2010 Missouri River – Holter Dam Tailwater Monitoring

Status Report for PPL-Montana
FERC Project 2188

Prepared by

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In 2010 Montana Fish, Wildlife & Parks received $20,029 from PPL-Montana for monitoring the Missouri River fishery below Holter Dam as part of FERC project 2188.

Missouri River trout populations

Two sections of the Missouri River downstream from Holter Dam were electrofished at night using aluminum jet boats. The Craig section is 5.6 miles long and located from river mile (Rm) 2.5 and 8.1. The Cascade section is 4.1 miles long and is located from Rm 24.2 to 28.3. Jet propelled boats were equipped with headlights and fixed boom-type electrofishing systems using stainless steel cable droppers suspended from each boom. Electricity from 240-VAC generators was converted to smooth DC using Coffelt or Smith-Root rectifying units. Brown trout estimates were conducted in each section during the first and third weeks of May each year and two jet boats were used in the Craig section, but only one boat was used in the Cascade section. Rainbow trout estimates were conducted in October and two boats were used in each section. Data are analyzed using the MFWP FA+ statistical software (Montana Fish, Wildlife & Parks (MFWP), 2004). Population estimates are calculated using the Log-liklihood or modified Petersen's methods. Estimates are calculated using 0.05 significance level. In 2010, rainbow trout ($\geq$ 10 inches) in the Missouri River Craig section were estimated at 2,818 per mile, which was 96% of the long-term average for this species in this section (Figure 1). Brown trout ($\geq$ 10 inches) in this section were estimated at 569 per mile, which was 101% of the long term average. In the Cascade section rainbow trout were estimated at 1,706 per mile which was 113% of the long term average and brown trout were estimated at 482 per mile which is 135% of the long term average (Figure 2).

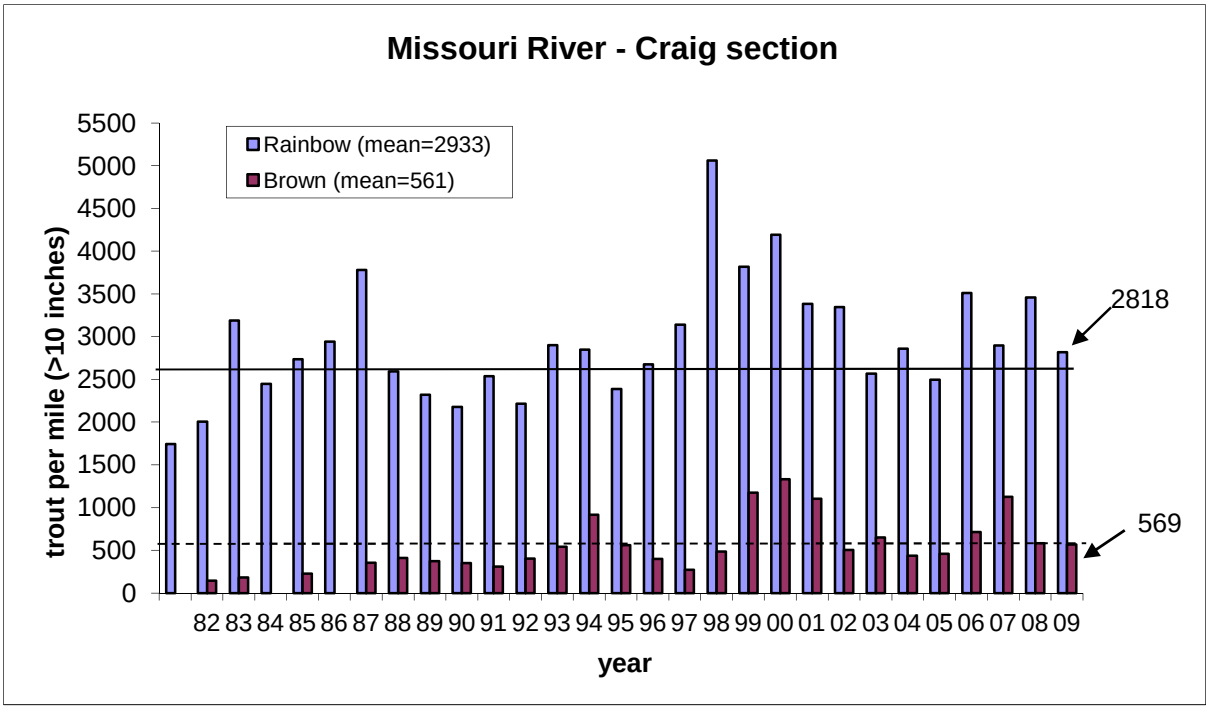

Figure 1. Estimated number of rainbow and brown trout greater than 10 inches per mile in the Craig section of the Missouri River 1982-2010 (solid line is long-term rainbow mean, dashed line is long-term brown mean).

The proportions of rainbow trout and brown trout in both monitoring sections is consistent with recent years with rainbows representing 86% and browns representing 14% of the trout population in the Craig section. In the Cascade section rainbows represented 72% and browns represented 28% of the trout population.

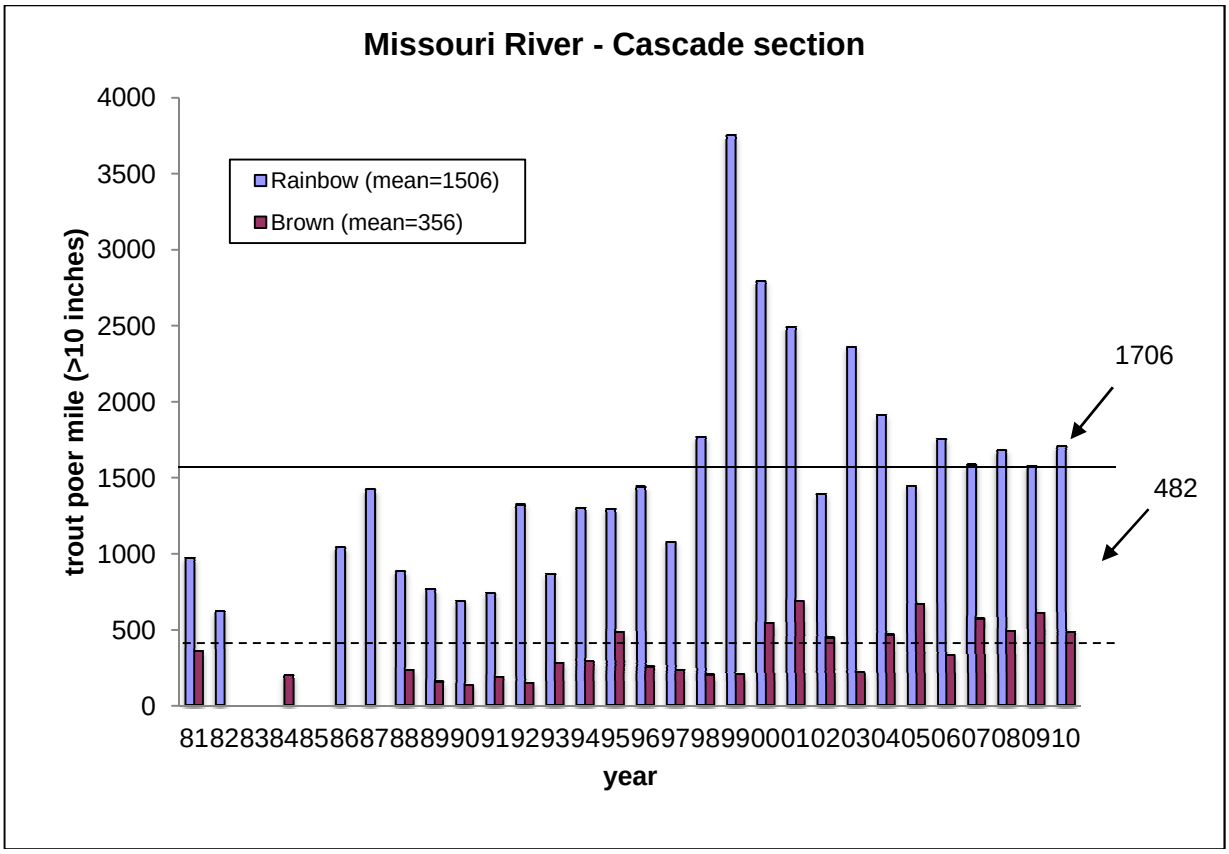

Figure 2. Estimated number of rainbow and brown trout greater than 10 inches per mile in the Cascade section of the Missouri River 1981-2010 (solid line is long-term rainbow mean, dashed line is long-term brown mean).

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Water flow

For the 2010 calendar year the Missouri River below Holter Dam had a mean discharge of 5681 cfs, which was 106% of the 64 year mean ($\bar{x}$=5331 [3120-8493]) (Figure 4). The maximum discharge in 2010 was 18,800 cfs, which occurred on June 18 (Figure 5, Table 1). There were 44 days in 2010 (from June 6 to July 18) where the river discharge was sustained above 6000 cfs.

