Stewardship Education

Best Practices Planning Guide

© TIM DANIEL / OHIO DNR

ASSOCIATION of
FISH & WILDLIFE
AGENCIES

© LUCAS CAVALHEIRO PHOTO / DREAMSTIME.COM

Stewardship Education
Best Practices
Planning Guide

Association of Fish and Wildlife Agencies
444 N. Capitol Street, NW, Suite 725
Washington, DC 20001
202-624-7890
www.fishwildlife.org

A Project of the Association of Fish and Wildlife Agencies'
North American Conservation Education Strategy

Acknowledgments

Editor:

The Association of Fish and Wildlife Agencies would like to thank the following people for contributing time and expertise to the development of this Guide.

Recreational Boating and Fishing Foundation

This document draws heavily on Chapter 9 of the Recreational Boating and Fishing Foundation's *Best Practices Workbook for Boating, Fishing and Aquatic Resources Stewardship* (Seng and Rushton, 2003). Portions of this chapter and other information from the *Workbook* are reprinted verbatim with the gracious permission of RBFF. The Best Practices *Workbook* and other tools are available for download at www.rbff.org. The following experts and researchers were intimately involved in development of the *Workbook*, and should be recognized individually for their contributions:

Anthony J. Fedler (ed.), Human Dimensions Consulting
Julie A. Athman, University of Florida (formerly)
Myron F. Floyd, University of Florida (formerly)
Rosanne W. Fortner, Ohio State University
Marni Goldenberg, University of Minnesota (formerly)
Alan R. Graefe, Pennsylvania State University
Tom Marcinkowski, Florida Technical Institute
Bruce E. Matthews, Recreational Boating and Fishing Foundation (formerly)
Martha C. Monroe, University of Florida
Janice D. McDonnell, Rutgers University
Jo-Ellen Ross, Chicago State University
William F. Siemer, Cornell University
Kathleen E. Vos, University of Wisconsin Extension
Michaela Zint, University of Michigan

McKenzie-Mohr Associates

Doug McKenzie-Mohr, Ph.D., granted permission to excerpt portions of his *Quick Reference: Community-Based Social Marketing*.

Table of Contents

Introduction

What are Best Practices?

A "Best Practice" is a program or practice with specific outcomes that has been clearly defined, refined, and evaluated through repeated delivery and supported by a substantial body of research. These practices represent the best knowledge available for use under specified circumstances. It's important to note that best practices may change over time. They are recommendations based on what has been observed or documented to be effective to date, but which may change given additional experience, evaluation, and research.
For natural resources management agencies and organizations trying to educate people about conservation, the use of best educational practices is simply a matter of applying tested, science-based practices to educational efforts, the same way biologists apply science to the management of fish, wildlife and other natural resources.

Best practices are process-oriented.

Best practices do not suggest *what* content you teach; but rather *how* you plan it, approach it, teach it, and evaluate it. Therefore, all the recommendations in this *Planning Guide* are applicable to nearly every sector within conservation education.

Best practices are meant to enhance, not replace, existing efforts.

The best practices in this *Planning Guide* do not constitute a "program" unto themselves. Rather, they are tools you can use to make your existing (or developing) programs more effective. Measuring effectiveness can be difficult; however, to be accountable for their programs, educators need to use appropriate evaluation tools and methods to measure intended outcomes. Furthermore, programs need to be designed and evaluated based on the best information research and practical experience has to offer.

Fortunately, today there are a variety of tools that can help conservation educators identify and achieve realistic goals and objectives for their programs. This *Planning Guide* is one such tool.

Getting the Most out of this *Planning Guide*

Although this *Planning Guide* was designed to be used as a stand-alone document, it can perhaps achieve its greatest effectiveness if used as a partner piece to the Recreational Boating and Fishing Foundation's (RBFF) landmark document
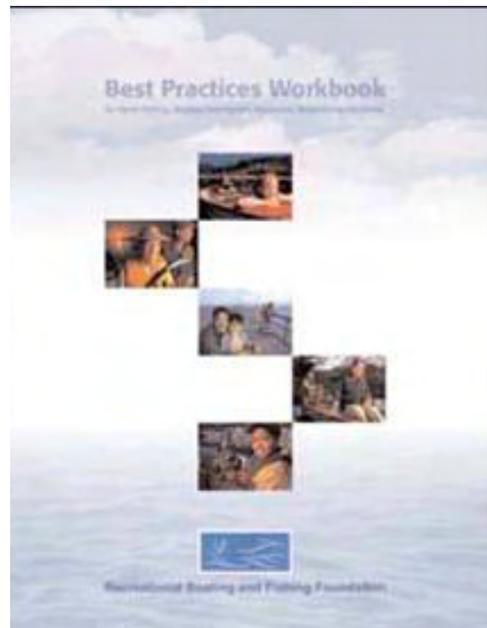
Best Practices Workbook for Boating, Fishing and Aquatic Resources Stewardship (RBFF *Workbook)*. Chapter 9 (Aquatic Stewardship Education) of the RBFF *Workbook* is the foundation of this *Planning Guide*—expanded and adapted to cover stewardship within a broad conservation education perspective, not just stewardship of aquatic resources. For maximum benefit, review some or all of the RBFF *Workbook* (especially the first two chapters) before working on the specific information provided in this *Planning Guide*. (Access the RBFF *Workbook* at www.rbff.org.)

Worksheets

Worksheets provided within this *Planning Guide* and throughout the RBFF *Workbook* give you the opportunity to apply the best practice information to your own situation. By completing these as you go, you'll have the basis or blueprint for an outstanding stewardship program.

New versus existing program

This *Planning Guide* can help you achieve your goals and objectives whether you are just developing a conservation education program, or whether you've been at it for years. If you are starting a new program, consider reviewing all chapters within the RBFF *Workbook* in addition to this *Planning Guide*. That information will help you make informed decisions on how to plan and implement your program and help you avoid pitfalls others have learned the hard way.

Administrators of existing programs can benefit from the RBFF *Workbook* by reviewing the chapters to see how closely their programs meet the best practice guidelines. You may find valuable ideas you want to add, holes in your program you can fill, or scientific research to back up or justify what you've been doing all along or plan to do in the future.

Where are the footnotes and citations?

This *Planning Guide* is based on scientific research and empirical evidence. Nearly every paragraph could contain one or more citations from other sources. However, to make this document easier to read and use by practitioners, footnotes and citations have been omitted from the body of the text. Original sources of information compiled in this *Planning Guide* are listed in the Bibliography. Most can be found in the technical publication: *Defining Best Practices in Boating, Fishing, and Aquatic Resources Stewardship Education* (Fedler et al., 2001). This document is available at www.rbff.org . The Association of Fish and Wildlife Agencies, RBFF and their partners are deeply indebted to all who made this compilation possible.

Creating Stewards of Natural Resources

Most people involved in outdoor education of any kind will agree that, as expansion of human development puts more and more pressure on the natural world, stewardship of our natural resources is critically important.

But what does *stewardship* mean? People have different perceptions about what stewardship means, and understanding those perceptions is an important first step in ensuring that stewardship messages and programs are well designed and delivered.

For the purposes of this Planning Guide, **natural resource stewardship** is defined as:

Informed, responsible action/behavior on behalf of the environment and future generations.

In a recent study by the RBFF, researchers asked U.S. residents to describe what they think of when they hear the term "natural resource stewardship." Responses were fit into one of three perception categories:

- Ethical (e.g., protecting the environment for future generations),
- Ecocentric (e.g., preserving the environment in its natural state for its own sake), or
- Responsible Use (e.g., managing natural resources wisely to provide for human needs).

Results were clear that the public does not have one, universal perception of stewardship. Respondents often hold simultaneous multiple (and seemingly opposing) perceptions. Respondents generally expressed some level of agreement with all three perceptions, although frequency scores for *responsible use* and *ethical* perceptions tended to be higher than for *ecocentric* perceptions.

What is a Steward?

Who is the "good steward" you are striving to develop with your program? What characteristics does he or she have? As part of your program "outcomes" and "impacts," develop a list of characteristics a good steward would have. Make this part of your instructional objectives. Some examples are listed below, although your list may be different.

A good steward:
- Has knowledge of basic ecological concepts.
- Has knowledge of pertinent problems and issues.
- Feels a personal connection to natural resources.
- Has skill in employing systems-thinking and a systems-based approach to identifying, analyzing, investigating, and evaluating problems and solutions (thinks of the world as a system of interconnected, interacting parts; considers how affecting a part affects the whole).
- Seeks to understand all aspects of an issue (e.g., environmental, scientific, social, political, historical, and economic).
- Has acquired a knowledge of and demonstrated skill in using action strategies essential to sound stewardship.
- Reflects a sense of obligation to future generations and the earth.
- Recognizes the difference between intention

and consequence (does the action truly have the desired effect?).
- Has an internal "locus of control" (the belief and/or feeling that working alone or with others, an individual can influence or bring about desired outcomes through his actions) and takes personal responsibility.
- Acts in an informed and responsible manner.
- Is willing and able to pass stewardship concepts on to peers and others.

The Role of Conservation Education

Conservation education is a process to help individuals acquire and learn to apply stewardship skills and build the capacities needed to enable them to make informed choices and take environmentally responsible actions.

The terms *ethics*, *morals*, and *character* are used interchangeably here to refer to the same concept—an internal system that determines socially acceptable behavior. *A stewardship ethic is at work when people feel an obligation to consider, not only their own personal well-being, but also that of their surroundings and human society as a whole.*

Researchers have come to three important conclusions about environmental and conservation education:

1. Ecological awareness and knowledge are not enough to cause long-lasting behavior changes, but they can provide a basis or readiness for learning and participation.
2. Ownership (a personal connection with one or more natural areas, and knowledge of and/or investment in problems/issues) is critical to responsible environmental behaviors.
3. Instruction and experiences intended to foster ownership and empowerment (a sense of being able to make changes and resolve important problems, and use critical issues investigation skills to do so) often permit individuals and groups to change their behavior.

The best practices in this *Planning Guide* are based on and flow from these critical conclusions.

Best Practices for Stewardship Education

The best practices in *Figure 1* are research-based guidelines for developing and/or maintaining an effective stewardship education program. Each practice is described in detail following the list.

