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## Locating Nitrogen Enrichment Areas

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The soil location for applying nitrogen to trees should be targeted at tree root concentration areas in healthy soil where nontarget organisms, erosion, and denitrification processes are minimized. Exempt a portion of the root plate area closest to the tree (3-5 feet radius around a medium-sized tree) from direct enrichment. Use any nitrogen designated for this stem base area across the rest of a site.

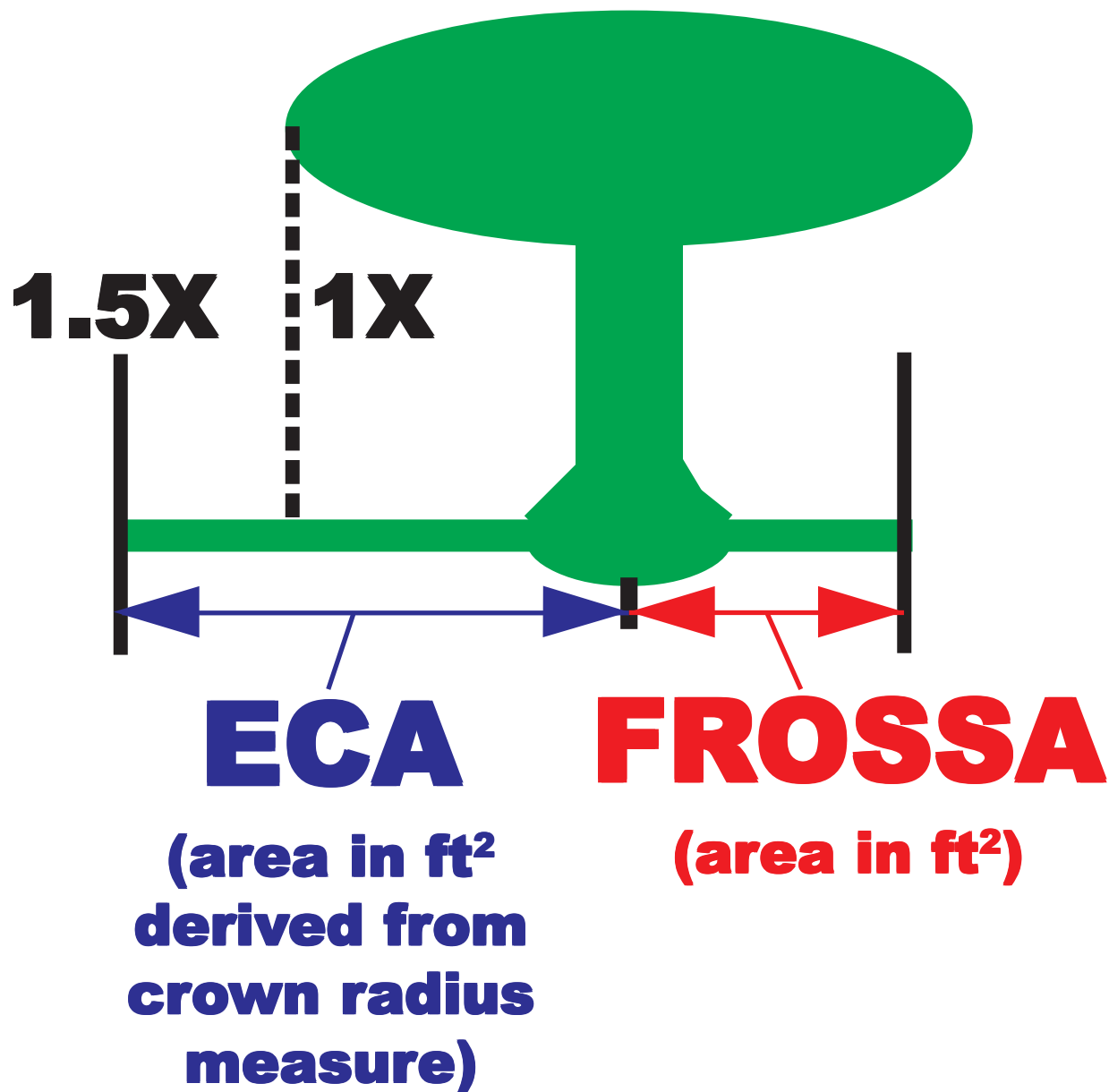
The tree and site provide two approximations to visualize rooting areas and soil element containing locations. The two estimates for supplemental enrichment coverage areas are ECA and FROSSA. The first area estimate is called the extended crown area (ECA) method and is based upon a distance away from a tree which is 1.5 times the average crown radius. The second area estimate is based upon the area where trees are free-to-root in soil whose surface is open to the atmosphere (FROSSA). Figure 1. Determine the extent of these areas by measuring the site around a tree in square feet (ft<sup>2</sup>).

