Environmental Management (2008) 41:893–903
DOI 10.1007/s00267-008-9075-9

Perceptions of Wood in Rivers and Challenges for Stream Restoration in the United States

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Received: 13 September 2007 / Accepted: 17 January 2008 / Published online: 28 February 2008

Abstract This article reports a study of the public perception of large wood in rivers and streams in the United States. Large wood is an element of freshwater aquatic ecosystems that has attracted much scientific interest in recent years because of its value in biological and geomorphological processes. At the heart of the issue is the nature of the relationship between scientific recognition of the ecological and geomorphological benefits of wood in rivers, management practices utilizing wood for river remediation progress, and public perceptions of in-channel wood. Surveys of students' perceptions of riverscapes with and without large wood in the states of Colorado, Connecticut, Georgia, Illinois, Iowa, Missouri, Oregon, and Texas suggest that many individuals in the United States adhere to traditionally negative views of wood. Except for students in Oregon, most respondents considered photographs of riverscapes with wood to be less aesthetically pleasing and needing more improvement than rivers without wood. Analysis of reasons given for improvement needs suggest that Oregon students are concerned with improving channels without wood for fauna habitat, whereas respondents

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elsewhere focused on the need for cleaning wood-rich channels for flood risk management. These results underscore the importance of public education to increase awareness of the geomorphological and ecological significance of wood in stream systems. This awareness should foster more positive attitudes toward wood. An integrated program of research, education, and policy is advocated to bridge the gap between scientific knowledge and public perception for effective management and restoration of river systems with wood.

Keywords Large wood · Environmental perception · Environmental management · Environmental education · River restoration

> "…watershed management, although dependent on science and engineering, is a process that is fundamentally social in nature." (Rhoads and others 1999)

Introduction

Translating results of research investigations into useful information to stakeholders and public policy is challenging for the scientific community. Given the participatory nature of environmental management today, experts cannot reasonably expect to work successfully in isolation from policy makers or the public. Yet, a fundamental dissonance often exists between scientific understanding and public perception that makes it difficult for both sides. Scientists find it difficult to influence environmental policy when policy-makers may not have sufficient understanding of the science; the public can be confused by seemingly conflicting information from experts (Gregory 2004). Thus, a proliferation of management rubrics (such as ecosystem management, integrated environmental management, ecological risk assessment, adaptive management, and community-based environmental management) highlights the need for forging closer ties among the scientific community, environmental managers, and the component of the public with a stake in environmental systems (Born and Sonzogni 1995; McLain and Lee 1996; Brosius and others 1998; Gregory and Wellman 2001; Johnson and others 2001; Reagan 2006; Wang and others 2006; Xue and others 2006). The eventual success of remediation strategies clearly depends on the extent to which scientific advances are conveyed effectively to policy-makers, and, in turn, on the level of public support for decisions made (Rhoads and others 1999).

This article reports a study of the public perception of large wood in rivers and streams, a specific element of freshwater aquatic ecosystems that has attracted much scientific interest in recent years. At the heart of the issue are incongruent perceptions of wood by the public despite the scientific progress achieved in recognizing the ecological and geomorphological benefits of wood, together with changing management practices regarding wood in rivers in response to scientific knowledge. The conflict arising was revealed in an international survey of students conducted in 10 areas of the world (Piégay and others 2005; Le Lay and others in press) that found generally negative views of wood in rivers. The students sampled considered riverscapes with wood to be less aesthetically pleasing, more dangerous, and needing more improvement than those without wood. These views persisted despite extensive research over the past few decades documenting the important functions of wood in river systems, although students in Germany, Sweden, and Oregon (USA) perceived wood more favorably.

In this article, we expand upon the international study by examining the reactions to wood in river landscapes of a broader group of students across the United States. First, the background to the international study is outlined with a summary of the main results providing the backdrop to the present investigation. Second, the rationale, methods, study sites, and results of surveys conducted in nine areas of the U.S. are presented to show the extent to which the perceptions of Oregon students accord with those from other locations across the United States. Third, we discuss the extent to which the views pose challenges for river restoration in the United States and elsewhere. Lastly, we suggest strategies toward successful management of streams using wood, including a provisional protocol for translating scientific information to stream managers and the public.

