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In Support of **H.B. No. 5820**, AN ACT CONSERVING NATURAL VEGETATION NEAR WETLANDS AND WATERCOURSES

Submitted to the Environment Committee February 23, 2009

My research at Connecticut College focuses on river dynamics and informs my testimony in support of H.B. No. 5820

Our state's waterways are intricately linked to the vegetation that surrounds them. In most ecosystems in the state, large trees grew along the sides of rivers on the floodplain in what is termed, a riparian forest. The cumulative impact of human activities on New England channels is staggering. Nationwide, at least 70 percent of the original area of riparian forest was cleared (Swift, 1984). In Connecticut, the number percent of cleared riparian forest was even higher. Although trees now appear along many rivers and streams, the history of clearing trees has and continues to negatively impact aquatic habitat and water quality of our states watercourses (Thompson, 2006). Therefore, it is imperative that the State takes measures to protect the riparian forest area, by setting up buffer areas along rivers, to permit the natural healing process already underway in many rivers and streams. In the document below, I try to explain exactly how riparian vegetation, especially forest areas, has a direct impact on the physical conditions in the State's rivers and streams.

Traditionally, buffer areas along wetlands are valued world-wide for their ability to reduce runoff and filter pollutants out from surface runoff before the reach the sensitive wetlands areas (Gregory, 1991; Sweeney, 1992; Sweeney et al., 2004; Correl, 2005; Parkyn et al., 2005; Hussein et al., 2007; Thompson et al., 2009; Veum et al., 2009). A great deal of literature exists on this subject, and other scientific experts will undoubtedly touch on this issue. This filtering function is clearly an important role of a buffer strip, but I wanted to highlight another extremely important, but often overlooked role that riparian trees play in rivers and streams.

Scientific research has shown that the type of vegetation has an impact on the size, especially the width, of an adjacent stream or river (Zimmerman et al., 1967; Sweeney, 1992; Hey and Thorne, 1996; Gregory and Gurnell, 1988; Hession et al., 2003; Sweeney et al., 2004; McBride et al., 2006). The mechanisms that control behavior in the rivers are complex (McBride et al., 2006), but it is clear that clearing riparian forests directly impact the physical conditions in

reestablished. In another New England channel, Thompson (1995) showed a correspondence between the volume of standing timber and the volume of wood in rivers. Based on field data of tree diameter and channel width, Likens and Bilby (1980) predicted that mature tree species common in New Hampshire should be capable of forming wood created pools on channels as wide as 30 feet. However, channels of this size were completely devoid of wood created pools even 60 years after logging activities ceased (Bilby and Likens, 1980; Likens and Bilby, 1980). Therefore, it is important for the state to continually protect riparian areas to insure trees can attain the larger sizes needed to produce pools in many systems.

Once the wood is introduced to a stream, the wood is then subject to redistribution by the river flow. Wood diameter and length both influence log stability and distance of movement (Likens and Bilby, 1980; Nakamura and Swanson, 1993; Beechie et al. 2000; Braudrick and Grant, 2001). Log stability is a necessary condition to form stable pools, so the minimum length and diameter of wood capable of creating pools in relation to channel characteristics should be sensitive to the nature of the riparian forest and the related logging history. Once again, larger logs are needed to form pools in larger rivers. Once again, protection of riparian vegetation through the establishment of buffer strips is critical to provide the wood utilized for formation of aquatic habitat used by fish and macroinvertebrates.

Excess sediment in streams is considered one of the most common negative impacts on water quality in the nation's streams and rivers (EPA, 2008). Wood in a river also has a large positive impact on sediment input and storage that helps improve water quality. Wood creates instream (Lisle, 1986) and overbank sediment storage sites (Gurnell and Gregory, 1984) that can contain from 123 percent of the stream's annual sediment yield (Marston, 1982) to between ten and fifteen times the annual sediment yield (Megahan and Nowlin, 1976; Swanson and Lienkaemper, 1978; Megahan, 1982; Swanson and Fredriksen, 1982). Wood also provides temporary-storage areas for new sediment pulses (Keller and Tally, 1979). Chin (1989) and Thompson (1995) described deposition of fine-grained sediment upstream and an armored channel-bed downstream from wood positioned across small channels. Klein et al. (1987) have also noted that wood can limit vertical erosion of a stream bed and stable sediment storage sites. Wood residence times in excess of 20-100 years have been suggested (Swanson and Lienkaemper, 1978; Megahan, 1982; Swanson et al, 1984; Hogan, 1987; Kelsey, 1987; Madej, 1987), which shows that long-term storage of sediment can occur. Researchers have also noted the ability of wood to protect channel banks from erosion (Marston, 1982). Therefore, an adequate supply of wood to a river can have an important role in improving water quality.

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2005-2007. *U.S. Fish and Wildlife Service.* Assessing Large Woody Debris for Salmon ($18,000). F. Magilligan P.I. D.M. Thompson collaborator.

2004-2005. *National Science Foundation.* Brownfield Action Proof of Concept ($74,857). P. Bower PI. D.M. Thompson collaborator.

1999-2003. *National Science Foundation: CAREER Program.* CAREER: Characterization of channel morphology and hydraulics for stream-restoration design ($231,998). Thompson PI.

1999. *National Science Foundation.* Acquisition of Hydraulic Instrumentation for Field-based Research ($54,068). E.E. Wohl PI. D.M. Thompson collaborator.

