GRASSES OF SALT MARSHES.

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No one who has traveled along the shores of New England and the Middle States can fail to have noticed the numerous hive-shaped stacks of hay thickly scattered over the extensive marshes which border these coasts. The character of this hay and the elements of which it is composed can not fail to be of interest, for they are wholly unlike those of other regions; and the hay itself, while less valuable than that usually found in our markets, serves many a useful purpose and forms a very important item of local trade. In olden times the products of the salt marshes were not forgotten by the coast dwellers of New England in their annual acknowledgment of blessings bestowed by Providence, when thanks were returned upon the day which is now one of national observance.

AREA OF SALT AND TIDE-WATER MARSHES.

The area of the salt and tide-water marshes bordering the ocean and gulf coasts of the United States is roughly estimated at from 6,000,000 to 7,000,000 acres. A considerable portion of this, particularly along the river banks of the Southern States, is beyond the reach of salt water, and possesses a different vegetation from that which comes under the direct influence of the sea and which alone is considered here. The salt marshes proper, which are covered by diurnal tides, or at least receive the storm and spring tides, are sufficiently extensive to receive special notice. The exact area of this land has never been definitely determined, except in a few States. In eleven of the States bordering the Atlantic there are approximately 2,459 square miles, or more than a million and a half acres. The quality of this land varies considerably, and so do the amount and value of the hay it produces. The plants composing the herbage, however, differ but little botanically.

Except along the shores of the New England and Middle States, this land has received comparatively little attention and been only occasionally utilized. In Connecticut, unimproved marsh is valued at from $5 to $20 per acre. Diked marsh is much more valuable, as it often exceeds in productiveness the adjoining uplands. The
marshes along the Gulf coast are very extensive, but their hay product is deemed of little or no value. Those along the shores of Texas, however, afford in many places extensive and highly prized areas for the winter grazing of cattle. On the Pacific coast the marshes are insignificant in extent, except in the north, along parts of Oregon and Washington, in the region of Puget Sound. Except when diked, practically no care is given to the marshes beyond keeping open the ditches which serve to drain off the tide water. They are fertilized entirely by the deposits of the tides, or, if located near the mouths of rivers, by such fertilizing elements as may be brought down by the streams in season of floods and deposited upon them.

The hay product of the marshes varies from half a ton to a ton or more per acre, and is harvested at any time from June to December, little attention being paid to the time of blooming of the grasses of which it is composed. When the marshes are firm enough to allow the use of machinery, the grass is cut with a mower, but in many cases this is impracticable and the cutting is done by hand. Occasionally it is necessary to take advantage of very low tides to carry on the operation of harvesting. After being cut the hay is raked, and if it can not be dried upon the marsh it is carried to the adjoining uplands, and there spread out to cure. More frequently it is stacked upon the marsh and hauled away during the winter season when the lands are frozen. The hay is taken to the stacks in various ways. One method, observed on the coast of Maine, is illustrated

Fig. 75.—Carrying salt hay to the stack.

HAY PRODUCT AND METHOD OF HARVESTING.
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here (figs. 75–77). These illustrations are from photographs taken on the marsh near Pine Point. The hay was cut and then raked up into small bundles; two poles were run under these bundles, and then the hay was carried to the stack and placed upon it. In this particular case the hay was cut upon shares, the harvester being allowed two stacks out of three for doing the work.

This hay, the value of which was given at $5 per ton, was designed in part to be used for fodder and litter, and in part to be sold in Portland for packing glassware and crockery. This latter is a very common use of salt hay in the vicinity of all the larger seaport towns, immense quantities of it being used in New York City for this purpose; the fine, and rather stiff, wiry stems of the grasses peculiar to

the marshes being particularly well adapted for packing purposes, much better than the hay of the uplands. The better quality of marsh or salt hay makes very good feed for growing stock, but possesses little fattening value. Some of the grasses composing the hay impart a disagreeable flavor to the milk or butter of cows feeding upon it.

SALT GRASSES.

The grasses of the seacoast may be divided into three classes: Those growing in the sands along the shore, those upon the marshes proper, and those upon the sandy and waste lands bordering the marshes. To the first class belong beach or marram grass and a few others to some extent valuable for holding drifting sands. To the third class belong quite a variety of species of value, including switch grass (*Panicum virgatum*), slender broom sedge (*Andropogon*
scoparius), creeping fescue (Festuca rubra), creeping bent (Agrostis stolonifera), and sea spear grass (Glyceria maritima). The last three occasionally extend onto the marshes proper, and add much to the value of the hay product there.