Figure 1: Best Practices for Stewardship Education

Effective programs:

- Have organizational mission, strategic vision, education program goals, and instructional objectives aligned with one another.
- Address each stage of a participant's progression from entry-level to ownership, to empowerment, and then to environmentally responsible behavior.
- Consider the role that ethical principles and reasoning can play in supporting stewardship.
- Provide opportunities for individuals to have positive and repeated contact with the outdoors over a long period of time.
- Match the developmental stages of the learner.
- Consider the social context in which the education takes place and provide avenues to enhance social support for learners.
- Help learners consider all aspects of the natural resource issue of interest (including historical, social, scientific, political, ecological and economic) with a systems-based approach.
- Encourage long-term stewardship behavior.
- Structure effective curricula to give learners a well thought-out and data-supported sequence of stewardship opportunities.
- Evaluate all aspects of the stewardship education program to determine what is working and where improvement is needed.

Mission, Goals and Objectives

Best Practice: Effective programs have organizational mission, strategic vision, education program goals, and instructional objectives aligned with one another to reflect stewardship education.

There may not be anything you can do that will have a greater impact on your program's chances for success than to identify your mission, vision, goals, and specific objectives regarding stewardship. If you don't know why your organization or program exists, any parameters can define you, and if you don't know where you're going, any road will get you there. Think strategically to identify why your program exists, what sets you apart from similar organizations, what you want your program to accomplish, and get agreement from the others who will help you implement a plan to achieve it.

- The mission statement is a broad, philosophical statement about what the program hopes to contribute. It provides overall guidance for program goals and objectives. It answers the questions: Why is this program in existence? What is it trying to do?
- The vision statement paints a picture of where you want to be. It is clarifying and often inspirational.
- Goals help define how the program will help achieve the mission. Goals explain why you are using a particular program or approach.
- Objectives spell out what, specifically, you want to accomplish. Objectives should be measurable, and generally—though not always—are set up on a relatively short time-frame "As a result of this program, participants will be able to _____."

Sometimes, the differences between missions, goals, and objectives can get fuzzy, especially when you're working in partnership with other organizations. Also, goals and objectives may overlap. Regardless of what you call the various levels, it is critical to ask the questions:

"Why are we doing this program?" and "What do we want to accomplish with this program?"

Definitions and explanations of mission, vision, goals, and objectives and much more can be found in RBFF *Workbook* Chapter 1. If you have not completed a strategic plan or a goal-setting process, you should start there.
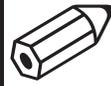
Worksheet 1: Mission, Goals and Objectives

How does your program define the characteristics of an environmental (or natural resource) steward?

List the characteristics.

List the mission, vision, goals, and objectives of your program related to stewardship.

Stewardship Mission Statement:

Stewardship Vision Statement:

 Stewardship Goal 1:
 Stewardship Objectives:
 Stewardship Objectives:

 Stewardship Goal 2:
 Stewardship Objectives:
 Stewardship Objectives:

Do the mission, vision, goals, and objectives align to reflect stewardship education?

How could you refine them to better accomplish stewardship education?

Developing Stewardship

Best Practice: Effective programs address each stage of a participant's progression from *entry-level* to *ownership* to *empowerment* to environmentally responsible, stewardship behavior.

These three stages contribute to environmentally responsible behavior.

Entry Level

Entry-level characteristics include a person's environmental sensitivity and knowledge about ecology. When individuals have little knowledge of or sensitivity toward the environment, programs must provide information and teach basic ecological concepts.

Without some understanding about the living and nonliving components of the environment and how they influence one another, individuals most likely will not progress to the ownership stage. For example, when people learn about the source of their drinking water, especially a local river or lake, they are more likely to take interest in what happens to that body of water. Building awareness, relevance and meaningful threshold experiences will provide a good foundation toward the next stage, developing a sense of ownership.

Ownership Level

A sense of ownership occurs when individuals and groups personalize environmental problems and issues, and thus take ownership of them. These characteristics include a personal connection with one or more natural areas, an in-depth understanding of the issues, and personal investment in and identification with an issue.

Individuals and groups who develop knowledge and apply skills, investing their own time, energy, and resources in addressing a particular problem or issue, often develop a sense of ownership for that problem or issue. Research indicates that when people directly experience the destruction of natural areas with which they are intimately familiar, they develop a sense of ownership for those areas. A sense of ownership is a motivator to move on to the next stage, empowerment.

Empowerment Level

Empowerment experiences give people a sense that they can make changes and help resolve important environmental issues. Empowerment characteristics include perceived skill in using environmental action strategies and skills, knowledge of action strategies, an internal locus of control, the intention to act, and assumption of personal responsibility. To accomplish empowerment, programs should help participants develop guidelines and foster internal motivations for responsible behavior toward other people and the natural world.

Given enough time and experience in the empowerment level, people truly becomes stewards. They internalize stewardship—it becomes a part of them. Stewardship behavior results from a long-term process of learning through a series of developmental stages (*Figure 2*). It calls for a series of complementary education efforts and usually works best when learning takes place in a combination of formal and non-formal learning environments.

The Entry-level is the bottom of the pyramid in *Figure 2*. At this stage, learners are exposed to new themes, concepts, and activities in a positive way, consistent with the mission of the organization. The focus is on giving participants a "gee-whiz" experience that engages them and makes them want more. Program activities that characterize this stage include exhibits/demonstrations at fairs, TV shows, park visits and exhibits, school presentations, etc.

Entry-level experiences should lead participants to learn more about and acquire skills regarding the activity—as participants take some ownership in the issue, they move a step closer to the top of the pyramid. Examples of ownership-level opportunities include: park day camps; Becoming an Outdoors Woman; hunter education; boater education; fishing clinics; some Project WILD activities; etc.

Figure 2. Progression toward environmentally responsible (stewardship) behavior.
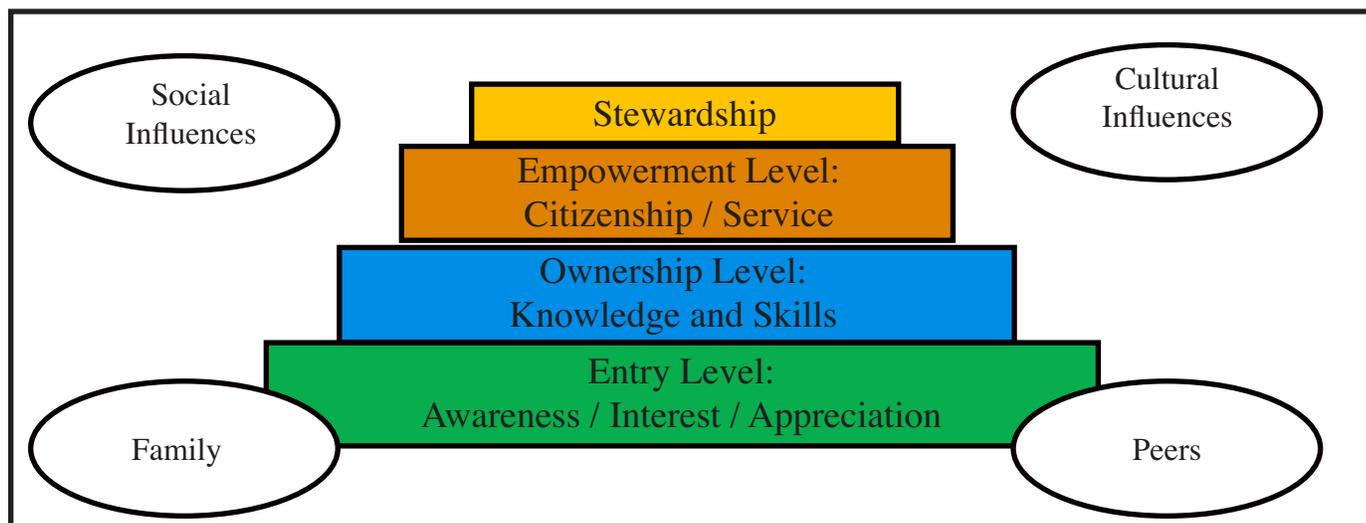
As knowledge and skills are obtained and as a participant gains more ownership in a topic or activity, he or she hopefully will be empowered to give service—to be a steward of natural resources. Showing participants the impacts their choices and actions have on interconnected natural and social systems can help them understand their place in these systems, which can aid and strengthen their empowerment and facilitate their willingness to adopt stewardship behaviors. It's important that learners have ample opportunities to "practice" stewardship behaviors at this stage. Examples of empowerment-level activities include: volunteers and friends groups; hunter and boater education instructors; Project WILD facilitators; Master Naturalists; student internships; advisory groups, etc.

When participants sustain service and citizenship behaviors over time, they become stewards. Examples of stewards include: long-term volunteers; those who actively participate in actions and community decision-making that benefit the environment and future generations; and safe, responsible and mentoring enthusiasts.

Obviously, the progression from entry level experience to becoming a steward does not occur in a vacuum. Myriad social and cultural factors influence participants every step of the way, and these need to be considered during program development.

Table 1 was adapted from materials developed by the Texas Parks and Wildlife Department. It is a practical application of the pyramid model in *Figure 2*. The text describes each stage from the perspective of the participant and gives tips for program planners.

Table 1. Characteristics of and recommendations for each stage in the progression toward environmentally responsible (stewardship) behavior.

Stage	What the Participant Experiences	What the Program Planner Should Do
Awareness/ Appreciation (Entry-level)	A "wow" threshold experience Exposure to new concepts and activities in positive ways, consistent with organizational mission. Short duration or limited scope.	Provide exposure or introduction to themes, concepts, and activities in positive ways, consistent with organizational mission. • Address the needs of the target audience. • Meet the audience "where they are." • Provide multiple, short/limited scope activities or events offered or repeated over time. • Includes most outreach and interpretation activities.
Knowledge/ Skills (Ownership)	In-depth learning/skill development. Critical thinking skills. Systems thinking skills. Greater time commitment. More involved activities/ programs. May involve certification, skill testing.	• Teach learning or skill development. Offer certifications, skill tests. • Address the needs of the target audience. • Meet the audience "where they are." • Foster partnerships for ongoing support of the learners' participation. • Include more complex/challenging curricula and programs that employ a systems-based approach to learning and investigating issues. • Engage participants by fostering stronger connections to their local natural places/natural resources.
Service/ Citizenship (Empower-ment)	Involvement in actual stewardship activity. Application of critical thinking skills—solve problems. Extended time investment. Commitment beyond self-interests.	Provide opportunities for participants to be stewards of the resource. • Encourage and facilitate extended time investment. • Promote volunteer programs and advisory groups. • Provide active ways for people to be involved in decision-making. • Offer opportunities to identify, investigate and address local environmental issues.
Stewardship	Life-long behaviors consistent with managing and conserving natural resources for sustainable use and enjoyment of present and future generations. Law-abiding citizens. Active decision-makers.	Provide support for individuals to develop and maintain life-long behaviors that are consistent with managing and conserving resources for the sustainable use and enjoyment of present and future generations. • Support activities/opportunities to remain involved. • Provide opportunities for active participation in decision-making and problem solving. • Provide opportunities to model good behaviors and be mentors. • Provide rewards, recognize and celebrate successes.
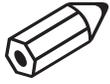
Ethical Principles and Reasoning

Best Practice: Effective programs consider the role ethical principles and reasoning can play in supporting stewardship.