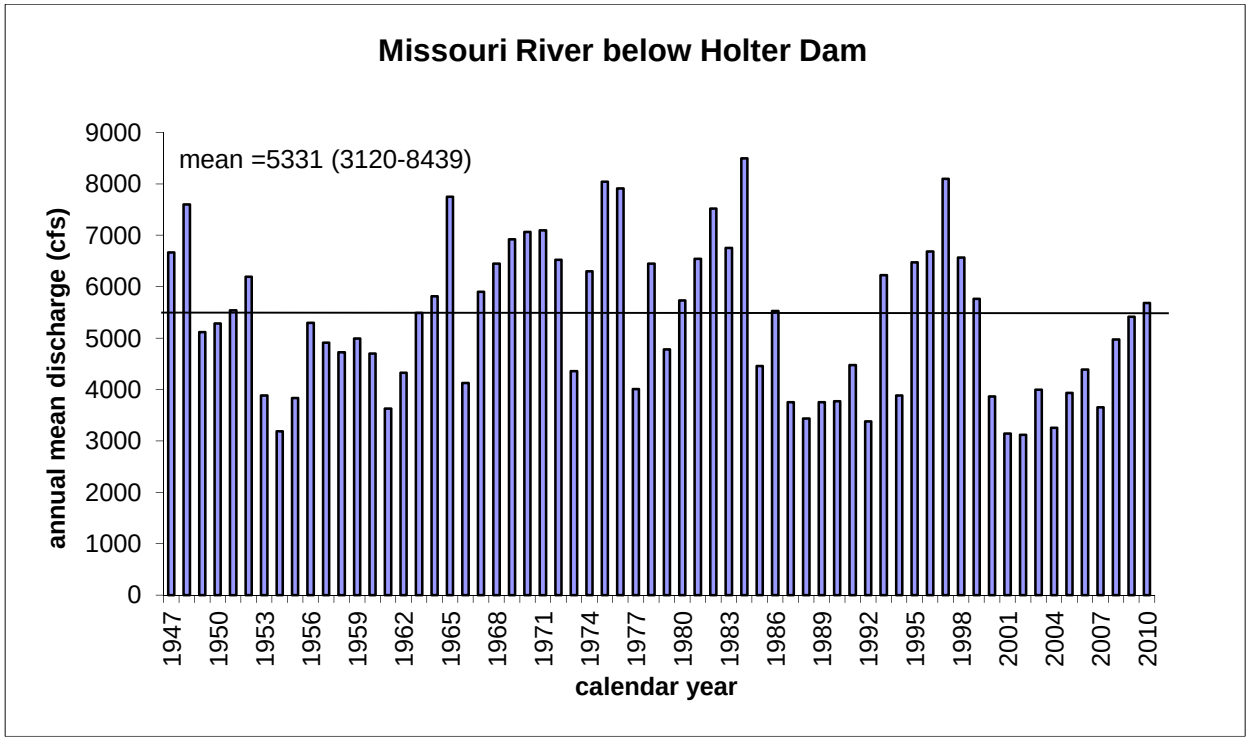


Figure 3. Mean annual flow for Missouri River below Holter Dam, 1947-2010.

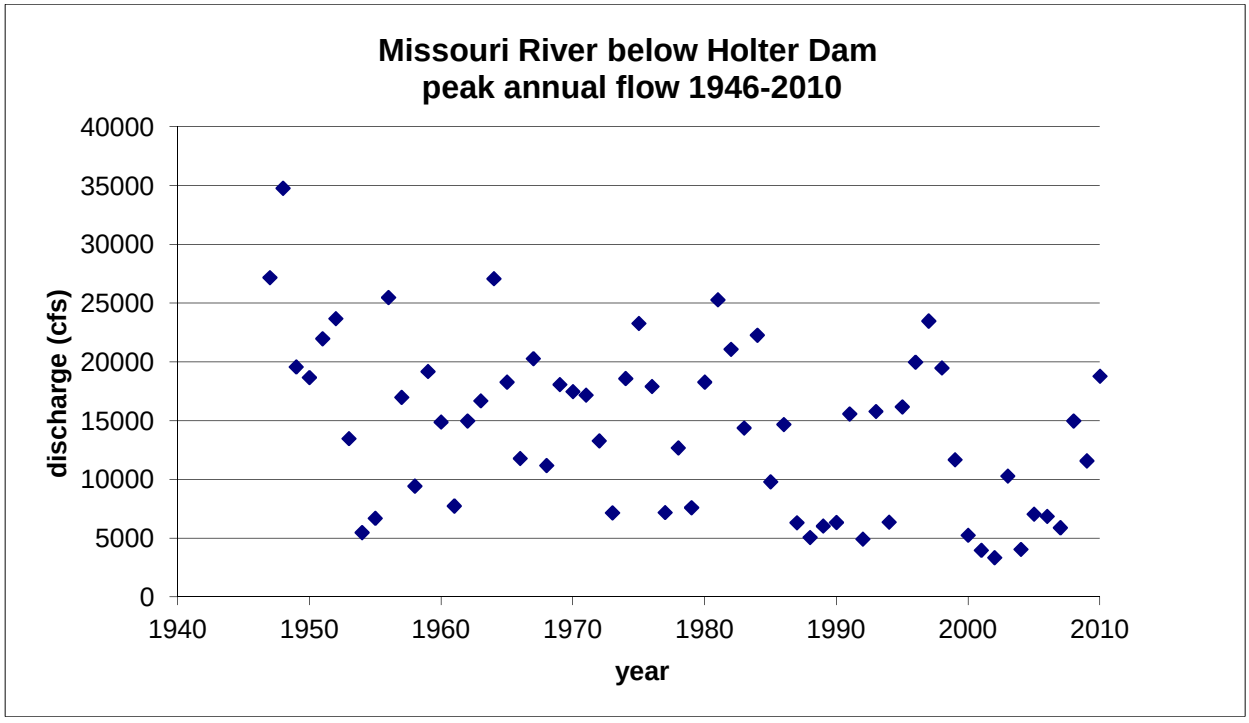


Figure 4. Maximum annual flow for the Missouri River below Holter Dam, 1946-2010.

Water temperature

When monitoring water temperature of the Missouri River, regional personnel rely on the information provided from the USGS gauging stations as the 'first line' of notification. When temperature reaches the critical threshold of 70°F, we switch to data monitored by several thermographs located at strategic locations in each the Missouri, Smith, Sun and Dearborn rivers. These thermographs are used in making management decisions that could include providing recommendations to the regional Fish, Wildlife & Parks Commissioner to institute time of day angling restrictions of certain fisheries to reduce stress from angling on the trout populations. It is the policy of MFWP to request such closures when "…daily maximum water temperature reaches or exceeds 73° F (23° C) for at least some period of time during three consecutive days…"

In 2010 the USGS Wolf Creek Bridge site below Holter Dam recorded a maximum daily temperature of 67°F on August 6 and 11 (Table 1). Fortunately, the relatively mild water temperatures in 2010 did not warrant recommending angling restrictions on this valuable fishery.

Table 1. River flow (cfs) and temperature (°F) recorded at USGS station 06066500 (Missouri River below Holter Dam near Wolf Creek, Montana) for the calendar year 2010.

		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Missouri flow 2010	Mean	4450	4140	4040	4320	4220	13900	8830	4540	4440	4480	5190	5680
	Minimum	4130	3900	3900	4170	3830	4630	4210	4150	4280	4070	4690	5490
	Maximum	4920	4310	4180	4540	4690	18800	16000	5060	4590	4880	5710	6040
		Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Missouri temp 2010	Mean	34.6	34.6	37.2	42.1	47.5	53.7	61.6	63.5	59.5	56.7	46.7	35.1
	Minimum	33.8	33.8	34.7	40.1	43.7	48.2	59.0	60.8	58.1	52.7	35.6	32.9
	Maximum	35.6	35.6	41.0	48.2	53.6	60.8	66.2	67.1	62.6	59.9	52.7	36.5

In fall 2010, regional MFWP staff received numerous reports of hundreds of dead brown trout in Little Prickly Pear Creek and Sheep Creek with "white cotton-like" growth. Further investigations revealed that the numbers of dead fish were exaggerated. During redd counts on Sheep Creek, one MFWP fishery worker observed 15 dead brown trout in a pool near the mouth. Another fishery worker observed 21 dead brown trout in the first 4.7 miles of Little Prickly Pear Creek. Additionally, during helicopter redd counts on the Missouri River, 18 dead brown trout were observed between Holter Dam and Pelican Point FAS. An analysis of the data showed water temperatures were elevated 2.59°F higher than the 10-year mean between October 8-19 and from November 4-20 it was elevated 3.34°F higher than the mean (Figure 5). On this basis, it was clear that *Saprolegnia* fungus, a commonly occurring fungus in the Missouri River, was expressed at higher than normal levels due to prolonged higher than normal water temperatures observed during the brown trout spawning season.

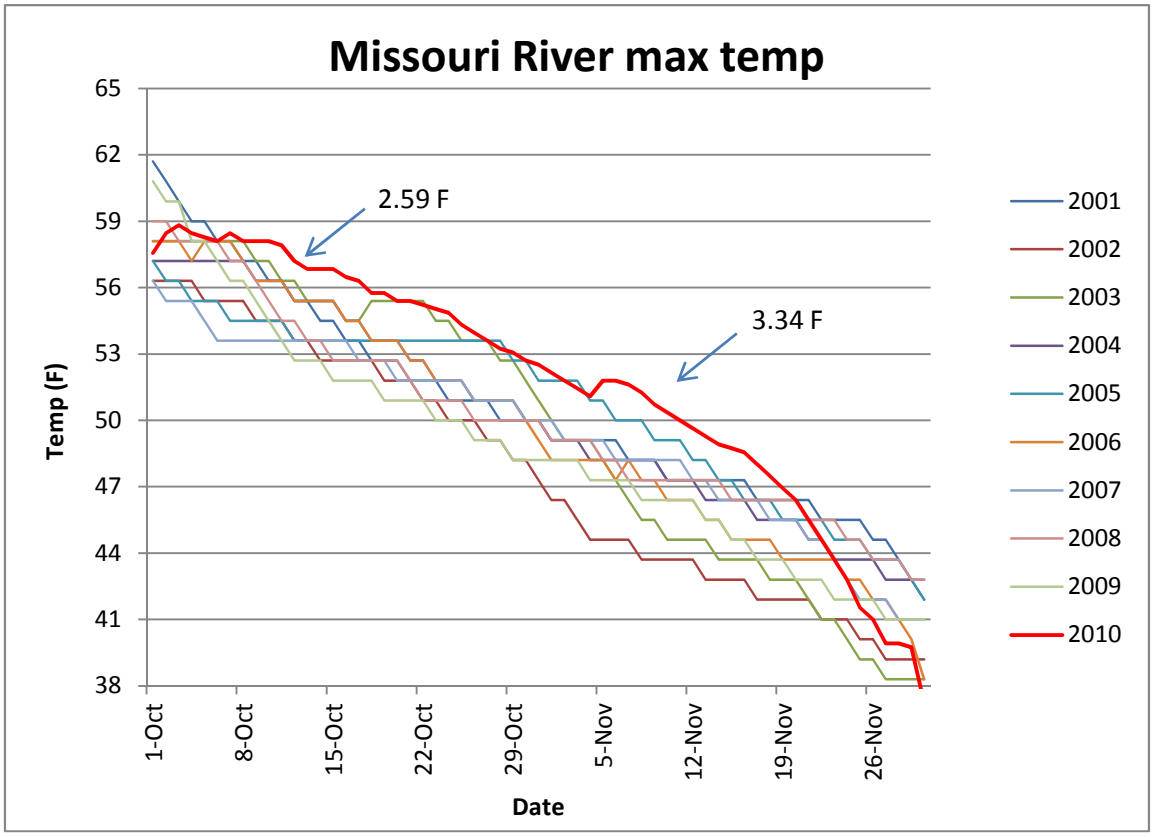


Figure 5. Maximum daily water temperature of the Missouri River below Holter Dam from October 1 through November 31, 2001-2010.