The International Study

In watershed management, large wood is increasingly recognized as beneficial to aquatic biota and to the maintenance of physical and hydraulic habitat. Wood provides mechanisms for energy dissipation (Gippel 1995; Curran and Wohl 2003), cover for young fish, and habitat throughout their life cycles (Harmon and others 1986; Gregory and others 2003). Channel stability (Montgomery and others 2003) and aquatic biodiversity (Wondzell and Bisson 2003) are commonly enhanced. Despite these benefits, wood has traditionally been removed in river management because of perceptions of negative consequences, such as flooding, bank erosion, and damage to infrastructure (Sedell and Froggatt 1984; Shields and others 1984; Diehl 1997). Whereas forested catchments historically had much more abundant wood (Collins and others

2002), so much wood has been removed from rivers in recent decades to centuries that people's perceptions of what is natural have changed (Wohl and Merritts 2007). Increased recent recognition of the positive role of wood has prompted efforts to reintroduce wood back into river channels (Gurnell and others 1995; Hilderbrand and others 1997; Abbe and others 1997; Reich and others 2003; Brooks and others 2006). These efforts seem to be well-received in some areas (e.g., Millington and Sear 2007), however, whereas elsewhere, the projects can fail because they are met with resistance. As demonstrated in studies of forestry management, public perception is intricately linked to the acceptance and success of management policies (Manning and others 1999; Minteer and others 2004; Ribe 2006).

An international study formulated to assess people's perceptions of wood in contrasting parts of the world explored how these perceptions could relate to successful channel restoration using wood (Piégay and others 2005; Le Lay and others in press). The study utilized photographs to assess visual landscape preference (Hodgson and Thayer 1980; McCool and others 1986; Ribe 1989; Kearney 2001; Ribe 2002; Ribe 2006). A total of 1886 undergraduate students in France, Germany, India, Italy, Poland, Russia, Spain, Sweden, and the United States (Oregon and Texas) were asked to view a set of 20 photographs, 10 with wood and 10 without wood (Fig. 1). These students rated the photographs according to four characteristics: how aesthetically pleasing the photographs appear, how natural the scene looks, how dangerous they feel the river to be, and the extent to which they perceived a need for improvement within the channels.

Results showed that, in most parts of the world, students expressed traditional and negative views of wood (Fig. 2). Except in Sweden, Germany, and Oregon (USA), students perceived rivers with wood to be less aesthetically pleasing, more dangerous, and needing more improvement than rivers without wood. The more favorable views of wood expressed by Swedish students are attributed to awareness of the forested nature of those environments, and to greater public familiarity with wood in rivers. Le Lay and others (in press) have also underlined the heightened awareness of Swedish students to environmental conservation and education. German students living in traditionally agricultural landscapes also tend to express favorable views towards nature and environmental education (Mutz and others 2006). In the case of Oregon, the critical issue of salmon as an endangered species (NRC 1996; Montgomery 2004) additionally elevates public awareness of the ecology of streams and rivers, as well as local research into the ecological benefits of wood. Germany and Oregon (USA) are, in fact, among the areas where the first instances of reintroduction of wood for river restoration occurred, and where the practice is generally accepted (Reich and others 2003).

Surveys in the United States

In the United States, the contrasting results from Oregon and Texas (Fig. 2) prompted the question of whether one of

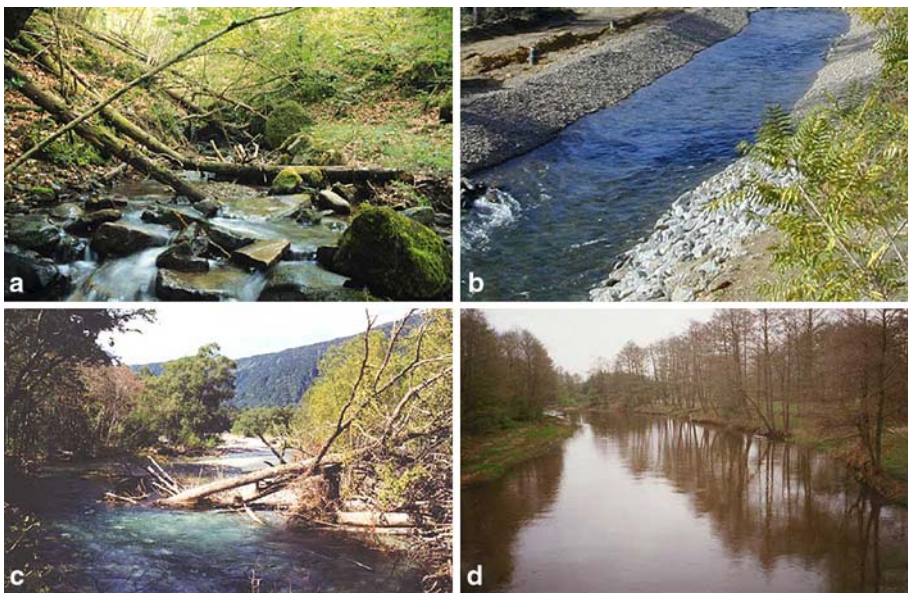

Fig. 1 Example photographs used in survey: with wood (**a** and **c**); without wood (**b** and **d**). Piégay and others (2005) provides the complete set of 20 photographs

