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Riparian Land Use/Land Cover Data for Three Study Units in Group II of the Nutrient Enrichment Effects Topical Study of the National Water-Quality Assessment Program

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U.S. Department of the Interior
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Conversion Table

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
	Area	
square kilometer (km^2)	0.3861	square mile (mi^2)

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

Abbreviations and Acronyms

[Additional information noted in parentheses]

DEM	digital elevation model
DOQQ	digital orthophoto quarter-quadrangle
ESRI	Environmental Systems Research Institute, Inc.
GIS	geographic information system
LULC	land use and land cover
NAPP	National Aerial Photography Program
NAIP	National Agriculture Imagery Program
NAWQA	National Water-Quality Assessment (program)
NEET	Nutrient Enrichment Effects Topical (study)
NHD	National Hydrography Dataset
NLCD	National Land Cover Dataset
NWI	National Wetlands Inventory
OZRK	Ozark Plateaus (study unit)
UMIS	Upper Mississippi River Basin (study unit)
USGS	U.S. Geological Survey
USNK	Upper Snake River Basin (study unit)

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Abstract

This data set was developed as part of the National Water-Quality Assessment (NAWQA) Program, Nutrient Enrichment Effects Topical (NEET) study. This report is concerned with three of the eight NEET study units distributed across the United States: Ozark Plateaus, Upper Mississippi River Basin, and Upper Snake River Basin, collectively known as Group II of the NEET study. Ninety stream reaches were investigated during 2006–08 in these three study units. Stream segments, with lengths equal to the base-10 logarithm of the basin area, were delineated upstream from the stream reaches through the use of digital orthophoto quarter-quadrangle (DOQQ) imagery. The analysis area for each stream segment was defined by a streamside buffer extending laterally to 250 meters from the stream segment. Delineation of land-use and land-cover (LULC) map units within stream-segment buffers was completed using on-screen digitizing of riparian LULC classes interpreted from the DOQQ. LULC units were classified using a strategy consisting of nine classes. National Wetlands Inventory (NWI) data were used to aid in wetland classification. Longitudinal riparian transects (lines offset from the stream segments) were generated digitally, used to sample the LULC maps, and partitioned in accord with the intersected LULC map-unit types. These longitudinal samples yielded the relative linear extent and sequence of each LULC type within the riparian zone at the segment scale. The resulting areal and linear estimates of LULC extent filled in the spatial-scale gap between the 30-meter resolution of the 1990s National Land Cover Dataset and the reach-level habitat assessment data collected onsite routinely for NAWQA ecological sampling. The resulting data consisted of 12 geospatial data sets: LULC within 25 meters of the stream reach (polygon); LULC within 50 meters of the stream reach (polygon); LULC within 50 meters of the stream segment (polygon); LULC within 100 meters of the stream segment (polygon); LULC within 150 meters of the stream segment (polygon); LULC within 250 meters of the stream segment (polygon); frequency of gaps in woody vegetation at the reach scale (arc); stream reaches (arc); longitudinal LULC transect sample at the reach scale (arc); frequency of gaps in woody vegetation at the segment scale (arc); stream segments (arc); and longitudinal LULC transect sample at the segment scale (arc).

