Review of

"Describing the Hydrologic Evolution of Tracts of Land near Bayou Sorrel, Atchafalaya River Basin, Louisiana"

A Thesis by L. A. Valentine

University of Louisiana at Lafayette, 2017.

By

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INTRODUCTION

This unpublished student thesis presents data purporting to investigate the hydrologic connectivity within tracts of land near Bayou Sorrel, The Nature Conservancy underwrote Valentine's study. The State amongst others is apparently using this thesis in an attempt to support or help justify the East Grande Lake (EGL) Project now being proposed by the State of Louisiana and apparently heavily supported by the Louisiana Nature Conservancy.

Firstly, the author uses some very low-resolution images of questionable quality to try to compare land cover change over time. Secondly, an attempt is made to investigate canopy cover by using tree ring data. According to Valentine (2017) this second technique consisted of tree-ring width and ring-to-ring carbon isotope measurements on seven bald cypress trees (*Taxodium distichum*) to test whether or not evolution of a regional distributary channel has a measurable effect on tree growth. Data such as Color Infra red and photos, satellite imagery even Google earth and such are plentiful and available at many locations including LSU.

Valentine, a student, claimed that comparing the low resolution images used allowed an interpretation of changes in canopy in selected portions of the Basin, but neither the carbon isotope data nor the tree-ring widths correlated with channel evolution. Instead tree-ring width did correlate with monthly temperature during the growing season, suggesting an overarching climate signal on tree-ring growth at this site.

The Louisiana Coastal Protection and Restoration Authority (CPRA), under the Atchafalaya Basin Program, cites Valentine (2017) in support of its proposed East Grand Lake diversion project. CPRA claims this unpublished student thesis and other studies prepared in collaboration with the Nature Conservancy provide "robust scientific insight" on environmental conditions of the project area. Specifically, CPRA claims that Valentine's 2017 imagery, which they term remote sensing analysis, documented a decline in forest canopy over time as poor water circulation (stagnation) reduced tree growth. Valentine (2017) claims that full canopy decreased 18 percent between 1957 and 1998, while partial canopy increased 26 percent and open water increased 4 percent in the project area. She used only two points of comparison, despite other data sets existing. Moreover, there was no data concerning circulation, river induced flooding, or stagnation in the areas compared, which makes CPRA's use of this study wholly inappropriate.

Valentine's 2017 conclusion is based on interpretations of selected low-resolution images to support her thesis. The tree ring data that she collected has no bearing at all on the subject matter. It does show that trees grow when the weather is conducive (warm summer with long days) and slower than when the season is adverse (cold winter with short days). Valentine's use of the low-resolution imagery is fraught with errors as will be discussed below.

I also note that Valentine (2017) does on numerous occasions point out that sedimentation and sediment build up as a concern in this area. On this, we are agreed.

VALENTINE'S CHOICE OF IMAGERY

As someone who has worked for decades in this area, I know there is much more imagery of much better quality than she used, available for public use and/or purchase. This higher quality imagery is available right up to the present and includes very high-resolution LiDAR topography. Be that as it may, let's review Valentine's data. Aerial photographs (Tobin survey mosaics) were acquired from the Cartographic Information Center at Louisiana State University in Baton Rouge where only four Tobin survey mosaics were available for the study area (years 1941, 1953, 1957, and 1965). Valentine used the 1957 Tobin aerial photographs and a different format 1998 image. These reflect conditions 66 years and 25 years ago! Not present day.

Valentine points out that the Tobin imagery consisted of a photocopied image of the original mosaic survey split into four posters for each year. The original mosaic was made up of small individual aerial photos being stapled together, and a significant number of the mosaics did not match up properly. However, the individual photos that make up the mosaics were not available. Valentine stated that she felt that what matched up the best and had the best photographic resolution was from 1957.

Valentine further states: "The current condition was determined from a 1-m resolution near-infrared aerial image of Iberville Parish collected in 1998. The data was downloaded from the USDA Data Gateway website https://datagateway.nrcs.usda.gov/GDGOrder.aspx." The images from 1957 (January) and 1998 (February) were both taken during winter months in "leaf-off conditions." Herein is a major issue or problem with the data selection. Taken in winter when many trees and other plants have lost vegetation cover (leaves) or died back is not the ideal time of the year to do a vegetation cover assessment. The leaves are gone! Actual canopy changes should be calculated when there is full leaf growth, as a change in winter canopy could reflect either tree loss or seasonal leaf loss, and there is no way to tell. Winter imagery when leaves are missing is a major problem of this study, one of many I am afraid.

Added to this is that 1998 imagery in no way can be considered "current conditions." The 1998 imagery is an expression of what was present 25 years ago. None of the imagery used by Valentine in any way can be said to reflect current conditions – another major flaw.

Additionally, the 1957 image was taken in January of that year and the 1998 imagery in February. Were the water levels in the system the same or could have been a big difference? The 1957 image was collected in early January while the 1998 image was collected at the end of February. In viewing the 59-year mean Mississippi River Flood Hydrograph (van Heerden 2019) the water elevation on average is 1 meter or 3 feet higher late February than early January at Butte la Rose. Three feet can make a big difference in reviewing imagery especially in

determining open water areas in shallow flat swamp locations; another likely source of error in Valentine's data.

THE 1957 -1998 COMPARISON ERRORS

As pointed out by the Atchafalaya Basinkeeper (2023) (see Appendix) the 1941 aerial photos are clearer and at a higher resolution. Why was this data set ignored (Figure 1)?

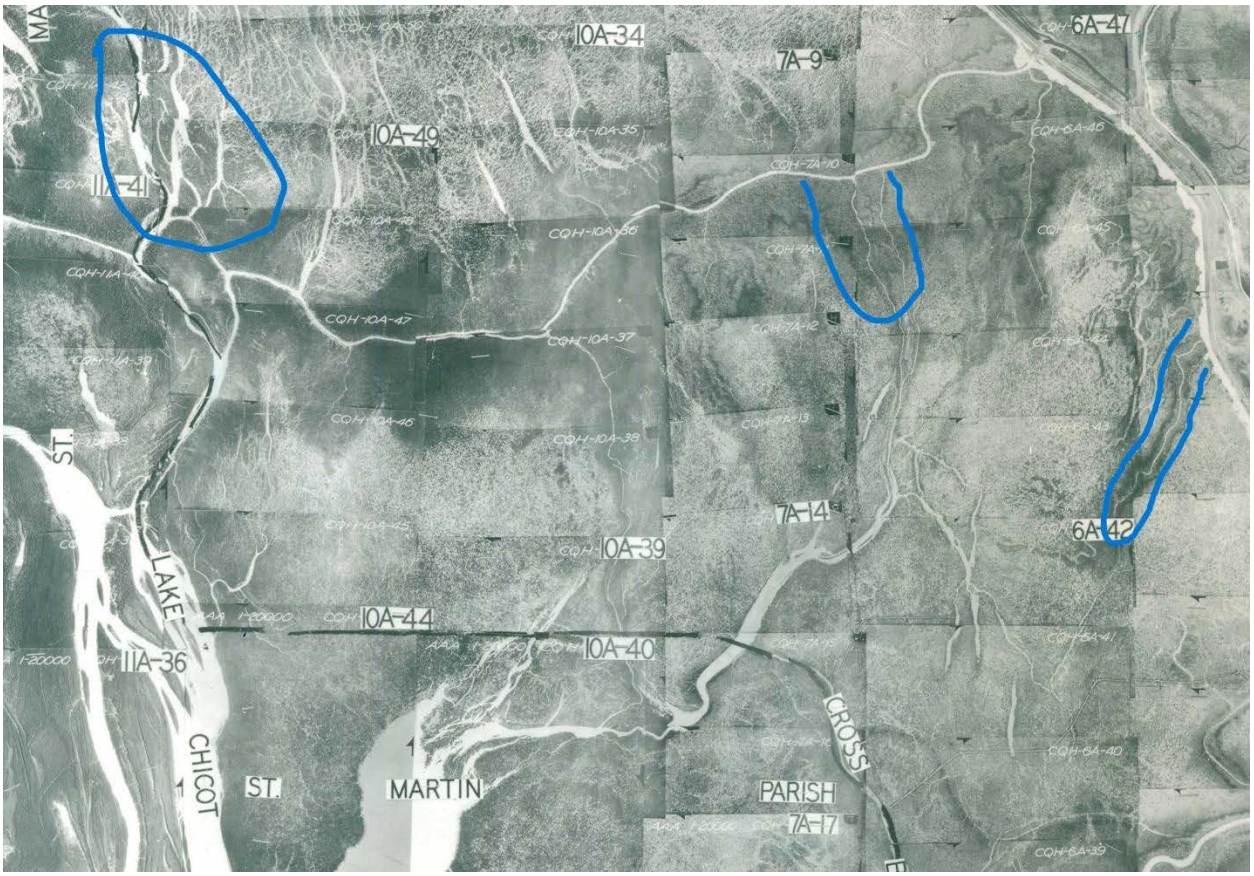


Figure 1. 1941 aerial mosaic of the EGL area from D. Wilson (public comment) attached as the Appendix to this report.

Instead, Valentine chose low resolution images (photos) from 1957 and 1998 (Figure 2 below). What is glaringly obvious from the 1957 data presented is that a significant portion of the middle section of the image is missing (black dark rectangle stretched vertically that intersects and obliterates a square lake) and is then claimed to be full canopy in 1998! It seems to me that the square lake in the 1998 image is also present in the 1957 image even with the missing photo section; an alternative interpretation of the rectangular black missing image section in the 1957 image (marked in solid red) is shown in purple. This is a far more realistic scenario and shows an increase in canopy cover between 1957 and 1998, not a decrease! Suffice it to say, the imagery chosen by Valentine (2017) is of very low quality and one can question the use of this imagery given that much better-quality data exists. The poor imagery obviously impacts her conclusions.

