# MANAGING SCIRPUS ROBUSTUS FOR DUCKS [1]

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Practical management procedures and adapted food plants for freshwater duck fields and brackish-water duck ponds have been developed. However, in coastal areas of the southeastern states, a landowner or biologist is often confronted with the problem of developing a duck field or marsh in a borderline location that is too salty for freshwater duck food plants and at the same time too fresh for widgeongrass ponds.

Since 1953, the Soil Conservation Service has conducted field trials in coastal South Carolina to determine: (1) adapted plants for these midsaline locations which will produce good yields of acceptable duck food; (2) soil and water management to establish and maintain these plants, and (3) economic control of competitive species, if necessary.

Native plants serve as useful indicators of the *average* degree of salinity in an undeveloped marsh. For instance, a *dominant* stand of giant cutgrass *(Zizaniopsis miliacea)* will tell a land-use planner that the salinity of the field is less than 1,000 parts per million and it is safe to plan a duck field for any of the freshwater food plants. Likewise, a *dominant* stand of needlerush *(Juncus roemerianus)* or smooth cordgrass (*Spartina alterniflora*) will indicate salinities above 10,000 ppm and such areas are best suited for widgeongrass ponds if they are to be developed for ducks.

The flag of caution needs to be raised on marshes without uniform vegetation and with scattered clumps of either big cordgrass *(Spartina cynosuroides)*, marshhay cordgrass *(Spartina patens)*, needlerush, or smooth cordgrass. Without soil or water tests, it is a safe guess that such areas have salinities ranging from 1,000 to 10,000 ppm. For simplicity of planning and establishment, a single duck food was needed which would grow anywhere in the broad salinity range without the worry of whether some years the field would be fresher or saltier than others. Many native duck food species and field crops were considered for the trials.

Browntopmillet *(Panicum ramosum)* is altogether unsuited to such areas as it will only tolerate salinities up to 1,000 ppm. Corn is more tolerant to salt than browntop. However, the deeper drainage and more prolonged drying of the soil required to grow corn increases the likelihood of cat-clay formation and the field thus becomes too acid to grow any useful plants. Most coastal marshes with a salt influence probably have the cat-clay potential.

Rice and grain sorghum have a fair degree of salt tolerance (up to 5,000 ppm, depending upon mineral or organic soil types). These two species have almost been abandoned for duck field plantings in the southeast as blackbirds and bobolinks eat most of the seed before the ducks arrive. Also the moist air of duck fields quickly causes the seed of grain sorghum to mold. Barley has a high degree of salt tolerance—8,000 to 10,000 ppm, but its growing season makes it unsuited to the type of duck field management required in the southeast. Thus it appeared that none of the field crops which might be grown for duck food were adapted to brackish marsh.

Studies of native duck food plants indicated that there were very few which would be worthwhile to consider for field trials in these problem marshes. Most of the smartweeds do not tolerate salinities above 3,000 ppm. Coast cockspur *(Echinochloa walteri)* will grow at salinities of 5,000 ppm. Its seeds are small and chaffy and several fields established in earlier trials had little attraction for ducks. (However it is easy to get stands of this species by Spring drawdown). Chufas (*Cyperus esculentus*) will possibly tolerate as high as 5,000 ppm salt but raccoons have destroyed every planting of chufas attempted in duck fields in coastal South Carolina. Sawgrass *(Cladium jamaicensis)* withstands a moderate degree of saltiness but its hard seeds have little food value.

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Sprangletop *(Leptochloa fascicularis)* and dwarf spikerush *(Eleocharis parvula)* had limited promise.

Saltmarsh bulrush (*Scirpus robustus*) seemed to have the most promise. Although it probably grows best in the salinity range of 3,000 to 7,000 ppm, it still thrives in the broader range of 1,000 to 10,0000 ppm. It is tolerant of some of the acid conditions which may be associated with cat-clays, growing well at a pH as low as 4.3. The brown seed are of good size and have an extremely low rate of deterioration. Records show that bulrush seeds are eaten by many species of ducks, though it is not clear whether the seeds are choice or only fair quality. Measured seed yields on natural stands varied from 400 to 950 pounds of clean saltmarsh bulrush seed per acre (unpublished SCS records). The species has the further advantage of being a perennial in addition to reproduction by tubers or seeds.

