

North Carolina Sandhills Conservation Partnership
Quarterly Meeting Minutes
“Climate Change in the Sandhills – Impacts, Resiliency, Solutions”
1:00-5:00 PM, Wednesday, September 14, 2022

➤ Welcome & land acknowledgement

- As we gather to discuss stewardship and conservation of the Sandhills, it is important to acknowledge the original inhabitants and stewards of these lands. Many still live here today, including the Tuscarora, Coharee and Lumbee tribes. We pay our respects to these past, present, and emerging leaders who have been custodians of this land for many years. We also welcome them to become a part of our partnership as we form conservation strategies going forward.

➤ Steering Committee Attendance

Present:

Pete Edmonds (chair)
Pete Benjamin
Jeff Marcus
Crystal Cockman
Clyde Sorenson
Tim McFayden

Fort Bragg – Training
USFWS
TNC
Three Rivers Land Trust
Sandhills Ecological Institute
NCWRC

Other attendees:

Sarah Hecoeks (TNC), Adam Terando (USGS/NCSU), Corey Davis (NC State Climate Office), Seth Younger (Jones Center at Ichauway), Alan Schultz (Fort Bragg – Wildlife), Carmella Stirrat (TNC), Mike Martin (NCWRC), Brian Williams (Fort Bragg – DPTMS), Barry Hull (Fort Bragg – ACUB), Darin Burns (Fort Bragg – DPTMS ITAM), Jake Comer (Quail Forever), Stacy Huskins (Fort Bragg – ESB), Rod Fleming (Fort Bragg – Environmental), Erick Rietschier (TNC), Susan Miller (USFS), Jackie Britcher (Fort Bragg – DPW ESB), Aaron Cinque (USDA-NRCS), Travis Moorehead (TRLT), Brian Ball (Fort Bragg – ESB), Chris Leach (Army Environmental Command), Coral Eginton (Army Environmental Command), Deah Lieurance (UFL & SE RISCC), Deb Maurer (TNC), Mary Lou Addor (Sentinel Landscape), Dallas Shoemaker (NCWRC), Wendy Dunaway (Public Works/Bonnie Doone), Gabe Bankston (Fort Bragg Fire Mgmt), Gabriela Garrison (NCWRC), Gretchen Coll (TNC), Jesse Wimberley (Sandhills PBA), Jesse Schillaci (Fort Bragg ESB), John Hammond (USFWS), Josh (PWC/Bonnie Doone), Julie DeMeester (TNC), Kevin Crawford (Fort Bragg Env), Nathan Shepard (NCNHP), Rex Badgett (NCDOT), Rhonda Sturgill (TNC), Ryan Bollinger (LLA), Saubhagya Silwal (Salem College), Tori Acosta (Fort Bragg Env), Zach Hardwick (PWC/Bonnie Doone)

Total attendees: **52**

➤ Partner updates

- TNC: 9 job postings currently up for burn crews (2 crews: 1 will last Jan-April, the other Jan-June). Also, two 4-year positions are available (1 is a crew leader position to support fire ops, the other is an assistant land steward position). Positions can be found at careers.tnc.org.

