

The background of the slide is a photograph of a wide river with a large, flat, sandy or silty floodplain extending to the right. The river water is calm and reflects the sky and the dense green trees lining the left bank. The sky is blue with some light clouds. The title text is overlaid in the upper half of the image.

Sabine River Floodplain Assessment

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Floodplain Ecology

- Classified as wetland
(Cowardin et al 1979)
- Ecosystem functions
- Several tree species depend on flooding
(Anderson and Mitsch 2008, Anderson 2008)
- Elevation differences affects composition
(Almquist 2002, Elderd 2003)



Floodplain ecology



- Flooding duration affects nutrient and sediment deposition, plant primary productivity, community composition (Wharton et al 1982, Cronk and Fennessy 2001)
- Timing and duration of hydroperiod is critical (Battaglia 2006, Nilsson 1991)

Dam Effects



- Alter hydrology and geomorphology downstream (Dixon 2006)
- Affect vegetative communities and wildlife habitat (Merritt et al 2010)
- Toledo Bend impoundment began in 1966

Research Questions

Has Toledo Bend Dam reduced flooding downstream?

- We hypothesized that flooding has been reduced and the floodplain inundated less.



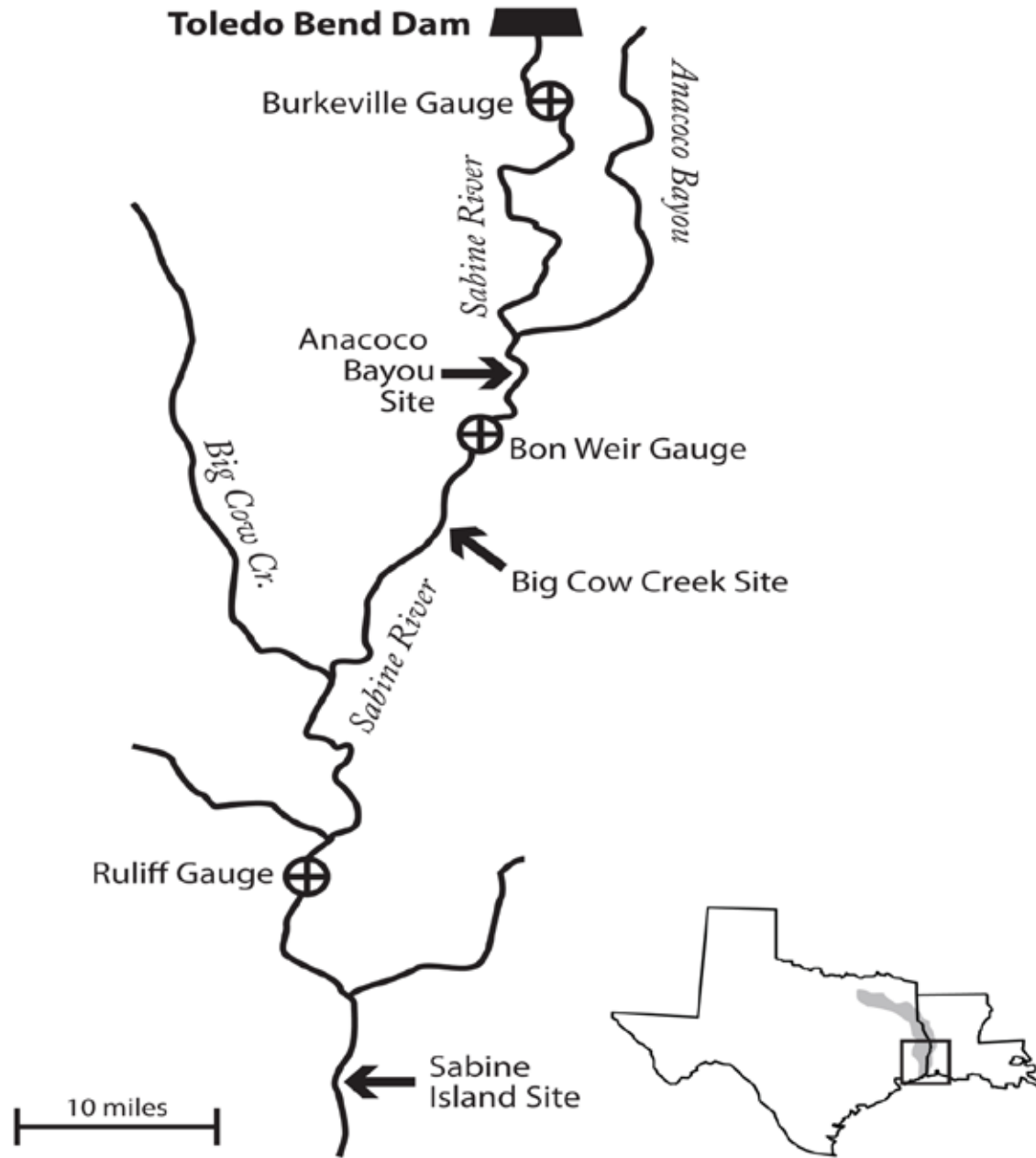
What is the condition of Sabine River floodplain vegetative communities?

- We expected to see the frequency and dominance of wetland species to be less than 50%.

Site Selection

- Within 500m of river
- 60 years since last cut
- Topographic plots
 - Levee, Mid-floodplains, and Sloughs
- 3 plots of 10m x 10m for each plot group
- No historical data





Classification

Method: Standard Deviation

Classes: 9 Interval Size: 1/2 Std Dev

Data Exclusion

Exclusion ...

Sampling ...

