



Illinois River Watershed Toolkit *for* SUSTAINABLE STORMWATER

BENTONVILLE



MAKING OUR NEIGHBORHOODS AND CITIES BLUER

INTRODUCTION

For those that may be new to the term “watershed,” you are sitting in one right now. Watersheds divide one drainage area from another, using natural boundaries such as elevation to determine where water will drain. In a watershed, all of the stormwater flows to a central outlet or collection point, and for much of Northwest Arkansas, that outlet is the Illinois River. While it is easy to observe surface drainage in many watersheds, much of the water can move below ground and thus be more difficult to measure and influence. In order to delineate and prioritize conservation and restoration efforts, watersheds, including the Illinois River Watershed, are divided into smaller sub-watersheds.

The Illinois River’s headwaters are in Hogeeye, Arkansas-- just south of Fayetteville. The watershed encompasses large portions of Benton and Washington Counties with the eastern border reaching Tahlequah, Oklahoma where it flows into Lake Tenkiller. Lake Tenkiller is the drinking water reservoir used by the City of Tahlequah and approximately 16 rural water districts.

In September 2005, a diverse group of Northwest Arkansas leaders organized an Upper Illinois River Summit with 65 watershed stakeholders committing to personal action and agreeing that public education is the number one priority to improve and protect water quality in the Illinois River. In December 2005, the summit group officially formed the Illinois River Watershed Partnership.

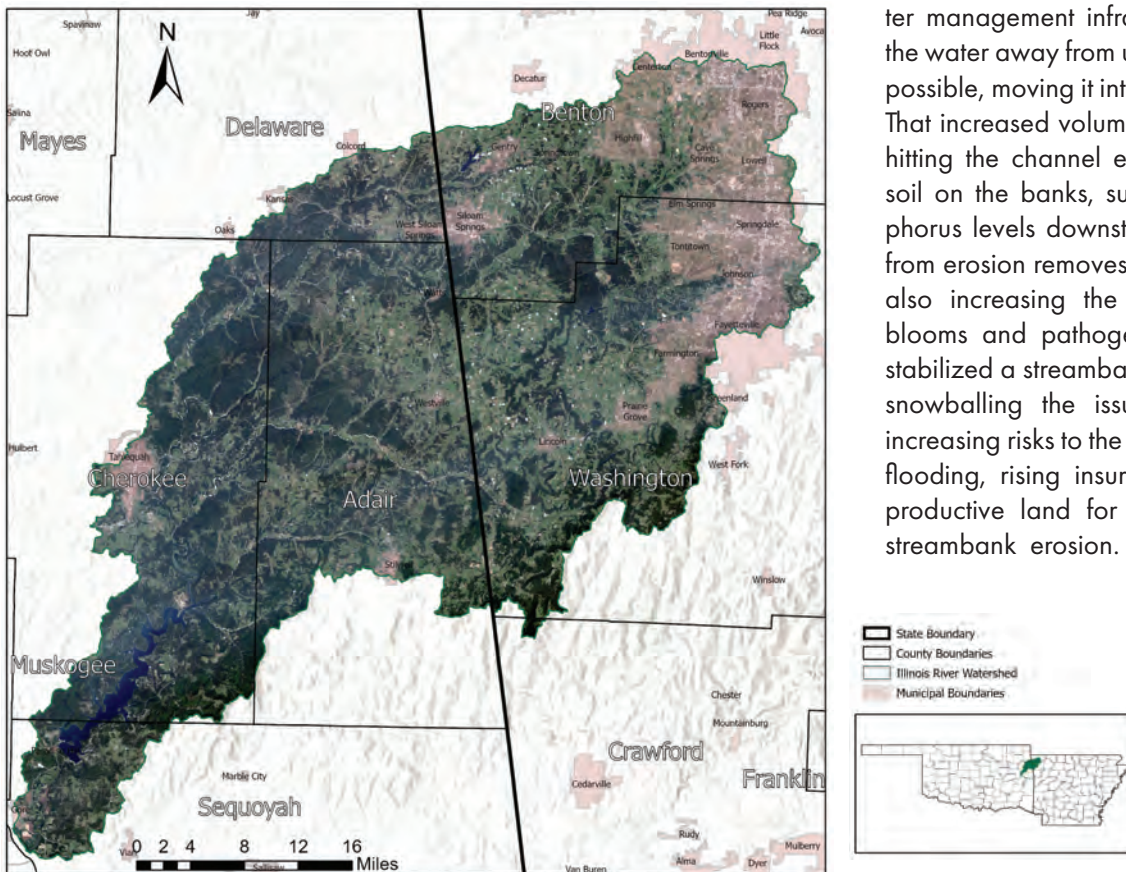
The Illinois River Watershed Partnership (IRWP) is a group of stakeholders from this watershed with an interest in protecting the natural resources in it. IRWP is not a regulatory nor enforcing body, but rather a nonprofit focused on the community-based conservation of this region. With over 15 years of establishment in 2021, IRWP can help connect cities with resources to educate, implement, and fundraise for water quality and stormwater sustainability.

