NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE GENERAL SPECIFICATIONS

RIPARIAN FOREST BUFFER

(Acre)

Code 391

THE LANDSCAPE PLANNING APPROACH

Three basic landscapes where a riparian forest buffer could be utilized will be considered in this specification.

Forested Landscape (timber production)

Forested Landscape (wildlife land)

Agricultural Landscape (agricultural land)

Suburban/Developing Landscape (urban land)

Many of the design criteria for Riparian Forest Buffers in each landscape will be similar but the intended purposes will vary. Similarly practices required to meet the Riparian Forest Buffer Standard (391) will vary by landscape.

General Buffer Parameters for Riparian Forest Buffers for all Land Uses

1. The upland edge of a riparian-forested buffer will be for the most part on the contour in order to promote sheet flow through the riparian forest buffer. This can be achieved using other conservation practices such as. Contour Farming (330), Diversions 362, Filter Strip (393), Field Border (386), Site Preparation, (490) Terrace (600) and other practices that will create and promote sheet flow through the forested section of the riparian forest buffer.
2. Water conveying structures such as tile drainage and grassed or rock lined waterways; ditches, culverts and non-essential roads will be removed from the riparian forest buffer. These serve to 'short circuit' the effects of the riparian forest buffer in treating water that comes from up slope areas especially on agricultural and urban lands.
3. The goals of the riparian buffer will be stated as part of its design. Examples of such goals are sediment removal, nutrient removal from surface or subsurface waters, wildlife or aesthetics.
4. Site preparation before planting can be used to restore the surface micro topography that is essential in the functioning of the buffer. Examples of site conditions are; associate wetlands, pit and mound ground surface, and organic mat/duff.
5. Tree, shrub and understory plant establishment can be by planting, natural regeneration or a mixture of both. Select the best technique suited for the restoration effort. Plant establishment techniques employed, target species, composition and density will be documented.
6. An ecological site description will be utilized to determine final species composition and density condition of the riparian forest buffer.
7. For all landscapes the three zone buffer system will be utilized in the design when the goal is sediment and nutrient treatment and removal.
8. For all landscapes the riparian forest buffer will be used in conjunction with nutrient and pest management practices, when the purpose of the buffer is to reduce these impacts.

INDIVIDUAL LANDSCAPE SPECIFICATIONS

FORESTED LANDSCAPE

Streamside Management Zone (SMZ) – an area of forest, varying in width, where timber management practices that might affect water quality or aquatic resources are modified. Objectives for the forested areas closest to the water are oriented away from timber productions and towards water quality protection and habitat concerns. Forest composition in the SMZ commonly represents a more natural diversity, rather than favoring only commercial species. SMZ widths are usually fixed, but may vary from 35 feet to 660 feet. The effective widths are typically controlled by slope or biological considerations. In Alaska the SMZ is determined by the region you are operating in and type of stream you are protecting.

Resource Concerns that are addressed in the SMZ are:

Water Quality – Surface Water – sedimentation, temperature extremes

Plants – Endangered Species, Loss of Riparian Vegetation.

Animals, Habitat Quality – Loss or Fragmentation of Habitat; Loss or Degradation of Forest or Riparian Habitat; Eutorphication of a Water Body; Water Temperature Extremes.

TWO ZONE BUFFER DESIGN FOR FORESTED LANDSCAPES

Zone 1 will be a minimum of 50 feet wide. This zone starts at the high water mark of an anadromous stream or high value resident fish water body. This zone will be composed of native vegetation with no disturbances from logging. Trails in this zone will only be used in crossing streams and for water access. Forest management activities in these areas can be used only for the purpose of maintaining the health and protection of the forest plant community within zone 1. Planned management or treatment action in zone 1 requires the approval of the state specialist and The AK DNR State Forester or his/her representative.

Zone 2 will begin at upper edge of zone 1 and will extend 100 feet from the edge of the water body. Harvest will be limited to leaving 30 percent of the original preharvest canopy.

Trails will be kept at a minimum and will be used only for extraction and not for conveying of forest products to a landing area. No more than 5% of the forest duff will be disturbed to mineral soil.

