RIPARIAN AREA MANAGEMENT

Process for Assessing
Proper Functioning Condition

by

U.S. Department of the Interior
Bureau of Land Management
Proper Functioning Condition Work Group

Don Prichard - Work Group Leader
Riparian-Wetland Coordinator
Service Center, Colorado

Work Group

Hugh Barrett
Riparian-Wetland Coordinator
Oregon State Office, Oregon

Jim Cagney
Range Conservationist
Grass Creek Resource Area, Wyoming

Ron Clark
Watershed Specialist
Colorado State Office, Colorado

Jim Fogg
Hydrologist
Service Center, Colorado

Karl Gebhardt
Hydrologist
Idaho State Office, Idaho

Dr. Paul L. Hansen
Plant Ecologist - School of Forestry
University of Montana, Montana

Brenda Mitchell
Riparian-Wetland Coordinator
Colorado State Office, Colorado

Dan Tippy
Supervisory Natural Resource
Specialist
Deschutes Resource Area, Oregon

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U.S. Department of the Interior
Bureau of Land Management
Service Center
P.O. Box 25047
Denver, CO 80225-0047

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I. Introduction

The Bureau of Land Management (BLM) has responsibility for 269 million acres of public lands (USDI, 1992) that sustain a variety and abundance of resources. These resources are prized for their recreation, fish and wildlife, cultural, and historic values, as well as their economic values, and for such uses as livestock production, timber harvest, and mineral extraction. Riparian-wetland areas, though they comprise less than 9 percent of the total land base, are the most productive and highly prized resources found on BLM lands.

Federal policy defines wetlands as ***areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and which, under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions***. BLM Manual 1737, ***Riparian-Wetland Area Management,*** includes ***marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas as wetlands***.

BLM's manual further defines riparian areas as ***a form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation or physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil***.

Riparian-wetland areas are grouped into two major categories: 1) lentic, which is standing water habitat such as lakes, ponds, seeps, bogs, and meadows, and 2) lotic, which is running water habitat such as rivers, streams, and springs.

A. Purpose

The Federal Land Policy and Management Act (FLPMA) of 1976 directs BLM to manage public lands in a manner that will provide for multiple use and at the same time protect natural resources for generations to come. In addition to FLPMA, numerous laws, regulations, policies, Executive orders, and Memorandums of Understanding (MOUs) direct BLM to manage its riparian-wetland areas for the benefit of the nation and its economy.

Under BLM's mandate of multiple-use management, a variety of activities such as livestock grazing, timber harvest, mineral extraction, recreation, and road and transportation corridor construction takes place on public lands. If not managed correctly, these activities can impact the quality of riparian-wetland areas.

In 1991, the BLM Director approved the *Riparian-Wetland Initiative for the 1990's*, which establishes national goals and objectives for managing riparian-wetland resources on public lands. One of the chief goals of this initiative is to restore and maintain riparian-wetland areas so that 75 percent or more are in proper functioning condition (PFC) by 1997. **The overall objective of this goal is to achieve an advanced ecological status, except where resource management objectives, including PFC, would require an earlier successional stage, thus providing the widest variety of vegetation and habitat diversity for wildlife, fish, and watershed protection**. This objective is important to remember because riparian-wetland areas will function properly long before they achieve an advanced ecological status. The *Riparian-Wetland Initiative for the 1990's* also includes a strategy to focus management on the entire watershed. Entire watershed condition is an important component in assessing whether a riparian-wetland area is functioning properly.

In the past, considerable effort has been expended to inventory, classify, restore, enhance, and protect riparian-wetland areas, but the effort has lacked consistency. The purpose of this document is to provide a thought process for assessing PFC for riparian-wetland areas on BLM-managed lands.

B. Approach

BLM depicts natural riparian-wetland areas as resources whose capability and potential is defined by the interaction of three components: 1) vegetation, 2) landform/soils, and 3) hydrology. A few resource specialists regard fish and wildlife as a fourth element because some wildlife species may alter a riparian-wetland area's capability and potential. However, most classifiers categorize fish and wildlife as a "user," but place wildlife species that can alter the capability and potential of a riparian-wetland site (i.e., beaver) as a special modifier under the hydrology component. BLM takes this approach in its inventory and classification system, Ecological Site Inventory (ESI).

Since natural riparian-wetland areas are characterized by the interactions of vegetation, soils, and hydrology, **the process of assessing whether a riparian-wetland area is functioning properly requires an interdisciplinary (ID) team**. The team should include specialists in vegetation, soils, and hydrology. A biologist also needs to be involved because of the high fish and wildlife values associated with riparian-wetland areas.

To initiate the process, in February 1992, the Director assembled an ID team of specialists to review existing Bureau definitions for PFC and to expand or develop new definitions as required. Appendix A provides the names of the specialists that were involved in this process. The ID team also developed a format for BLM to report functionality to Congress, which will include the tables in Appendix B.

C. Definitions

The terms introduced in BLM's definition of riparian-wetlands are generally understood by resource specialists. However, some confusion still exists with the term ephemeral stream. A stream is a general term for a body of flowing water. In hydrology the term is generally applied to water flowing in a natural channel as distinct from a canal. Streams in natural channels are classified as being perennial, intermittent or seasonal, or ephemeral and are defined as follows (Meinzer, 1923):

Perennial - A stream that flows continuously. Perennial streams are generally associated with a water table in the localities through which they flow.

Intermittent or seasonal - A stream that flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas.

Ephemeral - A stream that flows only in direct response to precipitation, and whose channel is at all times above the water table.

These terms refer to the continuity of streamflow in **time**; they were developed by the U.S. Geological Survey in the early 1920's, have a long history of use, and are the standard definitions used by BLM resource specialists. Confusion over the distinction between intermittent and ephemeral streams may be minimized by applying Meinzer's (1923) suggestion that the term "intermittent" be arbitrarily restricted to streams that flow continuously for periods of at least 30 days and the term "ephemeral" be arbitrarily restricted to streams that do not flow continuously for at least 30 days. Also, the intermittent stream is to be distinguished from an **interrupted** stream, which is a stream with discontinuities in **space**. Intermittent or seasonal streams usually have visible vegetation or physical characteristics reflective of permanent water influence; for example, the presence of cottonwood.

To understand how riparian-wetland areas operate and to implement proper management practices, thus ensuring an area is functioning properly, **the capability and potential of a riparian-wetland area must be understood**. Assessing functionality is based upon an area's capability and potential. For the purpose of this document, capability and potential are defined as follows:

Capability - The highest ecological status a riparian-wetland area can attain given political, social, or economical constraints. These constraints are often referred to as limiting factors.

Potential - The highest ecological status an area can attain given no political, social, or economical constraints; often referred to as the "potential natural community" (PNC).

In BLM's annual report to Congress, the following definitions are to be used when completing the table in Appendix B:

Proper Functioning Condition - Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve flood-water retention and ground-water recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. **The functioning condition of riparian-wetland areas is a result of interaction among geology, soil, water, and vegetation**.

Functional—At Risk - Riparian-wetland areas that are in functional condition but an existing soil, water, or vegetation attribute makes them susceptible to degradation.

Nonfunctional - Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows and thus are not reducing erosion, improving water quality, etc., as listed above. The absence of certain physical attributes such as a floodplain where one should be are indicators of nonfunctioning conditions.

Unknown - Riparian-wetland areas that BLM lacks sufficient information on to make any form of determination.

II. Process

Most of the Bureau's riparian-wetland areas are found in Alaska and are considered functioning properly because they are in their natural state (USDI, 1991). This is not the case for BLM riparian-wetland areas in the 11 contiguous Western States, as well as small tracts in Alabama, Arkansas, Florida, Louisiana, Minnesota, Mississippi, and Oklahoma. Most of these riparian-wetland areas have been altered by human activities. However, the following process for determining whether an area is functioning properly is the same for Alaska as it is for the other states.

