Habitat Associations of Riparian Birds in Successional Forests along the Missouri River

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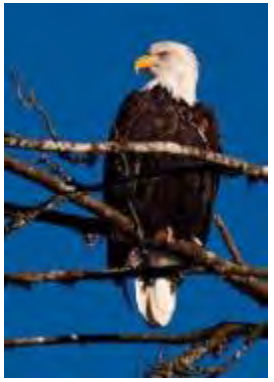
Photo by Tim Cowman

Riparian Cottonwood Forests are Biodiversity Hotspots

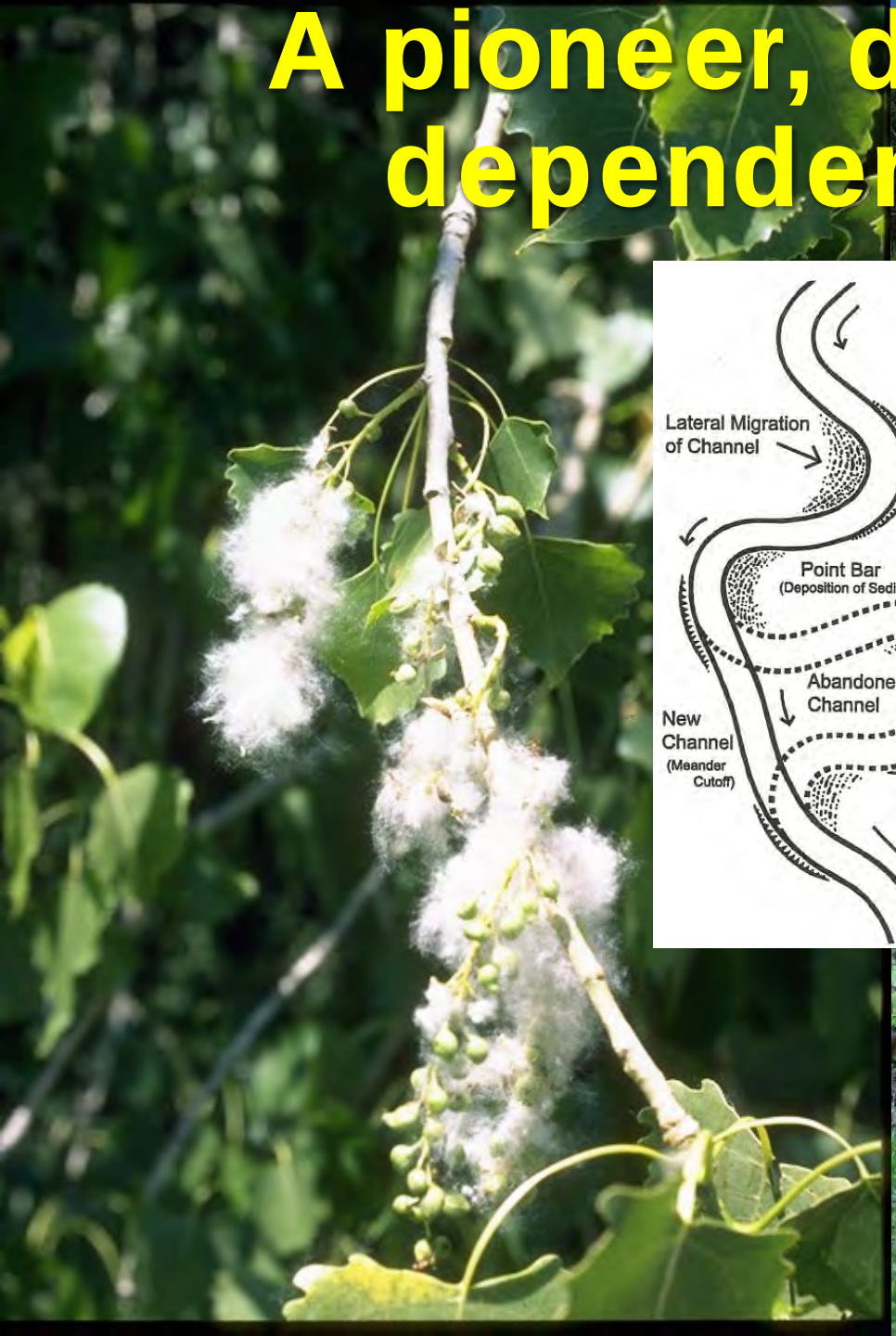
- **One of most biodiverse habitats in Great Plains region (Finch and Ruggiero 1993)**
- **High diversity of nesting landbirds**
- **Migratory bird stop-over habitat**
- **Bald Eagle nesting, roosting habitat**
- **Other woodland species**
  - E.g., Northern long-eared bat
    - Summer roosts, foraging in mature/old forests