Many of the behaviors that people exhibit are based on their personal ethics. So in addition to developing critical thinking and decision-making skills and empowering participants to take action, stewardship education should consider how an individual's ethics support natural resources stewardship. Programs should encourage development of personal ethical competence, including the:
- Sensitivity to recognize when a situation poses one or more ethical considerations.
- Knowledge of what behaviors are *legal* versus what behaviors might be *ethical* in a given situation.
- Willingness to contribute, participate and act in an ethical manner.
- Judgment to weigh various considerations where there are no laws or other guidelines for action.
- Humility to seek advice and additional knowledge to guide action.
- Ability to discern needs versus wants, and the various different contexts for decision-making.
- Awareness of and sensitivity for social and environmental justice.

The Institute for Global Ethics (www.globalethics.org) has identified a set of core ethical values that most people share: responsibility, fairness, honesty, respect, tolerance and caring. An education program should incorporate these core values and should look for ways to impart them to participants.

12

The Washington Department of Fish and Wildlife (WDFW) formally included ethics and the core values mentioned below into its 1999 Education Program Plan (O'Malley 1999).

An Individual's Code of Ethics for Protecting Washington's Fish and Wildlife

Responsibility
I want to be a responsible steward of fish and wildlife. I will learn what needs to be done to help preserve resources.
I will identify what changes I need to make in my personal actions to lighten my impact on the land, and I will make those necessary life-style changes.
I will donate a portion of my time and other resources to help improve fish and wildlife habitat.

Fairness
If I impact the habitat as a recreationist, commercial harvester or developer, I will choose the least-damaging option for fish and wildlife.
I will consider the effects of my actions on fish and wildlife when I use the land.
I recognize that I am a steward of the resources of the state, which belong to all people of the state and to future generations.
I recognize that I have an obligation to other users and future generations who are not here to represent themselves.

Honesty
I am honest with myself regarding my environmental actions and inactions.

Respect
I believe that all native fish, wildlife and plant populations have an intrinsic value in our landscape.

Tolerance
I recognize that each issue has differing points of view. While I may not agree with someone, I will allow him or her the right to express his or her side.

Caring
Fish and wildlife are critical to my way of life. I take the time to observe fish and wildlife and reflect on their condition.

WDFW's Code of Ethics in Education Program Development
In addition to helping to foster a code of ethics among Washington's citizens, department employees should adopt and use the following ethic in developing educational programs.

Responsibility
WDFW will identify the needs of fish and wildlife and make that information available to the public.
WDFW will identify issues and actions that impact fish and wildlife.
WDFW will recruit, train and direct volunteers to improve fish and wildlife habitats and populations and provide opportunities for people to help as individuals.
WDFW will advocate for the needs of fish and wildlife biodiversity and conservation.
WDFW will develop volunteer opportunities from the participant's point of view as well as from the department's point of view, to provide meaningful and enjoyable projects.

Fairness
Programs will be accessible to all.
Education efforts will include diverse audiences who currently impact wildlife or who may be encouraged to appreciate wildlife.

Honesty
Program materials will incorporate sound science; be accurate, timely and unbiased.
WDFW recognizes the limits of its ability to affect change.

Respect
Similar educational efforts by other agencies and organizations are appreciated and recognized.
WDFW will collaborate and cooperate with others.

Tolerance
Other points of view are respected.

Caring
The individuals who are helping to make a difference are appreciated, recognized and thanked.
We work as colleagues in a positive, encouraging atmosphere.
Shared work creates a common sense of community–we work with each others' strengths and help with weaknesses.

Worksheet 3: Ethical Principles and Reasoning

What is your program doing currently to help participants gain ethical competence?

What is your program doing currently to help participants identify and consider how the role of their personal ethics affect their behavior regarding natural resources?

How might your program help participants become more ethically competent?

How do your programs incorporate the core ethical values that most people share?
Responsibility:

> **Fairness:**
>
> **Honesty:**
>
> **Respect:**
>
> **Tolerance:**
>
> **Caring:**

Positive and Repeated Contact

Best Practice: Effective programs provide opportunities for individuals to have positive and repeated contact with the outdoors over a long period of time.

Environmental sensitivity refers to an increased level of empathy toward the natural environment. Research shows that environmental sensitivity is developed through significant, positive contact with the outdoors over a long period of time. For example, adults who are leaders in conservation or involved in environmental careers usually share a common set of experiences involving the outdoors when they were youngsters.

To have a meaningful environmental ethic, a person must have a fundamental sense of affection for and identification with nature, and see himself as an integral, necessary member of the ecological community.

Unethical behavior often is associated with feelings of alienation from nature, which allows an individual to abuse and exploit the resource without feelings of personal guilt or long-term responsibility.

Hunting, trapping, fishing, hiking, wildlife watching and boating are outdoor activities that may help people develop deeply personal connections with nature. However, a 2005 survey completed for the RBFF found that participation does not automatically translate to stewardship. Participation alone did not increase "lifestyle" behaviors such as recycling, picking up litter, etc., but did slightly increase "activism" behaviors like beach or stream clean-up or letter-writing to politicians. Interestingly, people who boated or fished before age 5, and those who perceived fishing and "getting away to nature" as central to their lives, had higher rates of stewardship.
Newly acquired behaviors require follow-up support to maintain. Research clearly shows that, even when strong, short-term behavioral change occurs, long-term change is doubtful without continued reinforcement. For example, if you teach a group of second-graders about water pollution (or boating or fishing), but then never do anything more with them over time, it is not likely they will retain that learning. Even if they left your program with new skills, knowledge and motivation, it is not likely to last without follow-up support. Apprenticeship experiences that the learner shares over time with a personally significant person are one (but not the only) way to encourage and maintain that follow-up support.

As you plan your program, consider how you might provide opportunities to reach a given target audience in multiple ways (such as through formal and non-formal learning), as well as over a span of time. Realistically, this can be accomplished only through partnership efforts among schools, agencies, and non-governmental organizations.

Match Developmental Stages

Best Practice: Effective programs match the developmental stages of the learners.

Research shows that children think and learn differently from adults. As children develop, they reorganize and reconstruct their base of knowledge, replacing one set of assumptions with another. They usually accept new information at face value and rely on others to decide what is important to be learned.

Real learning can occur only when the task is useful to the learner and when he or she is psychologically ready. Teaching is the act of creating environments that allow and encourage learners to move from their current stage to the next–providing learning opportunities at a level just above a student's current cognitive level.

Develop your program to facilitate stage-relevant thinking that allows students to discover for themselves the logical connections between objects or events. Consider providing learners with choices about what to learn, because they tend to choose learning experiences appropriate for their cognitive levels. It also helps to provide students with many opportunities to explore the natural world and think about it within their various stages of intellectual development.

Adults learn differently from children. They usually decide for themselves what is important to be learned. They have a lot of life experience, and need to validate new information based on this experience and their personal beliefs. Sometimes this makes learning more difficult, as adults may have preconceived ideas about a subject that may not be "true."

Adults often tackle learning with the purpose of solving a problem or applying the information right away, as opposed to learning a new subject for its own sake. Therefore, learning occurs best when new information is relevant to learner experiences and situations. Adult learners like to contribute to the process, and like to be recognized for their contributions.

Developmental Stages of Children

Following is a generalized overview of developmental stages children go through from kindergarten through high school. Children develop at their own pace and all characteristics will not be observed in all children at the same age or same stage of development; however, the order of the stages does not change much. But it is important to remember that each child is unique.

Kindergarten-Grade 3. Five- to nine-year olds are optimistic, eager and excited about learning. They have short attention spans. Five-year-olds can sit still and listen for 10-15 minutes; nine-year-olds for 20-30 minutes. They still think and learn primarily by experience. Rather than simply giving instructions verbally, demonstrate the activity. They enjoy doing, want to be active and are always in motion. They are more interested in working on a project than completing it. Children this age need rules to guide their behavior, information to make good choices and decisions, and consistency once the rule is established. Provide small group activities and lots of opportunity for them to be active.

Grades 4-6. This is a period of slowed physical growth when a lot of energy goes into learning. Children 10-12 years old love to learn facts, especially unique ones, and they want to know how things work and what sources of information are available to them. They still think in terms of concrete objects and handle ideas better if they are related to something they can do or experience with their senses. They are beginning to move toward understanding abstract ideas. They still look to adults for approval and need guidance to stay on task and to achieve their best performance. They often are surprised at what they can accomplish, especially with encouragement from an adult.

Grades 7-9. Youth 13-15 years of age are in a period characterized by much "storm and stress." Although they look older, most remain emotionally and intellectually immature. Young teens move from concrete to more abstract thinking. They can be very self-conscious, and a smaller group usually is less intimidating. Help them get over inferiority complexes by concentrating on developing skills. They are ready for in-depth, longer learning experiences. They can begin to deal with abstractions and the future. "Fitting in" with friends is a controlling influence.

Grades 10-12. High school students are future-oriented and can engage in abstract thinking. Teenagers continue to be group-oriented, and belonging to the group motivates much of their behavior and actions. They have more time constraints such as work, social ties or sports interests. They want to help plan their own programs. Involve them in the planning process. Use the discussion method when working with them. Instead of providing detailed instructions for how to put something together, provide suggestions and several alternatives.

