

Managing Black Bears on a Public Game Land in North Carolina: Are the Desires of Hunters Compatible with Unrestricted Public Hunting?

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Abstract: We used mail surveys to examine attitudes and methods of black bear (*Ursus americanus*) hunters on Van Swamp Game Land (Van Swamp). Van Swamp was located in eastern North Carolina and managed as an open public hunting area, with no restriction on hunter numbers or vehicular access. Reported bear harvest was higher in 2001 (22) than 2002 (4) or 2003 (8). Hunters in all three years generally believed that Van Swamp had “about the right number” of hunters ($\geq 57\%$) and that “too many” bears had been harvested ($\geq 38\%$). Retention of hunters from year to year was high ($\geq 70\%$) and, generally, a minority of hunters each year were in favor of specific management actions designed to limit bear harvest or hunter densities. Hunting method (i.e., hunting with dogs vs. still hunting) was related to hunter opinions on some questions. Although hunters identified problems with overharvest of bears, there was no mandate for management changes to address that issue. Our study may demonstrate that bear hunters do not feel a necessity for conservation of public lands (“tragedy of the commons”) and points out the need to communicate to hunters possible negative consequences of such overharvest.

Key words: black bear, bear hunters, bear hunting, hunter density, hunting method, hunter opinions, North Carolina, public hunting survey, *Ursus americanus*

Proc. Annu. Conf. Southeast. Assoc. Fish and Wild. Agencies 60:94-100

Although a variety of factors determine hunter satisfaction (i.e., multiple satisfactions) (Decker et al. 1980, Decker and Connelly 1989, Eichholz and Hardin 1990, Hammitt et al. 1990, Hazel et al. 1990 and Gigliotti 2000), McCullough and Carmen (1982) noted that it is most important to focus on factors contributing to hunter satisfaction which can be influenced by wildlife managers. Harvest success and game abundance can be partially controlled by managers, and are important contributors to satisfaction (Decker et al. 1980, Langenau et al. 1981, McCullough and Carmen 1982, Hammitt et al. 1990, Gigliotti 2000, Miller and Graefe 2001, Heberlein and Kuentzel 2002). Perceptions about hunter densities, which can be affected by management actions, may also contribute to hunting satisfaction (Decker et al. 1980, Hammitt et al. 1990, Vangilder et al. 1990, Gigliotti 2000, Heberlein and Kuentzel 2002).

We examined methods, perceptions, and attitudes of American black bear (*Ursus americanus*) (hereafter, bear) hunters on Van Swamp Game Land (Van Swamp), a public hunting area in North Carolina. Because a relatively high bear population existed in a six-county area that contained Van Swamp (WRC, unpublished data) and because open public hunting was permitted, we believed there may have been a high bear harvest on the area, especially during the first year hunting was allowed. We were concerned that high hunter densities and high bear harvest would lead to perceptions

by hunters that Van Swamp was overcrowded with hunters and that bears were being overharvested. If so, hunters in subsequent years would become dissatisfied as fewer bears were harvested. Furthermore, Peyton (1989) and ElHamzaoui et al. (1994) found differences in attitudes of bear hunters based on their hunting method (e.g., hunting with dogs vs. still hunting). Therefore, we were interested in determining if hunting method affected Van Swamp hunters' perceptions (e.g., were still hunters more likely than dog hunters to support road closures, since dog hunters often use roads to pursue bears?). We also examined hunter support of proposed management changes relative to hunter density and bear harvest.

Study Area

Van Swamp, a 2,158-ha tract in southwestern Washington and northern Beaufort counties in eastern North Carolina, was a flat basin extending northeast to southwest between the Pinetown Scarp to the west and the Suffolk Scarp to the east and was part of the Pamlico-Tar River Basin, the fourth largest in North Carolina. Primary land uses in the basin, and on sites surrounding Van Swamp, were intensive agriculture and forestry.

