

MARTEN (*Martes americanus*) ASSESSMENT

June 2, 1986

Prepared by:
Arthur Ritter

Maine Department of Inland Fisheries and Wildlife
284 State Street
Augusta, Maine 04401

NATURAL HISTORY

Stickland et al. (1982) provides an excellent overall reference to marten natural history and management. In general, material in this section comes from that source.

The American Marten (*Martes Americana*), a small (1-2 lb.) mustelid furbearer, inhabits northern regions of North America, as well as parts of the Rocky Mountain states and California. Maine is at the current southerly limit of the species' range in Eastern North America. Considerable range loss has occurred throughout its original southerly distribution (Strickland et al. 1982), due to land use changes and over exploitation. As near by as New Hampshire, the marten is listed as threatened, although Maine populations are presently secure.

Marten breed during mid to late summer. The fertilized egg develops for a short time, and then ceases development. Following this delayed implantation period, which lasts 190 to 250 days, normal development resumes. After a total gestation length of 220 to 276 days, young are born, usually in April. Large cavity trees and hollow logs for natal dens are required. Litters range from one to five young, but average slightly less than 3.0. The young grow rapidly, attaining adult size in about three months, and disperse in late summer to early fall.

Marten are basically carnivores, and their staple foods are voles and other small mammals. Depending on the season, birds, colonial insects, and fruits are important foods as well. During the winter, most alternative foods are unavailable, and voles increase in importance. Carrion, when present, is also an important source of winter

food. Marten spend much of their time foraging for prey, and investigating potential vole hiding places. In winter, most hunting occurs beneath the snow.

Marten prefer forested habitats, particularly those dominated by mature softwood trees, with medium to high (more than 50%) canopy closure, while avoiding large open areas (particularly in winter) and wetlands. In the summer, small forest openings with their diversity of food are attractive to marten. Female marten are more restrictive in their habitat needs than are males.

Marten are prized as a furbearer. Because they are trapped fairly easily, marten populations can be easily overharvested. Male marten of all ages are more susceptible to trapping than females (Soukkala 1983).

HISTORY

Habitat Trends

The marten has long been recognized as a “deep woods” animal, associated with northerly softwood dominated forest stands. Historically, Maine has been at the southerly limit of the marten’s range in North America.

Historical documentation of the species response to habitat changes do not exist. However, the animal probably reacted to the varying forest conditions which have occurred in Maine throughout the last two centuries. During this time, there has been a shift from forest to agricultural land, and then a return to forested conditions. After European settlement, forests were steadily converted to farms up to the late nineteenth century. At this time, the acreage in agriculture dropped rapidly as farms were abandoned. This rate of increase in forestland slowed after the 1920’s, and has stabilized since 1971, with about 90% of Maine forested.

Population Trends

Past accounts of marten populations and distributions are rare and inadequate for analysis. Manly Hardy, a trapper and fur dealer from Brewer in the late 1800’s, reported marten to be common in much of Maine at this time, with high “sable” catches in some areas. However, by 1940, Aldous and Mendall (1941) reported the species to exist only in northern and northwestern Maine and to be very rare even in those areas.

From the 40’s, marten gradually increased in population up to the 1960’s, followed by a more rapid increase in numbers during this period. Expansion into parts

of WMU 3 and 4 occurred by the 1970's. By the mid-1970's, most observers felt that the population reached its highest level, and stabilized or declined since then. However, marten are now found in small numbers in parts of WMU 5, due to a transplant program in the early 1980's and immigration.

Use and Demand Trends

Marten have historically been an important furbearer in northern forested regions. Historical demand for marten pelts is unknown, but the species was probably pursued by trappers whenever they trapped in good marten areas. In recent years, demand for marten has steadily increased. It is now a heavily favored species in northern parts of Maine, due to relatively high pelt prices, ease of pelt preparation, and light weight.

Harvest Regulations

Prior to 1866, no furbearers, including marten, were protected. After this time, the trapping season for "sable" varied somewhat, but was always in the period from mid-October to as late as May 31. After 1912, the season was never open past the end of February. In 1937, the season was closed entirely in response to low marten population levels, and remained so until 1973, when a section of northern Maine was opened to marten trapping with a five animal limit. Gradually, the season has evolved to coincide with the trapping of other upland furbearers, the limit was dropped, and harvest became legal statewide (Table 1). However, marten hunting is not allowed.

Table 1. Marten management history in Maine.

