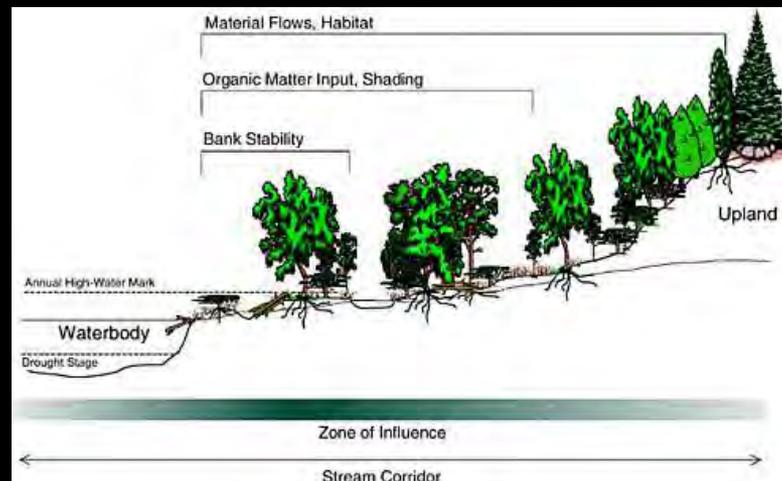
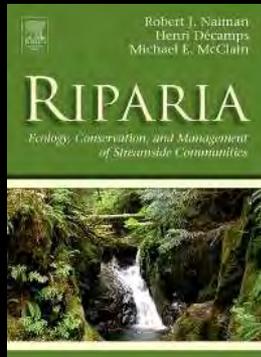


Riparia: Life at the River's Edge

Kevin Anderson, Ph.D.

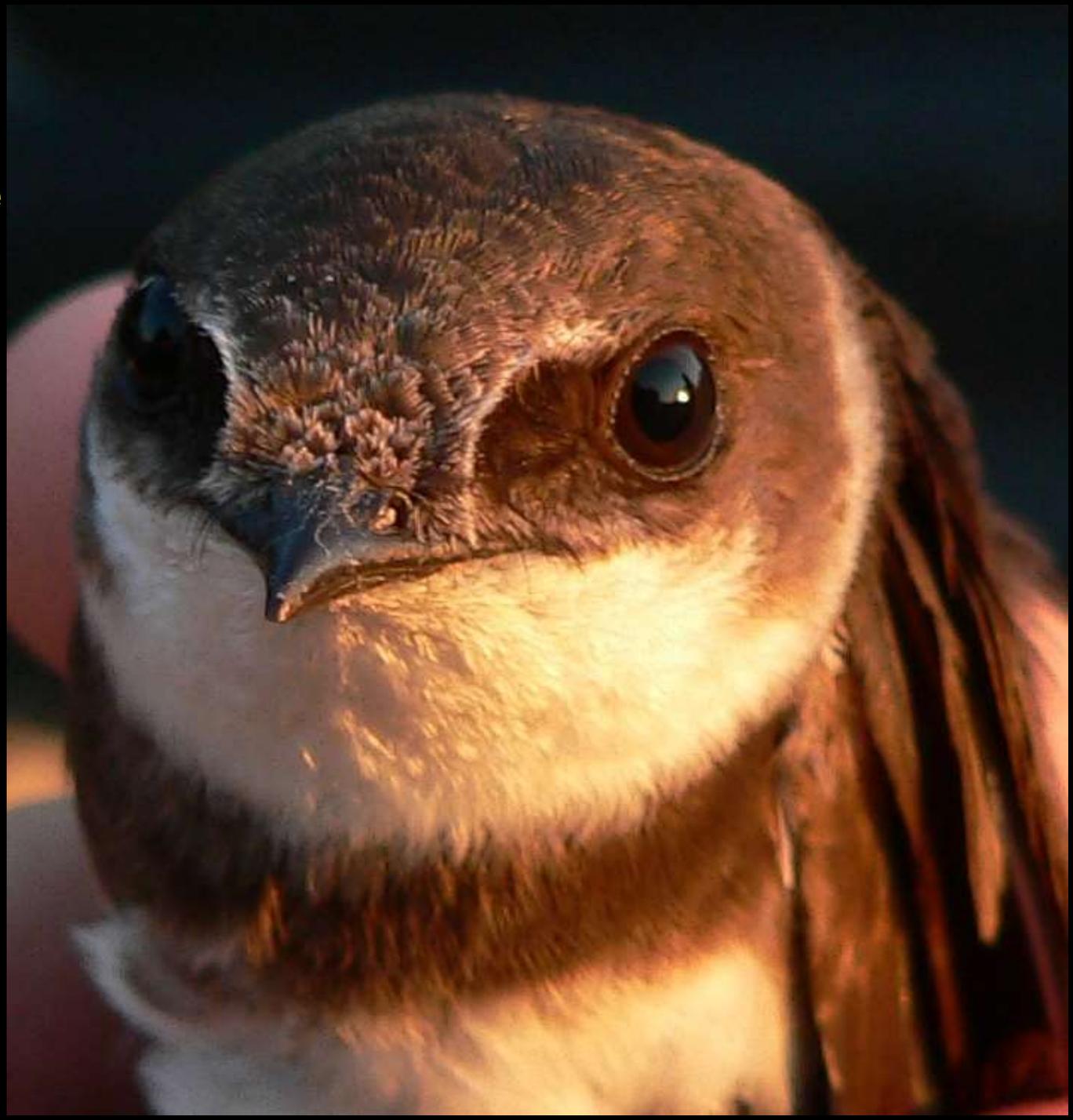
Austin Water - Center for Environmental Research



Life at the River's Edge

Riparia riparia
(Linnaeus, 1758)

