

Site Productivity Capacity As affected by Site Level, Site Shape and Early Silviculture

Northwest-Wide Soil/Site Stratification Analyses



A Demonstration Set of Yield Charts

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Introduction to the 10m Site Class Method

The Ten-Meter (10m) Site Class method is a concept developed by the Forest Biometrics Research Institute (FBRI). It is described in a research publication by Arney, Milner and Kleinhenz (draft, 2007). This analysis uses the 10m Site Classification method in determining the sustainable growth and yield capacity of forest lands based on direct tree measurements from groups of felled trees at various sample locations across the forest.

The 10m Site Classification method is replacing all current methods utilizing total or breast height age. It provides a permanent assessment of the natural productivity of any forest bio/geo/climatic region. In other words, this method attempts to classify the macro-site level and distribution of forest productivity independent of all silvicultural or genetic effects.

Interpretation of 10m Site Measurements

Higher site growth potentials can achieve growth from 34 to 67-feet in fewer years than lower sites. For example, a traditional site class of 150 can achieve this growth step in eight years while a traditional site class of 50 may require fifty years.

To distinguish the 10m Site Capacity classification from traditional indices (30-160), it is being represented here as the number of meters of height growth that may be attained in one decade (10 years). Simply divide 100 by the number of years observed to grow 10 meters (34-feet) in height. The 10m Site Classification is $(10 * 10/\text{Years})$:

<u>10m Site Class</u>	<u>#Years from 34 to 67-ft in Height</u>	<u>Traditional Site Class</u>
12	8.3	150
11	9.1	140
10	10.0	130
9	11.1	120
8	12.5	110
7	14.3	100
6	16.7	90
5	20.0	80
4	25.0	70
3	33.3	60
2	50.0	50
1	100	40

Summary Components of the 10m Site Classification Method

- Growth rates from zero to 34-feet of height are primarily driven by early *silvicultural effects*.
- Growth rates from 34 to 67-feet of height are primarily driven by *site capacity and genetics*.
- Growth rates from 67 to 100-feet of height are primarily indications of *local variation within a species* due to climatic, edaphic and topographic features.

The impact on yield capacities by site level and site shape are displayed on the following pages for a sample range of site index levels. Site curve shapes vary due to soil depth and available moisture for extended growth of the stand. Local conditions may be such that a Site Level of 80-feet may slow down beyond seventy feet in height on some soils while it may remain quite aggressive on other soils to heights beyond one hundred feet. These impacts of the extended rate of height growth for a given site level may have significant impact on harvest levels and optimal economic return at harvest.

