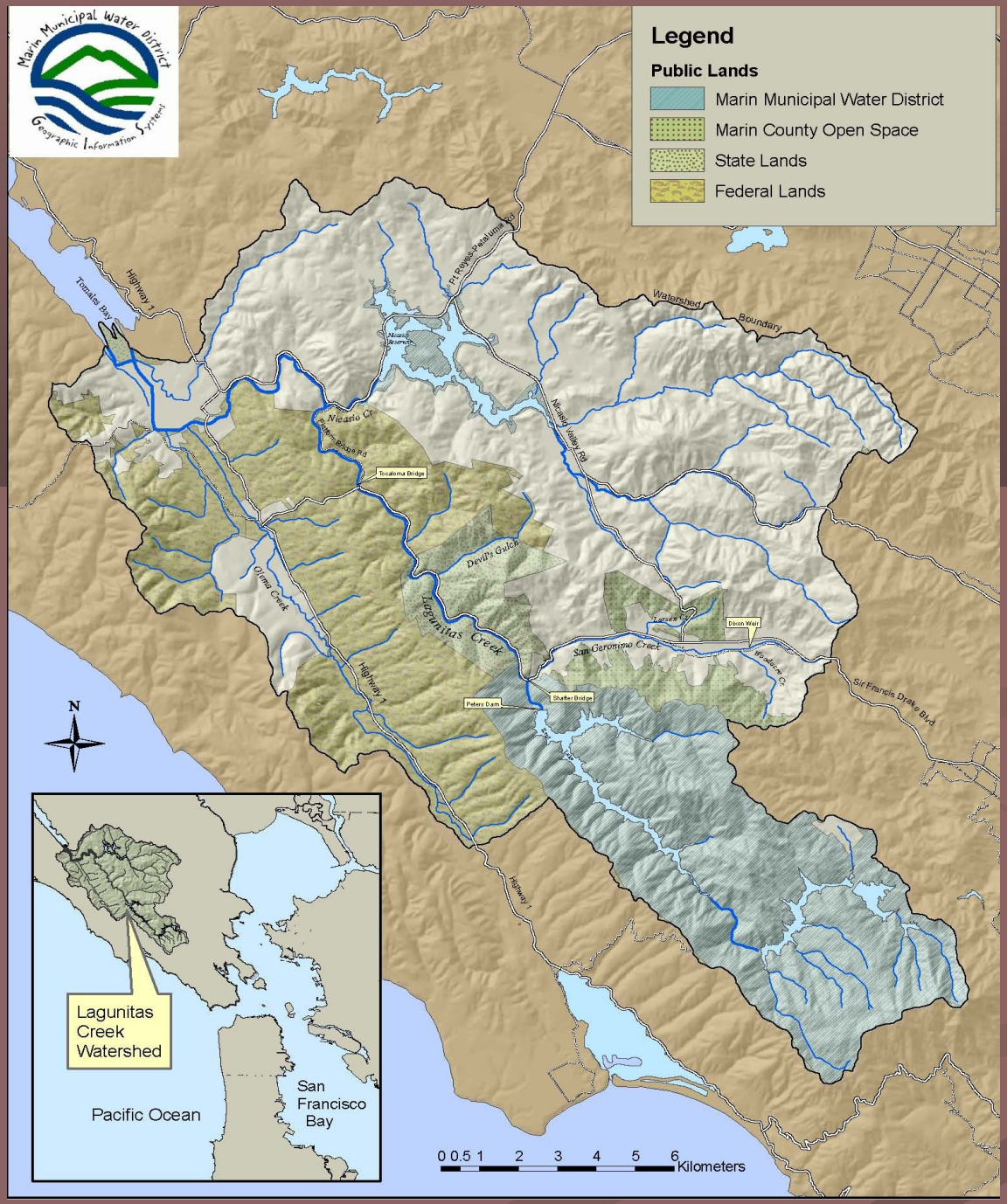
San Geronimo Valley Salmon

Gregory Andrew, MMWD

Marin Municipal Water District



Lagunitas Creek Watershed

109 sq. mi. watershed.

52 miles accessible to salmonids (12 miles of main stem accessible).

Coho & Steelhead.

64% of the watershed in public ownership; managed as park or open space land.

Strong partnership of agencies and organizations engaged in restoration.

What are Salmon?

