SECOND EDITION

Your Remarkable Riparian

A field guide to riparian plants within the Nueces River Basin of Texas

A publication of the Nueces River Authority

From the Managing Editor:

Our goal for this guide is to cultivate awareness of native riparian vegetation and appreciation for its role in proper riparian function. Within the Nueces River Basin, we identified hundreds of plants growing in riparian areas. Some have yet to have their role discovered or described. Some may be only temporary pioneers, blazing the trail to recovery following a disturbance. Others are simply placeholders, holding things together until conditions improve. They may be upland plants, marching into riparian territory, offering us a clue that the area has been altered, dewatered, downcut or overpumped. Still, almost any vegetation is better for riparian function than none. In a way, all plants contribute something to the riparian system and tell a story we need to learn to read.

This user-friendly guide introduces the most commonly observed riparian vegetation in the Edwards Plateau and Rio Grande Plains. However, most of the plants presented herein occur in riparian areas all across Texas, including the Cross Timbers, Trans-Pecos and Rolling Plains. The riparian principles described apply to all creeks and rivers. We've included images and details on plants that truly provide the heavy lifting when it comes to holding and cleaning water within the riparian landscape.

This field guide is a tool that you can refer to again and again. Keep it on the dashboard, take it to the creek, or leave it on the kitchen table so you can consult it regularly. It's up to you to learn to read your riparian areas and determine if they're gaining or losing function. With this knowledge and appreciation, you can successfully assess and monitor your riparian areas and help manage them in ways that conserve and enhance their function.

Thank you to Steve Nelle and Bill Carr who graciously provided their unmatched plant knowledge, field experience and unwilting patience to pull the content of this book together. Ginger Webb offered interesting information about medicinal values, and Kara Kroeger contributed culinary tidbits. Mary Kate Rogers conjured up creative graphics to illustrate complex and commonly misunderstood concepts. Jew-Lee Lann made our Web site support happen seamlessly. Karen Ford and Kevin Greenblat found a beautiful, functional way to present the information within these pages. Mary Knickerbocker kept us grammatically correct. Wayne Elmore and Janice Staats from the National Riparian Service Team and Ken Mayben from the Texas Riparian Service Team taught us all something about riparian function.

And most importantly, The Meadows Foundation, The Dixon Water Foundation, Shield Ayres Foundation, Save the Laja, Community Foundation of the Texas Hill Country, The John & Florence Newman Foundation, Yates Cattle & Conservation, Stewards of the Nueces, Texas Wildlife Association Foundation, Texas Parks and Wildlife Department and Texas Coalition–Grazing Lands Conservation Initiative, United States Department of Agriculture–Natural Resources Conservation Service invested generous financial support.

Use, learn and enjoy!

Sky Jones–Lewey
Resource Protection and Education Director
Nueces River Authority

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Table of Contents

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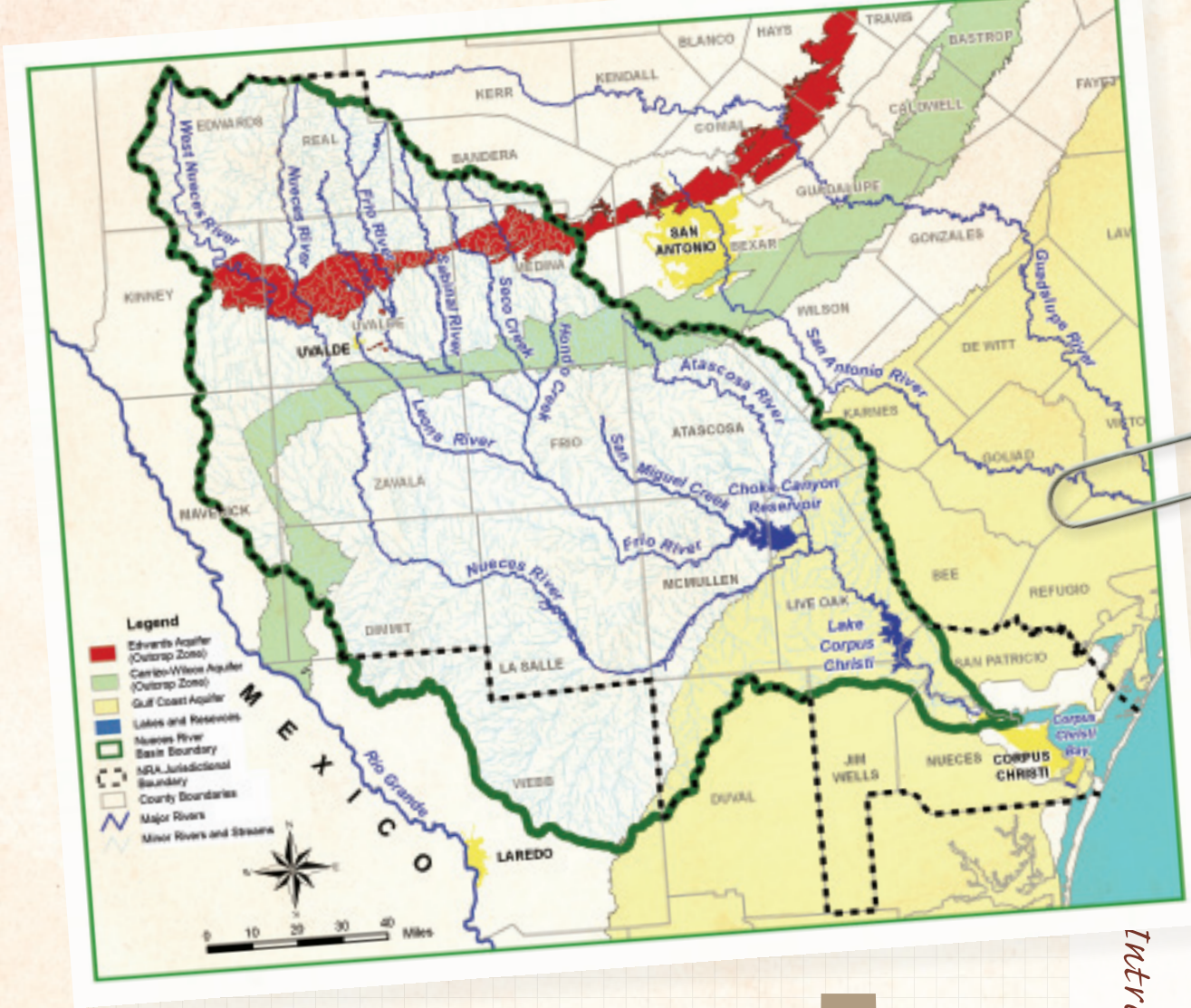
NUECES RIVER AUTHORITY

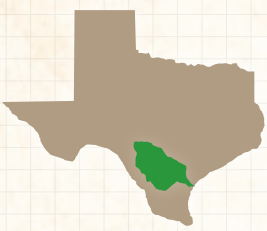
Sky Jones-Lewey, Managing Editor

Since ancient times the springs, creeks, rivers, aquifers and bays of the Nueces River Basin have been the lifeblood of a dry region—providing irrigation for thirsty crops, drinking water for growing populations, and a place to cool off on a hot day. These water resources were magnets for native civilizations, the selected sites for Spanish missions, watering holes for mustangs and longhorns, and continue to be a life-giving refuge for fish and wildlife.

Clean, abundant water in the Nueces Basin depends on an amazing natural system of tributary streams, creeks and riparian land that subtly works its magic—filtering, storing and releasing this precious resource. The transitional band of vegetation that occurs between waterways, large and small, and the upland regions marks the critical riparian landscape. This zone is where water, soil and vegetation interact. The plants within this system help determine its proper function—holding soil, and holding and cleaning water. Healthy riparian lands will determine the amount and quality of water in our rivers, bays and groundwater aquifers in the future.

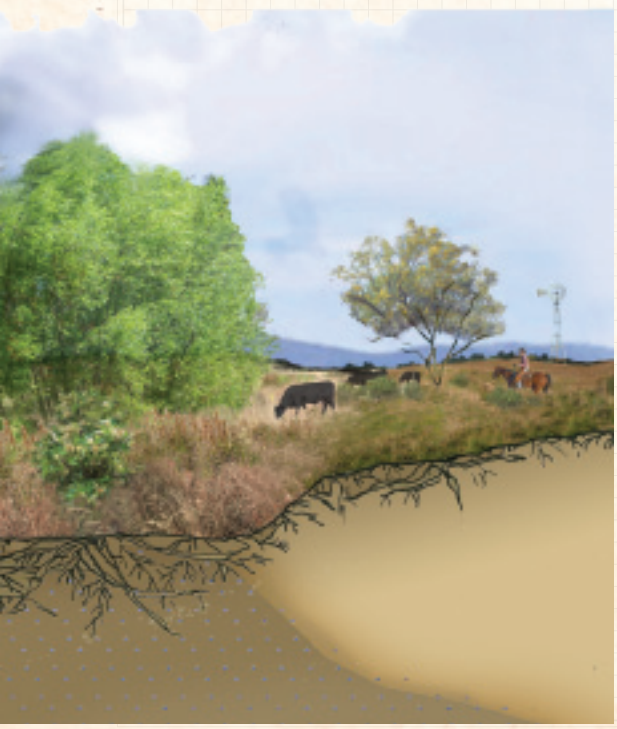
Riparian areas are some of the most productive pieces of land. They can be reliable producers of forage, shelter and water, and a critical buffer during drought or flood.





The Nueces Basin

From the Edwards Plateau to the Gulf of Mexico, Rocksprings to Corpus Christi, 235 miles long and 115 miles wide, the Nueces River Basin encompasses large parts of the Texas Hill Country, Brush Country and Coastal Plains. The river basin includes many miles of *ephemeral*, *seasonal* and *perennial* creeks and tributary streams. When flanked by healthy-functioning riparian land, these streams present a unique opportunity to enhance stream flow, water quality, groundwater recharge, and wildlife and fish habitat.



Ephemeral
Flows only in direct response to storm runoff

Seasonal
Flows occasionally and often has sustained flow for extended periods of time; enjoys a temporary connection to groundwater

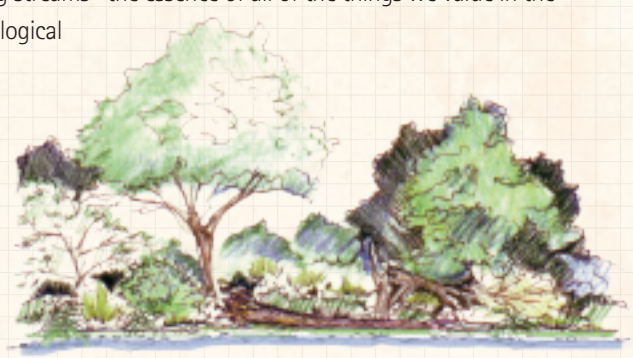
Perennial
Flows most of the time, except during severe drought; enjoys a continuous connection to groundwater

"A riparian area that is functioning properly will support a heavy stand of densely-rooted vegetation. Riparian plant species have different rooting characteristics than upland plants. Root systems are often stronger and denser than upland species. A strong interconnected root mass is one of the critical factors in maintaining bank and channel stability. In functioning condition, the riparian 'root basket' can act like a cradle holding the streambed above the bedrock and protecting the banks."

Steve Nelle, Wildlife Biologist with Natural Resource Conservation Service and riparian advocate

Function Produces Value

A healthy riparian system dissipates floodwater energy. It filters sediment and stabilizes soil on banks and within channels. This complex system depends on specialized plants to recharge ground water and keep rivers flowing during dry times. Working together as a community, riparian plants hold stream banks together and cradle streambeds up above the water table. When the riparian system is functioning, it produces clean, flowing streams—the essence of all of the things we value in the Nueces River Basin—natural beauty, ecological benefits, recreational resources, livestock forage and drinking water.



Healthy functioning riparian areas may seem unkept, overgrown or shaggy. They are not widely understood and often under-appreciated.

Disfunctional is Damaging

Signs that a riparian system is not functioning include exposed soil or gravel on banks and in the floodplain, a wide channel with shallow water, increased flood flows and excessive erosion often resulting in stream bank collapse. Lack of shade or over-hanging vegetation are other signs of a degraded riparian system, as are the noticeable absence of large wood or downed trees. The result is the loss of fish and wildlife habitat and the dominance of non-native invasive plants and/or upland species. Riparian function can be impaired by human activity, especially when banks are heavily manicured, mowed or grazed short, over browsed, graded or even paved.

Wetness Indicators

Within this guide, a Wetness Indicator (WI) is assigned to each plant according to the degree of soil moisture needed and tolerated by the plant. This rating is based on Region 6 U.S. Fish and Wildlife Service (USFWS), Wetland Plant List.

There are five categories:

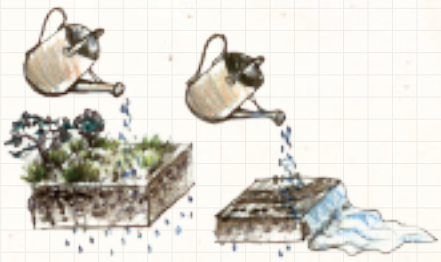
OBL – Obligate Wetland Plants
almost always found in very wet locations

FACW – Facultative Wetland Plants
usually found in wet locations

FAC – Facultative Plants
found equally in wet and non-wet locations

FACU – Facultative Upland Plants
usually found in non-wet locations

UPL – Obligate Upland Plants
almost always found in non-wet locations



Think of your riparian area as a sponge collecting, storing and slowly releasing water. Removal of vegetation, compaction or disturbance of the soil that makes up the sponge can inhibit this key function.

An abundance of OBL and FACW plants indicates that the riparian area is storing water, has a high water table, and stays wet for much of the year. This is referred to as the "riparian sponge." A riparian area lacking OBL and FACW plants indicates that the riparian area is not storing water very effectively and can be a sign of water table decline.

Stability Rating

A Stability Rating (SR) is assigned to each plant in this guide according to its observed ability to withstand the erosive forces of water. The rating scale is one to ten where SR 1 is equal to bare ground, and SR 10 is equal to the stability of anchored rock. SR 6-7 is considered the minimum necessary for adequate bank stability. The stability rating of individual plants is multiplied when they grow in interconnected colonies.

Functional Plant Groups

Colonizer plants spread quickly and put down a mat of new roots by stolons or rhizomes. These plants grow fast and trap sediments creating niches for deeper-rooted plants to take hold. Colonizers usually grow right at the water's edge or even out into the water. Early-stage colonizers are weak-rooted; their main function is to spread as quickly as possible, but they are critical to the recovery of riparian areas. Late-stage colonizers have stronger roots but do not grow as quickly. They provide a combination of colonizer and stabilizer functions.

Some Early-Stage Colonizers:

COMMON NAME	WI	SR
Water primrose	OBL	3
Watercress	OBL	3
Smooth bidens	OBL	5
Water hyssop	OBL	3
Pennywort	OBL	3
Mint	FACW	3
Frogfruit	FAC	4

Some Late-Stage Colonizers with Moderate Stability Rating:

Spikerushes (most)	OBL	6
Flat sedge	OBL	6
Knotgrass	FACW	6

Stabilizer plants are taller, upright plants with strong, dense root mass. Both woody and herbaceous, they are slower to establish than their colonizers, but once established, they are much stronger and more permanent. Most stabilizer plants also have large, stout top-growth, which helps to dissipate the energy of floodwater. When the velocity of flowing water is retarded, sediments are dropped and trapped in the vegetation and become incorporated into the bank or floodplain. Woody stabilizer plants function as "riparian rebar" because of their larger root diameter and ability to interlace with fibrous herbaceous roots. When left in place, fallen trees can become lodged in the streambed and bank and continue to provide valuable stability indefinitely. This is a primary way that floodplains are developed and channels repaired.

Some Herbaceous Stabilizer Plants:

Emory sedge	OBL	9
Sawgrass	OBL	9
Switchgrass	FAC	9
Eastern gamagrass	FAC	9
Big sacaton	FAC	9
Common reed	FACW	9
Gulf cordgrass	FACW	9
Lindheimer muhly	FAC	7
Water willow	OBL	7
Spiny aster	FACW	8

Some Woody Stabilizer Plants:

Bald cypress	OBL	9
Buttonbush	OBL	8
Black willow	FACW	7
Arroyo willow	FACW	7
Sandbar willow	FACW	7

Gravel Bar Pioneers live where others can't. In the upper Nueces region, large destabilized gravel deposits *(bed load)* are characteristic on many creek and river segments. The lack of shade, soil and subsequent poor water-holding capacity make gravel bars a harsh environment for plant growth. Plants that grow on these large, barren, gravel deposits are special. They are pioneers, mostly FAC and UPL plants, with a mix of colonizers and stabilizer functions. They aid in preparing more favorable conditions for other riparian plants to grow.

Gravel Bar Pioneers:

Roosevelt baccharis	FAC	6
Sycamore	FAC	6
Lindheimer indigo	FAC	5
Little walnut	FAC	6
Desert willow	FACU	6
Gravel bar brickellbush	UPL	5

Non-Plant Features and Tell-Tale Signs (Stream Morphology)

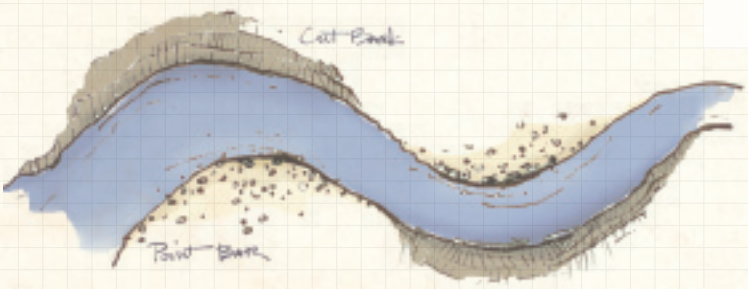
Over time, streams process bed load (gravel in the headwaters and sand or silt in the lower country) into stable channels and banks. Upland clearing, especially on steep slopes, can increase runoff and generate excessive bed load. Mechanical manipulation of riverbeds or clearing of riverbanks can mobilize more bed load than the stream can quickly or easily process. When the riparian plant community is degraded, it is practically impossible for the stream to stabilize the additional bed load. Streams struggling to process excessive bed load often react by widening and becoming braided.

These images show sediment transport problems.

Bed load includes gravel or other sediments washed in from uplands or dislodged from banks when stability is compromised.

A **Braided channel** consists of a network of small channels separated by small and often temporary islands called braid bars.

Erosion and deposition are two powerful opposing forces at work in a stream. All is well if neither is winning too much ground. Erosion and deposition are in balance when eroded bank material is being deposited not far downstream, building a new or expanded point bar and helping create sinuosity. Mid-channel deposition signals an imbalance, possibly excessive bed loading. When erosion and deposition are out of balance, the stream will swing, squirm and downcut until eventually, the two forces reach equilibrium by building new flood plains and new channels. A combination of living plants and large downed wood can slow and catch sediment helping to inhibit erosion and stabilize channels.



