TALL TIMBERS

FIREBIRD

Updates from the Stoddard Lab of Ornithology Fall–Winter 2021

Feathery Field of View

By Jim Cox

My introduction to Tall Timbers occurred 40+ years ago when I offered to help Todd Engstrom (former Tall Timbers ornithologist) set up a bird survey plot on the Wade Tract. I didn't know the difference between a towhee and a titmouse at the time, but those early days spent with Todd and other knowledgeable birders opened my eyes to the valuable contribution birds make to environmental monitoring.

Birds seek very specific vegetative conditions that enable scientists to infer the types of trees present and even the frequency of burning based on the species counted in a survey. A Wood Thrush favors closed-canopy beech-magnolia forests; Bachman's Sparrows prefer regularly burned pinewoods. Thanks to specific call notes and songs, birds also are much easier to detect than other wildlife. A thicket-loving Swainson's Warbler can be heard singing from 75 yards away; actually seeing the bird is much more difficult given the dense vegetation it prefers.

This issue of the *Firebird* features new research on the fire-dependent Frosted Elfin butterfly and declining Common Ground Dove, but we also take time to look back at decadal changes that have occurred among the birds of the Red Hills based on our long-term monitoring efforts. Bird surveys were a major focus for Tall Timbers during the early years. Little was known about the effects fire had on different species, and a good way to learn was to count bird numbers before and after fires occurred.

Our focus today has shifted a bit toward managing rare species like the Red-cockaded Woodpecker, and understanding the effects that fire has on the survival and productivity of rare birds, not just their abundances. Survival and productivity keep populations running, after all, and these parameters are important when developing recommendations that land managers can apply. That said, we continue to monitor birds using the same procedures used by Todd and others who came before us, knowing two important facts: (1) change is the only constant and (2) tracking change can identify declining species that might need more attention. ■

Burning for Butterflies—Digging Deep Saves Lives

By Rob Meyer

While the importance of fire was established for quail and other species decades ago, there's much to learn about fire effects on other species living in southern pinewoods. Some of the most under-studied organisms are insects, which make up over 80% of the animals found in pine forests. Insects perform critical ecosystem services such as pollination, plant decomposition, and soil aeration. Insect diversity also spans everything from the humble honey bee to the beautiful rainbow scarab and ethereal luna moth. The multitude of different insects found in a single acre may use a dizzying array of fine-scale and very specific habitat features. Many insects also lay their eggs on just a few different types of host plants.

Adult insects may fly away or scurry down a Gopher Tortoise burrow when a fire approaches, but other life stages (egg and pupa), are generally less mobile and fire impacts can come down to when fire occurs. In the case of the imperiled Frosted Elfin butterfly, timing and location could be everything.

Figure 2. A female Frosted Elfin laying eggs on sundial lupine. Photo by Dave McElveen

Frosted Elfins are endemic to longleaf pine savannas and require fire to maintain suitable habitat and their host plants, sundial lupine and wild indigo. Adult Frosted Elfins spread their wings and fly about only for the few months needed each year to mate and lay eggs on host plants. Larval caterpillars emerge within a week and chow down on the host plant for several weeks before forming a chrysalis (pupa). Each Frosted Elfin spends the majority of its life—about 8 months in total—in this intermediate, immobile pupa stage when they might be especially vulnerable to fire.

When can you burn the woods without burning them all up? The answer may lie with location, location, location.

Some, but not all, elfin caterpillars bury in the sand before forming a chrysalis. Why some individuals bury and others remain at ground level is unknown, but nature tends to promote this type of variation, when benefits render one strategy advantageous in one setting, and another strategy advantageous elsewhere.

Caterpillars that pupate on the soil surface are unlikely to survive a fire unless the chrysalis is located in areas with low fuel loads, or a lot of flame-resistant material. Lethal temperatures for most organisms are around 130° F, which is well below the 400° a mild, flickering flame can generate. On the other hand, low oxygen levels and heavy rains are known to affect metabolism for other species with subterranean pupa, so there could also be advantages to staying above ground.

To develop better information on fire effects, we raised elfin pupa last summer and subjected them to an experimental, small-scale fire on Tall Timbers. Our previous work found most pupa bury less than 1″ below ground, so we buried pupae at two depths (1/3″ and 2/3″), and then covered the area with pine straw to carry the fire.

We borrowed thermocouples from the Fire Ecology Lab to measure temperatures generated by the fire at ground level and below. Scott Pokswinski and Jacob Ney with the Fire Science (Figure 3) also helped record fire intensity using a thermal imaging camera as the fire moved across the plot. The combined tools enabled us to quantify the amount of heat the fires generated at fine scales, both above and below ground level.

