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# Document Information Form

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**From:**

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**Company** ENERGY WEST MINING

**Date Received:** AUGUST 17, 2006

**Explanation:**

Rilda Canyon Stream Restoration Working Group Project Summary And Stream Corridor Restoration Principles, Processess And Practice CD

**cc:**

**RILDA CANYON STREAM RESTORATION**
**WORKING GROUP**
**July 19, 2006**
**Energy West Main Office**

## PROJECT SUMMARY:

Rehabilitate the perennial portion of Rilda Creek, from Rilda Canyon Springs to the mouth of the canyon. Coordinate with government agencies and private property land owners to facilitate the project. Project would involve approximately two miles of stream corridor.

## GENERAL OBJECTIVE:

Conduct a stream restoration project of Rilda Canyon Creek throughout the perennial reach (approximately two miles). Project goals and objectives will follow the established guidelines developed by the Federal Interagency Stream Restoration Working Group (for a complete guide refer to (**http://www.usds.gov/stream_restoration**). Stream restoration will involve an systematic approach: identify the problems and opportunities, develop project goals and objectives, select and design restoration alternatives, implement selected designs, monitor results and modify designs if necessary.

## DATE OF IMPLEMENTATION:

Upon issuance of the Rilda Canyon permit, PacifiCorp will coordinate initial meeting with governmental agencies and private land owners within 180 days. PacifiCorp will provide funding to DWR to initiate and complete the project within a two year period (project completion dependent upon DWR).
Energy West discussed preliminary project goals with DWR and DOGM. The initial kickoff meeting will be held on July 19, 2006.

**Meeting Agenda:**
**July 19, 2006**

1. Update on Rilda Canyon site development schedule for 2006-2007 (Doug Johnson)
   a. Phase 1 Construction Activities: 2006
   b. Future Plans

2. Discuss aquatic surveys results (Craig Walker)
   a. Baseline Surveys 2004-2005
   b. Spring Surveys - DWR/Fall Surveys - Cirrus Ecological Solutions

3. Hydrologic characteristics of Rilda Creek (Chuck Semborski)
   a. Stream Quality 1989-2005
   b. Stream Quantity 1989-2005

