

Which riverine floods can we manage?



Beatriz Mogollón¹ and Paul Angermeier²

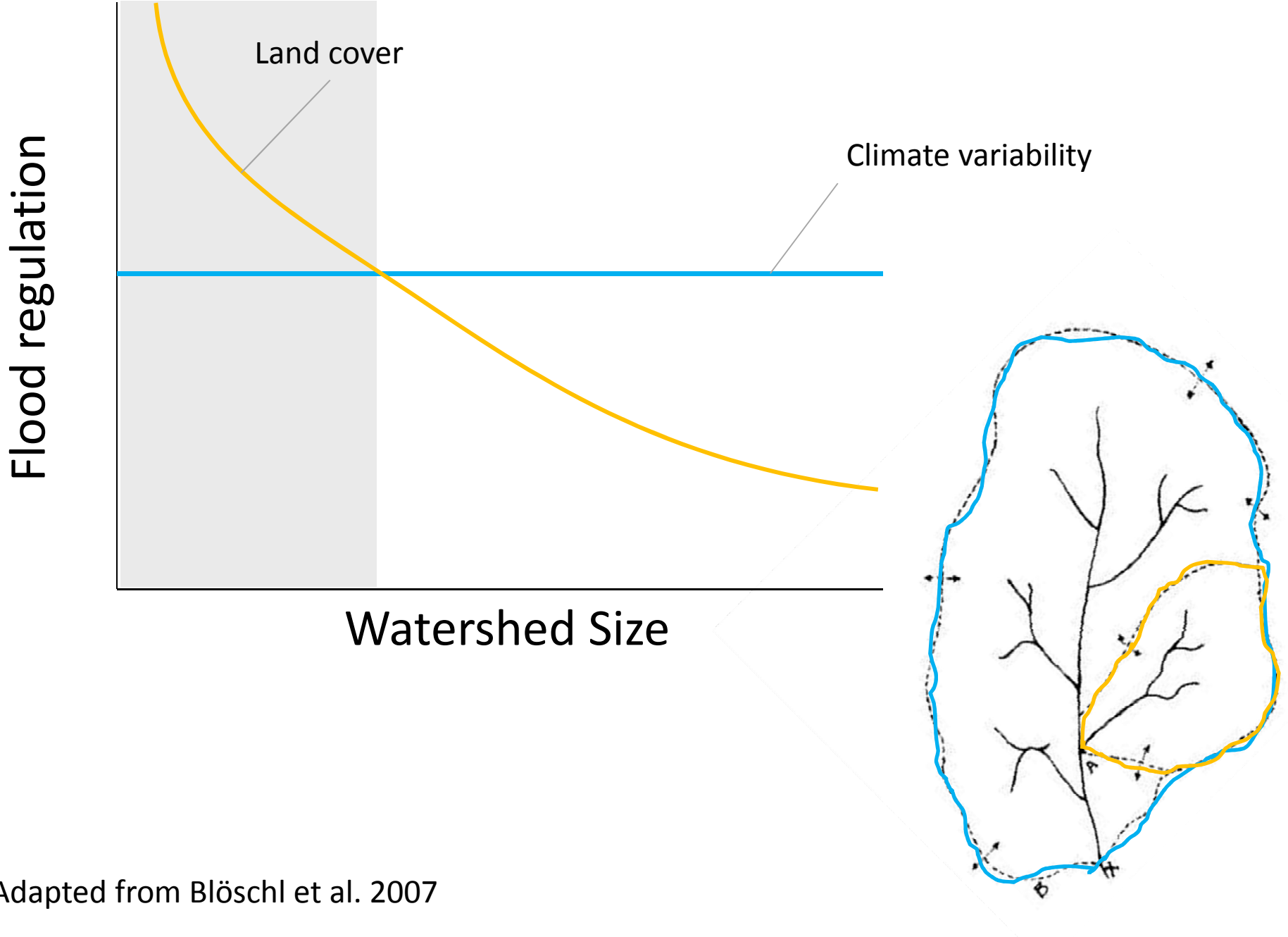
¹ MS Candidate, Department of Fish and Wildlife Conservation, Virginia Tech

² U.S. Geological Survey, Virginia Cooperative Fish and Wildlife Research Unit, Virginia Tech

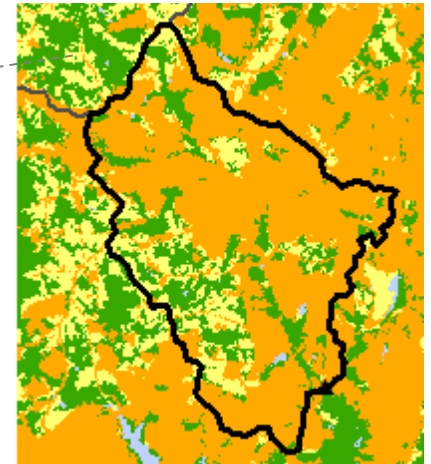
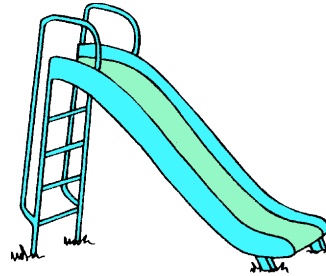
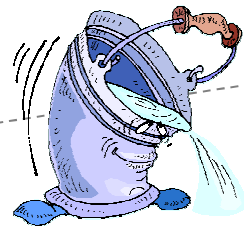
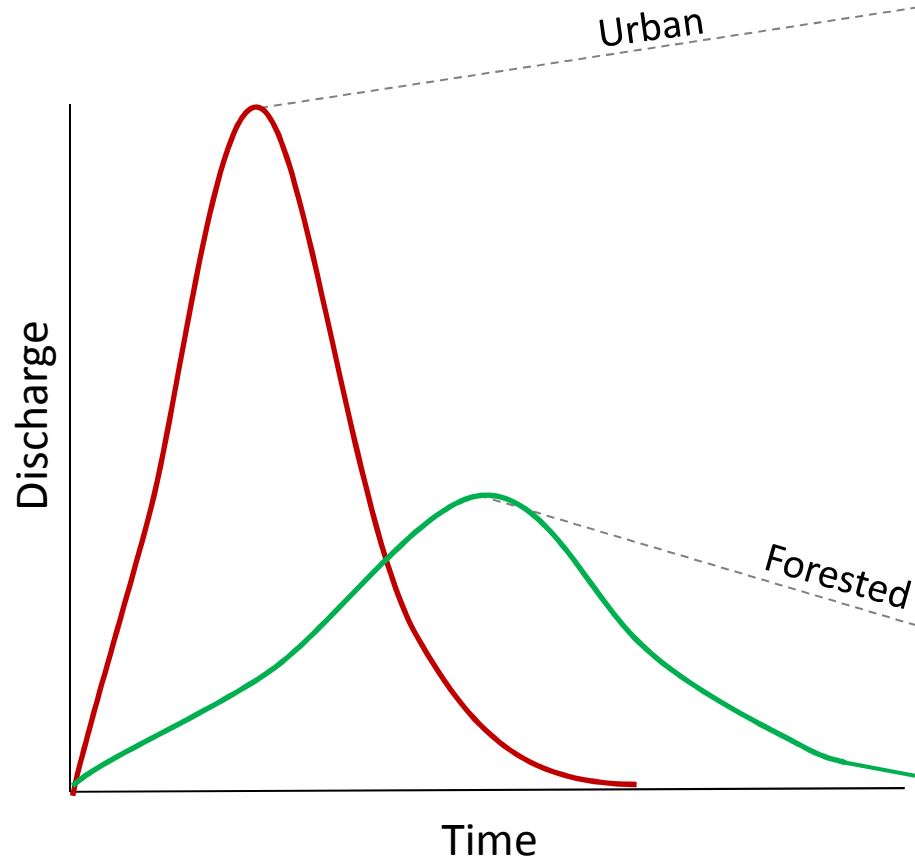
FREC Graduate Student Symposium

