2021/22 Stand 9a Sparta Mountain Wildlife Management Area Report

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Site Description and History

This site is located near the center of Sparta Mountain Wildlife Management Area (SMWMA), north of Edison Road, south of Edison Bog and accessed using an existing unpaved road from Edison Road to and through the 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, and this site is not only located at Ogden Mine, but also just west of where Edison a ridge was removed in the 1900s (Fig. 2). 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 then managed for timber in the 1980s and purchased by the state and NJ Audubon in 1994 to prevent it from being developed.

Before treatment, the 10-acre site consisted of a maturing mixed upland oak forest, about 86 years of age, with an average 521 trees per acre and average diameter of about seven inches. Most canopy trees on the site consisted of red and chestnut oaks, but most of the saplings consisted of maples and sweet birch, indicating the oak forest is converting to a northern hardwood forest (Fig. 3). Seedling regeneration was present but generally suppressed due to too much shade from the high density of trees. 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. Non-native invasive plants were observed on the site and included sporadic patches of Japanese barberry (< 20 plants total) and winged euonymus (< 3 plants total).

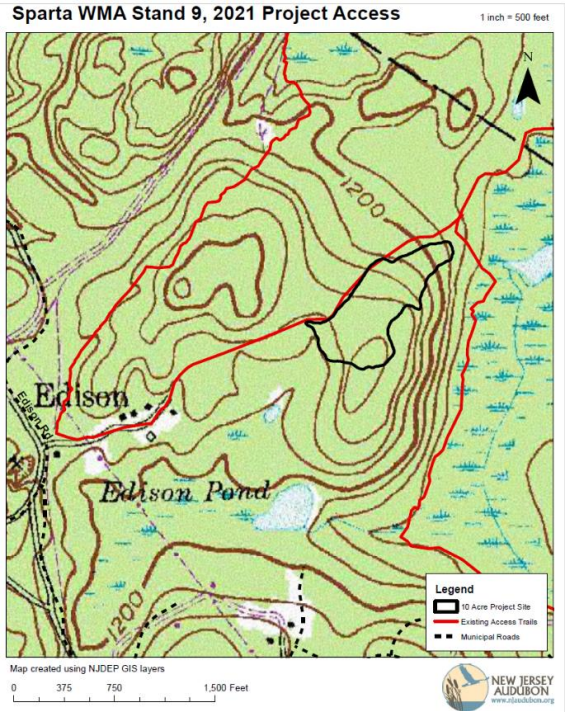

Figure 1. Map of the location of the site in Stand 9 (black bold) and existing unpaved access roads (red) on SMWMA.

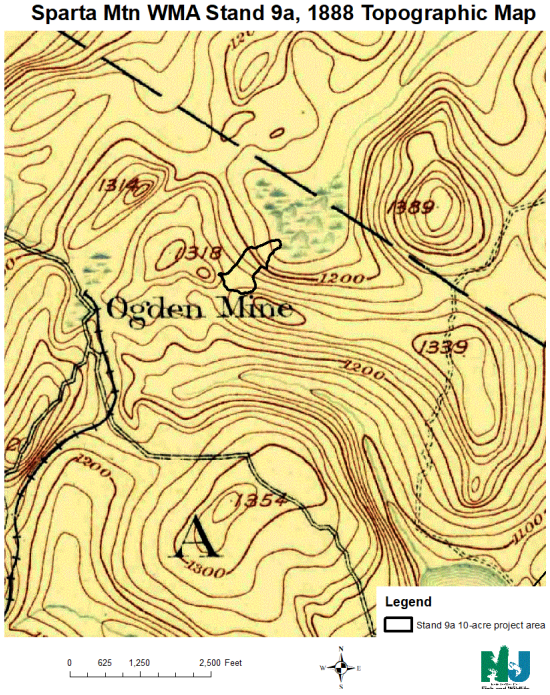

Figure 2. Map of the location of the site in Stand 9 on SMWMA on an 1888 topographic map. Note the ridge to the east and south of the site in 1888.

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. 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 9a on SMWMA prior to treatment (May 2021).

2021/2022 Treatment

Activities for this year in the 2017 Sparta Mountain WMA Forest Stewardship Plan included a group selection and planting treatment on 15-40 acres in Stand 30, an overstory removal in ½ acre in the wetlands of Stand 23, and a re-entry of a shelterwood that was prescribed for 2019/20 in Stand 22 but not done. Per the 2021 Addendum, the shelterwood treatment on 10-30 acres in Stand 9 that was prescribed for 2020/21 was reduced to 10 acres total and conducted this winter, and the other treatments were not to be completed.