Classification Statistics

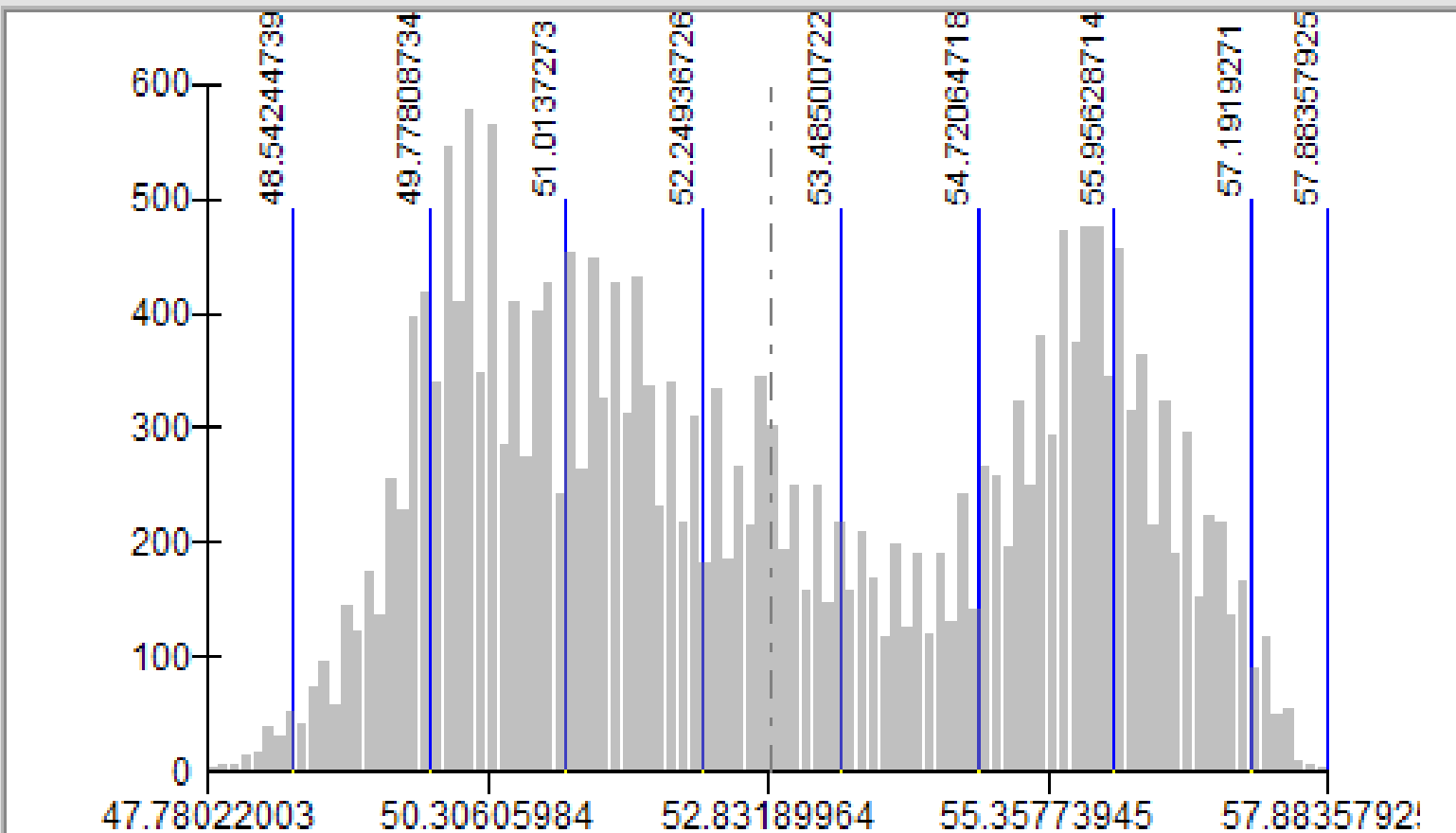
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Columns: 100

100

Show Std. Dev.