April 1, 2014

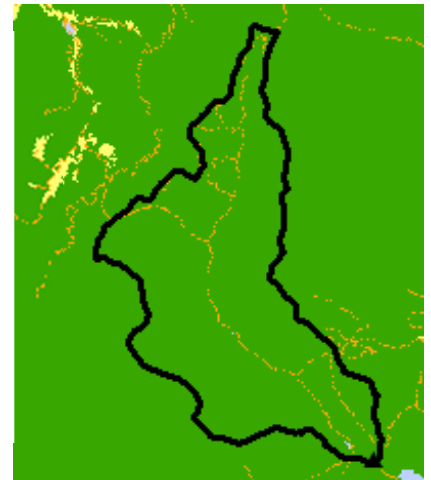
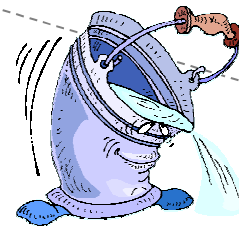
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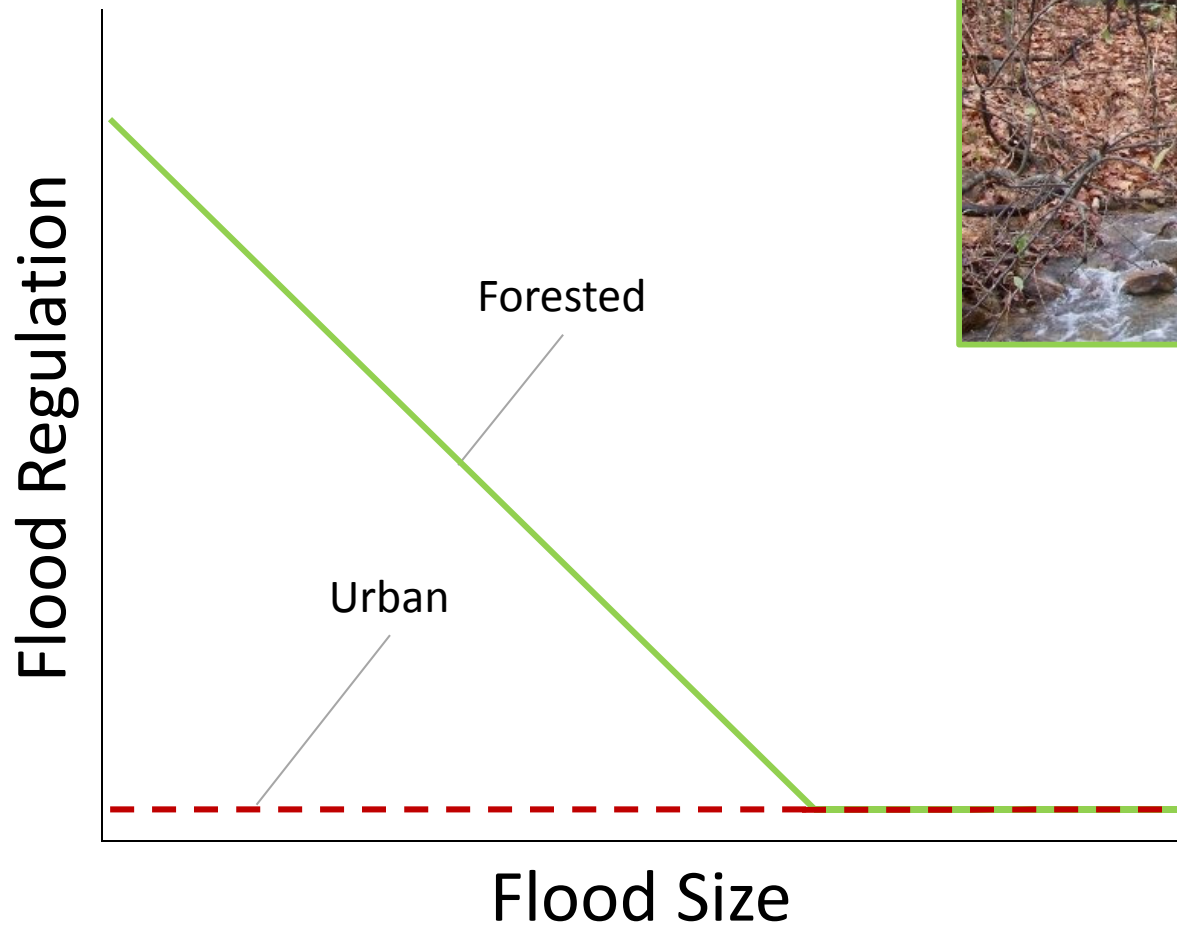


