cally all types of excavators as well as varying soil conditions and in order to maintain a proper slope on ditches constructed with a dipper dredge the specifications should provide for a deeper and wider ditch so that when the banks cave in and the sides erode the ditch will still have sufficient depth after the sides will have broken down to their proper slope. On ditches constructed with a dry land machine the specifications should provide that the slopes vary from 1:1 to 2:1 depending on soil conditions as it is far more economical to excavate the side slopes to the necessary inclination in the first instance than to later reconstruct the entire ditch. If this is done and a systematic patrol system adopted until such time as the ditch slopes have become firm, less trouble and expense would be experienced in maintaining the side slopes and as stated before after the sides of the ditches have become smooth they should be sown with grass seed which will protect them from erosion. Let me say in closing that the best way to eliminate the maintenance of slopes in open ditches is to eliminate, wherever possible, the open ditches and use tile.

Note: On both the Racine and Watertown field trips examples were seen where spoil banks of dredge ditches were levelled and the slopes of the ditch seeded for less than 50 cents a rod.— Editor.

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A SANE PLAN FOR MARSH DEVELOPMENT

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Well drained and well managed marsh lands are among the most profitable in Wisconsin. Poorly drained and poorly managed, they are among the most unprofitable. What our marsh lands need is safe and sane development. In Wisconsin we have examples of success and examples of failure.

A typical successful project may be cited in southeastern Wisconsin. The main ditch and large tile laterals were installed by the district about 1910. No one man owned more than 80 acres of marsh land. Some of this was peat to a depth of six feet, but all of it was a part of the farms on the surrounding upland, which was thickly settled, highly developed and selling for about $200 an acre. In its natural condition the wet land
furnished poor pasture or poor hay. A part of it had a growth of willow brush but none of it was heavily timbered. Today corn is being raised on every acre of this wet land. The spoil banks of the main ditch have been leveled and the slopes have been seeded. Lines of tile from four to eight rods apart have been put in by the farmers themselves to complete the drainage begun by the outlet drains. This land is worth just as much as the surrounding upland. These farmers can raise better corn on their drained lowland than they can on their highland, just as they can raise better alfalfa on their highland than they can on the lowland. The drainage of the lowlands has produced well balanced farms. The only regret that some of these farmers have is that a large tile and surface run was not put in originally in place of about two miles of the upper end of the main ditch.

Another project in southeastern Wisconsin has not been so successful but is typical of some drainage districts. The soil and the condition of the surrounding upland farms are similar to those of the successful district just noted. It was probably the engineer and the commissioners who made the first mistake. They dredged the outlet ditch to a depth of only six feet. It should have been eight feet. Instead of putting in large tile for laterals they put in capstan ditches about three feet deep. Nevertheless, the main ditch is deep enough that it can serve as a satisfactory outlet for tile on probably two-thirds of the wet land in the district. The farmers have not taken advantage of this outlet. To date, only three farmers in this district have land tile. They are meeting with good results and more tile will be laid there in the next few years. We have succeeded in getting a good tiler from northern Illinois to take up his residence in this district to stimulate the tile industry and incidentally to make good wages. The farmers have been disappointed because they expected too much of the outlet ditch, but that does not excuse them from laying tile now that they see that tile are necessary and profitable. The unfortunate feature is the loss that has been sustained by the delay in starting to tile.

In Juneau, Portage, Wood and Jackson counties, as well as counties in the northern part of the state, there are large areas of marsh land surrounded by upland that has not been developed
into farm land. These projects are less attractive because of this isolation. Strangely enough, more than half of the 800,000 acres in drainage districts in Wisconsin are of this type of marsh land. It is little wonder that three-fourths of the land in these districts is not being cultivated today. It is gratifying to note, however, that men with plenty of grit and some capital have built up farms in such drainage districts. In Wood county there is a man who settled on 160 acres of marsh land back in the nineties when the marshes were dry, and some people thought they were always going to remain dry. But when the wet years came it was evident that these marshes needed drainage. Our swamp angel stuck to his farm, organized a drainage district and put in outlet ditches. This improved his drainage so that he could make a living. The sub-soil was of sand and less tile were necessary than if the sub-soil were clay. Nevertheless, he laid a carload of tile occasionally. By 1915 he had over 200 acres of land drained and under the plow, with buildings on his farm worth more than $10,000. He used barnyard manure and commercial fertilizer on his land. His land is just as productive as lands that are selling for more than $200 an acre, but he does not want to sell. It is his home. Three-fourths of the land in this whole district, however, is still undeveloped. Pointing to the success of our swamp angel as an example a few real estate sharks are trying to get $50 an acre and more for the wild land. These men would require the prospective settler to pay down perhaps his last dollar on the land. They would leave him no money with which to lay tile and to break the sod or clear the brush. They are tying their settler hand and foot. There is little wonder that many settlers have to move away and leave the land to be sold to other unfortunate home seekers within a year.

There is another district in central Wisconsin that has a fall of about thirty feet to the mile. The wet land is wooded and is what may be called rolling swamp. Ditches are being dredged in the narrow swales and a large real estate company is planning on selling these rolling wet lands on the strength of the benefit that will be done by the outlet ditches. As a matter of fact the outlet ditches will not affect more than ten per cent of the land. It would have been a better investment to have laid out a system of section line roads on this area with a ditch four
feet deep at the side of each road discharging into the ravines and water courses. The underlying rock is so near the surface that tile must be laid there in order to effect drainage. These ditches would give each settler an outlet into which he could tile the first ten acres and thereby get a start. As it is, settlers are being asked to come to a country where there are no roads, no schools, no churches, and where they must make a considerable investment in tile drains and land clearing before they can raise any crops at all. With no money left, failure and discouragement is inevitable.