Missouri River YOY walleye survey

In 2010 we conducted the second year of YOY walleye sampling in the Missouri River. We standardized the sampling sites based on the results of the 2009 survey and added sites 5, 6, 8, 9 and 12 (Table 2). The protocol involved using a 4 foot tall x 25 foot long x 1/4 inch mesh common sense minnow seine and conducting 4 seine hauls at each site. We conducted total counts of fish species up to 500 individuals, and for numbers greater than 500, we estimated the total number by species.

In 2010, YOY walleye were distributed in select backwater areas over a 26.1 mile reach from the Cascade boat ramp to about 3 miles downstream of the Smith River mouth (Table 2). Walleye were most abundant in Little Muddy Creek mouth. We sampled 18 species of fish in 2010 compared to 12 species in 2009. We sampled YOY kokanee at sites # 2 and #8. Discussions with the Helena area biologist indicate kokanee were not stocked in 2010, which indicates these were likely wild kokanee produced by an increasing Holter Lake population, which likely spilled over Holter Dam during the high spring water flow.

Table 2. Walleye YOY seine survey sites and results, Missouri River, Montana.

Site	name	RM	2009 # of walleye	2010 # of walleye	Other species sampled in 2010
1	Cascade ramp	35.5	2	2	sucker, carp, creek chub, brown trout, rainbow trout, pumpkinseed sunfish, yellow perch, northern redbelly dace
2	Below Wing Dam	36.9	4	1	Spottail shiner, emerald shiner, kokanee, pumpkinseed sunfish, fathead minnow, sucker, carp, creek chub
3	Bird Creek mouth	41.4	85	11	Carp, yellow perch, spottail shiner, sucker, creek chub, emerald shiner, black crappie
4	Little Muddy ck mouth	43.2	118	179	Yellow perch, spottail shiner, pumpkinseed sunfish, emerald shiner, sucker, carp, longnose dace, northern redbelly dace, creek chub
5	Castner Coulee	50.7	---	2	Yellow perch, brown trout, golden shiner, spottail shiner, longnose dace, carp, sucker, fathead minnow, creek chub
6	Below Dunes FAS	54.2	---	14	Yellow perch, spottail shiner, fathead minnow, golden shiner, sucker, creek schub
7	0.5 mile into Smith R.	S-0.5	2	0	Spottail shiner, carp, sucker, pumpkinseed sunfish
8	Lord Ranch pt. Below Smith	57.4	---	11	Kokanee, fathead minnow, carp, spottail shiner, pumpkinseed sunfish, sucker, flathead chub
9	Lower Lord Ranch point	61.6	---	15	Yellow perch, carp, flathead chub, spottail shiner, golden shiner, sucker
10	Across from Woodland Est	69.4	0	0	Stickleback, carp, spottail shiner, sucker, yellow perch
11	Across From Big Bend FAS	75.2	2	0	Sucker, carp, stickleback, spottail shiner, golden shiner, fathead minnow, flathead chub
12	Sand Coulee Creek mouth	81.3	---	0	Yellow perch, sucker, pumpkinseed sunfish, golden shiner, carp, spottail shiner, northern redbelly dace

Rainbow trout age structure

In 2010, regional fishery personnel updated historic records of trout age data from 1981 through 2010. Calculations of mean length at age of rainbow trout in the Craig section over this time frame was; Age 0=6.1 inches (4.0-7.6), Age 1= 9.6 inches (6.3-13.0), Age 2=13.4 inches (8.8-16.7), Age 3=16.7 inches (13.1-19.8), Age 4=18.7 inches (16.2-21.1) and, Age 5=19.8 inches (18.6-21.0) (Figure 6). In the

Cascade section mean length at age was; Age 0=6.2 inches (4.8-7.4), Age 1= 9.3 inches (6.4-12.2), Age 2=13.3 inches (9.4-16.4), Age 3=16.5 inches (13.2-19.3), Age 4=18.3 inches (16.3-20.3) and, Age 5=19.4 inches (18.1-21.3) (Figure 7).

In 1988 and 1989 rainbow trout ages 2 and 3 years in the Craig section showed an increase in mean length at age, respectively (Appendix A). For rainbow trout ages 4 and 5 year old, a similar shift was observed in 1993 and 1992, respectively. Observations of these data over the period of record showed a noticeable increase in mean rainbow trout lengths that has been sustained in fish aged 2 years and older.

In the Cascade section, mean rainbow trout length at age showed predictable pattern of fluctuating annual values near the mean for each age group over the period of record, but not noticeable trends were observed (Appendix A).

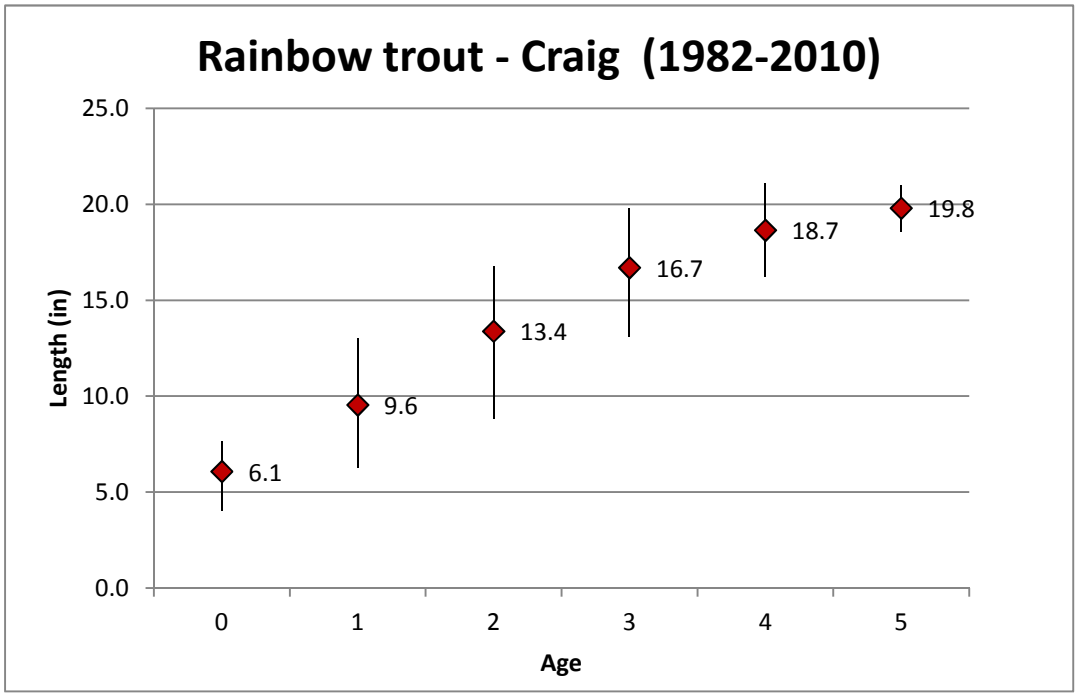


Figure 6. Mean length at age for Missouri River rainbow trout from the Craig section.

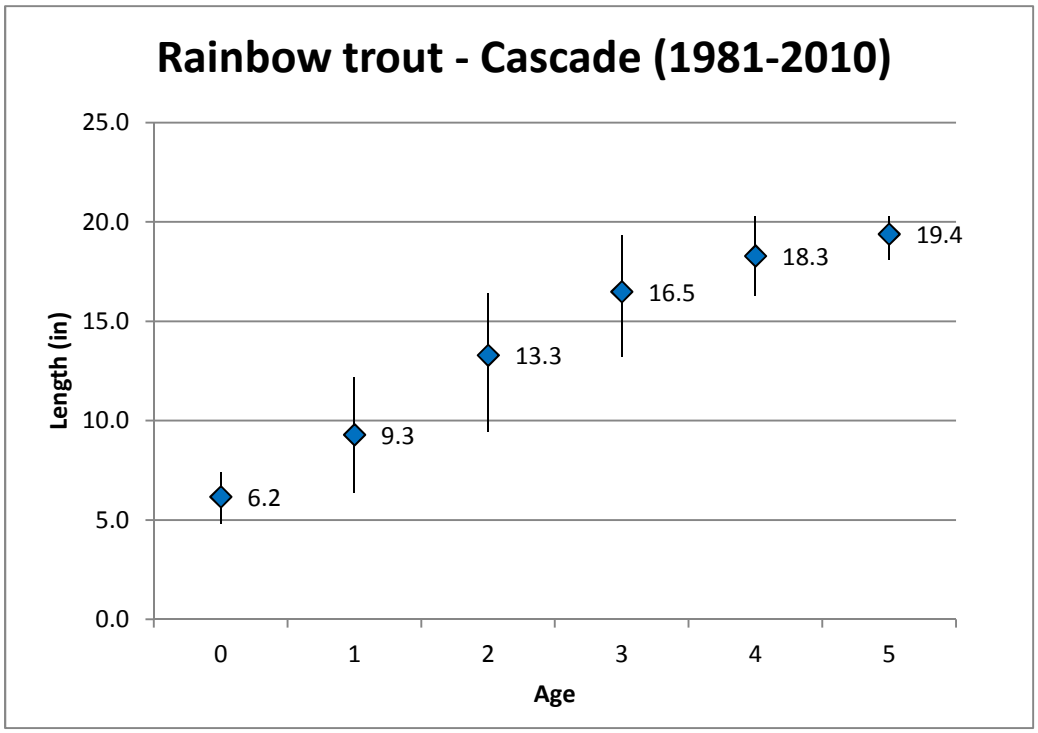


Figure 7. Mean length at age for Missouri River rainbow trout from the Cascade section.

The mean length at age for brown trout in the Craig section was Age 1=6.7 inches (4.6-8.4), Age 2= 11.3 inches (6.7-15.0), Age 3=15.5 inches (11.2-19.0), Age 4=18.6 inches (15.0-21.6), Age 5=20.6 inches (18.0-22.8) and, Age 6=22.5 inches (20.6-23.7) (Figure 8). In the Cascade section, mean length at age was: Age 1=6.6 inches (5.0-8.0), Age 2= 12.0 inches (7.6-14.7), Age 3=15.5 inches (11.6-18.9), Age 4=18.4 inches (14.9-21.6), Age 5=20.5 inches (18.3-23.3) and, Age 6=22.1 inches (20.3-23.3) (Figure 9).

In the Craig section, ageing patterns for brown trout showed subtle increases in mean length at age for ages 3, 4 and 5 near the 1998-99 period, but most increases were only slightly over the mean values for these age groups (Appendix A).