Year	Estimated ¹ harvest	Estimated ² effort	Estimated ³ average price	Trapping statutes and regulations
1866-1877	-	-	-	October 16 - May 31
1878-1910	-	-	-	October 16 - April 30
1911-1912	-	-	-	October 21 - March 31
1913-1916	-	-	-	November 1 - February 29
1917-1922	-	-	-	October 15 - February 29
1923-1924	-	-	-	November 1 - February 29
1925-1926	-	-	-	October 16 - February 29
1927-1928	-	-	-	November 1 - February 14
1929-1930	-	-	-	November 16 - January 31
1931-1932	-	-	-	Androscoggin, Cumberland, York, Sagadahoc, Kennebec, Lincoln, Waldo, Knox Counties November 16 - January 31; Washington, Hancock, Aroostook, Penobscot, Piscataquis, Franklin, Somerset, and Oxford Counties - October 16 - January 31
1933-1934	-	-	-	Androscoggin, Cumberland, York, Kennebec, Waldo, and Knox Counties November 16 - January 31; Lincoln, Sagadahoc Counties November 16 - December 15; Washington, Hancock, Aroostook, Penobscot, Piscataquis, Franklin, Somerset and Oxford Counties October 16 - January 31
1935-1936	-	-	-	Androscoggin, Aroostook, Cumberland, Hancock, Kennebec, Piscataquis, Somerset, Washington, York Counties November 1 - February 15; Oxford, Penobscot, Waldo Counties October 16 - January 31; Franklin County October 16 - February 15; Knox, Lincoln, Sagadahoc Counties November 1 - December 15
1937-1971	-	-	-	Closed by statute
1972	-	-	-	Statutory provision repealed 1972, replaced by regulation.
1973	152	2,535	-	New regulation; January season;
1974	158	3,226	-	5 limit Unit 1 and 2; Pelt tag
1975	256	3,373	12	required.
1976	481	3,345 (783)	12	October 20 - December 15
1977	1,402	3,935 (1,421)	14	October 20 - December 15
1978	1,125	4,200 (1,294)	26	WMU 1-6 October 20 - November 25; WMU 7-8 October 20 - November 15; No bag limit.
1979	2,718	4,839 (1,638)	32	WMU 1, 2, 3, 5, 6 October 20 - November 25; WMU 4, 7, 8 October 20 - November 10
1980	3,387	5,612 (1,499)	22	North and West deer zones: October 20 - November 30; South deer zone: October 28 - November 30
1981	5,174	5,333 (1,555)	24	North and West deer zones: October 20 - November 30; South deer zone: October 28 - November 30
1982	2,963	5,421 (1,464)	23	North deer zone: October 20 - November 30; South and West deer zones: October 28 - November 30
1983	5,296	4,926 (1,390)	20	North deer zone: October 20 - December 4; West and South deer zones: October 28 - December 4
1984	4,577	4,783 (1,391)	26	North deer zone: October 28 - December 15; West and South deer zones: October 28 - December 4

¹ Pelt tags.

² Total trapping license sales statewide (successful land trappers in WMU 1, 2, 3, and 4).

³ Estimated price from: 1975-1978 trapper questionnaire
1979-1981 on New Hampshire trapper questionnaire
1982-1984 furbuyer survey

Harvest Trends

Harvest records prior to 1973 are sketchy at best. Old State Planning Board records show an average annual catch of 67 from 1928 to 1933. During the long period of closed seasons (1937 to 1973), marten were undoubtedly caught illegally and by mistake in sets for other animals, but the magnitude of this harvest is unknown.

Since 1973, good records of the legal marten catch have been maintained. During this period, the catch went from 152 to a high of 5,296 in 1983, with an upward trend throughout the period. Figure 1 shows the dramatic harvest increases and expanded geographic areas in which marten were caught. Increases in catch during this period were found in all WMU's occupied by marten (Figure 2).

Users

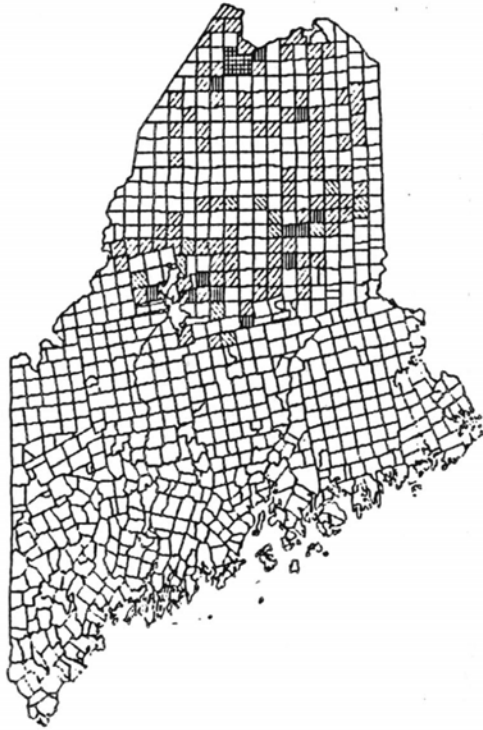
Historical information concerning the use of marten is not available. However, there is no doubt that the number of users fluctuated in response to the availability of marten and pelt price.

When the season was reopened in 1973, trapping license sales were 2,535. They peaked at 5,612 in 1980, and then declined and stabilized between 4,800 – 4,900. While not all trappers trap for marten, the increase in license sales clearly demonstrates a growing interest in trapping during this period.

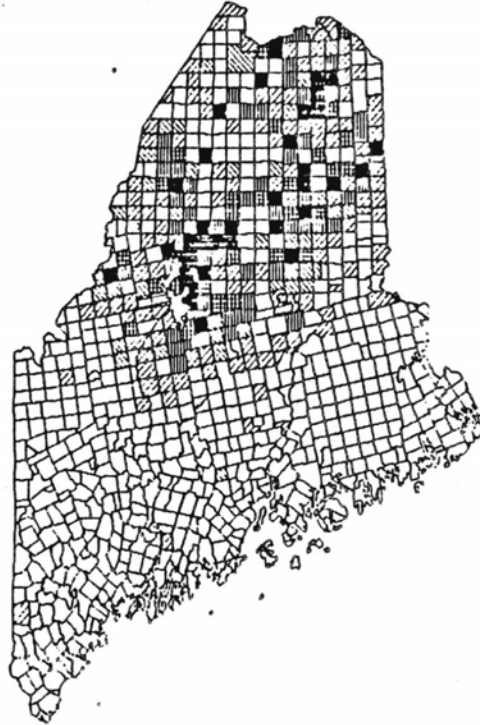
Past Management Goals

During the first planning period (1975-1979), the goal was to increase abundance and use. The catch objective was to maintain a catch of 1,000 to 1,500

