Negotiated Site Specific Rule Development

Selenium

58-0102-2601

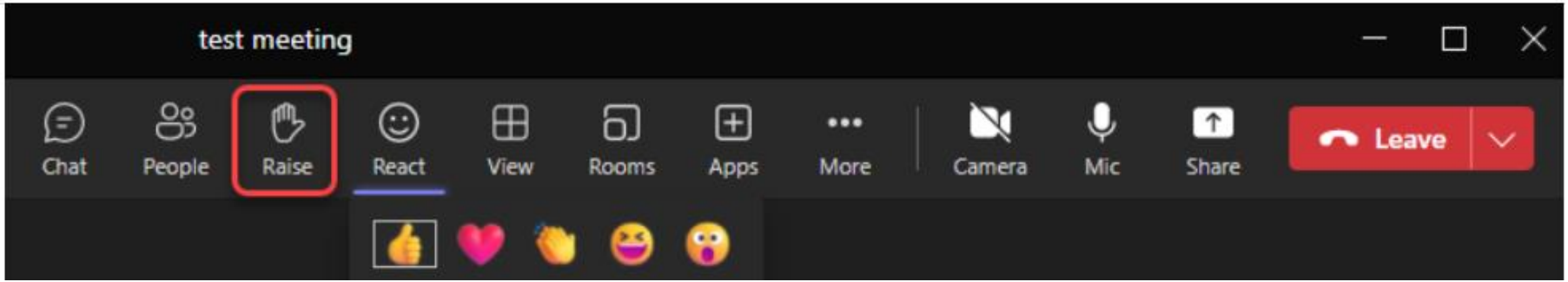
STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

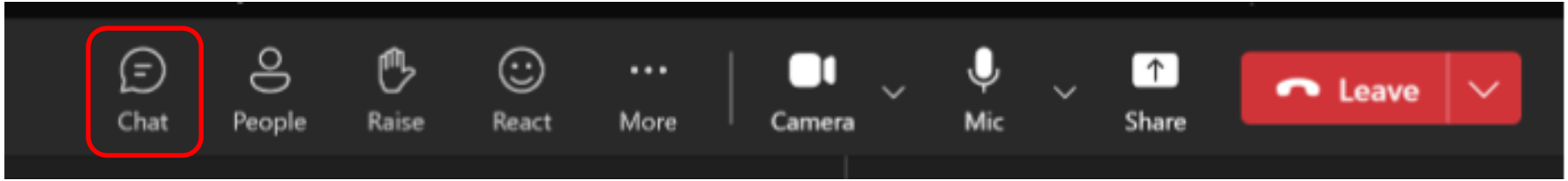
Beth Spelsberg
Senior Water Quality Standards Scientist

Agenda Slide

- Housekeeping/Introductions
- Overview of process
- Background
- Summary of the proposed rule language “clean up”
- Presentation of the proposals
  - Nu-West
  - Simplot
- Summary of proposed rule language – site specific criteria selenium
- Questions

Housekeeping





Introductions

Overview

- Negotiated Rule making for docket 58-0102-2601
  - Rule language clean up
  - Site Specific Criteria development for selenium

Timeline

58-0102-2601: Water Quality Standards - Selenium	
8-Apr	First Negotiated Rule Meeting
15-Apr	End public comment period (one week comment period)
5-May	Negotiated Rule Draft 2 due
12-May	Second Negotiated Rule Meeting
19-May	End public comment period (one week comment period)
	PROPOSED RULE
17-Jul	Submit documents to DFM
2-Sep	Proposed Rule Published in September Bulletin *Last Bulletin for 2027 effective date!
2-Oct	30-day comment period
	PENDING RULE
12-Nov	Board Meeting: Present rule docket for approval
6-Jan	Pending Rule posted in January Bulletin
	LEGISLATIVE APPROVAL
Jan/Feb 2027	Present rule to House and Senate committees for approval

IDAPA 58.01.02 Clean Up

Waters of the United States

Water Quality Standards

113. Waters and Waters Of The State. All the accumulations of water, surface and underground, natural and artificial, public and private, or parts thereof which are wholly or partially within, which flow through or border upon the state. (3-31-22)

010. DEFINITIONS.

~~For the purpose of the rules contained in IDAPA 58.01.02, "Water Quality Standards," the following definitions apply:~~The term "waters" or "water body" is defined in Section 39-3602, Idaho Code, and the term "surface waters" shall be interpreted as the same.

Statue 39-3602

(34) "Waters or water body" means the navigable waters of the United States as defined in the federal clean water act. For the purposes of this chapter, water bodies shall not include municipal or industrial wastewater treatment or storage structures or private reservoirs, the operation of which has no effect on waters.

Remove "of the state"

01. Criteria for Toxic Substances. The criteria of Section 210 apply to surface waters ~~of the state~~ as ed in Tables 1 and 2. Criteria for metals (arsenic through zinc) listed in Tables 1 and 2 are expressed as a

Updating Stream Names

- USGS update streams named sq__w throughout the state in 2022 and DEQ changing those in the rule to match.

SW-7	~~Squaw Creek~~Newe Waippe Naokwaide - source to mouth

SW-26	~~Squaw Creek~~Kwahate Naokwaide - source to mouth

Remove “comparative purposes only” values

Table 1. Criteria for Protection of Aquatic Life					
Compound	a CAS Number	b CMC (µg/L)		b CCC (µg/L)	
Inorganic Compounds/Metals					
Arsenic	7440382	340	c	150	c
Cadmium	7440439	~~1.3~~	f	~~0.6~~	f
Chromium III	16065831	~~570~~	f	~~74~~	f
Chromium VI	18540299	16	c	11	c
Copper	7440508	~~12.3~~	k		
Lead	7439921	~~65~~	f		

f. Aquatic life criteria for these metals are a function of total hardness (mg/L as calcium carbonate), the pollutant's water effect ratio (WER) as defined in Subsection 210.03.c.iii. and multiplied by an appropriate dissolved conversion factor as defined in Subsection 210.02. ~~For comparative purposes only, the example values displayed in this table are shown as dissolved metal and correspond to a total hardness of one hundred (100) mg/L and a water effect ratio of one (1.0).~~

Site Specific Criteria for Selenium

Background

Consistent with the Clean Water Act, states must develop criteria that protect designated beneficial uses and are based on sound science (CWA § 303(c)(2)(A), 40 CFR 131.11(a)).

States have the discretion to adopt the EPA's criteria recommendations, the EPA's recommendations modified to reflect site-specific conditions, or criteria based on other scientifically defensible methods.

Site Specific Criteria is best used when you have additional scientific information that more accurately expresses a level/concentration for a water quality parameter to protect a designated use.

LOCAL CONDITIONS

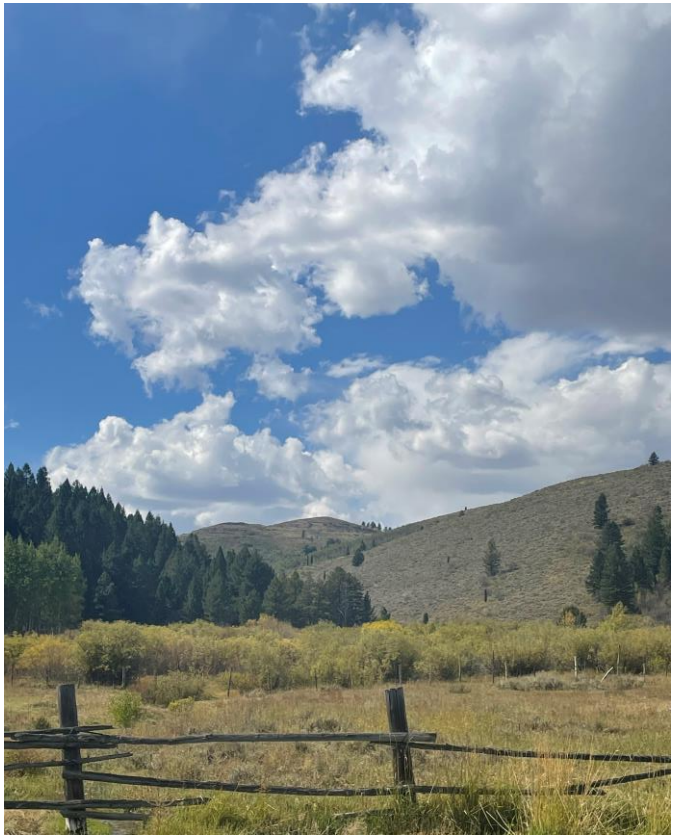


Idaho Water Quality Standards

Procedures for developing SSC

- Follow EPA's Guidelines
- Follow EPA's Water Quality Standards Handbook
- Other scientifically defensible procedures
- Deviations from EPA procedures shall have scientific rationale.
- Procedures reflecting the the nature of the pollutant, the beneficial uses, and the most sensitive resident species.

Recalculation Procedure



The Recalculation Procedure involves editing the composition of a Species Sensitivity Distribution of tested species used to derive a site-specific aquatic life criterion to allow it to better reflect the taxonomy of species that reside at the site.

Background -Previous Selenium Rulemaking



Notice of Negotiated Rulemaking for Docket 58-0102-1802 published



Final through Legislature in April 2019



EPA approval in July 2019, disapproval of North Fork Sage and Pole Canyon Creeks – requested additional data.

Simplot

Simplot Company Proposals for Site-Specific Selenium Criteria



Overview

- Background
- Existing Selenium Criteria
- Rationale for Site-Specific Selenium Criteria (SSSC)
- Effects Thresholds
- North Fork Sage Creek
  - Data Collection and SSSC Approach - Empirical BAFs vs Trophic Model
  - Results and Analysis
  - Proposed SSSC
- Crow Creek
  - Data Collection and SSSC Approach - Empirical BAFs
  - Results and Analysis
  - Proposed SSSC
- Summary

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Background

SSSC Background

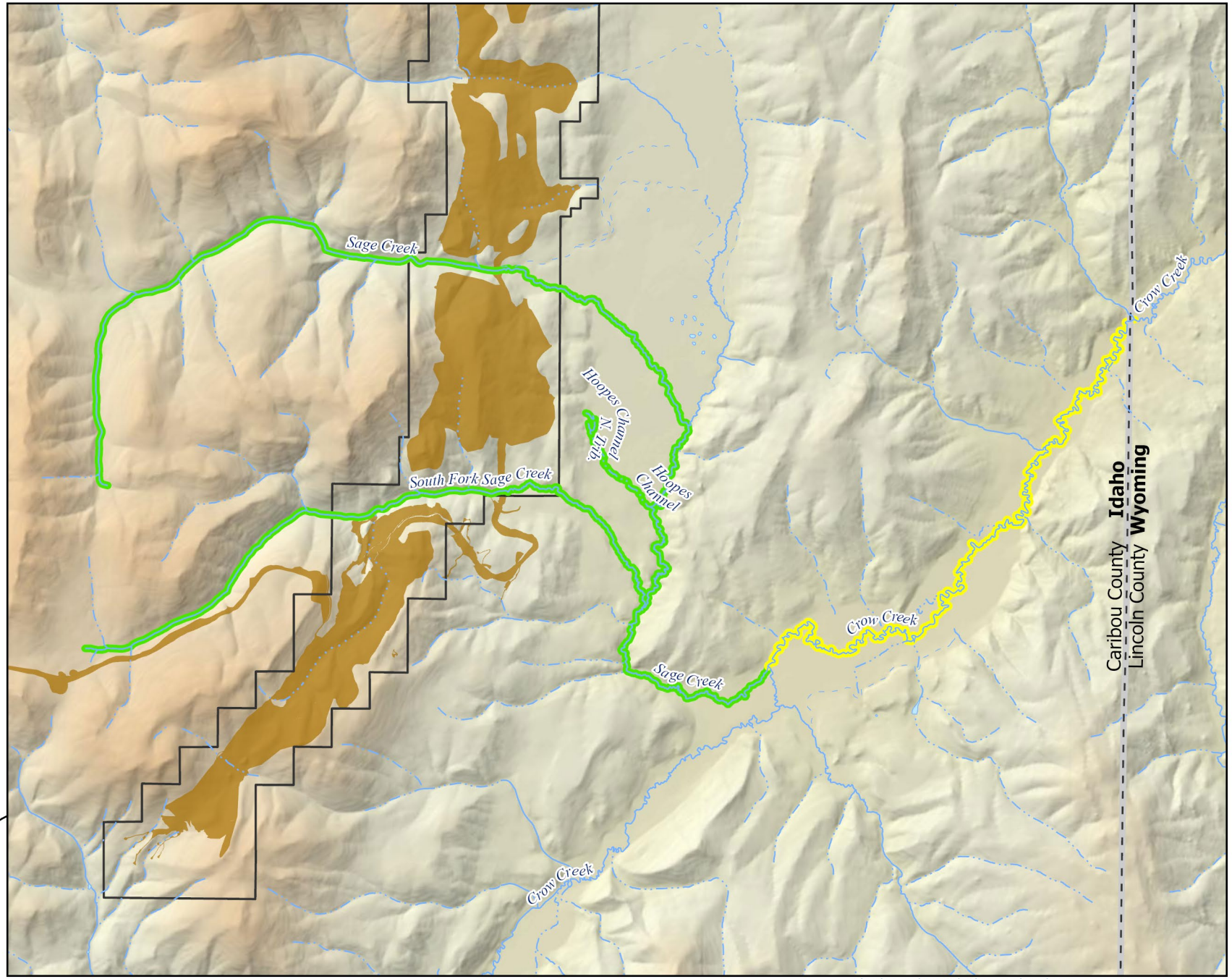
- Site-specific selenium studies on Crow and Sage Creeks (including Hoopes Spring and South Fork Sage), spring and fall - 2006 to 2008 (additional data collected through 2011 included)
  - Extensive field studies – biotic and abiotic media analyses
  - Adult reproductive success studies (brown trout and Yellowstone cutthroats [YCT])
  - Early life stage (ELS) study (YCT)
  - Extensive literature review
  - BAF and Trophic Food Web modeling
- In 2017, Simplot proposed site specific criteria for several waterbodies including North Fork Sage Creek (NFSC)
- July 2019, EPA approved site-specific selenium criteria (SSSC) for Hoopes Spring, Sage Creek, South Fork Sage Creek, and Lower Crow Creek
- EPA disapproved adoption of the SSSC for NFSC and its tributaries due to a lack of supporting data

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Existing Site-Specific Criteria - Hoopes, Sage Creek, South Fork Sage Creek, and Crow Creek





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Existing Selenium Criteria

Hoopes Spring, South Fork Sage Creek, Sage Creek – Site-Specific

Chronic [1]					Short-Term
Fish Tissue (mg/kg dw)			Water Column (µg/L)		Water Column (µg/L)
Egg-Ovary	Whole Body	Muscle	Lotic	Lentic	Water
20.5	13.6	11.3	16.7	1.5	Intermittent Exposure Equation
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter					

Crow Creek – Sage Creek to State Line – Site-Specific

Chronic [1]					Short-Term
Fish Tissue (mg/kg dw)			Water Column (µg/L)		Water Column (µg/L)
Egg-Ovary	Whole Body	Muscle	Lotic	Lentic	Water
20.5	12.5	11.3	4.2	1.5	Intermittent Exposure Equation
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter					

NFSC and Pole Canyon Creek – Default Non-Sturgeon

Chronic					Short-Term
Fish Tissue (mg/kg dw)			Water Column (µg/L)		Water Column (µg/L)
Egg-Ovary	Whole Body	Muscle	Lotic	Lentic	Water
19.0	9.5	11.3	3.1	1.5	Intermittent Exposure Equation
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter					

Crow Creek – Upstream of Sage Creek – Default Non-Sturgeon

Chronic					Short-Term
Fish Tissue (mg/kg dw)			Water Column (µg/L)		Water Column (µg/L)
Egg-Ovary	Whole Body	Muscle	Lotic	Lentic	Water
19.0	9.5	11.3	3.1	1.5	Intermittent Exposure Equation
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter					

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Site-Specific Studies

Site-Specific Laboratory Studies & Literature Review

Site-specific effects thresholds established:

- Brown trout EC10 = 20.5 mg/kg dw or 21 mg/kg dw
- Yellowstone cutthroat trout EC10 = 35.1 mg/kg dw
- Other adult reproductive studies (lit review)

North Fork Sage Creek

Spring and Fall, 2020 through 2025

- Biotic tissues: Fish (trout and sculpin), benthic macroinvertebrates, periphyton
- Abiotic tissues: Surface water, sediment

Crow Creek

2006 to 2008, spring and fall

Since 2008 through 2025, fall only:

- Fish population and habitat
- Biotic and abiotic media

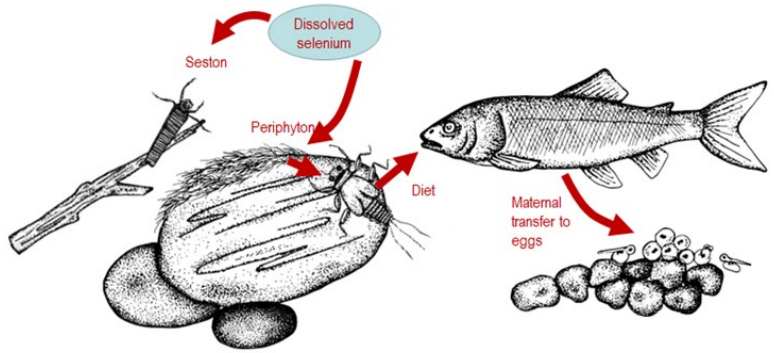


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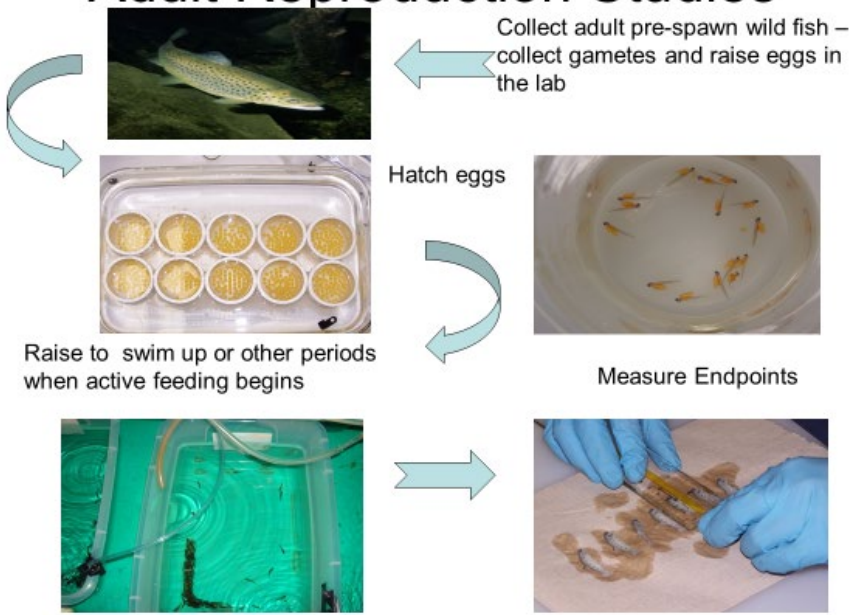
Rationale for NFSC and Updated Crow Creek Site-Specific Criteria

1. Precedence of most sensitive species approach established in 2017 – protective of all species
   I. Based on site-specific reproductive tests
   II. Brown trout is the **most sensitive species** present in this drainage
   III. Species assemblages known
2. Effects thresholds established based on site-specific studies:
   I. Brown trout EC10 = 20.5 mg/kg dw or 21 mg/kg dw
   II. Yellowstone cutthroat trout EC10 = 35.1 mg/kg dw
3. Default non-sturgeon criteria derived using thresholds for taxa **not present** in these streams (e.g., bluegill most sensitive species)

Sculpin Populations



Adult Reproduction Studies



Trout Population/tracking



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Species Present

Table 2
Fish Species Present During Monitoring from 2006 to 2025

Family/Common Name (Species)	Upper Crow and Deer				Hoopes		North Fork Sage		South Fork Sage	Lower Sage			Lower Crow	
	CC-75	CC-150	DC-600[1]	CC-350	HS-3A	HS-3	NSV-6	NSV-7	LSS	LS	LSV-2C	LSV-4	CC-1A	CC-3A
Salmonidae														
Brown Trout *(Salmo trutta)*	√	√	√	√	√	√	√	√	√		√	√	√	√
Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouvieri*)	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Brook Trout (*Salvelinus fontinalis*)											√	√	√	√
Mountain Whitefish *(Prosopium williamsoni)*		√		√								√	√	√
Cuttbow hybrid trout *(Oncorhynchus clarki bouvieri x Oncorhynchus mykiss)*													√	
Cottidae														
Paiute Sculpin *(Cottus beldingi)*	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Mottled Sculpin *(Cottus bairdi)*	√	√		√									√	√
Cyprinidae														
Longnose Dace *(Rhinichthys cataractae)*		√		√									√	√
Speckled Dace (*Rhinichthys osculus*)		√		√									√	√
Redside Shiner *(Richardsonius balteatus)*		√		√									√	√
Northern Leatherside Chub *(Lepdomeda copei)*				√										
Catostomidae														
Utah Sucker *(Catostomus ardens)*		√		√		√						√	√	√
Mountain Sucker *(Catostomus platyrhynchus)*				√									√	
# of Species	**4**	**9**	**3**	**11**	**3**	**4**	**3**	**3**	**3**	**2**	**4**	**6**	**12**	**10**

Notes:

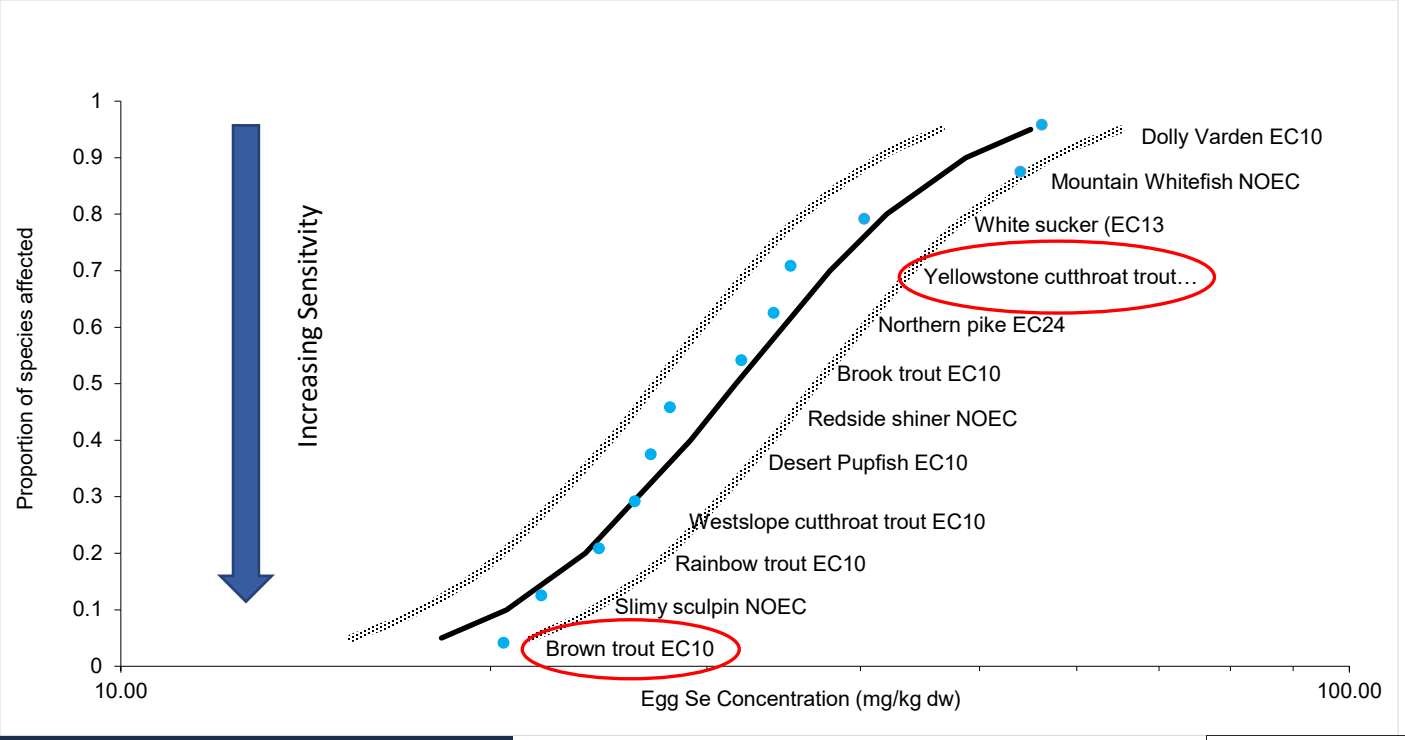
[1]Only a single brown trout has been observed in Deer Creek. This occurred at DC-600 in 2017.