A. Review Existing Documents

To start the process, existing documents that provide a basis for assessing PFC should be reviewed. Technical Reference 1737-5, ***Riparian and Wetland Classification Review*** (Gebhardt et al., 1990), provides an excellent start as it reviews, in a like format, the more common procedures that are used to classify, inventory, and describe riparian-wetland areas. This document identifies ESI as being the most complete procedure because it provides a process for defining the capability of an area, its potential, and how it functions. However, not all riparian-wetland areas will require the magnitude provided by ESI to assess functionality.

Technical Reference 1737-2, ***The Use of Aerial Photography to Inventory and Monitor Riparian Areas*** (Batson et al., 1987), Technical Reference 1737-3, ***Inventory and Monitoring of Riparian Areas*** (Myers, 1989), and Technical Reference 1737-7, ***Procedures for Ecological Site Inventory—With Special Reference to Riparian-Wetland Sites*** (Leonard et al., 1992), are three other documents that should be reviewed. These documents provide additional thought processes that will be useful in assessing functional status of riparian-wetland areas.

B. Analyze the Definition

Next, the definition of PFC must be analyzed. One way to do this is by breaking the definition down as follows:

> "Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris is present to:
>
> 1) dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality;
> 2) filter sediment, capture bedload, and aid floodplain development;
> 3) improve flood-water retention and ground-water recharge;
> 4) develop root masses that stabilize streambanks against cutting action;
> 5) develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses;
> 6) and support greater biodiversity."

Riparian areas are functioning properly when there is adequate structure present to provide the listed benefits **applicable** to a particular area. The analysis must be based on the riparian area's capability and potential. If, for example, the system does not have the potential to support fish habitat, that criteria would not be used in the assessment.

C. Assess Functionality

1. Attributes and Processes

The third aspect of assessing PFC involves understanding the attributes and processes occurring in a riparian-wetland area. Table 1 provides a list of attributes and processes that may occur in any given riparian-wetland area. When assessing PFC, attributes and processes for the area being evaluated need to be identified.

To understand these processes, an example of an alluvial/nongraded valley-bottom type riparian area in both a functional and nonfunctional condition is provided in Figure 1 (Jensen, 1992). Using the Bureau's definitions for PFC, **State A** represents

Table 1. Attributes/Processes List *

Hydrogeomorphic
Ground-Water Discharge
Active Floodplain
Ground-Water Recharge
Floodplain Storage and Release
Flood Modification
Bankfull Width
Width/Depth Ratio
Sinuosity
Gradient
Stream Power
Hydraulic Controls
Bed Elevation
Vegetation
Community Types
Community Type Distribution
Surface Density
Canopy
Community Dynamics and Succession
Recruitment/Reproduction
Root Density
Survival
Erosion/Deposition
Bank Stability
Bed Stability (Bedload Transport Rate)
Depositional Features
Soils
Soil Type
Distribution of Aerobic/Anaerobic Soils
Capillarity
Annual Pattern of Soil Water States
Water Quality
Temperature
Salinity
Nutrients
Dissolved Oxygen
Sediment

* This list provides examples of various attributes/processes that may be present in a riparian area. By no means is it complete.

a high degree of bank stability, floodplain, and plant community development, and would be classified as PFC. The important attributes and processes present for **State A** are:

Hydrogeomorphic - Active floodplain, floodplain storage and release, flood modification, bankfull width, width/depth ratio, sinuosity, gradient, stream power, and hydraulic controls.

Vegetation - Community type (2 of 3), community type distribution (similar in the wet types), root density, canopy, community dynamics, recruitment/reproduction, and survival.

Erosion/Deposition - Bank stability.

Soil - Distribution of anaerobic soil, capillarity.

Water Quality - No change.

State B may be properly functioning or functional—at risk. It would be classified as functional if bank stabilizing vegetation is dominant along the reach and other factors such as soil disturbance are not evident. It is important to identify the species of vegetation present since they do vary in their ability to stabilize streambanks and filter sediment.

State B would be classified as at risk if bank stabilizing vegetation is not dominant (even though it may be in an improving trend from prior conditions), nondesirable species are present (e.g., Kentucky bluegrass), soil disturbance is evident (e.g., caved banks from livestock or vehicle use), or hydrologic factors such as degraded watershed conditions exist, increasing the probability of extreme flow events that would damage the reach. The following changes in attributes/processes are likely in **State B**:

Hydrogeomorphic - Bankfull width (increase), width/depth ratio (increase in width, no change in depth), active floodplain frequency (decrease).

Vegetation - Community types changed, community type distribution changed, root density, canopy, community dynamics, recruitment/reproduction, and survival.

Erosion/Deposition - Bank stability (decrease).

Soil - No change.

Water Quality - No significant change.

Figure 1. Succession of states for alluvial/nongraded valley-bottom type.

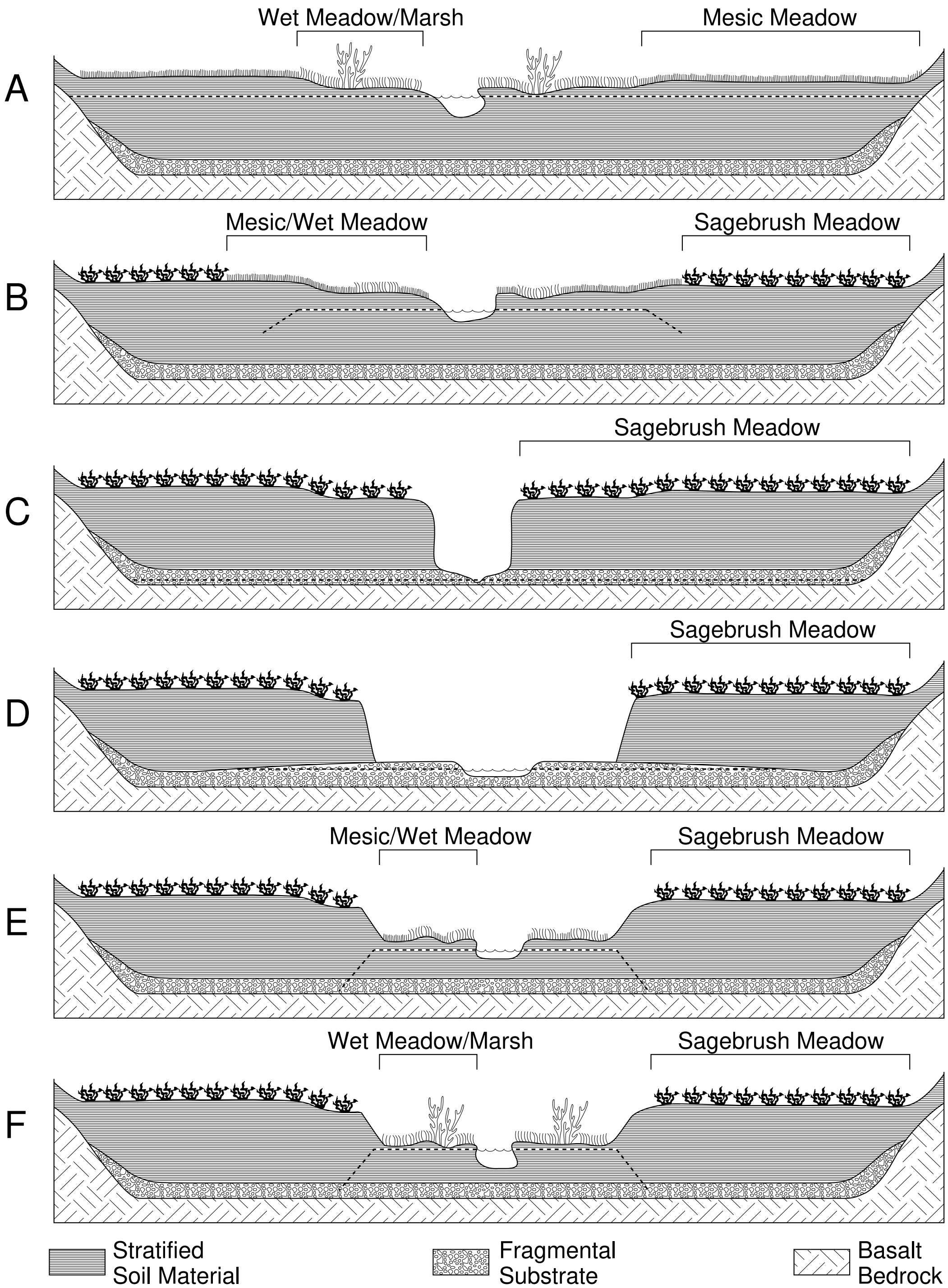

Figure 1. Succession of states for alluvial/nongraded valley-bottom type.

