2022/23 Stand 18a Sparta Mountain Wildlife Management Area Report

January 2025

By Sharon Petzinger, NJ DEP Fish & Wildlife, Endangered and Nongame Species Program

Site Description and History

This site is located near the center of Sparta Mountain Wildlife Management Area (SMWMA), north of Edison Road, east of Edison Bog and accessed using an existing unpaved road from Edison Road to site (Fig. 1). The parcel that includes this site was mined for iron in the 1800s through 1900s, then limestone in the early 1900s. As a result, all the trees were cut, rocks were blasted, and processing plants, roads, railroads, and the steam shovel were built to transport all the material. In fact, the parking area and existing unpaved road used to access this site was once part of Thomas Edison's processing plant. This parcel continued to be privately owned by multiple mining companies mining for zinc and other materials through at least the 1960s. The parcel was managed for timber in the 1980s and was purchased by the state and NJ Audubon in 1994 to prevent it from being developed.

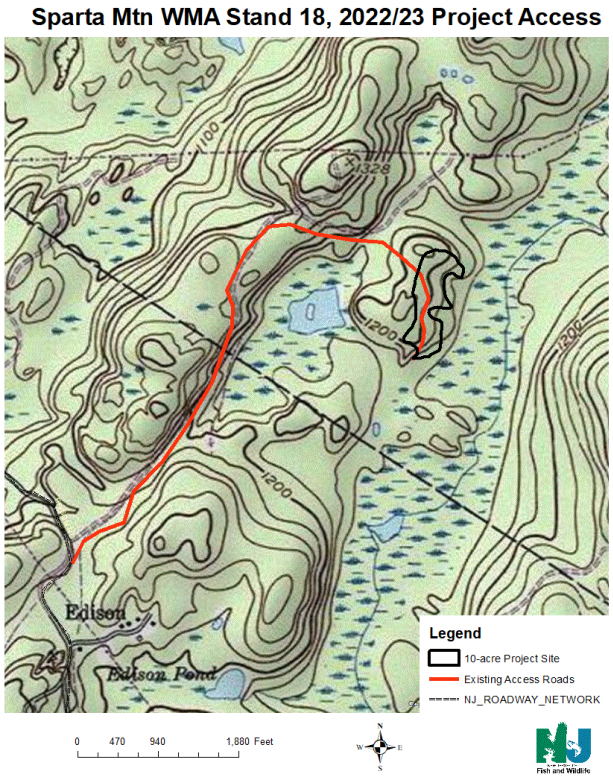

Figure 1.Map of the location of the site in Stand 18 (black bold) and existing unpaved access roads (red) on SMWMA.

Before treatment, the 10-acre site consisted of a maturing mixed upland oak forest, about 75 years of age, with an average 266 trees per acre and DBH of eight inches. Most canopy trees on the site consisted of red oak, but most saplings consisted of maple, indicating the oak forest is converting to a northern hardwood forest (Fig. 2). Deer densities appeared to be below 20 individuals per sq. mi., evidenced by patches of oak seedlings and maple-leaf viburnum in the understory with little to no browse, as well as a deer fence erected in another area of SMWMA with no differences in vegetation diversity and height inside and outside the fence. Very few non-native invasive plants were observed in the site.

Figure 2. Photo of the forest in the 10-acre site in Stand 18 on SMWMA prior to treatment (June 2022). Trees with orange markings were retained during treatment.

Based on the forest inventory data collected in the 10-acre site, the area was estimated to contain 528 tons of carbon and sequester 11 tons of carbon a year. According to the NED-3/FVS Climate Risk Assessment for this site, if left unmanaged, this forest was projected to become more dense with trees at the expense of tree growth rates resulting in an increase in tree

mortality due to crowding from the high density of trees. Red maple was projected to continue to dominate the understory and the regeneration of all tree species was projected to decline.

It is concerning that the oak forest is converting to a northern hardwood forest. Northern hardwood trees (American beech, sugar maple, sweet birch) are generally shade-tolerant, meaning they grow well under a closed forest canopy, but do not grow well in warmer and drier conditions, which is what is predicted for the growing season in NJ as the climate changes. Northern hardwood trees also are not drought tolerant and not adapted to fire so will be less likely to survive as the climate changes as well. Oak trees struggle growing under a closed forest canopy but will grow well in warmer and drier conditions, and they are much more likely to survive droughts and fires. During the drought in August 2022 many of the northern hardwood trees (sweet birch and maple) in this site were suffering from lack of water, evidenced by the leaves turning yellow or brown. The oak trees on the same site, however, did not show signs of drought stress (Fig 3). Managing this site to promote oak trees will help keep the forest as a forest into the future and help the wildlife that depend on oak trees as a food source. Not only do oak trees produce acorns, but they also support the majority of moth and butterfly species.

