Part 2. Restoring wetlands

- What is restoration?
- Project examples

What is restoration?

Ecological restoration is the process of assisting the recovery of a native ecosystem that has been degraded, damaged, or destroyed.

Society for Ecological Restoration
https://ser-rrc.org/what-is-ecological-restoration/

Ecological engineering is the design of sustainable ecosystems that integrate human society with its natural environment for the benefit of both.

American Ecological Engineering Society
https://www.ecoeng.org/

Everyone designs who devises courses of action aimed at changing existing situations into preferred ones.

– Herbert Simon

ECOLOGY

--the study of the relationship between organisms and their environment (Haeckel)

Ecosystem Design

Developing courses of action to change existing ecological conditions into preferred ones.

Ecological design charrettes

…are one way to bring diverse specialists & stakeholders together

The best ecological designs are usually the product of collaborative, multidisciplinary teams.

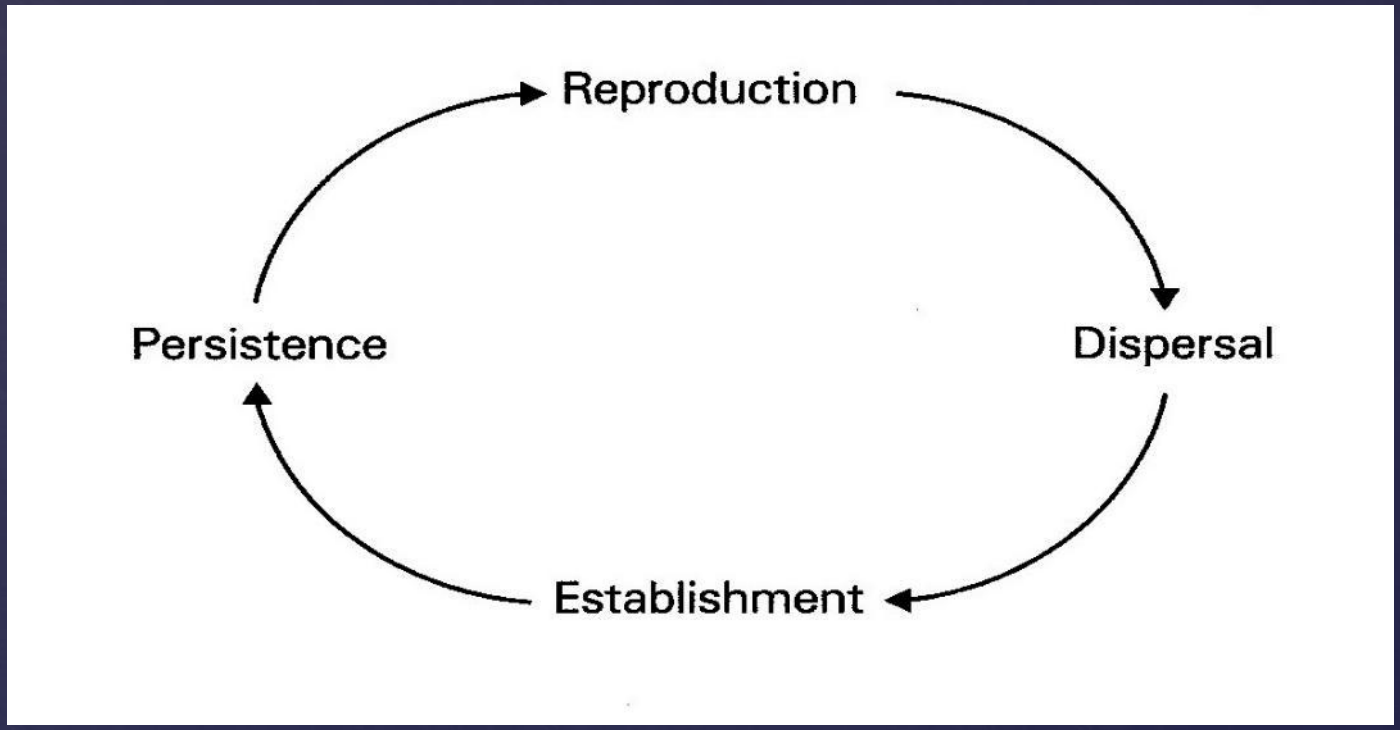
Processes produce patterns

- Physical processes
  - Climate (precipitation, insolation…), hydrology, geomorphology…
- Biological processes
  - Photosynthesis, respiration, reproduction…
- Ecological processes
  - Competition, predator-prey interactions, environmental gradients, life histories…

