Additional Proposal Information

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BIG SANDY RIVER BASIN

COMMONWEALTHS OF KENTUCKY AND VIRGINIA AND STATE OF WEST VIRGINIA

INITIAL WATERSHED ASSESSMENT

REPORT COMPLETE: MARCH 2014

REPORT APPROVED: JUNE 2014

U.S. ARMY CORPS OF ENGINEERS

HUNTINGTON DISTRICT

HUNTINGTON, WEST VIRGINIA

DEPARTMENT OF THE ARMY
HUNTINGTON DISTRICT, CORPS OF ENGINEERS
502 EIGHTH STREET
HUNTINGTON, WEST VIRGINIA 25701-2070

REPLY TO
ATTENTION OF

CELRH-PM-PD

24 March 2014

MEMORANDUM FOR Commander, U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, (ATTN: Gary Mosteller, CELRD-PDM-M), 550 Main Street, Room 10032, Cincinnati, Ohio 45202-3222

SUBJECT: Big Sandy River Basin, Commonwealths of Kentucky and Virginia, and State of West Virginia – Section 729, Initial Watershed Assessment

1. Submitted for policy compliance review and approval are six copies of the Initial Watershed Assessment (IWA) for the Big Sandy River Basin Section 729 Study. The IWA was prepared in accordance with the requirements outlined in Engineering Circular (EC) 1105-2-411, Watershed Plans, dated 15 January 2010. The report package includes the Planning and Policy Certification, Legal Certification, and ATR Certification.

2. Following approval of the IWA, the District will move forward by completing Watershed Assessment Management Plans (WAMPs) and Cost Share Agreements (CSAs) for the Tug Fork Sub-Basin and the Levisa Fork Sub-Basin. Further, once the two WAMPs are completed and associated cost-sharing agreements successfully negotiated, the District plans to pursue Final Watershed Assessments (FWAs) for both sub-basins.

3. The primary point of contact associated with the Big Sandy River Basin IWA is Ms. Sherry Adams. Should you have any questions regarding the subject project, please contact her directly at (304) 399-5844.

Encl

LEON F. PARROTT
Colonel, Corps of Engineers
Commanding

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DIVISION, GREAT LAKES AND OHIO RIVER
CORPS OF ENGINEERS
550 MAIN STREET
CINCINNATI, OH 45202-3222

CELRD-PDM

11 July 2014

MEMORANDUM for Huntington District, U.S. Army Corps of Engineers (CELRH-PM-PD/Ms. Sherry Adams), 502 Eighth Street, Huntington, WV 25701-2070

SUBJECT: Big Sandy River Basin, Commonwealths of Kentucky and Virginia, and State of West Virginia – Section 729, Initial Watershed Assessment

1. Reference CELRH-PM-PD Memorandum dated 24 March 2014, entitled "Big Sandy River Basin, Commonwealths of Kentucky and Virginia, and State of West Virginia – Section 729, Initial Watershed Assessment" with enclosure, copy attached.

2. The LRD Review Management Organization (RMO) has conducted a policy compliance review of the Initial Watershed Assessment (IWA) and concurs that all comments have been resolved and incorporated into the attached IWA dated June 2014.

3. I approve the enclosed IWA and the district may proceed to completing the Watershed Assessment Management Plans, Cost Share Agreements for the Tug Fork Sub-Basin and the Levisa Fork Sub-Basin, and pursue Final Watershed Assessments for both sub-basins.

4. If you have any questions please contact Mr. Gary Mosteller, CELRD-PDM, at (513) 684-3159.

Encl

JOHN C. ZIMMERMAN P.E., L.S.
Chief, Planning and Policy Division
Great Lakes and Ohio River Division

Executive Summary

A comprehensive Reconnaissance Report examining the Ohio River Basin was completed in December 2009. That report identified problems, issues, and opportunities throughout the basin and formulated numerous alternative courses of action, including future studies. During the development of the Reconnaissance Report and collection of geographic information system (GIS) data supporting the planning process, the basin was divided into 18 four-digit hydrologic sub-regions per the US Geological Survey (USGS) naming convention. These 18 separate hydrologic regions were referred to as "sub-basins" in the Reconnaissance Report. For that reason , the drainage area associated with the Big Sandy River six-digit hydrologic unit code (HUC) was referred to in the December 2009 report as the Big Sandy River sub-basin. In this Initial Watershed Assessment (IWA) and any following reports under the Section 729 authority, the term "Big Sandy River Basin" (rather than Big Sandy River sub-basin) will be used to identify the study area.

The Ohio River Basin Comprehensive Reconnaissance Report recommended 20 separate actions. In addition to recommending the development of a Programmatic Management Plan, the report recommended initiation of an unspecified number of Section 729 Watershed Assessments throughout the Ohio River Basin. One of those watershed assessments was assigned to the Big Sandy River Basin within the Huntington District.

The Big Sandy River Basin lies within the Commonwealths of Kentucky and Virginia and the State of West Virginia. The drainage area associated with the Big Sandy River Basin is classified as a HUC-6 accounting unit and consists of approximately 4,291 square miles.

Study authority to examine water resource related issues within the Big Sandy River Basin was provided through a resolution of the Committee on Public Works within the U.S. Senate, which was adopted on May 16, 1955, and Section 729 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) which was later amended by Section 202 of WRDA 2000 and Section 2010 of WRDA 2007.

Throughout the development of this IWA, professional and technical judgment was employed in order to determine whether or not further USACE participation was warranted. Special attention was given to identifying problems and opportunities, defining the existing condition, and developing potential alternative measures. While detailed procedures for conducting economic and environmental analyses were not utilized, the water resource planning process outlined in the Principles and Guidelines was generally followed.

In order to better define problems, needs, and opportunities, a broad spectrum of stakeholders ranging from Federal, state, and local government entities to nonprofit watershed associations were engaged. Overall, the primary water resource concerns raised were related to recreation opportunities, flooding, and floodplain management.

The final recommendation of this IWA, based on stakeholder input and technical research, are to prepare the following Watershed Assessment Management Plans (WAMP)s and subsequent comprehensive watershed assessments for the following areas:

- The Tug River Sub-Basin
- The Levisa Fork Sub-Basin

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1.0 Study Authority, Applicable Guidance, Process, and Funding

1.1 Introduction

A comprehensive Reconnaissance Report examining the Ohio River Basin was completed in December 2009. That report identified problems, issues, and opportunities throughout the basin and formulated numerous alternative courses of action including future studies.

The Ohio River Basin Comprehensive Reconnaissance Report recommended 20 separate actions. In addition to recommending the development of a Programmatic Management Plan, the report recommended initiation of an unspecified number of Section 729 Watershed Assessments throughout the Ohio River Basin. One of those watershed assessments was assigned to the Big Sandy River Basin within the Huntington District.

1.2 Study Authority

Study authority to examine water resource related issues within the Big Sandy River Basin was provided through Section 729 of the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662), which was later amended by Section 202 of WRDA 2000 and Section 2010 of WRDA 2007. An excerpt of the amended language reads as follows:

"The Secretary may assess the water resources needs of river basins and watersheds of the United States, including needs relating to ecosystem protection and restoration; flood damage reduction; navigation and ports; watershed protection; water supply; and drought preparedness."

In general terms, Section 729, as amended, allows the US Army Corps of Engineers (USACE) to assess the water resources needs of entire river basins and watersheds of the United States in consultation with appropriate Federal, state and local agencies and stakeholders. In contrast to most USACE traditional planning where the desired output of the study would be to identify a USACE project (usually for flood damage reduction, ecosystem restoration, or navigation), the watershed plan will have a series of recommendations which may or may not identify a specific USACE project.

Copies of the respective authorities cited in this section may be found in Appendix C to this report.

1.3 Applicable Guidance

The Planning Guidance Notebook, Engineering Regulation (ER) 1105-2-100, governs the overall procedures through which USACE Civil Works projects are formulated, evaluated, and recommended for implementation. In addition to describing USACE missions and programs, planning process, and applicable policies, ER 1105-2-100 provides clear guidance regarding the preparation of decision documents and the corresponding technical and policy reviews.

While the Planning Guidance Notebook served as the primary resource throughout the development of this Initial Watershed Assessment (IWA), the guidance for conducting watershed planning and preparing watershed plans led by USACE found in Engineering Circular (EC) 1105-2-411 "Watershed Plans" was the foundation for applying a comprehensive watershed approach. Watershed planning addresses problems, needs, and opportunities within a watershed or regional context, strives to achieve integrated water resource management, and results generally in non-project specific, holistic plans or strategies to address watershed needs. Watershed planning goes beyond planning for specific USACE projects and focuses more on comprehensive and strategic evaluations, analyses and solutions. In addition, the EC broadens the planning horizon to address both land and water resources issues and the multiple, interconnected systems that are frequently in play within watersheds. Systems that may be considered in watershed planning include:

- river and drainage systems;
- geomorphic and subterranean systems;
- weather (including climate change);
- transportation systems;
- power grid systems;
- water supply and wastewater systems;
- economic systems;
- recreation systems;
- institutional systems and legal frameworks;
- regulatory frameworks;
- floodplain management;
- ecosystems;
- water management systems;
- navigation systems;
- human resources; and
- any other system pertinent to the needs of the watershed effort.

This "broadening" of the traditional USACE emphasis on water resources alone provides opportunities to assess the complex interactions of the landscape and both surface and subsurface water systems at work in the watershed.

1.4 Process

There are two report phases leading to the development of a Watershed Plan. The first phase is the development of the IWA. The IWA is documented in this report and is similar to the traditional reconnaissance-level planning phase. The second phase is the development of a Final Watershed Assessment (FWA) and is similar to the traditional feasibility-level planning phase.

As defined in ER 1105-2-100[7], the six step planning process provides a systematic approach to problem solving and a rational framework for sound decision-making. Planning is an iterative process designed not only to stimulate creative thought and innovative solutions, but also to accommodate dynamic problems and opportunities. The six functional steps included within the planning process and employed during this study include:

1. Identifying problems and opportunities;
2. Inventorying and forecasting conditions;
3. Formulating alternative plan;
4. Evaluating alternative plans;
5. Comparing alternative plans; and
6. Selecting a plan.

Similar to the conventional two step – reconnaissance and feasibility – approach to USACE decision documents, the watershed planning process, as defined in EC 1105-2-411[4], essentially follows the same six step planning process. Section 8 of EC 1105-2-411 indentifies those six planning steps. However, watershed planning conducted under this guidance goes beyond the evaluation of a specific USACE project and moves toward a more comprehensive and strategic plan for managing land and water resources and addressing problems through a holistic process – a process that reflects the interdependency of land and water uses, competing demands, and desires of a wide range of stakeholders.

1.5 Stakeholder Involvement

In order to better define problems, needs, and opportunities, a broad spectrum of stakeholders ranging from Federal, state, and local government entities to nonprofit watershed associations were engaged. Five separate stakeholders meetings were held

throughout the basin during the latter part of April 2013 to accommodate the basin's diverse watershed needs and variety of water resources issues. As seen in Figure 1.1, the locations of the meetings were:

- Williamson, West Virginia – April 17, 2013
- Haysi, Virginia – April 17, 2013
- Welch, West Virginia – April 18, 2013
- Prestonsburg, Kentucky – April 22, 2013
- Louisa, Kentucky – April 22, 2013

Figure 1.1: Map of Stakeholder Meeting Locations

An additional meeting was held in Frankfort, Kentucky on May 15, 2013, with the Kentucky Sewer and Water Infrastructure Group (KSWIG) to inform them of the study, ascertain any interest and gather information from the members. The Public Service Commission, county and city organizations, and many other state and Federal agencies have representatives in the group.

During each of the stakeholder meetings, the Huntington District presented an overview of the basin and discussed potential agency programs and projects that could be utilized to address problems and opportunities. Afterwards, the floor was open to attendees to discuss land and water resource-related issues. The meetings were successful, but sparsely

attended, producing the need for more dialogue regarding all the problems and concerns within the basin. All concerns voiced by attendees were documented and included as part of this IWA.

The notes from the stakeholders meetings are attached to this document as Appendix F.

1.6 Funding

The Big Sandy River Basin IWA was conducted at full Federal expense and limited to $100,000 per EC 1105-2-411 guidance. Should the study move forward to the next phase under the Section 729 authority, a non-Federal sponsor will be required to cost share 25 percent of all efforts leading to the development of a comprehensive FWA and Watershed Plan. During the preparation of the FWA, the total amount of required non-Federal contribution may be provided by in-kind work contributions as described in a jointly prepared Watershed Assessment Management Plan (WAMP).

2.0 Study Purpose

The IWA is the first phase in the Section 729 Assessment process and is intended to accomplish five primary purposes that will be fully developed moving forward to an FWA. Those purposes are to:

- Determine interest in proceeding to a FWA;
- Identify a non-Federal sponsor;
- Define the scope and objective(s) of the Section 729 Assessment;
- Prepare a WAMP; and
- Negotiate a Cost Sharing Agreement (CSA).

Another purpose of the IWA phase is to identify watershed problems, needs and opportunities within the Big Sandy River Basin through stakeholder outreach. This IWA will serve as the basis for a comprehensive FWA and Watershed Plan, which will provide strategic guidance to watershed management from a system-wide approach.

The WAMP is analogous to a Project Management Plan (PMP) that is prepared for all USACE studies and projects. The WAMP will outline in considerable detail the tasks, agency responsibilities and costs associated with conducting a detailed FWA of the Big Sandy River Basin and will be completed with information developed in the IWA and in coordination with the non-Federal sponsor prior to executing a CSA.

3.0 Study Area and Congressional Districts

3.1 General

In accordance with EC 1105-2-411 and USACE Policy Guidance Letter #61 dated January 1999, watershed planning focuses on a specific watershed, which is a geographic area defined by a drainage basin and often described using hydrologic cataloguing units (HUCs) established by the US Gelogical Survey (USGS). Defining the appropriate watershed size or study area is critical. The study area needs to be broad enough geographically to capture the impacts or influences of the problems and likely solutions on the significant resources under study so that impacts and interactions are fully analyzed. The study area also needs to be broad enough to identify regional man-made and natural systems and assess the complex interactions of those systems that influence the use and development of land and water resources. Integrated watershed approaches often span diverse political, geographic, physical, institutional, technical, and stakeholder considerations and are valuable to both project planning and watershed planning.

During the development of the 2009 Ohio River Basin Comprehensive (ORBC) Reconnaissance Report and collection of geographic information system (GIS) data supporting the planning process, the basin was divided into 18 four-digit hydrologic subregions per the USGS naming convention. These 18 separate hydrologic subregions were referred to as "sub-basins". For that purpose, the drainage area associated with the Big Sandy River six-digit hydrologic unit code (HUC[1§]) (in this case also known as an accounting unit) was referred to as the Big Sandy River sub-basin. IWA and any following reports under the Section 729 authority, the term "Big Sandy River Basin" will be used to identify the study area.

EC 1105-2-411 suggests using the "hydrologic cataloguing units" (8-digit HUC watersheds) as the basic planning unit for watershed assessments. During the development of the 2009 ORBC Reconnaissance Report, future IWAs were planned at either the HUC4 or HUC6 watershed size. Further watershed planning with stakeholders and potential sponsors were expected to prioritize FWAs and Plans at the HUC8 or smaller watershed size, based

[1] [§]Watersheds in the United States and the Caribbean were delineated by the U.S. Geological Survey using a national standard hierarchical system based on surface hydrologic features and are classified into four types of hydrologic units: first-field (region), second-field (sub-region), third-field (accounting unit), and fourth-field (cataloguing unit). A fifth-field of classification (watershed) and sixth-field (sub-watershed) are currently under development. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to twelve digits based on the six levels of classification:

- 2-digit HUC first-level (region)
- 4-digit HUC second-level (subregion)
- 6-digit HUC third-level (accounting unit)
- 8-digit HUC fourth-level (cataloguing unit)
- 10-digit HUC fifth-level (watershed)
- 12-digit HUC sixth-level (subwatershed)

on sponsor needs. However, unique conditions within the basin and the needs of the sponsor and public may dictate a departure from that basic planning unit for study purposes. There are four HUC 8 watersheds within the Big Sandy River Basin as described in more detail below.

3.2 Study Area

As seen in Figure 3.1, the Big Sandy River Basin, with a total drainage area of approximately 4,291 square miles, lies in the southeastern portion of Kentucky and the southwestern portions of West Virginia and Virginia. This drainage area has an extreme width of about 90 miles from east to west and an approximate length of 100 miles extending from its headwaters in Virginia and West Virginia north to Catlettsburg, Kentucky at the mouth of the Big Sandy River. While most of the area within the basin is rugged with elevations reaching over 3,900 feet in the upper portions of the Tug Fork and Levisa Fork watersheds, valleys are relatively wide and hills are more gentle and rounded in the lower portion of the basin along the Big Sandy River where the lowest elevation is around 500 feet.

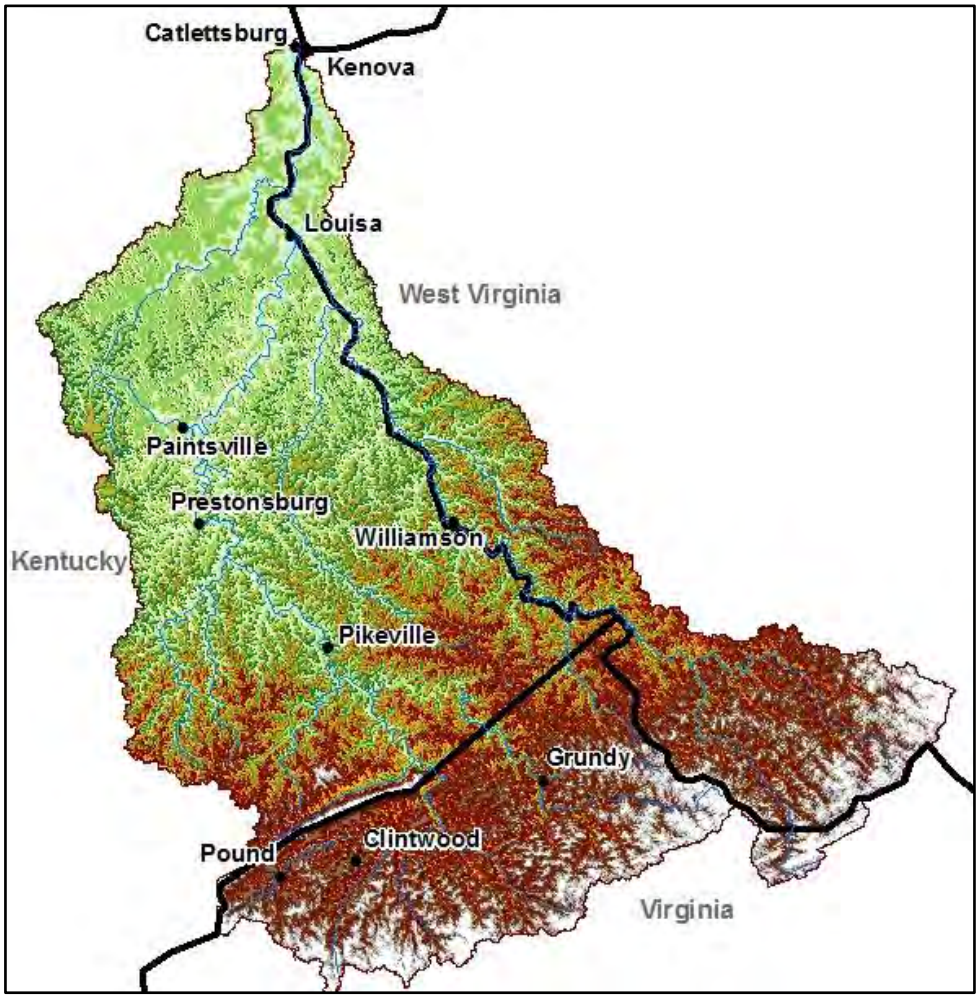

Figure 3.1: Relief Map of Study Area

The Big Sandy River itself, as seen in Figure 3.2, is formed at the confluence of the Tug Fork and Levisa Fork Rivers near Louisa, Kentucky and flows 29 miles north to enter the Ohio River at Kenova, West Virginia and Catlettsburg, Kentucky – approximately 10 miles downstream of Huntington, West Virginia. The Big Sandy River, along its entire length, forms a portion of the border between Kentucky and West Virginia and falls approximately 34 feet over its entire length. The only major tributary entering the main stem downstream of the Tug and Levisa Forks is Blaine Creek. Blaine Creek drains the northwest portion of the basin and has an approximate drainage area of 265 square miles and a length of around 50 miles.

Figure 3.2: Big Sandy River Basin

The Big Sandy River Basin ranges from uncontrolled flow along the Tug Fork River to controlled flow along the Levisa Fork and Blaine Creek sub-basins. There are many smaller

tributaries that remain uncontrolled and allow for free flow. While much of the basin was navigable at one point in time with the aid of navigation locks and dams, the majority of the basin is not suitable for commercial navigation at this point. The former lock and dam structures have been removed and no longer act as a barrier in the ecosystem. The exception is the lower nine miles of the Big Sandy River starting with its confluence with the Ohio River.

The principal tributaries of the Big Sandy River are the Tug Fork and Levisa Fork Rivers. The course of these rivers is tortuous with floodplains being relatively narrow and bounded by steep hills. The Tug Fork River rises in McDowell County in southwestern West Virginia and flows northward to its junction with the Levisa Fork River near Louisa, Kentucky and Fort Gay, West Virginia. The total length of the Tug Fork River is approximately 155 miles. Of this length, about 55 miles lies within West Virginia, approximately five miles forms a portion of the border between West Virginia and Virginia, and the remaining 95 miles establishes the boundary between Kentucky and West Virginia. The Tug Fork River falls approximately 1,678 feet over its entire length.

The Levisa Fork River rises in Buchanan County in southwest Virginia and flows northward through Prestonsburg, Kentucky to its junction with the Tug Fork River. The total length of the Levisa Fork River is approximately 164 miles. Of this length, approximately 130 miles lies within Kentucky and the remaining 34 miles in Virginia. Over the entire length of the Levisa Fork, the river falls approximately 1,878 feet. The Levisa Fork River has four tributaries with drainage areas exceeding 200 square miles – Russell Fork, Pound River, Beaver Creek, and Johns Creek.

Russell Fork rises in the southern most portion of Buchanan County, Virginia and flows in a northwestern direction to its confluence with the Levisa Fork River at Millard, Kentucky – approximately 12 miles upstream from Pikeville, Kentucky. Russell Fork is approximately 45 miles long with 30 miles lying in Virginia and the remaining 15 miles in Kentucky. Below Elkhorn City, Kentucky, the valley averages 800 feet in width. Above Elkhorn City, the valley is much narrower, particularly through the “Breaks of Sandy” at the Kentucky-Virginia state line, where the stream flows through a narrow gorge and steep cliffs rising from their bases near the water’s edge to a height more than 1,500 feet above the valley floor. Russell Fork falls from elevation 1,700 feet to elevation 665 feet with an average fall of the stream being 25 feet per mile. Of the total fall, approximately 450 feet occurs within the 12 miles below Haysi, Virginia when the stream falls though the “Breaks”.

The Pound River lies entirely within Virginia and is formed in the northern portion of Wise County by the confluence of the North and South Forks at Pound, Virginia. Pound River, which is approximately 45 miles in length, flows along the base of Pine Mountain in a

northeastern direction to its confluence with the Russell Fork – approximately three miles downstream of Haysi, VA. Beaver Creek lies entirely within Knott and Floyd Counties, Kentucky and is formed by the confluence of the Right and Left Forks near Martin, Kentucky. Beaver Creek flows in a northern direction to its confluence with the Levisa Fork near Allen, Kentucky. Johns Creek rises in the eastern portion of Pike County, Kentucky and flows in a northwest direction approximately 64 miles to its confluence with the Levisa Fork at the Floyd-Johnson county line.

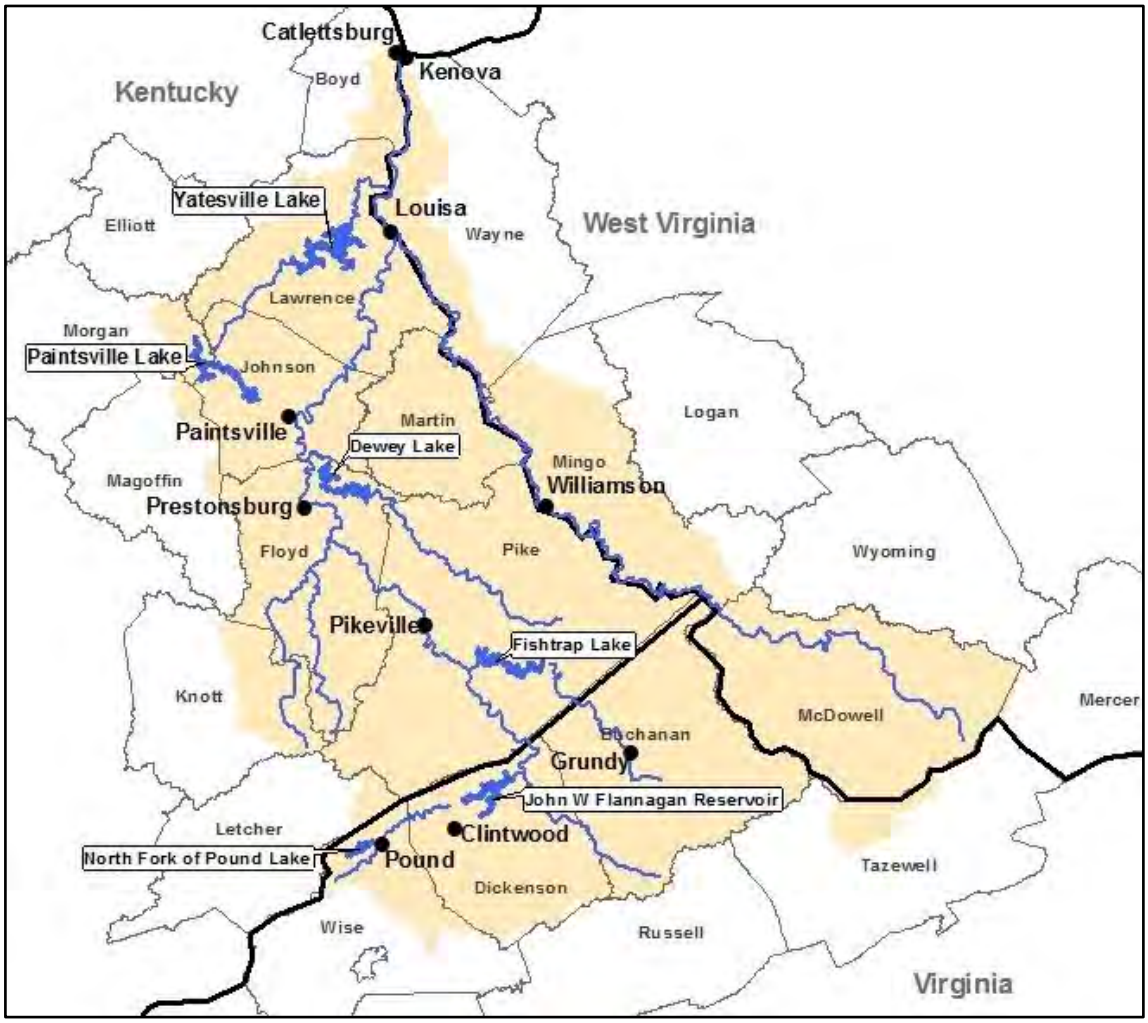

Figure 3.3: Counties within the Big Sandy River Basin

As previously stated, the Big Sandy River Basin lies within the Commonwealths of Kentucky and Virginia and the State of West Virginia and encompasses portions of or the entirety of the following counties: Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, and Pike in Kentucky; Buchanan, Dickenson, Tazewell, and Wise in Virginia; and McDowell, Mercer, Mingo, and Wayne in West Virginia. The counties included in the

watershed, as well as their area within the basin, are shown in Figure 3.3 and listed below in Table 3.1.

Table 3.1: Counties Contributing to the Big Sandy River Basin

County	Square Miles of County within Basin	Percent of County within Basin
Kentucky		
Boyd	43.2	26.7
Floyd	395.3	100
Johnson	263.8	100
Knott	100.5	28.5
Lawrence	379.6	90.4
Letcher	19.2	5.7
Magoffin	24.6	7.9
Martin	230.7	100
Morgan	38.3	10
Pike	788.5	100
Virginia		
Buchanan	503.5	100
Dickenson	328.4	98.5
Tazewell	46.6	9
Wise	119.8	29.6
West Virginia		
McDowell	534.3	100
Mingo	314.5	74.3
Mercer	3.1	0.7
Wayne	156.7	30.6

The Big Sandy River Basin is classified as a HUC-6 watershed (050702), which breaks down into four HUC-8 watersheds listed below. Figure 3.4 below shows the location of the watersheds within the basin.

- Tug Fork River watershed (05070201)
- Upper Levisa River watershed (05070202)
- Lower Levisa River watershed (05070203)
- Big Sandy River, Blaine Creek watershed (05070204)

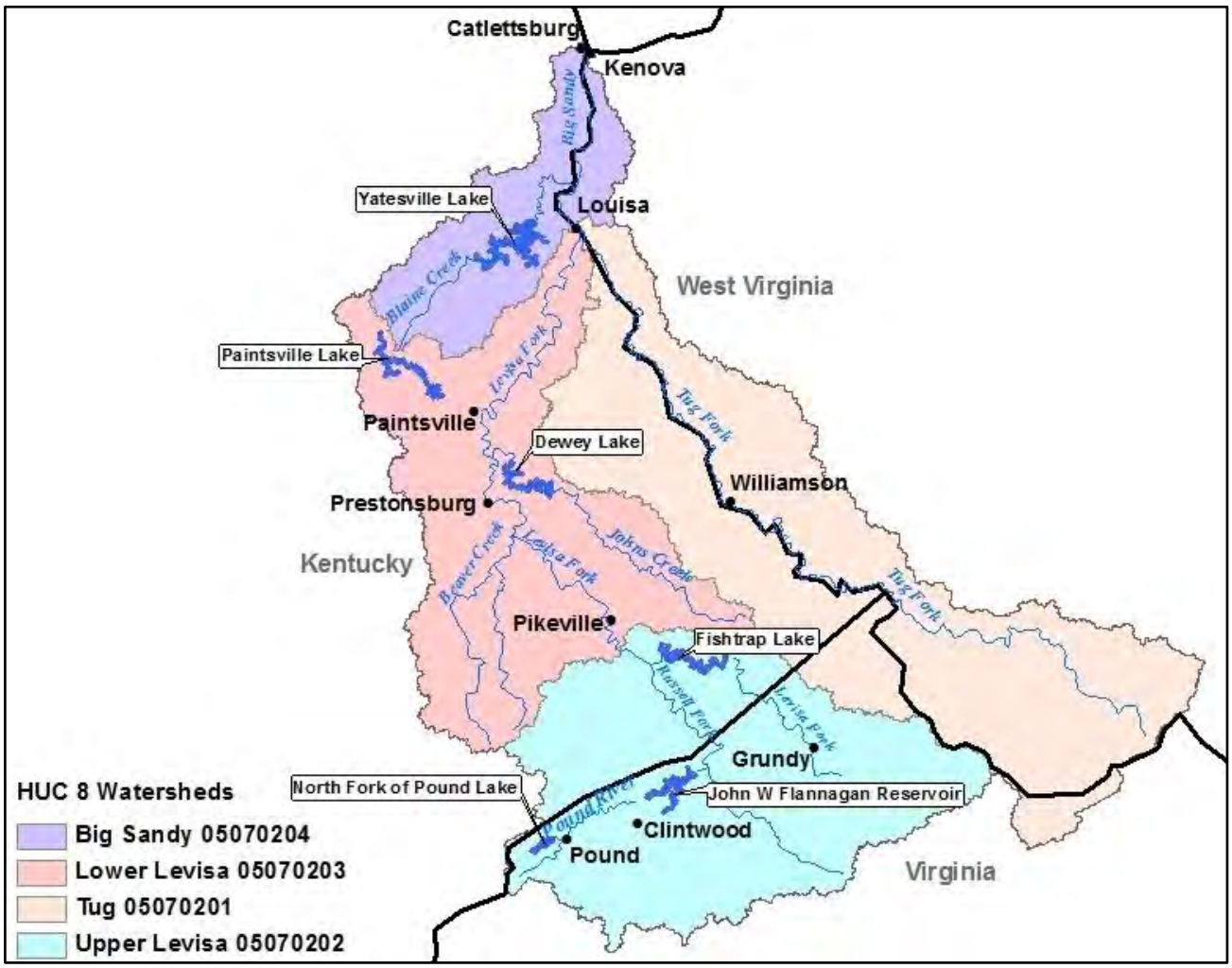

Figure 3.4: HUC 8 Watersheds within the Big Sandy River Basin

3.3 Congressional Districts

As shown in Figure 3.5, the Big Sandy River Basin lies within the geographical area of the following congressional interests and districts:

- Kentucky District 04 (Thomas Massie-R) – primarily Catlettsburg
- Kentucky District 05 (Hal Rogers-R)
- Virginia District 09 (Morgan Griffith-R)
- West Virginia District 03 (Nick Rahall-D)

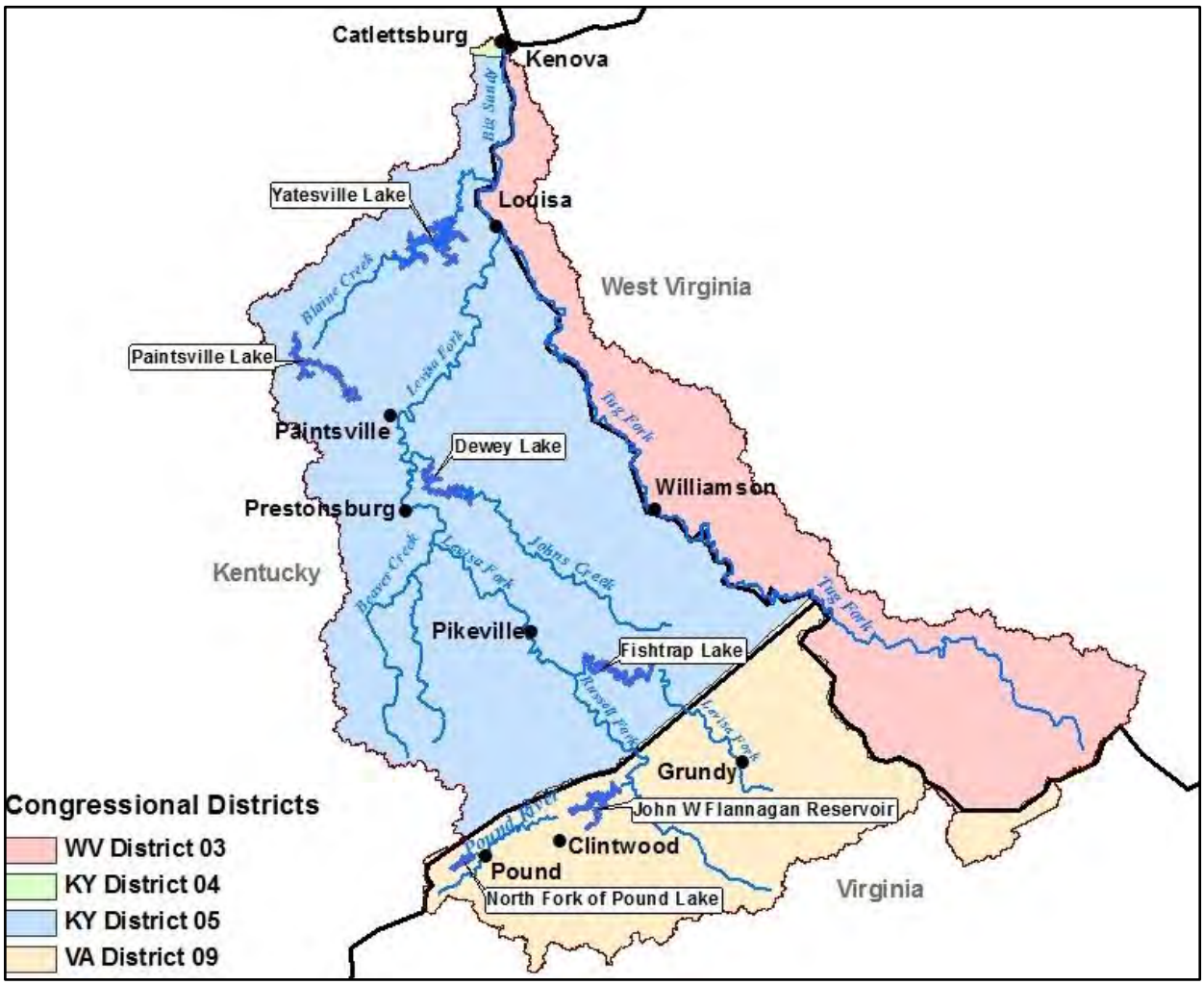

Figure 3.5: Congressional Districts within the Big Sandy River Basin

4.0 Prior Studies, Reports, and Existing Projects

Several investigations concerning the Big Sandy River Basin have been made by USACE and other agencies. In order to gain a better understanding of problems, needs, and opportunities within the Big Sandy River Basin, the findings and results of prior studies and reports along with implemented water resource related projects were considered to be part of the IWA. Given the history and size of the basin, an exhaustive list of all studies, reports, and projects undertaken within its boundaries would be nearly impossible to compile. However, presented below are summaries of the implemented projects, studies, and reports most applicable to watershed planning, which help to identify existing problems and opportunities in the Big Sandy River Basin.

4.1 Existing USACE Projects

The following subsections contain a list of key USACE projects, which have been completed or are currently underway. Projects were accomplished using various authorities including, but not limited to, the Flood Control Acts of 1938 and 1955; Section 202 of the Energy and Water Development Appropriations Act of 1981; and Section 205 of the Flood Control Act of 1948.

4.1.1 Reservoirs

The USACE owns and operates six dams and reservoirs in the Big Sandy River Basin. These include North Fork of Pound River Lake and John W. Flannagan Dam and Reservoir in Virginia; and Fishtrap, Dewey, Paintsville and Yatesville Dams in Kentucky. These reservoirs provide several important project purposes and benefits to the basin. Those purposes include flood risk reduction, recreation, water supply, fish and wildlife conservation, low flow augmentation and water quality. These projects are credited with preventing an estimated $1 billion in flood damages since operations began through fiscal year 2012. The recreational opportunities associated with these lakes are enjoyed by many visitors and the associated spending contributes to the regional economy. Additional details about each dam and reservoir are provided in the following sections.

In June 2005, USACE began evaluating the Nation's reservoir and lock and dam projects with known dam safety concerns to develop relative ratings for human and economic risk. The effort, called the Screening Portfolio Risk Assessment (SPRA), was used as a tool to help shape USACE budget decisions regarding reservoir and lock and dam infrastructure improvements. The SPRA initially evaluated over 60 USACE projects nation-wide. Since that time a new ranking system has been established, known as the Dam Safety Action Classification (DSAC) system. All of the dams in the Big Sandy River basin were evaluated

and designated as DSAC 4 - Priority (Marginally Safe) projects. Given these ratings, these projects are not currently under study in the Dam Safety program. Periodic reevaluations will monitor the condition of the dams and should the DSAC rating change, one or more dams may be considered for further dam safety study.