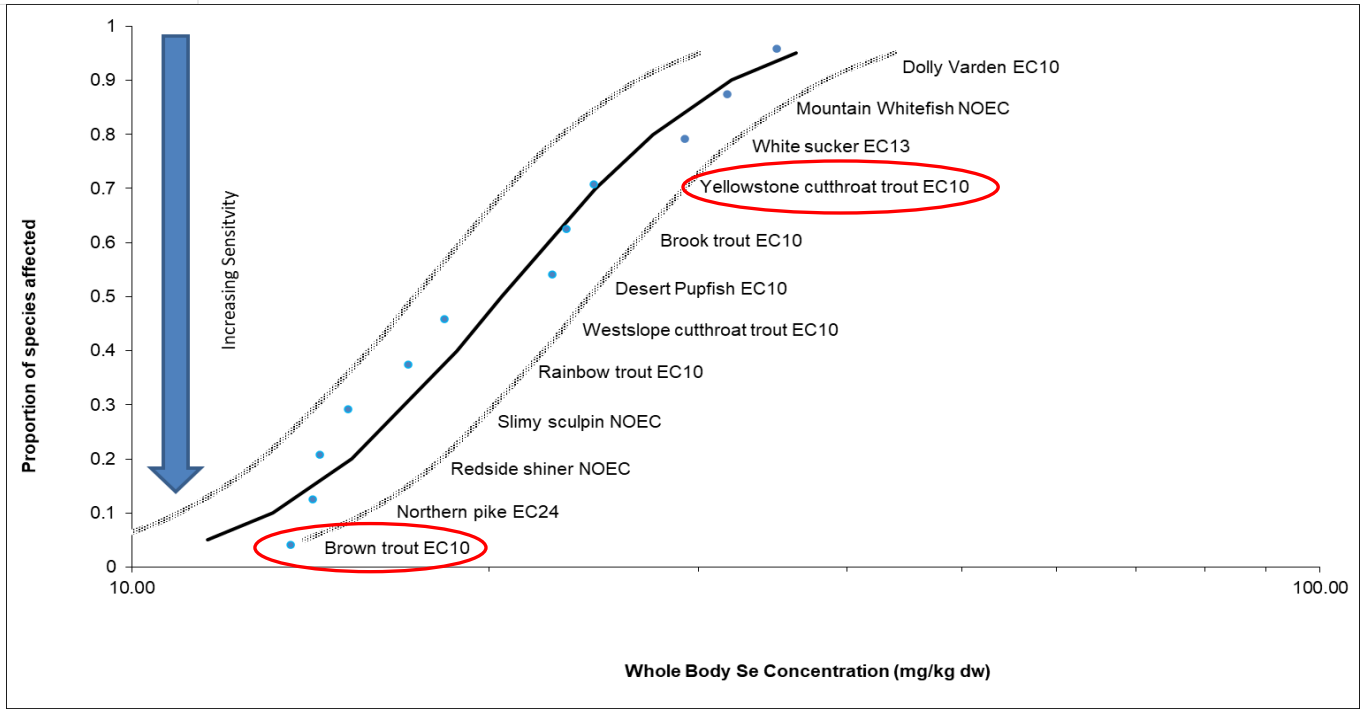
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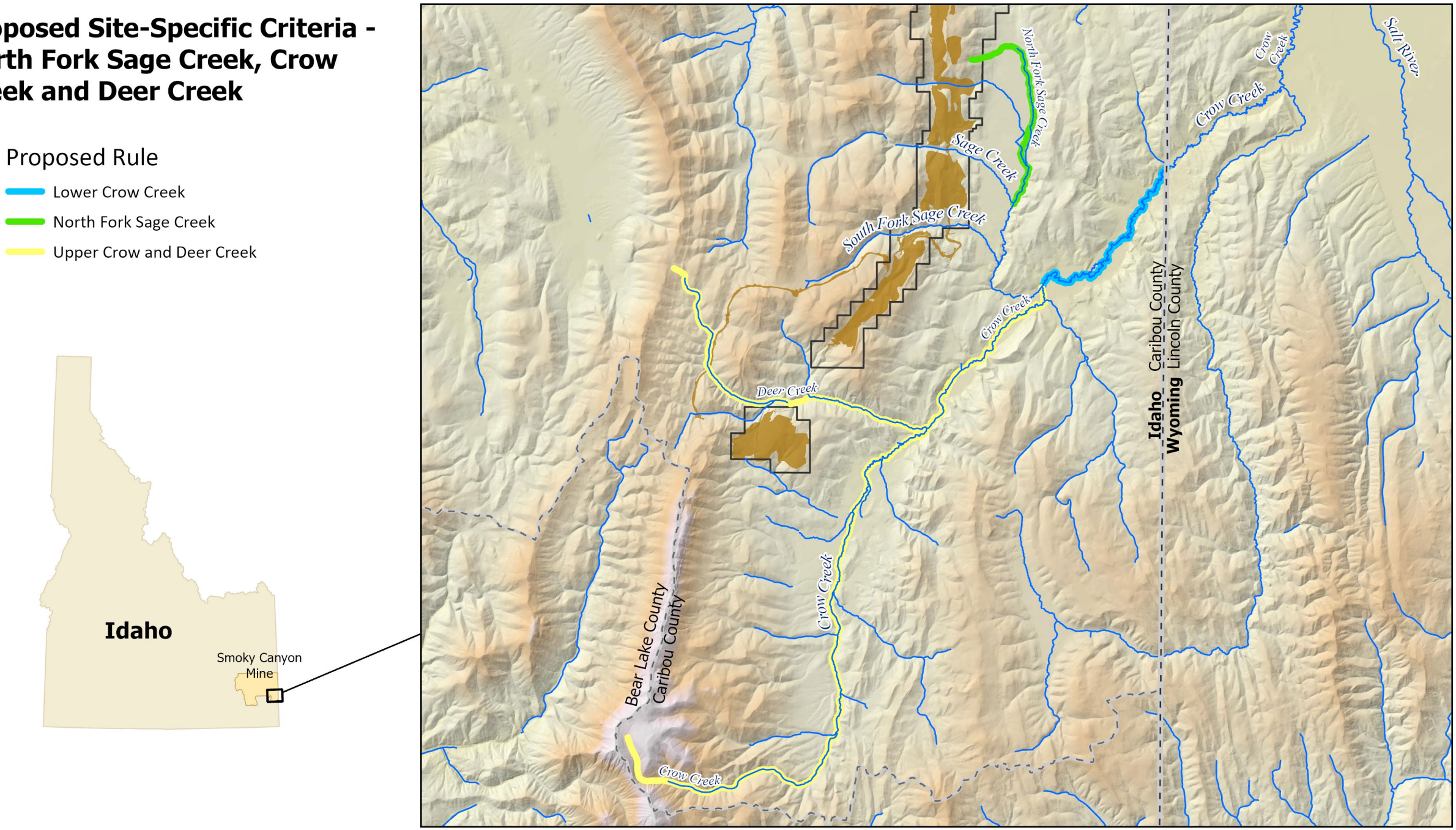




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Proposed Site-Specific Criteria - North Fork Sage Creek, Crow Creek and Deer Creek



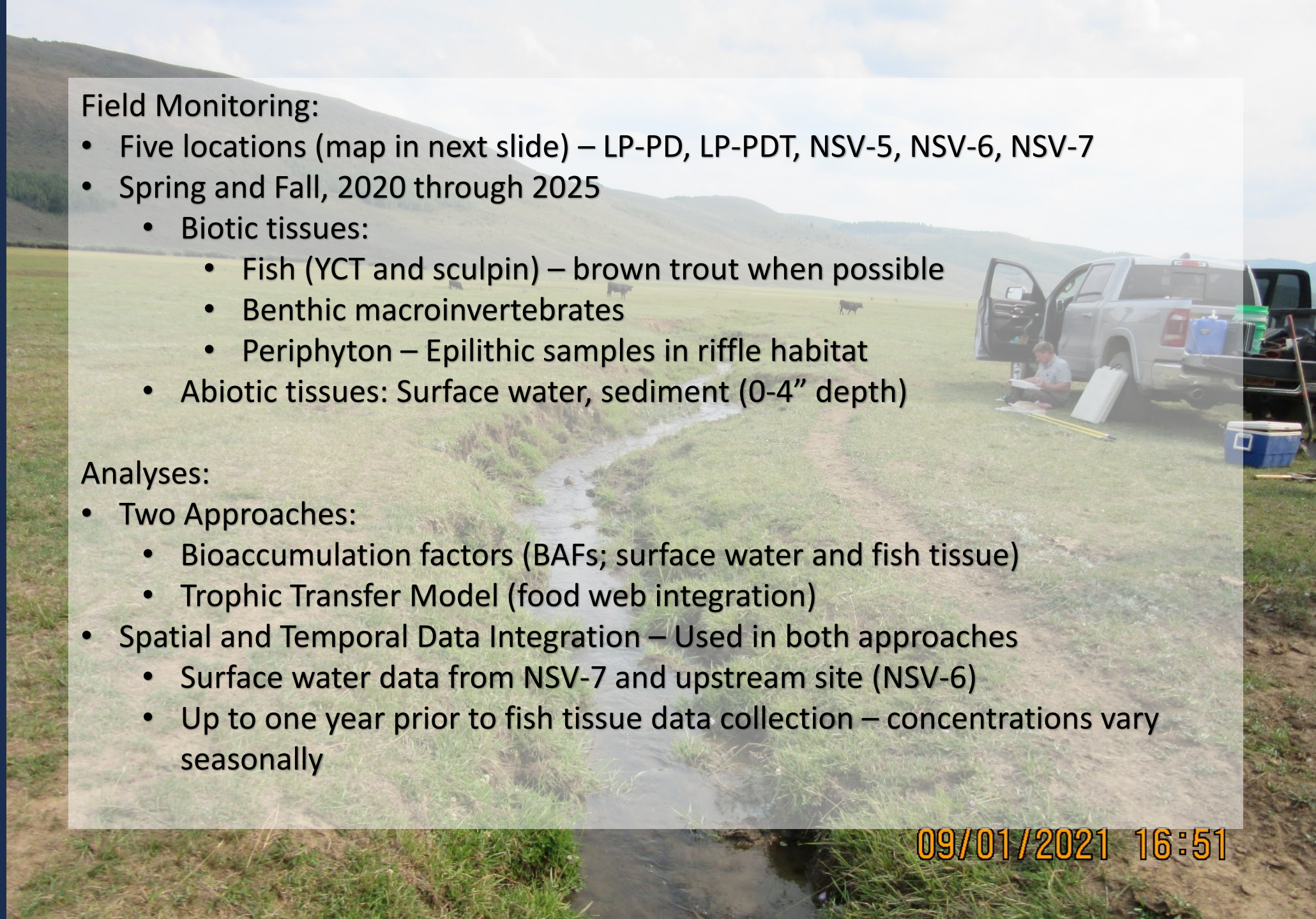
NFSC

Field Monitoring:

- Five locations (map in next slide) – LP-PD, LP-PDT, NSV-5, NSV-6, NSV-7
- Spring and Fall, 2020 through 2025
  - Biotic tissues:
    - Fish (YCT and sculpin) – brown trout when possible
    - Benthic macroinvertebrates
    - Periphyton – Epilithic samples in riffle habitat
  - Abiotic tissues: Surface water, sediment (0-4” depth)

Analyses:

- Two Approaches:
  - Bioaccumulation factors (BAFs; surface water and fish tissue)
  - Trophic Transfer Model (food web integration)
- Spatial and Temporal Data Integration – Used in both approaches
  - Surface water data from NSV-7 and upstream site (NSV-6)
  - Up to one year prior to fish tissue data collection – concentrations vary seasonally

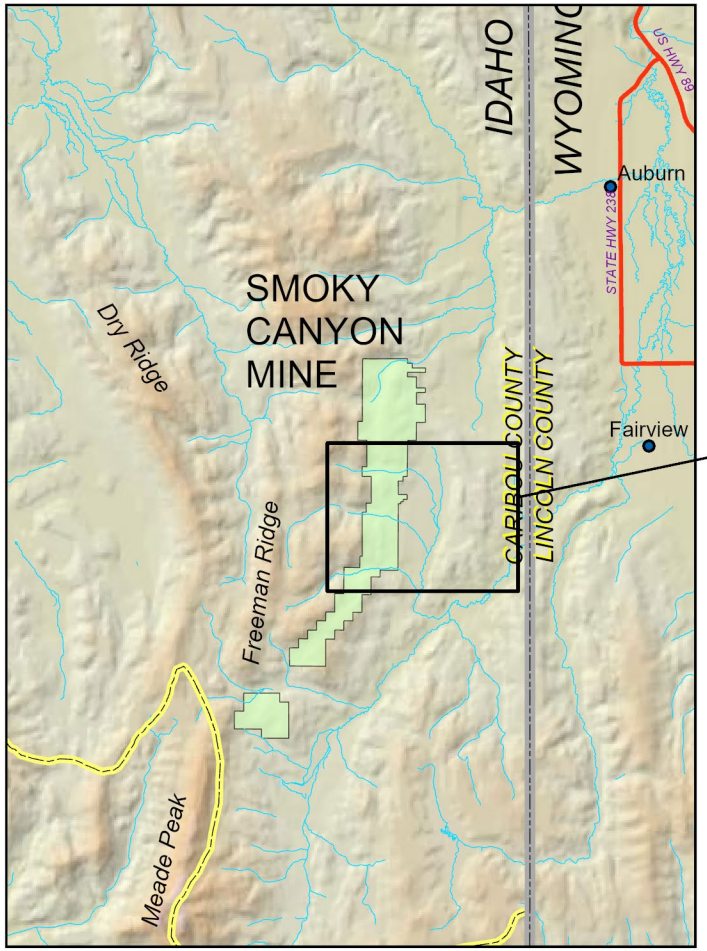


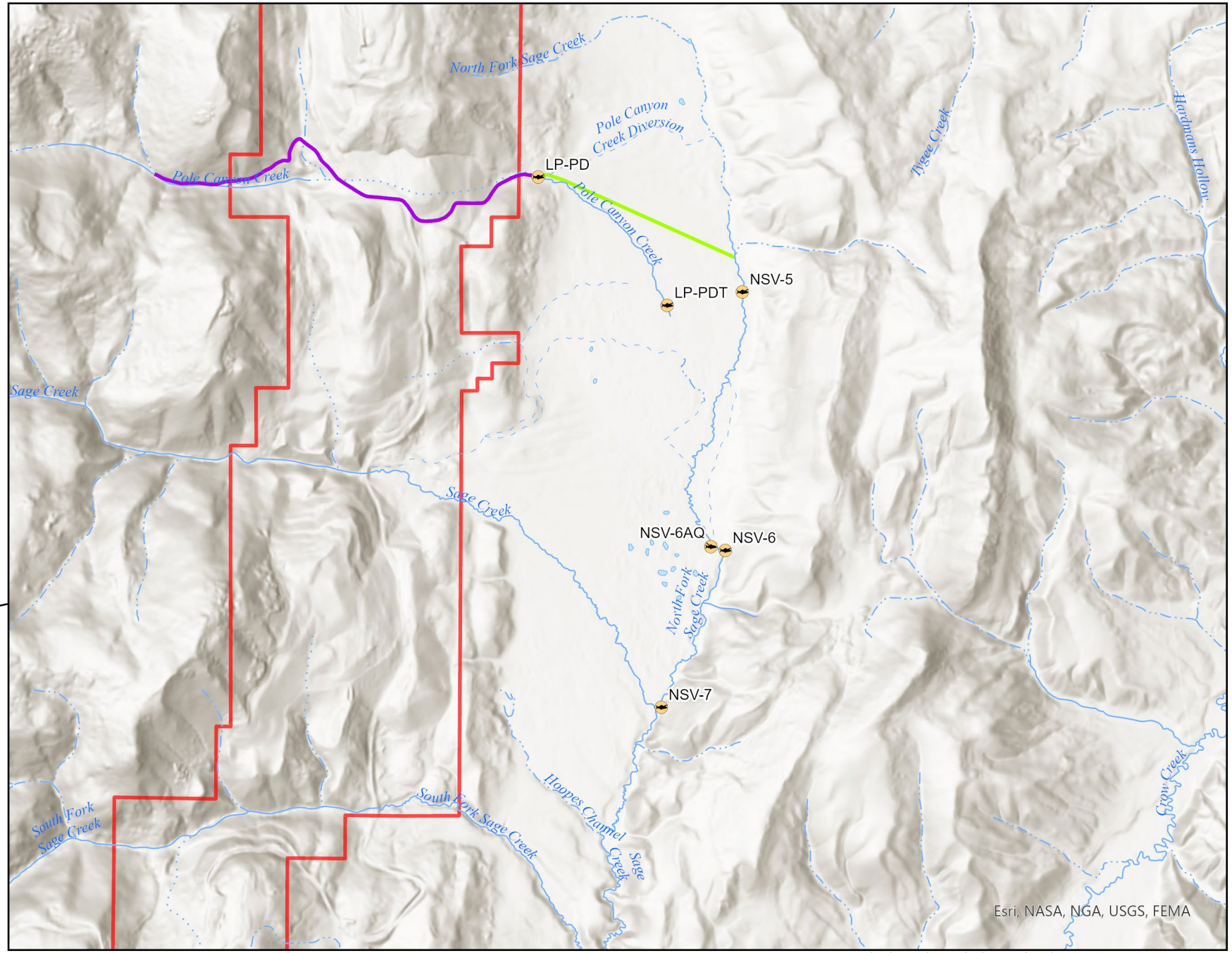
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Site-Specific Criteria Monitoring Locations North Fork Sage Creek

- Monitoring Locations
- 2006 NTCRA Bypass Pipeline Alignment
- Pole Canyon Creek Pipeline Extension

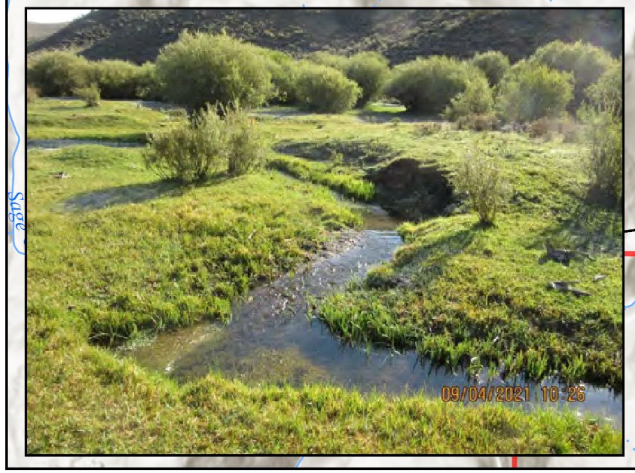




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North Fork Sage Creek

Pole Canyon Creek Diversion

Tygee Creek

LP-PD

Pole Canyon Creek

LP-PDT

NSV-5

Sage Creek

NSV-6AQ

NSV-6

North Fork Sage Creek

NSV-7

Hoopes Channel

South Fork Sage Creek

Sage Creek

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Approaches for Deriving Water Column Element

Trophic Transfer Model

Model of bioaccumulation throughout food web – requires understanding of diet

$$C_{water} = \frac{C_{egg}}{TTF_{composite}\ x\ EF\ x\ CF}$$

Where:

C_{water} = predicted dissolved water criterion concentration of selenium (micrograms per liter [ug/L])

C_{egg} = target egg selenium criterion (20.5 mg/kg dw)

EF = selenium concentration (mg/kg dw) in particulate materials / dissolved selenium concentration in water [$C_{particulate}$ (periphyton, detritus, sediments) / C_{water}] (liters per kilogram dry weight [L/kg dw])

CF = Whole body to egg conversion factor

Bioaccumulation Factors

Direct, empirical derivation of tissue concentrations from surface water concentrations

Doesn't require dietary composition

$$BAF_{EO} = \frac{C_{WB}\ x\ CF}{C_{water}}$$

Where: $BAF_{egg/ovary}$ = BAF equivalent for egg/ovary tissues (L/kg)

$C_{tissueWB}$ = Tissue concentration of selenium in whole-body YCT or sculpins (mg/kg dw)

CF = Conversion Factor ratio for egg/ovary to whole-body (YCT = 1.43, Sculpins = 1.45)

C_{water} = Concentration of dissolved selenium in surface water (µg/L)

$$C_{water} = \frac{C_{EO}}{BAF_{EO}}$$

Where:

C_{water} = Water column criterion element (µg/L)

