Fluid Urbanism: Linking The Tennessee River Mega-Region
John D. Koelsch

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Image: (Cover) Hunting Asian Carp. Source: Darkwater, Glenn Hall 2014

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Part 1

"Architects should be educated, skillful with the pencil, instructed in geometry, know much history, have followed the philosophers with attention, understand music, have some knowledge of medicine, know the opinions of the jurists, and be acquainted with astronomy and the theory of the heavens."

— Marcus Vitruvius Pollio

01_Positioning

Architecture is a field of context. Regardless of scale or project type, it is important to understand implications of design. Throughout the development of modern civilization, the natural world has often been neglected and exploited.

But what is the extent of context? Is it solely a physical proximity to a site, or is it also the cultural, environmental, and sociological fabric of a place or community?

Inquiries regarding scope could be asked of architecture as a whole as well. Where does architecture end and other fields begin? What is the role of the architect in society? Theorists as early as Marcus Vitruvius Pollio have argued for a comprehensive repertoir of architects, remaining a topic of architectural discourse by even modernists from Frank Lloyd Wright to Michael Brill.

How can an inquiry into wicked problems, disregarded by architects, expand the boundaries of what design can be, as well as provide accessibility to good design in rural America?

Image: Silver Carp Jumping in the Fox River. Source: Kentucky Monthly, Gary Garth 2019

01.1_Invasive Species

The 19th and 20th centuries saw tremendous technological advances in all facets of society. From small air-conditioner window units to magnificant, modernist dams, innovations controlled and harnessed the natural environment.

In the same rationale, beneficiaries of commercial fisheries throughout the South introduced Grass Carp, Black Carp, and Silver Carp, all three collectively monikered "Asian Carp" to fish farms as a means of algae and pest control in the 1970s. Flooding and human transport provided avenues for Asian Carp to spread into neighboring rivers and watersheds.

First infesting the Mississippi and Illinois Rivers, the genus is currently threatening the Great Lakes and the Tennessee River. Known for destroying ecosystems and decimating native fish species by eating large amounts of aquatic and terrestrial plants, and filter-feeding on microscopic plants and animals (MAISRC), Asian Carp typically spawn between 1 and 2 million eggs triannually, overpowering native fish species, and eat up to 20% of their bodyweight in plant and aquatic organisms, (MAISRC). Silver carp are extremely sensitive to vibrations, often from personal watercraft, and reflexively leap out of the water, secreting blood and mucus, severely injuring boaters and recreationists.

As a result of this invasion, entire outdoor recreation and fishing industries are facing an imminent threat.

Image: TVA studies whether to close more coal plants. Source: Chattanooga Times Free Press, Dave Flessner 2018

01.2_Skeletons of Past Industry

In 1933, Franklin Delano Roosevelt implemented legislation creating the Tennessee Valley Authority, part of the New Deal. TVA generated jobs when Americans needed them most—during the Great Depression. Towns located in the proximity of TVA infrastructure became hubs of industry, as well as catalysts for project completion.

TVA's original goals were threefold: "energy production, environmental stewardship and economic development" (Tennessee Valley Authority). Although execution and methods have changed, the Agency has stayed true to those goals, but in the 21st century, has focused more on energy production.

Now with activism regarding fossil fuels, the advent of green energy technology, and electronic automatization of former jobs, TVA has announced closings of plants and job reductions. Other private industries and local jobs have been moved overseas or replaced with big-box alternatives, furthuring the struggle in the already disadvantaged south.

In areas of current use, communities are shells of the past. In areas discontinued, artifacts remain and communities struggle. How can historical and cultural pride be paired with painful tribute to eminent-domain claimed river towns of old?

Image: Abandoned, flooded Danville Grain Elevator. Source: Reddit, Ryan Smith 2016

01.3_Cultural Fragments

In an era where large-scale industrial and infrastructural projects were innately discriminatory, not all areas were awarded winning hands.

Untouchable cultural fragments such as income disparity, racial tensions, and natural resource inequality form deep divides in community fabric that still exist today.

How can architecture shape reconciliation to allow growth? In what ways can urban ruins, cultural sources, and primary artifacts be examined and preserved attentively to mend and inform histories of both hardship and prosperity?

Image: Abandoned Manufacturing Facility. Source: Tennessee RiverLine Tour, Matt Cowan 2019

01.4_Economic Blight

Rural communities in the United States have waned throughout the 20th century with both industrial peaks and valleys. Due to increased globalization in the last 50 years, industry has relocated and internationalized, crumbling communities of which these cornerstones once supported.

Once a tremendous sense of pride, fragments of the past now form urban ruins, where communities are cemented in history, rather than optimistic for progress.

In what ways can these fragments of the past be embraced, rather than forgotten?

How can opportunities be incurred from urban ruins due to blight?

What are the urbanistic economic impliciations of architecture in rural settings?

02.1_Supporting Literature

“The inundated future that awaits us calls for lots of adaptation and innovation, as well as a keen sense of climate justice.”

— Simon Richter

02.1.1_Is Floating Architecture a Gimmick?

A commentary by Simon Richter on floating architectural interventions in the Netherlands, a group of students, let by a faculty advisor from the University of Pennslyvania experienced several different types of floating architecture.

Although the piece illustrates several examples of floating architecture, the main takeaway is the critique of these methods from an outside perspective, and personal interactions with designers and project beneficiaries. Some of the challenges in the design process and the nature of the project as a whole are discussed, while comments remain specific to the program involved in the architecture, providing great insight into such challenges.

“Regrettably, when design is disregarded, we make do with tents and rapid-assembly box-type structures. As such, there is a need to rethink shelter design and make it a formal part of architectural education.”

— Dr. Sudarshan Krishnan

02.1.2_Integrating Shelter Design in Architectural Curriculum

Focusing on implementing curriculum for disaster relief shelter design in architectural education, Dr. Sudarshan Krishnan pleads for thoughtful design in domains where it may not be present.

Architecture, often seen as a luxury for the wealthy, is not always accessible to the whole population or rural communities. “Integrating Shelter Design and Disaster Education in Architectural Education” is a perspective arguing for the broadening of conventional design thinking and application to situations and context to improve them beyond conventional means.

In regions of investigation, few architects attribute to limited or lacking design. Studying impermanent or temporary architecture will prove valuable in application to addressing wicked problems in the Tennessee Valley.

"[Architecture's relationship to the city] bears upon questions of architecture's disciplinary autonomy, its agency in the change and transformation of the city, and the possibility of its politics."

