Longleaf Pine Cone Prospects

for 2015 and 2016

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During the spring of 2015, cone production data were collected from selected low-density (e.g., shelterwood) stands of mature longleaf pine, throughout its native range. Binocular counts of green cones and unfertilized conelets were conducted on the crowns of sampled trees, as viewed from a single location on the ground. Visibility of cones and conelets on each tree is enhanced when the observer stands with their back to the sun. A breeze that moves the flexible pine needles about also helps the relatively more rigid cones and conelets standout for the observer. The near-term regional averages and individual site averages for these counts are reported in Table 1.

Table 1. Estimated Longleaf Pine Cone Production.

Cooperator	State and County	Estimated cones per tree from green cones for fall 2015	Estimated cones per tree from conelets for fall 2016
Kisatchie National Forest	Louisiana, Grant	17.3	3.3
T.R. Miller Woodlands	Alabama, Escambia	18.6	26.3
Blackwater River State Forest	Florida, Santa Rosa	16.8	9.4
Eglin Air Force Base	Florida, Okaloosa	2.8	4.5
Apalachicola National Forest	Florida, Leon	21.4	25.8
Jones Ecological Research Center	Georgia, Baker	6.5	24.9
Tall Timbers Research Station	Florida, Leon	14.7	28.4
Fort Benning Military Base	Georgia, Chattahoochee	32.0	40.6
Sandhills State Forest	South Carolina, Chesterfield	1.1	30.2
Bladen Lakes State Forest	North Carolina, Bladen	4.3	43.5
Ordway-Swisher Biological Station	Florida, Putnam	1.2	7.8
Region Averages		12.4	22.2

Regional Summary:

The regional cone crop, based on green cone counts, is **poor for 2015**, at 12.4 cones per tree. The natural variation typically seen throughout the longleaf pine range is evident in this year's data. One site in Chattahoochee County GA and one site in Leon County FL produced more than 20 cones per tree. Three sites in Escambia County AL, Santa Rosa County FL and Grant Parish LA produced between 15 and 20 cones per tree. While the remaining sampled sites produced considerably fewer longleaf pine cones per tree. It is not unusual for a large cone crop, such as that which occurred last year, to be followed by a much smaller cone crop during the subsequent year. Perhaps the trees require a year or so to recover their internal resources (i.e., photosynthate) following a year of extraordinary reproductive output (e.g., 2014).

The regional cone crop outlook, based on counts of unfertilized conelets, is also **poor for 2016**, at 22.2 cones per tree. The cone crop is forecasted to be fair at seven sites and failed at the other four sites. However, keep in mind that cone crop estimates based on counts of unfertilized conelets are less reliable than those based on counts of green cones, because of conelet losses during their first year, with often fewer than half surviving to become green cones during their second year.

The 50-year regional cone production average for longleaf pine is 28 green cones per tree. The single best cone crop occurred in 1996 and averaged 115 cones per tree. Good cone crops were observed in 1967 (65 cones per tree), 1973 (67 cones per tree), 1987 (65 cones per tree), 1993 (52 cones per tree) and 2014 (98 cones per tree). Fair or better cone crops have occurred during 50% of all years since 1966, with an increasing frequency since 1983. The reason for this increasing frequency might be related to genetic, environmental or management factors (or a combination of these). Recent analysis indicates that these more frequent better cone crops are correlated with patterns of increased variation in atmospheric temperature, during the three most recent decades. Perhaps these more frequent better cone crops are an adaptive response, to increased uncertainty that arises in a more variable environment, that is programmed into the species' genetic code (i.e., DNA), to serve as a hedge against local extinction.

Evaluating Longleaf Pine Cone Data:

Observations, concerning the natural variation in longleaf pine cone crops, and field studies, determining of the amount of seed (i.e., number of productive cones per tree) required to successfully regenerate even-aged shelterwood stands, resulted in development of Table 2.

The minimum cone crop needed for successful natural regeneration, using an even-aged management technique such as the uniform shelterwood method, is 750 green cones per acre. This assumes 30 cones per tree, with 25 seed-bearing trees per acre. Thus, cone crops classified as "fair or better" represent regeneration opportunities, for which a receptive seedbed may be prepared through application of prescribed fire during the months prior to seed fall in October.

When uneven-aged management stand-reproduction methods such as single-tree selection and group selection are being used, then "seed rain" incident on a site every year, although of variable intensity from year to year, is often sufficient for successful natural regeneration. While using selection silviculture frees one from dependency on the timing of good cone crops, it may nonetheless be useful for the manager of uneven-aged stands to be aware of cone crop quality from year to year when making management decisions.

It is also worth noting that a good deal of spatial variation occurs among longleaf pine stands across the Southern Region, relative to cone production. Therefore, even during a year with a lower overall regional average number of cones per tree, certain localities can experience substantial longleaf pine cone production. This regional report is intended as a guide, which broadly forecasts the overall status of longleaf pine cone production. Thus, we encourage forest managers to take binoculars to the field and carefully examine any individual stands in which they have an interest. In this way, they can, for those specific stands, acquire more detailed site-specific information that will aid them in making management decisions.

Table 2. Classification of Longleaf Pine Cone Crops*.

Crop Quality	Cones per Tree	Cones per Acre (on 25 trees per acre)
Bumper crop	≥ 100	≥ 2500
Good crop	50 to 99	1250 to 2475
Fair crop	25 to 49	625 to 1225
Poor crop	10 to 24	250 to 600
Failed crop	< 10	< 250

* Cones on mature trees (14-16 inches at dbh) in low-density stands (basal area < 40 $feet^2$/acre).

Study Cooperators:

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Terminology Correction:

Beginning this year, a terminology correction has been made in the longleaf pine cone crop report. Early observers used a somewhat more casual lexicon when referring to pine reproductive strobili that were counted each spring. They spoke of “flowers” and “conelets.”

In fact, pines are a member of the Gymnosperm group and have no true flowers. It is only the Angiosperm group (i.e., deciduous hardwoods, shrubs and numerous herbaceous plants) that have true flowers. What were previously called "flowers" are now more correctly called "unfertilized conelets" (or just "conelets"). By the time we count these very small conelets in April, they have been pollinated for about one month (typically during March), but not yet fertilized. It can take the pollen almost one year to grow a pollen tube from the conelet surface into the ovary to actually fertilize the conelet. A conelet will not develop into a green cone until it has been fertilized (not just pollinated). This is one reason why the reproductive cycle of pines takes a bit more than two years to complete, from strobili initiation (in August of year 1) to seed fall (in October of year 3). So, pine "flowers" are in fact and more correctly called conelets.

Early observers also casually spoke of the green cones as being "conelets" and this is where the mixed lexicon gets a bit confusing. They probably did this to distinguish the green cones from the brown cones (which they simply called "cones"). Just remember this: what were called "conelets," in previous reports, are actually "green cones."

Green cones contain the maturing seed that will be shed during October of the year during which they develop (i.e., about 6 months after we count them). When we count cones to assess the seed crop potential for the current year, we count the green cones, because only the green cones are producing viable seed for this year. Brown cones were green cones during the previous year, which shed their seed many months ago (typically 6 months earlier). So, the list of female strobili goes like this in order of development: **conelets > green cones** > brown cones.

Once the conelets are pollinated in March, they remain conelets until they become fertilized about one year later. Then these fertilized conelets grow rapidly into green cones that produce viable seed. This seed is eventually dropped in October, about 19 months after the March pollination. So to minimize future confusion, we will speak here only about **conelets** that will drop their seed <u>next</u> year and **green cones** which will drop their seed later <u>this</u> year.