WATERSHED RESOURCES ARE SHARED RESOURCES

While many governing activities are localized to the city or municipal boundary, there are additional challenges posed when it comes to watershed-scale resource management. Since natural hydrology does not adhere to county, state, nor political lines, it is important that there is region-wide coordination in water quantity and quality efforts. Cities and governments can incentivize, educate, and mandate water quality efforts that do make improvements, but the most positive impact will come from having many players who understand and are committed to doing their part for watershed-wide improvement.

In the first hour of rainfall, the water flowing down your streets into the storm drains is worse than raw sewage. As Northwest Arkansas urbanizes and undeveloped forests, pasturelands, and wetlands slowly become businesses, homes, warehouses, and parking lots, the amount of stormwater that cannot infiltrate the ground increases. Traditional stormwater management infrastructure was built to move the water away from urbanized areas as quickly as possible, moving it into the nearest stream or creek. That increased volume and velocity of stormwater hitting the channel erodes away vegetation and soil on the banks, subsequently increasing phosphorus levels downstream. The loss of vegetation from erosion removes habitats for wildlife and fish, also increasing the chances of harmful algae blooms and pathogens. Vegetation which once stabilized a streambank gets washed downstream, snowballing the issue. This is all paired with increasing risks to the public and infrastructure from flooding, rising insurance rates, and the loss of productive land for farmers and ranchers from streambank erosion. Even so, all of this fails to

mention the increased volumes of water contributed by increasing rates of precipitation recently experienced across the entire Northwest Arkansas region.



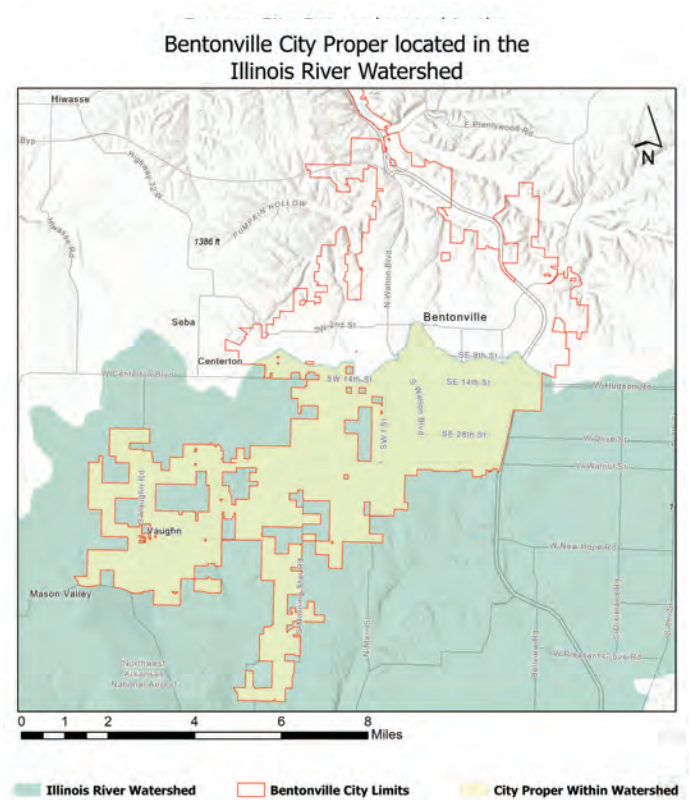
Thankfully, we are not alone in these challenges and there are solutions currently available to responsibly manage stormwater. We just have to be brave enough to acknowledge and proactively address them. Our hope is that you will prioritize stormwater management and encourage your City or County to join the Northwest Arkansas Stormwater Action Plan. Please read on for more detail.

