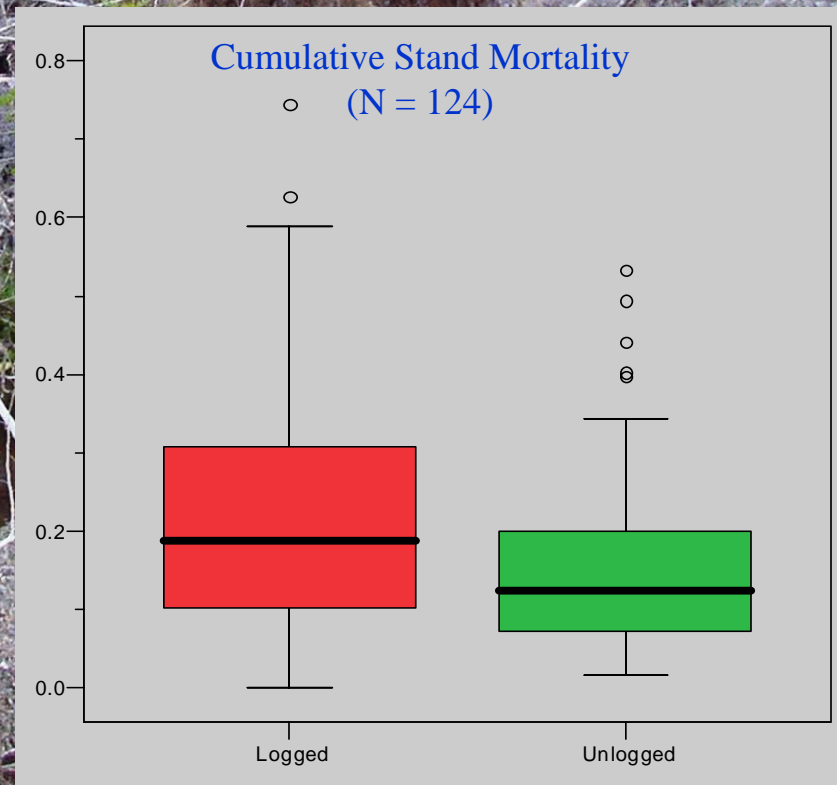


A photograph of a stream in a forest. A large, moss-covered log lies across the stream, with many dead, tangled branches and debris in the water. The background is a dense forest of green trees.

Buffer Strips and Tree Windthrow: Problem or Habitat Enhancement?

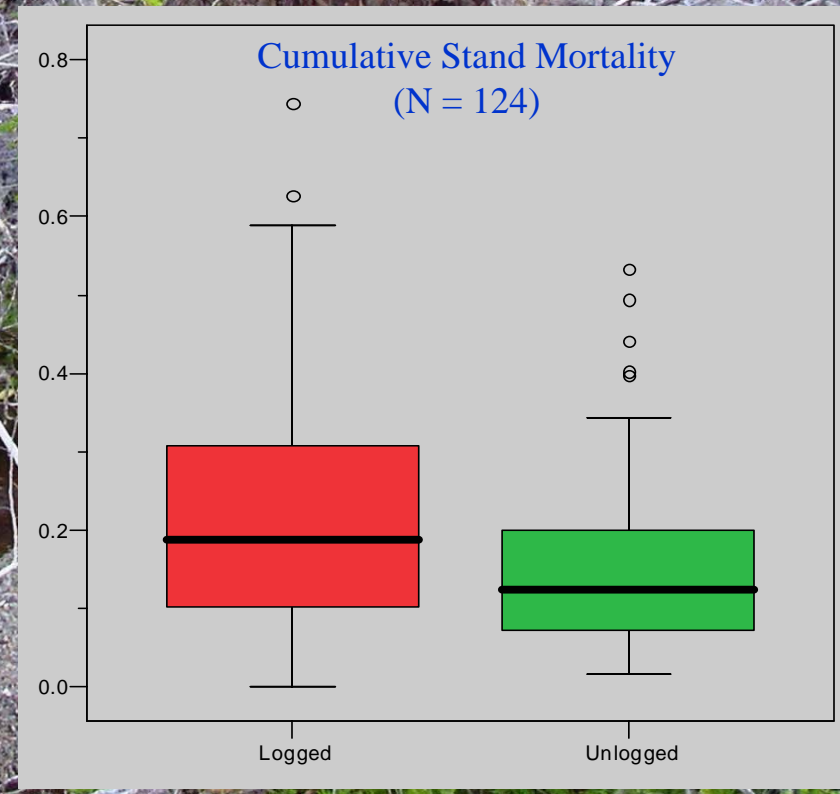
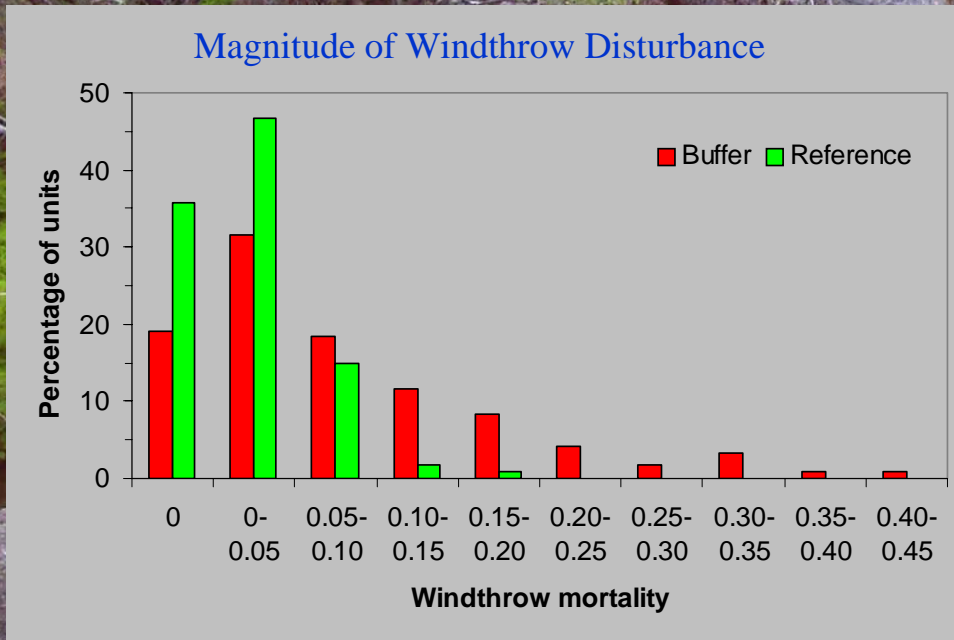
**Douglas Martin, Martin Environmental
Rich Grotefendt, Grotefendt Photogrammetric Services
Alice Shelly, TerraStat Consulting**

