

Larch plantings at Viles Arboretum, Augusta, ME

September 30, 2015

The Viles Arboretum has a note from Steve Oliveri (former Executive Director of Pine Tree State Arboretum) to Elsie Viles dated 25 January 2007 providing a short history of the larch plantations on the property. The note indicates that in 1989, Ms. Viles and Cliff West were interested in having a larch planting on a site at the arboretum known as Alfred's Acre. Plantings actually occurred in May, 1991 and the size of the project was reduced to a half-acre. The area is now known as Alfred's Half-Acre and lies across a trail from a plantation of Green ash. Location is noted on the Viles Arboretum brochure and map.

The original plantings were 2 year-old seedlings from the Saratoga State Nursery run by the NY State Department of Conservation. The original seed sources are below according to notes provided by the Arboretum. Checking with Carl Haag, who was the Research Forester with Scott Paper at the time, the tamarack was either from Dennistown, ME or from Nova Scotia. The European larch was from the NY State seed orchard in New York. The Hybrid larch was likely from von Lochow, Germany.

Tamarack	Scott 151
Japanese	Scott C 009
European	NY 803
"Hybrid" or "Dunkeld"	XLD/XLL 188

The original planting design on the half-acre was 6 rows of 11 trees for each of the cultivars. According to the notes provided by the Arboretum, only 44 hybrid larches were planted originally. Additional trees were planted in 1992 to complete the design. The spacing appears to be 12 feet between rows and 10 feet between trees within a row. The species ordered from north to south are Tamarack, Japanese, European, and Hybrid. Because the Tamarack had such poor survival, Japanese and European larch have been added, as fill plantings, to this block to help complete the design.

Notes provided show the numbers dead or damaged. Damage was likely caused by woodchucks.

	1992	1993	1994		1995	1996	1997
	Dead or damaged	Replaced	Dead	Replaced	Replaced	Replaced?	Dead or missing
Tamarack	18	20	19	8	7	15	16
Japanese	9	10	15	0	5	1	1
European	15	20	19	6	29	31	23
Hybrid	13	34	0 ?	10	2	4	7

In 1993, the replacements came from North Star Orchard in Madison, ME.

On 14 July 2015, Dave Maass, Lloyd Irland and Ken Laustsen¹ measured the height and diameters of the trees and made a map of the missing trees (map attached). Using the maps provided by the Arboretum, we were able to identify the rows and missing trees. The map with current diameters and indication of missing trees is included in this report.

If we use the original planting number of 66 trees and ignore the replacements, we found that the survival rate was highest for the hybrid and lowest for the Japanese and tamarack. Average diameter at breast height (dbh) and quadratic mean diameter (QMD or tree of average basal area) was lowest for Tamarack and highest for Japanese. The larger diameter for the Japanese is likely due to the larger space available for the surviving trees to develop crown, because of the low survival rate.

Within each block four trees in the common range of diameters were selected for height measurement. The tallest species were Japanese and the Hybrid. The Hybrid grew at nearly three feet per year.

	Survival	Average dbh (in)	Quadratic Mean Diameter (in.)	Average measured height (ft.)	Volume/acre (cords)	Mean Annual Increment (cords/ac/year)
Tamarack	32%	6.4	6.8	45	10.0	0.42
Japanese	36%	13.8	14.3	67	52.2	2.18
European	76%	10.7	11.0	59	66.3	2.76
Hybrid	82%	10.3	10.5	65	67.1	2.80

Individual Tree volume was calculated by applying the taper equations for larches provided by Dr. Weiskittel from the University of Maine². These equations use both height and diameter to calculate volume. Gross merchantable volume was above a 6" stump (.15 m) to a 3.5 inch top (9 cm). To calculate volume per acre, individual tree volume was summed and applied over the 0.1818 acres in each plot for the species. Cord volumes were calculated using 85 cubic feet per cord. Mean annual increment was calculated by dividing the per acre volume by 24 years from the establishment of the plantation to 2015 (2015-1991).

Volume per acre was highest for the European and Hybrid and lowest for the Tamarack. We would expect higher volumes for the Hybrid, but one-third or more of the planting stock is at least one year younger than the other trees. The lower volume in the Japanese are likely due to the low survival rate and therefore lower density. The three exotic species grew at 4 to 5 times better than the Tamarack, which is growing at around the average growth rate for all softwoods for Maine.

¹ David Maass and Lloyd Irland are forestry consultants from Portland and Wayne, ME, respectively. Ken Laustsen is the Maine Forest Service Biometrician.

² See Li, R et al. 2012. Regional Stem Taper Equations for Eleven Conifer Species in the Acadian Region of North America: Development and Assessment. Northern Journal of Applied Forestry 29(1)5-14.