Introduction

Riparian habitat plays an important ecological role, providing connections among land-use activities, nutrient dynamics, and aquatic ecosystems. Thus, quantifying the riparian systems is critical to the success of the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program, Nutrient Enrichment Effects Topical (NEET) study. Delineation of the extent and character of the riparian system and riparian woodland can aid understanding of their relative importance for different streams, facilitating comparisons. Encroachment of terrestrial land uses into the riparian zone also can be documented efficiently during the mapping of the riparian land use and land cover (LULC). The purpose of this NEET study component was to delineate and characterize LULC within the sampled riparian systems. The mapping of riparian LULC was previously completed for the five Group I study units of the NEET study that were sampled during 2003–04 (Johnson and others, 2007). The three Group II study units are the (1) Ozark Plateaus (OZRK) in Arkansas, Kansas, Missouri, and Oklahoma, (2) Upper Mississippi River Basin (UMIS) in Minnesota and Wisconsin, and (3) Upper Snake River Basin (USNK) in Idaho and Nevada (fig. 1). NAWQA uses a combined physical, chemical, and biological approach to assess the Nation's water quality in 42 major river-basin and aquifer systems. Habitat conditions are evaluated using a modified hierarchical system proposed by Frissell and others (1986) at four scales; (1) basin, (2) segment, (3) reach, and (4) microhabitat (Fitzpatrick and others, 1998). LULC data, primarily woody vegetation at the segment and reach scales, are being used to evaluate nutrient-enrichment conditions for a subset of the NAWQA study units (Zelt and Munn, 2009).

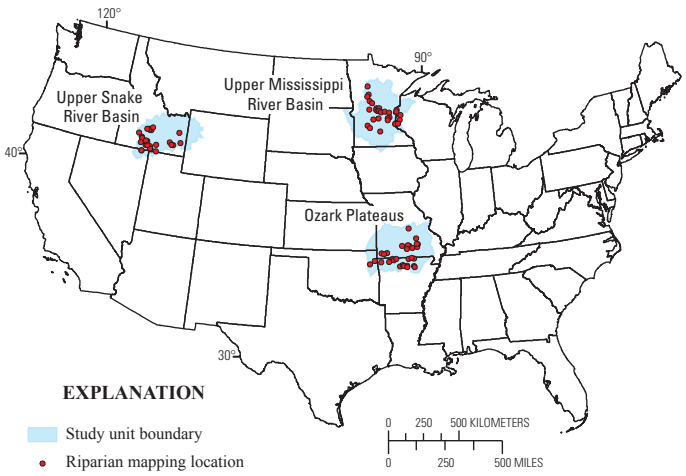

Figure 1. Location of three Group II study units and riparian mapping locations in the contiguous United States used to delineate land use/land cover for the Nutrient Enrichment Effects Topical study, 2006–08.

Purpose and Scope

This report provides riparian LULC data at the ecologically important scales of segments and reaches for 90 sites located in three of the eight NEET study units distributed across the United States. This data set provides information at a scale that fills in a data gap in riparian LULC characterizations between the land-cover data available at 30-m resolution from the 1990s National Land Cover Dataset (NLCD) (U.S. Geological Survey, 1999;Vogelmann and others, 2001) and the reach-level data routinely collected for each NAWQA habitat assessment. During the reach-level habitat assessments, only the dominant LULC type within 30-m from the top of each streambank was recorded at 11 evenly spaced transects (Fitzpatrick and others, 1998). The riparian LULC data described in this report are used to enrich the characterization of riparian conditions along selected streams studied by the USGS NAWQA Program.

Methodology

The riparian LULC map-unit delineation and classification of the sample of segments and reaches were determined for 90 sites using the methods documented by Johnson and Zelt (2005). The coordinates for the riparian mapping locations were the same as the locations of the field sites where stream reaches were sampled for NEET physical-habitat characterization induring 2006–08 (table 1).

Table 1. Riparian mapping locations used in study.

[OZRK, Ozark Plateaus; UMIS, Upper Mississippi River Basin; USNK, Upper Snake River Basin]

