MUSKRAT ASSESSMENT

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NATURAL HISTORY

The following Natural History section is an adaptation from Perry (1982).

Muskrats are native North American rodents. Through escapes and introductions they now also occur over much of Europe and Asia. They are closely associated with wetlands having an abundance of aquatic vegetation and do not normally spend much time on land.

Adult muskrats are about 20 inches long and weigh about 3 pounds. They have sleek heads with mouth, nostrils, and ears adapted to close when under water. Their senses of smell and hearing are well developed. The front feet are used for a variety of tasks with the hind feet adapted for swimming. The black, scaly tail is flattened dorsolaterally and serves as a rudder to maintain balance while swimming.

The popularity of the muskrat as a forbearer is due to its fine coat of dense, silky underfur and long, coarse guard hairs. The hair color ranges from a dark mahogany brown along the back, to a reddish, chestnut on the sides, with a soft silvery gray on the underside. The pelts reach peak primeness in late February.

In the northern part of their range, female muskrats begin to produce litters at one year of age, and have one to three litters of 4 to 8 kits each year. After a four week gestation period the kits are born, blind and nearly naked, and weighing less than one ounce. At four weeks they stop nursing but remain in their parents territory until after their first winter.

Muskrats generally prefer salt or freshwater marshes, ponds and slow moving streams, but are adaptable and easily found in a wide range of community types

including ditches, canals and flooded gravel pits. Principle foods include a variety of species of emergent aquatic vegetation. Muskrats also like cultivated plants including carrots, corn, clover and apples.

Muskrats build houses of mud and vegetation, dig dens in soft banks and construct feeding platforms built up from the wasted part of food plants. Their houses and feeding platforms require constant maintenance, and will deteriorate soon after abandonment.

Muskrats are mostly nocturnal. Their survival depends largely on concealment, and they spend a large amount of time in tunnels, burrows, and feeding shelters during the day. Muskrats are territorial and are fairly intolerant of other muskrats, particularly when food is scarce. Muskrats are semicolonial animals and dens occur in groups. Throughout most of the year, an individual den will contain a solitary adult, or a breeding pair and newborn offspring. However, in winter several muskrats may den together. Muskrats will attack savagely when cornered and can inflict considerable damage with their long and sharp incisor teeth.

Although muskrats have a high reproductive potential, they have a short life span. Disease, parasites, predators (mink primarily), intraspecific fighting and exploitation (trapping) are principal causes of mortality. In addition, the flooding of muskrat dens, complete freezing of shallow waterways, and food shortages are important indirect causes of muskrat mortality. Hemorrhagic disease may decimate whole populations and tularemia accounts for significant impacts in areas studied outside Maine. Muskrats have been known to alter their habitat by destroying their available food base during periods of high population densities. However, the extent of

habitat destruction by high muskrat densities in Maine is unknown. Together with all other factors that effect muskrats and their high reproductive rate it is not unusual to experience dramatic but short-term fluctuations in muskrat populations.

The muskrats' habit of burrowing into banks frequently cause landowners problems. They commonly construct burrows into earthen dams and dikes associated with farm ponds, causing them to leak.

HISTORY

Habitat Trends

The management of muskrats has been based on habitat information obtained for waterfowl and other management purposes. Maine wetland, stream and lake inventories form the basis for muskrat habitat analysis. The more specific life requirements of muskrats are not represented in the inventory. Furthermore, there has been no measure of the changes that have occurred over time. Therefore, the trend in habitat quality and muskrat populations based on habitat is not known.

Population Trends

Historically, muskrat population trends have not been monitored.

Use and Demand Trends

Furbearer harvest and user information is based on information from pelt tags, furbuyer reports, and trapper questionnaires. No location- or user-specific information has been used concerning the muskrat harvest. The measure of the statewide harvest up to 1977-78 comes from trapper questionnaires. From that period to 1980 there was no good record of muskrat harvest. However, in 1980 Clark (1985) conducted a detailed trapper questionnaire; and from 1981 to the present mandatory furbuyer reports have been used to track harvest trends.

