

## Background and Objectives:

- Cottonwood (*Populus deltoides*) forests along the Missouri River provide important foraging and nesting habitat for migrant and resident landbirds. Historically, periodic flooding helped maintain a diversity of forest successional stages across the floodplain.
- The construction of 6 large dams has effectively eliminated flood pulses on the upper and middle Missouri River for the last 60 years, thereby decreasing cottonwood recruitment. As forests age and senesce, lack of new recruitment reduces overall habitat available for birds.
- Despite flood control infrastructure, the Missouri River experienced a high amplitude and long duration flooding event in June–Aug. 2011.
- By comparing pre-and post-flood bird survey data, we seek to evaluate the initial effects of the flood on riparian bird abundances.
- This project complements ongoing research on Missouri River cottonwood forests and helps inform cottonwood management by the United States Army Corps of Engineers.



Figure 1: Map of the two study segments, as indicated by the arrows.

## Methods:

- The study site consists of two (39-mile and 59-mile) segments of remnant floodplain forest along the Missouri National Recreation River (MNRR) in southeastern South Dakota and northeastern Nebraska.
- Survey points are located in forest patches stratified by a combination of stand types (cottonwood, non-cottonwood) and ages (10–25, 25–50, 50–114, >114 years; relative to 2007). 77 stands were sampled, with 2 points per stand.
- We conducted 10 minute point-count surveys, twice per year, over three breeding seasons: pre-flood (2009–2010) and post-flood (2012).
- Bird data for 33 species were analyzed using Program DISTANCE<sup>1</sup> and compared among pre- and post-flood years.

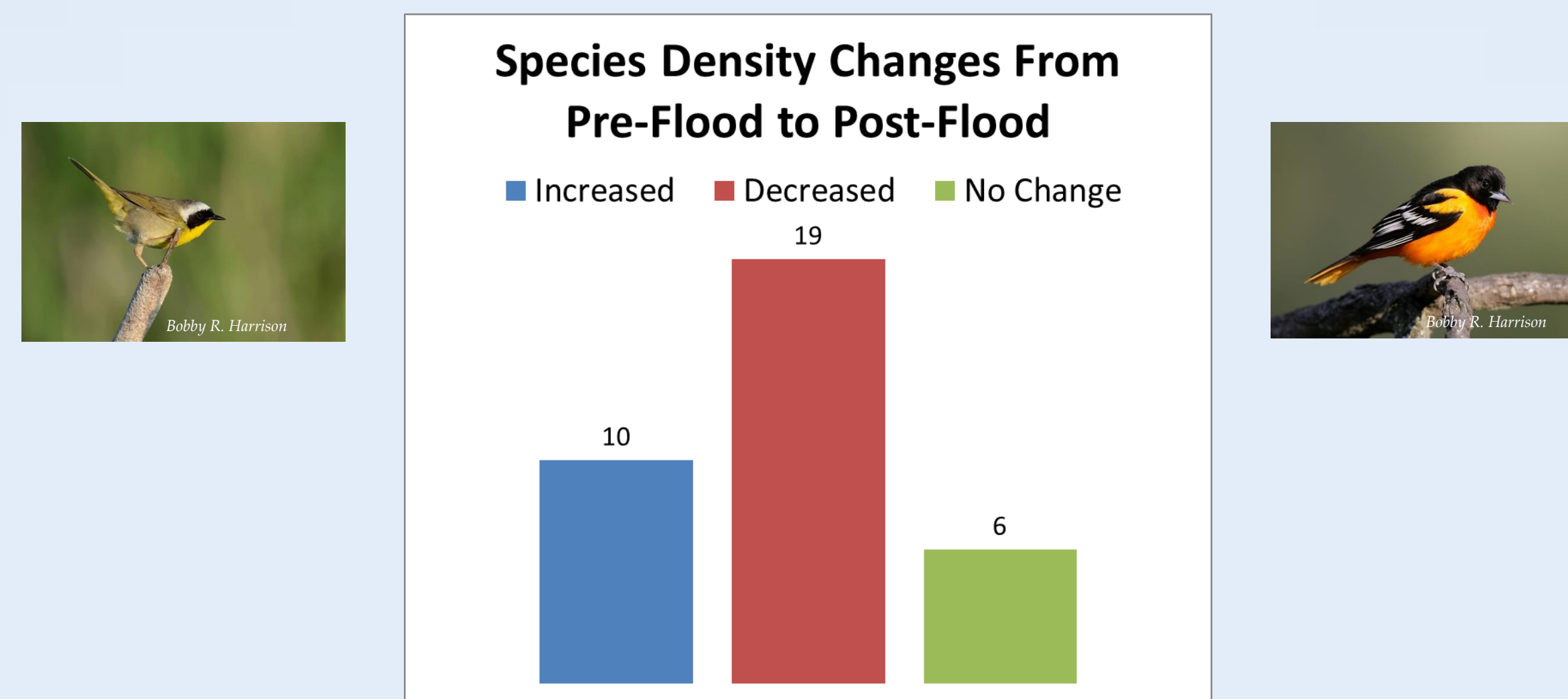


Figure 2: Number of species experiencing significant density changes from pre- to post-flood (2012) time periods.