Study unit	U.S. Geological Survey station number	Station name
OZRK	7064780	Barren Fork near Timber, Mo.
	7054410	Bear Creek near Omaha, Ark.
	71912219	Beaty Creek near Sycamore, Okla.
	7058970	Bennetts River near Vidette, Ark.
	7065040	Big Creek at Mauser Mill, Mo.
	7057100	Big Creek near Big Flat, Ark.
	6928730	Big Piney River near Simmons, Mo.
	7055893	Calf Creek near Silver Hill, Ark.
	7052790	Little Flat Creek at McDowell, Mo.
	7194947	Little Osage Creek at Healing Springs, Ark.
	7053203	Long Creek southeast of Denver, Ark.
	7065950	Mahans Creek at West Eminence, Mo.
	6926900	Maries River near Freeburg, Mo.
	7010335	Meramec River above Cook Station, Mo.
	70692655	Myatt Creek east of Salem, Ark.
	7057280	North Fork White River near Cabool, Mo.
	7188855	North Indian Creek near Wanda, Mo.
	7065160	North Prong Jacks Fork below Arroll, Mo.
	7060710	North Sylamore Creek near Fifty Six, Ark.
	7050228	Piney Creek near Cabanol, Ark.
	7060890	Poke Bayou near Sidney, Ark.
	7060661	Roasting Ear Creek near Newnata, Ark.
	7186670	Shoal Creek near Wheaton, Mo.
	7069267	South Fork Spring River north of Moko, Ark.
	7192100	Spring Creek near Locust Grove, Okla.
	7060894	Sullivan Creek near Sandtown, Ark.
	7056695	Water Creek near Evening Star, Ark.
	6928800	West Piney Creek near Bado, Mo.
	6927590	Woods Fork near Hartville, Mo.
	7053250	Yocum Creek near Oak Grove, Ark.
UMIS	5340962	Apple River at 70th Street near Range, Wis.
	5286297	Cedar Creek near East Bethel, Minn.
	5314510	Chetomba Creek near Renville, Minn.
	5272951	Clearwater River above Lake Louisa near South Haven, Minn.
	5273800	Elk River near Popple Creek, Minn.
	5287890	Elm Creek near Champlin, Minn.
	5341854	Kinnickinnic River at Steeple Drive near Hammond, Wis.

Table 1. Riparian mapping locations used in study.—Continued

[OZRK, Ozark Plateaus; UMIS, Upper Mississippi River Basin; USNK, Upper Snake River Basin]

Study unit	U.S. Geological Survey station number	Station name
UMIS	5268700	Little Rock Creek at Rice, Minn.
	5278020	Middle Fork Crow River at Crow River, Minn.
	5200170	Mississippi River near Vern, Minn.
	5245295	Moran Creek near Staples, Minn.
	5267185	North Two Rivers near Elmdale, Minn.
	5244409	Redeye River at Hillview, Minn.
	5270103	Sauk River below Lake Osakis near Osakis, Minn.
	5243200	Shell River near Horton, Minn.
	5267930	Skunk River near Buckman, Minn.
	5326189	South Branch Rush River at County Road 63 near Norseland, Minn.
	5267578	Spunk Creek near Opole, Minn.
	5284945	Stanchfield Creek at Springvale, Minn.
	5265698	Swan River below Sobieski, Minn.
	5340280	Trade River at Melo Drive near Trade Lake, Wis.
	5286790	Trott Brook at County Road 5 in Ramsey, Minn.
	5341763	Valley Branch near Afton, Minn.—Station 2
	5341764	Valley Branch near Afton, Minn.—Station 3
	5284690	West Branch Rum River near Foreston, Minn.
	531656290	West Fork Beaver Creek at 320 Street near Bechyn, Minn.
	5341685	Willow River at 210th Avenue near Deer Park, Wis.
	5244385	Wing River above waste water treatment plant at Verndale, Minn.
	5338955	Wood River at North Williams Road near Grantsburg, Wis.
USNK	13140800	Big Wood River at Stanton Crossing near Bellevue, Idaho
	13134640	Billingsley Creek below Vader Grade near Hagerman, Idaho
	13063000	Blackfoot River above reservoir near Heneary, Idaho
	13095400	Blind Canyon Spring near Buhl, Idaho
	13090999	Blue Lakes Spring below Pump Plant near Twin Falls, Idaho
USNK	13095500	Box Canyon Springs near Wendell, Idaho
	13095175	Briggs Spring at Head near Buhl, Idaho
	13141500	Camas Creek near Blaine, Idaho
	13093478	Cedar Draw at Clover Road (3900 N.) near Filer, Idaho
	13154400	Clover Creek near King Hill, Idaho
	13088510	Cottonwood Creek near Oakley, Idaho
	13089500	Devils Washbowl Spring near Kimberly, Idaho
	13082500	Goose Creek above Trapper Creek near Oakley, Idaho
	13147900	Little Wood River above High Five Creek near Carey, Idaho
	13082300	Marsh Creek near Albion, Idaho
	13075000	Marsh Creek near McCammon, Idaho
	13075320	Mink Creek above Kinney Creek near Pocatello, Idaho
	13094680	Mud Creek above Clear Creek near Buhl, Idaho
	13092300	North Cottonwood Creek near Rogerson, Idaho
	13073000	Portneuf River at Topaz, Idaho
	13078000	Raft River above Onemile Creek near Malta, Idaho
	13092747	Rock Creek above Highway 30/93 at Twin Falls, Idaho
	13141070	Rock Creek above Eagle Spring near Bellevue, Idaho
	13091995	Rock Creek at U.S. Forest Service footbridge near Rock Creek, Idaho
	13107200	Salmon Falls Creek at Lily Grade Road near Castleford, Idaho
	13103510	Salmon Falls Creek above Highway 93 near San Jacinto, Nev.
	13104900	Shoshone Creek 0.5 mile above mouth near San Jacinto, Nev.
	13150200	Stalker Creek near Gannett, Idaho
	13083000	Trapper Creek near Oakley, Idaho
	13057940	Willow Creek below Tex Creek near Ririe, Idaho
	13140900	Willow Creek near Spring Creek Ranch near Bellevue, Idaho

