RICE UNIVERSITY

SHIFTING THE LANDSCAPE
preservation through projection

by
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A THESIS SUBMITTED
IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE

Master of Architecture

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Houston, Texas
May 2004
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Shifting the Landscape
Preservation through projection

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Since its 1865 conception, the small freedman’s town of Princeville, North Carolina has been plagued with twenty floods from the nearby Tar River. Through the destruction of homes, businesses and archived documents, these sporadic floods have led to an inherent instability of Princeville’s historical and cultural landscapes. Existing flood control measures have severed the town from its historical site and the river from its natural floodplain.

This project proposes to stabilize (and vitalize) the town by shifting the physical landscape to respond to both ecological and communal needs. The river is reconnected to an altered floodplain, increasing flood storage capacity and allowing the resulting wetland to filter river pollutants. An existing dike spreads to become an inhabitable landform, allowing residents to return to the waterside. In contrast to the former dike, this shifted landscape offers opportunities for new town/wetland adjacencies while referencing historical conditions through specific moments in the landscape.
acknowledgements

Thanks to Doug Oliver and David Brown for their input and patience.

Special thanks for persistent desk crits from William Williams, and sincere apologies I lost his name in the bureaucratic shuffle.

Thanks to Lina Lee, Naseema Asif, Brent Linden, and Aidan Chopra for much needed last minute printing assistance. Thanks also to Jan Jander for helping with redlines.
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shifting the landscape
preservation through projection

TOWN Since its 1865 conception, the small freedman’s town of Princeville, NC has been plagued with at least 20 floods from the nearby Tar River. Each inundation has irrevocably destroyed historical documents and portions of the built environment, leading to the erosion and eventual erasure of historical landscapes. This instability has caused the town to be unable to thrive, always bordering the poverty line.

As buildings were repeatedly damaged, the town slowly migrated away from its historical spot near the river. After a major flood in 1958, the U.S. Army Corps of Engineers constructed an 18’ high earthen dike on the riverside roadbed, demolishing those waterfront structures which remained. Although the dike protected and stabilized the town, its construction finalized the separation of the community from its historical and cultural site by the river.

The original town site has now become a wooded wetland, inaccessible to the community. The dike prevents any interface between the wetland and the river, inhibiting the natural ability of the land to store and filter river water. This depleted wetland, in turn, prevents any interface between the town and the dike or river. The landscape of the town no longer acknowledges the forces that have shaped it; the river and protective dike are both hidden from view. The potential of this site has been lost to both the river and the community.

EVENT In 1999 two hurricanes hit the North Carolina coast within the span of just two weeks, causing extensive damage along the eastern seaboard. As of 2003, this event ranked as the sixth most expensive natural disaster in U.S. history. In North Carolina alone, over 50,000 homes were damaged as rivers and their tributaries rose well beyond 500 year floodplains.

Although the flooding was associated with heavy rains, similar rainfalls in the past had not resulted in such record-setting floods. Hurricanes Connie, Diane, and Ione crossed the eastern half of the state in August and September of 1955. These hurricanes brought 46 inches of rain, contrasted with only 29 inches dropped in 1999. 1955 flood levels in the Tar River, however, only reached 23.5 ft as compared to 38 ft in 1999. What accounts for this difference?

Many scholars, geologists, and regional planners agree that this discrepancy is to be blamed on the extensive floodplain development that has occurred in eastern North Carolina in recent years. As growing communities bend to economic pressures, marginal floodplains are
developed and sold at lower costs. These diminished floodplains limit the ability of the river to expand as needed, while placing human habitation in the path of floods that do occur. Many environmentalists called for the restoration of natural floodplains, but did not offer viable solutions for those communities already located in these low lying areas.

One of the most controversial communities was Princeville. As the Tar River rose to record levels, water breached the earthen dike protecting the town. The entire area was inundated within hours, forcing all residents to evacuate, many by boat. When the waters finally subsided ten days later, planning manager Sam Knight estimated that 65% of the homes were damaged beyond repair.

Although the town was effectively destroyed, the community refused to accept FEMA buyouts that would pay residents to relocate. This decision met many protests from public officials and neighboring communities who believed the town should not be rebuilt in the floodplain. Despite these protests, town residents felt that accepting the buyout would disperse and then eradicate the historical community. The refusal to move is indicative of the community's strong connection to place and of the residents' desires to remain stationed on the historical site.

