

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed



West Fork White River Before Restoration



West Fork White River After Restoration Funded through an NRCS RCPP Project - Constructed 2021

**Sandi J. Formica, Executive Director, Matthew Van Eps, PE, Associate Director
& Tyler Anderson, Water Resources Engineer
Watershed Conservation Resource Center**

**The 2023 National Stream Restoration Conference
Baltimore, Maryland, August 22, 2023**



Watershed Conservation Resource Center

Local 501(c)(3) Non Profit Organization

Fayetteville, AR



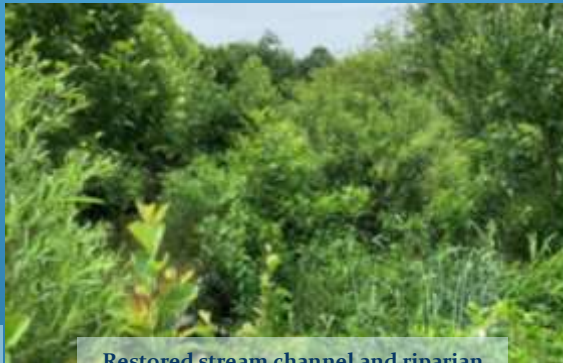
Established in 2003, the **Watershed Conservation Resource Center (WCRC)** is dedicated to:

- Protecting and Restoring Rivers, Riparian Corridors, Wetlands, and all Natural Resources
 - We implement and maintain rural and urban ecological restorations
 - Our projects reduce thousands of tons of sediment and pounds of phosphorus annually
- Conducting Watershed and River Assessments
- Providing needed Environmental-based Trainings
- Supporting Watershed Planning & Providing Technical Assistance to an Array of Partners

Thank You Partners!



WCRC Staff: Tanner Solloway, Jordan Holt, Sandi Formica, Tyler Anderson, Jordan Forbis, Taylor Enlow, Matt Van Eps, Greyson Farris, Tanner Wright, Michael Taylor, Lori Linn (NP), Kelly Carr (NP), Graham Thompson (NP), & Luna



Restored stream channel and riparian on Mullins Creek – University of Arkansas Campus -10 yr old



WCRC Founders Sandi Formica & Matt Van Eps at Brentwood Mountain WFWR Restoration

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Today's Presentation

West Fork White River (WFWR) Watershed 25 years

- Overview of History, Assessment, Early Restorations: 1998 – 2015
- NRCS Regional Conservation Partnership Program (RCPP) - WFWR Watershed Initiative: 2016-2021
 - Stream Restoration Conducted through
 - EQIP
 - PL-566 - WFWR Watershed Plan
- Continuation of the WFWR Watershed Plan - PL-566 and more restorations: 2022 into the future



Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Overview of History, Assessment, First Stream Restorations: 1998-2015

West Fork White River Watershed

- **One of six major tributaries of the Beaver Lake Watershed**
 - Beaver Lake is NWA's drinking water source
- **Historical Land Use Changes Resulted in Stream Instability**
 - Watershed Event! –Timber Boom 1870 – Early 1900's
 - First track of railroad opened in 1881 in WFWR watershed
 - White Oak timber is No 1 export
 - Railroad construction roads made timber easily accessible
 - Single landowner made \$12 million in 10 years
 - Land Use Changes Continued
- **1998, WFWR Placed on State 303 (d) list of impaired streams**
 - Causes: "high turbidity levels & excessive silt loads"



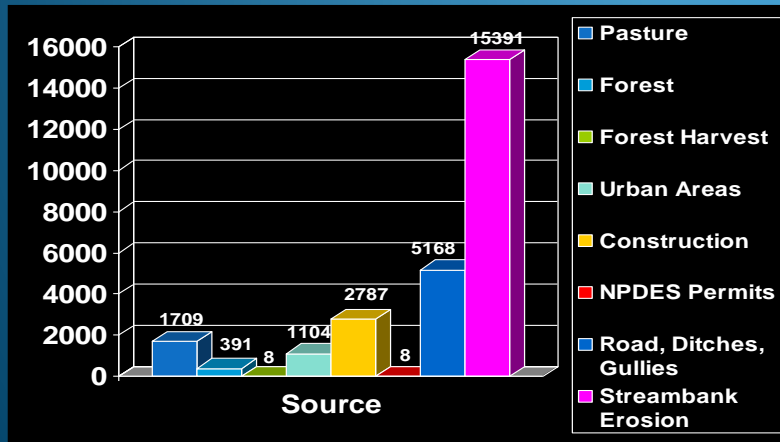
Leo Lesquereux- Visiting Biologist during the 1850's
"From the banks of the White River, where the Shellbark Hickory, the Sweet Gum, the Maple, with Red, Black and Spanish Oaks abound, the divide, to the high waters of Lee's Creek is still a broad ridge...It supports a very luxuriant growth of timber. The trees grow here at an equal distance from each other, just as though they had been planted by hand, raising their straight, large trunks to a height of sixty to eighty feet, and supporting immense pyramids of branches, forming there an arch of plashing boughs. They are of the same species formerly enumerated with the addition of the thick Shellbark Hickory, and without any underwood but some shrubs of the Chincapin."