Van Swamp was managed by the North Carolina Wildlife Resources Commission (WRC) and was opened to public access beginning with the 2001 hunting seasons. Van Swamp provided op-

portunities to hunt gray squirrel (*Sciurus carolinensis*), bear, white-tailed deer (*Odocoileus virginianus*; hereafter, deer), and eastern wild turkey (*Meleagris gallopavo sylvestris*). Bear hunting was allowed during an 18-day season each year (six days in mid November and 12 days in mid to late December). Van Swamp had an extensive road system, and most areas were within 1 km of a road. During this study, WRC management of Van Swamp included open public hunting (i.e., no use of permit hunts) and maintaining open public access on all roads during established hunting seasons.

Methods

Assessment of Hunter Perceptions and Behaviors

We annually surveyed individuals who hunted on Van Swamp during the 2001–2003 bear seasons. An incentive was mailed to survey respondents who completed surveys after the 2001 (a t-shirt) and 2002 (a mug) bear seasons, and all 2003 survey recipients were given a window decal with the initial survey mailing. During bear seasons in 2001 (12–17 November, 10–22 December), 2002 (11–16 November, 16–28 December), and 2003 (10–15 November, 8–20 December), two WRC personnel were on Van Swamp at road intersections near major access points during daylight hours every day (except Christmas Day 2002). We censused hunters by collecting contact information from all hunters we encountered on Van Swamp. However, because we did not control all access points, we did not necessarily encounter every hunter who hunted on Van

Swamp. We asked hunters which species they were hunting on Van Swamp. During the 2002 and 2003 seasons, we also asked hunting method (i.e., still, dog, both) used by hunters while on Van Swamp. Still hunting involves hunting bear from elevated stands or on foot and dog hunting is the use of dogs to track and pursue bears.

Each year after close of bear season, we used contact information gathered in the field to mail surveys to hunters. Our surveys used components of Dillman's (2000) Tailored Design method, and each subsequent survey had added elements designed to improve response rates. We mailed surveys after the 2001 bear season to every hunter contacted in the field that year ($N = 252$); hunters received up to two full survey mailings. After the 2002 season, we mailed surveys (up to three mailings) to the 391 Van Swamp hunters who had been contacted in the field either in 2001 or 2002. We sent two separate surveys after the 2003 bear season. One survey (up to three full mailings plus a reminder postcard after the first mailing) went to 218 hunters who were contacted in the field in 2003. We sent another survey (up to three mailings) to the 148 hunters who were contacted on Van Swamp in 2002 but who were not contacted in the field by WRC personnel in 2003.

In the 2001 survey, we asked hunters about their hunting characteristics (e.g., species hunted, bear hunting method), their thoughts on crowding, and their support for potential regulatory changes (Table 1). In surveys after the 2002 bear season, we added two questions related to perceptions about number of bears har-

Table 1. Selected questions from mail surveys of hunters on Van Swamp Game Land, North Carolina, conducted by the North Carolina Wildlife Resources Commission after black bear hunting seasons in 2001, 2002, and 2003.