Temperatures ranged between 100-900° at the surface, and 72-170° F below ground. None of the 31 pupa buried 1/3″ below the surface survived, and mortality was also high (ca. 60%) for pupa buried deeper.

–Burning for Butterflies continued p. 3

Figure 3. Jacob Ney supervising the burn at Tall Timbers. A thermal imaging camera affixed to the metal tripod records the fire as it moves over the plot where the Frosted Elfin pupae were buried.

Figure 5. Sundial lupine (green stems in red circles) near a Gopher Tortoise burrow on the Apalachicola National Forest. The area has not been burned in 4 years, yet still has a sparse fuel load thanks to a browsing tortoise.

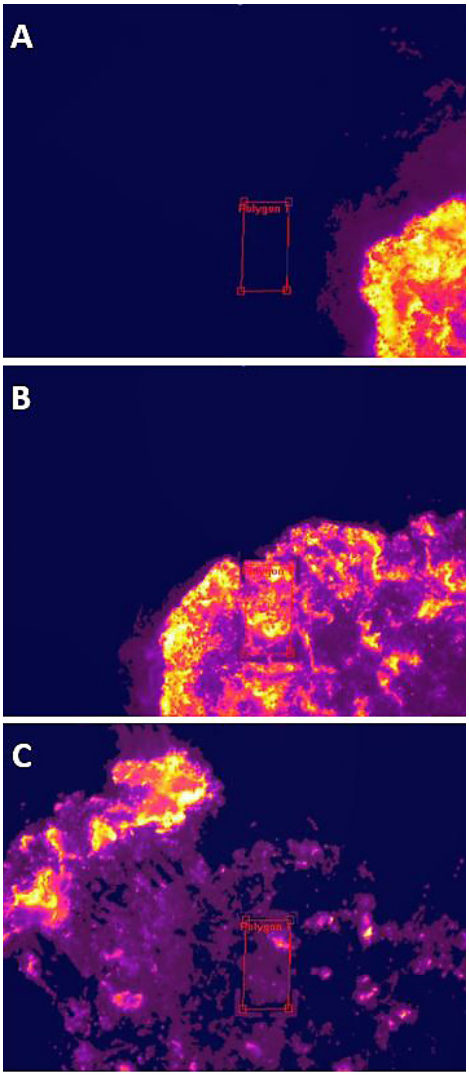


Figure 4. A time-lapse of one of the fires as it approaches (A), moves over (B), and eventually moves past (C) the Frosted Elfin pupa (within the red outline). Brighter colors indicate warmer temperatures. Note that the heat generated is uneven across the study area as a result of (C) variation in intensity and duration

Burning for Butterflies continued–

The time the fire lingered over pupa also affected survival, with higher mortality occurring when high temperatures were sustained for 3+ minutes (Figure 4).

It is fair to say that the deeper you go, the better your chances of surviving if you're a Frosted Elfin. The butterflies require fire to maintain suitable habitat, but fire could also lead to high rates of mortality under some circumstances. We need to know more about fire behavior in the field, especially in and around favored host plants.

Sundial lupine is often found in areas with bare ground. Larva that feed on plants located near Gopher Tortoise burrows (Figure 5) also could benefit from the less continuous fuel beds and open patches of bare soil created by browsing tortoises. These areas with bare ground may not burn as thoroughly nor sustain hot conditions for as long as burns moving through areas with denser grass cover.

Another approach to minimize threats might be to conduct smaller patch burns and to burn under conditions where fire intensity is predicted to be low. Low intensity fires will leave behind unburned patches that might serve as important refugia for Frosted Elfin. Low intensity fires may also mimic the variation found when natural fires burned into the night and low winds and high humidity prevailed. The Frosted Elfin's relationship with fire can tell us a lot about how they have evolved and adapted with natural fire regimes.

As always, there's more to learn as we continue to explore the complex relationships between fire and habitats used by rare species.■

Birds in Decline

Breeding bird populations in the Red Hills region have been monitored for decades on experimental plots, 115 point count stations, and 2 roadside surveys (Figure 6).

