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CHANNEL TYPE USER GUIDE
Tongass National Forest
Southeast Alaska

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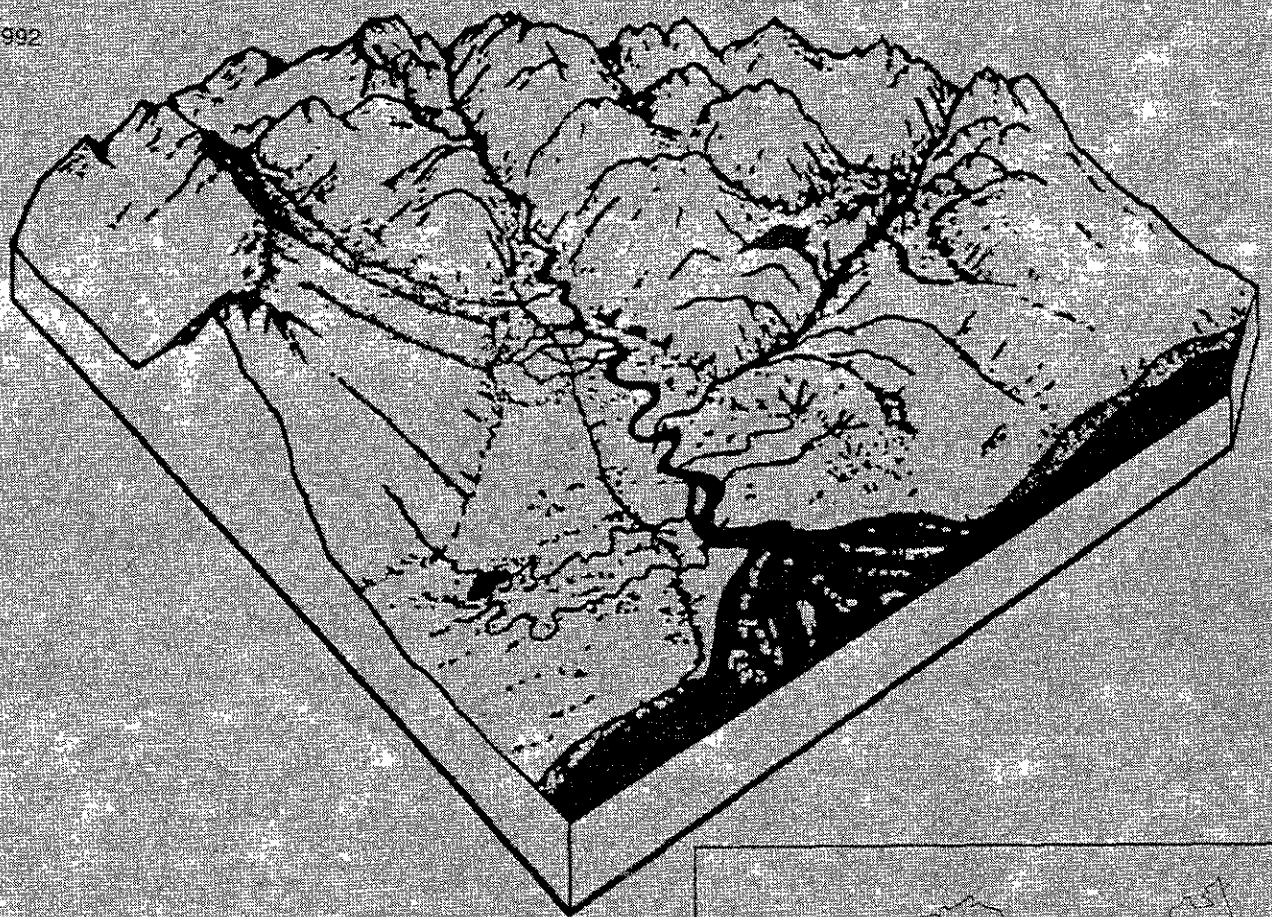
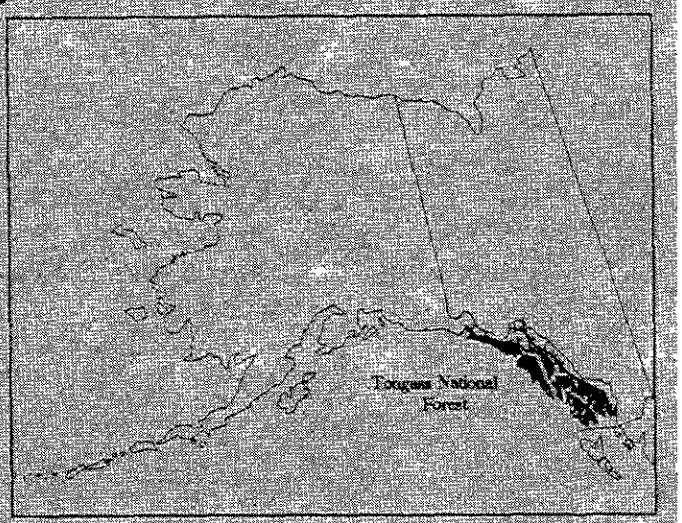
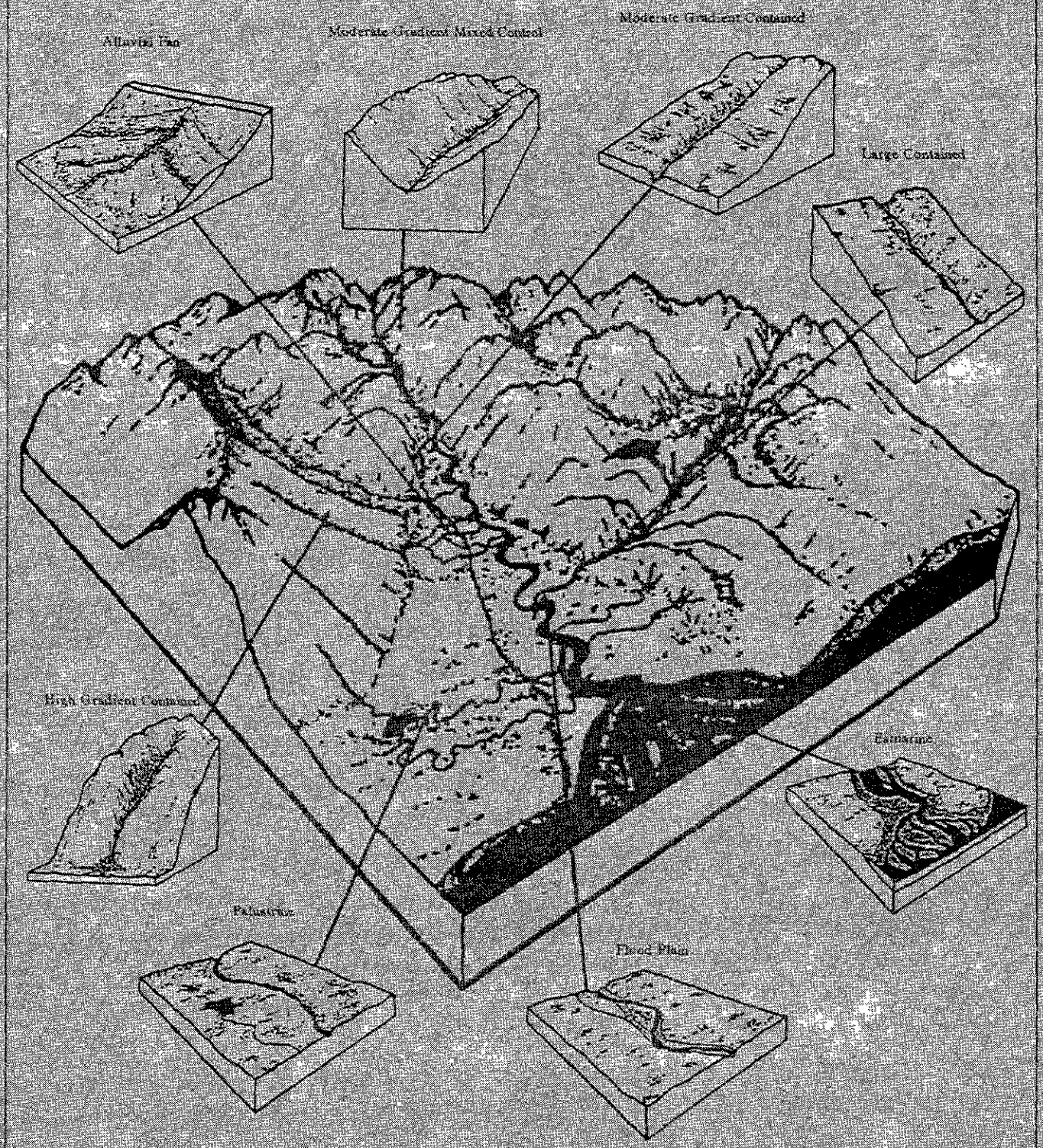