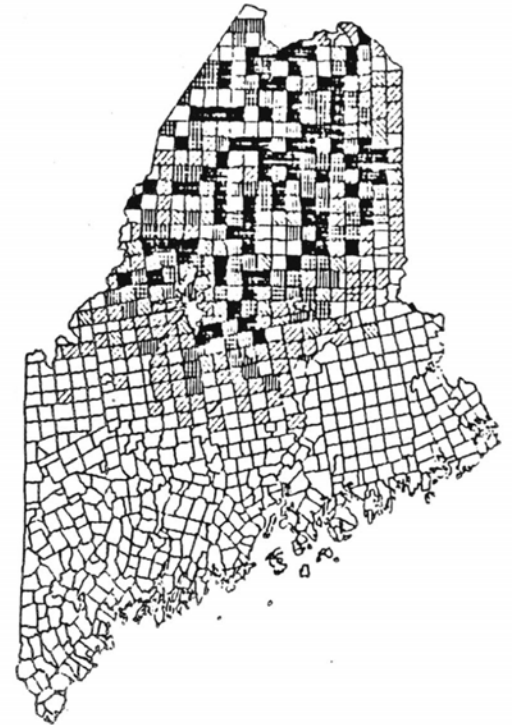
MAINE MARTEN KILL DISTRIBUTION, 1976





MAINE MARTEN KILL DISTRIBUTION, 1979





MAINE MARTEN KILL DISTRIBUTION, 1983



LEGEND: LEVEL

 ZERO
 11 TO 15

 1 TO 5
 16 TO 20



 6 TO 10
 OVER 20

Figure 1: Marten Kill Distribution by township, 1976, 1979, and 1983.

MAINE MARTEN LEGAL KILL , 1976 TO 1984
WILDLIFE MANAGEMENT UNITS 1 THROUGH 5

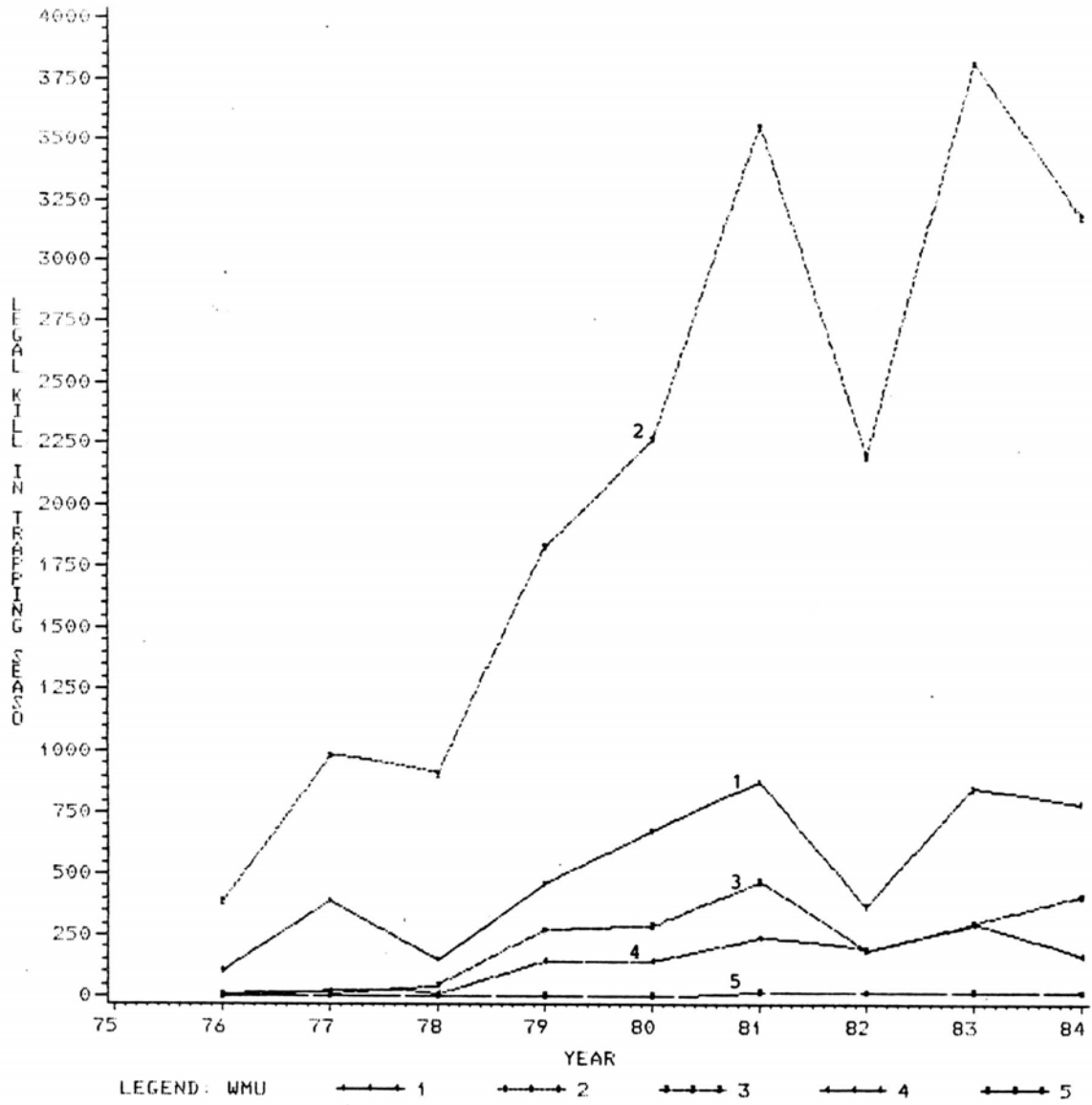


Figure 2: Plot of Marten kill by Wildlife Management Unit and Year, 1976 - 1984

marten. By the late 1970's, this level was attained, and then greatly exceeded in 1979 due to an underestimation of population levels at the time the objective was established (Table 2).