NEET sites for each study unit were located within the study unit and targeted nutrient ecoregion (Rohn and others, 2002) boundaries, where possible, according to the site-selection procedures documented by Brightbill and Munn (2008). The nutrient ecoregions targeted for each study unit were (1) central and eastern forested uplands of the OZRK, (2) mostly glaciated dairy region of the UMIS, and (3) xeric west region of the USNK (Rohn and others, 2002). In cases where a sufficient number of suitable sampling sites were not available within the study unit boundary, locations outside the study unit but within the targeted nutrient ecoregion were used. Exceptions also were made to include selected NAWQA surface-water trends sites outside the nutrient ecoregion boundary (Gilliom and others, 2001).

Lengths of stream reaches at each of the 90 sites examined for the three NEET study units were variable and based on field conditions. Generally, the reach length is 20 times the mean wetted channel width (Fitzpatrick and others, 1998). Reach lengths ranged from 60 to 500 m. Stream reaches were located at the downstream end of the delineated stream segments.

Stream segment lengths, in kilometers (km), were equal to the base-10 logarithm of their basin drainage area, in square kilometers (km^2). Segments were delineated upstream beginning at the downstream end of the stream reach, and used the channel shown in digital orthophoto quarter-quadrangle (DOQQ) imagery. The analysis area for each stream segment was defined by a streamside buffer extending laterally to 250 meters from the stream segment. Delineation of LULC map units within stream-segment buffers was completed using on-screen digitizing of riparian LULC classes interpreted from the DOQQ. The riparian LULC units were classified using a customized LULC classification system adapted for characterizing riparian zones (table 2). National Wetlands Inventory (NWI) data were used to aid in wetland classification (U.S. Fish and Wildlife Service, 2009). This classification system is a modified version of the classification strategy of Anderson and others (1976).

Areal LULC estimates were tabulated for 25-m and 50-m buffers at the reach scale and 50-m, 100-m, 150-m, and 250-m buffers at the segment scale. Reach- and segment-level longitudinal transects (lines offset from the stream reaches and segments) were generated digitally, used to sample riparian LULC maps, and partitioned in accord with the intersected LULC map-unit types. The longitudinal-transect samples yielded the relative linear extent and sequence of each LULC type within the riparian zone.

