

Surveys of Black Bear Hunters on Private Forest Ownerships in Eastern North Carolina

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Abstract: Over the past 30 years, American black bear (*Ursus americanus*; hereafter, bear) numbers have increased in eastern North Carolina. In response, the North Carolina Wildlife Resources Commission (NCWRC) set a goal to increase harvest rates of black bears on selected private lands in eastern North Carolina to manage the population. During 1993–2008, we annually surveyed leaseholders that leased hunting rights from Weyerhaeuser Company, a large landowner in this region, to better understand bear hunter and harvest dynamics. We received 1,937 surveys from 359 different leaseholders of which an average of 57% hunted bears. Approximately half of surveyed leaseholders set a minimum weight for harvestable bears and 25% limited number of bears harvested. Hunting leases that allowed bear hunting were larger in area than those that did not allow bear hunting ($P=0.01$). Year ($P=0.02$) and whether or not a hunting lease hunted bears with dogs ($P=0.01$) influenced approval of hunting bears with dogs. Most (67%) leaseholders approved of bear hunting with dogs and we recommend NCWRC take steps to maintain this tool for managing the bear harvest. Bear hunters in eastern North Carolina appear to support a minimum harvest weight larger than the current NCWRC guidelines, indicating a need to improve hunter education of the biological reasons for this regulation. Overall, leaseholders appeared supportive of bear management in eastern North Carolina. The leaseholder survey may be an effective index of bear harvest in eastern North Carolina, although further work is needed to verify this relationship. This survey also was an effective communication tool and provided valuable information on hunter attitudes and bear harvest dynamics.

Key words: American black bear, dog hunting, harvest regulations, human dimensions, hunters, hunting, hunter attitudes, North Carolina, survey, *Ursus americanus*

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American black bears (*Ursus americanus*; hereafter, bear) are a widespread and popular game species throughout North America (Pelton 1982, Pelton and van Manen 1994), including seven states in the Southeast (Pelton and van Manen 1997). Similar to other game species in the southeastern United States, bears experienced large-scale population declines due to over-hunting and habitat loss during the late 1800s to early 1900s (Pelton and van Manen 1997). Currently, North Carolina has huntable populations of bears in the western and eastern portions of the state, the latter of which contains the largest contiguous coastal bear population in the eastern United States (Jones and Pelton 2003). Additionally, although pursuing bears with dogs is legal in North Carolina, across the United States this practice is viewed unfavorably by a large proportion of the public (Elowe 1990, Vaughan and Inman 2002, Hristienko and McDonald 2007) and, in some cases, by other bear hunters (Peyton 1989). Given public opinion about hunting bears with dogs and because use of bear dogs was used by the North Carolina Wildlife Resources Commission (NCWRC) to liberal-

ize bear hunting in eastern North Carolina (see below), including maintaining bear populations below cultural carrying capacity, it is important to understand how stakeholders (i.e., hunters) perceive this hunting method.

In eastern North Carolina, much of the forest cover available to bears consists of landscapes of intensively managed pine (*Pinus* spp.) stands intermixed with small, natural, second growth timber stands (pine, mixed pine-hardwood, and bottomland hardwood). For example, within the central Coastal Plain of North Carolina (Beaufort, Craven, Pamlico, Jones, Carteret, Hyde, Tyrrell, and Washington counties), Weyerhaeuser is a dominant forest landowner with 219,799 forested hectares, primarily (89%) in intensively managed pine stands (acreage at end of 2007, Figure 1). During the early 1970s, concern was raised about the potential negative effects on black bear habitat from conversion of second growth forests to intensively managed pine stands (NCWRC, unpublished report). In response, NCWRC took a conservative approach to bear hunting in eastern North Carolina and worked with landowners to establish “bear sanctuaries” to provide safe haven and source populations of bears (Carlock et al. 1983).

