

# ENHANCING UNDERSTANDING OF EFFECTS OF RIPARIAN BUFFERS ON AQUATIC ECOSYSTEMS THROUGH DEVELOPMENT OF ENVIRONMENTAL OUTREACH TOOLS

Catherine M. Pringle<sup>1</sup>, Ron Bjorkland<sup>2</sup> and Bruce Newton<sup>3</sup>

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*AUTHORS:* <sup>1</sup>Institute of Ecology and <sup>2</sup>Department of Geography, University of Georgia, Athens, Georgia 30602; and <sup>3</sup>Natural Resources Conservation Service, National Water and Climate Center, Portland, Oregon 97204.

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**Abstract:** Environmental outreach is an important element in the protection of riparian and aquatic environments. Scientists can play a key role in helping stakeholders understand the role of riparian zones in the ecology of both aquatic and terrestrial ecosystems. Toward this end we have developed several outreach and teaching tools which we discuss here. First, we developed a presentation on the function and value of riparian environments (80 slides and accompanying written materials) with emphasis on their importance to the health and biotic integrity of aquatic ecosystems. This 1-2 hour long presentation can be adapted for a wide variety of audiences (local communities, high school, and/or university-level). Distributed through the North American Benthological Society, these materials are being used by a variety of local state and federal agencies, conservation organizations, and academic institutions. Second, we spearheaded the development of a Stream Visual Assessment Protocol (SVAP) through the Natural Resources Conservation Service (NRCS). SVAP was designed for use by NRCS field staff (who work with agricultural landowners in a nonregulatory capacity) to serve as an introductory screening-level assessment method. Third, we developed a 2-day training course for NRCS field staff and partners. The course covers three main topics: (1) basic stream ecology; (2) how to use SVAP; and (3) how to conduct a simple biological assessment using benthic organisms. It is designed in modules to allow for use in a variety of different contexts and includes an instructor's manual, a student workbook, ~300 slides, a videotape, a macroinvertebrate training kit, and other materials. Finally, we are developing a field guide for NRCS on stream ecological assessment that is designed to help NRCS field staff with stream assessments and to help landowners understand the importance of healthy riparian zones.

## INTRODUCTION

There are many challenges and opportunities for scientists to not only provide useful science (Lubchenco 1998, NRC 1998), but to also develop educational tools that can be used to

guide citizens, managers and policy-makers in the decision making process (Pringle et al. 1993, Pringle 1997, Dewberry and Pringle 1994, Firth 1998). Education based on sound ecological principals is critical and scientists can contribute a valuable perspective: numerous opportunities exist for scientific involvement. For instance, despite the vast amount of scientific information on the ecological, economic and social values of riparian zones, most communities lack information, guidelines and policies for their protection and restoration. There are many reasons for the deterioration of riparian zones and the absence of appropriate management policies, including: (1) lack of financial and other incentives; (2) deeply rooted attitudes about property rights and individual decisions on land use activities; and (3) the momentum of historical patterns of land use. In order to offset this trend, scientists must effectively communicate to stakeholders the value of ecological services that riparian areas provide. This presentation will discuss some outreach tools that we have recently developed through partnerships with academic institutions, scientific societies and government agencies.

## Background:

There are many unanswered questions about the structure and function of riparian areas because of their complex nature. In the absence of data and certainty of ecological processes, some scientists may be uncomfortable making policy recommendations. However, research is sometimes applied to broad-scale environmental issues with inadequate knowledge or incomplete understanding. Public policies to encourage or require landscape management techniques such as riparian management will often need to proceed with best professional decisions based on incomplete understanding (Lowrance et al 1997). Scientific knowledge and professional judgement of the importance of riparian areas must be effectively communicated to stakeholders and policy makers. Lack of such communication may result in a continued deterioration of these areas, and by extension, aquatic ecosystems. History has demonstrated this point well. Almost 70 percent of the riparian environment in the U.S. has been severely degraded in the

three hundred years since the pre-colonial period. This loss and degradation has contributed to deteriorated water quality, habitat loss and fragmentation, and significant declines in species diversity. It has also resulted in large scale economic loss and social disruption such as the precipitous decline in some commercial and sports fish populations, increased severity of downstream flooding and increased sedimentation and other non-point source pollution in water bodies. In Arizona, for example, almost 95% of the streamside habitat has been degraded and 85% of the wildlife depends on what remains. More than 95% of the riparian forests in California's Sacramento Delta basin have been lost to agriculture. Moreover, riparian areas provide a disproportionately large number of services and values to the watershed despite the fact that they usually constitute less than 5% of the total watershed area. Some of these services include pollution control of surface and subsurface water, groundwater and aquifer recharge, reduction of downstream flooding and critical habitat for wildlife. They are also an important economic resource and provide cultural, aesthetic and social benefits. Clearly then, degradation of the riparian environments has broad scale effects on many areas of the community.