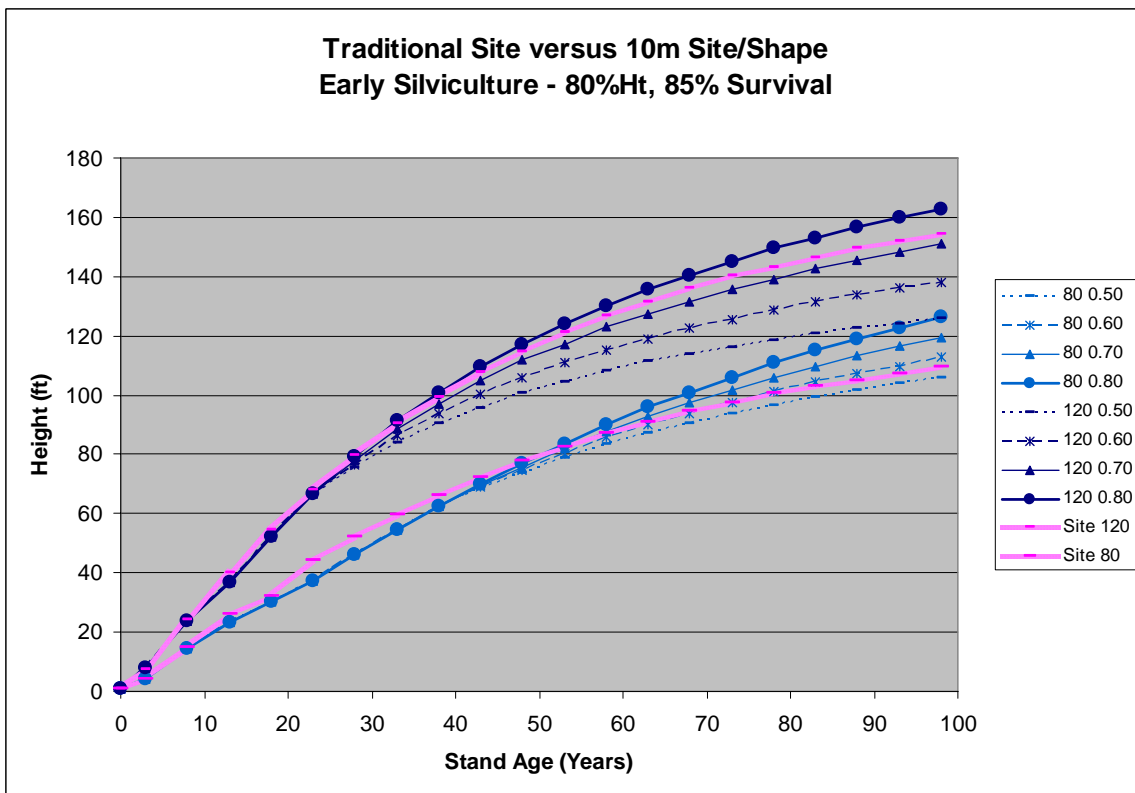
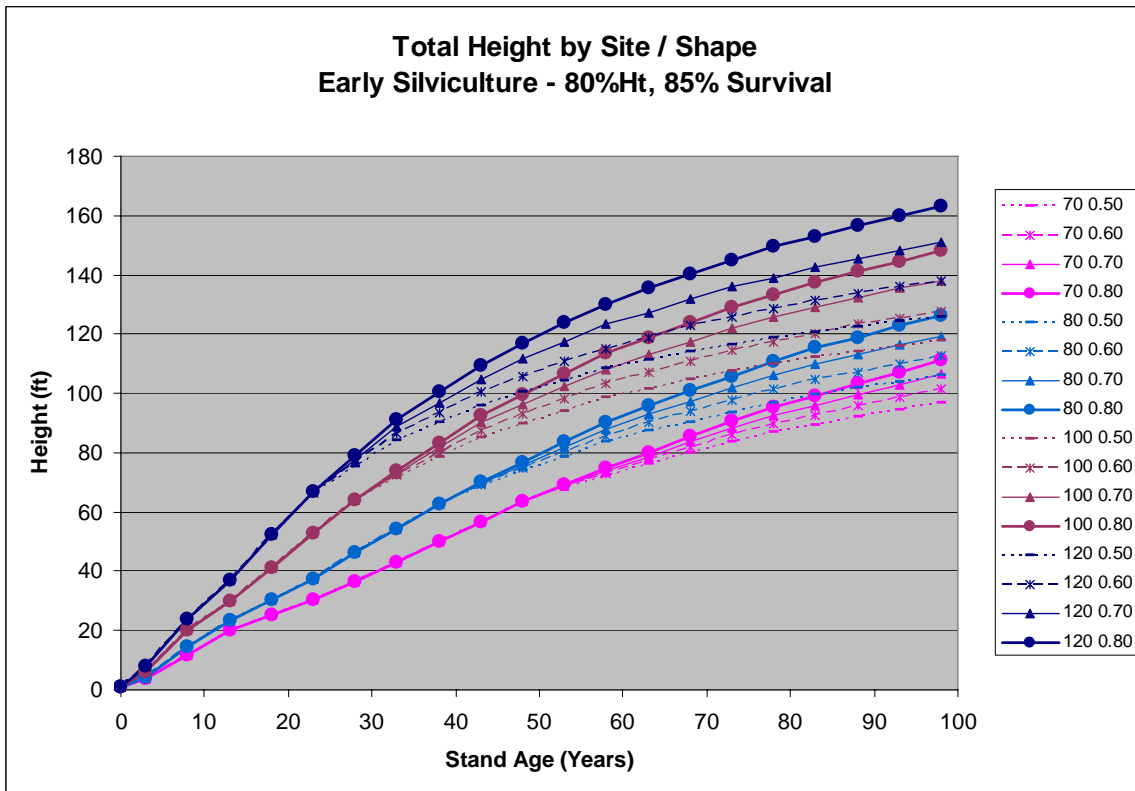
To display the relationships between site level and site shape the charts on the following pages are presented. The merchantable specifications are constant among all projections. The early silviculture is held at a constant level among all projections which provide for eighty-five percent survival of all trees to twenty-foot height and height growth rates at eighty percent of the maximum potential for the site class.

