

# Analyzing the effects of flood events on the temporal change in stream grain size distributions in Western Cascade, Oregon

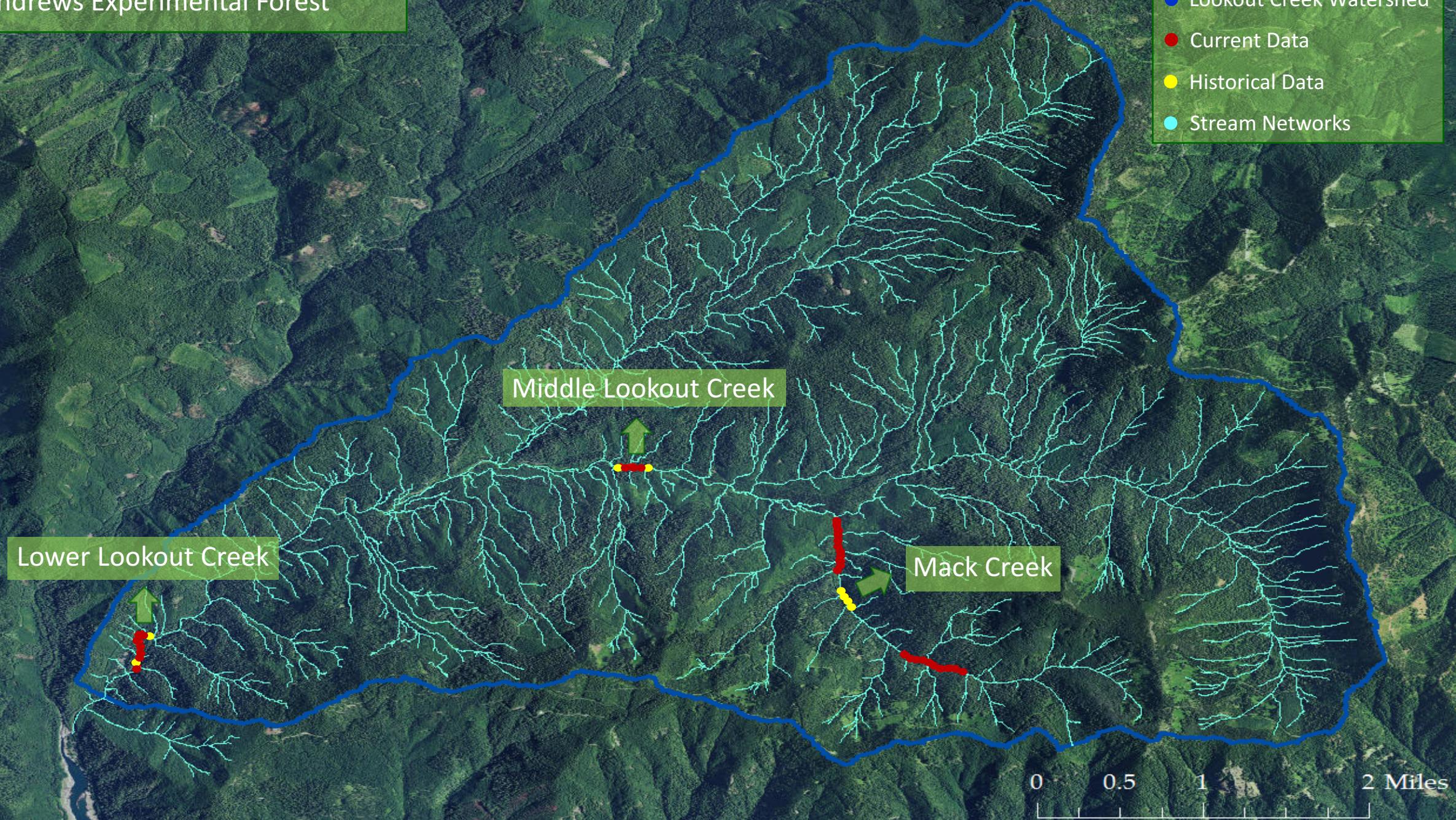
Malia Gonzales

Humboldt State University

8/17/2017

# HJ Andrews Experimental Forest

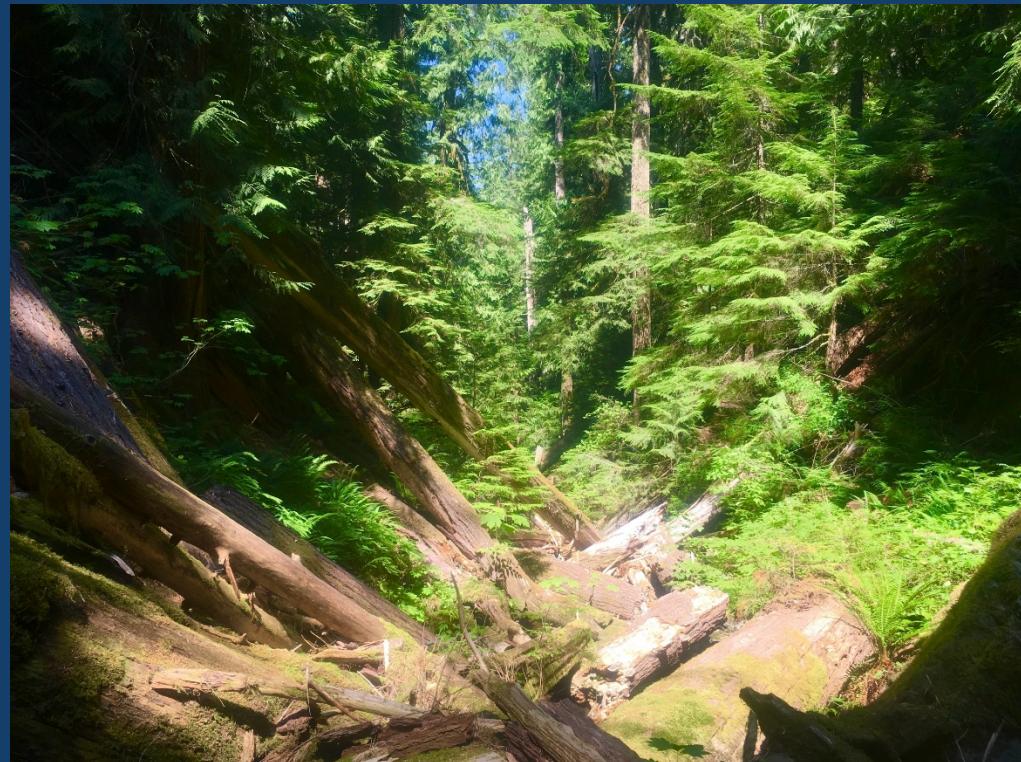
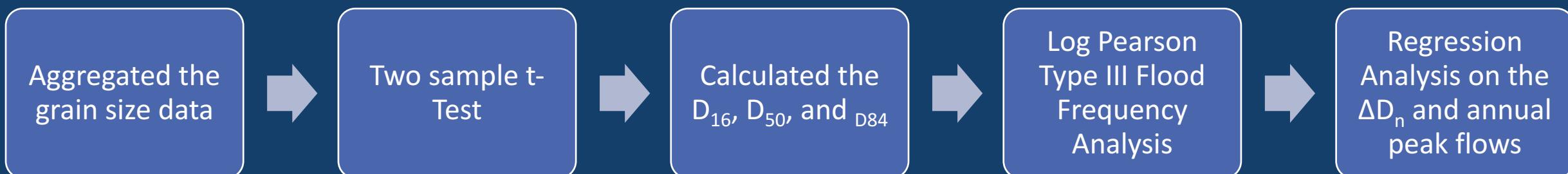
- Lookout Creek Watershed
- Current Data
- Historical Data
- Stream Networks



