

BACKGROUND

Trees are living organisms. They grow upwards and outwards, adding new wood each year, expanding in volume. Trees add new tissue at the tips of their branches, which is called primary, or extension growth. They also expand outwards, adding another annual ring to the entire outer layer of the tree, which is called annual growth. The data gathered in this exercise must be gathered over long periods of time (3 or more years), in order to draw conclusions. Long-term data gathering is not unusual as trees mature at 20-40 years depending on species.

ACTIVITY

The following data were collected for 3 years. To determine the health of your schoolyard forest, we will analyze the collected data.

First, fill in the height column for each monitoring year. Calculate the height of the tree by using the Angle – Tangent - Height table. Find the correct degrees on the chart under the "Angel" column. Find the upper angle height and lower angle height and add the two heights together.

Fill in the cumulative data sheet to analyze the status of the schoolyard forest. Group all tree species together, and record tree height, diameter and health status.

INFORMATION TO HELP WITH ACTIVITY

HEALTH ASSESSMENT CODES

Category	Codes
Status (ST)	(5) healthy/alive, (3) dying, (1) dead
Stance (STN)	(5) erect, (3) leaning, (1) prone
Mechanical damage (MD)	(5) none, (4) bark, (3) broken major limbs/root, (2) top breakage
Defects (D)	(5) none, (4) minor, (3) animal browsed, (2) insect damage, (1) diseased
Foliage state (FS)	(5) all green, (4) mostly green, (3) half green, (2) few green, (1) none

ANGLE – TANGENT – HEIGHT TABLE AT A HORIZONTAL DISTANCE OF 20 METERS

Angle°	Tan	Height (m)	Angle°	Tan	Height (m)	Angle°	Tan	Height (m)	Angle°	Tan	Height (m)
1	0.017	0.34	15	0.268	5.36	29	0.554	11.08	43	0.933	18.66
2	0.035	0.74	16	0.287	5.74	30	0.577	11.54	44	0.966	19.32
3	0.052	1.04	17	0.306	6.12	31	0.601	12.02	45	1.000	20.00
4	0.070	1.40	18	0.325	6.50	32	0.625	12.50	46	1.036	20.72
5	0.087	1.60	19	0.344	6.88	33	0.649	12.98	47	1.072	21.44
6	0.105	2.10	20	0.364	7.28	34	0.675	13.50	48	1.111	22.22
7	0.123	2.40	21	0.384	7.68	35	0.700	14.00	49	1.150	23.00
8	0.141	2.82	22	0.404	8.08	36	0.727	14.54	50	1.192	23.84
9	0.158	3.16	23	0.424	8.48	37	0.754	15.08	51	1.235	24.70
10	0.176	3.52	24	0.445	8.90	38	0.781	15.62	52	1.280	25.60
11	0.194	3.88	25	0.466	9.32	39	0.810	16.20	53	1.327	26.54
12	0.213	4.26	26	0.488	9.76	40	0.839	16.74	54	1.376	27.52
13	0.231	4.62	27	0.510	10.20	41	0.869	17.38	55	1.428	28.56
14	0.249	4.98	28	0.532	10.64	42	0.900	18.00	56	1.483	29.66

1ST MONITORING

Description		Location Coordinates		Eye-tree Distance (30m tape)	Height (clinometer and tangent table)			DBH Diameter tape (0.00 cm)	Health				
Tree #	Common name	N	W		Upper angle / Ht (0.00m)	Lower angle / Ht (0.00m)	Total Ht (0.00m)		ST	STN	MD	D	FS
13	Oak	14° 50.223'	007° 32.653'	20m	24 / 8.90	17 / 6.12	15.02	20.30	5	5	5	5	5
1	R. Oak	43° 56.708'	087° 12.591'	20m	23	15		20.40	5	5	5	5	5
2	R. Oak	43° 56.708'	087° 12.590'	20m	21	13		19.30	5	5	5	5	5
3	R. Oak	43° 56.708'	087° 12.589'	20m	29	19		22.50	5	5	5	5	5
4	S. Maple	43° 56.708'	087° 12.585'	20m	15	9		16.20	5	5	5	5	5
5	S. Maple	43° 56.706'	087° 12.583'	20m	17	10		17.60	5	5	5	5	5
6	S. Maple	43° 56.704'	087° 12.583'	20m	16	8		15.50	5	5	5	5	5
7	S. Maple	43° 56.696'	087° 12.583'	20m	13	7		10.90	5	5	5	4	5
8	R. Oak	43° 56.690'	087° 12.585'	20m	31	15		23.20	5	5	5	5	5
9	S. Maple	43° 56.690'	087° 12.588'	20m	17	8		15.40	5	5	5	5	5
10	R. Oak	43° 56.690'	087° 12.590'	20m	33	17		25.10	5	5	3	5	5
11	W. Pine	43° 56.690'	087° 12.591'	20m	8	4		8.40	5	3	5	5	5
12	W. Pine	43° 56.690'	087° 12.592'	20m	7	3		7.50	5	3	5	3	5
13	W. Pine	43° 56.700'	087° 12.593'	20m	9	5		9.20	5	3	3	2	5
14	R. Oak	43° 56.705'	087° 12.593'	20m	23	15		18.30	5	5	2	4	5
15	W. Pine	43° 56.709'	087° 12.583'	20m	8	1		6.40	5	5	3	4	5

