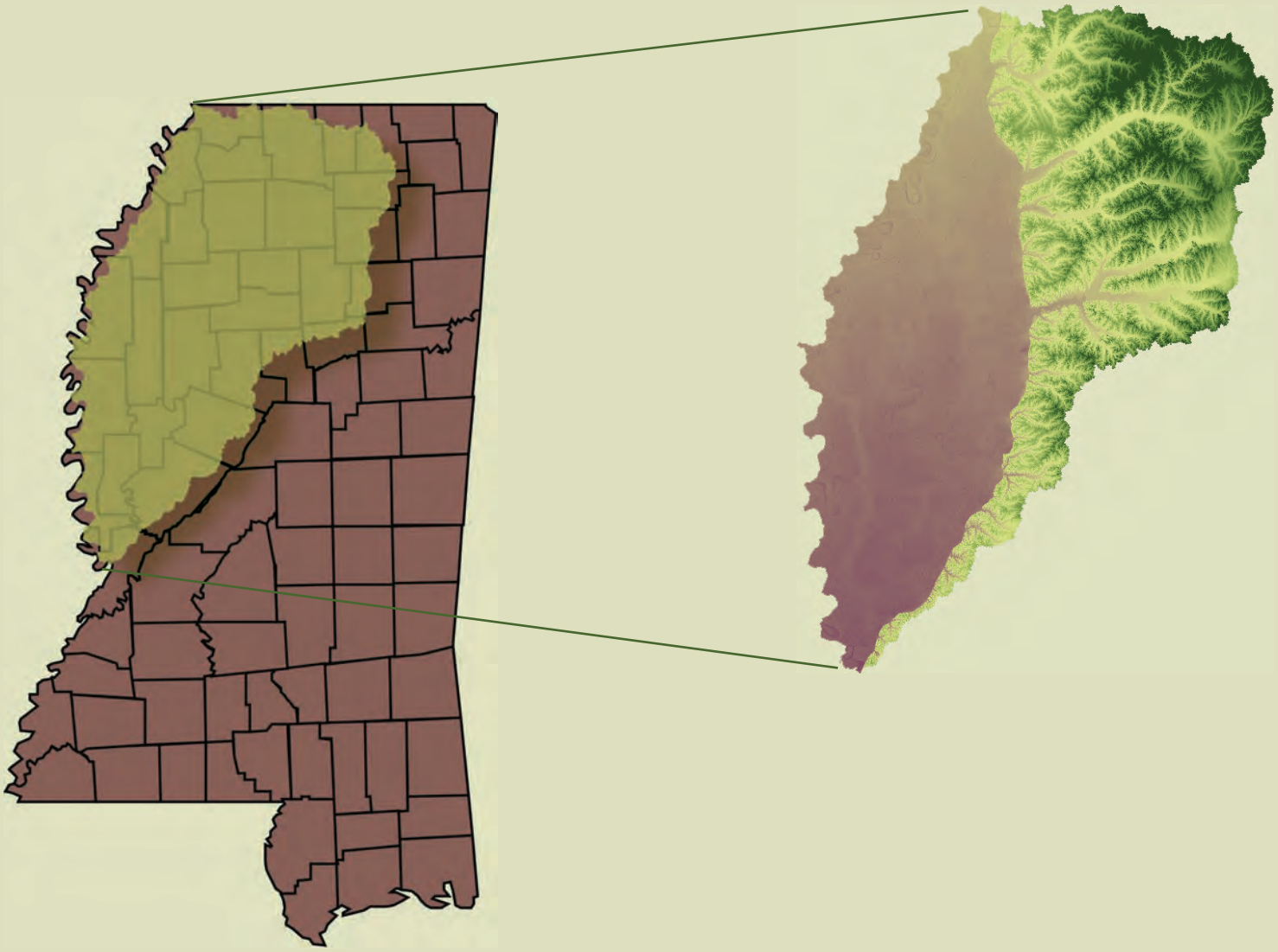
Bulletin 1202 December 2012

YAZOO RIVER BASIN ASSESSMENT:

Preliminary Report



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Yazoo River Basin Assessment: Preliminary Report

Prem B. Parajuli
Assistant Professor
Department of Agricultural and Biological Engineering

Hakkwan Kim
Postdoctoral Research Associate
Department of Agricultural and Biological Engineering

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Contents

Yazoo River Basin Assessment: Preliminary Report

Description

The Yazoo River Basin (YRB) is the largest river basin in Mississippi, covering a drainage area of approximately 35,000 square kilometers. Within the drainage area, there are approximately 39,515 kilometers of rivers and streams (Guedon and Thomas 2004). The basin contains 30% of the Mississippi's land area and is home to one-fifth of its population (YRB Team 2006). The Yazoo River is formed by the confluence of the Tallahatchie and Yalobusha rivers in the central portion of the basin near Greenwood, Mississippi. The Yazoo River then flows down to the southwest for about 315 kilometers to join with the Mississippi River near Vicksburg, Mississippi. Within the YRB boundary, there are four main reservoirs: Arkabutla Lake, Sardis Lake, Enid Lake, and Grenada Lake reservoir (Figure 1).

