

Upper Pecos Watershed ONRW

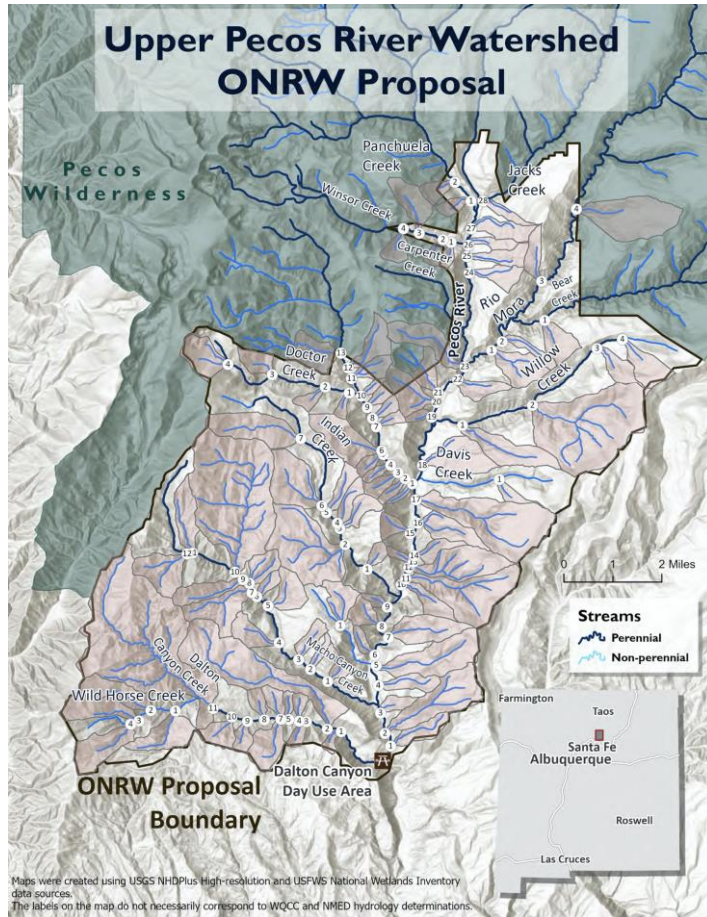
Ecologically Functioning Stream Networks

David Propst, Ph.D.

