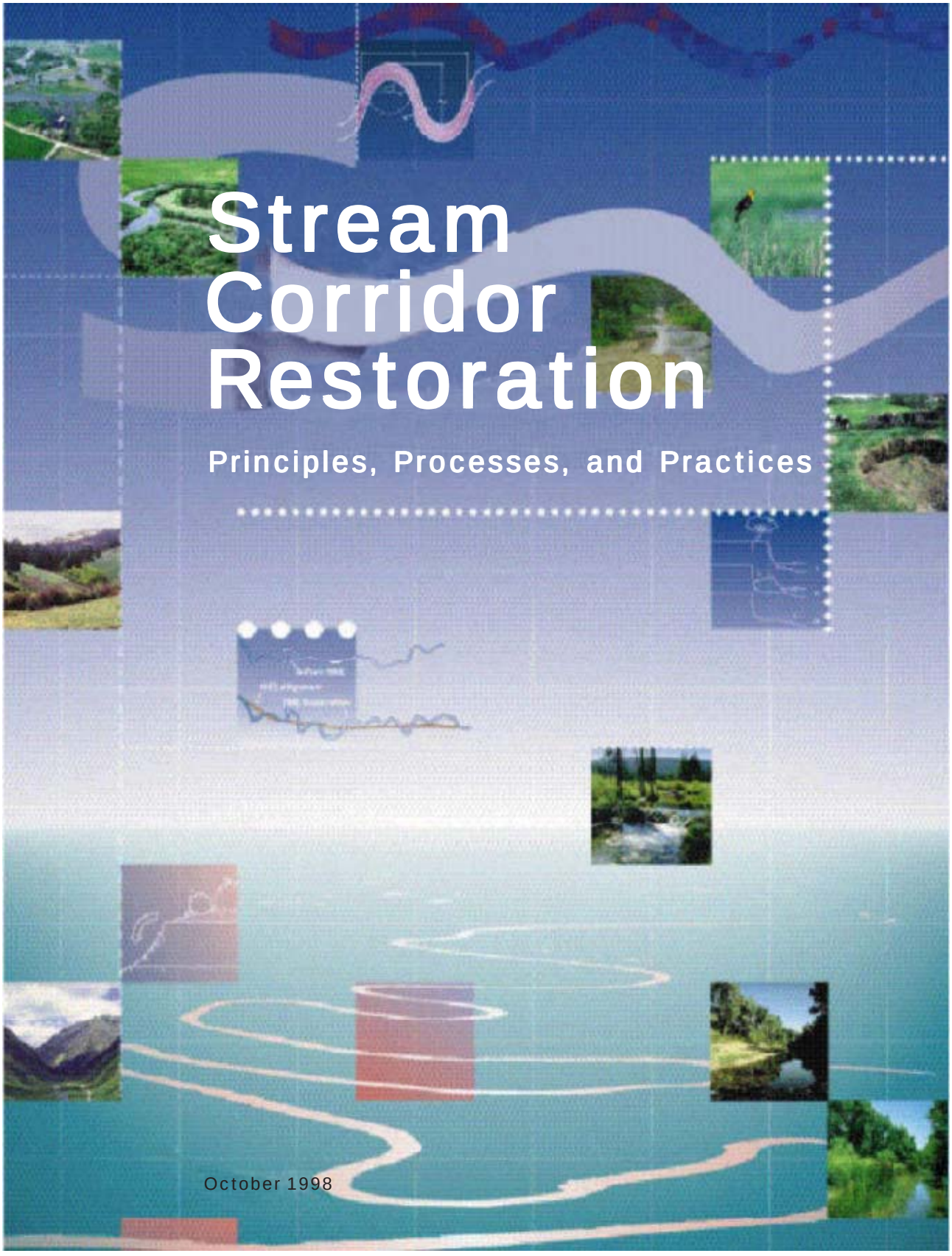

Stream Corridor Restoration

Principles, Processes, and Practices

October 1998

STREAM CORRIDOR RESTORATION

Principles, Processes and Practices

by the Federal Interagency Stream Corridor Restoration Working Group

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This document was produced by the collective experience, skills, and techonology of 15 Federal agencies of the United States government. It is a benchmark document that is being used by these agencies, as well as many others who are interested in restoring the functions and values of the nation's stream corridors.

