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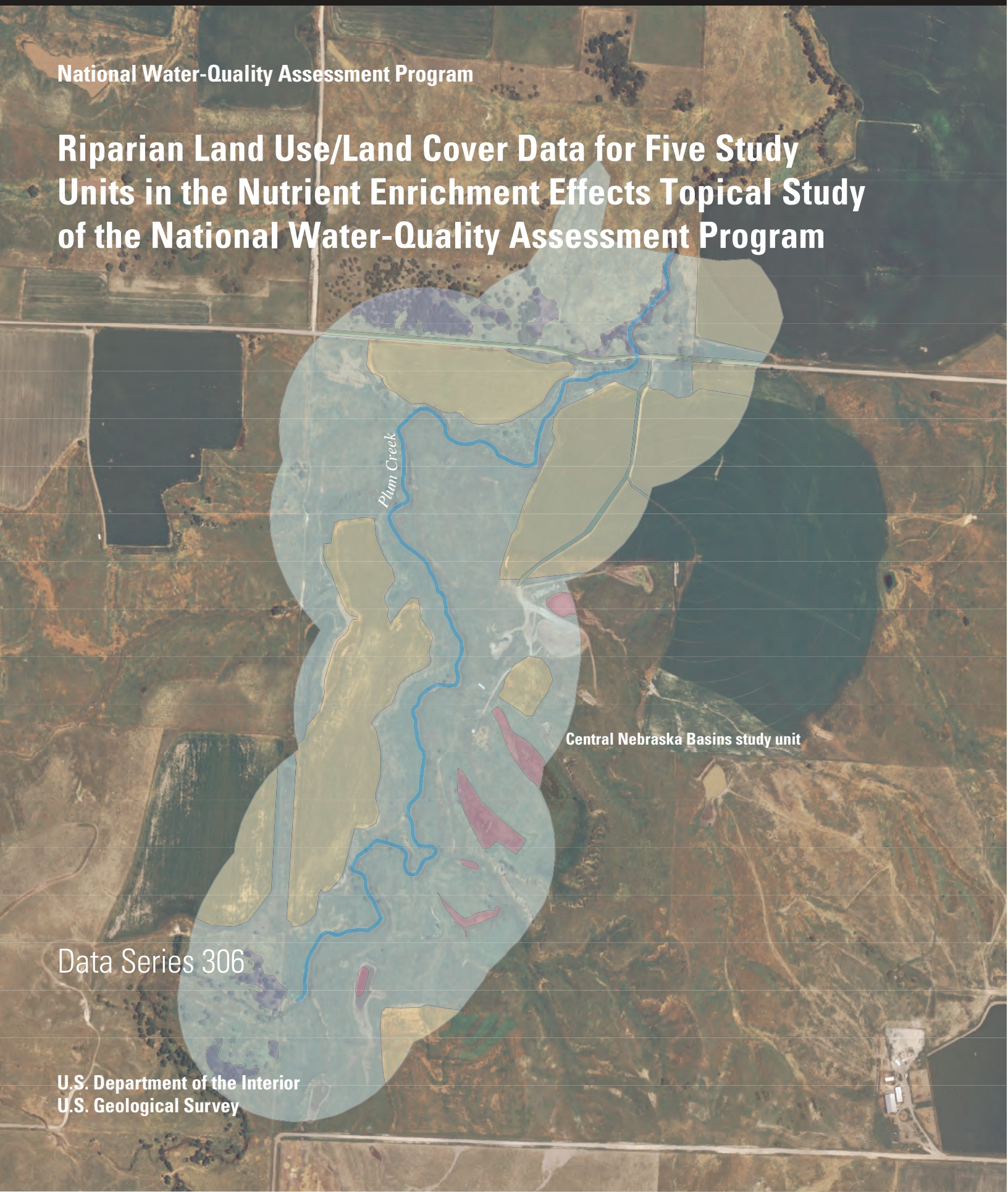
Riparian Land Use/Land Cover Data for Five Study Units in the Nutrient Enrichment Effects Topical Study of the National Water-Quality Assessment Program



Data Series 306

U.S. Department of the Interior
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Riparian Land Use/Land Cover Data for Five Study Units in the Nutrient Enrichment Effects Topical Study of the National Water-Quality Assessment Program