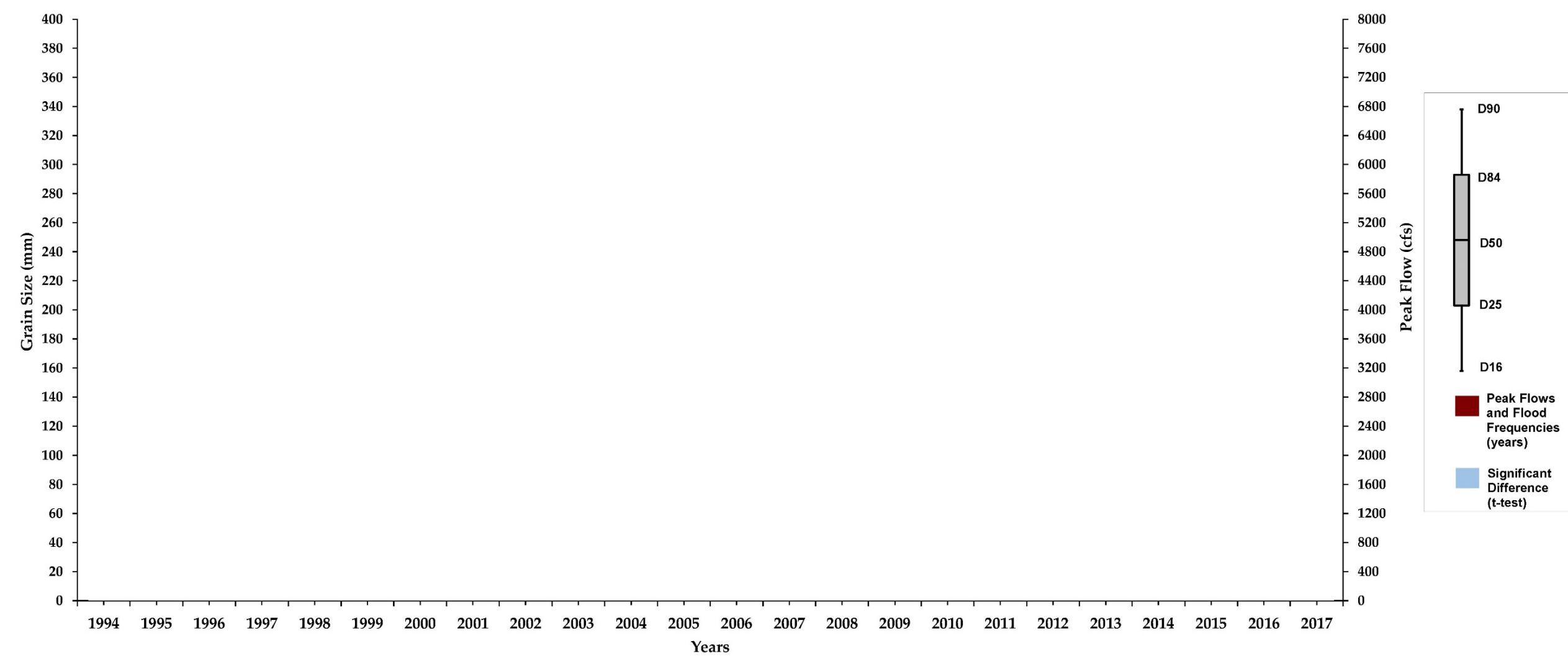
# How does the temporal grain size distribution compare to one another?

If there was a significant difference in between years what might have caused this change? (i.e. flood events, debris flows, gradient, LWD, tributaries, etc.)

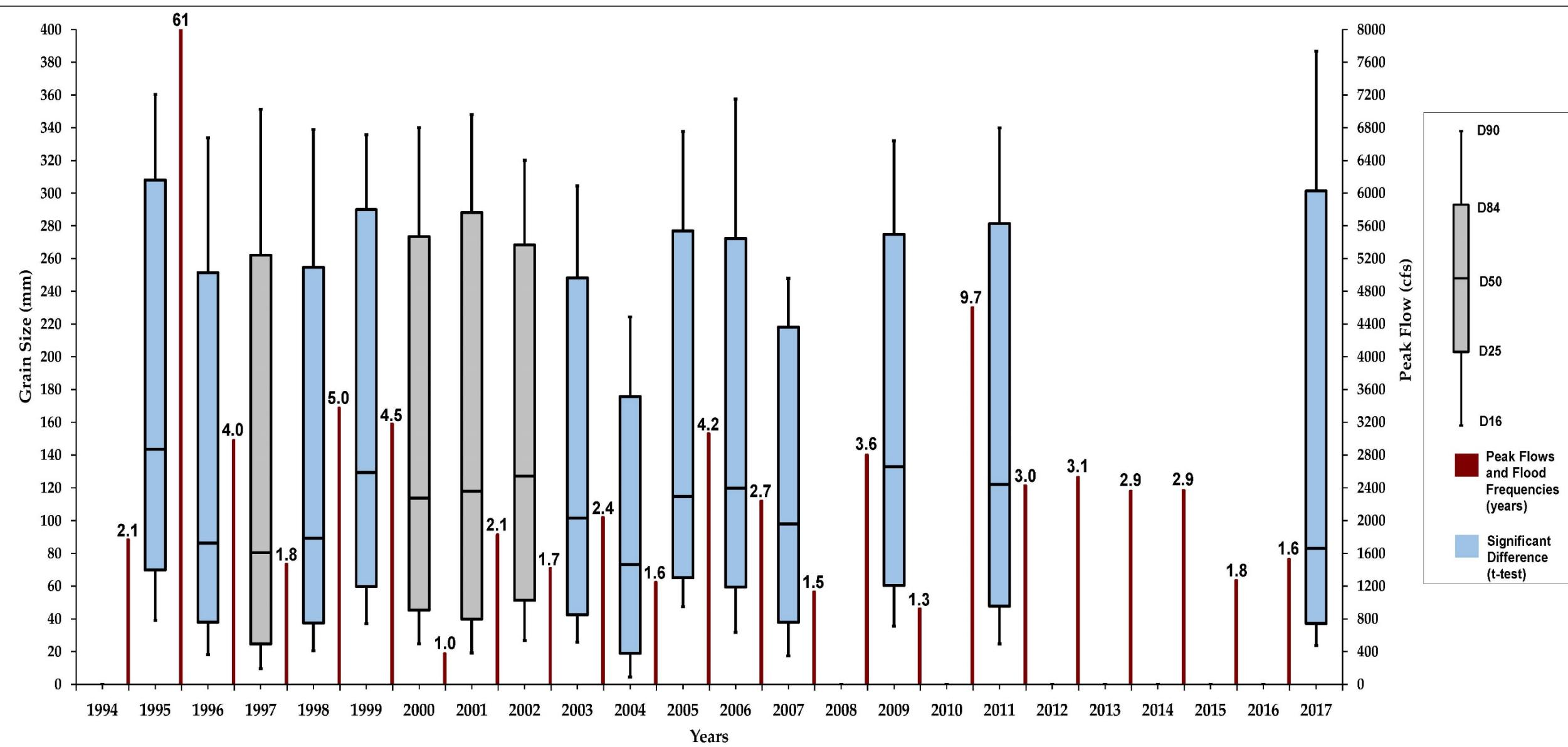
## Methods:



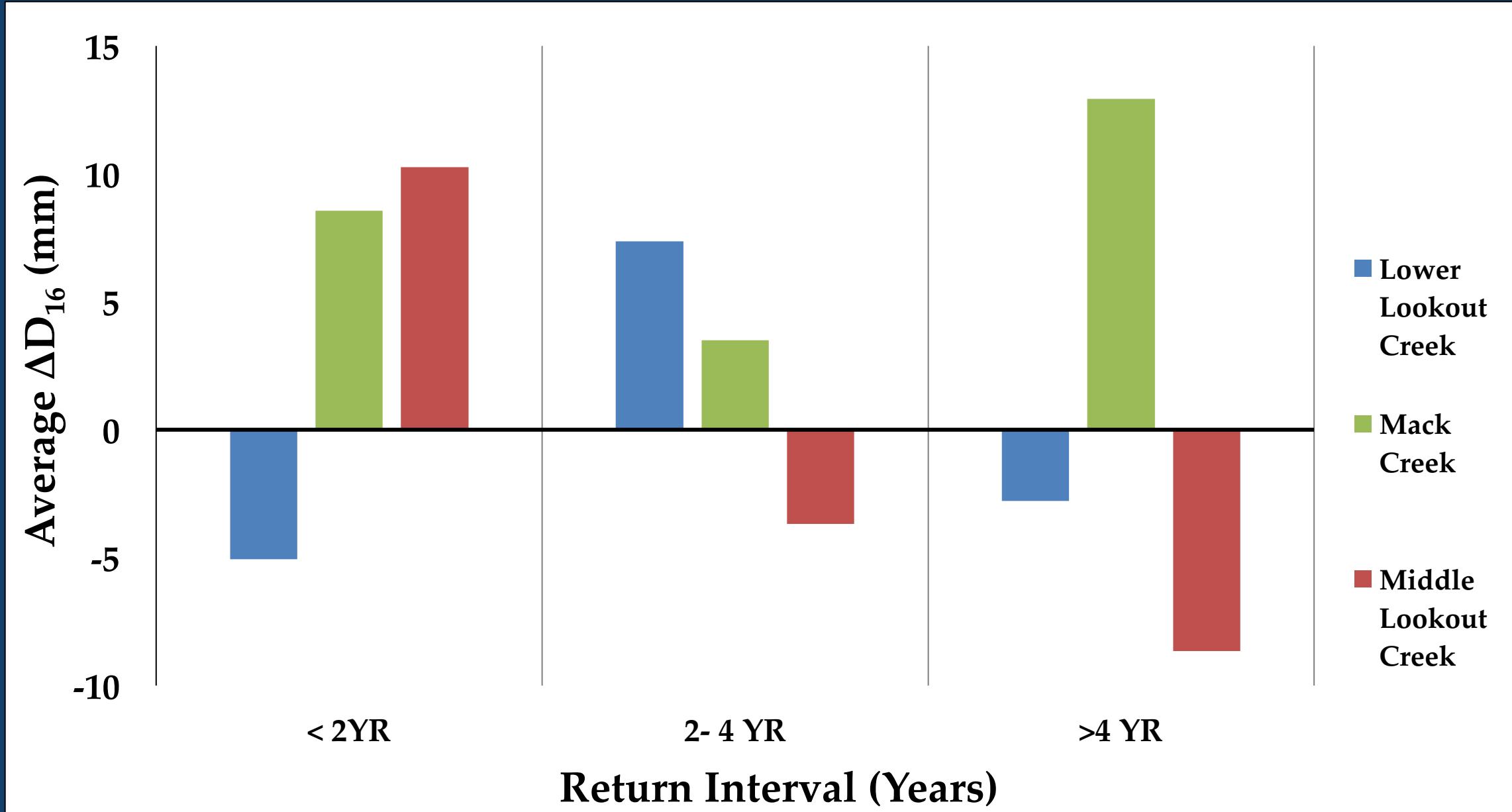
# Grain Size and Peak Flows vs. Years



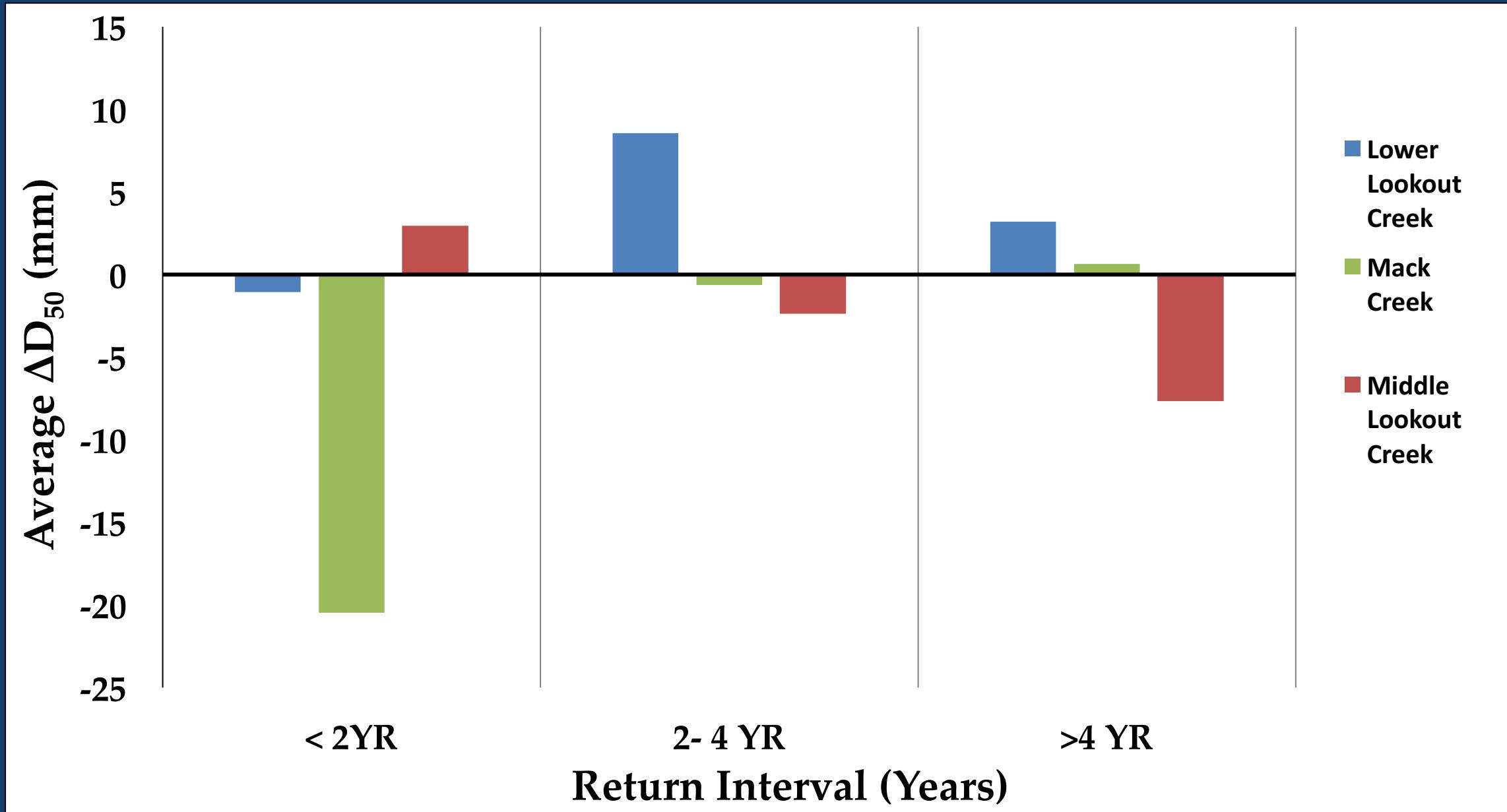
# Middle Lookout Creek



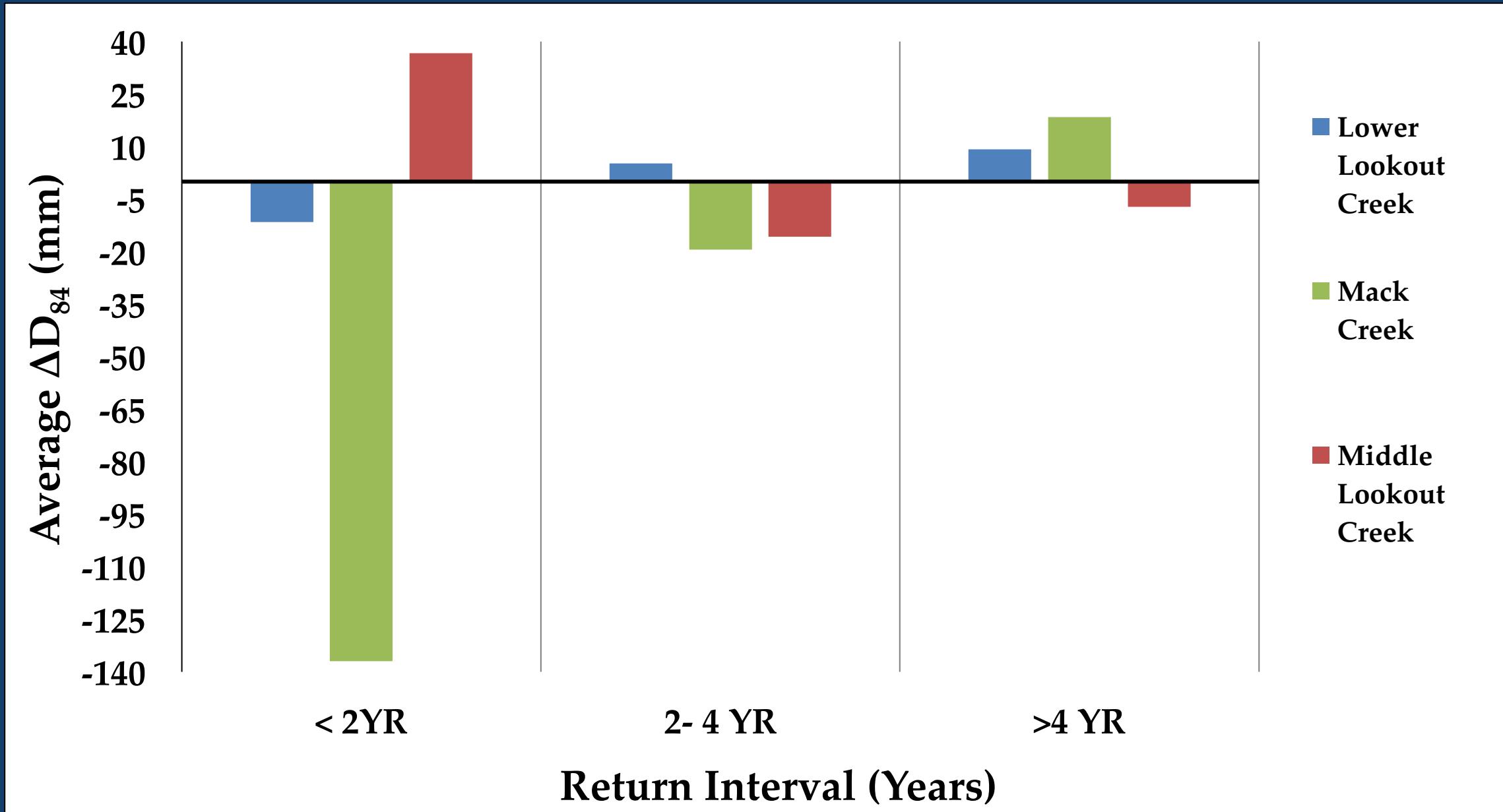
# The average change in $D_{16s}$ vs. return intervals



# The average change in D<sub>50s</sub> vs. return intervals



# The average change in $D_{84s}$ vs. return intervals



# Discussion

- So the question is why are these patterns occurring?
- Why is the grain size coarsening as the storm event increases for lower Lookout Creek and Mack Creek?
- Why is the grain size becoming finer as the storm event increases in middle Lookout Creek?

Locations	Average Channel Width (m)	Average Gradient (m/m)	Total Volume of Wood (m <sup>3</sup> )