States C and D would be classified as nonfunctional conditions. **State C** represents incisement of the stream channel to a new base level. There is little or no bank stabilizing vegetation and no floodplain. Channel widening exhibited in **State D** must occur to restore floodplain development. Vegetation, if present, is often only temporary due to the large adjustment process occurring. The following changes in attributes/processes are likely in **States C and D**:

Hydrogeomorphic - Bankfull width (increase), width/depth (increase/increase), active floodplain frequency (decrease).

Vegetation - Riparian community types lost; community type distribution changed; root density, canopy, community dynamics, recruitment, reproduction, and survival (decrease).

Erosion/Deposition - Bank stability (decrease).

Soil - Well drained.

Water Quality - Temperature (increase), sediment (increase).

State E may again be classified as functional-at risk or functional depending on vegetation, soil, and hydrologic attributes. Establishment of the floodplain and bank stabilizing vegetation indicate reestablishment of functional conditions. However, stream segments in this state are usually at risk for the same reasons described for **State B**. Attributes and processes would revert back to those that appear in **State B**.

State F is classified as functioning properly even though the riparian area may not have achieved the greatest extent exhibited in **State A**. Banks are stabilized and exhibit channel geometry similar to **State A**. The floodplain has widened to the extent that confinement of peak flows is only occasional and aggrading processes are slowed because of the surface area available. The largest difference between **States A and F** occurs in size and extent of hydrologic influence, which regulates size and extent of the riparian area.

This alluvial/nongraded valley-bottom example is found in the Great Basin and represents only one of many types found on public lands. However, it is important to remember that there are other types and to understand that:

Riparian-wetland areas do have fundamental commonalities in how they function, but they also have their own unique attributes. Riparian-wetland areas can and do function quite differently. As a result, most areas need to be evaluated against their own capability and potential. Even for similar areas, human influence may have introduced component(s) that have changed the area's capability and potential. Assessments, to be correct, must consider these factors and the uniqueness of each system.

Appendix C contains examples of other kinds of riverine systems found on BLM managed lands (Jensen, 1992). The analogy used for Figure 1 can be applied to most of the examples found in Appendix C because differing channel types do have functional commonality. However, differing channel types may accommodate their own unique evolutionary processes. Information concerning the classification system used by Jensen can be found in BLM technical reference TR 1737-5 (Gebhardt et al., 1990).

2. *Capability and Potential*

Assessing functionality then involves determining a riparian-wetland area's capability and potential using an approach such as the following:

- Look for relic areas (exclosures, preserves, etc.).
- Seek out historic photos, survey notes, and/or documents that indicate historic condition.
- Search out species lists (animals & plants - historic & present).
- Determine species habitat needs (animals & plants) related to species that are/were present.
- Examine the soils and determine if they were saturated at one time and are now well drained?
- Examine the hydrology, establish cross sections if necessary to determine frequency and duration of flooding.
- Identify vegetation that currently exists. Are they the same species that occurred historically?
- Determine the entire watershed's general condition and identify its major landform(s).
- Look for limiting factors, both human-caused and natural, and determine if they can be corrected.

This approach forms the basis for initiating an inventory effort like ESI. For some areas, conducting an ESI effort will be the only way to assess an area's capability and potential.

Some riparian-wetland areas may be prevented from achieving their potential because of limiting factors such as human activities. Most of these limiting factors can be rectified through proper management. However, some limiting factors such as dams and transmountain diversions are not as easy to correct. The placement of dams and transmountain diversions can result in a riparian-wetland area's flow regime being altered, thus changing the area's capability. For example, cottonwood trees are maintained by periodic flooding, which creates point bars for seedling establishment. A dam or transmountain diversion that reduces or eliminates the potential for flooding may remove the potential for cottonwoods to remain in that area. PFC must be assessed in relationship to the area's capability.

3. Functioning Condition

When determining whether a riparian-wetland area is functioning properly, the condition of the entire watershed, including the uplands and tributary watershed system, is important. The entire watershed can influence the quality, abundance, and stability of downstream resources by controlling production of sediment and nutrients, influencing streamflow, and modifying the distribution of chemicals throughout the riparian-wetland area. Riparian-wetland health (functioning condition), an important component of watershed condition, refers to the ecological status of vegetation, geomorphic, and hydrologic development, along with the degree of structural integrity exhibited by the riparian-wetland area. A healthy riparian-wetland area is in dynamic equilibrium with the streamflow forces and channel aggradation/degradation processes producing change with vegetative, geomorphic, and structural resistance. In a healthy situation, the channel network adjusts in form and slope to handle increases in stormflow/snowmelt runoff with limited perturbation of channel and associated riparian-wetland plant communities.

Riparian-wetland areas can function properly before they achieve their Potential Plant Community (PPC) or Potential Natural Community (PNC). In fact, some would argue that riparian-wetland areas are always functioning properly, no matter what state they are in. From the perspective of fluvial geomorphology, it is true that the channel is constantly adjusting itself to the water and sediment load delivered to it from the watershed; however, BLM's definition goes beyond the processes of channel evolution and includes vegetation and biological attributes. The Bureau's definition does not mean PNC or optimal conditions for a particular species have to be achieved to be rated as functioning properly.

Figures 2 and 3 provide an example of the relationship between PFC and vegetation community succession for one area. Assuming succession continues uninterrupted (Step 1 to Step 2 in Figure 2), the channel will evolve through some predictable changes from bare ground to PNC (although not necessarily as linearly as depicted). The riparian-wetland area will progress through phases of not functioning, functioning—at risk, and properly functioning along with plant succession. In this example, PFC occurs at the mid-seral stage (Step 3). Figure 3 shows a stream cross section of each condition (A-E) displayed in Figure 2.

At various stages within this successional process, the stream can provide a variety of values for different uses (Step 4). In Figure 2, optimal conditions for grazing occur when forage is abundant and the area is stable and sustainable (mid-seral). Wildlife goals depend upon the species for which the area is being managed. If the riparian zone in Figure 2 is to provide habitat for shrub nesting birds, the optimum conditions would be from mid- to late seral. Trout habitat conditions would be optimum from mid-seral to late seral. The threshold for any goal is at least PFC because any rating below this would not be sustainable.

For some areas, PFC may occur from early seral to late seral. Desired plant community (DPC) would be determined based on management objectives through an interdisciplinary approach (Step 5). Figure 2 is an example of only one riparian-wetland area.

When rating functionality, it will be easy to categorize many riparian-wetland areas as PFC or nonfunctional. For others it will not be easy. Difficulty in rating PFC usually arises in identifying the thresholds that allow a riparian-wetland area to move from one category to another. To provide consistency in reporting PFC, BLM has established a standard checklist for field offices to initiate this process (Appendix D).