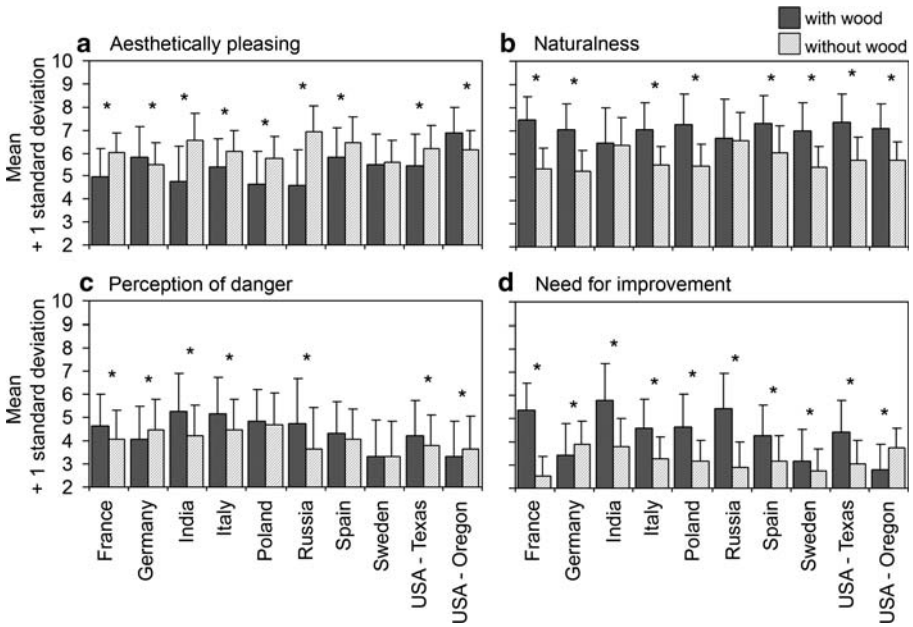

Fig. 2 Results from original international survey conducted in nine countries. Bars indicate mean scores given by students for photographs with wood and without wood, for the four characteristics evaluated. Asterisks denote significant difference at 0.05 level. (After Piégay and others 2005)

the two views is representative of a national perspective, and whether perceptions vary spatially. For example, can we identify spatial variations in the public perception of wood within the U.S., along with changes in environmental setting? More specifically, can we expect forested environments where the wood is more frequent, and therefore familiar to the public, to foster favorable perceptions of wood (Pedersen 1978; Kaplan and Herbert 1987; Larson and Santelmann 2007)? To test this hypothesis, we conducted further surveys of students in six additional states, giving a comparison among eight states. The study states are: Colorado, Connecticut, Georgia, Illinois, Iowa, and Missouri, in addition to Oregon and Texas. Topographically similar, Colorado, Connecticut, and Oregon are typified by forested mountain and hill landscapes. Thus, we hypothesized that students in these areas may hold similarly positive attitudes to wood in river channels as students in Oregon due to familiarity. Such positive public attitudes would likely be more supportive of stream restoration approaches using wood. In contrast, Illinois, Missouri, and Georgia are more typically agricultural, where perceptions of wood in rivers are hypothesized to be similar to those found in Texas. In such locations, focus may need to turn toward education and changing entrenched perceptions to improve public support prior to the implementation of stream restoration techniques utilizing wood.

