

A Riparian Area Assessment Guide for Streamside Landowners



**DIVISION OF AGRICULTURE
RESEARCH & EXTENSION**

University of Arkansas System

Cover photo: The Arkansas Game and Fish Stream Team and landowners work together to address property loss caused by streambank erosion due to the lack of a healthy riparian area.

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A man picks up trash alongside a stream.

Introduction to Stream*A*Syst

A Stream and Streamside Assessment System for Streamside Landowners

Streamside property is often highly sought after and prized by land, home and business owners alike. Streams offer many assets – provide water for livestock, irrigation, swimming and fishing; increase property value; provide wildlife habitat and much more. However, the condition and management of a streambank and the adjacent streamside area (known as the riparian area) can often determine if a streamside use or value is even achievable or realized. The purpose of this guide is to provide streamside landowners and land managers with basic information to increase awareness and consideration of the importance of proper streamside management and to provide an easy-to-use self-assessment guide.

There are three main parts to this guide.

- **Stream*A*Syst Worksheet** – A worksheet with “yes” or “no” questions to be answered about your stream. The worksheet provides an easy approach to the successful investigation into the health of your streamside area.
- **Stream*A*Syst Action Plan** – A chart to help you decide what to do once you find a potential stream health concern. The chart will help you decide what to do or who to call.
- **Stream*A*Syst Visual Assessment Aid** – A set of pictures to visually depict poor health to excellent health. The guide will serve as a visual aid to give you a quick-and-easy reference to the health of your streamside.

Whether you are concerned about the water quality of the stream or the potential of streamside property loss or even the scenic beauty, this guide can help you achieve multiple objectives across many different land-use scenarios.

How to Begin

- Familiarize yourself with the **Glossary of Terms** before you get started. If you find a term that you don’t understand along the way, just look for it in the glossary.
- Get to know your stream. Take some time to collect maps, take aerial photos or draw sketches of your stream reach. Also, take a walk alongside or float down your stream if possible.
- Read through the **Stream*A*Syst Worksheet** and answer the questions.
- Begin assessing only one parameter at a time, and evaluate each parameter separately.
- Based upon your answers to the worksheet questions, use the **Stream*A*Syst Action Plan** to determine your next step and who to contact.
- Contact the appropriate agency or organization to obtain the technical help needed to address your streamside concerns.

Glossary of Terms

Accelerated Streambank Erosion – Streambank erosion that occurs much faster than the average rate of natural erosion for a stream. Accelerated erosion is usually triggered by climate change or direct human or animal disturbances to a watershed, streambank or stream channel.

Algae – A plant or plantlike organism found mostly in aquatic settings that produces chlorophyll and does not have stems or leaves. Decaying algae can produce by-products that may give water a foul odor and flavor and will reduce oxygen content of the water.

Aquatic Ecosystem – Basic ecological unit composed of communities of living organisms interacting with a water-filled environment.

Aquatic Habitat – Habitat that is found in water.

Bankfull – The point at which water in a stream channel is running from bank to bank and is still contained within the stream channel; the point of incipient flooding.

Bioswale – A swale or depression that has vegetation and serves as a drainage conveyance.

Designated Water Use – Under the Clean Water Act, states are required to designate a use or uses of streams, such as swimmable, fishable, aquatic habitat, irrigation, etc., since water quality standards vary among different uses.

Dissolved Oxygen – Oxygen dissolved in water and available for use by aquatic organisms.

Ecosystem – An interdependent group of plants and animals and the physical environment where they exist.

Erosion – A type of weathering in which surface soil and rock are worn away through the action of glaciers, water and wind.

Floodplain – The flat or low-lying land next to a stream, river or lake that is covered by water during a flood.

Habitat – The place or environment where a plant or animal naturally or normally lives and grows.

Infiltration – The movement of water from the soil surface into the soil or subsurface.

Impaired Water Bodies/303(d) List – A listing of impaired water bodies in Arkansas as well as other states of the United States that are currently not meeting one or more designated uses.

Natural Channel Design – A form of streambank stabilization and stream restoration that incorporates vegetation, placement of rock formations and stream channel alterations appropriate to a particular type of stream.

Nutrient – A substance that is taken in (like nitrogen or phosphorus) by organisms and is needed for the organism to live, grow, breathe, move or reproduce.

Nonpoint Source Pollution – Pollution that comes from many places across a landscape or watershed and can't be easily tracked back to a source of origin.

Point Bar – A low ridge of sediment that forms along the inner bank of a meandering stream that is commonly composed of sand or gravel and often referred to as a sand or gravel bar.

Point Source Pollution – Pollution that comes from a pipe or some other source that is easily identifiable and to which a particular pollutant can be traced back to a single origin or source.

Pollutant – A contaminant existing at a concentration high enough to endanger the environment, public health and/or beneficial designated uses of a body of water.

Pollution – The action of polluting especially by environmental contamination with man-made waste.

Pool – Stretch of a river or stream in which the water depth is above average and the water velocity is quite below average.

Riffle – A shallow area of a stream located in between pools where water velocity is higher, rocks break up the flow of water and dissolved oxygen is produced.

Riprap – Rock, shot rock, rubble or other material used to armor shorelines, streambeds, bridge abutments, cattle crossings, etc., to reduce erosion due to water movement.

Riparian Area – The land area next to a stream, pond, lake or other body of water where the vegetation and soils are directly influenced by the body of water.

Riparian Buffer – A strip or corridor of vegetation that separates a stream from a surrounding land use. Riparian buffers protect streambanks from erosion, filter pollutants from runoff, slow floodwater and reduce flooding, provide aquatic and terrestrial wildlife habitat and enhance recreational use of the stream.

