

4 National and Regional Perspectives and Experience for Water Supply Protection and Recreational Uses of Drinking Water Reservoirs

The AWWA states in its policy on Recreational Use of Domestic Water Supply Reservoirs that the "*protection of public health and drinking water quality should be the highest priority in operational decisions for reservoirs used for both water supply and recreation*" (AWWA 2012). Thus, decisions regarding recreational use of domestic water supply reservoirs should be fully consistent with the intent of the source water protection.

AWWA further recommends that when considering recreational uses of domestic water supply reservoirs, the water utility should develop an integrated reservoir management plan and associated implementation actions to mitigate water quality impacts and to minimize increased risks to accommodate recreational uses of the reservoir. Reservoir management plans should include appropriate water quality monitoring to evaluate and, if necessary, mitigate water quality impacts and to minimize increased risks.

AWWA also recommends several protection and enhancement measures to protect drinking water supply sources including: land purchases, land use planning, zoning, and management practices, security measures and patrols, and identification, investigation and cooperative resolution of pollution issues (AWWA 2010). Additional measures that can be implemented to protect source water include participation in the development of point and nonpoint source pollution regulatory strategies such as permits and source assessments, pollutant source tracking (e.g., microbial source tracking) and public awareness and education.

EA conducted a limited survey of the following national water supply utilities in order to review the range of policy actions that other water supply utilities are taking in different regions of the country to protect reservoir water quality.

- Massachusetts Department of Conservation and Recreation
- Spartanburg Water System, South Carolina
- City of Seattle, Washington

The policies and procedures established by these national water supply utilities to manage reservoir properties and recreational activities are briefly summarized below.

4.1 Massachusetts Department of Conservation and Recreation

The Massachusetts Department of Conservation and Recreation (MDCR) operates a drinking water supply system consisting of four watershed areas, two drinking water supply reservoirs, and a series of intakes and aqueducts. To protect these public water supplies, Massachusetts MDCR implemented a Watershed Protection Act (WsPA). The intent in developing the WsPA was to regulate land use and activities within critical areas of the three main watersheds for the purpose of protecting the quality of drinking water. The Department's WsPA recognizes that it is important to preserve buffer zones around open water, and to limit impervious surfaces over an aquifer.

The WsPA established protective buffers to keep contaminants out of drinking water supplies by developing and enforcing a buffer zone protection policy. This policy recognizes two distinct zones around water supplies and their tributaries.

- The first zone consists of the area within 400 feet of a reservoir, and within 200 feet of tributaries and surface waters. Within this zone, any alteration including construction, excavation, grading, paving, and dumping is strictly prohibited. Additionally, the generation, storage, disposal or discharge of pollutants is also prohibited.
- The second protection zone is between 200 and 400 feet of tributaries and surface waters, and on land within flood plains, over some aquifers, and within bordering vegetated wetlands. Within this zone the alteration of bordering vegetated wetlands, more dense development and other activities are prohibited. Additionally, certain activities are prohibited including outdoor uncovered storage of manure.

In addition to the buffer zone areas noted above, the MDCR also enforces recreational use restrictions, including access for animal companions. The Massachusetts Drinking Water Regulations (310 CMR 22.00) cite strict prohibitions on animals within 100 feet of a public drinking water reservoir and its tributaries. Additionally, State drinking water regulations [310 CMR 22.20B(4)] require that "*No stabling, hitching, standing, feeding or grazing of livestock or other domestic animals shall be located, constructed, or maintained within 100 feet of the bank of a surface water source or tributary thereto.*"

Horses are restricted to MDCR's designated roads and trails. The designated roads and trails "*limit access to appropriate locations by prohibiting horses on trails with unbridged stream crossings and within 200 feet of a tributary or source water*", in accordance with MDCR's Master Policy (MDCR, 2009, p.55). The rationale for these buffer distance restrictions is that domestic animal wastes contain fecal bacteria and pathogens, such as *Giardia* and *Cryptosporidium* that can be passed to both human and wildlife populations, and ultimately into public water supplies. In addition to bacterial contamination and potential parasites, domestic animal waste also contains nitrogen and phosphorus which can alter water chemistry and quality. "*Horses also have the potential to alter the runoff characteristics of the landscape, increasing the ability of pollutants to enter the drinking water supply. The WsPA established protective buffers to help keep these contaminants out of the metropolitan Boston drinking water supply*" (MDCR, 2012).