#### **Partnerships to Develop Environmental Outreach Tools:**

A number of professional and government agencies have been active recently in outreach educational efforts to protect and restore riparian zones. Here, we will provide examples of outreach efforts that represent, in part, a collaborative effort between members of a scientific society (the North American Benthological Society; NABS), a government organization (the Natural Resources Conservation Service; NRCS), and a university (the University of Georgia).

Through NABS and the University of Georgia, we developed a slide show and text (Bjorkland et al 1997) entitled, "Riparian Environments: Values, Threats, Management and Restoration". This material was developed primarily as an educational outreach tool for persons with little understanding of riparian environments. It was designed to facilitate the understanding and appreciation of the ecological, economic, and societal roles and values of riparian zones. It consists of 80 slides and an accompanying text which can be modified to meet specific needs of various target audiences, from public groups to university students at the graduate level. The slide images are grouped into five themes:

(1) definitions; (2) values; (3) threats; (4) instruments for protection; and (5) restoration.

The presentation identifies economic and social activities that have contributed to the decline and degradation of riparian environment. It also stresses that many economic and social benefits can still be realized if appropriate management practices are exercised, providing examples of successful management and restoration efforts. Each of the slides has

accompanying written material that provides relevant information, including source of the slide, location and date. A glossary and list of references is also provided.

To date, over 100 copies have been sold through NABS and profits from the sales are being used to support NABS-sponsored student awards for the best paper related to aquatic conservation. The slide show has been sold to many domestic and international entities, including governmental agencies, educational institutions and non-governmental groups. It can be purchased by contacting: Leonard Smock, NABS (lsmock@saturn.vcu.edu), Department of Biology, Virginia Commonwealth University, Richmond, VA 23284-2012.

The success of the riparian slide show as an outreach tool led to a partnership between the NABS, the Natural Resources Conservation Service (NRCS) and the University of Georgia. We recently developed a variety of outreach tools designed for use by NRCS field personnel who work closely with private stakeholders in a non-regulatory capacity. With a long and successful history of working with the private landowner and an extensive network of more than 2,500 field offices in the US, NRCS can make a significant impact on conservation practices through education. NRCS views the landscape as an integrated complex of many interacting systems and parts. The agency provides guidance to landowners on the best conservation measures for natural resources. In response to the need for technical support in the area of stream ecological assessment, an "Aquatic Assessment Workgroup" was formed which included staff of NRCS, three Institutes, several States, the Environmental Protection Agency (EPA), and the University of Georgia. This group outlined three needs which are described in more detail below: (1) a simple stream assessment protocol for field office use; (2) training materials to provide an introduction to stream ecology and an introduction to the stream assessment protocol; and (3) a field guide for stream ecological assessment.

The *Stream Visual Assessment Protocol* (SVAP) (NRCS, et al 1999) was developed for use by NRCS field staff for their work with landowners. The protocol is an introductory screening-level assessment method for people who are unfamiliar with stream assessments. While it is not intended to replace more robust protocols that provide useful analytical information, SVAP is an operational tool that yields reliable information and can be easily employed. Initial analysis of pilot testing show that it is an effective assessment tool and a good educational instrument that can be used when working with landowners. Based on a visual inspection of the physical and biotic characteristics of the in-stream and riparian environments, SVAP measures a maximum of 15 stream elements or parameters. A score is assigned to each element, relative to reference conditions, as well as a total cumulative score for the entire stream reach. A qualitative description of "excellent", "good", "fair" and "poor"

for the stream reach is given based on the numerical rating. SVAP is an assessment tool that will be used in the development of management plans when working with private landowners. In effect, SVAP is another instrument in the "toolbox" of NRCS personnel to make their work more efficient and to help the landowner understand the importance of riparian areas to maintain or improve stream health. The emphasis of SVAP is on the participation by the landowner in the assessment. By participating, he/she learn about how healthy streams function, signs of impairment, the effects of land use activities on the stream and adjacent landscape, the importance of the riparian areas in stream health and remedial measures that can be taken to address current problems.