The minimum overall width of a forested riparian buffer (zone 1 + zone 2) will be 100 feet; additional width will be added based on site specific conditions and additional design criteria.

BUFFER PARAMETERS FOR WILDLIFE HABITAT (FORESTED LANDSCAPE)

Wildlife habitat is often difficult to improve or create due to the large and complex expanses that any particular wildlife may need. For example: Neotropical Song Birds may need a minimum 330 feet of buffer width for breeding habit, with an associated 200 acres of total forest. These same songbirds would greatly benefit if this area were as large as 1000 acres, which maximizes value for migrating songbirds.[1]

Some species such as mink and kingfisher were found to establish territories within a very narrow band within a buffer, 60 feet.

Travel corridors for most wildlife need to be a minimum of 660 feet (200 m) for all but the largest mammals. Wood ducks a noted riparian fowl nest most commonly within 660 (200 m) feet of open water. [2]

Meeting the entire habitat requirement through riparian buffers is often impractical. For example Brown bears will travel up to 3 miles in a daily cycle of feeding and resting. This allows for females and younger bears to have access to riverbanks and then retreat to safer areas, while large boars, come and go as they please. Buffers that are 3 miles in width may not be attainable.

For the most part buffers of 660 feet will provide for the habitat of most species with the

exception of large mammals and raptors such as brown bears, moose and eagles.

Where Wildlife habitat improvement is the primary objective of a Riparian Forest Buffer the minimum width will be 660 feet and the maximum width will be 1000 feet. Widths in excess of 1000 feet will need approval from the NRCS biologist.

AGRICULTURAL LANDSCAPE

The area of forest and trees that lies between an agricultural land use and aquatic habitat will be referred to as a riparian forest buffer. This area can be an existing forested area that was left in place when the agricultural land use was developed or it could be agricultural land that is being converted to a forested land use for the purposes of buffering the effects of the agricultural land use.

Agricultural land uses are characterized by:

- Maintenance and promotion of non-native plant cover
- Irregular and regular applications of nutrients and soil supplements
- Periodic disturbance of ground covers with an increased potential for soil movement.
- Application of pesticides and other chemicals.

A riparian forest buffer will be implemented as part of a suite of practices to reduce the impacts of farmland on the surrounding environment. In other words a riparian forest buffer will be used only as a finishing treatment

Resource concerns that are addressed by the Riparian Forest Buffer in Agricultural landscapes:

Water Quality – Surface Water –
Sedimentation, Temperature Extremes, Animal Wastes, Salts, Loss of Riparian Vegetation Loss of Wetlands, Stream Bank or Shoreline Erosion and Degradation

Water Quality – Ground Water

Nutrients, Pesticides Animal Waste Salts Loss of Wetlands

Water Quantity-

Declining Water Tables, Excess Surface Water

Plants –

Loss of Plant Diversity, Loss of Riparian Vegetation, Reforestation

Animals-

Habitat Quality – Loss or Fragmentation of Habitat; Loss or Degradation of Forest or Riparian Habitat; Eutorphication of a Water body; Water Temperature Extremes.

The maximum width for a riparian forest buffer used to threat agricultural lands will be determined by documented needs.

TWO ZONE BUFFER DESIGN FOR AGRICULTURAL LANDSCAPES

Zone 1 will be a minimum of 25 feet wide. This zone starts at the high water mark for the protected water body and will reach a minimum of 25 feet in width. This zone will be composed of naturally occurring native vegetation with no disturbances from logging. Trails in this zone will only be used in crossing streams and for water access. Forest management activities in this zone can be used but only for the purpose of maintaining the health and protection of the forest plant community. Planned management in zone 1 requires the approval of the state specialist. The upper edge of zone 1 will be determined by either Table 1, Table 2 or specific wildlife needs.

Zone 2 will begin at upper edge of zone 1 and will extend to the beginning of either the agricultural land use or the herbaceous filter strip. Zone 2 will be characterized by a continuous forest canopy whose purpose is to accomplish filtration, encourage deposition, provided for anaerobic denitrificaiton and other natural processes that remove sediment and nutrients from runoff and subsurface flows. This zone will be a minimum of 50 feet in width. Limited forest harvest activities will be allowed but only for the removal of nutrients sequestered in forest vegetation.