Adapted from Blöschl et al. 2007




- Water
- Forests and Wetlands
- Developed
- Agriculture

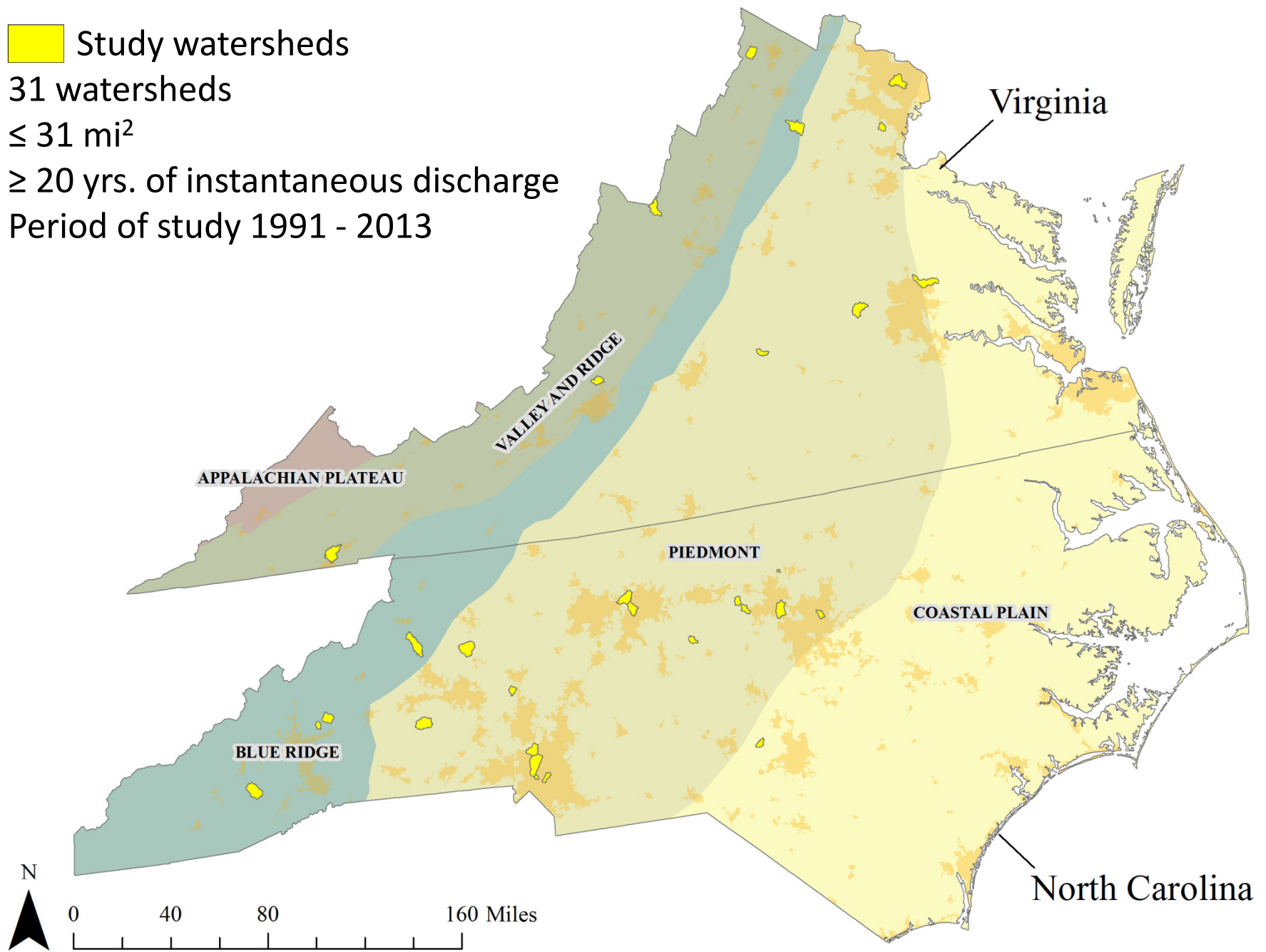




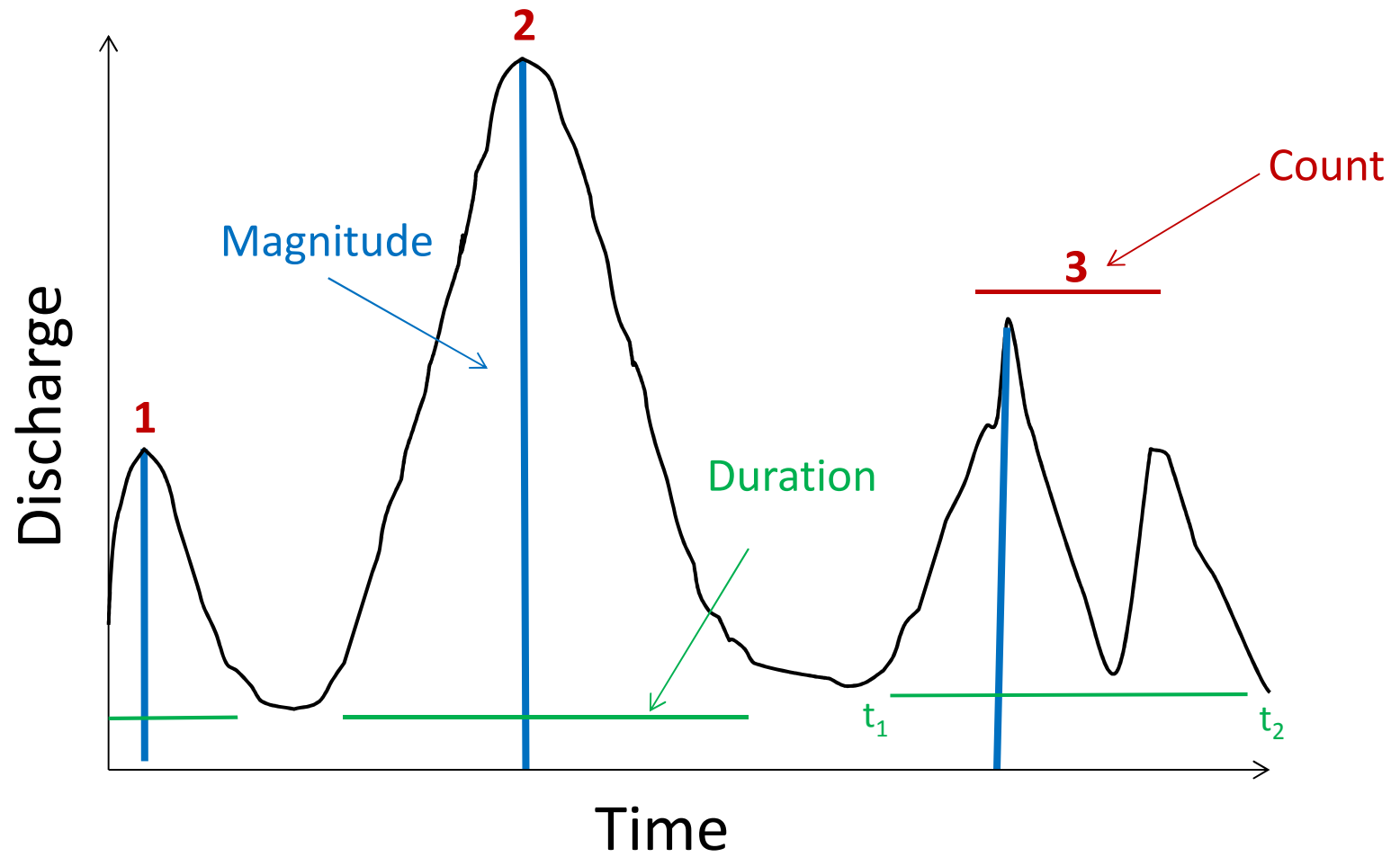
Objectives

- 1) Define a threshold for which changes in the landscape can have an impact on floods
- 2) Interpret flooding patterns in different landscapes

 Study watersheds
31 watersheds
≤ 31 mi²
≥ 20 yrs. of instantaneous discharge
Period of study 1991 - 2013