- **Conelets** indicate how much production *may* happen <u>next</u> year (see Figure 1).
- **Green cones** tell you how much production will happen <u>this</u> year (see Figure 2)
- Brown cones tell you how much production occurred <u>last</u> year.

Cone Counting Methodology:

We have received many requests for the protocol used when counting cones in the field. Therefore, the following document and field data sheet are provided, in the event that you may wish to conduct your own research on pine cone production in your locale.

Figure 1. Two **conelets** on a longleaf pine branch, on either side of a bud.

Figure 2. Three **green cones** on a longleaf pine branch, as they would appear in spring.

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.

(March 11, 2015)

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) =

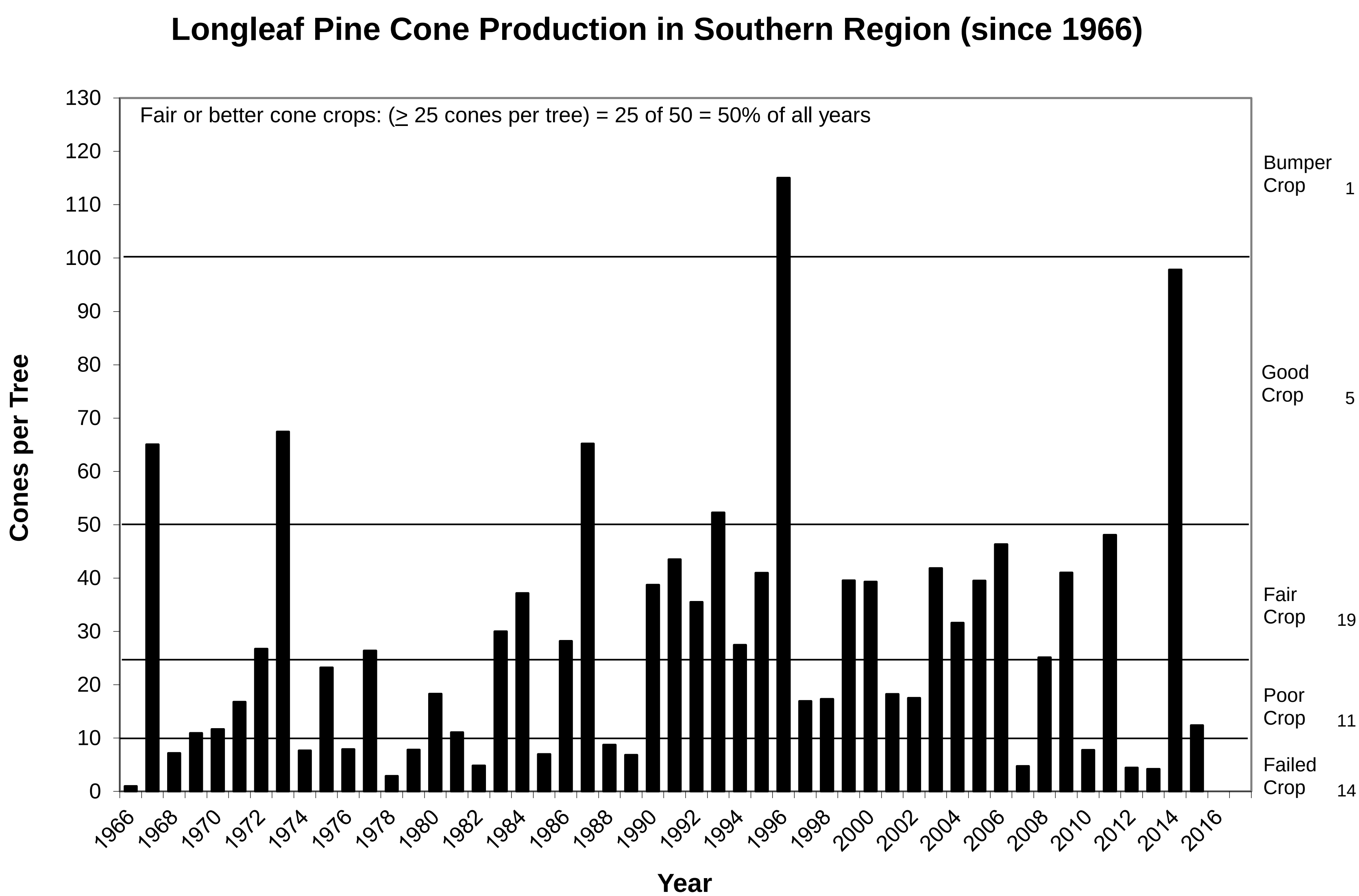
Number Per Tree =					
			last year	this year	next year

