Center for Environmental Research at Hornsby Bend

Austin Water

Fluvial Life: The Nature of the Colorado River

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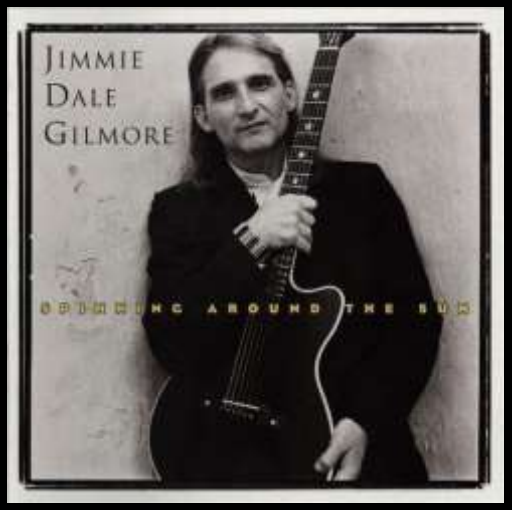
Austin Water – Center for Environmental Research

Which River is Which?
"Another Colorado" Jimmie Dale Gilmore

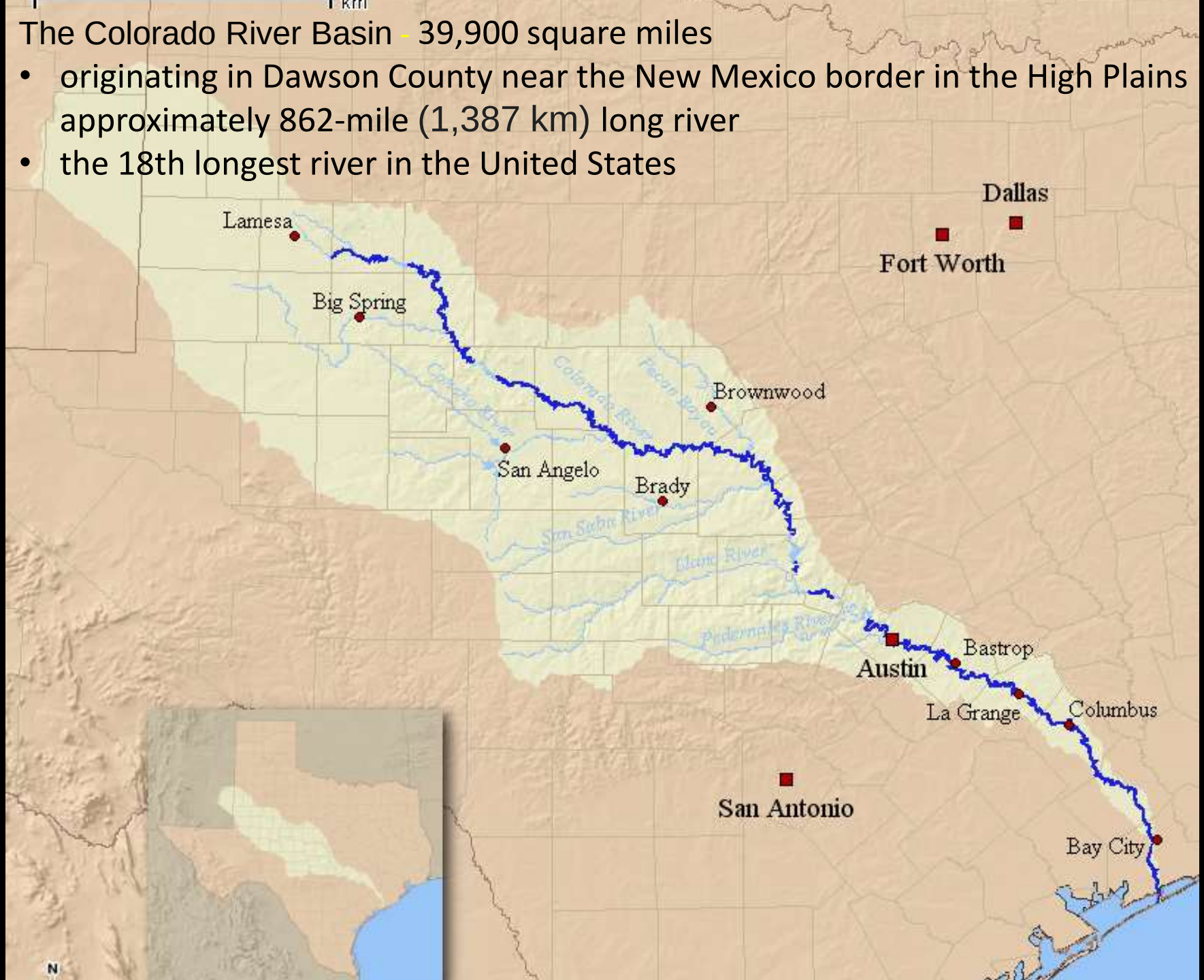
Down by the banks of the Colorado
My true love and I one night did lie
And we laughed and played and made fun
Of the entire world spinning 'round the sun
Down by the banks of the Colorado

There is another Colorado
Wise men have told me, wise women too
That I may find sweet El Dorado
Down by the banks of one sweet Colorado



The Colorado River Basin - 39,900 square miles

- originating in Dawson County near the New Mexico border in the High Plains approximately 862-mile (1,387 km) long river
- the 18th longest river in the United States

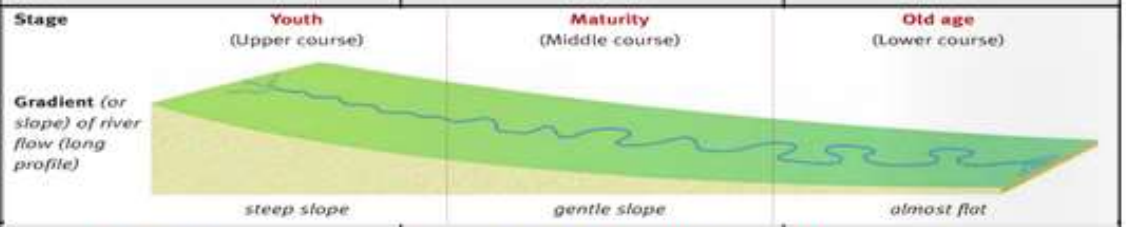
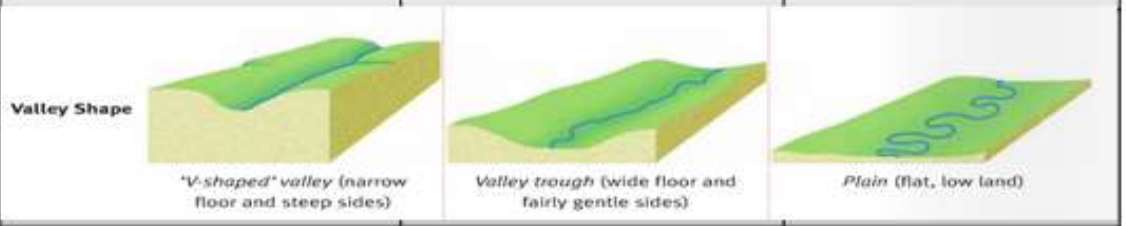


A Fluvial Life and Physical Geography – Waterway Ecosystem

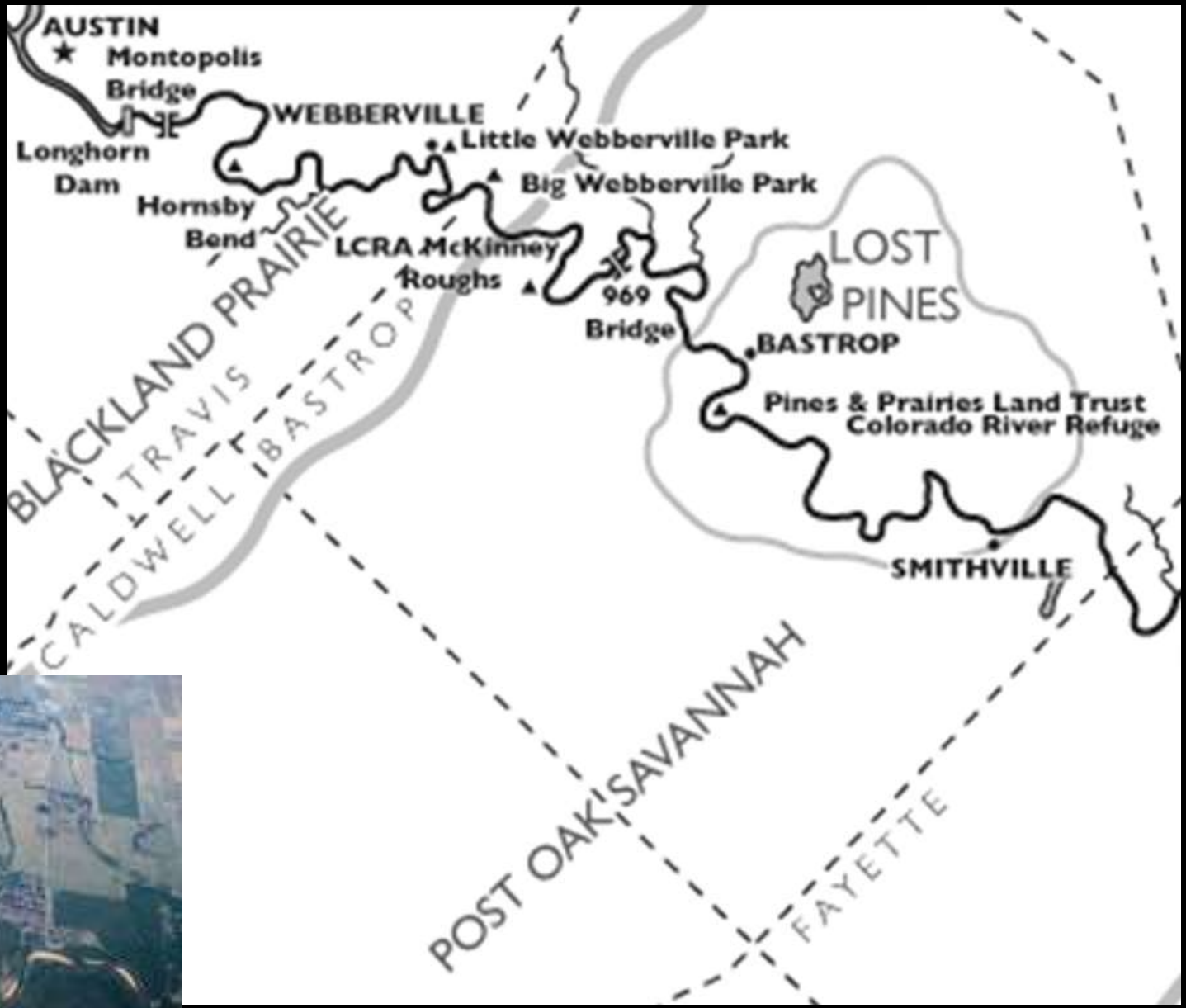
The Upper Course: steep and rugged

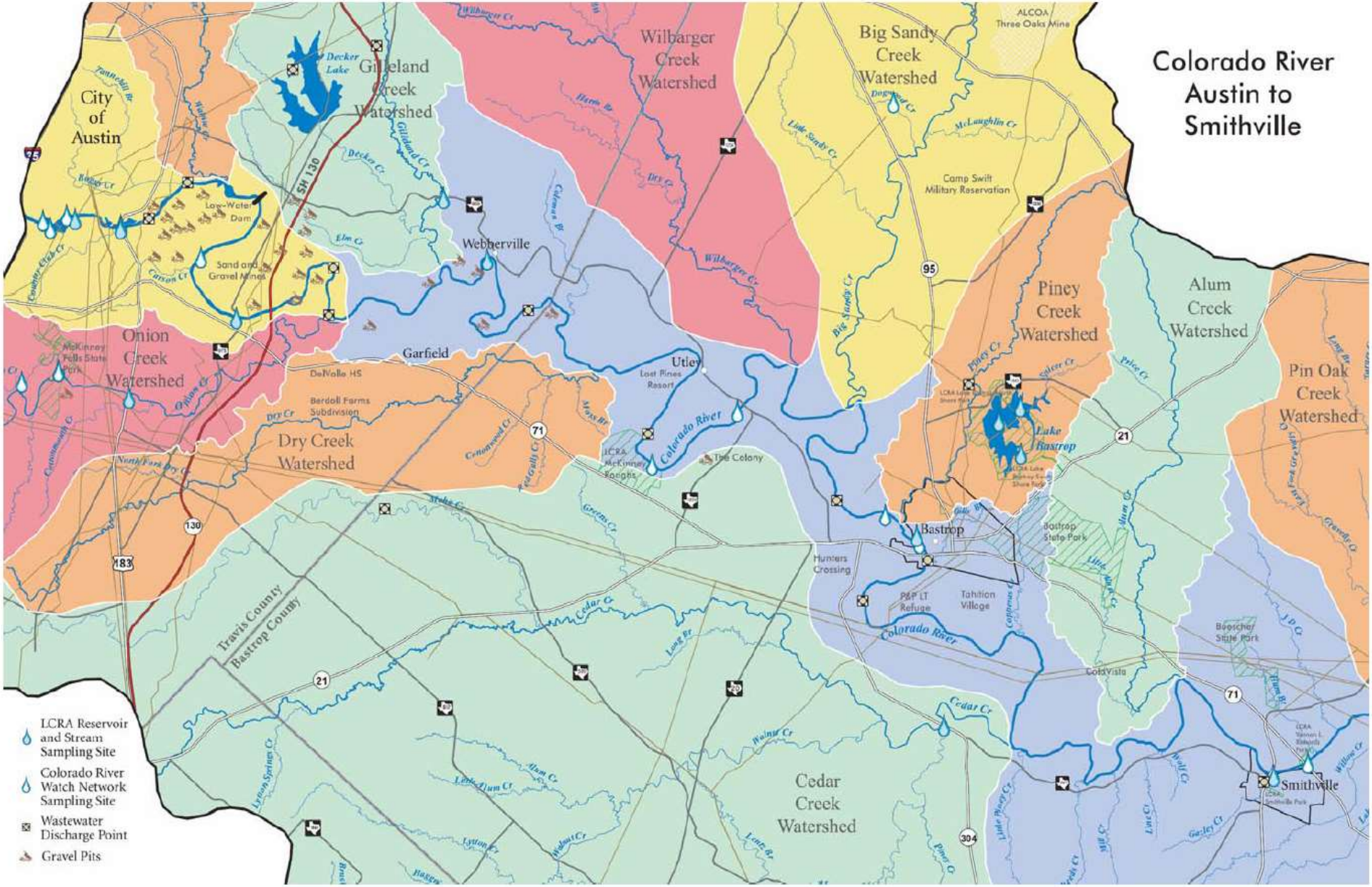
The Middle Course: winding sedately through wide valleys