Agencies Contributing to This Document:

United States Department of Agriculture:
- *– Agricultural Research Service*
- *– Cooperative State Research, Education, and Extension Service*
- *– Forest Service*
- *– Natural Resources Conservation Service*

United States Department of Commerce:
- *– National Oceanic and Atmospheric Administration*
- *– National Marine Fisheries Service*

United States Department of Defense:
- *– Army Corps of Engineers*

United States Department of Housing and Urban Development

United States Department of the Interior:
- *– Bureau of Land Management*
- *– Bureau of Reclamation*
- *– Fish and Wildlife Service*
- *– United States Geological Survey*
- *– National Park Service*

United States Environmental Protection Agency

Federal Emergency Management Agency

Tennessee Valley Authority.

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INTRODUCTION

There is a phenomenal resiliency in the mechanisms of the earth. A river or lake is almost never dead. If you give it the slightest chance... then nature usually comes back.

— Rene Dubos 1981

Why Is Stream Corridor Restoration Important?

The United States has more than 3.5 million miles of rivers and streams that, along with closely associated floodplain and upland areas, comprise corridors of great economic, social, cultural, and environmental value. These corridors are complex ecosystems that include the land, plants, animals, and network of streams within them. They perform a number of ecological functions such as modulating streamflow, storing water, removing harmful materials from water, and providing habitat for aquatic and terrestrial plants and animals. Stream corridors also have vegetation and soil characteristics distinctly different from surrounding uplands and support higher levels of species diversity, species densities, and rates of biological productivity than most other landscape elements.

Streams and stream corridors evolve in concert with and in response to surrounding ecosystems. Changes within a surrounding ecosystem (e.g., watershed) will impact the physical, chemical, and biological processes occurring within a stream corridor. Stream systems normally function within natural ranges of flow, sediment movement, temperature, and other variables, in what is termed "dynamic equilibrium." When changes in these variables go beyond their natural ranges, dynamic equilibrium may be lost, often resulting in adjustments in the ecosystem that might conflict with societal needs. In some circumstances, a new dynamic equilibrium may eventually develop, but the time frames in which this happens can be lengthy, and the changes necessary to achieve this new balance significant.

Over the years, human activities have contributed to changes in the dynamic equilibrium of stream systems across the nation. These activities center on manipulating stream corridor systems for a wide variety of purposes, including domestic and industrial water supplies, irrigation, transportation, hydropower, waste disposal, mining, flood control, timber management, recreation, aesthetics, and more recently, fish and wildlife habitat. Increases in human population and industrial, commercial, and residential development place heavy demands on this country's stream corridors.

The cumulative effects of these activities result in significant changes, not only to stream corridors, but also to the ecosystems of which they are a part. These changes include degradation of water quality, decreased water storage and conveyance capacity, loss of habitat for fish and wildlife, and decreased recreational and aesthetic values (National Research Council 1992). According to the 1994 National Water Quality Inventory of 617,806 miles of rivers and streams, only 56 percent fully supported multiple uses, including drinking water supply, fish and wildlife habitat, recreation, and agriculture, as well as flood prevention and erosion control. Sedimentation and excess nutrients were the most significant causes of degradation (USEPA 1997) in the remaining 44 percent.

Human activity has profoundly affected rivers and streams in all parts of the world, to such an extent that it is now extremely difficult to find any stream which has not been in some way altered, and probably quite impossible to find any such river.

— H.B.N. Hynes 1970.

Given these statistics, the potential for restoring the conditions in our nation's rivers and streams and protecting them from further damage is almost boundless.

Fig. I.1: Stream corridor in the Midwest. *Stream corridors have great economic, social, cultural, and environmental values.*

Fig. I.2: Concrete-lined channel. *Stream systems across the nation have been altered for a wide variety of purposes.*

What Is Meant by Restoration?

Restoration is a complex endeavor that begins by recognizing natural or human-induced disturbances that are damaging the structure and functions of the ecosystem or preventing its recovery to a sustainable condition (Pacific Rivers Council 1996). It requires an understanding of the structure and functions of stream corridor ecosystems and the physical, chemical, and biological processes that shape them (Dunster and Dunster 1996).

Restoration, as defined in this document, includes a broad range of actions and measures designed to enable stream corridors to recover dynamic equilibrium and function at a self-sustaining level. The first and most critical step in implementing restoration is to, where possible, halt disturbance activities causing degradation or preventing recovery of the ecosystem (Kauffman et al. 1993). Restoration actions may range from passive approaches that involve removal or attenuation of chronic disturbance activities to active restoration that involves intervention and installation of measures to repair damages to the structure of stream corridors.

