Guide to Best Management Practices for Riparian Lands

South Carolina Department of Natural Resources
Scenic Rivers Program
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Recognizing that activities occurring on the land, especially those adjacent to rivers, can have direct and immediate impacts on water quality, aquatic resources, and recreational uses of the state's rivers, the South Carolina Department of Natural Resources (SCDNR) Scenic Rivers Program encourages riparian landowners to practice wise land and water management to conserve the natural and scenic qualities of the rivers for themselves and their community.

Riparian landowners can practice good stewardship by adopting best management practices (BMPs) suited to their particular land uses. The recommended BMPs listed on the following pages are intended to serve as land-management guidelines for protecting and enhancing water quality, wildlife habitats, and the scenic character of state-designated scenic river corridors. The BMPs presented in this guide are merely recommendations; however, as noted in sections that follow, some activities addressed by this guide are regulated under existing local, state, and/or federal laws, and landowners are advised to be aware of the regulations and consult with the relevant governing agencies as additional information needs arise.

The Scenic Rivers Program has developed these BMPs to address several land uses including timber management, agriculture of various types, and residential and commercial development. Based on their land use objectives, a landowner may adopt a combination of BMPs to protect and enhance water quality, scenic values, and/or wildlife habitats in varying ways as different sections of land may be managed for different purposes.

The single-most important BMP for protection of river resources is to provide and protect riparian buffers. A riparian buffer is the land area adjoining a stream, lake or wetland characterized by a cover of naturally occurring vegetation consisting of trees, shrubs, grasses, and forbs. Buffers provide a continuous band of vegetated land along the water's edge. The recommended width of the buffer depends on the management goal, but larger buffers are always better at providing the functions that are valued by people, to include:

- Protecting water quality by filtering pollutants from runoff,
- Stabilizing stream banks and reducing channel erosion,
- Storing and slowing flood waters, thereby decreasing damage to property,
- Providing habitat cover and food sources for fish and wildlife,
- Improving aesthetics of stream corridors, which can increase property values, and
- Offering recreational and educational opportunities.

For protection of water quality, a minimum riparian buffer width of 50 to 100 feet (dependent on slope) on both sides of the stream is recommended. The greater the slope, the larger the riparian buffer needs to be to provide water quality protection.

To protect aesthetic/scenic values, it is recommended that the riparian buffer be extended to a minimum of 100 feet on both sides of the stream with the first 50 feet remaining undisturbed.

To conserve and enhance wildlife diversity, a riparian buffer measuring at least 100 to 300 feet on both sides of the stream is recommended. The wider the buffer, the greater the benefits will be for wildlife. Ideally, the riparian buffer will include the natural floodplain and adjacent bluff.

The SCDNR Scenic Rivers Program advocates a minimum riparian buffer of at least 100 feet on both sides of the stream to protect water quality, scenic values, and wildlife habitat.

Water Quality BMPs

The following sub-sections present best management practices for the protection of water quality. First, the topic of riparian buffers is addressed with the intent to inform readers that large amounts of technical information exist that can guide land managers in ways to utilize buffers to protect/improve water quality. Second, the BMPs for water quality are grouped by three general land use categories: forest management, agriculture, and residential/commercial development.

The BMPs presented here are important to the protection of water quality and are recommended for implementation by riparian landowners.

Riparian Buffers and Water Quality

Riparian buffers will protect water quality by reducing the amount of sediment, nutrients, and other contaminants that enter rivers and streams from rainfall runoff. Many studies have been conducted to demonstrate these benefits; studies also show that many factors affect the ability of the riparian buffer to remove pollutants from runoff. These factors include the hydrology (the way and rate water flows over and through the riparian area), soil structure, field slope, type and density of vegetation, and pollutant load from the adjoining land uses.

