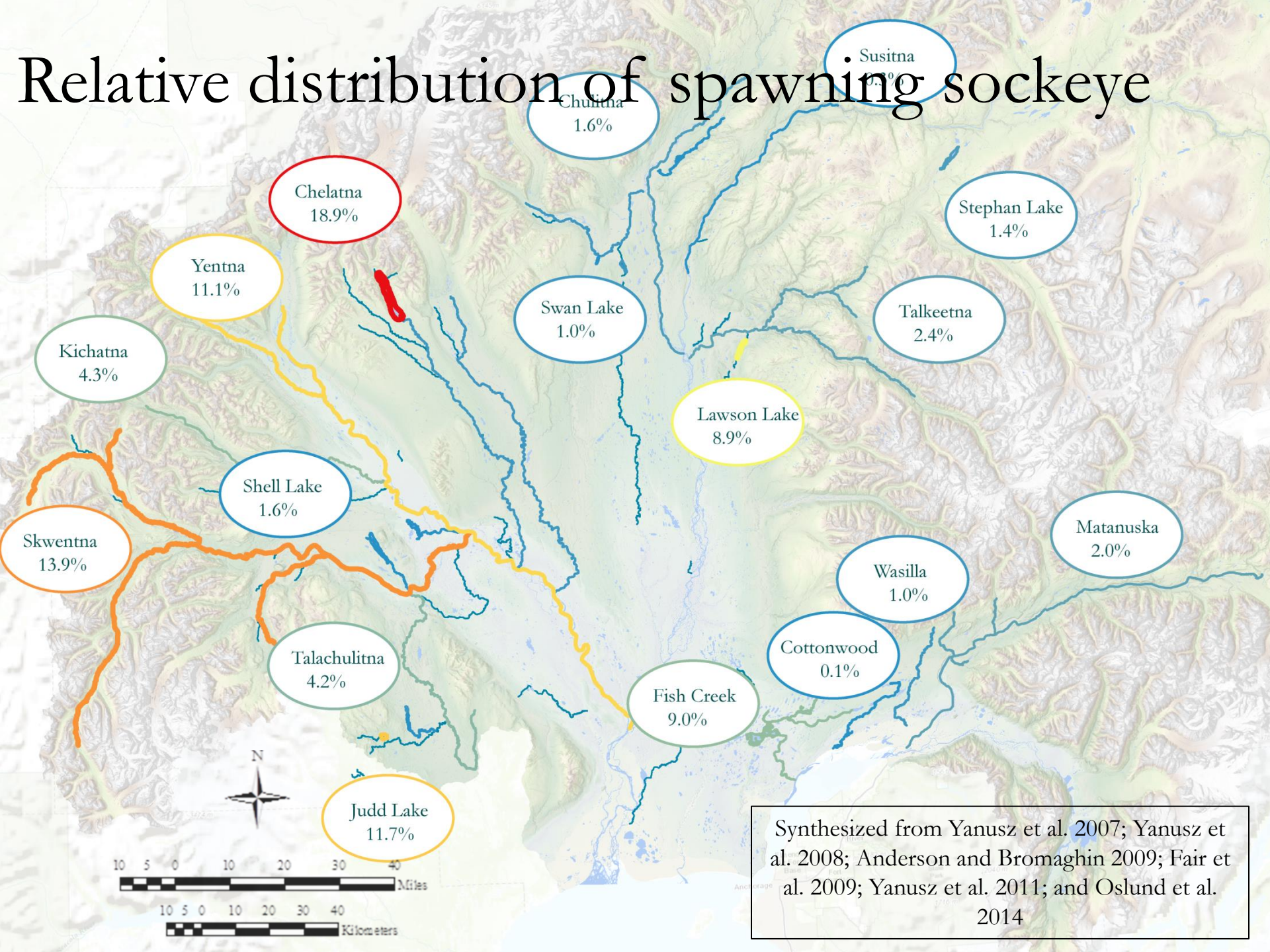
Oslund et al. 2014

Relative distribution of spawning sockeye



Synthesized from Yanusz et al. 2007; Yanusz et al. 2008; Anderson and Bromaghin 2009; Fair et al. 2009; Yanusz et al. 2011; and Oslund et al. 2014