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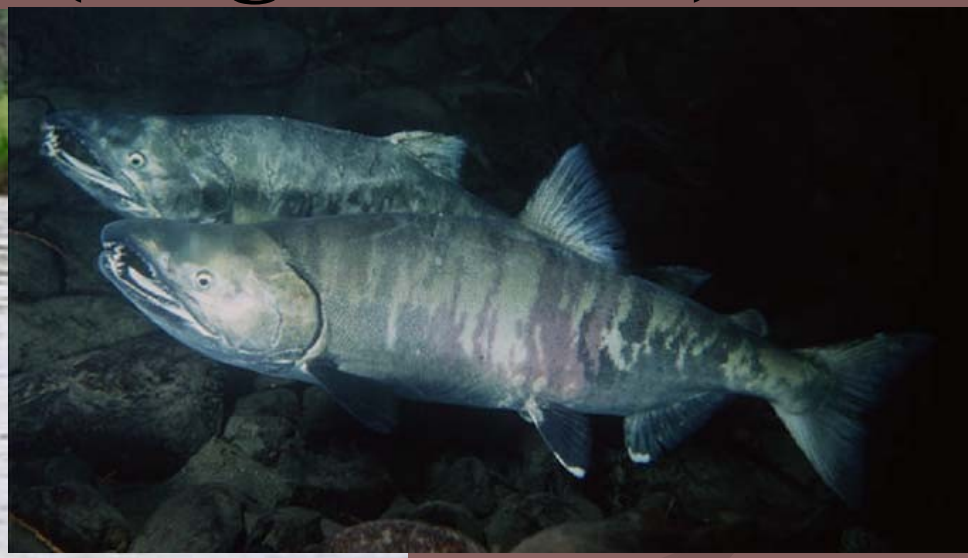
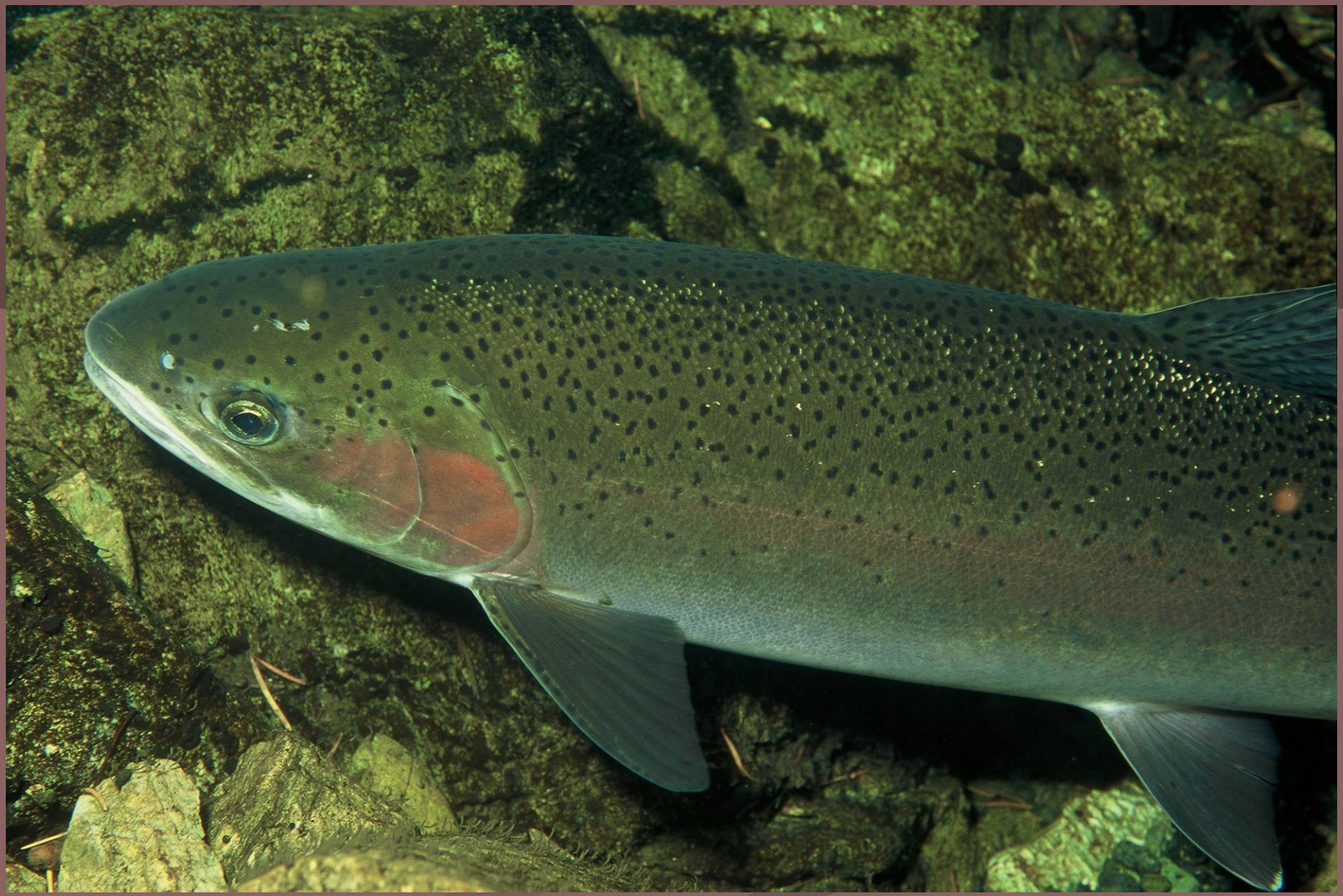
Coho Salmon (Silver Salmon)

Chinook Salmon (King Salmon)

Chum Salmon (Dog Salmon)