Herbaceous filter (formerly known as zone 3) will begin at the outer edge of zone 2 and will be a minimum of 25 feet wide to a maximum width needed to accomplish the

intended purpose of this zone. This zone will be characterized as land that will remain in grass cover, whose purpose is disperse concentrated flow, facilitate water infiltration and remove nutrients and sequester them in organic matter for either harvest or slow release into the environment. Removal of nutrients will be accomplished through controlled grazing and haying. This herbaceous filter will be used when soil has the potential to leave the crop field and enter the forested portion of the riparian forest area.

The minimum width of a riparian forest buffer used to treat agricultural land use effects maybe reduced to 75 feet[5] for Capability Class II e/s IIIc and IVc but the 100-foot buffer should be encouraged.

The minimum buffer with for Capability Class IIIe/s/w, and IVw soils is 100 feet

For soil capability class IVe, and all other VI, and VII soils the minimum buffer width is 150 feet.

The minimum total width of a forested riparian buffer for agricultural land will be 75, 100 or 150 feet based on Soil Capability Class. Where soils have not been mapped or if adjacent to an anadromous or high value stream the default minimum width will be 100 feet or a width based other scientific criteria.

URBAN –SUBURBAN DEVELOPING LANDSCAPE

These are landscapes where the riparian buffers are being retained, created and or managed to provide forested features between open parks, ball fields, roadways, lawns and residential commercial structures. They are retained or created to provide functions and values of sediment filtering, enhanced infiltration, nutrient uptake and processing, temperature moderation, noise control, screening, aesthetics, and wildlife habitat.

The resource concerns addressed with riparian buffers in urban-suburban developing landscape are:

Water Quality – Surface Water –

Sedimentation, Temperature Extremes, Domestic Pet-Wastes, Salts, Loss of Riparian Vegetation, Loss of Wetlands, Stream Bank or Shoreline Erosion and Degradation, Storm water Runoff

Water Quality – Ground Water

Nutrients, Pesticides Animal Waste, Salts

Water Quantity-

Declining Water Tables, Excess Storm Water Runoff.

Plants –

Loss of Plant Diversity, Loss of Riparian Vegetation,

Animals-

Habitat Quality – Loss or Fragmentation of Habitat; Loss or Degradation of Forest or Riparian Habitat; Eutorphication of a Water Body; Water Temperature Extremes.

Human- Social

Visual screening, Aesthetics, Quality of Life, Historic Preservation.

Air- Particulate Pollution, Excessive wind, Odor and Noise

BUFFER PARAMETERS FOR RIPARIAN FOREST BUFFERS FOR URBAN/DEVELOPOING LANDS

The minimum buffer width for an urban/suburban landscape is 35 feet for an existing developed area. This minimum width allows for two rows of trees to be established and mature and provide a specific benefit. This width allows for the installation of a buffer in areas that previously were developed. .

Newly developed area where buffers are being planned in conjunction to urban/rural development should be a minimum of 100 feet in width and have a three-zone design.

The three-zone buffer can be effective in an urban and rural setting where each zone can perform a different function. Each zone has a varying width and may have different vegetation.

Zone 1, referred to as the streamside zone. It protects physical and ecological integrity of the stream ecosystem. The vegetative target is a mature riparian forest that can provide shade, leaf litter, woody debris, and erosion protection to the stream. The minimum width is 25 feet. The land use is highly restricted. In existing urban situations, pre-existing conditions used as confined storm water channels footpaths, and utility and roadway crossings are allowable but in newly planned buffers these are discouraged.

Zone 2, referred to as the middle zone. It extends from the streamside zone and varies in width depending on many factors. A minimum width for zone 2 is 50 feet. It should encompass the entire 100 year flood plain if possible, adjacent wetlands, and steep slopes. Its function is to provide additional treatments as well as provided for non-competing uses of the area such as walkways and trails, picnic areas and other passive uses of forested land. The vegetative target for this area is mature forest with some openings, with an understory ground cover that allows for multiple uses.