If a landowner wants an enhanced level of performance in a riparian buffer to protect water quality, they should seek further science-based guidance to consider design aspects of a buffer (e.g., greater width or vegetation alternatives) that will address site-specific factors, as mentioned above, which can affect the removal of pollutants. Additionally, it should be understood that while riparian buffers are important, they are not the sole solution to managing polluted runoff. In places where pollutant loads are high, slopes are steep, or erosion is severe, additional land-management actions will be needed upslope from the buffer in order for the riparian buffer to be effective (Klapproth and Johnson, 2009).

Additional land-management actions that support riparian buffer functions include the following considerations: 1) Manage land to reduce water runoff and increase infiltration. 2) Maintain, conserve vegetative cover as much as possible. 3) Avoid potentially polluting activities on areas most prone to generating significant runoff, such as slopes. 4) Minimize potentially polluting activities during times of year most prone to generating runoff, such as high-rainfall seasons. 5) In addition to providing riparian buffers, use a system of upland BMPs to reduce runoff and pollution loads to adjacent streams (Bentrup, 2008).

Landowners are encouraged to make use of licensed or certified professionals knowledgeable of local hydrology, soils, and vegetation to obtain site-specific recommendations for buffers and other BMPs.

Forest Management

At a minimum, forest management activities along scenic rivers should be conducted according to the South Carolina Best Management Practices for Forestry produced by the South Carolina Forestry Commission (SCFC, 1998). Additional information and guidance for the management of riparian forest buffers can be obtained from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and USDA Forest Service.

The following are important examples of forestry BMPs for the protection of water quality:

- Land adjacent to perennial, intermittent, and ephemeral streams requires special attention during forestry operations. A riparian buffer, what foresters refer to as a “streamside management zone” (SMZ), should be identified and protected. At a minimum, the SMZ should be 40 to 80 feet in width on both sides of the stream, dependent on slope, as

recommended in the South Carolina BMPs for Forestry. Clear-cuts should never extend to the bank of perennial or intermittent streams.

- Larger SMZs, a minimum of 100 feet in width with the first 50 feet remaining undisturbed, are recommended on scenic rivers to enhance the protection of water quality, as well as aesthetics and wildlife habitat. Forest management on lands adjacent to scenic rivers should be designed to promote wildlife habitat and diversity; see Wildlife Habitat BMPs on the following pages.
- Forestry operations should be timed to avoid wet weather and wet soil conditions to prevent excessive ground disturbance, causing ruts and increasing erosion potential.
- Forest roads should be planned and designed to minimize the amount of sediment leaving the site and entering streams. Road construction should avoid sensitive areas such as the SMZs and wetlands. For guidance on planning, construction, stabilization, and maintenance of forest roads, refer to the South Carolina BMPs for Forestry or contact the S.C. Forestry Commission BMP Forester for your area.
- Broadcast application of herbicides should be avoided within the primary SMZ. If vegetation control is needed in riparian areas, then consider manual, targeted herbicide applications (e.g. backpack foliar spray, hack and squirt, or basil bark application).
    - Pesticide application activities are regulated and the landowner and/or pesticide applicator should be aware of the regulations, certification, and licensing requirements which are administered by Clemson's Department of Pesticide Regulation in partnership with the S.C. Department of Agriculture and Clemson Extension Service (S.C. Regulation 27-1070 through 27-1092).

Agriculture

Agricultural activities along scenic rivers should be conducted according to BMPs or Conservation Practice Standards published by the NRCS. In addition, many agricultural activities, animal operations in particular, are subject to state regulations; therefore, farmers are advised to consult with the South Carolina Department of Health and Environmental Control (SCDHEC), the NRCS, or Clemson Extension Service for case-by-case guidance.