Relative distribution of spawning sockeye



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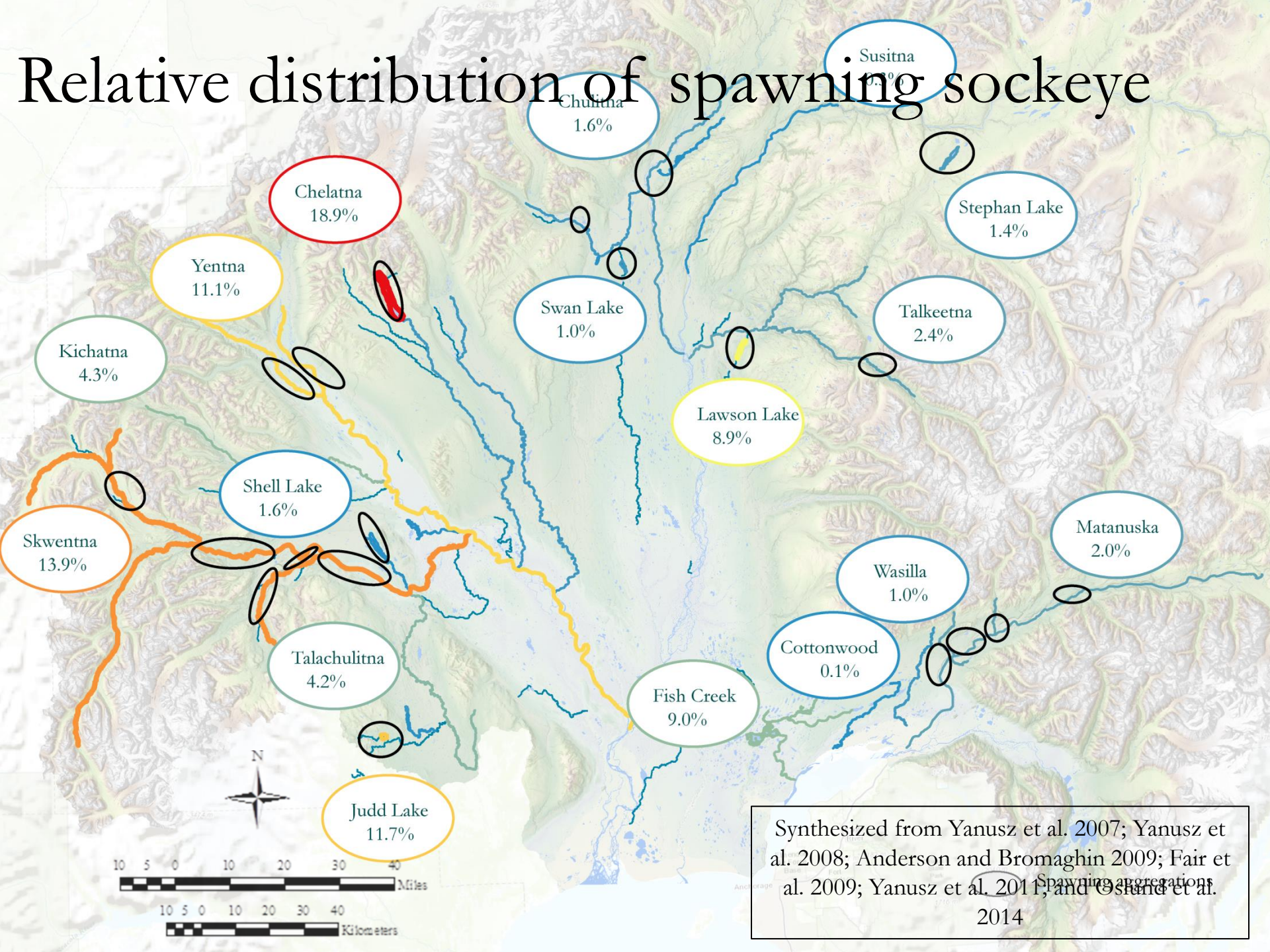
Relative distribution of spawning sockeye