Steelhead / Rainbow Trout

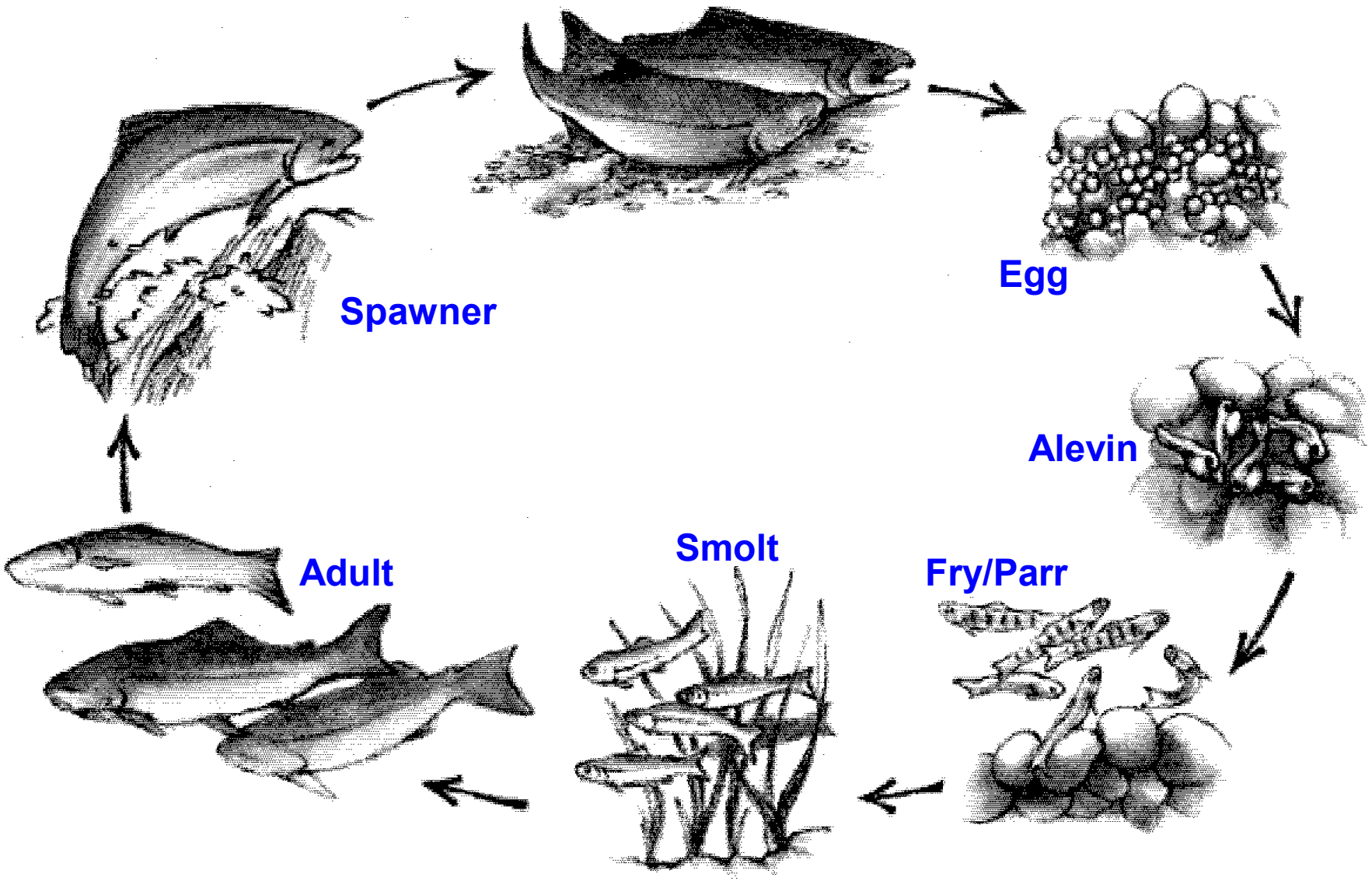


Marin Watersheds

In West Marin, four species of salmon spawn:

In East Marin, three species of salmon still spawn:

Salmon Life Cycle



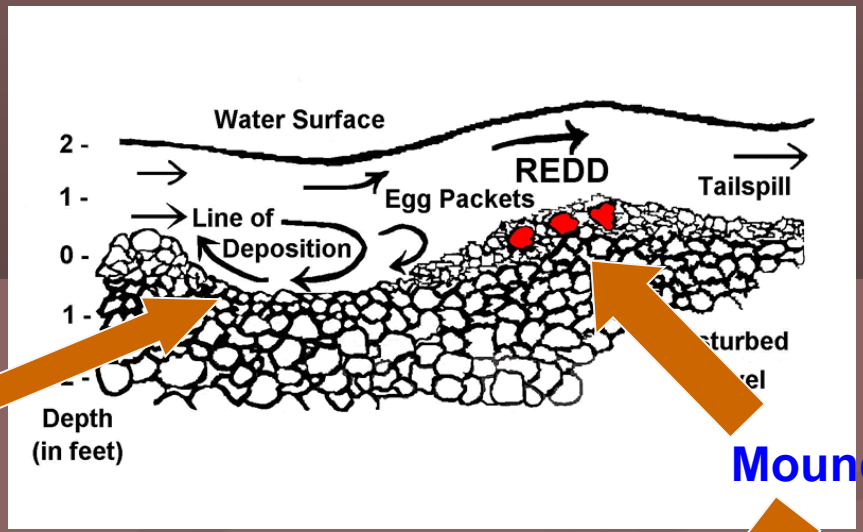
Graphic courtesy of Bellevue Utilities

Eyed eggs

Eggs in Mound

Lifecycle Stage: Eggs

- Salmon spawn and lay their eggs in a nest called a redd
- Females dig up the creek bed making a mound of small to medium sized gravel in flowing water



Pit

Mound

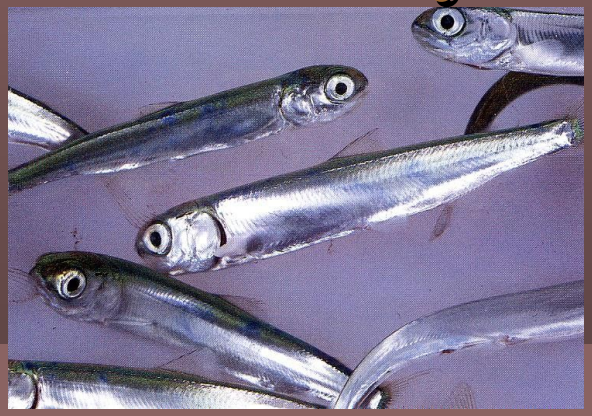
re

Pit

Lifecycle Stage: Alevin

- Alevin are larval fish that have the egg's yolk sack attached to their undersides.
- The yolk sack provides al… in its first weeks of life while its digestive system is still…
- Excessive sediment or wa… educe oxygen levels and trap the tiny fish inside the red… phyxiate.
- Alevin remain in the grav… s have been absorbed 4-10 weeks after hatching, eme…

Lifecycle Stage: Fry & Parr



Fry

Steelhead Parr

Coho & Chinook Parr

- Upon emergence fry seek out shallow water along stream margins
- As fry grow larger they develop parr marks and move to flowing riffles or cool pools with plenty of overhead cover
- Parr marks help fingerlings hide among cover from birds and predatory fish
- Fry, parr, young of the year, and fingerlings can all be used interchangeably to describe juvenile salmon
- Juveniles typically remain in their natal tributary for 12-15 months but may remain as long as 2 years before becoming smolts and migrating to the ocean.