The WsPA regulates land use and acceptable recreational activities within the reservoir watersheds for the purpose of protecting drinking water quality. The Ware River Watershed's Public Management Plan (MDCR, 2011a) lays out strict regulations that address recreational access and rules for many recreational groups including, but not limited to: motorized vehicle use, bicycles, hiking and walking, boating and fishing, camping and access for dogs and horseback riding.

Animal regulations for the Ware River Watershed require that all animal waste be removed or buried more than 100 feet from water. Dogs, horses and other domestic animals are restricted from water access at all times. Some effects of horseback riding include fecal wastes from

horses and their riders and the resulting threat of microbiological contamination and an increase in the sediment/nutrient inputs caused by large numbers of riders on trails, riding off trails, or riding on closed trails (MDCR, 2009). For these reasons horseback riding has been limited to MDCR Designated Horseback Riding Routes which are roads, not trails. Additionally there have been specific restrictions enacted, such as "*no riding during mud season, permit required for group rides of 15 or more, no watering of horses in tributaries*" (MDCR, 2011a, p.15).

In the Wachusett Reservoir Watershed, another Massachusetts water supply, similar restrictions are implemented. However, there is a section of the watershed that is sufficiently hydrologically distant from the reservoir and horseback riding is allowed on an extensive trail system on this property (MDCR 2011b).

MDCR's horseback riding policy takes into account Federal and State regulations for drinking water protection, as well as the local increasing popularity of recreational horseback riding and scientific research on waterborne diseases. The "*Division's policy allows opportunities, given past practices and public input, for horseback riding on designated roads and trails in the Ware River watershed, yet is adequate to restrict microbiological contamination to the drinking water supply source waters*" (MDCR, 2009, p. 54).

The regulations and limitations summarized above have allowed the Massachusetts Water Resource Authority (MWRA) to limit its water treatment and thus save significant capital and operational costs. MWRA's 2005-2010 Report states that its water supply system is one of the few in the nation that is so well protected and of such high quality that USEPA regulations do not require the added treatment step of filtration (MWRA 2010).

4.2 Spartanburg Water System, South Carolina

The Spartanburg Water System (SWS) developed a Buffer Management Plan to implement water protection measures within its watershed and surrounding buffer areas (SWS, 2009). The management plan is in effect for Lake Blalock, its surrounding property owners, and other recreational users. SWS acknowledges that its main purpose is to provide high quality drinking water, but also to provide recreational opportunities such as boating and fishing, and educational opportunities for users of the lake. The Plan sets standards to be applied to all users to help maintain a balance of source water protection and recreational uses.

Lake Blalock's normal surface water elevation is 710 feet above mean sea level (MSL) and as part of the Plan, SWS owns the property up to an elevation of 720 feet MSL around the lake, and in some areas above the 720 foot elevation mark. The amount of buffer land SWS owns laterally extends long distances on gently sloping land and shorter distances on the more steeply sloping lands. Protection of the SWS buffer property is essential for reducing contaminants that may adversely affect water quality. Vegetation is a vital component in SWS's buffer management program, as it provides soil stabilization, reduces surface runoff including sediment and pollutants, and provides wildlife habitat.

Adjoining landowners' access to the lake and SWS buffer property is secondary to protecting the lake as a source of drinking water. Adjoining landowners' access Lake Blalock and the SWS buffer property is strictly by permission from SWS, and access to the reservoir and SWS buffer

property is granted with the understanding that SWS can terminate that access if it is determined necessary to effectively manage the water supply and buffer lands.

Most of the buffer owned by SWS is wooded and there are many restrictions implemented to protect the vegetation. The vegetation management plan addresses the protection of trees, canopy, shrubs and understory, lawns, and the use of herbicides, fertilizer and pesticides. Invasive species and threatened species are also part of SWS's management plan.

