More Wildlife From Our Marshes and Wetlands

Philip F. Allan and Wallace L. Anderson

Our marshlands are one of the least known and least valued parts of our country—yet many products and pleasures come from them.

From the small pothole the farm boy earns his first dollar from the sale of a muskrat skin. Fur bearers in coastal marshes provide a principal source of income to many families. All of the recreation from waterfowl hunting enjoyed annually by more than 2 million gunners depends on the production of ducks and geese on the inland marshes of the United States and Canada and also upon the wintering grounds along our coasts and in Latin America.

The need to manage marshes is becoming more and more urgent if the United States is to maintain or expand the production of fur bearers and waterfowl. Marshlands have been shrinking in area ever since colonial days as a result of industrial developments, urbanization, agricultural drainage and other drainage, sedimentation, and the filling and subsiding of the coastlines. Much of the marshland remaining to us cannot be used for ordinary agricultural production, and so we must find other ways to make that land economically useful.

Waterfowl and fur bearers are the principal marsh products of economic value, but many other values and products are associated with marshes. They are the homes of a vast array of interesting mammals, birds, reptiles, fish, and lesser forms of animal life. Botanists, amateur and professional, find in marshes a host of fascinating plants. Among the commercial products are alligator hides, frog legs, edible turtles, wildrice, peat, rushes and cattails, and hay.

The management of fur bearers on coastal marshes is directed mainly at production of muskrats, by far the most important of the fur producers. Marshes also yield mink, otters, nutrias, raccoons, and foxes.

In the parts of the coastal area inhabited by muskrats there is one plant that is most used by 'rats. It is the Olney bulrush, also known by the names three-cornered grass and three-square. Cattails are important to muskrats along the Atlantic coast and in the Louisiana Delta country. Two other plant species of local importance are the saltmarsh bulrush (leafy three-cornered grass or coco) in Louisiana and Texas; and paille fine (maiden-cane) in eastern Louisiana. Each species is found in a more or less different kind of coastal marsh.

The management of coastal marshes centers upon keeping a good stand of whichever of those plants is suitable for the site. With some plants that is easy to do, but with others management is difficult. In order to learn how to produce or maintain the kinds of vegetation you want, it is necessary to understand the conditions under which they grow best.

The principal measures that permit the management of desirable kinds of plants are controlled burning and control of water levels and salinity.

Extensive areas of marsh along the coasts are too dry or too salty to be good for production of fur bearers. They are better for cattle range and winter feeding areas for wild geese.

FIRE IS USEFUL in the management of marshes when it is used with care. Unwise use of fire can do a great deal of damage. Trappers often burn marshes. Sometimes they get good results, sometimes poor. They do not always know why controlled burning is useful.

Fire is not good for any plant. In order to burn marshes properly one must know what the objective is and how to use fire to achieve it. The most important reason for burning marshes is to kill the plants that choke out the

better kinds. Then the better ones can increase. Burning, therefore, must be done in a manner that does not kill out desired kinds of plants. A less important reason for burning is to reduce accumulated dead plant materials (roughs) in order to make trapping easier and more thorough. When any burning is done it must be with knowledge of the right time of year, of the conditions suitable for the operation, and of what the end results should be.

A GOOD SYSTEM of water control benefits nearly any marsh. Ditches drain off excessive amounts of fresh or salty water. They also permit irrigation of a sort—allowing the addition of fresh or salty water—that helps the marsh operator maintain conditions favorable for the plants he wants. During dry spells ditches hold water and sustain muskrats that might otherwise leave. Muskrats use the banks of ditches for burrows and as refuges during floods. Ditches also enable trappers to move about the marsh easily and to trap it thoroughly and heavily.

Ditches in marshes should be designed to reach water sources that can be used for irrigation. A system of blocking off the sources is essential. Often the block need only be poles or stakes set at the end of the ditch. If large amounts of fresh water, or very salty water are likely to come in, carefully built gates are needed. The services of an agricultural engineer, then, will be useful.