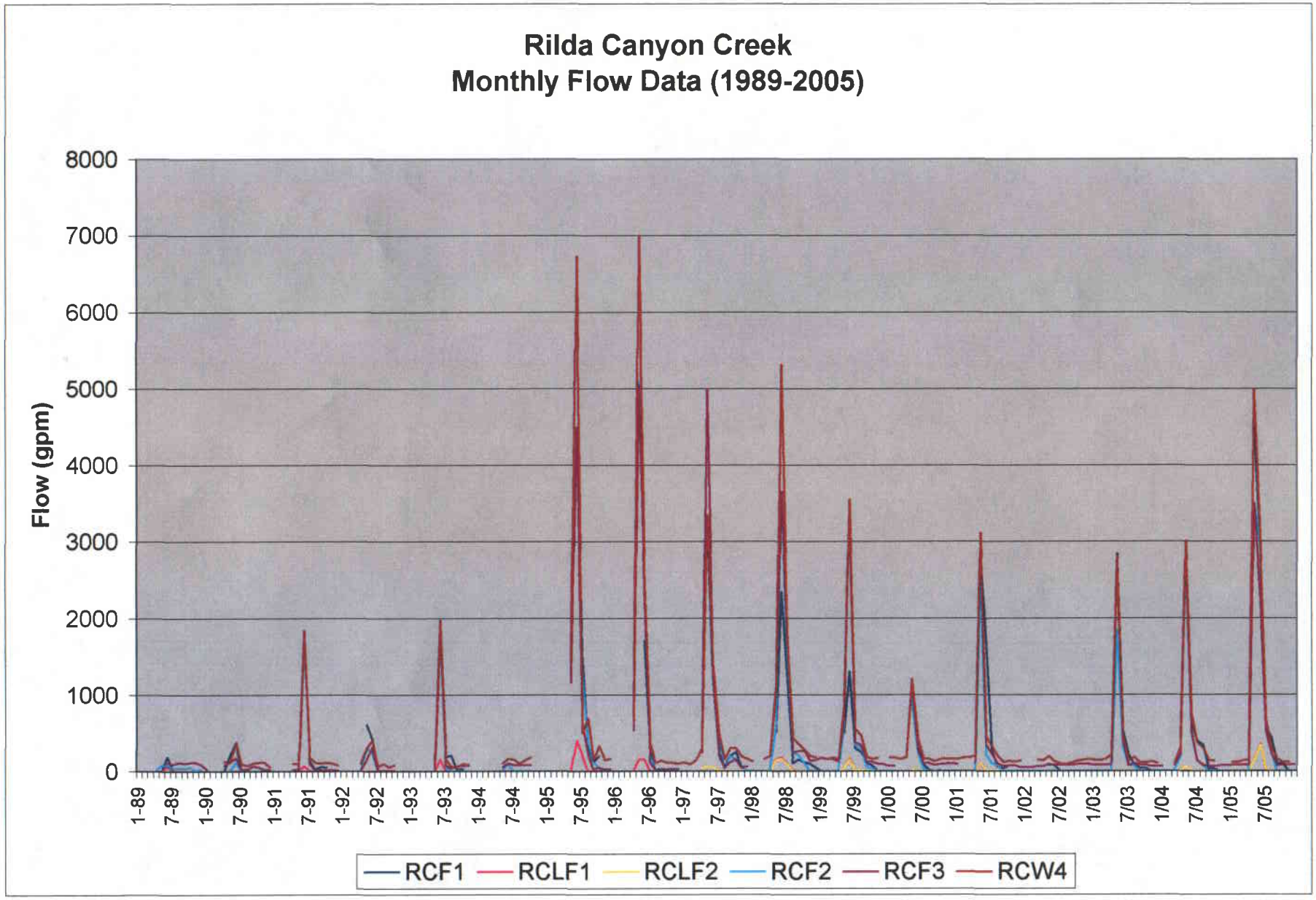
4. Review Stream Corridor Restoration manual, copies of the manual will be available to team members (Dennis Oakley)
   a. Review Stream Restoration Corridor Manual

5. Site meeting to review the perennial portion of Rilda Creek

# Rilda Canyon Water Quality

| LOCATION: | RCF3 | Start of Perennial Stream Section | | |
|---|---|---|---|---|
| HISTORICAL DATA | 1989-2006 | | | |
| PARAMETER | MAXIMUM | MINIMUM | AVERAGE | # ANALYSES |
| BICARB: | 500 | 206 | 367.2 | 59 |
| CALCIUM: | 112.2 | 52.7 | 82.0 | 59 |
| CARBONATE: | 28 | 0.1 | 5.4 | 27 |
| CHLORIDE: | 50 | 2 | 9.5 | 59 |
| CONDUCT: | 992 | 380 | 698.5 | 60 |
| DISS_OXY: | 14.16 | 4.4 | 8.2 | 57 |
| HARDNESS: | 748 | 225 | 389.2 | 59 |
| IRON_TOT: | 3 | 0.02 | 0.5 | 57 |
| IRON_DISS: | 0.41 | 0.01 | 0.1 | 21 |
| MAGNESIUM: | 60.7 | 21.2 | 42.7 | 59 |
| MANG_DISS: | 0.047 | 0.008 | 2.5 | 11 |
| MANGANESE: | 0.2 | 0.007 | 4.9 | 31 |
| OIL_GREASE | 5 | 0.4 | 2.6 | 25 |
| PH: | 8.83 | 7.5 | 8.1 | 60 |
| POTASSIUM: | 5 | 0.01 | 2.1 | 56 |
| SET_SOLIDS: | 2.5 | 0.01 | 0.5 | 21 |
| SODIUM: | 27.4 | 5.4 | 15.6 | 59 |
| SULFATE: | 176 | 7 | 93.7 | 59 |
| SUSPENDED: | 250 | 1 | 38.8 | 40 |
| TDS: | 624 | 199 | 432.6 | 59 |