Recreational use in the buffer zone is limited and allowed by permit access only. Any and all pathways used for access, walking or other uses must be pre-approved and compliant with SWS Policies (see Lake Blalock Buffer Management Plan 2009). Modifications to vegetation, grading and the addition of impervious structures are not permitted. All boats must be launched from permitted docks or at the public landing. The use of motorized vehicles is not permitted except for use in buffer restoration. The use of best management practices (BMPs) is encouraged for erosion and sediment control as well as for land development. Having a garden or livestock (including cows, horses, goats, and chickens) is not allowed within the buffer. Additionally, pet kennels, fences, pens, dog houses and enclosures are also not allowed within the buffer.

There are general land use maintenance regulations in place for adjacent land owners and buffer zone recreational users. These regulations include no camping and no fires, as well as banning the use of fish attractors. For adjacent land owners, SWS's buffer plan prohibits the use of herbicides, pesticides or other chemicals (including fertilizers) within the buffer. Residents are encouraged to maintain their septic systems and have properly managed stormwater systems that do not drain onto the buffer land.

To assure adjoining landowner compliance with the Plan, landowners must obtain a Landowner Access Permit. The Landowner Access Permit allows the landowner and their family (as well as guests) to passively use and enjoy the buffer land, access to the lake, and grants other rights specifically authorized in the Plan. Owning a valid Landowner Access Permit is required for all other permits and authorizations granted to the landowners. By maintaining the Landowner Access Permit, the landowner agrees that they will abide by the terms of the Buffer Management Plan, and will adhere to the SWS Policies and Procedures for Use of Water Supply Reservoirs for any activities that involve the buffer property. It also requires landowners to be responsible for any costs, damages, or penalties that result from violations of the Plan, or any permits granted under it. Similarly, all other users who wish to gain access to the SWS buffer property are required to obtain a permit before conducting activities within the buffer.

Any individual who does not obtain appropriate permits and prior authorization from SWS, or who violates the conditions of the permit, are subject to enforcement procedures which include fines, required restoration, permit revocation/denial, or other enforcement means as required and provided for by law. Enforcement of the buffer lands is handled by Lake Wardens who have State authority to issue citations.

4.3 City of Seattle, Washington

As stated above, the MWRA's five year report for 2005-2010 stated that its water supply system is one of the few in the nation that is so well protected and of such high quality that USEPA

regulations do not require the additional treatment steps of coagulation and filtration, and thus providing for substantial capital and operational cost savings.. The same can be said for the City of Seattle, Washington's water supply. The City has taken perhaps the strongest measure to ensure its source water protection by prohibition of agricultural, industrial, and recreational activities in (and residential use of) its entire 90,000-acre watersheds that supply its drinking water (NRDC, 2003, p. 39). *"This vigorous protection program means there is little opportunity for contaminants to enter the water"* (SPU, 2009).

Seattle's water comes primarily from two watersheds in the Cascade Mountains which are publicly owned by the Seattle Public Utilities (SPU). The main source of water comes from the Cedar River Watershed, an unfiltered surface water supply located about 35 miles east of downtown Seattle near North Bend. *"To protect the quality of the water from this unfiltered source, Seattle Public Utilities actively enforces the "closed status" of the 91,000-acre Cedar River Municipal Watershed. Guided tours and in-depth programs led by experienced Watershed educators and guest presenters provide a rare and exciting glimpse into this hidden gem"* (SPU, 2012, p. 5).

SPU has also begun replacing its open reservoirs with underground structures. The so-called "underground reservoirs" are intended to improve the quality and security of the water supply system. These covered areas provide new public spaces on the reservoir "lids" throughout Seattle which can be used for open recreation. The City plans to bury or decommission all remaining uncovered reservoirs by 2013.

<http://www.seattle.gov/util/MyServices/Water/WaterSystemProjects/ReservoirCovering/index.htm>

Personal communication with a SPU scientist indicated that horses are allowed to use a small part of SPU land which is not in the watershed, and does not drain to the drinking water reservoirs. However, horses are not allowed on SPU property that is within the reservoir's watershed.