In the Cascade section, Age 3 brown trout were the only group that showed a discernible, but small, change in mean length at age over the period of record. This age group reached its maximum length at age in 1991 and in 2000 (Appendix A).

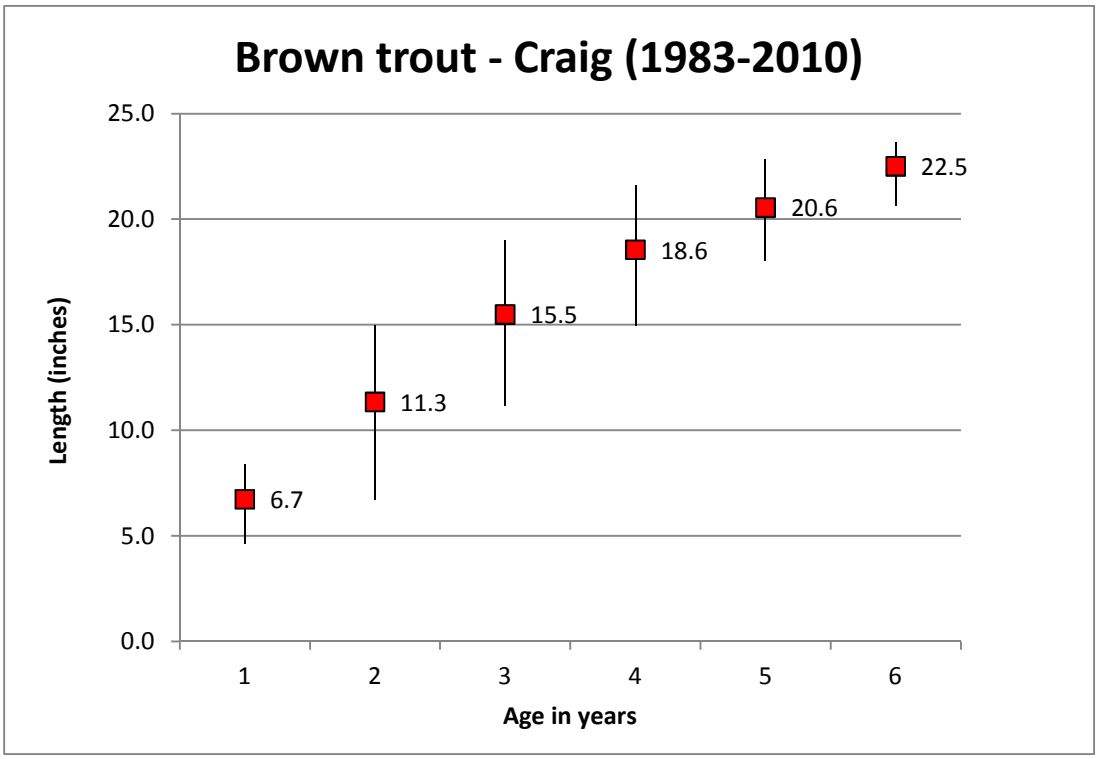


Figure 8. Mean length at age for Missouri River brown trout from the Craig section.

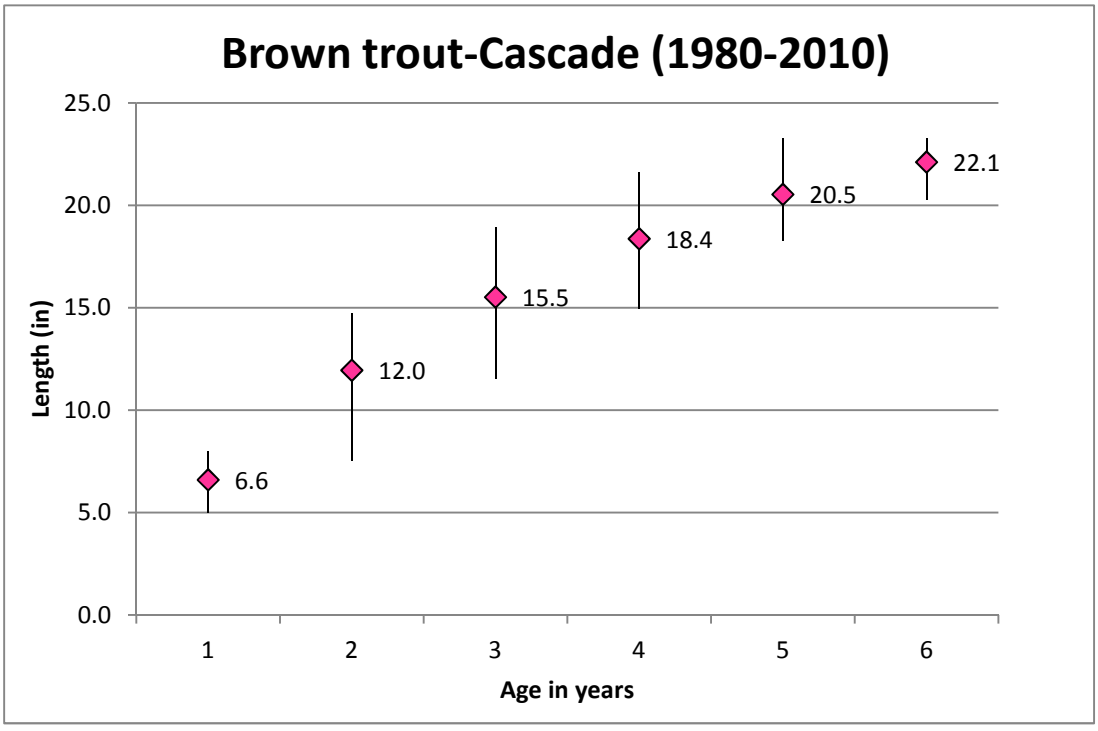


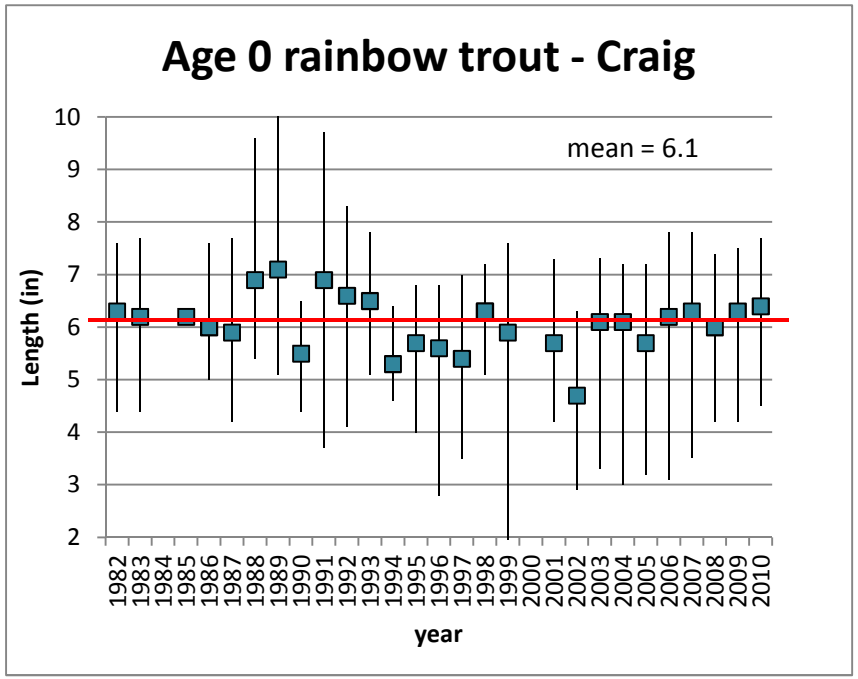
Figure 9. Mean length at age for Missouri River brown trout from the Cascade section.

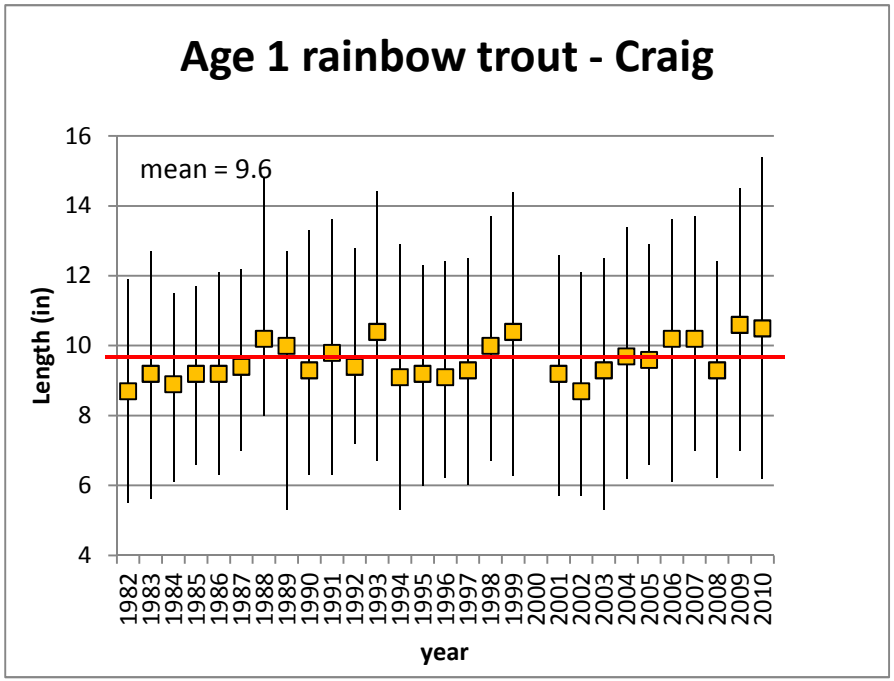
Submitted by; Grant Grisak December 10, 2011

