Attachment 02.04.03-08D
TVA letter dated February 11, 2010
RAI Response

ASSOCIATED ATTACHMENTS/ENCLOSURES:

Attachment 02.04.03-8D: API and Rain Runoff Relationship for Tennessee River Watershed, Rev 1.

(500 Pages including Cover Sheet)

NPG CALCULATION COVERSHEET/CCRIS UPDATE

REV 0 EDMS/RIMS NO.	EDMS TYPE:	EDMS ACCESSION NO (N/A for REV. 0)
L58 090625 001	calculations(nuclear)	L58 091230 053

Calc Title: API and Rain Runoff Relationship for Tennessee River Watershed

CALC ID	TYPE	ORG	PLANT	BRANCH	NUMBER	CUR REV	NEW REV
CURRENT	CN	NUC	GEN	CEB	CDQ000020080052	0	1
NEW	CN	NUC					

REVISION APPLICABILITY: Entire calc ☒ Selected pages ☐

ACTION	NEW ☐ REVISION ☒	DELETE ☐ RENAME ☐	SUPERSEDE ☐ DUPLICATE ☐	CCRIS UPDATE ONLY ☐. (Verifier Approval Signatures Not Required)	No CCRIS Changes ☐ (For calc revision, CCRIS been reviewed and no CCRIS changes required)

UNITS	SYSTEMS	UNIDS
N/A	N/A	N/A

DCN,EDC,N/A	APPLICABLE DESIGN DOCUMENT(S)	CLASSIFICATION
EDCNs 22404A(SQN), EDCN 54018A(WBN), Later (BFN)	N/A	E

QUALITY RELATED?	SAFETY RELATED? (If yes, QR = yes)	UNVERIFIED ASSUMPTION	SPECIAL REQUIREMENTS AND/OR LIMITING CONDITIONS?	DESIGN OUTPUT ATTACHMENT?	SAR/TS and/or ISFSI SAR/CoC AFFECTED
Yes ☒ No ☐	Yes ☒ No ☐	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒	Yes ☐ No ☒

PREPARER ID	PREPARER PHONE NO	PREPARING ORG (BRANCH)	VERIFICATION METHOD	NEW METHOD OF ANALYSIS
clstokes	615-252-4343	CEB	Design Review	☐ Yes ☒ No

PREPARER SIGNATURE	DATE	CHECKER SIGNATURE	DATE
Carrie L. Stokes	12/16/09	Bill Hamilton	12/16/09
Carrie L. Stokes		Bill Hamilton	

VERIFIER SIGNATURE	DATE	APPROVAL SIGNATURE	DATE
Bill Hamilton	12/16/09	K.E. Spates	12/18/09
Bill Hamilton		K.E. Spates	

STATEMENT OF PROBLEM/ABSTRACT

TVA has historically used the antecedent precipitation index (API) method of determining rain runoff to facilitate the integrated operation of the TVA reservoir system which includes flood control of the Tennessee River. The calculation documents the original basis and methodology used by TVA and the USWB (United States Weather Bureau) in the development of the relationships for estimating the volume of surface runoff from a given storm rainfall in the Tennessee Valley watershed. These relationships historically used to compute the storm runoff hygrographs for the SOCH stream course model calibration and Probable Maximum Flood (PMF) discharges.

This calculation demonstrates that the API method historically used by TVA in flood analyses provides a conservative estimation of the rain runoff volume compared to the predicted rain runoff estimated by the well-documented industry standard SCS (Soil Conservation Service) and IC (Initial/Constant loss) methodologies used by the Army Corps of Engineers.

This calculation contains electronic attachments and must be stored in EDMS as an Adobe.pdf file to maintain the ability to retrieve the electronic attachments.

MICROFICHE/EFICHE Yes ☐ No ☒ FICHE NUMBER(S)

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NPG CALCULATION COVERSHEET/CCRIS UPDATE

REV 0 EDMS/RIMS NO.	EDMS TYPE:	EDMS ACCESSION NO (N/A for REV. 0)
L58 090625 001	calculations(nuclear)	

Calc Title: API and Rain Runoff Relationship for Tennessee River Watershed

CALC ID	TYPE	ORG	PLANT	BRANCH	NUMBER	CUR REV	NEW REV	REVISION APPLICABILITY
CURRENT	CN	NUC						
NEW	CN	NUC	GEN	CEB	CDQ000020080052	N/A	0	Entire calc ☐ Selected pages ☐

ACTION	NEW ☒ REVISION ☐	DELETE ☐ RENAME ☐	SUPERSEDE ☐ DUPLICATE ☐	CCRIS UPDATE ONLY ☐ (Verifier Approval Signatures Not Required)	No CCRIS Changes ☐ (For calc revision, CCRIS been reviewed and no CCRIS changes required)

UNITS	SYSTEMS	UNIDS
N/A	N/A	N/A

DCN,EDC,N/A	APPLICABLE DESIGN DOCUMENT(S)	CLASSIFICATION
EDCNs 22404A(SQN), EDCN 54018A(WBN), Later (BFN)		E

QUALITY RELATED?	SAFETY RELATED? (If yes, QR = yes)	UNVERIFIED ASSUMPTION	SPECIAL REQUIREMENTS AND/OR LIMITING CONDITIONS?	DESIGN OUTPUT ATTACHMENT?	SAR/TS and/or ISFSI SAR/CoC AFFECTED
Yes ☒ No ☐	Yes ☒ No ☐	Yes ☐ No ☒	Yes ☒ No ☐	Yes ☐ No ☒	Yes ☐ No ☒

PREPARER ID	PREPARER PHONE NO	PREPARING ORG (BRANCH)	VERIFICATION METHOD	NEW METHOD OF ANALYSIS
snhenry	865-632-6315	CEB	Design Review	☐ Yes ☒ No

PREPARER SIGNATURE	DATE	CHECKER SIGNATURE	DATE
R.B. Williston for D.H. Stu Henry/David Hunt	22 Jun 2009 22 Jun 09	Adrian Ward	22 Jun 2009
VERIFIER SIGNATURE	**DATE**	**APPROVAL SIGNATURE**	**DATE**
R.B. Williston Bill Hamilton/Russ Williston	6/22/2009 22 Jun 09	K.R. Spates K.R. Spates 6/25/09	6/25/09

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MICROFICHE/EFICHE Yes ☐ No ☒ FICHE NUMBER(S)

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NPG CALCULATION COVERSHEET/CCRIS UPDATE

CALC ID	TYPE	ORG	PLANT	BRANCH	NUMBER	REV
	CN	NUC	GEN	CEB	CDQ000020080052	1

ALTERNATE CALCULATION IDENTIFICATION

BLDG	ROOM	ELEV	COORD/AZIM	FIRM BWSC	Print Report Yes ☐

CATEGORIES N/A

KEY NOUNS (A-add, D-delete)

ACTION (A/D)	KEY NOUN	A/D	KEY NOUN

CROSS-REFERENCES (A-add, C-change, D-delete)

ACTION (A/C/D)	XREF CODE	XREF TYPE	XREF PLANT	XREF BRANCH	XREF NUMBER	XREF REV
A	P	EN	WBN	CEB	54018	
A	P	EN	SQN	CEB	22404	
A	S	CN	GEN	CEB	CDQ000020080053	
D	P	CN	GEN	CEB	CDQ000020080053	

NPG CALCULATION RECORD OF REVISION

CALCULATION IDENTIFIER CDQ000020080052

Title API and Rain Runoff Relationship for Tennessee River Watershed

Revision No.	DESCRIPTION OF REVISION
0	Initial Issue (46 pages)
1	This calculation was revised to address the following: • PER 203951. The verification of the original calculation was completed by personnel who had not completed the required NEDP-7 Job Performance Record (JPR). A verification JPR is now in place for all personnel engaged in verification tasks. Checking includes only changes made in this revision as the checking of the calculation was not impacted by PER 203951. The verification is inclusive of work completed prior to this revision. • PER 203872 – Replaced NEDP-2 forms pages 2 through 9 with the forms from the NEDP-2 Revision in effect at the time of calculation issuance. Significant changes in Revision 1 are noted with a right margin revision bar. Administrative changes and typos are excluded. Pages Added: 1a Pages Replaced: 1-9 Total pages of calculation hard copy for Revision 1= 47

NPG CALCULATION TABLE OF CONTENTS

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2	API-RI-Runoff FLDHYDRO Lookup Table Data	10 pages
3	API-RI-Runoff Graphs	6 pages
4	NRCS Data - French Broad	26 pages
5	Excel File "French Broad soils9Feb09.xls"	N/A
6	NRCS Data - Nolichucky	24 pages
7	Excel File "Nolichucky soils9Feb09.xls"	N/A
8	NRCS Data - Norris	33 pages
9	Excel File "Norris soils9Feb09.xls"	N/A
10	NRCS Data - Sequatchie	112 pages
11	Excel File "Sequatchie soils9Feb09.xls"	N/A
12	NRCS Data - South Chickamauga	28 pages
13	Excel File "South Chickamauga soils9Feb09.xls"	N/A
14	Land Cover Eastern Tennessee Valley River Watershed	1 page
15	Kohler & Linsley Paper	12 pages
16	Office Memo_6-8-50	3 pages
17	Fry Work Assignment	2 pages
18	Engstrom	21 pages
19	Linsley & Kohler Text	5 pages
20	Sittner	16 pages
21	Chow	9 pages
22	Bousfield	67 pages
23	Beschta	10 pages
24	II.3-api-slc_NWSRFS	11 pages
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26	Map 6 GIE 322 E 200901 R0D	1 page
27	USWB Storm Studies Map	3 pages
28	Sherwani	4 pages
29	Hauser Tables	9 pages
30	Rain vs. Runoff Graphs	2 pages
31	Excel File "PMP_FrenchBroad.xls"	N/A
32	Excel File "PMP_Nolichucky.xls"	N/A
33	Excel File "PMP_Norris.xls"	N/A
34	Excel File "PMP_SouthChickamauga.xls"	N/A
35	Excel File "PMP_Sequatchie.xls"	N/A
36	TVA Provided Preliminary PMP Rainfall Data	3 pages
37	NRCS Curve Number Table for ARC I, II, and III	2 pages

NPG COMPUTER INPUT FILE
STORAGE INFORMATION SHEET

Document	API and Rain Runoff Relationship for Tennessee River Watershed	Rev. 1	Plant: GEN	

Subject:
This calculation documents the API method used in the development of the relationships for estimating the volume of surface runoff from a given storm rainfall in the Tennessee Valley watershed.

☐ Electronic storage of the input files for this calculation is not required. Comments:

☒ Input files for this calculation have been stored electronically and sufficient identifying information is provided below for each input file. (Any retrieved file requires re-verification of its contents before use.)

The files listed below are electronically attached to the parent Adobe .pdf calculation file. All files are, therefore, stored in an unalterable medium and are retrievable through the EDMS number for this calculation. Click on the "Attachments" tab within Adobe to view the attachment listing, to access and view the files as needed.

Attachments:

1 Attachment_01-USWB Rainfall Map.pdf
2 Attachment_02-FLDHYDRO look-up tables.pdf
3 Attachment_03-API-RI-Runoff_graphs.pdf
4 Attachment_04-NRCS Data French Broad.pdf
5 Attachment_05-French Broad soils9Feb09.xls
6 Attachment_06-NRCS Data Nolichucky.pdf
7 Attachment_07-Nolichucky soils9Feb09.xls
8 Attachment_08-NRCS Data Norris.pdf
9 Attachment_09-Norris soils9Feb09.xls
10 Attachment_10-NRCS Data Sequatchie.pdf
11 Attachment_11-Sequatchie soils9Feb09.xls
12 Attachment_12-NRCS Data South Chickamauga.pdf
13 Attachment_13-South Chickamauga soils9Feb09.xls
14 Attachment_14-Land Cover.pdf

☐ Microfiche/eFiche

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Attachments:

15	Attachment_15-Kohler&LinsleyPaper34.pdf
16	Attachment_16-Office Memo 6-8-50.pdf
17	Attachment_17-Fry Work Assignment.pdf
18	Attachment_18-Engstrom.pdf
19	Attachment_19-Linsley& Kohler Text.pdf
20	Attachment_20-Sittner.pdf
21	Attachment_21-Chow.pdf
22	Attachment_22-Bousfield.pdf
23	Attachment_23-Beschta.pdf
24	Attachment_24-II.3-api-slc_NWSRFS.pdf
25	Attachment_25-II.3-api-cont_NWSRFS.pdf
26	Attachment_26-Map 6 GIE 322 E 200901 R0 D.pdf
27	Attachment_27-USWB Storm Studies Map.pdf
28	Attachment_28-Sherwani.pdf
29	Attachment_29-Hauser Tables.pdf
30	Attachment_30-Rain vs Runoff Graphs.pdf
31	Attachment_31- PMP_FrenchBroad.xls
32	Attachment_32- PMP_Nolichucky.xls

☐ Microfiche/eFiche

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Attachments:

33 Attachment_33- PMP_Norris.xls
34 Attachment_34- PMP_SouthChickamauga.xls
35 Attachment_35- PMP_Sequatchie.xls
36 Attachment_36-RFI_BE21146056B028.pdf
37 Attachment_37-NRCS Curve Number Table.pdf

☐ Microfiche/eFiche

NPG CALCULATION VERIFICATION FORM

Calculation Identifier CDQ000020080052 Revision 1

Method of verification used:

1. Design Review ☒
2. Alternate Calculation ☐
3. Qualification Test ☐

Verifier Bill Hamilton Date 12/16/09

Comments:

This calculation entitled, "API and Rain Runoff Relationship for Tennessee River Watershed" was verified by independent design review. The process involved a critical review of the calculation to ensure that it is correct and complete, uses appropriate methodologies, and achieves its intended purpose. The inputs were reviewed and determined to be appropriate inputs for this calculation. The results of the calculation were reviewed and were found to be reasonable and consistent with the inputs provided. Backup files and documents were consulted as necessary to verify data and analysis details found in the calculation.

Detailed comments and editorial suggestions for the changes made in this revision were transmitted to the author and reviewer by email along with a marked up copy of the calculation.

(Note: The design verification of this calculation revision is for the total calculation, not just the changes made in the revision. This complete re-verification is performed to disposition PER 203951 as described in the Calculation Revision Log on Page 3)

1. Purpose

This calculation presents background documentation of the rain runoff Antecedent Precipitation Index (API) Method used historically by TVA in the determination of surface runoff for a given rainfall in flood analyses. This calculation also demonstrates that the API method conservatively predicts rain runoff volumes when compared to two industry standard methodologies used by the Army Corps of Engineers, the Soil Conservation Service (SCS) curve method and the Initial/Constant (IC)loss method.

2. Background

The Tennessee Valley Authority (TVA) has developed a runoff/stream course hydrologic model of the Tennessee River watershed upstream of Guntersville Dam for use in the design basis flood level analysis. Development of unit hydrographs for the runoff model requires estimates of the volume of surface runoff from a given volume of storm rainfall. Inputs to the model also require estimates of surface runoff to determine the probable maximum flood (PMF) discharges for the 47 sub-basins above Guntersville Dam. The PMF discharges are derived from probable maximum rainfall and unit hydrographs developed for each sub-basin.

The antecedent precipitation index (API) method is the current method of choice for TVA River Operations. The API method is used to determine rainfall runoff in facilitating the integrated operation of the TVA reservoir system which includes flood control of the Tennessee River. The API relationship was historically used in the development of the unit hydrographs for the watershed runoff model above Guntersville Dam as well as to compute historical storm runoff hydrographs for the Simulated Open Channel Hydraulics (SOCH) stream course model calibration and PMF discharges for the 47 sub-basins.

2.1 API Method Development

The estimation of the amount of runoff which will result from a given storm or series of storms is a fundamental requirement in flood forecasting. These estimates are necessary before the unit hydrograph or other techniques can be used to predict the streamflow hydrograph. In early years TVA used a method in its river forecasting which used runoff correlated with base flow or the rate of groundwater flow at the beginning of a storm, as an index. If applicable, the number of days since the last rain was also used as an auxiliary index. The method was reasonably satisfactory. However, it involved concurrent separation of the streamflow hydrograph to determine the rate of groundwater flow. This method was time consuming and quite approximate in complex storms.

TVA met with the U.S. Weather Bureau (USWB) in Washington, D.C. on May 30 and June 1, 1950, to discuss the USWB method of developing rainfall-runoff relationships. This method was at that time described in an unpublished paper entitled "Predicting the Runoff from Storm Rainfall", by M.A. Kohler and R. K. Linsley. It was later published in September 1951 as a research paper (Reference 3.1). A copy of the memorandum describing the 1950 Washington meeting is provided (Reference 3.2).

A USWB natural flow river stage forecasting unit (USWB RFU) was opened in Knoxville in 1951. Their work assignment was to:

a) Provide predicted natural flows on uncontrolled streams at locations requested by TVA to determine reservoir inflows necessary in the integrated operation of the TVA reservoir system which includes flood control.

b) Where requested, supply TVA with predicted natural stream flows and stages for significant points on the Tennessee River and tributaries, for existing (pre-regulated) conditions, so that the controlled flood stages would be lower than the elevations obtained naturally (unregulated).

c) Insofar as practicable, prepare flood stage forecasts for those points on uncontrolled streams in the Tennessee Valley which are vulnerable to flood damage and in need of flood warning such as First Creek in Knoxville and the cities of Shelbyville, Columbia, and Centerville on the Duck River and Fayetteville on the Elk River.

A copy of the June 19, 1951 memorandum outlining this work assignment is provided in Attachment 17 (Reference 3.3).

A fundamental requirement needed to accomplish these assignments was to estimate surface runoff from storm rainfall. The USWB RFU developed the rainfall-surface runoff relationships in the 1950s as part of this task. The relationships were based on the antecedent precipitation index (API) as described in References 3.1 (Kohler & Linsley), 3.4 (Engstrom, et. al.), 3.5 (Linsley, et. al.), 3.6 (Sittner, et. al.) and 3.7 (Chow).

In 1956 TVA changed its method of estimating runoff from rainfall. The rainfall-surface runoff relationships, or API method, developed by the USWB RFU were adopted. This change is addressed in Reference 3.4.

The API method is currently used by TVA River Operations to accomplish their federally mandated, integrated operation of the TVA reservoir system which includes flood control responsibilities, and is in use by the Colorado Basin River Forecast Center in Salt Lake City, Utah (Reference 3.10). These rainfall-surface runoff relationships have been historically used in the development of the unit hydrographs used in the TVA nuclear site hydrologic analysis. Information from file books indicates that minor adjustments have been made since TVA began using the API, but the original relationships have essentially remained the same. No documentation exists regarding a final USWB report, the initial format of the USWB API relationships, or any subsequent adjustments or modifications to the API methods as used in the FLDHYDRO code. An example of the geographical areas, number of storms used and data period reviewed to develop the API curves was recovered from the files and is included as Reference 3.29. No information was recovered on where or how this data was used.

2.2 API Method

The API method is a set of empirical relationships developed for specific watersheds from long-term rainfall and stream gauge data. Development of an API is an iterative method that requires a large time commitment for development and long-term data records; five to ten years according to Reference 3.4 and as shown in Reference 3.29. The data from observed storms is input graphically and an initial best-fit curve is developed. This curve is then used to produce runoff estimates which are compared to the gauged streamflow. The API numbers are adjusted to reconcile differences between the estimated and observed flows, the curve is refined, and the comparative process begins again. This process is outlined in References 3.4 through 3.11, with an example of index usage in forecasting in Reference 3.7.

The advantages of the API method are a higher accuracy for large events (Reference 3.8), the ability to forecast runoff in areas where the temporal distribution of rainfall is highly variable (Reference 3.9), and the ability to perform real-time runoff forecasting with adjustment to reduce error (Reference 3.6). Another benefit of the API method is that it accounts for the increased runoff over the course of the precipitation event by using the accumulated event precipitation. The reasons for the relatively rare usage of the API method are that it requires an extensive network of rainfall and stream flow gauges and a large time commitment for data gathering to provide sufficient data for index development and adjustment.

The USWB API region map (Attachment 1) was produced by the USWB during API development for the Tennessee Valley. This map is a historical document which has been geo-referenced and plotted with the watershed basins in Reference 3.25 for convenience. Regions were determined by the USWB based on iterative, empirical methods as described above. The Tennessee Valley is broken into 6 API regions with one, the West region, having a very small effect on the watershed upstream of Guntersville Dam. Differences in API curves for the API regions are due to numerous factors. These factors include variability in soils across the valley due to geology, the increased permeability in upland areas due to the erosive removal of fine particles over time, and the decreased permeability of alluvial soils in low areas due to the deposition of the finer particles. Orographic effects on the precipitation-runoff relationships are increased runoff due to steep slopes, reductions in rainfall on the leeward wall of the Tennessee Valley and increased rainfall on the windward valley face. Additionally, there are large seasonal variations in vegetative cover through the region that bring about changes in interception losses. These variations resulted in the development of separate API-Rainfall-Runoff curves for each of the six regions based on week of the year as shown in Attachment 3.

The week of the year and location inputs designate the appropriate API region curve to use in determining a runoff index (RI). This RI is used to forecast the surface runoff given a rainfall amount and runoff (RO) region. The USWB designated two RI versus RO regions for the Tennessee Valley identified as the TV and SE curves. The SE RI-RO curve is used only with the SE API region; all other API regions use the TV RI-RO curve. These curves are represented in the FLDHYDRO computer code by lookup tables (Reference 3.26). Data from these tables was converted to Microsoft Excel format in Reference 3.26 and is included as Attachment 2. The data tables from FLDHYDRO were plotted in a format similar to the referenced literature for clarity and are attached as Attachment 3. Arrows were added as a guide in usage of the graphs. Additionally, RI vs. runoff data from Reference 3.26 was plotted and is shown in Attachment 30.

3. References

3.1 Kohler, M. A. and R. K. Linsley, Research Paper No. 34, "Predicting the Runoff from Storm Rainfall", U.S. Department of Commerce, Weather Bureau, Washington, September 1951, EDMS #L58 090424 004, see Attachment 15.

3.2 Engstrom, LeRoy and A. J. Cooper, "Conference with U.S.W.B., Washington, May 30 and June 1 on Forecasting Procedures", Office Memorandum, June 8, 1950, see Attachment 16.

3.3 Fry, Albert S., "Coordination with Natural Flow Unit, U. S. Weather Bureau", TVA, Division of Water Control Planning, Hydraulic Data Branch, Work Assignment ASF-1173, June 19, 1951, see Attachment 17.

3.4 Engstrom, LeRoy, Jackson H. Wilkinson, and Alfred Blickensderfer, "Streamflow Forecasting and Water Dispatching for TVA Reservoir System", by presented at the Knoxville Convention, American Society of Civil Engineers, Knoxville, Tennessee, June 8, 1956, see Attachment 18.

3.5 Linsley, Jr., R.K., M.A. Kohler and J.L.H. Paulus, Hydrology for Engineers, Third Edition, McGraw-Hill Book Company, Inc., 1982, ISBN 0-07-037956-4, section 3-11, pg. 71-72, see Attachment 19.

3.6 Sittner, Walter T., Charles E. Schauss and John C. Monroe, "Continuous Hydrograph Synthesis with an API-Type Hydrographic Model", Water Resources Research, Vol. 5, No. 5, October, 1969, see Attachment 20.

3.7 Chow, Ven Te, Handbook of Applied Hydrology, McGraw-Hill Book Company, New York, NY, 1964, see Attachment 21.

3.8 Bousfield, Gregg, "Peakflow Prediction Using an Antecedent Precipitation Index in Small Forested Watersheds of the Northern California Coast Range", thesis presented to the faculty of Humboldt State University, April, 2008, see Attachment 22.

3.9 Beschta, R. L., "Peakflow Estimation Using an Antecedent Precipitation Index (API) Model in Tropical Environments", Research Needs and Applications to Reduce Erosion and Sedimentation in Tropical Steeplands, Proceedings of the Fiji Symposium, IAHS-AISH Publ. No. 192, June, 1990, see Attachment 23.

3.10 National Weather Service River Forecast System (NWSRFS) Users Manual, Chapter II.3-API-SLC, "Salt Lake City (CBRFC) API-Runoff Operation", dated 06/10/2003, www.weather.gov/oh/hrl/nwsrfs/users_manual/htm/xrfsdocpdf.php see Attachment 24.

3.11 National Weather Service River Forecast System (NWSRFS) Users Manual, Chapter II.3-API-CONT, "Continuous API Model", dated 08/29/2002, www.weather.gov/oh/hrl/nwsrfs/users_manual/htm/xrfsdocpdf.php see Attachment 25.

3.12 "UNITGRPH, FLDHYDRO, TRPROUTE, CHANROUT User Manual, Version 1.0 Rev0", EDMS # L58 090325 001.

3.13 "UNITGRPH, FLDHYDRO, TRPROUTE, CHANROUT Software Design Description (SDD) , Version 1.0 Rev0", EDMS # L58 090422 001.

3.14 "UNITGRPH, FLDHYDRO, TRPROUTE, CHANROUT Software Verification and Validation Report (SVVR) , Version 1.0 Rev0", EDMS # L58 090327 001.

3.15 United States Department of Agriculture, Natural Resources Conservation Service, "Web Soil Survey" http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx .

3.16 Schwarz, Francis K., Probable Maximum and TVA Precipitation over the Tennessee River Basin above Chattanooga, Hydrometeorological Report No. 41, Hydrometeorological Section, Office of Hydrology, U.S. Weather Bureau, U.S. Department of Commerce, Washington, http://www.nws.noaa.gov/oh/hdsc/PMP_documents/HMR41.pdf, dated June 1965.

3.17 U.S. Army Corps of Engineers, Engineering and Design - Flood Runoff Analysis, EM 1110-2-1417, http://140.194.76.129/publications/eng-manuals/em1110-2-1417/toc.htm, dated 31 August 1994.

3.18 U.S. Army Corps of Engineers, Hydrologic Modeling System HEC-HMS, Technical Reference Manual, Report CPD-74B, http://www.hec.usace.army.mil/software/hec-hms/documentation/CPD-74B_2000Mar.pdf, dated March 2000.

3.19 U.S. Army Corps of Engineers, Hydrologic Modeling System HEC-HMS, Version 3.3, http://www.hec.usace.army.mil/software/hec-hms/documentation.html, dated September 2008.

3.20 U.S. Department of Agriculture, Natural Resources Conservation Service, Part 630 Hydrology, Engineering Handbook, http://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21422, Chapter 10 dated July 2004, (cover page and Table 10-1 included as Attachment 37).

3.21 Calculation CDQ000020080057, "Subbasin 48 (Sequatchie River) Unit Hydrograph Validation", Revision 0, EDMS # L58 081125 800.

3.22 Calculation CDQ000020080058, "Subbasin 46 (South Chickamauga Creek) Unit Hydrograph Validation", Revision 0, EDMS # L58 081105 002.

3.23 Calculation CDQ000020080066, "Subbasin 26 (Norris Dam) Unit Hydrograph Validation", Revision A, EDMS # L58 090216 005.

3.24 Calculation CDQ000020080056, "Douglas Dam Watershed (Subbasins 1 through 6) Unit Hydrograph Validation", Revision A, EDMS# L58 090422 001.

3.25 Antecedent Precipitation (API) Regions with Drainage Basins above Guntersville Dam, TVA map #6 GIE 322 E 200901 R0 D, see Attachment 26.

3.26 UNITGRAPH-FLDHYDRO-TRBROUTE-CHANROUT, SVVR, Attachment 4 Independent Calculations, Attachment 4 FLDHYDRO Independent Calculations, Fldhydro_sample1.xls, dated 03 February 2009, EDMS # L58 090327 001.

3.27 Sherwani, Jabbar K. and David H. Moreau, Strategies for Water Quality Monitoring, Report No. 107, Water Resources Research Institute of the University of North Carolina, June, 1975, see Attachment 28.

3.28 Viessman, Jr., Warren, Gary L. Lewis and John W. Knapp, Introduction to Hydrology, Third Edition, Harper & Row, Publishers, Inc., New York, NY, 1989.

3.29 USWB Historic Map & data, from TVA file G107-12a, dated 1959, see Attachment 27.

3.30 Meeting with Gary Hauser on development of RI values less than 20, 11 February 2009, see Attachment 29.

3.31 Plot of Rainfall versus Runoff for RI values from 20 to 26, see Attachment 30.

3.32 TVA prepared PMP rainfall data files, provided by RFI BE21146056B028, see Attachment 36.

3.33 Calculation CDQ000020080061, "Subbasins 38 (Chatuge Dam), 39 (Nottely Dam), 40 (Hiwassee Dam), 41 (Apalachia Dam) and 43 (Ocoee No.1 Dam) Unit Hydrograph Validations", Revision 0, EDMS # L58 090414 001.

3.34 Calculation CDQ000020080062, "Unit Hydrograph Validation for Subbasin 7 (Little Pigeon River at Sevierville)", Revision 0, EDMS # L58 090227 001.

3.35 Calculation CDQ000020080063, "Holston River Watershed above Cherokee Dam (Subbasins 9 through 15) Unit Hydrograph Validation", Revision 0, EDMS # L58 090422 002.

3.36 Calculation CDQ000020080067, "Subbasin 35 (Emory River at Mouth) Unit Hydrograph Validation", Revision 0, EDMS # L58 090227 002.

3.37 Calculation CDQ000020080068, "Calculation of Initial Flood Flows from Subbasin 27, (Melton Hill Local) for Use in the SOCH Model Calibration and Subsequent Unit Hydrograph Validation", Revision 0, EDMS # L58 090511 003.

3.38 Calculation CDQ000020080069, "Calculation of Initial Flood Flows from the Fort Loudoun-Tellico Watershed (Subbasins 8, 16, 17, 18 and 24) for Use in the SOCH Model Calibration and Unit Hydrograph Validation", Revision 0, EDMS # L58 090511 001.

3.39 Calculation CDQ000020080070, "Little Tennessee River Watershed above Chilhowee Dam (Subbasins 19 through 23) Unit Hydrograph Validation", Revision 0, EDMS # L58 090414 002.

3.40 Calculation CDQ000020080071, "Unit Hydrograph Validation for Subbasin 44A, the Lower Hiwassee River from Charleston (River Mile 18.9) to Apalachia and Ocoee No.1 Dams", Revision 0, EDMS # L58 090216 006.

3.41 Calculation CDQ000020080091, "Subbasin 42 (Blue Ridge Dam) Unit Hydrograph Validation", Revision 0, EDMS # L58 081030 007.

3.42 Calculation CDQ000020080053, "PMF Inflow Determination" (not issued).

4. Assumptions used in the comparison of runoff methods

4.1 Assumption: The probable maximum precipitation (PMP) rainfall used is appropriate.
Technical Justification: The data was developed by TVA as a preliminary data set relative to Reference 3.16 and is used in this calculation as a representative PMP event only for the comparison of loss methods. Therefore, preliminary data used across all three methods provides a valid basis of comparison. Actual PMP data used in controlling calculations is being developed in the PMF Inflow Determination (CDQ 000020080053) with only very minor differences expected.

4.2 Assumption: Soil textures and soil ratings used in this calculation are accurate as provided by the Natural Resources Conservation Service (NRCS) web site (Reference 3.15).
Technical Justification: Based on the Acceptance Criteria Section of NUREG 0800 Standard Review Plan (SRP) 2.4.1; this data is not expected to meet the requirements of an Appendix B program, excerpt follows:

"Data collected, maintained, and distributed by Federal and State agencies, such as USGS, NOAA, NRCS, USACE, and various State water resources departments, are adequate for safety evaluation of the plant."

4.3 Assumption: Land Cover map used as Attachment 14 is valid.
Technical Justification: This data is not available through a source meeting the Appendix B requirements. However, the data is used only in this calculation to compare SCS and IC Methods with the API method.

4.4 Assumption: The maximum initial loss rate for the initial and constant loss rate method is assumed to be 0.5 inches.
Technical Justification: Published values in Table 6.1 of Reference 3.17 indicate 10-20% of total rainfall or 0.5 inches maximum is appropriate for forested areas. Since the watershed is primarily forest and pasture (Attachment 14) and 10% of total rainfall per storm is greater than the 0.5 inches maximum value, 0.5 inches is used for the maximum initial loss rate.

4.5 Assumption: Any complex that was unrated by the NRCS (water, pits, etc.) was given a soil type D with a conductivity rating of 0 mm per second.
Technical Justification: This assumption will result in 100% runoff from these areas and is considered conservative.

4.6 Assumption: Curve numbers used in the SCS method are based on Antecedent Rainfall Condition (ARC) III conditions.
Technical Justification: Curve numbers are associated with three soil moisture conditions: ARC(I) for relatively low runoff potential, ARC(II) for average runoff, and ARC(III) for relatively high runoff potential. The PMP storm as described in Reference 3.16 is a 9-day event; a 3-day antecedent storm followed by three dry days and the 3-day main storm. This assumption will result in a higher runoff amount and is considered conservative.

5. Design Input

5.1 API Method Input

5.1.1 Watershed Areas were taken from Unit Hydrograph Calculations, References 3.21-3.24.

5.1.2 Preliminary PMP rainfall input was provided by Reference 3.32 (Attachment 36), based on the PMP defined in the HMR-41, Reference 3.16.

5.1.3 API Method look-up tables were taken from Reference 3.26 and are included as Attachment 2.

5.2 SCS Method Inputs

5.2.1 Soil rating group data was taken from the NRCS web site (Reference 3.15) and processed using Microsoft Excel. Scans and electronic files are included as Attachments 4-13.

5.2.2 Watershed Areas were taken from Unit Hydrograph Calculations, References 3.21-3.24.

5.2.3 Preliminary PMP rainfall input was provided by Reference 3.32 (Attachment 36), based on the PMP defined in the HMR-41, Reference 3.16.

5.2.4 Data used for the SCS curve number determination was taken from Table 6-6 on page 6-22 of Reference 3.17, and Table 10-1 on page 10-6 of Reference 3.20 (Attachment 37).

5.3 IC Method Inputs

5.3.1 Data used for the Initial and Constant Loss Rate method was taken from Table 5-1 on page 40 of Reference 3.18, based on the soil rating group data taken from the NRCS web site (Reference 3.15).

5.3.2 Watershed Areas were taken from Unit Hydrograph Calculations, References 3.21-3.24.

5.3.3 Preliminary PMP rainfall input was provided by Reference 3.32 (Attachment 36), based on the PMP defined in the HMR-41, Reference 3.16.

6. Methodology

6.1 Because most of the collected data had not been maintained adequately for retrieval, original reports, gage charts and/or forms used to develop the API curves and data as incorporated in the FLDHYDRO code were not located. Therefore, Microsoft Excel spreadsheets were used to compare the API Method to two industry standard rain-runoff relationships used by the U. S. Army Corps of Engineers (References 3.18 and 3.19): the SCS curve number method and the initial and constant loss method. These alternate methods were chosen based on common usage and available data. See Flow Chart, Figure 6.6, for the process used to compare the three loss methods. See results and conclusions in Section 9.

6.2 5 basins were selected to compare the API Method with the SCS and IC industry standard methods. One basin was chosen from each of the API regions, excluding the West region which has a very small effect on the watershed upstream of Guntersville Dam. Each of the 5 basins chosen is located entirely within its region boundary, and the API method was used in the unit hydrograph calculations for all selected basins, therefore providing a representative data set for the Tennessee Valley reservoir area.

6.3 The ability of the API method to fit historical streamflow data was not reviewed in this calculation. However, the API method was compared against historical data in References 3.21 through 3.24 and References 3.33 through 3.41 to develop the watershed unit hydrographs. These calculations show a good fit between the historical and calculated data. No further analysis was required.

6.4 API, SCS curve number and the initial and constant loss methods were compared using preliminary PMP rainfall data for runoff volume and rainfall-runoff relationships in one watershed within each of the five API regions above Guntersville Reservoir. Calculated runoff volumes for all methods are shown in Section 9.

6.5 The NRCS soils data web site publishes soils data for the United States as part of the U.S. Department of Agriculture. The Web soil survey (WSS) provides an on-line interface to view and download published soils data such as soil ratings for saturated hydraulic conductivity and the four hydrologic soil groups (A, B, C, D). The density and accuracy of the NRCS data is not published. The interface is graphical in nature allowing the user to place a shape, referred to as an area of interest (AOI), over an area map background. Soil types for entire watersheds could not easily and reliably be sampled because the NRCS soils data web site has a size limitation of 10,000 acres for each AOI and no repeatable method of geolocation for an AOI. Initial work done on the Sequatchie watershed to sample the entire watershed resulted in numerous, large data files. Therefore, to reduce the data to a more manageable size, only portions of the watersheds were sampled by the AOI data (Attachments 4-13). To check that sufficient watershed sampling was included to give a reliable estimate of the watershed soil type, a statistical analysis (as described in Reference 3.27) was performed using the Student's 't" test. An error of 2% in the calculated mean hydrologic soil group percentages at a 95% confidence level was chosen as an adequate acceptance criterion for sample size calculations. Since the hydrologic soil rating group is a non-numeric parameter, the reported percentages for soil hydrologic ratings were used for the error calculations. Since each AOI sample taken included approximately 10,000 acres, diverse soil units, and an unknown number of field samples by the NRCS, sample size was based on acres sampled in the AOI.

6.6 Results were compared based on total runoff volume, cumulative runoff as a percentage of cumulative rainfall and incremental runoff as a percentage of incremental rainfall.

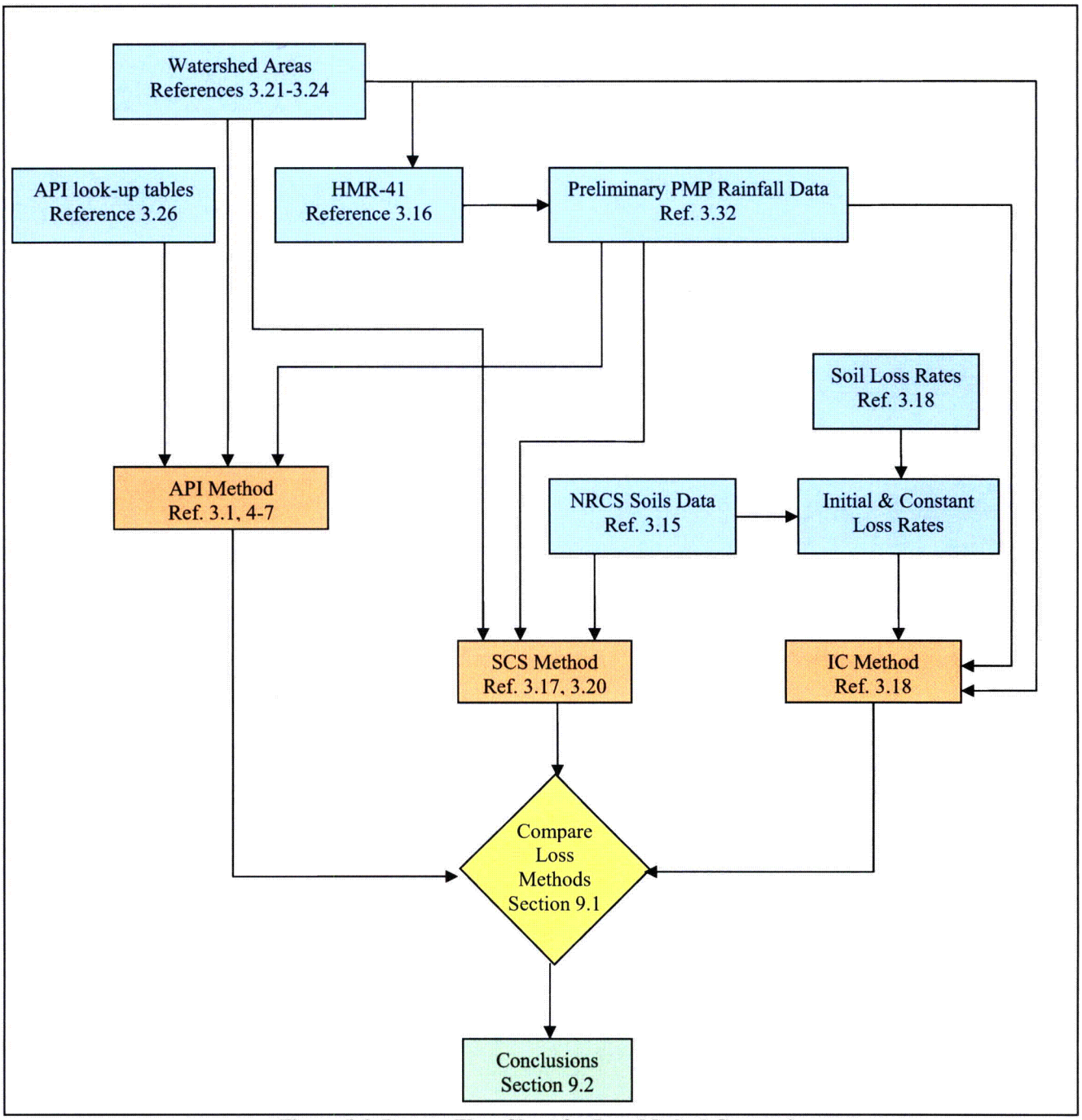


Figure 6.6: Process Flow Chart for Loss Method Comparison

7. Special Requirements/Limiting Conditions

7.1 The API method used by the FLDHYDRO program was developed specifically for and is applicable only within the Tennessee Valley watersheds as mapped by TVA and where TVA has responsibility to provide the integrated operation of the reservoir system which includes flood control.

7.2 The results and conclusions determined in this calculation is applicable only for the watershed areas above Guntersville Dam. A major portion of the TVA watershed downstream of the Guntersville Reservoir is in the API "West" region and runoff relationships applicable in that area should be used when developing correlations to industry standard methods for this area.

7.3 The FLDHYDRO data tables show a maximum API value of 5 and a minimum RI value of 16. A review of these values shows that a maximum API value of 5 and a minimum RI value of 16 (see reference 3.12 section 3 for data table of API and RI values and details of usage). In order to invoke an RI value less than 20, the user must manually specify the RI. Documentation was found showing the RI values in the table were extrapolated below 20 in the late 1970s (Reference 3.30) based on curve fitting techniques. A review of available files shows that tables prior to the 1970s show a maximum API value of 5 and minimum RI of 20 reflecting the API method as developed by the USWB based on field data. Since no API data was found to allow calculation of an API value greater than 5 or an RI value below 20, and values outside this range do not appear to be based on field data, it is concluded that API values above 5 and RI values below 20 should not be used in order to keep the parameters within the originally observed USWB field data limits. Also, any RI values below 20 are not currently in use.

8. Calculations

8.1 General

8.1.1 Microsoft Excel spreadsheets were used to compare the API method with the SCS curve number method and the initial and constant loss rate (IC) method in the preliminary PMP storm. They are included in Attachments 31-35. Graphs comparing the results for total runoff volume, cumulative runoff as a percentage of cumulative rainfall and incremental runoff as a percentage of rainfall are contained in Section 9.

The five basins that are used in this calculation are Basin 1- French Broad, Basin 4- Nolichucky, Basin 26- Norris, Basin 46- South Chickamauga, and Basin 48- Sequatchie. Each of these basins is located in a different API Region. The API Regions are taken from the map, "Antecedent Precipitation (API) Regions with Drainage Basins Above Guntersville Dam." (Attachment 26). The Watershed Basin Areas are taken from the Unit Hydrograph calculations in Reference 3.21-3.24.

Table 8.1.1

Basin	API Region	Basin Area (sq. mi.)
1 - French Broad River at Asheville	SE	944.4
4 – Nolichucky River at Embreeville	E	804.8
26 – Norris Dam	NE	2912.8
46 - South Chickamauga Creek	N	428.1
48 – Sequatchie River	S	384.0

Preliminary PMP rainfall data was provided by TVA (Reference 3.32, Attachment 36) for the 5 subbasins and are used in the comparison of the three rainfall-runoff methods. For the current study (CDQ 000020080053) the PMP is being determined using GIS procedures and only minor differences are expected.

8.1.2 Attachments 31-35 contain spreadsheets comparing the API, SCS, and IC methods to predict runoff from a given rainfall in a given watershed. The following sections explain the steps taken to compare the 3 methods.

8.1.3 Microsoft Excel spreadsheets with the weighted soil types and curve numbers are provided. These spreadsheets compile the NRCS data (Ref. 3.15 and Attachments 4-13). SCS curve numbers and constant loss rates were based on soil textures from NRCS. Results are shown in Section 9. The Microsoft Excel built in function was used for simple averages of calculated values.

8.1.4 Weighting for the SCS soil rating types was performed based on area as follows:

$$P_{soil} = \frac{A_1}{A_{total}} + \frac{A_2}{A_{total}} + .. + \frac{A_i}{A_{total}} \qquad \textbf{Eqn. 8.1.4}$$

where:

P_{soil} = proportion of area for reported soil rating (in percent)
i = number of soil map units
A_i = reported area for soil map unit name (in acres)
A_{total} = total sample area (in acres)

8.1.5 Weighting of soil infiltration rating was performed based on area as follows:

$$K_s = c \times \left(\frac{K_1 \times A_{mu\_1}}{AOI_{total}} + \frac{K_2 \times A_{mu\_2}}{AOI_{total}} + .. + \frac{K_i \times A_{mu\_i}}{AOI_{total}} \right) \qquad \textbf{Eqn. 8.1.5}$$

where:

K_s = weighted average soil conductivity rating for Area of Interest (in mm/hour)
K_i = soil conductivity rating for soil map unit (in μm/sec)
$Amu_{\_i}$ = area of soil map unit 'i' in area of interest (in acres)
AOI_{total} = total area of area of interest (in acres)
i = number of soil map units
c = conversion constant

in this case: $$c = \frac{1 \times mm}{1000 \times \mu m} \times \frac{3600 \times sec}{1 \times hour}$$

8.1.6 Due to the limited nature of the soils data (see section 6.5), the following statistical calculations were performed on the NRCS soil rating group data to determine if sufficient samples were taken to generate a representative soil type for the watershed. As discussed in section 6.5, a 95% confidence level was used for these calculations. This was to ensure sufficient sampling size in order to give a high confidence that the soil types used were representative of the entire watershed under review. Calculations were performed using Microsoft Excel 2003 and are included in Attachments 5, 7, 9, 11 and 13. Since the SCS soil rating is non-numeric, the reported percentages for soil hydrologic ratings were used for the error calculations. Sample size was based on total acres sampled.

8.1.7 Averages were taken using the following equation included in Microsoft Excel as the 'AVERAGE' function:

$$\bar{x} = \frac{x_1 + x_2 + .. + x_n}{n} \qquad \textbf{Eqn. 8.1.7}$$

where:

$\bar{x}$ = average value
x_1 = 1st observed value
x_2 = 2nd observed value
x_n = nth observed value
n = number of values

The average function was used on the soil rating groups as percentages of the sample area and the reported soil conductivity (as reported in μm per second) as reported by the NRCS in Reference 3.15 and included in Attachments 4, 6, 8, 10 and 12.

8.1.8 Standard deviations were calculated using the following equation included in Microsoft Excel as the 'STDEV' function:

$$s = \sqrt{\frac{\left(x_1 - \bar{x}\right)^2 + \left(x_2 - \bar{x}\right)^2 + .. + \left(x_n - \bar{x}\right)^2}{n - 1}} \qquad \textbf{Eqn. 8.1.8}$$

where:

s = standard deviation
$\bar{x}$ = mean value
x_1 = 1st observed value
x_2 = 2nd observed value
x_n = nth observed value
n = number of values

8.1.9 Error calculations were from equations in Reference 3.27 as follows:

$$CV = \frac{s}{\bar{x}} \qquad \textbf{Eqn. 8.1.9a}$$

where:

CV = coefficient of variation
s = standard deviation (see Eqn. 8.4.2)
$\bar{x}$ = mean value (see Eqn. 8.4.1)

$$P = \sqrt{\frac{t^2 \times CV^2}{n}} \qquad \textbf{Eqn. 8.1.9b}$$

where:

P = departure from mean expressed as a fraction (formatted as % in Microsoft Excel tables)
t = Student's 't' value (1.96 used for 95% confidence level)
CV = coefficient of variation
n = sample size, total sample acreage (Reference 3.15, Attachments 4-13)

See section 6.5 for methodology and the results at 95% confidence level are listed in Table 8.3.1.

8.1.10 The spreadsheets (Attachments 5, 7, 9, 11, 13) calculate Incremental Runoff Volume and Cumulative Runoff Volume based on Watershed Basin Area as follows.

$$Vol = k \times Q \times A \qquad \textbf{Eqn. 8.1.10}$$

where:

Vol = runoff volume (in acre-feet)
Q = runoff (in inches)
A = watershed area (in square miles)
k = conversion constant

in this case: $k = \frac{1 \times \text{foot}}{12 \times \text{inches}} \times \frac{640 \times \text{acres}}{1 \times \text{squaremile}}$

8.2 API Method

In the API Method sheets, the time steps and incremental rainfall were taken from the TVA provided preliminary PMP rainfall data (Reference 3.32). Cumulative rainfall and rainfall volume were calculated by summation of the incremental rainfall. Week 11 was assumed for all basins based on the PMF storm on or around March 15-17 (Reference 3.16). Next, the API was calculated. The API value is always less than or equal to 5 (see section 7.3). The API is computed using a recession factor of 90% of the previous day's API plus any incremental rainfall that has occurred.

$$API_i = 0.9 \times API_{i-1} + Rainfall_i \qquad \textbf{Eqn. 8.2}$$

where:

API_i = Antecedent Precipitation Index value for current time step

API_{i-1} = Antecedent Precipitation Index value for previous time s

$Rainfall_i$ = Rainfall (in inches) for current time step

The Runoff Index (RI) was taken from the API-RI tables (Attachment 2), originally produced by the USWB. Using the French Broad watershed as an example, the API region used was SE (see map, Attachment 26), Week 11 (for March 15th, beginning of PMP storm), and an API = 1. This produces a RI of 26. By convention, the RI only changes when a value in the table is exceeded. Once the RI is determined for a storm, it is to be used (i.e. stay on the same curve) throughout that storm. See Attachment 3 for the curve tables that correspond to the look-up tables (Attachment 2). At the beginning of the main storm, API = 3.65 and the RI equals 22 for the duration of that storm. After determining the RI, the cumulative runoff for the cumulative rainfall in the RI-Runoff Tables was determined and Total Rainfall and API Runoff was calculated. Since this is an empirical and not a functional relationship, the runoff values were manually determined and input into the spreadsheet.

8.3 SCS Method

In the SCS Method sheet, the time steps and incremental rainfall were taken from the TVA provided preliminary PMP rainfall data. Cumulative rainfall and rainfall volume were calculated from the incremental rainfall. Attachments 4, 6, 8, 10, and 12 contain the NRCS Soils Data and Attachments 5, 7, 9, 11, and 13 are spreadsheets prepared to calculate average percent of A, B, C, and D soils found within the basin. A Curve Number (CN) was calculated based on soil type and land cover (Attachment 14) using the SCS curve numbers given in Reference 3.17. The CN was calculated based on normal conditions, ARC II, then converted to ARC III (Attachment 37), for wetter conditions, since this calculation considered soil conditions during a large storm event.

Table 8.3

Basin	CN for ARC II	CN for ARC III
1 - French Broad River at Asheville	59	77
4 – Nolichucky River at Embreeville	59	77
26 – Norris Dam	70	85
46 - South Chickamauga Creek	73	87
48 – Sequatchie River	69	84

These Curve Numbers were put into the SCS spreadsheet, and Initial abstraction (Ia) and maximum retention (S) values were calculated.

The following is a reproduction of Eqn. 10-10, Reference 3.20.

$$I_a = 0.2 \times S \qquad \textbf{Eqn. 8.3a}$$

where:

Ia = Initial abstraction (in inches)
S = maximum potential retention (in inches)

The following equation is re-arranged from Eqn. 10-12, Reference 3.20.

$$S = \frac{1000 - 10 \times CN}{CN} \qquad \textbf{Eqn. 8.3b}$$

where:

S = maximum potential retention (in inches)
CN = SCS curve number

Then, Cumulative Runoff is calculated:

The following is a re-arrangement of Eqn. 10-9 and Eqn. 10-11, Reference 3.20.

$$Q = \begin{cases} 0 \text{ if } P \le I_a \\ \dfrac{(P - I_a)^2}{(P - I_a) + S} \text{ otherwise} \end{cases} \qquad \textbf{Eqn. 8.3c}$$

where:

Q = observed cumulative runoff (in inches)
P = observed cumulative rainfall (in inches)
I_a = Initial abstraction (in inches)
S = maximum potential retention (in inches)

8.3.1 The following is a summary table for the compilation for the NRCS soils data (Ref. 3.15, Attachments 4-13):

Table 8.3.1
Hydrologic Soil Group as % of Sample Area

Hydrologic Soil Group →	A		B		C		D	
↓ Watershed	Mean	Error	Mean	Error	Mean	Error	Mean	Error
1 - French Broad	25.68%	0.91%	68.14%	0.37%	4.55%	1.19%	2.42%	0.62%
4 - Nolichucky	15.08%	0.46%	77.54%	0.23%	0.50%	0.75%	7.14%	1.65%
26 - Norris	0.00%	N/A	47.74%	0.30%	37.59%	0.35%	13.31%	0.40%
46 - South Chickamauga	0.00%	N/A	55.22%	0.22%	26.08%	0.42%	18.72%	0.74%
48 - Sequatchie	0.20%	0.56%	61.90%	0.07%	21.02%	0.18%	17.07%	0.32%

No error is reported for the A type soils in the Norris and South Chickamauga watersheds as none of that soil type was reported in any of the AOI data collected. Table 8.3.1 shows that the sample size is adequate to represent the watersheds and exceeds the acceptance criteria of 2% error in the mean percentages calculated.

8.3.2 The weighted average soil rating groups were used for the final curve numbers used in the SCS method. Percent of basin in pasture and forest was estimated using Attachment 14. Results are as follows:

Table 8.3.2

	SCS Curve Numbers											
	A - CNs		B - CNs		C - CNs		D - CNs		All Groups			
Basin	Field	Wood	Field	Wood	Field	Wood	Field	Wood	Field	Wood	CN II	CN III
1 - French Broad	49	36	69	60	79	73	84	79	40%	60%	59	77
4 - Nolichucky	49	36	69	60	79	73	84	79	10%	90%	59	77
26 - Norris	49	36	69	60	79	73	84	79	50%	50%	70	85
46 - S. Chickamauga	49	36	69	60	79	73	84	79	80%	20%	73	87
48 - Sequatchie	49	36	69	60	79	73	84	79	40%	60%	69	84

8.4 IC Method

The preliminary PMP time steps and incremental rainfall are added to the first two columns in the IC Method Tab, Cumulative rainfall and rainfall volume calculated.

Max initial loss rate = 0.5 inches, see Assumption 4.4, Reference 3.17.

Constant Loss Rate (in/hr) calculated using Table 5.1, Reference 3.18, and NRCS Soil Group percentage, Attachments 4-13.

Incremental Runoff is calculated based on the 3 cases below.

The following is a re-arrangement of Eqn. 5-2, Reference 3.18.

$$Q_i = \begin{cases} 0 \text{ if } P_i \le L_{initial} \\ 0 \text{ if } L_{constant} \times t \ge P_i > L_{initial} \\ P_i - L_{constant} \times t \text{ otherwise} \end{cases} \qquad \textbf{Eqn. 8.4}$$

where:

Q_i = observed incremental runoff (in inches)
P_i = observed incremental rainfall (in inches)
$L_{initial}$ = Initial loss (in inches)
$L_{constant}$ = Constant loss (in inches/hour)
t = time increment (in hours)

Results, Discussion & Conclusions

9.1 **Results & Discussion**

9.1.1 The following is a summary table comparing the Cumulative Runoff Volumes and runoff as a percentage of rainfall for the Main Storm obtained by each of the rainfall-runoff prediction methods.

Table 9.1.1

Basin	Cumulative Rainfall Volume in ac-ft (Main Storm)	Cumulative Runoff Volumes in ac-ft (Main Storm only)					
		API		SCS		IC	
1 - French Broad	876,403	741,417	84.6%	718,572	82.0%	371,106	42.3%
4 - Nolichucky	648,132	562,287	86.8%	516,176	79.6%	246,956	38.1%
26 - Norris	2,143,821	1,924,778	89.8%	1,846,649	86.1%	1,190,063	55.5%
46 - South Chickamauga	280,834	248,640	88.5%	243,671	86.8%	138,669	49.4%

The table shows that when compared to the API method, the SCS and IC method calculate lower cumulative runoff volumes for the SCS Curve number and IC methods when using typical wet season loss values.

9.1.2 The following figures 9.1.2a -9.1.2e show the cumulative rainfall and runoff for the models as a function of time for the antecedent and main storm events. These figures were produced using Microsoft Excel and the electronic files are included as Attachments 31-35.