**PROPOSAL** The dike's failure opened the discussion of possibilities for alternate forms of flood control. This project proposes to reclaim Princeville's historical town site by creating a new landscape which has a dual responsibility to the town and the river. The river is reconnected to an altered floodplain, increasing flood storage capacity and allowing the wetland to filter nutrients from nearby farms. Land near the river is raised to safe heights, allowing new development to project the town back towards its original site. In contrast to the existing dike, this shifted landscape offers opportunities to project new town/wetland adjacencies while always referencing and framing existing historical conditions through specific moments in the landscape.

Although this project is specific to the town of Princeville, the design methodology can be applied to other low lying developments. While this proposal may not be a cost efficient solution for all riverside communities, the historical significance of the Princeville community warrants an exceptional solution. The concept, however, can be used to more sensibly design landscapes which accommodate human development and nature – benefiting both.
introduction notes


2. www.fema.gov


6. Ibid, p. 34

proposed site

Tar River

Princeville dike

historical townsite

existing wetlands
TOWN OF PRINCEVILLE
(INCORPORATED 1885)
MAYORS ROLL
MILTON PITTMAN
HENRY TYMAN
WILLIAM BRIDGES
BROOKEFIELD FOREMAN
HENRY CHERRY
TURNER FENDER
FRANK BATTLE
PETER JAMES
ZELMA FOREMAN
JOHN PATTERSON
ORRELL JAMES
GLENNIE MATTHEWSON SR
WILLIAM MATTHEWSON
JAMES ED BRIDGES
ASBURY BATTLE
JESSE M. BAKER
CAROLYN POWELL
GLENNIE MATTHEWSON
WALTER FLEMMER JR.
DELIA PERKINS
TOWN

Princeville was originally founded as Freedom Hill in 1865. The name was derived from a small knoll where Union troops declared the slaves of Edgecombe county to be free. Many of these newly released men and women settled under the protective care of the Union army camped just across the river from the city of Tarboro. Because this was a swampy area of little use to local farmers and landowners, the freedmen were allowed to continue living on the land long after the soldiers were gone.

The years of Reconstruction brought a sluggish economy, and landowners were more than willing to parcel and sell their wet riverside farmland to the citizens of Freedom Hill. While those who were able bought property, many residents were too poor to afford the land and never became legal owners. Large lots that were never sold remain in the families of absentee landowners today.

By 1880, the settlement had grown into a small town of 379. At a time when other African American towns were dwindling, Freedom Hill grew. The town survived by indirectly benefiting from the industrialization of Tarboro. Three rail lines ran through Freedom Hill, converging at the bridge that led to its sister city. Five new industries sprouted on both sides of the riverbank: cotton mills, a lumber mill, a knitting mill, and a fertilizer factory. The road leading into Freedom Hill bustled with ten specialty and general stores, two restaurants, and a butcher’s shop. The town’s first church was built in 1871; the first community school opened its doors in 1883. Princeville historian Joe Mobley writes, “Churches were focal points for making community decisions and holding political meetings as well as centers for religious and social activities.” Revivals and camp meetings drew attendees countywide. Freedom Hill had become the center for Edgecombe county’s African American politics, religion, and culture.

Freedom Hill incorporated in 1885, making it the first incorporated African American town in the United States. During this process, the town voted to change its name to Princeville – honoring a fellow citizen and carpenter.

Although its future may have looked bright, Princeville’s fortune was always tempered by the rise and fall of the Tar River. The unwanted farmland settled by future Princeville residents lay in
the 100-year floodplain. Each year, there was a 1% chance that the land would flood. In its first one hundred years, the town flooded twenty times. Between 1919 and 1927, three major floods inundated the entire town. ⁹

After each flooding event, various percentages of the community would leave, never to return. But it seems a larger portion would always remain behind. Time and time again, residents would rebuild on land that repetitively flooded. ¹⁰ Perhaps they did not want to leave the safety and support provided by the town, for racism and the Ku Klux Klan still ran rampart. Or perhaps it was too difficult to find available and affordable land elsewhere. Whatever the case, the act of returning home became somewhat of a ritual, ingrained in the consciousness of the community.

Over time, the town began to slowly migrate upland, away from the water’s edge. After a major flood in 1958, the U.S. Army Corps of Engineers constructed an 18’ high earthen dike along the riverside road, demolishing those structures which remained. ¹¹ Although the dike protected and stabilized the town, its construction finalized the separation of the community from its historical and cultural site by the river.

When the dike failed in 1999, residents again chose to return to the flooded land. Town officials voted to ask the Army Corps of Engineers to repair the earthen dike in lieu of accepting FEMA buyouts. Many people, including some residents, doubted the soundness of the decision to rebuild in the floodplain. ¹² Town commissioners and historians defended the choice, citing the unusual historical significance of the community.