— Architectural Type and the Discourse of Urbanism

02.1.3_Architectural Type and the Discourse of Urbanism

Katharina Borsi, Tarsha Finney & Pavlos Philippou address some of the big questions surrounding urbanism in the work, "Architectural Type and the Discourse of Urbanism". References to Aldo Rossi, Le Corbusier, Venturi, and others highlight spatial growth, urban planning, and public space.

One of the claims that is made is that there is no simple answer on what public space is, how it should be thought about, or when it is appropriate.

The piece sets the stage for conventional urban space to be challenged, and for architecture and thoughtful urban deign to be accessible in rural America.

02.1.4_Handbook on Technical Barge Concepts

The proposed intervention for the thesis proposes engaging the water as site. Therefore, it is important to understand the environment of the Tennessee River, and one important element to that is river commerce and barge traffic.

The European Handbook references different barge tankers, propulsion technology, and tonnage, as well as ice and other river conditions that may occur.

When designing an intervention that engages the water, understanding these practices are extremely important, so that the architecture is accessible to all and not prohibitive to existing industries.

02.1.5_Building the Back of Beyond

The relationships of government authority, community life, and economic development are a very delicate balance. In the Tennessee Valley, a region rich with natural resources, the area saw growth in the 20th century.

The dissertation by Stephen Taylor discusses complex issues pertaining to transient families and workers coming into the area, which contributed to the fragile economic and social structures. Projects through institutions such as the Tennessee Valley Authority created and changed communities greatly, attributing to the strong cultural identities of such areas.

It is important to be thoughtful in design to be respectful and empathetic toward different places with unique challenges. These roots must be studied and investigated thouroughly.

02.2_Precedent Allies

Architecture has always interacted with aquatic landscape, either symbiotically, or exploitatively. From the Roman aqueducts to the Palm Islands in Dubai, water has often been seen as a divider or a limitation for design and inhabitation.

A variety of projects have challenged the conventional site for different reasons. Whether that's urban farming, disaster prevention and response, or climate change, new horizons of design point to the aquatic world as a landscape. Citing such projects to become familiar with the design process, means, and methods will prove advantageous in proposing aquatic architecture to interact with the Tennessee River.

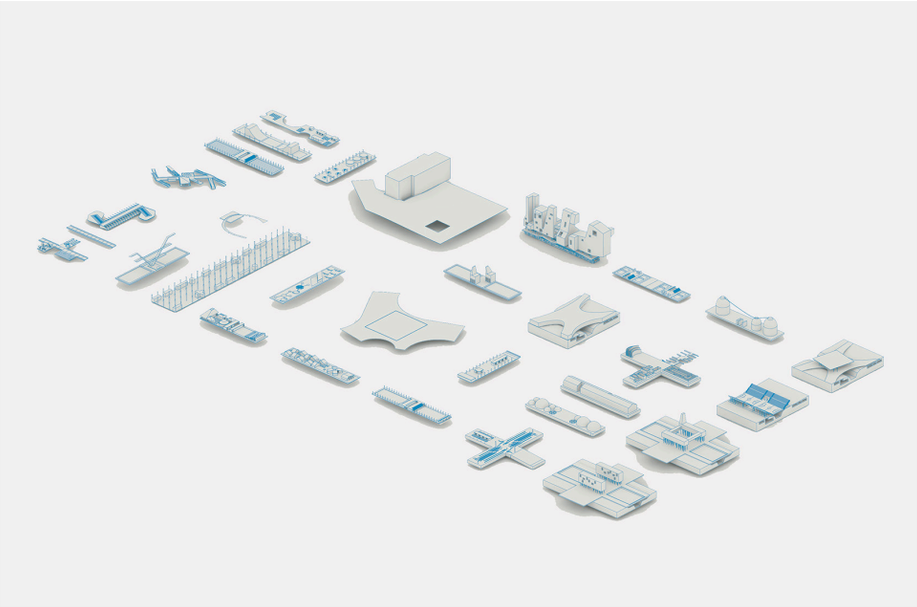
Images and Text: (Top) Above view of the Iceberg Rigging Station. Source: Iceberg Alley, Lateral Office 2010; (Bottom) View of rigging with iceberg augmentation. Source: Iceberg Alley, Lateral Office 2010

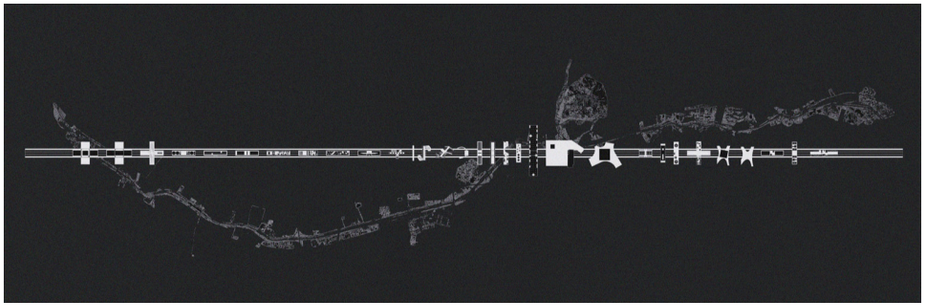
02.2.1_Iceberg Alley

Lateral Office
Newfoundland, Canada
2010

Since 1810, there have been more than 560 occurances of iceberg collisions in the Canadian Atlantic. Twillingate, known as the "Iceberg Capital of the World" swells from 2,500 to 17,500 inhabitants annually due to tourism in hopes of sighting whales or a genuine iceberg.

An intervention proposes a central rig system that mediates between touristic, industry, and military presence in the "Iceberg Alley". Additionally, a series of small, deployable devices allow for interaction with icebergs. Balancing of multiple activity types, using water as a site, to stimulate industry makes Iceberg Alley a valuable ally to pursue.





Images and Text: (Top) Architecture of Territorial Impacts. Source: the river that is not, LCLA Office 2013; (Bottom) Determination of Opportunity Zones. Source: the river that is not, LCLA Office 2013

02.2.2_The river that is not

LCLA Office
Medellin, Colombia
2013

Melledin's river is no longer a river. In the last 70 years, city urbanism transformed the already weak ecosystem into a constructed canal to support man-made infrastructure. The river is fed by 56 tributaries and small streams, some with their own problems, but others are quite clean.

Instead of attempting to re-naturalize the river, the proposal by LCLA redirects those resources into re-establishing the river as a backbone to hydric landscape. Platforms will bring conventional interior program onto the river. Rethinking conventional methodology to engage a threatened natural force through design is a valuable field of thought to pursue.

