Wetlands Working Group
The Wildlife Society
Newsletter, Volume 11, Issue 2
Winter 2021-22

A Message from the Chair

In This Issue....

Feature Article
Breeding Birds as Indicators of Bottomland Forest Ecosystem Health

WWG News
New Scholarship Fund!
Photo Contest Winners
Meet our new Vice-Chair
Member Highlights

Wetlands in the News

Upcoming Conferences

Hello Wetlands Working Group! We made it to 2022, through another challenging year personally and professionally for many people, with additional challenges for many wetland ecosystems and wetland-dependent wildlife. We were faced with another year of travel restrictions, limited social and professional interaction, canceled meetings, conferences, and events, extensive drought across much of the Midwest and Western regions of the US, the 3rd most extensive hurricane season on record, canceled biological surveys and field seasons, and much more. Through the resilience and adaptiveness of both wetland ecosystems and their practitioners, like yourself, we forged ahead despite the circumstances we were dealt in another tough year.

The Wetlands Working Group had a successful year despite many of these challenges, thanks to our members! This past year, we focused on increased member interaction within the working group and among peers, providing more pertinent information to our members, and increasing communication. We initiated several activities that will continue in to 2022, including more monthly emails with timely information, member spotlights highlighting the work and careers of WWG members, a wetlands and wildlife photo contest, an increase from two student scholarships to five student scholarship opportunities to cover registration costs for the National TWS conference, and an increase in participation and videos on our WWG YouTube page to further increase member interactions. We are still interested in finding some help on outreah via a WWG Outreach Coordinator position, so please let us know if you are interested in volunteering for that. Be on the lookout for several more opportunities for involvement in the WWG, as well as additional scholarship opportunities this year.

Our annual meeting held virtually during the National TWS conference was one of record attendance, including 44 total participants, with half of those being prospective members! As another year passes, so too do the officer positions within the group. We send a huge 'thank you!' to Drew Fowler, our 2021 Past Chair, for serving 4 years.

(*continued on page 4*)

*Cover Photos: Bottomland hardwood forest by Jeff Hoover (top); Bird-voiced treefrog (*Dryophytes avivoca*) by Olivia Wilson (left); and Indiana bats (*Myotis sodalis*) by Ann Froschauer, USFWS (right).*

Breeding Birds as Indicators of Bottomland Forest Ecosystem Health

by Jeffrey P. Hoover* and Wendy M. Schelsky, Illinois Natural History Survey, Prairie Research Institute, University of Illinois, Champaign, Illinois, USA. (*corresponding author: j-hoover@illinois.edu)

Overview– The loss, degradation and fragmentation of natural habitats continues to be a primary threat to populations of breeding birds (Wilcove et al. 1998, Askins 2000, Robinson and Hoover 2011). Bottomland forest in the United States only covers 20% of its original range and what remains is highly fragmented by agriculture (Abernethy and Turner 1987, Gosselink and Lee 1989, Twedt and Loesch 1999). In addition to the negative effects of forest fragmentation (e.g., increased brood parasitism by brown-headed cowbirds [*Molothrus ater*] and increased nesting failure caused by predators; Hoover et al. 1995, Robinson et al. 1995, Robinson and Hoover 2011), populations of birds breeding in bottomland forests are threatened by the alteration and degradation of "natural" hydrologic processes (Hoover 2006, 2009a). Channelization of streams and rivers has led to channel incision and the subsequent formation of lateral gullies that connect the main channel of streams to adjacent (off-channel) wetlands, thereby altering the hydrology of those wetlands (Shields et al. 1998). This process degrades off-channel wetlands, threatens the integrity of bottomland ecosystems, and reduces the quality of bottomland forests as breeding habitat for Neotropical migratory birds (Pashley and Barrow 1993, Sallabanks et al. 2000, Hoover 2009a).

Prothonotary Warbler at cavity. Photo by Michael Jeffords.