| LOCATION: | RCW4 | Weir Near Highway 31 | | |
|---|---|---|---|---|
| HISTORICAL DATA | 1989-2006 | | | |
| PARAMETER | MAXIMUM | MINIMUM | AVERAGE | # ANALYSES |
| BICARB: | 461 | 209 | 370.5 | 59 |
| CALCIUM: | 132.7 | 59 | 78.5 | 59 |
| CARBONATE: | 51 | 0.1 | 7.8 | 31 |
| CHLORIDE: | 700 | 2 | 26.4 | 59 |
| CONDUCT: | 1250 | 400 | 761.1 | 60 |
| DISS_OXY: | 15.87 | 3.9 | 8.3 | 57 |
| HARDNESS: | 659 | 254 | 412.8 | 59 |
| IRON_TOT: | 3.8 | 0.01 | 0.6 | 33 |
| IRON_DISS: | 0.28 | 0.01 | 8.6 | 19 |
| MAGNESIUM: | 90.8 | 24 | 52.6 | 59 |
| MANG_DISS: | 0.059 | 0.009 | 0.0 | 2 |
| MANGANESE: | 0.2 | 0.01 | 5.9 | 21 |
| OIL_GREASE | 5 | 0.1 | 2.5 | 25 |
| PH: | 8.86 | 7.27 | 8.3 | 60 |
| POTASSIUM: | 10 | 0.01 | 2.6 | 57 |
| SET_SOLIDS: | 1 | 0.01 | 0.4 | 20 |
| SODIUM: | 52 | 7 | 20.2 | 59 |
| SULFATE: | 309 | 15 | 124.9 | 59 |
| SUSPENDED: | 505 | 1 | 59.1 | 37 |
| TDS: | 814 | 260 | 484.2 | 59 |