- Fort Bragg Env: Hunting season just kicked in, so remember to wear blaze orange while in the field. ~2000 soldiers out on FB right now. Had a successful dove hunting season (1300 shot).
- Game Lands: dove hunting, timber sale marking, and structure repairs ongoing.
- NRCS: Sign-up deadline for private landowner funding is Oct 14. In the process of getting another farm bill biologist to help alleviate workload from Joint Chiefs project which has a ton of landowner interest (~100 landowner attendees at first outreach meeting!). Updates on that position TBD.
- USFS: Joint Chiefs project: “restoring fire to public and private lands across NC’s ancient mountain range”. USFS working on contract with Ember Alliance for 3 year burn crew to support USFS & NCFCS funded by Joint Chiefs. Contract not yet complete. USFS is providing the US Capitol Christmas tree this year, which will be harvested in early Nov from the Pisgah NF, and will then go on a 2-week tour accompanied by events (local events: Wed Nov 9 3-5pm on Main St in Troy, Thurs Nov 10 10-12pm at NC Zoo). It’s a 78ft red spruce, will be transported on a trailer >100ft long, and has its own security. Only the 3rd time when NC is providing the tree. USFS was in a 90-day pause on prescribed burning.
- Partner funding: NFWF stewardship grant (for \$614K over 3 years) was approved for ~\$392,000 which TNC scaled back to 2 years (we can apply again in 2 years). Will fund the new Quail Forever position, some TRLT work, NC State Parks invasive species & midstory control as well as wiregrass planting, Bonnie Doone property in Fayetteville, ForestHer workshops, and shared 6-person burn crew. Another exciting grant is the REPI challenge grant, thanks to Barry and Sentinel Landscape, for ~\$1mil over 4 years to address climate resiliency, with a big focus on fire. This will fund the 2 new TNC fire positions, an aerial ignition drone, a study on river flows (i.e. declining baseflows in Drowning Creek and floods on Little River), and PhD research at NC state to investigate the role of climate in declining brood productivity previously discovered by Jeff Walters over 40 years. Also the cooperative agreement between TNC and the US Army was set to expire at the end of Sept, but will now be extended for another 5 years.
- Fire training: TNC & PBA offering initial S-190 course on Oct 22nd for landowners and others who want that training in-person, with follow-up info on how to proceed with additional fire courses. In Feb 2023 there will be a women’s fire Training Exchange at Singletary Lake in the Bladen Lakes region; lots coming from across the country and some international participants as well.
- USFWS: Tricolored bat (EOs in Hoke Co.) was proposed as endangered. 60-day comment period closes Nov 14, so we should be talking with partners in the meantime about how to conserve populations, much of which have been decimated due to WNS. Much of what we know about this species is from work on the Northern long-eared bat, which occurs mostly on the coastal plain. We don’t know much about occurrences in Moore & Cumberland counties.
- Fort Bragg ESB: Great year of RCW growth on Fort Bragg, with 14 pioneer/buds and 2 additional unmanaged sites activated. Starting to translocate individual HY birds from the MPTR (new training range) to other inactive sites; also hoping to move a pair to Bonnie Doone.
- LLA: Upcoming 14th biennial Longleaf Conference on Oct 25-28; registration is open. America’s Longleaf is approaching 15yrs and we are looking to update the conservation plan and MOUs, so that process will be ongoing through the upcoming year.

- Appreciation for Barry Hull, Fort Bragg ACUB
 - Comments from Coral Eginton, Pete Edmonds, Travis Moorehead and Jeff Marcus: Barry's passion for the Fort Bragg mission and quality of life is unmatched. He has made a huge difference in accomplishing the sometimes competing goals of training and environmental conservation. ACUB originated at Fort Bragg and predates REPI, and all of Barry's predecessors would agree that he's taken the program to a higher level due to his ability to establish great relationships across agencies and divisions. His dynamic background takes into account the training aspect in addition to the DPW aspects. He is straightforward and completely understanding of processes, and ACUB directors rely on him to sound-board ideas off of. Aided the transition of SALT merging with TRLT. Willing to recognize, respect, and trust in the vision and mission of other agencies, and work with them towards shared goals. The NCSCP presented Barry with a Brady Beck wall print, a framed NCSCP Champion Award, and cake during the meeting break. The certificate read:
 - "After a combined career of Active Duty and National Guard service in the Army, you have directly supported the training mission of Fort Bragg as a Department of Army civilian while being valuable member of the Partnership. Since 2015, your exceptional leadership of Fort Bragg's Army Compatible Use Buffer (ACUB) resulted in leveraging over \$14 million for the program to protect 26 properties totaling 4,881 acres while indirectly influencing the conservation of additional thousands of acres. You have been a conduit of honest, open communication between the Army and the conservation community, building trust and respect while bringing a can-do, problem-solving approach to our Partnership. You have made life better for soldiers, outdoor enthusiasts, and many rare species in the NC Sandhills. That is a legacy to be proud of and one deserving the title 'Champion of the Sandhills'."
- Working Group updates
 - Resource Management** (Jessie Jordan, NC State Parks – absent, so Sarah Hecoeks filled in):
 - Visited the McCain tract on Aug 31st, managed by the NCDA, with the portion formerly controlled by NC Dept of Corrections now being transferred to the NC Army National Guard.. Trip highlighted the importance of this property for habitat connectivity for RCW and other wildlife between the game lands and Fort Bragg. Discussed management history, future goals of the NCDA Research Station, and saw examples of successes and challenges across the landscape. Was a great opportunity to get together and share management perspectives, support, and continue building on successful collaboration with the NCSCP around the property. Right as we were talking about connectivity in the corridor (the "Gap"), the Grey Eagle drone flew overhead, which was very appropriate timing!
 - Land Protection** (Jeff Marcus, TNC & Crystal Cockman, TRLT):
 - TRLT: Since last meeting closed on the Huff Property in Hoke County. It's a 272acre CE, it was donated, and is mostly protecting working lands with some longleaf and wetland area, and some farmland.
 - TNC: 3 projects to close soon are Creed CE, Caddell, BLATCO. 5 year extension granted for Cooperative Agreement with Fort Bragg.