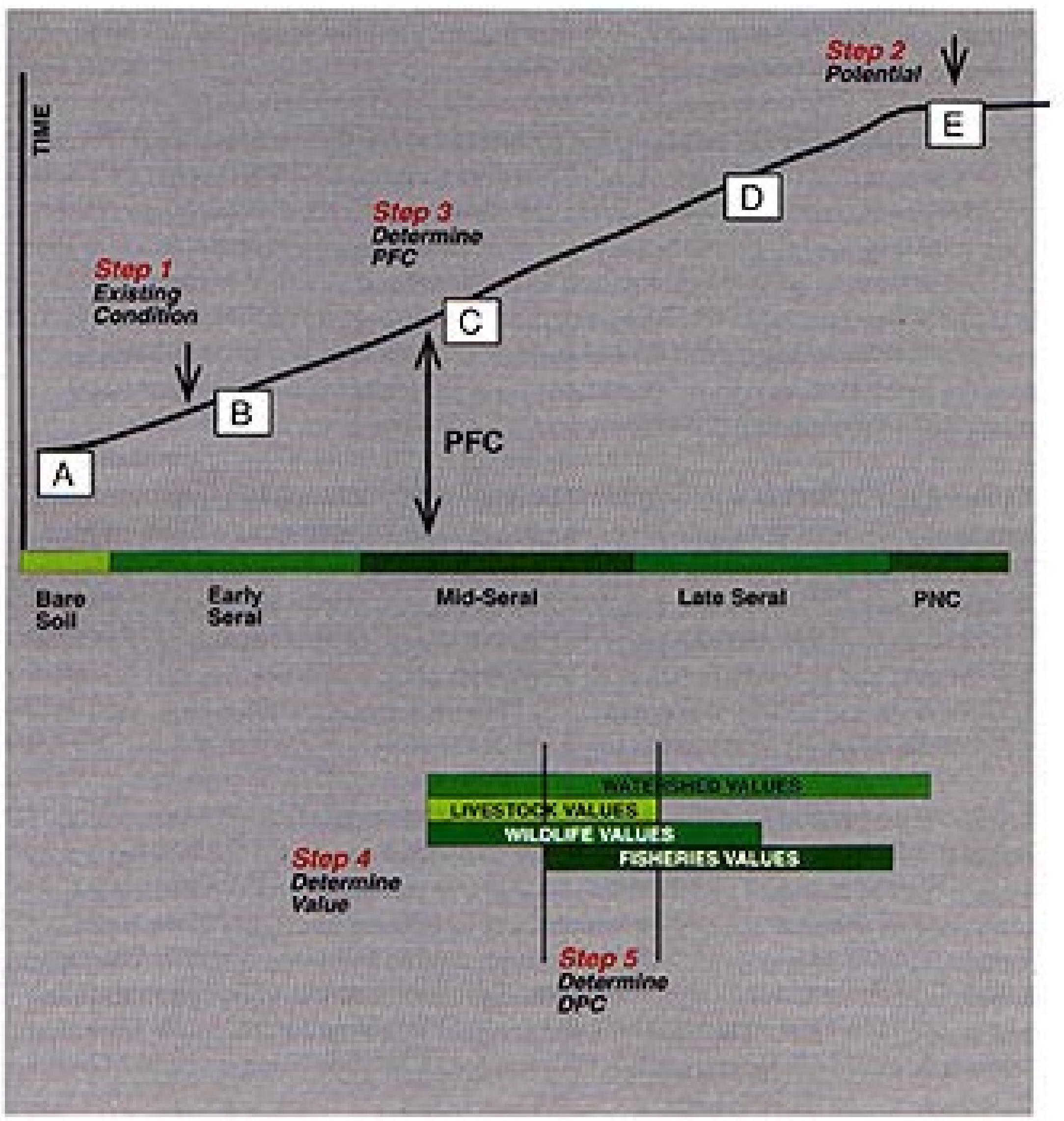

Figure 2. Succession for stream recovery.

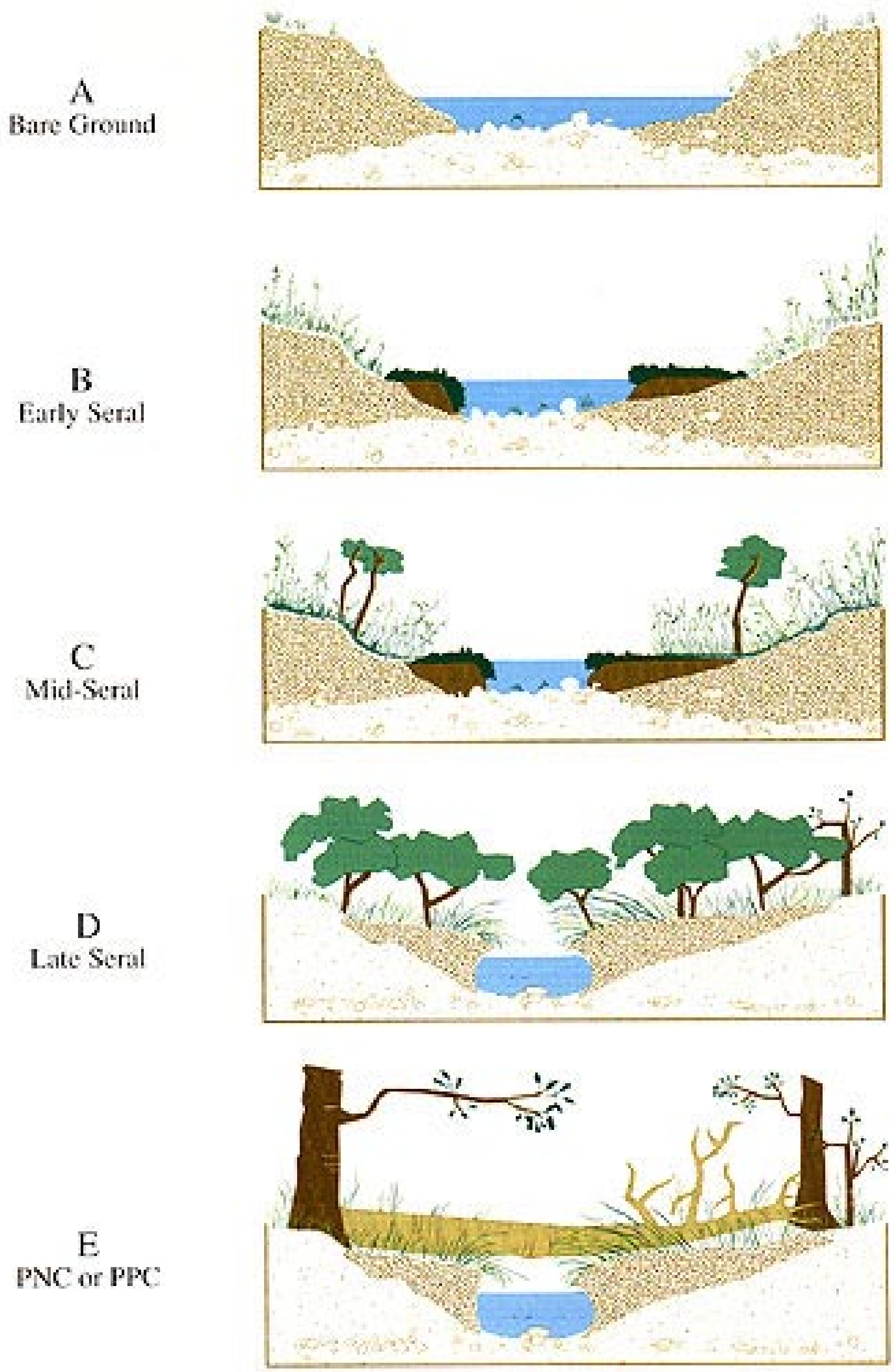

Figure 3. Stream cross sections.

BLM's checklist may not answer the question of functionality for all riparian-wetland areas. Some areas may require a more intensive inventory effort, like ESI. Elements can be added to BLM's standard checklist to address unique riparian-wetland attributes. To further assist field offices in assessing functionality, Appendix E provides examples of riparian-wetland areas and depicts the categories of PFC, functional—at risk, and nonfunctional.

The process described in this document has concentrated on lotic forms of riparian-wetland areas for two reasons: 1) they are the form of wetland BLM most frequently has to resolve conflicts on, and 2) inventory, classification, and monitoring efforts within and outside the Bureau have concentrated on this type of resource. However, the process would be the same for lentic forms of wetlands. Additional guidance will be developed for lentic wetlands as BLM gathers more information on them.

III. Instituting the Process

A. Planning

A logical manner to incorporate the information collected into a management plan is as follows (refer to Figure 2 in the Functioning Condition section):

Step 1 **Existing Condition** - Determine the existing riparian-wetland and watershed condition using BLM standard inventory methods.

Step 2 **Potential Condition** - Determine PNC by using relic areas, historic photos, etc. (ESI process).