Windthrow in buffer strips is significantly increased following logging

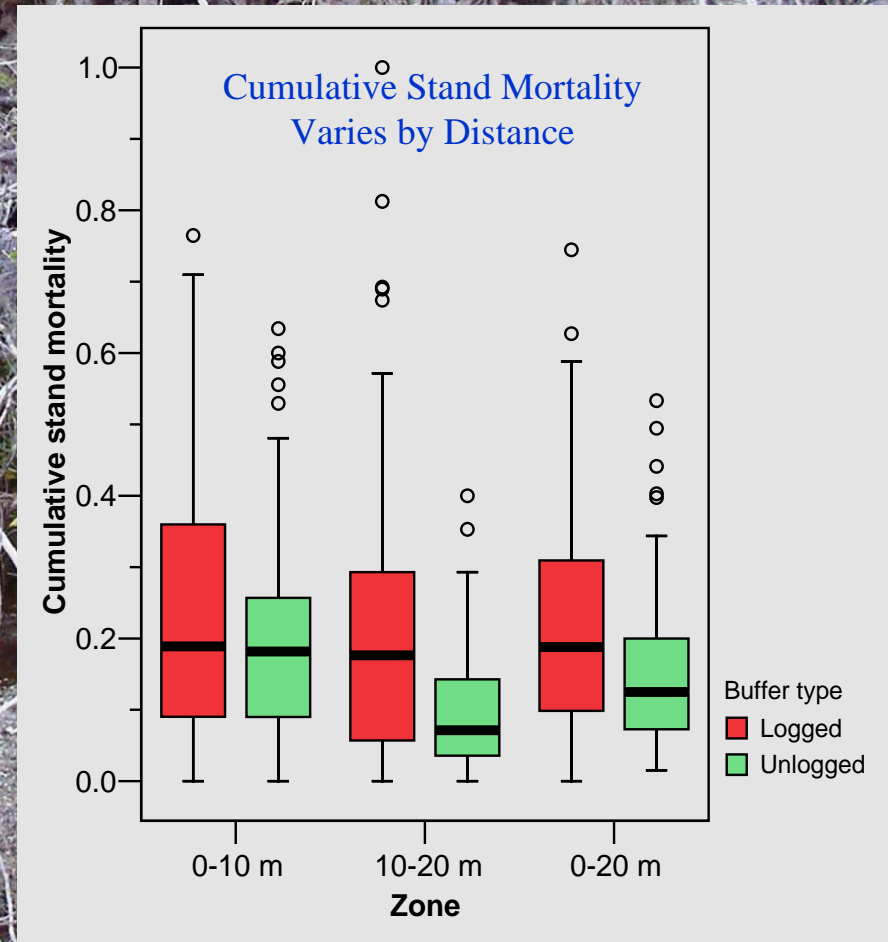


From Martin and Grotefendt 2007

Windthrow in buffer strips is significantly increased following logging



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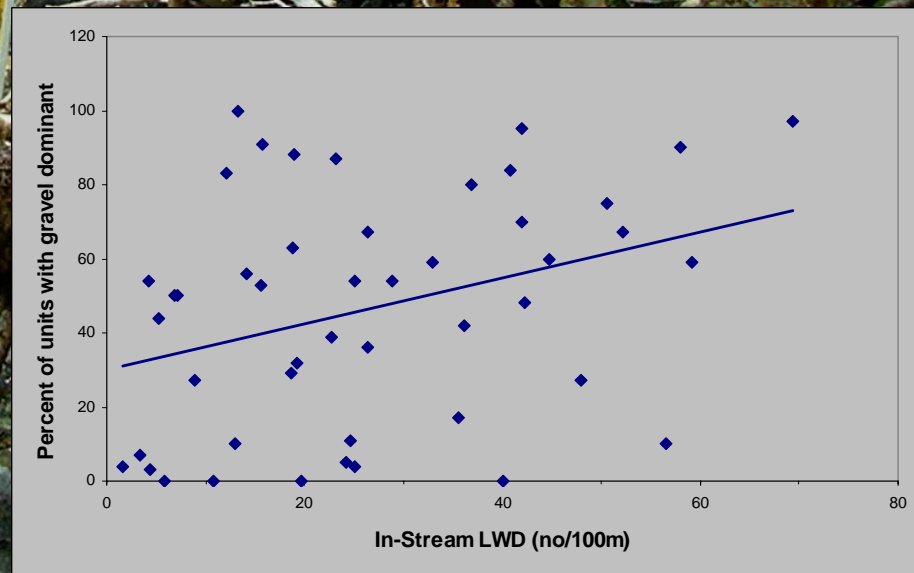
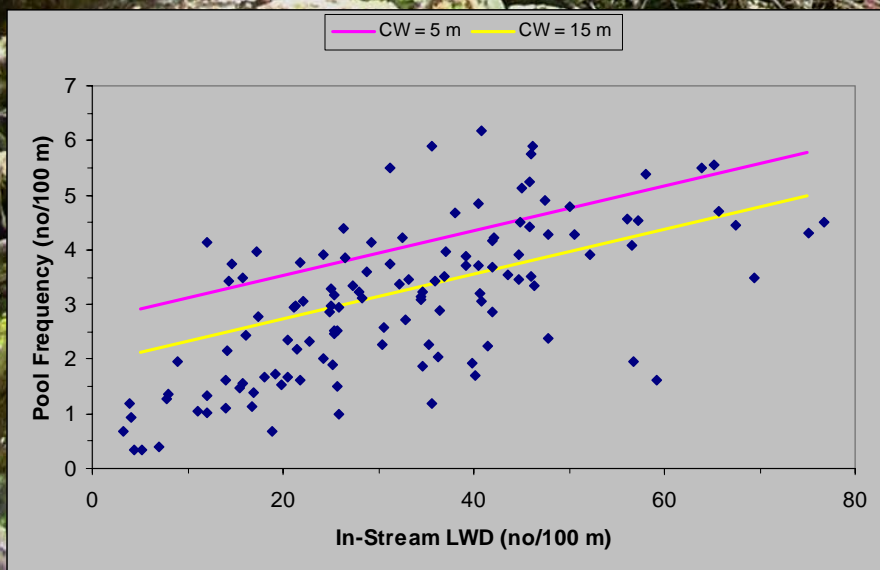
From Martin and Grotefendt 2007

What are effects of tree windthrow in buffer strips on fish habitat?



Habitat is strongly associated with LWD

- Beechie & Sibley 1997
- Montgomery et al. 1997
- Martin 2001

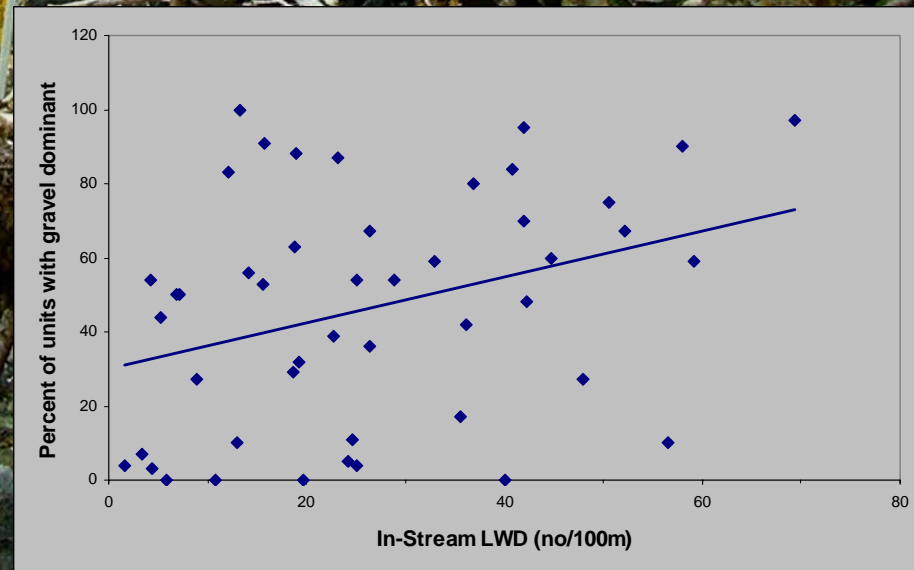
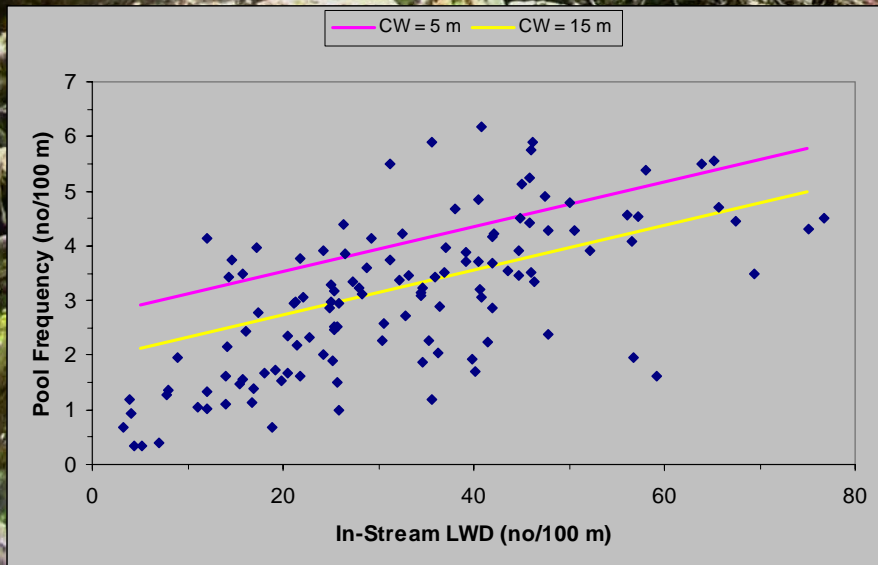