Figure 9.1.2a

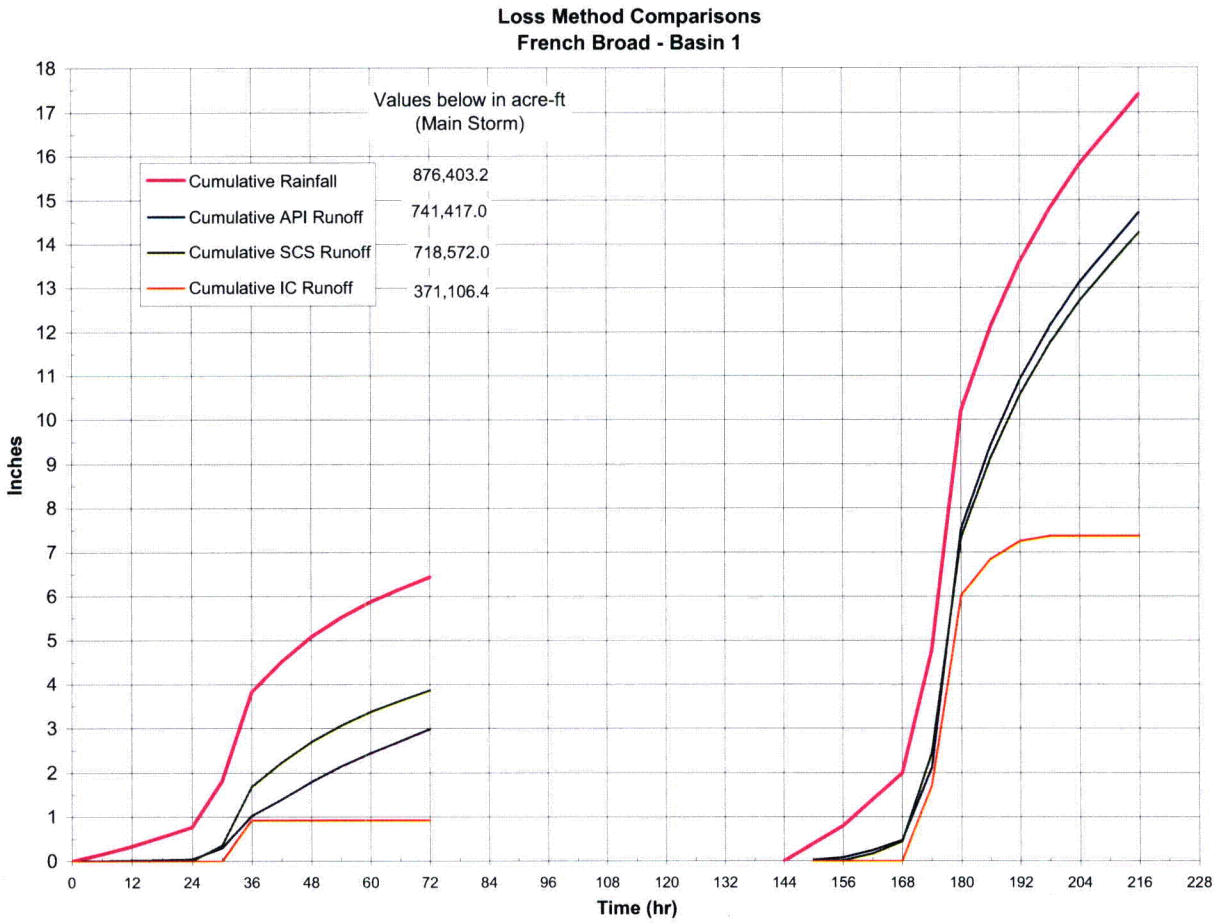


Figure 9.1.2b

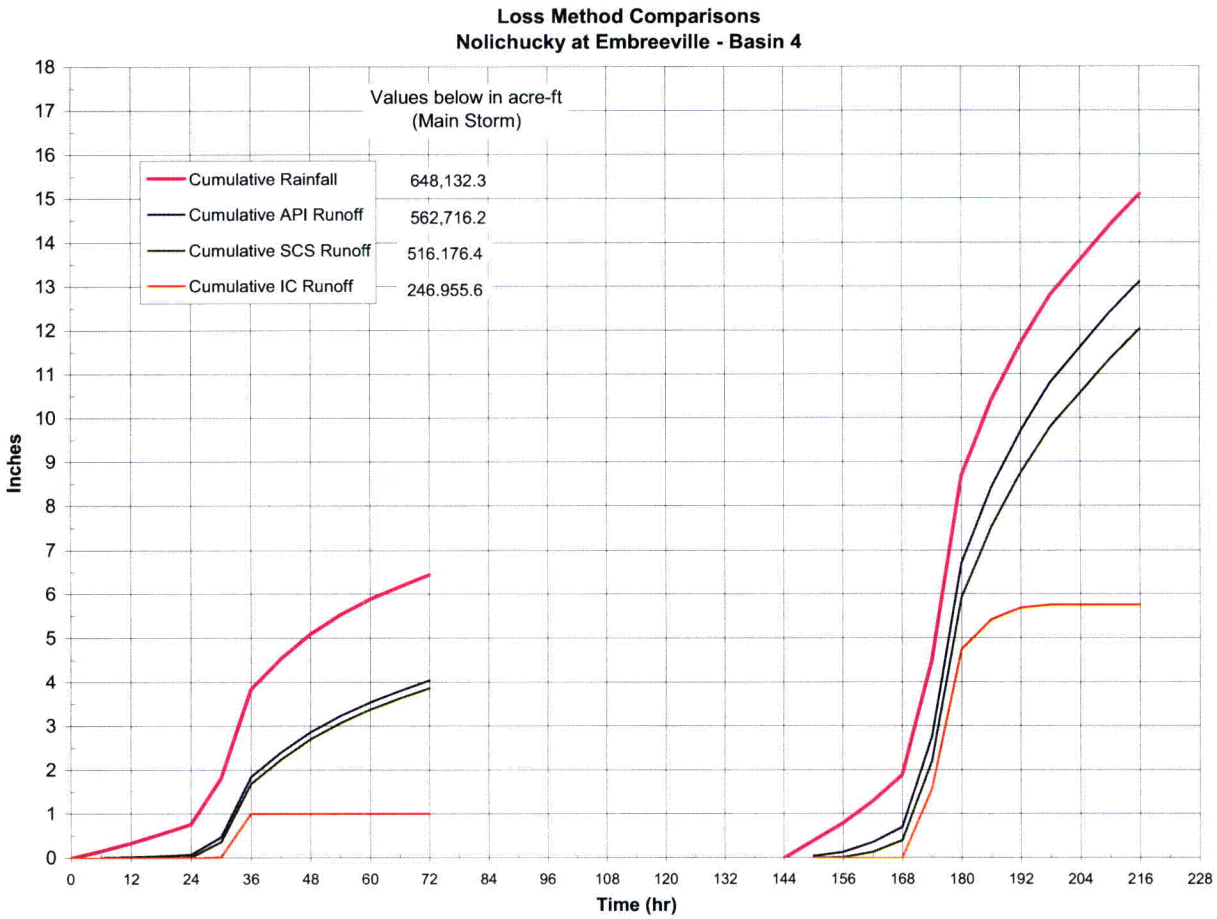

Loss Method Comparisons
Nolichucky at Embreeville - Basin 4
Values below in acre-ft
(Main Storm)
Cumulative Rainfall 648,132.3
Cumulative API Runoff 562,716.2
Cumulative SCS Runoff 516.176.4
Cumulative IC Runoff 246.955.6
Inches
Time (hr)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228

Figure 9.1.2c

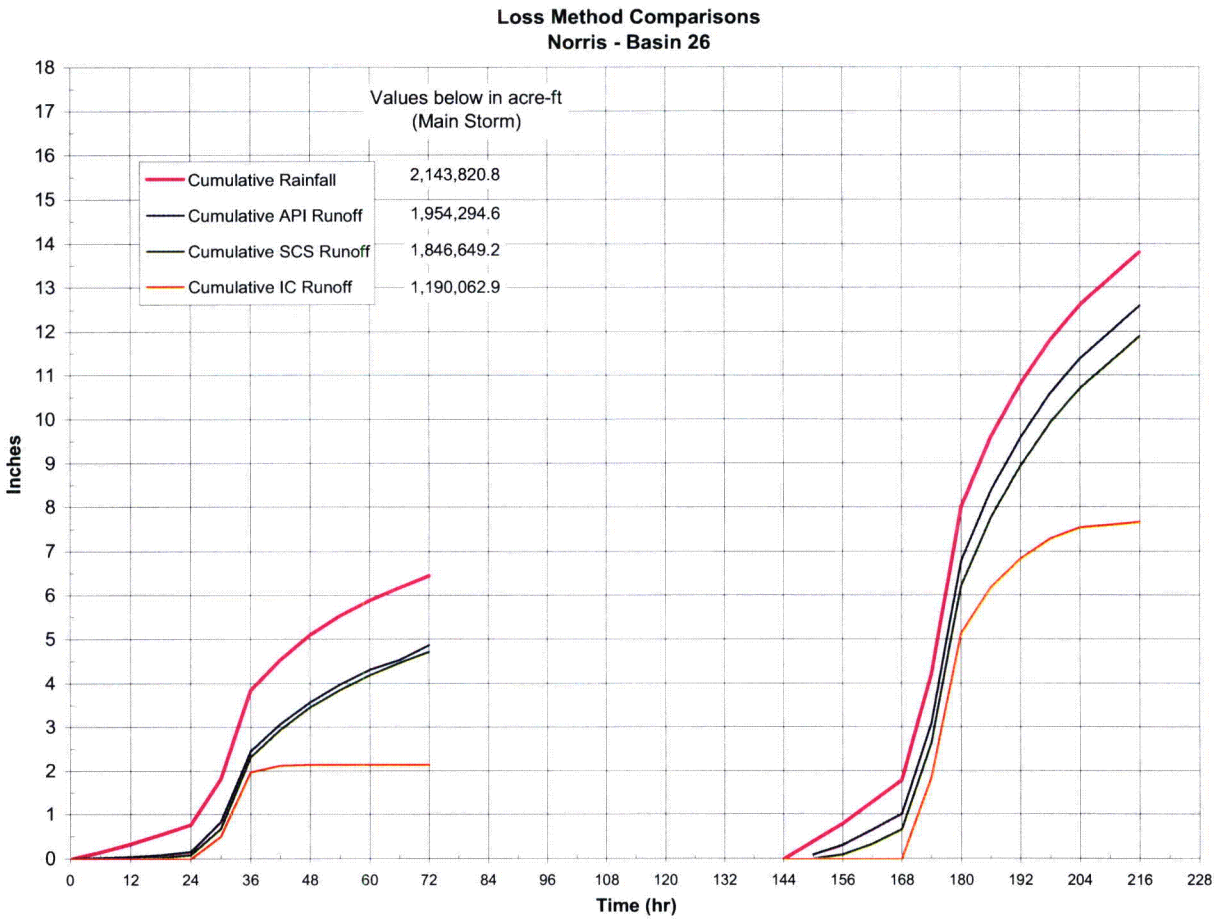

Loss Method Comparisons
Norris - Basin 26
Values below in acre-ft
(Main Storm)
Cumulative Rainfall 2,143,820.8
Cumulative API Runoff 1,954,294.6
Cumulative SCS Runoff 1,846,649.2
Cumulative IC Runoff 1,190,062.9
Inches
Time (hr)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228

Figure 9.1.2d

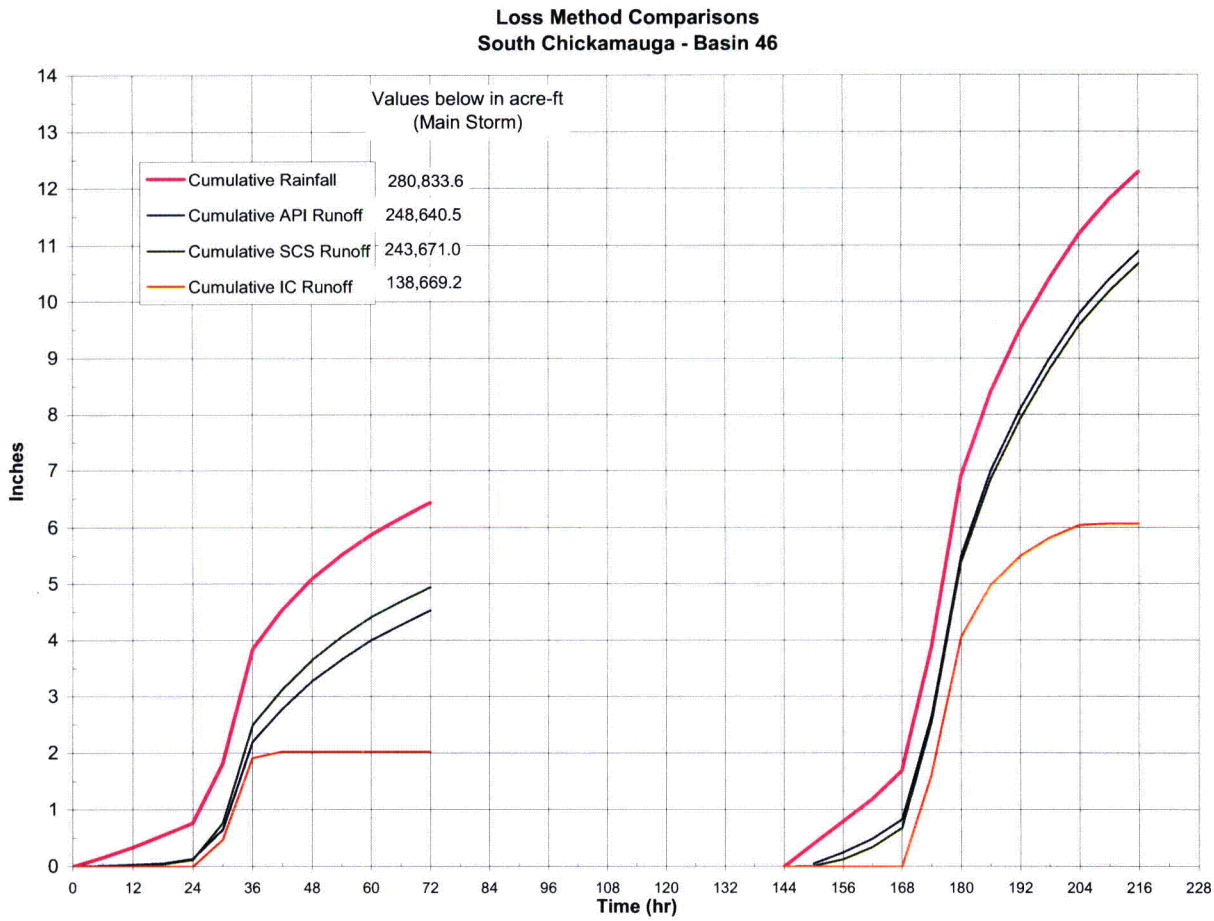
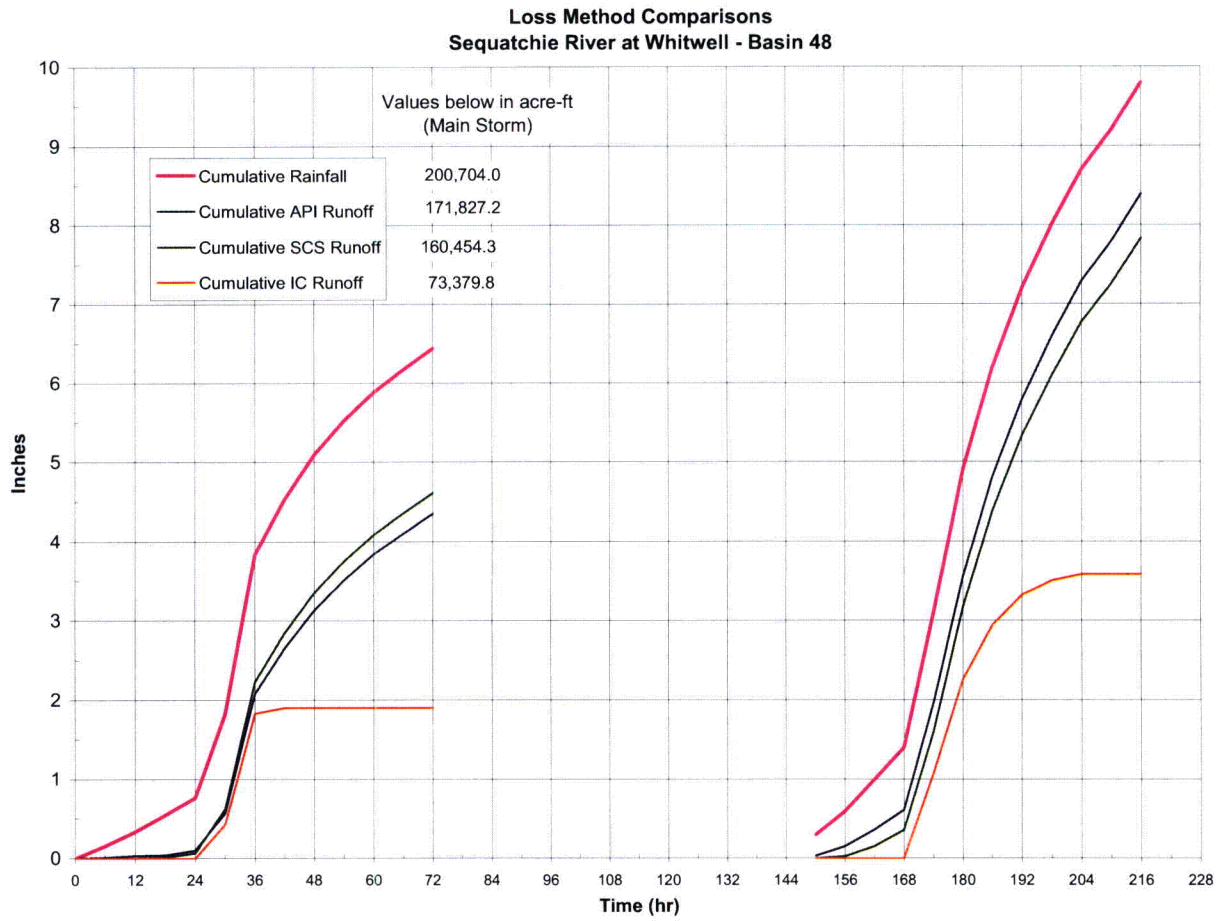

Loss Method Comparisons
South Chickamauga - Basin 46
Values below in acre-ft
(Main Storm)
Cumulative Rainfall 280,833.6
Cumulative API Runoff 248,640.5
Cumulative SCS Runoff 243,671.0
Cumulative IC Runoff 138,669.2
Inches
Time (hr)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228

Figure 9.1.2e



It can be seen in the previous figures that the runoff from the API method starts earlier than either of the other methods and all three methods produce approximately parallel loss for the most steeply rising portion of the runoff hydrograph with the API and SCS methods producing the greatest runoff during this period. At the tail of the hydrographs, it is apparent when the rainfall intensity is reduced that the constant loss in the IC method results in a reduction in runoff down to zero toward the end of the storm. The SCS and API methods produce very similar runoff through the main storm that approximately parallels the rainfall with the API method producing 1.8% to 7.1% more cumulative runoff than the SCS model. The API and SCS methods produce an overall hydrograph shape that is more nearly parallel with the rainfall than the IC method throughout both the antecedent and main storm events.

9.1.3 The following figures 9.1.3a-9.1.3e show the cumulative runoff as a percentage of cumulative rainfall for the models as a function of time for the antecedent and main storm events. These figures were produced using Microsoft Excel and the electronic files are included as Attachments 31-35.

Figure 9.1.3a

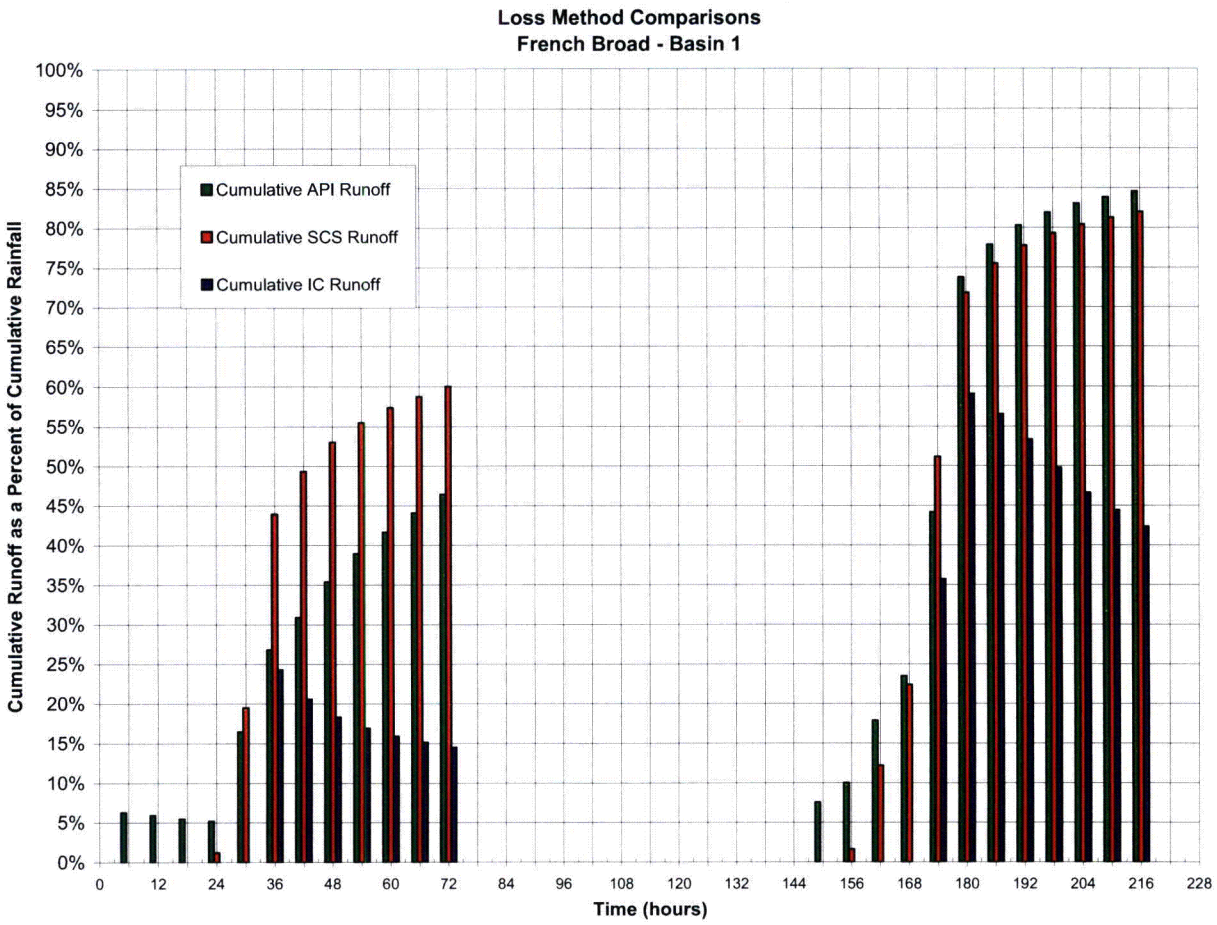


Figure 9.1.3b

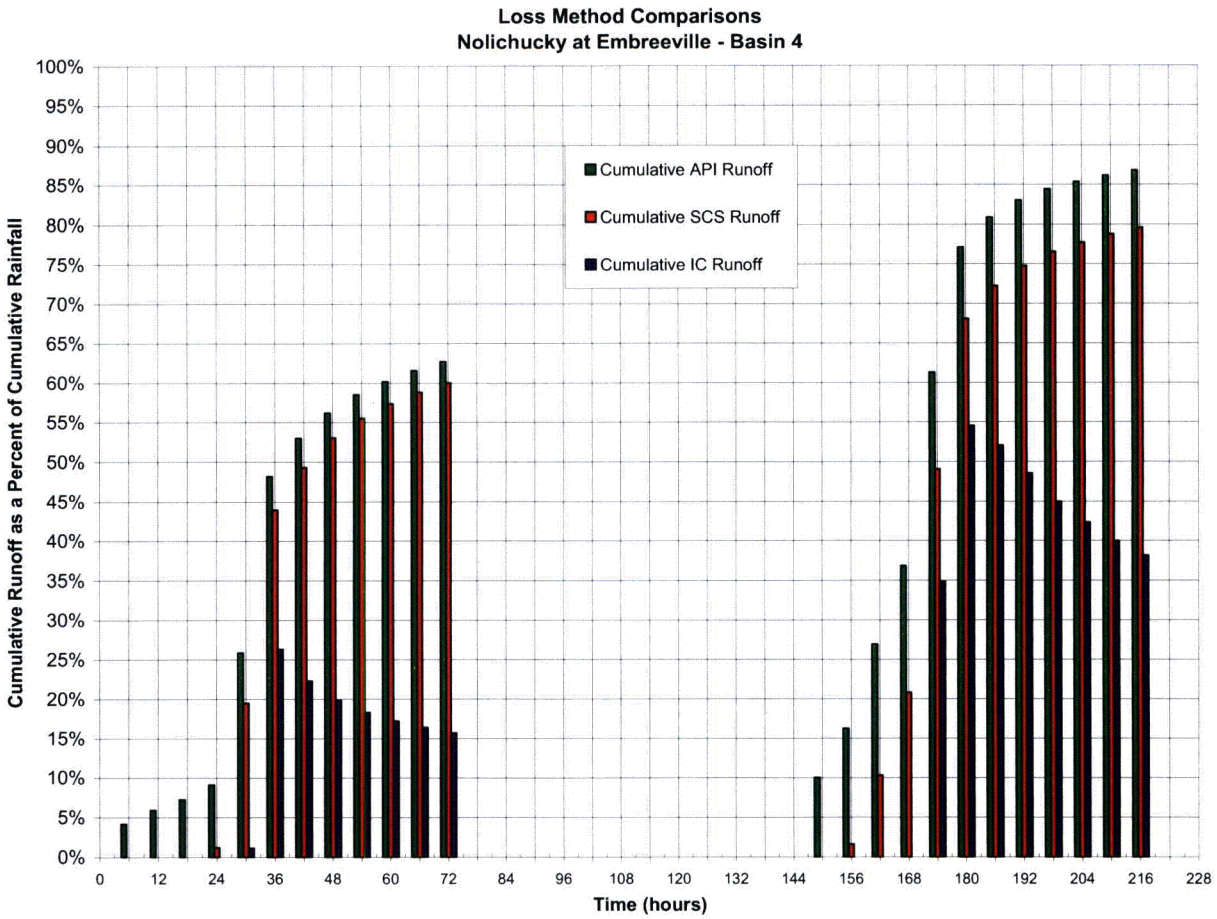

Loss Method Comparisons
Nolichucky at Embreeville - Basin 4
Cumulative API Runoff
Cumulative SCS Runoff
Cumulative IC Runoff
Cumulative Runoff as a Percent of Cumulative Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.3c

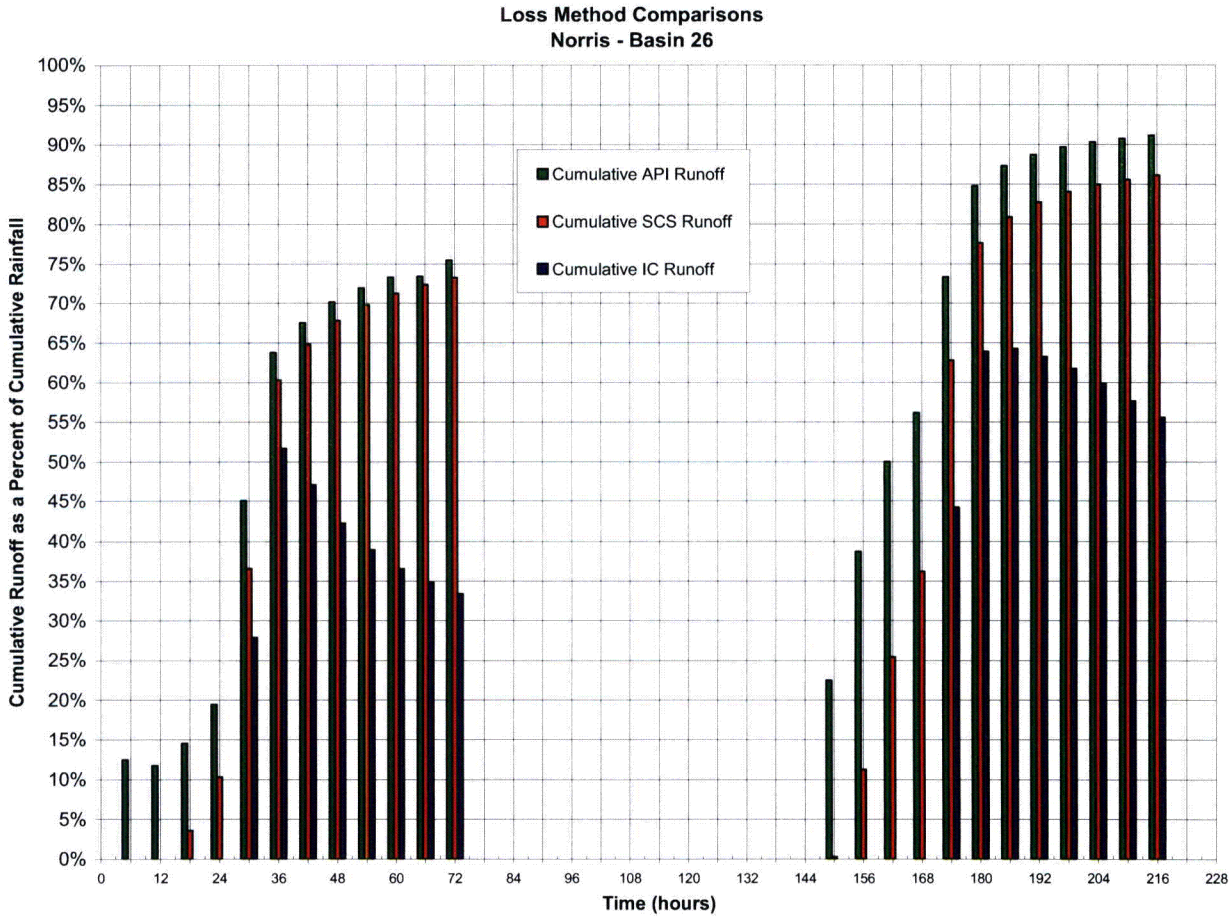

Loss Method Comparisons
Norris - Basin 26
Cumulative API Runoff
Cumulative SCS Runoff
Cumulative IC Runoff
Cumulative Runoff as a Percent of Cumulative Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.3d

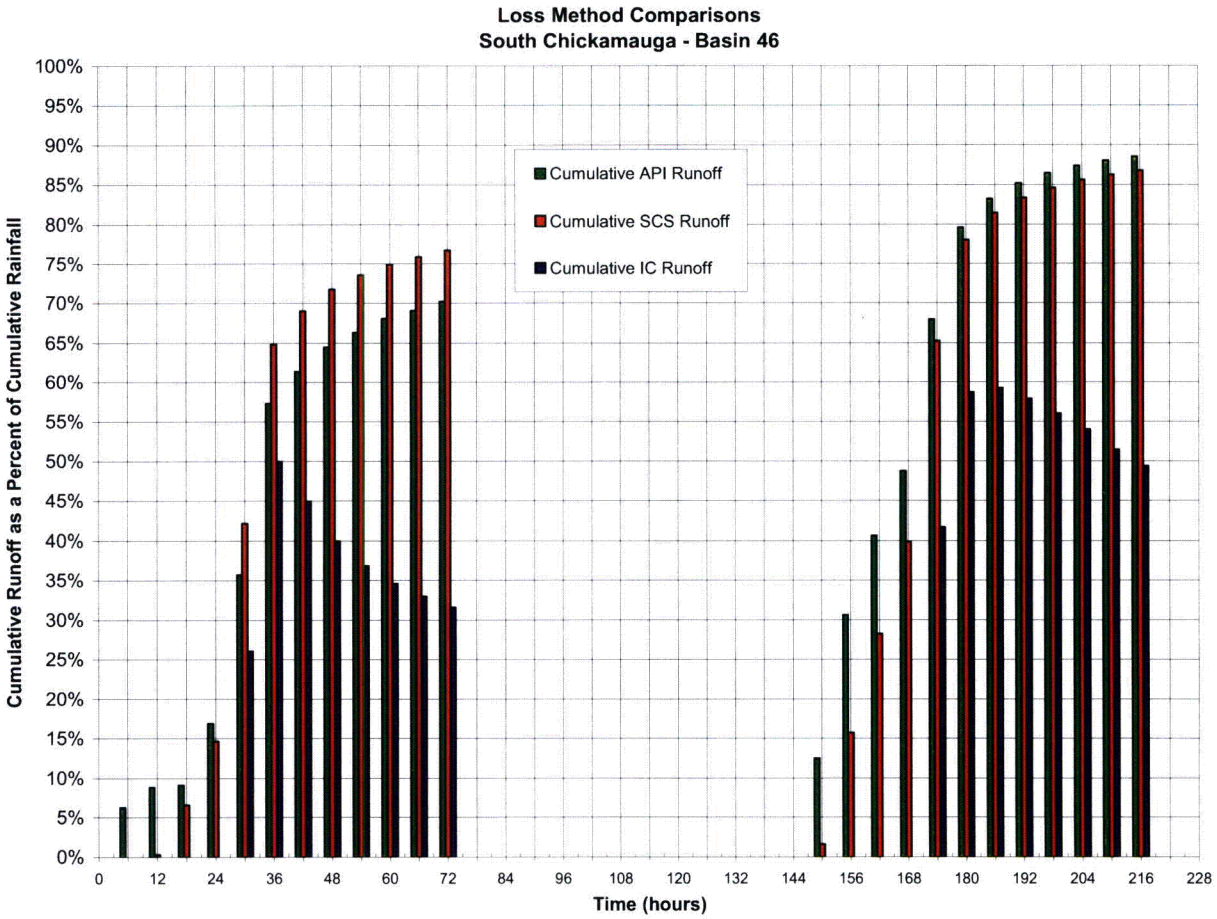
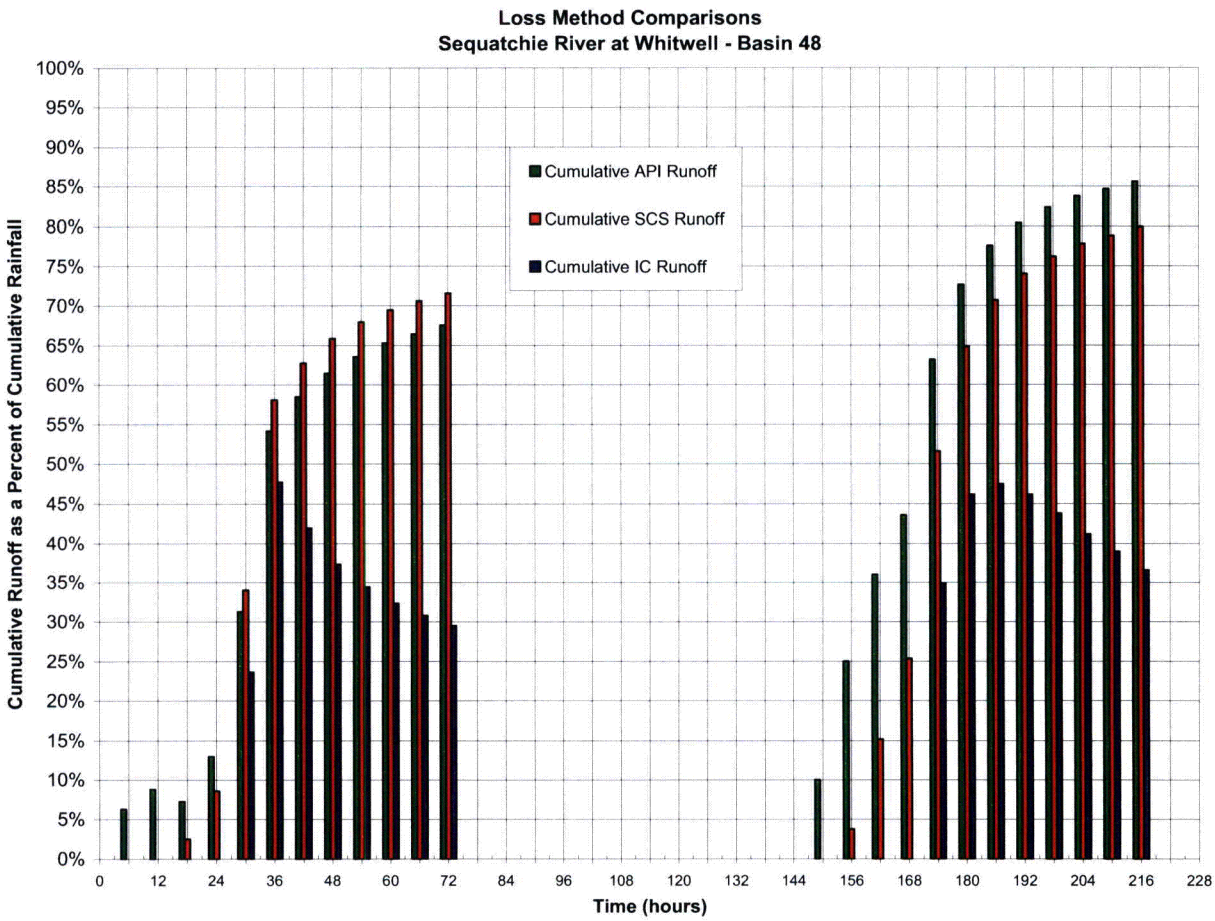

Loss Method Comparisons
South Chickamauga - Basin 46
Cumulative API Runoff
Cumulative SCS Runoff
Cumulative IC Runoff
Cumulative Runoff as a Percent of Cumulative Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.3e



Figures 9.1.3a through 9.1.3e show the cumulative runoff as a percent of cumulative rainfall over time for the three models reviewed. The API method shows the earliest runoff and has the highest percentage runoff at the end of the main storm. Generally, the SCS method generates more runoff during the antecedent storm and the API method generates more runoff during the main storm with the IC method generating much less runoff. It is interesting to note that the API and SCS methods are approximately parallel in generating an 'S' shaped curve similar to the cumulative rainfall (see Figures 9.1.2a - 9.1.2e) through both storms while the IC method develops little or no runoff during the first part of the rainfall hydrograph, high runoff during the most intense portion of the storm and then falls off sharply during the falling hydrograph limb. The sudden change in runoff during the rising limb occurs when the initial loss rate is exceeded. The sharp reduction in runoff after the storm peak is due to the constant loss approach used in the IC method that does not account for antecedent moisture conditions and sends the same proportion of incremental rainfall to runoff or loss regardless of whether the rainfall is on the rising or falling limb of the rainfall hydrograph. Under field conditions, one would expect to see more loss on the rising rainfall hydrograph limb as existing storage volume in the watershed (surfaces, depressions, soil void space, etc.) is filled and more runoff during the falling rainfall hydrograph limb when this storage is already full.

9.1.4 The following figures 9.1.4a-9.1.4e show the incremental runoff as a percentage of incremental rainfall for the models as a function of time for the antecedent and main storm events. These figures were produced using Microsoft Excel and the electronic files are included as Attachments 31-35.

Figure 9.1.4a

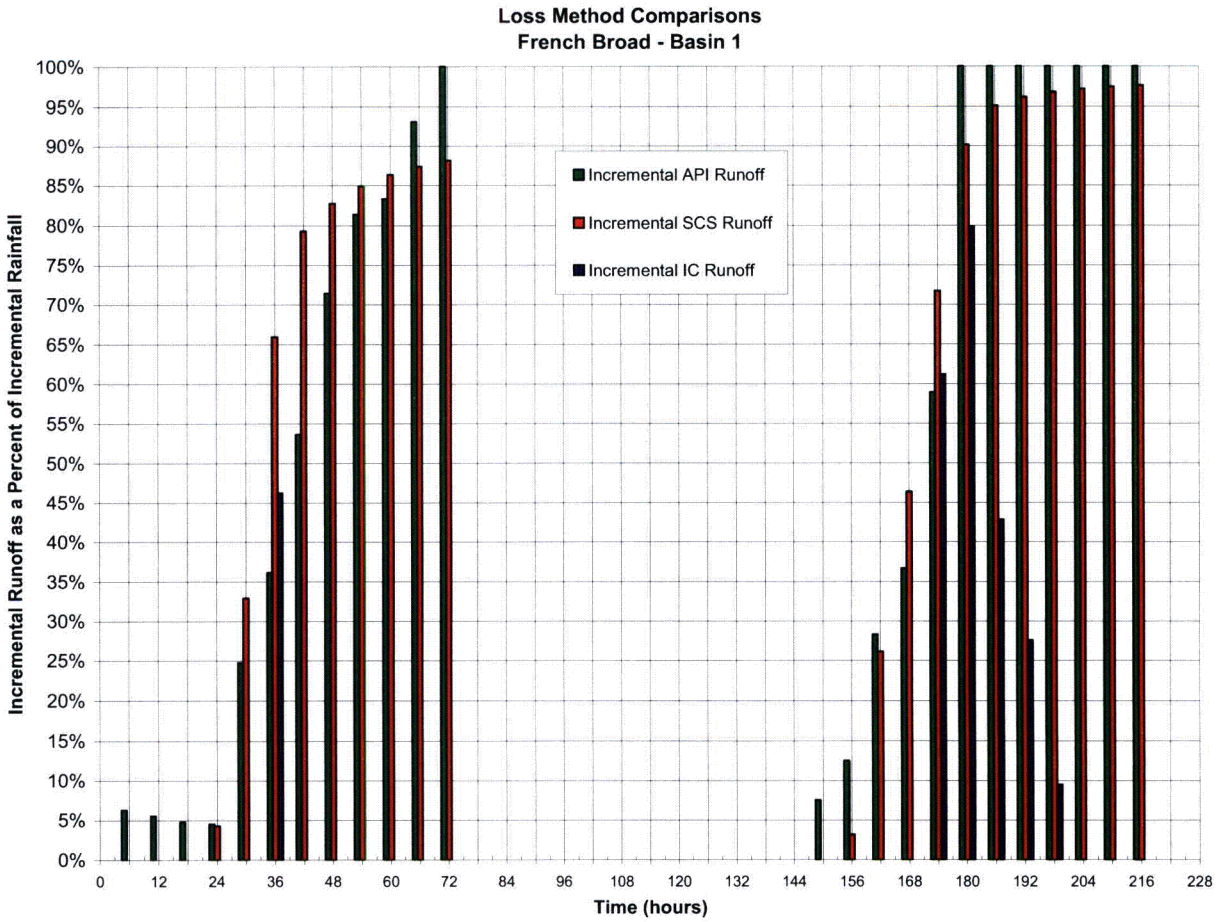


Figure 9.1.4b

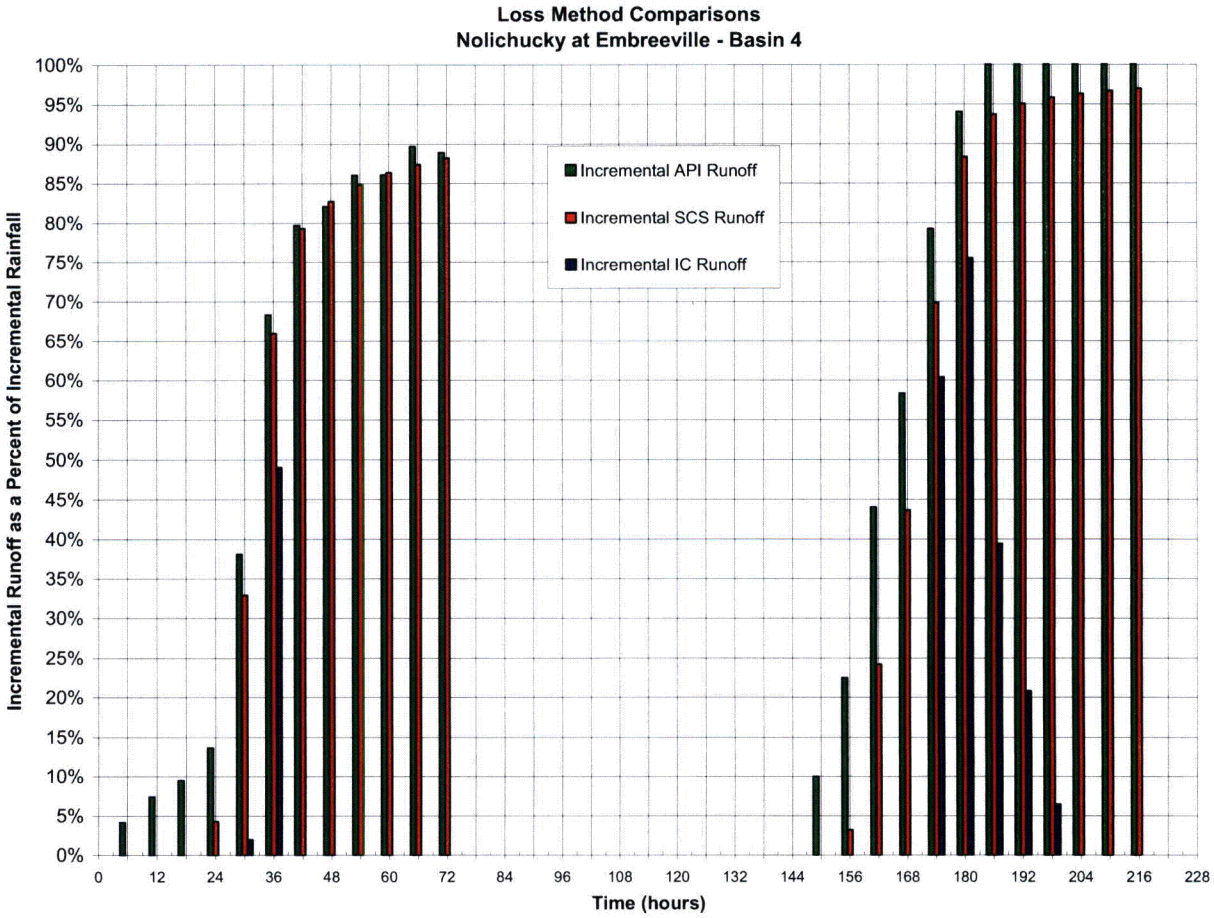

Loss Method Comparisons
Nolichucky at Embreeville - Basin 4
Incremental API Runoff
Incremental SCS Runoff
Incremental IC Runoff
Incremental Runoff as a Percent of Incremental Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.4c

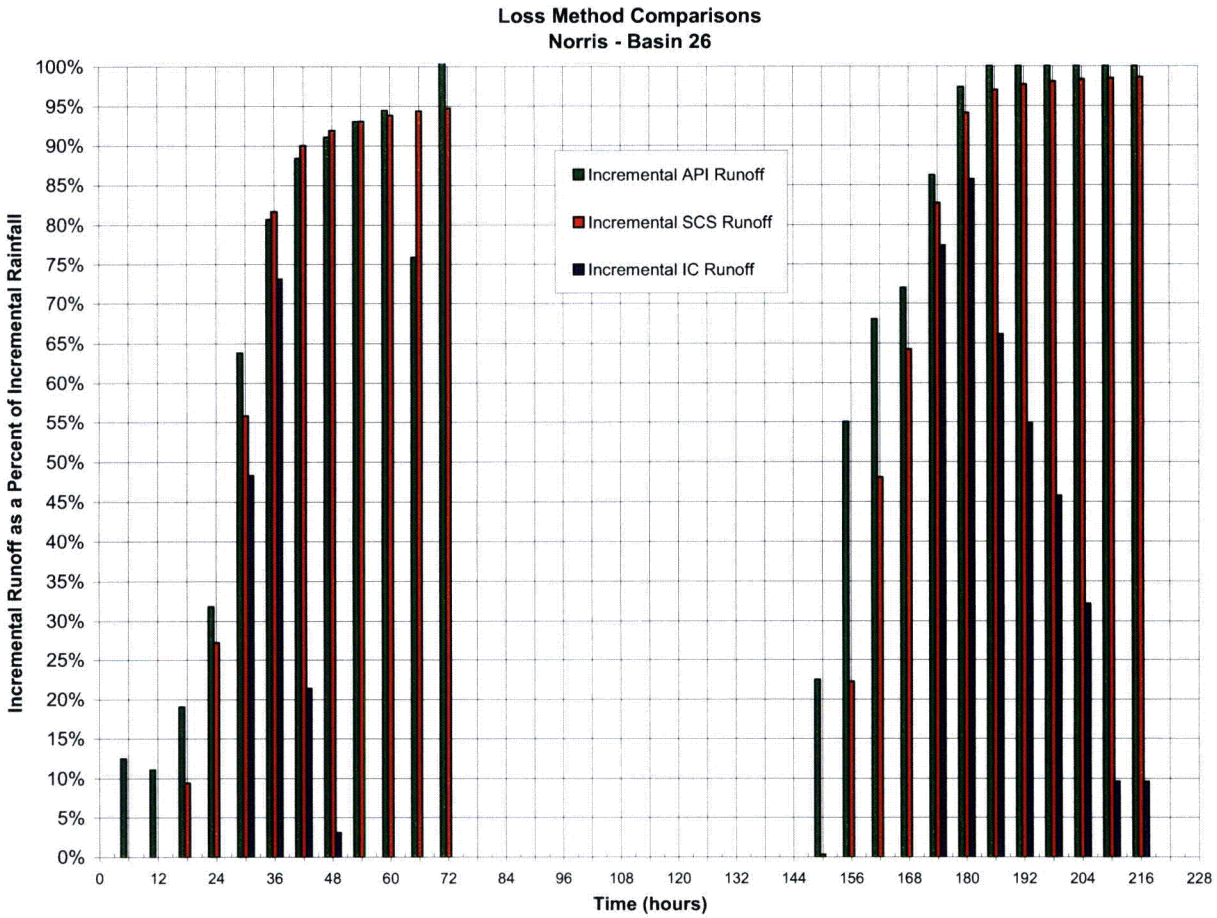

Loss Method Comparisons
Norris - Basin 26
Incremental API Runoff
Incremental SCS Runoff
Incremental IC Runoff
Incremental Runoff as a Percent of Incremental Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.4d

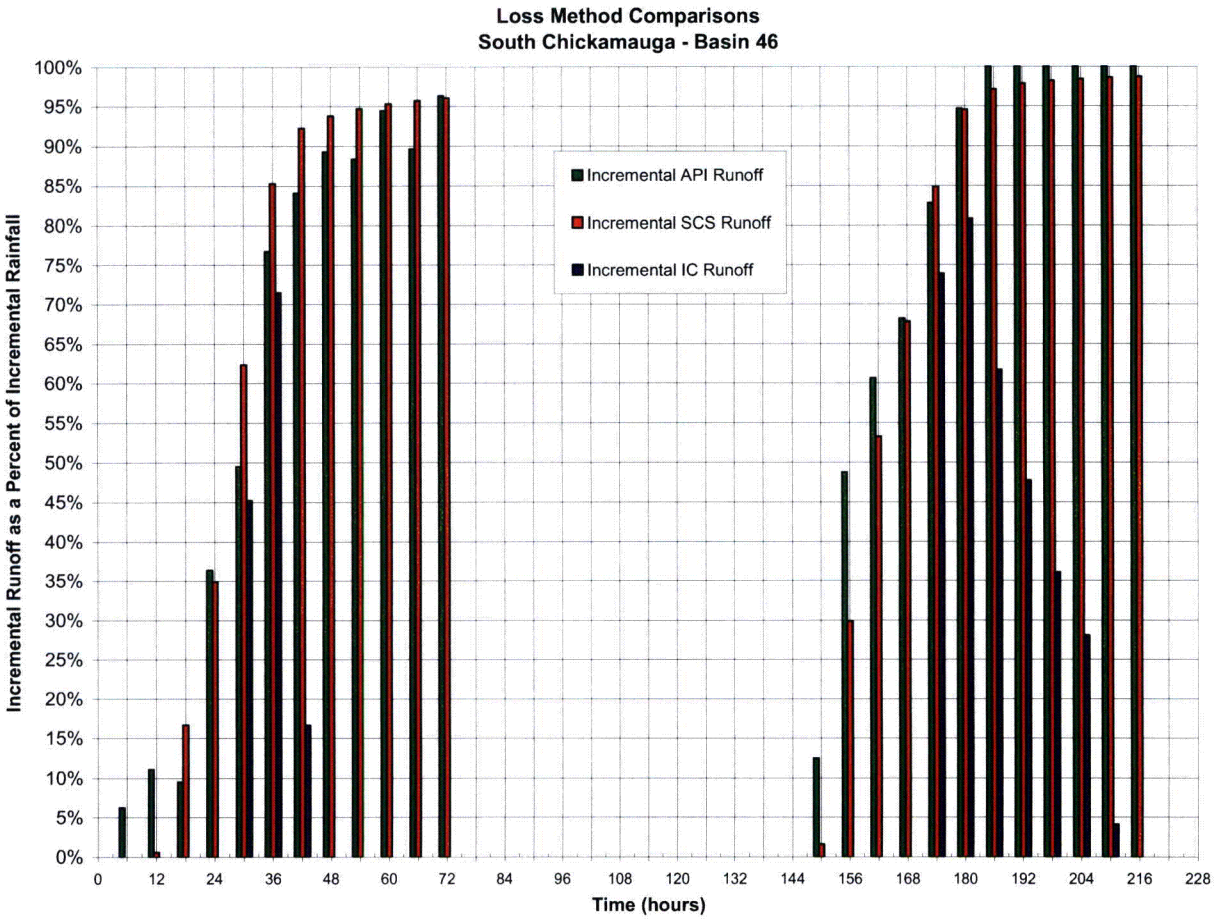
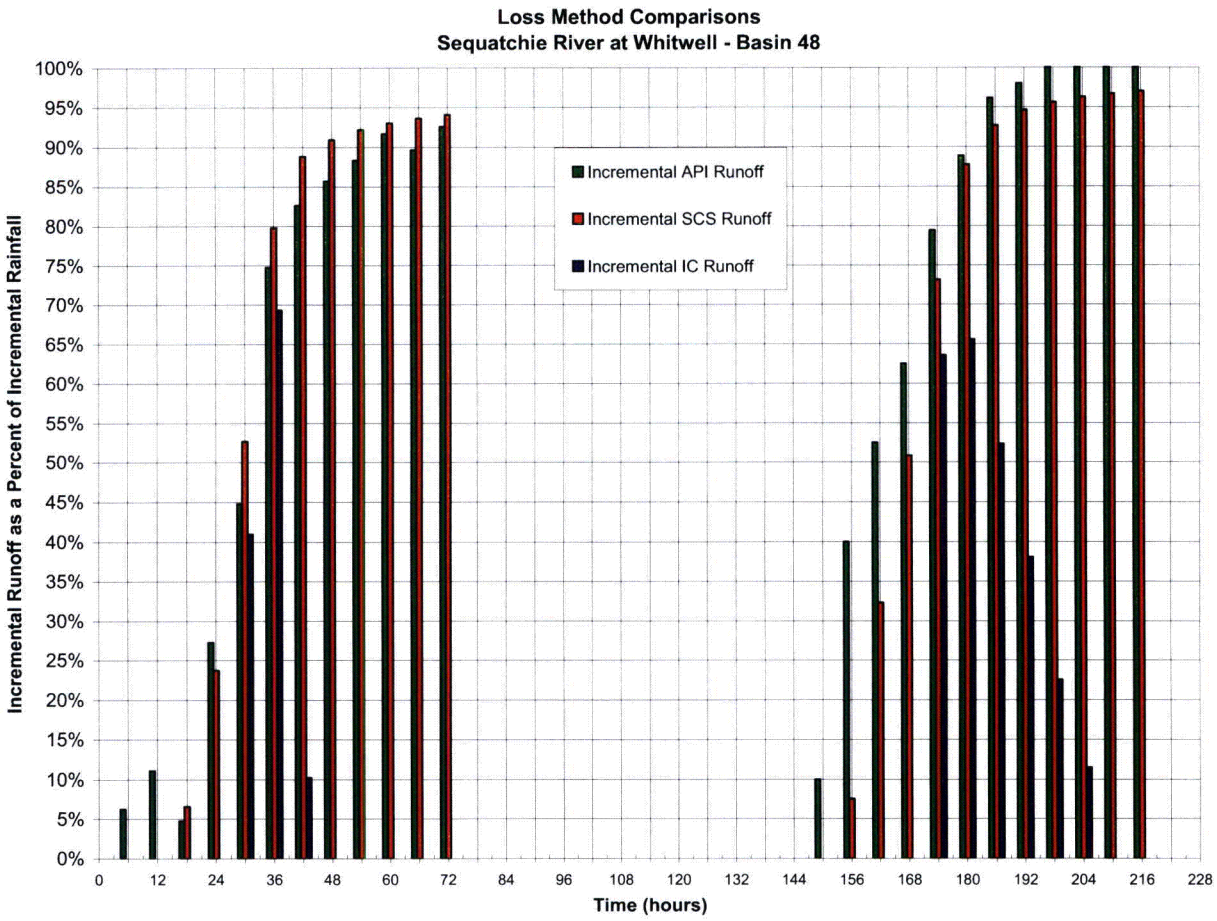

Loss Method Comparisons
South Chickamauga - Basin 46
Incremental API Runoff
Incremental SCS Runoff
Incremental IC Runoff
Incremental Runoff as a Percent of Incremental Rainfall
100%
95%
90%
85%
80%
75%
70%
65%
60%
55%
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
Time (hours)

Figure 9.1.4e



Figures 9.1.4a through 9.1.4e show how each of the models determines the amount of runoff at each rainfall increment. As in the previous section 9.1.3, runoff calculated using the API method starts earlier in both storms than either of the other two methods. The SCS method generates larger percentages of runoff per rainfall increment for the antecedent storm while the API method shows larger incremental runoff for the main storm. Additionally, the API method shows 100% runoff for at least the last half of the main storm for all watersheds except the Sequatchie with 98-100% for that watershed during that period. The IC method shows the characteristic peak runoff, as seen in the cumulative loss percentages in section 9.1.3, during the highest storm intensity with higher losses at the beginning and end of the storm. The API method shows some oscillations, particularly at the start and end of the antecedent storm that is most likely due to the interaction between the 10% per day recession constant and the RI vs. runoff values in the lookup tables. These oscillations are considered negligible.

9.2 Conclusions

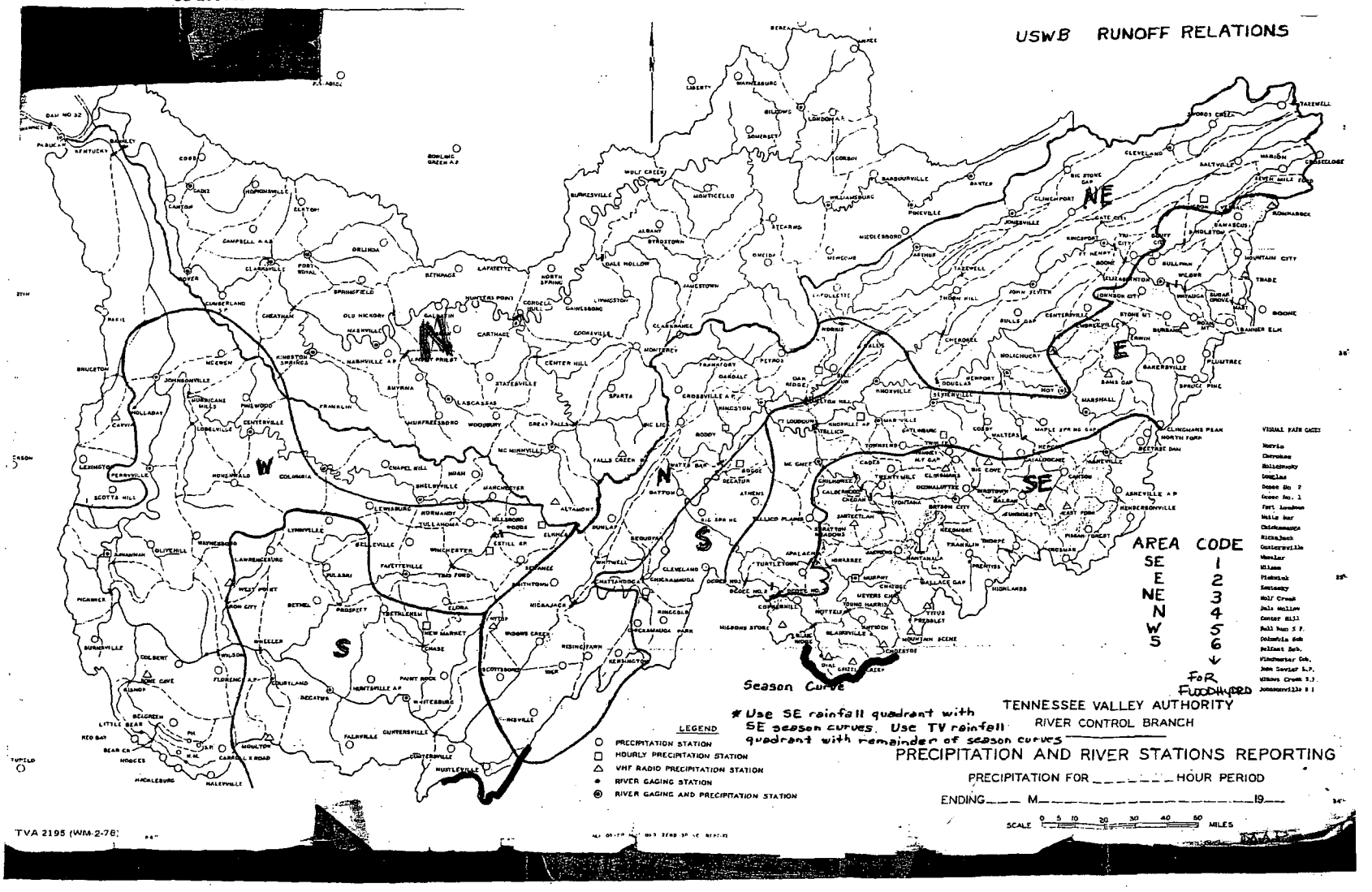
9.2.1 As shown in section 9.1.1, the historical TVA API method produces more conservative total runoff volumes than the SCS and IC industry standard methods when using input values considered reasonable based on available references and soils data.

