Using NOAA historical charts, maps, aerial photography, Digital Coast and other satellite imagery to establish the status and threats to remnant tidewater rice fields and canal systems along the Lower Cape Fear River, NC

James McDaid Kapetsky, Ph.D.

Coastal GeoTools 2015
Charleston SC, March 31, 2015

Eagles Island
COALITION

Which portals provided the data and which GIS was used?

- Google Maps via Manifold Internet Map Server
- NOAA Digital Coast
- NOAA Coast Survey
- USGS Earth Explorer
- USDA Geospatial Data Gateway
- New Hanover County, NC GIS Portal
- +Historical literature

manifold.net

Version 8.29.0

Abstract

Using NOAA historical charts, maps, aerial photography, Digital Coast and other satellite imagery to establish the status and threats to remnant tidewater rice fields and canal systems along the Lower Cape Fear River, NC

by

James McDaid Kapetsky, Ph.D.

Presented at Coastal GeoTools 2015

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Tidewater rice culture was practiced extensively along the Lower Cape Fear River from early colonial times up to early in the 20th century. Today tidewater rice culture is perceived as an important component of the Gullah-Geechee National Heritage Corridor and as a valuable historic resource by adjacent municipalities. However, considerable amounts of the original tidewater rice culture areas already have been lost to other uses, and the remnant rice canals and fields are threatened by erosion, but at an unknown rate.

Mapping the remains of the rice culture system is an essential part of conservation planning by the Eagles Island Coalition on whose behalf this study was carried out.

Satellite imagery, aerial photos, LiDAR and historical charts were used to interpret and inventory the remains of rice fields and to classify the various kinds of canals, as well as to establish the maximum expanse of rice cultivation along the lower Cape Fear River. With the focus on the five mi^2 Eagles Island, supervised classification of aerial photos and satellite images was used to locate and quantify the erosion threat as well as to estimate the areas lost to other uses.

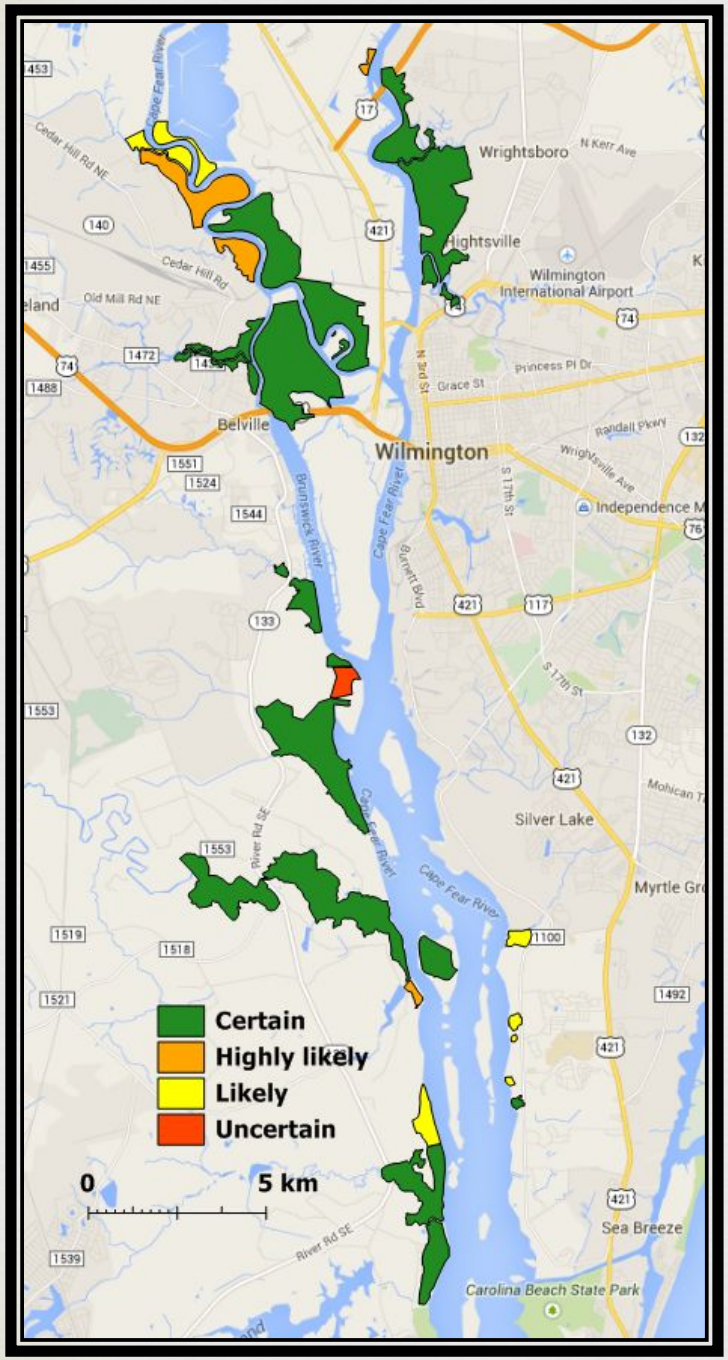
Please direct comments and questions to *jameskapetsky@gmail.com*

The water colors are from Smith, A.R.H. and H.R. Sass (1936) A Carolina Rice Plantation of the Fifties.

