Using a systems approach to retrospective regulatory review: quantifying economic impact and potential risk reduction due to cumulative regulatory actions in an agricultural watershed in Washington

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USDA Office of the Chief Economist

The views and analyses presented here are those of the authors and not necessarily those of USDA.

Importance of retrospective analysis – why this is a good case study

- Balancing benefits and costs is an integral part of our regulatory system.
- In the case of balancing the benefits and costs of actions pertaining to the protection of threatened or endangered species, there are few opportunities to consider costs. One is the economic analysis of Critical Habitat designations.
- With respect to PNW salmonid species, the EA for the CH designation epitomized ex-ante analysis. Now, following agency consultations, it is clear an ex-post analysis would generate very different cost and benefit estimates.

Endangered Species Regulatory Actions?

1. Propose to list a species.
2. Finalize a listing.
3. Propose a critical habitat designation with proposed Regulatory Impact Analysis (PRIA).
4. Finalize a critical habitat designation, in consideration of economic impacts with final RIA (FRIA).
5. Consultation with agencies.
6. Services issue Biological Opinions (BiOps) that define "reasonable and prudent" measures and alternatives to prevent adverse modification of the critical habitat.
7. Review their listing status every 5 years.

When might EO 13563 retrospective analysis be useful for ESA actions?

Goal: simplify and harmonize rules across agencies in order to reduce costs through retrospective review.

- When there has been a significant change in science or economic impacts due to unanticipated circumstances.
- When there are cumulative impacts from other agency(ies)' actions.
- When there is significant public participation in the issues governed by the original rulemaking.
- When there is already an ongoing review process.

NMFS lists and Designates Critical habitat For 13 ESUs of Pacific salmon and steelhead in WA, OR and ID

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 226

[Docket No. 030716175–4327–03; I.D. No. 070303A]

RIN No. 0648–AQ77

Endangered and Threatened Species; Designation of Critical Habitat for 13 Evolutionarily Significant Units of Pacific Salmon (*Oncorhynchus* spp.) and Steelhead (*O. mykiss*) in Washington, Oregon, and Idaho

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration, Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: We, the National Marine Fisheries Service (NMFS), propose to designate critical habitat for 13 Evolutionarily Significant Units (ESUs) of Pacific salmon (chum, *Oncorhynchus keta*; coho, *O. kisutch*, sockeye, *O. nerka*; chinook, *O. tshawytscha*) and *O. mykiss* (inclusive of anadromous

DATES: Comments on this proposed rule must be received by 5 p.m. P.S.T. on February 14, 2005. Requests for public hearings must be made in writing by January 28, 2005. We have already scheduled public hearings on this proposed rule as follows:

Tuesday, January 11, 2005, from 6:30–9:30 p.m. at the Doubletree Hotel Columbia River, 1401 North Hayden Island Drive in Portland, OR;

Thursday, January 13, 2005, from 6:30–9:30 p.m. at the Red Lion Hotel Columbia Center, 1101 North Columbia Center Blvd. in Kennewick, WA;

Tuesday, January 18, 2005, from 6:30–9:30 p.m. at the Radisson Hotel Seattle Airport, 17001 Pacific Highway South in Seattle, WA; and

Tuesday, January 25, 2005, from 6:30–9:30 p.m. at the Red Lion Hotel Boise Downtown, 1800 Fairview Avenue in Boise, ID.

Details regarding the hearing format and related information will be posted by December 24, 2004, on our Web site at *http://www.nwr.noaa.gov/1salmon/salmesa/crithab/CHsite.htm.*

ADDRESSES: You may submit comments, identified by docket number

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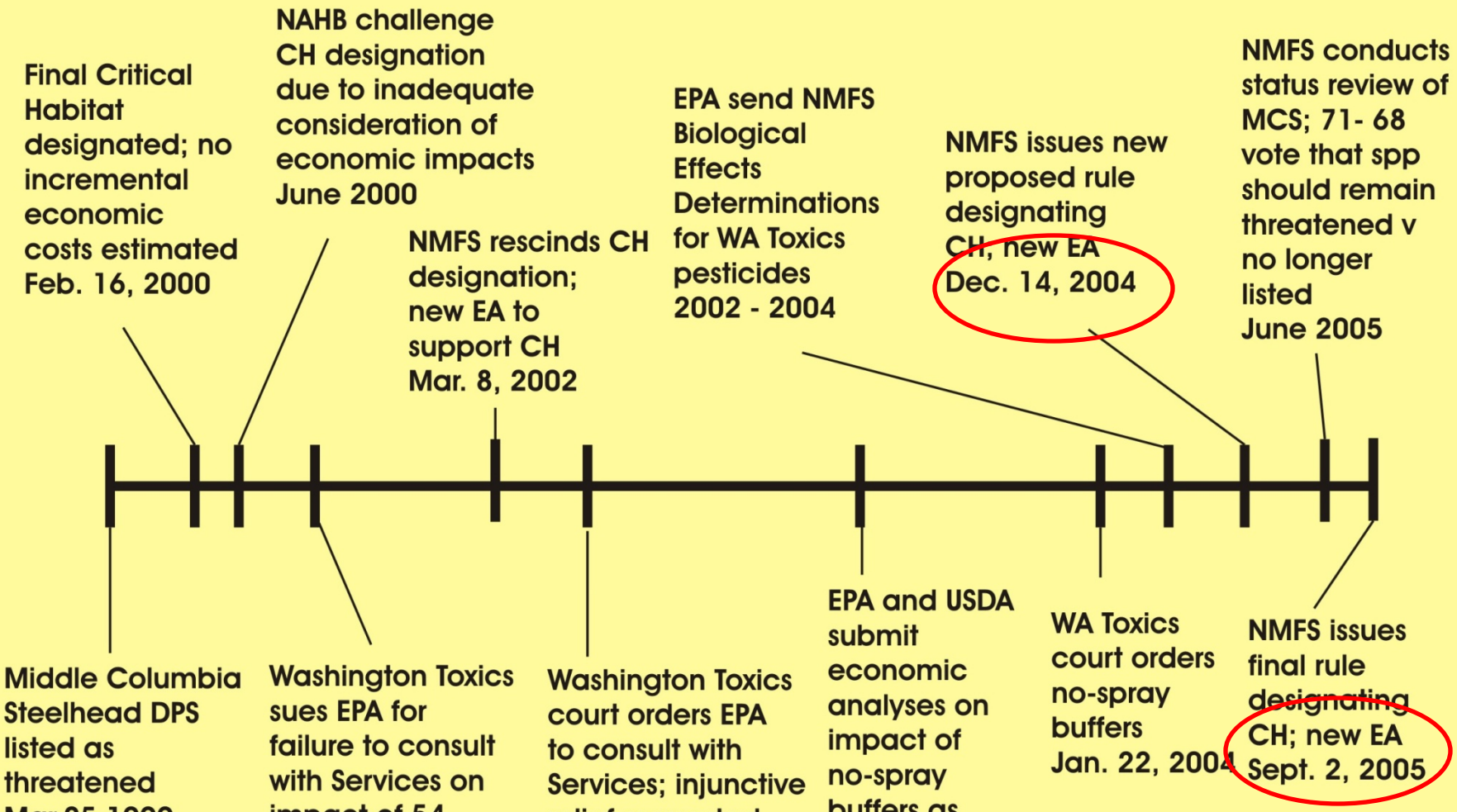
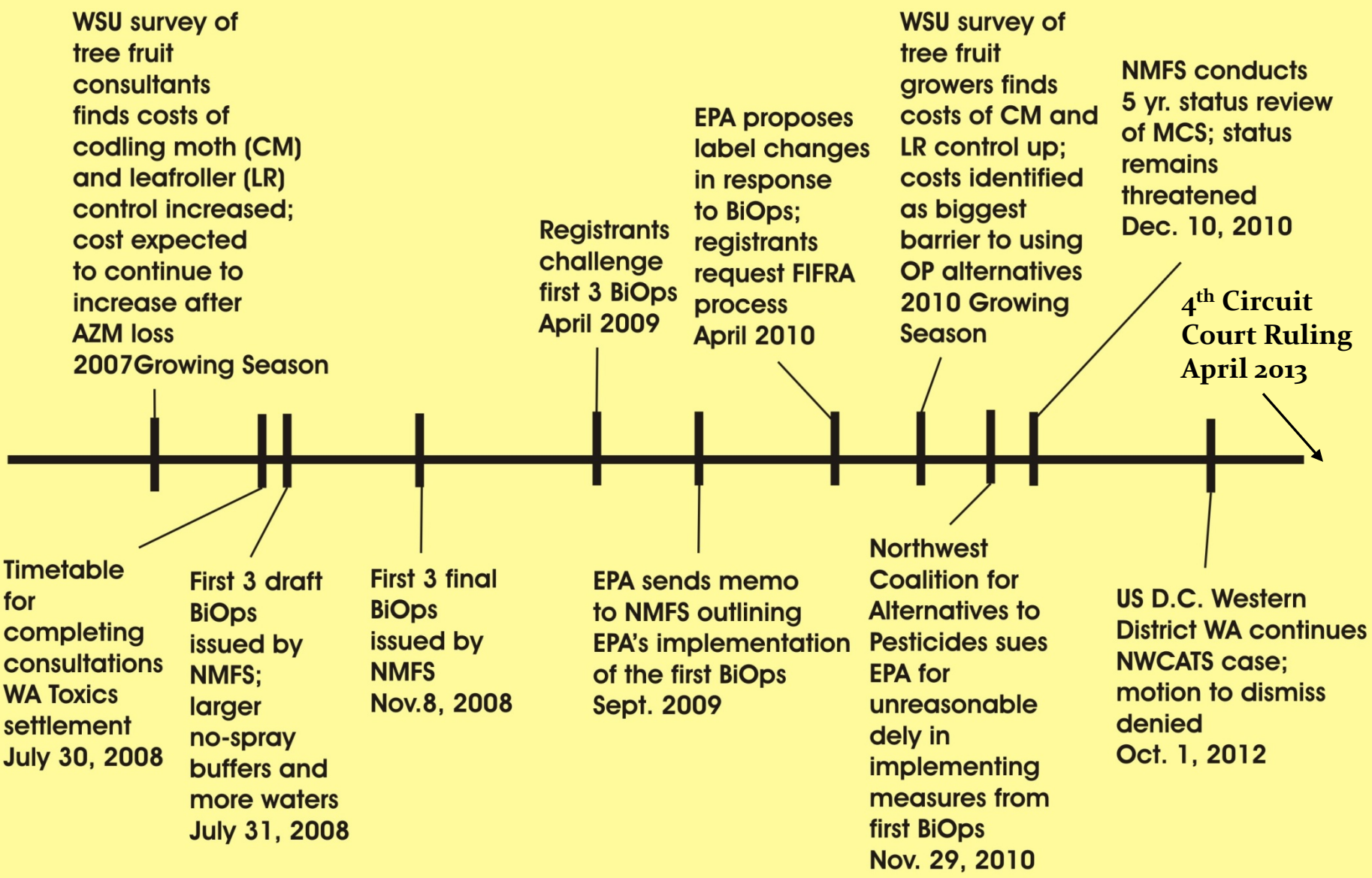

Middle Columbia Steelhead DPS listed as threatened Mar.25,1999
Final Critical Habitat designated; no incremental economic costs estimated Feb. 16, 2000
NAHB challenge CH designation due to inadequate consideration of economic impacts June 2000
Washington Toxics sues EPA for failure to consult with Services on impact of 54 pesticides on salmon Jan. 30, 2001
NMFS rescinds CH designation; new EA to support CH Mar. 8, 2002
Washington Toxics court orders EPA to consult with Services; injunctive relief requested until completion of consultation July 2, 2002
EPA send NMFS Biological Effects Determinations for WA Toxics pesticides 2002 - 2004
EPA and USDA submit economic analyses on impact of no-spray buffers as injunctive relief Aug. 13,2003
NMFS issues new proposed rule designating CH, new EA Dec. 14, 2004
WA Toxics court orders no-spray buffers Jan. 22, 2004
NMFS conducts status review of MCS; 71- 68 vote that spp should remain threatened v no longer listed June 2005
NMFS issues final rule designating CH; new EA Sept. 2, 2005