2ND MONITORING

Description		Location Coordinates		Eye-tree Distance (30m tape)	Height (clinometer and tangent table)			DBH Diameter tape (0.00 cm)	Health				
Tree #	Common name	N	W		Upper angle / Ht (0.00m)	Lower angle / Ht (0.00m)	Total Ht (0.00m)		ST	STN	MD	D	FS
13	Oak	14° 50.223'	007° 32.653'	20m	24 / 8.90	17 / 6.12	15.02	20.30	5	5	5	5	5
1	R. Oak	43° 56.708'	087° 12.591'	20m	24	16		21.30	5	5	5	5	5
2	R. Oak	43° 56.708'	087° 12.590'	20m	22	14		20.90	5	5	5	5	5
3	R. Oak	43° 56.708'	087° 12.589'	20m	31	20		23.10	5	5	5	5	5
4	S. Maple	43° 56.708'	087° 12.585'	20m	16	10		16.80	5	5	5	5	5
5	S. Maple	43° 56.706'	087° 12.583'	20m	19	11		17.90	5	5	5	5	5
6	S. Maple	43° 56.704'	087° 12.583'	20m	17	9		16.10	5	5	4	5	5
7	S. Maple	43° 56.696'	087° 12.583'	20m	15	8		11.30	5	5	5	4	5
8	R. Oak	43° 56.690'	087° 12.585'	20m	33	16		24.30	5	5	5	5	5
9	S. Maple	43° 56.690'	087° 12.588'	20m	18	10		16.10	5	5	5	5	5
10	R. Oak	43° 56.690'	087° 12.590'	20m	34	18		26.20	5	5	3	5	5
11	W. Pine	43° 56.690'	087° 12.591'	20m	8	5		8.50	5	5	5	5	5
12	W. Pine	43° 56.690'	087° 12.592'	20m	7	3		7.50	3	3	3	3	3
13	W. Pine	43° 56.700'	087° 12.593'	20m	9	5		9.20	3	3	3	3	3
14	R. Oak	43° 56.705'	087° 12.593'	20m	25	17		19.40	5	5	2	4	5
15	W. Pine	43° 56.709'	087° 12.583'	20m	8	1		6.30	5	5	3	4	5

3RD MONITORING

Description		Location Coordinates		Eye-tree Distance (30m tape)	Height (clinometer and tangent table)			DBH Diameter tape (0.00 cm)	Health				
Tree #	Common name	N	W		Upper angle / Ht (0.00m)	Lower angle / Ht (0.00m)	Total Ht (0.00m)		ST	STN	MD	D	FS
13	Oak	14° 50.223'	007° 32.653'	20m	24 / 8.90	17 / 6.12	15.02	20.30	5	5	5	5	5
1	R. Oak	43° 56.708'	087° 12.591'	20m	26	18		22.10	5	5	5	5	5
2	R. Oak	43° 56.708'	087° 12.590'	20m	25	16		21.10	5	5	5	5	5
3	R. Oak	43° 56.708'	087° 12.589'	20m	33	22		23.90	5	5	2	2	4
4	S. Maple	43° 56.708'	087° 12.585'	20m	18	11		17.50	5	5	3	2	4
5	S. Maple	43° 56.706'	087° 12.583'	20m	20	12		18.40	5	5	2	4	3
6	S. Maple	43° 56.704'	087° 12.583'	20m	18	10		16.90	5	5	2	5	1
7	S. Maple	43° 56.696'	087° 12.583'	20m	17	10		12.50	5	5	3	2	1
8	R. Oak	43° 56.690'	087° 12.585'	20m	35	18		25.60	5	5	4	4	1
9	S. Maple	43° 56.690'	087° 12.588'	20m	19	11		18.10	5	5	5	3	1
10	R. Oak	43° 56.690'	087° 12.590'	20m	35	19		27.30	5	5	5	5	1
11	W. Pine	43° 56.690'	087° 12.591'	20m	8	5		8.60	5	5	4	4	5
12	W. Pine	43° 56.690'	087° 12.592'	20m					1	1	1	1	1
13	W. Pine	43° 56.700'	087° 12.593'	20m					1	1	1	1	1
14	R. Oak	43° 56.705'	087° 12.593'	20m	27	19		19.70	5	5	5	4	4
15	W. Pine	43° 56.709'	087° 12.583'	20m	8	1		6.30	5	5	4	4	5

CUMULATIVE MONITORING SHEET

- √ √ indicates growth from the 1st to 2nd and 2nd to the 3rd monitoring periods for each set of data; a blank indicates stability or decline
- √ to decide the health status, a score of 20-25 score very healthy; 15-19 fairly healthy; 10-14 borderline healthy; 4-9 is stressed; 3 dead
- √ y (yes) indicates the overall growth (G?) and health of the tree.

Tree #	Latin Name	Common Name	Height 0.00m				Diameter 0.00 cm				Status Score /25				Healthy?
			1 st	2 nd	3 rd	G?	1 st	2 nd	3 rd	G?	1 st	2 nd	3 rd	G?	y

REFLECTION QUESTIONS

1. Is there any pattern to the data? If yes, what is the pattern that you see? Give 3 explanations for why this pattern might exist.

2. Which of these species is healthy? Which species is in decline?

3. What kind of problems does the Urban Forest have to contend with, in order to survive?