Rilda Canyon Creek
Monthly Flow Data (1989-2005)
Flow (gpm)
8000
7000
6000
5000
4000
3000
2000
1000
0
1-89
7-89
1-90
7-90
1-91
7-91
1-92
7-92
1-93
7-93
1-94
7-94
1-95
7-95
1-96
7-96
1-97
7-97
1/98
7/98
1/99
7/99
1/00
7/00
1/01
7/01
1/02
7/02
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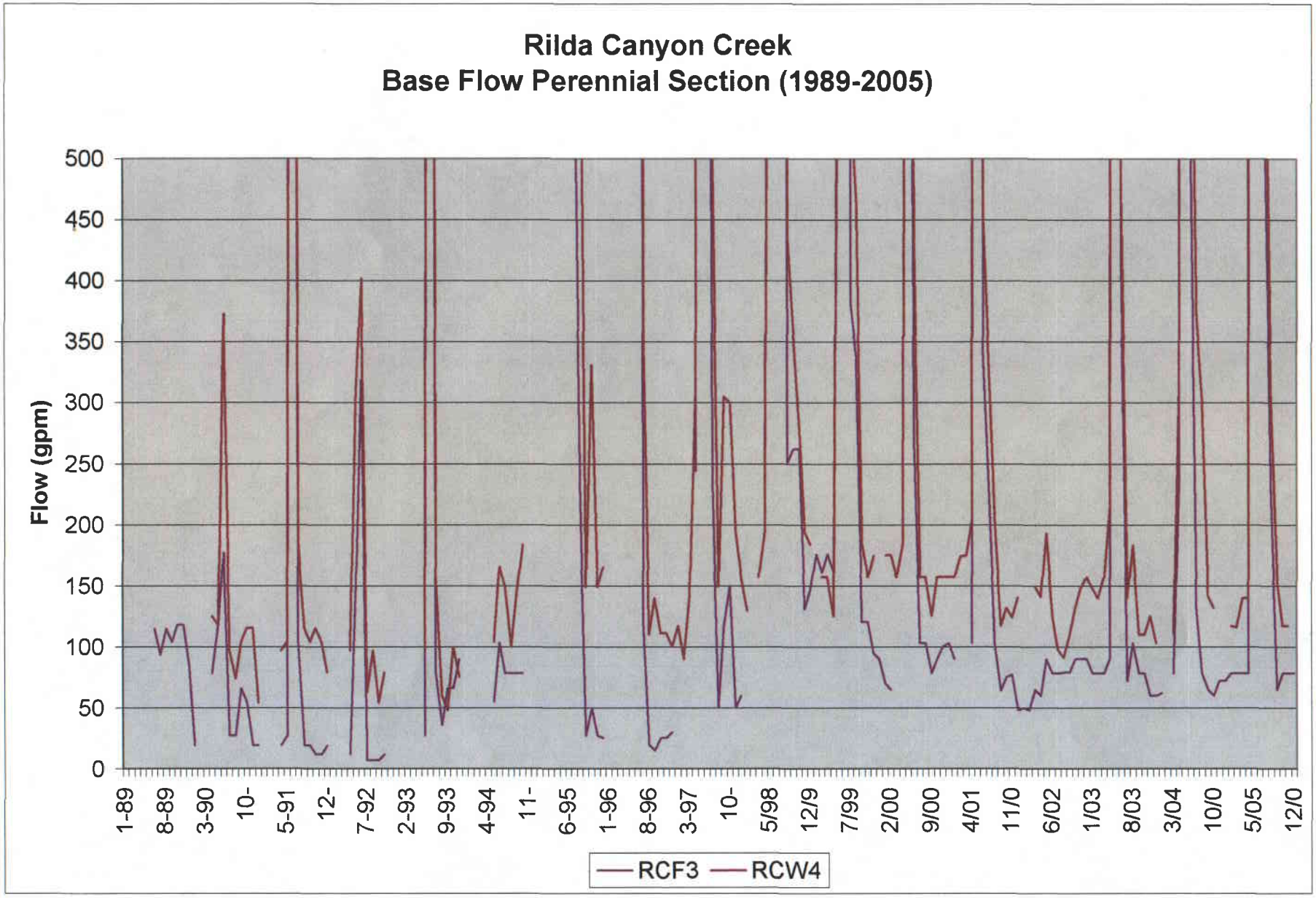
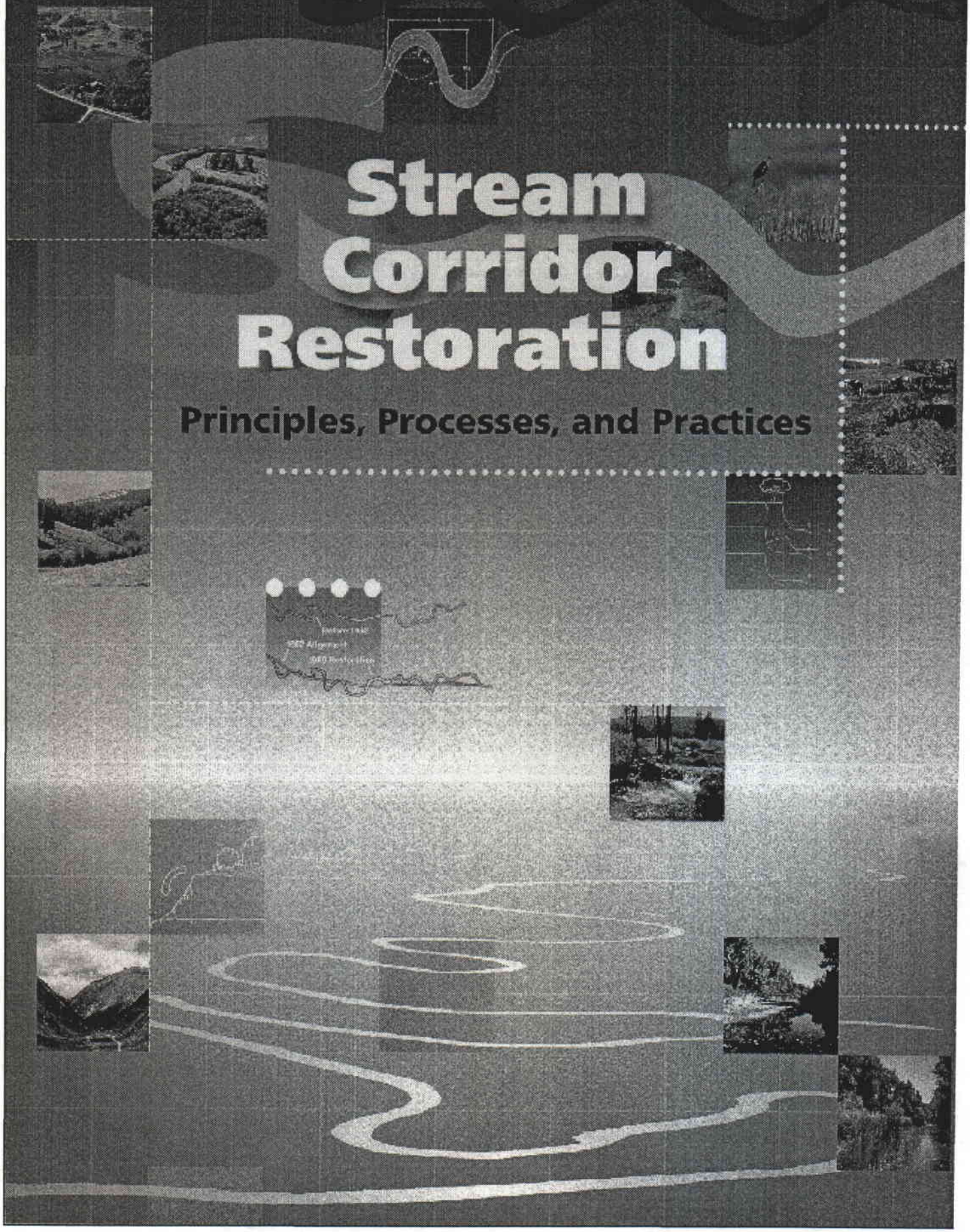
RCF1
RCLF1
RCLF2
RCF2
RCF3
RCW4


