

A scenic landscape of a river winding through a green valley with hills in the background. The river flows from the upper center towards the lower right, curving through the valley. The hills are covered in green grass and some trees, with a few rocky patches. The sky is bright with some light clouds.

Comments on Proposal for a Site-Specific Selenium Criterion in Southeast Idaho

**Smoky Canyon Mine
Caribou County, Idaho
July 2017**

Critical Comments to Discuss for the Simplot SSSC Proposal

- Whole body SSD
- Use of SMCVs vs GMCVs
 - Species used to derive criterion
- Inclusion of spring and fall data for BAFs
- Revised water column criterion for Hoopes Spring, Sage Creek, and South Fork Sage Creek
- Revised water column criterion for Crow Creek

Comment on Whole Body Criterion Element

- It is more appropriate to create a new SSD of whole body SMCVs to derive a whole body criterion

Site Specific Whole Body Criterion Element is Appropriate

- Egg-ovary element has primacy over all elements
 - “Adopting the fish whole-body or muscle tissue element into water quality standards ensures the protection of aquatic life when measurements from fish eggs or ovary are not available,…”
- For this Site, egg data from a reproductive study using a sensitive species are available.

Site Specific Whole Body Criterion Element is Appropriate

- Brown trout is the most sensitive species for this Site
- Relationship to effects
 - “The concentration of selenium in eggs and ovaries is the most sensitive and consistent indicator of toxicity.”
- Sensitive endpoint – EC10
 - “Using the most sensitive assessment endpoint (based on the state of the science) reduces uncertainty in the ability of the criterion to protect aquatic life.”
- Future monitoring – Target Species is brown trout
 - “Selection of the fish species in the aquatic system with the greatest selenium sensitivity and bioaccumulation potential is recommended.”

Species Present 2006 to 2015

SPECIES	Crow Creek (Upstream)			Crow Creek (Downstream)		Deer Creek	Hoopes Spring	Sage Creek	
	CC-75	CC-150	CC-350	CC-1A	CC-3A	DC-600	HS-3	LSV-2C	LSV-4
Salmonidae									
Brown trout (<i>Salmo trutta</i>)	√	√	√	√	√		√	√	√
Cutthroat trout (<i>Oncorhynchus clarki bouvieri</i>)	√	√	√	√	√	√	√	√	√
Brook trout (<i>Salvelinus fontinalis</i>)				√	√			√	
Cuttbow trout (<i>O. mykiss x O. clarki bouvieri</i>)				√					
Mountain whitefish (<i>Prosopium williamsoni</i>)			√	√	√				√
Cottidae									
Paiute sculpin (<i>Cottus beldingi</i>)	√	√	√	√	√	√	√	√	√
Mottled sculpin (<i>Cottus bairdi</i>)	√	√		√	√	√			
Cyprinidae									
Longnose dace (<i>Rhinichthys cataractae</i>)		√	√	√	√				
Speckled dace (<i>Rhinichthys osculus</i>)		√	√	√	√				
Leatherside chub (<i>Snyderichthys copei</i>)			√						
Redside shiner (<i>Richardsonius balteatus</i>)		√	√	√	√				
Catostomidae									
Utah sucker (<i>Catostomus ardens</i>)		√	√	√	√				√
Mountain sucker (<i>Catostomus platyrhynchus</i>)			√						
Species Total:	4	8	10	11	10	3	3	4	5

Comment on SSSC Derivation

- First, the EPA has concerns over the use of species mean chronic values (SMCVs) in this SSD as opposed to using genus mean chronic values (GMCVs). When creating an SSD, EPA recommends using GMCVs rather than SMCVs as species within a genus tend to be more similar toxicologically than species in different genera. Using GMCVs rather than SMCVs prevents data sets from being biased by an overabundance of species in one or a few genera.

Use of SMCVs

- Of the 8 maternal transfer studies used to derive the 2016 national criterion, only two are actually GMCVs
 - Oncorhynchus
 - Lepomis

Use of SMCVs

- Recalculation procedure is a species deletion process.
 - The deletion process itself is conducted on a species level rather than a genus level, making it more acceptable to utilize the SMAVs for the FAV calculation (Great Lakes Environmental Center 2005).

