

A Comparison of First-Year College Student Attitudes toward Coarse Woody Debris Following Review of a Brochure and Participation in a Cooperative Learning Activity

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Abstract

This research compared the attitudes of 352 first-year students towards coarse woody debris (dead wood in forested ecosystems) following exposure to brochures and cooperative learning activities at a major southern university. Students from suburban backgrounds had more positive attitudes concerning the benefits of coarse woody debris to ecosystems and people following the cooperative learning activity. The attitudes of students from rural backgrounds towards the benefits of coarse woody debris for plants and animals were similar following the cooperative learning activity and brochure. However, rural student attitudes towards the value of coarse woody debris to humans were more positive following the cooperative learning activity. Male student attitudes were similar following the brochure and cooperative learning activity. However, the cooperative learning activity convinced more females (36%) that coarse woody debris poses little environmental hazard and should remain on all forestland than females who read the brochure (6%). The brochure convinced more females (64%) of the importance to educate landowners to manage for coarse woody debris on their property than the cooperative learning activity (33%). This study indicates that students of different gender and sociodemographic background respond differently to educational techniques. Speculation on the potential influence of student learning styles is also discussed.

Introduction

Natural resource education programs provide a link between science and society and address natural resource related issues with local relevance. Outreach education promotes and builds cooperative partner-

ships between natural resource professionals and people of various backgrounds and abilities and can change citizen attitudes and perceptions (Brewer, 2001; Fisher, 1996; James, 2002; Vasievich et al. 1993). Outreach education programs can also be used as a venue for assessment of local knowledge, beliefs, and attitudes to provide local policy makers with information that can be incorporated into preservation and development decisions (Aipanjiguly et al., 2003; Tran et al., 2002). Impacting the value systems of the general public through environmental education can instill a land ethic that results in responsible environmental actions (Barden et al., 1996; Egan and Jones, 1993). The flexibility of outreach programming enables information to be delivered in a variety of ways, including: formal presentations, cooperative learning activities, informational brochures, internet links, computer modules, interactive displays, and educational videos (Rollins and Higginbotham, 1997; Seiler et al., 2002).

Informational brochures, a concise presentation of technical material in written and pictorial form, are one of the least expensive methods of natural resource education. Brochures have been demonstrated to be effective at advertising educational workshops. Promotional brochures given to dairy farmers in northeastern Ohio were an effective advertising tool for an extension workshop and helped recruit men and women from 66 different farms (Oelker, 1995). When compared to newsletters, newspapers, and email, most attendees (58%) of tree care workshops in Nebraska learned of the workshops through direct mailing of brochures (Skelton and Josiah, 2003). Brochures have also been useful in stimulating interest and questions from the public when made available in high profile locations.

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Brochures about lead paint remodeling hazards published for homeowners and contractors and made available in large retail home improvement stores caused an increase in requests for lead test kits and increased interaction between store personnel, customers, and painting contractors (Ponessa, 2003).

Cooperative learning activities, the instructional use of small groups, can be used by extension professionals when interacting with concerned citizens to increase participant engagement, focus group discussion, and encourage participant consensus (Bean, 1996; Ellefson and MacKay, 1996). The two goals commonly associated with cooperative learning are to: (a) enhance learning and (b) develop social skills such as decision making, conflict management, and communication (Bonwell and Eison, 1991). Extension education programs through universities that incorporate active learning strategies have been an effective means of improving learning in the environmental sciences for school students and their teachers (Lockee et al., 2003). Cooperative learning activities that involve teachers can aid in overcoming the fears many teachers have regarding science instruction (Lockee et al., 2003). Forestry education programs that are delivered by extension professionals and that incorporate classroom activities, such as Project Learning Tree, have been successful at fostering positive attitudes toward forestry in inner-city, middle-school students. The students who participated in environmental education sessions had more forestry knowledge than peers who did not participate (Broussard et al., 2001).