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Overview of History, Assessment, First Stream Restorations: 1998-2015

Assessment Provided Data and Information Needed to Identify Sources

- **ADEQ 2004 WFWR Sediment Watershed Assessment Conducted 1998-2004**
 - Assessment: funded by EPA 319 funds/Arkansas Natural Resource Commission
 - Purpose: identify sources of sediment to address turbidity problem.
- **Results**
 - Streambank erosion dominant source of sediment contributing 66% of the watershed load
 - 2002 Biological Assessment - Nine species of fish common to the Boston Mountains were missing

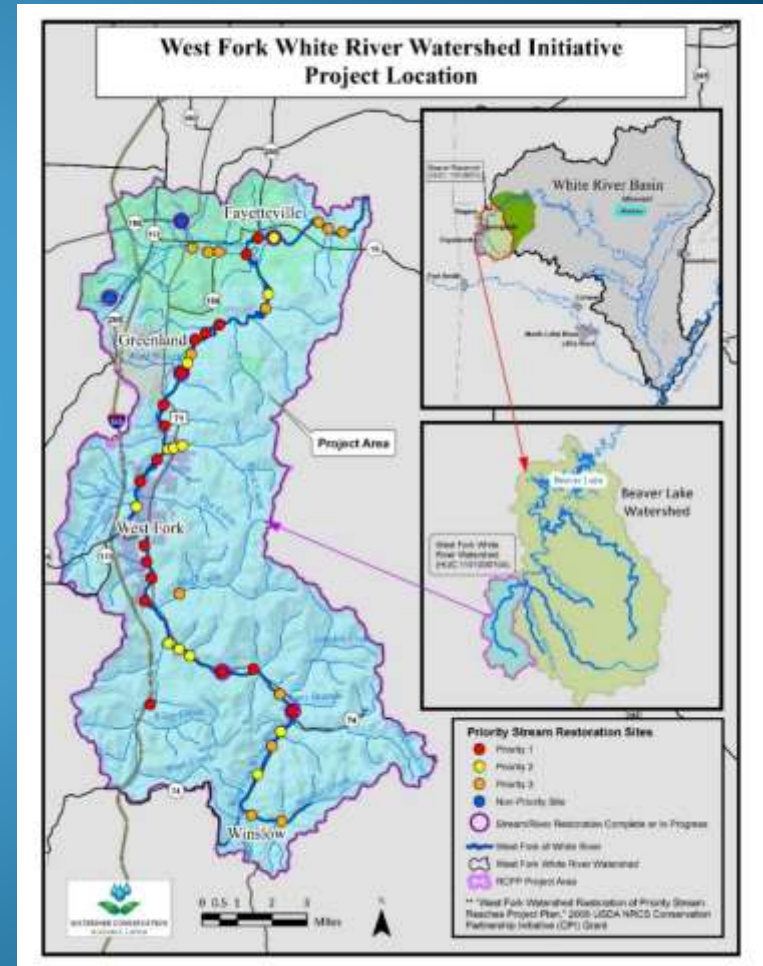


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Overview of History, Assessment, First Stream Restorations: 1998-2015

Watershed Planning

- **CPI Project : NRCS Conservation Partnerships Initiative – River Restoration Prioritization to Address Accelerated Streambank Erosion (2010)**
 - Built on 2004 Watershed Assessment
 - Identified reaches of river needing restoration
 - Estimated sediment and phosphorus loadings
 - Prioritized identified reaches
- **Watershed-Based Planning Indicated the WFWR watershed was major source of sediment & phosphorus to Beaver Lake Watershed**
 - 9-Element Watershed Management Plan
 - Source Water Protection Plan (BWD)
 - Beaver Lake Watershed Management Strategy (BWA)



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Overview of History, Assessment, First Stream Restorations: 1998-2015

Early WFWR Restoration Projects Stream channel, riparian, and wetlands Restored

- WFWR Brentwood Cemetery 2010 (CPI 3rd Priority Site)
- WFWR Airport I Project 2014 (CPI 2nd Priority Site)
- Mullins Creek on University of Arkansas Campus 2012 (urban tributary)
- WFWR Dead Horse Mountain 2015 (CPI Priority Site)
- Ground Cherry Creek at Mt. Kessler Regional Park 2015 (tributary)



WFWR at Fayetteville Airport Before Restoration 2011



WFWR at Fayetteville Airport After Restoration 2022



WFWR at Fayetteville Airport After Restoration 2022

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**NRCS Regional Conservation Partnership Program (RCPP) –
WFWR Watershed Initiative: 2016-2021**

Overview

- **Five Year Project that supported**
 - BMP Implementation through EQIP
 - Large River Restoration Projects Through PL-566
 - Outreach to Watershed Residents
- **Total Project was \$8.7 million: \$4.3 - NRCS & \$4.4 - Partners**
- **Located in a NRCS Critical Conservation Area (Mississippi River)**
- **Designed to address critical watershed-scale erosion and improve water quality, riparian areas, and aquatic habitat**
- **16 Partners participated**



Restored Native Riparian Corridor at Mullins
Creek University of Arkansas Campus 2022

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Thank You Partners!

with the USDA Natural Resource Conservation Service (NRCS)