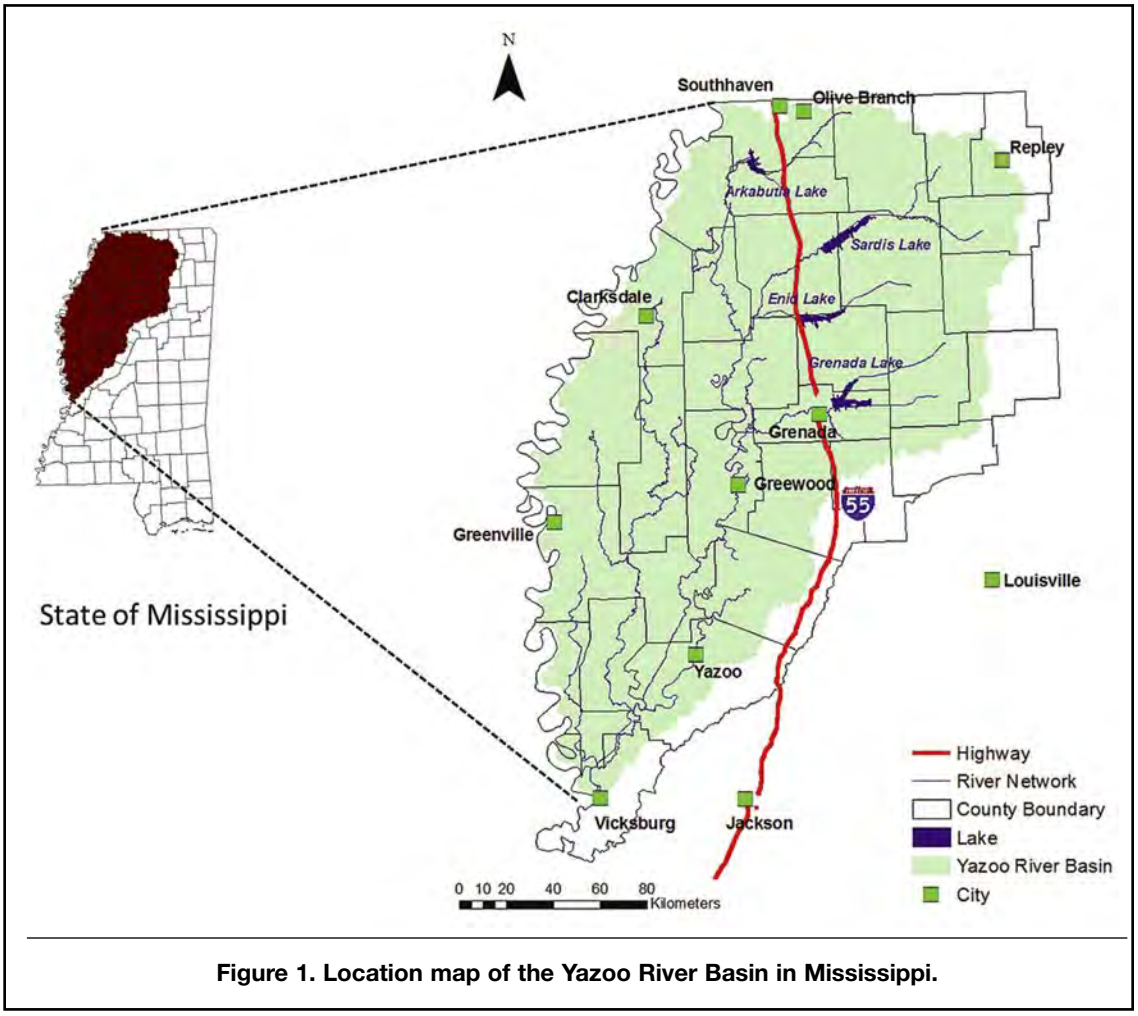

Figure 1. Location map of the Yazoo River Basin in Mississippi.

Land Use

Land use in the YRB is predominately cropland area, accounting for 41% of the land use. Other land use in the YRB consists of 30% forest, 12% wetland, 10% pastureland, 4% urban, and 3% water (USDA-NASS 2010).

Land Uses and Soil Types

Table 1. Model-generated subbasins, HRUs, land uses, and dominant soils in the watershed.[1]

Subbasin	No. of HRUs	Major land uses	Dominant soil types and soil names
1	24	FRSD, HAY, RNGB	MS093LoB2, MS093GvE, MS093CbE3
2	32	FRSD, HAY, RNGB	MS093GvE, MS093Va, MS093GuE
3	20	FRSD, WATR, SOYB	MS033Gk, MS033Cg, MS033W
4	41	HAY, FRSD, RNGB	MS033Gk, MS033Cg, MS033Cl
5	20	SOYB, FRSD, COTP	MS143270, MS033Gk, MS033Dm
6	35	FRSD, HAY, SOYB	MS033Gk, MS033Cg, MS033Cl
7	21	HAY, RNGB, FRSD	MS137GrC3, MS137Gt, MS137Gs
8	32	SOYB, WETF, AGRL	MS137As, MS143120, MS143270
9	20	HAY, FRSD, RNGB	MS107LoB2, MS137Gu, MS137Mg
10	30	FRSD, RNGB, FRSE	MS009SLF, MS009SSF
11	46	FRSD, WETF, FRSE	MS07138, MS07170, MS093LSF
12	22	HAY, FRSD, RNGB	MS145SHF, MS145Ar, MS145SWF
13	40	FRSD, RNGB, HAY	MS093GuE, MS0717F, MS07170
14	29	WETF, AGRL, FRSD	MS143291, MS14339, MS143272
15	18	SOYB, RICE, COTP	MS143270
16	30	FRSD, HAY, FRSE	MS07138, MS07170, MS07110
17	21	SOYB, AGRL, WETF	MS119Da, MS119Ae, MS119Ag
18	30	SOYB, FRSD, AGRL	MS107Fa, MS107Ad, MS119Ae
19	22	FRSD, RNGB, HAY	MS161STF, MS07170
20	28	HAY, FRSD, RNGB	MS107Gu, MS107Cm, MS107Gs
21	25	HAY, FRSD, RNGB	MS107Gu, MS107Cm, MS107LoC3
22	19	SOYB, AGRL, COTP	MS119Bh, MS119Bm, MS119Dn
23	23	SOYB, AGRL, WETF	MS119Bm, MS119Bh, MS135Fe
24	27	HAY, FRSE, FRSD	MS013Fa, MS013CrE, MS115TWE
25	15	SOYB, WETF, AGRL	MS135AcA, MS119Da, MS119Ae
26	14	COTP, SOYB, WETF	MS135DdA, MS119Dg, MS027Do
27	30	HAY, FRSE, FRSD	MS017Ad, MS013CrE, MS017Fa
28	52	HAY, WETF, FRSE	MS013Fa, MS013Ca, MS013CrE3
29	46	HAY, FRSE, FRSD	MS013Fa, MS013CrE, MS013CrE3
30	27	FRSD, FRSE, HAY	MS161STF, MS013CrE
31	42	FRSE, FRSD, HAY	MS013CrE, MS155SWE, MS017Ar
32	10	SOYB, COTP, WETF	MS027Ab, MS027Do, MS027Da
33	59	FRSD, FRSE, HAY	MS013CrE, MS155SWE
34	35	FRSD, FRSE, HAY	MS155SWE, MS155SOE, MS043Ff
35	56	FRSD, WATR, HAY	MS043RcF, MS043Gt, MS043CrF
36	50	FRSD, FRSE, HAY	MS161STF, MS161Oa, MS043CrF
37	41	WETF, URMD, URLD	MS043Cm, MS043GrB2, MS043GrC3
38	21	FRSD, HAY, SOYB	MS135AcA, MS135MeF, MS135Cn
39	32	FRSD, HAY, WETF	MS043Gu, MS043Ff, MS043MeF
40	31	FRSD, FRSE, HAY	MS097SsE, MS097SpE, MS097Gb
41	11	SOYB, WETF, CORN	MS135DdA, MS135Ad, MS08323
42	43	WETF, SOYB, URLD	MS08327, MS08321, MS08317