Two big questions remained—(1) how to establish and maintain it in a duck field, and (2) is it choice enough to attract ducks readily?

Observing natural stands of *Scirpus robustus* in several closed off quarter-drains of an abandoned rice field suggested the theory that water fluctuation was the key to management of the species. In the location observed, the full-moon high tides spilled into and filled the drains. Then for the remainder of the month, evaporation and seepage gradually removed the water. *Scirpus robustus* grew in the bottom and slightly up the sides of the drains—nowhere else in the field.

This type of fluctuation could be duplicated in a diked field with suitable water control structures. Fortunately such a field was available to begin the trials. A soil conservation district cooperator had a 125-acre newly diked field on which he had given up hopes of getting enough fresh water from shallow reservoirs during the drought year of 1953 for contemplated conversion to a freshwater duck field. The adjacent Combahee river at this reach had a salinity range of 1,500 to 10,000 ppm salt, depending upon rainfall and tide conditions. The tidal variation was ample to flood or drain the field as desired. A few plants of *Scirpus robustus* were scattered along an old ditch in one corner of the field, so further introduction was considered unnecessary until it was seen how these reacted under the proposed management. Big cordgrass was the predominant vegetation, with a few clumps of tropical cattail *(Typha domingensis)*. The presence of tropical cattail caused the trial to be undertaken with trepidation as it was feared the field would rapidly be taken over by it since this species of cattail will grow well in this range of salinity.

After burning off the dead vegetation, water fluctuation was begun in early spring using the type of structure described below. The water was gradually raised in the field to a depth of about six to eight inches and then gradually lowered to a saturated soil condition. About thirty days were taken for each complete cycle. By Fall there was a phenomenal increase of *Scirpus robustus* in the field. Not only was there a good scattering of plants over the whole field, but in some spots heavy beds of the plants had been generated. Such immediate results certainly had not been anticipated! Fruiting was good, but there was one disappointing note: few ducks used the field that winter and most of these came late in the season.

The second year of fluctuation produced a still further increase in the *Scirpus robustus*. Almost all of the big cordgrass was being replaced by the *Scirpus*. It cannot be said with certainty whether the fluctuation alone was eliminating the big cordgrass or whether *Scirpus* actually becomes dominant to it under these conditions. Most gratifying was that the clumps of tropical cattail had not enlarged. Again the second winter not many ducks used the field the first part of the season but there were enough for the landowner to have satisfactory hunting. By later winter, however, ducks were in the field in large numbers.

This field of *Scirpus robustus* is now six years old and is almost a solid stand over the 125 acres. Some open spots, however, occur among the bulrush beds. Topography probably caused some areas of the field to flood too deeply, or it might be a soil condition. At any rate, these spots have value as open water "landing strips" for ducks. The few clumps of tropical cattail remained but did not spread. All of the big cordgrass and other vegetation disappeared. After the first two years, large numbers of ducks used the field heavily for

the entire fall and winter season. Hunting was pleasingly successful. Cost of management (other than the original outlay for diking and water control structures) has been confined to a small amount of time required each month to raise or lower the flap-gates.

The early promise of success in this first field led to expansion of the trials to seven other fields, totaling about 550 acres in South Carolina. In each of these it was found possible to generate and maintain good stands of *Scirpus robustus* similar to the experiences in the field described above.

## WATER CONTROL DEVICE AND ITS MANIPULATION

Prefabricated flashboard risers of asphalt-coated corrugated metal have been found well suited as water control devices in fields planned for *Scirpus robustus*. These have a chimney-like affair on the inside of the dike in which flashboards are inserted to control the water level. A connecting pipe through the dike has a metal flap-gate on the outside end which is permitted to operate during times when the field is being drained, and propped open during times when the field is being flooded. Soil Conservation Service engineers can assist in selecting the proper riser and pipe needed for a particular field and water source.