We followed identical procedures to those outlined in Piégay and others (2005) for the international study. In the classroom, undergraduate students were shown the same set of 20 photographs of streams and rivers, 10 with wood, and 10 without wood (Fig. 1). We first projected each of these color photographs on a screen for 10 seconds each to give students an overall impression of the scenes. Using sheets of black and white photographs, students evaluated each picture according to the four characteristics: aesthetics, naturalness, perception of danger, and need for improvement. Students were not told that the surveys pertained to wood in river channels. They recorded their reactions to the landscape scenes on a questionnaire as tick mark scores using a graded scale from 1–10. After the students completed the surveys (typically in 30–45 minutes), we converted the tick mark responses into numerical scores with a ruler scale. These scores were then entered into an Excel spreadsheet for computation. Because mean scores were not normally distributed, we tested for differences between scores for photographs with wood and without wood using nonparametric methods (Wilcoxon Sum Rank Test). Piegay and others (2005) discussed in detail the careful selection of the 20 photographs out of an initial set of 300 candidates.

Whereas in the international study, students from four disciplines were surveyed to represent backgrounds in geography/environmental science, ecology, hydraulic engineering, and nonscience fields, here, we focused on student respondents from geography/environmental science classes as our sampling frame (Groves and others 2004). We selected a sample of geography/environmental science students because analysis of results among the student types sampled in the international study showed no discernable differences (Piégay and others 2005; Mutz and others 2006). Geography/environmental science students were also consistently accessible to us at our respective institutions. Thus, at each location, we administered the survey to undergraduate geography/environmental sciences classes of approximately 30–50 students. Some of these classes were our own; others were taught by our

Table 1 Study areas: characteristics and respondents

State	City	Number of respondents	Density (population/km^2)	Forest cover (% of land area)
Colorado	Fort Collins	33	16.9	32.6
Connecticut	Storrs	40	277.6	59.9
Georgia	Valdosta	20	57.9	65.8
Illinois	Carbondale	41	87.9	12.2
Iowa	Pella	46	20.3	5.7
Missouri	Columbia	58	32.0	31.7
Oregon 1	Corvallis	54	14.3	48.3
Oregon 2	Portland	31	14.3	48.3
Texas	College Station	53	32.6	10.2

Density and forest cover are state-wide values. The total sample size is 376

colleagues. In all cases, the students participated in the study anonymously and voluntarily, without compensation or risk of negative consequences.

Because, contrary to our expectations, initial results indicated a tendency for students in all locations across the U.S. to react to wood in similarly negative ways as those in Texas, we collected an additional dataset from Oregon (Portland State University) to corroborate the initial results obtained from the international survey (from Oregon State University). All together, a total of 376 students provided responses (Table 1) from nine locations in eight states. Although the sample size is not large for a country the size of the United States, results of these surveys nevertheless indicate how students in several contrasting areas across the U.S. perceive of wood in river channels. They can contribute to identifying outstanding needs to progress towards an integrated program of research, education, and management of river landscapes with wood.

Perceptions of American Students

The perceptions of students regarding wood in rivers in the nine areas of the U.S. surveyed showed distinct trends. Pertaining to aesthetics, students in Colorado, Connecticut, Georgia, Illinois, Iowa, Missouri, and Texas assigned higher scores to photographs without wood (Fig. 3a). These scores averaged 6.1 for scenes without wood compared to 5.8 for riverscapes with wood; statistical significance was achieved in the data for Connecticut, Georgia, and Texas. Contrasting with this trend, the two student groups from Oregon considered rivers with wood to be more aesthetically pleasing. Mean scores for these groups were 6.7 and 6.1 for photographs with and without wood, respectively. Results for both datasets from Oregon were statistically significant, suggesting distinct differences in how students in these areas view wood in river channels compared to those in other parts of the country.