9.2.2 As shown in sections 9.1.1 through 9.1.3, the API method more conservatively approximates the total losses based on antecedent conditions at the beginning of PMP main storm events and is applicable to rainfall events of this scale. The SCS and IC methods assume a constant loss rate that is used through the entire storm resulting in larger calculated losses and lower runoff quantities during the PMP level main storm event.

9.2.3 As shown in section 9.1.4, the API method accounts for a fixed volume available in the watershed for surface and infiltration losses, and transitions to 100% runoff for any increment of rainfall occurring above that volume. This can also be seen in the graphed API data included as Attachment 30. The 45° dashed line represents a 1:1 runoff to rainfall relationship. Note that at approximately 4 inches of rainfall in the TV region and 6 inches in the SE region, the rainfall-runoff relationship for all RI values parallels the dashed line. This shows that the API method reverts to a 1:1 runoff to rainfall relationship for all subsequent rainfall increments after a specific volume of rainfall is received by the watershed. This is due to the fact that the API method is empirically based on observed rainfall-runoff data specifically for the Tennessee Valley watershed areas and was adjusted iteratively to approximate observed stream gauge data. Because of this approach, the API was formulated to account for antecedent conditions, the existence of substantial interflow and baseflow during rainfall events and the saturation of the watershed storage during the course of large scale storm events.

9.2.4 The Antecedent Precipitation Index (API) method used in the FLDHYDRO subroutine to calculate the rainfall and runoff inputs for the SOCH model is a valid and conservative method for use in calculating storm runoff when compared to other rainfall/runoff models. The API method, developed by TVA and the USWB specifically for use in the Tennessee Valley basin, was formulated using an extensive long-term data set, and has been validated through use over a fifty year period. The ability of the API to fit historical data can be seen in the development of the majority of the unit hydrographs in the drainage area as presented in References 3.21 through 3.24 and References 3.33 through 3.41 Additionally, the API method is currently employed by TVA River Operations in the integrated operation of the TVA reservoir system which includes daily flood control activities to satisfy the Federal mandate for flood control in the Tennessee Valley. Based on comparison with the SCS curve number and initial and constant loss methods for PMP event size storms in the defined watersheds, the API method is shown to be more conservative in determining rain runoff volume for PMP scale events compared to two well-documented industry standard storm run-off methods; the SCS curve method and the Initial/Constant loss method.

CDQ000020080052-API Rain Runoff Relationship for Tennessee River Watershed- Attachment 1



CDQ000020080052-API Rain Runoff Relationship for Tennessee River Watershed- Attachment 2

North Season Quadrant API
Week vs. Runoff Index

Region	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
70																					0.04												
69																					0.07												
68																				0.03	0.11												
67																				0.07	0.14												
66																			0.04	0.11	0.17	0.03											
65																			0.07	0.14	0.21	0.07											
64																		0.04	0.11	0.18	0.24	0.11											
63																		0.08	0.14	0.21	0.28	0.15	0.03										
62																	0.04	0.11	0.18	0.24	0.31	0.19	0.07										
61																0.01	0.08	0.15	0.21	0.28	0.35	0.23	0.11										
60																0.05	0.12	0.19	0.25	0.32	0.39	0.27	0.15										
59																0.09	0.15	0.23	0.29	0.36	0.42	0.31	0.19	0.04									
58															0.04	0.12	0.19	0.27	0.32	0.39	0.45	0.35	0.22	0.08									
57															0.08	0.16	0.23	0.31	0.36	0.42	0.48	0.38	0.26	0.12									
56														0.04	0.12	0.2	0.27	0.35	0.4	0.46	0.52	0.42	0.3	0.16	0.03								
55														0.08	0.17	0.24	0.31	0.4	0.44	0.5	0.55	0.45	0.33	0.2	0.09								
54													0.05	0.12	0.21	0.28	0.35	0.44	0.48	0.53	0.59	0.48	0.37	0.24	0.1								
53												0.02	0.09	0.17	0.25	0.32	0.39	0.48	0.51	0.57	0.62	0.52	0.41	0.28	0.14	0.02							
52												0.06	0.13	0.21	0.3	0.37	0.43	0.51	0.55	0.61	0.66	0.56	0.45	0.32	0.18	0.05							
51												0.1	0.17	0.25	0.34	0.41	0.48	0.55	0.59	0.65	0.7	0.6	0.49	0.36	0.23	0.09							
50											0.04	0.14	0.21	0.3	0.38	0.45	0.52	0.59	0.63	0.69	0.73	0.64	0.53	0.4	0.27	0.13							
49											0.08	0.18	0.26	0.34	0.42	0.5	0.56	0.63	0.68	0.74	0.77	0.68	0.57	0.45	0.31	0.17							
48										0.04	0.13	0.22	0.31	0.39	0.47	0.54	0.61	0.68	0.73	0.78	0.82	0.73	0.62	0.5	0.36	0.22	0.05						
47									0.01	0.09	0.18	0.27	0.37	0.44	0.52	0.59	0.66	0.72	0.77	0.82	0.87	0.78	0.67	0.55	0.41	0.28	0.11						
46									0.06	0.15	0.23	0.33	0.42	0.5	0.57	0.64	0.71	0.77	0.82	0.87	0.93	0.83	0.72	0.61	0.47	0.34	0.17						
45								0.02	0.11	0.2	0.29	0.39	0.48	0.56	0.62	0.69	0.76	0.82	0.88	0.92	0.98	0.89	0.78	0.67	0.53	0.4	0.23	0.06					
44								0.07	0.16	0.25	0.35	0.45	0.54	0.62	0.68	0.75	0.81	0.88	0.93	0.98	1.03	0.94	0.84	0.73	0.6	0.46	0.3	0.12					
43							0.02	0.12	0.22	0.31	0.41	0.51	0.61	0.68	0.74	0.81	0.87	0.93	0.99	1.04	1.09	1	0.9	0.79	0.67	0.53	0.37	0.18	0.03				
42							0.07	0.17	0.27	0.37	0.48	0.58	0.67	0.74	0.8	0.87	0.93	0.99	1.05	1.1	1.16	1.06	0.96	0.83	0.74	0.6	0.43	0.24	0.09				
41						0.03	0.13	0.23	0.33	0.43	0.55	0.65	0.73	0.81	0.87	0.93	1	1.05	1.11	1.16	1.22	1.11	1.03	0.92	0.81	0.67	0.49	0.31	0.15	0.03			
40						0.08	0.19	0.29	0.4	0.5	0.62	0.72	0.8	0.88	0.94	1.01	1.07	1.12	1.17	1.22	1.28	1.17	1.1	0.99	0.88	0.74	0.56	0.38	0.21	0.08			
39					0.04	0.14	0.25	0.36	0.47	0.57	0.7	0.79	0.88	0.95	1.01	1.08	1.15	1.19	1.24	1.29	1.35	1.24	1.17	1.07	0.96	0.82	0.64	0.45	0.27	0.14	0.02		
38					0.1	0.2	0.31	0.42	0.54	0.65	0.78	0.87	0.96	1.03	1.08	1.15	1.22	1.27	1.31	1.37	1.42	1.31	1.24	1.14	1.03	0.9	0.71	0.52	0.34	0.2	0.08		
37				0.06	0.17	0.27	0.38	0.49	0.61	0.73	0.86	0.95	1.04	1.11	1.17	1.23	1.29	1.34	1.39	1.45	1.5	1.4	1.32	1.22	1.11	0.99	0.79	0.59	0.41	0.26	0.14		
36			0.02	0.12	0.23	0.33	0.45	0.57	0.7	0.82	0.95	1.03	1.12	1.18	1.25	1.31	1.37	1.42	1.47	1.53	1.6	1.49	1.41	1.31	1.19	1.08	0.87	0.67	0.49	0.33	0.2	0.03	
35			0.08	0.18	0.3	0.4	0.52	0.65	0.78	0.91	1.04	1.12	1.2	1.27	1.33	1.4	1.45	1.51	1.57	1.64	1.73	1.6	1.5	1.4	1.28	1.17	0.96	0.76	0.57	0.39	0.26	0.09	
34	0.03	0.03	0.14	0.25	0.37	0.47	0.6	0.73	0.88	1.01	1.13	1.21	1.29	1.37	1.42	1.49	1.54	1.62	1.68	1.77	1.87	1.72	1.61	1.49	1.38	1.27	1.05	0.85	0.65	0.47	0.32	0.16	0.03
33	0.09	0.09	0.21	0.32	0.44	0.55	0.69	0.83	0.98	1.11	1.22	1.31	1.39	1.46	1.52	1.58	1.67	1.74	1.83	1.92	2.02	1.87	1.73	1.61	1.48	1.36	1.16	0.95	0.74	0.55	0.39	0.23	0.09
32	0.15	0.15	0.28	0.38	0.51	0.63	0.78	0.93	1.08	1.21	1.32	1.41	1.49	1.56	1.63	1.72	1.82	1.91	2.02	2.12	2.24	2.07	1.9	1.75	1.62	1.47	1.28	1.07	0.85	0.63	0.46	0.29	0.15
31	0.22	0.22	0.35	0.45	0.59	0.72	0.88	1.05	1.19	1.32	1.43	1.53	1.61	1.68	1.77	1.88	2	2.12	2.24	2.37	2.52	2.31	2.17	1.94	1.77	1.63	1.42	1.2	0.97	0.74	0.55	0.36	0.22
30	0.28	0.28	0.41	0.53	0.69	0.82	1	1.17	1.31	1.43	1.55	1.67	1.75	1.85	1.97	2.12	2.23	2.38	2.54	2.69	2.88	2.62	2.4	2.13	1.97	1.81	1.58	1.35	1.1	0.86	0.63	0.43	0.28
29	0.35	0.35	0.5	0.63	0.8	0.94	1.13	1.32	1.45	1.56	1.69	1.88	1.97	2.09	2.24	2.42	2.58	2.77	2.95	3.14	3.34	3.02	2.76	2.52	2.26	2.05	1.78	1.53	1.26	0.98	0.74	0.5	0.35
28	0.42	0.42	0.6	0.75	0.93	1.07	1.28	1.47	1.6	1.73	1.89	2.08	2.27	2.47	2.67	2.88	3.06	3.27	3.5	3.74	3.98	3.58	3.25	2.95	2.63	2.36	2.03	1.74	1.44	1.16	0.86	0.6	0.42
27	0.52	0.52	0.72	0.9	1.09	1.25	1.48	1.68	1.84	2	2.19	2.47	2.77	3.02	3.26	3.48	3.71	4.02	4.3	4.6	4.85	4.35	3.95	3.53	3.15	2.78	2.38	2	1.69	1.27	0.99	0.73	0.52
26	0.66	0.66	0.88	1.09	1.31	1.5	1.77	2	2.26	2.53	2.8	3.12	3.45	3.76	4.02	4.35	4.69	5	5	5	5	5	4.8	4.37	3.85	3.45	2.88	2.37	2	1.63	1.21	0.91	0.66
25	0.85	0.85	1.11	1.35	1.6	1.89	2.35	2.63	2.95	3.32	3.73	4.05	4.42	4.79	5	5	5						5	5	4.85	4.35	3.65	2.96	2.42	2	1.52	1.17	0.85
24	1.12	1.12	1.43	1.73	2.08	2.67	3.1	3.55	3.96	4.45	4.9	5	5	5											5	5	4.65	3.9	3.1	2.56	1.96	1.5	1.12
23	1.48	1.48	1.9	2.4	3.05	3.75	4.25	4.85	5	5	5																5	5	4.25	3.37	2.6	2	1.48
22	2.18	2.18	2.85	3.65	4.5	5	5	5																					5	4.6	3.5	2.9	2.18
21	3.6	3.6	4.7	5	5																									5	5	4.5	3.6
20	5	5	5																													5	5

West Season Quadrant API
Week vs Runoff Index

Region	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
70																																	
69																																	
68																					0.01												
67																					0.08												
66																					0.14												
65																				0.06	0.21	0.05											
64																				0.13	0.28	0.11											
63																			0.07	0.21	0.35	0.17	0.02										
62																			0.14	0.28	0.42	0.23	0.09										
61																		0.08	0.22	0.36	0.49	0.3	0.16										
60																	0.02	0.16	0.29	0.43	0.56	0.37	0.23	0.07									
59																	0.1	0.24	0.37	0.51	0.65	0.44	0.3	0.14									
58																0.05	0.18	0.32	0.46	0.58	0.7	0.52	0.37	0.21	0.04								
57																0.12	0.26	0.4	0.53	0.66	0.78	0.59	0.44	0.29	0.12								
56															0.07	0.2	0.34	0.48	0.61	0.73	0.85	0.67	0.52	0.36	0.19	0.01							
55															0.15	0.28	0.42	0.56	0.68	0.81	0.92	0.74	0.59	0.44	0.27	0.09							
54														0.07	0.24	0.37	0.5	0.64	0.77	0.89	1	0.82	0.67	0.52	0.35	0.18	0.01						
53													0.04	0.16	0.32	0.45	0.58	0.72	0.85	0.97	1.07	0.9	0.75	0.59	0.43	0.26	0.1						
52													0.12	0.25	0.41	0.53	0.67	0.81	0.94	1.05	1.15	0.98	0.83	0.67	0.51	0.35	0.19	0.03					
51												0.08	0.21	0.34	0.49	0.62	0.76	0.9	1.02	1.13	1.25	1.07	0.91	0.75	0.59	0.43	0.28	0.12					
50											0.07	0.17	0.3	0.43	0.57	0.71	0.84	0.98	1.1	1.21	1.31	1.15	1	0.84	0.68	0.52	0.37	0.21	0.06				
49											0.14	0.26	0.38	0.52	0.66	0.8	0.93	1.07	1.19	1.29	1.39	1.24	1.08	0.92	0.77	0.62	0.46	0.29	0.14				
48										0.06	0.22	0.34	0.47	0.61	0.75	0.88	1.02	1.16	1.27	1.37	1.47	1.32	1.16	1.01	0.85	0.71	0.55	0.38	0.23	0.07			
47										0.14	0.31	0.43	0.56	0.7	0.84	0.97	1.11	1.25	1.36	1.46	1.56	1.4	1.24	1.1	0.94	0.8	0.64	0.47	0.32	0.16			
46									0.06	0.23	0.4	0.52	0.64	0.78	0.93	1.07	1.2	1.33	1.44	1.55	1.64	1.48	1.33	1.18	1.03	0.89	0.73	0.56	0.41	0.25	0.09		
45									0.16	0.33	0.48	0.6	0.73	0.87	1.02	1.16	1.29	1.42	1.53	1.63	1.72	1.57	1.42	1.27	1.12	0.98	0.82	0.66	0.5	0.34	0.18		
44								0.09	0.26	0.42	0.57	0.69	0.83	0.96	1.11	1.26	1.38	1.51	1.62	1.72	1.81	1.65	1.5	1.35	1.21	1.07	0.91	0.75	0.59	0.42	0.27		
43								0.19	0.35	0.52	0.66	0.78	0.92	1.06	1.2	1.35	1.48	1.6	1.71	1.81	1.89	1.04	1.59	1.44	1.3	1.16	1	0.84	0.69	0.52	0.37	0.07	
42							0.11	0.29	0.45	0.61	0.75	0.87	1.02	1.15	1.29	1.44	1.57	1.7	1.8	1.9	1.98	1.83	1.69	1.53	1.39	1.26	1.09	0.94	0.78	0.62	0.46	0.18	
41						0.04	0.22	0.39	0.55	0.7	0.84	0.97	1.12	1.25	1.37	1.54	1.67	1.79	1.9	1.99	2.08	1.94	1.78	1.63	1.49	1.36	1.19	1.04	0.88	0.71	0.56	0.29	
40						0.16	0.33	0.5	0.65	0.8	0.94	1.07	1.22	1.36	1.49	1.64	1.77	1.89	1.99	2.08	2.18	2.04	1.88	1.73	1.59	1.46	1.29	1.14	0.98	0.81	0.66	0.41	0.11
39					0.09	0.27	0.44	0.61	0.75	0.9	1.04	1.17	1.32	1.46	1.61	1.75	1.88	1.99	2.09	2.18	2.29	2.15	1.99	1.84	1.69	1.56	1.39	1.24	1.08	0.91	0.76	0.52	0.23
38	0.04			0.01	0.21	0.39	0.56	0.71	0.86	1	1.14	1.27	1.43	1.57	1.72	1.87	1.99	2.1	2.21	2.3	2.41	2.26	2.1	1.95	1.81	1.66	1.5	1.34	1.18	1.01	0.86	0.63	0.35
37	0.16			0.04	0.33	0.51	0.67	0.82	0.96	1.11	1.26	1.38	1.54	1.68	1.84	1.98	2.11	2.22	2.32	2.42	2.53	2.38	2.22	2.07	1.92	1.77	1.61	1.45	1.29	1.12	0.97	0.75	0.48
36	0.29		0.11	0.27	0.46	0.62	0.79	0.94	1.07	1.22	1.37	1.51	1.67	1.81	1.97	2.11	2.23	2.35	2.45	2.55	2.66	2.5	2.35	2.19	2.04	1.88	1.72	1.56	1.4	1.23	1.07	0.86	0.6
35	0.42	0.07	0.24	0.41	0.59	0.74	0.91	1.06	1.2	1.33	1.48	1.63	1.79	1.94	2.09	2.24	2.37	2.48	2.58	2.68	2.79	2.63	2.49	2.33	2.18	2.01	1.85	1.68	1.52	1.35	1.18	0.98	0.73
34	0.56	0.21	0.38	0.55	0.72	0.87	1.04	1.19	1.33	1.47	1.6	1.77	1.92	2.07	2.23	2.38	2.51	2.63	2.73	2.83	2.94	2.78	2.63	2.47	2.32	2.14	1.98	1.81	1.64	1.47	1.3	1.1	0.86
33	0.69	0.36	0.52	0.69	0.86	1	1.17	1.32	1.46	1.6	1.74	1.91	2.07	2.22	2.39	2.53	2.66	2.78	2.89	3.01	3.1	2.94	2.79	2.63	2.47	2.29	2.12	1.96	1.77	1.6	1.43	1.23	0.99
32	0.83	0.51	0.67	0.83	1	1.14	1.31	1.46	1.61	1.75	1.9	2.07	2.23	2.37	2.57	2.7	2.82	2.97	3.08	3.18	3.28	3.12	2.97	2.81	2.64	2.45	2.29	2.11	1.93	1.74	1.57	1.36	1.13
31	0.98	0.66	0.83	0.98	1.15	1.3	1.45	1.61	1.77	1.92	2.07	2.23	2.41	2.56	2.76	2.9	3.03	3.17	3.28	3.4	3.5	3.33	3.17	3.01	2.84	2.64	2.47	2.29	2.1	1.91	1.73	1.51	1.27
30	1.14	0.81	0.99	1.14	1.31	1.46	1.61	1.78	1.93	2.1	2.25	2.43	2.61	2.78	2.97	3.14	3.28	3.42	3.54	3.67	3.78	3.6	3.42	3.25	3.07	2.86	2.68	2.49	2.29	2.09	1.89	1.67	1.43
29	1.31	0.97	1.16	1.31	1.47	1.64	1.8	1.97	2.14	2.31	2.47	2.67	2.86	3.05	3.26	3.44	3.6	3.72	3.86	3.98	4.11	3.92	3.72	3.54	3.34	3.13	2.93	2.73	2.51	2.3	2.08	1.85	1.61
28	1.5	1.15	1.34	1.5	1.66	1.84	2.02	2.19	2.38	2.57	2.74	2.97	3.17	3.38	3.6	3.8	3.96	4.08	4.23	4.36	4.48	4.28	4.09	3.89	3.67	3.46	3.23	3.02	2.78	2.54	2.32	2.07	1.8
27	1.71	1.35	1.54	1.71	1.88	2.08	2.28	2.48	2.68	2.88	3.09	3.33	3.56	3.77	3.99	4.22	4.37	4.49	4.65	4.79	4.91	4.71	4.51	4.29	4.08	3.88	3.6	3.38	3.12	2.85	2.62	2.32	2.04
26	1.97	1.59	1.78	1.97	2.17	2.38	2.61	2.84	3.07	3.29	3.53	3.78	4.02	4.23	4.46	4.67	4.82	4.96	5	5	5	5	5	4.77	4.55	4.35	4.07	3.82	3.54	3.25	3	2.65	2.33
25	2.3	1.88	2.11	2.32	2.56	2.78	3.04	3.3	3.55	3.8	4.07	4.31	4.56	4.75	4.96	5	5	5						5	5	4.85	4.61	4.35	4.07	3.76	3.48	3.08	2.71
24	2.77	2.26	2.54	2.8	3.07	3.34	3.64	3.91	4.19	4.45	4.68	4.91	5	5	5											5	5	5	4.72	4.4	4.1	3.7	3.25
23	3.46	2.83	3.18	3.46	3.82	4.15	4.44	4.74	5	5	5	5																	5	5	4.9	4.5	4.02
22	4.62	3.82	4.24	4.59	5	5	5	5																							5	5	5
21	5	5	5	5																													
20																																	

South Season Quadrant API
Week vs Runoff Index

Region	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
70																																	
69																																	
68																																	
67																																	
66																																	
65																																	
64																																	
63																					0.04												
62																				0.03	0.08												
61																				0.08	0.13												
60																			0.02	0.13	0.18	0.05											
59																			0.07	0.19	0.23	0.11											
58																			0.13	0.24	0.28	0.17											
57																		0.03	0.19	0.29	0.33	0.22											
56																		0.07	0.25	0.34	0.38	0.28	0.03										
55																		0.12	0.31	0.4	0.43	0.34	0.1										
54																		0.18	0.37	0.46	0.49	0.4	0.16										
53																	0.04	0.24	0.42	0.52	0.55	0.46	0.22										
52																	0.1	0.31	0.48	0.58	0.62	0.53	0.28										
51																	0.17	0.38	0.53	0.64	0.68	0.59	0.35										
50																0.06	0.24	0.45	0.59	0.7	0.77	0.65	0.42	0.07									
49																0.14	0.32	0.52	0.66	0.76	0.83	0.72	0.48	0.11									
48															0.07	0.23	0.4	0.59	0.72	0.83	0.9	0.79	0.55	0.25	0								
47															0.16	0.31	0.48	0.66	0.79	0.9	0.96	0.86	0.62	0.33	0.09								
46														0.08	0.25	0.4	0.56	0.73	0.86	0.97	1.03	0.93	0.69	0.42	0.18								
45													0.04	0.18	0.34	0.48	0.64	0.81	0.95	1.03	1.1	1	0.76	0.51	0.27	0.08							
44												0.02	0.14	0.28	0.43	0.57	0.73	0.88	1	1.09	1.17	1.07	0.84	0.6	0.37	0.16							
43												0.12	0.25	0.38	0.53	0.66	0.81	0.96	1.07	1.16	1.24	1.14	0.92	0.68	0.46	0.24	0.07						
42											0.1	0.22	0.36	0.48	0.63	0.75	0.9	1.04	1.14	1.23	1.31	1.22	1	0.77	0.55	0.33	0.16	0.02					
41										0.08	0.21	0.33	0.46	0.59	0.73	0.84	0.99	1.12	1.22	1.31	1.38	1.29	1.08	0.85	0.65	0.42	0.25	0.12					
40								0.01	0.09	0.2	0.31	0.43	0.57	0.69	0.83	0.93	1.08	1.2	1.3	1.38	1.46	1.37	1.17	0.94	0.74	0.52	0.35	0.21	0.1				
39							0.03	0.11	0.21	0.31	0.42	0.54	0.68	0.8	0.93	1.03	1.16	1.28	1.39	1.46	1.53	1.46	1.26	1.03	0.83	0.61	0.45	0.32	0.2	0.04			
38						0.03	0.14	0.22	0.32	0.42	0.52	0.65	0.79	0.91	1.03	1.13	1.26	1.37	1.47	1.55	1.62	1.55	1.35	1.12	0.92	0.71	0.55	0.42	0.3	0.14	0.03		
37						0.13	0.25	0.34	0.43	0.53	0.63	0.76	0.9	1.02	1.13	1.24	1.36	1.47	1.57	1.65	1.72	1.64	1.45	1.22	1.01	0.8	0.65	0.52	0.4	0.25	0.13		
36						0.23	0.36	0.45	0.54	0.64	0.74	0.88	1.01	1.13	1.24	1.35	1.46	1.57	1.67	1.75	1.82	1.76	1.55	1.32	1.11	0.91	0.75	0.62	0.51	0.36	0.23	0.02	
35					0.11	0.34	0.47	0.56	0.67	0.76	0.86	0.99	1.12	1.24	1.36	1.46	1.57	1.67	1.77	1.86	1.94	1.85	1.66	1.43	1.21	1.02	0.85	0.73	0.61	0.47	0.34	0.12	
34				0.04	0.22	0.45	0.58	0.67	0.78	0.88	0.98	1.11	1.23	1.35	1.47	1.57	1.68	1.79	1.89	1.99	2.08	1.98	1.77	1.54	1.32	1.13	0.96	0.84	0.71	0.58	0.45	0.23	0.05
33	0.03	0.03	0.03	0.14	0.33	0.56	0.69	0.79	0.9	1	1.1	1.23	1.36	1.47	1.59	1.7	1.8	1.92	2.02	2.12	2.23	2.11	1.89	1.67	1.43	1.24	1.06	0.94	0.82	0.69	0.56	0.34	0.16
32	0.14	0.14	0.14	0.25	0.45	0.67	0.81	0.91	1.02	1.13	1.22	1.36	1.48	1.6	1.72	1.83	1.93	2.06	2.17	2.28	2.38	2.27	2.03	1.8	1.56	1.35	1.17	1.05	0.94	0.8	0.67	0.45	0.27
31	0.25	0.25	0.25	0.36	0.57	0.78	0.93	1.04	1.15	1.26	1.36	1.48	1.62	1.74	1.87	1.98	2.1	2.22	2.34	2.45	2.56	2.44	2.19	1.95	1.72	1.48	1.3	1.17	1.05	0.92	0.78	0.57	0.39
30	0.37	0.37	0.37	0.48	0.7	0.9	1.05	1.17	1.27	1.38	1.5	1.62	1.77	1.9	2.03	2.17	2.28	2.41	2.53	2.66	2.76	2.64	2.37	2.12	1.88	1.62	1.44	1.3	1.18	1.04	0.9	0.7	0.51
29	0.48	0.48	0.48	0.6	0.83	1.03	1.18	1.3	1.41	1.53	1.67	1.81	1.96	2.1	2.24	2.38	2.51	2.65	2.77	2.89	3	2.87	2.61	2.32	2.07	1.76	1.62	1.46	1.31	1.19	1.03	0.84	0.63
28	0.58	0.58	0.58	0.75	0.97	1.16	1.32	1.44	1.57	1.71	1.87	2.04	2.19	2.34	2.5	2.64	2.8	2.95	3.08	3.22	3.36	3.18	2.9	2.6	2.31	2.02	1.83	1.64	1.48	1.34	1.16	0.98	0.78
27	0.74	0.74	0.74	0.91	1.14	1.32	1.48	1.62	1.78	1.94	2.13	2.34	2.52	2.68	2.85	2.97	3.2	3.37	3.55	3.7	3.9	3.65	3.31	2.93	2.61	2.2	2.09	1.81	1.7	1.52	1.32	1.14	0.95
26	0.92	0.92	0.92	1.11	1.34	1.55	1.72	1.89	2.09	2.31	2.49	2.74	2.95	3.14	3.33	3.5	3.79	3.98	4.2	4.45	4.74	4.34	3.92	3.45	3.02	2.52	2.43	2.18	1.98	1.77	1.55	1.36	1.15
25	1.15	1.15	1.15	1.38	1.63	1.91	2.09	2.31	2.56	2.8	3	3.3	3.55	3.77	4.04	4.3	4.65	4.92	5	5	5	5	4.8	4.2	3.65	2.96	2.89	2.6	2.38	2.14	1.91	1.65	1.42
24	1.52	1.52	1.52	1.8	2.09	2.45	2.66	2.91	3.23	3.49	3.71	4.11	4.42	4.75	5	5	5	5					5	5	4.65	3.65	3.65	3.25	2.97	2.66	2.45	2.15	1.83
23	2.2	2.2	2.2	2.46	2.81	3.25	3.52	3.87	4.2	4.55	4.93	5	5	5											5	4.78	4.9	4.4	3.91	3.6	3.25	2.85	2.5
22	3.2	3.2	3.2	3.57	4	4.55	4.82	5	5	5	5															5	5	5	5	5	4.55	3.95	3.6
21	4.65	4.65	4.65	4.96	5	5	5																								5	5	5
20	5	5	5	5																													

East Season Quadrant API
Week vs Runoff Index

Region	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
70																	0.01	0.01	0.01	0.01	0.01												
69																	0.05	0.05	0.05	0.05	0.05												
68																	0.08	0.08	0.08	0.08	0.08												
67																	0.12	0.12	0.12	0.12	0.12	0.04											
66																0.04	0.16	0.16	0.16	0.16	0.16	0.08											
65																0.09	0.2	0.2	0.2	0.2	0.2	0.12											
64																0.13	0.23	0.23	0.23	0.23	0.23	0.16	0.04										
63															0.04	0.17	0.27	0.27	0.27	0.27	0.27	0.2	0.08										
62															0.08	0.21	0.31	0.31	0.31	0.31	0.31	0.24	0.11										
61															0.13	0.26	0.35	0.35	0.35	0.35	0.35	0.27	0.15										
60															0.17	0.3	0.39	0.39	0.39	0.39	0.39	0.31	0.19	0.05									
59														0.03	0.22	0.34	0.43	0.43	0.43	0.43	0.43	0.35	0.23	0.09									
58														0.08	0.26	0.38	0.47	0.47	0.47	0.47	0.47	0.39	0.27	0.14									
57														0.14	0.31	0.42	0.51	0.51	0.51	0.51	0.51	0.43	0.31	0.18	0.05								
56													0.03	0.19	0.35	0.46	0.54	0.54	0.54	0.54	0.54	0.46	0.35	0.22	0.1								
55													0.09	0.24	0.39	0.5	0.58	0.58	0.58	0.58	0.58	0.51	0.39	0.26	0.14	0.03							
54													0.15	0.3	0.43	0.54	0.61	0.61	0.61	0.61	0.61	0.55	0.42	0.3	0.18	0.07							
53												0.03	0.21	0.35	0.48	0.58	0.65	0.65	0.65	0.65	0.65	0.58	0.46	0.34	0.23	0.12							
52												0.08	0.26	0.4	0.52	0.62	0.68	0.68	0.68	0.68	0.68	0.62	0.5	0.38	0.27	0.16	0.04						
51											0.03	0.14	0.32	0.45	0.57	0.66	0.72	0.72	0.72	0.72	0.72	0.65	0.53	0.42	0.31	0.2	0.08						
50											0.07	0.19	0.37	0.51	0.61	0.7	0.76	0.76	0.76	0.76	0.76	0.69	0.57	0.46	0.35	0.24	0.12						
49										0.03	0.12	0.25	0.43	0.56	0.66	0.74	0.8	0.8	0.8	0.8	0.8	0.73	0.61	0.5	0.4	0.28	0.17	0.03					
48										0.08	0.17	0.31	0.49	0.61	0.71	0.78	0.84	0.84	0.84	0.84	0.84	0.77	0.64	0.54	0.45	0.33	0.21	0.08					
47										0.13	0.22	0.38	0.55	0.66	0.76	0.82	0.88	0.88	0.88	0.88	0.88	0.81	0.68	0.59	0.5	0.37	0.26	0.14	0.03				
46									0.03	0.18	0.28	0.44	0.6	0.72	0.8	0.87	0.93	0.93	0.93	0.93	0.93	0.86	0.73	0.63	0.54	0.42	0.31	0.19	0.08				
45									0.09	0.23	0.33	0.5	0.66	0.77	0.85	0.92	0.98	0.98	0.98	0.98	0.98	0.91	0.78	0.68	0.59	0.47	0.36	0.24	0.13				
44									0.16	0.29	0.39	0.56	0.72	0.83	0.91	0.98	1.03	1.03	1.03	1.03	1.03	0.96	0.83	0.73	0.64	0.53	0.41	0.3	0.18	0.05			
43								0.05	0.22	0.35	0.45	0.62	0.78	0.88	0.96	1.04	1.09	1.09	1.09	1.09	1.09	1.02	0.89	0.78	0.69	0.58	0.46	0.35	0.23	0.11			
42								0.13	0.3	0.42	0.51	0.68	0.83	0.93	1.02	1.11	1.16	1.16	1.16	1.16	1.16	1.08	0.95	0.84	0.75	0.63	0.52	0.41	0.29	0.17	0.03		
41							0.03	0.21	0.37	0.49	0.57	0.75	0.9	1	1.08	1.17	1.23	1.23	1.23	1.23	1.23	1.16	1.02	0.9	0.81	0.68	0.58	0.46	0.35	0.23	0.09		
40							0.13	0.3	0.45	0.56	0.63	0.82	0.97	1.07	1.15	1.26	1.31	1.31	1.31	1.31	1.31	1.23	1.1	0.97	0.87	0.74	0.64	0.52	0.41	0.29	0.15		
39						0.09	0.23	0.39	0.53	0.64	0.72	0.9	1.04	1.15	1.24	1.34	1.41	1.41	1.41	1.41	1.41	1.32	1.19	1.05	0.93	0.8	0.7	0.59	0.47	0.35	0.22		
38						0.19	0.34	0.49	0.63	0.73	0.82	0.99	1.13	1.24	1.33	1.45	1.52	1.52	1.52	1.52	1.52	1.43	1.28	1.14	1	0.87	0.77	0.65	0.54	0.41	0.28		
37						0.3	0.45	0.6	0.73	0.84	0.93	1.11	1.23	1.36	1.46	1.57	1.64	1.64	1.64	1.64	1.64	1.55	1.4	1.24	1.09	0.95	0.85	0.71	0.6	0.48	0.35	0.01	
36					0.05	0.42	0.57	0.71	0.84	0.96	1.07	1.23	1.36	1.49	1.61	1.72	1.81	1.81	1.81	1.81	1.81	1.69	1.52	1.36	1.2	1.05	0.93	0.8	0.68	0.54	0.42	0.09	
35					0.19	0.55	0.7	0.83	0.97	1.1	1.22	1.37	1.51	1.67	1.78	1.88	1.99	1.99	1.99	1.99	1.99	1.87	1.67	1.5	1.32	1.16	1.02	0.89	0.76	0.62	0.49	0.17	
34					0.35	0.69	0.84	0.97	1.13	1.27	1.39	1.54	1.68	1.87	1.99	2.1	2.2	2.2	2.2	2.2	2.2	2.07	1.86	1.66	1.46	1.28	1.14	0.99	0.85	0.71	0.57	0.27	
33				0.15	0.53	0.85	1	1.15	1.3	1.41	1.6	1.77	1.92	2.09	2.22	2.34	2.45	2.45	2.45	2.45	2.45	2.33	2.1	1.86	1.63	1.43	1.27	1.1	0.97	0.82	0.67	0.38	
32			0.11	0.35	0.72	1.03	1.2	1.36	1.51	1.69	1.85	2.02	2.18	2.37	2.52	2.63	2.73	2.73	2.73	2.73	2.73	2.6	2.29	2.1	1.84	1.62	1.45	1.25	1.1	0.94	0.79	0.51	
31	0.12	0.12	0.3	0.58	0.95	1.23	1.42	1.6	1.78	1.97	2.15	2.35	2.52	2.7	2.83	2.97	3.05	3.05	3.05	3.05	3.05	2.9	2.72	2.42	2.1	1.84	1.65	1.44	1.27	1.09	0.93	0.66	0.12
30	0.32	0.32	0.54	0.87	1.2	1.5	1.72	1.92	2.14	2.37	2.54	2.72	2.9	3.08	3.22	3.34	3.42	3.42	3.42	3.42	3.42	3.28	3.1	2.7	2.45	2.13	1.9	1.67	1.47	1.27	1.11	0.84	0.32
29	0.58	0.58	0.84	1.22	1.55	1.88	2.1	2.32	2.57	2.78	2.98	3.15	3.35	3.52	3.65	3.78	3.85	3.85	3.85	3.85	3.85	3.7	3.55	3.22	2.87	2.51	2.22	1.95	1.72	1.5	1.32	0.95	0.58
28	0.93	0.93	1.23	1.64	1.98	2.36	2.56	2.8	3.05	3.25	3.48	3.65	3.84	4	4.13	4.24	4.32	4.32	4.32	4.32	4.32	4.2	4.05	3.69	3.35	2.96	2.61	2.31	2.04	1.81	1.62	1.27	0.93
27	1.41	1.41	1.76	2.15	2.5	2.89	3.12	3.34	3.57	3.77	4	4.18	4.37	4.52	4.63	4.73	4.84	4.84	4.84	4.84	4.84	4.7	4.58	4.22	3.85	3.47	3.07	2.75	2.45	2.2	1.99	1.7	1.41
26	2.09	2.09	2.37	2.78	3.1	3.48	3.7	3.92	4.13	4.34	4.54	4.72	4.9	5	5	5	5	5	5	5	5	5	5	4.79	4.33	4.03	3.65	3.26	2.95	2.7	2.49	2.29	2.09
25	2.87	2.87	3.12	3.46	3.75	4.12	4.3	4.54	4.75	4.92	5	5	5											5	5	4.64	4.34	3.91	3.57	3.23	3.13	3	2.87
24	3.68	3.68	3.9	4.22	4.49	4.77	4.93	5	5	5																5	5	4.64	4.26	4.06	3.84	3.81	3.68
23	4.53	4.53	4.76	5	5	5	5																					5	5	5	4.6	4.56	4.53
22	5	5	5																												5	5	5
21																																	
20																																	

Northeast Season Quadrant API
Week vs. Runoff Index

Region	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
70																																	
69																																	
68																																	
67																																	
66																																	
65																																	
64																																	
63																																	
62																																	
61																																	
60																					0.01												
59																					0.02												
58																			0.01	0.03	0.04	0.02											
57																		0.01	0.03	0.05	0.06	0.04	0.01										
56																	0.01	0.02	0.05	0.07	0.08	0.06	0.03										
55																0.01	0.02	0.04	0.07	0.09	0.1	0.09	0.05										
54																0.03	0.04	0.06	0.09	0.11	0.12	0.11	0.07	0.01									
53															0.02	0.05	0.07	0.09	0.12	0.14	0.15	0.13	0.1	0.03									
52															0.04	0.07	0.09	0.12	0.15	0.17	0.18	0.16	0.13	0.05									
51														0.03	0.07	0.1	0.12	0.15	0.18	0.2	0.21	0.19	0.16	0.08	0.02								
50													0.02	0.06	0.1	0.13	0.15	0.18	0.22	0.24	0.25	0.23	0.19	0.11	0.04								
49												0.01	0.05	0.09	0.13	0.16	0.19	0.22	0.26	0.28	0.29	0.27	0.23	0.14	0.06								
48												0.04	0.08	0.12	0.16	0.2	0.23	0.27	0.31	0.32	0.33	0.32	0.27	0.18	0.09								
47											0.03	0.07	0.12	0.16	0.2	0.24	0.27	0.32	0.36	0.37	0.38	0.37	0.32	0.22	0.13	0.03							
46										0.02	0.06	0.11	0.15	0.2	0.24	0.28	0.32	0.37	0.41	0.43	0.44	0.43	0.37	0.26	0.17	0.06							
45										0.05	0.1	0.15	0.19	0.25	0.29	0.33	0.37	0.43	0.47	0.49	0.51	0.49	0.42	0.31	0.2	0.1	0.02						
44									0.02	0.08	0.14	0.19	0.23	0.3	0.34	0.39	0.43	0.5	0.54	0.56	0.58	0.56	0.49	0.36	0.24	0.13	0.05						
43									0.05	0.12	0.18	0.23	0.28	0.35	0.4	0.45	0.5	0.57	0.61	0.64	0.66	0.63	0.56	0.42	0.29	0.17	0.08						
42								0.02	0.09	0.16	0.22	0.28	0.33	0.4	0.46	0.51	0.57	0.64	0.69	0.72	0.74	0.71	0.64	0.48	0.34	0.22	0.12	0.02					
41								0.05	0.13	0.2	0.26	0.33	0.39	0.46	0.52	0.58	0.65	0.72	0.78	0.81	0.83	0.8	0.72	0.55	0.4	0.27	0.16	0.06					
40							0.01	0.09	0.17	0.25	0.31	0.39	0.45	0.52	0.59	0.67	0.74	0.81	0.87	0.9	0.92	0.89	0.81	0.63	0.46	0.32	0.2	0.1	0.02				
39							0.05	0.13	0.22	0.3	0.37	0.45	0.52	0.59	0.66	0.76	0.83	0.9	0.96	1	1.02	0.99	0.9	0.7	0.53	0.38	0.25	0.14	0.06				
38						0.01	0.09	0.18	0.27	0.36	0.44	0.52	0.59	0.67	0.75	0.85	0.93	1	1.06	1.1	1.12	1.09	0.99	0.79	0.6	0.44	0.3	0.19	0.1	0.01			
37						0.06	0.15	0.23	0.33	0.42	0.51	0.59	0.67	0.76	0.85	0.96	1.04	1.11	1.17	1.21	1.24	1.19	1.1	0.89	0.68	0.51	0.35	0.24	0.15	0.05			
36					0.01	0.11	0.2	0.28	0.39	0.49	0.58	0.67	0.76	0.86	0.95	1.07	1.16	1.23	1.3	1.34	1.36	1.3	1.21	1	0.77	0.58	0.41	0.3	0.2	0.1	0.01		
35					0.06	0.16	0.25	0.34	0.46	0.56	0.67	0.76	0.86	0.96	1.07	1.19	1.28	1.36	1.43	1.47	1.49	1.42	1.34	1.12	0.87	0.66	0.48	0.36	0.25	0.15	0.05	0.01	
34			0.01	0.03	0.11	0.21	0.31	0.41	0.53	0.64	0.76	0.86	0.97	1.08	1.2	1.31	1.42	1.5	1.57	1.6	1.63	1.57	1.48	1.26	0.98	0.75	0.55	0.42	0.31	0.2	0.09	0.05	0.02
33	0.01	0.01	0.04	0.08	0.17	0.27	0.37	0.48	0.61	0.73	0.86	0.97	1.09	1.21	1.34	1.46	1.57	1.66	1.73	1.77	1.8	1.74	1.63	1.4	1.1	0.85	0.64	0.49	0.37	0.26	0.14	0.09	0.05
32	0.04	0.04	0.08	0.13	0.23	0.34	0.45	0.56	0.71	0.84	0.97	1.1	1.23	1.36	1.5	1.65	1.74	1.83	1.92	1.97	2	1.92	1.8	1.56	1.24	0.96	0.74	0.57	0.44	0.33	0.19	0.13	0.08
31	0.07	0.07	0.12	0.19	0.3	0.41	0.52	0.65	0.81	0.95	1.1	1.23	1.4	1.54	1.69	1.85	1.93	2.03	2.13	2.18	2.21	2.12	1.99	1.75	1.41	1.09	0.85	0.66	0.51	0.4	0.25	0.18	0.11
30	0.11	0.11	0.17	0.25	0.37	0.49	0.61	0.76	0.92	1.08	1.24	1.41	1.59	1.75	1.91	2.06	2.15	2.25	2.36	2.41	2.44	2.34	2.21	1.96	1.6	1.24	0.96	0.76	0.6	0.48	0.32	0.24	0.15
29	0.16	0.16	0.23	0.32	0.45	0.58	0.72	0.87	1.06	1.25	1.42	1.63	1.83	2	2.16	2.3	2.38	2.48	2.58	2.63	2.67	2.56	2.44	2.19	1.84	1.42	1.11	0.87	0.7	0.56	0.4	0.3	0.21
28	0.22	0.22	0.29	0.39	0.54	0.67	0.83	1	1.24	1.49	1.67	1.91	2.12	2.3	2.44	2.56	2.62	2.72	2.82	2.87	2.91	2.86	2.69	2.46	2.12	1.65	1.35	1.02	0.81	0.65	0.49	0.37	0.27
27	0.28	0.28	0.37	0.48	0.63	0.78	0.94	1.2	1.49	1.78	2.01	2.26	2.46	2.62	2.74	2.85	2.89	3	3.1	3.14	3.17	3.08	2.97	2.76	2.44	1.97	1.63	1.24	0.95	0.77	0.6	0.45	0.33
26	0.36	0.36	0.45	0.58	0.75	0.92	1.16	1.48	1.89	2.24	2.44	2.65	2.82	2.96	3.06	3.14	3.19	3.3	3.38	3.42	3.44	3.36	3.26	3.07	2.82	2.37	1.98	1.58	1.16	0.91	0.72	0.55	0.42
25	0.47	0.47	0.56	0.71	0.91	1.15	1.5	2.03	2.46	2.73	2.89	3.06	3.2	3.31	3.74	3.46	3.51	3.61	3.66	3.7	3.72	3.66	3.56	3.39	3.21	2.8	2.48	2.03	1.58	1.14	0.9	0.67	0.54
24	0.63	0.63	0.72	0.88	1.2	1.72	2.25	2.64	2.97	3.22	3.35	3.48	3.6	3.67	4.09	3.8	3.85	3.92	3.96	3.99	4.01	3.98	3.88	3.74	3.58	3.28	3.01	2.65	2.12	1.6	1.18	0.89	0.72
23	0.86	0.86	0.98	1.24	1.8	2.67	3.1	3.27	3.5	3.71	3.81	3.91	4.01	4.05	4.48	4.15	4.2	4.05	4.3	4.32	4.34	4.3	4.22	4.11	4.01	3.77	3.56	3.32	2.88	2.28	1.78	1.26	1.01
22	1.28	1.28	1.66	2.3	3.1	3.58	3.8	3.9	4.05	4.2	4.28	4.35	4.42	4.45	4.88	4.52	4.56	4.6	4.64	4.66	4.67	4.64	4.58	4.5	4.45	4.3	4.14	4.02	3.76	3.3	2.77	2.1	1.6
21	2.75	2.75	3.45	3.88	4.25	4.42	4.49	4.56	4.63	4.7	4.77	4.8	4.83	4.86	5	4.91	4.94	5	5	5	5	5	4.96	4.92	4.88	4.84	4.8	4.75	4.75	4.5	4.3	3.95	3.25
20	5	5	5	5	5	5	5	5	5	5	5	5	5	5		5	5						5	5	5	5	5	5	5	5	5	5	5

CDQ000020080052-API Rain Runoff Relationship for Tennessee River Watershed- Attachment 2

Southeast Season Quadrant API
Week vs Runoff Index

Region	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
Week	1	2	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	41	42	43	44	45	46	47	48	49	50	51	52
RI																																	
50																																	
49																					0.05												
48																					0.14												
47																				0.09	0.23	0.03											
46																			0.04	0.19	0.33	0.14											
45																			0.15	0.29	0.43	0.24											
44																		0.11	0.26	0.4	0.53	0.34	0.08										
43																	0.06	0.22	0.37	0.51	0.63	0.44	0.2										
42																	0.18	0.34	0.48	0.62	0.73	0.54	0.31	0.04									
41																0.13	0.31	0.46	0.6	0.72	0.84	0.66	0.43	0.17									
40															0.13	0.26	0.43	0.58	0.72	0.83	0.96	0.77	0.55	0.29									
39														0.13	0.27	0.39	0.57	0.72	0.84	0.95	1.07	0.88	0.67	0.41	0.09								
38													0.13	0.28	0.42	0.53	0.71	0.85	0.97	1.08	1.2	1.01	0.81	0.55	0.24								
37												0.14	0.3	0.43	0.57	0.68	0.85	1	1.12	1.22	1.33	1.14	0.94	0.69	0.39								
36										0.06	0.16	0.27	0.47	0.59	0.73	0.84	1.01	1.15	1.27	1.37	1.48	1.28	1.09	0.84	0.54	0.15							
35								0.04	0.13	0.24	0.33	0.5	0.64	0.77	0.91	1.02	1.18	1.32	1.42	1.54	1.64	1.45	1.25	0.99	0.72	0.33	0.17						
34							0.13	0.23	0.33	0.43	0.52	0.69	0.84	0.97	1.1	1.22	1.37	1.51	1.61	1.72	1.82	1.62	1.42	1.18	0.89	0.52	0.35	0.18					
33						0.22	0.34	0.44	0.54	0.64	0.74	0.91	1.07	1.19	1.32	1.46	1.58	1.71	1.81	1.92	2.02	1.83	1.62	1.38	1.1	0.74	0.56	0.38	0.18				
32					0.21	0.44	0.56	0.67	0.77	0.88	0.98	1.16	1.3	1.43	1.57	1.71	1.82	1.93	2.04	2.16	2.28	2.07	1.84	1.62	1.33	0.98	0.78	0.59	0.39	0.2			
31				0.17	0.46	0.7	0.81	0.92	1.03	1.14	1.27	1.42	1.58	1.71	1.85	1.99	2.09	2.21	2.33	2.45	2.59	2.36	2.1	1.88	1.58	1.27	1.04	0.83	0.62	0.43	0.19		
30			0.12	0.43	0.72	0.98	1.09	1.22	1.32	1.45	1.57	1.74	1.88	2.02	2.17	2.28	2.42	2.55	2.69	2.82	2.97	2.71	2.43	2.18	1.88	1.57	1.34	1.1	0.87	0.68	0.43	0.17	
29	0.12	0.12	0.4	0.72	1.02	1.28	1.42	1.55	1.67	1.8	1.92	2.09	2.24	2.37	2.54	2.68	2.77	2.96	3.11	3.25	3.45	3.12	2.82	2.53	2.25	1.91	1.67	1.43	1.18	0.94	0.71	0.42	0.12
28	0.38	0.38	0.69	1.03	1.35	1.64	1.77	1.91	2.03	2.17	2.32	2.51	2.67	2.82	2.98	3.14	3.31	3.46	3.62	3.81	4	3.65	3.29	2.95	2.66	2.32	2.05	1.78	1.52	1.25	1.02	0.7	0.38
27	0.68	0.68	1.02	1.38	1.73	2.03	2.18	2.32	2.47	2.63	2.79	2.97	3.15	3.34	3.53	3.7	3.89	4.07	4.23	4.42	4.62	4.23	3.85	3.47	3.12	2.78	2.49	2.2	1.92	1.67	1.38	1.02	0.68
26	1.04	1.04	1.38	1.78	2.15	2.48	2.65	2.82	2.97	3.15	3.3	3.52	3.73	3.93	4.15	4.35	4.56	4.75	4.92	5	5	4.9	4.5	4.08	3.68	3.3	3	2.67	2.35	2.04	1.78	1.38	1.04
25	1.5	1.5	1.87	2.28	2.65	3	3.2	3.39	3.57	3.77	3.93	4.17	4.4	4.64	4.85	5	5	5	5			5	5	4.79	4.35	3.92	3.61	3.26	2.9	2.56	2.28	1.86	1.5
24	2.07	2.07	2.47	2.86	3.24	3.64	3.85	4.06	4.27	4.51	4.67	4.9	5	5	5									5	5	4.65	4.3	3.93	3.56	3.21	2.85	2.47	2.07
23	2.75	2.75	3.24	3.62	3.98	4.37	4.6	4.82	5	5	5	5														5	5	4.73	4.3	3.94	3.52	3.2	2.75
22	3.6	3.6	4.13	4.5	4.83	5	5	5																				5	5	4.78	4.36	4.03	3.6
21	4.6	4.6	5	5	5																									5	5	4.95	4.6
20	5	5																														5	5