WATERSHED CHALLENGES AND IMPAIRMENTS

SPECIES OF CONSERVATION CONCERN

The Ozarks and the Illinois River Watershed are home to abundant floral and faunal biodiversity. Uniquely composed of a variety of habitats, the Illinois River Watershed is home to everything from cave ecosystems to dry, upland, deciduous forests, and many different ecosystems in between.

This diversity of habitats means there historically existed a large diversity of species within the watershed. According to the Arkansas Natural Heritage Commission (or ANHC), six species that reside within the watershed are considered endangered and four species are considered threatened at the federal level. At the state level in Arkansas, 12 species are considered endangered and five are threatened. All of the species are either dependent on aquatic habitat or on healthy oak-hickory riparian forests that surround them.



ILLINOIS RIVER WATERSHED SPECIES OF CONSERVATION CONCERN

Common Name	Latin Name	Type	Federal Conservation Status	State Conservation Status
Benton County Cave Crayfish	<i>Cambarus aculabrum</i>	Invertebrate	Endangered	Endangered
Neosho Mucket	<i>Lampsilis rafinesqueana</i>	Invertebrate	Endangered	Endangered
American Burying Beetle	<i>Nicrophorus americanus</i>	Invertebrate	Endangered	Endangered
Rabbitsfoot	<i>Theliderma cylindrica</i>	Invertebrate	Threatened	Endangered
Ozark Big-Eared Bat	<i>Corynorhinus townsendii ingens</i>	Vertebrate	Endangered	Endangered
Gray Bat	<i>Myotis grisescens</i>	Vertebrate	Endangered	Endangered
Northern Long-Eared Bat	<i>Myotis septentrionalis</i>	Vertebrate	Threatened	Endangered
Indiana bat	<i>Myotis sodalis</i>	Vertebrate	Endangered	Endangered
Ozark Cavefish	<i>Troglichthys rosae</i>	Vertebrate	Threatened	Endangered
Missouri bladderpod	<i>Physaria filiformis</i>	Plant	Threatened	n/a

DESIGNATED USE IMPAIRMENTS

The Departments of Environmental Quality for Arkansas and Oklahoma assess water quality by monitoring data from numerous locations and utilize a comprehensive assessment methodology to determine which waters are not meeting their designated uses or water quality standards. The States develop their respective 303d lists every two years under provisions of Section 303(d) of the Federal Clean Water Act.



Our watershed has many “designated” (or beneficial) uses as determined by the Arkansas Department of Environmental Quality and the Oklahoma Water Resources Board.

In Arkansas, those uses include:

- Propagation of fish and wildlife,
- Water supply for domestic, agricultural, and industrial use
- and Primary contact recreation.

In Oklahoma, the Watershed has the same uses plus an additional aesthetic provision.

2018 Impairments listings show that Arkansas has eight impaired stream reaches. Oklahoma has 20, including two on Lake Tenkiller.