LOCATION MAP

TYPICAL DISTRIBUTION OF CHANNEL PROCESS GROUPS WITHIN ALEXANDER ARCHIPELAGO WATERSHEDS



A CHANNEL TYPE USERS GUIDE

for the Tongass National Forest, Southeast Alaska

USDA Forest Service, Alaska Region

R10 Technical Paper 26, April 1992

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Dedicated to the memory of Jim Downs, Soil Scientist.

Jim helped pioneer the application of integrated resource inventories in the Alaska Region.

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User Guide Purpose

This User Guide is intended for forest resource planners, fisheries biologists, hydrologists, ecologists, or anyone involved with water resource management on the Tongass National Forest. It describes a stream classification system based on mapped stream reaches called channel types. Since channel type mapping is a principal tool for managing aquatic and riparian resources of the Tongass National Forest, it is important that everyone involved with water and fisheries management in Southeast Alaska be familiar with this stream classification system.

The purpose of this User Guide is to provide users with sufficient information to understand the characteristics of each channel type and to know what should be considered when planning activities that may affect water and fisheries resources associated with each one. Channel types are being used for planning, implementing, and monitoring forest land management activities on the entire Tongass National Forest. In addition, most state and Native Corporation Land in Southeast Alaska has been mapped. Preliminary channel type mapping and stream inventory work is currently underway on the Chugach Forest in south central Alaska.

What Are Channel Types?

Components of the Alaska Region Channel Type Classification System are defined within the context of nine basic **fluvial process groups**. These process groups describe the interrelationship between watershed runoff, landform relief, geology, and glacial or tidal influences on fluvial erosion and deposition processes.

Individual channel type classification units within each process group are defined by physical attributes, such as channel gradient, channel pattern, stream bank incision and containment, and riparian plant community composition. Channel types are a means of distinguishing the various parts of a stream system. They allow us to define the characteristics of the channel and to predict, with a high degree of accuracy, probable responses to natural and human influences. However, channel types cannot be managed as isolated segments. Stream reach in one part of a watershed can be affected by activities taking place in a different part of the watershed, either upstream, downstream, or on adjacent land areas. Channel types help define the parts of a drainage basin and, as such, are tools intended to complement a holistic watershed management approach. It is important to remember this concept when using this guide.

Applications

The Channel Type Clasification System was developed with water resource management needs in mind. Propagation of anadromous fisheries is the major beneficial use of water resources in Southeast Alaska. Channel type inventories provide key information on fish habitat utilization, fish habitat capability, and fisheries enhancement options in survey area watersheds. Channel types also provide information on suitable stream crossing locations and design criteria for road drainage structures. Channel types are used to evaluate potential sediment delivery and retention for cumulative watershed effects analysis. Information on sport fishing potential and boat access is also included in the channel type descriptions.