- Watershed Conservation Resource Center (Lead & PL-566 Sponsor)
- Beaver Watershed Alliance (Lead Outreach)
- Beaver Water District (PL-566 Sponsor)
- Walton Family Foundation
- Washington County Conservation District
- Northwest Arkansas Land Trust
- Arkansas Game and Fish Commission
- City of Fayetteville
- City of West Fork
- Arkansas Natural Resources Commission
- Arkansas Forestry Commission
- Arkansas Farm Bureau
- Cooperative Extension Service
- Ozark Water Watch
- City of Greenland



WCRC and BWA visiting the WFWR Brentwood Mountain Restoration 2022

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

NRCS RCPP – WFWR Watershed Initiative 2016 - 2021

RCPP Used Two NRCS Programs to Restore Streams

- **EQIP Program:**
 - Implementation of Best Management Practices (BMP)
 - **Small-scale streambank/stream restoration Practices**
- **PL-566 Watershed Program:**
 - Restore Reaches of River: Channel, Riparian Areas, & Wetlands
 - Required Watershed Plan – Environmental Assessment



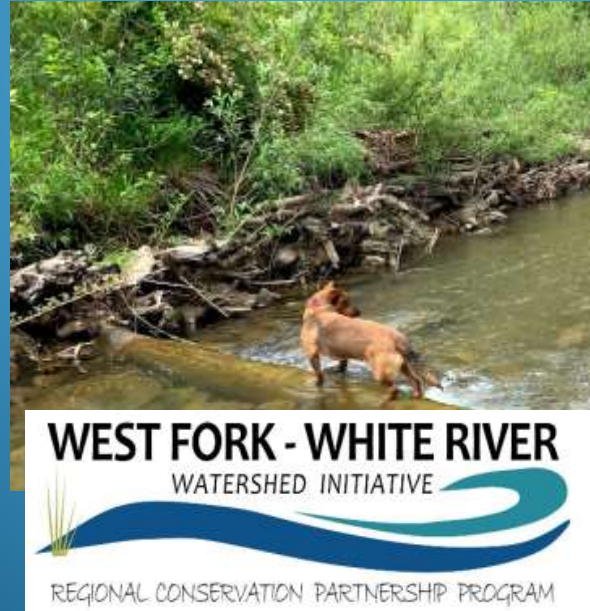
Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Utilizing EQIP Practices To Implement Small-scale Stream & Streambank Restorations

8 EQIP Contracts were stream restoration projects



8/22/2023



WEST FORK - WHITE RIVER
WATERSHED INITIATIVE

REGIONAL CONSERVATION PARTNERSHIP PROGRAM



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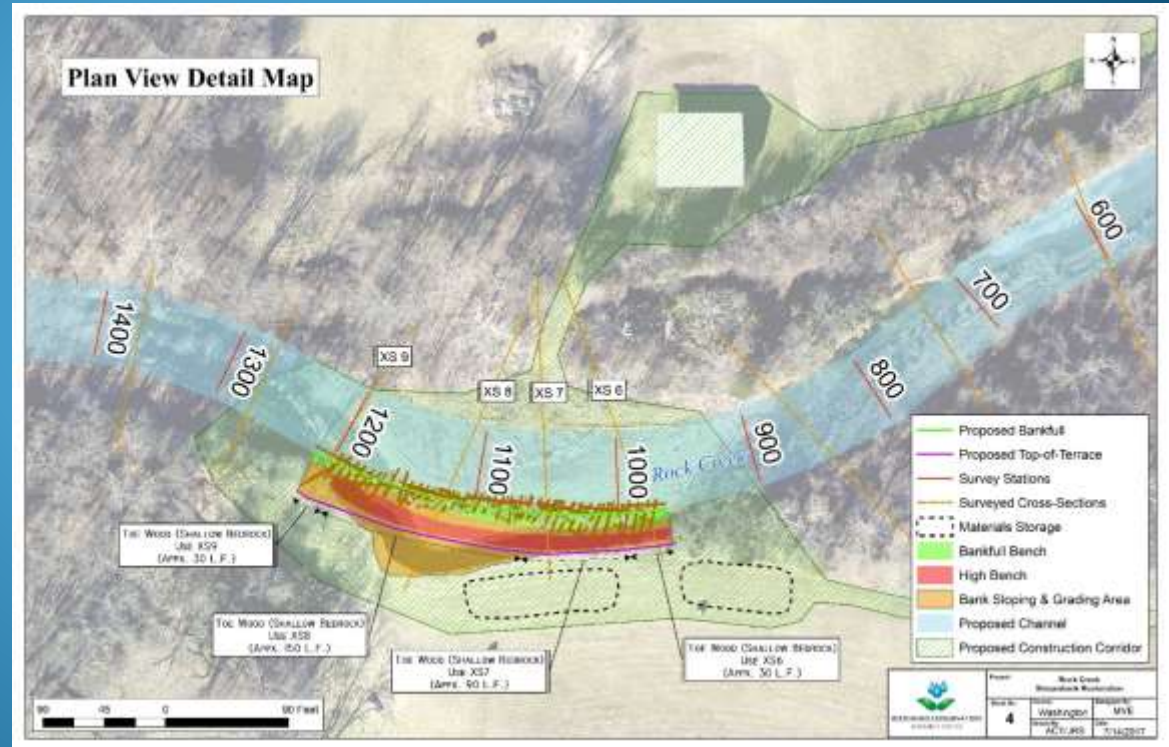
WFWR Watershed Initiative: EQIP Funded Streambank Restoration

