Tree Factors for Plot Sampling

FOR 372
March 28, 2023
Elliot Shannon

Plot Sampling Basics:

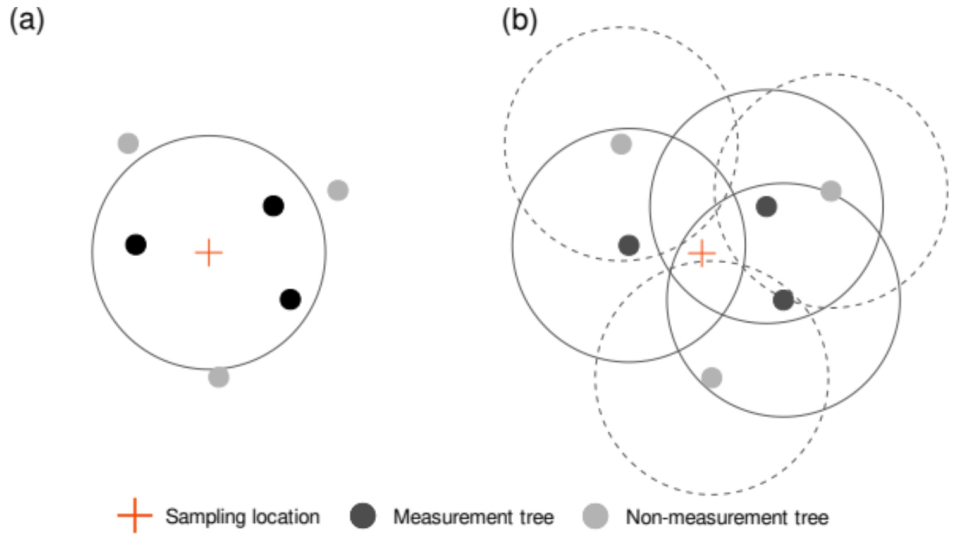
- fixed area plot at each sampling location

- all trees within plot boundary (from population of interest) are measured

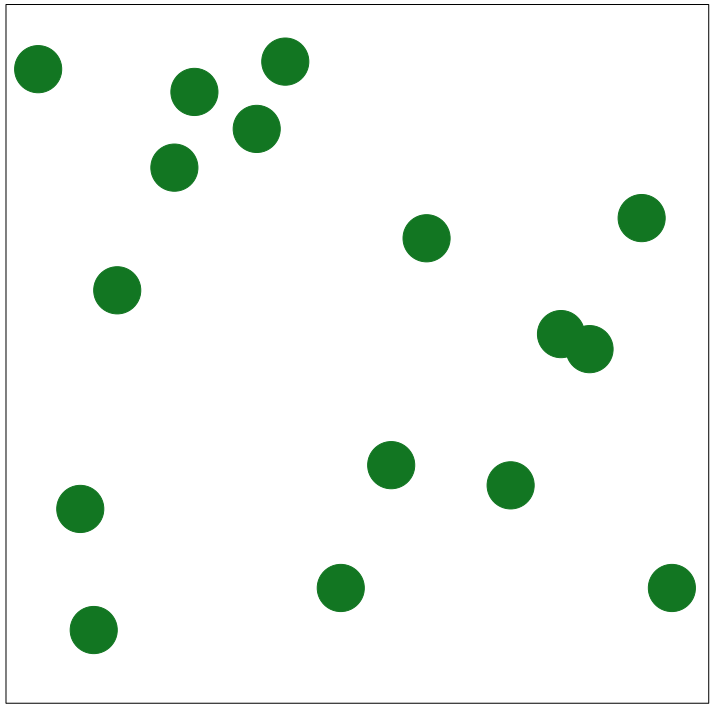
- ideal plot size may vary with population of interest (e.g. seedlings vs. overstory trees)

- we can use co-located plots that are sized appropriately for each population of interest