Part 1
Where was rice farmed along the Lower Cape Fear and what remains today?

Where and when was rice cultured in the Lower Cape Fear Region?

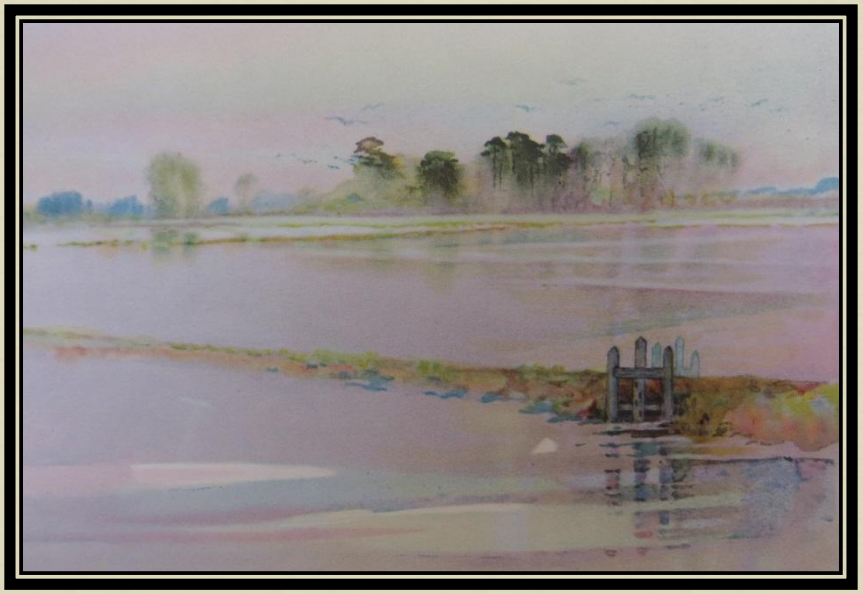
- 1731 to 1930
- 5,000 acres on 28 plantations in 1860



What remains of tidewater rice farming in the Lower Cape Fear Region?

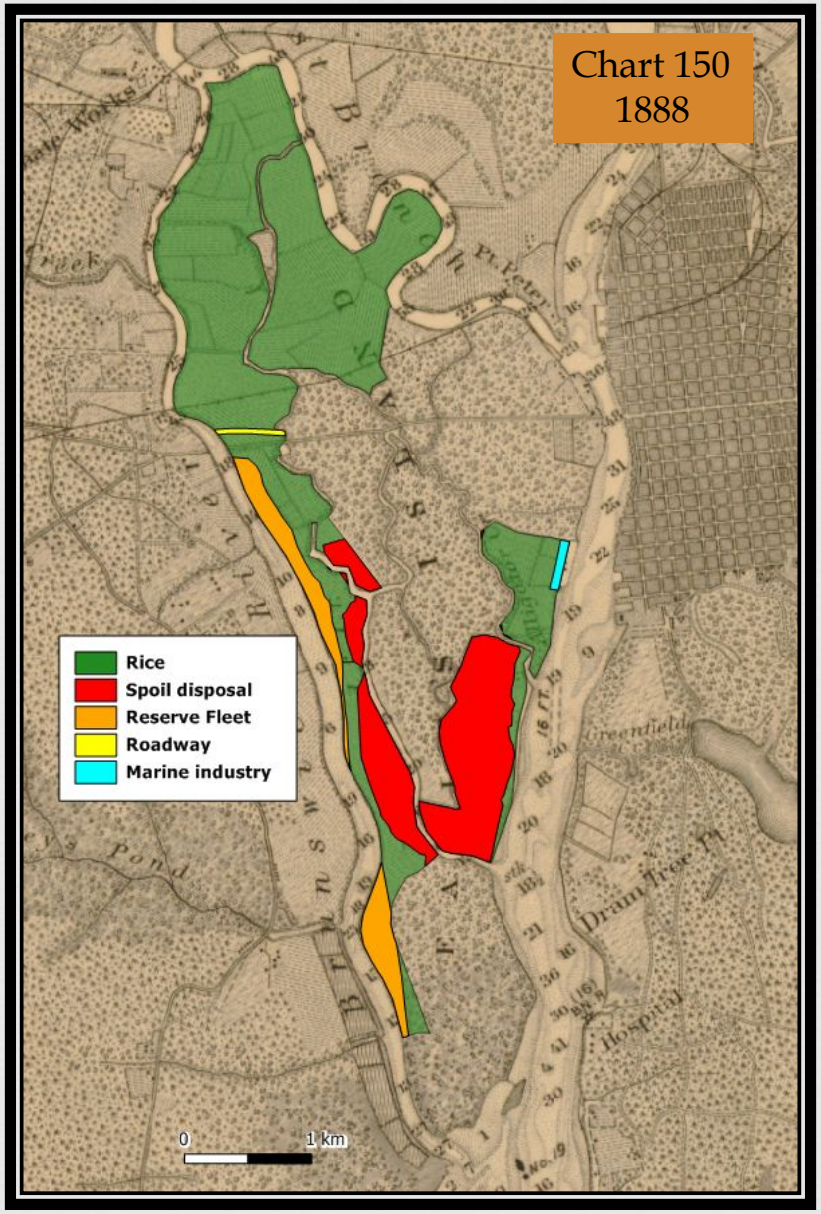
- 1860 estimate of maximum extent of rice = 2,024 ha (5,000 a)
- Remains still discernable in the present day = 2,610 ha (6,449 a)