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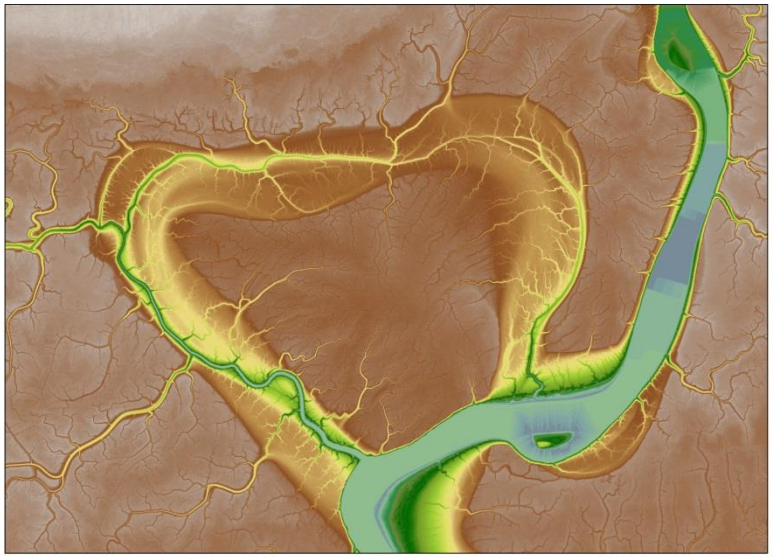
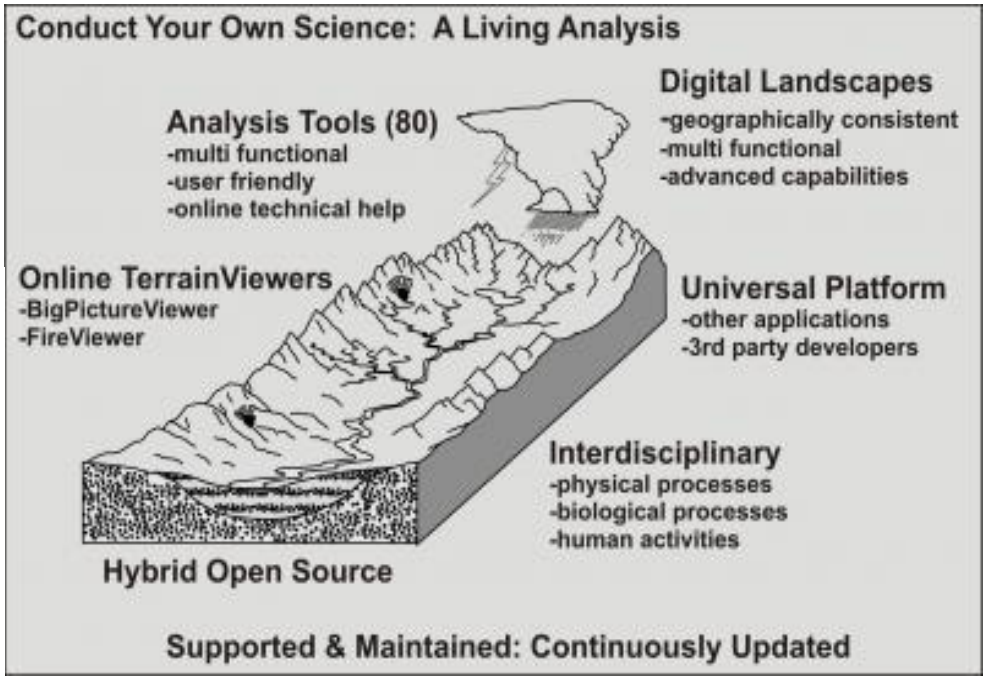
Juvenile habitat mapping

