

Appendix H41 –
2012 WVDP ASER Fish Data

Appendix H41: 2012 WVDP Annual Site Environmental Report Fish Data

2012 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek
Cattaraugus Creek above the Springville Dam (BFFCATC)

Species	% Moisture	Sr-90 (μCi/g - dry)		Cs-137 (μCi/g - dry)	
		Result	Error	Result	Error
Hog-nosed Sucker- 9.5"	79.1%	3.78E-08	3.10E-09	5.13E-08	6.06E-08
Hog-nosed Sucker- 10"	80.9%	2.66E-09	2.77E-09	5.00E-09	4.77E-08
Hog-nosed Sucker- 11"	78.1%	2.49E-09	2.21E-09	1.86E-08	7.45E-08
Hog-nosed Sucker- 12"	77.5%	1.52E-09	2.52E-09	1.21E-08	3.11E-08
Hog-nosed Sucker- 12"	78.2%	-6.80E-10	2.35E-09	3.64E-08	3.32E-08
Hog-nosed Sucker- 12"	79.3%	-5.30E-10	2.07E-09	-1.40E-08	5.25E-08
White Sucker- 10"	79.4%	2.83E-08	2.80E-09	-3.60E-08	1.20E-07
White Sucker- 11"	80.1%	2.60E-08	2.70E-09	4.90E-08	1.19E-07
White Sucker- 11"	80.0%	7.10E-09	3.85E-09	3.23E-08	5.22E-08
White Sucker- 11.5"	80.7%	5.90E-10	1.76E-09	9.60E-08	1.23E-07

2012 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek
Cattaraugus Creek below the Springville Dam (BFFCATD)

Species	% Moisture	Sr-90 (μCi/g - dry)		Cs-137 (μCi/g - dry)	
		Result	Error	Result	Error
Steelhead Trout-23"	72.7%	-1.56E-09	2.60E-09	2.85E-08	2.55E-08
Steelhead Trout-26.5"	76.0%	-2.26E-09	2.19E-09	0.00E+00	3.91E-08
Steelhead Trout-24"	75.6%	3.40E-10	2.55E-09	2.30E-08	1.95E-08
Steelhead Trout-22"	75.8%	7.80E-10	2.67E-09	1.28E-08	1.88E-08
Steelhead Trout-21"	74.5%	1.95E-09	2.68E-09	2.63E-08	3.19E-08
Steelhead Trout-25"	73.0%	1.88E-09	3.04E-09	5.00E-10	1.47E-08
Steelhead Trout-16"	71.2%	2.50E-10	2.94E-09	3.47E-08	2.80E-08
Steelhead Trout-17"	72.2%	-1.14E-09	1.94E-09	-6.40E-09	2.41E-08
Steelhead Trout-16"	71.9%	5.70E-10	2.61E-09	5.40E-09	3.02E-08
Steelhead Trout-15.5"	73.9%	1.10E-09	2.14E-09	2.73E-08	2.89E-08

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2012 Radioactivity Concentrations in Edible Portions of Fish From Cattaraugus Creek

Cattaraugus Creek Background (BFFCTRL)

Species	% Moisture	Sr-90 (µCi/g - dry)		Cs-137 (µCi/g - dry)	
		Result	Error	Result	Error
Brown Trout-8.5"	74.5%	6.40E-10	2.82E-09	3.30E-08	1.06E-07
Brown Trout-9"	71.4%	-2.52E-09	2.29E-09	1.34E-08	3.97E-08
Brown Trout-9.5"	77.7%	7.60E-10	2.81E-09	-1.77E-08	5.60E-08
Brown Trout-11"	74.7%	6.10E-10	2.64E-09	1.68E-08	4.21E-08
Brown Trout-11.5"	75.6%	-1.00E-10	2.39E-09	-8.00E-10	4.80E-08
White Sucker-8"	80.4%	7.85E-09	4.26E-09	4.90E-08	1.45E-07
White Sucker-10"	80.2%	1.39E-09	1.91E-09	4.63E-08	8.82E-08
Bullhead-9"	80.4%	1.13E-08	3.60E-09	-4.00E-10	9.72E-08
Hog-nosed Sucker-8"	79.6%	1.60E-08	3.70E-09	8.24E-08	9.85E-08
Hog-nosed Sucker-11"	77.6%	6.39E-09	2.10E-09	-7.60E-09	9.77E-08