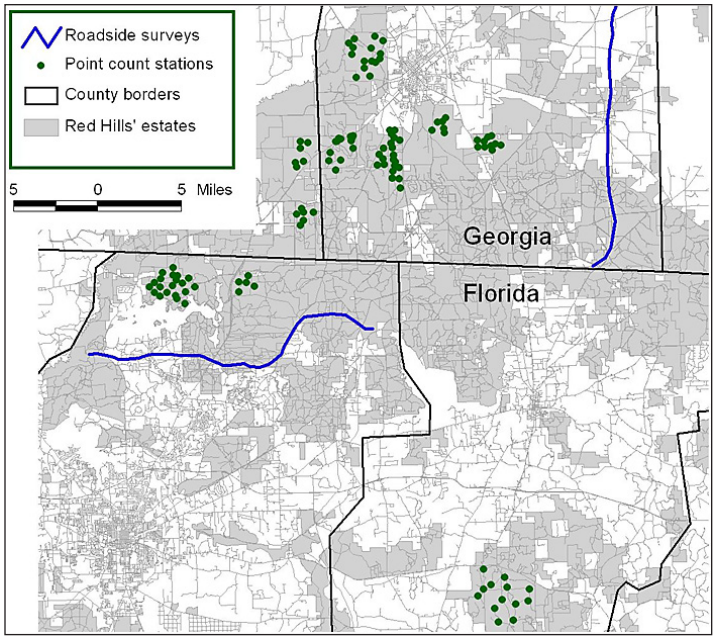


Figure 6. Point count stations and roadside bird surveys conducted in the Red Hills region within the past 20 years. Historic data come from research and surveys performed by former Tall Timbers staff members Wilson Baker, Bobby Crawford, and Todd Engstrom.

The roadside surveys began in 1967, and point to 14 declining species (Table 1) with 4 species falling into a Rare and Declining classification based on steady declines coupled with low counts (≤ 2) on recent surveys (Figure 7). There are 14 unique stories embedded in these trends, but data collected for the Eastern Meadowlark highlight the magnitude of some of the changes taking place both locally and regionally for a once common bird.

Species	Regional Status	Average on Counts
Kentucky Warbler	Rare and declining	0.3
Wood Thrush		0.7
Northern Flicker		1.5
Eastern Meadowlark		1.8
Loggerhead Shrike	Declining	2.5
Brown-headed Nuthatch		2.6
Field Sparrow		3.5
Eastern Wood Peewee		3.8
Eastern Kingbird		4.1
Yellow-breasted Chat		4.2
Bachman's Sparrow		4.4
Red-headed Woodpecker		4.6
Common Ground-Dove		6.3
Eastern Towhee		29.2

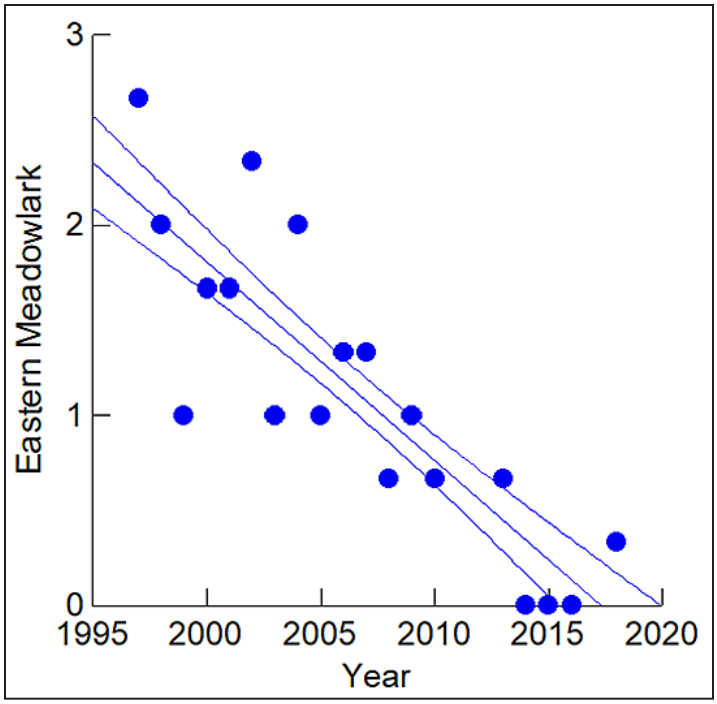
Table 1. Breeding birds in the Red Hills region exhibiting long-term declines based on roadside surveys and regional point counts. Rare and declining species had negative trends and low average abundances (≤ 2) on counts. Declining species had negative trends and higher average abundances (> 2) on counts.

Todd Engstrom recorded 9 males singing on the 200-acre Wade Tract in 1980, and found meadowlarks regularly breeding there through 1995. Soon afterwards, however, the bottom fell out with meadowlarks declining broadly and rapidly across all survey types (Figure 8). The last meadowlark detected on one of our point count surveys was in 2003; meadowlarks have almost disappeared totally along roadside counts.

While we don't know all the underlying reasons for meadowlark declines, northward expansion of Tallahassee's urban landscape has enveloped a significant portion of one of the roadside counts.

–Bird Decline continued on page 5.

Figure 7. Two of the rarest and most rapidly declining species in the Red Hills region are the Wood Thrush, left, and the Eastern Meadowlark.