Ditches in coastal marshes ordinarily need to be more than 2 feet deep and 4 feet wide. They are spaced 200 feet to a quarter of a mile apart. Ditches are constructed with a dragline, ditching dynamite, a marshbuggy and plow, or—in deep peat—by means of a boat equipped with choppers.

Levees are used mainly to block off unwanted fresh or salty water. They also may be constructed to impound water where the natural water level is too low. Levees usually should be 2 feet high after they have settled. The width across the top should be 10 feet and the sides should slope at a rate of 3:1. Higher levees may be needed where flooding is frequent.

If coastal marshes are used for livestock grazing and muskrat production, walkways are valuable. A walkway is a levee constructed through the marsh to permit cattle to travel into and across wet areas. The borrow pit from which soil is taken to build the walkway can be alternated from side to side of the levee to prevent excessive drainage. When a borrow pit is dug on only one side of the walkway—as along property boundaries—plugs left at intervals will prevent the formation of a ditch that will drain the land. Natural waterways are kept open by means of culverts through the walkway. Cattle can be kept from concentrating on valuable muskrat marshes by placing the borrow pit on the side of the levee next to the area to be protected and extending it well beyond either end of the area. Drift fences to keep cattle out give further protection.

Ditches and levees in coastal marshes usually cost 15 to 20 cents for each cubic yard of earth moved or about 20 to 25 cents a linear foot.

OLNEY BULRUSH GROWS BEST where soil waters are slightly salty. It will grow in water that is almost fresh—not strictly fresh—and in water that is moderately salty. Along the Atlantic coast Olney bulrush usually is found in places barely reached by monthly high tides, but where the soil is always waterlogged. Along the Gulf coast occasional storm tides are the only ones that reach areas where Olney bulrush grows. There, too, the soils are always wet—with standing water not more than 2 inches above or below ground. The soil may be peat, clay, or sand.

If a site is never burned or never grazed by livestock, little bulrush is likely to be found, because another plant—variously called marshhay cordgrass, couchgrass, or wiregrass—grows better under those conditions and chokes out the Olney bulrush.

Olney bulrush marshes should be burned every year except during droughts. Burning should begin in the South about the middle of October and be completed by mid-January. Burning is done in the North in late winter and should be finished before spring production of young muskrats is underway.

Fires should be set only when the water is standing at about an inch above ground level. Such burning tends to kill the crowns of marshhay cordgrass, but leaves the rootstocks of Olney bulrush protected. Because Olney bulrush grows best in cool weather, it recovers quickly after burning. The first burning should be limited to about two-thirds of the marsh if possible and the rest burned later. A well-placed pattern of trappers' ditches or other firebreaks helps control the extent of the burn.

It is best not to use the marshes for grazing by livestock, but if cattle are put on them, grazing should be limited to early fall and late spring. The grazing can be quite heavy at those times.

Sometimes Olney bulrush marshes receive too much salty water. "Scalds" may appear—areas temporarily bare of living plants. When the increase of saltiness is slow, plant life gradually changes—smooth cordgrass (seacane, oystergrass), seashore saltgrass, and needlegrass rush (black rush, paille chat tigre) increase. The first step in correcting the condition is to cut off the source of salty water. That may be done by blocking waterways that lead into the marsh, or, if that cannot be done, by constructing levees to keep out salty water. In extreme cases, water-control structures may be required that drain salty water and hold back fresh water.

Where soil water is too fresh, Olney bulrush grows poorly. An increase in cattails, sawgrass, cutgrass, or arrowheads usually indicates too much fresh water. The condition occurs where drainage waters from upland areas are dumped on the marshes or where natural drainage is so poor that fresh water accumulates. It can usually be corrected by cutting ditches to a source of salty water. In places where highways, levees, or other obstructions tend to pond fresh water, cuts or culverts are needed to aid in drainage. The blocking or diversion of fresh water sources might be required in unusual situations. Good drainage is important in deep peat marshes, for the marsh stays firm and more suitable for Olney bulrush. Drainage also is needed in order to make the marsh firm if muskrats or wild geese overgraze it. Trappers refer to such situations as eat-outs.

Although it often can be done, it seldom pays to convert a large fresh marsh or a large salt marsh to the medium conditions required by Olney bulrush.