Regional and Local Summaries

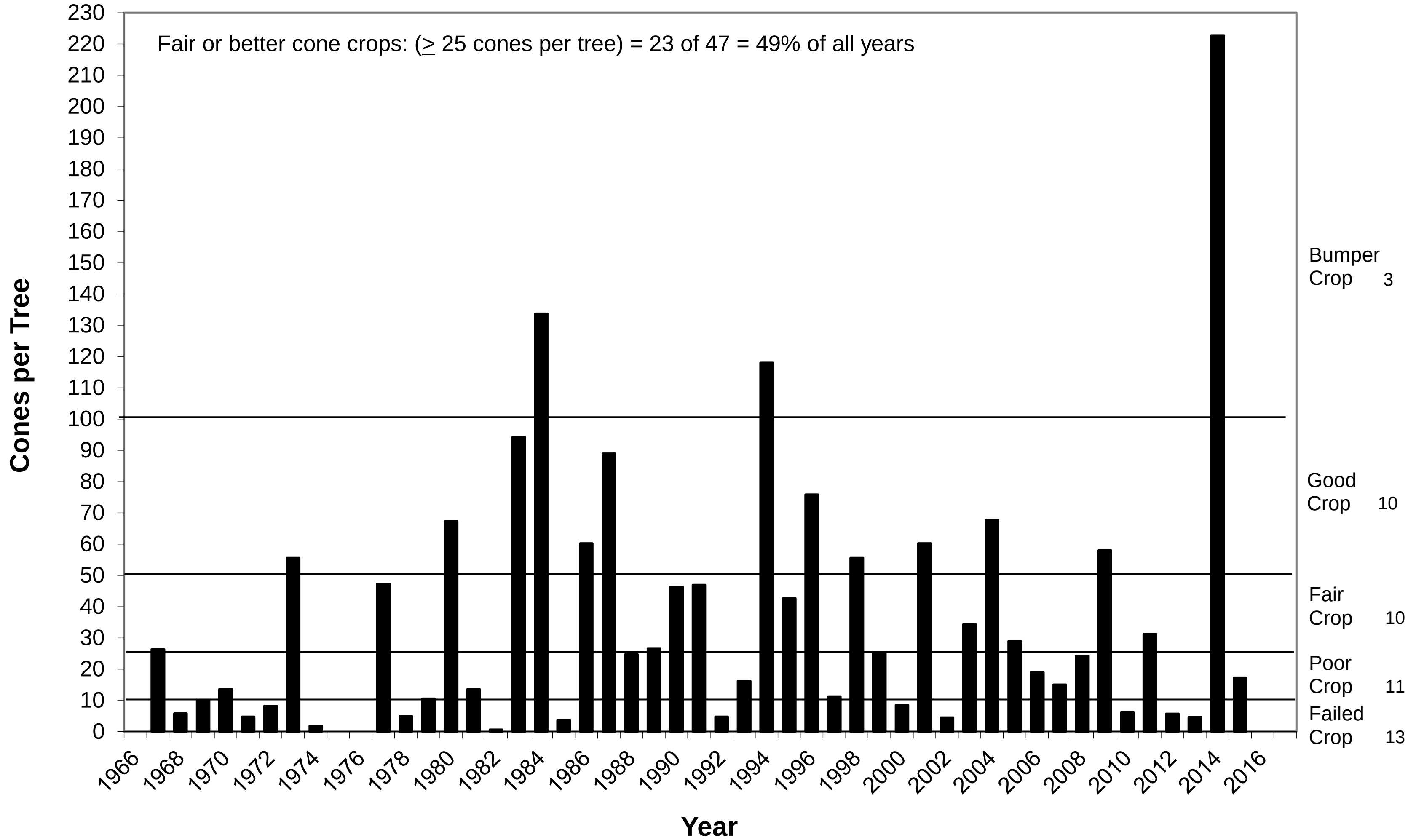
Year	**Southern Region**	LA-Kisatchie NF	AL-Escambia EF	W FL-Blackwater River SF	W FL-Eglin AFB	W FL-Apalachicola NF	SW GA-Jones Center	Red Hills-Tall Timbers	W GA-Fort Benning	SC-Sandhills SF	NC-Bladen Lakes SF	FL Pen.-Ordway-Swisher BS
1958			63.00									
1959			9.00									
1960			19.00									
1961			43.00									
1962			8.00									
1963			1.00									
1964			12.00									
1965			4.00									
1966	**0.81**		1.02			0.60						
1967	**22.95**	26.35	53.35	13.75		18.65	2.65					
1968	**7.62**	5.80	34.38	2.50	0.20	9.85	0.40				0.20	
1969	**5.73**	10.05	15.75	2.45	0.60	5.15	0.75			9.20	1.85	
1970	**4.35**	13.55	2.21	1.65	0.90	1.00	7.50			7.05	0.90	
1971	**11.04**	4.75	21.60	29.20	4.05	14.35	1.50			10.15	2.73	
1972	**11.90**	8.25	5.41	0.90	3.50	0.20	0.40			50.95	25.55	
1973	**30.50**	55.55	28.34	14.40	10.60	27.15	7.15			92.00	8.80	
1974	**6.00**	1.86	24.70	3.00	1.55	9.60	0.30			6.71	0.30	
1975	**23.23**		15.73	17.50	10.61		5.00			67.30		
1976	**7.94**		3.90	1.50	1.70	22.90	1.60			16.05		
1977	**26.42**	47.35	19.80	9.85	1.10	89.70	1.10			25.50	16.94	
1978	**2.89**	4.95	4.67	0.80	0.25	2.65	1.00			8.50	0.28	
1979	**7.81**	10.55	11.33	5.50	4.40		3.05			18.40	1.42	
1980	**18.31**	67.30	3.03	0.50	0.55		2.25			36.20		
1981	**11.10**	13.60	6.56	1.15	0.95		0.85			43.50		
1982	**4.83**	0.65	13.05	3.20	8.10		1.70			2.30		
1983	**30.03**	94.20	14.58	11.75	22.85		11.00			25.80		
1984	**37.18**	133.75	19.15	12.27	5.86		1.45			50.60		
1985	**7.01**	3.75	13.28	8.50	6.05		1.20			9.30		
1986	**28.22**	60.25	31.34	19.20	28.32		19.40			10.80		
1987	**65.22**	89.00	104.22	58.70	18.05		11.22			110.15		
1988	**8.75**	24.75	6.50	8.24			1.20			3.05		
1989	**6.87**	26.56	0.17	2.07			0.74			4.80		
1990	**38.75**	46.31	43.86	35.53			50.32			17.75		
1991	**43.50**	46.96	23.78	33.74			1.21			117.50	37.80	
1992	**35.51**	4.76	1.02	8.26		76.60	0.21			152.40	5.31	
1993	**52.27**	16.15	128.06	89.79		5.70	91.23		15.60	70.95	0.67	
1994	**27.49**	118.06	14.81	9.68	20.10	11.07	24.89			3.70	17.62	
1995	**40.97**	42.69	7.64	10.85	10.05	17.89	66.11		10.40	51.00	152.06	
1996	**115.02**	75.88	157.24	206.39	87.75	190.83	123.67		34.90	48.20	110.33	
1997	**16.95**	11.25	1.40	8.19	6.70	38.56	16.90		52.70	7.20	9.67	
1998	**17.35**	55.62	38.50	27.06	11.25	1.20	3.92		16.10	1.07	1.40	
1999	**39.55**	25.06	9.74	12.95	15.55	3.80	112.50	43.70	21.70	52.20	98.27	
2000	**39.32**	8.50	59.36	30.47	15.80	22.00	106.08	58.80	22.40	8.07	61.73	
2001	**18.26**	60.25	57.36	8.80	8.35	9.80	2.30	14.20	17.60	2.93	1.00	
2002	**17.52**	4.50	2.23	3.72	7.85	2.20	6.91	63.30	12.80	40.00	31.73	
2003	**41.85**	34.25	103.40	69.44	31.80	13.80	89.09	42.60	8.40	7.33	18.40	