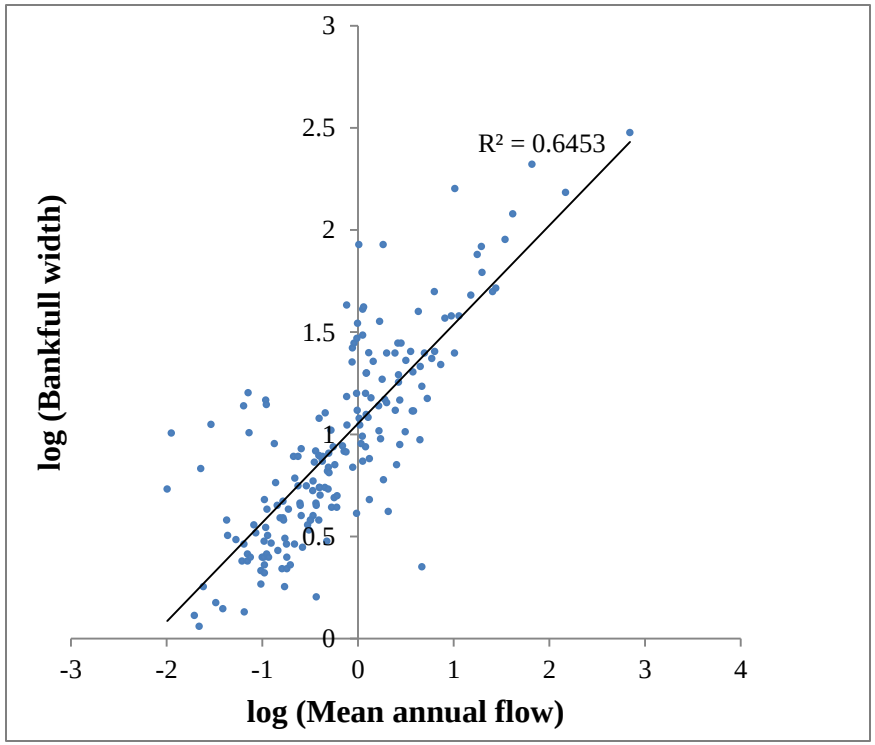
SDMI
Statewide Digital Mapping Initiative

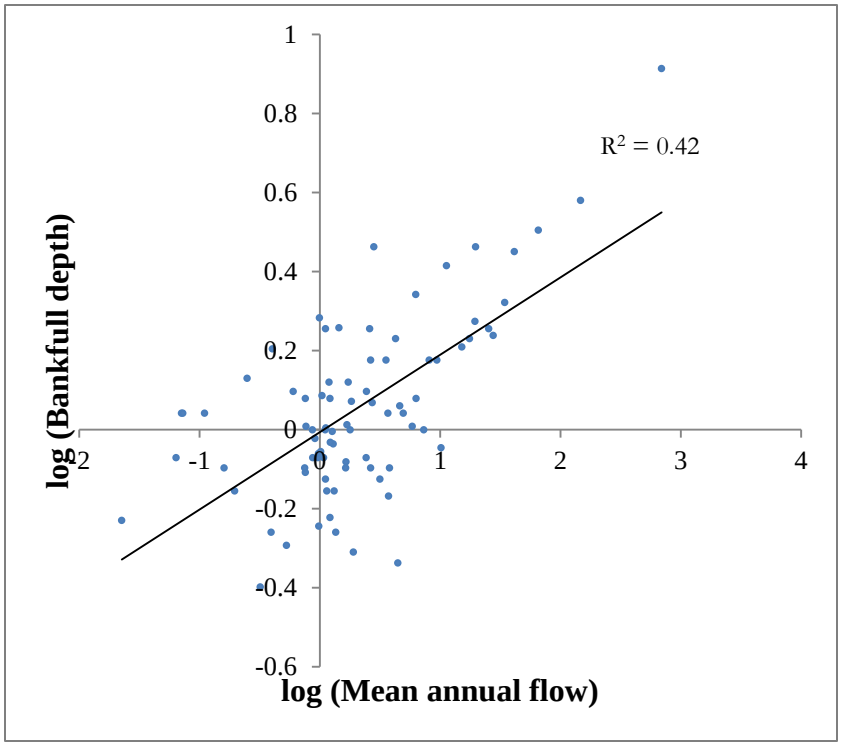




Juvenile habitat

- Mean annual flow = $10^{-1.33}$ $FA^{0.96}$ $P^{1.11}$ (Parks and Madison 1985)