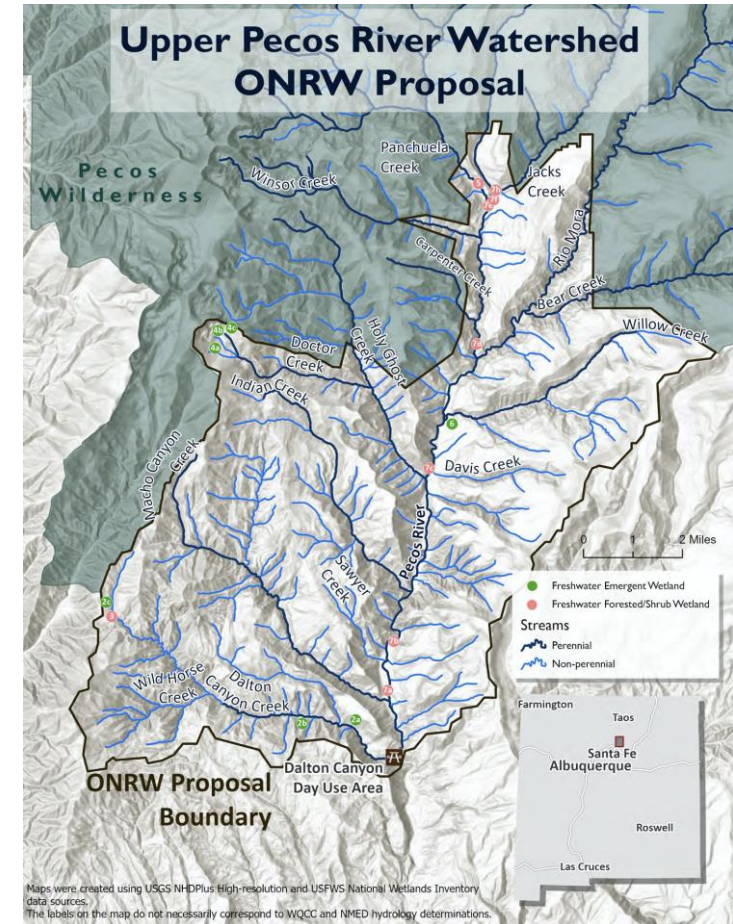


Pecos River, J O'Donnell

Perennial & Non-Perennial Waters of the Upper Pecos Watershed



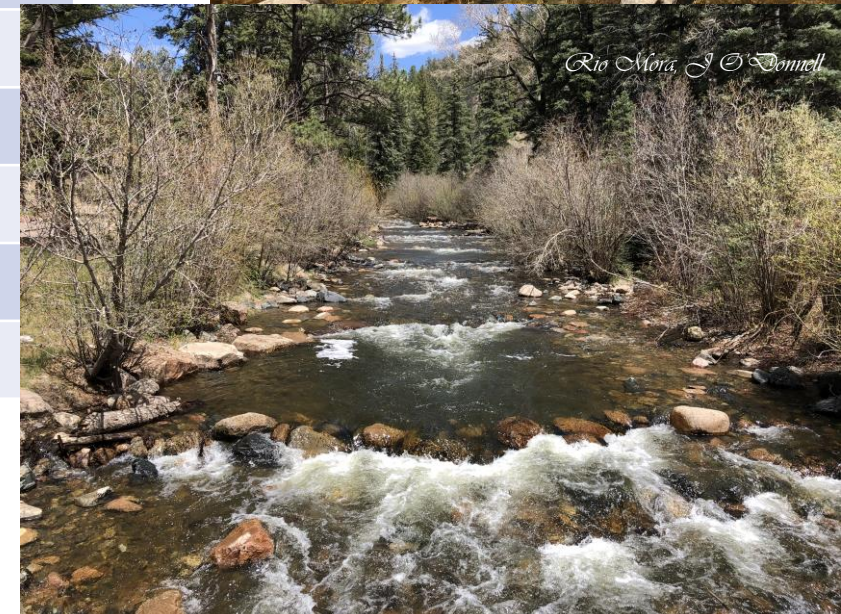
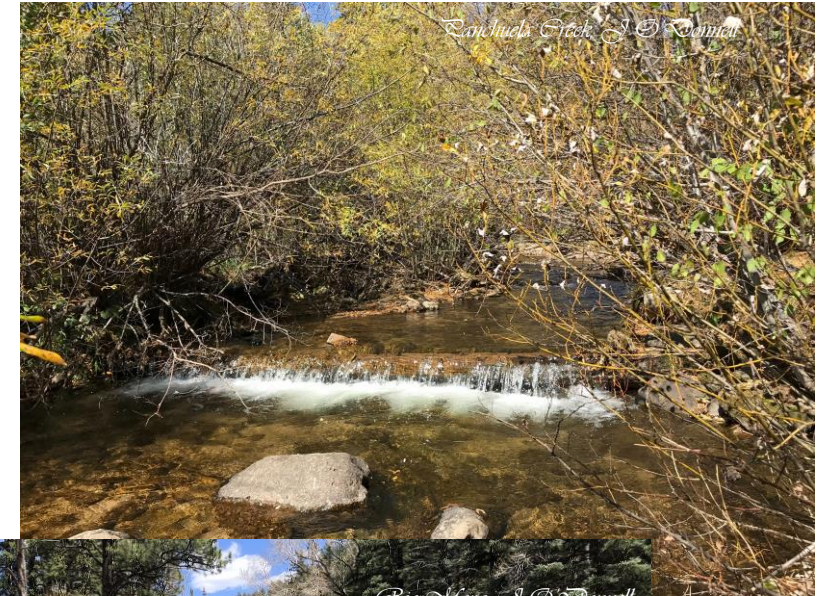
Perennial & non-perennial water courses



Wetlands



Water Courses of Upper Pecos Watershed



Named Water	# Tributaries	Named Water	# Tributaries
Jack's	0	Doctor	4
Panchuela	2	Holy Ghost	13
Winsor	4	Indian	7
Carpenter	0	Sawyer	1
Bear	1	Macho	12
Mora	4	Wild Horse	4
Willow	4	Dalton	11
Davis	1	Pecos	28

Named water courses ordered from most upstream (Jack's) to most downstream (Dalton), Pecos River listed last.

