Hydroriparian Decision Guide

Design of Hydroriparian Reserves
and
Identification of Areas Suited
for
Ecosystem-Based, Consumptive Land Use

Introduction

The design of hydroriparian reserves, and the resultant identification of areas suited for ecosystem-based, consumptive land use at the watershed and sub-drainage basin levels is part of the design of networks of ecological reserves at multiple spatial scales, which include:

- sub-regional,
- landscape,
- watershed,
- sub-drainage basin/small watershed, and
- ephemeral/patch/site

This guide assumes that sub-regional/large landscape ecological reserves, including riparian ecosystems, have been designed. Thus, this guide focuses on hydroriparian ecosystems at landscape and watershed levels of reserve design.

Landscape and watershed *character* and *condition* provide information and constraints for ecological reserve design, including hydroriparian reserves. Sub-regional and landscape levels of reserves may include watersheds that are, in their entirety, part of a protected areas network. There is no need to plan hydroriparian and other reserves within fully protected watersheds.

Similarly, hydroriparian reserve design in a watershed needs to be connected with a complete ecological reserve design for the watershed.

While hydroriparian reserves can be designed in a vacuum, without considering other scales and/or watershed reserves, this approach does not respect the basic tenet of ecosystem-based management that requires interconnected planning and reserve design at multiple spatial scales. Appropriate reserve design at multiple spatial scales results in interdependent reserve designs at differing scales.

Identification of hydroriparian reserves without recognizing the interdependence of these reserves with other watershed level reserves and with reserves at other scales is not only piecemeal planning but also is inefficient. Such an approach may result in less area being included in the landbase suitable for consumptive land use due to the need to take a more precautionary approach in designing hydroriparian reserves outside of the context of other watershed level reserves and/or reserve design at other spatial scales. Therefore, the process described below to design hydroriparian reserves assumes that hydroriparian reserves will be designed as part of a broader process to identify reserves at multiple spatial scales.

What is a Hydroriparian Ecosystem?

The *hydroriparian ecosystem* may be defined as:

> *Aquatic ecosystems plus adjacent terrestrial ecosystems that are influenced by, or influence, the aquatic system. They extend vertically, below ground in the soil (especially in near-stream gravels), and above ground to the forest canopy where precipitation is first intercepted.* (Hydroriparian Decision Tool, Coast Information Team, 2003)

In this guide, the term *riparian ecosystem* is used interchangeably with the term *hydroriparian ecosystem*.

The *hydroriparian zone* may be defined as:

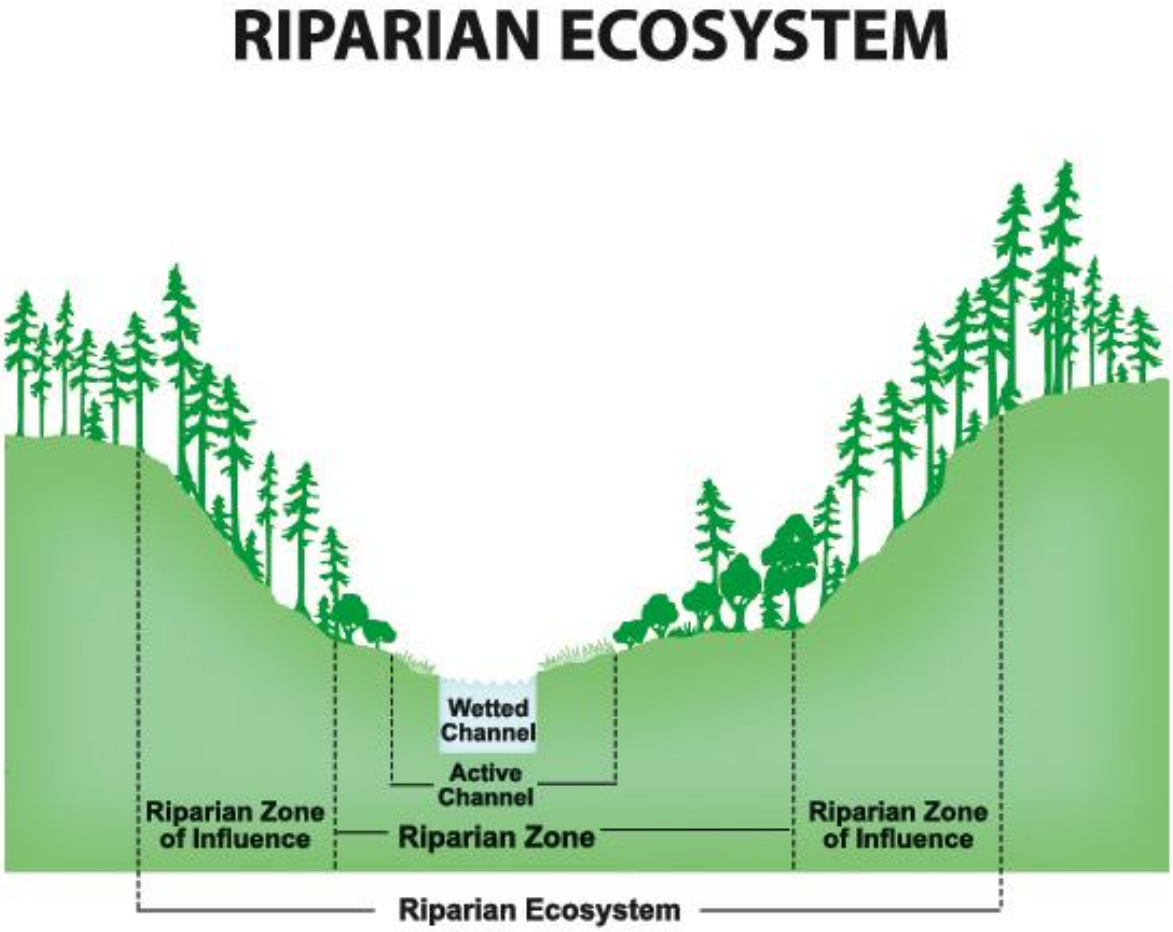
> *Area that extends to the edge of the influence of water on land defined by plant community (including high-bench or dry floodplains) or landform (e.g. gullies) plus two site-specific tree heights (horizontal distance) beyond. In the transportation and deposition process zones, the hydroriparian zone includes the entire valley bottom plus two site specific tree heights.* (adapted from Hydroriparian Decision Tool, Coast Information Team, 2003)