Restoration practitioners involved with stream corridors take one of three basic approaches to restoration:

- *Nonintervention and undisturbed recovery:* where the stream corridor is recovering rapidly, and active restoration is unnecessary and even detrimental.
- *Partial intervention for assisted recovery:* where a stream corridor is attempting to recover, but is doing so slowly or uncertainly. In such a case, action may facilitate natural processes already occurring.
- *Substantial intervention for managed recovery:* where recovery of desired functions is beyond the repair capacity of the ecosystem and active restoration measures are needed.

The specific goals of any particular restoration should be defined within the context of the current conditions and disturbances in the watershed, corridor, and stream. In all likelihood, restoration will not involve returning a system to its pristine or original condition. The goal should be to establish self-sustaining stream functions.

Because this document may be a primary reference on ecological restoration for many users, it is appropriate that more than one definition of restoration be included. The following definition of restoration has been adopted by the Society for Ecological Restoration (SER).

"Ecological restoration is the process of assisting the recovery and management of ecological integrity. Ecological integrity includes a critical range of variability in biodiversity, ecological processes, and structures, regional and historical context, and sustainable cultural practices."

Restoration, Rehabilitation, and Reclamation

• **Restoration** *is reestablishment of the structure and function of ecosystems (National Research Council, 1992). Ecological restoration is the process of returning an ecosystem as closely as possible to predisturbance conditions and functions. Implicit in this definition is that ecosystems are naturally dynamic. It is therefore not possible to recreate a system exactly. The restoration process reestablishes the general structure, function, and dynamic but self-sustaining behavior of the ecosystem.*

• **Rehabilitation** *is making the land useful again after a disturbance. It involves the recovery of eco-system functions and processes in a degraded habitat (Dunster and Dunster 1996). Rehabilitation does not necessarily reestablish the predisturbance condition, but does involve establishing geological and hydrologically stable landscapes that support the natural ecosystem mosaic.*

• **Reclamation** *is a series of activities intended to change the biophysical capacity of an ecosystem. The resulting ecosystem is different from the ecosystem existing prior to recovery (Dunster and Dunster 1996). The term has implied the process of adapting wild or natural resources to serve a utilitarian human purpose such as the conversion of riparian or wetland ecosystems to agricultural, industrial, or urban uses.*

Restoration differs from rehabilitation and reclamation in that restoration is a holistic process not achieved through the isolated manipulation of individual elements. While restoration aims to return an ecosystem to a former natural condition, rehabilitation and reclamation imply putting a landscape to a new or altered use to serve a particular human purpose (National Research Council 1992).

Streams Have the Capability to Restore Themselves —We must be able to recognize these situations.

"Each stream," says Christopher Hunter, "is a whole greater than the sum of its geologic, climatic, hydrologic, and biologic parts." Those who would save rivers must first see each river whole, as a separate, vital, and unique group of elements and energies that constantly seeks its own dynamic equilibrium (from Nick Lyons, Foreword to Better Trout Habitat: A Guide to Stream Restoration and Management*; Hunter 1991).*

It is this almost living quality of streams, along with the capability to repair and sustain themselves with the removal of disturbances, that this document must convey to the reader. This document addresses the need within agencies for a comprehensive restoration context, an appreciation of the importance of removing key dis-turbances to allow streams to restore themselves, and to better determine those circumstances when active intervention in the restoration process is the preferred alternative.

It is axiomatic that no restoration can ever be perfect; it is impossible to replicate the bio-geochemical and climatological sequence of events over geological time that led to the creation and placement of even one particle of soil, much less to exactly reproduce an entire ecosystem.
Therefore, all restorations are exercises in approximation and in the reconstruction of naturalistic rather than natural assemblages of plants and animals with their physical environments.
— Berger 1990.

Why Is a Stream Corridor Restoration Document Needed?

Interest in restoring stream corridor ecosystems is expanding nationally and internationally. Research is under way and guidelines are being developed for stream corridor restoration in both the public and private sectors. The number of case studies, published papers, technology exchanges, research projects, and symposia on both the technical and process aspects of stream corridor restoration is increasing.