1. Retired.

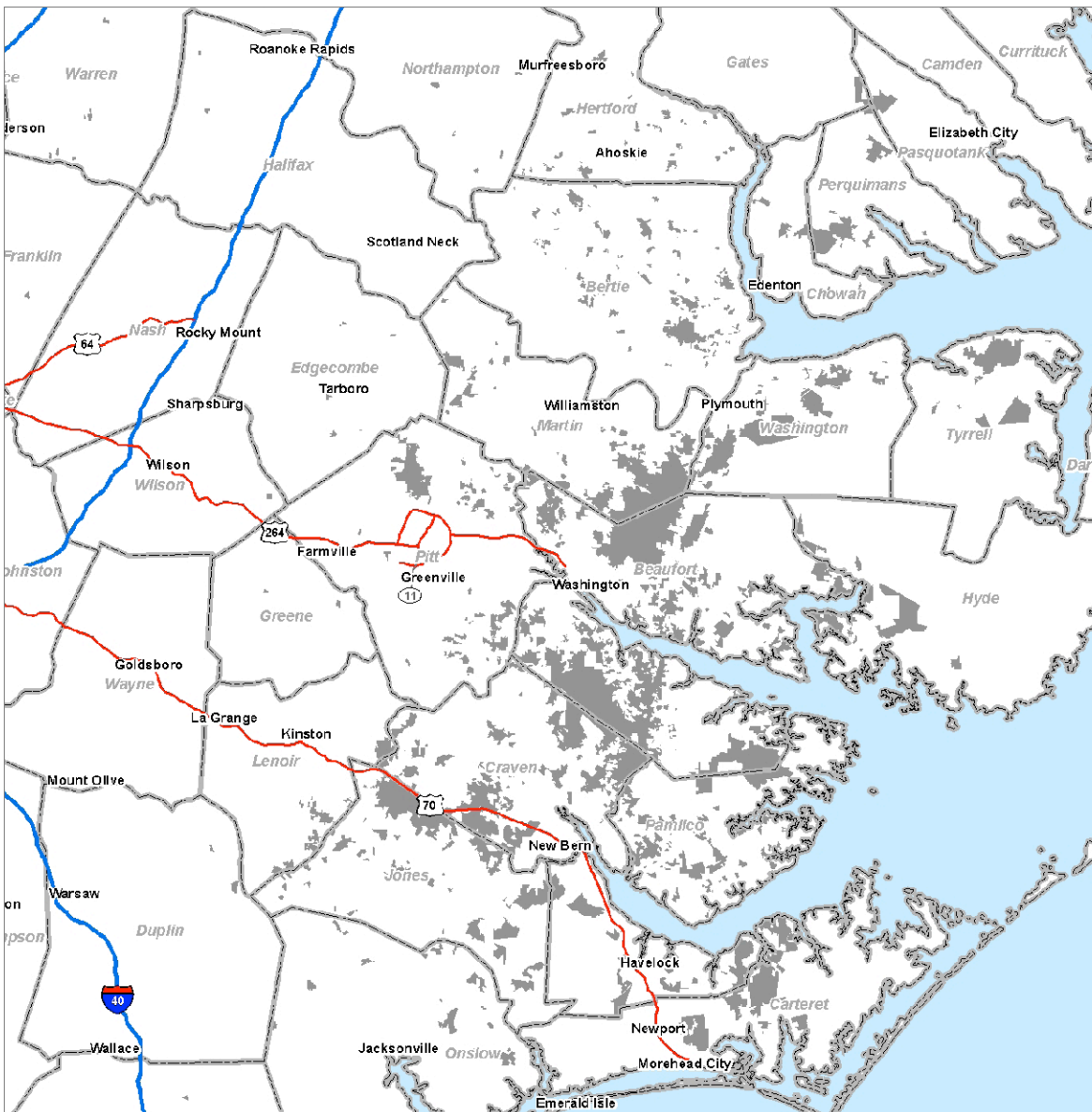


Figure 1. Eastern North Carolina with Weyerhaeuser Company ownership shaded in gray, December 2007.

As part of NCWRC efforts to manage the eastern North Carolina bear population, Weyerhaeuser Company, who leases hunting rights to hunting clubs (hereafter, leaseholders) on most of its ownership, worked cooperatively with NCWRC to establish bear sanctuaries and to regulate bear harvest on company-owned land. Prior to 1993, bear hunting was not allowed on Weyerhaeuser hunting leases. During 1993–1997, Weyerhaeuser issued bear hunting permits only to a subset of leaseholders (range of 43–68; mean 56) who were allowed to harvest bears via still hunting with a harvest quota based on recommendations from NCWRC. As the eastern North Carolina bear population increased (Figure 2), Weyerhaeuser Company, upon recommendation from NCWRC, permitted still hunting for bears by all leaseholders in counties

where bear hunting was legal during 1998–2008. Finally, Weyerhaeuser allowed leaseholders to hunt bears with the aid of dogs beginning in 2001 to further help control bear numbers.

Where bear hunting is allowed on Weyerhaeuser land, hunters must comply with all other NCWRC regulations regarding bear hunting. This includes (1) a one bear/person/season limit; (2) hunting within a season framework that generally begins the second Monday in November for six days and then opens again for two weeks in mid December; (3) hunting only in eastern North Carolina counties with a bear season (Beaufort, Bertie, Carteret, Chowan, Craven, Duplin, Gates, Halifax [1998 and later], Hertford [1995 and later], Martin [1995 and later], Northampton [1998 and later], Onslow, Pamlico, Pasquotank, Perquimans [2006 and

later], Surry [portions open 1995 and later], Tyrrell, and Washington); (4) not harvesting bears < 23 kg (designed to protect cubs; enacted in 1995); and (5) not harvesting bears using salt or bait (illegal since 1986).