Rilda Canyon Creek
Base Flow Perennial Section (1989-2005)
Flow (gpm)
500
450
400
350
300
250
200
150
100
50
0
1-89
8-89
3-90
10-
5-91
12-
7-92
2-93
9-93
4-94
11-
6-95
1-96
8-96
3-97
10-
5/98
12/9
7/99
2/00
9/00
4/01
11/0
6/02
1/03
8/03
3/04
10/0
5/05
12/0
RCF3
RCW4

# Stream Corridor Restoration

## Principles, Processes, and Practices



# Stream Corridor Restoration

*– by the Federal Interagency Stream Corridor Restoration Working Group*

AN INTERAGENCY PARTNERSHIP.


***Free Download of Complete Document or by individual chapters***

***(10/98 version of the document in its 08/2001 revision)***

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***(New! Bookmarked version of complete document available.)***

***Comments on this site, the book, and your restoration experiences are appreciated.***

***Suggested Citation:*** **FISRWG (10/1998). Stream Corridor Restoration: Principles, Processes, and Practices. By the Federal Interagency Stream Restoration Working Group (FISRWG)(15 Federal agencies of the US gov't). GPO Item No. 0120-A; SuDocs No. A 57.6/2:EN 3/PT.653. ISBN-0-934213-59-3.**

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## Why "stream corridor restoration"?