Habitat is strongly associated with LWD

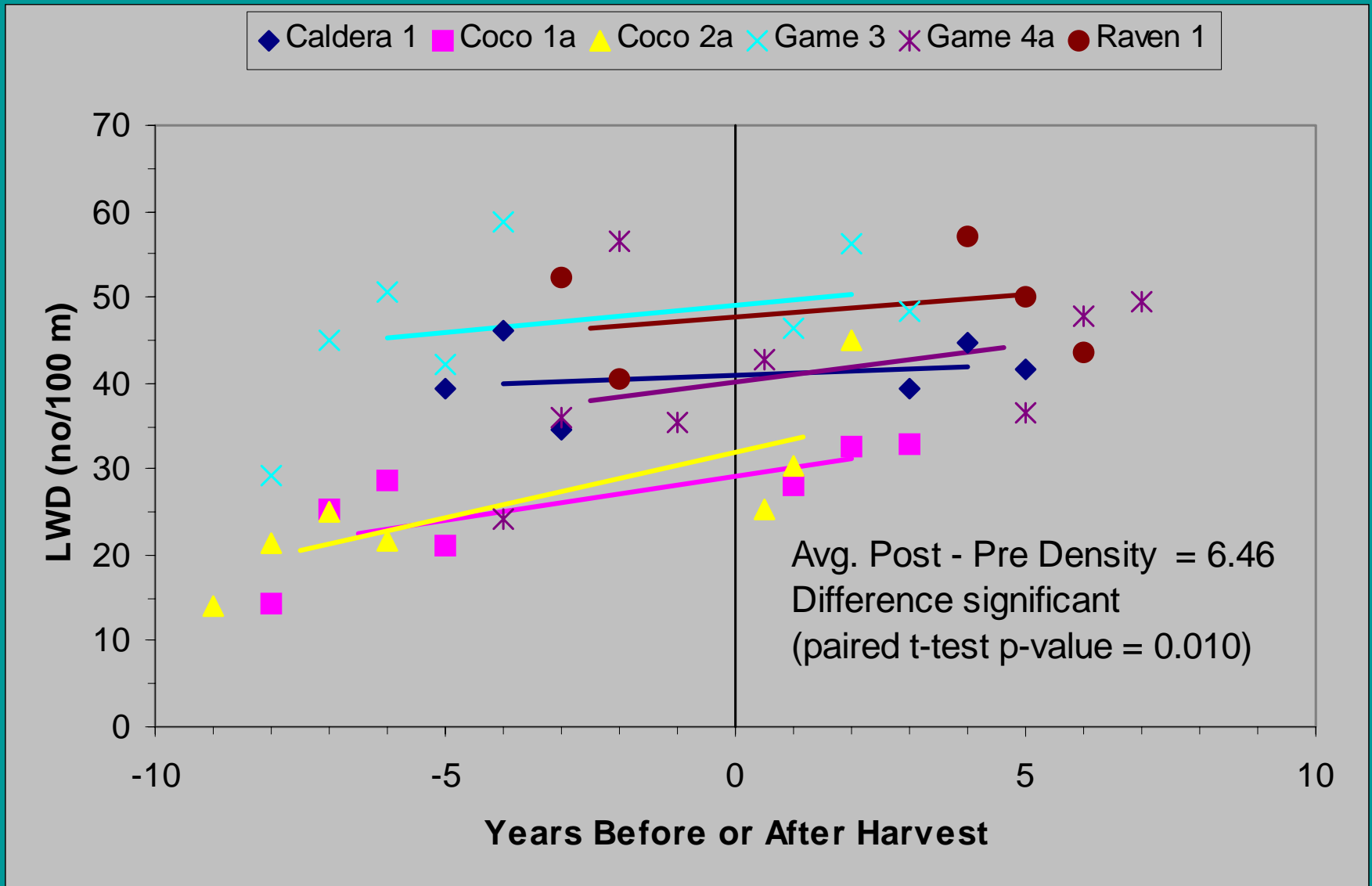
Question:

What is the magnitude and duration of habitat change following logging?

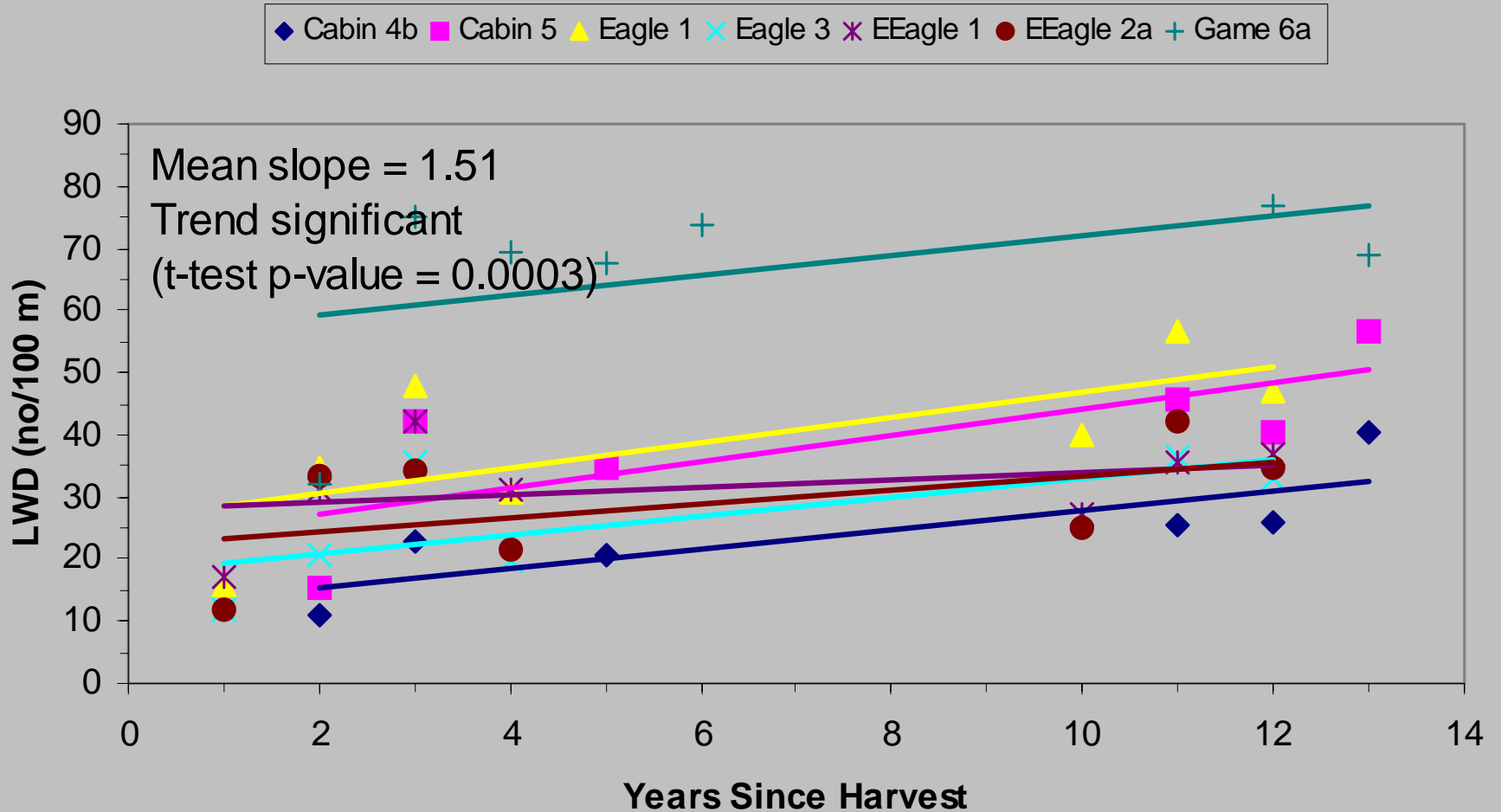
- Beechie & Sibley 1997
- Montgomery et al. 1997
- Martin 2001