River Reach – A length of a particular river or stream segment.

Runoff – The movement of water across the soil surface that occurs when water collects at a rate faster than it can infiltrate into the soil.

Stormwater Runoff – Water originating from snowmelt, overwatering or rainfall events that enters the storm drain system and usually flows directly into surface waters of streams or lakes.

Stream Channel – Stream channel is the physical confine of a natural stream (river) consisting of a bed and stream banks. Stream channels exist in a variety of geometries.

Terrestrial Habitat – Habitat that is on land.

Vegetative Filter Strip – A strip of herbaceous vegetation located between an area of frequent runoff and a body of water that filters pollutants and slows water velocity.

Vertical Streambank – A streambank that has a one to zero slope and usually rises up vertically from the streambed to the top of the streambank. Vertical banks are often referred to as cut banks.

Water Pollution – Pollution of river and lake water. There are two types of water pollution: point source pollution and nonpoint source pollution.

Water Quality – Water quality is the physical, chemical and biological characteristics of water in relation to the suitability of water for a particular use.

Watershed – The land area that receives rainfall and drains it into a particular stream, river, lake or other body of water; also called a drainage basin.

Goals of Streambank and Riparian Area Management

The goals of streambank management may vary depending on the goals of a particular land manager or landowner. Some landowners or managers will want to obtain all of the benefits associated with and obtainable through maintaining a healthy streambank and riparian area, while others may just want to obtain a few. Regardless of specific landowner objectives, there are goals all streamside owners and managers share – avoiding the costly and insidious problem of accelerated streambank erosion and obtaining the most benefits while reducing the negative drawbacks.

Benefits and Drawbacks Associated With Streambank and Riparian Management

Healthy streambanks and riparian areas provide many benefits.

- Improve water quality through pollutant filtration and stream shading (cooling of water).
- Absorb runoff water and reduce downstream flooding.
- Stabilize streambanks and prevent or reduce streambank erosion.
- Provide wildlife habitat (cover and food sources).
- Increase property value.
- Increase tax credit value.
- Increase timber value.
- Increase recreational value (swimming, fishing, etc.).

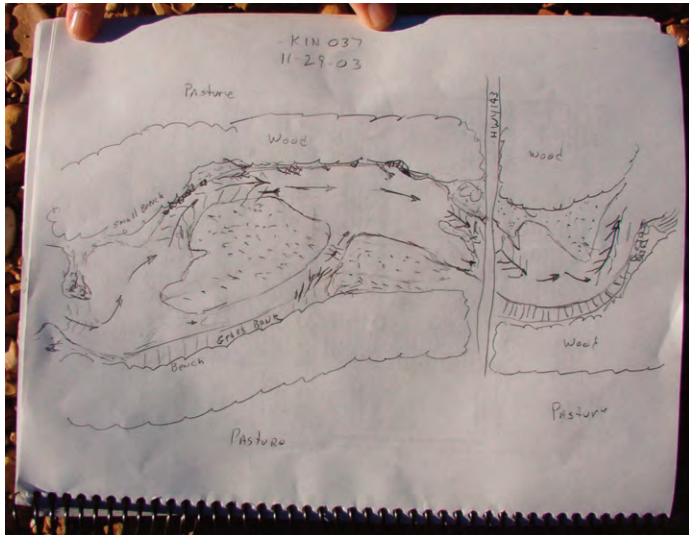
Unhealthy streambanks and riparian areas cause many problems.

- Increase streambank erosion.
- Increase property and structure loss.
- Decrease property value and increase financial loss.
- Degrade water quality.
- Degrade wildlife habitat.
- Degrade recreational potential.
- Increase runoff and flood damage potential.

Getting to Know Your Stream

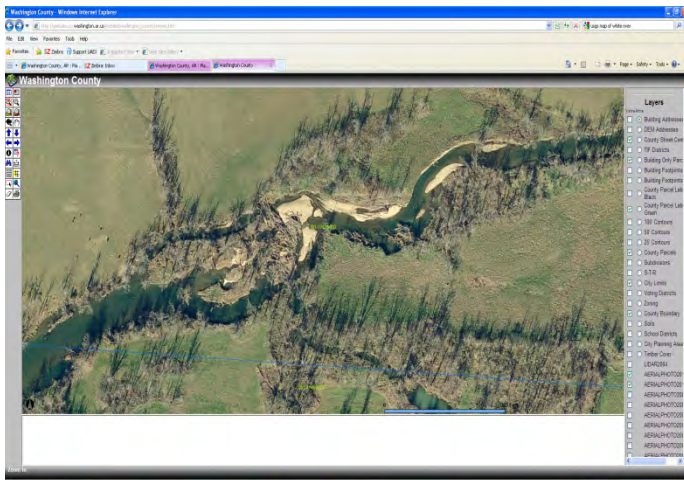
It is important to first get to know your stream. Gather available maps and aerial photos, walk the stream or float it, and take note of any wildlife present and make sketches. All of these steps can offer a valuable perspective of the stream that otherwise might get overlooked. You will have a better perspective when it comes to addressing particular issues that may be occurring in your stream.

Make a sketch that represents details of the stream as it flows along or through your property.



The stream sketch should include the surrounding land use on both sides of the stream and the location of pools, riffles, vertical banks, log jams, active stream channels and surrounding gravel bars. It is also good to include other references – the distance of the stream reach, bank heights or any other characteristics you happen to note and think may be important, such as joining streams or storm drain inlets.

Obtain an aerial photo, topographic map or watershed diagram to get helpful information.