Part 2
What remains of the rice farming system on Eagles Island?



Where was rice farmed on Eagles Island and what was the area under cultivation?

- 653 hectares maximum expanse of rice
- 50% of island area



What developments have replaced rice farming on Eagles Island?

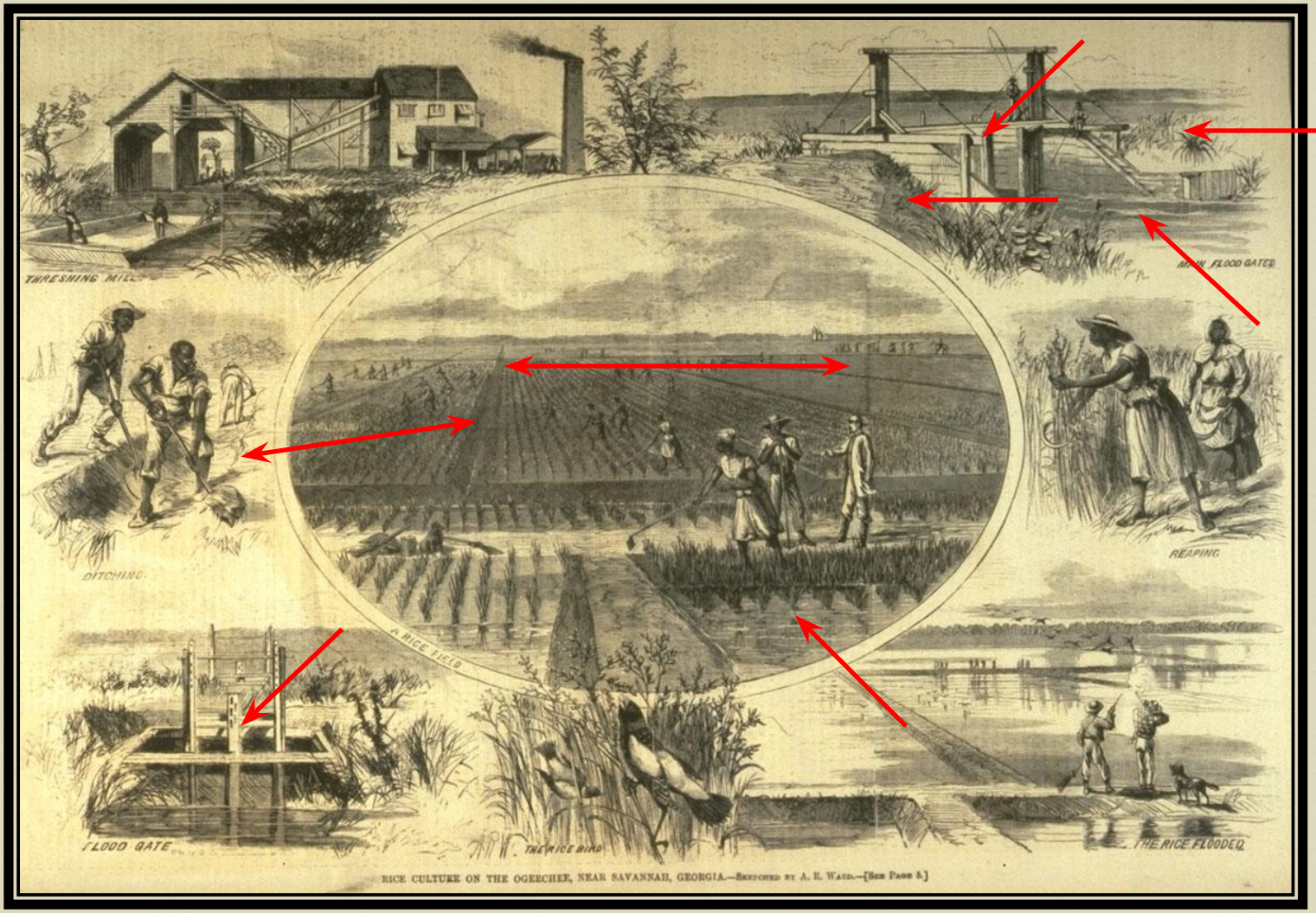
Developments:

- USACE spoil disposal
- Reserve Fleet
- Roadway
- Marine industry

Present area with remains:

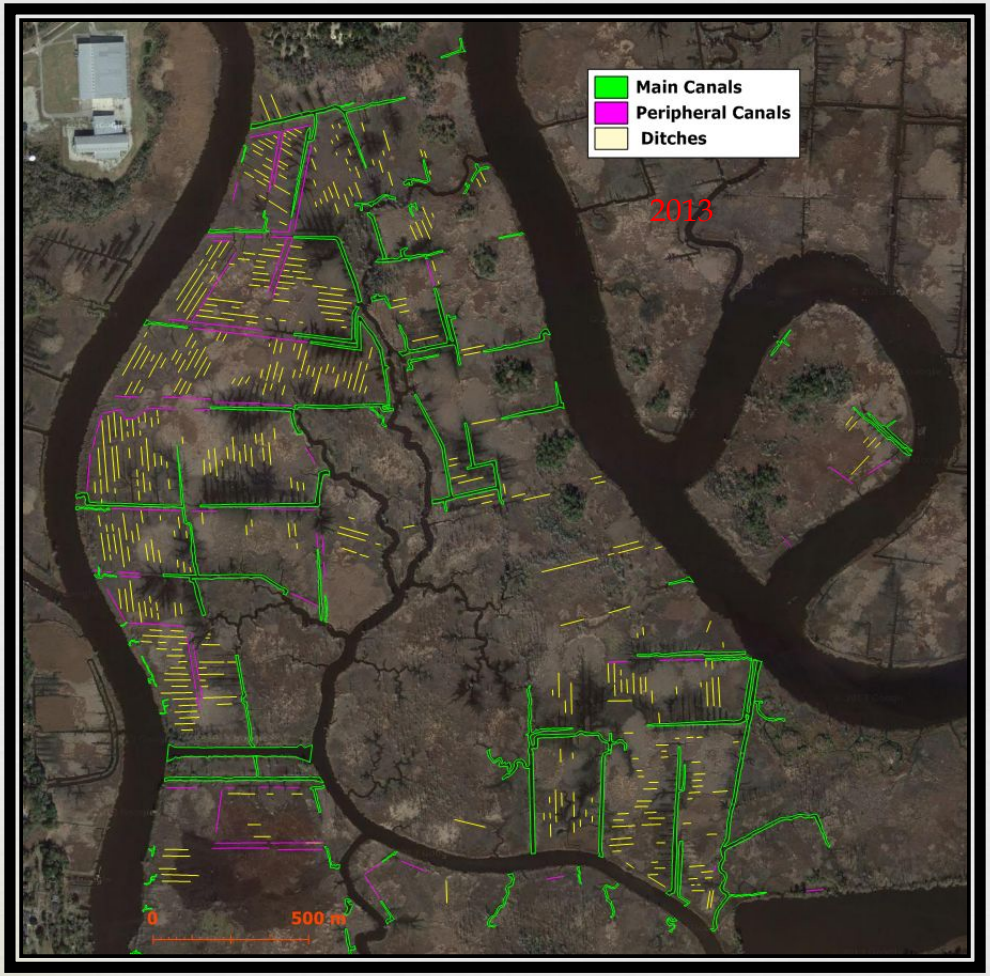
- 50% of historical maximum rice expanse (328 ha)

What were the basic requirements for **tidewater** rice farming?



What remains of the tidewater rice farming canal system?