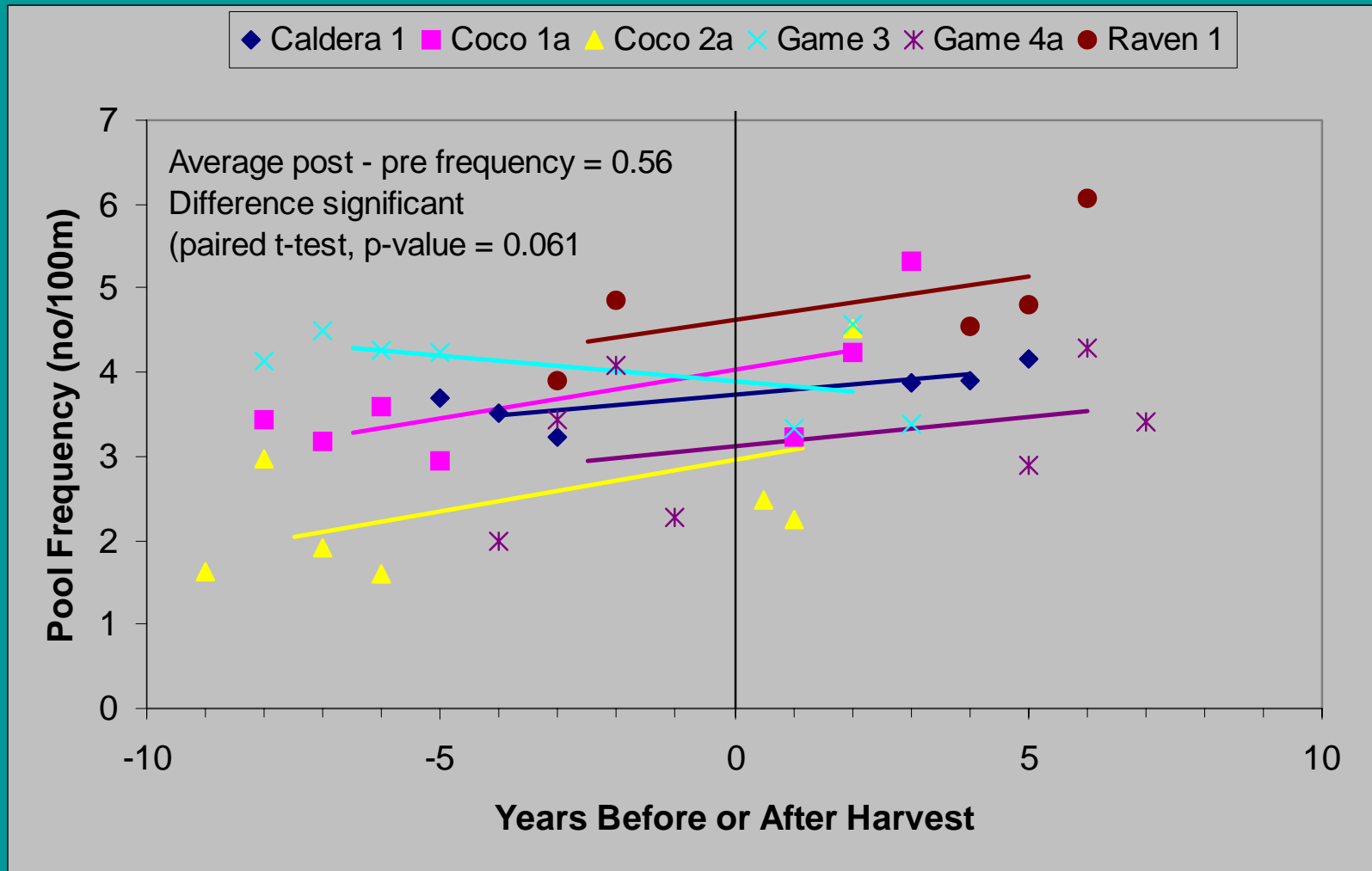
Trend in LWD Load In-Stream Pre- and Post-Harvest Group