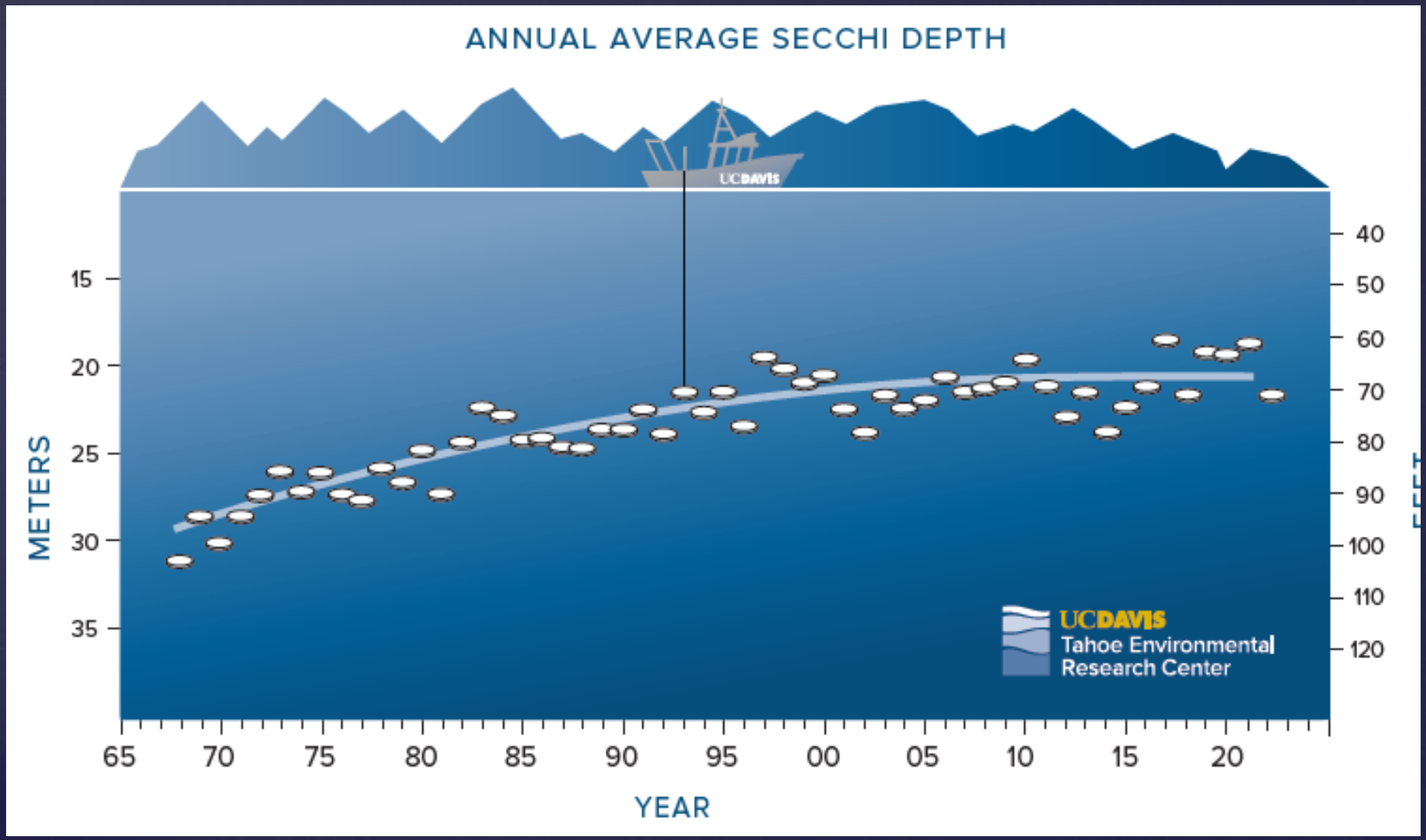
- Ecological restoration of a site is essentially a hypothesis about what the fundamental processes operating there are and how they have been disrupted.

- Interventions (that is, restoration actions) are designed to allow those processes to fully function once again.

Process: life histories




Upper Truckee River & Wetland Restoration
South Lake Tahoe, CA
Client: California Tahoe Conservancy


ANNUAL AVERAGE SECCHI DEPTH
UCDAVIS
METERS
15
20
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120
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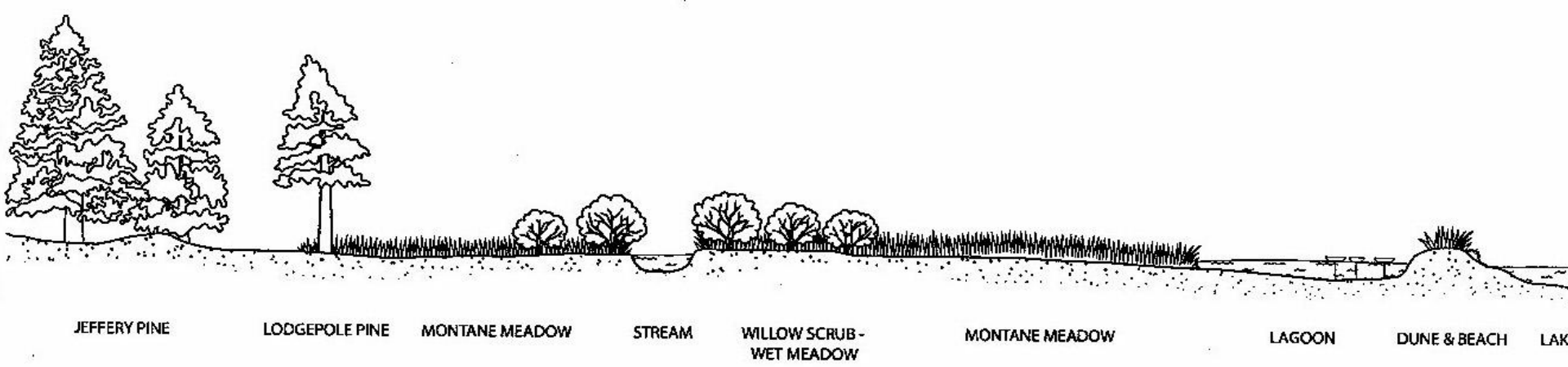
YEAR
UCDAVIS
Tahoe Environmental
Research Center