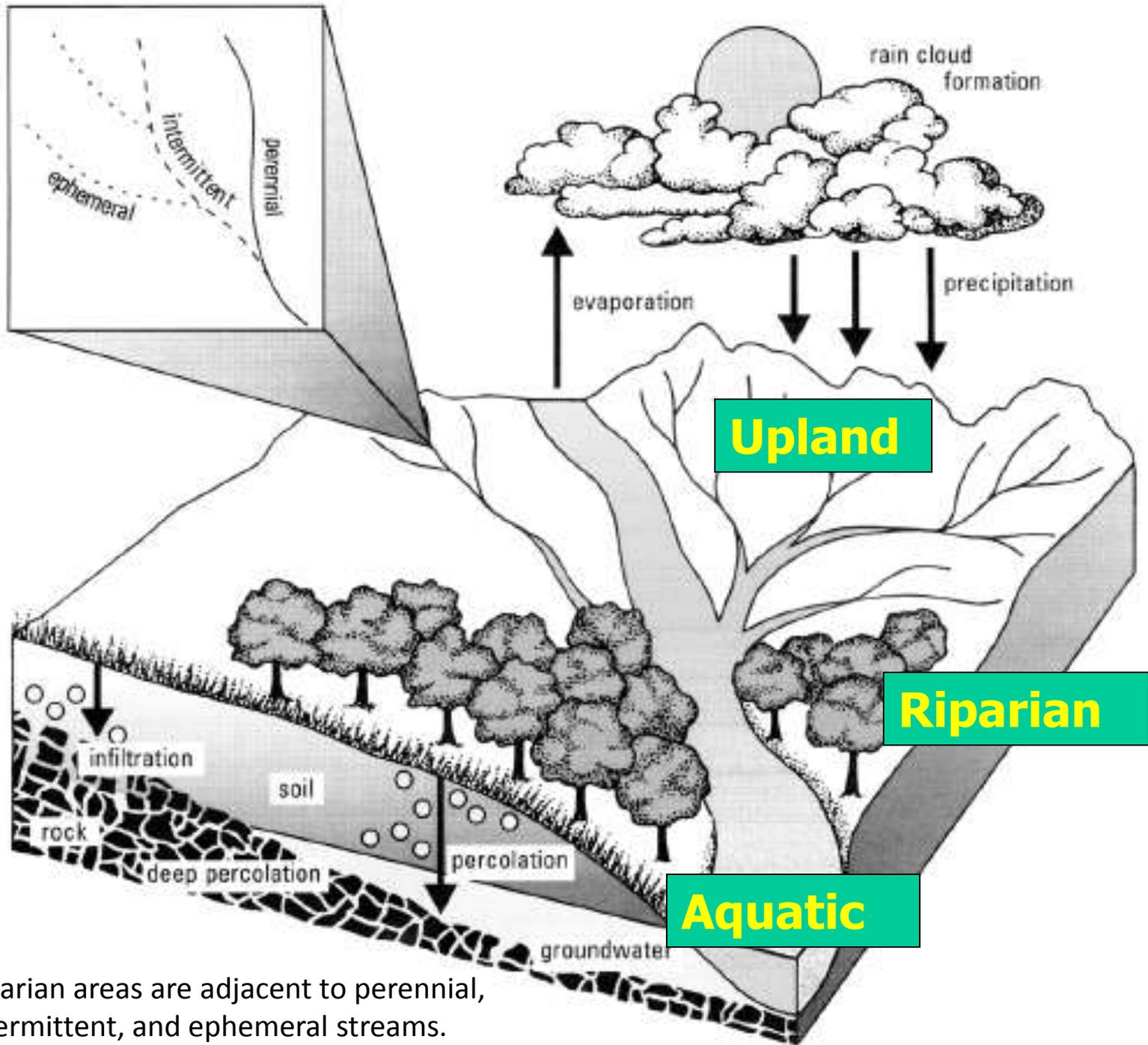
Sand Martin
Bank Swallow



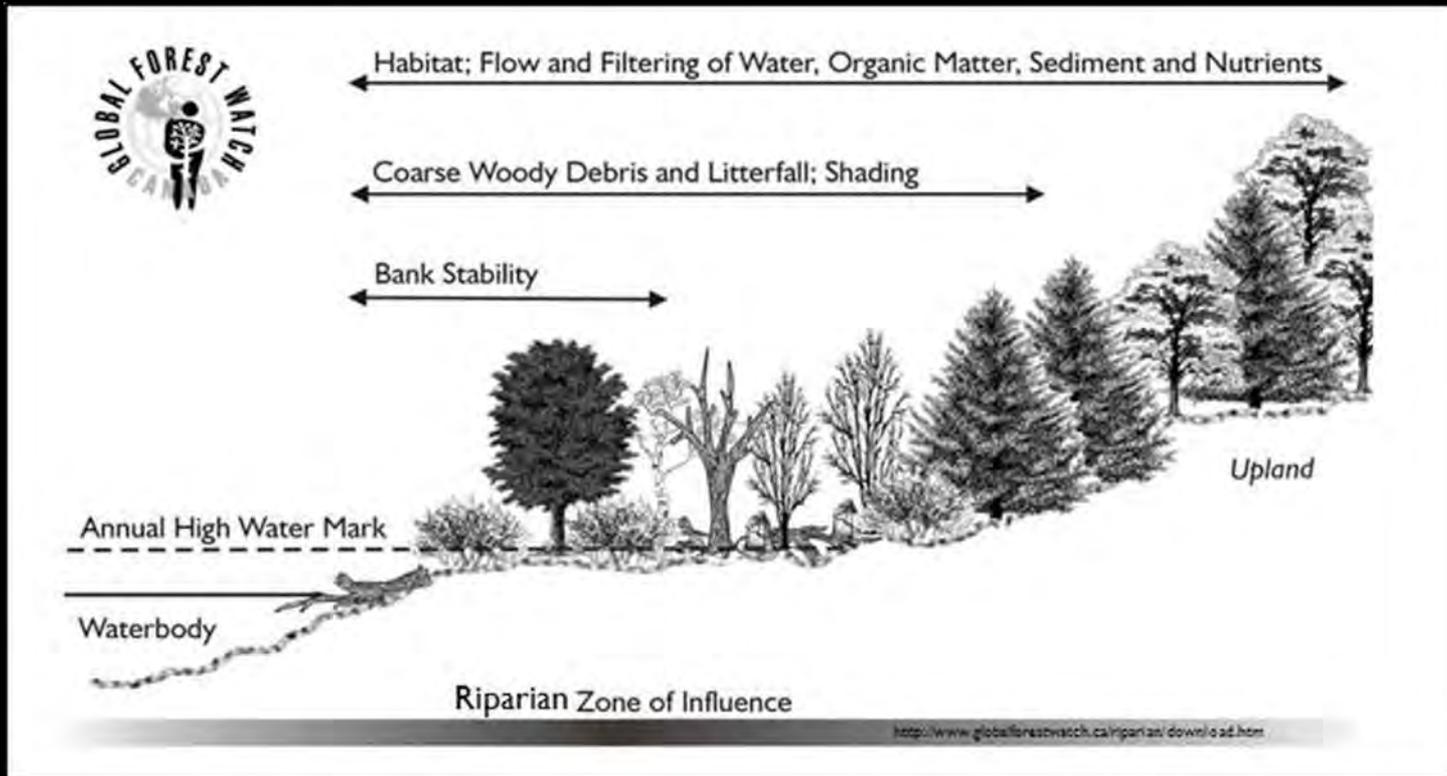
Riparian = Waterway Margins

Riparian areas are transitional zones between terrestrial and aquatic ecosystems.



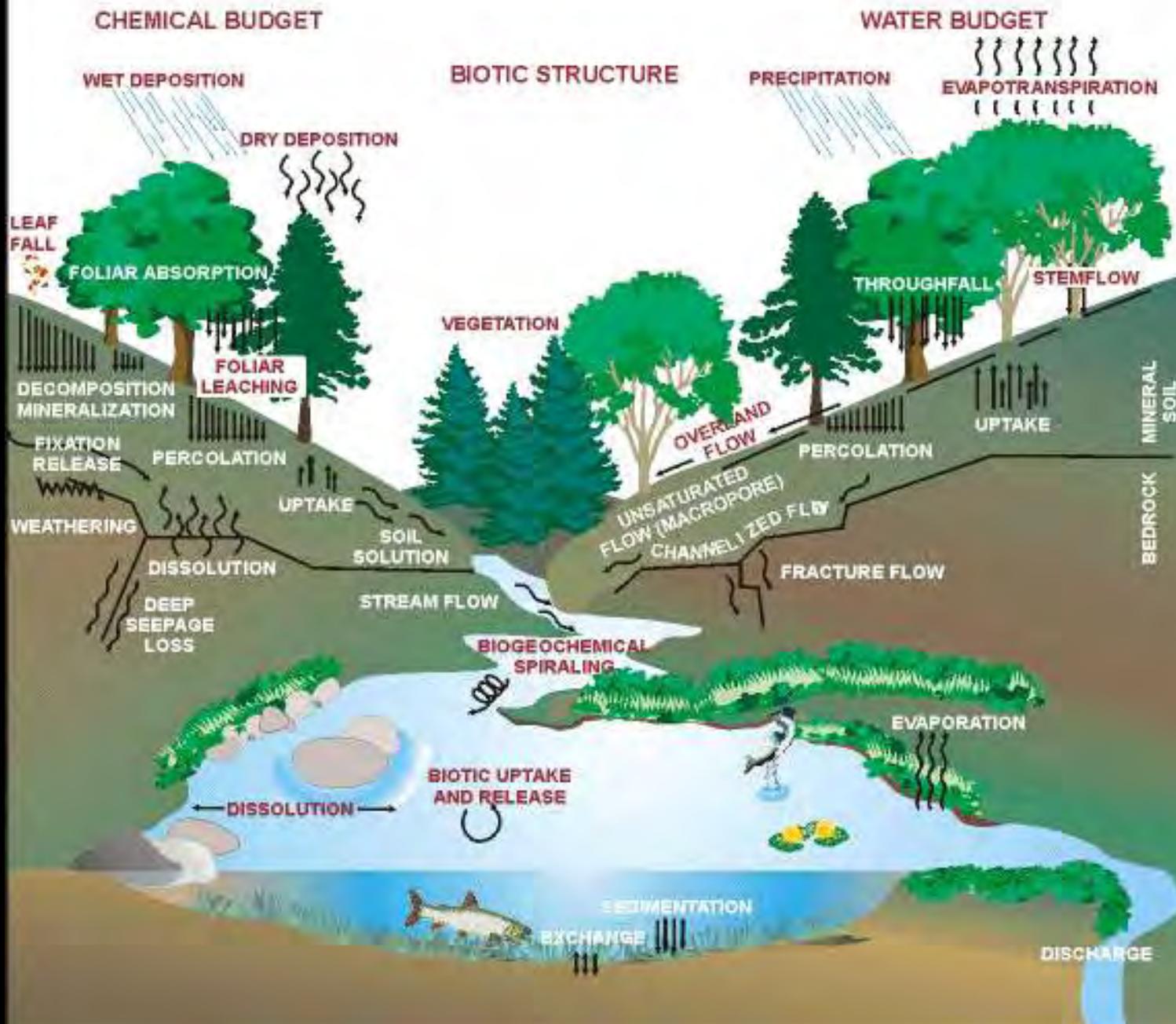


Riparian areas are adjacent to perennial, intermittent, and ephemeral streams.



Riparian zones include those portions of terrestrial ecosystems that significantly influence exchanges of energy and matter with aquatic ecosystems.