In the second planning period (1980-1984), the goal was to maintain harvest levels and species abundance (relative to 1978), and to encourage expansion of marten range. During this period, harvest levels greatly exceeded those of 1978, but species abundance probably stabilize or showed slight declines from this level. With further expansions into WMU3 and 4, and new expansions into WMU 5, the latter part of the goal was realized, although further expansion was probably halted by high catch levels. The objective kill of 1,200 marten was greatly exceeded (by 147 to 341%) every year of this planning period. This is not a management failure as marten populations were underestimated and could sustain much higher exploitation levels than the 1,200 figure chosen. However, at the harvest intensities evident during the period, local overharvests certainly occurred.

In conclusion, the recent history of marten in Maine has been mostly positive, with increases in population, range, and use.

Table 2. Comparison of statewide marten harvests and species plan objectives, 1975-1984.

Year	Objective Harvest*	Harvest	Deviation (%)
1975	1,250	256	-80
1976	1,250	481	-62
1977	1,250	1,402	+12
1978	1,250	1,125	-10
1979	1,250	2,718	+117
1980	1,200	3,387	+182
1981	1,200	5,174	+331
1982	1,200	2,963	+147
1983	1,200	5,296	+341
1984	1,200	4,577	+281

*Midpoint of objective range used for 1975-1979.

HABITAT ASSESSMENT

Statewide

Status

Marten require forested areas, and thus the amount of forestland in Maine can be used as a measure of habitat quantity. Maine has an estimated 27,420 mi² of forest (Powell and Dickson 1984), all of which is potential marten habitat.

The quality of Maine's marten habitat was assessed by applying forest survey data to a Habitat Suitability Index (HIS) model. This model (Appendix II) used the following variables to numerically evaluate an area's suitability for marten: forest stand size, percent crown closure, percent softwoods, prey (vole) habitat quality estimates, snags and dead trees, soil moisture class, and proximity of unsuitable areas. The model is useful for general quality comparative evaluation, but it is only an approximation of the complexities of habitat-marten relationships.

Statewide analysis of habitat is not meaningful due to wide geographic differences. Generally, northern and western Maine is superior in marten habitat quality to central, eastern, and southern Maine.

Changes

Habitat quantity (forest acreages) has not shown any real change between plans, and is assumed to have remained the same. An HIS was not computed in the last plan, thus there is no direct way to compare the two plans. However, some changes in quality have probably occurred. The forest inventory shows a maturing forest base from

1971 to 1982, which would tend to favor marten. There has been a decline in the acreage of the forest types most preferred by marten, and some regional biologists feel that much of the prime northern Maine marten habitat is being cut. These observations point to minor declines in marten habitat since the last plan. No habitat quality projection was made in the last plan.

Projections

The forest maturation noted in the 1982 forest inventory (Powell and Dickson 1984) probably cannot continue. There is now a low supply of sapling stands which are the mature stands of the near future. Although there is currently low demand for pulpwood, this may not continue to be the case. Also, great increases in the amount of fuelwood clear-cut for biomass power generation plants is anticipated. This points to a decline in marten habitat quality over the next five years. In fact, some regional biologists feel large declines may be forthcoming. A habitat quality decline of about 3% seems likely by 1990 in all units.

The quantity of habitat (forestland) is not expected to decline in the near future.

Wildlife Management Units

Status

There are great regional variations in marten habitat quality (Table 3). These are discussed as 3 groups.

Units 2, 3, and 5 – highest. These three units appear to have the best habitats. Each is at least 95% forested, with from 70 to 90% of their forest in the preferred forest

Table 3. Present marten habitat suitability – 1985.

Wildlife Management Unit	Total Land Area (mi ²)	Marten Habitat (mi ²)	Marten Habitat Suitability Index Value ²	Number of Marten Habitat Units ³
1	3,153	2,416	0.446	1,078
2	8,007	7,908	0.653	5,165
3	3,956	3,864	0.661	2,555
4	5,522	4,839	0.350	1,695
5	2,729	2,598	0.574	1,492
6	2,494	2,181	0.433	945
7	2,023	1,582	0.221	350
8	2,685	2,031	0.148	301
Total	30,569	27,420	--	13,581

¹Forestland.

²For forestland only.

³Habitat times HSI value.

type groups of spruce/fir and northern hardwoods. None of these units has more than 15% of their area estimated to be unsuitable habitat, indicating that they have large contiguous areas of suitable habitat.

Units 1, 4, and 6 – middle. These three units average about 50% of the habitat values of the upper group. They are from 77 to 87% forested, with 61 to 79% of their forest in the two preferred forest type groups. However, 40 to 50% of their area is estimated to be unsuitable to marten. This indicates that good habitat is probably somewhat interspersed with zones of very poor habitat. All of these units have remote as well as settled areas.

Units 7 and 8 – lowest. These units occupy southern Maine and have the lowest habitat potential. Even though they are both over three quarters forested, only 25 to 50% of their forested area is in the preferred forest type groups. Only one quarter of units 7 and 8 is estimated to be suitable marten habitat. This part of Maine has higher human populations and less remote forested area than the rest of the State. Although areas of suitable habitat exist, they are likely to be in smaller patches and isolated from large expanses of good marten range.