Reserve Design (Sarah Hecoeks, TNC/USFWS):

- No updates.

Communications (Debbie Crane, TNC – absent, so Jeff Marcus filled in):

- Recent issue of national TNC magazine highlights longleaf, and features some images from Fort Bragg with Stacy and Jackie. Does a nice job of talking about work being done across the range. If anyone wants a copy they can swing by the TNC office in Southern Pines.

RCW Recovery (Kerry Brust, SEI – absent):

- No updates.

➤ Introduction (Sarah Hecoeks, TNC/USFWS)

➤ Climate and climate change in the Sandhills – *Corey Davis, NCSU Climate Office*

○ Current trends:

- 3 NC State Climate Office weather stations in the Sandhills (Jackson Springs, Lilesville, Hamlet)
- Coldest nights barely get down to freezing; warmest nights in low 70's (warmest in NC)
- Hottest summer afternoons in low 90's; when we consider additional warmth on top of that, the sandhills are going to be one of the first and most vulnerable areas in the state to extreme heat events. Far enough from coast that we don't get
- Pretty even precipitation year-round; b/w drier western Piedmont & wetter coastline
- In the 21st century so far, our annual avg temp is already higher than 20th century avg. Most significant warming has been in nighttime low temps

○ Future projections for NC:

- We will see increases in:
 - High confidence: temps in all seasons, warm & very warm nights, extreme precip events
 - Medium confidence: hot & very hot days, annual total precip, intensity of strongest hurricanes, frequency of severe thunderstorms, & more frequent flooding & severe drought
 - Lower confidence: # of landfalling hurricanes, # of coastal winter storms, frequency of freezing rain/ice storms, favorability of conditions for near-surface ozone formation

○ Projections for Sandhills:

- Likely additional 2-4 degrees of warming by mid-century, & potentially up to 8 degrees by the end of the century
- # of nights where it never drops below 75 degrees will become more common; ~1 extra month of these nights
- Avg summer high temps could be approaching 95-100 degrees; Sandhills already hottest part of the state, so it doesn't take much
- More rain falling in fewer but heavier events
- Higher evaporation due to higher temps, & more severe drought
- Fruit farming (esp. stone fruits) will be affected due to decrease in chilling hours
- Extended wildfire seasons, starting earlier (late winter & early spring) & perhaps lasting later into the summer;