Lower Lookout Creek	18.2	1.38%	910.110
Middle Lookout Creek	18.5	2.75%	2683.59
Mack Creek	9.20	9.93%	3475.17

# Conclusion

- Not a strong correlation between changes in size fraction to annual peak flows.
- Lower Lookout Creek and Mack Creek have a similar pattern: as the return interval increases the grain sizes become coarser.
- Middle Lookout Creek has a pattern: as the return interval decreases the grain size become finer.

# Acknowledgements

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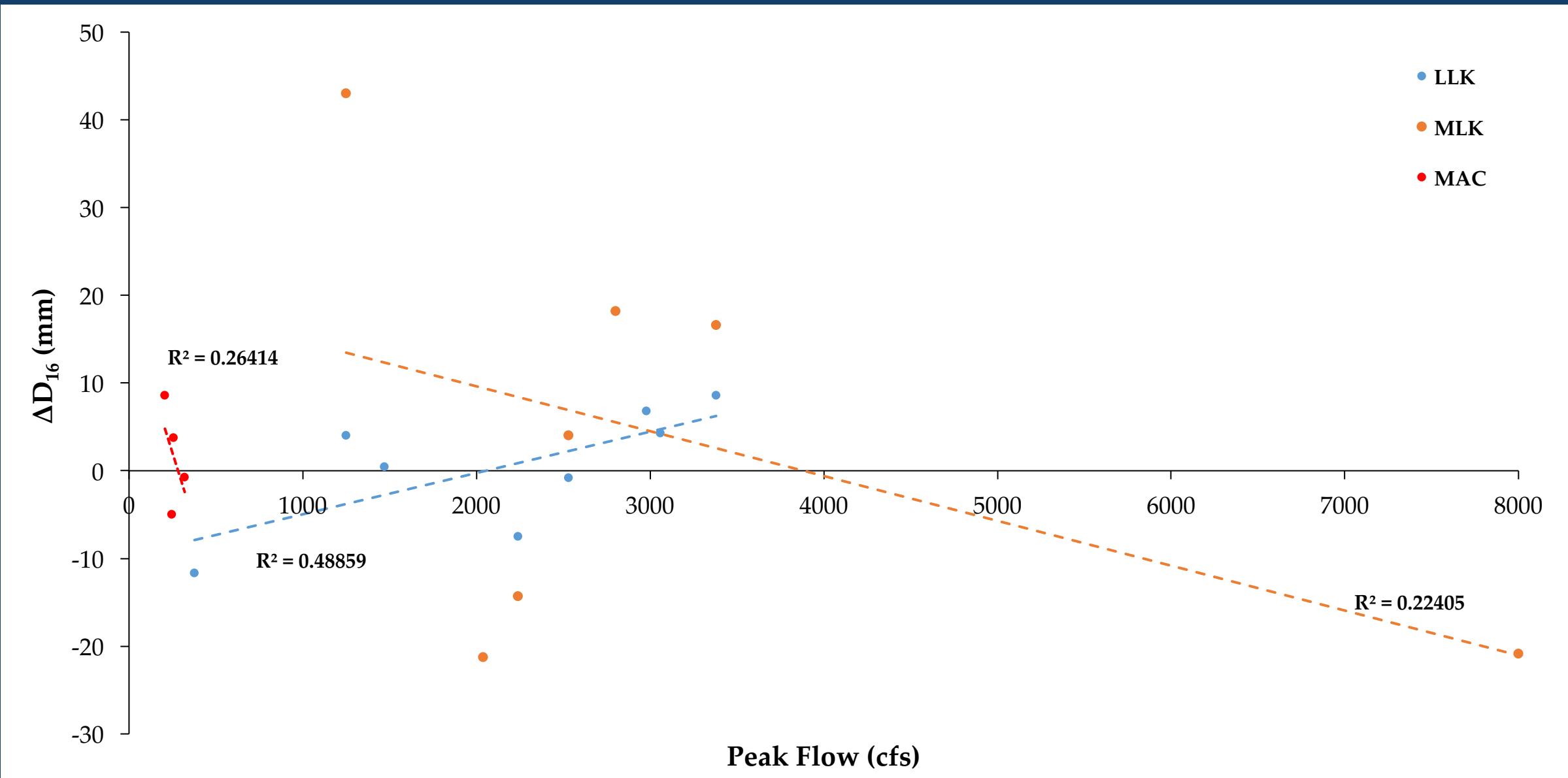
Oregon State University – Desiree Tullos, Julia Jones, Catalina Segura,  
Stephanie Bianco, Rebecca, and Cara Walter



