

Riparian Zones

A riparian zone is an area that is influenced by an adjacent stream or river that processes large fluxes of energy and material. There are two major types of riparian zones:

1. Bottomland hardwood forests
2. Western riparian zones

These zones can be low or high order. Low order streams feed into high order streams. Riparian zones are nutrient sinks in low order areas, the nutrients are deposited into the sediment layer. Riparian zones are nutrient transformers in high order areas because of all of the aerobic and anaerobic activity.

Watersheds: Riparian zones have a high water table because of their proximity to a river or stream. The plants in this zone have their roots into the saturated zone.

Odum called riparian zones the interface between mans most viable resource, water, and his living space, the land. Riparian zones are of great historical importance. Much of human civilization has been and is conducted in riparian areas.

Riparian zones are ecotones between aquatic and upland systems, meaning that there is a continuous exchange of energy, species, and nutrients.

In the eastern US riparian zones can be 10 km wide, while in the west they are usually only a couple of meters wide.

There are 36 million ha of riparian zones left in the US. The national loss rate is 2.7% per year. (This is from 1940-1980, 2.8 million have been lost in the past 40 years.)

In bottomlands before European settlement there were 21 million ha, today there are 4.9. The existing bottomlands are found from Virginia to Texas. Most of this land is fragmented into 100 ha plots or smaller which makes a poor habitat for animals.

Regional Estimates of riparian losses.

	1940	1980
North	8,500,000 ha	8,000,000 ha
Pacific	730,000 ha	1,250,000 ha
Rockies	730,000 ha	375,000 ha
Southwest (AZ, NM,CA)		360,000 ha
South	16,600,000 ha	13,200,000 ha
Alaska		12,000,000 ha

In the west, low order streams have suffered a lot of damage from grazing. High order streams have been dammed up. Now the withdrawal of water into these systems is greater than the input on a yearly basis.

ET: evapotranspiration, water loss due to evaporation from the soil and transpiration from the leaves.

East Vs West Riparian Characteristics.

	Southwest	Pacific Northwest	Southeast
Attribute	Upstream/Downstream (Low order-High order)	Upstream/Downstream (Low order-High order)	Upstream/Downstream (Low order-High order)
Example	Sabino Creek/Santa Cruz	Payette/Snake	Suwanee/Tennessee
Climate	Arid/Arid	Semi-arid/Arid	Mesic/Mesic
Precipitation	ET > Precipitation	ET = Precipitation	ET < Precipitation
Pattern	Linear/Braided	Linear/Linear	Linear/Floodplain
Flood plain width	Narrow	Broad	Very broad and meandering
Stream gradient	Steep/flat	Steep/moderately flat	Steep/moderately flat meandering
Valley Shape	V alluvial fan	V alluvial fan	U meandering depositional flats
Peak Flow	10-100/10-100 times average flow	10-100/10-100 times average flow	5-10/2-5 times average flow
Vegetation	Cottonwood, salt cedar	birches, hemlock, willow	Cypress, Oaks, gum trees

All kinds of vegetation found: alder, cottonwood, oak, maple, cypress, poplars willow, ash, sycamore, mesquite, birch, walnut, hickory, salt cedar, hemlock, gum.

(Oaks are characteristic of riparian zone.) SE high streams tend to carry more water on a daily basis, and there are not as many steep mountains. There is different vegetation because of long, continuous rains. In the SW there are bigger, stronger rain events, and bigger mountains. This area needs better-rooted plants to handle the lack of and then strong rains.

WATERSHEDS

The size of a watershed can have impact on amount of time land is flooded.
 Small (600 km²) Flooded 5% of time

mid size (1000 - 2000 km²) 15% of time
Large (greater than 5,000 km²) 20% to 45%

Size Matters - Floods are more frequent and larger with large watershed
Slope matters - High slope causes bigger floods but less frequent.

There are 3 zone divisions (refers to sediment and nutrients):

1. Zone of erosion - low order
2. Zone of transport/storage - mid gradient
3. Zone of deposition - high order, low elevation

In the west there has been a lot of change in channel morphology. A flood may cut a new channel. The riparian zone here keeps moving back and forth. In the east there are more meandering channels with slow evolution. One side may fill up while the other is being cut. This eventually cuts a new channel in a lake or swampy area. Dams cause a lot of sediment to drop out, there is not as much change in the channels.

Oxbows formed by meanders that are get blocked off leaving standing water

Chemistry and Soils:

Soil types determined by the flow of the river

-course soils found in erosional and storage zone

-typical riverwash has 63% gravel and coarse rocks, 35% sand, and 2% silt and clay

-This effects the soil oxygen layer: anaerobically flooded; primarily coarse soils quickly become aerobic again after water drains away.

-Plants must have some conditions and adaptations to deal with the anaerobic conditions for short periods of time.

-Soil Nutrients: East: high

West: low (generalized composition of riverwash)

Ecosystem Structure:

In the Southwest (like in Arizona):

Trees: *Populus fremonti*: cottonwood
Salix goodingii: Goodings willow (can form a gallery)
Prosopis glandulosa: honey mesquite (has straight beans)
Prosopis pubescens: screw bean mesquite (spiral beans)
Acacia gregii: catclaw acacia
Tamarix ramosissima: salt cedar (intorduced 1900, only this spp.)

Also: Ash
Sycamore
Oaks

Total Plants in Arizona: 200-400 spp.

Understory plants, mistletoes, migratory birds like them. 28,000 spp of insects associated with R.Z., important food for birds, etc.

Fish: limited

Birds: 88 obligate riparian spp; another 23 spp that use these areas
Mammals: 45 spp

0.01% of Arizona land is streams

-75% of animal spp

7 basin states that contribute to Colorado River. Climate in Desert Arizona: desert is only 10,000 years old. Climate settled where it is today in 2,000 BC. This is really a new desert area.