- 74% increase in lightning-caused fires across the state
 - Decreased prescribed burning opportunities
 - Weather whip-lash: heavy drought followed by heavy flooding and vice versa. We're already seeing this!
 - This will affect aquatic species and pond-breeding amphibians
- Changing climates, changing fires: How climate change could affect fire management in southern forests – *Adam Terando, USGS & NCSU*
 - Not only are we seeing increased wildfire, but we have increasing urbanization, so need to use prescribed fire to maintain what habitats used to look like
 - More acres intentionally burned per year in SE than in any other region
 - Two main questions to current and recent publications:
 - 1. How could the background fire regime 'state' change as the climate warms?
 - 2. What will be the key challenges facing these intensively managed (fire-dependent) systems?
 - How could projected changes in climate affect prescribed burning opportunities in the SE? (an area where fire frequency is high/return interval is low)
 - Use prescribed burning window criteria and estimate how many projected future days will fall into those criteria
 - Temp 0-32.5 deg C (32-90.5 deg F)
 - RH >30%
 - Avg daily wind speed 2.25-8m/s (~5-18mph)
 - Permitting data (mainly from FL and GA) spanned 11 yrs covering >240K burn permits
 - Applying the burn window criteria to the estimated noon temp and RH best matched permitted days (~95% of permits)
 - Note on emissions scenarios: RCP 8.5 is usually termed "business-as-usual", but at this point we can't dig up coal and oil fast enough to continue on that trajectory, so it should really be called "worst-case-scenario"
 - Overwhelmingly, projected changes are concentrated in the warm-season burning months (e.g. reduction in suitable burn days occurs during summer)
 - Under RCP 8.5, there is a high decrease in # of burn windows in warm summer months, especially as you move farther south
 - To answer the 2nd question, model with 3 variables: annual temp, annual precip, and partial pressure of oxygen (elevation)
 - Predicted changes: variation by time, RCP scenario, & location, but fire probability increases everywhere except where aridification drives down fuel availability
 - Increased fire probability in warm, humid pyromes
 - Already high fire probability in SE, but overall is projected to increase even more
 - Doubling of fire probability in cool, humid pyromes
 - Minimal change in deserts, plains, and uplands due to aridification

- Model can compare predicted regimes to current regimes in other pyromes
 - RAD approach: resist, accept, or direct. What will our action be as habitats transition into other habitat types?
 - Can prescribed fire managers adapt to a warming climate in a way that still allows them to accomplish their short-, medium- and long-term objectives?
 - e.g. if I don't burn next week, will I fall behind based on what the 5-year trajectory looks like? Should I take the risk and burn next week?
 - SE NC is not going to experience a radical change. More of the same.
- Maximizing prescribed burn efficiency during climate change – *Tim Mcfayden, NCWRC*
 - Currently experiencing “waves of extremes” (lots of rain followed by a micro-drought); makes burning difficult, esp in wetlands
 - When filling out burn plans, think about all the scenarios. Start as early as possible. Put fire on ground as soon as inversion starts to lift.
 - If meet all parameters but it rained a quarter of an inch the day prior, you can still do the burn and meet your objectives
 - Might have bigger windows to burn wetlands in future, so take advantage of that
 - Make sure you have adequate resources/staff for burns, esp when temps are high
 - Sharing crews
 - Move around the state (PBAs)
 - Increase training and provide opportunities
 - Larger burn units (smaller is not necessarily easier!)
 - Maximize smoke mgmt.
 - Utilize atmospheric dispersion models
 - Plan 1 year ahead of rotation
 - We get ~25% more burns accomplished by referring to smoke models
 - Concerns for smoke impacts to sensitive groups is the main factor limiting burn ability
 - Concerns:
 - Increase in population = increase in smoke sensitive areas (SSAs)
 - If # burn windows is decreasing, may have to do more manual midstory removal which is costly
 - Questions:
 - More night/fall burning?
 - What technology will make things easier? Ignition drones? Weather technology?
 - Increase in seasonal personnel & equipment?
 - If impact during summer is mostly on personnel safety, can we mitigate that risk with AC, scheduled frequent breaks, etc?
 - Tackle dormant/early season burning such that you have black surrounding/downwind of blocks that will be burned in growing season
 - Fire behavior models are in the development phase
- Evaluating opportunities for resilience to extremes using remote sensing, watershed modeling, and nature-based solutions – *Julie DeMeester, TNC*
 - Despite rain being fairly consistent throughout the year, we do have a seasonality with streamflow in the Cape Fear Basin