By Michaela R. Johnson, Gary R. Buell, Moon H. Kim, and Mark R. Nardi

Prepared as part of National Water-Quality Assessment Program

Data Series 306

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Conversion Factors and Datum

Multiply	By	To obtain
	Length	
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)

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

Abbreviations and Acronyms (additional information noted in parentheses)

ACFB	Apalachicola-Chattahoochee-Flint River Basin (study unit)
CCYK	Central Columbia Plateau – Yakima River Basin (study unit)
CNBR	Central Nebraska Basins (study unit)
DEM	digital elevation model
DOQQ	digital orthophoto quarter-quadrangle
ESRI	Environmental Research Systems Institute, Inc. (Redlands, Calif.)
GIS	geographic information system
LULC	land use/land cover
NAPP	National Aerial Photography 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
PODL	Potomac River Basin and Delmarva Peninsula (study unit)
USGS	U.S. Geological Survey
WHMI	White, Great and Little Miami River Basins (study unit)

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

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Abstract

This dataset was developed as part of the National Water-Quality Assessment (NAWQA) Program, Nutrient Enrichment Effects Topical (NEET) study for five study units distributed across the United States: Apalachicola-Chattahoochee-Flint River Basin, Central Columbia Plateau-Yakima River Basin, Central Nebraska Basins, Potomac River Basin and Delmarva Peninsula, and White, Great and Little Miami River Basins. One hundred forty-three stream reaches were examined as part of the NEET study conducted 2003–04. Stream segments, with lengths equal to the logarithm of the basin area, were delineated upstream from the downstream ends of the stream reaches with the use of digital orthophoto quarter quadrangles (DOQQ) or selected from the high-resolution National Hydrography Dataset (NHD). Use of the NHD was necessary when the stream was not distinguishable in the DOQQ because of dense tree canopy. The analysis area for each stream segment was defined by a buffer beginning at the segment extending to 250 meters lateral to the stream segment. Delineation of land use/land cover (LULC) map units within stream segment buffers was conducted using on-screen digitizing of riparian LULC classes interpreted from the DOQQ. LULC units were mapped using a classification strategy consisting of nine classes. National Wetlands Inventory (NWI) data were used to aid in wetland classification. Longitudinal transect sampling lines offset from the stream segments were generated and partitioned into the underlying LULC 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 LULC data filled in the spatial-scale gap between the 30-meter resolution of the National Land Cover Dataset and the reach-level habitat assessment data collected onsite routinely for NAWQA ecological sampling. The final data consisted of 12 geospatial datasets: 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 LULC at the reach scale (arc); stream reaches (arc); longitudinal LULC at the reach scale (arc); frequency of gaps in woody vegetation LULC at the segment scale (arc); stream segments (arc); and longitudinal LULC 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/land cover (LULC). The purpose of this NEET study component was to delineate and characterize LULC within the sampled riparian systems.

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 major river basins.

Purpose and Scope

This report provides riparian LULC data for five NEET study units distributed across the United States at the

ecologically important scales of segments and reaches. These data were developed by following procedures outlined in the protocol by Johnson and Zelt (2005). The five study units were (1) the Apalachicola-Chattahoochee-Flint River Basin (ACFB) in Georgia and Florida, (2) the Central Columbia Plateau-Yakima River Basin (CCYK) in Washington, (3) the Central Nebraska Basins (CNBR) in Nebraska, (4) the Potomac River Basin and Delmarva Peninsula (PODL) in Delaware and Maryland, and (5) the White, Great and Little Miami River Basins (WHMI) in Indiana and Ohio (fig. 1). Specifically, this dataset provides information at a scale that fills in a data gap in riparian LULC between the land-cover data available at 30-m resolution from the 1990s National Land Cover Dataset (NLCD) (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 support the USGS NAWQA Program.

Acknowledgments

Stephen J. Char (USGS Colorado Water Science Center) was instrumental in finalizing the geographic information system (GIS) datasets and metadata for publication. The authors wish to thank Naomi Nakagaki (USGS California Water Science Center) and James L. Kennedy (USGS Wisconsin Water Science Center) for their thoughtful and helpful reviews.