### Just Enough

Figure 2 provides a top-view of the nitrogen enrichment area determined by ECA. Figure 3 provides a top-view of the nitrogen enrichment area determined by FROSSA. A calculation for measuring the enrichment area around a tree is presented in Figure 4 (steps 1 & 2 of 3) and in Figure 5 (step 3 of 3). This three step calculation of area available for nitrogen enrichment applications, where tree roots are most likely to derive the most benefit, assures effective and efficient nitrogen use while minimizing non-target losses. To prevent overdosing, this type of proportional area control is critical.

The smaller of the two calculated enrichment areas should always be used. In unlimited open soil surface areas, determining what proportion of a 1000 square feet is available around a tree makes it easy to determine nitrogen enrichment dosing. In places where many soil surface limitations occur, much more care is needed to determine accurately the available area for nitrogen enrichment. By examining both ECA and FROSSA, and by selecting the smaller of the two areas, proper dosing of nitrogen enrichment can occur. Figure 6.

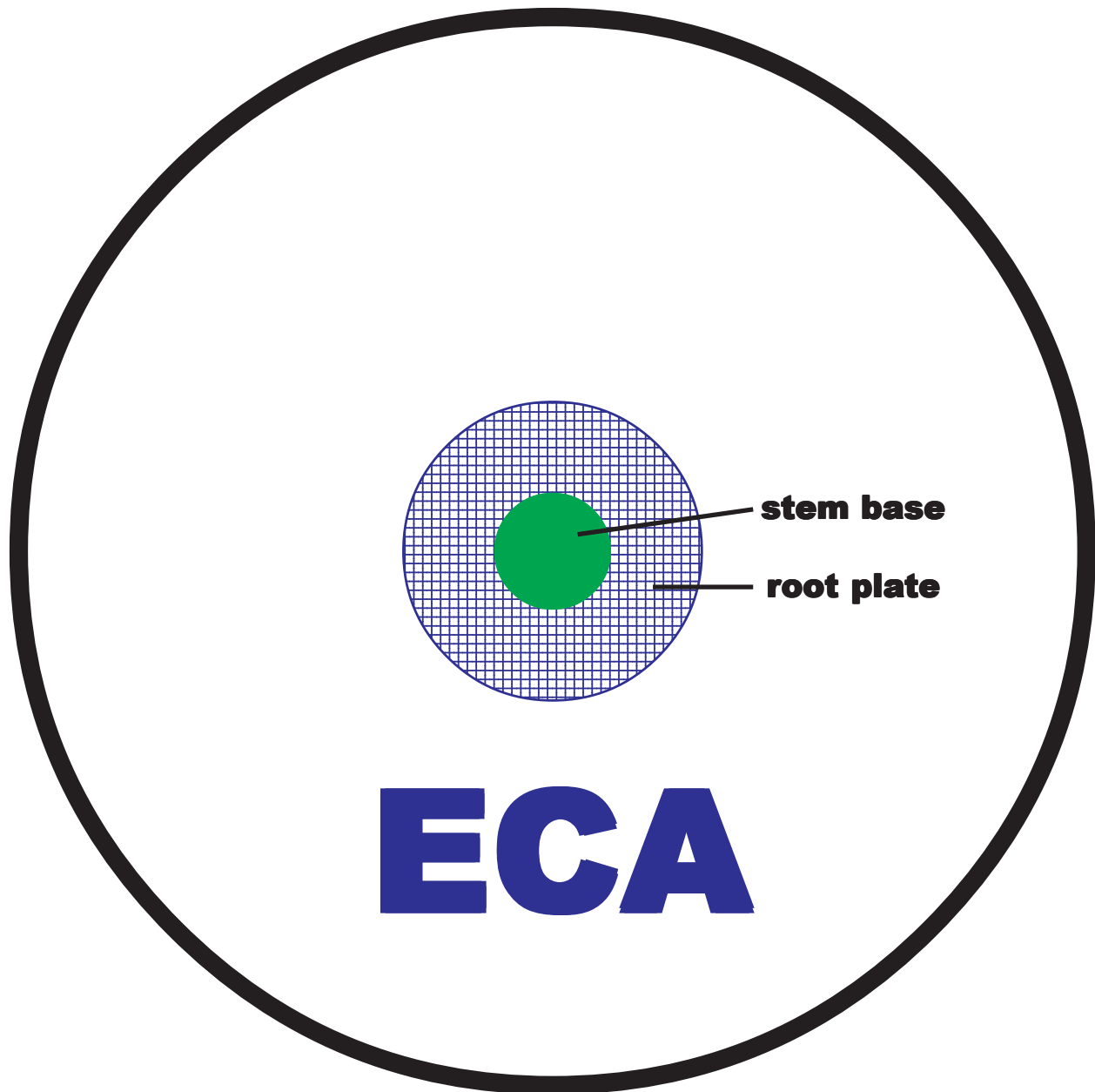
To prevent too extensive of coverage away from the target tree, a calculation is presented in Figure 7 determining the radial distance away from a stem base for applications. In greatly misshapen and elongated open soil surface areas, care is needed to not enrich nitrogen too far away from the tree, which increases the chance of non-target use, loss and waste. In highly limited open soil surface areas, over-application (over-dose) of nitrogen can cause waste through site loss, as well as damage the tree.



**use smaller area (ft<sup>2</sup>) of  
ECA or FROSSA**

Figure 1: Side view defining two means used for determining nitrogen enrichment application areas under a tree.

# Nitrogen Enrichment Area



**(exempt portion of root plate  
area around stem base)**

Figure 2: Top view of nitrogen enrichment application area extent under a tree where open soil surface area is not limited and a crown-based area determination can be used.