In the months following the 1999 flood, UNC graduate student Catherine Moga did extensive fieldwork in the area, questioning the motivations of a community that continually returned to such unstable ground. She found that the consistent string of thought binding the community together was idea that the town had always been able to overcome any obstacle. According to Moga, “the people of Princeville to a certain extent felt as though they would be letting down their ancestors if they gave up the land.” ¹³ When speaking about the town, one resident explained:

...even through hardships, ’cause they've been through floods before -- and even through all the hardships that they'd gone through that they still decided to stay and to continue on. Even after every flood, they continued on... ¹⁴
1  "Princeville: A Black Town In North Carolina 1865-1985."
    www.princevillenc.net /Princevilles_History.html

2  Mobley, Joe. "In the Shadow of White Society: Princeville, a Black Town in North
    340-384.

3  Ibid.


5  Ibid, p. 326.

6  Ibid, p. 368.

7  Ibid.

8  "Princeville: A Black Town In North Carolina 1865-1985."

9  U.S. Army Engineer District, Wilmington. Princeville Dike, Tar River, Edgecombe

10 "Princeville: A Black Town In North Carolina 1865-1985."


12 for example: Whittle, Daniel and Douglas Rader. "Floyd's Lessons: Restoring the

13 Moga, Catherine. email correspondence.

14 Moga, Catherine. "Ain't Nothing Like Home: Place, Identity, and Social Memory in
    Princeville, North Carolina." p. 10
City suffers population loss as residents leave in general post-war migration to northern cities.

Army Corps of Engineers constructs a 2 mile long, 22' high dike separating the northwestern border from the river.

City annexes Greenwood Heights.

City hires 8 different town managers.

State of North Carolina takes over town finances, fearing the town will go bankrupt.
flood plain map
Mayor Delia Brown and Princeville resident

photos courtesy FEMA archives
remaining historical district
cemeteries

remaining historical district
cemeteries
vacant land - pre-flood
Mr. Glass, age 72, oldest member of the Princeville Volunteer Fire Department
remaining historic district

existing wetlands

Powell Park
flood storage
FLOOD STORAGE

Although the record-setting 1999 flood was associated with heavy rains, similar rainfalls in the past had not resulted in such devastating floods.¹ Geologist Dr. Stanley Riggs blames this discrepancy on the recent, and extensive, modification of the coastal plain drainage system. Since the 1950s, vast quantities of riverside wetlands have been ditched and drained. Thousands of miles of tributaries, streams, and rivers were then channelized to speed the increased water flow downstream.² While this solution may suppress local flooding events, conveyance often causes large scale storms to result in catastrophic consequences downstream.³
<table>
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<tr>
<th>Flood Stages</th>
<th>River Levels</th>
<th>NWS Warnings</th>
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<tr>
<td>500 yr</td>
<td>93.7%</td>
<td>1993 flood stage</td>
</tr>
<tr>
<td>100 yr</td>
<td>45%</td>
<td>50 yr</td>
</tr>
<tr>
<td>8 yr</td>
<td>27.1%</td>
<td>10 yr</td>
</tr>
<tr>
<td>2.85 yr</td>
<td>34.47%</td>
<td>5 yr</td>
</tr>
</tbody>
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<tr>
<th>30% winter river height</th>
<th>35.17 flood stage/flood flooding begins</th>
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13% high water height
The massive floods of the Mississippi River in 1927 are one such example. When the Mississippi overflowed its banks, it was constricted by over 1,500 miles of levees. The rising waters were unable to expand to their natural floodplains. An enormous pressure built up, and the levees were breached in twelve locations. 23,000 square miles of land were inundated. When the river threatened to destroy New Orleans, officials blasted a hole in the levee downstream, opening up much needed storage space for the floodwaters. The Mississippi River Commission’s “levees only” policy had proven to have disastrous faults.

On a smaller scale, the flooding at Princeville was also partially a result of water conveyance and river constriction. In recent years, the town of Speed, just upstream from Princeville, constructed another dike and channelized a tributary to the Tar River. When heavy rains fell, floodwaters in Speed were channeled quickly past the now constricted floodplain, increasing the rate of flow in Princeville. In turn, Princeville’s dike also increases flow rates and flooding downstream.

This project proposes to partially restore the Tar River’s natural floodplain in Princeville, without dislocating the community.
Asymmetrical Tar River Valley

Channel
Carries day-to-day water flow

Primary floodplain
Carries increased water from small storms that produce the annual wet season for several months each year. Consists of obvious wetlands that filter water and hold it like a sponge for slow release, helping maintain a more uniform river flow throughout the year.