Species of Greatest Conservation Need

Herptiles	Birds	Mammals	
northern leopard frog	peregrine	bald eagle	Gunnison's prairie dog
	Lewis's woodpecker	northern goshawk	spotted bat
	red-headed woodpecker	Clark's nutcracker	American pika
	Williamson's sapsucker	Mexican spotted owl	Pacific marten
	olive-sided flycatcher	long billed curlew	
	bank swallow	mountain plover	
	pinon jay	brown capped rosy finch	
	juniper titmouse	loggerhead shrike	
	pygmy nuthatch	western bluebird	

Endangered & Threatened Wildlife

Species	US Endangered Species Act	NM Wildlife Conservation Act
Mexican spotted owl	X	
peregrine falcon		X
boreal owl		X
bald eagle		X
spotted bat		X



Rio Grande Cutthroat Trout



Conservation Populations

Dalton Canyon Creek (including Wild Horse)

Bear Creek

Jack's Creek

Macho Canyon Creek (including North Fork)

Rio Mora

Willow Creek

Exceptional Plants

Species	Federal	State	NMRPCS
Holy Ghost ipomopsis	X	X	X
Mountain lily		X	X
NM stickweed			X
Sapello Canyon larkspur			X
Hooded ladies' tresses			X
Yellow lady's slipper		X	X



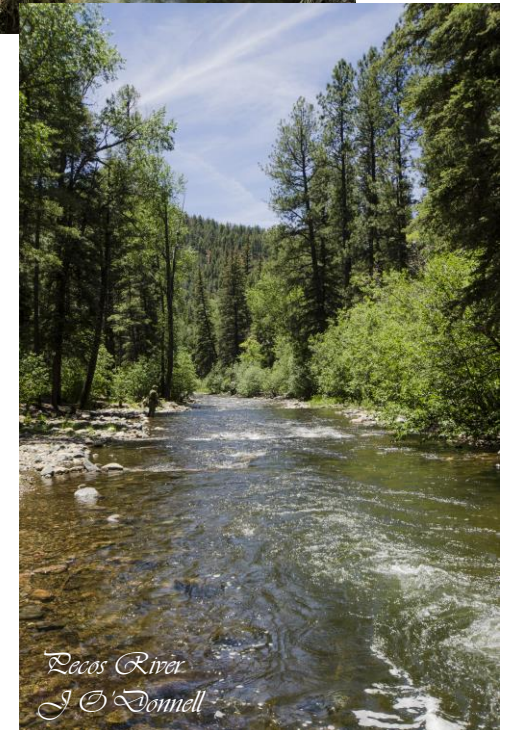
Holy Ghost ipomopsis
Ipomopsis sancti-spiritus
Daniella Roth



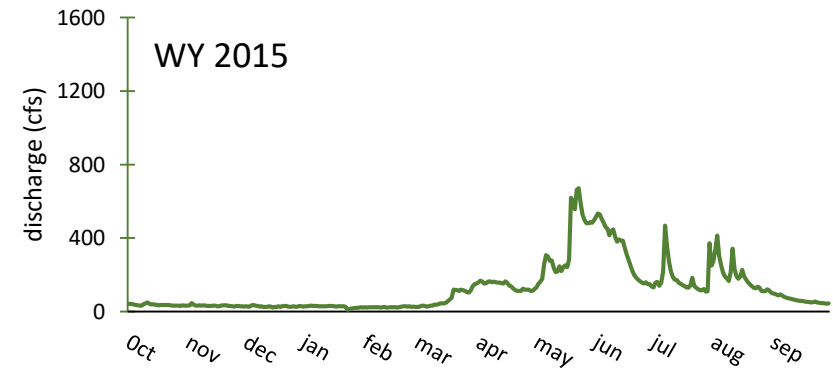
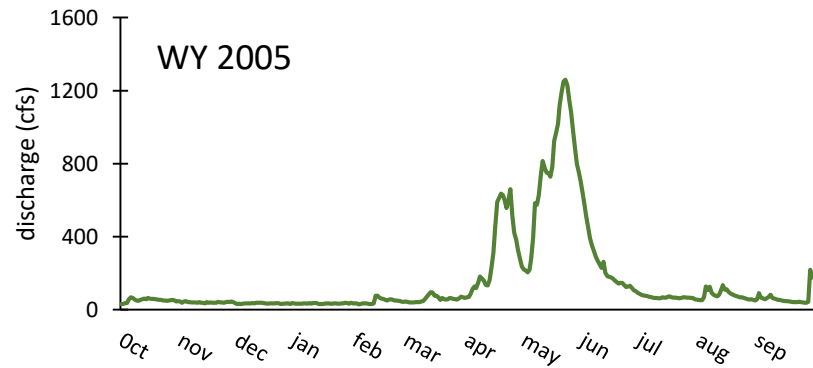
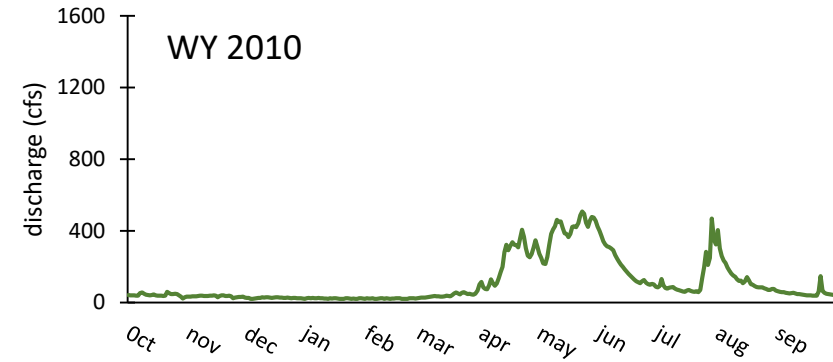
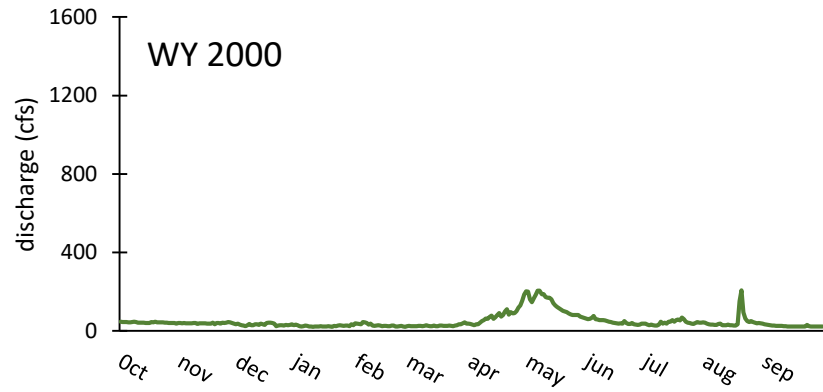
Yellow lady's slipper
Cypripedium parviflorum
Daniella Roth

Non-Perennial Waters, Wetlands, & Perennial Streams

- Upper Pecos watershed
 - 16 named water courses
 - 96 unnamed non-perennial water courses
 - 16 unnamed wetlands
- Ecological function
 - Biological
 - Physical
 - Chemical
- Interconnected
- Seasonal

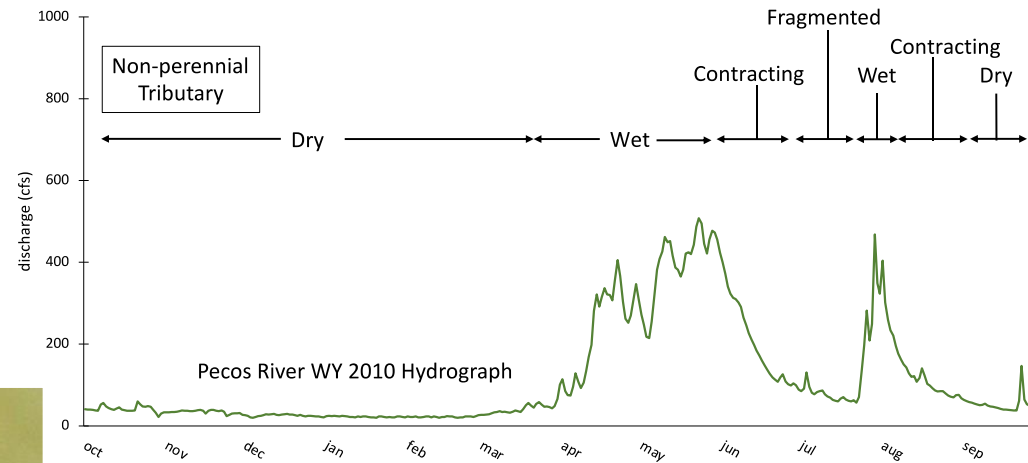


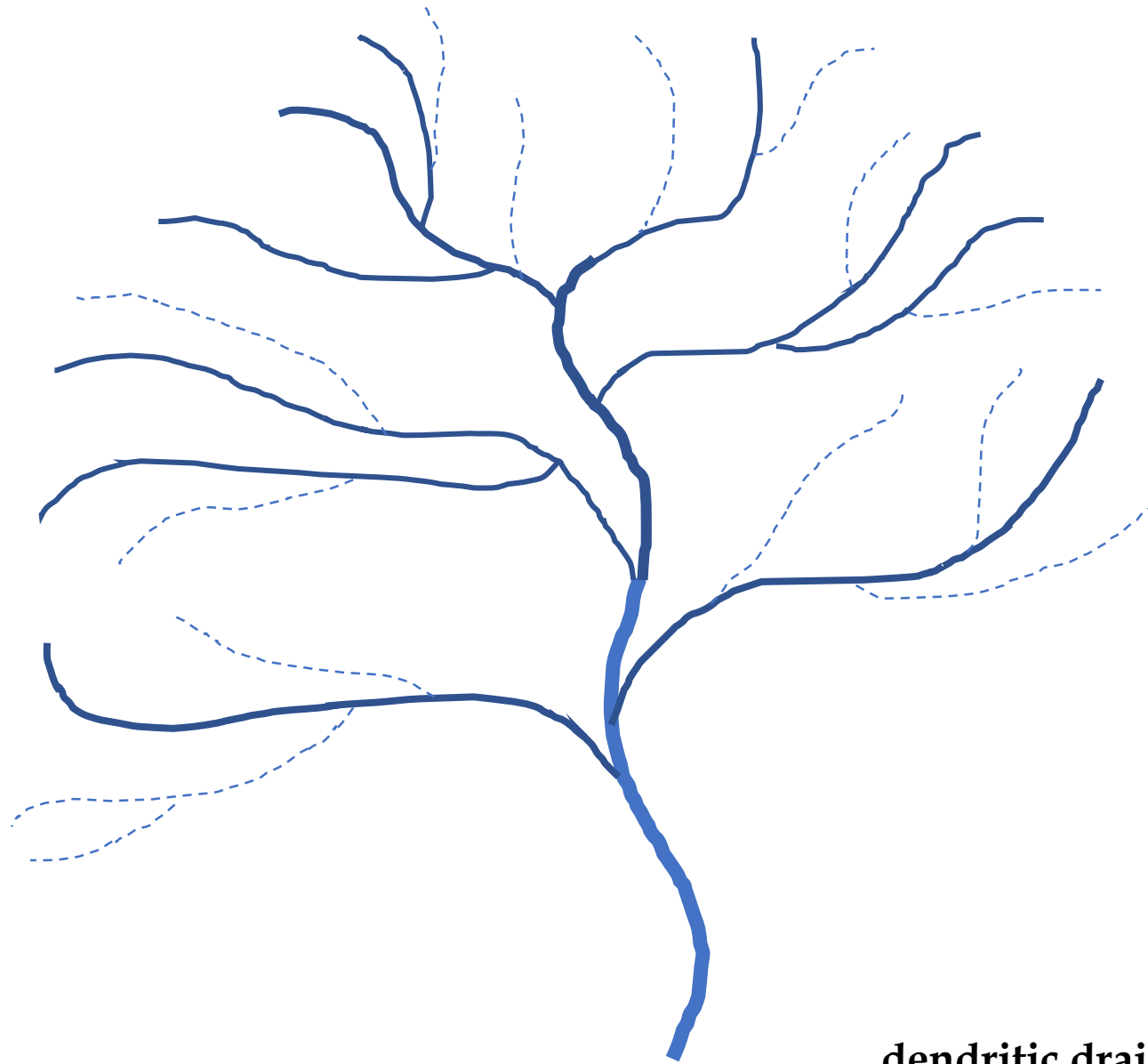
Non-Perennial Stream Courses



Annual Hydrological Cycle of Non-Perennial Stream

Hypothetical non-perennial water course hydrological cycle





dendritic drainage pattern

Spatial Dimensions

- 3 dimensions
- Bi-directional
- Temporal



Longitudinal

physical-channel incision
chemical-nutrient spiraling
biological-insect drift

Lateral

physical-point bar deposition
chemical-organic carbon exchanges
biological-insect dispersal

Vertical

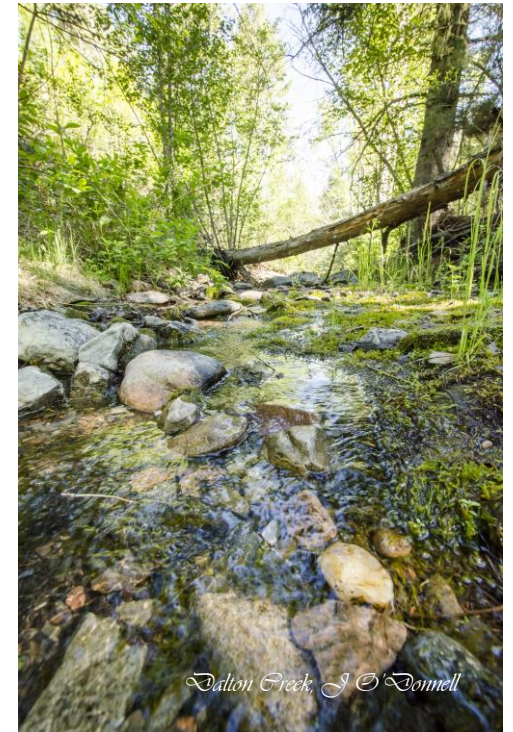
physical-up-welling groundwater
chemical-oxygenation of hyporheic by sfc water
biological-aquatic insect refuge

Non-Perennial Cycle



Dry

- -Terrestrial plants
- -Leaf litter
- -Subsurface microbial activity
- -Hyporheic refuge



Constriction & fragmentation

- Increased temperature variation
- Decreased dissolved oxygen
- Decomposition
- Insect movement (drift, aerial & overland)
- Diminished habitat



Wetting & wet

- Overland flow (snowmelt & rain)
- Connectivity
- Organic matter & nutrient import
- Increased microbial activity/decomposition
- Invertebrate processing
- Invertebrate reproduction
- Nutrient & organic transport

Wetlands



- 16 unnamed wetlands
- Hydrophilic plants
- Plant & wildlife diversity
- Flood protection
- Water reservoirs



Perennial & Non-Perennial Waters – Summary

- Dynamic & complex relationships
- Interdependence & connectivity
- Perennial waters health dependent on inputs from non-perennial waters
- Integrity of entire watershed
- Whole greater than sum of parts



- Ecosystem services
 - Provisioning
 - Freshwater
 - Food
 - Regulating
 - Water purification
 - Flood attenuation
 - Supporting
 - Nutrient cycling
 - Cultural
 - Spiritual
 - Recreational