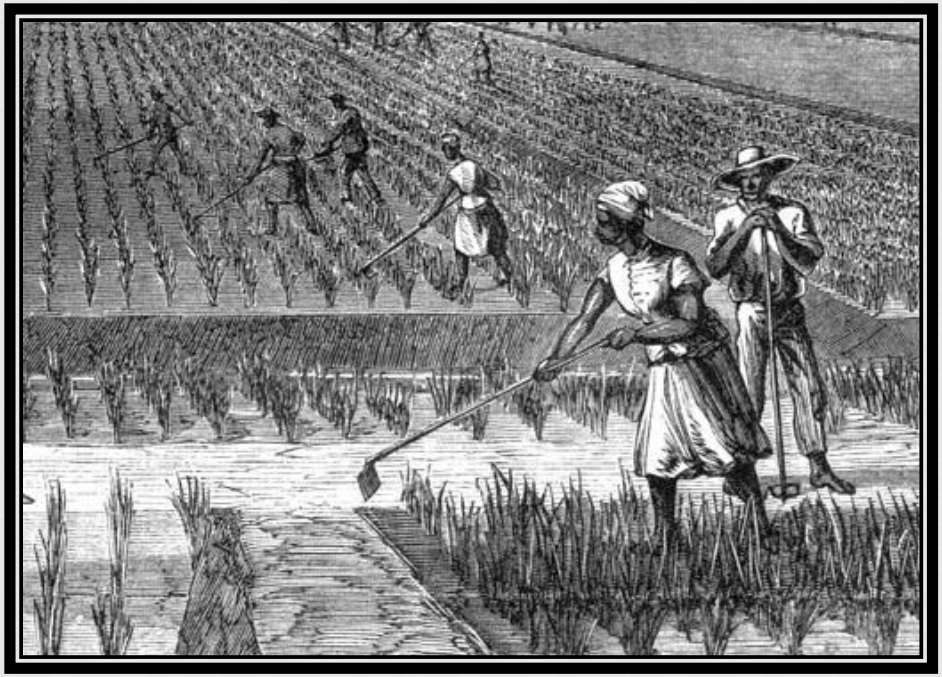
What remains of the rice canal system on Eagles Island?



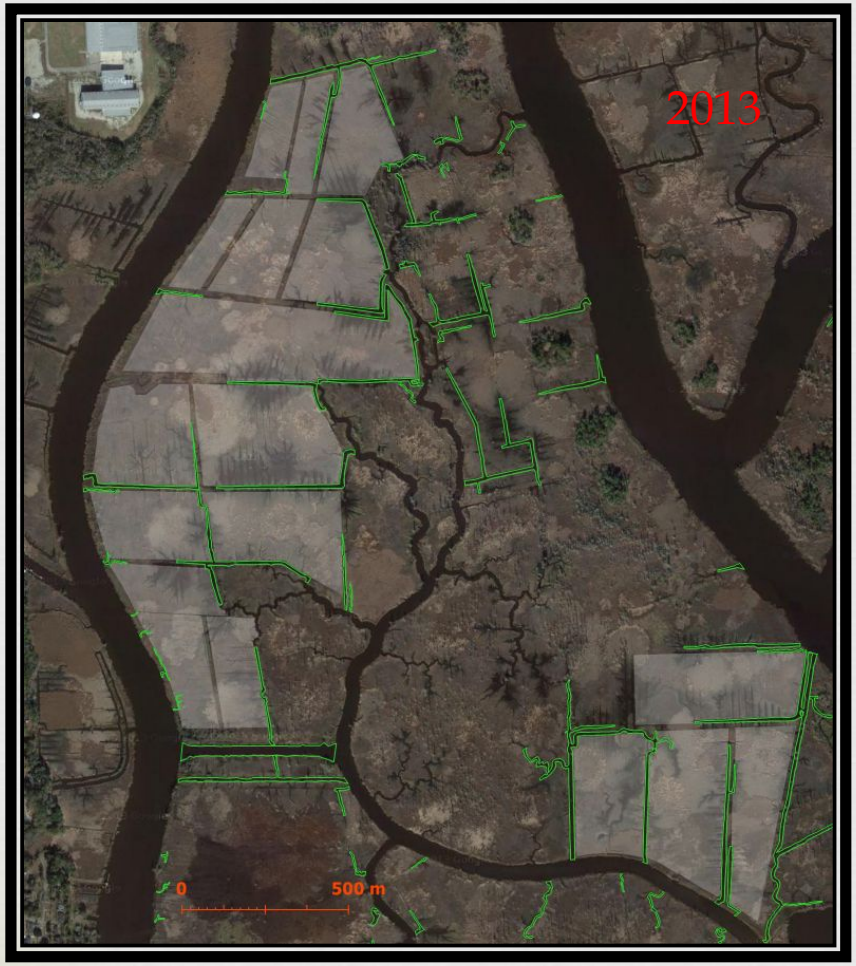
Canal type	Number	Length (km)
Main	83	17.7
Peripheral	79	6.6
Ditch	454	16.3

Sea of yellow

What remains of the tidewater rice fields on Eagles Island?