4.4 Additional Reservoir Policies and Best Management Practices

Review of the current literature has identified other watershed protection programs that provide insight into what municipalities and utilities are doing to protect drinking water quality. These are briefly summarized below.

Baltimore County, MD has established detailed regulations for the protection of water quality, streams, wetlands and floodplains (Baltimore County Code, Article 33, Title 3). Key provisions related to the protection of surface waters using forest buffers include:

- For a Designated Use I or I-P stream (i.e., water used for public water supply), the forest buffer shall be the greater of the following:
 - Seventy-five (75) feet,
 - Twenty-five (25) feet from the outer wetland boundary, or
 - Twenty-five (25) feet from the one hundred-year floodplain reservation or easement boundary.

- For Designated Use III, III-P, IV or IV-P streams (natural and recreational trout waters), the forest buffer shall be the greater of the following:
 - One hundred (100) feet,
 - Twenty-five (25) feet from the outer wetland boundary, or
 - Twenty-five (25) feet from the one hundred-year floodplain reservation or easement boundary
- There are additional County forest buffer standards and requirements for steep slopes (>10%) and highly erodible soils (K values >0.24) [§33-3-111(c)]
- Other County management requirements for forest buffers:
 - The existing vegetation within the forest buffer shall not be disturbed
 - Soil disturbance shall not take place within the forest buffer by grading, stripping of topsoil, plowing, cultivating, or other practices
 - Filling or dumping shall not occur within the forest buffer
 - Except as permitted by the Department, the forest buffer shall not be drained by ditching, underdrains, or other drainage systems
 - Pesticides shall not be stored, used, or applied within the forest buffer, except for the spot spraying of noxious weeds consistent with the recommendations of the University of Maryland Cooperative Extension Service
 - Animals may not be housed, grazed, or otherwise maintained within the forest buffer
 - Motorized vehicles shall not be stored or operated within the forest buffer, except for maintenance and emergency use approved by the Department
 - Materials shall not be stored within the forest buffer

Source: Baltimore County - Baltimore County Code, Article 33, Title 3 Protection of Water Quality, Streams, Wetlands and Floodplains.

[\[http://resources.baltimorecountymd.gov/Documents/Environment/eir/forestbufferregs.pdf\]](http://resources.baltimorecountymd.gov/Documents/Environment/eir/forestbufferregs.pdf)

City of Baltimore, Maryland – for Loch Raven, Prettyboy, and Liberty Reservoirs

The City of Baltimore owns the three reservoirs located in Baltimore County (a portion of one is also in Carroll County) and operates the central regional water system that supplies finished water to approximately 1.8 million people in the City and five surrounding counties. The “Reservoir Watershed Management Agreement of 2005” was signed to ensure that the three reservoirs and supporting watersheds will continue to provide high quality raw water for the Baltimore metropolitan area. Buffer requirements for these three reservoirs are not clear from the literature consulted by EA. For the Baltimore County properties, the buffer distances (noted above) apply. Loch Raven and Prettyboy Reservoirs are designated by MDE as Use III-P waters therefore the >100 foot buffer would apply (see above). Liberty Reservoir is designated as Use I-P, therefore the >75 foot buffer guidance (described above) would apply. For Carroll County bordering lands, a 100 foot buffer applies. [Source: Baltimore Metropolitan Council, 2000.]

The City of Baltimore allows certain types of recreational activities with some use restrictions for its three reservoirs. Fishing, boating, picnicking, hiking, mountain biking, and horseback riding are allowed at Loch Raven Reservoir. Birding, hiking, boating and horseback riding are allowed at Liberty Reservoir. Seasonal managed hunting with many associated enforced regulations is also allowed at Prettyboy and Loch Raven reservoirs. In addition to hunting, hiking, horseback riding, nature photography, and bird watching are allowed at Prettyboy Reservoir.