Figure 3. Photo of the forest in the 10-acre site in Stand 18 on SMWMA prior to treatment during the drought in August 2022. Trees with browning leaves were sugar maple and sweet birch while trees retaining green leaves were oaks.

2022/2023 Treatment

Activities for this year in the 2017 Sparta Mountain WMA Forest Stewardship Plan included a modified seed tree treatment on 10-30 acres in Stand 18, a prescribed burn on the shelterwood previously done in Stand 9, a shelterwood treatment on 10-30 acres in Stand 9, and an overstory removal in ½ acre in the wetlands of Stand 23. Per the 2021 Addendum, the seed tree treatment was reduced to 10 acres total and the prescribed burn, shelterwood, and overstory removal treatments were not to be completed.

NJ DEP Fish & Wildlife incorporated site-specific feedback provided during the public comment period. Changes based on comments received included altering the site boundaries to provide a greater buffer to an unmapped stream, potential vernal pool and wetland, and re-routing the skid trail to reduce the number of trees removed to access the site. A state-approved forester provided the details of the 10-acre seed tree treatment in accordance with the approved 2017 Forest Stewardship Plan and 2021 Addendum to that plan. The intent of a seed tree treatment is to open the forest canopy by 60-90% to

enable the regeneration of shade-intolerant and mid-tolerant native vegetation (such as oak trees) while also maintaining mature "seed" trees. The objectives for this activity are to increase structural and age-class diversity of forests across the larger landscape scale, regenerate the oak-hickory forest type, and create critical habitat for rare, endangered, and declining wildlife. Carbon storage and sequestration was not a goal of this activity, and while it will result in short-term carbon loss (0.05% of carbon stored on SMWMA), the treatment is projected to increase short-term carbon sequestration rates, long-term carbon storage, and the overall adaptability of trees to future climate conditions within this 10-acre site. The seed tree treatment was conducted in the winter and completed January 2023.

The treatment involved cutting most of the trees across all size classes while favoring retention of the healthier oak and hickory trees (Fig. 4). After treatment, about 22 trees per acre (residual BA=24 ft^2/ac) were retained on site, mostly red oak, with an average DBH of 14 inches (Fig. 5). Trees which were cut averaged 10.6 inches DBH (n=86) with an average age of 73.6 years (n=75), and about 21% of the 86 cut trees sampled exhibited signs of fungal rot.

Approximately 351 tons of carbon, or 66% of the carbon estimated on site, were removed from the live aboveground carbon pool. It is estimated that 102 tons of the carbon removed will be stored as wood products, 106 tons remain on site as dead wood, and 45 tons were emitted from the activity. Carbon sequestration rates also declined by about 30% because of the activity but is projected to more than double to 18 tons/year within the next 10-20 years and continue to have higher carbon sequestration rates long-term when compared with the no management scenario (Fig. 6). The total amount of carbon removed from this activity is estimated to be stored once again in the trees within the next 30 years. Because of the treatment done, according to the NED-3/FVS Climate Risk Assessment oak and hickory trees and other species are projected to regenerate, and tulip trees will continue to persist at this 10-acres site.

