Appendix D
DETAILED AFFECTED ENVIRONMENT DATA

Affected Environment—The environmental impact statement shall succinctly describe the area(s) to be affected or created by the alternatives under consideration. (40 CFR 1502.15).

This appendix presents the details of the affected environment of the three watersheds analyzed for cumulative impacts in the EWP Program PEIS, the six rural communities analyzed for socioeconomic and related human impacts, and the additional sites evaluated for aquatic, wetland, floodplain, riparian, and terrestrial community impacts.

D.0 INTRODUCTION

The typical EWP Program watershed restoration practice is installed in a relatively small watershed (less than 400 square miles), often in the upper reaches of the watershed, and usually in a rural community. Exceptions occur, such as the case of the 1993 Upper Mississippi floods where work was done on the mainstem river's levees and the Eighth Street Burn project on the rural outskirts of Boise, Idaho. Nevertheless, small watersheds and rural communities are the focus of the impacts analysis for this PEIS. It evaluates individual practices and multiple-practice impacts at project sites for biological and ecological impact, impact of these projects on the local communities, and cumulative impacts of EWP Program projects and all other activities in major (8-digit) watersheds.

The analysis sites were selected from EWP Program work completed in the 50 states and the territories to reflect these factors:

- A variety of different project types that would represent the range of watershed impairments and EWP Program restoration practices
- A range of geography, topography, and climate, representing influences of different weather and terrain and frequencies of various disaster types
- A range of rural communities, from small farms to rural portions of metropolitan areas
- A range of watershed influences, from relatively undeveloped to developed
- A good source of environmental data about each site and its watershed.

The selected sites, rural communities, and watersheds used in the cumulative effects analysis are listed in Table D.0-1. Fifteen project sites in 12 locations were selected to represent various impairments and typical practices. Six locations represent the range of rural community types. Three locations represent the cumulative effect types, where activities throughout the watershed were factored into the analysis.

Table D.0-1 EWP Program Project sites where impacts on the biotic community, human community, and cumulative watershed were analyzed

Location	Impacts of EWP Program Practices on Biotic Communities	Impacts of EWP Program Projects on Human Resources of Rural Communities	Impacts of EWP Program and Other Actions on Watersheds and Economic Regions
Boise Foothills north of Boise, ID	Burn Area on Watershed Above City	Recent Developments in Watershed and City	Boise River Watershed Ada County Region
Buena Vista, VA (small city on the Maury River)	4 Streams Flowing From Watershed Above City	City of Buena Vista	Maury River Watershed Rockbridge County Region
East Nishnabotna River Fremont Co. Montgomery Co., IA	3 Sites on River and Tributaries Easements	City of Shenandoah, IA, and Nearby Farms Easements	East Nishnabotna Watershed Fremont Co.
Bethel Road site, Hall Co., GA	Tornado Debris in Stream	Two Small Farms in Rural Community	
Rocky Run, Rockingham Co., VA	Streambank Repair Site Hypothetical Easement	Cluster Community of Rocky Run	
Rose River site, Criglersville, Madison Co., VA	Rock Weirs Hypothetical Easement	Hypothetical Easement	
San Lorenzo River - Santa Cruz County, CA	Soil-Bioengineering to Protect Banks		
Dry River, VA	Switzer Dam, Spillway Damaged by Hurricane Fran		
Antelope Valley, CA	Drought with Life-threatening Sandstorms		
Medicine Creek Livingston Co., MO	Setback Levee with Floodplain Easement		
Platte River Platte Co., MO	Floodplain Easement		
Missouri River St. Charles Co., MO	Sediment Deposition Removal		
Plumtree Avery Co., NC	Fluvial Geomorphology		
Clarendon, TX	Sewage Treatment Plant on Floodplain		
Bauxite Natural Areas, AR	Damage From Tornado		
Alexander, AR	Household Debris From Tornado		

D.1 CUMULATIVE IMPACTS OF EWP PROGRAM PRACTICES ON WATERSHEDS

EWP Program practices carried out as a result of sudden impairments in three example watersheds —the Buena Vista-Maury in Virginia, the Eighth Street Burn Area-Lower Boise in Idaho, and the East Nishnabotna in Iowa——were chosen for cumulative impact analysis. These were selected because (explained more fully in Appendix A) they include the best examples of the range of possible EWP Program practice situations. An intensive analysis of cumulative impacts in those watersheds was preferable to a more cursory examination of all example watersheds. Buena Vista and Boise represented the use of EWP Program practices in areas of potentially high interaction with a variety of land uses because of their urban settings and steep-slope environments. East Nishnabotna represented an almost totally agricultural land use.

The Virginia and Idaho watersheds in which the EWP Program practices were carried out (USGS 12-digit watersheds) and the larger 8-digit watersheds evaluated by EPA were relevant as contexts for evaluation. The importance of setting watershed and resource boundaries in the cumulative impact analysis is discussed in Appendix A.

D.1.1 Boise, Idaho – Eighth Street Burn Area-Lower Boise River Watershed

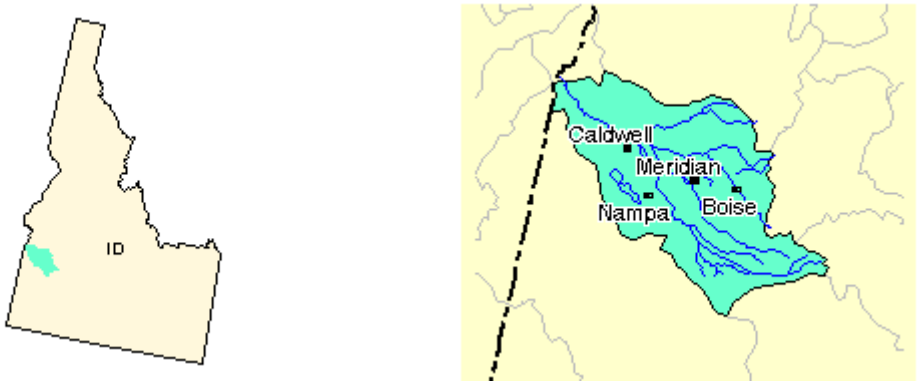

Fig. D.1-1 Location map and watershed configuration of Lower Boise
USGS HUC Unit 17050114, overall EPA watershed rating: 5

Called the Eighth Street Burn, this area is part of what is known as the Boise Front. Of its approximately 15,300 acres, 4,180 acres is Bureau of Land Management (BLM) administered public land, 2,120 acres is state of Idaho land, 3,160 acres is Boise National Forest land, and the remaining 5,840 acres split among private ownership, the City of Boise, and Ada County (BLM, et al., 1996).

D.1.1.1 Disaster Event

On August 26, 1996, a human-caused wildfire burned essentially all vegetation on 15,300 acres of the Boise foothills, severely impairing the area's ability to retard runoff (Fig. D.1-1). In the

aftermath, an NRCS interagency team estimated that as little as a two-year precipitation event could result in debris torrents and flooding of the 100-year floodplain. The team based its estimate on the experience of similar flooding after a similar fire in the area in 1959 (BLM, et al., 1996).

D.1.1.2 Site Description

The area is primarily shrub steppe habitat in the foothills, with Douglas fir stands on the upper slopes. These communities provided cover and forage for numerous game and nongame species, and were a particularly critical habitat for deer and elk. The area affected by the fire contains crucial winter habitat for more than 700 mule deer and more than 200 elk. The area is known also for its biodiversity; it provides both home range and migratory routes for approximately 250 species of wildlife. In addition, the area also contains the habitat of several plant and animal species considered "sensitive" by BLM and "species of special concern" by the state of Idaho (BLM, et al., 1996).

Fig. D.1-2 Eighth Street Burn area after critical area treatment

The area is of high scenic and recreation value, as well. The Boise Front is the scenic backdrop for the State Capitol and offers recreational opportunities for more than one-third of the state's population. The fire affected 37 miles of the area's 75 miles of hiking trails (BLM, et al., 1996) (see Fig. D.1-3).

Of principal concern was the Boise Front watershed's susceptibility to catastrophic erosion and flooding. The combination of steep slopes and highly erodible granitic soils in more than 90 percent of the burn area make the area extremely susceptible to erosion with the loss of vegetative cover resulting from the fire (See Fig. D.1-2). As many as 4,500 residents within the floodplain, as well as the state capitol, medical facilities, utilities, schools, and telecommunications, were at risk from flooding as a result of the fire. The potential loss from a 100-year thunderstorm was estimated at $144 million (BLM, et al., 1996). The concerns expressed about catastrophic erosion and flooding deemed it appropriate to perform the cumulative impact analysis in the Lower Boise River watershed.

Fig. D.1-3 Boise, Idaho Eighth Street Burn EWP Program site map, outlined in red

D.1.1.3 Baseline Environmental and Socioeconomic Conditions in the Watershed and the Communities

Baseline environmental conditions encompass both biological and socioeconomic situations. Biological conditions interact within the immediate burn area watersheds (Cottonwood, Crane, Curlew, and Dry Creeks, and Freestone and Hulls Gulches—11-digit HUCs) and into the Lower Boise watershed (8-digit HUC). Socioeconomic and other human resource interactions occur both within and outside the watersheds. Baseline biological environmental conditions are summarized in Table D.1-1. Baseline socioeconomic conditions for the Boise communities are summarized in Table D.1-2.

Table D.1-1 Eighth Street Burn Area and Lower Boise Watershed Baseline Environmental Conditions

Watershed Metric	EPA Rating and Description
Overall Watershed Quality	5 – More Serious Water Quality Problems, Low Vulnerability to Stressors
Designated Use	Insufficient Data
Fish and Wildlife Consumption Advisories	Insufficient Data
Source Water Indicators (Drinking Water)	Insufficient Data
Contaminated Sediments	Better – Low Degree of Concern
Ambient Water Quality – Toxics	Less Serious – 11 to 50%, Observations Exceeding Selected Reference Level
Ambient Water Quality – Conventional	Better – 0 to11%, Exceeding Selected Reference Level
Wetland Loss	Less Serious – Moderate Level of Loss
Aquatic/Wetland Species at Risk	Low – 1 Species Known to be at Risk
Pollutant Loads – Toxics	Low – No Aggregate Loads in Exceedance
Pollutant Loads – Conventional	Low – No Aggregate Loads in Exceedance
Urban Runoff Potential	Moderate – 1 to 4%, Land Above 25% Imperviousness
Agricultural Runoff	Moderate – Moderate Level of Potential
Population Change	High – Greater Than 7% change
Hydrologic Modification by Dams	High – Moderate Volumes of Impounded Water
Estuarine	Not Applicable
Atmospheric Deposition of Nitrogen	Low – <=7 kg/ha/yr

The information is drawn from the EPA characterization of the Lower Boise Watershed, USGS HUC 17050114, and applies to both watersheds unless otherwise noted (EPA, 1999b).

Table D.1-2 Baseline Socioeconomic Statistical Characterization of the Boise Affected Environment

Characteristic	Eighth Street Fire Community (1)	Boise City	Ada County	Watershed Region (2)
Population Size	14,579	125,738	205,775	298,950
Land Area (sq. mi.)	118.7	46.1	1,055.0	2,539
Rural Population (%)	12.2	0.0	12.1	23.9
Minority Composition (%)	4.3	5.5	5.2	8.19
Poverty (% at or below)	6.5	9.4	8.8	10.7
Per Capita Income	$22,200	$15,208	$14,268	$12,916
Total Employment	7,764	65,815	104,423	144,836
Principal Economic Sectors	Trade, Services Manufacturing	Trade, Services, Manufacturing	Trade, Services, Manufacturing	Trade, Services, Manufacturing
Agricultural Acreage	(3)	(4)	232,879	901,438
Average Farm Size (acres)	(3)	(4)	198	247
Principal Crops	(3)	(4)	Cattle, Poultry, Wheat Barley, Sugar beets, Hay	Cattle, Wheat, Barley, Beans
Housing – Median Year Constructed	1971	1970	1973	(3)
Housing – Median value	$97,600	$67,600	$70,400	(3)
Housing – Lived in Same House Since 1985 (%)	47.0	41.3	44.1	(3)

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.

Notes:

(1) Aggregated from Census Tracts 0101, 0002, and 0007.
(2) Not determined for this level.
(3) Urbanized area – no agricultural production.
(4) Aggregated at the county level.

D.1.2 Buena Vista, Virginia — Maury River Watershed

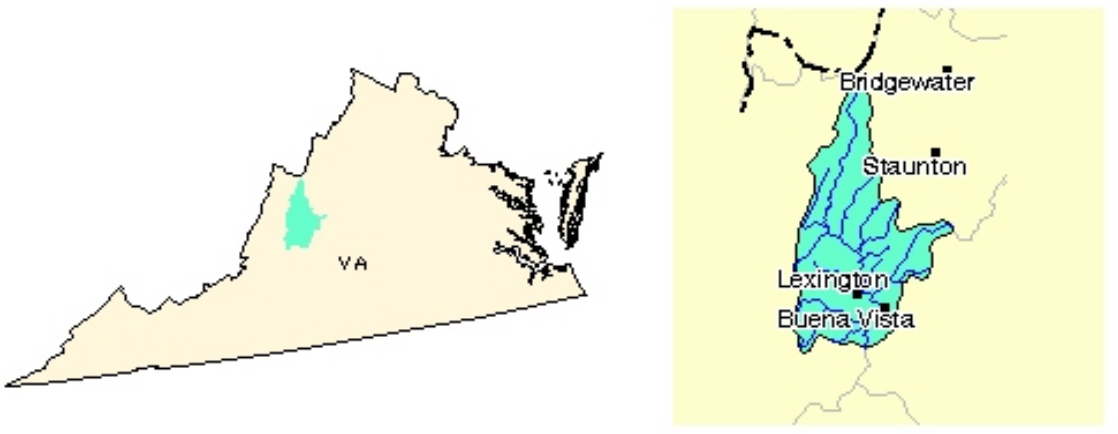

Fig. D.1-4 Location map and watershed configuration of Maury River Watershed USGS HUC Unit 02080202, EPA overall watershed rating: 3

The City of Buena Vista is in eastern Rockbridge County between the east bank of the Maury River and the west slope of the Blue Ridge Mountains adjacent to George Washington and Jefferson National Forests (GWJNF)(see Fig. D.1-4). Four streams that drain the National Forests' slopes flow through town and enter the Maury River.