Height and diameter growth averages were somewhat lower than have been measured elsewhere in Maine.

	Diameter growth per year (in.)	Height growth per year (ft.)
Tamarack	0.27	1.9
Japanese	0.58	2.2
European	0.45	2.5
Hybrid	0.43	2.7

We also checked the soils information by preparing a customize map from the US Department of Agriculture Natural Resource Conservation Service web soil survey. Soil map is printed at the end of this report.

Nearly all of Alfred's Half-Acre is located on Hollis fine-sandy loams. It appears that a small portion of Hybrid and European cultivars are situated on the Buxton sandy loam. The Hollis fine-sandy loams are listed as somewhat excessively drained with a depth to bedrock at 18 to 22 inches. The Buxton sandy loam is listed as somewhat poorly drained with no limit for rooting depth.

The fact that the Tamarack is planted on the excessively drained Hollis soils may explain its poorer survival.

Map of larch planting at Viles Arboretum. For printing convenience the map is split between the European and Japanese larch. The planting is side by side and lies opposite a plantation of Green ash. Data is the dbh for individual trees.

July 14, 2015 remeasurement of Viles Arboretum Larch Plantations													
Standing Dead Tree		Japanese Fill-planting				European Fill-planting				Extra Trees Planted			
SW Corner													
Tree # / Row #	Hybrid (Dunkeld) Larch						European Larch						
	1	2	3	4	5	6	1	2	3	4	5	6	
1	Missing	11.4	3.1	Missing	10.0	9.7	13.7	12.7	14.5	8.5	Missing	7.3	
2	11.3	8.1	13.2	7.2	Missing	10.9	Missing	11.6	12.7	Missing	7.7	15.5	
3	13.0	11.3	11.3	10.6	15.5	Missing	15.7	4.8	6.2	14.0	Missing	8.9	
4	9.1	10.6	8.6	10.1	Missing	Missing	6.9	Missing	15.5	10.9	13.5	9.3	
5	11.0	6.9	12.3	13.3	Missing	Missing	Missing	4.7	6.3	Missing	12.4	11.7	
6	9.1	9.2	10.2	4.4	7.5	8.2	14.2	8.0	10.2	12.5	9.8	10.0	
7	10.1	12.2	10.6	9.6	14.2	10.1	10.5	11.4	Missing	5.8	10.8	10.9	
8	11.2	9.2	9.5	9.0	10.2	Missing	Missing	Missing	11.9	10.6	10.2	10.8	
9	9.2	8.6	7.9	10.0	11.7	11.0	11.2	Missing	8.5	Missing	12.9	10.5	
10	9.4	9.7	10.0	2.2	7.4	11.1	12.7	8.5	Missing	Missing	7.5	11.0	
11A	14.0	4.3	Missing	12.2	10.6	12.8	5.3	10.5	9.9	9.7	14.6	14.3	
11B				8.9									
NE Corner													
Tree # / Row #	Japanese Larch						Tamarack						
	1	2	3	4	5	6	1	2	3	4	5	6	7
1	10.5	Missing	Missing	11.1	Missing	8.2	Missing	9.2	9.2	Missing	10.9	Missing	7.4
2	9.3	11.9	15.1	16.7	Missing	7.7	Missing	Missing	3.1	Missing	2.1	Missing	7.9
3	Missing	8.7	Missing	Missing	Missing	15.9	4.6	Missing	Missing	Missing	16.1	5.2	
4	Missing	Missing	18.7	Missing	Missing	Missing	3.9	Missing	Missing	Missing	Missing	Missing	
5	10.7	Missing	Missing	Missing	Missing	Missing	11.8	3.3	Missing	Missing	Missing	Missing	
6	8.5	Missing	Missing	15.6	12.1	21.1	Missing	Missing	Missing	6.6	Missing	Missing	
7	16.8	Missing	Missing	Missing	16.1	Missing	3.9	Missing	Missing	5.4	Missing	Missing	
8	Missing	17.8	Missing	Missing	Missing	Missing	6.9	8.8	7.3	5.2	Missing	Missing	
9	Missing	Missing	Missing	Missing	15.8	Missing	Missing	7.7	Missing	Missing	Missing	Missing	
10	Missing	17.6	13.2	Missing	Missing	Missing	3.7	9.6	9.6	Missing	Missing	10.7	
11	Missing	Missing	14.4	Missing	Missing	17.5	7.1	9.0	8.7	Missing	Missing	Missing	



Directional sign for Larch Collection at Alfred's Half-Acre, Viles Arboretum, Augusta, ME.