The following are important examples of agricultural BMPs for the protection of water quality:

Row Crop Production

- A minimum 50-foot riparian buffer should be established and maintained along both sides of all streams. The buffer should be characterized by native vegetation, typically trees, shrubs, grasses, and forbs. Farm fields should never extend to the bank of a stream or drainage ditch. Instead, a vegetated buffer is needed to prevent streambank erosion and excess sedimentation from entering the stream.
- Larger riparian buffers, a minimum of 100 feet in width, are recommended on scenic rivers to enhance the protection of water quality, as well as aesthetics and wildlife habitat.
- To help keep agricultural chemicals, such as fertilizers and pesticides, out of streams, a no-till vegetative-filter strip should be established along all drainage ditches; a minimum width of 15 feet on both sides of the ditch is needed and a wider filter strip, 30 feet, is recommended.
- New drainage ditches should not be constructed in the riparian corridor of scenic rivers. When maintaining existing ditches, care should be taken to minimize sediment loading to streams.

- Pesticide application activities are regulated and the landowner and/or pesticide applicator should be aware of the regulations, certification, and licensing requirements in South Carolina, which are administered by Clemson's Department of Pesticide Regulation in partnership with the S.C. Department of Agriculture and Clemson Extension Service (S.C. Regulation 27-1070 through 27-1092). Pesticide use considerations include the following:
    - Always read and follow the label directions for use, mixing, application, storage, and disposal of the pesticide.
    - Only apply pesticides when the economic benefit of spraying exceeds the cost of spraying.
    - Avoid applications when rainfall runoff losses are likely, such as right before a predicted rain event.
    - Consider the toxicity, runoff potential, and leaching potential when choosing the appropriate and most efficient pesticide for the target pest.
    - Pesticide containers should always be triple rinsed in upland areas and disposed of properly to prevent accidental contamination of chemicals to nearby waterways.
    - Aerial spraying of pesticides should not be conducted within 100 feet of a scenic river or its tributaries and aerial spraying should not be conducted under any wind condition blowing towards streams and wetlands or other sensitive areas.
- Minimize erosion; keep soil on the field. Establish cover crops that will help reduce water runoff and erosion and enrich the soil with organic matter.
    - Practice conservation tillage, an approach to growing crops that reduces tillage and soil disturbance, and retains plant residue on the soil surface. Conservation tillage reduces runoff and soil loss. Traditional plowing and tilling disturbs the soil, leaving it unprotected, allowing more erosion to occur.
- Control water runoff and sedimentation from fields. Filter, trap, or settle sediment before it reaches a stream by using control measures such as vegetated filter strips, field borders, sediment retention ponds, and terraces.
- Highly erodible lands, such as steep-sloped areas, should be removed from crop production.
- Nutrient management plans help a farmer know how much and when fertilizers should be used on crops. With the aid of the NRCS and/or Clemson Extension Service personnel, farmers should develop and implement nutrient management plans to minimize fertilizer costs and reduce nutrient runoff into local waterways.

Livestock/Poultry Production:

- Standards for the permitting of Agricultural Animal Facilities are found in S.C. Regulation 61-43. These regulations establish requirements on the growing or confinement of animals, processing of animal manure and other animal by-products, and land application of animal manure and other animal by-products. Operators of agricultural animal facilities should understand and adhere to these regulations, which are administered by SCDHEC.
    - Regulation 61-43 specifies many different setbacks/separation requirements. The setbacks and separations from streams range from 100 to 3,960 feet and are based on the size and type of animal facility being considered as well as the character of the affected stream based on flow regime (e.g. perennial, ephemeral, and intermittent) and special stream designations (e.g. Outstanding Resource Waters or Trout Waters as classified by SCDHEC).

- All animal facilities should be located outside the 100-year floodplain and should not be located within 100 feet of perennial, intermittent, or ephemeral streams. A greater separation, more than 100 feet from a stream (possibly as much as 3,960 feet), may be required by the regulations depending on the facility and stream type.
- Animal waste treatment lagoons/storage ponds should not be located within 100 feet of drainage ditches.
- Waste from confined animal facilities should be disposed of in such a manner to prevent contamination of both surface water and ground water. Animal waste sprayfields should not be located within 150 feet of perennial streams, adjacent wetlands, or drainage ditches.
- Pastured or free-roaming animals should not be allowed uncontrolled access to streams or adjacent wetlands. The animals should be fenced out at least 50 feet away from streams and wetlands to prevent destruction of the streambank and riparian buffer vegetation and to prevent contamination of the water from pollutants associated with fecal waste.