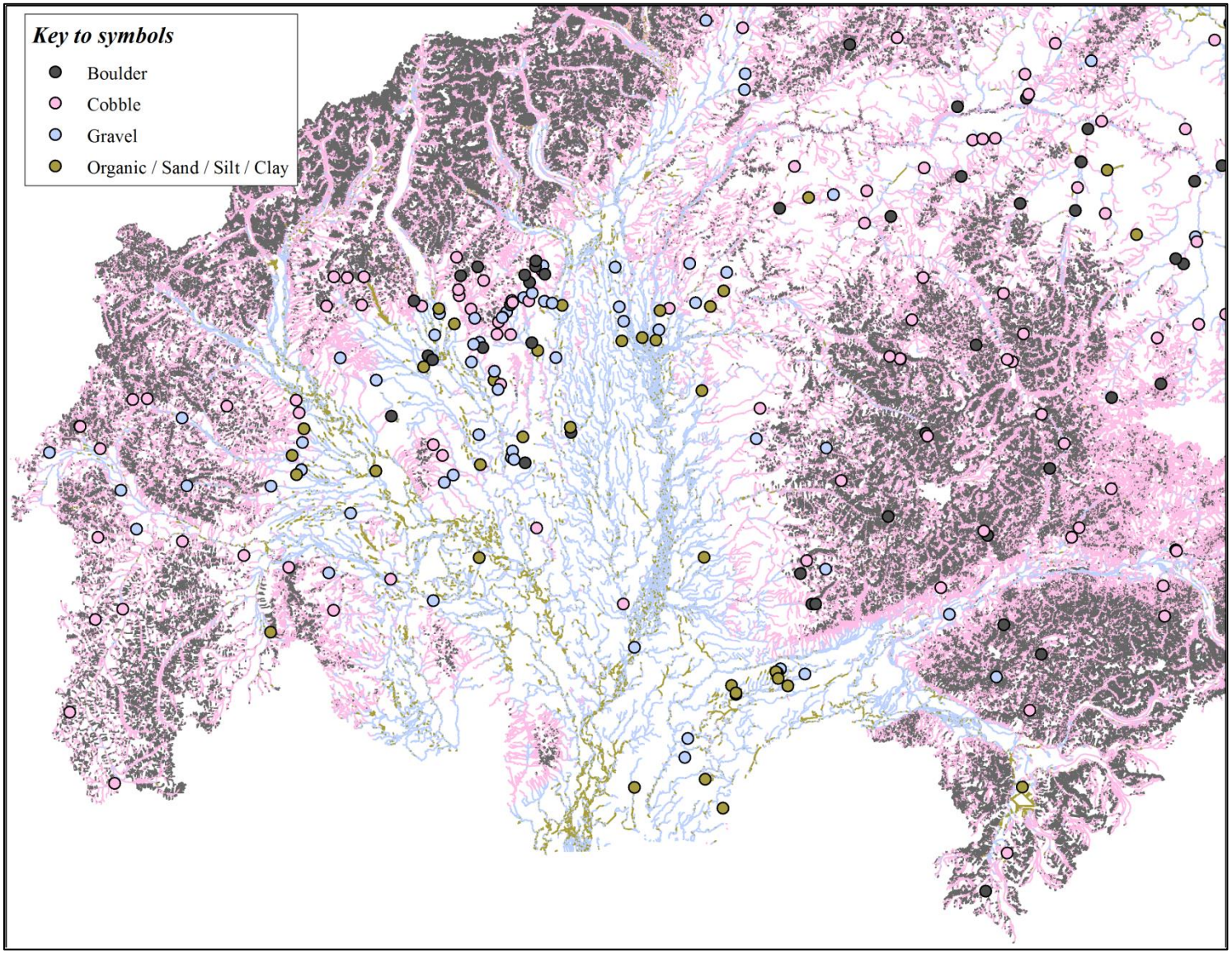




Width = 11.3 MAF $^{0.48}$

Depth = 0.98 MAF $^{0.20}$

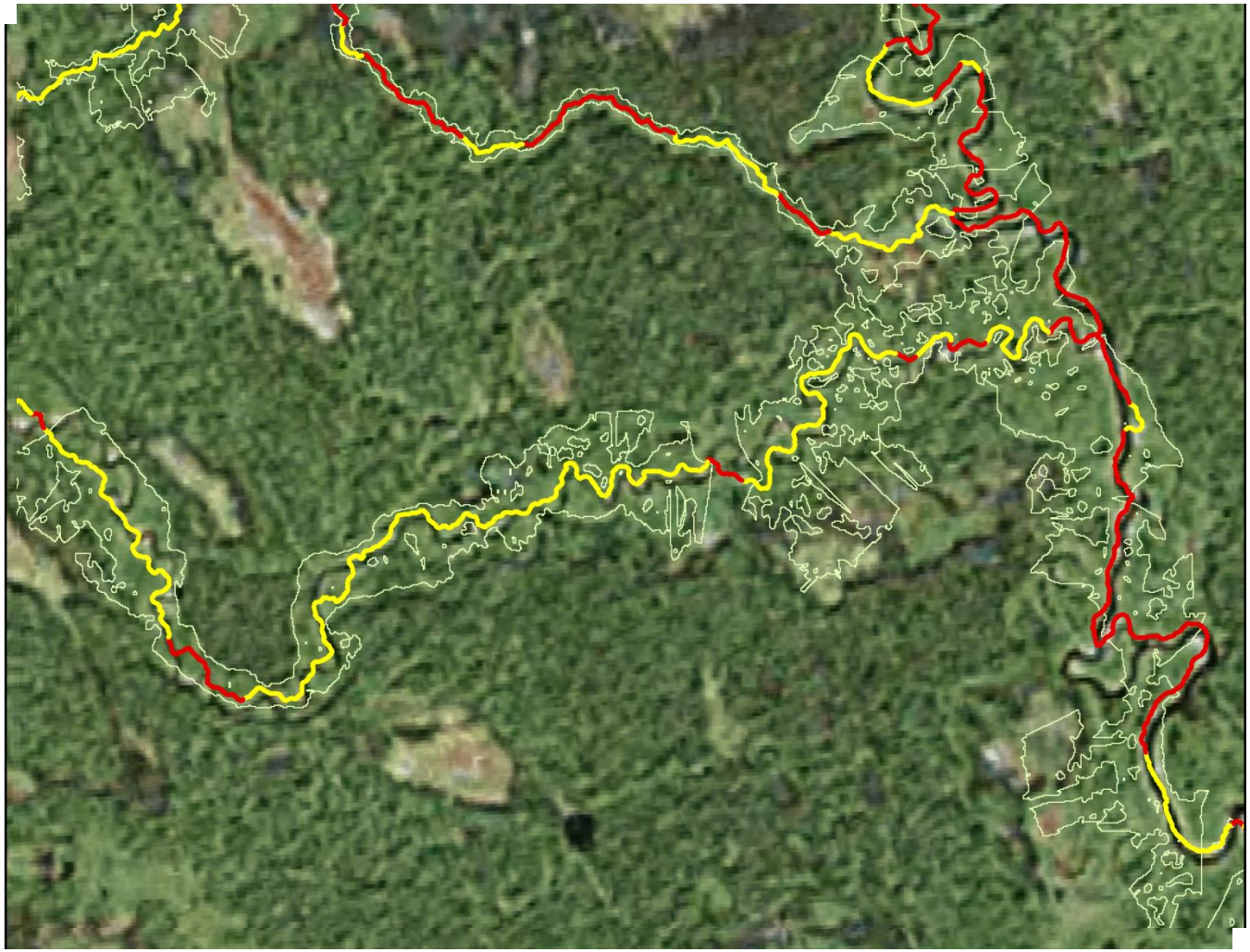