The channel type mapping process involves three major steps. Initial mapping units are defined through interpretation of 1:15840 (4 in. = 1 mi) aerial photographs. Field verification of channel type mapping units, using low level air reconnaissance and on-the-ground spot checks is the next step. Finally, photo mapping is transferred to mylar topographic base maps (usually 2 in. = 1 mi scale) and then digitized, for incorporation into the ArcInfo, Geographic Information System (GIS). A corollary stream inventory data base that includes channel morphology data, fish habitat data, and information on riparian plant community composition also resides at the Watershed and Fisheries Staff Group in the Chatham, Stikine, and Ketchikan Area Forest Supervisor's Offices.

Channel type mapping of State and Native Lands is currently on hard copy base maps. These maps and field verification data are maintained by the Alaska Department of Fish and Game, Commercial Fisheries Division, in Juneau.

Things To Be Aware Of

The information contained in this user guide is intentionally brief. The purpose is to give a picture of channel type characteristics and management concerns. Anyone seeking additional information should consult area hydrologists or fisheries biologists, as well as the sources listed in the References. Every attempt has been made to simplify technical terms to make this guide useful to a variety of people. However, since not all technical terms can be simplified, a glossary is provided.

The information provided in this user guide refers to typical channel type conditions, and is intended to summarize those conditions that most frequently represent the range of channel type characteristics found throughout Southeast Alaska. Although channel type characteristics are relatively consistent, a degree of variability is inherent in these map units. Therefore, caution should be used in relying solely upon this information for site-specific project decisions. An individual channel type is not necessarily invalid if actual stream characteristics, such as channel width, are outside the range of values reported in this user guide. Site-specific channel characteristics and management interpretations should be verified in the field, as necessary, for project planning.

Channel type mapping should play a prominent role in setting priorities for any field verification. Not all streams are mapped in the Channel Type Inventory. These unmapped streams are predominantly very small (1 meter wide), mountainslope, wetland, and flood plain drainage features. This mapping limitation is due to the scale of aerial photography used and because vegetation canopy obscures most small streams. In general, these unmapped streams have little management significance. Exceptions are unmapped flood plain and wetland drainages that often have important seasonal fish habitat. Users should refer to soils or landtype mapping unit descriptions for information on the distribution and frequency of the unmapped streams in a given geographic area. Where apparent mapping discrepancies occur, users are requested to consult with Area Hydrologists or Fisheries Biologists.

The channel type information contained in this user guide is the result of many years of development, modification, and validation. Nevertheless, the Channel Type Classification System will continue to evolve as new applications are developed and as additional resource data is compiled. The Tongass National Forest Supervisor's Offices, in a coordinated effort, will issue updates to this user guide whenever the need arises.

This User Guide contains brief information for each of the 38 channel types currently mapped on the Tongass National Forest. There is a separate section, consisting of three parts, **TITLE, PHYSICAL CHARACTERISTICS, and MANAGEMENT CONSIDERATIONS,** for each channel type. Data used to describe the channel structure, riparian vegetation, and aquatic habitat has been obtained from channel typing verification and stream inventories conducted on watersheds throughout Southeast Alaska.

TITLE

Each section begins with the naming convention which includes the channel type name and the process group name. The channel mapping symbol is commonly used as the shorthand name for a given channel type.

Process Group Name. Various channels bear the signatures of the processes that formed them. Channels formed and maintained by the same or similar fluvial processes are grouped for taxonomic purposes. Process groups reflect the long term interaction of geology, landform, climate, and riparian vegetation. Process groups characterize the basic interrelationships between the runoff, sediment transport, and vegetation patterns along stream banks. Forest Plan Management guidelines and practices developed for each process group will consistently address the various management concerns for distinct channel types.

Channel Type Name. Within each process group are a number of channel types which further define differences and describe individual channels. Channel type names are similar to *species* in a biologic taxonomy or to *series* in a soils taxonomy. Channel types have less variable characteristics than the process group level of the hierarchy. This allows for more site-specific analysis and prescriptions for project level plans. Some channel types may have one or more phases, or common variants, which influence management interpretations. These are similar to biological *varieties* of species.