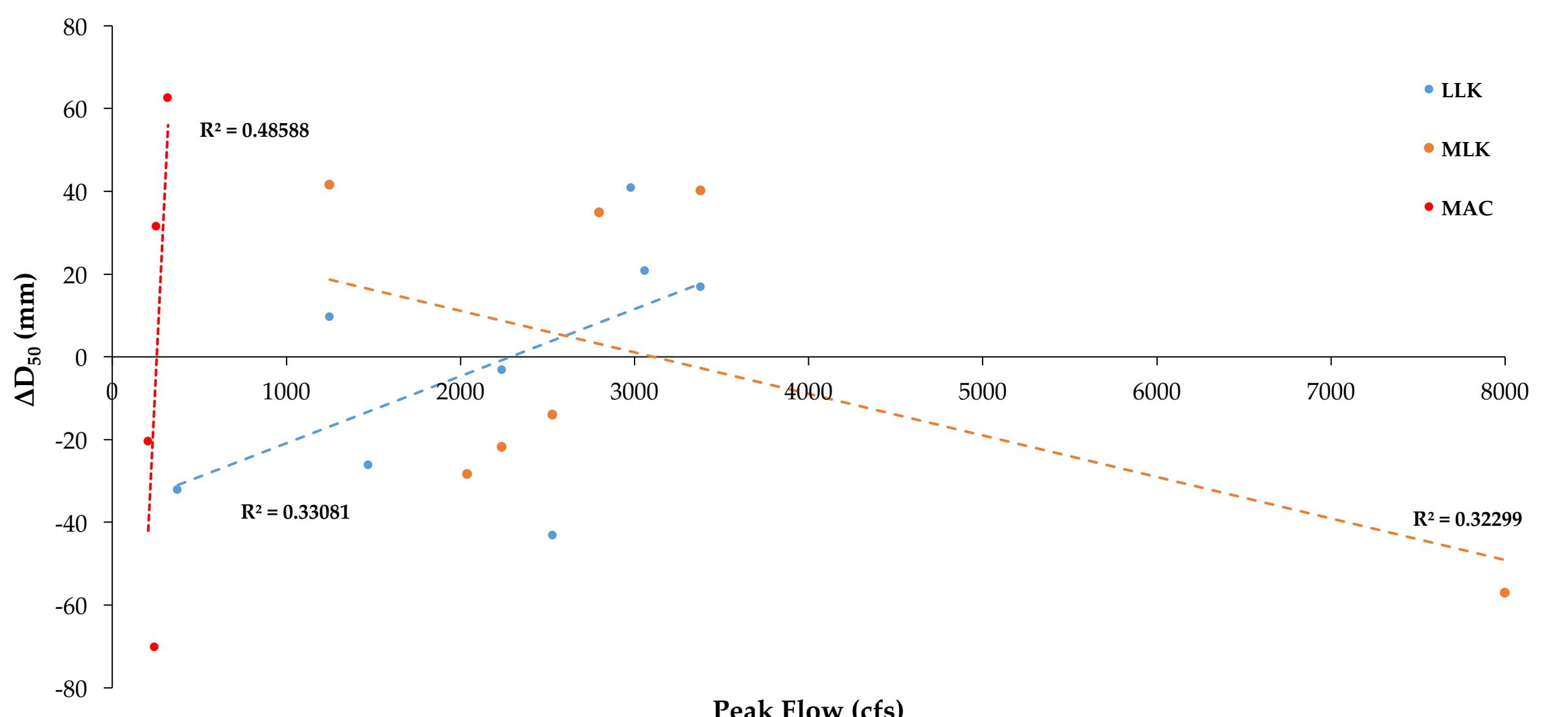
# Questions?