Show Mean



Break Values

%

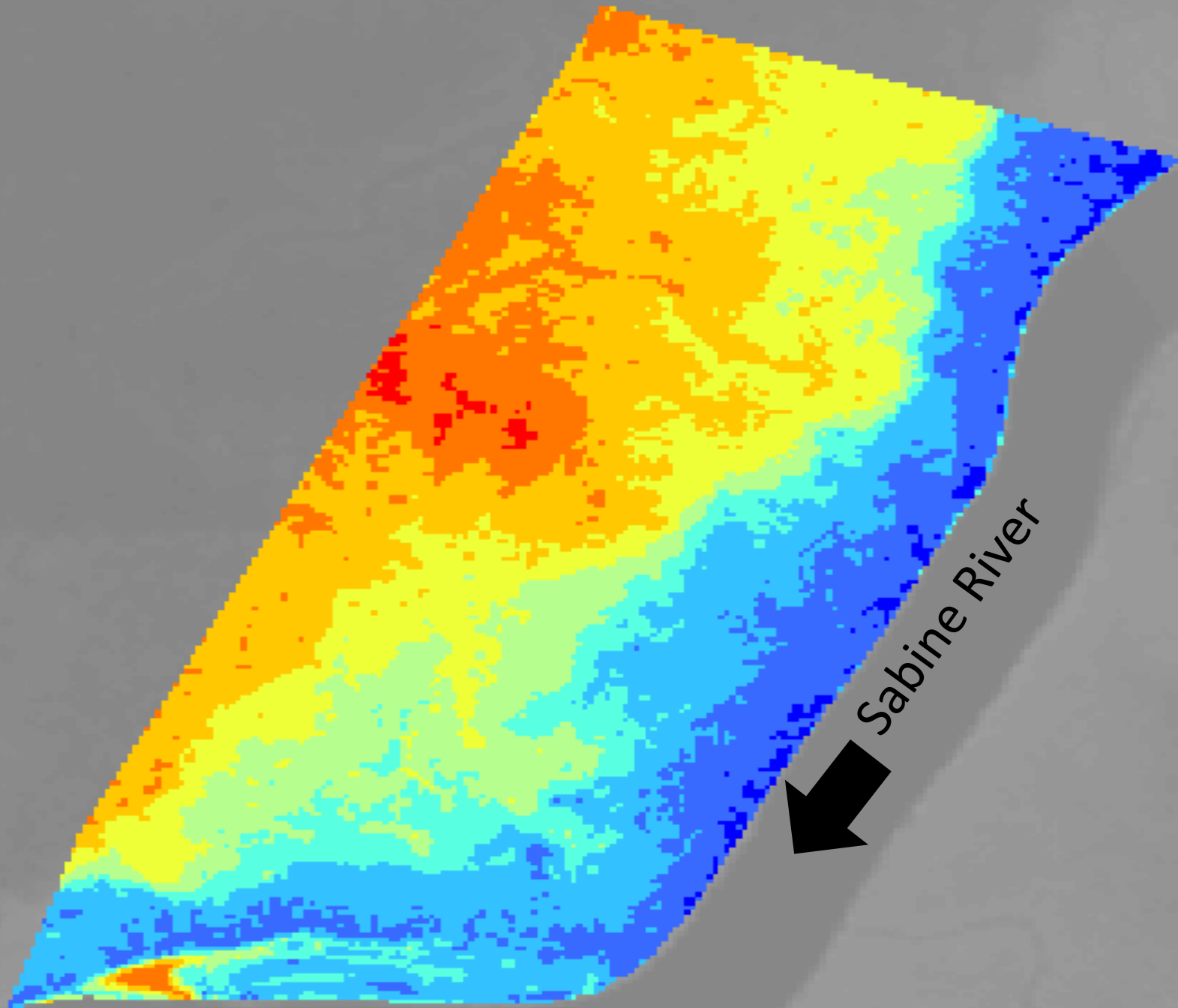
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 52.24936726
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 57.1919271
 57.88357925



OK

Cancel

Span breaks to data values



Sabine River

Site Description and Analysis

- Anacoco Bayou and Big Cow Creek
 - In convergent, tributary zone (Phillips, 2008)
 - Relative elevation ranges of 284 cm and 258 cm
 - 79 and 103 km downstream of dam
- Sabine Island
 - In divergent, distributary zone
 - Relative elevation range of 74 cm
 - 204 km downstream of dam
- Examined frequency, richness, dominance of sites and wetland indicator groups

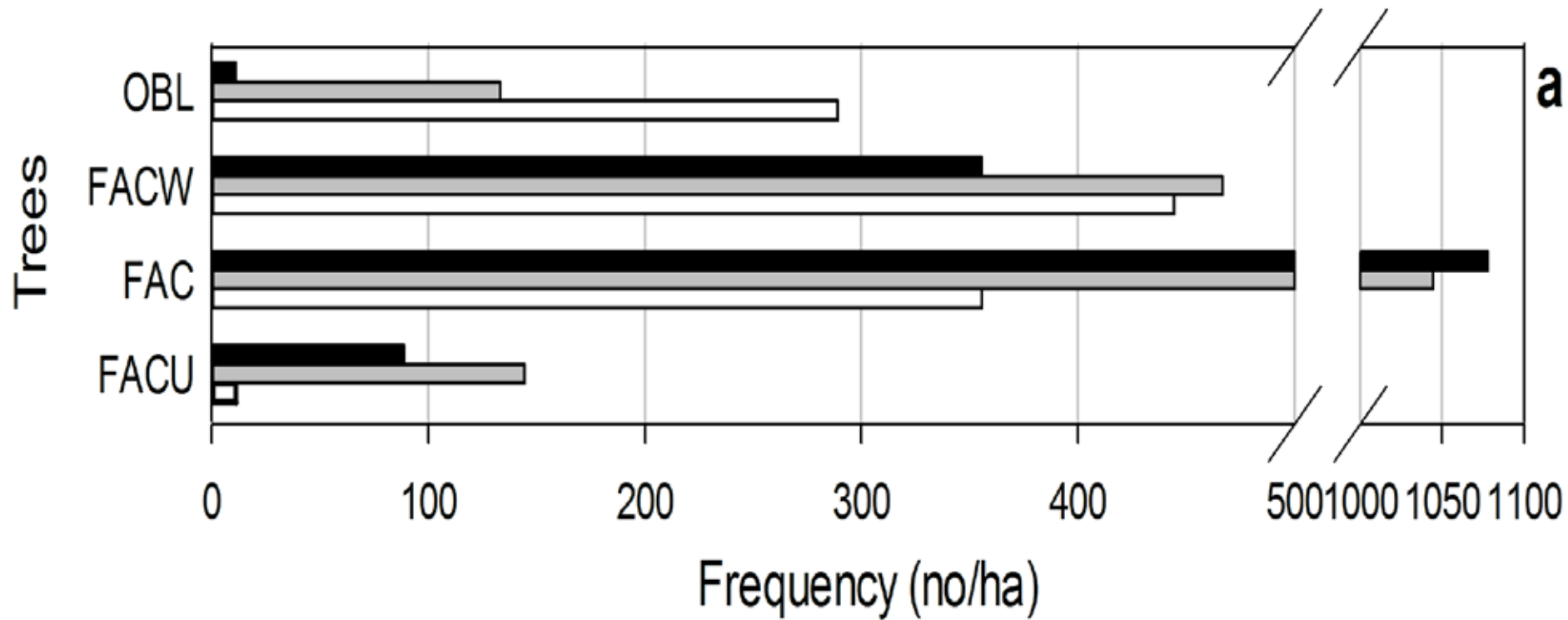
Wetland Indicators

Indicator	Wetland Occurrence
Obligate (OBL)	>99%
Facultative Wetland (FACW)	66-99%
Facultative (FAC)	33-66%
Facultative Upland (FACU)	1-33%
Upland (UPL)	<1%

