Special Management Practices for Deer Wintering Areas

The following management practices for deer wintering areas, or deer yards, are based primarily on information found in Deer Wintering Area Management for the Eighties (Boer *et al.* 1982), Forest/Wildlife Guidelines and Standards for Nova Scotia (Anonymous 1989) and Standards and Guidelines for Management of Deer Wintering Areas on Crown Land (Anonymous 2002). The recommendations below should produce an acceptable balance between quality deer habitat and the needs of the forestry industry.

Management Guidelines

i) Current wintering areas should be identified and mapped. Voight *et al.* (1997) recommend that at least 10-15% of a deer population's summer range be set aside as wintering area. Whenever possible, areas defined as deer yards should be spared from intensive forest harvest operations. When harvesting is unavoidable, selective cutting is preferable to large-scale clearcutting. As Boer *et al.* (1982) assert, successful management should be sensitive to the needs of industry, but view them as secondary to the needs of wildlife and wildlife habitats.

ii) Where forest harvesting is scheduled for an area which is identified as containing a deer wintering yard:

a) In areas which experience harsh winters (i.e. where deer select habitat based primarily on the proportion of cover rather than the availability of browse), at least 50% of existing conifer cover within the yard should be retained in uncut shelter patches. Each patch should have a minimum area of 10 ha, a minimum width of 300 m, and contain a mixture of age classes and species (Anonymous 1989; Anonymous 2002). Conifer height in each patch should be 10 m or higher, mean conifer D.B.H. should be a minimum of 18 cm, and crown closure should be kept between 60% and 80% (Voight *et al.* 1997; Anonymous 2002). Patterson *et al.* (1999) further recommend that no area in any deer yard should be more than one km from a stand at least 1 km^2 in size, and with canopy closure of at least 70%.

In areas which experience mild winters (i.e. where deer select habitat based primarily on the availability of browse rather than the proportion of cover), Anonymous (2002) recommends that at least 30% of existing conifer cover be retained in uncut shelter patches. Each patch should have an area of at least 5 ha, and a minimum width of 150 m. Conifer height in each patch should be 10 meters or higher, mean conifer D.B.H. should be a minimum of 18 cm, and crown closure should be at least 30%.

b) Shelter patches should not be isolated. Instead, they should be attached to other uncut areas by travel lanes. Travel lanes should have a minimum width between 50 m (Anonymous 1989) and 90 m (Anonymous 2002), and crown closure of at least 50%. Travel lanes should follow watercourses (when present) or established travel routes that are sheltered from wind flow.

c) Individual openings within a deer yard should be no larger than 10 ha, as cuts larger than this can potentially damage the integrity of the wintering area (Voight *et al.* 1997; Patterson *et al.*1999). Openings should be shaped irregularly to maximize edge, and be separated by shelter patches of at least equal size.

d) Silvicultural techniques to maximize browse quality and availability in the yard should be employed where possible, while maintaining the necessary levels of crown closure. Voight *et al.* (1997) recommend that browse plots of 0.5-2 ha be scattered throughout the yard to ensure that acceptable browse species are accessible to deer within 30 m of cover in areas where snow depths exceed 50 cm, and within 100 m of cover in more moderate areas.

e) Cutting should be scheduled for the fall or early winter to provide large amounts of easily accessible browse for deer.

iii) Deer wintering areas are dynamic and should not be managed as though they are fixed in time and space. Like any forested area, a myriad of factors (such as temperature, precipitation, and winter severity) can change from year to year within a deer yard, and affect the composition and distribution of the resident flora and fauna, as well as the physical environment itself (blowdowns, for example). Thus, managers must be aware of the effects of these environmental factors on deer, and take them into consideration when deciding upon actions to be implemented within deer wintering areas.

iv) Stands within a yard which are dead, diseased, or have suffered extensive insect or weather damage should be cut before healthy stands, as they would offer substantially less cover for wintering deer and run a greater risk of blowdown.

v) When felling trees within a yard, care should be taken to minimize damage to timber that is intended to be left standing. Such damage could include uprooting, trunk or branch breakage, or large tears in bark caused by falling trees.

vi) When harvesting within a yard, an awareness of other logging operations in the area is necessary. For example, if large clearcuts are occurring in the vicinity of a deer yard, then cutting within the yard should be minimized or restricted (Anonymous, 1989).

vii) In addition to wintering area management, creating openings in summer ranges is recommended where deer are in poor condition or populations are low, as this will promote browse regeneration and improve deer's physical condition entering winter. Shelterwood management or selection cutting to promote autumn mast species such as oak or beech by removing competitors for sunlight and nutrients could also improve the overall range quality for deer in seed years.