ARKANSAS IMPAIRMENTS

Stream	Impairment
Illinois River (at Stateline)	Chloride, Sulfate
Illinois River	Pathogen
Muddy Fork	Sulfate, Pathogen
Moore's Creek	Sulfate, Pathogen
Clear Creek	Pathogen
Little Osage Creek	Pathogen
Little Osage Creek	Pathogen
Illinois River (at Savoy)	Chloride, Sulfate

OKLAHOMA IMPAIRMENTS

Stream	Impairment
Flint Creek	Total Phosphorus; Enterococcus
Battle Creek	Enterococcus
Sager Creek	Macroinvertebrates; Enterococcus, Sedimentation
Illinois River	Enterococcus, Total Phosphorus
Tahlequah Creek	E. coli
Illinois River	Total Phosphorus, Enterococcus
Cedar Hollow Creek	Macroinvertebrate
Illinois River	E. coli, Total Phosphorus, Turbidity, Enterococcus
Flint Creek	Dissolved Oxygen, Total Phosphorus
Illinois River	Total Phosphorus
Ballard Creek	Enterococcus
Caney Creek	Macroinvertebrate, Enterococcus, E. coli
Illinois River, Barren Fork	Total Phosphorus
Walltrip Branch	Macroinvertebrate
Tyner Creek	Enterococcus
Peachwater Creek	Enterococcus
Illinois River, Barren Fork	Enterococcus
Caney Creek	Macroinvertebrate, Enterococcus, E. coli
Tenkiller Ferry Lake	Dissolved Oxygen, Total Phosphorus
Park Hill Branch	Macroinvertebrate



irwp.org/designated-use-impairments

View impairment categories & their definitions



THE EMERGING ISSUE: STREAMBANK EROSION

NATURAL RIVER CHANNEL EVOLUTION vs.
WHAT IS HAPPENING

While our water bodies are living and ever-changing, damaging streambank erosion is a sign that stormwater is evolving the banks too rapidly. All rivers, creeks, and streams move and erode, but the question is how much of that erosion (and subsequent movement) is due to man-made, land use change.

Erosion creates a snowball effect: Loss of vegetation further weakens the banks, making even small amounts of stormwater destructive, loading even more sediment and nutrients. Trees are wiped out and their branches collect downstream, causing further disruption. With no (or little) streamside vegetation and with so few roots to keep the soil on the banks in place, the water is exposed to direct sunlight, increasing the likelihood of algae blooms, pathogenic breeding grounds, and subsequently creating safety issues for animals and people. Infrastructure also becomes threatened by the increase in volume and velocity of stormwater, creating public safety hazards and costing cities and municipalities tax dollars.



EROSION IN OUR WATERSHED

In the Illinois River Watershed, many producers and families are losing acres of land every year from streambank erosion; the estimated loss of productive land in our watershed is 40 acres each year. Lush, diverse habitats that make the Ozarks so unique are being lost and becoming streams that resemble drainage ditches. It is important that we not only preserve these natural resources for recreational use to attract and engage citizens, but to preserve the natural history of our region for future generations.

According to data collected by IRWP as part of the Streambank Erosion Inventory across the Arkansas portion of the watershed, the average landowner is losing 5.2 feet of land per year and approximately 38% of streambanks are losing at least one foot per year. These data indicate that we are in the middle of system-wide change that will not only impact

SEE THE VIDEO



CASE STUDY **Jackie Hulet in Siloam Springs**

Jackie's father helped him purchase land in 1978 to raise dairy cattle. Aside from being a home for cattle, the land produced corn and alfalfa. In the last five years, Jackie and his family have seen the creek come out of the banks more times than they did in cumulatively in the past. "It is good land, and we are losing a lot of it," said Mr. Hulet. The property continues to erode due to being downstream of Fayetteville on Clear Creek.

the river, but may also impact the economic development potential of Northwest Arkansas as we expand westward into areas of the watershed that are at greater risk for flooding and erosion.