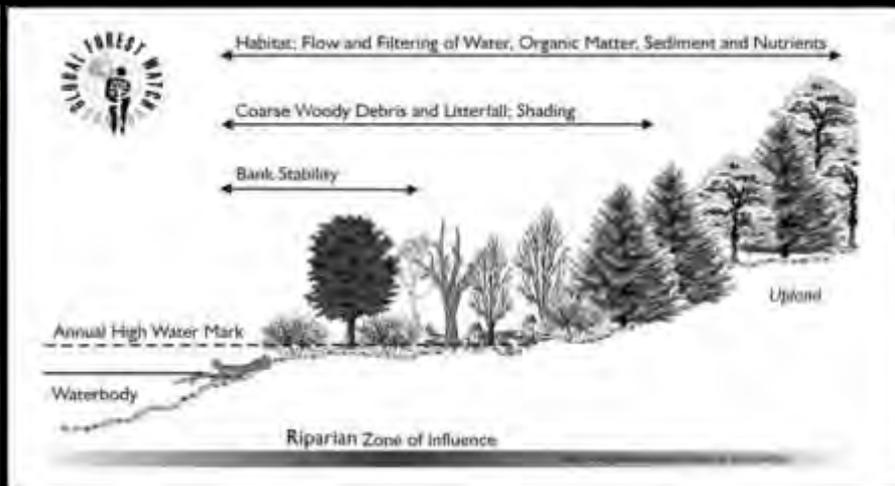
WATERSHED ECOSYSTEM DYNAMICS



Proper Functioning Condition

Riparian areas are functioning properly when adequate vegetation is present to:

- dissipate stream energy associated with high waterflows, thereby reducing erosion and improving water quality;
- filter sediment, capture bedload, and aid in floodplain development; improve flood-water retention and groundwater recharge;
- develop root masses that stabilizes streambanks against cutting action and store water;
- develop diverse ponding and channel characteristics to provide habitat and the water depth and temperature necessary for fish, waterfowl, benthic macroinvertebrates, and other fauna;
- support greater biodiversity



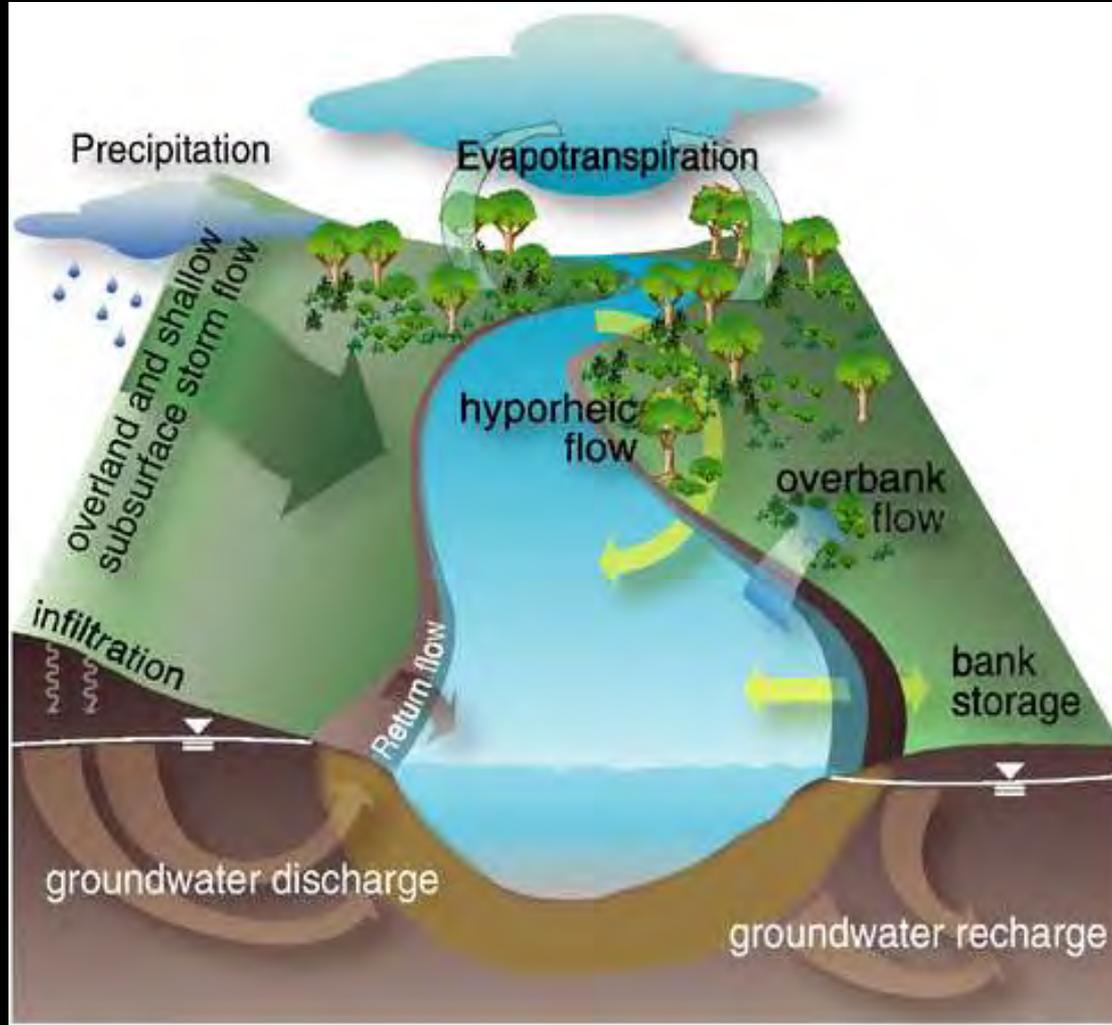
The Riparian Sponge

One of the attributes of a properly functioning riparian area is the sponge effect and water storage capacity within the riparian area.

This large absorbent sponge of riparian soil and roots will soak up, store, and then slowly release water over a prolonged period.

This riparian sponge can be managed in a way to greatly increase and improve this storage or it can be managed in a way to decrease and degrade water storage.





Riparian Zone and Hydrology

Hyporheic Flows
 hypo (below) and rheos (flow)

They are areas through which surface and subsurface hydrology connect water bodies with their adjacent uplands.

Hydrology - Hyporheic Flows Research
 at Hornsby Bend
 Dr. Bayani Cardenas
 UT Jackson School of Geosciences
 and
 TAMU Department of Geology & Geophysics



Figure 1. Location of study site on the Colorado River in relation to Austin, Texas, USA. USGS gaging station 08158000 is 2 km downstream from Longhorn dam, and the study site is another 13 km downstream



Figure 2. Map of Hornsby Bend piezometer transect. Bank piezometers are numbered in order of distance from the river, and the river stage recorder is denoted as (R). Dashed lines indicate the estimated extent of dam influence on the water table



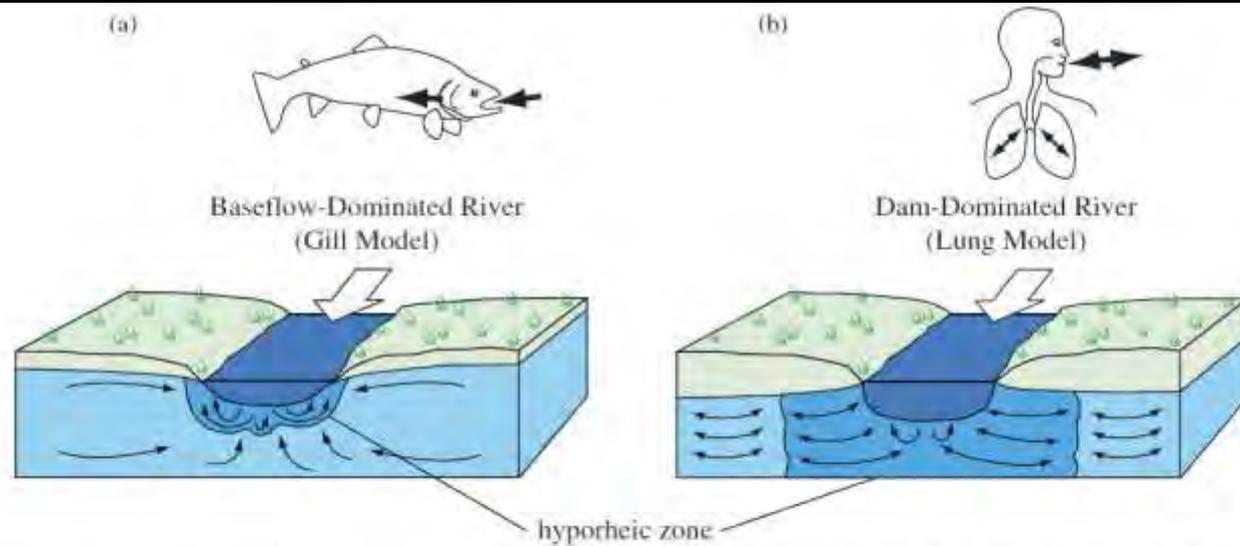


Figure 10. (a) Conceptual model of a natural river-groundwater system in a reach dominated by baseflow. During most of the year, groundwater flows steadily through the riparian aquifer in one direction like water through a gill. Groundwater discharge to the river limits the size of the hyporheic zone. (b) Conceptual model of a river-groundwater system downstream of a dam. Due to frequent stage fluctuations, river water flows in and out of the riparian aquifer like air flowing in and out of lungs. The hyporheic zone includes all flow paths that start and end in the channel