NJ DEP Fish & Wildlife incorporated site-specific feedback provided during the public comment period. Site-specific concerns about non-native invasive plants and impacts to rare plants and wildlife were incorporated and the activities were monitored for compliance. A state-approved forester provided the details of the 10-acre shelterwood treatment in accordance with the approved 2017 Forest Stewardship Plan and 2021 Addendum to that plan**.** The intent of a shelterwood treatment is to open the forest canopy by 40-60% to allow for the regeneration of shade-intolerant and mid-tolerant native vegetation (such as oak trees) under the "shelter" of mature canopy 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. The shelterwood treatment was conducted in the winter and completed March 2022.

The treatment involved cutting most of the trees across all size classes (Fig. 4) while retaining about half of the healthier mature oak and hickory canopy trees (Fig. 5). After treatment, about 23 large trees per acre (average 17 inches in diameter), mostly oak and hickory, were retained on site, as well as some younger oak and hickory trees (< 6 inches in diameter). The residual basal area was approximately 40 ft^2/ac. Trees which were cut averaged 12.7 inches in diameter (n=42) with an average age of 79 years (n=39), and about 24% of the 49 cut trees sampled exhibited signs of fungal rot.

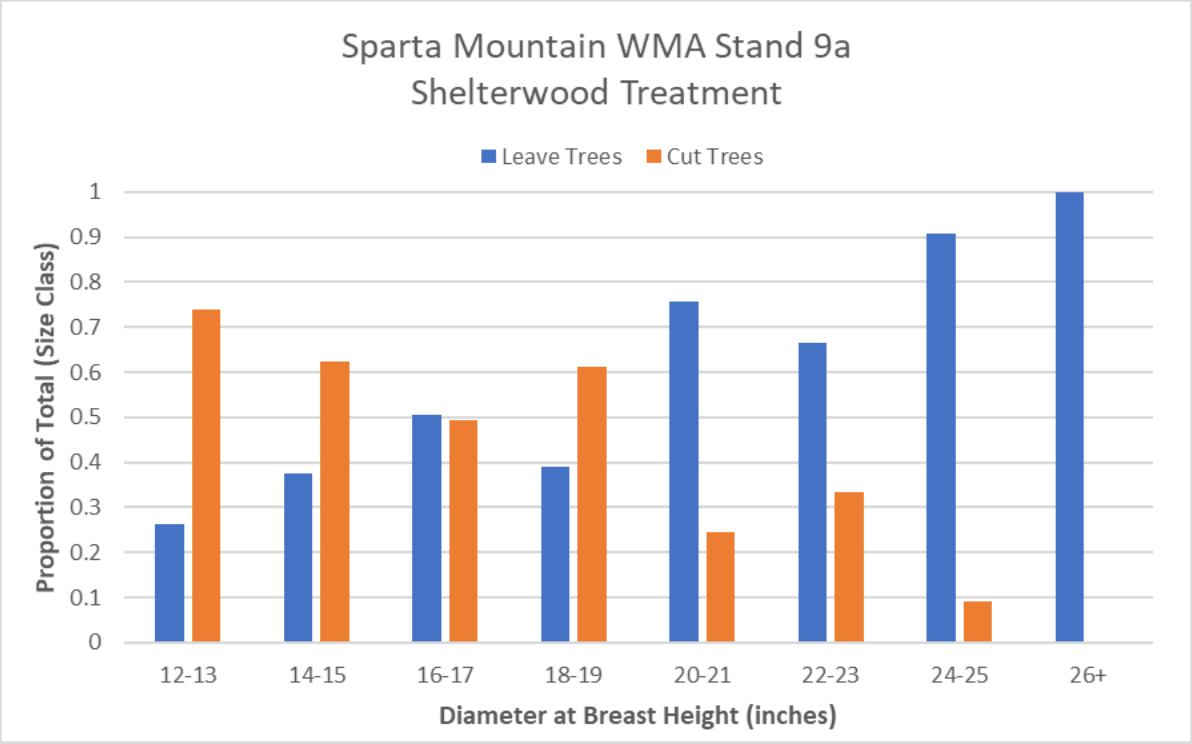

Figure 4. Proportion of trees retained (blue) vs cut (orange) by diameter size class for the 2021/22 shelterwood treatment in Stand 9a on SMWMA.