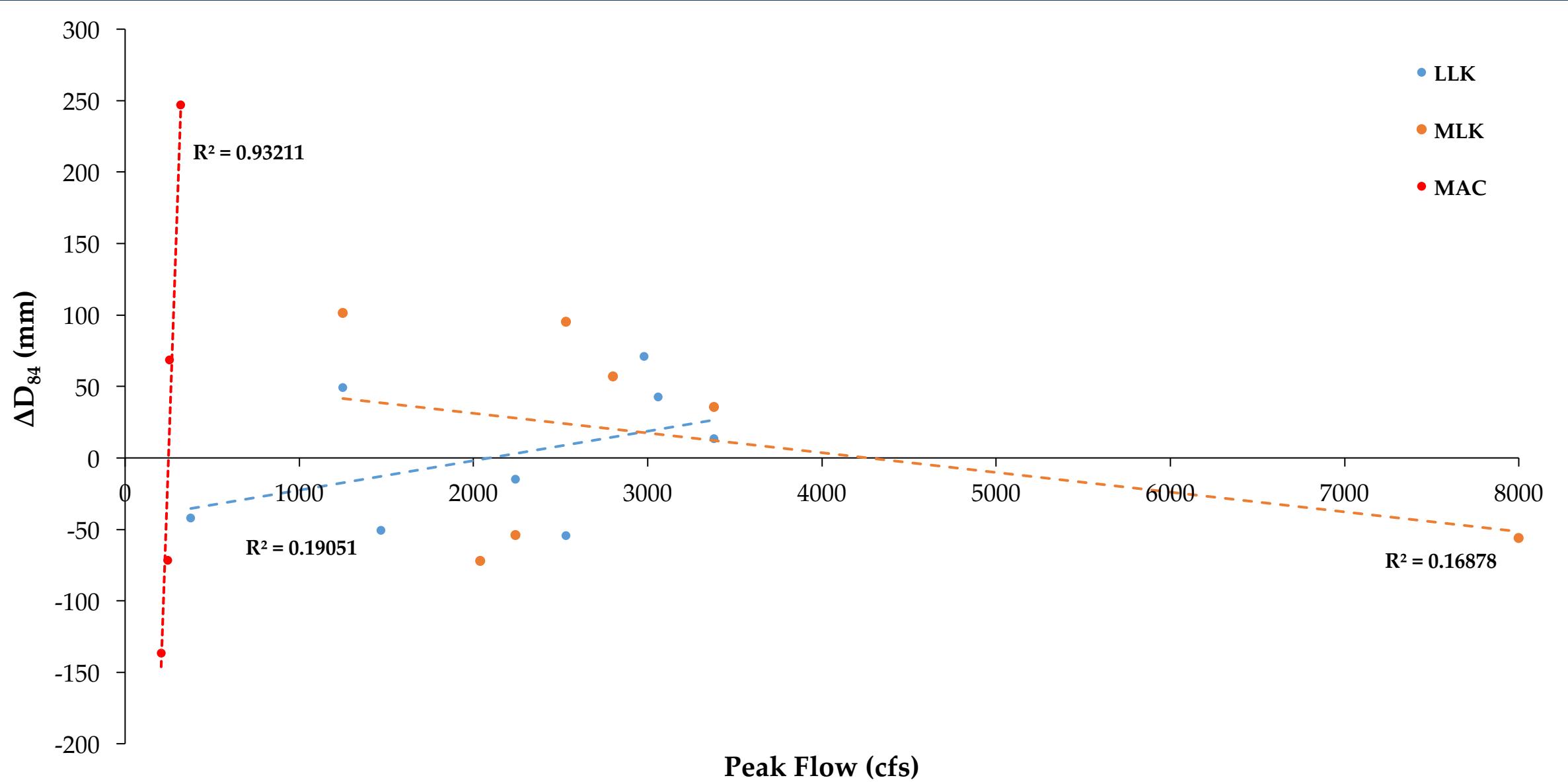
# Regression Analysis



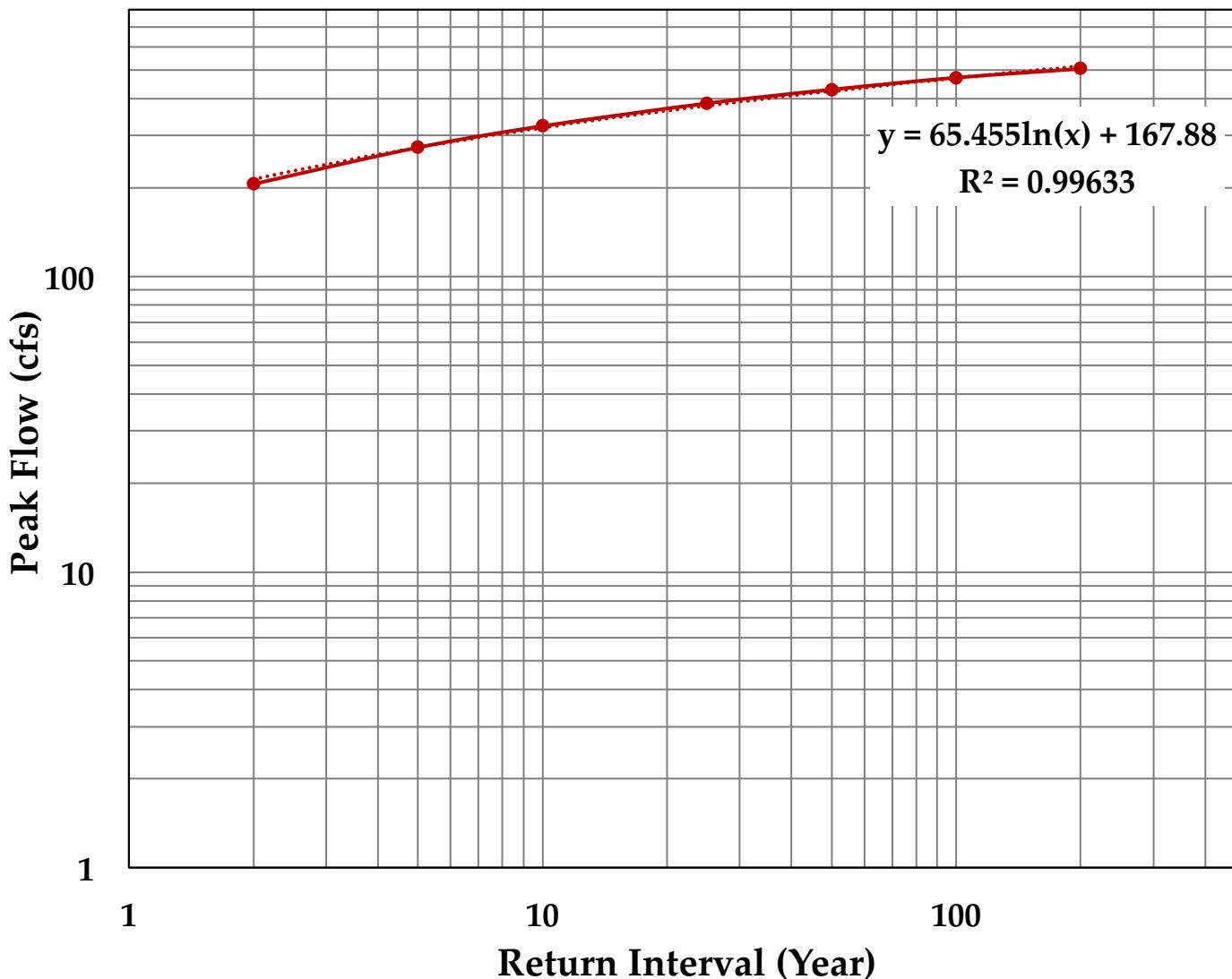
# Regression Analysis



# Regression Analysis



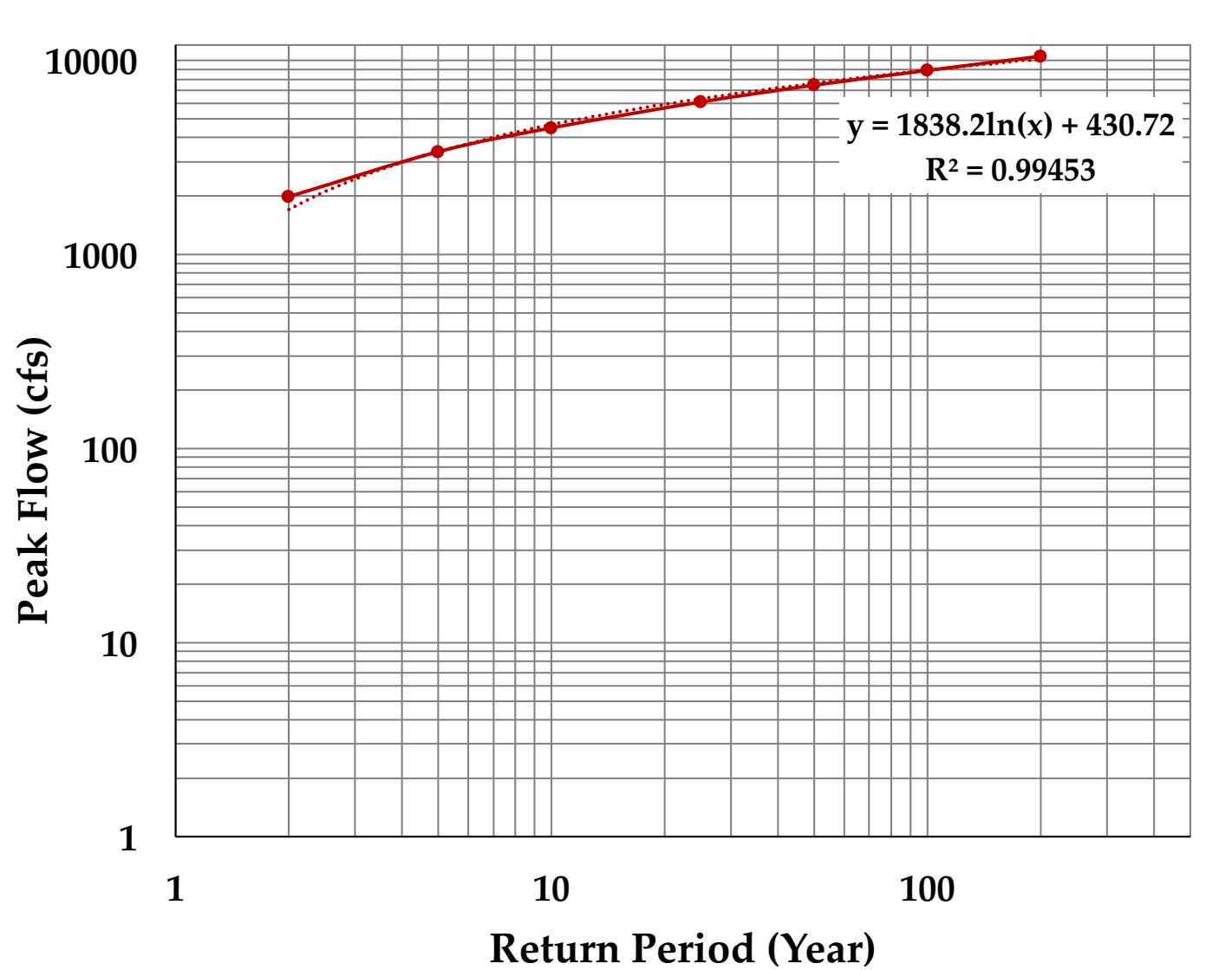
# Appendices



WATERYEAR	PEAK_Q (cfs)	RI (Year)
1995	168	1.0
1996	346	15.2
1997	254	3.7
1998	185	1.3
1999	210	1.9
2000	338	13.3
2001	55	0.2
2002	207	1.8
2003	169	1.0
2004	160	0.9
2005	166	1.0
2006	245	3.3
2007	245	3.3
2008	151	0.8
2009	226	2.4
2010	111	0.4
2011	321	10.3
2012	195	1.5
2013	192	1.4
2014	226	2.4
2015	245	3.2
2016	164	0.9
2017	140	0.7