Salmon Food . . . Bugs . . . mmmmm!

Lifecycle Stage: Smolt

- After spending a year or two in freshwater, juveniles lose their parr marks and their sides turn silver.
- Smolts then emigrate from freshwater into the ocean.
- As they migrate, smolts undergo physiological changes that allow them to live in a saltwater environment.
- Once they are in the ocean, smolts grow very rapidly on a diet of marine invertebrates, such as crab larvae, amphipods, and other crustaceans.

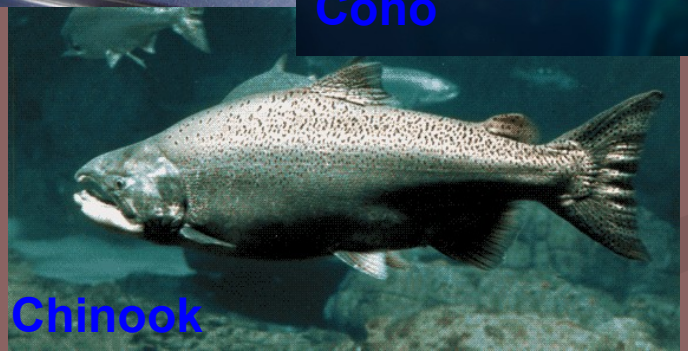

Steelhead smolt


Salmon smolt

Lifecycle Stage: Adult

Steelhead

Coho



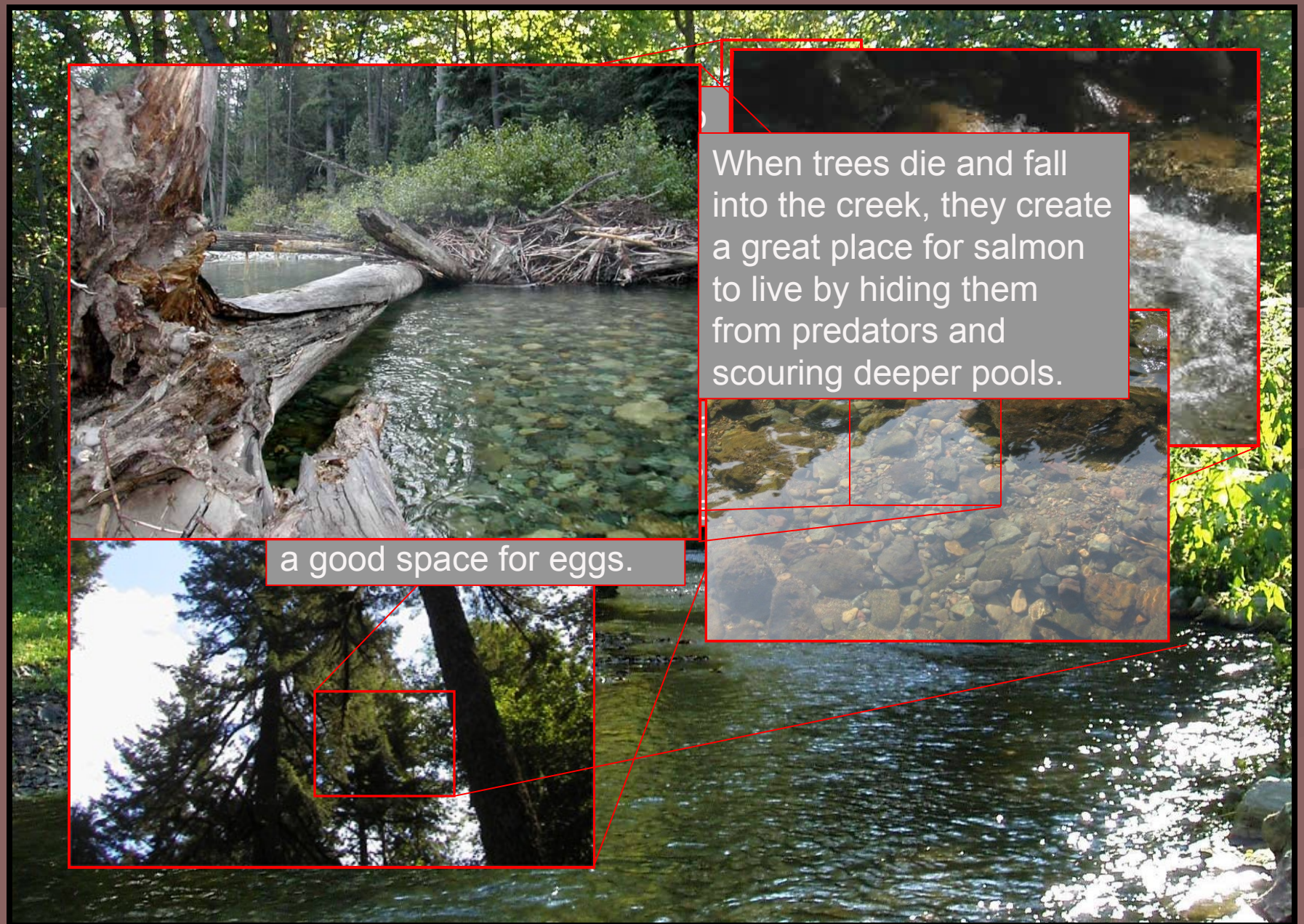
Chinook

- Immature fish just entering the ocean initially remain inshore, close to the parent stream.
- As they grow larger salmon move northward, staying in productive waters over the continental shelf.
- Adult salmon may move as far north as Alaska but most stay in California and Oregon waters.
- Salmon become increasingly piscivorous as they increase in size, feeding on a variety of small pelagic fishes (herring, anchovies, sardines).
- Salmon generally live 1-2 years in the ocean before returning to their natal tributary to spawn.