Because it was unclear how leaseholders (hunters) and bear harvest responded to these regulation changes on Weyerhaeuser lands leased for hunting, our objective was to use a survey of leaseholders to better understand attitudes of black bear hunters and characteristics of black bear hunting on Weyerhaeuser lands, including use of dogs for bear hunting. Additionally, we assessed ability of these surveys to index bear harvest in eastern North Carolina.

Methods

We developed a survey that was sent annually (1993–2008) to the primary leaseholder contact immediately at the end of bear hunting season with a requested return date at the end of January. Many of these leaseholders leased non-Weyerhaeuser lands along with Weyerhaeuser company lands as part of their hunting concession.

Because our survey was only sent to the leaseholder contact, our results may not be reflective of the entire lease membership. We sent only one survey, with no follow-up reminders. During 1993–1997, we sent this survey to all leaseholders that Weyerhaeuser permitted to hunt bears. During 1998–2008, when policy changed to allow all leaseholders to hunt bears, we sent surveys to all leaseholders, including those that leased land in counties without a bear season. Survey questions were the same throughout the study period with a few exceptions (Appendix).

We used simple, descriptive statistics to summarize annual survey results. We calculated bear harvest per hectare of leased land and survey return rate. We examined data primarily by year with the understanding that many of the same leaseholders responded in multiple years. However, given that individual responses by leaseholder may have changed over time, we included all survey responses in each year. We subjectively examined responses to the “Comments” section of the survey (Appendix) to gauge hunter attitudes toward bear hunting and harvest regulations where appropriate.

We tested leaseholder responses to two survey questions. First, we examined the null hypothesis that there was no relationship between leaseholders that permitted bear hunting to number of leased hectares or survey year. Due to the change in Weyerhaeuser policy regarding which leases could hunt bears, we tested this hypothesis within two different survey periods (1993–1997 and 1998–2008). Second, we tested the null hypothesis that approval by leaseholders to use of dogs for bear hunting on their lease was not related to (1) hectares leased, (2) whether or not the lease permit-

ted hunting bears with dogs, (3) whether or not the lease permitted bear hunting, (4) year, or (5) year by hectare interaction. We only included data beginning in 2001 for these analyses because this was the first year Weyerhaeuser allowed dogs for bear hunting on all leases. We tested these hypotheses using logistic regression in PROC GLIMMIX in SAS (SAS Institute, Inc., Cary, NC) with a binary response variable (approval or disapproval of bear hunting) and independent variables entered as either binary or continuous variables. Because leaseholders responded to the survey in multiple years, we used each hunting lease as a covariate to group responses by leaseholder. We used Type III sum of squares due to unequal sample sizes.

To examine possibility of using these surveys as an index of bear harvest in eastern North Carolina, we examined the correlation between leaseholder's reported total harvest and harvest per hectare based on leaseholder responses (1993–2008) and registered total harvest in eastern North Carolina, obtained from NCWRC, during the same years. Harvest per hectare in eastern North Carolina was available during 1999–2008. Therefore, we also compared leaseholder harvest data with bear harvest per hectare in North Carolina during these years. All statistical tests were deemed significant at an alpha level of 0.05.

Results

We surveyed 359 different hunting leases and received 1,937 useable surveys with a mean annual response rate of 55% and a range of 34% (2008) to 78% (1993; Table 1). Note that not all leaseholders existed in all years. Mean area leased within a year varied from 1,263 ha (2008) to 2,482 ha (1994) and individual lease sizes ranged from 1.2 ha to 16,194 ha (Table 2). Surveyed lease holders hunted on a combined number of hectares (both lands owned by Weyerhaeuser and other landowners) that ranged from 39,480 ha (1993) to 321,462 ha (2005). Across all years, an average of 57% of leases within counties where bear hunting was permitted hunted bears. During 1993–1997, when surveys were only sent to leaseholders that held bear hunting permits, bears were hunted on an average of 75% of leases. During 1998–2008, a mean of 63% of leases allowed bear hunting with most years ranging from 46%–60%. However, ≥99% of leases permitted bear hunting during 1999 and 2001 (Table 1).

Approximately half of the leaseholders each year set a minimum weight for bears permissible to harvest that varied from 23 to 350 kg (Table 1). Approximately 25% of leaseholders per year set a limit on number of bears that could be harvested per year on individual leases, ranging from zero to 16. Other leaseholders developed additional limits on bear harvest including such rules as “not excessive,” one per member per year, one per member per

Table 1. Results from annual surveys of black bear hunting for hunting leaseholders on Weyerhaeuser Company land in eastern North Carolina, 1992–2006. Sample size (n) is number of surveys returned and “Hunted bears” indicates proportion of leases that allowed bear hunting in counties and leases open for bear hunting. “Harvest rules” includes proportion of leases that set a minimum bear size for harvest and proportion of leases that set a limit on number of bears harvested. “Data to NCWRC” indicates proportion of leases that voluntarily reported harvested bears to the North Carolina Wildlife Resources Commission. Proportions are relative to number of respondents answering the survey questions. During 1993 to 1997, surveys were sent to all hunting leases that were given a permit to hunt bears on Weyerhaeuser land in counties with a bear season. During 1998–2008, a survey was sent to every hunting lease.