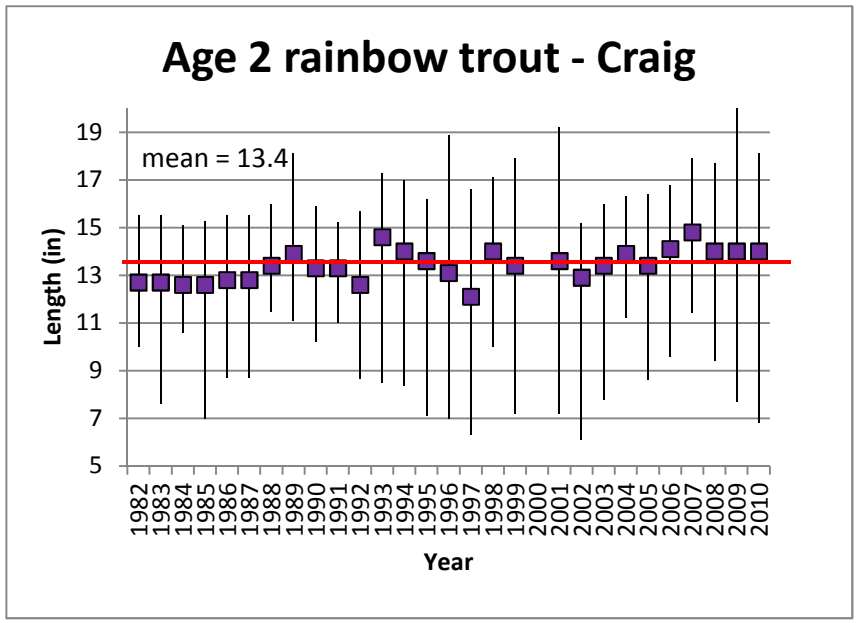
REFERENCES

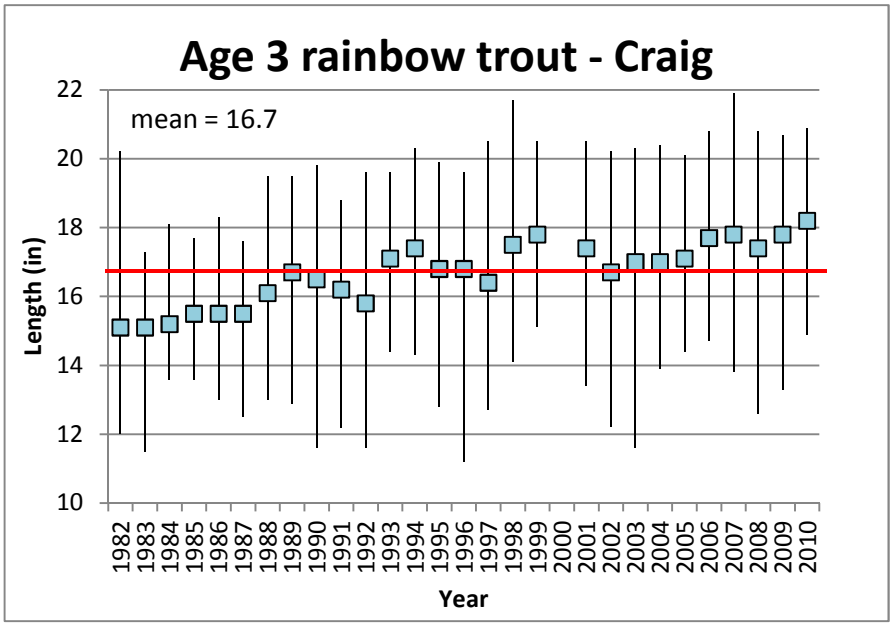
Montana Fish, Wildlife & Parks. 2004. Fisheries analysis + program. Version 02152005-VB6-A2K-CR85. Montana Fish, Wildlife & Parks, Bozeman, MT.