Question	Years included on survey
Describe your hunting participation on Van Swamp during the last two bear seasons. (I hunted on Van Swamp only in the 2001 bear season, I hunted on Van Swamp only in the 2002 bear season, I hunted on Van Swamp in both the 2001 and 2002 bear seasons)	2002
During which of the last three bear hunting seasons did you hunt any type of game animal on Van Swamp?	2003
During the [YEAR] hunting season, did you hunt bear, deer, or both bear and deer on Van Swamp?	2001, 2002, 2003
When hunting bear on Van Swamp in [YEAR], did you still hunt, hunt using dogs or both still hunt and hunt using dogs?	2001, 2002, 2003
Did you personally harvest a bear from Van Swamp during the [YEAR] bear season?	2001, 2002, 2003
During your [YEAR] hunt on Van Swamp, did you feel there were too many, too few or about the right number of other hunters on the Game Land?	2001, 2002, 2003
Which of the following would you support to limit the number of hunters on Van Swamp? (Permit lottery, Limiting vehicle access, Changing length of season, None of the above)	2001 ^a , 2002 ^a , 2003
Would you support closing some roads on Van Swamp so that these road openings could be used as habitat improvement areas?	2001, 2002, 2003
What is your opinion of the level of bear harvest on Van Swamp since it was opened as a Game Land in 2001? (Too few bears have been harvested, About the right number of bears have been harvested, Too many bears have been harvested, No opinion)	2002, 2003
Which of the following would you support to control bear harvest on Van Swamp Game Land? (Implementing permit lottery hunts, Closing the season in some years, Limiting vehicle access, Shortening the bear season, None of the above)	2002, 2003
How satisfied or dissatisfied were you with your overall hunting experience on Van Swamp in 2003? (Completely satisfied, Somewhat satisfied, Unsure, Somewhat dissatisfied, Completely dissatisfied)	2003
Do you plan to hunt on Van Swamp Game Land during the 2004 bear season?	2003

a. Worded as: "If you felt there were too many hunters, which of the . . ."

vested and support for regulations designed to limit bear harvest. We used two survey instruments after the 2003 bear season. The first was for all hunters who hunted on Van Swamp during 2003 and included questions from the 2002 survey and questions about hunting satisfaction and their future intentions to hunt on Van Swamp. The second instrument went to all hunters who hunted on Van Swamp during the 2002 bear season but did not return for the 2003 bear season; this survey contained satisfaction and hunting intentions questions sent to the 2003 hunters.

To rank responses, we coded opinion on crowding as -1 for "too few" hunters, 0 for "about the right number" of hunters, and 1 for "too many" other hunters. We also coded opinion on bear harvest as -1 for "too few" bears harvested, 0 for "about the right number" of bears harvested, and 1 for "too many" bears harvested. "No opinion" was not included in ranks. We coded responses for satisfaction with overall hunting experience as -2 for "completely dissatisfied," -1 for "somewhat dissatisfied," 0 for "unsure," 1 for "somewhat satisfied," and 2 for "completely satisfied."

We analyzed data using SPSS 13.0 (SPSS 2005). We used crosstabulations and chi-square tests (χ^2) to test null hypotheses that there were not differences in support for regulations changes to limit crowding or bear harvest based on hunting method or views on level of bear harvest. We calculated standardized residuals to determine which cells in crosstabulations were significantly different from expected values; an adjusted residual with an absolute value ≥ 2.0 was evidence against independence in the cell (Agresti and Finlay 1999). We used Mann-Whitney U tests to test null hypotheses that there were not differences in views on crowding, views on bear harvest, and satisfaction based on hunting method.

Monitoring of Bear Harvest

During 2001–2003, we recorded bear harvests within 4.8 km of Van Swamp. This buffer was used in an effort to include all harvest of bears that may have included parts of Van Swamp within their home ranges (Landers et al. 1979, Jones et al. 1998, Jones and Pelton 2003). We used data reported by hunters at stationary and mobile check stations to record where bears were harvested (i.e., any time a hunter registered a bear harvest in person with a WRC employee, we gathered information on harvest location). We did not include harvests reported through the WRC telephone or Internet reporting systems because only county-level data were available through these systems. Almost half (48%) of the reported statewide bear harvest in 2002 and 2003 was reported at check stations (WRC, unpublished data).

Results

Number of hunters contacted in the field by WRC personnel in 2001, 2002, and 2003 was 252, 223, and 218, respectively. Adjusted response rates, which did not include undeliverable surveys, were 71% ($N = 174$) for the 2001 survey, 52% ($N = 202$) for the 2002 survey, 76% ($N = 160$) for the 2003 survey, and 65% ($N = 88$) for the survey of hunters who hunted Van Swamp in 2002 but did not hunt in 2003. Number of bears registered at WRC check stations as having been harvested on or adjacent to Van Swamp was 22 (18 on Van Swamp, 4 adjacent to Van Swamp) in 2001, 4 (2 on Van Swamp, 2 adjacent to Van Swamp) in 2002, and 8 (6 on Van Swamp, 2 adjacent to Van Swamp) in 2003.