Methodology

The riparian LULC map unit delineation and classification of the sample of segments and reaches were determined for 143 sites using the methods documented by Johnson and Zelt (2005). Riparian mapping locations were the same sites where stream reaches were identified for NEET physical habitat sampling in 2003–04 (table 1).

NEET sites for each study unit were located within the study unit and targeted nutrient ecoregion boundaries, where possible, according to the site-selection procedures documented by Frankforter and others (2003). The nutrient ecoregions targeted for each study unit were ACFB—southern coastal plains, CCYK—xeric west, CNBR—south-central cultivated Great Plains, PODL—eastern coastal plains, and WHMI—Corn Belt and northern Great Plains (U.S. Environmental Protection Agency, 2002). In cases where a sufficient number of sampling sites were not available within the study unit boundary, locations outside the study unit but within the targeted nutrient ecoregion were allowed. Exceptions also were made for selected NAWQA national surface-water trends sites outside the nutrient ecoregion boundary (Gilliom and others, 2001).

Lengths of stream reaches at each of the 143 sites examined for the five 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 90 to 560 meters. Stream reaches were extracted from the downstream end of the delineated stream segments.

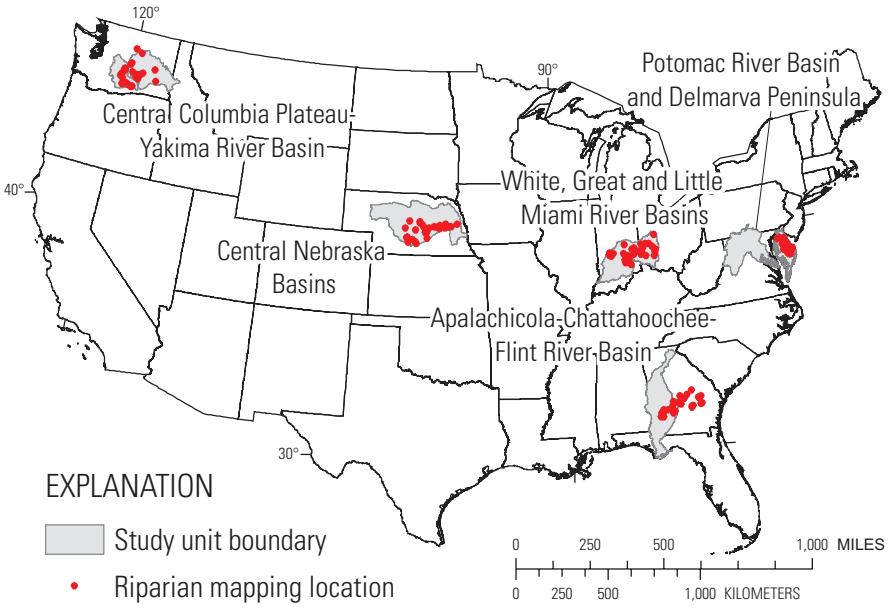

Figure 1. Locations of five National Water-Quality Assessment Program study units and riparian mapping locations in the contiguous United States used to delineate land use/land cover for the Nutrient Enrichment Effects Topical study, 2003–04.

Table 1. Riparian mapping locations in study.

[CR, county road; DR, drain; JD, joint drain; SCBID, South Columbia Basin Irrigation District; SR, state road]