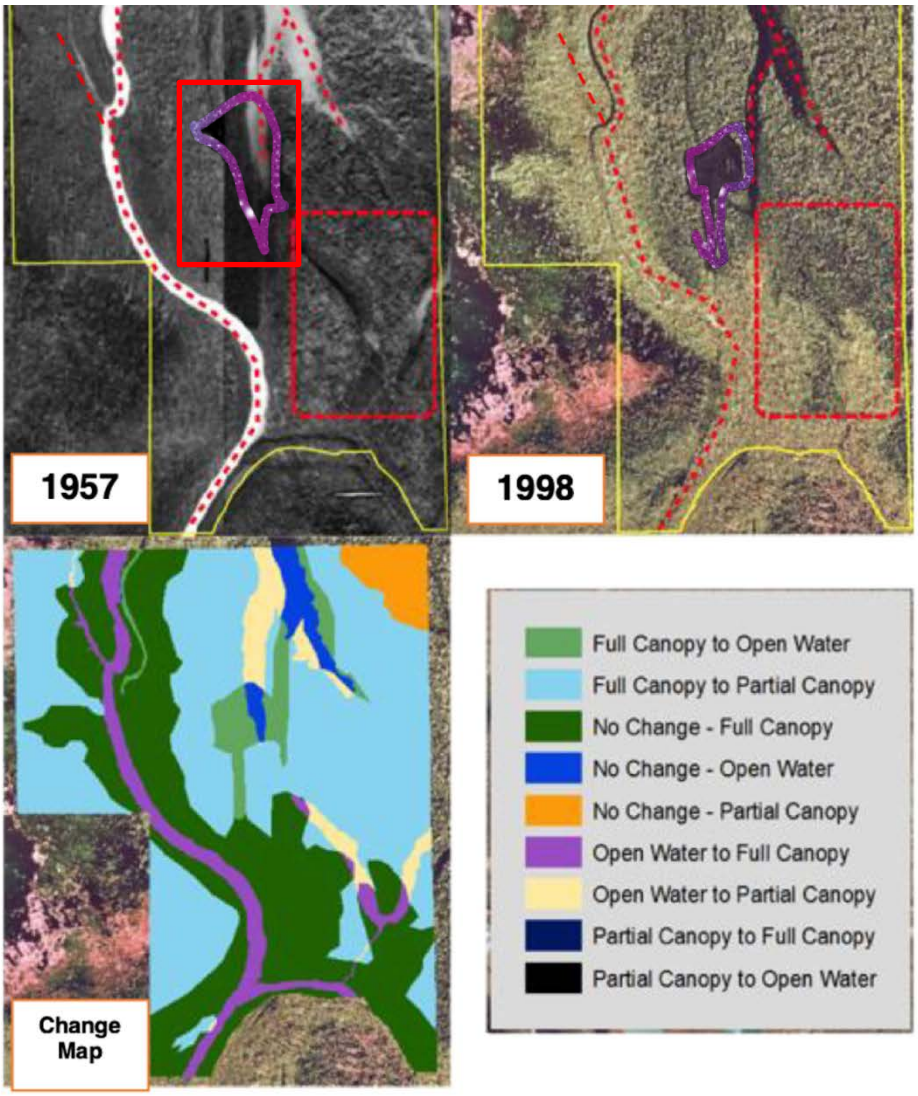


Figure 25: Images of Tract 5 in 1957 (top left) and 1998 (top right), Tract 5 change map (bottom left), and change map legend (bottom right). The dotted red lines in the 1957 and 1998 images outline where the "Open Water to Full Canopy" and "Open Water to Partial Canopy" class features from the change map are located on the original images.

A

Figure 2 from Valentine 2017.

I have attached as an Appendix a report written by the Atchafalaya Basinkeeper concerning this thesis, previously submitted to the Corps as an attachment to public comments on the proposed EGL permit. I agree with the Basinkeeper comments and see no point in regurgitating those.

CONCLUSIONS

1. Valentine (2017) claims to have found that between 1957 and 1998, full tree canopy decreased while open water and partial canopy increased in the study area. Valentine (2017)'s findings, however, completely misrepresent the changes the study area experienced between 1957 and 1998 - making her conclusions unreliable. A large central section of the 1957 image is missing and as a consequence misrepresented by Valentine. The image shows an increase in canopy cover between 1957 and 1998!

2. Her allegedly "current" conditions data are at least 25 years out-of-date. More recent and better quality data is available.

3. CPRA's reliance on the Valentine (2017) thesis to assert that introducing sediment-laden river water into the project area swamps is necessary to respond to environmental conditions impairing forestry health is unreasonable and relies on findings and assumptions that misrepresent the changes experienced in and the environmental conditions of the area.

4. Valentine's tree data have no bearing on the proposed EGL project. The vegetation is doing very well in the Basin, and has been shown in other reports the Basin is infilling with sediments creating more substrate for trees and shrubs to take root.

5. The EGL project will be very detrimental to the fauna and flora of the Basin resulting in more rapid sedimentation in the basin destroying the swamp and also the flood protection that the highly manipulated Basin provides for a large number of Louisiana Residents.

APPENDIX (From Dean Wilson, Atchafalaya Basinkeeper, recent public comments on the EGL project).

Atchafalaya Basinkeeper Comments on Valentine, L.A. (2017). Describing the hydrologic evolution of tracts of land near Bayou Sorrel, Atchafalaya River Basin, Louisiana. Master of Science Thesis, University of Louisiana at Lafayette, Lafayette, LA. 76 pages.

INTRODUCTION TO COMMENTS. This thesis may be the most blatant manipulation of facts and science found to date written in support of a project that is clearly designed to destroy aquatic and cypress-tupelo swamp habitat. We expect swift action by the University of Lafayette and state and federal agencies to condemn this kind of behavior and to conduct a complete review of all "science", created by TNC to support this project, before the permit is issued.

Context: the Louisiana Coastal Protection and Restoration Authority (CPRA), under the Atchafalaya Basin Program, cites to the Valentine (2017) Thesis in support of its proposed East Grand Lake diversion project. CPRA claims this Thesis and other studies prepared in collaboration with the Nature Conservancy provide "robust scientific insight" on environmental conditions of the project area, including:

> 2) Remote sensing analysis documented a decline in forest canopy over time as poor water circulation (stagnation) reduced tree growth. Valentine (2017) found that full canopy decreased 18 percent between 1957 and 1998, while partial canopy increased 26 percent and open water increased 4 percent in the project area.

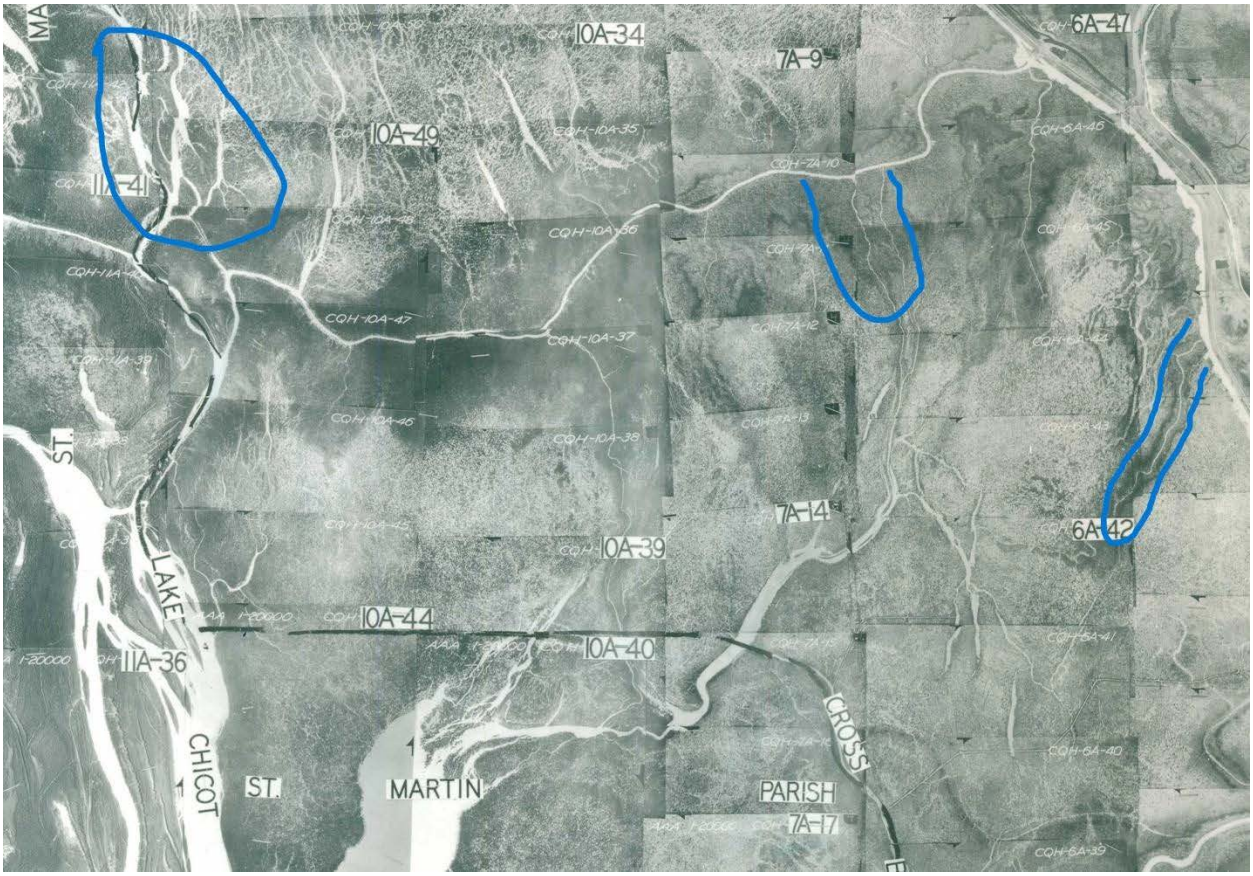
Valentine (2017) found that between 1957 and 1998, full tree canopy decreased while open water and partial canopy increased in the study area. Valentine (2017)'s findings, however, completely misrepresent the changes the study area experienced between 1957 and 1998. CPRA's reliance on the Valentine (2017) thesis to assert that introducing sediment-laden river water into the project area swamps is necessary to respond to environmental conditions impairing forestry health is unreasonable and relies on findings and assumptions that misrepresent the changes experienced in and the environmental conditions of the area.