The Lower Course: a somewhat aimless course toward final extinction

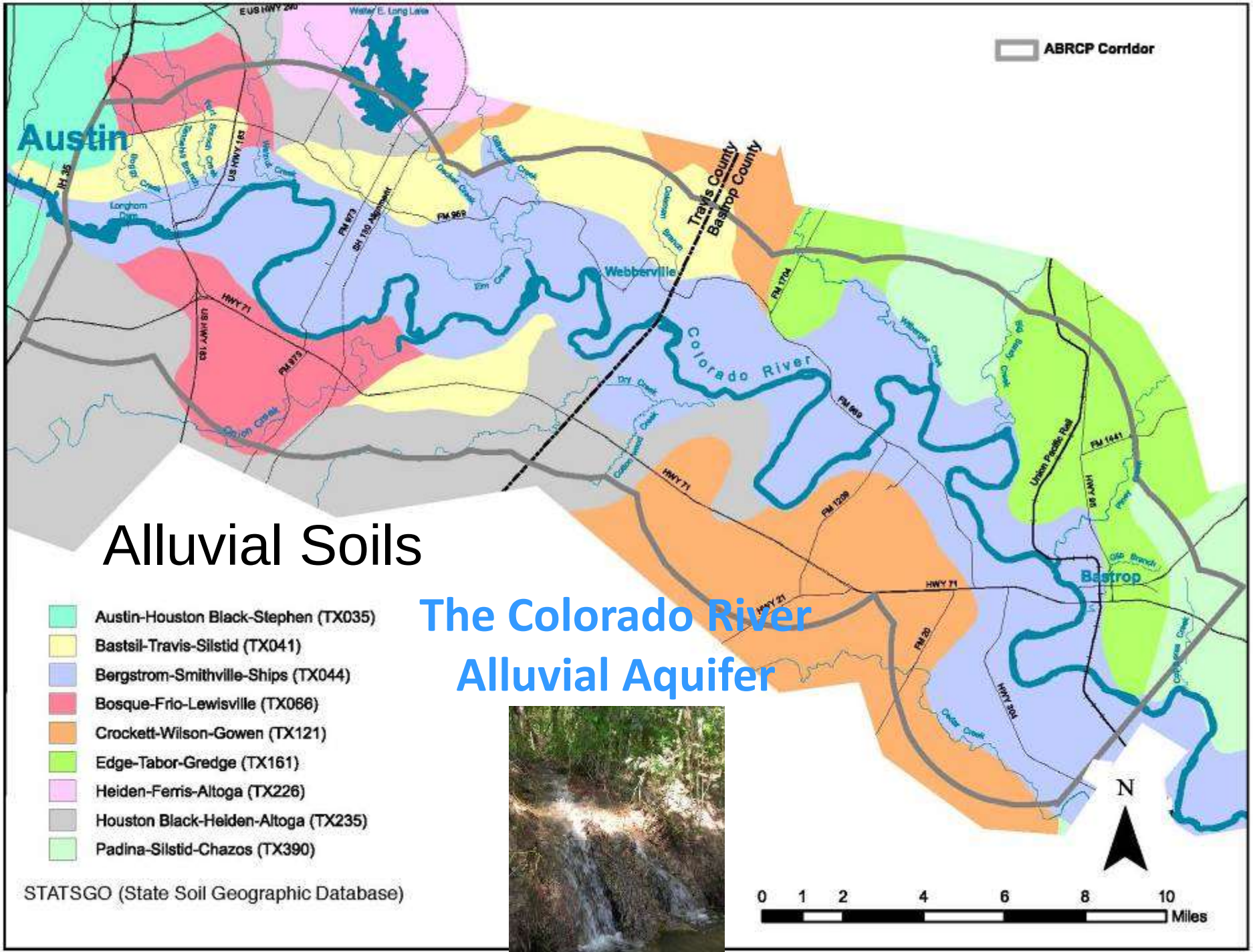
Course Stage	Upper Course Youth Stage	Middle Course Mature Stage	Lower Course Old Age Stage
Slope			
Main processes	Hydraulic Action Abrasion **Erosion**	**Erosion** and **Deposition**	**Deposition**
Valley shape			
Main features	V-shaped Valleys Interlocking Spurs Waterfalls	Meanders and Ox-Bow lakes	Deltas Levees Flood Plains (and m+ob lakes)

The Middle Course

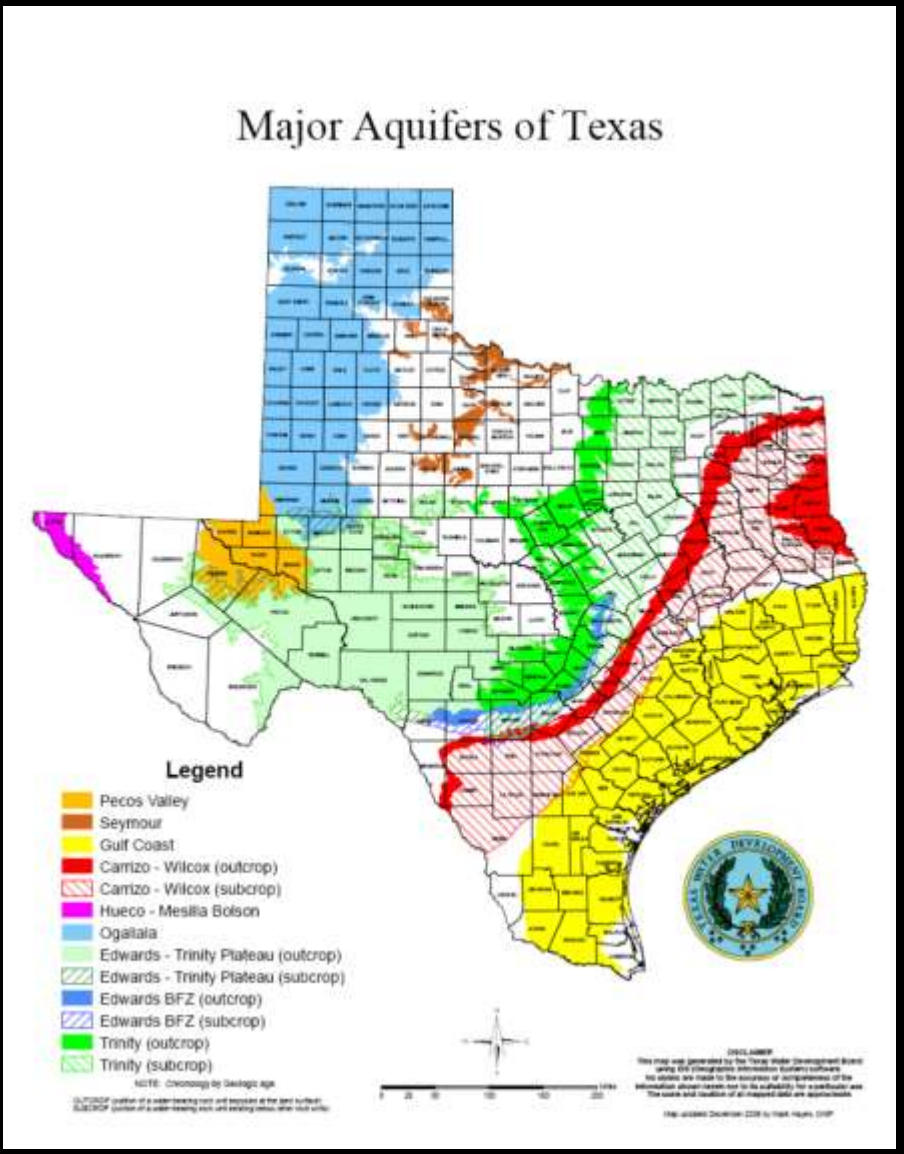


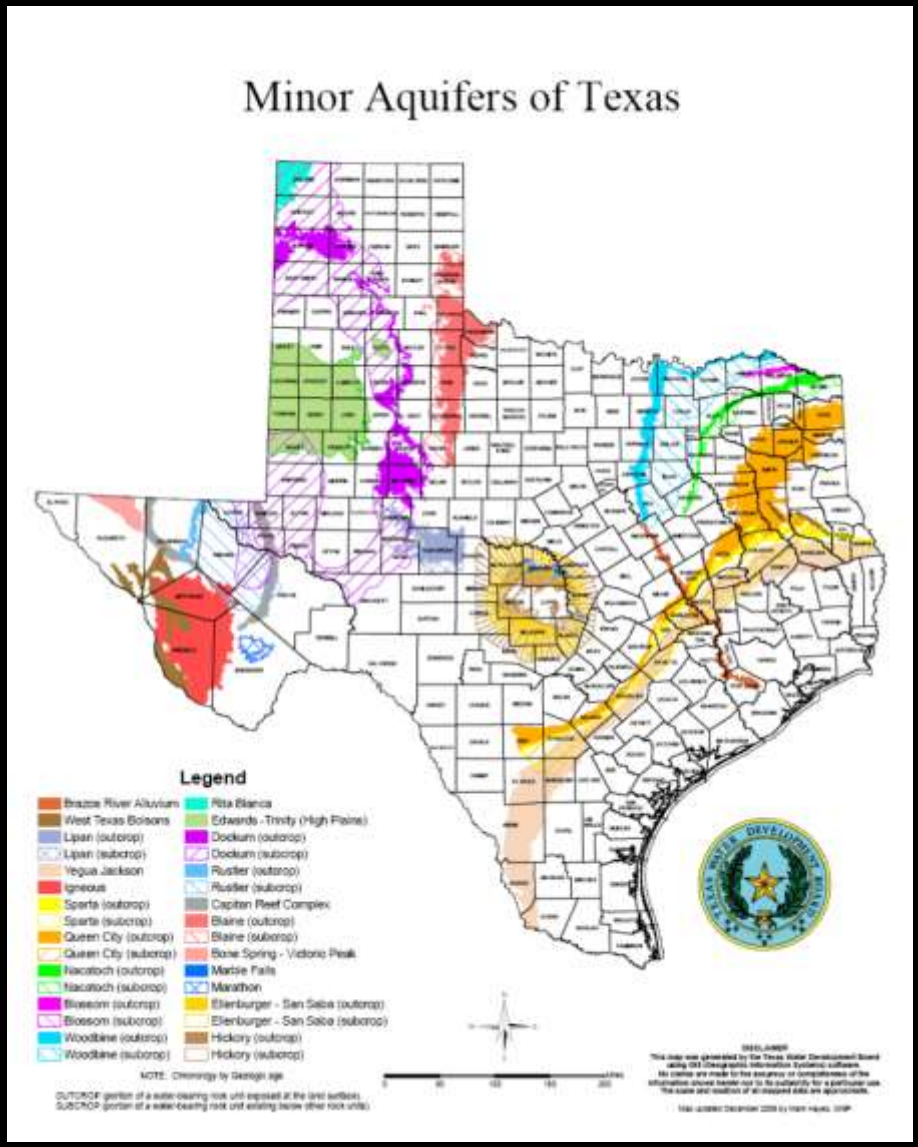


90 miles of the Colorado River


ABRCP Corridor
Austin
Webberville
Travis County
Bastrop County
Colorado River
Bastrop
Alluvial Soils
Austin-Houston Black-Stephen (TX035)
Bastsil-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-Helden-Altoga (TX235)
Padina-Silstid-Chazos (TX390)
STATSGO (State Soil Geographic Database)
The Colorado River
Alluvial Aquifer
N
0 1 2 4 6 8 10
Miles

Water Resources in Texas?
Alluvial Aquifers?





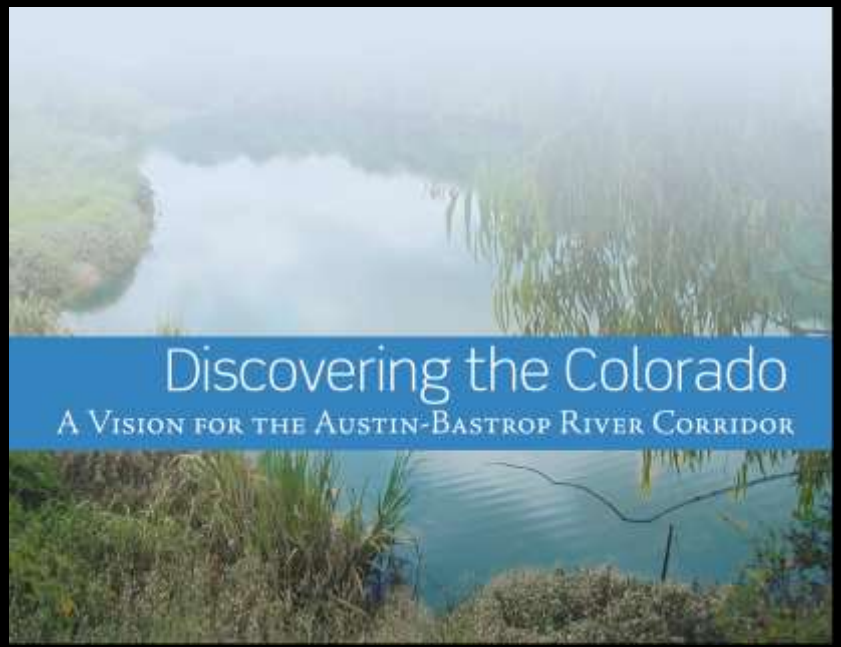
The Austin-Bastrop River Corridor Partnership

An open conversation about the future of the river corridor

An informal partnership of nonprofit organizations, governmental agencies, businesses, schools, landowners, and other local citizens concerned with the future of the Colorado River corridor from Austin through Bastrop County.