Environmental Flows and the Riparian Sponge



Storage capacity – Bear Creek, Central Oregon study

12 acres of riparian area per mile = 12 acre feet of water per mile

Interaction zone between - Surfacewater and Groundwater

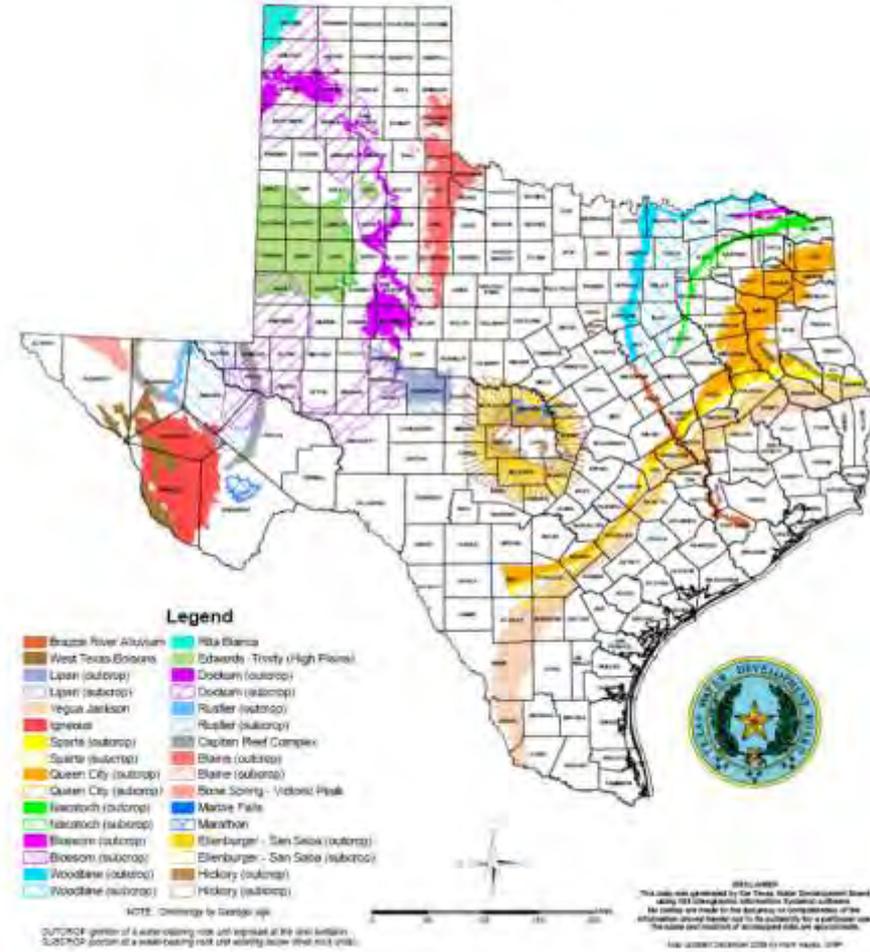
Interface with the Alluvial Aquifer

Riparian Water in Texas? Alluvial Aquifers?

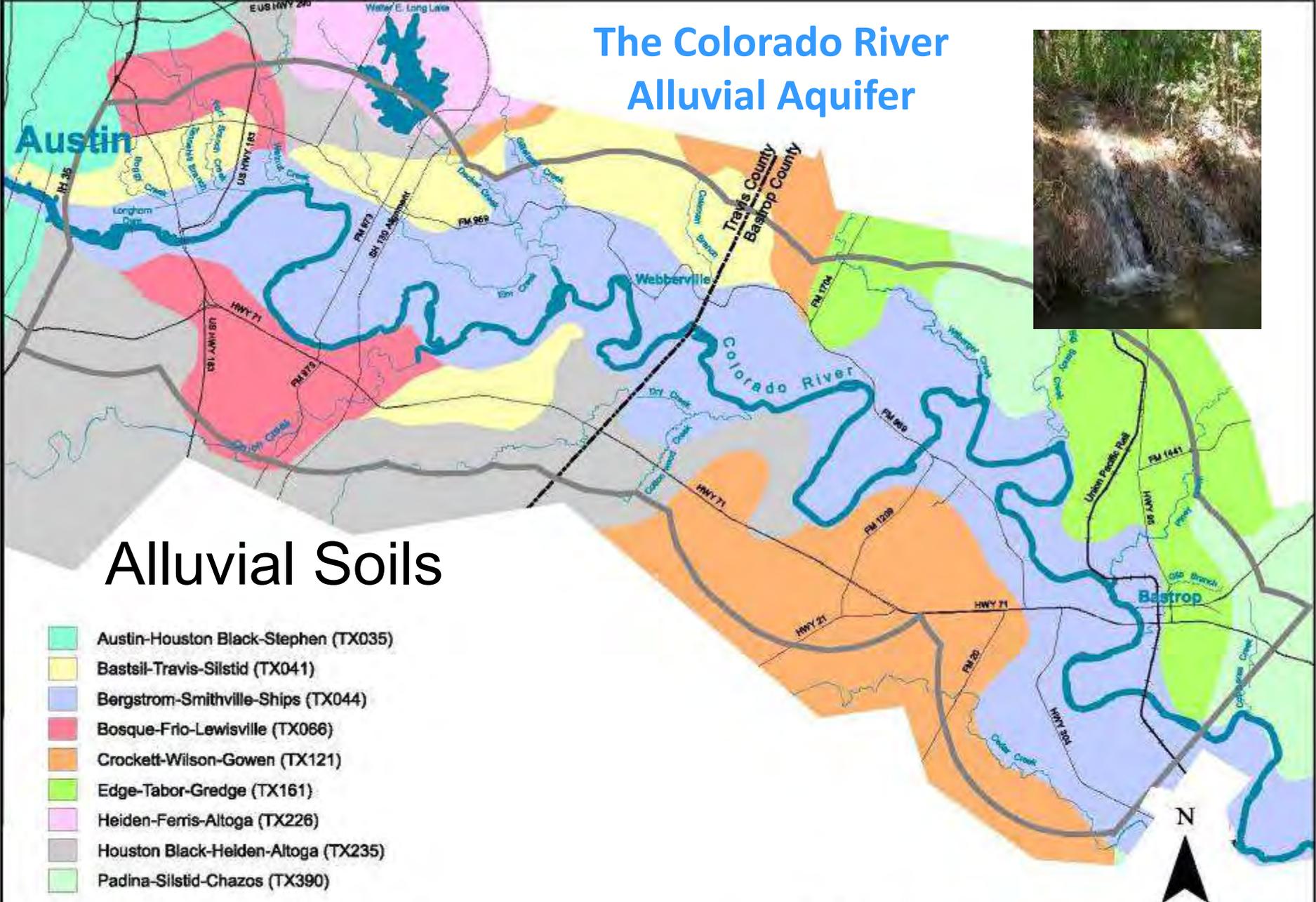
Major Aquifers of Texas



Minor Aquifers of Texas



The Colorado River Alluvial Aquifer



Alluvial Soils

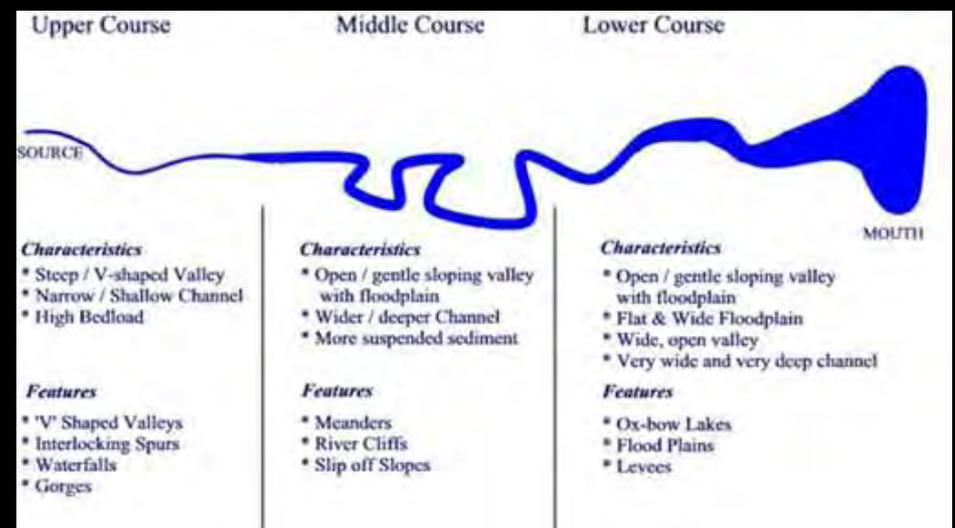
- Austin-Houston Black-Stephen (TX035)
- Bastil-Travis-Silstid (TX041)
- Bergstrom-Smithville-Ships (TX044)
- Bosque-Frio-Lewisville (TX066)
- Crockett-Wilson-Gowen (TX121)
- Edge-Tabor-Gredge (TX161)
- Heiden-Ferris-Altoga (TX226)
- Houston Black-Heiden-Altoga (TX235)
- Padina-Silstid-Chazos (TX390)