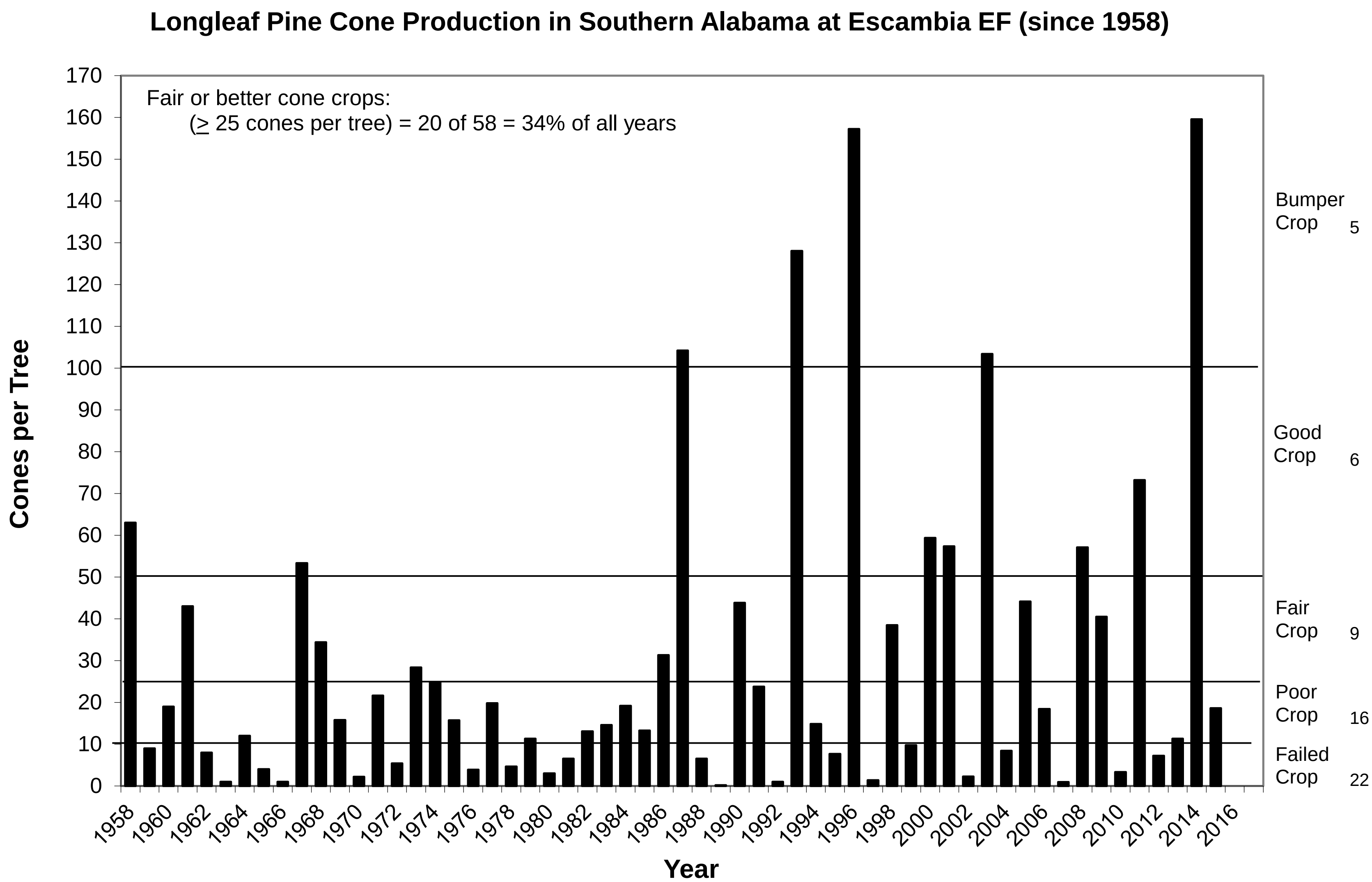
2004	**31.62**	67.75	8.41	24.90	43.56	37.90	88.91	32.80	2.40	4.53	5.00	
2005	**39.52**	28.94	44.17	23.00	57.05	36.10	117.09	26.80	21.24	37.36	3.47	
2006	**46.34**	19.00	18.41	4.10	16.85	14.00	129.18	56.80		49.93	108.80	
2007	**4.73**	15.06	0.96	0.00	0.78	2.80	5.80	2.00	15.36	0.71	3.87	
2008	**25.13**	24.25	57.13	38.60	30.16	38.40	8.55	30.60	16.20	7.00	0.40	
2009	**41.05**	58.00	40.50	31.60	14.26	6.00	65.09	20.20	81.40	55.29	38.13	
2010	**7.77**	6.25	3.30	4.00	3.74	0.80	1.64	2.60	39.80	5.57	10.00	
2011	**48.09**	31.25	73.20	141.20	65.10	32.80	66.20	7.00	38.12	18.43	7.60	
2012	**4.46**	5.75	7.24	1.00	0.60	1.80	2.36	12.14	2.24	8.14	3.33	
2013	**4.22**	4.68	11.30	2.60	1.81	0.80	0.91	1.33	12.68	3.86	2.27	
2014	**97.81**	222.80	159.81	149.00	74.90	7.00	134.36	13.56	138.48	54.10	24.10	
2015	**12.43**	17.33	18.60	16.80	2.76	21.40	6.50	14.70	32.00	1.10	4.30	1.20
2016												
2017												
Means	**28.14**	37.32	29.39	24.90	15.64	22.08	28.55	26.07	29.17	30.52	23.32	1.20
	Southern Region	LA-Kisatchie NF	AL-Escambia EF	W FL-Blackwater River SF	W FL-Eglin AFB	W FL-Apalachicola NF	SW GA-Jones Center	Red Hills-Tall Timbers	W GA-Fort Benning	SC-Sandhills SF	NC-Bladen Lakes SF	FL Pen.-Ordway-Swisher BS

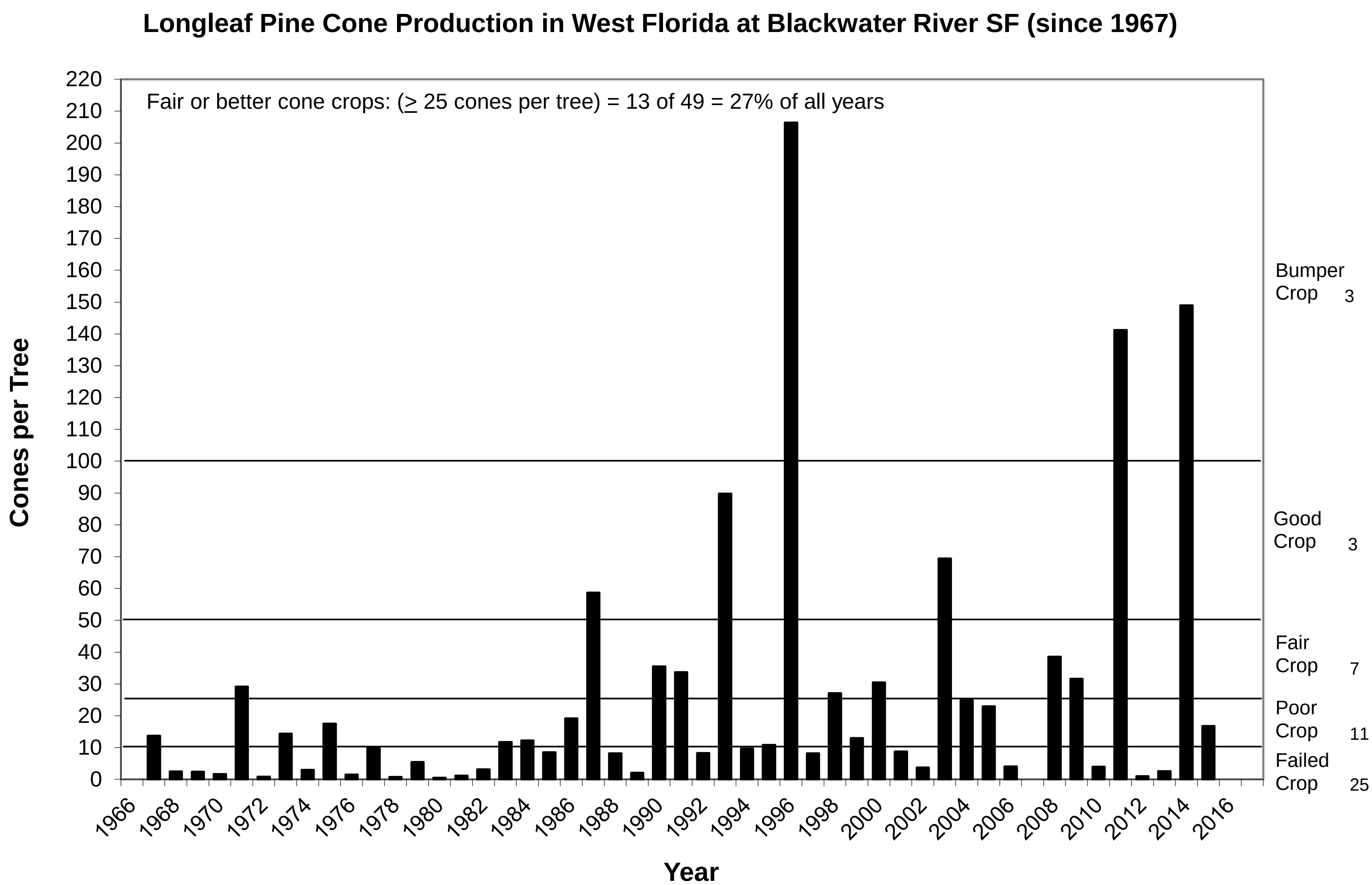
Data are the average number of cones per longleaf pine tree forecasted for the fall (late October), with estimates based on counts of **green cones** during the spring (April and May) of each year.