The so-called salt grasses, which for the most part are limited to the marshes themselves, comprise but few species; these are, however, very characteristic, and several of them have an exceedingly wide range, one being found upon both our Atlantic and Pacific coasts, as well as along the Gulf, also along the shores of Europe. The several grasses of the marshes do not usually grow intermixed, as do the varieties which occur upon our meadows and uplands, but each species occupies by itself definite areas of greater or less extent.

The most characteristic grasses of the marshes are the Spartinas. (see fig. 78). The most common and most conspicuous of these is what is known as sedge, creek sedge, or thatch (Spartina stricta var. glabra). Where this grass grows there is usually a daily flow of tide. Along the ditches and creeks this variety grows to the height of 6 or 8 feet, and its yield in bulk is often very great. It has a narrow, spike-like head, and many long and widely spreading shining leaves of a deep-green color. This grass remains green after the other vegetation of the marsh has been turned brown by the frosts of autumn. It is of little value for fodder, but makes excellent thatch, and is used to some extent for mulching and litter. A finer grass of the same species, called fine thatch, growing to the height of 1 or 2 feet, is found over the marshes away from the ditches, and often forms a considerable element of the salt or marsh hay. This grass has, in
addition to its smaller growth, narrower, less spreading leaves, and is of a lighter color, often having a pale, yellowish tint when seen in a mass upon the marshes.

Red salt grass, or fox grass, is another species of Spartina (Spartina juncea), and is one of the most valuable of this family for hay; in fact, is one of the most valuable of the true grasses found upon the marshes. It grows to the height of from 1 to 2 feet, has slender, somewhat wiry stems and leaves, with a few spreading and reddish spikes composing its inflorescence. This is strictly a salt-marsh grass, and is found along our coasts from Maine to Florida and westward to Texas. While one of the most valuable of the hay-producing species of the marshes, it is also most valuable for packing crockery, glassware, etc. Locally this grass is sometimes known as "black grass," a name which properly belongs to another species, mentioned below.

Along the Gulf Coast there is another Spartina (Spartina junciformis), which is taller than fox grass, with longer leaves, and the spikes which form the inflorescence or head are more numerous, shorter, and very closely appressed to the main stem. The head of this is shown to the right in fig. 79, while that of fox grass is on the left.

There are two other Spartinas which are occasionally found upon the marshes, or at least upon their borders. One of these, the fresh-water cord grass (Spartina cynosuroides), has already been noticed under "Grasses as sand and soil binders," in the Yearbook for 1894; the other, the largest of our Spartinas (Spartina polystachya), is less common than the last, and is confined to the coast, ranging from Maine to Alabama. It grows to the height of from 6 to 10 feet, and has the inflorescence composed of from 20 to 60 spikes (see centerpiece in fig. 78). It forms a conspicuous feature on portions of the Hackensack marshes near Jersey City. Associated with this, upon these
marshes, is the large reed *Phragmites communis*. This grows to the height of from 8 to 10 feet, with very leafy stems and plume-like inflorescence. It is shown in the center of fig. 79. This grass is not confined to the seashore, being widely dispersed throughout the temperate regions of the world, chiefly along margins of rivers and fresh-water lakes. It has remarkably long and penetrating roots, and is especially valuable as a sand and soil binder, as has already been noted. A large grass, common also on these marshes and abundant in the tide waters of the rivers of the Middle States, notably below Philadelphia, is Indian rice (*Zizania aquatica*). This is a tall, coarse grass, with rather long, broad leaves, and the seeds are the favorite food of the reedbirds. When the seeds are ripe, these birds resort to the marshes in great numbers, making them at such times a favorite resort of sportsmen.

Spike grass (*Distichlis spicata*), which also has been noted as an excellent sand binder, is occasionally found upon the marshes proper, sometimes occupying areas of considerable extent, as on the marshes of Cape Cod. It is peculiar in having the male or staminate flowers and the female or pistillate flowers on distinct plants; and while the male and female plants may grow associated together, they are sometimes found separate, the male plants covering an acre or so exclusively, while in the vicinity a similar area may be found exclusively held by the female plants. This grass has very tough, extensively creeping roots, wiry stems, narrow leaves, and a compact head of flowers, and when abundant may be detected at a distance by its peculiar yellowish hue.