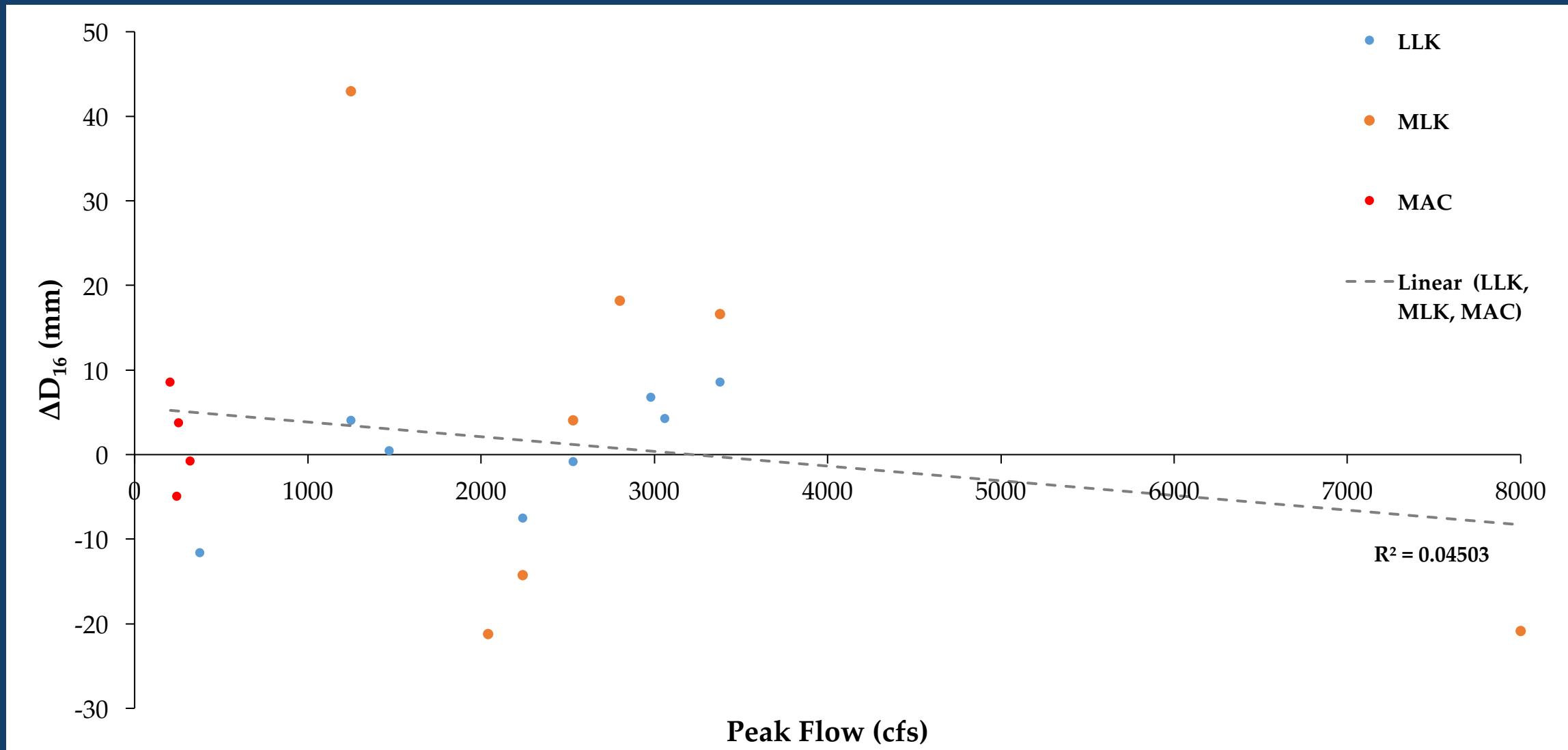
Mack Creek Log Pearson Type III Distribution Flood Frequency Analysis

# Appendices



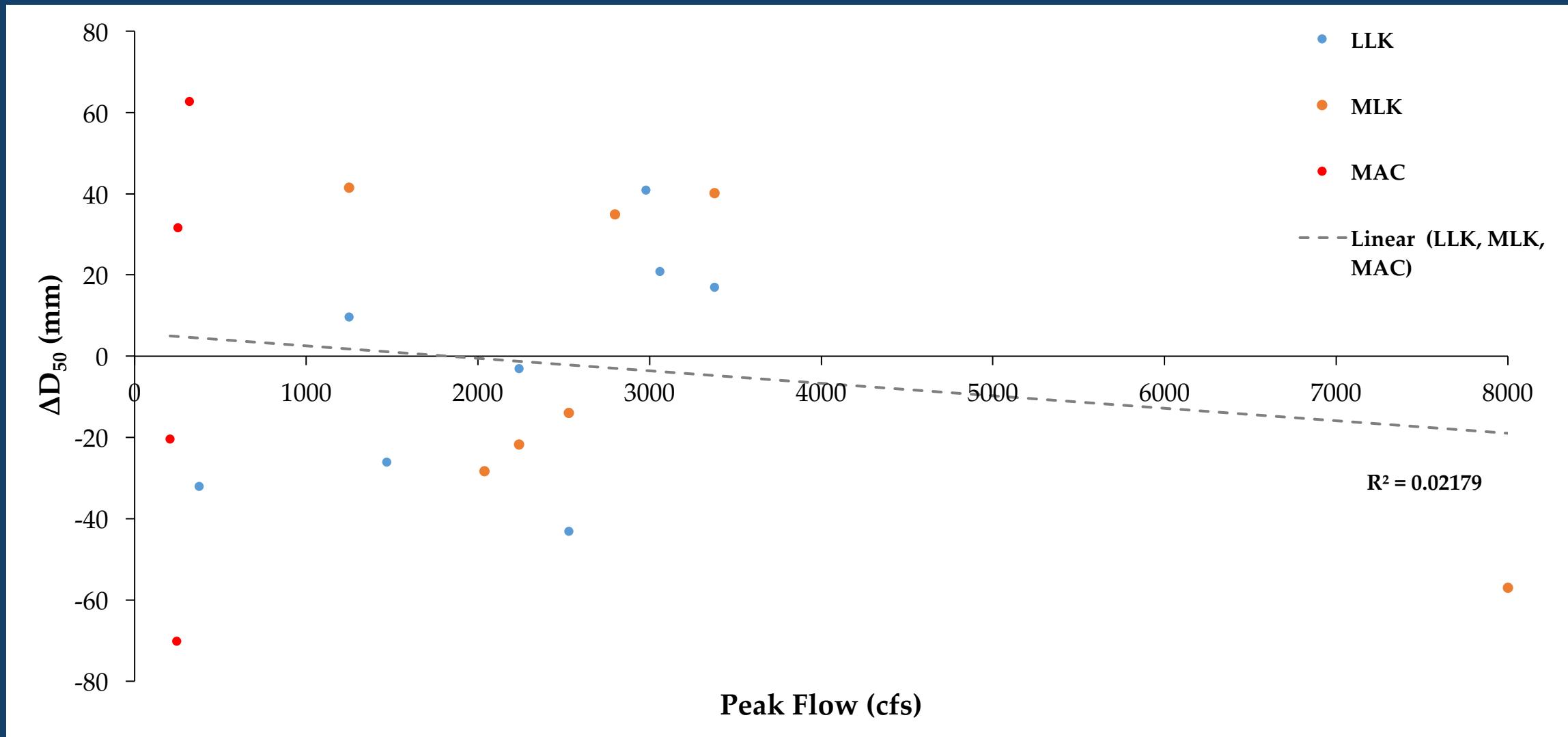
WATERYEAR	MAX_Q (cfs)	RI (Years)
1995	1770	2.1
1996	8000	61.4
1997	2980	4.0
1998	1470	1.8
1999	3380	5.0
2000	3180	4.5
2001	377	1.0
2002	1830	2.1
2003	1420	1.7
2004	2040	2.4
2005	1250	1.6
2006	3060	4.2
2007	2240	2.7
2008	1130	1.5
2009	2800	3.6
2010	925	1.3
2011	4600	9.7
2012	2430	3.0
2013	2530	3.1
2014	2360	2.9
2015	2370	2.9
2016	1270	1.6
2017	1530	1.8