CATTAILS GROW BEST where the soil water is very fresh, but some will grow in moderately salty water. These plants occur where water depths range from ground level to about 2 feet above ground level. They thrive on either mineral or peat soils. Other plants, such as the large-stemmed bulrushes, giant cutgrass, arrowheads, and sawgrasses sometimes grow in the same places, but only the sawgrasses seriously compete with cattails—and then generally on deep peat soils.

On the deep, fresh coastal marshes suitable for their growth, cattails usually crowd out other plants. Little special management is needed for them unless they are being destroyed by fire, livestock, or salt scalding. Along the gulf coast, Jamaica sawgrass may require control in cattail marshes. A strong burn on a sawgrass area during a dry season, and especially before a gulf storm, may destroy the sawgrass. If moderately salty water can be run into sawgrass areas long enough to scald the plants—and then be cut off—conversion of the vegetation to more desirable kinds can be achieved.

Cattail marshes along most of the gulf coast are poor muskrat-producing areas, though they do produce nutrias. On the Atlantic coast, however, these

marshes yield valuable crops of muskrats. The most important management measures are protection from livestock, prevention of overgrazing by muskrats, and installation of level or blind ditches. Burning is used occasionally to remove dead plant materials, but should only be done when water covers the root crowns of the cattails.

Cattail marshes seldom require water-control measures unless other plants begin to replace the cattails. Invasions of cordgrasses, common reed, and other salt-tolerant plants mean that the site is becoming too saline. The sources of salty water then must be blocked, or the marsh must be leveed to impound fresh water. The replacement of the cattails by panic grasses, giant cutgrass, or shrubs means that the site is becoming too dry. Plugging drainageways, building levees, or flooding with fresh water are means of preserving cattails on drying marshes.

SALTMARSH BULRUSH grows on peaty soils where soil water is quite salty. It thrives where soils are wet, but does not require standing water. Along the Atlantic coast the plant is relatively unimportant, but along the Gulf, saltmarsh bulrush areas produce many muskrats.

In most respects muskrat management on saltmarsh bulrush areas is similar to that on Olney bulrush marshes. Burning to control marshhay cordgrass is done in the same way, but it is done after the middle of February in the South, and 2 to 3 weeks after plant growth starts in the North. This bulrush makes its best growth in the spring.

Increasing saltiness of soil water is not of much concern on saltmarsh bulrush areas. Increases in water depth may cause invasion of smooth cordgrass—a fair muskrat food plant. Drying marshes may be invaded by big cordgrass, common reed, bigleaf sumpweed, eastern baccharis, or by gulf cordgrass in Louisiana and Texas. The appearance of those plants means that more water must be held on the marsh.

Paille fine is a fresh-marsh grass easily killed out by salty water. In eastern Louisiana, paille fine marshes are important muskrat producers. The grass grows well on mineral soil but grows best on floating peat, known locally as flotant. When paille fine is heavily grazed by livestock or burned, it may be replaced by less desirable plants. It will not thrive in water more than a few inches over the root crown. It will not live in soil that is not wet.

Little is known about how to manage paille fine marshes. The grass provides good livestock forage and is used widely for that purpose. When such marshes are used for muskrat production, the two principal management measures needed are the prevention of overgrazing by muskrats and careful control of fire—especially during dry periods. Salty water should be prevented from covering the marshes, if possible. The permanent flooding of paille fine marshes on mineral soils by fresh water to depths of 4 inches or more will kill out the grass.

THE MANAGEMENT of plants and manipulation of water provides the main permanent features of muskrat production. State biologists in a number of localities have found that control of raccoons when they are unusually abundant results in better muskrat crops. Muskrats should be trapped heavily during years of abundance—and lightly, if at all, during periods of scarcity.

MANAGEMENT of waterfowl on coastal marshes hinges principally on increasing areas of open water and developing and maintaining desirable kinds of plants. Contrary to general opinion, coastal marshes densely covered with undisturbed marsh plants are not of great value to waterfowl. Lagoons, bays, potholes, and streams within the marshes make up the greater part of the area frequented by ducks and geese. When the densely covered marsh sites have been flooded, burned,

or heavily grazed, however, they often become better places for waterfowl.

