

**DRAFT – FOR CONSIDERATION AT THE APRIL 27, 2006
MEETING OF NATURAL RESOURCES COMMITTEE
OF THE HIGHLANDS COUNCIL**

RMP Component: Resource Assessment / Ecosystem Assessment
Technical Report: Highlands Open Water Protection / Riparian Corridor
Council Committee: Natural Resource Committee
Memorandum Title: Technical Approach to Defining, Mapping and Characterizing Riparian Zones
Date: April 26, 2006

A. INTRODUCTION

Riparian zone analysis is an element of the ecosystem management resource assessment necessary to respond to the goals and requirements of the Highlands Water Protection and Planning Act (“Highlands Act”). The technical memorandum focuses on how riparian zones will be defined, mapped and characterized.

A riparian zone is defined as those areas adjacent to or hydrologically connected to the surface water network (e.g., streams, rivers, lakes or reservoirs). Riparian zones constitute the immediate upland buffer to a surface water as well as areas that may be more physically distant but are hydrologically connected through groundwater flow (e.g., hydric soils or wetlands that are in close proximity to a stream).

Riparian zones adjacent to water bodies play a crucial role in reducing erosion and sedimentation, removing excess nutrients and other contaminants, moderating fluctuations in water temperature, maintaining ground water recharge and base flow to streams, stabilizing stream banks, and flood storage and control. Riparian zones also serve as vital habitat for upland and wetland dependent species. The effectiveness of a riparian zone is often linked to its size, the intensity and type of adjacent land use, and the natural conditions of the corridor, including soils, slope, vegetation, wetlands and floodplain.

Due to the enhanced possibility of direct runoff or unimpeded groundwater flow, there is often a linkage between land use activities in the riparian zone and the health of adjacent and downstream aquatic ecosystems. Excluding conflicting human land use activities as well as maintaining streamside riparian areas in natural vegetation are critical for maintaining the quality of water resources in adjacent stream systems as well as to downstream reservoirs. Protected buffer zones adjacent to water bodies and streams where human development is excluded or minimized is a “best management practice” that are often advocated as a means to reduce the impact of human developed land uses on adjacent aquatic ecosystems and downstream water quality.

B. METHODOLOGY

1. Mapping Riparian Zones

Riparian zones in the Highlands will be defined and mapped according to the hydrologic properties of land cover and soil, as well as probability of inundation. Riparian zones will contain the following components: floodprone areas, riparian soils, wetlands, and stream buffers. The following existing digital GIS data sets will be used to map the individual parameters:

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1(a). Flood prone areas

- > NJDEP floodprone area
- > FEMA Q3 flood area

The NJDEP floodprone area was derived from the USGS 100-year floodplain coverage and includes the USGS documented floodprone area and undocumented floodprone area. *Source: NJDEP GIS CD-ROM Series 1, Bureau of Geographic Information and Analysis (CD-ROM date: January 1, 1996)*

The flood-prone areas have been delineated through the use of readily available information on past floods rather than from detailed surveys and inspections. In general, the delineated areas are for natural conditions and do not take into consideration the possible effects of existing or proposed flood control structures except where those effects could be evaluated. Flood areas have been identified for: (1) urban areas where the upstream drainage basin exceeds 25 square miles, (2) rural areas in humid regions where the upstream drainage basin exceeds 100 square miles, (3) rural areas where in semiarid regions where the upstream drainage basin exceeds 250 square miles, and (4) smaller drainage basins, depending on topography and potential use of the flood plains.

The FEMA Q3 flood coverage includes the 100-year floodplain. The FEMA 100 year floodplain is defined as

“Flood Insurance Risk Zone A” - Areas subject to inundation by the 1-percent-annual-chance flood event. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown. Mandatory flood insurance purchase requirements apply.

“Flood Insurance Risk Zone AE” - Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base flood elevations are shown within these zones. Mandatory flood insurance purchase requirements apply.

The digital Q3 Flood Data are designed to serve FEMA's needs for disaster response activities, National Flood Insurance Program activities, risk assessment, and floodplain management. The data are expected to be used for a variety of planning applications including broad-based review for floodplain management, land-use planning, commercial siting analysis, insurance target marketing, natural resource/environmental analyses, and real estate development and targeting.

Source: FEMA Q3 digital flood data. Disc 18 – New Jersey, Puerto Rico, Virgin Islands. (CD-ROM date: September 1996).

1(b). Riparian soils

- > Hydric soils
- > Soils exhibiting a depth to seasonal high water table less than or equal to 18 inches
- > Alluvial soils

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Hydric soils are those partial and full hydric classified soils; as defined in the SSURGO HYDCOMP (hydric component information) soil attribute table.

Soils exhibiting a depth to seasonal high water table less than or equal to 18 inches are derived from the SSURGO HYDCOMP (hydric component information) soil attribute table.

Alluvial soils include those taxonomically classified as fluvents, udifluvents, or fluvaquents (personal communication, Chris Smith, USDA, Natural Resources and Conservation Service).

Riparian soils mapping is based on the Natural Resources Conservation Service SSURGO digital soils coverage.

Source: Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) produced by the National Cartography and Geospatial Center, U.S. Department of Agriculture, Natural Resources Conservation Service, P.O. Box 6567, Fort Worth, Texas 76115. Downloaded from USDA NRCS Soil Data Mart, URL <http://soildatamart.nrcs.usda.gov/>.

The map extent for a Soil Survey Geographic (SSURGO) data set is a soil survey area, which may consist of a county, multiple counties, or parts of multiple counties. A SSURGO data set consists of map data, attribute data, and metadata.

