Pennsylvania Ruffed Grouse Habitat Assessment within Crawford County Local Game Land: High versus Low Populated Areas



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	5/2/09		5/2/09
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Abstract

The North American Ruffed Grouse is the one native, sedentary game bird that is found from the Atlantic to the Pacific; it inhabits a larger area than any other nonmigratory game bird. The extremities of its range are even greater north to south than east to west. (Edminster, 1954) Not to mention, the North American Ruffed Grouse has been honorably titled as Pennsylvania's State Game Bird. But the rate of declining population for the North American Ruffed Grouse has been increasing over the decades. Decline in population has been due crucially by poor habitat structure and availability of necessary resources. Based upon previous drumming count survey done in Pennsylvania Game Land No. 69, of Crawford County, an examination of habitat was conducted from the high to low population density in order to determine why ruffed grouse populations in PGL No. 69 are arranged the way they are. I hypothesized ruffed grouse are present in some areas and absent in others based upon resources provided by vegetation. After investigative research done in areas of high and low density and the area between, it was determined, but not entirely proven, the main resource for high population density was the amount of food availability. Tree species found in areas of high grouse population consisted of early successional vegetation fluent in aspen and absent of heavy coniferous species. The tree and herbaceous species recorded in the high population density areas provided higher quality and quantities of valuable resources for ruffed grouse than that of species recorded in low population density areas. Because of ruffed grouse population cycles this study must be conducted ever four to five years due to the fact ruffed grouse forest preferences change with every cycle.

Introduction

Because wildlife in the United States is publicly owned, management actions and policies depend on public acceptance (Zinn et Al., 1998). Therefore, wildlife management is a very extensive process that managers are always going to be held accountable for (Starfield 1997).

The ruffed grouse (*Bonasa Umbellus*), native to North America, has been living in the forested areas of the northern United States and Canada for at least 25,000 years, with evidence found in geographical remains dating back to the Pleistocene period in both eastern and western parts of North America. The North American ruffed grouse stands alone as the only native game bird that is found from the Atlantic to the Pacific, it occupies a larger area than any other non-migratory game bird. The extremities of its range extend even farther north to south than east to western North America. Additionally, the North American Ruffed Grouse has been honorably titled as Pennsylvania's State Game Bird (Edminster 1954).

It is believed the central, core population of the North American Ruffed Grouse was always within the Appalachians, but recently fewer birds have been noted in the Appalachians than in the Great Lakes regions of the United States (Jones et. al, 2005).

Ruffed grouse populations in the Appalachian region differed from the birds found in the central northern portion of the species' range (i.e., northern United States and Canada). Ruffed grouse in the Appalachian region had lower reproduction rates, but had a substantially higher survival rate than populations in the Great Lakes region, and southern Canada (Devers, et. al, 2007).

According to Breeding Bird Surveys, the North American ruffed grouse populations have been in decline throughout the Appalachian region over the past 35 years. Except for localized declines, ruffed grouse generally appear to be stable and secure in Canada and the Western United States but numbers seem to be declining in the eastern United States (Rusch et al. 1999).

In the Appalachian region, habitat loss and degradation are the principle causes for ruffed grouse population declines. Fire suppression, maturing eastern deciduous forests, and lack of management practices involving timber harvest not concerning grouse habitat, are major causes of habitat degradation

and loss (Barnes et Al., 1995). The quantity and quality of ruffed grouse habitat has declined in recent decades in the Appalachian region (Bumann et. Al., 2002).

The grouse was a populous species; once known as a staple item of food for the Indian tribes and early settlers that inhabited the northern United States and Canada, however, these people never seriously reduced the numbers of grouse by hunting, nor did they substantially affect the habitat with land-clearing practices. Periodic declines in the abundance of the game species throughout North America were thought to result from natural causes, rather than affects of over-hunting or man inflicted changes to habitat. Periods of decline were a reflection of prominent weather patterns, increased population of predators, and reductions in food sources available for the birds (Johnsgard, 2008).

The early settlements in the United States by Europeans lead to an era of reduced living habitat for the ruffed grouse. As settlers cleared the forests for the purpose of creating man's desired farm fields, the settlers influenced a great change to the habitat of the ruffed grouse. The final outcome was that the grouse's total home range was drastically reduced. Finally, in the 1950's grouse numbers had returned to a recognized stature of high abundance due to a decrease in agricultural land development. Some of the best grouse hunting known to man was recorded in the Midwest and Northeast (Edminster, 1954). Today the impact of poor management practices over the years has been believed to be the key reason for the decline in population.

Although the ruffed grouse is a popular game bird, hunting mortality is considered compensatory and helping improve grouse population cycles to some extent and is not thought of as a major factor controlling grouse populations (Barnes et. Al., 1995). In a recent study, it was reported that, on average, hunting accounted for only 12 percent of all mortality and ranged 0 to 35 percent across sites and years. This study did not conclude or infer that hunting would be compensatory at higher harvest rates (Bumann et. Al., 2002). The study also did not include any affects hunting may cause on ruffed grouse habitat or functions.

Grouse habitat must be based on the whole ecology of the grouse: on its cover preference, food requirements, principles of interspersion, the need for drumming logs, dusting sites, and escape shelter, and the relations of the bird to other species, including man. Mere considerations of timber environments

will not suffice. The game bird's main habitat requirements include: nesting cover, a "Drumming log" for males, brood cover for females and fall/winter cover (Atwater et al. 1989).

These game birds depend on early sucessional forest habitats throughout much of the year (Desseker et al. 2001) Ruffed grouse prefer young forest vegetation that is determined by species such as yellow birch, trembling aspen, and quaking aspen. The food supplied by such growth explains their preference for this habitat. During the winter and drought seasons, grouse feed on the buds of both quaking and trembling aspen to ensure the birds maintain enough energy (Guglielmo et. Al.,1996).

The ruffed grouse display three distinct behaviors throughout the year before they travel elsewhere for the summer and fall months. Those behavioral patterns are identified as *"courtship period," "nesting period,"* and *"brood period."* These behaviors are influenced by and dependent upon specific habitat.

Coniferous areas during winter months include the necessary adaptations for the ruffed grouse to survive during the cold winter months even though the bird can withstand very cold temperatures and can find enough thermal cover by diving deep into the snow itself in large, open, deciduous regions. During the warmer months, ruffed grouse prefer early successional forests abundant in aspen, yellow birch, and areas lacking in evergreen species. These sites usually include all the necessary resources for grouse activities, such as "drumming logs" and nesting (Johnsgard 2008).

When examining Crawford County, Pennsylvania, it should be noted the county was once a heavy agricultural area. At least 68% of total land was harvested cropland and livestock grazing land (OnBoardInf., 2010). Therefore the forest structure following the once agricultural areas satisfies much of the ruffed grouse needs. The forest succession occurring presently in the county includes the early progression forest structure ruffed grouse use to satisfy all their natural requirements. This makes Game Land 69 in Crawford County a desirable environment for grouse habitat. Game Land 69 is one of the largest game lands in Crawford County and is home to many types of native game species including the ruffed grouse.

For the purpose of determining ruffed grouse populations and related acreage, the Pennsylvania Game Commission uses drumming pattern surveys (Jones, 2005). This survey was used to establish harvesting techniques within the game land so there is little to no negative effects on ruffed grouse habitat. This study displaying population of grouse for just about any given area can also be used for study purposes for what makes for good grouse habitat.

Populations of the central and southern regions of the Appalachians are declining due to widespread maturation of forest cover (Jones et al. 2007). Effective management of this species also requires a sex- and age-specific understanding, and the habitat preferences at multiple temporal and spatial scales.

A recent study used multivariate logistic regression models to compare habitat within 1440 grouse home ranges, as well as 1400 equally sized buffered random points across seven CSA study areas. On most sites, grouse home ranges were positively associated with roads and young forest (<20 years old). Sex and age status were reflected in habitat preference. Generally, males showed a preference for younger forest than females because of differences in habitat use among different vegetative species during reproductive periods. (Tirpak, et. al, 2010) This study illustrates some of the complications of accounting for ruffed grouse populations for any given area.

But in a study done in Northern Minnesota, it was shown relative densities of Ruffed Grouse in aspen and conifer forests indicated that the aspen forest's carrying capacities for grouse was higher than the conifer forest's at least during the low and declining phases of the grouse's cycle due to optimal habitat these forest types provide for ruffed grouse. Grouse densities were highest where forest types were evenly distributed. On the basis of the study group's observations, they predicted that Ruffed Grouse populations in aspen-dominated landscapes will have higher population densities and fluctuate more than will populations in conifer-dominated landscapes because ruffed grouse extensively use such conifer-dominated landscapes for shelter throughout the entire year. The study group suggested that studies of avian habitat selection would benefit from knowledge about the relative densities among habitats at differing population sizes because this information could provide insight into the role of habitat in regulating populations and clarify inferences from studies about habitat quality for birds (Zimmerman et. Al, 2009)

In Crawford County, the technique has just come to fruition in 2009-2010, and has been used on only one occasion, has been drumming count surveys. This study was conducted in late March and early April of 2010 on Pennsylvania State Game Land Number 69 in Townville, Pennsylvania. The results of the study concluded the areas of most dense grouse populations and activity and areas with the least amount of grouse activity. The results of the SGL 69 study, using this technique, were then used to plan the harvesting techniques of forest for the PA Game Commission, in hopes that valuable grouse habitat could be sustained.

My thesis will consist of understanding the grouse and their populations throughout PGL No. 69. By understanding the extremities of the ruffed grouse's behavior and examining the habitat preferences of the ruffed grouse I will conclude a theory as to why ruffed grouse have located themselves in certain areas of PGL No. 69 and what main features of ruffed grouse preferences attracts them to reside in these locations.

Methods

The area of study was Pennsylvania State Game Land No. 69, in Townville, Crawford County, northwestern Pennsylvania (≈1,770 ha). The elevation of Game Land 69 above sea level is around 435 meters. The game land experiences an average temperature ranging from -4˚C to 24˚C per year, with an average precipitation level ranging from 8-13cm per year.

Game land 69 over the years has undergone transformations in agriculture and timber harvesting practices which have played a key role in the succession of the forest structure of the game land. Game Land 69 lies entirely in the glaciated part of the Allegheny Plateau, with greatly varying topography from east to west and consists of soils that are very poorly to somewhat poorly drained (CCCD, 2007). Soil types for Game Land 69 include Venango silt loam three to eight percent slope, and Valois-Cambridge three to eight percent slope (USDA, 2006). Most of the west region of Game Land 69 was crop land over 70 years ago and the last timber harvest was performed in 1973 for profit of lumber instead of focuses on game management. The mixes of deciduous and coniferous species now present in the game land are indicators of the huge transformation from an agricultural land to a stable forest land. The predominant species of the game land are red maple (*Acer rubrum*), and hemlock (*Tsuga Canadensis*).

Done in spring of 2009, ruffed grouse drumming surveys, imitating the methods in the southern Appalachian region of the Carolinas, (Jones, 2005) by the Pennsylvania Game Commission and myself, were used to predict core positions of high and low populated ruffed grouse habitats as a tool for safe harvesting techniques within Game Land No. 69. The study consisted of recording the location of each grouse drum heard and any flushes seen. Each drumming heard or grouse spotted accounted for two grouse. A total of 18 drums and spotting were recorded, therefore it was determined there were 36 total grouse in SGL 69 and their locations during Spring 2010. This data can be used to examine the habitat of these positions and correlate a theory as to why ruffed grouse are either present or absent in these areas of the game land.

Three transect lines were created from the highest populated area of ruffed grouse through the least populated area. The lines started at the west end (most populated) of the game land and directed easterly into the central region (least populated). The total distance of each transect line was around two-and-half kilometers long. Given the maximum range for a female grouse to travel during nesting, (one or two ha), each line was separated by 100 meters. The number two transect line was placed through the center of the most populated area while the other lines were created one ha both north and south.

For each transect line, 6 areas/transect, large enough to account for all overstory timber species in the area and one hectare apart from each other, were selected for examination. Any structures, such as, lakes, were skipped and the areas were continued five meters from the obstruction and continued east. There were a total of 18 areas of examination between all transect lines.

The Bitterlich method was used to account for the dominant overstory vegetative species which required a meter stick and a slit of material (usually paper), the width of the stick (≈2.5cm) risen up at the 35cm mark on the meter stick. While holding the stick up to the right eye and standing in a set position, the viewer rotated and recorded any timber wider than the slit of material (Hyder et. Al, 1960). For determining the understory species, (herbaceous species), a count of all the individual species was done and the highest occurring species was recorded, as well as the herbaceous species' estimated percent coverage in the area, not including open ground. If any area for examination was within a very dense early successional stand, overstory and understory species were concluded to be the timber stands species for the entire area. Finally, because grouse require more than vegetative resources, such as concerns of

food, moisture, predators, drumming logs, etc., notes were taken for each study site concerning these resources.

Food availability was concluded by how much budding is present in an area by taking the percentage of the most popular seeding/budding tree species' basal area for each site compared to the total basal area of the site. For drumming logs, absolute counts of drumming logs were recorded for each site. Nesting ground capabilities were recorded as either having a high, med, or low means of success based upon the following questions: Is there enough shelter, protein (insects, small reptiles…etc.) for juveniles, nesting materials, or any signs of predators? Moisture was also recorded based upon drainage classes of soils for each site.

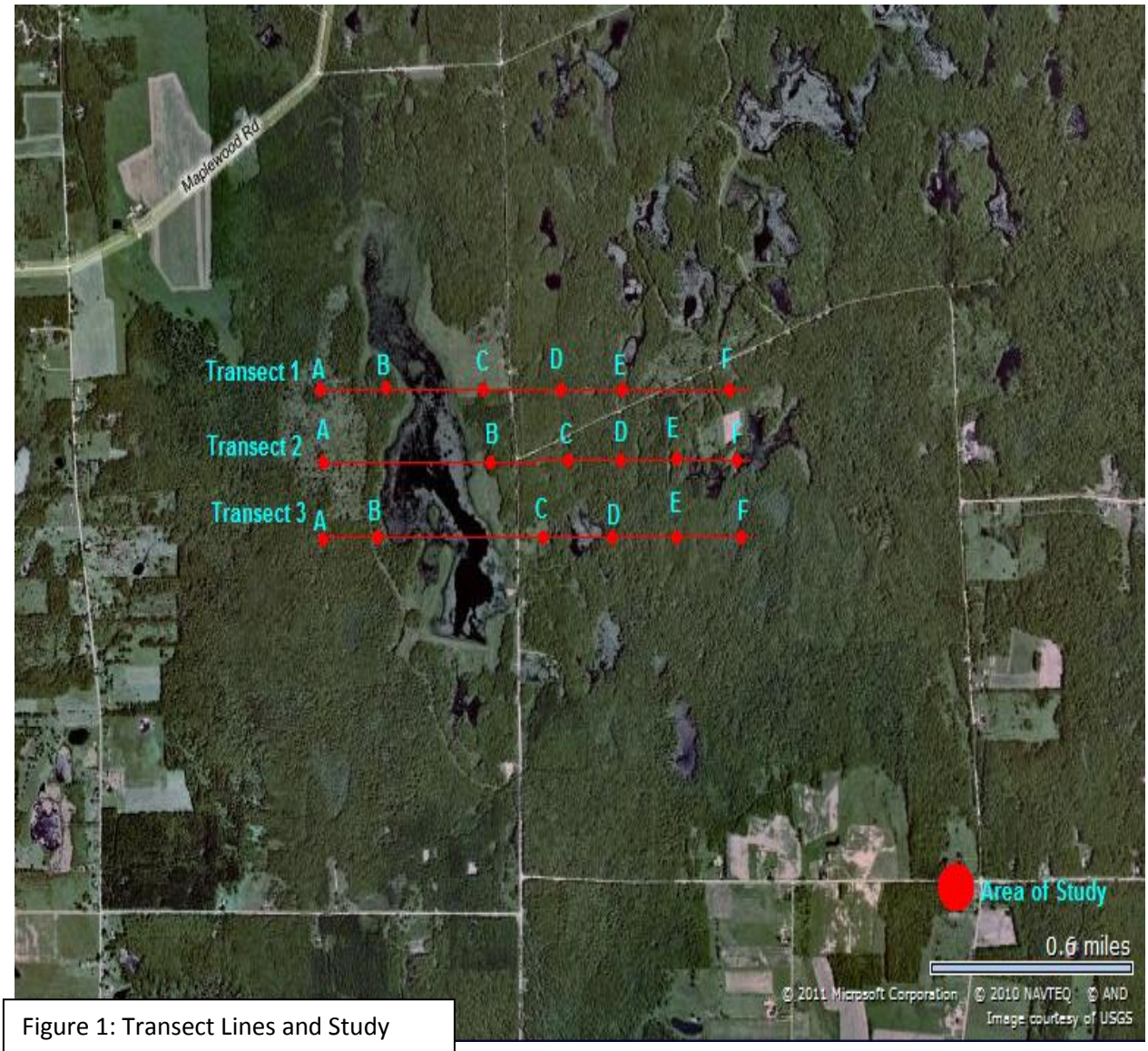


Figure 1: Transect Lines and Study Sites of Game Land No. 69

Results

The studies conducted in high populated areas consisted of more deciduous species than coniferous. The areas investigated in the low populated areas consisted of a mix of coniferous and deciduous timber species (Table: 1).

The basal area of deciduous species seemed to be greater in the high populated areas where coniferous species' basil area seemed to be greater in the low populated areas. The dominant timber species found in the high populated area was aspen. The dominant species found in the low population areas was hemlock. Red oak, sugar maple, red maple, and black cherry were the only species that appeared throughout each transect line between high and low population density sites (Table: 1).

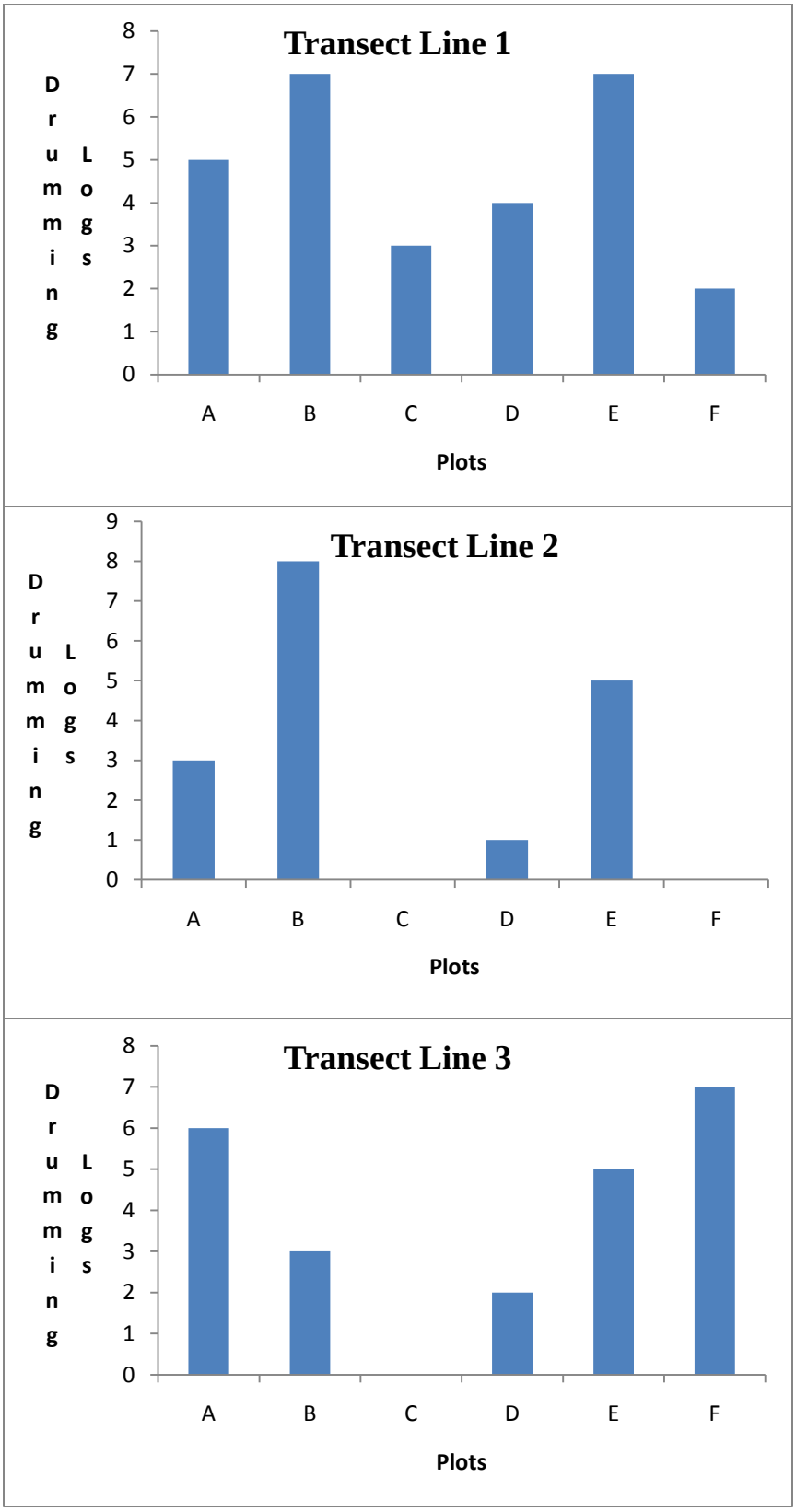
A greater amount of different herbaceous species was more apparent in high populated sites. The amount of percent coverage of each herbaceous species differed for each site. It appeared each site almost had its own herbaceous species specified to that given area. In large timber stands, consisting of early successional species, the common woody plant present was dogwood. There was less herbaceous species that appeared when getting closer and closer to the low populated areas. The most common that appeared, most likely because of a large wetland was ground ivy and different kinds of forest grasses (Table: 3).

There was no definite pattern for how many absolute drumming logs appeared for each site (Figure: 2). As for habitat sustainability for ruffed grouse nesting, sites examined on Transect Line 3, appeared to have the highest reliability for successful nesting (Table: 2). There was a presentable pattern displayed when recording percentage of populous tree species basal area for food accessibility (Figure: 4). Moisture, determined by soil drainage classes, proved to shift back and forth (Figure:3).

Table 1: Overstory Species Total Basal Area (10x(m^2/ha) to the nearest tenth)

Transect	Plot	**Tremb. Aspen** *Populus tremuloides*	**Black Cherry** *Prunus serotina*	**Red Maple** *Acer rubrum*	**Sugar Maple** *Acer saccharum*	**Red Oak** *Quercus rubra*	**White Oak** *Quercus alba*	**Black Oak** *Quercus velutina*	**Yellow Birch** *Betula alleghaniensis*	**Beech** *Fagus grandifolia*	**Ash** *Fraxinus excelsior*	**Hemlock** *Tsuga canadensis*	**Total**
1	**A**	30	0	20	0	0	0	0	40	10	0	0	100
	B	30	0	30	10	10	0	0	0	0	0	0	80
	C	Stand											100
	D	0	20	30	0	10	0	20	0	0	0	40	110
	E	0	0	20	20	30	10	0	0	0	0	30	110
	F	0	10	0	0	20	10	10	10	0	0	30	90
2	**A**	40	0	30	20	0	10	0	20	0	10	0	130
	B	20	0	0	30	0	0	0	0	0	0	10	60
	C	Stand											100
	D	0	20	30	0	30	10	0	20	10	0	30	140
	E	0	0	10	30	10	0	0	10	0	0	50	110
	F	0	10	0	0	30	0	20	0	0	0	40	100
3	**A**	10	20	20	0	0	20	0	30	20	10	0	130
	B	30	0	20	40	10	0	0	20	0	0	0	120
	C	Stand											100
	D	0	0	20	40	30	0	10	20	0	0	0	120
	E	0	0	0	0	0	10	0	20	0	10	0	40
	F	0	20	40	0	10	0	0	0	0	0	40	110

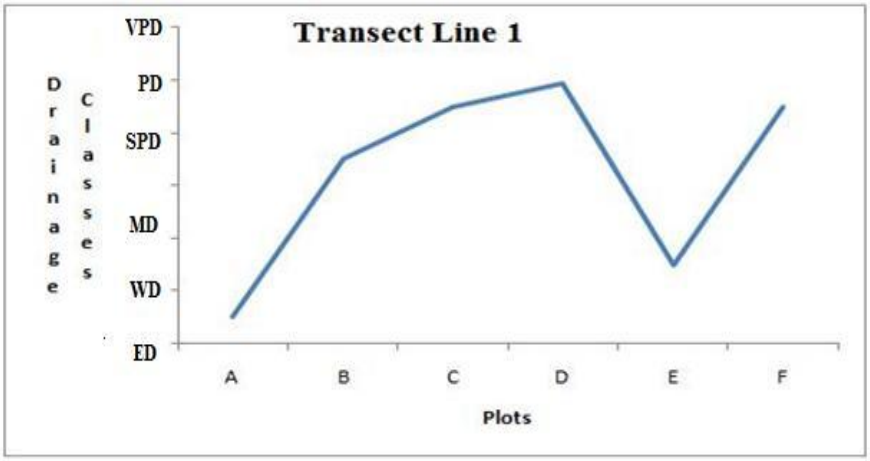
Figures 2: Absolute Drumming Logs per Site

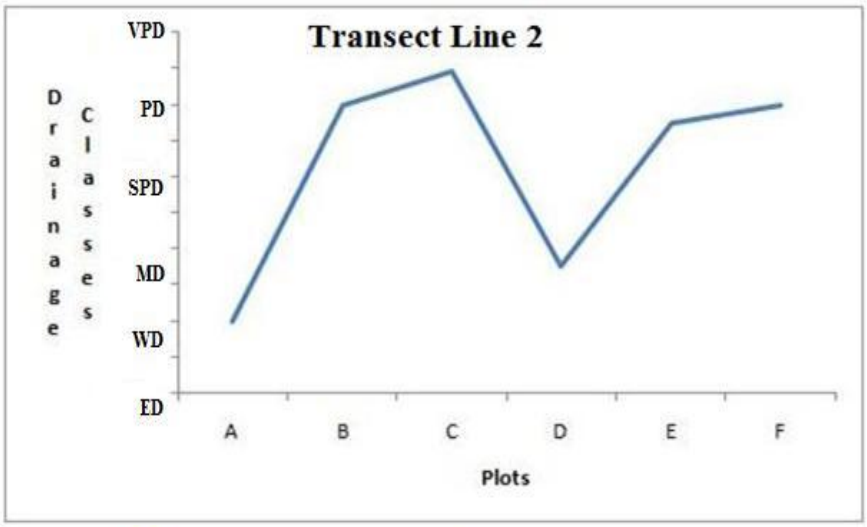


Figures 3: Amount of Moisture per Site by Soil Drainage

Legend: VPD-Very Poorly Drained **PD**-Poorly Drained **SPD-** Somewhat Poorly Drained

MD- Moderately Well Drained **WD**-Well Drained **ED**-Somewhat Excessively to Excessively Drained





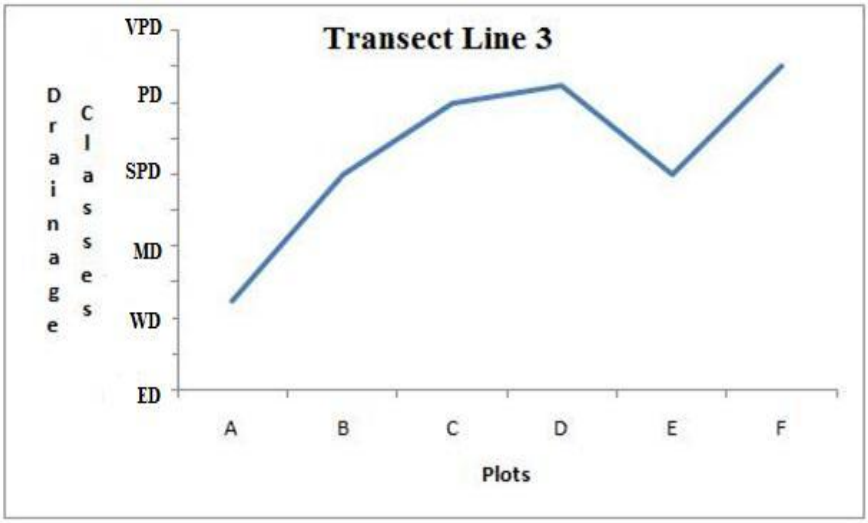


Table 2: Habitat Sustainability for Ruffed Grouse Nesting per Site

Transect Line 1		Transect Line 2		Transect Line 3	
Plot		**Plot**		**Plot**	
A	High	A	Med	A	Low
B	High	B	High	B	High
C	High	C	High	C	High
D	Med	D	High	D	High
E	Low	E	Very Low	E	High
F	Very Low	F	Low	F	Med

Figures 4: Percent of Populous Tree Species' Basal Area per Site Used in Determining Food Accessibility

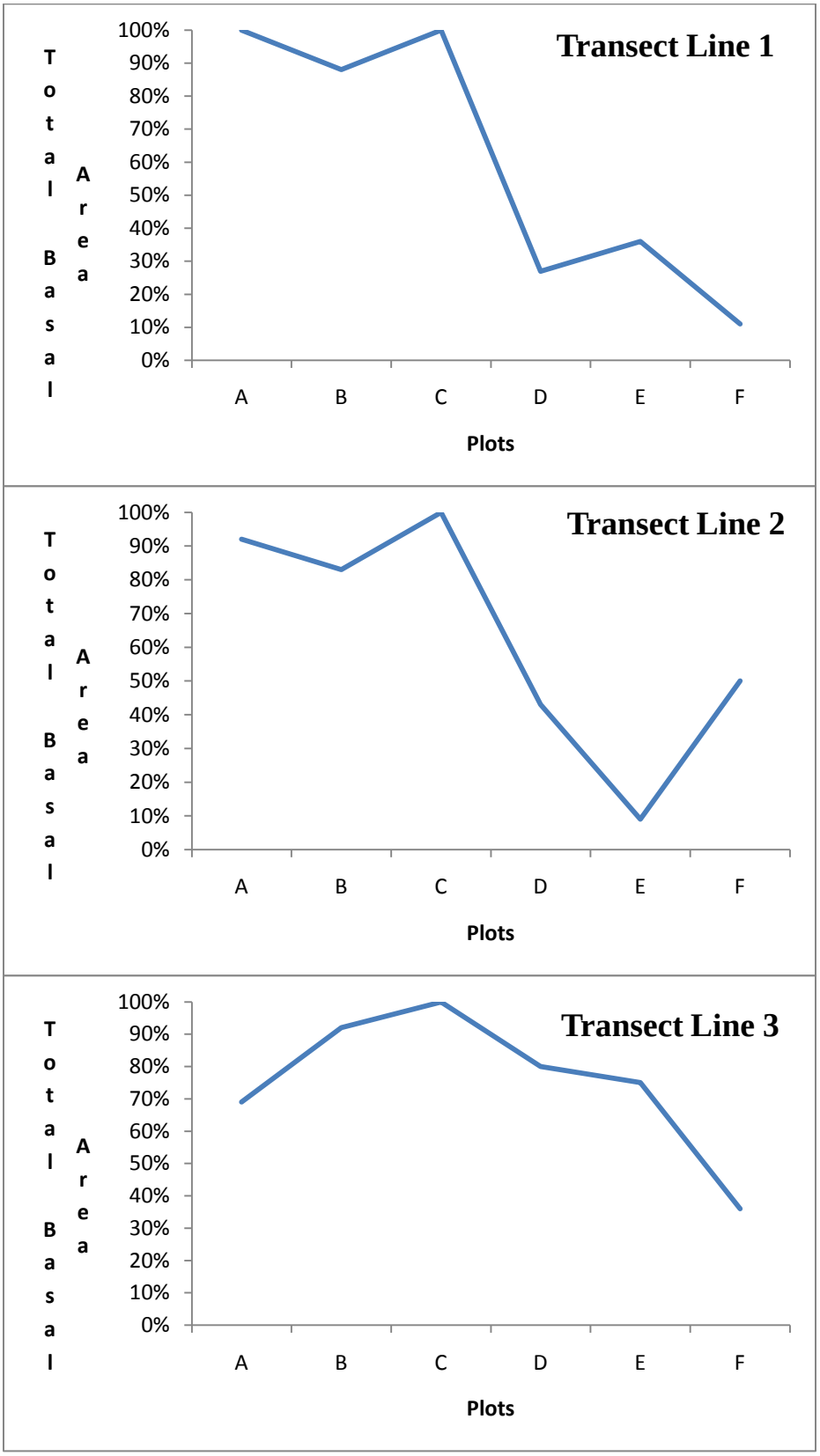


Table 3: Percent Coverage of Herbaceous and Other Plant Species within Plots Not Accounting Forest Floor

Transect	Plot	**Aster Sp.** *Aster family*	**Common Cattail** *Typha latifolia*	**Allegheny Blackberry** *Rubus allegheniensis*	**Partridgeberry** *Mitchella repens*	**Dogwood Sp.** *Cornus family*	**Cocklebur Sp.** *Xanthium strumarium L.*	**Rough Stemmed Goldenrod** *Solidago rugosa*	**Grass Sp.** *Poceae family*	**Swamp Grass** *Poceae family*	**Ground Ivy** *Glechoma hederacea*	**Indian Cucumber Root** *Medeola virginiana*
1	**A**	0	0	0	0	100	0	0	0	0	0	0
	B	0	30	0	20	0	0	0	30	20	0	0
	C	30	0	0	0	10	0	60	0	0	0	0
	D	0	0	0	0	50	0	0	0	0	10	40
	E	0	0	0	0	30	0	0	30	30	0	10
	F	0	0	0	30	10	0	0	0	0	50	10
2	**A**	0	0	10	0	20	0	70	0	0	0	0
	B	20	0	0	0	60	10	10	0	0	0	0
	C	0	0	30	20	40	0	0	0	0	0	10
	D	0	0	0	0	10	0	0	0	60	0	30
	E	0	0	0	10	10	0	0	0	20	60	0
	F	0	0	0	0	0	0	0	0	60	30	10
3	**A**	0	0	30	30	20	0	0	20	0	0	0
	B	30	0	0	0	0	0	70	0	0	0	0
	C	0	0	20	30	20	20	0	10	0	0	0
	D	0	0	10	0	70	0	0	20	0	0	0
	E	10	0	10	20	50	0	0	0	0	0	10
	F	0	0	0	0	20	0	0	10	40	30	0

Discussion

Ruffed grouse habitat populations in Game Land 69 are based mostly upon food source and grouse feeding habits. This is backed up due to the seeding and budding quantities and qualities of the vegetative species found in the high populated area versus that of the low populated area and the size of their basal areas.

As seen, (Figures: 4) food sources accessibility decreases when traveling from areas of high to low population densities. In some cases, food availability decreases dramatically when only traveling a few ha. Other grouse resources such as, nesting (Table: 2), moisture (Figures: 3), and absolute drumming log (Figures: 2) availabilities fluctuated or remained constant along all three transects from high to low population densities.

Much like studies in the Southern Appalachians, the ruffed grouse of game land 69 favored the increase in food availability. For the grouse of southern Appalachians, game land roads providing necessary vegetation and forest age predominantly influenced grouse home range location within the landscape, mesic forest types were most important in determining core area use within the home range. This was likely a result of increased food availability and favorable microclimate (Tirpak, 2010). As for the study in the Upper Peninsula of Michigan, the relationship between drumming patterns within aspen stands proved to be the key component as to why ruffed grouse populations in Northern Michigan are arranged the way they are (Felix-Locher et al. 2009). Other studies conclude ruffed grouse population placements have solely to do with landscape itself. It was noted in one study early successional forests supported the highest population although all grouse habitat requirements were not present in these sites (Blomberg et al. 2009), and as examined in Northern Minnesota, grouse preferred mixed coniferous and deciduous forest types rich in aspen necessary for shelter and nesting much of which is not present in PGL No. 69.

As for Game Land 69, it is concluded after examining all necessary resources of the ruffed grouse food quality and quantity have shown to be the main reason for the way ruffed grouse populations are arranged.

Both overstory and understory vegetative species in the high ruffed grouse population areas produce 2-3 times more seeding and fruiting/budding than species of the low population density area.

The average rate of tree species seed production found within the high populated area is every four to five years, but given the large area of these species; seeding productions take place frequently throughout the year as well as these species' budding quantity is higher (Burns et Al, 1965, *Silvics Updated 2007*). *Table 1*, shows the change in species' basil area from going west to east as well as the change in species. This is a crucial benefit for ruffed grouse feeding habits and production of shelter and nesting.

The species found in the low populated areas may produce close to the same quantity of seeding and budding as species found in the populated area but fall short of necessary ruffed grouse food uses and future growth for shelter and nesting. For example, despite the high frequency of cone crops produced by the numerous hemlocks found in the low populated area and the long period of time for cone production by individual trees, the viability of hemlock seed is usually low (Burns et Al, 1965, *Silvics Updated 2007*). The basal area of these species displays the appearance of good ruffed grouse habitat structurally but does not support the availability for ruffed grouse feeding or barely nesting habits (Can be seen in *Table 1*).

The dominant herbaceous species found within the high populated area are in greater quantity while also producing larger amounts of seeding and budding for food. The species also include sources necessary for nest building, shelter, and mating grounds. More importantly the food sources produced by these herbaceous species hold more beneficial nutrients during the spring months, during the nesting period, for juvenile grouse along with the insects and reptiles that link with these herbaceous species for vital protein (NRCS, 2009) (Displayed in *Table 3*).

When examining the whole resources necessary for ruffed grouse habitat, the levels of resource availability between the high and low populated areas were all around the same level except for food availability. Over all, the amount of drumming logs, estimated moisture levels, and nesting continued to vary with every plot whether or not it was in the high or low populated area. Noted though, in the areas of higher moisture, there were more reptile and insect species for feeding habits of ruffed grouse. Therefore is can be determined that ruffed grouse population densities are arranged by food source availability throughout PGL No. 69. As suggested by Benjamin Jones, drumming surveys should be repeated every four to five years as grouse populations in areas are subject to change, the same should be done when examining habitat preferences of high and low population densities.

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Appendix

Plot 1A

Saplings

Trembling Aspen

Herbaceous Species

Blackberry
Aster
Swamp Grass

Notes

Moist Soil
5 Possible Drumming Logs
Plenty of Nest Coverage
Hemlock Stand Near by For Protection
Escape Trees
Deadwood
Heavy Insect and Tree Buds

Plot 1B

Saplings

Trembling Aspen
Yellow Birch
Maple
Birch

Herbaceous Species

Aster
Swamp Grass
Willow

Notes

Moist Swampy Area near Carpenter Pond
Heavy Sign of Deer Activity
Heavily Dense Aspen Stand
5-7 Drumming Logs
High Nest Coverage
Heavy Insect and Tree Buds
Plenty of Escape Routes

Plot 1C

No Overstory Count Large Timber Stand

Saplings

Large Trembling Aspen Stand with Birch

Herbaceous Species

Aster
Black Cherry
Willow

Notes

Dense Aspen Stand; Young Succession
Plenty of Nest Cover
1-3 Drumming Logs
Hemlock Stand Near By
Not a lot of Dead Wood
Deer Bed Found
No Vegetation Large Enough
to Account for Overstory Growth

Plot 1D

Saplings

Red Maple

Herbaceous Species

20% Fern Cover

Notes

Young Succession is beginning to Decrease

Burough of Rodent or other Small Game Found

Soil is < Moist

Canopy Cover is High but Little Understory

Plot 1E

Saplings

Hemlock

Red Maple

Herbaceous Species

60% Fern Cover

Notes

Large Hemlock Stand

High Ammounts of Fungi and Moss

Spotted 3 Deer

Plenty of Escape Routes for Protection

6-7 Drumming Logs

Barely Enough Room for Nesting

Plot 1F

Saplings

Hemlock

Red Oak

Trembling Aspen

Herbaceous Species

Willow

Fern Cover 10%

Notes

Forest Begins to Open

High Geese Activity

Large Aspen Stand is Near By

Turkey Spotted

Plenty of Protection

Swampy Area

Fungi and Insect have Started to Increase

High Count of Moss Cover

A lot of Deadwood

Possible Escpe Routes

Plot 2A

Saplings

Red Maple

Herbaceous Species

Red Berry
Willow
Dogwood

Notes

Moist Soil
3 Possible Drumming Logs
Plenty of Nest Coverage

Escape Trees
Deadwood
Heavy Insect and Tree Buds

Plot 2B

Saplings

Trembling Aspen
Yellow Birch
Maple

Birch

Herbaceous Species

Aster
Swamp Grass
Willow

Notes

Moist Swampy Area
Heavy Sign of Deer Activity
Heavily Dense Aspen Stand
6-8 Drumming Logs
High Nest Coverage
Heavy Insect and Tree Buds

Salamanders

Plot 2C

Saplings

Large Trembling Aspen Stand mixed with Rough Leaf and Common Dogwood

Herbaceous Species

Goldilocks
Black Cherry
Willow

Notes

Dense Aspen Stand; Young Succession
Plenty of Nest Cover
0 Drumming Logs

Plot 2D

Saplings

Red Maple

Herbaceous Species

Common Dogwood

Notes

Early Succession gone
Deer Spotting

Soil is < Moist
Little Understory

Plot 2E

Saplings

Hemlock Cherry
Red Maple

Herbaceous Species

Toothwart
Saw Grass

Notes

Large Hemlock Stand
Ivy
Spotted 3 Deer

Plenty of Escape Routes for Protection
4-5 Drumming Logs
No Room for Nesting

Plot 2F

Saplings

Hemlock
Red Oak

Herbaceous Species

Ivy
Saw Grass
Toothwart

Notes

Dense Hemlock
High Protection and flushing

Very Moist Soil
Swamp
High Count of Moss Cover
A lot of Deadwood
Ivy everywhere

Plot 3A

Saplings

Red Maple

Herbaceous Species

Blackberry Gama
Goldilocks
Goldenrod
Corncockle

Notes

Moist Soil
5-6 Possible Drumming Logs
Plenty of Nest Coverage
Plenty of Shelter
Escape Trees
Low Deadwood
Insects and tree buds

Plot 3B

Saplings

Red Maple
Yellow Birch

Herbaceous Species

Aster
Swamp Grass
Willow
CornCockle

Notes

Moist Soil
Heavy Sign of Deer Activity
Aspen Stand
2-3 Drumming Logs
LowNest Coverage
Low Protection for flushing
Reptile Activity
Rabbits

Plot 3C

Saplings

Thick Herbaceous Species

Herbaceous Species

Goldilocks
Goldenrod
Grasses

Notes

No evidence of other species
Plenty of Nest Cover
0 Drumming Logs
No deadwood

Plot 3D

Saplings

None Present

Herbaceous Species

Common Dogwood

Notes

Early Succession but not a lot
Other Birds Present

Red Berry | A lot of drop seed | 2 Drumming Logs

Plot 3E

Saplings

Hemlock | Cherry

Red Maple

Herbaceous Species

Toothwart

Saw Grass

Notes

Large Hemlock Stand | Plenty of Escape Routes for Protection

Ivy | 4-5 Drumming Logs

Spotted 3 Deer | No Room for Nesting

Plot 2F

Saplings

Hemlock | Cherry

Red Oak

Maple

Herbaceous Species

Ivy

Saw Grass

Toothwart

Notes

Very Wet | Forest cover less dense | Only a few dry spots

Little food | Less Ivy | 6-7 Drumming logs

Less insects and reptiles

Moss