Trend in LWD Load In-Stream Post-Harvest Group

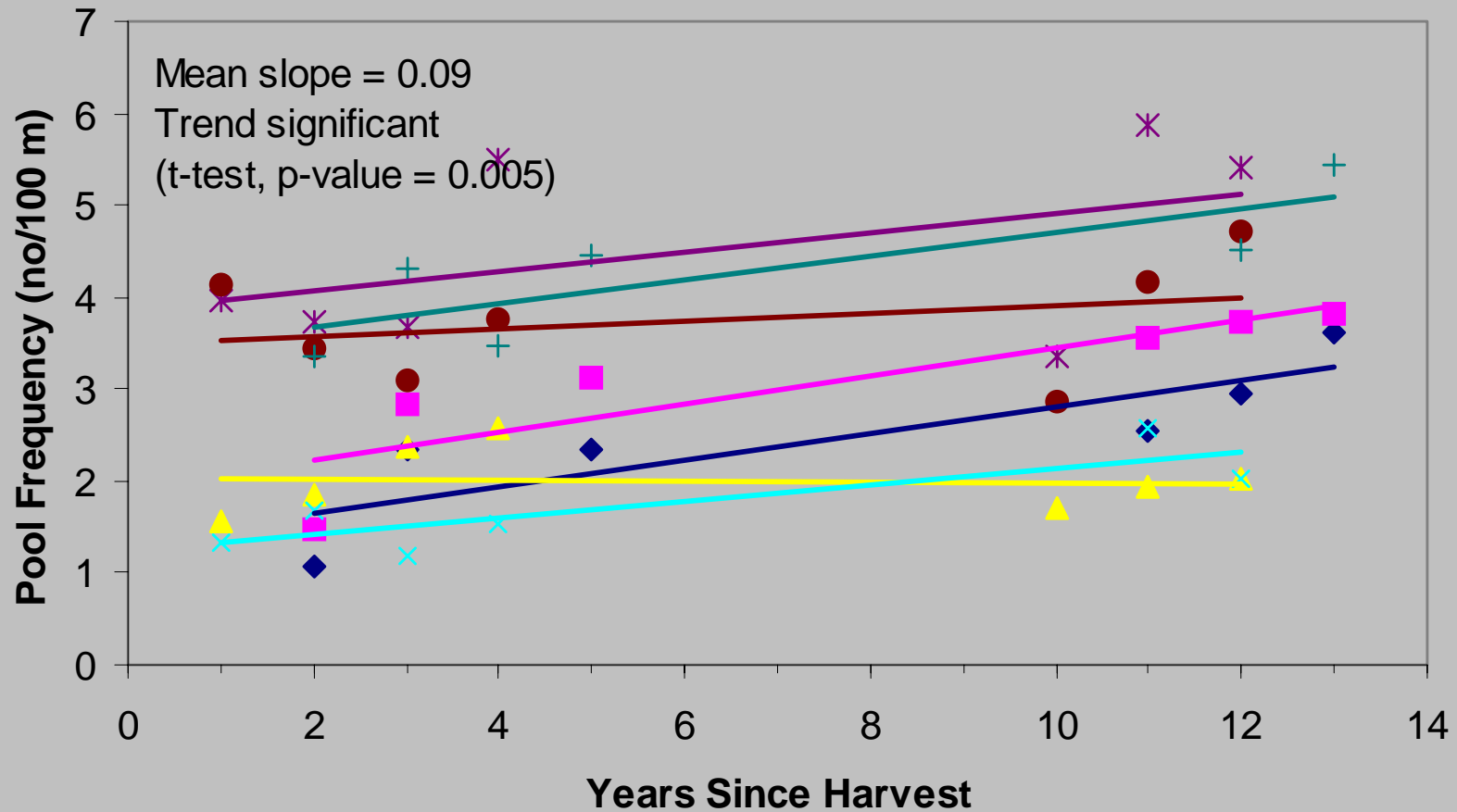


Trend in Pool Frequency Pre- and Post-Harvest Group

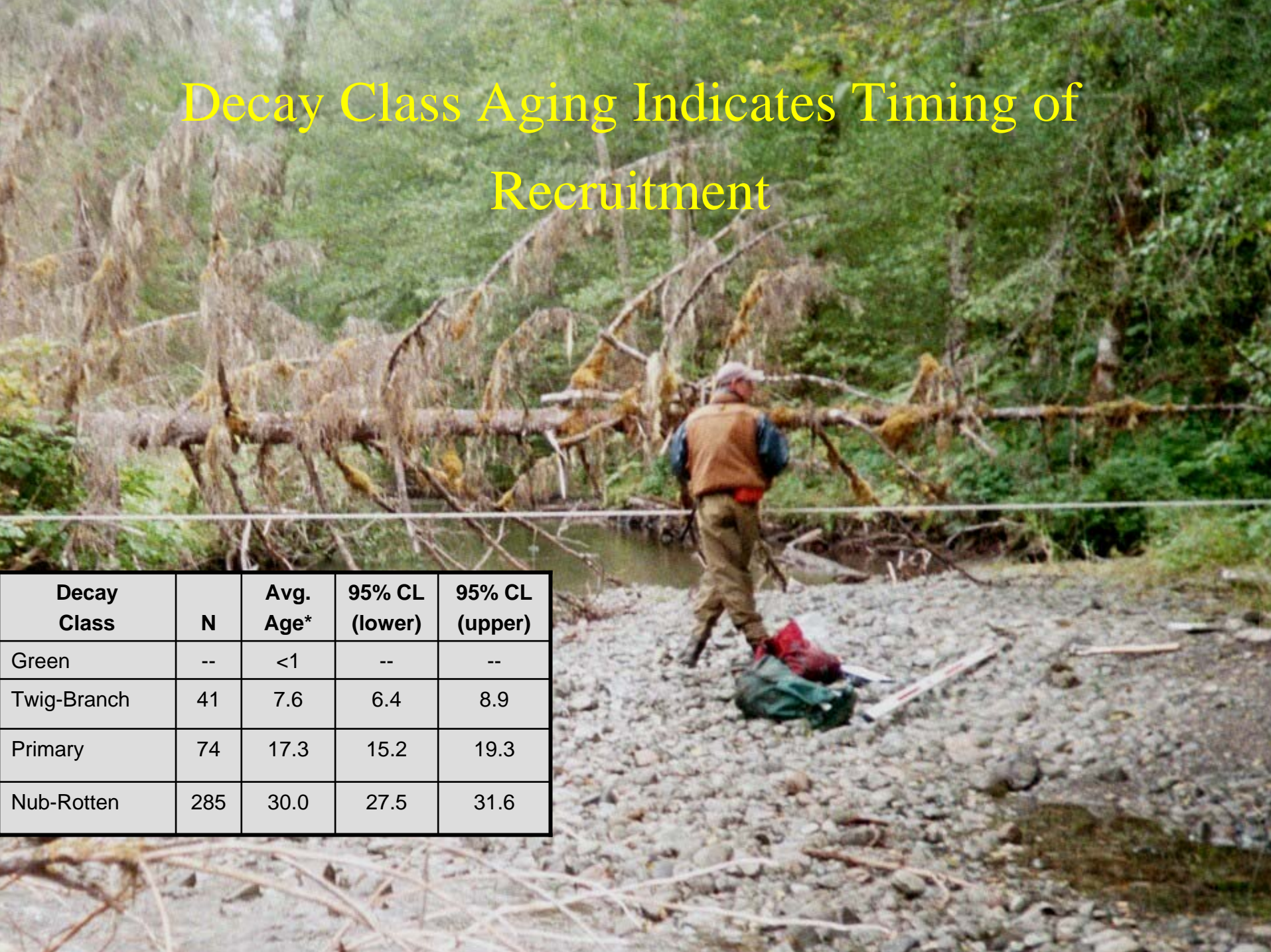


Trend in Pool Frequency Post-Harvest Group

◆ Cabin 4b ■ Cabin 5 ▲ Eagle 1 × Eagle 3 * E Eagle 1 ● E Eagle 2a + Game 6a

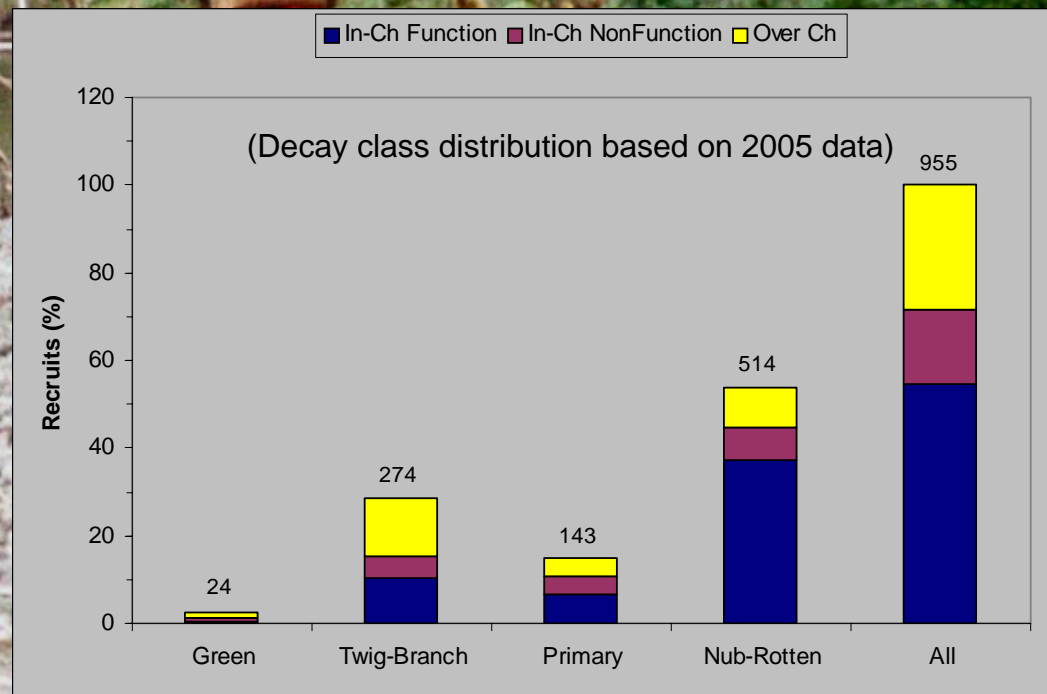


Decay Class Aging Indicates Timing of Recruitment



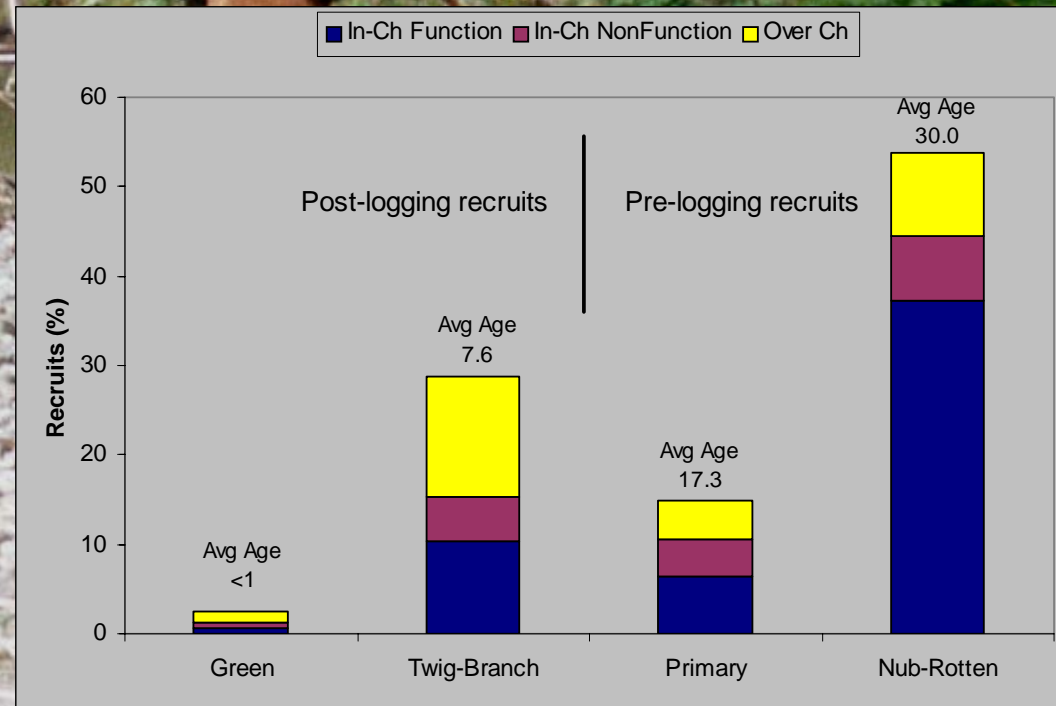
Decay Class	N	Avg. Age*	95% CL (lower)	95% CL (upper)