Use of SMCVs

- Precedence
 - Arid West Water Quality Standards Revisions
 - State of California Guidance for Development of Site-specific Water Quality Objectives
 - 2016 National Criterion

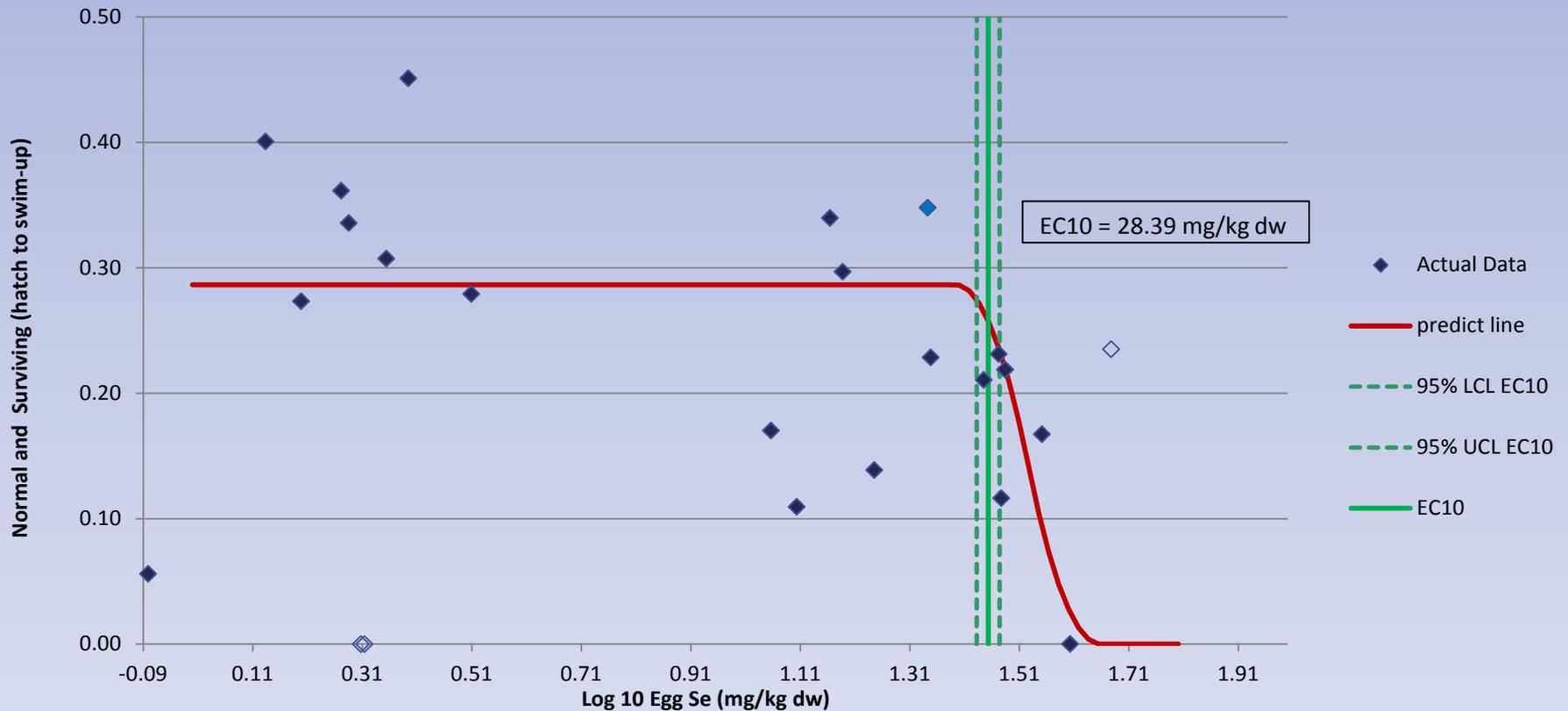
Comment on SSSC Derivation

- Concerns about some of the species that were included in the SSD. These include the Yellowstone cutthroat trout and white sucker. Lastly the EPA is concerned about the inclusion of the sculpin data, which is >22 mg/kg dw for a NOEL.