Indicator species provide important information about habitat quality and the ecological integrity of ecosystems, have been studied to sound the alarm when ecosystems are degraded or threatened, and are used to measure the success of habitat management and conservation activities. While studying many species in bottomland forests, we focused much of our attention on the Prothonotary Warbler (*Protonotaria citrea*). Prothonotary Warblers preferentially breed over or adjacent to water in forested wetlands in the eastern half of the U.S. and are therefore an emblematic species of bottomland forest ecosystems (Petit 1999). This habitat preference is thought to be associated with food (i.e., insect) availability (Petit and Petit 1996) and selective pressure from terrestrial nest predators like raccoons (*Procyon lotor*; Hoover 2006). Therefore, these warblers are not only threatened by habitat loss and habitat fragmentation like several other species (Robinson and Hoover 2011), but also by the channelization of streams and the subsequent cascade of events that degrade hydrological processes associated with forested wetlands (Hoover 2009a). Habitat specificity is tightly linked to hydrological processes, and the fact that Prothonotary Warblers can be studied in detail during the breeding season make them well-suited as an indicator species in bottomland forest ecosystems (Hoover 2009b).

We set out in the mid-1990s to study the breeding bird community in the Cache River watershed (Figure 1) in Illinois, with the goal of assessing local breeding bird populations and how they respond to various conservation actions being implemented to address the threats mentioned above. The conservation efforts were part of a Joint Venture Partnership that included U.S. Fish and Wildlife Service, Illinois Department of Natural Resources, The Nature Conservancy in Illinois, and Ducks Unlimited. This partnership sought to increase the amount of bottomland forest habitat

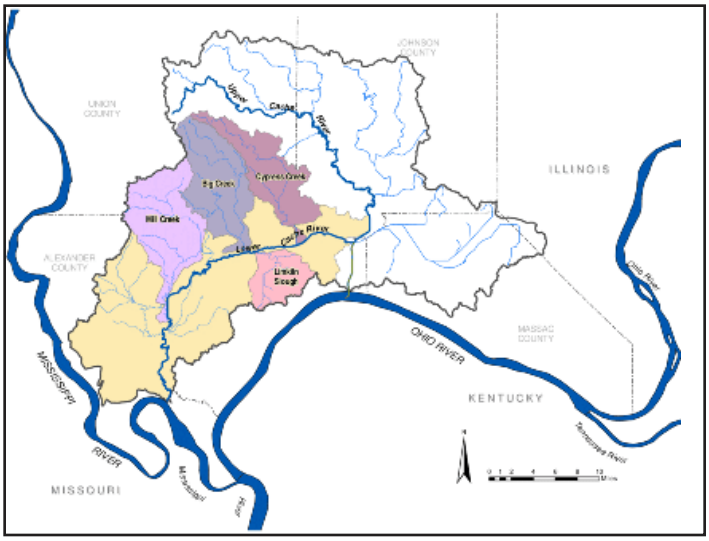


Figure 1. Cache River watershed. Map courtesy of the Cache River Joint Venture Partnership.

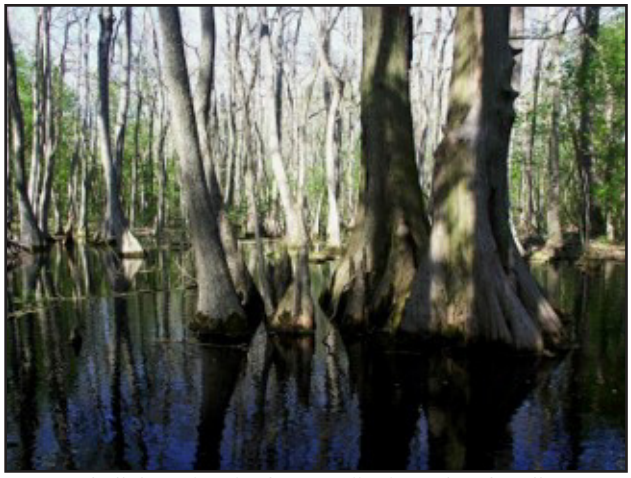
Continued on page 3

Breeding Birds & Bottomland Forest Health (*continued from page 2*)

in the watershed by thousands of hectares, and to improve what had become highly altered and degraded hydrological processes. Below we highlight some of our key findings and how they relate to these conservation efforts.