A **Point bar** is a depositional feature of streams. Point bars are found in abundance in mature or meandering streams. They are crescent-shaped and located on the inside of a stream bend.

Sinuosity is a measure of the wiggle or meander of a stream channel. Increasing sinuosity also increases length and results in energy dissipation. In the absence of proper functioning riparian areas, with plenty of plants and logs to dissipate flood energy, streams will excessively erode their stream banks or bed in order to dissipate that energy.

Lane's Balance

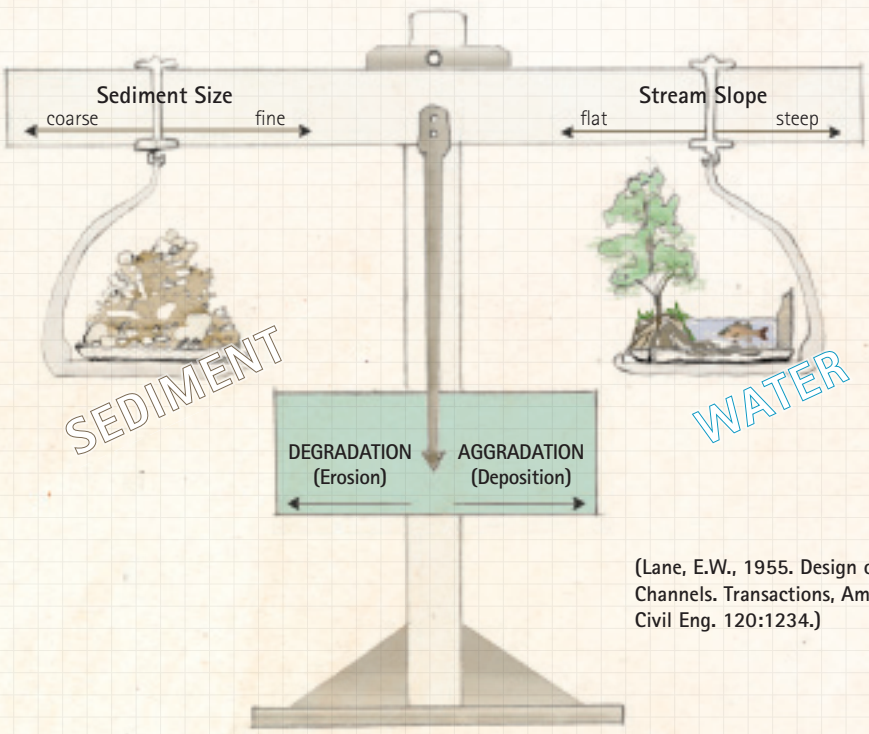
Lane's Balance shows the dynamic relationship between water and sediment or erosion and deposition in a stream channel. A stream's "job" is to move water and sediment downhill. Creeks and rivers evolve naturally to transport the volumes of water and sediment generated by its particular catchment areas.

When upland clearing, overgrazing, road building, drainage systems, rooftops or other changes in a catchment area cause more rainwater to run off, the stream will react to that increase by **degrading** i.e. down cutting and/or widening its channel. This erosion of the banks and/or bottom of the channel will add more sediment (gravel or silt) to the stream. Over time the channel will adjust its shape, slope and meander pattern to balance the new discharge and sediment supply.

Likewise the damming of tributaries, dewatering of aquifers, piping water out of a catchment can reduce the amount of water entering the stream. When this occurs, sediment cannot move through the system and the channel will **aggrade** i.e. build up, until balance is reached. Lane's Balance is helpful in understanding downstream impacts of geologic and climatic events, and large-scale changes in land cover within the catchment upstream. Lane's Balance does not include a clock; it may be years before a new balance is reached. It also does not account for the buffering role of plants.

Common Water/Sediment Connections

Cause	Effect
Overgrazing or excessive clearing on slopes, or development	More water
Damming of tributaries, better cover on catchment, alluvial pumping	Less water
Gravel mining, or mechanical disturbances	More sediment
Dams, or paved catchments	Less sediment
Cutting off meanders (straightening the channel)	More slope
Creating sinuosity	Less slope

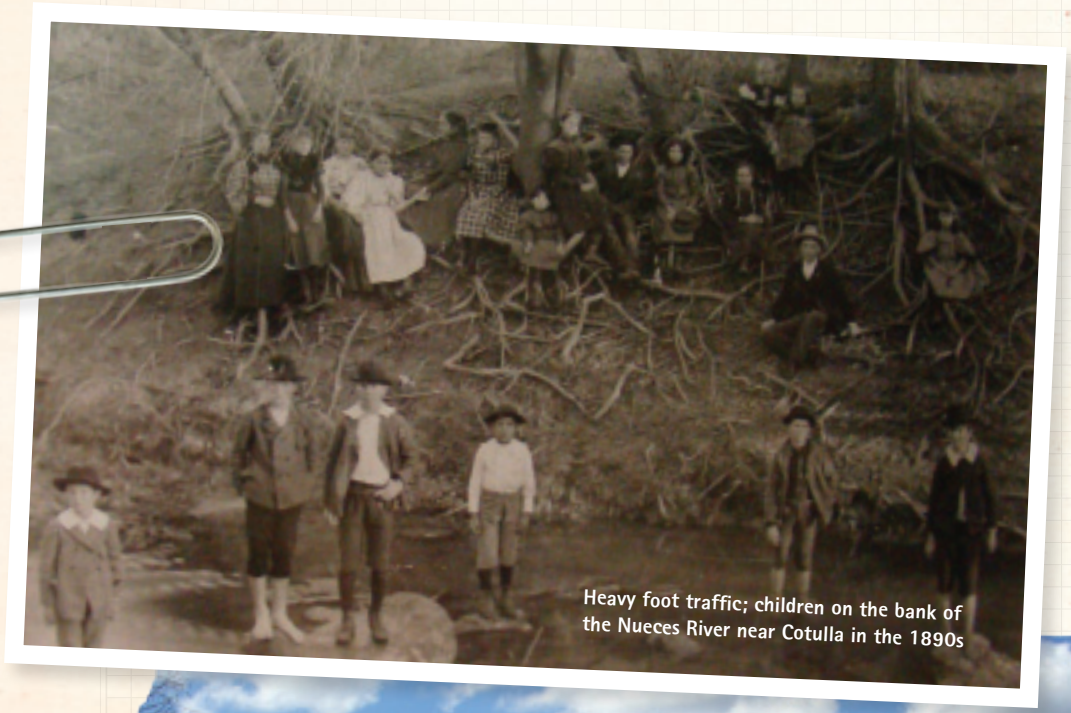


(Lane, E.W., 1955. Design of Stable Channels. Transactions, Am. Soc. Civil Eng. 120:1234.)

Good riparian vegetation helps keep Lane's Balance stabilized and allows the stream to absorb changes in sediment and water without degrading or aggrading.

Our Choices Influence the Riparian System

Riparian areas have attracted people for centuries. Flanked by healthy functioning riparian areas, many creeks and rivers have remained pristine and flowing, others have lost their natural functions and fallen prey to water quality problems, over-pumping, over-grazing and overuse. Abusive recreation and thoughtless mechanical manipulation by well-meaning but uninformed individuals have become far too commonplace. Regardless of their health, Nueces Basin streams are being asked to provide water and recreation to more and more people. This may not be possible unless people can come to understand and preserve the remarkable riparian function that produces the resources they require and treasure.



Heavy foot traffic; children on the bank of the Nueces River near Cotulla in the 1890s

All too common practice of clearing river banks for a "view of the water"

Heavily disturbed riparian plant communities, especially where the water table has been lowered or flows interrupted, may not recover in our lifetime. But most are extremely resilient and can recover as long as they have time, rest and an abundance of water. With knowledge, we can make informed choices to prevent unnecessary disturbance and help nurture riparian communities back to a healthy, functioning state.

Consider Your Choices

A knowledge and understanding of riparian function can lead to informed decision-making and good land stewardship. Riparian health hinges on a relationship between vegetation (plants), hydrology (water) and geology (soil); these are the gears of a functioning riparian machine. The interaction between plants, water and soil determines the amount and quality of water in our rivers, bays and groundwater aquifers now and for the future.

Paved or caliche-covered riparian areas, or those dominated by barren gravel bars with sparse vegetation, do not function properly.

Consider a better way - set parking areas away from riverbanks and leave a fringe of riparian vegetation intact.

Clearing for recreational sites can result in the loss of understory vegetation and riparian function, but it doesn't have to.

Consider a better way - rotate recreational sites and leave zones of understory intact.

Livestock and wildlife can damage riparian areas when allowed continuous access to them.

Consider a better way - flash or rotational grazing or temporary exclusion of grazing/ browsing animals can allow for plant recovery.

Acknowledgements:

Funding for this guide and the Nueces Riparian Network Project comes from The Dixon Water Foundation, The Meadows Foundation, Shield-Ayers Foundation, Save the Laja, Community Foundation of the Texas Hill Country, The John & Florence Newman Foundation, Yates Cattle & Conservation, Stewards of the Nueces, Texas Wildlife Association Foundation and Texas Coalition-Grazing Lands Conservation Initiative, Texas Parks and Wildlife Department and United States Department of Agriculture-Natural Resources Conservation Service.

For more information go to: www.nueces-ra.org

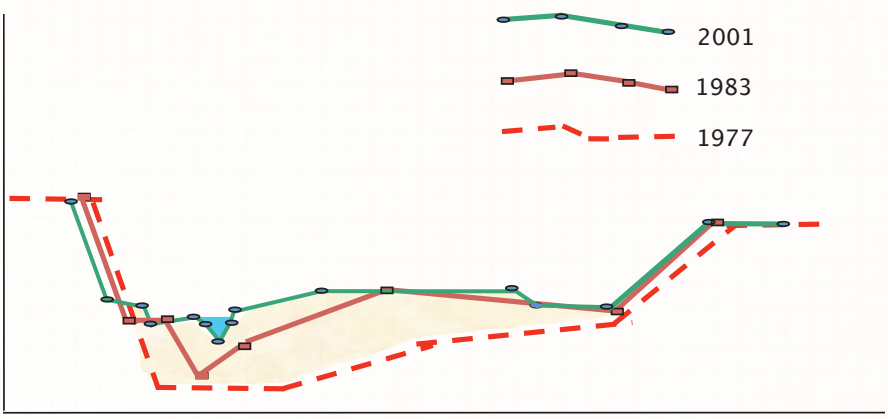
Images from the Nueces Riparian collection are housed at the Lady Bird Johnson Wildflower Center

Riparian Recovery of Bear Creek

In the 1960s a government program sponsored the spraying of willow trees along the banks in a plan to increase water. Without the stability and energy dissipation provided by the willows the creek down cut and became dryer, only running part of the year. In 1976, the managers changed from a year-round grazing program to a seasonal one which allowed the riparian vegetation to recover between disturbances. The creek healed itself and now flows year round, produces fish and a lot more forage for livestock and wildlife.

Changes in stream bed profile

Riparian recovery meant that vegetation began to trap sediments from flood waters creating banks rich in water-holding organic matter. As the banks grew in mass so did their ability to store water and release it slowly to the creek. Over time the channel became cradled by roots and held about 3-ft. higher above the bedrock.



Riparian function stats

	1978	1996
Wetted Area	7.8 acres	15.9 acres
Bank Erosion	12,448 feet	799 feet
Water Storage	500,000 gallons	1.5 mil gal/mi
Production	200 lbs/acre	2000 lbs/acre

Guided Observation of Riparian Function

Riparian areas are always changing. This worksheet is provided in the back of the guide for your use in tracking changes in riparian function on your creek. Below is a sample completed for Bear Creek in Central Oregon (11-inch precipitation); 1978 and 1996. Note that the Bear Creek example differs from what you may observe on creeks and rivers in the Nueces Basin. Bear Creek is a snow melt-driven system and not as reliant on woody riparian plants to dissipate energy as most flash flood-driven streams in the Nueces Basin.

1 **Is there a clearly defined active floodplain?** An active floodplain is an area where floodwaters spread out on a frequent basis (at least once every 1 – 3 years on average). These floodplains might be present only on one side or the other due to bluffs, high banks and meanders. Floodplain access for frequent runoff events is important to reduce the energy of floodwater, store water, and improve ground water recharge.

1978– no, channel is downcut, widened and is lacking a well-developed floodplain. However, it is beginning to create a new floodplain below the cut bank.
1996– yes, active floodplain has developed and appears to be receiving floodwaters regularly evidenced by trapped debris and sediment.

2 **Is there evidence that the banks and floodplains are storing water?** The storage of water in the riparian area is revealed by the presence of wetland plants rated as OBL or FACW, such as spikerush, bushy bluestem, Emory sedge, sawgrass, cypress, buttonbush, black willow, spiny aster, water primrose, watercress. A widening area that supports these kinds of plants indicates a good "riparian sponge" and the capacity to store water to help sustain base flow.

1978– no, almost no OBL and FACW riparian vegetation is present which is indicative of poor water storage capacity.
1996– yes, riparian area is dominated by OBL and FACW veg. Riparian area has widened and sponge is apparent.

3 **Are there young and middle-aged plants of some of these important riparian trees and shrubs: sycamore, cypress, buttonbush, black willow, little walnut?** This indicates that reproduction is occurring to replace old plants and to maintain or increase plant density.

1978– no, little to no woody vegetation exists (Willows were removed about 15 yrs. prior.).
1996– no, riparian area is dominated by grasses, sedges and rushes. Woody vegetation has not re-established.

4 **Are there new, young plants of some of these important riparian grasses or sedges becoming established in bare or sparse areas: switchgrass, eastern gammagrass, bushy bluestem, Emory sedge, sawgrass, bulrush, big sacaton?** This indicates successful reproduction to maintain or improve riparian plant cover.

1978– no, very few riparian plants are present, floodplain is sparsely vegetated with exposed sediments.

1996– yes, riparian grasses, sedges and rushes cover the area; sediment is being stabilized by these plants.

5 **Are there at least two species of stabilizing riparian grasses or sedges and at least two species of riparian woody plants?** A diversity of plant species is needed for maintaining stable riparian conditions or to promote recovery.

1978– no, only one colony of one rush species is present, lack of plant diversity.

1996– yes, several species of grasses, sedges and rushes dominate the area.

Note: on Nueces Basin streams at least two woody riparian species should be expected in addition to grasses and sedges.

6 **Are riparian plants healthy and vigorous?** Heavy browsing of woody plants and heavy grazing of grasses, sedges and forbs is the most obvious sign of poor vigor.

1978– no, riparian plants are scarce and their vigor is compromised by poor water storage capacity and frequent drying of the banks.

1996– yes, many palatable species are present without signs of heavy grazing; plant vigor is high which means that root systems are robust.

7 **Is there at least 70% coverage of stabilizing grasses, sedges or woody plants along the length of each bank?** For heavily wooded areas, consider the extent of dense, stabilizing tree roots to be equivalent to twice the canopy diameter. This amount of cover (or more) will help insure bank and channel stability, help trap sediment, build floodplains, and improve water storage capacity.

1978– no, only about 20% of the riparian area is covered with vegetation of any kind; only a small colony of riparian vegetation is present.

1996– yes, over 90% of the riparian area is covered with stabilizing grasses, sedges and rushes.

8 **Are there adequate numbers of medium-sized and large-sized trees such as cypress, sycamore, pecan, elm or oak along the banks to provide a future source of large wood in the channel?** Trees that fall into the channel and large logs that become lodged in the channel or floodplain are important to help trap and stabilize sediments and dissipate stream energy.

1978– no, woody vegetation is not present.

1996– no, woody vegetation is not present.

Note: questions number 8 and number 9 are not applicable to Bear Creek, but are very important on Nueces streams.

9 **Are there areas of large, anchored boulders or large, anchored logs in or near the channel?** These features provide roughness and obstructions in the channel, which help dissipate energy and improve stability.

1978– no, boulders and logs are not present.

1996– no, boulders and logs are not present.

10 **Are there overflow channels, secondary channels, backwater sloughs or oxbows?** These features help accommodate floodwaters and provide additional energy dissipation and floodwater retention.

1978– no, channel is heavily scoured and does not contain much roughness or complexity.
1996– yes, channel contains sufficient complexity to help dissipate energy.

Note: this question is not as applicable to Bear Creek as it will be for Nueces Basin streams. Bear Creek has achieved necessary roughness through vegetative growth.

11 **Are cut banks and channel erosion being compensated and balanced by the formation and enlargement of stabilized point bars?** Some bank erosion is normal and natural, especially on outside bends, but this needs to be balanced by a corresponding increase in stabilized and properly vegetated bars on the inside bends.

1978– no, large cut bank indicates recent erosion. It has begun to acquire angle of repose indicating that recovery is beginning. However, sediments are not being stabilized due to poor vegetation.
1996–yes, stream has developed a meander pattern with fully vegetated point bars.

12 **Is the channel vertically stable?** Vertical stability means that the creek bed is not lowering or cutting down. The evidence of vertical stability is the absence of active headcuts and overfalls ("waterfall" features which are actively eroding).

1978– no, evidence of previous down cutting is apparent. The channel appears to have cut down to bedrock so that no further down cutting is expected, but without stability the channel will widen, cutting into banks that lack stabilizing vegetation.
1996– yes, creek bed is stable with no signs of down cutting. Channel is now held above the bedrock because riparian plants have trapped and stabilized sediments.

13 **Do the water and sediment appear to be in proper balance?** If there are excessive gravel or sediment deposits forming and increasing, this indicates an imbalance. If there is excessive bank erosion and scour erosion, this also indicates an imbalance. If neither appears to be excessive, the creek is probably in balance.

1978– no, the excessive energy of floodwaters have scoured the channel and little or no sediment deposition in taking place.
1996– yes, water and sediment are in balance; sediments are being trapped in vegetation, stabilized and incorporated into banks.

What Your Answers Tell You

Mostly "Yes" answers: The area is in good functional condition.

Mostly "No" answers: The area is in poor, non-functional condition.

Combination of "yes" and "no" answers: If there is a mostly even combination, the area is probably at risk of degradation in future flood events.

1978– 13 "No" answers, 0 "Yes" answers
1996– 3 "No" answers, 10 "Yes" answers

Sedges and Rushes

"Sedges have edges,
and rushes are round..."

But not always.

Photo courtesy of David and Liz Smith

"Healthy, functional riparian areas provide the richest and most valuable habitat for wildlife; their importance to wildlife cannot be overestimated. Here wildlife find a rich food supply, abundant cover and clean, permanent water all in close proximity, even in times of severe drought. Whether we are talking about white-tailed deer, songbirds, or fish, healthy and diverse riparian vegetation is critically important."