Lifecycle Stage: Spawner

- Winter stream flows trigger adult salmon migration back to freshwater.
- Upstream migration occurs when stream flows are either rising or falling, not necessarily when streams are in full flood.
- Salmon again undergo physiological changes during their migration from the ocean to freshwater.
- Males develop hooked noses and bright red spawning colors while females develop egg cavities and more muted spawning colors.

Salmon & Trout Habitat



Salmon & Trout Habitat

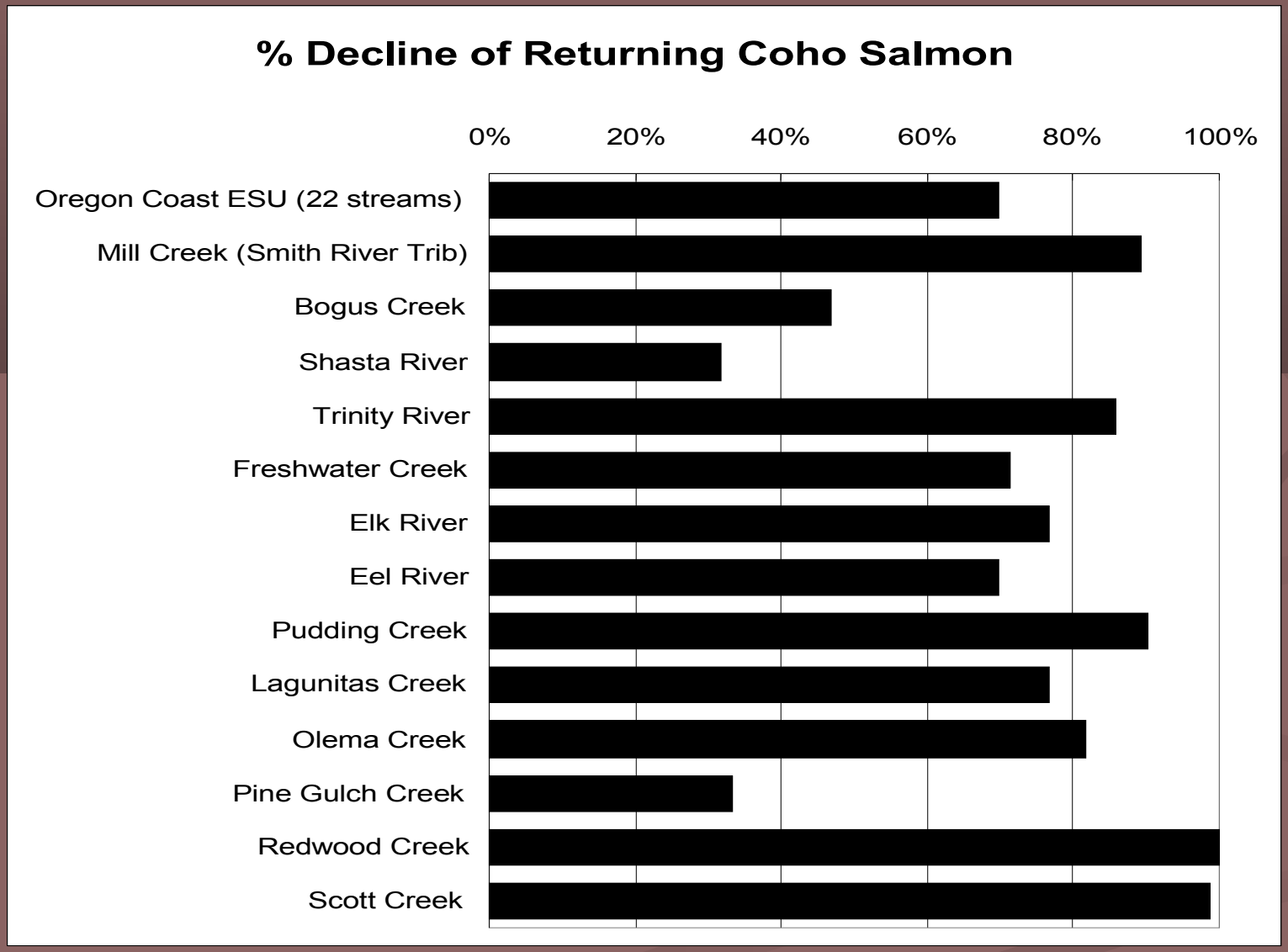
Messy Is Goooooood!