Derivation of YCT EC10

- EPA looked at survival and deformities independently
- Suggests no effects up to 30 mg/kg dw eggs
- Simplot derived a conservative EC10, using combined endpoint for surviving and normal fry
- EC10 well within the range of cutthroat trout estimates

Relationship of YCT Egg Selenium Concentrations to Proportion of Normal and Surviving Fry



Summary of egg selenium thresholds in wild fish from coldwater systems

Species	Source Study	Adult Exposure	Endpoint	Tissue	Endpoint Statistic	Selenium	Statistic Derivation Source
						(µg/g dry weight)	
Brown Trout	Formation Environmental (2012)	Field	Alevin survival	Egg	EC10	20.5	a
Brown Trout	USEPA interpretation of Formation Environmental (2012)	Field	Alevin survival	Egg	EC10	21	b
Brook Trout	Holm et al. 2005	Field	Larval deformities	Egg	NOEL	>48.7	b,c
Brook Trout	Holm et al. 2005	Field	Larval survival	Egg	EC10	32	a
Rainbow Trout	Holm 2002; Holm et al. 2003; Holm et al. 2005d	Field	Larval deformities	Egg	EC10	24.5	b
Yellowstone Cutthroat Trout	Hardy 2005; Hardy 2010	Lab	Larval deformities/ survival	Egg	NOEL	>16.04	b,c
	Formation Environmental (2012)	Field	Alevin survival and normal	Egg	EC10	28.5	a
Westslope Cutthroat Trout	Kennedy et al. 2000	Field	Larval deformities/ survival	Egg	NOEL	>21	c
	Rudolph et al. 2008	Field	Alevin survival	Egg	EC10	24.7	b
	Nautilus 2011; Elphick et al. 2009	Field	Alevin survival	Egg	EC10	27.7	b
Dolly Varden Char	Golder 2009e; McDonald et al. 2010	Field	Larval deformities	Egg	EC10	56.2	b
Northern Pike	Muscatello et al. 2006	Field	Larval deformities	Egg	EC24	34	b
White Sucker	de Rosemond et al. 2005	Field	Larval deformities	Egg	NOEL	40.3	b

Original table Source: Selenium Tissue thresholds - Tissue Selection Criteria, Threshold Development Endpoints, and Potential to Predict Population or Community Effects in the Field (NAMC 2009)