Harvest Regulations

The statutes and rules regulating the take of muskrat have been subject to many changes (Table 1). This is particularly true of the portion of the open season coming in the spring of the year. Since 1955 the spring season was changed in some part of the State ten times in twenty--four years. There has been no provision for spring trapping since 1979.

Season lengths in the extreme have been from October 20 to May 15, or some part of this period, to a fall-only season of October 29 to November 30 in the southern deer zone. Trapping under the ice has long been an accepted muskrat management practice in many states. Such a season has been provided in Maine by allowing muskrat trapping along with and in areas open to beaver trapping.

During the period from 1950 to the late 1960's, muskrats were managed rather intensively on several State-owned lands (Wildlife Management Areas). The muskrat population on these areas were controlled by utilizing local trappers who contracted with the Department to take muskrats. One trapper was granted access to each area, and his catch was monitored closely. Half of the muskrats taken in the program became Department property, and were sold. Concern over the fairness and legality of this program led to its cancellation.

Harvest Trends

Harvests, as estimated from available information, have fluctuated with pelt values and interest in other aquatic fur. In 1979, when the spring trapping season was eliminated, there was an expected drop in muskrat harvests. However, the high prices

Table 1. Muskrat management history.

Year	Estimated harvest[1]	Estimated effort[3]	Estimated price[4]	Statutes and Regulations[2]
1955	29,800	2,005	1.30	Washington and York Counties
1956	23,700	2,011	1.00	March 20-April 20; All other counties November 1-30.
1957	17,200	1,656	0.90	Washington and York Counties March 20-
1958	17,600	1,486	0.80	April 20; Saco River in Oxford County
1959	15,500	1,486	0.80	November 1-April 25; All other counties
1960	14,500	1,381	0.80	November 1-30.
1961	--	1,407	--	Washington County April 1-30; York
1962	13,500	1,323	0.90	County March 20-April 20; Aroostook
1963	19,000	1,435	1.40	County, Saco River in Oxford County
1964	33,300	1,698	1.20	November 1-April 25.
1965	28,300	1,600	1.40	Somerset County October 21-November 21
1966	30,800	1,586	1.40	Washington County April 1-30; York and Franklin Counties and Cumberland County in part, March 20-April 20; Aroostook County April 15-May 15; Piscataquis County April 1-30; Saco River in Oxford County November 1-April 30; rest of State November 1-30.
1967	21,600	1,507	0.90	Somerset County April 1-30; Penobscot
1968	33,300	1,496	0.90	County in part, Washington and Franklin Counties April 1-30; York County in part, March 20-April 20; Aroostook County and Penobscot County in part, April 15-May 15; Piscataquis County and Oxford County in part, November 1-April 30.
1969	41,100	1,741	1.30	North Zone November 1-May 15; South Zone
1970	28,200	1,648	1.30	November 1-April 30.
1971	27,000	1,649	1.50	North Zone November 1-May 15; South Zone November 1-April 15.
1972	29,500	1,916	2.00	Statutory provision repealed and replaced
1973	65,200	2,529	2.50	by regulations. North Zone November 1-May 15; South Zone November 1-April 15.
1974	76,100	3,226	2.70	WMU's 1 and 2 April 25-May 15, October 20-
1975	49,600	3,373	3.00	November 30; WMU's 3 to 8 April 1-20, November 1-30.
1976	34,700	3,345	4.10	WMU's 1 and 2 October 20-November 30;
1977	43,200	3,935	4.80	WMU's 3, 4, 7, and 8 November 1-30; WMU's 5 and 6 November 1-30; April 1-30.
1978	--	4,200	6.00[4]	WMU's 1 to 4 October 20-November 25;
1979	--	4,839	5.10[4]	WMU's 5 and 6 October 20-November 25, April 1-30; WMU's 7 and 8 October 25 to November 15.
1980	72,000[5]	5,612	6.60	Northern and Western deer zone October 20
1981	--	5,333	4.30	to November 30; Southern deer zone
1982	55,500[6]	5,421	2.80	October 28 to November 30.
1983	44,500	4,926	3.00	Northern deer zone October 20 to December 4; Southern deer zones October 28 to December 4.
1984	44,600	4,783	3.60	Northern deer zone October 28 to December 15; Southern deer zones October 28 to December 4; Seasons and areas open to beaver trapping also open to muskrat trapping.