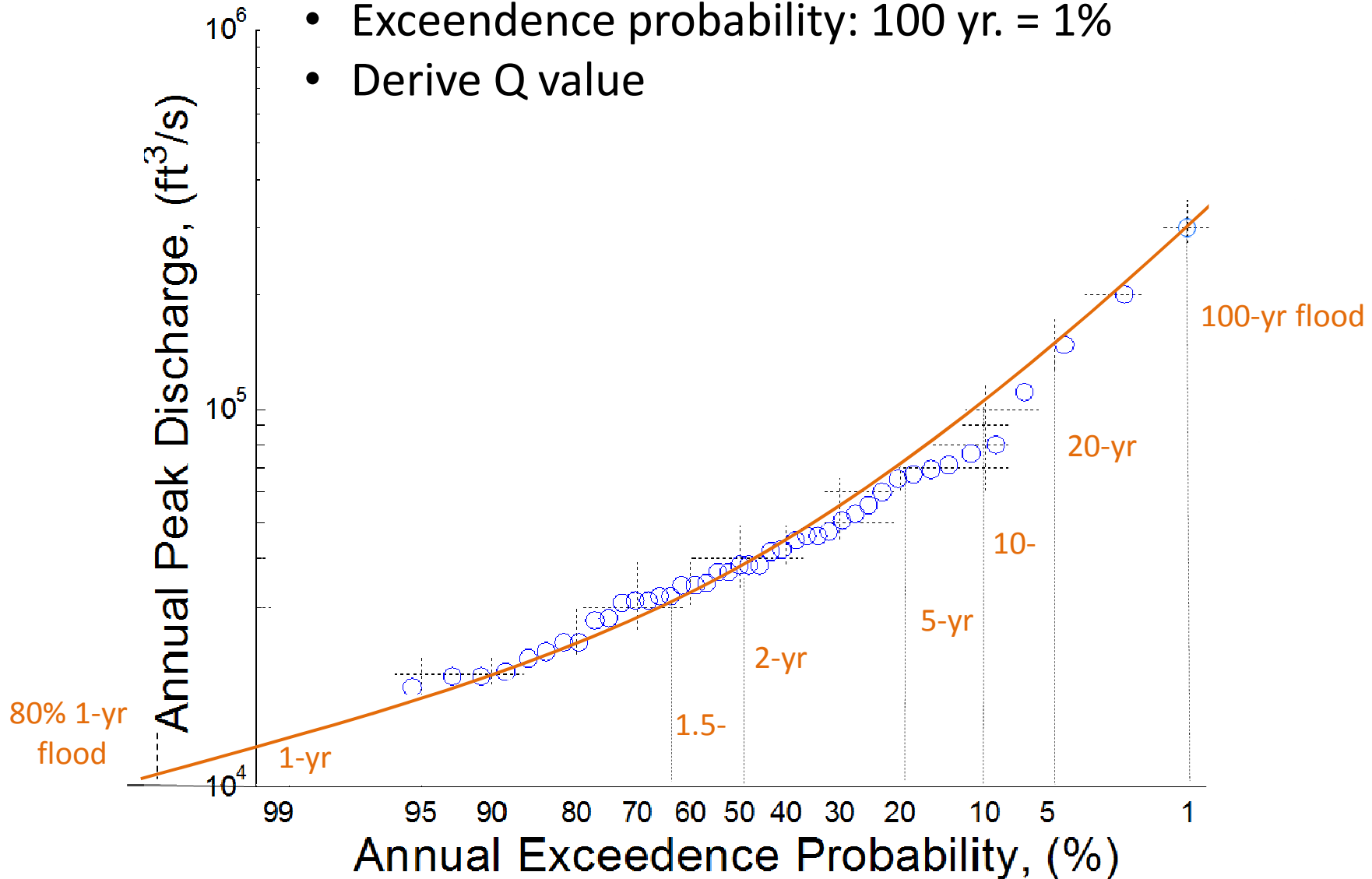


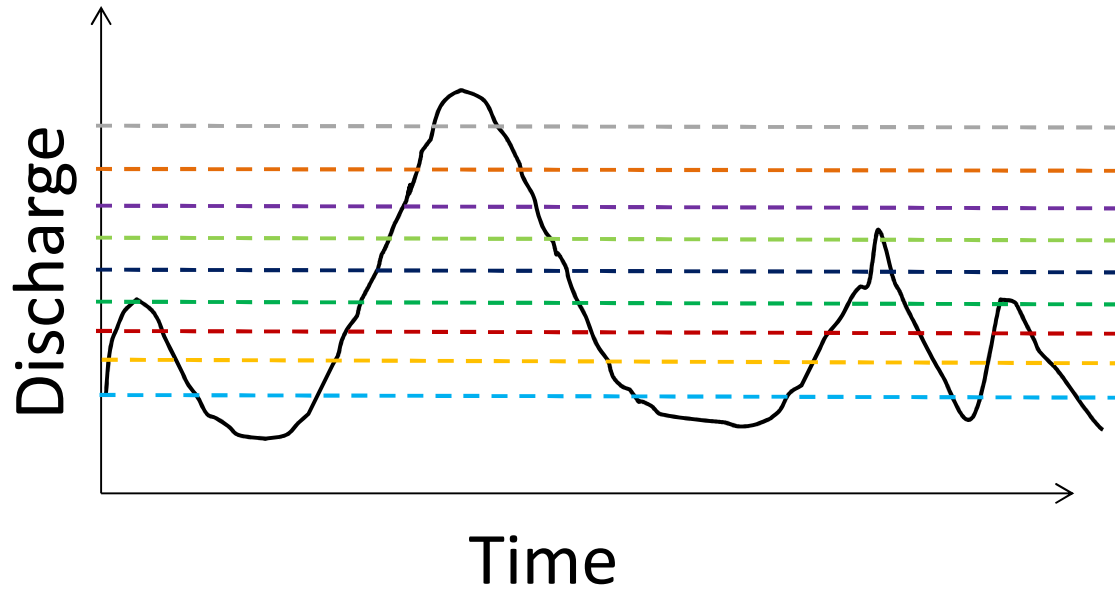
Flood metrics



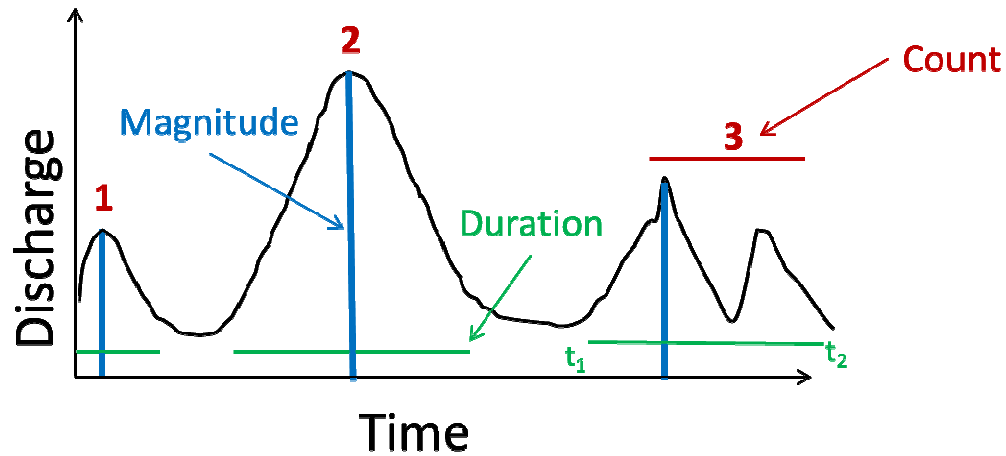
Deriving threshold of different flood sizes