Aerial photos and maps are available through your county or city mapping department, the United States Geological Survey or from Internet sites open to the public such as the Arkansas Watershed Information System or Google Earth. Aerial photos are helpful in obtaining a different perspective than can be obtained through walking, floating or sketching a river reach.

Stream*A*Syst Worksheet

A Tool to Help You Examine Stream, Streambank and Riparian Buffer Conditions on Your Property

1. Water Pollution	Are there ever any signs of pollution such as soap bubbles, oil sheen, unusual odors or trash in or along the stream?	No	Yes
2. Algae	A. Is the water green?	No	Yes
	B. Is there a green scum or thick, stringy clumps?	No	Yes
	C. Is there a heavy, dirty-brownish, slimy material coating underwater rocks, logs or other objects?	No	Yes
3. Muddy Water	A. Does the stream become muddy in the absence of storms?	No	Yes
	B. Does the stream become muddy during or after storms and then take a long time to clear up again?	No	Yes
	C. Is the stream water muddier or cloudier when it leaves your property than when it enters?	No	Yes
4. Long-Term Data	A. Is your stream listed as impaired on the 303(d) list or is water quality data available for the stream (http://www.adeq.state.ar.us/water/reports_data.htm)?	No	Yes
	B. Is water quality data unavailable for your stream?	No	Yes
5. Barriers to Fish or Water Flow	A. Are there any culverts, dams, other artificial structures or woody debris in your stream that block fish or water passage?	No	Yes
	B. Are bridges or in-stream culverts inadequate in size to be able to convey high, overbank flood flows?	No	Yes
6. Ditches and Drainage	Are there any irrigation ditches, tile lines, drainage ditches or other artificial waterways connected to the stream?	No	Yes
7. Water Removal	Do water withdrawals or upstream dams ever result in extremely low water levels?	No	Yes
8. Flood and Erosion-Control Structures	A. Are there any berms, concrete structures or riprap along the stream?	No	Yes
	B. Has the stream been straightened or realigned?	No	Yes
9. Floodplain	Are there any buildings, chemical storage facilities or other materials located within the 100-year floodplain? [Find the 100-year floodplain on Federal Emergency Management Agency (FEMA) maps available online or at the county floodplain administrator's office.]	No	Yes
10. Stream Channel Condition	A. Is the channel much wider and shallower or deeper than in the past?	No	Yes
	B. Are gravel, sand or silt bars noticeably building?	No	Yes
	C. Are there vertical banks with limited or no vegetation?	No	Yes
11. Streambank Stability	A. Is the streambank rapidly eroding away during large flows?	No	Yes
	B. Are structures built next to the creek or trees along the creek falling into the stream due to streambank erosion?	No	Yes
	C. Are there vertical banks with limited or no vegetation?	No	Yes

12. Changes After Large Flows	Are there major changes to the stream such as filled-in pools, new riffle areas, noticeably eroded banks or new stream channels after large flow events?	No	Yes
13. Streambank Protection	Are there areas of bare soil or limited vegetation along the stream that will come into contact with water during high or overbank flows?	No	Yes
14. Streambank Vegetation/ Riparian Buffer	A. Has vegetation along the streambank been disturbed?	No	Yes
	B. Has vegetation been disturbed by a channel width beyond the streambank?	No	Yes
	C. Have activities such as construction, grazing, landscaping or tilling within a creek width of the top of the streambank disturbed the permanent vegetation?	No	Yes
15. Types and Density of Streamside Plants	A. Are there very few or is there a low density of trees, shrubs and grasses along the streambank and riparian area?	No	Yes
	B. Are there large areas with invasive plants such as privet, Japanese honeysuckle, kudzu or others?	No	Yes
	C. Does bare soil or thin stands of grass dominate the area?	No	Yes
	D. Does a type or types of turfgrass dominate the area?	No	Yes
16. Stream Shading	A. Is the stream smaller and does it receive more sunlight than shade?	No	Yes
	B. Is the stream larger and does it receive more sunlight than shade?	No	Yes
17. Wildlife Habitat	A. Are roots or woody debris along the streambank missing?	No	Yes
	B. Is woody debris in the stream channel missing?	No	Yes
	C. Is streambank vegetation limited or missing?	No	Yes
	D. Is dense and diverse vegetation missing beyond the streambank?	No	Yes



Notes and Sketches

Stream*A*Syst Action Plan

Location of Property _____ Date of Plan _____

Directions: Based on your **Stream*A*Syst Worksheet**, mark your Areas of Concern below. If you identified concerns that are not listed, add them at the end of the chart. Use the recommended steps to address your concerns. Phone numbers and web sites for technical service providers are listed on the statewide **Agency Resources** list on page 15 and the **Nonprofit Groups** and **Watershed Organizations** lists on page 16.

Area of Concern	What You Can Do	Resource to Use
1. Water Pollution <input type="checkbox"/> Chemical odors, oil sheen, manure or sewage or other signs of water pollution entering the stream	<ul style="list-style-type: none"> ◆ Use Home*A*Syst Site Assessment, Runoff Management or Storage of Household Hazardous and Automotive Products Worksheets to check for leaks, spills or runoff risks on your property (http:// www.uaex.edu/washington/ Urban_HomeASyst/default.htm). ◆ Check with upstream neighbors to see if they are having the same problem. How far upstream is the problem apparent? ◆ Learn more about the type of pollution present. ◆ Report pollution to the ADEQ. ◆ Have your septic system pumped and inspected. If problems are found, contact ADH and make needed repairs. ◆ Have someone help you evaluate management practices contributing to pollution and work to make the recommended changes. ◆ Contact AWAG or another watershed organization. 	<ol style="list-style-type: none"> 1. Home*A*Syst 2. Neighbors 3. UACES 4. ADEQ 5. Septic pumping company 6. AACD 7. NRCS 8. AWAG 9. Watershed organization 10. For septic tank issues, contact the ADH



