

Controlled Burning in the Management of Muskrats and Waterfowl in Louisiana Coastal Marshes

CARROLL J. PERKINS

*Southlands Experiment Forest,
International Paper Company, Bainbridge, Georgia*

IN AS much as it has been 25 years since I have conducted any research in the marshes of Louisiana, most of what I have to say today has been gleaned from Ted O'Neal's study of the "Muskrat in the Louisiana Coastal Marshes." I am also indebted to the Louisiana Wildlife and Fisheries Commission for their making airplanes and biologists available for me to take pictures and bring myself up to date on marsh management.

The Louisiana coastal marshes comprise an area of approximately 4 million acres with an irregular coastline extending almost 400 miles from Texas on the west to the State of Mississippi on the east. This vast marshland is relatively flat, exclusive of natural levees and sea beaches, with an elevation of plus 2 to minus 2 feet. It is interspersed throughout with numerous lakes and bays, supports a luxuriant growth of herbaceous vegetation and is literally "teeming" with wildlife.

This unique marshland, said to be one of the richest wildlife



FIG. 1. The Louisiana coastal marshland is said to be one of the richest wildlife habitats on the continent.

habitats on the continent, was formed by millions of tons of sediment being dumped daily into the Gulf of Mexico by the Mississippi River as well as by the actions of the low energy waves, low tidal fluctuations and minor longshore currents of the Gulf on this sediment.

The geological history of this area has been marked by a succession of advances and retreats of the coastline. During the last Ice Age, about 35,000 years ago, the sea was 450 feet below its present level. The melting of the ice sheet caused the waters to reach their present level and for the past 3,000 to 4,000 years they have remained relatively constant. It is only since this time that our present marshes came into being.

The coastal marshes of Louisiana of today may be divided into three distinct classes (but with no sharp lines of demarcation): the

Delta, Sub-Delta, and Prairie Marshes, each of which has zones of fresh, brackish, and salt.

PRAIRIE MARSHES

The prairie marshes are located in the western third of the coastal region and comprise an area of approximately three-quarters of a million acres. These marshes are older than either the Delta or the Sub-Delta and were formed under different circumstances, having their beginning when the active delta of the ancient Mississippi River was much farther west than it is today. The sediment it brought into the Gulf was carried westward by offshore currents and dumped on the shallow continental shelf.

The rate of sedimentation evidently fluctuated considerably as the active delta periodically changed its location from west to east and from east to west. During periods of low sedimentation the constant wave action on the shore "pushed back" the marsh and created sea beaches, then subsequent period of high sedimentation created mud flats on the gulfward side of the sea beach. Later during other periods of low sedimentation the mud flats (or the marshes) were rolled back and new sea beaches were formed, leaving the older beaches stranded in the marsh. Some of these attained an elevation of 8 to 10 feet above sea level and are locally called "chenieres" (French for liveoak forests or groves). These chenieres resemble sea beaches in that they have a sharp, front slope to the south and a gradual backslope to the north and, in general, run parallel to the coastline.

Indian mounds located on many of these chenieres indicate that the prairie marshes were inhabited long before the coming of the white man.

The prairie marshes are made up of shallow peat soils, ranging in depth from 5 feet to 20 feet. They are poorly drained and contain deeper and more stable water levels than the other marshes.

Civilization has affected the plant ecology of this type marsh more than any other because of cattle grazing, drainage, and dike construction.

SUB-DELTA MARSHES

The sub-delta marshes comprise an area of approximately 3 million acres and are located on both sides of the present Mississippi River Delta reaching as far west as Vermillion Bay. These marshes were formed by several diversions of the Mississippi River during the last few thousand years.

Although the geology of the active and inactive Delta is similar, the principal difference is that the sub-delta has undergone more subsidence, contains deeper deposits of peat, and the water is more saline due to lack of fresh river flow. All these factors combine to support different plant and animal communities.

DELTA

The delta marshes comprise an area of approximately 300,000 acres located at the mouth of the present day Mississippi River. Archeological and geological studies indicate that the present bird-foot delta is approximately 450 years old. This area offers a unique opportunity for observations by students of geology as well as ecology for here they can see land formations building up almost overnight and the biologists can observe the resulting rapid changes in plant communities.