Steve Nelle
Wildlife biologist with NRCS

Emory sedge

River sedge

(Carex emoryi)
CYPEraceae

Wetland Indicator Status: OBL Stability Rating: 9

Emory sedge is large and leafy, a colony-forming sedge that often occurs in long, narrow bands along the water's edge. With an extensive and strong network of rhizomes, its roots can hold banks in place even during severe floods. The leaves are long and arching, the tips often touching the ground or the water. It can grow in full sun or moderately shaded locations. Its leaves have extremely fine serrations along the edge that are not discernible to the eye, but can be felt. Sedges are known for their dense root mass. Root length of a similar species, Nebraska sedge, has been documented to contain 20 miles of roots in a single cubic foot of soil. This kind of root mass is extremely important for stabilizing high-energy creeks and rivers. Emory sedge can be transplanted by digging clumps and dividing them into smaller units for replanting in similar locations. Transplanting should be done in winter or early spring.

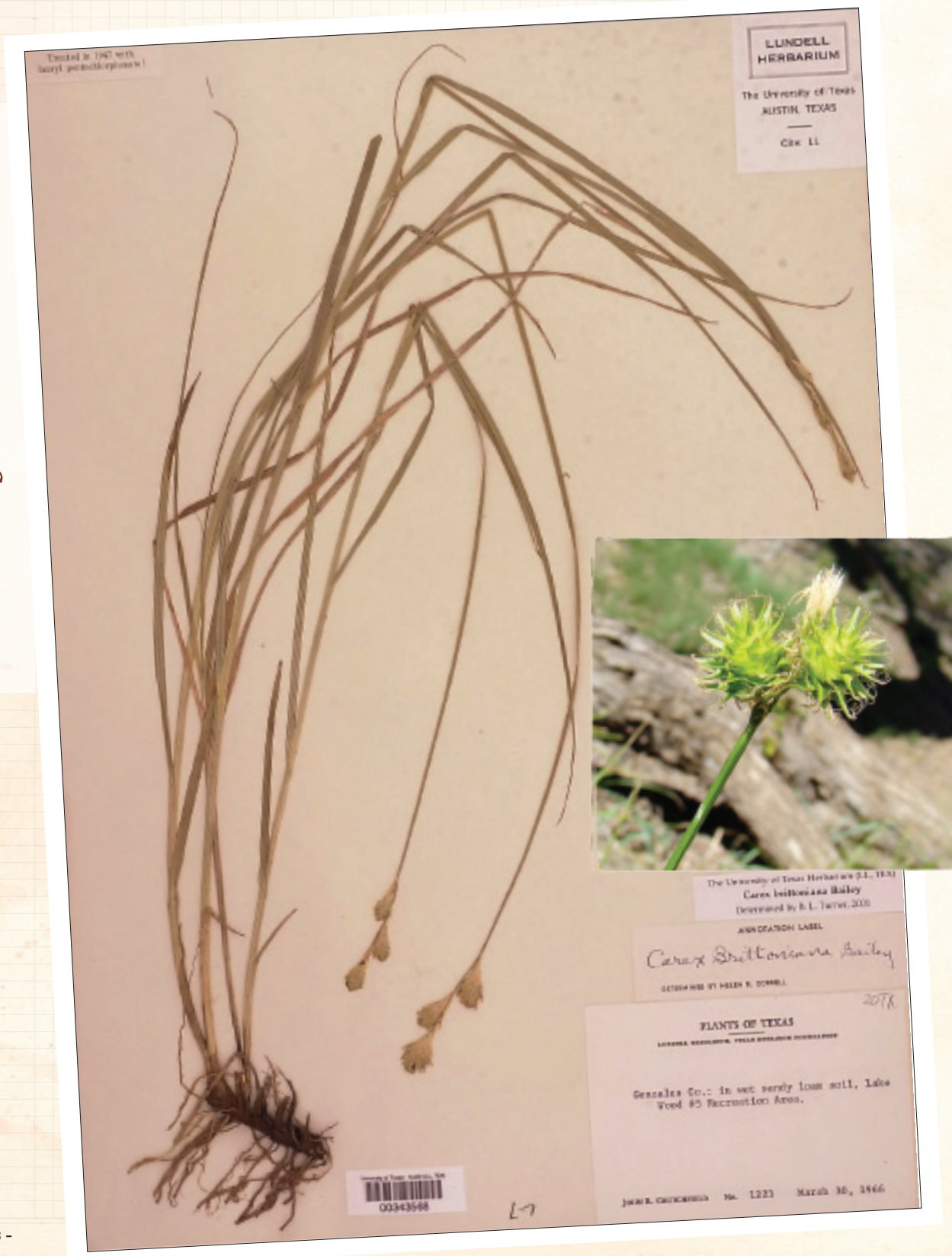
Roots often become so tightly woven they can only be separated from the soil with great effort.

Britton sedge

(Carex brittoniana)
CYPEraceae

Wetland Indicator Status: OBL Stability Rating: 6/7

Britton sedge is one of the 74 species of true caric sedges found in Texas, but one of only 6 species found in the Rio Grande Plains and the lower section of the Nueces basin. Taxonomists struggle with identification of sedges, which can often only be correctly identified by microscopic examination of seed. Britton sedge is much smaller and weaker than Emory sedge. It provides less energy dissipation and stability. Britton sedge can grow in shade or full sun; down close to the water, or up on floodplains that are inundated only once every one or two years.



Black sedge

(Schoenus nigricans)
CYPEraceae

Wetland Indicator Status: OBL

Stability Rating: 5

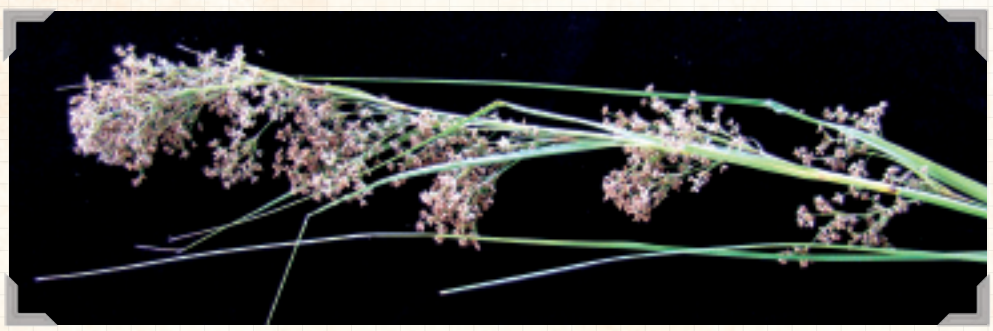
Black sedge can be found scattered in the upper Nueces catchment, but are seldom common and never the dominant species. When the seedhead is ripe, it is easy to see why it is called black sedge. Black sedge forms individual clumps and does not form colonies nor spreads by rhizomes. It plays a minor role in riparian stability, thus the relatively low stability rating.

Sawgrass

(Cladium mariscus)
CYPEraceae

Wetland Indicator Status: OBL Stability Rating: 9/10

Sawgrass is not a grass; it is a sedge, the largest sedge in Texas. The leaves are long and coarse with a V-shaped cross section and sharp serrations along the edge and midrib. They can cut your fingers to the bone. The plants can grow to 6-feet in diameter, and the seed heads can stand 8-feet tall. Unlike Emory sedge, sawgrass does not usually form continuous interconnected colonies, but rather grows in well-anchored individual clumps. The rooting characteristic of sawgrass gives it one of the highest stability ratings of any riparian plant in the region. In addition to a strong stabilizing root system, the large, robust top-growth effectively dissipates energy and traps sediment. The plant is not palatable to livestock under normal conditions, but the seeds are favored by birds.



Flat sedge

Umbrella sedge

(Cyperus sp)
CYPEraceae

Wetland Indicator Status: *FACW* Stability Rating: *5*

There are several species of flat sedge in the region; most are less than 18-inches tall. They grow right near the water's edge or in other wet or seepy areas. Flat sedges usually grow as individual clumps. They serve as colonizers; their root systems are not strong enough to provide good, long-term stability. The stems are triangular and the leaves are shiny green. Distinctive, large seed heads form at the top of the stem and produce thousands of tiny seeds. Other species of flat sedge common in the area but not pictured: *Cyperus acuminatus.*

Cyperus odoratus

Cyperus ochraceus

Spikerush

Spikesedge

(Eleocharis sp.)
CYPEeraceae

Wetland Indicator Status: OBL Stability Rating: 6

Spikerush is a bright-green, grassy-looking plant that grows at the water's edge on many creeks and rivers. Most spikerush grows in colonies by extensive underground rhizomes. It appears as a tight mass of soft, slender stems without leaves. Very small, almost inconspicuous seed heads form at the tip of the stems. Spikerush is considered either a strong, late-stage colonizer or a weak stabilizer. It has the ability to quickly colonize newly deposited sediment, yet it has strong enough roots to withstand moderate floods. It does not have the strength or depth of root to withstand severe disturbance. There are several different species of spikerush in the area, some larger and some smaller, but they have a similar appearance. Under conditions of high livestock numbers, spikerush is sometimes grazed short, which reduces its usefulness.

Eleocharis interstincta geniculata

Other species common but not pictured: Sand Spikesedge *Eleocharis montividensis,* Mat Spikesedge *Eleocharis parvula,* and Spikesedge E*leocharis interstincta cellulosa*

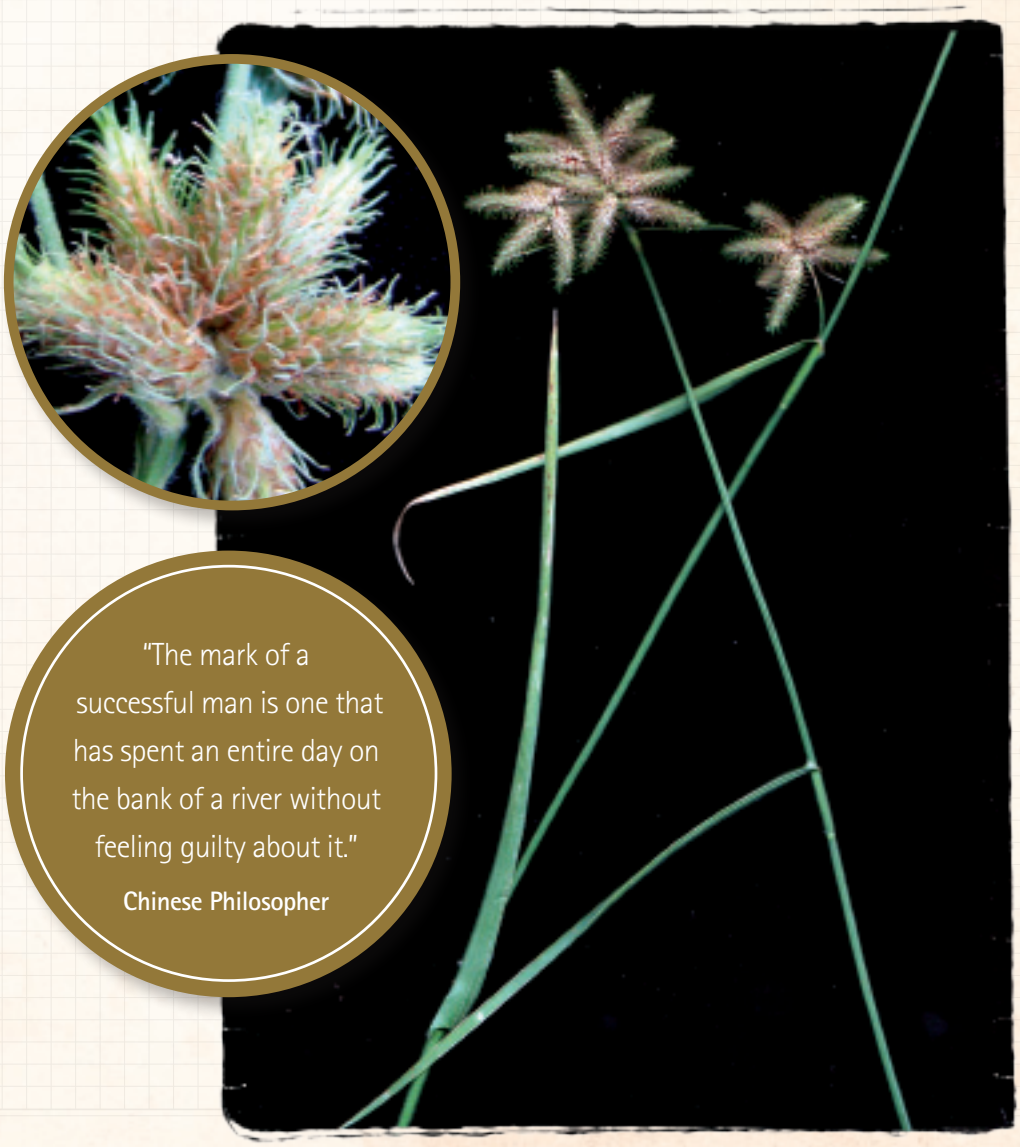
Tussock Spikesedge
Eleocharis rostellata

Porcupine sedge

(Fuirena simplex)
CYPEraceae

Wetland Indicator Status: OBL Stability Rating: 5

This small, perennial sedge is found in many riparian areas but is seldom abundant. It forms individual clumps, not colonies. The plants with distinctive triangular stems are usually less than 12-inches tall. The distinguishing characteristic is the burr-like seed heads that form at the top of stems. Porcupine sedge is weakly rooted but can help colonize barren areas.



"The mark of a successful man is one that has spent an entire day on the bank of a river without feeling guilty about it."

Chinese Philosopher

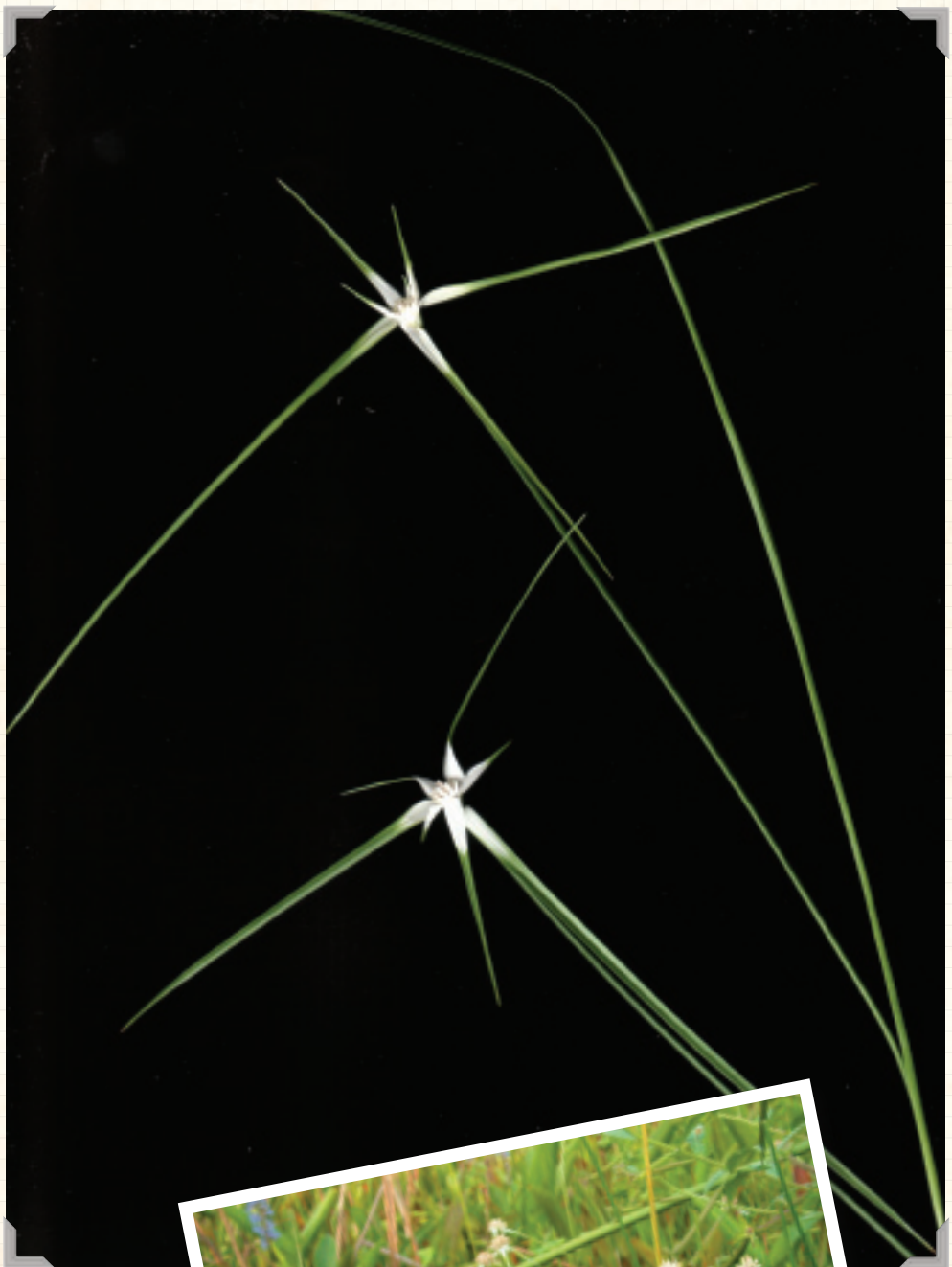
White-top sedge

Star sedge, Starrush whitetop

(Rhynchospora colorata)
formerly *Dichromena*
CYPEraceae

Wetland Indicator Status: FACW Stability Rating: 6

This sedge is easily recognized with attractive, white patches on its upper leaves and white seed heads. White-top sedge grows in colonies from orange rhizomes. Unlike most sedges, which are pollinated by wind, this species is pollinated by insects attracted to the white flowers. Other species not pictured: Snowy white-top sedge, *Rhynchospora nivea.*



Cattail

(Typha latifolia)
TYPHaceae

Wetland Indicator Status: OBL Stability Rating: 9

Cattail is a familiar, wetland plant to most people, but somewhat uncommon on creeks and rivers in the Nueces region. Before the characteristic seed head is formed in summer, cattail looks similar to bulrush. However, upon close inspection the two are easy to tell apart. Cattail leaves are flat, while the stems of bulrush are either round or triangular, but never flat. Cattail tends to grow best in still waters, but will also be found in and near running creeks. The massive stabilizing root network is very strong and able to withstand high-energy flooding. Cattail spreads mostly from existing colonies by large white rhizomes which form new plants. Some pond and lake owners find an abundance of cattail to be detrimental to fishing and recreational use. In these cases, it can be safely and effectively managed with herbicides. Controlled grazing may also offer a way to keep cattail suppressed.