Green	--	<1	--	--
Twig-Branch	41	7.6	6.4	8.9
Primary	74	17.3	15.2	19.3
Nub-Rotten	285	30.0	27.5	31.6

The Proportion of Recruited Trees that Function to Form Habitat is Related to Decay Class



Decay Class Age and Function Indicates:

- Only younger decay class recruits (11%) may be affecting habitat since logging
- Full effect of post-harvest recruitment may not occur, on average, for about 30 years

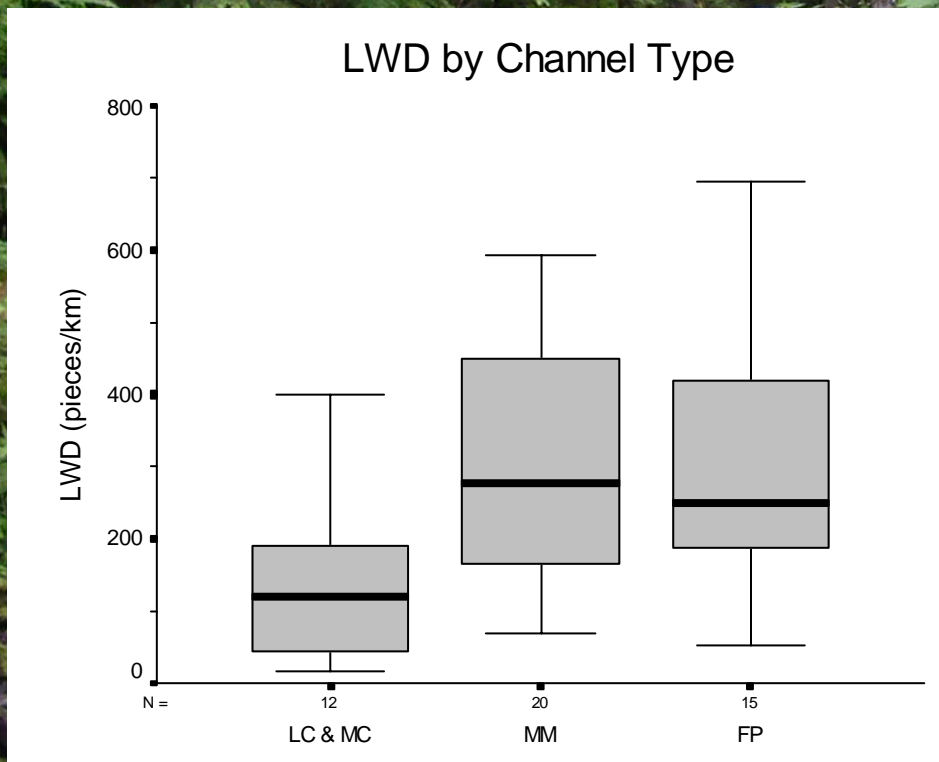


Habitat Formation Needs More than Riparian Stand!