Changes

It is difficult to evaluate changes by management unit, as the forest inventory data used in the last survey cannot be directly compared by unit with the current inventory. It appears that the southerly units have improved in habitat quality due to forest maturation. However, these units do not currently support marten populations. Ritter (1985) used Landsat imagery to evaluate marten habitat over 5,000 mi² of Units 2

and 3. He found a 2% decline in quality over a five year period. This decline is not supported by forest inventory data, but some regional biologists believe that a decline did occur.

Projections

Although 1990 is only four years from now, the habitat data for this plan was collected in 1980-82 and will have changed about 9 years by then. There is no hard data which indicates that some units will change more or less than the others.

Therefore, it is assumed that every unit will have a 3% decline in habitat quality, but that quantity will not change by 1990 (Table 4).

Table 4. Projected marten habitat suitability – 1990.

Wildlife Management Unit	Total Land Area (mi ²)	Marten Habitat (mi ²) ¹	Marten Habitat Suitability Index Value ²	Number of Marten Habitat Units
1	3,153	2,416	0.433	1,046
2	8,007	7,908	0.633	5,009
3	3,956	3,864	0.641	2,477
4	5,522	4,839	0.340	1,645
5	2,729	2,598	0.557	1,447
6	2,494	2,181	0.420	916
7	2,023	1,582	0.214	339
8	2,685	2,032	0.144	292
Total	30,569	27,420	--	13,505

¹Forestland.

²HSI values are 97% of 1985 values.

POPULATION ASSESSMENT - CARRYING CAPACITY

Statewide

Status

Estimation of carrying capacity is directly related to 3 parameters: habitat quantity (land area), habitat quality (HSI), and a measure of maximum sustainable marten population per unit area under optimum habitat conditions. As noted in Appendix 2, home range sizes in excellent range are about 0.8 – 1.1 mi² for females and 1.5 – 2.3 mi² for males. Ranges are exclusive for members of the same sex. The ranges are not exclusive for members of the opposite sex, so a given area could be the home of both males and females, as well as of transient juveniles. The maximum sustainable population is calculated for the spring season just prior to the birth of kits. Using the averages from above, a male range would be 1.9 mi² and a females 1.0 mi². If fully utilized, this translates to a density of 1.6 marten per square mile, which was used as an estimate of maximum supportable population.

Summing the unit estimates gives a statewide carrying capacity estimate of 21,730.

Changes

No carrying capacity estimates were documented in the last plan, therefore, no comparisons can be made.

Projections

Using the assumptions in the habitat section, carrying capacity can be expected to drop by 3%. This give the carrying capacity estimate of 21,073 marten in 1990.

Wildlife Management Units

Status

Geographic variations in carrying capacity are directly related to variations in habitat quality and quantity. These variations were discussed under the habitat section. Unit 2 has the largest carrying capacity (38% of the State total), followed by Unit 3; then 4 and 5; next 1 and 6; and 7 and 8 (Table 5).

Changes

No carrying capacity estimates were made in the last plan.

Projections

All units are assumed to decline by 3% in overall habitat quality by 1990. Therefore, carrying capacity losses should be of the same relative magnitude in all parts of the State.

Table 5. Current (1985) and projected (1990) maximum supportable marten overwinter populations by Wildlife Management Unit.

Wildlife Management Unit	1985 Maximum Supportable Populations	1990 Maximum Supportable Populations
1	1,725	1,674
2	8,264	8,014
3	4,088	3,963
4	2,712	2,632
5	2,387	2,315
6	1,512	1,466
7	560	542
8	482	467
Statewide	21,730	21,073

Assumes max pop den = 1.6/mi²

POPULATION ASSESSMENT - CURRENT ESTIMATED POPULATIONS

Statewide

Status

The overwinter population of marten is estimated as 10,629. Fall population is expected to be 17,645. Because of wide geographic variations, discussion of marten populations will be done on a management unit basis.

Changes

The fall population estimate for 1980 was 5,400. Assuming 30% of marten are young-bearing females that average 2.2 young surviving to fall, the fall estimate for 1985 is 17,645 marten. The projected number of marten for 1985 in the last plan was 5,490. Populations were severely underestimated in the 1980 plan.

Projections

A statewide decline in marten populations from 10,600 to 10,400 (spring season) is forecast for 1990, due to slight habitat declines and heavy trapping takes, which prevent further population expansion.

Wildlife Management Units

Status

Despite some apparent potential for marten based on habitat data, Units 6, 7, and 8 are not believed to have marten populations. Unit 5 has a very small population

in its northern section (11% of the Unit). Units 3 and 4 are believed to support marten only in their northern sections (33 and 22% of area respectively) despite the availability of suitable habitat in other areas. Units 1 and 2 have marten throughout.

Unit 2 is estimated to have an average spring population density of slightly over 1.0 marten per square mile, which is near carrying capacity. Population indices calculated from the marten catch data in Units 1, 3, 4, and 5 were compared

Changes

Units 1 and 2 have much higher population estimates now than before. It's apparent that the previous estimates for these units were low, as recent kill levels have exceeded the population and projected estimates. Units 4 and 5 were thought not to have marten populations, however, no marten expanded their range in both units since the last plan was written. Unit 3 had slightly higher estimates than in this plan, but the entire Unit was used for calculations instead of the one-third used here.

Marten populations have probably stabilized or even declined since 1980, due to high catch rates.

Projections

Marten populations are not expected to expand into Units 6, 7, and 8 by 1990. For the other 5 Units (1-5), several assumptions are necessary to project populations. The first assumption is that the carrying capacity projections are reasonable (Table 5). The second is that the major limiting factor in Units 1, 3, 4, 5 and parts of 2 is trapping pressure, as in all these Units' populations are below carrying capacity. The last is that

management will continue on its present course, with harvests at the 1983-84 level. It is assumed that continuation of recent (1983-84) kill levels will lead to the stabilization of current population levels (well below carrying capacity) in Units 1, 3, 4, and 5. In Unit 2, the 3% decline in habitat quality will lead to a 3% population reduction (Table 6).