4.1.1.1 North Fork of Pound River Lake

North Fork of Pound dam was authorized by the Flood Control Act of 1938. The project is located in Wise County, Virginia on the North Fork of the Pound River about a mile and a half west of Pound, VA. The Pound River is a tributary of the Russell Fork of the Levisa Fork of the Big Sandy River. The dam controls runoff from a drainage area of 17.2 square miles. Building of the project began in 1963 and was completed in 1966. Project purposes include flood risk reduction, water supply for Pound, Virginia, fish and wildlife conservation and recreation. The Virginia Department of Game and Inland Fisheries manages the North Fork of Pound Lake Recreation Area. Facilities at the project include two boat launch sites and picnicking facilities. The project lands fall within the boundaries of Jefferson National Forest and the US Forest Service manages forested lands at the project.

4.1.1.2 John W. Flannagan Dam and Reservoir

John W. Flannagan dam is located in Dickenson County, Virginia, and is situated on the Pound River, a tributary of the Russell Fork of the Levisa Fork of the Big Sandy River. The project was authorized by the Flood Control Act of 1938 and the Federal Water Pollution Control Act Amendments of 1961. The dam was completed in 1964 and controls a drainage area of 221 square miles. Project purposes are flood risk reduction, water supply, low-flow augmentation, fish and wildlife enhancement, recreation, and water quality. The project lands adjoin the Jefferson National Forest. Recreation facilities include five boat launching ramps, marina, campgrounds, picnicking and trails. During the first four full weekends in October, John W. Flannagan operates for whitewater releases to achieve winter pool. From the dam, the first two miles (3 km) are Class II rapids on the Pound River which progress downstream reaching Class V + rapids in the Breaks area. Some of the most challenging rapids in the eastern U.S. (with names like 20 Stitches, Broken Nose and Triple Drop) can be found while rafting, canoeing or kayaking through Breaks Interstate Park.

4.1.1.3 Fishtrap Dam

Authorized by the Flood Control Act of 1938, the dam creating Fishtrap Lake is located on the Levisa Fork of the Big Sandy River in Pike County, Kentucky, three miles above the mouth of the Russell Fork and 15 miles upstream from Pikeville. The project controls the

runoff from a drainage area of 395 square miles in parts of Kentucky and Virginia. Construction began in 1962 and the dam was completed in 1968. The project is operated for flood risk reduction, low flow augmentation, recreation, and fish and wildlife conservation in the Levisa Fork and Big Sandy River valleys. Kentucky Department of Fish and Wildlife manages the Fishtrap Wildlife Management Area to promote wildlife and fishing resources.

4.1.1.4 Dewey Dam

Dewey Dam is located in Floyd County, Kentucky on Johns Creek in the Big Sandy River Basin, near Paintsville and Prestonsburg. The project was constructed under authority of the Flood Control Act of 1938, and controls runoff from a drainage area of 207 square miles. Construction of the dam was completed in 1949. The project is operated for flood risk reduction and recreation. In addition to providing flood risk reduction in the Big Sandy Basin, the lake contributes to reducing floods on the Ohio and lower Mississippi Rivers. Jenny Wiley State Resort Park has been developed on leased property by the Kentucky Department of Parks. The state park has facilities including a lodge, an amphitheater, two marinas, boat ramps, picnic units, cabins, camp sites, trails, a chair lift, a swimming pool and golf course. Kentucky Department of Fish and Wildlife has developed fish and game resources at the Dewey Lake Wildlife Management Area. The Floyd County Fiscal Court oversees operation and maintenance of the German Bridge Camp and Equestrian Trails.

4.1.1.5 Paintsville Dam

Paintsville Dam, built under the authority of the Flood Control Act of 1965, is located on Paint Creek, eight miles above its confluence with the Levisa Fork, and about four miles west of Paintsville in Johnson County, Kentucky. The lake extends into Morgan County. The dam controls runoff from a drainage area of 93 square miles. Construction began in 1973 and the project was placed in operation in 1983. The project is operated for flood risk reduction, low flow augmentation, recreation, and fish and wildlife conservation. Paintsville Lake State Park is operated on and leased by Kentucky Department of Parks. The state park offers camping, a marina, boat ramps, picnic units, and trails. Kentucky Department of Fish and Wildlife has developed fish and game resources at the Paintsville Lake Wildlife Management Area. The Mountain Home Place Farm located on the project land is operated by Paintsville Tourism. The Home Place Farm offers a unique experience illustrating how people lived in eastern Kentucky during the second half of the 1800s.

4.1.1.6 Yatesville Dam

Yatesville Dam is located in Lawrence County, Kentucky, on Blaine Creek, a tributary of the Big Sandy River. Its confluence is about 18 miles above the mouth of the Big Sandy River and Ohio River. The dam is about four miles south of Yatesville and five miles west of Louisa, Kentucky. The project was authorized by Section 204 of Flood Control Act of 1965 and is operated for flood risk reduction, water quality, recreation and low flow augmentation. The project is also operated as a unit in the comprehensive flood control system for Ohio River Basin. The dam was completed in 1991 and controls a drainage area of 208 square miles. Yatesville Lake State Park is operated by Kentucky Department of Parks and features a marina, two boat ramps, campground, trails and a golf course.

Table 4.1: Big Sandy River Basin Reservoirs

Location	North Fork of Pound	John W. Flannagan	Fishtrap	Dewey	Paintsville	Yatesville
Drainage Area (Square Miles)	17	221	395	207	93	208
Flood Control Storage (Acre-feet)	9,400 winter 8,100 summer	94,700 winter 78,200 summer	153,800 winter 126,600 summer	81,000 winter 76,100 summer	36,300	57,100 winter 45,200 summer
Lake Surface (Acres)	349	2,098	569	1,100	1,867	3,805
Project Purposes*	FC, WS, FW, RE	FW, WS, FC, LFA, RE, WQ	RE, LFA, FC, FW, WQ	FW, FC, RE	FC, WQ, RE, LFA	FC, RE, WQ

*FC – Flood Control, WS – Water Supply, FW – Fish and Wildlife Conservation, RE – Recreation, LFA – Low Flow Augmentation, and WQ – Water Quality

4.1.2 Section 202 Flood Control Measures

Following a devastating flood in April 1977 along the Tug and Levisa Forks of the Big Sandy River and within the Cumberland River Basin, special legislation authorizing the design and construction of flood control measures was incorporated in Section 202 of the Energy and Water Development Appropriations Act of 1981 (P.L. 96-367). Section 202 directs the Secretary of the Army, acting through the Chief of Engineers, to design and construct, at full Federal expense, such flood control measures as the Chief of Engineers determines necessary and advisable to afford communities and localities and their immediate environs on both the Tug and Levisa Forks of the Big Sandy River and within the Cumberland River

Basin a level of protection preventing future flood losses from the reoccurrence of the April 1977 event. Section 202 further stipulated the total benefits of the authorized flood control measures exceeded the cost of implementation. To date, the Section 202 program has included the construction of levees, floodwalls, and pump stations; floodproofing and acquisition of structures located in flood hazard areas; relocation of public facilities including schools, town halls, and fire stations; and development of relocation sites for affected areas.

In April 1982, USACE completed a report entitled "General Plan for Section 202 Program Implementation". As the title suggests, this report outlined a general plan for implementing the Section 202 program and accomplishing flood control measures throughout the Tug Fork, Levisa Fork, and Upper Cumberland River Basins. The General Plan defined 17 specific project elements under the recommended plan, Plan F-1, which included levees, floodwalls, stream channel modifications, resettlement of development, floodproofing in flood prone areas, and flood warning and emergency evacuation features. Subsequent to the development of the General Plan, appendices documenting alternative formulation and detailed design parameters for specific project areas were prepared in response to an Assistant to the Secretary of the Army for Civil Works [ASA(CW)] request. A list of these appendices is contained in Table 4.2. Within this table, completed and ongoing projects within the Big Sandy River Basin are denoted by an asterisk (*) and discussed briefly in the following sections.

Table 4.2: Section 202 Implementation Appendices to the General Plan

Report	Date	Title
Appendix A	April 1982	Formulation of Defined Program
Appendix B	April 1982	Implementation Schedule
Appendix C	April 1982	Budget Constrained Implementation Schedule
Appendix D	April 1982	Pineville, KY Project Summary
Appendix E	April 1982	Pikeville, KY Project Summary (Pikeville Gate Closure)*
Appendix F	April 1982	Williamson, WV Area Project Summary (West Williamson Floodwall/Williamson CBD Floodwall/Snagging and Clearing)*
Appendix G	December 1983	Barbourville, KY Levee Project Summary
Appendix H	May 1985	Matewan, WV Area S/NS Project Summary SPR*
Supplement to Appendix F	January 1985	Williamson, WV NS Project SPR*
Appendix I	N/A	Untitled
Appendix J	January 1986	Upper Slate Creek (Grundy, VA) SPR (Terminated/Incorporated Appendix O)

Appendix K	January 1986	South Williamson, KY S/NS Project Summary SPR*
Appendix L	February 1990	Lower Mingo County, WV SPR*
Appendix M	September 1991	Hatfield Bottom (Matewan, WV) DPR*
Appendix N	October 1993	Pike County, KY DPR*
Appendix O	August 1993	Grundy, VA DPR*
Appendix P	February 1995	Upper Mingo County, WV DPR*
Appendix Q	July 1996	Martin County, KY NS Project DPR*
Appendix R	January 1997	Wayne County, WV DPR*
Appendix S	May 1998	McDowell County, WV DPR*
Supplement to Appendix P	September 1998	Upper Mingo County, WV NS Project Supplement*
Appendix T	March 2000	Town of Martin, KY DPR*
Supplement to Appendix N	2002	Pike County, KY Tributaries, NS Supplement*
Appendix U	January 2002	Buchanan County, VA DPR*
Appendix V	August 2003	Dickenson County, VA DPR*
Appendix W		
Appendix X		

4.1.2.1 Pikeville Gate Closure

The Pikeville cut-through was completed in 1987as a part of the "Model Cities Program". The Cut-Through Project consisted of rerouting the Levisa Fork River through Peach Orchard Mountain to bypass downtown Pikeville, Kentucky in order to reduce flood damages and create more developable land. The Appalachian Region Commission (ARC) was the lead agency responsible for the Cut-Through Project (constructed by USACE) and USACE completed the gate closure component of this project under the Section 202 authority.

4.1.2.2 West Williamson LPP

In 1989, USACE completed the construction of a LPP along the right bank of the Tug Fork River in the West Williamson section of Williamson, which is located in Mingo County, West Virginia. The project consists of approximately 6,000 feet of concrete wall, four gate openings permitting normal road and railroad traffic, two pedestrian openings, and one pump station. This project affords protection for the principal business and residential sections within the West Williamson area against floods equal to the Standard Project Flood. The total project cost was $43.1M. Mingo County is the local sponsor and is responsible for the operation and maintenance of the project.

4.1.2.3 Williamson CBD LPP

In 1991, USACE completed the construction of a LPP along the right descending bank of the Tug Fork River in the CBD of Williamson, which is located in Mingo County, West Virginia. The project consists of approximately 600 feet of concrete wall, 2,900 feet of sheet pile floodwall, five gate openings permitting normal road and railroad traffic, two pump stations, and an interior storm-drainage collection system. This project replaces an older flood protection project constructed by USACE in 1963 that was overtopped by the April 1977 flood event with devastating results. The total project cost was $62.7M. Mingo County is the local sponsor and is responsible for the operation and maintenance of the project.

4.1.2.4 Matewan LPP and Nonstructural Projects

In 1997, USACE completed the construction of a LPP along the right descending bank of the Tug Fork River in Matewan, which is located in Mingo County, West Virginia. The project consists of the placement of engineered fill along Mate Creek to the elevation of the April 1977 flood (plus a factor of safety known as freeboard) and the construction of approximately 2,350 feet of floodwall atop engineered fill within the Matewan CBD. The project also includes seven gate openings permitting normal road and railroad traffic, one pedestrian opening, one pump station, and an interior storm-drainage collection system. The total project cost of the structural component of the Matewan project was $56M. Local interests are responsible for the operation and maintenance of the project. In 1995, the nonstructural component of the Matewan project, which included voluntary floodproofing and acquisition of 57 structures, was completed at a total project cost of $10.1M.

The Mate Creek Relocation site is located on Mate Creek and was constructed in conjunction with the LPP. The site accommodated relocated residences and a fire station.

4.1.2.5 Williamson Nonstructural Project

In 1994, USACE completed a nonstructural project including voluntary floodproofing and acquisition of 178 structures within the general vicinity of Williamson, West Virginia at a total project cost of $24.5M. The program was designed to compliment structural projects by using nonstructural measures for those structures not protected by structural components. The areas primarily targeted included the communities of Fairview and East Williamson. As part of this project, the Valley View housing and community development site was constructed outside the floodplain. This site was developed to accommodate

construction of 56 single family housing units in cooperation with the West Virginia Housing Development Fund.

4.1.2.6 South Williamson Local Protection and Nonstructural Projects

In 1994, USACE completed the construction of a LPP along the left descending bank and the Tug Fork River in South Williamson, which is located in Pike County, Kentucky. The project consists of approximately 2,750 feet of concrete wall, two gate openings permitting normal traffic, one pump station, one residential opening and an interior storm-drainage collection system. The total project cost of the structural component of the South Williamson project was $25.5M. Pike County is the local sponsor and is responsible for the operation and maintenance of the project.

In 1992, the nonstructural component of the South Williamson project, which included voluntary floodproofing and acquisition of 207 structures, was completed at a total project cost of $27.9M. As part of nonstructural component of the project, the Pond Creek housing and community development site was constructed in an area outside of the floodplain. This site was developed in cooperation with the Kentucky Housing Corporation to accommodate construction of 21 single family housing units.

4.1.2.7 Lower Mingo County Nonstructural Project

In 2008, USACE completed a nonstructural project including voluntary floodproofing and acquisition of 429 structures within the lower portion of Mingo County, West Virginia at a total project cost of $51.3M. The project area extended from the downstream limits of Williamson, West Virginia to the Mingo-Wayne County line, including the Town of Kermit.

4.1.2.8 Hatfield Bottom Nonstructural Project

Under Section 202 authority, the USACE recommended a nonstructural project for Hatfield Bottom, West Virginia. Under Plan F-1, as reported in the General Plan, Hatfield Bottom was to be provided protection by the Big Bend Cutoff Project. The Big Bend Cutoff Project was subsequently deleted as a structural measure based on comparison with other least-costly alternatives and a lack of non-Federal support for the project. Deletion of the Big Bend Cutoff Project left the Hatfield Bottom portion of the Town of Matewan unprotected. The Hatfield Bottom area contains approximately 75 structures, including the Matewan High School, which was eligible for the nonstructural project. The construction of the ringwall to protect Matewan High School was completed in December 1997. Thirteen structures were acquired and 26 floodproofed in the nonstructural project.

4.1.2.9 Pike County (Tug Fork) Nonstructural Project

A nonstructural project consisting of voluntary floodproofing and acquisition of flood prone structures within Pike County, Kentucky is currently underway. Project implementation continues with a total project cost of $107M. Voluntary floodproofing and acquisition of eligible residential and commercial structures along the main stem of the Tug Fork is complete (128 floodproofed and 135 acquired). USACE is currently implementing the tributaries portion of the project. The tributaries portion includes 346 eligible structures on Peter, Pond, Big, Blackberry, Barrenshee, Poplar, and Knox Creeks. To date, six structures have been acquired and four structures have been floodproofed. The project also includes the relocation of Phelps Elementary School and construction of ring-walls around the Pike County Library, Phelps Fire Station, and the Belfry High School athletic building.

4.1.2.10 Grundy Nonstructural Project

A nonstructural project within the Town of Grundy, which is located in Buchanan County, Virginia, is currently underway at a total project cost of $131M. This project consists of voluntary floodproofing and acquisition of flood prone structures, protection of a portion of the Central Business District (CBD) by means of a ringwall/levee, community redevelopment on a prepared floodsafe site, relocation of public facilities including the fire and police stations, and upgrade of US 460 to a four lane highway through the town. Construction of the redevelopment site was completed in 2004 and the vehicular access bridge to this site was completed in January 2005. The ringwall/levee providing protection to the CBD was awarded in two phases and completed in 2009. The relocation of the fire station was completed in 2002 and the relocation of the police station was completed in 2013. Voluntary floodproofing and acquisition of flood prone structures within the project area continues. To date, 24 structures have been floodproofed and 22 tracts have been acquired.

4.1.2.11 Upper Mingo County Nonstructural Project

In 2008, USACE completed a nonstructural project including voluntary floodproofing and acquisition of 136 structures within the upper portion of Mingo County, West Virginia at a total project cost of $17.7M. The project area extended from Williamson, West Virginia to the Mingo-McDowell County line exclusive of the Hatfield Bottom and Matewan structural and nonstructural project areas.

4.1.2.12 Martin County Nonstructural Project

A nonstructural project consisting of voluntary floodproofing and acquisition of flood prone structures within Martin County, Kentucky is currently underway. Project implementation continues with a total project cost of $67.9M. The project area includes the main stem of the Tug Fork River and the tributaries of Wolf and Buck Creeks and extends from the Pike-Martin County line to the Pike-Lawrence County line. The project consists of an estimated 350 eligible structures. To date, $31.3M has been allocated to the project, 142 structures have been floodproofed, and 89 structures have been acquired.

4.1.2.13 Wayne County Nonstructural Project

In 2006, USACE completed a nonstructural project including voluntary floodproofing and acquisition of 66 structures within Wayne County, West Virginia at a total project cost of $8.3M. The project area extended from the Wayne-Mingo County line downstream to the confluence of the Tug and Levisa Forks, including major tributaries.

4.1.2.14 McDowell County Nonstructural Project

A nonstructural project within McDowell County, West Virginia is currently underway at a total project cost of $199.5M. WRDA 2007 later expanded the project scope to provide protection from the reoccurrence of the greater of the 2001 flood or 2002 floods, or the 100-year flood event, and to define the project area through a Supplemental Detailed Project Report (DPR). The project currently consists of voluntary floodproofing and acquisition of flood prone structures and relocation of public facilities, including multiple schools and the Kimble Town Hall and Fire Station. The construction of the Kimble Town Hall and Fire Station was completed in 2006. In May 2004, a relocations contract was executed between USACE and West Virginia State Board of Education for the design and construction of four schools. War Elementary/Middle School was completed in March 2008; Bradshaw Elementary was completed in August 2009; Bradshaw High School was completed in August 2010; and construction of Iaeger Elementary School was initiated in 2013. Voluntary floodproofing and acquisition of flood prone structures within the project area and development of the Supplemental DPR continues. To date, nine structures have been floodproofed and 53 tracts have been acquired.

4.1.2.15 Town of Martin Nonstructural Project

A nonstructural project within the Town of Martin, which is located in Floyd County, Kentucky, is currently underway at a total project cost of $100M. This project consists of four phases and includes voluntary floodproofing and acquisition of flood prone structures, mandatory acquisitions, floodsafe redevelopment, and relocation of four public facilities –

town hall, police station, fire station, and Floyd County Alternative School. Phase 1 is complete and included hillside excavation to create a redevelopment site for commercial and institutional development. Mandatory acquisition of tracts is necessary for placement of fill material in the existing downtown area for Phases 2 and 3 to provide a residential and commercial redevelopment site. Phase 4 includes the voluntary floodproofing or acquisition of properties within the floodplain, but no construction is planned for the Phase 4 area. Phase 2 properties are primarily commercial and will be acquired in order to construct a flood-safe residential redevelopment site contiguous with the Phase 1 site. Phase 3 properties are primarily residential, and those displaced as a result of these acquisitions would be offered lots in the Phase 2 redevelopment site. Specifically, the project includes voluntary floodproofing or acquisition of eight residential and four nonresidential structures and mandatory floodplain evacuation of 116 residential and 85 nonresidential structures. The relocation of the fire station to the Phase I redevelopment site was completed in 2013.

4.1.2.16 Buchanan County Nonstructural Project

A nonstructural project within Buchanan County, Virginia is currently underway at a total project cost of $119M. This project consists of voluntary floodproofing and acquisition of flood prone structures and the construction of ringwalls around Hurley High School and Buchanan County Technology and Career Center. Approximately 730 eligible structures exist within the project area, which includes all areas flooded during the April 1977 flood, excluding the Town of Grundy, on the Levisa Fork and upstream tributaries in Buchanan County, Virginia. An Emergency Evacuation Plan (EEP) for Buchanan County is near completion as of the date of this report and the plan is expected to be in place by early summer 2014. To date, $3.4M has been allocated to the project.

4.1.2.17 Dickenson County Nonstructural Project

A nonstructural project within Dickenson County, Virginia is currently underway at a total project cost of $156M. This project consists of voluntary floodproofing and acquisition of approximately 225 eligible structures; relocation of Ervinton High School, Sandlick Elementary School, and the lower buildings of Haysi High School; floodproofing of Clinchco Elementary School; and development of an Emergency Evacuation Plan. A relocations agreement for Ervinton High School, Sandlick Elementary School and the lower buildings of Haysi High School was signed in 2011. A floodproofing agreement for the Clinchco Elementary School site was executed in 2010. Dickenson County Public Schools proposed an alternate plan to consolidate the County's three high schools, construct a new middle school, and replace Sandlick and Clinchco Elementary Schools with a new elementary school at Haysi. This alternate plan as presented will exceed the requirements of providing

a floodsafe location for the four schools in the Section 202 Program. The school board awarded a construction contract for the high school/middle school/career technical center complex in January 2013.

4.1.3 Other Local Protection and Small Flood Control Projects

Flood control reservoirs are complimented with multiple local protection and small flood control projects spread throughout the Big Sandy River Basin as described in the following sections.

4.1.3.1 Ceredo-Kenova Local Protection Project (LPP)

In 1940, USACE completed the construction of a LPP on the left bank of the Ohio River along the contiguous municipalities of Ceredo and Kenova, which are located in Wayne County, West Virginia. Kenova is located at the confluence of the Big Sandy and Ohio Rivers, and Ceredo adjoins the lower course of Twelvepole Creek. Flood protection works, constructed under authority stemming from the Flood Control Act of 1938, include about 2.6 miles of earthen levee, 1.6 miles of concrete wall, 27 gate openings and two ramps permitting normal traffic, and six pump stations to address interior drainage and sewage collection during flood events. The project affords protection for the principal business and residence sections of the communities against floods equal to that of the January 1937 event. The maximum crest height of the combined floodwall/levee project is 562.2 feet, which is three feet above the recorded flood of record. Local interests are responsible for the operation and maintenance of the project.

4.1.3.2 Prestonsburg Small Flood Control Project

In 1959, USACE completed the construction of a small flood control project under Section 205 of the Flood Control Act of 1948, as amended, in Prestonsburg, which is located in Floyd County, Kentucky. This project supplemented a portion of an existing railway fill with 265 feet of earthen levee and a pump station to afford protection against backwater stemming from the Levisa Fork River. Local interests are responsible for the operation and maintenance of the project.

4.1.3.3 Catlettsburg LPP

In 1960, USACE completed the construction of a LPP in Catlettsburg, which is located in Boyd County, Kentucky near the confluence of the Ohio and Big Sandy River. The project includes about 1.2 miles of earthen levee, 0.7 miles of concrete wall, seven gate openings and one ramp permitting normal traffic, and four pump stations to address interior

drainage and sewage during flood events. The project components were constructed at a maximum crest height of 561.1 feet, which is three feet above the flood of record recorded in January 1937. Local interests are responsible for the operation and maintenance of the project.

4.1.3.4 Pikeville, Kentucky Model City Project

The Pikeville Model City Project involved the relocation of the Levisa Fork of the Big Sandy River, the Chesapeake and Ohio Railroad, and U.S. Highway 23 through a cut excavated in rock just to the west of the city. The cut-through project was planned to eliminate all mainstream flooding in Pikeville, create land for community development, reduce travel distance of U.S. 23 by 2.22 miles, and remove the rail line and six coal loading facilities from the city to reduce pollution, noise, traffic and unsightliness. The project was accomplished through contract technical assistance by USACE to the Appalachian Regional Commission. The project began design in 1972 and construction was completed in 1991.

4.1.3.5 South Williamson Small Flood Control Project

In 1971, USACE completed the construction of a small flood control project under Section 205 of the Flood Control Act of 1948, as amended, in South Williamson, which is located in Pike County, Kentucky. The project consisted of increasing the crest height of an existing levee protecting the Williamson Appalachian Regional Hospital from flooding along the Tug Fork and Big Sandy Rivers. This existing levee was not overtopped during the April 1977 flood event. Local interests are responsible for the operation and maintenance of the project.

4.2. USACE Planning Studies

Key studies within the Big Sandy River Basin that are either underway or have been completed are briefly described in the following sections.

4.2.1 Section 202 Pike County (Levisa Fork), Kentucky

A Detailed Project Report examining flood risk management measures along the Levisa Fork River and its tributaries within Pike County, Kentucky, was approved in July 2011. This study effort was completed under the Section 202 authority described in Section 4.1.2 of this report and included the incorporated areas of Pikeville, Coal Run, Elkhorn City and the unincorporated areas within Pike County subject to flood damage from the reoccurrence of the April 1977 event. Based on the study findings, the report recommended a combination of structural and nonstructural measures as the most

economically feasible and socially acceptable alternative for managing flood risk within the established study area. Overall, the project recommended within the approved Detailed Project Report consisted of voluntary floodproofing and acquisition of over 2,000 eligible structures including 24 public facilities, construction of floodwalls at North Pikeville and Coal Run, and construction of a ringwall protecting Millard Middle School and Pike County Vocational-Technical Center. The total project cost is estimated at $915M. Implementation of the project is currently on hold awaiting Federal and non-Federal funds.

4.2.2 Section 202 Floyd County, Kentucky

A Detailed Project Report examining flood risk management measures along the lower portion of the Levisa Fork River in Floyd County, Kentucky, including the City of Prestonsburg, was approved in July 2011. This first phase, which was documented in the Detailed Project Report approved in July 2011, includes voluntary floodproofing and acquisition of flood prone structures and construction of a floodwall protecting the City of Prestonsburg. The total project cost estimated for this phase is $153M. Implementation of the first phase of the project is currently on hold awaiting Federal and non-Federal funds. The remaining two phases include voluntary floodproofing and acquisition of over 3,000 eligible structures.

Additional Detailed Project Reports covering the upper portion of the Levisa Fork River and remaining tributaries in Floyd County, Kentucky were expected to follow the initial Detailed Project Report given the size of the study area. However, these reports have not been initiated. Based on the study findings, the report recommended a combination of structural and nonstructural measures as the most economically feasible and socially acceptable alternative for managing flood risk within the established study area, which was divided into three study phases. All study efforts have been accomplished under the Section 202 authority described in Section 4.1.2 of this report.

Overall, the first phase, which was documented in the Detailed Project Report approved in July 2011, includes voluntary floodproofing and acquisition of flood prone structures and construction of a floodwall protecting the City of Prestonsburg. The total project cost estimated for this phase is $153M. Implementation of the first phase of the project is currently on hold awaiting Federal and non-Federal funds. The remaining two phases include voluntary floodproofing and acquisition of over 3,000 eligible structures.

4.2.3 Section 202 Johnson County, Kentucky

A Detailed Project Report examining flood risk management measures along the Levisa Fork River and its tributaries within Johnson County, Kentucky, including the City of Paintsville, is currently underway. Study efforts are being accomplished under the Section 202 authority described in Section 4.1.2 of this report. An estimated 900 structures, including five public facilities, exist within the study area. Completion of the Detailed Project Report is contingent on the receipt of additional Federal and non-Federal funding.

4.2.4 Section 202 Flood Damage Reduction Plan Levisa Fork Basin/Haysi Dam Project

In 1997, a General Plan Supplement to the Section 202 General Plan for Implementation was completed under the authority of Section 202 of the Energy and Water Development Appropriations Act of 1981, as amended. The primary purpose of this report was to identify, through alternative formulation and evaluation, flood damage reduction alternatives for the Levisa Fork of the Big Sandy River Basin. The study addressed floodplains along the main stem of the Levisa Fork from Louisa, Kentucky to the downstream incorporated limits of Grundy, Virginia and along the main stem of the Russell Fork from its confluence with the Levisa Fork River, at Millard, Kentucky, to approximately four miles upstream of Haysi, Virginia.

A preliminary draft of the General Plan Supplement was completed in 1995 and circulated for review. In October 1996, Congress enacted WRDA 1996, which contained language modifying the Section 202 authority to specifically direct the construction of Haysi Dam substantially in accordance with the preliminary draft of the General Plan Supplement. The General Plan Supplement identified construction of Haysi Dam (as a dry dam structure) as the most cost effective alternative for reducing flood damages within the Levisa Fork Basin when combined with nonstructural measures downstream. However, the WRDA 1996 language authorized a project with a conservation pool with sufficient storage to enable downstream whitewater recreation on the Russell Fork in the Breaks area. As a result, the General Plan Supplement completed in 1997 recommended the construction of a concrete dam with conservation pool for recreational purposes approximately 4.6 miles upstream of Haysi, Virginia on the Russell Fork and the implementation of a nonstructural component including a voluntary floodproofing and acquisition program.

Despite being authorized for construction, Haysi Dam was never implemented for two primary reasons – a lack of non-Federal sponsor financial support by the Commonwealth of Virginia wherein the project was located and environmental concerns for constructing a dam on Russell Fork expressed by environmental groups despite general concurrence by state and Federal agencies for a collaboratively developed and comprehensive mitigation plan.

4.2.5 Big Sandy Navigation Study

In 1986, a Feasibility Report examining navigation improvement along the main stem of the Big Sandy River and the lower reaches of the Tug Fork and Levisa Fork Rivers was completed. Based on the study findings, channel improvements provided the highest net benefits of the alternatives considered. However, considering commercial navigation existed on the lower reach of the Big Sandy River and maintenance dredging was anticipated to continue, the report determined channel improvements would only have a small incremental effort on commodity traffic. As a result, no navigation improvements were recommended to be undertaken at that time.

4.2.6 Final Supplement Environmental Assessment for Operational Change to Provide Recreational Whitewater Releases at John W. Flannagan Reservoir

In 1996, a Supplemental Environmental Assessment examining the impacts of further modifying releases at John W. Flannagan Reservoir to provide additional whitewater recreational opportunities was completed. In 1992, following the completion of the initial Environmental Assessment, the flow regime from Flannagan was modified to provide releases during the first four weekends in October. The Supplemental Environmental Assessment concluded flow regimes could be further modified on the fourth and final weekends of October by increasing maximum flows from 800 cubic feet / second (cfs) to 1000 cfs during specific time frames.

4.2.7 Big Sandy River Water Conservation and Water Quality Study

In 1996, the USACE Hydrologic Engineering Center (USACE-HEC) completed a study examining the basin-wide impact on water quality of providing whitewater releases into Russell Fork from the John W. Flannagan Reservoir. The study examined a maximum release of 800 cfs during the first four weekends in October. Based on the study findings, the reservoir water quality profiles were slightly affected and the water temperature was modified a few degrees in the reservoir. It was noted that this change in temperature could adversely impact the trout population in the reservoir during some years where there was a late season lake mixing; however, the overall impact of the releases was insignificant. Based on the findings, stakeholders were in agreement that the releases should continue. There were no further modifications to the release regime based on the results of this study.

4.3 Other Agency Studies and Reports

4.3.1 Discovery Report – Tug Fork and Lower Levisa Fork

The Discovery Reports[11] were completed by the Federal Emergency Management Agency (FEMA) in coordination with the Kentucky Division of Water (KDOW) as a portion of the Risk MAP (Risk Mapping, Assessment and Planning) program. This program is a collaborative effort to assist communities with identifying, assessing, and reducing flood risk. The reports focused on flood history, hazard mitigation planning, and mitigation activities within communities in the basin. The reports primarily identify available data and gaps in datasets within the project area. Proposals from the reports include updating Flood Insurance Studies (FIS) and Flood Insurance Rate Maps (FIRMs), hazard mitigation plan updates, and education and outreach efforts.

4.3.2 Big Sandy River Basin Coalition

The Big Sandy River Basin Coalition (BSRBC) began in 1999 with roundtable discussions and formed a board of directors. They produced multiple strategies to address funding needs, education assistance, marketing the plan and region, and provide for sediment control. While the Coalition met for several years and produced many initiatives, the group is no longer active and there are no further updates to their initiatives since roughly 2007.

4.3.3 Rapid Watershed Assessment for the Big Sandy River Basin in West Virginia

The United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)[17] produced a report in June 2008 covering the basin within the West Virginia portion of the basin[18]. NRCS identified opportunities where they would be able to provide assistance through new and/or existing programs. The assessment looked at the history, geography, demographics, and resources of the basin within the boundaries of the state. The results of the assessment provided a good overview of the basin, but did not identify any specific projects or program initiatives.

4.3.4 Whitewater Recreational Improvements Site Study, Russell Fork River through Elkhorn City. McLaughlin Whitewater Design Group. 2009.

In March 2009, McLaughlin Whitewater Design Group completed the Recreational Improvements Site Study[12] focused on the recreation potential of the Russell Fork near Elkhorn City, Kentucky. It should be noted no environmental work was performed as a part of this analysis and those considerations would need to be assessed for future work within the area for recommended improvements. Within the report, the areas of whitewater interest were evaluated at their current condition with listed opportunities for improvement to the river bed and channel.

Flows for the area were presented in an historical chart and analyzed. Flows of 200-600 cfs are considered ideal for whitewater activities. While recreation opportunities are the highest in the summer-fall months, these months tend to have the least flow on the average. The report concluded that in the absence of dam releases, natural flow would provide the best water for boaters in the spring.

The Master Plan vision for Elkhorn City included enhancing the river within the City with improvements near the downtown area, providing high quality features to lure river enthusiast into the City, and providing boat passage through the City at normal, non-release flows. Several sites were identified to meet these goals with details on each site.

It was also noted that a gage at the City of Elkhorn is no longer in use. Restoring the Elkhorn City gage will allow for better monitoring of flows at this vital location.

5.0 Existing Conditions

In order to better understand problems and opportunities and forecast changes within the Big Sandy River Basin, the existing conditions of the study area were examined and inventoried in the following sections of the report. During this analysis, HAZUS[8] (HAZards US), which is a nationally accepted model based on GIS technology, is being used to estimate physical, economic, and social impacts associated with natural disasters, and was used as a source of readily available information. HAZUS was developed by FEMA and is commonly used by communities and states to support their All Hazards Mitigation planning process, which is the foundation for a community's long term strategy for reducing disaster losses. In addition to HAZUS, data was obtained from many different agencies including Environmental Systems Research Institute (ESRI)[5,6], US Environmental Protection Agency (USEPA), USGS, US Census Bureau, and US Fish and Wildlife Service (USFWS).

As previously stated in Section 3.0 and seen in Figure 3.4, the Big Sandy River Basin is a HUC-6 accounting unit (050702) of the Ohio River Basin, which has been subdivided into four HUC-8 watersheds by USGS.

- Tug Fork River watershed (05070201)
- Upper Levisa River watershed (05070202)
- Lower Levisa River watershed (05070203)
- Big Sandy River, Blaine Creek watershed (05070204)

5.1 Physiographic Area

The Big Sandy River Basin lies wholly within the physiographic province known as the Appalachian Plateau. Physiographic provinces and ecoregions[21] are often used synonymously. Ecoregions typically provide a greater level of detail and correspond to geographical areas defined by ecological resources, natural features, land uses, climate, and soil characteristics. According to USEPA, the Big Sandy River Basin is comprised of six Level IV ecoregions[24] – Cumberland Mountain Thrust Block (69e), Dissected Appalachian Plateau (69d), Monongahela Transition Zone (70b), Ohio/Kentucky Carboniferous Plateau (70f), Southern Limestone/Dolomite Valleys and Rolling Hills (67f), and Southern Sandstone Ridges (67h).

Figure 5.1: USEPA Ecoregions within Big Sandy River Basin

As seen in Figure 5.2 and Table 5.1, nearly 90 percent of the Big Sandy River Basin lies within the Dissected Appalachian Plateau ecoregion. The Dissected Appalachian Plateau ecoregion is a highly dissected, hilly, and mountainous plateau composed of steep ridges, narrow valleys, and deep coves. The Dissected Appalachian Plateau ecoregion is more rugged, more extensively forested, and has higher stream gradients than the Ohio/Kentucky Carboniferous Plateau. Cool, high gradient streams with cobble and boulder substrates and extensive riffles are common within this ecoregion.

Forest composition within the Dissected Appalachian Plateau ecoregion is highly variable and controlled by aspect, slope position, degree of topographic shading, and past usage. Natural vegetation ranges from mixed oak forests dominated by chestnut oak, red maple, white oak, and black oak on upper slopes; mixed mesophytic forests variously dominated by beech, yellow-poplar, and sugar maple with diverse understory's of small trees, shrubs, and herbs on middle and lower north and east facing slopes; mixed oak forests chiefly dominated by white oak with mountain laurel in the understory on middle and lower south and west facing slopes; mixed mesophytic forests or hemlock and magnolia with a

rhododendron understory within mesic coves and on bottomlands; and planted species such as tall fescue and black locust and exotic shrubs on reclaimed mine lands.

The Dissected Appalachian Plateau ecoregion is mostly underlain by flat-lying Pennsylvanian sandstone, shale, siltstone, and coal. Surface and underground coal mining, logging, and gas and oil production are common within this ecoregion and have degraded the stream quality in many areas. Nutrient levels in streams are very low and are a reflection of the ecoregion's low population density, limited agriculture, and non-carbonate rocks. On larger, adequately drained floodplains and terraces, cultivation of hay, tobacco, and corn occurs.

While the Big Sandy River Basin is predominately located within the Dissected Appalachian Plateau ecoregion, approximately five percent of the basin lies within the Ohio/Kentucky Carboniferous Plateau ecoregion. Of the remaining study area, approximately four percent of the Big Sandy River Basin lies within the Monongahela Transition Zone ecoregion – leaving less than one percent of the study area spread between the Cumberland Mountain Thrust Block, Southern Limestone/Dolomite Valleys and Low Rolling Hills, and Southern Sandstone Ridges ecoregions.

Like the Dissected Appalachian Plateau ecoregion, past land use and topographic variation within the Ohio/Kentucky Carboniferous Plateau and Monongahela Transition Zone ecoregions have contributed to today's highly variable forest composition. Within dissected, hilly uplands of the Ohio/Kentucky Carboniferous Plateau ecoregion, logging, livestock farming, oil production, and surface and underground coal mining are common activities. Over the years, these activities and land use practices have degraded stream quality throughout the basin. Agriculture is limited, but some cultivation for burley tobacco, hay, corn, soybean, and small grains occurs. Cool, moderate to high gradient streams are common with cobbles and boulder substrates along riffles and sandy bottoms in deeper pools. The Ohio/Kentucky Carboniferous Plateau ecoregion is mostly underlain by Pennsylvanian sandstone, shale, siltstone, and coal.