- Very wet in the winter due to: trees going dormant, ag isn't pulling water from basin, and still getting regular precip
- Driest in Aug-Oct; also most likely to experience tropical storms during this time
 - Common to experience drought or have a big hurricane completely flood the system all in the same few months
 - Extreme events pose a variety of risks to water resources in terms of quality as well
 - Contaminants spread via overland flooding
 - Concentration of pollutants during a dry period
- Base flow does fluctuate annually, but there is an overall decrease over time
 - Before the 2000s, we hardly ever went below 20ft³/second
 - Now we go below that number very frequently (urban growth, climate change—we need more data to decouple these things!)
- Nature-based solutions! Healthy floodplains reduce damage from extremes
- To better understand how and where to address issues and focus conservation, asked 2 questions:
 - Who and what flooded in recent large hurricanes?
 - Radar from sentinel-1 revealed repeated impacts from Hurricanes Matthew and Florence (only a category 1)
 - Cape Fear flooded twice
 - Fayetteville & Lumberton were both hit pretty hard
 - Where can we optimize solutions that improve water quality and flooding?/What's the landcover where it flooded?
 - Lots of opportunities for forest & wetland restoration in flood impact areas, including ag fields. But how much do you need to restore to see an increase in resiliency that mitigates largest impacts?
 - SWAT (Soil & Water Assessment Tool) from USDA models hydrologic processes to determine how much water is coming off the landscape & in streams, as well as movement of nutrients
 - Plug in scenarios: weather, land use, soil, topography
 - Output: runoff, soil erosion, water quality
 - TNC's model does really well with matching up with what's monitored on the ground (flow, sediment, nitrogen, phosphorus), so it's very reliable
 - The hotspots for conservation efforts vary based on whether you're in a flood or in a drought, but high risk areas across pollutants & conditions equate to <16% of the basin
 - Can plug restoration scenarios into model too
 - TNC's priorities: wetland & forest restoration
 - Additional scenarios for future exploration: ag field measures (no-till, cover crops), urban measures (stormwater retention ponds), animal farm buyouts or waste treatment, nutrient limits on wastewater treatment plants, community buyouts

- Colleagues at NCSU are adding urban growth/land use changes and CC scenarios into model to evaluate effectiveness of strategic buffers
- Longleaf pine restoration increases resiliency to droughts without increasing flooding – *Seth Younger, The Jones Center at Ichauway*
 - Rainfall exclusion project looking at drought tolerance of longleaf seedlings
 - So far they have survived >1 year beneath roof structures preventing direct rainfall
 - Observed LLP over 1 month of drought and found that they were able to reduce their stomatal conductance to almost 0; when rain started again, they were quickly able to recommence transpiration which indicates that they did not experience hydraulic damage (most other plants would have)
 - How do these drought resistance effects translate to the watershed scale?
 - Plugged leaf-level knowledge into watershed model (also using SWAT)
 - How does LL restoration impact streamflow (e.g. plantation converted to wiregrass understory)?
 - Converted 230,000 forested acres to LLP: 4% → 37%. Results:
 - Evapotranspiration (ET) decreased
 - Annual water yield increased by 5.2%
 - Most pronounced during periods of extreme low flow
 - Marginal increase in high flows
 - USGS gaged watersheds with and without LLP to compare hydrology
 - $ET = precip - streamflow$
 - Watersheds with LLP produce higher streamflow (higher low flows) during precip events than do those without LLP
 - To modify hydrology with landcover, we need to treat >20% of the area to see a significant effect at the watershed level
 - Good news is that FNAI estimates that LLP covers 19.7% of NC Sandhills, much of which is managed by federal and state partners
 - How much of this observed effect due to structural components of the forest (e.g. open due to thinning & burning) & low leaf area vs a species-effect (LL vs loblolly).
 - The structural component is the most important on an annual basis
 - Where the species-component comes into play is during droughts
 - The fastest way to see this effect is through thinning and burning in the forest type that already exists, rather than clearcutting and replanting in LLP
 - Rather than clearcutting, could thin out current forest type (slashpine, etc), underplant with longleaf, and burn so that over a long time period you can transition to LLP forest but in the meantime still get the intermediate advantages at watershed scale
- Climate Change and the Uncertain Future of Isolated Pond Breeding Amphibians – *Nathan Shepard, NCNHP*
 - Amphibian decline due to a variety of factors
 - Loss of quality habitat & refugia
 - Poor habitat management