Population Characteristics

Data on specific marten populations in Maine are lacking and insufficient for analysis.

Table 6. Current (1985) and projected (1990) marten population estimates by Wildlife Management Unit.

Wildlife Management Unit	1985 Estimated Population		1990 Estimated Population	
	Overwinter	Fall	Overwinter	Fall
1	1,403	2,329	1,403	2,329
2	8,095	13,438	7,852	13,035
3	624	1,036	624	1,036
4	436	724	436	724
5	71	118	71	118
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
Statewide	10,629	17,645	10,386	17,242

POPULATION ASSESSMENT - RELATIONSHIP OF CURRENT ESTIMATED POPULATION TO MAXIMUM SUPPORTABLE POPULATION

Maine's spring marten population estimate (10,629) is 49% of the carrying capacity estimate (21,740; Table 7). Both the actual population and carrying capacity are expected to decline slightly by 1990.

Unit 2 has marten populations near carrying capacity, while Unit 1 is probably held somewhat below by trapping pressure. Units 3, 4, and 5 are only partially occupied by marten, and Units 6, 7, and 8, although capable of supporting some marten, are not believed to have any established populations.

By 1990, Unit 2 is expected to remain near carrying capacity, but areas of this Unit are being overexploited, and local declines will occur, in part due to habitat declines. Units 6, 7, and 8 will still not have marten populations. The other Units are projected to remain stable, with Units 3, 4, and 5 held well below carrying capacity, and Unit 1 to about 80% of carrying capacity.

Table 7. Marten spring population vs. carrying capacity estimates for 1985.

Wildlife Management Unit	Population Estimate	Carrying Capacity Estimate	Percent of Carrying Capacity
1	1,403	1,725	81
2	8,095	8,264	98
3	624	4,088	15
4	436	2,712	16
5	71	2,387	3
6	0	1,512	0
7	0	560	0
8	0	482	0
Statewide	10,629	21,730	49

USE AND DEMAND ASSESSMENT - HARVEST

Statewide

Status

In the latest two years (1983-84), marten catches have averaged 4,850, about 76% of allowable. Harvest distribution varies considerably geographically (Table 8), and will be discussed in detail under the management unit section.

Changes

The statewide catch figure (942) used in the last plan was the average for 1975-77. The current average of 4,850 is 500% of this level. The projected catch used in the last plan was 3,146. Actual catches are about 50% higher than previous projections.

Projections

Marten catches under current management are expected to stabilize at around 5,000 by 1990. Demand for marten should remain high, due to ease of catching and handling, and the high pelt value.

Wildlife Management Units

Status

Unit 2 has the highest marten catch (3,438), by far, about 4 times as high as the catch in the next highest Unit, WMU 1 (814). Units 3 and 4 have catches in the 250-350 range, with marten generally caught in northern sections of these Units. Unit 5 has

Table 8. Current (1985) trapping marten harvest, effort and success rates by Wildlife Management Unit.

Wildlife Management Unit	Allowable Harvest	Harvest ¹	Estimated Potential Users ²	Successful Users ³	Serious Users ⁴	Percent Successful	Users/Habitat Units
1	842	814	275	134	25	49	0.255
2	4,857	3,438	276	241	98	87	0.053
3	374	354	165	58	8	35	0.065
4	262	232	644	65	6	10	0.380
5	43	11	157	8	0	5	0.105
6	-	0	189	0	0	0	0.200
7	-	0	310	0	0	0	0.866
8	-	1	348	1	0	<1	1.156
Statewide	6,377	4,850	2,367	507	136	21	0.174

¹Average trapping take, 1983-84.

²Average Successful land trappers, 1983-84.

³Average successful marten trappers, 1983-84.

⁴Average number trappers catching at least 10 marten, 1983-84.

had very low numbers of marten caught in recent years, as marten have only become established there in the last few years. Essentially no marten are caught in Units 6, 7, and 8.

Evaluation of sex and age data for trapped marten indicates that Units 3 and 4 have very young populations with fewer well established adult animals. This suggest that high trapping pressure and related mortality is making population expansion difficult in these areas. Unit 2 has more older animals in the harvest, indicating a lower exploitation rate and thus more older animals available (Soukkala 1983).

Catch per unit effort was analyzed in WMU2 to estimate a maximum sustained yield (MSY) according to Caughley (1977: pp 186-187). The estimate, $0.62/\text{mi}^2$, is about 60% of Unit 2's spring population density estimate. This proportion was applied to the population estimates of the other units to give maximum yield estimates. Results indicated that a number of areas within the management units have been overexploited, with Units 1, 3, and 4 on the whole being trapped at maximum rates. If increased, population declines will follow.

A key factor in whether an area will be heavily trapped is road access, which has increased greatly in northern Maine in the last decade. Soukkala (1983) felt that for an area to yield large marten catches, extensive (>20 km or 12.4 mi. spur and light vehicle roads in a township) access was required. The advent of 3 and 4 wheeler all terrain vehicles, combined with increased road access, has greatly changed the potential for harvest access to formerly inaccessible sections.

Changes

Harvest increases in all units have increased since the last plan, with the largest increases, percentage wise, in Units 3 and 4. The largest increases, in actual numbers have occurred in Unit 2, which contributes the majority of the marten catch.