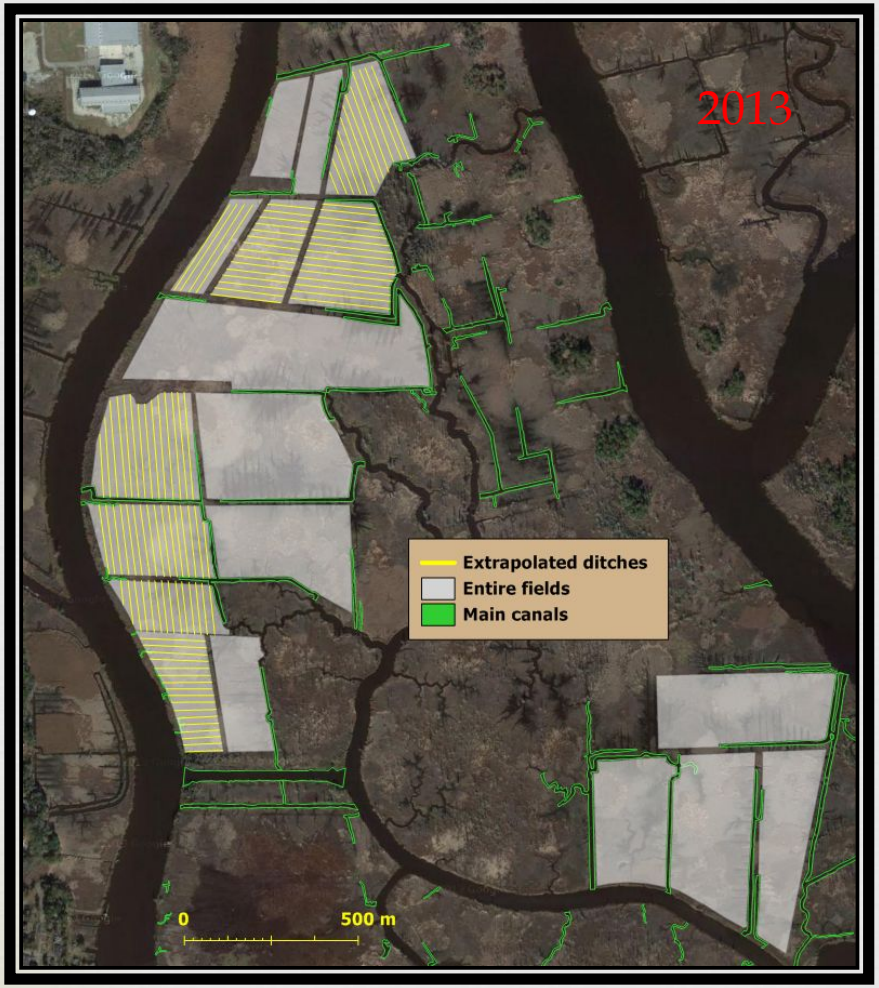


How many rice fields can be still be identified on Eagles Island?



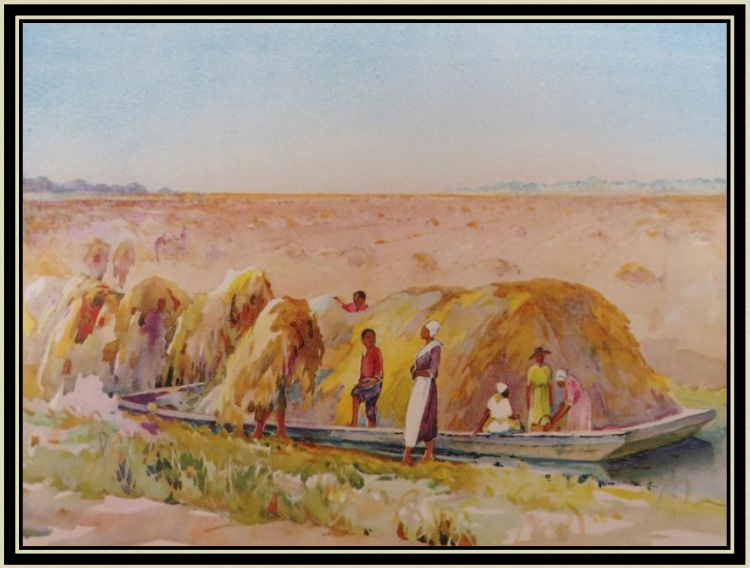
Rice Fields	
Number	18
Total area (ha)	86.6
In relation to the maximum extent of rice	13%
In relation to the extent of present-day rice remains	26%

In how many fields can fragments of ditches be digitally restored?



Ditch-Extrapolated Fields	
Number	8
Total area	31.6 ha
In relation to the maximum extent of rice	4.8%
In relation to the extent of present-day rice remains	9.7%

Part 3
What is causing Eagles Island's rice fields and canals to deteriorate?