Notes and Sketches

Area of Concern	What You Can Do	Resource to Use
2. Algae <input type="checkbox"/> Green water, mats of algae or heavy slime on rocks	<ul style="list-style-type: none"> ◆ Use Home*A*Syst Site Assessment, Runoff Management and Lawn and Garden Care Worksheets to check for leaks, spills or runoff risks on your property (http://www.uaex.edu/washington/Urban_HomeASyst/default.htm). ◆ Determine whether nutrients from a septic tank, fertilizer, manure or yard waste are entering the stream from your property. If so, take steps to prevent it. If not, check with upstream neighbors and in other places in the watershed to see how far up the problem is apparent. Check with technical service providers. 	1. Home*A*Syst 2. Neighbors 3. UACES 4. NRCS 5. AACD 6. AWAG 7. Watershed organization
3. Muddy Water <input type="checkbox"/> A. Water in the stream is muddy in the absence of rain	<ul style="list-style-type: none"> ◆ Determine whether sediment is entering the stream from your property or somewhere else. Use Home*A*Syst Site Assessment, Runoff Management and Lawn and Garden Care Worksheets to check for sediment runoff risks on your property (http://www.uaex.edu/washington/Urban_HomeASyst/default.htm). ◆ Check upstream to see if you can locate the source of the muddy water; look for illicit discharges. 	1. Home*A*Syst
<input type="checkbox"/> B. Stream becomes cloudy or muddy on your land after a rain	<ul style="list-style-type: none"> ◆ If the source of sediment is found on your land, check with educational and resource-based agencies and organizations to help you look into land use practices that might be causing muddy runoff and how best to prevent muddy runoff from occurring. 	1. UACES 2. AACD 3. NRCS 4. AWAG
<input type="checkbox"/> C. Stream becomes cloudy or muddy from an upstream source after a rain	<ul style="list-style-type: none"> ◆ If the source of sediment is not found on your land, check with upstream neighbors. Look into upstream land use practices that might be causing muddy runoff. Use the Watershed Approach to address the issue in a positive manner. If you have no success, then call ADEQ. 	1. Neighbors 2. AWAG 3. Watershed organization 4. ADEQ



Notes and Sketches

Area of Concern	What You Can Do	Resource to Use
4. Long-Term Data <input type="checkbox"/> A. Data show that your stream is impaired	<ul style="list-style-type: none"> ◆ Find the 303(d) or impaired river list on the Internet and search for your stream or the watershed of which your stream is a tributary. ◆ Learn more about the specific pollutant(s) responsible for the impaired listing. ◆ Assess your impact on your land or other places within the watershed. ◆ Get involved with existing efforts. ◆ Create a new stream team or watershed partnership. 	1. ADEQ 2. UACES 3. AWRC 4. AGFC-ST 5. AWAG
<input type="checkbox"/> B. There is inadequate water quality data for your stream	<ul style="list-style-type: none"> ◆ Check with ADEQ, United States Geologic Survey, Arkansas Stream Team, Arkansas Water Resources Center, Arkansas Watershed Advisory Group and relevant watershed organizations. 	1. ADEQ 2. USGS 3. AWRC 4. AGFC-ST 5. AWAG 6. Watershed organization
5. Barriers to Fish or Water Flow <input type="checkbox"/> A. Barriers might block water flow	<ul style="list-style-type: none"> ◆ Evaluate if water is allowed to pass through the barrier or if it is diverted around the potential barrier and is causing erosion or new stream channels to form during a high flow event. 	1. AGFC-ST 2. County or state road department
<input type="checkbox"/> B. Culverts or bridges not sized adequately	<ul style="list-style-type: none"> ◆ Water passage is blocked due to clogged or improperly designed culverts or bridges. 	1. AGFC-ST 2. County or state road department
6. Ditches and Drainage <input type="checkbox"/> Drainage culverts and ditches are connected directly to the stream	<ul style="list-style-type: none"> ◆ Create vegetative filter strips to remove pollutants from stormwater runoff. ◆ Use riprap between the drainage and stream and/or along the sides to stop scour erosion. A permit may be needed for this, so check with the ADEQ before proceeding. 	1. AGFC-ST 2. UACES 3. AACD 4. AWAG 5. USDA-NRCS 6. ADEQ

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Area of Concern	What You Can Do	Resource to Use
7. Water Removal <input type="checkbox"/> Water withdrawals cause low water levels in-stream	<ul style="list-style-type: none"> ◆ Improve efficiency of water use on your property. ◆ Use groundwater, rural water or city water. ◆ Encourage water conservation with your neighbors. 	1. UACES 2. AACD 3. USDA-NRCS 4. AWAG 5. ANRC
8. Erosion Control Structures <input type="checkbox"/> A. Riprap, cross vanes, concrete or rock walls along the creek	<ul style="list-style-type: none"> ◆ With the help of an expert, determine how these structures are affecting the condition of the stream. If a problem, modify as recommended by an expert. 	1. AGFC-ST 2. UACES 3. NRCS 4. CD 5. AWAG
<input type="checkbox"/> B. Stream has been straightened or realigned	<ul style="list-style-type: none"> ◆ Inquire with Arkansas Stream Team, County Road Department, Arkansas Highway and Transportation Department, Natural Resource Conservation Service, County Extension Office, Conservation District, Arkansas Watershed Advisory Group or relevant watershed organizations. 	1. AGFC-ST 2. UACES 3. NRCS 4. CD 5. AWAG 6. AHTD 6. Watershed organization
9. Floodplain <input type="checkbox"/> A. Fertilizer, manure, fuel, trash or hazardous chemicals are stored on the floodplain	<ul style="list-style-type: none"> ◆ If on your property, remove the source of future pollution to floodwaters. ◆ If on your neighbors' property, discuss your concerns with them. ◆ If a spill has occurred, report it to ADEQ and clean up according to their guidelines. 	1. AGFC-ST 2. UACES 3. Neighbor 4. ADEQ
<input type="checkbox"/> B. Structures are built or property is stored on the floodplain	<ul style="list-style-type: none"> ◆ If on your property, remove the structures if possible. If it is not possible to remove the structures, then don't add any more. ◆ If on your neighbors' property, alert them to the potential for property and structure loss or damage. 	1. AGFC-ST 2. Watershed organization