D.1.2.1 Disaster Event

In September 1996, rainstorms from Hurricane Fran swept through the area and flooded the four tributary streams that run through Buena Vista (Fig. D.1-5). Heavy loads of debris choked stream outlets, leaving the town under several feet of water. Severe erosion along streambanks threatened a number of homes and businesses.

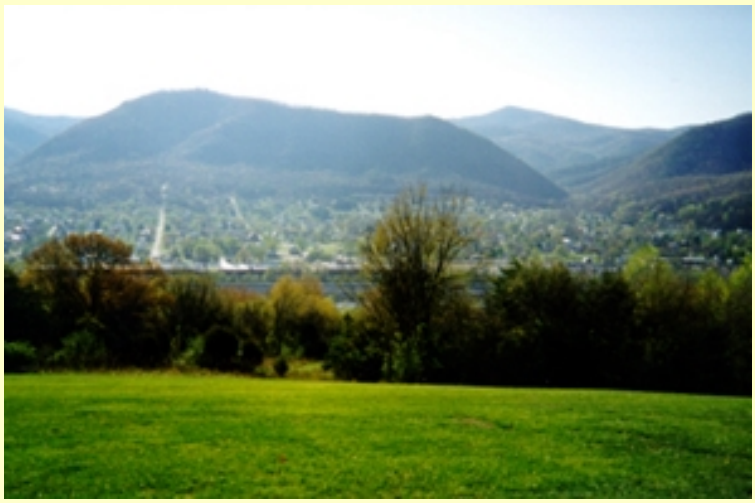

Fig. D.1-5 City of Buena Vista with George Washington and Jefferson National Forests in background

D.1.2.2 Site Description

The Buena Vista watershed's four streams, Chalk Mine Run, Indian Gap Run, Noel's Run, and Pedlar Gap Run, flow to the west off the Blue Ridge Mountains through the city and into the Maury River along the city's waterfront. All originate in Forest Service lands above the city in the Blue Ridge Mountains. The watershed's 11,850 acres consists of 8,900 acres of forestland (most of which is in the GW&JNF), 2,850 acres of urban land, and 100 acres of grassland (there is no cropland in the watershed). Ownership of land in the watershed is 74.3 percent federal, 24.2 percent private, and 1.5 percent city.

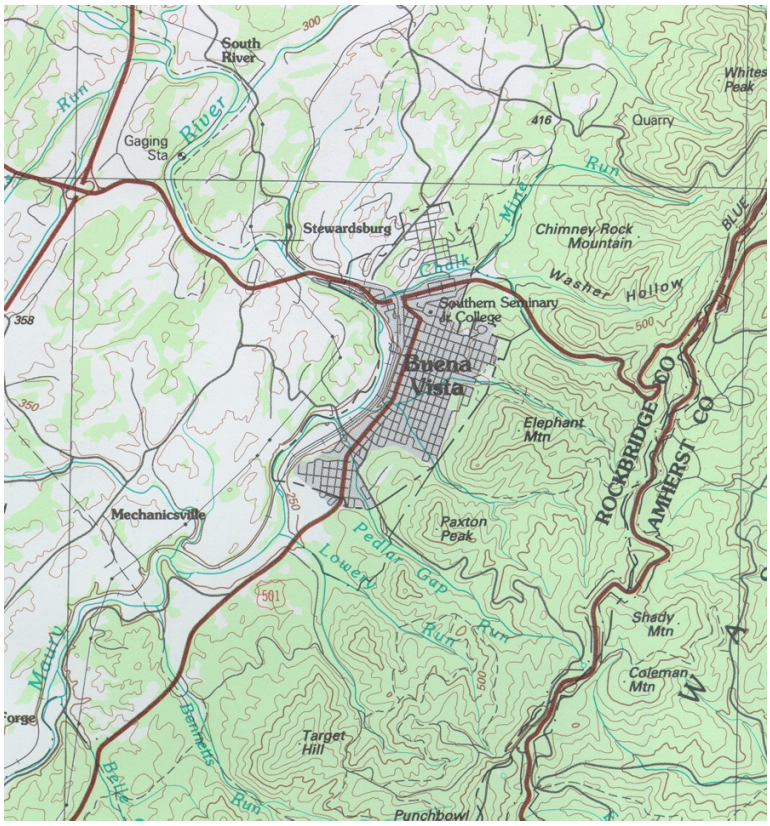

Fig. D.1-6 Buena Vista, Virginia EWP Site Map – Extensive 1995 flooding occurred in four streams that run through the city.

The Buena Vista watershed is a subbasin of the Maury River Watershed (USGS HUC 02080202), which originates about 40 miles north of Buena Vista on the eastern slopes of the Appalachian Mountains (see Fig. D.1-6). The Maury River has a drainage area of 835 square miles, of which 649 square miles are above Buena Vista and 184 square miles are downstream of the city (Rockbridge County, 1996).

The cumulative impacts analysis was first performed on that watershed because of the concentration of other connected, similar and cumulative actions on the stream reaches of the Buena Vista watershed (see *Table 5.4-1 –Cumulative Actions–Buena Vista Watershed*). The NRCS chose to perform the cumulative impact analysis in the Maury River watershed for several reasons: the relationship of turbidity and sedimentation to warm water fisheries in the lower reaches of the Buena Vista watershed; the location of the Buena Vista watershed in relation to the Maury River watershed; and the preponderance of agricultural land in the latter.

Where it flows through the City of Buena Vista, the Maury River is about 150 feet wide, approximately 1 to 4 feet deep, and has an average gradient drop of 10 ft/mi. Environmentally sensitive closed drainage areas, related to limestone bedrock formations, occur in the Maury River watershed (Rockbridge County, 1996) but have not been identified in the Buena Vista watershed. In these areas, streams discharge into bedrock formations instead of a river, eventually reaching groundwater. Evidence of both prehistoric and historic occupation of the floodplain of the Maury River has been found in Buena Vista (USACE, 1990). There are no dams on the four streams and no wetlands or threatened and endangered species have been identified in the watershed (NRCS, 1999).

Flooding has been a consistent problem in the Buena Vista watershed and particularly within the City of Buena Vista itself since the late 1700s when the area became settled (Rockbridge County, 1996). This is due to the location of much of the city's business and residential districts within the floodplain, extensive storm runoff from the steep watershed east of the city, and restrictions to that flow created by undersized culverts and bridges on the railroad lines along the Maury River. Extensive flooding resulting from Hurricanes Camille (1969) and Agnes (1972), as well as from more localized storms in 1985 and 1995, led to extended planning, and the construction in 1997 of a floodwall between the city and the Maury River by the USACE (USACE, 1990, 1992).

Since 1997, the floodwall has protected the city from flooding that originates in the upstream Maury River watershed. The floodwall, however, was not designed to alleviate the problem of flooding from the local watershed. Accordingly, Public Law 566 Watershed Plan/EIS was recently completed for the four streams in the watershed (NRCS, 1999). In combination with the floodwall, the Public Law 566 project is designed to eliminate the city's long-standing flooding problems.

The current flooding trend in the Buena Vista watershed culminated with Hurricane Fran in 1996. After Fran, FEMA, HUD, the Virginia Department of Emergency Services, the City of Buena Vista, and numerous private parties performed a variety of emergency restoration and mitigation projects. In the absence of performing the EWP Program practices and these other flood remediation actions, authorities feared that flooding and watershed damage would continue to occur unabated in the watershed (NRCS, 1999).

The EWP Program actions for which this cumulative impacts analysis is being performed are the same practices that are analyzed for direct and indirect impacts in Section 5.2.2. These practices involved using backhoes to remove cobble and sediment debris from Chalk Mine Run, Pedlar Gap Run, and Indian Gap Run, hauling the debris from the sites in dump trucks, and disposing of the debris by reusing it to stabilize work roads and construction staging areas. The biologic effects of these practices are discussed in Section 5.2.2.

D.1.2.3 Enduring Conservation Practices in the Maury

There are four enduring conservation practice sites located in the Maury River watershed, all upstream of the City of Buena Vista and on private farms (Fig. D.1-7). The four practices represented are: a diversion, a waste storage pond, an embankment pond, and a grassed waterway. Each of these sites is fully functional and has not failed during their lifespan, even in the heavy rains that caused the severe flooding in Buena Vista. Therefore, hypothetical failures have been analyzed with available information about the sites and the possible environmental effects. On each site, there are no wetlands present, no T&E species are known to exist, nor are any cultural resources present (Flint 1999).

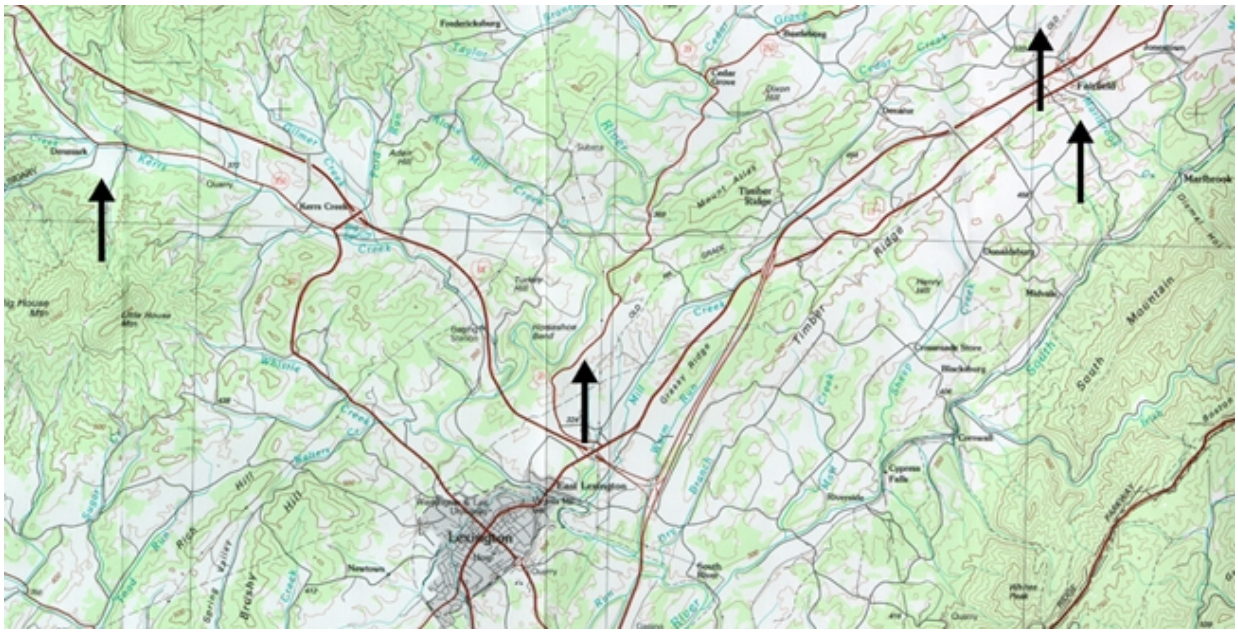

Fig. D.1-7 Maury River Enduring Conservation Practices Site Map. From left to right, a diversion, an embankment pond, an animal waste pond, and a grassed waterway.

The diversion is found on the Goodbar farm just to the south of the town of Denmark. The area is moderately steep, as it is part of the downward slope from Big House Mountain to Kerr's Creek below. The diversion is located away from existing stream channels and protects the downslope croplands from overland flow of rainfall and subsequent erosion. The water is channeled into a waterway and routed around the croplands.

Fig. D.1-8 Example of an embankment pond

An embankment pond is located on the Hickman farm, east of Horseshoe Bend in the Maury River. It is in an upslope area that drains into an unnamed intermittent stream and eventually into the Maury River approximately two miles below. It was built where two hills converge and serves to collect the runoff from each, preventing excessive runoff in the pasture and residences below.

The waste storage pond is found on the Martin farm, to the north of the town of Fairfield. The waste from the dairy on-site is collected and dried within the pond before eventually being applied to agricultural fields. There is no outflow from the pond and no stream channels are located nearby, although intermittent portions of Marlbrook Creek are a quarter of a mile away.

Fig. D.1-9 Example of a waste storage pond

Fig. D.1-10 Example of a grassed waterway

The grassed waterway site is found on the Moore farm to the southwest of the town of Raphine. The waterway routes runoff waters around agricultural land to prevent erosion. The grassy vegetation, a tall fescue, is used to slow flow velocities and prevent erosion of the waterway. The site drains into an unnamed tributary and eventually into Moore's Creek approximately a half mile downstream.

D.1.2.4 Baseline Environmental and Socioeconomic Conditions in the Watershed and the Communities

Baseline environmental conditions include both biological conditions that interact within the Maury River watershed, and socioeconomic and other human resource interactions that occur both within and outside the watershed. Table D.1-3 summarizes baseline biological environmental conditions. Baseline socioeconomic conditions for the Buena Vista and Maury communities are summarized in Table D.1-4.