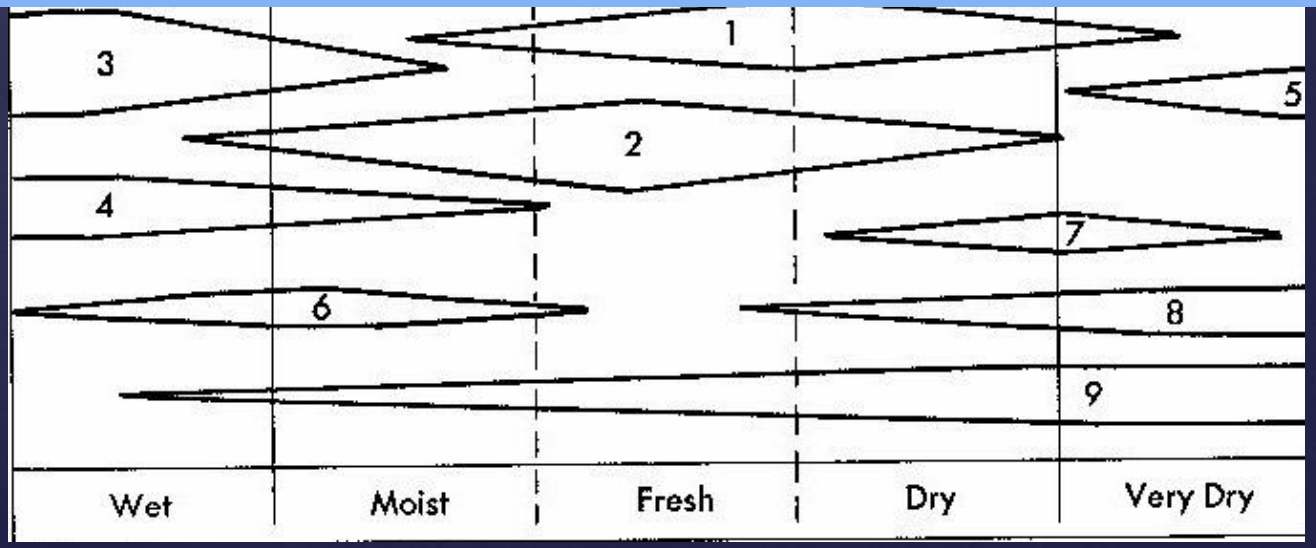
Upper Truckee River Marsh,
California Tahoe Conservancy,
Lake Tahoe, CA

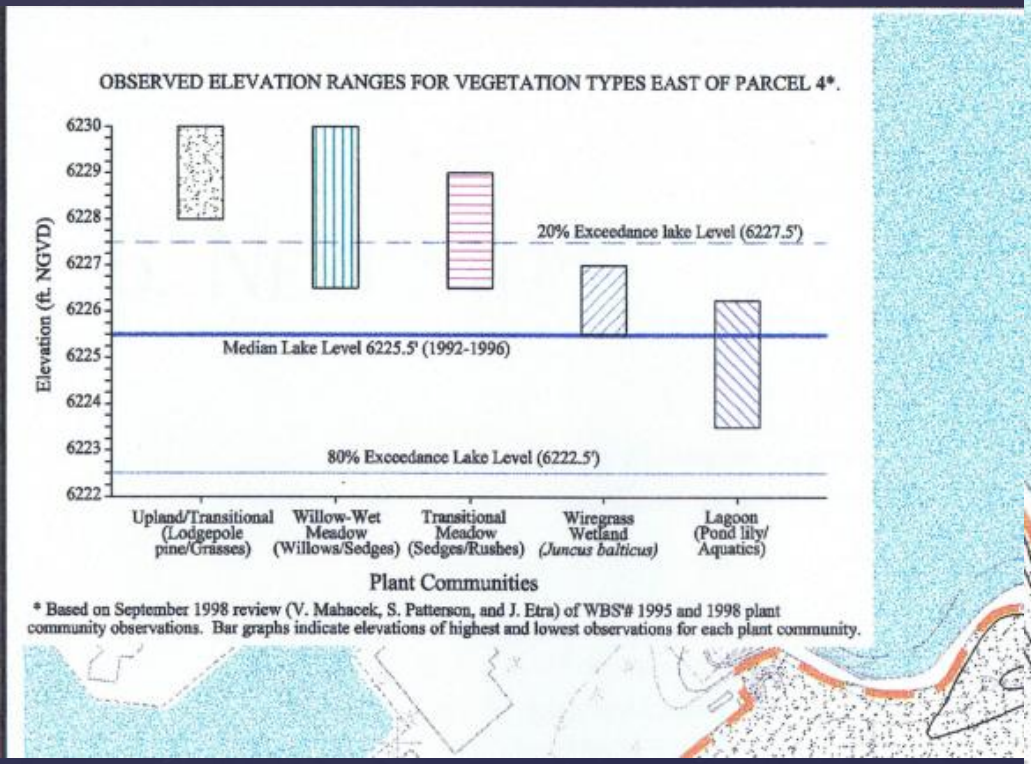
- Analyze the complex plant species distributions in adjacent reference system, especially in relation to elevation
- Excavate to reconnect river to floodplain and to recreate a similar range of surface elevations
- Provide a diverse set of plant propagules from multiple sources – seeds, container plants, native soil
- Allow to self-organize



Vegetation transect from upland to lake at the Upper Truckee Marsh.
Plant communities are distributed in relation to ground-surface elevation and water levels.