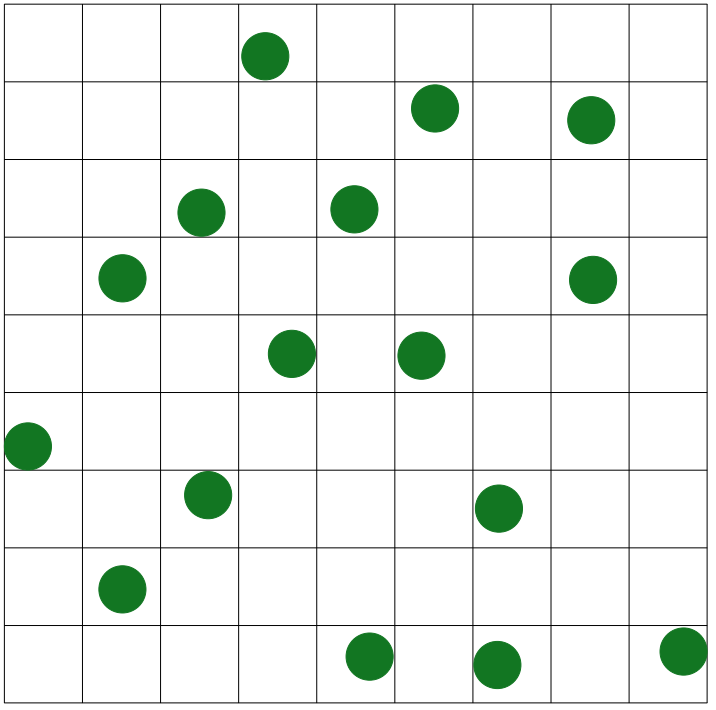
- smaller nested plots are referred to as “subplots”



Sampling With Replacement



Sampling Without Replacement



- We are interested in per unit area measurements (e.g. per acre or ha)

- We use an expansion factor to scale measurements expressed on one area basis to another area basis.

EXAMPLE:

We collect basal area data for a 1/20th acre plot in Baker Woodlot

We measure 6 trees, with a total basal area of 3.8 square feet.

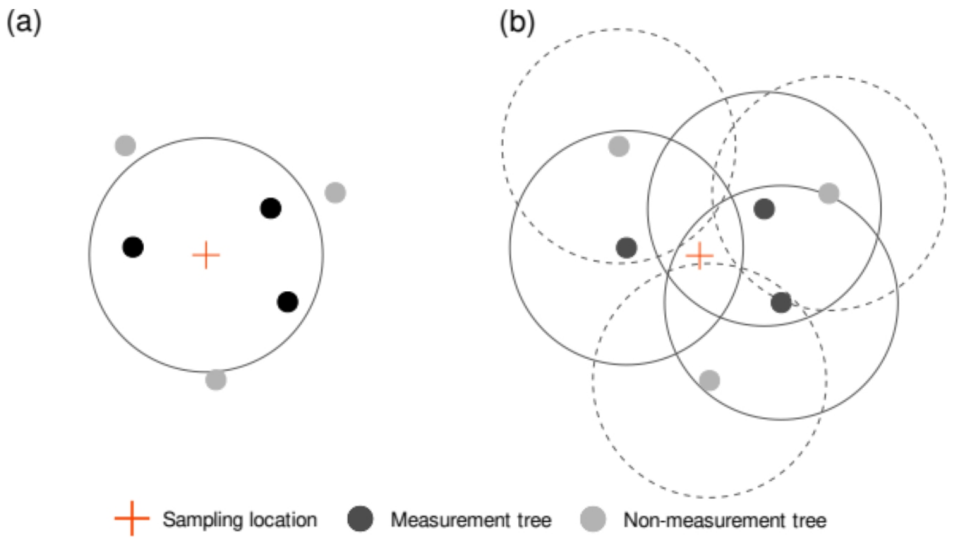
So we have determined basal area to be 3.8 sq. ft. per 1/20th acre

What does our measurement tell us basal area per acre to be?