Slide 8. Eastern Meadowlark trends on recent road side surveys in the Red Hills region.

Bird Decline continued –

Urbanization had no effect on birds on the Wade Tract, but regional declines may have destabilized the small population associated with pristine areas. It's probably a bit late to learn much about factors affecting declines for the Eastern Meadowlark given its current rarity, but declining trends can help establish priorities for work with other species. Common Ground Dove, Brown-headed Nuthatch, Field Sparrow, Loggerhead Shrike, and Red-headed Woodpecker are all declining, but still common on some areas. A small investment in research could help unearth factors to offset continued losses. ■

50 Years of Fire Suppression

Figure 9. Photo of NB66 taken in February 2003. Photo by Rose Rodriguez

In 1966, Tall Timbers staff marked off a 22-acre plot on a pine ridge that had been burned annually for decades. Known as NB66, staff burned it one last time on March 23, and then proceeded to monitor changes in the bird community annually as time-since-fire increased. This famous study documented rapid declines for species, such as Loggerhead Shrike, Eastern Kingbird, and Bachman's Sparrows that disappeared soon after fire was removed. Other birds associated with low-statured brush moved in 3-6 years later (Prairie Warbler, Yellow-breasted Chat, and White-eyed Vireo), but then also disappeared as succession slowly gave way to species like Wood Thrush, Acadian Flycatcher, Red-eyed Vireo, Hooded Warbler, and Kentucky Warbler that favor hardwood forests.

We now monitor NB66 every 5 years to document the presumably more gradual changes taking place. The number of breeding birds found on NB66 today is only two-thirds the number found in 1966 (Figure 10). The reduction in species reflects both the effects of fire suppression as well as the regional losses documented for species like Wood Thrush and Kentucky Warbler. Southern pine forests support more species of breeding birds than the other forest types in the region, but only if they are burned frequently to provide the grassy conditions needed by Bachman's Sparrow, Eastern Kingbird, and Loggerhead Shrikes.■

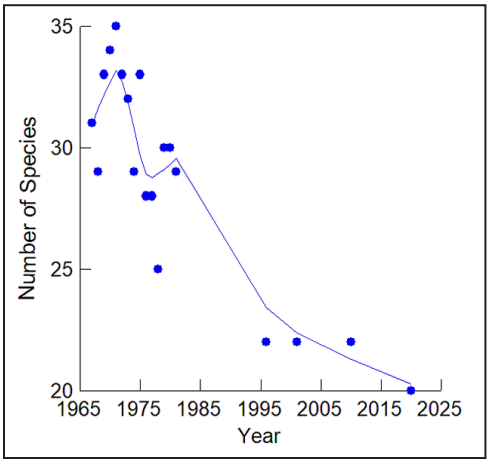


Figure 10. Trends in bird species richness on NB66.

A Fortuitous Change in Cavity-nesting Birds

Breeding season counts conducted on Tall Timbers (n = 20 census stations), helped to document a potentially fortuitous and unanticipated outcome associated with the reintroduction of Red-cockaded Woodpeckers to the property. Woodpecker reintroductions began in 2006, with the current population holding steady at 12-14 breeding groups annually.

The Red-cockaded Woodpecker is often called an "ecosystem engineer" thanks to the benefits the long-lived cavities created by the woodpecker provide to other species. Woodpeckers have excavated 44 natural cavities since returning to the property. Tall Timbers staff also constructed another 100 or so artificial cavities to help sustain and grow the reintroduced population. Over the past few years, our point counts suggest increases have also occurred for other cavity-nesting species that regularly use Red-cockaded Woodpecker cavities (Figures 11 and 12). Correlation is not causation, but we hope similar benefits take place on Livingston Place and other properties in the region, where Red-cockaded Woodpeckers are increasing thanks to hands-on management. ■