Background Information

The white-tailed deer (*Odocoileus virginianus*) is one of the most widely distributed and often-studied wildlife species in North America (Lavigne 1997). Halls (1984) recognized that deer are a valuable resource economically, recreationally and aesthetically, but illustrated that increases in forestry, agriculture and urbanization throughout the twentieth century may have had profound effects on deer populations because it altered wildlife habitats and led to increased rates of deforestation. Many wildlife agencies in Canada and the United States investigated the effects of land-use and recreational hunting on their indigenous deer populations in the 1980's, and proposed regulations to ensure deer would not be at future risk of extinction or population/genetic bottlenecks (Halls 1984). Most wildlife agencies across North America have recently noted that white-tailed deer numbers are increasing (Robinson *et al*. 2002), although in Nova Scotia, populations are currently low; a remnant effect of the harsh winter of 2000-2001.

In the northern part of their range, white-tailed deer tend to congregate, or yard, in large, high density groups during winter. This is thought to be a response to maximize browse availability, evade predators, or lessen energetic costs associated with moving through deep snow and/or thermoregulation in low temperatures (Halls 1984; Messier and Barrette 1985; Nelson 1998; St-Louis *et al.* 2000). Indeed, conspecifics in more southern areas (or in places with proportionately lower levels of winter snow accumulation) do not display as strong a pattern of yarding behaviour, if any at all. Patterson *et al.* (1999) found that deer in southwestern Nova Scotia (Queen's County) migrated to yards much less frequently than deer in the northeast (Cape Breton). This is probably because southern deer are not as restricted by snow depth, temperature, or energetic requirements.

Deer yards tend to occur frequently in fertile riparian areas or on south-facing slopes which provide shelter from the prevailing wind, and offer maximum exposure to the sun. Yards can generally be described as irregular, mature or mixed softwood stands which offer cover, as well as access to acceptable browse. They are often identified via field observations of deer residence in suitable territory in association with computer/mathematical models or photograph/map analysis. In Cape Breton, deer seem to prefer yards at low elevations (since highlands are colder, have longer winters and receive more snow), seek sites with large overstory trees, abundant understory growth, proximity to high softwood canopy, absence of a second story beneath the main canopy, and show an avoidance of north-facing slopes (Patterson *et al.* 1999). Deer in Queen's County select areas of diverse cover type, but show less preference for softwood cover and do not seem dependent on clearcuts or edges for food because of the milder winter temperatures (Patterson *et al.* 1999).

Voight *et al*. (1997) list the three most important features of a successful deer yard as: a) traditional use, b) sufficient softwood cover and c) sufficient browse. Traditional use refers to the fact that deer display fidelity to both their winter and summer ranges (Halls 1984; Nelson 1998; Kilpatrick *et al.* 2001). It is thought that this is a learned social behaviour, rather than a genetically encoded one, because fawns tend to mimic the movement patterns of their mothers. Fawns accompany their mothers on their first journey to and from winter yards and this establishes a pattern of migration that is often carried through a lineage and passed to successive generations (Nelson 1998; Lesage *et al.* 2000). Thus, elimination of a traditional yard may have serious detrimental effects on deer accustomed to migrating to a particular area, although there is evidence that deer are able to alter their migration patterns (Nelson 1998; Lesage *et al.* 2000).

