Buckthorn Assignment
Effects Of Buckthorn On The Trent Campus
Year: 2013
Prof:Dr. Stephen Hill
Semester: 1

Abstract: Every region of any environment has different growing effects on a plant. This study was conducted to confirm the european buckthorn is an invasive species on the Trent campus, specifically on the drumlin. Hundreds of students and TAs plotted and surveyed 18 sites. Using tape measurers and flagging tape to ensure accuracy of data, 3 regions were scanned for buckthorn. Thousands of buckthorn species were found in a 400m long, and 100m wide area. And surrounding this invasive species were little signs of plant life. This plant causes a devistating impact and can destroy an entire ecosystem within a decade.

Introduction: The Buckthorn (Rhamnus cathartica L.) was first introduced to North America after being imported from Europe. It was then accidently first began as a ortnamental plant imported from Europe. Then once released into the environment, it became a invasive species. Not only is the buckthorn a fast growing plant but it's seeds prevent other plants from growing, it can spread oat rust, and the seeds grow very fast. They can grow to over 7m and have thorns that can harm animals.

Buckthorn should be removed and monitored because of the dangers it causes in to our environment. My hypothesis is that the buckthorn species will have the highest count of stems per hectare in the forest fringe. The forest fringe will help grow the largest buckthorn count because of the regions characteristics. Buckthorn seeds will travel

faster because of the surrounding environment of the fringe. When a region has a majority fringe the forest floor is relatively free of bushes or other plants. Having a open area venerable to winds, the buckthorn seeds will travel father easier and more efficiently. Since the sugar maple have a has a lower access to winds, it takes longer for the buckthorn to become invasive.

Methods: To ensure the most accurate and relevant information possible, many precautions and procedures were created for recording the accurate information. Each site was plotted with GPS coordinates. Students and TAs created 18 20mx20m sites, inside the perimeter of is where the information was collected. The site was divided into four 10m x 10m subgroups, so the amount of buckthorn in the section was not overwhelming. After using measuring tapes and flagging tape, the following data was collected:

1) Amount of stems in each site

2) Amount of mature stems

3) Diameter of buckthorn (using a special tape measurer)

Any buckthorn under 0.10m tall would not be recorded, and diameter is taken at the trunk of the buckthorn if it is larger than 1 cm.

Results:

Buckthorn Count (Total and Mature) Averages & Standard Deviation by Environment. (Table 1)

Environment	Average Buckthorn Stems/Hectare (All)	Standard Deviation Buckthorn Stems/Hectare (All)	Average Buckthorn Stems/Hectare (Mature)	Standard Deviation Buckthorn Stems/Hectare (Mature)
1=red pine forest	5755	27	22	10
2=forest fringe	8605	96	20	13
3=sugar maple forest	2948	65	3	4

From the data above, it is clear that the Buckthorn is an invasive species. For all environments, the average for all the stems is over 260% higher than the mature stems. This means that the seeds are spreading rapidly through the Trent Campus. The standard deviation shows a relatively large variation of data this can mean the buckthorn is more heavily dense in some areas than others.

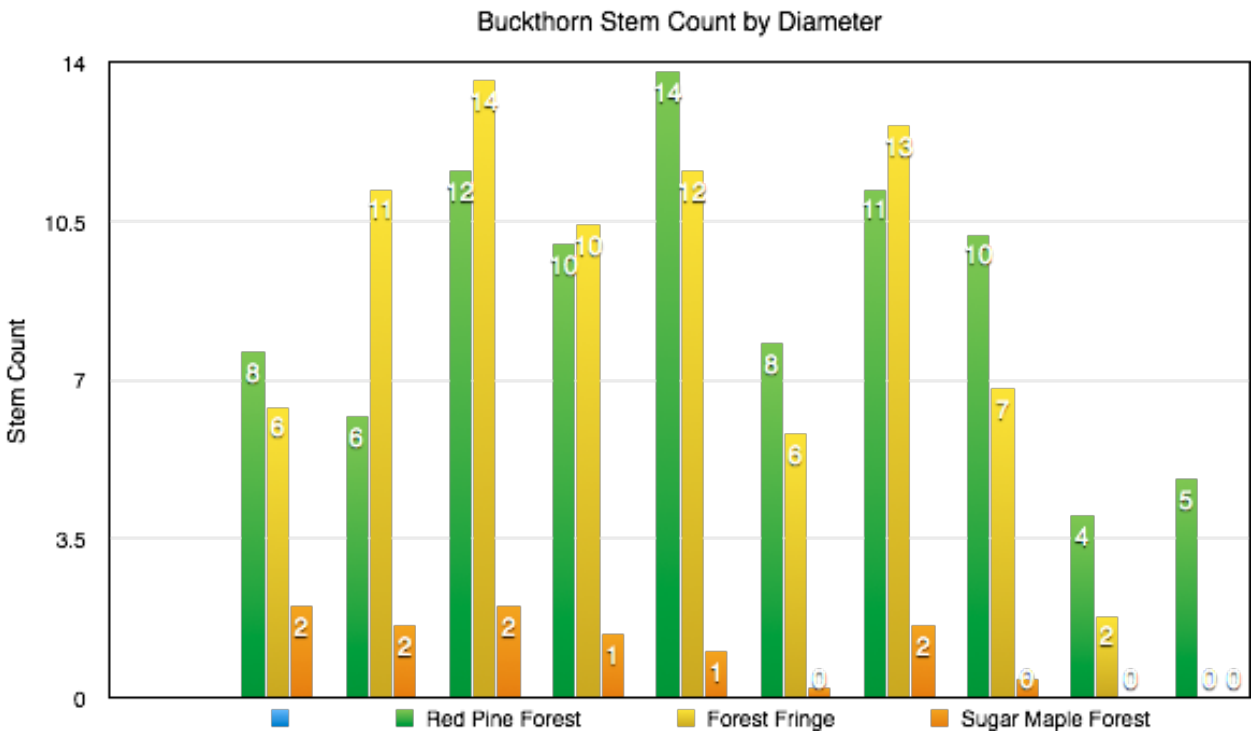
The forest fringe has the most inconsistent growing region, indicated from the high standard deviation. Therefore some areas of the forest fringe are dense, and others not. The red pine and sugar forests have a more consistent growing environment, but there are almost more buckthorn in the forest fringe than the sugar and red pine forest combined.

Buckthorn Diameter Average & Standard Deviation by Environment. (Table 2)

Environment	Average Buckthorn Stem Diameter (cm)	Standard Deviation Buckthorn Stem Diameter (cm)
1=red pine forest	4	2
2=forest fringe	3	0
3=sugar maple forest	2	1

This data can be compared to the stem count. In both tables it is concluded that the red pine forest has a strong growing environment, and now it also has the best average diameter. This means the red pine forest has the thickest buckthorn and the sugar maple forest has the least thick.

The standard deviation concludes that the forest fringe has the most consistent diameter of buckthorn, and the red pine forest has the least consistent diameter of buckthorn.

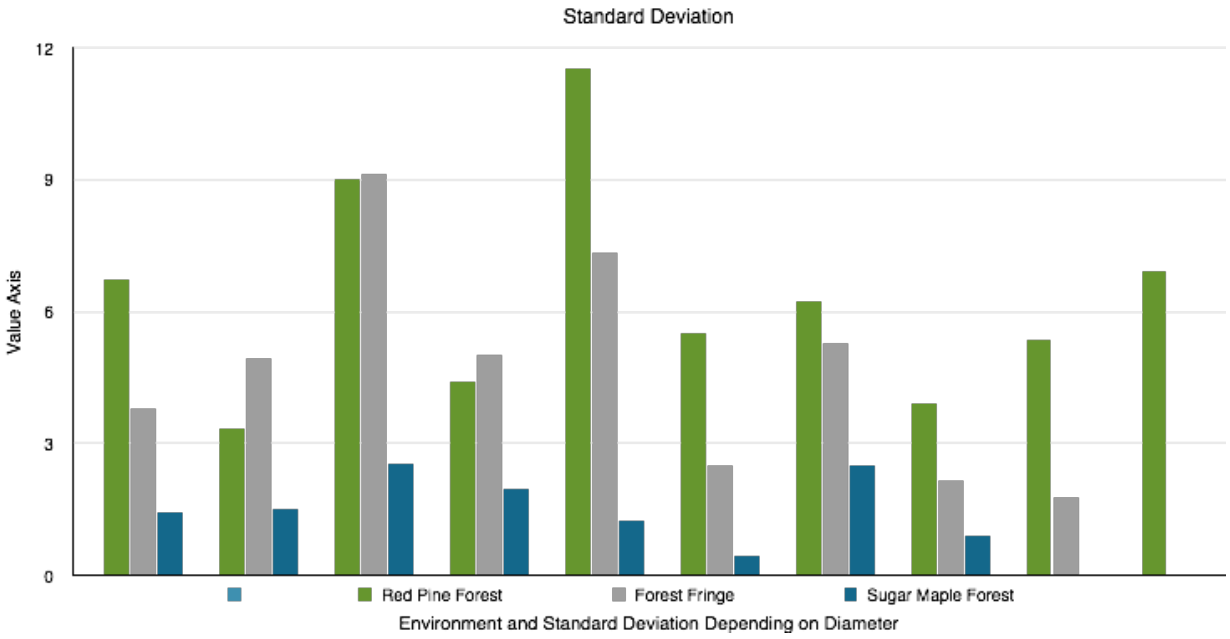


Environment	Stem Count 1-1.4 cm	Stem Count 1.5-1.9 cm	Stem Count 2-2.4 cm	Stem Count 2.5-2.9 cm	Stem Count 3-3.4 cm	Stem Count 3.5-3.9 cm	Stem Count 4-4.9 cm	Stem Count 5-6.9 cm	Stem Count 7-9.9 cm	Stem Count ≥10 cm

Diameter

The graph highlights that the best growing environments for buckthorn are in the forest fringe and the red pine forest. The sugar maple forest is the worst region on the drumlin to grow healthy buckthorn. This area has a low density and a low diameter average.

Also, the majority of the buckthorn in the red pine and for are between 2 -4.9 cm. This suggests that the buckthorn could be relatively new species in the sugar maple forest. There are no buckthorn plants over 5-6.9 cm tall.



Stem Count 1-1.4 cm	Stem Count 1.5-1.9 cm	Stem Count 2-2.4 cm	Stem Count 2.5-2.9 cm	Stem Count 3-3.4 cm	Stem Count 3.5-3.9 cm	Stem Count 4-4.9 cm	Stem Count 5-6.9 cm	Stem Count 7-9.9 cm	Stem Count ≥10 cm

This bar graph shows the variations between each grow period. The variation in diameter is the highest in the red pine forest and forest fridge, and the lowest in the sugar maple forest. Meaning the sugar maple has the most in consistent diameter. Although the red pine and fringe have unpredictable growing environment, it still grows thicker.

Discussion:

The overall average density of buckthorn on the drumlin is 5769.3 per hectare. The most abundant environment is the forest fringe, and the least dense is the sugar maple forest. The environments are rated the following by stems per hectare. The forest fringe contained 8605 stems per hectare, followed by 5755 in the red pine forest, and 2948 in the sugar maple forest.

The overall density of mature buckthorn on the drumlin is 15 stems per hectare, but the median is 20 stems per hectare. The red pine forest has the most mature buckthorn per hectare with 22, followed by 20 in the forest fringe, and 3 in the sugar maple forest. The diameters are similar with the amount of stems per hectare. On the drumlin, the overall diameter average is 3 cm. Red pine has the highest diameter average with 4cm, forest fringe had 3cm, and sugar maple forest has 2 cm.

From the data collected it became clear that the red pine and forest fringe contain a relatively similar number of old/mature buckthorn. The sugar maple forest contained the smallest average of stems per hectare, lowest mature stem average and the smallest average diameter. This suggests that the first exposed region of the drumlin was from the red pine forests. Specifically starting near site #1, the buckthorn then invaded the fringe forest, and finally the sugar maple.

Since buckthorn is a invasive species, the forest soon becomes filled. Buckthorn grows fast and tall, blocking sunlight from hitting the forest floor. Also, all berries produced are poisonous and a hazard for animals to consume. These berries also produce a difficult growing environment for other plants.

A red pine forest grows the strongest group of buckthorn. For future attempts of removal, groups should focus with this region first. Since it contains the most mature and thickest grouping, pose the highest threat for the rest of the environment. The red pine tree roots are shallow along the surface, making it hard for other organisms to grow. It's root system is designed to resist high winds (Pine Forest(2002)). The best way to remove them is by hand, or with a "Weed Wrench". In the winter months, the roots can be destroyed by the freezing. But if there is a high amount of leaves or needles on the ground, it can prevent the roots from freezing. "Pine straw also protects plants from freezing conditions, helping keep the soil around the plants at a stable temperature" (How to Use Pine Straw(2013))

In the future, the best way to gather information in a site would to have section A, B, C, and D sites contain a grid of tape. The grid would be 1m x 1m throughout the site, making it easier to identify every buckthorn. A limitation of the research was the time constraints. Since we only had 50m to survey and make small calculations, so it was difficult to accurately count each one.

My hypothesis was correct, the forest fringe produced the most buckthorn. I thought this because of how open the fringe region was. However, I did not take into consideration the health of the plant. The red pine region posed a higher threat to the environment because of it's height, thickness, and produced more germinating seeds. If I knew in advance that the pine needles had a large positive impact on the growth, my hypothesis would be that this forest would contain the most amount of stems.

References:

University of Pennsylvania (2002). *Red Pine*. [ONLINE] Available at: http://www.psu.edu/dept/nkbiology/naturetrail/speciespages/redpine.htm. [Last Accessed Nov 26th 2013].

(2011). *What You Can Do To Control Buckthorn*. [ONLINE] Available at: http://www.dnr.state.mn.us/invasives/terrestrialplants/woody/buckthorn/control.html. [Last Accessed Nov 24th 2013].

(2013). *How to Use Pine Straw*. [ONLINE] Available at: http://www.lowes.com/cd_How+toUse+Pine+Straw_1300457744_. [Last Accessed Nov 26th 2013].