Process: plant species distributed individualistically along environmental gradients

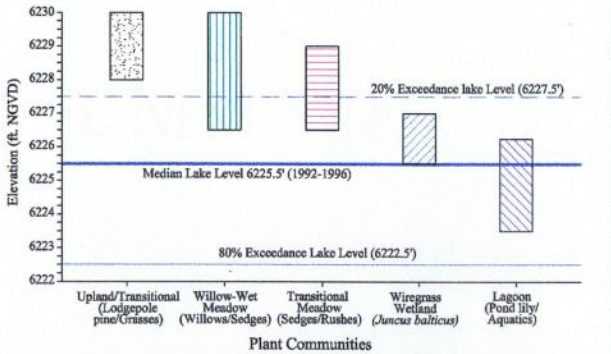




* Based on September 1998 review (V. Mahacek, S. Patterson, and J. Etra) of WBS'# 1995 and 1998 plant community observations. Bar graphs indicate elevations of highest and lowest observations for each plant community.

Table 1. Preliminary Restoration Plant Palette, Parcel 4 Fill Removal

	Target Plant Communities			
Species	**Upland** (6230'+ to 6228')	**Willow-Wet Meadow** (6230' to 6226.5')	**Transitional Meadow** (6229' to 6225.5')	**Wiregrass Wetland** (6227' to 6225.5)
Pinus contorta (lodgepole pine)	●			
Ribes lacustre (swamp current)	●			
Bromus carinatus (California brome)	●			
Deschampsia cespitosa (tufted hairgrass)	●			
Horedeum brachyantherum (meadow barley)	●			
Leymus tritocoides (creeping wild rye)	●			
Arnica chamissonis	●			
Potentilla gracilis (cinquefoil)	●			
Salix geyeriana (Geyer's willow)		●		
Salix lemmonii (Lemmon's willow)		●		
Salix lucida var. ***lasiandra*** (shining willow)		●		
Carex aquatilis (sedge)		●		
Carex athrostachya (sedge)		●		
Carex praegracilis(sedge)		●	●	
Carex nebrascensis (sedge)		●	●	
Carex utriculata (sedge)		●	●	
Juncus nevadensis (rush)			●	
Juncus ensifolius (rush)			●	
Eleocharis macrostachya (spikerush)			●	
Juncus balticus (wiregrass [rush])			●	●



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SAILING LAGOON

TAHOE KEYS MARINA

70+00 75+00 80+00 85+00 90+00 95+00

LEGEND

MAP SYMBOL	VEGETATION TYPE	ELEVATION RANGE	AREA (ACRES)
	UPLAND	6230' and above	11.6
	UPLAND, WILLOW–WET MEADOW	6230' TO 6229'	0.6
	UPLAND, WILLOW–WET MEADOW, TRANSITIONAL MEADOW	6229' TO 6228'	0.7
	WILLOW–WET MEADOW, TRANSITIONAL MEADOW	6228' TO 6227'	2.3
	WILLOW–WET MEADOW, TRANSITIONAL MEADOW, WIREGRASS WETLAND	6227' TO 6226.5'	3.7
	WIREGRASS WETLAND	6226.5' TO 6226.25'	1.7
	WIREGRASS WETLAND, LAGOON	6226.25' TO 6225.5'	2.2
	TOTAL WETLAND RESTORATION ACRES		11.2*
	TOTAL PROJECT ACRES		22.8

*INCLUDES 2.4 ACRES THAT WILL BE DISTURBED WHEN THE RESERVIE FILL IS REMOVED

PROPOSED PROJECT CONTOURS (APPROXIMATE)

EXISTING GROUND CONTOUR

MEDIAN LAKE LEVEL (6225.5')