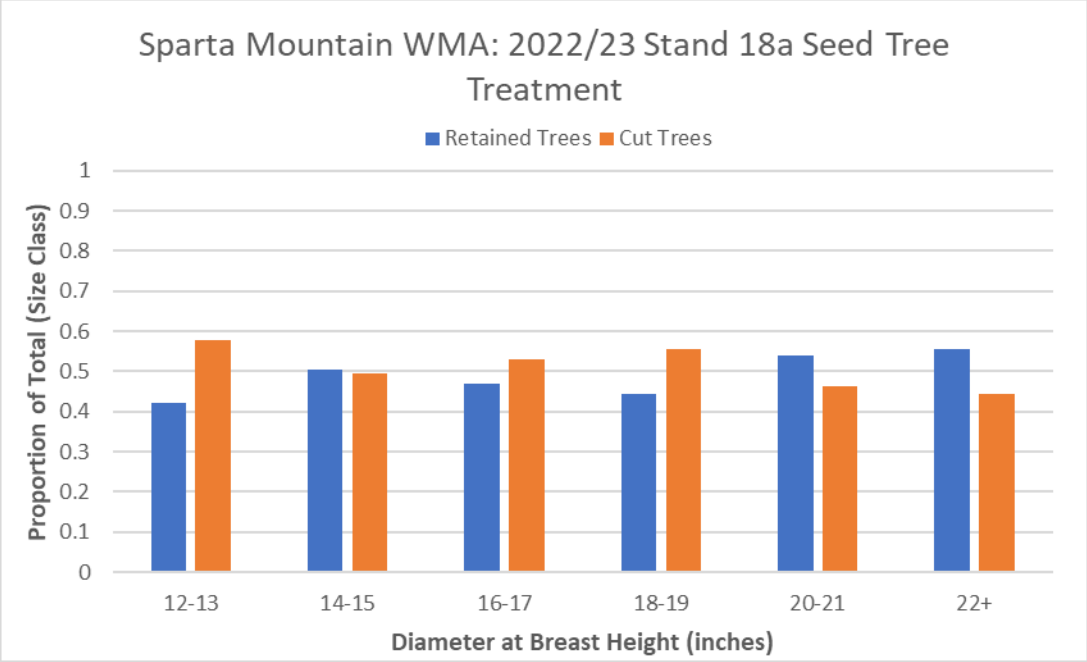

Figure 4. Proportion of trees retained (blue) vs cut (orange) by diameter size class for the 2022/23 seed tree treatment in Stand 18 on SMWMA.

Figure 5. Photo of the forest in the 10-acre site in Stand 18 on SMWMA after treatment (May 2023).

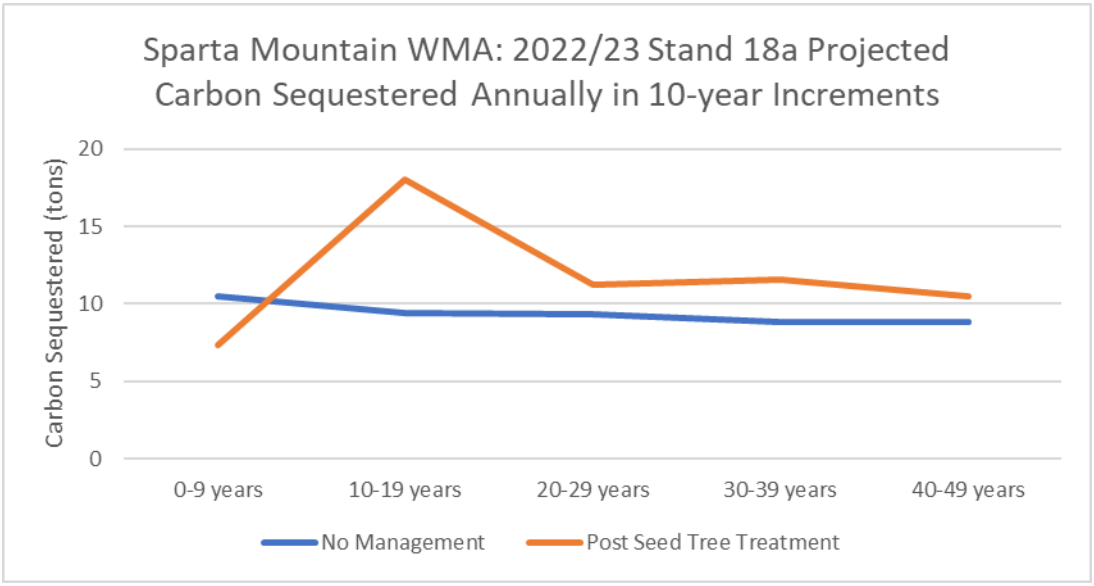

Figure 6. Summary of analyzed carbon accounting of the 10-acre site in Stand 18 on SMWMA comparing the changes in carbon accrued per year (annual sequestration rate) in 10-year increments under the scenarios of the proposed activity (orange) and no activity (blue). Data Source: 10-acre Stand 18 site inventory; NED-3/FVS

Stand 18 Bird Survey Results (2022-2024)

This site was surveyed for all bird species during the breeding season (May 15 – June 15) before treatment and once a year after treatment using the same protocol. Before treatment, 16 species of birds were observed, five of which were Species of Greatest Conservation Need (SGCN), giving the site a bird conservation score of 42. A few months after treatment, the site had 24 bird species (11 SGCN) with a conservation score of 64 (Fig. 7). Most of bird species observed before treatment were also observed after treatment, while birds like the eastern towhee, a species that has been steeply declining and is now considered to be at its Tipping Point, was observed afterwards because of the treatment done.