The Mississippi River with its daily bedload of 2 to 3 million tons is constantly in the process of building natural levees, mud flats and islands. The active passes are increasing longitudinally at an estimated rate of 120 feet a year while at the same time it is reported that the subsidence over the entire area is at the rate of 4 to 6 inches per year.

Up to 20 years ago civilization did not have much influence on the plant ecology in the Delta or Sub-Delta marshes, but since that time with the discovery of rich oil and gas fields in the area tremendous changes have taken place. These interests have dug canals to well locations, for pipelines and for transportation to such an extent that the physical features of the marshes have been drastically altered. In general, the oil and gas companies should be commended for their efforts, aided by the Louisiana Wildlife and Fisheries Com-

mission, in preserving the natural water fluctuations, however, vast changes have taken place.

MARSH VEGETATION

A wide variety of plant communities are to be found in the Louisiana coastal marshes because of the extreme range of environmental conditions varying from fresh to brackish to salt.

Some of the more extensive marsh communities are as follows:

FRESH WATER MARSHES

Cattail (*Typha* spp.), roseau cane (*Phragmites communis*), fresh marsh three-cornered grass (*Scirpus americanus*), dog-tooth grass (*Panicum repens*), yellow cutgrass (*Zizaniopsis miliacea*), and oyster grass (*Spartina alterniflora*) are the dominant herbaceous species on the Mississippi Delta. In this group should also be included the delta duck poatto (*Sagittaria latifolia*) which is found in both fresh and salt water marshes. At the present time, alligator grass (*Alternanthera philoxeroides*) and water hyacinth (*Eichornia crassipes*) have invaded and taken over much of the delta country.

Paille fine, or canouche (*Panicum hemitomon*) dominates the fresh marshes northwest of Lake Salvador in the Atchafalaya River area. Cattail, bulrush, saw grass, wapato, alligator grass and water hyacinth are also important species in this marsh.

The fresh marshes of the prairies of the western part of the State contain paille fine, cattail, bulltongue, spike rushes (*Eleocharis* spp.), yellow cutgrass, saw grass, roseau cane, and bulrush.

FLOATING FRESH MARSHES

Floating fresh marshes of paille fine, 10 feet in diameter, will support the weight of a 200 pound man. In these marshes the clay pan has subsided, leaving the crust of the marsh "suspended on a sea of very loosely connected vegetative muck."

DRAINED SALT MARSHES

Excessively drained salt marshes, containing numerous tidal bayous, undergo rapid tidal fluctuations with resulting marine deposits which

raise the marshes 2 to 6 inches in some sections. In such marshes are to be found black rush (*Juncus roemerianus*), wiregrass, oyster grass, and some saw grass. Salinities range from extremely salty to brackish.

BRACKISH THREE-CORNERED GRASS MARSHES

The brackish three-cornered grass marshes produce nearly 80 percent of Louisiana's muskrats. The brackish three-cornered grass (*Scirpus oleyi*) will revert to wiregrass if not burned at least every other year. This type of marsh extending from Marsh Island to Sabine Pass is the wintering ground for blue geese.

FLOATING THREE-CORNERED GRASS MARSH

Although as productive as the non-floating portions of the three-cornered grass marsh, these areas are subject to frequent "eat outs" by the muskrats and take a longer period to recover from the effects.

INTERMEDIATE MARSH (BETWEEN BRACKISH AND FRESH)

A variety of herbaceous species are to be found in marshes that are in a balance between fresh and brackish. In such areas saw grass (*Cladium jamaicense*), roseau cane, cattail, and bulrush (*Scirpus californicus*) are the most obvious species, but three-cornered grass, wiregrass (*Spartina patens*), bulltongue (*Sagittaria lancifolia*), and hog cane (*Spartina cynosuroides*) are also present in abundance.

LEAFY THREE-CORNERED GRASS OR COCO MARSH

A leafy three-cornered grass (*Scirpus robustus*), important in muskrat management, is difficult to manage as it is easily crowded out by wiregrass. In this type marsh hogcane is often present along the higher bayou banks.