Upon the higher portions of the marsh, which usually escape the ordinary tides, occur several fine grasses of excellent quality. Among these are the creeping fescue, sea spear grass, creeping bent or browntop,
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and black grass. The heads of these are shown to the left in fig. 79. Browntop, or creeping bent, which is common on the marshes of the New England coast and extends southward to New Jersey, is one of the best and most tender grasses for fodder which these lands produce. It is a variety of the well-known redtop, but the stems are creeping at the base and do not rise so high, and the head or panicle is less expanded. It has a decided brown tinge, whence the common name "browntop." Sea spear grass is found along the northern coasts as far south as New Jersey, and is in some places quite abundant, occasionally forming an important element in the hay. It is not so common, however, as are the grasses already mentioned. The stems are tender, the leaves comparatively soft, and the panicle has a few erect or spreading branches. By some it is classed with browntop and not recognized as distinct from it.

Creeping or red fescue which is more common on the sandy borders and waste grounds near the marshes, not infrequently occurs upon them in considerable abundance. This is particularly true of the marshes along the Jersey coast, although the grass extends northward to the shores of Maine. It is a low grass, and, when growing alone, forms an excellent turf; mixed with other species, it adds value to the hay product.

Of all the grasses of the marshes there is none more highly prized for hay than black grass {Juncus gerardi}, which is common on all the marshes of the New England coast, extends southward to Florida, and is found on the shores of the Pacific in the Northwest. Although popularly classed with the grasses, this is not a true grass, but a rush, its botanical characters being quite distinct from those of the Gramineae. A couple of heads of this rush are shown in fig. 79, above those of the sea spear grass. Its slender erect stems are from 1 to 2 feet high, are somewhat wiry, yet soft, and apparently palatable to stock. It contains less fiber and has a higher nutritive ratio, as shown by chemical analyses, than timothy or redtop.

There are a few other plants of the salt marshes which enter into the composition of salt or marsh hay, but as they belong to other families than grasses and are of comparatively little importance, rarely forming any appreciable amount of the product, no mention will be made of them.

The question of reclaiming salt marshes by systems of diking for the purpose of growing better hay or other farm crops has been fully discussed in publications of this Department. Usually a better quality of hay can be obtained from the marshes as they exist by paying more attention to the time of harvesting. If the hay is desired for fodder, the harvesting should be done so far as possible when the most valuable grasses are in flower. If it is delayed too long past the season of bloom, much of the nutritive quality which these grasses

1 Miscellaneous Special Report No. 7 (1884).
possessed in their season is lost. It must be remembered that the hay obtained from the salt marshes is their natural product—a free gift, as it were, of nature—no attempt being made to restore what is taken off, nor any effort to increase the growth of the more valuable sorts. Perhaps it is questionable whether it would pay to attempt to do this by collecting and scattering seeds upon the unimproved marsh or to try to destroy or collect the less desirable kinds to make place for the better varieties.

CHEMICAL COMPOSITION OF SALT-MARSH GRASSES AND HAY.

A sample of pure fox grass (*Spartina juncea*), collected on the marshes of Cape Cod, Massachusetts, about the middle of August, gave the following analysis: Moisture, 8.55 per cent; ether extract, 4; fiber, 26.88; ash, 5.41; nitrogen, 0.87; nitrogen as albuminoids, 5.44.

A sample of salt hay, composed chiefly of fox grass and spike grass, and collected near Atlantic City, N. J., in the latter part of August, gave the following composition by chemical analysis: Moisture, 7.44 per cent; ether extract, 4.02; fiber, 27.04; ash, 9.64; nitrogen, 0.77; nitrogen as albuminoids, 4.81.

A sample of salt hay, collected near Pine Point, Me., in the early part of August and made up of a variety of grasses, including black grass, fox grass, and browntop, analyzed as follows: Moisture, 8.04 per cent; ether extract, 5.44; fiber, 27.25; ash, 5.13; nitrogen, 0.94; nitrogen as albuminoids, 5.88.

The following table of analyses of the more important grasses here mentioned with those of the common meadow grasses inserted for comparison is taken from the annual report of the Connecticut Agricultural Experiment Station for 1889, page 240. The samples analyzed were gathered just before or at the time of blooming.

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<th>Timo-</th>
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<td>Ash</td>
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<td>7.9</td>
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<td>Albuminoids</td>
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<td>7.6</td>
<td>6.0</td>
<td>7.2</td>
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<tr>
<td>Fiber</td>
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<td>Nitrogen-free extract</td>
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The average of numerous analyses of the ash of some of these grasses shows that 5 tons of hay made from them contain as much nitrogen, phosphoric acid, and potash as is contained in a full crop of corn, including stover, from an acre of land. The average amount of salt contained in a ton of hay, according to the investigation at the Connecticut Agricultural Experiment Station, was 54 pounds.