TV Runoff Index vs. Runoff

TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.02	0.07	0.13	0.18	0.23	0.28	0.33	0.36	0.39	0.42	0.45	0.48	0.51	0.54	0.57	0.61	0.64	0.68	0.71	0.75	0.79	0.82	0.86	0.89	0.93	0.97	1.01
0.05	0.09	0.16	0.21	0.26	0.33	0.40	0.47	0.51	0.56	0.60	0.65	0.70	0.75	0.80	0.85	0.91	0.98	1.04	1.11	1.17	1.21	1.25	1.30	1.34	1.38	1.43	1.48
0.10	0.16	0.22	0.29	0.34	0.43	0.51	0.59	0.65	0.70	0.76	0.83	0.90	0.97	1.04	1.11	1.17	1.24	1.30	1.37	1.43	1.49	1.55	1.62	1.68	1.74	1.80	1.86
0.15	0.23	0.30	0.37	0.42	0.52	0.61	0.70	0.77	0.84	0.91	0.98	1.07	1.14	1.22	1.30	1.37	1.44	1.51	1.58	1.65	1.72	1.79	1.87	1.94	2.01	2.07	2.13
0.20	0.30	0.37	0.44	0.50	0.61	0.71	0.81	0.89	0.97	1.05	1.13	1.21	1.30	1.38	1.46	1.53	1.60	1.68	1.75	1.82	1.90	1.98	2.08	2.14	2.22	2.28	2.35
0.25	0.37	0.44	0.52	0.58	0.70	0.81	0.92	1.01	1.09	1.18	1.26	1.35	1.43	1.52	1.60	1.68	1.75	1.83	1.90	1.99	2.06	2.15	2.23	2.32	2.40	2.47	2.54
0.30	0.44	0.52	0.59	0.66	0.78	0.90	1.02	1.11	1.20	1.30	1.39	1.47	1.56	1.64	1.73	1.81	1.89	1.97	2.04	2.12	2.21	2.30	2.39	2.48	2.57	2.64	2.72
0.35	0.51	0.59	0.66	0.73	0.86	0.98	1.11	1.20	1.30	1.40	1.49	1.58	1.67	1.76	1.85	1.93	2.01	2.10	2.18	2.26	2.35	2.44	2.54	2.63	2.72	2.80	2.88
0.40	0.57	0.66	0.74	0.81	0.94	1.06	1.19	1.29	1.40	1.50	1.59	1.68	1.78	1.87	1.96	2.05	2.13	2.22	2.30	2.39	2.49	2.58	2.68	2.77	2.87	2.95	3.03
0.45	0.64	0.73	0.81	0.88	1.02	1.14	1.27	1.38	1.49	1.60	1.69	1.78	1.88	1.97	2.06	2.15	2.24	2.33	2.42	2.51	2.61	2.71	2.81	2.91	3.01	3.09	3.18
0.50	0.71	0.80	0.88	0.96	1.10	1.22	1.35	1.46	1.58	1.69	1.78	1.88	1.97	2.07	2.16	2.25	2.35	2.44	2.53	2.63	2.73	2.83	2.94	3.04	3.14	3.23	3.32
0.55	0.77	0.87	0.95	1.03	1.17	1.30	1.43	1.55	1.66	1.76	1.87	1.97	2.07	2.18	2.28	2.36	2.45	2.55	2.64	2.74	2.85	2.95	3.06	3.16	3.27	3.36	3.45
0.60	0.84	0.93	1.02	1.10	1.24	1.38	1.51	1.63	1.74	1.86	1.96	2.06	2.16	2.26	2.36	2.46	2.55	2.65	2.75	2.85	2.96	3.07	3.17	3.28	3.39	3.48	3.57
0.65	0.90	1.00	1.09	1.17	1.31	1.45	1.58	1.70	1.82	1.94	2.04	2.14	2.25	2.35	2.45	2.55	2.65	2.75	2.86	2.96	3.07	3.18	3.29	3.40	3.51	3.60	3.70
0.70	0.97	1.06	1.15	1.24	1.38	1.52	1.66	1.78	1.89	2.01	2.12	2.22	2.33	2.43	2.54	2.64	2.75	2.85	2.96	3.06	3.17	3.29	3.40	3.51	3.63	3.72	3.82
0.75	1.03	1.13	1.22	1.31	1.45	1.59	1.73	1.85	1.96	2.08	2.19	2.30	2.41	2.52	2.63	2.73	2.84	2.94	3.05	3.15	3.27	3.39	3.50	3.62	3.74	3.83	3.93
0.80	1.10	1.19	1.29	1.38	1.52	1.66	1.80	1.92	2.03	2.15	2.26	2.38	2.49	2.60	2.71	2.82	2.93	3.03	3.14	3.24	3.36	3.48	3.60	3.73	3.85	3.94	4.04
0.85	1.16	1.26	1.35	1.45	1.59	1.73	1.87	1.99	2.10	2.22	2.33	2.45	2.56	2.68	2.79	2.90	3.01	3.11	3.22	3.33	3.45	3.58	3.70	3.83	3.95	4.04	4.15
0.90	1.22	1.32	1.42	1.52	1.66	1.80	1.94	2.06	2.17	2.29	2.41	2.52	2.64	2.75	2.87	2.98	3.09	3.20	3.31	3.42	3.55	3.67	3.80	3.92	4.05	4.15	4.25
0.95	1.29	1.38	1.48	1.59	1.72	1.87	2.01	2.13	2.24	2.36	2.48	2.60	2.71	2.83	2.95	3.06	3.17	3.29	3.40	3.51	3.64	3.77	3.89	4.02	4.15	4.25	4.36
1.00	1.35	1.45	1.55	1.65	1.79	1.94	2.08	2.20	2.31	2.43	2.55	2.67	2.79	2.91	3.02	3.14	3.25	3.37	3.48	3.60	3.73	3.86	3.98	4.11	4.24	4.35	4.46
1.05	1.41	1.51	1.61	1.72	1.85	2.00	2.15	2.27	2.38	2.50	2.62	2.74	2.86	2.98	3.10	3.22	3.33	3.45	3.56	3.68	3.81	3.95	4.07	4.20	4.33	4.44	4.56
1.10	1.47	1.57	1.67	1.78	1.92	2.07	2.22	2.34	2.45	2.57	2.69	2.81	2.93	3.05	3.17	3.29	3.41	3.53	3.65	3.77	3.90	4.03	4.16	4.29	4.42	4.54	4.65
1.15	1.53	1.63	1.74	1.85	1.98	2.13	2.28	2.40	2.51	2.63	2.75	2.88	3.00	3.13	3.25	3.37	3.49	3.61	3.73	3.85	3.98	4.12	4.24	4.38	4.51	4.63	4.75
1.20	1.59	1.69	1.80	1.91	2.04	2.19	2.34	2.46	2.58	2.70	2.83	2.95	3.07	3.20	3.32	3.44	3.56	3.69	3.81	3.93	4.07	4.20	4.33	4.47	4.60	4.73	4.84
1.25	1.65	1.75	1.86	1.97	2.10	2.25	2.40	2.52	2.65	2.77	2.90	3.02	3.14	3.27	3.39	3.51	3.64	3.76	3.89	4.01	4.15	4.29	4.42	4.56	4.70	4.82	4.94
1.30	1.71	1.81	1.92	2.03	2.17	2.32	2.46	2.59	2.71	2.84	2.97	3.09	3.22	3.34	3.47	3.59	3.72	3.84	3.97	4.09	4.23	4.37	4.51	4.65	4.79	4.91	5.03
1.35	1.76	1.87	1.98	2.10	2.23	2.38	2.52	2.65	2.78	2.91	3.04	3.16	3.29	3.41	3.54	3.67	3.79	3.92	4.04	4.17	4.31	4.45	4.59	4.73	4.88	5.00	5.12
1.40	1.82	1.93	2.04	2.16	2.29	2.44	2.58	2.71	2.85	2.98	3.11	3.23	3.36	3.48	3.61	3.74	3.87	3.99	4.12	4.25	4.40	4.54	4.68	4.82	4.97	5.09	5.22
1.45	1.88	1.99	2.10	2.22	2.35	2.50	2.64	2.78	2.91	3.05	3.18	3.30	3.43	3.55	3.68	3.81	3.94	4.07	4.20	4.33	4.48	4.62	4.76	4.90	5.06	5.18	5.31
1.50	1.93	2.05	2.16	2.28	2.41	2.56	2.71	2.85	2.98	3.12	3.25	3.37	3.50	3.62	3.75	3.88	4.01	4.15	4.28	4.41	4.56	4.70	4.85	4.99	5.14	5.27	5.40
1.55	1.99	2.10	2.22	2.34	2.47	2.62	2.77	2.91	3.04	3.18	3.31	3.44	3.58	3.69	3.82	3.95	4.08	4.22	4.35	4.48	4.63	4.78	4.93	5.07	5.23	5.35	5.49
1.60	2.04	2.16	2.28	2.40	2.52	2.68	2.83	2.97	3.10	3.24	3.37	3.50	3.63	3.76	3.89	4.02	4.16	4.29	4.43	4.56	4.71	4.85	5.01	5.15	5.31	5.44	5.57
1.65	2.09	2.21	2.34	2.46	2.58	2.74	2.89	3.03	3.17	3.31	3.44	3.57	3.70	3.83	3.96	4.09	4.23	4.36	4.50	4.63	4.78	4.93	5.08	5.23	5.39	5.52	5.66
1.70	2.15	2.27	2.39	2.52	2.64	2.80	2.95	3.09	3.23	3.37	3.50	3.63	3.77	3.90	4.03	4.16	4.30	4.43	4.57	4.70	4.86	5.00	5.16	5.31	5.47	5.61	5.74
1.75	2.20	2.32	2.45	2.57	2.70	2.86	3.01	3.15	3.29	3.43	3.56	3.70	3.83	3.97	4.10	4.23	4.37	4.50	4.64	4.77	4.93	5.08	5.24	5.39	5.55	5.69	5.83
1.80	2.25	2.38	2.51	2.63	2.76	2.91	3.07	3.21	3.35	3.50	3.63	3.77	3.90	4.04	4.17	4.30	4.44	4.57	4.71	4.84	5.00	5.16	5.32	5.47	5.63	5.77	5.91
1.85	2.30	2.43	2.56	2.69	2.82	2.97	3.12	3.27	3.41	3.56	3.69	3.83	3.96	4.10	4.23	4.37	4.51	4.64	4.78	4.92	5.08	5.23	5.40	5.55	5.71	5.85	5.99
1.90	2.36	2.49	2.62	2.75	2.87	3.02	3.18	3.33	3.47	3.62	3.76	3.89	4.03	4.16	4.30	4.43	4.57	4.72	4.86	4.99	5.15	5.31	5.47	5.63	5.79	5.93	6.07
1.95	2.41	2.54	2.68	2.80	2.93	3.08	3.24	3.39	3.53	3.68	3.82	3.96	4.09	4.23	4.37	4.50	4.64	4.79	4.93	5.07	5.23	5.38	5.55	5.71	5.87	6.01	6.15
2.00	2.46	2.60	2.73	2.86	2.99	3.14	3.30	3.45	3.60	3.75	3.89	4.02	4.16	4.29	4.43	4.57	4.71	4.86	5.00	5.14	5.30	5.46	5.63	5.79	5.95	6.09	6.23
2.05	2.51	2.65	2.79	2.92	3.04	3.20	3.36	3.51	3.66	3.81	3.95	4.09	4.22	4.36	4.50	4.64	4.78	4.93	5.07	5.21	5.37	5.53	5.70	5.86	6.03	6.17	6.31
2.10	2.56	2.71	2.85	2.98	3.10	3.26	3.42	3.57	3.72	3.87	4.01	4.15	4.29	4.43	4.57	4.71	4.85	5.00	5.14	5.28	5.44	5.60	5.77	5.93	6.10	6.24	6.39
2.15	2.62	2.76	2.90	3.03	3.16	3.32	3.48	3.63	3.78	3.93	4.07	4.21	4.35	4.49	4.63	4.77	4.91	5.06	5.20	5.35	5.52	5.68	5.85	6.01	6.17	6.32	6.46
2.20	2.67	2.82	2.96	3.09	3.22	3.38	3.54	3.69	3.85	4.00	4.14	4.28	4.42	4.56	4.69	4.84	4.98	5.13	5.27	5.42	5.59	5.75	5.92	6.08	6.25	6.40	6.54
2.25	2.72	2.87	3.02	3.15	3.28	3.44	3.60	3.75	3.91	4.06	4.20	4.34	4.48	4.62	4.76	4.91	5.05	5.20	5.34	5.49	5.66	5.82	5.99	6.15	6.32	6.47	6.62
2.30	2.77	2.93	3.07	3.20	3.33	3.50	3.66	3.81	3.97	4.12	4.26	4.40	4.54	4.68	4.83	4.97	5.12	5.27	5.41	5.56	5.73	5.89	6.06	6.22	6.39	6.54	6.69
2.35	2.82	2.98	3.13	3.26	3.39	3.56	3.72	3.87	4.03	4.18	4.32	4.46	4.60	4.75	4.89	5.04	5.18	5.34	5.48	5.63	5.80	5.96	6.13	6.29	6.46	6.61	6.76
2.40	2.87	3.04	3.18	3.32	3.45	3.61	3.77	3.93	4.08	4.24	4.38	4.53	4.67	4.81	4.96	5.10	5.25	5.40	5.55	5.70	5.87	6.03	6.20	6.36	6.53	6.68	6.84
2.45	2.92	3.09	3.23	3.37	3.51	3.67	3.83	3.99	4.14	4.30	4.44	4.59	4.73	4.88	5.02	5.17	5.31	5.47	5.62	5.77	5.94	6.10	6.27	6.43	6.60	6.75	6.91
2.50	2.98	3.14	3.29	3.43	3.57	3.73	3.89	4.05	4.20	4.36	4.50	4.65	4.79	4.94	5.08	5.23	5.38	5.54	5.69	5.84	6.01	6.17	6.34	6.50	6.67	6.82	6.98
2.55	3.03	3.20	3.34	3.48	3.62	3.79	3.95	4.11	4.26	4.42	4.56	4.71	4.85	5.00	5.14	5.30	5.45	5.61	5.76	5.91	6.08	6.24	6.41	6.57	6.74	6.89	7.05
2.60	3.08	3.25	3.39	3.54	3.68	3.84	4.01	4.17	4.32	4.47	4.62	4.77	4.91	5.06	5.21	5.36	5.52	5.67	5.83	5.98	6.15	6.31	6.48	6.64	6.80	6.96	7.12
2.65	3.13	3.30	3.45	3.59	3.73	3.90	4.07	4.22	4.37	4.53	4.68	4.83	4.97	5.12	5.27	5.43	5.58	5.74	5.89	6.05	6.21	6.37	6.54	6.70	6.87	7.03	7.19
2.70	3.18	3.35	3.50	3.65	3.78	3.95	4.12	4.28	4.43	4.59	4.74	4.89	5.04	5.19	5.34	5.49	5.65	5.80	5.96	6.12	6.28	6.44	6.61	6.77	6.94	7.10	7.26
2.75	3.23	3.40	3.55	3.70	3.84	4.01	4.18	4.34	4.49	4.65	4.80	4.95	5.11	5.26	5.41	5.56	5.72	5.87	6.03	6.18	6.35	6.51	6.68	6.84	7.01	7.17	7.33
2.80	3.28	3.45	3.61	3.76	3.90	4.07	4.24	4.40	4.55	4.71	4.86	5.01	5.17	5.32	5.47	5.62	5.78	5.95	6.09	6.25	6.41	6.58	6.75	6.91	7.08	7.24	7.40
2.85	3.33	3.50	3.66	3.81	3.95	4.12	4.29	4.45	4.61	4.77	4.92	5.07	5.23	5.38	5.53	5.69	5.84	6.00	6.15	6.31	6.48	6.64	6.81	6.98	7.15	7.31	7.47
2.90	3.38	3.55	3.71	3.88	4.01	4.18	4.35	4.51	4.66	4.82	4.98	5.13	5.29	5.44	5.59	5.75	5.91	6.06	6.22	6.38	6.54	6.71	6.88	7.04	7.22	7.37	7.53
2.95	3.43	3.60	3.77	3.92	4.06	4.23	4.40	4.57	4.72	4.88	5.04	5.19	5.35	5.50	5.66	5.82	5.97	6.13	6.28	6.44	6.61	6.77	6.94	7.11	7.29	7.44	7.60
3.00	3.49	3.66	3.82	3.97	4.12	4.29	4.46	4.62	4.78	4.94	5.10	5.25	5.41	5.56	5.72	5.88	6.03	6.19	6.34	6.50	6.67	6.84	7.01	7.18	7.35	7.51	7.67
3.05	3.54	3.71	3.87	4.02	4.17	4.34	4.52	4.67	4.84	5.00	5.16	5.31	5.47	5.62	5.78	5.94	6.09	6.25	6.41	6.57	6.74	6.91	7.08	7.25	7.42	7.58	7.74
3.10	3.59	3.76	3.93	4.08	4.22	4.40	4.57	4.73	4.89	5.06	5.21	5.36	5.53	5.68	5.84	6.00	6.15	6.32	6.47	6.63	6.80	6.97	7.14	7.31	7.49	7.64	7.81
3.15	3.64	3.81	3.98	4.13	4.27	4.45	4.63	4.78	4.95	5.11	5.27	5.42	5.58	5.74	5.90	6.06	6.22	6.38	6.54	6.70	6.87	7.04	7.21	7.38	7.55	7.71	7.87
3.20	3.69	3.86	4.03	4.18	4.33	4.51	4.68	4.84	5.00	5.17	5.32	5.48	5.64	5.80	5.96	6.12	6.28	6.45	6.60	6.77	6.93	7.10	7.27	7.44	7.62	7.77	7.94
3.25	3.74	3.91	4.08	4.23	4.38	4.56	4.73	4.89	5.06	5.22	5.38	5.54	5.70	5.86	6.02	6.18	6.34	6.51	6.67	6.83	7.00	7.17	7.34	7.51	7.68	7.84	8.01
3.30	3.79	3.96	4.13	4.29	4.43	4.61	4.79	4.95	5.11	5.28	5.44	5.60	5.76	5.92	6.08	6.24	6.40	6.57	6.73	6.89	7.06	7.23	7.40	7.58	7.75	7.91	8.08
3.35	3.84	4.01	4.18	4.34	4.49	4.67	4.84	5.00	5.17	5.34	5.49	5.66	5.82	5.98	6.14	6.30	6.46	6.63	6.79	6.95	7.12	7.30	7.47	7.64	7.81	7.98	8.14
3.40	3.89	4.06	4.23	4.39	4.54	4.72	4.90	5.06	5.23	5.39	5.55	5.71	5.87	6.04	6.20	6.36	6.53	6.69	6.86	7.01	7.19	7.36	7.53	7.71	7.88	8.04	8.21
3.45	3.95	4.12	4.28	4.44	4.60	4.78	4.95	5.12	5.29	5.45	5.60	5.77	5.93	6.10	6.26	6.42	6.59	6.75	6.92	7.08	7.25	7.43	7.60	7.77	7.94	8.11	8.27
3.50	4.00	4.17	4.34	4.50	4.65	4.83	5.01	5.17	5.34	5.50	5.66	5.83	5.99	6.16	6.32	6.48	6.65	6.81	6.98	7.14	7.31	7.49	7.66	7.84	8.01	8.18	8.34
3.55	4.05	4.22	4.39	4.55	4.70	4.88	5.07	5.23	5.40	5.56	5.72	5.89	6.05	6.22	6.38	6.54	6.71	6.87	7.04	7.20	7.37	7.55	7.72	7.90	8.07	8.24	8.40
3.60	4.10	4.27	4.44	4.60	4.76	4.94	5.12	5.29	5.45	5.62	5.78	5.94	6.11	6.27	6.44	6.60	6.77	6.93	7.10	7.26	7.43	7.61	7.78	7.96	8.13	8.30	8.46
3.65	4.15	4.32	4.49	4.66	4.81	4.99	5.17	5.34	5.50	5.67	5.83	6.00	6.16	6.33	6.49	6.66	6.82	6.99	7.15	7.32	7.49	7.67	7.84	8.02	8.19	8.36	8.53
3.70	4.20	4.37	4.54	4.71	4.87	5.05	5.22	5.39	5.56	5.73	5.89	6.05	6.22	6.38	6.55	6.72	6.88	7.05	7.21	7.38	7.55	7.73	7.90	8.08	8.25	8.42	8.59
3.75	4.25	4.42	4.59	4.76	4.92	5.10	5.28	5.45	5.61	5.78	5.95	6.11	6.28	6.44	6.61	6.78	6.94	7.11	7.27	7.44	7.61	7.79	7.96	8.14	8.31	8.48	8.65
3.80	4.30	4.47	4.64	4.81	4.97	5.15	5.33	5.50	5.67	5.84	6.01	6.17	6.34	6.50	6.67	6.84	7.00	7.17	7.33	7.50	7.67	7.85	8.02	8.20	8.37	8.54	8.71
3.85	4.35	4.52	4.69	4.86	5.02	5.20	5.39	5.56	5.72	5.89	6.06	6.23	6.39	6.56	6.73	6.90	7.06	7.23	7.39	7.56	7.73	7.91	8.08	8.26	8.43	8.60	8.77
3.90	4.40	4.57	4.74	4.91	5.08	5.26	5.44	5.61	5.78	5.95	6.12	6.28	6.45	6.61	6.78	6.95	7.12	7.28	7.45	7.62	7.79	7.97	8.14	8.32	8.49	8.66	8.83
3.95	4.45	4.63	4.79	4.96	5.13	5.31	5.50	5.67	5.83	6.01	6.17	6.34	6.50	6.67	6.84	7.01	7.18	7.34	7.51	7.68	7.85	8.03	8.20	8.38	8.55	8.72	8.89
4.00	4.50	4.68	4.85	5.02	5.18	5.36	5.55	5.72	5.89	6.06	6.23	6.40	6.56	6.73	6.90	7.07	7.24	7.40	7.57	7.74	7.91	8.09	8.26	8.44	8.61	8.78	8.95
4.05	4.55	4.73	4.90	5.07	5.23	5.41	5.61	5.77	5.94	6.12	6.28	6.45	6.62	6.79	6.96	7.13	7.30	7.46	7.63	7.80	7.97	8.15	8.32	8.50	8.67	8.84	9.01
4.10	4.60	4.78	4.95	5.12	5.28	5.47	5.66	5.83	6.00	6.17	6.34	6.51	6.67	6.84	7.02	7.18	7.35	7.52	7.69	7.86	8.03	8.21	8.38	8.56	8.73	8.90	9.07
4.15	4.65	4.83	5.00	5.17	5.33	5.52	5.71	5.88	6.05	6.22	6.39	6.56	6.73	6.90	7.08	7.24	7.41	7.58	7.75	7.92	8.09	8.27	8.44	8.62	8.79	8.96	9.13
4.20	4.70	4.88	5.05	5.22	5.39	5.58	5.77	5.94	6.11	6.27	6.45	6.62	6.78	6.95	7.13	7.29	7.46	7.64	7.81	7.98	8.15	8.33	8.50	8.68	8.85	9.02	9.19
4.25	4.75	4.93	5.10	5.27	5.44	5.63	5.82	5.99	6.16	6.33	6.50	6.67	6.84	7.01	7.18	7.35	7.52	7.70	7.87	8.04	8.21	8.39	8.56	8.74	8.91	9.08	9.25
4.30	4.80	4.98	5.15	5.32	5.49	5.68	5.87	6.04	6.21	6.38	6.56	6.73	6.90	7.07	7.24	7.41	7.58	7.76	7.93	8.10	8.27	8.45	8.62	8.80	8.97	9.14	9.31
4.35	4.85	5.03	5.20	5.37	5.54	5.73	5.92	6.09	6.26	6.44	6.61	6.78	6.96	7.13	7.30	7.47	7.64	7.81	7.98	8.15	8.33	8.50	8.68	8.85	9.03	9.20	9.37
4.40	4.90	5.08	5.26	5.43	5.59	5.78	5.97	6.15	6.32	6.49	6.67	6.84	7.01	7.18	7.36	7.53	7.70	7.87	8.04	8.21	8.38	8.56	8.73	8.91	9.08	9.25	9.42
4.45	4.95	5.13	5.31	5.48	5.65	5.83	6.02	6.20	6.37	6.55	6.72	6.89	7.07	7.24	7.42	7.59	7.76	7.92	8.09	8.27	8.44	8.61	8.79	8.96	9.14	9.31	9.48
4.50	5.00	5.18	5.36	5.53	5.70	5.88	6.07	6.25	6.42	6.60	6.78	6.95	7.13	7.30	7.48	7.65	7.82	7.98	8.15	8.32	8.50	8.67	8.85	9.02	9.20	9.37	9.54
4.55	5.05	5.23	5.41	5.58	5.75	5.93	6.13	6.30	6.47	6.65	6.83	7.00	7.18	7.35	7.53	7.70	7.87	8.04	8.21	8.38	8.56	8.73	8.91	9.08	9.26	9.43	9.60
4.60	5.10	5.28	5.46	5.63	5.80	5.98	6.18	6.35	6.53	6.71	6.88	7.06	7.23	7.41	7.58	7.75	7.93	8.09	8.27	8.44	8.61	8.79	8.96	9.14	9.32	9.48	9.65
4.65	5.15	5.33	5.51	5.68	5.85	6.04	6.23	6.41	6.58	6.76	6.94	7.11	7.29	7.46	7.63	7.81	7.98	8.16	8.32	8.49	8.67	8.84	9.02	9.19	9.37	9.54	9.71
4.70	5.20	5.38	5.56	5.73	5.90	6.09	6.28	6.46	6.64	6.81	6.99	7.17	7.34	7.52	7.69	7.86	8.04	8.20	8.38	8.55	8.72	8.90	9.07	9.25	9.43	9.59	9.76
4.75	5.25	5.43	5.61	5.78	5.95	6.14	6.33	6.51	6.69	6.87	7.04	7.22	7.39	7.57	7.74	7.91	8.09	8.26	8.44	8.61	8.78	8.96	9.13	9.31	9.48	9.65	9.82
4.80	5.30	5.48	5.66	5.83	6.00	6.19	6.38	6.56	6.74	6.92	7.09	7.27	7.44	7.62	7.80	7.97	8.14	8.32	8.49	8.66	8.84	9.02	9.19	9.36	9.54	9.71	9.88
4.85	5.35	5.53	5.71	5.89	6.05	6.24	6.43	6.61	6.79	6.97	7.15	7.33	7.52	7.68	7.85	8.02	8.20	8.37	8.55	8.72	8.89	9.07	9.24	9.42	9.59	9.76	9.94
4.90	5.40	5.58	5.76	5.94	6.10	6.30	6.49	6.67	6.85	7.02	7.20	7.38	7.55	7.73	7.90	8.08	8.25	8.43	8.60	8.77	8.95	9.13	9.30	9.47	9.65	9.82	9.99
4.95	5.45	5.63	5.81	5.99	6.16	6.35	6.54	6.72	6.90	7.07	7.26	7.44	7.61	7.79	7.96	8.13	8.31	8.48	8.66	8.83	9.00	9.18	9.35	9.53	9.71	9.87	10.05
5.00	5.50	5.68	5.86	6.04	6.21	6.40	6.59	6.77	6.95	7.13	7.31	7.49	7.66	7.84	8.02	8.19	8.36	8.54	8.71	8.88	9.06	9.23	9.41	9.58	9.76	9.93	10.11
5.05	5.55	5.73	5.91	6.09	6.26	6.45	6.64	6.82	7.00	7.18	7.36	7.54	7.71	7.89	8.07	8.24	8.41	8.59	8.76	8.94	9.12	9.29	9.47	9.64	9.82	9.99	10.16
5.10	5.60	5.78	5.96	6.14	6.32	6.50	6.69	6.87	7.05	7.23	7.41	7.59	7.76	7.94	8.12	8.30	8.47	8.65	8.82	9.00	9.17	9.34	9.52	9.69	9.87	10.04	10.22
5.15	5.65	5.83	6.01	6.19	6.37	6.56	6.74	6.92	7.10	7.28	7.46	7.64	7.82	8.00	8.17	8.35	8.52	8.70	8.87	9.05	9.23	9.40	9.58	9.75	9.93	10.10	10.27
5.20	5.70	5.88	6.06	6.24	6.42	6.61	6.79	6.97	7.15	7.33	7.51	7.69	7.87	8.05	8.23	8.41	8.58	8.76	8.93	9.10	9.28	9.45	9.63	9.80	9.99	10.15	10.33
5.25	5.75	5.93	6.11	6.29	6.47	6.66	6.84	7.02	7.20	7.38	7.56	7.74	7.92	8.10	8.28	8.46	8.63	8.81	8.98	9.16	9.34	9.51	9.69	9.86	10.04	10.21	10.38
5.30	5.80	5.98	6.16	6.34	6.52	6.71	6.89	7.07	7.26	7.44	7.61	7.79	7.97	8.15	8.33	8.51	8.68	8.86	9.03	9.21	9.39	9.56	9.74	9.91	10.09	10.26	10.43
5.35	5.85	6.03	6.21	6.39	6.57	6.76	6.94	7.12	7.31	7.49	7.67	7.85	8.02	8.20	8.38	8.56	8.73	8.91	9.08	9.26	9.44	9.61	9.79	9.96	10.14	10.31	10.48
5.40	5.90	6.08	6.26	6.44	6.62	6.81	6.99	7.18	7.36	7.54	7.72	7.90	8.08	8.26	8.43	8.62	8.79	8.97	9.14	9.31	9.50	9.67	9.85	10.02	10.20	10.37	10.54
5.45	5.95	6.13	6.31	6.49	6.67	6.86	7.04	7.23	7.41	7.60	7.78	7.96	8.13	8.31	8.49	8.67	8.84	9.02	9.19	9.37	9.55	9.72	9.90	10.07	10.25	10.42	10.59
5.50	6.00	6.18	6.36	6.54	6.72	6.91	7.09	7.28	7.46	7.65	7.83	8.01	8.18	8.36	8.54	8.72	8.89	9.07	9.24	9.42	9.60	9.77	9.95	10.12	10.30	10.47	10.64
5.55	6.05	6.23	6.41	6.59	6.77	6.96	7.14	7.33	7.51	7.70	7.88	8.06	8.23	8.41	8.60	8.77	8.94	9.12	9.29	9.47	9.65	9.82	10.00	10.17	10.35	10.52	10.69
5.60	6.10	6.28	6.46	6.64	6.82	7.01	7.19	7.38	7.56	7.75	7.93	8.11	8.28	8.46	8.65	8.82	8.99	9.17	9.34	9.53	9.70	9.87	10.05	10.22	10.41	10.57	10.75
5.65	6.15	6.33	6.51	6.69	6.87	7.06	7.24	7.43	7.62	7.80	7.99	8.17	8.34	8.52	8.70	8.88	9.05	9.23	9.40	9.58	9.76	9.93	10.11	10.28	10.46	10.63	10.80
5.70	6.20	6.38	6.56	6.74	6.92	7.11	7.29	7.48	7.67	7.85	8.04	8.22	8.39	8.57	8.75	8.93	9.10	9.28	9.45	9.63	9.81	9.98	10.16	10.33	10.51	10.68	10.86
5.75	6.25	6.43	6.61	6.79	6.97	7.16	7.34	7.53	7.72	7.91	8.09	8.27	8.44	8.62	8.80	8.98	9.15	9.33	9.50	9.68	9.86	10.03	10.21	10.38	10.56	10.73	10.91
5.80	6.30	6.48	6.66	6.84	7.02	7.21	7.40	7.58	7.77	7.97	8.14	8.32	8.49	8.67	8.86	9.03	9.20	9.38	9.55	9.73	9.91	10.08	10.26	10.43	10.62	10.78	10.96
5.85	6.35	6.53	6.71	6.89	7.07	7.26	7.45	7.63	7.83	8.03	8.20	8.38	8.55	8.73	8.91	9.08	9.25	9.43	9.60	9.78	9.98	10.13	10.31	10.49	10.67	10.84	11.02
5.90	6.40	6.58	6.76	6.94	7.12	7.31	7.50	7.69	7.88	8.08	8.25	8.43	8.60	8.78	8.96	9.14	9.31	9.49	9.68	9.83	10.01	10.19	10.37	10.54	10.72	10.89	11.07
5.95	6.45	6.63	6.81	6.99	7.17	7.36	7.55	7.74	7.94	8.13	8.31	8.49	8.66	8.84	9.02	9.19	9.36	9.54	9.71	9.88	10.06	10.24	10.42	10.60	10.77	10.95	11.13
6.00	6.50	6.68	6.86	7.04	7.22	7.41	7.60	7.79	7.99	8.18	8.38	8.54	8.71	8.89	9.07	9.24	9.41	9.59	9.76	9.93	10.11	10.29	10.47	10.65	10.83	11.00	11.18
50.00	50.50	50.68	50.86	51.04	51.22	51.41	51.60	51.79	51.99	52.18	52.36	52.54	52.71	52.89	53.07	53.24	53.41	53.59	53.76	53.93	54.11	54.29	54.47	54.65	54.83	55.00	55.18

TV Runoff Index vs. Runoff

TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV	TV
43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.04	1.08	1.12	1.16	1.20	1.24	1.28	1.32	1.37	1.42	1.46	1.51	1.56	1.61	1.66	1.71	1.76	1.81	1.88	1.96	2.03	2.11	2.18	2.25	2.33	2.40	2.48	2.55
1.54	1.59	1.64	1.69	1.74	1.80	1.85	1.90	1.96	2.02	2.09	2.15	2.21	2.27	2.33	2.40	2.48	2.52	2.60	2.67	2.75	2.82	2.90	2.97	3.05	3.12	3.20	3.27
1.91	1.97	2.03	2.09	2.15	2.20	2.26	2.32	2.38	2.45	2.51	2.58	2.64	2.70	2.77	2.83	2.90	2.96	3.04	3.11	3.19	3.26	3.34	3.42	3.49	3.57	3.64	3.72
2.20	2.26	2.32	2.38	2.44	2.50	2.56	2.62	2.69	2.76	2.83	2.90	2.97	3.04	3.11	3.18	3.25	3.32	3.40	3.48	3.55	3.63	3.71	3.79	3.87	3.94	4.02	4.10
2.41	2.48	2.54	2.61	2.67	2.74	2.80	2.87	2.94	3.02	3.09	3.17	3.24	3.32	3.39	3.47	3.54	3.62	3.70	3.79	3.87	3.96	4.04	4.12	4.20	4.29	4.37	4.45
2.61	2.68	2.75	2.82	2.89	2.96	3.03	3.10	3.18	3.26	3.33	3.41	3.49	3.57	3.66	3.74	3.82	3.90	3.99	4.08	4.16	4.25	4.34	4.43	4.52	4.60	4.69	4.78
2.79	2.86	2.94	3.01	3.09	3.16	3.24	3.31	3.39	3.47	3.54	3.62	3.70	3.79	3.88	3.97	4.06	4.15	4.24	4.34	4.43	4.53	4.62	4.71	4.81	4.90	5.00	5.09
2.95	3.03	3.11	3.19	3.27	3.34	3.42	3.50	3.58	3.66	3.74	3.82	3.90	4.00	4.09	4.19	4.28	4.38	4.48	4.58	4.68	4.78	4.88	4.98	5.08	5.18	5.28	5.38
3.12	3.20	3.28	3.36	3.44	3.51	3.60	3.68	3.76	3.85	3.93	4.02	4.10	4.20	4.30	4.40	4.50	4.60	4.70	4.81	4.91	5.02	5.12	5.22	5.33	5.43	5.54	5.64
3.26	3.35	3.43	3.52	3.60	3.68	3.77	3.85	3.94	4.03	4.12	4.21	4.30	4.40	4.50	4.60	4.70	4.80	4.91	5.02	5.12	5.23	5.34	5.45	5.56	5.66	5.77	5.88
3.40	3.49	3.58	3.67	3.75	3.84	3.92	4.01	4.11	4.20	4.30	4.39	4.49	4.59	4.69	4.79	4.88	4.99	5.10	5.21	5.32	5.43	5.54	5.65	5.77	5.88	5.99	6.10
3.54	3.63	3.72	3.81	3.89	3.98	4.06	4.16	4.26	4.36	4.46	4.56	4.66	4.76	4.86	4.96	5.05	5.17	5.28	5.39	5.51	5.62	5.74	5.85	5.97	6.08	6.20	6.31
3.67	3.76	3.85	3.94	4.02	4.11	4.20	4.31	4.41	4.51	4.62	4.72	4.82	4.92	5.02	5.12	5.22	5.34	5.46	5.57	5.69	5.80	5.92	6.04	6.16	6.27	6.39	6.51
3.79	3.89	3.98	4.07	4.16	4.25	4.34	4.45	4.56	4.66	4.77	4.87	4.98	5.07	5.17	5.28	5.38	5.51	5.63	5.74	5.86	5.98	6.10	6.22	6.34	6.46	6.58	6.70
3.91	4.01	4.11	4.20	4.29	4.38	4.48	4.59	4.70	4.80	4.91	5.02	5.13	5.22	5.33	5.44	5.55	5.67	5.79	5.91	6.03	6.15	6.27	6.40	6.52	6.64	6.76	6.88
4.03	4.13	4.23	4.32	4.42	4.51	4.62	4.72	4.83	4.94	5.05	5.16	5.27	5.37	5.48	5.59	5.71	5.82	5.94	6.07	6.19	6.32	6.44	6.56	6.69	6.81	6.94	7.06
4.14	4.24	4.34	4.44	4.54	4.64	4.75	4.85	4.96	5.07	5.18	5.29	5.40	5.51	5.63	5.74	5.86	5.97	6.09	6.22	6.35	6.46	6.60	6.72	6.86	6.98	7.11	7.24
4.25	4.35	4.45	4.56	4.66	4.76	4.87	4.98	5.08	5.20	5.31	5.42	5.54	5.65	5.77	5.89	6.00	6.12	6.24	6.37	6.50	6.63	6.76	6.88	7.02	7.14	7.28	7.41
4.35	4.46	4.57	4.67	4.78	4.88	4.99	5.10	5.21	5.32	5.44	5.56	5.67	5.79	5.91	6.03	6.14	6.26	6.39	6.52	6.65	6.78	6.92	7.04	7.18	7.30	7.44	7.57
4.46	4.57	4.68	4.79	4.89	5.00	5.11	5.22	5.33	5.45	5.57	5.69	5.81	5.93	6.05	6.17	6.28	6.40	6.54	6.67	6.80	6.93	7.07	7.20	7.34	7.46	7.60	7.73
4.57	4.68	4.79	4.90	5.01	5.12	5.23	5.34	5.46	5.58	5.70	5.82	5.94	6.06	6.18	6.30	6.42	6.54	6.68	6.81	6.95	7.08	7.22	7.35	7.49	7.61	7.75	7.89
4.67	4.78	4.89	5.01	5.12	5.23	5.34	5.46	5.58	5.70	5.82	5.94	6.06	6.18	6.30	6.43	6.55	6.67	6.82	6.95	7.09	7.22	7.36	7.49	7.63	7.76	7.90	8.04
4.77	4.88	5.00	5.11	5.23	5.34	5.46	5.58	5.70	5.82	5.94	6.06	6.19	6.31	6.43	6.56	6.68	6.80	6.95	7.08	7.22	7.36	7.50	7.63	7.77	7.90	8.04	8.18
4.87	4.99	5.10	5.22	5.33	5.46	5.57	5.70	5.81	5.94	6.06	6.19	6.31	6.43	6.56	6.68	6.81	6.93	7.08	7.21	7.35	7.49	7.63	7.77	7.91	8.04	8.18	8.32
4.97	5.09	5.21	5.32	5.44	5.57	5.69	5.81	5.93	6.06	6.18	6.31	6.44	6.56	6.69	6.81	6.94	7.06	7.21	7.34	7.48	7.62	7.76	7.90	8.04	8.18	8.32	8.46
5.07	5.19	5.31	5.43	5.55	5.68	5.80	5.92	6.05	6.18	6.30	6.43	6.56	6.69	6.81	6.93	7.06	7.19	7.33	7.47	7.61	7.75	7.89	8.03	8.17	8.31	8.45	8.59
5.16	5.29	5.41	5.53	5.65	5.78	5.90	6.03	6.16	6.29	6.41	6.54	6.67	6.81	6.92	7.05	7.18	7.31	7.45	7.59	7.73	7.87	8.01	8.15	8.30	8.44	8.58	8.72
5.26	5.38	5.51	5.63	5.75	5.88	6.01	6.14	6.28	6.39	6.52	6.65	6.78	6.92	7.03	7.16	7.29	7.42	7.57	7.71	7.85	7.99	8.13	8.27	8.42	8.56	8.70	8.84
5.35	5.48	5.60	5.73	5.86	5.99	6.11	6.25	6.37	6.50	6.62	6.75	6.88	7.03	7.14	7.27	7.40	7.53	7.68	7.82	7.97	8.11	8.25	8.39	8.54	8.68	8.82	8.96
5.46	5.57	5.70	5.83	5.96	6.09	6.22	6.35	6.47	6.60	6.73	6.86	6.99	7.13	7.25	7.38	7.51	7.64	7.79	7.93	8.08	8.22	8.37	8.51	8.66	8.80	8.94	9.08
5.54	5.67	5.80	5.93	6.06	6.19	6.32	6.45	6.58	6.71	6.84	6.97	7.10	7.23	7.36	7.49	7.62	7.75	7.90	8.04	8.19	8.33	8.48	8.62	8.77	8.91	9.06	9.20
5.62	5.76	5.89	6.02	6.15	6.28	6.41	6.54	6.68	6.81	6.94	7.07	7.20	7.33	7.47	7.60	7.73	7.85	8.01	8.15	8.30	8.44	8.59	8.73	8.88	9.02	9.17	9.31
5.71	5.84	5.98	6.11	6.24	6.37	6.51	6.64	6.77	6.91	7.04	7.17	7.30	7.43	7.57	7.70	7.84	7.96	8.12	8.26	8.41	8.55	8.70	8.84	8.99	9.13	9.28	9.42
5.79	5.93	6.06	6.20	6.34	6.47	6.60	6.74	6.87	7.00	7.13	7.27	7.40	7.53	7.67	7.80	7.94	8.07	8.22	8.37	8.51	8.66	8.81	8.95	9.10	9.24	9.39	9.53
5.88	6.01	6.15	6.29	6.43	6.56	6.70	6.83	6.96	7.10	7.23	7.37	7.50	7.63	7.77	7.90	8.04	8.17	8.32	8.47	8.61	8.76	8.91	9.06	9.21	9.35	9.50	9.64
5.96	6.10	6.24	6.38	6.52	6.65	6.79	6.93	7.06	7.20	7.33	7.47	7.60	7.73	7.87	8.00	8.14	8.27	8.42	8.57	8.71	8.86	9.01	9.16	9.31	9.45	9.60	9.75
6.04	6.18	6.32	6.46	6.61	6.74	6.88	7.02	7.15	7.29	7.42	7.56	7.69	7.83	7.97	8.10	8.24	8.37	8.52	8.67	8.82	8.97	9.12	9.27	9.42	9.56	9.71	9.86
6.13	6.27	6.41	6.55	6.69	6.83	6.97	7.12	7.24	7.38	7.51	7.65	7.79	7.93	8.07	8.20	8.34	8.47	8.62	8.77	8.92	9.07	9.22	9.37	9.52	9.67	9.82	9.97
6.21	6.35	6.49	6.63	6.78	6.91	7.06	7.21	7.34	7.48	7.61	7.75	7.88	8.03	8.17	8.30	8.44	8.57	8.72	8.87	9.02	9.17	9.32	9.47	9.62	9.77	9.92	10.07
6.30	6.44	6.58	6.72	6.86	7.00	7.15	7.30	7.43	7.57	7.70	7.84	7.98	8.12	8.26	8.39	8.53	8.66	8.82	8.97	9.12	9.27	9.42	9.57	9.72	9.87	10.02	10.17
6.38	6.52	6.66	6.80	6.95	7.09	7.24	7.38	7.52	7.66	7.79	7.93	8.07	8.21	8.35	8.48	8.62	8.76	8.91	9.06	9.22	9.37	9.52	9.67	9.82	9.97	10.12	10.27
6.46	6.60	6.74	6.89	7.04	7.18	7.33	7.47	7.60	7.74	7.88	8.02	8.16	8.30	8.44	8.58	8.72	8.86	9.01	9.16	9.32	9.47	9.62	9.77	9.92	10.07	10.22	10.37
6.53	6.68	6.82	6.97	7.12	7.26	7.41	7.55	7.69	7.83	7.97	8.11	8.25	8.39	8.53	8.67	8.81	8.95	9.10	9.25	9.41	9.56	9.71	9.86	10.02	10.17	10.32	10.47
6.61	6.75	6.90	7.05	7.20	7.34	7.49	7.63	7.77	7.91	8.05	8.19	8.33	8.48	8.62	8.76	8.90	9.04	9.19	9.34	9.50	9.65	9.80	9.95	10.11	10.26	10.42	10.57
6.69	6.83	6.98	7.13	7.28	7.42	7.57	7.72	7.86	8.00	8.14	8.28	8.42	8.57	8.71	8.85	8.99	9.13	9.28	9.43	9.59	9.74	9.89	10.04	10.20	10.35	10.51	10.66
6.76	6.91	7.06	7.21	7.36	7.50	7.65	7.80	7.94	8.08	8.23	8.37	8.51	8.65	8.79	8.94	9.08	9.22	9.37	9.52	9.68	9.83	9.98	10.13	10.29	10.44	10.60	10.75
6.83	6.99	7.14	7.29	7.44	7.58	7.73	7.88	8.02	8.16	8.31	8.45	8.60	8.74	8.88	9.03	9.17	9.31	9.46	9.61	9.77	9.92	10.07	10.22	10.38	10.53	10.69	10.84
6.91	7.06	7.21	7.36	7.52	7.66	7.81	7.96	8.11	8.25	8.40	8.54	8.68	8.83	8.97	9.12	9.26	9.40	9.55	9.70	9.86	10.01	10.16	10.31	10.47	10.62	10.78	10.93
6.98	7.14	7.29	7.44	7.59	7.74	7.90	8.05	8.19	8.33	8.48	8.62	8.77	8.92	9.06	9.21	9.35	9.49	9.64	9.79	9.95	10.10	10.25	10.40	10.56	10.71	10.87	11.02
7.06	7.21	7.36	7.51	7.67	7.82	7.98	8.13	8.28	8.42	8.57	8.71	8.85	9.00	9.15	9.29	9.44	9.57	9.73	9.88	10.04	10.19	10.34	10.49	10.65	10.80	10.96	11.11
7.13	7.29	7.44	7.59	7.75	7.90	8.06	8.21	8.36	8.50	8.65	8.79	8.94	9.08	9.23	9.37	9.52	9.68	9.81	9.96	10.12	10.27	10.42	10.57	10.73	10.88	11.04	11.19
7.20	7.36	7.51	7.66	7.82	7.98	8.14	8.29	8.44	8.58	8.73	8.87	9.02	9.17	9.31	9.46	9.60	9.75	9.90	10.05	10.21	10.36	10.51	10.66	10.82	10.97	11.13	11.28
7.27	7.43	7.58	7.74	7.90	8.05	8.21	8.37	8.52	8.66	8.81	8.95	9.10	9.25	9.39	9.54	9.68	9.83	9.98	10.14	10.29	10.45	10.60	10.75	10.91	11.06	11.22	11.37
7.34	7.50	7.66	7.81	7.97	8.13	8.29	8.45	8.59	8.74	8.88	9.03	9.18	9.33	9.47	9.62	9.76	9.91	10.06	10.22	10.37	10.53	10.68	10.84	10.99	11.16	11.30	11.46
7.41	7.57	7.73	7.89	8.05	8.20	8.36	8.52	8.67	8.82	8.96	9.11	9.26	9.41	9.55	9.70	9.84	9.99	10.14	10.30	10.45	10.61	10.76	10.92	11.07	11.23	11.38	11.54
7.48	7.64	7.80	7.96	8.12	8.28	8.44	8.60	8.75	8.90	9.04	9.19	9.34	9.49	9.63	9.78	9.92	10.07	10.22	10.38	10.53	10.69	10.84	11.00	11.15	11.31	11.46	11.62
7.55	7.71	7.87	8.03	8.19	8.35	8.51	8.67	8.82	8.97	9.11	9.27	9.42	9.57	9.71	9.86	10.00	10.15	10.31	10.46	10.62	10.77	10.93	11.09	11.24	11.40	11.55	11.70
7.62	7.78	7.94	8.10	8.26	8.43	8.59	8.74	8.90	9.05	9.19	9.34	9.49	9.65	9.79	9.94	10.08	10.23	10.39	10.54	10.70	10.85	11.01	11.17	11.32	11.48	11.63	11.79
7.70	7.86	8.02	8.18	8.34	8.50	8.66	8.82	8.97	9.12	9.26	9.42	9.57	9.73	9.87	10.02	10.16	10.31	10.47	10.62	10.78	10.93	11.09	11.25	11.40	11.56	11.71	11.87
7.77	7.93	8.09	8.25	8.41	8.58	8.74	8.89	9.05	9.20	9.34	9.49	9.64	9.80	9.95	10.10	10.24	10.39	10.55	10.70	10.86	11.01	11.17	11.33	11.48	11.64	11.79	11.95
7.84	8.00	8.16	8.32	8.48	8.65	8.81	8.97	9.12	9.27	9.41	9.57	9.72	9.87	10.02	10.17	10.32	10.47	10.63	10.78	10.94	11.09	11.25	11.41	11.56	11.72	11.87	12.03
7.91	8.07	8.23	8.39	8.55	8.72	8.88	9.04	9.19	9.34	9.48	9.64	9.79	9.94	10.10	10.25	10.40	10.55	10.71	10.86	11.02	11.16	11.33	11.49	11.64	11.79	11.95	12.11
7.97	8.14	8.30	8.46	8.62	8.79	8.95	9.11	9.26	9.41	9.55	9.71	9.86	10.01	10.17	10.32	10.47	10.62	10.78	10.93	11.09	11.23	11.40	11.56	11.71	11.86	12.02	12.18
8.04	8.20	8.36	8.52	8.68	8.85	9.01	9.17	9.33	9.48	9.62	9.78	9.93	10.08	10.24	10.39	10.54	10.69	10.85	11.00	11.16	11.31	11.47	11.63	11.78	11.94	12.09	12.25
8.10	8.27	8.43	8.59	8.75	8.92	9.08	9.24	9.40	9.55	9.69	9.85	10.00	10.15	10.31	10.46	10.61	10.76	10.92	11.07	11.23	11.38	11.54	11.70	11.85	12.01	12.16	12.32
8.17	8.34	8.50	8.66	8.82	8.99	9.15	9.31	9.47	9.62	9.76	9.92	10.07	10.22	10.38	10.53	10.68	10.83	10.99	11.14	11.30	11.45	11.61	11.77	11.92	12.08	12.23	12.39
8.24	8.41	8.57	8.73	8.89	9.06	9.22	9.38	9.54	9.69	9.83	9.99	10.14	10.29	10.45	10.60	10.75	10.90	11.06	11.22	11.37	11.52	11.68	11.85	12.00	12.15	12.31	12.47
8.31	8.47	8.64	8.80	8.96	9.13	9.29	9.45	9.61	9.76	9.90	10.06	10.21	10.36	10.52	10.67	10.82	10.97	11.13	11.29	11.44	11.59	11.75	11.92	12.08	12.22	12.39	12.55
8.37	8.54	8.70	8.86	9.03	9.19	9.36	9.52	9.68	9.82	9.97	10.13	10.28	10.43	10.59	10.74	10.89	11.04	11.20	11.36	11.51	11.67	11.83	11.99	12.15	12.30	12.46	12.62
8.44	8.60	8.77	8.93	9.10	9.26	9.43	9.59	9.75	9.89	10.04	10.20	10.35	10.50	10.66	10.81	10.96	11.11	11.27	11.43	11.58	11.74	11.90	12.06	12.22	12.37	12.53	12.69
8.51	8.67	8.84	9.00	9.17	9.33	9.50	9.66	9.81	9.96	10.11	10.27	10.42	10.57	10.73	10.88	11.03	11.18	11.34	11.50	11.65	11.81	11.97	12.13	12.29	12.44	12.60	12.76
8.57	8.73	8.90	9.07	9.24	9.40	9.57	9.73	9.88	10.03	10.18	10.34	10.49	10.64	10.80	10.95	11.10	11.25	11.41	11.57	11.72	11.88	12.04	12.20	12.36	12.51	12.67	12.83
8.63	8.80	8.97	9.13	9.30	9.46	9.63	9.79	9.95	10.09	10.25	10.41	10.56	10.71	10.87	11.02	11.17	11.32	11.48	11.64	11.79	11.95	12.11	12.27	12.43	12.58	12.74	12.90
8.70	8.86	9.03	9.20	9.37	9.53	9.70	9.86	10.01	10.16	10.31	10.47	10.62	10.77	10.94	11.09	11.24	11.39	11.55	11.71	11.86	12.02	12.18	12.34	12.50	12.66	12.82	12.97
8.76	8.93	9.10	9.26	9.43	9.59	9.76	9.93	10.08	10.22	10.38	10.54	10.69	10.84	11.01	11.16	11.31	11.46	11.62	11.78	11.93	12.09	12.25	12.41	12.57	12.73	12.89	13.05
8.82	8.99	9.16	9.33	9.50	9.66	9.83	10.00	10.15	10.29	10.45	10.61	10.76	10.91	11.07	11.22	11.38	11.53	11.69	11.85	12.00	12.16	12.32	12.48	12.64	12.80	12.96	13.12
8.88	9.05	9.22	9.39	9.56	9.72	9.89	10.06	10.21	10.36	10.51	10.67	10.82	10.98	11.14	11.29	11.45	11.59	11.76	11.92	12.07	12.23	12.39	12.55	12.71	12.87	13.03	13.19
8.94	9.11	9.28	9.45	9.62	9.78	9.95	10.12	10.28	10.42	10.58	10.74	10.89	11.04	11.21	11.36	11.52	11.66	11.83	11.99	12.14	12.30	12.46	12.62	12.78	12.94	13.10	13.26
9.00	9.17	9.34	9.51	9.68	9.85	10.02	10.18	10.34	10.49	10.64	10.80	10.95	11.11	11.27	11.43	11.58	11.73	11.90	12.06	12.21	12.36	12.53	12.69	12.85	13.01	13.17	13.33
9.06	9.23	9.40	9.57	9.74	9.91	10.08	10.25	10.41	10.56	10.71	10.87	11.02	11.17	11.33	11.49	11.64	11.79	11.96	12.12	12.28	12.43	12.60	12.76	12.92	13.08	13.24	13.40
9.12	9.29	9.46	9.63	9.80	9.97	10.14	10.31	10.47	10.62	10.77	10.93	11.08	11.24	11.39	11.55	11.70	11.86	12.02	12.18	12.34	12.50	12.67	12.83	12.99	13.15	13.31	13.47
9.18	9.35	9.52	9.69	9.86	10.03	10.20	10.38	10.53	10.68	10.83	10.99	11.14	11.30	11.46	11.62	11.77	11.93	12.09	12.25	12.41	12.57	12.74	12.90	13.06	13.22	13.38	13.54
9.24	9.41	9.58	9.75	9.92	10.09	10.26	10.44	10.59	10.74	10.89	11.05	11.21	11.37	11.53	11.69	11.84	12.00	12.16	12.32	12.48	12.63	12.81	12.97	13.13	13.28	13.45	13.60
9.30	9.47	9.64	9.81	9.98	10.16	10.33	10.50	10.66	10.81	10.96	11.12	11.27	11.43	11.59	11.75	11.90	12.06	12.22	12.38	12.54	12.70	12.87	13.03	13.20	13.35	13.52	13.67
9.36	9.53	9.70	9.87	10.04	10.22	10.39	10.56	10.72	10.87	11.02	11.18	11.34	11.50	11.65	11.81	11.98	12.12	12.28	12.44	12.60	12.76	12.93	13.09	13.26	13.41	13.58	13.73
9.42	9.59	9.76	9.93	10.10	10.28	10.45	10.62	10.78	10.93	11.08	11.24	11.40	11.56	11.71	11.87	12.02	12.18	12.34	12.50	12.66	12.83	12.99	13.15	13.32	13.48	13.64	13.80
9.48	9.65	9.82	9.99	10.16	10.34	10.51	10.68	10.84	10.99	11.14	11.30	11.46	11.62	11.78	11.93	12.09	12.24	12.41	12.57	12.73	12.89	13.06	13.22	13.39	13.54	13.71	13.86
9.54	9.71	9.88	10.05	10.22	10.40	10.57	10.74	10.90	11.05	11.20	11.36	11.52	11.68	11.84	11.99	12.15	12.31	12.47	12.63	12.80	12.95	13.12	13.28	13.46	13.60	13.78	13.92
9.60	9.77	9.94	10.11	10.28	10.46	10.63	10.80	10.96	11.11	11.27	11.42	11.58	11.74	11.90	12.05	12.21	12.37	12.53	12.69	12.86	13.02	13.18	13.34	13.51	13.67	13.84	13.99
9.66	9.83	10.00	10.17	10.34	10.52	10.69	10.86	11.02	11.17	11.33	11.48	11.64	11.80	11.96	12.11	12.27	12.43	12.59	12.75	12.92	13.08	13.24	13.40	13.57	13.73	13.90	14.06
9.72	9.89	10.06	10.23	10.40	10.58	10.75	10.92	11.08	11.23	11.39	11.54	11.70	11.86	12.02	12.17	12.33	12.49	12.65	12.81	12.98	13.14	13.30	13.46	13.63	13.79	13.96	14.12
9.78	9.95	10.12	10.29	10.46	10.64	10.81	10.98	11.14	11.29	11.45	11.60	11.76	11.92	12.08	12.23	12.39	12.55	12.71	12.88	13.04	13.20	13.37	13.53	13.70	13.85	14.03	14.18
9.83	10.00	10.17	10.34	10.52	10.69	10.87	11.04	11.20	11.35	11.51	11.66	11.82	11.98	12.14	12.29	12.45	12.61	12.77	12.94	13.10	13.26	13.43	13.59	13.76	13.91	14.09	14.25
9.89	10.06	10.23	10.40	10.57	10.75	10.92	11.10	11.25	11.41	11.57	11.72	11.88	12.04	12.20	12.35	12.51	12.67	12.83	13.00	13.16	13.33	13.49	13.65	13.82	13.98	14.15	14.31
9.94	10.11	10.28	10.45	10.63	10.80	10.98	11.16	11.31	11.47	11.63	11.78	11.94	12.10	12.26	12.41	12.57	12.73	12.89	13.06	13.22	13.39	13.55	13.71	13.88	14.04	14.21	14.37
10.00	10.17	10.34	10.51	10.68	10.86	11.04	11.21	11.37	11.53	11.69	11.84	12.00	12.16	12.31	12.47	12.63	12.79	12.95	13.12	13.28	13.45	13.61	13.77	13.94	14.10	14.27	14.43
10.06	10.23	10.40	10.57	10.75	10.92	11.10	11.27	11.43	11.59	11.75	11.90	12.06	12.22	12.37	12.53	12.69	12.85	13.01	13.18	13.34	13.51	13.67	13.83	14.00	14.16	14.33	14.49
10.11	10.29	10.46	10.63	10.81	10.98	11.16	11.33	11.48	11.65	11.81	11.96	12.12	12.28	12.43	12.59	12.75	12.91	13.07	13.24	13.40	13.57	13.73	13.89	14.06	14.22	14.39	14.55
10.17	10.34	10.51	10.68	10.86	11.03	11.21	11.38	11.54	11.70	11.86	12.01	12.17	12.33	12.49	12.65	12.81	12.97	13.13	13.30	13.46	13.63	13.79	13.95	14.12	14.28	14.45	14.61
10.22	10.40	10.57	10.74	10.92	11.09	11.27	11.44	11.60	11.76	11.92	12.07	12.23	12.39	12.55	12.71	12.87	13.02	13.19	13.36	13.52	13.69	13.85	14.01	14.18	14.34	14.51	14.67
10.28	10.46	10.63	10.80	10.98	11.15	11.33	11.50	11.65	11.82	11.98	12.13	12.29	12.45	12.60	12.76	12.92	13.08	13.24	13.41	13.57	13.74	13.90	14.07	14.23	14.40	14.56	14.73
10.34	10.51	10.68	10.85	11.03	11.20	11.38	11.55	11.71	11.87	12.03	12.19	12.35	12.51	12.66	12.82	12.98	13.14	13.30	13.47	13.63	13.80	13.96	14.13	14.29	14.46	14.62	14.79
10.39	10.57	10.74	10.91	11.09	11.26	11.44	11.60	11.76	11.93	12.09	12.24	12.40	12.56	12.72	12.88	13.04	13.20	13.36	13.53	13.69	13.86	14.02	14.19	14.35	14.52	14.68	14.85
10.45	10.62	10.79	10.96	11.14	11.31	11.49	11.66	11.82	11.98	12.14	12.30	12.46	12.62	12.78	12.94	13.10	13.26	13.42	13.59	13.75	13.92	14.08	14.25	14.41	14.58	14.74	14.91
10.50	10.68	10.85	11.02	11.20	11.37	11.55	11.72	11.87	12.04	12.20	12.35	12.51	12.67	12.84	13.00	13.16	13.32	13.48	13.65	13.81	13.98	14.14	14.31	14.47	14.64	14.80	14.97
10.56	10.73	10.90	11.07	11.25	11.42	11.60	11.77	11.93	12.09	12.25	12.41	12.57	12.73	12.89	13.05	13.21	13.37	13.54	13.70	13.87	14.03	14.20	14.37	14.53	14.70	14.86	15.03
10.61	10.78	10.95	11.12	11.30	11.47	11.65	11.82	11.98	12.14	12.30	12.46	12.62	12.78	12.95	13.11	13.27	13.43	13.60	13.76	13.93	14.09	14.26	14.43	14.59	14.76	14.92	15.08
10.66	10.83	11.00	11.17	11.35	11.52	11.70	11.87	12.04	12.20	12.36	12.52	12.68	12.84	13.01	13.17	13.33	13.49	13.66	13.82	13.99	14.15	14.32	14.49	14.65	14.82	14.98	15.14
10.72	10.89	11.06	11.23	11.41	11.58	11.76	11.93	12.09	12.25	12.41	12.57	12.73	12.89	13.07	13.23	13.39	13.54	13.72	13.88	14.05	14.21	14.38	14.55	14.71	14.88	15.04	15.20
10.77	10.94	11.11	11.28	11.46	11.63	11.81	11.98	12.15	12.31	12.47	12.63	12.79	12.95	13.12	13.28	13.44	13.60	13.77	13.93	14.10	14.26	14.43	14.60	14.76	14.93	15.09	15.25
10.82	10.99	11.16	11.33	11.51	11.68	11.86	12.03	12.20	12.36	12.52	12.68	12.84	13.00	13.17	13.33	13.49	13.65	13.82	13.98	14.15	14.31	14.48	14.65	14.81	14.98	15.14	15.31
10.87	11.04	11.21	11.38	11.56	11.73	11.91	12.09	12.25	12.41	12.57	12.73	12.89	13.05	13.23	13.39	13.55	13.70	13.88	14.04	14.21	14.37	14.54	14.71	14.87	15.04	15.20	15.36
10.92	11.10	11.27	11.44	11.62	11.79	11.97	12.14	12.31	12.47	12.63	12.79	12.95	13.11	13.29	13.45	13.61	13.76	13.94	14.10	14.27	14.43	14.60	14.77	14.93	15.10	15.26	15.42
10.98	11.15	11.32	11.49	11.67	11.84	12.02	12.19	12.36	12.52	12.68	12.84	13.00	13.16	13.34	13.50	13.66	13.81	13.99	14.15	14.32	14.48	14.65	14.82	14.98	15.15	15.31	15.48
11.03	11.21	11.38	11.55	11.73	11.90	12.08	12.25	12.42	12.58	12.74	12.90	13.06	13.22	13.39	13.55	13.71	13.87	14.04	14.20	14.37	14.53	14.70	14.87	15.03	15.20	15.36	15.53
11.08	11.26	11.43	11.60	11.78	11.95	12.13	12.30	12.47	12.63	12.79	12.95	13.11	13.27	13.44	13.60	13.76	13.92	14.09	14.26	14.42	14.58	14.75	14.92	15.08	15.26	15.41	15.58
11.13	11.31	11.48	11.65	11.83	12.00	12.18	12.36	12.52	12.68	12.84	13.00	13.16	13.32	13.50	13.66	13.82	13.97	14.15	14.31	14.48	14.64	14.81	14.98	15.14	15.31	15.47	15.63
11.19	11.37	11.54	11.71	11.89	12.06	12.24	12.41	12.57	12.73	12.89	13.05	13.22	13.38	13.55	13.71	13.87	14.02	14.20	14.37	14.53	14.70	14.87	15.04	15.20	15.37	15.53	15.68
11.24	11.42	11.59	11.76	11.94	12.11	12.29	12.46	12.63	12.79	12.95	13.11	13.27	13.43	13.60	13.76	13.92	14.08	14.25	14.42	14.58	14.75	14.92	15.09	15.25	15.42	15.58	15.74
11.30	11.48	11.65	11.82	12.00	12.17	12.35	12.52	12.68	12.84	13.00	13.16	13.33	13.49	13.65	13.81	13.97	14.13	14.30	14.47	14.63	14.80	14.97	15.14	15.30	15.47	15.63	15.80
11.35	11.53	11.70	11.87	12.05	12.22	12.40	12.57	12.73	12.89	13.05	13.21	13.38	13.54	13.70	13.86	14.02	14.18	14.35	14.52	14.68	14.85	15.02	15.19	15.35	15.52	15.68	15.85
55.35	55.53	55.70	55.87	56.05	56.22	56.40	56.57	56.73	56.89	57.05	57.21	57.38	57.54	57.70	57.86	58.02	58.18	58.35	58.52	58.68	58.85	59.02	59.19	59.35	59.52	59.68	59.85