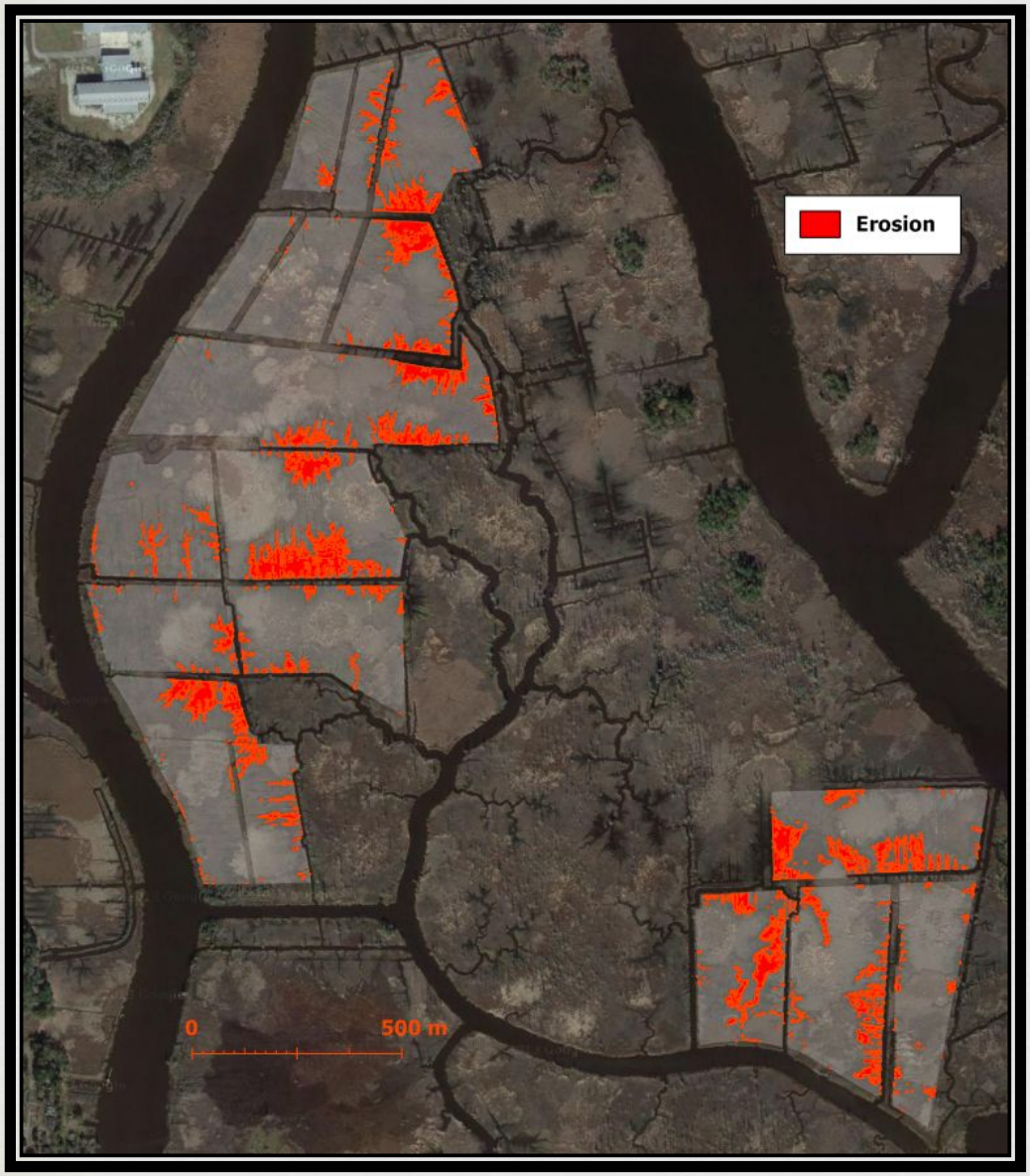


What does ditch erosion look like?

What did the field verification show?