Juvenile habitat



Juvenile habitat

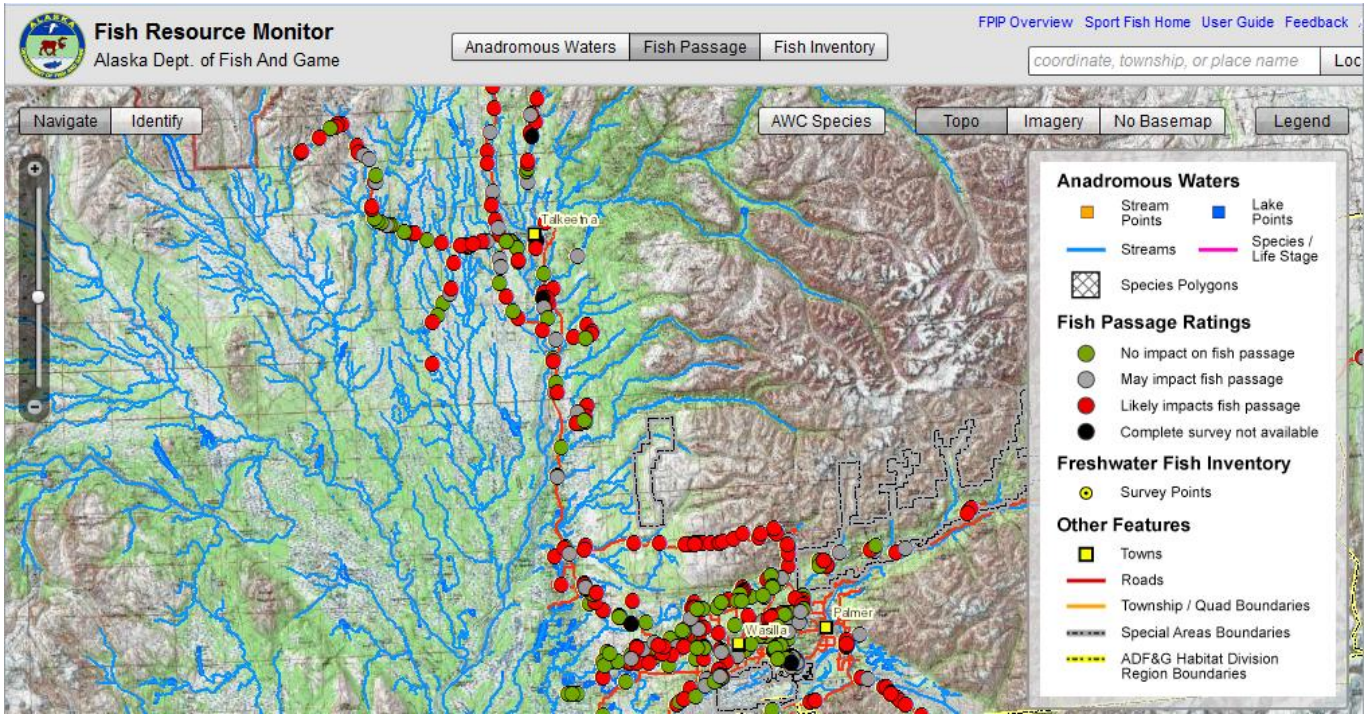
- Elevation
- Gradient
- Glacial extent
- Beaver habitat likelihood
- Sinuosity
- Braiding
- Relationship to lakes
- Relationship to wetlands
- Floodplain width and confinement
- Road density
- Wood accumulation probability