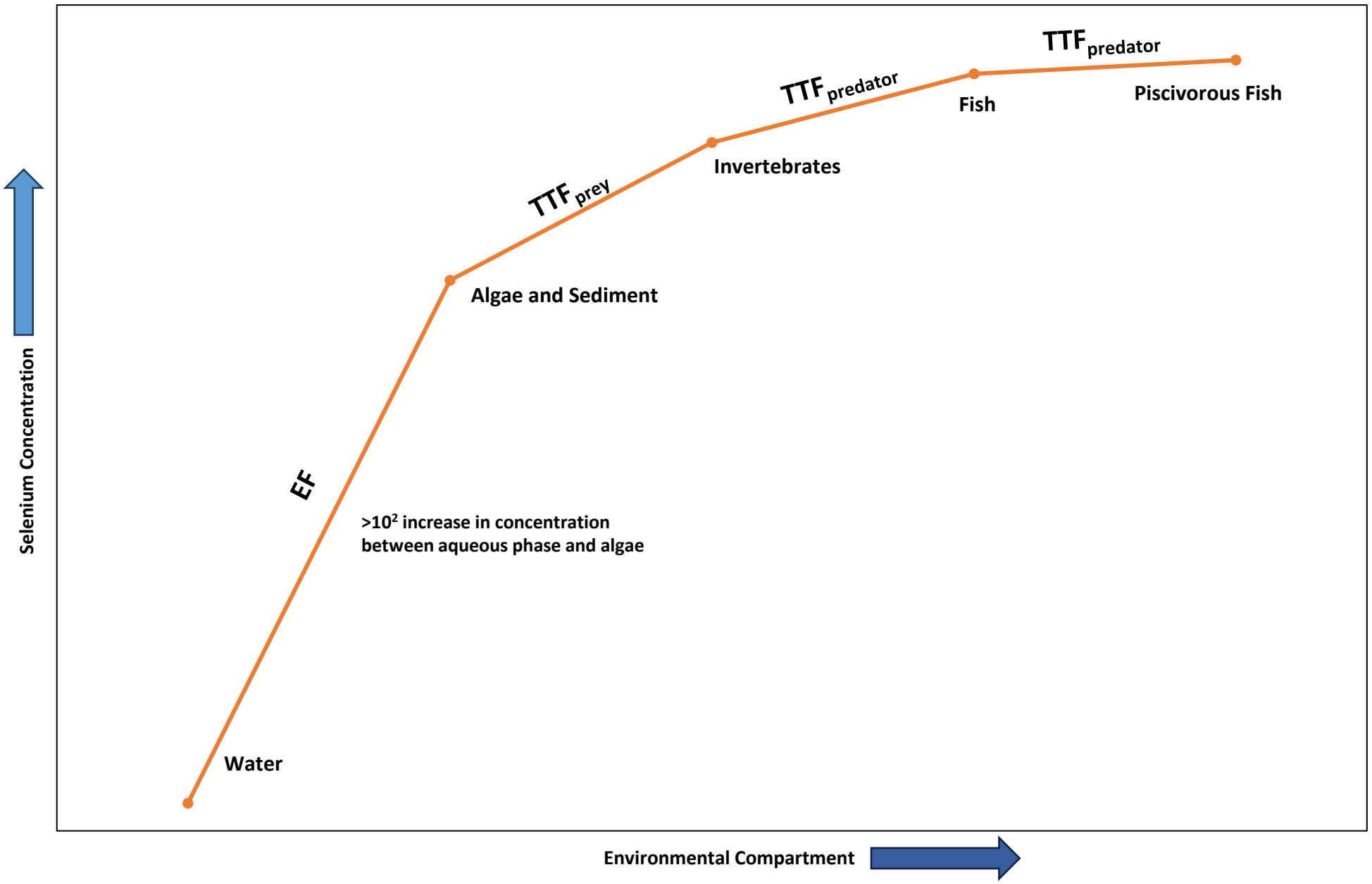
$C_{egg\text{-}ovary\ criterion}$ = Egg/ovary tissue criterion in brown trout (20.5 mg/kg dw)

$BAF_{egg/ovary}$ = BAF equivalent for egg/ovary tissue concentration (L/kg)

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CSM for Selenium Bioaccumulation



Source: Schneider et al 2015

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Table 5

Variables Used in the Derivation of a Water Column Criterion Element Using the Mechanistic Trophic Model and Comparable BAF Model Output

Location	Monitoring Event	Variables								
		Integrated Dissolved Se[a] (ug/L)	Sediment Total Se (mg/kg dw)	Periphyton Se (mg/kg dw)	Invertebrate Se (mg/kg dw)	Sculpin Se (mg/kg dw)	Trout Se (mg/kg dw)	Mean EF[b] (Periphyton & Sediment)	Benthic Diet	Trout Diet
NSV-6	Fall 2020	2.26	4.38	5.51	9.77	20.90	18.96	2.19	9.34	10.88
	Spring 2021	3.70	3.92	2.82	8.83	16.09	11.08	0.91	8.23	9.56
	Fall 2021	3.80	4.48	3.93	6.53	19.10	9.03	1.11	6.27	7.79
	Spring 2022	4.04	2.38	2.48	6.61	12.67	9.53	0.60	6.20	7.22
	Fall 2022	4.68	2.93	4.02	6.25	9.19	7.59	0.74	6.03	6.54
NSV 7	Fall 2020	1.54	2.10	3.65	9.00	10.12	8.92	1.87	8.47	9.11
	Spring 2021	2.15	2.43	3.50	11.65	8.43	7.40	1.38	10.84	11.33
	Fall 2021	2.48	3.63	2.99	7.73	9.23	8.86	1.33	7.26	7.88
	spring 2022	2.36	1.37	4.65	8.27	8.45	7.98	1.28	7.91	8.29
	Fall 2022	2.27	2.95	2.41	7.41	8.71	8.61	1.18	6.91	7.54
	spring 2023	0.94	1.49	3.15	4.80	9.07	6.06	2.47	4.64	5.23
	fall 2023	0.87	1.71	3.01	6.86	9.24	8.83	2.71	6.48	7.10
	spr 2024	1.27	1.54	4.43	5.00	7.07	8.71	2.35	4.94	5.21
	spring 2025	2.10	3.18	6.29	14.15	6.12	8.98	2.25	13.37	13.35



Table 6

EFs and TTFs Used in the Derivation of a Water Column Criterion Element Using the Mechanistic Trophic Model

Location	Monitoring Event	Variables						SW SSSC - Trout[a]	SW SSSC - Sculpin[b]
		EF	$TTF_{invertebrate}$	$TTF_{sculpin}$	TTF_{trout}	Trout $TTF_{composite}$	Sculpin $TTF_{composite}$	Egg Criterion = 20.5 mg/kg dw	Egg Criterion = 20.5 mg/kg dw
NSV-6	Fall 2020	2.19	1.81	2.14	1.74	6.75	3.87	0.97	1.67
NSV-6	Spring 2021	0.91	3.01	1.82	1.16	6.37	5.49	2.47	2.83
NSV-6	Fall 2021	1.11	1.64	2.92	1.16	5.56	4.79	2.33	2.67
NSV-6	Spring 2022	0.60	2.68	1.92	1.32	6.77	5.13	3.52	4.58
NSV-6	Fall 2022	0.74	1.60	1.47	1.16	2.73	2.35	7.09	8.11
NSV 7	Fall 2020	1.87	2.58	1.12	0.98	2.83	2.90	2.71	2.62
NSV 7	Spring 2021	1.38	3.43	0.72	0.65	1.62	2.48	6.40	4.13
NSV 7	Fall 2021	1.33	2.53	1.19	1.12	3.40	3.02	3.16	3.50
NSV 7	Spring 2022	1.28	1.91	1.02	0.96	1.88	1.96	5.97	5.67
NSV 7	Fall 2022	1.18	3.01	1.18	1.14	4.04	3.53	3.01	3.39
NSC-7	Spring 2023	2.47	1.61	1.89	1.16	3.53	3.04	1.65	1.88
NSV-7	Fall 2023	2.71	2.38	1.35	1.24	3.99	3.21	1.32	1.62
NSV-7	Spring 2024	2.35	1.21	1.41	1.67	2.86	1.71	2.14	3.52
NSV-7	Spring 2025	2.25	2.37	0.43	0.67	0.69	1.02	9.23	6.13
							Average	**3.71**	**3.74**
							Median	**2.86**	**3.45**

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Table 7

BAFs Used to Derive Sculpin and Trout Based Water Column Criterion Element Concentrations

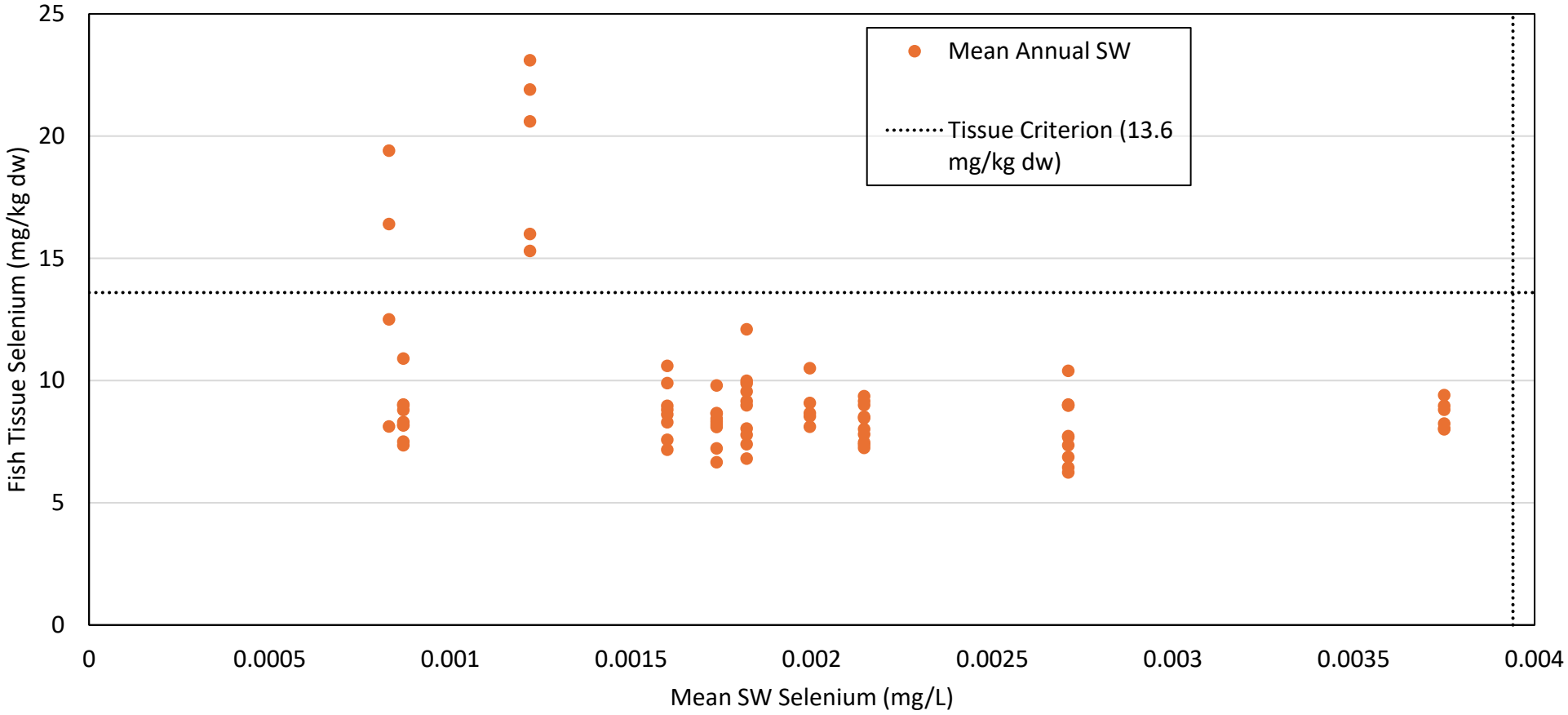
Location	Monitoring Event	Variables			Trout BAFs	Sculpin BAFs	SW SSSC - Trout[a]	SW SSSC - Sculpin[b]
		Integrated Dissolved Se (µg/L)	Sculpin Selenium (mg/kg dw)	Trout Selenium (mg/kg dw)	Egg Criterion = 20.5 mg/kg dw	Egg Criterion = 20.5 mg/kg dw	Egg Criterion = 20.5 mg/kg dw	Egg Criterion = 20.5 mg/kg dw
NSV-6	Fall 2020	2.26	20.90	18.96	12.00	13.41	1.71	1.53
NSV-6	Spring 2021	3.70	16.09	11.08	4.28	6.31	4.79	3.25
NSV-6	Fall 2021	3.80	19.10	9.03	3.40	7.29	6.03	2.81
NSV-6	Spring 2022	4.04	12.67	9.53	3.37	4.55	6.08	4.51
NSV-6	Fall 2022	4.68	9.19	7.59	2.32	2.85	8.84	7.20
NSV 7	Fall 2020	1.54	10.12	8.92	8.28	9.53	2.47	2.15
NSV 7	Spring 2021	2.15	8.43	7.40	4.92	5.69	4.17	3.61
NSV 7	Fall 2021	2.48	9.23	8.86	5.11	5.40	4.01	3.80
NSV 7	Spring 2022	2.36	8.45	7.98	4.84	5.19	4.24	3.95
NSV 7	Fall 2022	2.27	8.71	8.61	5.42	5.56	3.78	3.68
NSC-7	Spring 2023	0.94	9.07	6.06	9.22	13.99	2.22	1.47
NSV-7	Fall 2023	0.87	9.24	8.83	14.51	15.40	1.41	1.33
NSV-7	Spring 2024	1.27	7.07	8.71	9.81	8.07	2.09	2.54
NSV-7	Spring 2025	2.1	6.12	8.98	6.11	4.23	3.35	4.85
						Average	**3.94**	**3.33**
						Median	**3.90**	**3.43**

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NFSC Surface Water and Fish Tissues



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Proposal for NFSC SSSC

North Fork Sage Creek

Chronic				***Short-Term***
Fish Tissue (mg/kg dw)		***Water Column (µg/L)***		***Water Column (µg/L)***
Egg-Ovary	*Whole Body*	*Lotic*	*Lentic*	*Water*
20.5	*13.6*	*3.94*	*1.5*	*Intermittent Exposure Equation*
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter				

- **Unify** Sage Creek and Crow Creek Criteria: Transition from non-sturgeon based tissue criteria to brown trout-based tissue criteria
  - Brown trout most sensitive species - thresholds protective of all other fish species

- **Applicability**: North Fork Sage Creek (see figure on slide 10)

- **Propose** a new water column criterion derived using site-specific BAFs from NSV-6 and 7 data collected between 2020 to 2025 using the brown trout tissue criteria as the basis for derivation
  - Water column elements derived from the E/O tissue element

- No muscle tissue criterion proposed.
  - "EPA recommends states and tribes adopt all four elements of the criterion into their water quality standards. Two elements are based on the concentration of selenium in fish tissue (eggs or ovaries, and whole-body or muscle) and two elements are based on the concentration of selenium in the water column (a 30-day chronic element and an intermittent exposure element)".

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Crow Creek

Upper Crow Creek (upstream of confluence with Sage Creek):

- **Rationale**:
  - Unify the tissue criteria to most sensitive species, not multiple species
  - Brown trout is the most sensitive species present
  - Species present are limited and have been extensively identified – over 20 years at multiple sites throughout the drainage by IDFG, IDEQ, and Simplot

Lower Crow Creek (confluence to state line):

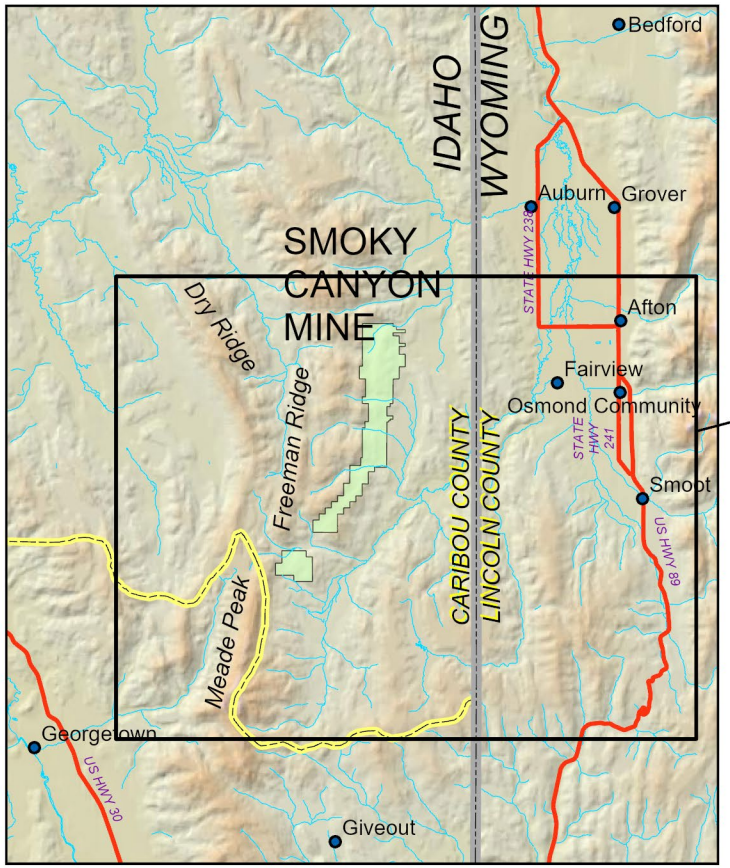
- **Rationale**:
  - Unify the tissue criteria to most sensitive species, not multiple species
  - Brown trout is the most sensitive species present
  - Species present are limited and have been extensively identified – over 20 years and multiple sites throughout the drainage
  - Conditions have changed in Lower Crow Creek – new equilibrium established since WTP came online
- **Field Monitoring**:
  - Fall 2018 through 2025 Fish tissue and surface water data available
- **Analyses:**
- Use BAF approach to derive new surface water criterion element
  - Temporal data integration for surface water : Up to one year prior to fish tissue data collection – concentrations vary seasonally

Simplot

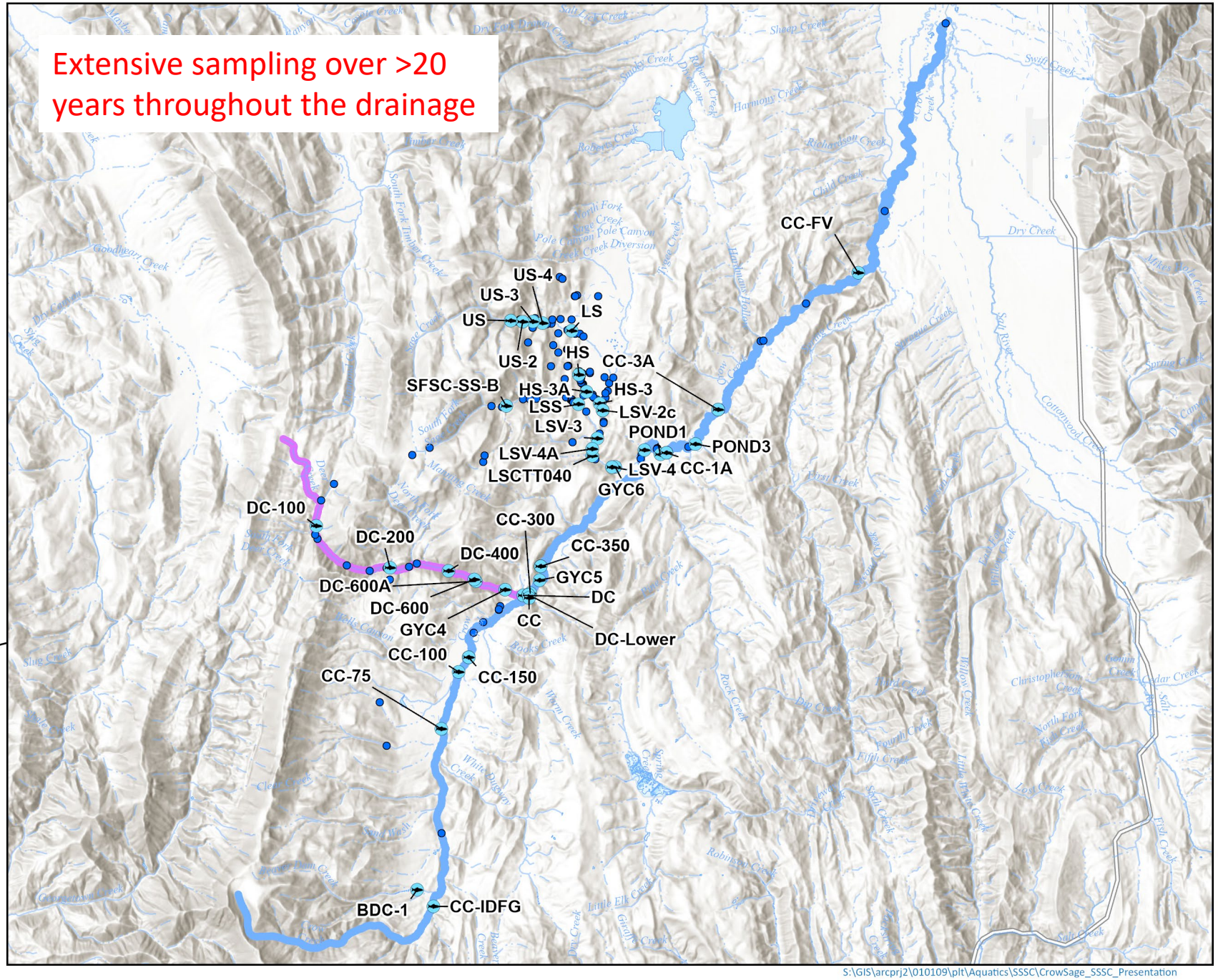
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Historical and Current Monitoring Locations Crow Creek and Deer Creek

- Fish Tissue Monitoring Location
- Aquatic Invertebrate and/or Surface Water Sample Location
- Deer Creek
- Crow Creek



Extensive sampling over >20 years throughout the drainage



S:\GIS\arcprj2\010109\plt\Aquatics\SSSC\CrowSage_SSSC_Presentation

Species Distribution

Table 1
Fish Species Present During Monitoring from 2006 to 2025

Family/Common Name (Species)	Upper Crow Creek			Deer Creek		Lower Crow Creek		
	CC-75	CC-150	CC-350	DC-600[1]	DC-100	CC-1A	CC-3A	CC-FV
Salmonidae								
Brown Trout *(Salmo trutta)*	√	√	√	√		√	√	√
Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouvieri*)	√	√	√	√	√	√	√	√
Brook Trout (*Salvelinus fontinalis*)						√	√	√
Mountain Whitefish *(Prosopium williamsoni)*		√	√			√	√	√
Cuttbow hybrid trout *(Oncorhynchus clarki bouvieri x Oncorhynchus mykiss)*						√		
Cottidae								
Paiute Sculpin *(Cottus beldingi)*	√	√	√	√		√	√	√
Mottled Sculpin *(Cottus bairdi)*	√	√	√			√	√	√
Cyprinidae								
Longnose Dace *(Rhinichthys cataractae)*		√	√			√	√	√
Speckled Dace (*Rhinichthys osculus*)		√	√			√	√	√
Redside Shiner *(Richardsonius balteatus)*		√	√			√	√	√
Northern Leatherside Chub *(Lepdomeda copei)*			√					
Catostomidae								
Utah Sucker *(Catostomus ardens)*		√	√			√	√	√
Mountain Sucker *(Catostomus platyrhynchus)*			√			√		
# of Species	**4**	**9**	**11**	**3**	**1**	**12**	**10**	**10**

Notes:

[1]Only a single brown trout has been observed in Deer Creek. This occurred at DC-600 in 2017.