Notes and Sketches

Area of Concern	What You Can Do	Who to Call
10. Stream Channel Condition <input type="checkbox"/> There are high vertical banks or the channel is getting deeper or wider or gravel bars are appearing and disappearing frequently with large flows	<p>◆ Do not be tempted to “fix” on your own. Work with an expert to determine causes and possible solutions and which permits, if any, are needed.</p> <p>The stream is likely unstable. Ask about changes you can make or restoration possibilities. Keep in mind that changes might be needed up and down stream, so plan coordinated efforts with neighbors and don’t forget to check into whether or not any permits are needed for this type of work.</p>	1. AGFC-ST 2. WCRC 3. UACES 4. AACD 5. USDA-NRCS 6. USACE 7. AWAG 8. Neighbors
11. Streambank Stability <input type="checkbox"/> The streambank is rapidly eroding away, trees or structures are falling into the creek, vegetation is absent or streambank is vertical	<p>◆ Do not be tempted to “fix” on your own. Work with an expert to determine causes and possible solutions and which permits, if any, are needed.</p> <p>The streambank is likely unstable. Ask about changes you can make or restoration possibilities. Keep in mind that changes might be needed up and down stream, so plan coordinated efforts with neighbors.</p>	1. AGFC-ST 2. WCRC 3. ADEQ 4. UACES 5. AACD 6. USDA-NRCS 7. USACE 8. AWAG 9. ADEQ 10. Neighbors
12. Changes After Large Flows <input type="checkbox"/> There are major changes to the stream such as filled-in pools, new riffle areas, noticeably eroded banks or new stream channels after large flow events	<p>◆ Do not be tempted to “fix” on your own. Work with an expert to determine causes and possible solutions.</p> <p>The stream is likely unstable. Ask about changes you can make to prevent property loss or people to contact for restoration possibilities if property loss is already occurring. Keep in mind that changes might be needed up and down stream, so plan coordinated efforts with neighbors.</p> <p>◆ Part of the solution may be working with local government.</p>	1. AGFC-ST 2. WCRC 3. UACES 4. AACD 5. USDA-NRCS 6. AWAG 7. Neighbors 8. Local government

Notes and Sketches



Area of Concern	What You Can Do	Who to Call
13. Streambank Protection <input type="checkbox"/> Streambanks are not protected from erosion during high flows	<ul style="list-style-type: none"> ◆ Provide natural long-term streambank protection with vegetative plantings that will add bank stability from plant roots. ◆ Call a professional to determine whether other natural channel design or artificial restoration measures are needed. 	1. AGFC-ST 2. WCRC 3. UACES 4. USDA-NRCS 5. AACD 6. AWAG
14. Streambank Vegetation/ Riparian Buffer <input type="checkbox"/> Vegetation on and around streambank has been removed or disturbed	<ul style="list-style-type: none"> ◆ Identify areas with disturbed or missing vegetation, and replant with appropriate native plants. ◆ Protect vegetation from disturbances such as mowing, grazing, etc. ◆ Commit to land management activities that do not remove or disturb streamside/riparian vegetation. ◆ Leave a “no mow zone” along the edge of the creek, and consider planting shrubs and trees along the streambank/riparian area. 	1. AGFC-ST 2. WCRC 3. AFC 4. UACES 5. AACD 6. USDA-NRCS 7. AWAG
15. Types and Density of Streamside Vegetation <input type="checkbox"/> There is a low diversity of plants, presence of invasive plants, bare soil spots, mowing to the edge of the creek	<ul style="list-style-type: none"> ◆ Increase the diversity of plants to include a mix of trees, shrubs and grasses that are appropriate to the site. ◆ Carefully remove invasive plants by pruning and replanting with native plants appropriate for the site. ◆ Revegetate areas of bare soil with appropriate trees, shrubs or grasses. ◆ Leave a “no mow zone” along the creek, and consider planting some and trees along the streambank/riparian area. ◆ Avoid overmanicuring the streamside area/riparian area, and consider letting it grow wild or planting a mixture of trees and shrubs for at least a distance equal to the width of the stream channel. ◆ This is healthy streamside/riparian area vegetation. Consider allowing vegetation to take up a space equal to the stream width on your side or both sides of the stream channel. 	1. AFC 2. UACES 3. AGFC-ST 4. AWAG