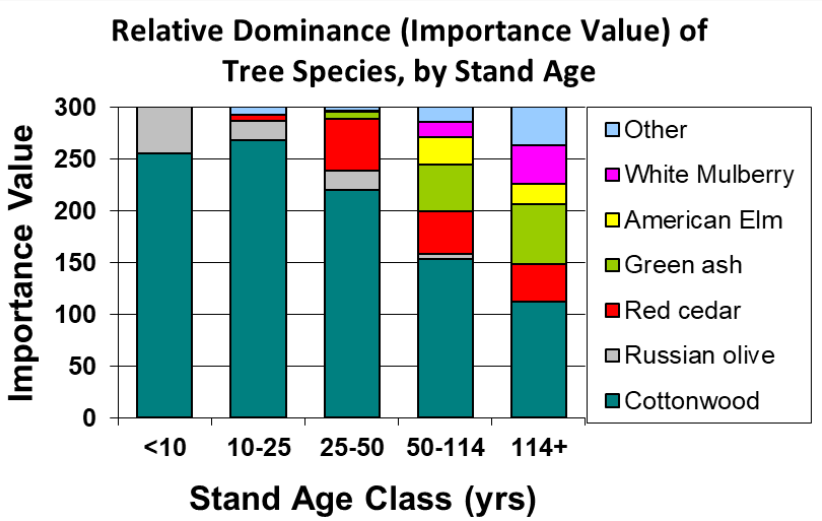


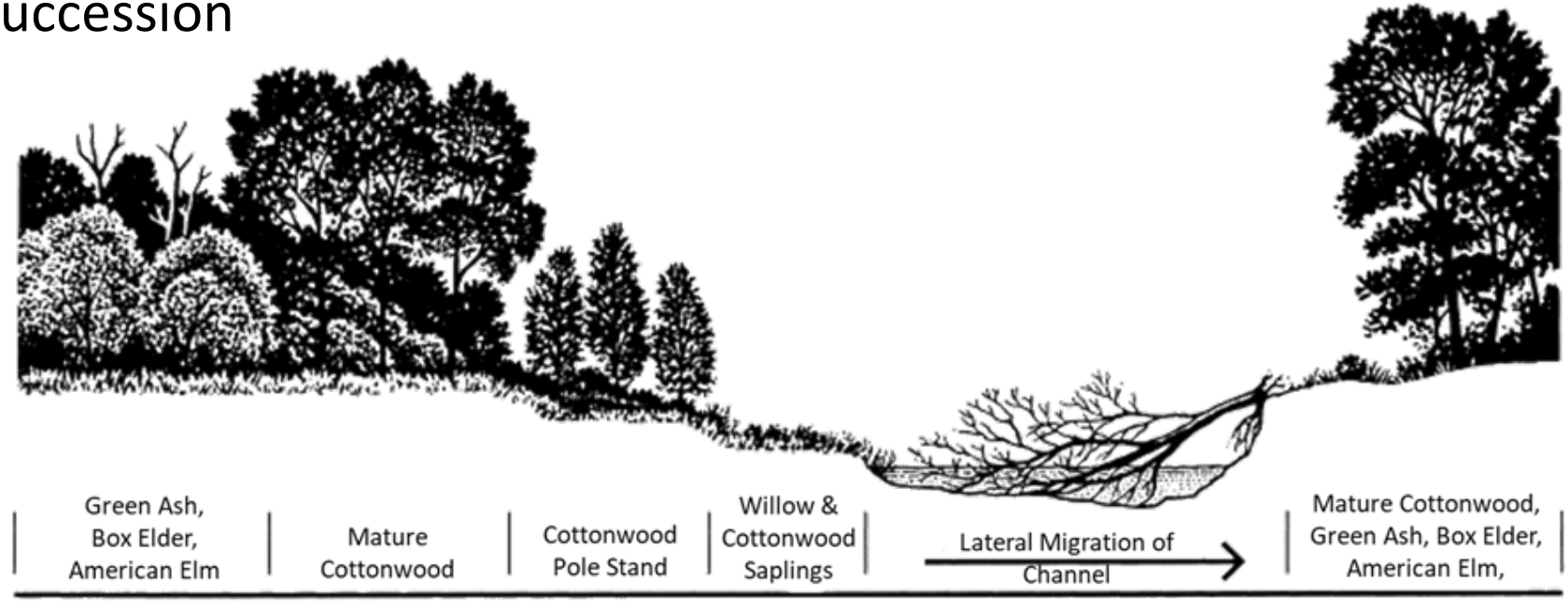

A pioneer, disturbance-dependent species



Successional Changes

- **As forest stands age…**
  - Cottonwood & willow decline in dominance & eventually may disappear
  - Late successional tree species (ash, box elder) increase in dominance…
  - …until flood disturbance restarts succession





Missouri River Basin Management

5 dams & reservoirs built 1952-1964 + Fort Peck Dam in 1937

- **Length: 3767 km**
- **Drainage area: 1.3 x 10^6 km^2**
- **Largest Reservoir Storage System in U.S. (90.5 km^3)**