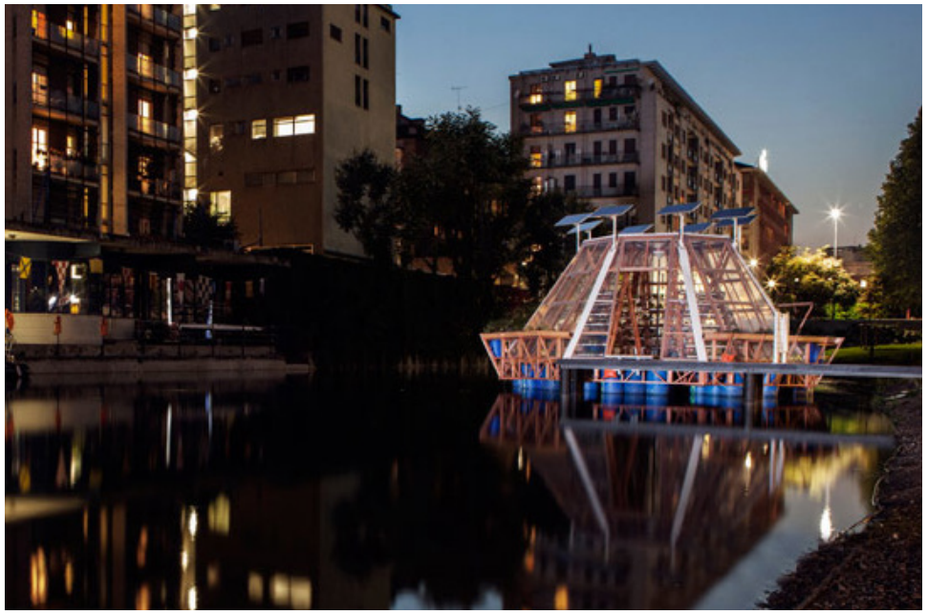
Images and Text: (Top) Floating modules would be arranged to protect a center channel. Source: Oceanix City, BIG n.d.; (Bottom) Formation of Islands. Source: Oceanix City, BIG n.d.

02.2.3_Oceanix City

Bjarke Ingles Group
n.d.

Due to rising sea levels, growing coastal populations, and reverse-dredging, new solutions are turning to the oceans for development and urbanization. Oceanix is a vision for city ecosystems that live sustainably on the oceans.

Small neighborhood modules are 2 hectares in size, which interlink to form villages of 12.2 hectares, combining to form cities of 75 hectares. Able to endure Category 5 hurricanes, Oceanix City introduces a typology into architecture that questions the conventional site.



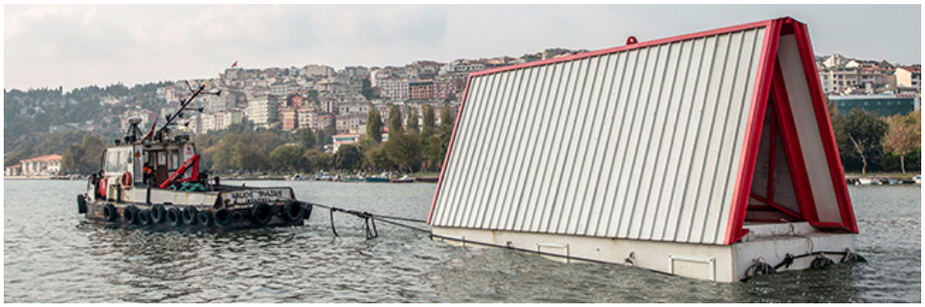
Images and Text: (Top) Floating Greenhouse in the Urban Fabric. Source: Jellyfish Barge, Studiomobile 2015; (Bottom) A new approach to urban farming. Source: Jellyfish Barge, Studiomobile 2015

02.2.3_The Jellyfish Barge

Studiomobile
2015

By 2050, the food demand is calculated to be approximately 60-70% more than it is today. Land and water scarcity are insurmountable in some areas of the planet, and existing farming practices are outdated and inefficient.

Jellyfish Barge is a floating modular greenhouse for urban agriculture which self-sufficiently generates its own fresh water and energy. The concept combines a food production facility with public space. The typology addresses several interdisciplinary issues in the urban space and provides discourse questioning the conventionality of site.



Images and Text: (Top) Towable Disaster Relief Shelter. Source: Fold and Float, So? 2019; (Bottom) Material use allows for quick assembly and transportation. Source: Fold and Float, So? 2019

02.2.3_Fold and Float

So?
Istanbul, Turkey
2019

Turkey is awaiting a once-in-a-century earthquake. Disaster prevention is a current dialogue facing Istanbul, and in the near future, disaster response will be addressed. The firm, So? responded by developing a prototype addressing a floating, emergency housing solution. During development of the design, a central question remained "what if the response is not about stable land, but managable water?"

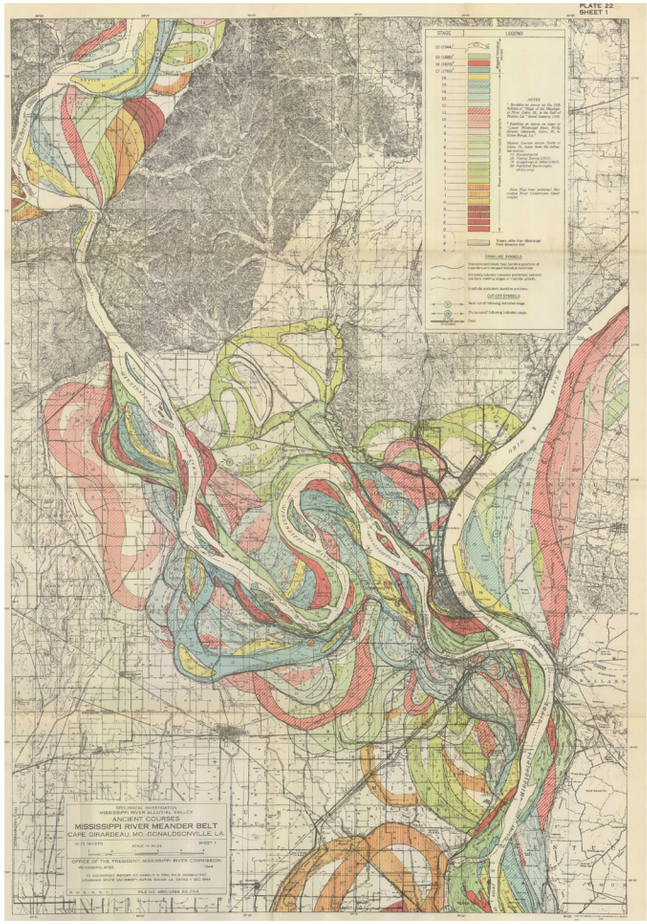
The concept utilizes efficient materials and fabrication methods. Questions raised developing the Fold and Float can be applied to other problems in other locations, and contribute for innovative means to engage water bodies.