Adult Learning Styles

Adults vary tremendously in how they acquire knowledge, and no single theory on adult learning styles can adequately address the diversity of each learner. However, a synthesis of the research findings on adult learning is illustrated in the following:

Structure of Learning Experiences

1. Adults prefer flexible schedules that respond to their own time constraints.
2. Adults learn better when learning is individualized.
3. Adults prefer face-to-face learning rather than through the use of video or audio tools.
4. Adults benefit from interactions with others who differ in age, level of experience, and professional preparation.

Learning Climate

1. Adults seem to learn better in an atmosphere of mutual helpfulness and peer support.
2. Since adult learners are reluctant to take risks, the climate should be characterized by a sense of trust and acceptance.
3. Adults appreciate the invitation to express their views and are open to the views of others.
4. Adults bring clear expectations to the learning environment and expect instructors to accommodate these expectations.

Focus of Learning

1. Since adult learners are often focused on problem-solving or immediate application of their learning, they derive the greatest benefit from instructional methods that assist them in processing their experience through reflection, analysis, and critical examination.
2. Adult learners value teaching methods that increase their autonomy.
3. Adult learners are motivated by practical, how-to learning.

Source: Stroot, S., Keil, V., Stedman, P., Lohr, L., Faust, R., Schincariol-Randall, L., Sullivan, A., Czerniak, G., Kuchcinski, J., Orel, N., & Richter, M. (1998). Peer assistance and review guidebook. Columbus, OH: Ohio Department of Education.

✎ **Worksheet 5: Match Developmental Stages**

To what age group(s) is your program targeted?

How have you customized your program to most effectively address age group/developmental stages?

Pre-Kindergarten:

Grades K-3:

Grades 4-6:

Grades 7-9:

Grades 10-12:

Adult:

How can you improve your program to better match the targeted developmental stages?

Social Context and Social Support

Best Practice: Effective programs consider the social context in which education takes place and provide avenues to enhance social support for learners.

Research clearly shows that the social context in which education takes place is at least as important as the methods by which stewardship concepts are taught. If not grounded within the particular community and cultural context of the learner, stewardship education will remain abstract, outside the scope of experience of the learner, inconsistent with cultural norms, and ultimately irrelevant.

Family, peers, and others in the community transmit their attitudes, beliefs, and values to participants in stewardship programs. Group members can encourage or discourage stewardship behaviors.

Stewardship programs are most effective in reaching behavioral goals if they incorporate parents, family, and neighborhoods as part of the learning community. Participants also can be given guidance on how to involve family and other peers in stewardship behavior. One of the premier illustrations for this technique is David Sobel's book, Place-based Education: Connecting Classrooms and Communities. The book offers research and practical examples of how schools and communities have incorporated the environment to facilitate learning, strengthen communities, and foster an appreciation for the natural world and a commitment to citizenship engagement (www.orionsociety. org).

The influence of the social context also may explain why the most effective service learning projects for schools are those that share information with the community (storm drain stenciling, flyers about control of exotic species, posters about how to recognize harmful situations, etc.).

How Communities Help Children Grow

Search Institute is a nonprofit organization whose mission is to provide leadership, knowledge, and resources to promote healthy children, youth, and communities. At the heart of this work is the framework of 40 Developmental Assets, which are experiences and personal qualities that young people need to grow up healthy, caring, and responsible. By considering how your subject matter can be used to help an individual develop these assets, you strengthen your program's overall impact on the individual's ability to become a steward.

External Assets
The first 20 assets focus on positive experiences young people receive from the people and institutions in their lives. Four categories of external assets are included in the framework:

Support - Young people need to experience support, care, and love from their families, neighbors, and many others. They need organizations and institutions that provide positive, supportive environments.
Empowerment - Young people need to be valued by their community and have opportunities to contribute to others. For this to occur, they must be safe and feel secure.
Boundaries and expectations - Young people need to know what is expected of them and whether activities and behaviors are in bounds and out of bounds.
Constructive use of time - Young people need constructive, enriching opportunities for growth through creative activities, programs, congregational involvement, and quality time at home.

Internal Assets
A community's responsibility for its young people does not end with external assets. There needs to be a similar commitment to nurturing internal qualities that guides choices and creates a sense of centeredness, purpose, and focus. Shaping internal dispositions that encourage wise, responsible, and compassionate judgments is particularly important in a society that prizes individualism. Four categories of internal assets are included:

Commitment to learning - the need to develop a lifelong commitment to education and learning.
Positive values - the need to develop strong values that guide their choices.
Social competencies - the need for skills and competencies that equip them to make positive choices, to build relationships, and to succeed in life.
Positive identity – the need for a strong sense of their own power, purpose, worth, and promise.
You strengthen your program's overall impact on the individual's ability to become a steward by integrating formation of developmental assets in your program design.

For more information on Developmental Assets, see the Search Institute's web site at www.search-institute.org/assets/.

Worksheet 6: Social

Context and Support

To what communities or peer groups do your participants belong?

What are the primary social influences on your participants (family, peers, media, school, organizations, community norms, etc)?

How can you enlist socially influential groups to help achieve your program goals?

How have you incorporated peer activities into your program?

How can you help create social support for participants' actions?

Consider All Aspects of an Issue

Best Practice: Effective programs help learners consider all aspects of the resource issue of interest (including historical, social, scientific, political, and economic).

Effective programs help participants look at and review all sides of an environmental issue. It is just as important that individuals understand and weigh the historical, social, political, and economic aspects of an issue as it is for them to understand the scientific and environmental issue itself. Understanding and weighing different cultural and social values of stakeholders, and identifying and managing potential conflicts, is critical. For example, in Florida, management decisions regarding manatees could impact

boaters, property owners, real estate, and the economy of several industries. Decisions that protect manatees but have minimal impact on other concerns likely will receive greater social support.
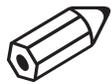
Worksheet 7: Consider All Aspects of an Issue

How does your program currently incorporate the influence of social, scientific, historical, political, and economic implications on environmental issue decisions?

How might you better address social, scientific, historical, political, and economic implications on environmental issue decisions?

How does your program help students consider all social, scientific, historical, political, and economic implications on environmental issue decisions?

How does your program encourage learners to consider compromise and consensus as they reach conclusions/solutions to issues?

Encourage Long-term Stewardship Behavior

Best Practice: Effective programs encourage long-term stewardship behavior.

Effective programs utilize strategies that result in long-term stewardship behavior. Many contemporary stewardship education efforts seem to take the form of short-term program modules or individual lessons. These piecemeal approaches need to be replaced or combined with in-depth and sustained programs. Program developers must be aware that some strategies provide for only short-term behavior changes.

Research indicates that goal-setting, commitment, and practicing positive citizenship behavior demonstration strategies can be effective in encouraging environmentally responsible behavior. Feedback, rewards, and penalties can produce short-term behavior change. However, when these consequence condi-

tions are removed, people often immediately return to their original behavior patterns. Rewards and penalties may have a place in stewardship education, but by themselves, they are not likely to produce lasting behavior change or environmental citizenship.

Also, there is very little evidence that mass media campaigns that promote conservation—even *intensive* mass media campaigns—have appreciable effects. *Information alone is not enough to change behavior.*

Information and Education: A Big Difference

The Random House Dictionary of the English Language (1987) defines these words as follows:

Information – knowledge of a specific event or situation, derived from study, experience or instruction.

Education – the act or process of imparting or acquiring general knowledge, developing the powers of reasoning and judgment, and generally of preparing oneself or others intellectually for mature life.

So *how do you* change behavior? A body of knowledge from the social sciences called Community-Based Social Marketing has identified a series of tools that can be effective in achieving behavior change. Some of these tools include:

- Commitment – Get participants to *commit* to doing one or more target behaviors. Research shows that commitment—even to small behaviors—predisposes people to accepting bigger commitments over time.

- Prompts – People forget things. Provide noticeable, self-explanatory, positive prompts to remind them of their commitments (e.g., stickers to turn off lights).
- Norms – Make stewardship behavior the acceptable thing to do within your community. If stewardship is the norm in a community, it can have a strong influence on behavior, even among people who have not made a personal commitment.
- Communication – Use lively, engaging communications to get the word out about stewardship efforts. Select and understand specific target audiences, customize your information to those audiences, and deliver it through sources your audiences will find credible. Be cautious about using threatening messages (e.g., your water is polluted); these can be effective, but may lead to backlash or hopelessness among your audience.
- Incentives – Rewarding people for taking stewardship actions can be very effective, but if not coupled with other methods to encourage stewardship behavior, people may stop taking the appropriate action when the incentive is removed.

More information on each of these tools can be found in Appendix A. For more information on community-based social marketing, go to www.cbsm.com.

Equally important for obtaining long-term results, formal and nonformal educators must seek to understand and identify barriers and constraints to stewardship behaviors and then design programs to minimize or eliminate them.

Sample constraints include:
- Not feeling able to engage in or perform the activity or behavior due to lack of knowledge, skill, and/or confidence.
- Not having social support—others with whom to engage in or carry out the activity or behavior, or having others who are discouraging them from taking part.
- Lack of time, money, or access to a site to perform the activity.

To create long-lasting outcomes, stewardship programs must be sustained over time. There must be follow-up support to help maintain change. Even when strong, short-term behavioral change occurs, long-term change still is highly doubtful without continued reinforcement. Learners need in-depth educational experiences over time.

Service-learning

Service-learning can be a good method for building a pathway to long-term stewardship behaviors and citizenship skills.

Service-learning is a teaching and learning strategy that integrates community service with instruction and reflection to enrich the learning experience, teach civic responsibility, and strengthen communities. Communities help identify real problems and needs. Students are involved in the selection, design, implementation and evaluation of a project to address the problem or need. Teachers integrate the project into learning objectives. Through a careful process of building awareness, knowledge and skills, critical thinking, active service and reflection, students learn problem-solving and citizenship skills.

For example, if school students collect trash out of an urban streambed, they are providing an important community service as volunteers. But if they first observe the condition of the stream bed, decide a clean up is necessary, collect the trash, test the stream's water quality, analyze what they found and possible sources of the litter, then share the results with local residents along with suggestions for reducing pollution, they are engaging in service-learning. They are providing an important service to the community AND, at the same time, learning about water quality and laboratory analysis, developing an understanding of pollution issues, learning to interpret science issues to the public, and practicing communications skills. They may also reflect on their personal and career interests in science, the environment, public policy or other related areas.