Herbaceous filter (formerly known as zone 3) It is an additional 25-foot setback. This area is typically non-forested and does not included hardened surfaces. In urban areas these are typically lawns and backyards. These zones functions to disperse concentrated flow facilitate water infiltration and remove nutrients and sequester them in organic matter for either removal or slow release into the environment. Removal of nutrients will be accomplished through controlled mowing and grass clipping removal. In residential settings, the application of nutrients and pesticides should follow nutrient and pest management standards for the buffer to meet designed function.

The minimum width of a forested riparian buffer for new urban and developing land will be 100 feet and will be based on these and other scientific criteria

On existing urban and developing lands the minimum width of a forested riparian buffer will be 35 feet.

Maximum widths will be established to meet specific functions and goals.

VEGETATION PRESCRIPTION AND ESTABLISHMENT

Native species will be used in all zones adjacent to streams.

Native species will be highly recommended in all other zones.

Potentially invasive and noxious plants will not be used in restoring or enhance any riparian buffers. Invasive and noxious plants will be removed from buffer areas as part of the operation and management plans for the practice.

A description of the native vegetation from a typical riparian site from either that stream system or a nearby stream system will be used to document a future target condition.

Vegetation establishment will be sufficient to meet the future target conditions. Plants that are not initially established or planted that are part of the target condition will be given either the environment for natural colonization.

An estimate as to the time needed to meet the fully functional condition of the riparian area will be documented in the plan.

Summary of Design Criteria

DESIGN PARAMETERS FOR TEMPERATURE MODERATION

Buffer condition should be maintained at a minimum of 80% canopy cover or naturally occurring canopy cover, which ever is greatest.

In many Alaska stream systems cold temperature may be a limiting factor for salmonid growth and development. The thermal insulating effects of canopy closure on shallow sloughs and backwater areas often protect over-wintering habitat by preventing water from freezing.

Specifications for Buffer Width for Temperature Control[3]

Table 1

Buffer Width	% shading Ability
80 ft	maximum shading
55 ft	90% shading
20 ft	50% shading

BUFFER PARAMETERS FOR SEDIMENTATION CONTROL

- No permanent roads will be constructed within the riparian forest buffer
- Soil within the buffer will be stabilized unless disturbed for vegetation establishment
- Logging and recreational trails will be located as indicated in table 2.
- Erosion will be treated on the producing land use before treatment is attempted by the installation of a riparian forest buffer.
- Where sediment can be transported into the buffer an herbaceous filter strip (AK standard 393) will be installed on the uphill edge of the buffer to trap sediment.

Specification for Buffer width for Sedimentation Control[4]

Table 2

Slope of Land Between trail and Water course	Width of Buffer Strip
Percent	Feet
0	35
10	55
20	75
30	95
40	115
50	135
60	175

RELATIVE IMPACTS OF RIPARIAN FOREST BUFFERS

The impacts/benefits of riparian buffers are dependent on many factors. The actual impact will be based on stream order, soil properties, and specific biological and physical characteristics of the land and type vegetation being planned for the riparian buffer.

Tables 3 and 4 and Figure 1 illustrate the varying degrees of impact and benefit for riparian forest buffers.

Relative Effective Widths for Various Purposes[5]

Table 3

Wildlife habitat	up to 660 feet
Flood Mitigation	up to 250 feet
Nitrogen Removal	up to 150 feet
Water Temperature	up to 60 feet
Bank Stabilization	up to 60 feet