"Authorized Purposes" of Flow Management

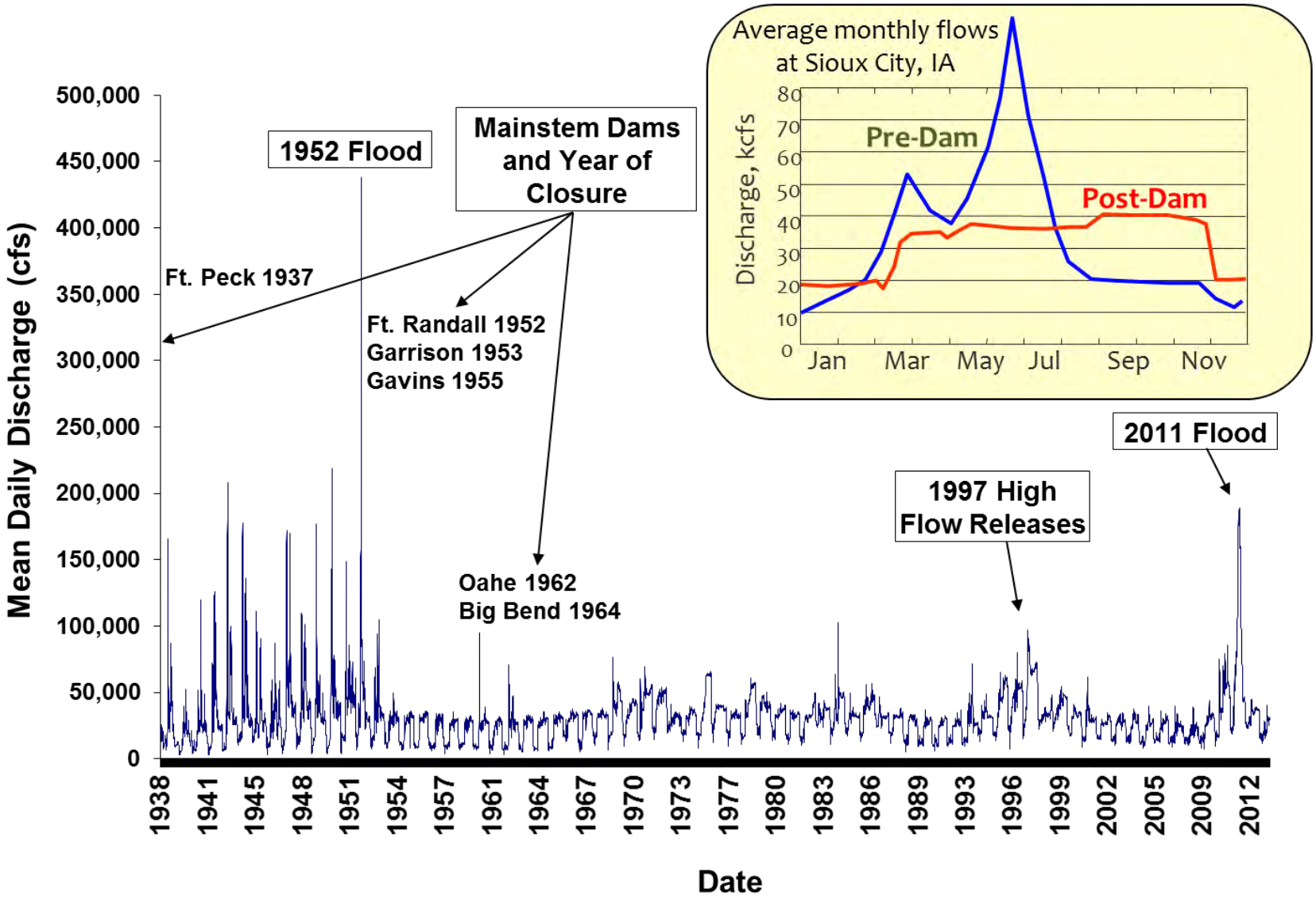
- Flood Control
- Irrigation
- Navigation
- Power
- Water Supply & Quality
- Recreation
- Fish & Wildlife

Bank Stabilization & Navigation Project (1912-1981)