The students' and community's investment of time, energy and problem-solving builds a sense of ownership with the area and empowerment as part of the solution. Note how closely Service-learning closely follows the Stewardship model described on page 9.

Adapted from the National Service-learning Clearinghouse. For more information see www.servicelearning.org/index.php.

Structured and Data-Supported Curricula

It is important to provide learners a well thought-out sequence of opportunities to help them develop, build upon or practice, and eventually apply their awareness, knowledge, skills, and participation strategies. Utilize curricula that incorporate best practices and that will:

- Result in an in-depth knowledge of issues.
- Teach learners the skills of issue investigation and analysis as well as provide time to learn to apply these skills.
- Teach learners the citizenship skills needed for issue remediation and provide the time needed to learn to apply these skills.
- Provide an instructional setting that helps learners develop an internal locus of control.

The Association of Fish and Wildlife Agencies has identified a set of Core Concepts that support the North American Model of fish and wildlife management. The North American model is unique in the world in that fish and wildlife are public trust resources managed by governmental agencies. The public retains ownership and shared responsibility in the conservation of fish and wildlife resources. Stewardship of resources is a key objective for the North American Model.

Worksheet 8: Encourage

Long-term Stewardship Behavior

How does your program:

- Get the learner to commit to doing one or more target behaviors?

- Prompt participants to participate in the target behaviors?

- Help create community norms for stewardship behaviors?

- Actively communicate with target audiences?

- Provide incentives to encourage stewardship behaviors?

What barriers prevent your participants from adopting stewardship behaviors?

How does your program help participants overcome these barriers and constraints?

How might your program better address these constraints?

The Core Concepts outline basic wildlife, ecological and wildlife management concepts. The concepts follow the vision of the AFWA Conservation Education Strategy for an informed and involved citizenry that:

1. Understands the value of our fish and wildlife resources as a public trust;
2. Appreciates that conservation and management of terrestrial and water resources are essential to sustaining fish and wildlife, the outdoor landscape, and the quality of our lives;
3. Understands and actively participates in the stewardship and support of our natural resources;
4. Understands and accepts and/or lawfully participates in hunting, fishing, trapping, boating, wildlife watching, shooting sports, and other types of resource-related outdoor recreation; and
5. Understands and actively supports funding for fish and wildlife conservation.

The full set of Core Concepts may be found in the appendices of this planning guide and may be used as a framework for conservation education programs.

Stewardship-oriented curricula that are project-driven can be set up so learners are adequately prepared to take each step. They also can be set up so teachers can prepare learners and guide them through the entire process. These strategies take into consideration the learner's developmental level(s), readiness to learn, prior knowledge and experience, and aptitude. These opportunities should be challenging, but within the participants' reach.

The North American Association for Environmental Education (NAAEE) has developed a series of excellent resources to assist educators with selecting, evaluating, and implementing stewardship-related curricula and programs. These tools are part of the *National Project for Excellence in Environmental Education*. Appendix B contains a brief description of these tools. All of the tools are available on NAAEE's website at www.naaee.org/programs-and-initiatives/guidelines-for-excellence/
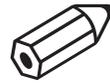
Worksheet 9: Structured and Data-supported Curricula

How do your curricula give learners appropriate sequences of activities that build on one another?

How can your programs address the AFWA Conservation Education Core Concepts?

How can your program incorporate NAAEE's Guidelines for Excellence to ensure your curricula are effective?

Evaluation

Best Practice: Effective programs evaluate all aspects to determine what is working and what is not.

Probably the most neglected component of all educational programs is evaluation. Far too often programs are based, not on research evidence supporting their effectiveness or on accepted education theory, but only on what another program or agency is doing. And most evaluation efforts rarely report more than simple program outputs such as the number of participants at an event, participant satisfaction, and cost of delivery. What do these simple outputs tell you about how well you are educating your audiences? If you are asked what kind of impact your program is having on the knowledge, attitudes or behaviors of your audience, how will you answer?

The rarity of formal evaluations of the short- and long-term impacts of education programs is somewhat puzzling, given what evaluation has to offer. *Programs that implement formal evaluation are successful* (or on their way to success), because the evaluation process shows what works and what doesn't. By building on what works and changing or removing what doesn't, you continually work toward and/or achieve your program goals and objectives.

Evaluation provides tangible evidence that your education efforts are based on sound educational theory

and are accomplishing agency/organizational goals and objectives.

Program evaluation is a complex endeavor that requires considerable attention to be done effectively. Evaluation should be considered during the program planning phase, not after program completion. RBFF *Workbook* Chapter 4 provides a good primer on basic program evaluation. RBFF also developed a stand-alone companion piece to the *Workbook* that covers program evaluation in detail. The Best Practices Evaluation Companion is available at www.rbff.org.

> For more information on program evaluation of all kinds, including tools, resources, publications, and experts, visit the American Evaluation Association website at: www.eval.org

Case Studies

Appendix D offers a set of case studies on efforts that encourage stewardship. Check the AFWA web site for future additional case studies and updates.

Bibliography

Fedler, A.J. (ed.) 2001. Defining Best Practices in Boating, Fishing, and Stewardship Education. Recreational Boating and Fishing Foundation. Alexandria, VA. 182pp.

Hocket, K.S., J.A. McClafferty and S.L. Mullin. 2005. The making of a resource steward: Defining the relationship between aquatic recreation and aquatic stewardship. Recreational Boating and Fishing Foundation. Alexandria, VA.

Hungerford, H.R. and T.L. Volk (1990). "Changing Learner Behavior through Environmental Education." *Journal of Environmental Education* 21(3): 8-21.

Kidder, R.M. 1995. *How Good People Make Tough Choices.* Institute for Global Ethics.

McKenzie-Mohr, D. and W. Smith. 1999. Fostering sustainable behavior: An introduction to community-based social marketing. Gabriola Island, B.C: New Society.

North American Association for Environmental Education. National Project for Excellence in Environmental Education. www.naaee.org/programs-and-initiatives/guidelines-for-excellence/

O'Malley, M.F. 1999. Washington Department of Fish and Wildlife Education Plan. Washington Department of Fish and Wildlife, Olympia. 63pp.

Seng, P.T. and S.R. Rushton (eds). 2003. Best Practices Workbook for Boating, Fishing, and Aquatic Resources Stewardship Education. Recreational Boating and Fishing Foundation. Alexandria, VA.

Sobel, D. 2004. Place-Based Education, Connecting Classrooms and Communities, Orion Nature Literacy Series Number 4, 2004.

Appendices

Appendix A. Information on Community-Based Social Marketing

The following is excerpted from *Quick Reference: Community-Based Social Marketing*, by Doug McKenzie-Mohr, Ph.D. Additional information is available at www.cbsm.com.

Tools of Behavior Change

Community-based social marketing draws upon research in the social sciences, and particularly psychology, which has identified a variety of effective "tools" for promoting behavior change. These tools are often most effective when used in combination with one another.

Commitment

In a wide variety of settings people who have initially agreed to a small request, such as to wear a button saying they support the purchase of products with recycled-content, have subsequently been found to be far more likely to agree to a larger request, such as actually purchasing these products.

Why does seeking commitment to an initial small request work? There are likely two reasons. First, when people go along with an initial request, it often alters the way they perceive themselves. That is, they come to see themselves, for example, as the type of person who believes it is important to purchase products that have recycled content. Second, we have a strong desire to be seen as consistent by others. Indeed, our society emphasizes consistency and people who are inconsistent are often viewed negatively. As a result, if we agree to wear a button supporting the purchase of products with recycled content, it would be inconsistent not to purchase these products when we shop.

Commitment as a behavior change tool has been utilized in a variety of studies with often dramatic results (see Chapter 3 of the online guide at www.cbsm.com). In considering using commitment, follow these guidelines:

Emphasize written over verbal commitments. Written commitments have been found to be more effective in bringing about long-term change.

Ask for public commitments. When commitments are made public, such as by having names advertised in a newspaper, behavior change is more likely.

Seek commitments in groups. If possible, seek commitments from groups of people that are highly cohesive, such as a church group. The close ties of these individuals, coupled with the importance of being consistent, make it more likely that people will follow through with their commitment.

Actively involve the person. When people are actively involved, such as being asked to peer into an attic or hold a container to measure the flow-rate of a shower, they are more likely to see themselves as committed to the activity.

Use existing points of contact to obtain commitments. Wherever natural contact occurs, look for opportunities to seek a commitment. For example, when people purchase paint ask them to sign a commitment that they will dispose of any left-over paint properly, or, better yet, take it to a paint exchange if one exists.

Help people to view themselves as environmentally concerned. Help people to see themselves as environmentally concerned, and therefore more committed to other sustainable activities, by commenting on their past actions. For example, when someone comes to pick up a composter, ask them if they recycle. If they do, note that their recycling is evidence of their concern for the environment and that beginning composting is a natural way to reduce waste even more.

Don't use coercion. In order for this behavior change tool to be effective, the commitment has to be freely volunteered. That is, only ask for commitments when people appear to be interested.

See the cases studies and graphics at www.cbsm.com for examples of how to use commitment.

Prompts

Numerous behaviors that support sustainability are susceptible to the most human of traits: forgetfulness. People have to *remember* to turn off lights, check the air pressure in car tires, turn down the thermostat, select items that have recycled-content, etc. Fortunately, prompts can be very effective in reminding us to perform these activities (see Chapter 4 of the online guide at www.cbsm.com). Prompts are visual or auditory aids that remind us to carry out an activity that we might otherwise forget. Follow these guidelines when using prompts:

Make the prompt noticeable. In order for a prompt to be effective it has to first be noticed. Make sure that your prompt is vivid (a bright color) and eye-catching.

Make the prompt self-explanatory. All the information that is needed for someone to take the appropriate action should be conveyed in the prompt. For example, if you were using a prompt to increase the likelihood that people with odd-numbered street addresses would only water their lawns on odd-numbered calendar days (and vice versa), the prompt that you attach to an outside faucet could read: "water your lawn only on odd numbered calendar days."

Present the prompt in as close proximity as is possible to where the action is to be taken. If you want to encourage people to turn off lights upon leaving a room, for example, affix the prompt beside or directly on the light switch plate.