Residential/Commercial Development

Many development activities are subject to state and/or county regulations affecting erosion and sediment controls (under S.C. Regulation 72-300 through 72-316) and local building standards. Developers should consult with SCDHEC and/or city and county building officials for case-by-case guidance.

At a minimum, it is recommended that all residential and commercial development activities near the river be conducted outside the 100-year floodplain and in accordance with the best management practices to control erosion, sediment, and stormwater runoff as provided by SCDHEC in their BMP handbook (SCDHEC, 2005). The recommendations in this section for residential and commercial development are intended to apply generally to any land-development and construction activities that can affect streams and riparian areas.

The following are important examples of BMPs for the protection of water quality:

- A minimum 50- to 100-foot riparian buffer should be established and maintained along both sides of the stream. Native vegetation, typically trees, shrubs, grasses, and forbs, should characterize the buffer. Any development within buffer areas should be avoided. Where possible, the Scenic Rivers Program advocates a more extensive buffer, a minimum of 100 feet, on the stream to allow for additional protection of water quality and preservation of other important values such as aesthetics and wildlife habitat.
- New buildings for residential or commercial purposes should be located outside the 100-year floodplain and set back at least 100 feet from the riverbank. If a new building must be sited within the Federal Emergency Management Agency (FEMA)-regulated floodplain or floodway then additional permits with specific building-design standards (e.g., elevation and setbacks) will be required by the local manager of the National Flood Insurance Program. County officials can be contacted for building requirements associated with the National Flood Insurance Program.
- When planning a site for development the following should be incorporated to reduce erosion and polluted runoff:
    - Minimize disturbance of natural groundcover; set aside more area into naturally vegetated open/undeveloped space.

  - Cluster or concentrate the development away from sensitive areas such as streams, wetlands, and wooded areas, which provide connectivity of habitats or refuge for wildlife.
  - Reduce the area of impervious surfaces, such as pavement and buildings. Keep as much area in naturally vegetated open space as possible. Use pervious (porous) surface material where possible, such as gravel instead of asphalt, for driveways and parking lots.
  - Incorporate the use of grass swales instead of curbs and gutters.
  - Reduce the amount of area devoted to lawns. Establish lawns at least 50 feet from streams and conserve a riparian buffer consisting of trees, shrubs, grasses, and forbs.

- Septic tank and drain systems should be properly designed and installed by a qualified contractor in suitable soils. Requirements for the design, construction, installation, operation, and maintenance of septic systems (onsite wastewater systems) are specified in S.C. Regulation 61-56. Developers should consult with SCDHEC for case-by-case guidance. Please note that no part of a septic tank or drain system may be located within 75 feet of a stream.
- Existing septic tanks for most homes will usually require maintenance cleaning every three to five years. Pumping is needed when solids fill from one-third to one-half of the tank. The only way to know when this occurs is to have your tank inspected. A septic tank service contractor will recommend pumping by a licensed septic tank pumper whenever: 1) the bottom of the scum (grease) layer is within 6 inches of the bottom of the outlet tee, or 2) the top of the sludge layer is within 12 inches of the outlet tee.
- Along roads and right-of-ways, culverts should be adequately sized, positioned, and installed to properly manage the main-channel flow of streams as well as flood flows from the upstream watershed. The area around culverts should be stabilized.
- The handling and disposal of chemicals, such as pesticides, should be avoided within 100 feet of the river and its tributaries.
- Existing homeowners and businesses are advised to consider how they may be causing water pollution and identify actions to reduce their inputs to pollution. Information from Clemson Cooperative Extension and SCDHEC can assist with this evaluation and the following are important examples to consider:
  - Apply lawn and garden chemicals sparingly or not at all; read and follow directions for applying pesticides and fertilizers.
  - Manage exposed ground surfaces to control soil erosion and stop sediment runoff to streams.
  - Maintain proper septic tank system function with inspections and pump-outs every 3-5 years (see more about septic tank systems, above).
  - Cleanup pet wastes, litter, and debris from yards, parking lots, streets, and storm-drain systems as these typically flow directly into streams.
  - Properly dispose of used oil, antifreeze, paints, and other household chemicals at recycling centers or service stations.
  - Repair automobile leaks and cleanup spilled brake fluid, oil, grease, and antifreeze. Do not wash spills into streets, as these will drain to streams.
  - Establish and maintain riparian buffers of native vegetation along all streams and lakes (see more about riparian buffers, above).