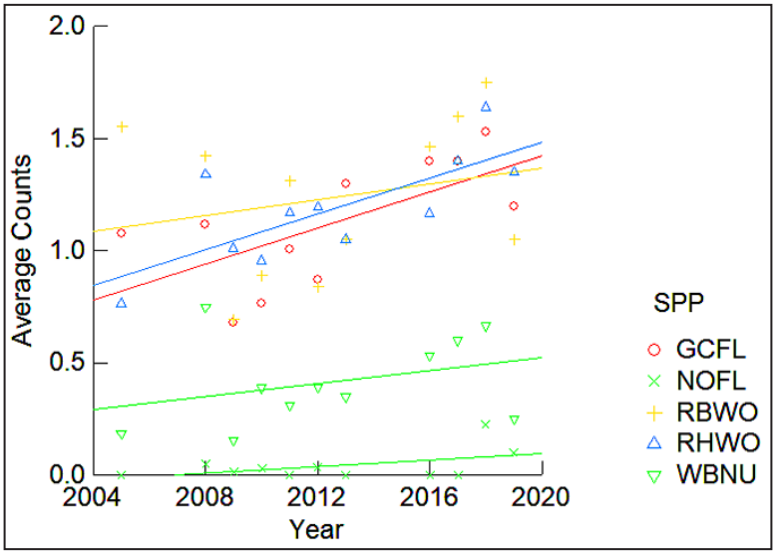


Figure 11. Changes in populations of 5 cavity-nesting birds following the reintroduction of Red-cockaded Woodpeckers to Tall Timbers. These birds are: GCFL–Great-crested Flycatcher; NOFL–Northern Flicker (lower left); RBWO–Red-bellied Woodpecker; RHWO–Red-headed Woodpecker; WBNU–White-breasted Nuthatch (lower right).

Figure 12. Red-headed Woodpecker, top, using an artificial Red-cockaded Woodpecker cavity. Below, Greg Hagan is excavating an artificial cavity.

The Beauty of Bycatch

The colorful Common Ground-Dove (Figure 18) is firmly on the list of declining species in the Red Hills region (Figure 17). The dove might not seem the biggest priority for research, given the fact it is still common on many areas. However, not much is known about the bird, and priorities for research often consider logistical factors, such as the ease of conducting research, as much as the rate of population decline.

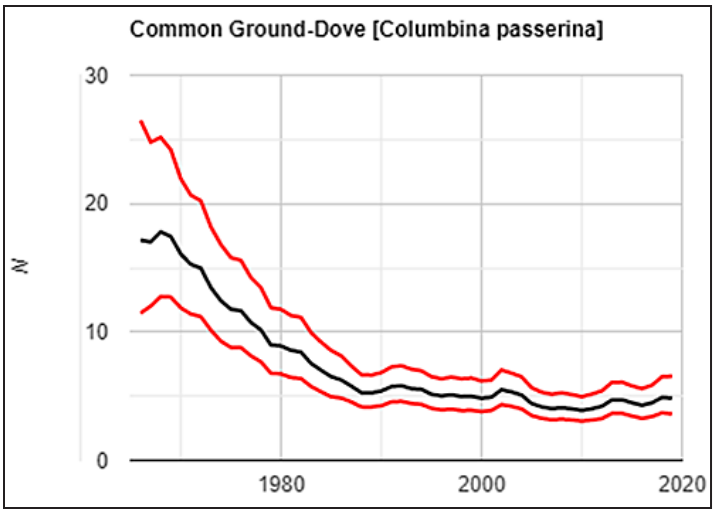


Figure 17. Common Ground-Dove trends on roadside counts.

In the case of the dove, the federal government provides Tall Timbers with free numbered bands that we can place on their legs, and use to monitor the comings and goings of individual doves. The dove is also commonly trapped by folks in the Game Bird Lab — often 5–10 during each evening trapping session. Taking the few minutes need to apply a band (or write down its number if already banded) could yield a ton of new information on this declining bird.

University of Georgia graduate student Destinee Story will study Common Ground Dove survival and movement on Tall Timbers and Livingston Place for the next couple of years. To date, over 150 doves have been banded and about half were recaptured months later. The main objectives for this research are to estimate survival rates and densities for doves on Tall Timbers and Livingston Place. We also hope to look at movement patterns through both the recapture of marked birds and by re-sighting color-banded birds, when we are out working with woodpeckers, sparrows, and nuthatches (Figures 18 A & B). ■

Figure 18 A & B. Trapping birds at night often yields a lot of Common Ground Doves as well as quail (top). Ground Doves (below) are declining throughout the Southeast, and are being color-marked to monitor individual movements and survival.

Crowd-sourced Monitoring for a Pineland Endemic

The National Fish and Wildlife Foundation (NFWF) graciously supports efforts to restore longleaf pine ecosystems throughout the southeast. NFWF is using a new metric to assess progress based on the number of Bachman's Sparrows (Figure 13) found in the large landscapes where restoration efforts occur. The target is to sustain 25,000 acres of occupied sparrow habitat. Recent studies show that the sparrow and Red-cockaded Woodpeckers serve as solid indicators of high-quality habitat for many other pineland birds.

Figure 13. Bachman's Sparrow

Tall Timbers has worked with the sparrow for nearly 20 years and offered to develop a survey program in 2020, to document the habitat occupied by Bachman's Sparrows within one of the regions where NFWF has made investments. The region known as the Apalachicola Regional Stewardship Alliance (ARSA) (Figure 13) covers over 6,000 sq. miles and 10 counties in Florida and Georgia. The only feasible approach for monitoring such a large area would be to crowd-source the effort, which also means developing a survey that almost anyone can perform.