Along the Atlantic and gulf coasts there are hundreds of thousands of acres of marshland which have no foreseeable use for producing crops or livestock forage but which can be devoted to waterfowl habitat and developed for that purpose.

Open-water areas are created in marshes mainly by impounding, blocking drainageways, or burning areas of deep peat. Most of the coastal waterfowl refuges and many of the private hunting clubs have demonstrated the success of impounding water as a means of developing duck marshes. The ideal impoundment is one on which water can be carefully controlled. The best control structures keep out high water—either salty or fresh—when unwanted, permit rather complete drainage, and hold 6 to 18 inches of water when needed. Such impoundments are expensive and ordinarily call for experienced engineering aid. In rice-growing areas, impoundments may serve the dual purpose of storing drainage water during the waterfowl wintering season and serving as a source of irrigation water in summer.

Marshes may be partly flooded by blocking natural drainageways with floodgates or other barriers. The removal of obstructions to water flow and the diversion of drainage water into suitable marshes also are means of flooding.

Areas of deep peat often become good waterfowl grounds when fire burns out holes. Such burns are made when marshes are usually dry. There are serious hazards in deep burning of marshes because of the difficulty of keeping fires within bounds of the area to be improved.

Among the chief benefits of flooding is the destruction of tall, dense growths of plants that have little value for waterfowl and their replacement by better species. On marshes where water can be controlled, removal of water during the growing season permits light cultivation of the valuable plants to increase production or the planting of such species if they are not already present.

Some alteration of the vegetation is necessary on nearly every coastal marsh in order to have satisfactory conditions for waterfowl. More severe treatments are required than on muskrat marshes. Where grazing can be done on the marsh, livestock help produce conditions favorable for water fowl. Very heavy grazing in the spring—to the point where most of the taller and ranker plants are killed out—results in an increase in more desirable plants. Marshes in which geese are hunted are improved by this method.

Where marshes cannot be grazed, they often may be improved by controlled burning. Burning marshes for waterfowl differs from that for fur bearers. The burn needs to be hotter and more complete. It is best done in the spring or early summer. Water levels should be at or slightly below ground surface.

Coastal marshes seldom need planting in order to produce good conditions for waterfowl. So many kinds of plants ordinarily are present that it is only necessary to create favorable conditions to have ample stands. All that needs to be known about such management, however, is not known, except the principle of reducing competition from the less valuable species. That can be done by the methods we have described.

Planting may be useful in places where the soil is relatively bare, dry enough to be lightly tilled, and moist enough for seeds to sprout. The surest plants to grow from seed are smartweeds, barnyard grass, and millets, which can be broadcast at 15 to 30 pounds of seed an acre and lightly harrowed. If conditions are suitable for drilling the seeds, the rate of seeding can be reduced one-third. Federal law prohibits the planting of cultivated plant species such as corn, wheat, and rice for the purpose of attracting waterfowl to shooting grounds.

325862°—55——39

COMMON PLANTS of the coastal marshes that have high value as food for the waterfowl include pondweeds, wildcelery, wigeongrass, smartweeds, watershield, waterlilies, the spikesedges, naiads, and beakrushes. Some bulrushes also are valuable. Plants of low value to waterfowl, which often grow in abundance, are common reed, cordgrasses, cattails, giant cutgrass, rushes, saltgrass, sumpweed, alligatorweed, coontail, and waterhyacinth.

The arrowheads and sawgrasses provide seeds that ducks like, but the plants often grow in stands too dense to provide good duck marsh.

ON INLAND MARSHES production of muskrats is far more important, economically, than production of mink or raccoons.

Muskrats are better able to convert marsh vegetation into a useful product than are hogs, cattle, or sheep. The fur produced by muskrats will be more valuable than the small amount of meat or milk that might be produced by grazing domestic livestock. Furthermore, grazing animals are less likely to contract diseases and parasites if they are excluded from marshes.