Secondary floodplain
Carries water resulting from less frequent, large to extreme storm events. Generally a transitional zone between riverine and upland areas and is characterized by less obvious wetland plant species. Less frequently used by rivers and habitually modified for other land uses. However, when the river system needs the secondary floodplain, it must be available. Princeville lies in this floodplain.

Tertiary floodplain
Marked by distinctive river terraces eroded into the valley walls by rare extreme flood events that occurred in the past.

Existing floodplain
Depleted wetland
town is flooded occasionally
elevation map shows Princeville is located in a low-lying area
wetland benefits
WETLAND BENEFITS

In addition to water storage capacity, wetlands provide a valuable resource to the riverine ecosystem.

- Wetlands provide the habitat of almost 66% of the state’s rare, threatened, and endangered plant and animal species.\(^1\)
- Wetlands trap, transform, and recycle many chemicals and pollutants found in the water supply.\(^2\)
- Wetland vegetation absorbs and utilizes excess nutrients which would otherwise cause harmful algal blooms.\(^3\)
- The roots of wetland plants help stabilize the soil, preventing sediment and silt from washing downstream, where they clog the gills of fish and smother shellfish.\(^4\)
- By stabilizing the soil, these roots prevent soil-bound pollutants from entering the river system.\(^5\)

When the first Europeans settled in North Carolina, there were 10.3 million acres of wetlands in the state. Since that time, almost 50 percent of North Carolina’s wetlands have been drained for agricultural or urban purposes. Although there are now laws limiting the acreage of wetland drainage per year, the past (and continued) exploitation of these areas has taken a toll on the coastal ecosystem.\(^6\)

Since colonial times, farmers have ditched and drained the fertile, swampy areas adjacent to rivers and streams. Although these altered landscapes have provided fruitful cropland, their drainage has not come without a cost to the riverine system. The farmland replacing the natural wetlands is unable to filter the normal nutrients and pollutants that typically run off the surface of the land. These contaminants now drain undisturbed, directly into the river.

Not only does the conversion of wetland to farmland remove nature’s ability to extract water pollutants, but it also compounds the problem by sending a substantial amount of fertilizer and pesticide runoff into the river system. Due to its large number of riverside farms, the Tar River has the state’s highest incident of pesticide detection during normal flow rates. The fertilizer runoff from these farms transports a surplus of nutrients, particularly phosphorus and nitrogen, into the river.\(^7\)

The damaging effects of over-nutrient-enriched waters can be seen in the series of fish kills suffered by the Tar-Pamlico Basin in the late 1980s and early 1990s.\(^8\) Excess nutrients in the estuary encouraged the normally harmless Pfiesteria alga to multiply rapidly, or “bloom.” The
blooming process produces toxins that can stun, injure, or kill fish. These toxins have also been reported to cause headaches, dizziness, skin lesions, nausea, and short-term memory loss in humans who have come in contact with it. ⁹

Similar fish kills have occurred when nutrient rich waters prompt the growth of “red blooms” and “white blooms.” As these blooms spread, they absorb high levels of dissolved oxygen. ¹⁰ With decreased oxygen levels, many fish fall ill or suffocate.

The joint state-federal Conservation Reserve Enhancement Program (CREP) has listed additional signs of excess nutrient damage found in the Tar-Pamlico river basin:

- declining fisheries
- outbreaks of fish and crab diseases
- contaminated shellfish waters
- loss of historic aquatic vegetation beds

Although this damage may make the future look bleak for both farmers and the environment, a healthy balance of farms and wetlands may offer a viable solution. CREP offers financial incentives to farmers to return marginal farmland and former wetlands to their natural state, while still cultivating those lands removed from the riverside. ¹¹

The increased wetland acreage will then be able to filter substantial amounts of excess nutrient from the waters. Wetland vegetation temporarily removes nitrogen from water by absorbing the particles in order to build plant tissue. When the plants die, the nitrogen is again released into the soil. However, alternating periods of flood and dryness allow nitrogen to be permanently removed. During the anaerobic conditions of flooding, organic nitrogen found in plant tissue is converted to ammonium; some ammonium (and thus, nitrogen) is released into the atmosphere. As the wetland dries, the ammonium is converted to a nitrate. With a second flooding, the nitrate is converted into gaseous nitrogen and released from the river system. ¹²