Step 3 **PFC** - Determine the minimum conditions required for the area to function properly.

Step 4 **Resource Values** - Determine existing and potential resource values and the plant communities necessary to support these values.

Step 5 **Management Goals** - Negotiate specific objectives to reach management goals for the watershed, DPC, or Desired Future Condition.

Step 6 **Planned Actions** - Design management actions to achieve DPC.

Step 7 **Monitoring** - Design appropriate monitoring strategies to assess progress towards meeting management goals.

Step 8 **Flexibility** - Maintain management flexibility to accommodate change based upon monitoring results.

B. Management

For BLM to be successful in reaching its goal of having 75 percent of its riparian-wetland areas functioning properly by 1997, best management practices need to be set in motion. Successful management strategies address the entire watershed. Upland and riparian areas are interrelated and cannot be considered separately.

Two other documents can be helpful in assisting with this process: Technical Reference 1737-4, ***Grazing Management in Riparian Areas*** (Kinch, 1989), provides grazing management principles, concepts, and practices that have been effective in improving and maintaining desired conditions on riparian-wetland areas. For other forms of management such as recreation development, mining opportunities, timber practices, and watershed treatments, Technical Reference 1737-6, ***Management Techniques in Riparian Areas*** (Smith and Prichard, 1992), provides suggested management practices. With a change in management, most riparian-wetland areas can achieve PFC in a few years, but some will take years to achieve the identified DPC or advanced ecological status.

C. Monitoring

Management effectiveness can be assessed and progress towards meeting PFC can be documented through monitoring. Sites should be revisited periodically as part of the overall monitoring program. Areas rated at a single point in time can reflect short-term factors such as climatic conditions. Monitoring will reflect longer-term trends. Technical references such as TR 1737-3 (Myers, 1989) are tools that can be used to develop monitoring criteria.

IV. Summary

Riparian-wetland areas constitute an important resource on lands managed by BLM. BLM's goal is to have 75 percent of its riparian-wetlands functioning properly by 1997. This technical reference provides a thought process for assessing functioning condition.

The status of some riparian-wetland areas will be relatively easy to discern while the status of others will be less evident. Appendix D contains the minimum national standards that BLM field offices will use in making this assessment. For hard-to-discern areas, Ecological Site Inventory may be the only method to determine capability and potential and assess functionality. Using either method will require an interdisciplinary team to adequately address the complexities associated with riparian-wetland areas and to report their functioning condition.

Appendix B contains the forms for reporting functioning condition. Riparian areas are reported in four categories: proper functioning condition, functional—at risk, nonfunctional, and unknown. Areas with and without specific riparian management and objectives are reported separately. The Definitions section of this technical reference describes the meanings of these terms.

Trend is reported for areas that are identified as functional—at risk, and is a key consideration in interpreting the data. Areas identified as functional—at risk with a downward trend are often the highest management priority because a decline in resource values is apparent. Yet these areas often retain much of the resiliency associated with a functioning area. There is usually an opportunity to reverse this trend through changes in management. Functional—at risk areas with an upward trend are often a priority for monitoring efforts. These areas are improving but remain at risk. Monitoring these areas assures that upward trends continue.

Conversely, trend is not reported for areas that are nonfunctional. While these areas could theoretically still be in decline, most of the riparian values have already been lost. The presence of sufficient riparian-wetland attributes and processes to warrant a determination of trend usually results in a designation of functional—at risk.

It is common for an area in PFC to continue to have an upward trend. Many sites that are properly functioning must continue to improve to meet site-specific objectives. However a downward trend may put the area at risk. Once proper functioning condition is reached, trend relates to specific objectives. Therefore, it is not part of this data report.

The lack of specific information will place many riparian-wetland areas into the category of unknown. In order for BLM to make an adequate assessment of progress towards its goal, it is imperative that areas for which no data exists be evaluated and added to the data base. As information is acquired and resource values are identified, best management practices need to be set in motion. Successful management strategies have to address the entire watershed, as upland and riparian-wetland areas are interrelated and cannot be considered separately.

Examples provided in this document have concentrated on lotic riparian areas for two reasons: 1) they are the form of wetland BLM most frequently has to resolve conflicts on, and 2) inventory, classification, and monitoring efforts within and outside the Bureau have concentrated on this type of resource the most. However, the thought process for assessing functionality of lentic areas would be the same. In the future, a technical reference will be developed with more specific information for lentic wetlands.

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Glossary of Terms

Active Floodplain - The low-lying land surface adjacent to a stream and formed under the present flow regime. The active floodplain is inundated at least once or twice (on average) every 3 years.

Advanced Ecological Status - A community with a high coefficient of similarity to a defined or perceived PNC for an ecological site, usually late seral or PNC ecological status.

Annual Pattern of Soil Water States - A description of field soil water over the year as applied to horizons, layers, or standard depth zones. Water state is reported by layers.

Hydraulic Control - Features of landform (bedform and bed material), vegetation, or organic debris that control the relationship between stage (depth) and flow rate (discharge) of a stream.

Hydrogeomorphic - Features pertaining to the hydrology and/or geomorphology of the stream system.

Potential Plant Community - Represents the seral stage the botanical community would achieve if all successional sequences were completed without human interference under the present environmental conditions.

Riparian-Wetland Ecological Site - An area of land with a specific potential plant community and specific physical site characteristics, differing from other areas of land in its ability to produce vegetation and to respond to management. Ecological site is synonymous with range site.

Seral Stage - One of a series of plant communities that follows another in time on a specific site.

Stream Power - A measure of a stream's ability to erode and transport sediment. It is equal to the product of shear stress and velocity.

Vegetation Community Dynamics - Response of plant communities to changes in their environment, to their use, and to stresses to which they are subjected. Climatic cycles, fire, insects, grazing, and physical disturbances are some of the many causes of changes in plant communities. Some changes are temporary while others are long lasting.

Vegetation Community Succession - Primary succession is a sequence of plant community changes from the initial colonization of a bare soil toward a PNC. Secondary succession may involve sequences of plant community change from PNC due to perturbations, or a sequence toward PNC again following a perturbation. Vegetation community succession may be accompanied by subtle but significant changes in temporal soil characteristics such as bulk density, nutrient cycling, and microclimatic changes, but is differentiated from major physical state changes such as landform modification or long-term elevation or lowering of a water table that would change the PNC of an ecological site.

Appendix A

Interdisciplinary Team

Team Member	Discipline
Ron Clark - WO-222 (Now CO-930)	Watershed Specialist
Mike Crouse - OR-932	Management/Biologist
Wayne Elmore - OR-050	Riparian-Wetland Specialist/ Wildlife Biologist
Jim Fogg - SC-212	Hydrologist
Ron Hooper - AZ-932	Riparian-Wetland Coordinator/ Hydrologist
Steve Leonard - NV-931	Range Scientist
Don Prichard - SC-213	Riparian-Wetland Coordinator/ Fishery Biologist
Dan Tippy - TC-200 (Now OR-050)	Riparian-Wetland Training Coordinator/Soils
Don Waite - WO-222	Management/Economist
Jack Williams - WO-240	Fisheries Program Manager