The best plants for muskrats on inland marshes are cattails, arrowheads or duckpotato, burreeds, bulrushes, and sweetflag. All will grow in marshes that have water levels at or near the surface of the ground to as much as 2 feet above the surface.

Many marshes have many muskrat food plants but have such shallow water that the foods are not available to the muskrats in the winter when the marshes are frozen solid. The muskrats then are forced to move out in search of something to eat and most of them are lost to predators.

Marshes used for the production of muskrats should not be grazed. The hooves of grazing animals often break through the thin layer of soil between the ground surface and the muskrat den. Then the muskrats have to construct new dens. Too much construction is particularly troublesome along level ditches, because each new den adds more sediment to the bottom of the ditch and hastens the time when a clean-out will be needed.

Fire is seldom used on inland marshes. It may be used occasionally to eliminate woody plants that have invaded the marsh during a series of dry years. In that situation, however, better results usually are had by cutting or bulldozing the woody plants during the winter or by using herbicides during the growing season.

Fire may be used in unditched marshes to eliminate accumulations of dead vegetation that hinder trapping operations. It should be used for that purpose only when needed and only when the water level is high enough to protect the plant crowns and rootstalks.

LEVEL DITCHING is an effective and economical practice in shallow marshes.

The Wisconsin Conservation Department, in research conducted on Horicon Marsh between 1949 and 1953, tested ditch spacings of 50, 100, 200, and 400 feet. They determined that ditches placed at 200-foot intervals produced the most return when investment and muskrat production are considered together.

A 10-acre plot ditched at the 200-foot spacing produced 554 muskrats in the 5-year period of the experiment. That is an average yearly harvest of 11.1 muskrats an acre and 23.8 muskrats for each 100 dollars invested in ditching.

An economic analysis, based on the muskrat production attained with the 200-foot spacing and using an average value of 1 dollar and 47 cents a pelt and 10 cents a carcass, indicates a yearly net return of 12.68 dollars an acre after expenses for labor, equipment, depreciation, taxes, maintenance, and interest on investment have been deducted. The gross annual income an acre was 17.43 dollars. Net income plus labor income was 14.51 dollars an acre a year. The initial investment for level ditching was 46.50

dollars an acre. The rate of interest earned on the capital investment was 31.2 percent.

Level ditches have no grade and need not have an outlet. They do not drain the marsh; they simply create deeper water, which makes food available to muskrats during winter. The spoil banks also provide denning sites and offer some degree of safety from drowning during floods.

Construction of level ditches is feasible in peat or muck or in medium to heavy mineral soils. Ditching is not recommended in places where light, sandy soils will be encountered. Ditches should be 5 to 6 feet deep in the North, 4 to 5 feet deep in the Central States, and 3 to 4 feet deep in the South.

Level ditches should be 12 to 20 feet wide. The spoil banks should be 3 to 4 feet high and placed on alternate sides of the ditch at 50-foot intervals. A berm approximately 6 feet wide between the edge of the ditch and the edge of the spoil bank will prevent the weight of the spoil bank from caving in the side of the ditch bank.

A dragline is the most satisfactory type of equipment to use in constructing level ditches. Blasting has been tried, but it costs no less than dragline construction and the desired depth is hard to obtain. Blasting does not produce the spoil banks that are important in providing denning sites for muskrats.

Long, straight ditches should be avoided because winds blowing lengthwise in the ditches may create waves that will make handling a boat difficult. Wave action may also cause erosion and sedimentation. Changing direction by means of a zigzag pattern at 200-foot intervals is recommended.

Trapping in level ditches is relatively easy. Sets are made from a boat and the need for trudging through heavy marsh vegetation is eliminated.

Control of water levels often provides the most economical methods of improving inland marshes for muskrats, but this method is limited to marshes having a reliable water supply such as a stream or heavy-flowing spring.

Control of water levels usually requires the construction of earth dikes at the outlet of the marsh and at such points as may be necessary to protect adjacent farmland from flooding when water levels are raised in the marsh. Also required is some type of structure, usually concrete or creosoted wood, that will allow water levels in the marsh to be varied from 6 inches to 2 or 3 feet above the ground surface.