Playback surveys fortunately enable anyone to become a sparrow expert quickly. If you blast the song of a male Bachman's Sparrow using a small boom box, your chances of detecting a sparrow are about 80%, and noticeably higher than the chances of detecting a sparrow based on natural rates of calling and singing (60% for experienced observers).

We developed a standardized 3-minute recording of the sparrow's song that biologists and land managers working in the ARSA region could use to elicit a territorial response. Funds provided by NFWF allowed us to purchase MP3 players that participants could use to broadcast the songs in a standardized manner. We also developed a special app folks used to log observations on their phones. The app allowed consistent data to be recorded by a wide range of participants, as well as GPS coordinates where the sparrows were found (or missed).

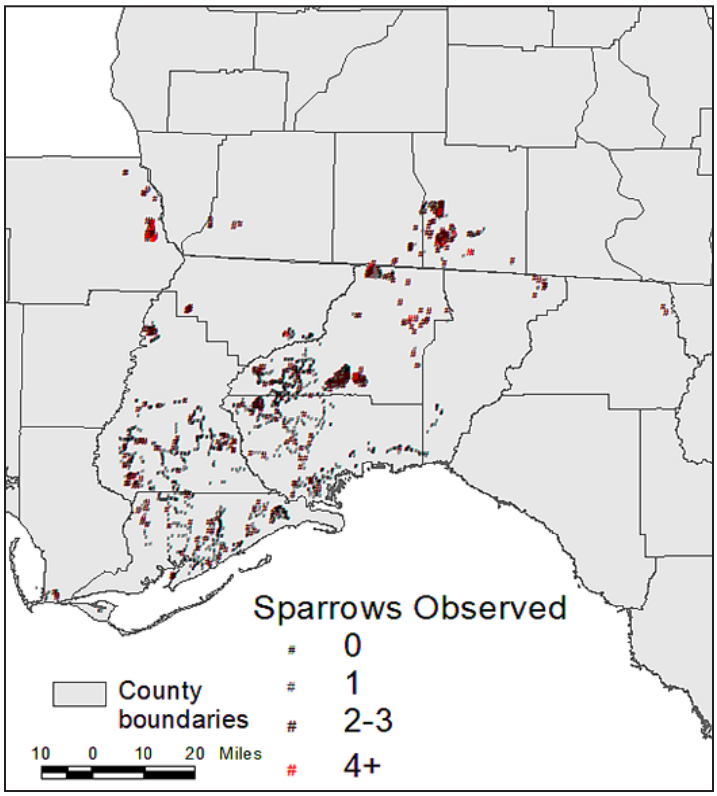


Figure 14. Crowd-sourced monitoring for Bachman's Sparrows in north Florida and southwest Georgia. Over 2800 males were documented to assess regional goals established by the National Fish and Wildlife Foundation.

Surveys were performed by 63 individuals associated with 7 different state, federal, and private entities (Figure 14). The crowd-sourced data documented a total of 2,833 singing males across the region. Each male defends approximately 5 acres of habitat, so the acreage occupied totaled at least 14,165 acres, and is likely much larger given the small area that each survey covered (ca. 25 acres for each sample based on a 100-m detection radius surrounding the sample). The area encompassed by all the surveys was approximately 30,000 acres, but the ARSA region contains 0.75 million acres of potential sparrow habitat. Taken collectively, the ARSA region likely supports over 100,000 Bachman's Sparrows. A more apt goal for NFWF might be to focus on increasing sparrow numbers on specific sites where restoration occurs.

The data collected for this project have another interesting application when linked up with other data created by the Geospatial Lab at Tall Timbers (Figure 15 A). The Lab has developed a map depicting burn history over the past 16 years for southeastern states (Figure 15 B). Extracting the burn history data associated with

