



# The Swamp Scene

friends of great swamp national wildlife refuge

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## WOOD TURTLE RECOVERY AT GREAT SWAMP NATIONAL WILDLIFE REFUGE Where We Are After Sixteen Years

*By Colin Osborn, Kurt Buhlmann, Jim Anglely*

*This article summarizes the results of our Wood Turtle Population Recovery Project from its inception in 2006 through its last full season in 2021. The 2022 season, which is in progress, will be summarized upon completion, likely in an early 2023 edition of this newsletter.*

In May of 2006, a female wood turtle was found dead on a road within Great Swamp National Wildlife Refuge (refuge). Prior to that, over a decade had passed since one had been confirmed there. Wood turtle status on the refuge was uncertain, and their prospects did not seem promising. But shortly thereafter, in a surprising twist of fate, a newly-acquired property containing an abundance of suitable habitat



led to the discovery of a small population that had been able to persist, in part due to its secretive location where it was likely able to go undetected by poachers and illegal collectors. The population that was present consisted almost entirely of old adults; specifically, 8 males and 18 females. With almost no younger age classes documented (subadults or juveniles), there were basically no prospects to take the places of those “founder” individuals when they inevitably passed on. Our excitement at reconfirming the presence of wood turtles and turning up a new population at Great Swamp eventually turned to worry as we realized we were dealing with a “ghost population.” Ghost, or “relict” turtle populations, comprised of mostly old adults, give the perception that all is fine, because these individuals may be observed on the landscape for many years.

To ensure the persistence of this population, and ultimately the species on the refuge, we needed to begin forming those younger age classes. Our first course of action was to protect the nests of every female we could, so their eggs, if viable, at least had a chance to develop into hatchlings. We suspected that an abundance of meso-predators—such as raccoons, foxes, and skunks—were largely to blame for why we were not encountering any young individuals. To complicate matters further, nesting habitat was limited, and an area where we observed several females attempting to nest in 2006—old, unoccupied farmland—was being threatened with development in early 2007.

*Continued on page 2*

## WOOD TURTLE RECOVERY *(continued from page 1)*



Colin, Kurt and former Great Swamp bio-tech Susi Ponce holding eight of the founder males and females before they were released with new transmitters in June 2007.

In order to assure the females had a place to nest later that spring, with the help of then-Watershed Biologist Mike Horne and a backhoe, we constructed an artificial nesting mound on refuge property in a field across the stream from the old farm nesting site. In order to familiarize the females with the new mound, when they were gravid and their eggs felt hard, we carefully hand-carried them to it, so they could at least give it a try if they felt so inclined. Different females took different degrees of convincing, but most eventually acclimated to it. At one point, we even had an unmarked female—one that we had never seen before—show up and nest. Over the first four years of its usage (2007-2010), 142 hatchling wood turtles were produced on the artificial nest mound with eighteen others from nests not on the mound.

After hatching each fall, these quarter-sized babies were individually marked and “directly released” in appropriate nursery habitats throughout the site. However, we failed to recapture nearly any of these individuals in those subsequent years. We note that under natural conditions, hatchling turtle

survivorship is low. But that is really not a problem if the adult population is robust, if adult survivorship is high, and a juvenile or two is reaching maturity each year or so. But a depleted old adult population cannot be rebuilt that way.

Without seeing a return in the efforts we were expending, we began to question whether all of our hard work was just for naught. Time was unfortunately not a luxury we had, so we couldn’t afford to just wait and see; we needed to come up with a Plan B. Hence, “head-starting”.

The concept is simple. Rear hatchlings indoors for nine months (September-May) and feed and protect them. Left in the wild, they would normally be snacks in the environment, not getting much bigger, and trying to survive their first winter in hibernation. After those nine months indoors, hatchlings can attain the size of a four year-old wild turtle. The larger size reduces the suite of predators that can prey upon them such as northern water snakes, bullfrogs, largemouth bass, crows, and others. This gives them a “head-start” over their wild counterparts. These head-starts were also large enough to handle radio transmitters with a one year

battery lifespan. We fitted all 22 head-starts from the 2011 cohort (the year we initiated head-starting) with transmitters. After release in June 2012, at least 12 of the 22 (54.5%) survived their first year in the wild—a marked increase over the estimated 10-25% of wild hatchlings that survive their first year.

Every successive year since then, each surviving individual from that first 2011 cohort has been given a new transmitter so it could be continuously radio-tracked. Fast forward a decade and four of them (18.2%) are still alive.