There's more to a stream than the rushing or meandering water. A stream corridor, or stream valley, is a complex and valuable ecosystem which includes the land, plants, animals, and network of streams within it. Recognition of the value of stream corridors has come with the understanding of what has been lost through uninformed or misguided actions on many streams and the watersheds that nourish them.

The U.S. has 3.5 million miles of rivers. The 1992 National Water Quality Inventory of 642,881 miles of these rivers stated that 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. In the remaining 44 percent of stream miles inventoried, sedimentation and excess nutrients were the most significant causes of degradation. Sediment problems result from soil erosion from watersheds and streambanks.

Today, interest in restoring stream corridors is expanding nationally and internationally, as indicated by increasing numbers of case studies, published papers, technology exchanges, research projects, and symposia. Stream corridors are increasingly recognized as critical ecosystems supporting interdependent uses and values.

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.

### 1.A Overview of Structure and Scale

- *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 Stream Corridor Functions and Dynamic Equilibrium

- *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?*

### 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 Chemical Processes

- *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 Processes

- *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 Stream Corridor 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)?*

### 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

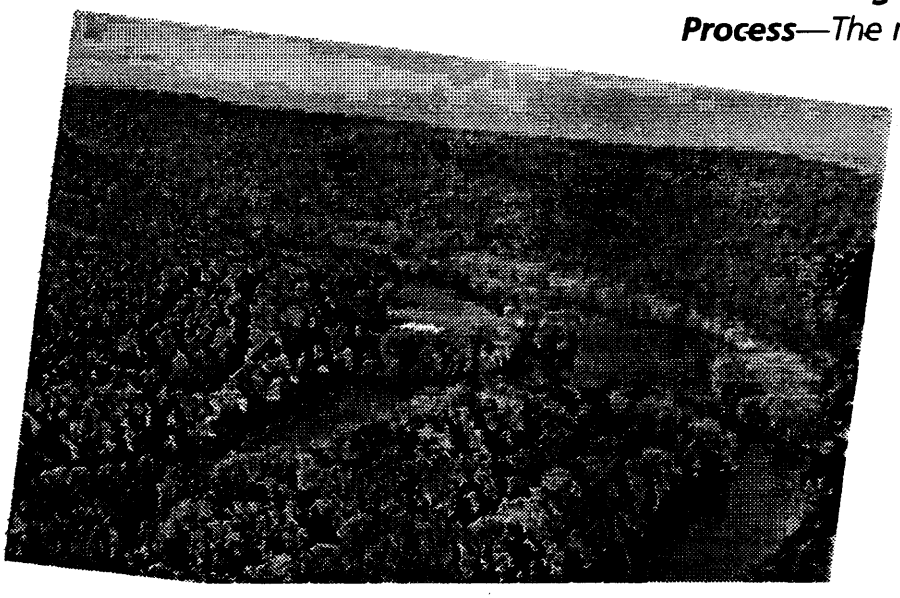
- *What are some examples of human-induced disturbances at several landscape scales?*
- *What are the effects of some common human-induced disturbances such as dams, channelization, and the introduction of exotic species?*
- *What are some of the effects of land use activities such as agriculture, forestry,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

# Developing a Stream Corridor Restoration Plan



*A well conceived and developed stream corridor restoration plan is critical to any restoration effort. The restoration plan establishes a framework for documenting the processes, forms, and functions operating within the corridor, identifying disturbances that disrupt or eliminate those functions, and planning and implementing restoration activities. The restoration plan essentially serves as the cornerstone of the restoration effort by achieving several key functions.*

- ***Problem Solving Framework**—The restoration plan establishes a framework for addressing critical stream corridor restoration issues, problems, and needs. As such, it prevents disjointed decision-making and facilitates the organization of restoration activities.*
- ***Documenting the Results of the Process**—The restoration plan serves as a record of all subsequent activities by outlining the restoration process. As a result, the plan enables*