Longleaf Pine Cone Production in Southern Region (since 1966)
Fair or better cone crops: (≥ 25 cones per tree) = 25 of 50 = 50% of all years
Cones per Tree
Year
Bumper Crop 1
Good Crop 5
Fair Crop 19
Poor Crop 11
Failed Crop 14
0
10
20
30
40
50
60
70
80
90
100
110
120
130
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016

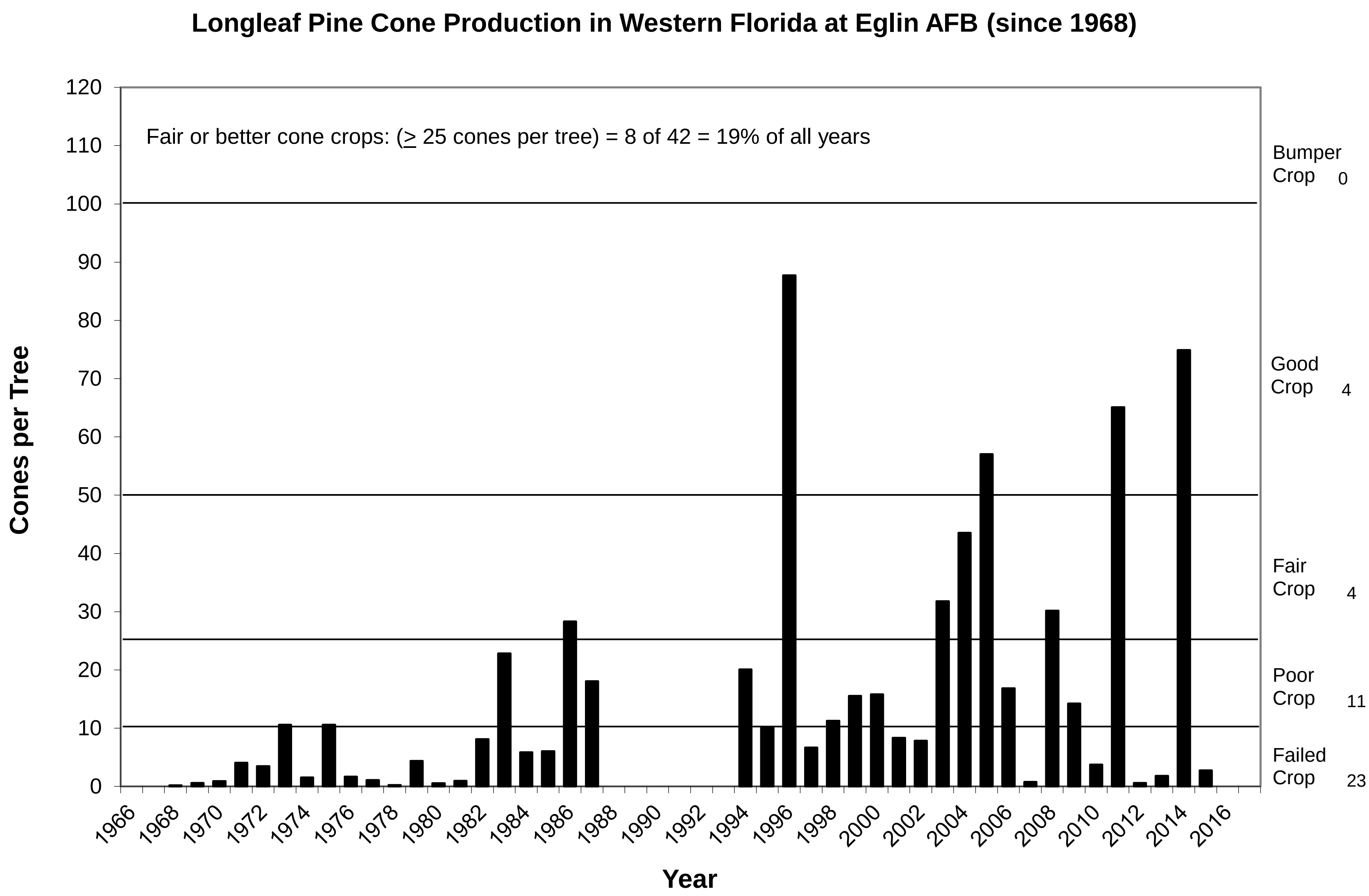
Longleaf Pine Cone Production in Louisiana at Kisatchie NF (since 1967)