Juvenile habitat



Juvenile habitat

- Man-made barriers



- Natural barriers:

  i) 1200 foot stream segments exceeding 8% gradient

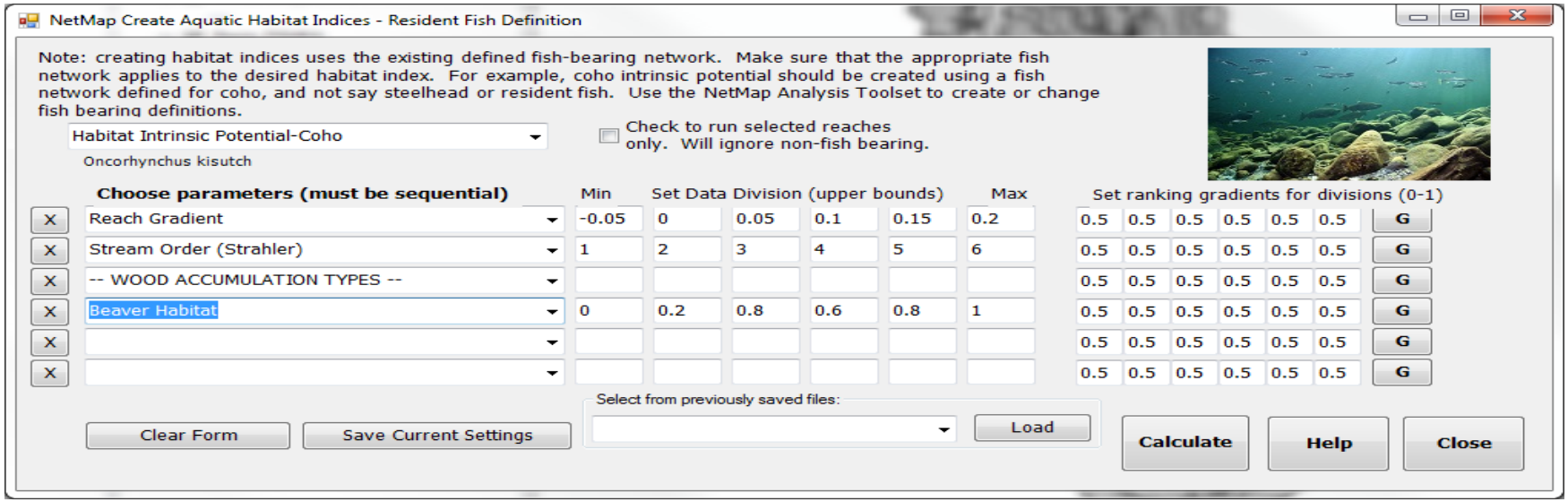
  ii) Waterfall barriers: 4 meters relief over a 10 meter stream segment

Local studies

- Importance of wetlands (ARRI - Davis and Davis 2010)
- Coho seasonal habitat use in Big Lake watershed (USFWS – Gerkin and Sethi 2013)
- Coho habitat use in Little Susitna (USFWS/UAF – Foley 2014)
- Fish assemblage patterns (ADFG – Kirsch et al. 2014)
  - Coho salmon: Temperatures ↑ Elevation ↓
  - Chinook salmon: Elevation ↓ Channel width ↑
- Susitna seasonal habitat use (Susitna-Watana 1980s and 2013)
  - Habitat suitability curves for coho fry: (depth, velocity, cover, temperature, upwelling)
  - Macro and meso habitat associations for juvenile Chinook, coho, and sockeye
- Limnological sockeye salmon studies (CIAA, ADFG)

Proposed models

- Summarize all methods and previous studies; propose models by species for summer and winter habitat



- Workshop in January

Interested?

cwoll@tnc.org

Future applications

- Future research
- Data publicly available

Mat-Su Basin Salmon Habitat Partnership
working for thriving fish, healthy habitats, and vibrant communities in the Mat-Su Basin

- Economic geography of salmon (ISER and ADFG)

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