*the transfer of "lessons learned" to other groups undertaking restoration efforts and helps legitimize the restoration process.*

- ***Communication and Outreach**—The restoration plan serves to communicate the elements of the corridor restoration process to the public and other interested parties. It also serves an important symbolic function in that it represents the common vision of multiple partners.*

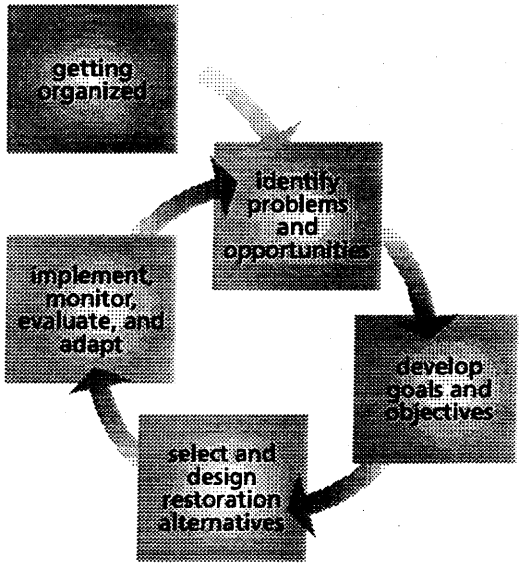
*The overall objective of the restoration plan will differ depending on local needs and objectives. Each corridor restoration initiative has unique ecological, social, and economic conditions that dictate activities to meet specific needs and changing circumstances. Despite these differences, the restoration plan should emphasize the ecological integrity of the stream corridor.*

The restoration plan should emphasize the maintenance and restoration of the ecological integrity and the dynamic stability of the stream corridor by focusing on multiple scales, functions, and values.

### *A Note About Scope*

*Although the concepts presented in these chapters are appropriate for all restoration initiatives, the organizational structure can be simplified for smaller restorations.*

*Not all restorations are complex or costly. Some may be as simple as a slight change in the way that resources are managed in and along the stream corridor involving only minor costs. Other restoration initiatives, however, may require substantial funds because of the*




***The Stream Corridor Restoration Plan Development Process***

*complexity and extent of the measures needed to achieve the planned restoration goals.*

*In recognition of the diversity of restoration plan objectives, Part II of the document focuses on identifying and explaining a general restoration plan development process that each initiative should follow. This process is characterized as a decision-making process composed of several steps (see illustration). These fundamental steps include: getting organized; identifying problems and opportunities; developing goals and objectives; selecting and designing restoration alternatives; and implementation, monitoring, evaluation, and adaptation.*

*Each of these steps can be integrated into any program- or agency-specific restoration planning process. In addition, these steps*

*should not be viewed as sequential, but iterative in nature. Many of the fundamental steps may be repeated or may occur simultaneously. In addition, the process, which is based on the philosophy of adaptive management, should be flexible enough to adjust management actions and directions in light of new information about the corridor and about progress toward restoration objectives.*

*Part II consists of three chapters and is organized in accordance with the fundamental steps of the restoration plan development process.*

- ***Chapter 4** introduces the first two steps of plan development. The first portion of the chapter focuses on the basics of getting organized and presents key steps that should be undertaken to initiate the restoration process. The remainder of the chapter centers on problem/opportunity identification and introduces the basics of stream corridor condition analysis and problem assessment.*
- ***Chapter 5** presents information concerning how restoration goals and objectives are identified and how alternatives are designed and selected.*
- ***Chapter 6** concludes with a discussion of implementation of restoration as well as monitoring and evaluation.*

### 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 established 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?*

### 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?*

**7.A Hydrologic and Hydraulic 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 Processes**

- *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 diversity 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?*

**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 Vegetative 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 Riparian / Terrestrial Habitat Recovery**

- *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 Design**

- *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 In-Stream 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?*

### 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?*