Dam
Reservoir
Unchannelized
Channelized

Modified from slide from Tim Cowman

Dams Alter Downstream Flows

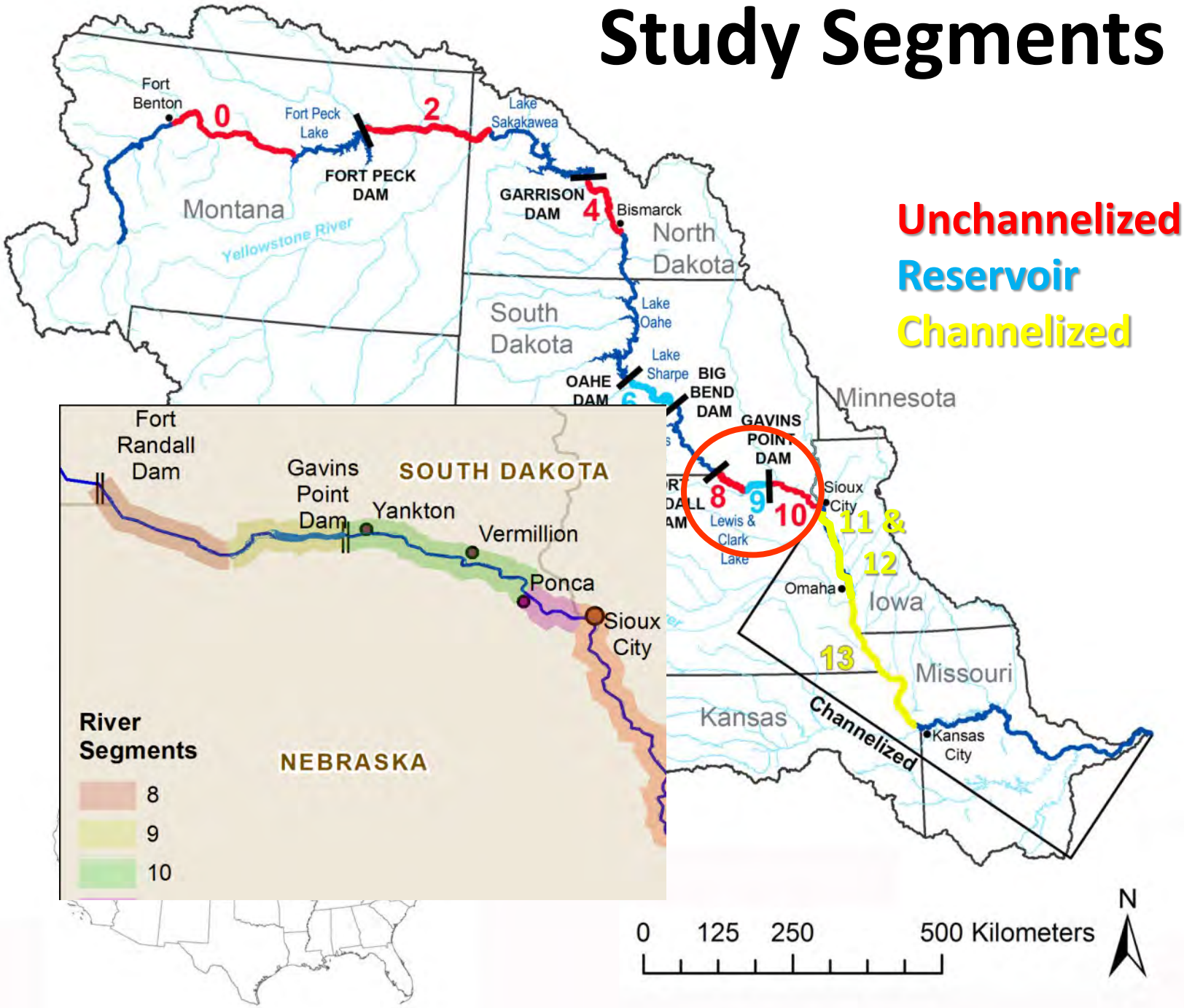


Modified from slide by Wayne Nelson-Stastny, USFWS

Changes in Missouri River Cottonwood Forests in the Great Plains

- **Forests are aging, with limited cottonwood recruitment in recent decades**
  - 67% of stands >60 years old (pre-dam)
- **Long-term declines in forest area (~70% since 1890s)**
  - Land cover conversion (to agriculture, reservoirs, urban)
  - Declines in early successional habitats and sandbars
- **Long-term changes in species composition of forests**
  - Increases of invasive trees (redcedar, Russian olive) & herbs
  - Disease, insect pests, other threats to native late successional trees (elm, box elder, ash)
- **How do these changes affect floodplain forest birds?**

Study Segments



Sampling & Analysis Methods

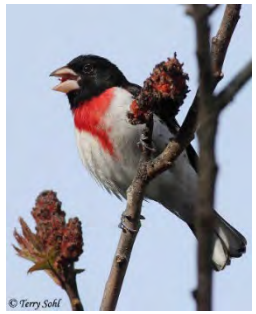
- **Point count bird surveys** at 79 riparian forest stands (156 points) in summer 2009 & 2010
  - Points distributed evenly among sites of different successional stages
- **Cluster analysis of veg data** to identify forest habitat categories
- **DISTANCE sampling & Bayesian binomial N-mixture models** to calculate bird densities & habitat associations
- **GIS analyses of bird associations** with forest and shrub habitat at 200, 400 & 1200 m scales

Survey Results

- 12,778 detected birds in 2009-2010
- 85 species (only 46 used in analysis)
- 6 most abundant:
  - House Wren, Yellow Warbler, Mourning Dove, Baltimore Oriole, Rose-breasted Grosbeak, Orchard Oriole