The purpose of this study was to compare brochures and cooperative learning activities at determining perceptions and attitudes of first-year college students toward coarse woody debris. Coarse woody debris (CWD) is dead wood in a forest with a minimum diameter of 7.5 cm and includes snags (standing dead trees), logs, and stumps. Perceptions of CWD within the scientific community have changed from negative to positive as recent forest ecology research has demonstrated the importance of CWD as a home for wildlife and plants, a sink for carbon sequestration, and in preventing soil erosion. We were particularly interested in tracking public perceptions of CWD as the subject undergoes a transition in value by professionals within the field of natural resources. Brochures are often used in environmental and extension education as a fairly inexpensive way to reach a broad audience concerning natural resources. Although brochures have been evaluated on their ability to increase knowledge about natural resource issues with home owners (Young and Witter, 1994), more information is needed on the use of natural resource related brochures with first-year college students. The use of cooperative learning activities such as Project Learning Tree have been effective at

educating middle school youth about natural resources (Broussard et al., 2001) and are having a greater presence in high school and college classrooms. We were interested in determining the perceptions and attitudes of first-year college students toward CWD following exposure to informational brochures and cooperative learning activities. We selected to work with first-year college students because they included diversity in gender, sociodemographic background, and disciplines (represented by their college major).

Methods

The population for this study consisted of 352 first-year college students of introductory English, Agriculture, and Natural Resources classes at a major southern university. One-hundred seventy students received the brochure and 182 students participated in the cooperative learning activity. Students who received the brochure were given as much time as needed to review the document and were allowed to keep the brochure if they wished while completing a post-brochure survey. Students who participated in the cooperative learning activity listened to a 20-minute PowerPoint presentation and interacted with classmates in a 30-minute cooperative learning activity.

The short informational brochure was used to determine the perceptions of first-year college students toward CWD and forestry using only written text and color pictures. The brochure defined CWD, discussed specific examples of CWD, and addressed opportunities that CWD provides for vegetation, wildlife, and people. The brochure discussed the disadvantages associated with CWD and suggested how to manage for CWD on private land. Faculty and third-year college students evaluated the brochure prior to the study to determine if the content and terminology used seemed appropriate for the target audience.

The 50-minute presentation and cooperative learning activity was given to first-year college students to determine their perceptions toward CWD and forestry following interaction with an instructor in a classroom setting. The presentation included the same information, with many of the same color photographs, as the brochure. The instructor defined CWD, provided specific examples of CWD, and identified the benefits of CWD for vegetation, wildlife, and people. To motivate group discussion and brainstorming, the presentation used active learning strategies (Bean, 1996) where students worked in groups of four or five to answer open-ended questions regarding CWD and forestry.

A survey was designed to determine participants' knowledge and attitudes toward CWD following the brochure and cooperative learning activity. The

survey had seven questions related to CWD and six questions concerning participant demographic information. Six CWD questions were five-point Likert-type questions with response choices ranging from not important to very important and strongly disagree to strongly agree, including a neutral middle response category. One of the CWD questions had response choices ranging from 0% to 100%. Demographic questions requested participants to provide information about gender, nationality, sociodemographic setting of residence, age, and academic major. A reliability test yielded a Cronbach's alpha of 0.524. An expert panel of professors reviewed the instrument to verify the validity of the survey. Changes were made based upon the panels recommendations.

Data Analysis

Post-brochure and post-cooperative learning activity survey data were analyzed using SPSS Version 11.0. Frequency tables were generated using post-brochure and post-cooperative learning activity categorical and Likert responses. Descriptive statistics (means, modes, and standard deviations) were calculated for each categorical and Likert response on post-brochure and post-cooperative learning activity survey instruments. The number of females to males, participants residing from urban, suburban, and rural locations, and students by major within seven colleges were examined using frequencies. Crosstabulations were generated to compare proportions of brochure and cooperative learning activity participants selecting response choices based on gender, sociodemographic setting (urban, suburban, and rural), and major.

Results and Discussion

The majority of brochure (65%) and cooperative learning activity (70%) participants were male. Two brochure participants did not indicate their gender. The majority of brochure (95%) and cooperative learning activity (95%) participants were citizens of the United States. Of students who received the brochure, 58% were from suburban areas, 26% were

from rural areas, and 16% were from urban areas. Of cooperative learning activity participants, 45% were from rural areas, 42% were from suburban areas, and 12% were from urban areas. Of students who received the brochure, 32% indicated majors within the College of Liberal Arts and Human Sciences. This included students of university studies and undecided majors. In addition, 21% of brochure participants were from the College of Engineering; 15% were from the College of Natural Resources; 15% were from the College of Science; 8% were from the College of Business; 5% were from the College of Architecture and Urban Studies; and 2% were from the College of Agriculture and Life Sciences. Of cooperative learning activity participants, 32% were from the College of Agriculture and Life Sciences; 25% were from the College of Liberal Arts and Human Sciences; 17% were from the College of Engineering; 9% were from the College of Science; 8% were from the College of Natural Resources; 7% were from the College of Architecture and Urban Studies; and 3% were from the College of Business.