[1]HRU: Hydrologic Response Unit.

Table 1 (continued). Model-generated subbasins, HRUs, land uses, and dominant soils in the watershed.[1]

Subbasin	No. of HRUs	Major land uses	Dominant soil types and soil names
43	35	WETF, FRSD, HAY	MS0837, MS0159F, MS0156E3
44	32	FRSD, WETF, HAY	MS0156E3, MS0159F, MS015300
45	15	SOYB, RICE, WETF	MS133Dc
46	36	SOYB, COTP, CORN	MS08330, MS08319, MS08327
47	13	SOYB, CORN, RICE	MS133Fb, MS133Db, MS133Dk
48	14	SOYB, RICE, WETF	MS0834, MS133Ab
49	17	SOYB, RICE, WETF	MS011Sb, MS011Dc, MS011Se
50	7	WETF, URLD, WATR	MS151Sw, MS151Ba
51	18	FRSD, WETF, SOYB	MS0837, MS08321, MS0834
52	35	WETF, COTP, CORN	MS08310, MS051DeB, MS051DbA
53	22	COTP, CORN, SOYB	MS051DbA, MS051DeA, MS051DdA
54	8	SOYB, CORN, WETF	MS133Fb, MS133Db, MS053Ac
55	47	FRSD, WETF, SOYB	MS0156E3, MS051MN, MS051DbA
56	26	SOYB, RICE, CORN	MS151Sb, MS151Fb
57	42	FRSD, HAY, RNGB	MS051MeF2, MS051SP, MS051MN
58	15	WETF, SOYB, CORN	MS163Sf, MS0834, MS163DnA
59	30	FRSD, WETF, AGRL	MS163MNE, MS163Mo
60	31	FRSD, WETF, SOYB	MS055Sr, MS149MnF2, MS149GrB
61	10	WETF, SOYB, CORN	MS055Sr, MS151Sb, MS055Sb
62	21	WETF, SOYB, CORN	MS053Ac, MS125Sr, MS053Fm
63	32	WETF, SOYB, URLD	MS149SDT, MS055Sr
64	23	WETF, WATR, URLD	MS055Sr, MS149Cn
65	11	FRSD, WETF, SOYB	MS149SDT, MS149MnF2, MS149Gu
66	28	WETF, SOYB, WATR	MS149SDT, MS149Do

[1]HRU: Hydrologic Response Unit.

Land Use Key:

AGRL = Agricultural Land - Generic

AGRR = Agricultural Land - Row Crops

CORN = Corn

COTP = Upland Cotton

FRSD = Forest - Deciduous

FRSE = Forest - Evergreen

FRST = Forest - Mixed

GRSG = Grain Sorghum

HAY = Hay

LIMA = Lima Beans

OATS = Oats

PAST = Pasture

PEAS = Garden or Canning Peas

PMIL = Pearl Millet

PNUT = Peanut

RICE = Rice

RNGB = Range - Brush

RNGE = Range - Grasses

SCRN = Sweet Corn

SOYB = Soybean

SPOT = Sweet Potato

SUNF = Sunflower

SWRN = Range - Southwestern U.S.