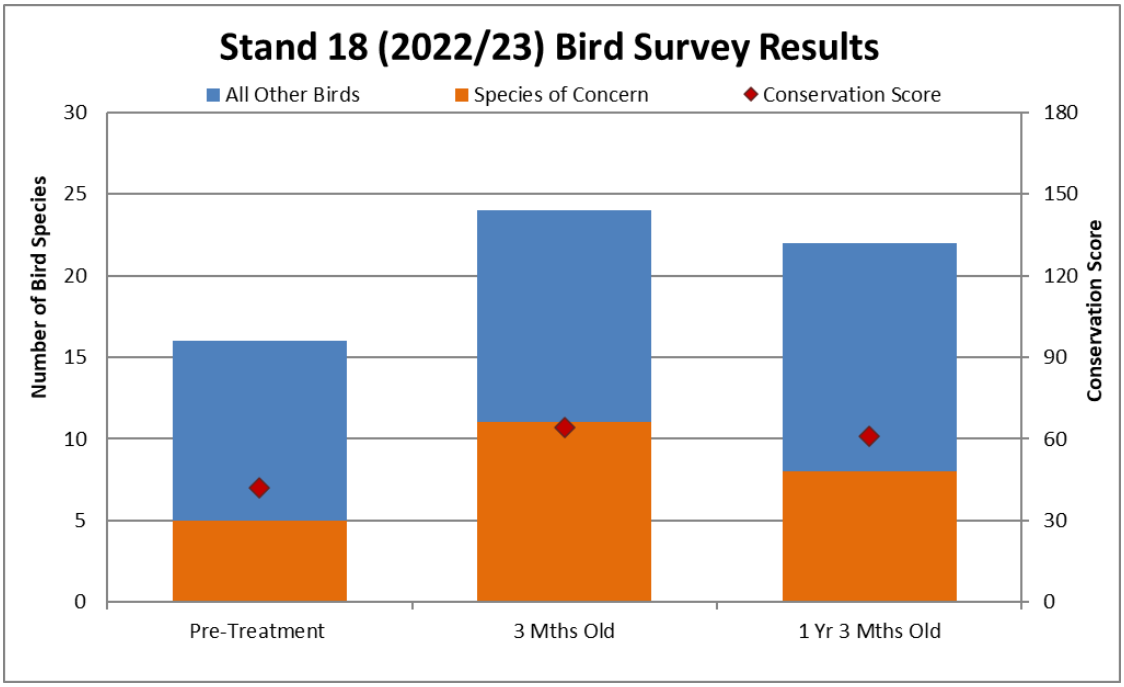

Figure 7. Average number of bird species of concern (orange bar), all other bird species (blue bar), and bird conservation score (red) observed during breeding bird surveys in Stand 18 on SMWMA. Bird conservation scores are the sum of the scores of each individual bird species detected, which were determined for each species based on federal, state, and regional statuses and rankings.

Stand 18 Vegetation Results (2022-2024)

Rapid vegetation surveys are conducted during the same time and location as the bird surveys (center of the site) to assess the vegetation cover and dominant species of vegetation before and after treatment (Table 1). Before treatment no non-native invasive plants were observed in the location of the bird survey before treatment. The treatment resulted in in opening the canopy by about 70%, retaining oak and hickory trees and targeting northern hardwoods (maple, beech) for removal. The shrub and herbaceous cover changed after treatment (Fig. 8). Witch hazel is still growing on the site but oak and blackberry responded quickly to the increased sunlight, as did cherry and aspen. Native grasses and sedges also become more dominant.

Table 1. Vegetation cover and the dominant trees, shrubs, herbaceous, and non-native invasive plants observed during the rapid vegetation surveys on Stand 18 in SMWMA before and after treatment.