Over the years, many federal agencies have contributed to this growing body of knowledge and have issued manuals and handbooks pertaining in some way to stream restoration. Much of this older literature, however, is significantly different from this document in terms of philosophy and technique. Narrow in scope and focusing on only specific aspects, regions, objectives, or treatments, it may be outdated and not reflective of new restoration techniques and philosophies. The result has been confusion and concern among both government agencies and the public on how to evaluate the need for development and implementation of restoration initiatives.

In response, this document represents an unprecedented cooperative effort by the participating federal agencies to produce a common technical reference on stream corridor restoration.

Recognizing that no two stream corridors and no two restoration initiatives are identical, this technical document broadly addresses the elements of restoration that apply in the majority of situations encountered. The document is not a set of guidelines that cover every possible restoration situation, but it does provide a framework in which to plan restoration actions and alternatives.

What Does the Document Cover?

This document takes a more encompassing approach to restoration than most other texts and manuals. It provides broadly applicable guidance for common elements of the restoration process, but also provides alternatives, and references to alternatives, which may be appropriate for site-specific restoration activities. Moreover, the document incorporates and reflects the experiences of the collaborating agencies and provides a common technical reference that can be used to restore systems based on experiences and basic scientific knowledge.

As a general goal, this document promotes the use of ecological processes (physical, chemical, and biological) and minimally intrusive solutions to restore self-sustaining stream corridor functions. It provides information necessary to develop and select appropriate alternatives and solutions, and to make informed management decisions regarding valuable stream corridors and their watersheds. In addition, the document recognizes the complexity of most stream restoration work and promotes an integrated approach to restoration. It supports close cooperation among all participants in order to achieve a common set of objectives.

The document is intended primarily for interdisciplinary technical and managerial teams and individuals responsible for planning, designing, and implementing stream corridor restoration initiatives.

The guidance contained in this document is applicable nationwide in both urban and rural settings. The material presented applies to a range of stream types, including intermittent and perennial streams of all sizes, and rivers too small to be navigable by barges. It offers a scientific perspective on restoration work ranging from simple to complex, with the level of detail increasing as the scale moves from the landscape to the stream reach.

Note that there are several things that this document is not intended to be.

- It is not a cookbook containing prescribed "recipes" or step-by-step instructions on how to restore a stream corridor.
- While this document refers to issues such as nonpoint source pollution and best management practices, wetlands restoration and delineation, lake and reservoir restoration, and water quality monitoring, it is not meant to focus on these subjects.
- It is not a policy-setting document. No contributing federal agency is strictly bound by its contents. Rather, it suggests and promotes a set of approaches, methods, and tech-

(a)

(b)

Fig. I.3: Stream corridor restoration can be applied in both (a) urban and (b) rural settings. *No matter the setting, vegetation and soil characteristics in the corridor differ distinctly from the surrounding uplands.*

niques applicable to most stream corridor restoration initiatives encountered by agencies and practitioners.
- It is not intended to be an exhaustive research document on the subject of stream corridor restoration. It does provide, however, many references for those desiring a deeper understanding of the principles and theories underlying techniques and issues discussed in general terms.

Who Is the Intended Audience?

The document is intended primarily for interdisciplinary technical and managerial teams and individuals responsible for planning, designing, and implementing stream corridor restoration initiatives.

The document may also be useful to others who are working in stream corridors, including contractors, landowners, volunteers, agency staff, and other practitioners.

How Is the Document Organized?

The document is organized to provide an overview of stream corridors, steps in restoration plan development, and guidelines for implementing restoration.

The document has been divided into three principal parts. *Part I* provides background on the fundamental concepts of stream corridor structure, processes, functions, and the effects of disturbance. *Part II* focuses on a general restoration plan development process comprised of several fundamental steps. *Part III* examines the information presented in Parts I and II to consider how it can be applied in a restoration initiative.

Because of the size and complexity of the document, two features are used to assist the reader to maintain a clear orientation within the document. These features will allow the reader to more easily apply the information to specific aspects of a stream corridor restoration initiative. These features are:
- Chapter dividers that include major chapter sections and reader preview and review questions for each chapter. Table I.1 presents a summary of these questions by chapter.
- Short chapter summaries included at the beginning and end of each chapter that explain where the readers have been, where they are in the document, and where they are going.

A special emphasis has been placed on document orientation due to the special mission that the document has to fulfill. The document audience will include readers from many different technical backgrounds and with various levels of training. The orientation features have been included to reinforce the comprehensive and interdisciplinary perspective of stream corridor restoration.