Table D.1-3 Buena Vista and Maury River Watershed baseline environmental conditions

Watershed Metric	EPA Rating and Description
Overall Watershed Quality	3 – Less Serious Water Quality Problems, Low Vulnerability to Stressors
Designated Use	Less Serious – 50 to 80% meeting all uses
Fish and Wildlife Consumption Advisories	Insufficient Data
Source Water Indicators (Drinking Water)	Less Serious – No Significant Source of Impairment
Contaminated Sediments	Better – Low degree of concern
Ambient Water Quality – Toxics	Better – 0 to 11%, Exceeding EPA Criteria
Ambient Water Quality – Conventional	Better – 0 to 11%. Exceeding EPA Criteria
Wetland Loss	More Serious – High Level of Loss
Aquatic/Wetland Species at Risk	Moderate – 2 Species Known to be at Risk in Maury River Watershed (James spinymussel (Pleurobema collina) and the Dwarf wedge mussel (Alasmidonta heterodon) identified in Maury River watershed)
Pollutant Loads – Toxics	Low – No Aggregate Loads in Exceedance [Siltation and Sedimentation]
Pollutant Loads – Conventional	Low – No Aggregate Loads in Exceedance
Urban Runoff Potential	Moderate to High – NRCS EIS Rates Runoff and Flooding in Urban Floodplain as Major Problem Necessitating its Proposed Action
Agricultural Runoff	Moderate – Moderate Level of Potential Impact
Population Change	Moderate – 0 to 7% Change
Hydrologic Modification by Dams	Moderate – Moderate Levels of Impounded Water
Estuarine	Not Applicable
Atmospheric Deposition of Nitrogen	Less Serious – <=7 kg/ha/yr

The information is drawn from the EPA characterization of the Maury River Watershed, USGS HUC 02080202, and applies to both watersheds unless otherwise noted (EPA, 1999a).

Table D.1-4 Baseline Socioeconomic Statistical Characterization of the Buena Vista Affected Environment

Characteristic	Chalk Mine Run Community (1)	Buena Vista City	Rockbridge County	Watershed Region (2)
Population Size	1,180	6,406	18,350	34,576
Land Area (sq. mi.)	0.7	6.8	599.7	1,344.4
Rural Population (%)	0.0	0.0	100	100
Minority Composition (%)	10.3	4.9	3.9	2.7
Poverty (% at or below)	11.3	14.4	13.6	11.0
Per Capita Income	$8,984	$10,241	$11,287	12,005
Total Employment	(3)	3,149	8,679	16,974
Principal Economic Sectors	(3)	Manufacturing, Trade, Construction	Manufacturing, Trade, Construction	Manufacturing , Trade, Services(5)
Agricultural acreage	(4)	(4)	141,766	476,218(5)
Average Farm Size (acres)			220	271(5)
Principal Crops	(4)	(4)	Cattle, Corn, Soybeans, Hay	Cattle, Chicken, Corn, Wheat, Soy, Hay(5)
Housing – Median Year Constructed	1964	1957	1963	(3)
Housing – Median value	$37,700	$43,300	$54,700	(3)
Housing – Lived in Same House Since 1985 (%)	50.3	62.6	60.7	(3)

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.

Notes:

(1) 1990 Defined by Census Block 9906.98-2.

(2) Defined by Rockbridge County and portions of Bath (blocks 9801-1, 9801-6) and Augusta Counties (blocks 0701-1, 0702-1,0709-1,0710-2,3 and tracts 0708 and 712.98) and does not include the urbanized areas of Buena Vista and Lexington.

(3) Not determined for this level.

(4) Urbanized area – no agricultural production.

(5) Aggregated at the county level for the three counties.

D.1.3 East Nishnabotna River Watershed, Iowa

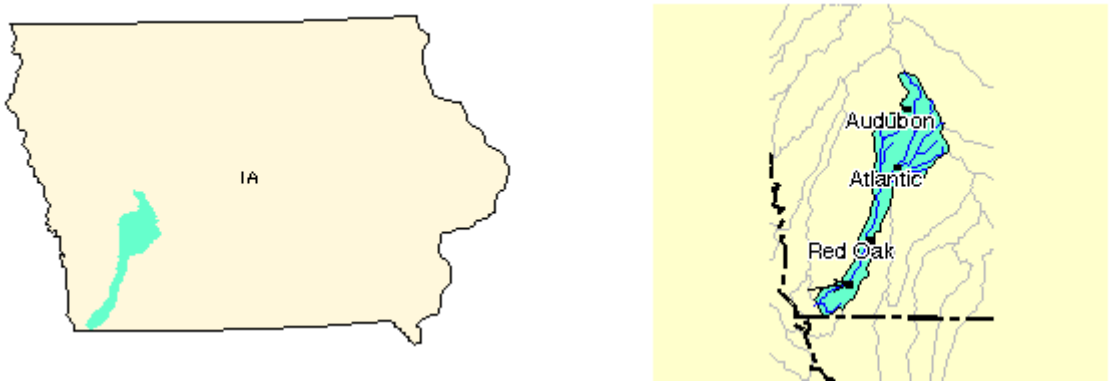

Fig. D.1-11 Location map and watershed configuration of East Nishnabotna Watershed USGS HUC 10240003, Overall EPA watershed rating: 3

The East Nishnabotna River originates between the towns of Manning and Templeton in Carroll County, Iowa. (see Fig. D.1-11) It flows south-southwest for 90 miles through Montgomery, Page, and Fremont counties to its confluence with the West Nishnabotna River, ten miles before they join the Missouri River.

D.1.3.1 Disaster Event

Rains in 1998 caused flooding that impaired streams and levees in Fremont and Montgomery counties. Levee repair in Fremont County and woody debris removal and riprap placement in Montgomery County were conducted under the EWP Program. The biologic effects of these practices are discussed in Chapter 5, Sections 5.2.1, 5.2.2, 5.2.3, and 5.2.4.

D.1.3.2 Site Description

The East Nishnabotna River watershed has an area of 1,133 square miles (see Fig. D.1-12). The area is a gently rolling portion of the Great Plains ecoregion, with 100 to 150 feet of terrain relief from the river valley floors. The watershed is almost completely agricultural. According to the EPA watershed characterization, crops occupy almost all of the land, except for about 11 percent that is covered by forest vegetation, most of which is in the stream valleys (EPA, 1999c). None of the watershed is characterized as urban, although the cities of Sidney, the Fremont County Seat, and Red Oak, the Montgomery County Seat, and a number of other small cities and towns (such as Shenandoah where one of the EWP practices took place) are in the watershed.

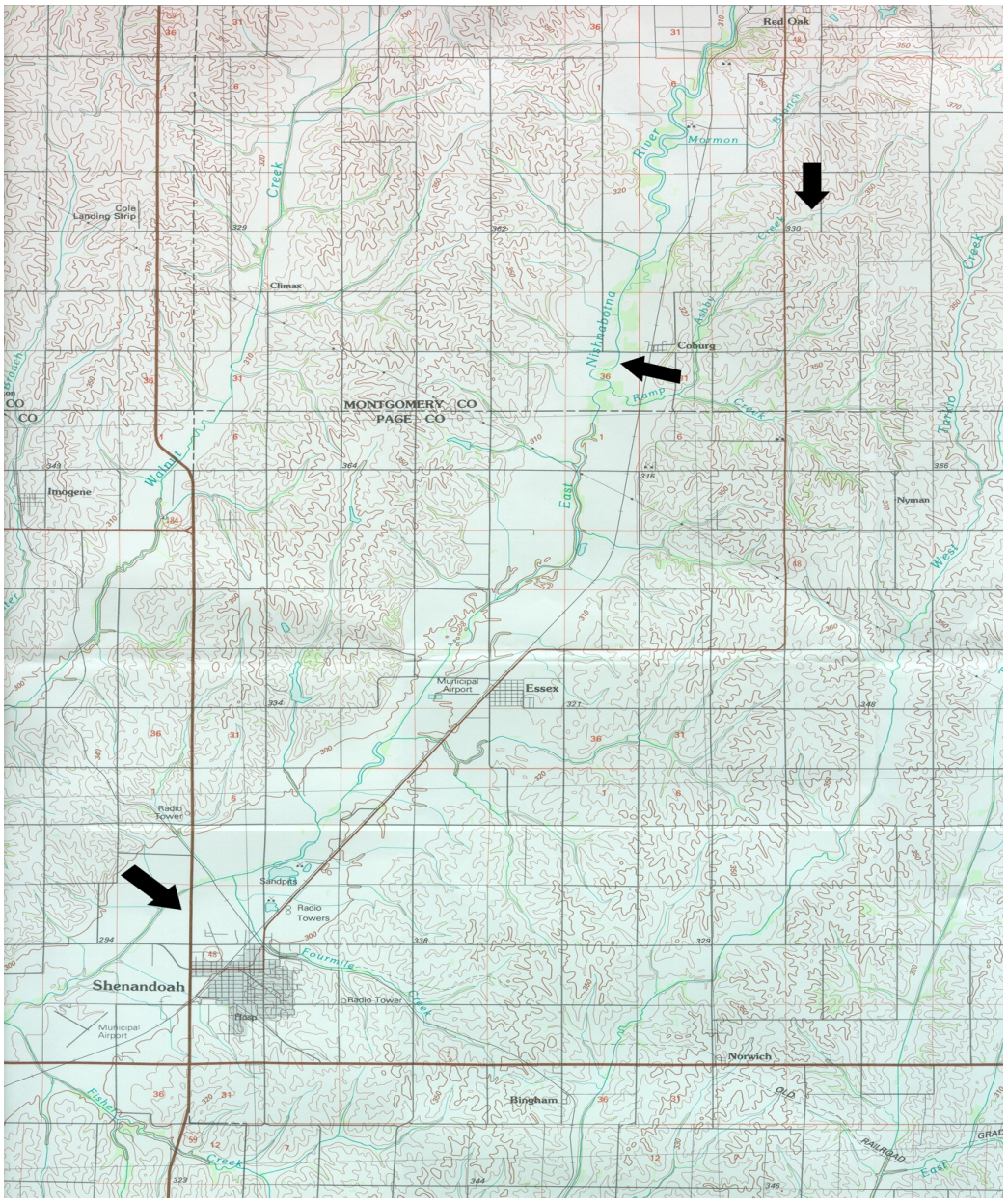

Figure D.1-12 East Nishnabotna River, Iowa, EWP Program site map – Projects shown by arrows

The appropriate watershed for cumulative impact analysis was the entire East Nishnabotna River (8-digit HUC) watershed. EWP Program practices under analysis were performed on the main stem of the river. Particular attention was given, however, both to the specific reaches of the river on which the EWP Program practices took place, and to actions affecting the river floodplain in the reaches above and below the EWP Program practices.

D.1.3.3 Riverton Easement

The Riverton floodplain easement site is located just to the east of the town of Riverton, Iowa, along the East Nishnabotna River (Fig. D.1-11). The tract is approximately 655 acres of lowland and subsequently must be protected by levees (Fig. D.1-13). Historically, the land has been exclusively in crops but has faced levee breaches on the order of every three years, causing the landowner to spend more than a quarter of a million dollars in repairs in addition to substantial NRCS expenditures. In 1999, the property was damaged, prompting the landowner to apply for an EWP easement. This part of the East Nishnabotna is a traditionally problematic area for flood damages and was therefore identified as a priority area for easement purchase. There are also 6 other sites awaiting EWP easement purchase along the East Nishnabotna (Hanson 1999).

Fig. D.1-13 Floodplain easement site, Riverton, Iowa, East Nishnabotna watershed EWP Program Site Map, project location outlined in red

Due to the repeated damage to the property, the site was a good candidate for the easement program. Since the property is at a lower elevation than the surrounding area, it retains water each spring and will be restored as a wetland. There is an existing forested wetland on the northern portion of the property along the river and runoff from the town of Riverton also contributes to the wet conditions. Water control structures and ditch plugs will be constructed to manage areas of varying water depths to promote wetland revegetation and waterfowl habitat, as well as increasing floodwater retention capability. There will be no planting, as the site is too wet, and the vegetation will be allowed to proceed naturally (Hanson 1999).

Once the easement is purchased, the land will be sold to the Iowa Department of Natural Resources via a third party organization to assist in the transfer. The easement will then become part of the Riverton State Game Management Area, a large reserve with several hundred acres of wetland just upstream on the opposite bank. The contiguous area of managed lands will create a large floodplain area and substantial habitat for migratory waterfowl and other species, such as reptiles, amphibians, songbirds, and some fish (Priebe 1999).

D.1.3.3 Baseline Environmental and Socioeconomic Conditions in the Watershed and the Communities

Baseline environmental conditions include both biological conditions that interact within the East Nishnabotna River watershed, and socioeconomic and other human resource interactions that occur both within and outside the watershed. Table D.1-5 summarizes baseline biological environmental conditions. Baseline socioeconomic conditions for the Nishnabotna communities are summarized in Table D.1-6.

Table D.1-5 East Nishnabotna River Watershed EPA Baseline Environmental Conditions

Watershed Metric	EPA Rating and Description
Overall Watershed Quality	3 – Less-Serious Water Quality Problems, Low Vulnerability to Stressors
Designated Use	Less Serious – 50 to 80% Meeting all Uses
Fish and Wildlife Consumption Advisories	Insufficient Data
Source Water Indicators (Drinking Water)	Better – No Significant Source of Water Impairment Identified
Contaminated Sediments	Better – Low Degree of Concern
Ambient Water Quality – Toxics	Insufficient Data
Ambient Water Quality – Conventional	Insufficient Data
Wetland Loss	More Serious – High Level of Loss
Aquatic/Wetland Species at Risk	Insufficient Data
Pollutant Loads – Toxics	Low – No Aggregate Loads in Exceedance
Pollutant Loads – Conventional	Low – No Aggregate Loads in Exceedance
Urban Runoff Potential	Low – 0 to 1% Imperviousness
Agricultural Runoff	High – High Level of Potential Impact
Population Change	Low – No change
Hydrologic Modification by Dams	Moderate – Moderate Levels of Impounded Water
Estuarine	Not Applicable
Atmospheric Deposition of Nitrogen	Less Serious – <=7 kg/ha/yr

The information is drawn from the EPA characterization of the East Nishnabotna River Watershed, USGS HUC 10240003 (EPA, 1999c).