03_Methodology

Due to investigating a site on a ecosystemic level, with various points of interest of more specificity, it is crucial to understand the sense of place on a local, regional, and systemic level at the same time.

The project seeks to not only revitalize a sense of place in areas where it has faded due to wicked problems, but also integrate communities into a common fabric to create a larger, regional identity.

Studies of a variety of methods will seek to help study the unique communities along the Tennessee River. The River's interaction and relationship to towns along its banks will inform an architectural investigation into the water as site, on a local level, but also a continuous system.



Images and Text: Mapping the Mississippi River. Source: Harold Fisk, jotot.com 1944

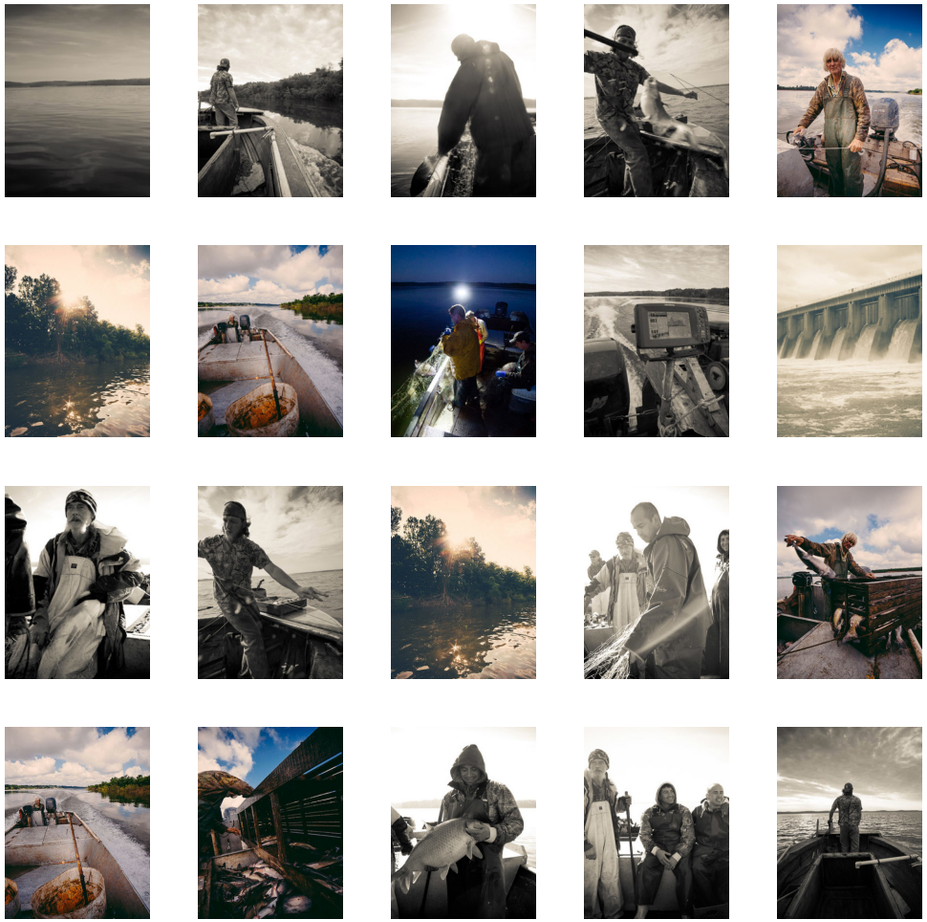
03.1_Harold Fisk Cartography

Harold Fisk was commissioned in 1944 by the US Army Corps of Engineers to study the flow, formation, and dynamic river, as part of his investigation, Geological Investigation of the Alluvial Valley of the Lower Mississippi River. 16,000 borings were taken, which allow for analysis of deep layers of soil and deposits.

Image: The Tennessee River. Source: Mathew Carey, Carey's American Atlas 1795

03.2_Early Tennessee River Map

Working at the scale of an ecosystem, site characteristics are indicative of the ways in which it is represented. Early maps of the Tennessee Valley are valuable because of the ability to see the perception of the river throughout time.



Images: Commercial Fishing on the Tennessee River. Source: Darkwater, Glenn Hall 2014

03.3_DarkWater Gallery

A series by Glenn Hall responding to the Asian Carp epidemic threatening the Tennessee River, DarkWater is a photographic investigation into commercial fishing in the Tennessee River. The gallery provides a unique perspective of engaging the site in a 1:1 scale.

Interviewee: XXX
Interviewer: XXX
Date of Interview mm.dd.yy
Location of Interview: XXX
List of Acronyms: AB-XX IN-Interviewer

(Begin Transcript 00:00:00)

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IN How has the river changed throughout the time you've been here?
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       omnis aut et inihita tquibus, soluptioses diat parum qui nem re

IN What are the challenges members of the communities face?
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       a quis mod ut odi dest, quaes st qui cum.

IN How is the city unable to meet needs of the community?
  -XXX Manandis explamimi niemin reoqe explistiis dest, si inctae ipeum
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(End Transcript 00:10:49)

03.4_Regional Interviews

A collection of interviews will be taken from persons of interest along the river, located in each pilot community. The interview content will focus on wicked problems of the specific area in question, as well as the river's impact on the community. When all interviews are complete, an archive of primary information will be available to support further study.

04_Site

The location for the investigation will be the Tennessee River. Known as the most biodiverse river system in North America, the River and its surrounding landscape face challenges, not unlike other natural elements of the country, resulting from climate change, resource exploitation, and invasive species introduction.

What makes the Tennessee River unique, however, are the communities along the way. Each has a reliance on the river for industry, recreation, and resources. The Tennessee is also important for shipping, transit, and barging, as well as serving as a large provider for many other regional industries.

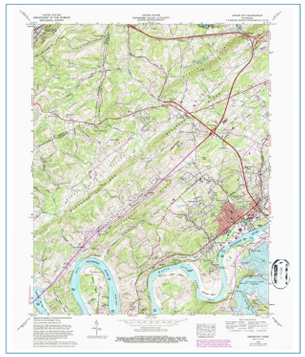
As a result, conservation and protection of the river should be of the utmost priority, as well as an increased utilization of the River by communities along its shore. Communities will be selected along the River using a series of criteria. First, towns must be at least 70 miles from each other to equally populate the whole river corridor. Second, populations must be less than 10,000 inhabitants to engage communities affected by wicked problems. Third, towns must be less than 10 miles from the nearest dam, due to auxilliary channels that exist, as well as remnants and history of past projects.