Over those 10 years, there have been 279 head-start hatchlings released back on the refuge. A total of 68 (24.4%) were re-encountered alive in 2021 alone. On the other hand, over the entirety of the project (2006-2021), there have been a total of 202 direct-release hatchlings—but only four of them (< 2%) have ever been recaptured. Currently, two of those individuals (both males; one a 2009 direct-release and the other a 2011 direct release) are being radio-tracked). *(continued on page 3)*



All 22 of the first (2011) cohort of head-starts, fitted with radio-transmitters, just prior to their release back on site in late May 2012. Photo by Kurt Buhlmann

## WOOD TURTLE RECOVERY *(continued from page 2)*

Clearly, head-starting is producing the increased survival results we had hoped it would and is helping to rebuild that conveyor belt towards adulthood that was missing. And more importantly, it is beginning to produce sexually mature individuals—and at a very critical time—because of the aforementioned eight male and 18 female “founder” individuals, none of the old males and only five of the old females (27.8%) are known to still exist. Remember, these were old individuals when we found them many years ago—so had we not discovered this population back then and began trying to bring it back to life, it would be nearly gone today. After 16 years of effort, including 10 years of head-starting, we have at least nine females of breeding age (the aforementioned five old adult “founders” plus four head-starts [two 2011 and two 2012]) and at least eight males: the two previously-mentioned direct-releases, five head-starts (two 2011 and three 2012), and one old adult male who emigrated into our site. More about him later!

So even with this monumental amount of effort, we are still playing “catch up” and trying to get back to the original numbers of adults we had at the site in the early years. You may be thinking, 202 direct-releases and 279 head-starts released over all of those years and they haven’t even been able to break even with the number of adults? Is all of this even worth it? Yes—we believe it is, in order to ensure the persistence of wood turtles on the refuge.

First, wood turtles take about as long as humans to mature—often 14 to 16 years, although head-starting may be



Our first documentation of two head-starts mating: 2012 head-start male M507 (left) and 2014 head-start female F4034 (right), found in October 2021.  
Photo by Colin Osborn

shortening that duration. So, it’s very easy to destroy a population (say, by illegal collecting of the adults) but very hard to rebuild it. And second, turtle conservation is an ultra-marathon, not a sprint, and we’re still in the early stages of that very long race. To put things in perspective, a similar North American turtle recovery project involving head-starting gopher tortoises in the Southeast, another project of co-author Kurt Buhlmann, considers a population to be self-sustaining if it consists of about 200 adult individuals. Our wood turtles are moving in the right direction, but using the aforementioned recovery benchmark as a ballpark target, we still have a long way to go and many more years of effort before we reach our goal of making this population self-sustaining and viable for the long term.

Despite that extensive reach, we remain faithful and optimistic. We’re at an extremely critical turning point now. We have cohorts of head-starts lined up, basically in the

“queue” preparing to reach sexual maturity and bump up those adult numbers—and begin reproducing themselves—to further boost the suites of future head-start cohorts. This year (2022) we expect two more of our 2012 cohort females and up to three 2013 cohort females to “come on line,” and next year there should be three or more 2014 cohort females, the following year it could be five or more 2015 cohort females, and so on. All of our hard work and investment into this population over the past decade is

about to pay consistent annual dividends into the future. And yes, we have many more years of hard work ahead of us, but each year moving forward should be just a tiny bit easier than the last. To sum up our strategy, slow and steady is how we win this race.

In order for the effects of our population augmentation actions to be maximized, we have to routinely care for the wood turtle site as well. To accomplish this, we rely on refuge support for help with various crucial habitat management actions and help from Friends volunteers. *(continued on page 4)*



Founder female F12, our most productive female since the beginning of the project, on the nest mound.  
Photo by Kurt Buhlmann

## WOOD TURTLE RECOVERY *(continued from page 3)*

Refuge staff conduct annual winter mowing of the fields that provide critical terrestrial habitat used by wood turtles during their active season. Volunteer help comes from Friends board member John Berry and his team who remove invasive plants that threaten to degrade this vital habitat. Collaboration with refuge neighbors through education and outreach, to minimize lawnmower accidents for example, has been and will continue to be implemented to reduce unintentional mortality.

Last April, something unexpected happened. We made a surprising discovery when an old adult marked male showed up at our site. However, his notch code, M207, was not one of our numbers, and we were baffled about where he could have come from. Was he one of the individuals marked and radio-tracked on the opposite end of the refuge by a graduate student in the mid-1990s? Or one of the first ones ever marked here in the 1970s



Co-author Jim Angley holds Male M207 on the day this wood turtle was found at the refuge site in late April 2021.

Photo by Colin Osborn

by Rutgers researchers at another separate site? None of the codes used for any of those individuals back then matched up though. So we reached out to the staff at New Jersey Division of Fish and Wildlife's Endangered and Nongame Species Program. They maintain a database of all wood turtles marked in the state, and they were able to confirm his origins.