Table D.1-6 Baseline Socioeconomic Statistical Characterization of the East Nishnabotna Affected Environment

Characteristic	Walnut Township Community (1)	Shenandoah City	Fremont County	Page County	East Nishnabotna Watershed Region (2)
Population Size	1,071	5,572	8,226	16,870	20,424
Land Area (sq. mi.)	115.0	3.1	568.4	563.9	862.5
Rural Population (%)	100	0.0	100	36.7	42.1
Minority Composition (%)	0.4	3.2	1.0	2.4%	14.9
Poverty (% at or below)	14.2	16.0	12.2	13.8%	11.0
Per Capita Income	$10,962	$10,954	$10,674	$11,122	$11,787
Total Employment	474	2,494	3,742	7,986	9,517
Principal Economic Sectors	Agriculture, Services, Trade	Trade, Services, Manufacturing	Services, Trade, Agriculture,	Trade, Services, Manufacturing	Trade, Services, Agriculture
Agricultural acreage	(3)	(4)	302,352	318,778	861,230 (5)
Average Farm Size (acres)	(3)	(4)	507	348	405 (5)
Principal Crops	(3)	(4)	Corn, Soybeans, Hogs	Corn, Soybeans, Hogs	Corn, Soybeans, Hogs
Housing – Median Year Constructed	1939	1949	1947	1944	(3)
Housing – Median Value	$32,500	$35,100	$32,000	$33,700	(3)
Housing – Lived in Same House Since 1985 (%)	73.0	59.3	64.7	62.6%	(3)

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.

Notes:
(1) Defined by Census block 9701-1.
(2) Aggregated from portions of Page Co. (Census 9901-3,9901-4,9902, 9903), Fremont Co. (Census 9701-1, 9701-2, 9701--3, 9703-1, 9703-2) and Montgomery Co. (Census 9801- 2, 9801-5, 9802, 9804-1).
(3) Not determined for this level.
(4) Urbanized area – no significant agricultural production.
(5) Aggregated at the county level for Fremont, Page, and Montgomery.

D.2 EWP PROGRAM IMPACTS ON OTHER RURAL COMMUNITIES

D.2.1 Bethel Road, Hall County, Georgia—Debris Removal Site

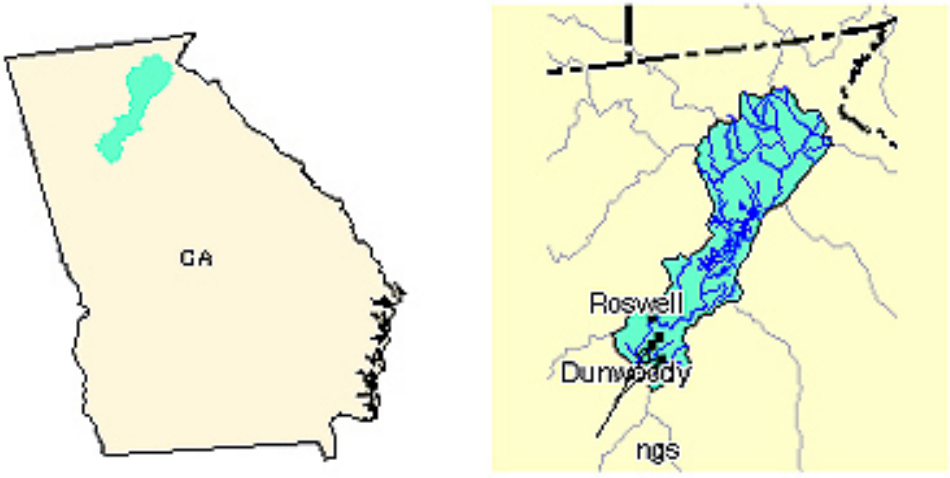

Fig. D.2-1 Location map and watershed configuration of Hall County USGS HUC 03130001, Overall EPA watershed rating: 6

D.2.1.1 Hall County Description and Disaster Event

Hall County is a moderately hilly area in northeastern Georgia in the foothills of the Blue Ridge Mountains, about one hour from metropolitan Atlanta (Fig. D.2-1). Its predominant feature is the Chattahoochee River, which runs into Lake Sidney Lanier, a large reservoir providing the surrounding area with flood control and recreation.

Fig. D.2-2 Backhoe removing woody debris, Hall County, Georgia

Hall County is just over 80 percent rural; however, the county is characterized by ERS classification as a manufacturing-dependent economy, 30 percent or more of total income is derived from manufacturing, but agribusiness is the core industry (Cook, P. and K. Mizer, 1989). Although significantly rural, the county also is the regional center of northeast Georgia for shopping, medical services, and education. It is made up of six incorporated cities that are important for manufacturing, retail, and agriculture.

In 1998, tornadoes swept through Hall County, destroying homes and causing widespread damage in the forested watersheds. Ten sites around the county were identified for EWP

Program work, primarily to remove the massive buildup of woody debris (Fig. D.2-2). One affected area, Bethel Road, is discussed Chapter 4.

Detailed statistics for selected characteristics of the affected environment at the Bethel Road site and at county levels are presented in Table D.2-1.

D.2.1.2 Bethel Road Rural Community

The Bethel Road EWP Program site is in a less densely populated, almost entirely rural community of Hall County (Fig. D.2.1-3), defined by Census block 0002-4 (Census, 1992). Of its population of 2,487, an estimated 131 are classified as rural by residence. Minorities represent less than 1 percent of the community, with no minority householders. This contrasts with the makeup of Hall County as a whole, which is just under 15 percent minority.

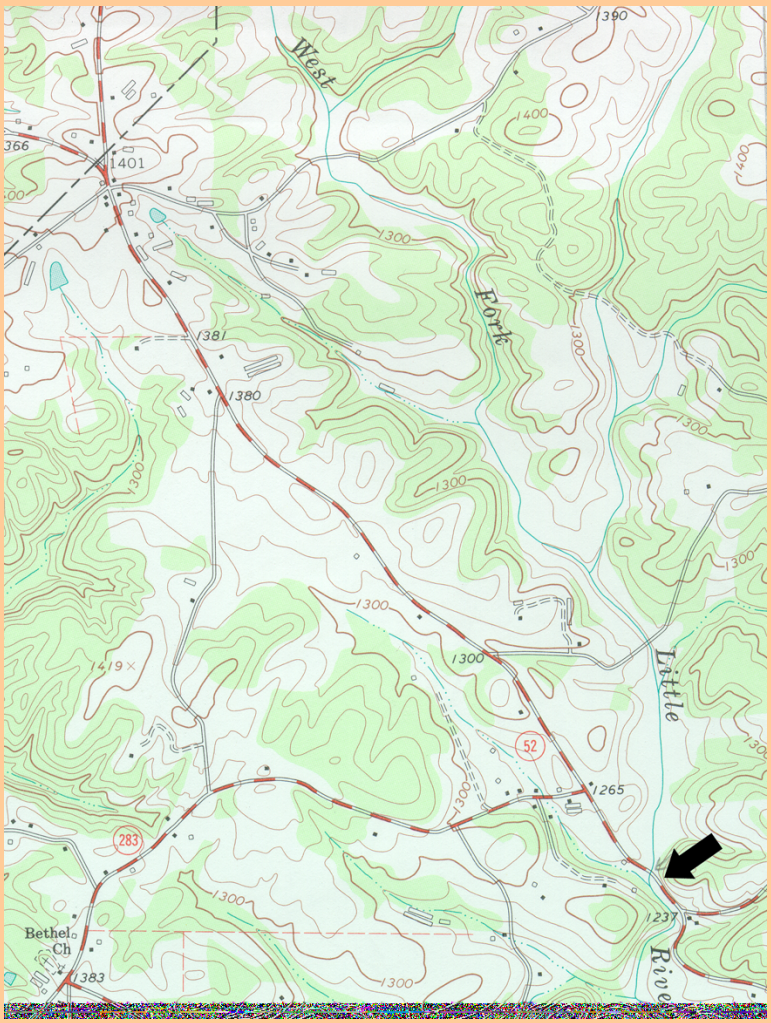

Fig. D.2-3 Bethel Road, Georgia, EWP Program site map with arrow showing project site

All land in the Bethel Road community is used for rural purposes. The main source of income, however, is services-related. An estimated 1,268 people living in the community were employed during 1990. Manufacturing represents the single largest sector of employment, accounting for 27.4 percent of all jobs, while agriculture accounted for only 4.9 percent of total employment.

Table D.2-1 Statistical characterization of the Bethel Road Affected Environment

Characteristic	Bethel Road Community (1)	Hall County
Population Size	2,487	95,428
Land Area (sq. mi.)	16.9	393.7
Rural Population (%)	100	81.08
Minority Composition (%)	0.8	14.21
Poverty (% at or below)	9.7	10.6
Per Capita Income	$12,198	$13,356
Total Employment	1,268	49,052
Principal Economic Sectors	Service	Manufacturing, Trade
Agricultural Acreage	(2)	53,944
Average Farm Size (acres)	(2)	78
Principal Crop	(2)	Cattle, Poultry, Hay
Housing – Median Year Constructed	1,978	1,975
Housing – Median Value	$88,600	$76,300
Housing – Lived in Same House Since 1985 (%)	50.00	51.60

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.

Notes:

(1) Defined by Census Block 9906.98-2.

(2) Not determined for this level.

Of the 892 housing units in the Bethel Road community, 512, or 57.3 percent, were built before 1980. The median year that houses were constructed is 1978, compared with 1975 for the county as a whole. More than fifty percent of the population has lived in Hall County since 1985, indicating a degree of residential stability that is reflected in the Bethel Road community as well. The median value of housing in the Bethel Road community is higher than that of Hall County. There is no significant difference in the poverty level between these two areas.

An example of multiple farms in a less densely populated agricultural area (see Chapter 4), the EWP Program site includes two farms, associated structures, and two local roads (DSR 001-139). The West Fork Little River Watershed, upstream from Bethel Road, experienced light debris (trees and hard wood lumber) blocking the stream channel for 500 feet. Slight to moderate erosion occurred along the sandy soils of the stream banks. The 2,400 feet below the road contained a mixture of heavy and medium deposits of debris. The project consisted of debris removal and streambank stabilization with woody and nonwoody vegetation regrowth.

D.2.2 Rocky Run, Rockingham County, Virginia—Streambank Erosion Site

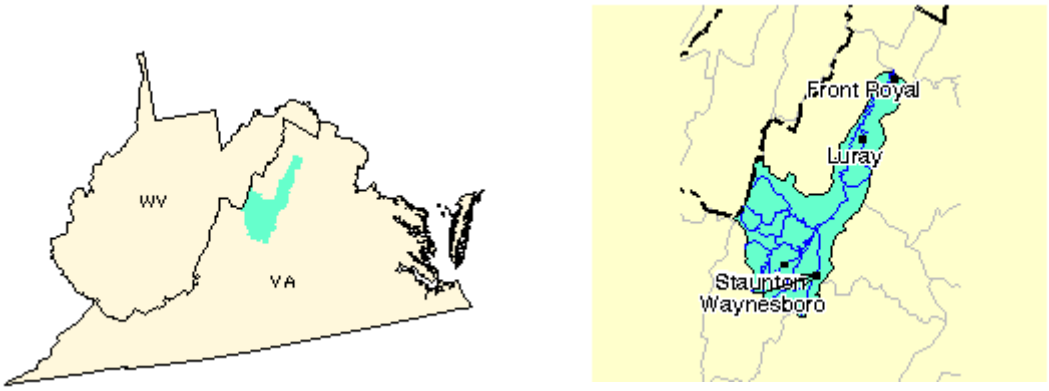

Fig. D.2-4 Location map and watershed configuration of Rocky Run and Dry River Dam, South Fork Shenandoah
USGS HUC 02070005, Overall EPA watershed rating: 4

D.2.2.1 Rocky Run Site Description and Disaster Event

Rocky Run is a high-gradient naturally producing brook trout stream in Rockingham County, Virginia (Fig D.2-4). It is a tributary of the Dry River. Flow in the lower reaches of Rocky Run ceases during dry periods, but pools containing fish remain. A variety of wildlife, including bear and deer, are present upstream of the project location.

The stream channel originally meandered through a residential development, but was redirected by landowners years ago. The redirected channel, which wraps around 15 homes, contains several 90-degree bends that have blown out during storms.

In 1992, stormflows eroded streambanks and deposited large amounts of cobble and debris in the floodplain. Eleven homes were threatened by the destabilized system.

Fig. D.2-5 Rocky Run community, Virginia

Riprap and gabions were placed on streambanks (Fig. D.2-5) to stabilize the channel and to protect life and property from future damage. Yet, in September 1996, heavy rains from Hurricane Fran swelled Rocky Run and the existing practices protecting the community failed.

Rather than following the constructed channel, the stream overflowed its banks and created a new channel directly through the residential areas and emptied into the Dry River. Five homes were flooded, and others endangered, while large volumes of cobble and woody debris were deposited in the floodplain. Approximately 140 feet of gabion and 200 to 300 feet of rock riprap revetments were installed to stabilize the steep slopes of the channel. Gabion mattresses were placed in the streambed at the same location to prevent downcutting.