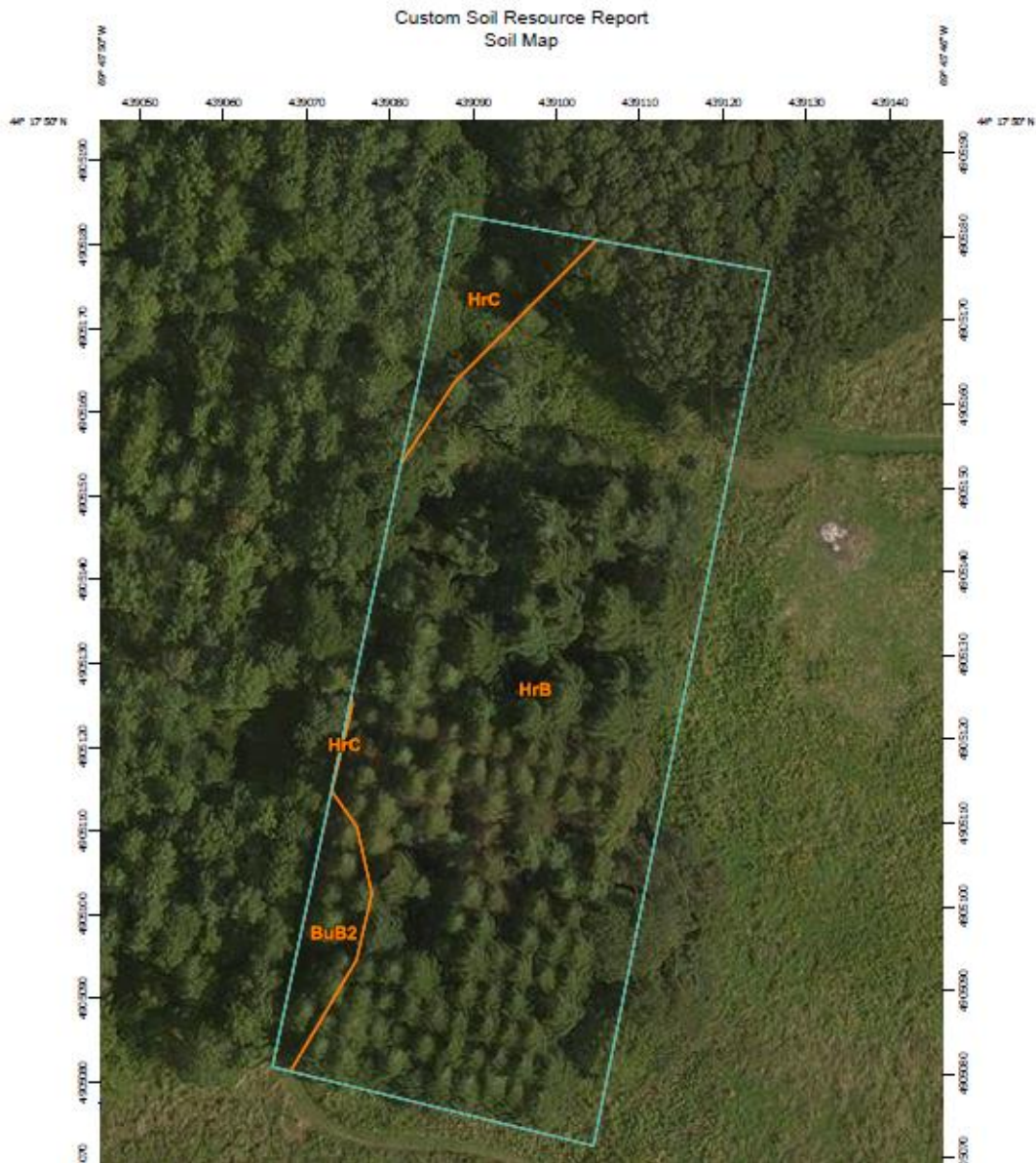
Display sign for Larch Collection, Viles Arboretum, Augusta, ME.



David Maass (left) and Ken Laustsen (right) measuring Hybrid larch trees at Viles Arboretum, 14 July 2015



Ken Laustsen (left) and David Maass (right) measuring larch trees on Alfred's Half Acre, Viles Arboretum



Soil survey map from US Department of Agriculture, Natural Resources Conservation Service web soil survey. The cultivars are represented from top to bottom as Tamarack, Japanese Larch, European Larch and Hybrid Larch at 6 rows each. Hr (B or C) is the Hollis fine sandy loam, and BuB2 is the Buxton silt loam. Only a small area of the Hybrid and European Larch lie in the Buxton silt loam soils.