[1]Performance Report, FWA-1-P-3, W202.

[2]Hunting the same as trapping through 1975, closed to hunting from 1976 to present.

[3]Total trapping license sales.

[4]New Hampshire and Maine furbuyer surveys.

[5]Maine trapper questionnaire.

[6]Analysis of furbuyer reports.

offered in the late 1970's, and new trappers participating in the harvest, kept harvest estimates higher than 50,000 through 1982.

Users

Numbers of muskrat trappers probably increased during the late 1970's, peaked in 1980 and declined since then, as these trends were apparent in trapping license sales. There does not appear to be a significant nonconsumptive demand or use of the muskrat.

Past Management Goals

In 1975, the Department adopted a goal of increasing the use of muskrats, with an associated objective annual harvest of 60,000 muskrats, taken by 2,000 trappers. During the late 1970's, concern over the size of spring muskrat harvest and concern over reports of high numbers of damaged pelts obtained during spring seasons lead to a shortening of the muskrat trapping season, and termination of spring trapping. An additional concern about spring muskrat trapping related to potential losses of waterfowl. As a result of the limitations these regulations changes placed on harvest size, the objective harvest was reduced to 45,000 muskrats annually in 1980.

Since 1980, muskrat harvests have declined to near the objective level of 45,000 animals. Harvest levels have apparently tracked declines in pelt price and trapper license sales during this period (Table 1).

HABITAT ASSESSMENT

Statewide

Status

The principal life requirements for muskrats are slow moving (lentic) wetlands with an abundance of cattails, bulrushes, sweetflag, arrowhead, spartina, wild rice or sedges covering three-quarters of the area. Freshwater levels must be reasonably stable, and of sufficient depth not to freeze fully in the winter. Clams, mussels, and other animal matter are consumed but not required. cover requirements are generally met sufficiently by the required food plants. The high vulnerability to avian predators makes the cover requirement particularly important.

Maine's wetland inventories classify each wetland into one of nine type classes. However, the type class does not reflect various mixtures of types which may exist on a small scale. Therefore, the relative value of these wetlands specifically for muskrats is not considered. In addition, wetland areas less than 10 acres in size are not included in these inventories. Rivers, streams, and lakes may have portions suitable for muskrats and consequently an estimate of these portions is included in this assessment. However, the 240,000 acres of muskrat habitat likely represents a very low estimate (Table 2).

In general, the proportion of wetlands classified as muskrat habitat increases progressively from north to south. However, the actual progression may not be so distinct and local variations in habitat abundance are recognized. It is generally accepted that waters in the northern parts of the State are more acidic and lower in

Table 2. Muskrat habitat.

Wildlife Management Unit	Total wetlands (acres)	Habitat wetlands (acres)
1	59,200	6,700
2	220,700	10,100
3	215,300	9,400
4	179,900	74,300
5	146,500	23,500
6	91,100	33,300
7	76,900	31,100
8	120,100	54,100
Total	1,109,700	242,500

dissolved nutrients. Northern Maine's colder climate also results in thicker ice accumulations and shorter growing seasons. Cumulatively, these features probably detract from good muskrat habitat.

Changes

There are no changes to be described since the last assessment.

Projections

Habitat conditions for muskrats are not expe ed to change substantially during the planning period.

Wildlife Management Units

Status

WKU's 4, 6, 7, and 8 contain the most favorable Fusk-rat habitat in the State. This reflects the importance of the coastal wetlands for muskrats.

Changes

No changes from the previous assessment can be demonstrated.

Projections

Habitat values for the assessment period cannot be anticipated.