SAW GRASS MARSH

This is a deep marsh with water levels ranging from 4 to 15 inches. Saw grass along with cattail, bulrush, roseau cane, bulltongue, hog cane, and spike rush with yellow cutgrass near the ridges dominate this type of marsh. This marsh can be converted to a three-cornered grass marsh by manipulating the salt and brackish water . . . and by the use of fire.

MARSH WILDLIFE

The Louisiana coastal marshes because of their high fertility, mild climate, and abundance of moisture undoubtedly have always provided excellent wildlife habitat. The remains of many animals, including giant sloths, and mammoths, extinct for thousands of years, have been found in salt pools on Avery Island in west central coastal Louisiana. The marshlands of today provide an ideal environment for year around resident wildlife, such as alligators, deer, raccoon, mink, and otter but especially muskrats and nutria. They are the wintering grounds for many migratory birds such as geese and ducks and shore birds in addition to being the habitat of certain resident waterfowl such as the mottled duck and the fulvous tree duck. The estuaries within these marshes are also of prime importance in the reproduction and growth of many forms of marine life.

MUSKRATS

The Louisiana muskrat (*Ondatra zibethicus rivalicicus*) is slightly smaller than the northern species. Adults weigh approximately 2 pounds and seldom exceed 22 inches in overall length. Due to the flat terrain of the coastal marshes they build "houses" out of marsh vegetation instead of burrowing. Their tremendous reproductive potential is evidenced by the fact that they normally have 5 to 6 litters per year, averaging 3 to 4 young per litter, and that the females apparently reach sexual maturity at the age of 6 to 8 weeks.

It is interesting to note that the muskrat is only a fairly recent inhabitant of the Louisiana marshes. All indications are that the muskrats first appeared below New Orleans just prior to the Civil War and it was not until 1878 that the first pelts from Louisiana muskrats appeared on the market.

NUTRIA

The nutria (*Myocastor coypus*) another vegetarian like the muskrat is also a very recent newcomer to the Louisiana marshes. This native of Argentina was introduced in 1937.

In appearance it resembles a beaver, weighing between 18 to 25 pounds, however, it is different in that it has a round tail, reddish-orange colored incisors and mammary glands on its back.

Nutria are very prolific, too, and have 3 to 4 litters per year averaging 4 to 6 young each. This high reproductive potential along with the fact that they have few natural enemies, parasites, or diseases resulted in a population explosion shortly after their introduction into the coastal marshes and in a period of 25 years they extended their range from the Mobile, Alabama delta to the coastal marshes of Texas. However, it is now believed that when it finds its proper niche in the marshland, the nutria's competition with the muskrat will be insignificant.

MARSH MANAGEMENT

As stated by O'Neal in 1949, the Gulf coastal marshes, despite being one of the richest wildlife habitats on the continent, the fur resources (from a commercial standpoint), were the most poorly managed big business in the country. Recent personal observations indicate that most probably, this statement still holds true.

Three-cornered grass makes up 90 percent of the muskrats food supply and approximately the same percentage of the winter food supply of the blue geese, so wherever feasible, marsh management for either muskrats or blue geese is essentially *Scirpus Olneyi* management.

BLUE GEESE MANAGEMENT

Geese feed twice a day, according to J. Lynch, eating only clean rhizomes, pulling up and discarding at least ten times the amount they actually consume. Their feeding grounds are often found completely denuded of all vegetation before the geese move out to a new feeding area. Such goose "eat outs" usually recover by the following year, but in the meantime, any muskrats living in these localities are forced to move on to more desirable marshes.

Fresh burns from late September through January tend to attract blue geese.