SE Runoff Index vs. Runoff

SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.00	0.42	0.44	0.45	0.48	0.50	0.52	0.54	0.56	0.58	0.60	0.62	0.64	0.67	0.69	0.71	0.73	0.75	0.77
0.05	0.54	0.56	0.59	0.62	0.65	0.68	0.73	0.77	0.78	0.84	0.89	0.92	0.94	0.97	1.00	1.03	1.06	1.09
0.10	0.65	0.68	0.72	0.75	0.80	0.84	0.90	0.96	0.98	1.04	1.10	1.14	1.18	1.21	1.26	1.31	1.38	1.39
0.15	0.76	0.80	0.85	0.89	0.95	1.00	1.07	1.13	1.17	1.23	1.29	1.34	1.40	1.44	1.50	1.57	1.64	1.68
0.20	0.87	0.92	0.98	1.02	1.09	1.16	1.23	1.30	1.35	1.42	1.48	1.54	1.60	1.66	1.72	1.81	1.89	1.95
0.25	0.98	1.04	1.11	1.15	1.23	1.31	1.39	1.46	1.52	1.60	1.66	1.73	1.80	1.86	1.93	2.04	2.13	2.20
0.30	1.09	1.15	1.23	1.28	1.37	1.46	1.54	1.61	1.68	1.78	1.84	1.92	1.99	2.06	2.13	2.25	2.35	2.43
0.35	1.19	1.26	1.35	1.41	1.50	1.60	1.68	1.76	1.84	1.95	2.02	2.11	2.17	2.28	2.33	2.45	2.55	2.66
0.40	1.29	1.37	1.47	1.53	1.63	1.73	1.82	1.91	2.01	2.12	2.19	2.29	2.35	2.45	2.53	2.65	2.75	2.85
0.45	1.39	1.48	1.59	1.65	1.76	1.86	1.96	2.06	2.16	2.26	2.35	2.46	2.53	2.63	2.72	2.84	2.94	3.05
0.50	1.49	1.59	1.71	1.77	1.88	1.99	2.10	2.20	2.31	2.43	2.51	2.62	2.70	2.80	2.90	3.02	3.13	3.24
0.55	1.59	1.69	1.82	1.89	2.00	2.12	2.23	2.34	2.45	2.58	2.68	2.78	2.86	2.97	3.07	3.19	3.31	3.43
0.60	1.69	1.79	1.93	2.00	2.12	2.24	2.36	2.47	2.58	2.72	2.80	2.93	3.02	3.13	3.23	3.35	3.48	3.61
0.65	1.78	1.89	2.04	2.12	2.24	2.38	2.48	2.60	2.71	2.86	2.96	3.07	3.17	3.28	3.38	3.51	3.64	3.78
0.70	1.87	1.99	2.14	2.23	2.35	2.47	2.60	2.72	2.84	2.99	3.08	3.21	3.32	3.42	3.52	3.67	3.79	3.94
0.75	1.96	2.09	2.24	2.33	2.46	2.58	2.71	2.84	2.96	3.11	3.22	3.34	3.46	3.56	3.66	3.82	3.93	4.09
0.80	2.05	2.18	2.34	2.44	2.57	2.69	2.82	2.96	3.08	3.23	3.35	3.48	3.59	3.69	3.80	3.98	4.07	4.23
0.85	2.14	2.27	2.44	2.55	2.68	2.80	2.93	3.07	3.20	3.35	3.47	3.58	3.71	3.82	3.93	4.09	4.20	4.36
0.90	2.23	2.36	2.53	2.65	2.78	2.91	3.04	3.18	3.31	3.48	3.58	3.70	3.83	3.94	4.05	4.21	4.33	4.48
0.95	2.31	2.45	2.62	2.74	2.89	3.01	3.15	3.29	3.42	3.57	3.69	3.82	3.94	4.05	4.17	4.33	4.46	4.60
1.00	2.39	2.54	2.71	2.84	2.98	3.11	3.25	3.39	3.53	3.67	3.79	3.93	4.05	4.16	4.28	4.45	4.58	4.72
1.05	2.47	2.62	2.80	2.93	3.07	3.20	3.35	3.49	3.64	3.77	3.89	4.03	4.15	4.27	4.39	4.56	4.70	4.84
1.10	2.55	2.70	2.88	3.02	3.16	3.29	3.44	3.58	3.74	3.87	3.99	4.12	4.25	4.37	4.50	4.67	4.81	4.96
1.15	2.63	2.78	2.96	3.11	3.25	3.38	3.53	3.67	3.83	3.97	4.08	4.21	4.34	4.47	4.60	4.77	4.92	5.08
1.20	2.70	2.86	3.04	3.20	3.34	3.47	3.62	3.76	3.92	4.06	4.17	4.30	4.43	4.57	4.70	4.87	5.03	5.20
1.25	2.77	2.94	3.12	3.28	3.42	3.56	3.70	3.85	4.00	4.15	4.26	4.39	4.53	4.66	4.80	4.97	5.14	5.31
1.30	2.84	3.01	3.19	3.36	3.50	3.64	3.78	3.94	4.08	4.24	4.35	4.48	4.62	4.75	4.90	5.07	5.24	5.42
1.35	2.91	3.08	3.26	3.43	3.57	3.72	3.86	4.02	4.17	4.32	4.44	4.57	4.71	4.84	5.00	5.17	5.34	5.52
1.40	2.98	3.15	3.33	3.50	3.64	3.80	3.94	4.10	4.25	4.40	4.52	4.66	4.80	4.93	5.09	5.26	5.44	5.62
1.45	3.04	3.22	3.40	3.57	3.71	3.87	4.01	4.18	4.33	4.48	4.60	4.75	4.88	5.02	5.18	5.35	5.53	5.72
1.50	3.10	3.28	3.46	3.63	3.77	3.94	4.08	4.25	4.40	4.55	4.68	4.83	4.98	5.10	5.26	5.43	5.62	5.81
1.55	3.16	3.34	3.52	3.69	3.84	4.00	4.15	4.32	4.47	4.63	4.76	4.91	5.04	5.18	5.34	5.51	5.71	5.90
1.60	3.22	3.40	3.58	3.75	3.91	4.06	4.22	4.39	4.54	4.70	4.83	4.99	5.12	5.26	5.42	5.59	5.79	5.99
1.65	3.28	3.46	3.64	3.81	3.97	4.12	4.28	4.45	4.60	4.77	4.90	5.07	5.20	5.34	5.50	5.68	5.87	6.07
1.70	3.33	3.51	3.69	3.87	4.03	4.18	4.34	4.51	4.66	4.84	4.97	5.14	5.28	5.42	5.57	5.76	5.95	6.15
1.75	3.38	3.56	3.74	3.92	4.09	4.24	4.40	4.57	4.73	4.90	5.04	5.21	5.35	5.50	5.65	5.84	6.03	6.23
1.80	3.43	3.61	3.79	3.97	4.15	4.30	4.46	4.63	4.79	4.96	5.10	5.28	5.42	5.57	5.72	5.92	6.11	6.31
1.85	3.48	3.66	3.84	4.02	4.20	4.36	4.52	4.69	4.85	5.02	5.16	5.35	5.49	5.65	5.80	6.00	6.19	6.39
1.90	3.53	3.71	3.89	4.07	4.25	4.42	4.58	4.75	4.91	5.08	5.22	5.41	5.56	5.72	5.87	6.08	6.27	6.47
1.95	3.58	3.76	3.94	4.12	4.30	4.48	4.63	4.80	4.97	5.14	5.28	5.47	5.63	5.79	5.95	6.16	6.35	6.55
2.00	3.63	3.81	3.99	4.17	4.35	4.53	4.68	4.86	5.03	5.20	5.34	5.53	5.70	5.86	6.02	6.24	6.43	6.63
2.05	3.68	3.86	4.04	4.22	4.40	4.58	4.73	4.91	5.09	5.26	5.40	5.59	5.77	5.93	6.10	6.31	6.51	6.70
2.10	3.73	3.91	4.09	4.27	4.45	4.63	4.78	4.96	5.15	5.32	5.46	5.65	5.83	6.00	6.16	6.38	6.58	6.77
2.15	3.78	3.96	4.14	4.32	4.50	4.68	4.83	5.01	5.21	5.38	5.52	5.71	5.89	6.07	6.25	6.45	6.65	6.84
2.20	3.83	4.01	4.19	4.37	4.55	4.73	4.88	5.08	5.27	5.44	5.58	5.77	5.95	6.14	6.32	6.52	6.72	6.91
2.25	3.88	4.06	4.24	4.42	4.60	4.78	4.93	5.11	5.32	5.50	5.64	5.83	6.02	6.21	6.39	6.59	6.79	6.98
2.30	3.93	4.11	4.29	4.47	4.65	4.83	4.98	5.16	5.37	5.56	5.70	5.89	6.08	6.27	6.46	6.66	6.86	7.05
2.35	3.98	4.16	4.34	4.52	4.70	4.88	5.03	5.21	5.42	5.62	5.76	5.95	6.15	6.34	6.53	6.73	6.93	7.12
2.40	4.03	4.21	4.39	4.57	4.75	4.93	5.09	5.26	5.47	5.67	5.82	6.01	6.21	6.41	6.60	6.80	7.00	7.19
2.45	4.08	4.26	4.44	4.62	4.80	4.98	5.13	5.31	5.52	5.72	5.88	6.07	6.27	6.48	6.67	6.87	7.06	7.25
2.50	4.13	4.31	4.49	4.67	4.85	5.03	5.18	5.36	5.57	5.77	5.94	6.13	6.33	6.54	6.73	6.93	7.12	7.31
2.55	4.18	4.36	4.54	4.72	4.90	5.08	5.23	5.41	5.62	5.82	6.00	6.19	6.39	6.60	6.79	6.99	7.18	7.37
2.60	4.23	4.41	4.59	4.77	4.95	5.13	5.28	5.46	5.67	5.87	6.05	6.25	6.45	6.66	6.85	7.05	7.24	7.43
2.65	4.28	4.46	4.64	4.82	5.00	5.18	5.33	5.51	5.72	5.92	6.10	6.31	6.51	6.72	6.91	7.11	7.31	7.49
2.70	4.33	4.51	4.69	4.87	5.05	5.23	5.38	5.56	5.77	5.97	6.15	6.37	6.57	6.78	6.97	7.17	7.37	7.56
2.75	4.38	4.56	4.74	4.92	5.10	5.28	5.43	5.61	5.82	6.02	6.20	6.42	6.63	6.84	7.03	7.23	7.43	7.61
2.80	4.43	4.61	4.79	4.97	5.15	5.33	5.48	5.66	5.87	6.07	6.25	6.47	6.68	6.90	7.09	7.29	7.49	7.67
2.85	4.48	4.66	4.84	5.02	5.20	5.38	5.53	5.71	5.92	6.12	6.30	6.52	6.73	6.96	7.15	7.35	7.55	7.73
2.90	4.53	4.71	4.89	5.07	5.25	5.43	5.58	5.76	5.97	6.17	6.35	6.57	6.78	7.02	7.20	7.41	7.61	7.79
2.95	4.58	4.76	4.94	5.12	5.30	5.48	5.63	5.81	6.02	6.22	6.40	6.62	6.83	7.07	7.25	7.47	7.67	7.85
3.00	4.63	4.81	4.99	5.17	5.35	5.53	5.68	5.86	6.07	6.27	6.45	6.67	6.88	7.12	7.30	7.53	7.73	7.91
3.05	4.68	4.86	5.04	5.22	5.40	5.58	5.73	5.91	6.12	6.32	6.50	6.72	6.93	7.17	7.35	7.59	7.79	7.97
3.10	4.73	4.91	5.09	5.27	5.45	5.63	5.78	5.96	6.17	6.37	6.55	6.77	6.98	7.22	7.40	7.64	7.85	8.03
3.15	4.78	4.96	5.14	5.32	5.50	5.68	5.83	6.01	6.22	6.42	6.60	6.82	7.03	7.27	7.45	7.69	7.90	8.09
3.20	4.83	5.01	5.19	5.37	5.55	5.73	5.88	6.06	6.27	6.47	6.65	6.87	7.08	7.32	7.50	7.74	7.95	8.15
3.25	4.88	5.06	5.24	5.42	5.60	5.78	5.93	6.11	6.32	6.52	6.70	6.92	7.13	7.37	7.55	7.79	8.00	8.20
3.30	4.93	5.11	5.29	5.47	5.65	5.83	5.98	6.16	6.37	6.57	6.75	6.97	7.18	7.42	7.60	7.84	8.05	8.25
3.35	4.98	5.16	5.34	5.52	5.70	5.88	6.03	6.21	6.42	6.62	6.80	7.02	7.23	7.47	7.65	7.89	8.10	8.30
3.40	5.03	5.21	5.39	5.57	5.75	5.93	6.08	6.26	6.47	6.67	6.85	7.07	7.28	7.52	7.70	7.94	8.15	8.35
3.45	5.08	5.26	5.44	5.62	5.80	5.98	6.13	6.31	6.52	6.72	6.90	7.12	7.33	7.57	7.75	7.99	8.20	8.40
3.50	5.13	5.31	5.49	5.67	5.85	6.03	6.18	6.36	6.57	6.77	6.95	7.17	7.38	7.62	7.80	8.04	8.25	8.45
3.55	5.18	5.36	5.54	5.72	5.90	6.08	6.23	6.41	6.62	6.82	7.00	7.22	7.43	7.67	7.85	8.09	8.30	8.50
3.60	5.23	5.41	5.59	5.77	5.95	6.13	6.28	6.46	6.67	6.87	7.05	7.27	7.48	7.72	7.90	8.14	8.35	8.55
3.65	5.28	5.46	5.64	5.82	6.00	6.18	6.33	6.51	6.72	6.92	7.10	7.32	7.53	7.77	7.95	8.19	8.40	8.60
3.70	5.33	5.51	5.69	5.87	6.05	6.23	6.38	6.56	6.77	6.97	7.15	7.37	7.58	7.82	8.00	8.24	8.45	8.65
3.75	5.38	5.56	5.74	5.92	6.10	6.28	6.43	6.61	6.82	7.02	7.20	7.42	7.63	7.87	8.05	8.29	8.50	8.70
3.80	5.43	5.61	5.79	5.97	6.15	6.33	6.48	6.66	6.87	7.07	7.25	7.47	7.68	7.92	8.10	8.34	8.55	8.75
3.85	5.48	5.66	5.84	6.02	6.20	6.38	6.53	6.71	6.92	7.12	7.30	7.52	7.73	7.97	8.15	8.39	8.60	8.80
3.90	5.53	5.71	5.89	6.07	6.25	6.43	6.58	6.76	6.97	7.17	7.35	7.57	7.78	8.02	8.20	8.44	8.65	8.85
3.95	5.58	5.76	5.94	6.12	6.30	6.48	6.63	6.81	7.02	7.22	7.40	7.62	7.83	8.07	8.25	8.49	8.70	8.90
4.00	5.63	5.81	5.99	6.17	6.35	6.53	6.68	6.86	7.07	7.27	7.45	7.67	7.88	8.12	8.30	8.54	8.75	8.95
4.05	5.68	5.86	6.04	6.22	6.40	6.58	6.73	6.91	7.12	7.32	7.50	7.72	7.93	8.17	8.35	8.59	8.80	9.00
4.10	5.73	5.91	6.09	6.27	6.45	6.63	6.78	6.96	7.17	7.37	7.55	7.77	7.98	8.22	8.40	8.64	8.85	9.05
4.15	5.78	5.96	6.14	6.32	6.50	6.68	6.83	7.01	7.22	7.42	7.60	7.82	8.03	8.27	8.45	8.69	8.90	9.10
4.20	5.83	6.01	6.19	6.37	6.55	6.73	6.88	7.06	7.27	7.47	7.65	7.87	8.08	8.32	8.50	8.74	8.95	9.15
4.25	5.88	6.06	6.24	6.42	6.60	6.78	6.93	7.11	7.32	7.52	7.70	7.92	8.13	8.37	8.55	8.79	9.00	9.20
4.30	5.93	6.11	6.29	6.47	6.65	6.83	6.98	7.16	7.37	7.57	7.75	7.97	8.18	8.42	8.60	8.84	9.05	9.25
4.35	5.98	6.16	6.34	6.52	6.70	6.88	7.03	7.21	7.42	7.62	7.80	8.02	8.23	8.47	8.65	8.89	9.10	9.30
4.40	6.03	6.21	6.39	6.57	6.75	6.93	7.08	7.26	7.47	7.67	7.85	8.07	8.28	8.52	8.70	8.94	9.15	9.35
4.45	6.08	6.26	6.44	6.62	6.80	6.98	7.13	7.31	7.52	7.72	7.90	8.12	8.33	8.57	8.75	8.99	9.20	9.40
4.50	6.13	6.31	6.49	6.67	6.85	7.03	7.18	7.36	7.57	7.77	7.95	8.17	8.38	8.62	8.80	9.04	9.25	9.45
4.55	6.18	6.36	6.54	6.72	6.90	7.08	7.23	7.41	7.62	7.82	8.00	8.22	8.43	8.67	8.85	9.09	9.30	9.50
4.60	6.23	6.41	6.59	6.77	6.95	7.13	7.28	7.46	7.67	7.87	8.05	8.27	8.48	8.72	8.90	9.14	9.35	9.55
4.65	6.28	6.46	6.64	6.82	7.00	7.18	7.33	7.51	7.72	7.92	8.10	8.32	8.53	8.77	8.95	9.19	9.40	9.60
4.70	6.33	6.51	6.69	6.87	7.05	7.23	7.38	7.56	7.77	7.97	8.15	8.37	8.58	8.82	9.00	9.24	9.45	9.65
4.75	6.38	6.56	6.74	6.92	7.10	7.28	7.43	7.61	7.82	8.02	8.20	8.42	8.63	8.87	9.05	9.29	9.50	9.70
4.80	6.43	6.61	6.79	6.97	7.15	7.33	7.48	7.66	7.87	8.07	8.25	8.47	8.68	8.92	9.10	9.34	9.55	9.75
4.85	6.48	6.66	6.84	7.02	7.20	7.38	7.53	7.71	7.92	8.12	8.30	8.52	8.73	8.97	9.15	9.39	9.60	9.80
4.90	6.53	6.71	6.89	7.07	7.25	7.43	7.58	7.76	7.97	8.17	8.35	8.57	8.78	9.02	9.20	9.44	9.65	9.85
4.95	6.58	6.76	6.94	7.12	7.30	7.48	7.63	7.81	8.02	8.22	8.40	8.62	8.83	9.07	9.25	9.49	9.70	9.90
5.00	6.63	6.81	6.99	7.17	7.35	7.53	7.68	7.86	8.07	8.27	8.45	8.67	8.88	9.12	9.30	9.54	9.75	9.95
5.05	6.68	6.86	7.04	7.22	7.40	7.58	7.73	7.91	8.12	8.32	8.50	8.72	8.93	9.17	9.35	9.59	9.80	10.00
5.10	6.73	6.91	7.09	7.27	7.45	7.63	7.78	7.96	8.17	8.37	8.55	8.77	8.98	9.22	9.40	9.64	9.85	10.05
5.15	6.78	6.96	7.14	7.32	7.50	7.68	7.83	8.01	8.22	8.42	8.60	8.82	9.03	9.27	9.45	9.69	9.90	10.10
5.20	6.83	7.01	7.19	7.37	7.55	7.73	7.88	8.06	8.27	8.47	8.65	8.87	9.08	9.32	9.50	9.74	9.95	10.15
5.25	6.88	7.06	7.24	7.42	7.60	7.78	7.93	8.11	8.32	8.52	8.70	8.92	9.13	9.37	9.55	9.79	10.00	10.20
5.30	6.93	7.11	7.29	7.47	7.65	7.83	7.98	8.16	8.37	8.57	8.75	8.97	9.18	9.42	9.60	9.84	10.05	10.25
5.35	6.98	7.16	7.34	7.52	7.70	7.88	8.03	8.21	8.42	8.62	8.80	9.02	9.23	9.47	9.65	9.89	10.10	10.30
5.40	7.03	7.21	7.39	7.57	7.75	7.93	8.08	8.26	8.47	8.67	8.85	9.07	9.28	9.52	9.70	9.94	10.15	10.35
5.45	7.08	7.26	7.44	7.62	7.80	7.98	8.13	8.31	8.52	8.72	8.90	9.12	9.33	9.57	9.75	9.99	10.20	10.40
5.50	7.13	7.31	7.49	7.67	7.85	8.03	8.18	8.35	8.57	8.77	8.95	9.17	9.38	9.62	9.80	10.04	10.25	10.45
5.55	7.18	7.36	7.54	7.72	7.90	8.08	8.23	8.41	8.62	8.82	9.00	9.22	9.43	9.67	9.85	10.09	10.30	10.50
5.60	7.23	7.41	7.59	7.77	7.95	8.13	8.28	8.46	8.67	8.87	9.05	9.27	9.48	9.72	9.90	10.14	10.35	10.55
5.65	7.28	7.46	7.64	7.82	8.00	8.18	8.33	8.51	8.72	8.92	9.10	9.32	9.53	9.77	9.95	10.19	10.40	10.60
5.70	7.33	7.51	7.69	7.87	8.05	8.23	8.38	8.56	8.77	8.97	9.15	9.37	9.58	9.82	10.00	10.24	10.45	10.65
5.75	7.38	7.56	7.74	7.92	8.10	8.28	8.43	8.61	8.82	9.02	9.20	9.42	9.63	9.87	10.05	10.29	10.50	10.70
5.80	7.43	7.61	7.79	7.97	8.15	8.33	8.48	8.66	8.87	9.07	9.25	9.47	9.68	9.92	10.10	10.34	10.55	10.75
5.85	7.48	7.66	7.84	8.02	8.20	8.38	8.53	8.71	8.92	9.12	9.30	9.52	9.73	9.97	10.15	10.39	10.60	10.80
5.90	7.53	7.71	7.89	8.07	8.25	8.43	8.58	8.76	8.97	9.17	9.35	9.57	9.78	10.02	10.20	10.44	10.65	10.85
5.95	7.58	7.76	7.94	8.12	8.30	8.48	8.63	8.81	9.02	9.22	9.40	9.62	9.83	10.07	10.25	10.49	10.70	10.90
6.00	7.63	7.81	7.99	8.17	8.35	8.53	8.68	8.86	9.07	9.27	9.45	9.67	9.88	10.12	10.30	10.54	10.75	10.95
50.00	51.63	51.81	51.99	52.17	52.35	52.53	52.68	52.86	53.07	53.27	53.45	53.67	53.88	54.12	54.30	54.54	54.75	54.95

SE Runoff Index vs. Runoff

SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE	SE
34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.78	0.80	0.81	0.83	0.85	0.87	0.88	0.92	0.96	1.01	1.05	1.10	1.22	1.34	1.46	1.58	1.70
1.12	1.15	1.20	1.25	1.30	1.35	1.40	1.48	1.56	1.65	1.73	1.82	1.98	2.14	2.30	2.46	2.80
1.44	1.49	1.54	1.62	1.69	1.78	1.88	1.90	2.00	2.11	2.23	2.35	2.51	2.67	2.83	2.99	3.15
1.74	1.80	1.87	1.97	2.04	2.12	2.20	2.28	2.41	2.55	2.68	2.80	2.97	3.14	3.31	3.48	3.65
2.01	2.08	2.18	2.29	2.35	2.44	2.55	2.64	2.78	2.97	3.05	3.20	3.36	3.52	3.71	3.87	4.05
2.27	2.34	2.47	2.58	2.65	2.74	2.86	2.98	3.12	3.29	3.39	3.55	3.72	3.88	4.08	4.24	4.40
2.51	2.59	2.73	2.84	2.92	3.03	3.15	3.28	3.42	3.58	3.70	3.85	4.01	4.17	4.36	4.55	4.72
2.74	2.83	2.97	3.08	3.18	3.30	3.41	3.55	3.69	3.85	3.98	4.12	4.28	4.45	4.64	4.87	5.02
2.98	3.08	3.19	3.30	3.42	3.54	3.65	3.79	3.94	4.08	4.22	4.37	4.55	4.72	4.91	5.11	5.29
3.17	3.28	3.40	3.51	3.65	3.76	3.87	4.02	4.17	4.30	4.45	4.62	4.80	4.98	5.17	5.35	5.53
3.37	3.48	3.60	3.71	3.85	3.96	4.08	4.23	4.38	4.52	4.68	4.85	5.03	5.22	5.40	5.58	5.76
3.56	3.67	3.78	3.90	4.03	4.15	4.28	4.43	4.58	4.73	4.90	5.05	5.25	5.44	5.62	5.80	5.98
3.73	3.85	3.96	4.08	4.21	4.33	4.47	4.61	4.77	4.93	5.10	5.27	5.46	5.65	5.83	6.00	6.20
3.89	4.02	4.13	4.25	4.39	4.51	4.65	4.80	4.96	5.12	5.30	5.48	5.66	5.85	6.03	6.20	6.40
4.04	4.18	4.29	4.42	4.56	4.69	4.82	4.98	5.14	5.31	5.49	5.67	5.85	6.04	6.23	6.40	6.60
4.19	4.34	4.45	4.58	4.73	4.86	4.98	5.15	5.31	5.49	5.67	5.85	6.03	6.22	6.42	6.59	6.78
4.34	4.49	4.60	4.73	4.89	5.02	5.14	5.31	5.48	5.66	5.85	6.03	6.20	6.39	6.60	6.77	6.95
4.48	4.63	4.75	4.88	5.04	5.17	5.30	5.47	5.64	5.83	6.02	6.20	6.37	6.58	6.77	6.94	7.12
4.62	4.77	4.90	5.03	5.19	5.32	5.45	5.62	5.80	5.99	6.18	6.36	6.53	6.72	6.93	7.11	7.28
4.75	4.91	5.04	5.18	5.33	5.47	5.60	5.77	5.96	6.14	6.33	6.51	6.69	6.88	7.08	7.27	7.44
4.88	5.04	5.17	5.32	5.46	5.61	5.75	5.92	6.11	6.29	6.48	6.66	6.84	7.03	7.23	7.42	7.60
5.00	5.17	5.30	5.45	5.59	5.75	5.89	6.08	6.26	6.44	6.63	6.81	6.99	7.18	7.38	7.57	7.75
5.12	5.29	5.42	5.58	5.72	5.88	6.03	6.20	6.40	6.58	6.78	6.95	7.14	7.33	7.52	7.71	7.90
5.24	5.41	5.54	5.70	5.85	6.00	6.16	6.34	6.54	6.72	6.92	7.09	7.28	7.47	7.66	7.85	8.04
5.36	5.52	5.66	5.82	5.97	6.12	6.29	6.47	6.67	6.85	7.05	7.23	7.42	7.60	7.80	7.99	8.18
5.48	5.63	5.78	5.94	6.09	6.24	6.42	6.60	6.80	7.00	7.18	7.36	7.55	7.74	7.94	8.13	8.32
5.59	5.74	5.90	6.06	6.21	6.36	6.54	6.72	6.92	7.13	7.31	7.49	7.68	7.87	8.07	8.26	8.45
5.70	5.85	6.01	6.17	6.33	6.48	6.66	6.84	7.04	7.25	7.43	7.62	7.81	8.00	8.20	8.39	8.58
5.80	5.96	6.12	6.28	6.44	6.60	6.77	6.96	7.16	7.36	7.55	7.74	7.93	8.12	8.33	8.52	8.71
5.90	6.07	6.23	6.39	6.55	6.71	6.88	7.07	7.27	7.47	7.66	7.86	8.05	8.25	8.45	8.64	8.84
6.00	6.17	6.33	6.50	6.66	6.82	6.99	7.18	7.38	7.58	7.77	7.97	8.17	8.37	8.57	8.76	8.96
6.09	6.27	6.43	6.60	6.77	6.93	7.10	7.29	7.49	7.69	7.88	8.08	8.28	8.48	8.69	8.88	9.08
6.18	6.37	6.53	6.70	6.87	7.04	7.20	7.39	7.59	7.79	7.99	8.19	8.39	8.59	8.80	9.00	9.20
6.27	6.46	6.63	6.78	6.97	7.14	7.30	7.49	7.69	7.89	8.10	8.29	8.50	8.70	8.91	9.11	9.32
6.36	6.55	6.72	6.88	7.06	7.23	7.40	7.59	7.79	7.99	8.20	8.39	8.60	8.80	9.01	9.22	9.43
6.45	6.64	6.81	6.97	7.15	7.33	7.50	7.69	7.89	8.09	8.30	8.49	8.70	8.90	9.11	9.33	9.54
6.53	6.72	6.89	7.06	7.24	7.43	7.60	7.79	7.99	8.19	8.40	8.59	8.80	9.00	9.21	9.43	9.65
6.61	6.80	6.97	7.15	7.33	7.52	7.70	7.89	8.09	8.29	8.50	8.69	8.90	9.10	9.31	9.53	9.75
6.69	6.88	7.05	7.24	7.42	7.61	7.80	7.99	8.19	8.39	8.59	8.78	8.99	9.20	9.41	9.63	9.85
6.77	6.96	7.13	7.32	7.51	7.70	7.89	8.08	8.28	8.48	8.68	8.88	9.09	9.30	9.51	9.73	9.95
6.84	7.04	7.21	7.40	7.60	7.78	7.98	8.17	8.37	8.57	8.77	8.98	9.18	9.40	9.61	9.83	10.04
6.91	7.11	7.29	7.48	7.68	7.87	8.07	8.26	8.46	8.66	8.86	9.07	9.28	9.49	9.71	9.93	10.14
6.98	7.18	7.37	7.56	7.76	7.95	8.15	8.35	8.55	8.75	8.95	9.16	9.37	9.58	9.80	10.02	10.23
7.05	7.25	7.44	7.64	7.84	8.03	8.23	8.43	8.64	8.84	9.04	9.25	9.46	9.67	9.89	10.11	10.33
7.12	7.32	7.51	7.72	7.91	8.11	8.31	8.51	8.72	8.92	9.13	9.34	9.55	9.76	9.98	10.20	10.42
7.19	7.39	7.58	7.79	7.99	8.19	8.39	8.59	8.80	9.00	9.22	9.43	9.63	9.85	10.07	10.29	10.51
7.26	7.46	7.65	7.86	8.06	8.27	8.46	8.67	8.88	9.08	9.30	9.51	9.71	9.93	10.15	10.38	10.60
7.33	7.53	7.72	7.93	8.14	8.34	8.54	8.75	8.96	9.16	9.38	9.59	9.80	10.02	10.24	10.46	10.68
7.40	7.60	7.79	8.00	8.21	8.41	8.61	8.82	9.04	9.24	9.46	9.67	9.89	10.10	10.33	10.55	10.77
7.46	7.66	7.86	8.07	8.28	8.48	8.68	8.90	9.11	9.32	9.54	9.75	9.97	10.19	10.42	10.64	10.86
7.52	7.72	7.93	8.14	8.35	8.55	8.76	8.97	9.18	9.40	9.61	9.82	10.05	10.27	10.50	10.72	10.94
7.58	7.78	8.00	8.21	8.42	8.62	8.83	9.04	9.25	9.47	9.68	9.90	10.13	10.35	10.58	10.80	11.02
7.64	7.84	8.07	8.27	8.49	8.69	8.90	9.11	9.32	9.54	9.75	9.97	10.20	10.43	10.65	10.87	11.10
7.70	7.90	8.13	8.33	8.56	8.76	8.97	9.18	9.39	9.61	9.82	10.05	10.28	10.51	10.73	10.95	11.18
7.76	7.96	8.19	8.39	8.62	8.83	9.04	9.25	9.46	9.69	9.89	10.12	10.35	10.58	10.80	11.03	11.26
7.82	8.02	8.25	8.45	8.68	8.90	9.11	9.32	9.54	9.76	9.96	10.19	10.43	10.66	10.88	11.11	11.34
7.88	8.08	8.31	8.51	8.74	8.96	9.18	9.39	9.61	9.83	10.03	10.26	10.50	10.73	10.96	11.19	11.42
7.94	8.14	8.37	8.57	8.80	9.02	9.24	9.46	9.68	9.90	10.10	10.34	10.57	10.80	11.03	11.27	11.50
8.00	8.20	8.43	8.63	8.86	9.08	9.30	9.53	9.75	9.96	10.17	10.41	10.64	10.87	11.10	11.34	11.57
8.06	8.26	8.49	8.69	8.92	9.14	9.36	9.59	9.82	10.03	10.24	10.48	10.71	10.94	11.17	11.41	11.64
8.12	8.32	8.55	8.75	8.97	9.20	9.42	9.65	9.88	10.10	10.31	10.54	10.78	11.01	11.23	11.47	11.71
8.18	8.38	8.60	8.81	9.03	9.26	9.48	9.72	9.94	10.16	10.38	10.61	10.85	11.08	11.30	11.53	11.78
8.23	8.44	8.65	8.87	9.09	9.31	9.53	9.78	10.00	10.22	10.45	10.67	10.91	11.14	11.37	11.60	11.85
8.28	8.50	8.71	8.93	9.14	9.37	9.59	9.84	10.06	10.28	10.51	10.74	10.97	11.20	11.44	11.67	11.92
8.33	8.55	8.76	8.99	9.20	9.43	9.65	9.90	10.12	10.34	10.57	10.80	11.03	11.27	11.50	11.74	11.98
8.38	8.60	8.81	9.05	9.25	9.48	9.71	9.96	10.18	10.40	10.64	10.87	11.10	11.34	11.57	11.81	12.04
8.43	8.65	8.86	9.11	9.30	9.54	9.77	10.02	10.24	10.46	10.70	10.93	11.16	11.40	11.63	11.87	12.10
8.48	8.70	8.91	9.17	9.36	9.59	9.83	10.08	10.30	10.52	10.76	10.99	11.22	11.46	11.69	11.92	12.16
8.53	8.75	8.96	9.23	9.42	9.65	9.89	10.13	10.36	10.58	10.82	11.05	11.28	11.51	11.74	11.97	12.22
8.58	8.80	9.01	9.28	9.48	9.70	9.95	10.19	10.42	10.64	10.88	11.11	11.34	11.57	11.80	12.03	12.28
8.63	8.85	9.06	9.33	9.53	9.76	10.01	10.24	10.48	10.70	10.94	11.17	11.40	11.63	11.86	12.09	12.34
8.68	8.90	9.11	9.38	9.58	9.81	10.06	10.30	10.53	10.76	11.00	11.23	11.46	11.69	11.91	12.15	12.40
8.73	8.95	9.16	9.43	9.63	9.86	10.12	10.35	10.58	10.82	11.06	11.29	11.52	11.75	11.97	12.20	12.46
8.78	9.00	9.21	9.48	9.69	9.92	10.17	10.41	10.64	10.88	11.11	11.35	11.58	11.81	12.02	12.26	12.51
8.83	9.05	9.26	9.53	9.74	9.97	10.22	10.46	10.70	10.92	11.17	11.41	11.64	11.87	12.08	12.32	12.56
8.88	9.10	9.31	9.58	9.80	10.03	10.28	10.51	10.75	10.98	11.23	11.47	11.70	11.92	12.14	12.38	12.62
8.93	9.15	9.36	9.63	9.85	10.08	10.33	10.56	10.80	11.04	11.28	11.52	11.75	11.97	12.20	12.44	12.67
8.98	9.20	9.41	9.68	9.91	10.13	10.39	10.62	10.86	11.10	11.34	11.58	11.81	12.03	12.26	12.50	12.73
9.03	9.25	9.48	9.73	9.96	10.18	10.44	10.67	10.91	11.15	11.39	11.63	11.86	12.08	12.32	12.55	12.78
9.08	9.30	9.51	9.78	10.01	10.24	10.49	10.72	10.96	11.20	11.44	11.68	11.91	12.13	12.38	12.60	12.83
9.13	9.35	9.56	9.83	10.06	10.29	10.54	10.77	11.01	11.25	11.49	11.73	11.97	12.18	12.43	12.65	12.88
9.18	9.40	9.61	9.88	10.11	10.34	10.59	10.82	11.06	11.30	11.54	11.79	12.03	12.24	12.48	12.71	12.93
9.23	9.45	9.66	9.93	10.16	10.39	10.64	10.88	11.11	11.35	11.59	11.84	12.08	12.29	12.53	12.75	12.98
9.28	9.50	9.71	9.98	10.21	10.44	10.69	10.93	11.17	11.41	11.65	11.90	12.13	12.35	12.58	12.82	13.03
9.33	9.55	9.76	10.03	10.26	10.49	10.74	10.98	11.22	11.46	11.70	11.95	12.18	12.40	12.63	12.87	13.08
9.38	9.60	9.81	10.08	10.31	10.54	10.79	11.03	11.27	11.51	11.75	12.00	12.23	12.45	12.68	12.93	13.13
9.43	9.65	9.86	10.13	10.36	10.59	10.84	11.08	11.32	11.56	11.80	12.05	12.28	12.50	12.73	12.98	13.18
9.48	9.70	9.91	10.18	10.41	10.64	10.89	11.13	11.37	11.61	11.85	12.10	12.33	12.55	12.78	13.03	13.23
9.53	9.75	9.96	10.23	10.46	10.69	10.94	11.18	11.42	11.66	11.90	12.15	12.38	12.60	12.83	13.08	13.28
9.58	9.80	10.01	10.28	10.51	10.74	10.99	11.23	11.47	11.71	11.95	12.20	12.43	12.65	12.88	13.13	13.33
9.63	9.85	10.06	10.33	10.56	10.79	11.04	11.28	11.52	11.76	12.00	12.25	12.48	12.70	12.93	13.18	13.38
9.68	9.90	10.11	10.38	10.61	10.84	11.09	11.33	11.57	11.81	12.05	12.30	12.53	12.75	12.98	13.23	13.43
9.73	9.95	10.16	10.43	10.66	10.89	11.14	11.38	11.62	11.86	12.10	12.35	12.58	12.80	13.03	13.28	13.48
9.78	10.00	10.21	10.48	10.71	10.94	11.19	11.43	11.67	11.91	12.15	12.40	12.63	12.85	13.08	13.33	13.53
9.83	10.05	10.26	10.53	10.76	10.99	11.24	11.48	11.72	11.96	12.20	12.45	12.68	12.90	13.13	13.38	13.58
9.88	10.10	10.31	10.58	10.81	11.04	11.29	11.53	11.77	12.01	12.25	12.50	12.73	12.95	13.18	13.43	13.63
9.93	10.15	10.36	10.63	10.86	11.09	11.34	11.58	11.82	12.06	12.30	12.55	12.78	13.00	13.23	13.48	13.68
9.98	10.20	10.41	10.68	10.91	11.14	11.39	11.63	11.87	12.11	12.35	12.60	12.83	13.05	13.28	13.53	13.73
10.03	10.25	10.46	10.73	10.96	11.19	11.44	11.68	11.92	12.16	12.40	12.65	12.88	13.10	13.33	13.58	13.78
10.08	10.30	10.51	10.78	11.01	11.24	11.49	11.73	11.97	12.21	12.45	12.70	12.93	13.15	13.38	13.63	13.83
10.13	10.35	10.56	10.83	11.06	11.29	11.54	11.78	12.02	12.26	12.50	12.75	12.98	13.20	13.43	13.68	13.88
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10.23	10.45	10.66	10.93	11.16	11.39	11.64	11.88	12.12	12.36	12.60	12.85	13.08	13.30	13.53	13.78	13.98
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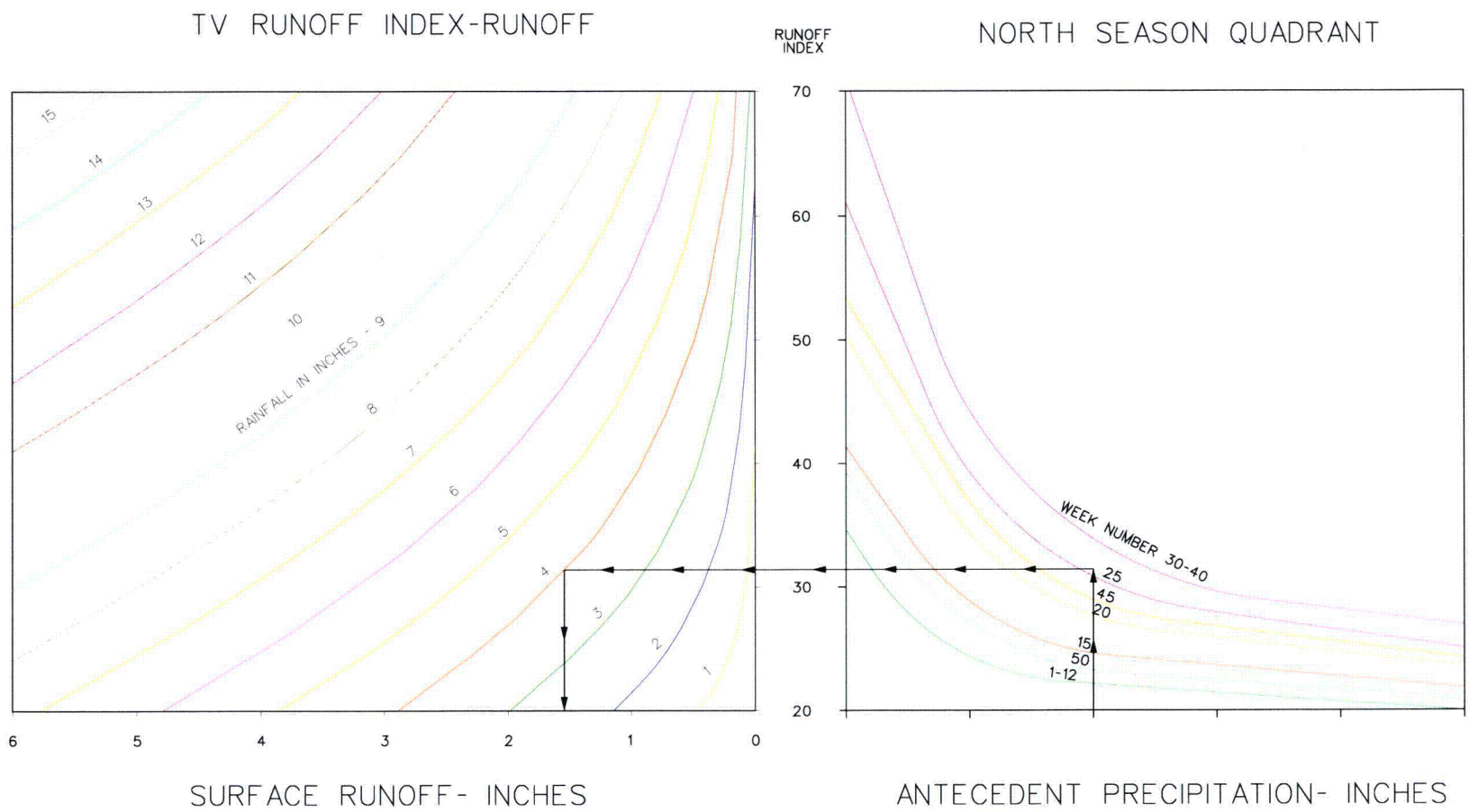
10.33	10.55	10.76	11.03	11.26	11.49	11.74	11.98	12.22	12.46	12.70	12.95	13.18	13.40	13.63	13.88	14.08
10.38	10.60	10.81	11.08	11.31	11.54	11.79	12.03	12.27	12.51	12.75	13.00	13.23	13.45	13.68	13.93	14.13
10.43	10.65	10.86	11.13	11.36	11.59	11.84	12.08	12.32	12.56	12.80	13.05	13.28	13.50	13.73	13.98	14.18
10.48	10.70	10.91	11.18	11.41	11.64	11.89	12.13	12.37	12.61	12.85	13.10	13.33	13.55	13.78	14.03	14.23
10.53	10.75	10.96	11.23	11.46	11.69	11.94	12.18	12.42	12.66	12.90	13.15	13.38	13.60	13.83	14.08	14.28
10.58	10.80	11.01	11.28	11.51	11.74	11.99	12.23	12.47	12.71	12.95	13.20	13.43	13.65	13.88	14.13	14.33
10.63	10.85	11.06	11.33	11.56	11.79	12.04	12.28	12.52	12.76	13.00	13.25	13.48	13.70	13.93	14.18	14.38
10.68	10.90	11.11	11.38	11.61	11.84	12.09	12.33	12.57	12.81	13.05	13.30	13.53	13.75	13.98	14.23	14.43
10.73	10.95	11.16	11.43	11.66	11.89	12.14	12.38	12.62	12.86	13.10	13.35	13.58	13.80	14.03	14.28	14.48
10.78	11.00	11.21	11.48	11.71	11.94	12.19	12.43	12.67	12.91	13.15	13.40	13.63	13.85	14.08	14.33	14.53
10.83	11.05	11.26	11.53	11.76	11.99	12.24	12.48	12.72	12.96	13.20	13.45	13.68	13.90	14.13	14.38	14.58
10.88	11.10	11.31	11.58	11.81	12.04	12.29	12.53	12.77	13.01	13.26	13.50	13.73	13.95	14.18	14.43	14.63
10.93	11.15	11.36	11.63	11.86	12.09	12.34	12.58	12.82	13.06	13.30	13.55	13.78	14.00	14.23	14.48	14.68
10.98	11.20	11.41	11.68	11.91	12.14	12.39	12.63	12.87	13.11	13.35	13.60	13.83	14.05	14.28	14.53	14.73
11.03	11.25	11.46	11.73	11.96	12.19	12.44	12.68	12.92	13.16	13.40	13.65	13.88	14.10	14.33	14.58	14.78
11.08	11.30	11.51	11.78	12.01	12.24	12.49	12.73	12.97	13.21	13.45	13.70	13.93	14.15	14.38	14.63	14.83
11.13	11.35	11.56	11.83	12.06	12.29	12.54	12.78	13.02	13.26	13.50	13.75	13.98	14.20	14.43	14.68	14.88
55.13	55.35	55.56	55.83	56.06	56.29	56.54	56.78	57.02	57.26	57.50	57.75	57.98	58.20	58.43	58.68	58.88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SURFACE RUNOFF- INCHES
RUNOFF INDEX
NORTH SEASON QUADRANT
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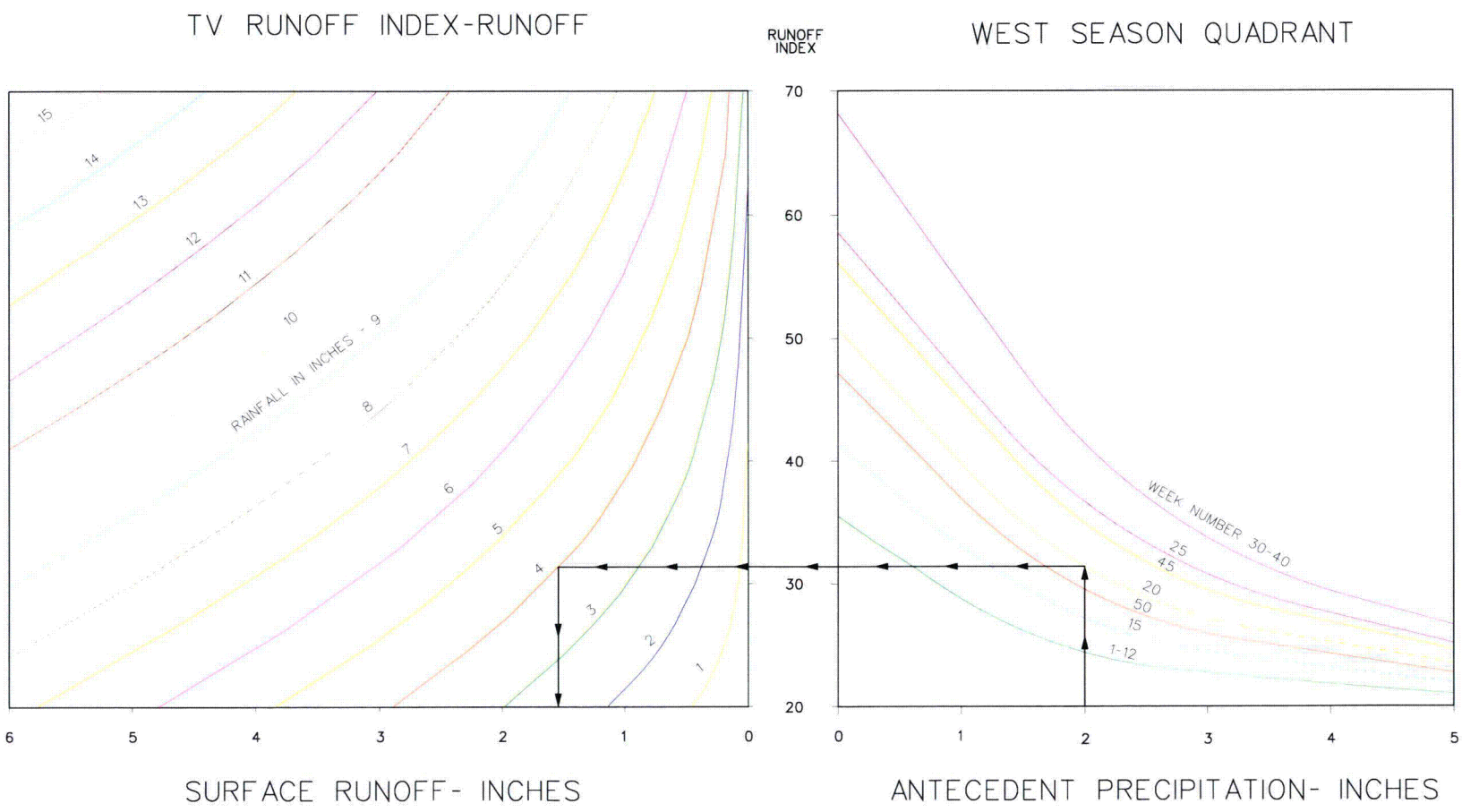
TV RUNOFF INDEX-RUNOFF
RAINFALL IN INCHES - 9
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SURFACE RUNOFF- INCHES
RUNOFF INDEX
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WEST SEASON QUADRANT
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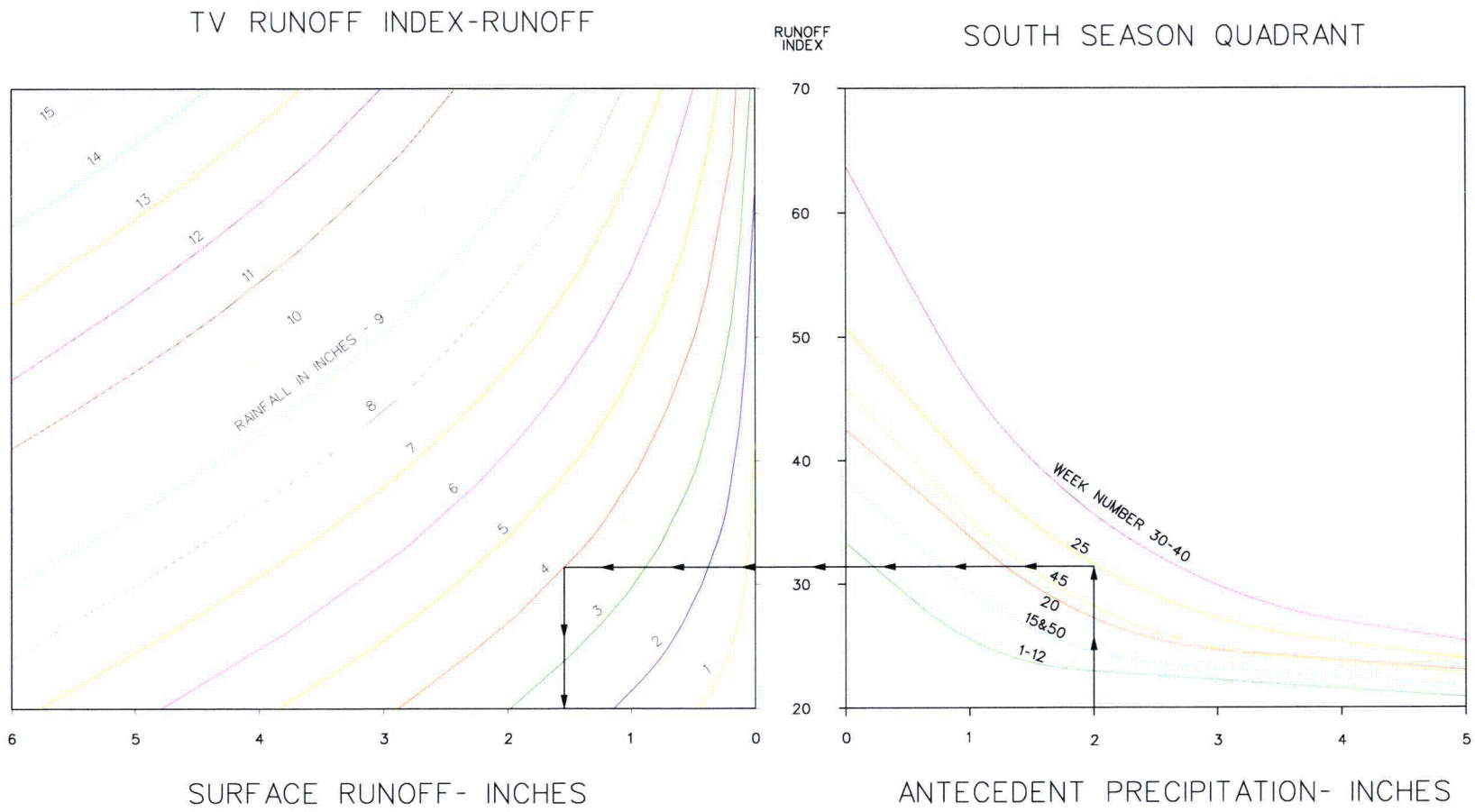
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RAINFALL IN INCHES - 9
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RUNOFF INDEX
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SOUTH SEASON QUADRANT
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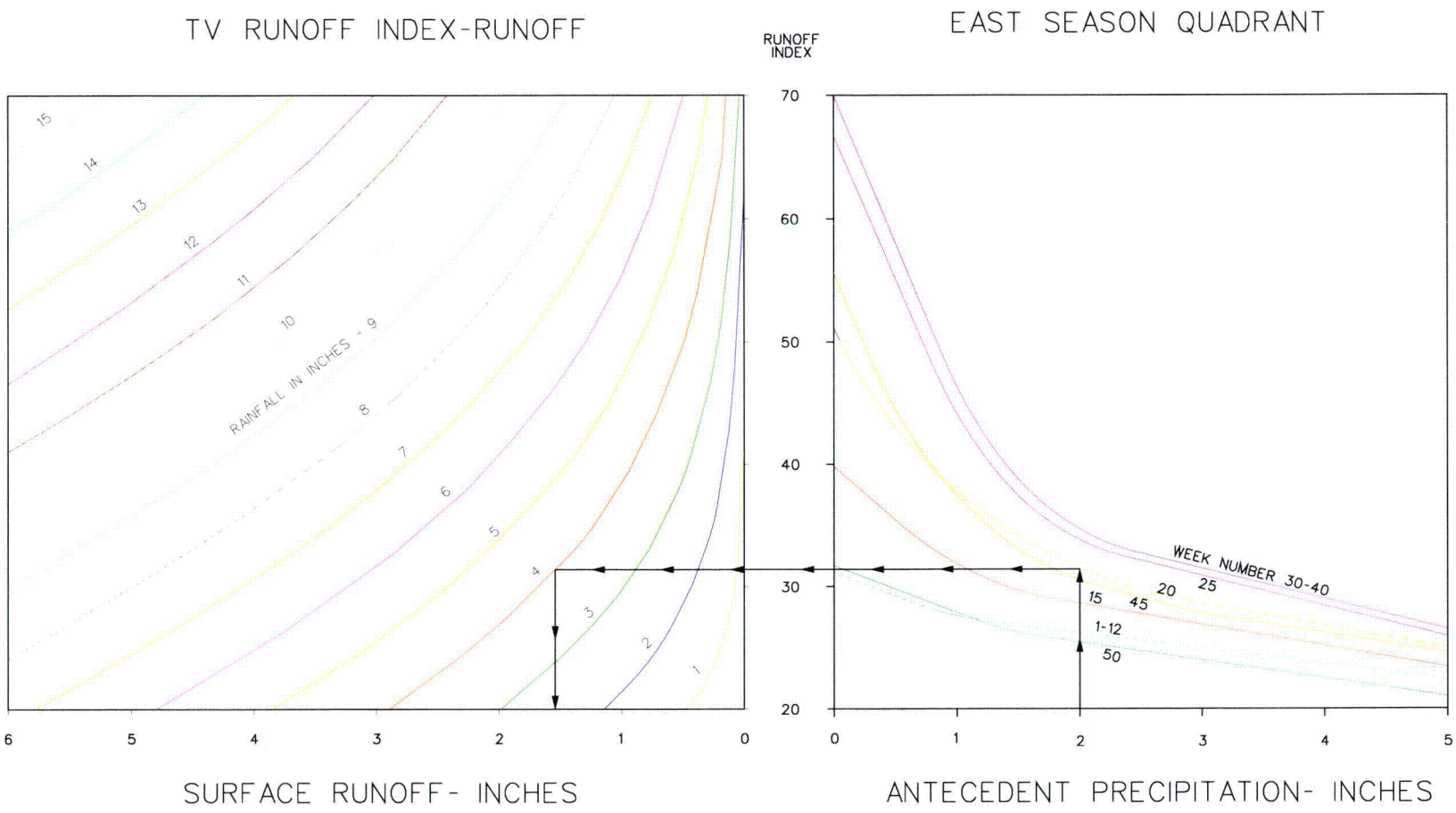
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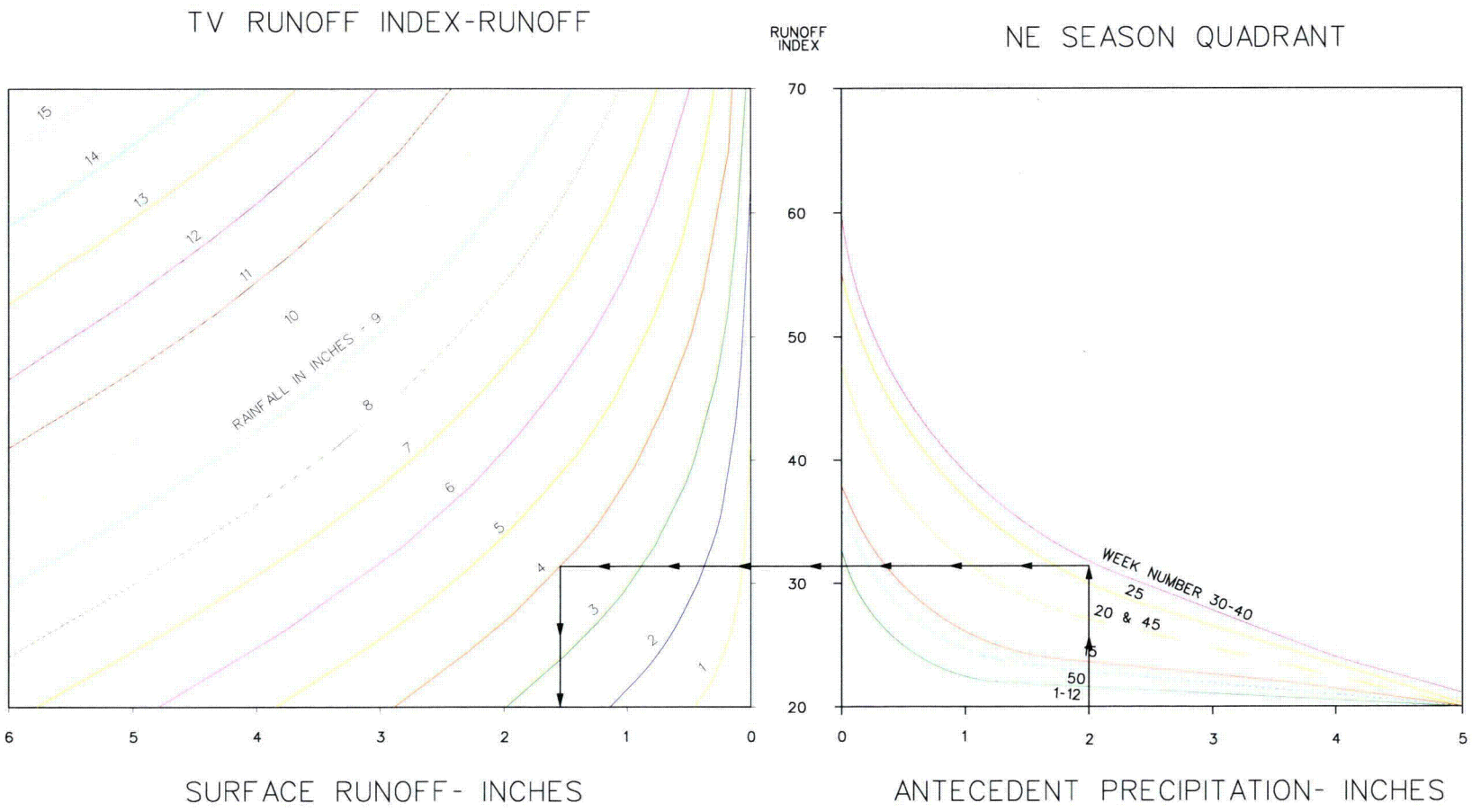
ANTECEDENT PRECIPITATION- INCHES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RAINFALL IN INCHES - 9
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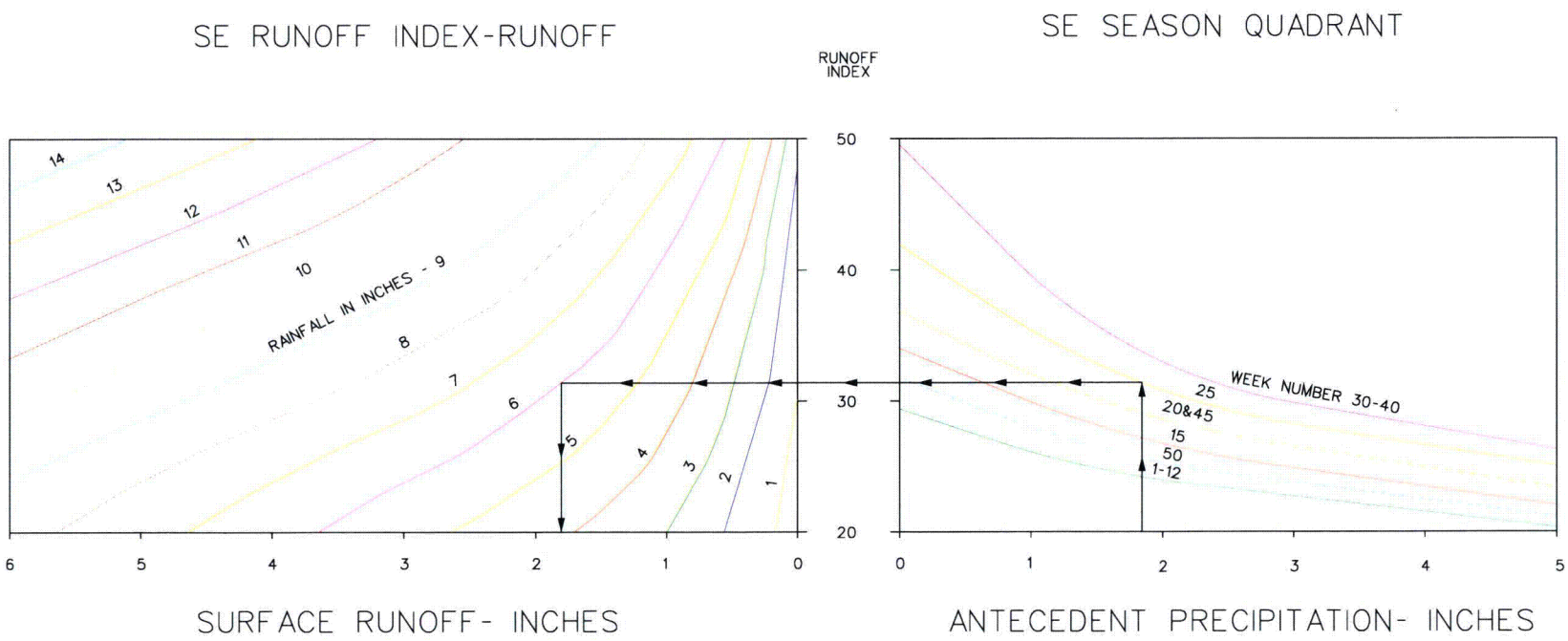
ANTECEDENT PRECIPITATION- INCHES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SE SEASON QUADRANT
RUNOFF INDEX
RAINFALL IN INCHES - 9
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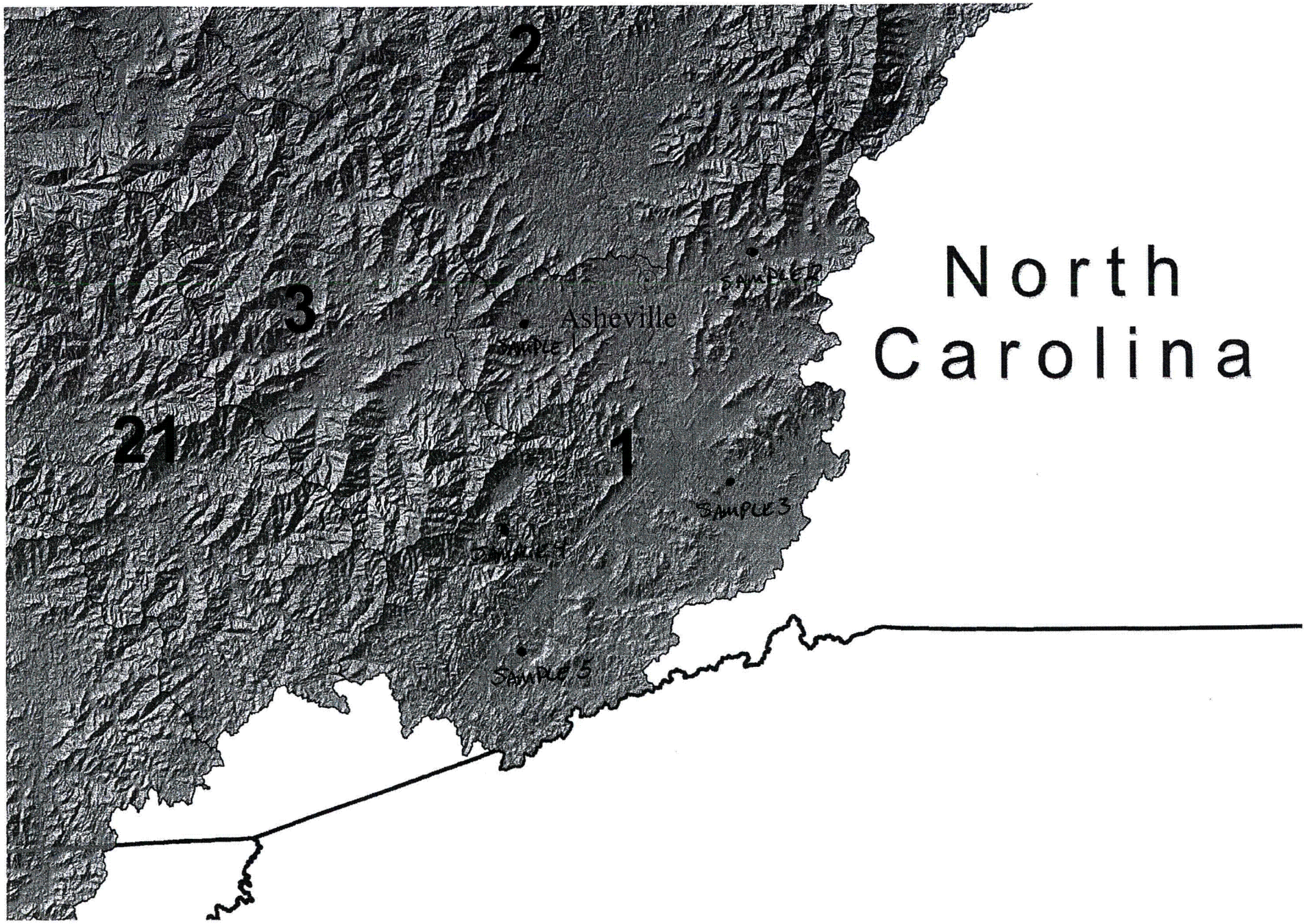
SURFACE RUNOFF- INCHES
ANTECEDENT PRECIPITATION- INCHES