Water Depth Influences Nest Predation– Early on we sought to fully understand mechanisms underlying patterns and rates of nest predation in the bottomland forest ecosystem. To that end we recorded the outcomes for 2,726 nesting attempts of Prothonotary Warblers breeding in the Cache River watershed. We quantified the effect of nest predation on annual fecundity, determined the influence of different nest predators on rates of nest predation, and identified the factors driving rates of nest predation. As expected, there was a highly significant negative correlation between rates of nest predation and the actual annual reproductive output of Prothonotary Warblers (Hoover 2006). Of 1,156 nest predation events, 73% were attributed to raccoons, 15% to snakes and 7% to southern flying squirrels (Glaucomys volans). This was not surprising given that raccoons thrive in fragmented landscapes, particularly in bottomland forests fragmented by agriculture. Our most interesting finding was that nests over water deeper than 60 cm were particularly successful because raccoons appear not to like foraging in water that is deep enough that they must swim (Hoover 2006). This highlighted that deeper forested wetlands and swamps inundated for 1-3 months during the warblers' breeding season (May-July) are critical to the nesting success and maintenance of healthy populations of Prothonotary Warblers and possibly other species (Hoover 2009a). Habitat fragmentation, the draining of wetlands, and stream channelization may act synergistically to elevate rates of nest predation for those birds breeding in forested wetlands.

Restoring Hydrology in Off-channel Wetlands Benefits Breeding Birds– We were provided a unique opportunity to study the potential reversal of negative effects that can occur following the channelization of rivers and streams (e.g., the formation of lateral gullies that connect streams to off-channel wetlands and unnaturally accelerate the draining of wetlands, potentially exposing some birds to high rates of nest predation). We monitored how the hydrologic restoration of off-channel wetlands (plugging gullies that drain off-channel wetlands) affected the diversity, abundance, and nesting success of birds breeding within those habitats. We compared surface area, water depth, bird diversity, bird densities, and nesting success between treatment (gully plugs added) and control (gully plugs not added) wetlands pre- and post-treatment. During the breeding season of birds, treatment wetlands retained more flooded area and greater water depths compared to control wetlands (Hoover 2009a). Bird diversity was unaffected by the installation of gully plugs. The density and nesting success of Prothonotary Warblers was higher in treatment wetlands than in control wetlands. These results highlighted how conservation activities (e.g., plugging lateral gullies) and natural processes (e.g., water control structures built by beavers; *Castor canadensis*; Hoover 2009b), which increase water storage in forested wetlands can increase the reproductive success and densities of Prothonotary Warblers and other wetland-dependent birds (Hoover 2009a).



Restored off-channel wetland using gully plugs. Photo by Jeff Hoover.

Birds use their Past Experiences when Deciding where to Breed– Using some novel experiments and color-banded individuals in our study populations, we were able to demonstrate that individual female and male Prothonotary Warblers decided whether to return to sites within the Cache River watershed based on their reproductive performance (Hoover 2003). Individuals producing two batches of offspring (broods) in a breeding season returned to the same habitat patch the following year at a rate of 80%. Individuals producing one batch of offspring returned at a rate of 50% and those producing no offspring returned only 25% of the time. Warblers used their own nesting success as a cue to return to good sites and to avoid returning to

Continued on page 5

SCHOLARSHIP DRIVE

Support Wetland & Wildlife Research

Donate $20 and receive a WWG re-usable chico bag!

The WWG will match each donation dollar for dollar up to $500 for a total scholarship of $1,000

Help the WWG reach our goal of providing a $1,000 scholarship for a MS or PhD student member!

Contact Adonia at wwg.tws@gmail.com
Pay by Check, Paypal, or Zelle®

Scholarship applications will be announced during summer 2022 or when funding goal is met.