Projections

Projections of kill is difficult and subject to considerable error. It is assumed that the marten catch will be at the maximum allowable level (MSY) in all units by 1990 except WMU 2 under current (1983-84) management, which does not address local overharvests. The MSY is estimated as 60% of the pre-birth population. Currently, local populations for some areas appear to be over-harvested, and if these trends accelerate, harvests would continue to exceed maximum sustainable yields by 1990. It is assumed that the laws of diminishing returns will take over and less effort will go into catching marten, and excessive kills will not continue. This may not happen if pelt value, and therefore demand, remains high. In this case, excessive kills could continue in many areas. Also, it is assumed that trapper numbers are stabilizing, and that numbers of successful land trappers and marten trappers will remain at the 1983 and 1984 levels, whichever is lowest. However, the 1984 (higher) figure was used for Unit 5 successful marten trappers, as the marten population is just recently getting established there (Table 9).

Stabilization of catches at the current level for WMU 2 and at the maximum allowable level for the other units is expected.

Table 9. Future (1990) marten harvest, effort, and success rate estimates by Wildlife Management Unit.

Wildlife Management Unit	Maximum Allowable Harvest	Catch	Estimated Numbers of Users ¹	Successful Users	Serious Users ²	Percent Successful	Users/Habitat Units
1	842	842	273	127	22	47	0.26
2	4,700	3,500	263	229	79	87	0.05
3	374	374	163	55	7	34	0.07
4	262	262	627	55	4	9	0.38
5	43	43	155	10	0	6	0.11
6	-	-	174	0	0	0	0.19
7	-	-	300	0	0	0	0.88
8	-	-	340	0	0	0	1.16
Statewide	6,221	5,021	2,356	481	112	20	0.18

¹Successful land trappers.

²Trappers catching at least 10 marten.

USE AND DEMAND ASSESSMENT - TYPES OF USERS

Statewide

Status

There are five types of marten users, and not much is known about any group. The first is the non-consumptive user. The marten is curious and aesthetically appealing, and is probably of much interest to those who see it in northern Maine. Whether these users are photographers, hikers, skiers, snowmobilers, campers, hunters, or anglers is unknown. Marten also have some value on pure aesthetic terms among people who may never see one, but like to "know it is there".

The second group is trappers who accidentally catch marten. Alan Clark (unpublished data) showed that only 7% of land trappers in northern and western Maine caught marten unintentionally.

The third group is those who trap for marten, but are unsuccessful. Clark's questionnaire for trappers in 1980 indicates about one fifth of trappers who try to catch marten fail to do so. How much effort these people expend, and their knowledge and experience as compared to successful trappers is unknown.

The fourth group is marten trappers who catch only a few marten. In 1984, 79% caught 10 or less.

The final group is those trappers who catch many marten. In 1984, 21% of successful marten trappers caught 11 or more marten, 18% caught more than 25 animals, and 3% caught over 50. Four individuals each caught over 100 marten which

accounted for 11% of the total harvest. This group, the smallest number of people, has the largest potential impact on marten populations and range expansion.

Two factors are important when evaluating preference for marten. First, the biggest impact on marten populations will be from a small number of very successful trappers who strongly prefer marten. Second, since 1980, prices for foxes and coyotes have dropped sharply, while marten prices have increased. This, coupled by their relative ease of capture, their light weight, and ease of pelt preparation, means that they are now a highly preferred species.

Numbers of potential consumptive users were given in Table 8, but they were not subdivided into groups.

Changes

The 1980 plan (1977-78 data), stated that there were 265 successful marten trappers. The number of successful trappers has doubled since then. However, only a 6% increase has occurred since 1980. There has been increases in the catch per successful trapper, which could indicate shifts in the numbers of people in the last two trapper categories referred to in the previous section.

A leveling off of the number of marten trapper numbers has occurred since 1980 and the numbers of trappers are much closer to those of 1980 than to the projections made in the last species plan.

In 1980, a higher percent of trappers caught fewer animals; only one person caught more than 70 compared to 10 people in 1984. The percentage of the catch

trapped by the most successful trappers increased dramatically from 13% in 1980 to 26% in 1984.

Projections

Land trappers or marten trappers are not expected to increase over mid-1980 levels by 1990. Likewise, the number of people trapping a lot of marten won't increase, as most populations are already being trapped near their maximum sustainable yield under current management.

The number of consumptive users may increase in the next 5 years. Increases in camping and other land activities are forecast by 1990 (Chaisson, unpublished report). There seems to be increasing interest in and awareness of wildlife among the general public as well. These combinations will likely lead to increased people/wildlife interactions of a non-consumptive nature. The marten, being rare where most people live, could be of considerable interest for observing and photographing.

Wildlife Management Units

Status

Numbers of consumptive users are estimated as the numbers of successful land trappers (Table 8). These data are misleading in Units 6-8, as there are no marten to catch and the actual number of prospective users in these areas approach zero. In some of the other units, marten populations are low or not widespread and there would be fewer people trapping intentionally for marten. However, where the species is

abundant, such as WMU 2, a very high proportion (87%) of land trappers who catch anything will catch marten.

The number of consumptive users depends on marten populations. If marten are present, trappers will attempt to catch them. If scarce in an area, trappers will concentrate on other animals. Any land trapper is a potential marten harvester if marten are available in the area being trapped.

There are only two user categories which can be evaluated: very successful trappers, and those who caught only a few animals. There are large differences between the five units in the percentages of trappers that fall into these categories, as might be expected. Units 1 and 3 are similar, with high percentages of trappers catching less than six marten, and low numbers catching more than 25. Unit 2 has much lower percentages catching less than six marten and three times as many, proportionally, catching more than 25. Unit 4 has very high percentages catching less than six marten, and non catching over 25. Unit 5 has no trapper catching more than two. These differences are likely to be related more to marten populations than to trapper differences. Trappers are taking advantage of the situation where they do their trapping.