–Monitoring continued on page 9

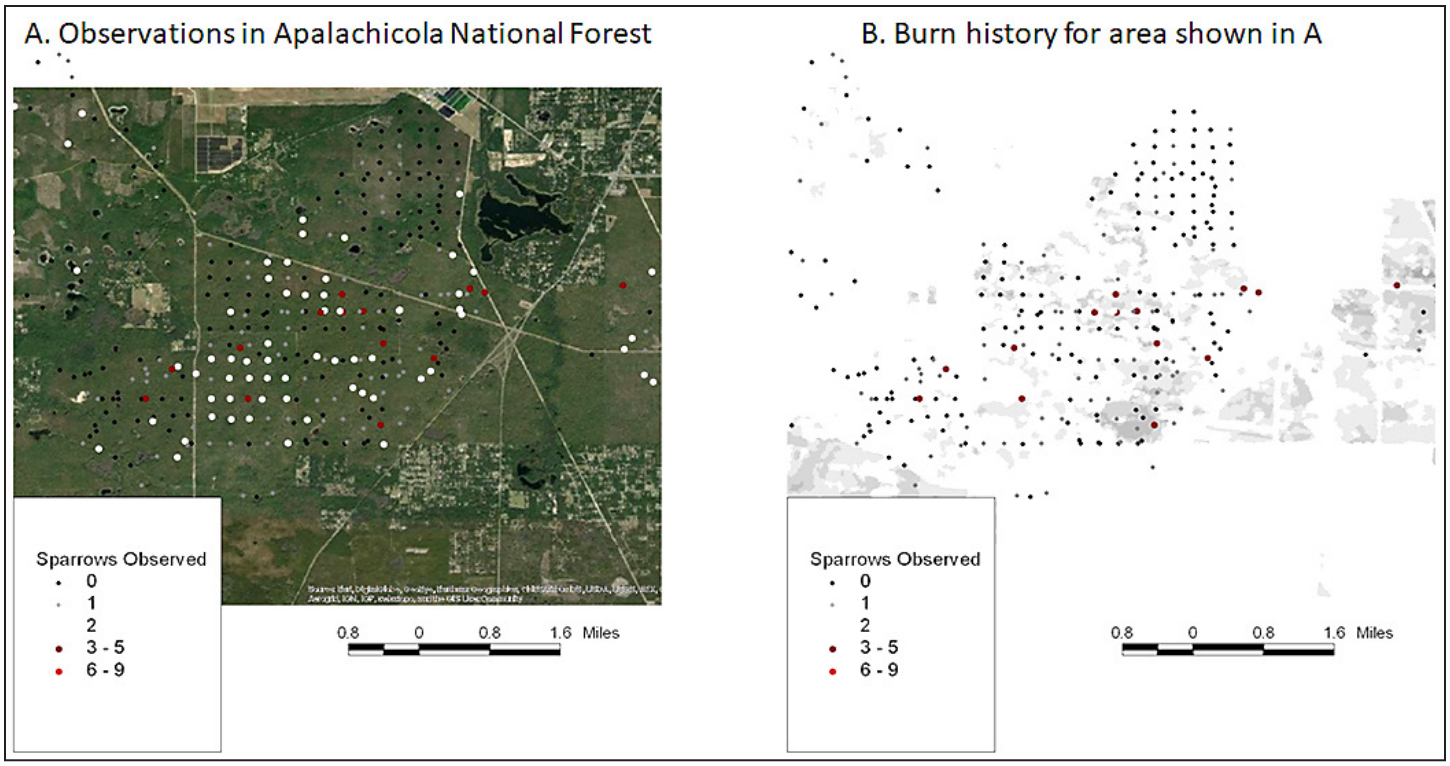
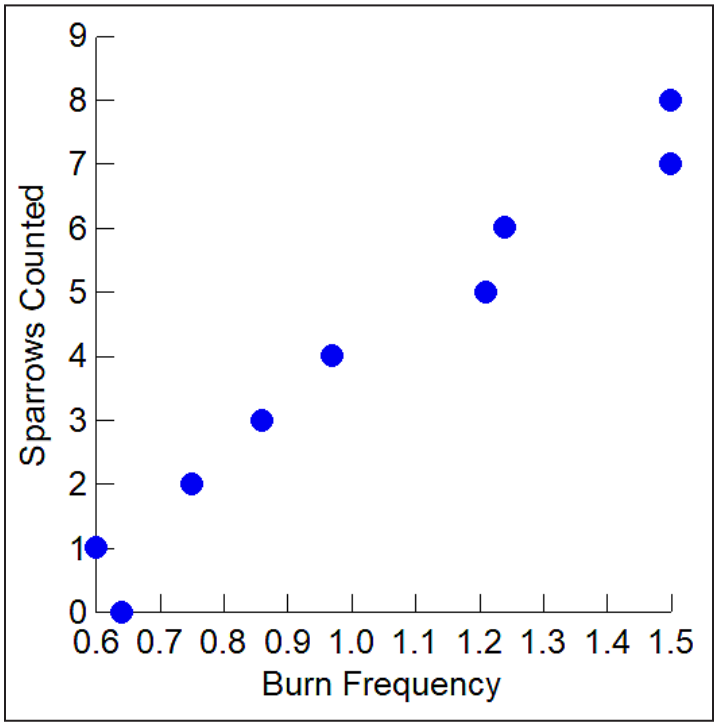


Figure 15 A & B.

each spot where a sparrow count occurred revealed a strong, positive trend between higher fire frequency and higher sparrow abundance (Figure 16). This has been well established through a lot of our research, but in this case, the results hit much closer to home because we can show land managers and biologists the trend using data they collected on their properties. ■



Slide 16. Relationship between the number of Bachman's Sparrows observed on a count and burn frequency as determined using satellite imagery.