The reliability test on the survey instrument yielded a low Cronbach's alpha (0.524). The researchers realize that this value is low and believe that the weak consistency among student responses may be attributed to several factors. First, this study was conducted in several classrooms where student values may have already been influenced by the instructor, the subject matter of the class, and their peers, all potentially adding inconsistency in responses. Another factor might have been the influence of media coverage of forest fires where CWD may have been portrayed as a dangerous fuel source, giving students with increased exposure to such media coverage a negative bias towards CWD prior to the cooperative learning activity.

Gender

Gender influenced how participants' perceived environmental risk associated with CWD. When questioned whether CWD is an environmental hazard and should be removed from both private and public lands, male responses following the brochure and

Table 1. Coarse woody debris is an environmental hazard and should be removed from both private (example: Farmer Fred's 50 acre forest) and public (example: a national park) The values listed below are percentages based on sample sizes of N = 170 (brochure) and N=182 (presentation)

Response	Brochure		Presentation	
	Female (%)	Male (%)	Female (%)	Male (%)
1 (strongly disagree)	3	16	20	21
2 (disagree)	74	58	58	55
3 (neutral)	14	21	16	18
4 (agree)	7	4	6	5
5 (strongly agree)	2	1	0	1

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cooperative learning activity were similar (Table 1). However, more females participating in the cooperative learning activity strongly disagreed that CWD is an environmental hazard when compared to females participating in the brochure. In a study involving college student attitudes toward nature and the environment, female students tended to have more positive attitudes than male students (Tikka et al., 2000). Female college student attitudes toward nature were more life centered than male student attitudes before and after a course in conservation biology (Caro et al., 1994). Following review of the brochure, five times more males than females strongly disagreed that CWD is an environmental hazard and should be removed from both private and public lands (Table 1). Sixteen percent more females than males disagreed that CWD is an environmental hazard following review of the brochure. Female pre-college students perceived greater risk than male students concerning environmental hazards such as tornadoes, earthquakes, pesticides, and oil spills (Riechard and Peterson, 1998). Female cooperative learning activity participants may have exaggerated when answering the survey question on CWD as an environmental hazard if they perceived a positive attitude in their instructor toward CWD (Tikka et al., 2000). However, females have been found to be significantly more open-minded than males, indicating that female cooperative learning activity participants would have respected the rights of the instructor to hold a different opinion and responded honestly (Rudd and Moore, 2003).

Gender influenced how participants perceived the value of CWD to plants and wildlife. Males and females more often strongly agreed that CWD is valuable to plants and wildlife following the cooperative learning activity than following brochure exposure (Table 2). Similarly, Kellert and Berry (1987) found that males expressed a greater concern for maintaining viable relationships between wildlife, habitat, and the ecosystem as a whole. Males tended to be more utilitarian in terms of wildlife and the environment and females tended to value wild animals as objects of affection, expressed sympathetic

concern over the consumptive exploitation of wildlife, and took a more positive attitude toward nature (Caro et al., 1994; Kellert and Berry, 1987). Perhaps male and female participants' perception of the "value" of CWD was as a habitat component for plants and wildlife and they exhibited concern for the well-being of plants, wildlife, and their habitat. These results suggest that when participants are asked to consider the "value" of an ecological entity to the environment, their attitudes are more positive following participation in a live presentation and cooperative learning activity than after reading a brochure.