Implementation of EQIP 580 – Streambank & Shoreline Protection

Example #1 Rock Creek

Site Overview

- Located in West Fork, AR
 - Landowner on Rock Creek, Tributary to WFWR
- Length of Project
 - 350 ft
- Bank Height
 - 12 ft
- Watershed Area
 - 6.0 mi²



WFWR Watershed Initiative: EQIP Funded Streambank Restoration

Implementation of EQIP 580 – Streambank & Shoreline Protection

Example #1 Rock Creek



**Before
Restoration
(1/2019)**



WFWR Watershed Initiative: EQIP Funded Streambank Restoration

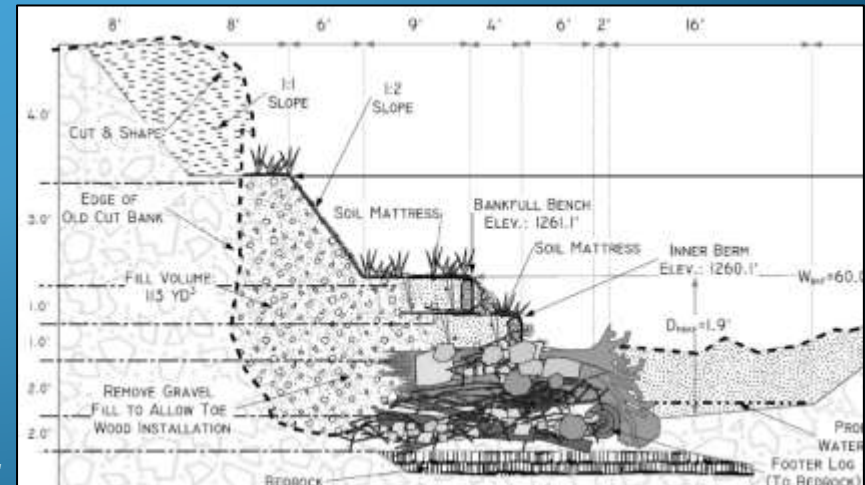
Implementation of EQIP 580 – Streambank & Shoreline Protection

Example #1 Rock Creek



Restoration Design & Implementation

- Stabilizes toe of streambank and helps to transport sediment
- Utilizes natural materials: trees, brush, gravel
- Constructed to bedrock
- Provides roughness and reduces near-bank velocity
- Provide cover for fish and other wildlife
- Wetland was created on abandoned floodplain



WFWR Watershed Initiative: EQIP Funded Streambank Restoration

Implementation of EQIP 580 – Streambank & Shoreline Protection

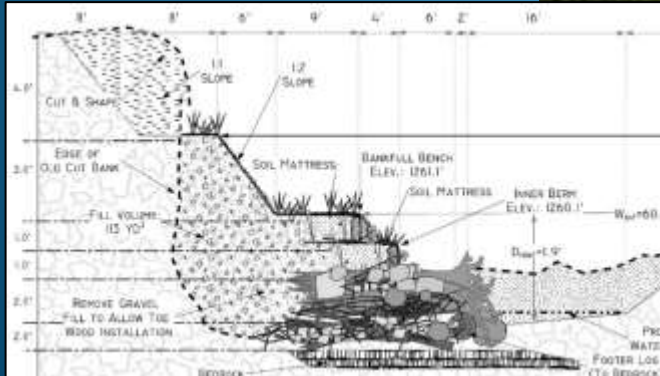
Example #1 Rock Creek Restored Streambank

Restoration Design & Implementation

- To complete finished cross-section soil mattresses built on top of the toe-wood structure to:
 - Create inner-berm and bankfull features
 - Provide soil medium to establish healthy native vegetation
 - Products made from Jute and Coconut fiber
 - Revegetate species native to the Boston Mountains Ecoregion
 - Used bare roots, plugs, pots, and native grass & wildflower seed



Rock Creek Restoration
Just after heavy equipment
construction (2019)



Rock Creek Restoration (2021)

WFWR Watershed Initiative: EQIP Funded Streambank Restoration

Implementation of EQIP 390, 391, 484, and 490 to Restore Terrace

#1 Rock Creek Streambank Restoration

Pasture was also converted to native riparian using the following EQIP practices:

- 390-Riparian Herbaceous Cover
- 391-Riparian Forest Buffer
- 484-Mulching
- 490-Tree & Shrub Site Preparation

Landowner -

“Our erosion problems had gone on so long, we didn't think we would even get our farm back. Two years after our project completion, we could not be more pleased. The worst of the erosion has stopped and the land reclaimed. Thanks WCRC, BWA, and all the partners! We look forward to working with you on future projects.”