IRWP's Streambank Erosion Data collected three years of erosion data from 968 streambanks over 45 miles across the entire watershed. A few results are:

Classification	Erosion Rate (feet/year)	Percent of Streambanks
Extreme	At Least 3	0.02
Very High	2 to 3	0.1
High	1 to 2	0.26
Moderate	0.66 to 0.99	0.42
Low	0.33 to 0.66	0.19
Very Low	0 to 0.33	0.02

To put this data in perspective, streambank erosion (from just our 45 mile study area) contributes over twice the amount of phosphorus as the watershed's five largest wastewater treatment facilities.

In other words, Northwest Arkansas could turn off all phosphorous sourced from treatment facilities today, we still would be unable to reduce phosphorus loading to the watershed-- let alone comply with Oklahoma's state standard.

STREAMBANK EROSION ASSESSMENT

Average erosion rate:

5.2 feet/year

As high as 42 feet/year

Sediment loading of study the area:

37,500 tons/year

Phosphorus loading of study the area:

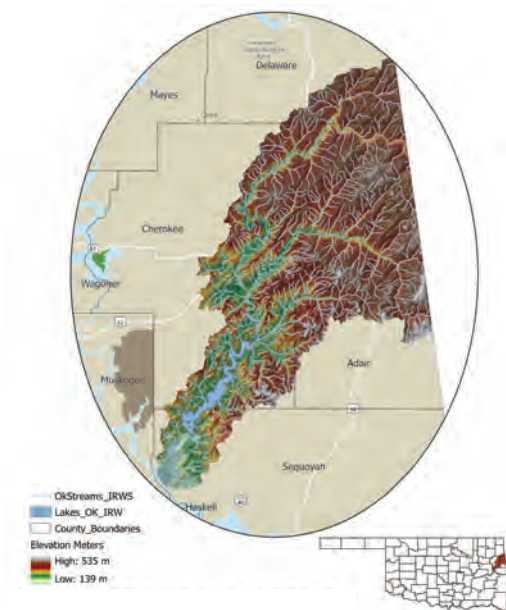
56,250 lbs/year

For Comparison, the P Loading from Wastewater Treatment Facilities in the watershed:

24,196 lbs/year

THE IMPACT IN OKLAHOMA

The impact of new streambank erosion in Oklahoma is a widening of the river from erosion, a loss of riparian area when vegetation is sheared away. This loss of vegetation and riparian area cause the water temperature to rise, which causes a few problems.



Large quantities of silt and mud from streambank erosion are loading into Lake Tenkiller. This reduces water quality, reduces the recreational value of the lake, and the new silt, sand, and mud make it increasingly difficult to treat the water for drinking water purposes. In addition, the added nutrients from sediment loading cause algae blooms which become anoxic when they decompose, killing fish and further reducing the useful life of the lake.

URBANIZATION

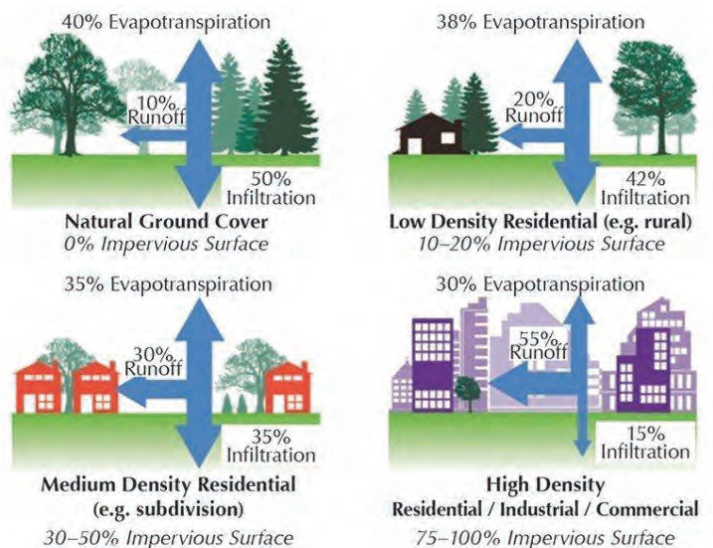
URBANIZATION'S ROLE IN STREAMBANK EROSION