## Young Forest Species

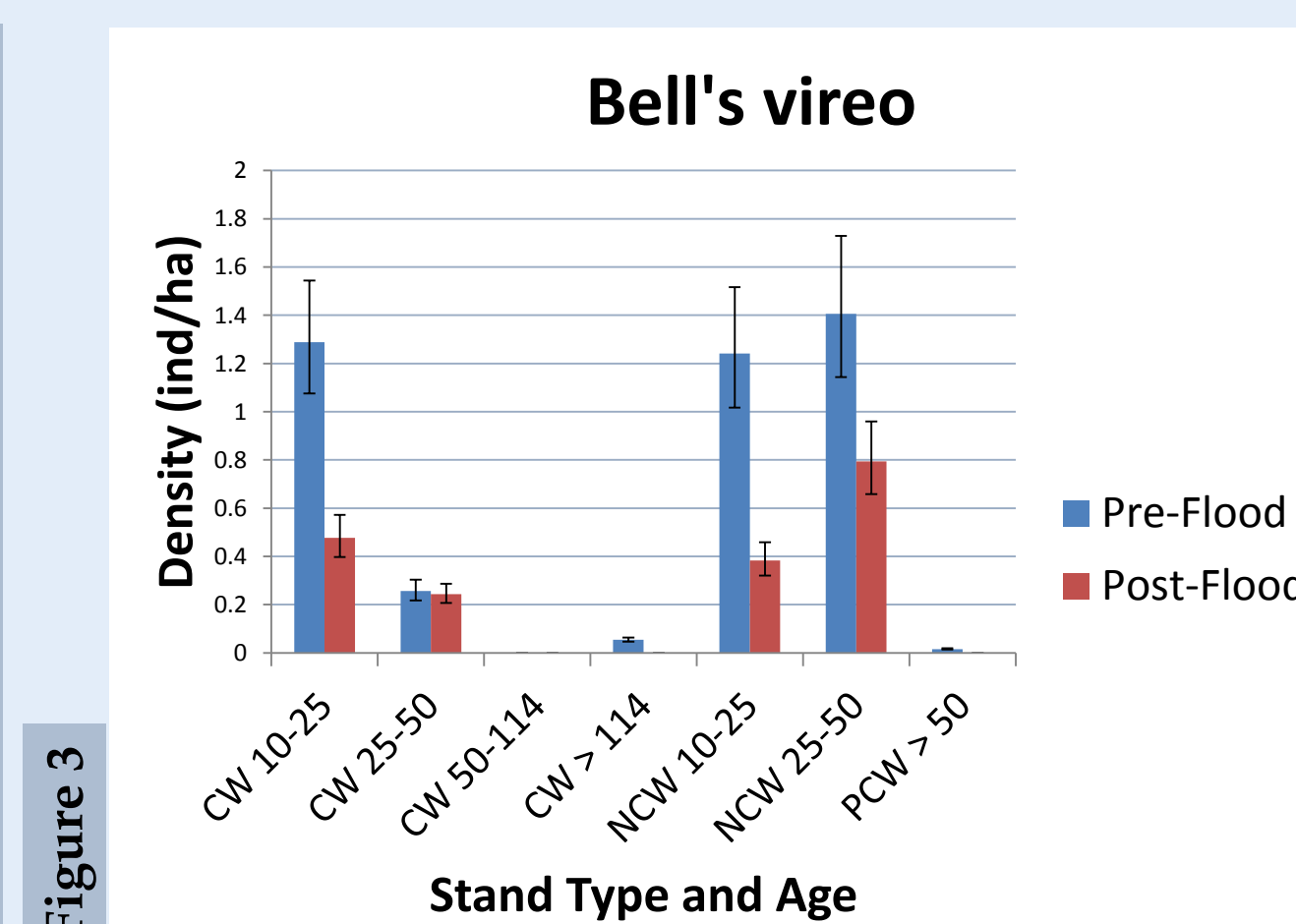


Figure 3

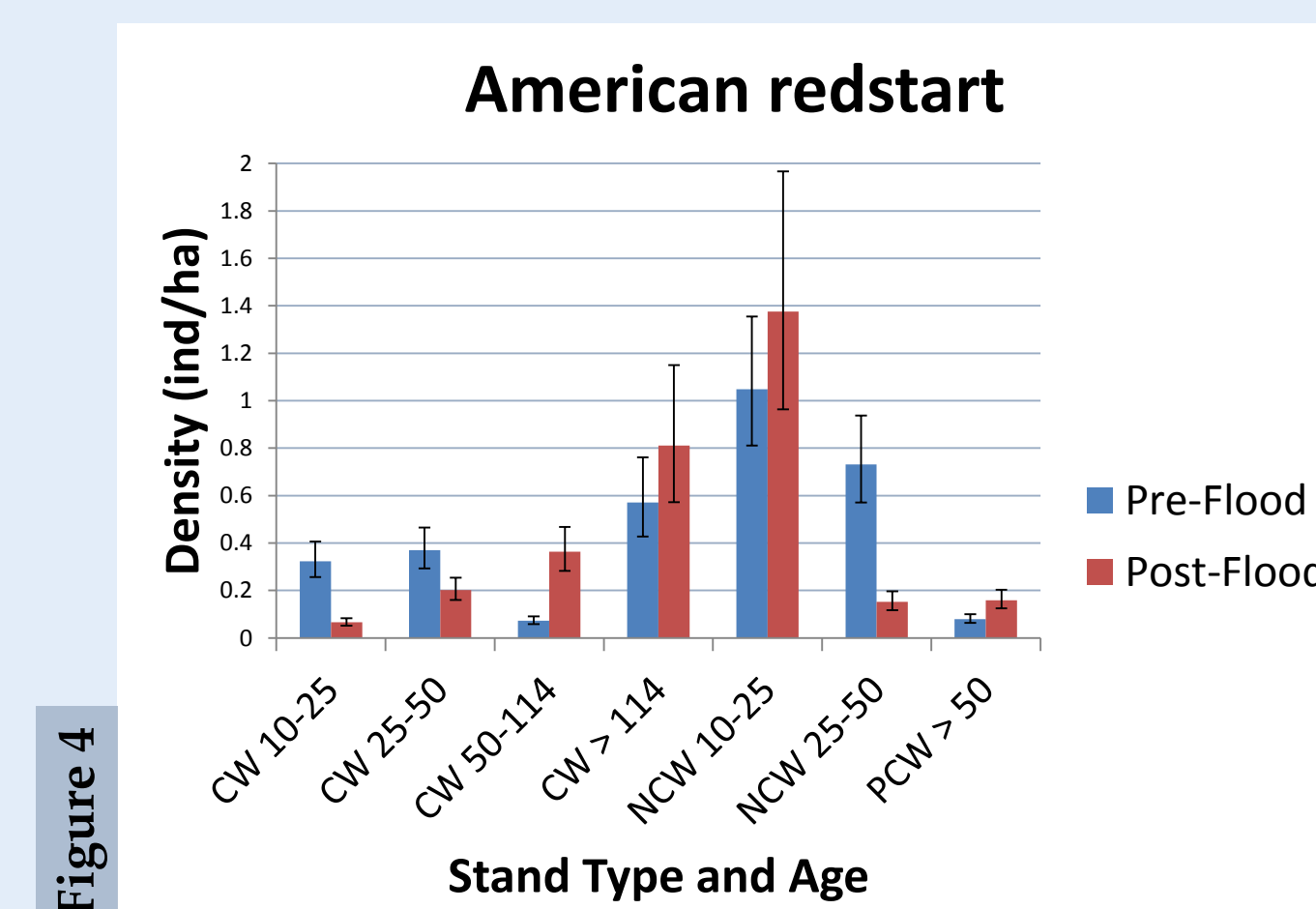


Figure 4

## Mature Forest Species