STATSGO (State Soil Geographic Database)



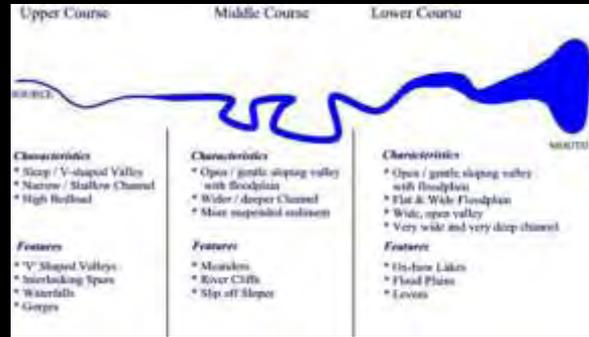
Riparian Areas Ecosystem Services

- Water Quality
- Erosion Control
- Flood Buffer
- Wildlife Habitat
- Aquatic Habitat
- Water Storage



Upper Course - Source

Critical Riparian Area



River sources are usually small and, in the case of mountain streams, steep and erosional.

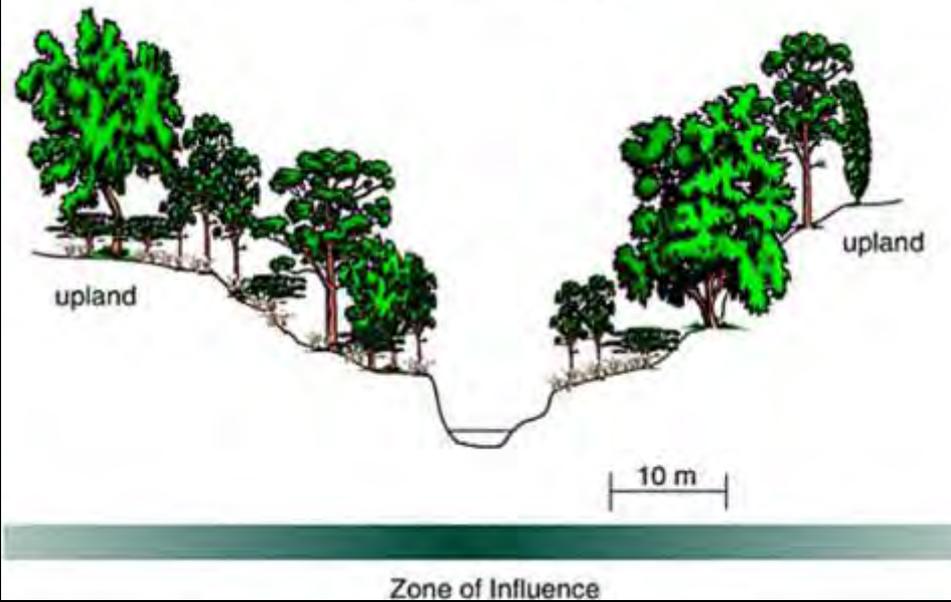
In temperate environments, small streams tend to be shaded by an interlocking, overhead tree canopy.

Such conditions result in cool, well-oxygenated streams that are abundantly supplied with a food base of leaves.

Fine particles of organic matter are released as the leaves are broken down by biological communities in the streams

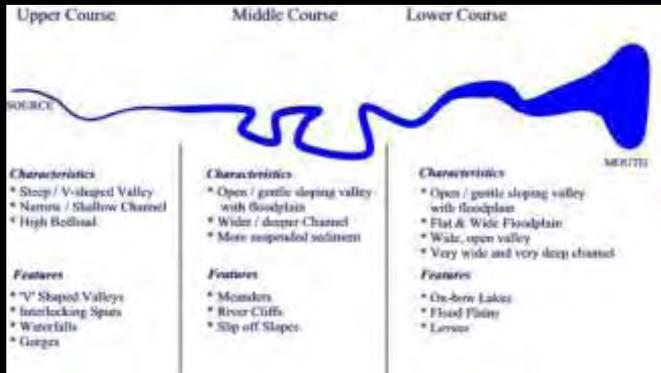


Small Stream

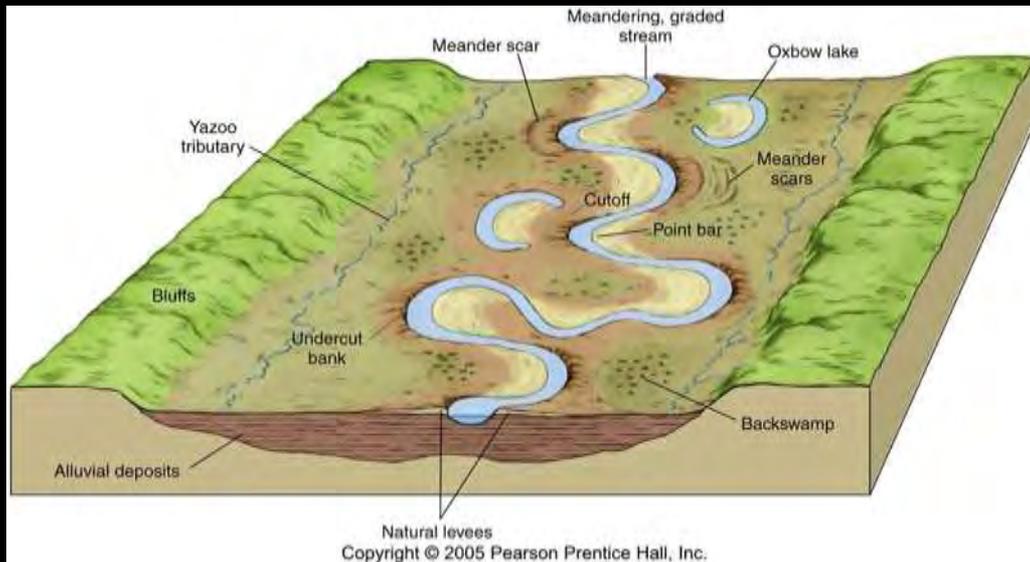
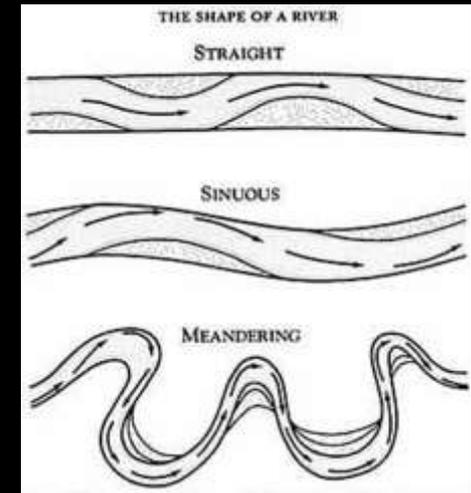