Sixty-nine hunters who were contacted in the field in 2001 but not in 2002 returned the 2002 survey and responded to the question on years hunted. Unexpectedly, 46% (32) of these hunters reported that they had hunted on Van Swamp in 2001 and 2002. Similarly, 35 of 81 (43%) hunters contacted in the field in 2002 but not 2003 reported on the 2003 survey having hunted in 2003. Hunters who were encountered in the field (and subsequently mailed surveys) may have hunted more days, more hours per day, or traveled more extensively on Van Swamp than those who were not encountered.

Twenty-four percent (41) of hunters in 2001 hunted bears exclusively, 45% (77) hunted bear and deer, 29% (49) hunted deer only, and 2% (3) hunted other species. In 2002, 30% (46) of respondents hunted bear only, 47% (72) hunted bear/deer, 23% (36) hunted deer only, and none hunted other species. Thirty-five percent (54) of 2003 respondents hunted bear only, 39% (60) hunted bear/deer, 27% (42) hunted deer only, and none hunted other species.

Most hunters in 2001 (64%, 106), 2002 (57%, 90), and 2003 (66%, 104) believed that there were "about the right number" and 35% (58), 38% (60), and 30% (48) in 2001, 2002, and 2003, respectively, believed there were "too many" other hunters on Van Swamp during bear season. Few hunters ($\leq 5\%$) during any year responded that there were "too few" other hunters. Perceptions on hunter crowding between still only (\bar{x} rank = 51.6–56.4, 39–45) and dog only (\bar{x} rank = 48.0–55.8, 60–64) hunters in 2001–2003 did not differ (Mann-Whitney $U \leq 1286.5$; $P \geq 0.28$).

Among hunters who responded that there were too many other hunters on Van Swamp, 38% (21) in 2001 and 32% (19) in 2002 supported limiting vehicle access. Thirty-six percent (20) in 2001 and 34% (20) in 2002 supported changing season length. Twenty-five percent (14) in 2001 and 37% (22) in 2002 supported a permit lottery. Twenty-one percent (12) in 2001 and 22% (13) in 2002 supported none of the presented regulation changes. Support by all hunters in 2003 (even those who responded that there were about the right number or too few other hunters) for limiting vehicle access was 33% (51), 27% (42) for changing season length, and 16%

(25) for a permit lottery. Forty-five percent (70) of 2003 hunters supported none of the presented regulation changes. We found no differences in support for limiting vehicle access to limit hunter crowding based on bear hunting method in 2001 ($\chi^2 = 2.7$, $df = 1$, $P = 0.10$) or 2003 ($\chi^2 = 3.5$, $df = 2$, $P = 0.17$) (Table 2). However, a higher proportion of 2001 dog only hunters (55%, 11; $\chi^2 = 7.0$, $df = 1$, $P = 0.01$) and 2003 still/dog hunters (54%, 7; $\chi^2 = 6.3$, $df = 2$, $P = 0.04$) supported changing season length than expected. In addition, a higher proportion of still only hunters in 2003 (31%, 12; $\chi^2 = 11.3$, $df = 2$, $P \leq 0.01$) supported a permit lottery than expected. Dog only hunters in 2003 (45%, 27) were less likely than expected to support one or more regulations changes, even though there were no overall differences in support for one or more regulations changes in 2003.

Forty-one percent (68) of respondents in 2001, 46% (73) in 2002, and 53% (84) in 2003 supported road closure on Van Swamp to improve wildlife habitat. A higher proportion of still only hunters in 2001 (59%, 26; $\chi^2 = 10.4$, $df = 2$, $P = 0.01$) and 2003 (72%, 28; $\chi^2 = 14.7$, $df = 2$, $P \leq 0.01$) supported road closures (Table 3).