Flashboard riser structures were designed to maintain static water levels, which we do not want in *Scirpus robustus* fields. Therefore a difference in operation is required from their normal functioning. This is easily done by making them into what some landowners have called a "leaky trunk." One or two of the lower flashboards are left out. Wooden or metal chocks are put on either side so that when flashboards are put on top of these, there is an opening left at the bottom of the riser equivalent in size to the one or two missing flashboards. Now instead of a static water level, each low tide on the outside of the field will result in a little water being drained from the field, the rate being determined by the size of the opening left in the riser. This should be adjusted so as to require two to three weeks to drain the field. On high tides, the flap-gate on the outside end of the pipe closes as soon as any reverse flow starts into the field. Once the correct size of opening is determined, from then on the process becomes more or less automatic. No further adjustment will be required either in draining or flooding.

As soon as the water is off the field, the flap-gate on the outside is propped open and the field will gradually reflood. Although water is lost during low tides, the hydraulic head at high tide will be great enough to push more water in than is lost, so that in two to three weeks the field will again be flooded six to eight inches deep. Simply dropping the flap-gate (on the outside end of the pipe) back into operation will then automatically start another cycle.

The four to six week cycle was found to be optimum in getting the best stands of *Scirpus robustus* in the shortest period of time. However, considerable variation is tolerated. Also if adverse tide and weather conditions cause excessively deep flooding of 12 inches or more even for several weeks, it is tolerated by *Scirpus robustus*. The greatest caution required in the entire system is to prevent complete drying of the field for any prolonged length of time. As soon as the water is let down to a saturated soil condition, reflooding should be started. Failure to do so could result in cat-clay formation with such acid conditions as to severely interfere with plant growth.

During the fall and winter months, the opening in the flashboard riser is closed and a static water level maintained until the ducks leave in their northward migration. During this time the riser performs its normal function as a spillway to let off water from rainfall. The best depth to flood fields of *Scirpus robustus* needs more study. Although ducks readily feed in fields with six inches of water, there are indications that depths of 12 inches may be better in thick stands. The stalks of *Scirpus robustus* remain erect all winter and the deeper water apparently makes it easier for ducks to swim among the beds of plants to feed. (Tipping feeders as mallards, pintails and blacks can still reach the bottom easily with 12 inches of water.)

Although all of the fields used in these trials were flooded and drained through tidal action, there is no apparent reason why the same fluctuation could not be accomplished by periodic pumping in or out with low-head pumps

where duck fields are wanted in locations with insufficient or no tidal action. This type of pump costs little more than flashboard risers and pipe, handles tremendous volumes of water, and is economical in operation. However, a maximum lift of 10 to 12 feet is all that can be obtained with best efficiency.

As has been mentioned, it was found that for the first year or two the maximum duck usage of fields of *Scirpus robustus* was after January. This was accounted for by the fact that a large part of the seed stay in the burs on the plant stalks until mid-winter. However since the seeds are so resistant to deterioration, there is a constant build-up of uneaten and ungerminated seed from one season until the next. After a couple of years, the fields are just as attractive to ducks in the early fall as later in the season.

## PLANTING PROBLEMS

No introduction or planting of *Scirpus robustus* was made in any of the fields used in these trials. In all but two of the locations at least one or two plants could be found somewhere in the field or a few dead stalks indicating it grew some time in recent years. In one of the fields where there was no sign of the species, it was planned to be introduced. Before the landowner got around to the actual planting, the water fluctuation resulted in clumps of *Scirpus robustus* appearing in many areas of the field. Another year of fluctuation brought the field into a good stand. This was replicated in a second field where no plants could be found in the beginning.

These experiences raised the conjecture if it would ever be necessary to plant the species. A few seed could survive in these marshes for a long period of years and then germinate when proper conditions existed. Certainly this has been the experience in freshwater marshes, with smartweeds seemingly coming from nowhere after suitable conditions were established.