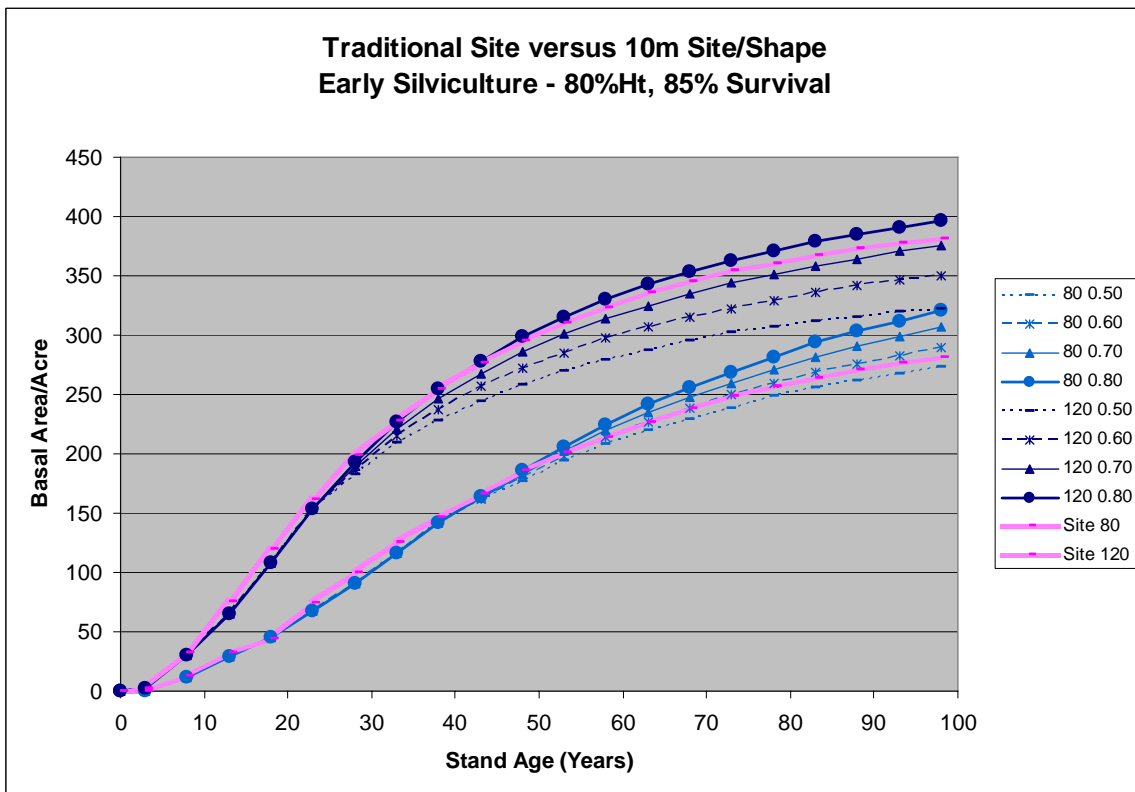
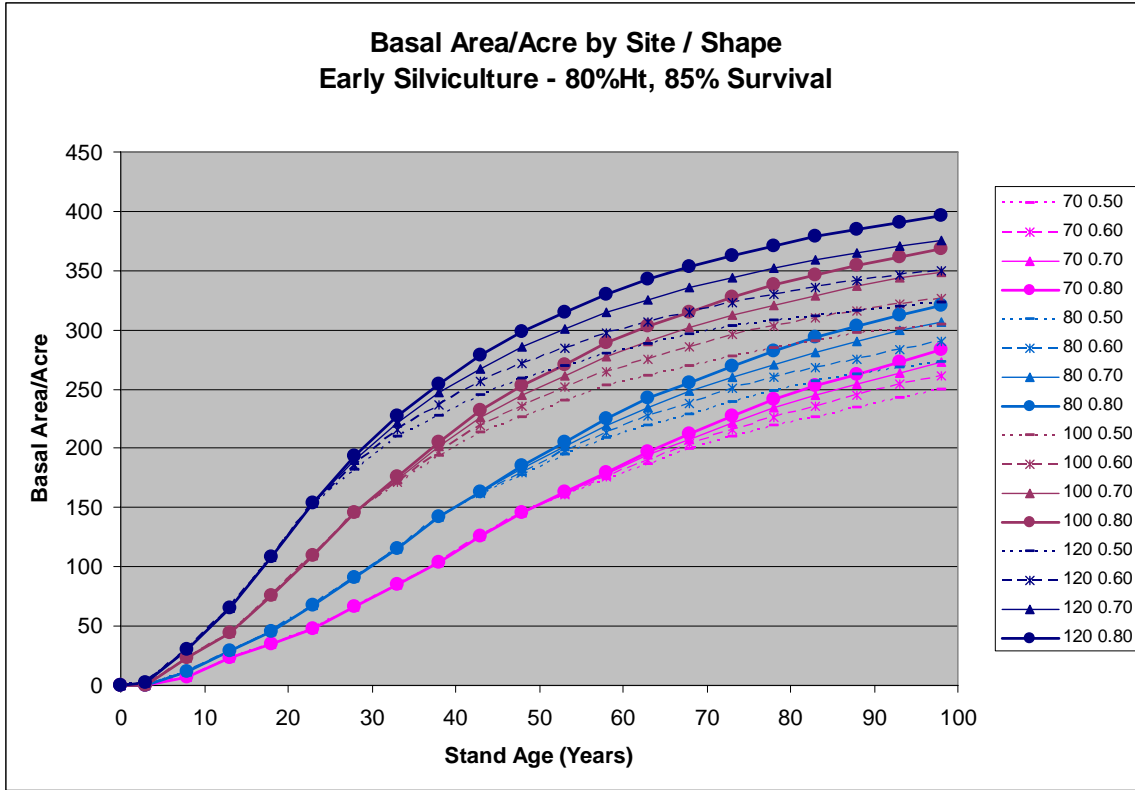
Site class 70, 80, 100 and 120 (Breast height basis) are included in the following charts where 350 trees per acre were planted in each case with common early silvicultural treatments. The only difference within a site class is the effect of the shape of the height growth curve beyond seventy-feet in height.