Use prompts to encourage people to engage in positive behaviors. Wherever possible, encourage positive behaviors. If you want people to purchase environmentally friendly products when shopping, place prompts throughout a store that bring attention to those items, rather than bringing attention to items that should be avoided. Not only is the encouragement of positive behaviors more likely to be supported by retail outlets (few would post negative prompts), but positive behaviors also make people feel good about their actions, which increases the likelihood that the actions will be carried out in the future.

See the cases studies and graphics at www.cbsm.com for examples of how to use prompts.

Norms

To date, few programs have emphasized the development of community norms that support people engaging in sustainable behavior. This lack of attention to norms is unfortunate, given the impact they can have upon behavior (see Chapter 5 of the online guide at www.cbsm.com). Norms guide how we should behave. If we observe others acting unsustainably, such as using water inefficiently, we are more likely to act similarly. In contrast, if we observe members of our community acting in a sustainable fashion we are more likely to do the same.

When considering including norms in programs you develop, keep the following guidelines in mind:
Make the Norm Visible. For norms to influence the behavior of others, they have to be aware of the norm. The very act of taking recyclables to the curbside, for example, communicates a community norm about the importance of recycling. Most sustainable activities, however, do not have the community visibility that recycling has, and norms that support the activity, therefore, have to be promoted more actively. Find ways to publicize involvement in sustainable activities, such as providing ongoing community feedback on the amount of water that has been saved by homes using water efficiently.

Use Personal Contact to Reinforce Norms. Research suggests that internalization of norms is more likely to occur as a result of personal contact. As a consequence, use personal contact as an opportunity to reinforce norms that support sustainable behavior.

See the cases studies and graphics at www.cbsm.com for examples of how to use norms.

Communication

All programs to foster sustainable behavior include a communication component. The impact of communications upon behavior can vary dramatically based upon how the communication is developed (see Chapter 6 of the

online guide at www.cbsm.com). You must know your audience and have clearly defined goals for your communications. To develop effective communications, include the following elements:

Use Captivating Information. All persuasion depends upon capturing attention. Without attention, persuasion is impossible. Communications can be made more effective by ensuring that they are vivid, personal and concrete.

Know your Audience. All communications should be developed with your audience in mind. Before developing communications, you should have a firm sense of the attitudes, beliefs and behavior of your intended audience(s).

Use a Credible Source. The individual or organization that presents your message can have a dramatic impact upon how it is received, as well as upon subsequent behavior. Ensure that whoever delivers your message is seen as credible. Individuals or organizations tend to be viewed as credible when they have expertise, or are seen as trustworthy.

Frame your Message. How you present or "frame" your activity can impact upon the likelihood that people will engage in it. In general, you should emphasize the losses that occur as a result of inaction (e.g., from not insulating) rather than the savings that occur from action (e.g. insulating).

Carefully Consider Threatening Messages. While environmental issues lend themselves easily to the use of threatening or fearful messages, do so with caution. While the public needs to understand the implications of such serious issues as global warming, toxic waste, or ozone depletion, they also need to be told what positive action they can take if threatening information is to be useful. In short, whenever you contemplate using a threatening message consider whether you can at the same time present concrete actions that individuals can take to reduce the threat.

Decide on a One-Sided versus Two-Sided Message. One-sided communications are usually more persuasive with audiences who have little or no comprehension of an issue. As knowledge increases, however, two-sided messages are generally more persuasive.

Make Your Message Easy to Remember. All sustainable activities depend upon memory. People have to remember *what* to do, *when* to do it, and *how* to do it. Use prompts (Chapter 4) to assist people in remembering. Also develop messages that are clear and specific.

Provide Personal or Community Goals. Providing targets for a household or community to achieve can help to provide motivation for sustainable behavior.

Emphasize Personal Contact. Research on persuasion documents indicates that the major influence upon our attitudes and behavior is the people we interact with rather than the media. Create opportunities for people to talk to one another through programs such as block leaders, in which individuals from a neighborhood who already have experience in a sustainable activity, such as composting, speak to others who live close by. Through personal contact, provide opportunities for people to model sustainable behavior for one another, such as installing weather-stripping, and facilitate ongoing discussions in your community to allow social diffusion of new behaviors to occur.

Provide Feedback. Remember to provide members of your community with feedback about the effectiveness of their actions. Feedback has been found to have a positive impact upon the adoption and maintenance of sustainable behaviors.

See the cases studies and graphics at www.cbsm.com for examples of how to effectively communicate.

Incentives

Incentives have been shown to have a substantial impact on a variety of sustainable activities including waste reduction, energy efficiency and transportation (see Chapter 7 of the online guide at www.cbsm.com). They are particularly useful when motivation to engage in action is low or people are not doing the activity as effectively as they could. Gardner and Stern (1996) suggest the following guidelines in using incentives:

Closely Pair the Incentive and the Behavior. The closer in time the incentive is presented to the behavior it is meant to affect, the more likely that it will be effective.

Use Incentives to Reward Positive Behavior. Where possible, use incentives to reward people for taking positive actions, such as returning beverage containers, rather than fining them for engaging in negative actions, such as littering.

Make the Incentive Visible. For incentives to be effective, you need to draw people's attention to them. Consider using vivid techniques to make incentives noticeable (see Chapter 6 of the online guide at www.cbsm.com). Also, incentives can be made more visible by closely associating them with the behavior they are meant to effect, such as having people attach tags to their garbage bags in order to have them picked up in a user pay garbage disposal program.

Be Cautious about Removing Incentives. Incentives can be powerful levers to motivate behavior, but they can also undermine internal motivations that people have for engaging in an activity. If you plan to use an incentive to encourage a sustainable behavior, remember that if you elect to remove the incentive at a later time the level of motivation that existed prior to the introduction of the incentive may no longer exist.

Prepare for People's Attempts to Avoid the Incentive. Incentives such as separate laneways for multiple occupant vehicles can have a significant impact upon behavior. However, because these incentives powerfully reward one behavior (car pooling) and strongly punish another (single occupant driving), there is strong motivation to try to "beat" the incentive. In preparing incentives, give careful consideration to how people may try to avoid the incentive and plan accordingly.

Carefully Consider the Size of the Incentive. In arriving at what size of incentive to use, study the experience of other communities in applying incentives to motivate the same behavior.

Use Non-Monetary Incentives. While most incentives are monetary, non-monetary incentives, such as social approval, can also exert a strong influence upon behavior. Consider ways that social approval and other non-monetary incentives can be integrated into your program.

See the cases studies and graphics at www.cbsm.com for examples of how to use incentives.

Appendix B. National Project for Excellence in Environmental Education

The North American Association for Environmental Education (NAAEE) initiated the *National Project for Excellence in Environmental Education* in 1993. As part of this project, NAAEE has developed a series of Guidelines that set the standards for high-quality environmental education. Each of these resources was developed by a diverse team of professionals, and each has gone through a substantive review by thousands of professionals prior to publication.

Quality environmental education programs help develop an environmentally literate citizenry that can compete in our global economy. These citizens then have the skills, knowledge, and inclinations to make well-informed choices. They then will exercise their rights and responsibilities as members of a community.

The National Project for Excellence in Environmental Education resources include:
1. *Environmental Education Materials: Guidelines for Excellence*, recommendations for developing and selecting environmental education materials, and companion publication, *Environmental Education Materials: Guidelines for Excellence - The Workbook,* which leads educators, step by step, through the process of using the *Guidelines for Excellence*.

2. *Environmental Education Collection - A Review of Resources for Educators:* A four-volume series of guides to quality environmental education materials:

3. Environmental education learner guidelines: *Excellence in EE - Guidelines for Learning (Pre K-12),* and its companion piece, the *Guidelines for Learning (Pre K-12) - Executive Summary & Self Assessment Tool*, developed to support state and local environmental education efforts by setting expectations for performance and achievement in grades 4, 8, and 12.

4. *Guidelines for the Preparation and Professional Development of Environmental Educators*, a set of recommendations for the preparation and continuing education of teachers and other environmental educators.

5. *Nonformal Environmental Education Programs: Guidelines for Excellence*, a set of recommendations for the design and implementation of comprehensive nonformal environmental education programs.

6. The Guidelines Trainers' Bureau is a list of environmental educators who are able to give presentations to a variety of audiences on the *Guidelines* and how they can be used.

7. Adopt the Guidelines is an initiative to encourage organizations and agencies to promote and use the *Guidelines*.

For more information on the *National Project for Excellence in Environmental Education*, or to download and/or order these resources, go to:

www.naaee.org/programs-and-initiatives/guidelines-for-excellence/

Appendix C. Association of Fish and Wildlife Agencies Core Concepts

These Core Concepts reflect the knowledge, actions and values that further the North American Model and were developed as part of the Conservation Education Strategy.

Conservation Education Strategy Mission

To unify and strengthen conservation education efforts of the Association of Fish and Wildlife Agencies (AFWA) member agencies and partners in a manner that effectively advances the AFWA Strategic Plan and the North American Model of Fish and Wildlife Conservation.

Conservation Education Strategy Vision

Conservation Education becomes an effective, dynamic means for the Association of Fish and Wildlife Agencies (AFWA), its members and partners to achieve the AFWA Strategic Plan through an informed and involved citizenry that:

I.   Understands the value of our fish and wildlife resources as a public trust.

II.   Appreciates that conservation and management of terrestrial and water resources are essential to sustaining fish and wildlife, the outdoor landscape, and the quality of our lives.

III. Understands and actively participates in the stewardship and support of our natural resources.

IV.   Understands and accepts and/or lawfully participates in hunting, fishing, trapping, boating, wildlife watching, shooting sports, and other types of resource-related outdoor recreation.

V.   Understands and actively supports funding for fish and wildlife conservation.

Core Concepts for Conservation Education

Please Note: Order does not indicate relative importance.

I.   Understands the value of our fish and wildlife resources as a public trust.

     A. In North America fish and wildlife are public trust resources managed by governmental agencies.

       1.   Ownership of land does not convey ownership of wildlife.

       2.   Primary responsibility for most fish and wildlife management programs in North America is delegated to governmental agencies.

          a.   State, provincial, and tribal fish and wildlife agencies are responsible for managing most fish and wildlife on public and private lands and water within their geographic jurisdictions.

             i.   In Mexico, only the six northern border states have been given authority over resident wildlife. In other parts of Mexico, the federal government maintains jurisdiction over resident wildlife and all inland fisheries.

          b.   Federal agencies, in cooperation with state and tribal agencies, are responsible for managing migratory fish and wildlife and federally listed threatened and endangered species, and for regulating wildlife trade. (In Canada, federal provincial and territorial agencies share responsibility for federally-listed endangered species.)

