Central Arkansas Water Prescribed Fire Photo Monitoring

Final Report

Post burn effects and green up in Bufflehead Bay unit.

The Nature Conservancy

August 2013
**Project Description**

This project addresses the desire of Central Arkansas Water (CAW) to monitor the changes in vegetation due to prescribed fire management on land adjacent to Lake Maumelle. Prescribed fire was first introduced to land adjacent to Lake Maumelle in March 2011 as a tool for reducing forest litter and associated inputs into the drinking water supply reservoir of central Arkansas. A subsequent prescribed burning operation occurred on the north bank of Lake Maumelle, near Lunsford Corner (Figure 1) on March 26, 2012. The Nature Conservancy and CAW have reached an agreement to capture and report on a photographic record of change in the vegetative structure and composition of past and proposed burn units owned by CAW. All photopoints were revisited on June 18, 2012 and June 28, 2013. Comparisons of photopoints from 2011 through 2013 are the focus of this report.

**Goals and Objectives**

The primary goal of this project is to better understand the impacts and rates of change within the CAW-owned portions of the Lake Maumelle watershed by capturing before-and-after photographs of the forested burn units and providing ecological assessments through annual reporting. Project-specific objectives are as follows:

1) Install 10 photo-monitoring plots in mutually agreed locations throughout CAW-owned property that has been burned or identified as to be burned
2) Take pre- and post-burn photographs at each monitoring plot
3) Submit three annual reports that include photos taken and comparisons from year to year

**Methods**

Ten plots were installed using steel t-posts pounded into the ground at five locations per burn unit. Each post was placed on one of five positions that represented the diversity of each location (Figure 1). Plots were established along representative aspects (N, E, S, and/or W) and/or other topographic features such as flats and ridges. Photos were taken at the post facing the angle that best captured the feature. Each photo was labeled first by the initials of the unit name, then feature, and azimuth of photo (i.e, BB_ridge_180.jpg for Bufflehead Bay unit, on a ridge feature, facing due south). On the Bufflehead Bay unit, plots were established on N, S, E, W, and ridge features. On the Lundsford Corner burn unit, plots were placed on N, W, and S facing aspects, as well as a ridge top and a flatwood location. GPS coordinates were taken at each plot center (Appendix A). Ability to access photopoints was also taken into consideration.
Project Summary – 2013

The overall trend determined by the photopoint monitoring for all sites monitored was positive from both an ecological restoration and fuels reduction perspective. The monitoring has shown several trends for almost all sites where management activities occurred:

- **Increased sunlight reaching the ground.** Every site which was burned had increased sunlight reaching the ground than from the baseline. The Bufflehead Bay unit was thinned after the burn.

- **Immediate decrease in leaf litter.** Initial reduction in leaf litter was excellent and the post burn photos show this reduction. The litter layer tends to recover after 5-8 years without subsequent burning. With continued fire and forest management, there will be less midstory and understory vegetation to contribute to the litter layer, as well as a shift towards more of an herbaceous component on the ground.

- **Decreased small woody stems and lower limbs.** Every site which was burned had a reduction in small woody stems and the crowns of the overstory trees were raised due to mortality of the lower limbs. This correlates directly with the increase in sunlight reaching the forest floor.

- **Increased herbaceous cover.** Most sites which were burned had an increase in herbaceous cover. Although the amount of herbaceous cover present varied greatly with site, aspect, and burn intensity, there was an increase noted from the baseline photos at almost all sites.
Figure 1: Map showing the locations of photo monitoring plots established in 2011 within CAW burn units
Photomonitoring Plot Data and Assessment

Name: BB_east slope_0
Location: Lat, 34.866092 by Long, -92.56911
Photo Date: 9/1/11
Treatment: burned on 3/3/11

Ecological Observations: Note the removal of leaf litter (exposed rocks), light charring at the base of the large white oak, scorch line (lack of green leaves) 6’-8’ high, mortality in many small stems, the mostly shaded condition, and the response of the ground cover which appears to be re-sprouting trees that were top-killed on this east-facing slope.
Name: BB_east slope_0
Location: Lat, 34.866092 by Long, -92.56911
Photo Date: 6/18/12
Treatment: burned on 3/3/11

Ecological Observations: After 1 year post burn, some of the leaf litter has returned, and most of the ground cover response appears to be re-sprouting saplings that were top-killed by the fire.
Name: BB_east slope_0
Location: Lat, 34.866092 by Long, -92.56911
Photo Date: 6/28/13
Treatment: burned on 3/3/11

Ecological Observations: After 2 years post burn, there is a noticeable increase in herbaceous cover, continued mortality in small wood stems, decrease in resprouting, and increased sunlight reaching the ground.
Name: BB_north slope_270
Location: Lat, 34.870733, by Long, -92.577229
Photo Date: 9/1/11
Treatment: burned 3/3/11