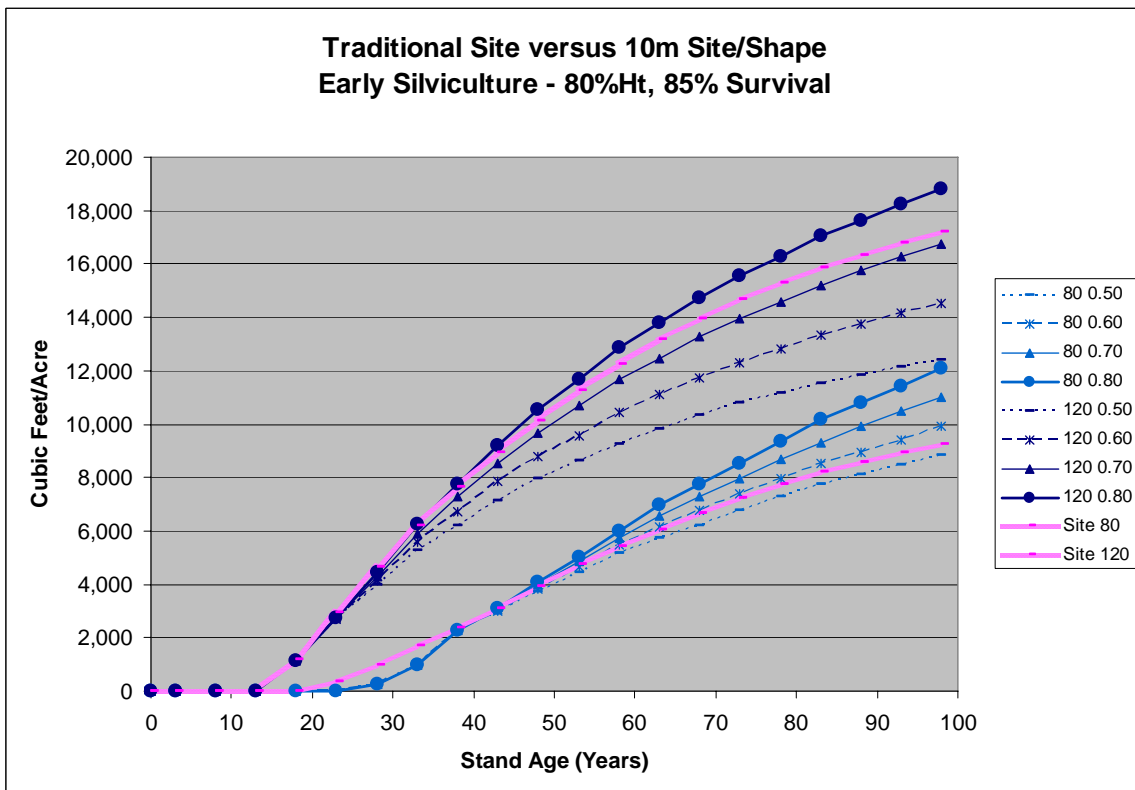
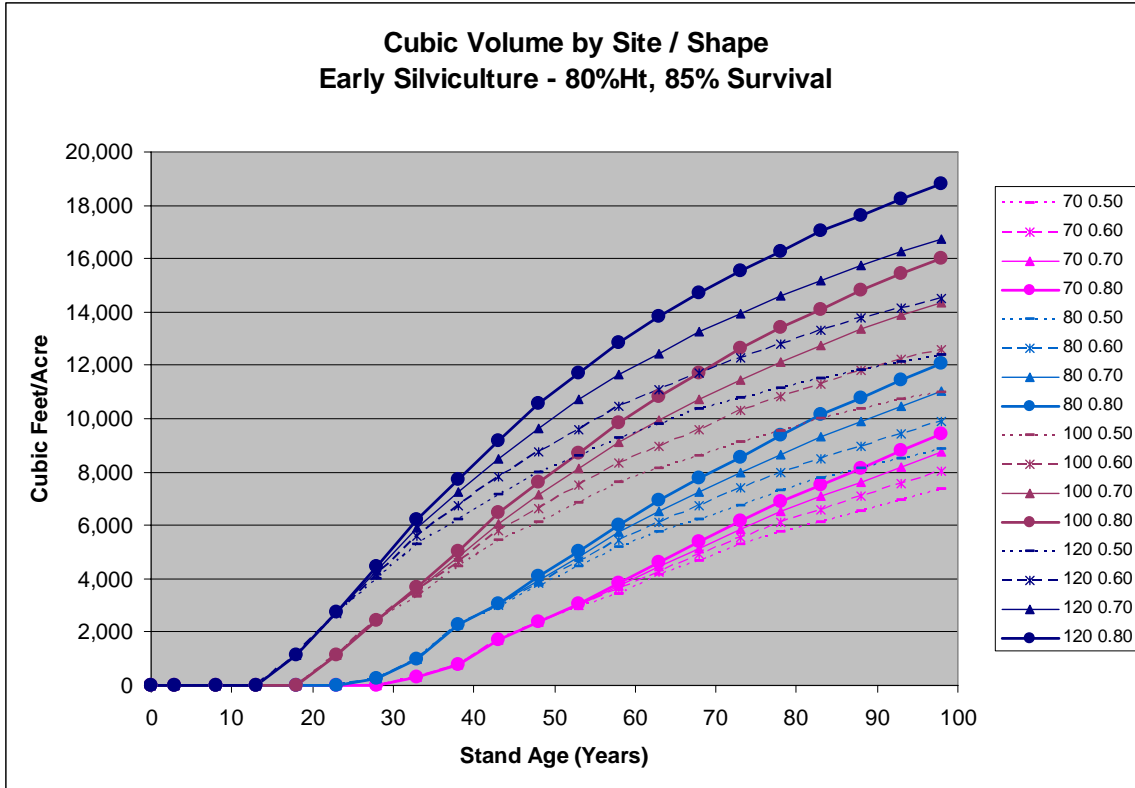
Traditional site index curves average all height/age trends into a common guide curve for each level of site index. In actual observations of felled-trees, this is not the case. When evaluating a given forest, tree farm or watershed the trend in height growth is observed to vary significantly beyond seventy feet in height depending on the soil/climate conditions. This variation in growth is measureable and predictable depending on soils and climate.

