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Uses of Buffer Zones

Riparian buffer zones are vegetative areas adjacent to bodies of water. Buffer zones are planted near streams, rivers, lakes, and other bodies of water. They serve many purposes including protecting waterways from runoff of chemicals such as nitrogen, phosphorous, and other pollutants as well as creating habitats for complex ecosystems. However as a former report from the Vermont Legislative Research Service notes, "The difficulty in legislating the creation or preservation of these zones lies in balancing the interests of landowners with the interests of those seeking to improve water-quality."¹ Creating incentives for productive uses of buffer zones can serve as a solution, benefiting both the environment as well as the land owner.

Installing buffer zones in rural or urban settings can have significant environmental, social, and economic benefits. Although the primary use of buffer zones is to protect waterways from pollution, they can also provide benefits to the local and greater communities, ecosystems, and landowners, as illustrated within this report. This can be achieved through creation and restoration of buffer zones, as well as through state action and legislation.

Environmental Benefits of Buffer Zones

The primary benefit of riparian buffer zones is environmental protection. Riparian buffer zones protect water quality by reducing excess nutrients and other pollutants from entering streams, ditches, lakes, wetlands, and other surface waters. They also reduce excess nutrients in groundwater. With root absorption, riparian buffer zones stabilize stream banks and reduce erosion. Finally, riparian buffer zones can protect wildlife by providing shade, food, shelter, and travel corridors.²

The US Department of Agriculture's (USDA) Agricultural Research Service scientists in Georgia have conducted several studies that evaluate different scenarios that may occur within

¹ Daniel Woodward, Sarah Palma, Travis Morrison, and Anthony Gierzynski, "Waterfront Buffer Zones," April 2, 2008, accessed April 3, 2011, <http://www.uvm.edu/~vlrs/Agriculture/bufferzones.pdf>.

² Minnesota Department of Agriculture, "Forested Riparian Buffer," accessed 4/11/2011, <http://www.mda.state.mn.us/protecting/conservation/practices/bufferforested.aspx>.

different types of buffer zones. Their longest study conducted over 9 years examined whether buffer zones are effective in reducing nitrogen and phosphorus levels that eventually make it to the waterways. They found that a three-zone buffer could be effective in removing excess nutrients from runoff water in agricultural fields. A three zone buffer system includes a grassy edge next to the field, a forested buffer, and a permanent forest along the stream on the far end of the field. The results of the study showed that “the restored riparian wetland buffer retained or removed at least 60 percent of the nitrogen and 65 percent of the phosphorous that entered from the adjacent manure application site.” The scientists also found in a separate study that a three-zone riparian buffer was effective at reducing the amount of herbicides in groundwater and surface runoff.³

Forested buffer zones also benefit wildlife. Not only do buffer zones improve water quality by removing pollutants, they also provide shade, keeping the water temperature cool, raising the dissolved oxygen content, and improving the quality of life for fish and aquatic insects. Shrubs and trees also provide food and cover for many aquatic animals. If the buffer zone is designed in the right way, it can also provide tunnels and pathways for terrestrial wildlife.⁴

Social Benefits of Buffer Zones

Riparian buffer zones also benefit the community. They improve drinking water in reservoirs and connected waterways, which contributes to a healthier community. Clean bodies of water can be used for recreation and improve community development as a whole. In addition, buffer zones can be used for activities such as hiking, camping, or as outdoor labs for education. Students can visit buffer zones and learn of their social and ecological benefits.⁵

Riparian zones have aesthetic value, which adds natural beauty to an environment. They increase privacy for landowners and beautify landscapes, especially within developed areas. “Forested buffers are especially valuable in providing a green screen along waterways, blocking views of nearby development, and allowing privacy for landowners.”⁶

It is important when evaluating the social benefits of buffer zones that the environmental benefits of the riparian zone are not compromised. This can be achieved through thoughtful planning of recreational areas within buffer zones. For example, when cutting trails through riparian zones it is important to place the trails far away from the waterways. It is also

³ Sharon Durham, “Designing the Best Possible Conservation Buffers,” US Department of Agriculture, Agricultural Research Service, accessed April 11, 2011, <http://www.ars.usda.gov/is/ar/archive/dec03/buffer1203.htm>.

⁴ Ellen Hawes and Markelle Smith, “Riparian Buffer Zones: Functions and Recommended Widths,” Yale School of Forestry and Environmental Studies for the Eightmile River Wild and Scenic Study Committee, April 2005, www.ci.durham.nc.us/departments/planning/pdf/wqattachment3.pdf.

⁵ Connecticut River Joint Commissions, “Introduction to Riparian Buffers for the Connecticut River Watershed,” Connecticut River Joint Commissions, September 2000, No.1, Page 2, accessed April 4, 2011, <http://www.crijc.org/buffers/Introduction.pdf>.