Within the rugged hills and ridges of the Monongahela Transition Zone ecoregion, many land slips occur on steep slopes when they become saturated. This ecoregion is predominately underlain with clay, shale, siltstone, sandstone, and minor amounts of limestone of the Pennsylvanian Monongahela and Conemaugh formations. While this ecoregion is mainly forested especially on the steep slopes, pastureland occurs on the gentler slopes and cropland exists in the valleys. In addition to gas production and livestock, cultivation for hay, tobacco, corn, and small grains occurs within this ecoregion.

Table 5.1: USEPA Level IV Ecoregions within Big Sandy River Basin

Ecoregion Name	Area (Square Miles)	Percentage of Watershed
Cumberland Mountain Thrust Block	26.1	0.61%
Dissected Appalachian Plateau	3854.8	89.79%
Monongahela Transition Zone	186.7	4.35%
Ohio/Kentucky Carboniferous Plateau	216.2	5.04%
Southern Limestone/Dolomite Valleys and Low Rolling Hills	7.8	0.18%
Southern Sandstone Ridges	1.5	0.03%

5.2 Geology

As previously noted, the Big Sandy River Basin lies entirely within the Appalachian Plateau physiographic province. Although the topography and drainage lines of portions of this province have been modified by continental ice sheets, the Big Sandy River Basin was not affected by glaciations. The consolidated rocks now appearing on the surface are predominately of the Pennsylvanian age with the exception of a narrow belt of Mississippian and possibly Devonian rocks exposed along Pine Mountain by a thrust fault. The Pennsylvanian rocks, ranging from Pottsville to Conemaugh in age, measure approximately 3,000 feet of sandstone and shale's containing numerous beds of coal and a few thin beds of limestone and clay. The Conemaugh rocks, which are the youngest rocks of the area, are confined to the lower portion of the basin. The Allegheny series of rocks underlies the Conemaugh rocks in the lower portion of the region, whereas, in other portions of the basin, only thin remnants of this series remains on high ridges. The Pottsville series comprises most of the exposed rocks within the basin. This series contains more than 20 coal seams that are of commercial thickness at certain locations.

The unconsolidated materials in the watershed are river-deposited silts, clays, sands, and residual materials formed by the disintegration of rock. The valley-fill materials are generally fine to medium grained and consist of river-deposited sands, silts, clay, and gravel. The uplands are blanketed with residual sandy clay, which generally transitions into bedrock at a shallow depth.

5.3 Land Use and Development

Based on land cover data from 2006 supplied by USGS[26,27], the Big Sandy River Basin is predominately comprised of natural cover. As seen in Figures 5.2 and 5.3 and Table 5.2, the natural cover within the watershed is primarily composed of deciduous forest, which accounts for nearly 78 percent of the basin. Other, less prevalent forms of natural cover include grasslands, mixed and evergreen forests, and scrubland, as well as open water sources, such as lakes, rivers, and ponds. These forms of natural cover combined equate to approximately 11 percent of the basin. Overall, the natural cover provides abundant habitat for a variety of flora and fauna throughout the basin.

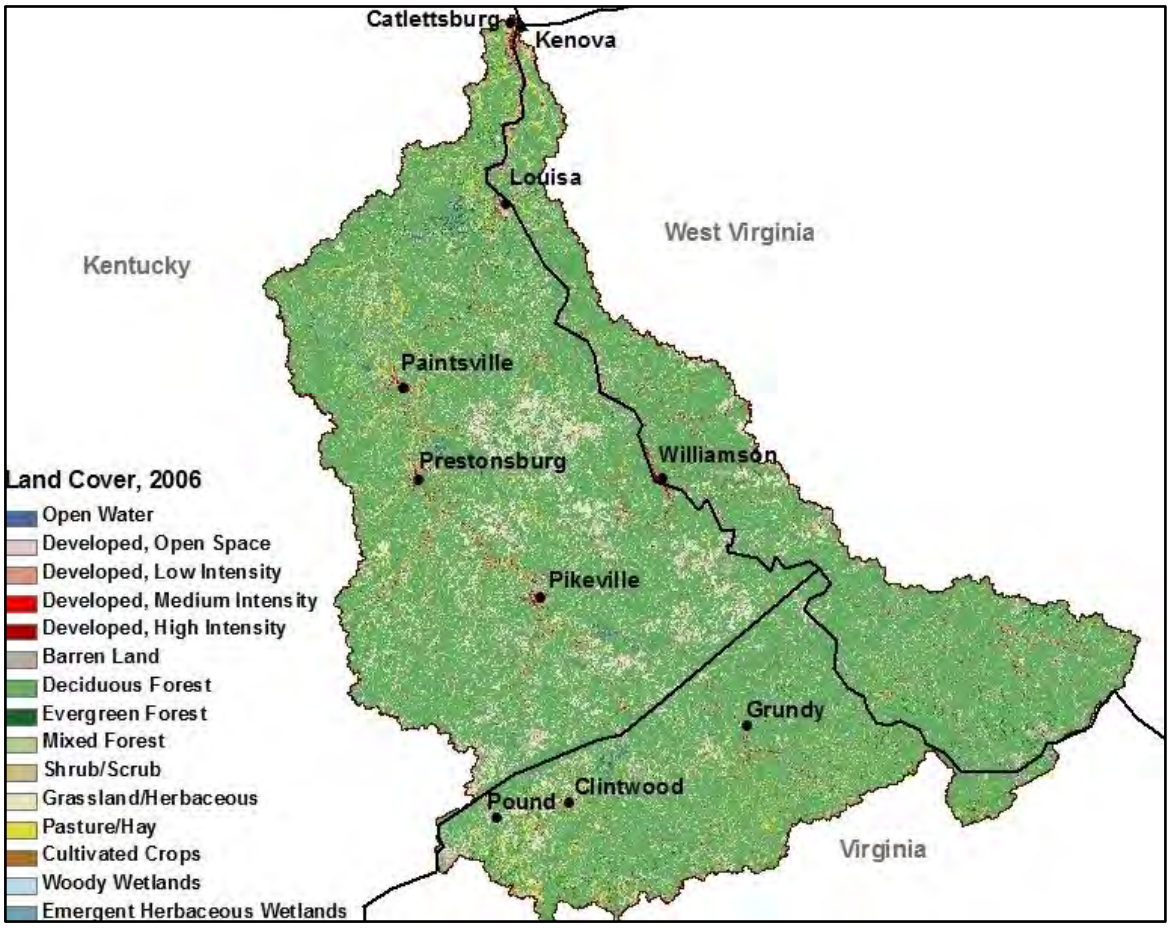

Figure 5.2: Land Cover in the Big Sandy River Basin

While agricultural land, largely used for raising livestock and cultivating crops, is limited to approximately three percent of the basin, the remaining 8 percent of land cover within the study area corresponds to developed land consisting of open space, urban and suburban development, and a small amount of barren land. Developed land is separated into four categories – open space and low, medium, and high intensities. Low and medium intensity

levels are typically associated with residential areas. While scattered commercial activity may occur within the low and medium intensity levels, urban areas consisting of highly developed infrastructure and commercial and industrial lands fall within the high intensity category. Within the Big Sandy River Basin, less than three percent of land use is considered to fall within the low, medium, and high intensity levels of development. As seen in Figure 5.2, the primary areas of development include Williamson, West Virginia and Pikeville, Paintsville, and Prestonsburg, Kentucky and Grundy, Virginia.

Table 5.2 below and the pie chart show in Figure 5.3 illustrate the percentages for each of the land covers found in the basin.

Table 5.2: Land Use within the Big Sandy River Basin (USGS, 2006)

Description	Percentage
Deciduous Forest	77.5%
Grassland/Herbaceous	8.4%
Developed, Open Space	4.0%
Pasture/Hay	2.9%
Developed, Low Intensity	1.8%
Mixed Forest	1.7%
Barren Land	1.5%
Developed, Medium Intensity	0.7%
Evergreen Forest	0.6%
Open Water	0.4%
Cultivated Crops	0.2%
Shrub/Scrub	0.1%
Developed, High Intensity	0.1%
Woody Wetlands	0.0%
Emergent Herbaceous Wetlands	0.0%

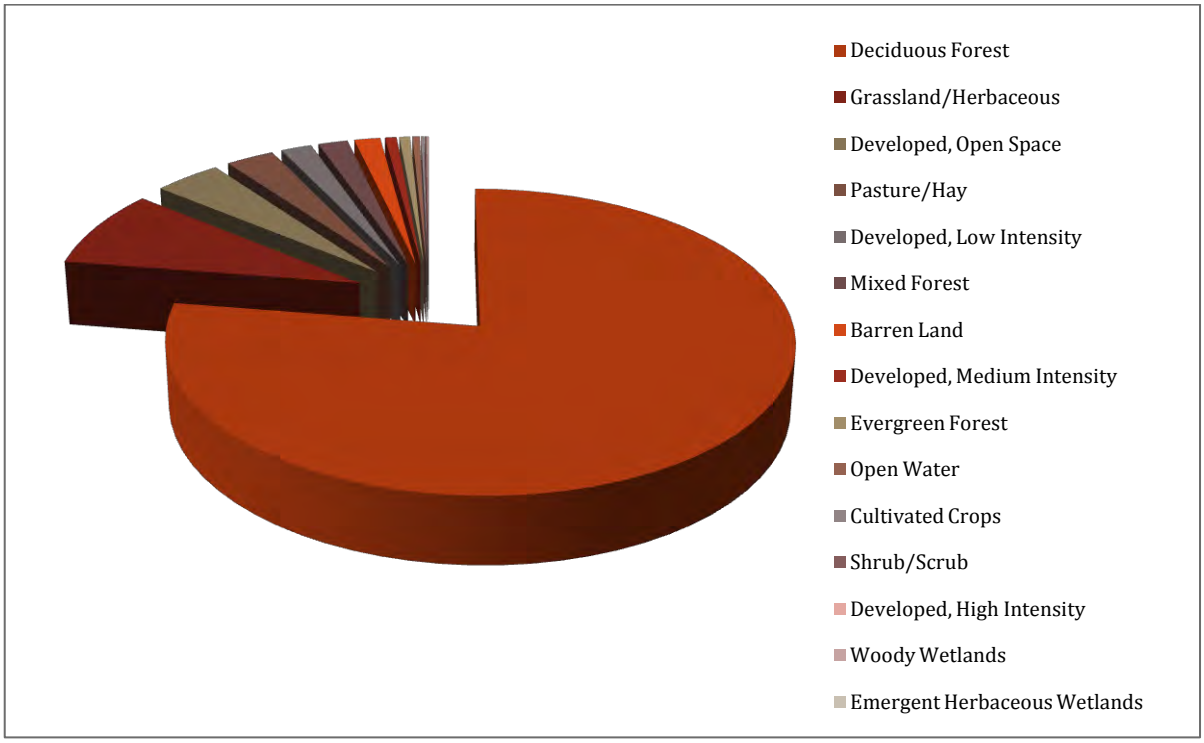

Figure 5.3: Distribution of Land Cover within the Big Sandy River Basin (USGS, 2006)

5.4 Water Quality

The waters of the United States are threatened by different sources and types of pollution. Under the Clean Water Act (CWA), every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. These standards must at "a minimum" meet the standards established by the CWA. These standards represent a level of water quality that will support the goal of "swimmable/fishable" waters. Water quality is ascertained by various measures and criteria to evaluate whether physical, chemical, and biological conditions for humans and aquatic life are satisfied. Water quality standards are ambient, requirements that specify the maximum amount of pollutant(s) a site may be allowed to have in its surroundings, standards as opposed to discharge-type standards. These ambient standards, through a process of back calculation procedures known as total maximum daily loads (TMDLs) or wasteload allocations, form the basis of water quality permit limitations that regulate the discharge of pollutants into the waters under the National Pollutant Discharge Elimination System (NPDES) permit program. Provisions of the CWA require every state to report water quality conditions to Congress biennially. The 2012 Draft Reports for each of the three states contain the most recent water quality conditions and have been referenced for the purposes of this initial assessment. The reports will be considered final upon approval by the USEPA.

The Big Sandy River Basin encompasses three states; Kentucky, Virginia, and West Virginia.

The largest portion of the basin is situated within eastern Kentucky. Water quality standards in Kentucky are established by Kentucky Administrative Regulation, Section (401 KAR 10:031). This regulation establishes six designated uses for surface waters, which can vary among waterways. The six designated uses are as follows: warm water aquatic habitat, cold water aquatic habitat, primary contact recreation, secondary contact recreation, domestic water supply, and outstanding state resource water. According to the Draft 2012 Report[2], which contains the 303(d) list of impaired streams for the Commonwealth of Kentucky, there are approximately 629 miles of impaired streams requiring the development of TMDLs within the Big Sandy River Basin. The primary designated use that is impaired throughout many portions of the basin is warm water aquatic habitat, followed by the primary contact recreation use designation. The primary pollutants and/or water quality criteria not being met for surface waters within the basin, in descending order are; sedimentation/siltation, specific conductance, total dissolved solids (TDS), nutrient/eutrophication, and organic enrichment. Other pollutants and criteria are factors but not as prevalent as those previously listed. For a full breakdown of pollutants and criteria for impaired streams, please refer to Appendix D, and locate the tables pertaining to Kentucky waterbodies. Three freshwater reservoirs within the basin are also designated as impaired. Dewey Lake (1,100 acres) is impaired for secondary contact recreation from total suspended solids (TSS) impairments. Both Fishtrap Reservoir (1,143 acres) and Paintsville Reservoir (1,139 acres) are impaired for fish consumption due to PCBs and mercury found in fish tissue within the lake.

The primary suspected sources for sedimentation/siltation issues include surface mining, oil and gas exploration and production, loss of riparian habitat, post-development erosion, silviculture activities, roadway runoff, streambank destabilization, and agricultural activities. Concerning specific conductance and TDS, mining and oil/gas activities are among the suspected sources. Inadequate sewage treatment, failing septic systems, straight-pipe discharges, and inappropriate waste disposal are the major sources of nutrient excesses and organic enrichment. According to the 2012 Draft 305(b)/303(d) Water Quality Assessment Report for Kentucky, there is no planned TMDL monitoring for the Big Sandy Watershed for 2013. At the present, there are approved TMDLs for segments of 21 streams, totaling approximately 107 miles within the watershed, and many more are being developed. The vast majority of approved TMDLs are for *Escherichia coli* impairments affecting the primary contact recreation use of these waters.

Virginia's water quality standards, set forth in Chapter 9 of the Virginia Administrative Code (9 VAC 25-260), establish standards for six designated uses of surface waters within Virginia – aquatic life, fish consumption, public water supplies (where applicable), recreation (swimming), shellfishing, and wildlife. Currently, there are seven approved TMDL Reports for surface waters within the Big Sandy River Basin in Virginia, and more

are scheduled in the future. Table 5.3 below contains a list of the existing TMDLs for the Big Sandy River Basin within Virginia. According to 2012 Draft 305(b)/303(d) Water Quality Assessment Report for Virginia[28] there are approximately 368 miles of Category 5 impaired streams within the Big Sandy River Basin. Data from the report indicates recreation and aquatic life designated uses to be the most prevalent impaired uses. Primary pollutants and water quality criteria not satisfied include elevated *Escherichia coli* levels and poor results from benthic assessments conducted. The Virginia Department of Environmental Quality (VADEQ) assesses the Big Sandy River Basin and the Tennessee River Basin jointly in its biennial report. As a result, suspect pollutant source data is representative of both basins. Data for streams only in the Big Sandy River Basin has been aggregated from the Draft Report and is located in Appendix D, in the table with the Virginia heading. Given the existing conditions and land use within the portion of Big Sandy River Basin in Virginia, probable sources include sewage discharge from unsewered areas, mining activities, oil/gas activities, abandoned mine lands, and agricultural practices.

Table 5.3: Existing TMDLs for the Big Sandy Watershed within Virginia (VADEQ, 2012)

TMDL Project	Basin	City/County	Pollutant(s)	Comment document	Final report	EPA approval date	SWCB approval date	Comments
Bull Creek and Tributaries	Big Sandy River	Buchanan	Total Suspended Solids Total Dissolved Solids	-	Final report	04/28/2011 EPA rationale	-	
Garden Creek Watershed	Big Sandy River	Buchanan, Russell	E. Coli	-	Final report	08/10/2007 EPA rationale	07/31/2008	
Garden Creek Watershed	Big Sandy River	Buchanan, Russell	Total Dissolved Solids Chloride	-	Final report	11/04/2007 EPA rationale	-	
Knox Creek and Paw Paw Creek	Big Sandy River	Buchanan	E. Coli Total Dissolved Solids Sediment	-	Final report	03/27/2007 EPA rationale	-	
Levisa Fork Watershed including Garden Creek and Slate Creek	Big Sandy River	Buchanan, Russell, Tazewell	E. Coli Sediment PCB	-	Final report	03/18/2011 EPA rationale	-	
North and South Forks Pound River	Big Sandy River	Wise	Total Suspended Solids Total Dissolved Solids	-	Final report	04/28/2011 EPA rationale	-	
Russell Prater Creek	Big Sandy River	Buchanan, Dickenson	Total Dissolved Solids Sediment	-	Final report Modification	06/22/2006 EPA rationale	-	

In West Virginia, water quality standards are codified in 47CSR2, Legislative Rules of the Department of Environmental Protection (WVDEP) – Requirements Governing Water Quality Standards. Antidegradation Implementation Procedures for water quality are codified in 60CSR5. Of the three states in the basin, West Virginia has the greatest diversity of designated uses for waters within its limits, as general categories are broken down into subcategories. It is important to note that if a waterbody has multiple uses it shall be protected for the use category with the most stringent criteria. West Virginia has designated six primary categories for designated use: public water, warm water fishery, trout water, contact recreation, agriculture and wildlife, and industrial. Please see Table 5.4 below for the use categories and subcategories for West Virginia waters. WVDEP has established a watershed framework that includes five groupings of watersheds to allow for rotating monitoring periods, and operates on a five-year, five-step process. Doing so,

fosters adherence to the five-year TMDL development process mandated by the CWA, while at the same time distributes watersheds at the HUC 8 level somewhat randomly throughout the state to create mixed groupings.

Figure 5.4 below depicts five groups of watersheds within West Virginia. The majority of the streams within the Big Sandy River Basin in West Virginia are located in the Tug Fork Subwatershed. Streams not within the Tug Fork Subwatershed directly enter the Big Sandy River below Fort Gay, WV. Water quality monitoring data in West Virginia is delineated to reflect the Tug Fork Subwatershed, a Group C Watershed, and the Big Sandy Watershed below Fort Gay, WV, which is a Group E Watershed. (Note: The grouping of West Virginia's watersheds were developed in the early stages of NPDES permitting. The watersheds were grouped accordingly in attempt to level the permitting load among the groups for the five-year permitting cycle.)

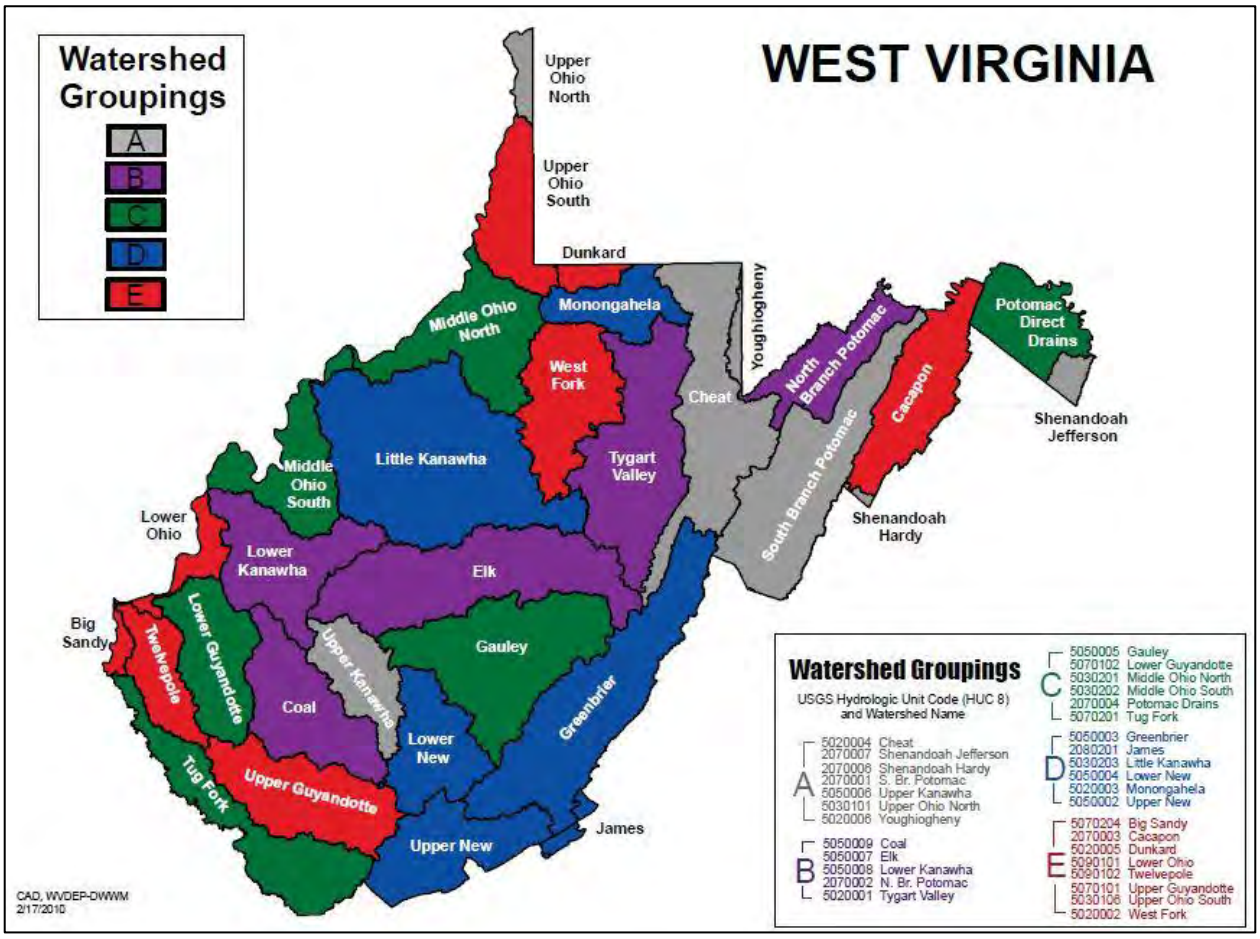

Figure 5.4: Watershed Groups within West Virginia for Water Quality Monitoring (WVDEP, 2012)

According to the 2012 Draft 303(d) Report[29], there are 51 impaired streams, totaling 374 stream miles within the limits of the Big Sandy Watershed in the State of West Virginia. According to data in the report, designated uses impacted by impaired waters include aquatic life, contact recreation, and public water supply. Primary pollutants and water quality criteria not satisfied in descending order include biological conditions not allowable (benthic assessments and chemical parameters), fecal coliform, selenium, and iron. A complete list of impaired streams within the Big Sandy River Basin within West Virginia can be found in the table with the West Virginia heading in Appendix D. The 2010 Integrated 305(b)/303(d) Report[30] for West Virginia cites unspecified land disturbance as the primary source of bio-impairment for streams throughout the state at approximately 34%. Other categories of sources of bio-impairment include mining (29%), agriculture (22%), untreated domestic waste (6%), and urban runoff (5%). Likely sources of bacterial contamination and elevated levels of fecal coliform include overflowing sewage collection systems, illegal homeowner discharges by straight pipes, failing septic systems, urban runoff, and agricultural runoff. Mining operations and fossil fuel combustion are two likely sources of selenium impairments, as both have potential to introduce the element into the watershed.

Table 5.4: Designated Water Use Categories and Subcategories for West Virginia (WVDEP, 2012)

Category	Use Subcategory	Use Category	Description
A	Public Water	Human Health	Waters, which, after conventional treatment, are used for human consumption.
B1	Warm Water Fishery	Aquatic Life	Propagation and maintenance of fish and other aquatic life in streams or stream segments that contain populations composed of all warm water aquatic life.
B2	Trout Waters	Aquatic Life	Propagation and maintenance of fish and other aquatic life in streams or stream segments that sustain year-round trout populations. Excluded are those streams or stream segments which receive annual stockings of trout but which do not support year-round trout populations.
B4	Wetlands	Aquatic Life	Propagation and maintenance of fish and other aquatic life in wetlands. Wetlands generally include swamps, marshes, bogs and similar areas.
C	Water Contact Recreation	Human Health	Swimming, fishing, water skiing and certain types of pleasure boating such as sailing in very small craft and outboard motor boats.
D1	Irrigation	All Other	All stream segments used for irrigation.
D2	Livestock Watering	All Other	All stream segments used for livestock watering.
D3	Wildlife	All Other	All stream segments and wetlands used by wildlife.
E1	Water Transport	All Other	All stream segments modified for water transport and having permanently maintained navigation aides.
E2	Cooling Water	All Other	All stream segments having one or more users for industrial cooling.
E3	Power Production	All Other	All stream segments extending from a point 500 feet upstream from the intake to a point one-half mile below the wastewater discharge point.
E4	Industrial	All Other	All stream segments with one or more industrial users. It does not include water for cooling.

5.5 Floodplain

FEMA is responsible for administering the National Flood Insurance Program (NFIP), which is a Federal program enabling a property owner to purchase subsidized flood insurance. NFIP is based on a formal partnership between local jurisdictions

(counties/municipalities) and the Federal government. Under this program, counties and municipalities adopt floodplain management regulations in order to reduce flood risks associated with future floodplain growth and rehabilitated floodplain structures. The Federal government in turn provides the opportunity for property owners within the community to purchase subsidized flood insurance.

NFIP is based on the established one percent (1%) annual chance flood risk, better known as the 100-year flood or Base Flood Elevation (BFE), which serves as the national standard for virtually every Federal and most state agencies. Flood Insurance Rate Maps (FIRM) produced by FEMA provide the official record of special flood hazard areas. The areal extent of the official special flood hazard area was determined for the Big Sandy Basin. Using digital flood data corresponding with published FIRMs, the 1% annual chance floodplain was overlaid on a basic map of the basin. It is important to note, mapping was not available for Wayne, Mingo, Johnson, or Floyd Counties (see Figure 5.5).

While flooding is a reoccurring problem within the basin, only a small portion of the watershed lies within the 1% annual chance floodplain. Of the 3,133 square miles mapped (72% of the total area), only 156 square miles or five percent lies within the 1% annual chance floodplain. However, nearly 21 percent of the structures within the mapped areas are situated in the floodplain. The basin's mountainous terrain results in narrow floodplains and much of the remaining land is steep hillside unsuitable for development. For this reason, transportation routes and developed lands tend to be concentrated in the floodplain.

As seen in Figure 5.5 below, the 1% annual chance floodplain is distributed throughout the basin; however, it is more concentrated in the northern portion of the basin where the valleys widen. According to HAZUS[9] and national land cover data, approximately 17,600 structures (16,356 residential (93 percent), 962 commercial (5.3 percent), 168 industrial (1 percent), and 118 public (0.7%)) or approximately 20 percent of structures within the mapped portions of the Big Sandy Watershed fall within the 100-year floodplain. The estimate for population at risk (PAR) for the mapped areas alone within the floodplain portions of the basin is nearly 35,000.

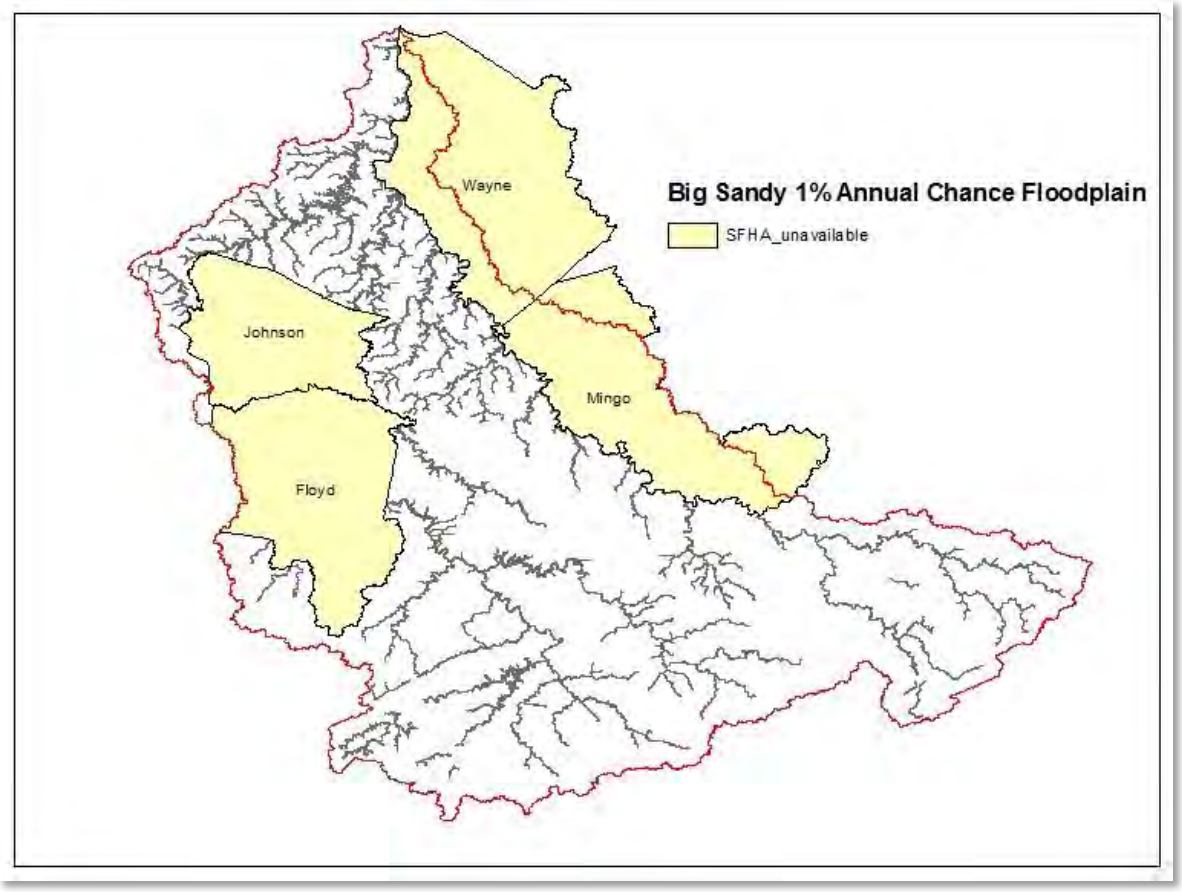

Figure 5.5: 1% Annual Chance Floodplain in the Big Sandy River Basin

5.6 Demographics

Based upon data collected by the US Census Bureau in 2010[15], approximately 274,700 people live within the basin. Table 5.5 shows historic population figures for all counties located within the basin (please note per Table 3.1 the percentage of the county that falls within the basin). As seen in Table 5.5, the counties located within the basin are rural with low population density overall. In general, the majority of the counties have experienced population decline or remained essentially constant since the 1980s to 1990s with the exception of Lawrence County, Kentucky, which has seen population growth.

Table 5.5: Population Data for Big Sandy River Basin Counties (US Census Bureau)

State/County	2010	2000	1990	1980	1970	1960
Kentucky	4,339,367	4,041,769	3,685,296	3,660,777	3,218,706	3,038,156
Boyd	49,542	49,752	51,150	55,513	52,376	52,163
Floyd	39,451	42,441	43,586	48,764	35,889	41,642
Johnson	23,356	23,445	23,248	24,432	17,539	19,748
Knott	16,346	17,649	17,906	17,940	14,698	17,362
Lawrence	15,860	15,569	13,998	14,121	10,726	12,134
Letcher	24,519	25,277	27,000	30,687	23,165	30,102
Magoffin	13,333	13,332	13,077	13,515	10,443	11,156
Martin	12,929	12,578	12,526	13,925	9,377	10,201
Morgan	13,923	13,948	11,648	12,103	10,019	11,056
Pike	65,024	68,736	72,583	81,123	61,059	68,264
Virginia	8,001,024	7,078,515	6,187,358	5,346,818	4,648,494	3,966,949
Buchanan	24,098	26,978	31,333	37,989	32,071	36,724
Dickenson	15,903	16,393	17,620	19,806	16,077	20,211
Tazewell	45,078	44,598	45,960	50,511	39,816	44,791
Wise	41,452	40,123	39,573	43,863	35,947	43,579
West Virginia	1,852,994	1,808,344	1,793,477	1,949,644	1,744,237	1,860,421
McDowell	22,113	27,329	35,233	49,899	50,666	71,359
Mercer	62,264	62,980	64,980	73,942	63,206	68,206
Mingo	26,839	28,253	33,739	37,336	32,780	39,742
Wayne	42,481	42,903	41,636	46,021	37,581	38,977

The major cities and towns within the Big Sandy River Basin include Louisa, Paintsville, Pikeville, and Prestonsburg in Kentucky; Clintwood, Grundy, and Pound in Virginia; and Williamson in West Virginia. Table 5.6 shows population for each of those cities or towns. Pikeville, Kentucky is the only city in the basin with population greater than 5,000 people.

Table 5.6: Population Data for Big Sandy River Basin Cities and Towns (US Census Bureau)

City or Town	2010
Kentucky	
Louisa	852
Paintsville	3,459
Pikeville	6,903
Prestonsburg	3,255
Virginia	
Clintwood	1,414
Grundy	1,021
Pound	1,037
West Virginia	
Williamson	3,191

Based upon data from the US Census Bureau[19], Table 5.7 shows annual per capita income and median household data for the nation, states, and counties of the Big Sandy River Basin. These data sets are based on years spanning from 2007 to 2011 and shown in 2011 dollars. For each income category, every county represented in the Big Sandy River Basin has significantly lower average income than its respective state and the nation. The overall trend of population loss and relative low income is indicative of the declining employment opportunities. The next section on industry will discuss employment by industry.

Table 5.7: Income Data (US Census Bureau)

Location	Per Capita (2007-2011) 2011 dollars	Median Household Income (2007-2011)
United States	$27,915	$52,762
Kentucky	$23,033	$42,248
Boyd	$22,698	$38,848
Floyd	$16,201	$28,221
Johnson	$19,276	$32,421
Knott	$16,857	$31,735
Lawrence	$16,839	$23,033
Letcher	$17,203	$29,564
Magoffin	$14,506	$25,410
Martin	$13,759	$23,920
Morgan	$19,623	$29,872
Pike	$19,326	$33,148
Virginia	$33,040	$63,302
Buchanan	$17,592	$30,606
Dickenson	$17,089	$30,556
Tazewell	$19,276	$36,436
Wise	$18,458	$34,717
West Virginia	$22,010	$39,550
McDowell	$13,345	$21,967
Mercer	$19,527	$33,704
Mingo	$18,610	$32,794
Wayne	$18,680	$36,029

According to HAZUS data, approximately 130,000 structures are located within the study area. Of these structures, roughly 123,520 are classified as residential structures while the remaining structures fall within the commercial, industrial, or public categories. The breakdown between structure classifications within the basin is shown in Table 5.8.

Table 5.8: Number of Structures within the Big Sandy River Basin by Category

Structure Category	Number of Structures
Residential	123,522
Commercial	4,825
Industrial	1,040
Public	586
Total	129,973

5.7 Industry

The Big Sandy River Basin includes various types of industries supporting the local and regional economies. The U.S. Bureau of Labor Statistics, through their state level agencies, collects and publishes employment statistics reported by employers in the United States. This information for 2012 is shown in Table 5.9 for all counties located within the Big Sandy River Basin. An analysis of the data shows the predominant source of employment within the basin is services (37%), followed by the utilities, trade, and transportation (20%) and government (18%) categories. Historically, the predominate industry within the study area was mining, but over time, employment opportunities have shifted toward the service industries.

Table 5.9: Employment Statistics in Big Sandy River Basins Counties 2012[20]

Counties	Industries									
	All Industries	Mining	Construction	Manufacturing	Utilities, Trade & Transportation	Information	Finance, Insurance & Real Estate	Services	Government	Aggregate/ Unclassified
Kentucky	1,721,915	20,285	67,205	223,760	364,761	26,517	86,150	659,701	265,538	7,999
Boyd	26,182	0	1,564	2,541	5,379	257	870	12,223	3,195	0
Floyd	11,446	900	652	148	2,498	377	348	4,204	2,310	10
Johnson	5,824	182	262	100	1,735	124	254	1,671	1,491	5
Knott	2,877	594	95	0	325	111	53	974	720	0
Lawrence	3,359	56	220	11	1,082	0	165	1,155	669	0
Letcher	5,323	1,012	107	104	980	0	141	1,787	1,120	0
Magoffin	2,034	78	56	0	356	13	63	617	627	0
Martin	2,562	599	29	0	468	0	67	684	690	0
Morgan	3,096	0	182	368	519	100	129	587	1,026	0
Pike	23,481	3,652	725	649	5,279	363	923	8,844	3,036	9
Virginia	3,617,363	9,017	185,575	240,631	873,955	76,600	178,256	1,806,224	242,580	4,535
Buchanan	8,390	2,163	750	291	1,737	30	203	2,501	647	0
Dickenson	3,593	989	197	34	670	20	73	790	303	0
Tazewell	16,307	734	712	1,588	551	116	574	5,563	935	0
Wise	14,265	1,697	804	268	3,701	118	341	5,671	1,655	0
West Virginia	710,734	34,509	35,591	49,039	132,640	9,599	25,462	280,239	143,154	0
McDowell	6,257	1,831	148	33	972	59	150	962	2,103	0
Mercer	20,859	238	644	1,192	4,275	329	624	8,678	4,872	0
Mingo	8,122	2,381	664	326	1,062	67	240	1,949	1,433	0
Wayne	9,042	845	357	562	1,706	32	138	2,118	3,281	0

5.8 Transportation and Public Infrastructure

The present transportation system within the Big Sandy River Basin networks over 500 miles of Federal and state highways, nearly 1,300 miles of railway, nine miles of navigable waterways, and four general aviation airports. The Big Sandy River Basin is also supported by a large inventory of infrastructure including hospitals, fire stations, schools, wastewater treatment plants, water treatment plants and dams.

5.8.1 Roadways

Interstate 64 travels east to west and connects Chesapeake, Virginia with Wentzville, Missouri through cities such as Richmond, Virginia; Huntington, West Virginia; Lexington and Louisville, Kentucky; and St. Louis, Missouri. Interstate 64 dissects the Big Sandy River Basin and crosses the Big Sandy River near its confluence with the Ohio River. Other major arteries through the basin are US Routes 23, 52, and 119. US Route 23 traverses north to south spanning from Mackinaw City, Michigan to Jacksonville, Florida. Within the Big Sandy River Basin, US Route 23 is situated in Kentucky and Virginia and connects the Cities of Paintsville, Prestonsburg, and Pikeville, Kentucky. US Routes 52 primarily follows a northwest to southeast route along the western border of West Virginia – connecting with Interstate 64 at Kenova, West Virginia. US Route 119 is also travels north to south – cutting across the State of West Virginia into the southern portion of Kentucky and connecting cities such as Williamsburg, West Virginia to Pikeville, Kentucky.