SVAP is a composite of existing visually-based assessments, and as such it builds on material that has already been extensively field-tested for utility and ease of use. It has been extensively reviewed and tested in the field. Six drafts were developed and evaluated and field trials have involved 182 sites and over 70 NRCS employees. This protocol was distributed to all the field offices in early 1999. The adoption of this protocol by NRCS represents a standardization of an assessment methodology and the implementation of an educational tool to help landowners better understand the ecological characteristics and conditions of streams and riparian areas.

The second tool that we developed is a 1-2 day training course for NRCS personnel that provides an introduction to stream ecology, the new stream visual assessment protocol (SVAP), and an overview of other stream assessment approaches. The course, *Introduction to Stream Ecological Assessment* (Bjorkland et al 1998), was piloted in Arkansas and Georgia. While the primary function of the training is to give NRCS field staff (and others) the technical skills and conceptual background to use SVAP, the training material may also serve other roles. For example, it may also be used to provide a refresher or introductory course in freshwater ecology and stream assessment methods, or it may serve as a supplement to training in other related subjects. The objectives of the training material are to: (1) provide basic and background information on material related to stream assessments; (2) maintain consistent course structure and quality, nationally, while reflecting regional differences in freshwater ecosystems; (3) provide suggestions, options and strategies to effectively teach the course; and (4) aid instructors in course preparation.

The training material was designed for national use with the flexibility for adaptation to local conditions and needs. It consists of eight independent, but linked modules with a total training time of 8-10 hours. The training may be spread over two or more days. The modular format permits the use of all or some of the modules and the rearrangement of their sequencing, depending on needs. A variety of educational

activities and support material are used, including ~ 300 slides, field sampling and testing, a video, and macroinvertebrate training kit. The training was designed for an audience with mixed levels of knowledge about aquatic systems. Pilot testing has shown that training is most effective if it is given by two or more trainers to groups not larger than 20 -25. Trainers are encouraged to use examples of local stream and riparian conditions and local supporting material in order to make the training more relevant. For example, trainer(s) are encouraged to become familiar with reference stream sites in the region and to incorporate slides and descriptions of them in the training section on "stream classification and reference sites". Local examples of stream restoration projects or conditions which impact stream health (such as clear-cut logging operations in a riparian zone or a point source pollution discharge) can also be used. The training material was released to each of the 50 state offices in December 1998. For more information about SVAP and/or the training course, contact: Bruce Newton ([Bnewton@storm.wcc.nrcs.usda.gov](mailto:Bnewton@storm.wcc.nrcs.usda.gov)) Natural Resources Conservation Service, National Water and Climate Center, 101 S. W. Main Street, Suite 1600, Portland, Oregon 97204.

The third educational product that we are currently developing is the Field Guide to Stream Assessments. The purpose of the Field Guide is to provide guidance to NRCS on how to use a wide range of stream assessment tools in situations where detailed and robust information and data are required. It is a broad-based guide on how to conduct many different types of assessments and how to use this diagnostic information to evaluate stream conditions and identify sources of ecological stress. This Field Guide will provide guidance in conducting assessments of fish and macroinvertebrate communities, riparian vegetation, and the physical habitat of a stream reach. It will provide the user with a general background in stream ecology and associated topics (e.g., stream classification and reference sites, general characteristics of stream health, and symptoms of impaired conditions). Because it covers a wide range of topics and is intended to be a guide (rather than a complete manual on the "how to" scale), some of the material is cross-referenced to outside sources and not presented in the Guide. One of the highlights is the decision-tree format. This structure aids the user by quickly identifying the appropriate actions to follow. This eleven-chapter Field Guide is designed to be more than a single protocol or suite of assessment measures; it will lead the user through an exercise identifying the best methods to assess a stream reach based on needs and current availability of information. In short, it is a road map on how to successfully assess stream health. The anticipated completion date of this Guide is fall 1999 when it will be distributed to the State offices for use by NRCS personnel.

In conclusion, the conservation of riparian areas depends

on effective communication of ecological information to a diversity of stakeholders. This paper briefly summarizes four outreach tools which we hope will be useful in guiding our leaders and citizens in making wise and ecologically sound decisions. The genesis of these environmental outreach tools is an example of an effective partnership between the scientific community, governmental agencies and other institutions for the common goal of resource protection and ecologically-based management. Our experience in developing these outreach tools supports Firth's (1998) contention that effective integration of science, education and decision making depends on flexibility and a high level of communication between decision makers and professionals providing information.

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