URHD = Urban High Density

URLD = Urban Low Density

URML = Urban Medium Density

WATR = Water

WETF = Wetlands - Forested

WETN = Wetlands - Nonforested

WMEL = Watermelon

WWHT = Winter Wheat

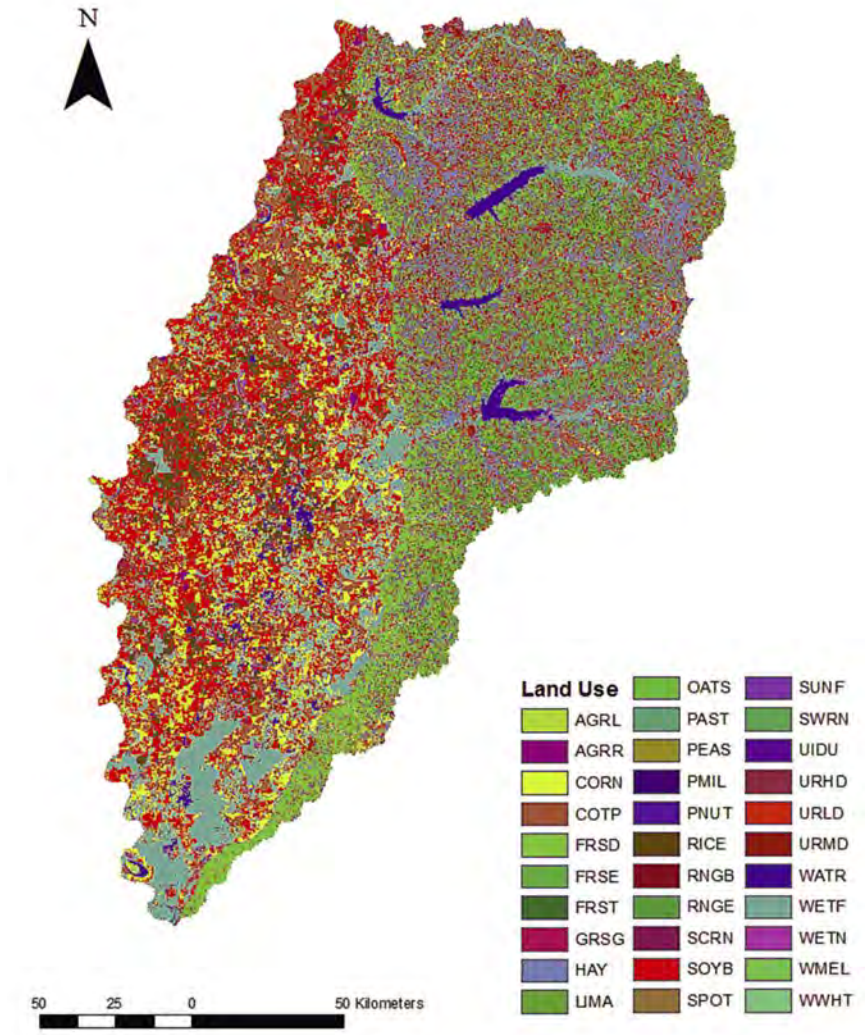

Figure 2. Distribution of land uses within the watershed.

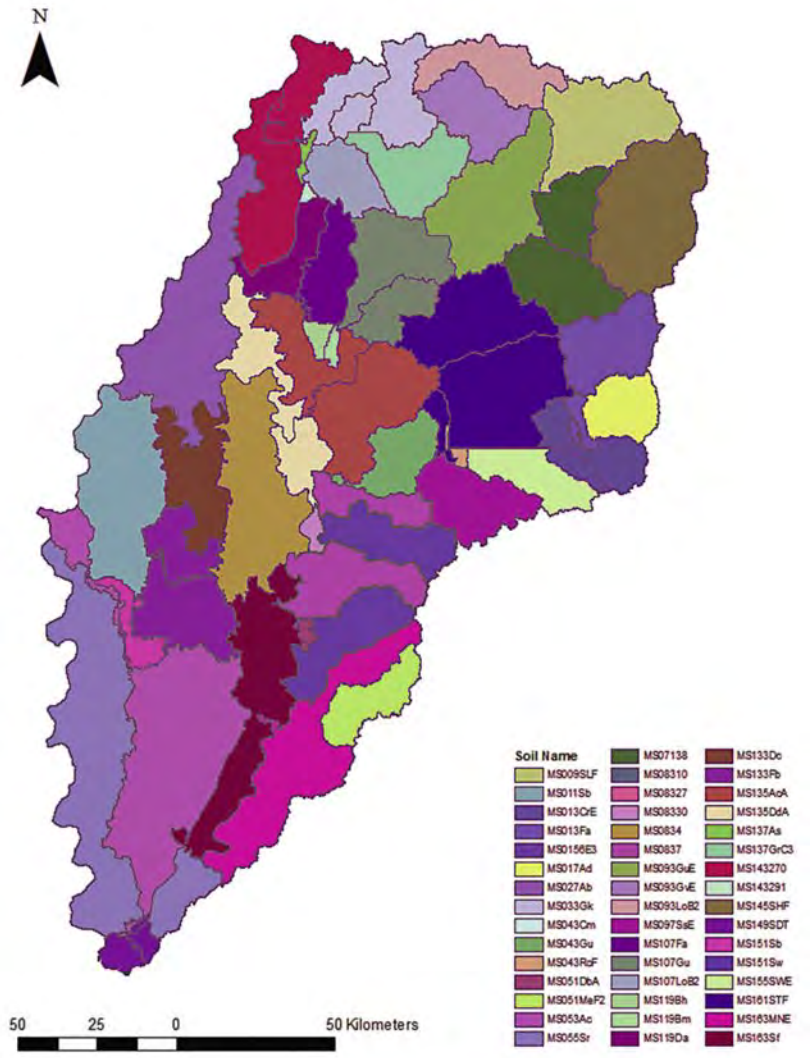

Figure 3. Distribution of dominant Soil Survey Geographic Database (SSURGO) soils in the watershed.

SUBBASINS

Subbasins Map

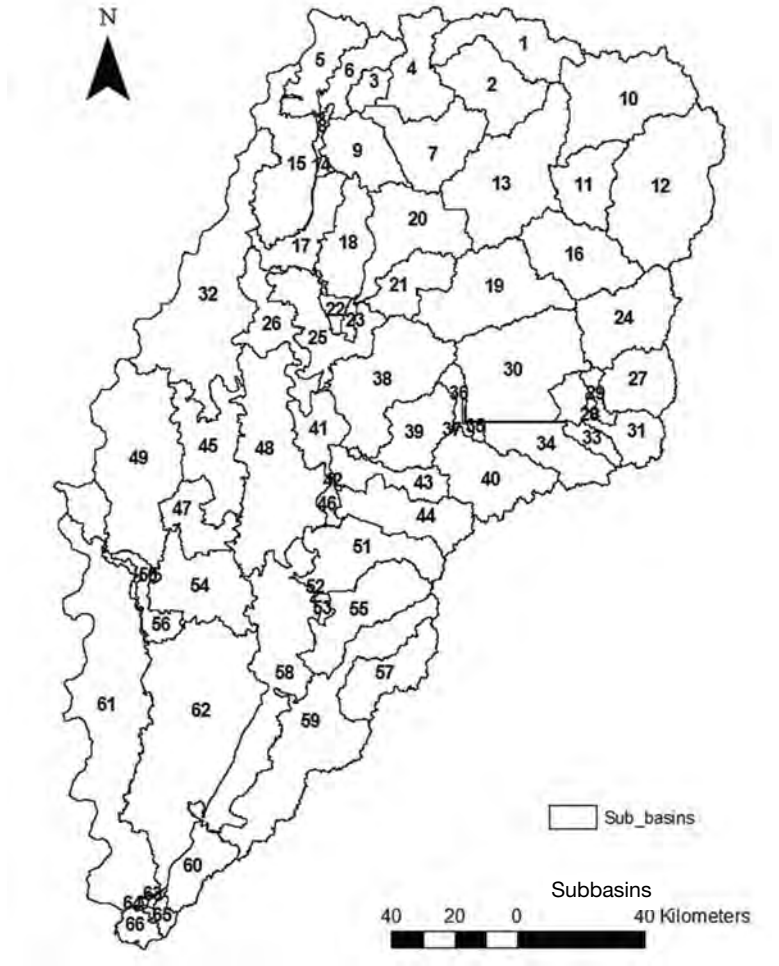

Figure 4. Map of the watershed subbasins (66) used during preliminary study.