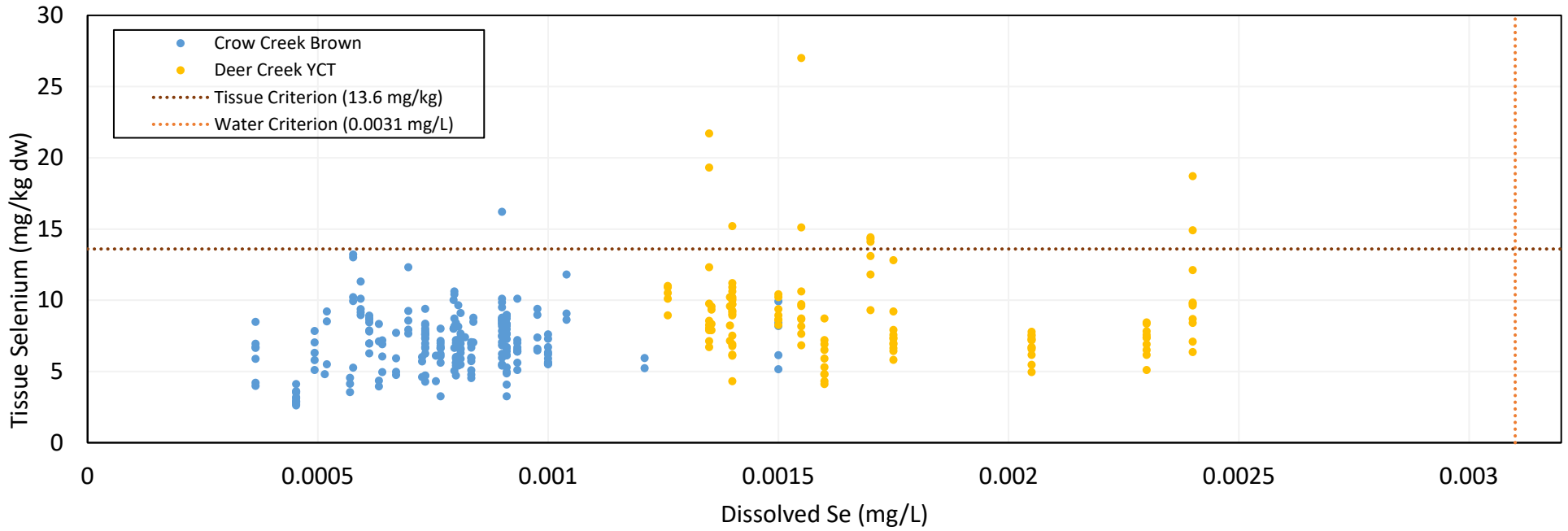


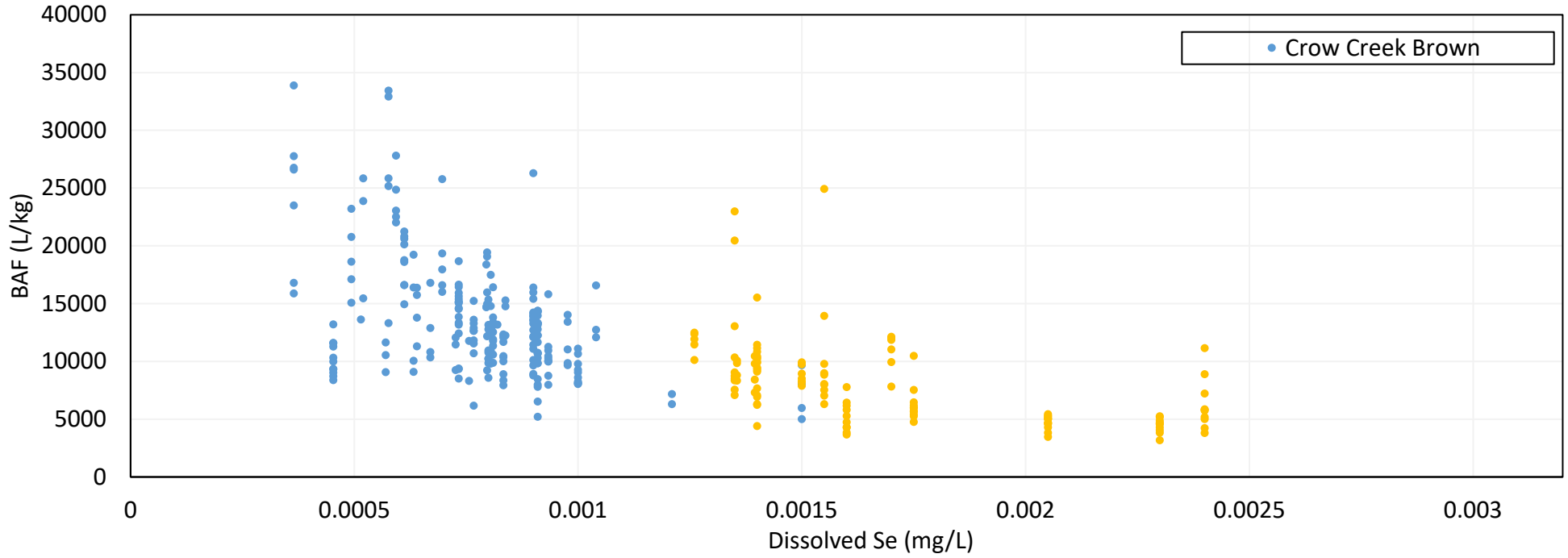


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Upper Crow and Deer Creek





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Proposal for Upper Crow Creek SSSC

Upper Crow and Deer Creek – upstream of Sage Creek

Chronic [1]				***Short-Term***
Fish Tissue (mg/kg dw)		***Water Column (µg/L)***		***Water Column (µg/L)***
Egg-Ovary	*Whole Body*	*Lotic*	*Lentic*	*Water*
20.5	*13.6*	*3.1*	*1.5*	*Intermittent Exposure Equation*
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter				

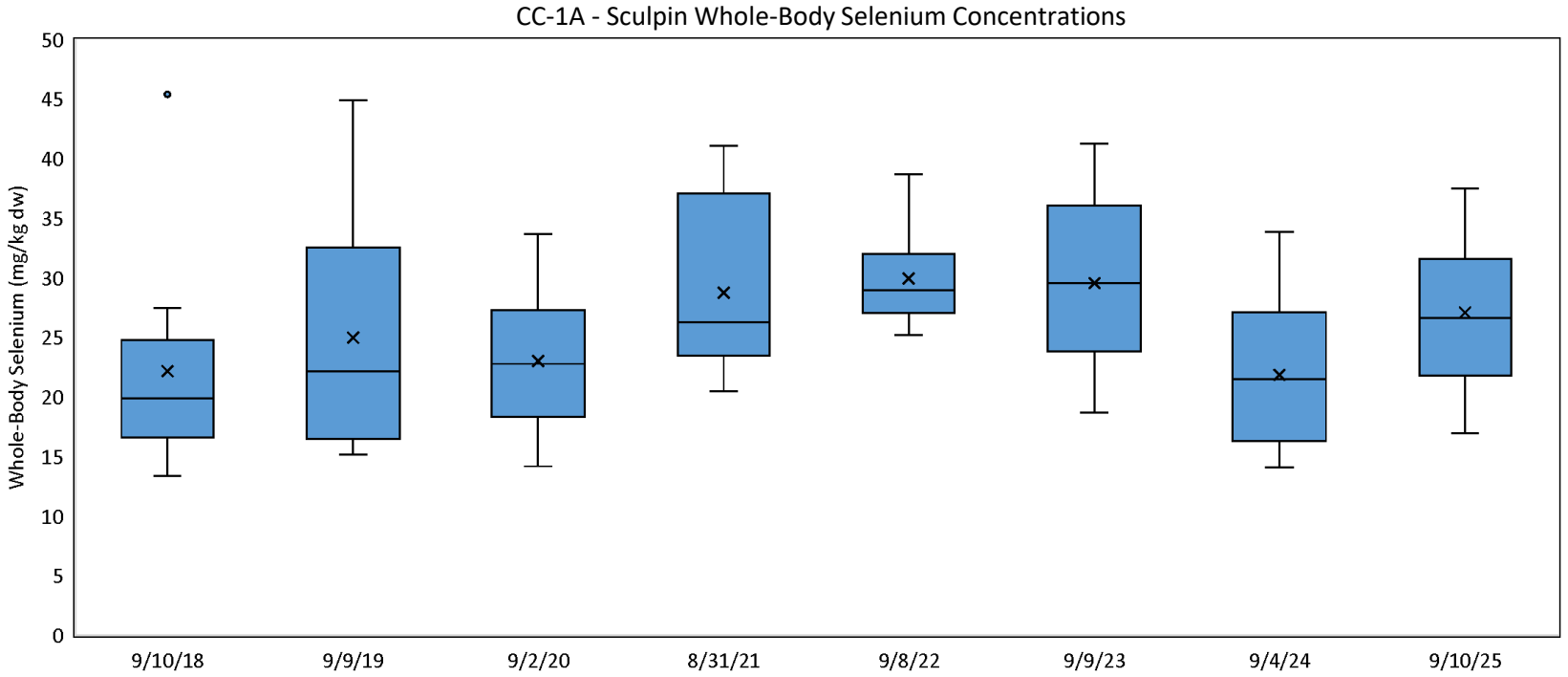
- **Unify** the tissue criteria for the entire watershed based on most sensitive species
- Tissue criteria protective of limited species assemblages in the upper Crow Creek drainage and Deer Creek drainage
- **No change** to existing water column criterion necessary

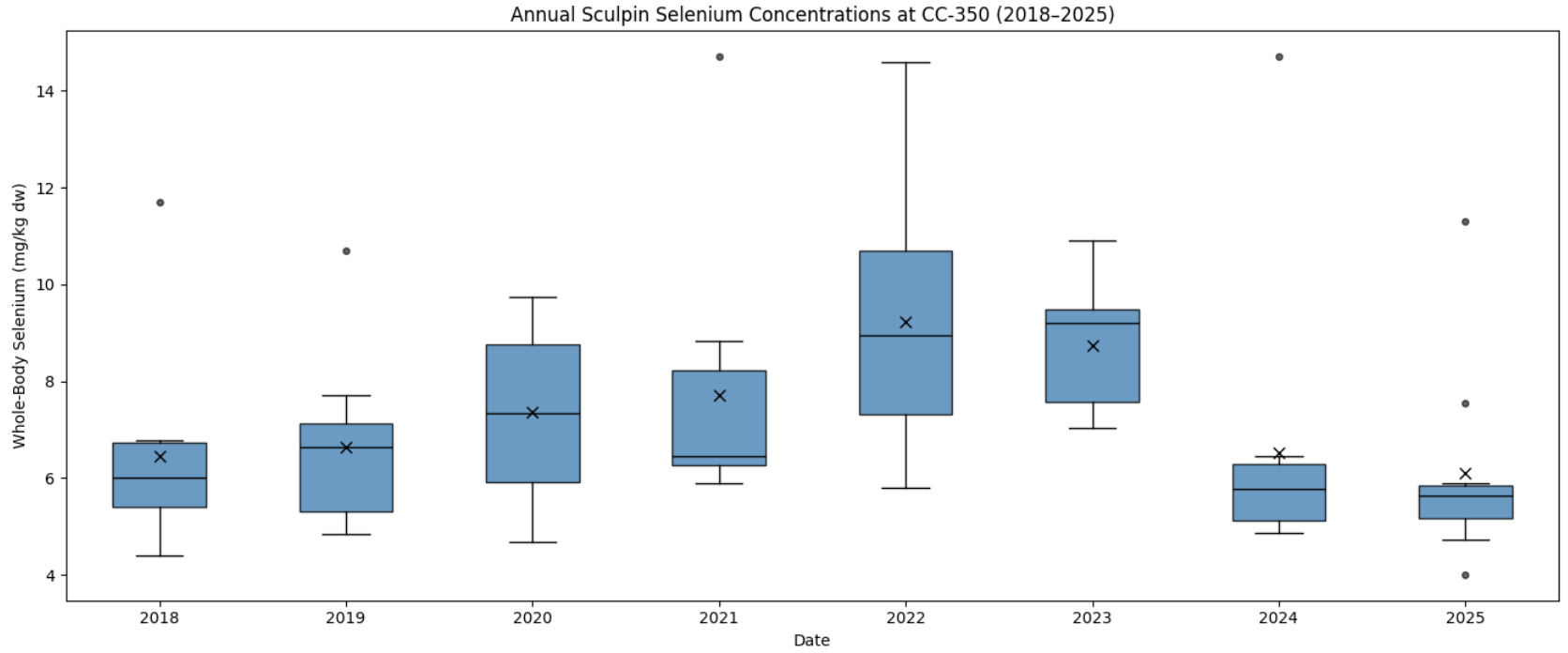
- No muscle tissue criterion proposed.
  - "EPA recommends states and tribes adopt all four elements of the criterion into their water quality standards. Two elements are based on the concentration of selenium in fish tissue (eggs or ovaries, and whole-body or muscle) and two elements are based on the concentration of selenium in the water column (a 30-day chronic element and an intermittent exposure element)".

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Lower Crow Creek





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Lower Crow Creek

Table 4. Bioaccumulation Factors and Surface Water Criteria Derived from Brown Trout Whole-Body Tissue Se Concentrations

Station	Year	Surface Water Dissolved Se			Brown Trout Whole-Body Se			BAF_{wb}	SW Element (ug/L)
		Avg	Min	Max	Avg	Min	Max		
CC-1A	2018	0.0152	0.0080	0.0207	22.7	16.8	27.6	2255	9.1
	2019	0.0123	0.0074	0.0150	23.0	18.7	32.5	2829	7.2
	2020	0.0139	0.0057	0.0206	21.4	18.3	24.2	2334	8.8
	2021	0.0161	0.0125	0.0193	24.9	21.3	28.9	2335	8.8
	2022	0.0119	0.0067	0.0172	30.2	24.9	36.1	3827	5.4
	2023	0.0131	0.0086	0.0159	No BRN			--	--
	2024	0.0125	0.0069	0.0159	17.1	15.4	21.0	2066	9.9
	2025	0.0138	0.0107	0.0155	20.6	17.8	25.2	2246	9.1
CC-1A Average								2556	8.3
CC-3A	2018	0.0160	0.0080	0.0207	25.7	23.2	28.4	2429	8.4
	2019	0.0139	0.0074	0.0150	21.9	17.4	26.9	2381	8.6
	2020	0.0185	0.0057	0.0206	No BRN			--	--
	2021	0.0166	0.0125	0.0193	No BRN			--	--
	2022	0.0167	0.0067	0.0172	No BRN			--	--
	2023	0.0137	0.0086	0.0159	No BRN			--	--
	2024	0.0151	0.0069	0.0227	17.1	16.2	19.3	1713	12.0
	2025	0.0147	0.0107	0.0155	20.9	20.0	23.4	2147	9.5
CC-3A Average								2167	9.6
Average Crow Creek								**2415**	**8.8**

Notes:

Only brown trout (BRN) whole-body tissue samples were included in the calculations; No BRN = No brown trout were sampled

BAFwb = Bioaccumulation Factor, whole body tissues

L/kg = liters per kilogram; mg/L = milligrams per liter; ug/L = micrograms per liter; mg/kg dw = milligrams per kilogram, dry weight

Criterion Elements:

Egg-Ovary (BRN)	20.5mg/kg dw
Whole-Body (BRN)	13.6mg/kg dw

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Proposal for Lower Crow Creek SSSC

Lower Crow Creek – downstream of Sage Creek

Chronic [1]				***Short-Term***
Fish Tissue (mg/kg dw)		***Water Column (µg/L)***		***Water Column (µg/L)***
Egg-Ovary	*Whole Body*	*Lotic*	*Lentic*	*Water*
20.5	*13.6*	*8.8*	*1.5*	*Intermittent Exposure Equation*
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter				

- **Unify** the tissue criteria for the entire watershed based on most sensitive species - brown trout
- **Propose** a new water column criterion for lower Crow Creek based on data from 2018 to 2025 site-specific BAFs for brown trout

- No muscle tissue criterion proposed.
  - "EPA recommends states and tribes adopt all four elements of the criterion into their water quality standards. Two elements are based on the concentration of selenium in fish tissue (eggs or ovaries, and whole-body or muscle) and two elements are based on the concentration of selenium in the water column (a 30-day chronic element and an intermittent exposure element)".

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Summary of Proposed Criteria

All Tissue Criterion Elements Based on Brown Trout Whole Body, Egg/Ovary

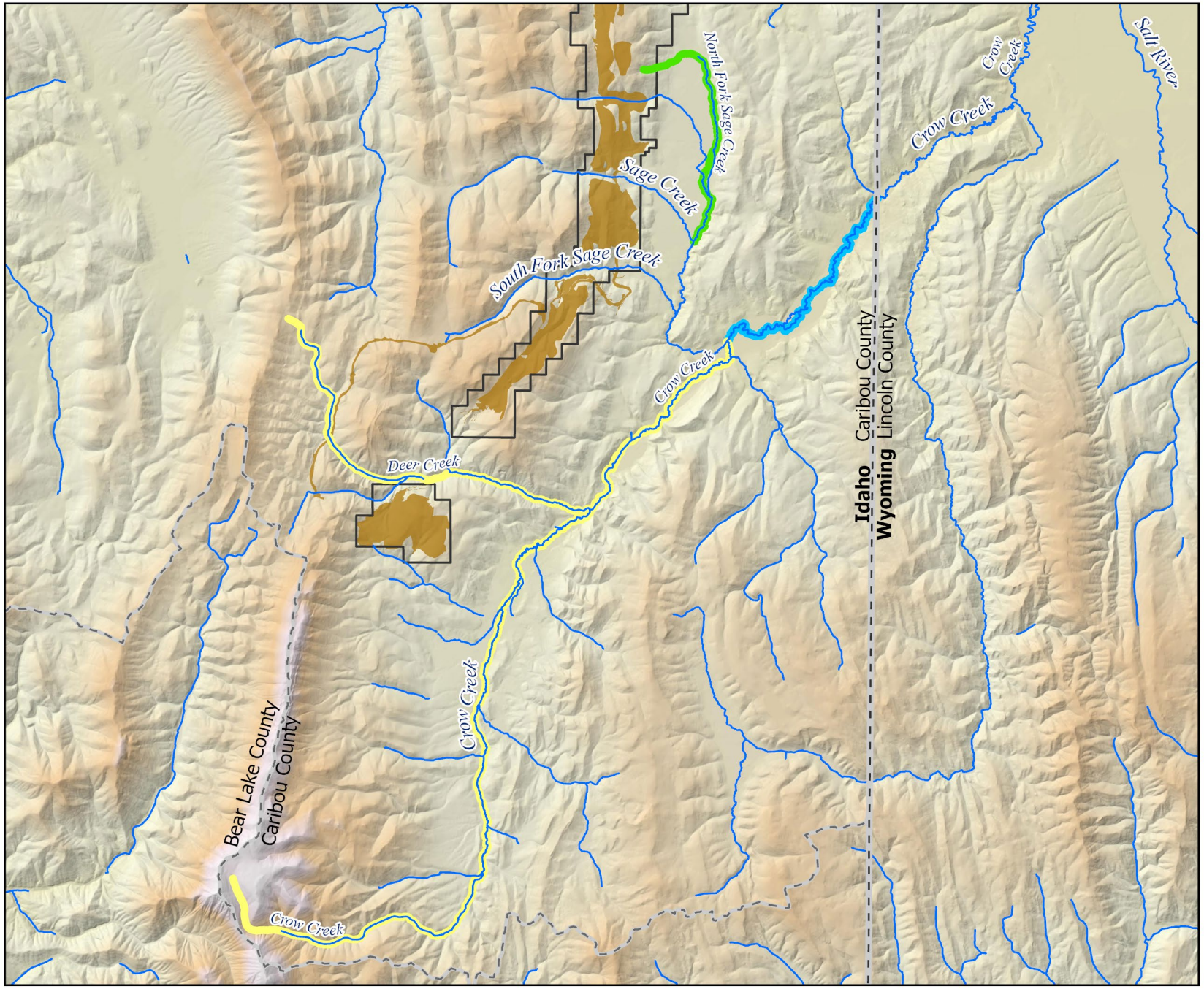
Fish Tissue (mg/kg dw)	
Egg-Ovary	*Whole Body*
20.5	*13.6*
mg/kg dw – milligrams per kilogram dry weight	

Site-Specific Water Column Element Derived from BAFs

North Fork Sage Creek - Water Column Element (µg/L)		
Chronic		***Acute***
Lotic	*Lentic*	*Water*
3.94	*1.5*	*Intermittent Exposure Equation*
ug/L = micrograms per liter		

Lower Crow Creek – Water Column Element (µg/L)		
Chronic		***Acute***
Lotic	*Lentic*	*Water*
8.8	*1.5*	*Intermittent Exposure Equation*
µg/L – micrograms per liter		

Upper Crow and Deer Creek – Water Column Element (µg/L)		
Chronic		***Acute***
Lotic	*Lentic*	*Water*
3.1	*1.5*	*Intermittent Exposure Equation*
µg/L – micrograms per liter		



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Nu-West



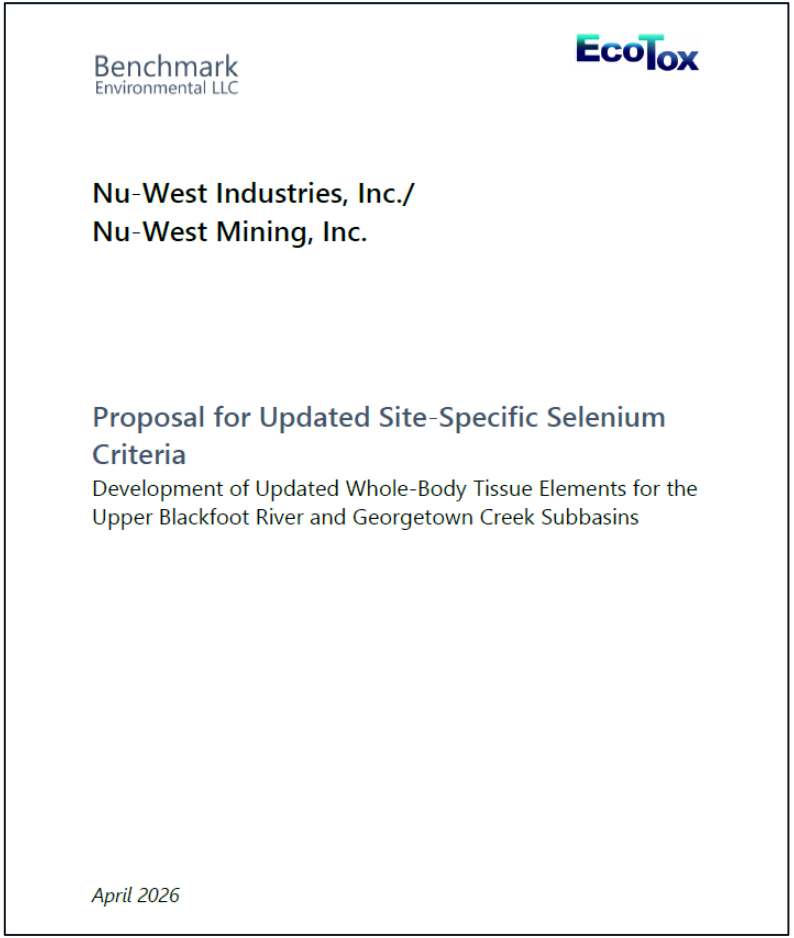
Updated Selenium Site-Specific Criteria for the Upper Blackfoot River and Georgetown Creek Watersheds