Softwood cover is a particularly important feature of deer yards, as it forms a canopy which limits the amount of snow accumulating on the forest floor, and also acts as a windbreak and thermal insulator. Deer tend to prefer softwood cover species such as hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), and balsam fir (*Abies balsamea*) in wintering areas. Pure softwood stands, while providing good shelter, are usually deficient in available browse, and are primarily selected when snow depths are restrictive (>50cm) or weather is severe. Mixed wood stands, on the other hand, offer acceptable amounts of cover, as well as a greater abundance of browse, and are usually selected when snow depths are moderate (20 cm). In areas where snow and/or temperature are not limiting factors, selection is based proportionately less on cover type and more on the presence of abundant, high quality browse.

Deer are primarily considered generalist foragers, but are often discriminatory with regard to the species of browse consumed. Patterson *et al.* (1999) list preferred species in Nova Scotia as red maple (*Acer rubrum*), aspen (*Populus* sp.), witch hazel (*Hamamelis virginiana*), wild raisin (*Viburnum cassinoides*), and red oak (*Quercas rubra*). Litterfall and mast crops such as acorns, beechnuts, and berries are also important for deer (Halls 1984; Voight *et al.*1997; Ditchkoff and Servello 1998). Substantial variation in diet is common when environmental variables affect local food availability. In severe winters, when snow depths restrict mobility and access to food, competition for browse can be extreme. This is exacerbated if the deer yard is of poor quality or population density is high. In these situations, deer will feed on lower quality browse, and arising nutritional stresses can negatively impact the survival, health, and reproductive success of the animals. Mortality due to coyote (*Canis latrans*) predation also tends to increase with snow depth (Patterson *et al.* 1998). On occasion, repercussions of a severe winter may be visible in a population for several years, especially if forage levels have been reduced/stunted due to overbrowsing, or winter survival and recruitment have declined (Halls 1984; Patterson and Power 2002). Patterson *et al.* (1999) described Nova Scotia's winter carrying capacity for deer as low, with a maximum level of 11 deer/km^2 in the Cape Breton lowlands, although high densities, poor accessibility or prolonged, successive deep snow winters could reduce this estimate.

In Nova Scotia, deer primarily migrate to wintering areas in response to snow depths greater than 19 cm (Patterson *et al.* 1999). Depths of 50 cm or greater are considered restrictive and should be accompanied by large numbers of yarding deer (Halls 1984; Patterson *et al.* 1998; Anonymous 2002). To assess which areas in Nova Scotia routinely display snow depths greater than 20 cm (i.e. where deer should migrate to wintering areas) and/or 50 cm (i.e. where deer would require high quality wintering areas), climate data from

16 weather stations were analyzed (Tables 1-8). The data showed that annual winter severity in Nova Scotia is highly variable, and snow accumulation can change drastically for any given location from year to year. Eight of the sixteen locations regularly reached depths of 20 cm or greater, but few reached restrictive levels (noticeable exceptions are Baddeck (Bell Museum) and Springfield). A point that should be made is that these results are not all encompassing, and may not generalize to all localities within an area because snow depths can vary significantly between and within ecoregions.

The quality of wintering areas is considered a limiting factor on the health of a deer population. Thus, if habitat quality in these areas is threatened by forestry operations, land clearing, overpopulation, or poor browse growth, management procedures are required. In the literature (Halls 1984; Anonymous 1989; Voight *et al.*1997; Reay 1999; Anonymous 2002), the most commonly proposed guidelines for the management of deer yards are :

i) At least 50% of the mature softwood in the yard must be left standing with a crown closure of 70-80% and a height of at least 10 m.

ii) Travel lanes connecting adjacent stands should be retained at a width of at least 50 m.

iii) Growth of high quality browse should be promoted.

iv) Cuts should be irregular to enhance edge effect.

The overall result of the aforementioned analysis with respect to deer yard management protocols in Nova Scotia is not entirely certain, as the variability of annual winter severity makes the application of a single management scheme problematic. A possible solution is to establish both harsh winter *and* moderate winter stands in areas which experience highly variable winters. This would ensure appropriate habitat, regardless of winter conditions. It would also make more timber available for forestry than if an entire area were classed as harsh winter habitat, and harvesting was restricted or minimized.