2
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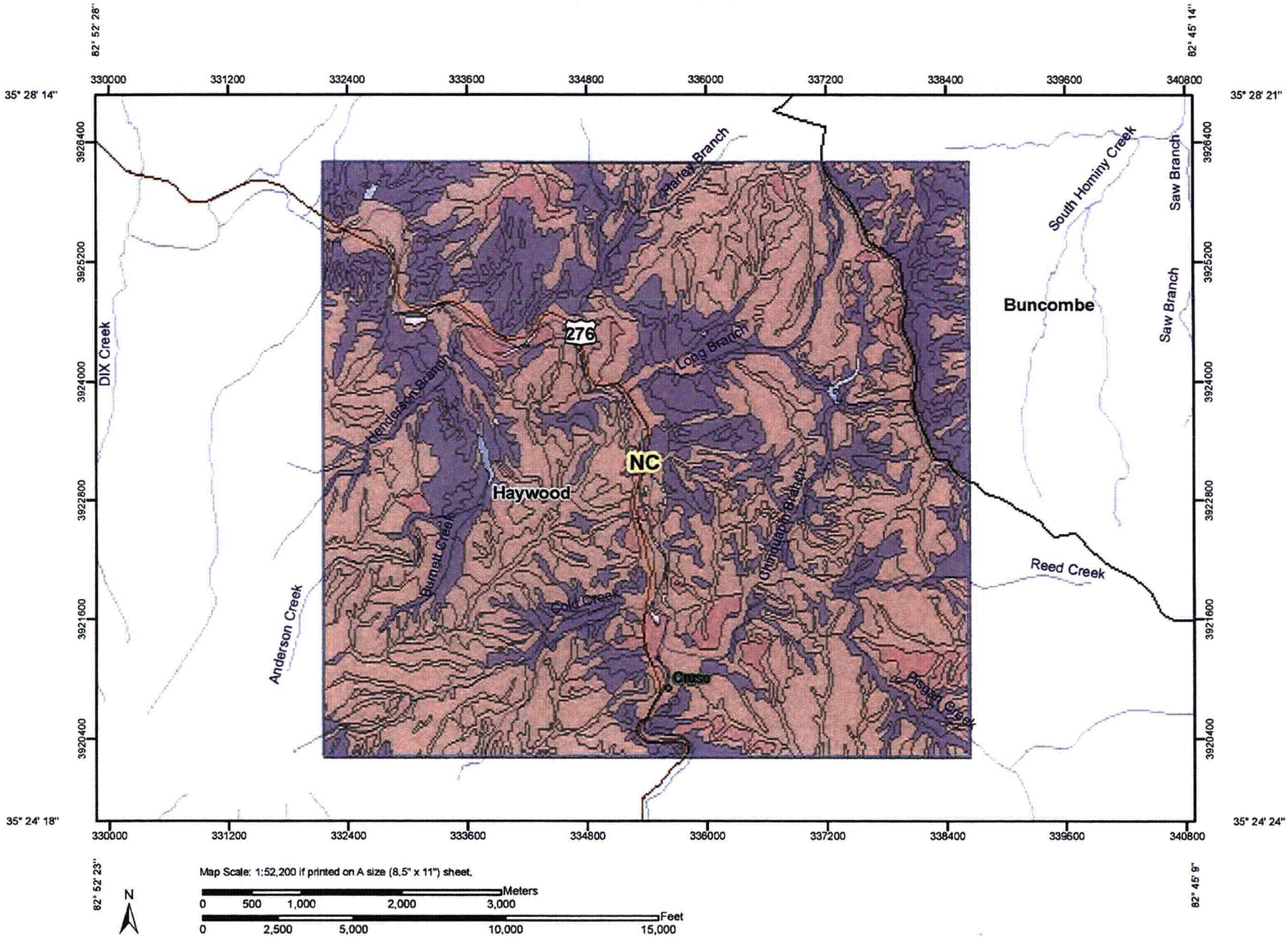
Asheville
SAMPLE 1
SAMPLE 2
SAMPLE 3
SAMPLE 4
SAMPLE 5
North
Carolina

Hydrologic Soil Group—Buncombe County, North Carolina, and Haywood County Area, North Carolina
(French Broad Sample 1)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

12/22/2008
Page 1 of 5

Hydrologic Soil Group–Buncombe County, North Carolina, and Haywood County Area, North Carolina
(French Broad Sample 1)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Buncombe County, North Carolina
Survey Area Data: Version 6, Apr 15, 2008

Soil Survey Area: Haywood County Area, North Carolina
Survey Area Data: Version 8, Feb 20, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group—Summary by Map Unit — Buncombe County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcD	Ashe-Cleveland-Rock outcrop complex, 15 to 30 percent slopes, very stony	B	14.5	0.2%
ArE	Ashe-Cleveland-Rock outcrop complex, 30 to 50 percent slopes, very bouldery	B	13.5	0.1%
ArF	Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	23.2	0.2%
EdD	Edneyville-Chestnut complex, 15 to 30 percent slopes, stony	A	6.1	0.1%
EdE	Edneyville-Chestnut complex, 30 to 50 percent slopes, stony	A	28.0	0.3%
EdF	Edneyville-Chestnut complex, 50 to 95 percent slopes, stony	A	2.1	0.0%
PwC	Porters-Unaka complex, 8 to 15 percent slopes, stony	B	3.1	0.0%
PwD	Porters-Unaka complex, 15 to 30 percent slopes, stony	B	49.8	0.5%
PwE	Porters-Unaka complex, 30 to 50 percent slopes, stony	B	131.4	1.4%
PxF	Porters-Unaka complex, 50 to 95 percent slopes, rocky	B	91.3	1.0%
TkC	Tate loam, 8 to 15 percent slopes, very stony	B	1.5	0.0%
TkD	Tate loam, 15 to 30 percent slopes, very stony	B	3.3	0.0%
TpD	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	38.4	0.4%
TpE	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	83.2	0.9%
TuD	Tusquitee-Toecane complex, 15 to 30 percent slopes, stony	B	2.8	0.0%
TwC	Tusquitee-Whiteside complex, 8 to 15 percent slopes	B	4.3	0.0%
UkE	Unaka-Rock outcrop complex, 30 to 50 percent slopes, very bouldery	B	7.8	0.1%
UkF	Unaka-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	68.4	0.7%
Subtotals for Soil Survey Area			572.6	6.0%
Totals for Area of Interest			9,541.4	100.0%

Hydrologic Soil Group—Summary by Map Unit — Haywood County Area, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BkB2	Braddock clay loam, 2 to 8 percent slopes, eroded	B	16.2	0.2%

Hydrologic Soil Group—Summary by Map Unit — Haywood County Area, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BkC2	Braddock clay loam, 8 to 15 percent slopes, eroded	B	23.3	0.2%
BoD2	Braddock clay loam, 15 to 30 percent slopes, eroded, stony	B	39.8	0.4%
CtD	Cullasaja very cobbly loam, 15 to 30 percent slopes, extremely bouldery	A	29.4	0.3%
CtE	Cullasaja very cobbly loam, 30 to 50 percent slopes, extremely bouldery	A	26.2	0.3%
CxA	Cullowhee-Nikwasi complex, 0 to 2 percent slopes, frequently flooded	B/D	21.3	0.2%
DeA	Dellwood cobbly sandy loam, 0 to 3 percent slopes, occasionally flooded	A	450.8	4.7%
DsB	Dillsboro loam, 2 to 8 percent slopes	B	27.6	0.3%
DsC	Dillsboro loam, 8 to 15 percent slopes	B	12.2	0.1%
EdC	Edneyville-Chestnut complex, 8 to 15 percent slopes, stony	A	7.0	0.1%
EdD	Edneyville-Chestnut complex, 15 to 30 percent slopes, stony	A	342.1	3.6%
EdE	Edneyville-Chestnut complex, 30 to 50 percent slopes, stony	A	1,559.9	16.3%
EdF	Edneyville-Chestnut complex, 50 to 95 percent slopes, stony	A	1,459.6	15.3%
EvD	Evard-Cowee complex, 15 to 30 percent slopes	B	291.6	3.1%
EvE	Evard-Cowee complex, 30 to 50 percent slopes	B	542.2	5.7%
EwF	Evard-Cowee complex, 50 to 95 percent slopes	B	19.3	0.2%
FnE2	Fannin loam, 30 to 50 percent slopes, eroded	B	3.2	0.0%
HaC2	Hayesville clay loam, 8 to 15 percent slopes, eroded	B	18.1	0.2%
HaD2	Hayesville clay loam, 15 to 30 percent slopes, eroded	B	9.8	0.1%
HmA	Hemphill loam, 0 to 3 percent slopes, rarely flooded	D	2.0	0.0%
Pg	Pits	D	68.3	0.7%
PwC	Plott fine sandy loam, 8 to 15 percent slopes, stony	A	2.1	0.0%
PwD	Plott fine sandy loam, 15 to 30 percent slopes, stony	A	57.4	0.6%
PwE	Plott fine sandy loam, 30 to 50 percent slopes, stony	A	366.8	3.8%
PwF	Plott fine sandy loam, 50 to 95 percent slopes, stony	A	1,406.5	14.7%
RfF	Rock outcrop-Ashe-Cleveland complex, 30 to 95 percent slopes	D	254.7	2.7%

Hydrologic Soil Group— Summary by Map Unit — Haywood County Area, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RmF	Rock outcrop-Craggey complex, windswept, 30 to 95 percent slopes	D	0.4	0.0%
RoA	Rosman fine sandy loam, 0 to 2 percent slopes, occasionally flooded	A	133.4	1.4%
ScB	Saunook loam, 2 to 8 percent slopes	B	153.7	1.6%
SdC	Saunook loam, 8 to 15 percent slopes, stony	B	505.9	5.3%
SdD	Saunook loam, 15 to 30 percent slopes, stony	B	757.0	7.9%
SeE	Saunook loam, 30 to 50 percent slopes, very stony	B	82.7	0.9%
SuA	Statler loam, 0 to 3 percent slopes, rarely flooded	B	22.7	0.2%
TcD	Tanasee-Balsam complex, 15 to 30 percent slopes, very stony	A	2.7	0.0%
TrE	Trimont gravelly loam, 30 to 50 percent slopes, stony	B	11.3	0.1%
TrF	Trimont gravelly loam, 50 to 95 percent slopes, stony	B	18.8	0.2%
TuD	Tuckasegee-Cullasaja complex, 15 to 30 percent slopes, very stony	A	87.7	0.9%
TvE	Tuckasegee-Cullasaja complex, 30 to 50 percent slopes, extremely stony	A	64.5	0.7%
W	Water		42.1	0.4%
WaE	Wayah sandy loam, 30 to 50 percent slopes, stony	B	1.8	0.0%
WaF	Wayah sandy loam, 50 to 95 percent slopes, stony	B	18.0	0.2%
WeE	Wayah sandy loam, windswept, 30 to 50 percent slopes, stony	B	3.6	0.0%
WhF2	Wayah loam, windswept, 50 to 95 percent slopes, eroded, stony	B	4.8	0.1%
Subtotals for Soil Survey Area			**8,968.8**	**94.0%**
Totals for Area of Interest			**9,541.4**	**100.0%**

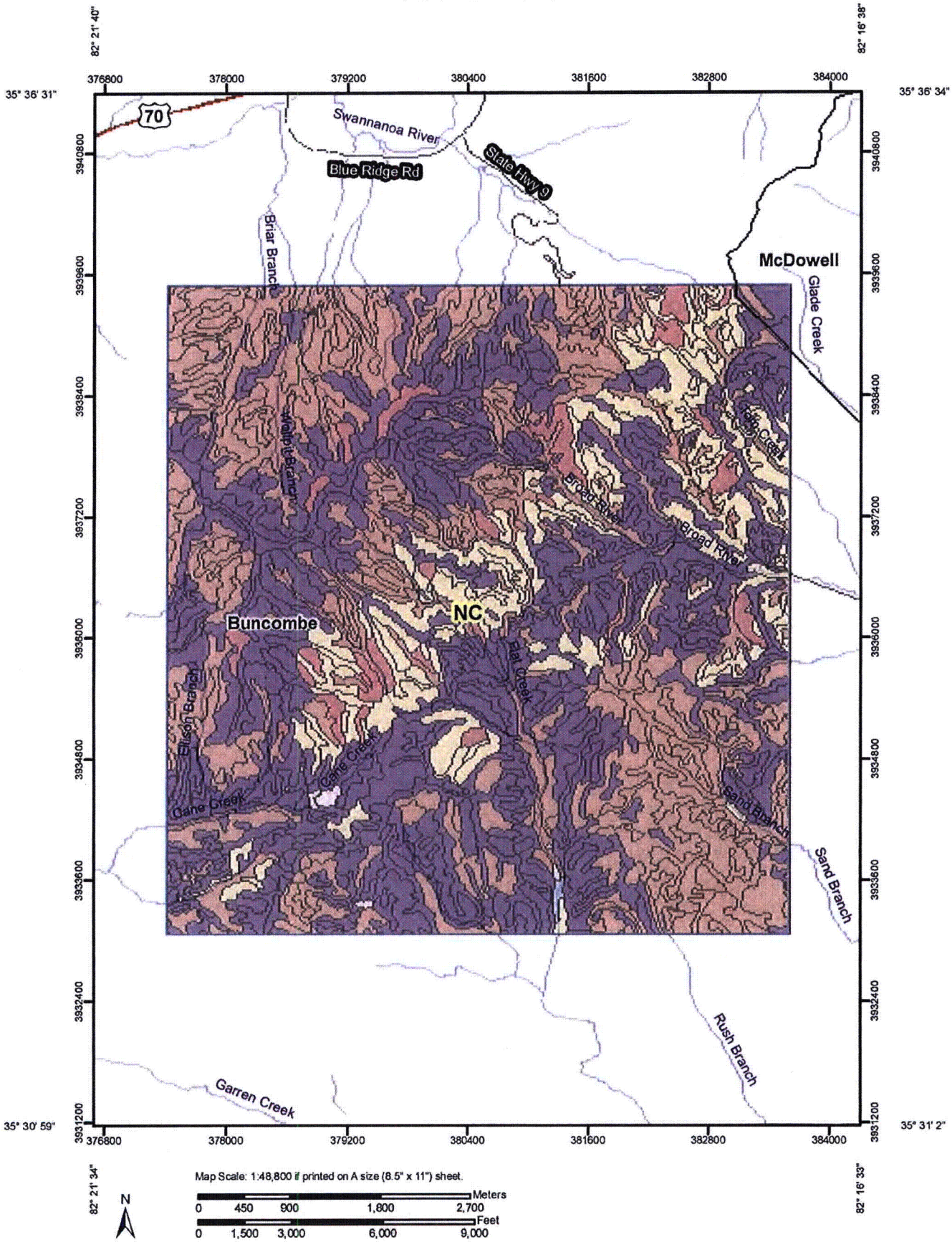
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Buncombe County, North Carolina, and McDowell County, North Carolina
(French Broad Sample 2)



Hydrologic Soil Group–Buncombe County, North Carolina, and McDowell County, North Carolina
(French Broad Sample 2)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
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- States
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- US Routes
- Major Roads

MAP INFORMATION

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The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Buncombe County, North Carolina
Survey Area Data: Version 6, Apr 15, 2008

Soil Survey Area: McDowell County, North Carolina
Survey Area Data: Version 8, Jan 2, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Buncombe County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcD	Ashe-Cleveland-Rock outcrop complex, 15 to 30 percent slopes, very stony	B	114.7	1.2%
ArE	Ashe-Cleveland-Rock outcrop complex, 30 to 50 percent slopes, very bouldery	B	216.6	2.2%
ArF	Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	439.4	4.5%
CaE	Cataska-Sylco complex, 30 to 50 percent slopes, very rocky	D	7.7	0.1%
CdF	Cataska-Sylco-Rock outcrop complex, 50 to 95 percent slopes, very stony	D	231.9	2.4%
CkC2	Clifton clay loam, 8 to 15 percent slopes, moderately eroded	B	19.3	0.2%
DAM	Dam		3.6	0.0%
DeA	Dellwood-Reddies complex, 0 to 3 percent slopes, occasionally flooded	A	67.8	0.7%
DrB	Dillard loam, 1 to 5 percent slopes, rarely flooded	C	4.0	0.0%
EdD	Edneyville-Chestnut complex, 15 to 30 percent slopes, stony	A	419.8	4.3%
EdE	Edneyville-Chestnut complex, 30 to 50 percent slopes, stony	A	901.4	9.2%
EdF	Edneyville-Chestnut complex, 50 to 95 percent slopes, stony	A	912.3	9.3%
EvD2	Evard-Cowee complex, 15 to 30 percent slopes, moderately eroded	B	32.0	0.3%
EvE2	Evard-Cowee complex, 30 to 50 percent slopes, moderately eroded	B	9.4	0.1%
EvF2	Evard-Cowee complex, 50 to 95 percent slopes, moderately eroded	B	3.2	0.0%
EwD	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	350.1	3.6%
EwE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	424.1	4.3%
EwF	Evard-Cowee complex, 50 to 95 percent slopes, stony	B	132.6	1.4%
FaD2	Fannin-Lauada complex, 15 to 30 percent slopes, moderately eroded	B	6.6	0.1%
FaE2	Fannin-Lauada complex, 30 to 50 percent slopes, moderately eroded	B	35.5	0.4%
FrA	French loam, 0 to 3 percent slopes, occasionally flooded	C	27.7	0.3%
JbC	Junaluska-Brasstown complex, 8 to 15 percent slopes	B	20.0	0.2%

Hydrologic Soil Group— Summary by Map Unit — Buncombe County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
JbD	Junaluska-Brasstown complex, 15 to 30 percent slopes	B	455.6	4.6%
JbE	Junaluska-Brasstown complex, 30 to 50 percent slopes	B	601.1	6.1%
NkA	Nikwasi loam, 0 to 2 percent slopes, frequently flooded	B/D	7.2	0.1%
NtD	Northcove-Maymead complex, 15 to 30 percent slopes, very stony	A	265.1	2.7%
NtE	Northcove-Maymead complex, 30 to 50 percent slopes, very stony	A	87.2	0.9%
Pg	Pits, gravel, occasionally flooded		2.1	0.0%
PwC	Porters-Unaka complex, 8 to 15 percent slopes, stony	B	12.5	0.1%
PwD	Porters-Unaka complex, 15 to 30 percent slopes, stony	B	70.1	0.7%
PwE	Porters-Unaka complex, 30 to 50 percent slopes, stony	B	151.3	1.5%
PxF	Porters-Unaka complex, 50 to 95 percent slopes, rocky	B	164.9	1.7%
RkF	Rock outcrop-Cleveland complex, 30 to 95 percent slopes, very bouldery	D	61.8	0.6%
SoD	Soco-Stecoah complex, 15 to 30 percent slopes, stony	B	64.9	0.7%
SoE	Soco-Stecoah complex, 30 to 50 percent slopes, stony	B	129.1	1.3%
SoF	Soco-Stecoah complex, 50 to 95 percent slopes, stony	B	282.7	2.9%
SyD	Sylco-Soco complex, 15 to 30 percent slopes, stony	C	170.5	1.7%
SyE	Sylco-Soco complex, 30 to 50 percent slopes, stony	C	382.8	3.9%
SzF	Sylco-Soco complex, 50 to 95 percent slopes, very stony	C	740.9	7.6%
TaB	Tate loam, 2 to 8 percent slopes	B	15.7	0.2%
TaC	Tate loam, 8 to 15 percent slopes	B	203.9	2.1%
TaD	Tate loam, 15 to 30 percent slopes	B	150.5	1.5%
TkC	Tate loam, 8 to 15 percent slopes, very stony	B	32.2	0.3%
TkD	Tate loam, 15 to 30 percent slopes, very stony	B	62.8	0.6%
ToC	Toecane-Tusquitee complex, 8 to 15 percent slopes, bouldery	A	38.2	0.4%
TpD	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	560.1	5.7%
TpE	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	421.2	4.3%

Hydrologic Soil Group—Summary by Map Unit — Buncombe County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
TuD	Tusquitee-Toecane complex, 15 to 30 percent slopes, stony	B	16.5	0.2%
TwC	Tusquitee-Whiteside complex, 8 to 15 percent slopes	B	10.4	0.1%
Ud	Udorthents, loamy	B	2.7	0.0%
UhE	Udorthents-Urban land complex, 2 to 50 percent slopes	B	13.7	0.1%
UkE	Unaka-Rock outcrop complex, 30 to 50 percent slopes, very bouldery	B	28.3	0.3%
UkF	Unaka-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	148.3	1.5%
W	Water		16.4	0.2%
Subtotals for Soil Survey Area			**9,750.4**	**99.5%**
Totals for Area of Interest			**9,803.8**	**100.0%**

Hydrologic Soil Group—Summary by Map Unit — McDowell County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EcF	Edneyville-Chestnut complex, 25 to 80 percent slopes, stony	A	10.5	0.1%
JbE	Junaluska-Brasstown complex, 25 to 60 percent slopes	B	32.6	0.3%
LnC	Lonon-Northcove complex, 6 to 15 percent slopes	B	10.3	0.1%
Subtotals for Soil Survey Area			**53.4**	**0.5%**
Totals for Area of Interest			**9,803.8**	**100.0%**

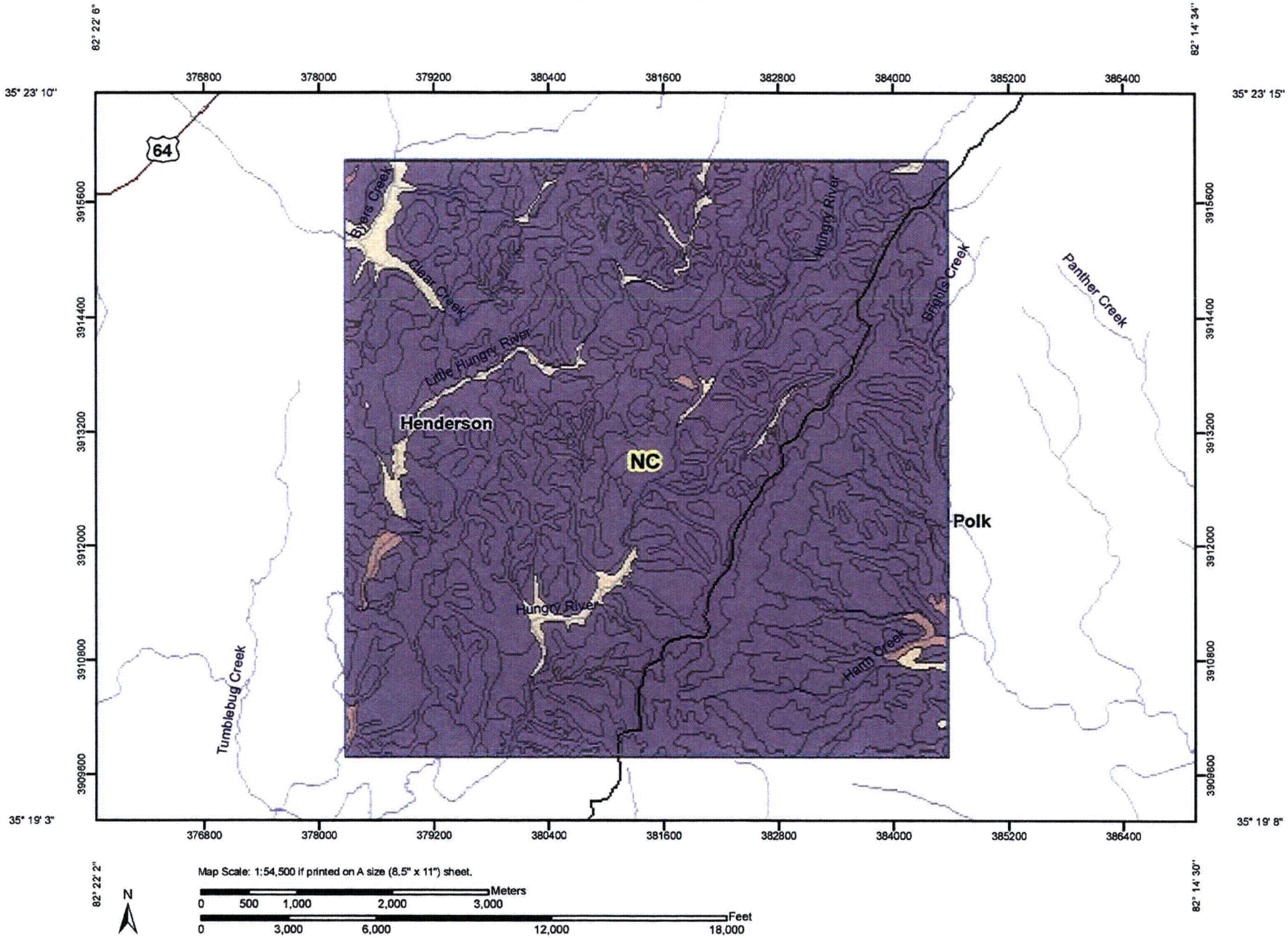
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Henderson County, North Carolina, and Polk County, North Carolina
(French Broad Sample 3)



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Hydrologic Soil Group–Henderson County, North Carolina, and Polk County, North Carolina
(French Broad Sample 3)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:54,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:20,000 to 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, North Carolina
Survey Area Data: Version 7, May 21, 2008

Soil Survey Area: Polk County, North Carolina
Survey Area Data: Version 8, Jan 22, 2007

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Henderson County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AhE	Ashe stony sandy loam, 15 to 25 percent slopes	B	321.7	3.3%
AhF	Ashe stony sandy loam, 25 to 45 percent slopes	B	814.4	8.4%
AhG	Ashe stony sandy loam, 45 to 70 percent slopes	B	945.0	9.8%
BaB	Bradson gravelly loam, 2 to 7 percent slopes	B	44.1	0.5%
BrE	Brevard loam, 15 to 25 percent slopes	B	31.5	0.3%
CaG	Chandler stony loam, 45 to 70 percent slopes	A	5.6	0.1%
CfE	Clifton (Evard) stony loam, 15 to 25 percent slopes	B	98.6	1.0%
CfF	Clifton (Evard) stony loam, 25 to 45 percent slopes	B	80.2	0.8%
Co	Codorus loam (Arkaqua)	C	296.7	3.1%
Cu	Comus (Colvard) fine sandy loam	A	35.9	0.4%
DeB	Delanco (Dillard) loam, 2 to 7 percent slopes	C	7.1	0.1%
EdC	Edneyville (Edneytown) fine sandy loam, 7 to 15 percent slopes	B	351.6	3.6%
EdE	Edneyville (Edneytown) fine sandy loam, 15 to 25 percent slopes	B	674.6	7.0%
EdF	Edneyville (Edneytown) fine sandy loam, 25 to 45 percent slopes	B	403.9	4.2%
EnB	Elsinboro loam, 0 to 3 percent slopes	B	34.4	0.4%
EvC	Evard fine sandy loam, 7 to 15 percent slopes	B	226.0	2.3%
EwE	Evard soils, 15 to 25 percent slopes	B	699.2	7.2%
EwF	Evard soils, 25 to 45 percent slopes	B	1,131.4	11.7%
EwG	Evard soils, 45 to 70 percent slopes	B	8.7	0.1%
Ha	Hatboro loam	D	2.5	0.0%
HyB	Hayesville loam, 2 to 7 percent slopes	B	106.1	1.1%
HyC	Hayesville loam, 7 to 15 percent slopes	B	222.3	2.3%
HyE	Hayesville loam, 15 to 25 percent slopes	B	6.7	0.1%
Ko	Kinkora loam	D	2.7	0.0%
TeB	Tate fine sandy loam, 2 to 7 percent slopes	B	108.6	1.1%
TeC	Tate fine sandy loam, 7 to 15 percent slopes	B	124.1	1.3%

Hydrologic Soil Group— Summary by Map Unit — Henderson County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
TsC	Tusquitee loam, 7 to 15 percent slopes	B	1.7	0.0%
TuE	Tusquitee stony loam, 15 to 25 percent slopes	B	212.5	2.2%
W	Water		1.2	0.0%
Subtotals for Soil Survey Area			**6,998.9**	**72.4%**
Totals for Area of Interest			**9,666.1**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — Polk County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AsF	Ashe-Cleveland-Rock outcrop complex, 50 to 95 percent slopes	B	357.4	3.7%
CxD	Cliffield-Cowee complex, 15 to 30 percent slopes, very stony	B	493.0	5.1%
DoB	Dogue-Roanoke complex, 0 to 6 percent slopes, rarely flooded	C	2.4	0.0%
EvD	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	58.0	0.6%
EvE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	589.7	6.1%
EvF	Evard-Cowee complex, 50 to 85 percent slopes, stony	B	24.5	0.3%
MsB	Masada sandy loam, 2 to 8 percent slopes	C	15.6	0.2%
OsA	Ostin loamy sand, 1 to 3 percent slopes, occasionally flooded	A	33.7	0.3%
PaC2	Pacolet sandy clay loam, 8 to 15 percent slopes, eroded	B	41.7	0.4%
PaD2	Pacolet sandy clay loam, 15 to 25 percent slopes, eroded	B	18.4	0.2%
RnE	Rion sandy loam, 25 to 45 percent slopes	B	91.8	0.9%
TaC	Tate-Greenlee complex, 8 to 15 percent slopes, extremely stony	B	117.2	1.2%
TaD	Tate-Greenlee complex, 15 to 30 percent slopes, extremely stony	B	230.8	2.4%
TgE	Tate-Greenlee complex, 30 to 60 percent slopes, extremely bouldery	B	593.0	6.1%
Subtotals for Soil Survey Area			**2,667.2**	**27.6%**
Totals for Area of Interest			**9,666.1**	**100.0%**

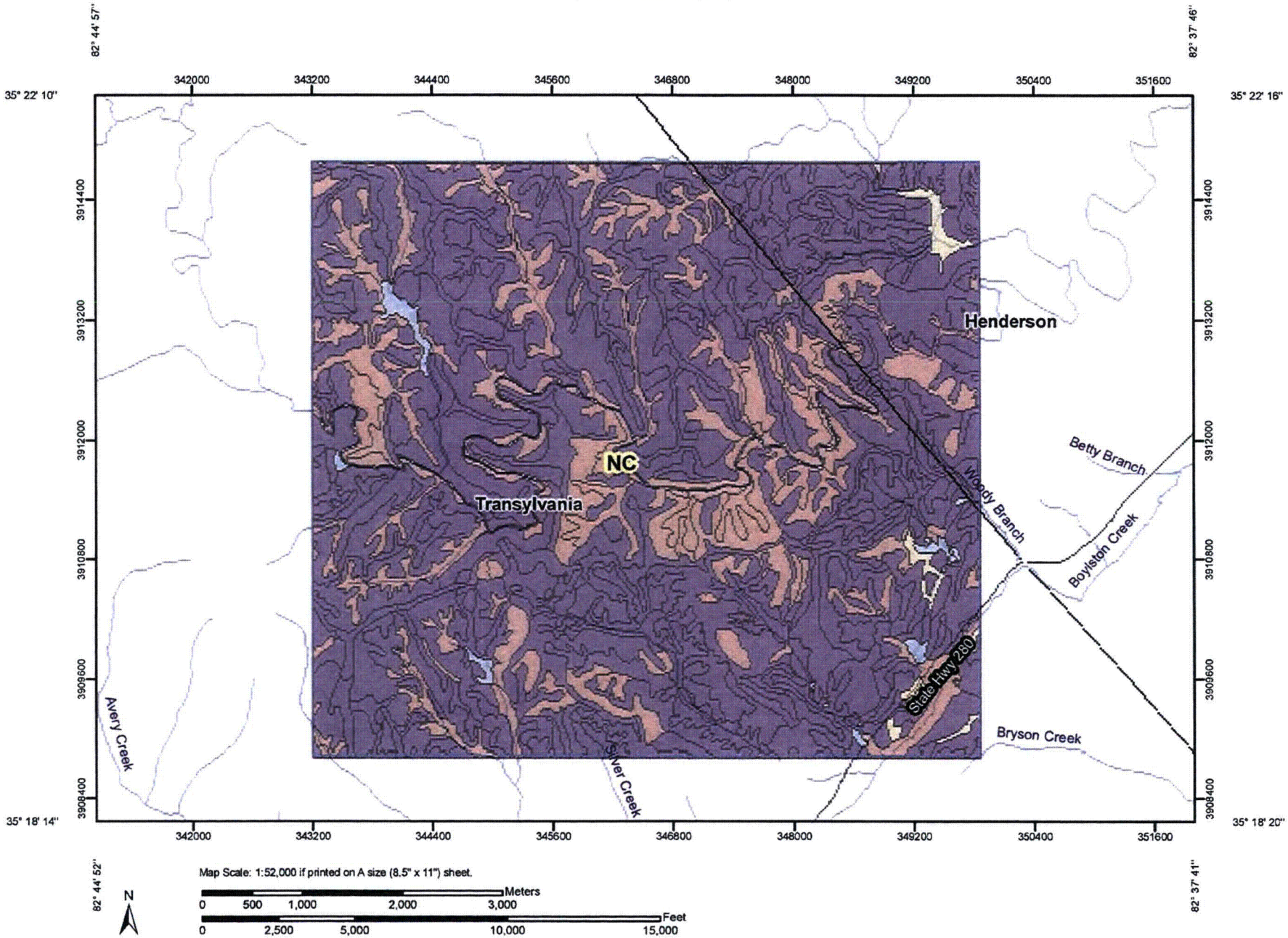
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Henderson County, North Carolina, and Transylvania County, North Carolina
(French Broad Sample 4)



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Hydrologic Soil Group–Henderson County, North Carolina, and Transylvania County, North Carolina
(French Broad Sample 4)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,000 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, North Carolina
Survey Area Data: Version 7, May 21, 2008

Soil Survey Area: Transylvania County, North Carolina
Survey Area Data: Version 7, Aug 26, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Henderson County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AhG	Ashe stony sandy loam, 45 to 70 percent slopes	B	276.7	2.8%
BrE	Brevard loam, 15 to 25 percent slopes	B	11.0	0.1%
BrF	Brevard loam, 25 to 45 percent slopes	B	17.0	0.2%
CaG	Chandler stony loam, 45 to 70 percent slopes	A	53.1	0.5%
Co	Codorus loam (Arkaqua)	C	38.8	0.4%
EdE	Edneyville (Edneytown) fine sandy loam, 15 to 25 percent slopes	B	53.9	0.6%
EdF	Edneyville (Edneytown) fine sandy loam, 25 to 45 percent slopes	B	173.6	1.8%
EwF	Evard soils, 25 to 45 percent slopes	B	56.5	0.6%
FaE	Fannin silt loam, 15 to 25 percent slopes	B	19.8	0.2%
FaF	Fannin silt loam, 25 to 45 percent slopes	B	87.1	0.9%
HyE	Hayesville loam, 15 to 25 percent slopes	B	3.8	0.0%
PoE	Porters stony loam, 15 to 25 percent slopes	B	1.1	0.0%
PoF	Porters stony loam, 25 to 45 percent slopes	B	1.8	0.0%
PoG	Porters stony loam, 45 to 70 percent slopes	B	128.3	1.3%
Ro	Rosman loam	A	100.1	1.0%
TsC	Tusquitee loam, 7 to 15 percent slopes	B	10.2	0.1%
TsE	Tusquitee loam, 15 to 25 percent slopes	B	143.5	1.5%
TuE	Tusquitee stony loam, 15 to 25 percent slopes	B	40.7	0.4%
TuF	Tusquitee stony loam, 25 to 45 percent slopes	B	22.1	0.2%
Subtotals for Soil Survey Area			**1,239.0**	**12.7%**
Totals for Area of Interest			**9,773.3**	**100.0%**

Hydrologic Soil Group— Summary by Map Unit — Transylvania County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AeE	Chestnut-Edneyville complex, 15 to 30 percent slopes, stony	B	110.0	1.1%
AhF	Ashe-Chestnut complex, 30 to 50 percent slopes, very rocky	B	50.1	0.5%
AhG	Ashe-Chestnut complex, 50 to 95 percent slopes, very rocky	B	1,179.5	12.1%

Hydrologic Soil Group—Summary by Map Unit — Transylvania County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnE	Ashe-Edneyville complex, 15 to 30 percent slopes, rocky	B	148.9	1.5%
AnF	Ashe-Edneyville complex, 30 to 50 percent slopes, very rocky	B	512.1	5.2%
AuA	Augusta fine sandy loam, cool variant, 1 to 4 percent slopes, rarely flooded	C	15.6	0.2%
BrF	Unaka-Porters complex 30 to 50 percent slopes, very rocky	B	161.4	1.7%
BrG	Unaka-Porters complex, 50 to 95 percent slopes, very rocky	B	1,084.9	11.1%
BvB	Braddock loam, 2 to 8 percent slopes	B	18.2	0.2%
BvC	Braddock loam, 8 to 15 percent slopes	B	25.8	0.3%
BvE	Brevard loam, 10 to 25 percent slopes	B	218.7	2.2%
BvF	Brevard loam, 25 to 45 percent slopes	B	100.3	1.0%
ByG	Burton-Wayah complex, windswept, 30 to 50 percent slopes, stony	B	2.0	0.0%
CdE	Chandler-Micaville complex, 15 to 30 percent slopes, stony	A	83.6	0.9%
CeG	Chandler-Micaville complex, 50 to 95 percent slopes, stony	A	598.5	6.1%
CfF	Chandler-Micaville complex, 30 to 50 percent slopes, stony	A	9.1	0.1%
ChD	Evard loam, 8 to 15 percent slopes, stony	B	5.5	0.1%
ChE	Evard loam, 15 to 30 percent slopes, stony	B	41.6	0.4%
ChF	Evard loam, 30 to 50 percent slopes, stony	B	261.0	2.7%
CrE	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	25.0	0.3%
CrF	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	118.8	1.2%
DeB	Dillard loam, 1 to 5 percent slopes, rarely flooded	C	27.8	0.3%
EdG	Chestnut-Edneyville complex, 50 to 95 percent slopes, stony	B	108.9	1.1%
FaE	Fannin fine sandy loam, 15 to 30 percent slopes	B	133.7	1.4%
FaF	Fannin fine sandy loam, 30 to 50 percent slopes	B	613.6	6.3%
FaG	Fannin fine sandy loam, 50 to 95 percent slopes	B	120.1	1.2%
FfE	Brasstown-Junaluska complex, 15 to 30 percent slopes	B	24.6	0.3%
HaE	Hayesville loam, 15 to 30 percent slopes	B	120.1	1.2%
HaF	Hayesville loam, 30 to 50 percent slopes	B	193.8	2.0%

Hydrologic Soil Group—Summary by Map Unit — Transylvania County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HcE3	Hayesville clay loam, 15 to 30 percent slopes, moderately eroded	B	7.8	0.1%
HdE	Cullasaja-Tuckasegee complex, 15 to 30 percent slopes, very stony	A	40.3	0.4%
HdF	Cullasaja-Tuckasegee complex, 30 to 50 percent slopes, very stony	A	52.1	0.5%
PoE	Porters loam, 15 to 30 percent slopes, stony	B	40.8	0.4%
PoF	Porters loam, 30 to 50 percent slopes, stony	B	107.6	1.1%
PrF	Porters-Unaka complex, 30 to 50 percent slopes, rocky	B	60.5	0.6%
Ro	Rosman fine sandy loam, 0 to 2 percent slopes, frequently flooded	A	227.3	2.3%
Rs	Dellwood-Reddies complex, 0 to 5 percent slopes, occasionally flooded	A	7.2	0.1%
St	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slope, very bouldery	B	97.0	1.0%
TaF	Junaluska-Tsali complex, 30 to 50 percent slopes	B	16.7	0.2%
TcG	Sylco-Cataska complex, 50 to 95 percent slopes	C	10.9	0.1%
TeB	Tate fine sandy loam, 2 to 8 percent slopes	B	16.5	0.2%
TeD	Tate fine sandy loam, 8 to 15 percent slopes	B	43.4	0.4%
Tn	Toxaway loam, 0 to 2 percent slopes, frequently flooded	B/D	39.3	0.4%
To	Cullowhee-Ela complex, 0 to 3 percent slopes, occasionally flooded	B/D	32.7	0.3%
Tr	Transylvania silt loam, 0 to 2 percent slopes, frequently flooded	B	15.4	0.2%
TsD	Saunook loam, 8 to 15 percent slopes	B	107.6	1.1%
TsE	Saunook loam, 15 to 30 percent slopes, stony	B	303.8	3.1%
TuD	Toecane-Tusquitee complex, 8 to 15 percent slopes, bouldery	A	59.8	0.6%
TuE	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	369.7	3.8%
TuF	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	528.4	5.4%
W	Water		59.7	0.6%
WaE	Watauga loam, 15 to 30 percent slopes	B	12.6	0.1%
WaF	Watauga sandy loam, 30 to 50 percent slopes, stony	B	164.3	1.7%
Subtotals for Soil Survey Area			**8,534.3**	**87.3%**
Totals for Area of Interest			**9,773.3**	**100.0%**

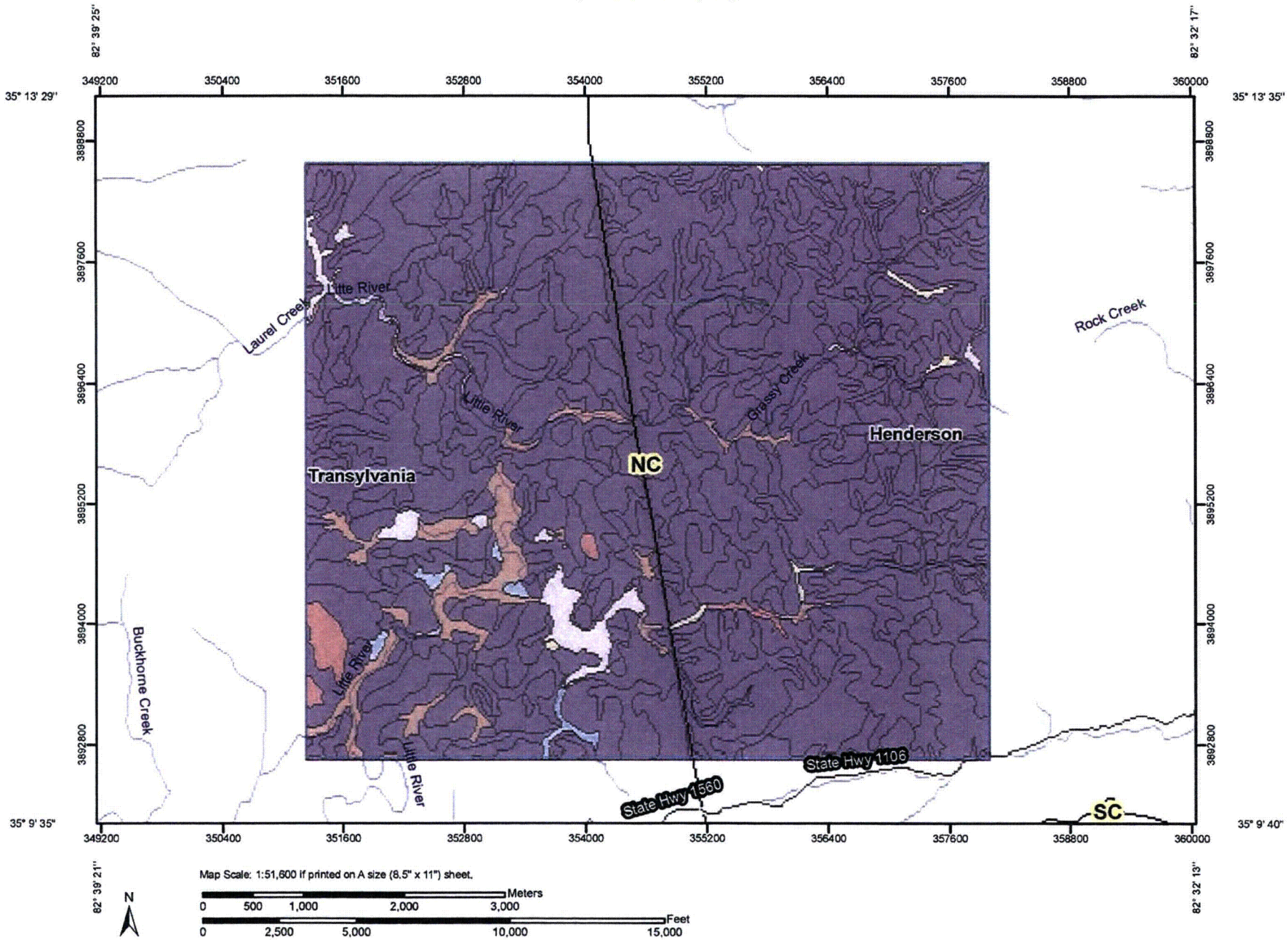
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Henderson County, North Carolina, and Transylvania County, North Carolina
(French Broad Sample 5)



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Hydrologic Soil Group–Henderson County, North Carolina, and Transylvania County, North Carolina
(French Broad Sample 5)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:51,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at scales ranging from 1:12,000 to 1:20,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Henderson County, North Carolina
Survey Area Data: Version 7, May 21, 2008

Soil Survey Area: Transylvania County, North Carolina
Survey Area Data: Version 7, Aug 26, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Henderson County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AhE	Ashe stony sandy loam, 15 to 25 percent slopes	B	1,117.0	11.3%
AhF	Ashe stony sandy loam, 25 to 45 percent slopes	B	893.5	9.1%
AhG	Ashe stony sandy loam, 45 to 70 percent slopes	B	14.2	0.1%
ArG	Ashe-Rock outcrop complex, 15 to 70 percent slopes	B	235.8	2.4%
CfE	Clifton (Evard) stony loam, 15 to 25 percent slopes	B	117.0	1.2%
CfF	Clifton (Evard) stony loam, 25 to 45 percent slopes	B	108.5	1.1%
Co	Codorus loam (Arkaqua)	C	30.6	0.3%
EdC	Edneyville (Edneytown) fine sandy loam, 7 to 15 percent slopes	B	1,224.3	12.4%
EdE	Edneyville (Edneytown) fine sandy loam, 15 to 25 percent slopes	B	249.6	2.5%
EvC	Evard fine sandy loam, 7 to 15 percent slopes	B	78.4	0.8%
EwE	Evard soils, 15 to 25 percent slopes	B	104.9	1.1%
EwF	Evard soils, 25 to 45 percent slopes	B	193.9	2.0%
EwG	Evard soils, 45 to 70 percent slopes	B	24.2	0.2%
Ha	Hatboro loam	D	16.4	0.2%
HyB	Hayesville loam, 2 to 7 percent slopes	B	36.0	0.4%
HyC	Hayesville loam, 7 to 15 percent slopes	B	97.4	1.0%
PoF	Porters stony loam, 25 to 45 percent slopes	B	29.8	0.3%
PoG	Porters stony loam, 45 to 70 percent slopes	B	54.6	0.6%
Su	Suncook loamy sand (Biltmore)	A	29.8	0.3%
TeB	Tate fine sandy loam, 2 to 7 percent slopes	B	72.5	0.7%
TeC	Tate fine sandy loam, 7 to 15 percent slopes	B	109.6	1.1%
TsC	Tusquitee loam, 7 to 15 percent slopes	B	7.5	0.1%
TsE	Tusquitee loam, 15 to 25 percent slopes	B	33.2	0.3%
TuE	Tusquitee stony loam, 15 to 25 percent slopes	B	124.2	1.3%
W	Water		9.1	0.1%

Hydrologic Soil Group—Summary by Map Unit — Henderson County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Subtotals for Soil Survey Area			5,012.1	50.9%
Totals for Area of Interest			9,848.3	100.0%

Hydrologic Soil Group—Summary by Map Unit — Transylvania County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AeD	Chestnut-Edneyville complex, 8 to 15 percent slopes, stony	B	208.5	2.1%
AeE	Chestnut-Edneyville complex, 15 to 30 percent slopes, stony	B	498.5	5.1%
AeF	Chestnut-Edneyville complex, 30 to 50 percent slopes, stony	B	739.7	7.5%
AhF	Ashe-Chestnut complex, 30 to 50 percent slopes, very rocky	B	293.7	3.0%
AhG	Ashe-Chestnut complex, 50 to 95 percent slopes, very rocky	B	243.1	2.5%
AnD	Ashe-Edneyville complex, 8 to 15 percent slopes, rocky	B	307.6	3.1%
AnE	Ashe-Edneyville complex, 15 to 30 percent slopes, rocky	B	292.3	3.0%
AnF	Ashe-Edneyville complex, 30 to 50 percent slopes, very rocky	B	68.5	0.7%
BrG	Unaka-Porters complex, 50 to 95 percent slopes, very rocky	B	147.2	1.5%
BvB	Braddock loam, 2 to 8 percent slopes	B	4.1	0.0%
BvC	Braddock loam, 8 to 15 percent slopes	B	11.9	0.1%
BvE	Brevard loam, 10 to 25 percent slopes	B	25.6	0.3%
ChD	Evard loam, 8 to 15 percent slopes, stony	B	255.7	2.6%
ChE	Evard loam, 15 to 30 percent slopes, stony	B	199.8	2.0%
ChF	Evard loam, 30 to 50 percent slopes, stony	B	25.4	0.3%
CrE	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	127.6	1.3%
CrF	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	182.3	1.9%
DeB	Dillard loam, 1 to 5 percent slopes, rarely flooded	C	2.5	0.0%
HaD	Hayesville loam, 8 to 15 percent slopes	B	13.2	0.1%
HaE	Hayesville loam, 15 to 30 percent slopes	B	72.8	0.7%
HaF	Hayesville loam, 30 to 50 percent slopes	B	65.2	0.7%
HcE3	Hayesville clay loam, 15 to 30 percent slopes, moderately eroded	B	40.3	0.4%
PoE	Porters loam, 15 to 30 percent slopes, stony	B	3.5	0.0%
PoF	Porters loam, 30 to 50 percent slopes, stony	B	37.6	0.4%