Agencies Contributing to This Document

United States Department of Agriculture:
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- *– United States Geological Survey*
- *– National Park Service*

United States Environmental Protection Agency

Federal Emergency Management Agency

Tennessee Valley Authority.

How Is the Document Intended to Be Used?

Use of the document mostly depends on the goals of the reader. To begin with, a quick overview of the material is suggested prior to more thorough reading. A reader seeking only a general understanding of the principles of stream restoration may skip over some of the technical details in the body of the document. Use of document sections, chapters, and headings allows each reader to readily identify whether further, more detailed reading on a subject will serve his or her purposes.

The reader is urged to recognize the interdisciplinary and technical nature of stream restoration. While some technical material may, on the surface, appear irrelevant, it may in fact be highly relevant to a specific part of the process of restoring a stream corridor.

Stream corridor restoration technologies and methodologies are evolving rapidly. Readers are encouraged to add their own notes on restoration and to make the document more relevant to local needs (e.g., a list of suitable native plant species for streambank revegetation).

This document is being published in a notebook form to allow insertion of:
- Updated material that will be made available at the Internet sites printed in the *Preface*.
- Addition of regional or locally relevant materials collected by the reader.

Chapter 1:
Overview of Stream Corridors

1.A Physical Structure and Time at Multiple Scales
- What are the structural components of a stream corridor?
- Why are stream corridors of special significance, and why should they be the focus of restoration efforts?
- What is the relationship between stream corridors and other landscape units at broader and more local scales?
- What scales should be considered for a stream corridor restoration?

1.B A Lateral View Across the Stream Corridor
- How is a stream corridor structured from side to side?
- How do these elements contribute to stream corridor functions?
- What role do these elements play in the life of the stream?
- What do we need to know about the lateral elements of a stream corridor to adequately characterize a stream corridor for restoration?
- How are the lateral elements of a stream corridor used to define flow patterns of a stream?

1.C A Longitudinal View Along the Stream Corridor
- What are the longitudinal structural elements of a stream corridor?
- How are these elements used to characterize a stream corridor?
- What are some of the basic ecological concepts that can be applied to streams to understand their function and characteristics on a longitudinal scale?
- What do we need to know about the longitudinal elements that are important to stream corridor restoration?

Chapter 2: Stream Corridor Processes, Characteristics, and Functions

2.A Hydrologic and Hydraulic Processes
- Where does stream flow come from?
- What processes affect or are involved with stream flow?
- How fast, how much, how deep, how often, and when does water flow?
- How is hydrology different in urban stream corridors?

2.B Geomorphic Processes
- What factors affect the channel cross section and channel profile?
- How are water and sediment related?
- Where does sediment come from and how is it transported downstream?
- What is an equilibrium channel?
- What should a channel look like in cross section and in profile?
- How do channel adjustments occur?
- What is a floodplain?
- Is there an important relationship between a stream and its floodplain?

2.C Physical and Chemical Characteristics
- What are the major chemical constituents of water?
- What are some important relationships between physical habitat and key chemical parameters?
- How are the chemical and physical parameters critical to the aquatic life in a stream corridor?
- What are the natural chemical processes in a stream corridor and water column?
- How do disturbances in the stream corridor affect the chemical characteristics of stream water?

2.D Biological Community Characteristics
- What are the important biological components of a stream corridor?
- What biological activities and organisms can be found within a stream corridor?
- How does the structure of stream corridors support various populations of organisms?
- What are the structural features of aquatic systems that contribute to the biological diversity of stream corridors?
- What are some important biological processes that occur within a stream corridor?
- What role do fish have in stream corridor restoration?

2.E Functions and Dynamic Equilibrium
- What are the major ecological functions of stream corridors?
- How are these ecological functions maintained over time?
- Is a stream corridor stable?
- Are these functions related?
- How does a stream corridor respond to all the natural forces acting on it (i.e., dynamic equilibrium)?

Chapter 3: Disturbance Affecting Stream Corridors

3.A Natural Disturbances
- How does natural disturbance contribute to shaping a local ecology?
- Are natural disturbances bad?
- How do you describe or define the frequency and magnitude of natural disturbance?
- How does an ecosystem respond to natural disturbances?
- What are some types of natural disturbances you should anticipate in a stream corridor restoration?