WSU survey of tree fruit consultants finds costs of codling moth (CM) and leafroller (LR) control increased; cost expected to continue to increase after AZM loss 2007Growing Season
Timetable for completing consultations WA Toxics settlement July 30, 2008
First 3 draft BiOps issued by NMFS; larger no-spray buffers and more waters July 31, 2008
First 3 final BiOps issued by NMFS Nov.8, 2008
Registrants challenge first 3 BiOps April 2009
EPA sends memo to NMFS outlining EPA's implementation of the first BiOps Sept. 2009
EPA proposes label changes in response to BiOps; registrants request FIFRA process April 2010
WSU survey of tree fruit growers finds costs of CM and LR control up; costs identified as biggest barrier to using OP alternatives 2010 Growing Season
Northwest Coalition for Alternatives to Pesticides sues EPA for unreasonable dely in implementing measures from first BiOps Nov. 29, 2010
NMFS conducts 5 yr. status review of MCS; status remains threatened Dec. 10, 2010
US D.C. Western District WA continues NWCATS case; motion to dismiss denied Oct. 1, 2012
4th Circuit Court Ruling April 2013

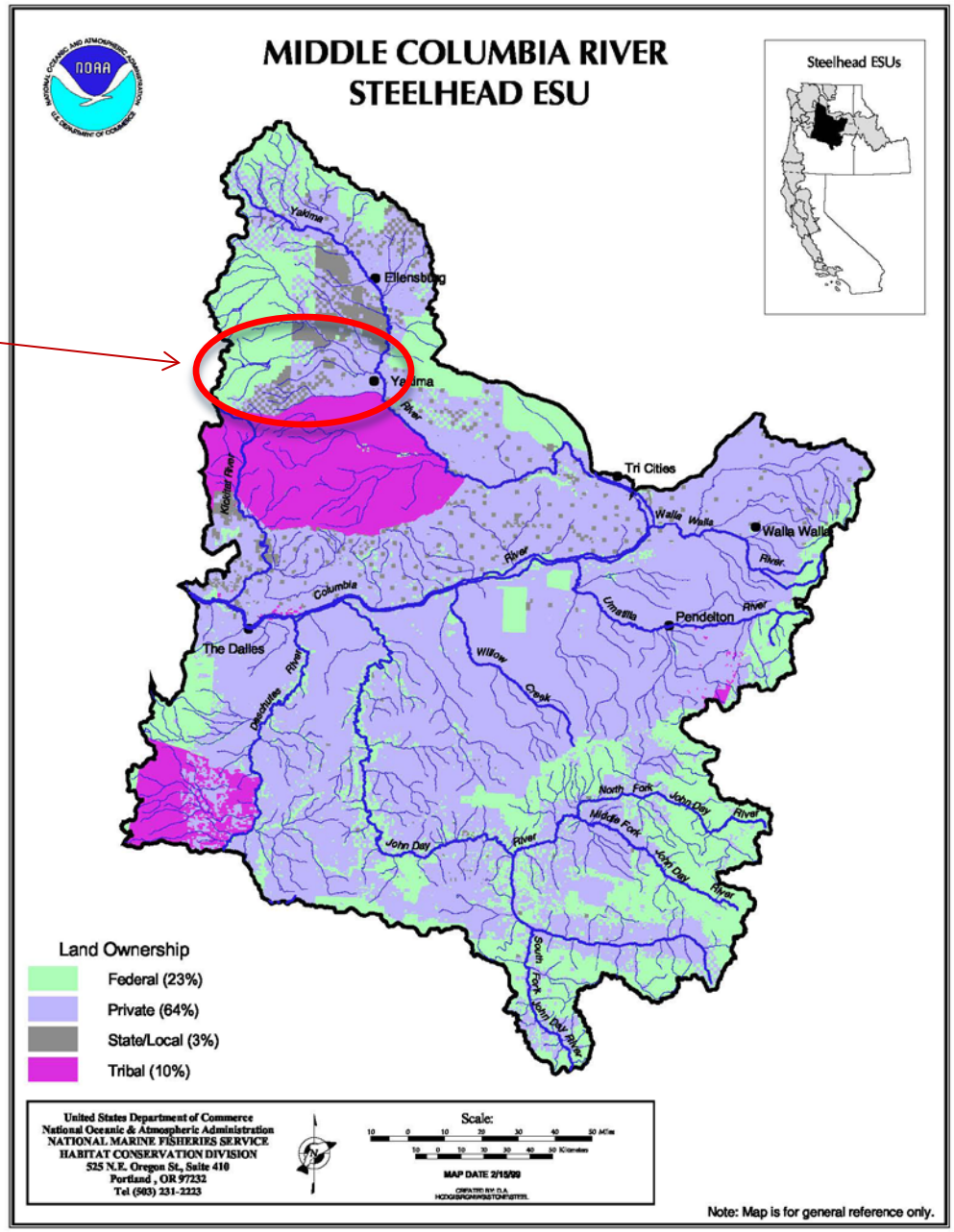
2005 Final Economic Analysis for Designation of Critical Habitat*

- Estimated Economic Impacts for 13 Activity Types:

- Hydropower Dams
- Non-hydropower Dams
- Federal land management
- Federal land management (wilderness)
- Grazing
- Transportation Projects
- Utility Projects
- Sand & Gravel Operations
- Instream Activities
- Dredging
- Residential & Commercial Development
- NPDES Activities
- Pesticides

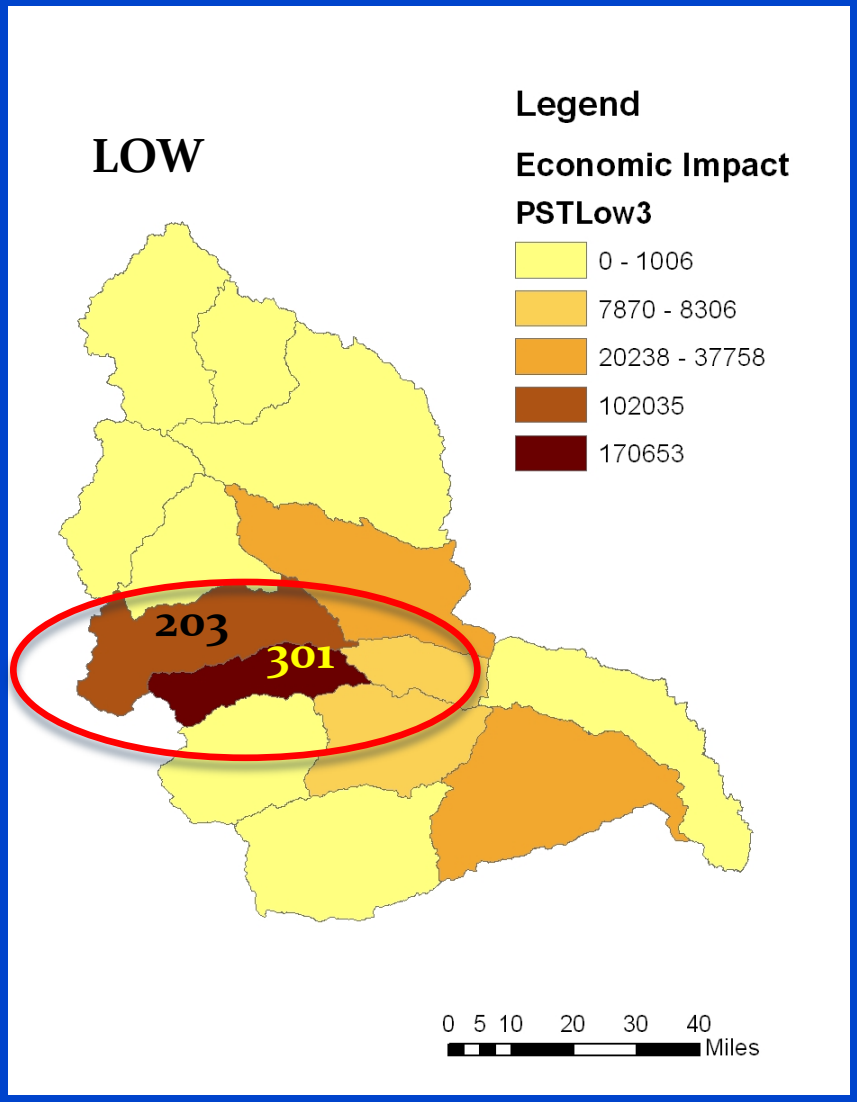
Final Economic Analysis of Critical Habitat Designation for 12 West Coast Salmon and Steelhead ESUs, August 2005, Northwest Fisheries Science Center, National Oceanographic and Atmospheric Administration, Seattle, WA http://www.nwr.noaa.gov/habitat/critical_habitat_in_the_nw/2005_northwest_salmon_and_steelhead_designations.html