The Thesis does not show an accurate understanding of cypress swamp ecology. Cypress trees do not create a swamp wetland but are found in the swamps of the Atchafalaya Basin for a myriad reasons, including lack of competition in areas that experience near-year round inundation. The conditions present in the Basin's cypress-tupelo swamps are distinct from other coastal wetland forests. For example, many coastal wetlands in Louisiana suffer from subsidence, saltwater intrusion and sea level rise that keeps these forests flooded all the time, impeding regeneration. But existing cypress stands in swamps in the Atchafalaya Basin do best in areas that are flooded nearly all year because more frequent dry periods allow for the growth of competing trees, vines, and bushes. This is evident in any of the accreted areas throughout the Basin away from the coast. In the Atchafalaya Basin most existing cypress stands are healthy but lack regeneration because of high water levels due to anthropogenic alterations to allow for flood protection. These conditions will not be improved with more accretion. Cypress trees do not make a swamp. Deep swamps and open lakes with scattered forests provide some of the most productive wetlands in the Basin and the world. Exacerbating and expediting the infilling of these areas with sediments is not the answer.

In the “Abstract”, Valentine claims that “[t]he canopy change map showed that from 1957 to 1998, ‘full canopy’ decreased by 18%, ‘open water’ increased by 4%, and ‘partial canopy’ increased by 26%.”

The EGL area suffers from one of the higher sedimentation rates in the entire Basin, well documented by LIDAR and acknowledged by the Atchafalaya Basin Program. These comments will reveal how things were manipulated and that this area actually experienced a loss of natural open water, a huge increase in full canopy cover and a massive decrease in partial canopy cover. Moreover, although the thesis acknowledges the impacts of sedimentation in the Basin, it confoundingly suggests that the proposed project cuts will also minimize sedimentation. These conflicting statements exemplify the miscomprehension underlying the Thesis – the growth of deltas from openings in waterways carrying sediment-laden river water in the area shows that sediments are not separate from introduced waters, and openings that bring in water also bring sediments that deposit near the mouth of the opening.

To support the claims, 1957 aerial pictures were selected instead of the clearer aerial pictures from 1941. Higher elevations will have more canopy, so they intentionally picked the tracks that TNC owns along ridges, avoiding as much as possible the swamps with partial canopy and open water. See picture below.



Study site

Thesis at p. 9: **"**The area of interest is part of the Atchafalaya Basin Water Management Unit-namely the Flat Lake WMU (Fig. 3). Excess sedimentation and spoil deposition have resulted in stagnation, which negatively impacts the Flake Lake WMU by degrading the water quality and aquatic habitat due to hypoxia. Bank cuts and bank shavings have been proposed by the "East Grand Lake (EGL) Project" (FY 2014 Annual Plan) to improve the water flow, and therefore, the water quality in the region (Fig. 4)."

Comment: Although the thesis identifies problems in the study area, namely excessive sedimentation and spoil piles that impair water quality and aquatic habitat, it does not address the proposed project's blind spots. First, the project only proposes making bank cuts (new man-made channels/canals) and no bank shavings to lower the spoil/bank height across an extended area. Second, it does not address the concern of increased sediment deposition in the backswamps and the physical and hydraulic barrier to flow in the Williams Canal (the southern AU in the project area).

Thesis at p. 5: "However, the Upper Region is highly channelized, resulting in areas of high sediment accretion rates. This network causes small areas in the Lower Region to become isolated from sediment buildup and water restriction."
Page 6: "These cuts will supply water to areas that were bypassed by the channelization of the Upper Region while simultaneously minimizing sedimentation."

Comment: These statements are contradictory. The thesis acknowledges that in the upper project region (the location for the proposed EGL project) experiences high sediment accretion, but without reason suggests that the proposed cuts will introduce water but also minimize sedimentation.

Thesis at p. 12:

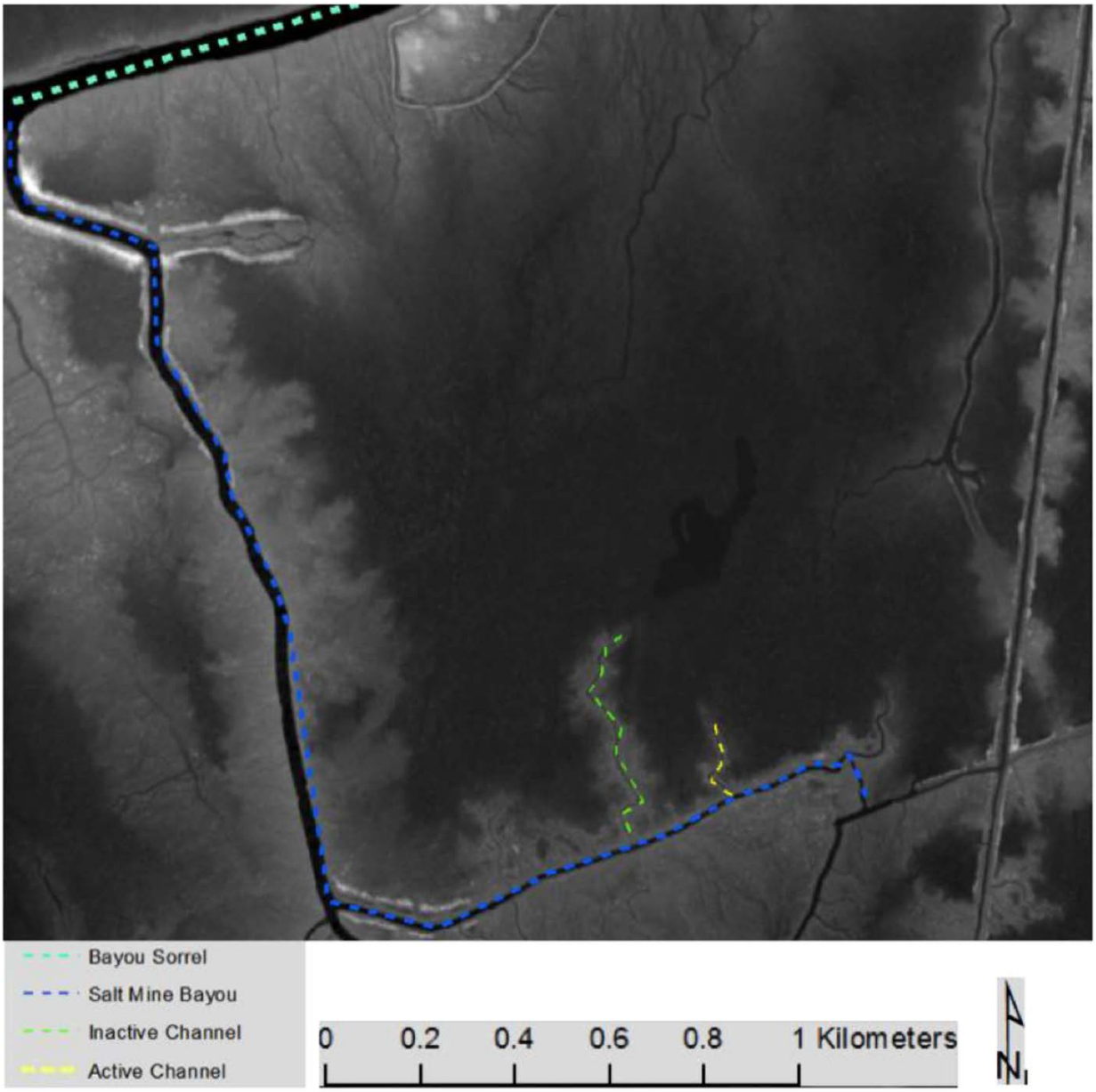


Figure 5: A map of the two distributary channels on Salt Mine Bayou in the southeast corner of Tract 2 (shown in Fig. 4).

Comment: This map is labeled incorrectly. The lower portion of what is labeled "Salt Mine Bayou" that makes a turn to the east is not in fact Salt Mine Bayou. While Salt Mine Bayou did once occur in this location it has filled with sediments and is no longer a waterway. Rather, the identified waterway is a location canal dredged by an oil company. It is not a natural waterway. Big deltas can be seen protruding north and east from cuts in the spoil banks created by dredging the canal filling adjacent wetlands. What are labeled channels are actually growing deltas in the deep swamps. The deep swamps that were present south of the canal are now completely filled in. These areas that were cypress swamps (partial canopy) and open water are now full canopy bottomland hardwood forests on elevated ground.

Thesis at p. 13-14: "The channel to the east formed between 1992 and 1998."