Updated Tissue Conversion Factors

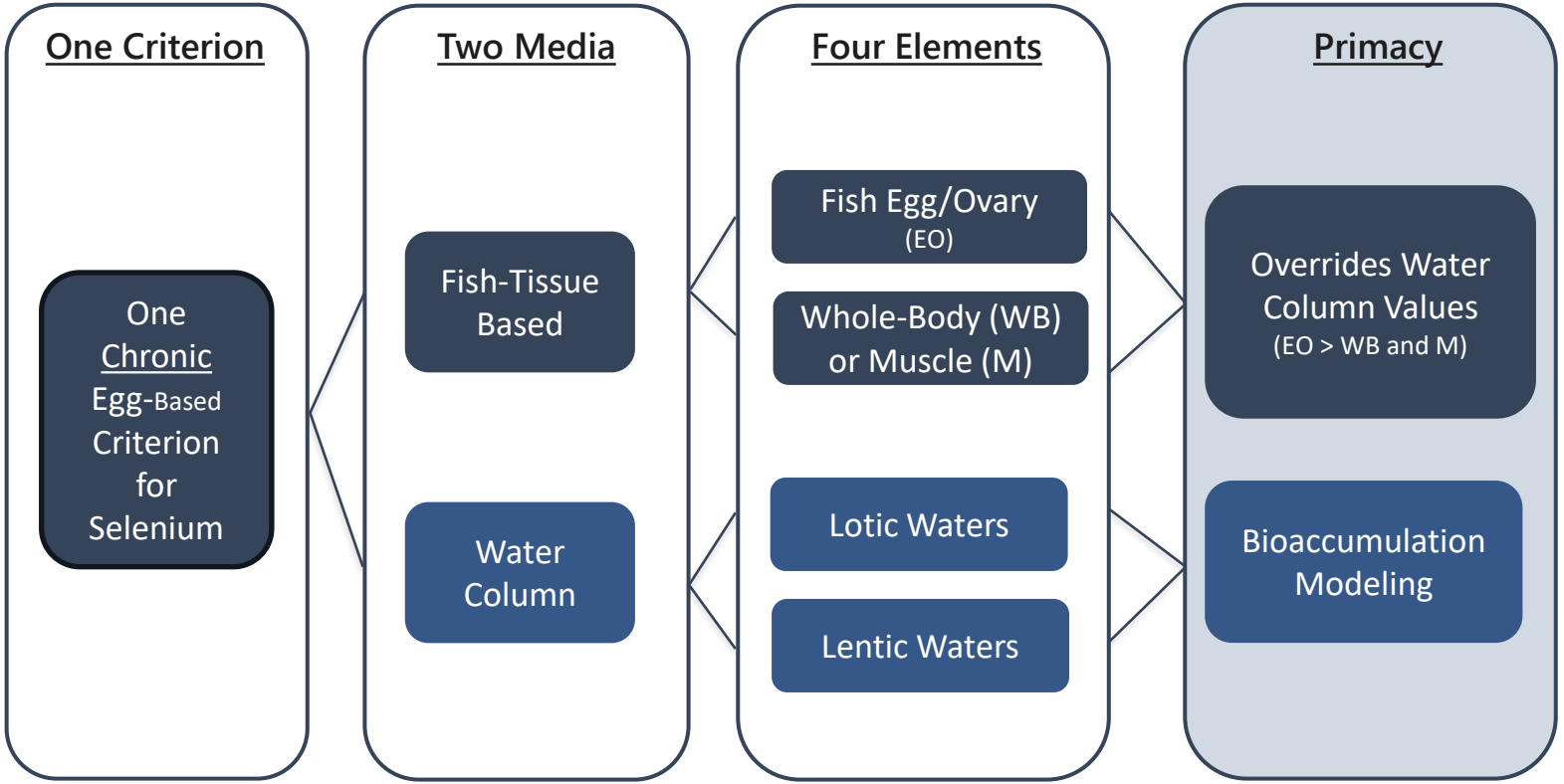
Idaho Rulemaking Meeting, April 8, 2026

Overview

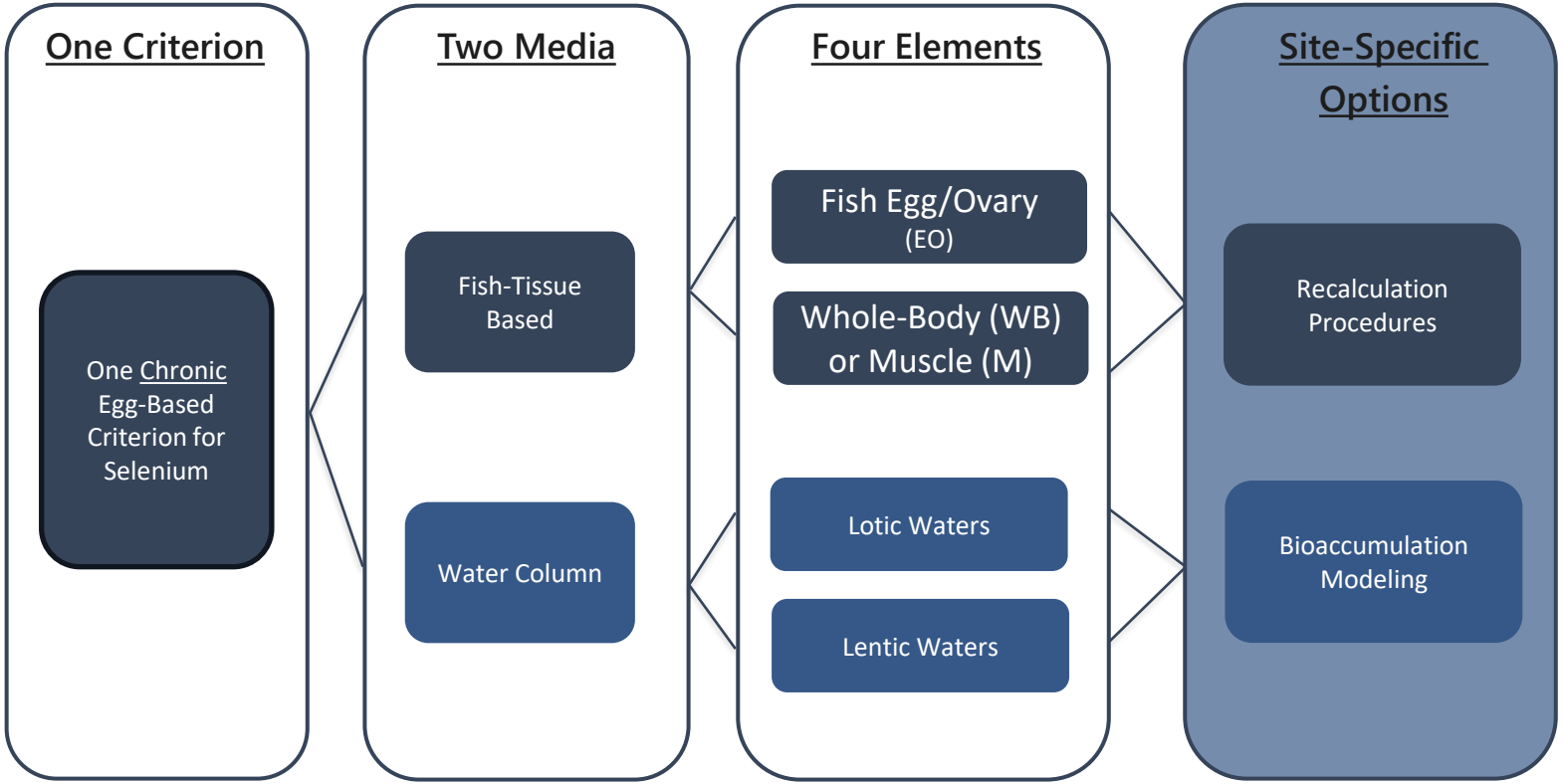
- Updated selenium (Se) site-specific criteria (SSC) are proposed for the Upper Blackfoot River (UBR) and Georgetown Creek (GTC) subbasins
- Technical and regulatory rationale provided in Nu-West's *Proposal for Updated Site-Specific Selenium Criteria* (2026)
- Updates are limited to whole-body tissue elements based on further analysis of tissue-to-tissue conversion factors (CFs)
  - No updates proposed for the egg/ovary, muscle, or water-column elements
  - No updates proposed for the hierarchy or implementation of the multi-element criterion



Overview of EPA (2016) Se AWQC



Overview of EPA (2016) Se AWQC



Idaho Se AWQC

	Element	USEPA (2016) / IDEQ WQC	IDEQ SSC (Non-Sturgeon)	UBR & GTC SSC	
Primacy	Egg / Ovary (mg/kg)	15.1	19.0	24.5 & 21.0	Tissue
	Whole-Body (mg/kg)	8.5	9.5	12.5	
	Muscle (mg/kg)	11.3	13.1	12.8	
Applies absent fish tissue	Water Column[1] (µg/L)	Lotic = 3.1 or SSC	Lotic = 3.1 or SSC	SSC[2]	Water

1. In fishless waters, Se concentrations in fish from the nearest downstream waters may be used to assess compliance using methods provided in EPA (2016)

2. Fish tissue supersedes any site-specific water column values when fish are sampled downstream of fishless waters

Idaho Se AWQC

	Element	USEPA (2016) / IDEQ WQC	IDEQ SSC (Non-Sturgeon)	UBR & GTC SSC
Primacy	Egg / Ovary (mg/kg)	15.1	19.0	24.5 & 21.0
	Whole-Body (mg/kg)	8.5	9.5	12.5
	Muscle (mg/kg)	11.3	13.1	12.8
Applies absent fish tissue	Water Column[1] (µg/L)	Lotic = 3.1 or SSC	Lotic = 3.1 or SSC	SSC[2]

Egg-based criteria converted to whole-body & muscle values using tissue "conversion factors" from EPA (2016)

Water

1. In fishless waters, Se concentrations in fish from the nearest downstream waters may be used to assess compliance using methods provided in EPA (2016)

2. Fish tissue supersedes any site-specific water column values when fish are sampled downstream of fishless waters

Idaho Se AWQC

	Element	USEPA (2016) / IDEQ WQC	IDEQ SSC (Non-Sturgeon)	UBR & GTC SSC	
Primacy	Egg / Ovary (mg/kg)	15.1	19.0	24.5 & 21.0	→ No changes proposed
	Whole-Body (mg/kg)	8.5	9.5	12.5	→ Proposed updates based on more rigorous analysis of tissue-to-tissue CFs
	Muscle (mg/kg)	11.3	13.1	12.8	→ Re-evaluated, no changes proposed
Applies absent fish tissue	Water Column[1] (µg/L)	Lotic = 3.1 or SSC	Lotic = 3.1 or SSC	SSC[2]	**Water**

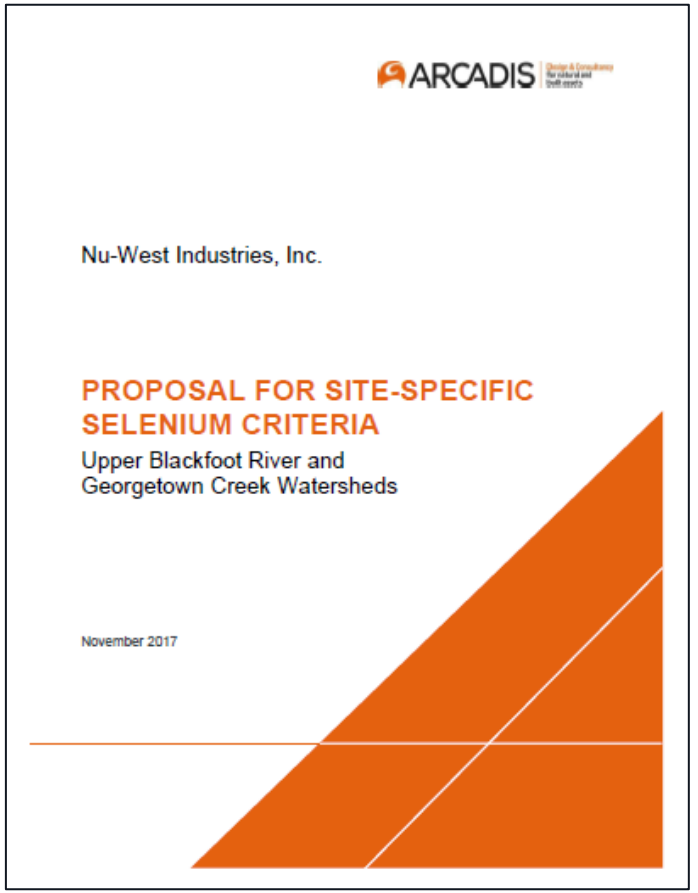
1. In fishless waters, Se concentrations in fish from the nearest downstream waters may be used to assess compliance using methods provided in EPA (2016)

2. Fish tissue supersedes any site-specific water column values when fish are sampled downstream of fishless waters

Refresher on Current Se SSC

Overview of SSC Approach for UBR and GTC subbasins

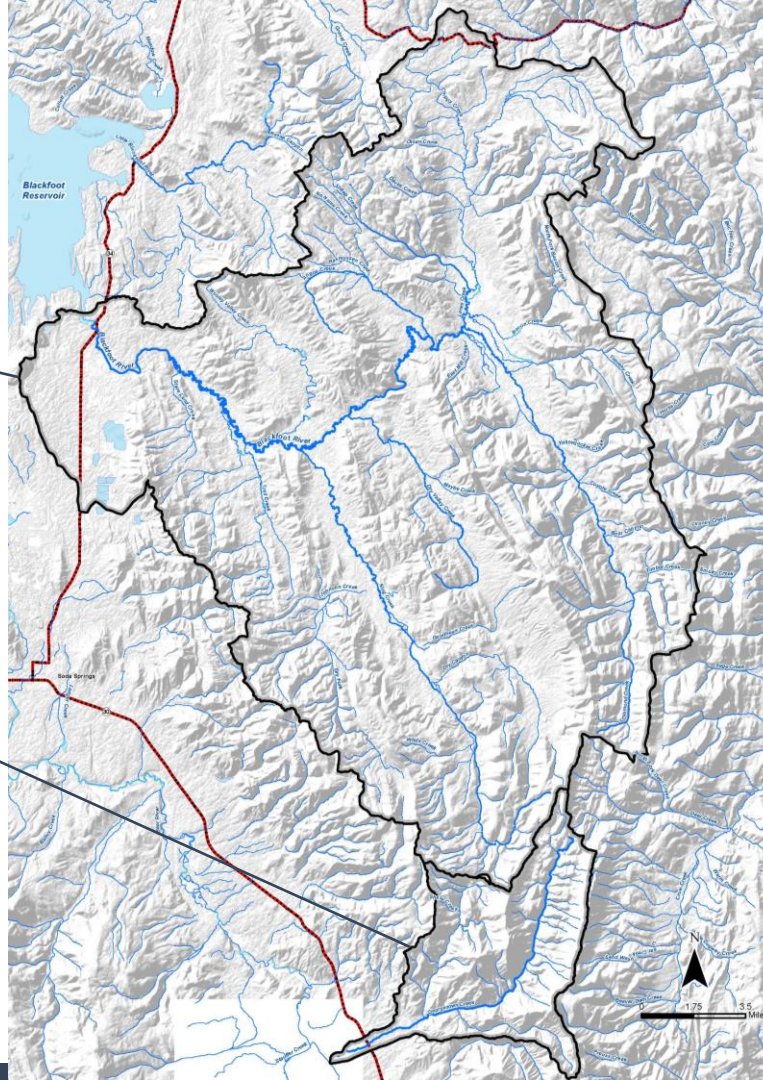
1. "Site" boundaries
   a. Upper Blackfoot River
   b. Georgetown Creek
2. Developed list of resident fish
3. Applied modified Re-Calculation Procedure
   a. Most-sensitive species approach
   b. Protective of other fish
4. Converted egg-based criteria to whole-body and muscle criteria using conversion factors in EPA (2016)



Selenium SSC

Subsection of Blackfoot Sub-Basin:
Blackfoot River – confluence of Lanes and Diamond Creeks to Blackfoot Reservoir (unit US-10), and all tributaries thereof

Georgetown Creek:
Source to mouth (unit B-22), and all tributaries thereof



Upper Blackfoot River Se SSC

Four Resident Families



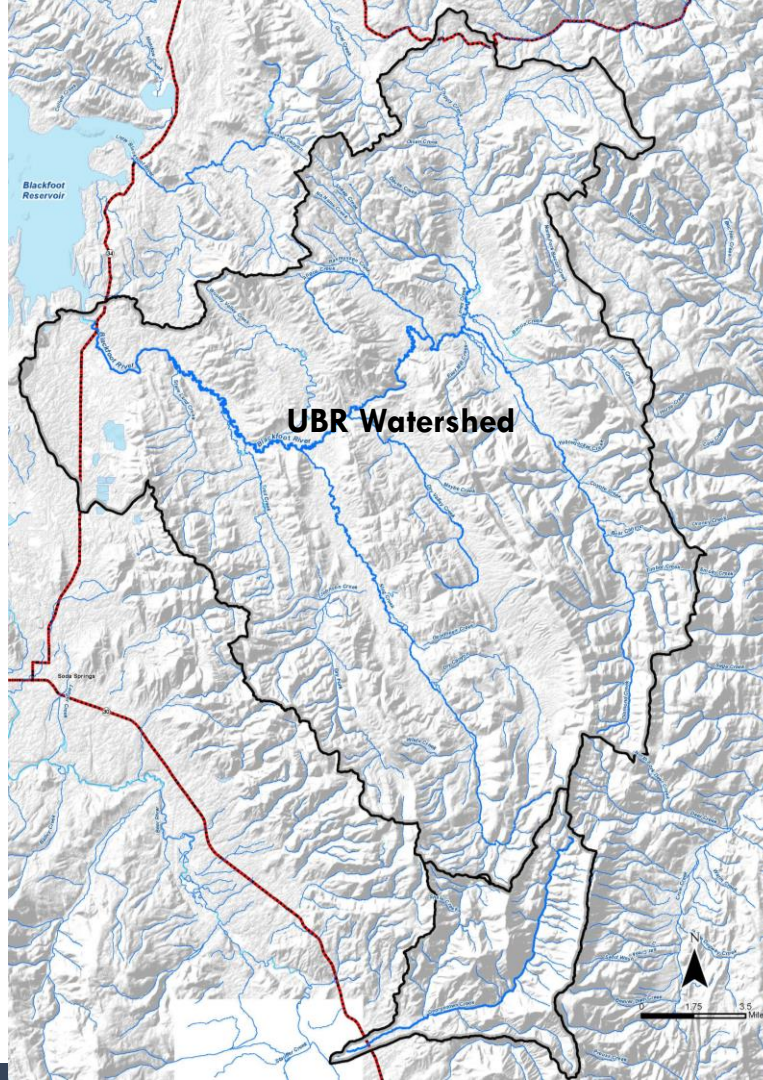






Family	Genus	Species	Common Name
Salmonidae	*Oncorhynchus*	*O. mykiss*	Rainbow trout
		O. clarkii bouvieri	Yellowstone cutthroat trout
	Salvelinus	*S. fontinalis*	Brook trout
Cyprinidae	*Rhinichthys*	*R. cataractae*	Longnose dace
		R. osculus	Speckled dace
		R. falcatus	Leopard dace
	Richardsonius	*R. balteatus*	Redside shiner
	Gila	*G. atraria*	Utah chub
	Couesius	*C. plumbeus*	Lake chub
	Lepidomeda	*L. copei*	N. leatherside chub
	Cyprinus	*C. carpio*	Common carp
Catostomidae	*Catostomus*	*C. ardens*	Utah sucker
		C. platyrhynchus	Mountain sucker
Cottidae	*Cottus*	*C. bairdii*	Mottled sculpin
		C. beldingii	Paiute sculpin

Resident species list is comprehensive per extensive record of fisheries data in the UBR watershed (>80,000 fish survey counts and detailed fish stocking records)



Refresher on Current SSC

Egg-Based Se SSC for UBR Watershed

Genus	Species	Study EC10 (mg Se/kg Egg)	SMCV (mg Se/kg Egg)	GMCV (mg Se/kg Egg)
Oncorhynchus	Rainbow trout[1,2,3]	24.5	24.5	25.3
	Cutthrout trout[4,5]	24.7 27.7	26.2	

[1] Holm (2002)
[2] Holm et al. (2003)
[3] Holm et al. (2005)
[4] Rudolph et al. (2008)
[5] Nautilus Environmental (2011)

- Selected as most sensitive egg-based EC10 for resident fish
- Comparable to most-sensitive EC10 for cutthroat trout (i.e., 24.5 vs 24.7 mg/kg egg)
- Protective of other resident fish and aquatic taxa based on site-specific fish surveys and toxicity reviews

Refresher on Current SSC

Egg-Based Se SSC for UBR Watershed

Element	Upper Blackfoot River SSC
Egg / Ovary (mg/kg)	24.5
Tissue Conversions	
Whole-Body (mg/kg)	12.5
Muscle (mg/kg)	12.8

→ Most-sensitive resident egg-based EC10

} Converted using EPA (2016) conversion factors

EPA (2016) Conversion Factor Approaches:

1. Egg/Ovary → Whole Body
2. Egg/Ovary → Muscle
3. Egg/Ovary → Muscle → Whole body

*Using paired tissue concentrations and a hierarchical approach based on taxonomic relatedness

EPA (2016) Tissue Conversion Factors

EPA (2016) Tissue Conversion Factors (CFs)

Types of Conversion Factors:

- Egg/Ovary → Whole Body
- Egg/Ovary → Muscle
- Egg/Ovary → Muscle → Whole Body

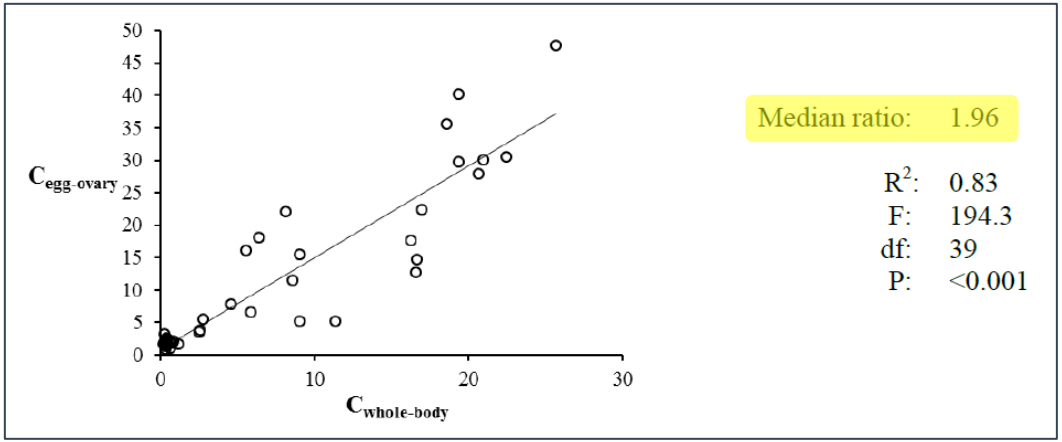
EPA (2016) Methods for Deriving CFs

1. Compiled matched pairs of Se measurements in different tissues from the same fish
2. Confirmed a statistical relationship between matched tissue pairs using OLS regression
3. If regression was significant ($p \leq 0.05$) with a positive slope, median ratio of matched tissue pairs selected as CF for that species
4. If CF data were unavailable for a given species, EPA selected CFs by considering sequentially higher taxonomic classifications