While well-intentioned, some published guidelines may be locally impractical, and implementation should include a manager's knowledge of the local deer populations and their ecology (preferred browse species in the area, local wintering area characteristics, etc). For instance, a set of guidelines may identify cedar or hemlock as highly important cover species that should be maintained. If a manager knows that deer in his/her locality prefer balsam fir cover to either cedar or hemlock (or if no cedar or hemlock exist locally), then the guideline for that area must be changed. Likewise, while most guidelines stress the retention of softwood cover, in some areas it may be necessary to accept sub-optimum levels of cover in order to stimulate browse regeneration. These are examples of decisions that could only be made at a local level.

White-tailed deer's reaction to human presence or disturbance is somewhat unpredictable, especially if it occurs in winter. While some studies have shown that deer are unperturbed by, or can benefit from human activity such as winter logging, supplemental feedings, snowmobile activity, etc. (for ex. Mautz *et al.*1976; Halls 1984; Berteaux *et al.*1998; Patterson *et al.* 1999), others have found that human disturbance such as hunting/poaching, snowmobiling, and forestry can cause deer to disperse from an area (Halls 1984). This places deer at potential energetic risk if they cannot locate another yard of similar quality to the one they vacated. Of course, several factors are at play here, including the frequency and degree of intensity of the disturbances in question, as well as the environmental conditions at the time. Patterson *et al.* (1999) conducted a timber harvest at the Eden wintering area in Cape Breton, Nova Scotia, and found that while deer left the area during felling, they returned afterward to feed and none were permanently displaced or displayed excessive activity. However, since this harvest took place during a very mild winter, when deer were free to forage and did not have a great need for cover, the observed results may not generalize to what could happen if such disturbances occurred during a severe winter (Patterson *et al.* 1999).

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Table 1: Snow accumulation data for the Atlantic Coastal Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Louisbourg							
	1995	28	9.9	16	0	0	0
	1996	32	3.9	6	1	0	0
	1997	25	7.1	5	0	0	0
	1998	39	3.7	4	4	0	0
	1999	12	0.5	0	0	0	0
*	2000	19	6.5	0	0	0	0
*	2001	59	32.5	16	11	6	3
	2002	13	11	0	0	0	0
Shearwater							
	1995	18	1.2	0	0	0	0
*	1996	16	3.2	0	0	0	0
*	1997	27	3.2	3	0	0	0
	1998	9	1.4	0	0	0	0
	1999	8	0.4	0	0	0	0
	2000	24	0.4	5	0	0	0
	2001	36	10.6	27	4	0	0
	2002	46	6.5	10	6	4	0
	2003	29	7.7	12	0	0	0
Yarmouth							
	1995	23	2	1	0	0	0
	1996	28	3.9	8	0	0	0
	1997	20	2.4	1	0	0	0
	1998	21	2.1	1	0	0	0
	1999	15	1.6	0	0	0	0
	2000	46	5.6	13	8	4	0
	2001	38	8.1	19	9	0	0
	2002	20	1.3	1	0	0	0
	2003	38	10.8	33	13	0	0

Table 2: Snow accumulation data for the Cape Breton Highlands Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Ingonish Beach							
	1995	57	18.2	53	35	13	7
	1996	24	3.8	2	0	0	0
	1997	29	14.2	35	0	0	0
	1998	43	19.6	60	18	1	0
	1999	30	8.8	15	1	0	0
*	2000	27	5.5	1	0	0	0

Table 3: Snow accumulation data for the Eastern Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Stillwater/Sherbrooke							
	1995	12	1.8	0	0	0	0
	1996	29	5.6	12	0	0	0
	1997	31	4.8	6	5	0	0
	1998	35	4.7	1	0	0	0
	1999	31	2.5	1	0	0	0
	2000	31	2.3	1	0	0	0
	2001	20	28.1	70	53	44	21
	2002	80	24.6	56	41	35	25
*	2003	67	49.8	67	27	27	22
Upper Stewiacke							
	1995	15	2.5	0	0	0	0
	1996	24	3.6	1	0	0	0
	1997	15	3.4	0	0	0	0
	1998	16	2.9	0	0	0	0
	1999	10	1	0	0	0	0
*	2000	18	2.7	0	0	0	0
	2001	49	21.9	46	27	10	0
	2002	46	11.4	22	7	6	0
*	2003	39	13.6	31	16	0	0