Rushes

(Juncus sp.)
JUNCaceae

Wetland Indicator Status: FACW Stability Rating: 6

True rushes have a similar appearance to some sedges and spikerushes but are in a family by themselves and are often referred to by their family name, Juncus. There are many species within the Juncus family and most look very similar. True rushes, Juncus family, can be separated from spikerushes, Cyperaceae family, by their shorter, fatter and hollow stems. When the two are seen side by side, or with a seed head, they are easily differentiated. Most species of rushes form colonies by the growth of underground rhizomes. During periods of drought, these rhizomes and new plants rapidly colonize newly exposed mud in response to receding water levels. This addition of root material helps to reinforce the bottom of the channel when water levels return. Rushes, like many other riparian plants, are grazed by livestock, deer and exotics. Careful attention to grazing and wildlife populations is an important aspect of riparian land stewardship. The more common rushes in the region include Interior rush *(Juncus interior),* Texas rush *(Juncus texanus),* Torrey rush *(Juncus torreyi),* Grassleaf rush, *(Juncus marginatus)* and Knotleaf rush *(Juncus acuminatus).*

Interior rush

Texas rush

Torrey rush

Septa (partitions) in the hollow stem of a Juncus

Juncus can be characterized as a strong colonizer or a weak stabilizer.

Bulrush

(Scirpus sp)
CYPEraceae

Wetland Indicator Status: OBL Stability Rating: 8/9

There are several species of bulrush in the region, but they are not really in the rush family. They occur more often in still water areas rather than fast water areas and they are more common in clay, mud and sand rather than gravel. It is more common in the Rio Grande Plains than in the Edwards Plateau. Bulrushes tend to form large colonies, interconnected by rhizomes. The root system is strong and capable of withstanding high-flow events. The plants consist of numerous stems, without leaves. The stems can range from sharply triangular to round and plants range in height from 3-to 8-feet depending on the species. Seedheads vary by species but are rather small compared to the size of the plant.

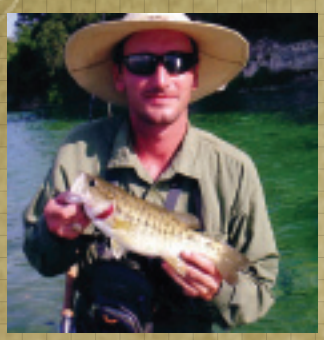
Bulrush with full seed head

Rhizome root system

Some riparian grasses can provide as much as 30 tons of root mass per acre.

Grasses

"Riparian grasses are amazing! They have extreme root systems. Upland grasses produce a volume of roots about equal to the amount of leaf growth. But riparian grasses produce three to five times more root volume than top growth. Grass roots weave together and interlace with other roots and rocks and wood to hold banks together. The stability offered by thickly matted grass roots allows for the creation of undercuts, providing excellent fish habitat."



Aaron Riggins,
avid fisherman and fishing guide

Switchgrass

Texas switchgrass, Prairie switchgrass

(Panicum virgatum)
POACeae

Wetland Indicator Status: FAC Stability Rating: 8/9

Switchgrass is the most common and most important stabilizer grass in the Upper Nueces region. It grows in large, dense clumps often 5-feet across and 6-feet high. Switchgrass has superior root strength for holding banks and large stiff leaves and stems that can dissipate energy and catch sediment during high flows. Deergrass, another riparian grass with a similar growth form, has been documented to produce more than 30 tons of roots per acre. This incredible root mass is what allows these strong riparian grasses to hold banks in place during severe floods. Switchgrass is a good example of the versatility of a facultative plant. It does not require access to the water table for survival but can become very productive when it does. It grows equally well near the water or in drier locations, even on barren gravel bars where it can catalyze rapid improvements in riparian function. During the growing season the leaves are a distinctive grayish-green color. It provides desirable habitat for game birds and forage for cattle; the plant is often found grazed short. Switchgrass will usually regenerate naturally with proper grazing management, but seed is commercially available for those who desire to accelerate natural recovery. It can also be transplanted by dividing a large clump into many smaller clumps.

Bushy bluestem

(Andropogon glomeratus)
POACeae

Bushy beardgrass

Wetland Indicator Status: FACW Stability Rating: 5

Bushy bluestem is one of the most familiar and easy-to-recognize riparian tall grasses. It is a bunchgrass growing 3- to 4-feet tall. In the fall it appears erect and bronze in color with the large, fluffy seedheads and can present a striking pose on white gravel bars. In spring and summer, it can be recognized by the very flat stems at the base of the plant. Bushy bluestem can establish quickly from windblown seed and helps to provide cover on new gravel deposits. The roots are not extremely strong, but the plant does catch some sediment and improve conditions for other stronger species. It is not one of the most preferred grasses for cattle, but will often be grazed short where livestock are not well managed and thus indicates grazing pressure.

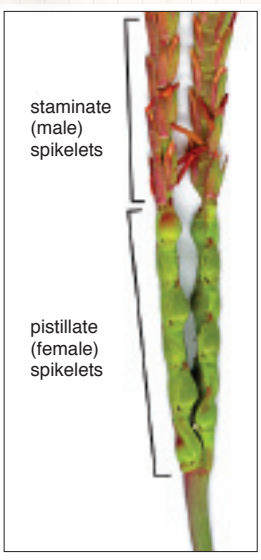
Photo courtesy of Lady Bird Johnson Wildflower Center

Eastern gamagrass

(Tripsacum dactyloides)
POACeae

Wetland Indicator Status: FAC Stability Rating: 9

Eastern gamagrass is a big, green, leafy cousin of corn with finger-like seed heads. Dactylus is Greek for finger and "oides" means *like* or *resembling*, hence the origin of its Latin name dactyloides. Gamagrass grows in bunches and has extremely good root stability, sometimes called "riparian rebar" for its stabilizing function in riparian areas. It prefers to grow in deeper soil, rather than on raw gravel bars. Clumps are often 6-feet across and 6-feet tall or taller with their towering seed head. Their short, knotty rhizomes serve to enlarge the diameter of clumps, but colonies are not actually interconnected. Gama clumps can act as a seedling nursery for trees like pecan and cypress. Their nuts, often trapped along with silt, are protected from herbivores by gamma's umbrella of long leaves. Gama plants reproduce and can be propagated from seed. The seed head is a segmented stack of large, hard kernels resembling corn at the lower end of the stalk and the male flower parts above. This riparian grass is highly palatable to livestock and therefore is not common on creeks where continuous grazing is practiced. It can produce huge quantities of livestock forage and wildlife habitat under the right rotation program. Those landowners who have suspended grazing in their riparian areas or who practice conservative rotational grazing often notice a remarkable comeback in this desirable grass.



Typical rhizome root structure

Lindheimer muhly

(Muhlenbergia linheimeri)
POACeae

Wetland Indicator Status: FAC Stability Rating: 7

photo courtesy of Lady Bird Johnson Wildflower Center

Lindheimer muhly is a large, coarse bunchgrass, more commonly found on small, seasonal headwater tributaries and seepy areas. It is occasionally found on larger creeks. Its leaves are narrow and rigid and have a grayish-green color and the seed head is an attractive silver plume. Lindheimer muhly is a very unpalatable grass, seldom eaten by cattle or deer. For this reason, it persists very well in many areas. It is sometimes planted in native landscapes as an ornamental grass.

Ferdinand Jacob Lindheimer (1801-1879) is often called the Father of Texas Botany because of his work as the first permanent-resident plant collector in Texas. Lindheimer is credited with the discovery of several hundred plant species and his name is used to designate forty-eight species and subspecies of plants.

"...The Nueces was full of fish and woods were full of bear, deer and turkey, so they decided to build a log house in order to have shelter for the winter...1882 and later in 1889 when one of the Thurman sons married, he and his bride built a picket house on Bluff Creek near Kickapoo Spring. The house was chinked and daubed with mud and cedar bark and covered with grass."

Except from Nueces Headwaters Country by Alan A. Stoval, published by The Naylor Company, 1959.

Big sacaton

(Sporobolus wrightii)
POACeae

Wetland Indicator Status: FAC Stability Rating: 8/9

Photo courtesy of Lady Bird Wildflower Center

Big sacaton occurs on some deep-soil banks and floodplains in the Rio Grande Plains. It is not common in the Edwards plateau portion of the Nueces. It is a very large, densely-rooted bunchgrass, with similar characteristics as switchgrass. Ranchers sometimes burn areas of big sacaton to improve palatability. However, its best use is for riparian stability rather than for livestock forage. Alkali sacaton, a smaller cousin, is likewise not very palatable.

"I have observed large areas of Big sacaton dying after a winter burn followed by a dry spring and summer."

Steve Nelle

Gulf cordgrass

Sacahuiste

(Spartina spartinae)
POACeae

Wetland Indicator Status: FACW Stability Rating: 8/9

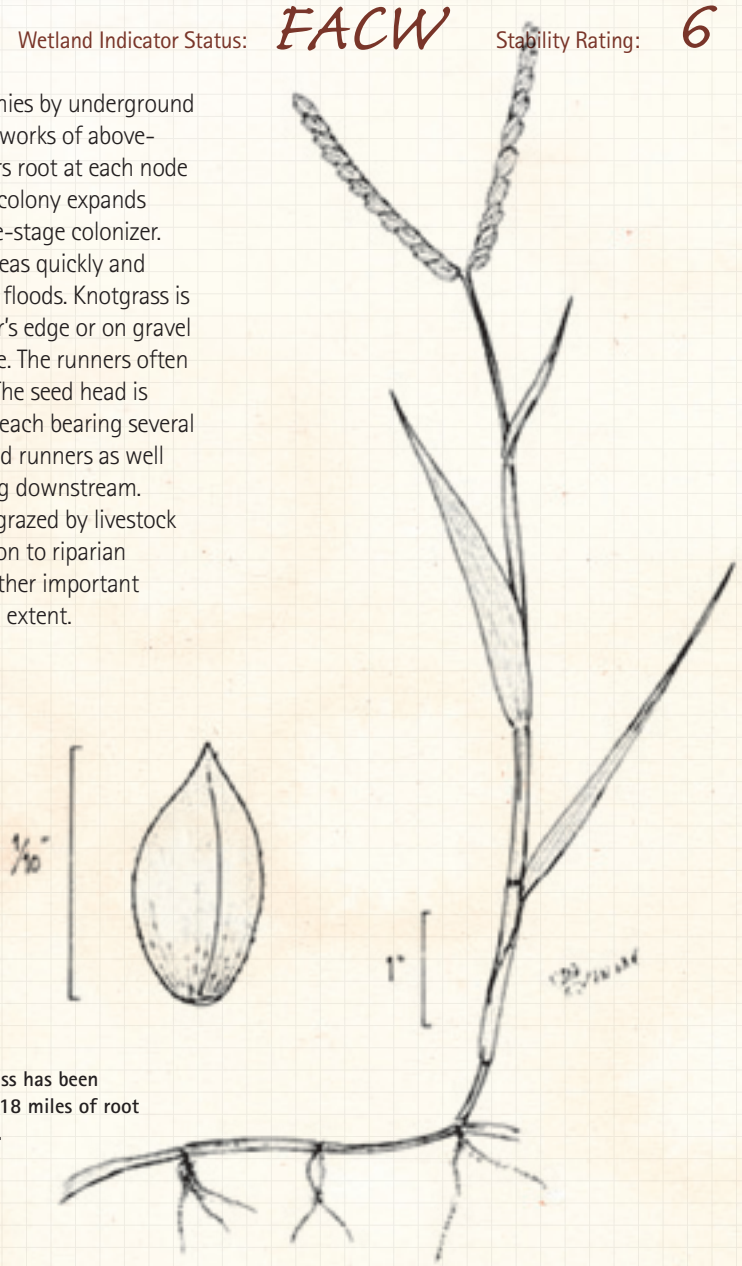
Gulf cordgrass grows mostly in the lower part of the Nueces in saline soils of the Rio Grande Plains. It is a dense bunchgrass with a dense root system that provides erosion control and energy dissipation. In coastal areas it is sometime considered a wetland obligate plant and is saline tolerant, found in salt marshes and sand dunes throughout the Nueces-Rio Grande Coastal Basin. Gulf cordgrass is coarse and unpalatable to cattle. Ranchers commonly burn cordgrass areas to promote new, tender growth and improved grazing value. Repeated burning, followed closely by grazing, can inhibit riparian function.

Knotgrass

(Paspalum distichum)
POACeae

Wetland Indicator Status: FACW Stability Rating: 6

Knotgrass forms large colonies by underground rhizomes and extensive networks of above-ground runners. The runners root at each node creating new plants as the colony expands outward. Knotgrass is a late-stage colonizer. It can colonize new, bare areas quickly and provide fair stability during floods. Knotgrass is found growing at the water's edge or on gravel bars with a high water table. The runners often spread out into the water. The seed head is forked with two segments, each bearing several seeds. It spreads by seed and runners as well as broken-off pieces drifting downstream. Knotgrass is palatable and grazed by livestock and exotics. Careful attention to riparian grazing will help this and other important species to grow to their full extent.



Root mass of knotgrass has been measured to contain 18 miles of root per cubic foot of soil.

Water bentgrass

(Agrostis semiverticillata)
POACeae

Wetland Indicator Status: OBL Stability Rating: 4/5

Water bentgrass, as the name implies, usually grows right in the water and the stems are often bent. It is a classic, colonizer plant with the stems rooting at each node. The root system is weak, but its primary function is to help hold fine sediments in place until stronger-rooted plants can establish. The plant spreads by seed and by sections of stem that are washed downstream. Water bentgrass is more commonly found on smaller creeks and headwater spring areas.

Paspalum grasses

(Paspalum sp.)
POACeae

Wetland Indicator Status: FAC & FACW Stability Rating: 5/6

Hairyseed paspalum

(Paspalum pubiflorum)

Hairyseed paspalum is found in many creek areas, but seldom abundant and often inconspicuous. It frequently grows on gravel areas under the shade of riparian trees.

Rustyseed paspalum

(Paspalum langei)

Rustyseed paspalum can be found in wooded riparian bottomlands in dense shade. The leaves are a distinctive and attractive shiny green with crinkled margins. This native can be easily seeded into disturbed, shady sites.

Vaseygrass

(Paspalum urvillei) Non-native

Introduced from South America but now naturalized in Texas, this tall, slender grass sprouts seed heads up to 6-feet tall with densely hairy, purple basal stems. The grass provides some riparian stability and often grows along with Bushy bluestem.

Dallisgrass

(Paspalum dilatatum) Non-native

Also introduced from South America, Dallisgrass is considered a noxious weed in parts of East Texas. Though present, it is not abundant in the Nueces Basin.

Aparejograss

(Muhlenbergia utilis)
POACeae

Wetland Indicator Status: FACW Stability Rating: 6

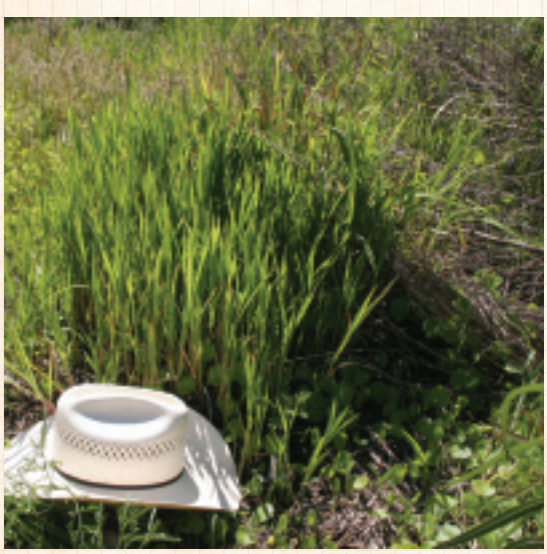
Aparejograss is a fine-stemmed, low- growing grass that forms colonies and spreads by rhizomes. It is a short grass, seldom growing taller than 12-inches. Superficially, it resembles bermudagrass, but the stems and leaves are much finer. Aparejograss often grows right at the water's edge and is more common along smaller creeks and less common on larger rivers. It does an admirable job of helping to hold low banks in place in low-energy situations. Being weak-stemmed, it lies over during flooding and does not provide much energy dissipation. It serves the function of a weak stabilizer, filling the gaps in between stronger-rooted plants.

Rice cutgrass

(Leersia oryzoides)
POACeae

Wetland Indicator Status: OBL Stability Rating: 6

Rice cutgrass is found in scattered locations on many creeks in the region, but never as the dominant riparian plant. The seed head is unusual and easily recognized. However, most of the time, no seed head is present and the grass is easy to overlook. The leaves are short and wide compared to other riparian grasses. The most characteristic trait of this grass is the texture of the leaf. Mature leaves have a definite, scratchy texture formed by short, stiff hairs that catch in one direction. The botanical term for this is retrorsely scabrous. Although it spreads by rhizomes, this grass seldom grows in dense colonies.



Teal lovegrass

(Eragrostis hypnoides)
POACeae

Wetland Indicator Status: OBL Stability Rating: 4

Teal lovegrass is a low, mat-forming grass. The stems, which are weak, often lay over and root at the nodes giving the impression of runners. This grass is common in the Rio Grande Plains, but is not commonly found in the Edwards Plateau. It is an annual, meaning it must come up from seed each year. Teal lovegrass serves as a colonizer plant and can cover wet mud in a short period of time during favorable growing conditions.

1842–*Sterling Brown Hendricks in* The Somervell Expedition to the Rio Grande *tells of missing the Laredo road crossing of the Nueces and finding the riparian wetland difficult to cross "...none of the men were lost in crossing the river, but we had now to encounter a marshy bog, two miles wide, and filled with numerous sloughs, which we were all day crossing—fifty horses were lost in this bog, including General Somervell's."*

Southwestern Hist. Quarterly, Vol 23, #2 (Oct., 1919) pp112-140.

Broadleaf uniola

Inland sea oats, Creek oats, Wood oats, Fish-on-a-pole grass

(Chasmanthium latifolium)
POACeae

Wetland Indicator Status: FAC Stability Rating: 5

Broadleaf uniola is a distinctive grass that grows in heavily wooded riparian areas. It is one of the few grasses that thrives under dense shade. Both the leaves and the seed head spikelets are abnormally broad, compared to most other grasses. The seed head is rather large and heavy causing the weaker stalk to bend over. Uniola helps to stabilize soils on steep, creek bank slopes where stronger stabilizers may not want to grow. It is a larval host for several skipper butterflies and is readily grazed by livestock and exotics.

Common reed (Native)

Phragmites australis (communis)
POACeae

Wetland Indicator Status: FACW Stability Rating: 8/9

Common reed is a large, native reed grass but much smaller than Giant reed. It is not common in the region, but is found on some creeks in the Rio Grande Plains and western Nueces Basin. It is a strong-rooted stabilizing grass that forms colonies interconnected by rhizomes. Common reed has excellent ability to hold and stabilize banks, even during flooding.