M207 was marked two years prior at a separate preserved property along a completely different but connected waterway, over four miles away. It was an area known to contain a small population in the 1990s, but the habitat quality has decreased over the years. So it was no surprise to us that he seemingly vacated this site, likely in search of better habitat and more females, but it was quite the surprise that he moved as far as he did, and found our population. We attached a transmitter to him and tracked him regularly throughout the season. Not only did we note him routinely moving upstream and downstream throughout the majority of our site, but we also found him mating with several of our founder females. His presence was a welcome addition to the site for many reasons, but the increase in genetic diversity he is now providing is surely the most significant.

Over the years we have noted several of our founder females traveling a mile upstream when gravid to search for a nest site. We've noted two of our young adult male head-starts, a 2011 and a



Colin with Male M207 and founder Female F24 after they were found mating in mid-May 2021. Photo by Jim Angley

2012, move about a half mile and a mile, respectively, seemingly looking to establish territories in their own areas of the stream. There is a hierarchy in wood turtle populations where the oldest and most dominant males control the prime portions of the stream where the greatest numbers of females reside. When young males reach maturity they are typically driven from these prime areas, often forced to venture significant distances to find and set up their own territories. We've had several individuals even venture into a different nearby stream altogether. And in addition to M207, about six years ago, Dan Hannon, turtle project field technician at the time, found an old adult female, possibly from the same home site as M207, crossing a gravel road within the refuge. We attached a transmitter to her and tracked her for two seasons, during which she moved over 2.5 miles, also found the stream in which our population resides, and nearly made it there. She unfortunately died during hibernation after choosing a questionable hibernaculum in a backyard pond; one of the many risks

*(continued on page 5)*

## WOOD TURTLE RECOVERY *(continued from page 4)*

involved with making these long-distance journeys into unfamiliar territory. It is truly a gamble when they choose to make these ventures; but it also speaks to how great the reward is if they are successful, as they are literally willing to bet their lives on it.

In conclusion, thanks to another very kind and substantial donation from the Friends of Great Swamp, our efforts on this project are going full strength in 2022. The nesting output from our females last year was unfortunately low, as was their success, giving us only eight hatchlings, the lowest number we have had in our 15 years of protecting nests. But all of them survived and grew substantially during their nine month stay at Bristol County Agricultural High School, and were released back on site this spring.

This spring, for the second year in a row, we conducted our early-season stream surveys, which were exceptionally successful, and once again enabled us to account for many non-radioed head-starts. In response to these excellent results, we have had discussions with refuge staff about surveying other suitable streams on the refuge, especially ones that may have remnant, relict populations and ones that had historic populations. This would not only allow further documentation of the status of the species on the refuge, but could also

present additional potential opportunities for population recovery projects and genetic diversity. Marking individuals from other sites would also allow confirmation of their origins and could provide valuable migration data should they show up at our main site (like M207 did), or elsewhere. Even in a worst-case scenario where none of those sites produce results, we still have a small but solid and growing population at our main site. We have proven that turtles are expanding out of this main site into adjacent habitat and additional waterways, and some outsiders are even entering into it, thus having a positive impact well beyond its footprint and across the refuge as a whole.

What started as a small, localized attempt to recover wood turtles at one site has now grown into a much larger-scale effort that is well on its way to assuring the persistence of the species at Great Swamp National Wildlife Refuge and beyond. To have come this far, when just 16 years ago the fate of the species here was unknown and their outlook grim, is an accomplishment that we are extremely proud of.

We would like to take this opportunity to deeply thank the Friends of Great Swamp NWR, who have loyally and very generously supported the project every year since our initiation of head-

starting 11 years ago. Without their steadfast backing, the project would not be anywhere near as successful as it is today. The three of us, and all of the turtles, are forever grateful for their endorsement and we're proud to say that we "get by with a little help from our Friends!"



### IT REALLY WORKS!

These two turtles are siblings, both hatched in August 2012. The larger turtle on the top is a head-start turtle and the smaller one below was directly released on the refuge after it hatched. The photo was taken in 2013. Photo by Kurt Buhlmann



### HERE'S A GREAT WAY TO KEEP UP WITH REFUGE NEWS & EVENTS

Did you know that the Friends publish a monthly email newsletter called "Happenings"? Each issue brings you current information on upcoming events, recent wildlife sightings and other news about Great Swamp National Wildlife Refuge and the Friends.

It is delivered right to your email in-box each month so you won't miss a thing. You may sign up to receive Happenings from the home page of the Friends website. Sign up and stay in touch.