Scenic Quality BMPs

The natural conditions of a river corridor, its landforms and vegetation, are the basis of the scenic qualities that enhance the recreational value of a river and increase adjacent private property values. The land use and development activities of riparian landowners have a major effect on the natural and scenic qualities of a river corridor.

The following BMPs are important to the protection of scenic quality and aesthetic values in scenic river corridors and are recommended for implementation by riparian landowners.

- For the protection of scenic and aesthetic values, a minimum 100-foot riparian buffer is recommended along both sides of the stream to promote a natural visual environment within the river corridor. The buffer should be characterized by native vegetation, typically trees, shrubs, grasses, and forbs.
- If creating a view through a riparian buffer is desired, then openings or thinning in the riparian buffer should be established by selectively thinning underbrush, shrubs, and low-hanging limbs using hand tools. Cutting and felling trees should be avoided when attempting to create views, and such view corridors should be limited in width (e.g. the lesser of either 75 feet or one third of the lot width).
- All new structures/buildings and related site development should be designed to minimize visual impacts on views from the river and surrounding lands. Structures should be set back, away from the riverbank. A setback distance of least 100 feet is recommended to conserve the natural, scenic qualities of the river corridor.
- The exterior design, color, and height of buildings and other structures should be compatible with, and unobtrusive to, the scenic, natural, and cultural qualities of the river corridor.
- Avoid using riverfront areas as a storage yard. Keep trailers, campers, vehicles, equipment, storage buildings, and discarded items/junk at least 100 feet away from the riverbank.
- Docks, landings, and bulkheads require state and federal permits to be constructed in rivers. Docks and piers proposed within a designated state scenic river should be designed to avoid and minimize negative impacts to water quality, scenic values, wildlife habitat, and public recreational uses of the river.
    - Docks and piers in scenic rivers should be minimal in size and should not include any covered or enclosed structures.
    - To reduce the number of dock structures and related visual impacts to the river, plan and design docks to be shared by multiple property owners or provide community docks to provide access for the residents of a riverside community.
- To stabilize and restore eroded stream banks, avoid the use of riprap, concrete rubble, or bulkhead walls; instead, consider using techniques of live planting and bioengineering with plants and woody materials with minimal use of riprap and no walls. Clemson Extension Service provides detailed information about designing and maintaining vegetated shorelines to stop erosion, protect water quality, enhance wildlife habitat, and beautify waterfronts.
- Structures for utilities, such as communication towers, transmission lines, and gas lines should be built in ways that minimize visual impacts to the scenic river. The collocation of equipment for multiple users on existing and new towers or corridors is recommended. Wherever possible, utility structures should be screened from the scenic river by topographical features. Where this is not possible, the structure height and design should be such to minimize visual impact.

- Signage should be limited and designed to be unobtrusive and blend with the surroundings. Placement of commercial signs within the viewshed of scenic rivers should be avoided.
- Fences or barriers should not visually or physically obstruct natural or aesthetic features.
- Restore over-used or abused areas (e.g., areas denuded of vegetation with exposed, eroding soils) within the scenic river corridor. Landscape and re-vegetate these areas, as well as areas where the riparian buffer is thin. Control access and specific uses that may be causing the degradation (e.g., roaming livestock, vehicle access, random foot trails).