Table 2. Land-use/land-cover classification system for riparian areas.

[Modified from Anderson and others (1976); LU_CODE, land-use code used in digital data and tables; LULC, land use or land cover]

LU CODE	LULC Class	Explanation
B	Barren land	Bare soil, sand, gravel deposit, rock outcrop
C	Cropland	Row crops, small grains, alfalfa, or other herbaceous crops
F	Farmstead	Farm dwelling, outbuildings, barnyards, livestock yards, or pens
G	Grassland	Grass, pasture, or herbaceous rangeland
O	Open water	Water bodies including ponds, lakes, streams, and canals
S	Shrubland	Shrubs, where able to distinguish
U	Urban/ built-up land	Urban residential, commercial, transportation, or industrial land covers
W	Wetland	Both herbaceous and wooded wetlands
WV	Woody vegetation	Trees, shrubs, brushy rangeland (includes orchards and vineyards)

Riparian Land Use/Land Cover Data

The data sets described in this report are available for download directly from the Web links that follow. The compressed file available at each Web link contains a ReadME.txt file, metadata, and all 12 geospatial data sets in one of three formats;

ArcInfo coverage;
Personal geodatabase; and
ESRI shapefile.

Data available from these links are in .zip compressed format. WinZip® is a Windows-based compression utility. Acompression/decompression utility program is needed to extract the data. A trial copy of WinZip software is available at: *http://www.winzip.com/downwz.htm* (accessed June 1, 2009). Each link corresponds to a compressed file containing the set of geospatial data in one of three format types: (1) Environmental Systems Research Institute, Inc. (ESRI, Redlands, Calif.) ArcInfo coverages (ESRI, 2007a); (2) ESRI personal geodatabase; or (3) ESRI shapefile (ESRI, 1998) native-format Geographic Information System (GIS) files.

For more information on ESRI, refer to *http://www.esri.com* (accessed June 1, 2009). *Coverage* is the term used by ESRI (2007a) for a vector-based digital map stored in ArcInfo native format. The riparian LULC data consist of geographic features stored as lines or polygons, feature-attribute tables,

and other data files and indexes that are used by the software. A *personal geodatabase* functions as a container housing the different types of data including vector features (polygon or line) and attribute data in one location (ESRI, 2007b). All 12 data sets from this the report are stored within a single geodatabase. An ESRI *shapefile* consists of a main file, an index file, and a dBASE® -format attribute table. Each record in the main file describes a geographic feature (or *shape*) with a list of its vertices and coordinates. The dBASE table contains feature attributes with one record per feature and contains LULC and additional information describing the feature.

Processing steps and detailed descriptions of the 12 geospatial data sets are reported in the protocol (Johnson and Zelt, 2005), but data set names are listed and briefly described as follows:

1. lulc025—riparian land use/land cover within 25 m of the stream reach (polygon);
2. lulc050r—riparian land use/land cover within 50 m of the stream reach (polygon);
3. lulc050s—riparian land use/land cover within 50 m of the stream segment (polygon);
4. lulc100s—riparian land use/land cover within 100 m of the stream segment (polygon);
5. lulc150s—riparian land use/land cover within 150 m of the stream—segment (polygon);
6. lulc250s—riparian land use/land cover within 250 m of the stream segment (polygon);
7. r_freq—frequency of gaps in woody vegetation land cover at the reach scale (arc);
8. reach—stream reaches (arc);
9. rmargin—longitudinal land use/land cover at the reach scale (arc);
10. s_freq—frequency of gaps in woody vegetation land cover at the segment scale (arc);
11. segment—stream segments (arc); and
12. smargin—longitudinal land use/land cover at the segment scale (arc).

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