04.1_Lenoir City, Tennessee

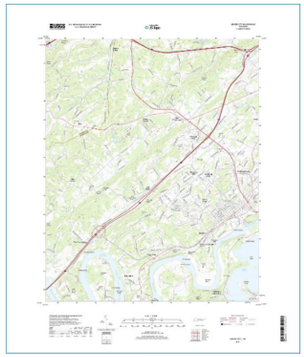
Lenoir City, outside of nearby Knoxville, has a population of approximately 9,200 people. Originally began as a 5,000 acre plantation given to General William Lenoir by the state of North Carolina, his sons maintained the land after his death and founded the Lenoir City Company in 1890, known for cotton manufacturing. [1]

A site of past TVA projects, industry has waned in recent years and a small population and limited resources limit development potential.

1935



1968



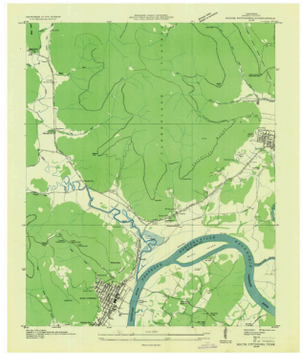
2019

1. Rachel Downs. *Hometown Spotlight: The History of Lenoir City*. Knoxville, TN. WBIR. 2017
Images: Lenoir City. Source: USGS. (L to R) 1935, 1968, 2019.

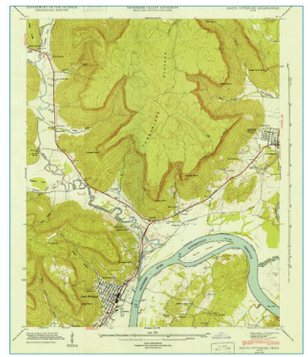
04.2_South Pittsburg, Tennessee

Located outside of Chattanooga, English Investors once purchased land to be a manufacturing hub in the Sequatchie Valley. [1] With a rich history, including Civil War significance, South Pittsburg was known for steel and coal mining and production.

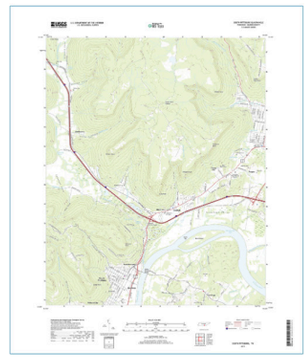
The railroad network connected South Pittsburg to other regional communties, as well as Nashville and Chattanooga. However, when the Tennessee, Coal & Iron Railroad Company moved to Birmingham, Alabama at the turn of the 20th century, population declined. [2]



1936



1943



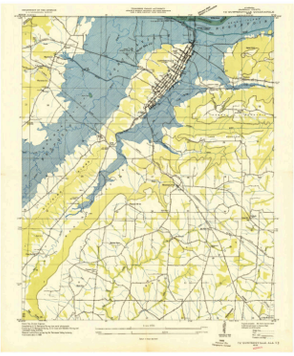
2019

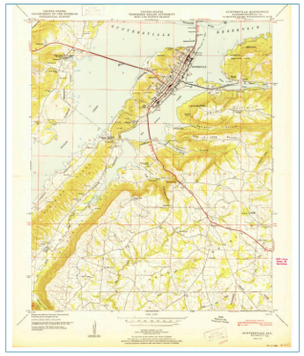
1. Dennis Lambert. *The Birth of South Pittsburg, Tennessee*. South Pittsburg, TN. South Pittsburg Historic Preservation Society. n.d.
2. Lambert. The Birth of South Pittsburg, Tennessee.
Images: South Pittsburg. Source: USGS. (L to R) 1936, 1943, 2019.

04.3_Guntersville, Alabama

Guntersville was founded through the 1835 New Treaty of Echota between the US Goverment and the Cherokee Nation, originally called Gunter's Landing. A few years later, Guntersville served as an embarkation point on the Trail of Tears. [1]

After destruction from the Civil War, Guntersville was rebuilt quickly in large part to its proximity to the Tennessee River. In the 1930s, the TVA "brought further prosperity to the area as well as low-cost electricity to the town". [2] Also supported by the backbone of the railroad, with flux and transition of that industry, the community has transitioned as well, with main industry now shifting from railroad transit to lake and recreational tourism.


1936


1950

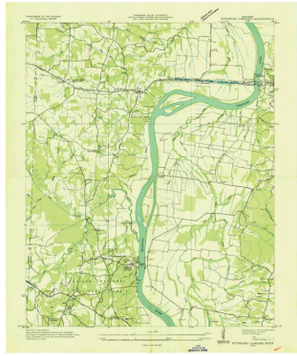
2018

1. James P. Kaetz. *Guntersville*. Guntersville, Alabama. Encyclopedia of Alabama. February 3, 2010.
2. Kaetz. *Guntersville*.
Images: Guntersville. Source: USGS. (L to R) 1936, 1950, 2018.

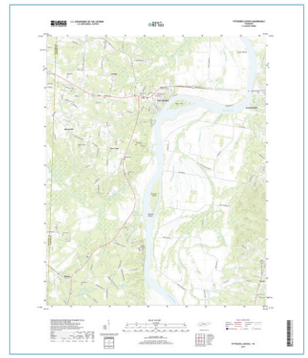
04.4_Savannah, Tennessee

History dating back to prehistoric times, Savannah, has been reliant on the Tennessee River for centuries. From the early moundbuilders to Revolutionary War veterans to conflicting Civil War views, the backbone of development has always been the River.