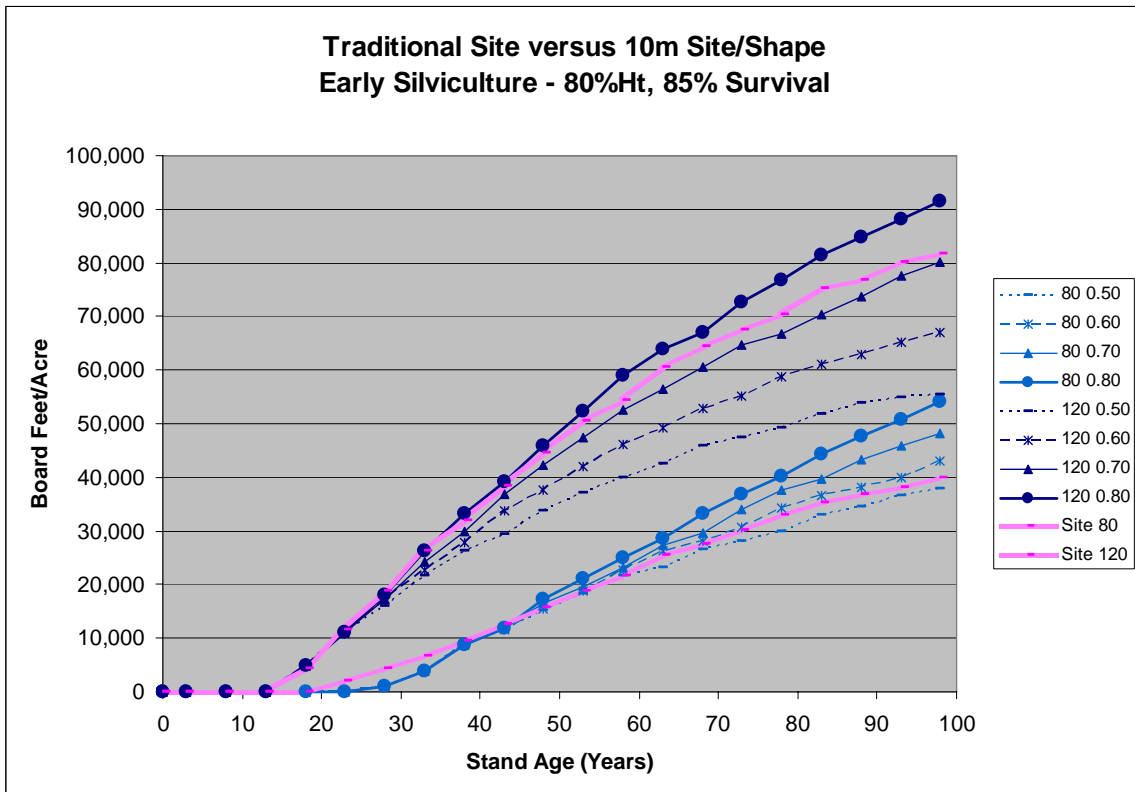
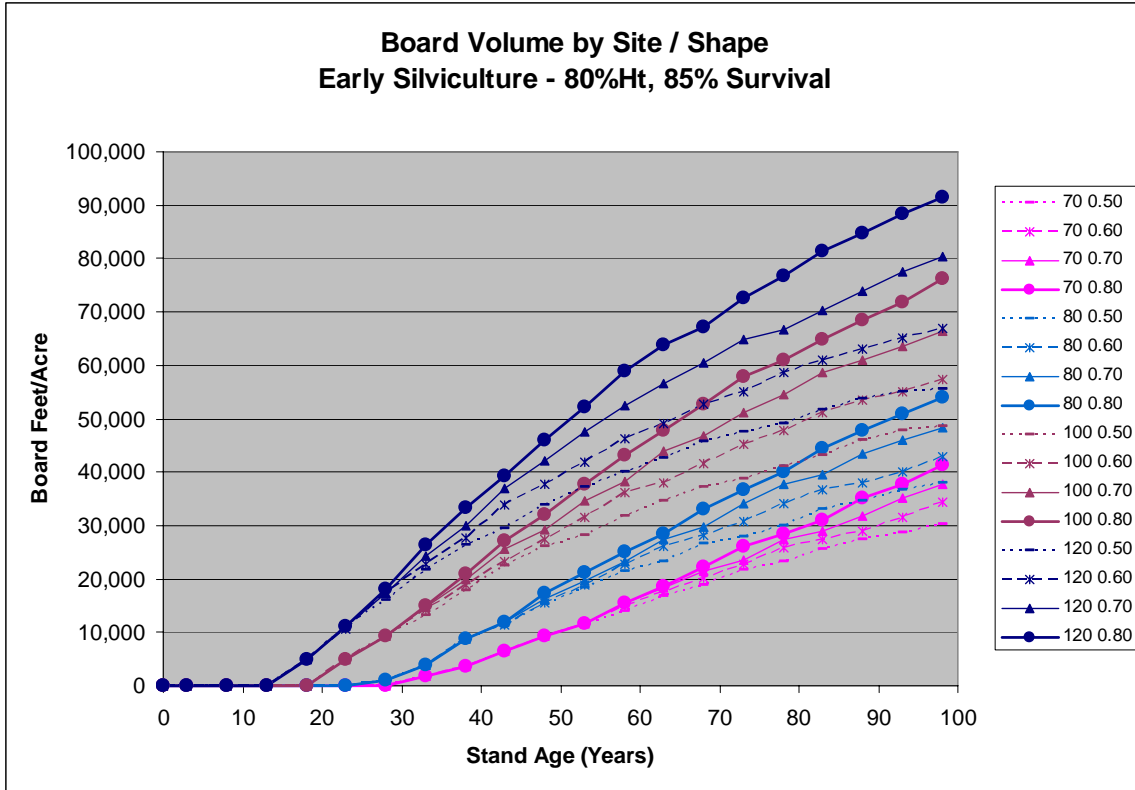
The FBRI has developed a permanent productivity classification approach for all stands in a forest based on easily observed soil, climatic and topographic parameters. This classification is transferred to a GIS productivity classification layer for the forest inventory as a permanent site productivity classification of all lands. This GIS layer is used to update the FBRI inventory databases for site productivity for each stand in the entire forest.