Rock Creek Restoration
Pasture Area - Seed Distributed and
Planted just after construction 2019



Rock Creek Restoration
Pasture Restored to Native Plants 2021

WFWR Watershed Initiative: EQIP Funded Stream Restoration

Costs and Funding

<i>Project Completion Date</i>	Project 1	Project 2	Project 3
	<i>May 2019</i>	<i>Ocotober 2020</i>	<i>July 2019</i>
EQIP TA Funds Received	\$16,667	\$16,667	\$16,667
EQIP Contract Funds Received	\$75,353	\$44,406	\$22,264
Total Federal Funds Received	\$92,020	\$61,073	\$38,931
Survey and Design	\$16,564	\$22,285	\$8,999
Construction	\$125,587	\$70,214	\$36,163
Total Implementation Cost	\$142,151	\$92,499	\$45,162
Maintenance Expense to Date	\$13,170	\$1,276	\$3,684
Total Project Cost to Date	\$155,320	\$93,775	\$48,845

Partners covered costs outside of EQIP Funding

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

NRCS RCPP – WFWR Watershed Initiative 2016 - 2021

PL-566 Program or Watershed Protection and Flood Prevention Act

- Authorizes the NRCS to help local organizations & government plan and implement watershed projects
- The PL-566 Program was used to
 - Develop and Implement the WFWR Watershed Plan - EA to Conduct Large-scale River Restoration that would
 - Improve Water Quality
 - Enhance Fisheries and other Wildlife



Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

NRCS RCPP – WFWR Watershed Initiative 2016 - 2021

WFWR Watershed Plan – Environment Assessment (Required)

Approved October 2020

- Address channel instability and resulting accelerated streambank erosion along the WFWR and its tributaries
 - utilize natural channel design principles by designing, constructing, and maintaining large-scale river restorations
 - projects involve the cooperation of multiple landowners
 - utilizes PL-566 authority
- Result in reduction of watershed-scale erosion, land loss, and sediment loadings to the WFWR and Beaver Lake watersheds, while improving aquatic, riparian, and wetland habitats.

USDA Natural Resources Service Program (NRCS)

RCPP Lead & Sponsor Organization:

Watershed Conservation Resource Center

Lead Sponsor Organization:

Beaver Water District



White River Streambank Restoration

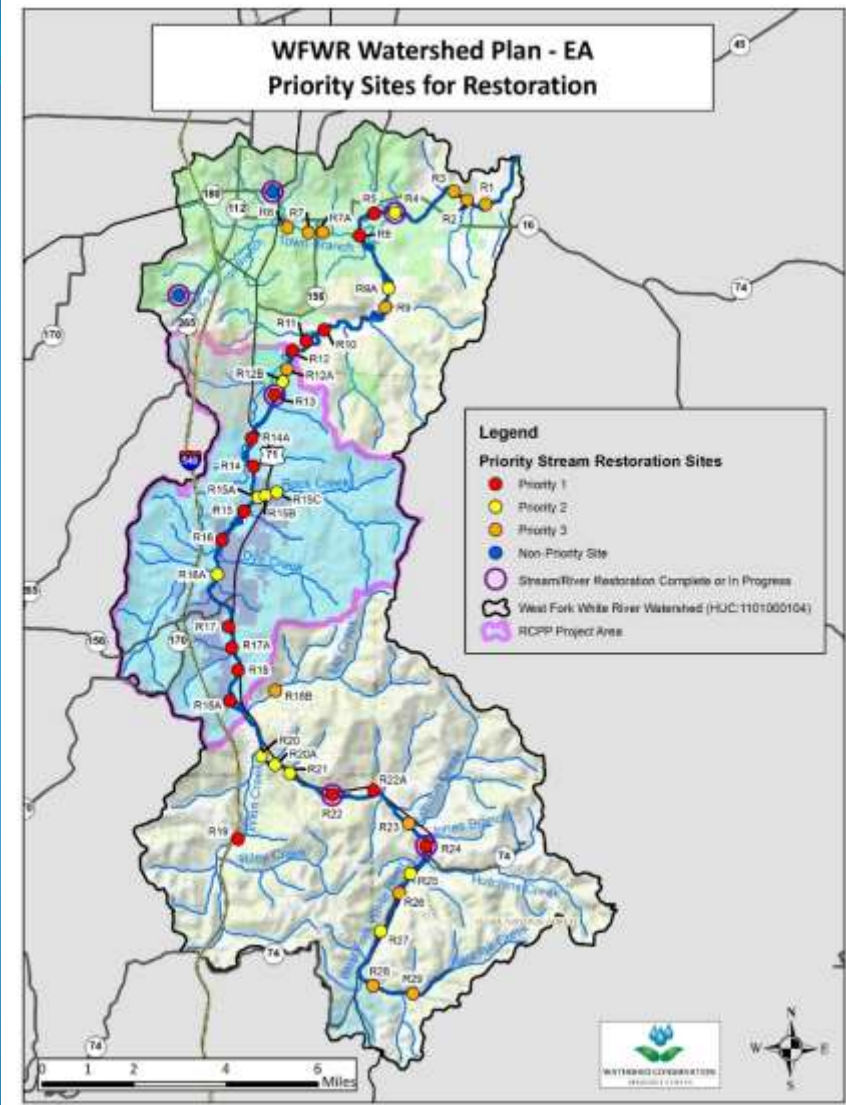
Long-Term Funding Source

WFWR Watershed Plan – EA

Authorized PL-566 Watershed 11-13-20

Updated WFWR Reaches in Need of Restoration

CPI Group	Reach Number	CPI Reach Length (ft)	New Reach Length (ft)	CPI Sediment Load (ton/yr)	Airphoto - Sediment Load (2004 to 2016) (ton/yr)	Updated Group or Comment
Group I	16	4220	6438	7300	45484	Group I
Group I	15	2890	3162	269	15230	
22a	n/a	2031	n/a	9606		
Group I	14	4050	4871	394	8308	
18a	n/a	4344	n/a	6601		
17a	n/a	2600	n/a	4927		
Group I	11	2132	3048	562	4669	
Group II	17	950	1185	29	4060	
Group II	18	849	2503	270	4052	
Group I	12	3680	3162	946	3419	
Group II	6	2032	3219	567	3264	
14a	n/a	2336	n/a	3178		
16a	n/a	3235	n/a	2942		
Group I	5	2414	3841	1070	2696	
Group I	10	2981	3049	294	2650	
Group III	25	1470	1874	100	2546	
Group II	20	916	1024	167	2447	
12b	n/a	1760	n/a	2326		
15a	n/a	1611	n/a	2166		
Group II	21	3283	1997	331	1860	
20a	n/a	1042	n/a	1734		
Group II	27	1325	1410	127	1201	
Group II	26	2376	2496	127	849	
12a	n/a	1153	n/a	823		
Group III	23	1590	1741	270	746	
Group II	28	3547	3676	188	521	
Group III	2	1420	130	185	446	
Group II	9	2331	2402	243	219	
Group III	3	1640	1580	110	208	
Group II	22	n/a	5845	n/a	n/a (4147)	Funded for Restoration
Group II	4	1502	595	411	n/a	Mitigation Bank - Deadhorse
Group II	1	846	742	719	n/a	No appreciable erosion
Group III	7	1317	1432	64	n/a	Town Branch - No change
Group III	8	1880	1483	136	n/a	Town Branch - No change
Group I	13	2210	2654	1430	n/a	Airport Restoration Phase I
Group III	19	904	1095	55	n/a	Winn Creek
Group I	24	1150	973	572	n/a	Brentwood Restoration
Group II	29	2780	2756	55	n/a	No appreciable erosion



West Fork White River Watershed Initiative

Large-scale River Restoration Projects utilizing PL-566

Two Priority Sites Selected For Restoration

- **Site 12b – Airport II - 1,800 feet channel and 3,600 feet riparian area**
 - 2 landowners signed 20-yr agreements
 - Construction and revegetation completed 2021
 - WCRC continues to maintain the site
 - Sediment reduction is 5,500 tons/yr
 - Includes wetland restoration
- **Site 16 – Downstream of Dye Creek Road Bridge - 6,000 feet channel and 12,000 feet riparian area**
 - 6 landowners signed 20-yr agreements
 - Under Construction
 - Sediment reduction is over 10,000 tons/yr
 - Extensive wetland creation and restoration



WFWR at Brentwood
Before Restoration (2012)



WFWR at Brentwood
After Restoration (2018)

Priority Site "24" restored in 2012

Protects historic cemetery and private lands

West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b

- Watershed Area – 84 mi²
- Site Bankfull Flow – 3,200 cfs
- Watershed Flow range – 0.1 cfs to 45,000 cfs
- Annual Load Reductions (typical flow year)
 - Sediment – 5,500 tons/yr
 - T. Phosphorus – 1,330 lbs/yr
- Project Cost - \$1,100,000



Before Restoration (4/2019)



Heavy Equipment Construction Completed (4/2021)



Restoration Site (8/2023)