- Plot annual maximum discharge
- Fit curve
- Exceedence probability: 100 yr. = 1%
- Derive Q value

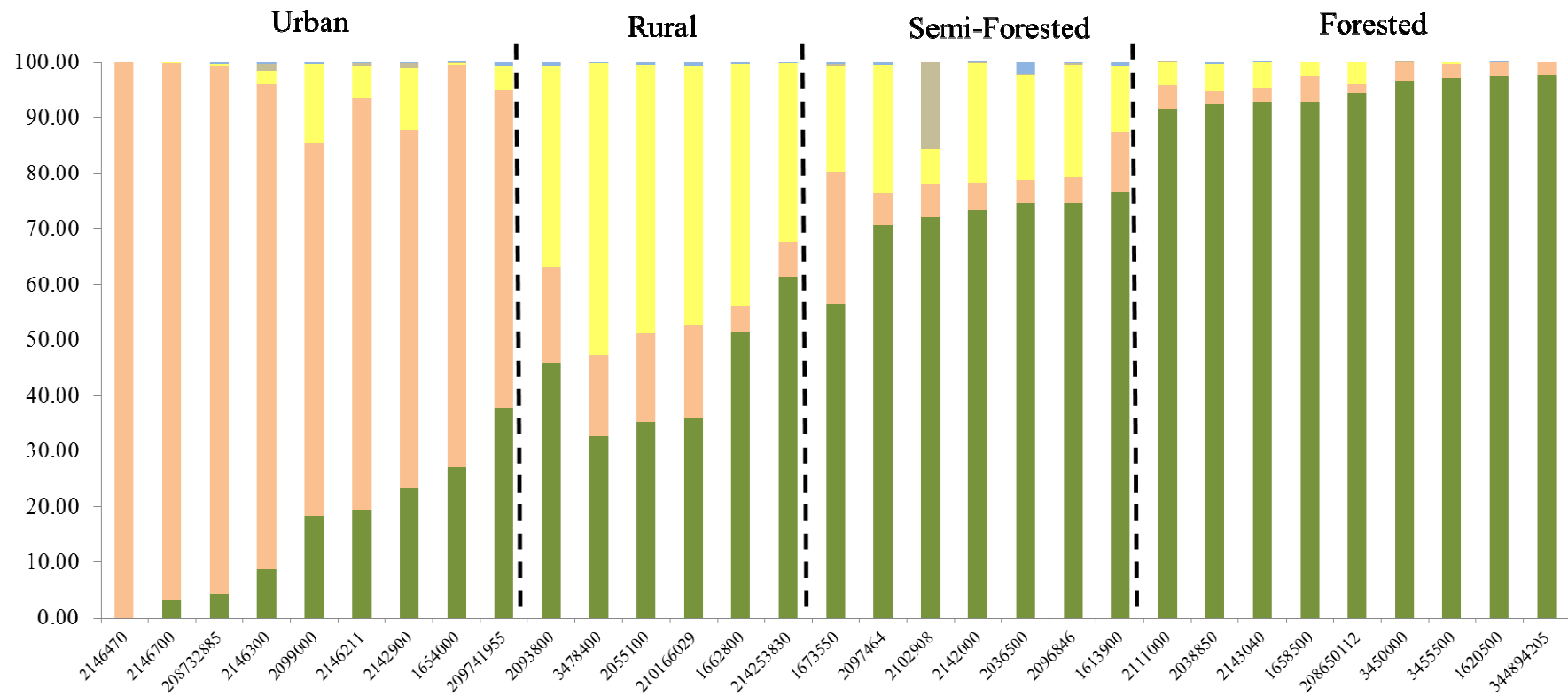
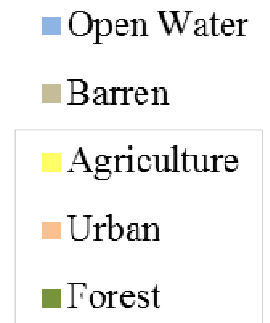