3.B Human-Induced Disturbances
- What are some examples of human-induced disturbances at several landscape scales?
- What are the effects of some common human-induced disturbances such as dams, channelization, and the introduction of exotic species?
- What are some of the effects of land use activities such as agriculture, forestry, mining, grazing, recreation, and urbanization?

Chapter 4: Getting Organized and Identifying Problems and Opportunities

4.A Getting Organized
- Why is planning important?
- Is an Advisory Group needed?
- How is an Advisory Group formed?
- Who should be on an Advisory Group?
- How can funding be identified and acquired?
- How are technical teams estab-

lished and what are their roles?
- What procedures should an Advisory Group follow?
- How is communication facilitated among affected stakeholders?

4.B Problem and Opportunity Identification
- Why is it important to spend resources on the problem ("When everyone already knows what the problem is")?
- How can the anthropogenic changes that caused the need for the restoration initiative be altered or removed?
- How are data collection and analysis procedures organized?
- How are problems affecting the stream corridor identified?
- How are reference conditions for the stream corridor determined?
- Why are reference conditions needed?
- How are existing management activities influencing the stream corridor?
- How are problems affecting the stream corridor described?

Chapter 5: Developing Goals, Objectives, and Restoration Alternatives

5.A Developing Restoration Goals and Objectives
- How are restoration goals and objectives defined?
- How do you describe desired future conditions for the stream corridor and surrounding natural systems?
- What is the appropriate spatial scale for the stream corridor restoration?
- What institutional or legal issues are likely to be encountered during a restoration?
- What are the means to alter or remove the anthropogenic changes that caused the need for the restoration (i.e., passive restoration)?

5.B Alternative Selection and Design
- How does a restoration effort target solutions to treat causes of impairment and not just symptoms?
- What are important factors to consider when selecting among various restoration alternatives?
- What role does spatial scale, economics, and risk play in helping to select the best restoration alternative?
- Who makes the decisions?
- When is active restoration needed?
- When are passive restoration methods appropriate?

Chapter 6: Implement, Monitor, Evaluate, and Adapt

6.A Restoration Implementation
- What are the steps that should be followed for successful implementation?
- How are boundaries for the restoration defined?
- How is adequate funding secured for the duration of the project?
- What tools are useful for facilitating implementation?
- Why and how are changes made in the restoration plan once implementation has begun?
- How are implementation activities organized?
- How are roles and responsibilities distributed among restoration participants?
- How is a schedule developed for installation of the restoration measures?
- What permits and regulations will be necessary before moving forward with restoration measures?

6.B Restoration Monitoring, Evaluation, and Adaptive Management
- What is the role of monitoring in stream corridor restoration?
- When should monitoring begin?
- How is a monitoring plan tailored to the specific objectives of a restoration initiative?
- Why and how is the success or failure of a restoration effort evaluated?
- What are some important considerations in developing a monitoring plan to evaluate the restoration effort?

Chapter 7: Analysis of Corridor Condition

7.A Hydrologic Processes
- How does the stream flow and why is this understanding important?
- Is streamflow perennial, ephemeral, or intermittent?
- What is the discharge, frequency, and duration of extreme high and low flows?
- How often does the stream flood?
- How does roughness affect flow levels?
- What is the discharge most effective in maintaining the stream channel under equilibrium conditions?
- How does one determine if equilibrium conditions exist?
- What field measurements are necessary?

7.B Geomorphic Processes
- How do I inventory geomorphic information on streams and use it to understand and develop physically appropriate restoration plans?
- How do I interpret the dominant channel adjustment processes active at the site?
- How deep and wide should a stream be?
- Is the stream stable?
- Are basin-wide adjustments occurring, or is this a local problem?
- Are channel banks stable, at-risk, or unstable?
- What measurements are necessary?

7.C Chemical Characteristics
- How do you measure the condition of the physical and chemical conditions within a stream corridor?
- Why is quality assurance an important component of stream corridor analysis activities?
- What are some of the water quality models that can be used to evaluate water chemistry data?

7.D Biological Characteristics
- What are some important considerations in using biological indicators for analyzing stream corridor conditions?
- Which indicators have been used successfully?
- What role do habitat surveys play in analyzing the biological condition of the stream corridor?
- How do you measure biological di-

versity in a stream corridor?
- What is the role of stream classification systems in analyzing stream corridor conditions?
- How can models be used to evaluate the biological condition of a stream corridor?
- What are the characteristics of models that have been used to evaluate stream corridor conditions?