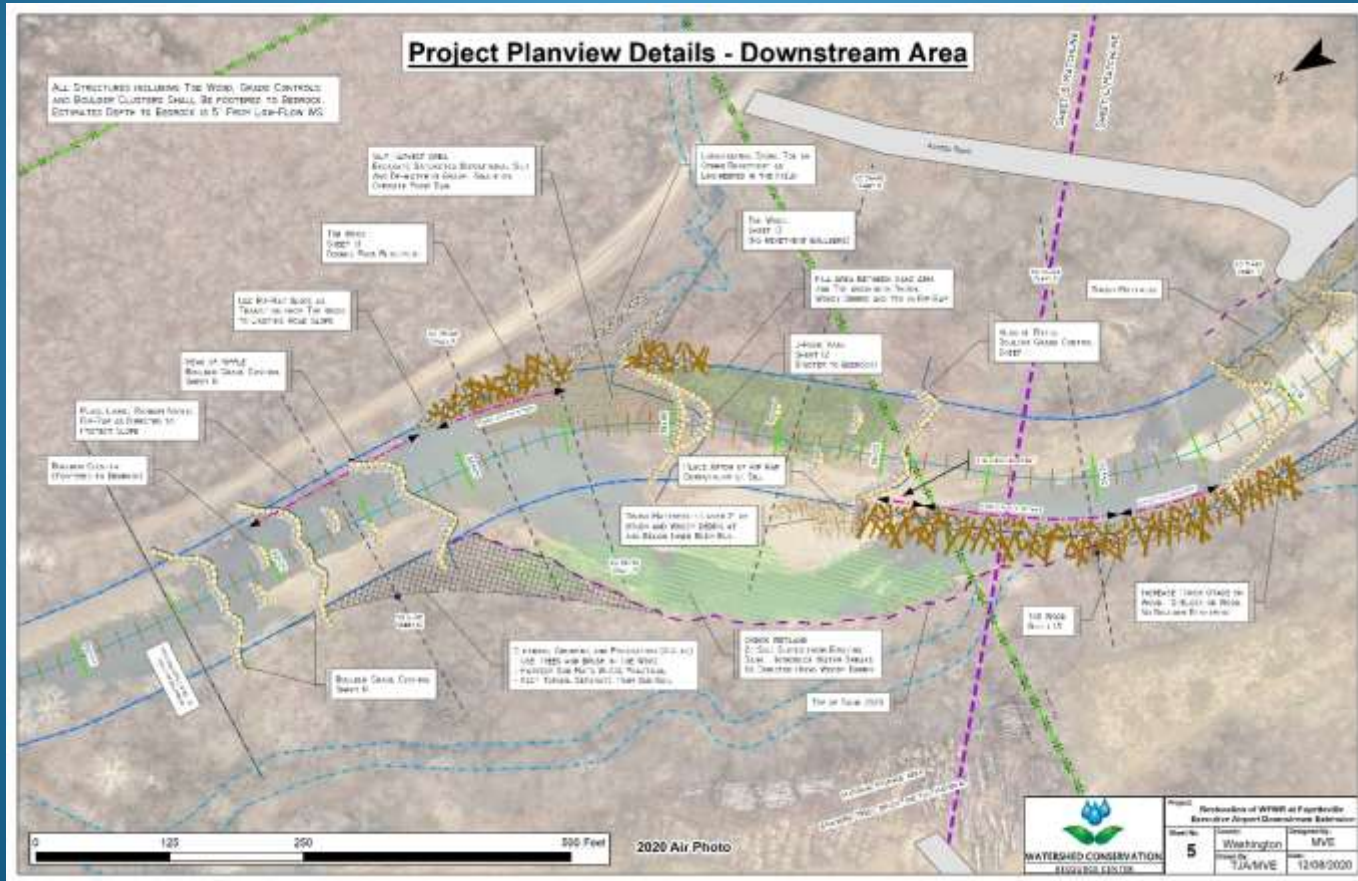
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West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b



West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b



BEFORE (8/2/2023)

8/22/2023

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West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b



BEFORE (8/2/2020)

8/22/2023

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West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b

BEFORE (8/4/2019)



West Fork White River Watershed Initiative

First Completed PL-566

Extension to Airport Project – Priority Site 12b



BEFORE (8/4/2023)

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Continuation of the WFWR Watershed Plan - PL-566 and other projects: 2022 into the future

- **PL-566 program continues**
 - Covers restoration design costs and 75% construction costs
 - Construction of Dye Creek Project funded
 - Design of Pump Station Project is funded
 - WCRC and BWD worked with NRCS and added 12 reaches to Watershed Agreement
 - Approved for funding to develop restoration plans for 6 reaches



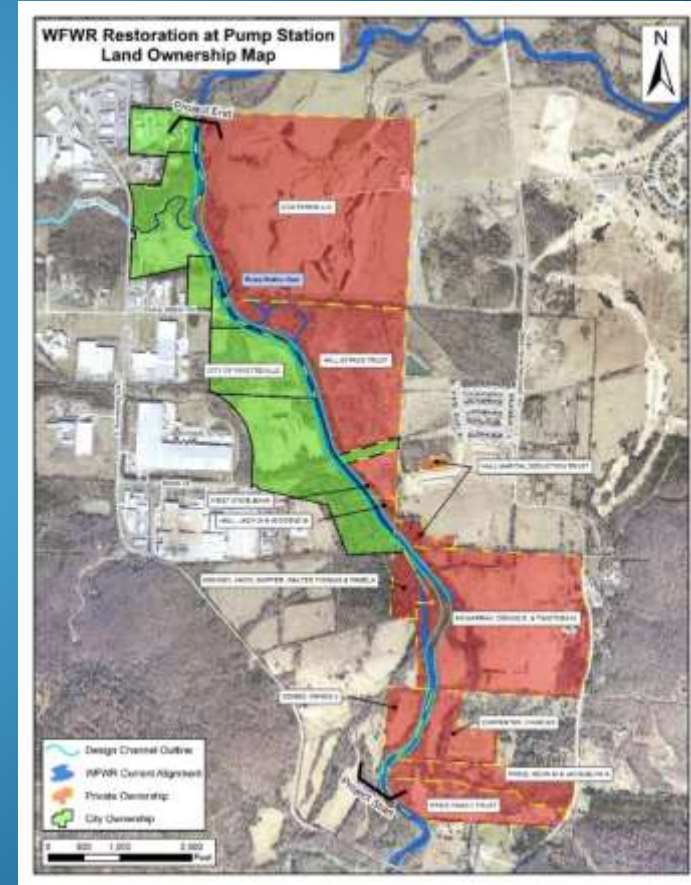
West Fork White River Watershed Plan Implementation

Post RCPP: Large-scale River Restoration Projects utilizing PL-566 Pump Station – Priority Site 6