Subbasin Area and Elevation

Table 3. Watershed subbasin area and average elevation.

Subbasin	Area (ha)	Avg. elevation (m)	Subbasin	Area (ha)	Avg. elevation (m)
1	56,425.95	123.168083	34	46,709.26	74
2	58,985.16	116.501328	35	3,272.62	110.469528
3	12,882.19	70.93177	36	9,875.77	57.562969
4	48,796.01	110.660103	37	151.00	54.633205
5	42,139.30	60.657234	38	95,610.95	46.24572
6	29,099.06	77.018326	39	45,150.15	56.070053
7	63,296.48	103.137169	40	64,000.20	103.650421
8	4,289.81	57.383884	41	29,710.79	42.558598
9	42,300.67	100.624443	42	24.15	35.465488
10	97,778.38	134.352936	43	32,341.50	58.447582
11	42,280.61	116.00602	44	54,091.62	91.352951
12	136,752.36	107.374115	45	68,247.42	38.054852
13	112,838.80	99.293137	46	6,619.89	40.319836
14	2,675.78	52.85463	47	34,797.67	33.053402
15	75,713.44	52.809444	48	134,774.18	37.989243
16	65,770.59	100	49	132,650.27	41.105629
17	37,748.32	48.667702	50	0.94	34.404892
18	45,898.07	46.764389	51	64,415.87	38.04245
19	91,292.74	116	52	307.69	33.71608
20	68,867.47	77.981392	53	3,822.79	35.857937
21	35,858.47	94.771721	54	66,828.08	33.648045
22	7,136.82	44.994621	55	63,347.75	83.800354
23	4,493.44	45.049412	56	20,218.64	34.14856
24	66,351.54	95	57	45,433.86	61.16951
25	55,154.89	42.785976	58	123,330.29	32.017254
26	46,774.47	47.202343	59	135,236.27	53.124031
27	41,721.77	109	60	32,082.36	86.342239
28	2,027.24	74	61	204,673.30	29.550831
29	7,731.71	77	62	236,410.81	27.372219
30	109,572.56	127	63	1,495.35	28.210386
31	40,872.75	99	64	199.63	24.886621
32	158,236.36	46	65	6,712.48	28.239353
33	12,739.18	68	66	12,085.80	25.870556

U.S. Geological Survey (USGS) Gages

USGS Gage Station Locations

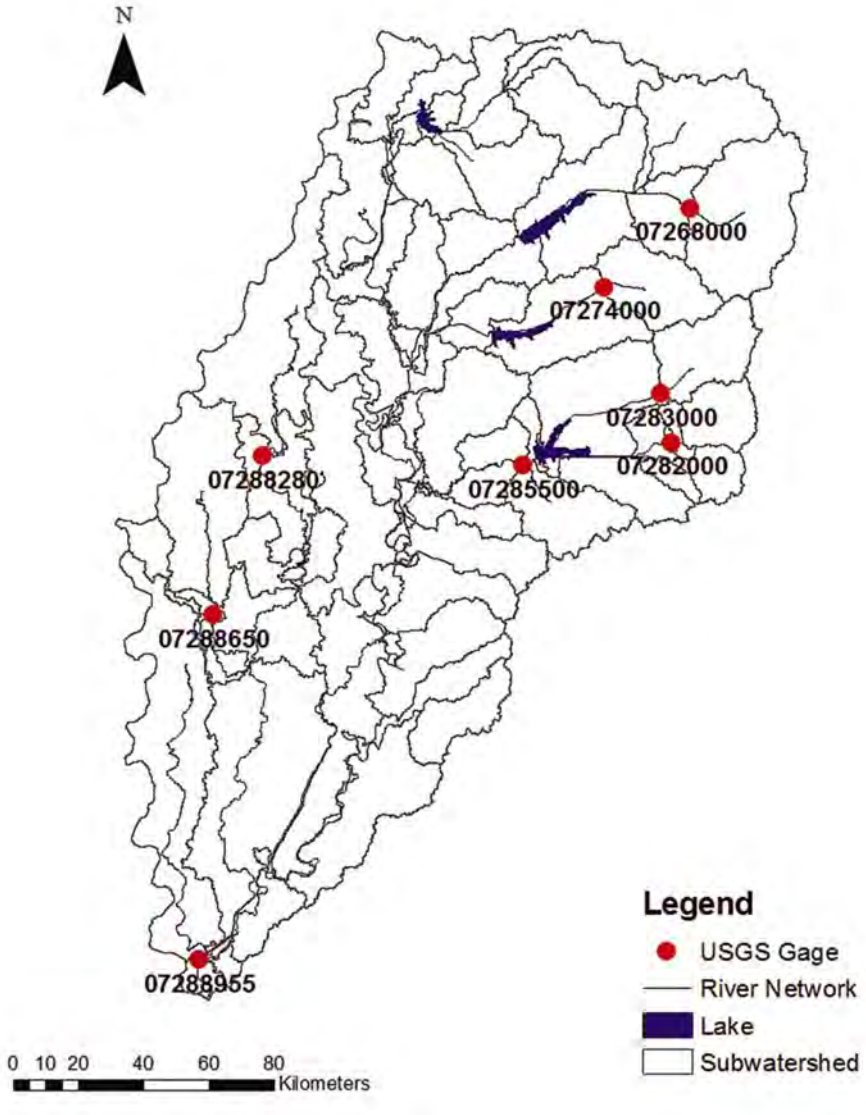

Figure 5. USGS gage stations within the watershed.

Table 3. Number and coordinates of the USGS gage stations in the watershed.