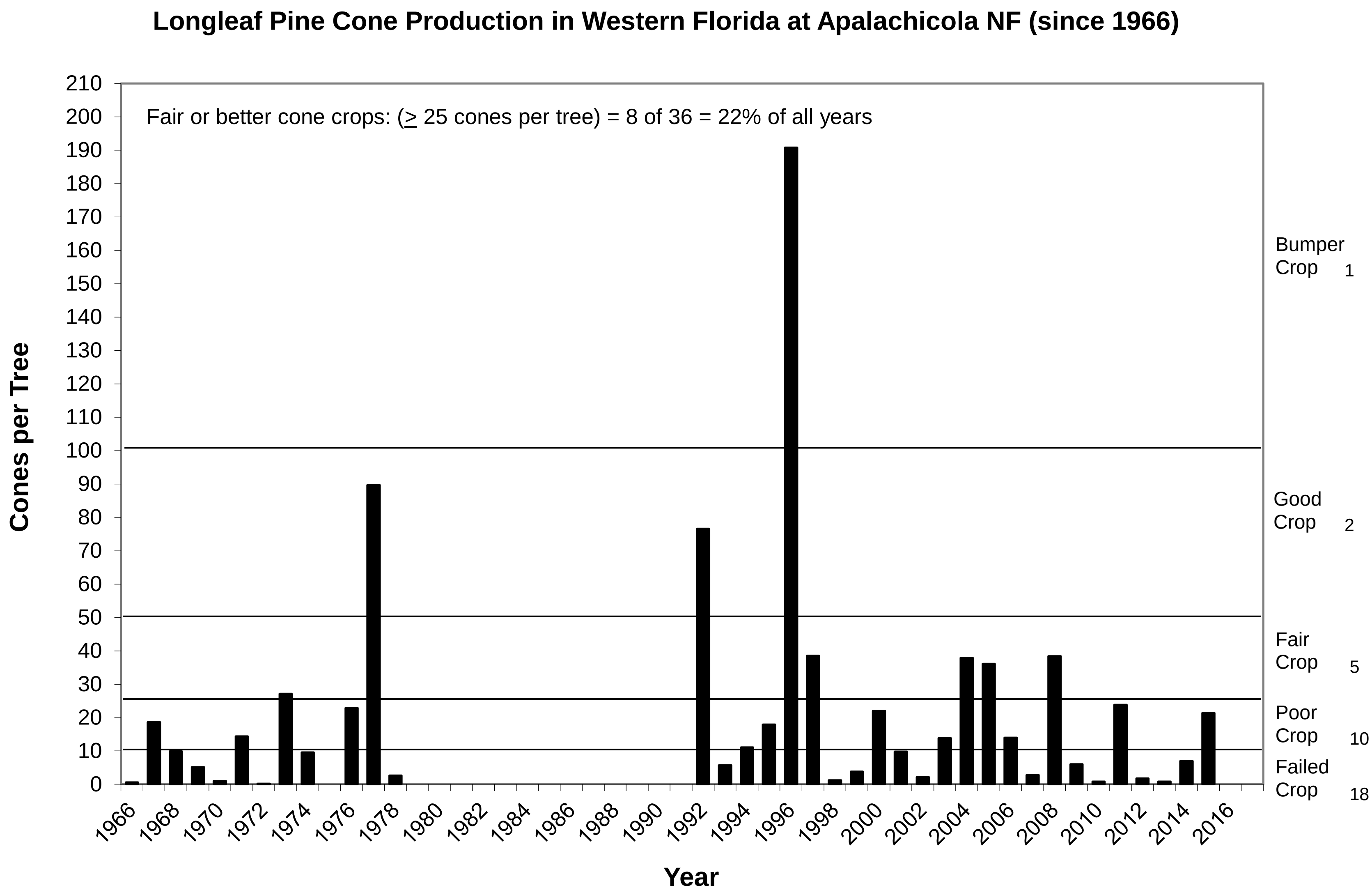


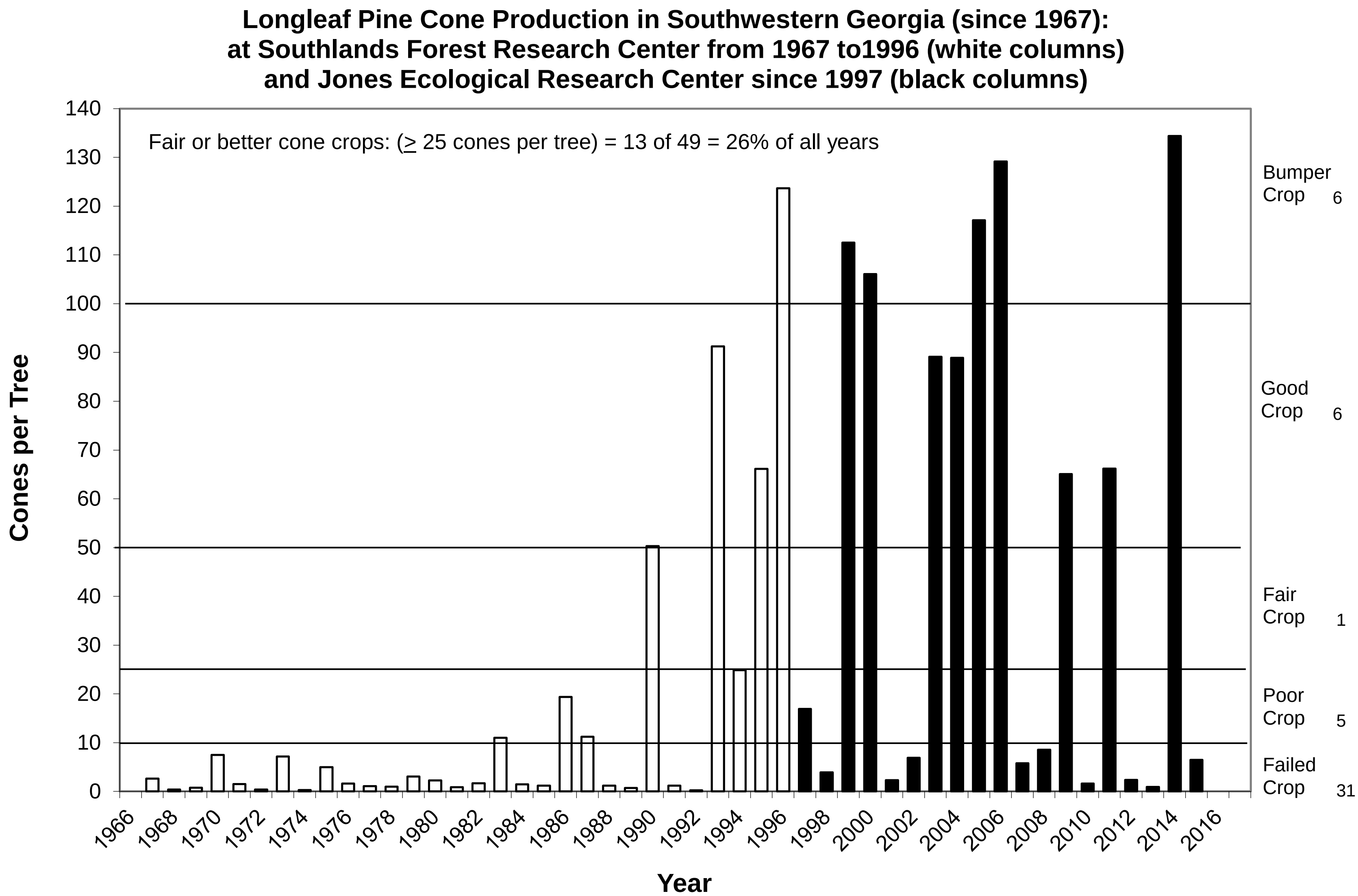

Longleaf Pine Cone Production in Southern Alabama at Escambia EF (since 1958)
Fair or better cone crops:
(≥ 25 cones per tree) = 20 of 58 = 34% of all years
Cones per Tree
Year
Bumper Crop 5
Good Crop 6
Fair Crop 9
Poor Crop 16
Failed Crop 22



Longleaf Pine Cone Production in West Florida at Blackwater River SF (since 1967)
Fair or better cone crops: (≥ 25 cones per tree) = 13 of 49 = 27% of all years
Cones per Tree
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
Year
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Bumper Crop 3
Good Crop 3
Fair Crop 7
Poor Crop 11
Failed Crop 25


Longleaf Pine Cone Production in Western Florida at Eglin AFB (since 1968)
Fair or better cone crops: (≥ 25 cones per tree) = 8 of 42 = 19% of all years
Cones per Tree
Year
120
110
100
90
80
70
60
50
40
30
20
10
0
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Bumper Crop 0
Good Crop 4
Fair Crop 4
Poor Crop 11
Failed Crop 23


Longleaf Pine Cone Production in Western Florida at Apalachicola NF (since 1966)
Fair or better cone crops: (≥ 25 cones per tree) = 8 of 36 = 22% of all years
Cones per Tree
Year
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Bumper Crop 1
Good Crop 2
Fair Crop 5
Poor Crop 10
Failed Crop 18