POPULATION ASSESSMENT - CARRYING CAPACITY

Statewide

Status

The estimate for the maximum number of muskrats that can be sustained is based on density estimates for each of the nine marsh types in the Wetland Inventory, three lake types, rivers and streams (Table 3). Although good population estimates are not available, a survey of muskrat houses and dens in wetland types of central Maine found use consistent with harvest estimates (Rollins 1978). The statewide total of approximately 370,000 muskrats equals an average density of 1.5 muskrats/acre of habitat.

Changes

Except for minor refinements, the density estimates used for developing the population carrying capacity is the same as those used in the 1975 species assessment. However, this assessment includes all habitat types.

Projections

No substantial change in muskrat carrying capacity is expected during the planning period.

Table 3. Muskrat population estimates.

Wildlife Management Unit	Present		Future	
	Carrying capacity	Preharvest (fall) density (number/100 acres)	Carrying capacity	Preharvest (fall) density (number/100 acres)
1	9,700	145	9,700	145
2	7,600	75	7,600	75
3	8,700	93	8,700	93
4	91,000	123	91,000	123
5	32,100	73	32,100	73
6	53,000	159	53,000	159
7	59,200	190	59,200	190
8	109,900	203	109,900	203
Statewide	371,200	153	371,200	153

Wildlife Management Units

Status

Estimated carrying capacities for the various W14U's demonstrate the abundance of high quality habitat in the southern and coastal portions of the State (Table 3). WMU 8 has the highest estimated carrying capacity (109,900), followed by WMU 4 (91,000) then WMU 7 (59,200), WMU 6 (53,000) and WMU 5 (32,100). WMU's 1, 2, and 3 each have carrying capacities estimated at less than 10,000 muskrats.

Changes

WMU carrying capacity is a reflection of the statewide totals.

Projections

No changes in any WMU's carrying capacities are expected.

POPULATION ASSESSMENT - CURRENT ESTIMATED POPULATION

Statewide

Status

The estimated population of muskrats is essentially the same as the carrying capacity, subject to a number of mortality and Population stress factors. Muskrat densities are constantly changing, reflecting the volatile nature of these impacts, most of which are contingent on local conditions. carrying capacity may be exceeded in one region, only to be greatly understated in another. Each condition is temporary, with relatively short-term recovery from either extreme.

Thus, the actual preharvest population may vary from the estimated carrying capacity by at least one third to perhaps two thirds. Because of their rapid pioneering into new habitat (presumably vacated by other declining populations of muskrats), and very high reproductive rate the time cycle of these abundance changes is very short. an overriding feature of muskrat population fluctuations is that they are not the same in different areas. Except for periods of extreme climatic stress, the ups and downs of a large number of muskrat marshes probably tend to cancel each other.

With all the factors affecting muskrat abundance it is unlikely that fall and winter removals by trapping have any influence on the size of the breeding population in the spring. Impacts on fall populations by trapping removals in the spring season are not known. This assessment reflects an allowable harvest of two thirds of the fall population (Table 4). The allowable harvest may exceed 200,000 muskrats annually.

Table 4. Use and demand of muskrats by Wildlife Management Unit.

Wildlife Management Unit	Allowable harvest	Harvest	User	Successful users
1	7,500	Unknown	Unknown	Unknown
2	10,000	"	"	"
3	10,000	"	"	"
4	77,500	"	"	"
5	25,000	"	"	"
6	35,000	"	"	"
7	32,500	"	"	"
8	55,000	"	"	"
Statewide	250,000	44,500	5,115	--

This allowable harvest is, for the most part, compensatory mortality - the muskrats harvested would have died from other natural causes had they not been trapped.

Changes

Population estimates are substantially higher than estimates in earlier assessments, because estimates of amount of habitat have increased.

Projections

No significant change is anticipated during the planning period.

Wildlife Management Units

Status

WMU's 4, 5, 6, 7, and 8, reflecting the most favorable habitat, are estimated to contain the highest numbers of muskrats.

Changes

Changes from previous assessments are not comparable.