As the region develops and impervious surface cover increases, the amount of stormwater to move away from urban homes and businesses also increases. Traditional stormwater management utilized infrastructure to pipe it to the nearest stream or waterway. Since then, engineers have worked more with detention and retention solutions; however, the loss of infiltration is still present. The cumulative impact of current stormwater management practices in the region is resulting in more water being introduced to the watershed. The increased quantity of water results in ascending rates of streambank erosion, creating water quality issues from phosphorus loading and loss of vegetation due to the increased volume and velocity of water moving through the channels. Detention ponds' lack of infiltration opportunity can be demonstrated by the figure below.

EFFECTS OF IMPERVIOUSNESS ON RUNOFF & INFILTRATION

"For every 1% impervious pavement development, the average flood incidents per year will rise by 3.3%."

Geophysical Research Letters, AGU



TheCivilEngineer.org
Source: Johns Hopkins University

POLLUTION

Additionally, pollutants such as pet waste, litter, industrial, and vehicular waste (and everything in between) are carried to the stream channel via impervious surface runoff. Once again, in the first hour of rainfall, the water flowing down your streets into the storm drains is worse than raw sewage, and that flows directly to our creeks and streams.



Before the drainage manuals, stormwater was piped to the nearest stream or waterway.

The following are excerpts from the linked publications:

EPA: Urbanization - Riparian/Channel Alteration



Urbanization typically reduces the extent and quality of riparian areas, via the removal of native vegetation and the development of near-stream areas. These alterations can contribute to multiple instream stressors, including:

- **Water/sediment quality:** decreased nutrient uptake and retention, increased erosion of bank sediments (and associated contaminants)
- **Temperature:** decreased shading and thermal buffering
- **Hydrology:** decreased woody debris inputs, decreased interception of surface and groundwater flows
- **Physical habitat:** increased erosion of bank sediments, decreased woody debris inputs
- **Energy sources:** decreased leaf inputs, increased algal biomass (due to decreased shading), increased dissolved organic carbon

Direct modification of stream channels is common in urban systems. These direct alterations of channel morphology often are the most damaging changes urban streams experience.

USGS: Effects of Urban Development on Floods



The changes in land use associated with urban development affect flooding in many ways. Removing vegetation and soil, grading the land surface, and constructing drainage networks increase runoff to streams from rainfall and snow-melt. As a result, the peak discharge, volume, and frequency of floods increase in nearby streams. Changes to stream channels during urban development can limit their capacity to convey floodwaters. Roads and buildings constructed in flood-prone areas are exposed to increased flood hazards, including inundation and erosion, as new development continues. Information about streamflow and how it is affected by land use can help communities reduce their current and future vulnerability to floods.

After the drainage manuals, builders began working with detention and retention.

We are now learning about the loss of infiltration as a major drawback to our current stormwater management practices.

Regional coordination, Low Impact Development practices, (like retrofitting detention ponds), ensuring stormwater infrastructure is working properly, and moving forward with water-friendly practices as we develop is how we reach stormwater sustainability!



IRWP's INITIATIVES

BLUE CITIES, BLUE NEIGHBORHOODS

IRWP's Blue initiative programs are focused on sustainable stormwater management. Proactive water resource management is much more cost effective than reactive management, which typically includes complete streambank restoration after extensive data collection. (See Estimating Benefits and Costs of Stormwater Management in the Supplemental Documents List.)

