

## Review of Riparian/Wetland Buffers Literature

### What are buffers? Why are they Important?

- An area adjacent to a resource that preserves or protects the resource's ecological functions (1.)
- Buffers are vegetated areas adjacent to an aquatic resource that can, through various physical, chemical, and/or biological processes, reduce impacts from adjacent land uses. Buffers also provide the terrestrial habitats necessary for wildlife that use wetlands to meet their life-history (2.)
- The primary purpose of buffers is to protect and maintain the wide variety of functions and values provided by wetlands (or other aquatic areas). The physical characteristics of buffers—slope, soils, vegetation, and width—determine how well buffers reduce the adverse impacts of human development and provide the habitat needed by wildlife species that use wetlands (2.)

### Terms used to Describe Buffers:

The scientific literature varies widely on the terms used to denote the area that serves to reduce impacts to wetlands from adjacent land uses and provide habitat for parts of the life-cycle of many species. Common terms include:

- Buffer
- Wetland setback
- Vegetated filter strip
- Buffer strip
- Riparian area
- Riparian zone
- Riparian corridor

These terms can be differentiated as those that are a product of regulations or policy language and those that define or describe an ecological condition or location (Castelle et al. 1994). Terms such as *buffer*, *wetland setback*, or *vegetated filter strip* are most commonly applied in an administrative context to denote the landscape immediately adjacent to an aquatic resource, the dimensions of which are legally determined.

### Functions of Buffers:

The literature is broadly consistent on the ways in which buffers can provide for the protection and maintenance of wetland functions (2.). These include:

- Removing sediment
- Removing excess nutrients (phosphorous and nitrogen)

- Removing toxics (bacteria, metals, pesticides)
- Influencing the microclimate
- Maintaining adjacent habitat critical for the life needs of many species that use wetlands
- Screening adjacent disturbances (noise, light, etc.)
- Maintaining habitat connectivity

### **How wide does a buffer need to be?**

- Wide-ranging discussion about how much buffer is necessary to be effective in providing a particular level of function (Young et al. 1980, Booth 1991, Castelle et al. 1994, Norman 1996, Dosskey 2000, McMillan 2000, Rickerl et al. 2000).

### **Effective Widths for Water Quality and Wildlife Habitat**

#### **Water Quality**

Buffers protect the water quality of wetlands through four basic mechanisms:

- They remove sediment (and attached pollutants) from surface water flowing across the buffer
- They biologically “treat” surface and shallow groundwater through plant uptake or by biological conversion of nutrients and bacteria into less harmful forms
- They bind dissolved pollutants by adsorption onto clay and humus particles in the soil
- They help maintain the water temperatures in the wetland through shading and blocking wind

#### **Summary of Buffer Widths (2.)**

Below are useful summary tables describing the effective ranges of buffers for water quality and wildlife habitat from the comprehensive Washington Department of Ecology report (2.)

Table 5-7 presents a summary of the buffer ranges recommended by the authors who conducted literature reviews or syntheses on buffer effectiveness. Minimums ranged from 25 feet (8 m) to 197 feet (60 m). Maximums ranged from 98 feet (30 m) for some land uses to 350 feet (107 m).

**Table 5-7. Summary of recommendations for buffer dimensions from the literature.**

Author(s)	Date	Minimum Buffer	Maximum Buffer	Comments
Castelle et al.	1994	50 to 100 feet (15 - 30m)		"Minimum buffers necessary to protect wetlands and streams under most circumstances"
Fischer et al.	2000	98 feet (30 m)	328 feet (100 m)	Larger buffer for reptiles, amphibians, birds and mammals
Groffman et al.	1991 a	197 feet (60 m)	328 feet (100 m)	For most wildlife needs
Howard and Allen	1989	197 feet (60 m)		For most wildlife needs
McMillan	2000	25 feet (8 m)	350 feet (107 m)	Case by case, using a rating system and the intensity of proposed or existing land use for protecting most wetland functions
Norman	1996	164 feet (50 m)		To protect wetland functions; more may be required to protect more "sensitive wildlife species"

**Table 5-8. A summary of the effectiveness of pollutant removal and the value of the wildlife habitat of vegetated buffers according to buffer width (Desbonnet et al. 1994).**