Section number	Latitude	Longitude
07268000	34°28’57”	89°13’28”
07274000	34°16’24”	89°31’17”
07282000	33°50’19”	89°18’56”
07283000	33°58’25”	89°20’52”
07285500	33°47’16”	89°48’35”
07288280	33°49’57”	90°40’12”
07288650	33°23’48”	90°50’52”
07288955	32°26’39”	90°54’51”

Slope

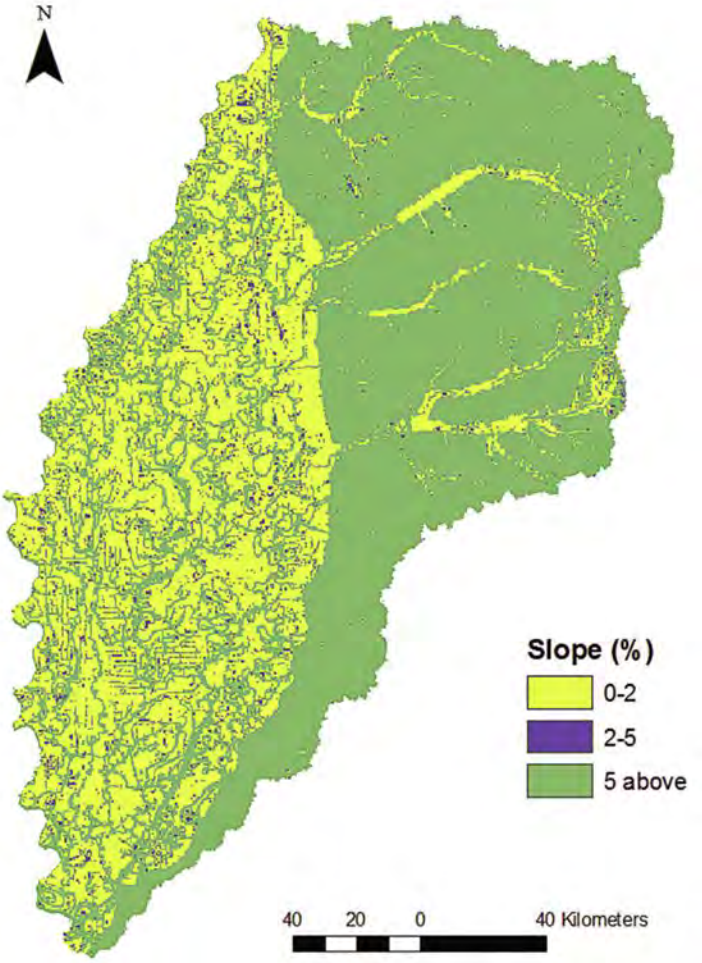

Figure 6. Distribution of landscape slopes in the watershed as classified using the model.

Major River Network

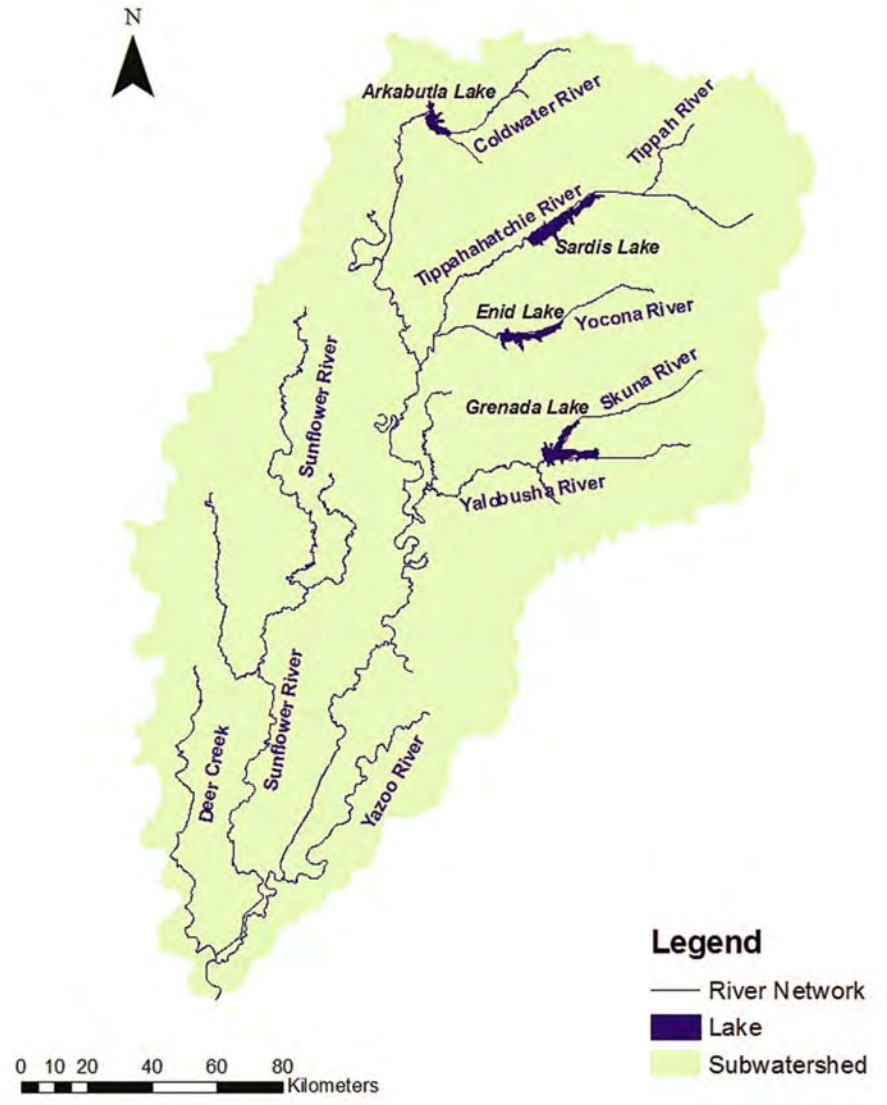

Figure 7. Major rivers network within the watershed as delineated by the model.