"+" indicates species leans towards wetland

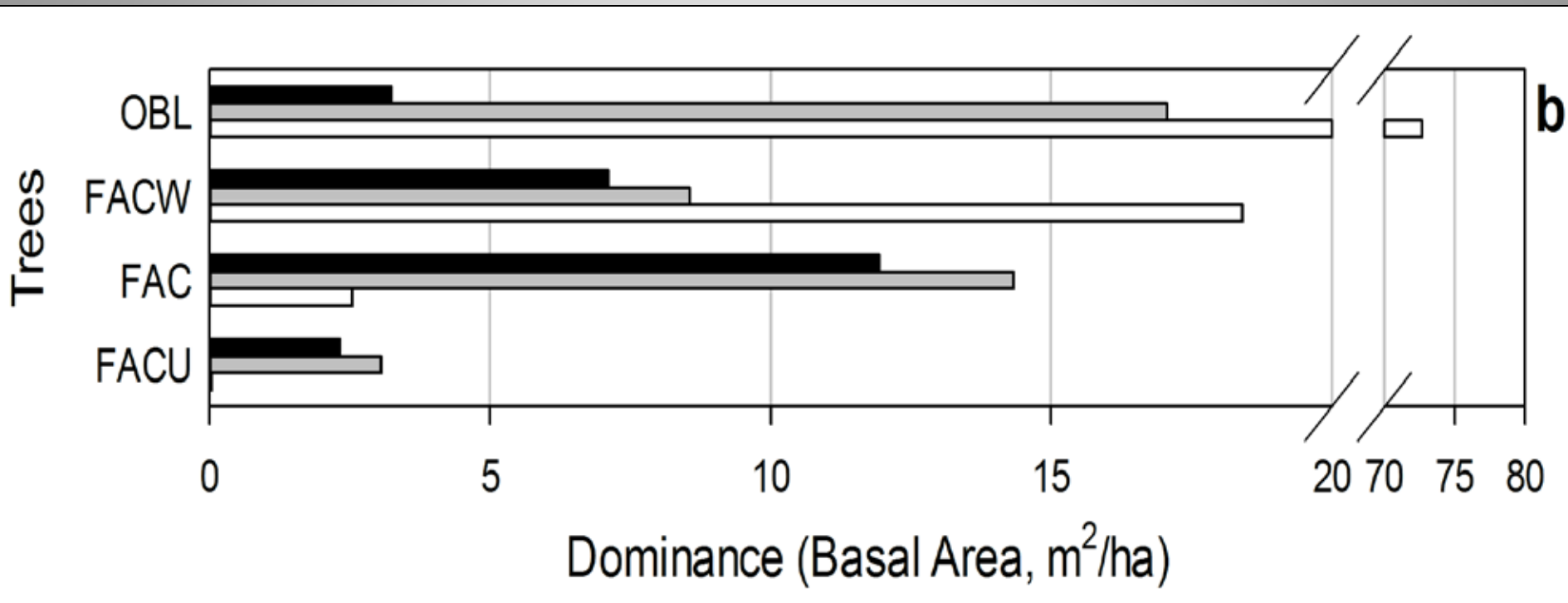
"-" indicates species leans towards uplands