Design funded

Project is 8,000 feet of WFWR and includes

- Wetland restoration
- Includes unstable section of Town Branch
- Pump Station Dam will be removed
- Pre-restoration water quality, macroinvertebrates, and fish studies have been conducted



Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Continuation of the WFWR Watershed Plan - PL-566 and other projects: 2022 into the future

Projects Funded Through Other Programs

- Completed WFWR Brentwood Mountain Restoration funded by NRD 319 Grant, WCRC, BWA, & BWD.
- Completed urban restoration of Tanglewood Branch and tributary in “The Ramble” funded through EPA Wetlands Development Grant
- Mullins Creek Phase III along Lot 56 on U of A funded through 319 Grant
- Four more EQIP projects constructed or will be constructed through 2024

WFWR at Brentwood Mountain
Before Restoration



WFWR at Brentwood Mountain
After Restoration – constructed 2022

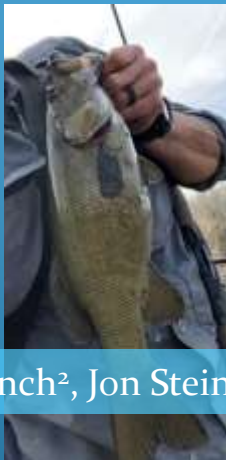


Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Data + Assessment + Planning + Implementation = Results

Evaluation of Fishes at Restored and Unrestored Sites at the West Fork White River:
Annual Project Report 2021, AG&FC¹ & ANHC²

- Observed significantly larger Smallmouth Bass
- Though significantly more Smallmouth Bass were not angled, more were captured with electrofishing
- Observed high species diversity at the restored Greenland site (Airport I), including two SGCN species
- **Can currently conclude that restoration work being conducted in the West Fork White River has likely benefited the abundance and size structure of Smallmouth Bass while promoting diversity of other fishes**



Christopher R. Middaugh¹, Dustin Lynch², Jon Stein¹, Jordan Lindaman¹, Eric Gates¹, and Vic DiCenzo¹

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Data + Assessment + Planning + Implementation = Results

Protects our Water Resources and NWA Drinking Water Source

2010 to 2022	Project name	Watershed Area (mi2)	Length (ft)	Date Complete mm/yy	Age (year) as of 7/23	Cost	Riparian Protected/ Restored (ft)	Wetlands Restored	Sediment Reduced ton/yr	TP Reduced lb/yr	Cumulative Over Time Sediment ton TP lb	
Early Restoration	WFWR - Brentwood	18	1,800	05/10	13.2	\$406,000	3,600	x	1,880	640	24,816	8,448
	Mullins Creek - U of A	0.75	1,000	09/12	10.8	\$425,000	2,000	x	52	24	562	259
	WFWR - Fayetteville Airport Ph. 1	83	4,600	02/15	8.4	\$1,360,000	9,200	x	4,072	1,817	34,205	15,263
	WFWR Dead Horse Mtn. Rd	120	2,500	07/15	8.0	\$550,000	5,000	x	1,860	1,080	14,880	8,640
	Ground Cherry Creek - Kessler Mtn. Reg. Park	0.75	2,000	06/16	7.1	\$435,000	4,000		61	48	433	341
RCPP WFWR Watershed Initiative	WFWR Fayetteville Airport Ph. 2	83	1,400	02/21	2.4	\$1,100,000	2,800	x	5,500	1,330	13,200	3,192
	Rock Creek - Ph. 1	6	300	03/19	4.3	\$155,000	600	x	1,830	900	7,869	3,870
	Rock Creek - Ph. 2	6	300	07/21	2.0	\$130,000	600	x	986	571	1,972	1,142
	Unnamed Trib. WFWR 1	2.3	300	10/20	2.7	\$94,000	600		-	-	-	-
	Unnamed Trib. WFWR 2	0.8	50	07/19	4.0	\$49,000	100		-	-	-	-
Post RCPP	WFWR - Brentwood Mountain	33	1,600	03/22	1.3	\$700,000	3,200	x	2,200	1,140	2,860	1,482
	Tanglewood Branch	0.5	1,000	07/22	1.0	\$750,000	2,000	x	33	12	33	12
TOTAL			16,850			\$5,954,000	33,700		18,474	7,562	100,830	42,649

Implementation of Restorations has Reduced Sediment and Phosphorus Loads to WFWR & Beaver Lake Watersheds

Through 2022: Sediment by 18,500 ton/yr (101,000 ton cum.)

Phosphorus by 7,600 lb/yr (43,000 lb cum.)

Numbers do not include extreme floods or benefits of floodplains, wetlands, and riparian

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Data + Assessment + Planning + Implementation = Results

16.5 miles of the WFWR was removed from 303 (d) list for turbidity



Restored Channel

Restored Wetland

Restored Floodplain

Utilizing Watershed-Based Programs to Restore Streams, Riparian Corridors, & Wetlands in the West Fork White River Watershed

Questions?

Tyler Anderson, Water Resources Engineer
Anderson@watershedconservation.org
(847) 721-0353

Sandi J. Formica, Executive Director
Watershed Conservation Resource Center
Fayetteville, Arkansas, (501) 352-5252
formica@watershedconservation.org