Mission: To support sustainable development and a healthy riparian ecosystem along the Austin to Bastrop River Corridor.

Since 2003 Meetings, Workshops, Online Report, River Trips



Austin-Bastrop River Corridor Partnership Goals

Sustainability Goal: To promote economic and recreational use of the river corridor that supports long-term ecological health and social equity.

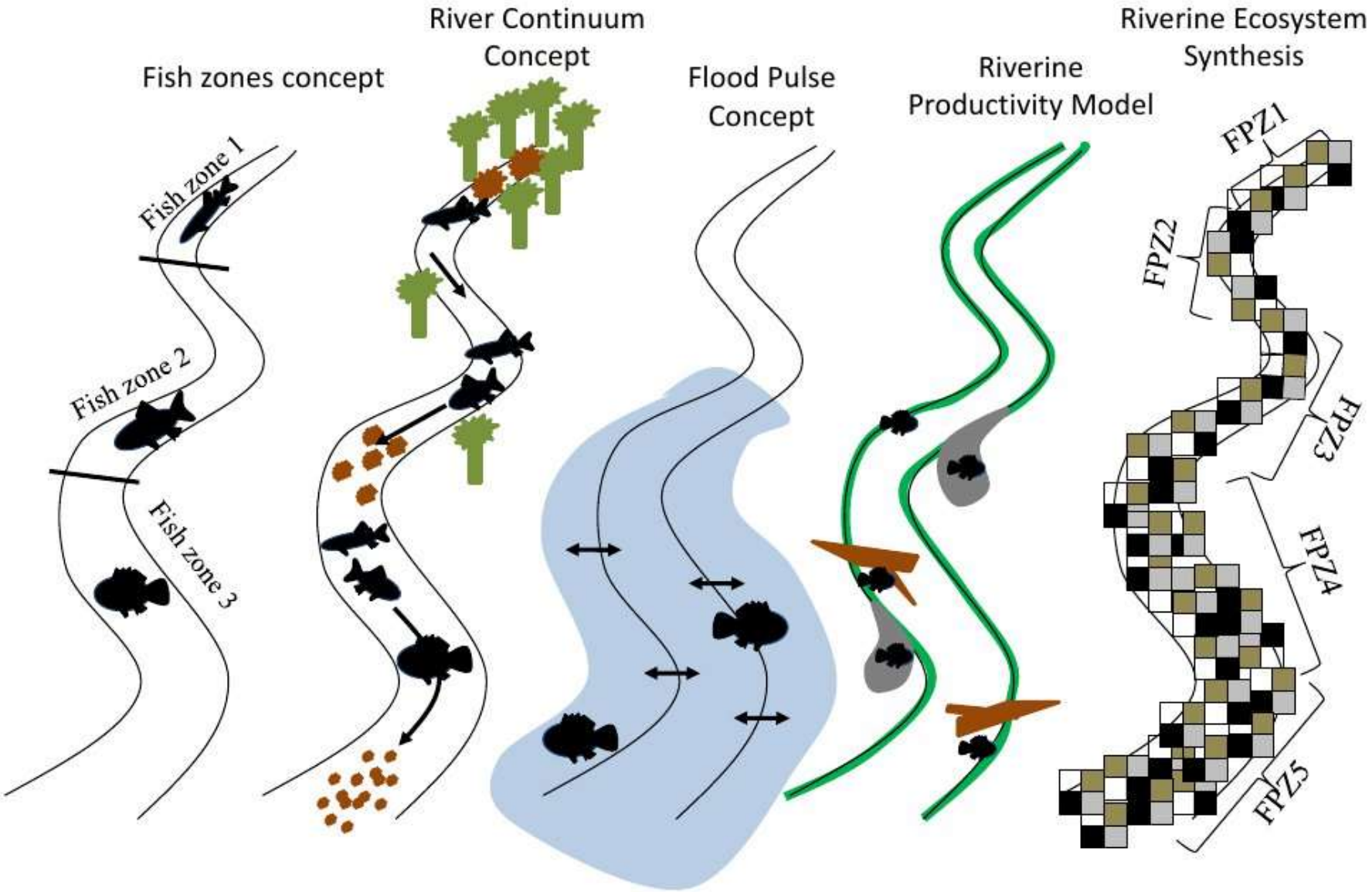
Riparian Management Goal: To promote actions that conserve and maintain a healthy riparian system along the Austin-Bastrop Colorado River Corridor.

Restoration Goal: To assist with restoration of riparian habitats along the river corridor.

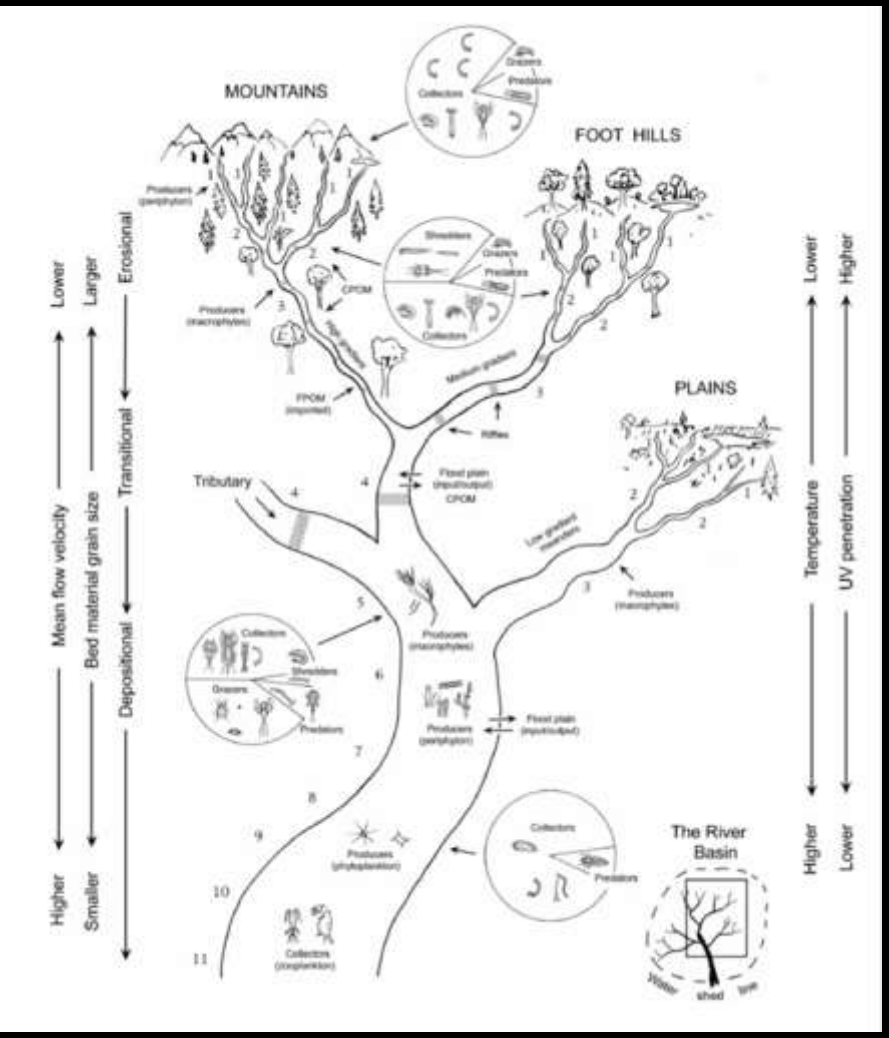
Public Awareness Goal: To create community awareness and support for land-use planning and restoration of the river corridor.

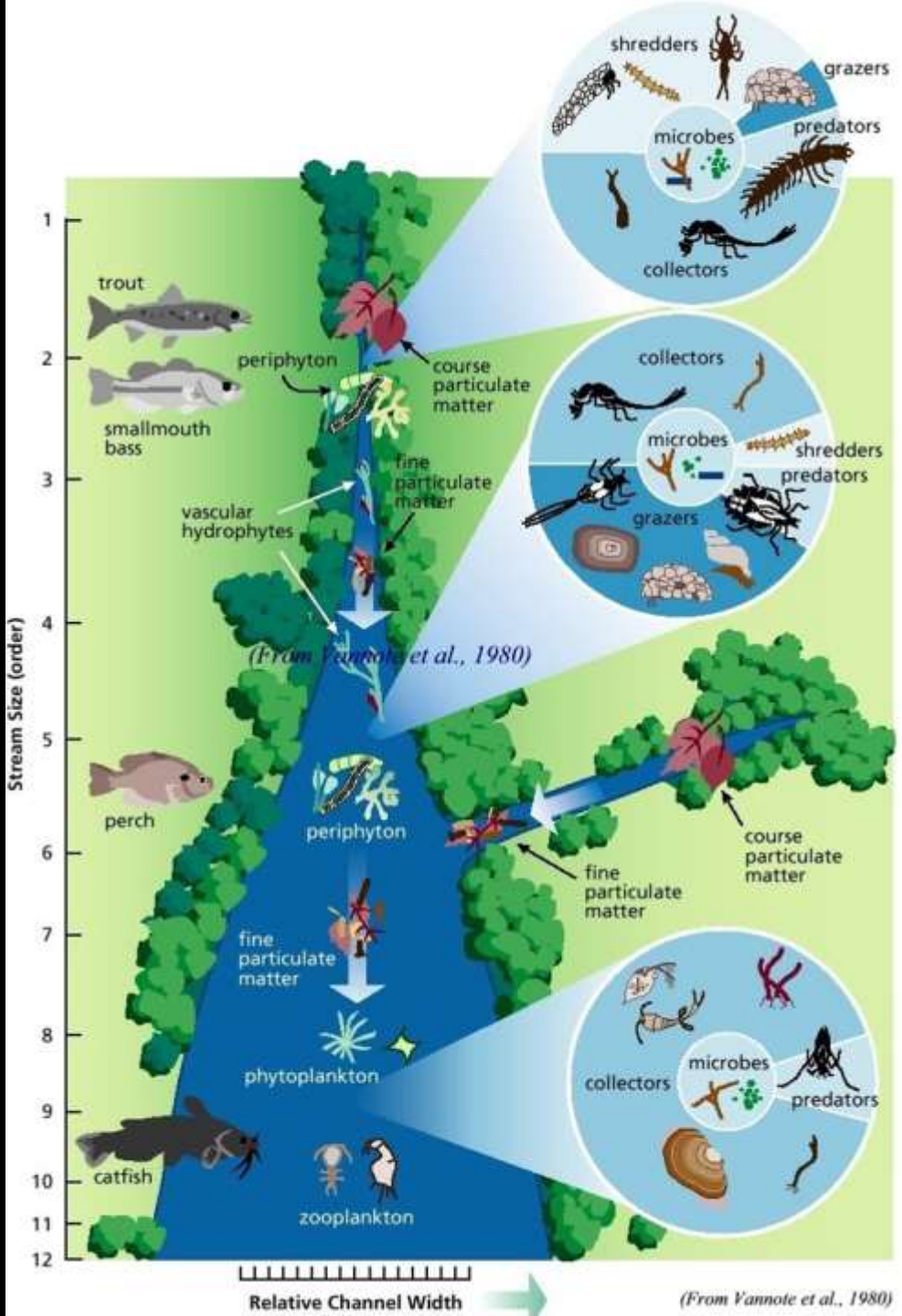
Fluvial Life: The Nature of the Colorado River

River ecosystem concepts



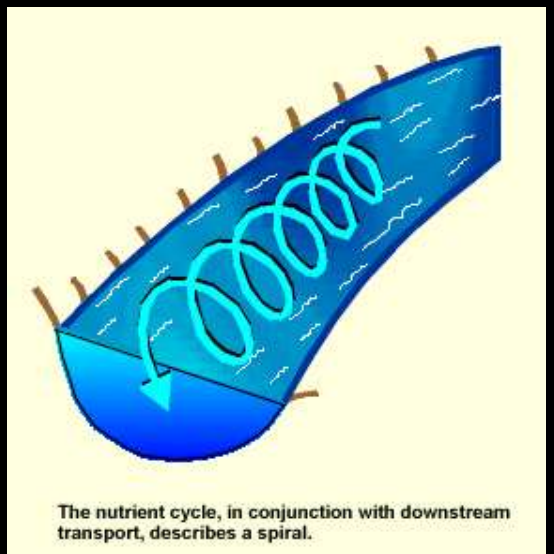
The River Continuum Concept (RCC)