Conversion of Sr-90 Concentration for BFFCATC and BFFCATD from per Dry Weight to per Wet Weight

Species	% Moisture	Sr-90 (µCi/g - wet)				
		Result	Error	1 Sigma	Wi	XiWi
Hog-nosed Sucker- 9.5"	79.1%	1.81E-07	1.48E-08	7.42E-09	1.82E+16	3.29E+09
Hog-nosed Sucker- 10"	80.9%	1.39E-08	1.45E-08	7.25E-09	1.90E+16	2.65E+08
Hog-nosed Sucker- 11"	78.1%	1.14E-08	1.01E-08	5.05E-09	3.93E+16	4.47E+08
Hog-nosed Sucker- 12"	77.5%	6.76E-09	1.12E-08	5.60E-09	3.19E+16	2.15E+08
Hog-nosed Sucker- 12"	78.2%	-3.12E-09	1.08E-08	5.39E-09	3.44E+16	-1.07E+08
Hog-nosed Sucker- 12"	79.3%	-2.56E-09	1.00E-08	5.00E-09	4.00E+16	-1.02E+08
White Sucker- 10"	79.4%	1.37E-07	1.36E-08	6.80E-09	2.17E+16	2.97E+09
White Sucker- 11"	80.1%	1.31E-07	1.36E-08	6.78E-09	2.17E+16	2.84E+09
White Sucker- 11"	80.0%	3.55E-08	1.93E-08	9.63E-09	1.08E+16	3.83E+08
White Sucker- 11.5"	80.7%	3.06E-09	9.12E-09	4.56E-09	4.81E+16	1.47E+08
Steelhead Trout-23"	72.7%	-5.71E-09	9.52E-09	4.76E-09	4.41E+16	-2.52E+08
Steelhead Trout-26.5"	76.0%	-9.42E-09	9.13E-09	4.56E-09	4.80E+16	-4.52E+08
Steelhead Trout-24"	75.6%	1.39E-09	1.05E-08	5.23E-09	3.66E+16	5.10E+07
Steelhead Trout-22"	75.8%	3.22E-09	1.10E-08	5.52E-09	3.29E+16	1.06E+08
Steelhead Trout-21"	74.5%	7.65E-09	1.05E-08	5.25E-09	3.62E+16	2.77E+08
Steelhead Trout-25"	73.0%	6.96E-09	1.13E-08	5.63E-09	3.16E+16	2.20E+08
Steelhead Trout-16"	71.2%	8.68E-10	1.02E-08	5.10E-09	3.84E+16	3.33E+07
Steelhead Trout-17"	72.2%	-4.10E-09	6.98E-09	3.49E-09	8.21E+16	-3.37E+08
Steelhead Trout-16"	71.9%	2.03E-09	9.29E-09	4.64E-09	4.64E+16	9.41E+07
Steelhead Trout-15.5"	73.9%	4.21E-09	8.20E-09	4.10E-09	5.95E+16	2.51E+08

Average	Sr-90	1.40E-08	+/-	1.16E-09	µCi/g - wet
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Conversion of Cs-137 Concentration for BFFCATC and BFFCATD from per Dry Weight to per Wet Weight