Mapping Symbol. Mapping symbols are assigned to each channel type and are often used as a shorthand means of identification. The mapping symbol legend is connotative so that the user can easily identify the process group and the general relationship between channel types in each one. The first two alpha characters are an abbreviation for the process group name (e.g. FP = Flood Plain Process Group). The first digit represents a distinct channel type unit. The channel type numbering sequence is designed to identify key physical criteria that help distinguish channel types within a given process group. For example, FP1 channel types have low stream gradient and fine bed substrate, whereas FP4 channel types have higher gradient and large substrate relative to other channel types in this particular process group. This connotative legend was recently developed, therefore, the old mapping symbol is placed in parentheses to assist those who have worked with the system prior to 1991.

Immediately beneath the channel type name(s) given at the beginning of each section is a figure that aids in understanding the process group and channel type being discussed. This block diagram illustrates typically associated landform and channel type morphology.

PHYSICAL CHARACTERISTICS

The Physical Characteristics section presents quantitative data for and qualitative descriptions of each channel type.

Geographic Setting. This subsection is a short description of landforms commonly associated with the channel type. It describes the typical size of the drainage basin and discusses features unique to the channel. Mapping symbols of similar channel types are listed.

Immediately following the Geographic Setting description are two figures. The first is a cross-sectional profile of the channel and its adjacent sideslopes. The second is an actual in-stream photo. Both represent average characteristics for the given channel type in Southeast Alaska.

Similar Channel Types. This is a list of channel type map units that have similar mapping criteria and differentia to the channel type being described.

Channel Structure. Quantitative geomorphic data from the Tongass National Forest Channel Type Database is included here. Mean values and percentages are calculated for all surveyed channels in the database. (See Chapter 20 of the R-10 Soil and Water Conservation Handbook [FSH 2509.22] for detailed explanation of data collection methodologies.)

Composite Channel Cross-Section. Channel cross-section schematics are based on a compilation of channel and sideslope profiles. Key morphologic characteristics shown in the diagram are mean values. The symbols in the diagram are defined as follows: **ID**=Channel Incision Depth, **Wbf**=Width Bankfull, **Bfs**=Bankfull Water Surface, **SS**=Sideslope Angle.

Gradient. Gradient refers to the slope of the water surface profile. It is usually measured using a clinometer and stadia rod over two riffle-pool sequences.

Incision Depth . Incision depth is the vertical distance between the first major slope break above bankfull stage and the channel bottom at the thalweg. It is measured using a visual estimate verified by a transect of the sideslope perpendicular to the stream.

Bankfull Channel Width. Bankfull width is the distance from bank to bank when the stream stage is considered to be "bankfull" or at the most active channel forming stage (may be considered to be a two year flood event). Bankfull width is generally measured using a surveyor's tape strung across a channel perpendicular to its banks.

Substrate. Substrate refers to the surface stream bed material composing the channel bottom and lower banks. It is measured using an ocular, boot-tip transect. The dominant size classes for each channel type are presented.

Bank Composition. Bank composition refers to the dominant stream bank material. Three bank composition categories are used - alluvium, bedrock, and mixed. Alluvial channel banks are composed of unconsolidated, fluvial, sediment particles with very infrequent bedrock occurrence (less than 2% bedrock along the channel segment). Bedrock channels have extensive bedrock outcropping along stream banks and stream bed (bedrocks occur along more than 15% of the stream segment). Mixed implies a combination of unconsolidated particles and bedrock material, where bedrock occurrences are consistent but not extensive (2-15% of the stream segment). Bank composition is determined from field surveys along a sample channel type segment.

Sideslope Length and Sideslope Angle. The landform immediately adjacent to the channel is characterized by sideslope length and angle measurements. These landform values are measured along the slope distance in the field using a clinometer and hip-chain along a 61 meter (200 feet) transect perpendicular to a representative portion of sample channel type. These parameters are not described for some flood plain and low relief riparian landforms.