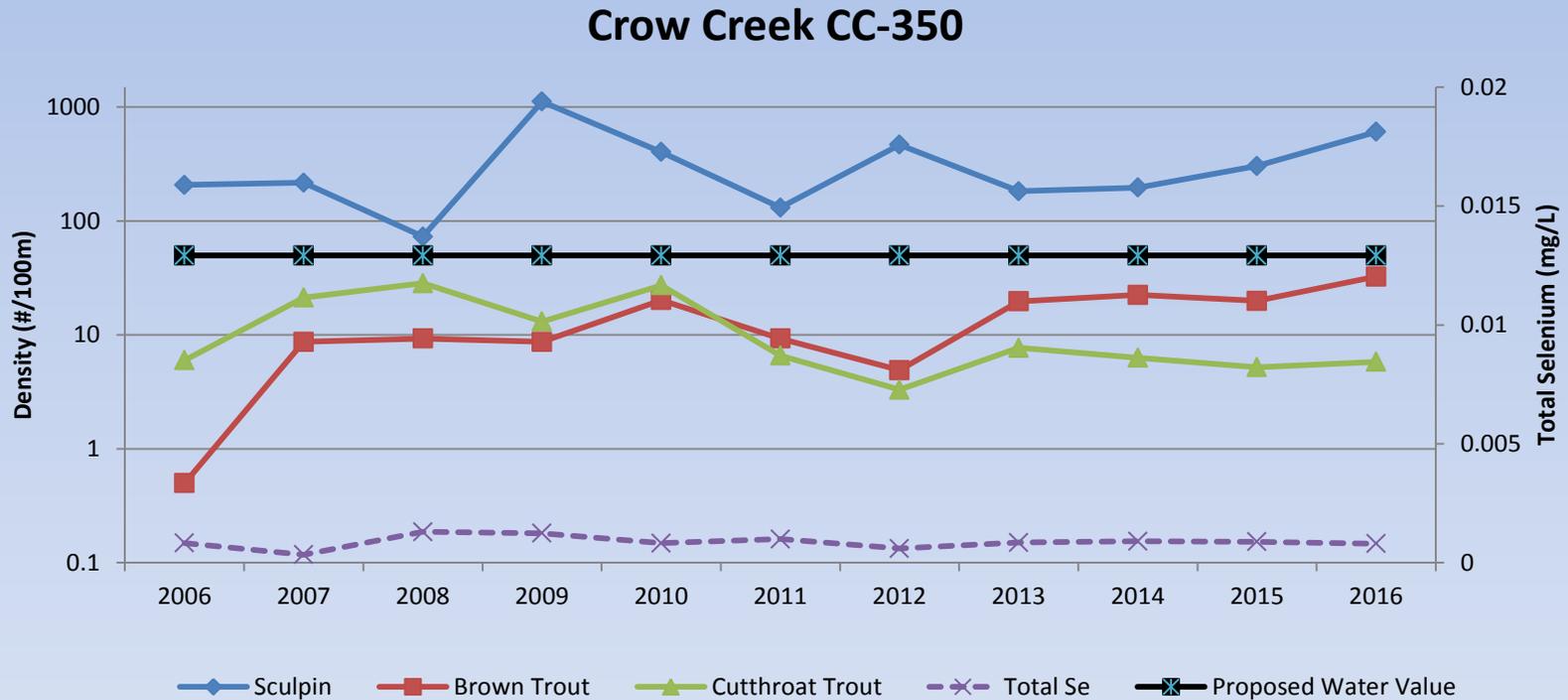
White Sucker Study Data

- EPA did not estimate an effect concentration for this study because a reference condition with low selenium exposure was not sampled.
- Four fish, 200 eggs from each fish
 - Egg selenium concentrations ranged from 8.4 to 48.3 mg/kg dw.
 - Effect information (EC10) not needed, data are available to define a NOEC.
- NOEC is 40.3 mg/kg dw, higher than the four most sensitive species.