- ≥ 100-yr. flood
- ≥ 50- & ≤ 100-yr. flood
- ≥ 20- & ≤ 50-yr. flood
- ≥ 10- & ≤ 20-yr. flood
- ≥ 5- & ≤ 10-yr. flood
- ≥ 2- & ≤ 5-yr. flood
- ≥ 1.5- & ≤ 2-yr. flood
- ≥ 1- & ≤ 1.5-yr. flood
- ≥ 80% of 1- & ≤ 1-yr. flood

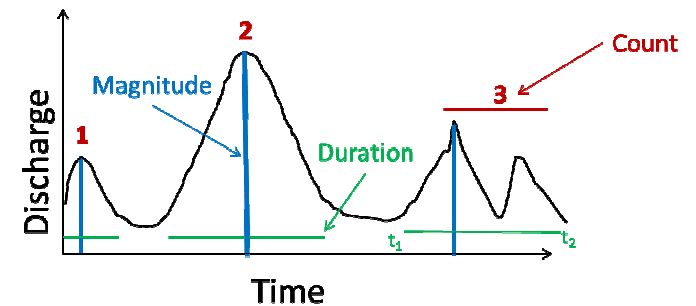
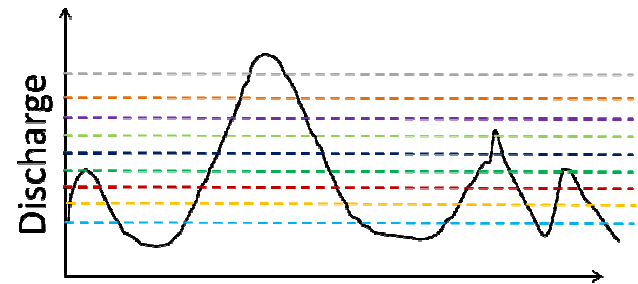
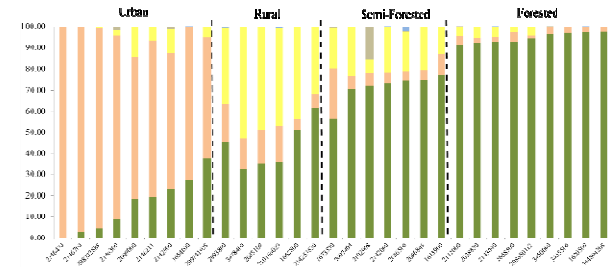


- Used AG/U/F: 1990, 1992, 2001 and 2006
- Classified watersheds doing a cluster analysis
- Derived 4 groups