RAIN GAGE

Rain Gage Stations

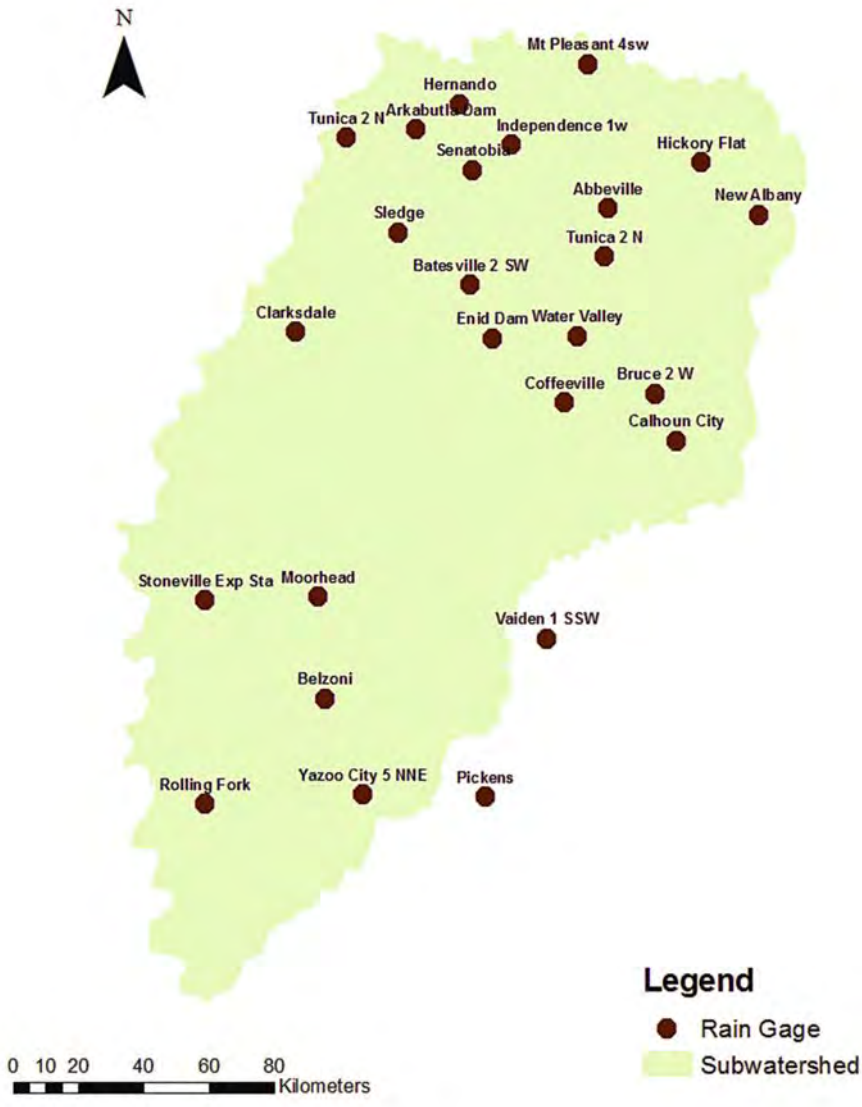

Figure 8. Distribution of the rain gages used in the preliminary study of the watershed.

Rain Gage Data

Table 4. Location of rain gage stations for each subbasin assigned by the model.

Subbasin	Station	Subbasin	Station	Subbasin	Station
1	Mt Pleasant 4sw	23	Enid Dam	45	Moorhead
2	Mt Pleasant 4sw	24	Bruce 2 W	46	Moorhead
3	Hernando	25	Clarksdale	47	Moorhead
4	Hernando	26	Clarksdale	48	Moorhead
5	Arkabutla Dam	27	Calhoun City	49	Stoneville
6	Hernando	28	Calhoun City	50	Stoneville
7	Independence 1w	29	Calhoun City	51	Moorhead
8	Arkabutla Dam	30	Coffeeville	52	Moorhead
9	Senatobia	31	Calhoun City	53	Belzoni
10	Hickory Flat	32	Clarksdale	54	Moorhead
11	Abbeville	33	Calhoun City	55	Vaiden 1 SSW
12	New Albany	34	Calhoun City	56	Stoneville
13	Abbeville	35	Coffeeville	57	Pickens
14	Sledge	36	Coffeeville	58	Belzoni
15	Tunica 2 N	37	Coffeeville	59	Yazoo City 5 NNE
16	University	38	Enid Dam	60	Rolling Fork
17	Sledge	39	Coffeeville	61	Rolling Fork
18	Sledge	40	Coffeeville	62	Rolling Fork
19	Water Valley	41	Moorhead	63	Rolling Fork
20	Batesville 2 SW	42	Moorhead	64	Rolling Fork
21	Enid Dam	43	Vaiden 1 SSW	65	Rolling Fork
22	Enid Dam	44	Vaiden 1 SSW	66	Rolling Fork

Table 5. Elevations and coordinates of the rain gage locations used by the model.

Cooperative Station ID	Name	Elevation (m)	Latitude (deg.)	Longitude (deg.)
220008	Abbeville	123.7	34°30’	-89°30’
220237	Arkabutla Dam	73.2	34°45’	-90°08’
220488	Batesville 2 SW	67.1	34°18’	-89°59’
220660	Belzoni	35.1	33°11’	-90°30’
221152	Bruce 2 W	82.3	34°00’	-89°22’
221314	Calhoun City	77.7	33°52’	-89°19’
221707	Clarksdale	52.7	34°11’	-90°33’
221804	Coffeeville	73.5	33°59’	-89°40’
222773	Enid Dam	92.0	34°10’	-89°54’
223975	Hernando	115.8	34°49’	-89°59’
224001	Hickory Flat	121.9	34°37’	-89°11’
224377	Independence 1w	105.2	34°42’	-89°49’
226009	Moorhead	35.7	33°27’	-90°31’
226084	Mt Pleasant 4sw	131.1	34°54’	-89°34’
226256	New Albany	115.8	34°28’	-89°00’
226926	Pickens	72.5	32°53’	-89°59’
227560	Rolling Fork	32.0	32°54’	-90°53’
227921	Senatobia	73.2	34°38’	-89°58’
228145	Sledge	50.3	34°28’	-90°13’
228445	Stoneville	38.7	33°26’	-90°55’
228998	Tunica 2 N	62.8	34°44’	-90°22’
229079	University	124.4	34°22’	-89°32’
229114	Vaiden 1 SSW	123.1	33°20’	-89°45’
229400	Water Valley	94.5	34°10’	-89°38’
229860	Yazoo City 5 NNE	32.6	32°54’	-90°23’