The hydroriparian or riparian zone is often divided into the riparian *zone* and riparian *zone of influence*. The riparian zone is approximated by the active flood plain and is recognized by plants adapted to living in wet environments. The riparian zone of influence is the upland ecosystems immediately above the riparian zone where ecological processes, like water filtration and/or mass movement of soil directly affect the riparian zone.

The definition of the hydroriparian or riparian zone, coupled with an understanding of the riparian or hydroriparian zone of influence provide a starting point for designing hydroriparian or riparian ecological reserves, or simply "hydroriparian reserves" or "riparian reserves." In other words, the hydroriparian or riparian reserve consists of the active flood plain of the water body plus two site

specific tree heights, or in the case of clear topographic changes the zone of influence extends to the first significant slope break or bench above the riparian zone.

A diagrammatic view of the hydroriparian or riparian ecosystem follows on the next page.


RIPARIAN ECOSYSTEM
Wetted Channel
Active Channel
Riparian Zone of Influence
Riparian Zone
Riparian Zone of Influence
Riparian Ecosystem

Key Points That Affect the Design of Hydroriparian Reserves and Highlight the Need to Protect Hydroriparian Ecosystems

- Hydroriparian ecosystems store and regulate the release of energy into water bodies through their multi layered, diverse, and often dense vegetation. As such, hydroriparian ecosystems buffer runoff and assist in maintaining more even annual flows than where riparian vegetation has been extensively modified. Maintaining hydroriparian ecosystems is vital to maintaining healthy aquatic ecosystems.

- The hydroriparian ecosystem (i.e. hydroriparian zone and zone of influence) extends at least 2 site specific tree heights from the normal high water mark, or to the first prominent slope break, whichever is the greater distance. Thus, in deeply incised creeks with steep slopes that run from valley bottom to mountain top, the hydroriparian ecosystem may extend from valley bottom to ridge top.

- The smallest streams are the most dependent upon tree cover to regulate water chemistry, water temperature, water turbidity; and for in-stream structure of fallen trees. In-stream fallen trees create structural diversity important for aeration of water, collection of sediment, diverse fish habitat, and for habitat for the prey of fish. Often these streams may be ephemeral, or so small that they do not contain fish. However, they are amongst the most important hydroriparian ecosystems to protect, because their characteristics cumulate to create the characteristics of streams, rivers, and lakes that contain fish.

- The majority of the mammals in the Xeni Gwet'in Caretaker Area require healthy, intact hydroriparian ecosystems at either some point in their annual life cycle, or at some point in their overall lives. Therefore, hydroriparian ecosystems are biological hot spots that a large percentage of the species in the Caretaker Area depend upon.

Design of Hydroriparian Reserves—Hydroriparian Ecosystem Networks (HENs)

As stated in the introduction, this guide assumes that sub-regional/large landscape ecological reserves, including riparian ecosystems, have been designed. Thus the process for design of hydroriparian ecosystem networks (HENs) outlined below is applicable primarily to small landscapes, watersheds, and sub-watershed drainage basins.

The generic process for designing hydroriparian ecosystem networks (HENs) reserves is explained in a series of steps below.

Step 1: ***Landscape context . . .*** Use the *characteristics* of the landscape to identify the existence of rare ecosystems, ecologically sensitive areas (e.g. frequent wet slopes), etc. within or adjacent to riparian ecosystems.