expansion factor = 20

Basal area per acre = 3.8 × 20 = 76 sq. ft. per acre

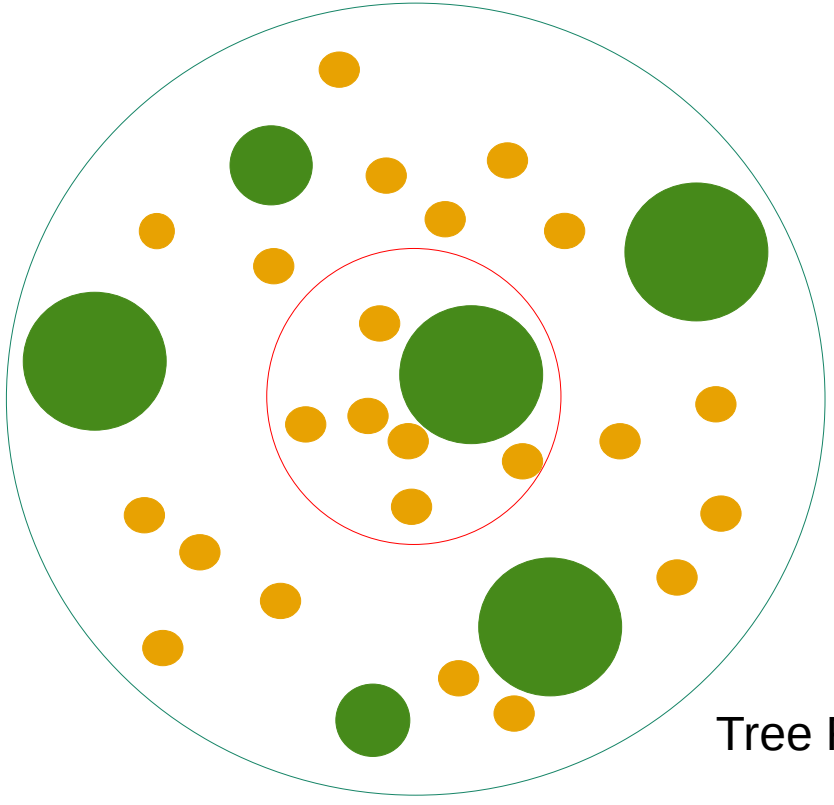
Plot-Centered Perspective



Tree-Centered Perspective

Inclusion Zone

A tree factor (TF) is an expansion factor for measurements from an individual tree, representing the number of trees per unit area the given measurement tree represents.



½ acre plot (21,780 sq. ft.)

⅛ acre subplot (5445 sq. ft.)

Overstory Tree

Juvenile

Tree Factor = Target Unit Area ÷ Inclusion Zone Area

2 = 43,560 ÷ 21,780

8 = 43,560 ÷ 5,445

Now you try, *we are interested in measurements per acre*:

What is the TF for a tree measured on a 1 acre plot?
on a 0.5 acre plot?
on a 1/100 acre plot?
on a 5000 sq. ft. plot?
on a 100 sq. m plot?
in my 150 sq. ft. bathroom?
on a regulation NBA basketball court?

What size plot gives a TF of 3?
a TF of 10?
a TF of 1000?

Hint: 1 acre = 43560 sq. ft. ≈ 4047 sq. m.

Tree Factor = Target Unit Area ÷ Inclusion Zone Area

Now you try, *we are interested in measurements per acre*:

What is the TF for a tree measured on a 1 acre plot?	1
on a 0.5 acre plot?	2
on a 1/100 acre plot?	100
on a 5000 sq. ft. plot?	8.712
on a 100 sq. m plot?	40.47
in my 150 sq. ft. bathroom?	290.4
on a regulation NBA basketball court?	9.27

What size plot gives a TF of 3?	1/3 acre, 14520 sq. ft, 1357 sq. m
a TF of 10?	1/10 acre, 4356 sq. ft, 405 sq. m
a TF of 1000?	1/1000 acre, 43.5 sq. ft, 4 sq. m

Hint: 1 acre = 43560 sq. ft. ≈ 4047 sq. m.

Tree Factor = Target Unit Area ÷ Inclusion Zone Area

We can then expand a measurement for a given tree as follows:

Expanded measurement = TF × individual measurement

EXAMPLE:

Suppose a tree measured on a 0.1 acre plot had a volume of 16 cubic ft

So the *expanded volume* of this tree is:

$$10 \times 16 = 160 \text{ cubic ft}$$

Now you try, *we are interested in measurements per acre*:

What is the expanded measurement for:

a tree with 600 kg biomass measured on a 0.4 acre plot?
a tree with 1.8 sq. ft basal area measured on a 0.1 acre plot?
a tree with 19 cubic ft of volume measured on a 900 sq. ft plot?
a tree that produces 1 gallon of maple syrup on a 200 sq. m plot?

Hint: 1 acre = 43560 sq. ft. ≈ 4047 sq. m.

Tree Factor = Target Unit Area ÷ Inclusion Zone Area

Expanded measurement = TF × individual measurement

Now you try, *we are interested in measurements per acre*:

What is the expanded measurement for:

a tree with 600 kg biomass measured on a 0.4 acre plot?	1500 kg
a tree with 1.8 sq. ft basal area measured on a 0.1 acre plot?	18 sq. ft
a tree with 19 cubic ft of volume measured on a 900 sq. ft plot?	919.6 cubic ft
a tree that produces 1 gallon of maple syrup on a 200 sq. m plot?	20.235 gallons

Hint: 1 acre = 43560 sq. ft. ≈ 4047 sq. m.

Tree Factor = Target Unit Area ÷ Inclusion Zone Area

Expanded measurement = TF × individual measurement