Projections

No long-term change in muskrat population estimates is anticipated.

POPULATION ASSESSMENT – RELATIONSHIP OF CURRENT POPULATION TO MAXIMUM SUPPORTABLE POPULATION

The current population estimate is essentially that of carrying capacity with the assumption that there are localized short-term fluctuations. It is expected that, except during periods of extreme climatic impacts or epizootics, statewide population levels remain relatively stable while locally populations may exceed carrying capacity, and then become temporarily suppressed.

USE AND DEMAND ASSESSMENT - HARVEST

Statewide

Status

Statistics for the muskrat resource have not been routinely collected. The harvest of muskrats (Table 4) is calculated using a proportion of muskrat pelts sold to furbuyers, to other pelts sold during the same period when the total pelts from pelt tagging records is known. This analysis provides only rough harvest estimates, but is useful in determining harvest trends. Recent harvest estimates have hovered around 50,000 animals, but if the true harvest were as many as 100,000 it would still be far below the allowable harvest of nearly 250,000 muskrats.

Changes

Harvest of muskrat peaked in 1980, in conjunction with high pelt values for many furbearers, and license sales.

Projections

If current trends in license sales and fur values continue over the planning period, muskrat harvests are expected to decline.

Wildlife Management Units

Status

No harvest information is available on a WMU basis.

Changes

Changes in harvest within WMU's are not known.

Projections

Muskrat harvests will continue to decline with a ecline in licensed trappers and pelt values.

USE AND DEMAND ASSESSMENT - TYPES OF USERS

Statewide

Status

Nonconsumptive users do not appear to comprise an important user group for muskrats. Trappers are the only consumptive users. A trapper mail questionnaire in 1980 (Clark 1985) revealed that 68% of trappers, statewide, trapped for muskrats. The same proportion applied to recent license sales would indicate that there are about 3400 muskrat trappers in the State (Table 5).Muskrats were apparently the most preferred aquatic species to trap in Maine in 1980 and followed only raccoon and red fox in trapper preference for all furbearers (Clark 1985).

In 1982 and 1983, the average value of the muskrat harvest in Maine was 13 percent of the total fur harvest value. Trapping license sales peaked when muskrat pelts peaked in value.

Changes

Consumptive use of muskrat appears to have peaked around 1980.

Projections

Trapping license sales and muskrat trappers are expected to decline during the planning period.

Table 5. Past, present and future muskrat harvests and users.

Year	Harvest			Users total[2]
	Actual (est.)	Allowable[1]	Objective	
1976	34,746		60,000	3,345
1977	43,192		60,000	3,935
1978	--		60,000	4,200
1979	--		60,000	4,839
1980	72,000	153,000	45,000	5,612
1981	--	153,000	45,000	5,333
1982	55,500	153,000	45,000	5,421
1983	44,500	153,000	45,000	4,926
1984	44,600	153,000	45,000	4,783
1985	--	--	--	--
1990	50,000	250,000	--	5,115

[1]Allowable = optimum in 1980 plan.

[2]License sales.

Wildlife Management Units

Status

Use of muskrats by WMU is unknown

Changes

Changes in the use of muskrats on a WMU basis are unknown.

Projections

WMU trends in use are unknown, and projections are not possible.

SUMMARY AND CONCLUSIONS

Muskrats are indigenous North American semiaguatic rodents, about 20 inches long and weighing about 3 pounds. They are associated with both fresh and marine wetlands and streams, and because of their abundance and attractive fur they are an extremely popular forbearer. Muskrats are prolific breeders. However, their short life span and numerous mortality factors cause severe short-term population fluctuations.

Muskrat ecology has not been studied thoroughly in Maine, but some helpful information has been derived from associated species harvests and related resource data. A general habitat base is derived from a statewide wetland inventory. Trapper questionnaires and furbuyer reports provide limited periodic harvest data. Muskrat harvests have generally tracked license sales and fur prices.

Harvest regulations for muskrat fluctuated in the past with increased trapper license sales and in response to a concern for the potential of overexploitation. A spring trapping season was terminated in 1979. Later, winter trapping was initiated concurrent with beaver trapping.