Appendix B

Reporting Tables

Table 1. Functioning Condition Status

State:____________

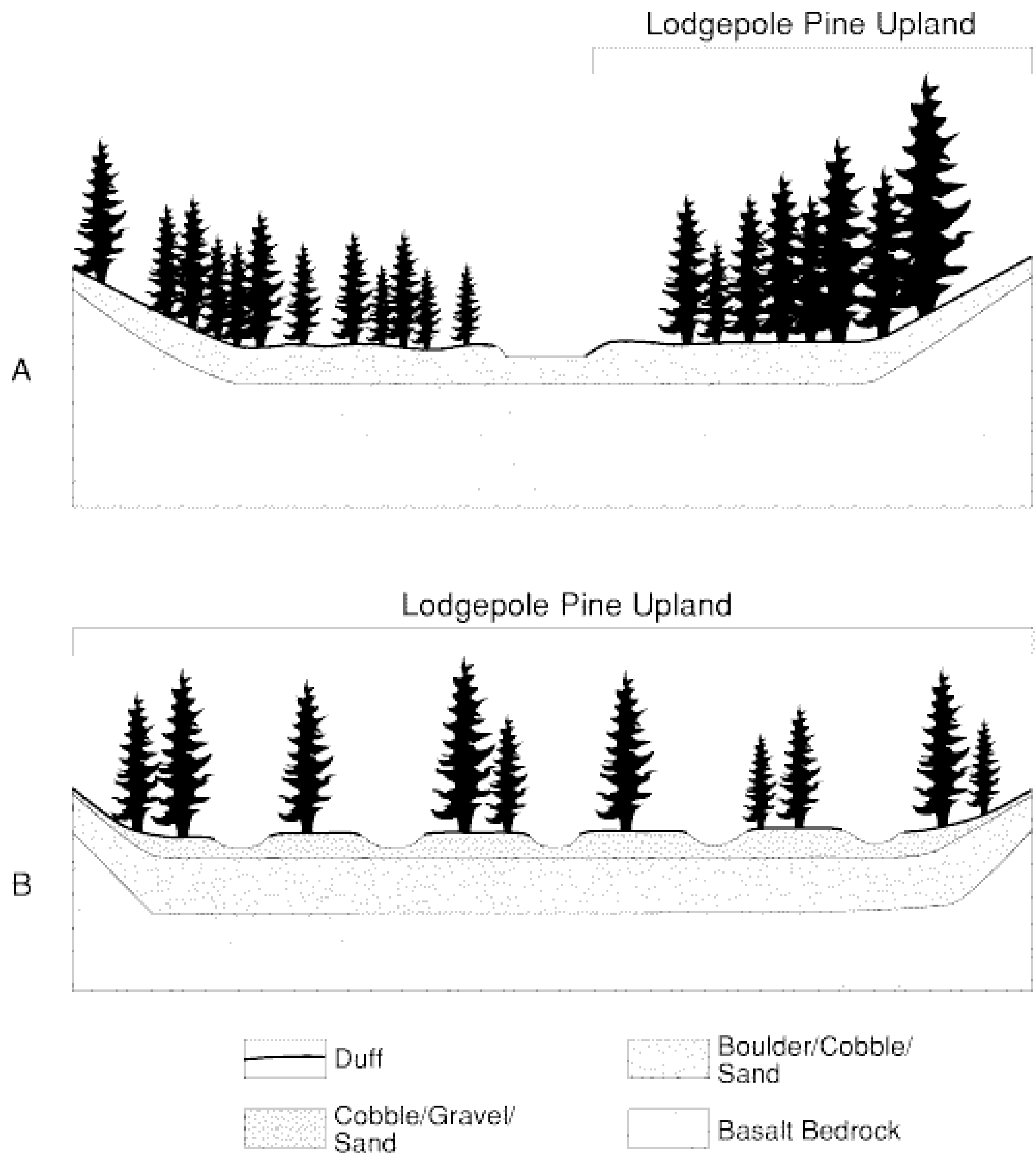
Habitat Types	Proper Functioning Condition	Functional—At Risk			Non-functional	Unknown	Total
		Trend Up	Trend Not Apparent	Trend Down			
Riverine Miles (Lotic)							
Nonriverine Acres (Lentic)*							

* Report only acres associated with lentic riparian-wetland areas. Do not include acres associated with lotic riparian-wetland areas.