Ecological Effects: Note the removal of leaf litter (exposed rocks), scorch line (lack of green leaves) 6’-8’ high, mortality in many small stems, sunlight reaching the ground, and the response of the ground cover (mostly grasses and sedges) on this north-facing slope.
Name: BB_north slope_270
Location: Lat, 34.870733, by Long, -92.577229
Photo Date: 6/18/12
Treatment: burned 3/3/11

Ecological Effects: Some of the leaf litter has returned, and a cedar sapling in the center of the photo remains standing after being killed by the fire.
Name: BB_north slope_270
Location: Lat, 34.870733, by Long, -92.577229
Photo Date: 6/28/13
Treatment: burned 3/3/11

Ecological Effects: Two years post fire and the leaf litter has returned but there is also a noticeable increase in grasses and sedges and in sunlight reaching the ground. Note mortality in lower limbs.
Name: BB_ridge_90
Location: Lat, 34.867733 by Long, -92.573039
Photo Date: 9/1/11
Treatment: burned 3/3/11

Ecological Effects: Note the leaf fall post burn has covered the soil exposed during the burn and the sunlight reaching the ground. The scorch line is (lack of green leaves) 2’-3’ high, and the response of the ground cover (grasses, sedges, and a few re-sprouting trees) on this ridge top.
Name: BB_ridge_90
Location: Lat, 34.867733 by Long, -92.573039
Photo Date: 6/18/12
Treatment: burned 3/3/11

Ecological Effects: One year post burn, the increase in grasses stimulated by the removal of the litter layer in the opening along the south side of the hill is significant.
Name: BB_ridge_90
Location: Lat, 34.867733 by Long, -92.573039
Photo Date: 6/28/13
Treatment: burned 3/3/11

Ecological Effects: After 2 years post burn, there is a considerable amount of grasses and forbs and the leaf litter layer is light and patchy. Some shrubs have recovered from the burn but mortality if small woody stems continues.
Name: BB_south slope_150
Location: Lat, 34.868807 by Long, -92.578981
Photo Date: 9/1/11
Treatment: burned 3/3/11

Ecological Effects: Note the removal of leaf litter (exposed rocks), moderate charring on the boles of the trees, scorch line (lack of green leaves) more than 10’ high, mortality in many small and a few larger stems, sunlight reaching the ground, and the response of the ground cover (grasses and resprouting blueberries) on this south-facing slope.
Name: BB_south slope_150  
Location: Lat, 34.868807 by Long, -92.578981  
Photo Date: 6/18/12  
Treatment: burned 3/3/11  

Ecological Effects: 2 years post bur the herbaceous response is mostly re-sprouts of tree saplings. Some small, standing dead trees of less than 2” diameter at breast height remain, but do not prohibit sunlight reaching the forest floor.
Name: BB_south slope_150  
Location: Lat, 34.868807 by Long, -92.578981  
Photo Date: 6/28/13  
Treatment: burned 3/3/11; overstory thinning 2012

**Ecological Effects:** Residual slash is present from the overstory thinning conducted in 2012. This, in conjunction with the prescribed burn in 2011 has opened the overstory and midstory and allowed ample sunlight to reach the ground. Subsequent burns will maintain this woodland structure and herbaceous vegetation will increase.
Name: BB_west slope_320
Location: Lat, 34.870777 by Long, -92.580028
Photo Date: 9/1/11
Treatment: burned on 3/3/11

**Ecological Effects:** Note the removal of leaf litter, scorch line (lack of green leaves) less than 3’ tall, sunlight reaching the ground, and the response of the ground cover on this west-facing slope.
Name: BB_west slope_320
Location: Lat, 34.870777 by Long, -92.580028
Photo Date: 6/18/12
Treatment: burned on 3/3/11

Ecological Effects: A considerable amount of re-sprouting of top-killed shrubs is present. These shrubs will provide some shade and structure, but subsequent prescribed burns will minimize their impact on long-term impediment of sunlight.
Name: BB_west slope_320
Location: Lat, 34.870777 by Long, -92.580028
Photo Date: 6/28/13
Treatment: burned on 3/3/11

Ecological Effects: The midstory in this area is well developed and not impacted by the burn, and most topkilled understory woody vegetation has resprouted. This contributes to shading of the forest floor. Continued prescribed burns should open this area up and increase the amount of sunlight reaching the ground. Note mortality that appears due to the 2012 drought.
Ecological Effects: Note that this is a nicely stocked pine stand with a dense midstory and a ground cover of vines (muscadine). The prescribed burn objective would be to reduce the midstory, increase sunlight to the ground, and remove much of the leaf litter.
Name: LC_flatwood_0  
Location: Lat, 34.907557 by Long, -92.552235  
Photo Date: 6/18/12  
Treatment: post burn, fire skip.