Changes

Changes by management unit are similar to statewide changes. However, Unit 2 has been particularly notable in the increase in the numbers of trappers catching large numbers of marten. Units 4 and 5 have a higher gain, percentage-wise, in the number of successful marten trappers, but these units still have low marten trapper numbers.

Projections

Under the current intensive trapping pressure, populations, and thus successful trapper numbers, cannot be expected to grow by 1990. One exception could be Unit 2, which still has unexploited areas. Even in this unit, consumptive use is not expected to grow much.

Nonconsumptive use could increase particularly in Unit 2, if expected gains in back country recreation take place.

SUMMARY AND CONCLUSIONS

The marten is a carnivore that, although abundant in northern Maine, is absent in southern Maine and most of the rest of the Eastern United States. Consumptive use of marten has increased dramatically in Maine in the last decade. In 1975, only a few hundred marten were trapped; twice since 1981, over 5,000 animals were taken. These levels have greatly exceeded anything forecasted even as late as the last species plan. As the species is trapped and the pelts handled with relative ease, the price for pelts has increased greatly, and the number of people trapping large numbers of marten has grown, there needs to be real concern for this animal in setting regulations. Also, marten cannot bear young until they are at least two years old, and thus have a lower reproductive potential than many other furbearers.

Marten habitat exists throughout Maine, but is best in western and northern sections, and poorest in the south. There are contradictory data regarding whether habitat is improving or declining; it probably will not change greatly either way by 1990 although close monitoring is advised. Overharvest of softwood forest poses the greatest potential loss of habitat.

Population levels are variable across the State, with the coastal Management Units (6, 7, and 8) not believed to have marten populations. The northernmost units (1 and 2) probably have populations near carrying capacity. Units 3 and 4 have viable populations in their northern sections, but have the potential for many more marten than actually live there. Unit 5 appears to have good marten habitat, but extremely low populations.

Most data points to current harvest levels approaching or even exceeding the maximum sustainable yield, with the exception of many parts of Unit 2. The apparently large population increases and range expansions which occurred over the last couple of decades took place during a time of light to nonexistent trapping pressure. This situation is now reversed, and marten populations are being held in check, with local declines and a cessation of range expansion. Natural regulation factors and their magnitude are unknown. The maximum sustained yield of marten populations seems to be near 60% of the prebirth population. Assuming that 30% of a population are females that average 2.2 young surviving to autumn, the maximum fall exploitation rate is about 36%. This gives little margin for error for excessive natural mortality. It also decreases some other benefits that may result from marten, such as nonconsumptive use and their ecological role, and reduces or eliminates range expansion. Under current management some population declines and consumptive user stability is projected by 1990 (Table 9).

Few specifics are known about different marten user groups. The group with the most potential impact on marten populations is trappers who catch large numbers of marten. The percentage of trappers catching more than 25 animals has doubled since 1980, and their share of the catch has grown from 28 to 47%. They are, however, a small group, comprising about 8% of the successful marten trappers. One problem in interpreting marten catch data is the lack of reliable effort data. These data would make analysis more flexible and would help to delineate user groups.

The management of the species must be done with more care in the future to protect populations from reductions. Its direction will be shaped by the objectives for

the species; the key will be to develop a management strategy which will meet those objectives in a workable and enforceable manner.

Recent marten management data are summarized in Table 10.

Table 10. Past, present, and projected marten use statewide by year.

Year	Harvests			Consumptive Users***	
	Actual	Maximum Allowable*	Objective	Total	Successful
1973	152	3,100	-	-	-
1974	158	3,400	-	-	-
1975	256	3,700	1,250	-	-
1976	481	4,150	1,250	783	153
1977	1,402	4,500	1,250	1,421	399
1978	1,125	5,000	1,250	1,294	234
1979	2,718	5,500	1,250	1,368	444
1980	3,387	6,200	1,200	1,499	478
1981	5,174	6,200	1,200	1,555	579
1982	2,963	6,200	1,200	1,464	425
1983	5,296	6,200	1,200	1,390	533
1984	4,577	6,200	1,200	1,391	481
1985	5,200	6,200	-	1,400	500
1990**	5,021	6,200	-	1,326	476

*Assumes population doubled between 1973 and 1980.

**Assumes current management continues.

***Land Trappers WMU 1, 2, 3, and 4.

LITERATURE CITED

- Aldous, C. M. and H. L. Mendall. 1941. The status of big game and fur animals in Maine. Maine Cooperative Wildlife Research Unit. Unpublished mimeo. 24pp. plus appendices.
- Caughley, G. 1977. Analysis of vertebrate populations. John Wiley and Sons. New York. 234pp.
- Powell, D. S. and D. R. Dickson. 1984. Forest statistics for Maine: 1971 and 1982. Resour. Bull. NE-81. Broomall, PA. USDA Forest Service. 194pp.
- Ritter, A. E. 1985. Marten habitat evolution in Northern Maine using Landsat imagery. Paper presented at 41st N. E. Fish and Wildlife Conference, Hartford, CT, May 8.
- Soukkala, A. 1983. The effects of trapping on marten populations in Maine. Unpub. Master's thesis. Univ. of Maine, Orono. 41pp. plus supplement.
- Strickland, M. A., C. W. Douglas, M. Novak, and N. P. Hunziger. 1982. Marten. Pages 599-612 in J. A. Chapman and G. A. Leldhamer, eds. Wild Mammals of North America – Biology, Management, and Economics. Johns Hopkins University Press. Baltimore, MD. 1147pp.