***Phragmites* or Common reed is a native riparian grass.**

Arundo Donax or Giant reed (described on following page) is an invasive, non-native riparian grass.

Giant reed (Invasive Non-Native)

Georgia cane

(Arundo donax)
POACeae

Wetland Indicator Status: FAC

Stability Rating: 7

This gigantic, cane-like grass is found scattered throughout the region. It can grow up to 20-feet tall with stout, hollow stems, 1- to 2-inches in diameter. It forms dense colonies, interconnected by a network of fibrous rhizomes. Brought to North America by early Spanish settlers because of its usefulness, *cana* was cut for animal forages, used as building and roofing material, woven into mats and used for piping to transport water. With a decline in human use and absence of natural predators, it has overgrown and completely dominated some riparian areas to the detriment of native plants, fish and wildlife diversity. Along sections of the Rio Grande, Giant reed has interrupted geomorphic and hydrologic processes creating a narrow, highly channelized in-stream habitat reducing diversity for aquatic species. Although it has been issued a stability rating, its roots are relatively shallow compared to native tall grasses. Giant reed is becoming a problem in some areas of the Nueces Basin where it has formed monocultures, disrupting riparian function. The plant does not produce fertile seed in this area, but spreads readily from disturbed clumps and segments that float downstream to form new plants. Chemical control has been successful in managing infestations in some areas. Landowners should be aware of the potential invasiveness of the plant and be prepared to take measures to control it before it begins to increase.

NOTE:
Texas Dept. of Agriculture prohibits the planting and selling of *Arundo donax* without a permit.

The familiar name (Carrizo cane) has been loosely used to refer to Phragmites and Arundo.

St. Augustine grass

Carpetgrass

(Stenotaphrum secundatum)
POACeae

Wetland Indicator Status: FAC Stability Rating: 6

St. Augustine is a familiar turfgrass commonly used in yards. It is not a native grass but has escaped into the wild in some places. It is a dense, low-growing grass that spreads by short, stout runners. Although not preferred over the native, deep-rooted, tall riparian grasses, it does function to cover bare ground and provides some erosion protection.

Bermuda grass

(Cynodon dactylon)
POACeae

Wetland Indicator Status: FACU Stability Rating: 6

Grasses

Bermuda grass is the most common yard grass used in the region, and is also a common forage grass for livestock grazing. Originally from Africa, it has become widely "naturalized" across large parts of Texas, especially along some creeks and rivers. Bermuda grass spreads by three methods: underground rhizomes, above-ground runners and seed. It serves the function of a riparian colonizer since it can spread rapidly to cover bare ground, but provides only moderate stability, not enough to hold banks together during flooding. One disadvantage of some of the aggressive exotic plants is that they can dominate an area and "out compete" the native plants.

King Ranch bluestem

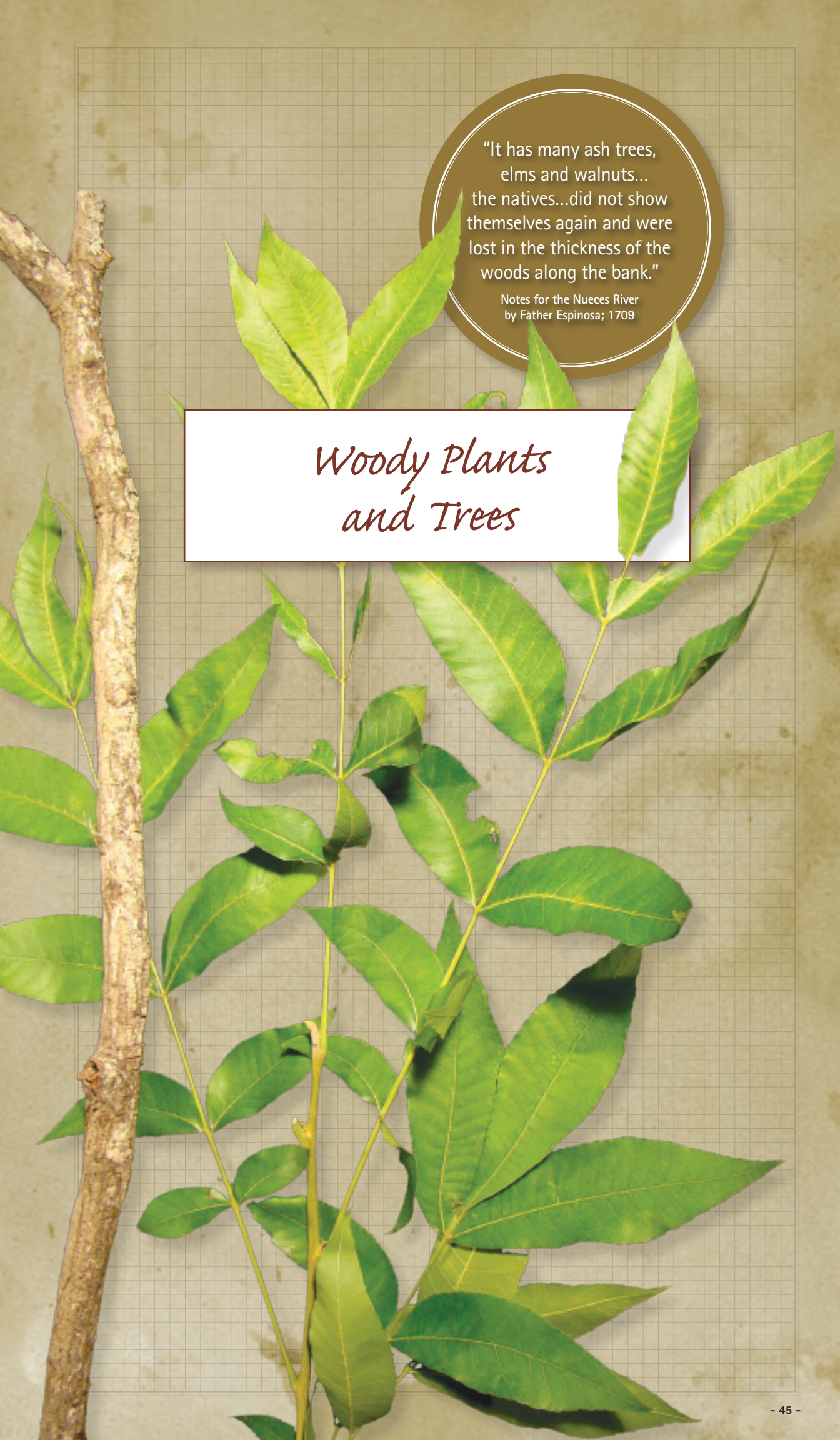
K. R. bluestem

(Invasive Non-Native)

(Bothriochloa ischaemum)
POACeae

Wetland Indicator Status: UPL Stability Rating: 5

King Ranch bluestem is an exotic grass introduced into Texas many years ago as a range forage grass. It is a bunch grass, but can grow thick enough to form a mat. It has been widely planted on roadsides and ranches, and has spread aggressively across the region, including many riparian areas. The seeds are fluffy and readily spread by wind. K. R. can dominate riparian areas especially following mechanical disturbance or regular mowing, or when the more desirable grasses have been overgrazed. It provides a degree of erosion control, but is inadequate to dissipate the energy of high flows. There are several other closely related exotic bluestem grasses with similar characteristics, which are generically referred to as "old world bluestems." These include Kleberg bluestem, Caucasian bluestem, Yellow bluestem and Old World bluestem. These should not be confused with the desirable native bluestems.



"It has many ash trees, elms and walnuts... the natives...did not show themselves again and were lost in the thickness of the woods along the bank."

Notes for the Nueces River
by Father Espinosa; 1709

Woody Plants and Trees

1844–"When almost exhausted and ready to sink in his tracks, Ackland came to a large drift that covered an acre or more of ground which had been deposited there during some great rise in the river and this afforded a good hiding place. Crawling in under the drift he dragged (his blinded comrade) Perry after him as far as he could.....(the two rangers hid from their enemy)... The drift covered so much ground and had so many openings in which a man could crawl that they (the Indians) failed to find the right one and finally went on down the river."

Describing four rangers caught swimming unarmed in the Nueces near present day Barksdale and their attempt to hide after being severely wounded by arrows. From *Early Settlers and Indian Fighters of Southwest Texas* by A.J. Sowell, published 1900 by Argosy-Antiquarian, Ltd. Incident of Ranger Life.

Buttonbush

Button willow

(Cephalanthus occidentalis)
RUBIaceae

Wetland Indicator Status: OBL Stability Rating: 8

The gnarly buttonbush is a strong-rooted riparian shrub, able to hold banks in place during severe flooding. While its central trunk can grow to a diameter of 8-inches or more, it is often seen with a multi-branched base from being broken off in floods and re-sprouting from the stump. Buttonbush can grow out in the open, on a naked gravel bar, or under the shade of riparian trees. It has large shiny leaves that occur in pairs or triplets at each node. The flowers are distinctive white balls with many stamens offering an important source of nectar for birds and insects. After flowering, the seed heads harden into a cluster of brown balls that float and can be identified in flood debris. Buttonbush is palatable and can be heavily browsed by deer, exotics or livestock reducing the root mass of the shrub and preventing adequate reproduction. Buttonbush is reportedly easy to propagate by pushing fresh cut stems into wet soil.

Bald cypress

Sabino

(Taxodium distichum)
TAXOdiaceae

Wetland Indicator Status: OBL Stability Rating: 9

Cypress is the largest and most characteristic riparian tree on many creeks and rivers in the Nueces headwaters. Trunk diameters of 2- to 4-feet are common, but many 8- to 12-foot diameter trees can still be seen. The state champion bald cypress on the Frio River near Concan is 96-feet tall and has a trunk diameter of 30-feet.

In the early days of European settlement, cypress was highly valued as lumber since the wood is very durable and resistant to rot. Cypress was extensively used as shingles by early settlers. Much of the original stand of bald cypress on Nueces headwater rivers and creeks had been logged by the late 1800s.

The woody roots of cypress form an exceptionally strong bulwark of reinforcement along banks which effectively resist the flash flooding common in the area. Fine feeder roots also aide in holding loose soils together. During floods, some cypress will either get washed out or will break off. These whole trees and logs can become lodged in the channel or floodplain, and play an extremely important role in initiating and sustaining riparian stability.

Cypress seeds float and help spread populations downstream. Young cypress plants are vulnerable to heavy browsing by deer, livestock and exotics. Landowners who wish to see more reproduction of cypress may need to apply very aggressive control of wildlife populations. Seedlings can also be planted to help restore or improve cypress communities.

"He drove ox teams to Uvalde and San Antonio, hauling cypress lumber and shingles from the Leakey mill ... I worked for Old Man Leakey four or five years. Cypress was the main thing he milled, though he used a certain amount of ash timber and white oak. He had the timber sawed, and we hauled it to mill, then we hauled the lumber to town. I remember one old cypress tree that measured 18-feet through the base of it. It was a common thing to see trees that was eight and ten feet through."

Ox Wagon Bring Cypress from Leakey, documented by Florence Fenley in interview with J.H. Thompson

Fall color on the Frio River
Photo courtesy of Ron Sprouse

Retama

(Parkinsonia aculeata)
FABAceae

Mexican palo verde, Jerusalem thorn, Lluvia de oro

Wetland Indicator Status: *FACW* Stability Rating: *6*

Retama is often the dominant riparian tree in the deep-soil floodplains of the Rio Grande Plains portion of the Nueces Basin. It is rare in the Edwards Plateau. Growing to a height of 10- to 15-feet, retama has green twigs and branches, armed with numerous, vicious thorns. The leaves are unique, having dozens of very small leaflets growing from a long, central leaf stalk. The flowers are showy and intricate with five yellow petals. One of the flowers has a honey gland at its base which turns red and remains on the stalk longer than the others. Bean pods contain a few large seeds. Retama is a legume and thus helps to enrich the soil with nitrogen. Retama is sometimes considered a pest, especially when it becomes very thick, but it is an important riparian plant, helping to stabilize banks and floodplains. It is also browsed by deer.

"...we reached the banks of a river... we worked our way... through timber... cutting a passage for the troops"

Nueces River; Zavala Co; Domingo Terán de los Ríos; 1691.

Sycamore

Eastern sycamore

(Platanus occidentalis)
PLATanaceae

Wetland Indicator Status: FAC Stability Rating: 6

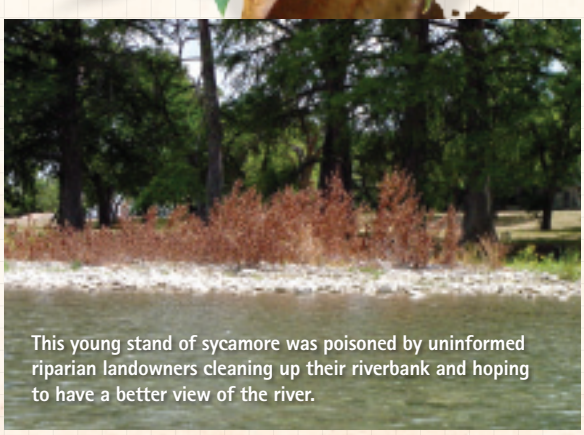
Sycamore is well known to most creek and river enthusiasts with its characteristic leaves, bark and seed balls. It can grow to a large tree more than 50-feet in height, but more commonly it's found in clusters of medium-sized trees or colonizing freshly disturbed gravel bars. Where cypress is absent, sycamore may be the largest riparian tree and only source of large wood on some streams. It is a moderately fast-growing tree and readily establishes from seed under the right conditions. Sycamore is an important tree to help stabilize gravel bars. The roots are not as strong as cypress, but a large colony of sycamore provides acceptable stability. When sycamore trees are uprooted and washed out, the downed trees serve as small dams to trap gravel and sediment, and often form nursery pools for fish and other aquatic species. Medium-sized trees can help catch and hold larger trees and floating logs during floods. Catching and anchoring large wood in channels and floodplains is an important riparian function, especially on high-energy, high-sediment creeks and rivers. Sycamore is not preferred for browsing, but beaver are fond of stripping and eating the bark.

Obvious browse line on riparian Sycamore indicates a serious deer, exotic or goat problem.

The Spring-dwelling Caddis fly larvae make their tiny homes from circles they cut from sycamore leaves.

"What happened to all the sycamore trees? When we came to the Montell area in the forties, the Nueces river bottom was thick with big sycamore trees. There was an old two story house on our place that we kids used for a playhouse. That house was built completely out of sycamore wood; floors, walls, beams, rafters, everything. It seems to me the river's channel and deep holes started disappearing once the big sycamores were gone."

Oscar Estes, long-time resident of the Nueces Canyon



This young stand of sycamore was poisoned by uninformed riparian landowners cleaning up their riverbank and hoping to have a better view of the river.

Pecan

Nuece

(Carya illinionensis)
JUGLandaceae

Wetland Indicator Status: FAC

Stability Rating: 6

No other tree in Texas is more clearly associated with creeks and rivers than the pecan, the Texas state tree. Nueces is a Spanish word for the pecan nut. Pecan groves, often called pecan bottoms, line much of the major Nueces Basin floodplains and play an important role in riparian ecology. They are often the largest riparian tree, reaching heights of more than 80-feet and living up to 300 years. Pecan grow best in deep, fertile alluvial deposits. They grow on active floodplains or on abandoned terraces with access to a shallow water table. Pecan, like other bottomland trees, provide bank reinforcement and energy dissipation during flooding. When left unmanicured, pecan bottoms can provide protected incubator space for tall riparian grasses and baby replacement trees to establish and flourish. However, these areas are often kept "clean" and mowed, reducing their riparian function and inhibiting regeneration. Pecans that grow near the active channel may eventually be undercut by flood water and fall into the river, creating an important source of large wood. Pecan trees, especially the tall, mature trees, provide roost sites for the Rio Grande turkey and a variety of other large birds; their nuts are a rich source of energy and protein for many species of wildlife.

"They set off at a brisk pace for about forty miles through the Nueces valley; a delightful region, adorned with beautiful trees and picturesque rocks, and watered by many fair rivers, tribute to the great Rio del Nueces, River of Nuts."

A historic note from *Recollection of Western Texas 1852–55 by Two of the U.S. Mounted Rifles* published by Texas Tech Press.

Little walnut

Nogalito

(Juglans microcarpa)
JUGLandaceae

Wetland Indicator Status: FAC Stability Rating: 7/8

Little walnut is a smaller cousin to the larger black walnut. It is usually a multi-stemmed gnarly shrub or small tree growing to a height of 10- to 15-feet. Little walnut occurs on even the largest and deepest gravel deposits, often being the only species to thrive in that harsh environment. It is an important plant to help stabilize gravel bars, dissipating the energy of floodwater, allowing some fine sediment to settle out and capturing organic debris. The leaves are similar to pecan, having many smaller leaflets growing from a central leaf stalk. The walnuts are small and very hard with only a small amount of meat and not worth the effort to extract. Walnuts will float downstream and germinate on new gravel bars. Little walnut is not a preferred browse plant although deer and exotics will sometimes use it.

1930s–"Mr. Henderson also did considerable business in marketing walnut stumps and timber. The walnut stumps were very valuable in making veneer for furniture, on account of the beautiful patterns that are brought out when the timber is sawed in cross sections. Bud Reagan also worked at the business of getting walnut stumps. He dug stumps all over the river beds of the Nueces Canyon... The competition between the various groups soon cleaned out the stands of walnut timber in the canyon and the people thus engaged turned to other means of livelihood."

From *Nueces Headwaters Country*, by Alan A. Stoval, published by The Naylor Company, 1959.

Black willow

Sauz

(Salix nigra)
SALIcaceae

Wetland Indicator Status: FACW Stability Rating: 7

Black willow is the most common species of willow in the region. It can grow more than 40-feet in height in protected areas, but it seldom gets that big. Their extensive root system provides very good bank stability. Black willow is recognized by its long, narrow leaves, finely serrated margins and pointed tip. Flowers occur in early spring as yellow drooping catkins, followed by the white fluffy seed, which is dispersed by the wind. The wood of willow is weak, and branches and limbs are often broken off in flooding. The branches that get broken off can float downstream and root if they land in a suitable location. This characteristic can also be used to transplant willow. Poles or limbs are cut in the winter, kept moist, then planted while still dormant. The butt of the pole must be buried deep enough to stay wet. In the spring, the pole will sprout roots and new leaves. Willow is a preferred browse plant for deer, exotics and livestock. Heavy browsing will limit the recruitment of new plants and the success of transplants. Control and management of deer and livestock is an important consideration to help restore willow. Beaver are also very fond of willow as a food source. There are two other less common species of willow found in the region—Sandbar willow *(Salix exigua)* can be found in the Rio Grande Plains, and Arroyo willow *(Salix lasiolepis)* can be found in the Edwards Plateau.