The City of Baltimore watershed regulations governing the three reservoirs are presented in: <http://publicworks.baltimorecity.gov/Portals/publicworks/documents/Watershed%20Regulations.pdf>. The regulations concerning horseback riding are quoted below:

“Horseback riding is permitted on the unpaved fire roads ONLY. There are over 200 miles of such roads on the three Water Quality Management Areas. Horseback riding is not permitted in areas where the public normally congregates. More specifically, riding is banned in the following areas: picnic areas; along paved roads (except where necessary to reach fire roads); parking lots; police pistol ranges; Pine Ridge Golf Course property; The Loch Raven Skeet and Trap Center; maintenance facility areas; boat dock areas; below the high water line or in the reservoirs and tributary streams; shortcutting between fire roads is prohibited; when the roads are wet or muddy; within the reservoir lakes; and through wetlands or other environmentally sensitive areas.”

Note that the City is currently working to resolve issues with mountain bikers using unauthorized trails at Loch Raven Reservoir that were developed within sensitive areas of the City-owned forest buffer around the reservoir.

Maryland Department of Agriculture – Changes to Nutrient Management Regulations

In May 2012, Maryland’s Department of Agriculture (MDA) issued proposed changes to the State’s nutrient management regulations, based on *“recommendations of a University of Maryland scientific panel as well as concerns raised by environmental, agricultural and municipal stakeholders.”* The revised nutrient management regulations are effective as of October 15, 2012, and are designed to achieve consistency in the way all sources of nutrients are managed and help Maryland meet nitrogen and phosphorus reduction goals. Although these proposed changes do not directly address reservoir shoreline or buffer land protection as applied to the Patuxent (or Baltimore) reservoirs, there is useful and current information contained in the document. For the latest supplement of the Nutrient Management Manual see: <http://www.mda.maryland.gov/pdf/finalnmregs.pdf>

When discussing nutrient application setbacks from surface water resources, the proposed regulations offer the following requirements assuming a vegetated buffer or riparian forested buffer is present (which is not typically the case around the Patuxent reservoirs):

- Application of crop nutrients using a broadcast spreader (e.g., spinners or slashers) requires a 35-foot setback from the edge of surface water.
- Pastures and hayfields are subject to a 10-foot nutrient application setback.

- Livestock shall be excluded from the setback to prevent direct deposition of nutrients within the setback.
- Operators are responsible for sediment and erosion control of livestock stream crossing areas.

Regarding “temporary field stockpiling (staging) for stackable organic nutrient sources” (e.g., horse manure and poultry litter piles), MDA’s proposed regulations offer the following requirements:

- If a vegetated buffer is not in place, at least 100 feet from any surface water and any irrigation or treatment ditch.
- At least 100 feet from wells, springs and wetlands.
- At least 200 feet from any residence outside the operator’s property.
- Material shall be field stockpiled temporarily in a manner that prevents nutrient runoff.

Although this proposed regulatory guidance is focused solely on nutrient management to protect water quality (not microbial contamination), and does not address recreational activities such as horse trails or dog walking, it does provide additional useful guidance on the protection of water quality from nutrient applications adjacent to surface waters.

US EPA's Model Surface Water Ordinance

USEPA produced a guidance document with general information on stream and shoreline buffers to serve as general guidance for communities. The language in the model came from enforced ordinances which were in place at the time. According to the USEPA Ordinance website (<http://www.epa.gov/owow/NPS/ordinance/osm7.htm>), there were five (5) surface water ordinances in effect for areas within Nevada, Minnesota, North Carolina, Virginia and New York. Language from the Model Ordinance includes:

- "Stream and shore buffer widths vary from twenty feet to up to 200 feet in ordinances throughout the United States. Since this ordinance is for reservoirs that supply public drinking water, the larger buffer width of 200 feet would be more appropriate."
- "The buffer strip shall be maintained in its natural state to the maximum extent possible, and shall be planted with an erosion resistant vegetative cover in those areas that have been disturbed."
- A “buffer strip shall be maintained along the edge of all public water supply reservoirs and any tributary stream discharging into these reservoirs.”
- “The following uses shall not be permitted within the buffer strip or within [blank] feet of the required buffer strip:
 - septic tanks and drainfields;
 - feed lots or other livestock impoundments;
 - trash containers and dumpsters which are not under roof or which are located so that leachate from the receptacle could escape unfiltered and untreated;