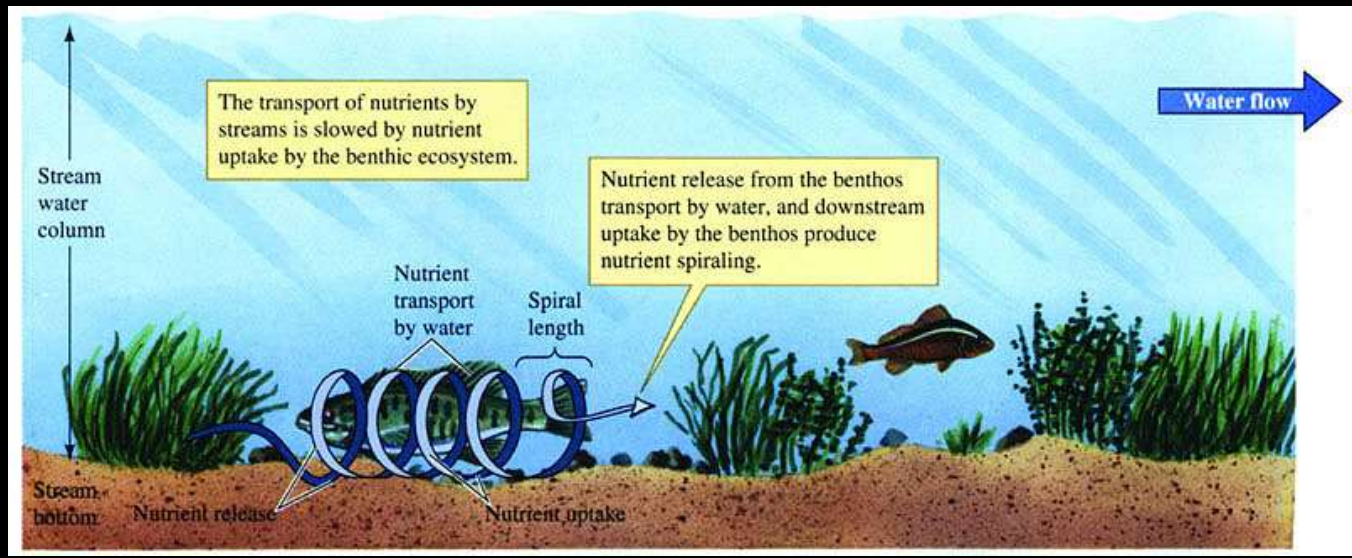


Biogeochemistry
Terrestrial Ecology vs. Fluvial Ecology
Nutrient Cycles and Nutrient Spiraling

- Nutrient cycles describe changes in nutrient states through time and usually do not consider a spatial component
- But water in streams have a strong spatial component.
- Because these nutrient cycles occur simultaneously with downstream transport, nutrient transformations in streams are conceptualized as "spiraling"
- The spiraling length represents the distance over which the average nutrient atom travels as it completes one cycle of utilization from a dissolved available form, passes through one or more metabolic transformations and is returned to a dissolved available form.



The nutrient cycle, in conjunction with downstream transport, describes a spiral.



Freshwater Ecology - Food Webs

Freshwater ecosystems begin with the consumption of living or dead plant material

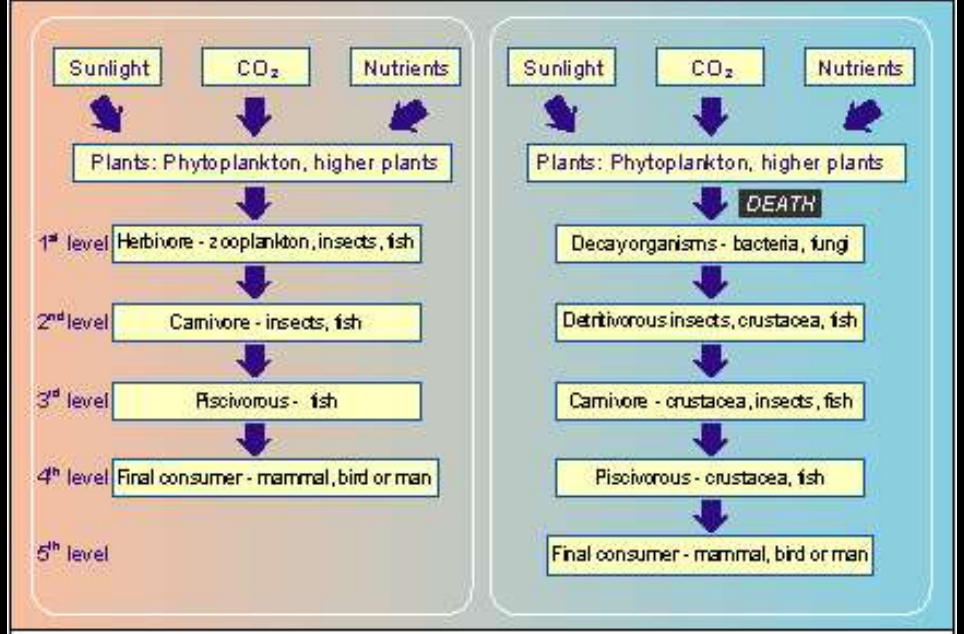
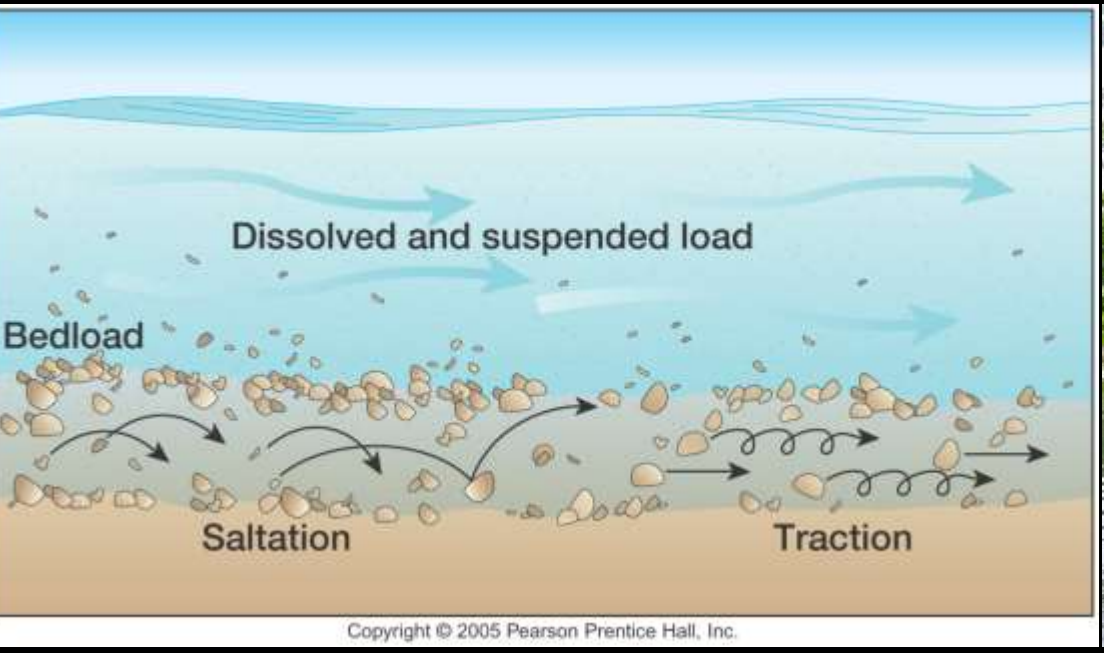


Figure: Alternative pathways for energy and nutrient flow among river organism.

Fluvial Transportation
Water, Sediment, and Organic Material

- Rivers transport three main materials downstream – water, sediment, and organic material.
- The abiotic components – water and sediment – most directly affect the shape of the river channel [Fluvial Geomorphology].
- The biotic components of a river's transported load range from dissolved organic matter to large woody debris.



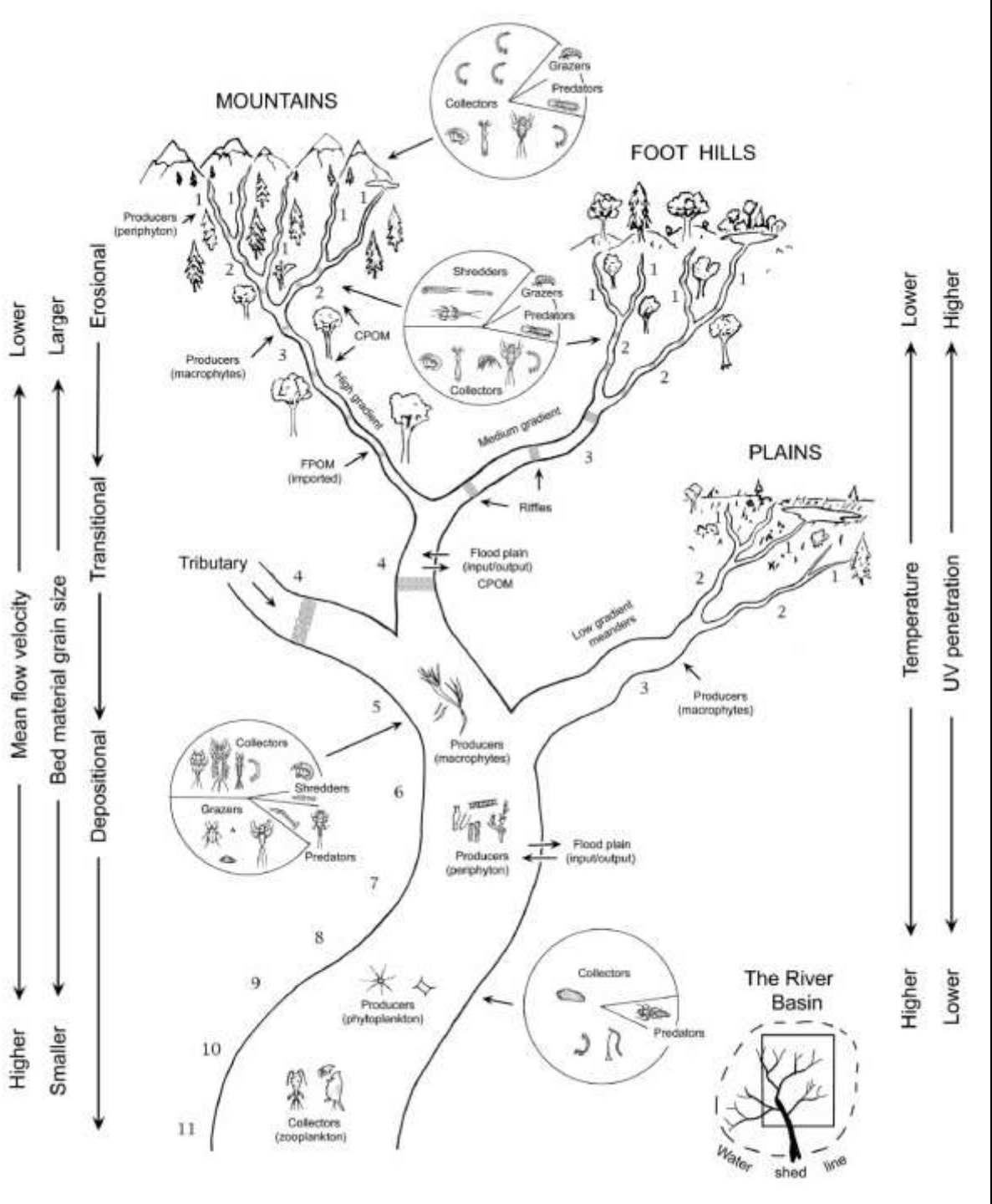
The River Continuum Concept (RCC)

River Food Web

Throughout the continuum of the river, the proportion of the four major organism types change -

- shredders
- collectors
- grazers (scrapers)
- predators

With the exception of the predators, all these organisms feed directly from plant material