MUSKRAT MANAGEMENT

In his studies of the muskrats of Louisiana in the early 1940's, O'Neal found that marsh management for muskrat production was



FIG. 2. Fire plays a most important part in the management of Louisiana coastal marshland for wildlife.

feasible and that fire played a most important part. The following is quoted directly from his report:

When the muskrat industry first became established in Louisiana, around 1912 to 1915, it was the common belief that fire in the marshes would destroy the furbearers and other wildlife, leaving the marshes a biological desert. Until recently, no scientific data has been collected to prove the merits of fire relative to muskrat marsh management. Many fires have been witnessed in all types of marshes during this study. There was no damaging effect upon muskrats when fire was used as a management practice. This, however, does not mean that muskrats cannot be destroyed by fire. No doubt millions of muskrats have perished in marsh fires. Catch records and also observations made by trappers during the drought of 1924-25 indicate that in certain areas the muskrat population was completely wiped out by fire. This was no doubt due to peat burns in marshes having comparatively few tidal guts and a shallow clay pan.

Marshes that have not been burned annually allow roughs to accumulate. If ignited by lightning or other agencies during dry spells, these will suffer damage to muskrat populations. A fire in a rough of this type, fanned by a strong westerly wind, heats up intensively and travels very rapidly. Probably great numbers of muskrats were destroyed by this type of burn before landowners, trappers, and cattlemen learned something of the value and proper use of fire on the Gulf Coast marshes.

For the past thirty years the trappers and landowners have gradually become more experienced in the use of fire for the purpose of cultivating muskrat marshes, but during this study, many burns were observed that were not used as a management practice in the true sense of the word. There were personal reasons, such as one trapper burning-out his neighbor so as to force the muskrats to disperse to his own land, and alligator hunters setting fires on valuable rat land to make (alligator) hunting easier. This type of burning usually upsets the regular burning schedule for a muskrat marsh and it will prevent the operator from making the maximum catch the following year.

Fires probably have always been a major factor in the marshes. During early times severe fires set by lightning undoubtedly raged in accumulated roughs. Indians probably used fire to make trapping easier and to create openings in the dense stands of marsh vegetation for the purpose of attracting waterfowl. It is just within the past six to eight years that the real importance of fires has begun to dawn upon the muskrat trapper and in the majority of cases, it still means to him only that fires make trapping easier and seem to assist the growth and spread of three-cornered grass. Only occasionally will a trapper or marsh operator burn for specific results.

O'Neal recommends that a normal three-cornered grass marsh be burned any time from October 10th to January 1st, with a 0 to 2 inch water level. Providing all other conditions remain stable this will maintain and sustain a constant annual growth of three-cornered grass. He points out the danger of "eat outs" which occur if the area becomes over populated with muskrats. There can be so many runs and houses that they prevent the marsh from burning. He recommends that burns should take place before the construction of houses begin, around early October. "*Without annual burns neither normal nor peak rat populations can be reached.*"

The food plants must first be produced and this food plant, being a sub-climax species depends for its existence on the removal of the climax species by fire or other means. Fire is by far the easiest method found for doing this. After muskrat "eat outs" have occurred in three-cornered grass marshes, the climax species, wiregrass, usually dominates the area. It is then necessary to burn these marshes during periods of prolonged low tides or during dry spells which may occur during August, September, or October, and hope that a storm tide will follow.

Two to four years of this type treatment are usually necessary before a larger portion of the marsh will return to three-cornered grass.

If a wiregrass rough is burned without a particular purpose and without the right combination of conditions, it is unlikely that a stand of three-cornered grass will be produced.

Experimental late winter and early spring burns have shown a great deal of promise in developing the leafy three-cornered grass marshes in certain parts of the coast. Fall burns favor *Scirpus Olneyi* mainly because it grows during the winter. On the other hand, *Scirpus robustus* grows only during the spring and is definitely a poor competitor, but a fast grower. So the clearing away of the other plants gives the *robustus* an opportunity to come in.

Hoffpauer, in a recent article entitled "Burning for Coastal Marsh Management" reports that 750,000 to 1 million acres of marshland are burned annually. He suggests that some of these burns are made by cattlemen to improve grazing conditions for marsh cattle.

However, it is quite probable that most burning in the Louisiana Marshes is done, like O'Neal says, "Just for the hell of it!;" to hunt alligators, raccoon, mink, and rabbits; to make traveling easier; and to satisfy a desire to burn billions of mosquitos, flies, and gnats."

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