Additional Grants

2008. *The Nature Conservancy and the Aquarion Water Company of CT,* Saugatuck River Managed Flows Project: Proposal for Development of Draft Environmental Flow Recommendations for the Saugatuck River Watershed ($3,500). P. Parasiewicz P.I. D.M. Thompson co-PI.

2006. *Ecological Society of America.* Funds to cover full publication costs for article ($780). D.M. Thompson PI.

2005. *Connecticut College: Goodwin-Niering Center for Conservation Biology and Environmental Studies, Mellon Research Fellowship.* Assessing Large Woody Debris for Salmon ($3,000). D.M. Thompson, K. Cooke '01 co-PIs.

2004. *U.S. Fish and Wildlife Service: Silvio O. Conte National Fish & Wildlife Refuge.* Proposal for an Assessment of the Importance of Conservation of Grasslands in the Central Connecticut River Valley ($2,500). R.A. Askins and D.M. Thompson co-PIs.

2004. *Connecticut College: Goodwin-Niering Center for Conservation Biology and Environmental Studies, Mellon Research Fellowship.* Hydrology of erosion dominated channels ($3,000). D.M. Thompson, A.S. Weinberg '05 co-PIs.

2003. *Barnard College* and *The Mellon Center for Educational Technologies.* Brownfield Action Seminar (Unspecified award to cover registration fee, food and housing). D.M. Thompson participant.

2001. *Connecticut College: Tempel Summer Institute.* Designing a course that incorporates web-based technology ($2,000). D.M. Thompson participant.

2001. *Connecticut College: Goodwin-Niering Center for Conservation Biology and Environmental Studies, Mellon Research Fellowship.* Evaluating the success of stream restoration designs ($3,000). D.M. Thompson, M.R. Gryboski '01 co-PIs.

2000. *Lucent Technology Foundation.* Teach and Learn Partnership for Math and Science Excellence ($1,250). Connecticut College PI, D.M. Thompson participant.

2000. *National Academy of Sciences.* Third Annual Chinese-American Frontiers of Science Symposium, Irvine, California, October 20-22, 2000 (Unspecified award to cover travel, food and housing). D.M. Thompson participant.

2000. *Connecticut College: Goodwin-Niering Center for Conservation Biology and Environmental Studies, Mellon Research Fellowship.* Channel restoration efforts on the Blackledge River ($3,000). D.M. Thompson, E.F. Pitney '01 co-PIs.

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Thompson, D.M., 1994. Hydraulics and sediment transport processes in a Rocky Mountain stream. M.S. Thesis, Colorado State University, Fort Collins, CO, 288 p.

Thompson, D.M., 1990. The effects of large organic debris on sediment processes in the Green Mountains of Vermont. B.A. Thesis, Middlebury College, Middlebury, VT, 125 p.

Professional Service: Manuscript Reviews

American Society of Civil Engineers, Journal of Environmental Engineering; American Society of Civil Engineers, Journal of Hydraulic Engineering; Canadian Journal of Civil Engineering; Catena; Ecological Applications; Environmental Management; Geological Society of America Bulletin; Geomorphology; Journal of the American Water Resources Association; Journal of Hydro-environment Research; North American Journal of Fisheries Management; Oxford University Press; Prentice-Hall, Inc; Regulated Rivers: Research & Management; Restoration Ecology; Saunders College Publishing; Sedimentology; The Northeast Geographer; U.S. Forest Service, Rocky Mountain Experimental Station (computer model); U.S. Geological Survey; Water International; Water Resources Research; Yale University Press.

Professional Service: Service to Professional Organizations and Journals

2004- Present. Reviewer, Research Award, Connecticut Institute of Water Resources.
2004. Reviewer, Baker Fund Award Committee, Ohio University.
2003 - Present. Reviewer, American Chemical Society.
2003 - 2004. Participant, NEC Extreme Science: Give a Day, Make a Difference, NEC Foundation of America.
2002. Member. Geol. Soc. of Am., Authur D. Mackin Award and J. Hover Howard Award Selection Committee.
2002 - Present. Reviewer, Natural Sciences and Engineering Research Council of Canada.
2001 - Present. Institutional Liaison for Connecticut College, Council on Undergraduate Research.
2001. Student Presentation Judge, American Geophysical Union Fall Meeting.
2000, 2001, 2004. Session Chair, Geological Society of America Annual Meeting.
2000 - 2002. Member, National Science Foundation, Scientists and Engineers in the Schools Program.
1999 - Present. Reviewer, National Science Foundation.

Introduction to flooding, landslide, climatic, volcanic and earthquake hazards facing humans. Seminar topics examine the role of individuals, industry and government in preparing for and responding to natural disasters (1998, 1999 2002, 2006 and 2008).

Environmental Studies 494h Ecology And Geology Of The Southwestern United States
Discussions will emphasize biological responses to changes in the physical environment in the arid Southwest. Topics progress from the role of local topography and weather patterns on local environments, to the influence of natural disturbance regimes on the distribution of different species of plants and animals. Emphasis on how understanding ecological and geological processes can help prevent and solve environmental problems (2005).

Freshman Seminars FYS 133: Wet But Not Wild: Taming The Colorado River The Colorado River was one of the last areas of the American West explored by non-native Americans. To learn how the river was transformed from one of the wildest places in the United States to one of the most heavily impacted ecosystems, the course investigates the first expedition down the river by John Wesley Powell and the current status of the river as a major water source in the American southwest (2006).

Professional Website

http://www.conncoll.edu/ccacad/envstudies/Doug_Thompson.html