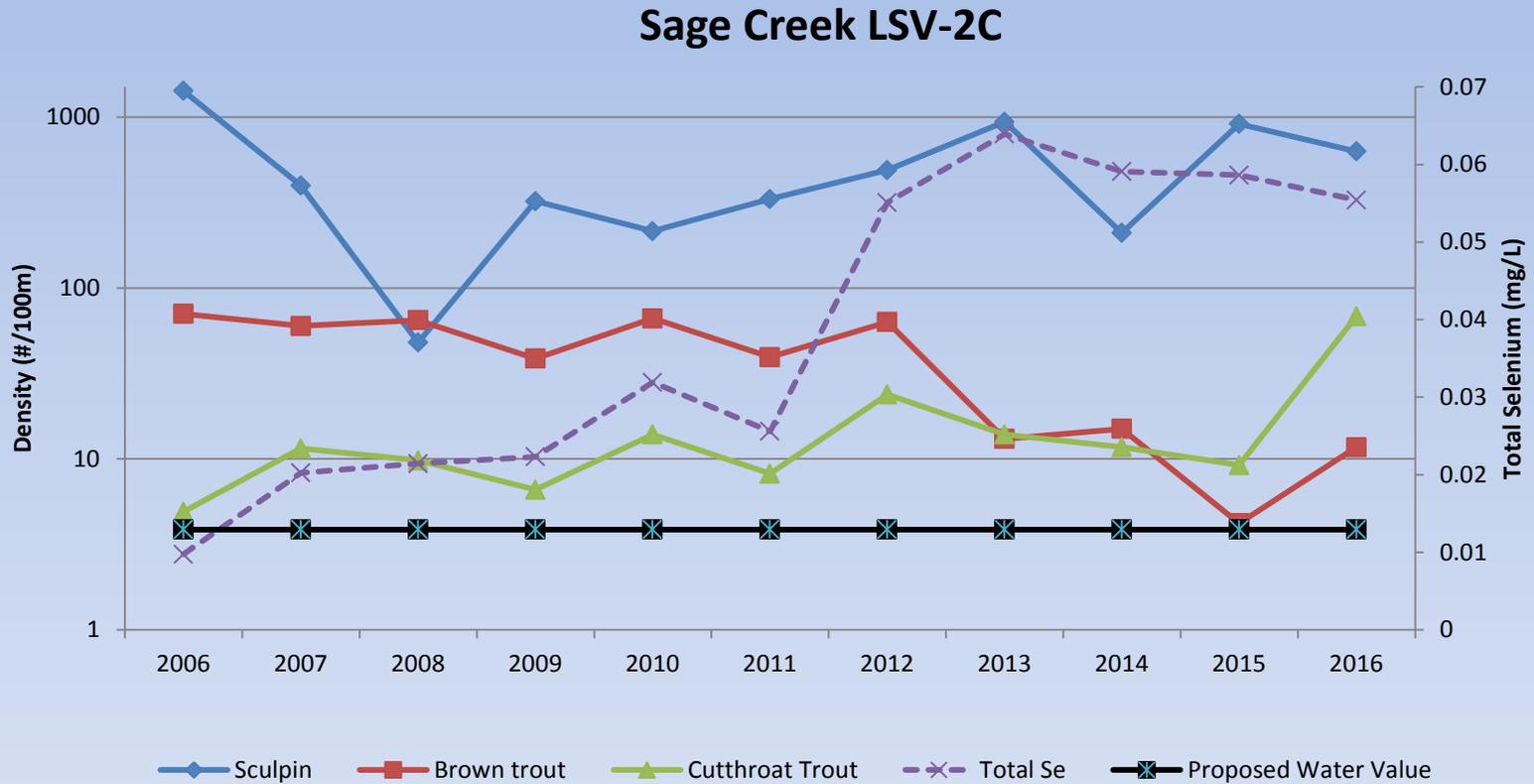
Sculpin Study Data

- Lo et al. (2010) provided a NOEC of >22 mg/kg dw eggs
- Long term population density is high despite elevated selenium concentrations.
- Multiple age classes are consistently present even at whole body concentrations in excess of the whole body EC10 for YCT (14.5 mg/kg dw).