Message from the Chair (*continued from page 1*)

It is my hope that in 2022, the WWG will continue to develop activities and strategies to further collaboration and involvement among our members, and that we will continue to build avenues for student success through scholarships, presentations, and networking opportunities. We love hearing suggestions from our members on how we can improve the WWG, so please feel free to reach out to our officers anytime with ideas for activities, news, recent publications or job openings, or other information you think may be valuable to our members. We had some great participation last year, and I consider myself lucky to be part of such a passionate group of wetland professionals. We are looking forward to another fun year working with you to improve wetland and wetland wildlife conservation in 2022!

Cheers, Jay VonBank, Chair

Wetlands in the News

Massive wetland restoration project in the works for Upper Klamath Lake.

A review of policy 'wins' for the birds.

USGS releases nationwide marsh vulnerability maps.

U.S. eyes wetland restoration as hedge against climate change.

Dragonflies & damselflies disappear as wetlands are lost.

Feds defend irrigation in drought-stricken wetland refuge.

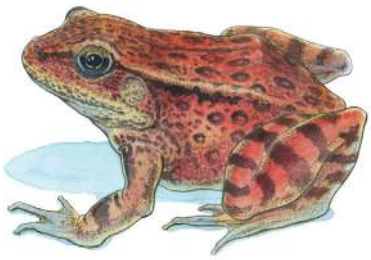
When a wetland is too wet, sometimes nature needs a plumbing assist.

Eagles, beavers, and sea turtles: Why N.Y.C. is humming with wildlife.

Enhanced wetland at UCSC campus will benefit threatened frogs.

Floating wetlands help combat nutrient pollution in Baltic lagoons.

$15 million to strenghten Chesapeake Bay preservation.



California red-legged frog (Rana draytonii). *Illustration by Chuck Todd; source lamag.com.*

Click on the light blue hyperlinked text above for links to the original articles.

Breeding Birds & Bottomland Forest Health (*continued from page 3*)

bad ones. These "decision rules" lead to the build-up (increased densities) of warblers on good sites because many of the breeding adults return year after year, and because the presence of these returning adults is attractive to other warblers looking for a good place to breed (including older failed breeders the previous year and 1-year-olds who are looking for a place to breed for the first time) (Hoover 2003). These results also verified that warbler densities are a good proxy for assessing the quality of breeding habitat, with higher densities of warblers in forested wetlands where reproductive output is typically high and lower densities where output is low.

Offspring Produced Locally Return to Breed Locally–Since 1994, we banded >10,000 Prothonotary Warbler nestlings in the Cache River watershed and searched for them in subsequent years in suitable habitat across southern Illinois and northern Kentucky within a 30-km radius around our core study area. We found that the vast majority (80%) of banded offspring that return to breed, do so to within 2-3 km of where they were produced (McKim-Louder et al. 2013). We assessed 2,500 breeding adults in the zone around our core study area that was 15-30 km away and did not find a single banded bird. The implication of these results is that offspring recruit into the population near where they were produced. The valuable management implication of this result is that local conservation efforts to improve nesting success will benefit local population dynamics. Simply put, it seems that birds produced in the Cache return to the Cache or very close to it, and local habitat management efforts that improve nesting success (land acquisition, restoration, consolidation of forests, managing water levels, etc.) will provide an even greater benefit to the local bird community.

Prothonotary Warbler with color bands on legs.

Insect-rich Bottomland Forest Ecosystems Bolster Breeding Bird Densities– Another primary objective was to test for effects of food limitation, as a byproduct of local warbler densities, on measures of productivity. During a 4-year study we nearly doubled overall prothonotary warbler breeding densities on select study sites and manipulated nest box spacing to increase local breeding densities (defined as the number of pairs breeding within 200 m of a pair's nest). We did not detect an effect of local density on any measures of annual reproductive output (e.g., clutch sizes, hatching success, total number of offspring produced per female, etc.) despite our vast range of local densities (1–27 pairs; i.e., 0.16–2.23 pairs per ha) (Hoover et al. 2020). Nor did we detect differences in nestling provisioning rates and nestling body condition relative to local density. The warblers are insectivorous during the breeding season but do not specialize on one type of insect (Petit et al. 1990a, b, Petit 1999, Dodson et al. 2016). Bottomland and swamp forests, such as those in the Cache River watershed, produce a diverse and abundant invertebrate biomass (Batzer et al. 2016) that continuously emerges throughout the warbler's breeding season (Petit and Petit 1996, Heinrich et al. 2013, Batzer et al. 2016, Dodson et al. 2016). Abundant and diverse invertebrate biomass likely promotes the diverse assemblage of insectivorous bird species that breed in bottomland forests (Sallabanks et al. 2000, Wakeley et al. 2007, Hoover 2009a). By breeding in a productive ecosystem rich in food resources, these warblers and other bird species may avoid reduced reproductive output when breeding in high densities (Hoover et al. 2020).