Wildlife Habitat BMPs

Riparian habitats are ecologically diverse and productive places. When managed to conserve natural conditions, riparian habitats can support a broad range of plants and animals. Riparian areas provide an essential transitional habitat for semi-aquatic species such as salamander, frog, turtle, mink, beaver, and otter. Additionally, there are many species that use riparian buffers as a travel corridor. Many water-dependent birds, such as heron, kingfisher, eagle, and osprey, rely on forested riparian areas for both resting and nesting habitat.

The following are examples of BMPs recommended to riparian landowners for the protection and enhancement of wildlife diversity in river corridors.

- To conserve and enhance wildlife diversity, landowners are encouraged to maintain riparian habitat corridors in naturally occurring vegetation along streams. For the protection of wildlife values, a vegetated riparian buffer measuring at least 100 to 300 feet on both sides of the stream channel is recommended; the wider the riparian buffer, the greater the benefits for wildlife. Native vegetation, typically trees, shrubs, grasses, and forbs, should characterize the buffer.
- Ideally, the riparian buffer will include the natural floodplain and adjacent bluff. Bluffs provide important transitional habitats from floodplains to upland areas, which may be critical to animals during floods. Additionally, bluffs can provide rare habitats for sensitive species of plants and animals and should be managed to protect these natural habitat values.
- Timber management can occur within the riparian habitat corridors, but should be designed to promote wildlife habitat and diversity and protect water quality. For example:
    - Maintain the mixed or hardwood forest stands and other naturally occurring habitats of the river corridor and avoid converting to short rotation monoculture forest stands. Maintain stands of trees in a variety of size classes and ages.
    - Leave groups of mature nut- and fruit-bearing trees, such as oak, hickory, and dogwood, to provide food for wildlife.
    - Leave snags, or non-hazardous dead trees, and old trees that provide hollow dens and cavities for wildlife.
    - Use prescribed burning to remove thick undergrowth and promote the growth of valuable wildlife food, such as legumes and hardwood sprouts, and perpetuate fire-dependent species.
    - Provide wildlife travel corridors to connect tree stands that are separated by clearings.
    - Provide for the specific habitat needs of sensitive species located in the area.
    - Bluffs provide important transitional habitats from wetlands/floodplains to uplands, they often support sensitive species of plants and animals and should be managed to protect their habitat values.

- Landowners with forested or woodland lots in the river corridor can enhance wildlife diversity on their property by maintaining an understory of native shrubs and herbaceous plants, a multi-layered tree canopy with diverse tree sizes, and some standing dead snags and fallen trees.
- Maintain large, contiguous blocks of natural habitats and avoid habitat fragmentation that can be caused by permanent land clearing. Enhance the connections between existing natural habitat blocks, particularly to those that are isolated, by establishing forest stands or vegetated habitat corridors.
- Fences or barriers that create a hindrance to the movement of wildlife should not be constructed in the riparian corridor, except those that are pertinent to protecting the riparian buffer or stream from livestock.
- The use of recreational vehicles in river corridors should be controlled and minimized to avoid degradation of riparian buffers caused by the destruction of vegetation, erosion of soil, and disturbance of wildlife.
- To stabilize and restore habitat on eroded streambanks, avoid the use of riprap, concrete rubble, or bulkhead walls; instead, use techniques of live planting and bioengineering with plants and woody materials with minimal use of riprap and no walls. Clemson Extension Service provides detailed information about designing and maintaining vegetated shorelines to stop erosion, protect water quality, enhance wildlife habitat, and beautify waterfronts.
- Exotic (non-native) invasive plant species pose a significant threat to wildlife habitats in South Carolina because they displace native plant communities. Some invasive plant species will alter entire landscapes within the span of one to three growing seasons; many will invade and spread along river corridors. Landowners need to be aware of exotic invasive species and take steps to control and/or eradicate these plants to prevent their further spread.
    - Information to identify and control exotic invasive plant species can be obtained from the South Carolina Exotic Pest Plant Council, Clemson Extension Service, South Carolina Native Plant Society, and USDA Invasive Species Information Center.

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