EPA (2016) Conversion Factors

Cutthroat Trout E/O to WB CF

Median ratio approach from EPA (2016) Appendix B



Paired tissue data from EPA (2016), Appendix B

Cutthroat trout (*Oncorhynchus clarkii*)

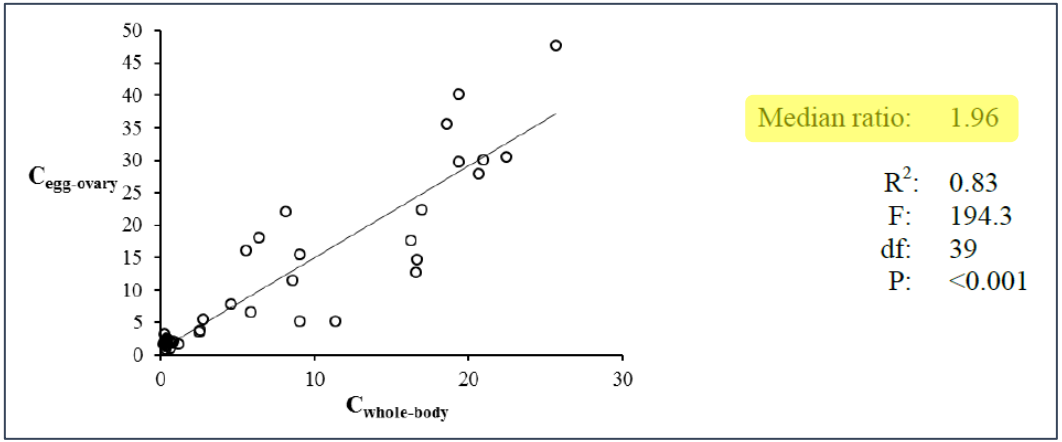
Study	$C_{whole\text{-}body}$	C_{egg}	C_{ovary}	$C_{egg\text{-}ovary}$	Ratio
Hardy 2005	0.70	1.00	-	1.00	1.43
Hardy 2005	2.60	3.80	-	3.80	1.46
Hardy 2005	2.80	5.50	-	5.50	1.96
Hardy 2005	6.40	18.00	-	18.00	2.81
Hardy 2005	1.20	1.60	-	1.60	1.33
Hardy 2005	4.60	7.80	-	7.80	1.70
Hardy 2005	5.90	6.60	-	6.60	1.12
Hardy 2005	9.10	5.10	-	5.10	0.56
Hardy 2005	11.40	5.20	-	5.20	0.46
Hardy 2005	5.60	16.00	-	16.00	2.86
Formation 2012	2.56	3.43	-	3.43	1.34
Formation 2012	16.3	17.6	-	17.6	1.08
Formation 2012	20.7	27.9	-	27.9	1.35
Formation 2012	19.4	29.7	-	29.7	1.53
Formation 2012	17	22.3	-	22.3	1.31
Formation 2012	16.7	14.6	-	14.6	0.87
Formation 2012	25.7	47.6	-	47.6	1.85
Formation 2012	8.17	22	-	22	2.69
Formation 2012	9.07	15.4	-	15.4	1.70
Formation 2012	8.63	11.4	-	11.4	1.32
Formation 2012	16.6	12.7	-	12.7	0.77
Formation 2012	19.4	40.1	-	40.1	2.07
Formation 2012	21	30	-	30	1.43
Formation 2012	18.6	35.6	-	35.6	1.91
Formation 2012	22.5	30.5	-	30.5	1.36
Formation 2012 Henry Lake fish hatchery	0.4	1.65	-	1.65	4.13
Formation 2012 Henry Lake fish hatchery	0.45	2.03	-	2.03	4.51
Formation 2012 Henry Lake fish hatchery	0.44	2.48	-	2.48	5.64
Formation 2012 Henry Lake fish hatchery	0.36	1.36	-	1.36	3.78
Formation 2012 Henry Lake fish hatchery	0.5	2.33	-	2.33	4.66
Formation 2012 Henry Lake fish hatchery	0.36	0.83	-	0.83	2.31
Formation 2012 Henry Lake fish hatchery	0.44	2.26	-	2.26	5.14
Formation 2012 Henry Lake fish hatchery	0.28	1.87	-	1.87	6.68
Formation 2012 Henry Lake fish hatchery	0.44	1.98	-	1.98	4.50
Formation 2012 Henry Lake fish hatchery	0.43	1.34	-	1.34	3.12
Formation 2012 Henry Lake fish hatchery	0.31	3.23	-	3.23	10.42
Formation 2012 Henry Lake fish hatchery	0.23	1.58	-	1.58	6.87
Formation 2012 Henry Lake fish hatchery	0.72	1.93	-	1.93	2.68
Formation 2012 Henry Lake fish hatchery	0.73	1.79	-	1.79	2.45
Formation 2012 Henry Lake fish hatchery	0.91	2.06	-	2.06	2.26
Formation 2012 Henry Lake fish hatchery	0.85	1.74	-	1.74	2.05

EPA (2016) Conversion Factors

Cutthroat Trout E/O to WB CF

$$\text{Whole-Body Se SSC} = \frac{24.5 \text{ mg/kg egg}}{1.96} = 12.5 \text{ mg/kg WB}$$

Median ratio approach from EPA (2016) Appendix B



Paired tissue data from EPA (2016), Appendix B

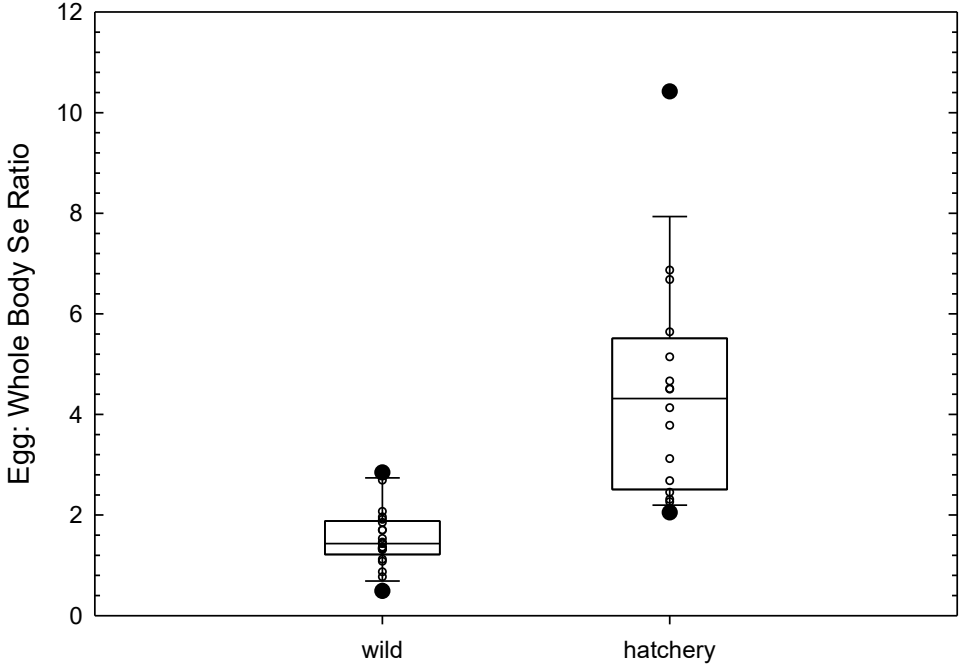
Cutthroat trout (*Oncorhynchus clarkii*)

Study	$C_{whole\text{-}body}$	C_{egg}	C_{ovary}	$C_{egg\text{-}ovary}$	Ratio
Hardy 2005	0.70	1.00	-	1.00	1.43
Hardy 2005	2.60	3.80	-	3.80	1.46
Hardy 2005	2.80	5.50	-	5.50	1.96
Hardy 2005	6.40	18.00	-	18.00	2.81
Hardy 2005	1.20	1.60	-	1.60	1.33
Hardy 2005	4.60	7.80	-	7.80	1.70
Hardy 2005	5.90	6.60	-	6.60	1.12
Hardy 2005	9.10	5.10	-	5.10	0.56
Hardy 2005	11.40	5.20	-	5.20	0.46
Hardy 2005	5.60	16.00	-	16.00	2.86
Formation 2012	2.56	3.43	-	3.43	1.34
Formation 2012	16.3	17.6	-	17.6	1.08
Formation 2012	20.7	27.9	-	27.9	1.35
Formation 2012	19.4	29.7	-	29.7	1.53
Formation 2012	17	22.3	-	22.3	1.31
Formation 2012	16.7	14.6	-	14.6	0.87
Formation 2012	25.7	47.6	-	47.6	1.85
Formation 2012	8.17	22	-	22	2.69
Formation 2012	9.07	15.4	-	15.4	1.70
Formation 2012	8.63	11.4	-	11.4	1.32
Formation 2012	16.6	12.7	-	12.7	0.77
Formation 2012	19.4	40.1	-	40.1	2.07
Formation 2012	21	30	-	30	1.43
Formation 2012	18.6	35.6	-	35.6	1.91
Formation 2012	22.5	30.5	-	30.5	1.36
Formation 2012 Henry Lake fish hatchery	0.4	1.65	-	1.65	4.13
Formation 2012 Henry Lake fish hatchery	0.45	2.03	-	2.03	4.51
Formation 2012 Henry Lake fish hatchery	0.44	2.48	-	2.48	5.64
Formation 2012 Henry Lake fish hatchery	0.36	1.36	-	1.36	3.78
Formation 2012 Henry Lake fish hatchery	0.5	2.33	-	2.33	4.66
Formation 2012 Henry Lake fish hatchery	0.36	0.83	-	0.83	2.31
Formation 2012 Henry Lake fish hatchery	0.44	2.26	-	2.26	5.14
Formation 2012 Henry Lake fish hatchery	0.28	1.87	-	1.87	6.68
Formation 2012 Henry Lake fish hatchery	0.44	1.98	-	1.98	4.50
Formation 2012 Henry Lake fish hatchery	0.43	1.34	-	1.34	3.12
Formation 2012 Henry Lake fish hatchery	0.31	3.23	-	3.23	10.42
Formation 2012 Henry Lake fish hatchery	0.23	1.58	-	1.58	6.87
Formation 2012 Henry Lake fish hatchery	0.72	1.93	-	1.93	2.68
Formation 2012 Henry Lake fish hatchery	0.73	1.79	-	1.79	2.45
Formation 2012 Henry Lake fish hatchery	0.91	2.06	-	2.06	2.26
Formation 2012 Henry Lake fish hatchery	0.85	1.74	-	1.74	2.05

EPA (2016) Conversion Factors

Cutthroat Trout E/O to WB CF

The median egg: whole-body ratio for hatchery fish is 3-fold greater and significantly different than for wild fish (p<0.001)



Paired tissue data from EPA (2016), Appendix B

Cutthroat trout (*Oncorhynchus clarkii*)

Study	$C_{whole-body}$	C_{egg}	C_{ovary}	$C_{egg-ovary}$	Ratio
Hardy 2005	0.70	1.00	-	1.00	1.43
Hardy 2005	2.60	3.80	-	3.80	1.46
Hardy 2005	2.80	5.50	-	5.50	1.96
Hardy 2005	6.40	18.00	-	18.00	2.81
Hardy 2005	1.20	1.60	-	1.60	1.33
Hardy 2005	4.60	7.80	-	7.80	1.70
Hardy 2005	5.90	6.60	-	6.60	1.12
Hardy 2005	9.10	5.10	-	5.10	0.56
Hardy 2005	11.40	5.20	-	5.20	0.46
Hardy 2005	5.60	16.00	-	16.00	2.86
Formation 2012	2.56	3.43	-	3.43	1.34
Formation 2012	16.3	17.6	-	17.6	1.08
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Formation 2012	17	22.3	-	22.3	1.31
Formation 2012	16.7	14.6	-	14.6	0.87
Formation 2012	25.7	47.6	-	47.6	1.85
Formation 2012	8.17	22	-	22	2.69
Formation 2012	9.07	15.4	-	15.4	1.70
Formation 2012	8.63	11.4	-	11.4	1.32
Formation 2012	16.6	12.7	-	12.7	0.77
Formation 2012	19.4	40.1	-	40.1	2.07
Formation 2012	21	30	-	30	1.43
Formation 2012	18.6	35.6	-	35.6	1.91
Formation 2012	22.5	30.5	-	30.5	1.36
Formation 2012 Henry Lake fish hatchery	0.4	1.65	-	1.65	4.13
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Formation 2012 Henry Lake fish hatchery	0.31	3.23	-	3.23	10.42
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Formation 2012 Henry Lake fish hatchery	0.72	1.93	-	1.93	2.68
Formation 2012 Henry Lake fish hatchery	0.73	1.79	-	1.79	2.45
Formation 2012 Henry Lake fish hatchery	0.91	2.06	-	2.06	2.26
Formation 2012 Henry Lake fish hatchery	0.85	1.74	-	1.74	2.05

EPA (2016) Conversion Factors

Cutthroat Trout E/O to WB CF

Regarding hatchery data, EPA (2016) notes:

*The two species with relatively high standard deviations for their CF values (brown trout and cutthroat trout) contained potentially anomalous hatchery data that contributed to the variability (see **Table 3.12** footnote).*

Table 3.12. EPA-derived E/O to WB Conversion Factor Values (EPA 2016).

Common name	Scientific name	CF	*n*	Standard Deviation
Cypriniformes				
Bluehead sucker	*Catostomus discobolus*	1.82	7	0.19
Flannelmouth sucker	*Catostomus latipinnis*	1.41	7	0.20
White sucker	*Catostomus commersonii*	1.38	42	0.36
Desert pupfish	*Cyprinodon macularius*	1.20	6	0.10
Common carp	*Cyprinus carpio*	1.92	5	0.49
Roundtail chub	*Gila robusta*	2.07	7	0.29
Fathead minnow	*Pimephales promelas*	1.40	44	0.75
Creek chub	*Semotilus atromaculatus*	1.99	12	1.00
Perciformes				
Bluegill	*Lepomis macrochirus*	2.13	27	0.68
Green sunfish	*Lepomis cyanellus*	1.45	38	0.23
Smallmouth bass	*Micropterus dolomieu*	1.42	6	0.19
Salmoniformes				
Brown trout	*Salmo trutta*	1.45	38	1.81
Cutthroat trout	*Oncorhynchus clarkii*	1.96	41	2.03

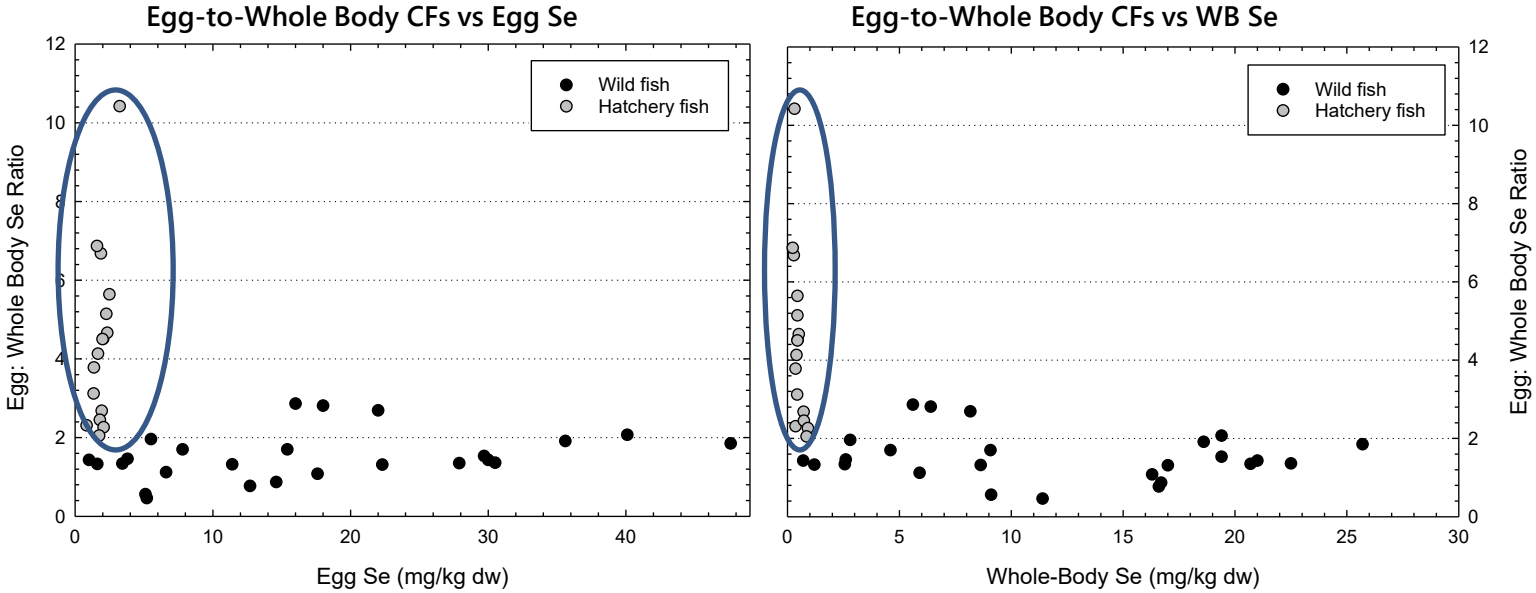
***EPA (2026) Table 3.12** footnote*

The cutthroat trout CF values are from two sources (Formation 2012 and Hardy 2005). The reason for the higher variability in the cutthroat trout CF values is due to relatively higher CF values in the hatchery fish. The standard deviation for cutthroat trout drops to 0.62 if the hatchery fish are excluded.

EPA (2016) Conversion Factors

Cutthroat Trout E/O to WB CF

- Hatchery samples exhibit different Egg: WB relationship & significantly more variability than wild samples
- Egg Se in hatchery fish (≤ 3 mg/kg) distant from egg Se SSC (24.5 mg/kg)
- Egg and whole-body Se in hatchery fish not representative of background Se in the UBR basin



Updated Evaluation of Tissue Conversion Factors

Approach for Evaluating Updated Conversion Factors

For translating egg-based SSC (24.5 mg/kg) to a whole-body value

1. Literature Review

- Database of paired Se tissue measurements
- NAMC-SWG study (Detering et al. 2025)

2. Egg → Whole Body

- "One-Step Approach"
- *n*=41 for cutthroat trout, including hatchery (*n*=16) and wild (*n*=25) fish
- Evaluated with and without hatchery data

3. Egg → Muscle → Whole Body

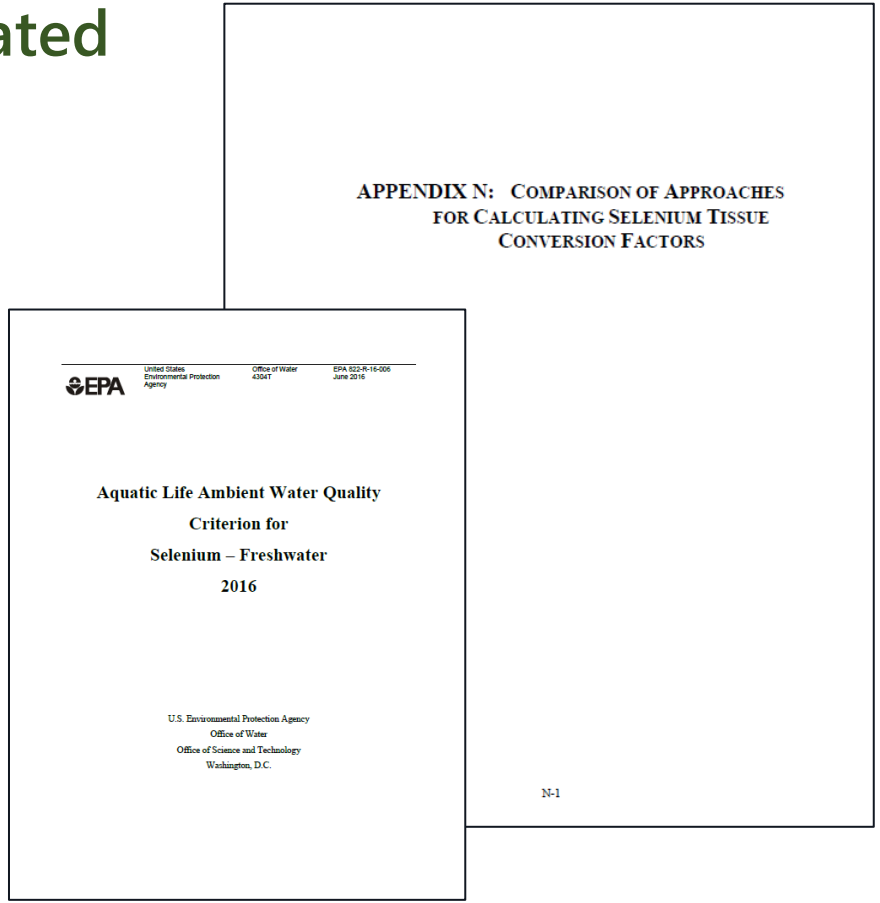
- "Two-Step Approach"
- *n*=219 for the genus *Oncorhynchus*:
  - Rainbow trout (*n*=46 E-M; *n*=51 WB-M)
  - Westslope cutthroat trout (*n*=54 E-M)
  - Yellowstone cutthroat trout (*n*=25 E-WB; n=43 WB-M)
    - Includes site-specific M-WB samples

4. Median Ratio and Regression-Based CFs

- Median ratio and regression-based CFs evaluated per EPA (2016) guidance for each scenario:
  - Egg→ Whole Body
  - Egg→ Muscle → Whole Body

Approach for Evaluating Updated Conversion Factors

- Appendix N of EPA (2016) discusses use of both median ratio and regression-based approaches for calculating tissue-to-tissue conversion factors
- Regression-based and median ratio approaches both have advantages and disadvantages (EPA 2016)
- Therefore, the median ratio and regression-based CF approaches were evaluated following methods presented in Appendix N of EPA (2016)
  - Total Least Squares (TLS) regressions on log-transformed tissue Se measurements



APPENDIX N: COMPARISON OF APPROACHES FOR CALCULATING SELENIUM TISSUE CONVERSION FACTORS

N-1

EPA

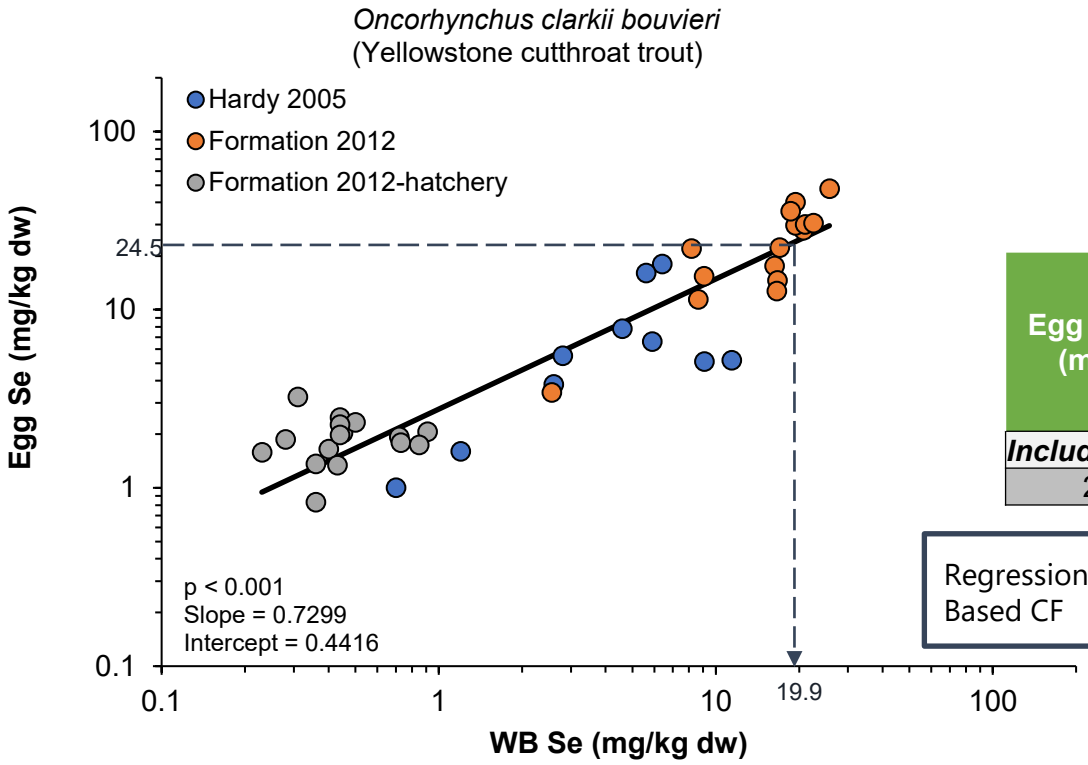
United States Environmental Protection Agency | Office of Water 4304T | EPA 822-R-16-006 June 2016

Aquatic Life Ambient Water Quality Criterion for Selenium – Freshwater 2016

U.S. Environmental Protection Agency
Office of Water
Office of Science and Technology
Washington, D.C.