Currently, plans are underway to expand the existing roadway network throughout the basin. The King Coal Highway – a new four-lane highway paralleling the existing US Route 52 through McDowell, Mercer, Mingo, Wyoming and Wayne counties – has been designated as a high priority segment of a high priority corridor in the National Highway System. It ultimately will cover approximately 90 miles of mountainous southern West Virginia, opening it up to faster, safer transportation. The West Virginia Division of Highways (WVDOH) plans to build the highway from a point near Williamson – at the intersection of West Virginia State Route 65 and US Route 119 – to Interstate 77 at its US Route 52 interchange in the Bluefield area.

In addition, a four-lane highway linking Interstates 64 and 77 near Beckley, West Virginia to US Route 23 near Pound, Virginia is currently under construction. This improvement, known as the Coalfields Expressway or US Route 121, stretches 116 miles. Running generally along the Virginia Route 83 corridor in Wise, Dickenson, and Buchanan Counties, the Coalfields Expressway extends to Slate, Virginia near the West Virginia border where it continues to follow West Virginia Route 83 and West Virginia Route 16 through McDowell

and Wyoming Counties and West Virginia Route 16 in Raleigh County until reaching Interstates 77 and 64 near Beckley, West Virginia.

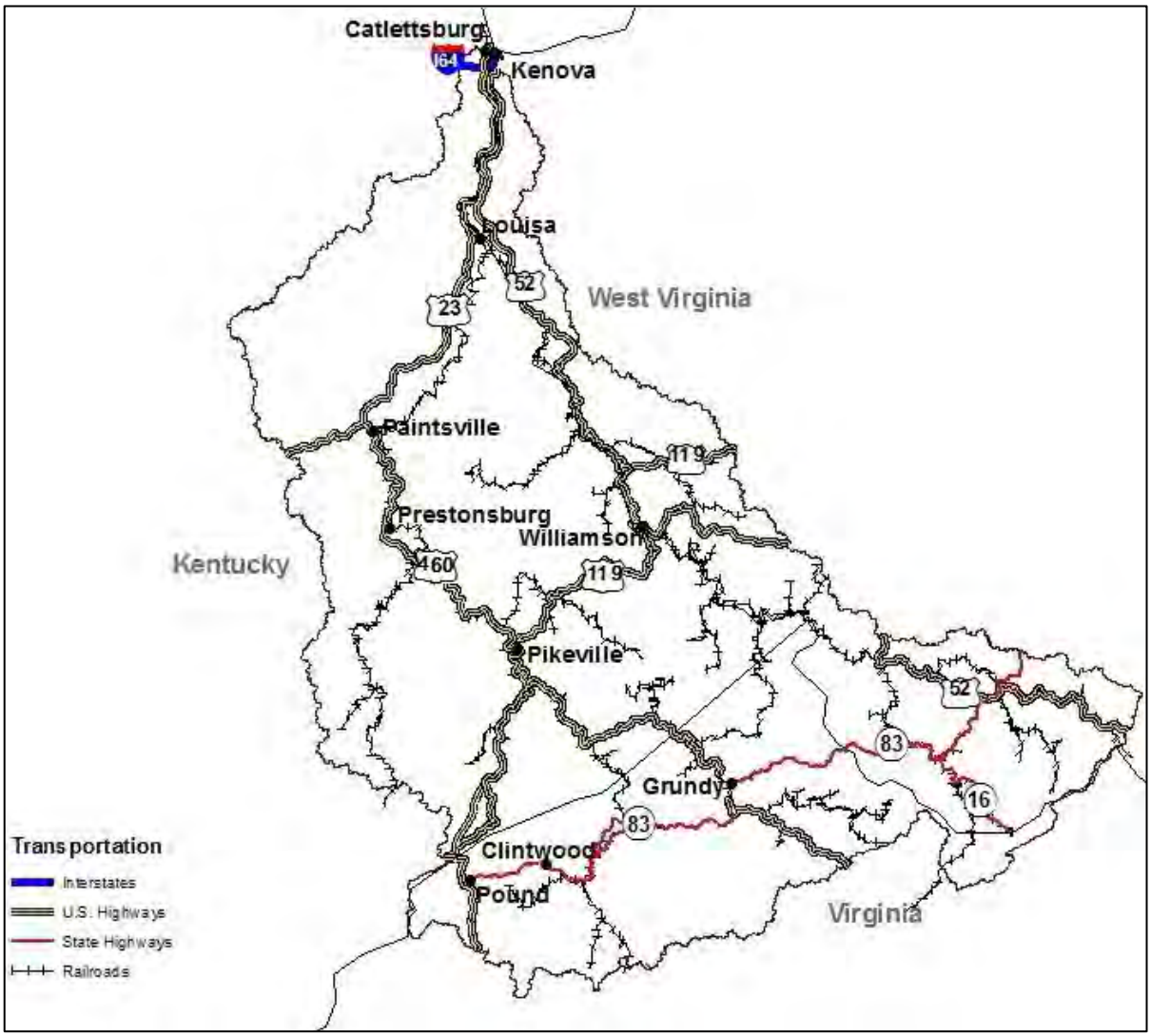

Figure 5.8: Major Roadways and Railroads within the Big Sandy River Basin

5.8.2 Railways

Transportation of coal was the original reason the railways were first constructed in the Big Sandy River Basin. Many of those lines are still used today. Major rail owners within the basin are Norfolk Southern and CSX Corporation. While Norfolk Southern lines primarily lie in the West Virginia portion (Tug Fork) of the basin, CSX lines runs through Kentucky and Virginia within the Levisa Fork River Basin. Although the majority of the rail-based transportation within the basin is for freight purposes, Amtrak operates a passenger line (Cardinal through Kenova and Catlettsburg) in the area.

The "Heartland Corridor", which was a public-private partnership between Norfolk Southern, the Federal Highway Administration, and three US states, became operational in September 2010. This project was an upgrade of rail lines including tunnel improvements and facility construction in order to facilitate double stack container service and increase freight capacity between Norfolk, Virginia and two Midwest destinations – Columbus, Ohio and Chicago, Illinois – as seen in Figure 5.9. A contract to construct an intermodal container facility (Heartland Intermodal Gateway[14]) consisting of approximately 100 acres adjacent to the Heartland Corridor at Prichard, West Virginia along the Big Sandy River was awarded in August 2013. In addition to providing intermodal transportation access the facility will offer industrial and warehouse space.

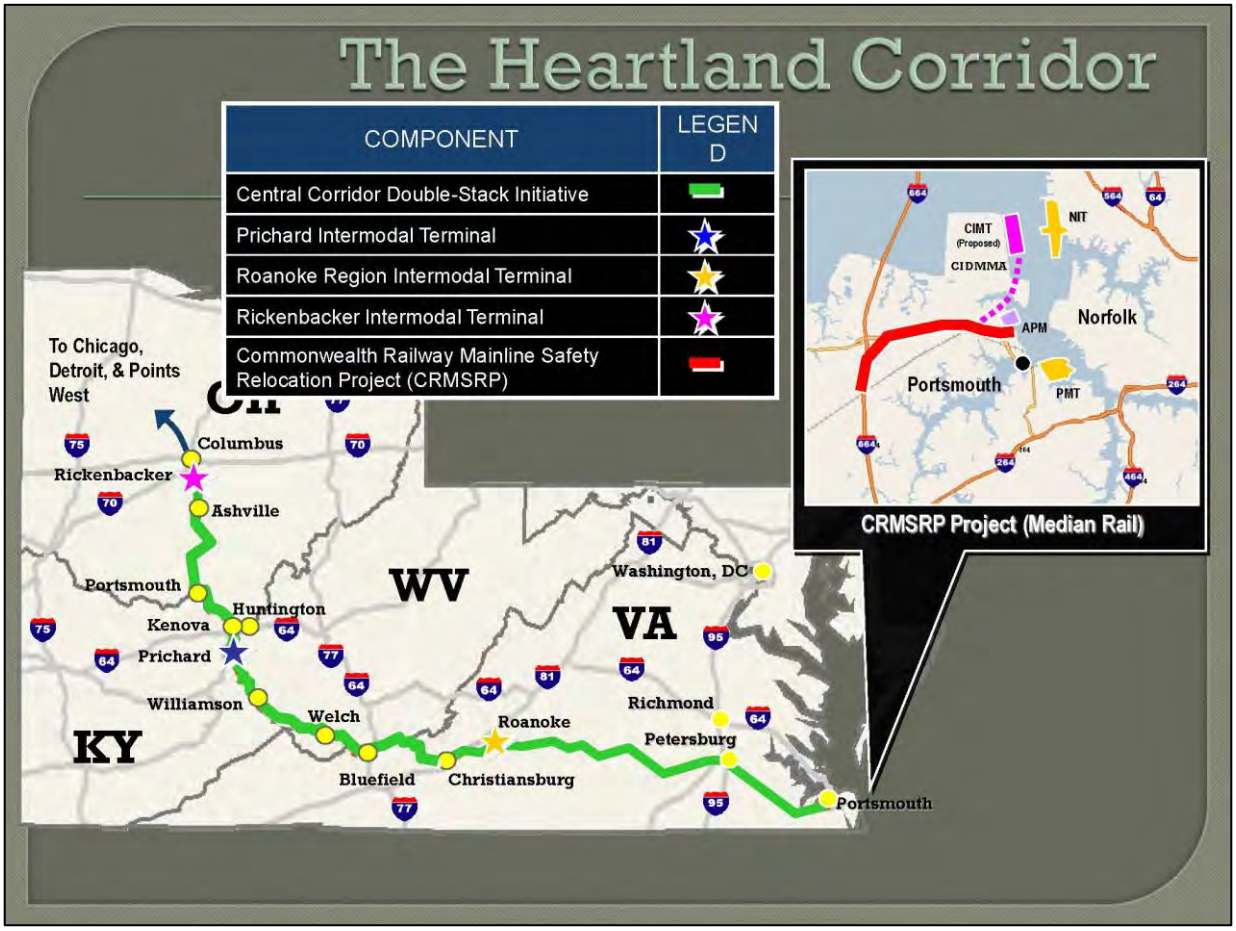

Figure 5.9: Map of the Heartland Corridor

5.8.3 Airports

The Tri-State Airport located in northern Wayne County near Huntington, West Virginia provides commercial service for those living and working in the Big Sandy Basin geographical area. Huntington Tri-State Airport (HTS) handles commercial airline, air

cargo, military, and general aviation traffic. HTS has two major airlines serving five non-stop destinations, including: Charlotte, Orlando, St. Petersburg/Clearwater, and Myrtle Beach. General Aviation services are provided by the Huntington Jet Center (FBO) located next to the main terminal.

In addition to HTS, there are three smaller publically-owned airports located throughout the basin. These are found in Grundy, Virginia, and Pikeville and Prestonsburg, Kentucky. Starting in March 2014, Appalachian Air will provide daily roundtrip passenger service from the Pikeville-Pike County Regional Airport to Nashville International Airport – allowing passengers to connect with any of the nine airlines providing nonstop service to 50 major destinations throughout the United States, Canada, and Mexico.

5.8.4 Other Public Infrastructure

In addition to transportation resources, HAZUS provides an inventory of hospitals, wastewater treatment plants, dams, schools, and fire stations. While public infrastructure outside transportation facilities is scattered throughout the basin, hospitals, schools, wastewater treatment plants, and fire stations are more heavily concentrated around the primary centers of population. In addition, Figure 5.10 reflects a large number of dams within the Big Sandy River Basin. Of the 131 dams within the basin, over half are owned by coal, mining, processing, and power companies.

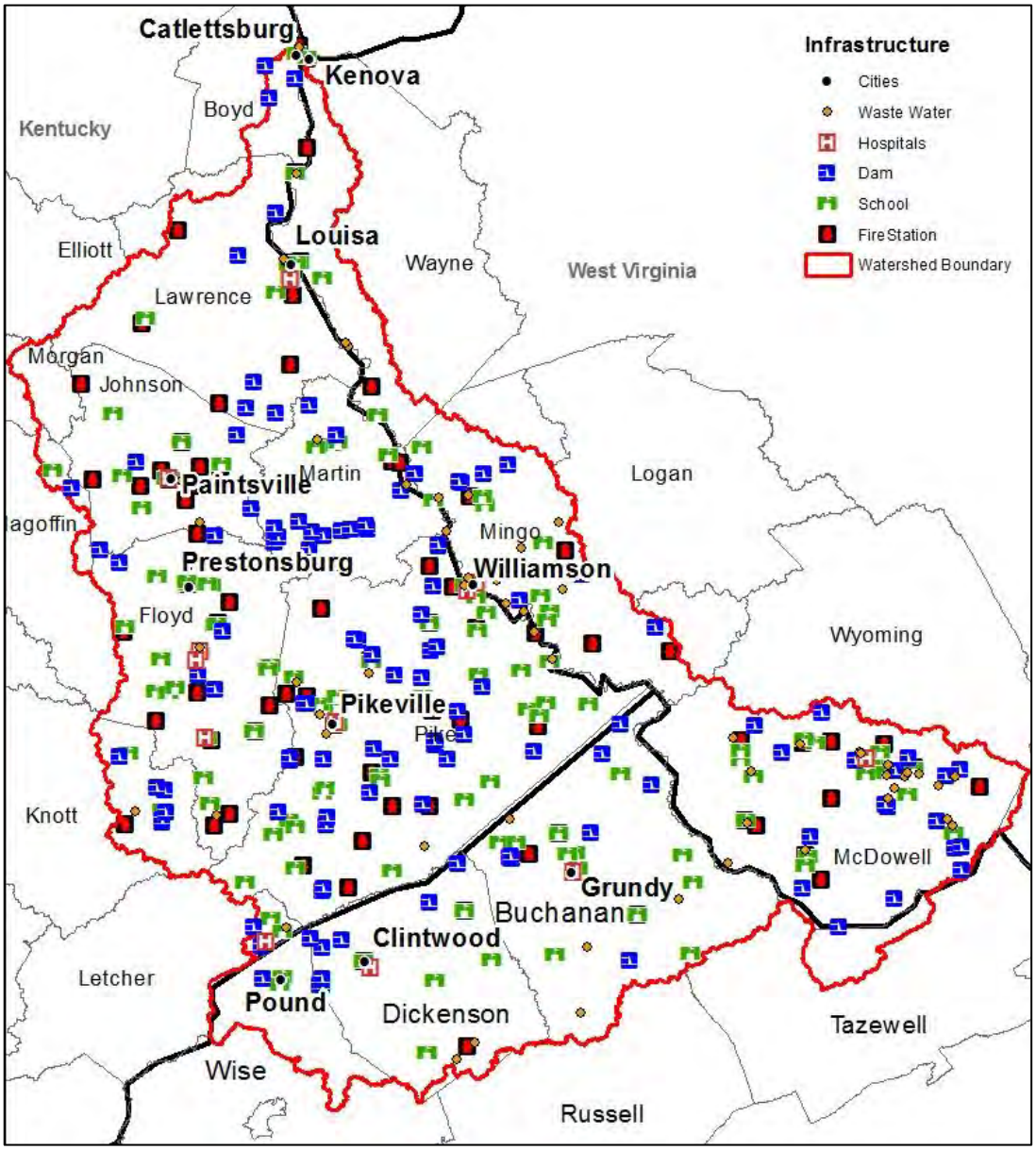

Figure 5.10: Infrastructure within the Big Sandy River Basin

5.9 Climate

The Big Sandy River Basin's mid-latitude position makes it susceptible to highly variably weather throughout the year[31]. The basin's climate is greatly influenced by oceanic and atmospheric interactions. With the Gulf of Mexico directly to the south longitudinally, the watershed typically encounters rather mild temperatures and ample precipitation. Mean annual temperatures for the watershed are in the 53-55 degrees Fahrenheit range. The watershed experiences seasonal weather patterns, with climatic conditions typical of summer, fall, winter, and spring seasons for the Mid-Atlantic and Southeast Regions of the

United States. Variability in weather tends to be greater during the late winter, spring, and fall seasons within the basin. The variability during these timeframes is often the result of passing hot and cold frontal systems, movement of the jet stream as well as weather influences from hurricanes and tropical storms along the Atlantic and Gulf Coasts.

Summers are usually characterized by warm to hot weather with periods of high humidity. High temperatures average in the mid to upper 80 degree Fahrenheit range during summer months, with high temperatures exceeding 90 degrees an average of 15-20 times each year. Temperatures in excess of 100 degrees Fahrenheit can occur occasionally in areas within the basin but are not common. The basin's northern proximity to the Gulf of Mexico and common southwesterly jet stream flows in summer months tend to have a tropical influence on the area, bringing warm temperatures and oftentimes precipitation. Southerly and southwesterly winds are the common prevailing winds in the basin. Cold fronts and winter weather fronts are typically fostered by cold north and northwesterly air masses from Canada. Winters within the basin are typically mild, with areas in the headwaters of the basin at higher elevations experiencing slightly harsher winters and greater snowfall. The Pine Mountain range situated along the Virginia and Kentucky border, with elevations around 3,000 feet above sea level along its extent, is one area in particular that usually experiences harsher winter weather and greater snowfall. High temperatures during the winter months average around 47 degrees Fahrenheit within the basin and lows average around 25 degrees Fahrenheit. Single digit lows and temperatures below 0 Fahrenheit occur infrequently in limited instances but are not common.

For Figure 5.11 Average Annual Temperature in the Big Sandy River Basin, data was obtained initially from the USDA NRCS Data gateway[16] with the source being from the PRISM Climate Group[13]. It is an annual dataset covering the conterminous U.S., for the year 2012, containing spatially gridded average mean temperature at 4km grid cell resolution. Distribution of the point measurements to the spatial grid was accomplished using the PRISM model, developed and applied by Dr. Christopher Daly of the PRISM Climate Group at Oregon State University. The data covers the period 1981-2010.

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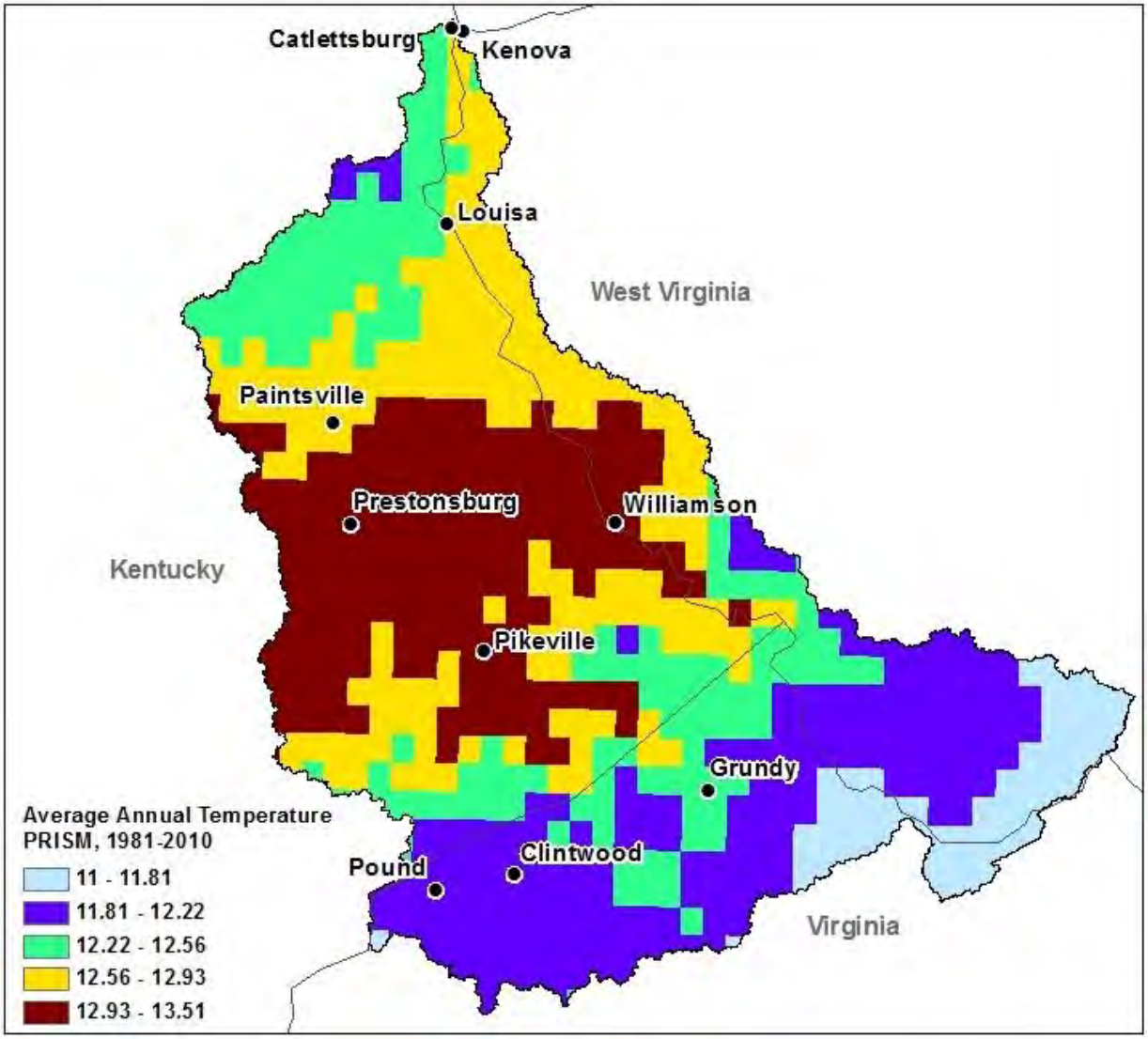

Figure 5.11: Average Annual Temperature in the Big Sandy River Basin (1981-2010)

According to data provided by the PRISM Climate Group at Oregon State University, the basin experienced an average of 40-50 inches of precipitation annually from 1981 to 2010, see Figure 5.12: Average Annual Precipitation within the Big Sandy River Basin. Fall is typically the driest season within the watershed, while spring is typically the wettest. For the most part, precipitation is distributed well throughout the year, but high intensity rainfall can occur within the study area. Such intense rainfall events are common with summer thunderstorms where rainfall rates of one-inch or more per hour can occur. These events have potential to cause flash flooding throughout the watershed, especially in headwater areas and along higher gradient streams. In fact, intense rainfall events and corresponding flash flooding have plagued the basin over the years. Ample annual precipitation throughout the watershed allows water use needs to be met for agricultural purposes as well as industrial, commercial, and residential users. Droughts do occur

periodically in the basin, but are not a common occurrence, and typically coincide with multi-week periods without precipitation in summer and fall months. Drought conditions during fall months lead to increased potential for forest fires, and though not as common, dry spring conditions also pose the same risk. Drought conditions primarily pose problems to water quality and both aquatic and terrestrial resources in the watershed. Impacts to commercial farming and agricultural practices are also present during droughts, but are limited due to the low density of such practices in the region.

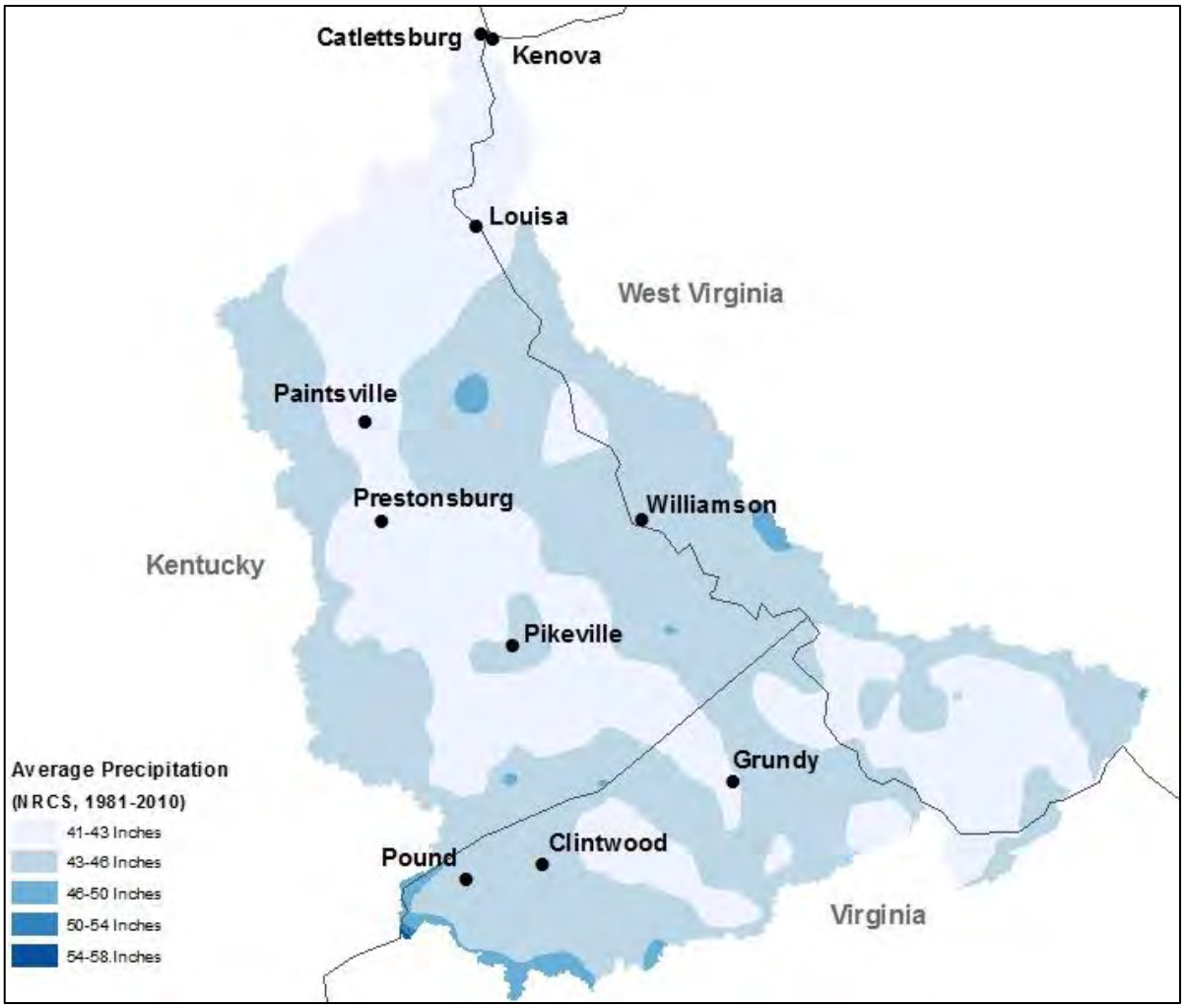

Figure 5.12: Average Annual Precipitation within the Big Sandy River Basin (NRCS, 1981 - 2010)

Flooding generated by heavy spring rains and heavy thunderstorms is the most prevalent form of inclement weather that occurs within the basin. Thunderstorms can occur almost any time of year within the basin but are more common between May and August. Though uncommon, tornadoes have been recorded throughout history in the basin. Recently in March 2012, several strong tornadoes crossed the basin causing significant damage to

several communities. The Town of West Liberty, Kentucky just to the west of the west-central boundary of the basin was devastated by an F-3 tornado. As the tornado moved eastward, it inflicted damage on several towns within the basin including Salyersville, Kentucky where several deaths were recorded and numerous structures were destroyed. Other communities within the basin in Kentucky and West Virginia endured damages as the tornado moved eastward on the ground for over 90 miles before dissipating. Hurricanes can also have weather impacts on the basin by interrupting the jet stream and dropping large amounts of precipitation as tropical storms stalling as they move through the mountainous terrain. Several significant flood events in the basin have resulted from hurricane and tropical storm systems moving northward from the Gulf of Mexico or tropical systems that have made landfall on the Atlantic Coast and pushed into the basin from the coast.

The general growing season in the basin starts in late April and oftentimes extends to early October, yielding around 160 frost-free days annually. Frosts can occur before and after these dates, especially in areas of higher elevation in the watershed, and in sheltered valleys away from sizable streams and larger bodies of water.

5.10 Ecology

5.10.1 Terrestrial Resources

The Big Sandy River Basin is primarily characterized by mixed mesophytic forest throughout its extent. Forest communities vary in species composition throughout the basin based on topography, elevation, slope, aspect, soils, and other variables. Common tree species found within the basin include white oak (*Quercus alba L.*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), tulip tree (*Liriodendron tulipifera*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*), Eastern hemlock (*Tsuga canadensis*).

Terrestrial wildlife species in the watershed are predominantly comprised of species that utilize woodland habitats. Common game species include the white-tailed deer (*Odocoileus virginianus*), grey squirrel (*Sciurus carolinenis*), fox squirrel (*Sciurus niger*), eastern wild turkey (*Meleagris gallopavo*), and cottontail rabbit (*Sylvilagus floridanus*). Black bear (*Ursus amercanus*) can be found throughout the basin, but densities are less in the far lower portion of the watershed compared to the upper reaches. Kentucky opened several counties within the watershed as part of its first bear hunting season in over 100 years in 2009 as a result of the growing numbers. Designated bear seasons exist for all counties within the watershed in West Virginia. Additionally, wild boars (*Sus scrofa*) were

introduced in the early 1970s and have become established in portions of southern West Virginia and may occur in certain parts of the watershed. Ruffed grouse (*Bonasus umbullus*) were once abundant in areas within the watershed, but at the present populations are very limited. Habitat loss, predation, and low hatch rates are all factors in the population decline. Elk (*Cervus elaphus*) are perhaps the most unique game mammal found in the watershed, given their presence east of the Mississippi River is sparse in present times. Historically elk were found in areas of the watershed but became expatriated from the area as a result of overharvest, disease, and habitat loss. In 1997, the Kentucky Department of Fish and Wildlife Resources (KDFWR) partnered with the Rocky Mountain Elk Foundation (RMEF) to reintroduce elk to a designated area in Eastern Kentucky.

Elk stocking took place until 2002, when it halted. The reestablishment effort has been very successful with the population at its target level of approximately 8,000 elk at the present. A 12-county area, many counties of which are in the Big Sandy Watershed, was designated as the area for reestablishment. Biologists attribute mild winters, successful breeding rates, and lack of natural predators as success factors for the flourishing elk herd. In fact, Kentucky's elk herd is the largest elk herd east of Montana. Kentucky conducts an annual elk lottery to issue hunting tags to actively manage the herd's population to target levels. Elk sightings have been documented in counties outside of the 12-county area as well as in bordering areas of West Virginia and Virginia in the watershed. Furbearers within the watershed mainly include gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), beaver (*Castor Canadensis*) and bobcat (*Lynx rufus*).

Surface mining is prevalent within the watershed. Areas of grasses and shrubs on reclaimed surface mines provide unforested openings and important edge habitat diversifying the landscape. Such areas are oftentimes sought by elk and deer as preferred habitat. Many of these areas will undergo gradual succession into woodland habitats. The topography of many of these areas has been altered due to contouring earthwork performed from surface mining activities. This change in contour often results in wider and flatter ridge tops and likewise for downgrade bench features.

Riparian corridor areas within the basin also contain a wide variety of tree and plant species. Common tree species include: silver maple (*Acer saccharinum*), river birch (*Betula nigra*), sycamore or American planetree (*Platanus occidentalis*), yellow buckeye (*Aesculus octandra*), box elder (*Acer negundo*), green ash (*Fraxinus pennslyvanica*), black willow (*Salix nigra*), American beech (*Fagus grandifolia*), and slippery elm (*Ulmus rubra*). Vines and shrubs found in riparian corridors within the basin include; smooth alder (*Alnus serrulata*), crossvine (*Bignonia capreolata*), elderberry (*Sambucus canadensis*), wild

hydrangea (*Hydrangea arborescens*), privet (*Ligustum vulgare*), spicebush (*Lindera benzoin*), pawpaw (*Asimina triloba*), ironwood (*Carpinus caroliniana*), and poison ivy (*Toxicodendron radicans*). Several common herbaceous plant species found in riparian corridors of the Big Sandy Watershed include giant ragweed (*Ambrosia trifida*), orange jewelweed (*Impatiens capensis*), yellow jewelweed (*Impatiens pallid*), water willow (*Justicia Americana*), common horsetail (*Equiselum arvense*) and Virginia saxifrage (*Saxifraga virginensis*).

The Big Sandy Watershed also sustains a variety of reptile and amphibian species. Common reptile species include Northern water snake (*Northern sipedon*), box turtle (*Terrapene carolina carolina*), black rat snake (*Elaphe obsoleta obsolete*), Eastern garter snake (*Thamnophis sirtalis sirtalis*), snapping turtle (*Chelydra serpentina serpentine*) Two venomous snakes, the copperhead (*Agkistrodon contortrix*) and timber rattlesnake (*Crotalus horridus*), can be found in portions of the watersheds. Typically, these two species of snakes are found in secluded, rocky areas that have preferred food sources present, such as small mammals and rodents.

The watershed provides important woodland habitat for neotropical migrant songbird species. Large forested tracts are particularly important habitat for woodland warbler species. Songbird species dependent upon non-forest and edge habitats are found on reclaimed surface mine sites. Hawks, including the Red-tailed hawk (*Buteo jamaicensis*) and Cooper's hawk (*Accipiter cooperii*), are the most common birds of prey found within the basin. Two common nocturnal birds of prey include the Northern barred owl (*Strix varia*) and the Eastern screech owl (*Otus asio*). The American Kestrel (*Falco sparverius*), the smallest member of the falcon family also occurs throughout the Big Sandy Basin.

5.10.2 Aquatic Resources

Fish diversity varies greatly within the basin, with water quality and habitat being the primary factors influencing diversity. Streams and water bodies with higher water quality and ample habitat can be expected to support a greater diversity of fishes and aquatic organisms. Several streams and segments of streams within the basin are moderate to high quality fisheries, while many are of poor quality. Pollutants that impact dissolved oxygen levels, heavy metals, unregulated sewage discharges, and sedimentation are the primary culprits within the basin that negatively impact fisheries. Section 5.1.4 highlights the water quality status of many streams within the watershed. Over the last century land-use practices, timbering, and mining have had an adverse influence on water quality and aquatic life in streams throughout the basin. In October of 2000 a massive spill of liquefied coal waste in Martin County, Kentucky entered the Tug Fork and traveled downstream the full extent of the Big Sandy River, impacting a total of almost 75 miles of waterway. The

spill resulted in practically most all aquatic life within a majority of the extent being eliminated, and recovery throughout the stretch is still ongoing.

Comprehensive data for the entire Big Sandy Watershed for fishes and mollusks is limited. Data is typically specific to a stream or reach of stream in the respective state. Additionally, the presence and density of many species varies within the watershed. Stream size, substrate composition, water quality, and temperature are all variables affecting distribution and density of many aquatic species. For example, smaller streams at the upper reaches of the watershed typically have a higher gradient and the presence of boulders, cobble, and gravel in streambeds is common. In the downstream reaches of the watershed, the lower stretches of Levisa Fork and Tug Fork as well as the Big Sandy River have less gradient and streambeds are primarily comprised of silts and sands.

An aquatic resource survey[10] conducted by the West Virginia Division of Natural Resources (WVDNR) in the mid-1980's on the Big Sandy River and the lower reaches of the Levisa and Tug Fork Rivers documented a variety of aquatic species, including fishes, mollusks, and benthic macro invertebrates. The report indicates that ichthyofauna in the Big Sandy River drainage is diverse and variable in quantity throughout the watershed, citing both natural and manmade changes in hydrology and water quality as factors. Over 100 species of fish have been documented to occur in the Big Sandy River Basin, with over 90 species documented on the Levisa Fork and over 70 species on the Tug Fork. The survey conducted by the WVDNR on the three aforementioned streams yielded 52 different species of fish collected at 5 different sampling stations. The survey conducted by WVDNR, and previous surveys by the agency and the KDFWR indicate forage and rough fish species to be abundant in the Big Sandy River. Numerous carp (*Cyrinus carpio*), golden redhorse (*Moxostoma erythrurum*), freshwater drum (*Aplodinotus grunniens*), gizzard shad (*Dorsoma cepedianum*), emerald shiner (*Notropis atherinoides*), sand shiner (*Notropis stramineus*), striped shiner (*Notropis chrysocephalus*), spotfin shiner (*Notropis spilopterus*), and bluntnose minnow (*Pimephales noatus*). Channel catfish (*Ictalurus punctatus*) was the dominant game fish species throughout all of the monitoring stations during the WVDNR survey.

Other game fish collected in notable quantities included spotted bass (*Mircopterus punctulatus*), flathead catfish (*Pylodictis olivaris*), white crappie (*Pomoxis annualaris*), and longear sunfish (*Lepomis megalotis*). Sampling at the stations on the Levisa and Tug Forks yielded similar species as well. Though not in high quantities, other game fish collected during the surveys, included bluegill (*Lepomis macrochirus*), sauger (*Stizostedion canadense*), and largemouth bass (*Micropterus salmoides*). According to angling surveys moderate populations of smallmouth bass (*Micropterus dolomieui*) exist in the mid and upper reaches of the Tug and Levisa Forks.

A variety of game fishes can be found throughout the Big Sandy Basin, most of which are warm water species. There are a few cold-water streams in the watershed that can support trout year-round in the upper reaches of the watershed. Deep mine discharges of cold water support Elkhorn Creek and Jacobs Fork populations of rainbow trout and brown trout in McDowell County, West Virginia. However, many streams in the basin are stocked seasonally with trout, primarily during the late winter and spring months. Details on trout stocking, including streams, stocking schedule, and amounts can be found by contacting the respective state fish and wildlife agency or accessing their websites. Fishing for largemouth bass (*Micropterus salmoides*) is popular at several lakes within the watershed, along with channel (*Ictalurus punctatus*) and flathead (*Pylodictis olivaris*) catfish, black crappie (*Pomoxis nigromaclatus*), and bluegill (*Lepomis macrochirus*). Smallmouth bass (*Micropterus dolomieu*), spotted bass (*Micropterus punctulatus*), rock bass (*Ambloplites rupestris*), and channel catfish (*Ictalurus punctatus*) are the primary game fishes sought after by fisherman in streams supporting populations in the watershed. Unfortunately, there are many streams in the watershed that are limited by their size and/or by pollution and cannot sustain significant warm-water fisheries.

As previously noted, comprehensive data on mollusks for the entire Big Sandy Basin is limited. While, no Federally threatened or endangered mollusks are known to occur at the present within the Big Sandy River Basin, a variety of common mollusks do occur within the basin. A survey recently conducted on the lower portion of the Big Sandy River and conducted by Arcadis U.S., Inc. during the summer of 2013 yielded four different species of freshwater mussels. The pink heelsplitter (*Potamilus alatus*) was the dominant species in the survey, with a total of 13 collected. Other species collected include the mapleleaf (*Quadrula quadrula*), threehorn wartyback (*Obliquaria reflexa*), and the pink papershell (*P. ohiensis*).