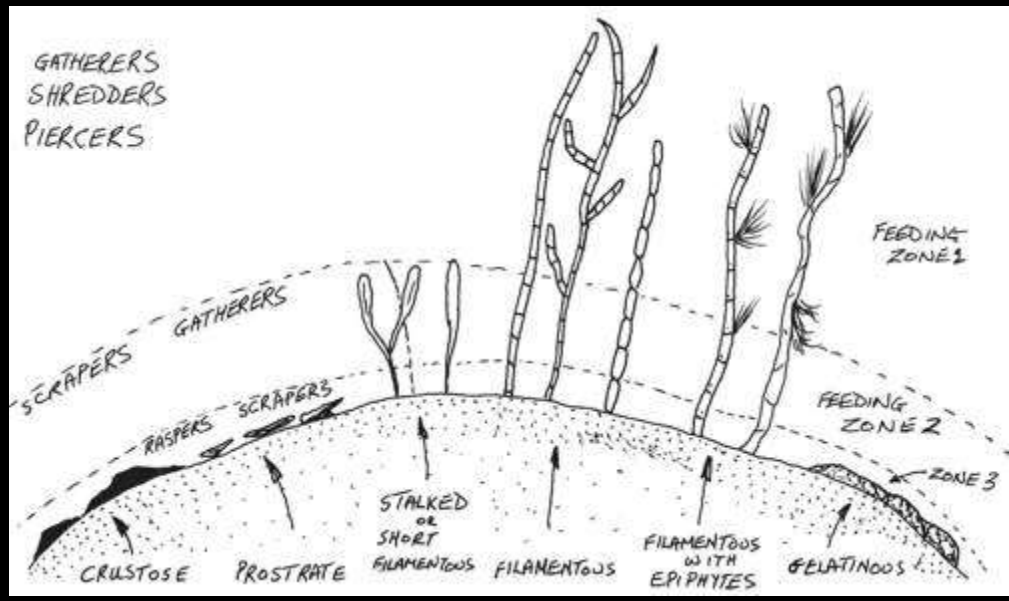


Surface Habitat

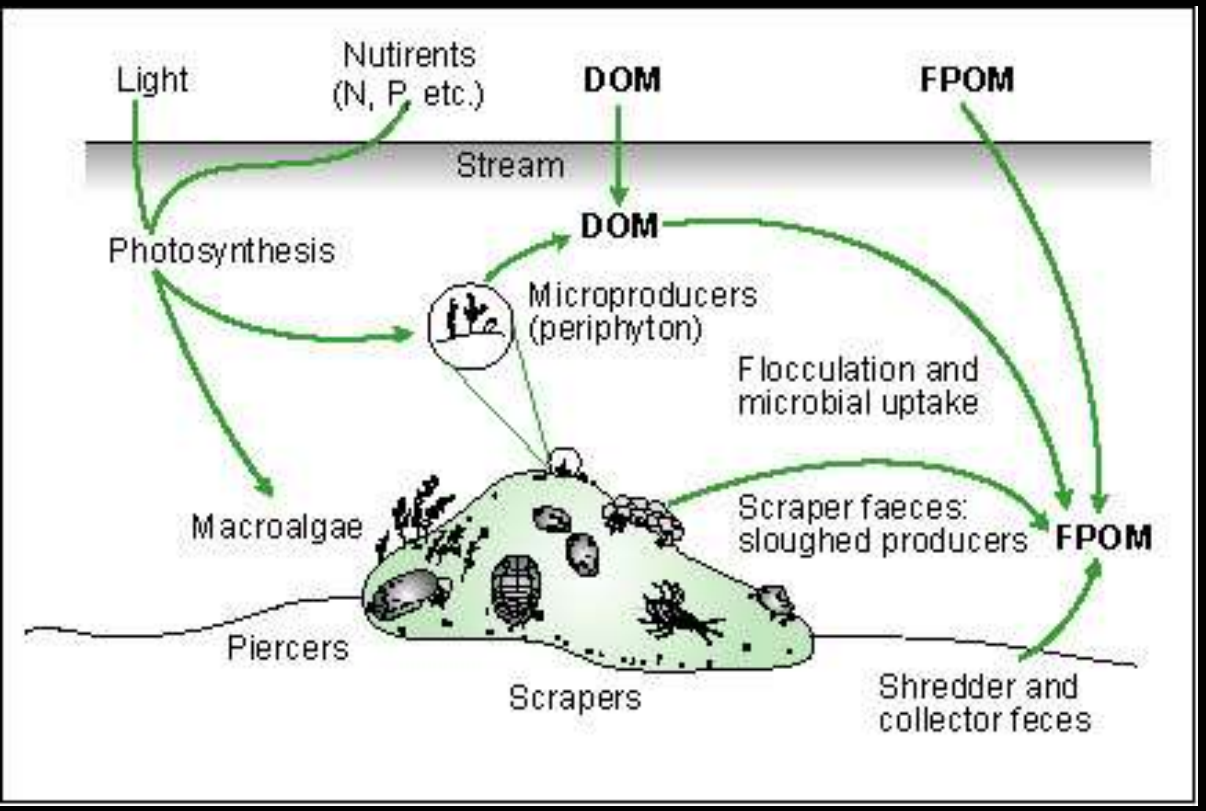
Periphyton is a complex mixture of algae, cyanobacteria, and detritus that are attached to submerged surfaces in most aquatic ecosystems.

The three zones of Periphyton on stones →

Zones relate to the ability of the animals to consume the material



Surface Habitat

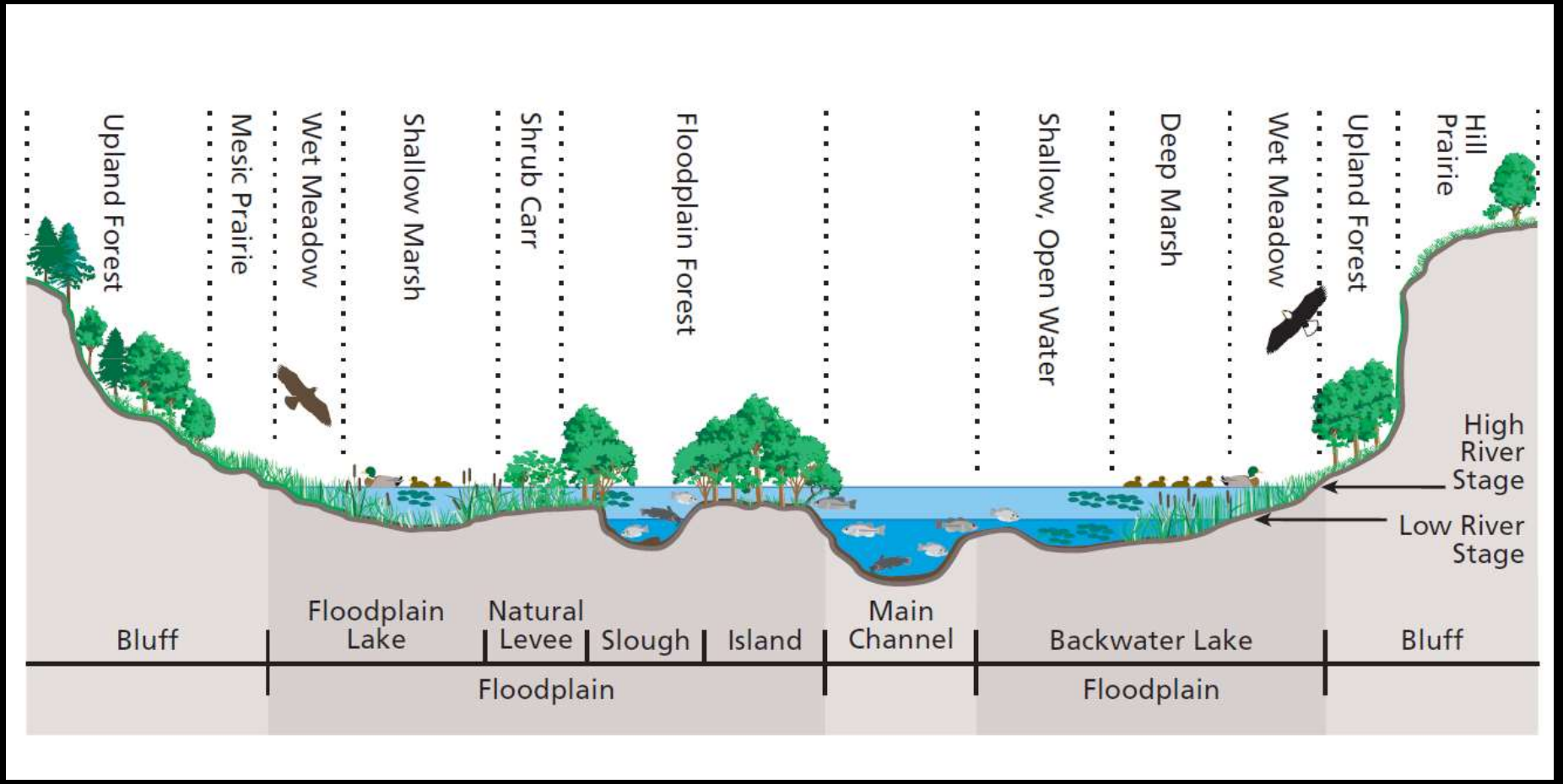


By a variety of mechanisms, the periphyton-bacteria-organic microlayer on substrate surfaces is scraped or browsed.

Diatoms are a prominent constituent of this matrix. Small Trichoptera larvae (Hydroptilitae) pierce the cell walls of macroalgea and suck out cell fluids.

The Middle Course: Life in the Meander Belt

Habitat Diversity = Biodiversity

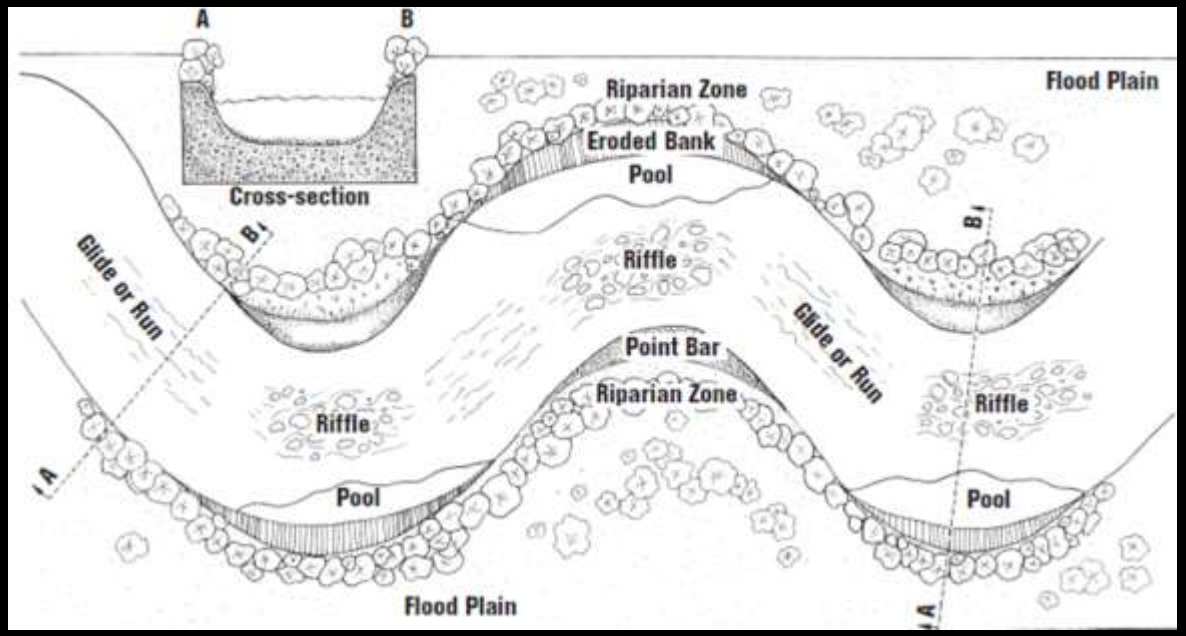


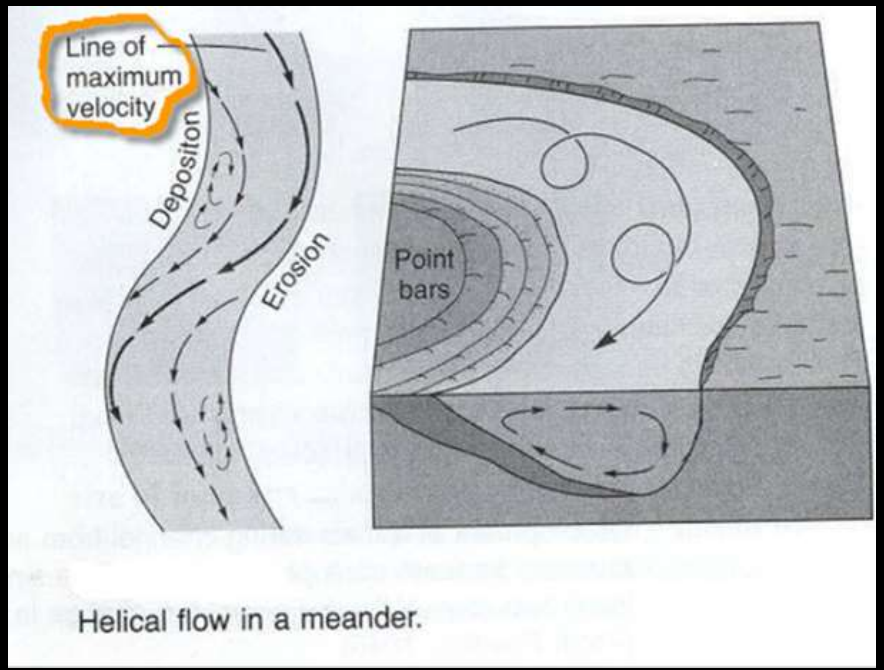
The Middle Course

Wider Channel = More Solar Energy

- At some point along their path to the sea, rivers have typically gained enough water and width to preclude interlocking tree canopies.
- Streams at this point are warmer and less abundantly supplied with leaves than was the case upstream.
- Open canopy, and fairly shallow water, means that light can reach the river benthos, increasing in-stream primary productivity.

Aquatic Life Worlds: Erosional Zone and Depositional Zone



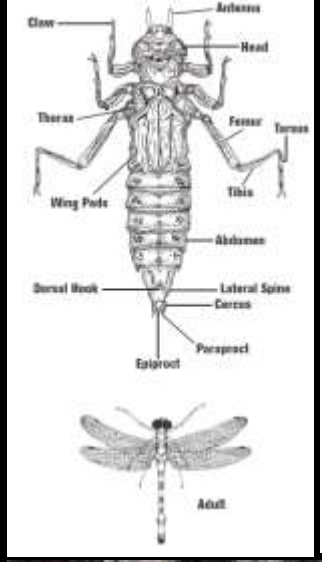


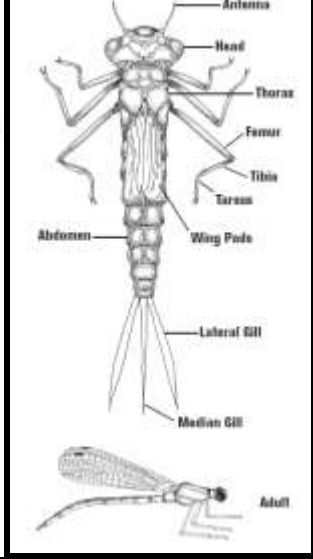
Erosional and Depositional Zone – Pools

A pool is relatively deep and wide with slow-moving water compared to riffle, run, or glide areas. Pools often contain large eddies with widely varying directions of flow compared to riffles, glides, and runs, where flow is nearly all downstream.

Deposition - Reduced velocity allows suspended materials to settle to the bottom. Sediment in most pooled areas of streams and rivers is composed of sand, silt, clay, and organic matter, compared to the coarser sediment of riffles, runs, and glides.

The slower-moving water supports organisms similar to those found in lakes and pond systems (dragonflies, damselflies, water striders) and shelter fish out of the strong downstream flow.