Ecological Effects: The flatwoods were a portion of the unit east of the abandoned road and was not included in the burn operations on this day. Winter rainfall and poor drainage kept this area too wet to burn in the early Spring.
Name: LC_flatwood_0
Location: Lat, 34.907557 by Long, -92.552235
Photo Date: 6/28/13
Treatment: post burn, fire skip.

Ecological Effects: The flatwoods were a portion of the unit east of the abandoned road and was not included in the burn operations in 2012. An ice storm during the winter of 2013 has created some small canopy gaps that will allow additional light to reach the forest floor.
Name: LC_north slope_270  
Location: Lat, 34.904961 by Long, -92.551718  
Photo Date: 9/2/11  
Treatment: none  

**Ecological Effects:** Typical north aspect mixed pine and hardwood litter with a depauperate herbaceous layer. The prescribed burn objective would be to reduce the number of stems, increase sunlight to the ground, and remove much of the leaf litter.
Name: LC_north slope_270  
Location: Lat, 34.904961 by Long, -92.551718  
Photo Date: 6/18/12  
Treatment: burned on 3/26/12

**Ecological Effects:** The controlled burn conducted in the spring did not burn hot enough to expose soil on the north slopes. North slopes do not typically burn as intensely as other aspects because of higher moisture and shade levels. The Fire Summary Report (FSR) conducted for this unit indicated good coverage, but mostly mild litter consumption, especially on north-facing aspects. Scorched pine needles often fall to the ground a couple of weeks after controlled burns, and can mask the effectiveness of the burn. Objectives were met at this location.
Name: LC_north slope_270
Location: Lat, 34.904961 by Long, -92.551718
Photo Date: 6/28/13
Treatment: burned on 3/26/12

Ecological Effects: After 1 year post burn, there has been a reduction in small woody stems, and lower limbs on smaller trees and shrubs. Subsequent prescribed burns will continue to open up this stand.
Name: LC_ridge_295
Location: Lat, 34.901574  by Long, -92.548338
Photo Date: 9/2/11
Treatment: pre-burn

Ecological Effects: Note that this is a pine dominated ridge with many small trees and some ground cover of vines and grasses. The prescribed burn objective would be to reduce the number of stems, increase sunlight to the ground, and remove much of the leaf litter.
Name: LC_ridge_295
Location: Lat, 34.901574 by Long, -92.548338
Photo Date: 6/18/12
Treatment: burned on 3/26/12

Ecological Effects: Increased sunlight is noticeable after the controlled burn. This will help increase germination of herbaceous species that will contribute to ecological diversity and maintain soil structure.
Name: LC_ridge_295
Location: Lat, 34.901574 by Long, -92.548338
Photo Date: 6/28/13
Treatment: burned on 3/26/12

Ecological Effects: The burn has reduced woody stems, increased sunlight reaching the ground, and there has been a noticeable increase in herbaceous cover.
Name: LC_south slope_0  
Location: Lat, 34.900346 by Long, -92.549225  
Photo Date: 9/2/11  
Treatment: pre-burn

**Ecological Effects:** Note that this is a moderately stocked oak stand with high-bush blueberry understory, a deep leaf litter, and no ground cover. The prescribed burn objective would be to lower the shrub layer, reduce the leaf litter, increase ground cover, and increase sunlight to the ground.
Name: LC_south slope_0
Location: Lat, 34.900346  by Long, -92.549225
Photo Date: 6/18/12
Treatment: burned on 3/26/12

**Ecological Effects:** A line of scorch is visible in the midstory where fire will decrease shrub and small tree cover. This will increase light to the forest floor and stimulate increased herbaceous cover and diversity. South slopes typically burn better than other aspects due to a dryer site conditions.
Ecological Effects: The scorch line is still visible in the midstory where fire has decreased shrub and small tree cover, reduced the litter layer, and increased sunlight reaching the ground.
Name: LC_west slope_180  
Location: Lat, 34.903575 by Long, -92.551491  
Photo Date: 9/2/11  
Treatment: pre-burn

**Ecological Effects:** Note that this is a dense stand of small hardwoods, mostly oaks with no ground cover. The prescribed burn objective would be to reduce the number of stems, increase sunlight to the ground, and remove much of the leaf litter.
Name: LC_west slope_180
Location: Lat, 34.903575 by Long, -92.551491
Photo Date: 6/18/12
Treatment: burned on 3/26/12

**Ecological Effects:** A line of scorch is visible in the canopy of the midstory. This reduction in leaf and limb will all increased light to reach the forest floor and stimulate increased germination of herbaceous cover and diversity.
Name: LC_west slope_180  
Location: Lat, 34.903575  by Long, -92.551491  
Photo Date: 6/28/13  
Treatment: burned on 3/26/12

Ecological Effects: A line of scorch is still visible in the canopy of the midstory. This reduction in leaf and limb has increased light to reach the forest floor and stimulate increased herbaceous cover and diversity.