Longleaf Pine Cone Production in Southwestern Georgia (since 1967):
at Southlands Forest Research Center from 1967 to1996 (white columns)
and Jones Ecological Research Center since 1997 (black columns)
Fair or better cone crops: (≥ 25 cones per tree) = 13 of 49 = 26% of all years
Cones per Tree
Year
Bumper Crop 6
Good Crop 6
Fair Crop 1
Poor Crop 5
Failed Crop 31
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
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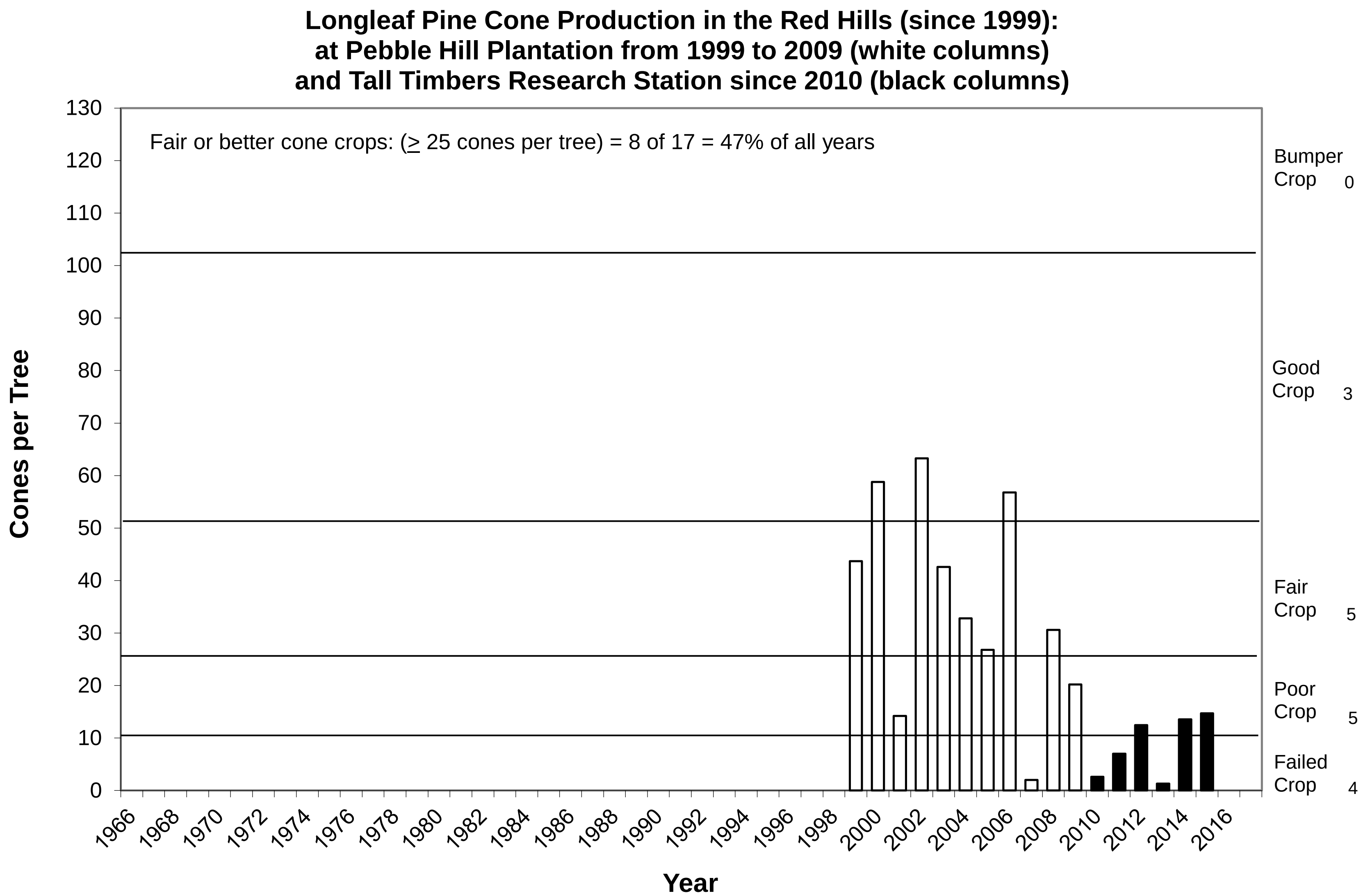
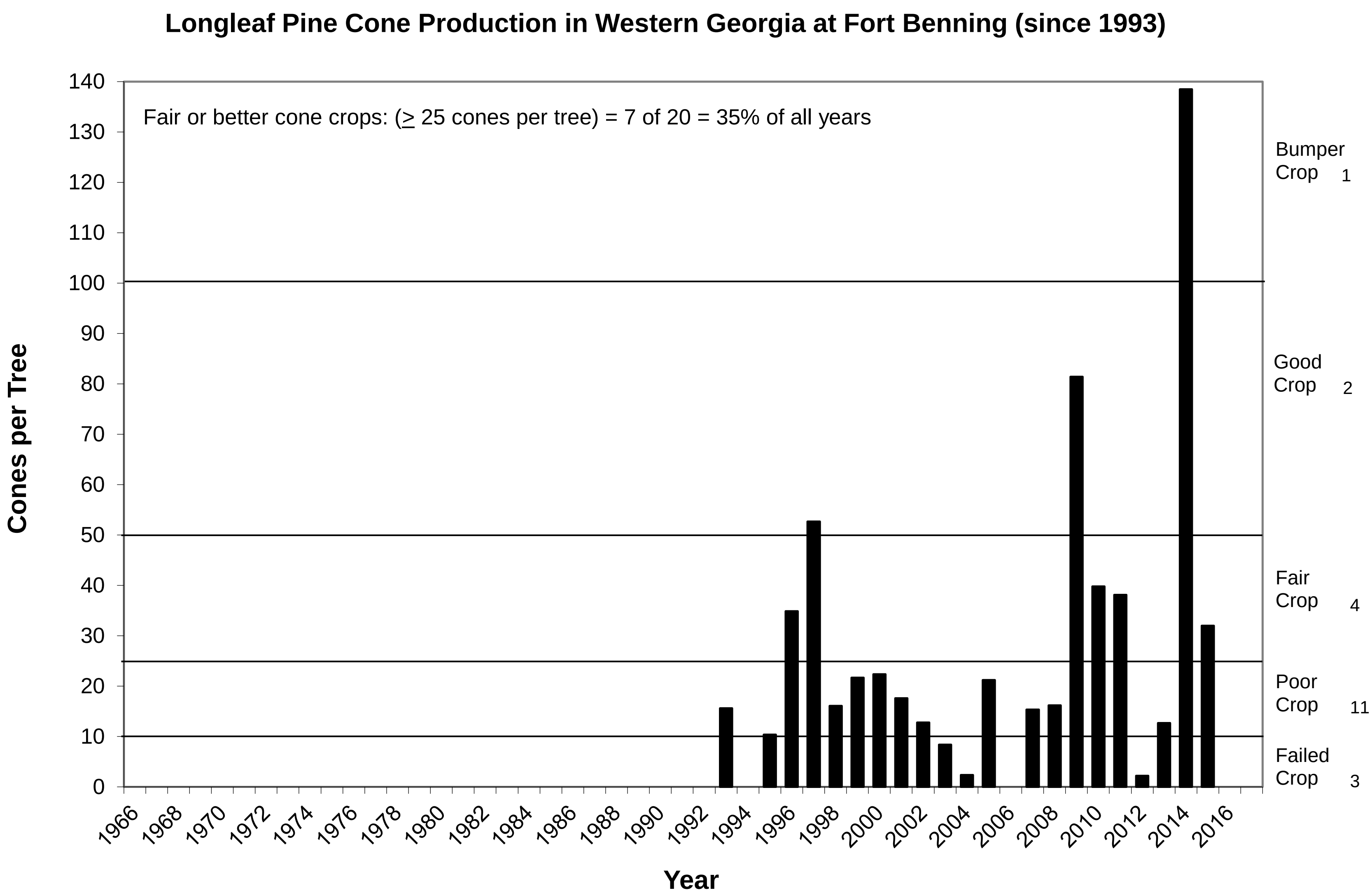
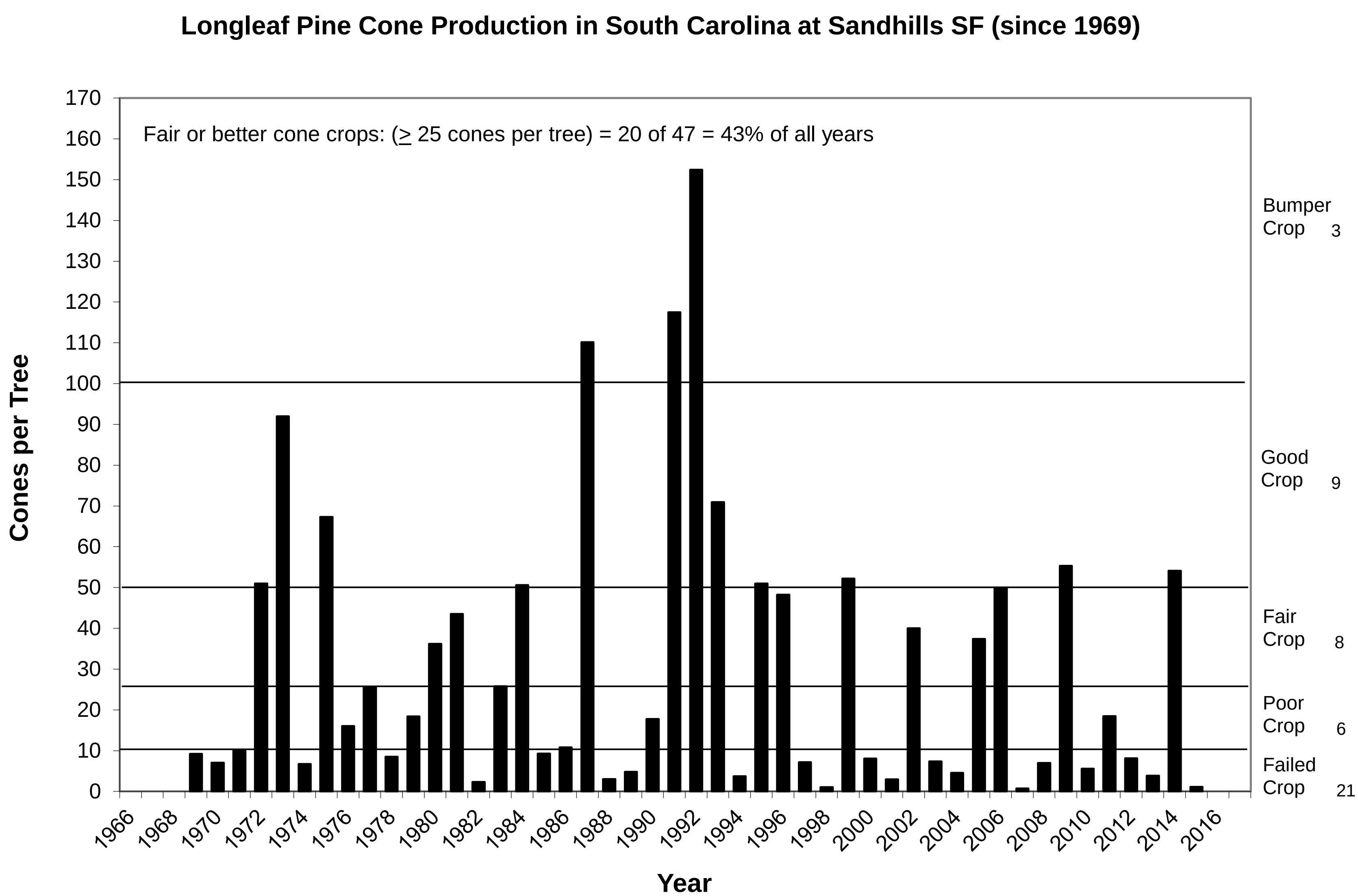
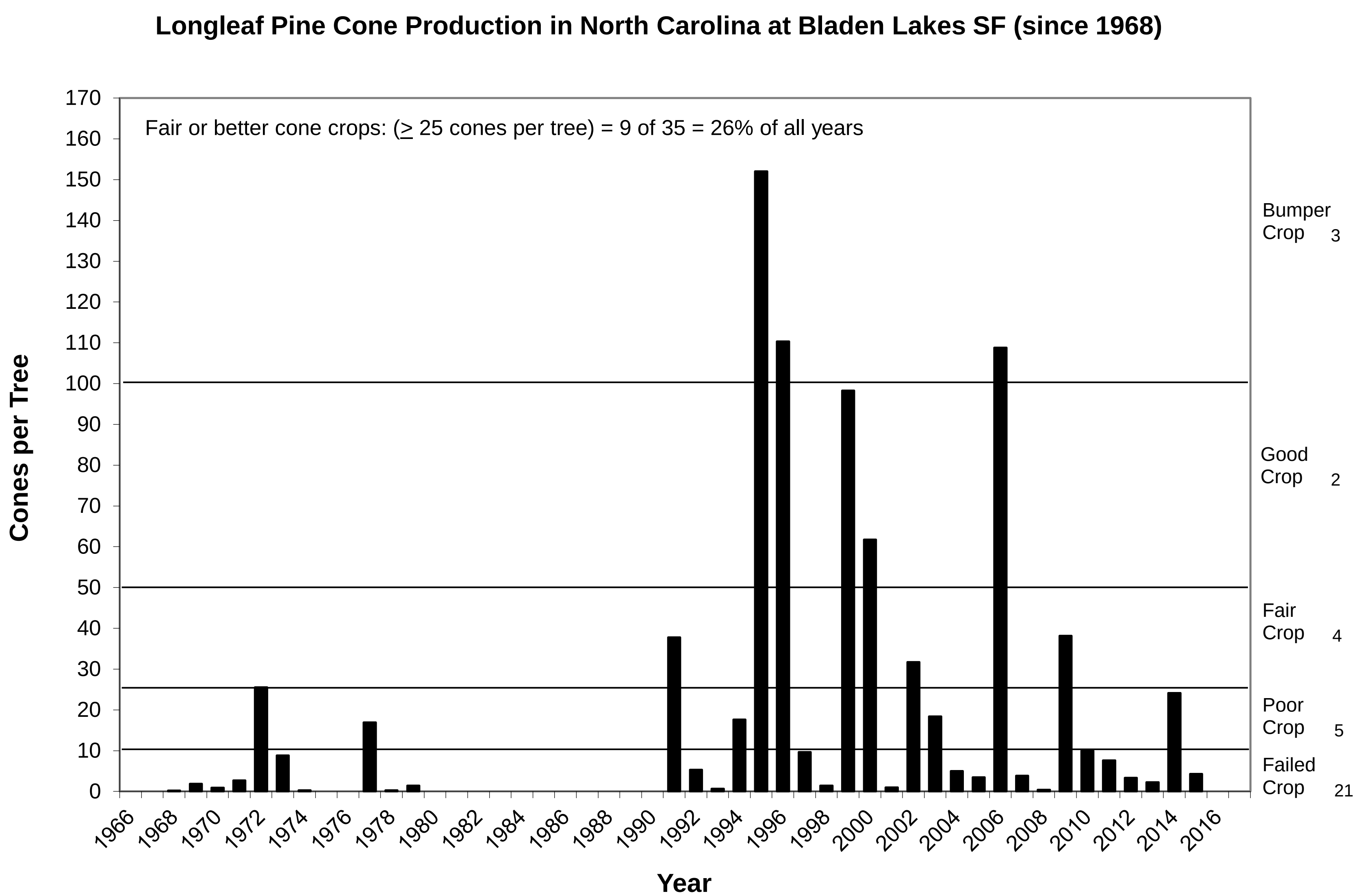
2014
2016



