

**Hard and Soft Mast Survey Report  
Western North Carolina, Fall 2008  
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## **Hard Mast Surveys**

North Carolina Wildlife Resources Commission (NCWRC) personnel have surveyed hard mast in the Mountain Region of North Carolina since 1983. From 1983-2005, North Carolina's hard mast surveys were conducted and reported using a method developed by Whitehead (1969) with slight modifications (Wentworth et al. 1992). This same protocol was used in whole or part by Georgia and Tennessee for many years and was adopted by South Carolina in the 1990's. In an effort to reduce costs and manpower commitments, while maintaining quality data and standard methodology among neighboring states, the member states of the Southern Appalachian Black Bear Study Group (SABBSG, Georgia, North Carolina, South Carolina, and Tennessee) have long searched for an improved technique for monitoring hard mast surveys. Beginning with the 2006 survey, we are using a new protocol and formula for determining mast indices (Greenberg and Warburton 2007). The new protocol only requires simple calculation of percent crown with acorns in the field. In order to maintain consistency with the old technique, the new technique uses statistically verified equations to convert mast index values to numbers previously used with the Whitehead (1969) method. Hard mast results reported in this document utilize the techniques described in Greenberg and Warburton (2007) and are described using the scale used by our agency since 1983. Due to small sample sizes, results will no longer be reported for individual routes for hickory and beech, but overall values for these species will be reported. Sample sizes are sufficient to allow the reporting of values for both the white oak and red oak groups by route.

## **Hard Mast Overall Results**

The 2008 hard mast survey was conducted on 12 routes in western North Carolina. A total of 1,353 trees were sampled including 543 from the white oak group, 637 from the red oak group, 135 hickories, and 38 beeches. Combining all groups of species, mast was rated in the fair range with an overall index of 2.1 (Table 1). Since 1997, North Carolina has experienced eighteen years in which the hard mast index was rated as fair. White oak production (1.01) rated as poor, a decline from last year and below the long-term average of 1.85. When the white oak group is separated by species, chestnut oak production rated at the low end of poor (0.56) while white oak had an index of 1.51. Red oak production (2.40) was in the fair range, but below the long-term average (2.81) for the species. Hickory production (3.82) was in the high range of fair and above the long-term average (2.35) for the species, while beech production (4.34) was good and above the long-term average (4.19).

## **Hard Mast Survey Area Results**

As in previous years, hard mast production varied significantly by location and species (Table 2). No area that was surveyed had an overall oak index above fair; Standing Indian and Santeetlah had the highest overall oak index of 3.0 and 3.8, respectively (Table 2). Cold Mountain and Santeetlah were the only areas that had red oak indexes ranked as good, while the Nantahala area had the lowest red oak index (0.4). Santeetlah also had the highest white oak

index (2.2); Edgemont, Poplar, Sherwood and Cold Mountain had the lowest white oak index (0.4).

## **Soft Mast Surveys**

A soft mast survey was implemented during the summer and fall of 1993 to document berry production and abundance. The technique used for evaluating the soft mast survey has remained consistent throughout this period including the current year. Summer soft mast surveys have been conducted in conjunction with the Sardine Bait Station Survey (SBSS). During summer 2006, based on an agreement with the member states of the SABBSG, we did not conduct the SBSS. Review of data from the SBSS indicates that we can obtain long-term bear population trend information by conducting the survey every other year. Because of the new schedule, the summer soft mast survey will be conducted in odd years in the future. The previous survey was conducted in 2007 and the next survey will be conducted during the summer of 2009.

## **Fall Soft Mast Results**

The 2007 fall soft mast survey, which is conducted in conjunction with the hard mast survey, yielded varying results by species (Table 3). All species were above long-term averages, with cherry having the highest index (4.64) followed by grape (4.08). As usual, local areas experienced variable production of fall soft mast with levels from 0 to 9 depending on species and area (Table 4).

## **Conclusion**

This season's hard mast crop was the eighteenth year since 1997 in which the overall hard mast index was fair. While white oak production was poor, red oak and hickory was fair and beech was good. The mountain region has experienced drought conditions for two years and there were concerns about potential impacts on soft and hard mast production. However, reports from field personnel indicate that white oak mast production in lower elevations was adequate and red oak mast production in upper elevations was good. In addition, soft mast production, specifically cherry and grape, was good in several areas.

While the overall mast production was fair (2.1), staff observed good to very good hard mast production. One explanation for the difference in the index and observed field conditions is that hard mast started dropping by the time surveys were conducted. Fall mast survey protocol instructs staff to perform surveys between August 15 and September 15; during 2008, staff performed surveys between August 28 and September 4. However, field staff reported several survey spots where mast had already dropped off trees. This made measurements of the percentage of crown with acorns difficult and likely inaccurate in these survey spots. In order to improve the accuracy of the survey, a recommendation will be made to perform the surveys in August to ensure better measurements of mast production.

NCWRC and SABBSG efforts to refine and improve the mast survey technique should be continued. Furthermore, the management implications of the long-term mast survey should be examined in order to maximize the benefits of this survey in our state and regional black bear management efforts.