Sociodemographic Setting

Sociodemographic setting influenced participant attitudes toward CWD. When presented with the statement, "CWD is valuable to plants and wildlife," few participants who participated in the brochure or cooperative learning activity disagreed or strongly disagreed, regardless of sociodemographic setting (Table 3). Participants from urban areas had the highest proportion of neutral responses when asked to consider the value of CWD to plants and wildlife, regardless of educational technique used (Table 3). Urban students may have responded neutrally because of uncertainty in whether the presence of CWD was a form of environmental protection. Perhaps if an outdoor educational session, such as a visit to a demonstration forest, was used in combination with a brochure and cooperative learning activity, the value of CWD to plants and wildlife might become more obvious to urban students (Broussard et al., 2001). The attitudes of students from suburban areas concerning the value of CWD to plants and wildlife were more positive following the cooperative learning activity as evidenced by the proportion of strongly agree responses (Table 3).

The size and location of an individual's hometown has been found to influence their attitudes toward the environment (Tikka et al., 2000). In contrast to the results of this study, Arcury and Christianson (1993) and Tikka et al. (2000) found that individuals from metropolitan and urban settings had a stronger environmental world view than individuals from

Table 2. Coarse woody debris is valuable to plants and wildlife. The values listed are percentages based on sample sizes of N = 170 (brochure) and N=182 (presentation)

Response	Brochure		Presentation	
	Female (%)	Male (%)	Female (%)	Male (%)
1 (strongly disagree)	0	0	0	2
2 (disagree)	2	0	0	0
3 (neutral)	3	6	5	6
4 (agree)	66	57	40	42
5 (strongly agree)	29	37	55	50

Table 3. Coarse woody debris is valuable to plants and wildlife. Values are percentages based on sample sizes of N = 170 (brochure) and N=182 (presentation)

Response	Brochure			Presentation		
	urban (%)	suburban (%)	rural (%)	urban (%)	suburban (%)	rural (%)
1 (strongly disagree)	0	0	0	0	0	3
2 (disagree)	0	1	0	0	0	0
3 (neutral)	12	5	2	14	1	9
4 (agree)	58	63	52	43	40	40
5 (strongly agree)	30	31	46	43	59	48

Table 4. Coarse woody debris is an environmental hazard and should be removed from both private and public lands. Values based on sample sizes of N=170 (brochure) and N=182 (presentation)

Response	Brochure			Presentation		
	urban (%)	suburban (%)	rural (%)	urban (%)	suburban (%)	rural (%)
1 (strongly disagree)	23	6	18	14	25	19
2 (disagree)	46	67	66	57	61	53
3 (neutral)	19	20	16	19	13	20
4 (agree)	8	6	0	10	1	7
5 (strongly agree)	4	1	0	0	0	1

urban-nonmetropolitan and rural-nonmetropolitan locations. Individuals who live in crowded, urban locations may be more likely to become aware of existing environmental problems and adopt sympathetic attitudes toward nature and the protection of the environment. Middle-school youth from urban Michigan indicated that their knowledge of and attitude toward natural resources changed following a summer science academy experience (Vasievich et al., 1993). Such students became more aware of the scope of natural resources and developed a better understanding of people's need to use natural resources and the need for environmental preservation.

When presented with the statement, "CWD is an environmental hazard and should be removed from private and public lands," the majority of brochure and cooperative learning activity participants disagreed, regardless of sociodemographic setting (Table 4). Students from suburban areas most often disagreed that CWD was an environmental hazard and should be removed from both private and public lands regardless of educational technique used. More suburban students who participated in the cooperative learning activity strongly disagreed (25%) that CWD is an environmental hazard and should be removed from private and public lands than did suburban students who received the brochure (6%). No rural participants who received the brochure

agreed or strongly agreed that CWD was an environmental hazard. An average of 10% of participants from urban areas agreed or strongly agreed that CWD posed a risk, regardless of educational technique used. Participants from urban areas more often disagreed or strongly disagreed that CWD posed a risk.

Since urban participants would be less likely to have seen CWD than rural participants may explain the lack of perceived risk. However, rural participants more often disagreed or strongly disagreed that CWD was an environmental hazard, regardless of educational technique used. Conversely, individuals from urban and rural areas differed significantly in their perceptions of risks posed by various land use practices on groundwater quality (Suvedi et al., 2000). People with homes in urban areas perceived a higher level of risk to groundwater associated with roadside weed control, industrial areas, and agricultural lands than did individuals living in rural areas (Suvedi et al., 2000).