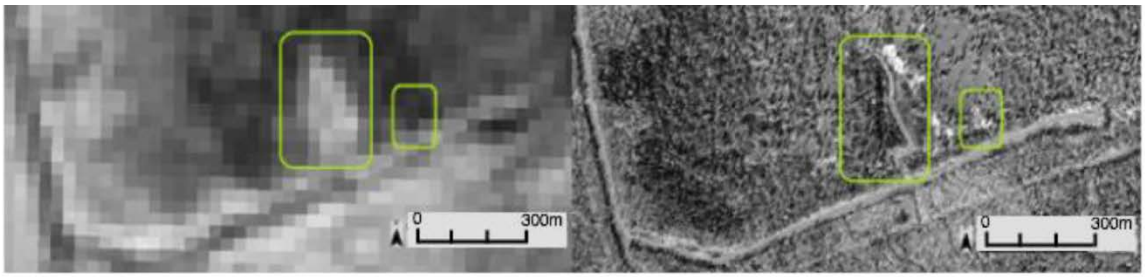


Figure 6: Landsat 1992 (resolution of 30m; on left) vs Digital Orthophoto Quarter Quad (DOQQ) 1998 (resolution of 0.3048m; on right). The western distributary channel is visible on the Landsat 1992, but the eastern distributary channel had not yet formed. The eastern channel formation is visible on the DOQQ 1998. Therefore, this channel formed sometime between 1992 and 1998.

Comment: This statement is incorrect. The channel to the east was present – and much larger – in 1992. The channel was formed shortly after an oil company dredged the location canal. The dredged canal created conditions for the transformation of what was deep swamp in the area to an elevated bottomland hardwood forest because of accreted sediment. The channel was larger in 1992 and can be seen in the blurry image on the right.

Thesis at p. 17:

Figure 7: Aerial photo of the active distributary channel prograding to the unnamed lake south of Bayou Sorrel. As the channel progrades, there are sand deposits indicated by the yellow box and channel mud deposits indicated by the brown box near the mouth. Photo courtesy of Joseph Baustian, Wetland Ecologist with The Nature Conservancy of Louisiana.

Comment: This photo depicts two things clearly: 1) sand and silt introduced from the river diversion man-made location canal filling deep swamps, and 2) the transformation of partial canopy forest and the deep swamp areas to full canopy bottomland hardwood forests by river water moving into the wetlands through cuts in the spoil bank. Atchafalaya Basinkeeper Executive Director Dean Wilson fished crawfish in this swamp before the artificial introduction of river water destroyed the waterbodies.

Thesis at "METHODS" (No page number)

"However, the individual photos that make up the mosaics were not available.
The mosaic that matched up the best and had the best photographic resolution was from 1957. Therefore, the 1957 map was chosen for comparison to current day conditions."

Comment: 1957 was clearly chosen because the blurs and black areas hide the true conditions in those areas allowing manipulation of science. 1941 is by far the best, pictures from 1941 can be seeing and compared to 1957 through these comments. This is blatant manipulation of facts and science. See maps on pages 20 and 21.

Thesis at "SIGNIFICANCE" (no page number given)**:** "The water quality of the Upper Basin is poor due to a lack of water movement and altered sediment deposition. The EGL Project serves to redirect water flow and sediment deposition to improve the water conditions. Improved

water conditions could, in turn, result in better commercial fishing, potentially boosting the local economy. TNC bought tracts of land around Bayou Sorrel with the intention of altering the land to improve water and sediment movement."

Comment: These statements highlight how the purported benefits of this experimental project are purely speculative, and a key point of contention surrounding this project: you cannot improve water conditions if the receiving wetlands are filled with sand and silt. At least Valentine acknowledges that the project has always intended to improve water quality *and sediment movement* in the project area. Unfortunately, the introduction of more water will introduce more sediment in an area that the literature recognizes already experiences significant sedimentation.

Thesis at p. 21:

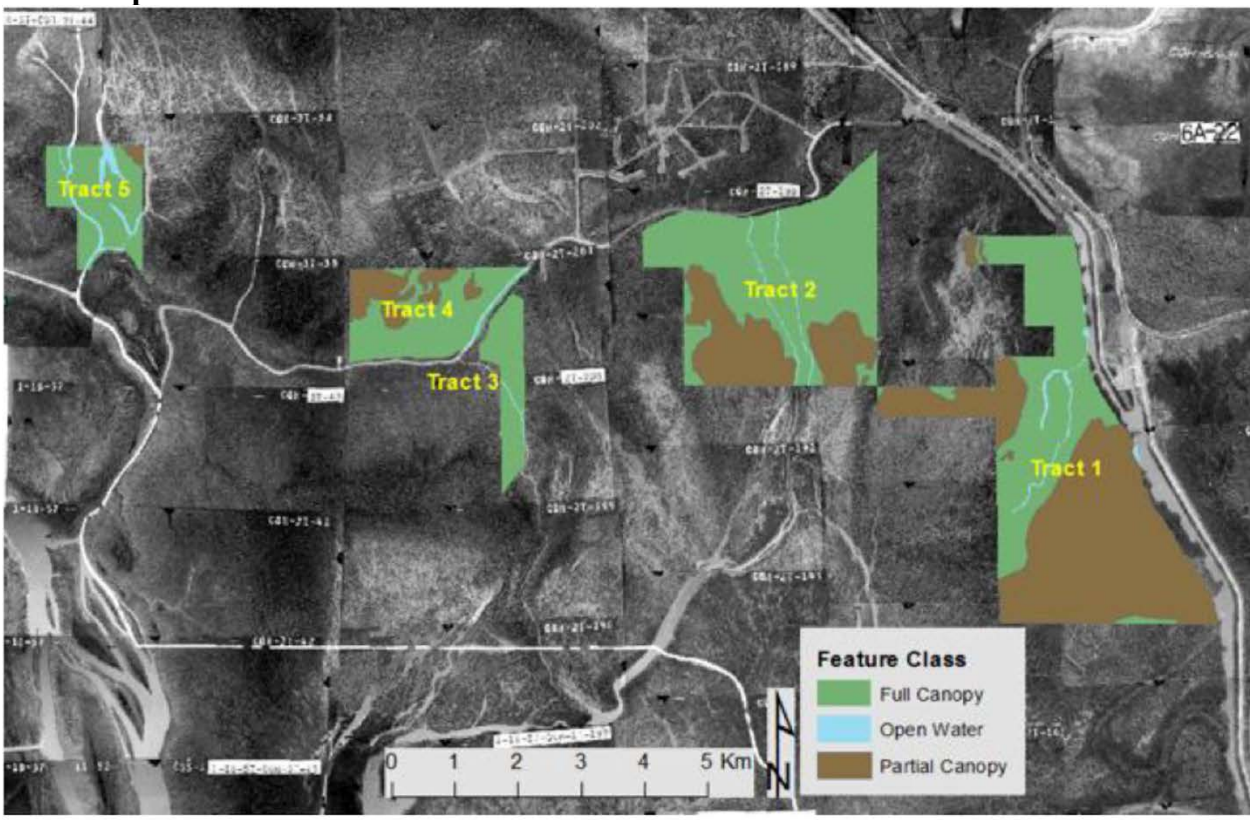


Figure 9: January 1957 georeferenced imagery in with the three feature classes digitized.

Comment: This map is not accurate. First, despite representations to the contrary, the 1957 aerial image is less clear than the 1941 aerial image (see below). The 1941 aerial shows hundreds of waterways, deep bayous, deep partial canopy swamps and open water with scattered cypress. Compared with the 1998 aerial, it is evident that most of the partial canopy swamps and many open water areas are now gone, replaced with full canopy forests as a consequence of increased accretion and growth of bottomland hardwood species in accreted areas.

The 1957 aerial image was actually chosen because the areas that were partial canopy/open water are darker and blurry or hidden. This 1941 aerial (above) shows that most of the area contained partial canopy/open water contrary to what Valentine suggests.

Thesis at p. 22:

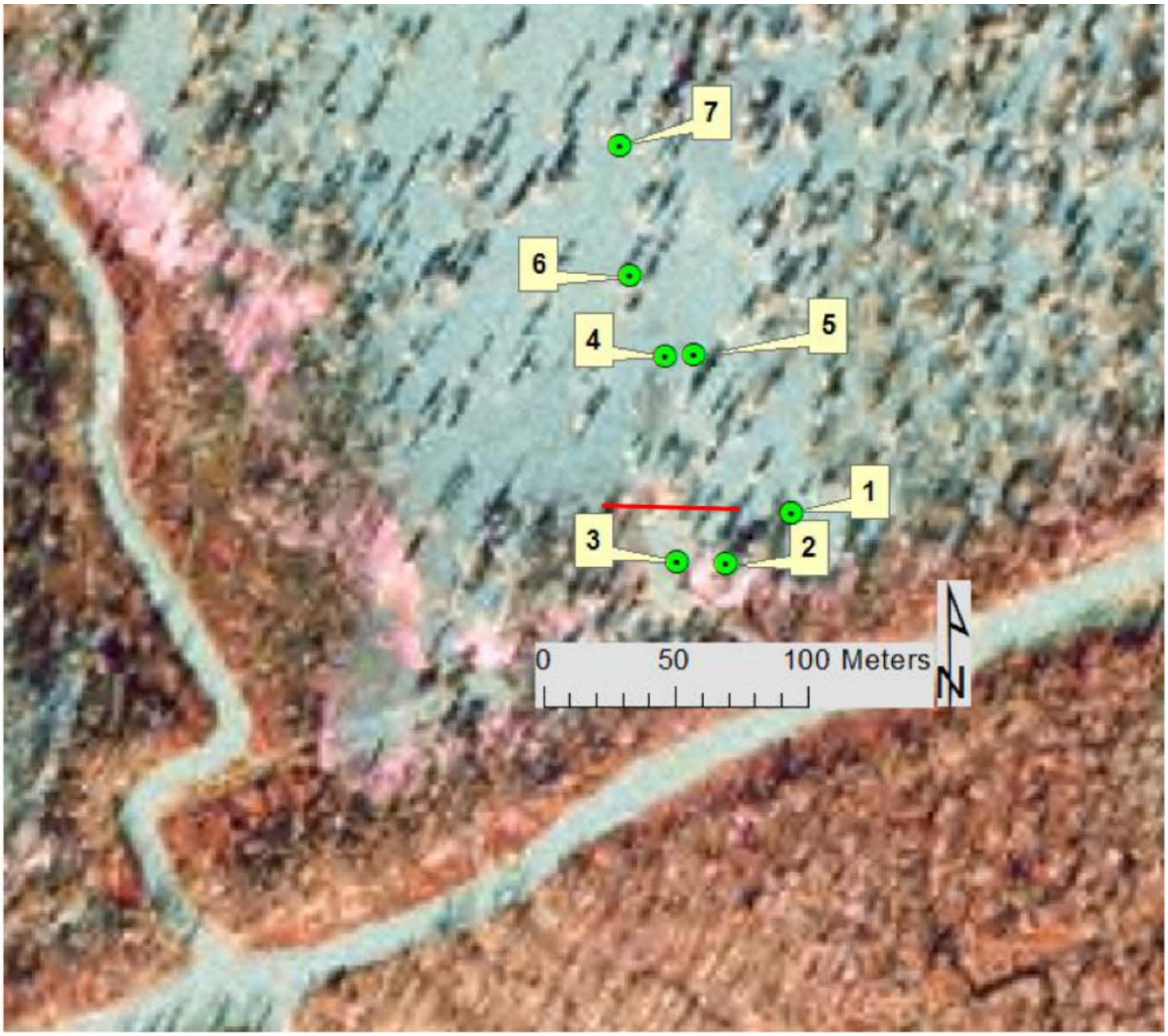


Figure 10: False color DOQQ 1998 showing the sites for the seven tree cores along the flooded active distributary channel. The red line indicates the location of the channel mouth i.e. how far the channel has prograded. The location for the red line was determined by color difference.

Comment: This figure clearly shows open water with scattered cypress. Since constant inundation do not kill cypress, it clearly shows that in 1957 it looked very similar. The area south of the canal used to be like the area north and now is a full canopy bottomland hardwood forest. This partial canopy cypress-swamp wetland ecosystem extended past Lake Zadrick to the south and east all the way to the ridges of Cow Bayou. The area south of the canal depicts how diverted sediment from the location canal transformed this ecosystem to a full canopy forest.

Thesis at p. 25:

Figure 13: False color infrared DOQQ 2008 with tree cores labeled along active distributary channel. The red line indicates the location of the channel mouth, i.e. how far the channel has prograded. The location for the red line was determined by color difference.

Comment: this figure clearly shows again the transformation of partial canopy, navigable, scattered cypress and cypress-tupelo swamps wetlands to bottomland forest with full canopy. The 1941 aerial image below shows this location, including open water with scattered cypress (lighter areas are water – the speckled areas are scattered trees within the waterbodies).

Canon and Salt Mine 1941.

Thesis at p. 26:

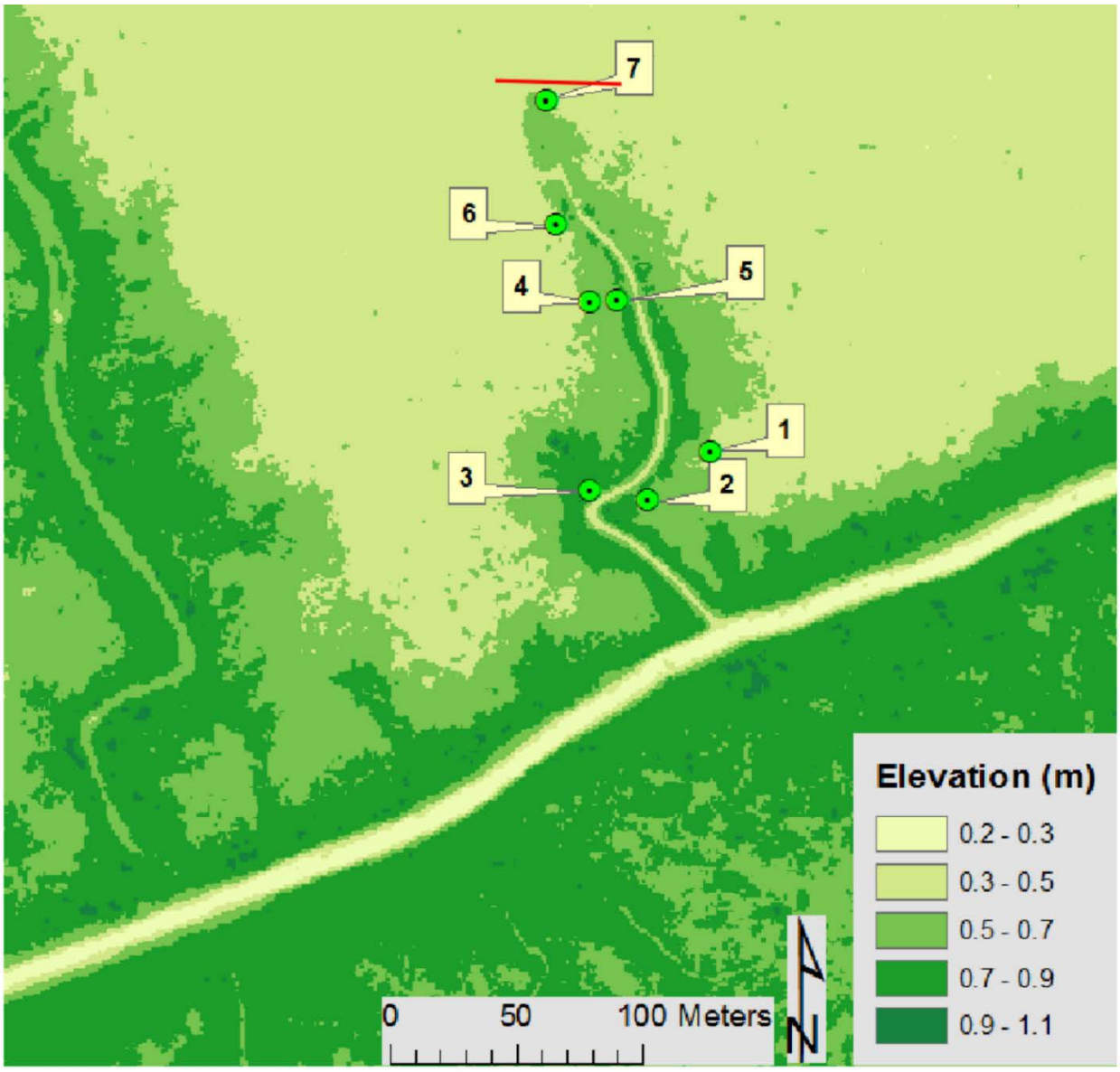


Figure 14: LiDAR 2012 with tree cores labeled along active distributary channel. The red line indicates the location of the channel mouth, i.e. how far the channel has prograded. The location for the red line was determined by color/elevation difference.

Comment: This figure shows a delta formed by the man-made canal that become a sediment diversion channel. The LIDAR shows massive accretion. The elevations are wrong. There is at least a 7" difference between the very light and dark greens on the map. Again, the 1941 aerial image above depicts open water with scattered cypress in the same area east of Salt Mine Bayou.

Thesis at "RESULTS – Land Cover Change" [no page number]: "In 1957, "full canopy" was the dominant feature class, covering a total of 12.97 km2 for all the tracts combined. "Partial canopy" covered 8.73 km2, only surpassing "full canopy" as the main feature class in Tract 1. Open water was present in every tract, varying from 0.02 to 0.22 km2 coverage for individual

tracts (Fig. 15, Table 3). In 1998, "partial canopy" was the dominant feature class, covering a total of 10.98 km2 for all the tracts combined. Even though the total area of "partial canopy" was greater than that of " full canopy," the latter remained the dominant feature class for Tracts 2, 3, and 4. "Open water" increased to 0.21 and 0 .15 km2 for Tracts 1 and 2, respectively (Fig. 16, Table 3)."