5.10.3 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 is administered by the USFWS and the National Marine Fisheries Service (NMFS). The ESA is a Federal law that serves to protect and recover imperiled species and the ecosystems upon which they depend. Under the ESA, species may be listed as either endangered or threatened. A species designated as "endangered", means the species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means a species is likely to become endangered in the foreseeable future. Under the ESA, all species of plants and animals, with the exception of pest insects, are eligible for listing. The ultimate goal of the ESA is the recovery and reestablishment of listed species. Through collaboration with state wildlife agencies, biologists, and other experts, USFWS biologists develop recovery plans for listed species to

establish a framework for the species recovery. According to USFWS databases[32,33] and online resources there a currently three listed species and one species proposed for listing that are likely to occur within the Big Sandy River Basin. Both the Indiana bat (*Myotis sodalis*) and the Virginia big-eared bat (*Corynorhinus townsendii virginianus*) are listed as endangered species. Recently (October 2013), the Northern big-eared bat (*Myotis septentrionalis*) has been proposed for listing as endangered by the USFWS. Additionally, Virginia spiraea (*Spiraea virginiana*), a listed threatened species, has been documented and has the potential to occur in the Big Sandy River Basin and were identified in the Breaks in 1991.

The Indiana bat (*Myotis sodalis*), see Figure 5.13, has the potential to occur throughout the Big Sandy Watershed. Indiana bats are rather small, weighing on average around one-quarter of an ounce, but have a wingspan near 10 inches wide. Their fur is dark brown and black in color. During winter months the bat hibernates in caves and sometimes abandoned mine portals. During late spring through early fall they oftentimes inhabit areas around stream corridors, upland woodlots, and hedgerow areas where they forage for insects. Like other bat species, the Indiana bat plays a critical role in insect control, commonly eating half of their weight in insects nightly. Female bats migrate from hibernation areas to establish maternity colonies during summer months and roost in timber stands containing tree species with loose, exfoliated bark along with hollow trees and dead snags. Prior to reentry to hibernation areas, the bats mate during the fall. Each female will only give birth to one pup each spring, further complicating population expansion. According to the Virginia Department of Game and Inland Fisheries (VDGIF) the Indiana bat is known to commonly occur in Dickenson, Tazewell, and Wise Counties. In addition to habitat loss from timbering and other land-use practices throughout its range, the Indiana bat has been negatively affected by white nose syndrome (WNS) since 2006. The syndrome is characterized by the presence of a ring of white fungus on the faces or wings of hibernating bats. The USFWS has issued a moratorium on any caving activities where bats have been found with WNS.

Figure 5.13: Side profile picture of an Indiana Bat

Virginia spiraea (*Spiraea virginiana*), see Figure 5.14, is found in the Appalachian Plateaus and Southern Blue Ridge Mountains. This plant species has the potential to occur within areas of the Big Sandy River Basin, particularly the upper reaches of the watershed. Mature plants can reach heights of three to ten feet. Young plant stems are of greenish-yellow to dark brown color, and mature stems are dark gray in color. Mature plants are characterized by creamy white flowers in tightly packed clusters during spring and summer months. The plant is often found along scoured banks of high gradient streams, meandering sections of streams, point bars, natural levees, and braided sections of streams. The plant prefers soils composed of sands, silts, and clays and has been documented in most instances at elevations between 1,000 to 2,400 feet above sea level. From field observations, seed production appears to be sporadic and very little population expansion has been documented, with genetic variability thought to be the main cause. Dispersion through erosion and downstream travel are thought to be critical for success in establishment of Virginia spiraea. The USFWS indicates that the most important factor in maintaining the plant species involves the removal of woody plant species competition through erosion. Impoundments are the primary threat to Virginia spiraea. Other threats include beaver activities along streams, roadway maintenance along riparian corridors, off-road vehicle use, foraging from wildlife, and invasive plant species.

Figure 5.14: Mature Virginia spiraea in flowering stage

The Virginia big-eared bat (*Corynorhinus townsendii virginianus*), see Figure 5.15, has the potential to occur in the headwater areas of the Tug Fork within the Big Sandy River Basin. According to the USFWS, the bat is known to occur in Tazewell County. The Virginia big-eared bat is a medium sized bat, around four inches long. As its common name indicates, the Virginia big-eared bat has rather large ears, over an inch long, and the presence of two large lumps on its muzzle. The lumps on the muzzle are glands. The bat has a pale to dark brown color on its back with light brown fur on its chest area. The Virginia big-eared bat has a more limited range compared to the Indiana bat, and isolated populations have been documented in parts of Virginia, West Virginia, North Carolina, and Kentucky. The big-eared bat prefers caves in karst regions (areas of limestone bedrock characterized by caves and sinkholes) where oak, hickory, beech, maple, and hemlock trees species are prevalent. The Virginia big-eared bat is non-migratory, and resides in caves year round. They typically hibernate in tight clusters near the entrances of caves, where the cave is well-ventilated and temperatures range from 32 to 50 degrees Fahrenheit. Like the Indiana bat, the female Virginia big-eared bats bear one pup each summer, which are able to fly within three weeks of birth. The Virginia big-eared bat forages on insects and moths are its primary prey. Given the bat inhabits caves year-round, human disturbance is the greatest

threat to the Virginia big-eared bat. Disturbances occurring during hibernation can be particularly detrimental, causing bats to lose fat reserves that are critical to sustain them through winter into spring when insects become readily available again.

Figure 5.15: Virginia big-eared bat

While the bald eagle (*Haliaeetus leucocephalus*), see Figure 5.16, has been delisted under the ESA several years ago, it is still afforded protection under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Bald eagle sightings are not uncommon in present times within the Big Sandy River Basin. In recent years a pair of nesting bald eagles was situated on Yatesville Lake in the lower portion of the watershed.

Figure 5.16: Nesting Pair of Bald Eagles

While not formally listed as threatened or endangered by the USFWS, the Northern long-eared bat (*Myotis septentrionalis*), see Figure 5.17, has been proposed as endangered by the USFWS. In October of 2013, the USFWS published the proposal in the Federal Register for the Northern long-eared bat throughout its range. The range of the bat is quite extensive. The bat can be found from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north from there to North Dakota. Part of the range even extends to eastern Montana and Wyoming. The listing process can take up to a year from the recent Federal Register publication to become official. The Northern long-eared bat prefers cool, high humidity areas of caves and abandoned mines for hibernacula. Particularly, the bat prefers small cracks or crevices in cave ceilings, making them difficult to locate during cave surveys. During summer months, the bat primarily roosts in interior areas of forested cover. Females assemble small maternity colonies behind exfoliating bark and sometimes even in barns, bat houses, and abandoned structures. While the bat is not a migratory species it has been documented to travel over 30 miles from its hibernacula during summer months. The primary reasoning behind listing the bat as endangered stems from the sharp decline in population throughout the northeastern part of its range, caused by the emergence of WNS that is negatively impacting the bats.

Figure 5.17: The Northern long-eared bat

5.11 Recreation

There are many resource-based recreational opportunities to pursue within the Big Sandy River Basin. The basin's landscape diversity, cultural heritage, and abundance of natural resources creates a unique array of recreational opportunities including extreme whitewater and at the same time allows for general recreational activities. General recreational activities such as fishing, hunting, wildlife viewing, boating, canoeing, hiking, horseback riding, and golf are plentiful within the watershed.

5.11.1 Wildlife Viewing, Hunting and Fishing

Fishing opportunities exist for a variety of freshwater fish along streams and rivers as well as within several lakes within the basin. All three states within the watershed have trout stocking programs that stock various streams and tailwater reaches below several lakes within the watershed during late winter and spring. Each state's respective fish and wildlife resource agency can be contacted for information on trout stocking and have stocking schedules available online. Bass and catfish are the most sought after game fishes within the basin in streams and lakes. Bass fishing tournaments are common during spring and summer months at larger lakes within the watershed including Dewey Lake, Yatesville

Lake, J.W. Flannagan Reservoir, and Fishtrap Lake. Boating is most common on the larger lakes within the watershed, while canoeing is more common on streams and rivers.

There are also ample hunting opportunities for sportsmen within the watershed. Both large-game and small game animals are plentiful in many areas of the watershed, and the most common pursued game animals include white-tail deer, eastern wild turkey, gray squirrel, black bear, and eastern cottontail rabbit. The white-tailed deer is the most widely pursued big game animal within the watershed. Significant portions of Mingo and McDowell Counties are located within the watershed. These two counties are part of a four-county area designated as archery hunting only for deer by the WVDNR, making trophy potential higher in these areas. Hunting on private land is common throughout the watershed but quite a few public land opportunities also exist. In Kentucky, there are several large acreage KDFWR wildlife management areas (WMAs), Yatesville Lake WMA (13,191 acres), Dewey Lake WMA (9,242 acres), Fishtrap Lake WMA (13,134 acres), Paintsville Lake WMA (11,221 acres), Consol of Kentucky WMA (4,693 acres). Within the Tug Fork subwatershed in West Virginia, there are four WMAs that offer public hunting opportunities, Panther WMA (7,810 acres), Tug Fork WMA (2,165 acres), Anawalt Lake WMA (1,792 acres), Berwind Lake WMA (80 acres). In Virginia, a large portion of the Jefferson National Forest is located within the watershed along the Kentucky-Virginia border within Dickenson and Wise Counties. Portions of the Jefferson National Forest also stretch across into Kentucky. The Jefferson National Forest is managed and operated by the United States Forest Service (USFS). Also within the watershed in Virginia, is the J.W. Flannagan Reservoir that offers approximately 3,261 acres of land adjacent to the reservoir for public access. Hunting regulations vary from state to state. Additionally, some WMAs have specific regulations and portions of them may be closed during certain seasons. For specific regulations and seasons, as well as licensing information, the appropriate management agency should be consulted.

Wildlife watching and viewing is often considered a traditional recreational activity, however the presence of elk within many Kentucky counties in the Big Sandy River Basin allows for a rare opportunity given the extremely limited presence of elk in the eastern United States. In fact, Jenny Wiley State Resort Park near Prestonsburg, Kentucky offers guided elk tours during times throughout the year for wildlife viewers seeking such opportunities. Kentucky's elk herd has a current approximate population of 8,000 animals, making it by far the largest elk herd east of the Mississippi River. Many of the counties within the 16-county restoration zone fall within or portions of the watershed. The flourishing elk population in eastern Kentucky has resulted in remarkably unique elk hunting opportunities. Since the first designated hunting season for elk in 2001, the number of allotted tags has grown significantly in recent years. Elk tags are issued by a lottery system administered by the KDFWR and both residents and nonresidents can apply

for a tag. Information on the elk lottery, quotas, and license fees can be found on the KDFWR website.

Figure 5.18: Kentucky bull elk harvested near Dewey Lake

5.11.2 Hatfield-McCoy Trail System

While many general recreational activities exist within the Big Sandy Watershed, there are several unique offerings within the watershed. Perhaps the most unique recreational offering within the watershed is the extensive trail systems of the Hatfield-McCoy Trails in southern West Virginia. The trail system was created by the West Virginia State Legislature in an effort to generate economic development through tourism in nine southern West Virginia counties. While the entire 600+ miles of trail network is not located entirely within the watershed, significant portions of it are. The trail system is designed for off-highway vehicle (OHV) use including all-terrain vehicles (ATVs), dirt bikes, and off-road

utility vehicles (UTVs). Eight segments of trails make up the entire Hatfield-McCoy trail system, with established trailheads in areas to provide easy access for riders. Within each segment there are various trails, marked accordingly, that indicate the level of difficulty to inform riders and foster safe riding. The current trail network has grown considerably since the inception trail system in October of 2000 that contained 300 miles of trail. Each year the Hatfield-McCoy Trails hosts various trail riding events that attract riders from all over the United States. The Hatfield-McCoy National Trailfest, the largest annual event conducted on the trails system, is scheduled for mid-October of 2014. As the trail system has continued to grow, towns and communities along the trail system have seen economic benefits. Lodging opportunities have expanded near trailhead areas within the various segments. Trailheads for two major trail segments are located within the Big Sandy River Basin. The Buffalo Mountain trailhead is located in Williamson, West Virginia and allows riders to traverse further to the south to Matewan, West Virginia. The vast majority of the segment is located within the watershed. Significant portions of the Indian Ridge trail segment are located within the basin, with the trailhead located in Ashland, WV. This trail segment serves as a connector to the Pinnacle Creek and Pocahontas trail segments. Detailed maps for each segment are available at the Hatfield-McCoy Trails website. To ride the trail systems riders must purchase an annual permit. The cost of a permit for West Virginia residents is $26.00 and $50.00 for non-residents. Additionally, the trail system is patrolled by staff of the Hatfield-McCoy Trails to ensure trail regulations are adhered to and promote safety.

Figure 5.17: ATV riders along the Hatfield-McCoy Trails

5.11.3 Whitewater Rafting

Another unique offering within the watershed can be found on the Russell Fork River below J.W. Flannagan Dam and on throughout its descent through the gorge at Breaks Interstate Park. Each fall, many rafting and kayaking enthusiasts travel from all over the country and even from abroad to battle extreme whitewater along the Russell Fork. USACE increases water releases from J.W. Flannagan Reservoir during the first four weekends in October (a function of the winter drawdown process), which creates ideal and challenging whitewater adventure along the river below the dam. The section of river that flows through the gorge is considered to be among the most challenging whitewater trips in all of the eastern United States, and contains many Class V rapids along with a few daunting Class VI rapids. Many of the challenging rapids along this stretch have unique names that point to the power they possess and challenge they pose. Some of the popular rapids include "triple drop," "broken nose," and "twenty stitches." Perhaps the most significant rapid, "El Horrendo," features a torturous 75-foot stretch of whitewater. Throughout its course through the gorge, the river features extreme gradient with one section dropping over 180 feet in a mile stretch. Elkhorn City, Kentucky is situated right below the gorge and experiences an influx of visitors each year during the rafting season, bringing positive economic benefits to the area during those times.

Figure 5.19: Whitewater kayaker on the Russell Fork River

5.11.4 State Parks

Several state parks are located within the watershed and offer many recreational activities. While activities offered vary somewhat among parks within the watershed many offer hiking trails, picnicking facilities, swimming, and fishing. Some of the parks even offer boating, hunting, bridle trails, golf, camping, cabins, and dining. Jenny Wiley State Resort Park near Prestonsburg, Kentucky boasts lodging, dining, camping, and even an outdoor theatre where scheduled performances are conducted. Yatesville Lake just outside of Louisa, Kentucky offers golf at the 18-hole Eagle Ridge Golf Course. The course was named as the third ranked new golf course nationally for affordability in 2005 by Golf Digest Magazine. Breaks Interstate Park, shared by Kentucky and Virginia, is situated along the state boundary line. The 4,600 acre park is situated within the Jefferson National Forest at the northeastern terminus of Pine Mountain. Facilities at the park sit high atop Breaks Canyon, often referred to as the "Grand Canyon of the South" and is the deepest gorge east of the Mississippi River. Once discovered, the passage ("break") through the mountain range was accessed by early settlers as a route to ease travels. The park offers a variety of year round recreation and offers many scenic lookouts over the canyon. The park also features a lodge with over 75 guest rooms, conference center, visitor center, restaurant, cottages, cabins, and a 138-site campground.

Figure 5.20: Lookout view of Breaks Canyon

5.11.5 Festivals

The Big Sandy River Basin is embedded within the Appalachian cultural region. The region is highlighted by many unique social and cultural characteristics. Recreational events and festivals tied to Appalachian culture are held annually in locations within the basin. Each fall Paintsville, Kentucky hosts its annual "Kentucky Apple Festival" that includes dancing, music performances, pageants, arts and crafts, various apple cuisines, and a parade. The event has been hosted for over 50 years and draws visitors from throughout the region. Since 1977, Pike County has been celebrating its annual "Hillbilly Days" in Pikeville, Kentucky. The event is conducted each spring and offers music, carnival rides, antique cars, a parade, and various other activities. More recently, starting in 2000, an annual Hatfield & McCoy Reunion and Festival has been held in Williamson, West Virginia. The event contains a variety of activities and entertainment and is highlighted by guided and narrated tours to landmark sites where significant events took place during the well-known feud between the two families.

Figure 5.21: Hillbilly Days Parade in Pikeville, Kentucky

6.0 Identification of Problems and Needs

Early in the development of the IWA, water resource related problems and needs were identified and defined. The main tool used for identifying problems and needs was stakeholder outreach. As previously mentioned, five stakeholder meetings were held throughout the basin during the period April 17-22, 2013. The stakeholders consisted of Federal, state and local government officials, as well as resource agencies and nonprofit watershed associations. The meeting locations are marked in red below in Figure 6.1. The comments received from the stakeholders meetings are attached to this document as AppendixF.

Figure 6.1: Locations of Stakeholder Meetings

The main areas of concern can be roughly divided into the five following categories and are summarized below:

- Environmental/Water quality/Ecosystem Restoration
- Land use/Floodplain Management
- Flooding Issues
- Infrastructure Issues
- Recreation

6.1 Environmental/Water Quality/Ecosystem Restoration

The waters of the United States are always threatened by various sources and types of pollution. Under the Clean Water Act, every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. State standards represent a level of water quality that will support their goal of "swimmable/fishable" waters.

Water quality standards are ambient standards, requirements that specify the maximum amount of pollutant(s) a site may be allowed to have in its surroundings, as opposed to discharge-type standards. These ambient standards, through a process of back calculation procedures known as TMDLs or wasteload allocations, form the basis of water quality based permit limitations that regulate the discharge of pollutants into the waters under the NPDES permit program. Streams not meeting the State water quality standards are placed on the USEPA's 303(d) Impaired Waters lists. Information from the Kentucky Geological Survey states the following:

- "Nearly 7,600 miles of streams flow through the basin's 3,440 square miles in 14 counties to the Tug Fork, Big Sandy River, and Ohio River. The Big Sandy River Basin has 2,285 square miles in Kentucky and 1,950 square miles in West Virginia and Virginia. There are nearly 17,000 acres of wetlands, including water bodies.

- Residents draw about 27 million gallons of water per day (mgd) from streams and reservoirs in the basin. About three in five residents are on public water; other households rely primarily on domestic wells. Only about one in four households are on public sewer. On-site wastewater treatment is a critical issue affecting water quality throughout the basin.

- More than 540 miles of streams in the basin do not fully support designated uses for warm-water aquatic habitat, fish consumption, and primary contact recreation. Most streams have not been assessed. The percentage of assessed streams not supporting uses was: warm-water aquatic habitat (60%); fish consumption (16%); primary contact recreation (40%).

- 45 miles of streams have been declared special use waters: either exceptional waters or reference reach waters.

- There are four remediation priority watersheds including 200 square miles: primary impacts are pathogens, PCBs, metals, siltation, dissolved solids, chlorides, and salinity."

There were several water quality related concerns that were voiced during the five stakeholder outreach sessions, see Figure 6.1. They included the following broad categories:

Water/ecosystem quality
Sediment and siltation
Erosion and trash/debris

6.1.1 Water/Ecosystem Quality - General

As noted in the information in Section 5, water quality and the aquatic ecosystem within the watershed are not in a state that supports a level of diversity and productivity characteristic of a high-quality Appalachian stream. Various forms of pollution have been identified. Two of the more critical water pollution sources in the Big Sandy Basin include "straight pipes" placing raw or "untreated" sewage in streams and acid mine drainage (AMD).

Pollution from dumping solid and liquid wastes along water courses is an issue throughout the Big Sandy Basin. Illegal dumping has long been a way of life, just the same as dumping raw sewage directly into a nearby creek. Illegal dumping is a key pollution source for streams not meeting their designated use categories. Most waste, solid or liquid, is disposed of in or around streams in the basin. While each state involved in this study has worked to increase both education and opportunity to eliminate these practices, this type of pollution still generates a great deal of stakeholder concern.

One of the major problems noted at each of the reservoirs in the basin is the amount of trash that flows in during periods of high water. Volunteer cleanups and other methods have been utilized to collect the trash once it gets deposited on the banks of streams but the volume of trash and waste being dumped into the waters is still greater than what can be removed. Ultimately, this debris is transported to the Ohio River where it presents operational problems at the navigation locks and dams or is passed through during gate operations to points downstream.

Another major concern with water quality in the region is tied to AMD. At its worst, AMD generates a variety of pollutants that if not treated can render any stream unable to support aquatic flora or fauna. Pyrite (iron disulfide) is the main ingredient of AMD and is

an abandoned acid-generating rock mineral. It is frequently found in underground mines or coal waste material. AMD is typically produced when groundwater or surface runoff comes into contact with rocks that contain acid-bearing minerals, like pyrite. Such minerals are especially commonplace in coal mining regions. Typically, mine water contaminated with pyrite reaches the surface through abandoned mine shafts or other underground openings. Water that comes into contact with pyrite becomes contaminated with iron and sulfur producing trace amounts of sulphuric acid and other contaminates (i.e. arsenic). Once at the surface, the metals (mostly iron) in the contaminated water undergo a further chemical change, becoming "heavy" and drop out of the water [as precipitates], or more exactly, drop to the bottom of the stream bed. Iron hydroxide develops an orange or yellowish-orange coloring of the streambed and generates an odor like rotten eggs. The orange color is created when oxygen interacts with the dissolved iron. The bad smell is caused by release of the sulfur compounds.

AMD damages aquatic ecosystems and limits water uses in affected watersheds. Aquatic plants and algae, which form a critical link in the energy flow for aquatic systems, cannot photosynthesize well when AMD concentrations are high. Aquatic insects, an important food source for fishes, cannot live in AMD-impacted streams because the slimy, thick iron precipitates create an unsuitable substrate or "home" in which the insects can move and burrow. Furthermore, iron or aluminum particles clog their delicate gill structures, preventing the insects from getting enough oxygen. Because aquatic insects are normally important food items for fish, amphibians, and reptiles, those creatures higher in the aquatic food chain are limited in streams that contain AMD. Thus, AMD impacted streams are often biologically dead, even though other physical characteristics are well within the adequate realm of biological life and reproductive activities. See Table 6.1 for constituent impacts to aquatic life including acidity, iron, and aluminum.

Table 6.1: Aquatic Organisms Response to AMD Constituent Levels

pH (s.u)	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Acidity	TOXIC too acidic				Limited	<-10				TOXIC	too alkaline			
Iron	TOXIC in suspension				Limited	<1 mg/l					TOXIC			
Aluminum	TOXIC in suspension					<0.5 mg/L					TOXIC in suspension			
Flow	At low flow, metal concentrations and acidity levels increase. At higher flow, dilution of consituents occurs.													
Macros	NO LIFE			No EPT	Limited				Limited	9	NO LIFE			
Fish	NO LIFE				Limited				Limited	9	NO LIFE			
Overall Recovery Status	NO LIFE			Very Limited	Limited if no Al						NO LIFE			

Legend
Toxic - No Life
Very Limited Life
Limited Life if no Al
Supports Life

6.1.2 Sediment and Siltation

Resource extraction can be a major contributor to the sediment and siltation problems in streams and waterways. Adherence to best management practices (BMPs) are meant to minimize these effects. Sedimentation and siltation in the Big Sandy River Basin was consistently mentioned as a concern in stakeholder meetings. In addition, a small amount of urbanization is taking place in the basin which can contributes to increased runoff and more frequent bank-full flow events leading to bank erosion and bank failures, both of which contribute to sedimentation and siltation in the streams. Lastly, agricultural practices (soil cultivation on steep slopes and adjacent to stream banks) are also big contributors to sediment and siltation in the streams that run alongside and throughout farmland in the basin.

6.1.3 Erosion and Trash/Debris

Riparian buffers are strips of grass, trees, shrubs and other vegetation thriving adjacent to streams, ditches, wetlands and other waterbodies. They are composed of plant materials adapted to that water-rich environment and contribute detrital matter to the water that is important for the aquatic food chain. The buffers are beneficial to the environment by filtering nutrients from surface water runoff, as well as intercepting and trapping contaminants from surface water and ground water. Riparian buffers provide important habitat and corridors for fish and wildlife, and ultimately help stabilize stream banks.

According to experts in protecting riparian areas, degraded and unhealthy riparian areas have some or all of the following characteristics:

- Patchy and/or scrubby plant growth with bare ground;
- Vegetation dominated by upland plants and noxious weeds;
- Compacted and eroded soil with bare trails and pathways;
- Eroding or undercut streambanks;
- Turbid stream water; and/or
- Limited biodiversity.

The primary source of lost riparian buffer in the basin seems to stem primarily from agricultural and streambank cultivation land use practices. This is supported by EPA's statement that "agriculture has a greater impact on stream and river contamination than any other nonpoint source.[23]" These practices cause river contamination due to the production of sedimentation caused by cultivation as well as loss of stream buffer due to

cultivation of the riparian areas along the stream. These inappropriate cultivation techniques, including unwillingness by landowners to leave sufficient buffers when cultivating streamside farmland (or "plowing to the edge"), results in loss of the riparian buffer. In addition improper grazing practices along riparian areas contribute to nonpoint source pollution.

Animals have grazed along and around bodies of water for thousands of years. However, the original grazing animals were bison, moose and deer, which were roamers. This intermittent use allowed riparian areas to re-grow following a period of grazing. Today, however, the majority of grazers are domestic livestock, such as horses, cows and sheep, which graze continuously in the same area. Livestock tend to congregate in the cooler temperatures along the streams where shade is provided by the lush riparian vegetation growing there, but that pattern of use leads to trampling the streambank and overgrazing the surrounding vegetation. This continual use pattern leaves no period of renewal and re-growth for the riparian areas. Added to the grazing effects on the riparian zone is the tendency for livestock to stand in the streams and ponds during hot weather as a method of cooling their bodies. This natural tendency contributes to addition of nutrients and pathogens in the water by the introduction of livestock feces and urine.

Uncontrolled trampling and grazing of the riparian zone leads to compacted soil, streambank failure, reduction in infiltration along with increased surface runoff, erosion, generation of sediment, and nutrient loading. These are all problems noted throughout the Big Sandy River Basin. Additionally, all of these causes of water quality impacts are listed on the EPA's 303(d) List of Impaired Waters[22] under the Causes of Impairments. The List of Impaired Waters for the Big Sandy Basin is located in Section 5.1.4 as Table 5.3.

6.2 Land use/Floodplain Management

6.2.1 Changes in Land Use

The largest land use category (by acreage) in the river basin is deciduous forest. Forest cover accounts for about 95.6% of the river basin land cover. Cropland and pastures account for about 3.5% of the basin. The remaining land use categories make up less than 1% of the river basin area. They consist of strip mines and transitional areas (.77%), land for urban, industrial and utilities (.06%), and water (.03%). The land use changes in the Big Sandy River Basin by individual use categories have been relatively insignificant over the past several decades, but cumulatively these changes have produced adverse effects in water quality, visual aesthetics, and wildlife habitat. The coal mining industry has suffered a slight downturn due to market conditions and environmental regulations, but is still a major employer in the area and strip mining continues. Urban areas have not significantly

grown, especially not in areal extent. With the recognition that the visual quality and diversity of natural resources is one of the area's greatest assets, recent emphasis on land use development has been tied to ecotourism in the area.

6.2.2 Floodplain Management

Lack of floodplain enforcement is a recognized problem not just within the Big Sandy River Basin, but across the region and the nation. Floodplain management usually takes the form of a community-administered program (under the direction and guidance provided by the NFIP where corrective and preventative measures are employed for the purposed of reducing flood damages. The program typically includes requirements for zoning of hazardous floodplain areas, building codes and floodplain development ordinances.

Enforcement of those floodplain management requirements is critical to protecting the community, businesses and citizens from repetitive flood damages, which affect short and long-term economic health of a community and can hamper local marketing efforts for new development.

Adoption of a Flood Damage Prevention Ordinance is required for communities to participate in the NFIP. Among the standard ordinance's goals are to:

- protect human life and health;
- minimize expenditure of public money for costly flood control projects;
- minimize rescue and relief efforts;
- minimize business interruptions;
- minimize damage to public facilities and utilities;
- ensure flood storage and conveyance functions of floodplain are maintained;
- minimize environmental impacts of development on the natural benefits of the floodplain; and
- meeting community participation requirements of the NFIP.

The ordinances state that their means of or applied measures for achieving these goals are:

- restricting/prohibiting uses within the floodplain which are dangerous to health, safety and property, including activities which result in increases in flood heights and velocities;
- requiring that uses vulnerable to floods, including facilities which serve such uses, be protected against flood damage at the time of initial construction;
- controlling the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel flood waters;

- controlling filling, grading, dredging, excavating, and other development within the floodplain which may increase flood damage; and
- preventing or regulating the construction of flood barriers which will unnaturally divert flood waters or which may increase flood hazards in other areas.

These are typical goals and measures laid out by floodplain ordinances across the region; however the quality of their enforcement varies among the communities across the region. Many communities lack the internal resources (trained staff and financial support) that are necessary to effectively manage the local floodplain ordinances and enforce the requirements of those ordinances. Initial and continuing education in floodplain management requirements and enforcement techniques for those responsible for management and enforcement is also a concern in the basin.

6.3 Flooding

Despite the presence of six USACE dams in the basin that provide some level of control to about 60% of the basin watersheds, the remaining 40 percent of the basin's streams are uncontrolled, or have no retention structures. The location of the six Flood Risk Management (FRM) USACE dams is displayed again as Figure 6.6 below.

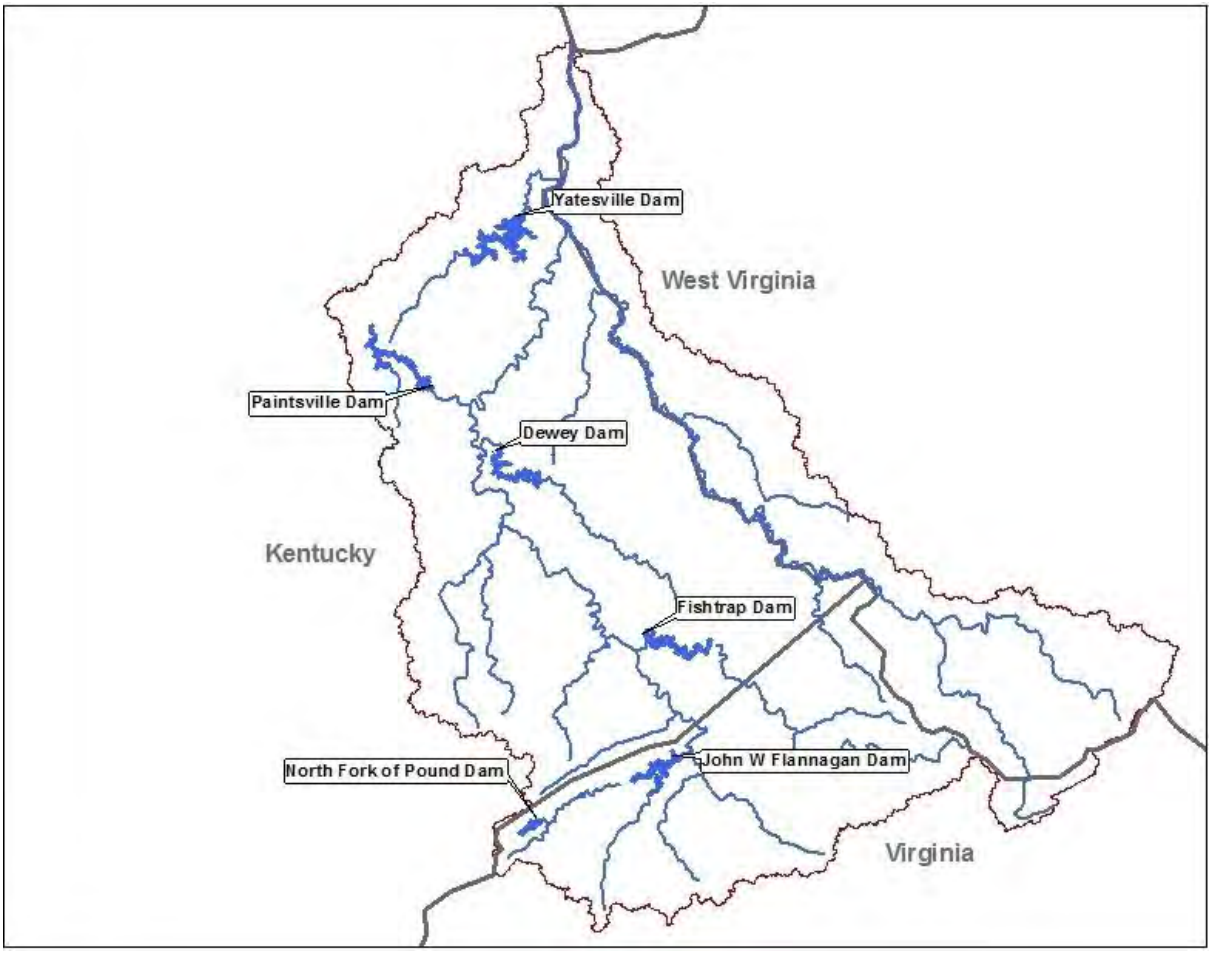

Figure 6.6: Names and Locations of USACE Dams within the Big Sandy River Basin

Given the number of uncontrolled streams within the Basin, flooding continues to be an issue for many communities. Since 1967 there have been numerous Federally-declared disasters in the basin related to flooding. Details on each disaster, including date and counties impacted are displayed below in Table 6.2.

Table 6.2: Federally-Declared Disasters in the Big Sandy River Basin (Flood-Related)

Disaster number	Declaration Date	Classification of Event	Incident Begin Date	Declared County/Area
226	27 Mar 1967	Severe Storms, Flood	27 Mar 1967	Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Pike, Martin
282	2 Feb 1970	Heavy Snowmelt, Rain, Flood	2 Feb 1970	Knott, Letcher, Martin, Pike
332	15 May 1972	Heavy Rain, Flood	15 May 1972	Floyd, Knott, Letcher, Pike

468	24 May 1975	Severe Storms, Flood	24 May 1975	Knott, Letcher, Pike
529	6 Apr 1977	Severe Storms, Flood	6 Apr 1977	Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Pike
568	12 Dec 1978	Severe Storms, Flood	12 Dec 1978	Johnson, Lawrence, Magoffin, Martin, Morgan, Pike
592	19 Jul 1979	Severe Storms, Flood	19 Jul 1979	Pike
670	29 Sep 1982	Flash Flood	29 Sep 1982	Letcher
705	15 May 1984	High Wind, Tornado, Flood	15 May 1984	Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Pike
821	24 Feb 1989	Severe Storms, Flood	13 Jan 1989	Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, Pike
834	30 Jun 1989	Severe Storms, Flood	15 Jun 1989	Floyd, Knott, Letcher, Magoffin, Pike
846	30 Oct 1989	Severe Storms, Mudslides, Flood	16 Oct 1989	Floyd, Knott, Letcher, Magoffin, Pike
893	29 Jan 1991	Severe Storm	6 Dec 1990	Boyd, Johnson, Lawrence, Magoffin
1163	4 Mar 1997	Severe Storm, Flood	1 Mar 1997	Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Morgan, Pike, Magoffin
1216	29 Apr 1998	Severe Storm, Tornadoes, Flood	16 Apr 1998	Floyd, Knott, Letcher, Pike, Johnson, Lawrence, Magoffin
1320	28 Feb 2000	Severe Storms, Flood	18 Feb 2000	Boyd, Johnson, Lawrence
1388	15 Aug 2001	Severe Storms, Flood	27 Jul 2001	Floyd, Knott, Letcher, Pike, Johnson, Lawrence
1407	4 Apr 2002	Storms, Flood	17 Mar 2002	Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, Pike
1414	7 May 2002	Severe Storms, Tornadoes, Flood	27 Apr 2002	Floyd, Knott, Letcher, Magoffin, Martin, Pike
1471	3 Jun 2003	Severe Storms, Flood, Mud and Rock Slides, Tornadoes	4 May 2003	Boyd, Lawrence
1475	2 Jul 2003	Severe Storms, Flood, Mud and Rock Slides, Tornadoes	14 Jun 2003	Boyd, Floyd, Johnson, Knott,

				Lawrence, Letcher, Magoffin, Martin, Pike
1523	10 Jun 2004	Severe Storms, Tornadoes, Flood, Mudslides	26 May 2004	Boyd, Floyd, Johnson, Knott, Lawrence, Letcher, Magoffin, Martin, Morgan, Pike
1703	25 May 2007	Severe Storms, Flood, Mudslides, Rockslides	14 Apr 2007	Floyd, Johnson, Knott, Lawrence, Martin, Pike
1818	5 Feb 2009	Severe Winter Storm, Flood	26 Jan 2009	Boyd, Floyd, Johnson, Lawrence, Magoffin, Martin, Morgan
1841	29 May 2009	Severe Storms, Tornadoes, Flood, Mudslides	3 May 2009	Floyd, Magoffin, Pike, Knott, Lawrence, Letcher
1912	11 May 2010	Severe Storms, Flood, Mudslides, Tornadoes	1 May 2010	Boyd, Magoffin
1925	23 Jul 2010	Severe Storms, Flood, Mudslides	17 Jul 2010	Pike
4008	25 Jul 2011	Severe Storms, Tornadoes, Flood	19 Jun 2011	Knott, Magoffin
4057	6 Mar 2012	Severe Storms, Tornadoes, Straight-line Winds, Flood	29 Feb 2012	Johnson, Lawrence, Magoffin, Martin, Morgan

6.4 Infrastructure Issues

Another issue that came up at each stakeholder meeting was concern over public infrastructure. The type of infrastructure soliciting the most concern was wastewater collection systems and extending service to residents in areas where systems were already providing limited service. Infrastructure concerns specific to a particular community will be addressed in any future FWA that might be conducted as a result of this IWA.

Wastewater collection is of particular concern throughout this region of eastern Kentucky, southern West Virginia and southwest Virginia. In the recent past, great strides have been made through various federal and state programs and initiatives within local communities to expand wastewater collection coverage. However, there are many residents within this region who are not on individual package plants, septic systems or any type of wastewater collection system.

6.5 Recreation

During the workshops one of the major topics discussed was how important recreation-based tourism has become in the Levisa Fork Sub-basin of the Big Sandy River Basin. Community concerns about and an awareness of the need for marketing the region for extreme type sports is high for towns like Elkhorn City, Kentucky and Haysi, Virginia. While recreation opportunities in general were discussed, most of the concern brought forward from among the stakeholders is providing for "whitewater friendly" releases from J.W. Flannagan Dam. Organizations such as Bluegrass Wildwater Association (BWA) and American Whitewater[1] (AW) have consistently been represented at meetings to discuss additional water releases from Flannagan Dam.

Currently, water releases from Flannagan are based on what discharge levels are approved in the project's Water Control Manual. This document is a requirement for all Corps' reservoirs and does not allow the local flexibility and discretion at the project level to make releases that would better facilitate whitewater rafting during the weekday and/or weekend periods, or just for the sake of providing releases that are "whitewater friendly". Those organizations representing the whitewater industry believe that more flexibility in the timing and amount of releases could be a great boon for the region's economy.

6.6 Climate Change Issues

The Intergovernmental Panel on Climate Change (IPCC) has developed and published several Comprehensive Assessment reports of the potential effects of global climate change on precipitation, temperature, snowmelt, tropical storms, sea levels and other aspects of global climate. The IPCC uses a series of global climate models (GCM) generally accepted by the international scientific community to derive these forecasted changes. The most current of these assessments is the 5th Assessment being published in sections between September 2013 and October 2014.

Additional models used in the continental United States by NOAA, USGS, USACE, and other Federal agencies have been able to downscale† data from the GCM into regions of the US for the purpose of defining what future climate changes may produce in terms of precipitation, temperature and other climate factors that influence our daily weather. Current studies by the USACE and collaborating agencies from the Ohio River Basin Alliance (NOAA, USGS, USEPA, TNC, etc.) are further refining that regional data with additional modeling to

† Downscaling is a computer modeling process whereby global climate variables are condensed to regional scales based upon geographic and topographic realities and regional weather patterns.

forecast future river flows and air temperatures within the Ohio River Basin[3]. These recent modeling efforts were based upon the IPCC 4th Assessment report data published in 2007.