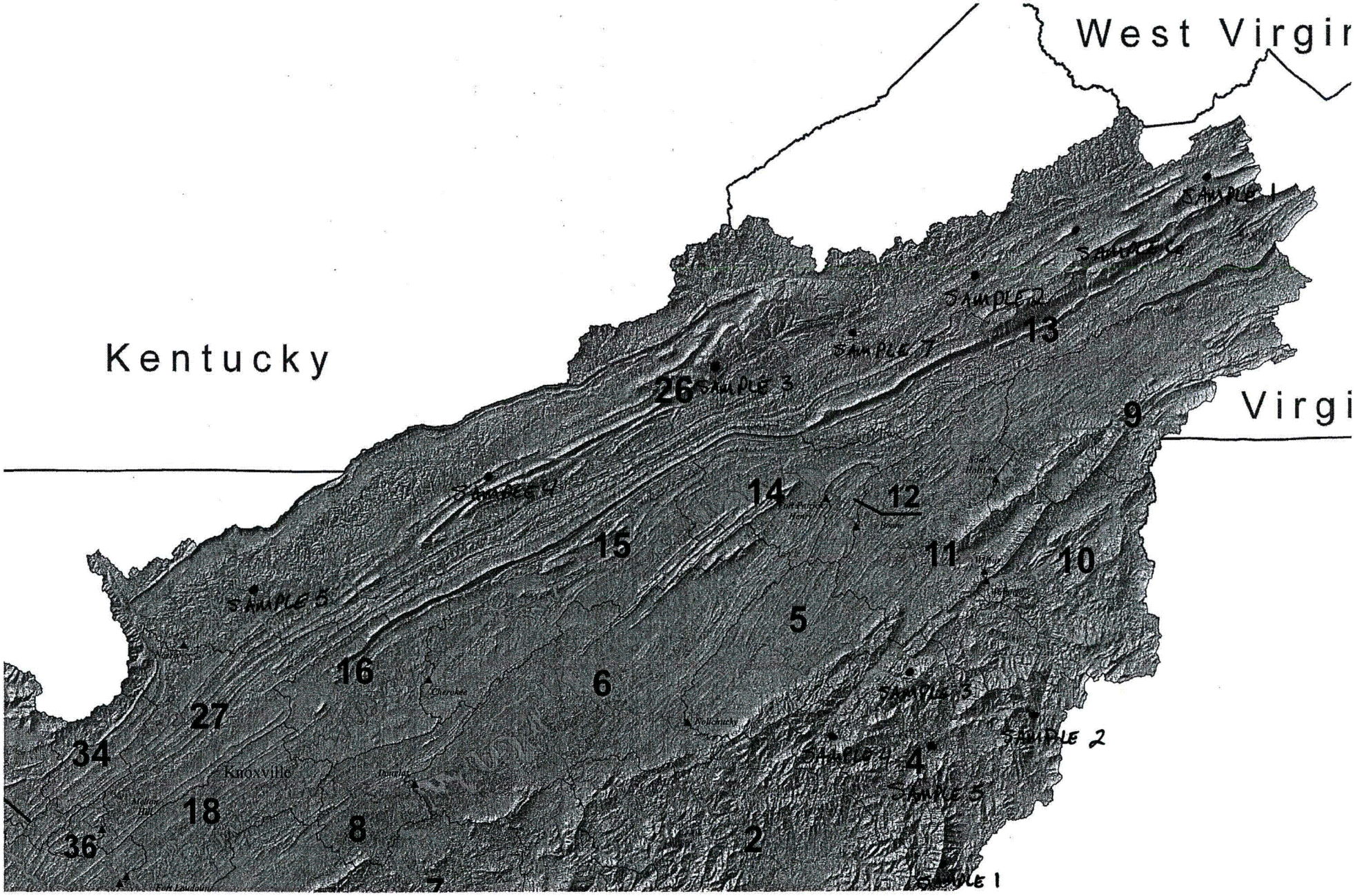
Hydrologic Soil Group—Summary by Map Unit — Transylvania County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PrF	Porters-Unaka complex, 30 to 50 percent slopes, rocky	B	32.3	0.3%
Rk	Rock outcrop-Cleveland complex, 30 to 95 percent slopes, very bouldery	D	68.8	0.7%
Ro	Rosman fine sandy loam, 0 to 2 percent slopes, frequently flooded	A	251.9	2.6%
Rs	Dellwood-Reddies complex, 0 to 5 percent slopes, occasionally flooded	A	61.7	0.6%
St	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slope, very bouldery	B	168.1	1.7%
TeB	Tate fine sandy loam, 2 to 8 percent slopes	B	13.2	0.1%
TeD	Tate fine sandy loam, 8 to 15 percent slopes	B	11.7	0.1%
TeE	Tate fine sandy loam, 15 to 30 percent slopes	B	22.7	0.2%
Tn	Toxaway loam, 0 to 2 percent slopes, frequently flooded	B/D	51.4	0.5%
Tr	Transylvania silt loam, 0 to 2 percent slopes, frequently flooded	B	7.5	0.1%
TsD	Saunook loam, 8 to 15 percent slopes	B	46.3	0.5%
TsE	Saunook loam, 15 to 30 percent slopes, stony	B	13.4	0.1%
TuE	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	26.6	0.3%
TuF	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	7.8	0.1%
W	Water		186.4	1.9%
Subtotals for Soil Survey Area			**4,836.2**	**49.1%**
Totals for Area of Interest			**9,848.3**	**100.0%**

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower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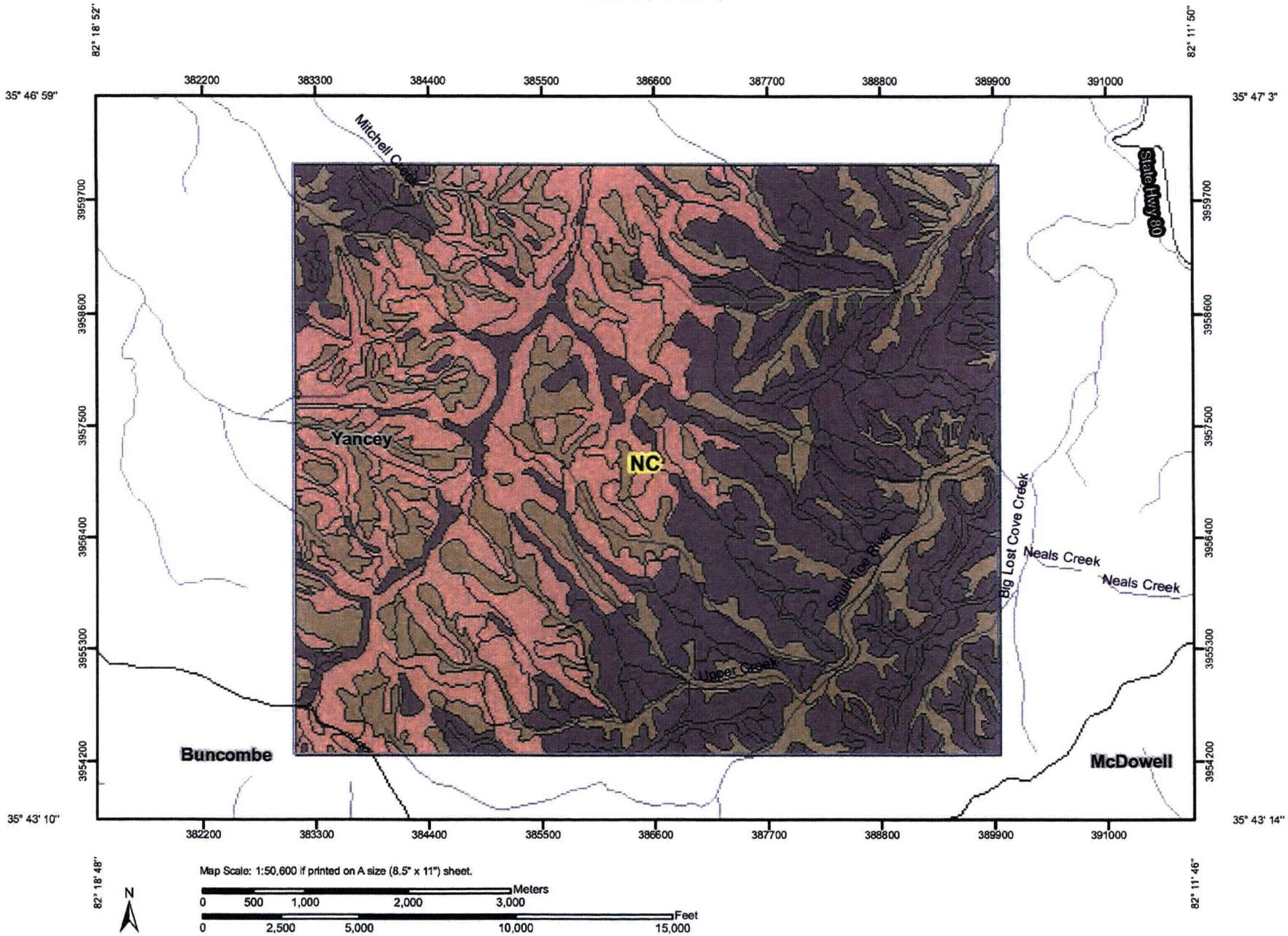
Knoxville

Soil Properties and Qualities—Buncombe County, North Carolina, and Yancey County, North Carolina
(Nolichucky Sample 1)



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National Cooperative Soil Survey

1/22/2009
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Soil Properties and Qualities–Buncombe County, North Carolina, and Yancey County, North Carolina
(Nolichucky Sample 1)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:50,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Buncombe County, North Carolina
Survey Area Data: Version 6, Apr 15, 2008

Soil Survey Area: Yancey County, North Carolina
Survey Area Data: Version 9, Jan 31, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

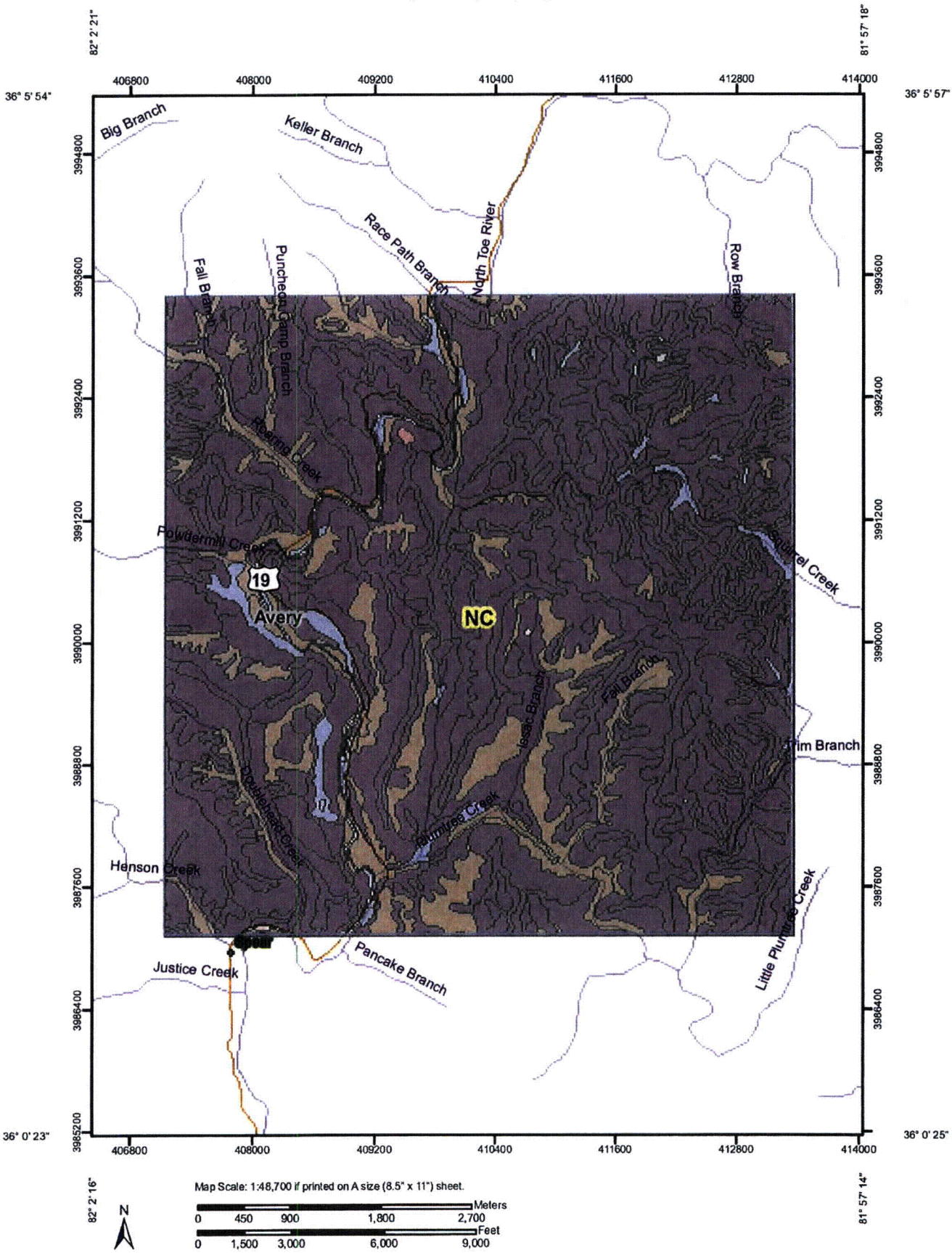
Soil Properties and Qualities

Soil Properties and Qualities— Summary by Map Unit — Buncombe County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BaE	Balsam-Tanasee complex, 30 to 50 percent slopes, extremely bouldery	A	1.2	0.0%
BwD	Burton-Craggey complex, windswept, 15 to 30 percent slopes, rocky	B	2.9	0.0%
BxE	Burton-Craggey-Rock outcrop complex, windswept, 30 to 50 percent slopes, very bouldery	D	4.7	0.0%
BxF	Burton-Craggey-Rock outcrop complex, windswept, 50 to 95 percent slopes, very bouldery	D	3.6	0.0%
CxE	Craggey-Rock outcrop-Clingman complex, windswept, 30 to 50 percent slopes, rubbly	D	12.1	0.1%
CxF	Craggey-Rock outcrop-Clingman complex, windswept, 50 to 95 percent slopes, rubbly	D	22.7	0.2%
Subtotals for Soil Survey Area			**47.2**	**0.5%**
Totals for Area of Interest			**9,794.0**	**100.0%**

Soil Properties and Qualities— Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcF	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slopes, very bouldery	B	1,039.1	10.6%
BbF	Balsam cobbly loam, 50 to 95 percent slopes, rubbly	A	492.5	5.0%
BcD	Balsam-Tanasee complex, 15 to 30 percent slopes, extremely bouldery	A	135.4	1.4%
BcE	Balsam-Tanasee complex, 30 to 50 percent slopes, extremely bouldery	A	890.6	9.1%
BtD	Buladean-Chestnut complex, 15 to 30 percent slopes, stony	B	129.3	1.3%
BtE	Buladean-Chestnut complex, 30 to 50 percent slopes, stony	B	467.2	4.8%
BtF	Buladean-Chestnut complex, 50 to 95 percent slopes, stony	B	352.8	3.6%
BwD	Burton-Craggey complex, windswept, 15 to 30 percent slopes, rocky	B	368.5	3.8%
BxE	Burton-Craggey-Rock outcrop complex, windswept, 30 to 50 percent slopes, very bouldery	D	1,241.1	12.7%
BxF	Burton-Craggey-Rock outcrop complex, windswept, 50 to 95 percent slopes, very bouldery	D	1,122.3	11.5%

Soil Properties and Qualities— Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CeD	Chandler-Micaville complex, 15 to 30 percent slopes, stony	A	8.6	0.1%
CeE	Chandler-Micaville complex, 30 to 50 percent slopes, stony	A	51.9	0.5%
CeF	Chandler-Micaville complex, 50 to 95 percent slopes, stony	A	39.9	0.4%
CrE	Craggey-Rock outcrop-Clingman complex, windswept, 30 to 50 percent slopes, rubbly	D	99.3	1.0%
CrF	Craggey-Rock outcrop-Clingman complex, windswept, 50 to 95 percent slopes, rubbly	D	529.2	5.4%
DeA	Deliwood-Reddies complex, 0 to 3 percent slopes, occasionally flooded	A	103.6	1.1%
HuE	Huntdale clay loam, 30 to 50 percent slopes, stony	B	38.6	0.4%
PuD	Porters-Unaka complex, 15 to 30 percent slopes, stony	B	26.9	0.3%
PuE	Porters-Unaka complex, 30 to 50 percent slopes, stony	B	280.5	2.9%
PwF	Porters-Unaka complex, 50 to 95 percent slopes, rocky	B	868.1	8.9%
TuC	Toecane-Tusquitee complex, 8 to 15 percent slopes, bouldery	A	55.1	0.6%
TwD	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	387.2	4.0%
TwE	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	471.2	4.8%
Ud	Udorthents, loamy, stony	B	3.7	0.0%
UrF	Unaka-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	193.7	2.0%
W	Water		0.7	0.0%
WcF	Wayah-Burton complex, 50 to 95 percent slopes, very rocky	B	84.4	0.9%
WhC	Wayah-Burton complex, windswept, 8 to 15 percent slopes, bouldery	B	14.2	0.1%
WhD	Wayah-Burton complex, windswept, 15 to 30 percent slopes, bouldery	B	114.2	1.2%
WhE	Wayah-Burton complex, windswept, 30 to 50 percent slopes, bouldery	B	137.5	1.4%
Subtotals for Soil Survey Area			**9,746.8**	**99.5%**
Totals for Area of Interest			**9,794.0**	**100.0%**

Hydrologic Soil Group—Avery County, North Carolina
(Nolichucky Sample 2)



Hydrologic Soil Group–Avery County, North Carolina
(Nolichucky Sample 2)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:48,700 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Avery County, North Carolina
Survey Area Data: Version 14, Jul 21, 2008

Hydrologic Soil Group

Hydrologic Soil Group—Summary by Map Unit — Avery County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
BaD	Balsam very cobbly loam, windswept, 15 to 30 percent slopes, extremely bouldery	A	4.8	0.0%
BwD	Burton-Wayah complex, windswept, 15 to 30 percent slopes, stony	B	4.1	0.0%
CaD	Cashiers sandy loam, 15 to 30 percent slopes, stony	B	220.4	2.3%
CaE	Cashiers sandy loam, 30 to 50 percent slopes, stony	B	232.1	2.4%
CeE	Chandler-Micaville complex, 30 to 50 percent slopes, stony	A	105.0	1.1%
ChD	Chestnut-Ashe complex, 15 to 30 percent slopes, very stony	B	8.3	0.1%
ChE	Chestnut-Ashe complex, 30 to 50 percent slopes, very stony	B	18.7	0.2%
ChF	Chestnut-Ashe complex, 50 to 95 percent slopes, very stony	B	9.5	0.1%
CtC	Cullasaja cobbly loam, 8 to 15 percent slopes, extremely bouldery	A	37.7	0.4%
CtD	Cullasaja cobbly loam, 15 to 30 percent slopes, extremely bouldery	A	289.6	3.0%
CtE	Cullasaja cobbly loam, 30 to 50 percent slopes, extremely bouldery	A	570.5	5.9%
CuA	Cullowhee loam, 0 to 3 percent slopes, frequently flooded	B/D	1.2	0.0%
DeB	Dellwood cobbly sandy loam, 1 to 5 percent slopes, occasionally flooded	A	224.0	2.3%
EpD	Edneytown-Pigeonroost complex, 15 to 30 percent slopes, stony	B	2.1	0.0%
EtE	Edneyville-Chestnut complex, 30 to 50 percent slopes, stony	A	4.6	0.0%
NkA	Nikwasi loam, 0 to 3 percent slopes, frequently flooded	B/D	216.5	2.2%
PuC	Porters gravelly loam, 8 to 15 percent slopes, stony	B	30.3	0.3%
PuD	Porters gravelly loam, 15 to 30 percent slopes, stony	B	784.5	8.1%
PuE	Porters gravelly loam, 30 to 50 percent slopes, stony	B	1,881.1	19.5%
PuF	Porters gravelly loam, 50 to 80 percent slopes, stony	B	58.1	0.6%
Px	Pits, quarry	D	4.4	0.0%

Hydrologic Soil Group—Summary by Map Unit — Avery County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
ReA	Reddies fine sandy loam, 0 to 3 percent slopes, frequently flooded	B	132.6	1.4%
RoA	Rosman loam, 0 to 3 percent slopes, occasionally flooded	A	38.9	0.4%
RsB	Rosman sandy loam, 0 to 5 percent slopes, frequently flooded	A	4.9	0.1%
SaB	Saunook loam, 2 to 8 percent slopes	B	32.2	0.3%
SaC	Saunook loam, 8 to 15 percent slopes	B	334.3	3.5%
SbD	Saunook loam, 15 to 30 percent slopes, very stony	B	378.4	3.9%
SgC	Saunook-Nikwasi complex, 2 to 15 percent slopes	B	8.7	0.1%
ShC	Saunook-Thunder complex, 8 to 15 percent slopes, very stony	B	189.1	2.0%
ShD	Saunook-Thunder complex, 15 to 30 percent slopes, very stony	B	851.8	8.8%
SsB	Statler loam, 0 to 6 percent slopes, rarely flooded	B	13.4	0.1%
UnD	Unaka-Porters complex, 15 to 30 percent slopes, very rocky	B	429.0	4.4%
UnE	Unaka-Porters complex, 30 to 50 percent slopes, very rocky	B	1,184.2	12.3%
UnF	Unaka-Porters complex, 50 to 95 percent slopes, very rocky	B	1,271.1	13.2%
W	Water		61.7	0.6%
WaD	Watauga sandy loam, 15 to 30 percent slopes, stony	B	10.2	0.1%
Totals for Area of Interest			**9,648.0**	**100.0%**

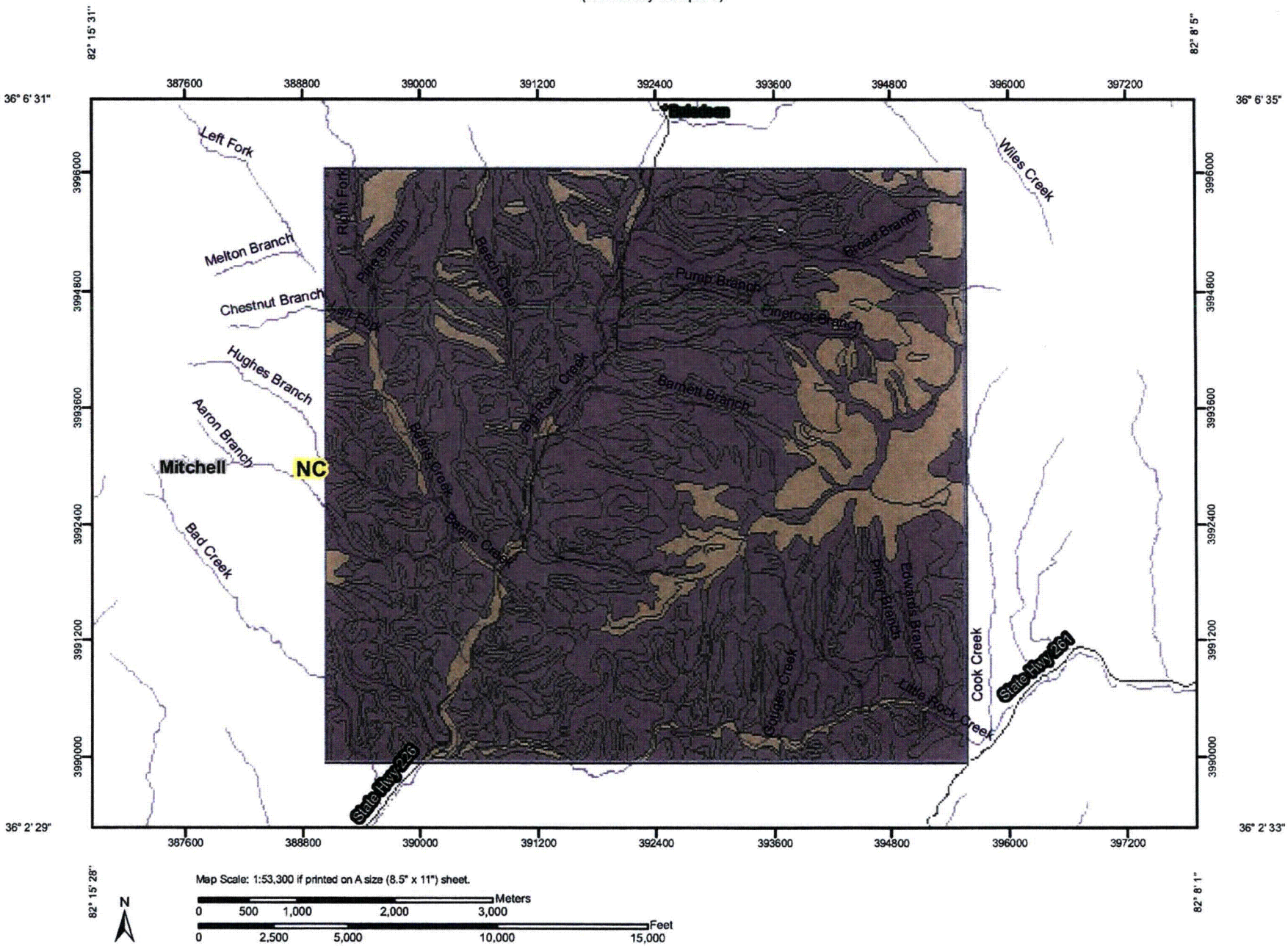
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Mitchell County, North Carolina
(Nolichucky Sample 3)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

1/22/2009
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Hydrologic Soil Group–Mitchell County, North Carolina
(Nolichucky Sample 3)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:53,300 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mitchell County, North Carolina
Survey Area Data: Version 5, Jan 25, 2008

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Mitchell County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcF	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slopes, very bouldery	B	3.8	0.0%
BaE	Balsam sandy loam, 30 to 50 percent slopes, extremely bouldery	A	57.0	0.6%
BdA	Bandana sandy loam, 0 to 3 percent slopes, occasionally flooded	B	111.6	1.1%
BtD	Buladean-Chestnut complex, 15 to 30 percent slopes, stony	B	162.9	1.7%
BtE	Buladean-Chestnut complex, 30 to 50 percent slopes, stony	B	33.1	0.3%
BtF	Buladean-Chestnut complex, 50 to 95 percent slopes, stony	B	902.0	9.2%
CeF	Chandler-Micaville complex, 50 to 95 percent slopes, stony	A	4.9	0.1%
CnC2	Clifton clay loam, 8 to 15 percent slopes, eroded	B	119.8	1.2%
CnD2	Clifton clay loam, 15 to 30 percent slopes, eroded	B	312.1	3.2%
CnE2	Clifton clay loam, 30 to 50 percent slopes, eroded	B	69.1	0.7%
CsD	Cullasaja cobbly fine sandy loam, 8 to 30 percent slopes, very bouldery	A	47.5	0.5%
DeA	Dellwood-Reddies complex, 0 to 3 percent slopes, occasionally flooded	A	66.0	0.7%
DoB	Dillsboro clay loam, 2 to 8 percent slopes	B	88.3	0.9%
DrC	Dillsboro clay loam, 8 to 15 percent slopes, stony	B	466.7	4.7%
DrD	Dillsboro clay loam, 15 to 30 percent slopes, stony	B	83.0	0.8%
DsC	Dillsboro clay loam, 8 to 15 percent slopes, rarely flooded	B	11.4	0.1%
EcC	Evard-Cowee complex, 8 to 15 percent slopes	B	27.1	0.3%
EcD	Evard-Cowee complex, 15 to 30 percent slopes	B	200.0	2.0%
EdE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	664.1	6.7%
EdF	Evard-Cowee complex, 50 to 95 percent slopes, stony	B	251.1	2.6%
FeD2	Fannin sandy clay loam, 15 to 30 percent slopes, eroded	B	18.6	0.2%
FeE2	Fannin sandy clay loam, 30 to 50 percent slopes, eroded	B	685.4	7.0%

Hydrologic Soil Group—Summary by Map Unit — Mitchell County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HnD	Huntdale silty clay loam, 15 to 30 percent slopes, stony	B	16.5	0.2%
HuE	Huntdale silty clay loam, 30 to 50 percent slopes, very stony	B	580.3	5.9%
HuF	Huntdale silty clay loam, 50 to 95 percent slopes, very stony	B	267.4	2.7%
PeD	Pigeonroost-Edneytown complex, 15 to 30 percent slopes, stony	B	19.3	0.2%
PeE	Pigeonroost-Edneytown complex, 30 to 50 percent slopes, stony	B	56.0	0.6%
PtD	Plott loam, 15 to 30 percent slopes, stony	A	76.3	0.8%
PtE	Plott loam, 30 to 50 percent slopes, stony	A	108.4	1.1%
PtF	Plott loam, 50 to 95 percent slopes, stony	A	555.0	5.6%
RoA	Rosman fine sandy loam, 0 to 3 percent slopes, occasionally flooded	A	142.0	1.4%
SaB	Saunook silt loam, 2 to 8 percent slopes	B	88.2	0.9%
ScC	Saunook silt loam, 8 to 15 percent slopes, stony	B	471.5	4.8%
SdD	Saunook-Thunder complex, 15 to 30 percent slopes, stony	B	457.7	4.6%
SdE	Saunook-Thunder complex, 30 to 50 percent slopes, stony	B	57.6	0.6%
TbE	Tanasee-Balsam complex, 30 to 50 percent slopes, very bouldery	A	506.3	5.1%
TsB	Thunder-Saunook complex, 2 to 8 percent slopes, very bouldery	B	6.2	0.1%
TsC	Thunder-Saunook complex, 8 to 15 percent slopes, very bouldery	B	389.0	4.0%
TsD	Thunder-Saunook complex, 15 to 30 percent slopes, very bouldery	B	878.3	8.9%
TsE	Thunder-Saunook complex, 30 to 50 percent slopes, very bouldery	B	330.2	3.4%
Ud	Udorthents, loamy	B	10.6	0.1%
W	Water		1.6	0.0%
WgC	Watauga sandy loam, 8 to 15 percent slopes, stony	B	5.4	0.1%
WgE	Watauga sandy loam, 30 to 50 percent slopes, stony	B	139.6	1.4%
WhD	Wayah-Burton complex, windswept, 15 to 30 percent slopes, stony	B	93.0	0.9%
WyE	Wayah-Burton complex, windswept, 30 to 50 percent slopes, very stony	B	201.5	2.0%
Totals for Area of Interest			9,843.7	100.0%

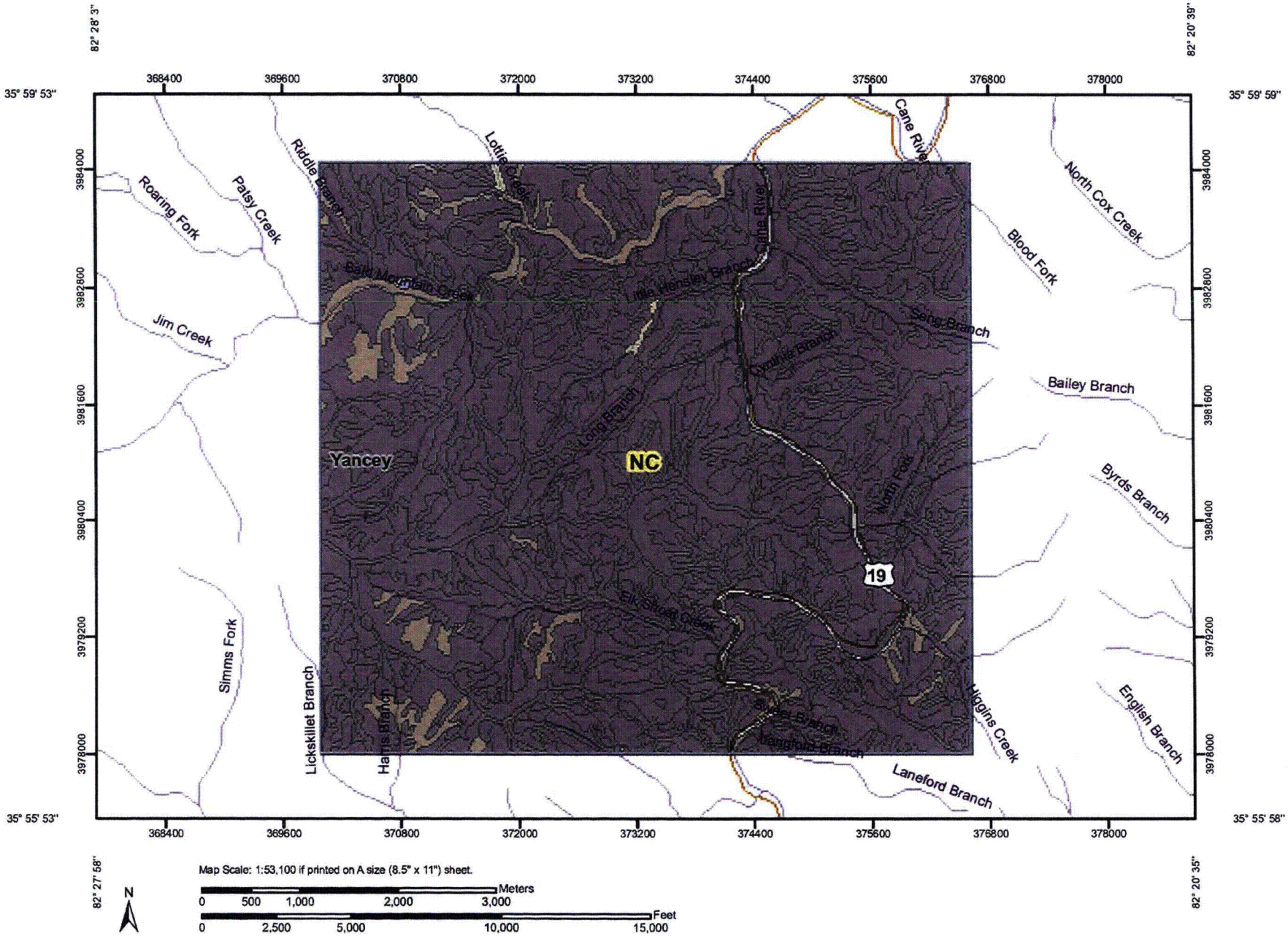
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Yancey County, North Carolina
(Nolichucky Sample 4)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

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Hydrologic Soil Group–Yancey County, North Carolina
(Nolichucky Sample 4)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:53,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Yancey County, North Carolina
Survey Area Data: Version 9, Jan 31, 2008

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcF	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slopes, very bouldery	B	395.0	4.0%
BdA	Bandana sandy loam, 0 to 3 percent slopes, occasionally flooded	B	8.0	0.1%
BmA	Biltmore sand, 0 to 3 percent slopes, frequently flooded	A	8.4	0.1%
BtD	Buladean-Chestnut complex, 15 to 30 percent slopes, stony	B	48.9	0.5%
BtE	Buladean-Chestnut complex, 30 to 50 percent slopes, stony	B	313.1	3.2%
BtF	Buladean-Chestnut complex, 50 to 95 percent slopes, stony	B	1,417.2	14.3%
CnC2	Clifton clay loam, 8 to 15 percent slopes, eroded	B	11.2	0.1%
CnD2	Clifton clay loam, 15 to 30 percent slopes, eroded	B	55.1	0.6%
CnE2	Clifton clay loam, 30 to 50 percent slopes, eroded	B	68.5	0.7%
DeA	Dellwood-Reddies complex, 0 to 3 percent slopes, occasionally flooded	A	136.1	1.4%
DrB	Dillard clay loam, 2 to 8 percent slopes, rarely flooded	C	18.4	0.2%
EcD	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	333.2	3.4%
EcE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	1,087.6	11.0%
HuD	Huntdale clay loam, 15 to 30 percent slopes, stony	B	96.4	1.0%
HuE	Huntdale clay loam, 30 to 50 percent slopes, stony	B	836.2	8.4%
NkA	Nikwasi sandy loam, 0 to 3 percent slopes, occasionally flooded	B/D	2.8	0.0%
PeD	Pigeonroost-Edneytown complex, 15 to 30 percent slopes, stony	B	46.7	0.5%
PeE	Pigeonroost-Edneytown complex, 30 to 50 percent slopes, stony	B	207.9	2.1%
PuC	Porters-Unaka complex, 8 to 15 percent slopes, stony	B	7.4	0.1%
PuD	Porters-Unaka complex, 15 to 30 percent slopes, stony	B	62.2	0.6%
PuE	Porters-Unaka complex, 30 to 50 percent slopes, stony	B	147.6	1.5%

Hydrologic Soil Group—Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PwF	Porters-Unaka complex, 50 to 95 percent slopes, rocky	B	1,697.0	17.1%
RoA	Rosman fine sandy loam, 0 to 3 percent slopes, occasionally flooded	A	28.8	0.3%
SaB	Saunook sandy loam, 2 to 8 percent slopes	B	8.9	0.1%
ScC	Saunook sandy loam, 8 to 15 percent slopes, stony	B	97.1	1.0%
SdD	Saunook-Thunder complex, 15 to 30 percent slopes, stony	B	194.6	2.0%
TsB	Thunder-Saunook complex, 2 to 8 percent slopes, very bouldery	B	0.3	0.0%
TsC	Thunder-Saunook complex, 8 to 15 percent slopes, very bouldery	B	98.6	1.0%
TsD	Thunder-Saunook complex, 15 to 30 percent slopes, very bouldery	B	832.2	8.4%
TsE	Thunder-Saunook complex, 30 to 50 percent slopes, very bouldery	B	998.3	10.1%
TuC	Toecane-Tusquitee complex, 8 to 15 percent slopes, bouldery	A	4.3	0.0%
TwD	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	31.6	0.3%
TwE	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	312.8	3.1%
Uc	Udifluvents, sandy-skeletal, frequently flooded	A	1.3	0.0%
UrF	Unaka-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	176.5	1.8%
UsB	Unison loam, 2 to 8 percent slopes	B	21.9	0.2%
UsC	Unison loam, 8 to 15 percent slopes	B	28.6	0.3%
UsD	Unison loam, 15 to 30 percent slopes	B	9.3	0.1%
W	Water		80.1	0.8%
Totals for Area of Interest			9,930.0	100.0%

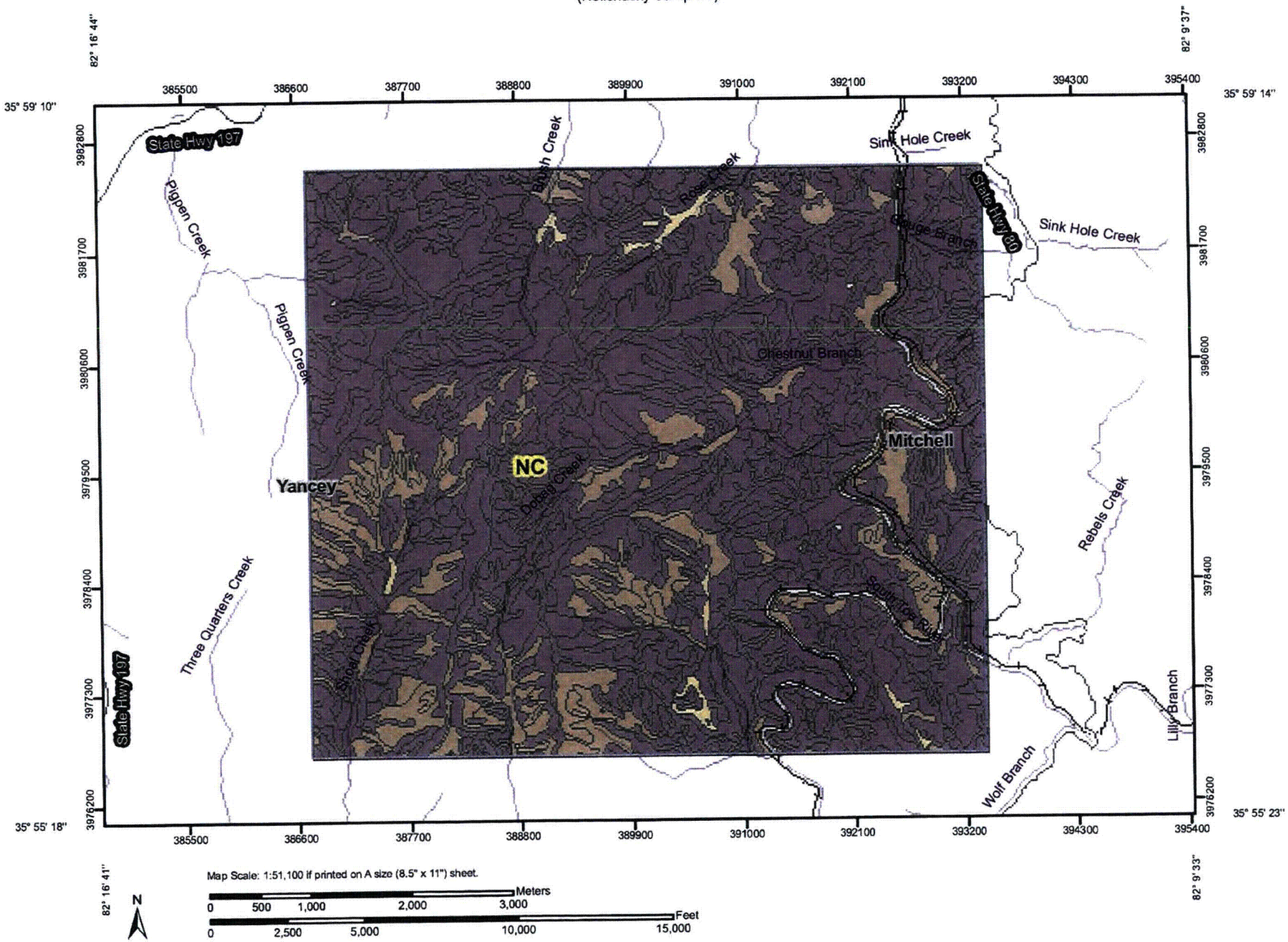
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Mitchell County, North Carolina, and Yancey County, North Carolina
(Nolichucky Sample 5)



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Hydrologic Soil Group–Mitchell County, North Carolina, and Yancey County, North Carolina
(Nolichucky Sample 5)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:51,100 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mitchell County, North Carolina
Survey Area Data: Version 5, Jan 25, 2008

Soil Survey Area: Yancey County, North Carolina
Survey Area Data: Version 9, Jan 31, 2008

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Mitchell County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcF	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slopes, very bouldery	B	97.2	1.0%
BdA	Bandana sandy loam, 0 to 3 percent slopes, occasionally flooded	B	1.6	0.0%
BmA	Biltmore sand, 0 to 3 percent slopes, frequently flooded	A	22.6	0.2%
BtD	Buladean-Chestnut complex, 15 to 30 percent slopes, stony	B	2.5	0.0%
BtE	Buladean-Chestnut complex, 30 to 50 percent slopes, stony	B	30.5	0.3%
CaE	Cashiers sandy loam, 30 to 50 percent slopes, stony	B	5.3	0.1%
CaF	Cashiers sandy loam, 50 to 95 percent slopes, stony	B	18.1	0.2%
CeD	Chandler-Micaville complex, 15 to 30 percent slopes, stony	A	2.9	0.0%
CeE	Chandler-Micaville complex, 30 to 50 percent slopes, stony	A	42.9	0.4%
CeF	Chandler-Micaville complex, 50 to 95 percent slopes, stony	A	32.9	0.3%
CnC2	Clifton clay loam, 8 to 15 percent slopes, eroded	B	23.2	0.2%
CnD2	Clifton clay loam, 15 to 30 percent slopes, eroded	B	15.8	0.2%
EcD	Evard-Cowee complex, 15 to 30 percent slopes	B	20.7	0.2%
EdE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	8.7	0.1%
FeC2	Fannin sandy clay loam, 8 to 15 percent slopes, eroded	B	8.0	0.1%
FeD2	Fannin sandy clay loam, 15 to 30 percent slopes, eroded	B	103.7	1.1%
FeE2	Fannin sandy clay loam, 30 to 50 percent slopes, eroded	B	77.3	0.8%
HnD	Huntdale silty clay loam, 15 to 30 percent slopes, stony	B	3.8	0.0%
HuE	Huntdale silty clay loam, 30 to 50 percent slopes, very stony	B	29.5	0.3%
PeD	Pigeonroost-Edneytown complex, 15 to 30 percent slopes, stony	B	11.4	0.1%
PeE	Pigeonroost-Edneytown complex, 30 to 50 percent slopes, stony	B	13.5	0.1%
PtF	Plott loam, 50 to 95 percent slopes, stony	A	4.4	0.0%

Hydrologic Soil Group—Summary by Map Unit — Mitchell County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
SaB	Saunook silt loam, 2 to 8 percent slopes	B	0.8	0.0%
ScC	Saunook silt loam, 8 to 15 percent slopes, stony	B	42.5	0.4%
SdD	Saunook-Thunder complex, 15 to 30 percent slopes, stony	B	36.7	0.4%
TsC	Thunder-Saunook complex, 8 to 15 percent slopes, very bouldery	B	5.7	0.1%
TsD	Thunder-Saunook complex, 15 to 30 percent slopes, very bouldery	B	30.7	0.3%
TsE	Thunder-Saunook complex, 30 to 50 percent slopes, very bouldery	B	2.3	0.0%
Ud	Udorthents, loamy	B	25.1	0.3%
Un	Udorthents, loamy, stony	B	13.0	0.1%
W	Water		42.5	0.4%
WgD	Watauga sandy loam, 15 to 30 percent slopes, stony	B	28.4	0.3%
WgE	Watauga sandy loam, 30 to 50 percent slopes, stony	B	152.6	1.6%
Subtotals for Soil Survey Area			**956.9**	**9.9%**
Totals for Area of Interest			**9,624.2**	**100.0%**

Hydrologic Soil Group—Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AcF	Ashe-Cleveland-Rock outcrop complex, 30 to 95 percent slopes, very bouldery	B	584.7	6.1%
BdA	Bandana sandy loam, 0 to 3 percent slopes, occasionally flooded	B	77.3	0.8%
BmA	Biltmore sand, 0 to 3 percent slopes, frequently flooded	A	7.4	0.1%
BtD	Buladean-Chestnut complex, 15 to 30 percent slopes, stony	B	64.0	0.7%
BtE	Buladean-Chestnut complex, 30 to 50 percent slopes, stony	B	148.0	1.5%
BtF	Buladean-Chestnut complex, 50 to 95 percent slopes, stony	B	417.9	4.3%
CcD	Cashiers fine sandy loam, 15 to 30 percent slopes, stony	B	29.1	0.3%
CcE	Cashiers fine sandy loam, 30 to 50 percent slopes, stony	B	142.1	1.5%
CcF	Cashiers fine sandy loam, 50 to 95 percent slopes, stony	B	163.1	1.7%
CeD	Chandler-Micaville complex, 15 to 30 percent slopes, stony	A	32.6	0.3%
CeE	Chandler-Micaville complex, 30 to 50 percent slopes, stony	A	492.6	5.1%

Hydrologic Soil Group—Mitchell County, North Carolina, and Yancey County, North Carolina

Hydrologic Soil Group—Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CeF	Chandler-Micaville complex, 50 to 95 percent slopes, stony	A	378.0	3.9%
CnC2	Clifton clay loam, 8 to 15 percent slopes, eroded	B	44.3	0.5%
CnD2	Clifton clay loam, 15 to 30 percent slopes, eroded	B	149.3	1.6%
CnE2	Clifton clay loam, 30 to 50 percent slopes, eroded	B	89.0	0.9%
DeA	Dellwood-Reddies complex, 0 to 3 percent slopes, occasionally flooded	A	34.3	0.4%
DrB	Dillard clay loam, 2 to 8 percent slopes, rarely flooded	C	81.2	0.8%
EaC2	Evard-Cowee complex, 8 to 15 percent slopes, eroded	B	39.5	0.4%
EcD	Evard-Cowee complex, 15 to 30 percent slopes, stony	B	404.9	4.2%
EcE	Evard-Cowee complex, 30 to 50 percent slopes, stony	B	489.0	5.1%
FeC2	Fannin sandy clay loam, 8 to 15 percent slopes, eroded	B	26.8	0.3%
FeD2	Fannin sandy clay loam, 15 to 30 percent slopes, eroded	B	536.5	5.6%
FeE2	Fannin sandy clay loam, 30 to 50 percent slopes, eroded	B	768.9	8.0%
HuC	Huntdale clay loam, 8 to 15 percent slopes, stony	B	4.6	0.0%
HuD	Huntdale clay loam, 15 to 30 percent slopes, stony	B	76.7	0.8%
HuE	Huntdale clay loam, 30 to 50 percent slopes, stony	B	607.4	6.3%
PuD	Porters-Unaka complex, 15 to 30 percent slopes, stony	B	18.5	0.2%
PuE	Porters-Unaka complex, 30 to 50 percent slopes, stony	B	171.8	1.8%
PwF	Porters-Unaka complex, 50 to 95 percent slopes, rocky	B	781.7	8.1%
RoA	Rosman fine sandy loam, 0 to 3 percent slopes, occasionally flooded	A	3.6	0.0%
SaB	Saunook sandy loam, 2 to 8 percent slopes	B	17.4	0.2%
ScC	Saunook sandy loam, 8 to 15 percent slopes, stony	B	168.2	1.7%
SdD	Saunook-Thunder complex, 15 to 30 percent slopes, stony	B	198.9	2.1%
TsB	Thunder-Saunook complex, 2 to 8 percent slopes, very bouldery	B	2.5	0.0%
TsC	Thunder-Saunook complex, 8 to 15 percent slopes, very bouldery	B	50.6	0.5%

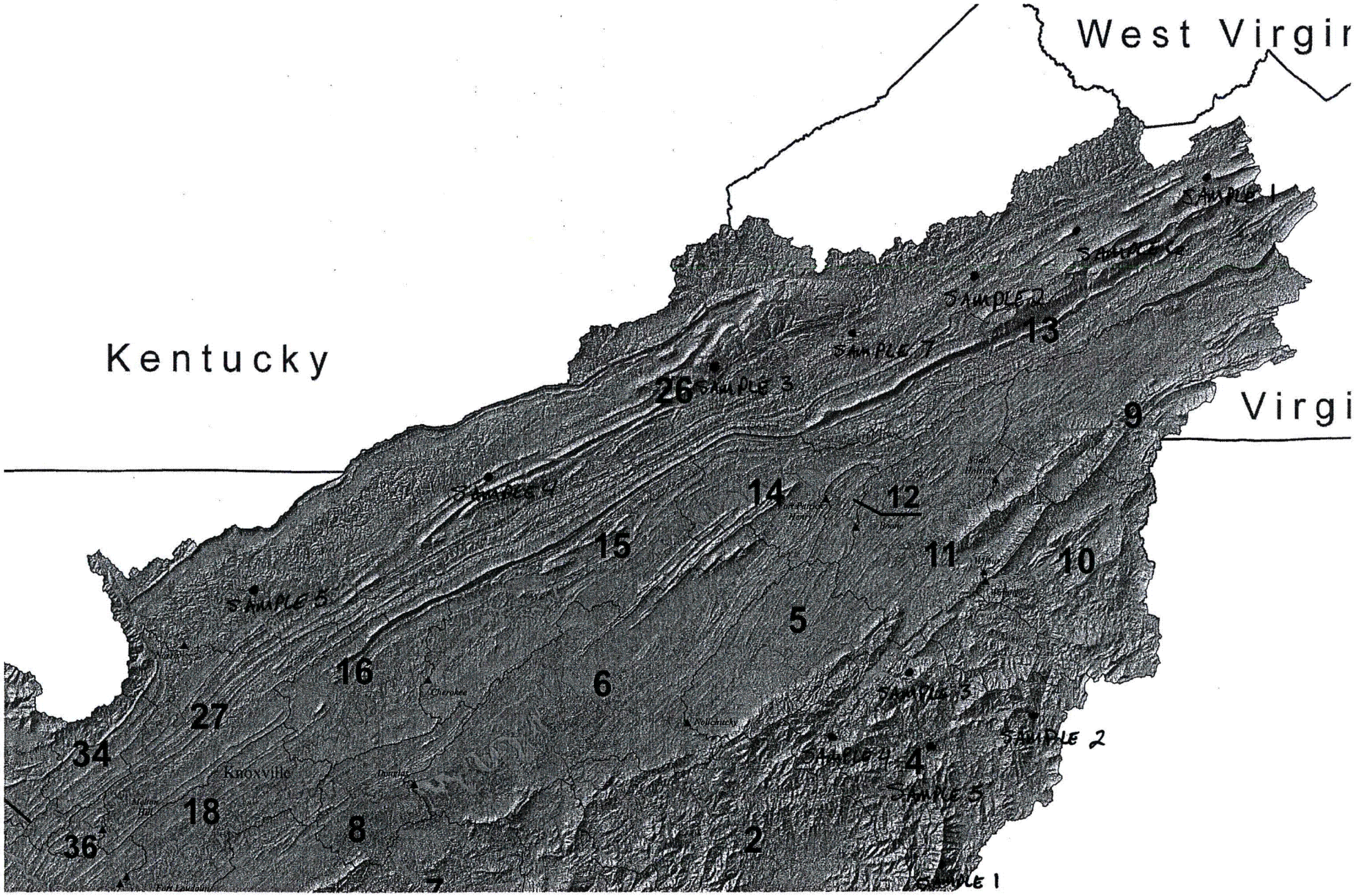
Hydrologic Soil Group—Summary by Map Unit — Yancey County, North Carolina				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
TsD	Thunder-Saunook complex, 15 to 30 percent slopes, very bouldery	B	363.3	3.8%
TsE	Thunder-Saunook complex, 30 to 50 percent slopes, very bouldery	B	309.6	3.2%
TuC	Toecane-Tusquitee complex, 8 to 15 percent slopes, bouldery	A	63.4	0.7%
TwD	Toecane-Tusquitee complex, 15 to 30 percent slopes, very bouldery	A	77.2	0.8%
TwE	Toecane-Tusquitee complex, 30 to 50 percent slopes, very bouldery	A	187.3	1.9%
Ud	Udorthents, loamy, stony	B	113.0	1.2%
UrF	Unaka-Rock outcrop complex, 50 to 95 percent slopes, very bouldery	B	104.9	1.1%
UsC	Unison loam, 8 to 15 percent slopes	B	42.5	0.4%
UsD	Unison loam, 15 to 30 percent slopes	B	28.2	0.3%
W	Water		75.2	0.8%
Subtotals for Soil Survey Area			8,667.3	90.1%
Totals for Area of Interest			9,624.2	100.0%

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower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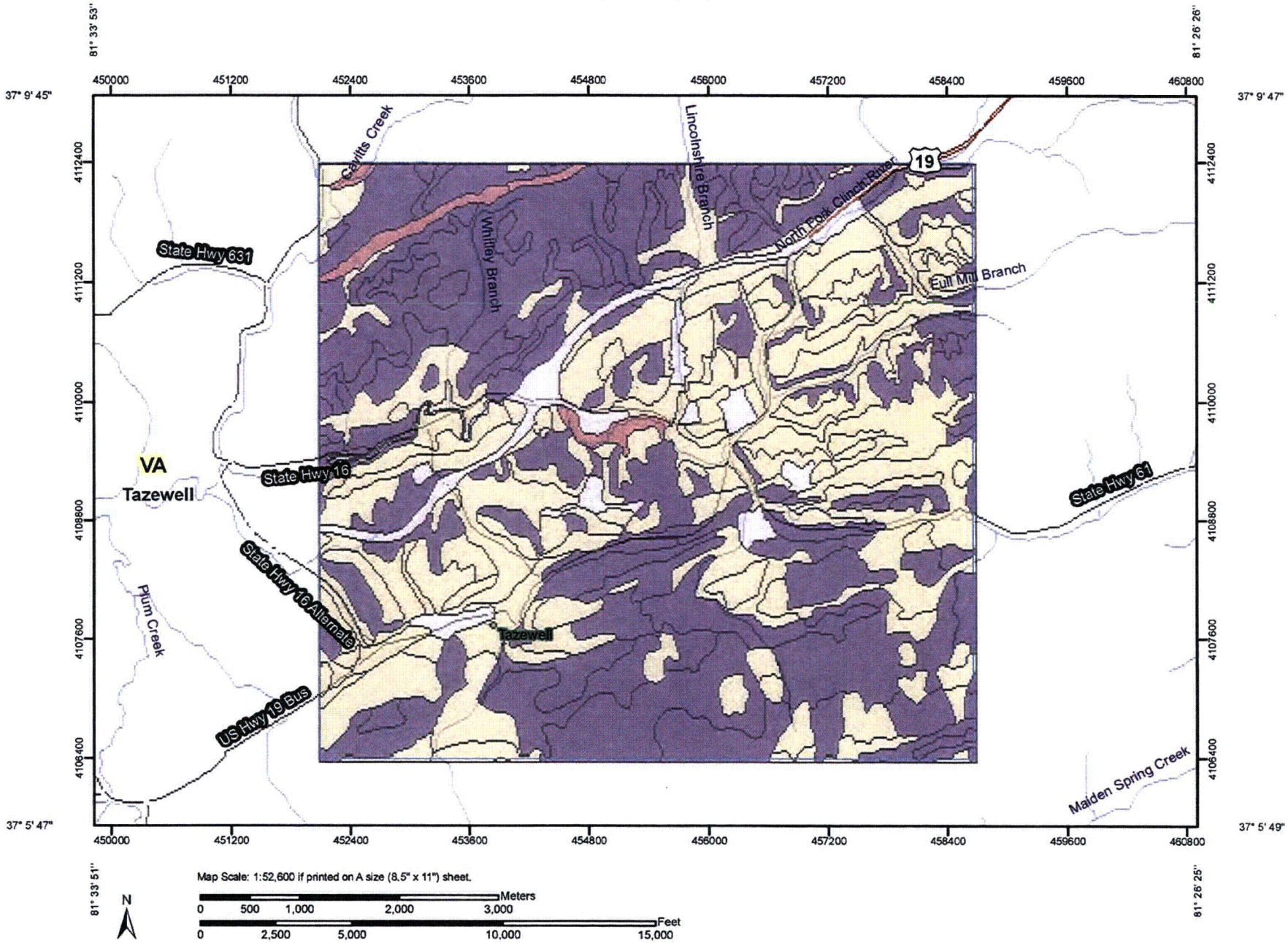
Knoxville

Hydrologic Soil Group—Tazewell County, Virginia
(Norris Sample 1)



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Hydrologic Soil Group–Tazewell County, Virginia
(Norris Sample 1)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Tazewell County, Virginia
Survey Area Data: Version 6, Dec 18, 2007

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Tazewell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1B	Allegheny loam, 2 to 7 percent slopes	B	11.1	0.1%
5D	Bland-Rock outcrop complex, 15 to 25 percent slopes	C	112.8	1.2%
5E	Bland-Rock outcrop complex, 25 to 50 percent slopes	C	536.4	5.5%
6C	Bland silty clay loam, 7 to 15 percent slopes	C	51.4	0.5%
6D	Bland silty clay loam, 15 to 25 percent slopes	C	19.4	0.2%
10E	Calvin channery silt loam, 35 to 55 percent slopes, very stony	C	51.3	0.5%
11C	Carbo silt loam, 7 to 15 percent slopes	C	34.6	0.4%
12D	Carbo-Rock outcrop complex, 7 to 25 percent slopes	C	255.0	2.6%
12E	Carbo-Rock outcrop complex, 25 to 65 percent slopes	C	962.4	9.8%
13E	Carbo-Rock outcrop complex, karst, 7 to 65 percent slopes	C	300.6	3.1%
16E	Chiswell-Litz complex, 25 to 35 percent slopes	D	16.2	0.2%
16F	Chiswell-Litz complex, 35 to 60 percent slopes	D	62.9	0.6%
18B	Craigsville very gravelly sandy loam, 0 to 5 percent slopes, frequently flooded	B	44.5	0.5%
20C	Frederick silt loam, 7 to 15 percent slopes	B	5.1	0.1%
20D	Frederick silt loam, 15 to 25 percent slopes	B	47.0	0.5%
20E	Frederick silt loam, 25 to 35 percent slopes	B	15.2	0.2%
21B	Frederick gravelly silt loam, 2 to 7 percent slopes	B	54.7	0.6%
21C	Frederick gravelly silt loam, 7 to 15 percent slopes	B	143.6	1.5%
21D	Frederick gravelly silt loam, 15 to 25 percent slopes	B	567.5	5.8%
21E	Frederick gravelly silt loam, 25 to 35 percent slopes	B	1,138.8	11.6%
21F	Frederick gravelly silt loam, 35 to 60 percent slopes	B	211.4	2.2%
22C	Frederick silt loam, karst, 7 to 15 percent slopes	B	95.1	1.0%