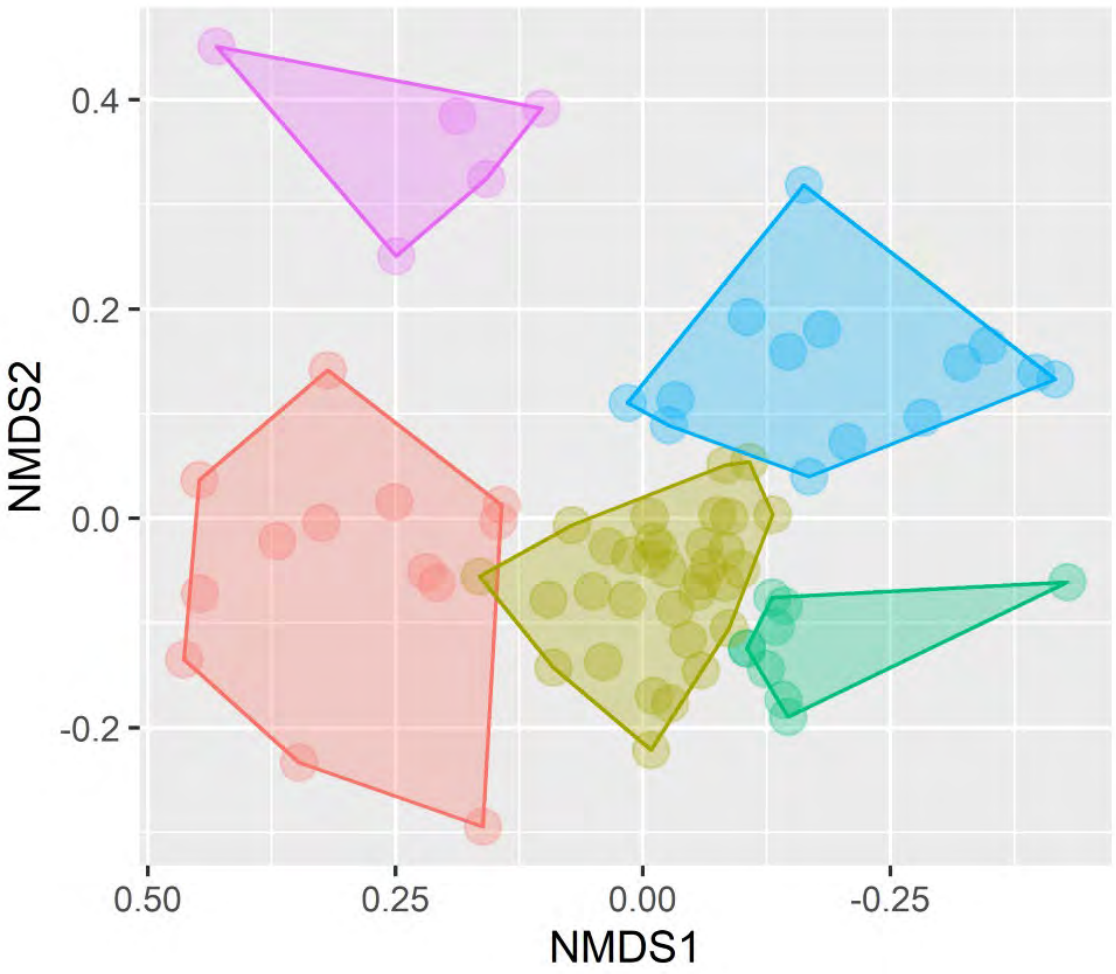







Data are unpublished and should be considered provisional

Riparian Forest Categories



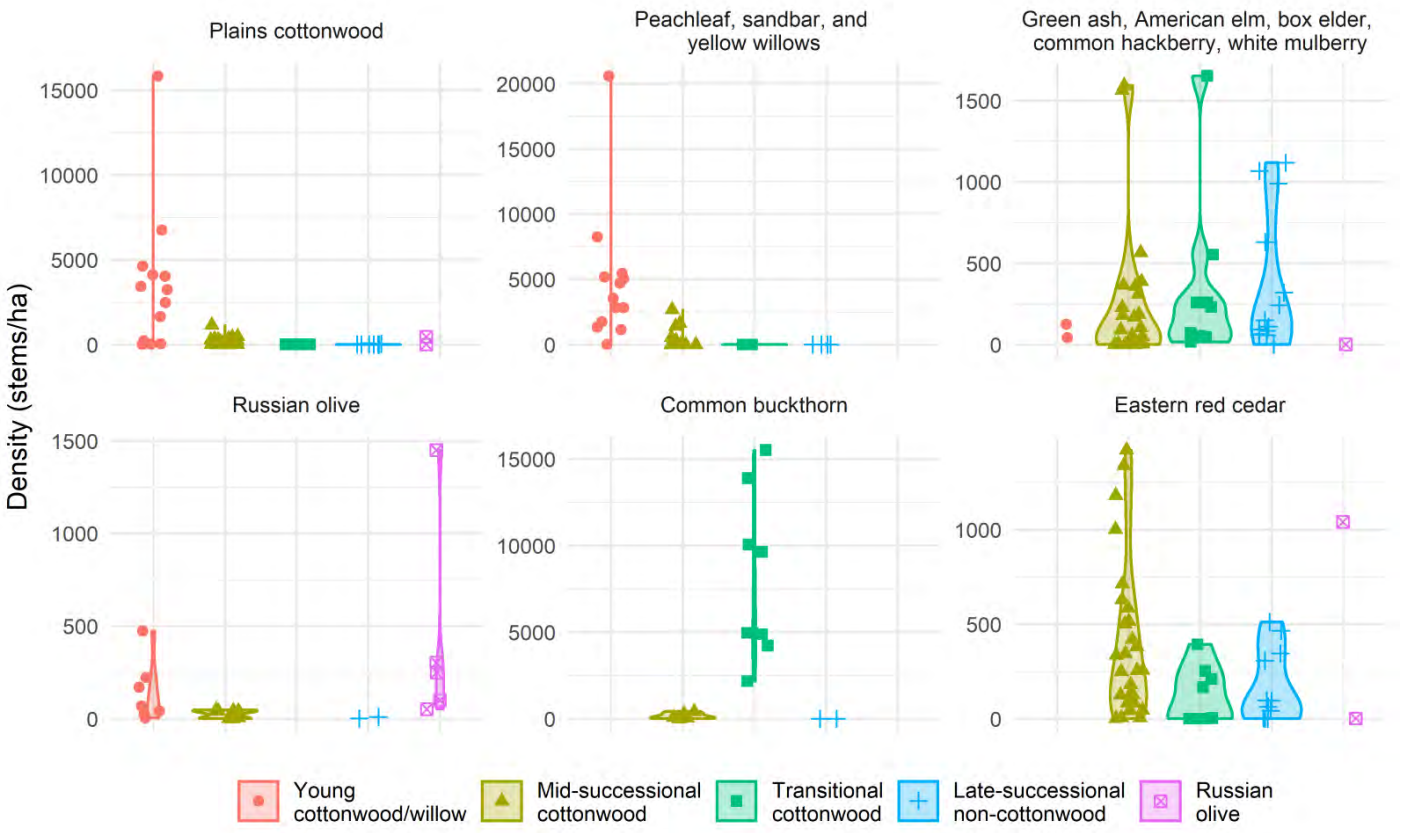
- Ordination of sites based on a combination of stem density and basal area of woody plant species.
- Recovered five separate clusters.

Site Cluster

- Young cottonwood/willow
- Mid-successional cottonwood
- Transitional cottonwood
- Late-successional non-cottonwood
- Russian olive

Data are unpublished and should be considered provisional

Vegetation Characteristics in Riparian Forest Categories



Violin plots depicting ***stem density*** of six of the most common woody plant species or species groups found at bird survey sites.

Densities are shown for each of the five habitat types recovered by cluster analysis.

