# Assessing the Quality of Ruffed Grouse Habitat in a Managed Early-Successional Mixed Hardwood Forest at Lake Alice Wildlife Management Area, Chazy, NY

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May 2017
ENV499IH

## ABSTRACT

Ruffed grouse *Bonasa umbellus* are valuable upland game birds that are found in early-successional upland forests consisting of trees such as aspen *Populus spp.* that form dense stands. Grouse utilize saplings found in this young forest habitat as cover from predation, while tree buds, catkins, and leaves constitute the majority of their dietary requirements. The New York State Department of Environmental Conservation established a clear cut management site at Lake Alice Wildlife Management Area (LAWMA) in the early 1970s in order to improve ruffed grouse habitat, primarily for increased hunting opportunities. In the fall of 2016, I began to research this site in an attempt to determine the current quality of the habitat. I conducted a vegetation composition and density analysis in three out of the five stands using fixed circular plots. I conducted grouse flush count surveys over nine weeks, counting the number of grouse flushes I encountered every hour. Average vegetation data supports that the area holds adequate stem density for grouse protection (≥4,942 stems per hectare, as suggested by DeStefano et al. (2001)). The clear-cut is heavily dominated by American elm *Ulmus americana*, and not aspen, although aspen are present. Flush data from the 2016-2017 hunting season shows that the number of flushes per hour collected at the site were higher than the state average from the previous hunting season, and even topped the average for the surrounding Champlain Valley and Transition region (NYSDEC 2016b). This data suggests that a healthy grouse population and grouse habitat exists at the site.


## INTRODUCTION

Wildlife Management Areas (WMAs) such as the one at Lake Alice in Chazy, New York are valuable pieces of public property that can be managed to improve wildlife habitat while

simultaneously providing optimal recreational opportunities. The Lake Alice Wildlife Management Areas (LAWMA) is managed in this way by the New York Department of Environmental Conservation (NYSDEC) for a variety of species, notably the ruffed grouse *Bonasa umbellus*. Ruffed grouse are medium-sized upland game birds that are heavily dependent on early-successional mixed deciduous and coniferous forests. These birds favor dense stands of young aspen *Populus spp.* for food and cover from predators, notably the great horned owl *Bubo virginianus* and the Northern goshawk *Accipiter gentilis* (Ruffed Grouse Society 2016). Although their preferred food of choice is the buds and catkins of quaking aspen *Populus tremuloides,* the ruffed grouse diet consists of a wide variety of plants including birch *Betula spp.,* beech *Fagus spp.,* and apple *Malus spp.,* as well as various insect species, all of which can be found in and around early-successional habitat. Early-successional habitat is a forest that is in the early stages of regrowth following a disturbance, and is typically dominated by fast growing, short-lived, shade-intolerant species. Ideal grouse habitat consists of at least 16.19 hectares of mixed early-successional and older growth hardwoods and conifers in an arrangement that allows for a large amount of forest edge and transition zones between each different forest type (DeStefano et al. 2001). Water availability, in the form of a swamp or creek, is an added bonus, due to the prevalence of shrub species found in these locations that are utilized by grouse. Dense sapling growth of at least 4,942 stems per hectare are required for brood rearing and protection from predators (DeStefano et al. 2001). Older growth hardwoods with lesser stem density, complete with scattered conifers, is also required for grouse mating and shelter during certain times of the year (Figure 1) (Bump et al. 1947). Ruffed grouse thrive where there is a rich diversity of forest types; each type serves an important function in the life cycle and habitat use of grouse (Bump et al. 1947). For example, grouse prefer conifer species (notably eastern

hemlock *Tsuga canadensis*) for shelter in the winter, with secondary growth aspen stands as a primary food source (Kouffeld et al. 2013). One study showed that adult female grouse use the young forests with dense regeneration in the summer for brood rearing, and use older forest areas during the rest of the year (Blanchette et al. 2007). For this reason, simply creating a clear-cut area does not necessarily create ideal grouse habitat, but it is clear that having high stem densities of trees such as aspen form the cornerstone of the species' habitat needs (Whitaker et al. 2006).

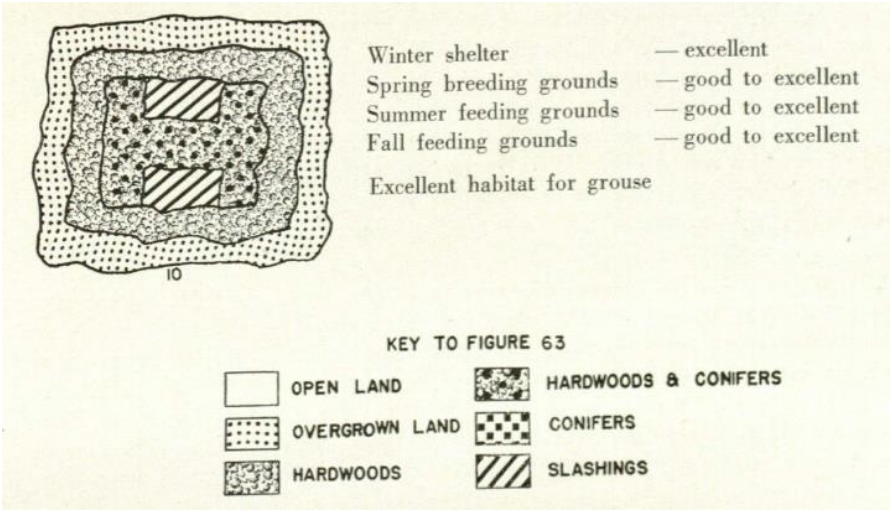


**Figure 1.** Hypothetical ideal grouse habitat structure (Bump et al. 1947).

Historically, ruffed grouse flourished in remote forests shaped by natural disturbance (like wild fires), in abandoned agricultural fields, and recovering logging operations, but as these habitats began to mature and fewer early-successional forest stands remained, grouse habitat quality began to decrease. The current management practice conducted at LAWMA revolves around the ecological concept of forest succession following disturbance. Succession is the sequential progression in which a forest ages, where early stages of forest growth mature into later stages consisting of a higher association of plants, ultimately settling into a mature forest climax stage (Bump et al. 1947). This cycle begins with a disturbance in the original habitat. In nature, this

disturbance is often due to fire or storm damage, but in the case of the LAWMA project, this was completed by clear-cut logging of the five stands. This disturbance created an open field, which was then taken over by annual and perennial ground plants, followed by shrubs. As the clear-cut follows the stages of succession, a secondary-growth woodland dominated by shade intolerant trees (aspen, cherry, etc.) develops, which creates the type of habitat grouse require the most. As the stand continues to age, it returns to a mature woodland dominated by shade-tolerant oak and beech (DeStefano et al. 2001). Because of this process, grouse habitat is continually changing. One area may hold high grouse numbers, but as it ages, it may not hold as many birds as it once did. Some management practices that may be beneficial for other species will be detrimental to grouse. Clean farming, prohibition of lumbering, complete reforestation with conifers, and the maintenance of pure/homologous stands will not support healthy grouse populations (Bump et al. 1947).

When managing a public property for optimal grouse habitat, management organizations (in this case, the NYSDEC) must first consider the basic requirements for not only grouse but all animals: food, shelter, and water availability, during all stages of the year. Once these qualifications are met, then the area can be modified to allow for ease of public access (parking lots, trails, etc.). As a way to improve upland habitat not only for grouse but also for rabbits, turkeys, deer, and songbirds, the NYSDEC began a rotational clear-cut management plan at LAWMA in 1975 (Chambers 1975). The original plan was created for rotational clear-cuts of four designated plots every 10 years, for a full cycle of 40 years. Due to budget restrictions and other hindrances, this plan was delayed for many years. Historical aerial photo analysis indicates that in the late 2000's, five small stands were cut and left to regrow. Since the cut was completed, little to no monitoring has been completed to assess the success of this management

plan. Although grouse data has not been collected at LAWMA, the NYSDEC runs a successful citizen science program to collect state wide grouse data from licensed hunters. They publish a yearly report that summarizes average flush rate (number of birds flushed per hour per hunter) and other statistics regarding ruffed grouse and American woodcock *Scolopax minor* in New York state (NYSDEC 2016b).

The primary goal for this project was to assess the health of the ruffed grouse population at the clear cut site at LAWMA, while monitoring the growth of aspen and other grouse-preferred vegetation in the clear-cuts. My initial expectations were that the clear-cut plan had been successful from the start, and had been quietly providing ideal grouse habitat to a large and healthy population of ruffed grouse in the woods of LAWMA. I hypothesized that the clear-cut site at Lake Alice would be considered "ideal grouse habitat" in relation to the above mentioned habitat parameters. I predicted this under the assumption that the DEC clear-cut would be in the process of natural regeneration and unaltered forest succession and would therefore have the sufficient stem density and forest composition for ruffed grouse habitat. I also hypothesized that the grouse population would provide flush data that would exceed the state average flush data from the previous 2015-2016 hunting season, with hopes that a management project designed specifically for optimizing upland habitat would be effectively establishing better grouse habitat and supporting a larger population of birds than other forests throughout the state.

## METHODS

### *Study Area*

This study of ruffed grouse and managed early-successional forest plots took place at Lake Alice Wildlife Management Area located in Chazy, New York. LAWMA contains a mix of wildlife

habitats ranging from open fields to hemlock stands to migratory bird sanctuaries located on several ponds and wetlands. This specific sampling site was located on an approximately 39 hectare section that is being managed by the NYSDEC for upland habitat via clear-cutting. Dominant species include aspen, maple, hemlock, and beech (NYSDEC 2016c). The northernmost plot (labeled CP1), the middle plot (labeled CP2), and the southernmost plot (labeled CP3) are as shown (Figure 2).


**Figure 2.** Lake Alice WMA Chazy, NY clear cut site with three 3.58 meter radius fixed circular plots on the three western clear cut plots.

The original clear-cut plan indicated that four plots were supposed to be rotationally clear-cut on a 10-year time interval, meaning one of the four stands was to be cut every 10 years, with a new stand being cut each time until all were cut and the rotation could start once again every 40 years. Due to budget cuts within the state and the retirement of the main officer overseeing the project, the exact cutting years are unknown (Chambers 1975). Google Earth satellite image data estimates the most recent cutting to be around 2009, where it appears that all four plots, plus an additional fifth plot, were cut not rotationally, but simultaneously. There are currently five clear-

cut stands located on the property located along the center trail: three on the eastern side, and two on the western.

*Vegetation Sampling*

Vegetation data was collected from the three eastern stands to gather a representative sample of the tree composition of the site as a whole. Each stand is roughly rectangular in shape, and approximately one hectare in size. Starting from the center trail, a 30.48 meter line was drawn down the middle of each stand. From the endpoint of this line, a circle plot was constructed with an area of .004 hectares (3.58 meter radius) (Figure 2). The plot was set up using flagging tape to mark the perimeter of the circle in order to ensure the greatest accuracy in woody stem counts. The small radius was necessary due to the dense nature of the young stands and the abundance of woody stems. The species and diameter at breast height (DBH) of every woody stem over 1.5 meters tall was recorded using a DBH tape. This procedure was repeated in CP2 and CP3. The density readings of each of the three .004 hectare plots were added to get a density measure for .012 hectares. This value was then divided by .012 to calculate the woody stem density per hectare. This vegetation sampling was completed on September 6$^{th}$, 2016.

*Ruffed Grouse Survey*

To sample the ruffed grouse population, I followed the exact protocol for the NYSDEC's Citizen Science Wildlife Observation Data Collection for Grouse and Woodcock (NYSDEC 2016a). I hunted the area during the open grouse season by walking throughout the vicinity of the clear-cut area, making sure to cross each clear-cut plot as well as the adjacent older growth forest. I recorded every ruffed grouse flush, grouse kill, and the total time spent afield, to the nearest whole hour. Data was entered directly into the NYSDEC's 2016-2017 Cooperator Grouse and Woodcock Hunting Log, following the same directions that all participating hunters do. This

flush survey was conducted from October 18th, 2016 to the close of grouse season on February 28th, 2017 over the course of nine weeks.

## RESULTS

Vegetation results compiled from all three circle plots showed that the clear-cut was primarily dominated by American elm *Ulmus Americana* and gray birch *Betula populifolia*, with quaking aspen *Populus tremuloides* holding a minimal 4.96% relative abundance (Figure 3).

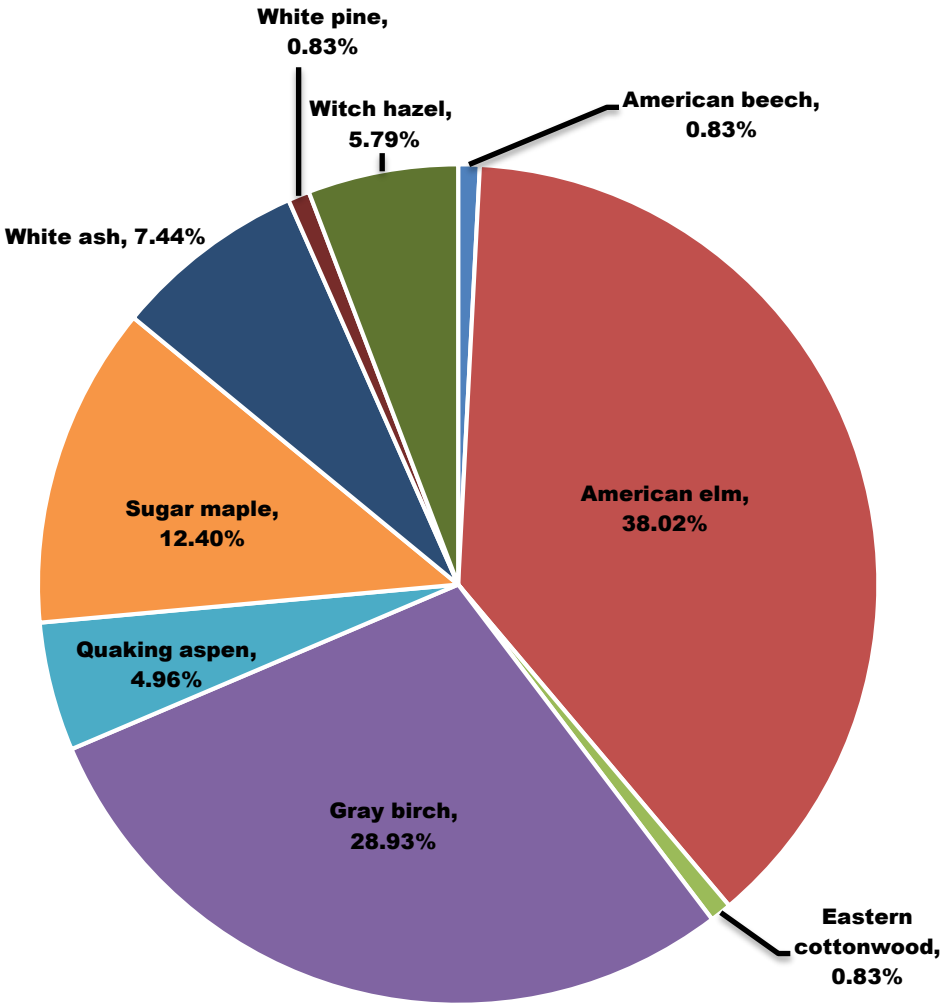


**Figure 3.** Relative abundance of tree species sampled at all three circle plots at LAWMA.

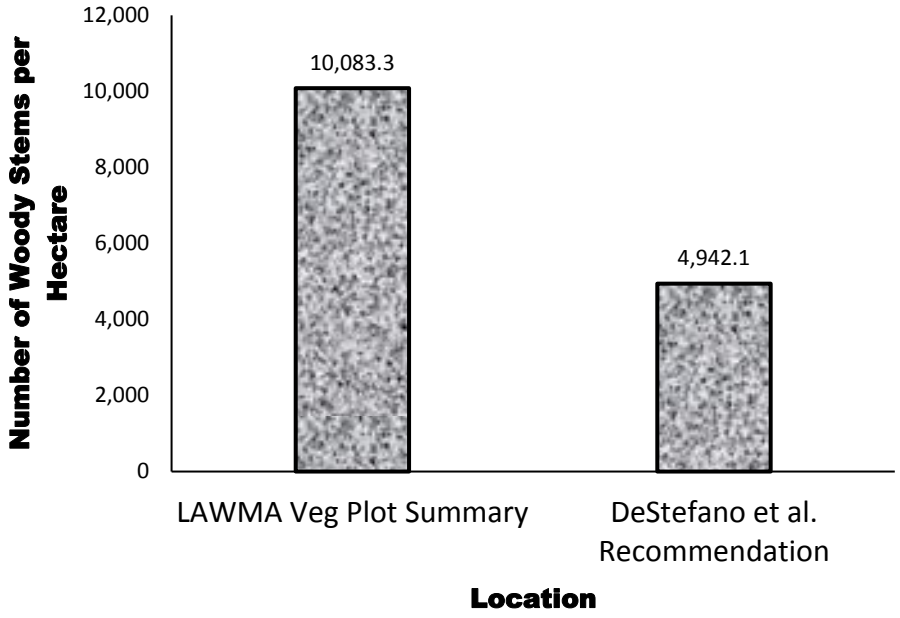


**Figure 4.** Average woody stem density of individual trees with a height of 1.5 meters or more per hectare, as calculated from all three circle plots, compared to the literature recommendation for woody stem density of ideal grouse habitat.

An average woody stem density of the three plots more than doubled the DeStefano et al. recommendation woody stem density for adequate ruffed grouse cover (Figure 4).

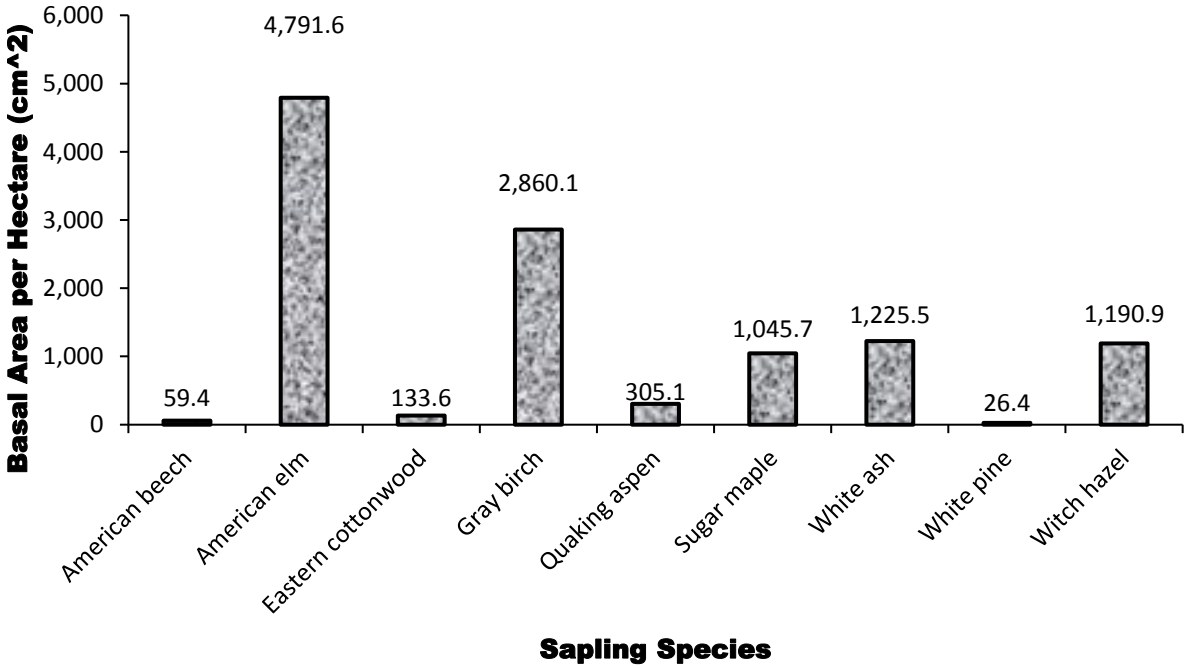


**Figure 5.** Basal area per hectare for each tree species sampled.

The plots contained nine different tree species, with American elm, gray birch, and white ash *Fraxinus americana* covering the most basal area per hectare (Figure 5).

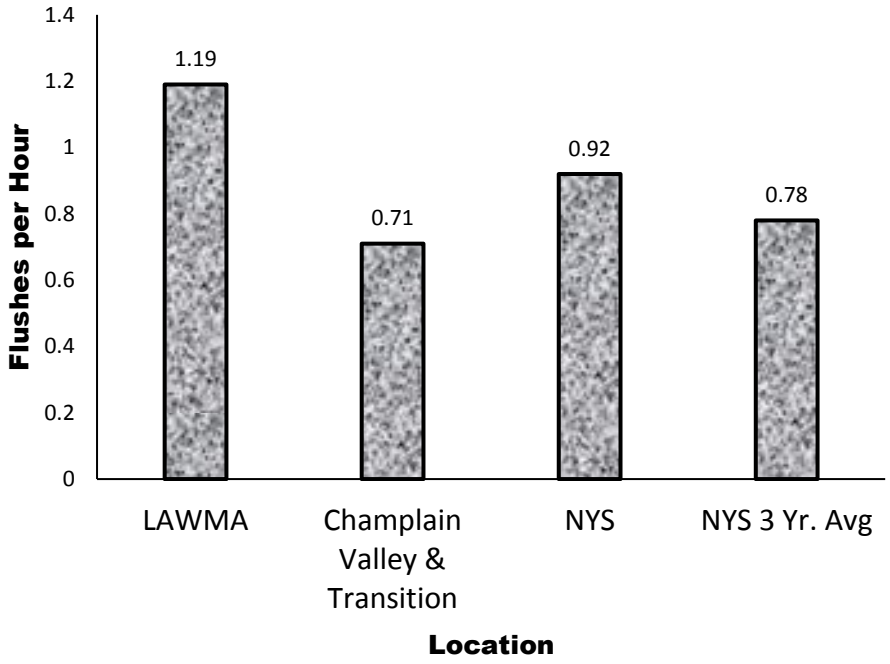


**Figure 6.** Average flush rate comparison of the study site and the Champlain Valley and Transition region of New York (where LAWMA falls according to the NYSDEC report), the entire state of New York from the 2015-2016 season, and a three-year average of state wide flush data from 2012-2015, as stated in the NYSDEC Cooperator Ruffed Grouse and American Woodcock Hunt Log 2015-2016 Season Results Report (NYSDEC 2016b).

Twenty nine total ruffed grouse flushes were encountered at the LAWMA clear-cut, with 22 total hours of active hunting at the site over the course of nine weeks. Analysis of the flush data revealed that the average flush rate (number of birds flushed per hunter per hour, rounded to the nearest whole hour) exceeded the NYSDEC average flush rate for the region surrounding LAWMA, the state flush rate from the previous season, and even the previous three year average for the entire state of New York (Figure 6). The difference was greatest between LAWMA and the Champlain Valley and Transition region (0.48 flushes per hour), and smallest between LAWMA and the state average flush rate from the previous year (0.27 flushes per hour).

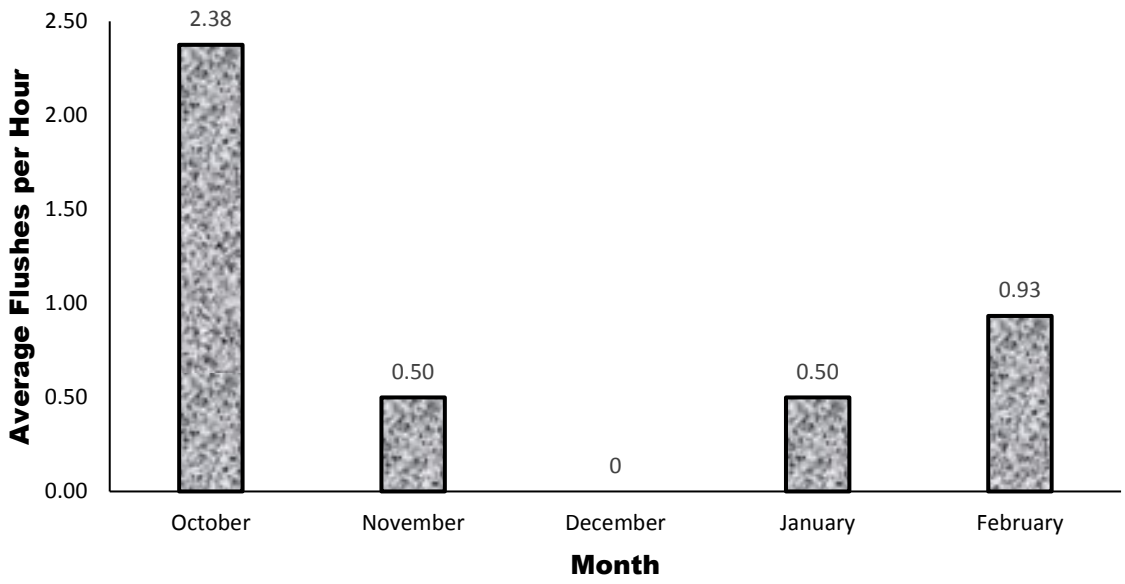


**Figure 7.** Average ruffed grouse flush rate per month at the LAWMA site, over the course of the 2016-2017 hunting season.

Grouse flush data was broken down into monthly segments spanning from the open of grouse season to its close in order to analyze activity level and clear-cut habitat use over the course of a single season. Flush rate was highest at the beginning of the season in October, slumped during the middle of winter, and appeared to rebound before the close of the season at the end of February (Figure 7). No data was collected in the month of December.

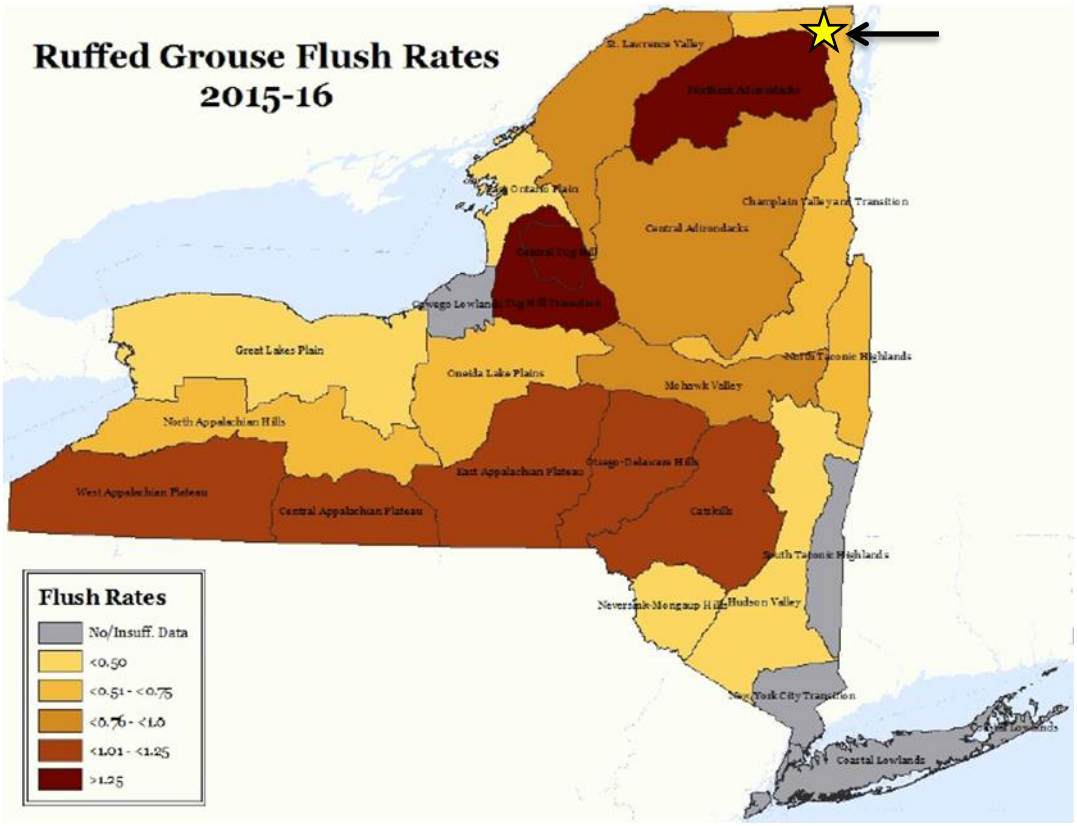


**Figure 8.** Ruffed Grouse flush rate (grouse flushed/hour) by Wildlife Management Unit (WMU) aggregate from the Cooperator Ruffed Grouse & American Woodcock Hunting Log, 2015-16. Only aggregates with >20 observations/records and >35 hours were included in the analysis. The statewide flush rate for 2015-16 was 0.92 grouse flushed/hour. WMU aggregate in gray north of New York City had too few observations for analysis. The Coastal Lowlands aggregate does not have a grouse hunting season, so the survey was not conducted there (NYSDEC 2016b). The star indicates the approximate location of LAWMA.

Flush rates determined by the NYSDEC from the 2015-2016 NYS grouse season suggested that the Northern Adirondacks and the Tug Hill region had the greatest number of grouse. LAWMA falls within the Lake Champlain and Transition region, where flush rates fell between 0.51-0.75 flushes per hour (Figure 8).

## DISCUSSION

This data supports both hypotheses for this study. Although aspen dominance was not as high as the initial prediction, the species that were there, such as gray birch and American elm, are still useful to ruffed grouse and still provide the food and cover that these birds need. Less

than expected aspen dominance could be due to the higher rates of sexual reproduction of this species in the eastern portion of its range, compared to asexual reproduction via cloning that creates purely homogenous stands in western regions (Johnson 1999). American elm sapling dominance may support grouse for now, but concerns exist regarding Dutch Elm Disease leading to heavy sapling mortality in the future (Kirwan et al. 2004). Average woody stem density for all three of the plots combined was well beyond the DeStefano et al. literature recommendation of 4,942 stems per hectare. Circular plots were not established in the older forest sections adjacent to the clear-cut stands, but these sections do serve important grouse functions, as suggested by the literature. Although no hemlocks were found in the clear-cuts, due to the fact that they are one of the most shade-tolerant species found in New York, there were scattered hemlocks in the surrounding older growth hardwoods on all sides, with a thick hemlock stand on the southeast side of the management area. These trees seem to have been heavily utilized by the grouse in the middle of the season. Large piles of grouse scat were found under many of these lone scattered hemlocks, suggesting that these trees were used regularly. Deep snow in the clear-cut areas likely prevented ground foraging and hemlocks provided safety from predators. On the eastern and western sides of the clear-cut, a small brook and swamp can be found, complete with grouse-preferred shrub species such as speckled alder *Alnus incana*. On the southwest side, a pure stand of older beech growing on a drier and more upland region of the woods exists, which provides yet another food source for grouse as well as optimal drumming and breeding grounds (Bump et al. 1947). The general mosaic of the different forest stands provided plenty of forest edge and supplied adequate cover, food, and water for the birds throughout the year.

Regarding the birds themselves, it appears that the ruffed grouse population at the LAWMA clear-cut management site is thriving. Of the 22 hours spent afield, only four hours failed to

provide a single grouse flush. This flush data suggested a greater bird presence than the state average from last year, the previous three year average, as well as the average for the Lake Champlain and Transition region (Figure 8). The highest flush rate recorded at LAWMA occurred during the early part of the season in October, which is the most preferred time to hunt grouse by many hunters. This high rate can be explained due to the presence of leaf cover on the trees and the remaining summer food supply (such as blueberries *Vaccinium spp.*) that the birds take advantage of before the winter months. A resurgence of grouse activity directly in the clear-cuts themselves occurred at the tail end of the season in February, and can be explained by the unusual warm spell that triggered snow melt and early spring growth of food items within the early-successional species found in the clear-cuts.

A few sources of error exist in this study that may have affected the accuracy of the data. The vegetation analysis occurred in the fall, when the leaves were changing colors and were falling from the trees. This helped with navigating through the thick brush of the clear cuts, but it may have affected tree species identification, which is hard enough when trying to identify saplings and immature trees. This grouse flush dataset was much smaller than that collected by the hundreds of hunters across the state. The two varying sample sizes between these two studies may prove to be less than ideal for comparing otherwise identical data. The state flush data also involves hundreds of thousands of acres of potential grouse habitat that hunters trekked through, whereas in this study, the exact same area was hunted repeatedly. Because of this, there is the possibility of encountering the same birds on multiple occasions, or even driving some birds out of the area due to increased hunting/predation pressure. The fact that LAWMA is open to the public for hunting and that I was not the only hunter frequenting this area could have had an impact on the flush data. At least one other bird was harvested by another hunter at the site, as

determined by the large amount of grouse feathers found in the parking lot. Grouse are known to be highly territorial birds, with relatively low carrying capacities per hectare, which means that the more ground a hunter covers in a given trip, the more new birds he/she may encounter (DeStefano et al. 2001). The same group of birds was most likely hunted within their home range, with a smaller chance of encountering new individuals each time.

*Management Implications*

One important management suggestion would be to start and/or continue monitoring the clear-cut site for vegetation data as well as bird data, preferably on an annual basis. If this is done, then data can be compared on an annual basis to truly see if progress towards optimal upland habitat is being made, and modification cuts can help the plot growth reach optimal composition and density. It would also be interesting to see if the grouse population at this site is following the ten-year growth/decay population fluctuation that has been noted in grouse populations across the country (Ruffed Grouse Society 2016). Also, like the original plan had stated, if each of the five plots are rotationally cut on a regular basis, then early-successional growth will always exist within the management area, and the birds can utilize different portions of the habitat to the fullest extent. One source recommended that ideal grouse habitat consists of 7-10 year old aspen stands, so perhaps following the initial plan for a cutting rotation interval of ten years would be ideal (Dessecker 2016). One last management recommendation is not only for the grouse themselves, but for sportsmen who plan on hunting the area in the future. If the NYSDEC cuts a small perimeter foot path along the entirety of the five plots, the whole area would have improved hunter access to the young plots as they undergo succession. This perimeter trail would also help the grouse; the development of an ecotone between the clear cut plots and the trail would provide enough edge effect to improve the overall upland habitat. This concept was

experienced firsthand during flush data collection on the property. Oftentimes, a small patch of hemlocks would be found among the older growth aspens or some other type of forest edge, and I would predict that a bird was there. Sure enough, one would flush from the spot shortly after. Ruffed grouse are known to be edge-dependent species, and are oftentimes encountered along abandoned logging roads as they consume small stones to aid in the digestion of leaves and berries in their gizzard (DeStefano et al. 2001). This could be imitated with the establishment of a perimeter trail. It is also suggested that any trail or road be seeded and fertilized as a means to diversify foraging opportunities and to buffer mast failures for grouse and other upland species (Whitaker et al. 2006). Due to lack of data on the completion of the cut, and whether or not the execution of the plan was followed through regarding cut rotation intervals, these management suggestions may be limited. Like with many older state projects lacking funding and participation, this project has next to no preliminary/post cut monitoring data.

*Further Research*

This study could be continued at any time throughout the course of the entire year, not just during hunting season. Although flush counts are a practical surveying method, others exist. Starting in April, drumming surveys can be conducted to further evaluate the prevalence of grouse in the area, and shed light on which specific areas of the property are used for this unique mating strategy. Nest and egg counts in the spring months can provide information on mating success and brood survival in the weeks to follow. In the summer, camera trapping can document grouse habitat use and behavioral activities in the clear-cuts. Returning to the fixed circle plots in CP1-CP3 on an annual basis can monitor the growth success of the saplings and determine which species have a competitive advantage for space and resources in the clear-cuts. Detailed, year-to-year collection of both bird and vegetation data will reveal exciting new trends and patterns of

the ecological interactions between *Bonasa umbellus* and the early-successional habitat they depend on. In conclusion, this study suggests that this ruffed grouse management project is successfully creating high quality upland habitat and is supporting a healthy population of ruffed grouse at LAWMA. Further monitoring and forest management may help this property maintain or even improve ruffed grouse populations and hunting opportunities.

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