- Important recruitment age classes (years 1-3) are present at sites with the highest selenium concentrations in water and dietary media.
- Young fish are surviving the critical life stages where selenium toxicity is typically lethal, and adult fish are remaining abundant and reproducing.

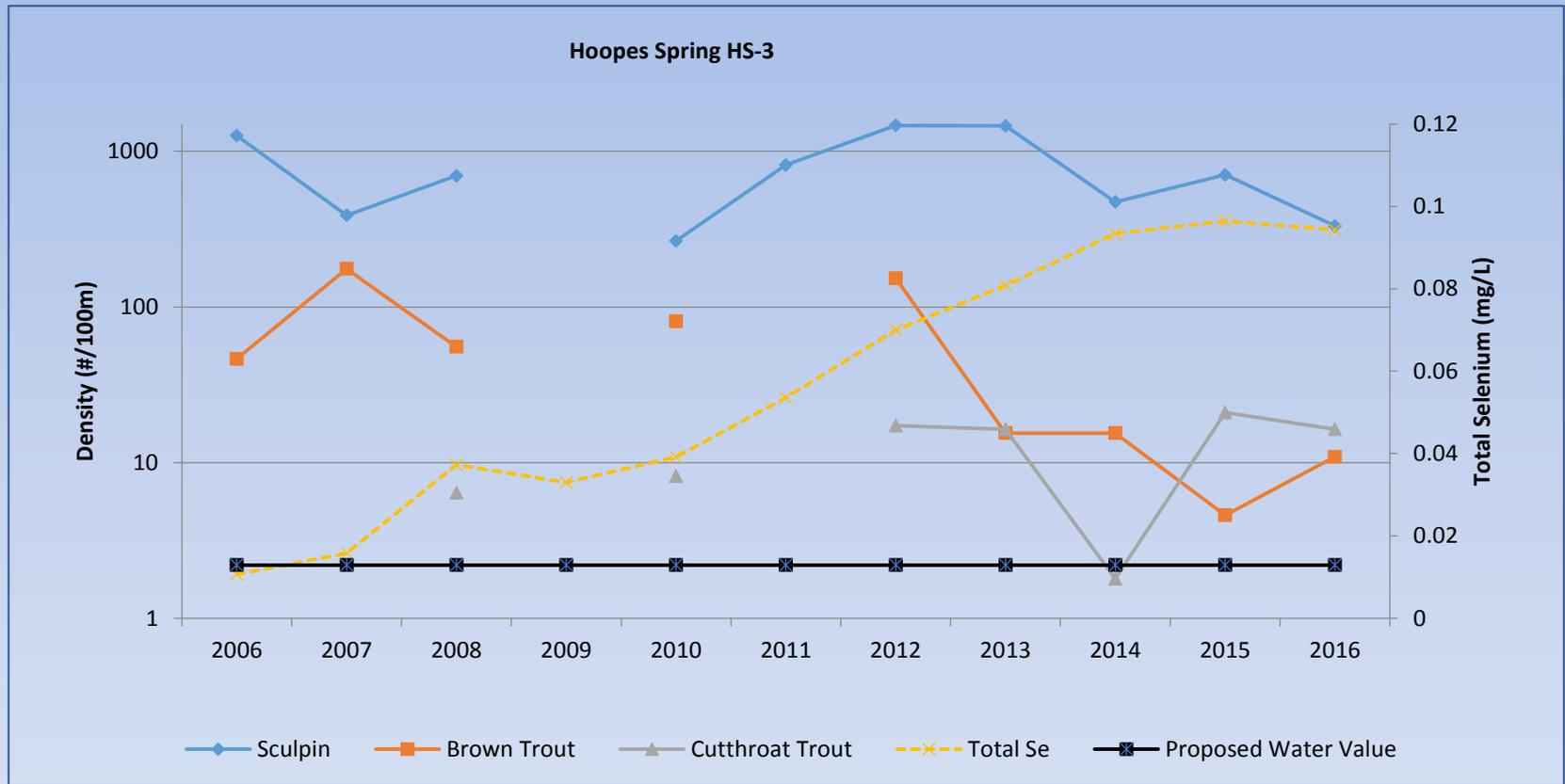
Fish Population Density vs Total Selenium in Water through Time



