

# Synthesis of Watershed Analysis and Ecoclassification at a River-Basin Scale for the Conservation and Management of Aquatic Ecosystems

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## Overview

Federal and state laws typically manage aquatic ecosystems by establishing a standard-width **buffer zone** on either side of a stream. Buffer zones are limited because they do not account for variation in an individual watershed. Some buffer zones are too small to allow proper riparian function, and some are too large and exclude management for harvest, disease control, and fire prevention.

A better approach is **watershed analysis**, which is an extensive analysis of stream conditions that examines the cause-and-effect relationship among streamside vegetation, fish habitat, and water quality. However, watershed analysis is costly. The goal of Technical Report #8 is to develop a watershed analysis framework, based on classification of the parts of a watershed, that can be applied cost-effectively to different watersheds.

## Key Points

Designing a framework for watershed analysis confirmed two conclusions:

1. A Geographic Information System (GIS)-based classification can be used to group physically similar channel segments.
2. These classifications, called **guilds**, can be used as a template to characterize other watersheds.

## Supporting Technical Information

When you perform watershed analysis across similar landscapes, common patterns begin to emerge. Certain types of channel shapes and vegetation communities typically occur together. These patterns are based on the landforms (geomorphic characteristics) of a particular section of a stream. Our work is based on the premise that geomorphic processes generally determine how the stream channel functions and what kind of fish habitat the stream provides.

### *GIS-Based Classification*

Geomorphic processes are predicted by landscape-scale features, such as geology, typical erosion processes, drainage patterns, and climate patterns. Aquatic organisms are found where the geomorphic processes provide habitats that are ideal for various species' needs. The GIS-based classification is used to identify groups of channel segments that have similar fish habitat, fish distribution, and sensitivity to land management activities. These geomorphic groups are called **guilds**.

Guilds are the building-block group of our ecoclassification approach. This classification approach includes the geomorphic characteristics of a stream that influence the presence of fish habitat, such as the following:

- Drainage area
- Stream size
- Valley bottom slope (steepness)
- Dominant substrate
- Lithology and landform class
- Principal riparian vegetative community type

GIS is used to identify particular guilds and locate the guilds on a map. The map then becomes a tool for resource management in a particular watershed.

### ***Guilds as a Template for Other Watersheds***

As described above, guilds can be effectively used to predict the presence of fish and identify sensitive habitat areas. Therefore, one guild type may be appropriate for one type of timber harvest, while another guild type is not.

By using the guild classifications we identified, landowners can better manage an entire watershed based on the needs of the individual guild types found within it. Although our study was limited to the Swan River Basin, this classification is appropriate for watersheds that have similar climate, geology, geomorphic processes, and vegetation.

## **Conclusion and Implications**

Effective management depends on knowing site-specific conditions. Watershed analysis is a good tool for defining site-specific conditions. The guilds identified in this Technical Report can be used to select appropriate management for specific areas of a stream. This approach accomplishes two goals:

1. Site-specific management is used to provide better habitat for species.
2. Landowners are not required to follow buffer widths that are too large and prevent economic use of the land.

Landowners can use the classification and analysis in this Technical Report to predict the distribution of rare or threatened species based on the habitat conditions. The classification can also be used by other industries, such as mining, grazing, or agriculture.