Fifty-percent (79) of hunters in 2002 and 38% (60) in 2003 believed “too many” bears were harvested on Van Swamp; fewer hunters believed “about the right number” (2002: 12%, 19; 2003: 19%, 30) or “too few” (2002: 4%, 6; 2003: 4%, 6) bears had been harvested. Over a third of 2002 (34%, 54) and 2003 (39%, 61) hunters had “no opinion” about level of bear harvest. Opinions of still only (\bar{x} rank = 40.0, 35.6; 29, 26) and dog only (\bar{x} rank = 35.0, 29.5; $n = 44$, 37) hunters on level of bear harvest did not differ (Mann-Whitney $U = 551.0$, 387.5; $P = 0.22$, 0.14) in 2002 and 2003, respectively.

Table 2. Bear only and bear/deer hunter support or lack of support for regulations to limit crowding on Van Swamp Game Land, North Carolina as reported on mail surveys of hunters on Van Swamp conducted by the North Carolina Wildlife Resources Commission after black bear hunting seasons in 2001, 2002, and 2003.

Support for regulation	Year ^{b,c}	Which of the following would you support to limit the number of hunters on Van Swamp?						χ^2	df	P
		Still only hunters		Dog only hunters		Still/dog hunters ^a				
		N	%	N	%	N	%			
Limiting vehicle access	2001	16	62.5	20	35.0	–	–	2.7	1	0.10
	2003	39	41.0	60	23.3	13	30.8	3.5	2	0.17
Changing season length	2001	16	12.5 ^d	20	55.0 ^e	–	–	7.0	1	0.01
	2002	13	23.1	26	50.0	–	–	2.6	1	0.11
	2003	39	17.9	60	28.3	13	53.8 ^e	6.3	2	0.04
Permit lottery	2002	13	53.8	26	30.8	–	–	2.0	1	0.16
	2003	39	30.8 ^e	60	6.7 ^d	13	7.7	11.3	2	≤ 0.01
≥ 1 options	2003	39	61.5	60	45.0 ^d	13	76.9	5.6	2	0.06

a. Due to small numbers of respondents, still/dog hunters are not included in some crosstabulations.
 b. For 2001 and 2002, bear only and bear/deer hunters who responded that “too many” other hunters hunted on Van Swamp; for 2003, all bear only and bear/deer hunters.
 c. Due to small numbers of respondents, the following crosstabulations are not reported: support or opposition for a permit lottery (2001), support or opposition for limiting vehicle access (2002), support or opposition for one or more of the proposed regulation changes (2001, 2002).
 d. Adjusted residual ≤ -2.0 .
 e. Adjusted residual ≥ 2.0 .

Table 3. Bear only and bear/deer hunter support for road closure to improve habitat by hunting method as reported on mail surveys of hunters on Van Swamp Game Land, North Carolina conducted by the North Carolina Wildlife Resources Commission after black bear hunting seasons in 2001, 2002, and 2003.

Support road closure	Year	Would you support closing some roads on Van Swamp so that these road openings could be used as habitat improvement areas?						χ^2	df	P
		Still only hunters		Dog only hunters		Still/dog hunters ^a				
		N	%	N	%	N	%			
Support road closure	2001	44	59.1 ^b	64	28.1 ^c	10	40.0	10.4	2	0.01
	2002	45	57.8	61	39.3	–	–	3.5	1	0.06
	2003	39	71.8 ^b	61	32.8 ^c	13	53.8	14.7	2	≤ 0.01

a. Due to small numbers of respondents, still/dog hunters are not included in some crosstabulations.
 b. Adjusted residual ≥ 2.0 .
 c. Adjusted residual ≤ -2.0 .