# Nitrogen Enrichment Area

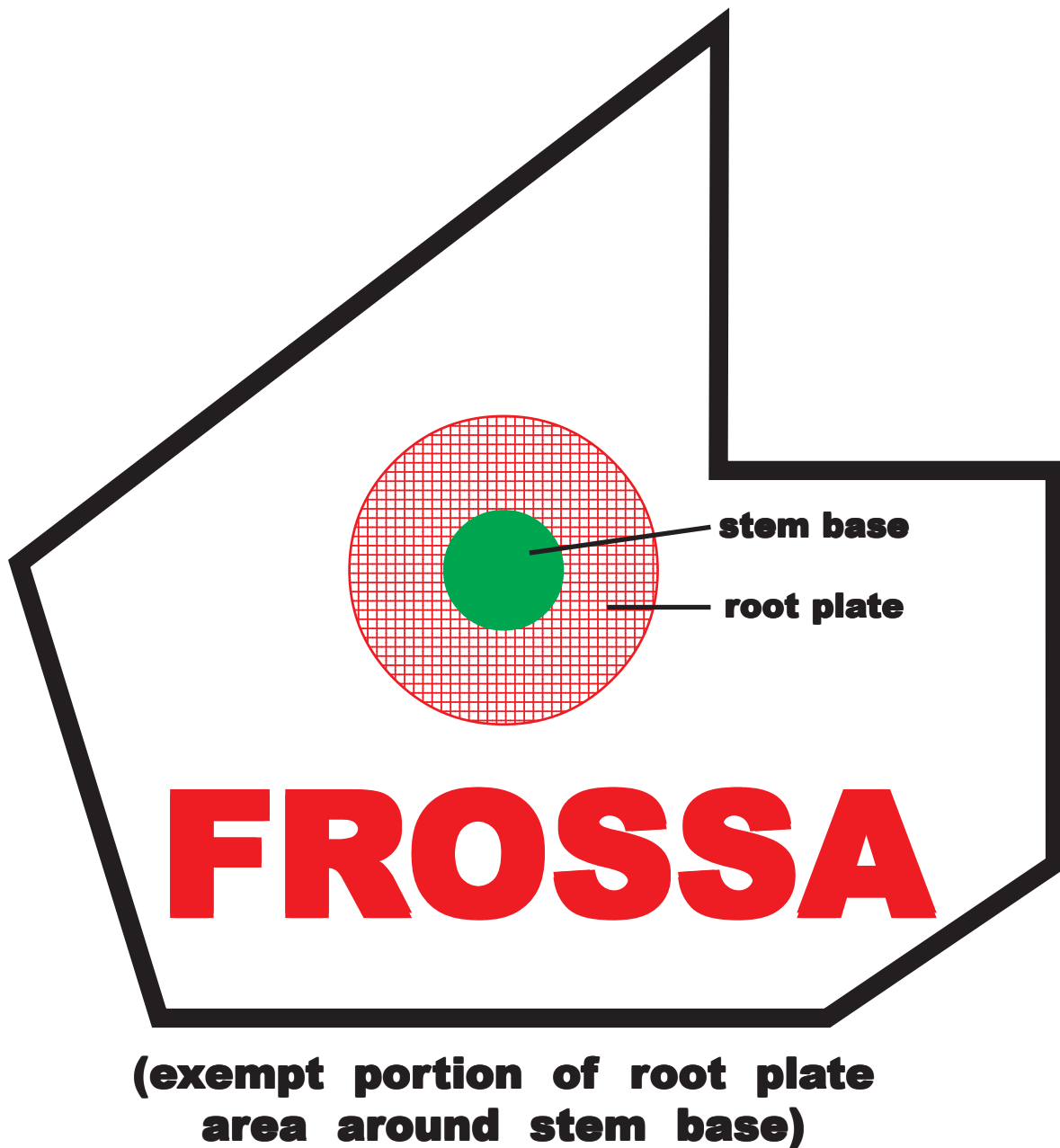


Figure 3: Top view of extent of a nitrogen enrichment application area under a tree where open soil surface area is constrained in one or more directions and total open soil surface area must be used.

## **STEP 1**

**Measure average tree  
crown radius in feet (r).**

$$4.7 \times (r)^2 = ECA$$

**ECA =  
expanded crown area (ft<sup>2</sup>)**

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## **STEP 2**

**Measure contiguous area (ft<sup>2</sup>)  
of open soil surface available  
to tree roots.**

**FROSSA =  
free-to-root open soil  
surface area (ft<sup>2</sup>)**

Figure 4: Three step calculation determining open soil surface area around a tree for nitrogen enrichment applications. (here steps 1 & 2 of 3 are provided)