⁶ Connecticut River Joint Commissions, “Introduction to Riparian Buffers for the Connecticut River Watershed,” Connecticut River Joint Commissions, September 2000, No. 1, Page 2 accessed April 4, 2011, <http://www.crijc.org/buffers/Introduction.pdf>.

important to prevent environmentally damaging activities such as walking animals within the area.⁷

National and State Programs Relating to Buffer Zones

A number of programs offset some of the costs of creating and conserving buffer zones. The National Resources Conservation Service (NRCS) of the USDA provides programs that assist private landowners in creating buffer zones. The Environmental Quality Incentives Program provides technical and financial support to agricultural producers attempting to reduce their impact on the environment.⁸ Another NRCS program, the Wetlands Reserve Program, provides technical and financial support to landowners looking to restore their waterways.⁹ Additionally, the Partners for Fish and Wildlife Program has established nationwide initiatives that work with private land owners to protect wildlife and create more habitat. They are very active in Vermont and often plant buffer zones in close proximity to agricultural land.¹⁰ The Conservation Reserves Enhancement Program (CREP), also run by the USDA, pays for farmer enrollment as well as a significant portion of the necessary plants and materials. The program requires a fifteen-year commitment and the farmer cannot harvest anything in the buffer zone within this period.¹¹

The Vermont Agriculture Buffer Program (VABP) was created in response to farmer's preference of a shorter duration agreement than the current fifteen-year commitment in the CREP and an interest in being able to harvest grass buffers to maintain more rigorous buffers. VABP helps farmers pay for the infrastructure needed to create a grassed buffer zone, and the farmers make a minimum five-year commitment. The difference between the VABP and CREP programs is that farmers under the VABP program may harvest perennial crops within the buffer zone.¹²

Economic Benefits of Buffer Zones

Agricultural Opportunities and Benefits

Buffer zones provide a number of benefits for agricultural land. Riparian zones help retain nutrients in the soil so they can be used by crops. This increases yield and productivity of cash

⁷ Connecticut River Joint Commissions, "Introduction to Riparian Buffers for the Connecticut River Watershed," No. 6, Page 4.

⁸ Natural Resources Conservation Service, "Environmental Quality Incentives Program," Updated April 4, 2011, accessed April 5, 2011, <http://www.nrcs.usda.gov/programs/eqip/>.

⁹ National Resources Conservation Service, "Wetlands Reserve Program," Updated March 23, 2011, accessed April 5, 2011, <http://www.nrcs.usda.gov/programs/wrp/>.

¹⁰ Partners for Fish and Wildlife Program, "Partners for Fish and Wildlife Program in Vermont," accessed April 4, 2011, <http://www.fws.gov/partners/>.

¹¹ US Department of Agriculture, "Conservation Reserve Enhancement Program," Farm Service Agency, accessed April 12, 2011, <http://www.fsa.usda.gov/FSA/webapp?area=home&subject=prod&topic=cep>.

¹² Laura DiPietro, Deputy Director of ARMES, VT Agency of Agriculture, Interview with authors, April 11, 2011.

crops. This process also develops healthy soil by reducing erosion, which then reduces crop loss due to flooding.¹³

Cash crops can also be grown within a buffer zone itself. These crops may include lumber, hay, nuts, fruits and berries, and pharmaceuticals. It is important to sustainably farm these areas in order to preserve their environmental benefits. State regulation can assist in assuring that agricultural production within buffer zones is done in a way that preserves the environmental benefits of the riparian zone. For instance, the Connecticut River Joint Commissions recommends that any logging transport machinery be kept 25 feet away from waterways.¹⁴ The USDA's Agricultural Research Service found that if done in a sustainable way, the removal of mature trees in a streamside mature forest buffer does not affect the buffer in a negative way. The harvested forest can grow back quickly. This is beneficial information for farmers who may be able to "gain income from the buffers while keeping their buffering capacities at peak levels."¹⁵ In Vermont, farmers are allowed to harvest as many personal crops as they wish within their own buffer zone. It is prohibited, however, to do any farming between the top of the riverbank and the water.¹⁶

The Vermont Agency of Agriculture requires a ten-foot buffer of non-tilled land on all farms. These buffer zones usually use grass as their buffer. These regulations only apply to farms next to perennial streams (streams that run year round). From the point of runoff, where soil is in direct contact with the body of water, the buffer zone must be 25 feet. On farms with more than 200 mature animals, the buffer zone must be 25 feet everywhere, next to both intermittent and perennial streams. The Agency of Agriculture regulates these widths by measuring soil loss. If there is a high amount of soil loss, farmers are given 30 days to create a plan for improving the buffer zone and informing the Agency of Agriculture of the plan. Buffer zones are often a viable option for improving soil retention, although there are other options for farmers.¹⁷

Energy Production within Buffer Zones

In the future, it may be plausible to harvest biomass energy within riparian zones. Agricultural buffer zones are good candidates for producing bio-power, or electricity generated from biological material, as well as bio-fuels, or liquid fuels from plant materials, because they are rich in both organic plant material and agricultural wastes. Landowners could see economic benefits from biomass power, which could be harvested from buffer zones. In addition, biomass production is thought to be carbon neutral, emitting an equal amount of carbon as is absorbed

¹³ Connecticut River Joint Commissions, "Introduction to Riparian Buffers for the Connecticut River Watershed," No. 6, Page 2.