       3.   Non government organizations, businesses, and individuals play important roles as advocates and conservation partners with fish and wildlife agencies.

4.   Since most wildlife live on private lands, private landowners play an important role in sustaining and improving habitat.

5.   Many species move across state, provincial, and national boundaries, requiring interstate and international agreements and partnerships to manage these species.

B. Sustainable natural resources depend on the support of an informed and responsible citizenry.

C. Regulations are necessary for natural resources conservation.

1. The adoption and enforcement of regulations help conserve fish and wildlife resources.

2. Regulations allow for sustainable human use of fish and wildlife resources.

3. Regulations combat illegal trafficking and exploitation of fish and wildlife resources.

II. Appreciates that conservation and management of terrestrial and water resources are essential to sustaining fish and wildlife, the outdoor landscape, and the quality of our lives.

A. The health and well-being of fish, wildlife, and humans depend on the quality of their environment.

1.   All living things depend on habitat that includes adequate and suitably arranged food, water, shelter, and space.

   a.   Fish and wildlife numbers and species compositions are constantly changing based on a variety of natural and human-caused conditions.

   b.   Loss and degradation of habitat are the greatest problems facing fish and wildlife; therefore, enhancing and protecting habitat is critical to managing and conserving them.

      i.   Human changes to the landscape alter fish and wildlife habitat, changing the amount and type available.

      ii.   Natural events alter the landscape, changing the amount and type of fish and wildlife habitats available. The effects of these events can be exacerbated by human changes to the landscape.

      iii.   Fragmentation of habitats alters fish and wildlife distribution, movement, and composition.

2.   The carrying capacity of an area determines the size of the population that can exist or will be tolerated there.

   a.   Biological carrying capacity is an equilibrium between the availability of habitat and the number of animals of a given species the habitat can support over time.

   b.   Cultural carrying capacity is the number and type of a given species that people will tolerate over time.

   c.   Carrying capacity is dynamic and can change from season to season and from year to year.

   d.   Regulated hunting, fishing, and trapping are important tools for preventing populations of certain species from exceeding the carrying capacity of their habitat.

3.   Living things tend to reproduce in numbers greater than their habitat can support. The populations are limited by factors such as quantity and quality of food, water, shelter, and space. Other limiting factors may include disease, predation, and climatic conditions.

a. When a population becomes too large it may damage or destroy its habitat as well as habitat for many other species.

b. When a population exceeds the carrying capacity for an area, individuals of that population must out-compete others, emigrate, or die.

4. Fish and wildlife are present in nearly all areas of the earth. Each ecosystem has characteristic species.

   a. Climate, topography, and habitats influence species diversity.

   b. All living things are connected to each other and their environment.

      i. Plants and animals in ecological systems live in a web of interdependence in which each species contributes to the function of the overall system.

      ii. Energy from the sun is captured by plants and enters the animal world primarilythrough animals that eat plants.

      iii. Interactions between different fish and wildlife populations include competition, predation, and symbiosis.

   c. Each species occupies a niche within its environment.

5. Ecological succession is a process involving continuous replacement of one community by another.

   a. As succession occurs fish and wildlife found in that community will change.

   b. Natural events and human activities affect the rate and direction of succession.

6. Species differ in their ability to adapt.

   a. Fish and wildlife are adapted to their environment in ways that enable them to compete and survive.

   b. The more adaptable a species is, the more likely it is to thrive.

   c. Most species that are endangered or threatened in North America became so as a result of natural or human-caused changes in their habitat and their inability to adapt or adjust to such changes.

7. Conserving biodiversity is important.

   a. Isolated ecosystems and populations are more vulnerable to environmental change than well connected ecosystems.

   b. Native species are important to the stability of an ecosystem.

   c. Exotic/non-native species introduced into a community can change the dynamics of that community.

   d. Reintroduction of fish or wildlife into its former range may be possible if conditions such as suitable habitat and social acceptance exist.

8. Many species are indicators of environmental health.

B. Fish and wildlife can be conserved and restored through science based management which considers the needs of humans as well as those of fish and wildlife.

1. Fish and wildlife management practices are based on natural, physical, and social sciences.

2. Wildlife management practices involve population and habitat inventory and monitoring, research, manipulation of populations, protection and manipulation of habitat, regulation, and education.

   a. Wildlife populations are managed through such practices as regulated hunting, fishing and trapping; artificial propagation; stocking; and transplanting as well as predator and damage control.

   b. Enhancing and protecting healthy habitat are critical to managing and conserving fish and wildlife.

   c. Management of one species may affect other species within the same ecosystem.

3. Fish and wildlife management decisions consider biological, economic, social, and political factors.

4. Conservation of fish and wildlife habitats provides human health, recreation, aesthetic, and economic benefits.

III. Understands and actively participates in the stewardship and support of our natural resources.

A. A person's culture affects his or her view and use of fish and wildlife and their habitats.

1. People use fish and wildlife resources for food, shelter, clothing, and other products; practices that have continued throughout history.

2. Fish and wildlife provide a recreational focus for millions of people in North America.

B. The distribution and abundance of fish and wildlife provide significant economic benefits.

C. Everyone impacts fish and wildlife and their habitats and as human populations grow, impacts on natural resources increase.

1. Conversion of fish and wildlife habitat for human uses has altered the amount of land and water available for fish, wildlife, and associated recreation.

2. Humans are agents in the spread of invasive species and fish and wildlife diseases; and therefore, must take steps to avoid associated problems

D. Unlike other organisms, only humans have the capacity and responsibility to consider the effects of their actions on their environment.

1. People make decisions collectively and individually each day that directly and indirectly impact fish and wildlife and their habitats.

2. Decisions people make relative to fish and wildlife are based on their values, as well as knowledge of and experiences with those resources.
3.

IV. Understands and accepts and/or lawfully participates in hunting, fishing, trapping, boating, wildlife watching, shooting sports, and other types of resource-related outdoor recreation.

A. Regulated hunting, fishing, and trapping are important tools for managing some wildlife populations and habitats.

B. Fish and wildlife-based resources provide recreational benefits directly to participants and increase advocacy for conservation.

C. Responsible users of fish, wildlife, and the outdoors respect the rights and property of others.

V. Understands and actively supports funding for fish and wildlife conservation.

    A. Within the U.S., state fish and wildlife management is funded primarily through hunting, fishing and trapping licenses and through federal excise taxes collected from the sale of hunting, target shooting, and fishing equipment and motor boat fuels.

        1. Wildlife Restoration - Federal Aid in Wildlife Restoration (Pittman-Robertson Act [1937]) provides funding in the U.S. for the protection, restoration, rehabilitation and improvement of wildlife habitat, wildlife management research, hunter education, and the distribution of information produced by the projects.

        2. Sport Fish Restoration - Federal Aid in Sport Fish Restoration (Dingell-Johnson [1950] and Wallop-Breaux amendment [1984]) is a parallel program to Pittman Robertson for management, conservation, restoration of fishery resources, access and boating and aquatic resource education.

    B. Wildlife-based activities, such as hunting, fishing, viewing, and photography provide people with millions of days of outdoor recreation each year and generate billions of dollars for the economy.

    C. The future of fish and wildlife conservation requires additional funding from a broad-based constituency.

Appendix D. Case Studies

Case Study: Connecting Classrooms and Communities

Great Brook Middle School in Antrim, New Hampshire has focused on using its school grounds and community as a place for learning for over 15 years. Antrim is a small, history-rich community nestled in a typical New Hampshire landscape with forested hills, wetlands, rivers and a few open fields. The support of two committed teachers and administrators, Antioch University New England and the Harris Center for Conservation Education have helped turn the entire school into a model for place-based education and as a launching pad for students to become good stewards and citizens.

Great Brook fifth grade teachers Ann Kenney and Barbara Black recognized that using the local environment as a teaching tool held lots of promise for enriching the curriculum and motivating students. With support from Harris Center staff, Kenney and Black developed the Wetlands project to take advantage of the namesake Great Brook which runs behind the middle school. Over the course of three years, students, teachers and community artists-in-residence designed and built a boardwalk and elegant gateway, and they wrote and produced a theater piece. A comprehensive fifth grade water-studies curriculum emerged. Once the students understood how to use pH monitors and test the water of the marshland behind the school, they were able to expand outward to other places in the watershed.

"We wanted the students to look at a stream environment that was different from the marsh behind the school," recalls Kenney. "No Name Brook (a small stream in nearby McCabe Forest) is steep and rocky and we thought the water quality and macro-invertebrates might be different, so we started making regular field trips to McCabe to expand our water studies curriculum."

Indeed, water testing in No Name Brook helped the students understand that even after you've seen one stream, you certainly haven't seen them all. This was just the beginning of using the community and local places to enliven the curriculum. The work at Antrim spurred the development of a program developed at Antioch University New England to provide additional opportunities to the school and community through the CO-SEED (Community-based School Environmental Education) project.

Through community forums and other connections, Great Brook continues to be involved in not only providing learning opportunities for students but also in providing projects that benefit the entire community. Projects have included developing entranceway gardens to the Hancock town offices, the creation of an historical walking guide to the center of Antrim as well as interpretive trails in McCabe Forest. The community curriculum connections at Great Brook have been going on for a substantial amount of time. Consequently, the students involved in the early years of the model have now become active and contributing members of their community.

Adapted from Place-Based Education, Connecting Classrooms and Communities, David Sobel, Orion Nature Literacy Series Number 4, 2004.

Case Study: Project CAT

Traditionally, field biologists at the Department of Fish and Wildlife have used telemetry procedures to locate cougars. A directional antenna, mounted on a fixed wing aircraft, picks up signals from a radio collar on a cougar. The technique does not pinpoint the location of the animal, but rather identifies a general location that is accurate to within a 250-meter radius of the actual animal. Flights are done every two weeks.

Cle Elum Senior High School students have been involved for several years with tracking cougar locations in western Kittitas County, using a different technique. Cougar radio collars have been outfitted with a global positioning system (GPS) unit, which provides 600 precise locations of each animal per year. Students participate in capturing the cougars by assisting the research biologist from the state Department of Fish and Wildlife. Students also assist with marking the cougars with an ear tag, and with radio collaring them. Students collect physical data including length, neck girth, chest girth, length and condition of canine teeth, and weight, and they collect blood and tissue samples for disease analysis and DNA profiling, respectively.