## LITERATURE CITED

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- Wentworth, J.M., A.S. Johnson, P.E. Hale, and K.E. Kammermeyer. 1992. Relationship of Acorn abundance and deer herd characteristics in the southern Appalachians. *Southern Journal of Applied Forestry* 16:5-8.
- Whitehead, C.J. 1969. Oak mast yields on wildlife management areas in Tennessee. Tennessee Game and Fish Commission, Nashville, USA.

Table 1. Hard Mast Survey Results for Western North Carolina, 1983-2008.

Year	White Oak	Red Oak	All Oaks	Hickory	Beech	Total
1983	1.43	2.59		1.99	5.51	2.25
1984	1.08	2.73		3.05	4.28	2.30
1985	2.01	3.66		0.80	3.06	2.80
1986	1.32	1.98		2.25	5.22	1.90
1987	1.16	0.56		3.57	5.75	1.31
1988	3.16	4.07		2.04	4.25	3.57
1989	0.43	4.89		2.78	6.44	3.14
1990	1.85	2.62		1.20	1.89	2.17
1991	2.38	1.93		3.75	6.89	2.43
1992	1.07	2.45		0.72	1.17	1.78
1993	0.65	3.58		2.43	4.77	2.48
1994	2.06	3.48		2.02	6.20	2.85
1995	2.80	5.60		2.48	0.36	4.22
1996	3.70	1.99		2.81	4.31	2.72
1997	0.53	1.79		1.17	2.35	1.29
1998	2.26	4.68		3.27	4.70	3.69
1999	3.28	2.76		2.80	6.22	3.05
2000	0.50	2.11		2.73	5.71	1.82
2001	2.83	4.92		2.88	3.97	3.98
2002	1.90	3.01		1.75	3.44	2.47
2003	1.24	0.68		3.58	5.42	1.33
2004	3.99	2.93		1.32	1.65	3.09
2005	0.70	3.11		1.86	4.30	2.14
2006	1.70	1.40	1.50*	3.20	4.10	1.80
2007	3.02	1.19	2.04*	0.73	2.71	1.90
2008	1.01	2.40	1.76*	3.82	4.34	2.06
<b>Average</b>	<b>1.85</b>	<b>2.81</b>	<b>1.77</b>	<b>2.35</b>	<b>4.19</b>	<b>2.48</b>

Numerical Rating = Crop Quality

0.0 to 2.0 = Poor      2.1 to 4.0 = Fair

4.1 to 6.0 = Good      6.1 to 8.0 = Excellent

\* Not reported for prior years.

Table 2. Hard Mast Survey Results by Area, 2008.

Area	White Oak	Red Oak	All Oaks
Avery Creek	0.9	1.7	1.3
Cold Mountain	0.4	5.0	2.8
Edgemont	0.4	1.0	0.7
Fires Creek	1.3	3.3	2.2
Harmon Den	0.7	1.6	1.1
Linville Mtn.	0.9	0.7	0.8
Nantahala	1.9	0.4	1.0
Poplar	0.4	1.9	1.3
Santeetlah	2.2	4.9	3.8
Sherwood	0.4	2.0	1.5
South Mountains	0.5	0.6	0.6
Standing Indian	2.1	3.5	3.0

Table 3. Results of Mountain Fall Soft Mast Surveys, 1993-2008.

Year	Pokeberry	Cherry Index	Grapes Index	Blackgum
1993	2.00	2.70	2.10	0.40
1994	3.10	2.00	3.80	1.70
1995	2.70	5.00	2.20	1.80
1996	2.40	1.60	3.30	1.80
1997	4.20	1.30	3.10	0.80
1998	4.63	2.67	2.80	1.50
1999	2.40	2.70	3.25	1.10
2000	2.20	2.70	3.30	1.00
2001	2.80	3.30	4.18	2.33
2002	1.10	2.45	2.73	1.27
2003	2.33	3.00	2.55	2.22
2004	1.67	2.70	3.00	1.44
2005	2.45	2.09	1.36	1.55
2006	3.73	2.00	3.17	2.50
2007	2.08	1.58	2.73	0.67
2008	2.91	4.64	4.08	2.58
<b>Average</b>	<b>2.67</b>	<b>2.65</b>	<b>2.98</b>	<b>1.54</b>

Table 4. Local Results of Mountain Fall Soft Mast Surveys, 2008.

Area	Pokeberry	Cherry	Grapes	Blackgum
Avery Creek	0	0	4	0
Cold Mountain	0	6	2	4
Edgemont	4	2	4	2
Fires Creek	6	6	9	3
Harmon Den	0	9	0	0
Linville Mtn.	2	1	2	9
Nantahala	4	6	6	0
Poplar	2	6	4	2
Santeetlah	6	9	9	6
Sherwood	2	4	6	1
South Mountains	2	0	2	4
Standing Indian	4	2	1	0
<b>Average</b>	<b>2.91</b>	<b>4.64</b>	<b>4.08</b>	<b>2.58</b>