Year	n	Survey return rate ^a	Bear harvest statistics			Harvest rules		Data to NCWRC ^e
			Hunted bears	Harvest ^b	Hectares per harvest	Minimum weight (kg) ^c	Limit on bear harvest ^d	
1993	29	78% (37)	0.60	12 (4)	3,093	N/A	N/A	N/A
1994	29	46% (63)	0.82	23 (8)	2,091	N/A	N/A	N/A
1995	32	50% (64)	0.77	21 (6)	2,622	N/A	N/A	N/A
1996	21	47% (45)	0.81	8 (1)	1,096	N/A	N/A	N/A
1997	26	38% (68)	0.73	18 (17)	2,519	N/A	N/A	N/A
New Weyerhaeuser hunting lease policy—all leases allowed to bear hunt in counties with bear season								
1998	177	59% (300)	0.56	90 (37)	1,820	0.47 (92; 34 – 181)	0.25 (91; 1 – 16)	0.70 (40)
1999	85	58% (147)	0.99	107 (49)	1,418	0.35 (79; 45 – 181)	0.20 (80; 1 – 6)	0.50 (56)
2000	175	56% (313)	0.46	108 (48)	1,266	0.49 (75; 45 – 295)	0.28 (76; 0 – 6)	0.63 (46)
New Weyerhaeuser hunting lease policy—allowance for hunting bears with dogs								
2001	95	56% (170)	1.0	207 (123)	812	0.45 (95; 45 – 350)	0.28 (93; 1 – 8)	0.72 (88)
2002	121	38% (318)	0.57	104 (65)	1,744	0.54 (65; 23 – 181)	0.29 (63; 1 – 5)	0.71 (59)
2003	223	71% (314)	0.55	181 (95)	1,727	0.45 (98; 23 – 181)	0.21 (98; 0 – 12)	0.79 (90)
2004	198	63% (314)	0.52	165 (92)	1,480	0.48 (96; 45 – 227)	0.18 (95; 1 – 15)	0.79 (98)
2005	242	76% (318)	0.57	160 (82)	1,969	0.52 (93; 23 – 181)	0.26 (93; 0 – 12)	0.76 (96)
2006	164	52% (315)	0.57	155 (79)	1,349	0.48 (87; 45 – 227)	0.22 (87; 0 – 15)	0.76 (89)
2007	196	58% (339)	0.57	194 (103)	1,288	0.63 (102; 45 – 227)	0.27 (103; 1 – 10)	0.63 (68)
2008	124	34% (367)	0.60	148 (81)	1,041	0.51 (67; 68 – 159)	0.18 (69; 1 – 8)	0.64 (53)

a. Parenthetical value is number of surveys sent.

b. Harvest on all leased land; parenthetical value is bears harvested on Weyerhaeuser owned land.

c. Parenthetical values are number of respondents that answered the question and range of minimum sizes (kg).

d. Parenthetical values are number of respondents that answered the question and range of maximum bag limits for bears.

e. Parenthetical values are number of respondents that answered the question.

every other year, two per day on the lease, etc. By comparison, NC-WRC’s regulations restrict the season bag limit to one bear per hunter per year. Also, 228 responses (25% of 920 survey responses) listed “other rules” for bear harvest (e.g., no hunting with dogs, hunting restricted to certain days or parts of hunting leases, no small bears, etc.).

During 1993–1997, hunting leases that permitted bear hunting were larger in area ($n=99$; mean = 2,391 ha; SE = 169 ha) than leases that did not permit bear hunting ($n=33$; mean = 1,409 ha; SE = 145; $F_{1, 49} = 6.39$, $P=0.01$), but we did not detect a year effect ($F_{1, 49} = 0.02$, $P=0.89$). Similarly, during 1998–2008, hunting leases that allowed bear hunting ($n=929$) were larger in area (mean = 1,813 ha SE = 53 ha) than leases that did not hunt bears ($n=722$; mean = 928 ha, SE = 45; $F_{1, 1299} = 33.7$, $P<0.001$) but did not vary by year ($F_{1, 1299} = 0.93$, $P=0.34$). We used 483 surveys to examine factors affecting a leaseholder’s approval of using dogs to hunt bears; 325 approved of using dogs and 158 did not. We found that hectares in a hunting lease ($F_{1, 311} = 0.10$, $P=0.75$), and whether or not clubs chose to hunt bears ($F_{1, 311} = 0.37$, $P=0.54$) did not impact a hunting leases’ approval to hunt bears with dogs. The interaction between year and size of the lease holding did not differ ($F_{1, 311} = 0.10$, $P=0.75$). However, year ($F_{1, 311} = 9.62$, $P=0.002$)