Students are also involved with radio-tracking animals from the airplane and from the ground. They plot coordinates of cougar locations on computer-generated maps of the study area, and use computer programs to calculate the space each individual occupies during each season and annually. They compare estimates of a cougar's use of space calculated from locations obtained during bi-weekly telemetry flights to those estimates from GPS data collected from data remotely downloaded from collars. They present these findings to classmates and at professional conferences.

The location information allows scientists to study the home range of the animal throughout the year.

Case Study: The Short-horned Lizard Studies

Descriptive Studies
Students at Waterville Elementary School in Washington State and local area farmers have worked together since 1999 to examine several aspects of short-horned lizard biology. With guidance from Karen Dvornich, the National Director for NatureMapping at the University of Washington, and Diane Petersen, a teacher at the elementary school, second graders have recorded and graphed food preferences for the local lizards, their habitat niches, and body characteristics such as length, weight, and color. Fourth graders at the school wanted to know what the short-horned lizard did over the winter; however a literature search and discussions with experts provided little data on hibernating lizards. The students then decided to build an enclosure in the schoolyard in an attempt to mimic conditions in the field. The students' work provided new descriptive insights into how the lizards behave during the change of seasons.

Comparative Studies
Some fourth-graders were interested in learning about home range and daily and seasonal movements of the lizards. Local area farmers brought information about lizard sightings to the students, and the students then identified and marked these locations on maps. While this is another type of descriptive inquiry, the students are currently planning a comparative study, based on this descriptive information. They are planning on fitting a number of lizards with radio collars and will collect data comparing the amount of movement they make during each of the four seasons.

Correlative Studies
Another study being planned at Waterville Elementary includes correlating lizard abundance with temperature and rainfall data, using tools such as geographic information systems (GIS) and spreadsheets. Once several years of data are collected, students will begin to make predictions about lizard abundance based on weather forecast information.

Case Study: Wetlands Estonoa Learning Center Project

St. Paul is a small southwest Virginia town of 1,000 nestled in a karst river valley having the Clinch River as its primary water source. The area's karst topography results from the dissolving and weathering of limestone mountains and has resulted in numerous caves and sinkholes.

In the spring of 1999, Appalachian ecology students were assigned a project. One student, Stevie Sabo, chose to do his project on a local, forgotten lake, Lake Estonoa. His project covered the lake's history, present condition, and his desire to see the lake returned to its former pristine state. The project piqued the interest of another student, Nikki Buffalow, in the fall of 1999. From her research, she discovered the "lake" was a wetland, and an existing law protected wetlands. With the hope of preserving Lake Estonoa, she began a quest to have the lake officially dubbed a wetland. She succeeded in this endeavor and began her mission to preserve the site. Because of her accomplishments, an interest began to grow and the entire Appalachian ecology and physics classes soon undertook the project. The students became known as Team Estonoa and the protection and conservation of Wetlands Estonoa became their mission. Semester after semester, it is with excitement, curiosity and high expectations that the team looks forward and ventures forth with the Wetlands Estonoa Learning Center Project. Team Estonoa members accept the responsibility for their project and realize this student directed project mandates hours of commitment from them as they participate in an innovative service-learning program. Seeing how enthusiastic and dedicated students are year after year, the Town of St. Paul is honored to be a partner in a project to preserve and protect the wetlands.

St. Paul High School is the smallest of Wise County's six high schools with 204 students, including grades 8-12. St. Paul High School is approximately in the center of the town. Wetlands Estonoa, our project's focus, is immediately adjacent to the school complex and acts as a buffer zone for the town's water source – the Clinch River. According to the Nature Conservancy, the Clinch River is the number one river for biodiversity in the United States. Although the Clinch has been recognized for its diversity, it is in dire need of protection.

During the past six years, Team Estonoa has built partnerships, pursued grant opportunities, performed hours of public outreach and maintained the outdoor classroom. To date, the team has removed many truckloads of trash and brush from Wetlands Estonoa, constructed a crusher run walk path, built and installed bridges, picnic tables, a floating dock, benches, and has constructed a beautiful learning center building. The building's stunning log exterior is complemented by the native stone on the basement and highlighted by the green metal roof. Inside, the walls are a textured bleached Spanish lace, and the hardwood floors match the kitchen cabinets.

Over the past six years, Team Estonoa students have amassed over 4,000 hours outside school time. Activities range from maintaining the center to presenting their project at the White House. Team members present to groups, host visitors, mop floors, mow and trim and have landscaped the grounds around the center. This area serves as a learning lab for area schools and citizens. The lab contains native Appalachian flora, interpretive signs, an observation area with a seating area and a rain garden. The rain garden controls storm water and serves as a teaching tool, which illustrates its value as a low impact method of storm water management. Throughout the past six years, the team has conducted wetlands workshops for area teachers and students, presented for/hosted college groups, conducted a two-week long environmental institutes. A few of the projects recognitions include being selected as a VA Naturally School (2000-2006), receiving the 2003 SeaWorld Environmental Excellence Award, and the 2004 EPA Presidential Environmental Youth Award. To date, the team has presented to/hosted over 200 groups, looks forward to hosting many more, and is excited about working with local watershed groups for the improvement of our environment.

Some groups that visit Estonoa require overnight accommodations, but due to the lack of lodging in the area, a bunkhouse is desperately needed to house these visitors. In past years, Team Estonoa has invited guests to stay with members in their homes, but this custom has posed quite an inconvenience. The presence of a bunkhouse would

alleviate this problem and facilitate future weeklong environmental camps for students and educators.

Team Estonoa's dream is to revitalize the Lion's Den, a town-owned property located immediately adjacent to the wetlands that would be a convenient location for lodging.

Please visit our web site at – estonoa.org

Team Estonoa
St. Paul High School
P.O. Box 976
St. Paul, VA 24283

Lab Phone   276 762 0221
Home Phone   276 762 5059
e-mail tvencil@wise.k12.va.us

Case Study: What Do Horny Toads Have To Do With Education?

By Diane Petersen

When, after reading recent newspaper articles, my mother asked me "What do horny toads have to do with reading, writing and arithmetic?" I realized that many of you might have asked yourself the same question. In this article I will try to explain how horny toads, the Gates Foundation work, the state targets and testing, and Waterville elementary students all fit together.

We are in a very exciting time in education right now. In the Waterville School we have the honor, information and responsibility that come with dollars from the Gates grant. Gates' expectations include personalized work, using technology as a tool, and performance-based learning, among others. We also have, like all other schools in the nation, the job of making sure all students reach the state standards.

Our school has developed a mission statement that puts "personalization" at the center of our work. We know that different kids learn in different ways. When one of my students brought a mother horny toad and three babies to school on the first day and I saw the excitement of the other students and heard their questions and comments, I knew that this year the horny toad project could take on deeper meaning and integrate lots of subjects. This personal attachment of the students to the little critter would be the impetus for the first few weeks of our work together.

Science provides the structure for this project. We follow the steps of scientific inquiry as outlined in the state guidelines as we ask questions, set up research and report our results. Scientific inquiry begins with questions. Some of our questions can be answered by reading.

Before beginning our reading, each student predicted what they believed would be true about the lizard   Then we read the available information on short horned lizards using field guides. Students learned to decipher some really tough reading material. We literally read the field guides word by word and sentence by sentence, taking notes, making drawings, looking up new words, acting out predator/prey relationships and recording our findings on charts. Students understood in personalized ways, then, what the book said about the day and the year and the characteristics of the pygmy short-horned lizard. Now they could compare that to what they had predicted.

 Finally, the farmers brought in the real data and we will begin compiling that to compare it to what the field guide says. Past years have shown some discrepancies. Is it possible that 4th graders could add to the actual body of scientific knowledge about a common species? Indeed, groups of Waterville students have presented their findings to teachers and scientists in Idaho, Cle Elum and San Diego. Preparing for these presentations takes a great deal of organizing, writing and speaking practice.

In our elementary classes we have been teaching our students about the different purposes for writing. They are required to identify the writer's purpose for anything they read. To solidify this understanding of different purposes for writing, students were asked to write about horny toads in different ways: a description of a horny toad, an in-

formative article about the lizard, a list of steps to follow in catching a horny toad, a paragraph to persuade someone to capture a lizard, an explanation of why horny toads look like dirt clods (camouflage). The intensity of interest in this writing was fascinating!

Personal projects are used to show student learning. Some students made posters to show the yearly or daily activities of horny toads. Some used art to show their knowledge. One wrote a song and is putting it to music on a CD with the help of our music teacher.

Data analysis through graphing is one of the state targeted skills for our students. In the horny toad project, students plot each sighting on a computer map (we had to learn township, range and section to do this), then put all the associated information on a large spreadsheet. From the spreadsheet, students select data to answer a question they have and use the computer to help them make a graph of the information. They spend time scrutinizing each other's graphs for clarity and then write an analysis of the results before these are put on our website along with samples of the other work they have done. The Arcview program, seldom used in elementary schools, is a powerful tool that the students can continue to use in more sophisticated ways as they move through the grades. This year, for the first time, we were able to add aerial photos of the farmer's lands as an overlay to the maps. Several farmers worked with students to plot very exact horny toad sightings.

We are currently working on gathering information for two questions that no one seems to really know the answer to: What is the actual range of the horny toad? and Where do horny toads go in the winter? The tracking project you read about in the Empire Press article will help us answer those two questions. Funds from the South Douglas Conservation District have allowed us to purchase some transmitters to begin our tracking next spring and fall.

We are fortunate to be partners with farmers, parents, the conservation district, Karen Dvornich from the University of Washington Naturemapping program and Dan Hannifous, Arcview expert. It was through Karen's efforts that GLEF heard about our project and decided to film it. The filming day gave our students an opportunity to use their manners and social skills as we greeted farmers and filmers. They were filmed doing real science with real people who have real jobs in the real world and the students were working as partners. I was so proud of their professionalism and knowledge. Now they feel like stars and that is a powerful thing!

So, Mom, and anyone else who was wondering, I hope that gives you an idea of how students can learn from horny toads or anything else that really interests them and how they can do it in a variety of interesting ways.