Maine has a relative abundance of swamps, marshes and slow moving streams, in proximity to favorable vegetation conditions for good muskrat habitat. The quantity and quality of these types of wetlands is not changing substantially. The best muskrat habitat is found in coastal and central interior sections of the State.

Carrying capacity for muskrats is about 370,000 estimated from expected densities in each of the various habitat types taken from literature. This results in densities averaging about 1.-5 muskrats/acre of habitat. Actual population estimates

assume that populations are near carrying capacity on a statewide and regional level, even though volatile fluctuations in density occur locally. The allowable harvest is easily between 1/3 and 2/3 of the preharvest population, or nearly 250,000 muskrats statewide.

Muskrats are one of the most popular furbearers among trappers because of their abundance, relatively high fur value, and the enjoyment provided in their harvest. However, without a spring trapping season, both trapper numbers and use of the muskrat resource are expected to decline, resulting in an underutilized resource statewide.

LITERATURE CITED

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Muskrat Goal and Objectives
1985-1990

GOAL: Allow muskrat population to fluctuate naturally.

OBJECTIVES

Abundance Objective: Allow muskrat densities to fluctuate naturally in all WKU's through 1990.

Harvest Objective 1: Increase harvest opportunity (season length) by 10% in WMU's 11 2, 5, and 6 and maintain harvest opportunity at current levels in the remainder of the State by 1990.

Harvest Objective 2: Maintain harvest opportunity (season length) at current levels statewide through 1990.

Capability of Habitat: Muskrat habitat throughout Maine is capable of supporting fluctuating muskrat populations. Although local variations in muskrat numbers may cause declines in habitat quality, habitat conditions will not be affected on a regional basis.

Feasibility: No changes in harvest regulations are required to accomplish the goal and abundance objective, and to maintain harvest opportunity (Harvest objective 2). However, an increase in season length (harvest opportunity, associated with Harvest Objective 2) in parts of the State will require a change in the Department's rules for harvesting muskrats.

Desirability: The goal and abundance objective may be desirable to trappers throughout the State. However, the alternative harvest objectives reflect regional differences in desires of muskrat trappers. Some trappers residing in northern and eastern Maine would welcome increased opportunity to take muskrats, as they believe the current fall water trapping season dates are too restrictive. However, many southern Maine trappers are concerned that additional trapping opportunity may lead to overharvest of muskrats, and are opposed to a spring trapping season. They believe the benefits of spring trapping would be outweighed by the potential for catching damaged muskrats, and are concerned about trapping losses to waterfowl populations.

Consequences: Regional differences in the attitudes of trappers regarding muskrat trapping will result in continued trapper dissatisfaction with harvest opportunity regardless of the harvest objective selected. This dissatisfaction may only be overcome by regional management strategies and harvest regulations. However, the level of trapper dissatisfaction will probably not be intense, and legislative intervention in the management process is unlikely. Large fluctuations in pelt price may impact harvest pressure, but a drastic increase in the market value of muskrat would be necessary to increase trapping pressure to levels which impact muskrat populations.

Summary of Working Group Concerns

MUSKRAT

Habitat

None

Population

1. Population estimates are inadequate.

Harvest

1. Harvest estimates are inadequate.

2. Could be a spring season but several problems need to be addressed.
   a. Waterfowl losses
   b. Where (not statewide)
   c. Short time to avoid damaged pelts
   d. Incidental mink catches

3. Potential overharvest if heavy trapping in spring and fall.

4. Much disagreement on extended trapping seasons.

Muskrat Problems and Strategies in Order of Priority

Problem 1: Opposition to consumptive use of muskrat by non-consumptive users.

Strategy 1: Develop programs to minimize the conflicts and concerns of nonconsumptive users and maintain use opportunity.

Problem 2: Disagreement between consumptive users on harvest regulations (e.g., opening dates, spring seasons).

Strategy 1: Develop programs to promote trapper acceptance of management programs.