Vegetation Type	Before Treatment	3 Months After Treatment	1 Year 3 Months After Treatment
Tree (% cover)	70	20	20
Shrub (% cover)	20	15	25
Herbaceous (% cover)	10	10	30
Non-native (% cover)	0	0	0
Dominant 3 Trees	Oak, hickory, maple	Oak, hickory	Oak, hickory
Dominant 3 Shrubs	Blueberry, oak, witch hazel	Blueberry, oak, viburnum	Oak, blackberry, cherry
Dominant 3 Herbaceous	Forb, grass/sedge, fern	Forb, grass/sedge	grass/sedge, forb, fern

Dominant 3 Non-native Invasive	None Observed	None Observed	None Observed

Figure 8. Photo of the forest in the 10-acre site in Stand 18 on SMWMA 1 year, 3 months after treatment (May 2024).

In summary, while the number of species detected during surveys can vary year to year, there is a treatment effect that results from opening the forest canopy. The bird conservation score, which represents both the number and conservation concern of species observed, is highly correlated with less tree canopy cover (Fig. 9), even before the end of the first growing season post-treatment.

The seed tree treatment in Stand 18 on Sparta Mountain WMA opened the forest canopy to allow for herbaceous and small woody vegetation (shrub and saplings) to grow, specifically vegetation that cannot grow or thrive in the shade of closed-canopy forests. This resulted in many more bird species using the area during the breeding season compared to before treatment, especially SGCN in NJ. This treatment also increased the diversity of vegetation which will help this forest be more resilient and less vulnerable to future climate conditions, and in time will also sequester more carbon than if the site had not been managed.

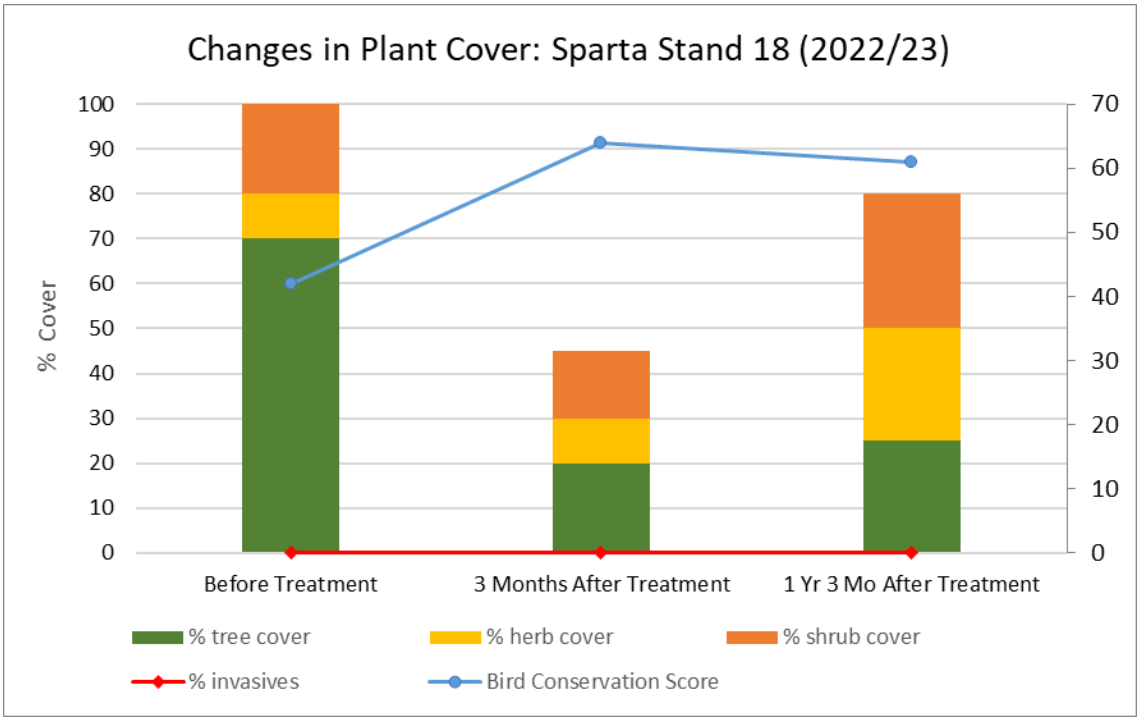

Figure 9. Bird Conservation Score (blue line) and vegetation cover observed during breeding bird surveys on Stand 18 in SMWMA before and after treatment. Columns represent different types of average vegetation cover: Trees include all woody vegetation >4m tall, shrubs include all woody vegetation <4m tall, and herbs are all non-woody vegetation. The red line represents the percentage of the area with non-native invasive plants (tree, shrub, and herb).