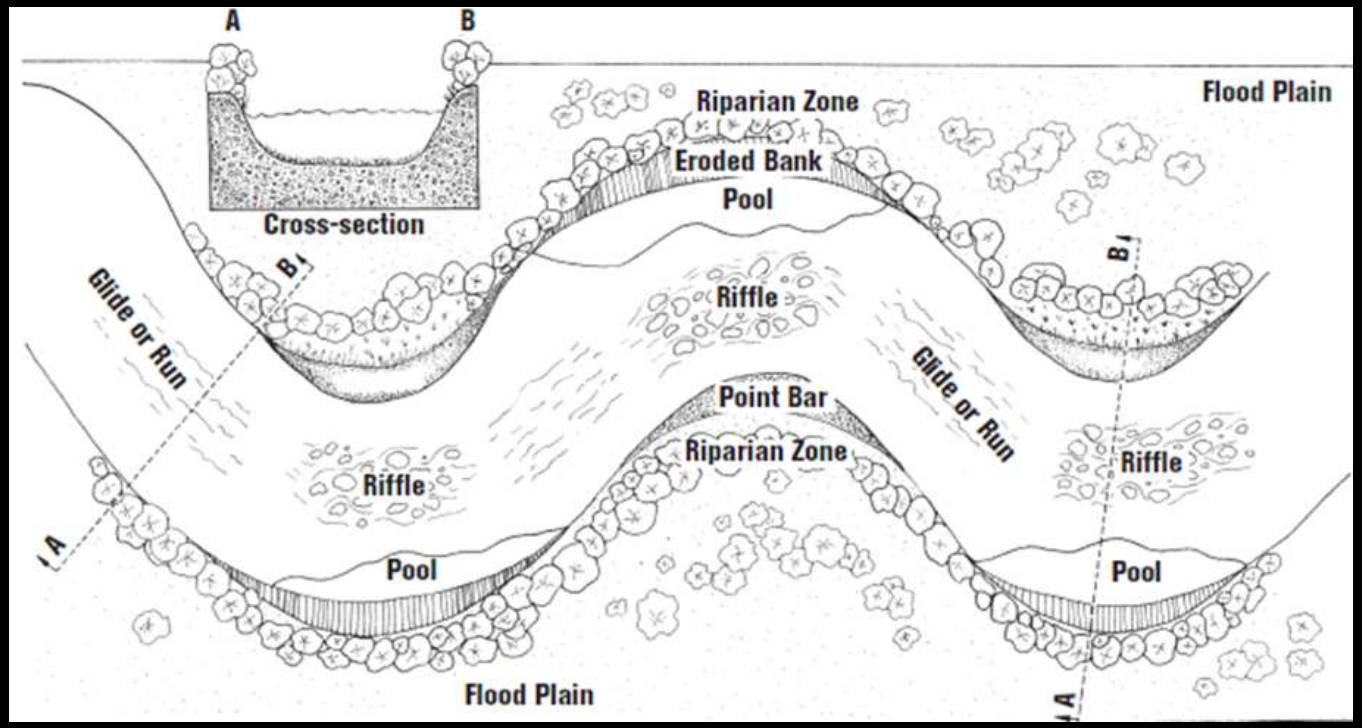


Erosional Zone – Riffles

Riffles are the shallow portions of a stream characterized by relatively fast-moving, turbulent water with bottom materials composed of cobble, gravel, or bedrock.

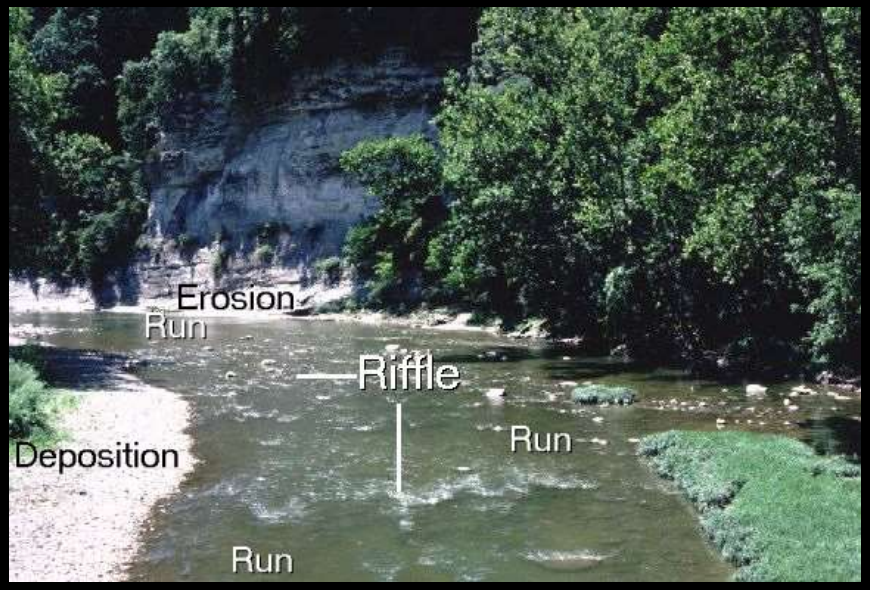
Riffle areas of streams are important habitats for many aquatic insects and small fish that require flowing water for feeding and high oxygen levels

Few plants grow in the fast-moving water of a stream, but some may be adapted for living in the current of smaller streams. Riffle areas commonly support those organisms adapted to life in fast-moving waters, such as algae, plants, and invertebrates that can anchor themselves to rocks, logs, and other stream debris. (mayflies, caddisflies, riffle beetles, water pennies)



Erosional Zone – Runs and Glides

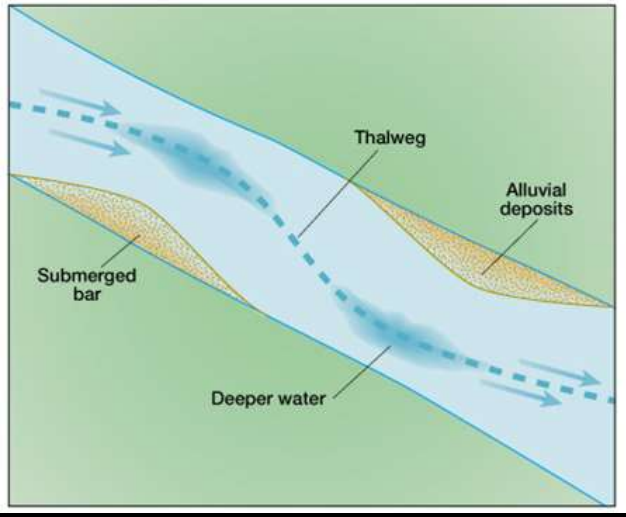
Some fish prefer the fastest part of a stream (darters). Many fish spawn in the riffles of streams.

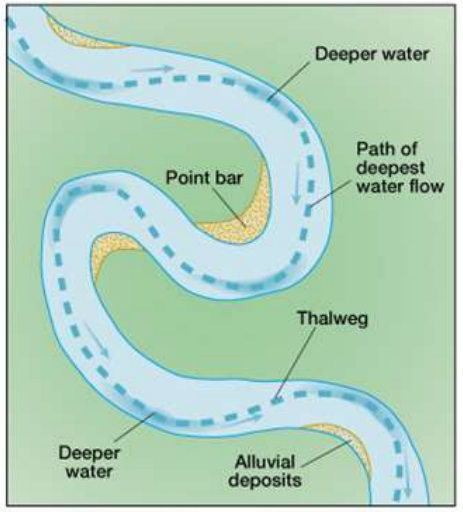


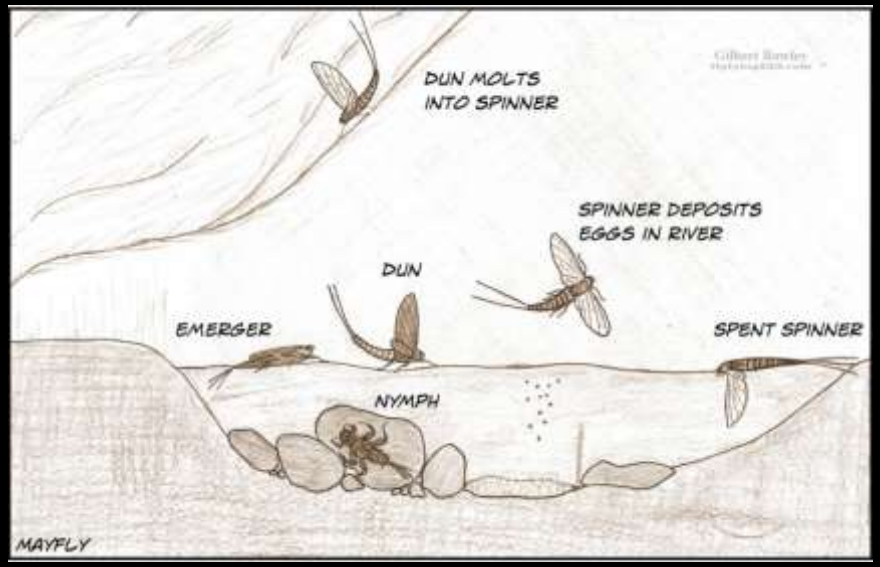
- Glides and runs are intermediate habitat types that fall between riffles and pools.
- A glide is an area where the flow is characterized by slow-moving, nonturbulent flow referred to as laminar, similar to that in a shallow canal. A glide is too shallow to be a pool, but the water velocity is too slow to be a run.
- A run is a relatively shallow portion of a stream characterized by relatively fast-moving, nonturbulent flow.

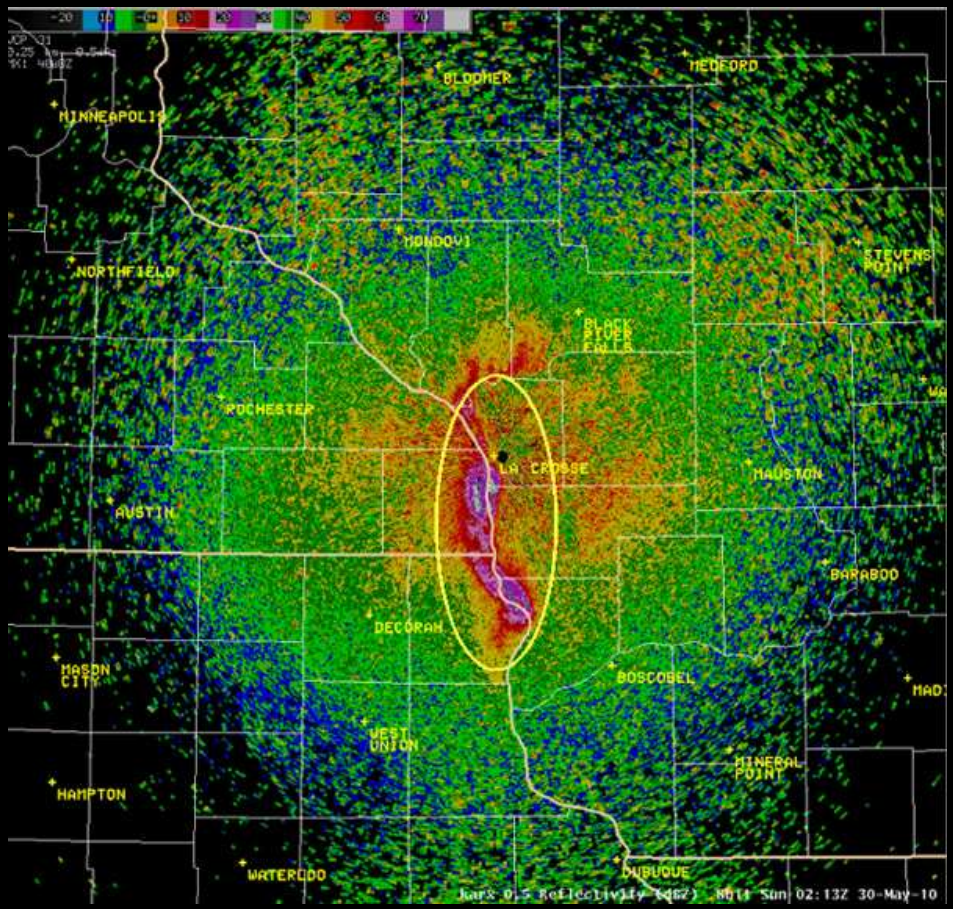
Depositional Zone – Gravel Bars

- The depositional zone refers to the inner bank of a stream where velocity is at a minimum.
- The slower velocities allow for the deposition of suspended sediment and bed materials (gravel, pebbles), which form bars.
- These bars often support emergent aquatic vegetation and, as the bars grow larger, they are colonized by terrestrial plants and trees, to form islands.