Prothonotary Warbler at nest box.

Composition of Surrounding Landscape Influences Cowbird Parasitism of Warbler Nests– Landscape composition (e.g., the relative amounts of forest and non-forest habitat in an area) is thought to have strong effects on various aspects of nesting success in songbirds, including rates of nest predation and cowbird parasitism. By studying Prothonotary Warblers nesting in nestboxes in the Cache River watershed, we found that rates of parasitism by brown-

Parasitized Prothonotary Warbler nest with three cowbird eggs.

Continued on page 6

All photos this page by Jeff Hoover.

Breeding Birds & Bottomland Forest Health (*continued from page 5*)

headed cowbirds decreased with an increased percent of the landscape that was forested within a 3-km radius (Hoover and Hauber 2007). This consistent effect of landscape composition on cowbird parasitism led to our finding that brood parasitism status of brown-headed cowbird hosts is consistent across generations in individually color-banded female Prothonotary Warblers. Warbler daughters were more likely to share their mothers' parasitism status (i.e., parasitized/not parasitized) if they returned to breed in the habitat patch where they were produced (Hoover and Hauber 2007). These results highlight the predictable and consistent effects the local landscape has on rates of cowbird parasitism in the existing tracts of bottomland forest, and the importance of putting more bottomland forest back on the landscape in the watershed.

Re-foresting Acquired Land in the Cache River Watershed Improves Nesting Success– Land acquisition and tree planting ("re-forestation") has reduced fragmentation of the bottomland forests in the Cache River watershed. We found and monitored 1,554 bird nests of seven bird species in several tracts of forest in the watershed during 1993-1995 (beginning of land acquisition) and again during 2010-2012 (many areas newly forested). Preliminary analyses of nesting data show reduced rates of cowbird parasitism and increased daily survival rates for nests can be linked to the changing composition of the landscape in the watershed (i.e., more forest and less agricultural land near focal study sites). Averaging across all species, overall rates of cowbird parasitism decreased from 30% to 18%. It is possible the decrease in cowbird parasitism stemmed from 1) the restoration increasing the commuting distance for female cowbirds between forest egg-laying areas and suitable non-forest feeding areas and/or 2) the absorbing of some cowbird eggs by the many cowbird hosts now occupying the early successional stages of restored bottomlands adjacent to the original mature bottomland forest. The probability of a nest to successfully produce a fledgling (i.e., not fail because of predation) increased from 13% to 20% in the watershed. These trends for reduced overall rates of nest predation and cowbird parasitism are promising and suggest that nesting outcomes improve when the fragmentation of bottomland forests is reduced.

Summary–Bird research in bottomland forest ecosystems can be an invaluable companion to management and conservation efforts aimed at improving these altered ecosystems. What we have learned is that when off-channel forested wetlands retain deep enough water during the summer and the fragmentation of bottomland forests is reduced, the reproductive success of birds breeding there can increase more than 4-fold (Hoover 2003, 2006, 2009a, Hoover et al. 2020), with many warblers raising multiple broods in a single breeding season (Hoover 2003). High reproductive success (i.e., fledging 2 broods) results in high between-year fidelity of adults to territories (Hoover 2003), more fledglings produced that can return to breed in a subsequent year (McKim-Louder et al. 2013), and increased breeding densities of birds over time (Hoover 2009a, b, Hoover et al. 2020). In combination, conservation actions in the Cache River watershed have created "source" habitats that can maintain or increase local populations of breeding birds. Our studies spanning two decades have provided evidence of tangible benefits to populations of bottomland forest birds resulting from effective and achievable management/conservation actions in the Cache River watershed in Illinois. Documenting changes in the bird community in response to conservation efforts provides a means to measure the success of restoration activities in the Cache River watershed and inform conservation plans and restoration efforts in other bottomland forest ecosystems. *See page 8 for literature cited.*