It is IRWP's hope that by educating two major players in stormwater management in NWA-- the citizens and the cities-- on how our changing land use is affecting the water, everyone including city planners, code writers, developers, and other stakeholders can better plan to build communities that are stormwater resilient.



PROGRAMS FOR LANDOWNERS

Landowners living in the Illinois River Watershed may be eligible for financial and/or technical assistance through one of our programs.

Septic Tank Remediation Program

Anyone living in the watershed with a failing septic system can get financial help to repair or replace the system through a combination of zero interest loans and non-repaid grants. Email septic@irwp.org or visit irwp.org/septic to apply for this program. There is no income cap to qualify.

Riparian Restoration Program

Those living in priority subwatersheds can have their land assessed for conservation value, receive a tailored conservation plan for their property, and may receive funding to cover up to 75% of the costs of revegetating riparian areas. Lush vegetation improves aesthetic value and buffers streambanks to protect from pollution and erosion.

Email contact@irwp.org to get started.

Landowner Services Program

To reach the public education part of our mission, we have our Landowner Services Program which includes field tours, our Online Learning Center, newsletters, community relations, and more-- we are available to connect those living in our watershed with the resources available to help them succeed in implementing a practice or simply learning how they can be better watershed stewards.

NWA LID Conference

Pilot: November 3-4, 2021 at Thaden Fieldhouse and via ZOOM

If you are reading this at the time of publishing, IRWP is just a few months away from the pilot Northwest Arkansas Low Impact Development Conference. By bringing in national speakers, IRWP offers engineers, developers, landscape architects, architects, elected officials, and professionals in related disciplines an opportunity to get connected to real-life planning, implementation, and funding mechanisms for managing and improving flooding and erosion, and subsequently improving water quality. It is our hope to secure future funding for practice implementation and further educational opportunities for low impact development.

MAKING OUR NEIGHBORHOODS AND CITIES BLUER



Blue Neighborhoods

The Blue Neighborhoods program will identify the key challenges on a neighborhood scale and then promote low impact practices that best solve the problem(s). The result will be more green spaces in neighborhoods, less flooding, and an open channel to address runoff issues.

Blue Cities

The Blue Cities program will tailor education to help elected officials and staff understand how humans impact the land, how the land impacts the water, and what are the recommended best practices to neutralize the addition of impervious surfaces as we develop our region.

BEST MANAGEMENT PRACTICES

RECOMENDATIONS FOR CITIES AND MUNICIPALITIES

Riparian Buffers

2017 study from Arkansas Water Resources Center, which provides a quantified recommendation of a 30 meter riparian buffer on each side of a stream (total of 60 meters in width), based on three years of E. coli data at 29 sites across the IRW.

Low Impact Development

The name of the game is Slow, Spread, and Soak! Low impact development, or LID, refers to practices that use or mimic natural processes that result in the infiltration, evaporation, or use of stormwater in order to protect water quality.

ADDITIONAL NOTE

We cannot stress the importance of region-wide coordination enough! We hope that you will commit to the Northwest Arkansas Stormwater Action Plan.

RECOMMENDATIONS FOR HOMEOWNERS AND LANDOWNERS

Simple Tips for Living Water Quality Friendly

1. Do not litter
2. Pick up pet waste
3. Only Rain down the storm drains-- never leaves or grass clippings
4. Fix leaky vehicles

Septic Remediation irwp.org/septic

Any landowner (no income cap) in the Illinois River Watershed is eligible for a combination of grants and zero-interest loans to repair or replace a failing septic system.

Contact: Matt Taylor, matt@irwp.org

Get a Custom Conservation Plan irwp.org/rrp

Increase the value of your property, protect threatened or endangered species, and conserve the aesthetic for generations to come. Contact:

Travis Chaney, travis@irwp.org

Learn Online

ONLINE LEARNING CENTER

Riparian Buffers	Commercial Low Impact Development	Land Conservation
Rain Gardens	Youth Education	Streambank Erosion & Restoration
Residential Low Impact Development	Septic Tank Care for Water Quality	Homeowner Water Quality Tips
	Visit the Online Learning Center	Each block is a clickable link if viewing in .PDF.

