ATTS Group

Site Assessment To Choose Tree Species

By Toso Bozic

Prior **tree selection, planting, care, and maintenance of the site assessment is a MUST**. A site assessment is a thorough and detailed evaluation of site conditions to understand limitations or opportunities for tree and shrub survival, growth, and vigour. Each site is different and understanding and assessing site is vital. When assessing it is important to look at basic soil, water, nutrients as well as space, light, temperature, and wind information which will allow tree/shrub to grow. The assessment can be divided into soil, climate, and space conditions for choosing tree/shrub species.

Soil conditions

Understanding soil conditions is one of the most important assessments prior to choosing trees for planting. A tree is supported both structurally and nutritionally by its roots in the soil. Any soil limitations will result, directly or indirectly, on tree survival, growth, and vigour as well as future health problems. The following assessment should be considered during soil condition assessment:

- **Type of soil** (e.g., Luvisol, Chernozem, Regosol, etc.) can be obtained from various sources including Alberta Soil Information Viewer. Understanding your soil types and their limitations will greatly influence what tree species you may choose. For example, there are very few trees that will grow, thrive, or survive on high sodium levels or organic soils.
- **Soil texture** is defined by the soil's relative amounts of sand and clay. Soil influences moisture holding capacity, drainage rate, and nutrient availability. Several tree species (e.g., Poplars, willow, elm, etc.) can survive and thrive in clay soils which retain moisture and nutrients but are prone to compaction. On other hand some tree species (pine, Siberian larch, etc.) prefer drier, sandy soils that drain well and resist compaction, but have reduced water and nutrient holding capacity, nutrient poor, and moisture deficient.
- **Soil pH and plant nutrients** are important determinants of a site's suitability for tree growth. Most trees prefer pH between 5.5-7.0 but several tree species can sustain on more acidic or more alkaline soils. Soil testing can evaluate soil fertility, pH, and organic matter and is highly recommended before tree selection and planting.
- **Soil compaction** is the squeezing together of soil particles, reducing the space available for air and water. Compaction is a long-term underlying problem for tree health. In compacted soils, water infiltration is slow and root penetration is difficult. Tree growing on compacted soils are less vigorous, making the tree susceptible to insects, diseases, and mechanical damage, and overall cause of poor tree health. Soils with very high clay content are easily compacted compared to coarse texture and sandy soils. In extreme cases, roots are forced to the surface.
- **Soil drainage** is the soil's ability to intercept and remove surface or groundwater. Water moves through soil at various rates depending on climate, topography, soil texture, and structure. Drainage can range from very good to very poor. Good drainage prevents waterlogging, promotes healthy root growth, and ensures adequate oxygen availability. Poor drainage can lead to root rot and nutrient deficiencies. Soil type, structure, and organic matter content significantly influence drainage efficiency. Best ways to determine your site's drainage is to observe the site, after a rain OR dig up a hole to perform your own drainage test.
    - After rain, is the water draining or is it standing on the surface?

  - After rain dig a hole into the soil: is it wet or dry after rain? OR
  - Dig hole 12 cm (foot deep) and fill it up with water and observe for next 12 hours to see how rapid the water drains. Fast drains more than (15 cm or 6 inches) in an hour; moderate drains (2-15 cm or 1–6 inches) per hour, and slow drain less than (15 cm or 6 inches) per hour.
- **Soil volume** is the measure of soil available for root growth. In urban towns, roads, and certain reclamation areas; the soil volume is inadequate for rooting space and will limit water and oxygen availability, nutrient uptake, and microorganisms necessary for successful tree growth. In areas where soil volume is limited, selection of smaller tree species can grow with limited root systems.
- **Other soil information** such as weeds, erosion, site disturbances, and construction are important to assess.

Picture 1: Natural undisturbed soil (L), anthropogenic soil in the urban areas (C); healthy fine roots in good soils (R)

Climatic conditions

Understanding climatic conditions are equally important to prior choosing trees for planting. Climatic limitations will impact overall tree selection. The following assessment should be considered during climatic conditions assessment:

- **Canadian Plant Hardiness Zone Map** provides insights what can grow in your area and it combines information about a variety of climatic conditions across the entire country. Alberta is ranging from zone 1a in northern Alberta to 5a in southern Alberta. Local microclimate knowledge is very important and obtaining local information from local gardeners, landowners and professionals are crucially important.
- **Wind** direction, speed and frequency can greatly impact tree selection. Strong winds (warm Chinook and cold jet streams) imposed several stresses on trees including stunted growth, shorter branches, smaller leaves, leaning and uprooted trees. Sites exposed to constant wind are usually drier and may need supplemental watering to prevent them from drying out as quickly. Alberta Agriculture and Forestry – " Current and Historical Alberta Weather Station Data Viewer" provides information on prevailing winds and developing a "Wind rose" from local weather

stations. Wind tunnels are very common in urban areas but also in river valleys, improperly designed shelterbelts and along rural roads.

- **Frost** can be very destructive to trees. Early frost is especially destructive for tender seedlings that are too fragile to survive sudden dips in temperature. Fruit trees are extremely vulnerable to frost damages and requires extra attention prior fruit planting. Local low areas are where cooler air collects and lowering the air temperature is best for frost to occur. These frost pockets are usually found at the bottom of the slopes or land depression (bowl) are often found. Several trees are susceptible to Frost and Thaw damages.
- **Snow** is excellent insulator for trees and roots. Lack of snow makes trees more vulnerable from cold wind and sub-zero temperatures. Excessive amount of snow may physically damage trees, create local flooding during the springtime and cause winterburn in coniferous trees.
- **Sunlight level** is important as some trees prefer full sunlight's (e.g., pine) while others prefer partly to shade or full shade (e.g., white spruce) for their growth. Sunlight levels can be blocked by surrounding trees or buildings in urban areas.
- **Water** is crucial for tree growth. Having sufficient water quantity and quality for irrigation purposes during drought or stress time is important. In area where deep aquafer and soil contain significant amount of sodium, checking for levels of sodium in water prior watering is must.

Picture 2: tree grown under full/partly shaded in urban area (R); tree exposed to constant wind force (C); large snowdrifts around shelterbelt (R)

Site conditions

Site conditions may determine what tree species you may choose to plant. Local microsite evaluation is required.

- **Elevation is variable in** Alberta, ranging from just below 700 meters near the Saskatchewan border to 1100 meters in parts of Calgary and rising further west. This elevation difference impacts how some trees grow, as higher elevations are colder and could be limiting the growth of many trees, especially hardwood species.
- **Slope** is one of the factors for determining vegetation. The vegetation on opposing slopes is vastly different. South-facing slopes are warmer and dryer than north-facing slopes. South-facing

slopes dominated by sun loving species such as pines, larch, birch, poplars, aspen and many others. The north-facing slopes are colder, moist, and have less sunlight and heat. White spruce, and balsam fir are tree species growing more on north-facing slopes.

- **Space** (above and underground) limitations may include above ground powerlines, buildings, roads, and other human-caused structures. Below ground limitations such as underground utilities, and available soil volumes are important to assess.

Picture 3: limitations for trees to grow in urban areas (L); trees planted in open areas (C), slope and elevation difference in southern Alberta.

Choosing trees and shrubs for your land can be very challenging but also very rewarding endeavor. Proper and careful assessment of your soil, climate and site conditions will greatly help you with tree and shrub selection and in the long run will pay off.

For more information:

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