¹⁴ Connecticut River Joint Commissions, "Introduction to Riparian Buffers for the Connecticut River Watershed," No. 1

¹⁵ US Department of Agriculture, Agricultural Research Service, "Designing the Best Possible Conservation Buffers," accessed April 11, 2011, <http://www.ars.usda.gov/is/ar/archive/dec03/buffer1203.htm>.

¹⁶ Laura DiPietro, Deputy Director of ARMES, VT Agency of Agriculture, Interview with authors, April 11, 2011.

¹⁷ Laura DiPietro, Deputy Director of ARMES, VT Agency of Agriculture, Interview with authors, April 11, 2011.

by plants. This process has the potential to have broader environmental benefits by reducing overall dependence on fossil fuels.¹⁸

State and federal legislation can play a major role in the creation of biomass sources within riparian buffer zones. The US Federal government has a nearly 20-year history of legislation relating to biomass production. In this time period, a number of programs have been created to encourage biomass energy production. This includes the Energy Policy Act of 1992, intended to provide financial incentives for renewable energy companies as well as the Farm Bill of 2002. Title IX of this program specifically addresses bio fuels. The Farm Bill was an important piece of legislation that provided grants for bio-refineries as well as education programs about the growing trend of bio-diesel production.¹⁹ In 2005, the Energy Policy Act established standards that mandated that 250 million gallons of US fuel be derived from biomass. It also required that the US Secretary of Energy hear proposals for loans to be used for biomass production. However, many of these programs provide incentives for refineries, not farmers. The more recent development, the Energy Independence and Security Act of 2007, is perhaps most relevant to providing incentives for growing biomass. It provides grants for research, development, and demonstration of biomass energy.²⁰

The United Kingdom (UK) has also implemented federal incentives for biomass production. The Low Carbon Buildings Programme uses federal funds to match funding for biomass infrastructure. In addition, the Bio Energy Capital Grant Scheme provides a grant for increasing biomass production in order to reduce dependence on fossil fuels. Finally, the UK is now implementing widespread requirements for planning that includes a mandatory 10-20% of energy to be derived from renewable sources. Biomass production is a common method of satisfying these requirements.²¹

Producing and using biomass energy instead of traditional fossil fuels has economic benefits. The State of Vermont offers an incentive program, Interconnection Standards, which requires electric companies to offer net metering to customers who use biomass-energy.²² Net metering enables customers to use their own generation to offset their consumption over a billing period by allowing their electric meters to turn backwards when they generate electricity

¹⁸ National Atlas of the United States, "Renewable Energy Sources in the United States," accessed April 10, 2011, http://www.nationalatlas.gov/articles/people/a_energy.html#five.

¹⁹ United States Department of Energy, "Federal Biomass Policy," accessed April 14, 2011, http://www1.eere.energy.gov/biomass/federal_biomass.html.

²⁰ United States Department of Energy, "Federal Biomass Policy," accessed April 14, 2011, http://www1.eere.energy.gov/biomass/federal_biomass.html.

²¹ Partnership for Urban South Hampshire, "Biomass Supply Chains in South Hampshire," July 2009, accessed April 1, 2011, http://www.push.gov.uk/biomass_supply_chains_in_south_hampshire.pdf.

²² US Department of Energy, "Financial Incentives," Database of State Incentives for Renewables and Efficiency, accessed April 8, 2011, <http://www.dsireusa.org/incentives/allsummaries.cfm?State=VT&&re=1&ee=1>.

in excess of their demand.²³ This program encourages consumers to utilize alternative energies.²⁴

Conclusion

In an agricultural state like Vermont, buffer zones are a common resource that can be both beneficial to the community as well as productive to landowners. The benefits of buffer zones are environmental, social, and economic. Buffer zones can facilitate improved water quality, resources for wildlife, and erosion control. Economically, buffer zones can be used for agricultural production, improved soil quality, and biomass energy production. Buffer zones also provide aesthetically pleasing areas. The national government as well as the State of Vermont has numerous programs to encourage the creation and use of riparian buffer zones. The expanding role of the state is an important factor that will allow for the expansion of productive uses of buffer zones. The role of the United States in encouraging biomass production is also an important factor for farmers to consider. Buffer zones can be put to productive use in many ways, some of which are supported through state and federal government aid.

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Disclaimer: This report has been compiled by undergraduate students at the University of Vermont under the supervision of Professor Anthony Gierzynski. The material contained in the report does not reflect the official policy of the University of Vermont.

²³ US Department of Energy, Energy Efficiency and Renewable Energies, "Net Metering Policies," accessed April 8, 2011, <http://apps3.eere.energy.gov/greenpower/markets/netmetering.shtml>.

²⁴ "Financial Incentives," Database of State Incentives for Renewables and Efficiency, accessed April 8, 2011, <http://www.dsireusa.org/incentives/allsummaries.cfm?State=VT&&re=1&ee=1>