Natural Wood Loading is Highly Variable

Southeast Alaska



Washington

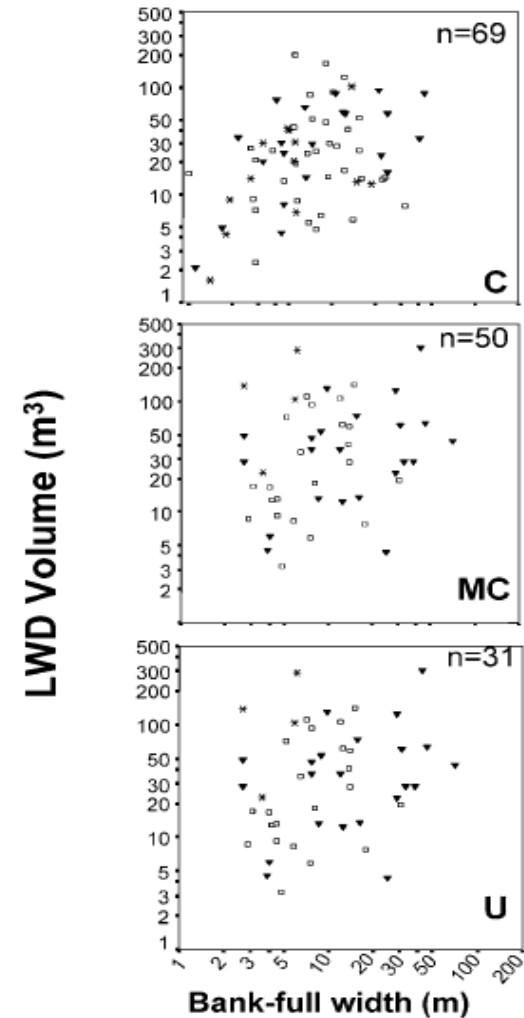


FIGURE 2.—The combined effect of gradient (triangles = 0–4%, squares = 4–20%, and asterisks = 20% or more) and confinement (confined [C], moderately confined [MC], and unconfined [U]) on the volume of instream wood (LWD) per 100 m of channel length by bank-full width for surveyed streams in Washington, 1999–2000.

From Martin 2001

From Fox & Bolton 2007

Wood Recruitment and Forest Management?

Wood Recruitment Processes

- chronic mortality
- wildfires
- bank erosion
- landslides
- ice storms
- windstorms

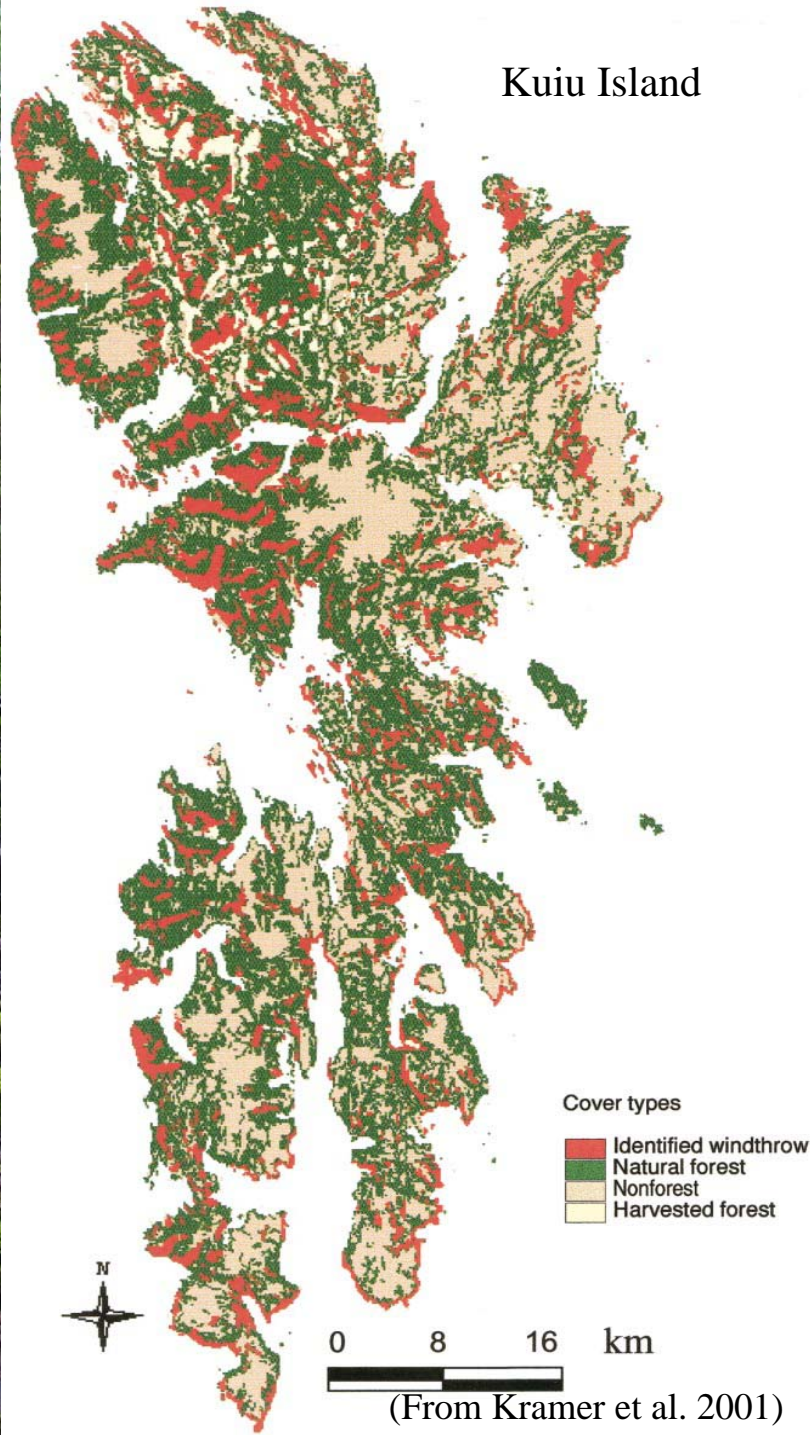
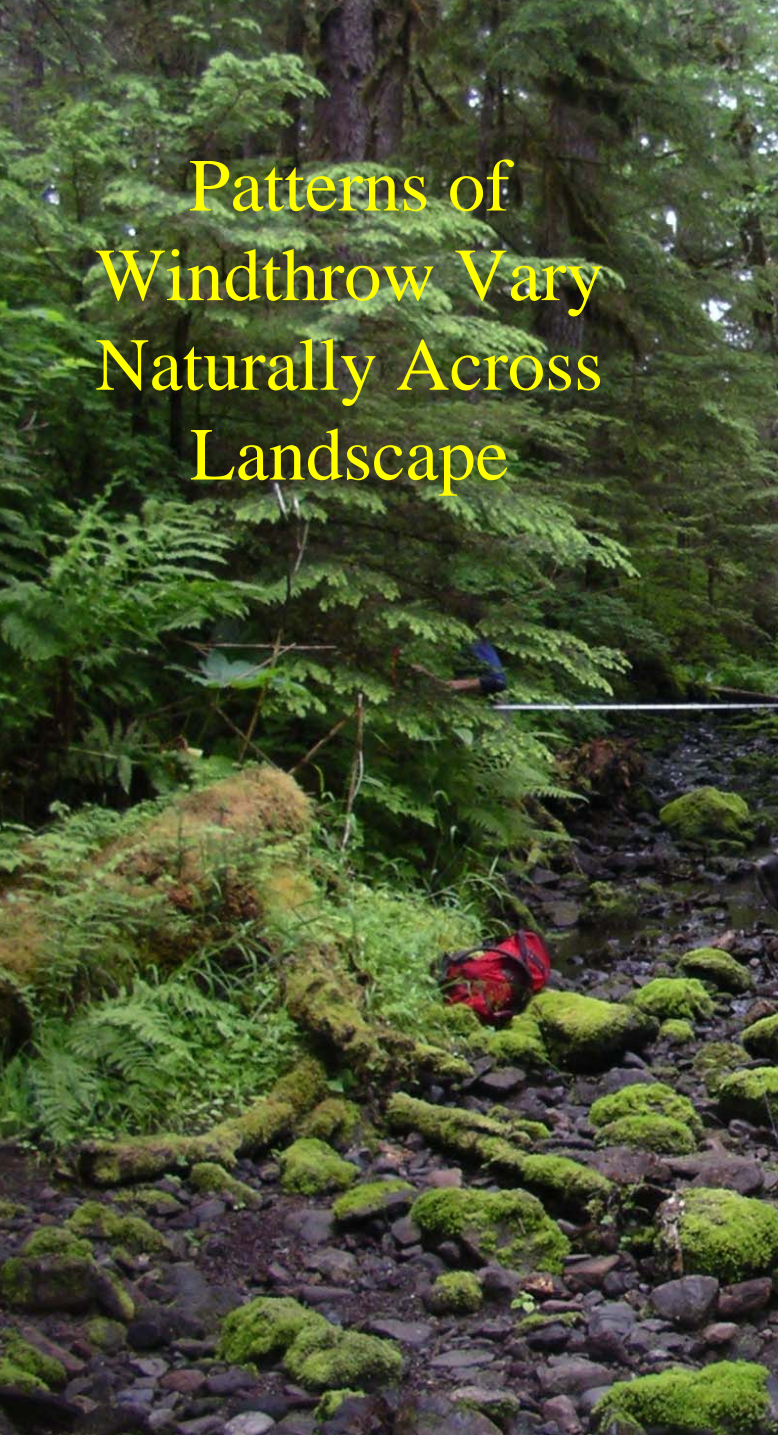
Wood Recruitment and Forest Management?