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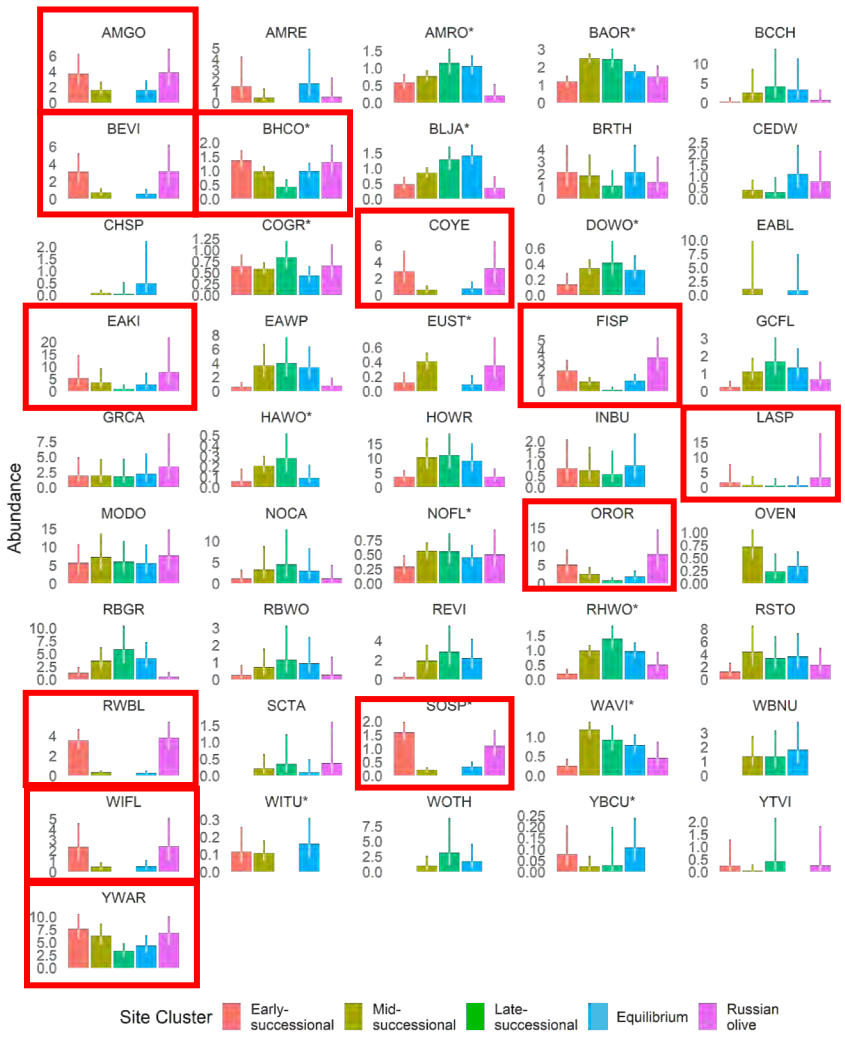
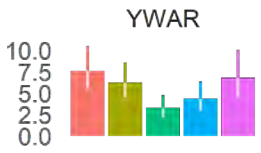
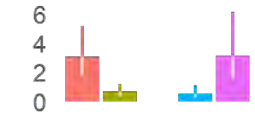
Breeding Bird Densities by Vegetation Type



Some bird species prefer early-successional (young) cottonwood/willow stands (& Russian olive)





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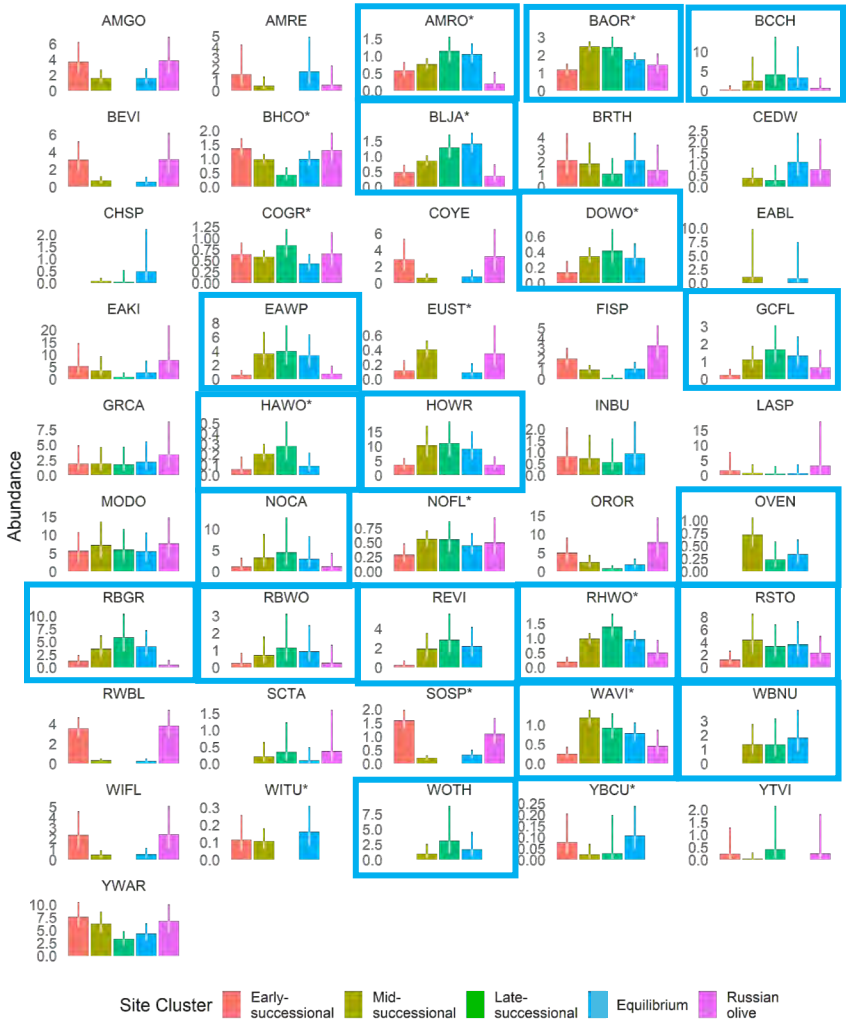
Breeding Bird Densities by Vegetation Type



Some bird species prefer more mature forests… including cavity nesters









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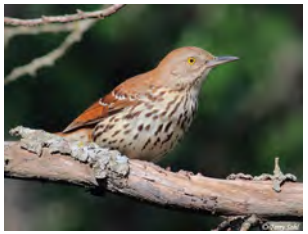
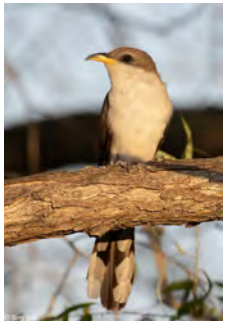
Breeding Bird Densities by Vegetation Type

Some bird species are riparian habitat generalists

- Red = Early successional (11 spp.)
- Blue = Mid-to-late successional (19 spp.)
- No color = Riparian habitat generalist (16 spp.)