Frequency by Plot Type



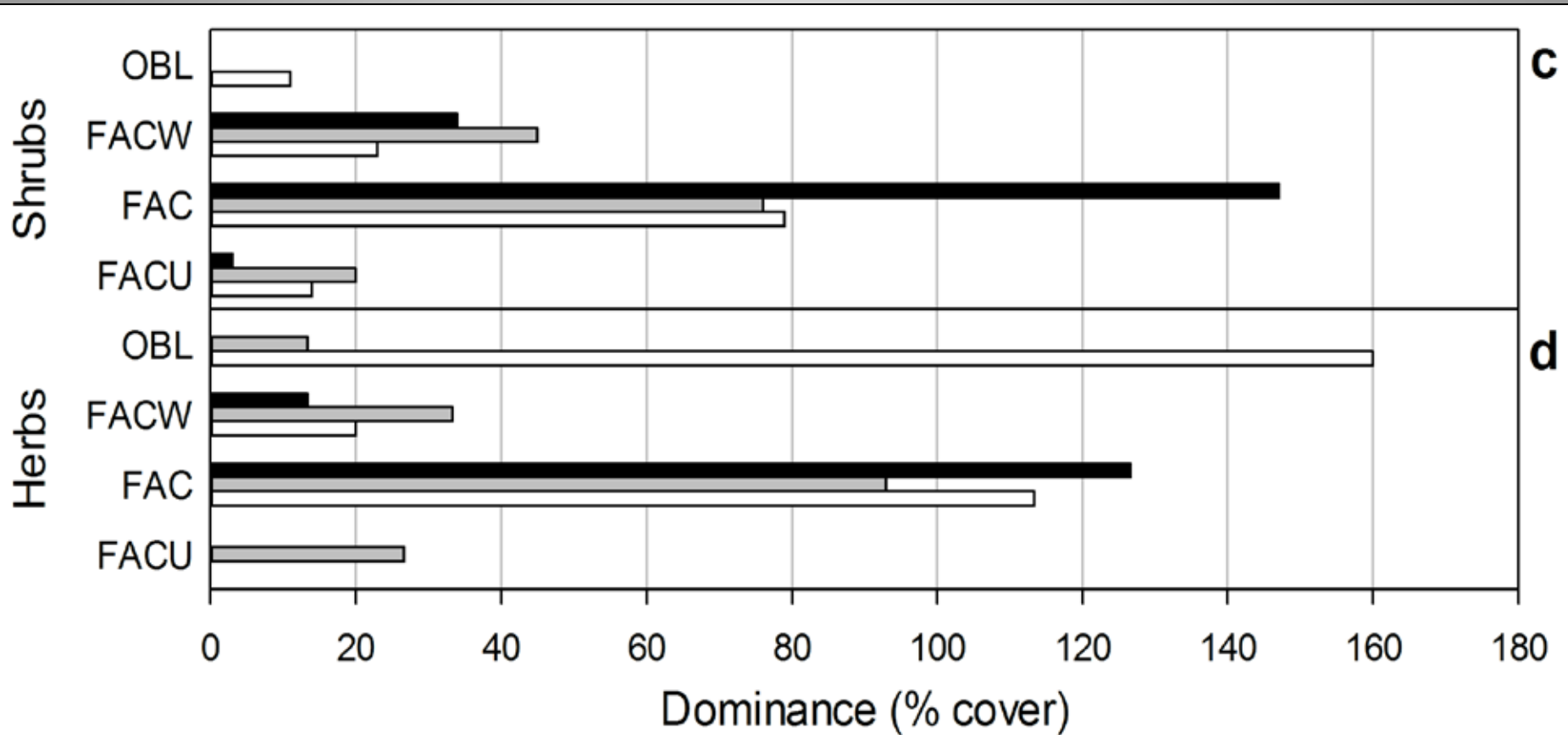
Black – Levees; Grey – Mid-floodplains;
White – Sloughs

Dominance by Plot Type



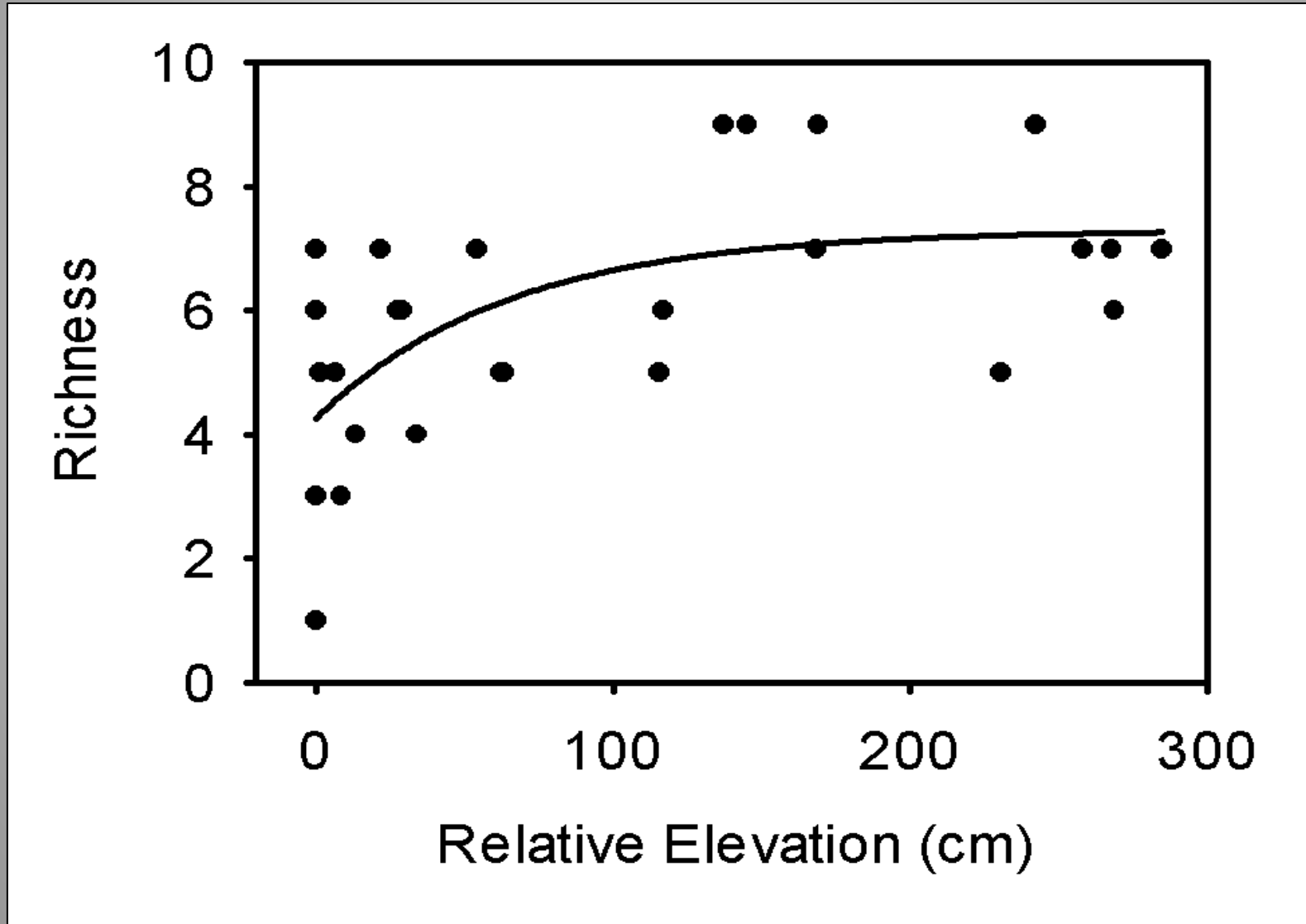
Black – Levees; Grey – Mid-floodplains;
White – Sloughs