U.S. Geological Survey station number	Station name
Apalachicola-Chattahoochee-Flint River Basin	
02214315	Savage Creek at CR 87 near Westlake, GA
02215090	South Prong Creek near Hawkinsville, GA
02215120	Cedar Creek at CR 198 near Hawkinsville, GA
02215295	Bluff Creek at Laidler Road near Finleyson, GA
02215375	Horse Creek at GA 149 near Lumber City, GA
02215656	Gum Swamp Creek at GA 126 near Cochran, GA
02216170	Sugar Creek at CR 194 near Towns, GA
02216185	Turnpike Creek at GA 149 near McRae, GA
02223900	Turkey Creek at Old Hawkinsville Road near Dudley, GA
02225105	Cobb Creek at US 1 near Johnson Corner, GA
02225148	Ohoopee River at GA 57 near Wrightsville, GA
02225317	Jacks Creek at CR 252 near Stillmore, GA
02225353	Pendleton Creek at GA 297 near Vidalia, GA
02225365	Tiger Creek at GA 297 near Vidalia, GA
02225600	Rocky Creek at GA 147 near Johnson Corner, GA
02349685	Hogcrawl Creek at GA 329 near Five Points, GA
02349900	Turkey Creek at Byromville, GA
02350080	Lime Creek near Cobb, GA
02350360	Swift Creek near Warwick, GA.
02350470	Chokee Creek at New York Road near Leesburg, GA
02350509	Jones Creek near Oakfield, GA
02350798	Bear Creek at CR 124 near Parrott, GA
02351790	Muckaloochee Creek at Cross Road near Sumter, GA
02353097	Ichawaynochaway Creek at Cherry Cola Road near Dawson, GA
02353098	Turkey Creek at Cherry Cola Road near Graves, GA
02353190	Little Ichawaynochaway Creek at CR 3 near Cuthbert, GA
02353245	Falling Creek at CR 149 near Morgan, GA
02353330	Pachitla Creek Fountain Bridge Road near Carnegie, GA
02353360	Carter Creek at CR 20 near Carnegie, GA
Central Columbia Plateau-Yakima River Basin (CCYK)	
12437940	East Foster Creek at Bell Butte Road near Leahy, WA
12449950	Methow River near Pateros, WA
12462545	Rock Island Creek near Rock Island, WA
12462640	Colockum Creek near Rock Island, WA
12464606	Sand Hollow Creek at S Road SW near Vantage, WA

Table 1. Riparian mapping locations in study.—Continued

[CR, county road; DR, drain; JD, joint drain; SCBID, South Columbia Basin Irrigation District; SR, state road]

U.S. Geological Survey station number	Station name
Central Columbia Plateau-Yakima River Basin (CCYK)—Continued	
12464770	Crab Creek at Rocky Ford Road near Ritzville, WA
12471400	Lind Coulee Wasteway at SR 17 near Warden, WA
12472190	Lower Crab Creek near McManamon Road near Othello, WA
12472380	Crab Creek Lateral above Royal Lake near Othello, WA
12472515	Red Rock Coulee at E Road SW near Smyrna, WA
12472940	SCBID Wahatis Wasteway near Mattawa, WA
12473190	Wahluke Branch 10 Wasteway near White Bluffs, WA
12483940	Naneum Creek above Game Farm Road near Kittitas, WA
12483995	Coleman Creek below Town Canal near Kittitas, WA
12484550	Umtanum Creek near mouth at Umtanum, WA
12485940	Wenas Creek at Fletcher Lane near Selah, WA
12498980	Cowiche Creek at Weikel, WA
12502500	Ahtanum Creek at Union Gap, WA
12505450	Granger Drain at Granger, WA
12508400	Satus Creek above Dry Creek near Toppenish, WA
12508480	Dry Creek near Toppenish, WA
12508820	Black Canyon Creek at Waneta Road near Sunnyside, WA
12509698	Spring Creek at McCreadie Road near Prosser, WA
13351000	Palouse River at Hooper, WA
461315119452400	JD 55.1 at Bettinson Road near Prosser, WA
461517119402500	Snipes Creek at Mccreadie Road near Whitsran, WA
462023120075200	DR 2 at Yakima Valley Highway near Granger, WA
465647120265700	Park Creek at S. Ferguson Road near Ellensburg, WA
465708120270500	Caribou Creek at S Ferguson Road near Ellensburg, WA
Central Nebraska Basins (CNBR)	
06767500	Plum Creek near Smithfield, NE
06772000	Wood River near Alda, NE
06773500	Prairie Creek near Silver Creek, NE
06781800	South Loup River near Callaway, NE
06784500	Oak Creek near Dannebrog, NE
06788898	Mira Creek near North Loup, NE
06795500	Shell Creek near Columbus, NE
06800000	Maple Creek near Nickerson, NE
403559099112201	North Dry Creek at CR 742, Phelps County, NE

Table 1. Riparian mapping locations in study.—Continued

[CR, county road; DR, drain; JD, joint drain; SCBID, South Columbia Basin Irrigation District; SR, state road]