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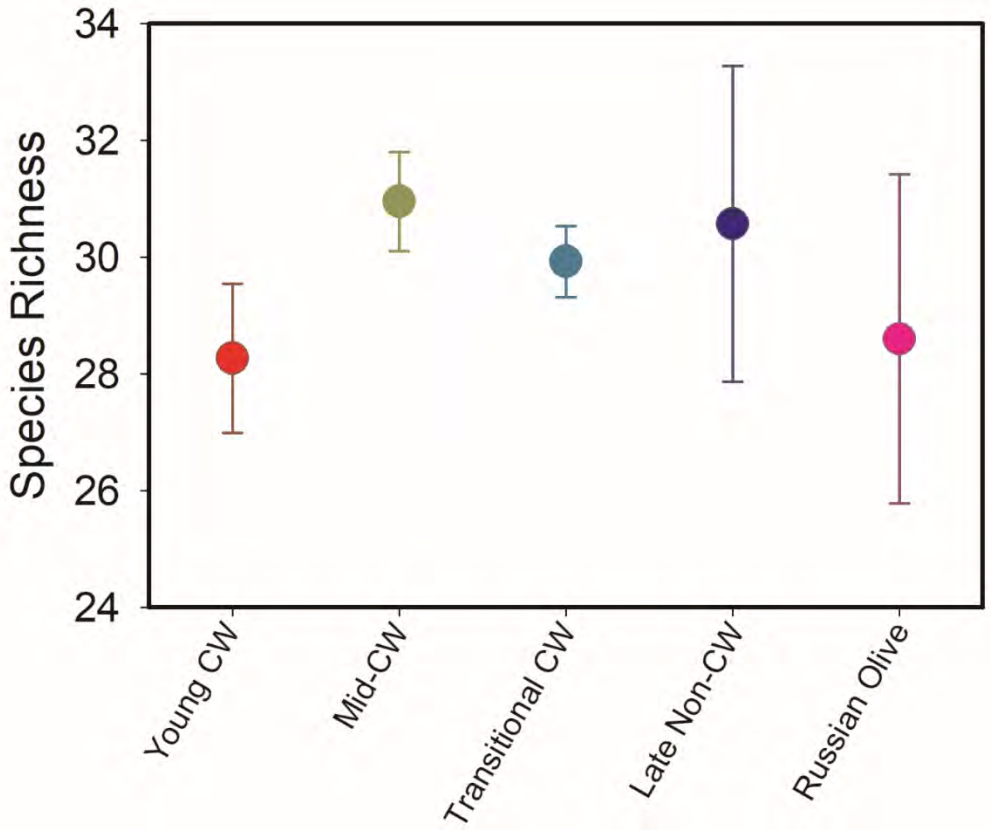
Bird Species Richness (Mean ± SE) by Riparian Forest Type



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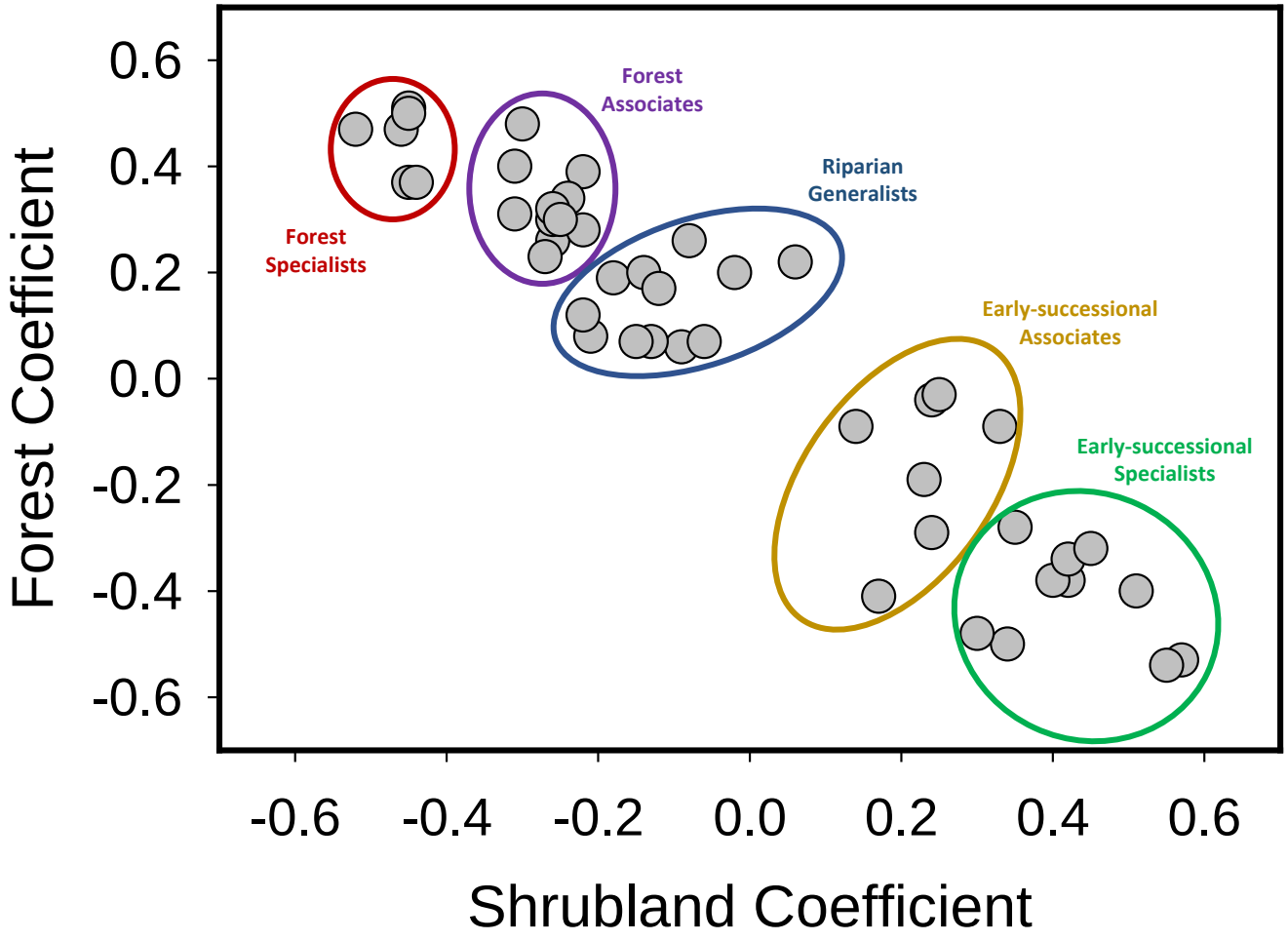
These habitat associations can be defined at the landscape level as well