Species	% Moisture	Cs-137 ($\mu\text{Ci/g}$ - wet)				
		Result	Error	1 Sigma	Wi	XiWi
Hog-nosed Sucker- 9.5"	79.1%	2.45E-07	2.90E-07	1.45E-07	4.76E+13	1.17E+07
Hog-nosed Sucker- 10"	80.9%	2.62E-08	2.50E-07	1.25E-07	6.41E+13	1.68E+06
Hog-nosed Sucker- 11"	78.1%	8.49E-08	3.40E-07	1.70E-07	3.46E+13	2.94E+06
Hog-nosed Sucker- 12"	77.5%	5.38E-08	1.38E-07	6.91E-08	2.09E+14	1.13E+07
Hog-nosed Sucker- 12"	78.2%	1.67E-07	1.52E-07	7.61E-08	1.72E+14	2.88E+07
Hog-nosed Sucker- 12"	79.3%	-6.76E-08	2.54E-07	1.27E-07	6.22E+13	-4.21E+06
White Sucker- 10"	79.4%	-1.75E-07	5.83E-07	2.91E-07	1.18E+13	-2.06E+06
White Sucker- 11"	80.1%	2.46E-07	5.98E-07	2.99E-07	1.12E+13	2.75E+06
White Sucker- 11"	80.0%	1.62E-07	2.61E-07	1.31E-07	5.87E+13	9.48E+06
White Sucker- 11.5"	80.7%	4.97E-07	6.37E-07	3.19E-07	9.85E+12	4.90E+06
Steelhead Trout-23"	72.7%	1.04E-07	9.34E-08	4.67E-08	4.58E+14	4.79E+07
Steelhead Trout-26.5"	76.0%	0.00E+00	1.63E-07	8.15E-08	1.51E+14	0.00E+00
Steelhead Trout-24"	75.6%	9.43E-08	7.99E-08	4.00E-08	6.26E+14	5.90E+07
Steelhead Trout-22"	75.8%	5.29E-08	7.77E-08	3.88E-08	6.63E+14	3.51E+07
Steelhead Trout-21"	74.5%	1.03E-07	1.25E-07	6.25E-08	2.56E+14	2.64E+07
Steelhead Trout-25"	73.0%	1.85E-09	5.44E-08	2.72E-08	1.35E+15	2.50E+06
Steelhead Trout-16"	71.2%	1.20E-07	9.72E-08	4.86E-08	4.23E+14	5.10E+07
Steelhead Trout-17"	72.2%	-2.30E-08	8.67E-08	4.33E-08	5.32E+14	-1.23E+07
Steelhead Trout-16"	71.9%	1.92E-08	1.07E-07	5.37E-08	3.46E+14	6.65E+06
Steelhead Trout-15.5"	73.9%	1.05E-07	1.11E-07	5.54E-08	3.26E+14	3.41E+07

Average	Cs-137	5.46E-08	+/-	1.31E-08	$\mu\text{Ci/g}$ - wet
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Conversion of Sr-90 Concentration for BFFCTRL from per Dry Weight to per Wet Weight

Species	% Moisture	Sr-90 ($\mu\text{Ci/g}$ - wet)				
		Result	Error	1 Sigma	Wi	XiWi
Brown Trout-8.5"	74.5%	2.51E-09	1.11E-08	5.53E-09	3.27E+16	8.21E+07
Brown Trout-9"	71.4%	-8.81E-09	8.01E-09	4.00E-09	6.24E+16	-5.50E+08
Brown Trout-9.5"	77.7%	3.41E-09	1.26E-08	6.30E-09	2.52E+16	8.59E+07
Brown Trout-11"	74.7%	2.41E-09	1.04E-08	5.22E-09	3.67E+16	8.86E+07
Brown Trout-11.5"	75.6%	-4.10E-10	9.80E-09	4.90E-09	4.17E+16	-1.71E+07
White Sucker-8"	80.4%	4.01E-08	2.17E-08	1.09E-08	8.47E+15	3.39E+08
White Sucker-10"	80.2%	7.02E-09	9.65E-09	4.82E-09	4.30E+16	3.02E+08
Bullhead-9"	80.4%	5.77E-08	1.84E-08	9.18E-09	1.19E+16	6.84E+08
Hog-nosed Sucker-8"	79.6%	7.84E-08	1.81E-08	9.07E-09	1.22E+16	9.54E+08
Hog-nosed Sucker-11"	77.6%	2.85E-08	9.38E-09	4.69E-09	4.55E+16	1.30E+09