PROJECT BOUNDRY

RIVER ALIGNMENT AND STATION LOCATION

80+00 RIVER STATION APPROX. FEET DOWNSTREAM FROM HWY 50 BRIDGE

DATUM: NGVD

2nd year, total vegetated cover 73.2%

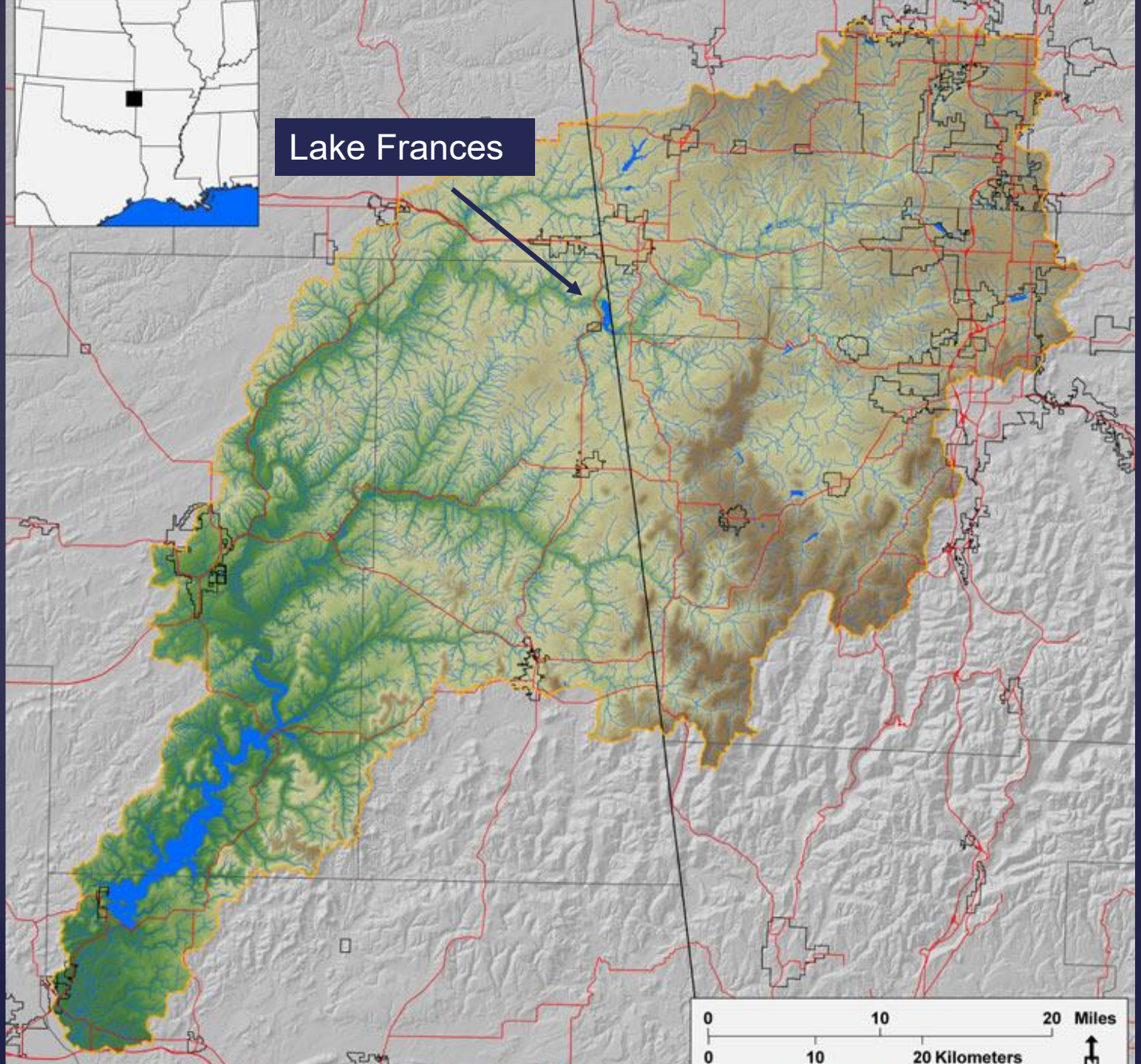
- 29 species encountered
- 8 were included in plugs or seed mix