Academic Major

When presented with the statement, "CWD is valuable to plants and wildlife," the proportion of participants responding neutrally or in strong agreement differed by academic college and between brochure and cooperative learning activity groups (Table 5). More students from the College of

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Architecture and Urban Studies, College of Business, and College of Engineering responded neutrally when asked to consider the value of CWD to plants and wildlife after reviewing the brochure than after the cooperative learning activity (Table 5). Compared to other academic majors, engineering students have the most negative attitudes toward the environment (Tikka et al., 2000). However, the majority of engineering students in this study showed positive attitudes toward the environment when asked to consider the value of CWD in the forest landscape. Most students in the College of Engineering agreed or strongly agreed that CWD was valuable to plants and wildlife regardless of whether they received the brochure or cooperative learning activity (Table 5). No students from the College of Architecture and Urban Studies strongly agreed that CWD is valuable to plants and wildlife after reviewing the brochure (Table 5). More architecture and urban studies students, business students, natural resources students, students in the College of Science, and university studies/undecided major students strongly agreed that CWD is valuable to plants and wildlife following the cooperative learning activity (Table 5).

Although most first-year college students hold positive attitudes toward the environment, students majoring in sociology, biology, or the environmental sciences consistently have stronger positive beliefs and attitudes toward the environment than students from other disciplines (Caro et al., 1994; Hodgkinson

and Innes, 2001). Students with undecided majors were among the least environmentally minded (Hodgkinson and Innes, 2001). However, in this study, students with undecided majors were more environmentally conscious when asked to consider the potential environmental risks associated with CWD. Students in university studies and undecided majors more often strongly disagreed that CWD was an environmental hazard and should be removed from both private and public lands following the cooperative learning activity. By strongly disagreeing, these students perhaps believed CWD should not be removed because of its perceived ecological value.

These results suggest that when attempting to instill positive attitudes concerning the environment--particularly forestry--in college students with majors outside of the life sciences, the use of a cooperative learning activity may help bring about more positive attitudes than the use of a brochure. Positive attitudes toward the environment have previously been found in students majoring in the natural resources (Tikka et al., 2000). Students majoring in forestry showed positive attitudes toward the environment (Tikka et al., 2000). In this study, students in the College of Natural Resources showed positive attitudes toward the environment by strongly agreeing that CWD is valuable to plants and wildlife. These results suggest that when attempting to instill positive attitudes toward the environment in college students majoring in the life sciences, the use of

Table 5. Coarse woody debris is valuable to plants and wildlife. Values are percentages based on sample sizes of N = 170 (brochure) and N=182 (presentation)

Response	Brochure				Presentation			
	Aglife (%) [*]	Archit (%)	Busine (%)	Engine (%)	Aglife (%)	Archit (%)	Busine (%)	Engine (%)
1 (strongly disagree)	0	0	0	0	3	0	0	0
2 (disagree)	0	0	0	0	0	0	0	0
3 (neutral)	0	33	7	11	14	8	0	3
4 (agree)	67	67	71	47	43	33	60	50
5 (strongly agree)	33	0	21	42	40	58	40	47

Response	Brochure			Presentation		
	Natres (%)	Scienc (%)	Univst (%)	Natres (%)	Scienc (%)	Univst (%)
1 (strongly disagree)	0	0	0	0	0	0
2 (disagree)	0	0	2	0	0	0
3 (neutral)	0	4	0	0	0	2
4 (agree)	42	56	72	27	19	46
5 (strongly agree)	58	40	26	73	81	52

Note. ^{*}Only 3 students that reviewed the brochure were from the College of Agriculture and Life Sciences. Aglife = College of Agriculture and Life Sciences; Archit = College of Architecture and Urban Studies; Busine = College of Business; Engine = College of Engineering; Natres = College of Natural Resources; Scienc = College of Science; Univst = College of Liberal Arts and Human Sciences.

cooperative learning activities may help bring about more positive attitudes than the use of a brochure.