Figure 5. Photo of the forest in the 10-acre site in Stand 9a on SMWMA after treatment (August 2022).

Stand 9a Bird Survey Results (2021 – 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, 7 species of birds were observed, three of which were Species of Greatest Conservation Need (SGCN), giving the site a bird conservation score of 22. Both the total number of species and number of SGCN more than doubled after treatment, and conservation scores more than tripled, at this site after treatment compared to

before treatment, including within three months after the treatment was completed (Fig. 6). 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.

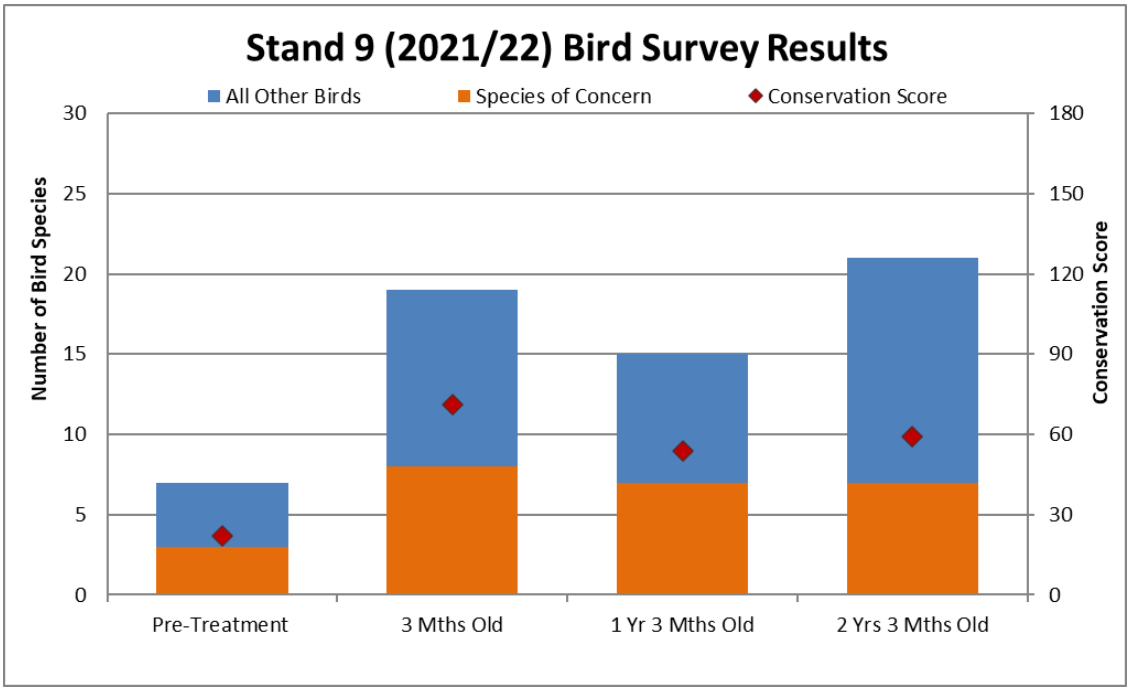

Figure 6. Average number of bird species of concern (orange bar), all other bird species (blue bar), and bird conservation score (red) observed during breeding bird surveys in Stand 9 on SMWMA. Bird conservation scores are the sum of the scores of each individual bird species detected, which were determined for each species based on federal, state, and regional statuses and rankings.

Stand 9a Vegetation Survey Results (2021 – 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 some non-native invasive plants (barberry and stiltgrass) were observed in the location of the bird survey before treatment and were removed prior to the treatment. The treatment resulted in opening the canopy by about 50%, retaining oak and hickory trees as well as some cherry, and targeting northern hardwoods (maple, beech) for removal. The shrub cover grew in quickly after treatment and the herbaceous cover changed from mostly ferns and forbs to mostly grasses, sedges, and forbs. Witch hazel and maple-leaf viburnum are still growing on the site but oak and blueberry responded quickly to the increased sunlight (Fig. 7).

Table 1. Vegetation cover and the dominant trees, shrubs, herbaceous, and non-native invasive plants observed during the rapid vegetation surveys on Stand 9a in SMWMA before and after treatment.