The recent modeling indicates that the climate experienced in Ohio River basin and the Big Sandy basin since 1952 and the weather episodes (seasonal rainfall and temperatures) associated with that climate aren't anticipated to change significantly out through the year 2040. The only change of note during that period is a small increase in annual mean river discharge[‡] by 2040 at the NOAA forecast point at the mouth of the Big Sandy. This added discharge would be due to increased precipitation in the basin potentially combined with growth in runoff from placement of additional impervious surfaces.

After 2040, the forecast suggests that the Big Sandy basin will experience measurable increases (25%-35% above the base flow condition) in mean annual discharge at the same NOAA forecast point. As described above, this forecasted increase in river discharge suggests greater amounts of precipitation within the basin and additional increases in placement of impervious surfaces. Of particular note is the fact that through all of the forecasted changes in river flow on the Big Sandy River between 2011 and 2099, there is a reduction in river flow only during October between 2070 and 2099. All other forecasts of seasonal river flow indicate increases in river flow."

These flow increases as suggested above relate to an increase in the mean annual precipitation in the basin area and runoff from development and new land uses as a result of placement of additional impervious surfaces. Increasing urbanization of the basin and changes in land use that reduce the absorptive capacities of the soil create increased runoff from even the smallest increases of precipitation. Current forecasts from the same downscaled modeling also suggests that regional mean annual air temperatures will increase about ½ degree per decade between 2011 and 2040 and 1.0 degree per decade from 2040 through 2099. These increases in air temperature will eventually result in warmer water temperatures in lakes, ponds and streams as well.

The impacts of these forecasted changes in river discharge (flow) and air temperature fall upon the infrastructure of the basin that: 1) are dependent upon river flow such as municipal and county water supply facilities (public service districts (PSD's), 2) are dependent upon flow to offset water quality impacts due to introduction of regulated/permitted effluents (WWTP), 3) provide protection against flooding and flood damages (dams and reservoirs, levee/floodwall, and diversion channels), and/or 4) use the river as a source of cooling water for production of electric power or for processing materials. Positive changes in annual mean flow benefit water supply extraction, dilution of effluent streams and extraction for cooling water and processing materials.

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‡ Discharge is measured in cubic feet per second (cfs) at the NOAA river forecast point (river gage) and the increase is measured against the base flow condition recorded from 1952 to 2001.

Many of these facilities are dependent upon a reliable source of water to operate efficiently. On the downside, communities with combined sewers (wastewater and stormwater combined systems) may experience more instances of untreated sewage overflows due to increased precipitation thus leading to further reductions in water quality.

The same flow increases can present challenges for flood risk management (FRM) infrastructure because of potential increases in future flood heights. However, most FRM projects (including those located in the Big Sandy sub-basin) have been designed and constructed using safety factors that account for some variability in future hydrologic changes including increased river flows. More at risk would be facilities constructed for stormwater runoff retention or conveyance that may not have included such robust design measures and which may bear the brunt of higher rates of precipitation and runoff. Efforts to decrease placement of impervious surfaces and onsite rainfall capture (rain gardens, bio-retention swales) can help to adapt to these new hydrologic conditions and reduce the pressure on stormwater facilities.

Other concerns would be the affect of greater amounts of precipitation on the AMD issues with more rainfall coming in contact with exposed contaminants and more filling of abandoned mine shafts. Both of these problems in the basin would be exacerbated by greater amounts of rainfall.

Of additional concern would be future increases in water temperatures that follow the forecasted increases in air temperature. Warmer water reduces the efficiency of thermal electric power plants that use “once-through” cooling systems. Plants that re-circulate heated water through cooling towers are less susceptible to the warmer water temperatures. Warmer temperatures also result in increased evaporation at lakes and reservoirs that may maintain storage for water supply, hydropower or other uses. This water loss through evaporation could challenge the operational complexities of both public and private providers for these uses. Some opportunities for attenuating warmer water temperatures may be provided by cold or cool water releases from USACE reservoir projects (there are six USACE reservoir projects in the basin), but sustained releases to address these issues may require changes in current operating policies.

Natural systems such as aquatic and terrestrial ecosystems will also be affected by these forecasted changes in river flows and air temperatures. Many aquatic species are sensitive to seasonal changes in water flow during breeding and migration periods. Significant increases in the mean annual or annual maximum river flows during critical seasons could jeopardize the health, reproduction and diversity of numerous species. Likewise terrestrial species may be impacted by changes in precipitation and warmer air temperatures. Additional threats are presented by the potential introduction of invasive species that

would be more productive in warmer water temperatures associated with forecasted warmer air temperatures.

6.7 Findings

While USACE is serving as the lead agency in the development of the IWA, the Section 729 Authority encourages participation from various other Federal, state, and local agencies and stakeholders. The authority also allows recommendations for problems and issues identified to be developed that align with missions and authorities of other agencies, and does not limit the analysis and subsequent recommendations to existing USACE authorities. Outreach measures were performed during the early stages of the IWA. Five stakeholder meetings were scheduled and conducted at distributed locations throughout the watershed in attempt to maximize stakeholder involvement. Correspondence regarding the stakeholder meetings and overall watershed study effort was sent out to over 200 individuals. County and municipality representatives, local and state representatives, congressmen and senators, and several Federal partner agencies were among those provided notice. Attendance was limited at the five stakeholder meetings, despite the widespread notice and distributed meeting locations. Several agencies and stakeholder groups where involved throughout the development process of the IWA either directly or indirectly. Representatives with Kentucky Division of Water (KDOW), representatives of The Nature Conservancy (TNC), members of the American Whitewater Association, Bluegrass Wildwater Association, a representative from Appalachian Voices, various county emergency management officials, representatives with economic and infrastructure development entities within the watershed, and representatives from Governor Tomblin's and Senator Joe Manchin's Offices, both of West Virginia were directly involved in identifying problems and opportunities within the watershed. While many other agencies were not directly involved throughout the development of the IWA, readily available information and data sources was obtained from many agencies and incorporated into the IWA. Some of the primary agencies that information was obtained from include; USFWS, FEMA, WVDNR, WVDEP, KDFWR, VADEQ, VDGIF, NRCS, USGS, NOAA, and NWS.

As previously stated, the main areas of concern in the Big Sandy River Basin can be divided into the following categories:

- Environmental/Water quality/ecosystem deterioration – Streams in this basin do not fully support designated uses for war-water aquatic habitat, fish consumption, and primary contact recreation. Water pollution from untreated sewage going straight into the stream and AMD are large contributors to poor water quality and ecosystem degradation and deterioration. Erosion and trash/debris are also concerns that should be addressed in a holistic way within the basin.

- Land use/floodplain management – Changes in land use have not been significant but need to be managed in a way that cumulatively do not have adverse affects in the region. Floodplain management continues to be a challenge for the area as most of the population/urban centers are located near or adjacent to the stream.
- Flooding issues – Given the number of uncontrolled streams within the basin, flooding continues to be an issue for many communities. Many counties in the basin have had major flood events or disaster declarations due to flooding in the past several decades.
- Infrastructure issues – Wastewater collection coverage and extension of wastewater service is the main area of concern in the basin.
- Recreation – Importance of recreation-based tourism associated with the abundant water resources throughout the Big Sandy Basin and the lack of consistent water releases below J.W. Flannagan dam were of significant concern.

All of these issues occur basin-wide, though they may be more concentrated in some areas. Specific areas of concern and potential treatment of these issues are discussed in subsequent sections of this IWA.

7.0 Recommendations

7.1 Watershed Assessments and General Recommendations

Given the findings in Section 6.6 of this IWA, the Huntington District Corps of Engineers recommends moving ahead with the second phase of this study to develop two FWAs for the Big Sandy River Basin. These FWAs would cover the Tug Fork River Sub-Basin and the Levisa Fork Sub-Basin and the problems and opportunities described below.

7.1.1 Watershed Assessment for Tug Fork River Sub-Basin

The Huntington District Corps of Engineers recommends developing a FWA for the Tug Fork River Sub-Basin. This FWA would be developed in collaboration with The Nature Conservancy (TNC) and function as an action plan that uses and supports prioritization methods in the West Virginia Watershed Assessment Pilot Project (WVWAPP). The WVWAPP was initiated by TNC and funded by grants from the West Virginia Department of Environmental Protection (WVDEP) and the U.S. Environmental Protection Agency to develop a watershed assessment process to inform conservation and management actions within the state.

The result of the FWA would be a watershed assessment designed around a multi-step process which includes completing a baseline analysis that describes watershed resources, impacts, and condition; conducting workshops to review the assessment process, evaluate the data collected, obtain local information on watershed specific resources, issues, and other relevant information, and define appropriate metrics for parameters used to evaluate the importance or value/contribution of potential actions; completing a consolidated analysis using results from the expert workshop to incorporate local data and apply prioritization metrics to rank potential actions and sites within the watershed; conduct a second workshop to review the data collected, evaluate the conclusions of the prioritization process, and develop strategies designed to address issues within the watershed; and finally complete an end user workshop to present findings and complete the FWA.

The TNC has completed assessments on five watersheds within West Virginia as a pilot project. Partnering with the Huntington District Corps of Engineers on this FWA would produce synergistic effects within the state beyond just the Tug Fork Sub-basin and Big Sandy River Basin and would complement the existing assessments. The primary cost sharing sponsor for the FWA would be the TNC.

7.1.2 Watershed Assessment for the Levisa Fork River Sub-basin

During stakeholder meetings, economic viability of the region and an emphasis on a recreation-based tourism industry was a major theme. With six USACE dams in the sub-basin (Figure 6.6) that have impounded lakes allowing for a variety of both in-reservoir and downstream recreational opportunities, there is a natural desire to maximize the economic potential and draw for all types of water-based recreation. An FWA for the Levisa Fork could assist on-going efforts such as the Blue Water Trail which touts some of the best paddling access and infrastructure in the Commonwealth of Kentucky (http://fw.ky.gov/Education/Pages/Levisa-Fork.aspx).

Water releases of the Russell Fork below J.W. Flannagan Dam were raised as a particularly important issue. This area and the river reach known as the "Breaks of The Russell Fork" is home to some of the most extreme whitewater in the Eastern United States. As such, it is an attractive force from not only the region but also national and international whitewater enthusiasts. While there are four weekends in October during the scheduled reservoir drawdown when high-volume releases are made that draw huge number of rafters and visitors to the area, the same water availability for whitewater recreation does not apply throughout the year.

The greatest issue for these stakeholders is the timing of releases from the reservoir. It is the opinion of most of the stakeholders that releases could be coordinated with the whitewater industry to maximize the week days and weekends available for rafting. A Water Release Study that would focus on "whitewater friendly" releases for evenings and weekends when water is available and in an amount conducive to rafting and how those releases may affect downstream fishermen most likely to be wading the stream, other users of the river and resident aquatic species in the Pound River and Russell Fork could be a major component of that FWA.

Currently authorized purposes for the lake do not include "enhanced recreation" which is a key trigger to allowing regular and/or controlled releases to support the whitewater industry along the Russell Fork and downstream. Recommendations from this FWA could be a Reservoir Storage Reallocation Study or Congressional action to modify the authorized purposes of the project. Either method would result in additional study (see Section 216 – Review of Completed Projects below) and a potential update to the Water Control Manual for J.W. Flannagan Lake. The Water Control Manual is the vehicle that USACE has established to determine the parameters for reservoir operation.

7.1.3 Further Study of Water Resource Issues under USACE Authorities

USACE has several standing authorities that are available to assist communities, local governments, counties and Non-Governmental Organizations (NGO's) with water resource issues. Listed in the sections that follow are brief descriptions of some of the more pertinent of these programs. While there were not specific study areas identified that would benefit from these potential efforts during this IWA, it is recognized that this assessment and recommended FWA's could spur interest and/or a request for assistance once issues come to light and are analyzed in more detail.

7.1.3.1 Planning Assistance to States (PAS)

Section 22 of the Water Resources Development Act (WRDA) of 1974, as amended, provides authority for USACE to assist the States, local governments, and other non-Federal entities in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land. The program can encompass many types of studies dealing with water resources issues including flood damage reduction studies and floodplain management studies. The program planning activities cannot formulate any project alternatives (e.g. flood risk management) that could be specifically authorized for or constructed by USACE. The needed planning assistance is determined by the individual State. Every year, each State and Indian Tribe can provide USACE its request for studies under the program, and the USACE then accommodates as many studies as possible within the funding allotment. Typical studies are only planning level of detail; they do not include detailed design for project construction. The studies generally involve the analysis of existing data for planning purposes using standard engineering techniques although some data collection is often necessary. Most studies become the basis for State or Tribal and local planning decisions. Information on how to request PAS activities including a sample letter and Cost Sharing Agreement are included as Appendix E to this IWA.

7.1.3.2 905(b) Reconnaissance Study

A 905(b) Reconnaissance Study is the first part of a two-phase study process leading to implementation of a USACE project. Studies performed under the 905(b) guidance require authorization by Congress prior to study funding or initiation. The study is performed to determine whether or not planning to develop a project should proceed to the more detailed feasibility stage. The reconnaissance phase is Federally-funded and the target for completion is six to twelve months from the initial obligation of funds. Specifically the objectives of this phase are to:

- determine if the water resource(s) problems warrant Federal participation in feasibility studies;
- define the Federal interest;
- complete a 905(b) Analysis (refers to Section 905(b) of the WRDA of 1986) or a Reconnaissance Report;
- prepare a Project Management Plan (PMP);
- assess the level of interest and support from non-Federal entities; and
- negotiate and execute a Feasibility Cost Sharing Agreement (FCSA).

This analysis determines whether or not planning to develop a project should proceed to the more detailed feasibility stage. The objective of feasibility studies is to investigate and recommend a solution(s) to water resources problems. Cost of feasibility studies, except single purpose inland navigation studies, are 50 percent Federal and 50 percent non-Federal as defined in Section 105 of the WRDA of 1986. As a part of the newly adopted Specific Measurable Attainable Risk-Informed and Timely (SMART) planning feasibility study process, USACE feasibility studies are to be completed within three years at a cost of no more than $3 million dollars. The risk-informed process works to reduce redundant tasks and limit the amount of engineering and other investigations that are not critical to the decision making process, and which in many cases could be deferred until the project engineering and design phase. The enhanced vertical team involvement of the three levels of management, which includes the District, Division and USACE Headquarters Offices, streamlines reviews and approvals. The resulting streamlined feasibility report will include the information necessary, including the NEPA compliance documentation, to seek Congressional authorization for project construction.

7.1.3.3 Continuing Authorities Program (CAP)

The United States Congress has delegated the USACE a number of standing authorities to study and build water resource projects for various purposes without the need for further Congressional approval. There are specified limits on the amount of Federal money that can be spent for a project under these continuing authorities. The project development process is similar to individually authorized studies and projects, including cost sharing requirements. However, the process is streamlined, since specific individual Congressional authorization is not required for these smaller studies and projects. This expedited process saves development and approval time, thereby reducing the time required to respond to small water resources challenges and opportunities. Authorities exist for the following purposes:

- Section 107 Navigation Improvements
- Section 1135 Environmental Protection and Restoration, Project Modifications for Improvement of the Environment
- Section 14 Emergency Streambank and Shoreline Protection
- Section 205 Flood Damage Reduction
- Section 206 Aquatic Ecosystem Restoration
- Section 208 Snagging and Clearing for Flood Control

In order to initiate a project under the CAP, a letter of intent from a non-Federal sponsor seeking Federal assistance must first be received by USACE. This letter documents the sponsor's willingness to cost share the implementation of the project and accomplish operation and maintenance requirements following completion. Given that funding under the CAP is limited, projects are prioritized locally and regionally with respect to each authority. Once funding is received, a decision document examining the feasibility and environmental acceptability of various alternative measures is completed. Should a feasible alternative be identified, the design and implementation phase is initiated following the execution of a formal cost sharing agreement.

The initial funding for a CAP feasibility study is 100% Federal, up to $100,000 and if the study costs exceed the initial amount then a FCSA will be necessary and the remainder of the feasibility study will be cost shared 50%/50%. Implementation cost share rates and total Federal expenditures vary based upon each respective authority as shown in Table 7.1 below. Fact sheets about individual CAP authorities and sample Letters of Intent can be found in Appendix E to this IWA.

Table 7.1 - CAP Parameters

Authority Section	Title or Emphasis	Implementation cost sharing ratio Fed/Non-Fed	Cash payment required	Maximum National Funding	Maximum Federal share per project
Section 107, 1960 River and Harbor Act, as amended	Navigation Improvements	Varies, based on depth	N/A	$35M	$7.0M
Section 1135, 1986 Water Resources Development Act, as amended	Environmental Protection and Restoration, Project Modifications for Improvement of the Environment	75/25	N/A	$40M	$5M
Section 14, 1946 Flood Control Act, as amended	Streambank and Shoreline Erosion Protection	65/35	5%	$15M	$1.5M
Section 205, 1948 Flood Control Act, as amended	Flood Damage Reduction	65/35[1,2]	5%	$55M	$7.0M
Section 206, 1996 Water Resources Development Act, as amended	Aquatic Ecosystem Restoration	65/35	N/A	$50M	$5.0M
Section 208, 1954 Flood Control Act, as amended	Removal of Obstructions, Clearing Channels for Flood Control (Snagging and Clearing for Flood Control)	65/35[1]	5%	$7.5M	$500K

[1] For structural flood damage reduction purpose, Non-Fed share is 35% up to 50% (based on cost of LERRDs), plus 5% must be in cash.

[2] For non-structural flood damage reduction purpose, Non-Fed share limited to 35%, with no 5% cash requirement.

7.1.4.4 Section 216 of the 1970 Flood Control Act – Review of Completed Projects (Section 216)

Section 216 authority reads as follows: *The Secretary of the Army, acting through the Chief of Engineers, is authorized to review the operation of projects, the construction of which has been completed and which were constructed by the Corps of Engineers in the interest of navigation, flood control, water supply, and related purposes, when found advisable due to the significantly changed physical or economic conditions, and to report thereon to Congress with recommendations on the advisability of modifying structures or their operation, and for improving the quality of the environment in the overall public interest.*

A Section 216 study to address significantly changed physical or economic conditions at an individual operating project could address the current project purposes, water use, and water quality needs downstream of that project, such as in the case of the John W. Flannagan Dam and Reservoir, where increased releases to support downstream white water recreation are an issue. Also, a Section 216 study could be undertaken of the Big Sandy River Basin as related to the systematic operation of the basin's six USACE dams to resolve storage allocation disparities between the reservoirs that support flood risk management, water supply and flow augmentation.

Under this authority there are two study phases. The reconnaissance phase is conducted at full Federal expense (an amount up to $100,000) to determine the Federal interest in continuing to a feasibility level study. The feasibility phase is cost shared with a non-Federal sponsor (50% Federal and 50% non-Federal) and could result in modifying the reservoir operations. Costs for these studies could range from $500K for a single project to $2.5 M for multiple projects.

7.1.4.5 Silver Jackets

The Silver Jackets is an innovative program that provides an opportunity to consistently bring together multiple state, federal, and sometimes tribal and local agencies to learn from one another and apply their knowledge to reduce risk. State agencies, including those of the State Hazard Mitigation Officer and State NFIP Coordinator, come together with the Federal family of agencies, including USACE and FEMA, in a common forum to address the state's flood risk management priorities. Silver Jacket programs are developed at the state level. There are currently 41 active state teams (including West Virginia, Virginia, and Kentucky) and nine states developing teams; the ultimate goal is to offer an interagency team in every state.

The program's primary goals are to:

- Create or supplement a mechanism to collaboratively identify, prioritize, and address risk management issues and implement solutions
- Increase and improve risk communication through a unified interagency effort
- Leverage information and resources and provide access to such national programs as FEMA's Risk Mapping, Assessment, and Planning (Risk MAP) program and USACE's Levee Inventory and Assessment Initiative
- Provide focused, coordinated hazard mitigation assistance in implementing high-priority actions such as those identified by state mitigation plans
- Identify gaps among agency programs and/or barriers to implementation, such as conflicting agency policies or authorities, and provide recommendations for addressing these issues.

More information about Silver Jackets at http://www.nfrmp.us/state/index.cfm.

7.2 Water Quality/Ecosystem Restoration Recommendations

7.2.1 Development of TMDLs

Even though most of the streams in the watershed are on the 303(d) list of Impaired Waters, none of these streams have TMDL requirements in place as of yet. A TMDL is a calculation of the maximum amount (loading) of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that loading among the various sources of that pollutant. Pollutant sources are characterized as either a point source that receive a waste load allocation or a nonpoint source that receive a load allocation. This would in turn allow for better decision making when resource agencies are issuing and managing water-quality related permits.

7.2.2 Construction of New or Extension of Existing Wastewater (WW) Collection Systems

As previously stated there is a need throughout the watershed to address inadequate WW collection systems. This additional collection of heretofore “straight-pipes” untreated sewage and failing septic systems may require adding capacity to WWTP’s or upgrading existing facilities. This system improvement can have a dramatic effect on water quality in the basin and greatly improve the aquatic habitat. These types of activities can be extremely costly and beyond the capability of small communities typical of those found in the watershed. USACE, however, offers an array of Environmental Infrastructure programs to help alleviate the financial burden of these needed improvements.

The primary objective of the Section 531 Program is to provide design and construction assistance to non-Federal interests for carrying out water-related environmental infrastructure and resource protection and development projects in Southern and Eastern Kentucky. The Section 340 program covers the same scope of projects and is designated for Southern West Virginia. The authority for these programs is derived from Water Resources Development Acts (WRDA) of 1993 and 1996. Projects are usually cost shared at a 75 percent Federal 25 percent non-Federal split. Projects are prioritized by a selection process. If there is available annual funding that is not allocated to a specifically named project in the appropriation, then there is a selection process in place (based upon a program management plan) with an application period established. Those applications received in the event of an application solicitation will go thru an approval process. The amount available per fiscal year changes as it is allocated by Congress. The total amount that can be allocated in the program currently stands at $40M for Section 531 of which approximately $32M has been appropriated. For Section 340 the program limit is $40M of which $35M has been appropriated.

7.2.3 Development of Riparian/Wetland Areas

Riparian zones along streams and wetlands are influential in filtering toxins, nutrients and sediments from non-point surface runoff. Often these natural buffers are damaged or destroyed when cultivation practices associated with agricultural use are extended into this zone. Maintaining or restoring the riparian buffer and associated wetlands can greatly improve water quality in a watershed. Many times these riparian areas include high quality wetlands as well that provide nutrient filtering, flood storage and high quality terrestrial and aquatic habitat. There are programs available through the US Department of Agriculture, NRCS and USEPA http://water.epa.gov/polwaste/nps/buffers.cfm to assist communities and landowners in meeting these goals:

NRCS Wetland Reserves Program - The Wetlands Reserve Program (WRP) is a voluntary conservation program that offers landowners the means and opportunity to protect, restore, and enhance wetlands on their property through perpetual easements, 30 year easements or Land Treatment Contracts. The USDA Natural Resources Conservation Service (NRCS) manages the program as well as providing technical and financial support to help landowners who participate in WRP.

Conservation Reserve Enhancement Program (CREP) - a federal/state natural resource conservation program targeted to address state and nationally significant agricultural related environmental problems. Through CREP, program participants receive financial incentives from USDA to voluntarily enroll in the Conservation Reserve Program (CRP) in contracts of a minimum 14 to 15-years. Participants remove cropland from agricultural

production and convert the land into buffers of native grasses, trees and other vegetation. CRP is authorized by the Food Security Act of 1985, as amended. Several watersheds in Kentucky (Green River Watershed), West Virginia (Cheat, Kanawha, Little Kanawha and Monongahela watersheds) and Virginia (Chesapeake Bay Watershed) have already been enrolled in the CREP and CRP programs.

Kentucky also has a Stream Team Program that is provided through KDFWR. This team can offer landowners free repairs to eroding and unstable streams and wetlands. Landowners must meet certain criteria which can be found at http://fw.ky.gov/Fish/Pages/Stream-Team-Program.aspx.

7.2.4 Mitigation Banking and In-lieu Fee Mitigation Programs

USACE is directed by Congress under Section 404 of the Clean Water Act (33 USC 1344) to regulate the discharge of dredged and fill material into all waters of the United States, including wetlands. The intent of the law is to protect the nation's waters from the indiscriminate discharge of material capable of causing pollution and to restore and maintain their chemical, physical and biological integrity. State Water Quality Certification under Section 401 of the Clean Water Act is also required in associated with the federal permit. Therefore, the discharge of dredged and fill material requires a permit from USACE and the State Water Quality Agency.

In the case where a project is going to disturb streams or wetlands[25], the Clean Water Act Section 401 or 404 permit may require an offsetting restoration. Mitigation Banking is one type of compensatory mitigation, where a company or "applicant" may purchase "credits" from an approved mitigation bank to offset project impacts. In-lieu Fee (ILF) mitigation is another type of compensatory mitigation, where an applicant provides a monetary payment to offset project impacts. Applicants often must provide compensatory mitigation to offset unavoidable impacts due to the discharge of fill material into waters of the U.S. in order to obtain a permit. Both Bank and ILF Sponsors must follow a defined process that is established by the 2008 Federal Rule on Compensatory Mitigation (33 CFR 332) to obtain an approved Instrument (procedural agreement). The USACE administers the interagency review and coordination process.

West Virginia has a mitigation banking and an ILF program now in operation. The goal of the program is to achieve no net loss of existing stream and wetland acreage and functions in West Virginia through effective restoration, enhancement, replacement, and preservation of aquatic resources. More information on this program can be found at the following website: http://www.dep.wv.gov/WWE/Programs/Pages/In-Lieu-Fee.aspx.

Kentucky has a similar effort that is administered through KDFWR. The state is divided into a number of service basins that are identified in their Wetland and Stream Fee In-Lieu-Of-Mitigation Program. The Big Sandy Service Basin includes the area covered in this IWA. KDFWR's website with information on the program and current status can be found at the following website: http://fw.ky.gov/Fish/Pages/Stream-Team-Program.aspx.

The Virginia Department of Environmental Quality or Virginia DEQ also has a program for compensatory mitigation in the form of mitigation banking and an IFL program. Information about programs for wetland and stream mitigation in Virginia can be accessed at the following website:
http://www.deq.state.va.us/Programs/Water/WetlandsStreams/Mitigation.aspx.

Process improvements for USACE working nationally with states to assist in dealing with unavoidable impacts to waters of the United States include the implementation/updating of an online tracking system, developed by USACE, called the Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS). This system can be accessed at the following website: http://www.lrl.usace.army.mil/Missions/Regulatory/Mitigation/RIBITS.aspx.

Additional guidance and information from USEPA on this topic can be found at:
http://www.epa.gov/owow/wetlands/guidance/mitbankn.html.

7.2.5 Improvements to Land Use Planning and Control (Comprehensive Plans and Zoning)

The Big Sandy River Basin is divided between three states (West Virginia, Kentucky and Virginia), each of which has a statewide system of regional planning and area development districts that are responsible for assisting local governments and counties in community planning, new infrastructure development and coordinating various Federal grant and loan programs. Table 7.2 lists the regional planning and area development districts that overlay the Big Sandy Basin and the counties they are assigned to assist.

Table 7.2 - Regional Planning and Area Development Districts in the Basin

Regional Planning & Area Development Districts	Counties
Kentucky Districts	
Big Sandy Area Development District (BSADD)	Johnson, Magoffin, Martin, Floyd, Pike
FIVCO	Boyd, Lawrence
Kentucky River	Knott, Letcher
West Virginia Districts	
Region 1 Planning and Development	Wayne, Mingo
Region 2 Planning and Development	McDowell
Virginia Districts	
LENIWISCO	Wise
Cumberland Plateau Planning District	Buchanan, Dickenson

The planning and area development districts can assist the counties and municipalities with planning activities including development of county and municipal comprehensive plans. Under state code provisions, county and municipal entities with planning commissions are required to develop and update their comprehensive plans. The comprehensive plan is the legal precursor to institution of any land use controls such as zoning, subdivision regulations and many other land use ordinances. Issues regarding the effects of new development on water quality, ecosystem resources and sensitive environments (wetlands and riparian areas) should be addressed in these comprehensive planning documents in accordance with state code provisions.

While there are not significant areas of urban development in the Big Sandy watershed, it is important to note that land use controls such as zoning are excellent measures to assist in reducing future problems in the watershed due to uncontrolled urban development. To address stream quality impairments stemming from upstream development practices, it would be prudent for counties, towns and communities to revisit current comprehensive plans to determine what methods of land use controls may be appropriate to protect sensitive environments and reduce water quality deterioration through the NPDES permit system and other regulatory methods. Modifications to comprehensive plans could include delineating green space along stream corridors that would promote a healthy riparian corridor for the filtering of pollutants and to provide stability to the flow in the stream and the habitat associated with the stream. This could potentially lessen

streambank erosion and downstream water quality impairments, as well as protecting the floodplain from unnecessary encroachment, reducing flooding issues to the community. Properly controlling these new areas of development has the potential to decrease impacts associated with increased sedimentation and runoff.

7.3 Flooding Issue Recommendations

7.3.1 Installation of Early Flood Warning Systems (FWS)

A typical flood warning system consists of rain gages, stream gages (or a combination thereof), computer monitoring equipment, transmitters and associated equipment enclosures. This equipment all ties together to keep local emergency officials apprised of any upcoming flood threats.

A FWS is a low cost (when compared to other options) way to prevent damages and life loss resulting from high water events. When given enough warning, citizens can not only move their more expensive and precious possessions to higher elevations within structures, but have time to evacuate their families, their vehicles and themselves from high-risk floodplain areas.

USACE may be able to help with the study, design and installation of these potential FWS through the Section 205 program, previously discussed in Section 7.1.4.5 above. In addition to USACE, USGS and NWS also have interest in helping communities with installation of a FWS. USGS has a mission to collect and disseminate reliable, impartial, and timely information needed to understand the Nation's water resources. As such they perform watershed modeling, inundation mapping, install stream and precipitation gages and collect the information used in a FWS. Both USGS and NWS need a state or local cost share sponsor to improve the existing gage/flood warning capabilities.

Flood warning in the Big Sandy Basin has improved through the USACE previously mentioned Section 202 program with various FWS already installed and both Flood Warning and Emergency Evacuation Plans (FWEEP) and Emergency Evacuation Plans (EEP) being complete, underway or planned. In addition, the NWS Integrated Flood Observing and Warning System (IFLOWS) was initiated in 1981 as a prototype in a three state, 12 county area along the borders of Virginia, West Virginia, and Kentucky due to its susceptibility to flooding and lack of existing flood warning systems and available communication circuits. This system has grown to include 12 states and shares information from 1700 sensors. The IFLOWS links communities, state and federal agencies into an Automated Flood Warning Systems (AFWS) network.

http://water.weather.gov/afws/afws_about.php

http://water.usgs.gov/programs.html

7.3.2 Nonstructural Measures - FEMA Flood Hazard Mitigation Grant Program

FEMA's Hazard Mitigation Grant Program (HMGP) provides grants to states and local governments to implement long-term hazard mitigation measures after a major disaster declaration. The purpose of the HMGP is to reduce the loss of life and property due to natural disasters and to enable mitigation measures to be implemented during the immediate recovery from a disaster. The HMGP is authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act.

Eligible applicants for the HGMP include local governments, state agencies and certain nonprofit organizations. Individual homeowners and businesses may not apply directly to the program; however, an eligible Applicant or Sub-applicant may apply on their behalf.

These funds from the FEMA represent up to 75% of the costs of mitigation projects, such as:

- Voluntary Acquisition/Demolition or Elevations of flood-prone structures to conversion to open space in perpetuity
- Voluntary Acquisition/Demolition of landslide-prone structures to conversion to open space in perpetuity
- Infrastructure Protection Measures against windstorms or earthquakes
- Dry Floodproofing of commercial property
- Minor Structural Flood Control Projects
- Tornado Safe Rooms and Community Shelters
- Utility Protection Measures

The remaining 25% must come from non-federal sources. In Kentucky, the state provides up to 12% of the project costs; and the applicant community must provide the remaining 13%. In West Virginia, the state pays the entire 25% non-federal share. In Virginia, the amount of assistance to the applicant has generally been 20%, after required approval of the Governor after every disaster, but future legislation may align with the Virginia Public Assistance state legislative code which would then provide anywhere from 0% to 25% based on economic stress index factors.

Up to seven percent (7%) of the HMGP funds allocated to the state after a declared disaster may be used for local or state mitigation planning activities. Mitigation planning is mandated by the Disaster Mitigation Act of 2000 as a condition for receiving mitigation grants.

For more information, please visit FEMA's Hazard Mitigation Grant Program.

7.3.3 Log Jam and Debris Removal

Logjams are woody vegetation, with or without other debris, which obstruct a stream channel and create a backwater condition. Logjams occur naturally, providing beneficial stream structure and cover for fish and wildlife and allowing nutrient-rich sediment to be deposited on adjacent floodplains. However, streams are also expected to function as efficient drainage outlets, conveying water off the land in a timely manner. Logjams may inhibit this drainage function thus causing flooding issues in the vicinity, especially during more frequent, small-scale events.

There are areas within the basin that experience blockages and logjam issues. The local communities are responsible for clearing jams within their jurisdictions. However, the cost of removal can be high depending on the volume of material to be removed and public access to the stream and is a low budget priority in some areas. There are programs through NRCS including the Emergency Watershed Protection Program (EWP) that may be able to assist local areas with logjam and debris removal, but funding for those programs is not always available.

7.4 Floodplain Management Practices

7.4.1 Improved Enforcement of Floodplain Management Practices

During the study scoping phase, it was discovered that the consistent enforcement of floodplain ordinances is a problem basin-wide. Consistency in enforcing floodplain ordinances is critical to maintaining a floodplain that does not morph into a repetitive damage area. People who live and work in the floodplain and administer floodplain regulations need to be educated about flood hazards and actions which can be taken to reduce and/or prevent property damage and loss of life caused by flooding.

The Floodplain Management Services (FPMS) Program was developed by USACE specifically to address public needs for floodplain information. The program's authority stems from Section 206 of the1960 Flood Control Act (PL 86-645), as amended. Its objective is to foster public understanding of the options for dealing with flood hazards and to promote prudent use and management of the Nation's flood plains. Land use adjustments based on proper planning and the employment of techniques for controlling and reducing flood damages provide a rational way to balance the advantages and disadvantages of human settlement on flood plains. These adjustments are the key to sound flood plain management.

The FPMS Program provides the full range of technical services and planning guidance that is needed to support effective flood plain management. They fall under three categories:

General Technical Services - The program develops or interprets site-specific data on obstructions to flood flows, flood formation and timing; flood depths or stages; flood-water velocities; and the extent, duration, and frequency of flooding. It also provides information on natural and cultural flood plain resources of note, and flood loss potentials before and after the use of flood plain management measures.

General Planning Guidance - The program provides assistance and guidance in the form of "Special Studies" on all aspects of floodplain management planning including the possible impacts of off-flood plain land use changes on the physical, socio-economic, and environmental conditions of the flood plain.

Guides, Pamphlets and Supporting Studies - The program enables studies to be conducted to improve methods and procedures for mitigating flood damages. Also, for preparing guides and pamphlets on flood proofing techniques, flood plain regulations, flood plain occupancy, natural flood plain resources, and other related aspects of flood plain management.

Upon request, program services are provided to State, regional, and local governments, Indian Tribes, and other non-Federal public agencies without charge. Program services also are offered to non-water resource Federal agencies and to the private sector on a 100 percent cost recovery basis. For more information please see Appendix E to this report. Additionally, USACE certified floodplain managers are available to answer any questions that local floodplain managers and/or county and local officials may have. They may be reached at 1.866.401.3980 (toll free).

7.4.2 Community Rating System

The National Flood Insurance Program's Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum of NFIP requirements. As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS: reduce flood losses, facilitate accurate insurance rating and promote the awareness of flood insurance. The CRS brochure is located in Appendix G to this document.

7.4.3 Better Public Education on Permitting Processes

The permitting process governing impacts to any given environmental resources can be confusing and difficult to understand, especially to people who do not often deal with these requirements. Issues on the permitting process were mentioned at several stakeholder meetings indicated that often landowners do not seek the appropriate permits when they are working in and around their streams because they do not realize that permits are needed, or they view the permitting process as being too complicated to take the time to comply with. To help rectify this issue the Huntington District would like to facilitate educational sessions between our permitting staff and interested state, county and/or local officials. This extra step may help local, state and regional officials better explain the permitting process to landowners and result in greater permit compliance in the future.

7.5 Other Programs

7.5.1 Eastern Kentucky PRIDE

Created over 10 years ago at the direction of Congressman Rogers with assistance from the Commonwealth of Kentucky, Eastern Kentucky PRIDE (Personal Responsibility in a Desirable Environment) provides a three-pronged approach to the local environment. Their first approach is to identify and eliminate straight pipes and failing septic systems within their region. This is accomplished in conjunction with Section 531 projects as well as their own wastewater grants. The second approach is removal and cleanup of illegal dumps. PRIDE has one of the largest volunteer cleanups in the state annually and removes tons of trash from the basin and properly disposes of it. Their final approach is education. They have school contacts and created "PRIDE clubs" within the local school districts promoting environmental education and recycling efforts. The philosophy is to educate the children so that environmental problems do not continue into the future.

7.5.2 Kentucky Division of Water - Big Sandy Watershed Watch

The Big Sandy Watershed Watch (BSWW) has volunteers in Kentucky, Virginia and West Virginia. The BSWW began training volunteers in August 1999 and has continued to sample for fecal coliform, *E. coli*, sulfates and other parameters in the Big Sandy River, Little Sandy River, Tug Fork and other streams or tributaries.

The BSWW and the Big Sandy River Basin Coalition work together in an effort to protect the watershed. Anyone who would like to participate in this volunteer program is trained to collect a grab sample and perform basic field chemistry such as dissolved oxygen, pH,

temperature and conductivity. In addition, participants are trained to perform habitat, physical and biological assessments on streams. The training is free, and the equipment is "on loan" for as long as participants remain in the program.

The Kentucky Division of Water's Water Watch program supports the BSWW and Big Sandy River Basin Coalition. The office maintains a secure database that houses all volunteer, sampling site and event records for the BSWW. The sampling analysis is shared with the Water Watch office and is housed at the Kentucky Geological Survey.

8.0 Non-Federal Interest and Potential Sponsors

During the development of this IWA, there were five stakeholder meetings held and interest expressed from a number of agencies and other governmental and local groups. To date no letters of intent have been received on behalf of potential interested local sponsors. However, TNC has shown significant interest in the Tug Fork watershed as a part of a larger effort they are involved in with other watersheds in the State of West Virginia. There are also several local governments and non-profit entities interested in a Water Release Study for downstream recreation below J.W. Flannagan Lake. The Huntington District Corps of Engineers is engaged in ongoing discussions assessing the level of interest of these potential sponsors in participating in further studies..