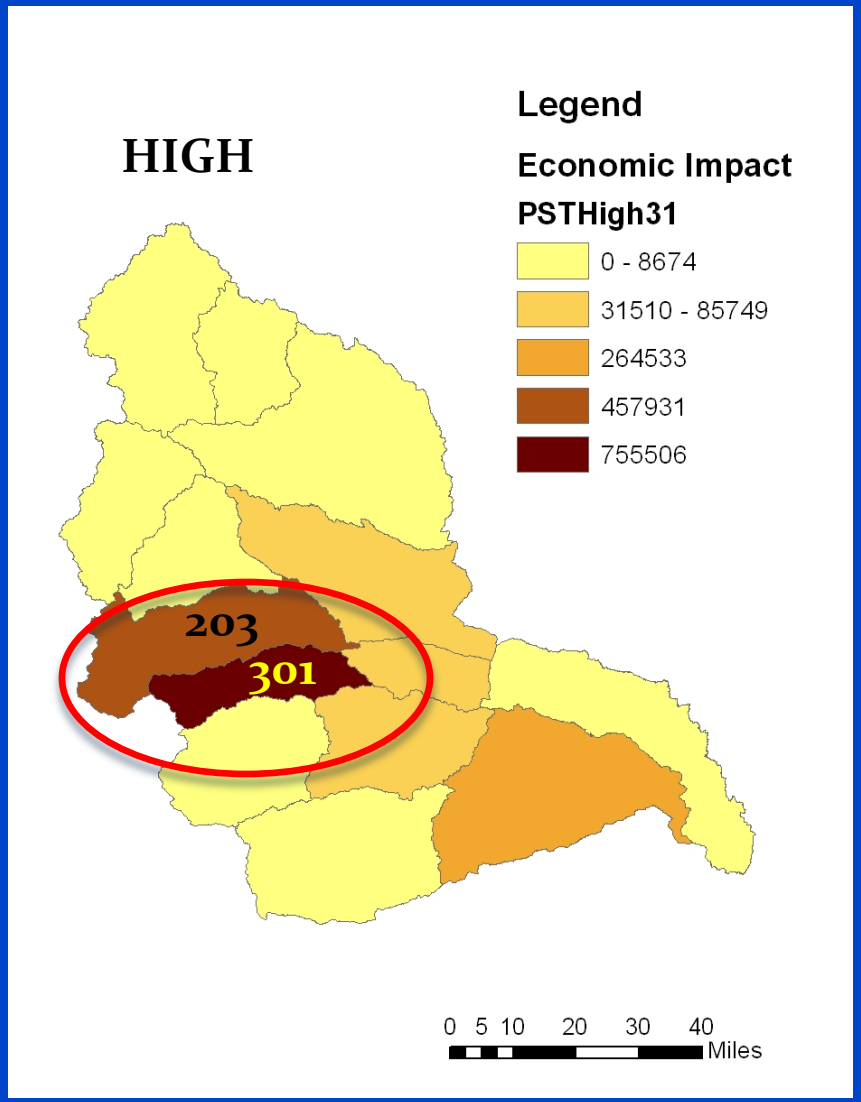
Study Area



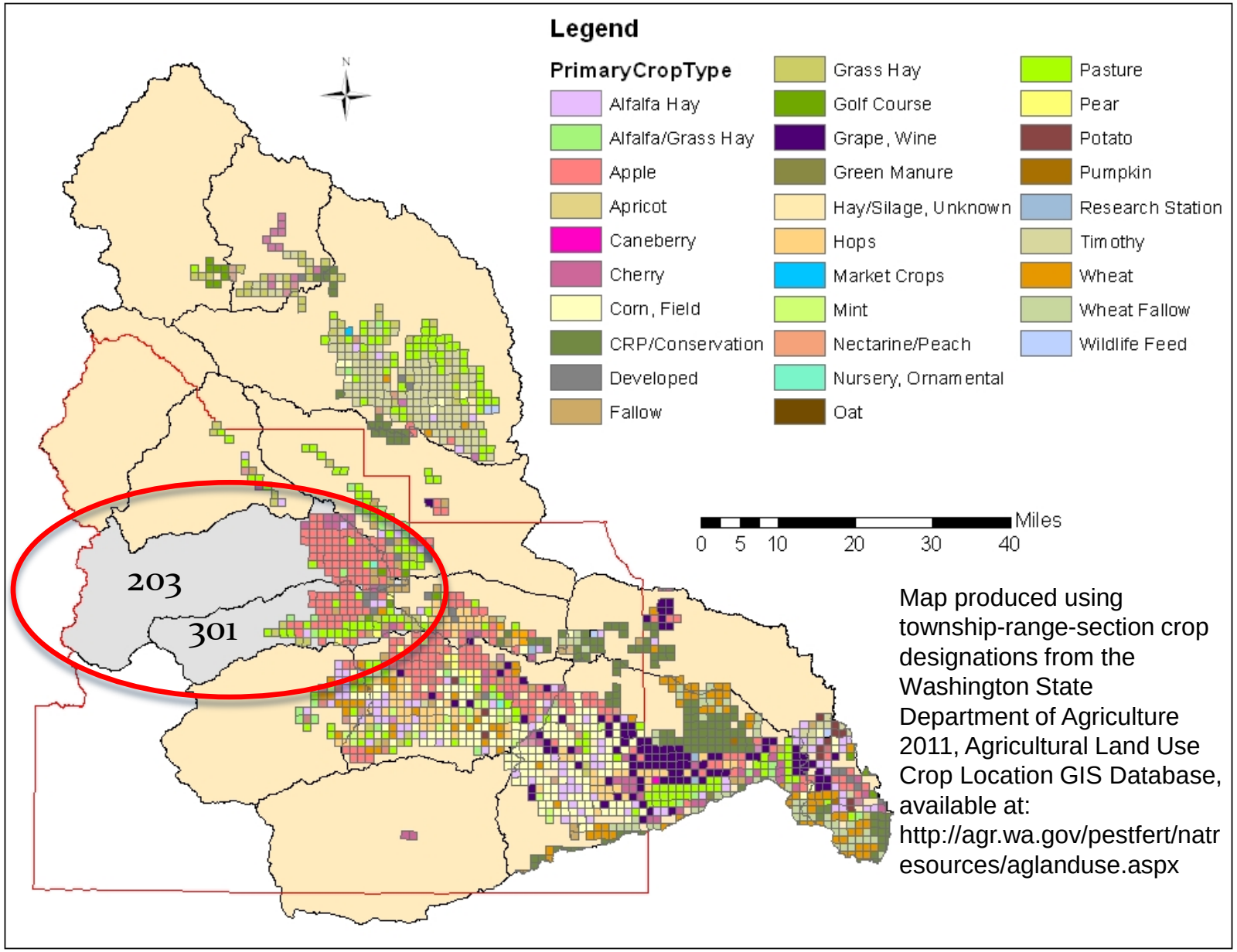
National Oceanographic and Atmospheric Administration, National Marine Fisheries Service, Habitat Conservation Division. 1999. Available at: http://www.nwr.noaa.gov/publications/gis_maps/maps/salmon_steelhead/esa/steelhead/steelheadmcrmap.pdf

Economic impact* due to pesticide restrictions

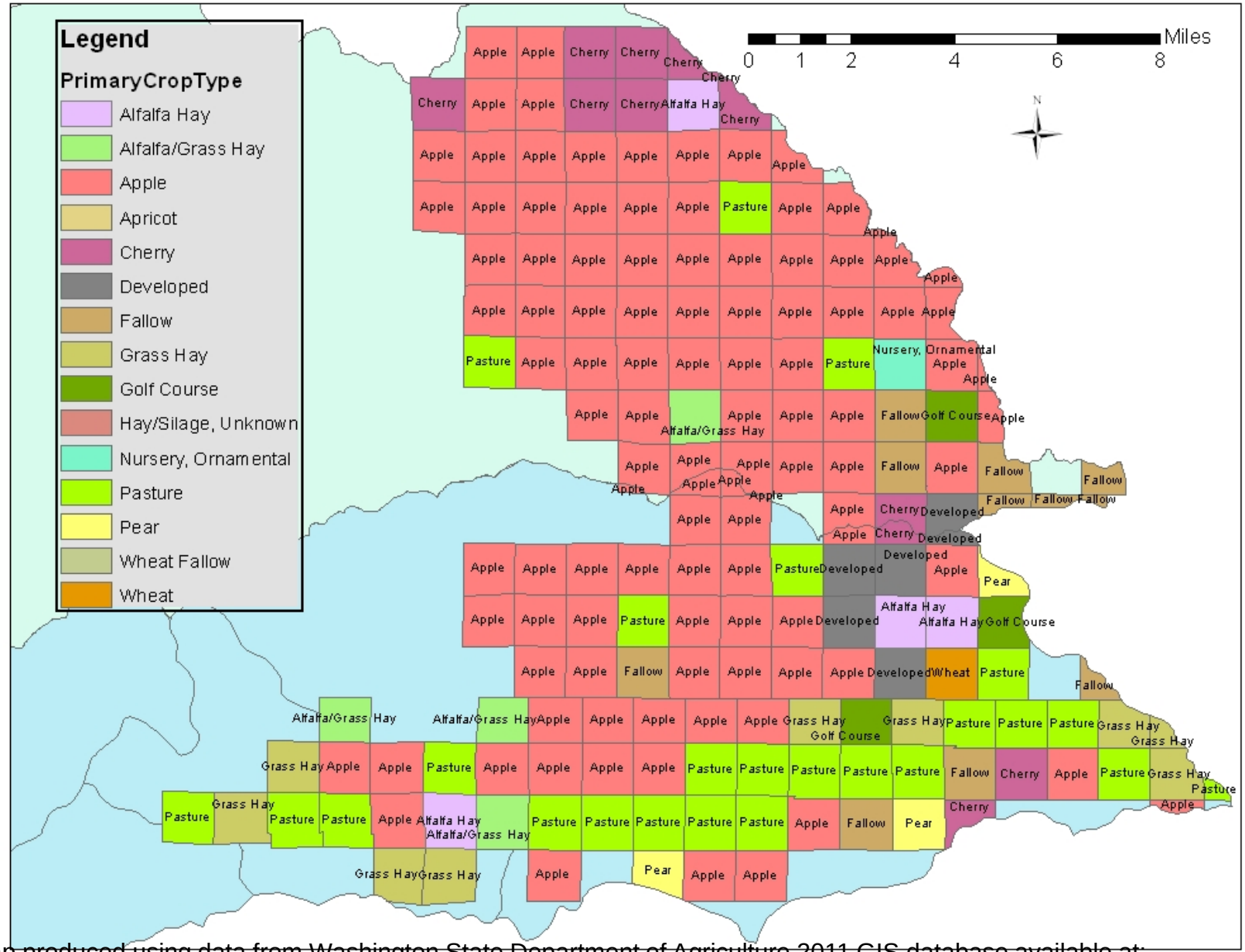




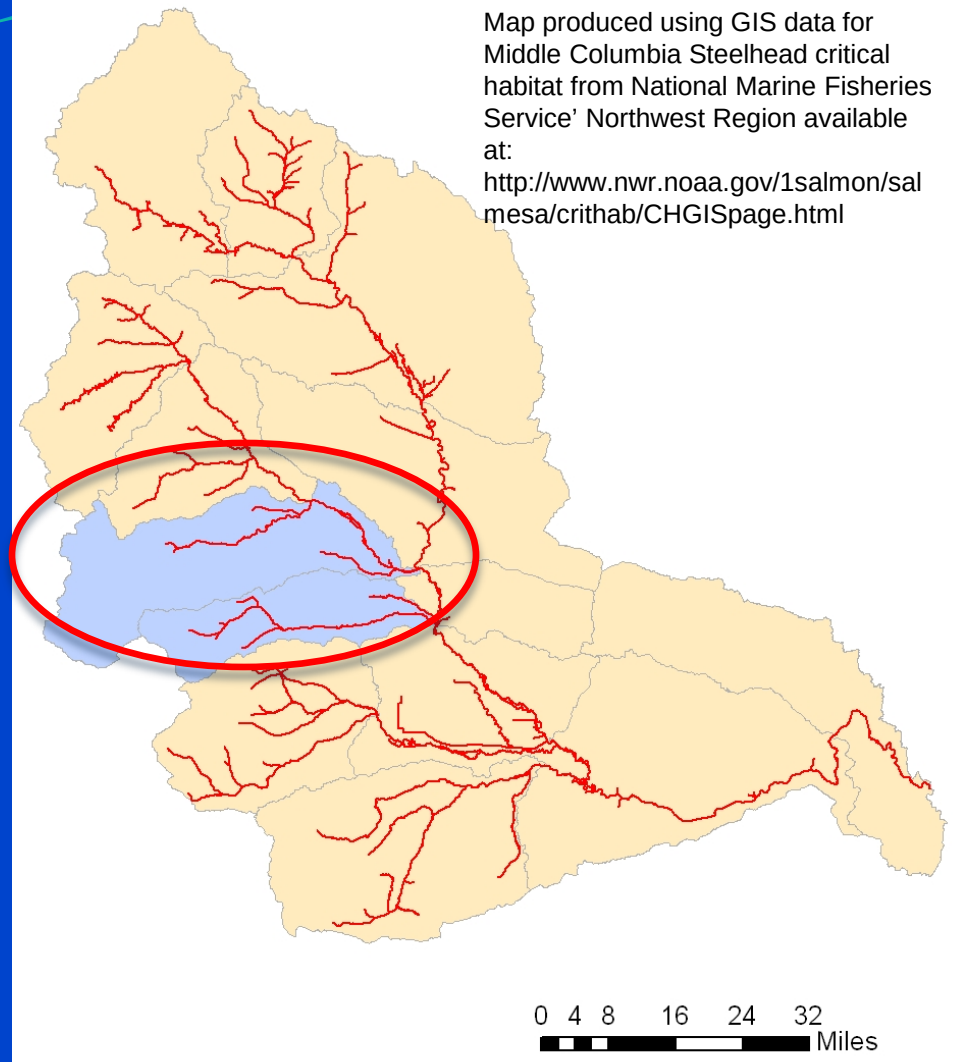
From the low and high economic impact scenarios calculated for 5 digit HUCs in Yakima in the Final Economic Analysis of Critical Habitat Designation for 12 West Coast Salmon and Steelhead ESUs, August 2005. See slide 8 for complete citation.