Chapter 8: Restoration Design

8.A Valley Form, Connectivity, and Dimension
- How do you incorporate all the spatial dimensions of the landscape into stream corridor restoration design?
- What criteria can be applied to facilitate good design decisions for stream corridor restoration?

8.B Soil Properties
- How do soil properties impact the design of restoration activities?
- What are the major functions of soils in the stream corridor?
- How are important soil characteristics, such as soil microfauna and soil salinity, accounted for in the design process?

8.C Plant Communities
- What is the role of vegetative communities in stream corridor restoration?
- What functions do vegetative communities fulfill in a stream corridor?
- What are some considerations in designing plant community restoration to ensure that all landscape functions are addressed?
- What is soil bioengineering and what is its role in stream corridor restoration?

8.D Habitat Measures
- What are some specific tools and techniques that can be used to ensure recovery of riparian and terrestrial habitat recovery?

8.E Stream Channel Restoration
- When is stream channel reconstruction an appropriate restoration option?
- How do you delineate the stream reach to be reconstructed?
- How is a stream channel designed and reconstructed?
- What are important factors to consider in the design of channel reconstruction (e.g., alignment and average slope, channel dimensions)?
- Are there computer models that can assist with the design of channel reconstruction?

8.F Streambank Restoration
- When should streambank stabilization be included in a restoration?
- How do you determine the performance criteria for streambank treatment, including the methods and materials to be used?
- What are some streambank stabilization techniques that can be considered for use?

8.G Instream Habitat Recovery
- What are the principal factors controlling the quality of instream habitat?
- How do you determine if an instream habitat structure is needed, and what type of structure is most appropriate?
- What procedures can be used to restore instream habitat?
- What are some examples of instream habitat structures?
- What are some important questions to address before designing, selecting, or installing an instream habitat structure?

8.H Land Use Scenarios
- What role does land use play in stream corridor degradation and restoration?
- What design approaches can be used to address the impacts of various land uses (e.g., dams, agriculture, forestry, grazing, mining, recreation, urbanization)?
- What are some disturbances that are often associated with specific land uses?
- What restoration measures can be used to mitigate the impacts of various land uses?
- What are the potential effects of the restoration measures?

Chapter 9: Restoration Implementation, Monitoring, and Management

9.A Restoration Implementation
- What are passive forms of restoration and how are they "implemented"?
- What happens after the decision is made to proceed with an active rather than a passive restoration approach?
- What type of activities are involved when installing restoration measures?
- How can impact on the stream channel and corridor be minimized when installing restoration measures (e.g., water quality, air quality, cultural resources, noise)?
- What types of equipment are needed for installing restoration measures?
- What are some important considerations regarding construction activities in the stream corridor?
- How do you inspect and evaluate the quality and impact of construction activities in the stream corridor?
- What types of maintenance measures are necessary to ensure the ongoing success of a restoration?

9.B Monitoring Techniques Appropriate for Evaluating Restoration
- What methods are available for monitoring biological attributes of streams?
- What can assessment of biological attributes tell you about the status of the stream restoration?
- What physical parameters should be included in a monitoring management plan?
- How are the physical aspects of the stream corridor evaluated?
- How is a restoration monitoring plan developed, and what issues should be addressed in the plan?
- What are the sampling plan design issues that must be addressed to adequately detect trends in stream corridor conditions?
- How do you ensure that the monitoring information is properly collected, analyzed, and assessed (i.e.,

quality assurance plans)?

9.C Restoration Management

- What are important management priorities with ongoing activities and resource uses within the stream corridor?
- What are some management decisions that can be made to support stream restoration?
- What are some example impacts and management options with various types of resource use within the stream corridor (e.g., forest management, grazing, mining, fish and wildlife, urbanization)?
- When is restoration complete?

Feedback

Readers are encouraged to share their restoration experiences and provide feedback. They can do so by accessing the Stream Corridor Restoration home page on the Internet address printed in the Preface*. Other sources of information may also be found by exploring the cooperating agencies' home pages on the Internet.*

A Note About Units of Measurement

Metric units are commonly used throughout the world, but most data published in the United States are in English units. Although adoption of the metric system is on the increase in the United States —and for many federal agencies this conversion is mandated and being planned for— restorers of stream corridors will continue to use data that are in either metric or English units.

Appendix B contains a table of metric to English unit conversion factors, in case a unit conversion is needed.