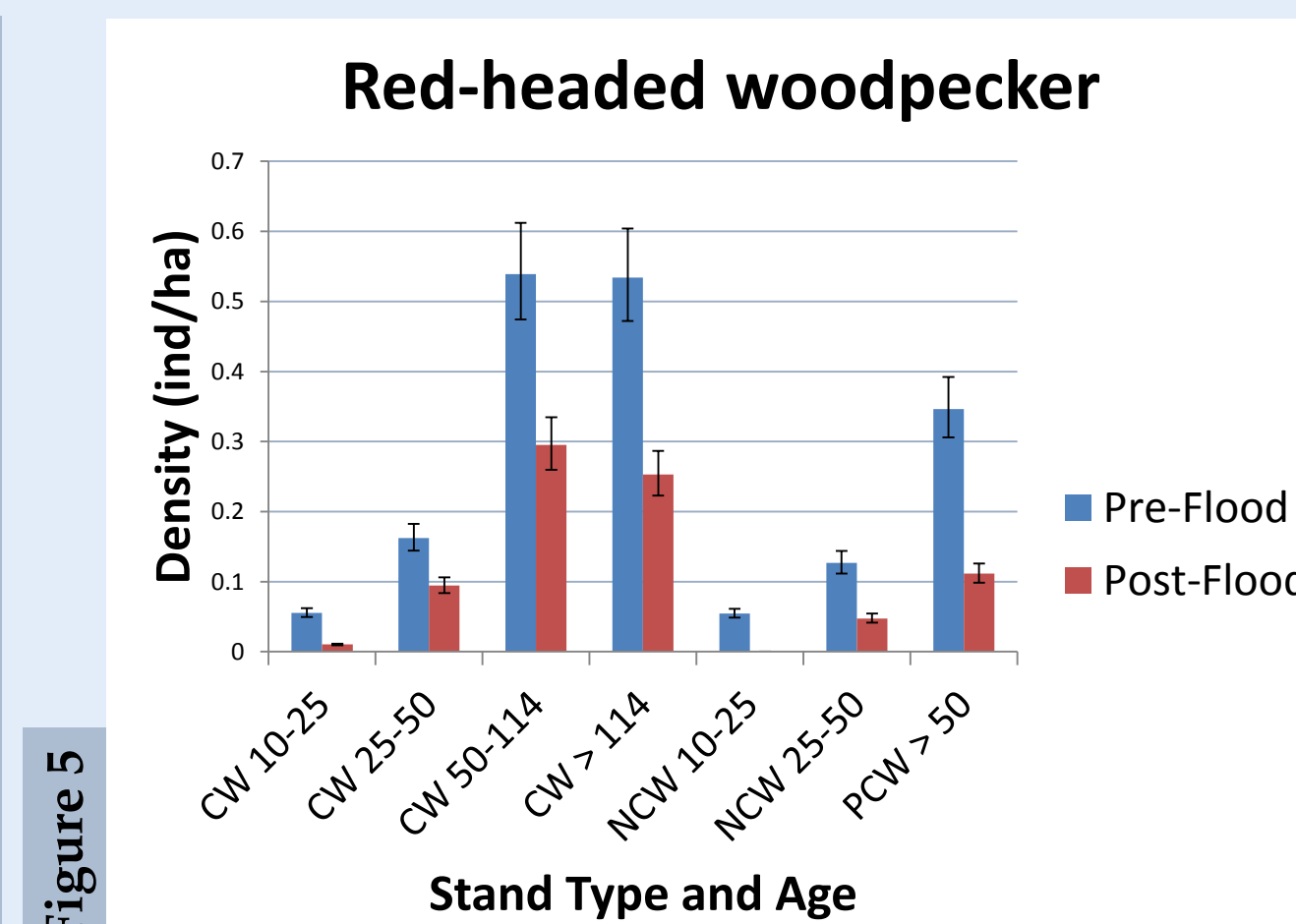


Figure 5

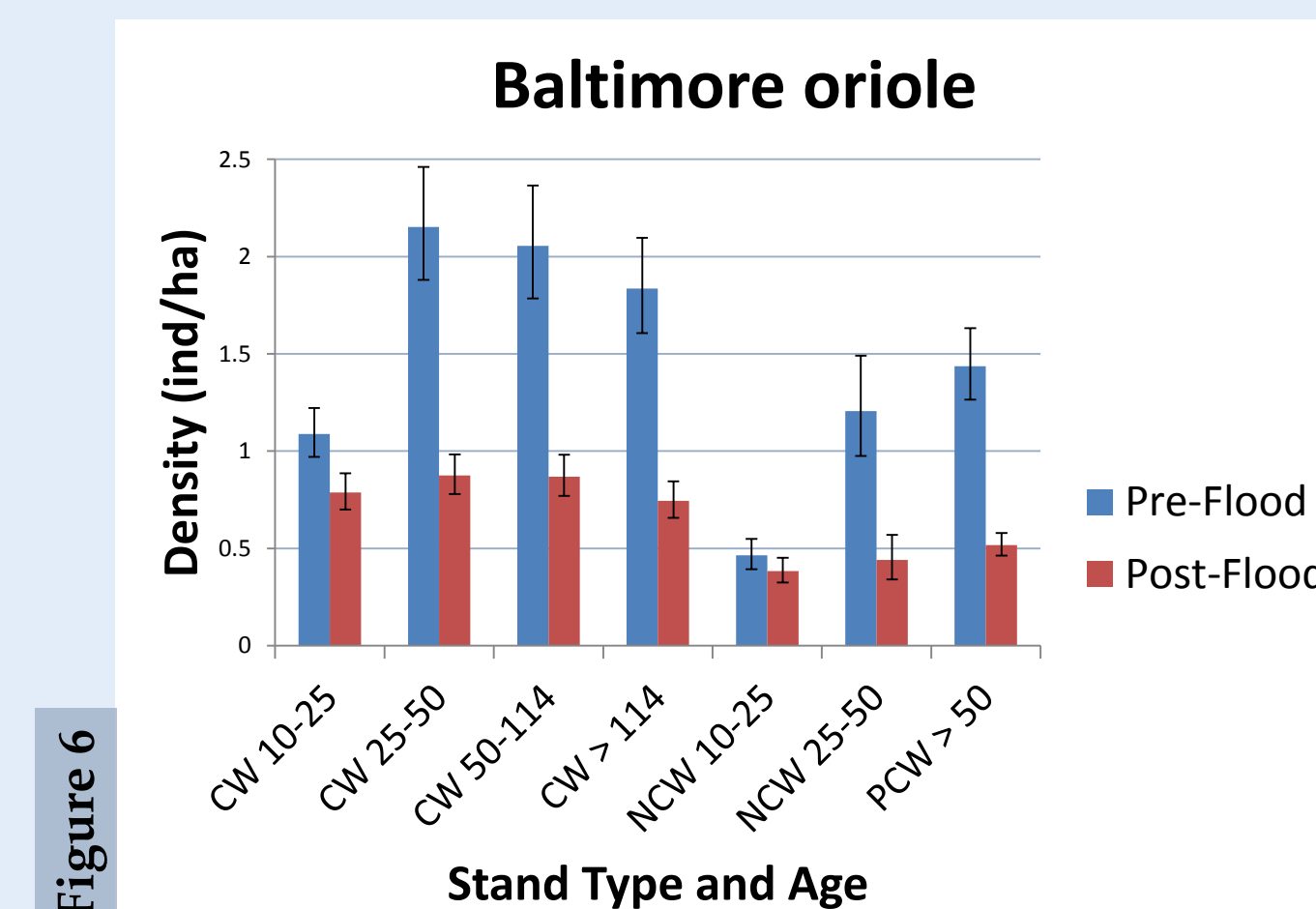


Figure 6

Figures 3-6: Pre-and post-flood bird densities by forest age class (10-25, 15-50, 50-114, >114 years) and dominant tree type (CW=Cottonwood, NCW=Non-cottonwood, PCW=Post-cottonwood). Average density of species (+/- SE).