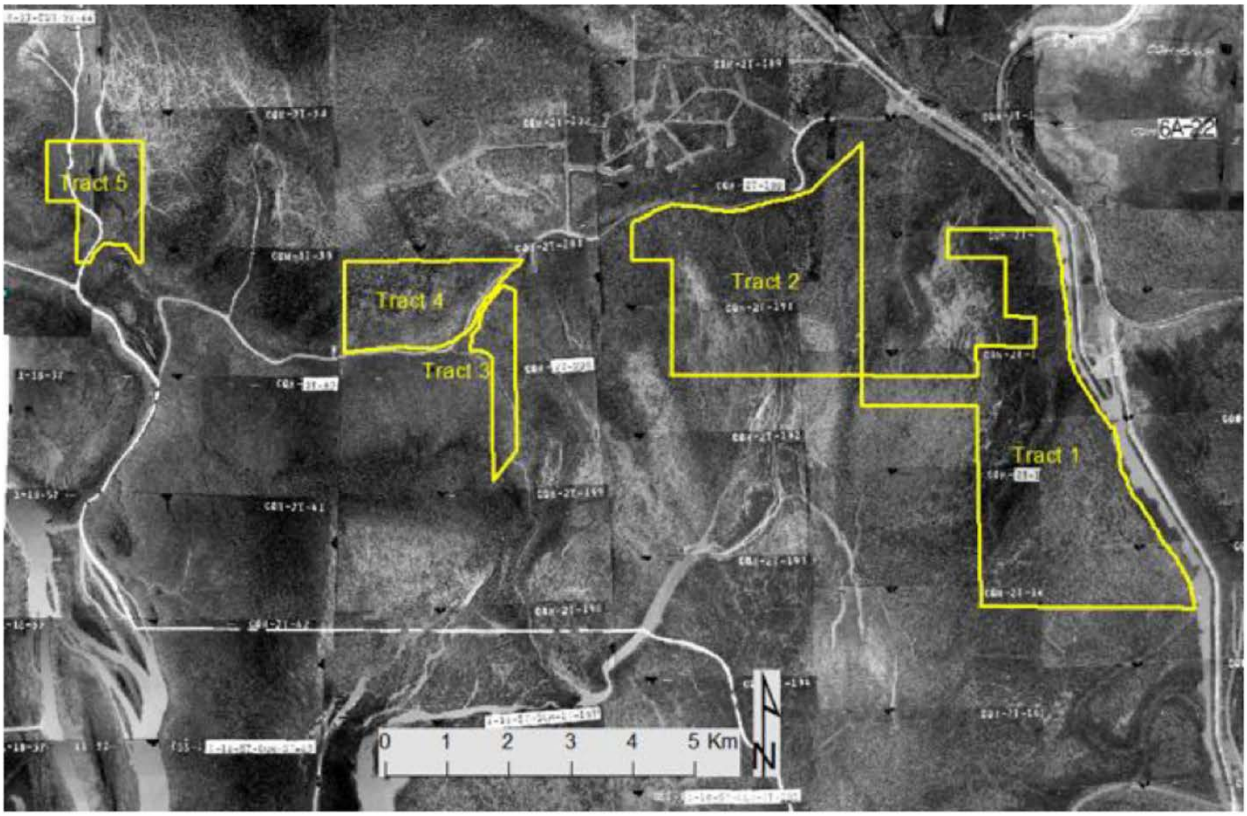
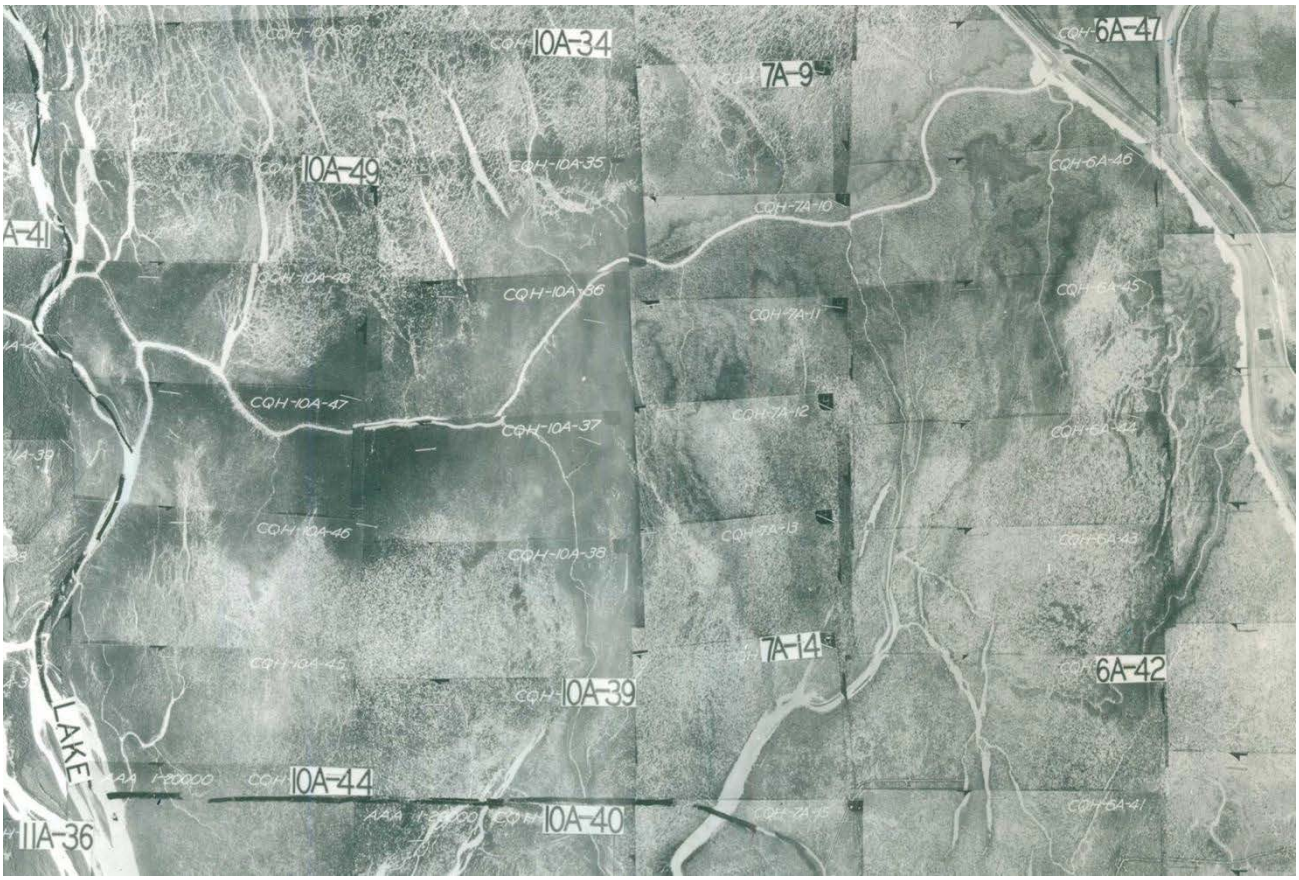


Figure 8: January 1957 georeferenced imagery with The Nature Conservancy tracts outlined in yellow.

Comment: The black areas and blurs in the 1957 image make it harder to see the historical hydrology in these tracks. The thesis does not show the comparison maps between 1957 and 1998 of Tract 1. The only named bayou was Cow Bayou, a bayou that has filled in and is no longer present in Track 1. Part of the bayou still exists south of Track 1, but it is very shallow. Tract 1 shows the same pattern, massive loss of productive partial canopy swamps and complete loss of deep-water habitat. The only open water left in Tract 1 are a few flooded areas that cannot drain mainly because of beaver dams. The 1941 aerial image is clearer. Below is a comparison of aerials from 1941 and 2020; notice the complete loss of lakes north of Cow Bayou (the only bayou on the map – running southwest from the GIWW on the right).

Thesis at p. 36:

Comment: This change map is not accurate. The areas depicting change from full canopy to partial canopy were partial canopy in 1957. Most open water is gone having filled in with sediments; half of Cannon Bayou has filled in and the other half is degraded. Half of Salt Mine Bayou has filled in, and Cow Bayou and Mound Bayou have filled in. The swamps north of Lake Zadrick almost all the way to Bayou Sorrel used to be a huge open lake with scattered cypress and now is mostly full canopy hardwood forest. Track 5 is on the southwestern corner of what is locally referred to as the Shell Field. The 1957 image – but more clearly in the 1941 image included directly below – shows the Shell Field was mostly partial canopy with hundreds of waterways. Today this area is mainly full canopy, most of the waterways have filled in, and the few lakes and bayous that remain are very shallow. The only deeper waterways that remain are the man-made canals.



Thesis at "DISCUSSION – Land Cover Change" (no page number given): "The GIS portion of this project aims to classify the land cover change of the five TNC tracts over the past 40+ years. Because this area is seasonally flooded, the most consistent land cover classification(s) is canopy percentage. Overall, the percent of "Full Canopy" decreased from 58.43% to 48.11 % of the total combined area. "Open Water" minimally increased from 2.25% to 2.33%, and "Partial Canopy" increased by 10%+ from 39.32% to 49.56%. Tracts 3 and 5 had the greatest percent change in area (km2). A large portion of what was once "Full Canopy" had transformed into "Partial Canopy" for both tracts. Tract 3 lost 34% of its "Full Canopy" to "Partial Canopy," and Tract 5 lost 45 .37% of its "Full Canopy" to "Partial Canopy" (Table 4). "Open Water" was only lost in Tracts 4 and 5 along channels that have for the most part filled in with sediments (Fig. 25)."

Comment: This representation of the land cover change is again inaccurate. The whole area lost nearly 90% of open water and nearly 100% of the natural deep-water habitat over the intervening decades. Most of the productive swamps, represented by partial canopy, are gone. Unlike wetland forests along the coast, partial canopy in the Atchafalaya Basin represents productive swamp wetlands, some deep-water habitat and flood capacity. Track 5 was mostly open water and partial canopy, but today is mostly full canopy with almost complete loss of open water and 100% loss of deep-water habitat (the remaining open water too shallow for deep-water habitat) The main bayou, West Fork Pigeon, is completely gone having filled in with sediment. In 1941, Track 3 had less partial canopy but what was there is now gone, and Indigo Bayou has now filled in and too shallow for deep-water habitat. There is a camp along the banks of Indigo Bayou that

is half buried in sand and silt. The only open water gains are man-made oil access canals and pipeline canals.