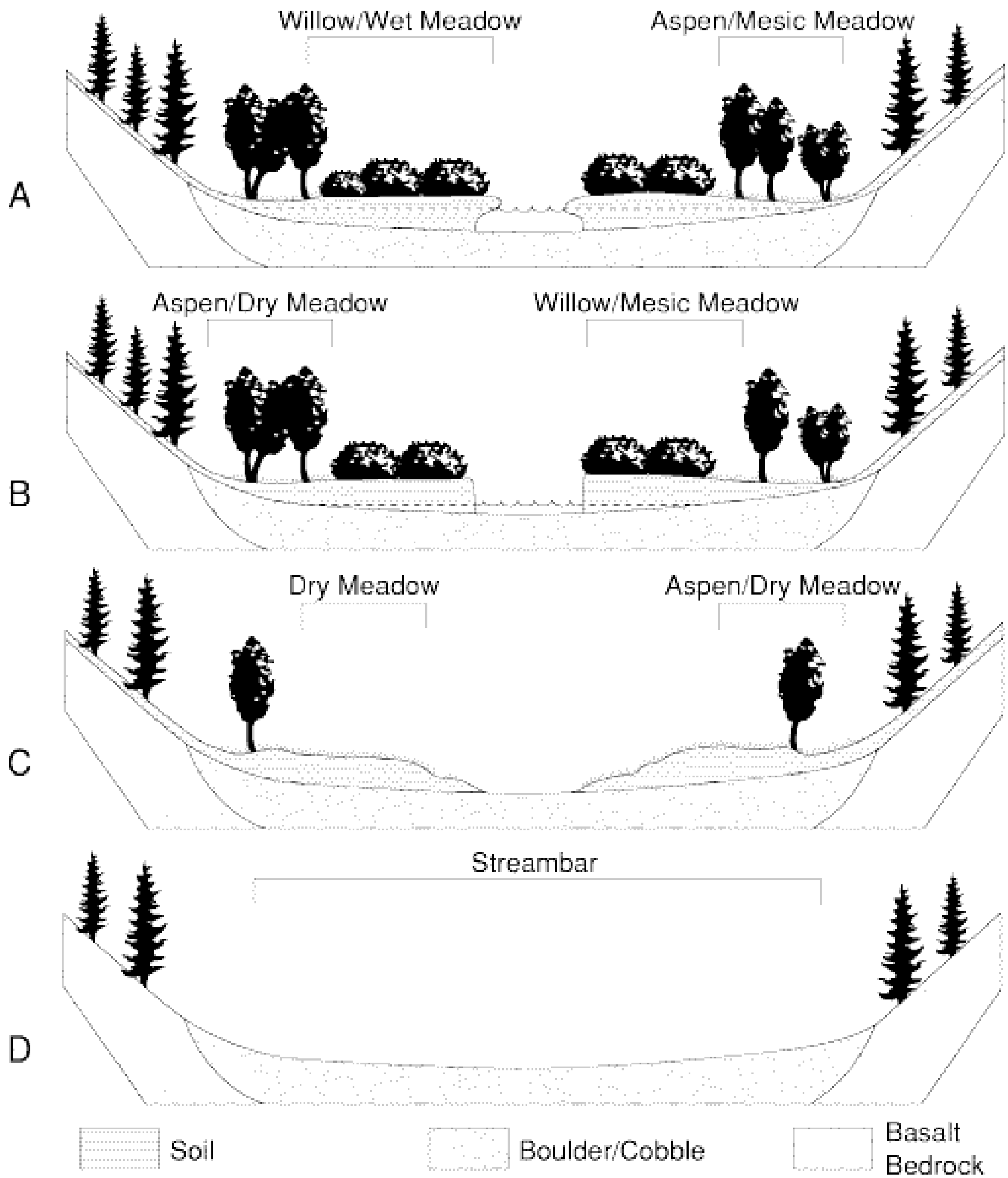
Appendix C

Channel Evolution Examples

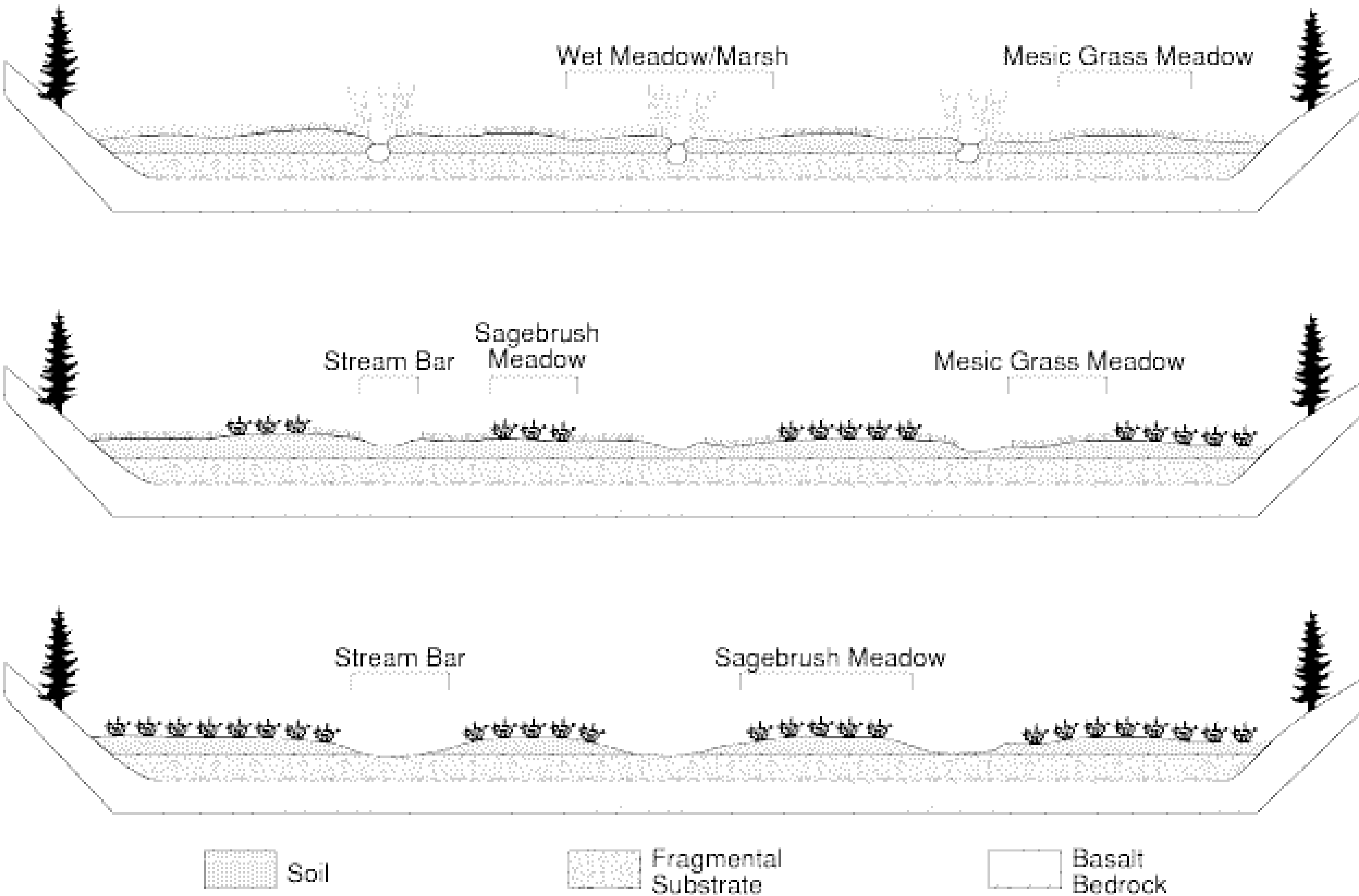
Glacial Valley-Bottom Type



Succession of States for Fluvial/V-Shaped Depositional Valley-Bottom Type



Succession of States for Alluvial/Graded Valley-Bottom Type



Appendix D

Riparian-Wetland Functional Checklist

General Instructions

1) This checklist constitutes the **Minimum National Standards** required to determine proper functioning condition of lotic riparian-wetland areas.

2) As a minimum, an **ID team** will use this checklist to determine the degree of function of a riparian-wetland area.

3) An ID team **must review existing documents**, particularly those referenced in this document, so that the team has an understanding of the concepts of the riparian-wetland area they are assessing.

4) An ID team **must determine the attributes and processes important** to the riparian-wetland area that is being assessed.

5) Mark one box for each element. Elements are numbered for the purpose of cataloging comments. The numbers do not declare importance.

6) For any item marked "**No**," the severity of the condition must be explained in the "**Remarks**" section and must be a subject for discussion with the ID team in determining riparian-wetland functionality. Using the "**Remarks**" section to also explain items marked "**Yes**" is encouraged but not required.

7) Based on the ID team's discussion, "**functional rating**" will be resolved and the checklist's summary section will be completed.

8) Establish photo points where possible to document the area being assessed.

Standard Checklist

Name of Riparian-Wetland Area: ____

Date: __________ Segment/Reach ID: ____

Miles: ____________________ Acres: ____

ID Team Observers: ____

Yes	No	N/A	HYDROLOGY
			1) Floodplain above bankfull is inundated in "relatively frequent" events
			2) Where beaver dams are present they are active and stable
			3) Sinuosity, width/depth ratio, and gradient are in balance with the landscape setting (i.e., landform, geology, and bioclimatic region)
			4) Riparian-wetland area is widening or has achieved potential extent
			5) Upland watershed is not contributing to riparian-wetland degradation

Yes	No	N/A	VEGETATION
			6) There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)
			7) There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)
			8) Species present indicate maintenance of riparian-wetland soil moisture characteristics
			9) Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events
			10) Riparian-wetland plants exhibit high vigor
			11) Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows
			12) Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)

Yes	No	N/A	EROSION/DEPOSITION
			13) Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy
			14) Point bars are revegetating with riparian-wetland vegetation
			15) Lateral stream movement is associated with natural sinuosity
			16) System is vertically stable
			17) Stream is in balance with the water and sediment being supplied by the watershed (i.e., no excessive erosion or deposition)

(Revised 1998)

Remarks

____
____
____
____
____
____
____
____
____
____
____

Summary Determination

Functional Rating:

Proper Functioning Condition __________
Functional—At Risk __________
Nonfunctional __________
Unknown __________

Trend for Functional—At Risk:

Upward __________
Downward __________
Not Apparent __________

Are factors contributing to unacceptable conditions outside the control of the manager?

Yes __________
No __________

If yes, what are those factors?

____ Flow regulations ____ Mining activities ____ Upstream channel conditions
____ Channelization ____ Road encroachment ____ Oil field water discharge
____ Augmented flows ____ Other (specify) ____________________

Appendix E

Riparian-Wetland Examples

Texas Creek—Colorado
September 1976
Nonfunctional

Texas Creek—Colorado
September 1976
Nonfunctional

Texas Creek—Colorado
June 1978
Functional—At Risk

Texas Creek—Colorado
September 1976
Nonfunctional

Texas Creek, located in south-central Colorado on public lands administered by the Canon City District Office, would have been rated ***nonfunctional*** in 1976 based on the Bureau's definitions. Texas Creek is a small coldwater perennial stream that originates in the Sangre De Cristo Mountains, flowing for approximately 24 miles before it enters the Arkansas River. Inventories conducted in 1976 classified the stream as a laterally unstable area that was moderately confined, severely impacted from continuous grazing, and providing limited fish and wildlife values.

The September 1976 photograph clearly demonstrates why Texas Creek would have been rated ***nonfunctional***. This riparian area was clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energies associated with high flows. With each storm event, the stream channel migrated, erosion accelerated, sediment was not filtered, flood-water retention and ground-water recharge were limited, and water quality was altered. Wildlife values were limited to principally a watering site, and the brown trout population, less than 13 fish per 500 feet of stream, was well below the area's capability or potential.

For the most part, placing a stream into the category of ***nonfunctional*** would be a simple task. However, there are areas (natural and altered) that will always look like this.

Texas Creek—Colorado
June 1978
Functional—At Risk

Management actions were changed in 1977 to reverse the trend of Texas Creek and to allow the area to progress towards its capability and potential. Changes included improved fencing, and rest and implementation of deferred seasonal grazing or winter grazing. Quality of habitat in Texas Creek began to improve immediately after changing management practices, and the June 1978 photo displays the results. Using the Bureau's definitions, Texas Creek would have been rated as ***functional—at risk*** in June 1978, with an upward trend.

Comparing the changes between the 1976 photo and the 1978 photo shows that Texas Creek was in an upward trend and had started to function physically. With increased vegetation, stream energies had been reduced, sediment had been filtered and captured, streambanks had developed, flood-water retention and ground-water recharge had increased, stream width had decreased, erosion was reduced, and water quality improved. With these physical changes, wildlife and fishery values had increased. The brown trout population more than doubled from 1976.