Arroyo willow

Cottonwood

Alamo, Poplar

(Populus deltoides)
SALIcaceae

Wetland Indicator Status: FAC Stability Rating: 6/7

Remnants of a once large stand of Cottonwood along San Miguel Creek in McMullen County

Cottonwood is uncommon in the Nueces basin but has the potential to be one of the largest trees in the region, growing to a height of 100-feet and a diameter of eight-feet. It is a fast-growing tree, yet relatively weak and short-lived compared to pecan or oak. Cottonwood is in the same family as willow and shares many common characteristics. The name comes from the light, fluffy seed that resemble cotton. The falling of seed can be so prolific that it gives the appearance of falling snow. One medium-sized tree produces an estimated 20 to 30 million seed. The seed drop from the tree during May and June, which coincides with the greatest probability of landing on bare, wet, freshly deposited riparian soil. The seed of both willow and cottonwood are very short lived, usually only a few days to two weeks.

Under the right conditions, seed begin to germinate within several hours and must remain consistently moist for several weeks. New, young plants must have constant access to wet soil or the seedling will die. For these reasons, successful natural regeneration of cottonwood and willow does not occur very often. In addition the seedlings and young plants of both species are readily browsed by livestock and deer and eaten by beaver. Across much of Texas, old, large cottonwood can still be found along creeks and rivers, but saplings and small trees are rare, indicating a lapse in natural reproduction. Cottonwood can be easily rooted from dormant branches in the same manner as willow. Large cottonwood trees can provide a source of large wood to help stabilize channels and catch and retain sediment.

Mexican ash

(Fraxinus berlandieriana)
OLEAceae

Fresno

Wetland Indicator Status: FAC Stability Rating: 6

Mexican ash is a major component of some riparian areas in the Rio Grande Plains, but is seldom found in the Edwards Plateau portion of the basin. It is associated with cedar elm and other riparian hardwoods that can form nearly continuous canopies on banks and can provide good stability. Known locally as fresno, these trees grow quickly and have expansive root systems that reinforce banks and minimize erosion. In the lower gradient creeks and rivers of the Rio Grande Plains, a Stability Rating of 6 is often adequate to hold banks in place and this tree is a key component of that stability. Fresno serves as a larval host for a number of butterflies including Two-tailed tiger swallowtail, Tiger swallowtail, Orange sulphur, Sleepy orange and Cloudless giant sulphur.

Large, strong root systems of Ash and other hardwood trees stabilize banks.

"... in the afternoon arrived at the Nueces River... Its groves consist of ash trees, elm, and poplars. Its bed is spread with loose rocks and its deep ravines can flood right and left over much ground, and the soil of its banks is hard, and the forest on the right bank very dense..."

Historic note from Brevet Colonel Jose Maria Carrasco, of General Woll's army, 1842, probably near present La Pryor in Zavala County.

Wafer ash

Hoptree

(Ptelea trifoliata)
RUTAceae

Wetland Indicator Status: FAC Stability Rating: 5/6

Wafer ash is not related to Mexican ash or other ash trees. Leaves of the wafer ash are composed of three leaflets giving them the superficial appearance of ash leaves. It is actually in the citrus family and the crushed leaves have a strong citrus smell. Wafer ash is a bushy tree that grows to a height of 8- to 16-feet and can be found in a variety of situations, from exposed gravel bars to terraces to riparian woodlands. Fragrant bundles of blossoms appear in early spring and are followed by distinctive fruit. The fruit contains a seed pocket surrounded by a thin wing or wafer. Wafer ash is usually a minor component of riparian vegetation.

Dwarf palmetto

(Sabal minor)
ARECaceae

Wetland Indicator Status: FACW Stability Rating: Presume 7+

Dwarf palmetto as the name implies is a small species of palm, which does not grow a trunk like other palms. It is found growing along the lower Nueces and coastal tributaries. It has the characteristic fan-shaped leaves which can be over 6-feet in width. Dwarf palmetto grows as a dense cluster of basal leaves up to a height of 12- to 18-feet.

Hackberry

Palo blanco

(Celtis laevigata and *Celtis reticulata)*
ULMAceae

Wetland Indicator Status: FAC Stability Rating: 5/6

There are two species of Hackberry trees in the region which look very similar and provide equivalent riparian value, Sugar hackberry and Netleaf hackberry. The leaf of sugar hackberry is smooth to the touch, while the leaf of netleaf hackberry is rough. Hackberry grows to a medium-sized tree of 25- to 40-feet at maturity. The bark is gray with warty bumps. The reddish-brown berries that mature in the fall are used by many species of birds and other wildlife. Hackberry is often a component of riparian bottomlands and is found in the Rio Grande Plains as well as the Edwards Plateau. Hackberry furnishes excellent browse for deer and livestock.

Spiny hackberry

Granjeno, Desert hackberry

(Celtis ehrenbergiana or *pallida)*
ULMAceae

Wetland Indicator Status: UPL Stability Rating: 5/6

Spiny hackberry or granjeno is common along creeks and rivers especially in the Rio Grande Plains portion of the Nueces Basin. It produces bright-orange, edible berries and is the larval host for the snout nose butterflies that periodically defoliate entire stands of this plant. Granjeno is an important wildlife browse plant found in drier marginal riparian sites, often along the banks of ephemeral and seasonal streams. It performs erosion control and bank stabilization in the absence of FACW and OBL species.

1850s–"Several of these, dry in later months, contained running water and in their valleys, here and there, the gravelly soil was black, and the grass was abundant beneath the shrubs ... The bottoms of two or three of these creeks were marked by a thin belt of wood—hackberry and elm—and those [bottoms] of the Nueces and Turkey creek ... were well shaded by timber ... pasturage ... would be impracticable, where sheep would lose their whole fleece in the labyrinths of thorns and cattle stray instantly out of sight and beyond possible control."

Historic description of a Nueces River tributaries by Fredrick Olmsted.

Cedar elm

Olmo

(Ulmus crassifolia)
ULMAceae

Wetland Indicator Status: FAC Stability Rating: 6

Cedar elm often grows in rich bottomland soils and sometimes on steep banks. It can grow to a large tree of 50-feet in height. It is one of the components of mature riparian woodlands and associated with live oak, pecan, hackberry and other deciduous hardwoods. Leaves are small and rough with serrated edges. Stems and smaller limbs are sometimes characterized by a woody flag. Seeds produced in spring, are flat, surrounded by a thin wing, and are eaten by turkey. Cedar elm, especially seedlings, are a preferred browse plant and often heavily used by livestock, deer and exotics. Another species, American elm (*Ulmus americana),* is also found in the area.

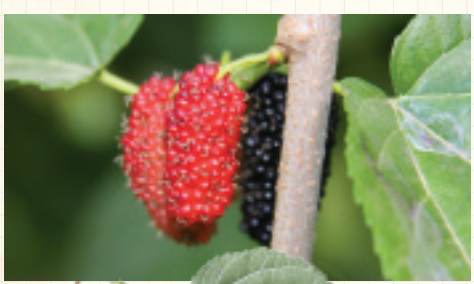
Red mulberry

Moral

(Morus rubra)
MORAceae

Wetland Indicator Status: FACU Stability Rating: 6

Red mulberry is a medium-sized tree, found on many creeks, but seldom common. It is another important component of riparian woodlands and is associated with elm, pecan, hackberry and other hardwoods. In combination with other trees, it helps provide bank stability and some large wood to dissipate energy and catch debris. Leaves are large, palm-shaped, often with scalloped edges. The berries, which appear on female trees, are good to eat and relished by a variety of birds and small animals. Asian mulberry *(M. alba)* is similar in appearance but is non-native.



Baccharis

(Baccharis neglecta)
ASTEraceae

Roosevelt weed, New deal weed, False willow, Poverty weed, Jara Dulce, Dryland willow

Wetland Indicator Status: FAC Stability Rating: 6

Most people think baccharis is ugly, but it is important in the early stages of riparian recovery. Baccharis is a multi-stemmed bush growing from 4- to 8-feet tall. It can resist moderate flows, and its brushy tops help to dissipate energy, catch sediment and organic debris which creates a micro-environment suitable for propagation of other riparian plants. It is common to find young sycamore and switchgrass plants getting started in a thicket of baccharis. The flower heads form in the fall in silvery-white clusters. There are separate male and female plants. The prolific, fluffy seeds are spread by the wind to vegetate new gravel deposits. Baccharis can be troublesome in upland pastures and control may be warranted, but in riparian areas, it should be left alone. There is another less common species of baccharis sometimes found in the region, Seepwillow baccharis (Baccharis salicifolia). It has similar characteristics, except that it is FACW.

Burrobrush

(Hymenoclea monogyra)
ASTEraceae

Cheese brush

Wetland Indicator Status: UPL Stability Rating: 6

Burrobrush, like baccharis, is often thought of as ugly. It fulfills a similar and important functional niche. Able to colonize highly disturbed riparian lands, it may have earned its name from growing in overgrazed areas where burros were kept or congregated. Burrobrush is more common than baccharis in the arid western part of the Nueces catchment and into the Trans Pecos and Mexico. It is well adapted to dry, barren, gravel deposits, where it provides a degree of energy dissipation, resistance to erosion, sediment catching and a source of organic material. The leaves are long and thread-like. The bushes are multi-stemmed and usually from 4- to 8- feet tall.

Indigobush amorpha

(Amorpha fruticosa)
FABAceae

Wetland Indicator Status: OBL Stability Rating: 7

Indigobush is a switchy, multi-stemmed shrub that forms loose colonies and spreads by root sprouts. It is found scattered in the upper Nueces basin but not recorded in the lower reaches. Indigobush is a legume and has the characteristic compound leaves. The flowers form in early spring in attractive terminal spikes. Each individual flower is small with rich-purple petals and bright-yellow stamens. The spikes are normally composed of 100 or more individual flowers, creating a strikingly beautiful flower stalk. While the stems of indigobush are weak, the root system is strong and capable of holding soil in place during flood events. Indigobush can be moderately browsed by livestock and deer, although it has been reported to be poisonous to cattle.

Desert willow

(Chilopsis linearis)
BIGNoniaceae

Wetland Indicator Status: FACU Stability Rating: 6

Desert willow is not a true willow. It is a large shrub or small tree, growing to a height of 10- to 15-feet. It normally grows on the uppermost parts of gravel bars, where it helps dissipate stream energy, stabilize sediments, and trap debris. Flowers are showy and range in color from pinkish-white to light-purple. Seed pods are pencil-shaped and contain many hairy seeds. Desert willow is a desirable ornamental tree for landscaping and is not heavily browsed by deer.

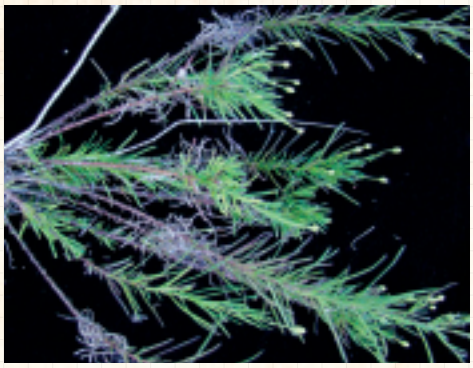
Brickellbush

(Brickellia sp.)
ASTEaceae

Wetland Indicator Status: UPL Stability Rating: 4

This scrubby bush is often one of the first species to colonize new gravel deposits, a gravel bar pioneer. Two species are equally common along the upper Nueces and its tributaries. Both are less than 3-feet tall and grow exclusively on barren gravel bars. They have impressive tap roots for such small shrubs. The roots help hold the sediments in place until stronger-rooted plants such as little walnut or sycamore can get established. The seeds are dispersed by the wind and can quickly re-seed new gravel bars. The leaves of one species are covered by sticky resin.

A tea of brickellbush leaves used repeatedly may lower elevated blood sugar levels.



Slinder brickellbush; Brickellia eupatorioides var gracillima

Gravel bar brickellbush; Brickellia dentata gracillima

Lindheimer indigo

Lindheimer scarlet pea

(Indigofera lindheimeri)
FABAceae

Wetland Indicator Status: UPL Stability Rating: 4

Lindheimer indigo is a small shrub, rarely growing to waist height. It is another gravel bar pioneer, often found along with brickellbush. It has a distinctive, gray appearance due to the dense covering of fine hairs on the leaf, peachy-red flowers, and banana-shaped seed pods. It is not particularly strong rooted, but it is able to establish and survive on new gravel deposits making it a valuable plant in the early stages of recovery. Since it is a legume, it does help improve the barren soil by fixing nitrogen. It is not browsed by livestock or deer.

Lovely red blossoms and banana-shaped seed pods

Chinaberry (Non-Native)

(Melia azedarach)
MELIaceae

Wetland Indicator Status: UPL Stability Rating: 5

Chinaberry is a familiar and common yard tree in many towns and cities. Introduced from Asia as an ornamental, it has been widely planted as a fast-growing shade tree. Chinaberry is not to be confused with western soapberry, which is a desirable native tree with some similarity. Chinaberry is considered by some to be invasive since it readily spreads in riparian areas. Exotic species such as chinaberry can cause problems when they crowd out native species. Chinaberry is in the mahogany family and has beautiful, multi-colored, streaked wood. One of the best uses of chinaberry trees is to make beautiful furniture with the wood.

Waxleaf ligustrum (Non-Native)

(Ligustrum quioui)
OLEAceae

Wetland Indicator Status: UPL Stability Rating: 5

Ligustrum is another exotic ornamental that has been widely planted in urban landscapes as a hedge plant. Like some other exotics, it has escaped from yards and into creek and river bottoms, especially below towns and cities. Mature ligustrum bushes produce multiple thousands of berries each year, which are readily eaten and spread by birds. Dense groves of ligustrum can inhibit the development of native riparian species. Furthermore, the root system of ligustrum is inferior to many native riparian trees and shrubs and does not provide a high degree of bank stability.


Photo courtesy of Paul Barwick

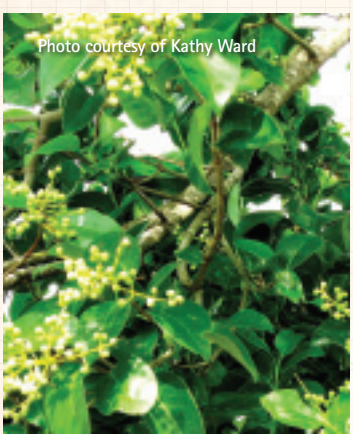


Photo courtesy of Kathy Ward

Downed trees and logs should be left in place in riparian areas and floodplains. Large wood in riparian areas helps dissipate the energy of floodwater so that sediments can be trapped and new banks and floodplains can be built. Large wood often gets buried in sediment or gravel which helps hold it in place. Large wood also helps create meanders in the channel and helps create good fish habitat. Logging has contributed to the degradation of many rivers in the world. Some riparian experts believe that the massive mobile gravel deposits in Nueces Basin headwater streams will not stabilize and recover until a sufficient quantity of large wood gets caught and anchored into the floodplain.

Forbs

Forb—
a broad-leafed
herbaceous plant.

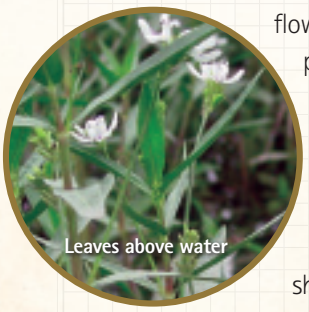
According to local history, in 1629 a Spanish priest named Salas first named the Nueces the "Rio de las Perlas," presumably because of an abundance of freshwater pearls. Only a few of the 14 documented native species of freshwater mussels can be found today. As an ecological indicator species, extremely sensitive to changes in water quality and sediment loading, their absence may indicate that significant changes have already occurred. Riparian function produces the values humans treasure in rivers, mostly clean-flowing water, but riparian function also produces the values other species depend upon for survival.

Water willow

(Justicia americana)
ACANthaceae

Wetland Indicator Status: OBL Stability Rating: 7

This strong-rooted perennial often forms large colonies in shallow water. It can also grow on gravel bars near the waterline, underwater and in channels that are temporarily dry. Plants within a colony are interconnected by a dense network of roots and rhizomes. It is recognized by having thick stems with leaves that occur in opposite pairs. The small-white to purplish flowers occur on stalks. Water willow is an important plant to help stabilize gravel and mud deposits. During flooding, the tops may be stripped of leaves or the tops may be broken off, but the roots usually remain intact and will quickly re-sprout. Plants broken off or uprooted during floods can wash downstream and form new plants from rooting stems. Water willow is palatable to deer and livestock and is sometimes grazed short. This kind of grazing reduces the strength of the root system. Colonies of water willow provide good habitat for aquatic insects and small fish.


Leaves above water


Leaves under water

Water hyssop

(Bacopa mommieri)
SCROphulariaceae

Wetland Indicator Status: OBL Stability Rating: 3

This short, perennial forb has many tiny prostrate stems that root every few inches to form a mat. The flowers are small, pale-blue to white. Water hyssop is an early-stage colonizer plant that generally grows right at the waterline of gravel bars and mud deposits. It is sometimes grazed by deer.

Watercress

(Rorippa nasturtium-aquaticum)
BRASicaceae

Wetland Indicator Status: OBL Stability Rating: 3

Watercress is familiar to many people as a low-growing leafy, semi-aquatic plant that can be eaten cooked or raw. It grows in shallow water or at the water's edge. It is a native of Europe but has become common on many creeks and rivers. The stems are prostrate and root every few inches to form a mat that helps colonize newly deposited fine sediment. The flowers are very small and white which later form small seed pods. Watercress is sometimes grazed by deer or livestock. This plant is often cultivated for use in salads adding a pungent, peppery taste.

Weak stabilizer of fine sediments in low-energy headwater creeks and springs

… *Salads* …

Watercress & Grapefruit Salad with Minty Asian Dressing and Pecans

By Kara Kroeger Certified Nutritionist, Herbalist and Culinarian

FOR THE SALAD
2 Ruby Red Texas grapefruits, peeled with a knife and sectioned to remove pith
8 ounces watercress (about 2 bunches), thick stems removed
1 avocado, sliced
1/2 small jicama, cut into matchsticks
1/8 teaspoon coarse salt
Freshly ground pepper

FOR THE DRESSING
2 tablespoons mint, minced
1 teaspoon ginger, grated
1/4 teaspoon garlic, minced
Juice of one lime
1 1/2 teaspoons rice wine vinegar
1/4 teaspoon Asian sesame oil
1/8 teaspoon sugar
3 tablespoons extra-virgin olive oil

Arrange the watercress in a salad bowl and top with grapefruit sections, jicama matchsticks and avocado slices. For the dressing, combine all the ingredients in a bowl and whisk until well blended. Drizzle the vinegar over the salad and garnish with chopped pecans.