Status and Trends

Salmonid Spawning 1996 - 2011

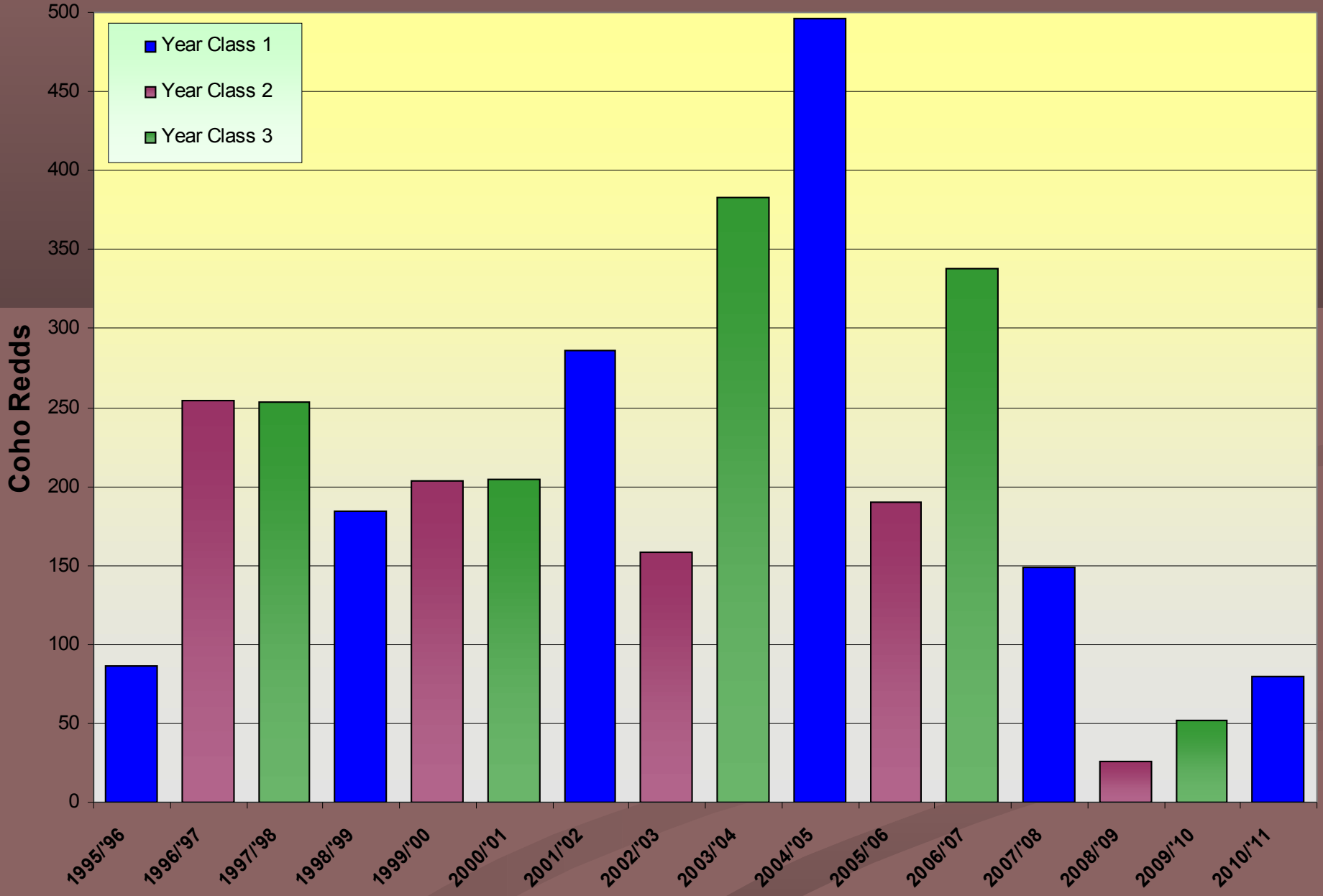
Years	Chinook		Chum		Coho		Steelhead	
	Live Fish	Redds	Live Fish	Redds	Live Fish	Redds	Live Fish	Redds
1995-96	-	-	-	-	365	86	-	-
1996-97	1*	-	-	-	549	254	-	-
1997-98	-	-	1*	-	428	253	10	3
1998-99	-	-	-	-	123	184	4	1
1999-00	1	-	-	-	568	203	24	7
2000-01	5	-	-	-	320	204	18	11
2001-02	44	28	28	10	735	286	52	67
2002-03	31	20	5	0	572	158	44	50
2003-04	19	36	2	1	947	383	57	71
2004-05	125	44	4	1	**1342**	**496**	57	136
2005-06	10	8	0	0	679	190	73	136
2006-07	40	40	1	1	886	338	588	303
2007-08	4	0	0	0	238	148	475	297
2008-09	1	1	0	0	**43**	**26**	45	80
2009-10	1*	0	0	0	**67**	**51**	13	20
2010-11	0	0	0	0	**152**	**80**	nd	nd
Average:	24	18	4	1	**501**	**209**	112	91