U.S. Geological Survey station number	Station name
Central Nebraska Basins (CNBR)—Continued	
403948099160201	South Channel Platte tributary near Odessa, NE
404523099253501	Elm Creek 3.6 miles northwest of Elm Creek, NE
405041099460501	Buffalo Creek near Lexington, NE
405129099493201	Spring Creek at CR 761, Dawson County, NE
405205099460401	French Creek near Lexington, NE
411320099154301	Mud Creek near Mason City, NE
412103098234701	Spring Creek near Wolbach, NE
412240097205901	Clear Creek near Columbus, NE
412258098433301	Davis Creek near Scotia, NE
412338097533201	Plum Creek near Fullerton, NE
412441098033901	Timber Creek near Fullerton, NE
412512097055301	Lost Creek near Schulyer, NE
412546096542001	Skull Creek near Linwood, NE
412829097405601	Looking Glass Creek near Genoa, NE
413311097171001	Loseke Creek near Columbus, NE
413548098575901	Dane Creek near Ord, NE
413850099402301	Victoria Creek southeast of Milburn, NE
413931098585901	Turtle Creek near Elyria, NE
414008098295801	Turkey Creek 3.7 miles southwest of St. Paul, NE
Potomac River Basin and Delmarva Peninsula	
01483500	Leipsic River near Cheswold, DE
01483666	Penearose Branch near Pearsons Corner, DE
01483990	Black Swamp Creek near Mastens Corner, DE
01484036	Hudson Branch at Canterbury, DE
01484050	Pratt Branch near Felton, DE
01484100	Beaverdam Branch at Houston, DE
01484534	Swan Creek near Millsboro, DE
01484640	Unity Branch at Fairmount, DE
01484645	Phillips Branch near Fairmount, DE
01484652	Bundicks Branch near Cool Spring, DE
01485025	Burnt Mill Branch near Pittsville, MD
01485030	Aydylotte Branch at Pittsville, MD
01486100	Andrews Branch near Delmar, MD
01487060	Mifflin Ditch near Georgetown, DE
01487116	Stony Branch at Hardscrabble, DE

Table 1. Riparian mapping locations in study.—Continued

[CR, county road; DR, drain; JD, joint drain; SCBID, South Columbia Basin Irrigation District; SR, state road]

U.S. Geological Survey station number	Station name
Potomac River Basin and Delmarva Peninsula—Continued	
01487250	Chapel Branch near Seaford, DE
01487300	Butler Mill Branch near Woodland, DE
01487910	Meadow Branch at Little Acres, DE
01488530	Cattail Branch near Adamsville, DE
01489000	Faulkner Branch at Federalsburg, MD
01490590	Cow Marsh Ditch near Willow Grove, DE
01490600	Meredith Branch near Sandtown, DE
01491020	Gravelly Branch near Greensboro, MD
01491050	Spring Branch near Greensboro, MD
01492900	Jordan Branch near Downs Chapel, DE
01492990	Mill Branch near Millington, MD
01493500	Morgan Creek near Kennedyville, MD
White, Great and Little Miami River Basins (WHMI)	
03240500	North Fork Massie Creek at Cedarville, OH
03264900	Painter Creek near Sugar Grove, OH
03272200	Elk Creek at Miltonville, OH
03357330	Big Walnut Creek near Roachdale, IN
390948085274301	Vernon Fork Muscatatuck River at CR 1220N near Zenas, IN
391545085454301	Duck Creek at CR 850E near Newbern, IN
391726085485101	Haw Creek at CR 600N near Nortonburg, IN
391732085414401	Clifty Creek at CR 1150E near Hartsville, IN
392402085503001	Slash Creek at CR 850S near Lewis Creek, IN
392735083544101	Todd Fork Creek at Hale Road near Wilmington, OH
392751085291801	Little Flatrock River 700 feet upstream from CR 1000S near Milroy, IN
393619084461200	Fourmile Creek at Camden College Corner Road, OH
393659085340301	Mud Creek at CR 650W near Arlington, IN
393723085120201	Williams Creek at Williams Road near Connersville, IN
393828086381301	Mill Creek at CR 625W near Stilesville, IN
393837083505401	Caesar Creek at Hoop Road near Xenia, OH
393930084410901	Paint Creek at Camden Sugar Valley Road near Camden, OH
394211086454801	Clear Creek at CR 300N near Fillmore, IN
394340085524601	Sugar Creek at CR 400S at New Palestine, IN
394510084545801	Elkhorn Creek at Esteb Road near Abington, IN
394544086305601	West Fork White Lick Creek at Ellis Park at Danville, IN