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Area of Concern	What You Can Do	Who to Call
16. Stream Shading <input type="checkbox"/> A. The stream is smaller and there is no or very limited shading of the stream	<ul style="list-style-type: none"> ◆ Smaller order rivers and streams need a lot of shading. Seek to increase the amount of vegetation along the streamside/riparian area on your side or both sides of the stream by planting an appropriate mix of trees and shrubs. 	1. AFC 2. UACES 3. AGFC-ST 4. AWAG
<input type="checkbox"/> B. The river is larger and the stream receives more sun than shade	<ul style="list-style-type: none"> ◆ Larger order rivers such as the Mississippi, Arkansas and White Rivers don't need as much shade, but they still need healthy riparian areas. If the riparian area is degraded, then you should seek to increase the amount of riparian vegetation. 	1. AGFC-ST
17. Wildlife Habitat <input type="checkbox"/> Roots and woody debris are missing along the streambank or in the stream channel; streambank vegetation is limited or missing; dense and diverse vegetation is missing beyond the streambank	<ul style="list-style-type: none"> ◆ Identify areas with disturbed or missing vegetation and replant with appropriate trees, shrubs or grasses. ◆ Protect vegetation from disturbances such as mowing, grazing, etc. ◆ Commit to land management activities that do not remove or disturb streamside or riparian vegetation. ◆ Avoid mowing to the edge of the creek, and consider planting some native shrubs, grasses and trees along the streambank or riparian area. 	1. AFC 2. UACES 3. AGFC-ST 4. AWAG 5. USDA-NRCS 6. AACD 7. USFWS



Notes and Sketches

Agency Resources for the Stream*A*Syst Action Plan in Arkansas

Abbreviation	Contact Information
AACD	Arkansas Association of Conservation Districts assists in efforts to serve the soil and water conservation needs of the people of Arkansas. Phone: 1-501-682-2915 Local Phone: _____ Web: http://www.aracd.org/CD/districts.htm
ADEQ	Arkansas Department of Environmental Quality protects the air, water and land through programs of regulation, stream work permits, education and assistance. Phone: 1-501-682-0655 Local Phone: _____ Web: http://www.adeq.state.ar.us/water/
ADH	Arkansas Department of Health protects and improves the health and well-being of all Arkansans. Phone: 1-800-462-0599 Local Phone: _____ Web: http://www.healthy.arkansas.gov/Pages/default.aspx
AFC	Arkansas Forestry Commission serves urban and rural forest management needs of Arkansans. Phone: 1-501-296-1940 Local Phone: _____ Web: http://www.forestry.state.ar.us/
AGFC-ST	Arkansas Game and Fish Commission - Stream Team helps with litter pickups, water quality monitoring, streambank restoration and watershed improvement. Phone: 1-800-364-4263 Local Phone: _____ Web: http://www.agfc.com/fishing/Pages/FishingProgramsAST.aspx
AWRC	Arkansas Water Resource Center conducts water quality testing, trains future scientists and transfers water quality information to the public of Arkansas. Phone: 1-501-682-0022 or 479-575-4403 Local Phone: _____ Web: http://www.uark.edu/depts/awrc/
UACES	University of Arkansas Cooperative Extension Service serves Arkansans by providing information and education for the public in informal settings. Phone: 1-501-671-2000 Local Phone: _____ Web: http://www.uaex.edu/
USACE	United States Army Corps of Engineers provides public engineering services and is responsible for in-stream work permits. Phone: 1-501-324-5295 Local Phone: _____ Web: http://www.swl.usace.army.mil/
USDA-NRCS	United States Department of Agriculture - Natural Resource Conservation Service – A government agency involved with natural resource conservation. Phone: 1-501-301-3100 Local Phone: _____ Web: http://www.nrcs.usda.gov/
USFWS	United States Fish and Wildlife Service works to conserve, protect and enhance fish, wildlife and their habitats for the continuing benefit of the American people. Phone: 1-501-513-4470 Local Phone: _____ Web: http://www.fws.gov/southeast
USGS	United States Geological Survey works to collect, analyze and disseminate hydrologic information that is needed to wisely manage water resources. Phone: 1-501-228-3600 Local Phone: _____ Web: http://ar.water.usgs.gov/

Nonprofit Groups for the Stream*A*Syst Action Plan in Arkansas

Abbreviation	Contact Information
AA	Audubon Arkansas assists Arkansans by promoting local voluntary approaches to watershed management and conservation. Phone: 1-501-244-2229 Web: http://ar.audubon.org/
AWAG	Arkansas Watershed Advisory Group assists Arkansans by promoting local voluntary approaches to watershed management and conservation. Phone: 1-501-682-0022 Web: http://www.awag.org/index.html
TNC	The Nature Conservancy provides technical and planning services for the protection, conservation and restoration of watershed resources. Phone: 1-501-663-6699 Web: http://www.nature.org/wherewework/northamerica/states/arkansas/
WCRC	Watershed Conservation Resource Center provides technical and planning services for the protection, conservation and restoration of watershed resources. Phone: 1-479-444-1916 Web: http://watershedconservation.org/index.html

Watershed Groups for the Stream*A*Syst Action Plan in Arkansas

Association for Beaver Lake Environment

Bayou Bartholomew Alliance

Beaver Lake Watershed Alliance

Cache River Watershed Partnership

Elk River Watershed Improvement Association

Fourche Creek Watershed Group

Friends of the North Fork and White Rivers

Friends of the Mulberry

Illinois River Watershed Partnership

Kings River Watershed Partnership

L'Anguille River Watershed Coalition

Lake Fayetteville Watershed Partnership

Leatherwood Creek Watershed Partnership

Lower Little River Conservation Committee

Lower White River Watershed Coalition

Save Our Spring River

Upper White River Basin Foundation

West Fork Watershed Alliance

Visual Assessment Aid for the Stream*A*Syst Evaluation

Water Pollution

In many cases, water pollution can be seen or smelled, but water pollution is sometimes undetectable to the eye or nose. If the water in your stream looks clear and you have not seen any fish kills, had an illness occur after direct contact with the water, seen raw sewage or read about potential pollution to the water from a reputable source, then you likely don't have any water pollution in the stream.