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Benda et al, 2003. Wood recruitment processes and wood budgeting. *The Ecology and Management of Wood in World Rivers*.

Patterns of
Windthrow Vary
Naturally Across
Landscape



Harvest Management Patterns and Windthrow in Buffer Strips may be Influencing the Quantity and Distribution of Fish Habitat?



Timber Harvest may be More Concentrated in Geographic Areas That are Naturally Less Prone to Windthrow

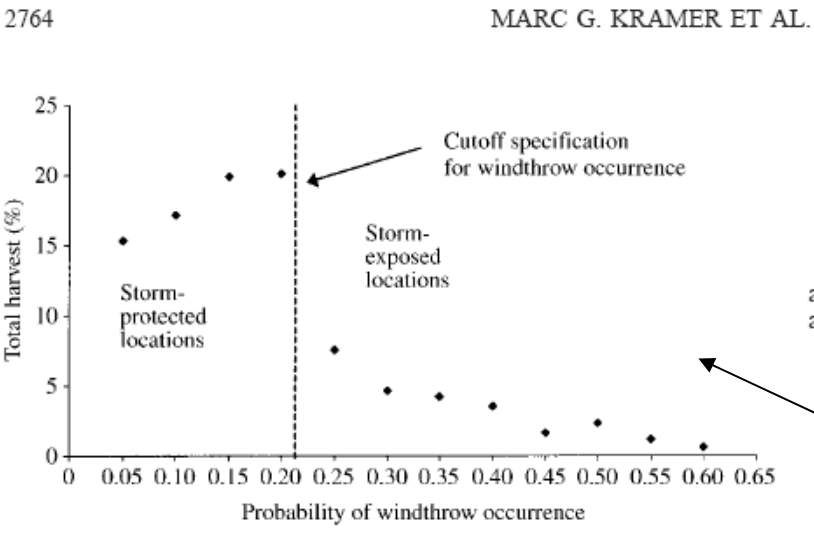
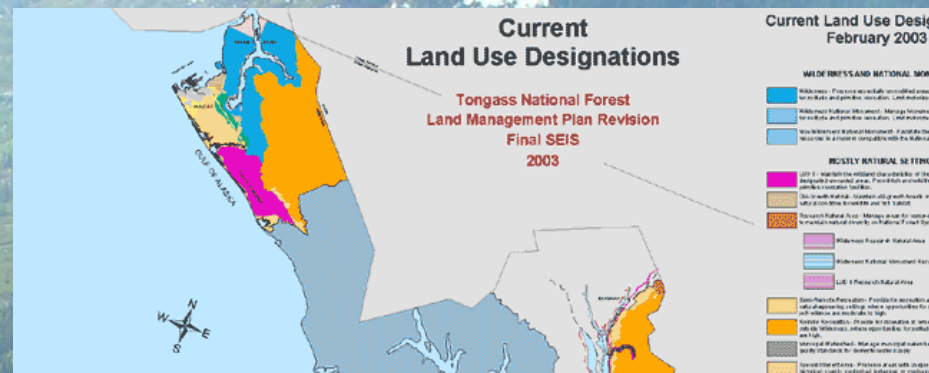
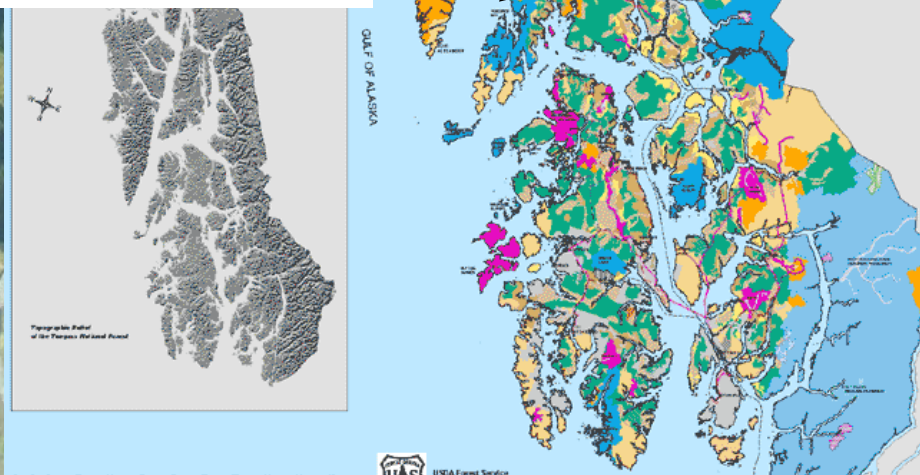


FIG. 10. The amount of logging (measured as percentage of total harvest) in storm-exposed and storm-protected locations.

Kuiu Island



Conclusion and Hypotheses

Windthrow in buffer strips is increased following logging

Windthrow is naturally greater in storm exposed landscapes



Conclusion and Hypotheses

An aerial photograph of a forested landscape. A stream flows through the center, surrounded by dense evergreen trees. Several logging roads are visible, winding through the forest. The terrain is hilly and shows signs of logging activity, with some areas appearing cleared or with sparse vegetation. The stream has a braided pattern in some sections, with multiple channels and sandbars.

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Windthrow is naturally greater in storm exposed landscapes

Fish habitat is strongly associated with the amount and distribution of LWD in streams

Conclusion and Hypotheses

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Fish habitat may vary spatially and temporally across the landscape as a result of natural patterns of windthrow.

Windthrow disturbance following logging may be increasing fish habitat in streams where windthrow was historically infrequent.

A photograph of a person standing in a stream, surrounded by a dense forest and a large pile of driftwood. The person is wearing a light-colored shirt and dark pants, and is looking towards the camera. The stream is filled with water and has a rocky, pebbly bed. The forest is composed of tall, thin trees, likely spruce or fir, with green foliage. The scene is brightly lit, suggesting a sunny day.

Acknowledgements

Sealaska Corporation

Alaska Department of Natural Resources

Alaska Department of Conservation

Alaska Clean Water Action Program

Clearwater Logging Research Team - 1974



Clearwater Logging Research Team - 1974



<http://www.dnr.wa.gov/hcp/research/pubs/index.html>