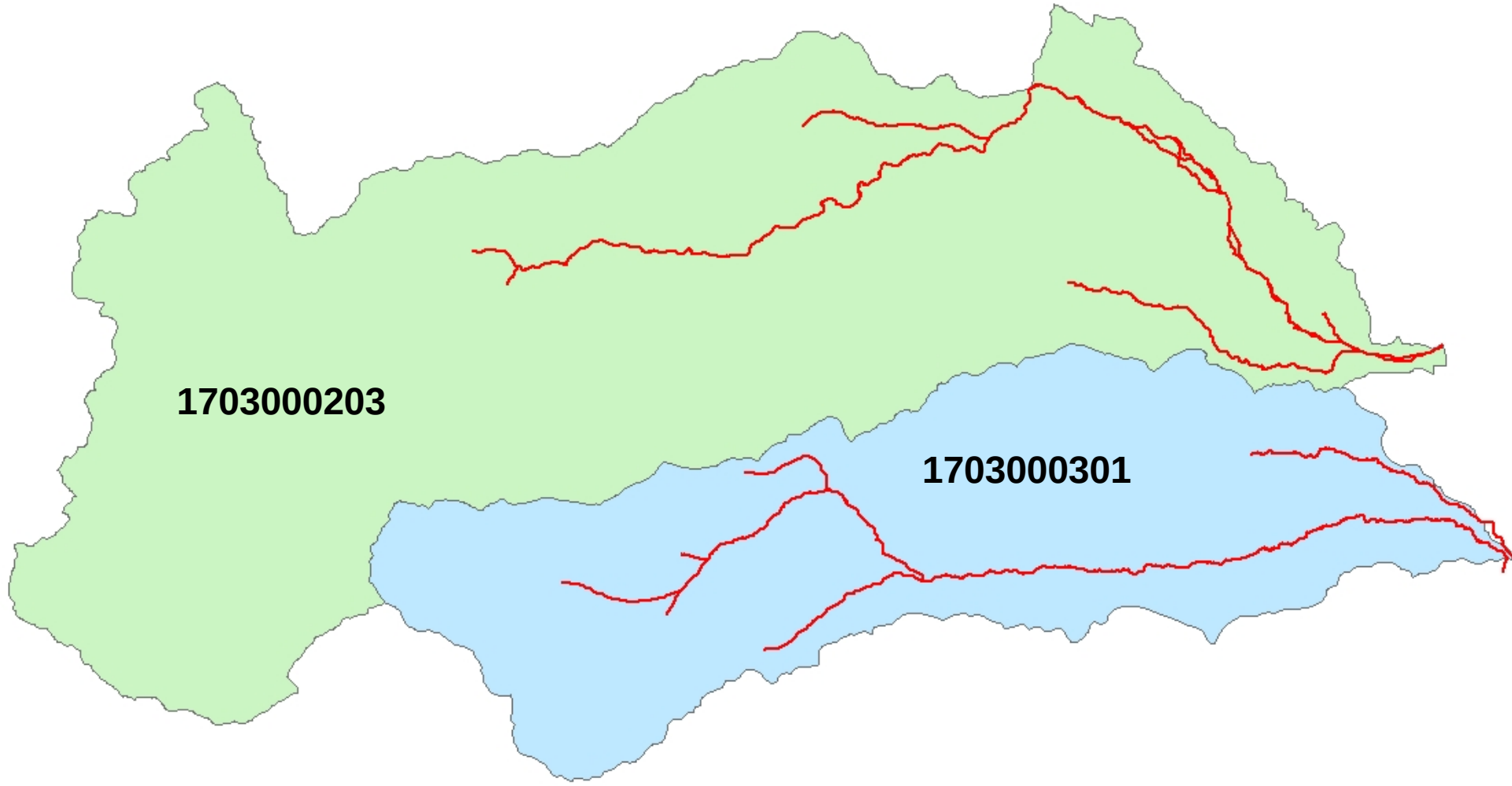
Map produced using township-range-section crop designations from the Washington State Department of Agriculture 2011, Agricultural Land Use Crop Location GIS Database, available at: http://agr.wa.gov/pestfert/natresources/aglanduse.aspx



Map produced using data from Washington State Department of Agriculture 2011 GIS database available at: http://agr.wa.gov/pestfert/natresources/aglanduse.aspx as in previous slide



Map produced using GIS data for Middle Columbia Steelhead critical habitat from National Marine Fisheries Service' Northwest Region available at: http://www.nwr.noaa.gov/1salmon/salmesa/crithab/CHGISpage.html