A healthy-looking stream that has no visible signs of water pollution.



A stream that appears to have some chemical pollution present.



A stream that appears to have some litter pollution present.

Algae

Algae is a normal part of any healthy stream, but there can sometimes be excessive algae growth in a stream. When algae growth is excessive, fish kills can occur and recreational uses can be limited. When algae growth is excessive over a long period of time, species composition shifts; desirable game fish populations such as bass can be replaced by undesirable non-game fish like sucker fish. Excessive algae growth is usually attributed to excessive amounts of nutrient loading from sediment and fertilizer runoff or excessive amounts of sunlight resulting from degraded or nonexistent streambank vegetation and associated riparian area vegetation.



Planktonic algae are common to all fresh water in Arkansas and can become problematic with enough light and nutrients present.



Green algae are common to all fresh water in Arkansas and can become problematic with enough light and nutrients.



Didymo, also called "rock snot," is an invasive freshwater algae that is problematic in Arkansas streams.

Muddy Water

Sediment is the number one contaminant of surface waters in the United States. If you see muddy water in your creek during low-flow conditions, you should easily be able to walk or travel along the stream to see the source of muddy water. If the stream is in bank-full or flood stage, it will be much more difficult to determine the source of the sediment, but it is still possible to search your property and other places in the watershed to determine where the sediment is entering the stream.



This stream did not become muddy after a rainfall event. Streams should not become muddy due to a rainfall.



This stream became muddy after a rainfall event. Just because a river is rising doesn't mean it should become muddy.



Sediment in streams can come from many places, but often the source can be found with simple investigation.

Long-Term Data

Long-term data is useful for understanding what pollutants or land management practices may be impacting a particular stream or even a watershed. If you can know what pollutants or land management practices are impacting a stream or a watershed, then you can target your efforts to improve water quality and watershed condition. The four agencies listed below have a lot of long-term water quality information.



Barriers to Fish and Water Flow

Barriers to fish and water flow can prevent the easy passage of aquatic creatures up and down stream and inhibit the movement of water downstream. When aquatic creatures can't move freely up and down stream, their range, reproduction patterns and ability to move to another location with more desirable food or oxygen levels is limited. When water passage is blocked or inhibited by a low-water bridge, woody debris dam or low head dam, extreme streambank erosion or a new channel can form downstream and increased flooding can occur.



Woody debris can sometimes collect and form a river-wide blockage. These blockages will oftentimes alter a stream channel by diverting water.



Low-water bridges installed without proper design can often block or limit both water flow and aquatic life movement up and down stream.



Culverts can clog with woody debris, trash and sediment. When this occurs, water flow can be blocked and aquatic wildlife movement can be limited.

Ditches and Drainage

The drainage of water through a riparian area indicates the pollutant filtration ability of the riparian buffer and the erosive potential of drainage water being piped in from surrounding land uses.



It is beneficial to deliver drainage water from a parking lot to a creek by first draining it through a bioswale before it is discharged, with riprap at the outfall of the discharge.



Drainage water delivered to a creek by pipe should have riprap protection around it and, if possible, should have to run through riparian vegetation before entering a stream.



Runoff delivered to a creek by level spreader with no riprap protection or vegetative filter strip will deliver pollutants and become an erosion problem before entering a stream.

Water Removal

Water removal from a stream is a legal right of a streamside landowner, as long as enough water is left for other downstream uses. If all of the water from a stream is removed, it is not good for other downstream water users or for the terrestrial and aquatic wildlife.



Water removal from a riparian area is the right of a riparian landowner. In this case, there is plenty of water for withdrawal without taking water away from a downstream use.



Water removal from a riparian area can potentially be excessive and lower the amount of water available for use by aquatic organisms and alter water chemistry.



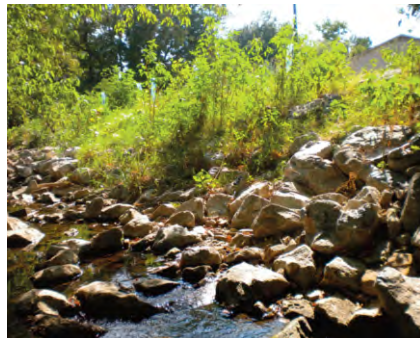
Too much water withdrawal or removal from a creek during low-flow periods can harm aquatic wildlife and take away other downstream uses of water.

Erosion Control Structures

The best erosion control measure is to leave streambank and associated riparian vegetation undisturbed. However, if the streambank and associated riparian vegetation are already gone and an unrelenting erosion problem is occurring, then an erosion control structure may be necessary.



A cross vane rock structure incorporated with vegetation as part of a natural channel redesign will not likely have to be replaced.



Riprap placed at the bottom of a re-sloped bank with vegetation added for increased beauty and strength will not likely have to be replaced.



Riprap placed at the bottom of a vertical bank with no re-sloping or vegetation added will likely have to be replaced.

Floodplain

The floodplain is the location where sediment and energy are deposited and released as the water flows out of the stream channel when there is a flood. If personal property is located or stored within a floodplain, it can become damaged or lost and contribute to stream pollution as it contacts the floodwaters.



Materials stored at the edge of a streambank will be washed into the creek during a flood.



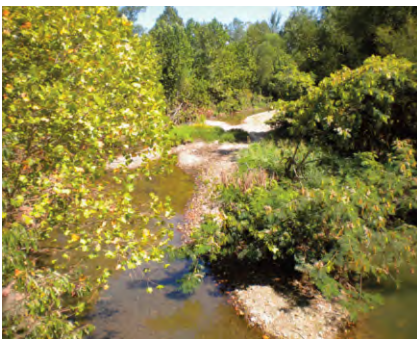
Materials stored or built in a floodplain will be washed away or damaged in a flood.