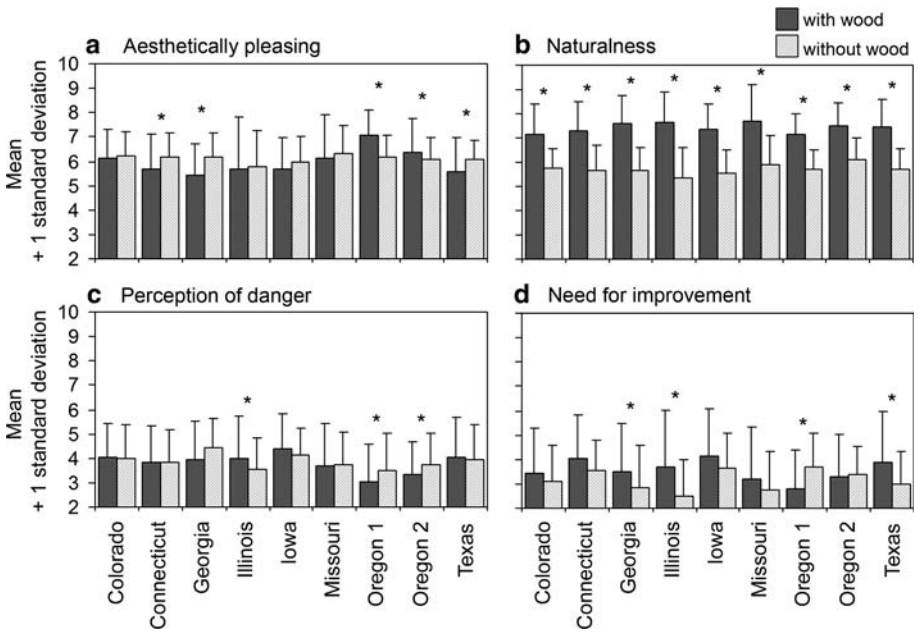

Fig. 3 Perceptions of students for photographs with wood and without wood regarding (**a**) aesthetics; (**b**) naturalness; (**c**) danger; and (**d**) need for improvement. Asterisks denote statistical significance at 0.05 level, as in Fig. 2

Table 2 Reasons for perceived danger

State	No Danger		Flooding/ Inundation		Erosion		Leisure Activity		Water Quality		Other	
	Wood	No Wood	Wood	No Wood	Wood	No Wood	Wood	No Wood	Wood	No Wood	Wood	No Wood
Colorado	104	120	77	94	26	28	66	66	33	34	2	1
Connecticut	117	154	60	71	28	25	103	103	29	33	14	3
Georgia	65	67	24	52	20	14	50	42	17	17	0	4
Illinois	113	139	73	80	22	36	130	113	23	32	5	5
Iowa	90	126	58	78	35	49	180	136	38	55	13	16
Missouri	162	187	89	154	34	37	194	158	35	34	0	3
Oregon 1	162	151	129	155	35	45	92	87	51	88	10	8
Oregon 2	81	89	64	82	19	17	60	72	33	36	7	2
Texas	111	161	105	121	35	51	176	144	45	46	5	5
Total	1005	1194	679	887	254	302	1051	921	304	375	56	47

Numbers are summed totals for responses given for photographs with wood and without wood. Oregon 1 and Oregon 2 refer to responses given by students in Corvallis and Portland, respectively

The "naturalness" characteristic showed predictable trends (Fig. 3b). Respondents in all nine areas considered riverscapes with wood to be more natural than those without wood. Scores for photographs with wood were 7.4, compared to 5.7 for photographs without wood. The differences were statistically significant for all nine areas.

The data for perceived danger exhibited more variation (Fig. 3c). Whereas students in Oregon indicated significantly more danger in the scenes without wood, respondents in Illinois, Iowa, and Texas assigned higher scores for photographs with wood (statistically significant for Illinois). Other scores (from Colorado, Connecticut, and Missouri) were similar between the two scenarios. Table 2 summarizes the reasons given by students for their perceived danger, collected as part of the questionnaire survey. These results indicate that, overall, students perceived more danger in rivers without wood because of flooding, erosion, and water quality issues. The responses for water quality suggest that Oregon students were particularly concerned in this regard. In contrast, riverscapes with wood were considered more dangerous for leisure activity. The responses from students in Illinois, Iowa, Missouri, and Texas were especially pronounced, where students reported decidedly that wood posed danger to their leisure activities, such as kayaking in river channels.

Regarding perceived needs for improvement, the student responses showed clear trends (Fig. 3d). Traditionally, stream "improvement" in the U.S. consists of dredging, snagging, straightening, and other forms of channelization that enlarge channels, remove obstructions, and increase channel capacity. These activities were motivated by the public resolve to reduce inherent threats posed by waterways, such as sanitary improvements to eliminate health risks, drainage improvements to eliminate flooding, and transportation improvements to increase the safety of those navigating on rivers and streams (Urban 2005). Almost across the board, except for the Oregon groups, students perceived channels with wood to need more improvement. Mean scores from Colorado, Connecticut, Georgia, Illinois, Iowa, Missouri, and Texas were 3.7 for photographs with wood, and 3.1 for scenes without wood. Oregon students, in contrast, considered rivers without wood (mean 3.5) to need more improvement than channels with wood (mean 3.0).