- 2-D plots of correlation coefficients for bird species abundance against proportion of cover of shrubland and forest from ***landscape analyses*** of riparian habitats along the middle Missouri River.
- Each symbol represents an individual bird species.
- Ovoids identify bird groups classified as early successional specialists or associates, forest specialists of associates or habitat generalists.

Data are unpublished and should be considered provisional

Summary & Management Implications

- **Riparian forests support high breeding bird numbers & diversity**
- **Some birds prefer young, early successional forest stands**
  - These habitats have become more limited on many regulated rivers
  - "Invasive" species (Russian olive) may provide habitat
- **More species prefer mid-successional, mature, and late successional/post-cottonwood stands**
  - Especially canopy- and cavity-nesting species
  - These increasingly make up most of the remaining forest
  - But "ageing-out" of cottonwood forest may have negative effects for some species (Baltimore Oriole, woodpeckers, secondary cavity nesters)
- **Conservation to maintain early successional habitats and cottonwoods in mature forests will likely be needed in the future**
- **Implications of levee vegetation management?**

Opportunities to restore bird habitat & enhance floodplain services via levee setbacks?

Damage on the L536 showing breaches and water flowing through them

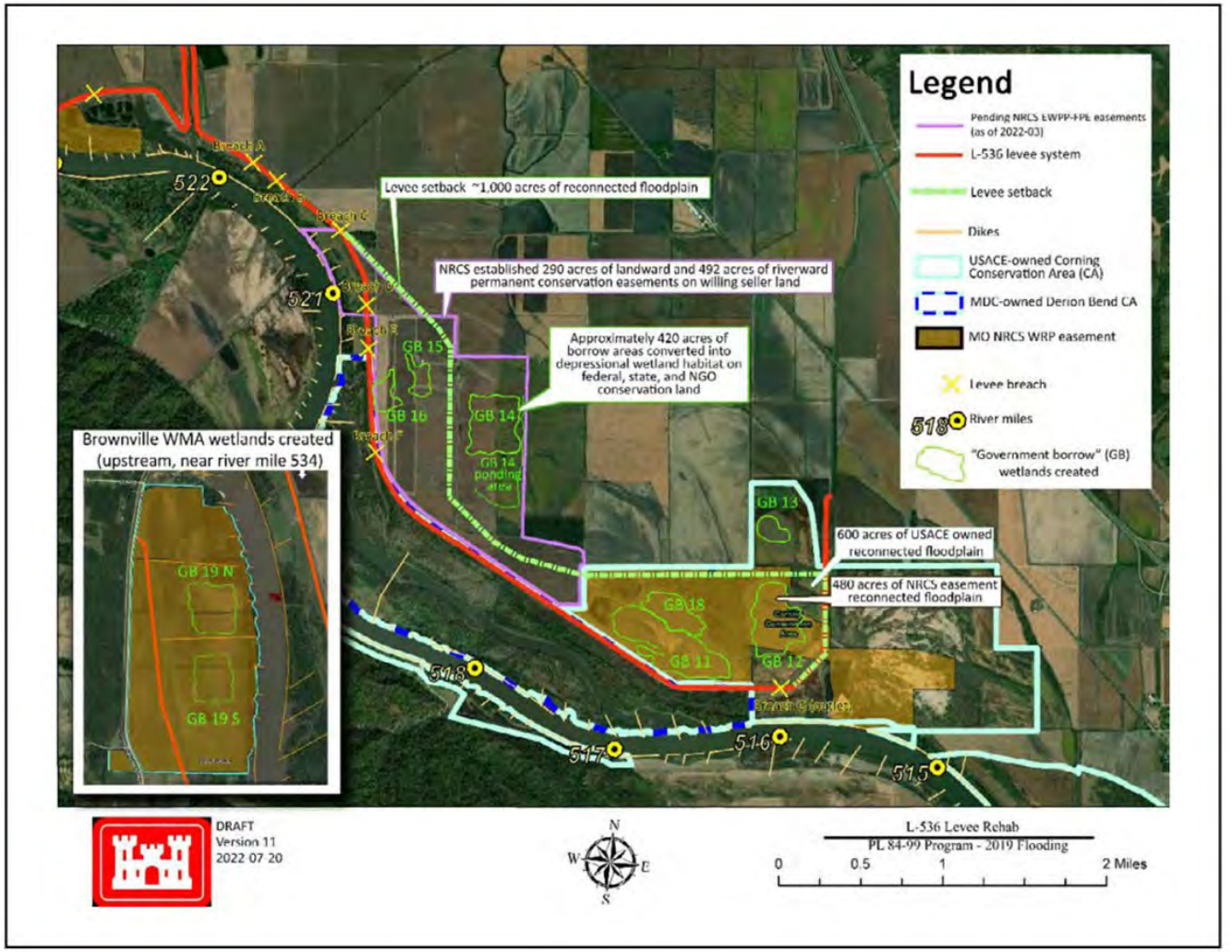
Collaboration in Large-scale Levee Setbacks Along the Missouri River

2019 Flood and Beyond

by Dave Crane[1] and Viv Bennett

Figure 4. Flooded conservation land along the Missouri River near Columbia, Missouri.

Photo credit: Robert Jacobson, U.S. Geological Survey



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Thank you!