If you are harvesting the watercress from the wild and are not able to collect the amount required by the recipe, you can mix what you do have available with arugula or some other green leafy lettuce.

Wild mint

(Mentha piperina and *Mentha spicata)*
LAMIaceae

Wetland Indicator Status: FACW Stability Rating: 3

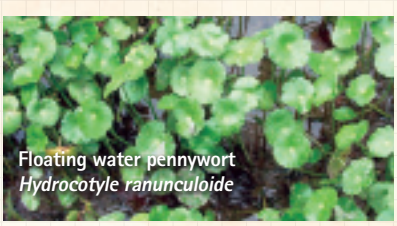
Two species of wild mint grow in the region, peppermint and spearmint. Both species were introduced from Europe by early settlers for culinary purposes. Mint has found its way into many riparian areas where it serves nicely as a colonizer plant. It has the characteristic opposite-paired leaves shared by all plants in the mint family. The fresh mint smell when the leaves are crushed is another distinguishing feature. Mint is a perennial plant that spreads effectively by rooting along any stems that touch wet soil. It can form dense colonies and is often mixed with watercress, water hyssop and pennywort. Like other colonizer forbs, it is not strong-rooted but can help hold fine sediments in place until more robust plants are established. Mint and other colonizers can spread from pieces of the plant that are broken off by flooding and wash downstream. Mint is readily grazed by deer and livestock.

Water pennywort

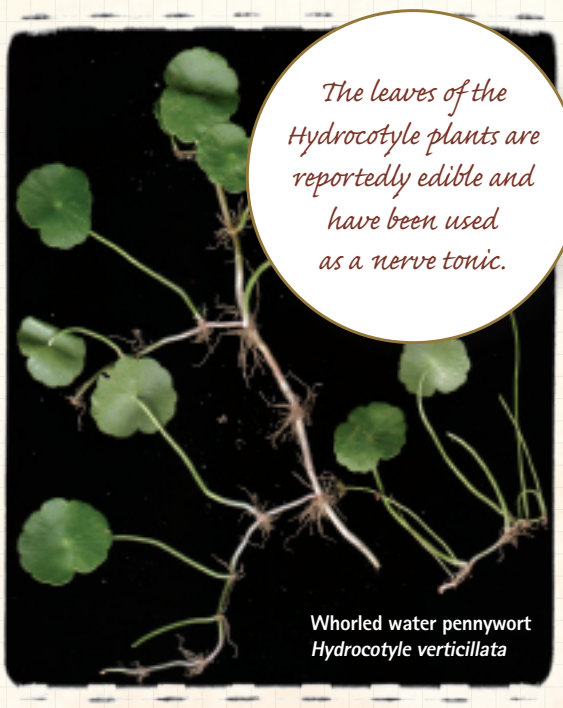
(Hydrocotyle sp.)
APIAceae

Wetland Indicator Status: OBL Stability Rating: 3

Water pennywort is a mat-forming perennial with numerous prostrate stems that root every few inches. The leaves are round with slightly scalloped edges, and the leaves are elevated on a central stalk. Flowers are inconspicuous. It occurs at the water's edge and helps hold fine sediments in place until stronger stabilizing plants can become established. There are three species of water pennywort found in the area—all look very similar.



Floating water pennywort
Hydrocotyle ranunculoide



The leaves of the Hydrocotyle plants are reportedly edible and have been used as a nerve tonic.

Whorled water pennywort
Hydrocotyle verticillata

Spiny aster

Devil weed

(Aster spinosa or *Chloracantha spinosa)*
ASTEraceae

Wetland Indicator Status: FACW Stability Rating: 8

Spiny aster is a very strong perennial plant that appears as a mass of green stems without leaves. It grows in the Rio Grande Plains part of the Nueces Basin and often forms large continuous colonies interconnected by a dense network of roots and rhizomes. The lower stems, which can be woody, are armed by short, stout spines. The upper stems are branched and somewhat evergreen. Flowers are relatively sparse, small and unimpressive, with white petals and a yellow central disk. The dense rooting network provides excellent bank stabilization. It is generally not eaten by deer or livestock except under extreme conditions. Spiny aster can be easily transplanted by digging sections of root during the winter or early spring.

Lindheimer senna

Velvet leaf senna

(Senna lindheimeriana)
FABAceae

Wetland Indicator Status: UPL Stability Rating: 4/5

Lindheimer senna is an erect, perennial, foul-smelling legume with one to several velvety stems rising from a deep, woody root. Like the Lindheimer indigo, senna tends to be an early colonizer of gravel and sand bars and from that standpoint performs an important riparian function. The seeds are a food source for birds, and the flower is a larval host and/or nectar source for the Sleepy orange butterfly *(Abaeis nicippe)*. Lindheimer senna is toxic to livestock and very unpalatable; it is consumed only under unusual circumstances.

Sesbania

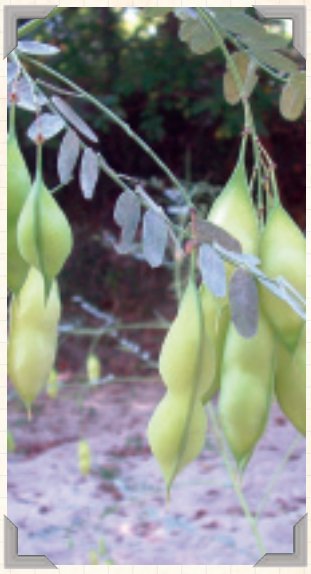
Danglepod plants

(Sesbania, sp)
FABAceae

Wetland Indicator Status: FACW/FAC Stability Rating: 3/4

Three species of sesbania are common in the Nueces Basin. This nitrogen-fixing weak colonizer is quick to spring up on raw gravel and sand bars.

Pencilpod sesbania
(Sesbania macrocarpa or exaltada)



Bagpod sesbania
(Sesbania vesicaria)

Rattlebox sesbania
(Sesbania drummondii)

Frogfruit

Turkeytangle

(Phlya nodiflora)
VERBenaceae

Wetland Indicator Status: FACW Stability Rating: 4

Frogfruit is one of the common, early-stage colonizer plants found on the fringe of gravel bars in moist areas. It has low, branching, prostrate stems that root at every node to form a living mat. Leaves are formed in opposite pairs and have saw-toothed serrations at the tip. Flowers are formed in tight heads on short stalks.

Photo courtesy of Lady Bird Johnson Wildflower Center

Frostweed

Iceweed, Ice plant

(Verbesina virginica)
ASTEraceae

Wetland Indicator Status: FACU Stability Rating: 5

Frostweed is common and often dominates the bottomland terraces of Nueces headwater floodplains. It is sometimes found in the active channel floodplain and can help to stabilize gravel deposits. Frostweed grows to a height of 4- to 6-feet and often forms dense colonies by an extensive network of rhizomes. It is easily identified in spring by the narrow, thin wings that form along the length of the stem. Clusters of white flowers appear in late summer or fall, followed by seed heads which persist through winter. Frostweed is not palatable to deer or livestock and is seldom grazed. It is often considered an undesirable weed by landowners, especially when it dominates large areas to the exclusion of other plants. The flowers are a valuable source of nectar for many species of butterfly.

At the first freeze of the year, the sap freezes, bursting the stems, extruding ice in paper-thin sheets, providing a beautiful, but short-lived display.

Water primrose

(Ludwigia sp.)
ONAGraceae

Wetland Indicator Status: OBL/FACW Stability Rating: 3/4

Floating water primrose *(Ludwigia peploides)* is a low-growing, leafy, mat-forming plant which roots every few inches along the prostrate stems. It is often rooted at or near the water's edge, and the stems grow out across the water to help anchor fine, newly captured sediment. It is a superb colonizer plant. Flowers are bright-yellow with five petals and very showy.

Tall water primrose *(Ludwigia octovalvis)* is a stemmy, upright plant, growing to a height of 3-feet. It is less valuable as a colonizer since it does not form a matted network of roots. Tall water primrose also has showy, yellow flowers but with only four petals. Both species are subject to grazing by deer and livestock.

Tall goldenrod

(Solidago altissima)
ASTEraceae

Wetland Indicator Status: FACW Stability Rating: 6/7

Tall goldenrod is the most common species of goldenrod in the region. It grows in colonies interconnected by a network of underground rhizomes and can help colonize disturbed riparian areas. During the spring and early summer it is a nondescript-looking plant. As the characteristic goldenrod flowers form in late summer, it begins to standout on the riparian landscape. Goldenrod favors fine soil deposited by previous floods, and the root system can help hold these soils together. Goldenrod is readily eaten by deer, exotics and livestock, and for that reason may not be common on some creeks. There are several other species of goldenrod in the region.

Plateau goldeneye

(Viguiera dentata)
ASTEraceae

Wetland Indicator Status: UPL Stability Rating: 5

Goldeneye can often be found in abundance on abandoned floodplain terraces. It is a large perennial forb, growing to a height of 3- to 6-feet. In summer it bears many bright-yellow flowers, resembling sunflowers, and attracts a variety of butterflies, moths and bees.

Elephant ear (Non-Native)

Taro

(Colocasia esculenta)
ARACeae

Wetland Indicator Status: FACW

Stability Rating: unknown

A tropical plant with very large leaves on a stout, hollow stalk, this plant grows from elongated underground tubers. Elephant ears were introduced from Asia as an ornamental plant. Commonly planted in riverside landscapes, it sometimes escapes into the wild and can be quite invasive. Large colonies have the potential to displace native riparian vegetation. The starchy roots of this plant are made into "poi" by Pacific Island cultures and used as a staple food.

Sea purslane

Sesuvium sp.
AIZOaceae

Wetland Indicator Status: FACW

Stability Rating: 4

Sea purslane is a salt-tolerant succulent, or halophyte. It can colonize saline soils and utilize salt water while providing vital ground cover for contaminated or salted-out riparian sites. The plant stores salt in its leaves and is apparently used by wildlife and livestock as a source of dietary salt.

Beggars'-ticks

Smooth bidens, Bur marigold, Joaquin sunflower

(Bidens sp.)
ASTEraceae

Wetland Indicator Status: OBL Stability Rating: 4/5

Smooth beggars'-ticks and cutleaf beggars'-ticks are large, perennial forbs with bright-yellow flowers. They grow in shallow water or at the water's edge on gravel bars with a high water table. They can grow either upright to a height of 3-feet, or more commonly, prostrate, with the stems rooting at the nodes. They sometimes form large colonies and serve well as colonizers. The seeds resemble a pitchfork with each prong having barbs that easily catch in animal hair coats or clothing. It is especially annoying and difficult to remove the seed from clothing after walking through a colony of beggars'-ticks, but this is nature's way of dispersing seed of these valuable riparian plants. Livestock and wildlife readily graze the plants.

"Infusions and tinctures of cutleaf beggars'-ticks (Bidens frondosa) are rated as outstanding herbal therapies for irritation, inflammation, pain and bleeding of the urinary tract."

(M. Moore 1993).

Smooth beggars'-tick
Bidens Laveis

Cutleaf beggars'-tick
Bidens Fondosa

Forbs

Cardinal flower

(Lobelia cardinalis)
CAMPanulaceae

Wetland Indicator Status: FACW Stability Rating: 5

Cardinal flower is one of the most striking riparian plants when it's in full bloom. As the name implies, the flowers, which form in spiked clusters, are brilliant red. The flower stalks are 2- to 4-feet tall and is a favorite of hummingbirds. When not flowering, the plant is fairly inconspicuous. It usually grows right at the water's edge, often in partial shade. Cardinal flower is neither a colonizer nor a stabilizer and is seldom present in significant amounts. What it may lack as a contributor of riparian function, it makes up for in sheer beauty. Cardinal flower is available commercially as a potted plant and is often added to landscapes in wet locations, but the leaves of this plant are toxic to humans and livestock.

Late boneset

(Eupatorium serotinum)
ASTEraceae

Wetland Indicator Status: FAC Stability Rating: 5

Late boneset is a perennial that forms small colonies growing 3- to 5-feet tall, often in gravel deposits. Leaves form in opposite pairs and have saw-toothed margins. Flowers, which appear in late summer or early fall, are dirty white in color and form in clusters. It is an excellent source of nectar for butterflies and can be seen colonizing disturbed riparian areas.

Bog hemp

False nettle

(Boemeria cylindrica)
URTIcaceae

Wetland Indicator Status: FACW Stability Rating: 5

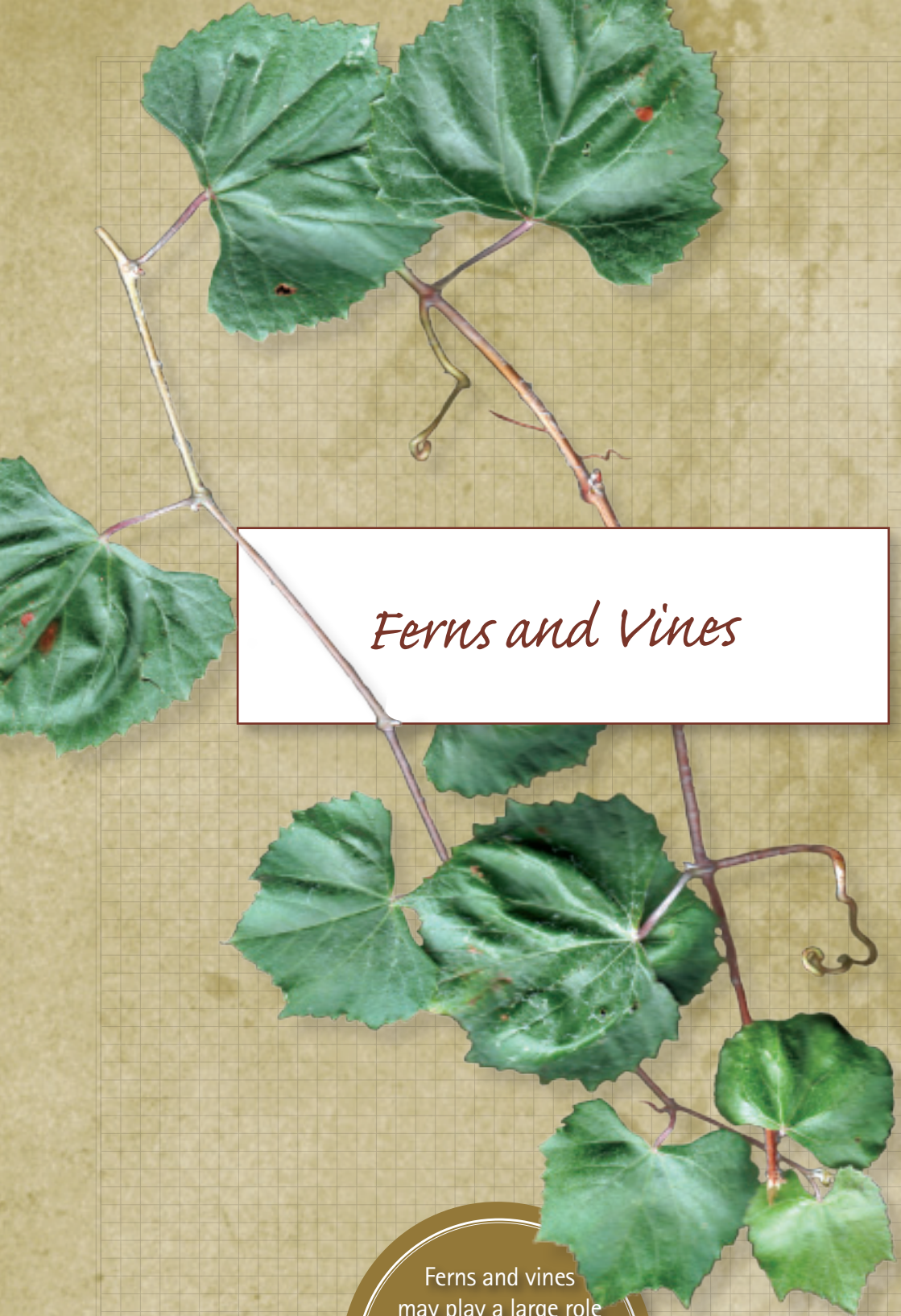
Bog hemp is a perennial riparian forb that grows to a height of about 3-feet. The leaves are strongly serrated (saw-toothed margin) and form in opposite pairs along the main stem. The flowers are not showy or attractive but form in spikes at the base of each leaf. Bog hemp often grows in partially to heavily shaded riparian areas.

Big selenia

(Selenia grandis)
BRASsicaceae

Wetland Indicator Status: FACW Stability Rating: 3

Big selenia is an attractive winter annual that occurs in the middle reaches of the Nueces bottomland in Dimmitt and La Salle counties. Big selenia is an endemic species, meaning that it has a restricted distribution. It grows in tight clay soils on the floodplain and is often found growing with gulf cordgrass and retama. As an annual forb, it does not have a strong root and therefore does not provide good stability. However, it does add beauty to the late winter landscape with its attractive, yellow flowers. Big selenia is in the mustard family, all of which have flowers with four petals. The old botanical name for the mustard family was "crucifer" since the four petals resemble a crucifix.



Ferns and Vines

Ferns and vines may play a large role in ecosystem function albeit a minor, or yet-to-be-defined role, in riparian function.

"One of the beautiful spots of Nueces Canyon ... passes by a large hole of deep blue water. Just above the waterhole is a series of strong springs from which gush sparkling streams of clear cold water. The water from these springs is unfailing. Masses of ferns and other water plants line the river bank for some distance ..."

1930-1940

From *Nueces Headwaters Country*, by Alan A. Stoval, published by The Naylor Company, 1959. pg 363.

"Fine Ferns ... deep Pools ... rocky bottom ... and constant supply of water ... Banks were a thicket of mesquite, live oak, pecan and mulberry."

William Bollaert's 1844 description the Leona River riparian areas, reporting his finding to the Geological Society of London.

Scouring rush

Horsetail

(Equisetum laevigatum)
EQUIsetaceae

Wetland Indicator Status: OBL

Stability Rating: 6

Scouring rush is an odd-looking, but unmistakable plant. Technically it is not a rush but a type of fern. The upright stems, which bear no leaves, resemble hollow, green, segmented tubes up to 3-feet tall. It forms colonies interconnected by rhizomes and is normally found in partially shaded areas. Since it is an obligate wetland species, it is a good indicator that the riparian area is storing water and maintaining a water table connection.

Horsetail stems contain silica and were used by early settlers to scour pots and pans, hence the name; scouring rush.

River fern

Lindheimer shield fern

(Thelypteris ovata var. lindheimeri)
THELypteridaceae

Wetland Indicator Status: FAC

Stability Rating: 6

This large, robust fern forms colonies by a network of rhizomes. Leaves are long and triangular, with many smaller leaflets. River fern sometimes occurs in large, thick beds under dense shade within floodplains. It can also be seen around springs and seeps.