Fish Population Density vs Total Selenium in Water through Time

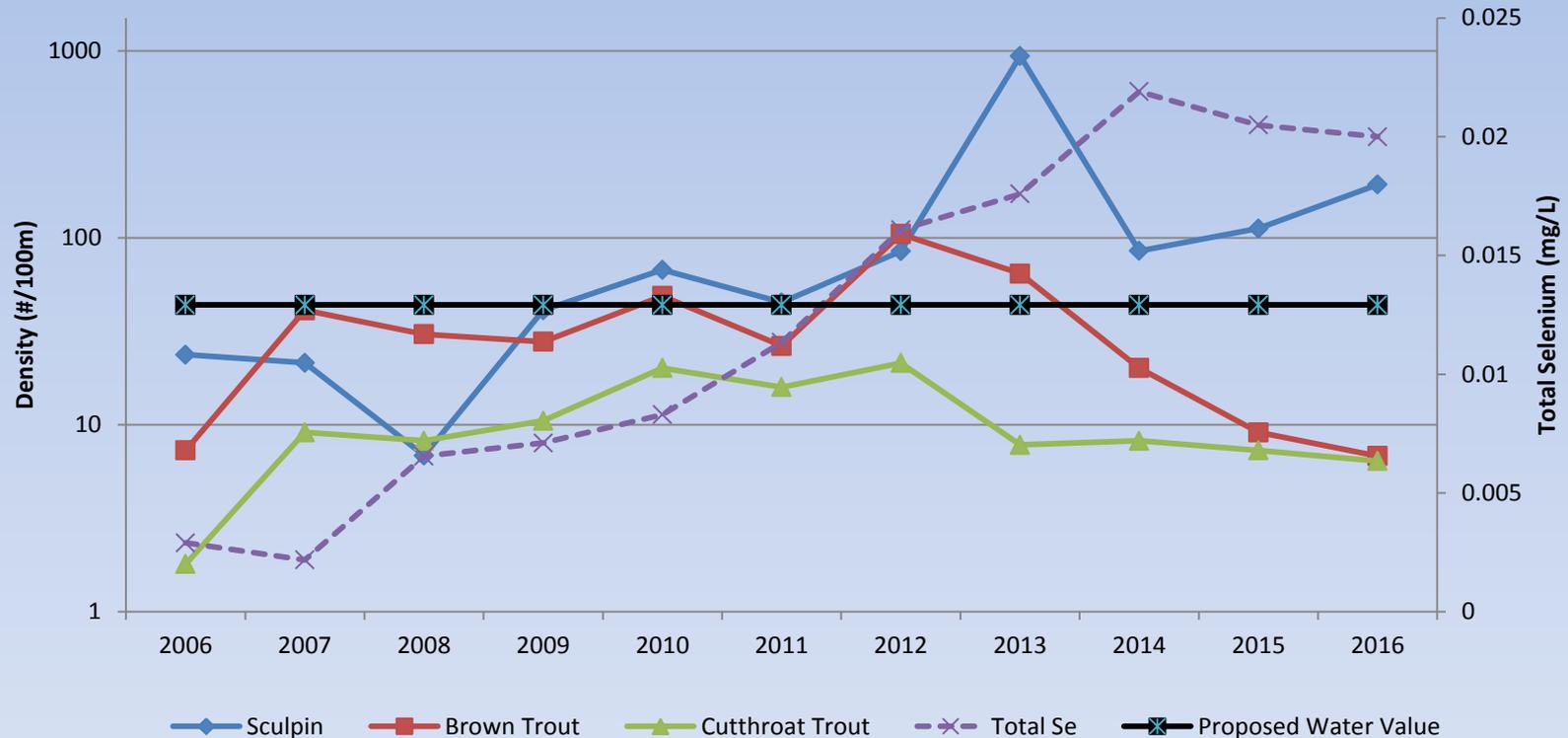


Fish Population Density vs Total Selenium in Water through Time



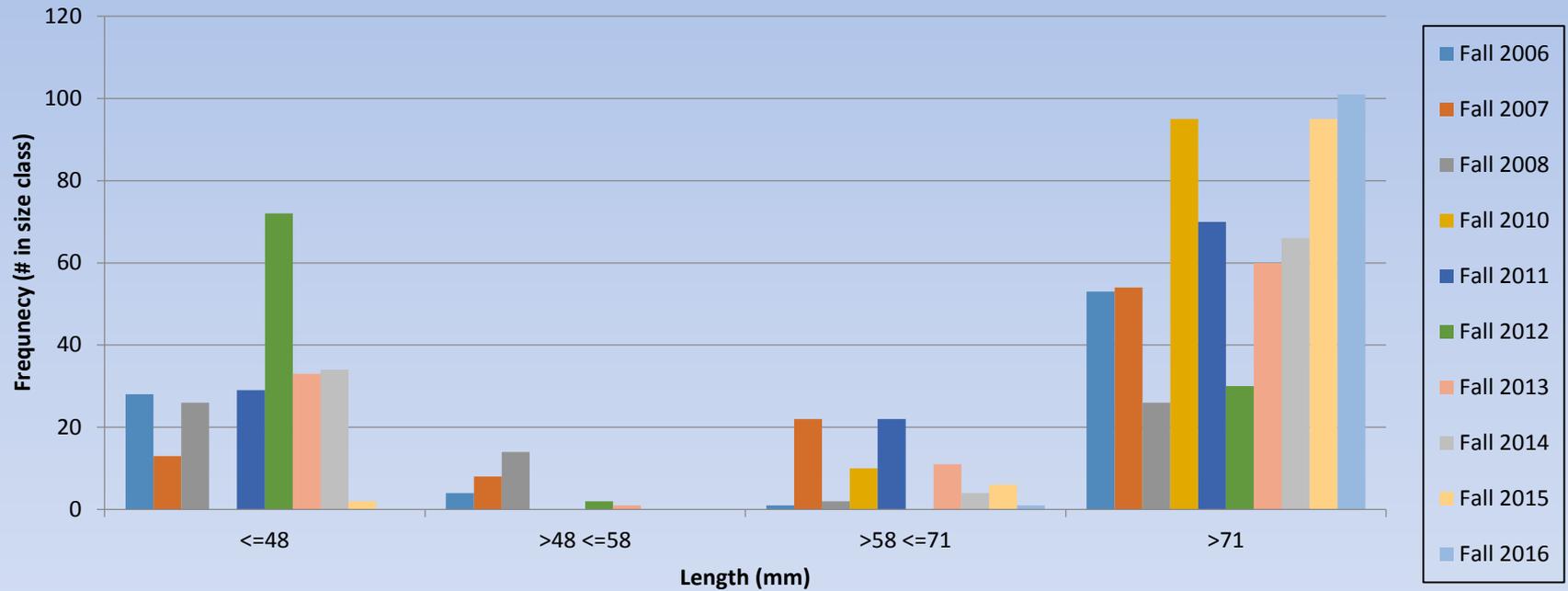
Fish Population Density vs Total Selenium in Water through Time