Industries for stone, grain, timber, and minerals have capitalized on geographical advantages, especially throughout the last 200 years, and although still transitioning, existing industry remains stable, with tourism rising recently. [1]


1936

1972

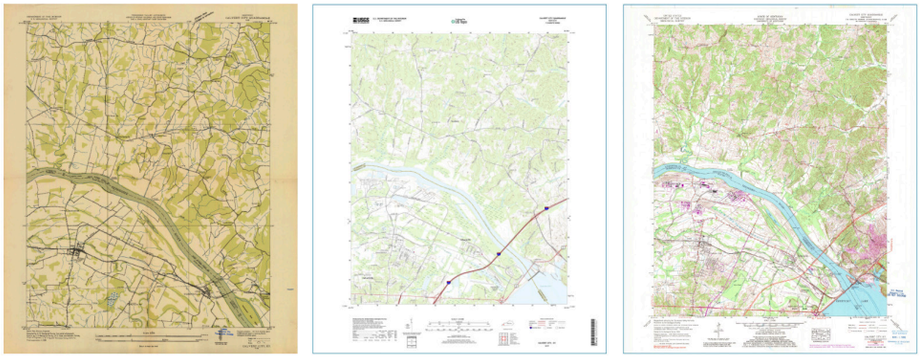

2019

1. James B. Phillips. *Hardin County*. Savannah, TN. Tennessee Historical Society. October 8, 2017.
Images: Savannah. Source: USGS. (L to R) 1936, 1972, 2019.

04.5_Calvert City, Kentucky

Another River town with its roots deep in the railroad, land was first developed for a railroad station, providing the spark for the city needed to blossom. A conflicting racial history, at one point not even allowing African-Americans to reside there, it was known as a "sundown town". [1]

Due to the construction of the Kentucky Dam, development of commerce and industry attracted many chemical plants due to newly accessible and plentiful electricity. [2]



1936 1958 2019

1. Triposo. *Calvert City History*. Calvert City, KY. Triposo.com. n.d.
2. Triposo. *Calvert City History.*
Images: Calvert City. Source: USGS. (L to R) 1936, 1958, 2019.

05_Proposal

How can an inquiry into wicked problems in the Tennessee River region be alleviated by architecture? How can this be done sensitively without disrupting senses of place and culture that are essential to the identity of the place?

The investigation will use temporary, floating architecture to create urban spaces to be shared by each selected community. These can be transported up and down the river in accordance to need, in a similar manner to current industry, which is already so important to the region. Program will vary to create a "corridor of urbanism" in an unconventional way, giving each community an opportunity to access urban, public space.

The effort will be a progressive approach to the urban environment of communities, and will introduce veins of public space in areas it might not be optimized, as well as questioning the conventionality of site. Communities will be a part of something bigger than themselves, and the connectivity throughout the river system will unite the region to help develop the corridor economically, culturally, socially, and environmentally.

05.1_Alternate Reworking

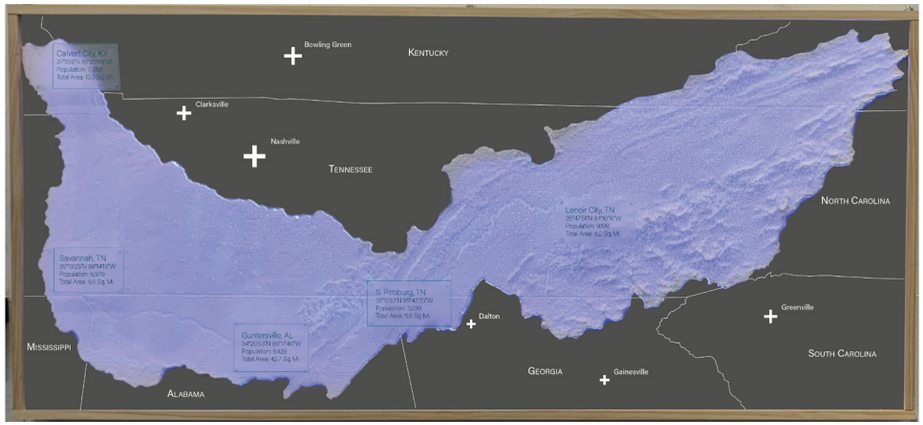
Other than the presented approach, there are a few other methods or avenues to retool the project.

A historical map-making emphasis could be taken, studying the River and how it has changed, which is the first part of this investigation. This could be more detailed and could lead to other claims on a historical or cultural level.

A construct-heavy approach could highlight the water as a dynamic system. Both in lateral movement of vessels and in water levels of the river.

A critique could be made of TVA and the organization's effectiveness in the 21st century. Alternate realities and speculative futures regarding the future of TVA, as well as hypothetical scenarios of apocalyptic ends could redirect the investigation to a different scale.

Part 2

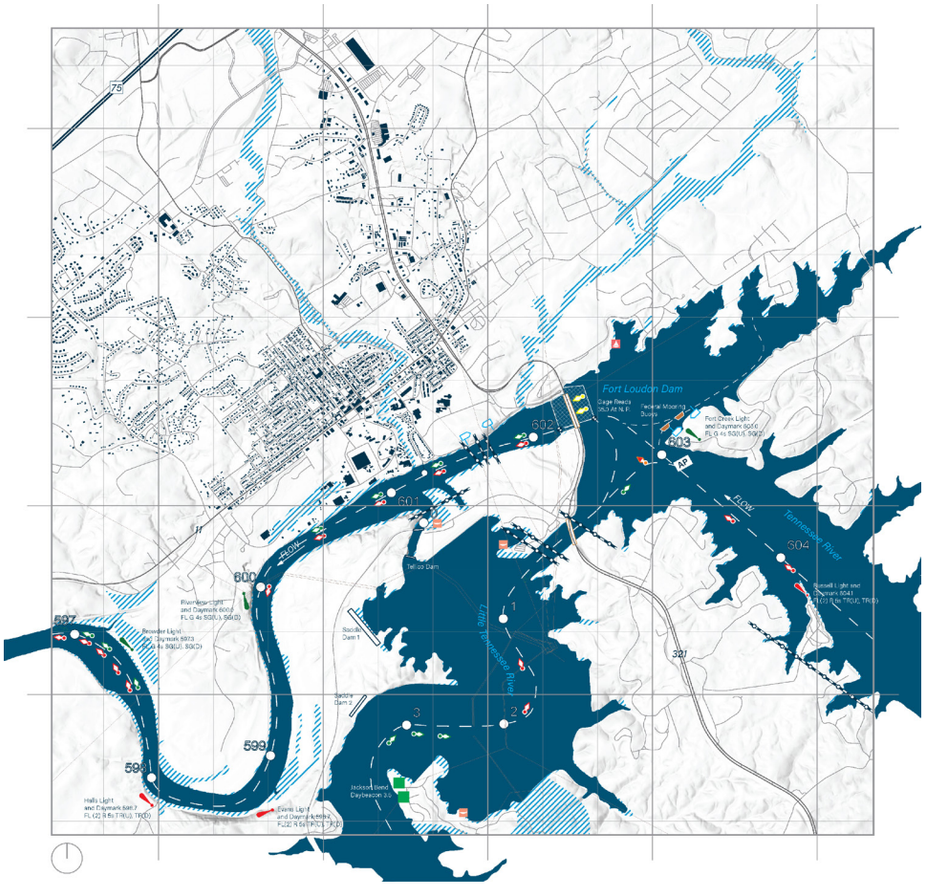


01_Site Investigation & Analysis

Throughout the preliminary investigation, the tenative site was the Tennesssee River watershed, both as a mega-region and a connection of individual community nodes that make up a larger context.

