

The Transition from Agricultural Lands to Wetlands during Sea Level Rise: Managing the Ecology and Economics



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Effects of Sea Level Rise on Agricultural Lands

The Earth's climate is dynamic and as a consequence of burning fossil fuels, atmospheric carbon dioxide has increased. This increase contributes to global warming and the melting of the polar ice, causing sea levels to rise.



East Coast areas are especially susceptible to rising sea levels. With a 1 meter rise in sea level the areas in red would be under water.



In Kent County, Delaware coastal farmland is currently becoming salinized from the inundation of Bay water.

Coastal farmland is progressively inundated with salt water as sea level rises, exacerbating the shortage of land arable for traditional crop production. With continuing sea level rise building dikes could delay the process, however, the best management practice for these areas may be a calculated retreat, allowing the ecosystem to naturally transition. In order to manage a calculated retreat, economic output from the land is needed for the interim period.

Seashore Mallow and Potential Uses



During this interim period of ecological change, when farm fields would otherwise be barren, they can be of economic and ecological benefit by growing Seashore Mallow (*Kosteletzkya virginica*). Seashore Mallow is a halophyte native to salt marshes along the East Coast and the Gulf of Mexico. Five petaled, pink flowers of the Seashore Mallow can be pollinated by insects or self-pollinated if necessary.

Once pollinated, pods containing five seeds are formed. Seashore Mallow is perennial plant, with an extensive root system, that lasts between 5 and 10 years.

Some potential products to be produced from Seashore Mallow:

1. Biodiesel

Seashore Mallow seeds contain 18-20% oil. The oil is similar in composition to cottonseed and soybeans.



2. Feed Meal

Meal remaining after oil extraction contains 32% protein. Does not contain the harmful metabolite Gossypol, which is found in cottonseeds.

3. Stems for ethanol production

Seashore Mallow stems are high in ligno-cellulose.



4. Industrial Gum produced from the roots

After five years the roots can be harvested.

1 year old Seashore Mallow root system

Salt Water-Based Agriculture

Seashore Mallow can be planted with traditional agricultural equipment. Traditional row grain planters with sorghum plates in the hoppers were used to plant acres of Seashore Mallow. Cultivators and sprayers for weed control were standard. Leaves drop from stems when pods are mature, simplifying the harvest process.

Seashore Mallow in a 2.5 acre field in Sussex County, DE



The natural habitat of Seashore Mallow is not suitable for agricultural use. Farmland affected by sea level rise is one potential area for use, along with several other areas no longer suitable for traditional crop production.

Suitable habitats for Seashore Mallow Agriculture:

1. Farmland Transitioning to Aquatic Ecosystem
Resulting from sea level rise

2. Sandy Coastal Desert
Globally, 22,000 miles of coastal desert exist

3. Dry Farmland with Brackish Water Wells
The water is too saline for traditional crops, but would support Seashore Mallow

4. Salinized Farmland
Salt accumulated over years of faulty irrigation, salt deposits shown (areas of white)