Coho Decline & Ocean Conditions

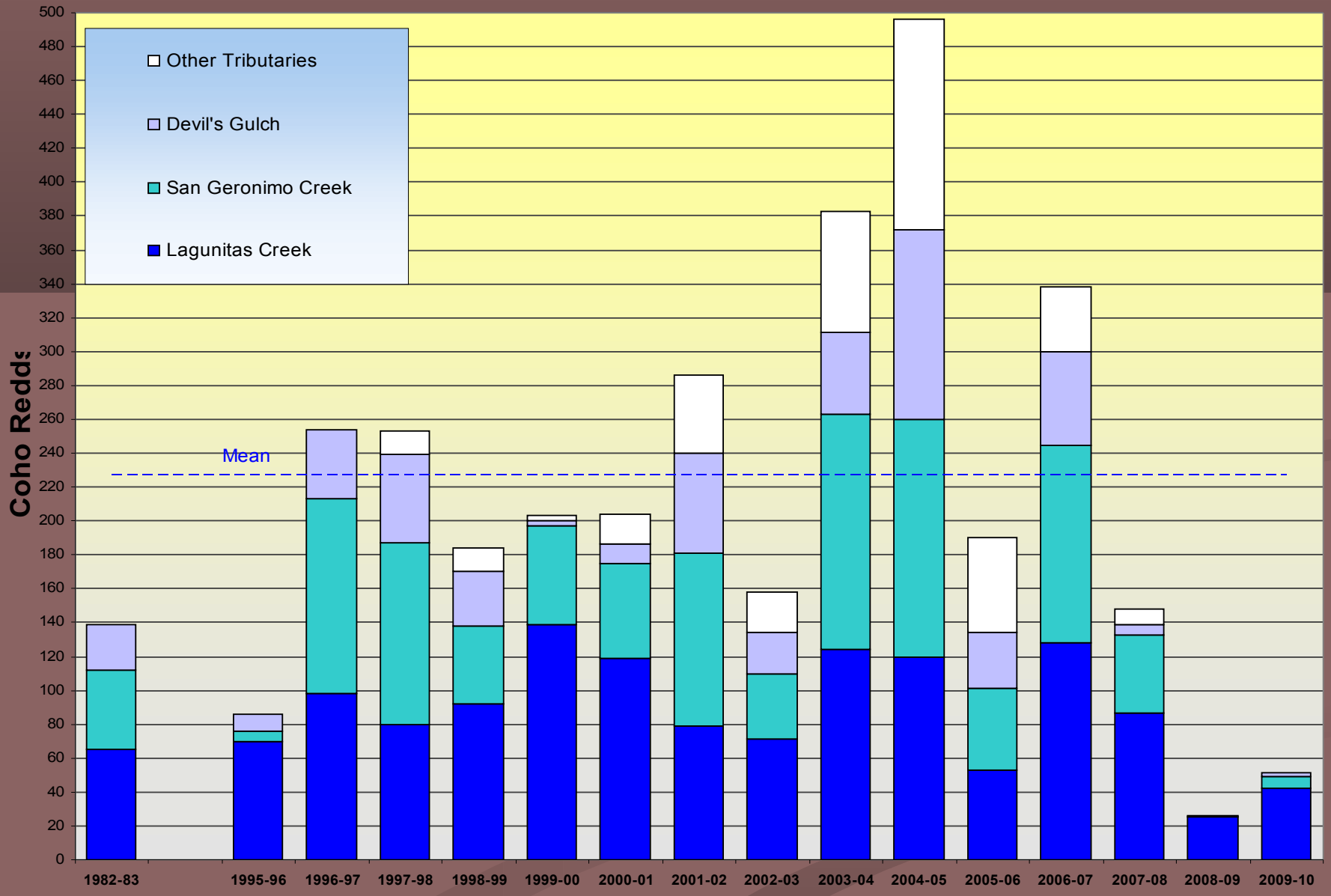


Percent decline of returning coho salmon to streams in California and Oregon 2007/08, relative to returns in 2004/05 (Source: NMFS 2008).