Early in the final investigation, it became apparent the importance of understanding the River as it moves through the watershed on a large scale. Left, a construct was buit to show the topographical and geographic relationships between the different communities within the region.

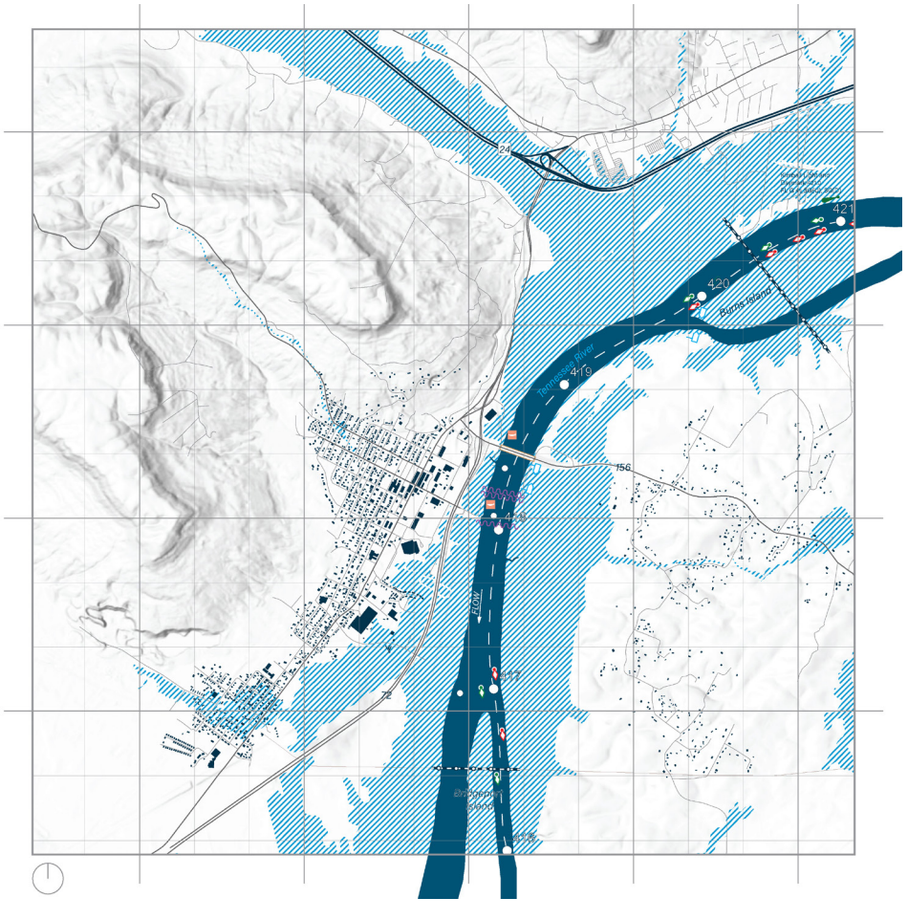
Following, studies of each community were conducted, investigating the River's relationship to the urban fabric.



01.1.1_Lenoir City, TN

Just downstream of Lake Loudon, where most of suburban west-Knoxvillians reside, Lake Loudon is a slightly less-dense suburb town, where wealthy mc-mansion owners blend with recreation users from nearby small, rural towns for Lenoir City's established water access points, dam proximity for fishing, and infrastructure access.

Due to these different demographics utilizing the city, urban space in the downtown is secondary to acquiring the best land for a gas station or Super-8. Like in other rural river communities, the downtown would benefit from increased traffic and cash flow, but a unified industry draw would allow the downtown to engage the riverfront. That utilization would connect the city to the River in better ways than the current state, and would lead to a consequent downtown revitalization to allow all demographics to blend together and be a part of one community.



01.1.2_S. Pittsburg, TN

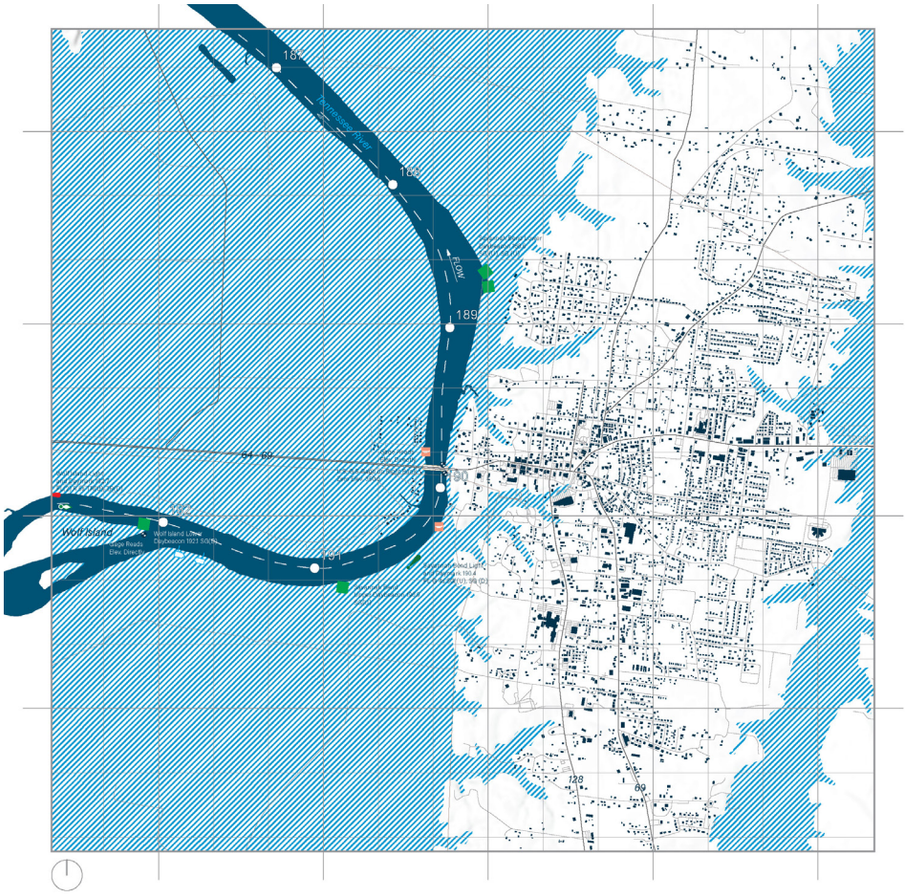
South Pittsburg faces many challenges. Aging population, little industry, and blight of young people are all serious problems within the city.