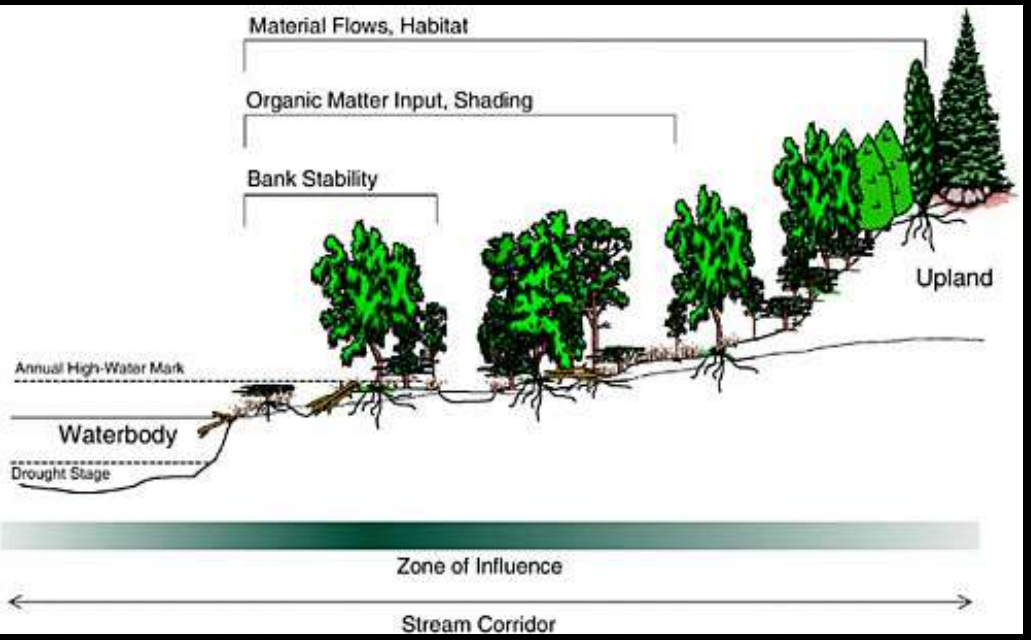


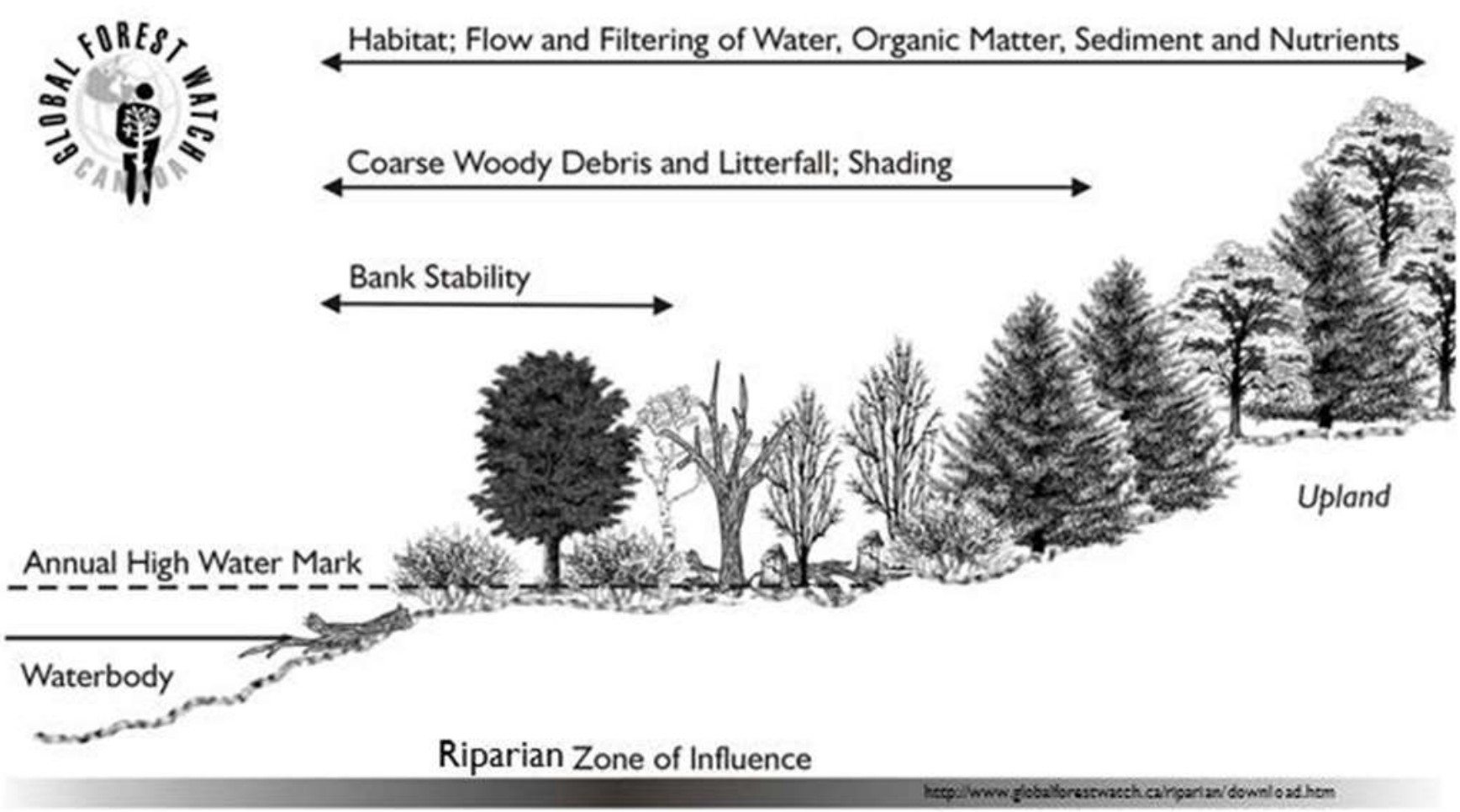
A mayfly mass emergence or hatch from the Mississippi river captured by the National Weather Service Doppler radar in La Crosse Wisconsin (USA) in May 2010
The adult mayflies in flight are represented by the bright pink, purple, and white.

Riparian Zone = Waterway Margins

Riparian areas are transitional zones between terrestrial and aquatic ecosystems.

Vary in width depending on influence of water





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

Hydric Soils

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.

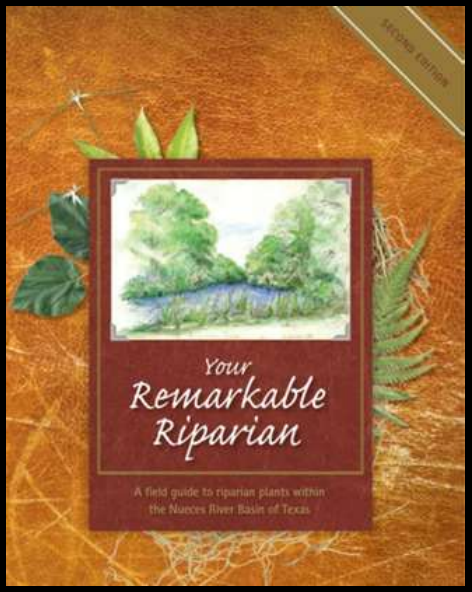
Texas Riparian Association

Founded 2001

Mission: To encourage healthy riparian systems within Texas

Texas - 3,700 named streams and 15 major rivers

www.texasriparian.org



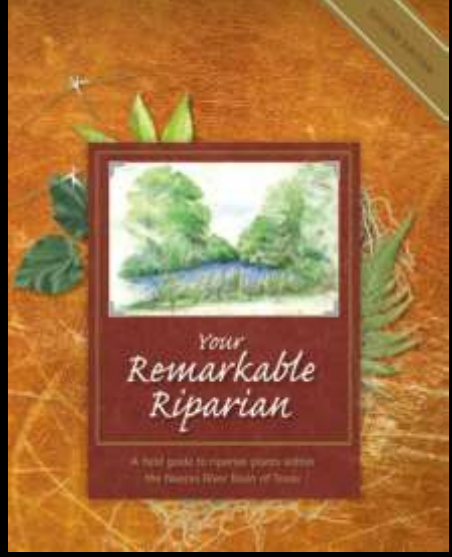
Riparian Process

Types of Vegetation:

Colonizers

Stabilizers

Woody



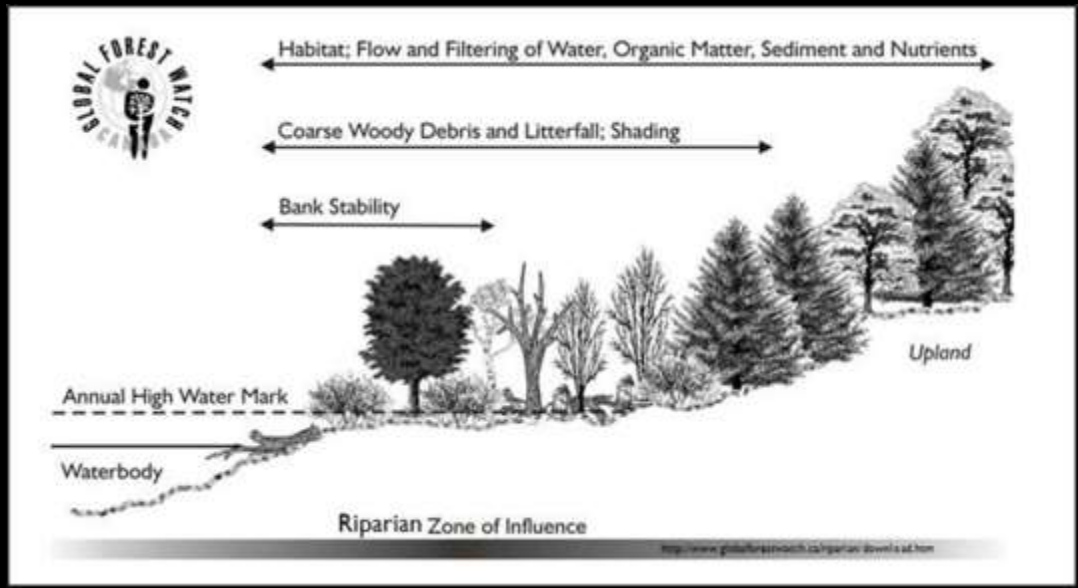
Ecosystem Process

Nonequilibrium dynamics

Riparian Zone = Waterway Margins

Proper Functioning Condition

- dissipate stream energy
- improving water quality and quantity
- filter sediment
- capture bedload
- aid in floodplain development
- improve flood-water retention
- improve groundwater recharge
- stabilize streambanks
- store water
- provide habitat
- support greater biodiversity