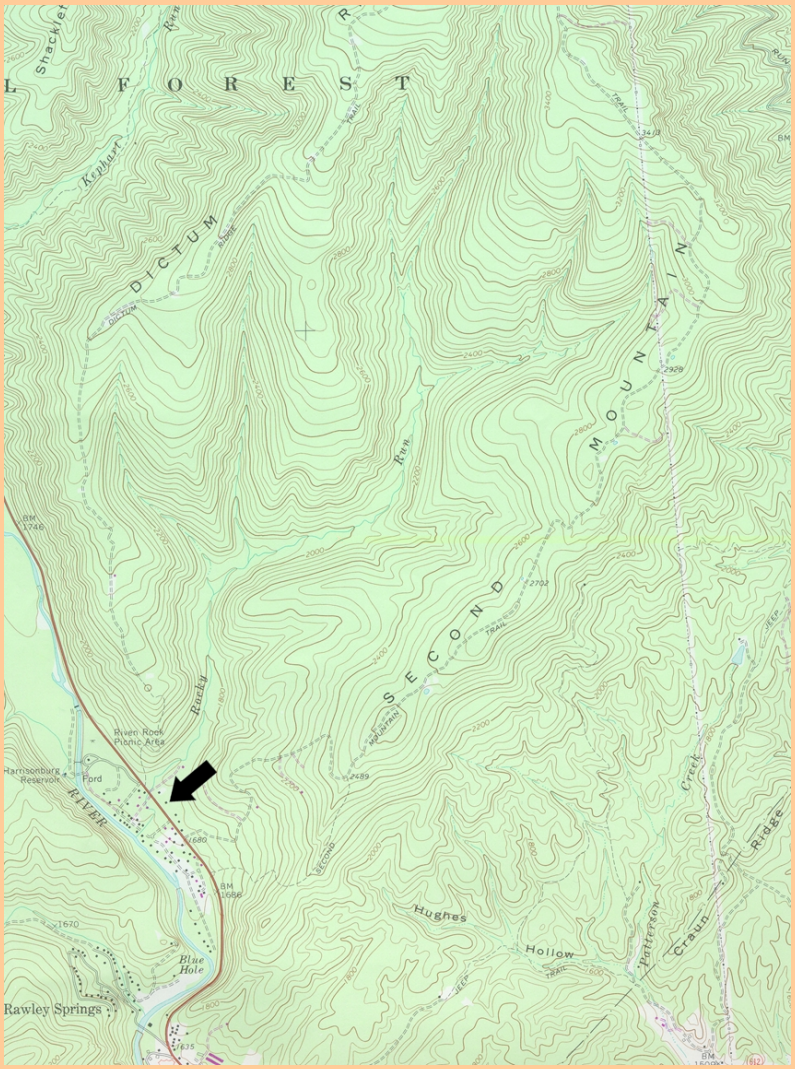

Fig. D.2-6 Rocky Run, Virginia, EWP Program site map, with project location shown by arrow

D.2.2.2 Rural Community of Rocky Run, Virginia

The community directly protected by the EWP Program project at the Rocky Run site consists of 15 single-family dwellings and associated service buildings. This is an example of a residential cluster (Fig. D.2-6) in an unincorporated rural area. The population of the Rocky Run community is approximately 42 persons. The Rocky Run site is classified by ERS typology as a Federal income county with a nonspecialized economy (Cook, P. and K. Mizer, 1989). Table D.2-2 provides detailed statistics for both the Rocky Run community and Rockingham County.

Table D.2-2 Statistical Characterization of the Rocky Run Affected Environment

Characteristic	Rocky Run Community (1)	Rockingham County
Population Size	1,181	57,482
Land Area (sq. mi.)	51.7	851.2
Rural Population (%)	100	93.2
Minority Composition (%)	2.2	2.8
Poverty (% at or below)	10.3	6.9
Per Capita Income	$11,088	$12,674
Total Employment	658	30,026
Principal Economic Sectors	Manufacturing, Trade, Agriculture	Manufacturing, Trade
Agricultural Acreage	(2)	236,074
Average Farm Size (acres)	(2)	127
Principal Crop	(2)	Cattle, poultry, fruit
Housing- Median Year Constructed	1969	1969
Housing- Median Value	$55,700	$71,800
Housing- Lived in Same House Since 1985 (%)	71.7	63.3

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.
Notes:
(1) Defined by Census Block 0111-3.
(2) Not determined for this level .

The 1992 census data for the block containing the Rocky Run site show that the immediately surrounding community contains a population of 1,181. Minorities comprise approximately 2.2 percent of the population, a figure significantly lower than the 22.5 percent for the state of Virginia. A total of 658 area residents were employed in 1990. Manufacturing represented the single largest sector of employment, accounting for 27 percent of all jobs, followed by retail and agriculture.

Of the 479 housing units in the larger community surrounding Rocky Run, 373, or 78 percent, were built before 1980. The median year for unit construction was 1969, the same as for the surrounding county, and is close to the 1970 median for the state of Virginia. The median value of owner-occupied units in the block was $55,700, which also compares with the estimated unit value of houses in the area protected at the Rocky Run site (DSR RC-01), but is significantly lower than the state median of $90,400. Approximately half of the local residents have lived in the same house since 1970, indicating a very stable residence pattern for the area surrounding the Rocky Run site.

D.2 3 Rose River, Madison County, Virginia—Floodwater Damage Site

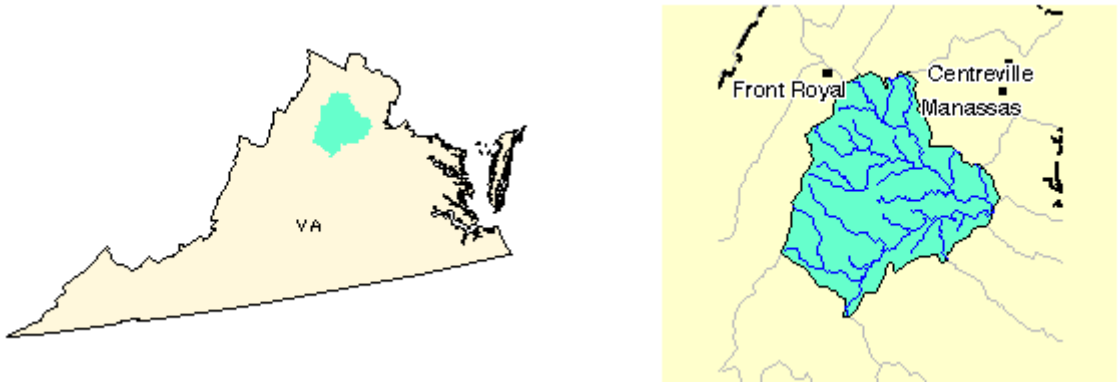

Fig. D.2-7 Location map and watershed configuration of Rapidan-Upper Rappahannock USGS HUC 02080103, Overall EPA watershed rating: 1

D.2.3.1 Rose River Site Description and Disaster Event

The Rose River site (Fig. D.2-7 and Fig. D.2-8) is located in Madison County near the town of Criglersville, Virginia. At its headwaters, the Rose River is a high-gradient stream that supports naturally reproducing brook trout. The native trout extend downward to approximately two miles upstream of the EWP Program project site, which lies in the low-gradient sections of the stream. The aquatic environment within the EWP Program project area does not support a naturally producing resident trout population because of the lack of shade and other habitat characteristics. Trout are stocked in this area for recreational fishing.

Fig. D.2-8 Rose River site, Madison County, Virginia

The floodplain surrounding the EWP Program site is nearly void of vegetation from heavy grazing and the disruptive floodwaters. Several marginal wetlands are downstream of the project area, which most likely would have been inundated with sediment if the EWP Program work had not been completed.

In June 1995 and September 1996, flooding affected the Rose River area. Then, in December 1996, floodwaters from a large storm caused severe erosion, channel movement, and heavy deposits of cobble and woody debris. A homeowner's access road was threatened, along with other features on the property. EWP Program stream restoration practices, including rock weirs, riprap, rootwads, and vegetative techniques were used to repair and protect the disturbed area.

D.2.3.2 Rural Community of Rose River Site

Fig. D.2-9 Rose River, Virginia, EWP Program site map with project shown by arrow

Located in an almost completely rural county in western Virginia, the area immediately affected by the EWP Program project is sparsely populated, (Fig. D.2-9). It may include at least two single-family dwellings, farm buildings, other structures, and pasture land (DSR MA-200). The affected area is an example of multiple farms in a less densely populated agricultural area (see Section 4.1.1.3). Madison county is characterized by ERS typology as having a nonspecialized economy with at least 40 percent of the workforce commuting to employment outside of the county); indicating a relatively small local economy (Cook and Mizer, 1989). Detailed statistics for selected characteristics of the affected environment at the immediate site and county levels are provided in Table D.2-3.

The area immediately surrounding the site is defined by census tract and contains a population of 5,672 persons (Census, 1992). Of these, an estimated 78 households (209 persons) are classified as rural by residence. Manufacturing represents the single largest sector of employment accounting for 21 percent, while agriculture accounts for 8.3 percent of total employment. Of the 2,301 housing units in the tract, 1,794 or 69 percent were built before 1980, and 78 percent have been occupied by the same householder since 1985, with nearly half, or 46 percent, of the residents living in the same house since 1970. This would indicate a stable residence pattern for the area surrounding the Rose River site, compared to only 38.3 percent for Madison County as a whole.

Table D.2-3 Characterization of the Rose River Affected Environment

Characteristic	Rose River Community (1)	Madison County
Population Size	5,672	11,949
Land Area (sq. mi.)	(2)	321.5
Rural Population (%)	100	100
Minority Composition (%)	13.6	14.8
Poverty (% at or below)	14.1	13.1
Per Capita Income	$11,751	$11,145
Total Employment	2,660	5,511
Principal Economic Sectors	Manufacturing, Services, Trade	Manufacturing, Trade, Services
Agricultural Acreage	(2)	100,602
Average Farm Size (acres)	(2)	229
Principal Crop	(2)	Cattle, Corn, Soy, Hay
Housing- Median Year Constructed	1966	1967
Housing- Median Value	$70,200	$69,700
Housing- Lived in Same House Since 1985 (%)	62	38.3

Sources: U.S. Bureau of the Census: Census of Population and Housing, 1990, 1992 Economic Census, and 1992 Census of Agriculture.

Notes:

(1) 1990 Defined by Census tract 9902.

(2) Not determined for this level.

D.3 EWP PROGRAM PRACTICE EFFECTS

D.3.1 San Lorenzo River, Santa Cruz County, CA—Soil Bioengineering Site

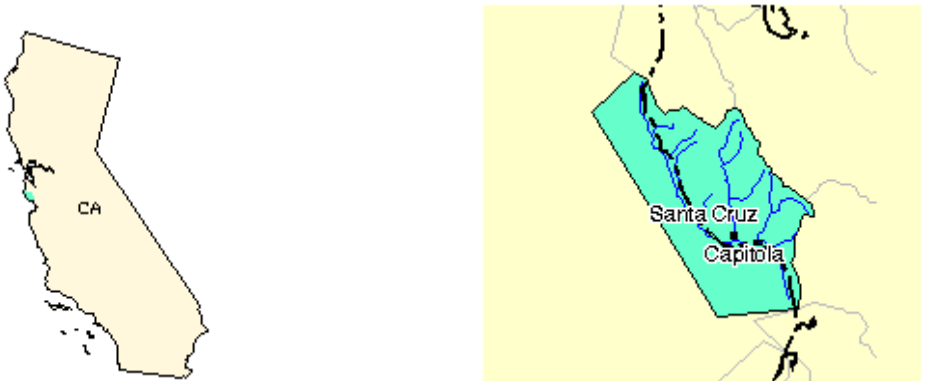

Fig. D.3-1 Location Map and Watershed Configuration San Lorenzo-Soquel watershed USGS HUC 18060001, Overall EPA watershed rating: 3

The California soil bioengineering site is located on the banks of the San Lorenzo River, near the community of Glen Arbor, in Santa Cruz County. (Fig. D.3-1) The riparian corridor within the project area is important to several threatened or endangered species, including the redlegged frog (*Rana auroa draytonii)*, and steelhead trout (*Oncorhynchus (Salmo) mykiss)*.

A rainstorm on February 3rd, 1998 caused severe bank erosion spanning 450 feet on one side of the channel, which endangered 6 homes, and a landslide on the opposite bank, which endangered roads and businesses (Fig. D.3-2).

The EWP repair work involved the removal of debris from the channel, bank restoration with large riprap, and the revegetation of both banks.

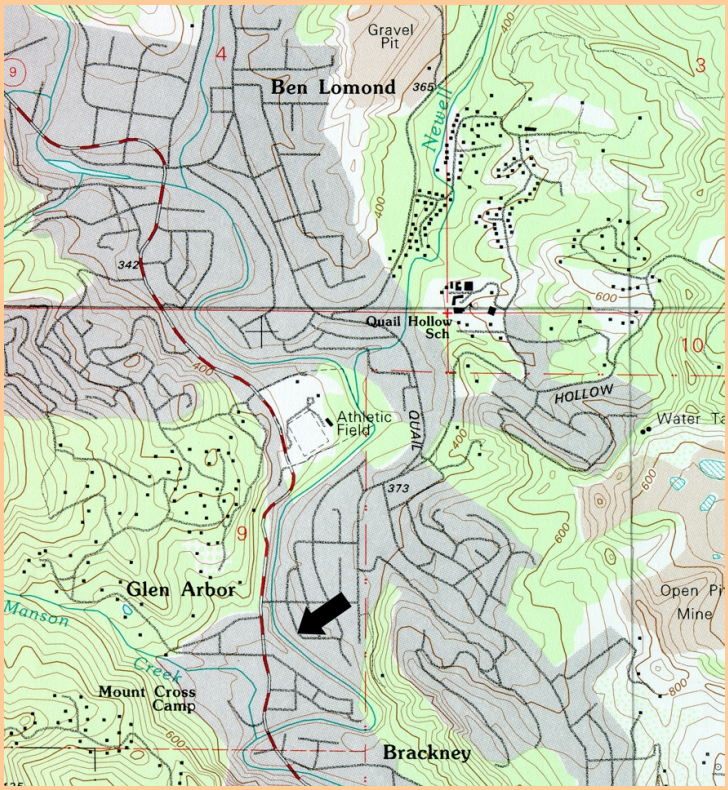

Fig D.3-2 Santa Cruz County, San Lorenzo River, California– Willow trees planted to reduce streambank erosion. (EWP project location shown with arrow)

Repairing the bank that suffered the landslide involved mostly revegetation practices (willows) and some filling. Repairing the opposite bank involved a large amount of riprap and some vegetation plantings (willows). Approximately 460 tons of loose rockfill, 4,900 tons of large riprap, and 2,230 square yards of geotextile fabric were utilized to repair the damaged site.