## Habitat Specialists

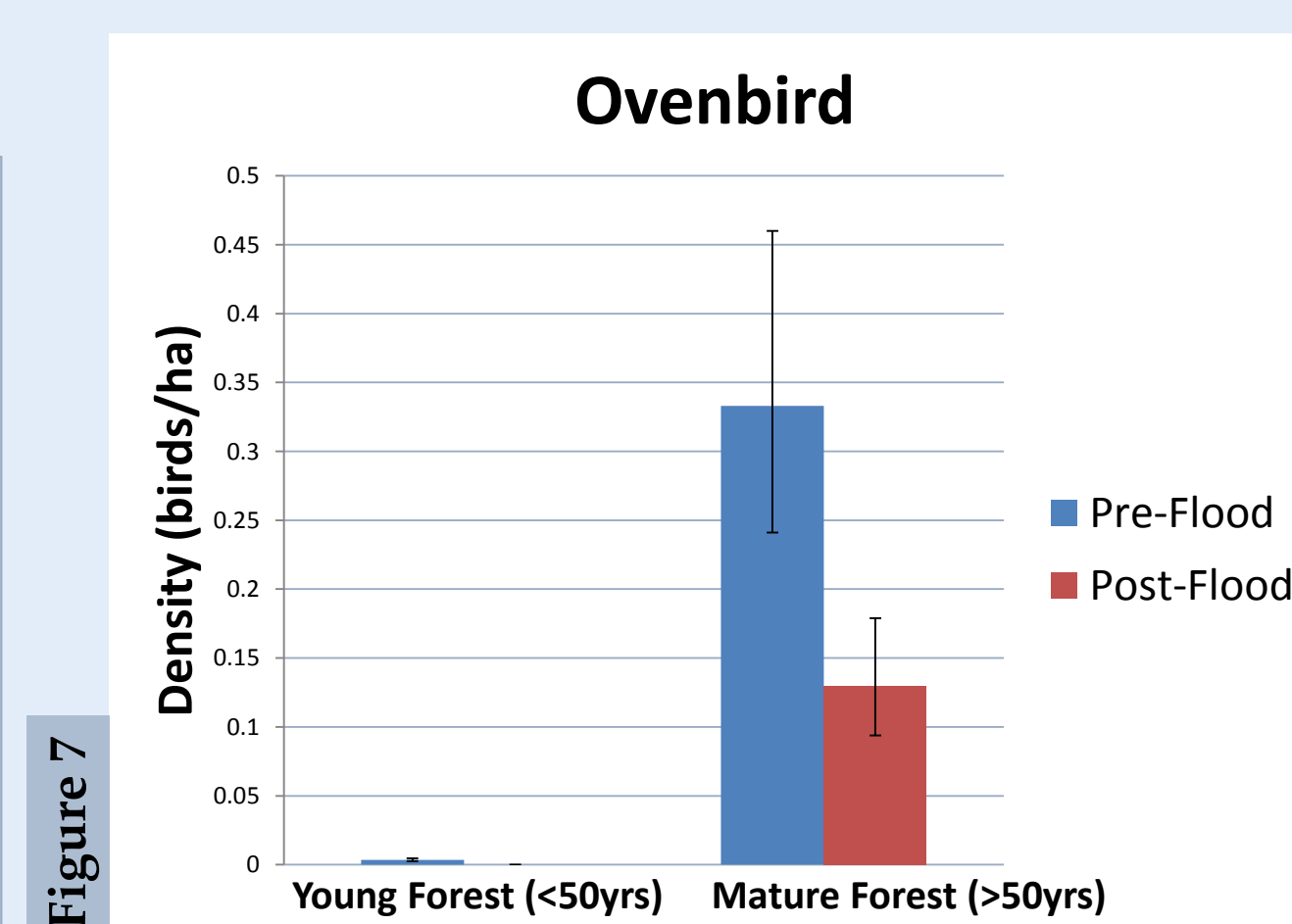


Figure 7

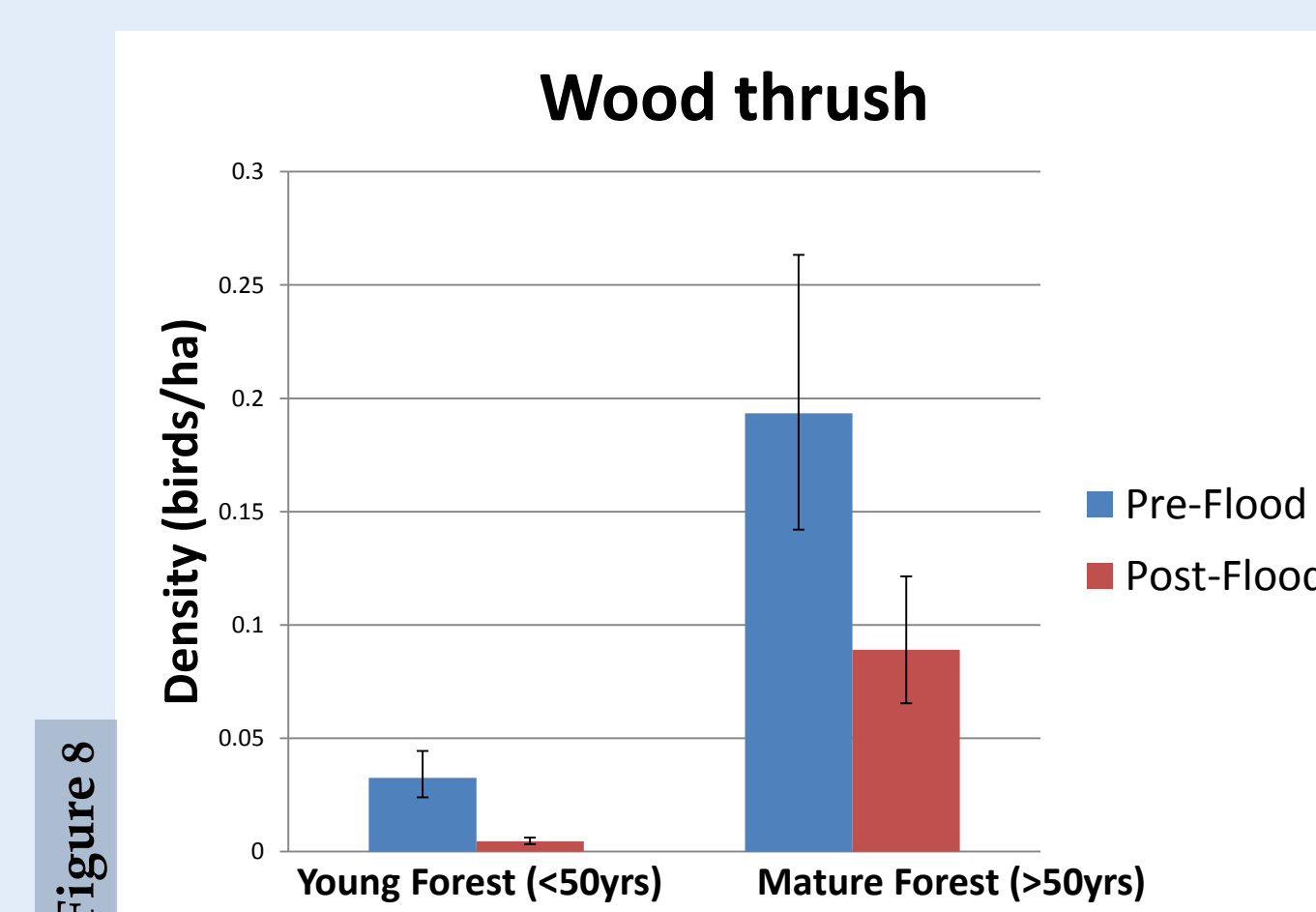


Figure 8

## Generalist Species