Hydrologic Soil Group

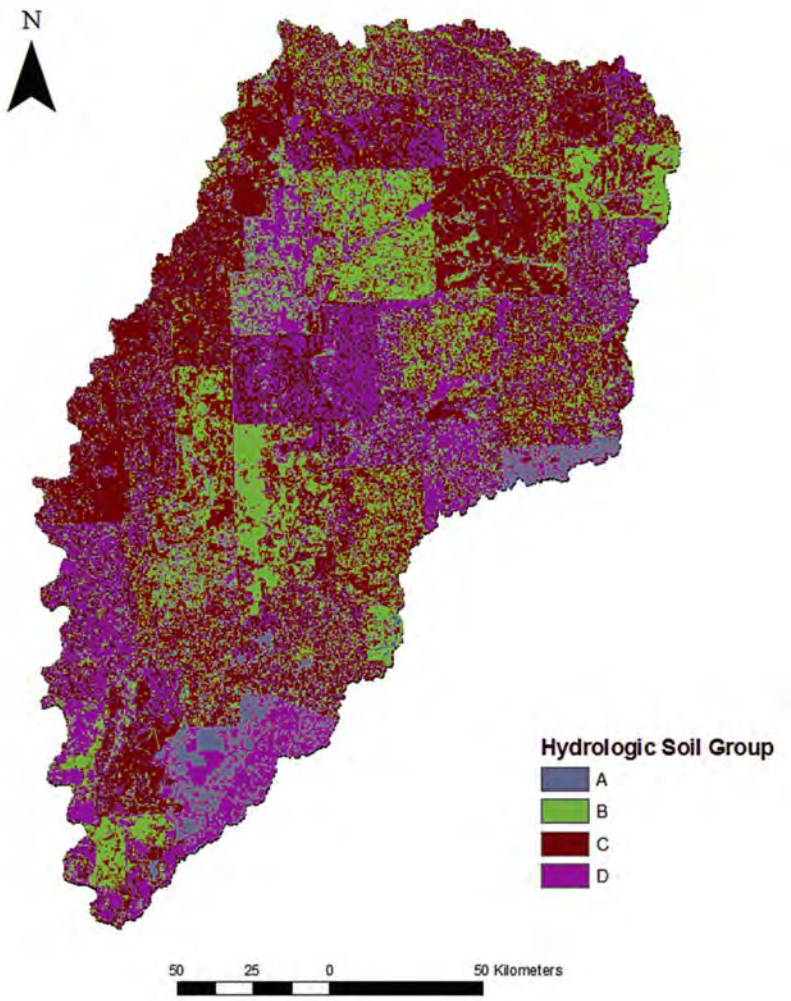

Figure 9. Distribution of hydrologic soil groups within the watershed used by the model. Note: Group A = low runoff potential when very wet; Group B = moderately low runoff potential when very wet; Group C = moderately high runoff potential when very wet; and Group D = high runoff potential when very wet.

Elevation

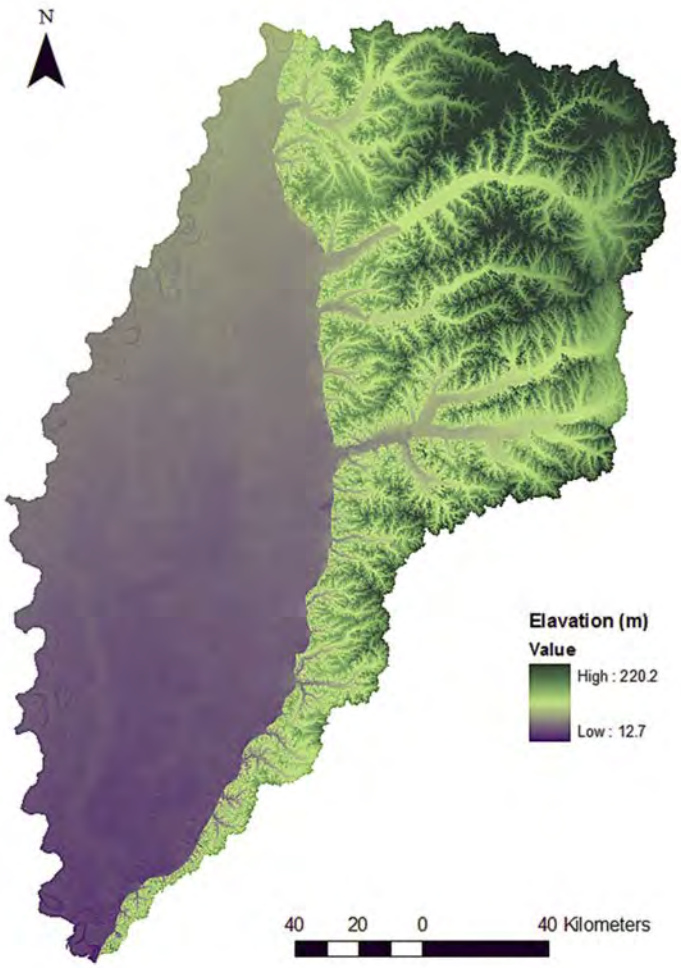

Figure 10. Distribution of elevation ranges within the watershed based on digital elevation model (DEM) grids.

Preliminary Results

The Soil and Water Assessment Tool (SWAT, Arnold et. al. 1998) model was applied to evaluate average monthly stream flow and average annual crop yield. Continuous monthly observed USGS stream flow data for a period between 12 and 20 years from the eight USGS gage stations within the YRB were used to calibrate and validate the SWAT model. The soybean and corn crop yields were calibrated using the observed USDA-NASS county level crop yield data for 2002–2005 and validated using data for 2007–2010. Preliminary results of the calibrated and validated SWAT model determined a reasonable performance for average monthly stream flow and average annual crop yield.

Discussion

Based on the preliminary SWAT model simulation results, the water yield and crop yield indicate that feedstock yields from the watershed subbasins were spatially variable. Crop yield was dependent on the management practices, topography, land-use conditions, and weather conditions of the watershed. This study helps watershed managers to prioritize areas in the watershed.

Acknowledgments

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