Table 4: Snow accumulation data for the Fundy Shore Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Parrsboro							
	1995	27	7.5	8	0	0	0
	1996	30	6.5	15	3	0	0
	1997	30	12.7	19	1	0	0
	1998	20	6	1	0	0	0
	1999	27	2.7	3	0	0	0
	2000	43	10.6	16	4	4	0
	2001	85	42.3	81	73	69	62
*	2002	43	18.7	59	38	26	0

Table 5: Snow accumulation data for the Northumberland Bras d'Or Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Baddeck							
	1995	36	9.6	20	7	0	0
	1996	19	4	0	0	0	0
	1997	30	9.1	14	1	0	0
	1998	54	6	9	4	2	1
	1999	45	1	0	0	0	0
*	2000	45	13.8	10	23	3	0
Baddeck (Bell Museum)							
*	2000	14	1	0	0	0	0
	2001	102	48	77	71	70	66
	2002	74	21.1	49	41	21	12
*	2003	68	30.4	69	42	26	10
Nappan							
	1995	35	12.7	17	6	0	0
*	1996	40	8.5	24	9	2	0
*	1998	0	0	0	0	0	0
*	1999	0	0	0	0	0	0

Table 6: Snow accumulation data for the Nova Scotia Uplands Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Collegeville							
	1995	17	4.2	0	0	0	0
	1996	30	5.2	14	1	0	0
*	1997	20	5.6	2	0	0	0
*	1998	8	2.9	0	0	0	0
Margaree Forks							
	1995	45	9.5	24	9	2	0
	1996	30	5.2	10	2	0	0
	1997	35	9.8	14	3	0	0
*	1998	20	4	3	0	0	0
	1999	25	4.7	7	0	0	0
	2000	40	10.6	25	7	1	0
*	2001	60	32.9	50	44	36	15
*	2002	50	17.1	18	5	2	1
	2003	70	32.7	23	19	10	6

Table 7: Snow accumulation data for the Valley and Central Lowlands Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Greenwood							
	1995	30	6.7	8	1	0	0
	1996	25	5.5	8	0	0	0
	1997	31	7.4	5	1	0	0
	1998	14	3.1	0	0	0	0
	1999	25	2.6	2	0	0	0
	2000	65	7.7	15	11	5	4
	2001	61	25	74	62	20	8
	2002	48	16.5	52	21	12	0
	2003	77	28.5	61	57	51	31
Salmon Hole							
	1995	35	5.1	11	5	0	0
	1996	62	8.6	22	13	9	5
	1997	42	8.9	20	3	1	0
*	1998	20	2.7	1	0	0	0
	1999	35	2.5	1	1	0	0
	2000	95	10.4	19	9	9	7
	2001	102	47.8	93	77	70	53
*	2002	125	47.3	64	56	49	33
*	2003	50	40.3	27	27	21	6

Table 8: Snow accumulation data for the Western Ecoregion of Nova Scotia. "# Days >__ cm" refers to the number of days in the given year which had a snow accumulation greater than the indicated depth. Asterisks mark years for which limited data were available.

Town/City	Year	Max Depth (cm)	Mean Depth (cm)	# Days >19cm	# Days >29cm	# Days >39cm	# Days >49cm
Bridgewater							
	1995	21	1.8	1	0	0	0
	1996	23	5.1	10	0	0	0
	1997	35	4.2	4	2	0	0
	1998	16	3.2	0	0	0	0
	1999	11	0.7	0	0	0	0
	2000	38	4.3	10	8	0	0
	2001	67	28.5	72	66	47	21
	2002	33	8.1	8	5	0	0
*	2003	56	28.6	68	42	10	5
Springfield							
	1995	56	11.4	24	13	10	5
	1996	80	14.9	34	22	20	16
	1997	58	19.8	63	37	12	6
	1998	37	7.9	19	4	0	0
	1999	23	2.5	2	0	0	0
	2000	70	12	25	16	11	4
	2001	118	65.3	100	92	83	79
	2002	75	23.2	59	38	32	15
*	2003	102	50.7	75	43	53	49

<u>Figure 1</u>: Map detailing weather station locations in Nova Scotia.