Channel Pattern. The channel pattern is described as single, multiple, braided, or some combination of these categories. Channel sinuosity may also be described. Channel pattern is determined from aerial photography and verified in the field.

Basin Size. When appropriate, a range of the basin sizes associated with sample stream segments is listed.

Riparian Vegetation. Immediately preceding this subsection is a table showing the distribution of plant associations along the channel type within about 61 meters (slope) of the channel. These plant associations were inventoried in the same location as the sideslope profile transects. Data represents a weighted mean of canopy cover for each plant association occurring along the transect. The text and a table summarize the dominant plant association series and nonforested plant communities in the 61 meter riparian zone. The location of the most common plant communities with respect to the channel edge is also discussed. Note that these percentages reflect Tongass-wide data and may not reflect riparian plant communities representative of your local area.

Plant Association Series. This is a listing of major Forest plant series defined by the R-10 Plant Association Classification.

Channel Type Phases. This subsection provides a listing of phases that have been accepted for use with channel types on the Tongass National Forest. Phases may be considered variants or subspecies within the channel type, and are identified by the addition of a lower case letter immediately following the numeric digit of the channel type mapping symbol (e.g. FP2f). They are defined where taxon class limits are too wide for needed interpretations, or where some feature, such as adjacent riparian plant community structure, has significance for management. For further discussion on phases, refer to the appropriate section of Chapter 20 of the R-10 Soil and Water Conservation Handbook (FSH 2509.22).

MANAGEMENT CONSIDERATIONS

This section presents quantitative data for and qualitative descriptions of channel type characteristics that are pertinent to aquatic and riparian resource management. Channel type data and interpretations for various land management planning activities are summarized in this section, which is divided into three subsections, **Hydrologic Function, Aquatic Habitat Capability, and Riparian Management Considerations.**

Hydrologic Function. The hydrologic function of a channel refers to its typical flow characteristics (average as well as range), and, therefore, its ability to function in sediment routing. This discussion provides a qualitative assessment of whether a channel type best serves the erosion, transport, or deposition (storage) phase of sediment transport in a stream network. Relative stream energy or power describes the bedload transport capability of a channel type. It also includes relevant discussion on sediment sources, and the role of large woody debris on channel structure.

Aquatic Habitat Capability. This subsection contains a summary of key stream inventory data relevant to fish habitat capability, including available spawning area (ASA), available rearing area (ARA), and large woody debris (LWD) volume. A tabular summary of qualitative ratings for spawning and rearing habitat capability for key (Management Indicator Species - MIS) fish species is also listed. These ratings (LOW, MODERATE, HIGH) are based on a combination of habitat inventory data, fish population sampling, and the professional judgement of fisheries biologists and hydrologists having extensive knowledge of Southeast Alaska stream habitat and fisheries. A rating of NEGLIGIBLE (NEG) is used when the species of concern is not likely to utilize the channel type for spawning or rearing habitat. These ratings are meant to portray a very general picture of the potential quality of fish habitat associated

with a given channel type. The narrative following this table further describes various habitat characteristics, including spawning habitat distribution, the type and distribution of large woody debris habitat, pool characteristics, overwintering habitat, stream bank cover, and other important habitat features that are typical for that channel type. (Refer to FSH [FSH 2609.24 and FSH 2509.22] for more detailed discussion on aquatic habitat capability.)

Riparian Management Considerations. This subsection presents management concerns for instream and near-stream management activities, as well as a consideration of riparian management opportunities.