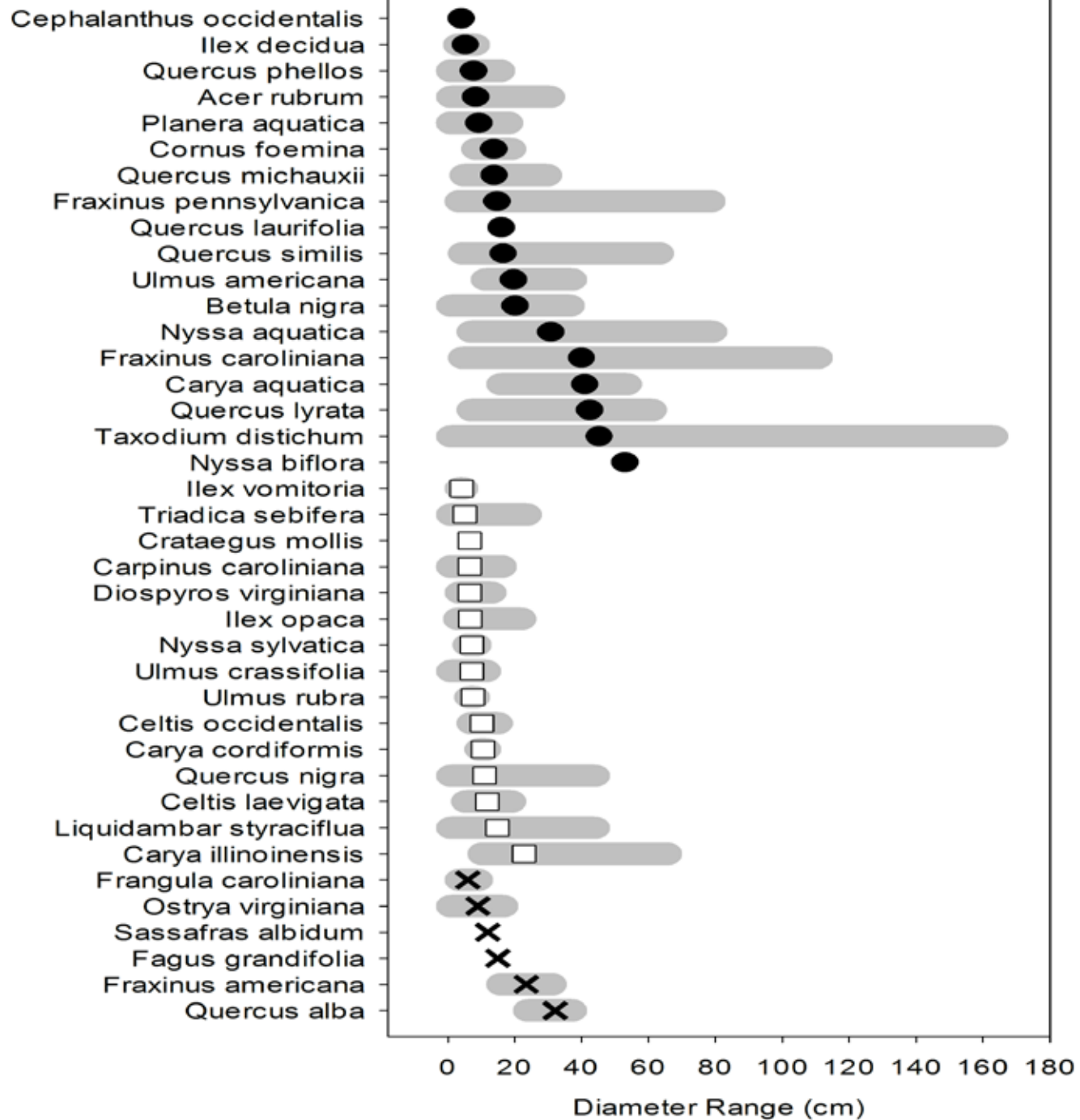
Shrub and Herb Dominance



Black – Levees; Grey – Mid-floodplains;
White – Sloughs

Greater richness at higher relative elevations (Hughes 1997) and farther downstream