Yet, the area was still at risk because soil and vegetation attributes still made it susceptible to degradation. The area contained too much bare soil and lacked desirable species of vegetation. The dominant species present lacked root masses that stabilize streambanks against cutting action.

Texas Creek—Colorado
October 1978
Proper Functioning Condition

Texas Creek—Colorado
October 1978
Proper Functioning Condition

Texas Creek—Colorado
July 1987
Proper Functioning Condition

Texas Creek—Colorado
October 1978
Proper Functioning Condition

By the end of the 1978 growing season, Texas Creek progressed to where it had crossed its threshold as described in Figure 2 in the Functioning Condition section. Using the Bureau's definitions, in October 1978, Texas Creek would have a rating of ***PFC***. **Yet, by no means had Texas Creek achieved its capability or potential. However, it may have achieved its management objectives and obtained its desired plant community (early seral versus PNC).** The early seral vegetation community that had established itself in the October 1978 photo possessed the ability to dissipate stream energies associated with high flows for Texas Creek. The instability that was present in Texas Creek in June 1978 had dissipated and the soil and vegetation attributes that placed Texas Creek into the category of ***functional—at risk*** were no longer present. Attributes such as reduced erosion; improved water quality; floodplain development; trapment of woody debris; improved retention of flood-water and ground-water recharge; diverse ponding; channel characteristics that provide habitat and water depth, duration, and temperatures necessary for fish production; and other wildlife values had been greatly strengthened.

Adjusting the rating of an area from ***functional—at risk*** to ***PFC*** may not be easy. For Texas Creek it was easy because 12 years of data had been collected. For most areas, BLM does not have that luxury. **That's why an ID team is necessary.** For some areas, the only way to assess functionality is with an effort like ESI.

Texas Creek—Colorado
July 1987
Proper Functioning Condition

Placing areas that have achieved late seral or PNC, as Texas Creek had in this July 1987 photo, into the appropriate category is easy. Using the Bureau definitions, Texas Creek would have a rating of ***PFC***. The difference between the October 1978 photo and the July 1987 photo is that the vegetation community was early seral for 1978 and late seral for 1987. However, both communities were functioning properly. Management defines its Desired Plant Community for an area, which in turn defines BLM's management options.

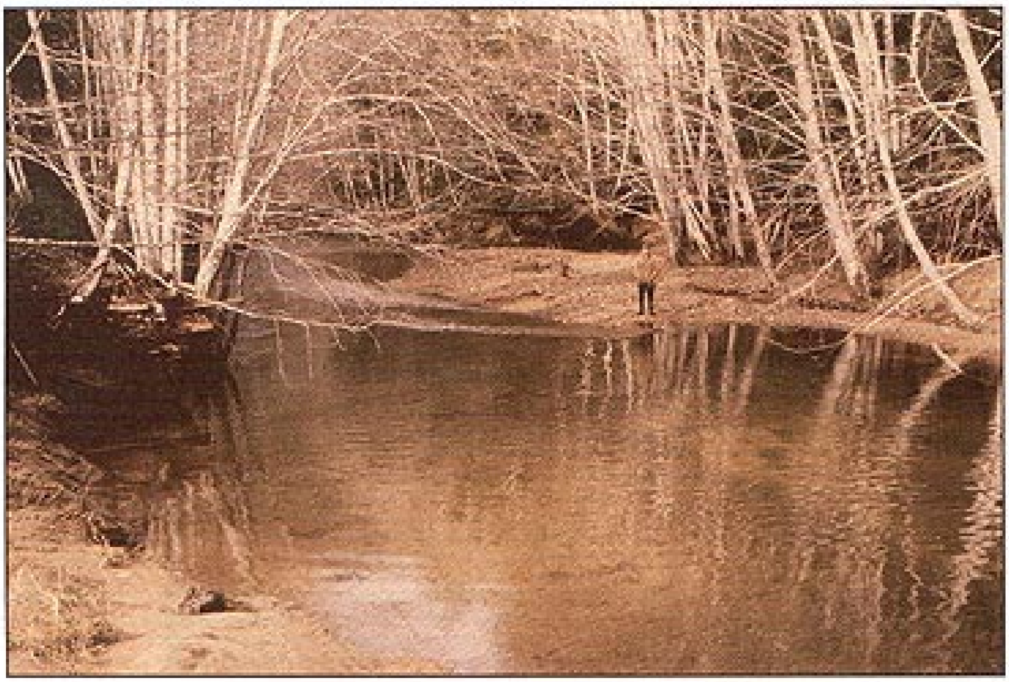
For example, bighorn sheep and brown trout are present in the Texas Creek watershed. If the desired species for management is bighorn sheep, which prefer early seral vegetation around watering sites, the desired plant community for Texas Creek would be early seral (October 1978 photo). At the same time, brown trout production is possible, but not at optimal numbers. Yet, the area can **function properly**. Optimal numbers of brown trout for this area would occur by managing for mid-seral to late seral. However, this would not be to the liking of the bighorn sheep.

Riparian-wetland areas can be managed to provide greater biodiversity as well as to allow the **entire area to function properly**. Most riparian-wetland areas can function properly in all seral stages, thus giving BLM greater management flexibility.

Forested Coastal Stream—Oregon
Nonfunctional

The below photograph gives an example of a coastal stream, located in Oregon, that would be rated as ***nonfunctional*** relative to BLM's definitions for proper functioning condition. The riparian area is clearly not providing adequate vegetation, landform, or large woody debris to dissipate stream energies associated with high flows. During precipitation events, the stream channel migrates, erosion continues, sediment is not filtered, flood-water retention and ground-water recharge are limited, and water quality is altered. Wildlife values are limited, and the area is not providing diverse ponding or channel characteristics that provide habitat and water depth, duration, and temperature necessary for fish production. The area provides little biodiversity.

Forested Coastal Stream—Oregon
Functional—At Risk



Forested Coastal Stream—Oregon
Proper Functioning Condition

Forested Coastal Stream—Oregon
Functional—At Risk

Establishment of alders provides the capacity to dissipate some stream energies that occur with flow events in this area. This capability results in captured sediment and bedload, reduced erosion, and improved water quality, and aids floodplain development and improves flood-water retention and ground-water recharge. In other words, the area has started to function physically.

In spite of functioning, this area would be rated as ***functional—at risk*** because a vegetation and hydrologic attribute still make the area susceptible to degradation. While the alder plant community does provide root masses that stabilize streambanks against cutting action, it probably is insufficient for major flow events. Large woody debris (hydrologic controls) is also lacking, which inhibits capture of sufficient bedload to aid in the development of habitat that provides water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses, thus supporting greater biodiversity.

This area will function properly before it obtains PNC. As the alder community ages, it will topple into the stream providing woody debris that aids in the capture of bedload. Also, as the alders depart, conifer climax species will dominate the site and provide the necessary bank stability. All this will occur before optimal numbers of wildlife and fish species (greater biodiversity) are achieved.

Forested Coastal Stream—Oregon
Proper Functioning Condition

The photograph to the left depicts a forested riparian-wetland area that achieved the rating of ***PFC***. The photograph clearly shows a coastal stream that contains adequate vegetation and large woody debris that is dissipating stream energy associated with high waterflows, thereby reducing erosion and improving water quality. The plant community has developed root masses that have stabilized streambanks against cutting action, filtered sediment, and captured sufficient bedload. This has aided floodplain development and has improved flood-water retention and ground-water recharge. The natural process has created diverse ponding and channel characteristics that provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses, thus supporting greater biodiversity.

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This technical reference outlines the Bureau of Land Management's (BLM's) process for assessing the functioning condition of riparian areas on public lands. Emphasis is placed on the interaction of vegetation, landform/soils, and hydrology in defining capability and potential of an area. The importance of using an interdisciplinary team is also stressed. The document describes four categories of functioning condition—proper functioning condition, functional—at risk, nonfunctional, and unknown, and discusses management strategies for each.

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