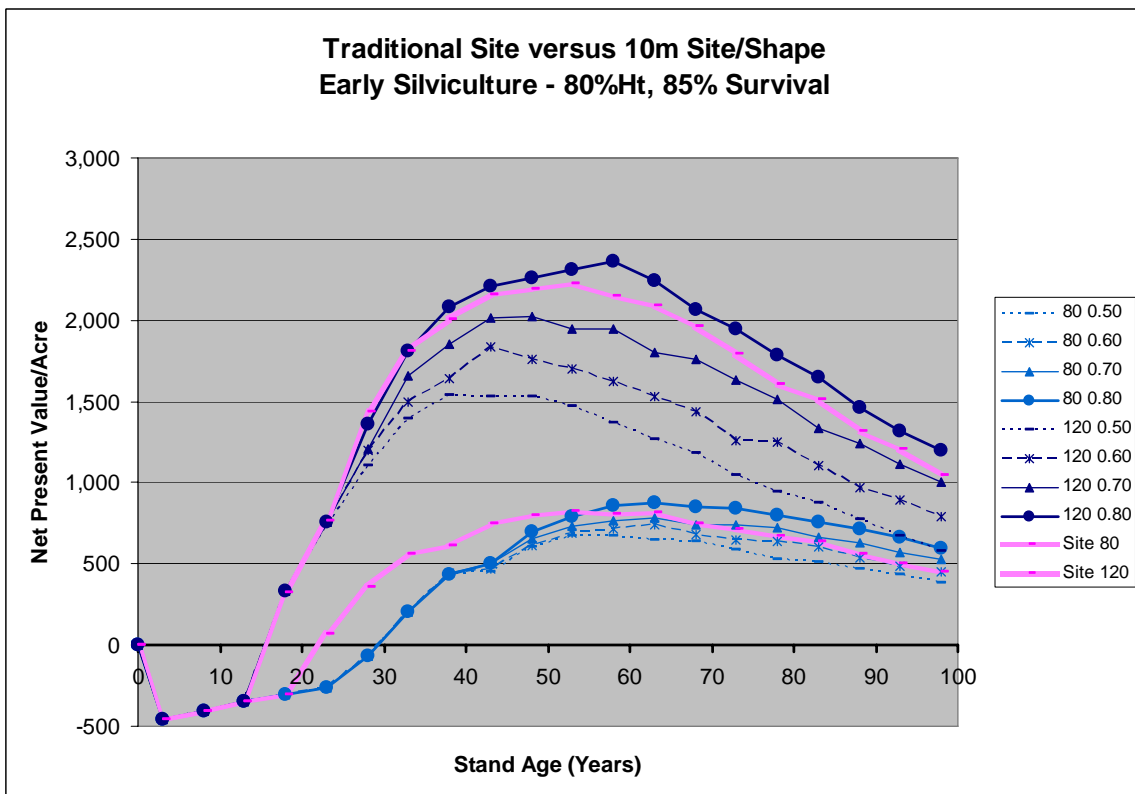
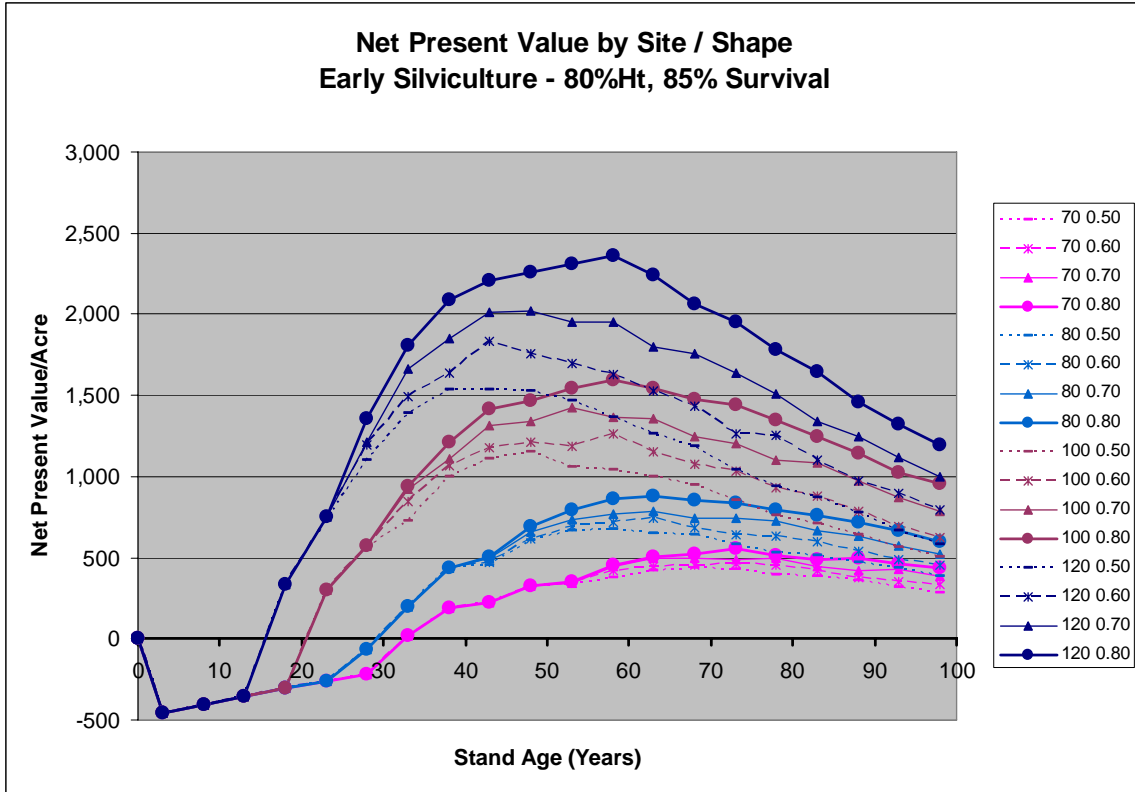
Legend values of “80 0.70”, for example, imply a site index level of 80-feet with a site shape of 70%. A shape of 70% means that height growth *rate* from seventy to one hundred feet total height has declined to *seventy percent of the rate* between thirty-five and seventy feet in height. The typical range in shape is from about 55% to 85% .











This next set of charts displays the variation in yield capacity when the percent of survival and height growth capacities are improved through early silvicultural treatments. These treatments include more vigorous planting stock, aggressive site preparation, intensive herbicide treatments and vigorous pest control. The index of success of these treatments is indexed in these charts as the number of years required to achieve a stand height of twenty feet (six meters) for height growth and the percent survival of all trees at that index height.

Site index level and shape are held constant in the following charts to compare the differential trends in early silviculture on height and survival.