Hydrological Analysis

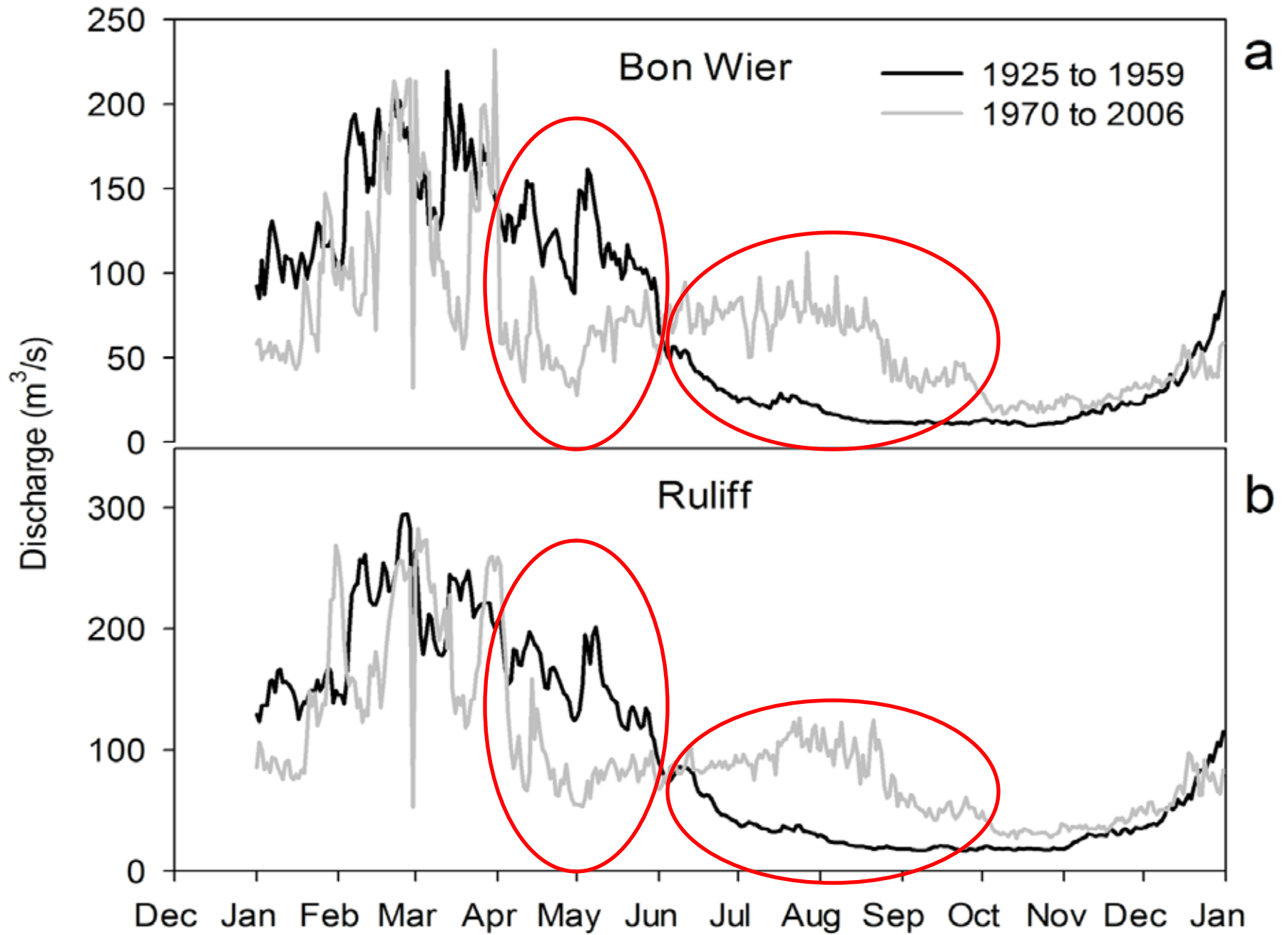
- Data taken from USGS gauges
- Examined flood frequency, duration, total discharge, peak discharge, and timing in 5-year periods
- Examined inundation of floodplain around gauges
- No evidence of differences in precipitation between periods