Support for closing bear hunting season in some years to limit bear harvest was 35% (55) in 2002 and 33% (52) in 2003. Thirty-three percent (52) of 2002 and 24% (38) of 2003 respondents supported shortening the bear season while 26% (41) in 2002 and 31% (48) in 2003 supported limiting vehicle access. Permit hunts were supported by 18% (29) of 2002 hunters and 22% (34) of 2003 hunters; 27% (43) of 2002 and 28% (44) of 2003 hunters supported none of the presented regulation changes. Support for closing the bear season some years (2002: $\chi^2 = 2.5$, $df = 2$, $P = 0.29$; 2003: $\chi^2 = 2.5$, $df = 2$, $P = 0.29$), shortening bear season (2002: $\chi^2 = 2.3$,

$df = 2$, $P = 0.31$; 2003: $\chi^2 = 0.3$, $df = 2$, $P = 0.84$), limiting vehicle access (2002: $\chi^2 = 1.9$, $df = 2$, $P = 0.38$; 2003: $\chi^2 = 0.6$, $df = 2$, $P = 0.73$), or support for one or more regulations (2002: $\chi^2 = 0.5$, $df = 2$, $P = 0.78$; 2003: $\chi^2 = 3.1$, $df = 2$, $P = 0.21$) did not differ based on hunting method (Table 4). During 2003, higher proportions (36%, 14) of still only hunters and lower proportions (5%, 3) of dog only hunters supported permit hunts than expected ($\chi^2 = 15.7$, $df = 2$, $P \leq 0.01$). In 2002, support for closing the bear season some years ($\chi^2 = 16.3$, $df = 2$, $P \leq 0.01$) varied based on opinions on the level of bear harvest (Table 5). In 2002 and 2003, support for shortening

Table 4. Bear only and bear/deer hunter support for regulations to limit bear harvest on Van Swamp by hunting method as reported on mail surveys of hunters on Van Swamp Game Land, North Carolina conducted by the North Carolina Wildlife Resources Commission after black bear hunting seasons in 2002 and 2003.

		Which of the following would you support to control bear harvest on Van Swamp Game Land?									
		Still only hunters		Dog only hunters		Still/dog hunters					
Support for regulation	Year	N	%	N	%	N	%	χ^2	df	P	
Closing season some years	2002	45	28.9	61	31.1	9	55.6	2.5	2	0.29	
	2003	39	33.3	60	21.7	13	38.5	2.5	2	0.29	
Shortening the bear season	2002	45	26.7	61	34.4	9	11.1	2.3	2	0.31	
	2003	39	23.1	60	21.7	13	15.4	0.3	2	0.84	
Limiting vehicle access	2002	45	31.1	61	23.0	9	11.1	1.9	2	0.38	
	2003	39	33.3	60	28.3	13	38.5	0.6	2	0.73	
Permit hunts	2002	45	20.0	61	13.1	9	0.0	2.7	2	0.26	
	2003	39	35.9 ^a	60	5.0 ^b	13	23.1	15.7	2	≤ 0.01	
≥ 1 options	2002	45	66.7	61	70.5	9	77.8	0.5	2	0.78	
	2003	39	76.9	60	60.0	13	69.2	3.1	2	0.21	

a. Adjusted residual ≥ 2.0 .
 b. Adjusted residual ≤ -2.0 .

Table 5. Bear only and bear/deer hunter support for regulations to limit bear harvest on Van Swamp by opinions on the level of bear harvest as reported on mail surveys of hunters on Van Swamp Game Land, North Carolina, conducted by the North Carolina Wildlife Resources Commission after black bear hunting seasons in 2002 and 2003.