The outstanding fact in the drainage movement in Wisconsin is that such a large percentage of the lands in drainage districts has not been cultivated since the outlet drains were installed. This is due chiefly to the following reasons:

1. Sparse settlement from the surrounding uplands.
2. Promoters have been penny-wise and pound-foolish. They ask too much for their land and require initial payments that the settler cannot afford to make. They have also represented the drainage to be better than it is.
3. Outlet ditches have been made too shallow.
4. Too much has been expected of the outlet drains.
5. Many drained marshes have been poorly cultivated and managed.
6. Mineral fertilizers have not been used as much as needed.

But it is of the possibilities of Wisconsin's wet acres if properly managed that I would speak. If I were living on a farm that contained marsh land, I would drain that marsh as soon as possible. If the marsh were timbered with good timber there would be less need for haste than if the marsh were merely brushy or cleared.

The settler buying 80 acres of land in a drainage district should see to it first that the outlet ditch is deep enough to tile every foot of the land with tile four feet deep and falling at least 1 in 100 feet to the top of the water in the outlet ditch. Here also cleared marsh land is preferable to timbered or brushy marsh. It should be on a road. It is desirable to have an island of hard land near the road for a building site but that is not necessary if drainage is deep. For such an eighty he should not pay over from $30 to $50 an acre, depending upon the locality, and if he had but $2000 he should not pay over $200
down, keeping the other $1800 to tile his first ten acres intensively for cultivated crops. Then tile 20 acres slightly for timothy and alsike, and then put up some temporary buildings. These thirty acres would make him a living and increase his credit so that he could tile and develop the other fifty acres and gradually improve his stock and buildings. In addition to the purchase price there would be the drainage tax which he would pay in installments.

The man buying 640 acres of marsh land in a drainage district should get it for less per acre than the 80-acre man, because it is to be assumed that he has plenty of capital or else he would not tackle so large a tract. He does not ask for credit from the seller and hence does not need to pay for that service. Nevertheless, if the outlet ditch has been constructed, he should ascertain carefully the amount of the drainage taxes against the land and the sufficiency of the depth of the outlet ditches. He should also measure his finances in advance. Many a man has had to drop a half-finished project because he lacked funds. He should plan on financing the development for ten years, because the chances are that he will have to hold it that long. With proper management there will be an income during these ten years. I believe firmly that a developer of marsh lands should carry the development to a stage where the land is self-supporting before he asks anybody to buy those lands of him. The same applies to the promoter who buys 10,000 acres of marsh land and organize a district and then tries to unload it upon someone else or sell it to unsuspecting settlers before the outlet ditches exist anywhere except on paper. We do not want that kind of a promoter.

There is a place for a promoter who buys up 10,000 acres of marsh land at about $15.00 an acre, even in an undesirable locality, and then after organizing a district and assuring the construction of the outlet drains, sells it at about $20.00 to a development company with sufficient capital. In that case the promoter has assumed some risk and has rendered some service which entitles him to $5.00 an acre. The development company then should lay tile and make the land produce valuable crops—part of it tiled intensely for corn and potatoes where temperature permits, and part of it more sparsely tiled for timothy and alsike. This converts the marsh into income property. Big
companies are making large profits each year farming large areas of drained marsh on a big scale. Some day these companies may desire to sell their holdings to home seekers, and when that time comes, the settlers will get what they pay for. They will build happy homes and live contented lives. Only in this way should large areas of marsh land be developed in Wisconsin.

There is some land adjacent to deep (7 feet or more) outlet ditches in all drainage districts where the drainage is such that timothy and alsike can be raised without any tile at all. The width of this strip varies with the nature of the sub-soil and the depth of the ditch. But however wide or narrow this strip is, it should be seeded as soon as possible so that there will be tame hay for revenue. As soon as a few deep lines of tile are put in at the edges of the marsh to cut off seepage, the timothy and alsike area may be enlarged. A few more deep lines in well selected places within the area make it all available for timothy and alsike. One crop of tame hay should be actually harvested with profit on at least half of an 80, by the big development company, before the land is sold to a settler for a home, and the company should stand ready to loan the settler at a reasonable rate of interest and on liberal terms such money as he needs to complete the development of the farm. Unless the company can do that, it had better stay out of the game.

It takes two years to get land well seeded to timothy and alsike. Break the land the first year, disk it well and seed it to buckwheat or flax. Put in the seed deep and roll with a heavy roller. Frost may take the crop, but the chances are fifty-fifty that there will be thirty bushels of buckwheat to the acre. In any case the land will be in fine shape to seed to grass on the following spring, when heavy disking will prepare a good seed bed without plowing. Then seed about one and one-half bushels of oats to the acre for a nurse crop with plenty of grass seed. About July 1, mow the oats for hay and the grass will get a good start for a second crop of hay that year. If the oats are allowed to ripen they may lodge and smother the grass.

To sum up: Timothy and alsike are good crops for marsh soils because (1) they do not require such thorough drainage
as cultivated crops; (2) they resist frost; (3) they require comparatively little labor per acre; and (4) they are a profitable crop for the first five years while the excessive acids are being drained out of the soil, and while the operator may lack the time or capital necessary to put in enough tile to complete the drainage sufficient for the more intensive crops.