It is important to note that during the stakeholder meeting there was significant interest by local officials and various non-profit organizations in participating in future studies that might come out of this IWA. The towns of Haysi, Virginia and Elkhorn City, Kentucky are interested in supporting a Water Release Study for Flannagan in order to enhance downstream recreation below that facility. The regional whitewater group would be a potential source for non-profit sponsorship as well. TNC has been identified as a possible sponsor for a basin study in the Tug Fork watershed.

Letters of intent will be an initial step in completing the WAMP.

9.0 Scope and Objective of FWAs (Section 729 Assessments)

As previously mentioned in Section 7.1.1, Section 7.1.2 and Section 7.1.3 the Huntington District Corps of Engineers recommends moving ahead with the second phase of this study to develop a FWA for the Levisa Fork Sub-Basin, and the Tug Fork River Sub-Basin.

USACE may be involved with partners in watershed planning as either a participating agency or as a lead agency. As a participating agency, USACE could assist local efforts by providing technical expertise, skills, tools and data. Funding for such endeavors is available under USACE's Section 22 Planning Assistance to States.

The full scope and objective of the FWAs will be fully developed and negotiated with non-Federal cost share partners through a WAMP. Numerous problems are prevalent in the basin and watershed that could form the basis for the scope and objective of the WAMP. The most encompassing problems found through research and stakeholder outreach is water quality and flooding. These both have direct connections to Flood Risk Management measures and Ecosystem Restoration opportunities, as well as water quality, and land use planning. It would be important that development of the scope and objective of a FWA addresses at a minimum ways to combat or minimize the issues identified by this IWA.

In addition to studying water quality and flooding problems future watershed planning may consider protecting historical, scenic, and natural beauty areas; protecting wetlands and stream corridors; opportunities to educate landowners on best land use management practices, providing for open spaces and parks; developing attractive residential, institutional and industrial areas which adequately manage storm runoff; and maintaining floodplains for flood storage, groundwater recharge, water supply protection, critical habitat preservation, recreation buffer zones, and conservation education uses.

If potential USACE projects that fall under one or more USACE missions are identified, such Federal projects would require specific congressional authorization for a following feasibility study prior to implementation and construction. The FWA can be modified in that case to include the necessary elements of the 905(b) Expedited Reconnaissance Report and serve as the phase one reconnaissance report preceding the feasibility study. It is unknown at this time whether the watershed studies are likely to generate specific proposals for major Federal actions that could adversely affect the human environment. If they do, National Environmental Policy Act (NEPA) documentation will be required. If they do not, the Final Watershed Plans will be classified as categorical exclusions according to ER-200-2-2 9.c. which includes "planning and technical studies which do not contain

recommendations for authorization or funding for construction, but may recommend further study."

While an FWA for the Levisa Fork Sub-Basin would take a view of recreation throughout the entire basin including recommendations for operational changes to releases for whitewater below J.W. Flannagan Dam, it would not necessarily provide the mechanism for implementing the changes. Therefore, due to the high demand from the recreation industry and individuals that frequent the Russell Fork area for the purpose of whitewater rafting, a Water Release Study is recommended specifically for J.W. Flannagan. Currently approved purposes for the lake do not include "enhanced recreation" which is a key trigger to allowing regular and/or controlled releases to support the whitewater industry along the Russell Fork and below. A water release study could come in the form of either a Reallocation Study or Congressional action. Either method would result in a study and potential update to the Water Control Manual for J.W. Flannagan Lake.

Water quality and flooding problems are key problems in the Tug Fork River Basin. These issues can be highly detrimental to water resources. Water quality issues in the basin and watershed stem from a number of sources including wastewater drainage, streambank erosion, loss of riparian corridor, urban development and other impairments as detailed in section 5 above. Flooding is a common problem throughout the basin and watershed which result in property damage, emergency management and cleanup costs. Section 202 work has alleviated some potential flood damage, but more work to reduce the risk along the corridor is necessary.

One of the most effective solutions to water quality and flooding problems in the basin and watershed is watershed planning. Watershed planning integrates water resources, natural resources, economic considerations, and social desires in order to meet private and public needs and provide a joint vision of a desired end state within the watershed. A USACE led watershed approach will be able to identify desired future conditions, improve natural resource management, minimize conflict, and address problems and opportunities reflecting upon the interdependency of water uses, competing demands and the desires of a wide range of stakeholders.

10.0 Final Recommendations

Based upon this IWA and potential sponsor and strong stakeholder support, I recommend that the following WAMPs be developed and negotiated with a non-Federal sponsor:

- The Tug River Sub-Basin
- The Levisa Fork Sub-Basin

Further, I recommend that if the WAMPs and associated cost-sharing agreement are successfully negotiated for these projects, that the U.S. Army Corps of Engineers, Huntington District initiate comprehensive Watershed Assessments of the two previously mentioned watersheds and tributary streams as discussed in this report.

26 MAR 14

Leon F. Parrott
Colonel, Corps of Engineers
District Engineer

Date

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APPENDICES

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APPENDIX A

REFERENCES

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APPENDIX A – REFERENCES

In addition to prior reports completed by the Corps of Engineers, several resources were used to examine data and prepare the Initial Watershed Assessment. Listed below are the primary references used during this study.

1. American Whitewater, *Russell Fork – Gorge Section: Garden Hole Road (Breaks Park) to KY takeout (4 miles).* (http://www.americanwhitewater.org/content/River/detail/id/2010/)

2. Commonwealth of Kentucky Department of Environmental Protection, Division of Water, Draft 2012 Integrated Report: Volume 11. 303(d) List of Surface Waters, August 2012. (http://water.ky.gov/Documents/PublicNotice/2012%20IR%20Document-proposed.pdf)

3. Drum, R.G. and Noel, J. *Synopsis of Downscaled Modeling Results - Ohio River Basin Climate Change Pilot Study*, Huntington District, US Army Corps of Engineers. 1-8.

4. EC 1105-2-411, Planning: Watershed Plans, 15 January 2010.

5. Envrionmental Systems Research Institute, ESRI Data & Maps. (http://www.esri.com/data/data-maps/html)

6. Environmental Systems Research Institute, U.S. Geographic Names Information System Populated Places, 2010.

7. ER 1105-2-100, Planning Guidance Notebook, 22 April 2000.

8. Federal Emergency Management Agency, HAZUS®MH MR4. (http://www.fema.gov/plan/prevent/hazus/)

9. Federal Emergency Management Agency: Kentucky, Virginia, and West Virginia HAZUS State Datasets.

10. Hess L., Menendez R., Woodrum J. Wildlife Resources Division, West Virginia Department of Natural Resources: Fishery Resources of the Big Sandy River, Levisa Fork and Tug Fork, West Virginia and Kentucky. April 1985

11. Kentucky Division of Water, Community Discovery Report: Tug Fork Watershed HUC -05070201, Kentucky, Virginia & West Virginia, Report Number: FY11.09.12. 24 July 2013. CD.

[12.] McLaughlin Whitewater Design Group. Recreational Improvements Site Study, Russell Fork River through Elkhorn City. March 2009.

[13.] Prism Climate Group, Oregon State University. Prism Climate Data Historical Past. (http://prism.oregonstate.edu/)

[14.] Ratcliffe, Lawrence. "National Gateway: Southeastern Regional Infrasturcure Perspectives." Infrastructure Planning and Funding in the Wake of Regulatory Crisis. NCIT. 29 May 2009. Presentation. (http://ncit.msstate.edu/events/documents/Ratcliffe_The%20National%20Gateway%20Southeastern%20Regional%20Infrasturcure%20Perspectives.pdf)

[15.] United States Census Bureau, American Fact Finder. (http://factfinder.census.gov/home/saff/main.html?_lang=en)

[16.] United States Department of Agriculture Natural Resource Conservation Service, Geospatial Data Gateway. (http://datagateway.nrcs.usda.gov.html)

[17.] United States Department of Agriculture, Natural Resource Conservation Service, Watersheds, Hydrologic Units, Hydrologic Unit Codes, Watershed Approach, and Rapid Watershed Assessments, 18 June 2007.

[18.] United States Department of Agriculture, Natural Resource Conservation Service, Rapid Watershed Assessment for The Big Sandy River Basin in West Virginia, June 2008.

[19.] United States Department of Labor, Bureau of Labor Statistics, Quarter Census of Employment and Wages. (http://data.bls.gov/location_quotient/ControllerServlet)

[20.] United States Department of Labor, Bureau of Labor Statistics, Workforce West Virginia, Workforce Kentucky, and Virginia Workforce Connection.

[21.] United States Environmental Protection Agency, Office of Research and Development: National Health and Environmental Effects Research Laboratory, Ecoregions, 2012. (http://www.epa.gov/wed/pages/ecoregions.html)

[22.] United States Environmental Protection Agency, Office of Water:303(d) Listed Impaired Waters NHD Indexed Dataset, 2013. (http://www.epa.gov/waters/data/download.html)

[23.] United States Environmental Protection Agency, Office of Water: Nonpoint Source Control Branch, Handbook for Developing Watershed Plans to Restore and Protect Our Waters, March 2008.

[24.] United States Environmental Protection Agency, Western Ecology Division, Level III and IV Ecoregions of the Continental United States. (http://www.epa.gov/wed/pages/ecoregions/level_iii_iv.htm)

[25.] United States Fish and Wildlife Services, National Wetlands Inventory. (http://www.fws.gov/wetlands/Data/DataDownload.html)

[26.] United States Geological Survey, Seamless Data Warehouse. (http://seamless.usgs.gov/)

[27.] United States Geological Survey, The National Map: The National Map Viewer. (http://nationalmap.gov/viewer.html)

[28.] Virginia State Department of Environmental Quality, Draft 2012 Integrated 303(b)/303(d) Water Quality Report, July 2012. (http://www.deq.virginia.gov/LinkClick.aspx?fileticket=G9CM2UbjnvA%3d&tabid=1840&portalid=0&mid=2352)

[29.] West Virginia State Department of Environmental Protection, Draft 012 Section 303(d) Report, March 2012. (http://www.dep.wv.gov/WWE/watershed/IR/Documents/IR_2012_Documents/EPA_Approved_Narrative.pdf)

[30.] West Virginia State Department of Environmental Protection, Final 2010 Integrated Integrated Water Quality Monitoring and Assessment Report for West Virginia, October 2010. (http://www.dep.wv.gov/WWE/watershed/IR/Documents/IR_2010_Documents/2010IR_EPA_Approved_Full_Version.pdf)

[31.] Western Kentucky University, Department of Geography and Geology: Kentucky Climate Center Climatography: http://www.kyclimate.org/climatography.html

[32.] United States Fish and Wildlife Services, Northeast Region, Federally Listed Endangered and Threatened Species and Candidate Species in Virginia and West Virginia (By County). (http://www.fws.gov/northeast/EcologicalServices/endangeredspecies.html)

[33.] United States Fish and Wildlife Services, Southeast Region, Kentucky Species List by County. January 2014. (http://www.fws.gov/frankfort/pdf/KY_te_list_by_county.pdf)

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APPENDIX B

ACRONYMS

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Acronym	Name
AFWS	Automated Flood Warning System
AMD	Acid Mine Drainage
ARC	Appalachian Regional Commission
ASA(CW)	Assistant to the Secretary of the Army for Civil Works
AW	American Whitewater
BFE	Base Flood Elevation
BLS	Bureau of Labor Statistics
BMPs	Best Management Practices
BSRBC	Big Sandy River Basin Coalition
BSWW	Big Sandy Watershed Watch
BWA	Bluegrass Wildwater Association
CAP	Continuing Authorities Program
CBD	Central Business District
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CRS	Community Rating System
CSA	Cost Share Agreement
CWA	Clean Water Act
DPR	Detailed Project Report
DSAC	Dam Safety Action Classification
EA	Environmental Assessment
EC	Engineering Circular
EEP	Emergency Evacuation Plan
ER	Engineering Regulation
ESA	Endangered Species Act
EWP	Emergency Watershed Protection Program
FCSA	Feasibility Cost Share Agreement
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Study
FONSI	Finding of No Significant Impact
FPMS	Floodplain Management Services
FRM	flood risk management
FWA	Final Watershed Assessment
FWEEP	Flood Warning and Emergency Evacuation Plan
FWS	Flood Warning System
GCM	global climate model
GIS	Geographic Information Systems
HAZUS	HAZards US

HMGP	Hazard Grant Mitigation Program
HTS	Huntington Tri-State Airport
HUC	hydrologic unit codes
IFLOWS	Integrated Flood Observing and Warning System
ILF	In-lieu Fee
IPCC	Intergovernmental Panel on Climate Change
IWA	Initial Watershed Assessment
KAR	Kentucky Administrative Regulation
KDFWR	Kentucky Department of Fish and Wildlife Resources
KDOW	Kentucky Division of Water
KSWIG	Kentucky Sewer and Water Infrastructure Group
LERRD	Lands, Easements, Relocations, Right-of-Ways and Disposal Sites
LPP	Local Protection Project
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NS	Nonstructural
ORBC	Ohio River Basin Comprehensive
PAS	Planning Assistance to States
PCB	Polychlorinated Biphenyls
PMP	Project Management Plan
PAR	population at risk
PRIDE	Personal Responsibility In a Desirable Envrionment
RIBITS	Regulatory In-Lieu Fee and Bank Information Tracking System
RMEF	Rocky Mountain Elk Foundation
SMART	Specific Measurable Attainable Risk-Informed and Timely
SPR	Special Project Report
SPRA	Screening Portfolio Risk Assessment
TDS	Total Dissolved Solids
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TSS	Total Suspended Solids
USACE	US Army Corps of Engineers
USACE-HEC	US Army Corps of Engineers – Hydrologic Engineering Center
USDA	US Department of Agriculture
USEPA	US Environmental Protection Agency
USFS	US Forest Service
USFWS	US Fish and Wildlife Service
USGS	US Geological Survey

VAC	Virginia Administrative Code
VADEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
WAMP	Watershed Assessment Management Plan
WMA	Wildlife Management Area
WNS	White-nose syndrome
WRDA	Water Resources Development Act
WRP	Wetlands Reserve Program
WVDNR	West Virginia Division of Natural Resources
WVDOH	West Virginia Department of Highways
WWTP	Wastewater Treatment Plant

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APPENDIX C

AUTHORIZING LANGUAGE

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WATERSHED PLANNING AUTHORIZING LANGUAGE

SECTION 729 OF WRDA 1986
SECTION 202 OF WRDA 2000
SECTION 2010 OF WRDA 2007

WATER RESOURCES DEVELOPMENT ACT OF 1986 (PUBLIC LAW 99-662)

Sec. 729. Study of Water Resources Needs of River Basins and Regions.

(a) The Secretary, in coordination with the Secretary of the Interior and in consultation with appropriate Federal, State, and local agencies, is authorized to study the water resources needs of river basins and regions of the United States. The Secretaries shall report the results of such study to Congress not later than October 1, 1988.

(b) In carrying out the studies authorized under subsection (a) of this section, the Secretaries shall consult with State, interstate, and local governmental entities.

(c) There is authorized to be appropriated $5,000,000 for fiscal years beginning after September 30, 1986, to carry out this section.

WATER RESOURCES DEVELOPMENT ACT OF 2000 (PUBLIC LAW 106-541)

Sec. 202. Watershed and River Basin Assessments.

Section 729 of the Water Resources Development Act of 1986 (100 Stat. 4164) is amended to read as follows:

‘‘SEC. 729. WATERSHED AND RIVER BASIN ASSESSMENTS.

‘‘(a) IN GENERAL.—The Secretary may assess the water resources needs of river basins and watersheds of the United States, including needs relating to—

‘‘(1) ecosystem protection and restoration;
‘‘(2) flood damage reduction;
‘‘(3) navigation and ports;
‘‘(4) watershed protection;
‘‘(5) water supply; and
‘‘(6) drought preparedness.

‘‘(b) COOPERATION.—An assessment under subsection (a) shall be carried out in cooperation and coordination with—

‘‘(1) the Secretary of the Interior;
‘‘(2) the Secretary of Agriculture;
‘‘(3) the Secretary of Commerce;
‘‘(4) the Administrator of the Environmental Protection Agency; and
‘‘(5) the heads of other appropriate agencies.

‘‘(c) CONSULTATION.—In carrying out an assessment under subsection (a), the Secretary shall consult with Federal, tribal, State, interstate, and local governmental entities.

‘‘(d) PRIORITY RIVER BASINS AND WATERSHEDS.—In selecting river basins and watersheds for assessment under this section, the Secretary shall give priority to—

‘‘(1) the Delaware River basin;
‘‘(2) the Kentucky River basin;
‘‘(3) the Potomac River basin;
‘‘(4) the Susquehanna River basin; and
‘‘(5) the Willamette River basin.

‘‘(e) ACCEPTANCE OF CONTRIBUTIONS.—In carrying out an assessment under subsection (a), the Secretary may accept contributions, in cash or in kind, from Federal, tribal, State, interstate, and local governmental entities to the extent that the Secretary determines that the contributions will facilitate completion of the assessment.

‘‘(f) COST-SHARING REQUIREMENTS.—

‘‘(1) NON-FEDERAL SHARE.—The non-Federal share of the costs of an assessment carried out under this section shall be 50 percent.

‘‘(2) CREDIT.—

‘‘(A) IN GENERAL.—Subject to subparagraph (B), the Secretary may credit toward the non-Federal share of an assessment under this section the cost of services, materials, supplies, or other in-kind contributions provided by the non-Federal interests for the assessment.

‘‘(B) MAXIMUM AMOUNT OF CREDIT.—The credit under subparagraph (A) may not exceed an amount equal to 25 percent of the costs of the assessment.

‘‘(g) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to carry out this section $15,000,000.’’.

Sec. 2010. Watershed and River Basin Assessments.

Section 729 of the Water Resources Development Act of 1986 (33 U.S.C. 2267a; 114 Stat. 2587–2588; 100 Stat. 4164) is amended—

(1) in subsection (d)—

(A) by striking ‘‘and’’ at the end of paragraph (4);

(B) by striking the period at the end of paragraph (5) and inserting a semicolon; and

(C) by adding at the end the following:

‘‘(6) Tuscarawas River Basin, Ohio;

‘‘(7) Sauk River Basin, Snohomish and Skagit Counties, Washington;

‘‘(8) Niagara River Basin, New York;

‘‘(9) Genesee River Basin, New York; and

‘‘(10) White River Basin, Arkansas and Missouri.’’;

(2) by striking paragraph (1) of subsection (f) and inserting the following:

‘‘(1) NON-FEDERAL SHARE.—The non-Federal share of the costs of an assessment carried out under this section on or after December 11, 2000, shall be 25 percent.’’; and

(3) by striking subsection (g).

APPENDIX D

WATER QUALITY REPORTS

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2012 Kentucky 303(d) Streams for the Big Sandy River Basin (source: DRAFT 2012 Integrated Report: Volume II. 303(d) List of Surface Waters)																										
				Supporting Use		Pollutant (Criteria Impairing Use)																				
Stream	Segment	Total Miles	Designated Use Impaired	Non-Support	Partial Support	Nitrogen	Nutrient/ Eutrophication	Organic Enrichment	Dissolved O_2	Turbidity	Sedimentation/ Siltation	TDS	TSS	Specific Conductance	Fecal Coliform	Iron	Nitrate/ Nitrite	pH	E. coli	Ammonia	Phosp.	unknown	PCB in Fish Tissue	Temp.	Methyl-mercury	PCBs	Chlorine
Abbott Creek	0.0 to 3.2	3.2	WWAH	x		x	x	x	x	x																	
Arkansas Creek	0.0 to 3.6	3.6	WWAH	x			x	x			x	x		x													
Arnold Fork	0.0 to 2.6	2.6	WWAH	x			x				x	x		x													
Banjo Branch	0.0 to 1.5	1.5	WWAH		x						x																
Barnetts Creek	0.0 to 1.6	1.6	WWAH		x						x																
Bear Creek	0.0 to 2.0	2	PCRW	x											x												
Beaver Creek	0.0 to 7.1	7.1	WWAH	x			x	x			x		x	x		x	x										
Big Creek	0.0 to 1.9	1.9	PCRW	x											x												
Big Creek	7.3 to 10.6	3.3	WWAH		x		x	x			x	x		x													
Big Creek	10.6 to 15.1	4.5	WWAH		x		x	x			x	x		x													
Big Mine Creek	1.4 to 3.9	2.5	WWAH, PCRW, SCRW		x		x	x			x							x									
Big Mine Creek	5.8 to 8.4	2.6	WWAH		x						x																
Big Sandy River	0.0 to 21.1	27.1	WWAH	x							x																
Bill D Branch	0.0 to 1.1	1.1	WWAH	x			x				x	x		x													
Bill D Branch	1.1 to 2.9	1.8	WWAH	x								x		x													
Blaine Creek	8.2 to 17.6	9.4	WWAH	x			x				x		x														
Blaine Creek	35.0 to 39.8	4.8	PCRW, WWAH	x			x				x		x		x				x								
Blaine Creek	40.9 to 45.3	4.4	WWAH, PCRW, SCRW	x	x		x	x			x							x									
Brushy Fork	0.0 to 10.0	10	WWAH		x		x				x	x															
Buck Branch	0.0 to 2.8	2.8	WWAH	x			x	x			x			x		x											
Buffalo Creek	0.0 to 1.8	1.8	WWAH	x							x																
Caleb Fork	0.0 to 1.2	1.2	WWAH	x		x	x	x			x	x		x		x				x	x						
Caney Fork	0.0 to 7.5	7.5	WWAH	x			x					x		x													
Caney Fork	7.5 to 11.3	3.8	WWAH	x								x		x													
Clear Creek	0.0 to 4.9	4.9	WWAH	x		x					x	x		x							x						
Coldwater Creek	2.1 to 5.3	3.2	WWAH		x						x	x															
Dry Creek	0.0 to 4.0	4	WWAH		x						x	x		x													
Elkhorn Creek	0.0 to 10.7	10.7	PCRW	x	x						x	x	x	x	x												
Frasure Creek	0.0 to 5.2	5.2	WWAH		x		x	x			x	x		x		x											
Georges Creek	0.0 to 2.9	2.9	WWAH		x		x				x			x													
Goose Creek	0.0 to 2.2	2.2	WWAH	x							x	x		x													
Greasy Creek	0.0 to 4.7	4.7	WWAH		x		x	x			x																
Hall Fork	0.0 to 2.0 2		WWAH	x								x		x		x											
Harriet Branch	0.6 to 2.3	1.7	WWAH		x																	x					
Hood Creek	0.0 to 3.6	3.6	WWAH		x		x				x											x					
Ice Dam Creek	0.0 to 0.4	0.4	WWAH	x		x					x											x					
Ice Dam Creek	0.4 to 2.4	2	WWAH	x		x					x	x										x					
Indian Creek	0.0 to 3.5	3.5	WWAH		x				x		x	x															
Island Creek	0.0 to 1.7	1.7	WWAH		x						x	x															

Jacks Creek	0.0 to 4.4	4.4	WWAH	x			x				x	x		x								x					
Jenny's Creek	0.0 to 3.1	3.1	WWAH		x						x			x													
Jenny's Creek	5.3 to 10.8	5.5	WWAH	x							x																
Johns Branch	0.0 to 1.6	1.6	WWAH	x							x	x		x													
Johns Creek	0.0 to 5.8	5.8	WWAH		x						x	x		x													
Johns Creek	24.0 to 30.65	6.65	PCRW, WWAH	x	x						x			x	x												
Johns Creek	34.4 to 42.5	8.1	WWAH	x							x	x															
Jones Fork	0.0 to 9.9	9.9	WWAH	x		x					x	x		x		x					x						
Keaton Fork	0.0 to 5.1	5.1	WWAH	x							x											x					
Knox Creek	0.0 to 8.0	8	FC, PCRW, WWAH	x	x						x			x	x								x	x			
Left Fork Beaver Creek	0.0 to 11.4	11.4	WWAH		x						x	x		x		x											
Left Fork Beaver Creek	11.4 to 13.55	2.15	WWAH	x										x													
Left Fork Beaver Creek	18.7 to 28.,6	9.9	WWAH	x			x					x		x													
Left Fork Blaine Creek	0.0 to 2.1	2.1	WWAH, PCRW, SCRW	x			x	x			x							x									
Left Fork Malachi Branch	0.0 to 0.7	0.7	WWAH		x																	x					
Left Fork Middle Creek Levisa Fork	0.0 to 10.3	10.3	PCRW, SCRW, WWAH	x								x		x	x			x									
Levisa Fork	0.0 to 5.8	5.8	WWAH	x				x					x	x													
Levisa Fork	5.8 to 15.3	9.5	FC, WWAH		x						x	x													x	x	
Levisa Fork	31.4 to 54.7	23.3	PCRW, WWAH	x									x	x					x								
Levisa Fork	65.2 to 98.0	32.8	PCRW, WWAH	x	x			x	x				x	x													x
Levisa Fork	98.0 to 101.25	3.25	PCRW	x											x												
Levisa Fork	116.0 to 124.4	8.4	PCRW, WWAH	x	x						x				x												
Lick Branch	0.0 to 1.3	1.3	WWAH	x																		x					
Lick Creek	0.3 to 4.7	4.4	WWAH		x		x				x																
Little Paint Creek	3.2 to 6.5	3.3	WWAH		x						x																
Little Paint Creek	6.5 to 11.6	5.1	WWAH, PCRW, SCRW	x	x		x	x			x							x									
Lockwood Creek	2.6 to 3.2	0.6	WWAH		x		x															x					
Long Branch	0.0 to 2.0	2	WWAH	x							x	x												x			
Long Fork	0.0 to 1.4	1.4	WWAH		x																	x					
Long Fork	0.4 to 7.5	7.1	WWAH		x									x													
Lower Chloe Creek	0.0 to 1.5	1.5	WWAH	x							x			x													
Lower Laurel Fork	0.0 to 7.9	7.9	WWAH		x		x				x											x					
Marrowbone Creek	1.4 to 11.3	9.9	WWAH		x						x	x															
Meathouse Fork	0.0 to 2.9	2.9	WWAH		x						x		x	x													
Middle Creek Levisa Fork	0.0 to 4.6	4.6	PCRW, WWAH	x	x						x		x	x					x								
Middle Fork Rockcastle Creek	0.0 to 16.8	16.8	WWAH		x						x	x															

Miller Creek	0.0 to 6.4	6.4	WWAH	x			x	x			x	x															
Mud Creek	0.0 to 2.7	2.7	WWAH	x						x	x																
Nats Creek	0.0 to 3.1	3.1	WWAJ		x						x																
Open Fork	6.4 to 11.3	4.9	WWAH, PCRW, SCRW	x	x		x	x			x							x									
Otter Creek	0.0 to 0.5	0.5	WWAH	x		x	x	x			x	x		x						x	x						
Paddle Creek	0.0 to 1.4	1.4	WWAH	x			x	x			x	x															
Paint Creek	0.0 to 7.1	7.1	CWAH, PCRW	x			x	x			x				x				x					x			
Paint Creek	7.1 to 8.3	1.2	CWAH, PCRW	x	x		x	x			x				x									x			
Panther Fork	0.0 to 2.95	2.95	WWAH		x						x	x															
Peter Creek	0.0 to 5.8	5.8	WWAH	x							x																
Pigeonroost Fork	0.0 to 1.3	1.3	WWAH	x							x																
Pond Creek	0.0 to 9.7	9.7	PCRW, WWAH	x	x		x	x			x	x	x						x								
Puncheon Branch	0.0 to 3.6	3.6	WWAH		x		x	x				x		x													
Raccoon Creek	5.6 to 7.4	1.8	WWAH		x						x	x															
Right Fork Beaver Creek	0.0 to 17.4	17.4	WWAH, PCRW, SCRW	x	x		x	x			x	x		x				x									
Right Fork Beaver Creek	17.4 to 23.3	5.9	WWAH	x			x					x		x													
Right Fork Beaver Creek	23.3 to 30.3	7	WWAH	x			x					x		x													
Right Fork Beaver Creek	30.3 to 33.4	3.1	WWAH		x		x	x			x	x		x													
Right Fork Beaver Creek	33.4 to 37.9	4.5	WWAH	x			x					x		x													
Right Fork of Little Paint Creek	0.4 to 2.1	1.7	WWAH	x							x																
Right Fork of Panther Fork	0.0 to 1.05	1.05	WWAH	x										x													
Right Fork of White Cabin Branch	0.0 to 1.1	1.1	WWAH	x										x													
Righthand Fork	0.0 to 2.0	2	WWAH	x								x		x													
Rob Fork	0.0 to 1.05	1	WWAH	x							x			x													
Rock Fork	0.0 to 7	7	WWAH		x		x				x	x		x													
Rockcastle Creek	0.0 to 3.7	3.7	PCRW, WWAH	x	x						x		x	x					x								
Rockcastle Creek	3.7 to 13.25	9.55	WWAH		x						x	x															
Rockcastle Creek	13.25 to 15.3	2.05	WWAH	x							x																
Rockhouse Fork	0.0 to 6.4	6.4	WWAH		x						x	x		x													
Salisbury Branch	0.0 to 1.8	1.8	WWAH		x		x				x	x		x													
Salt Lick Creek	0.0 to 6.8	6.8	WWAH		x	x			x		x			x							x						
Shelby Creek	0.0 to 6.0	6	PCRW, WWAH		x						x	x		x					x								
Shelby Creek	6.0 to 13.3	7.3	WWAH		x		x	x			x																
Simpson Branch	0.0 to 1.8	1.8	WWAH		x		x	x			x	x		x		x											
Sizemore Branch	0.0 to 2.0	2	WWAH	x								x		x													
Spewing Camp Branch	0.0 to 3.1	3.1	PCRW, SCRW, WWAH	x								x	x	x				x				x					

Spurlock Creek	0.0 to 0.6	0.6	WWAH	x								x		x													
Spurlock Creek	0.6 to 4.0	3.4	WWAH	x								x		x													
Steele Creek	0.0 to 2.4	2.4	WWAH	x			x	x			x	x		x						x							
Stephens Branch	0.0 to 2.6	2.6	WWAH	x			x	x			x	x		x						x							
Straight Fork	0.0 to 1.1	1.1	WWAH		x									x													
Stratton Branch	0.4 to 2.1	1.7	WWAH	x										x													
Sycamore Creek	0.0 to 3.8	3.8	WWAH		x																	x					
Toms Creek	0.0 to 8.0	8	WWAH		x						x																
Tug Fork	71.9 to 77.7	5.8	FC		x																					x	
Turkey Creek	0.0 to 5.9	5.9	WWAH	x			x		x		x			x													
Upper Pidgeon Branch	0.0 to 2.1	2.1	WWAH	x		x					x	x															
UT of Mudlick Branch	0.0 TO 0.6	0.6	WWAH, PCRW, SCRW	x										x				x									
Venters Branch	0.4 to 1.8	1.4	WWAH	x										x													
Wilson Creek	0.0 to 2.9	2.9	WWAH	x			x	x			x	x															
Wolf Creek	0.0 to 6.6	6.6	PCRW, WWAH		x						x	x							x								
Wolf Creek	6.6 to 17.6	11	WWAH	x							x	x		x													
Wolf Creek	17.6 to 20.5	2.9	WWAH		x						x	x		x													
Wolfpen Branch	0.0 to 1.7	1.7	WWAH	x							x	x												x			
	Total Miles	**628.55**	**Total Occurrences**	**80**	**62**	**9**	**47**	**30**	**5**	**2**	**92**	**63**	**12**	**67**	**11**	**8**	**1**	**9**	**8**	**4**	**5**	**13**	**1**	**5**	**1**	**2**	**1**

WWAH = Warm Water Aquatic Habitat
PCRW = Primary Recreation Water Contact
SCRW = Secondary Recreation Water Contact
FC = Fish Consumption
CWAH = Cold Water Aquatic Habitat

2012 Virgina 303(d) (Category 5) Impaired Streams within the Big Sandy River Basin (source: Draft 2012 305(b)/303(d) Integrated Report)											
						Pollutant (Criteria Imparing Use)					
Stream(s)	Cause Group Code(s)	Total Miles	Acres	Impaired Use(s)	Cause Category	PCB Fish Tissue	Fecal Coliform	E. coli	Temp.	Benthic Assessment	Mecury Fish Tissue
Knox Creek & Tribs	Q03R-02-PCB	93.26		Fish Consumption	5A	x					
Knox Creek & Tribs	Q03R-02-PCB	8.43		Fish Consumption	5A	x					
Knox Creek & Tribs	Q03R-02-PCB	5.99		Fish Consumption	5A	x					
Guess Fork, Pawpaw Creek, & Jacobs Fork	Q03R-03-BAC	8.43		Recreation	5A		x	x			
Guess Fork, Pawpaw Creek, & Jacobs Fork	Q03R-03-BAC	6.7		Recreation	5A			x			
Levisa Fork & Tribs	Q04R-01-BAC	4.69		Recreation	5A			x			
Dismal Creek	Q05R-00-TEMP, Q05R-01-BAC	5.31		Aquatic Life, Recreation	5A			x	x		
Dismal Creek	Q05R-01-BAC	12.12		Recreation	5A			x			
Bull Creek & Poplar Creek	Q08R-01-BAC	3.14		Recreation	5A			x			
Bull Creek & Poplar Creek	Q08R-01-BAC	16.83		Recreation	5A			x			
Home Creek	Q08R-02-BEN	4.74		Aquatic Life	5A					x	
Russell Fork	Q09R-01-BAC	8.68		Recreation	5A			x			
Russell Fork	Q09R-01-BAC	14.52		Recreation	5A			x			
Indian Creek	Q09R-01-BEN	2.5		Aquatic Life	5A					x	
Sullivan Branch	Q09R-02-BEN	1.6		Aquatic Life	5A					x	
Fryingpan Creek	Q10R-01-BEN	9.1		Aquatic Life	5A					x	
McClure River	Q11R-02-BAC	10.01		Recreation	5A			x			
McClure River	Q11R-02-BAC	3.26		Recreation	5A			x			
McClure River	Q11R-02-BAC	3.05		Recreation	5A			x			
McClure River	Q11R-02-BAC	10.53		Recreation	5A			x			
McClure River	Q11R-02-BEN	13.27		Aquatic Life	5A					x	
McClure River	Q11R-02-BEN	8.27		Aquatic Life	5A					x	
Russell Prater Creek	Q12-01-BAC	17.02		Recreation	5A			x			
Russell Fork	Q12R-01-BAC	3.77		Recreation	5A			x			

John Flannagan Reservoir	Q13L-01-HG		1,177.21	Fish Consumption	5A						x
North Fork Pound River	Q13R-02-TEMP, Q13R-08-BEN	10.59		Aquatic Life	5C, 5A				x	x	
North Fork Pound River	Q13R-02-TEMP	16.6		Aquatic Life	5C				x		
Pound River	Q13R-03-BAC, Q13R-06-BEN	16.6		Recreation, Aquatic Life	5A			x		x	
Pound River	Q13R-03-BEN	2.1		Aquatic Life	5A					x	
North Fork Pound River	Q13R-03-TEMP	1.2		Aquatic Life	5A				x		
Indian Creek	Q13R-06-BEN	2.78		Aquatic Life	5A					x	
Bear Pen Branch	Q13R-07-BEN	0.82		Aquatic Life	5A					x	
North Fork Pound River	Q13R-09-BEN	3.96		Aquatic Life	5A					x	
Cranesnest River	Q14R-01-BAC	7.27		Recreation	5A			x			
Cranesnest River	Q14R-01-BAC	12.32		Recreation	5A			x			
Birchfield Creek & Cranesnest River	Q14R-01-BEN	14.7		Aquatic Life	5A					x	
Dotson Creek	Q14R-02-BEN	3.61		Aquatic Life	5A					x	
	Total Miles	**367.77**			**Total Occurrences**	**3**	**1**	**18**	**4**	**14**	**1**
	Total Acres		**1,177.21**								

2012 Section 303(d) List

WEST VIRGINIA

Stream Name	Stream Code	Criteria Affected	Source	Impaired Size (stream-miles) (lake-acres)	Reach Description	Projected TMDL Year (No Later Than)	2010 list?
HYDROLOGIC GROUP E							
BIG SANDY WATERSHED - HUC# 05070204							*11 streams 62 miles*
Big Sandy River	WVBS	Iron	Unknown	26.6	Entire length	2018	Yes
Miller Creek	WVBS-1	CNA-Biological	Unknown	1.7	Entire length	2018	Yes
Cedar Run	WVBS-3	CNA-Biological	Unknown	1.5	Entire length	2018	Yes
Whites Creek	WVBS-5	CNA-Biological	Unknown	8.8	Entire length	2018	Yes
Gragston Creek	WVBS-6	CNA-Biological	Unknown	6.5	Entire length	2018	Yes
Elijah Creek	WVBS-7	CNA-Biological	Unknown	2.2	Entire length	2018	Yes
Gilkerson Branch	WVBS-7-B	CNA-Biological	Unknown	1.2	Entire length	2018	Yes
Hurricane Creek	WVBS-8	CNA-Biological	Unknown	7.9	Entire length	2018	Yes
Sugar Branch	WVBS-8-0.7A	CNA-Biological	Unknown	0.8	Entire length	2018	Yes
Tabor Creek	WVBS-10	CNA-Biological	Unknown	3.8	RM 1.0 to RM 4.8	2018	Yes
Redhead Branch	WVBS-13	CNA-Biological	Unknown	0.7	Entire length	2018	Yes

2012 Section 303(d) List

WEST VIRGINIA

Stream Name	Stream Code	Criteria Affected	Source	Impaired Size (stream-miles) (lake-acres)	Reach Description	Projected TMDL Year (No Later Than)	2010 list?
TUG FORK WATERSHED - HUC# 05070201							*40 streams 312 miles*
Tug Fork	WVBST	CNA-Biological	Unknown	103.4	RM 51.6 to HW	2016	Yes
		Fecal Coliform	Unknown	155.0	Entire length	2021	Yes
Mill Creek	WVBST-1	CNA-Biological	Unknown	8.7	Entire length	2021	Yes
Lost Creek	WVBST-7	CNA-Biological	Unknown	4.5	Entire length	2021	Yes
Silver Creek	WVBST-16	CNA-Biological	Unknown	2.5	Entire length	2016	Yes
Parsley Big Branch	WVBST-23	CNA-Biological	Unknown	2.2	Entire length	2021	Yes
Left Fork/Right Fork/Trace Fork	WVBST-24-K-4-A	Selenium	Unknown	1.9	Entire length	2021	Yes
UNT/Oldfield Branch RM 0.46	WVBST-24-T-1	Selenium	Unknown	0.6	Entire length	2021	Yes
Slick Rock Branch	WVBST-24-AA	Selenium	Unknown	1.4	Entire length	2021	Yes
Sulphur Creek	WVBST-41	CNA-Biological	Unknown	1.7	Entire length	2016	Yes
Ben Creek	WVBST-52	Selenium	Unknown	8.2	Entire length	2021	Yes
Bull Creek	WVBST-57	Fecal Coliform	Unknown	4.9	Entire length	2021	Yes
Left Fork/Bull Creek	WVBST-57-B	Fecal Coliform	Unknown	2.0	Entire length	2021	Yes
Greenbrier Fork	WVBST-60-A	CNA-Biological	Unknown	3.5	Entire length	2016	Yes
Horse Creek	WVBST-63	CNA-Biological	Unknown	4.6	Entire length	2021	Yes
Dry Fork	WVBST-70	CNA-Biological	Unknown	34.5	Entire length	2021	Yes
		Fecal Coliform	Unknown	34.5	Entire length	2021	Yes
Grapevine Branch	WVBST-70-F	CNA-Biological	Unknown	1.8	Entire length	2016	Yes
Bradshaw Creek	WVBST-70-M	Fecal Coliform	Unknown	5.5	Entire length	2021	Yes
Wolfpen Branch	WVBST-70-M-3	CNA-Biological	Unknown	1.6	Entire length	2016	Yes
Little Slate Creek	WVBST-70-N	Fecal Coliform	Unknown	6.8	Entire length	2021	Yes
Jacobs Fork	WVBST-70-W	Fecal Coliform	Unknown	10.6	Entire length	2021	Yes
Mountain Fork	WVBST-70-W-1-A	CNA-Biological	Unknown	4.2	Entire length	2016	Yes
Middle Fork/Big Creek	WVBST-70-W-1-G	CNA-Biological	Unknown	1.6	Entire length	2021	Yes
Beech Fork	WVBST-70-AA	CNA-Biological	Unknown	1.0	Entire length	2021	Yes
Clear Fork	WVBST-76	Fecal Coliform	Unknown	10.5	Entire length	2021	Yes

2012 Section 303(d) List

WEST VIRGINIA

Stream Name	Stream Code	Criteria Affected	Source	Impaired Size (stream-miles) (lake-acres)	Reach Description	Projected TMDL Year (No Later Than)	2010 list?
Spice Creek	WVBST-78	CNA-Biological	Unknown	5.7	Entire length	2021	Yes
Badway Branch	WVBST-78-G	CNA-Biological	Unknown	1.3	Entire length	2016	Yes
Davy Branch	WVBST-85	CNA-Biological	Unknown	4.1	Entire length	2021	Yes
		Fecal Coliform	Unknown	4.1	Entire length	2021	Yes
Upper Shannon Branch	WVBST-95	CNA-Biological	Unknown	2.4	Entire length	2016	Yes
Browns Creek	WVBST-98	CNA-Biological	Unknown	5.1	Entire length	2021	Yes
		Fecal Coliform	Unknown	5.1	Entire length	2021	Yes
Puncheoncamp Branch	WVBST-98-A	CNA-Biological	Unknown	3.0	Entire length	2021	Yes
Trail Fork	WVBST-98-B	Fecal Coliform	Unknown	2.4	Entire length	2021	Yes
Elkhorn Creek	WVBST-99	Iron (trout)	Unknown	22.7	Entire length	2021	Yes
North Fork/Elkhorn Creek	WVBST-99-L	Fecal Coliform	Unknown	8.0	Entire length	2021	Yes
Bearwallow Branch	WVBST-99-L-2	Selenium	Unknown	2.8	Entire length	2026	No
Rock Narrows Branch	WVBST-103	CNA-Biological	Unknown	1.7	Entire length	2016	Yes
Sandlick Creek	WVBST-109	Selenium	Unknown	5.3	Entire length	2021	Yes
UNT/Tug Fork RM 145.75	WVBST-114.2	Selenium	Unknown	0.9	Entire length	2026	No
Little Creek	WVBST-120	Fecal Coliform	Unknown	4.2	Entire length	2021	Yes
Ballard Harmon Branch	WVBST-122	Selenium	Unknown	2.0	Entire length	2026	No
UNT/Ballard Harmon Branch RM 1.49	WVBST-122-A	Selenium	Unknown	0.5	Entire length	2026	No

APPENDIX E

FACT SHEETS AND EXAMPLE LETTERS OF INTENT FOR CAP AUTHORITIES

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SECTION 14
EMERGENCY STREAMBANK AND SHORELINE PROTECTION

WHAT CAN THE CORPS DO?