Water levels should be maintained at about 6 inches during the growing season to provide the best growing conditions for food plants for muskrats. At the time muskrats begin to construct houses, water levels should be raised gradually to 3 feet in the North, 2 feet in the Central States, and to 1 foot in localities where freezing seldom occurs.

Raising water levels in the fall and maintaining the raised level throughout the winter are necessary to prevent the marsh from freezing solidly and to make sure that muskrats will be able to get food at all times.

Waterfowl production on inland marshes is important in maintaining the supply of this valuable resource. Waterfowl production on farmland is almost always a product of water areas not suitable for other uses or is a by-product of wetlands managed primarily for muskrats, livestock water, or water storage. Because of the migratory nature of waterfowl, it is generally economical for farmers to manage marshes primarily for waterfowl only if they are able to sell shooting rights.

Level ditching is not recommended primarily for waterfowl production but waterfowl production is increased by the practice.

Research by the Wisconsin Conservation Department at Horicon marsh in 1952 and 1953 revealed that the spoil banks of level ditches on 35 acres had 24 waterfowl nests in 1952 and 51 nests in 1953. Nesting success was 46 percent in 1952 and 20 percent in 1953.

Predators, principally raccoons, were believed to be responsible for the relatively low nesting success. The research indicates that level ditching concentrates both waterfowl and predators on a relatively small area, and that rather thorough control of predators is necessary for high nesting success.

Control of water levels can help increase waterfowl production on inland marshes if a dependable water supply exists. There are two methods of management.

The one most likely to result in the highest production of waterfowl is to maintain a uniform depth of 18 to 30 inches of water throughout the year. Such management favors the growth of pondweeds, wildcelery, coontail, duckweeds, musk grass, and duckpotato. It also furnishes courtship areas in the spring and may provide a brood area in the summer.

Another method is to draw the water down in the spring so that a saturated soil condition is maintained during the growing season. The soil should be wet, but there should be a minimum of water on the surface. Such management will favor the growth of smartweeds, wild millet, and burreeds. The water level should be raised to 18 inches in the fall to make the foods available to waterfowl. The method is not likely to encourage waterfowl nesting or the production of muskrats. It is primarily valuable in producing good waterfowl shooting.

PHILIP F. ALLAN *is the biologist for the Soil Conservation Service in the Northeastern States. His headquarters are at Ithaca, N. Y. He attended the University of New Hampshire and the University of Michigan. Mr. Allan has been in the Soil Conservation Service since 1934.*

WALLACE L. ANDERSON, *a graduate of the University of Minnesota, is biologist for the Soil Conservation Service assigned to the Corn Belt States, with headquarters at St. Paul, Minn. He joined the Department of Agriculture in 1935 and has been concerned with the management of wildlife land, including northern wetlands, since 1944.*

Waterfowl and the Potholes of the North Central States

Thomas A. Schrader

The prairie pothole region in Minnesota and the Dakotas, the most important nesting area of waterfowl in the United States, may have produced 15 million ducks a year in the past. Today it produces about 5 million. Drainage is mainly to blame for the difference.

Nature made the region ideal for nesting waterfowl. It is dotted with many shallow depressions—potholes, sloughs, marshes—which hold water for a few weeks in early spring or all summer long. The potholes are of all shapes and sizes. Some cover 100 acres or more, but most of them cover less than 10 acres.

We hear of the days when flights of ducks and geese darkened the sky, so numerous were they, in their spring and fall migrations between wintering grounds in the South and summer nesting areas in the North. But no more. The alarming decline in numbers of waterfowl came when farming brought drainage of the wetland areas and destroyed more than half of the nesting range of ducks in the prairie pothole region. The additional corn and wheat produced as a result of the drainage can be recorded as a gain in the dollar-and-cents ledger; but the change has left us poorer in the waterfowl resource account, which is kept in a different set of books.

In calculating the value of further drainage, two other factors should be considered. First, since the most economically drainable land has been drained, any future drainage is likely to be more difficult and less rewarding. Second, with increasing demand and decreasing supply, the duck has become vastly more valuable. In pioneer days the value of a duck was expressed in cents per pound, but today waterfowl values do not find true expression