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0 2 4 8 12 16
Miles

Middle Columbia Steelhead Life History

Anadromous Form of Species

Steelhead

Egg

Fry

Fingerling Juvenile

Smolt

Oceanic Adult

Resident Form of Species

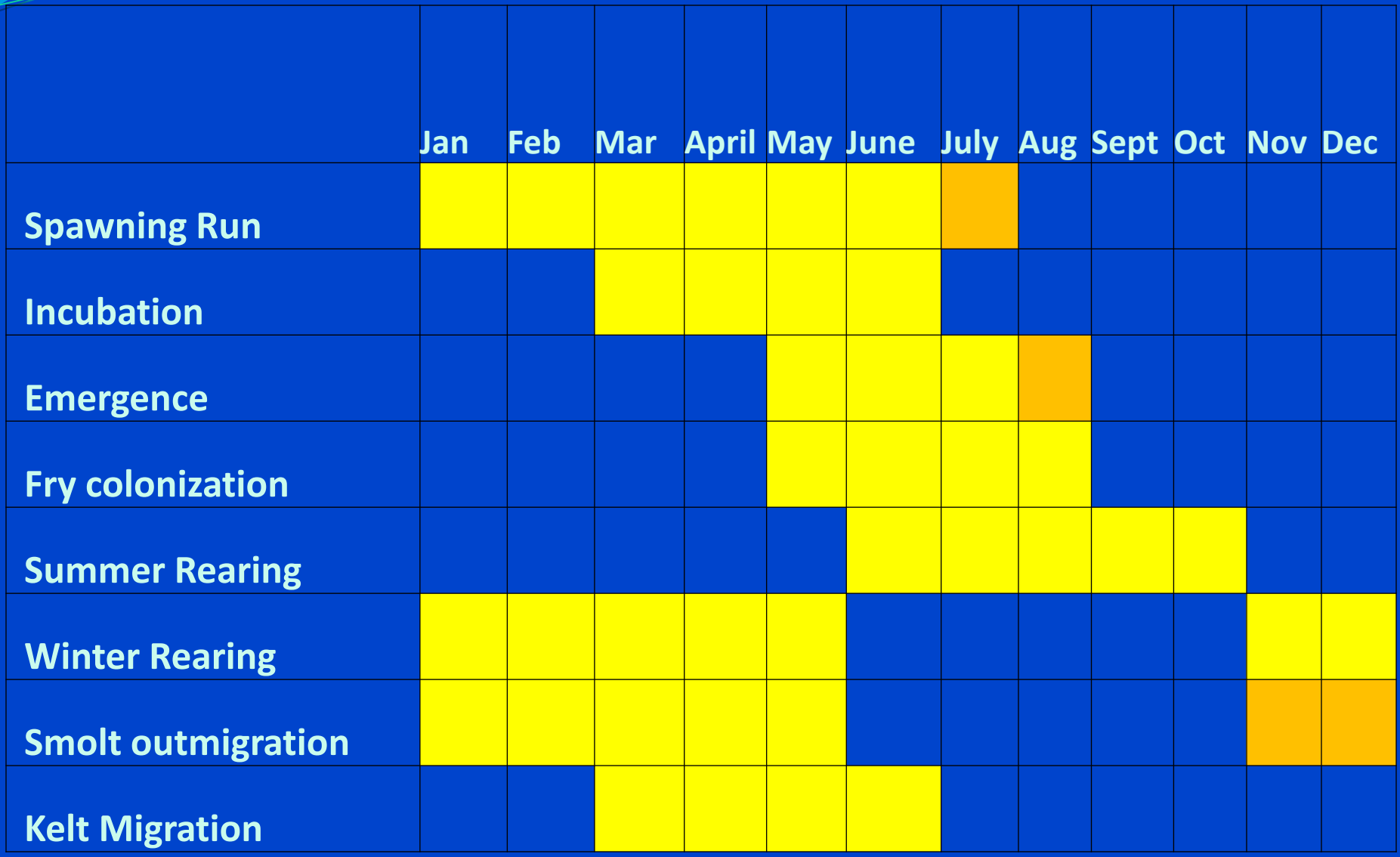
Rainbow Trout

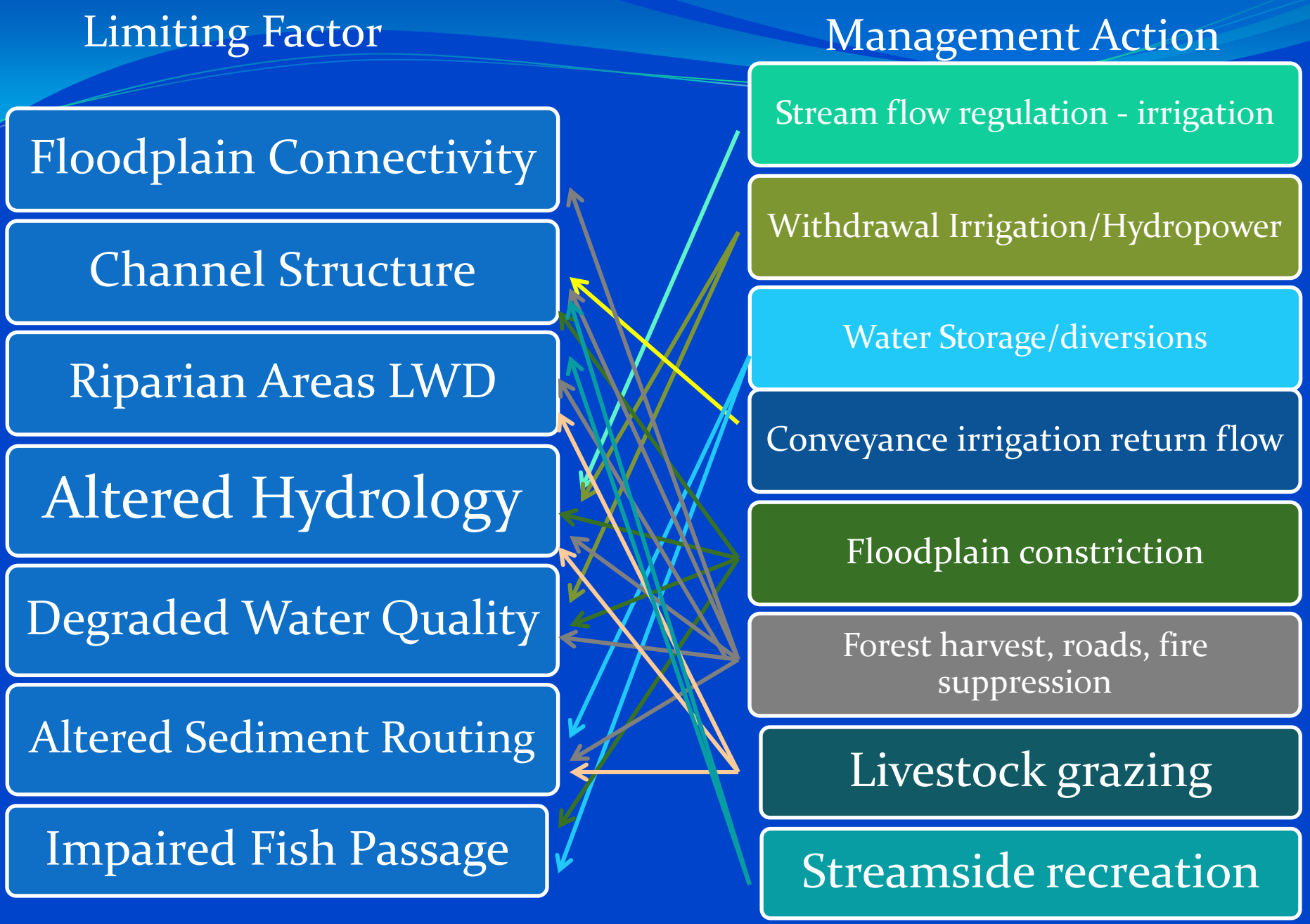
Kelt - Reconditioned

Spawning Adult

Jacks – Adults returning to Freshwater for maturation

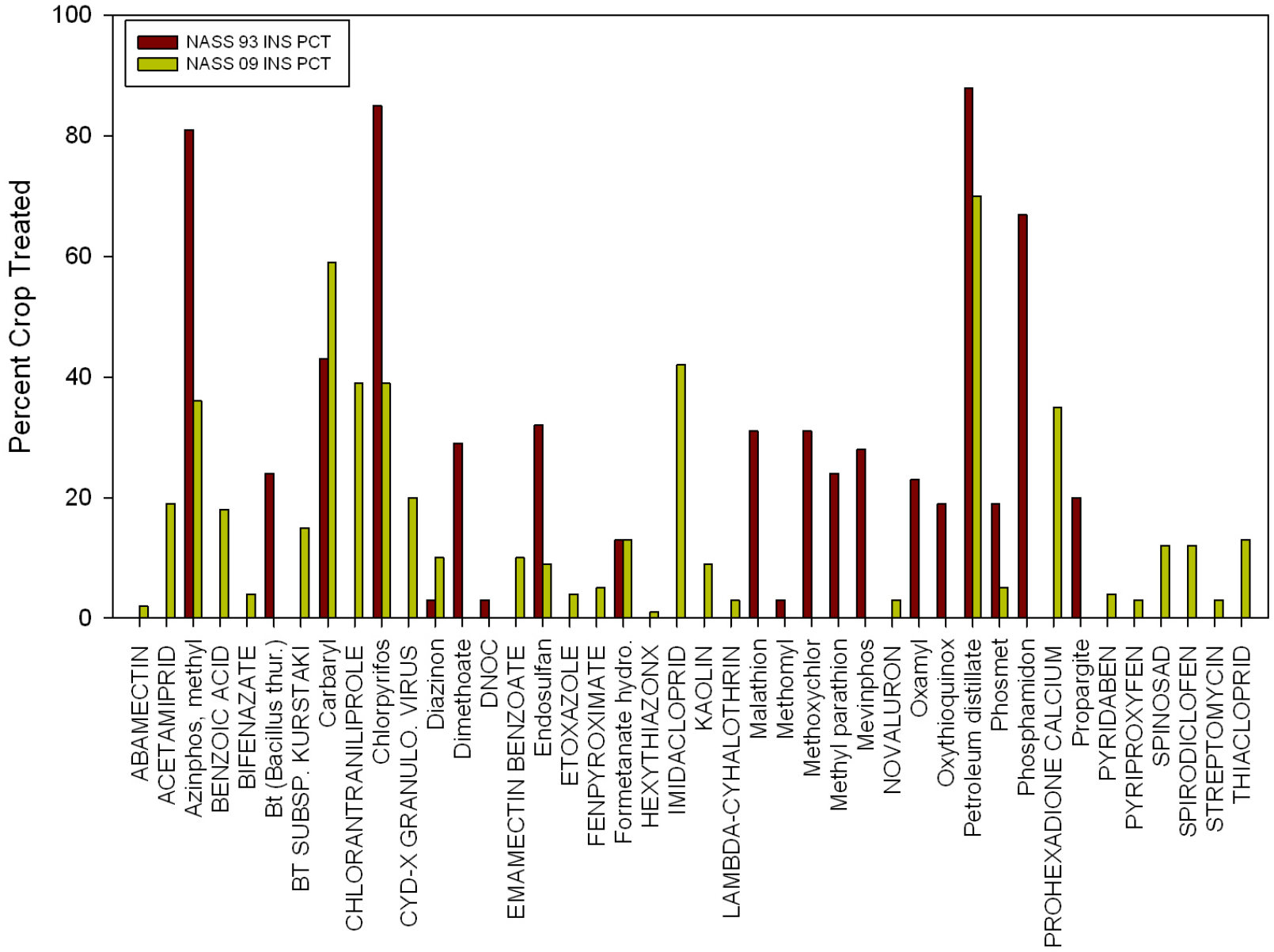
Yakima Basin Salmon Presence





2009 Yakima Steelhead Recovery Plan; Extracted from the 2005 Recovery Plan with Updates; Yakima Basin Fish and Wildlife Recovery Board. www.ybfwrb.org

Insecticide Use (NASS) WA Apples - 1993 - 2009

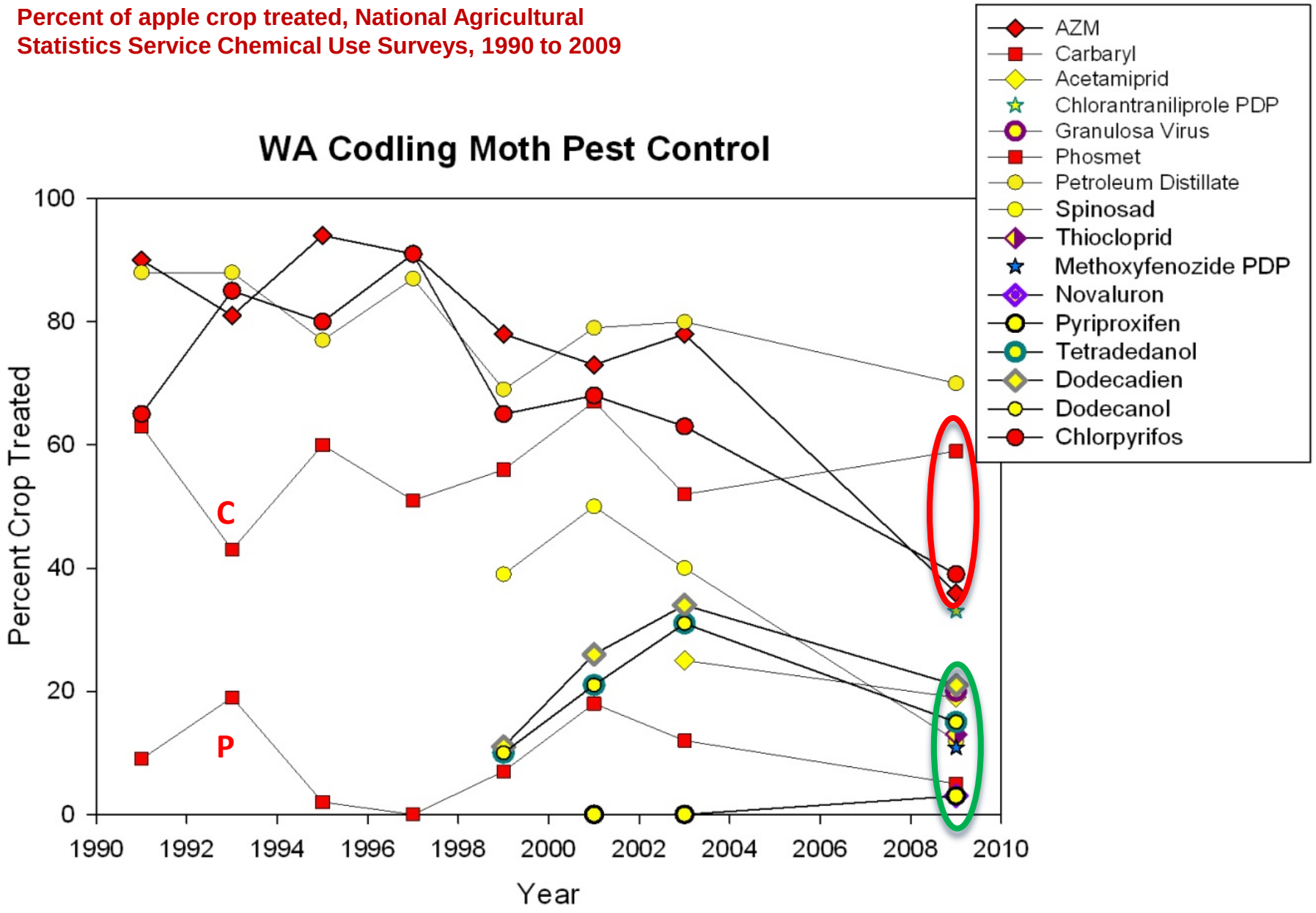


Pesticide Application by Season

Codling Moth Horticultural Pest	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Pheromone								
Acetamiprid/ Petroleum oil						3-4	3-4	3-4
Petroleum Oil							3	
Spinetoram					4	4	4	4
Chlorantronilprole					4	4	4	
Azinphos methyl							3-4	
Thiacloprid							4	
Phosmet						3	3	

2011 Crop Protection Guide for Tree Fruits in Washington. Washington State University Extension EB0419, Pullman WA http://pubs.wsu.edu

Percent of apple crop treated, National Agricultural Statistics Service Chemical Use Surveys, 1990 to 2009



Percent of apple crop treated using pesticides included in WA Toxics (red) and subject to 60 or 300 ft buffers and newer pesticides (other colors). Red circle highlights older, less expensive pesticides; green – newer products

Pesticide Application by Season

Cutworms	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Chlorpyrifos	4							
Endosulfon	4	4					4	
Indoxacarb								
Methoxyfenozide								

Apple Maggot Horticultural Pest	Delayed Dormant	Pre Pink	Pink	Bloom	Petal Fall	After Bloom	Spring Summer	Pre-harvest
Acetamiprid								
Azinphos methyl								
Phosmet								

August 2005 NMFS Method

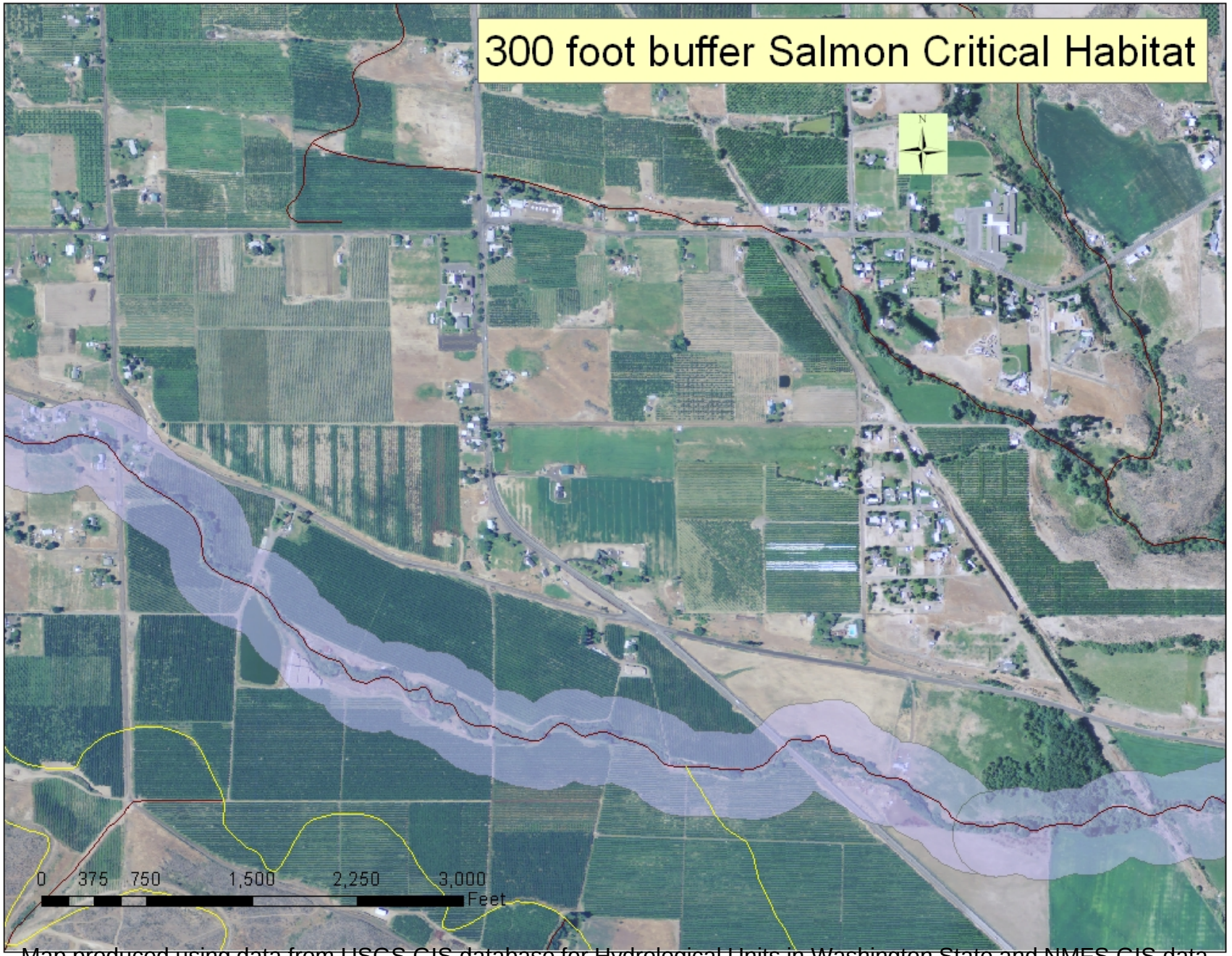
- Based on court injunction, NMFS assumed for all pesticides:
  - a buffer of 60 feet for ground application
  - a buffer of 300 feet for aerial application
  - Around "salmon supporting waters"
  - Buffer assumed to be land retirement
- Range:
  - High Cost (H)= all applications are aerial (300 ft)
  - Low Cost (L) = all applications are ground (60 ft)
- $(\text{Per acre costs})_i = (\text{net revenue})_j \div (\text{acres})_j$ for
  - huc i = Yakima watersheds and
  - crop j = orchards, vegetables, grains
- $\text{Total Cost}_{\text{H or L}} = \Sigma_{ij} (\text{per acre costs})_{ij} \times \text{buffer}_{\text{H or L}}$