Diversity of Life in The Middle Course


84 F
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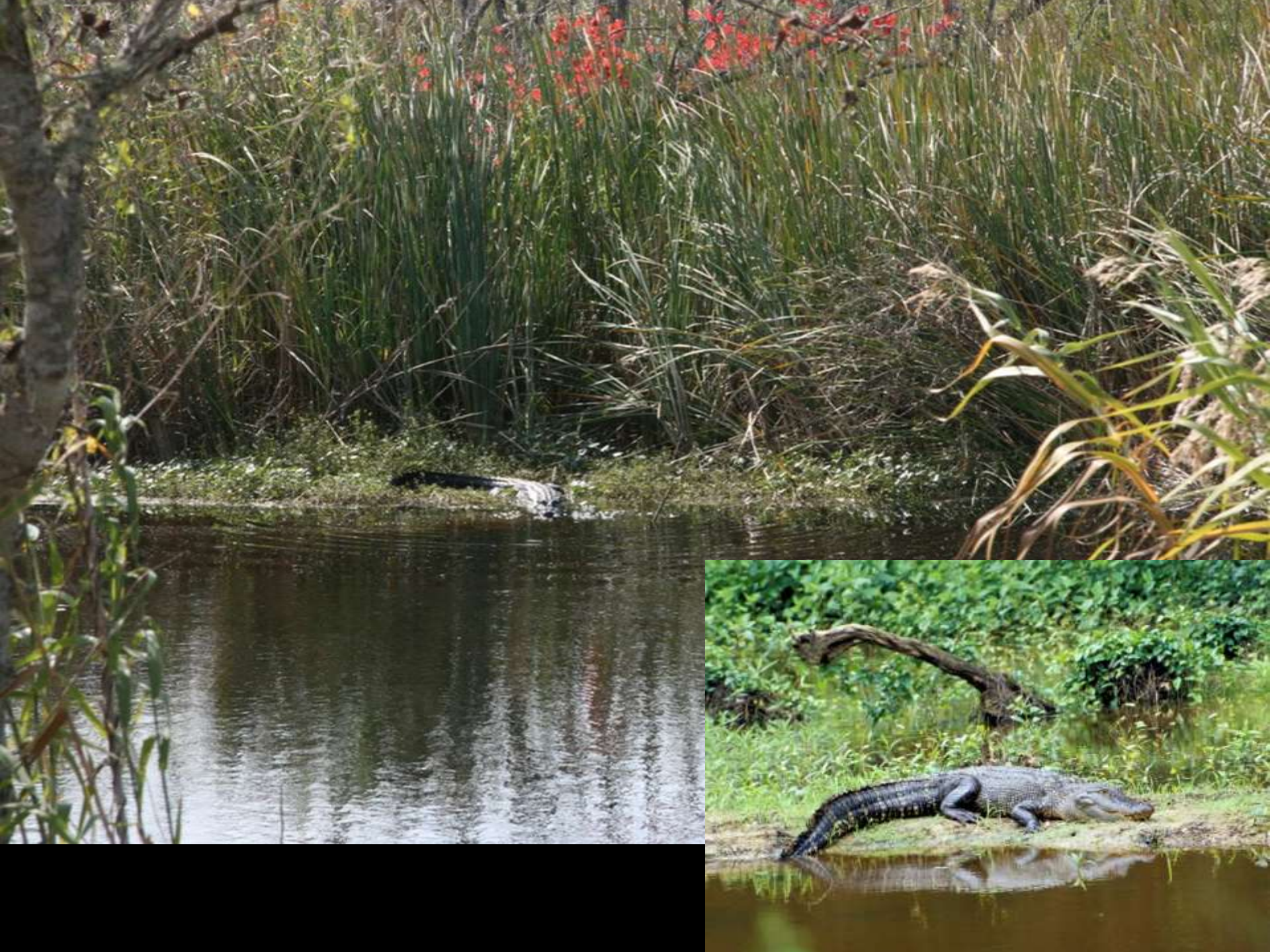
05/19/2017 11:12PM


84 F
HORNSBY 17
05/19/2017 19:12PM




HBBO
Hornsby Bend Bird Observatory

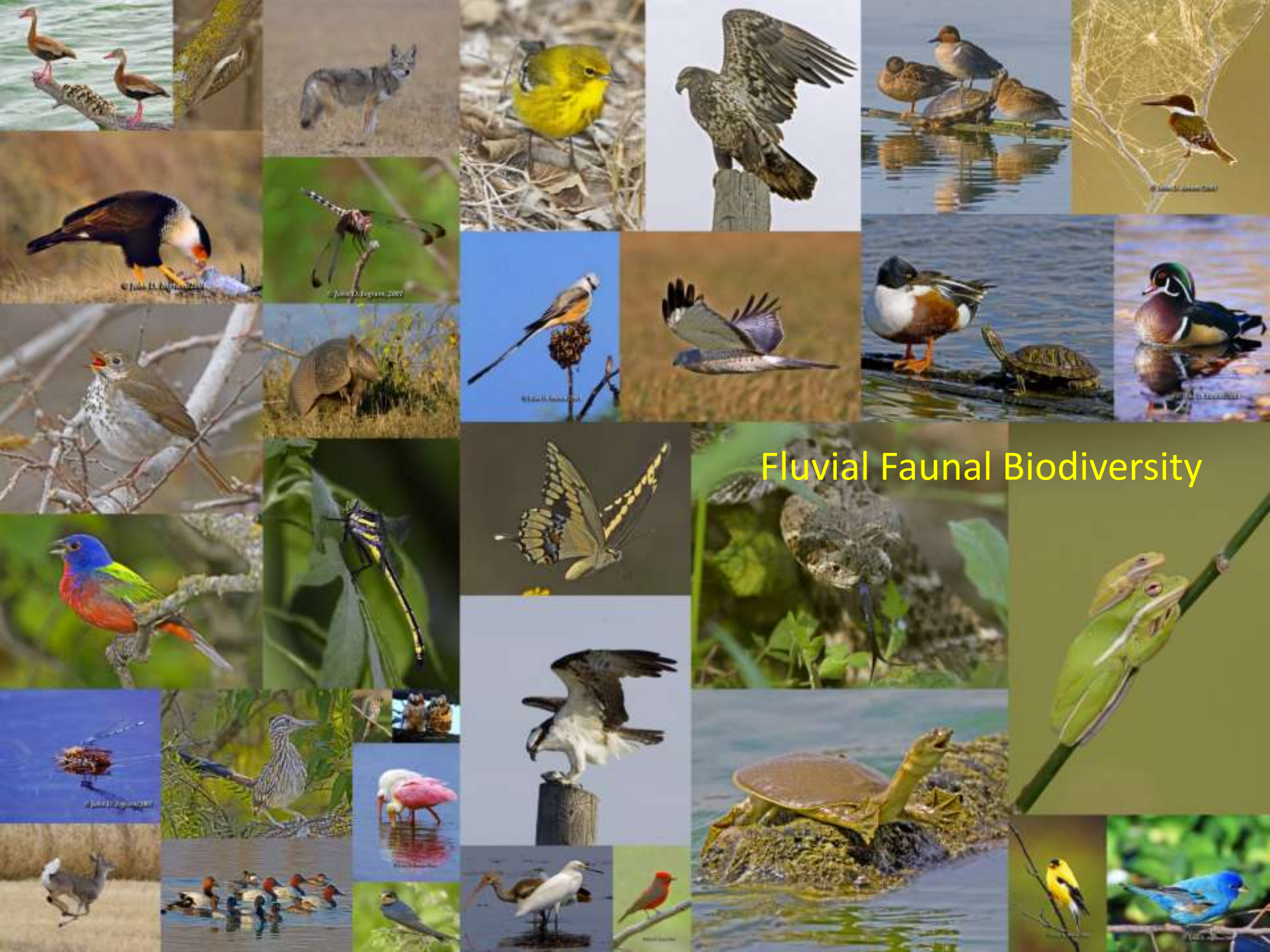
The Kingfishers

Green

Ringed

Belted

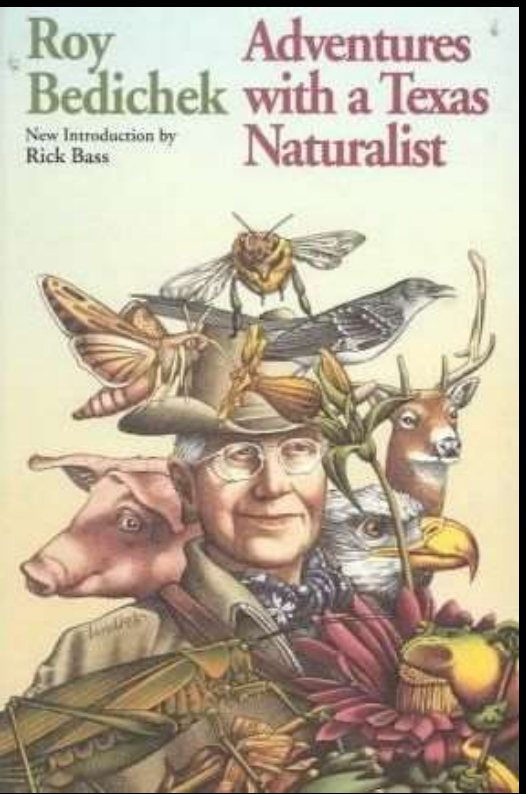

© John D. Ingram/2001

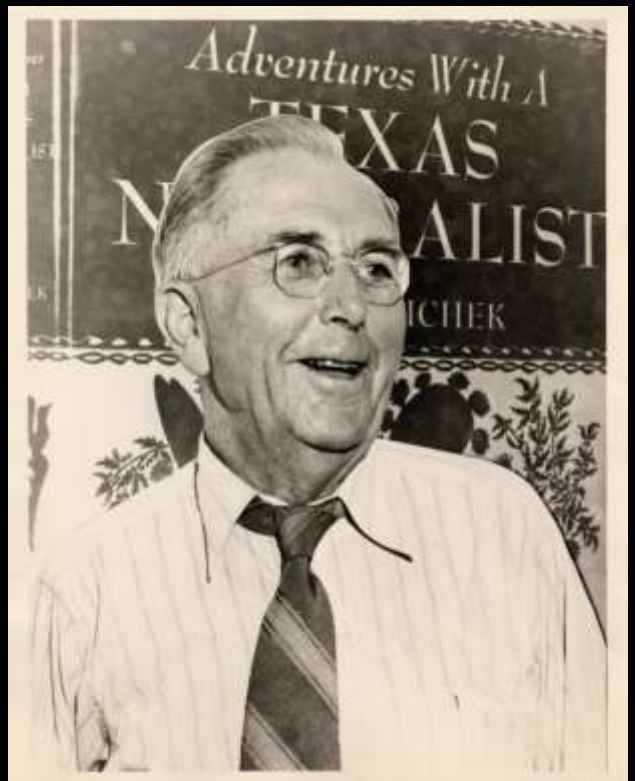

Fluvial Faunal Biodiversity

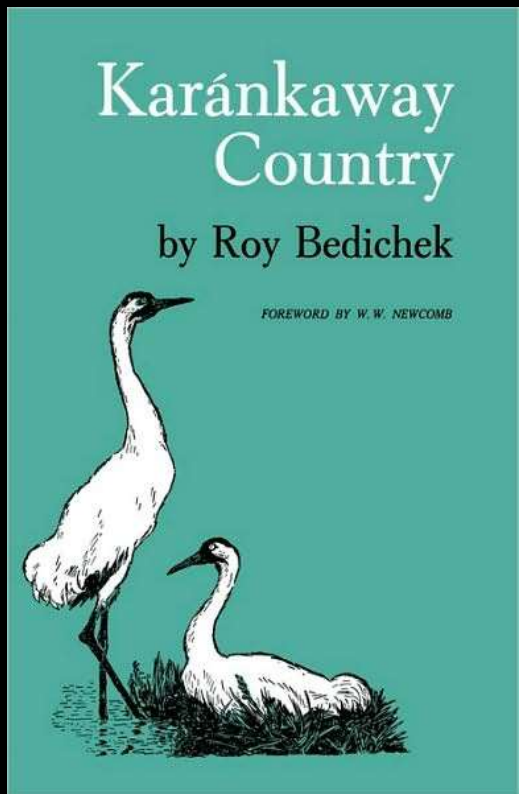
The Texas Naturalist - Roy Bedichek

Adventures with a Texas Naturalist (1947)

Karánkaway Country (1950)





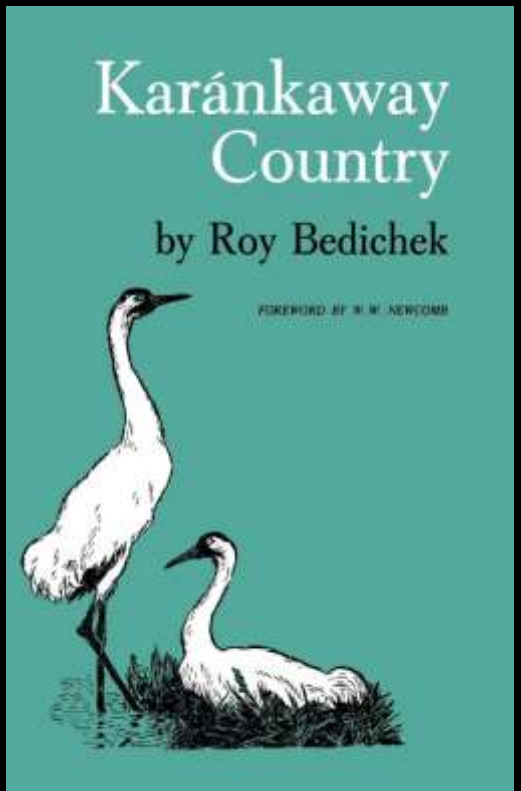


He shared a love of Texas with two UT faculty members, **J. Frank Dobie** of the English Department, and **Walter Prescott Webb** of the History Department.

Karánkaway Country - Texas Rivers

"Texas has a river unity which invites unified treatment of Texas rivers"

- "Rivers intrigue me. I can sit on a log and look upon a flowing stream for an hour at a time without feeling those twinges of conscience which come while idling in other environments."
- "The river is a living organism, or at least it presents characteristics so similar to those of a living organism that to speak of it as such is more than mere metaphor."
- "A river system is one of Nature's units, and it must be dealt with as such if it is to be dealt with successfully for serving human needs."



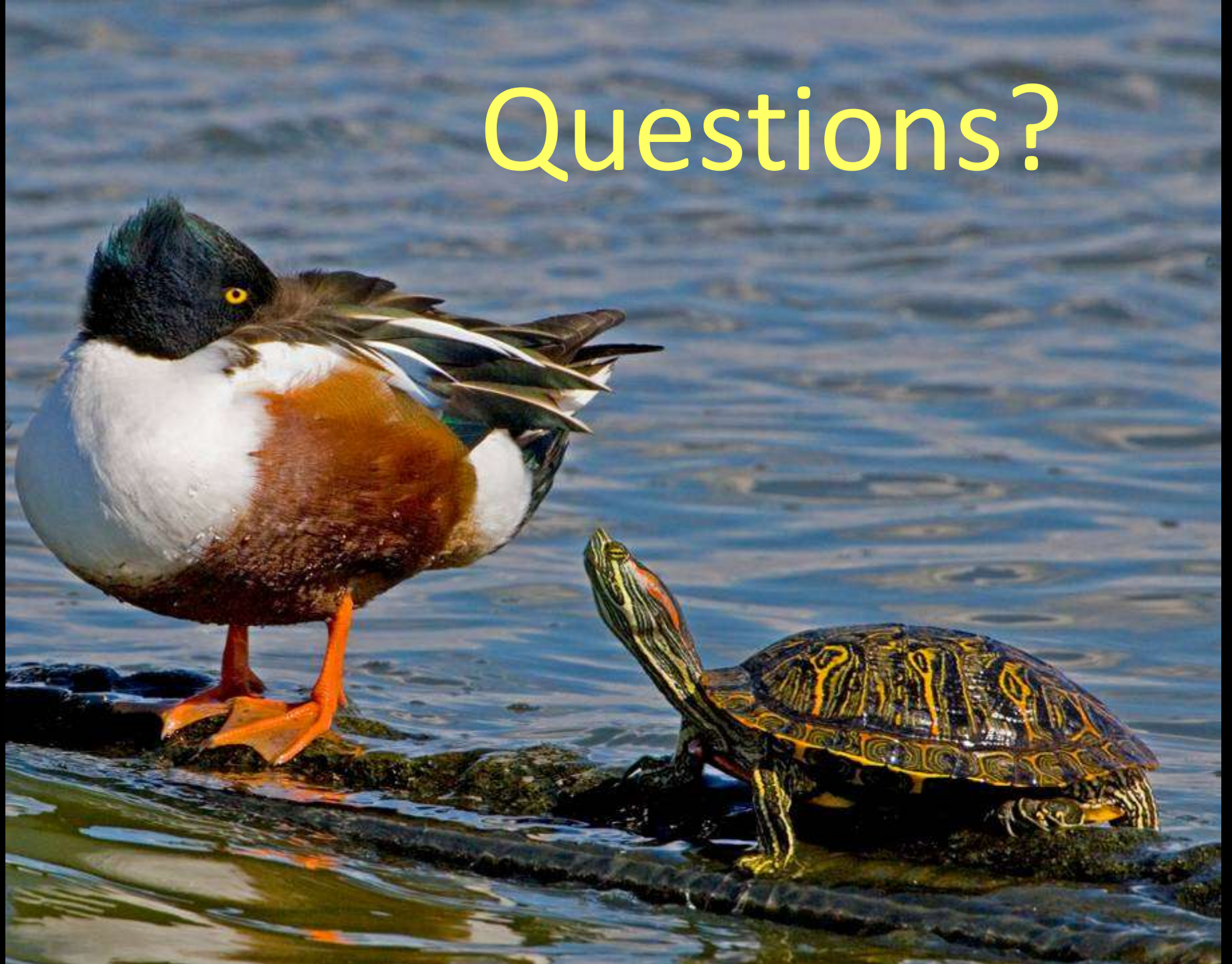
River of Contrasts

THE TEXAS COLORADO

MARGIE CRISP


Applause!


Questions?


Questions?