# Appendices



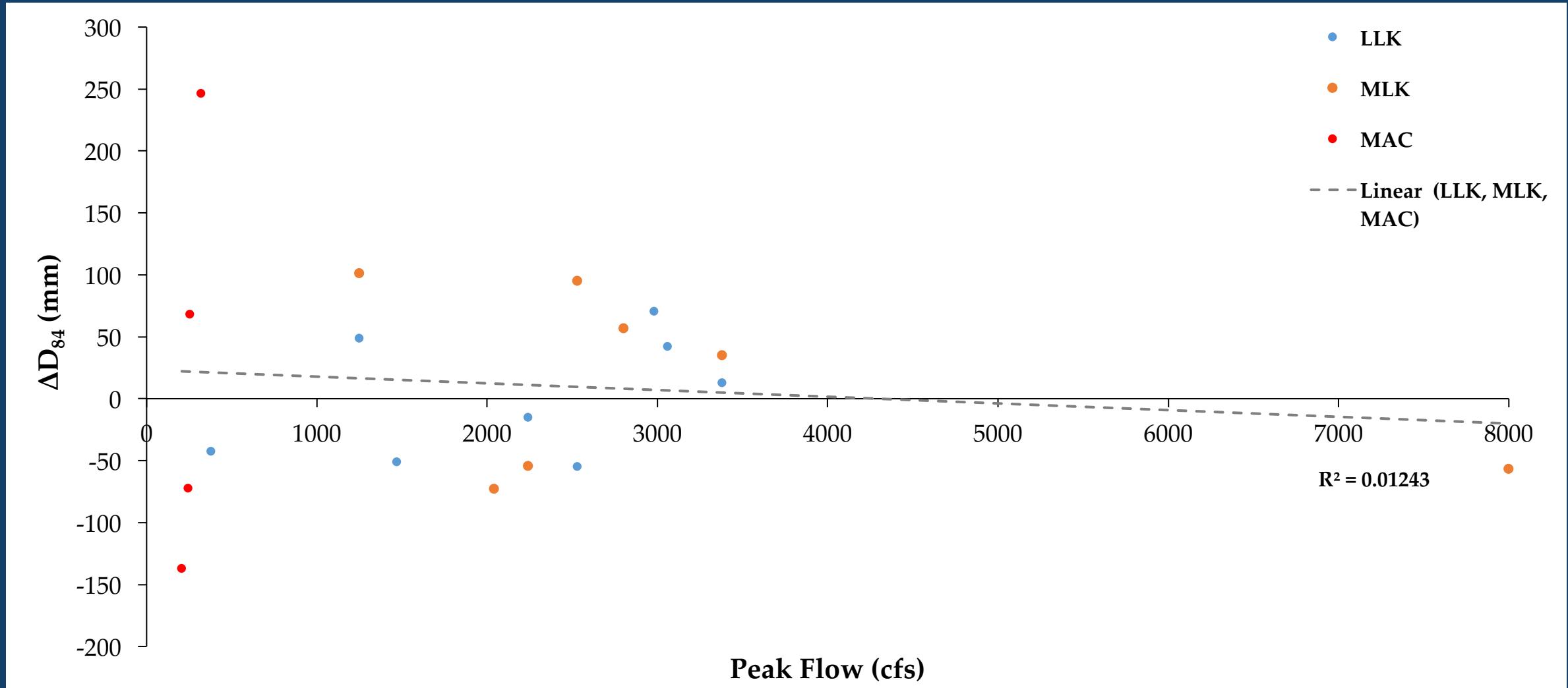
Linear regression analysis for lower Lookout (blue), middle Lookout (orange), and Mack Creek (red). The x-axis is the annual peak flows with the corresponding change in D16 for a given year.

# Appendices



Linear regression analysis for lower Lookout (blue), middle Lookout (orange), and Mack Creek (red). The x-axis is the annual peak flows with the corresponding change in D50 for a given year.

# Appendices



Linear regression analysis for lower Lookout (blue), middle Lookout (orange), and Mack Creek (red). The x-axis is the annual peak flows with the corresponding change in D84 for a given year.

X	Y	Significantly Different?	t - value	df	p-value	X 95% Confidence Interval	Y 95% Confidence Interval	X Mean (mm)	Y Mean (mm)
1995	1996	Yes	6.18	2119	7.8E-10	35.7	69.0	216.0	163.6
1996	1997	No	-0.826	2104	0.41	-24.9	10.2	163.6	171.0
1997	1998	No	0.403	2133	0.69	-13.6	20.7	171.0	167.5
1998	1999	Yes	-3.59	2055	3.4E-04	-45.2	-13.3	169.0	198.2
1999	2000	No	1.44	2188	0.15	-4.1	26.9	198.2	186.8
2000	2001	No	0.07	741	0.94	-20.4	22.0	186.8	186.0
2001	2002	No	0.14	833	0.89	-21.8	25.1	186.0	184.4
2002	2003	No	0.954	360	0.34	-14.8	42.8	184.4	170.4
2003	2004	Yes	3.71	291	0.00	28.1	91.7	170.4	110.6
2004	2005	Yes	-6.92	167	0.00	-104.6	-58.2	110.6	192.0
2005	2006	No	-0.629	2169	0.53	-22.1	11.4	192.0	197.3
2006	2007	Yes	4.97	415	9.8E-07	33.8	78.0	197.3	141.5
2007	2009	Yes	-4.16	524	3.7E-05	-79.5	-28.5	141.5	195.4
2009	2011	No	0.259	744	0.80	-18.3	23.9	195.4	192.6
2011	2017	No	0.175	2523	0.86	-13.0	15.6	192.6	191.4
2011	2017	Yes	-2.949	858	3.27E-03	-62.5	-12.5	192.6	230.1

Middle Lookout Creek t-test statistics.

# Appendices

X	Y	Significantly Different?	t - value	df	p-value	X 95% Confidence Interval	Y 95% Confidence Interval	X Mean (mm)	Y Mean (mm)
1995	1996	No	0.213	2553	0.83	-11.2	14.0	158.4	157.0
1996	1997	Yes	-6.90	2703	6.3E-12	-66.1	-36.9	157.0	208.5
1997	1998	Yes	3.84	2769	1.3E-04	14.6	45.2	208.5	178.6
1998	1999	Yes	-2.01	2784	0.04	-30.4	-0.38	178.6	194.0
1999	2000	No	0.226	2770	0.82	-13.1	16.5	194.0	192.3
2000	2001	Yes	4.10	1017	4.5E-05	18.9	53.6	192.3	156.0
2001	2002	No	1.63	979	0.10	-3.21	34.5	156.0	140.4
2002	2003	No	0.388	1086	0.70	-13.9	20.8	140.4	136.9
2003	2004	No	-0.696	960	0.49	-23.3	11.1	136.9	143.0
2004	2005	Yes	-3.76	757	1.9E-04	-41.9	-13.1	143.0	170.5
2005	2006	Yes	-5.50	2680	4.2E-08	-51.3	-24.3	170.5	208.4
2006	2007	Yes	2.21	1399	0.03	2.23	37.5	208.4	188.5
2007	2009	No	-0.603	820	0.55	-29.4	15.6	188.5	195.4
2009	2011	No	20.4	399	2.2E-16	167.5	203.2	195.4	10.1
2011	2017	Yes	4.5553	1987	5.55E-06	24.88262	62.5042	185.2775	141.584

Lower Lookout Creek t-test statistics.

# Appendices

X	Y	Significantly Different?	t - value	df	p-value	X 95% Confidence Interval	Y 95% Confidence Interval	X Mean (mm)	Y Mean (mm)
1995	1996	No	-0.335	2421	0.738	-30.2	21.4	205.1	209.5
1996	1997	Yes	-3.45	2364	5.81E-04	-78.0	-21.4	209.5	259.2
1997	2000	No	0.966	2384	0.334	-14.8	43.6	259.2	244.8
2000	2005	Yes	5.36	2142	9.00E-08	42.0	90.5	244.8	178.5
2005	2011	Yes	-10.50	1639	2.20E-16	-220.3	-150.9	178.5	355.7
2011	2017	Yes	4.26	1850	2.17E-05	41.7	113.0	364.1	286.8

Mack Creek t-test statistics.