		Which of the following would you support to control bear harvest on Van Swamp Game Land? (Opinion on the number of bears harvested on Van Swamp ^a)									
		About right		Too many		No opinion					
Support for regulation	Year	N	%	N	%	N	%	χ^2	df	P	
Closing season some years	2002	17	17.6	59	49.2 ^b	35	11.4 ^c	16.3	2	≤ 0.01	
	2003	24	16.7	39	41.0 ^b	41	24.4	5.0	2	0.08	
Shortening the bear season	2002	17	23.5	59	40.7 ^b	35	11.4 ^c	9.4	2	0.01	
	2003	24	12.5	39	41.0 ^b	41	12.2 ^c	11.3	2	≤ 0.01	
Limiting vehicle access	2002	17	23.5	59	33.9 ^b	35	14.3	4.5	2	0.11	
	2003	24	16.7	39	33.3	41	39.0	3.6	2	0.17	
Permit hunts	2002	17	5.9	59	22.0 ^b	35	5.7	5.9	2	0.05	
	2003	24	16.7	39	25.6	41	14.6	1.7	2	0.43	
≥ 1 options	2002	17	58.8	59	91.5 ^b	35	42.9 ^c	26.9	2	≤ 0.01	
	2003	24	45.8 ^c	39	87.2 ^b	41	63.4	12.5	2	≤ 0.01	

a. Due to small numbers of respondents, respondents who believed "too few" bear were harvested are not included in crosstabulations.
 b. Adjusted residual ≥ 2.0 .
 c. Adjusted residual ≤ -2.0 .

the bear season (2002: $\chi^2 = 9.4$, $df = 2$, $P = 0.01$; 2003: $\chi^2 = 11.3$, $df = 2$, $P \leq 0.01$), or support for one or more regulations (2002: $\chi^2 = 26.9$, $df = 2$, $P \leq 0.01$; 2003: $\chi^2 = 12.5$, $df = 2$, $P \leq 0.01$) varied based on opinions on the level of bear harvest. Even though there were no overall differences, in 2003, there were higher proportions of hunters who believed too many bears had been harvested on Van Swamp who supported closing the bear season some years (41%, 16). Likewise, higher proportions of hunters in 2002 who believed too many bears had been harvested supported limiting vehicle access (34%, 20) or permit hunts (22%, 13). However, less than half ($\leq 49\%$) of hunters who believed too many bears had been harvested on Van Swamp supported any of the regulations.

Most 2003 hunters were “completely” (29%, 45) or “somewhat” (38%, 59) satisfied with their overall Van Swamp hunting experiences. Fewer 2003 hunters were “unsure” (10%, 16), “somewhat dissatisfied” (18%, 28), or “completely dissatisfied” (6%, 9). Satisfaction did not differ based on hunting method (still only hunters: \bar{x} rank = 44.6, 39; dog only hunters: \bar{x} rank = 53.5, $N = 60$; Mann-Whitney $U = 960.5$, $P = 0.12$).

Hunter retention was high on Van Swamp. Seventy percent (90) of 2001 hunters hunted in 2002 and 71% (118) of hunters in 2002 returned in 2003. Also, most (85%, 156) Van Swamp hunters in 2003 indicated that they planned to return to Van Swamp for the 2004 bear hunting season.

Discussion

Most ($\geq 57\%$) Van Swamp hunters from 2001–2003 perceived Van Swamp to have the right number of other hunters. There was no clear preference (i.e., support by a majority of hunters) for any specific actions to limit crowding, although most ($\geq 55\%$) of 2001–2003 hunters supported at least one of the presented changes. Even those hunters who thought there were too many other hunters were not in favor of any regulatory change designed to decrease hunter densities and those hunters who believed that there was an over harvest of bears did not support regulations to limit bear harvest.

Permanently closing some roads on Van Swamp to improve wildlife habitat likely would be controversial. Overall, there was low support (41%–53%) for permanent road closure for habitat improvement. These closures likely would be accepted by still hunters (58%–72% support), but opposed by dog hunters (28%–39% support).

Fifty percent and 38% of the respondents who hunted during 2002 and 2003, respectively, believed that too many bears had been harvested from Van Swamp since it opened as a game land. There was a dramatic decrease in the bear harvest (as reported at

check stations) on or near Van Swamp from 2001 (22 bears) to 2002 (4 bears) and 2003 (8 bears) and this may have influenced hunter perceptions of overharvest. However, WRC has few management options to limit bear harvest that are acceptable to Van Swamp hunters. The least controversial regulatory change may be to close bear season in some years, but even this option was not supported by most hunters from each year (even those who believed that too many bears had been harvested) and would be administratively problematic.

