Texas Agricultural Extension Service
The Texas A&M University System

SCS-1998-31
TAMU-SG-99-701

THE BENEFITS OF UNCONFINED DREDGE MATERIAL TO RANCHERS ALONG THE INTRA-COASTAL CANAL

In 1986, the Corp of Engineers used a free flow, unconfined method to dredge the Gulf Intra-Coastal Waterway. This method of disposal free flows dredge material onto adjacent ranch lands. Dikes constructed adjacent to the canal prevent dredge material from flowing back into the waterway. In some cases, dikes also were built along the sides of the disposal site to contain the dredge materials and associated drainage, and to protect drainage channels and existing wetlands.

During the dredging process, the water/sediment slurry was distributed through a large pipe onto the adjacent ranch land. The dredge material produced a sediment layer approximately 6-12 inches deep which extends 500 to 1000 feet away from the canal, depending on the topography and amount of material deposited. This resulted in an even, gently sloping disposal site which is accessible by livestock or vehicular traffic, and has potential for revegetation and use by the rancher. Management and potential use of such sites were examined in a result demonstration conducted by the Texas A&M University Agricultural Extension Service with support of the Texas A&M University Sea Grant College. This l995-l998 study found the free flow disposal method beneficial to the ranch landowner for both livestock and wildlife habitat along the Gulf Intra-Coastal Waterway.

Ranchers' negative perception of dredge material as "spoil" is often the result of past experience with alternative dredging methods which resulted in piles of material dumped next to the canal at sites surrounded by large dikes. These dikes created a lagoon type area, which usually remained muddy without external drainage. The large dikes surrounding all sides also made the area inaccessible for vehicles or even livestock use. In contrast, the free flow dredging method has relatively low dikes which are constructed only along the canal edge (parallel) and extend perpendicular from the canal into the pasture. No dikes are placed on the opposing side of the area allowing easy access to the site by vehicles, livestock and wildlife. The free flow dredge method deposits dredge that is evenly sloped, but slightly higher than the surrounding land. The material has a smooth surface instead of the piles or mounds of material associated with previous dredging. Drainage is actually better than on most of the surrounding lands.

Dr. David Bade, *Professor and Extension Forage Specialist*
Paul Salas, *Extension Demonstration Assistant*

FACTORS HINDERING NATURAL REVEGETATION

One of the major problems caused by dredging is that dredge deposits bury existing vegetation and plant seeds, preventing natural revegetation by inland salt-grass and other native plant species. In addition, the material is high in soluble salts and has very poor structure, which results in a thick surface crust upon drying. Surface crusting also hinders natural leaching of salts by rainfall and prevents emergence of any seedlings that sprout under the dredge. Natural revegetation of these areas by native plant species did not occur from 1986 to l995. This study demonstrated that these disposal sites can be revegetated using sod-type grasses, and that soil tilth and salt leaching rates can be greatly increased through management.

DREDGE NUTRIENT COMPOSITION AND SALT LEACHING RESULTS

One benefit of the dredge material is the high concentration of nutrients necessary for plant growth. Soil tests conducted on the material showed very high levels of nitrogen, phosphorous, potassium, sulfur, magnesium, calcium, and such trace minerals as zinc, iron, copper, boron and manganese. In fact, phosphorus and potassium (two essential macronutrients usually in low supply in coastal soils) were present at levels of over 200 and 1600 pounds per acre, respectively. At current fertilizer prices, over $50.00 per acre would be required to apply phosphorous as fertilizer at rates equivalent to that present in the dredge material. These high nutrient levels enable economical forage production once salts are reduced to acceptable levels for revegetation. In addition, forage grown on these sites has contained higher concentrations of phosphorous, potassium, calcium and many micronutrients required by cattle.

Salt concentrations in the dredge material at the time of disposal were extremely high (19500 to 26000 ppm), and leaching of salts from 1986 to l995 was very limited (Table 1). Leaching removal of salts contained in the dredge material was essential for revegetation and use of the site by livestock and wildlife.