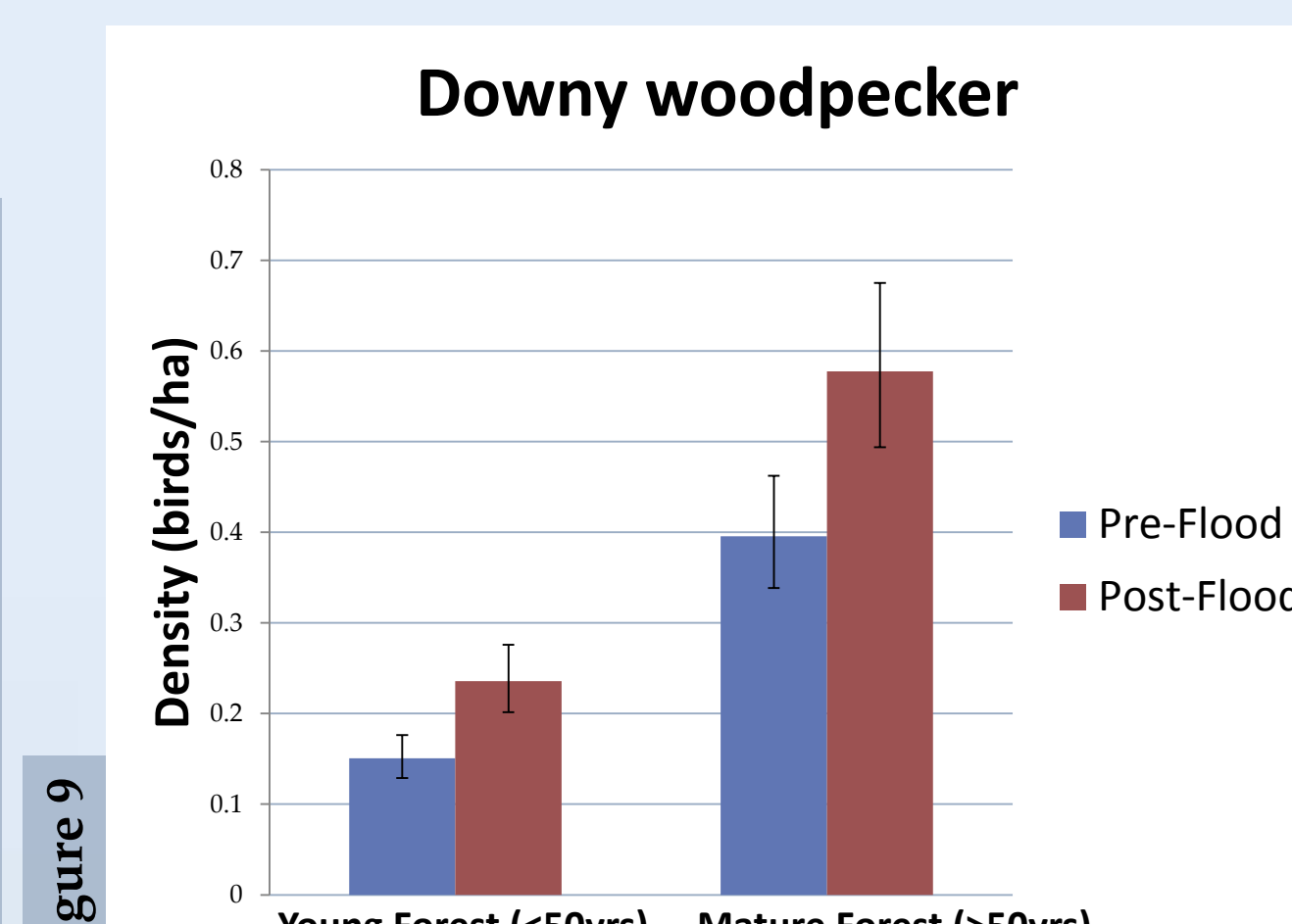


Figure 9

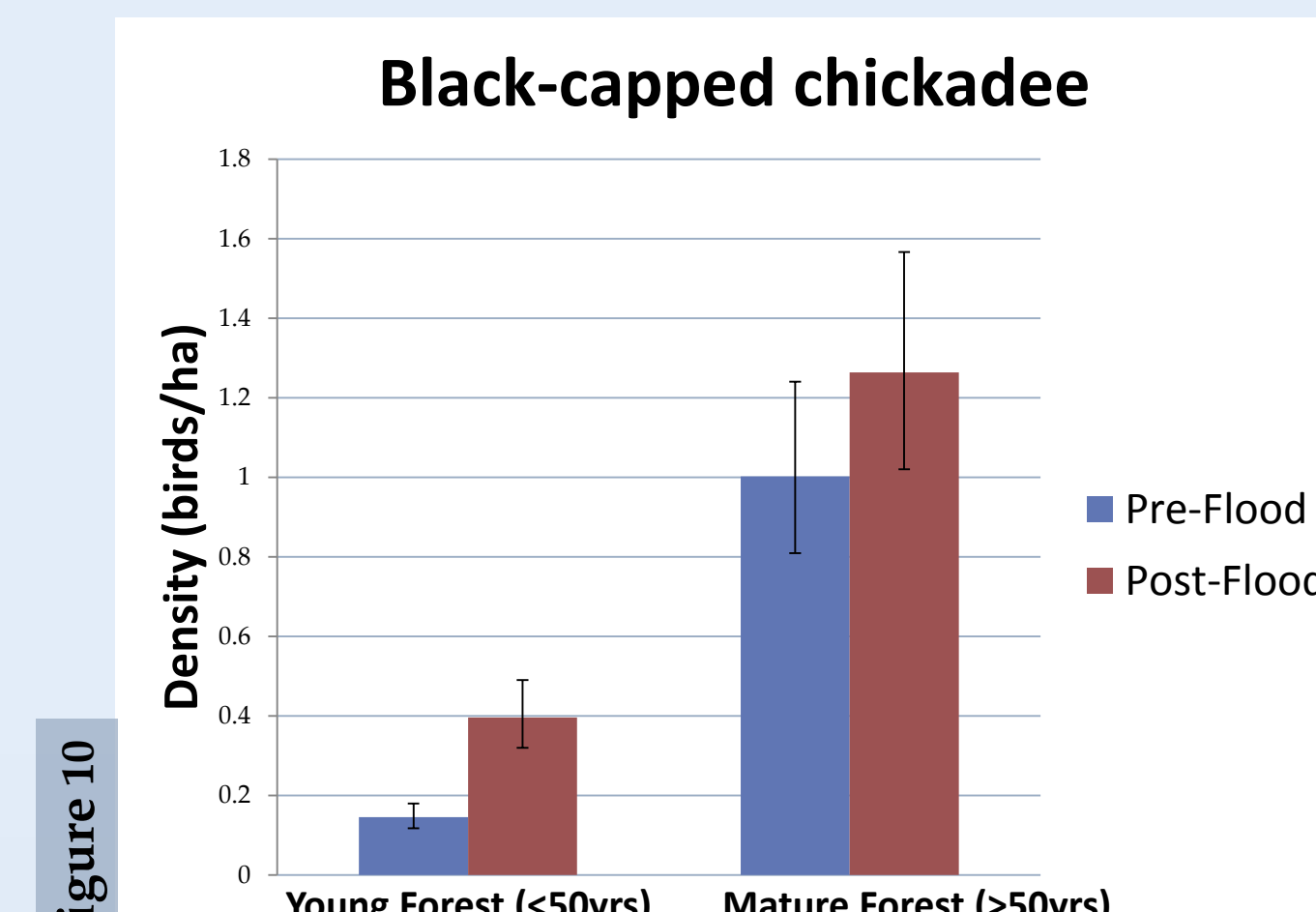


Figure 10

Figures 7-10: Pre- and post-flood bird densities by forest age class. 7 forest age and type classes consolidated into 2 categories (Young and Mature Forest) for ease of interpretation. Average density of species (+/- SE).