## **STEP 3**

### **Proportional Area Control of Nitrogen Enrichment**

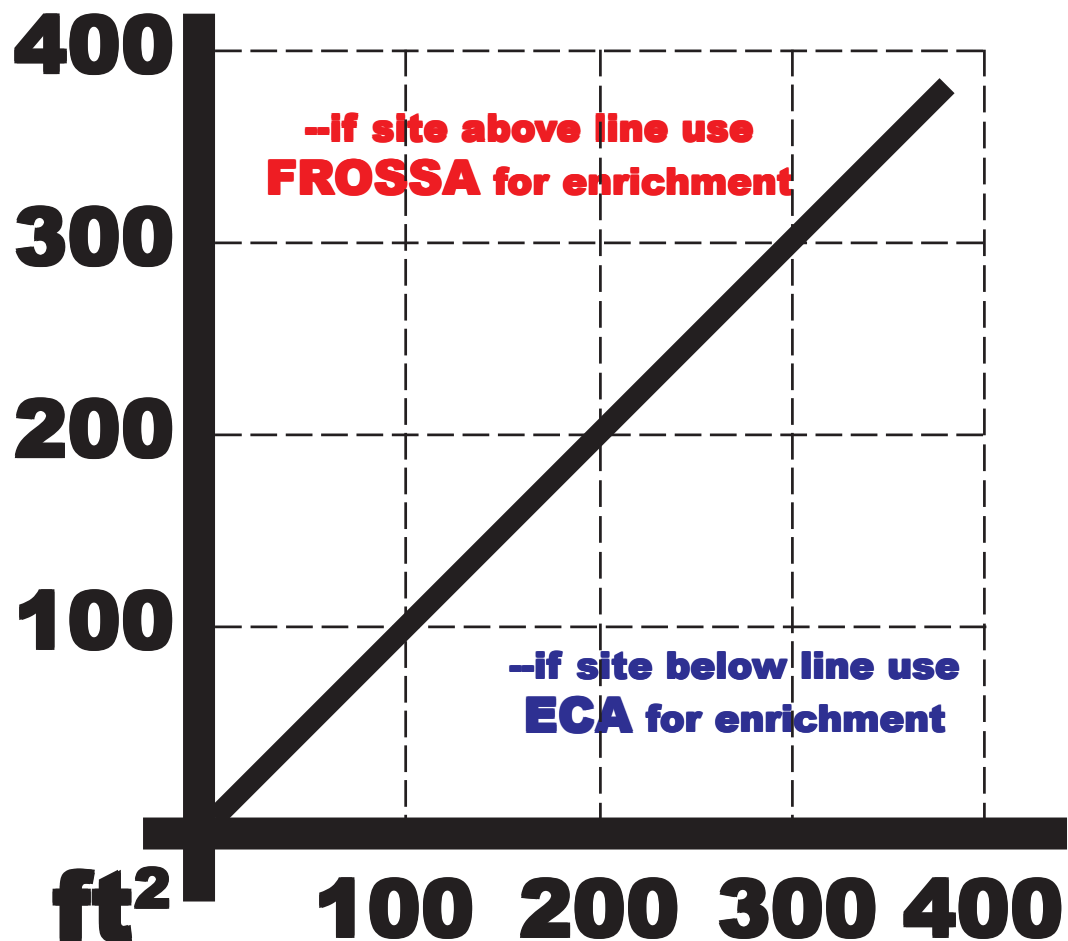
**A – If  $ECA < FROSSA$ ,  
use  $ECA$  for area.**

**OR**

**B – If  $ECA > FROSSA$ ,  
use  $FROSSA$  for area.**

Figure 5: Final step (Step 3) in three step calculation determining open soil surface area around a tree for nitrogen enrichment applications.  
(here step 3 of 3 is provided)

# **ECA** (expanded crown area)



# **FROSSA** (free to root open soil surface area)

Figure 6: Selecting the smaller of two calculated areas (ft<sup>2</sup>) for nitrogen enrichment applications under a tree.

# Nitrogen Enrichment Area

$$\sqrt{\text{ECA or FROSSA}}$$

**3.14**

**=**

**Maximum Radial Distance  
From Stem Base In Feet  
For Nitrogen Enrichment**

**(exempt portion of root plate area around stem base)**

Figure 7: Determining the maximum distance (ft) from a tree stem for nitrogen enrichment applications.



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