An empty floodplain will not allow items to be damaged or washed away by a flood.

Stream Channel Condition

Stream channel condition refers to the amount of deterioration that has occurred in the stream and riparian areas as a result of streamside management and other land use practices within a watershed. A healthy channel will be able to convey high flows without eroding away, provide wildlife habitat and be densely covered with vegetation extending up the streambank and out into the riparian area.



A healthy channel most often will have densely vegetated streambanks, few vertical banks and will not change much after a flood.



A moderately healthy channel will have some vegetation on the streambanks, some vertical banks and some changes after a flood.



An unhealthy channel will not have much vegetation on the streambank, lots of vertical banks and will change with almost every flood.

Streambank Stability

The stability of a streambank is measured by its rate of erosion. A streambank that erodes by an inch annually is most often not a problem, but a streambank that erodes by several inches to several feet per year is a serious problem that degrades water quality, wildlife habitat, property value and is usually very costly to fix.



A stable streambank has a lot of dense and diverse vegetation and is usually not a vertical bank.



A moderately stable streambank has some vegetation and may or may not have a vertical bank.



A highly unstable streambank has little to no vegetation and a vertical bank.

Changes After Large Flows

Being a streamside landowner, resident or manager, you will likely be the first to notice changes in the stream or to the streambank when they occur. Changes are often signs of channel or bank instability and should serve as a warning to begin making streamside land management changes that increase the strength of the streambank and health of the riparian area. A great first step to making changes in land management is to contact your local stream team coordinator.



Before



After



Before



After

Streambank Protection

The best kind of streambank protection is the natural protective vegetation that comes with an undisturbed or unmanicured streambank and riparian area. Roots of plants serve as natural anchors to keep streambank soil from eroding away. Usually streambanks don't need protection like riprap or other restoration measures when they have been left alone and allowed to keep their briars, bushes, vines, shrubs, trees and grasses.



Dense and diverse vegetation on the streambank and in the riparian area is the best and most cost effective form of streambank protection.



Riprap is an unsightly form of streambank protection that offers no pollutant filtration, wildlife habitat or aesthetics but can fix an unstable bank.



A streambank stripped of its natural protective vegetation and without any type of restoration is completely unprotected and highly erosive.

Vegetative/Riparian Buffer

The width of the riparian buffer indicates the functional ability of a riparian area to filter pollutants from runoff, shade the stream, provide wildlife habitat and prevent streambank erosion.



A vegetative/riparian buffer on a streambank and out for a distance in the associated riparian area is good for water quality, wildlife and prevention of streambank erosion.



A limited vegetative/riparian buffer on a streambank and in an associated riparian area is less good for water quality, wildlife or streambank erosion prevention.



No vegetation on a streambank or in an associated riparian area is bad for water quality, wildlife or streambank erosion prevention.

Vegetation Type

The type of vegetation on a streambank and in the associated riparian area indicates the functional ability of a riparian area to provide ecosystem functions such as the filtering of pollutants from runoff, shading the stream, providing wildlife habitat and preventing streambank erosion.



A mixture of trees, shrubs, vines and grasses is most often the best type of streambank and riparian area vegetation for water quality, wildlife habitat and streambank protection.



A mixture of unmanicured grasses is usually not as good as trees, shrubs, vines and grasses. However, unmanicured grass on the streambank is much better than mowed turfgrass.



Mowed turfgrass down to the creek is only more beneficial than having bare soil next to the creek and in the riparian area. This is what you want to try to avoid.

Vegetation Density

The density of vegetation on a streambank and in associated riparian area indicates the functional ability of a riparian area to filter pollutants from runoff, shade the stream, provide wildlife habitat and prevent streambank erosion.



Dense vegetation on a streambank and in the associated riparian area is good for water quality, wildlife habitat and streambank erosion prevention.



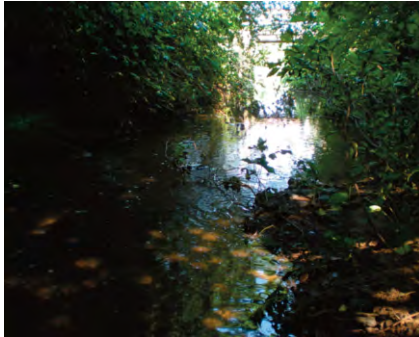
Moderate vegetative density on a streambank is better than no vegetation or sparse vegetation. However, it is not as good as dense vegetation on the bank and out into the riparian area.



A lack of vegetative density on a streambank and associated riparian area is not good for water quality, wildlife habitat or erosion prevention.

Stream Shading

Stream shading is important for providing water temperature regulation and dissolved oxygen for aquatic organisms such as fish and crawfish, among others.



A well-shaded stream has more dissolved oxygen content. A stream with highly dissolved oxygen is also a stream with desirable fish and other aquatic species.



A moderately shaded stream has more dissolved oxygen content than an unshaded stream.



An unshaded stream has low dissolved oxygen content and a lack of desirable fish and other aquatic species.

Wildlife Habitat

Wildlife habitat is indicated by the width, diversity, density, health and presence or absence of the riparian area and the presence or absence of wildlife.



A vegetative/riparian buffer that is wide, diverse and dense with plants is much more healthy and likely to have more wildlife present.



A vegetative/riparian buffer that is thin, not diverse or dense with vegetation, is moderately healthy and likely to have some wildlife present.



A vegetative/riparian buffer that is nonexistent is unlikely to have any wildlife present.

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