Maidenhair fern

(Adiantum capillus-veneris)
PTERidaceae

Wetland Indicator Status: FACW

Stability Rating: 5

This delicate fern also forms colonies through a network of rhizomes. The leaf is composed of many irregular-shaped and lobed segments. The plant is found most often on seepy limestone bluffs or around springs in the Edwards Plateau portion of the basin.

Vines

Vines are an undergrowth component of many riparian woodlands. Often overlooked, they are seldom valued for their riparian function. Some have edible berries, most are browsed by wildlife, and many host insects. Vines seem to tie things together in the riparian area.

Mexican grape

Graybark or Gray-leaf grape
(Vitis cinerea) VITAceae

Possum grape

Cow itch
(Cissus incise) VITAceae

Mustang grape

(Vitis mustangensis) VITAceae

Poison ivy

(Toxicodendron radicans)
ANACardiaceae

1767–"We crossed it four times...All this intervening space and its surroundings are composed of hills and very dense thickets of blackberries, plum, pear and apple trees and mesquites, cedars and silver birches intertwined with a great many wild grape vines. A man on horseback can travel this road only with difficulty."

Historic Note on the East Nueces River in Edwards Co by Nicolás de Lafora.

1850s–"Regarding the coastal Nueces...A number of long, narrow islands form the shore, and are so near one another as to form the segment of a circle around the coast, so that the interjacent sea is thus completely land-locked and continues ever calm. Near the shore, and for about 100 miles inward, the country is flat, abounding with rich prairies and well-watered by rapid and shallow rivers, the banks of which are generally fringed with stately and graceful trees of various kinds, such as the cotton tree, live oak, mesquite, mulberry—most of these are thickly-crowned with grape vines which bear abundance of fruit in season. It is a curious feature in the level country that no trees grow in any part of it, except near rivers or some collection of water. The chaperelle, or underwood, with which the country abounds, cannot be regarded as an exception to this."

Historic notes on lower Nueces country from *Recollection of Western Texas* 1852-55 by Two of the U.S. Mounted Rifles published by Texas Tech Press.

Purple leather flower

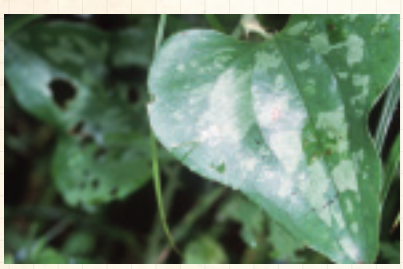
(Clematis pitcheri)
RANUnculacea

Common morning glory

(Ipomoea cordatotriloba)
CONVolvulaceae

Sawleaf greenbriar

(Smilax bona-nox)
SMILacaceae



Dewberry

Zarzamora
(Rubus trivialis)
ROSAceace

Alamo vine

(Merremia dissecta)
CONVolvulaceae

Dodder

(Cuscuta sp)
CUSCutaceae

Plant Name	Other Names	Grouping	Page
Ptelea trifoliata	Wafer ash; Hoptree	Woody	57
Purple leather flower	*Clematis pitcheri*	Ferns and Vines	83
Purslane, sea	*Sesuvium sp*	Forbs	75
Red mulberry	*Morus rubra*	Woody	59
Retama	*Parkinsonia aculeata*	Woody	50
Rhynchospora colorata	White-top sedge	Sedges and Rushes	24
Rice cutgrass	*Leersia oryzoides*	Grasses	39
River fern; Lindheimer shield fern	*Thelypteris ovata var lindheimeri*	Ferns and Vines	81
Roosevelt weed baccharis	*Baccharis neglecta*	Woody	60
Rorippa nasturtium-aquaticum	*Watercress*	*Forbs*	*68*
Rubus trivialis	Dewberry; Zarzamora	Ferns and Vines	83
Rushes, Torrey; Interior; Texas	*Juncus sp.*	Sedges and Rushes	26
Rush, scouring; horsetail	*Equisetum laevigatum*	Ferns and Vines	81
Rustyseed paspalum	*Paspalum langei*	Grasses	38
Sabal minor	*Dwarf palmetto*	*Woody*	*57*
Sacahuiste	*Spartina spartinae*	Grasses	35
Sacaton, big	*Sporobolus wrightii*	Grasses	35
Salix nigra	Black willow	Woody	54
Sawgrass	*Cladium mariscus*	Sedges and Rushes	20
Sawleaf greenbriar	*Smilax bona-nox*	Ferns and Vines	83
Scarlet pea, Lindheimer; Lindheimer indigo	*Indigofera lindheimeriana*	Woody	62
Schoenus nigricans	Black sedge	Sedges and Rushes	19
Scirpus sp.	Bulrush	Sedges and Rushes	28
Scouring rush	*Equisetum laevigatum*	Ferns and Vines	81
Sea oats, inland; Creek oats; Fish on a pole grass	*Chasmanthium latifolium*	Grasses	41
Sea purslane	*Sesuvium sp.*	Forbs	75
Sedge, black	*Schoenus nigricans*	Sedges and Rushes	19
Sedge, britton	*Carex brittonianna*	Sedges and Rushes	18
Sedge, emory	*Carex emoryi*	Sedges and Rushes	17
Sedge, porcupine	*Fuirena simplex*	Sedges and Rushes	23
Sedge, umbrella	*Cyperus odoratus*	Sedges and Rushes	21
Sedge, white-top	*Rhynchospora colorata*	Sedges and Rushes	24
Selenia grandis	Big selenia	Forbs	78
Senna lindheimeriana	Lindheimer senna	Forbs	70
Sesbania drummondii	Rattlebox sesbania	Forbs	71
Sesbania macrocarpa	Pencilpod sesbania	Forbs	71
Sesbania vesicaria	Bagpod sesbania	Forbs	71
Sesbania, bagpod	*Sesbania vesicaria*	Forbs	71
Sesbania, rattlebox	*Sesbania drummondii*	Forbs	71
Sesbania, pencilpod	*Sesbania macrocarpa or exaltada*	Forbs	71
Sesuvium sp.	Sea purslane	Forbs	75
Slender brickellbush	*Brickellia eupatorioides var gracillima*	Woody	62
Smilax bona-nox	Sawleaf greenbriar	Ferns and Vines	83
Smooth beggars'-ticks	*Bidens laevis*	Forbs	76
Solidago altissima	Tall goldenrod	Forbs	74
Spartina spartinae	Gulf cordgrass	Grasses	35
Spearmint, Peppermint, Wild mint	*Mentha spicata*	Forbs	69
Spikerush	*Eleocharis interstincta*	Sedges and Rushes	22
Spikerush	*Eleocharis rostellata*	Sedges and Rushes	22
Spikesedge, knotted	*Eleocharis interstincta*	Sedges and Rushes	22
Spikesedge, tussock	*Eleocharis rostellata*	Sedges and Rushes	22
Spiny aster; Devil weed; Mexican devil weed	*Chloracantha spinosa*	Forbs	70
Spiny hackberry; Granjeno	*Celtis ehrenbergiana (or pallida)*	Woody	58
Sporobolus wrightii	Big sacaton	Grasses	35
St. Augustine grass; Carpetgrass	*Stenotaphrum secundatum*	Grasses	44
Starrush whitetop	*Rhynchospora colorata*	Sedges and Rushes	24
Stenotaphrum secundatum	St. Augustine grass; Carpetgrass	Grasses	44
Sugar hackberry	*Celtis laevigata*	Woody	58
Switchgrass	*Panicum virgatum*	Grasses	31
Sycamore, eastern	*Platanus occidentalis*	Woody	51
Tall Goldenrod	*Solidago altissima*	Forbs	74
Tall water-primrose	*Ludwigia octovalvis*	Forbs	73
Taxodium distichum	Bald cypress	Woody	48
Teal lovegrass	*Eragrostis hypnoides*	Grasses	40
Thelypteris ovata var lindheimeri	River fern; Lindheimer shield fern	Ferns and Vines	81
Toxicodendron radicans	Poison ivy	Ferns and Vines	82
Tripsacum dactyloides	Eastern gamagrass	Grasses	33
Tussock spikesedge	*Eleocharis rostellata*	Sedges and Rushes	22
Typha latifolia	Cattail	Sedges and Rushes	25
Ulmus crassifolia	Cedar elm	Woody	59
Uniola, broadleaf	*Chasmanthium latifolium*	Grasses	41
Vaseygrass	*Paspalum urvillei*	Grasses	38
Verbesina virginica	Frostweed; Iceplant; Iceweed	Forbs	72
Viguiera dentata	Plateau goldeneye	Forbs	74
Vitis cinerea	Mexican grape	Ferns and Vines	82
Vitis mustangensis	Mustang grape	Ferns and Vines	82
Wafer ash; hoptree	*Ptelea trifoliata*	Woody	57
Walnut; Nogalito	*Juglans microcarpa*	Woody	53
Water bentgrass	*Agrostis semiverticillata*	Grasses	37
Watercress	*Rorippa nasturtium-aquaticum*	Forbs	68
Water hyssop	*Bacopa mommieri*	Forbs	67
Water primrose, floating	*Ludwigia peploides*	Forbs	73
Water primrose, tall	*Ludwigia octovalvis*	Forbs	73
Water-willow, american	*Justicia americana*	Forbs	67
Waxleaf ligustrum	*Ligustrum quioui*	Woody	63
White-top sedge	*Rhynchospora colorata*	Sedges and Rushes	24
Whorled water pennywort	*Hydrocotyle verticillata*	Forbs	69
Wild mint	*Mentha spicata*	Forbs	69
Willow, black	*Salix nigra*	Woody	54
Willow, button; Buttonbush	*Cephalanthus occidentalis*	Woody	47
Willow, desert	*Chilopsis linearis*	Woody	61
Zarzamora; Dewberry	*Rubus trivialis*	Ferns and Vines	83

Riparian Function Worksheet

Date: / /

Use this worksheet to guide your observation of riparian areas and their function. Observe your site at least annually. In addition to answering the questions "yes" or "no," write notes and photo document the same point each year. These tools will help you recognize and interpret changes over time.

1 **Is there a clearly defined active floodplain?** An active floodplain is an area where floodwaters spread out on a frequent basis (at least once every 1–3 years on average). These floodplains might be present only on one side or the other due to bluffs, high banks and meanders. Floodplain access for frequent runoff events is important to reduce the energy of floodwater, store water, and improve ground water recharge.

2 **Is there evidence that the banks and floodplains are storing water?** The storage of water in the riparian area is revealed by the presence of wetland plants rated as OBL or FACW, such as spikerush, bushy bluestem, Emory sedge, sawgrass, cypress, buttonbush, black willow, spiny aster, water primrose, watercress. A widening area that supports these kinds of plants indicates a good "riparian sponge" and the capacity to store water to help sustain base flow.

3 **Are there young and middle-aged plants of some of these important riparian trees and shrubs: sycamore, cypress, buttonbush, black willow, little walnut?** This indicates that reproduction is occurring to replace old plants and to maintain or increase plant density.

4 **Are there new, young plants of some of these important riparian grasses or sedges becoming established in bare or sparse areas: switchgrass, eastern gammagrass, bushy bluestem, Emory sedge, sawgrass, bulrush, big sacaton?** This indicates successful reproduction to maintain or improve riparian plant cover.

5 **Are there at least two species of stabilizing riparian grasses or sedges and at least two species of riparian woody plants?** A diversity of plant species is needed for maintaining stable riparian conditions or to promote recovery.

6 **Are riparian plants healthy and vigorous?** Heavy browsing of woody plants and heavy grazing of grasses, sedges and forbs is the most obvious sign of poor vigor.

7 **Is there at least 70% coverage of stabilizing grasses, sedges or woody plants along the length of each bank?** For heavily wooded areas, consider the extent of dense, stabilizing tree roots to be equivalent to twice the canopy diameter. This amount of cover (or more) will help insure bank and channel stability, help trap sediment, build floodplains, and improve water storage capacity.

8 **Are there adequate numbers of medium-sized and large-sized trees such as cypress, sycamore, pecan, elm or oak along the banks to provide a future source of large wood in the channel?** Trees that fall into the channel and large logs that become lodged in the channel or floodplain are important to help trap and stabilize sediments and dissipate stream energy.

9 **Are there areas of large, anchored boulders or large, anchored logs in or near the channel?** These features provide roughness and obstructions in the channel, which help dissipate energy and improve stability.

10 **Are there overflow channels, secondary channels, backwater sloughs or oxbows?** These features help accommodate floodwaters and provide additional energy dissipation and floodwater retention.

11 **Are cut banks and channel erosion being compensated and balanced by the formation and enlargement of stabilized point bars?** Some bank erosion is normal and natural, especially on outside bends, but this needs to be balanced by a corresponding increase in stabilized and properly vegetated bars on the inside bends.

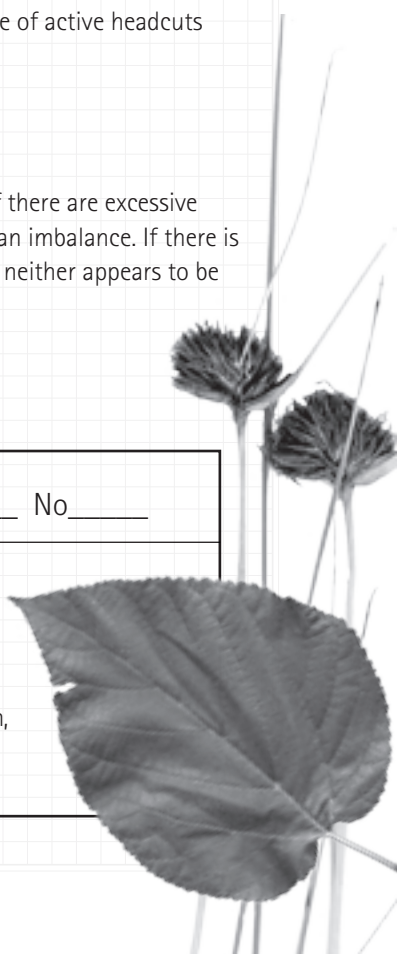
12 **Is the channel vertically stable?** Vertical stability means that the creek bed is not lowering or cutting down. The evidence of vertical stability is the absence of active headcuts and overfalls ("waterfall" features which are actively eroding).

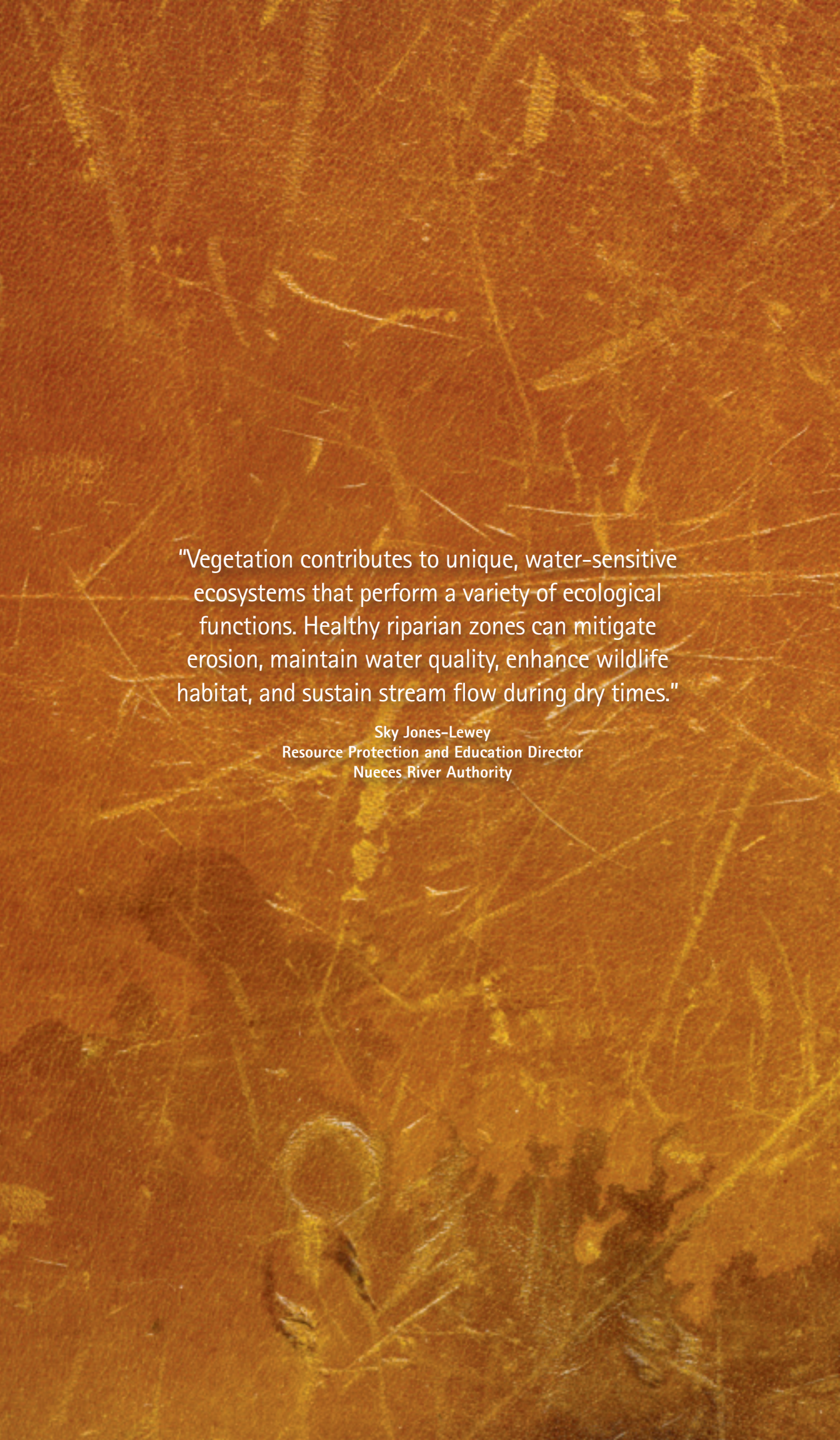
13 **Do the water and sediment appear to be in proper balance?** If there are excessive gravel or sediment deposits forming and increasing, this indicates an imbalance. If there is excessive bank erosion and scour erosion, this also indicates an imbalance. If neither appears to be excessive, the creek is probably in balance.

Please tally the number of "Yes" and "No" answers. Yes_____ No_____

What Your Answers Tell You

Mostly "Yes" answers: The area is in good functional condition.
Mostly "No" answers: The area is in poor, non-functional condition.
Combination of "yes" and "no" answers: If there is a mostly even combination, the area is probably at risk of degradation in future flood events.





"Vegetation contributes to unique, water-sensitive ecosystems that perform a variety of ecological functions. Healthy riparian zones can mitigate erosion, maintain water quality, enhance wildlife habitat, and sustain stream flow during dry times."

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