Final Economic Analysis of Critical Habitat Designation for 12 West Coast Salmon and Steelhead ESUs, August 2005, Northwest Fisheries Science Center, National Oceanographic and Atmospheric Administration, Seattle, WA http://www.nwr.noaa.gov/habitat/critical_habitat_in_the_nw/2005_northwest_salmon_and_steelhead_designations.html

NMFS Economic Analysis – Entire Middle Columbia ESU

2003 Prices	Orchards/ Vineyards	Row Crops	Small Grains	Total
# acres in 60 ft buffer	**764**	**482**	**2615**	
# acres in 300 ft buffer	**3685**	**2363**	**13404**	
Gross $/acre	**$4817**	**$1449**	**$173**	
Gross revenue 60 ft buffer	**$3,524,510**	**$699,838**	**$436,358**	**$4,660,707**
Gross revenue 300 ft buffer	**$16,998,100**	**$3,430,635**	**$2,234,339**	**$22,663,073**
Net revenue 60 ft buffer	**$176,226**	**$34,992**	**$21,818**	**$233,035**
Net revenue 300 ft buffer	**$849,905**	**$171,352**	**$111,717**	**$1,133,154**

Draft Economic Analysis of Critical Habitat Designation for 13 Pacific Salmon and O. mykiss ESUs. 2004. NOAA Northwest Fisheries Center, Seattle WA

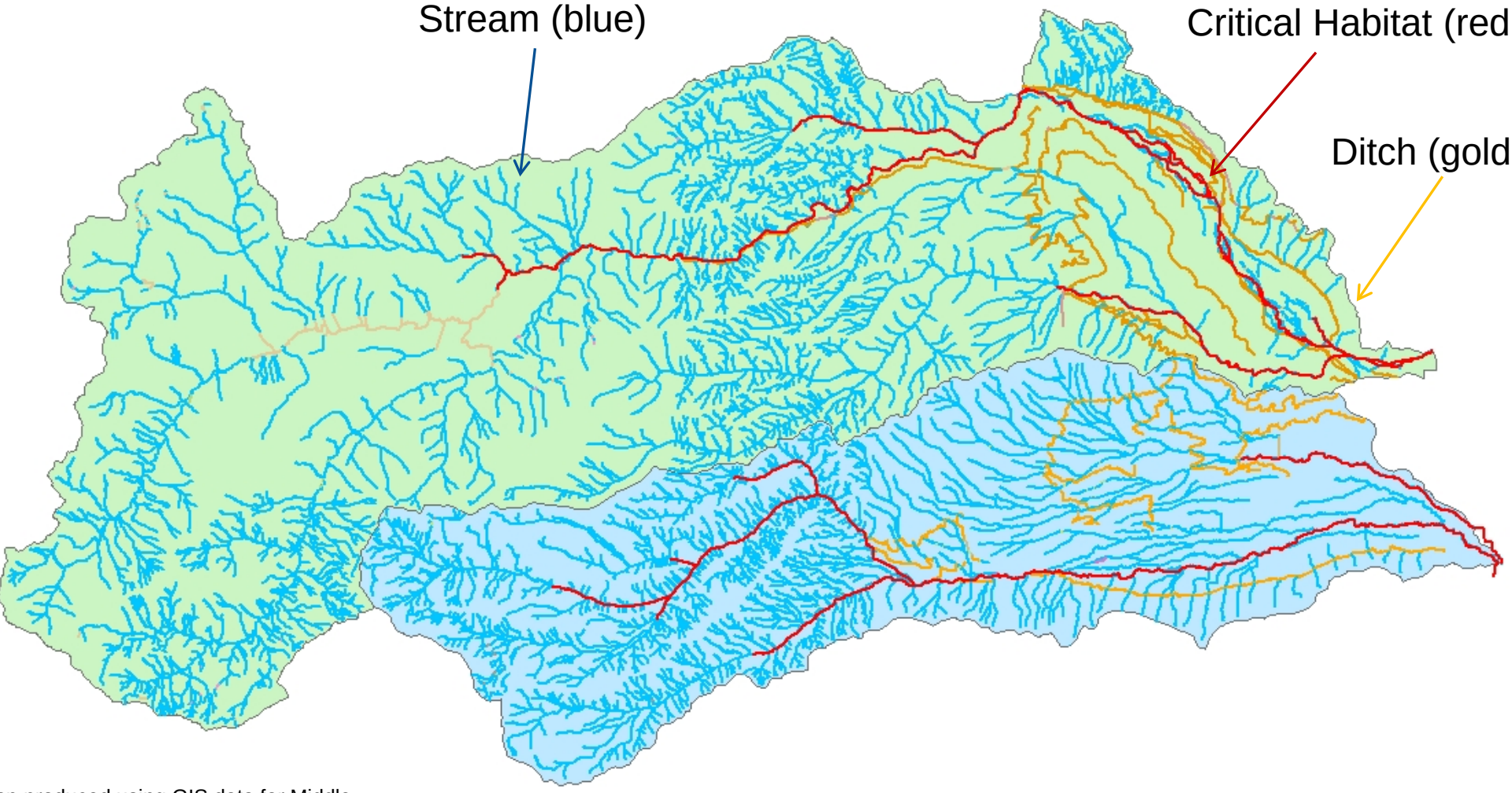


Map produced using data from USGS GIS database for Hydrological Units in Washington State and NMFS GIS data of critical habitat. Orthophoto from USDA Farm Service Agency, National Agriculture Imagery Program, 2009.

What's Changed (i)?

Then: "Salmon-supporting waters" was interpreted by NMFS to mean actual waters that actually were occupied by the listed species.

Now: Pesticide applications are restricted in the BiOps to include all waters in the watershed connected to critical habitat, such as agricultural ditches or man-made conveyances.



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olumbia Steelhead critical habitat from
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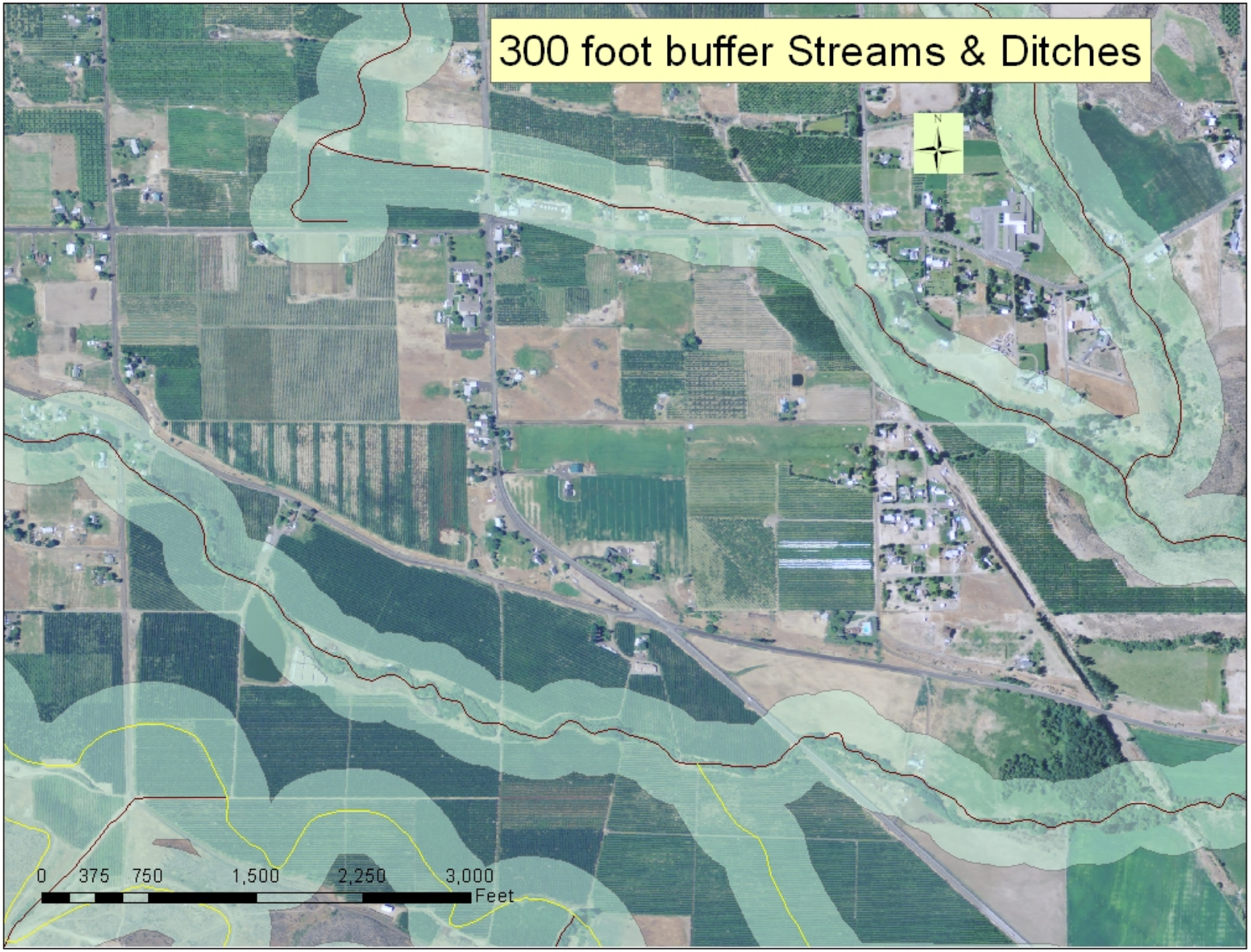
egion available at:
tp://www.nwr.noaa.gov/1salmon/salmesa/crith
/CHGISpage.html
nd GIS data from the Washington State
epartment of Natural Resources Washington
ate Watercourse Hydrography available at:
tp://www3.wadnr.gov/dnrapp6/dataweb/dmm