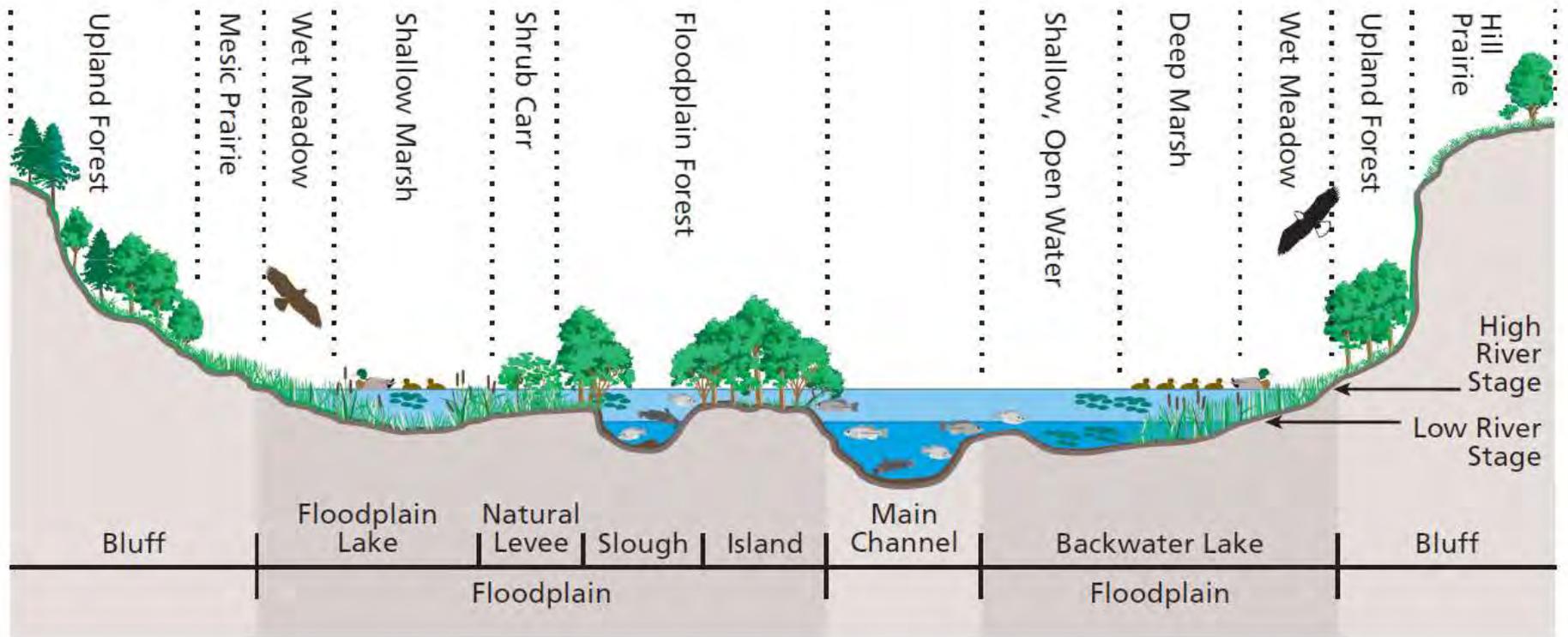




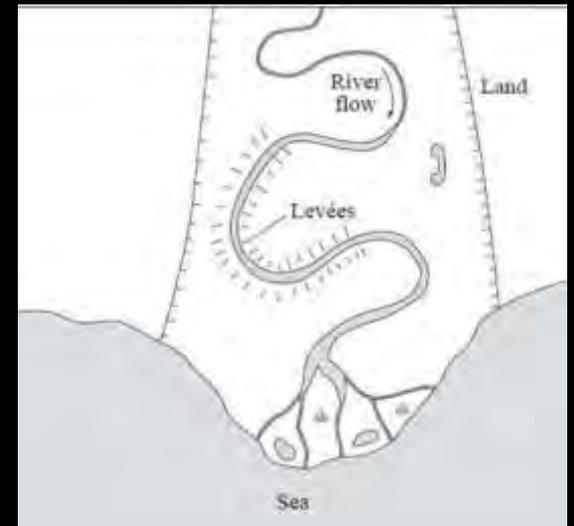
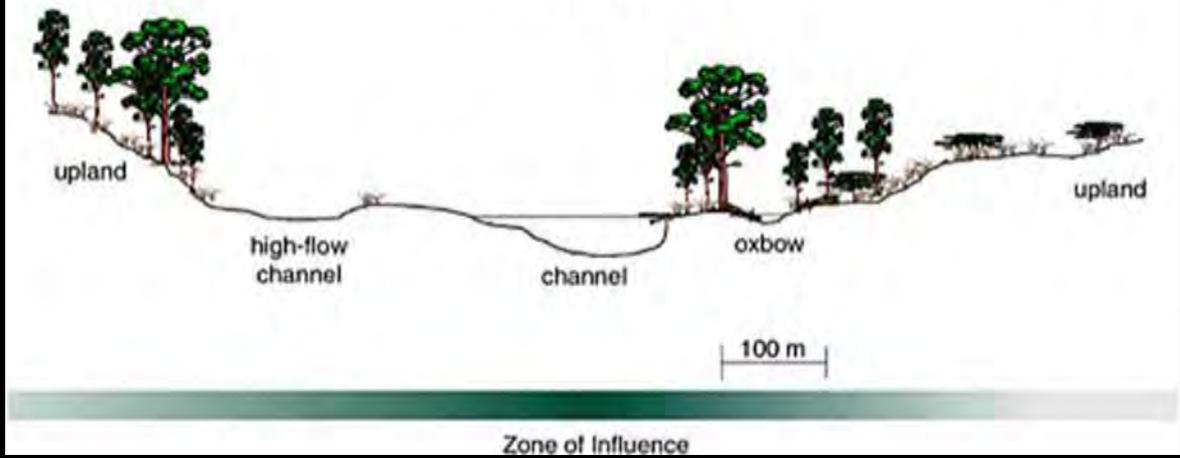


The Middle and Lower Course: Life in the Meander Belt





Large River



Riparian Vegetation

The functionality of riparian zones is determined by a combination of erosion, deposition, hydrology and riparian vegetation.

The factor you can most easily influence is the plant community that exists in the riparian zone.

Different plant species, or groups of plants, support riparian zone ecosystem function.

A diversity of plants, both in species and structure, is needed to provide optimum ecosystem functionality.



A diverse plant community is also critical to streambank stability.

Stable streambanks usually need a mix of species that include those with both fine roots and those with larger, more substantial roots. In most cases, this requires a mixture of sedges or rushes, grasses and woody species.



Riparian Vegetation



Central Texas Wetland Plants

About This Guide

Central Texas Wetland Plants is a collection of institutional knowledge and photos taken in and around the Austin area. It is not intended to be comprehensive, but rather to be used as a supplement to other resources when identifying plants in Central Texas. Special Thanks to wetland biologist emerita Mike Lyday, whose 20 years of service, dedication and expertise established the foundation for wetland protection in the City of Austin.

Wetland Indicators Categories

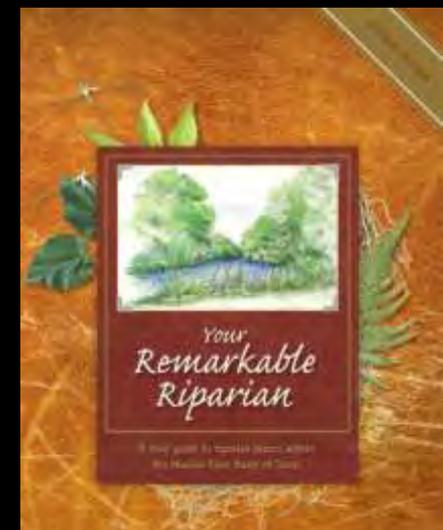
- **Obligate Wetland (OWL)**: Occur almost always in wetlands (probability >99%)
- **Facultative Wetland (FACW)**: Usually occur in wetlands (67%-99%)
- **Facultative (FAC)**: Equally likely to occur in wetlands or nonwetlands (34%-66%)
- **Facultative Upland (FACU)**: Occasionally found in wetlands (1%-32%)
- **Obligate Upland (OUL)**: Occur almost always in nonwetlands in the specified region

A positive (+) or negative (-) sign is used with the FAC category to indicate a regional higher or lower frequency of being found in wetlands, respectively.