To understand the differences in responses between students in Oregon and other areas, we also summarized the reasons given by students for channels needing improvement. Figure 4 shows that, for riverscapes with wood, students in areas except Oregon reported improvement needs to clean channels because of flood risk management (19%) and landscape quality (20%). Only 6% of these students were concerned with habitat for fauna. For wooded landscapes, a larger proportion of responses by Oregon students indicated improvement needs for fauna habitat (13%), whereas they focused less on the need to clean channels (6%). A larger proportion of the Oregon responses also indicated no need for improvement for channels with wood (49%).

The differences in thinking between Oregon and non-Oregon students become clearer when considering, additionally, the reasons for channel improvements in river landscapes without wood (Fig. 5). Oregon students indicated even more concern for improving faunal habitat in non-wooded channels (21% of responses compared to 9% for non-Oregon results). On the other hand, without wood in channels, a larger proportion of the non-Oregon responses (55%) indicated no need for improvement (compared to 42% for Oregon results). Presumably, students in Oregon understand that channel cleaning would reduce the probability of local flooding (by increasing

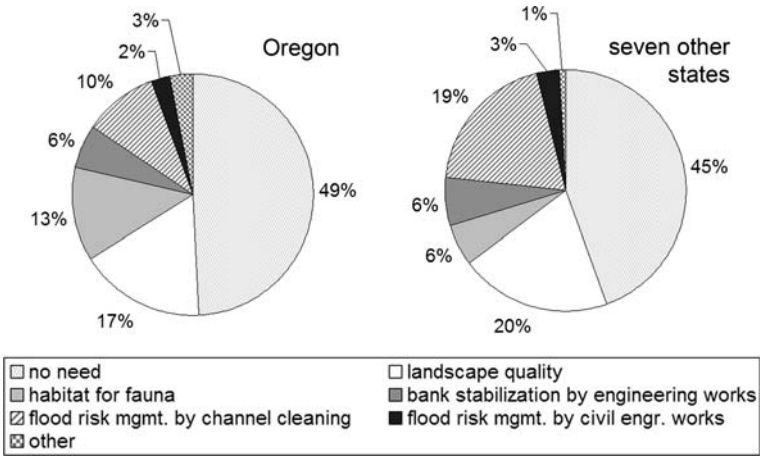

Fig. 4 Reasons for improvement needs for riverscapes with wood given by students in Oregon, and by students elsewhere. The sample sizes for Oregon and the seven other states are 85 and 291, respectively

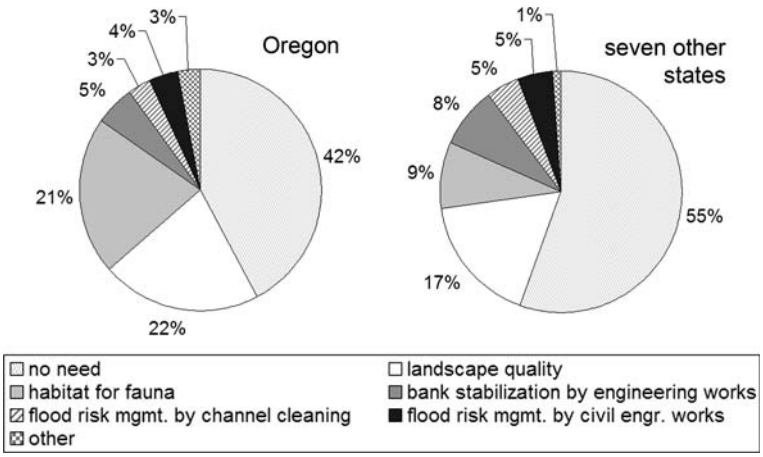

Fig. 5 Reasons for improvement needs for riverscapes without wood given by students in Oregon, and by students elsewhere. The sample sizes for Oregon and the seven other states are 85 and 291, respectively

velocity and reducing depth), but consider this effect as unnecessary or undesirable given the ecological costs. More information is needed, however, to fully reveal the motivations behind the responses.

In summary, surveys of students in nine areas of the United States suggest that many individuals in the country still hold the traditionally negative views of wood. Except for students in Oregon, the views that channels containing wood are unaesthetic, hazardous, and needing cleaning permeate. The views expressed by students in Oregon are differentiated in that they reflect awareness of the nature of streams in forested areas and are probably influenced by the active research being conducted in this part of the country on the ecological importance of wood in rivers. Also, Oregon was the center of the initial research in the 1970s (for example, Swanson and others 1976) that recognized the importance of wood in rivers. Additionally, an environmentally progressive culture and a sharp public awareness of salmon as an endangered species in rivers also contribute to positive views of in-channel wood. Other areas of the U.S. may prompt similar influences to foster favorable perceptions of wood, but, for the most part, the traditional and negative perceptions apparently prevail.