Table 2. Number (n), size (ha), and total hectares (Total) of hunting leases on Weyerhaeuser Company land encompassed in annual bear hunting surveys in eastern North Carolina, 1993–2008. Sample size (n) is number of surveys returned with hectares reported. Size includes both Weyerhaeuser and non-Weyerhaeuser land within hunting leases. During 1993 to 1997, surveys were sent to all hunting leases that were given a permit to hunt bears on Weyerhaeuser land in counties with a bear season. During 1998–2008, a survey was sent to every hunting lease.

Year	n	Hunting lease size (ha)			Total (ha)
		Mean	Minimum	Maximum	
1993	29	1,361	217	3,821	39,480
1994	27	2,482	311	6,883	67,025
1995	31	2,189	202	8,097	67,863
1996	21	2,306	405	5,668	48,419
1997	25	2,465	220	6,073	61,616
1998	177	1,346	25	10,121	238,304
1999	84	1,821	75	7,287	152,965
2000	168	1,475	16	16,194	247,853
2001	95	1,769	40	8,097	168,057
2002	116	1,569	12	7,287	181,994
2003	216	1,330	12	7,287	287,381
2004	183	1,366	12	9,716	249,944
2005	235	1,368	10	7,287	321,462
2006	160	1,318	15	7,287	210,860
2007	191	1,308	1.2	7,145	249,863
2008	122	1,263	4.5	7,145	154,093