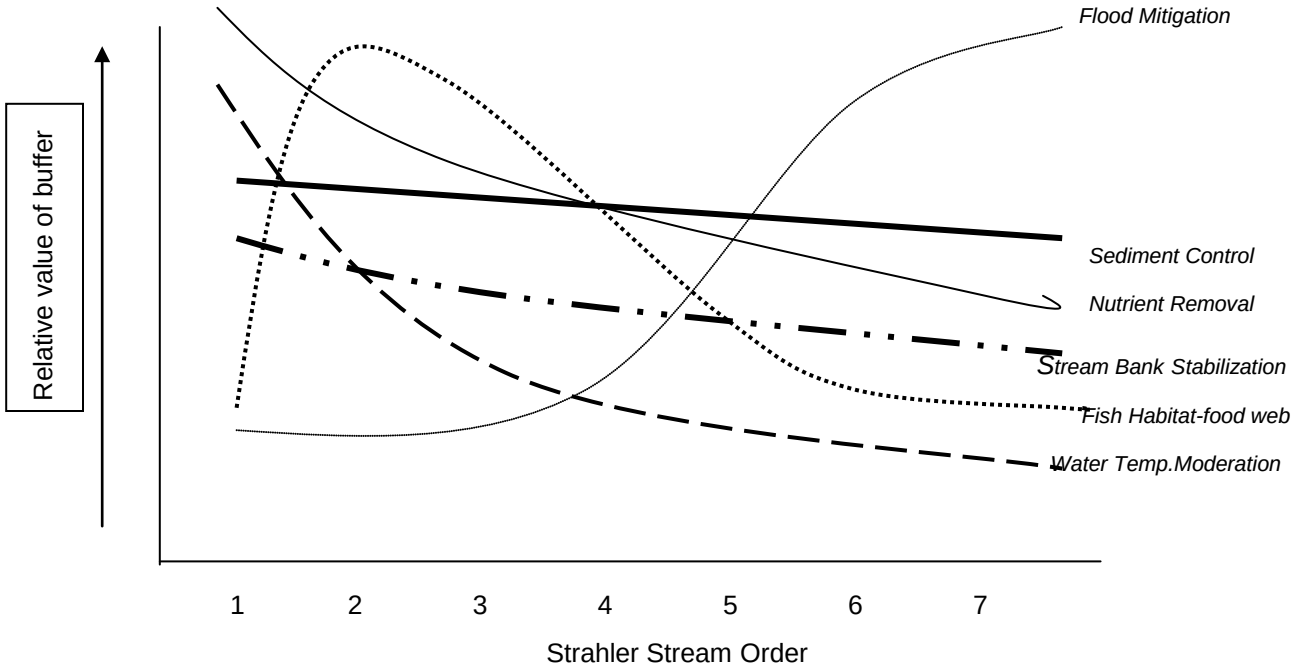
Buffer width effectiveness is enhance or limited by many factors[6]

Table 4

Factors that enhance effectiveness	*Factors that reduce effectiveness*
Slopes < 5 percent	Slopes ≥ than 5 percent
Contributing flow length <150 feet	Overland Flow paths ≥ 300 feet
Seeps, high water table – and shallow subsurface flow	Flow path to deep or regional groundwater
Permeable, but not highly sandy soils	Compacted Soil
Organic matter, humus, or mulch layer	Snowmelt, ice conditions, low soil organic matter
Entry runoff velocity less then 1.5 feet per second	Entry runoff velocity more than 5 feet per second
Routine maintenance	Sediment buildup at entrance
Poorly drained soils, deep roots	Shallow root systems
Forest and dense grass cover (6 inches)	Tall bunch grass; Sparse vegetation cover

Effectiveness of Buffer Impact versus stream order[4]

Figure 1



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[1] Morse, D.H. Ecological aspects of some mixed species foraging flocks of birds. Ecology Monogram, 40 (1): 119-168 (1970)

[2] Excerpts from Buffer Strips for Riparian Zone Management, Section 22 Vermont, Jan 1991, US Army Corps of Engineers, New England Division.

[3] Buffer Strips for Stream Temperature Control, Brazier and Brown 4-1973 Research Paper 15, Oregon State University, Corvallis Oregon

[4] Building Water Pollution Control into Small Private Forest and Ranchland Roads, UDSA Forest Service, Soil Conservation Service, Sept. 1981, R6-S&PF-006-1980

[5] Excerpts from Buffer Strips for Riparian Zone Management, Section 22 Vermont, Jan 1991, US Army Corps of Engineers, New England Division

[6] Chesapeake Bay Riparian Handbook, A Guide for Establishing and Maintaining Riparian Forest Buffers, USDA, Forest Service, NRCS, CSREES, NA-TP-02-97