Protocol for Counting Longleaf Pine Cones and Conelets

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Equipment: 8 to 10x binoculars, field data sheet, clipboard, pencil, d-tape, paint, tree tags

1. Locate a stand that is growing at a shelterwood density of less than 40 square feet per acre (25 to 35 square feet per acre is a typical range) and contains numerous trees of at least 10 inches at dbh. Better cone crops come from larger-diameter trees and poorer cone crops come from smaller-diameter trees. A key consideration is that high brush and/or trees cannot obscure the crowns of your sample trees, or your data will not be worth collecting. The midstory must be relatively open, so you can see the entire crowns of sample trees.

2. Select at least 10 trees in the stand to serve as your representative sample for monitoring, by painting a ring around the tree at dbh or higher and a sequence number on each (I use yellow paint so it won't be confused with the white rings around RCW trees). You may also attach an aluminum tag to the tree, but attach this high enough so that the tag number will not become obscured by black char from or, even worse, melted during the periodic prescribed fires (yes, I have seen this happen to tags when placed too low).

3. Using the field data sheet, enter the following data at the top: location, date and crew. Then, for each tree, enter: the tree number and its dbh. Now, you are ready for the fun part, the counting of cones and conelets.

4. While standing close to each tree, count the number of <u>brown cones lying on the ground</u> around the tree. The cones from the most recent year appear brown and fresher than the cones from earlier years which appear weathered and gray. Enter this number. Then, walk toward the sun away from the tree. The precise distance away from the tree is not crucial, but it should be far enough away to give your neck a comfortable angle while looking up, but not so far away that you cannot clearly see the cones with 8 to 10 power binoculars. With the sun at your back, you may need to adjust your position a bit to the left or to the right, so that you can view the entire tree crown without moving from your counting spot.

5. Let's work from least difficult to most difficult strobili to see. First, let's count the number of <u>brown cones still hanging on the tree</u> from last fall. I usually start at the lower left of the crown and work my way up to the top of the crown, then across the top of the crown to the right and then down the right side of the crown all the way to the bottom-most branches. This is a systematic approach that sweeps across the entire crown (left half, top, right half) and leads to consistently accurate counts. Once you

have done this, enter the number of brown cones still hanging on the tree into the data sheet.

6. Next, repeat the same up-over-down sweep with your binoculars, counting all of the green cones that can be seen from the single spot on which you are standing. Because these newer cones are green, they are more difficult to see against the green pine foliage. It really helps to count these green cones (and other structures) on a bright sunny day, when the light is good. It also helps if there is a light breeze blowing that moves the pine needles about, thereby revealing the more rigid cones. Once you have done this, enter the number of green cones into the data sheet. This is perhaps the most important count you will make, since these green cones contain the seed that will be shed during the upcoming October, and it is these data that will become the numbers upon which the cone crop forecast for the current year will be based (a forecast in which many land managers have a great interest). News of a good cone crop usually alerts forest managers to get busy during the summer, preparing seedbeds that will be receptive to capturing and deriving the most benefit from the upcoming seed shed. You will also note on the data sheet that the raw number you see in your green cone count needs to be multiplied by 2 at the end of the column. Bill Boyer's research, through many years, confirmed that this adjustment to the raw count needed to be performed to obtain an accurate estimate (the actual regression from his work approximated 1.98). In general terms, he explained this as being needed, because the cone count is performed by looking at only one side of the tree, thus the raw count for green cones needs to be doubled.

7. Finally, repeat the same up-over-down sweep with our binoculars, counting the small conelets that can be seen from the single spot on which you are standing. They are small, so this will take more time to locate them. But, they are up there. These conelets were pollinated only one month earlier (during March), but will not become fertilized for almost another 11 months (until a pollen tube grows from the surface of the conelet deep into its ovary). These conelets are the basis for estimating what the cone crop might be during the following year. But, it is worth bearing in mind that conelet abortion happens in nature for a variety of natural reasons (e.g., genetics, disease, insects, adverse weather). Thus, not all conelets will survive to maturity. In fact, the conelet mortality rate is typically more than 50 percent. So, this estimate for next year, based on conelets, is less reliable than the forecast for this year, based on green cones.

This is the field procedure for conducting binocular cone counts. Several years ago, I suggested that a small helicopter drone might be useful for counting pine cones, since such a small device could fly completely around the entire crown of each tree and perhaps more accurately count the strobili by using a natural light, infrared, radar or other type of video camera. In the future, this currently-used binocular approach may very well be supplanted by a more high-technology method. Given sufficient resources, it might be worthwhile to conduct a field study that tests the feasibility and efficacy of using a helicopter drone to assist with pine cone crop monitoring.

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Regional Longleaf Pine Cone Study: Female Strobili Count Data - - Field Data

Location: _____ Date: _____ Crew: _____

Tree Number	DBH	Brown Cones on Ground	Brown Cones on Tree	All Brown Cones	Green Cones	Conelets
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
Total Count =						

Adjusted Count performed only for Green Cones (is the Total Count x 2) = | |

Number Per Tree =					
			last year	this year	next year