- Road mortality & fragmentation
- Isolated wetlands:
 - Not connected to other waterbodies (historically fish-free)
 - Open canopy with grassy herb layer
 - Fire-maintained, but also driven by hydroperiod
 - Vary in size, shape, hydroperiod, and possibly function
- Winter-breeding SGCN in isolated ephemeral wetlands: gopher frog, tiger salamander, Mabee's salamander, ornate chorus frog, southern chorus frog
- What could a changing climate mean?
 - Shifting phenology (opportunistic breeding in fall during tropical storms)
 - Variability in rainfall (e.g. prolonged droughts >2yrs, severe rainfall all at once that lead to fish entering, flooding from bays right next to road, or trigger breeding but then the rain isn't enough to fill the pools and keep them full)
 - Sea level rise
 - Many NC populations are within 5 miles of the ocean (Patsy Pond in Croatan, Camp Mackall wetlands)
- Droughts are the biggest threat
 - Many examples of local extirpation in the Sandhills due to drought. Over the last 30 years, SGCN have disappeared from several sites that are otherwise high-quality habitat
 - Why drought? Many species are short-lived, due to fragmentation many populations have restricted gene-flow, desiccation & high predation...
- How to increase resiliency:
 - Increase connectivity between populations/sites
 - Restore uplands & ponds
 - Population augmentation & translocation
 - Increase # of ponds at a population/site (rule of 3 per population)
 - More experimenting with pond creation (e.g. liner or compact clay)
 - Esp in populations where suitable restoration ponds aren't present
 - Some current experimentation with adding liners into deepest parts of natural ponds to increase hydroperiod, esp during drought
 - Continue long-term monitoring to understand where populations are and were, and how successful they are
 - Reshape communication skills with people in the landscape, esp those with a hand in management/land use
- Using decision support tools and consensus building to predict future terrestrial plant invasions – *Deah Lieurance, UFL*
 - Invasion curve: over time, after a species is introduced, control cost & area infested increases, and eradication success decreases
 - For these reasons, we want to stay in the prevention and/or eradication phase of invasion
 - Consequences of climate change for invasive plants:
 - Altered distribution of existing invasives
 - Altered transport & introduction mechanisms
 - Establishment of new invasives

- Altered impact of existing invasives
 - Altered effectiveness of control strategies
 - How do we predict & prevent future invasions?
 - Invasive range expanders listing tool
 - Provides lists of invasive plants expected to expand ranges into the chosen region by 2040-2060 based on climate projections for suitable habitat
 - Horizon scanning: method used to identify potential threats and emerging issues to inform policy, regulations, & decision-making
 - Can use the expanders tool to conduct a scan
 - Objective:
 - Provide a ranked list of plant taxa
 - Identify pathways for movement
 - Categorize potential impacts
 - Process:
 - 1. Assemble working group
 - Workshop-training and organization
 - 2. Develop rubric with scoring elements
 - 3. Build a list for consideration
 - Start big then narrow to a reasonable number (e.g. through climate matching, whether already present in state or not, naturalization & invasion history)
 - 4-5. Rapid assessments, peer review, rank
 - RA with rubric to calculate risk score: likelihood of arrival (1-5) x likelihood of establishment (1-5) x severity of impacts (1-5)
 - Max score 125 (>64 high, 27-63 moderate, <27 low)
 - 6. Use prioritized list for next steps (e.g. policy, mgmt., public awareness)
 - Impacts from Florida RA: ecological (88%), economic (48%), & human health (10%)
- Predicted impacts to military training on Fort Bragg – *Brian Williams, Fort Bragg*
 - Issues:
 - Urbanization has increased stormwater runoff
 - Aging infrastructure not sized to handle increased rain events
 - Flooding cut off Manchester Road access to installation & training area
 - Storm recovery = clearing trees, etc which takes away time from training
 - Reduced burn windows = increase in training restrictions due to higher fuel load and greater wildfire risk
 - Actions being taken:
 - Lowering lake levels during peak hurricane season
 - Conducting watershed research projects
 - Replacing aging infrastructure
 - Closing non-strategic firebreaks and reconfiguring burn blocks