Height above MLLW on 1/21/15

- Range -0.5 to 1.2 m
- Level of marsh ca. 1.0 to 1.2 m



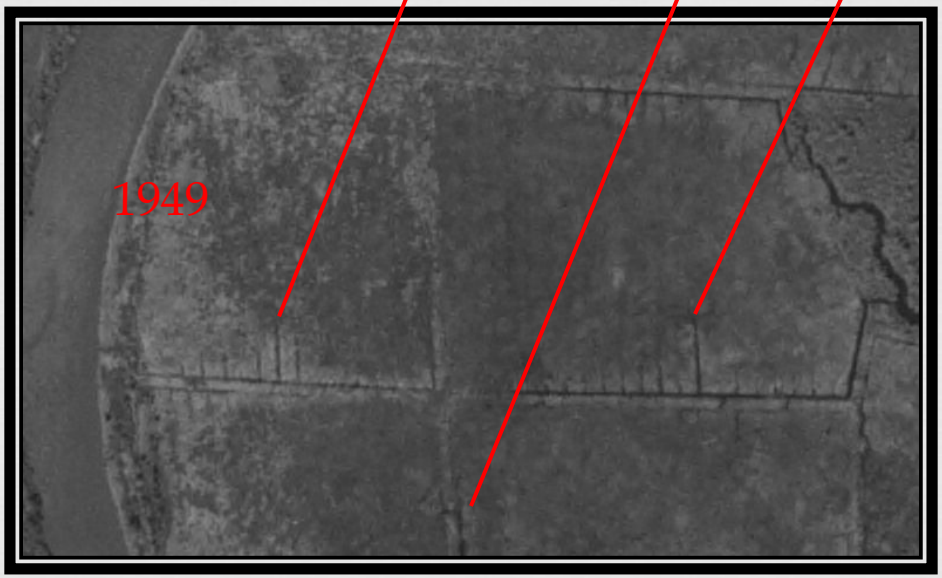
How extensive is erosion among the 18 rice fields?

*In individual fields, erosion ranges from <1% to 29%

*Overall, erosion covers 15%of the total 18-field area

For how long has this erosion been going on?

To what extent have ditches eroded over 65 years?



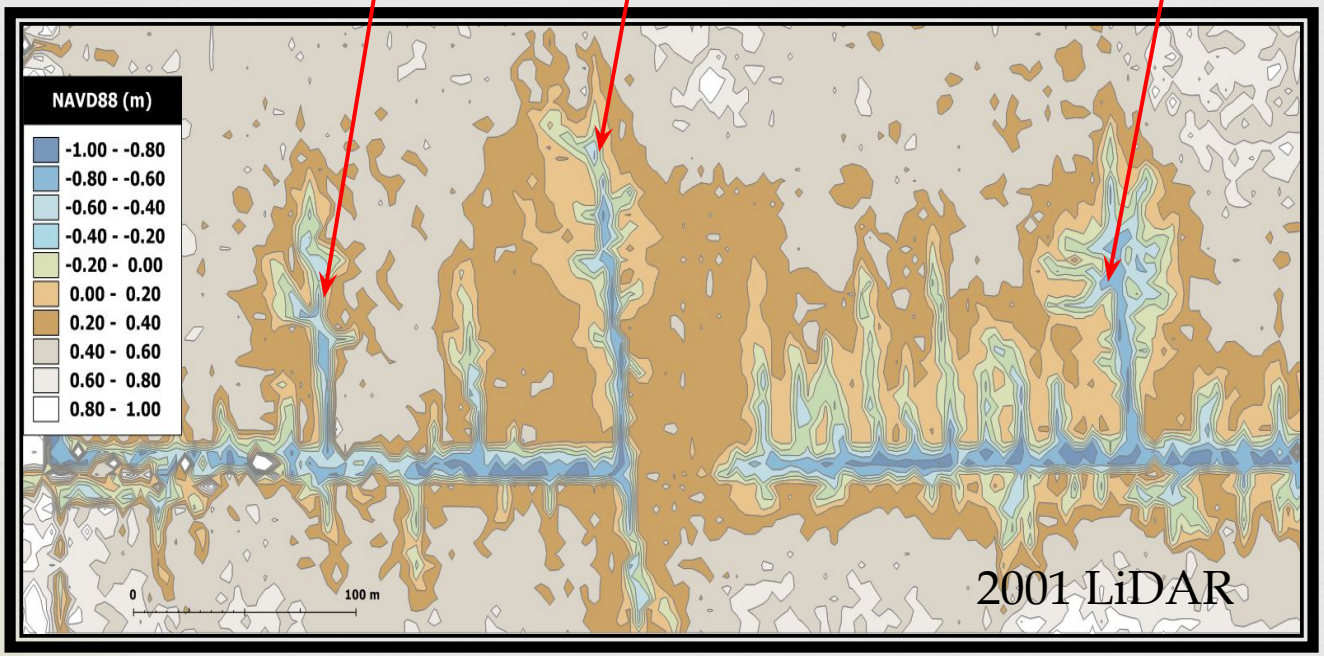
How have rice field embankments changed over 41 years?

1969

2010

1969 over 2010

Could LiDAR help to quantify ditch erosion?



-1.0 to 0.4 m = range from greater to lesser depth of erosion

0.4 to 0.6 m = level of marsh

What can be concluded about the remains of rice farming on Eagles Island?

- Remains can be found on about half the area where rice was once farmed;
- Only short segments of many canals still exist;
- The boundaries of only 18 fields can be identified;
- The ditches of only eight fields can be digitally restored;
- Erosion has been a long-term threat to the remains and the rate may be accelerating;
- The quantity of spatial data was almost overwhelming, but lack, or inaccuracy of date/time metadata was a significant problem

Conserve Eagles Island!