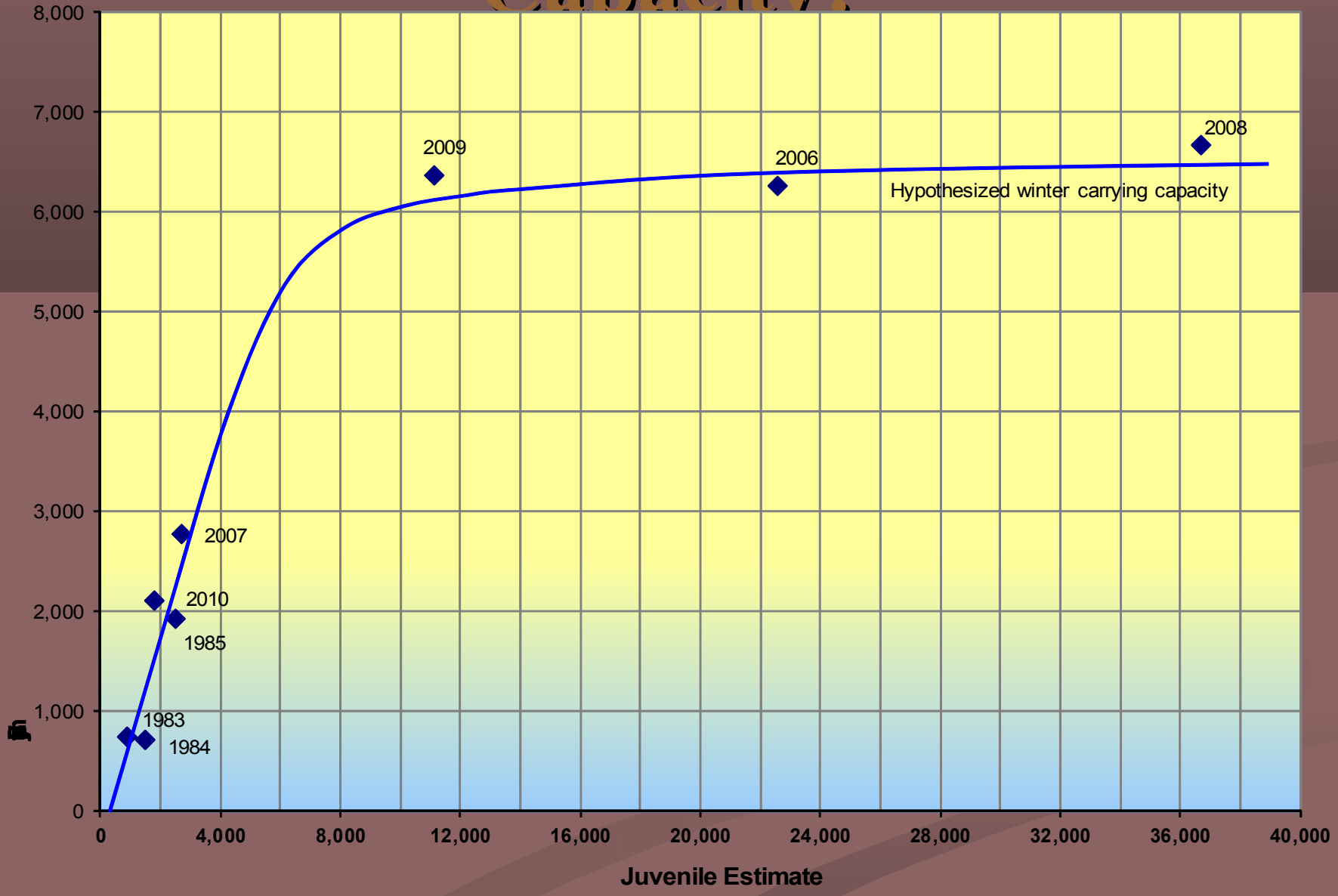
Coho Year Class Declines



Coho Spawning Trends, 1983 - 2010

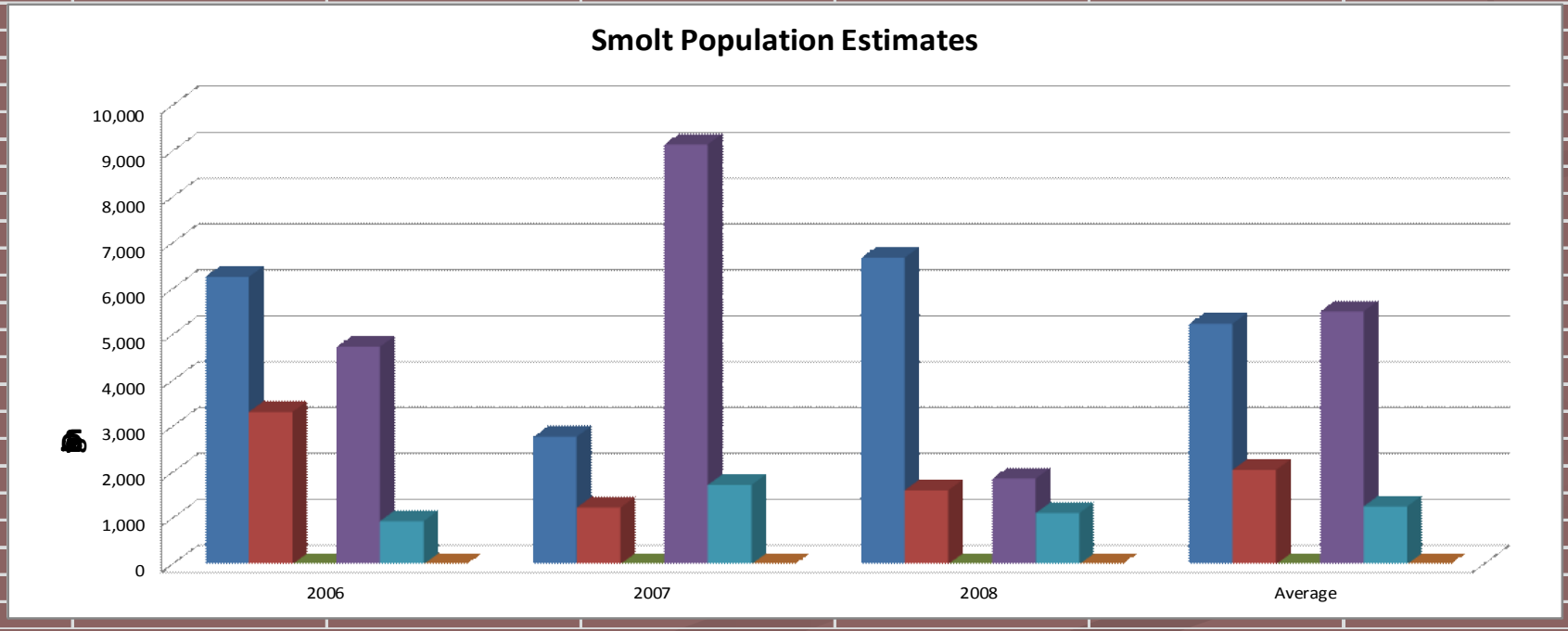


Lagunitas Coho Carrying Capacity?



Coho and Steelhead Smolt Production San Geronimo Creek

YEAR	Total Lagunitas Coho Smolts	San Geronimo Smolts	San Geronimo Coho Percent of Total (%)	Total Lagunitas Steelhead	San Geronimo Steelhead	SG Steelhead Percent of Total (%)
2006	6,261	3,318	**53%**	4,738	938	**20%**
2007	2,776	1,232	**44%**	9,152	1,728	**19%**
2008	6,679	1,609	**24%**	1,866	1,112	**60%**
Average	5,239	2,053	**39%**	5,509	1,259	**33%**



Summary of coho and steelhead smolt population estimates from San Geronimo Valley and the Lagunitas Creek Watershed, 2006 – 2008 (Source: Spawn).

Conclusions

Coho populations have declined sharply and are influenced by many phenomena, including ocean conditions, floods, access to habitat, and habitat quality.

Habitat enhancement efforts throughout the watershed stand the best chance of increasing coho populations and preventing their extinction.

Right now, time is <u>not</u> on our side –

Coho have come to the brink of extinction . . .
but they can recover.


Thank You
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