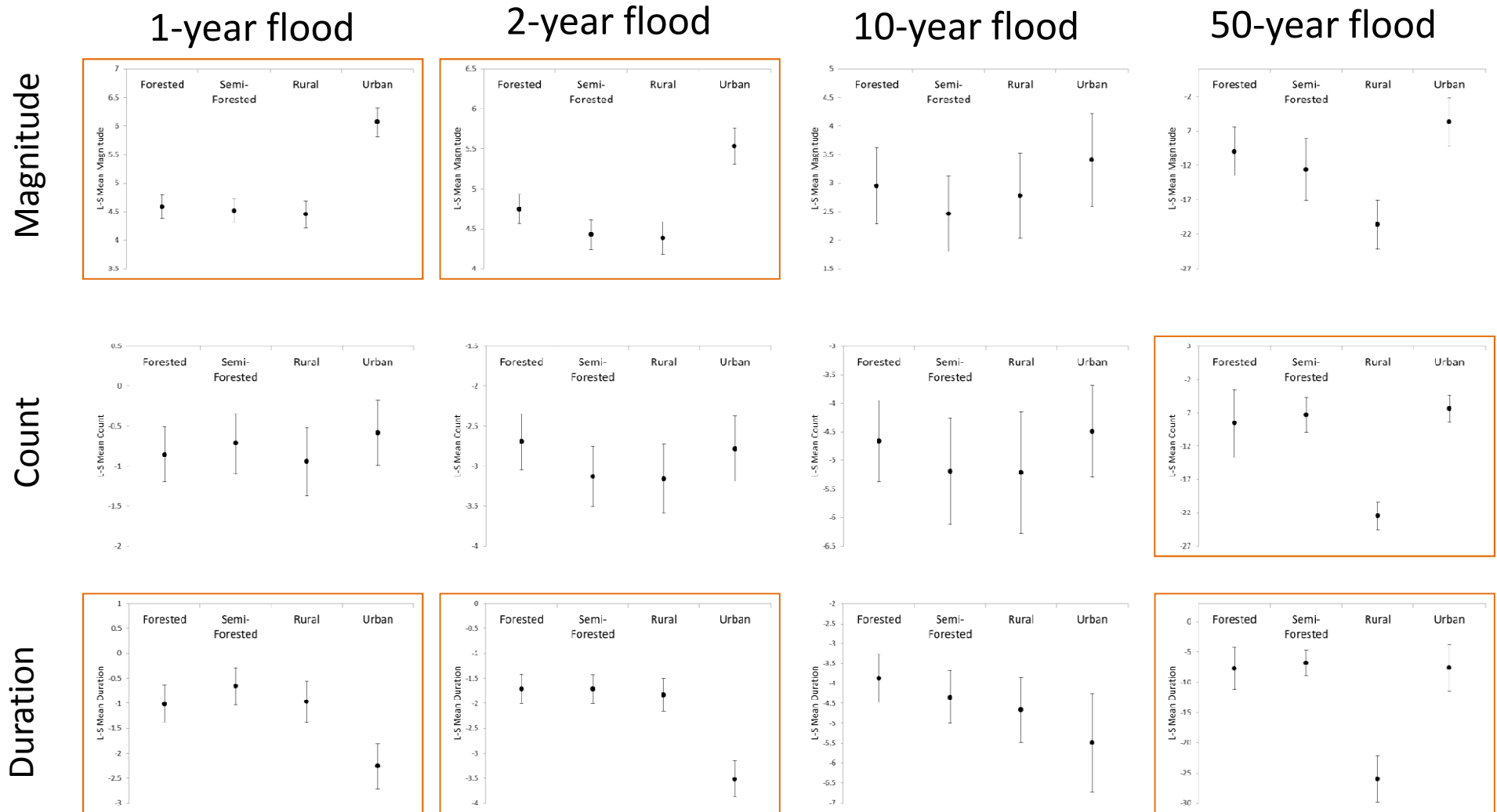


Statistical Analysis

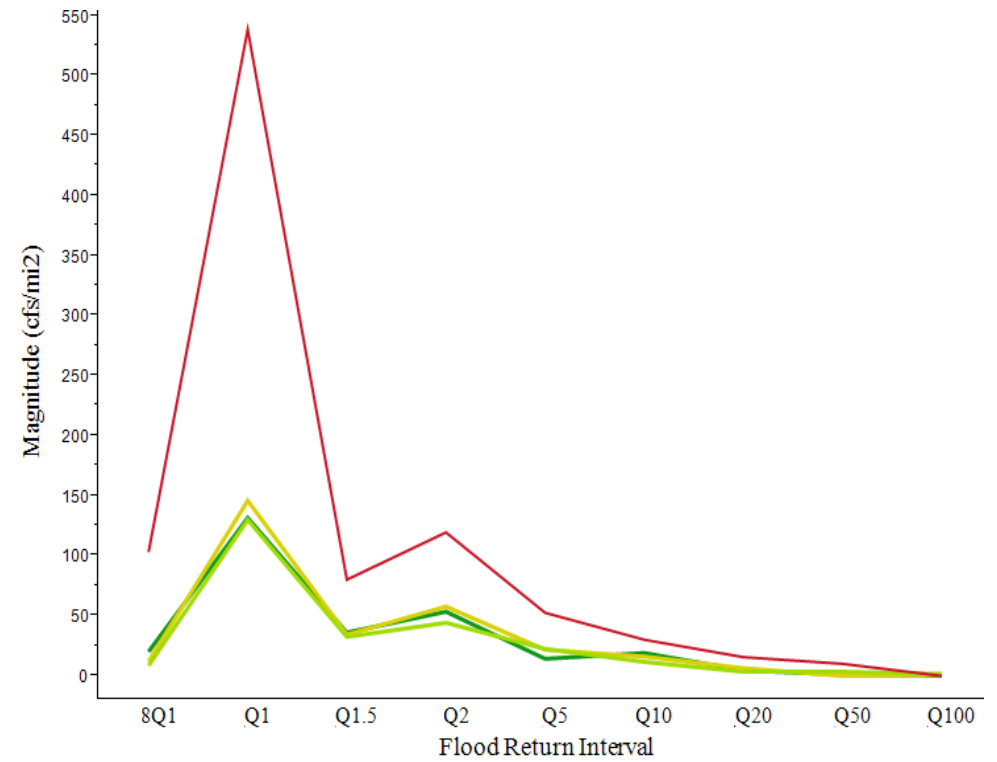
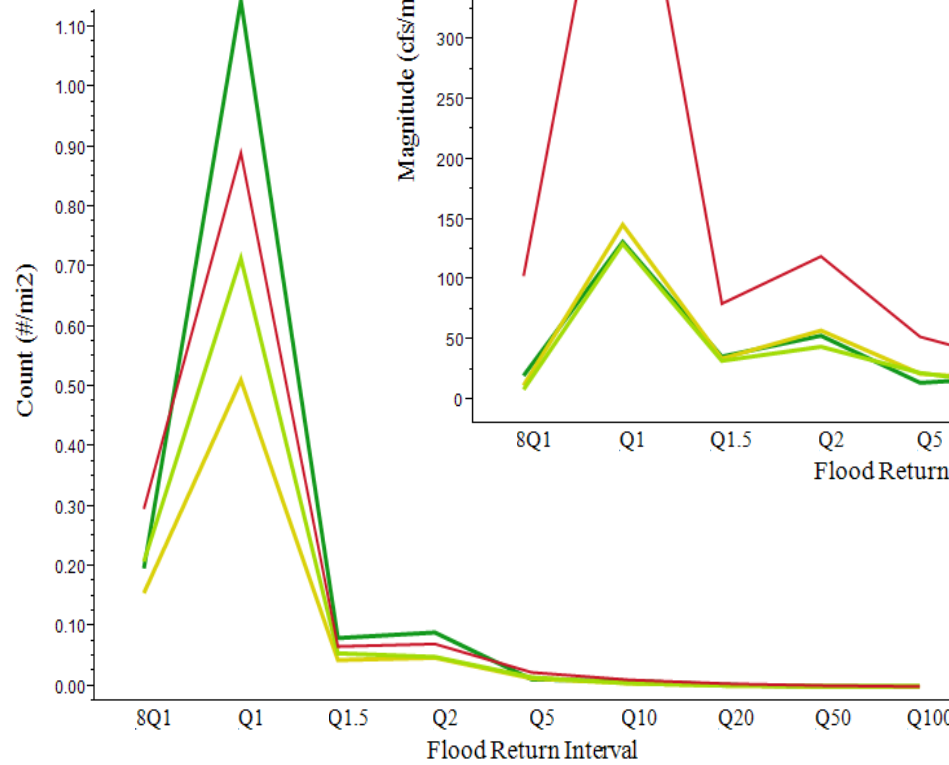
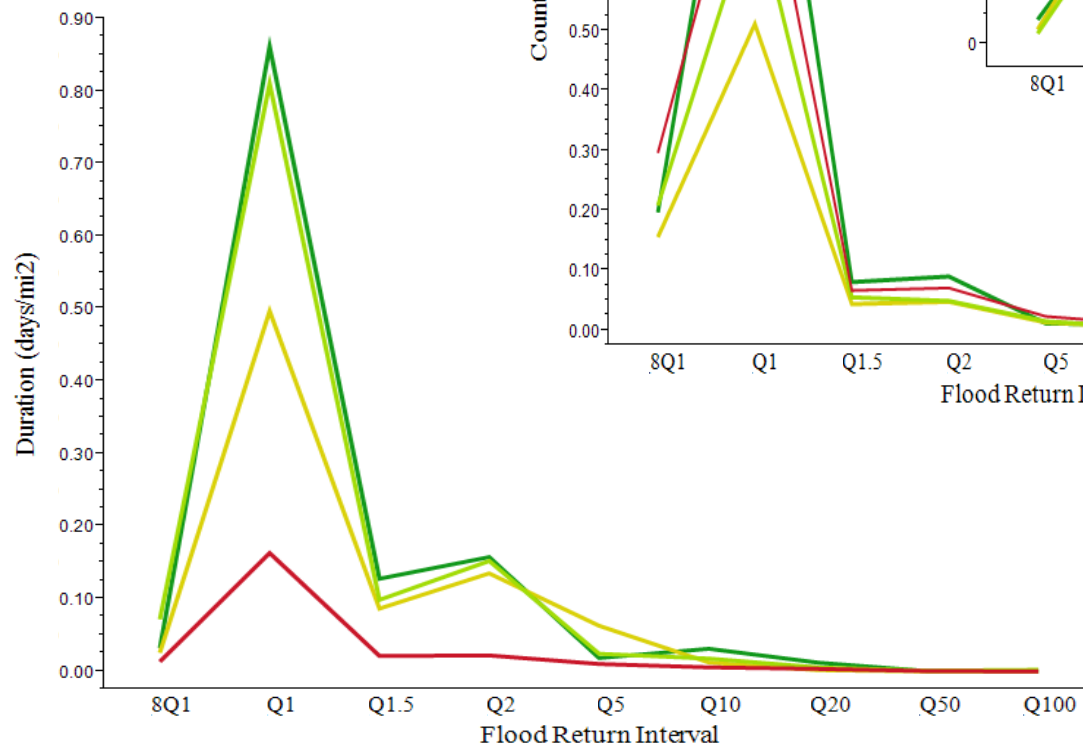
- Tested the differences between the four land cover types at each return interval for the three metrics
- Least-Square Means using Bonferroni confidence limits
- Generalized Linear Mixed Model