Marsh

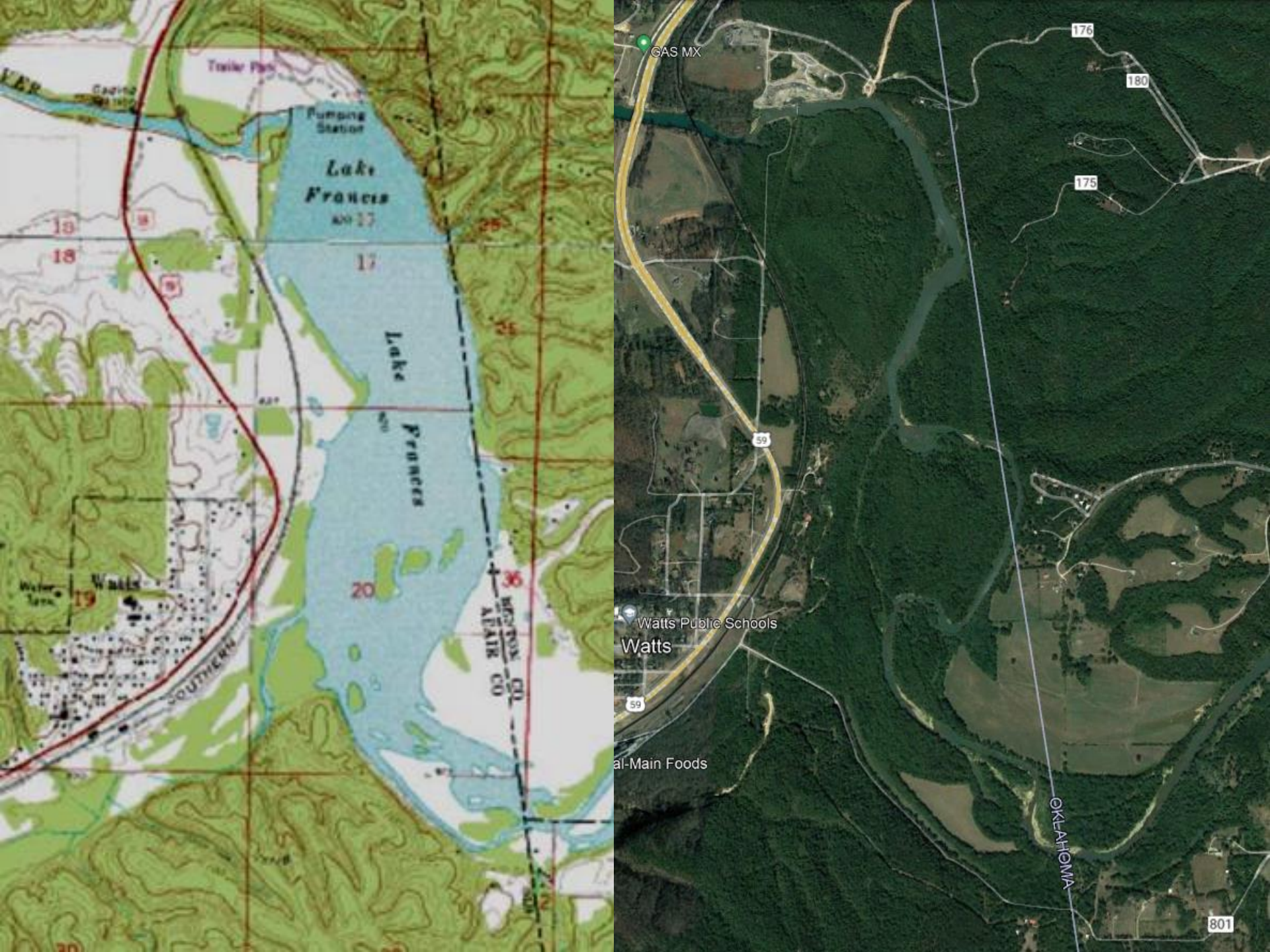
Eufaula Wetland Park
Eufaula, OK

Eufaula Wetland Park is 0.2 mile from Lake Eufaula. A multifunction wetland—water quality, wildlife, recreation, education--Eufaula Wetland Park treats urban stormwater runoff from downtown Eufaula before it reaches the lake