Perceptions of wood expressed by the students surveyed could be extrapolated to the broader community. While the sampling methodology was not intended to generate a statistically representative probability sample, the survey population was targeted at regional clusters of undergraduate students enrolled in geography and environmental science courses. Because the universities surveyed serve students primarily drawn from their respective regions, the results can be interpreted reasonably as being characteristic of the regions in general. By targeting undergraduate students, the survey responses reflect the views of non-experts with no specific training regarding the ecological significance of wood in rivers. It is possible that views expressed by geography/environmental science students could represent a more progressive ecological perspective, which would tend to skew the results towards a "best-case scenario" from a management perspective, though previous analyses revealed no statistical difference in responses among the disciplinary groups sampled (Piégay and others 2005; Mutz and others 2006). Additional research targeting sub-populations of students could reveal deeper insights into the motivating factors behind their responses. Such analyses could involve clustering by

landscape-scale region in addition to state, by place of origin in addition to current residence, and by length of university and professional training (e.g., Wyzga and others in press).

The perceptions of wood in rivers revealed for the United States is akin to the picture at the international level (Piégay and others 2005). This situation calls for increased focused attention to develop strategies to meet the challenges for channel restoration posed by these perceptions. These new findings also suggest that familiarity alone does not result in positive perceptions of wood, reinforcing the critical role that environmental education would play in a successful program of stream restoration using wood (Mutz and others 2006).

Toward an Integrated Program of Research, Education, and Policy

The lingering negative public perceptions of wood in river channels pose obvious challenges for river restoration using wood in the United States and elsewhere. These views indicate the incongruent nature of scientific knowledge and the perceptions of the public based on personal experience, culture, or incomplete understanding (Kimmins 1999; Carolan 2006). As the number of interested and vested stakeholders grows, and as the public have the ability to exert greater influence in the formation and successful implementation of environmental policy, these gaps become increasingly critical (Marchi 1997).

The results of this study suggest a three-pronged approach to successful management of river channels using wood. Clearly, river management and restoration must be based on sound scientific principles (Downs and Gregory 2004; Wohl and others 2005). Thus, continuing basic research on the processes pertaining to the transfer, storage, and function of wood in river systems at a range of spatial and temporal scales is needed (Piégay and Gregory 2005). As scientific knowledge has expanded, however, and as large wood has become increasingly recognized as significant natural elements of river systems (e.g., Gregory and others 2003; Gurnell 2007), two other issues come to the forefront. First, how can scientists translate research findings effectively to managers, policy-makers, and the general public? Perhaps more importantly, how can lingering perceptions be changed to incorporate the positive aspects of wood? Doing so would help foster acceptance of management policies formulated based on results of scientific research.

Recent studies have demonstrated how results of scientific investigations can be expressed as basic rules, or protocols, for effective presentation to managers. For example, Gregory and others (2006a, b) developed a provisional protocol for understanding global change by relating it to past hydrological events. In applied fluvial geomorphology more generally, Gregory and others (in press) further presented a synopsis version of a protocol embracing palaeohydrological inputs for application to river channel management. Thus, conclusions from geomorphological research can be expressed in formats that can be considered by managers.

Following these examples, we suggest that the fundamental concepts regarding wood in river landscapes can be expressed in a set of rules or protocols that could be available to managers, stakeholders, and to the public. An effective protocol must address the normality of wood in rivers, the significance of wood, the way in which it is perceived, and the alternatives for its management. It could comprise the following simple statements: (1) Rivers and streams in forested areas naturally include wood; (2) Wood in river channels is dynamic, increasing from tree fall and from upstream, and decreasing through decomposition to produce uneven distributions of wood along the channel; (3) Wood in channels is valuable ecologically by diversifying habitats; (4) Wood in channels is significant geomorphologically by providing channel resistance and facilitating sediment storage; (5) Clearing wood has been common in managing rivers and streams to aid river flow and to reduce floods, but regular clearance can produce false appearances because it may foster images that "natural" channels should not include wood; (6) Estimating an appropriate loading of wood is possible for a particular river, thus giving a guide for managing river channels that may involve addition or removal of wood (Piégay and Landon 1997).