Average	Sr-90	1.02E-08	+/-	1.77E-09	$\mu\text{Ci/g}$ - wet
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Conversion of Cs-137 Concentration from per Dry Weight to per Wet Weight

Species	% Moisture	Cs-137 ($\mu\text{Ci/g}$ - wet)				
		Result	Error	1 Sigma	Wi	XiWi
Brown Trout-8.5"	74.5%	1.29E-07	4.16E-07	2.08E-07	2.31E+13	3.00E+06
Brown Trout-9"	71.4%	4.69E-08	1.39E-07	6.94E-08	2.08E+14	9.73E+06
Brown Trout-9.5"	77.7%	-7.94E-08	2.51E-07	1.26E-07	6.34E+13	-5.03E+06
Brown Trout-11"	74.7%	6.64E-08	1.66E-07	8.32E-08	1.44E+14	9.59E+06
Brown Trout-11.5"	75.6%	-3.28E-09	1.97E-07	9.84E-08	1.03E+14	-3.39E+05
White Sucker-8"	80.4%	2.50E-07	7.40E-07	3.70E-07	7.31E+12	1.83E+06
White Sucker-10"	80.2%	2.34E-07	4.45E-07	2.23E-07	2.02E+13	4.71E+06
Bullhead-9"	80.4%	-2.04E-09	4.96E-07	2.48E-07	1.63E+13	-3.32E+04
Hog-nosed Sucker-8"	79.6%	4.04E-07	4.83E-07	2.41E-07	1.72E+13	6.93E+06
Hog-nosed Sucker-11"	77.6%	-3.39E-08	4.36E-07	2.18E-07	2.10E+13	-7.13E+05

Average	Cs-137	4.75E-08	+/-	4.00E-08	$\mu\text{Ci/g}$ - wet
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Appendix H41: 2012 WVDP Annual Site Environmental Report Fish Data

Concentrations in Edible Portions of Fish around Springville Dam (BFFCATC + BFFCATD)

Isotope	Average	+/-	1 Sigma	Units
Sr-90	1.40E-08	+/-	1.16E-09	μCi/g - wet
Cs-137	5.46E-08	+/-	1.31E-08	μCi/g - wet

Background Concentrations in Edible Portions of Fish (BFFCTRL)

Isotope	Average	+/-	1 Sigma	Units
Sr-90	1.02E-08	+/-	1.77E-09	μCi/g - wet
Cs-137	4.75E-08	+/-	4.00E-08	μCi/g - wet

Net Concentrations in Edible Portions of Fish

Isotope	Flesh	Units
Sr-90	3.74E-09	μCi/g - wet
Cs-137	7.08E-09	μCi/g - wet

1	kg	=	1000	g
9	kg/year	=	9000	g/year

Intake Rates for Edible Portions of Fish

Isotope	Intake	Units
Sr-90	3.37E-05	μCi/year
Cs-137	6.37E-05	μCi/year

Ingestion dose coefficients (mrem / μCi) from ICRP 68

Isotope	f1	DCF	Units
Sr-90	0.3	1.04E+02	mrem/μCi Ing
Sr-90	0.01	1.00E+01	mrem/μCi Ing
Cs-137	1	4.81E+01	mrem/μCi Ing

Dose Rates for Edible Portions of Fish

Isotope	Avg Dose	Units
Sr-90	3.49E-03	mrem/year
Cs-137	3.07E-03	mrem/year
Total	6.56E-03	mrem/year