Section 14 of the Flood Control Act of 1946, as amended, provides authority for the Corps of Engineers to plan and construct emergency streambank and shoreline protection projects to protect endangered highways, highway bridge approaches, public facilities such as water and sewer lines, churches, public and private nonprofit schools and hospitals, and other nonprofit public facilities.

The unstable conditions caused by flood induced streambank and shoreline erosion call for prompt action to eliminate the threat to public safety and to prevent interruption of vital services. This is recognized in the streamlined study and shortened time frame of the Section 14 program. Federal costs are limited to not more than $1,500,000 in one locality during any fiscal year.

A Section 14 project may include new streambank or shoreline protection works, or it may repair, restore, or modify existing works. Each project must constitute a complete solution to the problem and not commit the Federal government to additional improvements to ensure effective protection. A project is accepted for construction only after an investigation shows its engineering feasibility, environmental acceptability, and economic justification.

After a state or local agency requests Federal assistance, the Corps will conduct a feasibility study pending potential Federal interest and available funding. The feasibility study begins at Federal expense. Study costs in excess of $100,000 are shared 50/50 with the non-Federal sponsor according to a Feasibility Cost Sharing Agreement (FCSA). In the feasibility study, the problem is defined, project viability is determined, potential solutions are identified, and the most feasible plan is selected for implementation. The costs, benefits, and environmental impacts of the potential project are analyzed. A draft project partnership agreement (PPA) is drawn up by which the Federal government and the sponsor agree to share project construction costs. No more than 12 months should pass between the start of the feasibility study and the time the project is ready for construction.

WHAT ARE THE LOCAL RESPONSIBILITIES?

Costs for emergency streambank and shore protection projects are shared between the Federal government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1986, as amended. During construction the local sponsor must contribute a minimum of 35% of the total cost of a project, with credit granted toward the amount for providing lands, easements and rights-of-way, and pay a minimum cash requirement of 5% of the total project cost. The local sponsor (a state or local government) must have the legal and financial capability to fulfill the requirements of cost sharing and local cooperation.

Formal assurances of cooperation must be furnished by the local sponsor. The sponsor generally must agree to the following:

- Contribute a minimum of 5%of the total project cost in cash
- Provide all lands, easements, rights-of-way, and relocations
- Provide any additional cash contributions needed to make the local sponsor's share of the project costs 35%

- Assume the full responsibility for all project cost above the Federal cost limit of $1,500,000
- Hold and save the United States free from claims for damages due to the construction and maintenance of the project, except damages due to fault or negligence of the United States or its contractors
- Provide all access routes and relocations of utilities necessary for project construction and subsequent operation and maintenance
- **OPERATE, MAINTAIN, REPAIR, REPLACE, AND REHABILITATE THE PROJECT AS LONG AS THE PROJECT IS AUTHORIZED**
- Comply with provisions of pertinent Federal acts in carrying out the specified non Federal responsibilities of the project

HOW CAN HELP BE REQUESTED?

An investigation under Section 14 may be initiated after receipt of a formal request from the prospective sponsoring agency. A sample letter is offered below. This letter is generally referred to as a Letter of Intent (LOI) and must be received by the Corps from a prospective non-Federal sponsor prior to initiating the feasibility phase.

District Engineer
U.S. Army Corps of Engineers, Huntington District
502 8th Street
Huntington, West Virginia 25701

Dear Sir:

In accordance with the provisions of Section 14 of the Flood Control Act of 1946, the (name of local sponsor, i.e. Town of Newberry) requests Corps of Engineers assistance in addressing a streambank erosion problem (briefly state problem) on (name of site, i.e. street or park name) along (name of stream).

We are aware of the following cost sharing requirements associated with projects undertaken under this authority and are able to meet these obligations within 12 months.

a. Feasibility Phase is Federally funded up to $100,000. Costs in excess of $100,000 are shared on a 50/50 basis with the local sponsor. The sponsor's 50% share of any costs over $100,000 may be provided by in-kind services.

b. Sponsor's Share of Construction consists of provision of land, easements, rights-of-way, relocations and disposal areas, plus a cash contribution of at least 5% of the total project cost. If this amount is less than 35% of the total project cost, the sponsor will provide any additional cash contribution required to equal 35%. The Federal limit is $1,500,000.

c. The sponsor is responsible for removal of all Hazardous, Toxic, and Radioactive Wastes prior to any construction and for the operation and maintenance of the project after it is completed.

We are aware that this letter serves as an expression of intent and is not a contractual obligation and that either party may discontinue the study process at any stage prior to construction.

Sincerely,
(Name and title of public official authorized to request study)

US Army
Corps of Engineers
Huntington District

SECTION 205
FLOOD DAMAGE REDUCTION

WHAT CAN THE CORPS DO?

Section 205 of the Flood Control Act of 1948, as amended, provides authority to the Corps of Engineers to plan and construct small flood damage reduction projects not specifically authorized by Congress. A project is accepted for construction only after detailed investigation clearly shows its engineering feasibility, environmental acceptability, and economic justification. Each project must be complete within itself, not a part of a larger project. The maximum Federal expenditure per project is $7,000,000, which includes both planning and construction costs. Costs of lands, easements, and operation and maintenance must be non-Federal.

There are two types of projects: structural and nonstructural. Structural projects may include levees, flood walls, diversion channels, pumping plants, and bridge modifications. Nonstructural alternatives, which have little or no effect on water surface elevations, might include measures such as floodproofing, relocation of structures, and flood warning systems.

After a state or local agency requests Federal assistance, the Corps will conduct a feasibility study pending potential Federal interest and available funding. The feasibility study begins at Federal expense. Study costs in excess of $100,000 are shared 50/ 50 with the non-Federal sponsor according to a Feasibility Cost Sharing Agreement (FCSA). In the feasibility study, the problem is defined, project viability is determined, potential solutions are identified, and the most feasible plan is selected for implementation. The costs, benefits, and environmental impacts of the potential project are analyzed. If there is a feasible solution to the flooding problem recommended by the study, a draft project partnership agreement (PPA) is drawn up by which the Federal government and the sponsor agree to share project construction costs. No more than 3 years should pass between the start of the feasibility study and the time the project is ready for construction.

WHAT ARE THE LOCAL RESPONSIBILITIES?

Costs for Section 205 flood damage reduction projects are shared between the Federal government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1986, as amended. During construction the local sponsor must contribute a minimum of 35% of the total cost of a project, with credit granted toward the amount for providing lands, easements and rights-of-way, and for structural projects, pay a minimum cash requirement of 5% of the total project cost. The local sponsor (a state or local government) must have the legal and financial capability to fulfill the requirements of cost sharing and local cooperation. The sponsor generally must agree to the following:

- Contribute the local share of project planning and construction costs
- Provide all lands, easements, rights-of-way, relocations, and dredged material disposal area (LERRDs)
- Provide for non-Federal cost share of a minimum 35%, up to 50% (based on cost of LERRDs), plus 5% must be in cash
- Hold and save the United States free from damages due to the construction and maintenance of the project, except damages due to fault or negligence of the United States or its contractors

- Prepare a floodplain management plan designed to reduce the impact of future flood events in the project area
- Comply with provisions of pertinent Federal acts in carrying out specified non-Federal responsibilities of the project
- Operate, maintain, repair, replace, and rehabilitate the project

HOW CAN A STUDY BE REQUESTED?

An investigation under Section 205 may be initiated after receipt of a formal request from the prospective sponsoring agency. A sample letter is offered below. This letter is generally referred to as a Letter of Intent (LOI) and must be received by the Corps from a prospective non-Federal sponsor prior to initiating the feasibility phase.

District Engineer
U.S. Army Corps of Engineers, Huntington District
502 8th Street
Huntington, West Virginia 25701

Dear Sir:

In accordance with the provisions of Section 205 of the Flood Control Act of 1948, as amended, the (name of local sponsor) requests the Corps of Engineers to undertake a flood control study for (name of site) along (name of stream).

We are aware of the following cost sharing requirements associated with projects undertaken under this authority.

a. Feasibility Phase is Federally funded up to $100,000. Costs in excess of $100,000 are cost shared on a 50/ 50 basis with the local sponsor. The sponsor's 50% share of any costs over $100,000 may be provided by in-kind services.

b. Preparation of Plans and Specifications is cost-shared in the same proportion as construction and is collected with the construction cost share.

c. Sponsor's Share of Construction for structural measures consists of provision of land, easements, rights-of-way, relocations and disposal areas, plus a cash contribution of at least 5% of the total project cost. If this amount is less than 35% of the total project cost, the sponsor is required to provide additional cash contribution to equal 35%. The sponsor's cost share is limited to a maximum of 50% of the total cost when the project is under the Federal limit of $7,000,000. The sponsor's share for nonstructural measures such as floodproofing is 35%.

d. The sponsor is responsible for the operation and maintenance of the project after it is completed.

We are aware that this letter serves as an expression of intent and not a contractual obligation and either party may discontinue the study process at any stage prior to construction.

Sincerely,
(Name and title of public official authorized to request study)

US Army
Corps of Engineers
Huntington District

SECTION 206
AQUAIC ECOSYSTEM RESTORATION

WHAT CAN THE CORPS DO?

Section 206 of the Water Resources Development Act of 1996, provides authority for the Corps to restore aquatic ecosystems. A project is accepted for construction after a detailed investigation shows it is technically feasible, environmentally acceptable, and provides cost effective environmental benefits. Each project must be complete within itself, not a part of a larger project. The maximum Federal expenditure per project is $5,000,000, which includes both planning and construction costs. The Corps does restoration projects in areas that affect water, such as rivers, lakes, and wetlands. We evaluate projects that benefit the environment through restoring, improving, or protecting aquatic habitat for plants, fish and wildlife.

After a state or local agency requests Federal assistance, the Corps will conduct a feasibility study pending potential Federal interest and available funding. The feasibility study begins at Federal expense. Study costs in excess of $100,000 are shared 50/50 with the non-Federal sponsor according to a Feasibility Cost Sharing Agreement (FCSA). In the feasibility study, the problem is defined, project viability is determined, potential solutions are identified, and the most feasible plan is selected for implementation. The costs, benefits, and environmental impacts of the potential project are analyzed. A draft project partnership agreement (PPA) is drawn up by which the Federal government and the sponsor agree to share project construction costs. No more than two years should pass between the start of the feasibility study and the time the project is ready for construction.

WHAT ARE THE LOCAL RESPONSIBILITIES?

Costs for Section 206 projects are shared between the Federal government and a non-Federal sponsor in accordance with the Water Resources Development Act of 1986, as amended. During construction the non-Federal sponsor must contribute a minimum of 35% of the total cost of a project, with credit granted toward the amount for providing lands, easements and rights-of-way. Section 206 also allows credit for certain works in-kind, including design work, provision of materials, and construction activities. Contributions, such as volunteer labor, can also be accepted to reduce the overall project cost. The local sponsor (a state or local government) must have the legal and financial capability to fulfill the requirements of cost sharing and local cooperation. The sponsor generally must agree to the following:

- Provide all lands, easements, rights-of-way, relocations, and dredged material disposal areas
- Provide any additional cash contributions needed to make the local sponsor's share of the cost 35%
- Hold and save the United States free from damages due to the construction and maintenance of the project, except damages due to fault or negligence of the United States or its contractors
- Provide all access routes and relocations of utilities necessary for project construction and subsequent operation and maintenance
- Comply with provisions of pertinent Federal acts in carrying out the specified non-Federal responsibilities of the project
- Contribute in cash the local share of project planning and construction cost

- Maintain and operate all the non-Federal works after completion in accordance with regulations prescribed by the Secretary of the Army

HOW CAN A STUDY BE REQUESTED?

An investigation under Section 206 may be initiated after receipt of a formal request from the prospective sponsoring agency. A sample letter of intent (LOI) is offered below.

District Engineer
U.S. Army Corps of Engineers, Huntington District
502 8th Street
Huntington,WV 25701

Dear Sir:

In accordance with the provisions of Section 206 of the Water Resources Development Act of 1996, as amended, the (name of local sponsor) requests the Corps of Engineers to undertake a study of aquatic ecosystem restoration at (name of site) along (name of stream(s)).

(Briefly describe the nature of the aquatic ecosystem restoration and any issues that might affect the acceptability of any recommended solutions, from the perspective of local government and/or the public.)

We are aware of the following cost sharing requirements associated with projects undertaken under this authority.

a. Feasibility Phase is Federally funded up to $100,000. Costs in excess of $100,000 are cost shared on a 50/50 basis with the local sponsor. The sponsor's 50% share of any costs over $100,000 may be provided by in-kind services.

b. Preparation of Plans and Specifications is cost-shared in the same proportion as construction and is collected with the construction cost share.

c. Non-federal interests shall provide 35% of the cost of construction including the provision of all lands, easements, rights-of-way, and necessary relocations.

d. The non-Federal share of construction costs shall be paid after the project is approved for implementation and before a construction contract is awarded.

e. The non-Federal Sponsor is responsible for all operation, maintenance, repair, rehabilitation and replacement of the project.

We are aware that this letter serves as an expression of intent and not a contractual obligation and either party may discontinue the study process at any stage prior to construction.

Sincerely,
(Name and title of public official authorized to request study)

APPENDIX F

STAKEHOLDER MEETING SLIDES & NOTES

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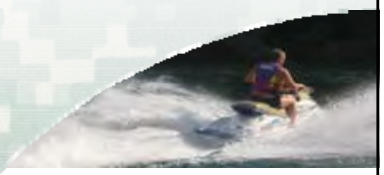
Big Sandy River Basin
Section 729 Watershed Assessment

Stakeholder Involvement Meetings

Sherry Adams, Project Manager
Dan Bailey, Lead Planner



US Army Corps of Engineers
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Agenda

- Introductions
- Big Sandy Basin Overview
- Section 729 Watershed Assessment Overview
- Matching Problems and Resources
- Discussion

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Big Sandy Basin Overview

•Total Basin Area = 4,292 square miles

•Comprised of Tug and Levisa Forks and the main Big Sandy (total of 352 miles in length)

•Within 3 states:
- •54% - KY
- •23% - VA
- •23% - WV

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History of the Basin

- Federal Efforts To Control Big Sandy Basin
  - ► 1949-1991 USACE constructs six reservoirs
    - Dewey (1949)
    - North Fork of the Pound (1963)
    - J. W. Flannagan (1964)
    - Fishtrap (1968)
    - Paintsville (1979)
    - Yatesville (1991)

  - ► 1977 Flood – Section 202
    - Structural and non-structural flood protection

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Section 729 - Watershed Assessment Overview

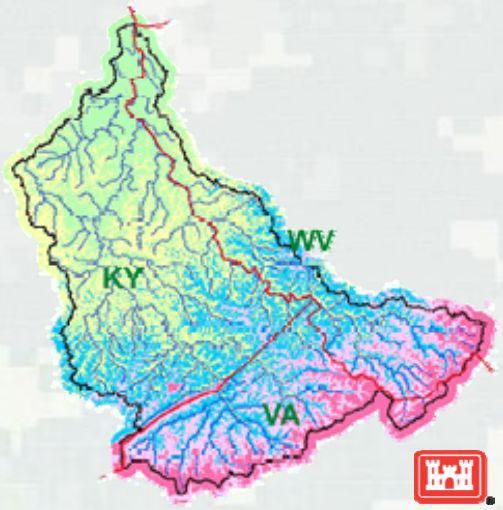
•Authority comes from Section 729 of WRDA 1986;

•Addresses problems, needs, and opportunities within a watershed;

•Looks to achieve integrated water resources management;

•Can result in general, non-project specific plan and/or strategies to address watershed needs; and

•Uses a watershed approach to solving problems



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What is a Section 729 Watershed Approach?

• Working collaboratively with all stakeholders to help solve water resources problems in an integrated and sustainable manner;

•Using systems approaches to understand the connection between natural and man-made systems;

•Analyzing water resources problems on a large geographic scale; and

• Striving to achieve multiple goals and functions using water and related resources in a balanced way.

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The Study Process/Products

- Initial Watershed Assessment
  - Inventory problems, needs and opportunities in the Basin
  - Identify stakeholders and resources
  - **Defines scope of Final Watershed Assessment**
- Final Watershed Assessment
  - Provides a plan for managing water resources in the Basin
    - Reflects interdependency of water uses and competing demands
  - Defines approaches for dealing with problems in a holistic manner
    - May be on a sub-basin level

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Examples of Non-Corps Programs

- Programs and Grants
  - KY Department for Local Government
    - Coal Severance funds
  - KY Infrastructure Authority
    - State revolving funds
  - USGS
    - Agricultural Management Assistance

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Examples of Corps Programs

- Continuing Authorities Program (CAP)
  - Section 1135 – Restoration Associated with a Corps Project
  - Section 14 – Emergency Streambank Protection
  - Section 205 – Small Flood Risk Management
  - Section 206 – Aquatic Ecosystem Restoration
- Environmental Assistance (Infrastructure)
  - Section 340 – WV
  - Section 531 – KY
  - Section 502 – VA

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Section 1135

Restoration Associated with a Corps Project

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Section 14
Emergency Streambank Repair

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Section 205
Small Flood Control

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Section 206

Aquatic Ecosystem Restoration

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Environmental Infrastructure

Specific legislation that allows for design and construction assistance for environmental infrastructure projects for local communities in Southern and Eastern KY; Southern WV; SW VA

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Questions and Discussion

Contact:
Dan Bailey
304.399.5824
Daniel.S.Bailey@usace.army.mil

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Big Sandy 729 – Stakeholder Meeting Block Notes

Williamson, WV

Flooding

- Smaller tributaries

Recreational

- Low water (Kermit area)
- Timing of releases and white water notification of releases
- Russell Fork

Environmental

- Water quantity
- Improved water quality over years
- Populated hollows – straight pipes scattered throughout
- More outreach for trash – schools
- Post mining operations
- Russell Fork above gorge – water quality (acid mine) eddies (lower flows)
- Dredging/stream bank cleaning

Other

- Elkhorn City – October releases (8 days) economic benefits (diversification)
- World class white water rafting

Haysi, VA

Flooding

- Sediment fr**o**m flooding – erosion issues

Recreational

- Releases – changes that are more white water friendly (small variations, stop dumping all at once)
- Original language – free camping, etc. “Other rec purposes” “1/2 - .6” discretion
- Rains have more flow than requested release from dam

Environmental

- Water quality issues – 303D listed
- Zebra mussels – Fishtrap lake
- Didymo algae
- Sediment
- Invasive species
- Conductivity
- Total dissolved oxygen
- Erosion
- Riparian

Other

- In lieu fee mitigation funding – KY Fish and Wildlife
- Riparian habitat laws
- Utilize spring flows for white water releases

Prestonsburg, KY

Flooding

- Trash/debris
- Flash flooding – economic development impact
- Detention basins
- Swift water rescue

Recreation

- Big Sandy Water Trail – flooding concerns
    - Elkhorn City – Louisa
- Access ramps to water along Big Sandy Trail (F&WL-Prestonsburg)
- Sediment (ramps at lakes)

Environmental

- Straight pipes, water plants
- Medicines in water – water quality issues
- Sewer lines, plants
- Department of Water – TMDL website
- KY Waterways Alliance
- Innovative wastewater systems – geographic issues
- O&M concerns of wastewater systems
- Constructed wetlands – individual homes
- Rain guard systems – wetland restoration
- Risk map project
- FEMA funding for green infrastructure
- Big Sandy H&H modeling – resilience meetings
- Hot spots – illegal dumping, waste management
- Impacted waters list
- Trash debris problems at lakes – Paintsville (tourism)
- Dewey – sediment – Stone Crest Golf Course
- Corps data to other offices – water quality
- Cam Coal and Cezar strip mine – water quality issues
- Logging industry and siltation issues
- Logging, coal mining, gas wells

Other

- Outreach to community – first responders, etc.
- Pike TV – Local access channels
- Alternate meetings – day and evening
- Flash flooding is preventing economic development. Local government is making an effort.

- Possible exception for benefit-cost ratio
- River debris blocking major roadway – flood warning system
- DLG
- NRCS and extension offices
- Gages
- Involve local colleges
- Community trash drop-offs

Welch, WV

Flooding

- Debris buildup – bridges
- Trash – manmade and natural

Environmental

- Priority list – Region I
    - Water supply
    - Water quality
    - Waste water/sewer
- Project packages
- Fieldwork – line locations (water lines) – Bureau of Public Health (GIS info)
- Siltation, debris, RR bridges (last two floods)
- Wastewater coalition (EDA), DEP orders/fines, consent decree, CVI data – Gary
- $500,000 block grant
- Individual homeowner to get IDI issues
- Are there any self help programs? – Sewers backing up, Coalwood
- Debt forgiveness
- Outreach – trash, low water crossings

Lousia, KY

Flooding

- Development causing some flooding issues
- Blaine Creek at Rt.32 (around 14ft. mark)

Recreational

- Falls campground – At max flow, there is backup (flash flooding)
- Yatesville road flooding – resolved
- Boat/river access

Environmental

- Levisa Fork – Trees and stream bank erosion
- Subdivisions – Causing stream bank erosions
- Small stream issues – NRCS, sewer issues (Section 14)
- Water quality issues
- Some trash debris issues
- Upstream siltation
- Erosion – gas line exposure (60ft.)
- Water quality has improved at lake

Other

- Lake had done education/outreach for youth

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APPENDIX G

FEMA'S COMMUNITY RATING SYSTEM (CRS) BROCHURE

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National Flood Insurance Program

Community Rating System

A Local Official's Guide to

Saving Lives

Preventing Property Damage

Reducing the Cost of Flood Insurance

FEMA 573

FEMA

How the Community Rating System Works

Every year, flooding causes hundreds of millions of dollars' worth of damage to homes and businesses around the country. Standard homeowners and commercial property policies do not cover flood losses. So, to meet the need for this vital coverage, the Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP).

The NFIP offers reasonably priced flood insurance in communities that comply with minimum standards for floodplain management.

The NFIP's Community Rating System (CRS) recognizes community efforts beyond those minimum standards by reducing flood insurance premiums for the community's property owners. The CRS is similar to — but separate from — the private insurance industry's programs that grade communities on the effectiveness of their fire suppression and building code enforcement.

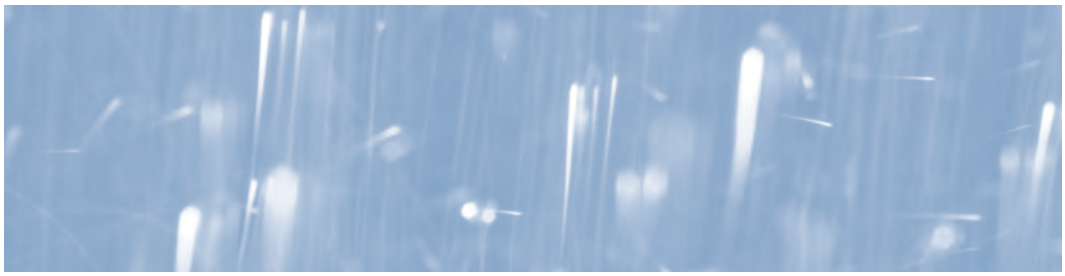
CRS discounts on flood insurance premiums range from 5% up to 45%. Those discounts provide an incentive for new flood protection activities that can help save lives and property in the event of a flood.

To participate in the CRS, your community can choose to undertake some or all of the 18 public information and floodplain management activities described in the *CRS Coordinator's Manual*.

You're probably already doing many of these activities. To get credit, community officials will need to prepare an application documenting the efforts.

The CRS assigns credit points for each activity. Table 2 lists the activities and the possible number of credit points for each one. The table also shows the average number of credit points communities earn for each activity. These averages may give a better indication than the maximums of what your community can expect.

To be eligible for a CRS discount, your community must do Activity 310, Elevation Certificates. If you're a designated repetitive loss community, you must also do Activity 510,



Floodplain Management Planning. All other activities are optional.

Based on the total number of points your community earns, the CRS assigns you to one of ten classes. Your discount on flood insurance premiums is based on your class.

For example, if your community earns 4,500 points or more, it qualifies for Class 1, and property owners in the floodplain get a 45% discount. If your community earns as little as 500 points, it's in Class 9, and property owners in the floodplain get a 5% discount. If a community does not apply or fails to receive at least 500 points, it's in Class 10, and property owners get no discount.

Table 1, below, shows the number of points required for each class and the corresponding discount.

Table 1:

How much discount property owners in your community can get

Rate Class	Discount SFHA*	Discount Non-SFHA**	Credit Points Required
1	45%	10%	4,500 +
2	40%	10%	4,000 – 4,499
3	35%	10%	3,500 – 3,999
4	30%	10%	3,000 – 3,499
5	25%	10%	2,500 – 2,999
6	20%	10%	2,000 – 2,499
7	15%	5%	1,500 – 1,999
8	10%	5%	1,000 – 1,499
9	5%	5%	500 – 999
10	0%	0%	0 – 499

** Special Flood Hazard Area*

*** Preferred Risk Policies are available only in B,C, and X Zones for properties that are shown to have a minimal risk of flood damage. The Preferred Risk Policy does not receive premium rate credits under the CRS because it already has a lower premium than other policies. Although they are in SFHAs, Zones AR and A99 are limited to a 5% discount. Premium reductions are subject to change.*

Table 2:

What You Can Do to Get Credit

The CRS grants credit for 18 different activities that fall into four series:

Series 300	Public Information	Maximum Points*	Average Points*
	This series credits programs that advise people about the flood hazard, flood insurance, and ways to reduce flood damage. The activities also provide data that insurance agents need for accurate flood insurance rating.		
310	**Elevation Certificates** • Maintain FEMA elevation certificates for new construction in the floodplain. (At a minimum, a community must maintain certificates for buildings built after the date of its CRS application.)	162	69
320	**Map Information Service** • Provide Flood Insurance Rate Map (FIRM) information to people who inquire, and publicize this service.	140	138
330	**Outreach Projects** • Send information about the flood hazard, flood insurance, flood protection measures, and/or the natural and beneficial functions of floodplains to flood-prone residents or all residents of a community.	380	90
340	**Hazard Disclosure** • Real estate agents advise potential purchasers of flood-prone property about the flood hazard. • Regulations require notice of the hazard.	81	19
350	**Flood Protection Information** • The public library and/or community's website maintains references on flood insurance and flood protection.	102	24
360	**Flood Protection Assistance** • Give inquiring property owners technical advice on how to protect their buildings from flooding, and publicize this service.	71	53
	Series 300 Total	936	393

*Maximum and average points are subject to change. See the current *CRS Coordinator's Manual* for the latest information.

Series 400	Mapping and Regulations	Maximum Points*	Average Points*
	This series credits programs that provide increased protection to new development.		
410	**Additional Flood Data** • Develop new flood elevations, floodway delineations, wave heights, or other regulatory flood hazard data for an area not mapped in detail by the flood insurance study. • Have a more restrictive mapping standard.	1,346	86
420	**Open Space Preservation** • Guarantee that currently vacant floodplain parcels will be kept free from development.	900	191
430	**Higher Regulatory Standards** • Require freeboard. • Require soil tests or engineered foundations. • Require compensatory storage. • Zone the floodplain for minimum lot sizes of 1 acre or larger. • Require coastal construction standards in AE Zones. • Have regulations tailored to protect critical facilities or areas subject to special flood hazards (for example, alluvial fans, ice jams, subsidence, or coastal erosion).	2,740	166
440	**Flood Data Maintenance** • Keep flood and property data on computer records. • Use better base maps. • Maintain elevation reference marks.	239	79
450	**Stormwater Management** • Regulate new development throughout the watershed to ensure that post-development runoff is no worse than pre-development runoff. • Regulate new construction to minimize soil erosion and protect or improve water quality.	670	98
	Series 400 Total	5,895	620

Series 500	Flood Damage Reduction	Maximum Points*	Average Points*
	This series credits programs that reduce the flood risk to existing development.		
510	**Floodplain Management Planning** • Prepare, adopt, implement, and update a comprehensive flood hazard mitigation plan using a standard planning process. (This is a minimum requirement for all repetitive loss communities.)	359	115
520	**Acquisition and Relocation** • Acquire and/or relocate flood-prone buildings so that they are out of the floodplain.	3,200	213
530	**Flood Protection** (Protection of existing floodplain development by floodproofing, elevation, or minor structural projects.)	2,800	93
540	**Drainage System Maintenance** • Conduct periodic inspections of all channels and retention basins, and remove debris as needed.	330	232
Series 500	Total	6,689	653

Series 600	Flood Preparedness	Maximum Points*	Average Points*
	This series credits flood warning, levee safety, and dam safety projects.		
610	**Flood Warning Program** • Provide early flood warnings to the public, and have a detailed flood response plan keyed to flood crest predictions.	255	93
620	**Levee Safety** • Maintain existing levees not otherwise credited in the flood insurance rating system that provide some flood protection.	900	198
630	**Dam Safety** (All communities in a state with an approved dam safety program receive some credit.)	175	66
Series 600	**Total**	**1,330**	**357**
All Series	**Total**	**14,850**	**2,023**

Extra Credit

Your community can get extra credit points — in addition to the points listed in the table — if you coordinate your activities through a comprehensive floodplain management plan. Also, if your community faces growth pressures, the mapping and regulation activities in Series 400 receive extra credit. See the *CRS Coordinator's Manual* for full details.

Many communities can qualify for what the CRS calls "uniform minimum credit," based on the activities a state or regional agency implements on behalf of its communities. For example, some states have disclosure laws eligible for credit under activity 340, Flood Hazard Disclosure. Any community in those states can receive the uniform minimum credit.

Your community may want to consider floodplain management activities not listed in the *CRS Coordinator's Manual*. You should evaluate these activities for their ability to increase public safety, reduce property damage, avoid economic disruption and loss, and protect the environment. In addition, you can request a review of these activities to determine whether they should be eligible for CRS credit. FEMA welcomes innovative ways to prevent or reduce flood damage.

How to Apply

Participation in the CRS is voluntary. If your community is in full compliance with the rules and regulations of the NFIP, you may apply. There's no application fee, and all CRS publications are free.

Your community's chief executive officer (that is, your mayor, city manager, or other top official) must appoint a CRS coordinator to handle the application work and serve as the liaison between the community and FEMA. The coordinator should know the operations of all departments that deal with floodplain management and public information. And the coordinator should be able to speak for the community's chief executive officer.

The first step in the application process is to get a copy of the CRS Application, which contains all the instructions and procedures you need for preparing and submitting your community's initial application for a CRS classification. The CRS Application includes easy-to-follow worksheets that provide credits for applicable activities. The CRS Application also identifies the documentation you must submit to support the credits you are requesting.

You may also want to order a copy of the *CRS Coordinator's Manual*, which describes the program in full and provides specific information, including eligible activities, required documentation, and resources for assistance.

Your designated CRS coordinator should fill out and submit your application. Help is also available through the contact information below. The CRS will verify the information and arrange for flood insurance premium discounts.

To order CRS publications at no charge, fax the order form on the following page to 317-848-3578, or mail to the address below. You can also e-mail your request to **nfipcrs@iso.com.** Both the CRS Application and the *CRS Coordinator's Manual* are also available at FEMA's CRS Resource Center website — **www.training.fema.gov/emiweb/crs.**

For more info, write, phone, or fax:

NFIP/CRS
P.O. Box 501016
Indianapolis, IN 46250-1016
Telephone: 317-848-2898
Fax: 317-848-3578
E-mail: nfipcrs@iso.com

Order Form

Fax to: 317-848-3578

Please send me these CRS publications:

No. of Copies	Document
_____	*CRS Coordinator's Manual*
_____	CRS Application

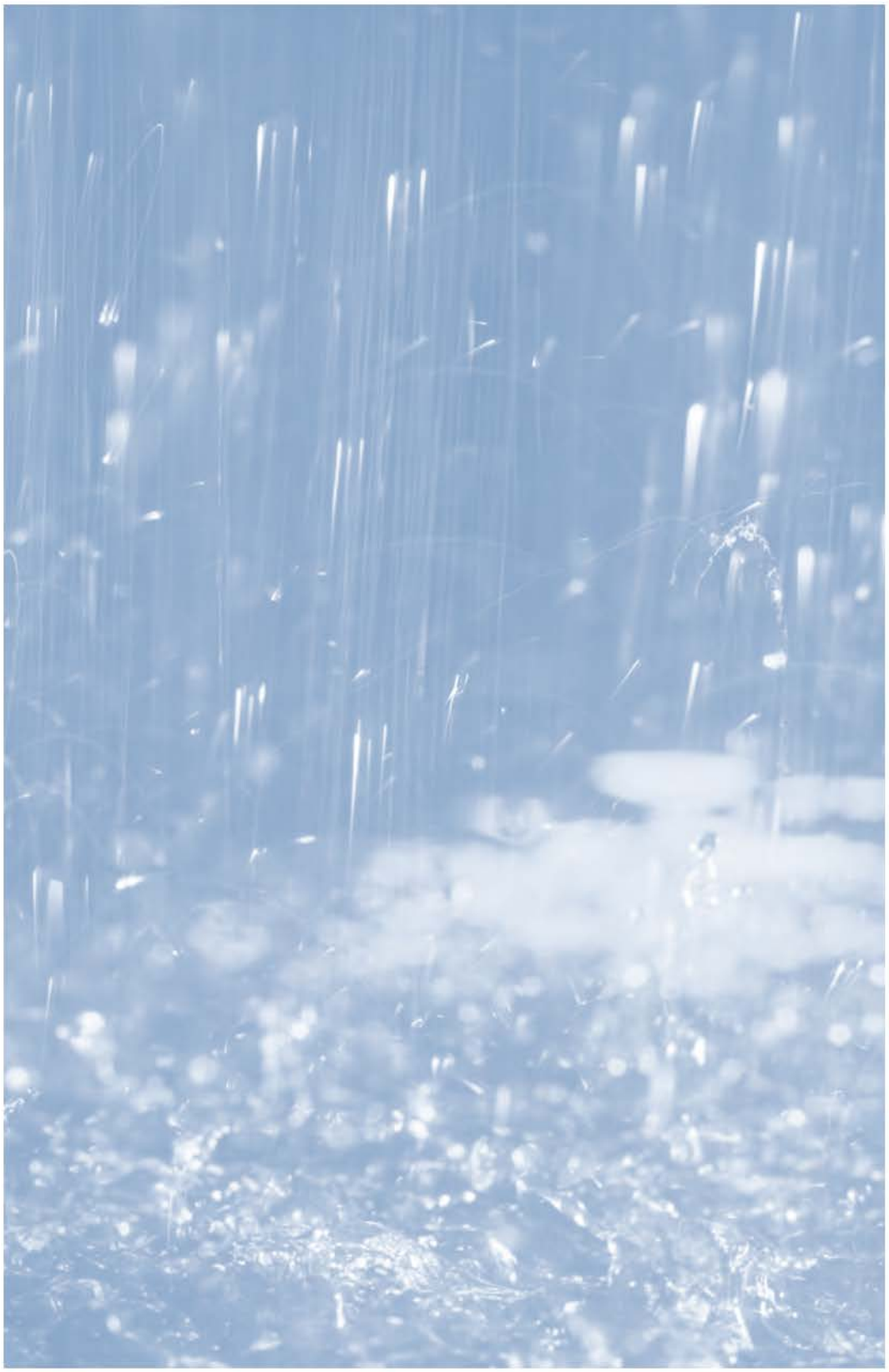
Name _____ Phone _____

Title _____

Street _____

City _____ State _____ ZIP _____

Community Name _____ NFIP Number _____
(if applicable) (if applicable)



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