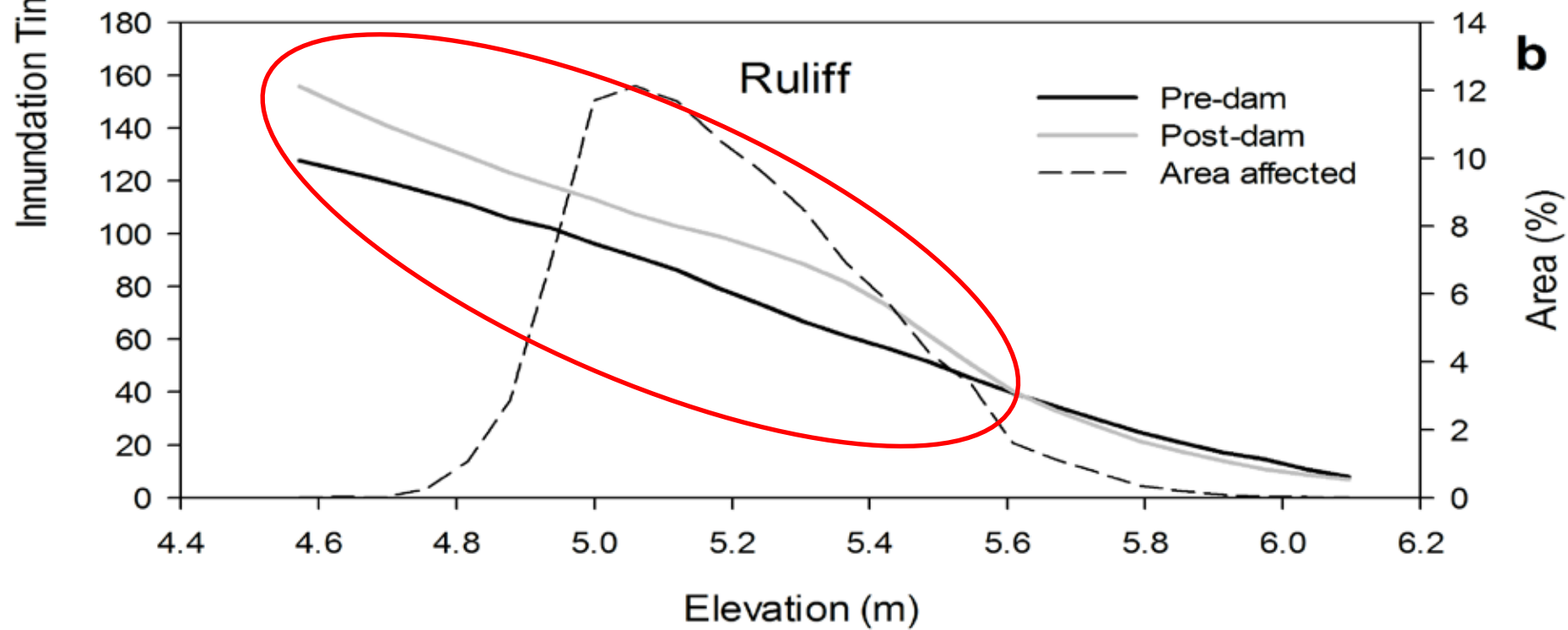
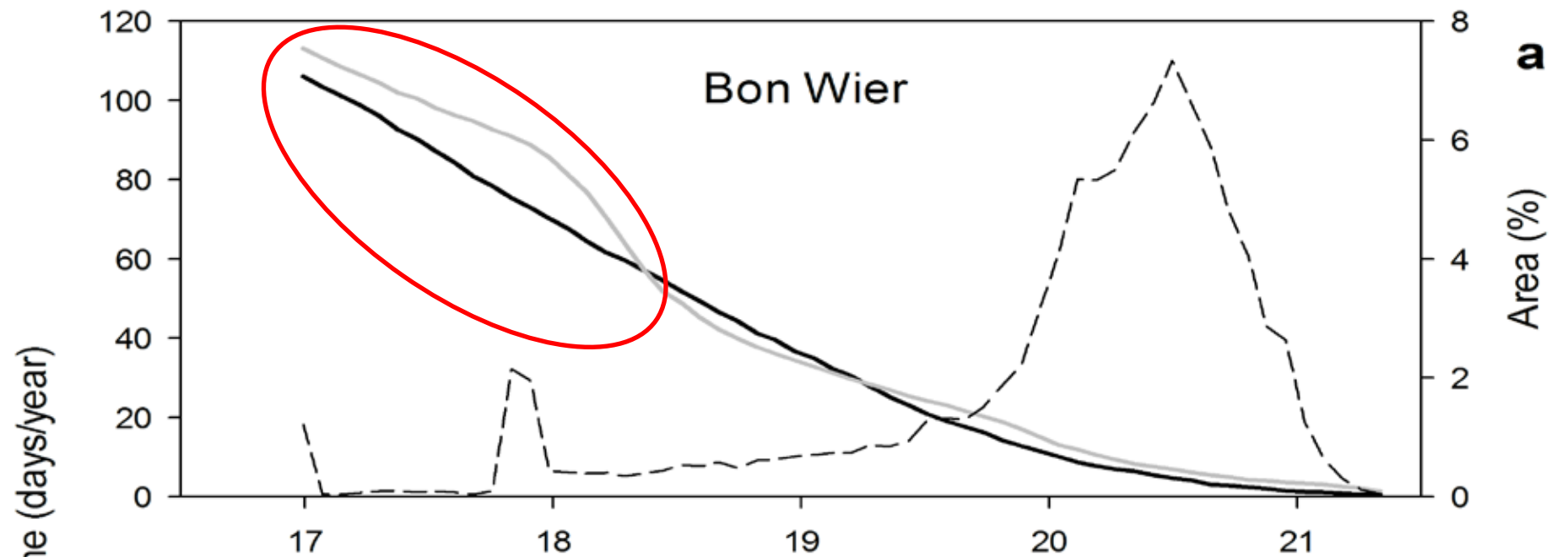
Hydrological Analysis

- ~~Burkeville (1955) – 991 m³/s or 35,000 f³/s~~
– 24 km downstream
- Bon Wier (1923) – 779 m³/s or 26,000 f³/s
– 90 km downstream
- Ruliff (1924) – 377 m³/s or 13,000 f³/s
– 180 km downstream

Hydrological Results

- Bon Wier
 - Total flood discharge *reduced 49%* in post-dam period from $398.7 \pm 173.5 \text{ m}^3$ to $195.4 \pm 51.1 \text{ m}^3$ per flood event ($p < 0.05$)
 - Duration *decreased 49%* in post-dam period from 13.6 ± 5.0 days to 6.7 ± 1.6 days ($p < 0.01$)
 - No difference in frequency or peak discharge
- Ruliff experienced no changes between periods





Conclusions

- OBL and FACW species dominate the slough areas of all sites, FAC and FACU species are more common on higher elevations.
- OBL species tended toward larger size classes which may indicate reduced recruitment post-dam construction.
- Species composition was highly sensitive to elevation, which *MAY* indicate changes since dam construction. More analysis needed.

Conclusions

- Bon Wier experienced reductions in total flood discharge and duration; no change in peak discharge or frequency
- No change at Ruliff 180 km downstream
- Increased base flows and inundation of lower elevations
- Related to management of reservoir for hydropower?

Conclusions

- Has Toledo Bend Dam altered hydrology downstream sufficiently to affect the plant composition in the floodplains?
- Maybe...
- Maybe not!

Future Needs

- Method for evaluating floodplain vegetative communities on other rivers lacking historical vegetation data.
- Inundation mapping
- Vegetation-flow response guilds (Merritt et al., 2010)