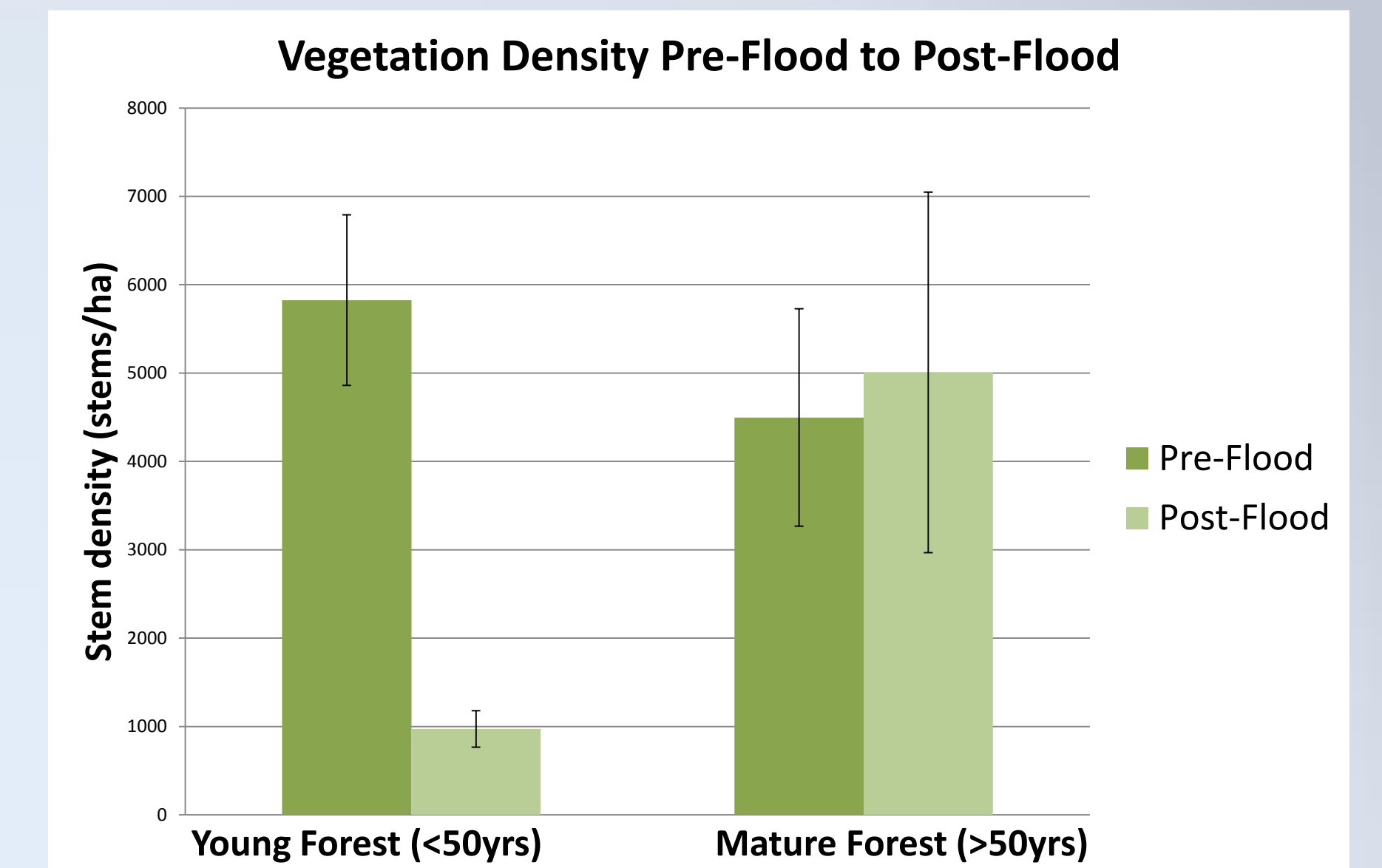


Figure 11: Tree and shrub stem density changes from pre- to post-flood. Average density of stems (+/- SE).

## Results and Discussion:

- In 2009, 2010, and 2012, 20,268 individuals among 97 species were observed.
- Young forests experienced more flood effects, such as scouring and mortality of shrubs and trees, than older forests (Fig. 11). Some mature stands were inundated, but most were unaffected.
- The majority of bird species showed declines in density from pre-flood to post-flood (2012) periods (Fig. 2).
- Declines were greater among habitat specialists (Fig. 3, 7, & 8). In contrast, generalists were less affected, generally increasing in density or showing no change (Fig. 9 & 10).
- Several species shifted densities to habitat types that were less frequently used prior to the flood. American redstarts decreased in density in young forests, while increasing in mature forests (Fig. 4).
- Surprisingly, some species associated with mature forests also showed steep declines (Figures 7 & 8). This may implicate causes other than flood-induced structural habitat alteration on bird densities, such as weather effects on nesting and foraging success.

## Future Work:

- Vegetation data collected in each forest stand will be related to bird abundances.
  - Help determine whether structural alterations of habitat in young forests due to flood damage were indeed the causes of bird declines.
- Bird densities will be projected into the future using density and models of future landscape change, based on current trajectories of succession and land cover change.
  - Determine the long-term implications of the 2011 flood for bird communities.

## Acknowledgements:

Funding for this project was provided by the United States Army Corps of Engineers. Adam Benson provided pre-flood survey data as part of his Master's Thesis field work. Kirsten Wert assisted with bird surveys in 2012. Chris Boever and Jennifer Brown collected vegetation data.

## Literature Cited:

Thomas, L., S.T. Buckland, E.A. Rexstad, J. L. Laake, S. Strindberg, S. L. Hedley, J. R.B. Bishop, T. A. Marques, and K. P. Burnham. 2010. Distance software: design and analysis of distance sampling surveys for estimating population size. *Journal of Applied Ecology* 47: 5-14. DOI: 10.1111/j.1365-2664.2009.01737.x.