D.3.2 Dry River, Rockingham Co., VA—Dam Spillway Repair

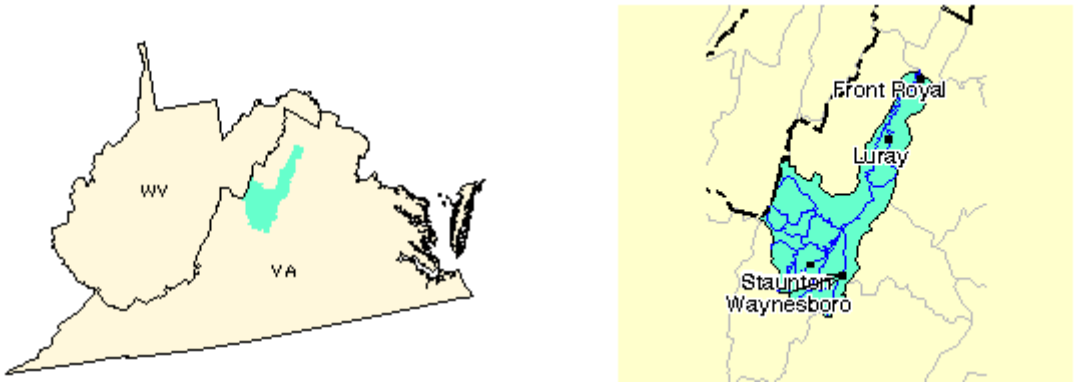

Fig D.3-3 Location Map and Watershed Configuration of Switzer Dam, Dry River, South Fork Shenandoah
USGS Cataloging Unit 02070005, Overall EPA watershed rating: 4

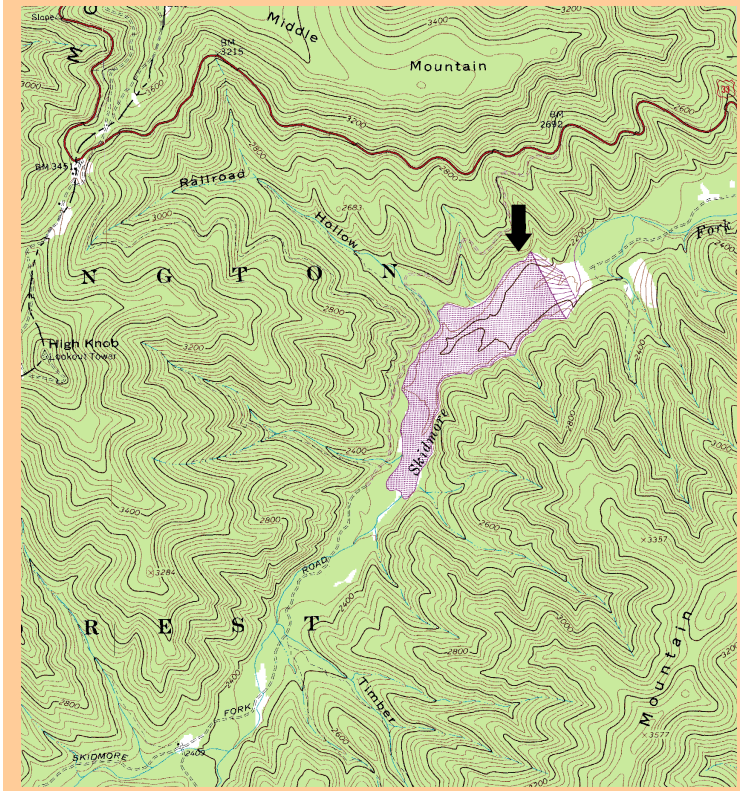

Fig. D.3-4 Dry River, Virginia EWP Program Site Map, project location shown with arrow

Intense 1996 floodwaters caused by Hurricane Fran caused the destruction of three spillways on three dams located in the Lower North River Watershed (Fig. D.3-3). The first earthen dam (Switzer Dam) is located at the confluence of Skidmore Fork and the Dry River Tributary. The second is located on the Dry River. The third dam is located on Dry Run, a tributary to the Dry River. (Fig. D.3-4) The Dry River is a tributary to the North River, and the North River is a tributary to the South Fork Shenandoah River. All three dams suffered a high degree of erosion causing large amounts of sediment, cobble, and woody debris to be expelled into the Dry River, which resulted in channel blockages, and prevented the flow of water from the reservoirs.

All of the dams are located on National Forest Service Property. The pre-disaster aquatic, riparian, and terrestrial environments at both sites were typical of National Forest land in Virginia, and contained diverse habitat features. No wetlands exist within the project areas, and no federally listed threatened or endangered species were known to inhabit the project sites immediately prior to, during, or after the disaster. The Dry River, to which the dams release water, contains native Brook Trout, but usually dries up during the summer months. The trout move in and out of the river for spawning purposes. Numerous species of wildlife including bear and deer inhabit both project areas.

The repair of the spillways involved excavating 2,100 cubic yards of storm deposited material; placing 6,000 cubic yards of fill in severely eroded areas; and grading, seeding, and fertilizing approximately 6 acres at both sites. Activities that were only completed at the Switzer dam site included removing cobble and sediment from 500 feet of stream channel and installing 1,357 yards of gabion mattresses. 65 cubic yards of concrete was also used to stabilize the spillway on the unnamed tributary leading into the Dry River.

D.3.3 Clarendon Texas—Floodplain Structure Protection

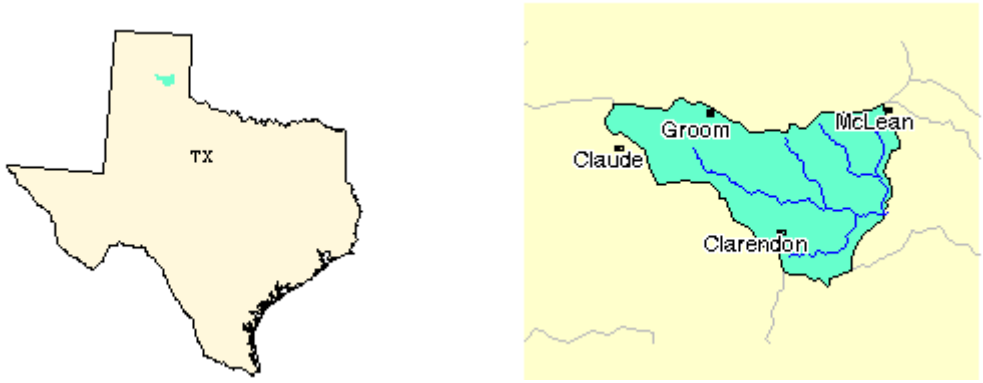

Fig. D.3-5 Location Map and Watershed Configuration Upper Salt Fork Red watershed USGS HUC 11120201, Overall EPA watershed rating: Not Available

Clarendon is a town of approximately 2000 located in the panhandle of northern Texas and is the county seat of Donley County. (Fig. D.3-5) Just to the northeast of the city lies Clarendon Lake, a playa lake, as well as the municipal sewage plant, which is separated from the lake by a berm. Sewage is treated in holding ponds and then released into the lake.

Clarendon Lake is considered a wetland and does host wildlife and aquatic vegetation but has few other uses, as drinking water comes from Greenbelt Reservoir several miles away and there is little recreational usage (Sears 1999).

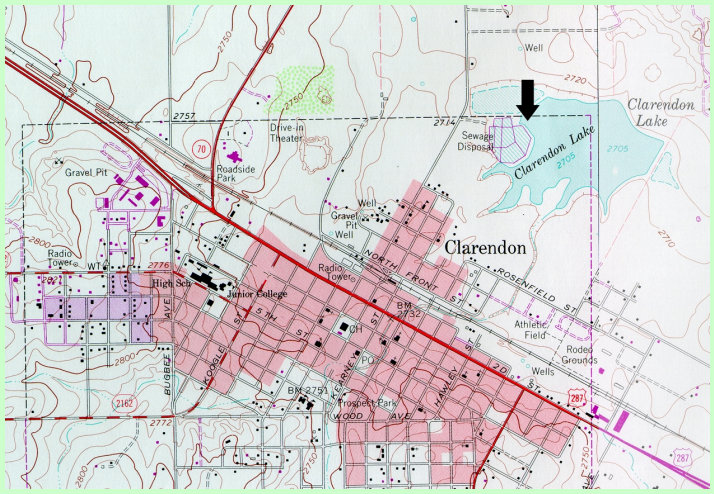

Fig. D.3-6 Clarendon, Texas EWP Program Site map, project location shown with arrow.

Heavy rains hit the area in April of 1997. Rainfall exceeded the 100-year rainfall event limits and the lake swelled to almost 10 times its normal area (Sears 1999). Rising water levels overflowed the protective berm and flooded the sewage plant, allowing untreated effluent to flow directly into the lake. (Fig. D.3-6) The primary concern was health related, as sewer service to the town was jeopardized. Several residences are located near the lake and were also threatened. A number of private wells in the area were contaminated and are still unavailable for human use.

The EWP project used a diversion/berm to close off the plant and halt the flow of untreated sewage into the lake. This berm repair/diversion then allowed for the dewatering of the lagoon system and the return to normal operations.

D.3.4 Antelope Valley, Los Angeles Co, California—Critical Area Treatment Site

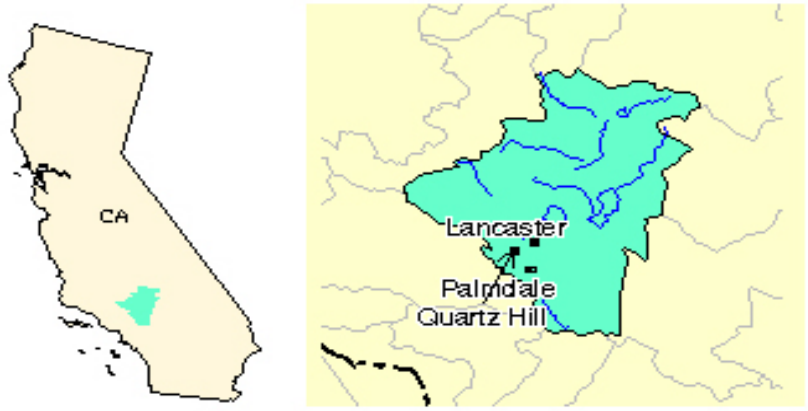

Fig. D.3-7 Location Map and Watershed Configuration of Antelope-Fremont Valleys watershed
USGS HUC 18090206, Overall EPA watershed rating: 3

The Antelope Valley Dust Buster site is a large, flat area in southern California north of the city of Los Angeles. (Fig. D.3-7) Consisting of approximately 7,700 acres of abandoned desert farmland, the site has little remaining vegetation and is regularly subjected to high winds. Drought conditions in the late 1980s and early 1990s precipitated the severe soil erosion and vegetation loss that existed before the EWP project. (Wolcott, 1992) The site is located less than a mile from Antelope Acres, which is a residential development of approximately 350 homes.

(Fig. D.3-8) Numerous problems from the high winds, including multi-vehicle accidents, reductions in air quality, and sight reductions during aircraft landings at Edwards Airforce Base have occurred. The lack of vegetative cover and high wind conditions have led to a high volume of topsoil being eroded and the necessity to re-vegetate the area and enact soil management techniques to minimize future aeolian losses.

EWP practices that were utilized to combat the erosion conditions included aerial seeding, installing sand fences, seed drilling, furrowing, and tumbleweed disposal.