However, if plants do not appear after the first or second cycle of fluctuation, it would be necessary to introduce the species. Plants can be transplanted in early spring or tubers can be planted three to six inches deep at any season. We have no experience with the problems of seeding.

A word of caution for those who might attempt hand separation of seed from the burs: the ripe burs contain many fine, almost invisible awns which get into the skin between the fingers and cause an unpleasant itching sensation. Gloves should be worn for hand separation, or a mechanical cleaner used. These prickly awns are in the burs, not on the seed.

Perhaps one reason why *Scirpus robustus* stands increase so rapidly once a few plants are established in a field is that a part of the seed do not immediately sink when they drop from the burs. The seed have some sort of a coating that does not "wet" easily and the surface tension of the water allows the seed to float and become widely dispersed by wave and wind action before they finally sink.

## DWARF SPIKERUSH AND SPRANGLETOP

Dwarf spikerush *(Eleocharis parvula)* is another species which is favored by water fluctuation. It spontaneously started growing in bare spots of the *Scirpus robustus* fields. It is a fair food for ducks. They pull it up to eat the roots, then leave the tops to float on the surface of the water. Large masses of these floating tops are often found rafted on the down-wind edges of a field. Dwarf spikerush is never a dominant species in the *Scirpus robustus* fields and efforts to manage for or against it are not considered worthwhile.

Sprangletop *(Leptochloa fascicularis)* appeared in early trials as a possible duck food which would grow in a broad range of saline conditions if proper management could be developed. However, the grass-like seed are chaffy. Although measurements were not made, seed yields appear to be light.

An accidental sequence of soil and water conditions during the diking and preparing of one field of about 100 acres resulted in a heavy stand of sprangletop in a part of the field. There was a winter drawdown, drying, burning, grazing, slightly wetting, drying, deep flooding, followed by a continuous moist soil condition for the remainder of the summer. This stand of sprangletop was regularly used by ducks that winter. For the next two years, the same sequence of soil and water conditions was purposely followed on the field in an attempt

to maintain and increase the stand of sprangletop. From field notes, the timing of every event was done just the same as had been accidentally done the first year. However, the original stand of sprangletop did not come back and no new stands were generated. Indeed, except for a few scattered plants, the species virtually disappeared from the field! Since not even the slightest lead was found on how to grow sprangletop, it was dropped from the trials. The above field was easily converted into a good stand of *Scirpus robustus* with water fluctuation.

## SUMMARY

In coastal areas of the southeastern states, a landowner or biologist is often confronted with the problem of developing a duck field in a borderline location which is too salty for freshwater duck food plants and at the same time too fresh for widgeongrass ponds.

Field trials were undertaken to determine adapted plants and their management for the broad salinity range of 1,000 to 10,000 parts per million salt. Several duck food plants are described which were partially adapted to the circumscribed conditions but which were discarded for one or more reasons.

Only one plant emerged as a suitable species. From these trials it was found possible to generate and maintain good stands of saltmarsh bulrush *(Scirpus robustus)* which produced heavy seed crops. Cost of management was relatively low and landowners have been pleased with the large numbers of ducks which have regularly used the fields.

To generate and increase stands of *Scirpus robustus,* it is necessary to gradually fluctuate the water level from a saturated soil condition to six or eight inches of flooding and down again. The fluctuation is done during the spring, summer, and early fall, requiring about 30 days for each complete cycle.

A simple water control device is described which automatically permits this fluctuation and which required little attention. There are no critical requirements in the system. If adverse conditions cause excessively deep flooding for several weeks, it is tolerated by the plants. The greatest caution is to prevent complete drying of the soil.

When the trials were first begun, it was feared the fields would rapidly be taken over by tropical cattail *(Typha domingensis)* which also grows in this range of salinity. However, this has not been the case. Dominant stands of big cordgrass *(Spartina cynosuroides)* have been eliminated by this method of management.

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