Use the *condition* of the landscape to determine the appropriate level of risk to apply in the design of hydroriparian reserves. In landscapes that have been moderately to highly modified, the appropriate level of risk acceptable for hydroriparian reserves, including upland "zone of influence" reserves in the watershed will be low risk. This means that the riparian reserve will extend beyond the minimum definition of hydroriparian ecosystems to include unusual and/or representative upland forest or other ecosystem types. This approach to design of hydroriparian reserves serves to add protection of broader biodiversity in modified landscapes.

For landscapes that have only been slightly modified to unmodified, the appropriate level of risk will generally be moderate. This means that the hydroriparian reserve will generally be limited to the boundaries of the riparian ecosystem, including both the riparian zone and the riparian zone of influence. In instances where the riparian zone of influence abuts a unique, rare, or sensitive ecosystem type, the hydroriparian reserve will be expanded to include these ecosystem types.

Step 2: ***List constraints for hydroriparian ecosystem functions. . .*** The constraints and information developed from reviewing the interpretive maps for hydroriparian ecosystem functions, including maintaining hydrological regime, maintaining stream morphology, maintaining channel bank stability, and providing down wood, respectively will identify both the need and potential locations/boundaries for some hydroriparian ecosystem reserves in the watershed and sub-drainage basins that make up the watershed.

Constraints are derived from analyzing interpretive maps:

- Interpretative Map 1: Identify sensitive terrain---data sources: terrain mapping and air photo interpretation

- Interpretative Map 2: Hydroriparian ecosystems---data sources: terrain mapping, TRIM, forest cover,

- Interpretative Map 3: Terrestrial ecosystems---data sources: forest cover, site series

- Interpretative Map 4: Rare Ecosystems---data sources: site series, forest cover, CDC listings

- Interpretative Map 5: Watershed Condition and Old Growth Forests---data sources: forest development plans, forest cover, site series

These reserves will be mapped as the beginning of the hydroriparian ecosystem network (HEN). Further hydroriparian ecosystem reserves will be added to the HEN as the process of identifying hydroriparian reserves continues in the steps that follow.

Step 3: ***Location for watershed refugia . . .*** In order to maintain high-valued fish habitat, watershed level refugia will be selected from analysis of the interpretive maps that synthesize high-valued fish habitat. These watershed refugia will be added to the hydroriparian ecosystem network map.

Step 4: ***Biodiversity for transport and deposition zones . . .*** Establish initial hydroriparian reserves, defined as the entire valley bottom plus two site specific tree heights. These initial reserves are subject to review according to the level(s) of acceptable risk, to site specific terrain/ecological features, and to representation of ecosystem type analyses. Appropriate interpretive maps will provide important information regarding site series, stand age, and tree cover that are useful in defining appropriate boundaries for hydroriparian reserves for biodiversity in the transport and deposition zones. Once defined these hydroriparian reserves in the transport and deposition zones will be added to the hydroriparian ecosystem network, and mapped accordingly.

Step 5: ***Biodiversity for initiation zone . . .*** Identify small streams in the initiation zone that are fish bearing streams and their direct tributaries, and establish initial hydroriparian reserves of two site specific tree heights for these streams. For other small streams, locate hydroriparian reserves for groups of small streams considering geographic distribution of reserves, site series representation, structural stage (stand age), and forest cover. Add hydroriparian ecosystem reserves for small fish-bearing streams and their direct tributaries, and hydroriparian ecosystem reserves for groups of small streams to hydroriparian ecosystem network, and map accordingly. Note, hydroriparian ecosystem reserves for small streams in the initiation zone may actually result in reserves from one small stream joining with reserves for another small stream.

Step 6: ***Rare ecosystems . . .*** Using interpretive mapping, identify the location of rare ecosystems in hydroriparian ecosystems. Ensure that these rare ecosystems are contained within already identified hydroriparian ecosystem reserves established in earlier steps, or establish additional hydroriparian ecosystem reserves for rare ecosystems. As necessary, add additional hydroriparian ecosystem reserves for rare ecosystems to the hydroriparian ecosystem network, and map accordingly.

Step 7: ***Riparian corridors . . .*** Review hydroriparian ecosystem network map to determine whether or not hydroriparian connectivity is well-distributed throughout the watershed, including from headwaters to the bottom of the watershed, and across the watershed. If using a risk assessment approach, identify any additional hydroriparian reserves necessary to provide adequate connectivity, based upon selected level of risk. As appropriate, add additional hydroriparian reserves for corridors to hydroriparian ecosystem network, and map accordingly.

Step 8: ***Ecosystem productivity . . .*** Test hydroriparian ecosystem network map with site series map to determine whether the range of ecosystem productivity present in the watershed is well-represented within the hydroriparian ecosystem network. Based upon the selected level of risk for ecosystem productivity, add, as required, additional hydroriparian ecosystem reserves to ensure representation of ecosystem productivity in the hydroriparian ecosystem network, and map accordingly.