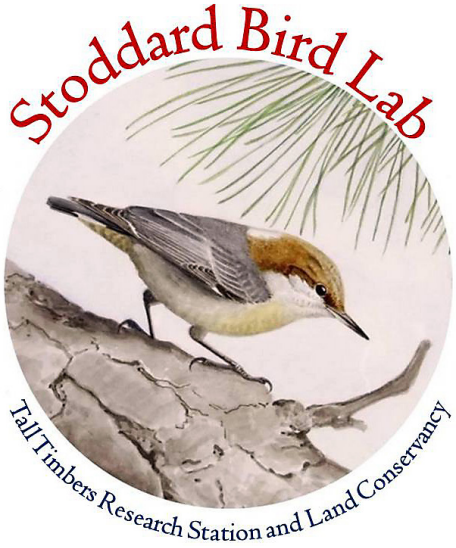
Other Notables

Heather Levy, Heather Hill, and Destinee Story found Black Rails on over 20 sites in the Big Bend region this past summer. The first encounters occurred in early April and responses peaked in June. The bulk of the encounters were associated with recently burned sites on the St. Marks National Wildlife Refuge.

For the second year in a row, the Stoddard Bird Lab helped the Missouri Department of Conservation (MDC) restore the Brown-headed Nuthatch to the Mark Twain National Forest. We spent five days catching nuthatches in Arkansas, so they could be transported to Missouri.

The new Motus tower is up and running (Figure 19). We've had one possible detection thus far—a Yellow-billed Cuckoo that passed by in early October.■

Figure 19. Motus tower



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Publications

Cusick, J., E. DuVal, and J. Cox. 2021. Breeder aggression does not predict current or future cooperative group formation in a cooperatively breeding bird. *Ethology*: https://doi.org/10.1111/eth.13141

Settlecowski, A., K. Davis, J. A. Cox, S. Woltmann, and S. Taylor. In press. Natural history and community science records confirm rapid geographic shifts in the distribution of Bachman's Sparrow (Peucaea aestivalis). *Avian Conservation and Ecology*.

McElveen, D. and R. Meyer. In press. Use of a camera trap to monitor male mating territories of the Imperiled Callophrys irus (Family: Lycaenidae). *Journal of the Lepidopteristis Society*.

Engstrom, R. T., S. Pokswinski, K.J. Hiers, J.A. Cox, and M. Varner. In press. Long-term recovery of selected indicator species following anthropogenic disturbances in an old-growth longleaf pine (Pinus palustris) forest. *Natural Areas Journal*.

Cox, J. A., M. M. Gray, H. E. Levy, and G. L. Slater. In press. Cooperative breeding behavior emerges early in restored populations of the Brown-headed Nuthatch (Sitta pusilla). *Wilson Journal of Ornithology*.

Presentations

(Mostly virtual)

Cox, J. Methods for Monitoring Rare Pineland Birds. Gulf of Mexico Avian Monitoring Network, Mississippi. October; 35 participants.

Cox, J. Prescribed Fire in Coastal Marshes. Alabama Prescribed Fire Council Meeting, October; 60 participants.

Six presentations at a joint meeting of The Florida Chapter of the Wildlife Society and Florida Ornithological Society Tallahassee. October; 50 participants.

Cox, J. — Wade Tract Preserve: Research on a National Natural Landmark

Cox, J. — Bird Monitoring That Anyone Can Perform.

Cox, J. — A Curious Cooperative Breeder: the Brown-headed Nuthatch.

Levy, H. — Black Rails in Florida: Occupancy and State-wide Priority Areas.

Meyer, R. — Safety in Safe Harbor: Conserving Red-cockaded Woodpeckers.

Meyer, R. — New Techniques for Safely Banding Red-cockaded Woodpeckers.

Meyer, R. — Burning Butterfly Questions. Apalachicola National Estuarine Research Reserve. October; 35 participants.

Cox, J. and H. Levy. — Fire in Coastal Marshes: Knowledge Transfer from Uplands. Black Rail Symposium at the 28th Annual Conference of the Wildlife Society. November; 140 participants.

Cox, J. — Herbert Stoddard and Conservation of the Red Hills Landscape. 26th Annual Wildlife Arts Festival; November; 20 participants.