*Bald cypress (*Taxodium distichum*) in off-channel forested wetland. Photo by Michael Jeffords.*

The WWG Welcomes James Morel as Vice-Chair

James Morel currently serves as a senior biologist, in the role of "Wetlands and Migratory Bird Coordinator" for the Oklahoma Department of Wildlife Conservation. In this position, he jointly manages and implements restorative and new development wetland projects, as well as migratory bird management and research, while also serving as the state's representative for the Central Flyway Council's Waterfowl and Webless Technical Committees and several central flyway subcommittees and working groups. The purview of our wetland program is statewide and focused on 38 wetland development units and many additional wildlife management area wetland habitats, comprised of natural wetlands (playas, basin depressions, riparian), moist-soil units, and flooded green-tree reservoirs. Prior to beginning work with ODWC in December of 2020, James worked as a Ph.D. student (ongoing) with Texas Tech University, evaluating waterfowl use and forage provision of man-made habitats within the Oaks and Prairies ecosystem of eastern and north-central Texas. Before pursuit of his doctoral research, James spent many years working as a biologist for tribal agencies in the capacity of endangered and native fish recovery programs, primarily researching population dynamics and factors that influence population growth and declines, as well as managing an endangered fish rearing aquaculture program. James received a Bachelor of Science degree in Wildlife and Fisheries Management from Southeastern Oklahoma State University in 2006, a Master of Science degree in Natural Resource Management from New Mexico State University in 2010, and plans to complete his Ph.D. in the spring of 2022.

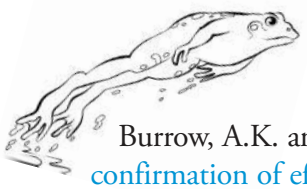
Black-necked stilt
WWG Member Jeremiah Psiropoulos

CONGRATULATIONS TO OUR 2021 PHOTO CONTEST WINNERS!!

WWG Member Julia Olson
Boundary Waters

Member Highlights

New Publications



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Click on the light blue hyperlinked text above for links to article.

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Training Opportunities & Upcoming Conferences

National Association of Wetland Managers
(previously the Association of State Wetland Managers)
Check out their facebook page for updates on their new website and information on webinars, trainings, & special events

2022

87th North American Wildlife and Natural Resources Conference
13-18 March 2022 Spokane, WA

Joint Aquatic Sciences Meeting
16-20 May 2022 Grand Rapids, MI

ICEWW 2022: International Conference on Environment, Water, & Wetlands
23-24 May 2022 Montreal, Canada
16-17 June 2022 Toronto, Canada

American Ornithological Society Annual Meeting
27 June - 2 July 2022 San Juan, Puerto Rico

Joint Meeting of Ichthyologists & Herpetologists
27-31 July 2022 Spokane, WA

The Wildlife Society 29th Annual Meeting
6-10 November 2022 Spokane, WA

ESA, ESC, & ESBC Joint Annual Meeting
Entomology as Inspiration:
Insects through art, science & culture
13-16 November 2022 Vancouver, British Columbia

Click on the light blue hyperlinked text above for conference information.

Cypress Creek National Wildlife Refuge. Photo by Eric Johnson, USFWS.

Questions?

Interested in sharing your wetland experiences and contributing to the Newsletter?

Contact a Board Member!
(see below)

*Pacific treefrog (*Pseudacris regilla*), Bruceport, Washington, salt marsh. Photo by Amy Yahnke.*

2022 Board Members

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How to Join WWG

When you renew your TWS membership, sign up for the Wetlands Working Group!

If you're already a member of TWS, you can add membership in the Wetlands Working Group at any time by logging into your account at http://wildlife.org/.

Membership dues are only $5 annually, which helps support activities at meetings, student travel awards, and outreach events.

Newsletter formatted and edited by Adonia Henry.