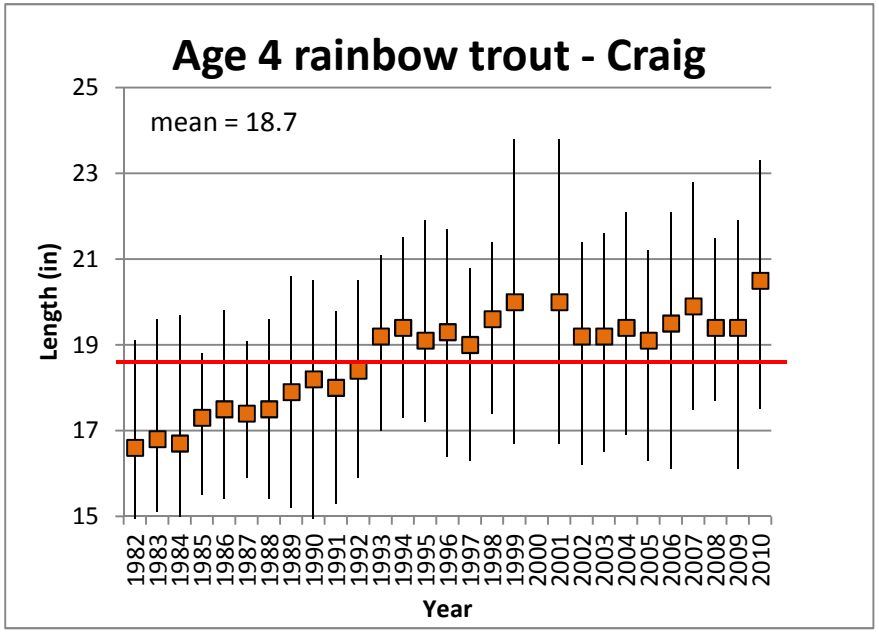
Appendix A

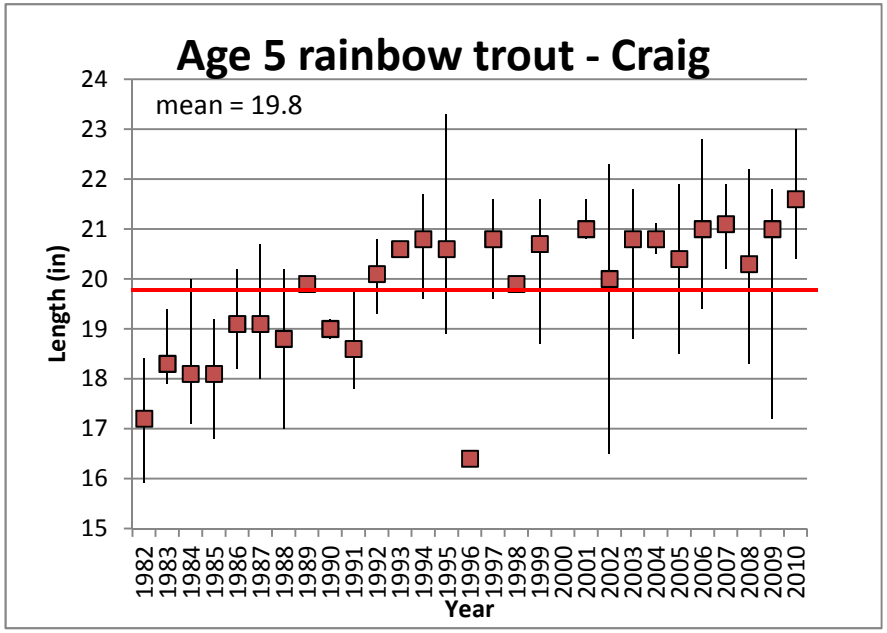

Age 0 rainbow trout - Craig
mean = 6.1
Length (in)
year

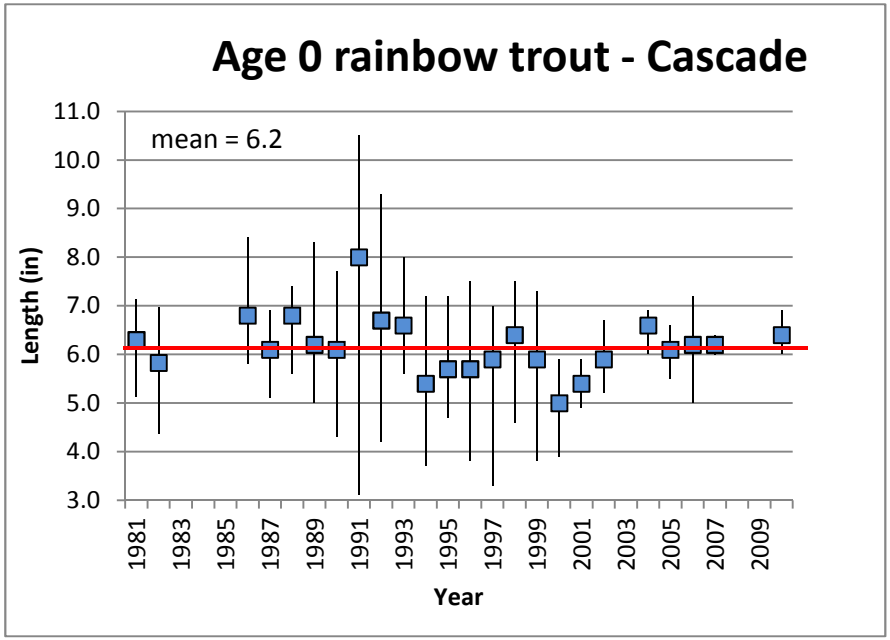

Age 1 rainbow trout - Craig
mean = 9.6
Length (in)
year

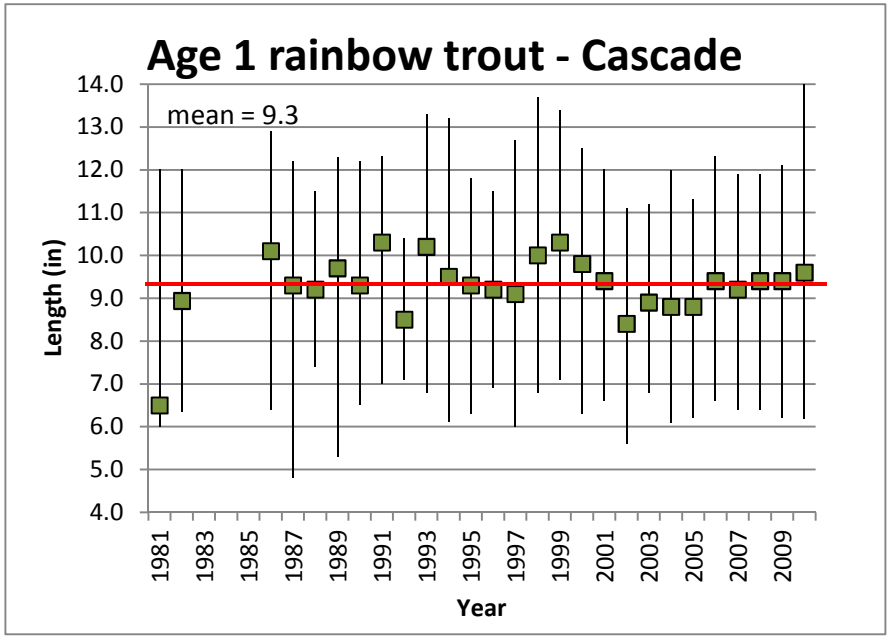

Age 2 rainbow trout - Craig
mean = 13.4
Length (in)
Year

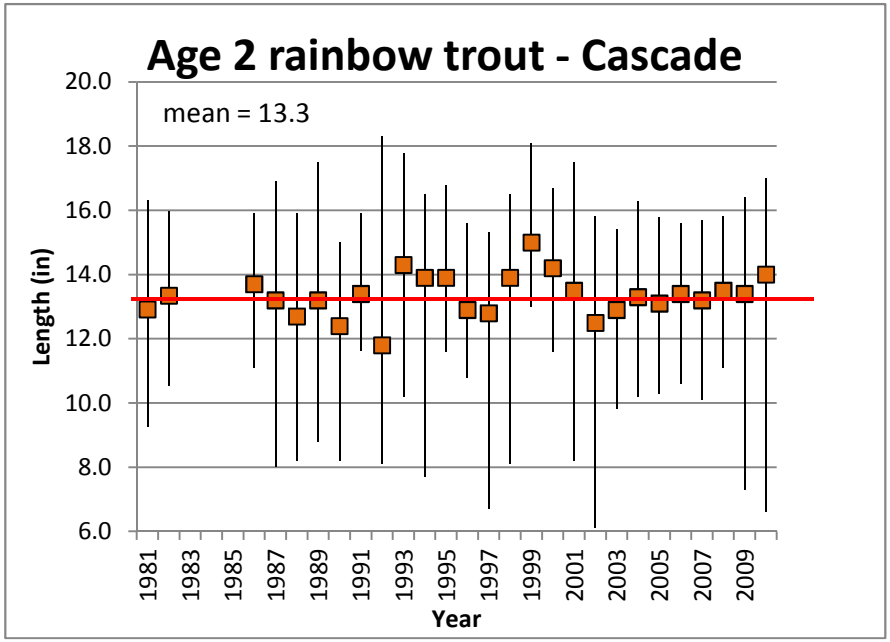

Age 3 rainbow trout - Craig
mean = 16.7
Length (in)
Year

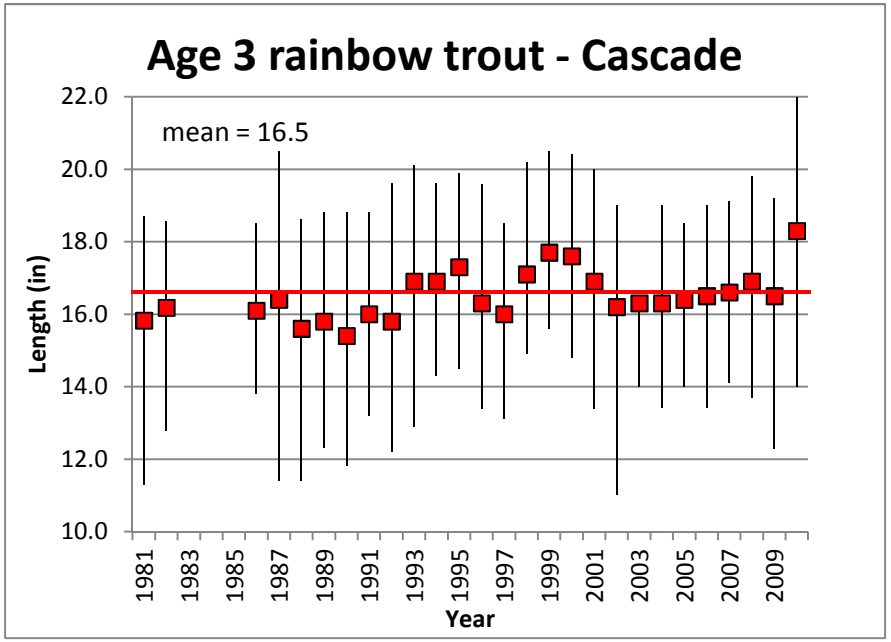

Age 4 rainbow trout - Craig
mean = 18.7
Length (in)
Year

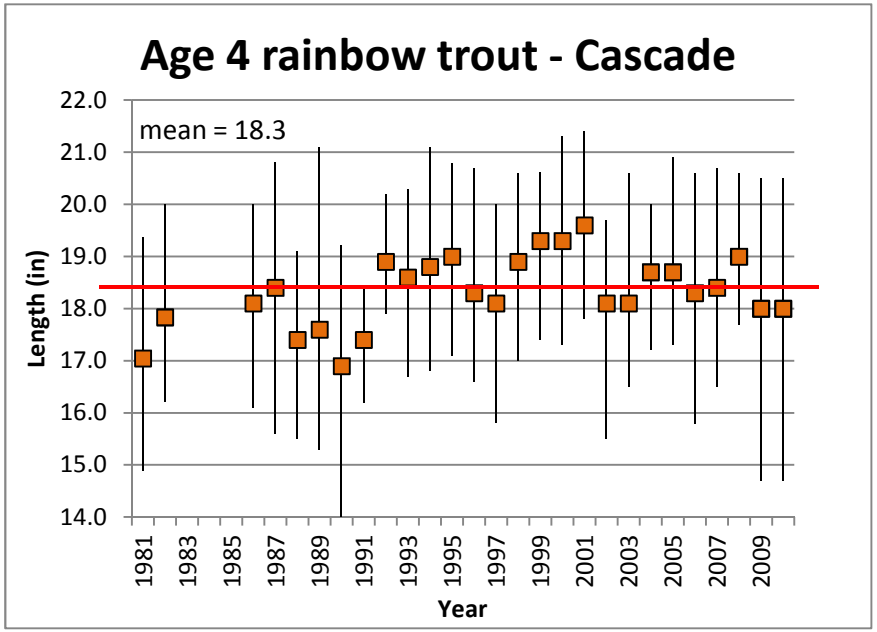

Age 5 rainbow trout - Craig
mean = 19.8
Length (in)
Year


Age 0 rainbow trout - Cascade
mean = 6.2
Length (in)
Year


Age 1 rainbow trout - Cascade
mean = 9.3
Length (in)
Year


Age 2 rainbow trout - Cascade
mean = 13.3
Length (in)
Year


Age 3 rainbow trout - Cascade
mean = 16.5
Length (in)
Year


Age 4 rainbow trout - Cascade
mean = 18.3
Length (in)
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
1981
1983
1985
1987
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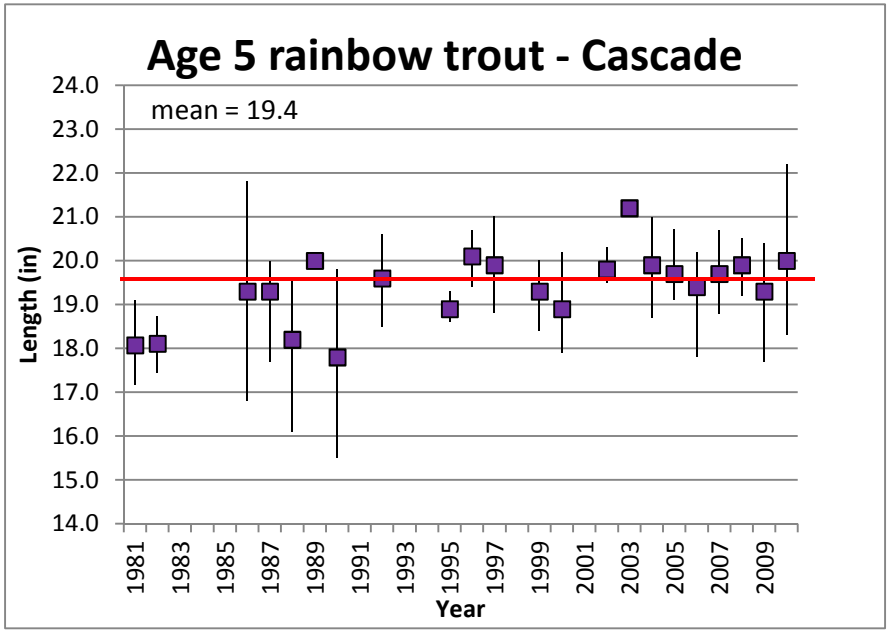
2001
2003
2005
2007
2009
Year