Vegetation Type	Before Treatment	3 Months After Treatment	1 Year 3 Months After Treatment	2 Years 3 Months After Treatment
Tree (% cover)	80	40	40	40
Shrub (% cover)	5	10	20	30
Herbaceous (% cover)	15	15	15	20
Non-native (% cover)	0.1	0	0	0

Dominant 3 Trees	Oak, maple, beech	Oak, hickory	Oak, hickory	Oak, hickory
Dominant 3 Shrubs	Witch hazel, viburnum, sweet birch	Viburnum, oak, blueberry	Blueberry, oak, sweet birch	Blueberry, sweet birch, oak
Dominant 3 Herbaceous	Fern, forb, grass/sedge	Forb, grass/sedge, fern	grass/sedge, forb, fern	grass/sedge, forb, fern
Dominant 3 Non-native Invasive	Barberry, stiltgrass	None Observed	None Observed	None Observed

Figure 7. Photo of the forest in the 10-acre site in Stand 9a on SMWMA 2 years, 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. 8), even before the end of the first growing season post-treatment.

The shelterwood on Stand 9a in SMWMA 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.

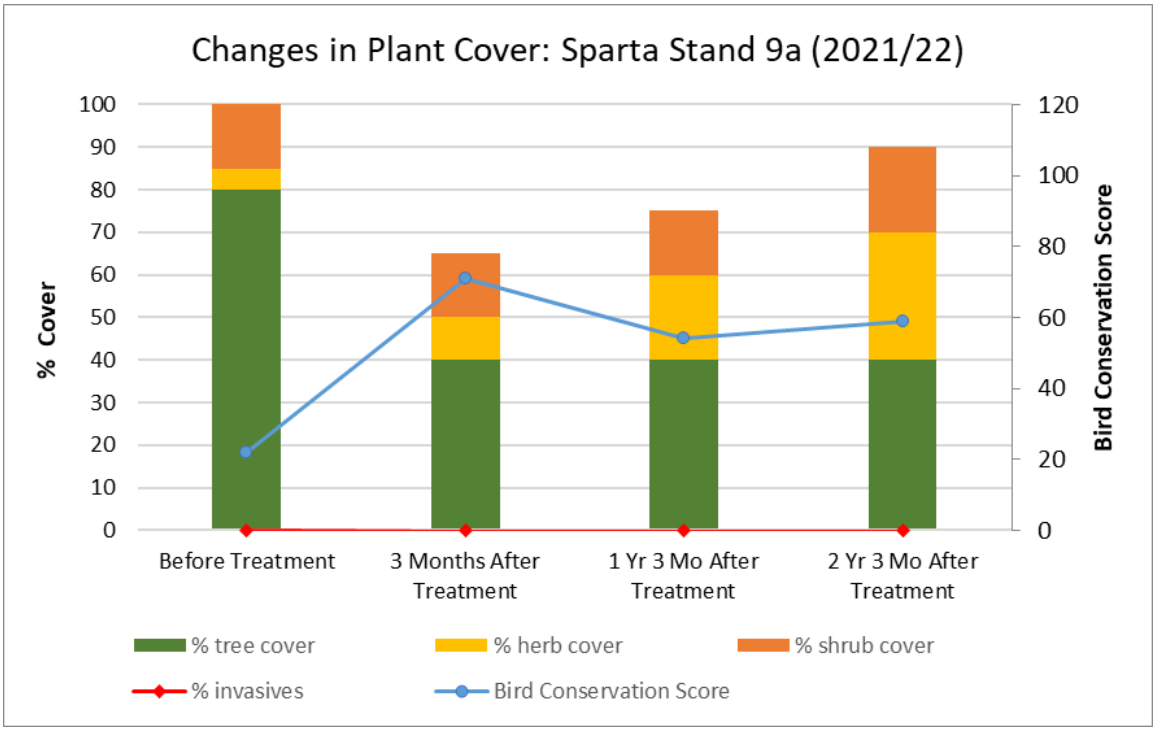

Figure 8. Bird Conservation Score (blue line) and vegetation cover observed during breeding bird surveys on Stand 9a in Sparta Mtn WMA before and after treatment. Columns represent different types of average vegetation cover: Trees include all woody vegetation >4m tall, shrubs include all woody vegetation <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).