One-Step Approach: Egg → Whole-Body

With Hatchery Samples

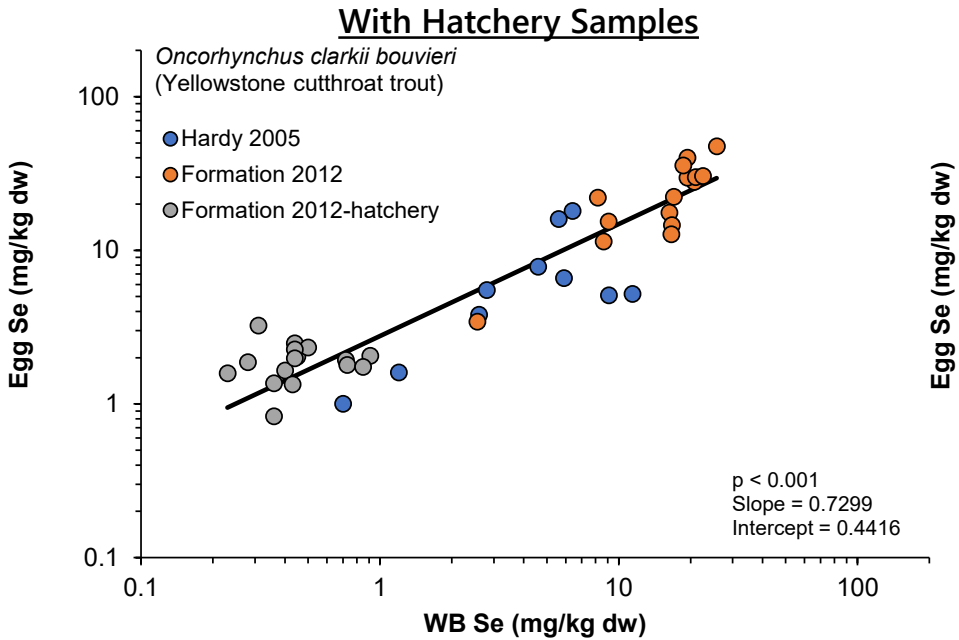


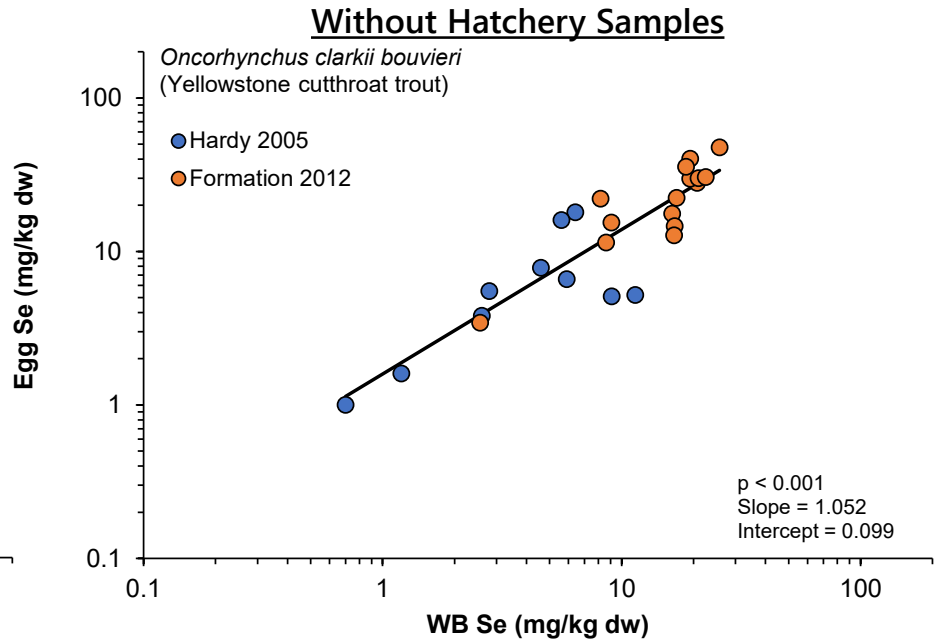
Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-Based CF	WB Se (mg/kg)
Including hatchery fish				
24.5	1.96	12.5	1.23	19.9

Regression-Based CF = 24.5 / 19.9 = 1.23

One-Step Approach: Egg → Whole-Body

With & Without Hatchery Samples





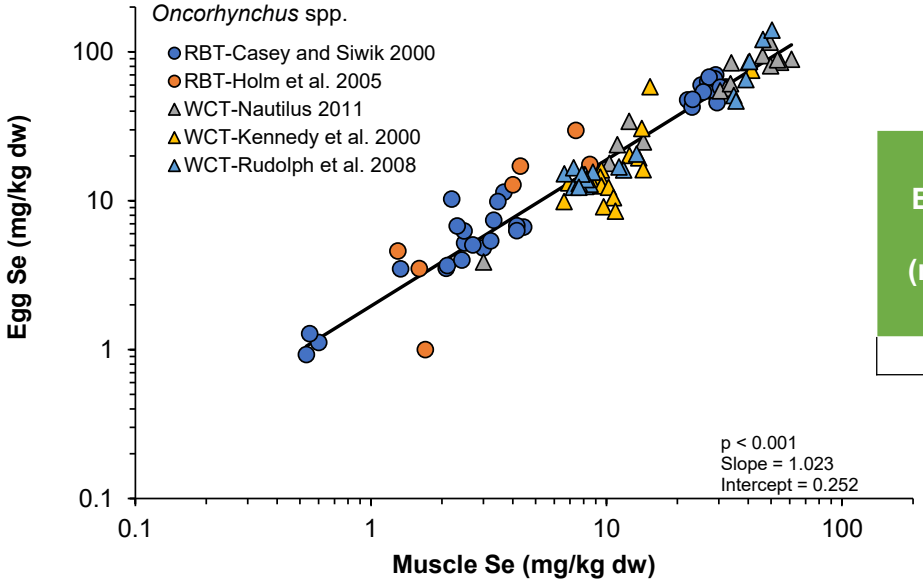
Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-Based CF	WB Se (mg/kg)
24.5	1.96	**12.5**	1.23	**19.9**

Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-Based CF	WB Se (mg/kg)
24.5	1.43	**17.1**	1.46	**16.8**

Two-Step Approach:
Egg → Muscle → Whole-Body

Two-Step Approach: Egg → Muscle

***Oncorhynchus* spp.**

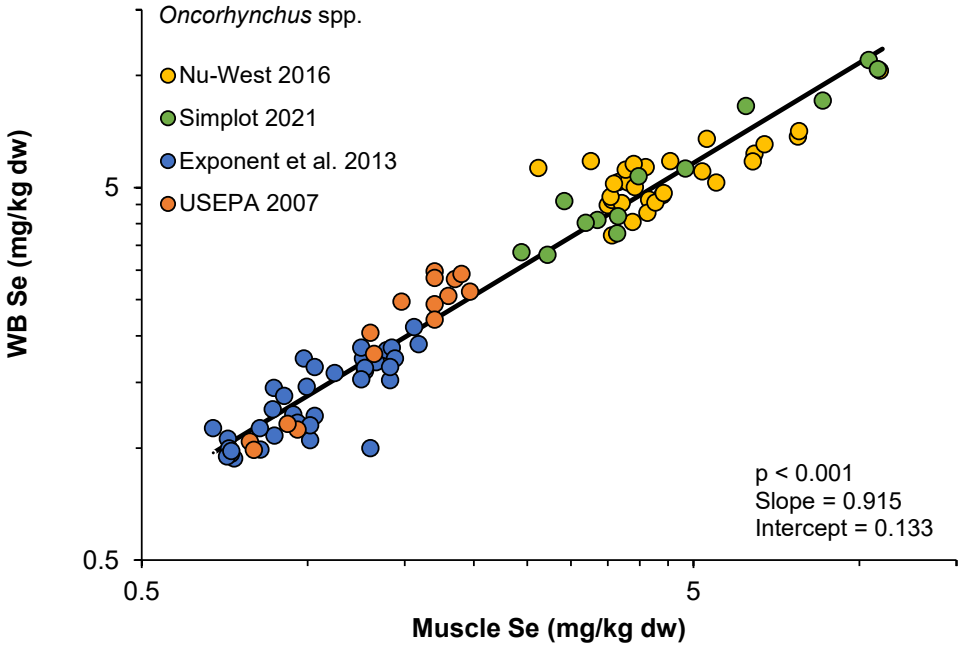


Egg Se SSC (mg/kg)	Median Egg: Muscle Ratio Approach		Regression Approach	
	Median Egg: Muscle Ratio	Muscle Se (mg/kg)	Regression-Based CF	Muscle Se (mg/kg)
24.5	1.83	13.4	1.90	12.9

Comparable to current muscle Se SSC of 12.8 mg/kg

Two-Step Approach: Muscle → Whole-Body

Oncorhynchus spp.

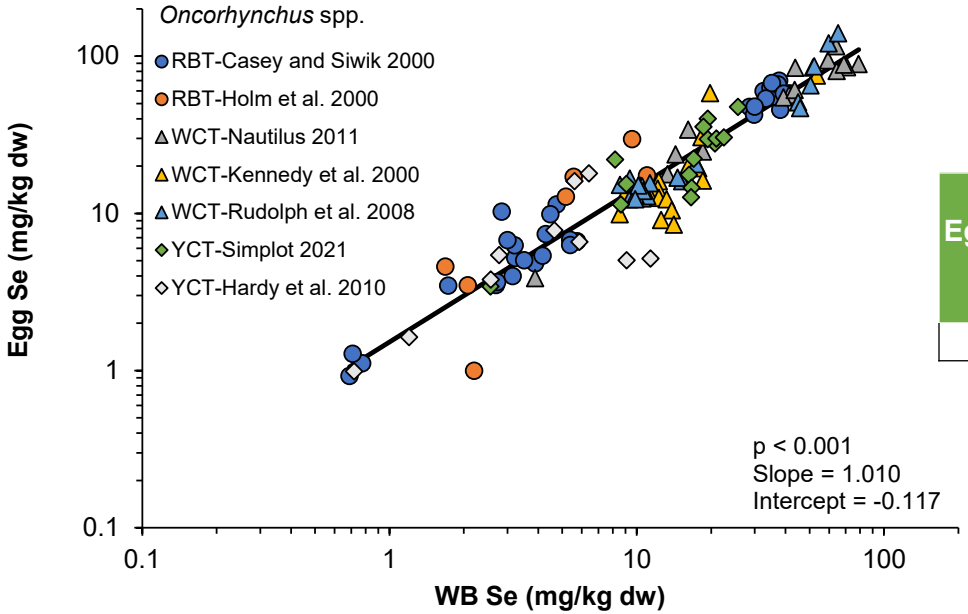


Species	Median Whole-Body: Muscle Ratio	Standard Deviation
Oncorhynchus spp.	1.29	0.23

Includes *n*=30 YCT in the UBR basin

Two-Step Approach: Egg → Muscle → Whole-Body

Oncorhynchus spp.



Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-based CF	WB Se (mg/kg)
24.5	1.41	17.4	1.35	18.2

Summary of *Oncorhynchus* Tissue Conversion Factors

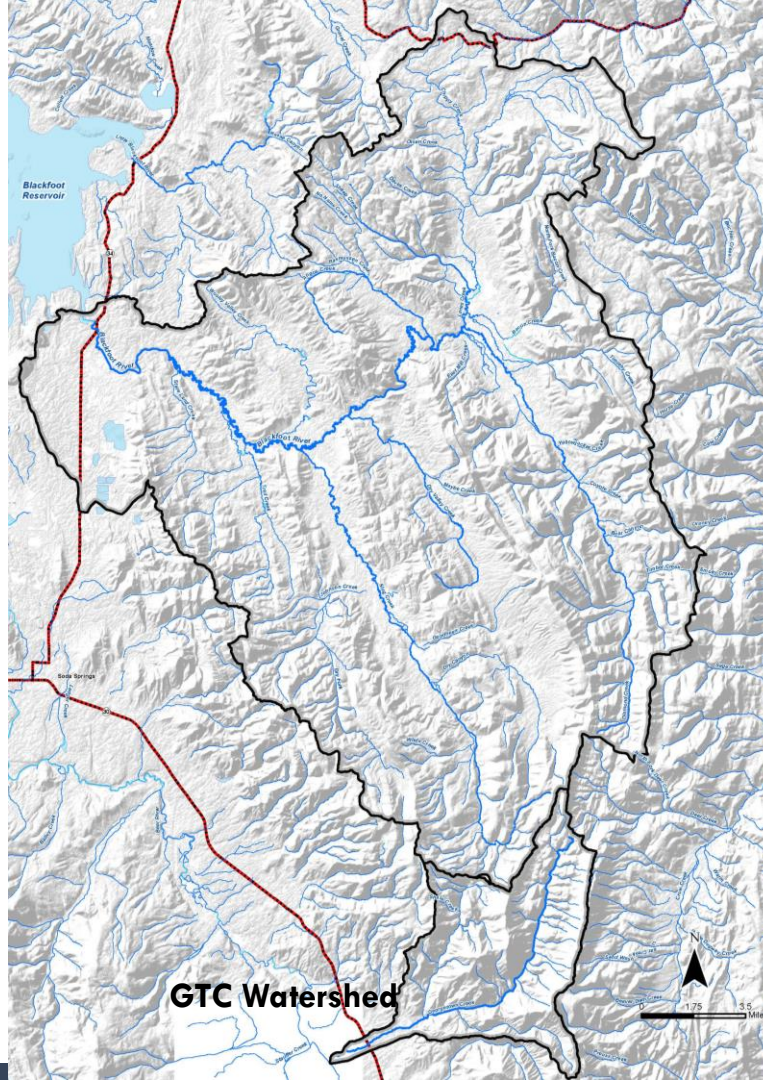
- Excluding hatchery data increases the whole-body value to ~17-18 mg/kg
- The two-step CF method incorporates additional *Oncorhynchus* tissue data and results in whole-body EC10s comparable to those excluding hatchery data
- Using the median ratio approach (as per EPA) we propose a revised whole-body tissue threshold of 17.1 mg/kg dw

Tissue Conversion	Egg Se SSC (mg/kg)	Median Ratio Approach	Regression-Based Approach	Sample Size
		Whole-Body Se (mg/kg)	Whole-Body Se (mg/kg)	
One Step: Egg → WB	*Including Hatchery Samples*			
	24.5	12.5	19.9	*n*=41
	Excluding Hatchery Samples			
	24.5	17.1	16.8	*n*=25
Two Steps: Egg → M → WB	24.5	17.4	18.2	*n*=219

Georgetown Creek Se SSC

Two Resident Families

Family	Genus	Species	Common Name
Salmonidae	*Oncorhynchus*	*O. mykiss*	Rainbow trout
		O. clarkii utah	Bonneville cutthroat
	Salvalinus	*S. fontinalis*	Brook trout
	Salmo	*S. trutta*	Brown trout
Cottidae	*Cottus*	*C.* spp.	--



EPA (2016) Conversion Factors

Brown Trout E/O to WB CF

Regarding hatchery data, EPA (2016) notes:

*The two species with relatively high standard deviations for their CF values (brown trout and cutthroat trout) contained potentially anomalous hatchery data that contributed to the variability (see **Table 3.12** footnote).*

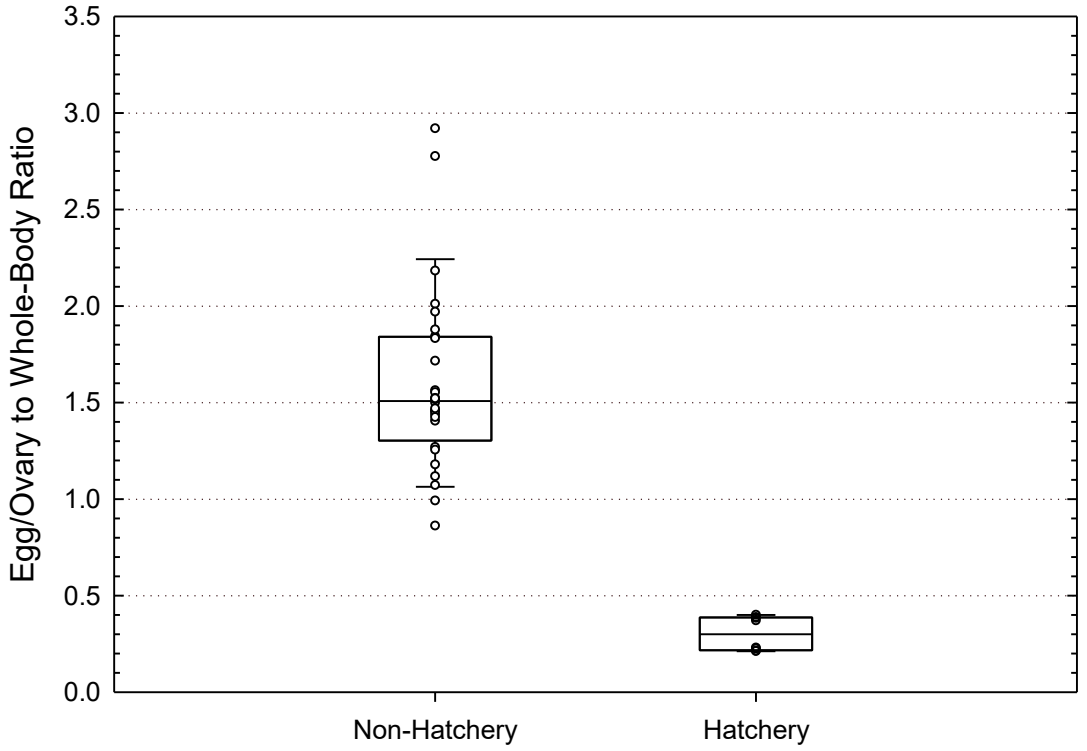
Table 3.12. EPA-derived E/O to WB Conversion Factor Values (EPA 2016).

Common name	Scientific name	CF	*n*	Standard Deviation
Cypriniformes				
Bluehead sucker	*Catostomus discobolus*	1.82	7	0.19
Flannelmouth sucker	*Catostomus latipinnis*	1.41	7	0.20
White sucker	*Catostomus commersonii*	1.38	42	0.36
Desert pupfish	*Cyprinodon macularius*	1.20	6	0.10
Common carp	*Cyprinus carpio*	1.92	5	0.49
Roundtail chub	*Gila robusta*	2.07	7	0.29
Fathead minnow	*Pimephales promelas*	1.40	44	0.75
Creek chub	*Semotilus atromaculatus*	1.99	12	1.00
Perciformes				
Bluegill	*Lepomis macrochirus*	2.13	27	0.68
Green sunfish	*Lepomis cyanellus*	1.45	38	0.23
Smallmouth bass	*Micropterus dolomieu*	1.42	6	0.19
Salmoniformes				
Brown trout	*Salmo trutta*	1.45	38	1.81
Cutthroat trout	*Oncorhynchus clarkii*	1.96	41	2.03

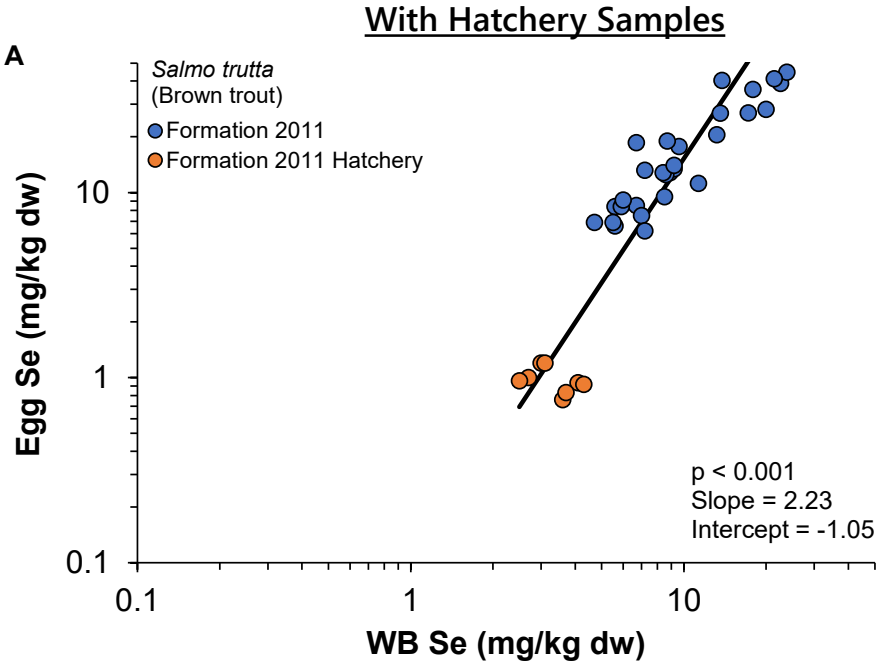
The brown trout data were taken from two studies, NewFields (2009) and Osmundson et al. (2007). CF values for three of the four fish samples from Osmundson et al. were four to six times lower than the median value. Although collectively, the data set meets the criteria for including the brown trout CF, the CF values for Osmundson et al. and NewFields hatchery samples may be anomalously high and low, respectively. Excluding these potentially anomalous data reduces the brown trout standard deviation to 0.47.