Age 5 rainbow trout - Cascade
mean = 19.4
Length (in)
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
14.0
1981
1983
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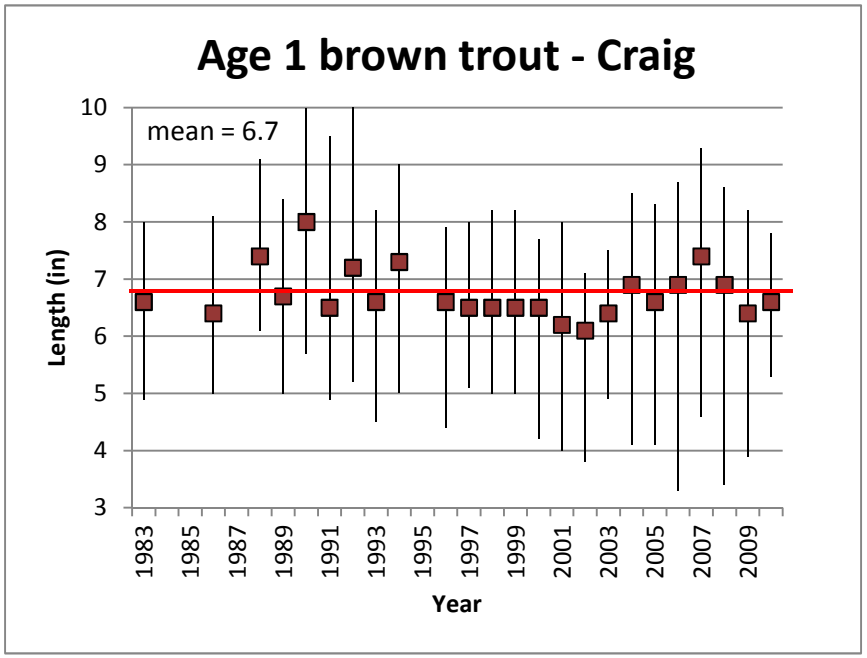
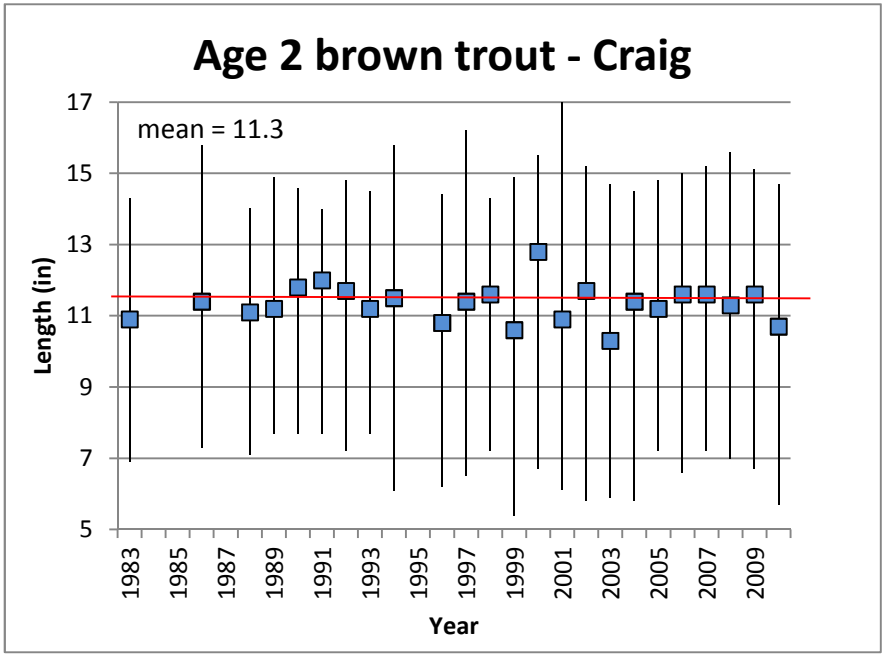
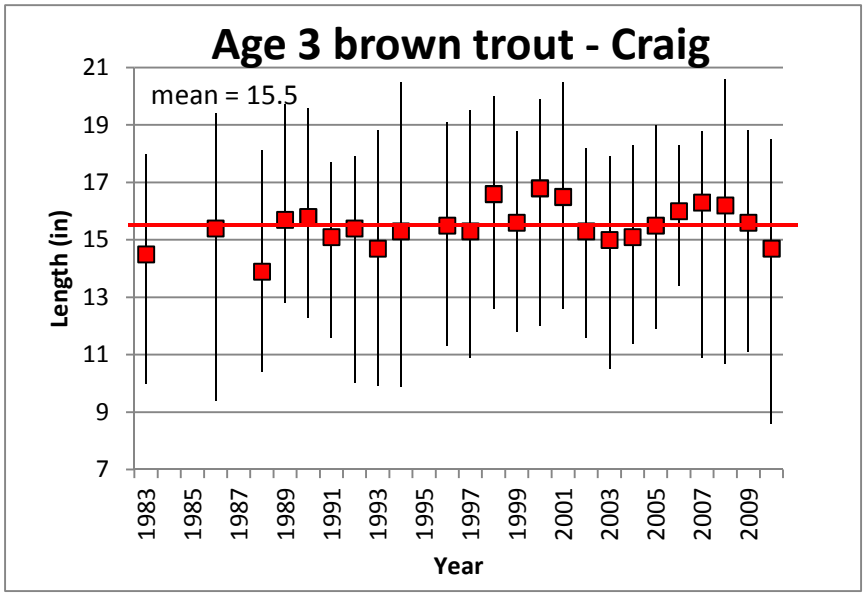
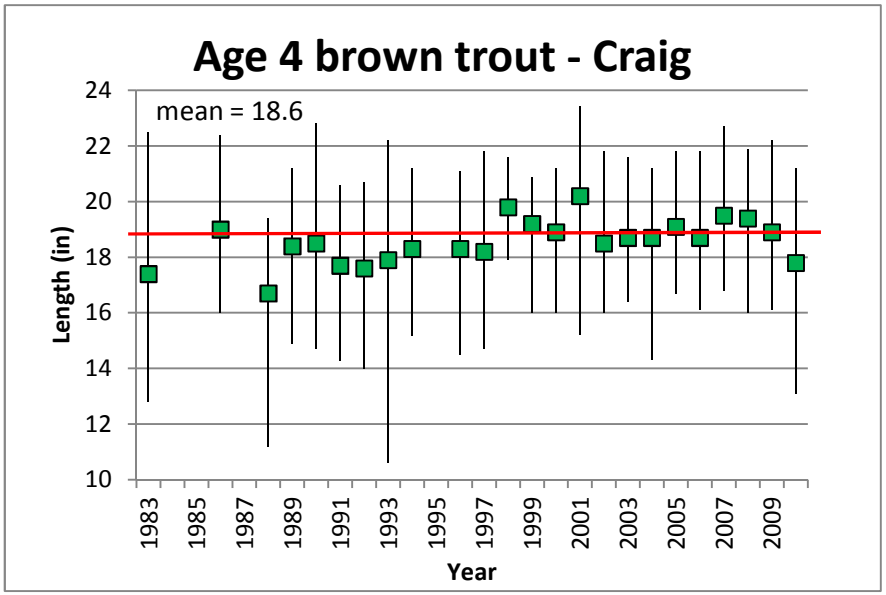
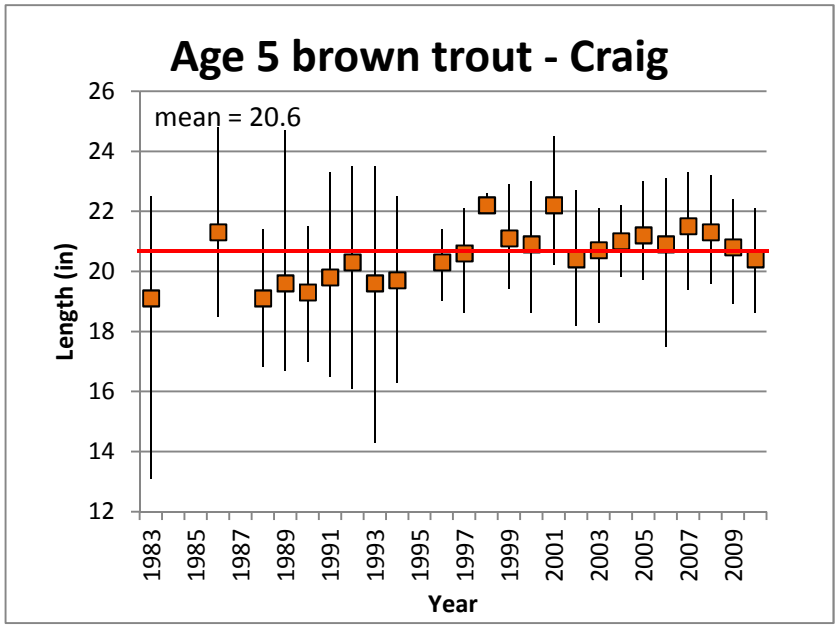
Year


Age 1 brown trout - Craig
mean = 6.7
Length (in)
Year


Age 2 brown trout - Craig
mean = 11.3
Length (in)
Year


Age 3 brown trout - Craig
mean = 15.5
Length (in)
Year


Age 4 brown trout - Craig
mean = 18.6
Length (in)
Year


Age 5 brown trout - Craig
mean = 20.6
Length (in)
Year
26
24
22
20
18
16
14
12
1983
1985
1987
1989
1991
1993
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1997
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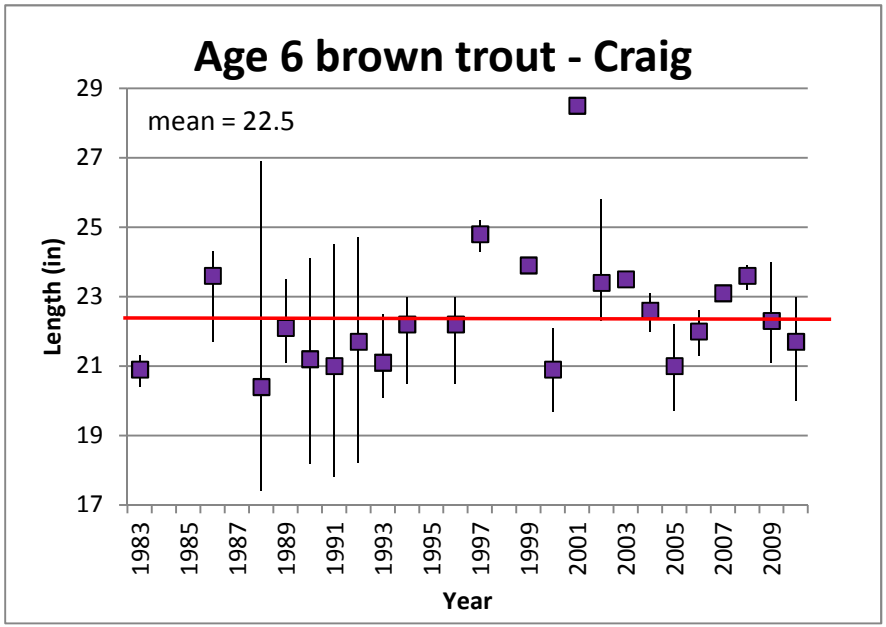
2007
2009


Age 6 brown trout - Craig
mean = 22.5
Length (in)
Year
29
27
25
23
21
19
17
1983
1985
1987
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1991
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1995
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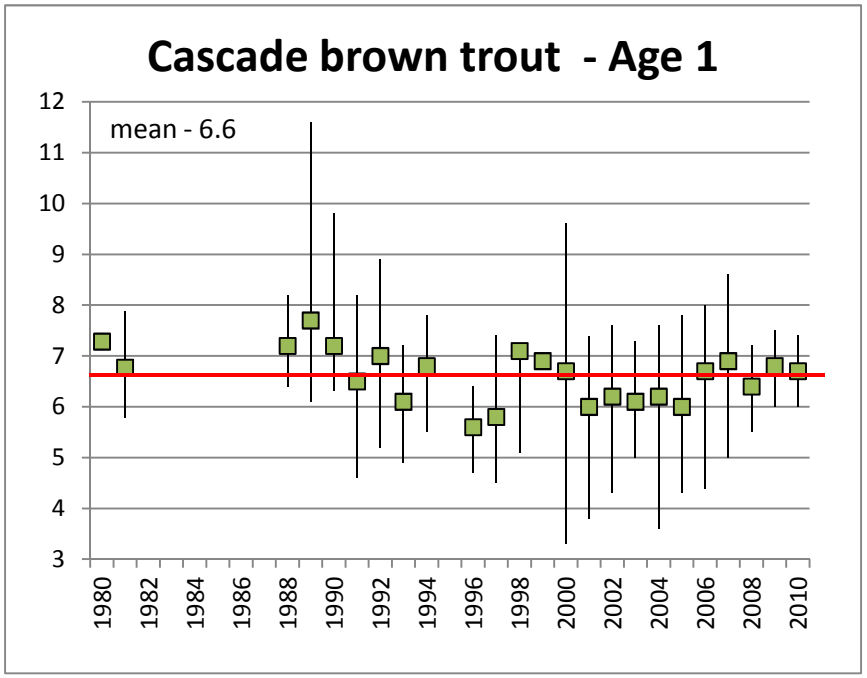
2001
2003
2005
2007
2009