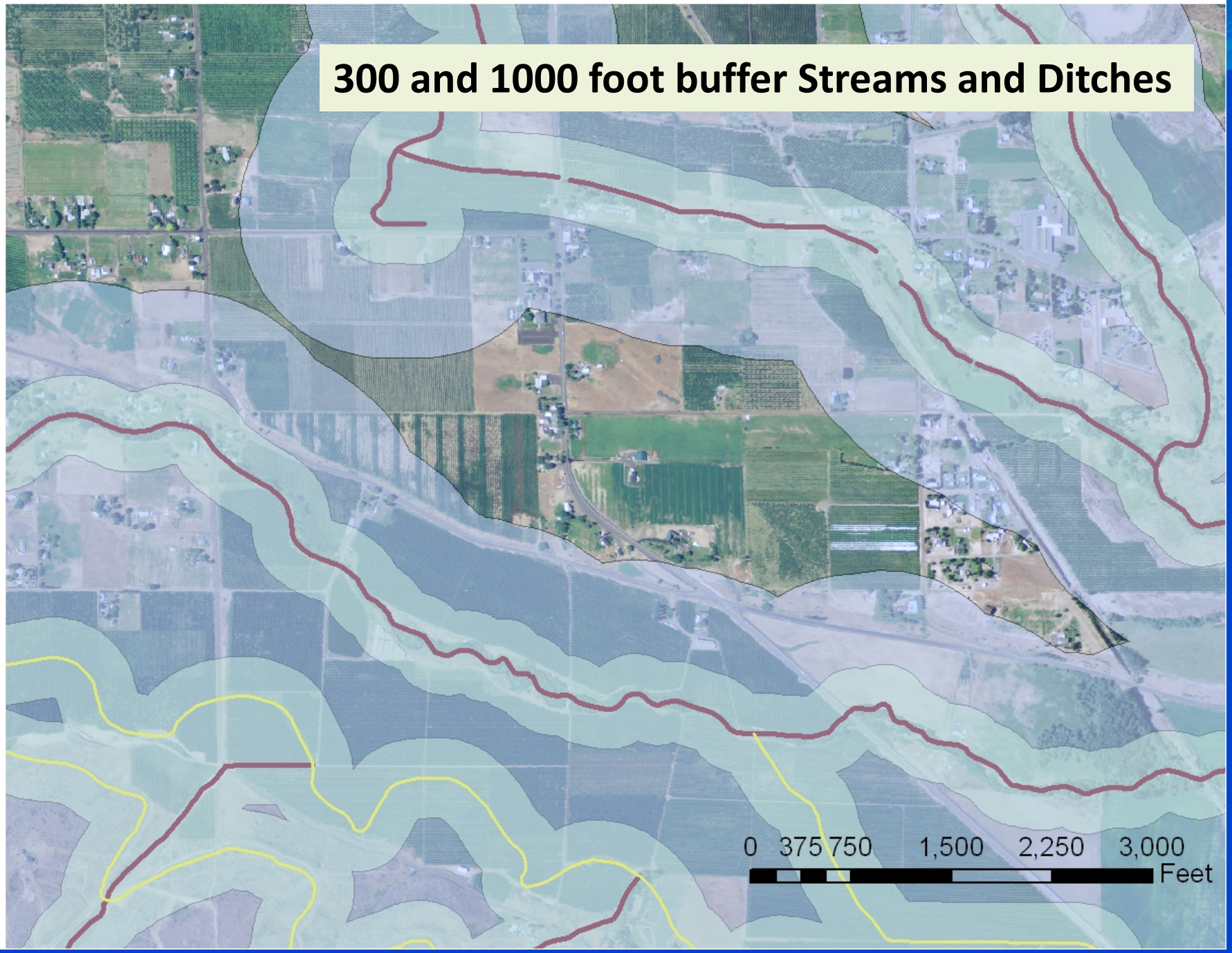
What's Changed (ii)?

Then: Buffers were 60 ft to 300 ft

Now: Buffers are adjustable depending on concentration, but range from 25ft to 1000ft


300 foot buffer Streams & Ditches
N
0
375
750
1,500
2,250
3,000
Feet

300 and 1000 foot buffer Streams and Ditches



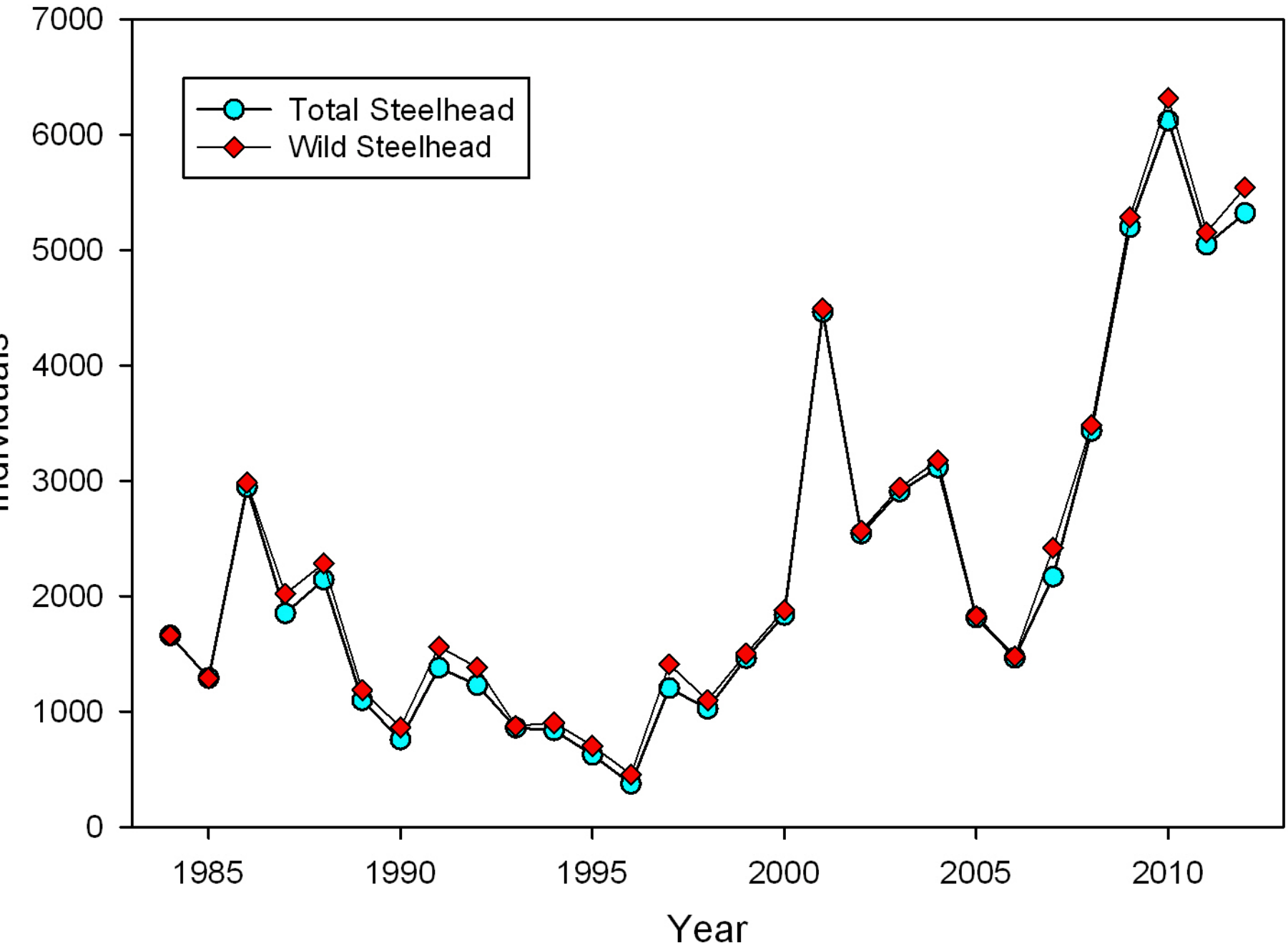
Do those changes matter?

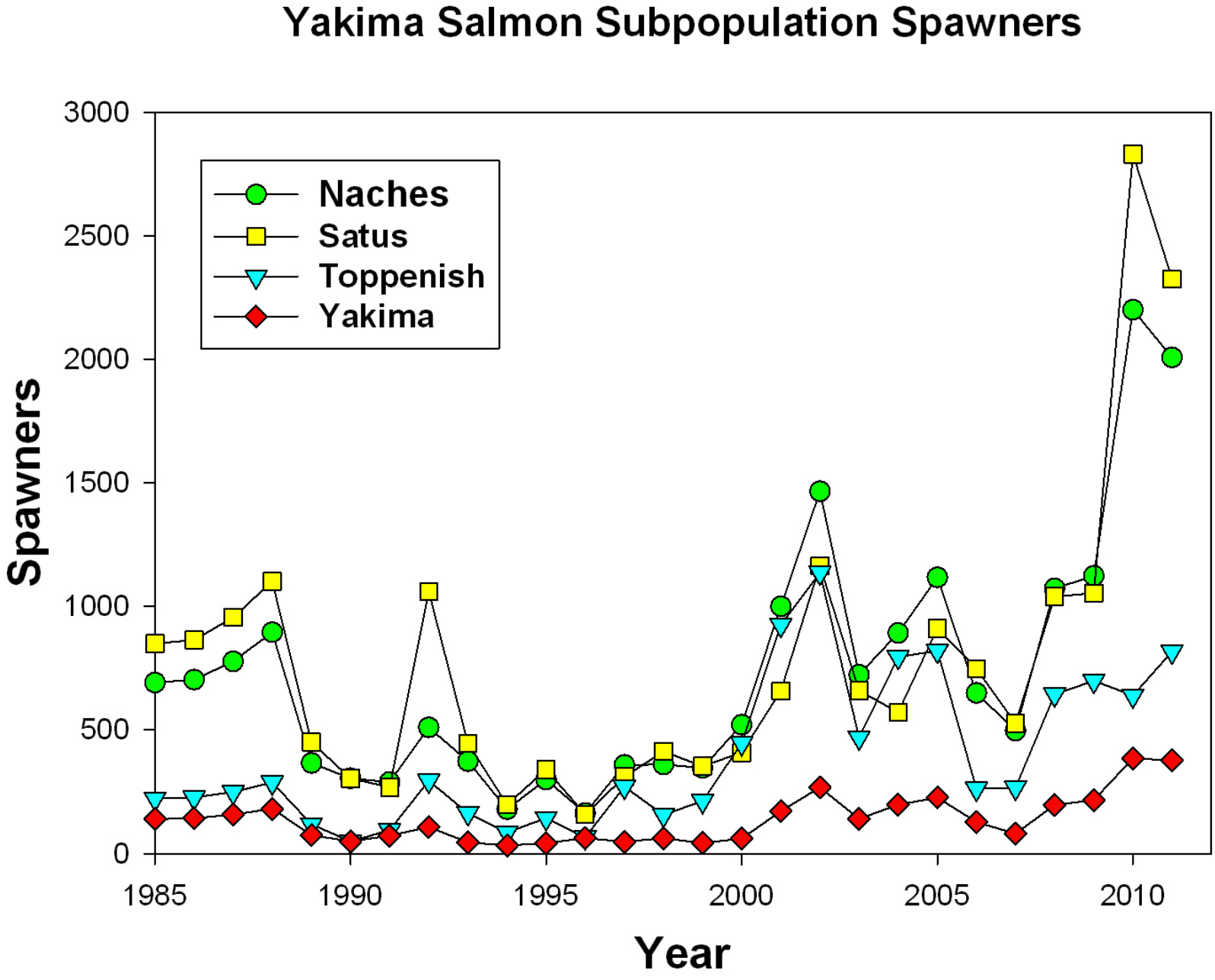
- Based on BiOps, assume:
  - a buffer of 25 feet for ground application (we do 60 feet)
  - a buffer of 1000 feet for aerial application
  - Around ALL WATERS
- Range:
  - High Cost (H)= all applications are aerial (1000 ft)
  - Low Cost (L) = all applications are ground (60 ft)
- $(\text{Per acre costs})_i = (\text{net revenue})_j \div (\text{acres})_j$ for
  - huc i = Yakima watersheds and
  - crop j = orchards, vegetables, grains
- $\text{Total Cost}_{\text{H or L}} = \Sigma_{ij} (\text{per acre costs})_{ij} \times \text{buffer}_{\text{H or L}}$