Thesis at p. 48:

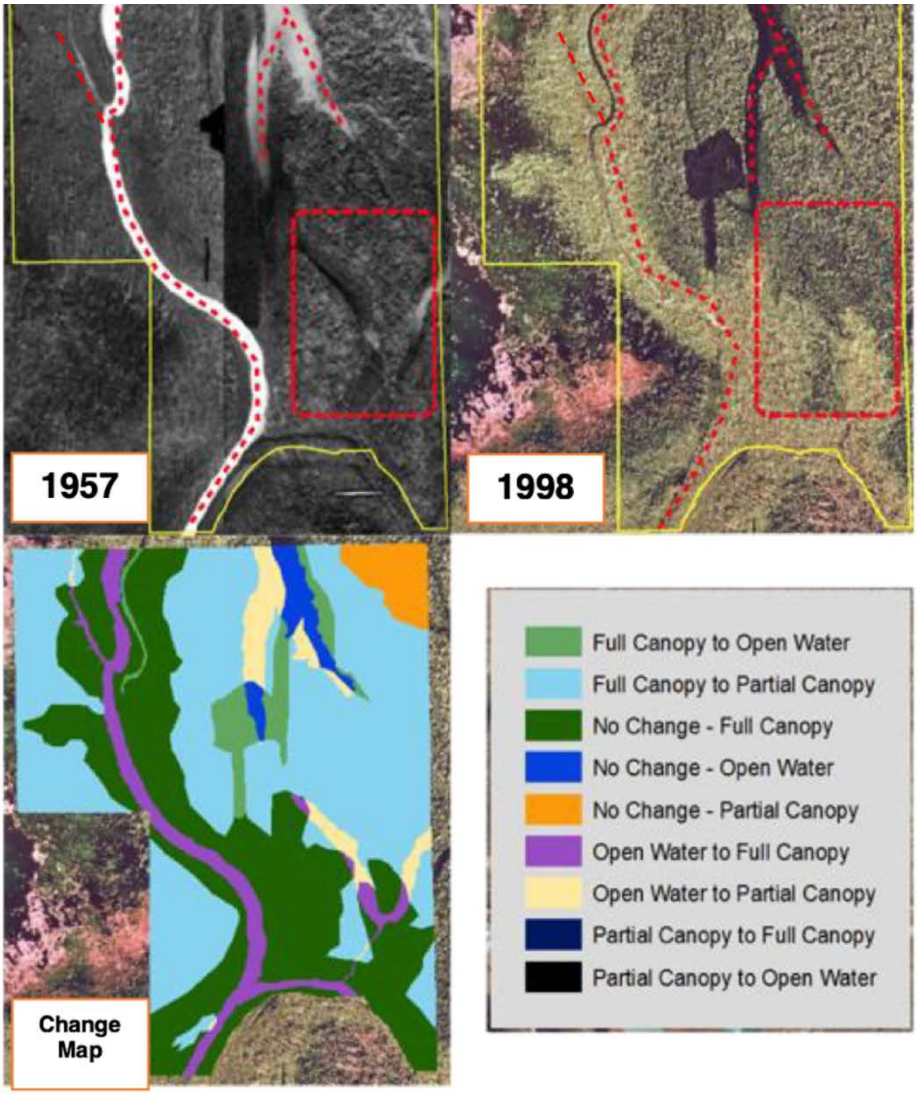
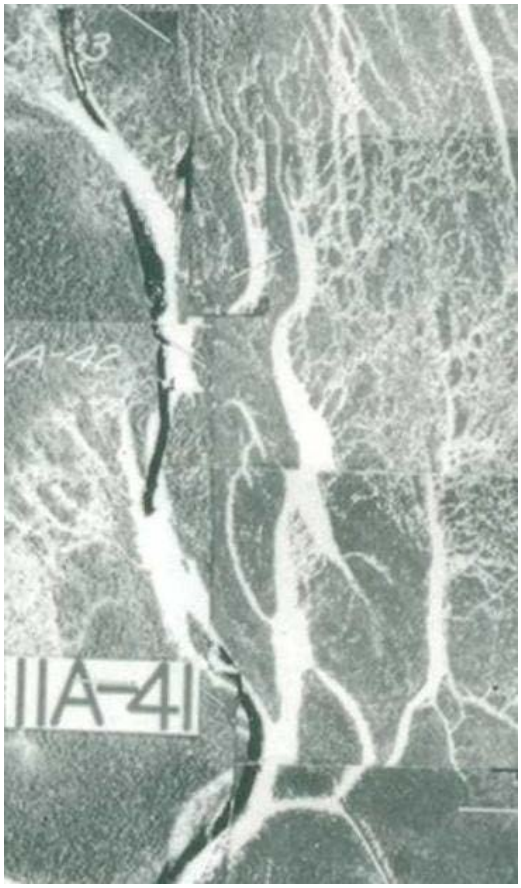


Figure 25: Images of Tract 5 in 1957 (top left) and 1998 (top right), Tract 5 change map (bottom left), and change map legend (bottom right). The dotted red lines in the 1957 and 1998 images outline where the "Open Water to Full Canopy" and "Open Water to Partial Canopy" class features from the change map are located on the original images.

Comment: This change map is inaccurate. The square lake is a location canal made by an oil company and that square lake has filled in and is no longer present today. The representation of change from full canopy to open water is patently false. The representation of change from full canopy to partial canopy is clearly the opposite. The main bayou, West Fork Pigeon Bayou, is completely gone. The remaining deep lake with the shape of an inverted V was nearly filled by 2020, what remains is shallow today with no more than 2 feet in low water.



Track 5, 2020 **Track 5, 1941**

Hundreds of waterways and a large area of partial canopy swamp wetlands that were present in 1941 are filled in with full canopy forests today. Much of the is conveniently blurred out on the 1957 aerial picture.

Thesis at p. 50:

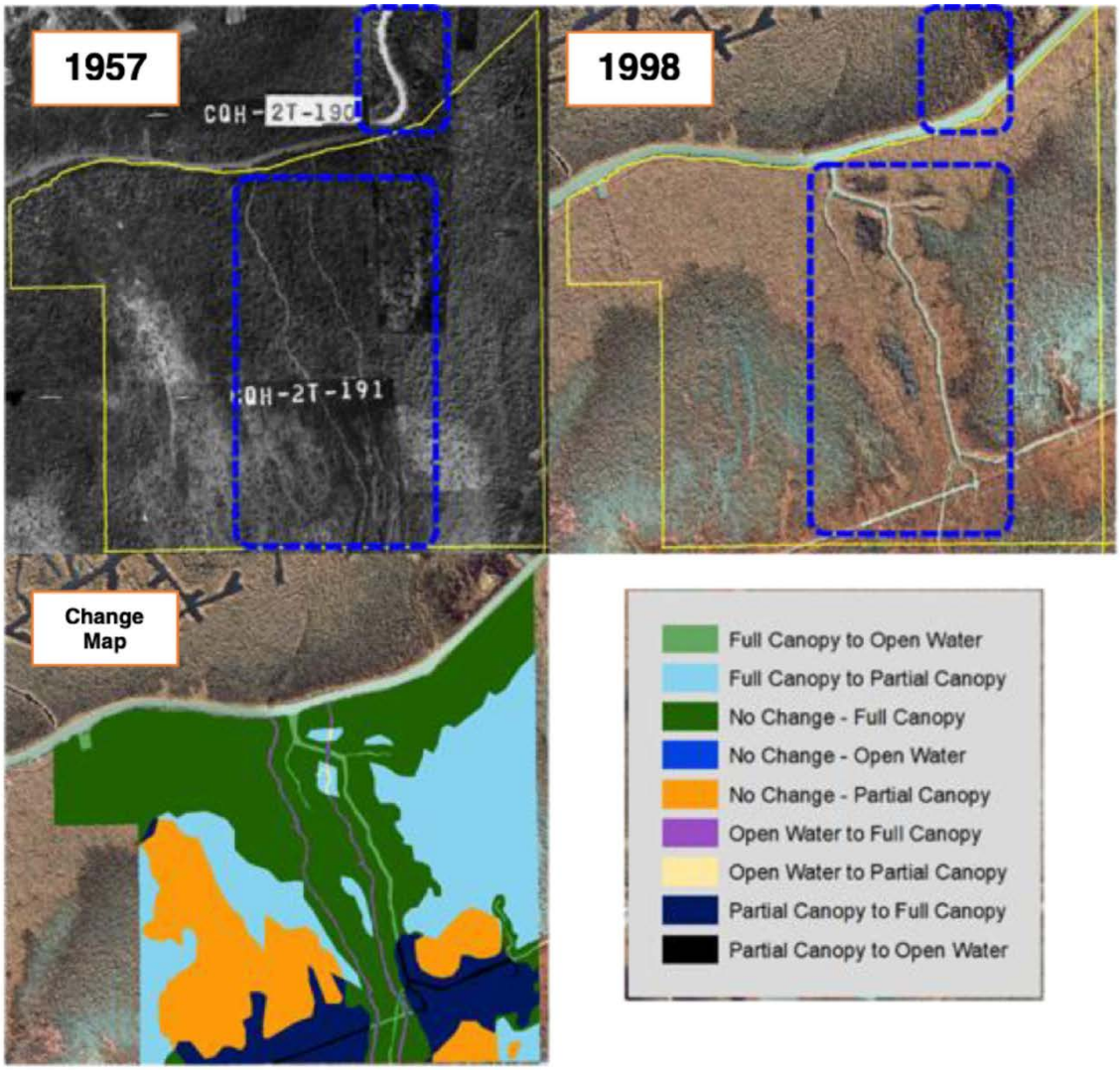
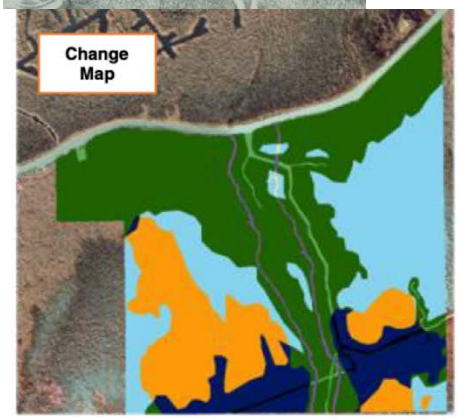


Figure 27: Images of Tract 2 in 1957 (top left) and 1998 (top right), Tract 2 change map (bottom left), and change map legend (bottom right). The dotted blue lines in the 1957 and 1998 images outline where the preexisting rivers have filled with sediment as a result of anthropogenic alterations.

Comment: The change map is again completely inaccurate. Track 2 used to have three historical Bayous (Canon, Mound, and Salt Mine): Canon Bayou is now filled and what remains of what was deep is now very shallow, Mound Bayou is completely filled in, and only half of Salt Mine Bayou remains today. LIDAR shows that this area experienced massive accretion, a huge loss of productive partial canopy swamps and a massive increase of bottomland hardwoods replacing deep cypress-tupelo swamps.