Lake Frances

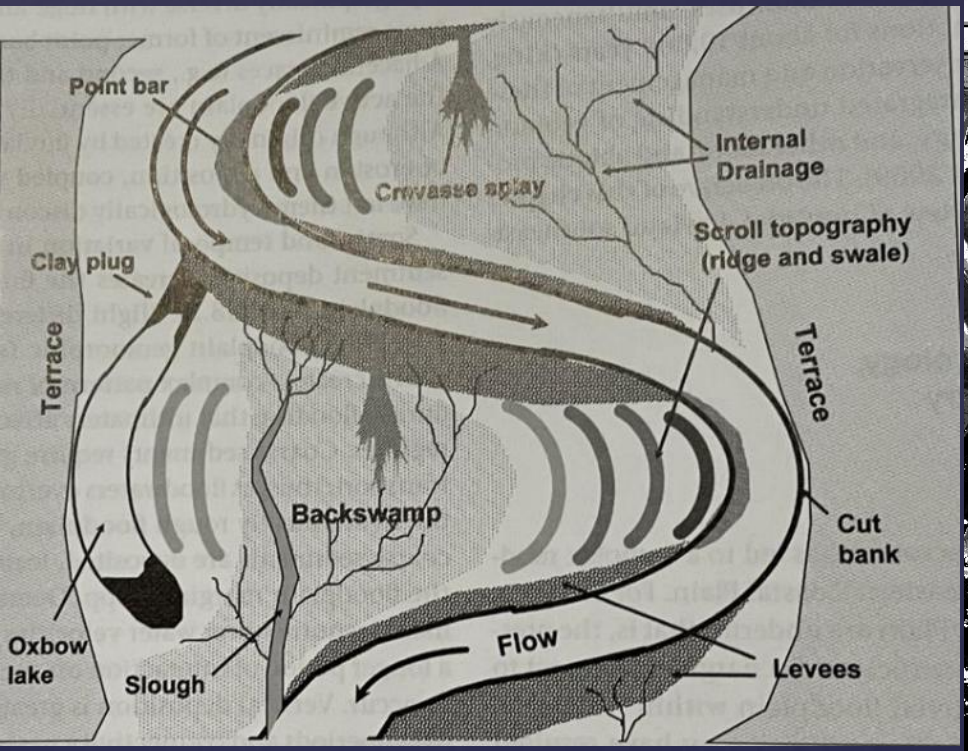

Lake Frances
0
10
20 Miles
0
10
20 Kilometers

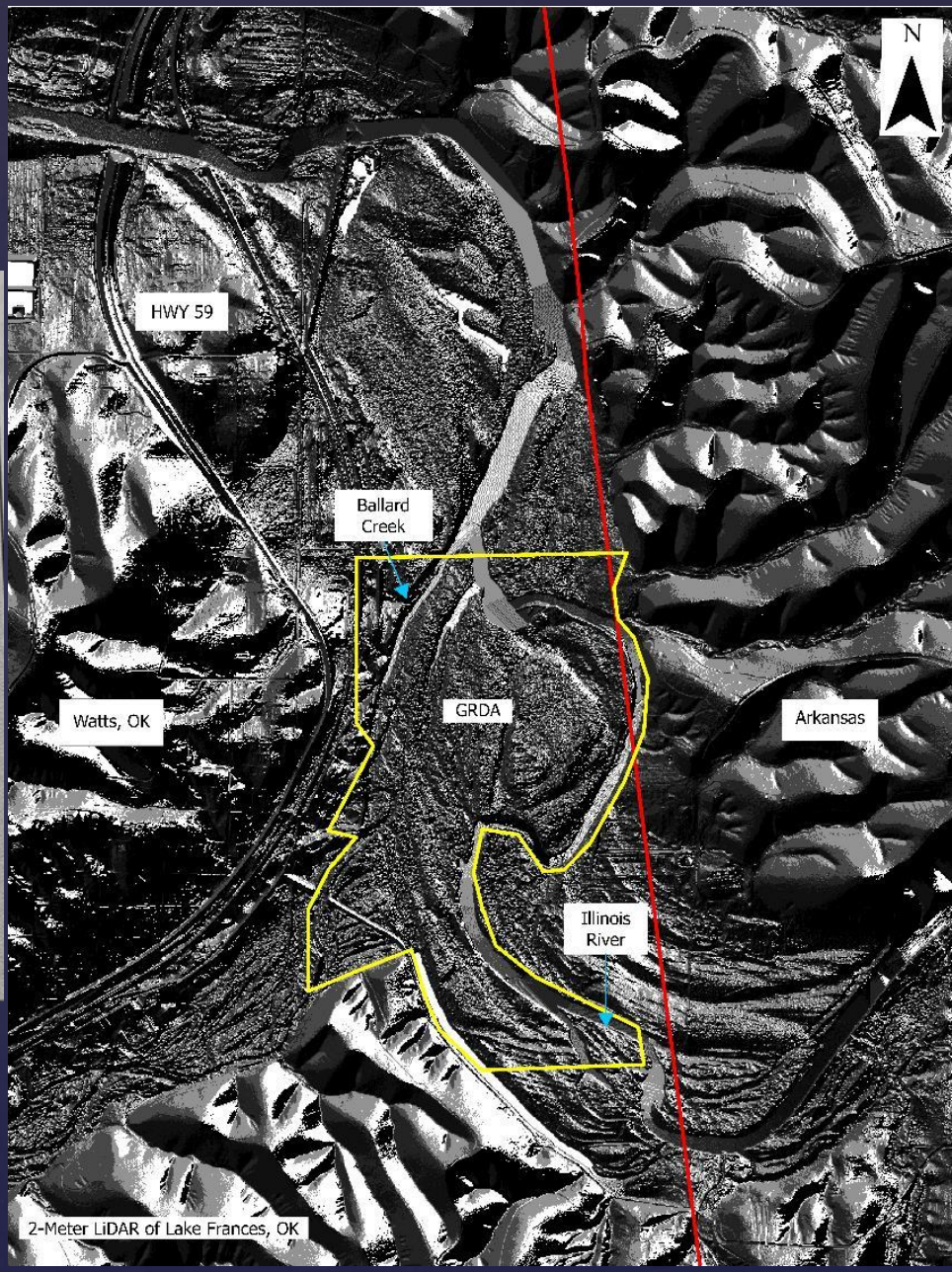

WOKA
Lake Frances Preserve NWA Land Trust
Lake Frances Wetlands Center
GRAND RIVER DAM AUTHORITY
GRAND RIVER DAM AUTHORITY
Frances Dam
NORTHWEST ARKANSAS LAND TRUST
N4740
59
GRAND RIVER DAM AUTHORITY
Watts
(Private)
BAILEY GARY B.
CITY OF SILOAM SPRINGS
mapbox

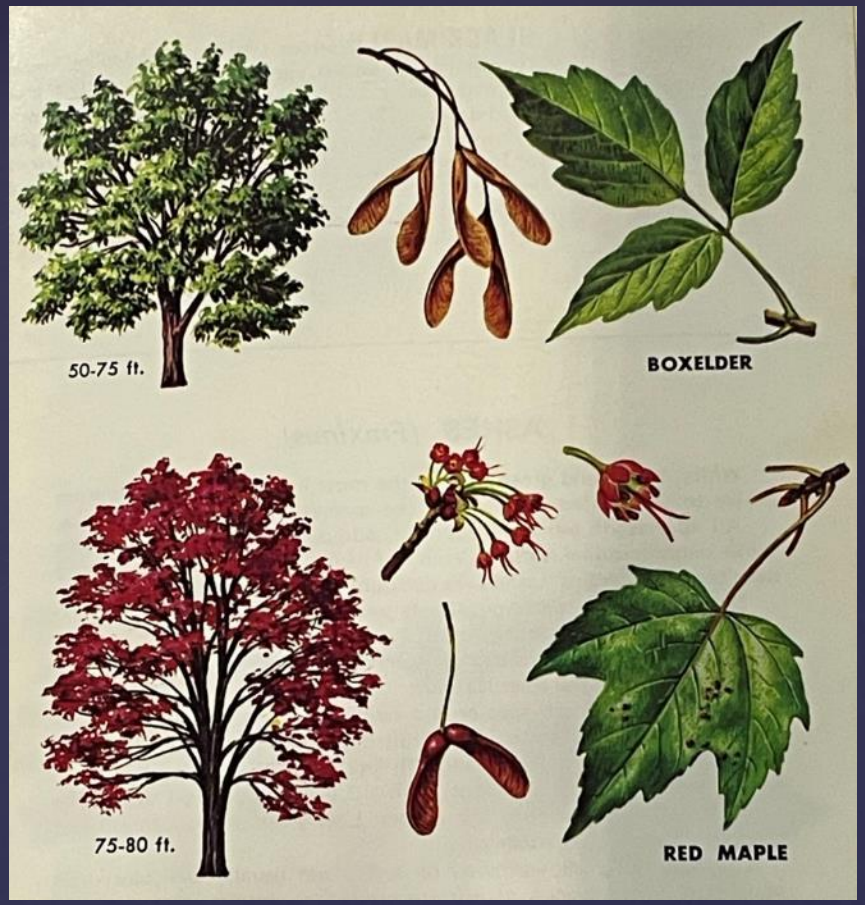

Lake Frances
Lake Frances
Pumping Station
Trailer Park
Watts
Water Tank
SOUTHERN
MIDDLE OKLA AIR CO
GAS MX
Watts Public Schools
Watts
al-Main Foods
OKLAHOMA
176
180
175
59
59
801