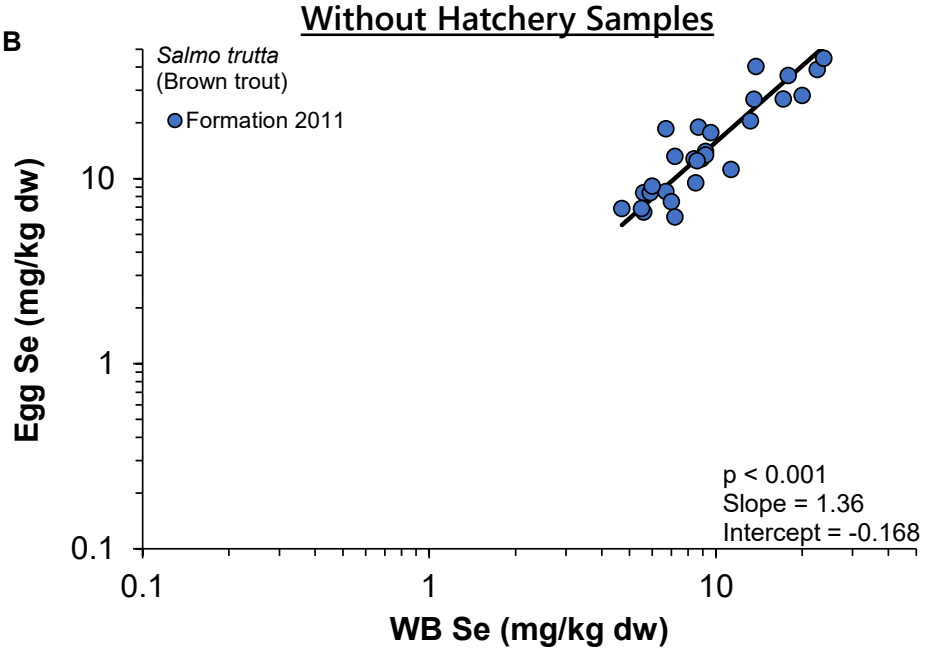
Georgetown Creek Se SSC

- Hatchery fish exhibit a significantly different, whole-body relationship compared to wild fish
- The median egg: whole-body ratio for hatchery samples (0.30) is 5-fold lower and significantly different ($p < 0.001$) than the median ratio for wild samples (1.51).



Georgetown Creek Se SSC – Brown Trout WB





Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-Based CF	WB Se (mg/kg)
21.0	1.45	**14.5**	1.82	**11.5**

Egg Se SSC (mg/kg)	Median Egg: WB Ratio Approach		Regression-Based Approach	
	Median Egg: WB Ratio	WB Se (mg/kg)	Regression-Based CF	WB Se (mg/kg)
21.0	1.51	**13.9**	1.70	**12.4**

Georgetown Creek Se SSC – Brown Trout Muscle

EPA (2016) Brown Trout Muscle Value (18.5 mg/kg)

$$\text{EO/M CF (1.14)} = \frac{\text{Brown Trout EO/WB CF (1.45)}}{\text{“All Fish” M/WB (1.27)}^{a}}$$

$$\text{Brown Trout Muscle (18.5 mg/kg)} = \frac{\text{Brown Trout EO Chronic Value (21 mg/kg)}}{\text{EO/M CF (1.14)}}$$

Table 3.6. Tested Reproductive-Effect Muscle (M) Concentrations Measured Directly or Converted to M Concentrations from Egg-Ovary (EO) Concentrations.

Taxon	EO Chronic Value	EO/M CF	Direct or Calculated Muscle Repro Chronic Value	Direct Calculation or Basis for EO/M CF (from Appendix B)
Salvelinus	56.2	1.26	44.5	Dolly Varden EO/M
Esox	34.0	NA	21.7	Directly determined EC_{24}
Cyprinodon	27.0	0.94	28.7	Desert pupfish EO/WB (1.20) / all fish M/WB (1.27)
O. mykiss	24.5	1.92	12.8	Rainbow trout EO/M
Rudolph et al. 2008	24.7	NA	16.6	Directly calculated EC_{10}
Nautilus 2011	27.7	1.81	15.3	Cutthroat trout EO/M
O. clarkii	26.2	NA	16.0	Geometric mean of two studies
Oncorhynchus	25.3	NA	14.3	Geometric mean of two SMCVs
Micropterus	26.3	1.19	22.2	*Micropterus* EO/M
Salmo	21.0	1.14	18.5	Brown trout EO/WB (1.45) / all fish M/WB (1.27)

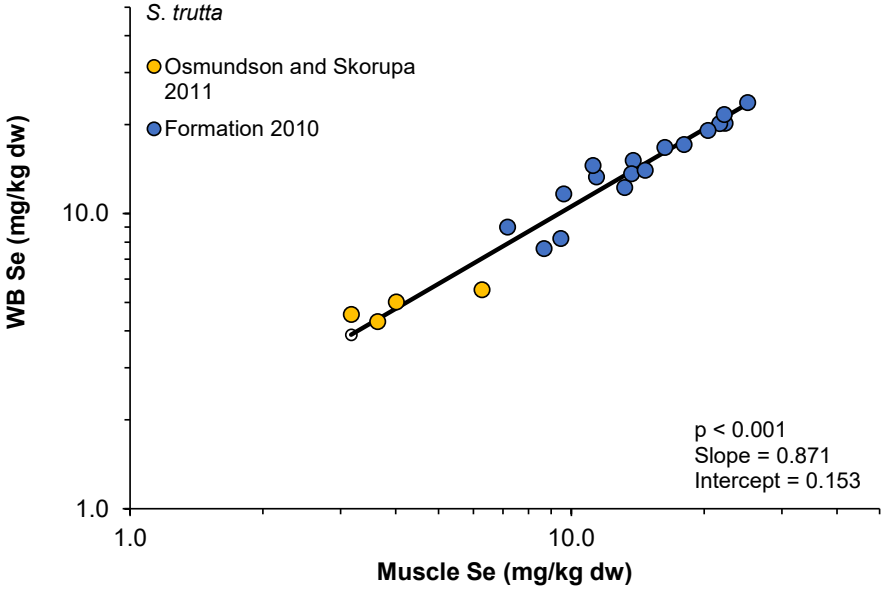
[a] *Median M/WB ratio from eight non-salmonid species with M/WB tissue pairs*

Georgetown Creek Se SSC – Brown Trout Muscle

Re-evaluated Brown Trout Muscle Value (14.3 mg/kg)

$$\text{EO/M CF (1.47)} = \frac{\text{Brown Trout EO/WB CF (1.51)}}{\text{Brown Trout M/WB (1.04)}}$$

$$\text{Brown Trout Muscle (14.3 mg/kg)} = \frac{\text{Brown Trout EO Chronic Value (21 mg/kg)}}{\text{EO/M CF (1.47)}}$$



Georgetown Creek Se SSC – Brown Trout Muscle

Re-evaluated Brown Trout Muscle Value (14.3 mg/kg)

$$\text{EO/M CF (1.47)} = \frac{\text{Brown Trout EO/WB CF (1.51)}}{\text{Brown Trout M/WB (1.04)}}$$

$$\text{Brown Trout Muscle (14.3 mg/kg)} = \frac{\text{Brown Trout EO Chronic Value (21 mg/kg)}}{\text{EO/M CF (1.47)}}$$

Summary of Re-Evaluated Brown Trout Muscle Value

Egg Se SSC (mg Se/kg EO dw)	Median EO/WB CF	Median M/WB CF	Final EO/M CF	Muscle Value (mg Se/ kg dw)
EPA (2016) Egg-to-Muscle (with hatchery fish)				
21.0	1.45	1.27	1.14	18.50
Updated Egg-to-Muscle (excluding hatchery fish, using brown trout M/WB CF)				
21.0	1.51	1.03	1.47	14.28 *

*No updates proposed to the Georgetown Creek SSC because the brown trout reproductive muscle value of 14.3 mg/kg is greater than the current muscle element of 12.8 mg/kg for the resident rainbow trout.

Summary of Updated Se SSC

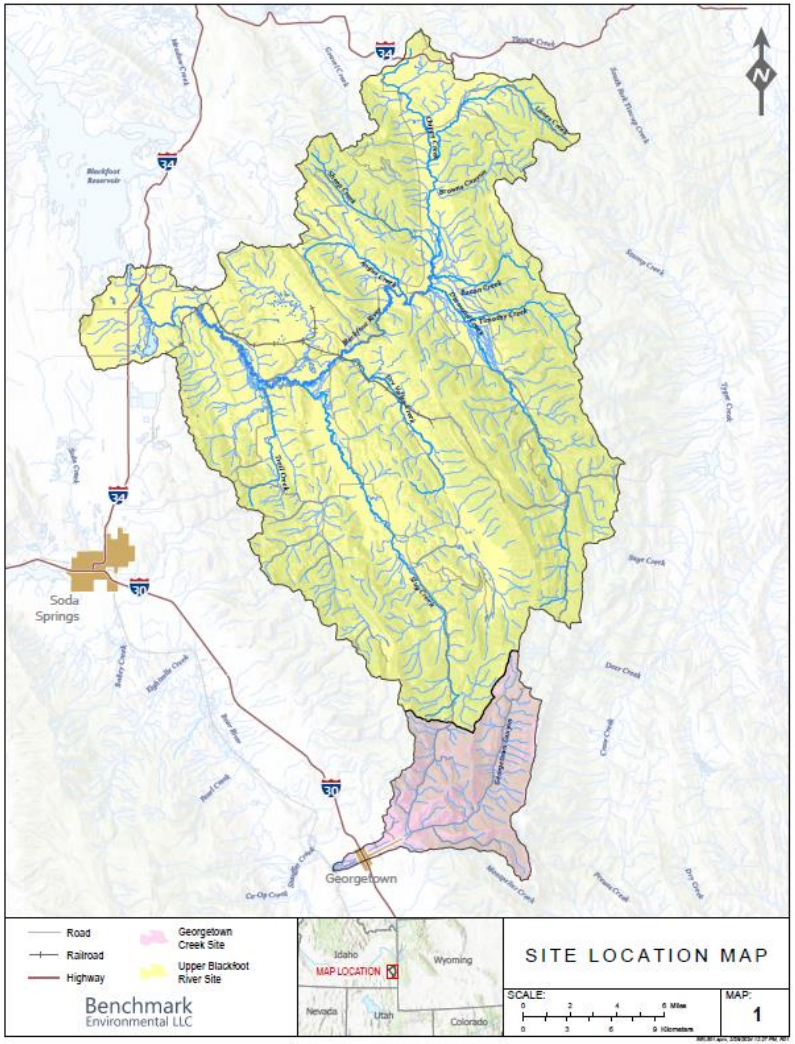
Fish Tissue (mg/kg dw)			Water Column (µg/L)
Egg-Ovary	**Whole-Body**	**Muscle**	**Water Lotic**
No changes 24.5[1], 21.0[2]	Proposed Changes ~~12.5~~ 17.1[1], 13.9[2]	No changes 12.8[1,2]	No changes BAF calculation[3]

Notes:

1. Applicable to the UBR subbasin
2. Applicable to the Georgetown Creek subbasin
3. Water column values are derived using the empirical bioaccumulation factor (BAF) method

- Updated whole-body tissue elements are supported by a more robust, site- and species-specific assessment of tissue-to-tissue conversion factors
- No updates are proposed to other tissue or water-column elements or to Se implementation procedures (i.e., hierarchy of elements, sample sizes, sampling windows, steady-state, etc.)

Questions



Georgetown Creek and Upper Blackfoot

Site- Specific Aquatic Life Criteria for Selenium (IDAPA 58.01.02.287.01)

01. Subsection of Blackfoot Subbasin. Blackfoot River - confluence of Lanes and Diamond Creeks to Blackfoot Reservoir (unit US-10), and all tributaries thereof. Site-specific egg-ovary, whole-body, and muscle criterion elements for these water bodies are set out in the following table. The lentic and short-term exposure water column criterion elements set out in Subsection ~~210.01~~ 287.05.b.~~, table footnote I.~~, are also applicable to the water bodies identified in this subsection.

Chronic			
Egg-Ovary (mg/kg dw)	**Fish Tissue (mg/kg dw)**		**Water Column (µg/L)**
Egg-Ovary	Whole-Body	Muscle	Water Lotic
24.5[1]	~~12.5~~[2]17.1[2]	12.8[2]	11.9[3,4,5]
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter			

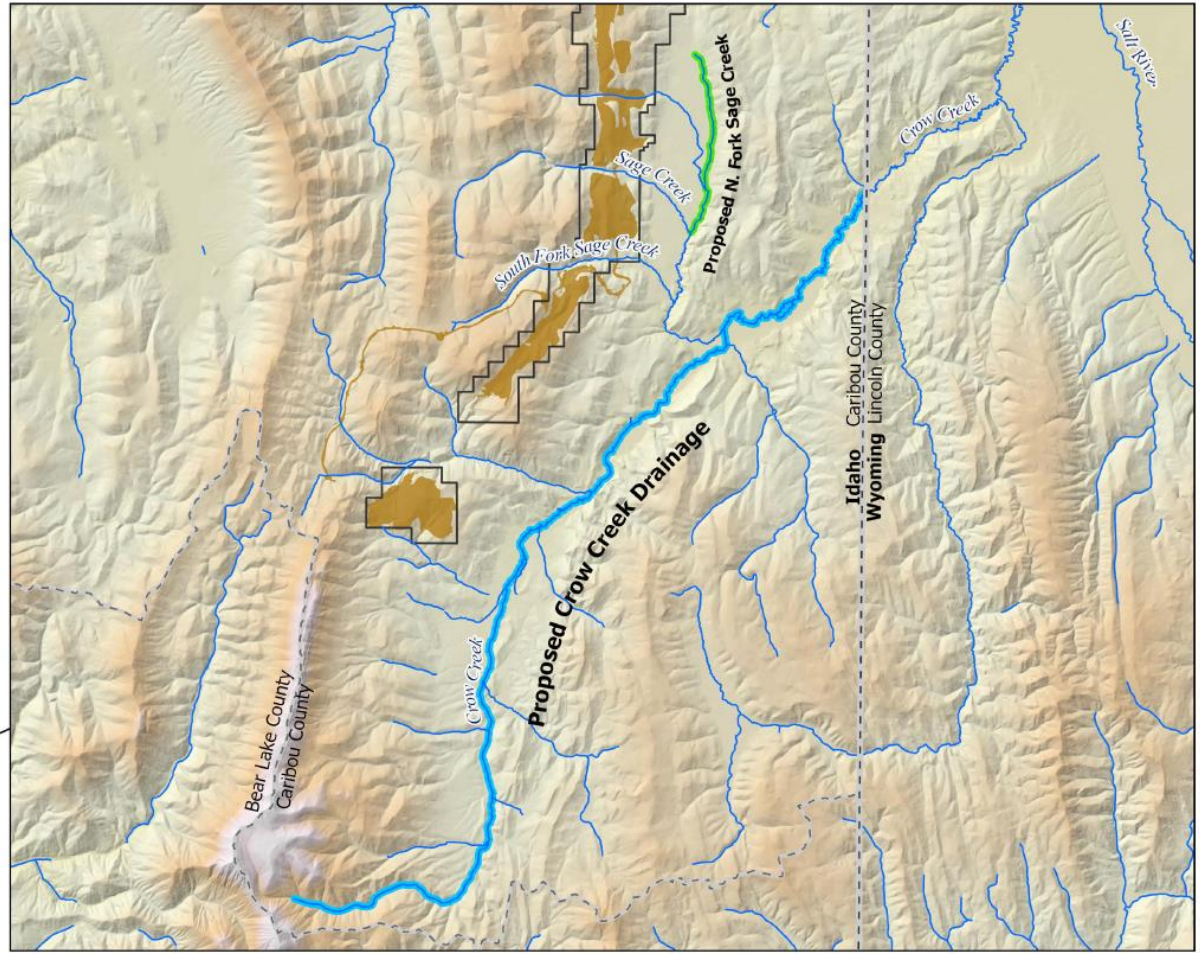
Site- Specific Aquatic Life Criteria for Selenium (IDAPA 58.01.02.287.02)

02. **Subsection of Bear Lake Subbasin**. Georgetown Creek - source to mouth (unit B-22), and all tributaries thereof. Site-specific egg-ovary, whole-body, and muscle criterion elements for these water bodies are set out in the following table. The lentic and short-term water column criterion elements set out in Subsection ~~210.01~~ 287.05.b., ~~table footnote I.~~, are also applicable to the water bodies identified in this subsection.

Chronic			
Egg-Ovary (mg/kg dw)	**Fish Tissue (mg/kg dw)**		**Water Column (µg/L)**
Egg-Ovary	Whole-Body	Muscle	Water Lotic
21.0[1]	~~12.5~~[2] 13.9[2]	12.8[2]	3.8[3,4,5]
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter			

Proposed Site-Specific Criteria - North Fork Sage Creek and Crow Creek Drainage





Site- Specific Aquatic Life Criteria for Selenium (IDAPA 58.01.02.287.XX)

xx. **Subsection of Salt Subbasin —North Fork Sage Creek**. North Fork Sage Creek – source to confluence with Sage Creek and tributaries. Site-specific egg-ovary and whole-body criterion elements for these water bodies are set out in the following table. The muscle, lentic water column, and short-term water column criterion elements set out in Subsection 287.05.b., are also applicable to the water bodies identified in this subsection.

Chronic		
Egg-Ovary (mg/kg dw)	**Fish Tissue (mg/kg dw)**	**Water Column (µg/L)**
Egg-Ovary	Whole-Body	Water Lotic
20.5[1]	13.6[2]	3.94[3,4,5]
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter		

Site- Specific Aquatic Life Criteria for Selenium (IDAPA 58.01.02.287.XX)

xx. **Subsection of Salt Subbasin — Crow Creek**. Upper Crow Creek – Upstream of Sage Creek confluence and tributaries . Site-specific egg-ovary and whole-body criterion elements for these water bodies are set out in the following table. The muscle, lentic water column, and short-term water column criterion elements set out in Subsection 287.05.b., are also applicable to the water bodies identified in this subsection

Chronic		
Egg-Ovary (mg/kg dw)	**Fish Tissue (mg/kg dw)**	**Water Column (µg/L)**
Egg-Ovary	Whole-Body	Water Lotic
20.5[1]	13.6[2]	3.1[2]
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter		

Site- Specific Aquatic Life Criteria for Selenium (IDAPA 58.01.02.287.XX)

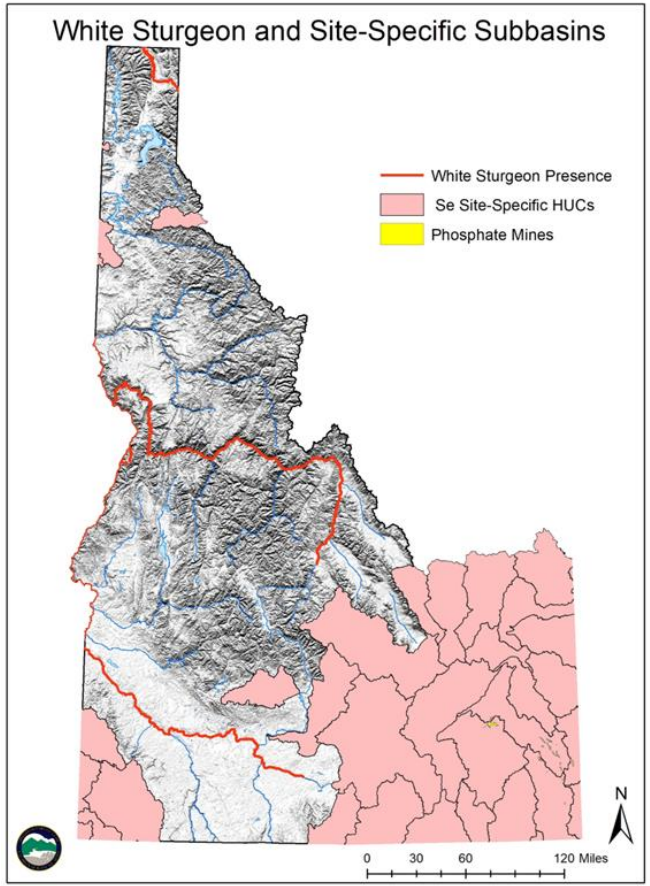
04. Subsection of Salt Subbasin — Crow Creek. Lower Crow Creek – Downstream of Sage Creek confluence to Wyoming state line (US-8). Site-specific egg-ovary and whole-body criterion elements for these water bodies are set out in the following table. The muscle, lentic water column, and short-term water column criterion elements set out in Subsection ~~210.01~~ 287.05.b.~~, table footnote l.~~**,** are also applicable to the water bodies identified in this subsection.

Chronic		
Egg-Ovary (mg/kg dw)	**Fish Tissue (mg/kg dw)**	**Water Column (µg/L)**
Egg-Ovary	Whole-Body	Water Lotic
20.5[1]	~~12.5[2]~~ 13.6[2]	~~4.2[2]~~ 8.8[2]
mg/kg dw – milligrams per kilogram dry weight, µg/L – micrograms per liter		

Footnotes

1. Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured. Single measurement of an average or composite sample of at least five (5) individuals of the same species. Not to be exceeded; DEQ will evaluate all representative egg-ovary data to determine compliance with this criterion element.
2. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured. Single measurement of an average or composite sample of at least five (5) individuals of the same species where the smallest individual is no less than seventy-five percent (75%) of the total length (size) of the largest individual. Not to be exceeded; DEQ will evaluate all representative whole-body and muscle data to determine compliance with this criterion element.
3. Water column values are derived using the empirical BAF method. For comparative purposes only, the example displayed in this table represents the lotic water column value for Georgetown Creek, upstream of the intermittent reach, based on the average BAF for Brook Trout in all sampling locations and years.
4. Lotic Water Column Equation= $\frac{Tissue_{criterion}}{BAF}$ where Tissue criterion is the fish tissue element (whole-body), and BAF is the bioaccumulation factor derived by dividing site-specific field-collected samples of fish tissue (whole-body) by site-specific field-collected samples of water.
5. Water column values are the applicable criterion element in the absence of steady-state condition fish tissue data. In fishless waters, surface water from the fishless waters and fish tissue from the nearest downstream waters are used for bioaccumulation modeling. Fish tissue supersedes any site-specific water column values when fish are sampled downstream of fishless waters.

Summary of criterion comparisons



Selenium Criterion	Chronic				Short-Term
	Fish Tissue (mg/kg dw)		Water Column (µg/L) (30-Day Average)		Water Column (µg/L)
	Egg-Ovary	Whole Body	Water (Lentic)	Water (Lotic)	Water
Statewide	15.1	8.5	1.5	3.1	Intermittent exposure equation
Site-Specific Waters	19.0	9.5	1.5	3.1	Intermittent exposure equation
Upper Blackfoot River	24.5	~~12.5~~ 17.1	1.5	$\frac{Tissue_{criterion}}{BAF}$	Intermittent exposure equation
Bear Lake	21.0	~~12.5~~ 13.9	1.5	$\frac{Tissue_{criterion}}{BAF}$	Intermittent exposure equation
North Fork Sage	20.5	13.6	1.5	3.94	Intermittent exposure equation
Sage Creek	20.5	13.6	1.5	16.7	Intermittent exposure equation
Upper Crow	20.5	13.6	1.5	3.1	Intermittent exposure equation
Lower Crow Creek	20.5	~~12.5~~ 13.6	1.5	~~4.2~~ 8.8	Intermittent exposure equation

Questions?

Thank you

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY