How Have Gilmanton's White Pine Trees Changed Over Time?

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All columns should have *exactly* the same width and be separated from each other by *exactly* the same amount of white space.

Introduction

We are doing this investigation because we want to see how our White Pine Trees have changed over time. We want to know if they have improved in health or have gotten more unhealthy.

We also believe that by looking back at the data we have collected, we can look for patterns to help us better understand what is happening to our climate and forests.

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Materials and m

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possible to illustrate organism, protocol, or experimental design. Viewers don't want to read about the gruesome details, however fascinating you might find them.

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Team members conversing abou

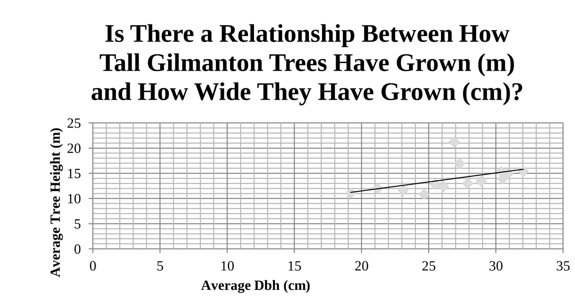
Results

We conducted this investigation because we wanted to see how our white pine trees have grown over time.

The first comparison that we examined was if there was a relationship between how tall our white pine trees have grown and how wide they've grown.

Is There a Relationship Between How Tall Gilmanton Trees Have Grown (m) and How Wide They Have Grown (cm)?

Year	Average Dbh (cm)	Average Tree Height (m)
1996-1997	19.2	11.1
1997-1998	24.66	10.84
1998-1999	23.1	11.6
1999-2000	21.2	12
2000-2001	25.5	12.8
2001-2002	26.1	12.4
2002-2003	26.9	21.2
2003-2004	27.9	13
2004-2005	28.9	13.4
2005-2006	30.5	13.9
2006-2007	30.4	15.3
2007-2008	30.9	14.9
2008-2009	32.04	15.4
2009-2010	27.3	16.94
Average:	26.6	13.8

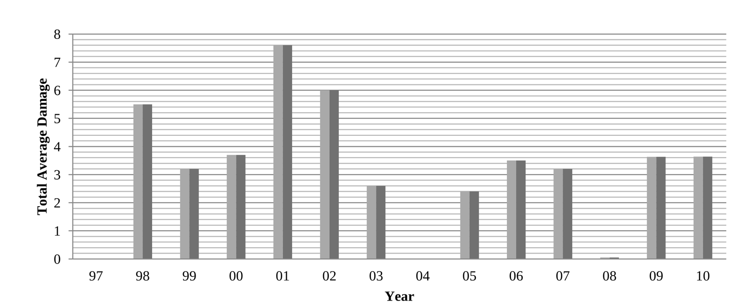


These results showed that as the Average height for years 1996-2010 increased, so did the dbh.

Next, we investigated Total Percent Needle Damage over time.

What Trends in Total Percent Damage Do We See in Our Needles From 1996 to 2010?

Year	Total Average Damage
97	0
98	5.5
99	3.2
00	3.7
01	7.6
02	6
03	2.6
04	0
05	2.4
06	3.5
07	3.2
08	0.053
09	3.633
10	3.636

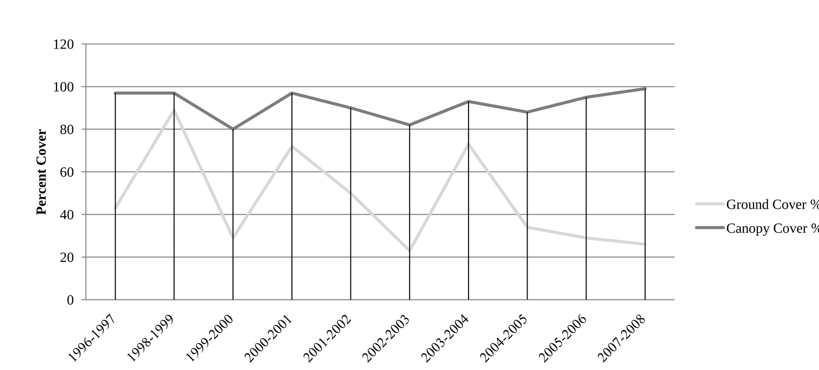


These results tell us that there were years when our needles were extremely healthy (2004, 2008) and other years when we saw as much as nearly 8% of the needles overall damaged (2001, 2002).

We then examined the overall change in our Pixel Sized Sampling Plot's Canopy and Ground Cover.

What is the Relationship Between Canopy Cover and Ground Cover?

Year	Ground Cover %	Canopy Cover %
1996-1997	43	97
1998-1999	89	97
1999-2000	29	80
2000-2001	72	97
2001-2002	50	90
2002-2003	23	82
2003-2004	73	93
2004-2005	34	88
2005-2006	29	95
2007-2008	26	99

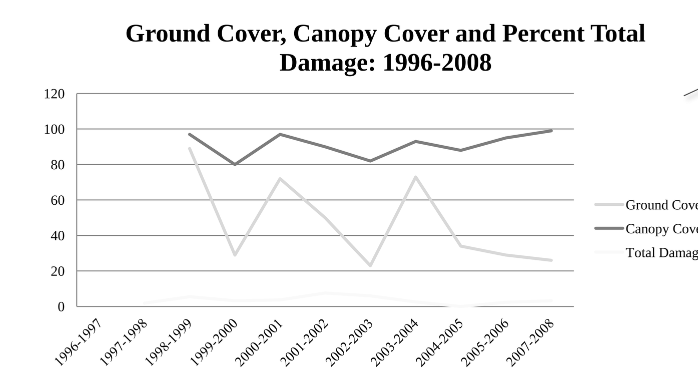


From 1996 to 2005, the data above seems to be inconsistent. However, since 2005, the comparison clearly shows that as the canopy became more dense, the amount of ground cover was reduced. This is due to the lesser amount of sunlight reaching the ground.

For the final comparison, we tried to look for a relationship between the Canopy Cover, Ground Cover and Total Damage.

Is There a Relationship Between the Amount of Ground Cover, Canopy Cover and Total Percent Damage?

Year	Ground Cover %	Canopy Cover %	Total Damage %
1996-1997	43	97	
1997-1998			1.9
1998-1999	89	97	5.5
1999-2000	29	80	3.2
2000-2001	72	97	3.7
2001-2002	50	90	7.6
2002-2003	23	82	6
2003-2004	73	93	2.6
2004-2005	34	88	0
2005-2006	29	95	2.4
2007-2008	26	99	3.2



Looking South toward our PSSP.

Conclusions

Our team believed that we would find that our needles and trees would show more signs of damage more recently due to increasing levels of greenhouse gasses. What we found was that even though there is some slight increasing and decreasing in the height and dbh numbers (students error, perhaps?), the general trend is that the trees are growing steadily taller and wider.

We also found out that since 2005, the canopy in our PSSP is extremely closed, over 90%! This means that the trees have grown so tall and so tight together that it is hard for sunlight to penetrate to the ground. The data supports the fact that the forest has indeed changed in the past fifteen years.

When we tried to look for a trend in the Total Percent Damage over time, we found none. In fact, there seemed to be years when the needles were extremely healthy (2004, 2008) and years when there was much more damage (2001, 2002). This raised the question if the needles are not cumulatively affected by pollution, then what might have caused the spikes in the data?

As you can see, we did not find any correlation between the thickness of the canopy, the amount of light reaching the ground and whether or not our needles showed signs of damage.

This leads us to look at other factors, such as: Was there anything going on at the school property that might have caused a sudden change in the health of our trees? A new septic system leach field? Extension of the softball and soccer field? Or, could this damage be more influenced by the amount of rain that we got in those summers, by higher or lower temperatures, or by High Ozone Exceedence Days?

This photo illustrates the thickness of the canopy.

Literature cited

Forest Watch Data Books: 1196-2010

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For further information

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More information on this and related projects can be obtained at **http://www.forestwatch.sr.unh.edu**.

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