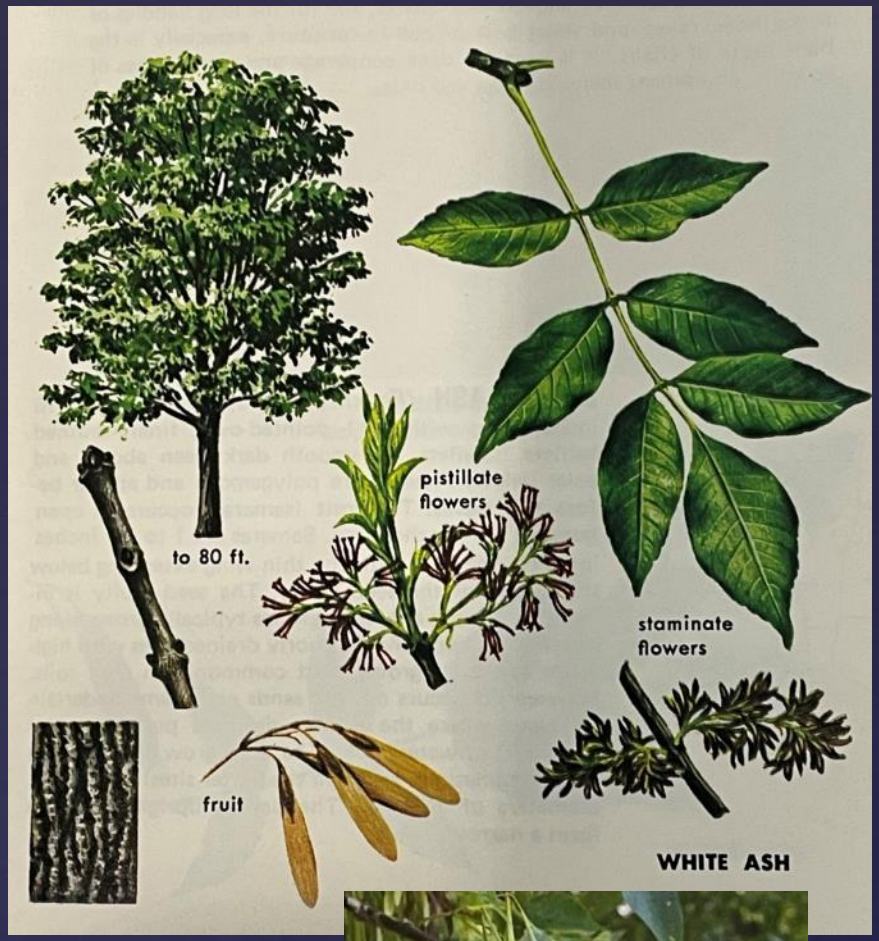

Lake Frances, Early 1970s

Vegetation today at Lake Frances is young, early successional bottomland hardwood forest


Point bar
Crevasse splay
Internal Drainage
Scroll topography (ridge and swale)
Clay plug
Terrace
Terrace
Backswamp
Cut bank
Oxbow lake
Slough
Flow
Levees


N
HWY 59
Ballard Creek
Watts, OK
GRDA
Arkansas
Illinois River
2-Meter LiDAR of Lake Frances, OK


50-75 ft.
BOXELDER
75-80 ft.
RED MAPLE


to 80 ft.
pistillate flowers
staminate flowers
fruit
WHITE ASH


young trunk
old trunk
SILVER MAPLE

Green ash

Red maple

Jim McCormack for the Columbus Dispatch

Black walnut, *Juglans nigra*

American Crow.

CORVUS AMERICANUS.

Male.

Black Walnut. Juglans nigra.

Top of the Rocky Mountains, Nov.

With Fewer Animals to Move Their Seeds, Plants Are Stuck in Threatened Habitats

For many types of vegetation, the only way to migrate to a more favorable range is through the guts of mammals and birds

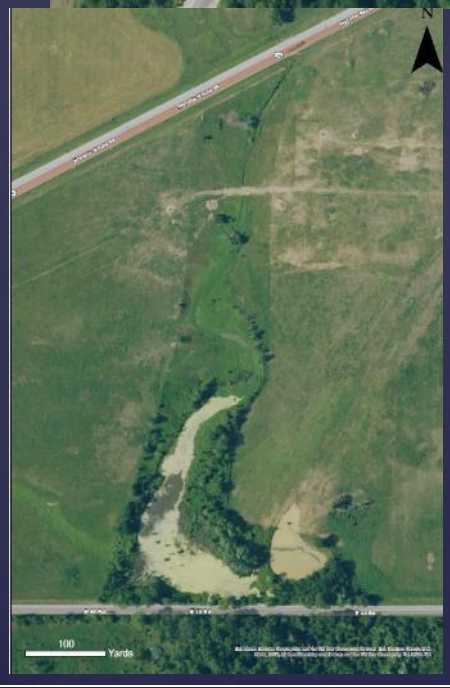
Smithsonian Magazine, 2022

Characteristics of old growth bottomland hardwood forest

- Snags
- Treefalls
  - Decaying wood host insects, which attracts birds to feed on them
  - Large, hollow trees become nest habitat
  - Treefalls open up microhabitats to light & create microtopograpy, diversifying plant species on the forest floor

Pileated woodpecker
(Dryocopus pileatus)

Catholic 40



Charrette Project Sites

Beaver Creek North

Smelter

Questions?