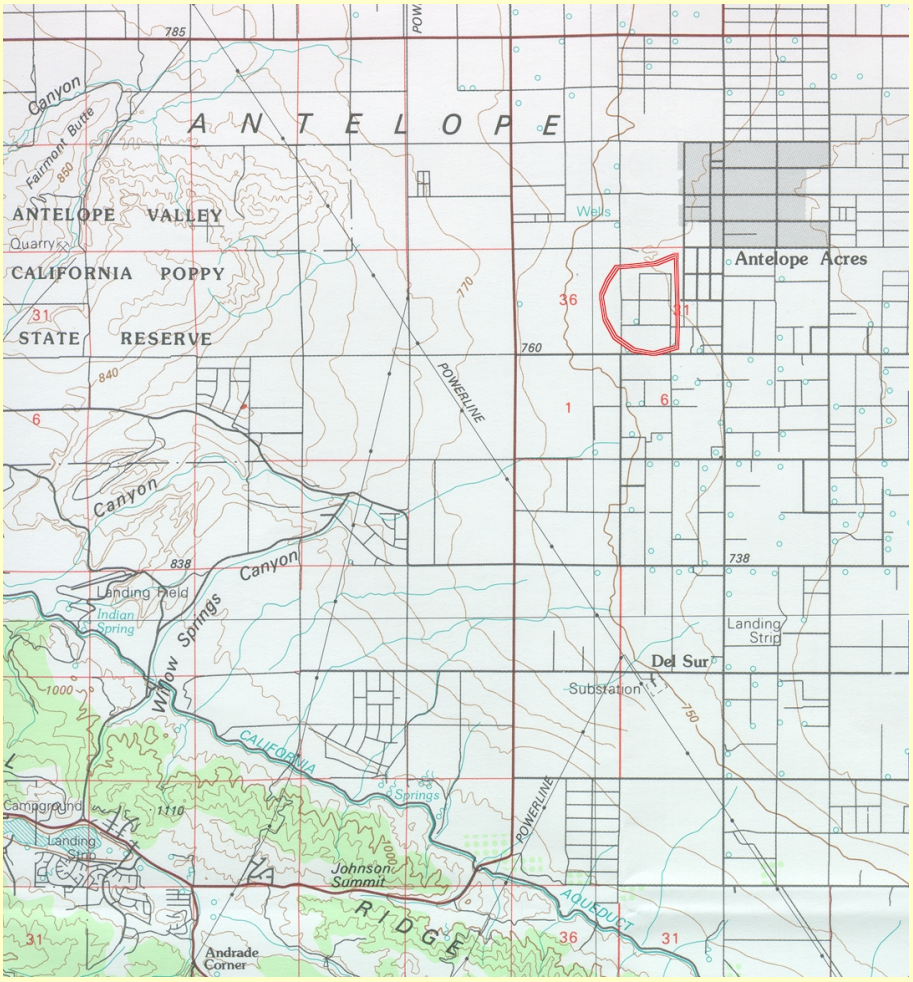

Fig. D.3-8 Antelope Valley, California EWP Program Site Map, project location outlined in red.

D.3.5 Plumtree, North Carolina--Principles of natural stream dynamics

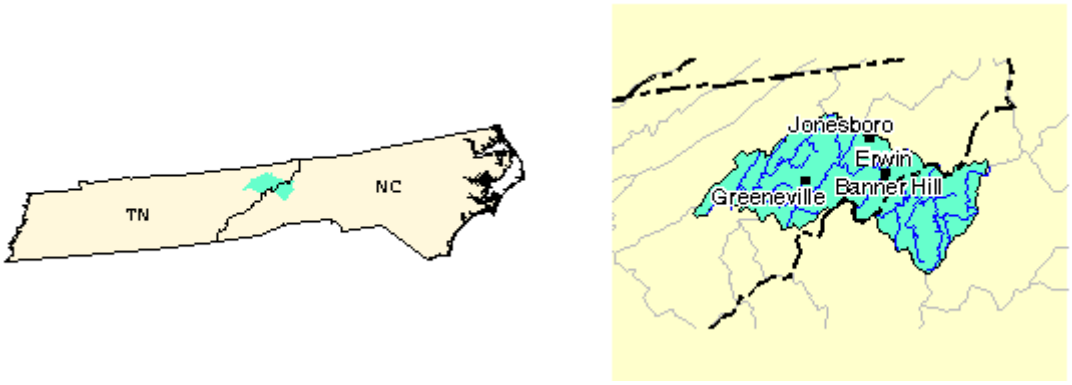

Fig. D.3-9 Location Map and Watershed Configuration Nolichucky watershed USGS HUC 06010108, Overall EPA watershed rating: 1

The Plumtree site is an approximately 9-mile section of the North Toe River in Avery County, North Carolina, just north of the town of Plumtree. (Fig. D.3-9) In this mountainous region on the border of the Pisgah National Forest, the land use at the site is primarily agricultural, with several Christmas tree farms. (Fig. D.3-10) Some residences also exist along the river and have multiple, private owners (Hinton 1999). There are no known wetlands in the area; however, previous gravel mines that have not been rehabilitated have evolved wetland vegetation and create minimal wetland function (Brown 1999). For most of the length of the site, a 20-25-foot zone of grass and woodland riparian vegetation is present. No cultural resources or federally listed T&E species exist on or immediately downstream of the site (Bessler 1999).

In 1998, rain in excess of 17 inches caused flooding and debris blockage in portions of the North Toe River. Streambank damage was also significant, as the stream left its banks in several locations and led to braiding. To restore the site, debris removal and streambank protection practices were implemented. As part of the work, the principles of natural stream dynamics were used to restore the stream profile, restore eroding stream banks and improve trout habitat. The natural stream design included rock vanes, root wads, log sills, point bars and revegetation. Materials needed to create these structures were either gathered on-site or from Roaring Creek, which is north of the site. Bank stabilization was accomplished using native vegetation, including deeply-rooted woody vegetation such as locust and willow.

Fig. D.3-10 Natural stream dynamics site, Plumtree, North Carolina EWP Program Site Map

A reference reach from the Toe River upstream of the site was used to best duplicate the natural stream structure. To ensure the re-establishment of a stable stream, the design for the restoration project included stream slope, valley slope, watershed area, stream type, substrate size distribution, proposed width/depth ratio, proposed meander geometry, and measures to minimize streambank erosion and substrate sediment discharge during construction (Hinton 1999).

D.3.6 Missouri River—Floodplain deposition site

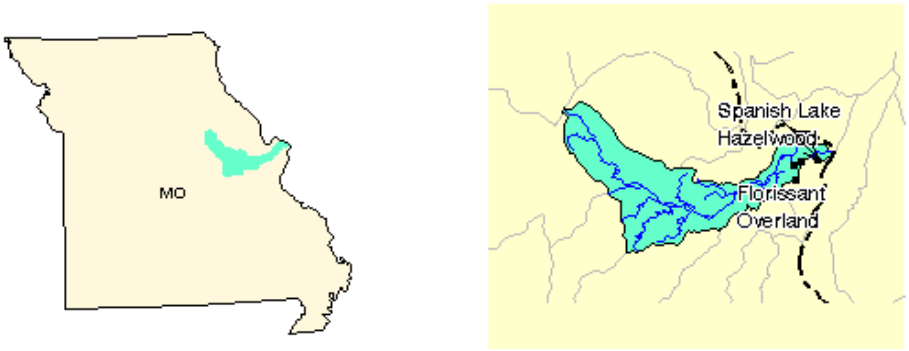

Fig. D.3-11 Location Map and Watershed Configuration Lower Missouri watershed USGS HUC 10300200, Overall EPA watershed rating: 3

The floodplain sediment deposition site is located along the Missouri River in St. Charles County, Missouri. (Fig. D.3-11) The property lies behind levees on the northern bank of the river and is primarily used for agriculture, in a corn-soybean rotation. (Fig. D.3-12) Historically, flooding has been frequent and severe, as the site is subjected to floodwaters from the Missouri as well as backwater from the Mississippi River (Cook 1999).

In 1993, the flooding along the Missouri breached the levee and deposited immense volumes of sand and debris in the cropland. The levees themselves are composed of sand dredged from the river, providing further material for deposition. In order to restore agricultural utility to the lands, two phases of heavy equipment operation were used. First, a scraper was used to flatten and level the sand deposits to an even layer of approximately 18 inches. Then, a deep plow was used to till the soil and mix the sand with the buried topsoil and recreate usable fields. The levees were repaired (Tummons 1995).

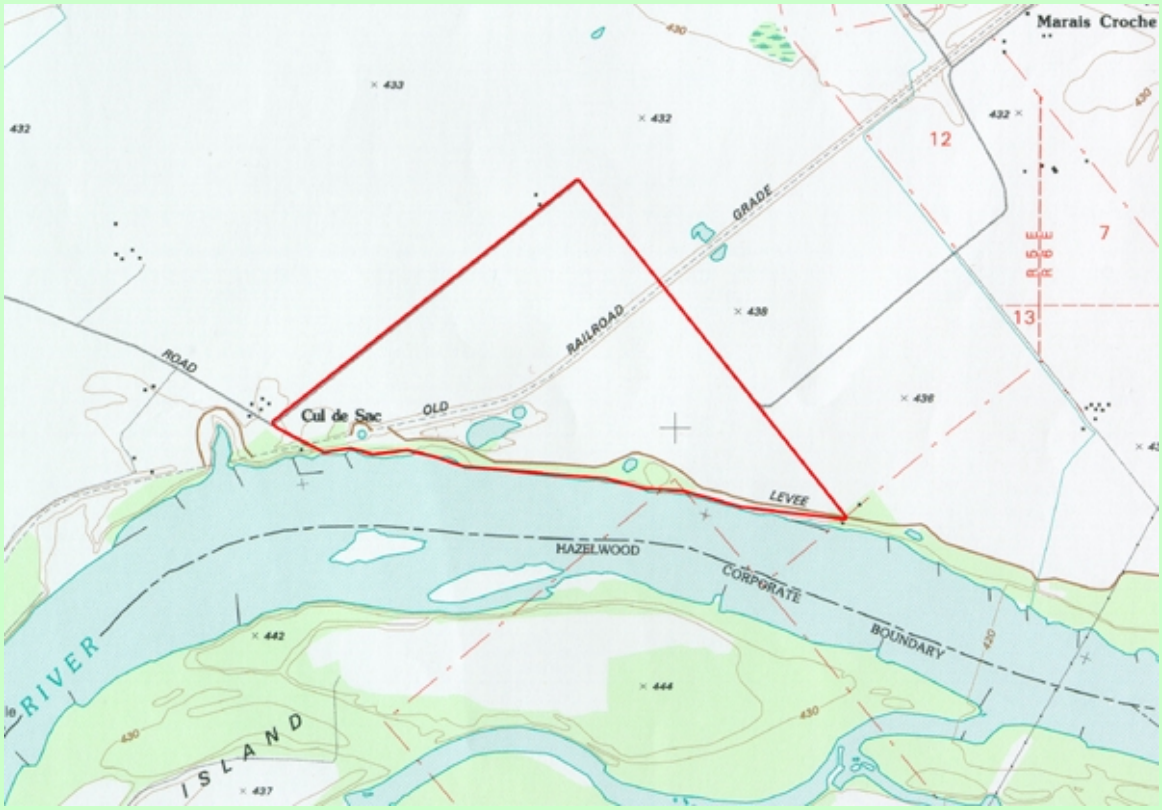

Fig. D.3-12 Floodplain overburden site, Lower Missouri River EWP Program Site Map, project location outlined in red

D.3.7 Bauxite Natural Area, Arkansas—Upland disaster debris from tornado

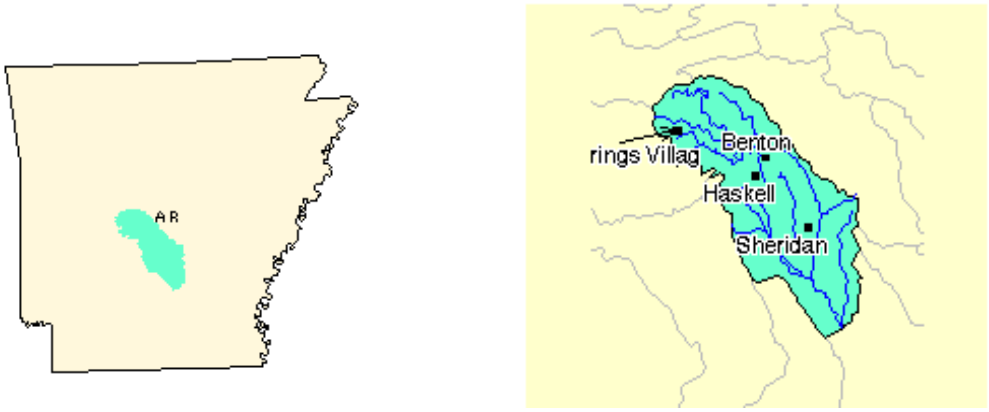

Fig. D.3-13 Location Map and Watershed Configuration Upper Saline watershed USGS HUC 08040203, Overall EPA watershed rating: 1

The Alcoa Corporation manages bauxite mining operations in central Arkansas in the vicinity of the towns of Benton, Bryant and Bauxite, all southwest of Little Rock. (Fig. D.3-13) In 1996, Alcoa entered into an agreement with The Nature Conservancy to implement conservation and ecological management on 1400 acres of land within the Bauxite Natural Areas on Alcoa lands. The region is home to several rare ecological communities and does contain several federally listed species. (TNC 1998)

In March 1997, tornados ravaged central Arkansas and swept through the Alcoa/TNC managed area. (Fig. D.3-14) The tornado was classified as category four with winds exceeding 200 miles per hour and an estimated 500 acres of woodlands was damaged and woody debris was widespread.

Much of the debris was gathered into brush piles, a less than optimal situation for the rare herbaceous species, as well as the increased danger of wildfire due to the ready supply of fuel. Invasive species (kudzu and Japanese honeysuckle) also posed a threat to plant communities. (TNC 1998)

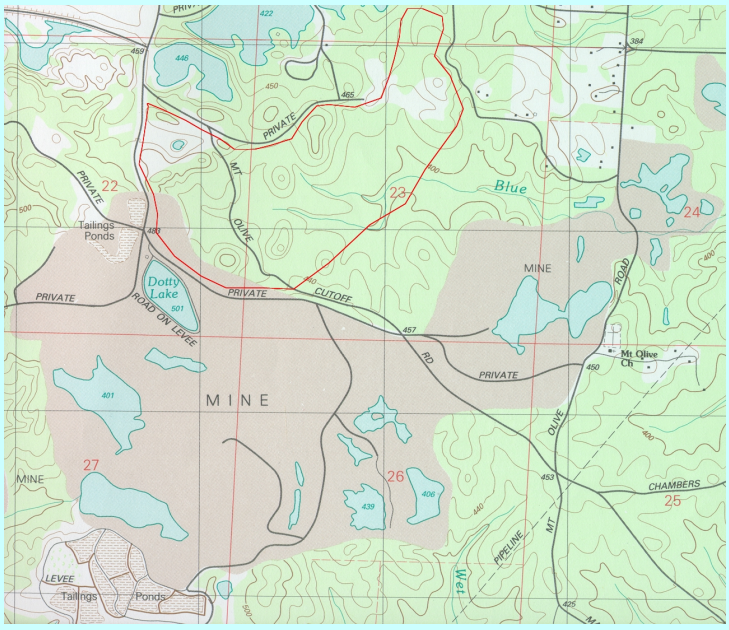

Fig. D.3-14 Arkansas/Nature Conservancy EWP Site map, project location shown outlined in red

The Nature Conservancy acted on behalf of NRCS for this EWP project and was reimbursed with EWP funds. TNC drafted a plan to remove the debris and reduce the threats in the most environmentally sensitive manner possible. TNC staff and volunteers executed a series of prescribed burns and a large amount of hand clearing was done over an area of 265 acres. Follow-up monitoring has shown very positive results-T&E species are thriving, exotic species have been suppressed and regrowth is progressing (TNC 1998).