Management Concerns presents a rating (LOW, MODERATE, or HIGH) of the sensitivity of channel types to timber harvest and road building activities. A LOW sensitivity rating indicates a low probability that special mitigation measures for management activities are necessary to meet water quality and fish habitat protection objectives. MODERATE sensitivity indicates that some management limitations are associated with the channel type. Site specific mitigation measures may need to be considered. HIGH sensitivity indicates that site specific management prescriptions to protect water quality, fisheries, and riparian resources are usually needed. (N/A for not applicable is used when the particular concern does not apply.) Six general categories of concerns for management are considered. These include **Large Woody Debris, Sediment Retention, Stream Bank Sensitivity, Sideslope Sensitivity, Flood Plain Protection, and Culvert Fish Passage.**

Large Woody Debris. This concern deals with the need to provide long-term sources of large wood critical for maintaining stream channel structure and habitat diversity. The size, quantity, and distribution of natural large woody debris are primary factors considered in this rating.

Sediment Retention. This is a key water quality concern related to the potential for retention of fine sediments (sand particles or smaller) in spawning beds. Relative stream power is the primary factor considered in this rating.

Stream Bank Sensitivity. Stream bank sensitivity rates the potential for management disturbance associated with timber harvest or road crossings to contribute to accelerated stream bank erosion. Natural stream bank composition and channel stability factors are considered in this rating.

Sideslope Sensitivity. This rating deals with the potential for mass wasting erosion and sediment delivery resulting from disturbance of sideslopes associated with well contained channel types. Natural sideslope length and angle, and natural mass wasting potential are the primary factors considered.

Flood Plain Protection. This rating deals with the concern for maintaining riparian flood plain and wetland functions and long-term stability. Riparian habitat extent and diversity are the principal factors considered.

Culvert/Fish Passage. Fish passage concerns relate to the requirement that unrestricted migration of juvenile and adult salmonids be maintained through crossing structures on Value Class I streams. Stream class, peak stream discharge, stream gradient, debris and bedload transport potential are factors considered in rating culvert passage concerns for a given channel type.

BEST MANAGEMENT PRACTICES (BMPs)

A narrative elaborating principal riparian management concerns follows this rating table. Key Best Management Practices (BMPs) designed to protect water quality and beneficial uses, such as fisheries, wetland, and riparian habitats, are also referenced in this subsection (see Chapter 10 of FSH 2509.22). The BMPs referred to in this discussion are meant to provide guidance for development of site-specific riparian management prescriptions. However, this listing of pertinent BMPs should not be considered all inclusive, as additional BMPs will most likely need to be incorporated into individual management prescriptions.

Typical Stream Value Class. The typical stream value classes are also listed in this subsection. Stream class for a specific stream map unit should be adjusted based on site specific criteria when available.

Stream class for each channel type is indicated as Class I, II or III, depending on the fish use of the streams. These define AHMUs (Aquatic Habitat Management Units) in the Aquatic Habitat Management Handbook, FSH 2609.24. These stream classifications are defined as follows:

> **Class I**: Streams with anadromous (fish ascending from oceans to breed in fresh water) or adfluvial (fish ascending from fresh water lakes to breed in streams) lake and stream habitat. Also included are the habitat upstream from migration barriers known to be reasonable enhancement opportunities for anadromous fish and habitat with high value resident sport fish populations.
>
> **Class II**: Streams with resident fish populations and generally steep (often 6-15 percent) gradient (can also include streams from 0-5 percent gradient where no anadromous fish occur). These populations have limited sport fisheries values. These streams generally occur upstream of migration barriers or are steep gradient streams with other habitat features that preclude anadromous fish use.
>
> **Class III**: Streams with no fish populations but which have potential water quality influence on the downstream aquatic habitat.

Riparian Management Opportunities. This section discusses recreational sport fishing potential and various other enhancement opportunities.

Sport Fish Potential. Rates the relative potential (LOW, MODERATE, HIGH) for developing or enhancing a sport fishery on the typical channel type.

Enhancement Opportunities. Lists several habitat enhancement opportunities that may be feasible on a site-specific basis for a given channel type. Enhancement opportunities considered include large wood placement, fry stocking upstream of removed fish barriers, development of off-channel spawning beds, and introduction of beavers to improve rearing habitat.