Below is the clearer 1941 aerial image next to the Track 2 change map.



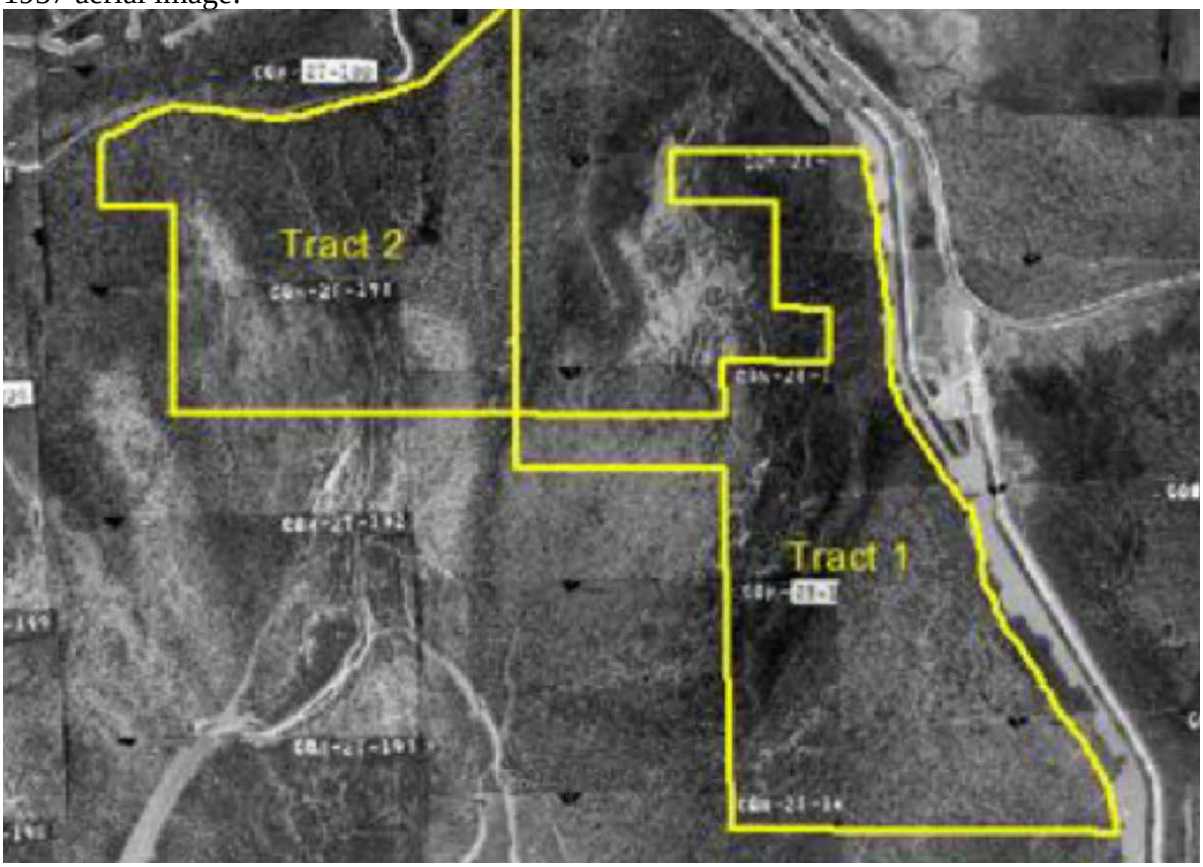
Thesis (no page number given):

Track 1. "Open water" increased to 0.21 and 0.15 km2 for Tracts 1 and 2, respectively.

Comment: In track 1, Cow Bayou went east southeast for about 3.37 miles from the GIWW to the Williams Canal. Historical depth of Cow Bayou is unknown but likely 10' plus. Today the bayou goes dry for 1,87 miles and very shallow 1 to 3 feet after that, mainly because of beaver dams. Aerial from 1957 was chosen because it hides most of the areas that were partial canopy/open water.

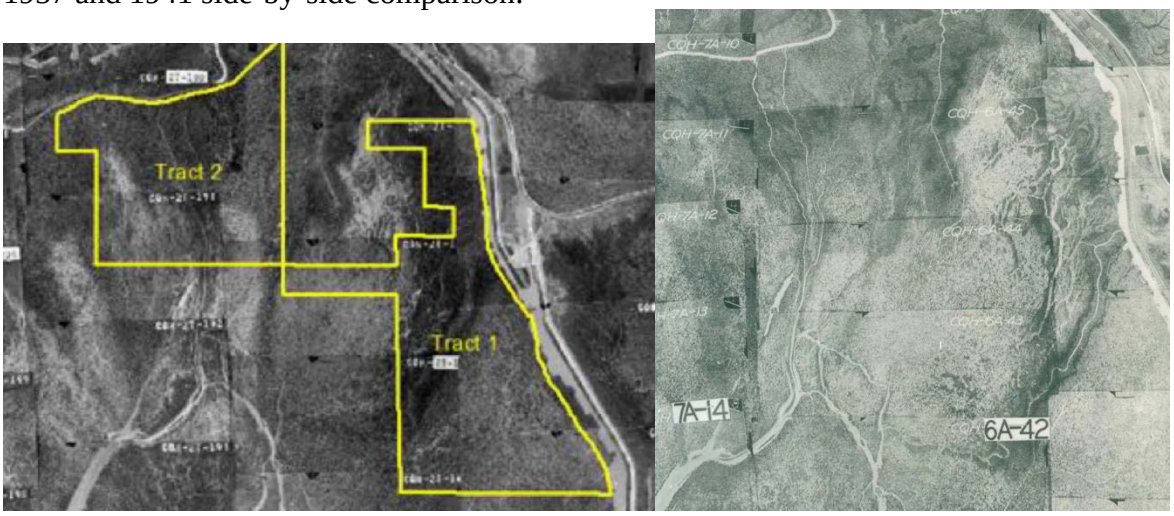
Compare the 1957 aerial with the 1941 aerial below.

1957 aerial image:



1941 aerial image:

1957 and 1941 side-by-side comparison:



Thesis at "CONCLUSION" (no page number given):

"The Nature Conservancy of Louisiana bought tracts of land within the Atchafalaya River Basin with the intention of implementing bank shavings and cuts as outlined in the East Grand Lake Project. One way of understanding the local hydrology is to document the land cover change by utilizing historical and current aerial imagery. Over the past 40+ years , the five TNC tracts have lost a total of 10% "Full Canopy" and gained 10% "Partial Canopy". Another way to study the regional hydrology is to describe the formation and evolution of unnamed distributary channels in the area. Satellite and LiDAR imagery provides a general overview of channel formation, but there is no annual imagery data available."

Concluding Comment: We are extremely concerned with what we have identified to be complete misrepresentations of the change in land cover in these parts of the East Grand Lake project area of the Atchafalaya Basin since the mid-1900s. The historical imagery shows that these tracks have truthfully lost most of their productive, partial canopy swamps, most of the natural open water and almost all its deep-water habitat.

The study appears to disregard cypress swamp ecology in the Basin. Cypress trees occur in the swamp wetlands in the Atchafalaya Basin, but cypress trees alone do not make a wetland. Cypress trees can survive in upland areas as well (see the abundance of cypress trees all over the city of New Orleans). A cypress forest is not necessarily indicative of swamp wetlands. Moreover, the conditions of cypress-tupelo swamps in the Atchafalaya Basin are distinct from most other coastal wetland forests impaired by subsidence and sea level rise. In these forests, subsidence contributes to constant flooding of the forests and impedes regeneration by depriving seeds the dry period needed to germinate, and saltwater intrusion contributes to cypress mortality and/or loss of canopy. But in the Atchafalaya Basin, cypress swamps need long periods of flooding throughout the year; the longer the dry period the more species of competing (and often invasive) vegetation will survive. This is evident on most accreted areas in the Basin where certain hardwood species, vines, and bushes thrive (and produce a fuller tree canopy). In the Atchafalaya Basin, cypress trees are generally healthy but lack the ability to regenerate due to the water levels dictated by the Corps' manipulation and management of the Basin as a spillway for

floodwaters. More accretion will not improve swamp wetlands and alleviate the impacts of these anthropogenic conditions on cypress forest regeneration. Deep swamps and open lakes with scattered (partial canopy) forests can be – and often are – the most productive wetlands in the Atchafalaya Basin and the planet.

Unfortunately, this thesis is being cited by CPRA and the proponents of this project to suggest that forest canopy has declined over time because of poor water circulation and that the EGL project is thus needed to improve forestry health in the Basin. But the study's findings and CPRA's use of the study does not appear to reflect sound judgement and consideration of accurate, on-the-ground conditions in the Atchafalaya Basin. Basinkeeper is concerned with the perceived misrepresentation of the environmental conditions in the project area to support project outcomes that are inconsistent with the goals and policies underlying management of the Atchafalaya Basin Spillway, and the failure to share openly with the public all the anticipated outcomes and goals of the project and concurrent environmental processes (i.e., introduction of river water and sediment).

The Valentine thesis represents just one example of the misuse of research, false science, and misrepresentation of environmental conditions that can have extreme and dire consequences of natural resources critical to the safety and well-being of the public. It is imperative that our agencies thoroughly scrutinize these studies and reliance thereon by our state and federal agencies to ensure that deference is owed only to sound, justifiable and defensible scientific support and transparency is regulatory decision making is achieved for the public good. It is likewise imperative that the agencies recognize the need for comprehensive, collaborative, and inclusive study of the Atchafalaya Basin Floodway System's water flow and sediment delivery conditions to inform review of projects such as the proposed East Grand Lake project.