Results



- Greatest differences at small floods
- Same response at large floods



- Forested
- Semi-Forested
- Rural
- Urban

Type	Mean Annual Rainfall (mm)	Mean Slope (degrees)	Mean % Sandy/Loamy Soils	Artificial waterbodies (acres)	Flood-control Structures (acres)
Forested	1308	25.61	71%	0.06	0.00
Semi-Forested	1121	9.87	57%	0.96	0.11
Rural	1085	9.58	63%	0.76	0.09
Urban	1067	7.33	57%	0.49	0.53



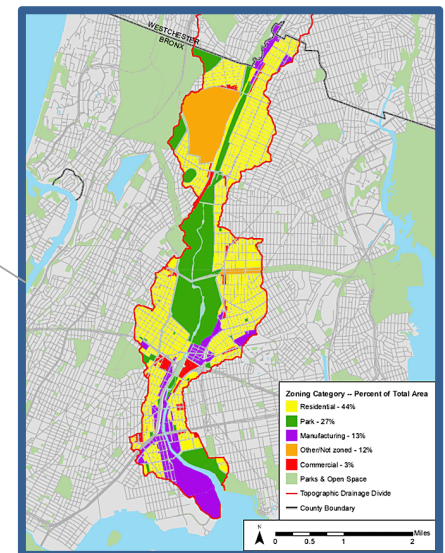
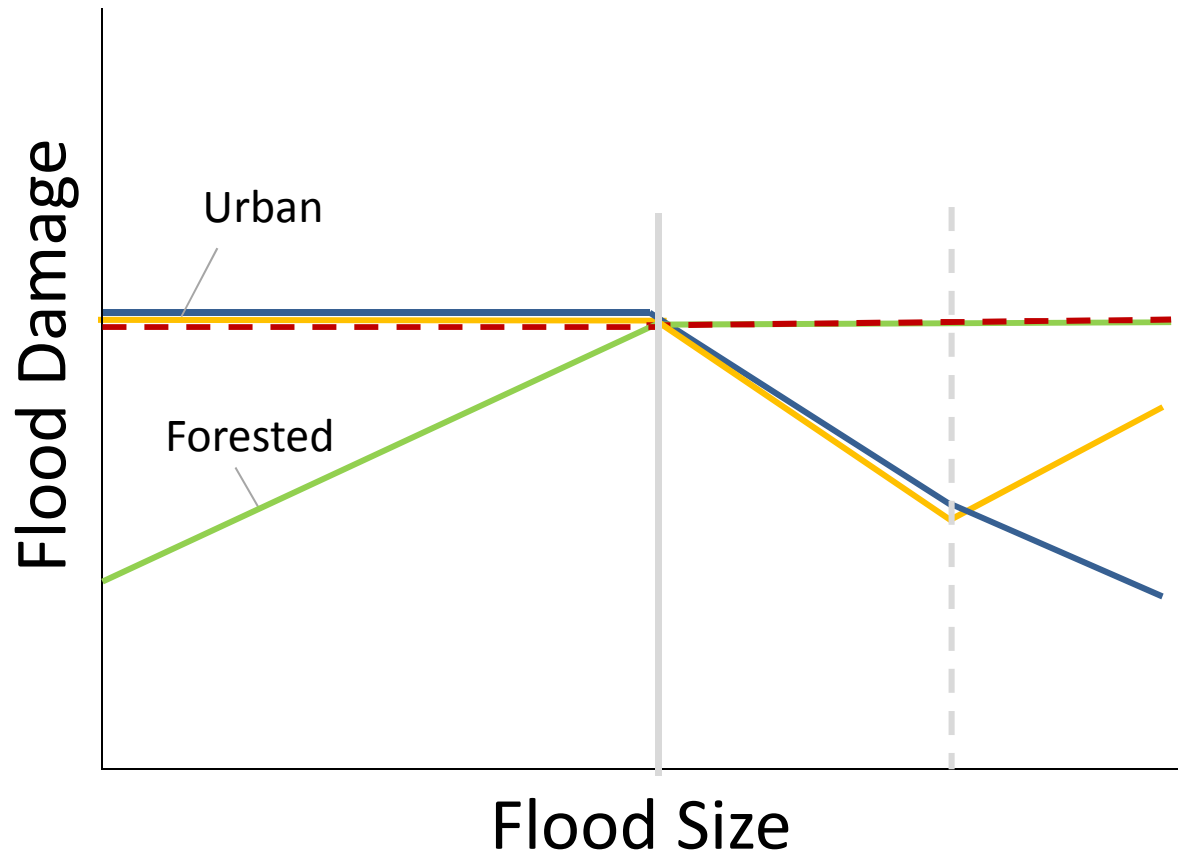
Conclusions

- Beyond a 5 year flood, magnitude and duration are the same for all watersheds, regardless of land cover
- Number of floods across watersheds is the same, perhaps driven by precipitation



Future research...

- Small floods mainly impact aquatic ecosystems
- But what about the floods that affect people?



Questions?

Beatriz (Tiz) Mogollón

mogollon@vt.edu

tizmogollon@weebly.com

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