Even though a plurality of hunters in 2002 and 38% of hunters in 2003 believed that bears were being overharvested, hunter satisfaction and hunter retention did not seem to suffer. Van Swamp hunters generally reported being satisfied with their hunting experiences and most returned ($>70\%$ between 2001 and 2002, and between 2002 and 2003) to hunt the following year. It is possible that many Van Swamp hunters did not place a high importance on level of bear harvest and therefore were generally satisfied, even if they believed there was an overharvest of bears, and that other aspects of the hunt (e.g., social, running dogs, access to Van Swamp) had more of an impact on satisfaction.

One limitation of this study is that we did not ask hunters how important it was to them that there be an acceptable number of other hunters and an acceptable number of bears harvested. It may be that even though there is a perception by many hunters that too many bears have been harvested on Van Swamp, this perception does not negatively impact their satisfaction levels (i.e., they may not be concerned about this issue). Also, we did not measure the degree (i.e., strong, moderate) of support or opposition to various management options and thus do not know how strongly hunters felt about management proposals, thus affecting potential management decisions.

Like Peyton (1989) and ElHamzaoui et al. (1994), we found that perceptions varied by hunting method. On Van Swamp, it is important for wildlife managers to understand that still hunters may be more accepting of limiting vehicular access on public hunting lands than dog hunters. This is probably because dog hunters often use vehicles to pursue bears.

One of our findings is that in almost all cases, most ($\geq 62\%$) hunters were not willing to make specific concessions to try to affect hunter densities or hunting pressure. Even hunters who believed there were problems with too many hunters or too many bears harvested were generally not in favor of regulations to correct these problems. We speculate that this is a classic example of “tragedy of the commons” (Hardin 1968) where citizens overuse or degrade public trust resources because of a lack of personal ownership or reason to conserve these same resources. The “trag-

edy” in this case is even though a plurality of bear hunters in 2003 perceived there was an overharvest of bears they still attempted to harvest a bear themselves.

As Lauber and Brown (2000) noted, a variety of factors (e.g., concerns about crowding, health of game populations, hunting opportunities, individual bag limits) determine support or opposition to hunting regulations. Lauber and Brown (2000) also stressed the effect that information about impacts of proposed changes can have on hunter opinions. Our study may indicate the need to educate hunters about possible long-term consequences of overharvest on bear populations and hunting opportunities.

Management Implications

For the most part, Van Swamp hunters in 2003 were satisfied and hunter retention was high from year-to-year. Also, Van Swamp hunters generally did not favor actions to limit bear harvest. This indicates that hunters who chose to hunt on Van Swamp had views that were compatible with unrestricted public hunting, even though reported bear harvest decreased after 2001 and a plurality of hunters in 2002 and 38% of hunters in 2003 believed that there had been an overharvest of bears.

However, managers of public lands should not assume that perceptions of hunters who hunt on a particular area are the same as those who do not hunt on such an area. According to Heberlein and Kuentzel (2002), preference by hunters for hunter density can be dependent on area(s) studied. This study did not attempt to assess perceptions of bear hunters who did not hunt on Van Swamp. It is possible that bear hunters who preferred areas with lower hunter densities, lower bear harvest rates, and limited vehicular access avoided hunting on Van Swamp. If this was the case, then perceptions of these potential hunters on management of bears on Van Swamp could be quite different from those who did hunt on Van Swamp, and they may react differently to management changes. Also, if management changes were implemented on Van Swamp to decrease hunter densities, bear harvest, and vehicular access, hunters who preferred these changes might begin hunting on Van Swamp.

Acknowledgments

We thank Scott Osborne for coordinating field interviews during this study and for reviewing this manuscript. We also thank WRC staff members who conducted field interviews with hunters and those who assisted with mailing surveys and data entry.

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