- fuel storage in excess of fifty (50) gallons [200L];
- sanitary landfills;
- activities involving the manufacture, bulk storage or any type of distribution of petroleum, chemical or asphalt products or any materials hazardous to a water supply (as defined in the Hazardous Materials Spills Emergency Handbook, American Water Works Association, 1975, as revised)”
- “A reduction in the required buffer width down to an absolute minimum of seventy-five feet (75') may be granted by the [local governmental authority] upon presentation of an impact study that provides sufficient documentation and justification that even with the reduction, the same or a greater degree of water quality protection would be afforded as would be with the full-width buffer.”

Source: USEPA Model Surface Water Ordinance:

http://water.epa.gov/polwaste/nps/upload/Model_Surface_Water_Ordinance.pdf

Other Buffer Information

In addition to source and drinking water protection, we also looked into protection of streams for general environmental protection. We looked into other source water protection measures to get an understanding of distances mandated for protection of source waters in several areas.

Examples include:

Lane County, Oregon has implemented the following BMPs to protect water quality:

- Riparian setback of 50 feet along streams
- Non-impact forest lands, impacted forest lands and exclusive farm use zones will have 100 foot setback
- Restrict development in riparian areas

Source: EWEB Source Water Protection Project: Best Management Practices and Model Ordinance Review. June 2009. p. 7

http://www.lanecounty.org/departments/pw/lmd/landuse/documents/flood_dwp/cpw%20bmp%20report_final.pdf

County of York, Virginia – Watershed Management and Protection Area Overlay Zone:

- "A two hundred foot (200') [60m] wide buffer strip shall be maintained along the edge of any tributary stream or reservoir. The required setback distance shall be measured from the centerline of such tributary stream and from the mean high water level of such reservoir. Such buffer strip shall be maintained in its natural state or shall be planted with an erosion resistant vegetative cover."
- "The following uses shall not be permitted within the buffer strip required above or within five hundred feet (500') [150m] of the required buffer strip:
 - septic tanks and drainfields;
 - feed lots or other livestock impoundments;

- trash containers and dumpsters which are not under roof or which are located so that leachate from the receptacle could escape unfiltered and untreated;
- fuel storage in excess of fifty (50) gallons [200L];
- sanitary landfills;
- activities involving the manufacture, bulk storage or any type of distribution of petroleum, chemical or asphalt products or any materials hazardous to a water supply"

Source: County of York, VA Article III. Districts Division 7. Overlay Districts Sec. 24.1-376. WMP-Watershed Management and Protection area overlay district.

http://www.epa.gov/owow/NPS/ordinance/documents/york_va.pdf

Marquette County, Michigan – Model Riparian Buffer Implementation Plan:

- “Buffer of 50 feet in total width recommended for both sides of a stream
 - Zone 1 - The Streamside Zone: 25' from the stream's edge. The first 25' are responsible for protecting the physical and ecological integrity of the stream system. This zone has critical importance in protecting water quality.
 - Permitted Activities in Zone 1:
 - Footpaths
 - Road crossings
 - Utility right-of-ways
 - Flood control structures
 - Restricted Activities in Zone 1:
 - Removal of existing vegetation (except where necessary to accommodate permitted uses)
 - Soil disturbance (grading or filling)
 - Use of pesticides or fertilizer
 - Presence of livestock
 - Use of motorized vehicles
 - Construction of permanent structures”
- “Zone 2 - The Outer Zone: Begins at the edge of Zone 1 and extends out another 25 feet. Its primary purpose is to protect the streamside zone and to provide distance between the streamside zone and any upland development. While the retention of the natural vegetation is encouraged, some management is allowed.
 - Permitted Activities in Zone 2:
 - Removal of mature tree cover (retention of shrub layer and herbaceous groundcover is required to allow for infiltration of run-off)
 - Bike paths
 - Stormwater management facilities
 - Approved recreational uses
 - Restricted Activities in Zone 2:

- Soil disturbance (grading or filling)
 - Use of pesticides or fertilizer
 - Presence of livestock
 - Construction of permanent structures”
- “Increase the size of vegetative riparian buffers on lands with steep slopes. Increase buffers an additional 10 feet on 15% - 17% slopes, and up to an additional 70 feet on slopes > 25%”
- “Regulate certain land uses designated as potential water pollution hazards, and must be set back from any stream or waterbody by the distances indicated below:
 1. Storage of hazardous substances - (150 feet)
 2. Above ground or underground petroleum storage facilities - (150 feet)
 3. Drainfields from onsite sewage disposal and treatment systems (i.e., septic systems) - (100 feet)
 4. Raised septic systems - (250 feet)
 5. Solid waste landfills or junkyards - (300 feet)
 6. Confined animal feedlot operations - (250 feet)
 7. Subsurface discharges from a wastewater treatment plant - (100 feet)
 8. Land application of biosolids - (100 feet)”

Source: A Model Riparian Buffer Implementation Plan. Developed for local units of government in the Upper Peninsula of Michigan with an emphasis on protecting water quality and quality of life. A Simple, Low-cost Great Lakes Protection Tool. July 2003.

<http://www.superiorwatersheds.org/images/riparianbufferreportnew.pdf>

New Jersey Department of Environmental Protection – Riparian Zone Model Ordinance:

- “Riparian zones shall be 50 - 300 feet wide along both sides of water
- Where steep slopes (> 15 percent) are located within the designated widths, the riparian zone shall be extended to include the entire distance of this sloped area to a maximum of 300 feet
- Extend the riparian zone to cover the entire floodway in areas where the floodway has been delineated per the Flood Hazard Area Control Act or the State's adopted floodway delineations
- Riparian zone areas shall remain in a natural condition or, be restored to a natural condition.
- Restricted activities within these zones include:
 - clearing or cutting of trees and brush, except for removal of dead vegetation and pruning for reasons of public safety or for the replacement of invasive species with indigenous species.
 - altering of watercourses
 - dumping of trash, soil, dirt, fill, vegetative or other debris
 - regrading or construction

- no new construction, development, use, activity, encroachment, or structure shall take place in a riparian zone, except as specifically authorized
- Permitted activities include:
 - passive recreation areas of public and private parkland
 - hiking, bicycle and bridle trails, provided that said trail have been stabilized with pervious materials”

Source: NJDEP's Riparian Zone Model Ordinance. July 2008.

http://www.nj.gov/dep/wqmp/docs/riparian_model_ordinance.pdf

4.5 Summary and Findings

Numerous municipalities and states have implemented legislation, regulations, policies and practices defining land uses, recreational restrictions, and riparian buffers as a means of source water protection. These range from Seattle where there is no recreational or commercial use allowed within the entire reservoir's watershed area, to watersheds where shoreline buffers may range from 50-100 feet with minimal restrictions. It is clear, however, that there are no consistent recommendations or guidance for what restrictions are required to reasonably achieve source water protection. Nevertheless, the existence of such restrictions acknowledges the special protection that is afforded to drinking water supply sources.

Distance restrictions (buffer setbacks) for recreational horseback riding, dog walking and other animal activities have not been identified that could be directly applied to the Rocky Gorge and Triadelphia Reservoirs. AWWA recommends (see Section 1) that shoreline access for such animal activities “should be discouraged” but does not indicate what form of discouragement or separation from the shoreline could be determined. Appropriate criteria for setbacks would be expected to vary nationally for each region based upon surficial soil characteristics, slopes, runoff characteristics for storm types, amount and type of activity, and seasonal wet weather concerns.

The information reviewed would obviously suggest that a larger buffer would be more protective than a smaller buffer, and that properly designed and maintained roads and trails which minimize erosion and runoff are necessary to protect proximate water resources. Although they do not currently exist, shoreline buffer requirements could be developed for the WSSC buffer properties based upon the overall guidance presented above, which might dictate minimal distances for all fishing and horse trails, as well as specifying required characteristics (BMPs) for the design of all future buffer area improvements.