A clearly-articulated composite statement, such as this, could promote the complete and detailed understanding of the role of wood and the inevitable trade offs of some risks at the expense of others. The statement can be transmitted effectively to managers and stakeholders through short courses, popular articles, and publications that emphasize teaching and learning. It could form the basis for overcoming the paradigm lock (Endreny 2001) that exists between scientists and managers, comprising a major step toward effective channel management using wood.

A remaining issue pertains to the lingering perceptions of wood despite greater scientific understanding of the role of wood in ecosystems. Because perception is inextricably linked to attitudes and behavior (Proshansky 1983; Fishwick and Vining 1992), the cultural legacy of certain objects, such as wood, can elicit negative attitudes or feelings despite cognitive realization of the beneficial aspects of these objects. This incongruity makes acceptance of sustainable management practices using wood difficult and hinders effective policy-making. It necessitates efforts toward changing long-held perceptions of

wood in rivers, in addition to promoting a complete scientific understanding of the role of wood in rivers.

Changing long-held perceptions of wood in river channels is not a simple process. Human behavior represents the end result of a complex mediation by individuals of the internal phenomena of attitudes, values and experience with the more outward looking process of perception (Gifford 1987). Whereas environmental perception involves an active filtering, collection, and distillation of sensory input from the external environment, attitude results from an evaluative meaning ascribed to the object being perceived (Ajzen and Fishbein 1972; Ajzen 1989). Attitude includes components of cognition, affect, belief, values, and ethical orientation (Rokeach 1986). Attitudes are crucial linkages between the act of perception and environmental behavior (Vining 1994; Grob 1995; Karp 1996; Garling and others 2003; Poortinga and others 2004). Visual preference studies (such as this one), then, effectively tap into perception, cognition, and affective responses (Hodgson and Thayer 1980; Herzog 1985; Herzog and Bosley 1972; Gregory and Davis 1993). The way in which an image or picture is immediately understood or perceived is based on already established thoughts, values, feelings, and beliefs (i.e., a priori attitudes). At the same time that attitudes mediate perception, they may also be modified by the experience of perception, so that the individual may adjust how they think, feel, or believe about certain environmental phenomena upon further reflection.

Education could play a major role in changing human perceptions, attitudes, and behaviors. Academic training enables individuals to acquire knowledge about fundamental processes of environmental systems. Such knowledge influences perceptions by directing an individual's attention to certain features of the environment while filtering other sensory information out. Education also influences attitudes and behaviors toward the environment. For example, a 10-week environmental course considerably changed the attitudes and behaviors of business students (Benton 1993). Thus, some environmental education programs have focused on creating emotional affinity toward the environment (Ballantyne and Packer 1996). They have also successfully targeted feelings and beliefs (Kals and others 1999; Pooley and O'Connor 2000) toward forming positive environmental attitudes and behaviors. In Poland, academic education resulted in more positive views of wood in riverscapes in geography and biology students (Wyzga and others in press). An aggressive campaign of public education would go a long way toward changing the long-held perceptions of wood in river channels, thereby promoting acceptance of in-channel wood and facilitating effective policy. Accordingly, integrating research and education can help to close the gap between scientific knowledge and public understanding of environmental systems, leading to more effective management and restoration of river systems with wood.

Acknowledgments The international study was developed by a working group led by H. Piégay (CNRS, France) and K.J. Gregory (University of Southampton, UK) and comprising: V. Bondarev (Moscow State University, Russia), A. Chin (Texas A&M University, USA), N. Dahlstrom (Mid Sweden University, Sweden), A. Elosegi (University of the Basque Country, Spain), S.V. Gregory (Oregon State University, USA), V. Joshi (S.P. College, Pune, India), M. Mutz (Brandenburg Technological University, Cottbus, Germany, M. Rinaldi (University of Florence, Italy), B. Wyzga (Polish Academy of Science, Krakow, Poland), and J. Zawiejska (Jagiellonian University, Poland). We thank the numerous individuals who participated in the surveys and provided assistance. In particular, Megan Meier analyzed the data from Portland State University; Clint Jackson, Emily Driskill, Jennifer Kippenberger, and Raleigh McClure assisted with compilation of the survey responses. The collaborations developed for this study were stimulated and supported in part by grants from the European Science Foundation (Standing Committee for Life, Earth and Environmental Sciences) and the U.S. National Science Foundation (through the Association of American Geographers). Texas A&M University (College of Geosciences and Department of Geography) provided additional support for manuscript preparation. We very much appreciate the valuable comments from three reviewers and the editor.

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