D.3.8 Alexander, Arkansas—Tornado household debris site

This site is in the same watershed as the previous site. (Fig. D.3-13) The 5-acre plot near Alexander, Arkansas is privately owned and is a single dwelling residential plot. The land is heavily wooded. (Fig. D.3-15)

Tornados struck the area in March 1997 and many households were damaged. The four-acre Griffin site was littered with heavy woody debris, as well as a significant amount of household debris, such as construction materials (fiberglass insulation, shingles, etc) and personal belongings. The debris poses a danger to human health, as the piles can harbor rats, mosquitoes and other disease vectors.

The EWP project consisted principally of woody and household debris removal. Most debris was transported off-site to a landfill and burned. Nothing was burned on site due to the close proximity of an airport. Additionally, the project area was revegetated and mulched.

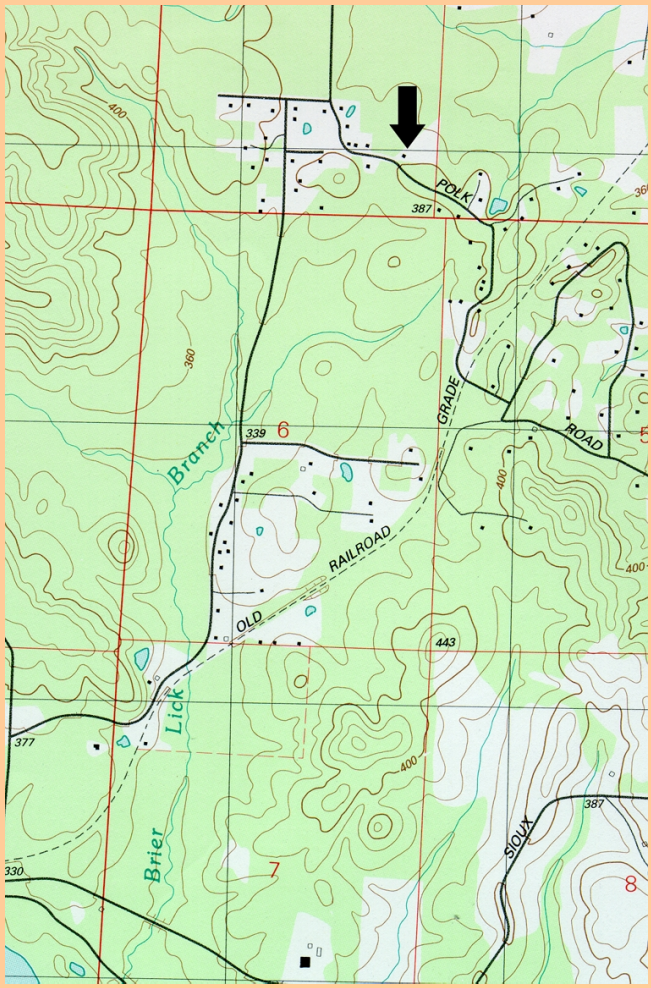

Fig. D.3-15 Arkansas debris site, Alexander, AR EWP Site Map – Residential waste cleared and removed.

D.3.9 Platte River, Missouri—Floodplain easement site

Fig. D.3-16 Location Map and Watershed Configuration Platte watershed USGS HUC 10240012, Overall EPA watershed rating: 1

The Platte River floodplain easement site is located in western Missouri, north of Kansas City at the confluence of the Platte River and the Little Platte River. (Fig. D.3-16) The easement property is just over 100 acres and was subdivided from a larger tract which the landowner purchased only several months prior to heavy flooding in 1995. The historical land use of the property is agricultural and has primarily been used for tenant farming. The tract also is home to approximately 15 acres of wetland located in the southeast portion of the property. This wetland area was left out of agricultural use due to property disputes and remains open to the river. Flooding is very frequent in this area, with 3 to 4 short duration floods per year in the spring (Berka 1999). Traditionally, maintaining this levee has been a struggle (Howard 1999).

During the rains leading to the 1995 flooding, a breach formed along the Platte River portion of the privately constructed levee, on the northern edge of the property. (Fig. D.3-17) Existing crops were lost and damage to the levee was substantial. At that time, the landowner applied for assistance under EWP. NRCS determined that the levee repairs would only protect one landowner and were therefore not eligible for EWP repair funds. However, NRCS was able to offer a floodplain easement, as this is a frequently flooded area and would be a good site for restoring floodplain function to the Platte River basin. The landowner, who is building a residence on the upland portions of the remaining privately held lands, accepted (Berka 1999).

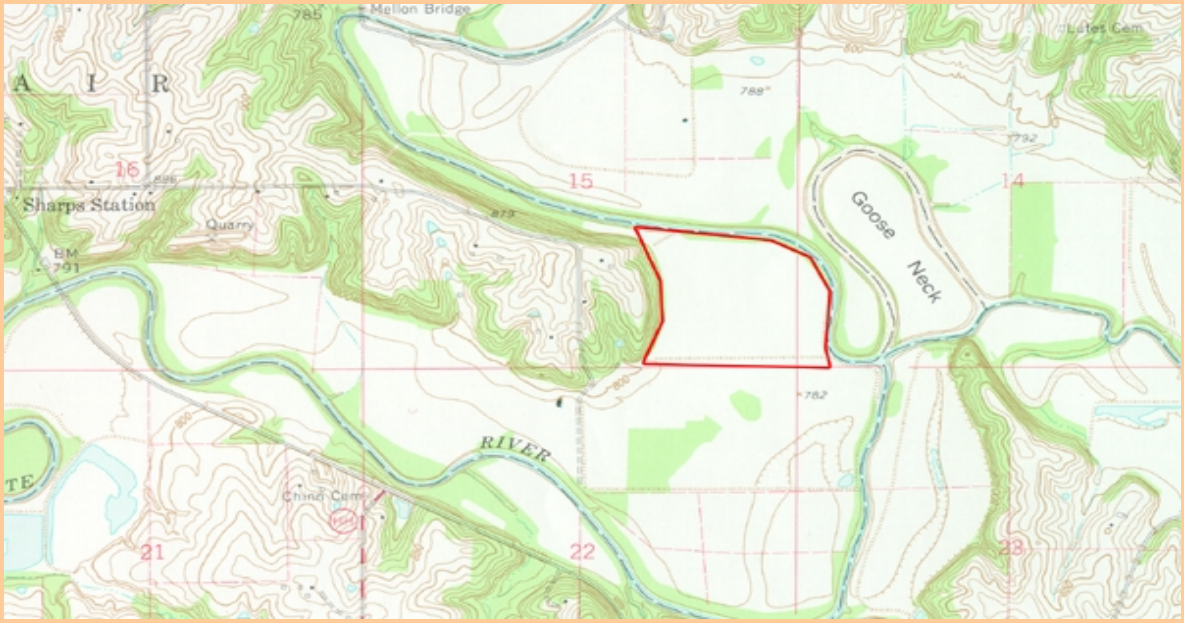

Fig. D.3-17 Floodplain easement site, Platte River, Missouri EWP Program Site Map, project location outlined in red

The new floodplain resulting from this easement will be managed for the creation of wetlands. The breach in the levee will not be repaired (and may be widened), allowing floodwaters to enter the easement area. Low level berms and water control structures will help to retain some water and maintain wetted conditions in the low portions of the site. Portions of the levee near the existing wetland will also be removed to allow for expansion of that wetland. Some seeding will take place, in addition to tree planting in the less frequently flooded portions of the property. Natural revegetation will restore wetland vegetation. Initial cost estimates for the work, slated to begin in early 2000, are approximately $18,000 (Berka 1999).

D.3.10 Medicine Creek, Missouri--Setback levee site

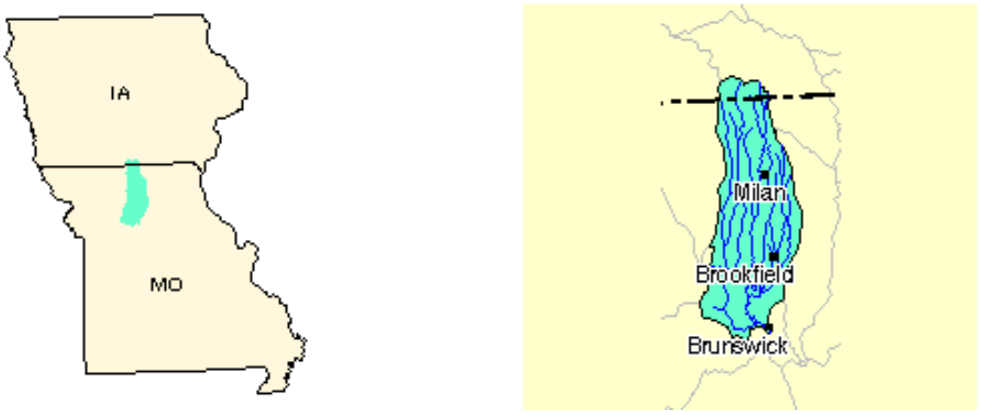

Fig. D.3-18 Location Map and Watershed Configuration Lower Grand watershed USGS HUC 10280103, Overall EPA watershed rating: 3

The Medicine Creek site is a tract of 517 acres located in Livingston County in northern Missouri. (Fig. D.3-18) The property is just southwest of the town of Wheeling (population of about 300) and is located between Medicine Creek and Muddy Creek, approximately 2.5 miles north of where the two creeks converge and then empty into the Grand River. (Fig. D.3-19) The site, previously used for intensive cropping by tenant farmers, falls within the historical floodplain for both creeks and is subject to frequent flooding—seven floods in the last 10-12 years (Young 1999).

In 1993 and 1995, the levees protecting the site were breached during flooding and repairs were made. Under the EWP Floodplain Easement Program, the landowner was offered an easement, thus allowing for the construction of a setback levee. Under this proposal, a 300-foot portion of the levee along Medicine Creek (the western boundary of the property, see Fig. D.3-13) would be removed after the construction of two new levees perpendicular to the stream channel that would protect the croplands both upstream and downstream of the easement site. The newly created floodplain would then be restored as a managed wetland, with water control structures and ditch plugs to maintain wet conditions and a limited amount of vegetative planting. Much of the vegetative restoration is intended to be through natural regenerative processes, with annual site inspections from the designers to ensure that the restoration is proceeding well. Construction is set to begin in early 2000 and restoration costs are estimated to be approximately $275,000 (Young 1999).

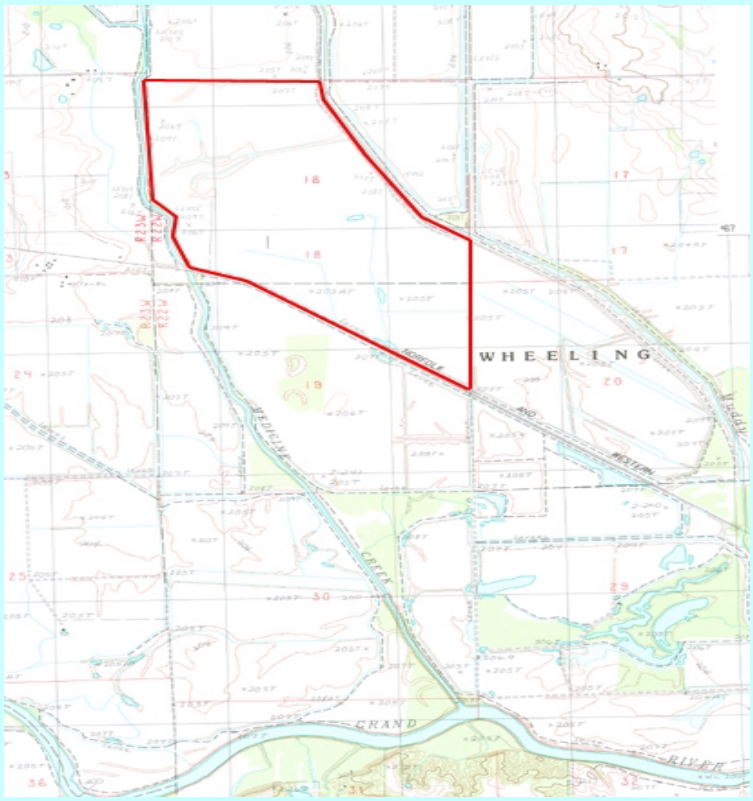

Fig. D.3-19 Setback levee site, Medicine Creek, Missouri EWP Program Site Map, project location outlined in red

The Medicine Creek easement site is part of the Grand River Emphasis Area, a region prioritized for easement purchase and floodplain restoration. Medicine and Muddy Creeks are both heavily engineered, with levees directly adjacent to the streambank for much of the stream length. Subsequently, there is virtually no floodplain remaining in these sub-basins.

D.3.11 Riverton, Iowa—Floodplain easement

The Riverton floodplain easement site is discussed in detail in section D.1.3 of this Appendix, under the East Nishnabotna watershed assessment.

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