Photo credit: Mike Lyday, Bill Carr, Andrew Chastain, Morgan Drobish, Emily Yeevan, and Ryan Hoyle

Plant community structured by hydrology

Hydric Soils

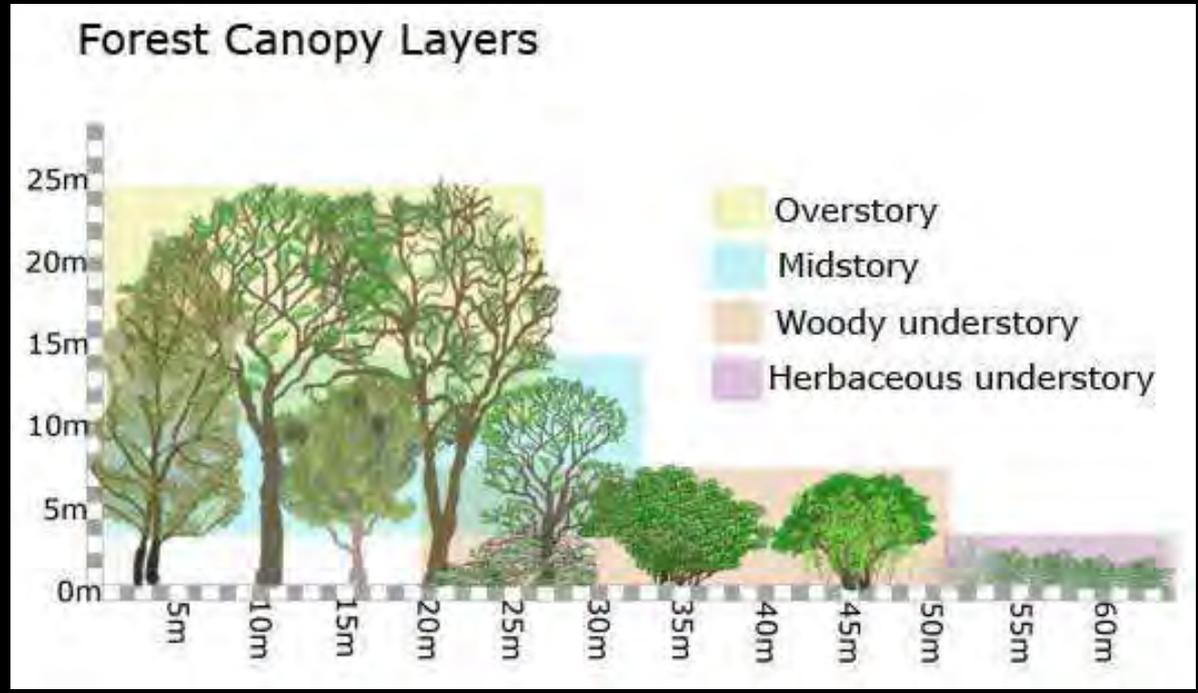


Riparian Vegetation

Above Permanent Waterline

Open Areas and Forest Areas

- American Elm
- Honey Locust
- Roughleaf dogwood
- Eve's Necklace
- Box elder
- Buttonbush
- Green ash
- Baccharis
- Black willow
- Western soapberry
- Pecan
- Bur oak
- Cottonwood
- Sycamore
- Little walnut
- False indigo
- Wafer ash (Hop tree)
- Live oak
- Mulberry
- Black Hickory
- Yaupon
- Switchgrass
- Eastern gamagrass
- Big bluestem
- Indiangrass
- Little bluestem
- Virginia wildrye
- Texas bluegrass
- Purpletop
- Inland sea-oats
- Texas wintergrass
- Maximilian sunflower
- Illinois bundleflower
- Dogbane
- Buffalograss
- Herbaceous mimosa
- Redbud
- Gum Bumelia



Riparian Forest - Vertical structure

At Permanent Waterline, not saturated year-long

- | | |
|-----------------------|---------------------------------|
| Elder berry | Southern wildrice (Zizaniopsis) |
| Buttonbush | Texas Sophora (Eve's Necklace) |
| Dwarf willow | Eastern Gamagrass |
| Sandbar willow | Switchgrass |
| Black willow | Horsetail (Scouring rush) |
| Box elder | Soft rush |
| Sycamore | Bulrushes |
| False indigo | Sedges |
| Roughleaf dogwood | Bushy bluestem |
| Bald cypress | Smartweed |
| Baccharis | Cattails |
| River Hemp [Sesbania] | Spikerushes |



In the water, or permanently saturated:

Bald Cypress

Bulrushes

Horsetail

Soft rush

Reeds

Cattails

Spikerushes

Ludwigia



Types of Vegetation:

Colonizers

Stabilizers

Woody

Ecosystem Process - Nonequilibrium dynamics



Non-native species – are foreigners good or bad?

Elephant ear, coco yam, wild taro

Colocasia esculenta



Tobacco Tree

Nicotiana glauca

Texas
Riparian
Habitat?

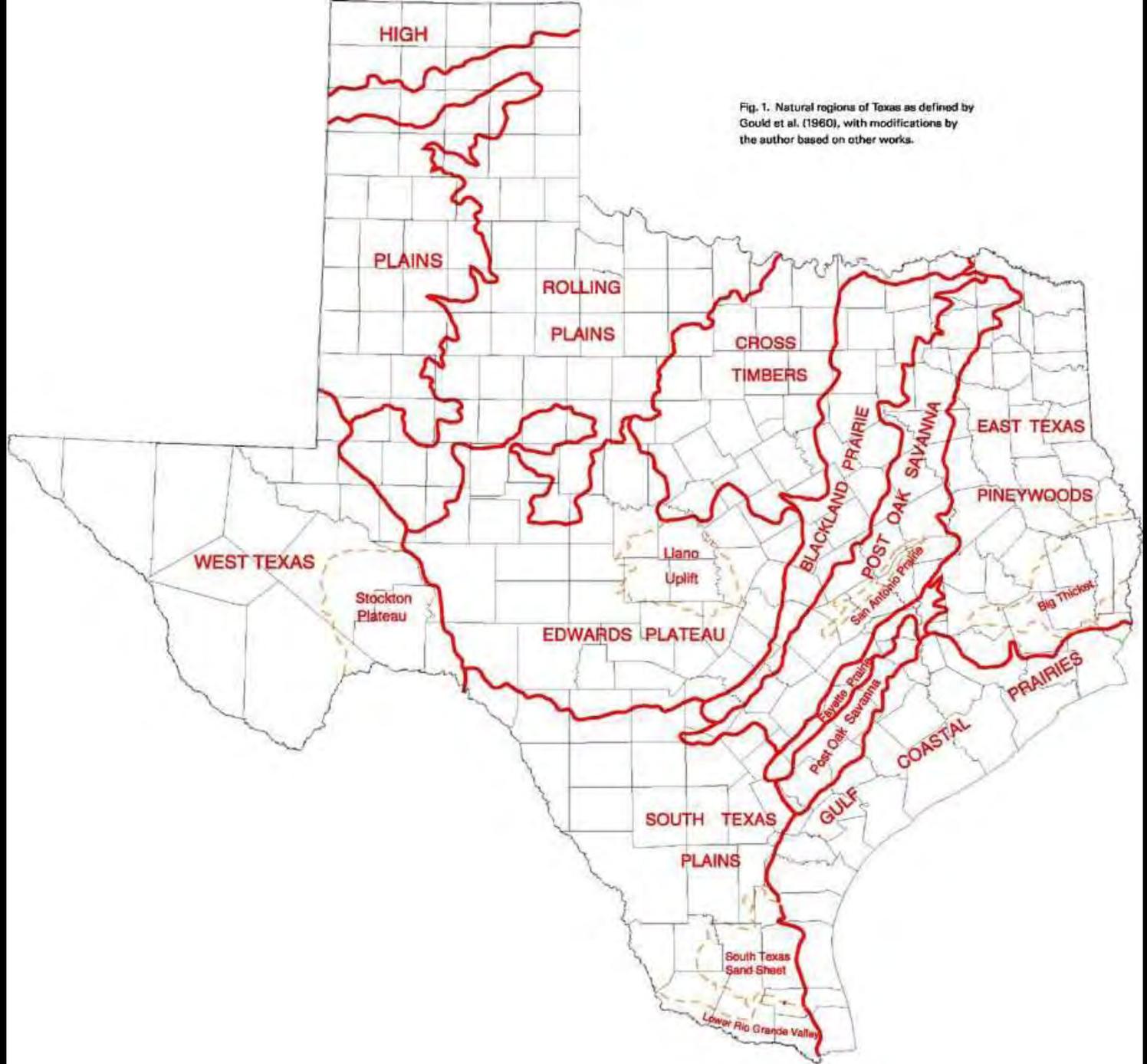
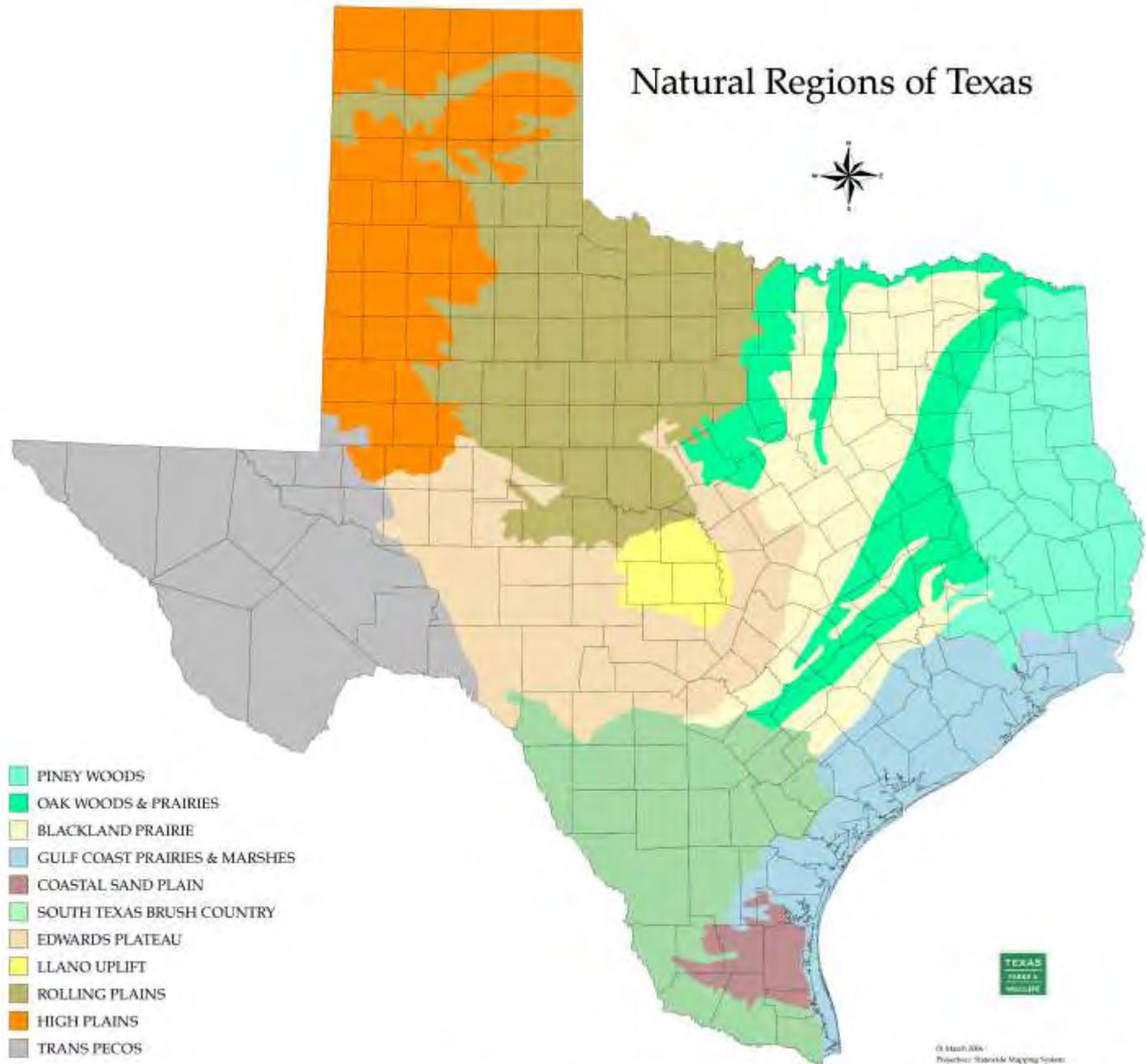