Cascade brown trout - Age 1
mean - 6.6
12
11
10
9
8
7
6
5
4
3
1980
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1988
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2000
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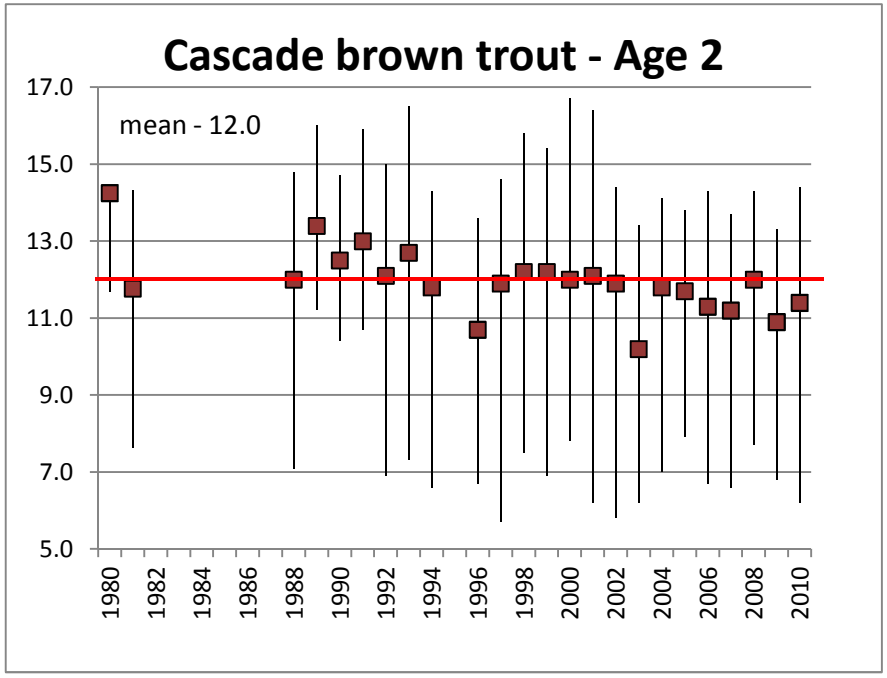
2004
2006
2008
2010


Cascade brown trout - Age 2
mean - 12.0
17.0
15.0
13.0
11.0
9.0
7.0
5.0
1980
1982
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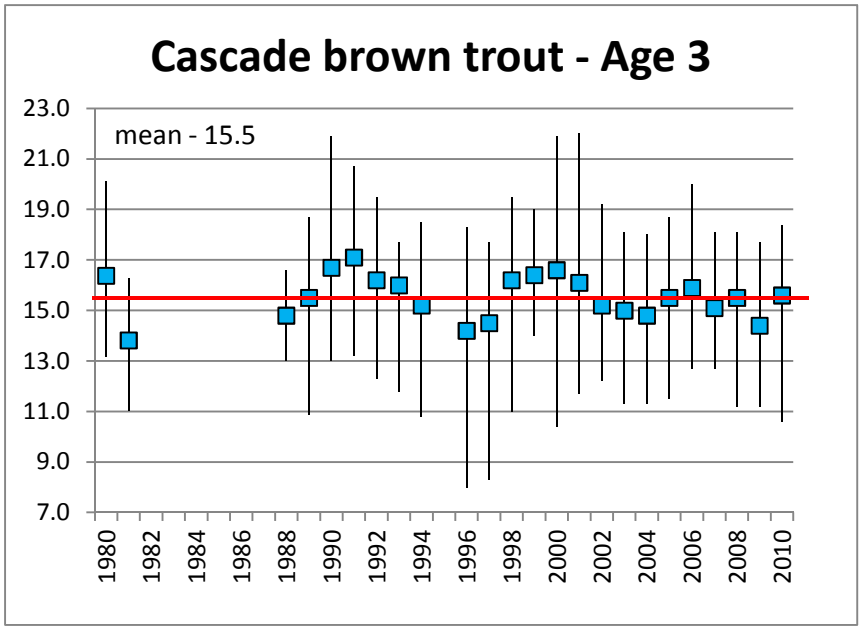
Cascade brown trout - Age 3
mean - 15.5
23.0
21.0
19.0
17.0
15.0
13.0
11.0
9.0
7.0
1980
1982
1984
1986
1988
1990
1992
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2008
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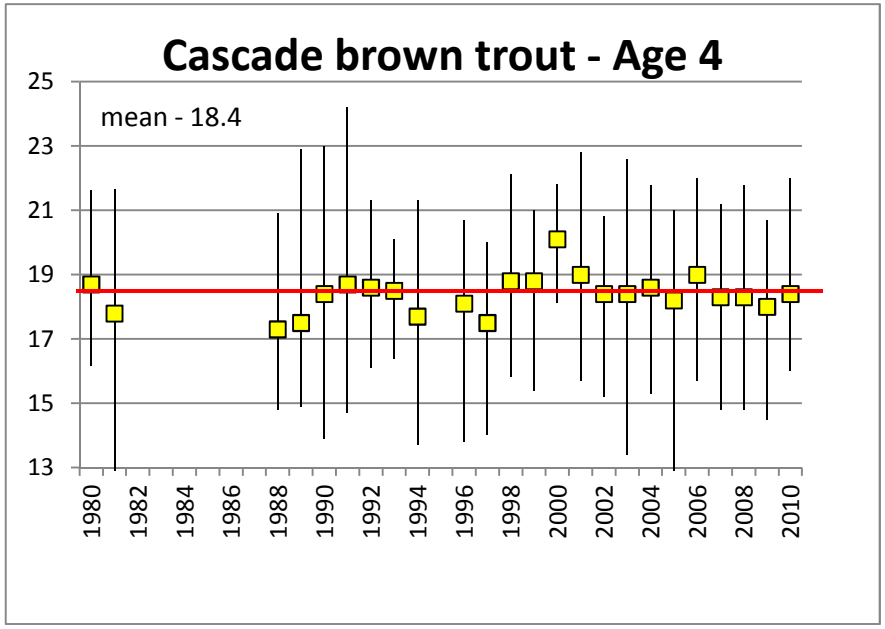
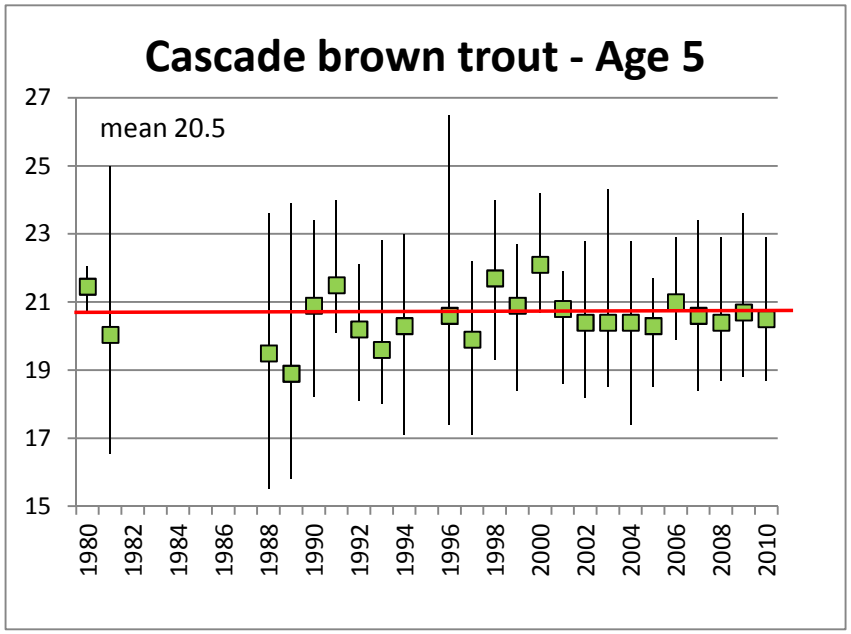
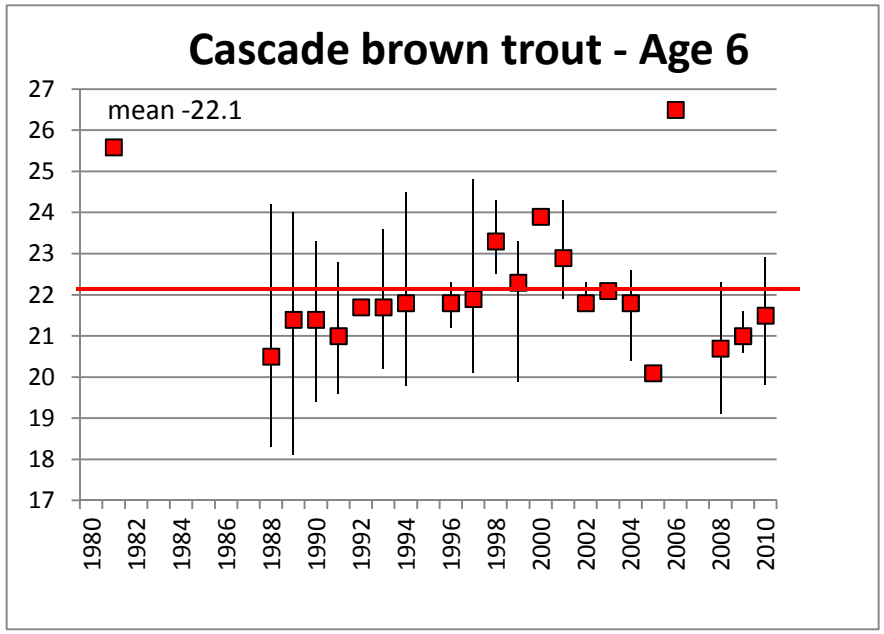

Cascade brown trout - Age 4
mean - 18.4
25
23
21
19
17
15
13
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010


Cascade brown trout - Age 5
mean 20.5
27
25
23
21
19
17
15
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010


Cascade brown trout - Age 6
mean -22.1
27
26
25
24
23
22
21
20
19
18
17
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
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2010