Hydrologic Soil Group— Summary by Map Unit — Tazewell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
22D	Frederick silt loam, karst, 15 to 25 percent slopes	B	329.1	3.4%
26B	Groseclose silt loam, 2 to 7 percent slopes	C	17.2	0.2%
26D	Groseclose silt loam, 15 to 25 percent slopes	C	0.0	0.0%
27B	Guernsey silt loam, 2 to 7 percent slopes	C	46.6	0.5%
32A	Melvin silt loam, 0 to 2 percent slopes, frequently flooded	D	57.3	0.6%
34C	Murrill silt loam, 7 to 15 percent slopes	B	24.9	0.3%
35A	Newark-Lindside complex, 0 to 3 percent slopes, occasionally flooded	C	291.3	3.0%
37C	Oriskany gravelly fine sandy loam, 7 to 15 percent slopes	B	279.0	2.9%
37D	Oriskany gravelly fine sandy loam, 15 to 25 percent slopes	B	199.9	2.0%
38C	Oriskany gravelly fine sandy loam, 7 to 15 percent slopes, very stony	B	2.8	0.0%
38D	Oriskany gravelly fine sandy loam, 15 to 35 percent slopes, very stony	B	676.9	6.9%
38E	Oriskany gravelly fine sandy loam, 35 to 55 percent slopes, extremely stony	B	247.8	2.5%
39E	Paddyknob-Rock outcrop complex, 35 to 80 percent slopes, extremely stony	A	0.3	0.0%
46C	Poplimento-Westmoreland complex, 7 to 15 percent slopes	C	497.6	5.1%
46D	Poplimento-Westmoreland complex, 15 to 25 percent slopes	C	590.8	6.0%
50	Udorthents-Urban land complex		385.5	3.9%
51E	Wallen-Rock outcrop complex, 35 to 80 percent slopes, extremely stony	B	46.8	0.5%
52E	Wallen channery sandy loam, 35 to 65 percent slopes, very stony	B	16.6	0.2%
53E	Westmoreland-Poplimento-Berks complex, 25 to 35 percent slopes	B	635.0	6.5%
53F	Westmoreland-Poplimento-Berks complex, 35 to 65 percent slopes	C	650.2	6.7%
W	Water		43.0	0.4%
Totals for Area of Interest			**9,775.7**	**100.0%**

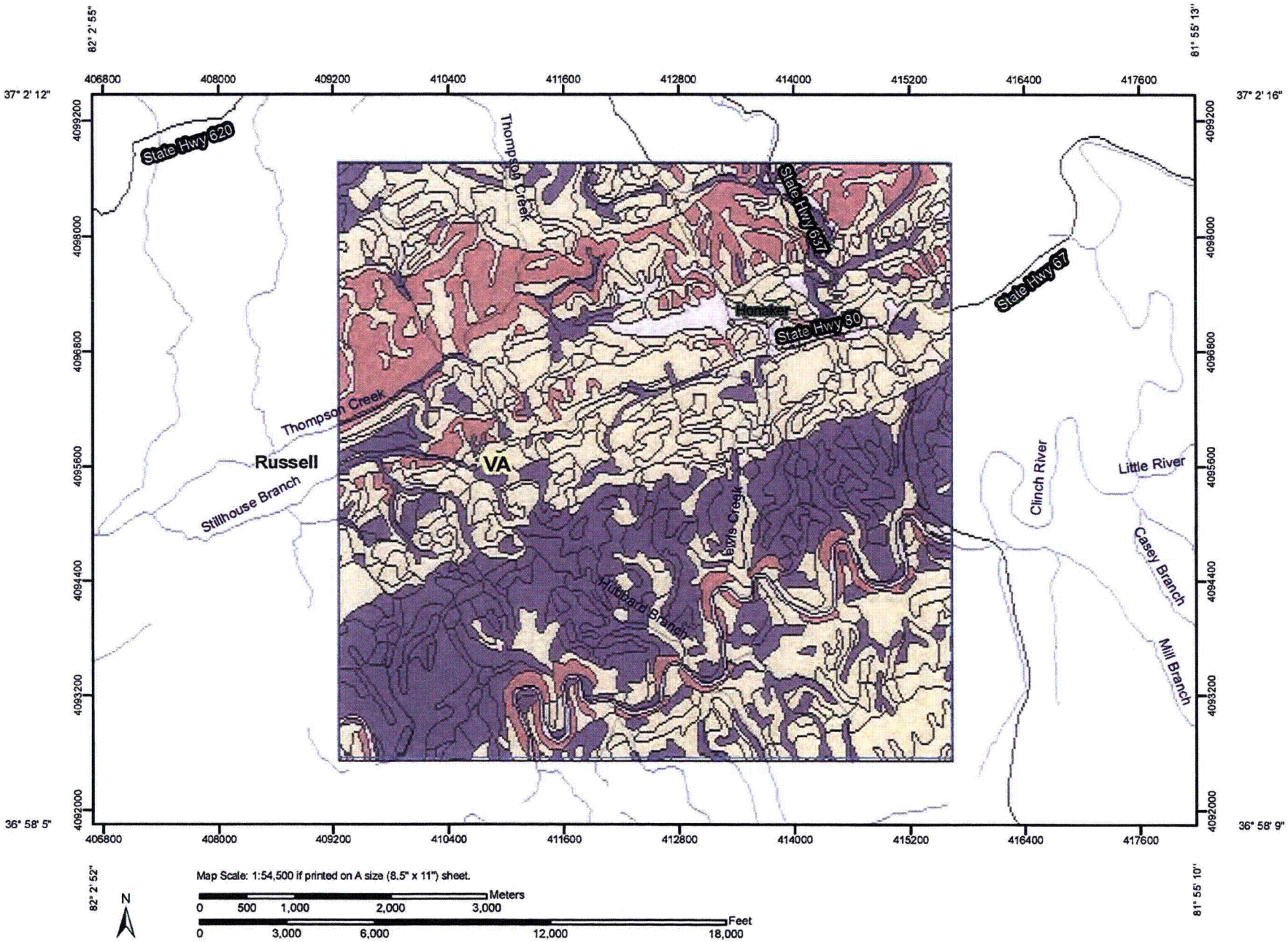
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Russell County, Virginia
(Norris Sample 2)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

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Hydrologic Soil Group–Russell County, Virginia
(Norris Sample 2)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:54,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Russell County, Virginia
Survey Area Data: Version 5, Dec 18, 2007

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Russell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1E	Berks-Chiswell complex, 35 to 55 percent slopes	C	522.9	5.3%
1F	Berks-Chiswell complex, 55 to 80 percent slopes	D	931.1	9.5%
3C	Berks-Groseclose complex, 8 to 15 percent slopes	C	97.9	1.0%
3D	Berks-Groseclose complex, 15 to 35 percent slopes	C	470.8	4.8%
4D	Berks-Poplimento complex, 15 to 35 percent slopes	C	343.6	3.5%
6E	Berks-Westmoreland complex, 35 to 55 percent slopes	C	397.6	4.0%
6F	Berks-Westmoreland complex, 55 to 70 percent slopes	C	600.4	6.1%
8D	Bland-Rock outcrop complex, 8 to 25 percent slopes, eroded	C	22.9	0.2%
8E	Bland-Rock outcrop complex, 25 to 50 percent slopes, eroded	C	87.5	0.9%
12C	Carbo-Beech Grove complex, 8 to 15 percent slopes, very rocky, eroded	C	131.5	1.3%
12D	Carbo-Beech Grove complex, 15 to 25 percent slopes, very rocky, eroded	C	483.7	4.9%
12E	Carbo-Beech Grove complex, 25 to 35 percent slopes, very rocky, eroded	C	198.3	2.0%
12F	Carbo-Beech Grove complex, 35 to 65 percent slopes, very rocky, eroded	C	126.6	1.3%
14D	Carbo-Rock outcrop complex, 8 to 25 percent slopes, eroded	C	552.5	5.6%
14E	Carbo-Rock outcrop complex, 25 to 65 percent slopes, eroded	C	998.3	10.2%
15D	Carbo-Rock outcrop complex, karst, 8 to 35 percent slopes, eroded	C	37.7	0.4%
17A	Chagrin loam, 0 to 3 percent slopes, occasionally flooded	B	71.6	0.7%
18	Dumps, mine-Urban land complex		2.2	0.0%
19C	Frederick silt loam, 8 to 15 percent slopes, eroded	B	125.6	1.3%
19D	Frederick silt loam, 15 to 25 percent slopes, eroded	B	165.3	1.7%
19E	Frederick silt loam, 25 to 35 percent slopes, eroded	B	47.7	0.5%
19F	Frederick silt loam, 35 to 60 percent slopes, eroded	B	22.9	0.2%

Hydrologic Soil Group—Summary by Map Unit — Russell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20C	Frederick silt loam, karst, 8 to 15 percent slopes, eroded	B	52.6	0.5%
20D	Frederick silt loam, karst, 15 to 25 percent slopes, eroded	B	29.4	0.3%
21C	Frederick gravelly silt loam, 8 to 15 percent slopes, eroded	B	67.9	0.7%
21D	Frederick gravelly silt loam, 15 to 25 percent slopes, eroded	B	106.0	1.1%
21E	Frederick gravelly silt loam, 25 to 35 percent slopes, eroded	B	90.5	0.9%
21F	Frederick gravelly silt loam, 35 to 60 percent slopes, eroded	B	18.1	0.2%
27A	Grigsby sandy loam, 0 to 3 percent slopes, occasionally flooded	B	94.7	1.0%
35C	Lily loam, 8 to 15 percent slopes	B	27.9	0.3%
35D	Lily loam, 15 to 35 percent slopes	B	9.7	0.1%
36A	Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded	B	94.3	1.0%
41A	Ogles very stony loam, 0 to 3 percent slopes, occasionally flooded	B	29.8	0.3%
43	Pits, quarry		3.7	0.0%
44C	Poplimento-Westmoreland complex, 8 to 15 percent slopes	C	80.6	0.8%
46F	Rock Outcrop-Beech Grove-Benthole complex, 55 to 100 percent slopes, extremely bouldery	D	206.7	2.1%
54F	Udorthents-Urban land complex, 0 to 80 percent slopes		193.6	2.0%
57C	Watahala gravelly silt loam, 8 to 15 percent slopes	B	151.1	1.5%
57D	Watahala gravelly silt loam, 15 to 25 percent slopes	B	445.6	4.5%
57E	Watahala gravelly silt loam, 25 to 35 percent slopes	B	498.5	5.1%
57F	Watahala gravelly silt loam, 35 to 55 percent slopes	B	574.1	5.8%
58D	Watahala gravelly silt loam, 15 to 25 percent slopes, extremely stony	B	45.2	0.5%
58E	Watahala gravelly silt loam, 25 to 35 percent slopes, extremely stony	B	69.1	0.7%
61B	Wyrick-Marbie silt loams, 3 to 8 percent slopes	B	93.2	0.9%
61C	Wyrick-Marbie silt loams, 8 to 15 percent slopes	B	300.1	3.1%
W	Water		111.6	1.1%
Totals for Area of Interest			9,832.4	100.0%

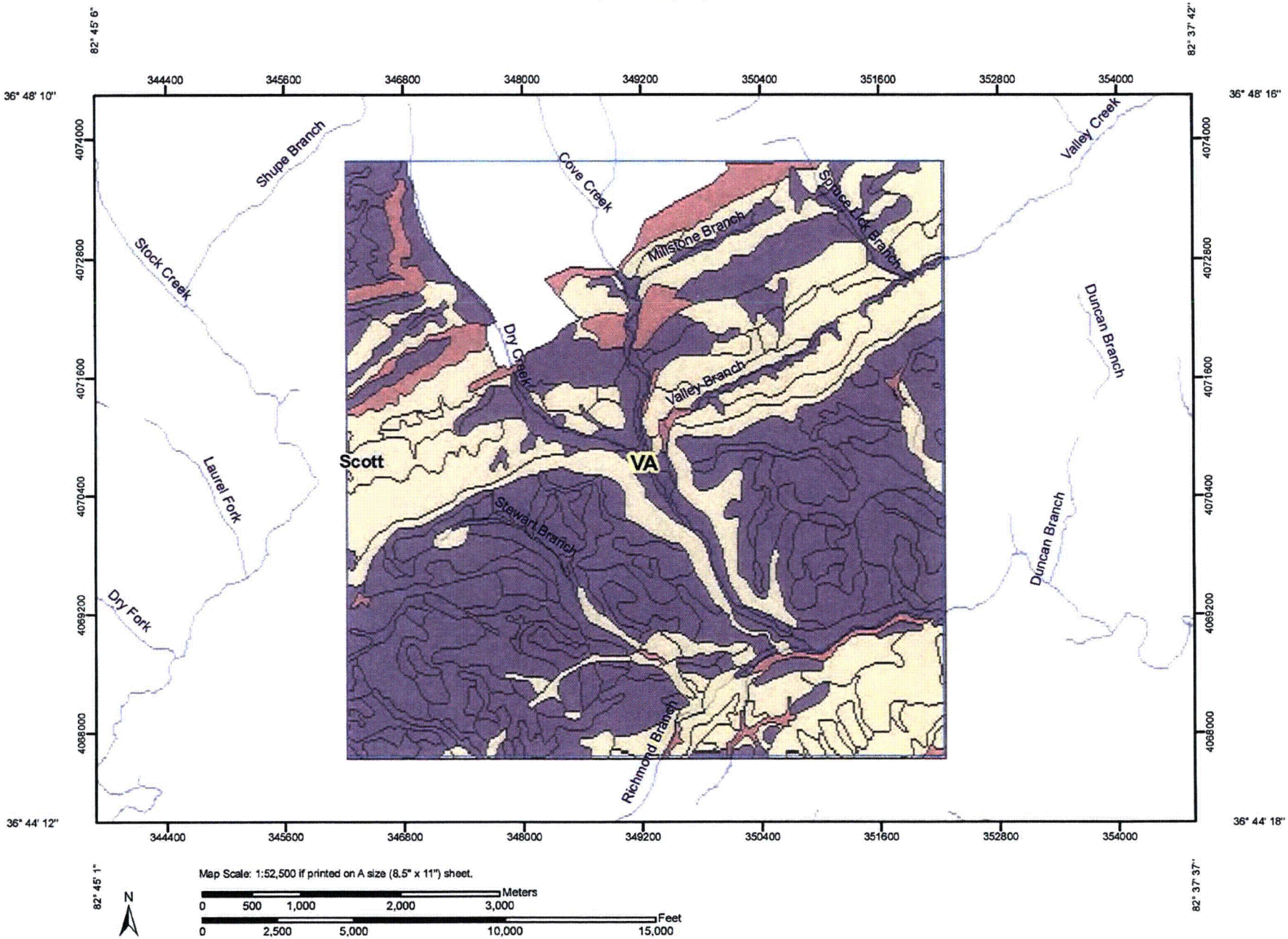
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Jefferson National Forest, Virginia, Southern Part; and Scott County, Virginia
(Norris Sample 3)



Hydrologic Soil Group–Jefferson National Forest, Virginia, Southern Part; and Scott County, Virginia
(Norris Sample 3)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jefferson National Forest, Virginia, Southern Part
Survey Area Data: Not available

Soil Survey Area: Scott County, Virginia
Survey Area Data: Version 7, Dec 18, 2007

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Scott County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
3F	Berks-Chiswell complex, 55 to 80 percent slopes	D	4.8	0.1%
6E	Berks-Westmoreland complex, 35 to 55 percent slopes	C	195.3	2.2%
6F	Berks-Westmoreland complex, 55 to 70 percent slopes	C	375.5	4.2%
8C	Carbo-Beech Grove complex, 8 to 15 percent slopes, very rocky, eroded	C	12.1	0.1%
8D	Carbo-Beech Grove complex, 15 to 25 percent slopes, very rocky, eroded	C	81.7	0.9%
8E	Carbo-Beech Grove complex, 25 to 35 percent slopes, very rocky, eroded	C	32.2	0.4%
8F	Carbo-Beech Grove complex, 35 to 60 percent slopes, very rocky, eroded	C	284.2	3.2%
9E	Carbo-Frederick complex, 25 to 35 percent slopes, very rocky, eroded	C	12.6	0.1%
10D	Carbo-Frederick complex, karst, 15 to 25 percent slopes, very rocky, eroded	C	43.2	0.5%
11D	Carbo-Rock outcrop complex, 8 to 25 percent slopes, eroded	C	147.5	1.7%
11F	Carbo-Rock outcrop complex, 25 to 65 percent slopes, eroded	C	946.2	10.6%
12D	Carbo-Rock outcrop complex, karst, 8 to 35 percent slopes, eroded	C	105.7	1.2%
13A	Chagrin loam, 0 to 3 percent slopes, occasionally flooded	B	80.0	0.9%
14C	Claiborne silt loam, 8 to 15 percent slopes, eroded	B	40.4	0.5%
14D	Claiborne silt loam, 15 to 25 percent slopes, eroded	B	176.6	2.0%
14E	Claiborne silt loam, 25 to 35 percent slopes, eroded	B	314.3	3.5%
14F	Claiborne silt loam, 35 to 65 percent slopes, eroded	B	289.9	3.2%
15A	Ebbing loam, 0 to 3 percent slopes, rarely flooded	C	10.6	0.1%
16C	Frederick gravelly silt loam, 8 to 15 percent slopes, eroded	B	98.5	1.1%
16D	Frederick gravelly silt loam, 15 to 25 percent slopes, eroded	B	544.0	6.1%
17C	Frederick gravelly silt loam, karst, 8 to 15 percent slopes, eroded	B	46.1	0.5%

Hydrologic Soil Group—Summary by Map Unit — Scott County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
17D	Frederick gravelly silt loam, karst, 15 to 25 percent slopes, eroded	B	195.2	2.2%
19C	Frederick-Carbo complex, karst, 8 to 15 percent slopes, very rocky, eroded	B	138.8	1.6%
20D	Gilpin silt loam, 15 to 35 percent slopes	C	7.2	0.1%
21E	Gilpin-Shelocta silt loams, 35 to 55 percent slopes, very stony	C	497.1	5.6%
21F	Gilpin-Shelocta silt loams, 55 to 70 percent slopes, rocky	C	186.3	2.1%
22A	Gladehill sandy loam, 0 to 3 percent slopes, occasionally flooded	B	36.8	0.4%
23D	Groseclose-Carbo silty clay loams, 15 to 25 percent slopes, severely eroded	C	14.7	0.2%
25A	Holly loam, 0 to 3 percent slopes, occasionally flooded	D	50.0	0.6%
26E	Kaymine very channery silt loam, 8 to 45 percent slopes, very stony	C	28.4	0.3%
27C	Lily loam, 8 to 15 percent slopes	B	56.2	0.6%
27D	Lily loam, 15 to 35 percent slopes	B	45.2	0.5%
27E	Lily loam, 35 to 55 percent slopes, very stony	B	36.7	0.4%
28A	Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded	B	53.6	0.6%
31C	Nicelytown silt loam, 8 to 15 percent slopes	C	42.8	0.5%
32A	Ogles very stony loam, 0 to 3 percent slopes, occasionally flooded	B	128.7	1.4%
33D	Opequon-Beech Grove complex, 8 to 25 percent slopes, rocky, severely eroded	C	14.6	0.2%
34B	Oriskany very cobbly fine sandy loam, 3 to 8 percent slopes, very stony	B	93.8	1.1%
34C	Oriskany very cobbly fine sandy loam, 8 to 15 percent slopes, extremely stony	B	16.5	0.2%
34D	Oriskany very cobbly fine sandy loam, 15 to 35 percent slopes, extremely stony	B	40.7	0.5%
34E	Oriskany very cobbly fine sandy loam, 35 to 55 percent slopes, extremely stony	B	216.4	2.4%
35E	Oriskany very stony fine sandy loam, 25 to 55 percent slopes, rubbly	B	8.3	0.1%
37F	Ramsey-Rock outcrop complex, 35 to 70 percent slopes	D	377.7	4.2%
38F	Rock outcrop-Beech Grove-Benthole complex, extremely bouldery	D	34.9	0.4%
39C	Shottower loam, 8 to 15 percent slopes	B	3.0	0.0%
40C	Tumbling loam, 8 to 15 percent slopes	B	66.4	0.7%
40D	Tumbling loam, 15 to 35 percent slopes	B	20.5	0.2%

Hydrologic Soil Group— Summary by Map Unit — Scott County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
40E	Tumbling loam, 35 to 45 percent slopes, very stony	B	35.6	0.4%
42E	Wallen gravelly loam, 35 to 55 percent slopes, very stony	B	365.7	4.1%
43C	Watahala gravelly silt loam, 8 to 15 percent slopes	B	21.3	0.2%
43D	Watahala gravelly silt loam, 15 to 25 percent slopes	B	85.0	1.0%
43E	Watahala gravelly silt loam, 25 to 35 percent slopes	B	704.1	7.9%
43F	Watahala gravelly silt loam, 35 to 55 percent slopes	B	249.5	2.8%
44E	Watahala-Opequon gravelly silt loams, 25 to 35 percent slopes, rocky	B	50.6	0.6%
44F	Watahala-Opequon gravelly silt loams, 35 to 55 percent slopes, rocky	B	135.8	1.5%
45C	Watahala-Opequon gravelly silt loams, karst, 8 to 15 percent slopes, rocky	B	9.3	0.1%
45D	Watahala-Opequon gravelly silt loams, karst, 15 to 25 percent slopes, rocky	B	104.9	1.2%
47C	Wyrick-Marbie silt loams, 8 to 15 percent slopes	B	80.8	0.9%
Subtotals for Soil Survey Area			**8,093.9**	**90.7%**
Totals for Area of Interest			**8,921.3**	**100.0%**

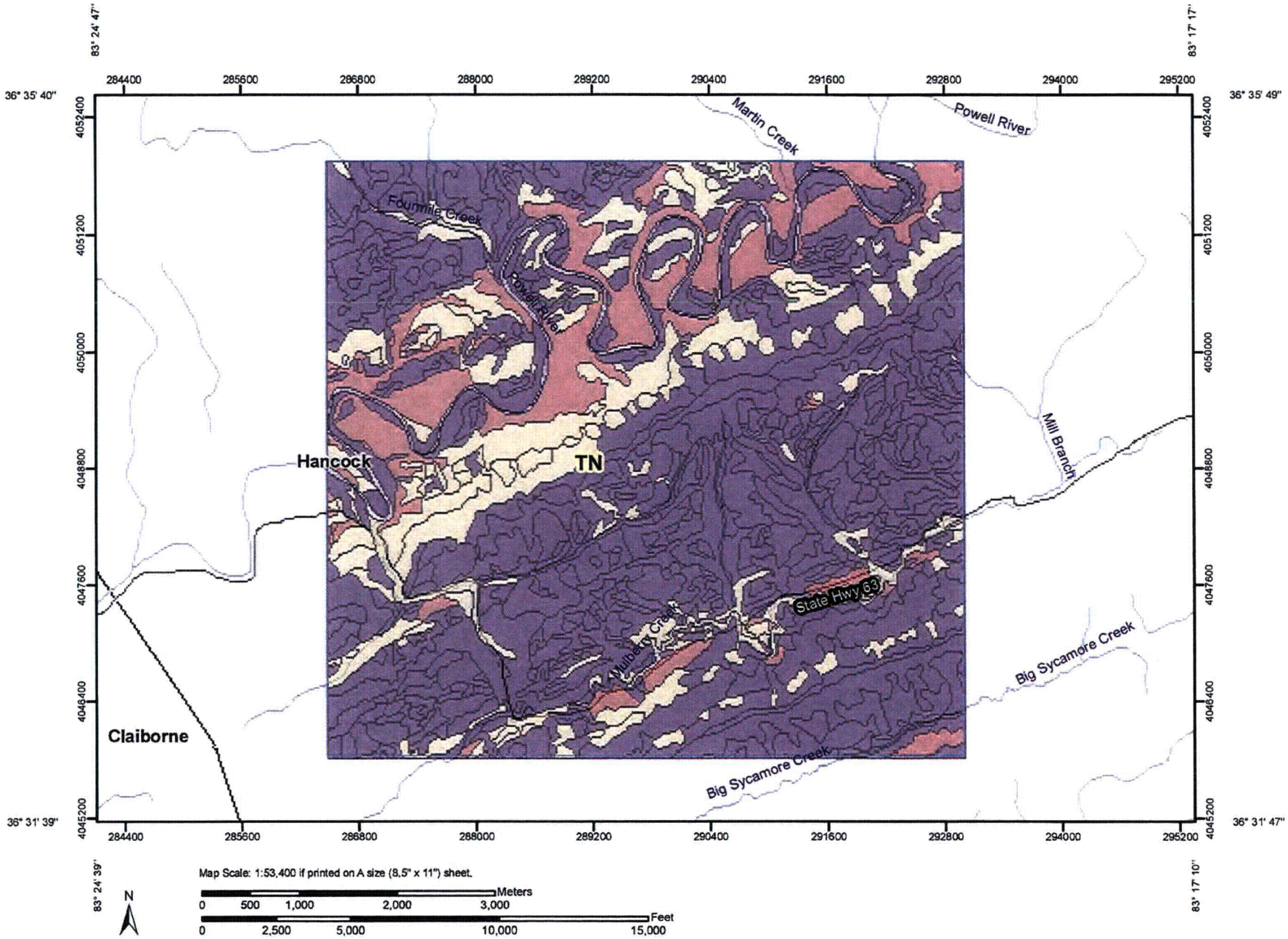
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower

Hydrologic Soil Group—Hawkins and Hancock Counties, Tennessee
(Norris Sample 4)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

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Hydrologic Soil Group–Hawkins and Hancock Counties, Tennessee
(Norris Sample 4)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:53,400 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hawkins and Hancock Counties, Tennessee
Survey Area Data: Version 5, Sep 28, 2007

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Hawkins and Hancock Counties, Tennessee				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnC	ALLEN LOAM, 5 TO 12 PERCENT SLOPES	B	51.2	0.5%
AnD	ALLEN LOAM, 12 TO 20 PERCENT SLOPES	B	21.0	0.2%
AnE	ALLEN LOAM, 20 TO 35 PERCENT SLOPES	B	24.5	0.2%
BoF	BOULDIN COBBLY LOAM, 20 TO 60 PERCENT SLOPES	B	104.5	1.1%
CaE	CALVIN SILT LOAM, 15 TO 35 PERCENT SLOPES	C	14.3	0.1%
CaF	CALVIN SILT LOAM, 35 TO 60 PERCENT SLOPES	C	169.3	1.7%
CeC	CLAIBORNE SILT LOAM, 5 TO 12 PERCENT SLOPES	B	51.0	0.5%
CeD	CLAIBORNE SILT LOAM, 12 TO 25 PERCENT SLOPES	B	183.3	1.9%
CeE	CLAIBORNE SILT LOAM, 25 TO 40 PERCENT SLOPES	B	580.3	5.9%
CfE3	CLAIBORNE SOILS, 15 TO 35 PERCENT SLOPES, SEVERELY ERODED	B	2.0	0.0%
CkD	CLARKSVILLE CHERTY SILT LOAM, 5 TO 20 PERCENT SLOPES.	B	370.4	3.8%
CkE	CLARKSVILLE CHERTY SILT LOAM, 20 TO 40 PERCENT SLOPES	B	514.8	5.2%
CoC	CLOUDLAND LOAM, 5 TO 12 PERCENT SLOPES (MONONGAHELA)	C	2.9	0.0%
CyD	CYNTHIANA FLAGGY SILTY CLAY LOAM, 5 TO 20 PERCENT SLOPES	D	24.0	0.2%
CyE	CYNTHIANA FLAGGY SILTY CLAY LOAM, 20 TO 50 PERCENT SLOPES	D	6.1	0.1%
DeC	DEWEY SILT LOAM, 5 TO 12 PERCENT SLOPES	B	79.2	0.8%
DeD	DEWEY SILT LOAM, 12 TO 20 PERCENT SLOPES	B	60.3	0.6%
DnE	DUNMORE SILT LOAM, 20 TO 35 PERCENT SLOPES	B	3.0	0.0%
Du	DUNNING SILTY CLAY LOAM	D	5.5	0.1%
Em	EMORY SILT LOAM	B	18.3	0.2%
EtC	ETOWAH SILT LOAM, 5 TO 12 PERCENT SLOPES	B	27.3	0.3%
FnC	FULLERTON CHERTY SILT LOAM, 5 TO 12 PERCENT SLOPES	B	367.3	3.7%

Hydrologic Soil Group— Summary by Map Unit — Hawkins and Hancock Counties, Tennessee				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FnD	FULLERTON CHERTY SILT LOAM, 12 TO 20 PERCENT SLOPES	B	495.7	5.0%
FnE	FULLERTON CHERTY SILT LOAM, 20 TO 35 PERCENT SLOPES	B	449.8	4.6%
Gr	GREENDALE SILT LOAM	B	33.9	0.3%
Ha	HAMBLEN SILT LOAM	C	160.8	1.6%
HeD	HARTSELLS LOAM, 12 TO 20 PERCENT SLOPES	B	126.3	1.3%
HhC	HAYTER LOAM, 3 TO 12 PERCENT SLOPES	B	117.4	1.2%
HhD	HAYTER LOAM, 12 TO 20 PERCENT SLOPES	B	278.2	2.8%
HhE	HAYTER LOAM, 20 TO 35 PERCENT SLOPES	B	213.0	2.2%
HkD	HAYTER COBBLY LOAM, 10 TO 20 PERCENT SLOPES	B	57.1	0.6%
HkE	HAYTER COBBLY LOAM, 20 TO 35 PERCENT SLOPES	B	39.2	0.4%
HkF	HAYTER COBBLY LOAM, 35 TO 55 PERCENT SLOPES	B	329.4	3.4%
JeD	JEFFERSON LOAM, 12 TO 20 PERCENT SLOPES	B	6.0	0.1%
JfC	JEFFERSON COBBLY LOAM, 5 TO 12 PERCENT SLOPES	B	2.5	0.0%
JfD	JEFFERSON COBBLY LOAM, 12 TO 20 PERCENT SLOPES	B	41.7	0.4%
JfE	JEFFERSON COBBLY LOAM, 20 TO 35 PERCENT SLOPES	B	183.4	1.9%
LzE	LITZ SHALY SILT LOAM, 20 TO 35 PERCENT SLOPES (SIL)	C	12.6	0.1%
LzE3	LITZ SHALY SILT LOAM, 20 TO 35 PERCENT SLOPES, SEVERELY ERODED (SIL)	C	27.1	0.3%
LzF	LITZ SHALY SILT LOAM, 35 TO 60 PERCENT SLOPES (SIL)	C	306.0	3.1%
MeB	MINVALE SILT LOAM, 2 TO 5 PERCENT SLOPES	B	10.0	0.1%
MeC	MINVALE SILT LOAM, 5 TO 12 PERCENT SLOPES	B	245.1	2.5%
MeD	MINVALE SILT LOAM, 12 TO 20 PERCENT SLOPES	B	74.2	0.8%
MnD	MONTEVALLO SHALY SILT LOAM, 8 TO 25 PERCENT SLOPES	D	2.6	0.0%
MnE	MONTEVALLO SHALY SILT LOAM, 25 TO 50 PERCENT SLOPES	D	33.8	0.3%
NeC	NELLA COBBLY LOAM, 5 TO 12 PERCENT SLOPES	B	8.5	0.1%

Hydrologic Soil Group—Summary by Map Unit — Hawkins and Hancock Counties, Tennessee				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NeD	NELLA COBBLY LOAM, 12 TO 20 PERCENT SLOPES	B	152.3	1.5%
NeE	NELLA COBBLY LOAM, 20 TO 45 PERCENT SLOPES	B	251.8	2.6%
RtE	ROCK OUTCROP-TALBOTT COMPLEX, 10 TO 40 PERCENT SLOPES	D	1,030.7	10.5%
Sa	SENSABAUGH GRAVELLY LOAM	B	99.7	1.0%
Se	SEQUATCHIE LOAM	B	3.1	0.0%
SkC2	SEQUOIA SILT LOAM, 3 TO 12 PERCENT SLOPES, ERODED	C	13.1	0.1%
SkD2	SEQUOIA SILT LOAM, 12 TO 20 PERCENT SLOPES, ERODED	C	9.5	0.1%
Sn	SEWANEE LOAM	B	18.2	0.2%
SoC	SHOUNS SILT LOAM, 3 TO 12 PERCENT SLOPES	B	7.3	0.1%
SoD	SHOUNS SILT LOAM, 12 TO 25 PERCENT SLOPES	B	24.2	0.2%
Ss	STASER SILT LOAM	B	350.0	3.6%
St	STATLER SILT LOAM	B	4.6	0.0%
Su	SULLIVAN LOAM	B	29.6	0.3%
TbC2	TALBOTT SILT LOAM, 5 TO 12 PERCENT SLOPES, ERODED	C	61.1	0.6%
TbD2	TALBOTT SILT LOAM, 12 TO 25 PERCENT SLOPES, ERODED	C	27.0	0.3%
TrD	TALBOTT-ROCK OUTCROP COMPLEX, 5 TO 20 PERCENT SLOPES	C	187.0	1.9%
TrE	TALBOTT-ROCK OUTCROP COMPLEX, 20 TO 50 PERCENT SLOPES	C	859.8	8.8%
W	WATER		157.2	1.6%
WaF	WALLEN GRAVELLY LOAM, 25 TO 60 PERCENT SLOPES	B	355.7	3.6%
WeF	WALLEN-ROCK OUTCROP COMPLEX, 25 TO 60 PERCENT SLOPES	B	249.4	2.5%
Totals for Area of Interest			9,826.4	100.0%

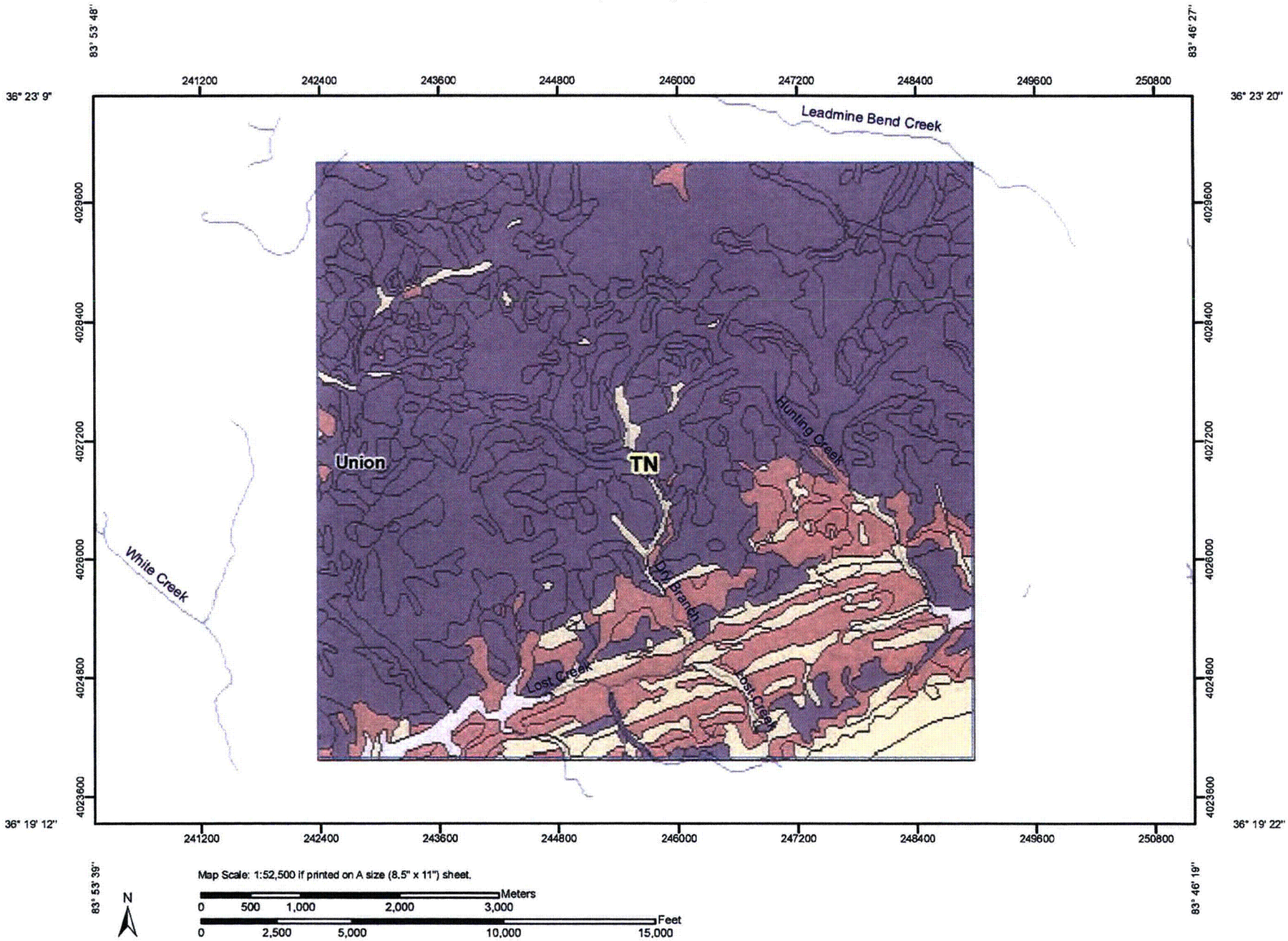
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Union County, Tennessee
(Norris Sample 5)



Hydrologic Soil Group–Union County, Tennessee
(Norris Sample 5)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,500 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Union County, Tennessee
Survey Area Data: Version 4, Aug 29, 2007

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Union County, Tennessee				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
A	ALLUVIAL SOILS, UNDIFFERENTIATED (LINDSIDE)	C	42.7	0.4%
Btl	BOLTON SILT LOAM, HILLY PHASE	B	29.0	0.3%
Bto	BOLTON SILT LOAM, ROLLING PHASE	B	11.6	0.1%
Btz	BOLTON SILT LOAM, STEEP PHASE	B	24.5	0.3%
Cao	CLARKSVILLE LOAM (CR-L), ROLLING PHASE	B	5.5	0.1%
Cbp	COLBERT SILT LOAM, ROLLING DEEP PHASE	D	49.8	0.5%
Ccl	CLARKSVILLE CHERTY SILT LOAM, HILLY PHASE	B	1,408.1	14.4%
Cco	CLARKSVILLE CHERTY SILT LOAM, ROLLING PHASE	B	551.5	5.7%
Ccz	CLARKSVILLE CHERTY SILT LOAM, STEEP PHASE	B	2,773.5	28.4%
Cnl	CLAIBORNE SILT LOAM, HILLY PHASE	B	66.9	0.7%
Cno	CLAIBORNE SILT LOAM, ROLLING PHASE	B	15.9	0.2%
Cnz	CLAIBORNE SILT LOAM, STEEP PHASE	B	72.7	0.7%
Crn	CAYLOR (ETOWAH) SILT LOAM, UNDULATING PHASE	B	12.0	0.1%
Cro	CAYLOR (ETOWAH) SILT LOAM, ROLLING PHASE	B	90.6	0.9%
Cte	COLBERT SILTY CLAY LOAM, ERODED ROLLING PHASE	D	25.9	0.3%
Dsn	DEWEY SILT LOAM, UNDULATING PHASE	B	5.8	0.1%
Dwe	DEWEY SILTY CLAY LOAM, ERODED ROLLING PHASE	B	49.9	0.5%
Dwf	DEWEY SILTY CLAY LOAM, ERODED STEEP PHASE	B	2.7	0.0%
Dwt	DEWEY SILTY CLAY LOAM, ERODED HILLY PHASE	B	42.7	0.4%
Fcl	FULLERTON CHERTY SILT LOAM, HILLY PHASE	B	809.1	8.3%
Fco	FULLERTON CHERTY SILT LOAM, ROLLING PHASE	B	293.7	3.0%
Fcz	FULLERTON CHERTY SILT LOAM, STEEP PHASE	B	325.6	3.3%
Fsl	FULLERTON SILT LOAM (CR-SIL), HILLY PHASE	B	191.0	2.0%
Fso	FULLERTON SILT LOAM (CR-SIL), ROLLING PHASE	B	271.8	2.8%
Fsz	FULLERTON SILT LOAM (CR-SIL), STEEP PHASE	B	3.3	0.0%

Hydrologic Soil Group— Summary by Map Unit — Union County, Tennessee				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Grn	GREENDALE SILT LOAM, UNDULATING PHASE	B	117.1	1.2%
Gro	GREENDALE (ETOWAH) SILT LOAM, ROLLING PHASE	B	64.0	0.7%
Ld	LIMESTONE ROCKLAND (ROC-TALBOTT), ROUGH	D	12.6	0.1%
Lhz	LEHEW FINE SANDY LOAM, STEEP PHASE	C	114.9	1.2%
Ll	LINDSIDE SILT LOAM	C	37.0	0.4%
Lr	LIMESTONE ROCKLAND (ROC-TALBOTT), ROLLING PHASE	D	316.1	3.2%
Mfz	MUSKINGUM STONY FINE SANDY LOAM (ST-L), STEEP PHASE	C	71.8	0.7%
Os	OOLTEWAH (LINDSIDE) SILT LOAM	C	54.9	0.6%
Pf	PHILO FINE SANDY LOAM (SL)	B	27.4	0.3%
RgM	ROUGH GULLIED LAND, MONTEVALLO SOIL MATERIAL	D	4.6	0.0%
RgT	ROUGH GULLIED LAND, TALBOTT SOIL MATERIAL	C	16.8	0.2%
RLT	ROUGH STONY LAND, TALBOTT SOIL MATERIAL	D	725.0	7.4%
Rs	ROANE SILT LOAM (CR-SIL)	C	98.5	1.0%
RsF	ROUGH STONY LAND, FULLERTON SOIL MATERIAL	D	80.3	0.8%
SsT	SMOOTH STONY LAND, TALBOTT SOIL MATERIAL	D	188.5	1.9%
Tce	TALBOTT SILTY CLAY LOAM, ERODED ROLLING PHASE	C	211.1	2.2%
Tcf	TALBOTT SILTY CLAY LOAM, ERODED STEEP PHASE	C	34.7	0.4%
Tct	TALBOTT SILTY CLAY LOAM, ERODED HILLY PHASE	C	52.7	0.5%
Tsn	TALBOTT SILT LOAM, UNDULATING PHASE	C	248.6	2.5%
W	WATER		108.0	1.1%
Totals for Area of Interest			**9,760.7**	**100.0%**

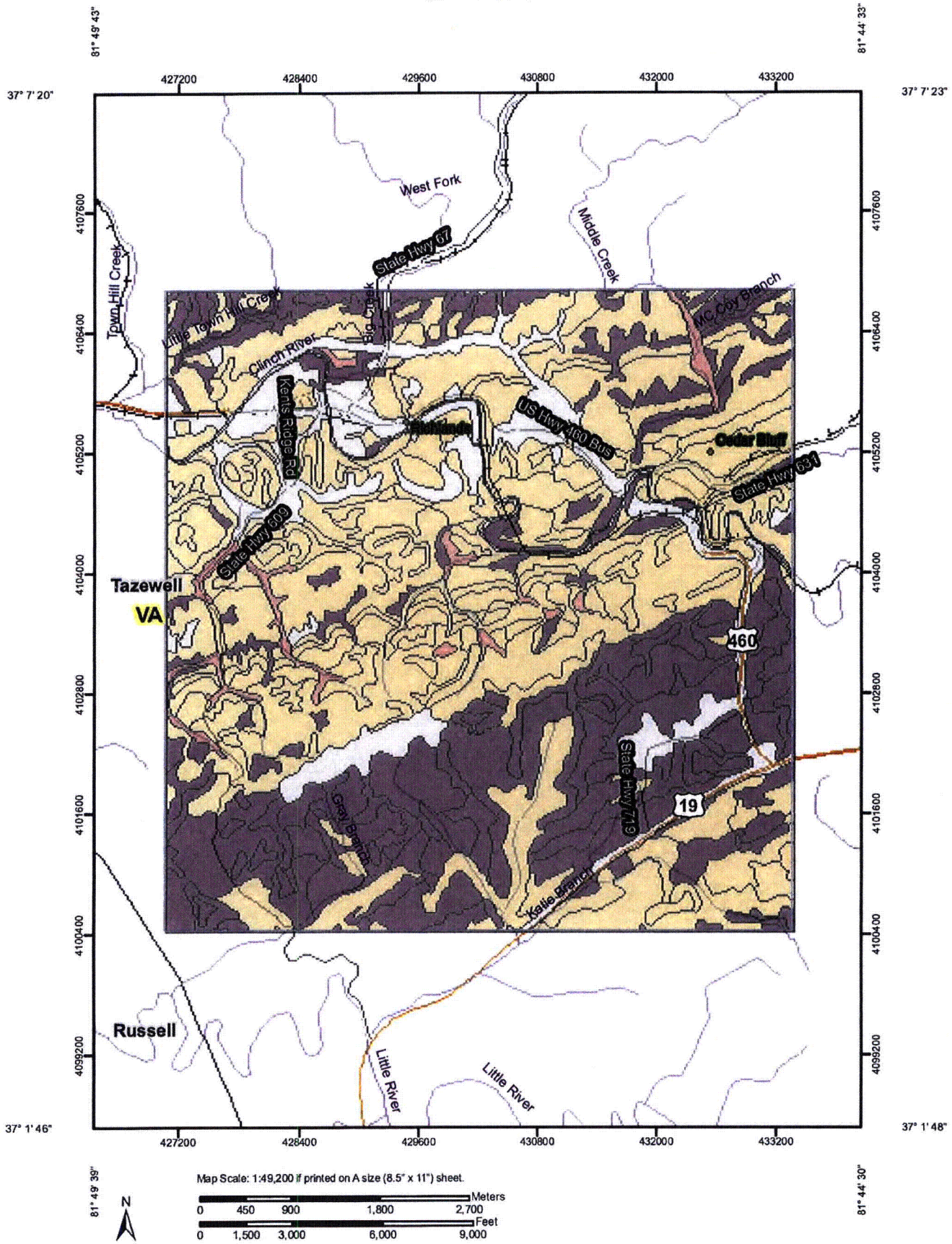
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Tazewell County, Virginia
(Norris Sample 6)



Hydrologic Soil Group–Tazewell County, Virginia
(Norris Sample 6)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:49,200 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Tazewell County, Virginia
Survey Area Data: Version 7, Jan 21, 2009

Hydrologic Soil Group

Hydrologic Soil Group—Summary by Map Unit — Tazewell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1B	Allegheny loam, 2 to 7 percent slopes	B	17.1	0.2%
2D	Alticrest fine sandy loam, 15 to 25 percent slopes	B	4.1	0.0%
2E	Alticrest fine sandy loam, 25 to 40 percent slopes	B	128.1	1.3%
3C	Berks-Weikert complex, 7 to 15 percent slopes	C	9.3	0.1%
3D	Berks-Weikert complex, 15 to 35 percent slopes	C	122.2	1.2%
3E	Berks-Weikert complex, 35 to 55 percent slopes	C	1,628.8	16.4%
4E	Berks-Gilpin complex, 25 to 35 percent slopes	C	40.8	0.4%
4F	Berks-Gilpin complex, 35 to 70 percent slopes	C	177.7	1.8%
5E	Bland-Rock outcrop complex, 25 to 50 percent slopes	C	25.8	0.3%
8D	Brushy gravelly loam, 15 to 25 percent slopes	B	12.1	0.1%
8E	Brushy gravelly loam, 25 to 60 percent slopes	B	152.8	1.5%
9E	Calvin channery silt loam, 35 to 55 percent slopes	C	33.3	0.3%
11C	Carbo silt loam, 7 to 15 percent slopes	C	37.2	0.4%
11D	Carbo silt loam, 15 to 25 percent slopes	C	95.1	1.0%
11F	Carbo silt loam, 35 to 65 percent slopes	C	194.7	2.0%
12D	Carbo-Rock outcrop complex, 7 to 25 percent slopes	C	203.9	2.0%
12E	Carbo-Rock outcrop complex, 25 to 65 percent slopes	C	1,725.2	17.3%
13E	Carbo-Rock outcrop complex, karst, 7 to 65 percent slopes	C	332.0	3.3%
15E	Cedarcreek-Rock outcrop complex, 35 to 80 percent slopes, very stony	C	28.4	0.3%
18B	Craigsville very gravelly sandy loam, 0 to 5 percent slopes, frequently flooded	B	11.1	0.1%
20B	Frederick silt loam, 2 to 7 percent slopes	B	25.4	0.3%
20C	Frederick silt loam, 7 to 15 percent slopes	B	36.7	0.4%
20D	Frederick silt loam, 15 to 25 percent slopes	B	38.8	0.4%

Hydrologic Soil Group—Summary by Map Unit — Tazewell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
21C	Frederick gravelly silt loam, 7 to 15 percent slopes	B	144.5	1.5%
21D	Frederick gravelly silt loam, 15 to 25 percent slopes	B	604.4	6.1%
21E	Frederick gravelly silt loam, 25 to 35 percent slopes	B	526.1	5.3%
21F	Frederick gravelly silt loam, 35 to 60 percent slopes	B	521.8	5.2%
22C	Frederick silt loam, karst, 7 to 15 percent slopes	B	235.9	2.4%
22D	Frederick silt loam, karst, 15 to 25 percent slopes	B	107.4	1.1%
22E	Frederick silt loam, karst, 25 to 35 percent slopes	B	113.7	1.1%
23D	Gilpin-Berks complex, 15 to 25 percent slopes	C	15.4	0.2%
24D	Grimsley loam, 15 to 35 percent slopes, very stony	B	10.3	0.1%
24E	Grimsley loam, 35 to 70 percent slopes, very stony	B	86.0	0.9%
25E	Grimsley-Cedarcreek-Berks complex, 35 to 70 percent slopes, rocky	C	1.1	0.0%
27B	Guernsey silt loam, 2 to 7 percent slopes	C	302.7	3.0%
28E	Lily fine sandy loam, 25 to 35 percent slopes	B	73.0	0.7%
32A	Melvin silt loam, 0 to 2 percent slopes, frequently flooded	D	171.5	1.7%
34C	Murrill silt loam, 7 to 15 percent slopes	B	11.9	0.1%
34D	Murrill silt loam, 15 to 25 percent slopes	B	135.7	1.4%
35A	Newark-Lindside complex, 0 to 3 percent slopes, occasionally flooded	C	182.8	1.8%
38D	Oriskany gravelly fine sandy loam, 15 to 35 percent slopes, very stony	B	38.8	0.4%
38E	Oriskany gravelly fine sandy loam, 35 to 55 percent slopes, extremely stony	B	34.6	0.3%
41A	Philo fine sandy loam, 0 to 3 percent slopes, frequently flooded	B	142.9	1.4%
45A	Pope fine sandy loam, 0 to 2 percent slopes, rarely flooded	B	22.6	0.2%
48B	Timberville silt loam, 2 to 7 percent slopes, frequently flooded	B	11.4	0.1%
50	Udorthents-Urban land complex		1,074.9	10.8%
51E	Wallen-Rock outcrop complex, 35 to 80 percent slopes, extremely stony	B	5.3	0.1%
52E	Wallen channery sandy loam, 35 to 65 percent slopes, very stony	B	27.0	0.3%

Hydrologic Soil Group—Summary by Map Unit — Tazewell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
53E	Westmoreland-Poplimento-Berks complex, 25 to 35 percent slopes	B	18.1	0.2%
53F	Westmoreland-Poplimento-Berks complex, 35 to 65 percent slopes	C	183.2	1.8%
W	Water		65.5	0.7%
Totals for Area of Interest			**9,949.2**	**100.0%**

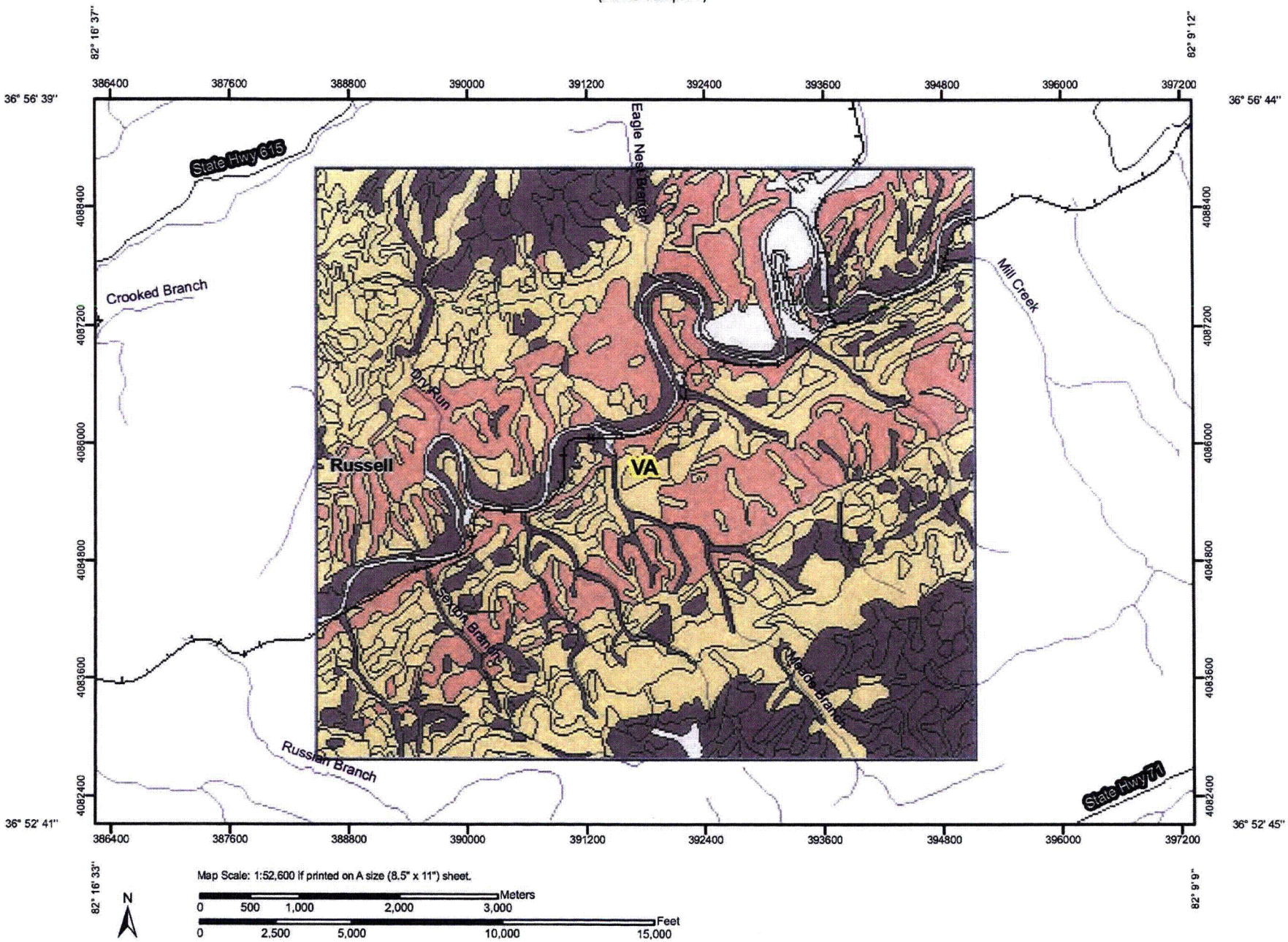
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Hydrologic Soil Group—Russell County, Virginia
(Norris Sample 7)



USDA Natural Resources Conservation Service

Web Soil Survey 2.1
National Cooperative Soil Survey

1/23/2009
Page 1 of 4

Hydrologic Soil Group–Russell County, Virginia
(Norris Sample 7)

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Ratings

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Political Features

- States
- Counties
- Cities

Water Features

- Oceans
- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads

MAP INFORMATION

Map Scale: 1:52,600 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Russell County, Virginia
Survey Area Data: Version 6, Dec 29, 2008

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Russell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1E	Berks-Chiswell complex, 35 to 55 percent slopes	C	606.0	6.1%
1F	Berks-Chiswell complex, 55 to 80 percent slopes	D	2,144.6	21.7%
3C	Berks-Groseclose complex, 8 to 15 percent slopes	C	109.0	1.1%
3D	Berks-Groseclose complex, 15 to 35 percent slopes	C	389.2	3.9%
4D	Berks-Poplimento complex, 15 to 35 percent slopes	C	224.4	2.3%
5D	Berks-Weikert channery silt loams, 15 to 35 percent slopes	C	0.6	0.0%
5F	Berks-Weikert channery silt loams, 55 to 70 percent slopes	C	3.6	0.0%
6E	Berks-Westmoreland complex, 35 to 55 percent slopes	C	210.1	2.1%
6F	Berks-Westmoreland complex, 55 to 70 percent slopes	C	580.8	5.9%
12C	Carbo-Beech Grove complex, 8 to 15 percent slopes, very rocky, eroded	C	120.6	1.2%
12D	Carbo-Beech Grove complex, 15 to 25 percent slopes, very rocky, eroded	C	349.9	3.5%
12E	Carbo-Beech Grove complex, 25 to 35 percent slopes, very rocky, eroded	C	150.8	1.5%
12F	Carbo-Beech Grove complex, 35 to 65 percent slopes, very rocky, eroded	C	241.5	2.4%
14D	Carbo-Rock outcrop complex, 8 to 25 percent slopes, eroded	C	297.3	3.0%
14E	Carbo-Rock outcrop complex, 25 to 65 percent slopes, eroded	C	1,301.2	13.2%
15D	Carbo-Rock outcrop complex, karst, 8 to 35 percent slopes, eroded	C	247.2	2.5%
17A	Chagrin loam, 0 to 3 percent slopes, occasionally flooded	B	215.7	2.2%
18	Dumps, mine-Urban land complex		133.5	1.4%
19C	Frederick silt loam, 8 to 15 percent slopes, eroded	B	140.5	1.4%
19D	Frederick silt loam, 15 to 25 percent slopes, eroded	B	258.6	2.6%
19E	Frederick silt loam, 25 to 35 percent slopes, eroded	B	38.6	0.4%
19F	Frederick silt loam, 35 to 60 percent slopes, eroded	B	59.0	0.6%

Hydrologic Soil Group—Summary by Map Unit — Russell County, Virginia				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
20C	Frederick silt loam, karst, 8 to 15 percent slopes, eroded	B	23.9	0.2%
20D	Frederick silt loam, karst, 15 to 25 percent slopes, eroded	B	1.0	0.0%
21D	Frederick gravelly silt loam, 15 to 25 percent slopes, eroded	B	0.9	0.0%
21E	Frederick gravelly silt loam, 25 to 35 percent slopes, eroded	B	21.3	0.2%
22C	Frederick gravelly silt loam, karst, 8 to 15 percent slopes, eroded	B	50.4	0.5%
22D	Frederick gravelly silt loam, karst, 15 to 25 percent slopes, eroded	B	14.3	0.1%
27A	Grigsby sandy loam, 0 to 3 percent slopes, occasionally flooded	B	220.6	2.2%
36A	Lobdell-Orrville complex, 0 to 3 percent slopes, occasionally flooded	B	102.3	1.0%
44C	Poplimento-Westmoreland complex, 8 to 15 percent slopes	C	15.2	0.2%
54F	Udorthents-Urban land complex, 0 to 80 percent slopes		130.0	1.3%
57C	Watahala gravelly silt loam, 8 to 15 percent slopes	B	54.9	0.6%
57D	Watahala gravelly silt loam, 15 to 25 percent slopes	B	327.8	3.3%
57E	Watahala gravelly silt loam, 25 to 35 percent slopes	B	287.2	2.9%
57F	Watahala gravelly silt loam, 35 to 55 percent slopes	B	294.4	3.0%
58D	Watahala gravelly silt loam, 15 to 25 percent slopes, extremely stony	B	14.1	0.1%
58E	Watahala gravelly silt loam, 25 to 35 percent slopes, extremely stony	B	5.4	0.1%
61B	Wyrick-Marbie silt loams, 3 to 8 percent slopes	B	246.0	2.5%
61C	Wyrick-Marbie silt loams, 8 to 15 percent slopes	B	74.5	0.8%
W	Water		173.3	1.8%
Totals for Area of Interest			**9,880.3**	**100.0%**

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Lower