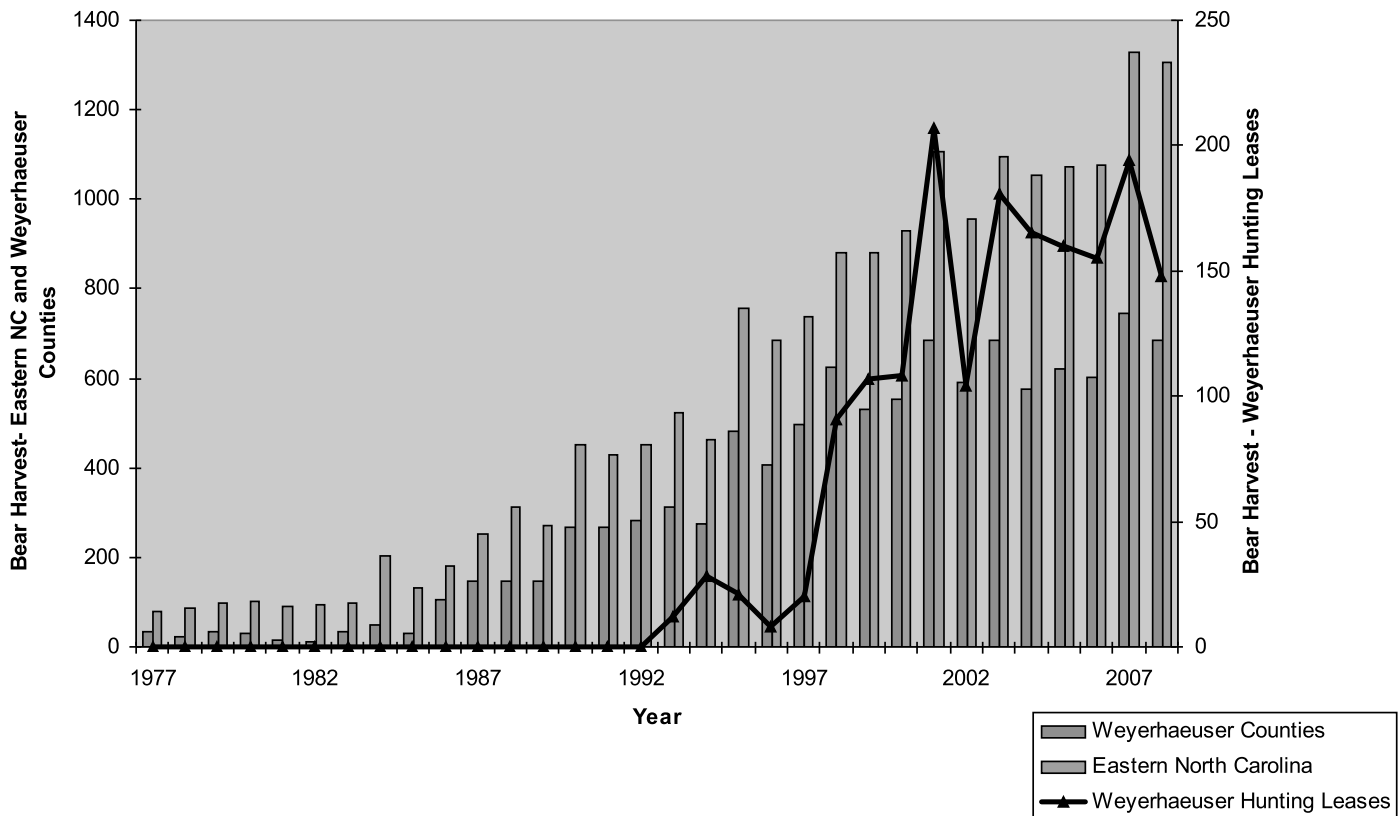


Figure 2. Number of black bears harvested (1) as reported in hunting lease surveys (2) in an eight-county area (Beaufort, Craven, Pamlico, Jones, Carteret, Hyde, Tyrrell, and Washington counties) of eastern North Carolina where Weyerhaeuser is a large landowner, and (3) total number of bears harvested in eastern North Carolina, 1977–2008. Total bear harvest and bear harvest in Weyerhaeuser counties data are from North Carolina Wildlife Resources Commission. Dog hunting was allowed on Weyerhaeuser lease holdings beginning in 2001.

influenced dog hunting approval, and those leases that did not allow dog hunting were less likely ($F_{1,311} = 6.43$, $P = 0.01$) to approve use of dogs. During 2001–2006, between 44% and 48% of clubs approved of hunting bears with dogs; however, during 2007 and 2008, this percentage increased to 79% and 78%, respectively.

Bear harvest on hunting leases increased throughout the study period with the least number of bears taken during 1996 ($n = 8$) and the most taken during 2001 ($n = 207$). Similarly, total harvest in the coastal region increased during our study from 524 bears in 1993 to 1,305 bears in 2008 (NCWRC, unpublished data; Figure 2). Prior to our study, bear harvest in eastern North Carolina increased from 79 in 1977 to a high of 453 in 1992 (NCWRC, unpublished data; Figure 2). Bears harvested per hectare ($r = -0.69$; $P = 0.003$) and total bears harvested ($r = 0.89$, $P < 0.001$), as reported in hunting lease surveys during 1993–2008, were correlated with the total bear harvest in eastern North Carolina. However, during 1999–2008, total bears harvested ($r = -0.44$, $P = 0.19$) and bears harvested per hectare on hunting leases ($r = 0.17$, $P = 0.65$) were not correlated with reported bear harvest per hectare in coastal North Carolina.

Discussion

Our survey response rate was high especially considering that surveys were only sent one time without any follow-up reminders. We speculate this finding reflected strong interest by leaseholders in the black bear resource and perhaps leaseholders felt that this was their opportunity to influence bear management decisions. However, we recognize that we did not assess non-response bias which may have affected our conclusions. A review of the open-ended “comments” section revealed that, for the most part, leaseholders were satisfied with Weyerhaeuser and NWRC’s bear management program. Additionally, a majority of leaseholders ($\bar{x} = 69\%$) voluntarily reported bear harvest to NCWRC, possibly indicating a desire to assist the agency with bear management decisions. This conclusion is supported by Palmer (2006) who found that 72% of North Carolina bear hunters supported NWRC’s bear management.

Palmer (2006) found that 81% of North Carolina bear hunters disapproved of harvesting bears that weighed <45 kg. By region, hunters in the Coastal Plain (66%) were more likely than hunters

in western North Carolina (54%) to strongly disapprove of harvested bears <45 kg. Approximately half of the leaseholders in our study set minimum bear sizes and others adopted additional rules to avoid taking “small bears.” Approximately 10% of responses indicated dissatisfaction with the North Carolina regulation allowing harvest of bears weighing as little as 23 kg. However, NCWRC data indicates size restrictions may not provide the results expected by hunters (i.e., increased recruitment of bears by protecting smaller animals) and may actually result in increased harvest pressure on breeding females while reducing harvest of young males (NCWRC, unpublished data). In light of these results, NCWRC should consider educating hunters on the biological and social implications of implementing further size restrictions on bear harvest.

During 1993–2008, the only variable that impacted a leaseholder’s decision to hunt bears on their lease was size of the lease holding, with larger leases more likely to permit bear hunting. We believe this may be partially due to the perception that harvest opportunity for bears is greater on larger leases. Based on respondent comments, it appears that many smaller leaseholders did not feel they had a sufficient number of bears on their lease to warrant hunting. Many of these leaseholders commented that they would in fact enjoy the opportunity to hunt bears. We suggest further investigation into whether this relationship is warranted and whether there are opportunities to create “bear hunting cooperatives” among adjoining leaseholders to increase bear harvest opportunities for smaller lease holdings. This may become more important as it appears leaseholder size generally decreased during the course of our study (Table 1).