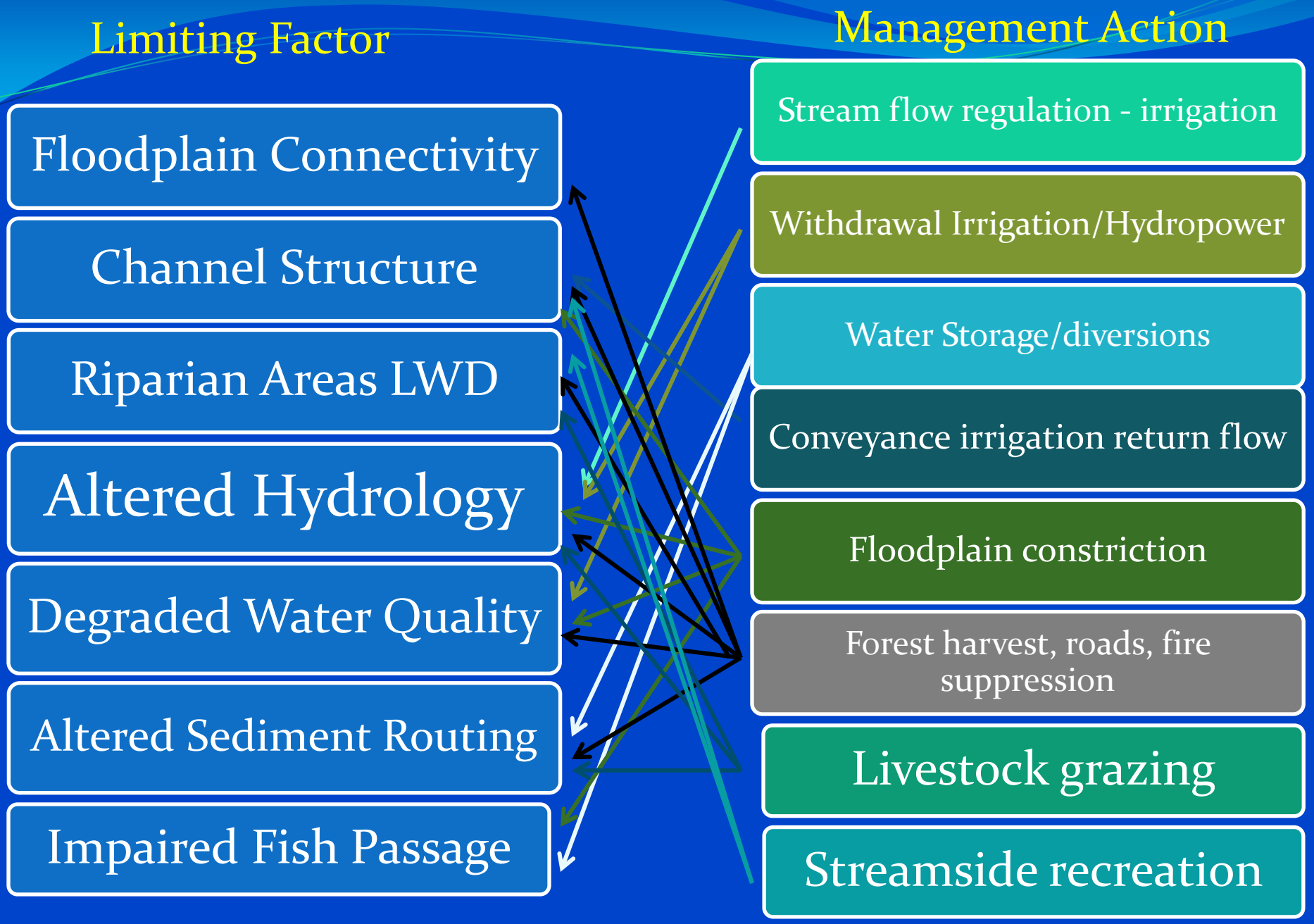
Comparison 2005 and 2013

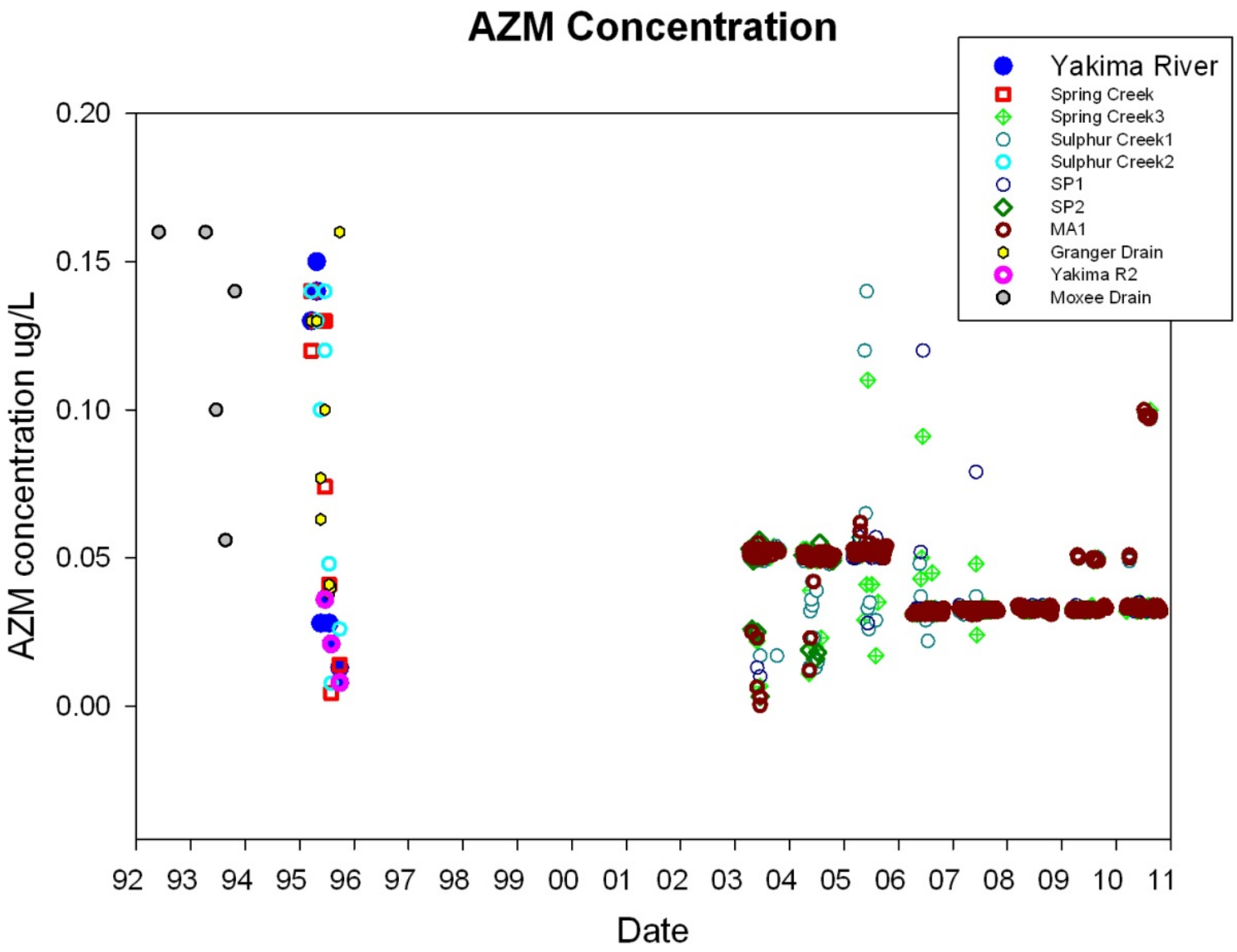
Watershed	2005 Acres	2005 Dollars	2013 Acres [1]	2005 Dollars [2]
203				
Low 60 ft buffer	165	$102,035	1,192	$848,230
High **300 ft/1000 ft (2013)**	817	$457,931	16,209	$11,132,549
301				
Low 60 ft buffer	187	$170,653	1035	$732,234
High **300 ft/1000 ft (2013)**	1,039	$755,506	14,072	$9,226,634

[1] 2013 Acres are acres of agricultural land uses within 60 ft (low) or 1000 ft (high) buffers of streams and ditches. Acres of crop types calculated using 2011 National Agricultural Statistics Service Cropland Data Layer for WA.
[2] 2005 Dollars estimated using average WA net operational dollar for orchards, row crops and field crops.


Total Steelhead
Wild Steelhead
7000
6000
5000
4000
3000
2000
1000
0
1985
1990
1995
2000
2005
2010
Year


Yakima Salmon Subpopulation Spawners
Naches
Satus
Toppenish
Yakima
Spawners
Year
0
500
1000
1500
2000
2500
3000
1985
1990
1995
2000
2005
2010


Limiting Factor
Management Action
Floodplain Connectivity
Channel Structure
Riparian Areas LWD
Altered Hydrology
Degraded Water Quality
Altered Sediment Routing
Impaired Fish Passage
Stream flow regulation - irrigation
Withdrawal Irrigation/Hydropower
Water Storage/diversions
Conveyance irrigation return flow
Floodplain constriction
Forest harvest, roads, fire suppression
Livestock grazing
Streamside recreation


AZM Concentration
Yakima River
Spring Creek
Spring Creek3
Sulphur Creek1
Sulphur Creek2
SP1
SP2
MA1
Granger Drain
Yakima R2
Moxee Drain
AZM concentration ug/L
0.20
0.15
0.10
0.05
0.00
92 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11
Date

Trends

- Since the 2005 BiOps, salmonid population is increasing and acres under production is decreasing even absent the application restrictions.
- What does this imply?
  - Salmonid populations are rebounding due to other habitat restoration efforts
  - General farming trend to fewer operations due to increased competition and higher management costs
- If so, does a pesticide ban policy really make sense for this CH?

Other management options to limit adverse modification due to pesticide use

- Restrict pesticide applications (lower aggregate risk to species --- not simply each pesticide separately)
- Change spatial distribution of crops
- Habitat restoration (planting vegetative buffers / shade trees / minimizing sediment deposition)
- Conservation reserve (permanent easements --- essentially assumed in earlier methodology)

Last question --- does this seem to matter much?

- February 21, 2013 the 4th Circuit found that….
- NMFS did not meet the "economically feasible" requirement as detailed by the ESA.
- "Under the Fisheries Service's reading, the economic feasibility requirement becomes simply a limitation that the reasonable and prudent alternative be economically possible, without any need for discussion," according to the opinion. "We cannot agree with this position, as it effectively reads out the explicit requirement . . . that the agency evaluate its reasonable and prudent alternative recommendation for, among other things, economic and technological feasibility."

Emphasis Added

"…We cannot agree with this position, as it effectively reads out the explicit requirement of Regulation 402.02 that the agency evaluate its reasonable and prudent alternative recommendation for, among other things, economic and technological feasibility. Moreover, economic feasibility becomes especially relevant when recommending uniform buffers because, as the Pesticide Manufacturers point out, pesticide applications would be prohibited within 500 feet (for ground applications) and 1,000 feet (for aerial applications) of *any* waterway that is connected, *directly or indirectly*, at *any* time of the year, to *any* water body in which salmonids *might be* found at *some point*. Such a broad prohibition readily calls for some analysis of its economic and technical feasibility…"