Crow Creek CC-1A



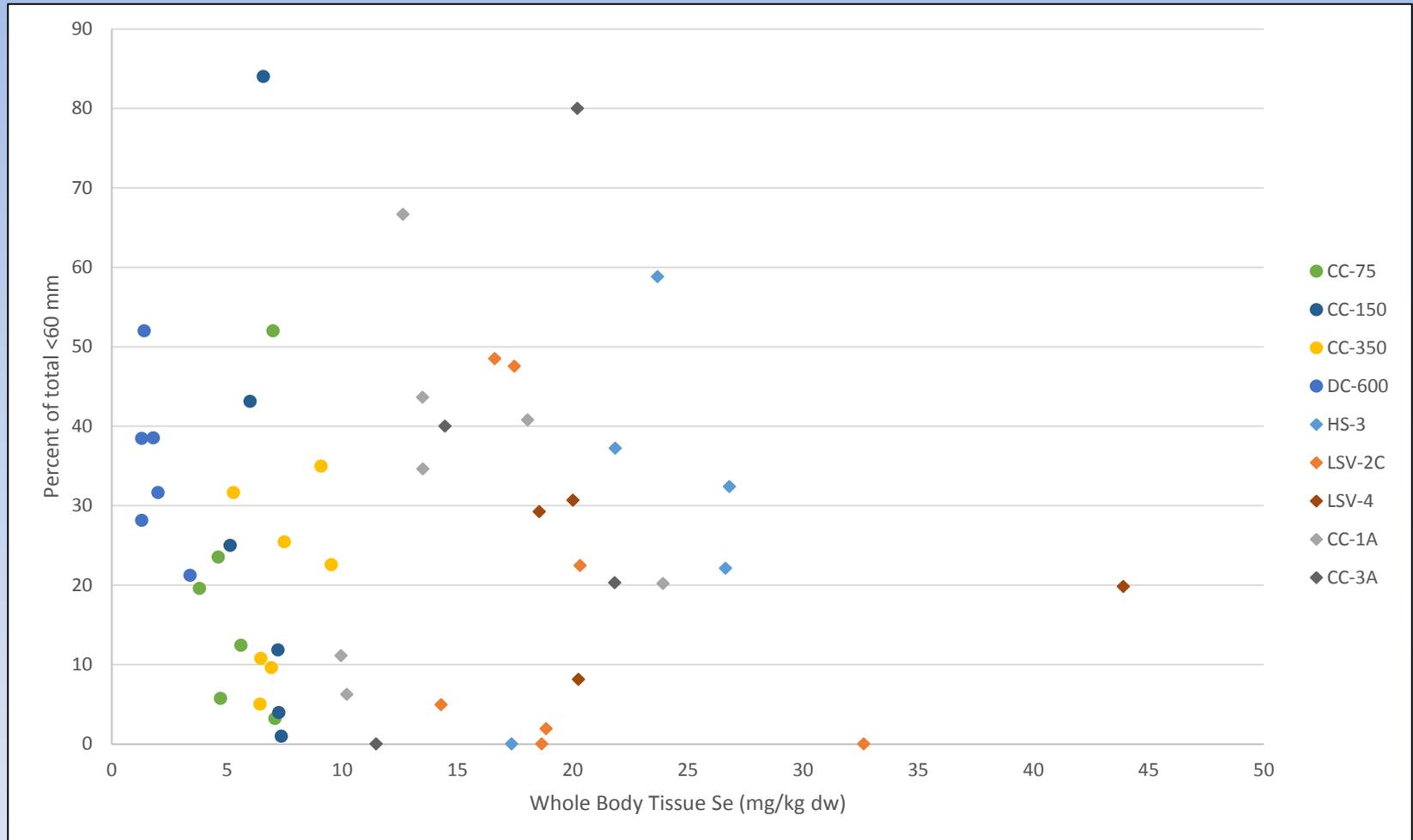
Sculpin Frequency by Age Size Class

HS-3



<=48 - Age 1 or less; >48<=58 - Age 2 or less; >58<=71 - Age 3 or less; >71 - Age 4 or more

Sculpin Percent <60 mm relative to whole body concentrations



Use of Spring and Fall Data for BAF Derivation

- BAFs used to derive water column criterion concentrations were based on summer/fall data.
- Represent likely time periods when future monitoring will be conducted.
- Represents the time frames when bioaccumulation will be highest for this system.
- Limited spring data were collected, but can be included to represent the full cycle of exposures that occur for brown trout.
- BAFs will be examined based on spring and fall exposure.

Revise Proposed Water Column Criterion

- Original proposal includes a single egg threshold criterion, a whole body criterion and water body criterion
- Revision to the water column element of the criterion
 - A new water column element will be proposed for Hoopes Spring, Sage Creek, and South Fork Sage Creek based on the BAF approach that best represents these streams
 - A new water column element will be proposed for Crow Creek downstream of Sage Creek based on the BAF approach that best represents these streams
- Will provide adequate downstream protections, yet still be based on site-specific data and effects thresholds.



Thanks for Listening

Questions/Comments?