Not surprisingly, leaseholders who hunted bears with dogs were more likely to approve of this hunting method. This is consistent with the survey of North Carolina bear hunters by Palmer (2006). We hypothesized that area of hunting leases may impact approval of dog hunting as it is generally accepted that larger, contiguous hunting areas are more conducive to pursuing bears with dogs. However, this factor and a leaseholder’s decision whether or not to hunt bears did not impact views on hunting bears with dogs. This may indicate a general acceptance of using dogs to hunt bears among surveyed leaseholders. We did find that leaseholders were much more likely to approve of bear hunting with dogs (>78%) during the last two years of the survey (2007–2008) than during the first five years (44%–48%). We believe three factors may have influenced this result. First, the early perception among many leaseholders was that hunting bears with dogs would cause declines in bear populations and reduce success rates for still hunters, which did not occur (Figure 2). Second, bear hunting was new to eastern North Carolina bear hunters on Weyerhaeuser land, which may have led to uneasiness about this “new” technique. Addition-

ally, it is possible bear hunters were gradually recruited to hunting bears with dogs.

Overall, use of dogs to hunt bears is a controversial topic among the general public and bear hunters. It is commonly perceived that hunting bears with dogs is unethical due to fair chase, trespass, and bear trauma issues (Peyton 1989, Elowe 1990, Hristienko and McDonald 2007). However, data from Michigan (Peyton 1989) and Virginia (Vaughan and Inman 2002) suggest that dog hunters experience similar success rates as still hunters and there is no evidence of trauma to bears pursued by dogs but not harvested. In North Carolina, 62% of bear hunters support hunting bears with dogs (Palmer 2006). Similarly, 67% of leaseholders in our study approved of hunting bears with dogs. Given that hunting bears with dogs is generally accepted by bear hunters and appears to have been effective in helping to meet bear management goals in eastern North Carolina, NCWRC may consider an effort to educate the public and hunters (approximately one-third of hunters do not approve of dog hunting) about bear hunting with dogs to maintain the ability to use this management tool.

The increase in both number of leaseholders who hunted bears (with and without dogs; 100%) and number of bears harvested (207) during 2001, the first year dog hunting was allowed on Weyerhaeuser hunting leases, is of interest. A similar increase in leaseholders who hunted bears (99%) was also observed during 1999 without a clear reason why this occurred. Additionally, the increased hunting effort during 1999 did not translate into increased bear harvest. Initially, it was thought among NWRC and Weyerhaeuser biologists that the increase in bear harvest during 2001 was due solely to increased hunting success via use of dogs. However, as indicated above, use of dogs to hunt bears does not necessarily translate into greater harvest rates. The increased harvest was likely simply due to increased harvest effort during 2001 which may have occurred because leaseholders perceived bear numbers were high due to liberalization of bear hunting regulations (i.e., hunting with dogs permitted). However, the number of leaseholders that reporting they hunted bears declined substantially and was close to the average rate during 2002 (Table 1). Thus, it is unclear why the number of leaseholders who hunted bears increased so dramatically during 1999 and 2001.

The annual harvest metrics of the leaseholder surveys may provide an effective index of bear harvest in eastern North Carolina. Bear harvest per hectare and total bear harvest, as reported on returned surveys, was highly correlated with total bear harvest in eastern North Carolina, based on NCWRC records. However, harvest metrics from the survey were not related to bear harvest per hectare in eastern North Carolina. This may be because a significantly larger proportion of land was hunted within the Weyer-

haeuser leases as opposed to the eastern North Carolina landscape at large. Bear harvest on surveyed hunting leases ranged between approximately 10%–20% of total bear harvest in eastern North Carolina. Based on our limited results, we suggest that this level of effort may be sufficient to effectively index bear harvest for this region.

Management Implications

During our study, NCWRC worked with Weyerhaeuser Company to increase bear harvest with the intent of maintaining a bear population that was viable without exceeding human tolerances, particularly tolerance for bear damage. Past research has shown that increasing bear hunting opportunities can reduce human-bear conflicts (Will 1980, Miller 1990, Hristienko and McDonald 2007). Our survey indicates that leaseholders, who represent a primary stakeholder group, generally approved of changing bear hunting regulations. Continuation of surveys, perhaps with addition of questions to further elucidate stakeholder satisfaction, would provide important data for bear management in coastal North Carolina. It may also be beneficial to send a subset of surveys to hunting lease members other than those in leadership positions. We further suggest that the annual survey be used as an effective communication tool to leaseholders so that they are engaged in bear management decisions and, as such, the surveys may maintain and encourage a positive relationship between NWRC, Weyerhaeuser Company, and leaseholders. Finally, we suggest further work is needed to fully understand utility of surveys such as this one to index harvest of black bears and perhaps other species, in a cost-effective manner.