To facilitate natural leaching of salts, one renovation operation and two tillage operations were conducted on the demonstration site. In addition, vegetative treatments which included both seeded and sprigged plant materials were installed. Salinity levels of the dredge material at the time of dredging, of untreated material 7 and 10 years after disposal, and in response to applied treatments are presented in Table 1.

Table 1. Salinity levels of dredge materials.

Time	Salinity levels (ppm) Inside Project	Outside Project
1988 - dredging time	26000	—
1995 - project start	12350	12350
1998 - project end	2210	8450

Results indicated that salt concentrations in dredged materials were reduced by 82.1% in the treated areas compared to only a 31.5% reduction in areas where no tillage or vegetation treatments were applied. Salinity values of the dredge material at the end of the result demonstration (2210 ppm) would not cause a yield reduction in bermudagrass. In contrast, salinity values of untreated dredge material (obtained outside the treated area) averaged 8450 ppm and would result in approximately a 40% reduction in bermudagrass yields. Revegetation of the site also enhanced infiltration of rainfall into the dredge material, improving salt leaching. Results indicated that leaching removal of salts could occur more rapidly than initially anticipated, allowing for faster revegetation by introduced and/or native forage species.

BENEFITS FROM ELEVATED PASTURE SITES

Much of the rangeland along the Gulf Intra-Coastal Waterway is flat, and is saturated or flooded with water for much of the year. For this land to be grazed and utilized by livestock, cattle must walk through mud to forage for existing plants. Cattle production and mud do not mix well! Muddy conditions increase foot problems (i.e., foot-rot) in cattle, and make it more difficult for cattle to graze an area. The National Research Council's Beef Nutrient Requirements indicate that mild mud (4 to 8-inch depth) can reduce dry matter intake of cattle by 15%. Severe mud (12 to 18-inch depth) can reduce dry matter intake by up to 30%. Muddy conditions increase the energy requirements of the cow as she forages by as much as 50% compared to a cow fed in a pen. Mud also increases cold stress during winter months. Feeding hay or supplemental feed in muddy conditions increases hay/feed wastage. Mud definitely has a negative effect on cow body condition and animal performance.

Having evenly sloped, slightly elevated disposal sites along the canal provides a dryer place for cattle to graze, locations for hay or supplement feeding, and improved conditions for bedding. This allows better grazing distribution to areas adjacent to the disposal sites. During the result demonstration, cattle used the elevated disposal sites along the intra-coastal canal both for grazing and bedding (Figure 1). Increased grazing of the native salt-grass next to the result demonstration site was evident as animals grazed and then rested on the revegetated area.

BENEFITS FROM REVEGETATING WITH IMPROVED FORAGE SPECIES

Although many species of salt tolerant forages were planted on the result demonstration site, those planted by vegetative plant parts (sprigs) were most successful. Seeded plants had a harder time establishing. Problems included failure of the seed to sprout in the dredge material due to poor seedbed tilth, failure of young seedlings to emerge through the crust, and failure of emerged seedlings to become established due to increased grazing pressure from cattle and wildlife. Sprigged grasses such as bermudagrass and adalayd were planted by roots and were better able to become established. They also had the advantage of spreading by runners (stolons) and were able to cover more of the area once established. At the end of the study, over 40% of the area where bermudagrass or adalayd were planted was vegetated. These plant species are higher yielding and have higher forage quality compared to native species. As indicated in Figure 2, cattle selectively grazed these grasses in the result demonstration area.

Figure 1. The use of elevated disposal sites as bedding areas.

Figure 2. Cattle grazing of established bermudagrass outside clipping cages.

These sod-type forage grasses have the following advantages for revegetation of dredge disposal sites:

1. Higher yield and quality than native vegetation.
2. Planted by sprigs and easier to establish.
3. Spread by stolons and cover the site faster.
4. Re-vegetate from roots after subsequent dredging (if not covered too deep).
5. Vegetate the dredge site faster enhancing salt leaching and preventing crusting problems.
6. Better at preventing erosion and movement of material from site into channels even in heavy rainfall.
7. Provide better footing for cattle in wet years.

This work was funded in part by Project R/ES-62 of Institutional Grant NA56RG0388 to the Texas Sea Grant Program, National Ocenanic and Atmospheric Administration, U.S. Department of Commerce.