Fig. 1. Natural regions of Texas as defined by Gould et al. (1960), with modifications by the author based on other works.

Texas Riparian Habitat?



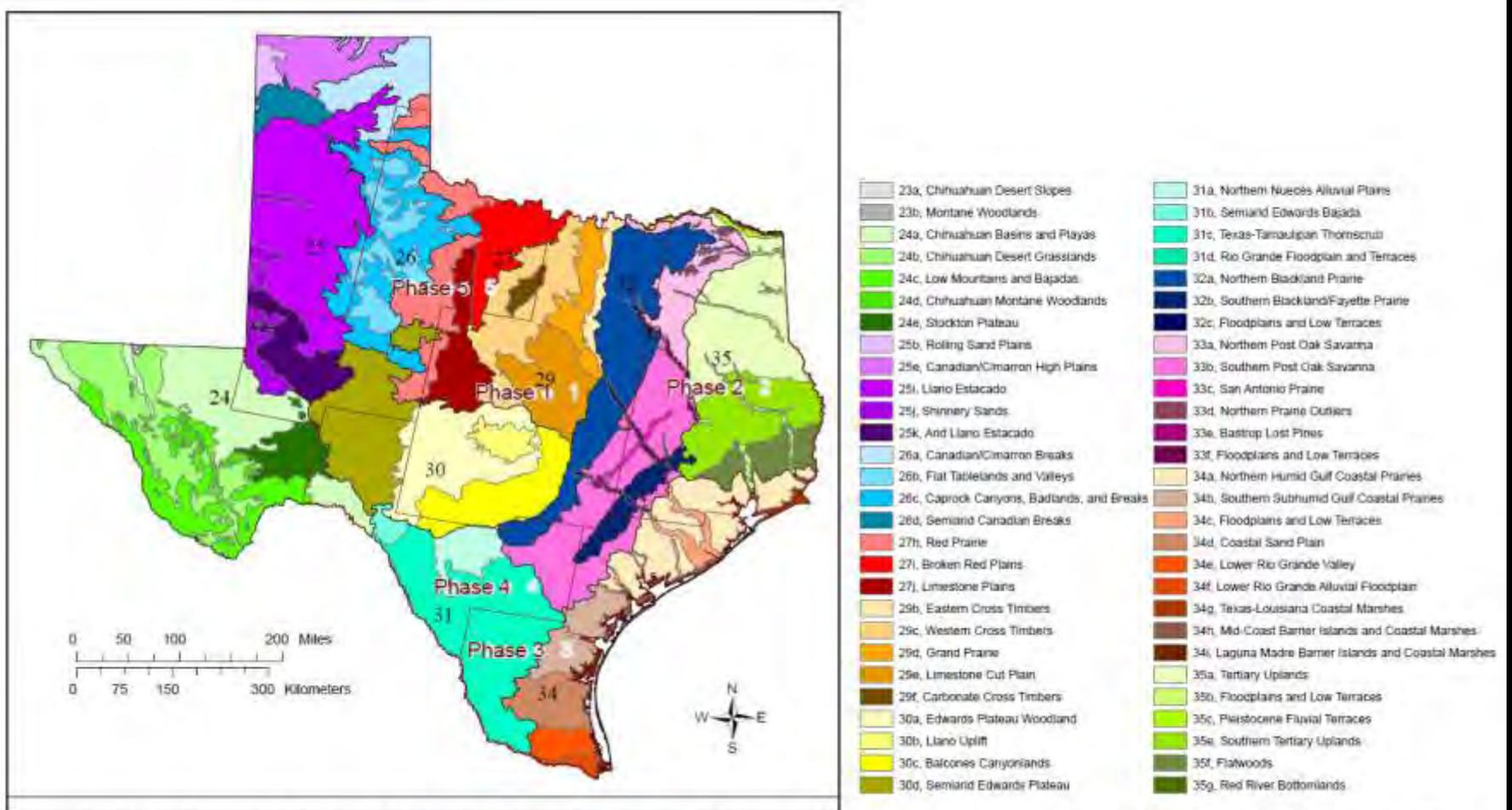


Figure 1. Texas Ecological Systems Mapping project phase map. Outlines of the phases correspond with the footprints of satellite scene data. The project will be completed in the early fall of 2012.

Texas Ecological Systems Project

The Texas Parks and Wildlife Department cooperated with private, state, and federal partners to produce a new land cover map for Texas, using an expansion and modification of the original NatureServe Ecological System Classification System. The resulting Mapping Subsystems are essentially land cover types within more broadly-defined ecological systems, which represent groups of related plant communities affected by similar processes, and occurring together within larger landscapes.

Southeastern Great Plains Riparian Forest

-  Central Texas: Riparian Juniper Forest
-  Central Texas: Riparian Live Oak Forest
-  Central Texas: Riparian Hardwood / Evergreen Forest
-  Central Texas: Riparian Hardwood Forest
-  Central Texas: Riparian Evergreen Shrubland
-  Central Texas: Riparian Deciduous Shrubland
-  Central Texas: Riparian Herbaceous Vegetation

Southeastern Great Plains Floodplain Forest

-  Central Texas: Floodplain Juniper Forest
-  Central Texas: Floodplain Live Oak Forest
-  Central Texas: Floodplain Hardwood / Evergreen Forest
-  Central Texas: Floodplain Hardwood Forest
-  Central Texas: Floodplain Evergreen Shrubland
-  Central Texas: Floodplain Deciduous Shrubland
-  Central Texas: Floodplain Herbaceous Vegetation



Riparian Faunal Biodiversity



TEXAS RIPARIAN ASSOCIATION

Mission:

To encourage
healthy riparian
systems within
Texas

3,700 named streams and 15 major rivers flowing
through nearly 200,000 miles of Texas

www.texasriparian.org



Riparian = Waterway Margins

Riparian areas are transitional zones between terrestrial and aquatic ecosystems.