Considering these large scale environmental problems, the site at Princeville can be as used an example of an inclusive design strategy to be implemented at other sites along the river.
wetland benefit notes


5. Ibid.


9. NC Department of Health and Human Services website. www.schs.state.nc.us/epi/hab/

10. Ibid.


wetland as nitrogen remover

wetland floods
- nitrogen absorbed by plants is converted to ammonium.
- some ammonium evaporates.

flood subsides
- ammonium is converted to nitrate.

wetland floods
- nitrate is converted to gaseous nitrogen.
Healthy wetlands are tied to the river's rise and fall, a flux known as "flood pulsing." Seeds are dispersed when winter waters rise; they germinate once the waters subside. The existing wetlands on the site are cut off from this flow.
catalogue of plants native to the site
- Site documentation

direction of site photos
101 mutual bvd
Old Iton House in Pitnokeville
1880

259 mutual bvd
Abraham Wootten House
1890
belonged to founder of Mt. Zion Primitive Baptist Church
eligible for listing in the National Historic Register

301 mutual bvd
Wiggins House
1885-1900
natural floodplains

functioning wetland  town is flooded frequently

existing floodplains

depleted wetland  town is flooded occasionally

proposed floodplains

functioning wetland  town is above tertiary floodplain
The secondary dike spreads to allow future development and contracts to protect existing conditions.
created wetland

existing wetlands

parkland

wetland created by cut aids in removing runoff of nutrients from nearby farms

cuts allow water to pass through existing wetland areas in the winter, promoting seed dispersal and plant variation

grassy parks line the wetland, running along the top edge of the dike

winter seed dispersal

summer drawdown

wetland as nitrogen remover

wetland flood

root outlets

wetland flood
historical houses

dike pinches at points to preserve existing homes

preserved woodlands/pond edge

pond and buffering environment are left intact serves as large flooding event storage

future development

spreads allow future homes to overlook the wetland area

projected parks + future development
site sections

section aa
possible development

2 yr flood storage

500 yr flood storage

section bb
existing pond

dike breaks

spring water level
winter water level

section cc
museum/park edge

possible development
raised landform allows future homes to overlook the river

2 yr flood storage

500 yr flood storage
500 yr flood storage

area floods only during major floods in order to preserve pond ecology

framed view
flood damaged house

flood gate closes

framed view
old town hall/ new museum
section dd
wetlands/possible development

winter water level
spring water level
winter water level

2 yr flood storage
500 yr flood storage

section ee
farmer's market/former town site

farmers' market serves local farmers and town residents who sell produce along the roadside
existing wetlands
winter water levels connect existing wetland areas, promoting diversity between the areas
possible development
raised landform allows future homes to overlook the wetland area

1890 Abraham Wooten House
belonged to the founder of oldest church in Princeville
eligible for listing in the National Historical Register

Freedom Hill Marker

spring water level
preservation
Smaller properties remain at their original levels to indicate frequency of past flooding
winter water level
2 yr flood storage
500 yr flood storage
built interventions
view along top of dike
framing, marking, preserving
museum crossing

preservation
natural land level is left as a slice in the dike, marking the elevation change needed in order to protect the town

1" = 3'

markings
planting strations indicate points of connection over the dike
strations are based on past flood elevations
over time, strations blend as the visible remnants of past floods become less apparent
small frames
specific sites are framed in the cross-dike circulation paths
one's frame of vision is narrowed upon descent
small frames

Abraham Wooten House  T+T Groceries  First Primitive Baptist Church  Home damaged by Floyd
Winter water levels flood the area, encouraging seed dispersal and wetland variation.

Small areas of the site, following old property lines, remain at existing grade level. Portions of these original lots are flooded during 2-yr flood levels, indicating the frequency of pre-dike flooding events. During the altered winter flow, the sites become islands, accessible only by the concrete retaining walls that surround them.
Sweet Gum trees are planted on axes connecting local churches to the former town baptismal site. These axes will turn a brilliant red in the fall, commemorating the season that the various congregations would come together. Even after the churches are gone, the axes will remain.
A shelter is built into the dike, providing access through and over the land. This shelter can be used for as a farmer’s market for locals who normally sell their produce on the streetside. It can also serve as an outdoor gathering space for those local churches that still do not have air conditioning.
sketch model of the multiple levels converging at the farmer's market
bibliography
bibliography

Princeville


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1999 flood


River and Flood Control


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North Carolina Wildlife Resources Commission, April 15, 2003 in a letter to US EPA found at earthjustice.org/backgrounder/documents.

River and Wetland Ecology


Cultural Landscapes


Physical Landscapes