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Literature Cited

- Carlock, D. M., R. H. Conley, J. M. Collins, P. E. Hale, K. G. Johnson, A. S. Johnson, and M. R. Pelton. 1983. The tri-state black bear study. Technical Report 83–9. Tennessee Wildlife Resources Agency, Nashville.
- Elowe, K. D. 1990. Bear hunting with hounds: techniques and effects on bears and the public. *Proceedings of the Eastern Workshop on Black Bear Research and Management* 10:101–109.
- Hristienko, H. and J. E. McDonald, Jr. 2007. Going into the 21st Century: a perspective on trends and controversies in the management of the American black bear. *Ursus* 18:72–88.
- Jones, M. D. and M. R. Pelton. 2003. Female American black bear use of managed forest and agricultural lands in coastal North Carolina. *Ursus* 14:188–197.
- Miller, S. D. 1990. Population management of bears in North America. *International Conference on Bear Research and Management* 8:357–373.
- Palmer, D. 2006. A survey of bear hunters in North Carolina. North Carolina Wildlife Resources Commission, Raleigh.
- Pelton, M. R. 1982. Black bear. Pages 504–514 in J. A. Chapman, and G. A. Feldhamer, editors. *Wild mammals of North America: biology, management, and economics*. John Hopkins University Press, Baltimore, Maryland.
- and F. T. van Manen. 1994. Distribution of black bears in North America. *Eastern Workshop on Black Bear Research and Management* 12:133–138.
- and ———. 1997. Status of black bears in the southeastern United States. *International Symposium on the Trade of Bear Parts* 2:31–44.
- Peyton, B. 1989. A profile of Michigan bear hunters and bear hunting issues. *Wildlife Society Bulletin* 17:463–470.
- Vaughan, M. R. and K. L. H. Inman. 2002. Hunter effort and success rates of hunting bears with hounds in Virginia. *International Association of Bear Research and Management* 13:223–230.
- Will, G. B. 1980. Black bear-human conflicts and management considerations to minimize and correct these problems. *Proceedings of the Eastern Workshop on Black Bear Research and Management* 5:75–87.

**2001 BLACK BEAR HUNTING SEASON QUESTIONNAIRE
2002**

We have a few questions to ask you about bear hunting that your club may have done in 2001. The questions are intended

- 1) to help the North Carolina Wildlife Resources Commission (NCWRC) biologists evaluate coastal bear hunting and supplement existing surveys designed to determine the status of our coastal bear population and
- 2) to help NCWRC biologists and Weyerhaeuser Company foresters understand how well our bear management program is working.

Your complete and prompt answers will help us to evaluate the 2001 bear management program and to improve the program in future years.

HUNT CLUB NAME _____

1. What is the total area in your club, including both Weyerhaeuser land and land owned by others?

ACRES _____

In what county or counties is your club located? COUNTY or COUNTIES

2. Did your club chose to hunt bears this year? YES NO (Please circle your answer)

If your answer to question 2 is NO, skip to Question 9.

3. Did any of your members choose to not hunt bears this year? YES NO

What percentage of club members did not hunt bears? (Please circle your best guess)

0% 25% 50% 75% 100%

4. Did any of your member chose to hunt both deer and bear during the bear season? YES NO

What percentage of club members hunted both deer and bears? (Please circle your best guess)

0% 25% 50% 75% 100%

5. Did any of your member chose to hunt for only bears during the bear season? YES NO

What percentage of club members hunted only bears during the bear season? (Please circle your best guess)

0% 25% 50% 75% 100%

6. Did your members develop club rules for bear hunting? YES NO

Did you limit the numbers of bears that the club would harvest? YES NO ; If YES, how many?

Did you limit the kill to only "large" bears? YES NO ; If YES, what minimum weight? _____
(pounds)

Did you limit bear hunting in any other way? YES NO ; If YES, how?

7. How many bears were killed by your club? _____

How many on Weyerhaeuser land? _____

Were you in contact with a NCWRC biologist to take data from the bears that you killed? YES NO

8. Did you use bear dogs in hunting bear this year? YES NO

9. Do you approve of the change in Weyerhaeuser policy to allow bear dogs this year? YES NO

Do you have any suggestions about the bear harvest control program that may improve how we do it in the future? Please write additional comments on the back of this sheet.

PLEASE RETURN COMPLETED QUESTIONNAIRES IN THE ENCLOSED ENVELOPE BY
January 28, 2002.

THANK YOU FOR COOPERATING WITH US. THE INFORMATION THAT YOU GIVE WILL BE
USED TO IMPROVE BLACK BEAR MANAGEMENT IN COASTAL NORTH CAROLINA.

Appendix. Sample survey sent to Weyerhaeuser Company hunting leaseholders to assess bear hunting attitudes in eastern North Carolina, 1993–2008. The survey was the same during all years except addition of question No. 6 in 1998 and questions No. 8 and No. 9 during 2001–2008.