Table 1. Riparian mapping locations in study.—Continued

[CR, county road; DR, drain; JD, joint drain; SCBID, South Columbia Basin Irrigation District; SR, state road]

U.S. Geological Survey station number	Station name
White, Great and Little Miami River Basins (WHMI)	
395121083561701	Mud Run Creek at Hunter Road near Enon, OH
395327085190801	Flatrock River at CR 350E near New Castle, IN
395350084353800	Twin Creek at Euphemia Castine Road, OH
395623085090401	West Fork Whitewater River at Hoover Road near Hagerstown, IN
395625084010101	Honey Creek at New Carlisle Pike near New Carlisle, OH
400421084115601	Spring Creek at Piqua Troy Road near Troy, OH
400540084415601	West Branch Greenville Creek at Nashville Road near Greenville, OH
400806085455601	Indian Creek at CR 200N near Hamilton, IN
402901083482601	South Fork Great Miami River at CR 96 near Belle Center, OH

Stream segments, with lengths equal to the logarithm of the basin area, were delineated upstream from the downstream end of the stream reach with the use of digital orthophoto quarter quadrangles (DOQQ) or selected from the high-resolution National Hydrography Dataset (NHD). Use of the NHD was necessary when the streams were not distinguishable in the DOQQ as was the case for most ACFB sites because of dense tree canopy. The analysis area for each stream segment was defined by a buffer beginning at the segment extending to 250 meters lateral to the stream segment. Delineation of LULC map units within stream segment buffers was conducted using on-screen digitizing of riparian LULC classes interpreted from the DOQQ. The riparian LULC units were mapped using a customized LULC classification system adapted for characterizing riparian zones (table 2). This classification system is a modified version of the classification strategy by Anderson and others (1976). National Wetlands Inventory (NWI) data were used to aid in wetland classification. Areal LULC datasets were produced 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 longitudinal transect sampling lines offset from the stream reaches and segments were generated and partitioned into the underlying LULC types. The longitudinal samples yielded the relative linear extent and sequence of each LULC type within the riparian zone.

Riparian Land Use/Land Cover Data

The datasets described in this report are available directly for download from these Web links:

ArcInfo coverage;
ArcInfo interchange format (.e00)*; and
ESRI shapefile.

Data available from these links are in .zip compressed format. WinZip® is a Windows-based compression utility. A program like this is needed to extract the data. A link to a trial copy of WinZip software is available at: *http://www.winzip.com/downwz.htm* (accessed October 2, 2007). Each link contains a compressed file containing geospatial data sets in one of three format types: (1) Environmental Systems Research Institute, Inc. (ESRI) ArcInfo coverages (Environmental Systems Research Institute, Inc., 2007); (2) ESRI ArcInfo export (.e00); or (3) ESRI shapefile (Environmental Systems Research Institute, Inc., 1998) format files.

ESRI distributes the GIS software ArcGIS, which is an integrated collection of GIS software products including ArcInfo. For more information on the ESRI, please refer to *http://www.esri.com* (accessed October 2, 2007). Coverage is the term used by ESRI (2007) for a vector-based digital map stored in ArcInfo (Environmental Systems Research Institute, Inc., 2007). Coverages consist of geographic features stored as points, lines or polygons, attribute tables accessible to the user, and tables that are used exclusively by the software. An ESRI shapefile consists of a main file, an index file, and a dBASE® format table. Each record in the main file describes a shape with a list of its vertices. In the index file, each record contains the offset of the corresponding main file record from the beginning of the main file. The dBASE table contains feature attributes with one record per feature and may contain additional information describing the feature.

The 12 geospatial datasets are detailed in the protocol (Johnson and Zelt, 2005) and are listed and described as follows:

1. lulc025r—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);

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/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)

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 use/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 use/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).

Available at each link is a compressed file containing a ReadME.txt file, metadata, and all 12 geospatial datasets in the following formats: ArcInfo coverage, ArcInfo interchange format (*.e00), and ESRI shapefile.

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