NRCS is still in the process of completing the digitization of SSURGO soils data for Warren County. In this instance the NJDEP soils data were extracted from their original Integrated Terrain Unit Maps (ITUM). In the Arc/Info polygonal ITUMs, generated in the mid 1990's, soil boundaries were moved slightly in order to synthesize/register with other layers such as land use/land cover, geology, flood-prone areas, etc into one single GIS coverage.

For all counties represented in the SSURGO data, hydric soils were extracted using the Hydric Class Presence Field, [hydclsprs], in the muaggatt table, which is defined as “An indication of the proportion of the map unit, expressed as a class, that is "hydric", based on the hydric classification of individual map unit components.” All features with a [hydclsprs] value of ‘All hydric’ OR ‘Partially hydric’ were extracted. For Warren County, hydric soils were extracted from the ITUM data using the [Hydric] field, which represents hydric condition as a yes or no (0/1) value rating. All features with a [hydric] value of ‘1’ were extracted.

Soils with a DWT of less than or equal to 18 inches were extracted using the Water Table Depth – Annual – Minimum Field, [wtdepannmin], in the muaggatt table, which is defined as “The shallowest depth to a wet soil layer (water table) at any time during the year expressed as centimeters from the soil surface, for components whose composition in the map unit is equal to or exceeds 15%”

All features with a [wtdepannmin] value of ≤ 45.7 cm (=18 inches) were extracted. For

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Warren County, ITUM polygons were joined to the SSURGO dataset using the soil label and newsym fields. This method was used as a last resort and is likely that it is underestimating soils with a DWT of ≤ 18 inches.

For all counties represented in the SSURGO data, alluvial soils were extracted using the Taxonomic Class Field, [taxclname], in the component table, which is defined as “A concatenation of the Soil Taxonomy subgroup and family for a soil (long name).” All features that included the characters “fluv” in the [taxclname] field were extracted to capture fluvents, udifluvents, and fluvaquents. For Warren County, alluvial soils were extracted from the ITUM data using the [TAXCLASS] field. Features including the following values in the [TAXCLASS] field were extracted: EAQFLMO, IOCDYFL, IOCEUFL.

1(c). Wetlands

Wetland mapping is based on the NJDEP 2002 Land Use/Land Cover mapping.

Source: 2002 draft LU/LC data, “NJDEP 2002 Land Use/Land Cover for New Jersey (DRAFT) for WMA, Highlands Study Area”: New Jersey Department of Environmental Protection, draft data

Stream coverage is based on the NJDEP 2002 Hydrography mapping.

Source: 2002 draft hydrography data, “NJDEP 2002 Streams for New Jersey (DRAFT) for WMA, Highlands Study Area”: New Jersey Department of Environmental Protection, draft data.

All wetland types as well as Agricultural Wetlands Modified (according to the Anderson classification) that fall within 33 feet of a stream were considered to be hydrologically connected to streams, and will be considered part of the riparian area. (The 33 foot threshold was used as this distance represents the National Mapping Accuracy Standard for the possible inaccuracy in the spatial location of a mapped feature). All 2002 mapped streams were included in the analysis. Some of these mapped stream segments (e.g., drainage ditches) may not be directly connected to the larger stream-river network according to the existing mapping since there may be unmapped piped connections.

1(d). Stream Buffer

Stream coverage is based on the NJDEP 2002 Hydrography mapping (refer to source in 1(c) *Wetlands*).

All mapped streams will be buffered by 300 feet on either side of the stream bank or from the centerline of the stream if no stream bank is mapped. Narrow riparian corridors may provide suitable habitat certain wildlife species; however, wider corridors have been documented to support a greater diversity of species, including interior species. Although species habitat requirements vary, the literature has consistently found that a buffer width of at least 300 feet on either side of the stream would ensure adequate protection of wildlife habitat and movement corridors.

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1(e). Data integration

A single riparian GIS coverage will be created by joining the flood prone area, riparian soil, wetland and stream buffer coverages to create a single, combined riparian zone GIS map.

2. Characterizing Riparian Zone Land Use

Using the combined riparian zone map as the template, the land use and road density information will be extracted from the following GIS coverages:

- NJDEP 2002 Land Use/Land Cover
Source: (refer to 1c Wetlands)

- NJDOT 2002 Roads GIS coverages.
Source: 2002 roads data, “NJDOT 2003 New Jersey Roadway Network”: New Jersey Department of Transportation.
<http://www.state.nj.us/transportation/gis/map.shtm>

The land use/land cover for each of these catchments using the modified 13 class Anderson system will be extracted for each riparian zone polygon. The modification entails extracting class 2140 modified agricultural wetlands from category 10 wetlands and placing it in a separate category 14. Agricultural modified wetlands are more appropriately considered an agricultural land use rather than a wetlands land cover.¹ Since the focus of this mapping exercise is on stream impacts rather than regulatory constraints on buildout, agricultural modified wetlands were moved into an agricultural use. In addition, the following human land use intensity parameters were extracted for each riparian zone polygon.

- Urban land use (NJDEP 2002 *Land Use/land Cover*)

- Agriculture land use (NJDEP 2002 *Land Use/land Cover*)

- Percent Impervious surface (NJDEP 2002 *Land Use/land Cover*)

- Road density (ft/acre) (NJDOT 2002 *roads*)

When these analysis are complete, a summary of the degree of riparian zone impact by HUC14 will be developed. The land use/land cover, impervious surface and road density data for each HUC14 overall riparian zone will be summarized to characterize the degree of human alteration and impact.

1 Modified agricultural wetlands are defined according to the Anderson classification system include lands under cultivation that are modified former wetland areas, and which still exhibit evidence of soil saturation on the photography. These agricultural wetlands also exist in areas shown on soil surveys of the Natural Resources Conservation Service to have hydric soils.