Learn In-Person

VISIT THE WATERSHED SANCTUARY

We can train you on BMPs!

Visit irwp.org/events to see what trainings we have scheduled. If you would like to have IRWP come to you for training or if you need something not listed, please contact us at contact@irwp.org.



irwp.org

NORTHWEST ARKANSAS STORMWATER ACTION PLAN

By the end of 2022:

1. Review and assess existing stormwater infrastructure to make sure it is working properly
2. Review drainage manual and ordinances to ensure adoption of “infiltration”/low impact development practices
3. Read EPA’s report: Evaluating Stormwater Infrastructure Funding and Financing (can be found here)
4. Transform the Stormwater Compliance Group to a Regional Stormwater Management Advisory Council
5. Re-forest city-owned riparian areas and educate residents about the reasons for doing so

By end of 2024:

1. Fix infrastructure structural problems when found on city-owned property
2. Provide technical assistance to POA’s/property owners on proper maintenance and oversight of stormwater infrastructure assets
3. Leverage Regional Stormwater Management Advisory Council to conduct region-wide assessment of stormwater management options in current and projected, future urban areas

By end of 2026:

1. Implement agreed-upon, region-wide option to implement comprehensive stormwater management and/or low impact development practices
2. Adopt NWARPC’s Open Space Plan into your urban planning and stormwater management policies and processes
3. Make a plan to conserve high-priority properties

TAKE THE PLEDGE



FUNDING OPPORTUNITIES

Grant Programs

FEMA Hazard Mitigation Assistance Grants

Hazard Mitigation Grant Program (HMGP)

Arkansas contact: Lacye Blake at

Department of Emergency Management

Flood Mitigation Assistance (FMA)

Arkansas contact: Veronica Villalobos-Pogue at

ANRC

Pre-Disaster Mitigation (PDM)

Arkansas contact: Lacye Blake at

Department of Emergency Management

Building Resilient Infrastructure and Communities Funds

Arkansas contact: Lacye Blake at

Department of Emergency Management

Natural Resources Division of the Arkansas Dept. of Agriculture

Contact: Ryan Benefield with NRD

Other Innovative Ways to Pay:

A few ideas of how you can raise money locally to implement urban LID practices! See Chapter 5 of the EPA's Evaluating Stormwater Infrastructure Funding and Financing:

"Stormwater user fees provide the greatest opportunity to provide communities with local sustainable, recurring revenue to fund stormwater needs"

1. Stormwater Utility Fees (recommended)
2. "Green" bonds
3. Clean Water Revolving Loan Funds for LID Implementation
4. Sales Tax - *Johnson County, Kansas is a great example of this working successfully*

SUPPLEMENTAL DOCUMENTS

While this Toolkit gives you an overview of our watershed and it's challenges, there is still more to learn. We hope you will read through these documents and use them as reference guides when making planning and development decisions.

Watershed Stewardship Guide

UACDC's Low Impact Development Manual

Cave Springs Karst Study

Estimating Benefits and Costs of Stormwater Management

Model Ordinance Language Document

Streambank Erosion Inventory Study
in the Illinois River Watershed

Each block is a clickable link if viewing in .PDF.

IRWP's mission is to improve the integrity of the Illinois River Watershed, a region covering rapidly urbanizing Northwest Arkansas and Eastern Oklahoma, through public education, outreach, and the implementation of conservation and restoration practices.

ILLINOIS *River*
WATERSHED PARTNERSHIP

IRWP.ORG

With help from
ARKANSAS NATURAL RESOURCES DIVISION
USDA's NATURAL RESOURCES CONSERVATION SERVICE
& the WALTON FAMILY FOUNDATION



irwp.org/toolkit