

Hard and Soft Mast Survey Report
Western North Carolina, Summer and Fall 2007
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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.

The 2007 hard mast survey was conducted on 12 routes in western North Carolina. A total of 1,331 trees were sampled including 543 from the white oak group, 624 from the red oak group, 132 hickories, and 29 beeches. Combining all groups of species, mast was rated in the poor range with an overall index of 1.9 (Table 1). Since 1997, North Carolina has experienced five years in which the hard mast index was rated as poor. White oak production (3.02) ranked as fair, which was an improvement over last year and above the long-term average of 1.88. However, red oak production (1.19) was in the lower part of the poor range and below the long-term average (2.83) for the species. Hickory production (0.73) was poor and below the long-term average (2.29) for the species, while beech production (2.71) was fair, but still below its long-term average (4.19).

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; Fires Creek and Linville Mountain had the highest overall oak index (3.1; Table 2) compared to all other surveyed areas. The Poplar area had the highest white oak index (5.5) and the lowest red oak index (0.4). South Mountains had the lowest white oak index (0.4) while Linville Mountain had the highest red oak index (2.9).

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 2005 and the next survey was conducted during the summer of 2007 (Table 3). Summer soft mast production varied significantly on a local basis with some areas failing to produce any significant fruit of certain species while producing “fair” to “good” crops of others (Table 4). With the exception of pokeberry (1.84), this summer’s soft mast is below overall averages (Table 3), but produced varying results across different areas in the Mountain region (Table 4).

The 2007 fall soft mast survey, which is conducted in conjunction with the hard mast survey, yielded varying results by species (Table 5). All species were below long-term averages, with blackgum having the lowest index (0.67) and grape having the highest index (2.73). As usual, local areas experienced variable production of fall soft mast with levels from 0 to 6 depending on species and area (Table 6).

This season’s hard mast crop was the fifth year since 1997 in which the overall hard mast index ranked as poor. However, while red oak production ranked as poor for the second year in a row, white oak, chestnut oak and beech production ranked as fair. A late freeze occurred in late April, which likely impacted certain soft and hard mast crops. However, reports from field personnel indicate that mast production in upper elevations was minimally impacted by the freeze. In addition, four areas surveyed ranked as having good white oak production. This will offset some of the negative impacts of the poor red oak production on the mountain black bear population. 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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Table 1. Hard Mast Survey Results for Western North Carolina, 1983-2007.

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
Average	1.88	2.83	1.77	2.29	4.19	2.50

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, 2007.

Area	White Oak	Red Oak	All Oaks
Avery Creek	2.2	0.8	1.4
Cold Mountain	3.5	1.0	2.2
Edgemont	1.4	1.0	1.2
Fires Creek	4.5	1.4	3.1
Harmon Den	2.6	1.4	2.0
Linville Mtn.	3.2	2.9	3.1
Nantahala	2.9	1.8	2.1
Poplar	5.5	0.4	2.2
Santeetlah	4.4	1.7	2.9
Sherwood	4.1	0.5	1.5
South Mountains	0.4	1.2	0.7
Standing Indian	1.4	0.6	1.0

Table 3. Results of Mountain Summer Soft Mast Surveys, 1993-2007¹.

Year	Blueberry	Huckleberry	Blackberry	Pokeberry
1993	3.20	3.60	3.80	2.40
1994	3.20	3.50	3.50	1.40
1995	1.90	2.50	3.10	1.20
1996	2.00	2.00	3.40	1.50
1997	2.80	3.00	3.80	2.00
1998	1.90	1.20	3.30	2.33
1999	2.72	2.45	2.90	1.78
2000	2.70	2.72	2.99	1.64
2001	2.27	2.73	2.87	0.87
2002	1.87	2.22	3.55	1.32
2003	2.27	2.74	3.20	1.02
2004	1.67	1.61	4.25	1.41
2005	1.57	1.41	4.07	1.48
2007	2.11	1.23	2.48	1.84
Average	2.29	2.33	3.35	1.57

¹ Soft mast survey not conducted in 2006

Table 4. Mountain Summer Soft Mast Survey Results by Area, 2007.

Area	Blueberry	Huckleberry	Blackberry	Pokeberry
Daniel Boone	1.75	1.25	1.25	0.50
Fires Creek/Santeetlah	1.40	2.60	3.40	1.80
Flattop/Rich Mtn.	1.00	1.00	6.00	4.00
Harmon Den Area	1.00	0.00	4.67	0.00
Mt. Mitchell	2.00	0.50	3.25	1.00
Pisgah Area	3.25	2.00	0.50	0.00
Rich Mountain	2.00	0.00	2.00	2.00
Standing Indian	x	x	x	x
T. Chatham/Stone Mtn.	2.00	0.67	1.67	0.67
Cheoah	1.00	2.00	1.50	1.00
Chunky Gal	2.00	3.00	2.00	2.00
South Mountains	4.00	0.00	0.00	6.00
Gorges State Park	4.00	2.00	4.00	1.00
Lake James State Park	2.00	1.00	2.00	4.00
Average	2.11	1.23	2.48	1.84

Table 5. Results of Mountain Fall Soft Mast Surveys, 1993-2007.

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
Average	2.65	2.52	2.91	1.47

Table 6. Local Results of Mountain Fall Soft Mast Surveys, 2007.

Area	Pokeberry	Cherry	Grapes	Blackgum
Avery Creek	2	2	4	0
Cold Mountain	0	2	2	2
Edgemont	4	0	2	1
Fires Creek	2	4	2	1
Harmon Den	0	0	2	0
Linville Mtn.	1	1	1	3
Nantahala	4	0	2	0
Poplar	2	4	4	0
Santeetlah	2	4	6	2
Sherwood	2	0	4	0
South Mountains	2	0	-	0
Standing Indian	4	2	1	0
Average	2.08	1.58	2.73	0.67