Longleaf Pine Cone Production in the Red Hills (since 1999):
at Pebble Hill Plantation from 1999 to 2009 (white columns)
and Tall Timbers Research Station since 2010 (black columns)
Fair or better cone crops: (≥ 25 cones per tree) = 8 of 17 = 47% of all years
Cones per Tree
Year
0
10
20
30
40
50
60
70
80
90
100
110
120
130
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Bumper Crop 0
Good Crop 3
Fair Crop 5
Poor Crop 5
Failed Crop 4


Longleaf Pine Cone Production in Western Georgia at Fort Benning (since 1993)
Fair or better cone crops: (≥ 25 cones per tree) = 7 of 20 = 35% of all years
Cones per Tree
Year
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
Bumper Crop 1
Good Crop 2
Fair Crop 4
Poor Crop 11
Failed Crop 3


Longleaf Pine Cone Production in South Carolina at Sandhills SF (since 1969)
Fair or better cone crops: (≥ 25 cones per tree) = 20 of 47 = 43% of all years
Cones per Tree
Year
Bumper Crop 3
Good Crop 9
Fair Crop 8
Poor Crop 6
Failed Crop 21



Longleaf Pine Cone Production in North Carolina at Bladen Lakes SF (since 1968)
Fair or better cone crops: (≥ 25 cones per tree) = 9 of 35 = 26% of all years
Cones per Tree
Year
Bumper Crop 3
Good Crop 2
Fair Crop 4
Poor Crop 5
Failed Crop 21

Longleaf Pine Cone Production on Florida Peninsula at Ordway-Swisher Biological Station (since 2015)