Influence of Student Learning Styles

Although student learning styles were not a focus of this research, previous work on learning styles may help explain some of the results of this study. The cooperative learning activity helped reveal more positive attitudes toward CWD and forestry when compared to the brochure for students from the College of Agriculture and Life Sciences. However, Cano (1999) reported that the majority of incoming first-year students enrolled in a college of agriculture could be categorized as field-independent by the Group Embedded Figures Test (GEFT) (Witkin et al., 1971). Students categorized as field-independent are more likely to favor independent study, provide their own structure to facilitate learning, and are generally unresponsive to social reinforcement (Witkin et al., 1977), coinciding with a likely preference for the brochure over the cooperative learning activity. On the Gregorc Style Delineator (Gregorc, 1982) a field-independent classification corresponds to Concrete Sequential (CS)/Concrete Random (CR) learning styles (Myers and Dyer, 2004). As Gregorc (1982) defines them, CS learners want activities with hands-on applications. Perhaps students from the College of Agriculture and Life Sciences were field-independent with CS dominant learning styles and gained more from the cooperative learning activity than the brochure.

Student learning styles differ by gender and sociodemographic setting and may explain the ability of the cooperative learning activity and brochure to reveal student attitudes toward CWD and forestry. Female attitudes toward CWD overall were more positive following the cooperative learning activity on issues involving the “value” of CWD to the environment. However, female student attitudes were more positive following the brochure on issues that involved human interactions with CWD. In terms of learning style, these findings make sense. Females tend to be more field-dependent and Abstract Random (AR) in their learning style (Gregorc, 1982) and typically believe people are more important than things (Dyer, J.E., personal communication). Although AR learners prefer communication and interaction with others that the cooperative learning activity provided, their priority on people over things may explain why female attitudes were more positive following the brochure when it came to human interactions and CWD. Considering sociodemographic setting and student learning styles, the influential nature of the cooperative learning activity for suburban students may be a result of their typically field-dependent learning style (Dyer, J.E., personal communication). Individuals

with field-dependent preferred learning styles tend to be highly sensitive and attuned to the social environment and are generally more extrinsically motivated (Witkin et al., 1977). This is one potential explanation why suburban students benefited most from the cooperative learning activity.

Summary

This study examined the attitudes of first-year college students towards CWD following exposure to two commonly used environmental education techniques (brochure and cooperative learning activity). By using a survey that collected demographic information and assessed student perceptions of CWD, the researchers tracked the ability of each teaching technique to reveal student attitudes with regards to gender, sociodemographic residence, and college major. Overall, student attitudes toward the benefits of CWD to wildlife, plants, humans, and the environment were more positive following the cooperative learning activity than the brochure. This is not surprising since active learning strategies have previously been effective at fostering dialogue and focusing group discussion concerning controversial subjects like forestry (Ellefson and MacKay, 1996). Participants from urban areas more often responded neutrally to questions about the value of CWD following the brochure and cooperative learning activity perhaps indicating their inability to relate to the natural resources topic. Rural student attitudes concerning the benefits of CWD to the environment were similar following the cooperative learning activity and brochure. However, rural student attitudes concerning the benefits of CWD to humans were more positive following the cooperative learning activity when compared to the brochure. The cooperative learning activity convinced more students from suburban areas about the importance of CWD than did the brochure this may reflect a greater exposure to established natural resource education programs, such as Project Learning Tree and Project Wild that commonly use active learning techniques. In addition, the influential nature of the cooperative learning activity for these students may be a result of their typically field-dependent learning style.

Females exhibited more positive attitudes toward CWD than males following the brochure and the cooperative learning activity. However, females responded differently to the brochure than the cooperative learning activity. Female attitudes were more positive following the brochure on issues that involved human interactions with CWD (e.g., active forest management for CWD) and female attitudes were more positive following the cooperative learning activity on ecological issues (e.g., the value of CWD as habitat for plants and animals). Tending to be more field-dependent/AR learners, female student priority

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for people over things may explain why female attitudes were more positive following the brochure when it came to human interactions and CWD. Male students did not demonstrate a strong differentiation in their perception of CWD following the brochure or the cooperative learning activity.

Although many factors contribute to how effective a natural resource education program is at educating students about the importance of an environmental topic, this study showed that gender and sociodemographic residence can influence response following exposure to a specific teaching method. For issues of greatest concern to women and suburban residents, cooperative learning activities could help reveal positive attitudes toward potentially controversial environmental topics when compared to brochures. Urban residents did not respond strongly to either of these techniques and they may require “in the field” or “hands on” environmental programs to connect to natural resource topics.

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