Buffer Width in Feet (Meters)	Pollutant Removal Effectiveness	Wildlife Habitat Value
16 feet (5 m)	Approximately 50% or greater sediment and pollutant removal	Poor habitat value; useful for temporary activities of wildlife
32 feet (10 m)	Approximately 60% or greater sediment and pollutant removal	Minimally protects stream habitat; poor habitat value; useful for temporary activities of wildlife
49 feet (15 m)	Greater than 60% sediment and pollutant removal	Minimal general wildlife and avian habitat value
66 feet (20 m)	Greater than 70% sediment and pollutant removal	Minimal wildlife habitat value; some value as avian habitat
98 feet (30 m)	Approximately 70% or greater sediment and pollutant removal	May have use as a wildlife travel corridor as well as general avian habitat
164 feet (50 m)	Approximately 75% or greater sediment and pollutant removal	Minimal general wildlife habitat value
246 feet (75 m)	Approximately 80% or greater sediment and pollutant removal	Fair to good general wildlife and avian habitat value
328 feet (100 m)	Approximately 80% or greater sediment and pollutant removal	Good general wildlife habitat value; may protect significant wildlife habitat
656 feet (200 m)	Approximately 90% or greater sediment and pollutant removal	Excellent general wildlife value; likely to support a diverse community
1,968 feet (600 m)	Approximately 99% or greater sediment and pollutant removal	Excellent general wildlife value; supports a diverse community; protection of significant species

### Summary of Key points from Above Tables:

Many researchers have recommended using four basic criteria to determine the width of a buffer:

- the functions and values of the aquatic resource to be protected by the buffer
  - the characteristics of the buffer itself and of the watershed contributing to the aquatic resource
  - the intensity of the adjacent land use (or proposed land use) and the expected impacts that result from that land use
  - the specific functions that the buffer is supposed to provide including the targeted species to be managed and an understanding of their habitat needs
- Protecting wildlife habitat functions of wetlands generally requires larger buffers than protecting water quality functions of wetlands
  - Effective buffer widths should be based on the above factors. They generally should range from: 25 to 75 feet (8 to 23 m) for wetlands with minimal habitat functions and low-intensity land uses adjacent to the wetland 75 to 150 feet (15 to 46 m) for wetlands with moderate habitat functions and moderate or high-intensity land uses adjacent to the wetland 150 to 300+ feet (46 to 92+ m) for wetlands with high habitat functions,

regardless of the intensity of the land uses adjacent to the wetland

- Fixed-width buffers may not adequately address the issues of habitat fragmentation and population dynamics. Several researchers have recommended

### **Maintaining Buffers:**

- Maintenance by Private and Public depending on ownership.
- Width and Fencing—increased width along with fencing increasing the long term effectiveness of the riparian/wetland buffer.

## **Review of Model Buffer Ordinances (3.)**

### **Background**

- Riparian/wetland protection ordinances adopted by local government take two principal forms:
  - **‘Stand-alone ordinances’;**
    - Buffers, stream setbacks, and various river and stream corridor protection ordinances, and
  - **Regulations adopted as part of broader resource protection or comprehensive planning efforts.**
    - Riparian protection regulations adopted as part of broader regulations, include floodplain ordinance, stream setbacks, minimum lot sizes, restrictions on vegetation removals. Combined wetland and riparian areas “sensitive area”

## **Typical Ordinance Components**

### **Finding of Fact**

- Riparian and Wetland ordinances usually begin with findings of fact. Findings help explain to the public, landowners, and regulatory agencies why the ordinance is necessary.
- Important for evaluating permit applications, and providing outreach and education (what has happened to the resources, and what is recommended to be done to protect/improve resources).

### **Purposes, Goal**

- What is the point of the rules, incentives, etc.?

### **Definitions**

- Technical terms are defined and approved by all groups.

### **Lands to Which Ordinance Applies**

- Formally identify the lands and waters to which an ordinance applies.

### **Delineation**

- Provision for on-site field investigations to determine how definitions/rules apply.
- Many ordinances allow landowners to contest determinations by map or in the field—typically a landowner must submit a technical report to support any proposed changes

### **Non-conforming Activities**

- Typically ordinances allow existing, lawful activities to continue in buffer areas—however expansion of activity or reestablishment of an activity after abandonment is discouraged

### **Enforcement**

- Most difficult to check that the ordinance is being followed correctly and consistently.

### **Sources:**

- 1. Summary of Streamside Science (January 2002):** see 'Background Information Section' in Benton County Riparian and Wetlands Work Binder.
  - Reviewed literature general buffer width recommendations ranged from 50-326 feet.
  - 100 ft buffers are frequently cited as appropriate.
- 2. Wetlands in Washington State - Volume 1: A Synthesis of the Science (March 2005):** <http://www.ecy.wa.gov/biblio/0506006.html>
- 3. Model Ordinances for Regulating Wetlands; Riparian Habitats; Stream Buffers (December, 2009).** Discussion Paper for Association of State Wetland Managers