Located on a fast-flowing section of the River, there aren't many recreational access points, and nearby Bridgeport, Alabama is in a much more strategic location. South Pittsburg is located in an interstate junction, located in close proximity to Chattanooga, Tennessee and Huntsville, Alabama. Although not an ideal location on the river for a port, how could the interface between the interstate and the River be catalyzed by the city, helping transport goods through multiple transportation methods, and bringing consumer traffic into the city, which most importantly, provides cash flow.

01.1.3_Guntersville, AL

The only community within the investigation located on a peninsula, Guntersville is surrounded by mountain foothills, state parks, and forests. Recreation is a tremendous draw to the area, and bass fishing is king. Guntersville Lake is known as one of the premier bass fishing destinations in the world. Recreation tourism and hospitality thrives in Guntersville, however other industry is secondary. Some might say Guntersville is a seasonal city.

A city seemingly intertwined with the River is seeking developing industry in other sectors, to diversify and bring new residents to the city. A major barge hub with boats coming west from the mountains, offers potential for industry catalyzation.

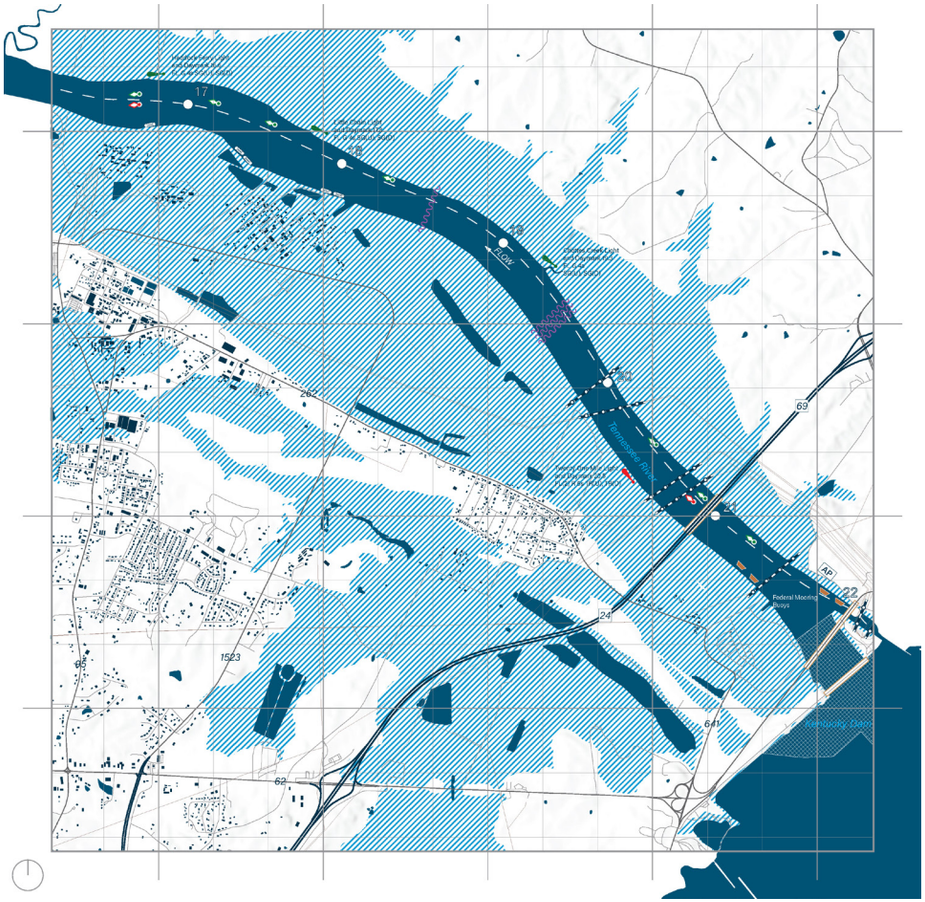


01.1.4_Savannah, TN

As the Tennessee River meanders through west Tennessee, it comes upon a small town as it flows north towards the Ohio River. A city with rich history, starting with the early settlers in the state, was originally a ferry destination, as the river is narrow enough to cross, and surrounding topography is forgiving.

A city always in-tune with the river, TVA's construction of nearby Pickwick Dam allowed increased flooding control and electricity generation, as well as jobs for the surrounding area.

Currently, population growth is stagnant, there is no diversified industry, and residents are aging. The River has always been an asset to the community, but new innovation must recatalyze that connection that has arguably grown stale.



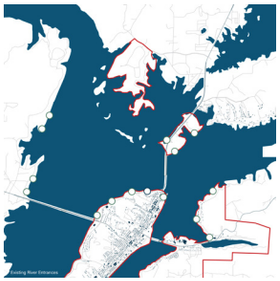
01.1.5_Calvert City, KY

The western-most community in the investigation, Calvert City lies on the south bank of the Tennessee, outside of Paducah, Kentucky. In the mid to late 1900s, Paducah was the site of the Paducah Gaseous Diffusion Plant, a sister project to the Manhattan Project in Oak Ridge, Tennessee. Each facility was identical to allow for seamless progress during a possible attack on one of the facilities.

As nuclear development has waned, chemical plants and raw suppliers dominate the waterfront, and is underutilized by its citizens. Living in the shadow of nearby larger Paducah and recreation-rich Gilbertsville and Kentucky Dam Village, Calvert City faces its own unique set of problems. However, taking advantage of its main asset, the Tennessee River, could spurn the economy and make the city a destination.

Lenoir City, in its close proximity to Knoxville, as well as its adjacency to a TVA Dam, has a heavy TVA presence in terms of land ownership. The hatched region shows TVA's land ownership in relation to the urban center. This presents a unique challenge in activating the riverfront.

South Pittsburg is located just south of Interstate 24, a major distribution channel from Chattanooga to Nashville. Industry has the potential to take advantage of affordable land prices and easy interstate access. South Pittsburg is located in a very fast-flowing section of the River, where docks, lake houses, and marinas aren't common. However, there are two existing recreational entry points shown.



As previously mentioned, Guntersville has plenty of river engagement opportunities that already exist. Contrasting to communities such as Calvert City where those are sparse, this is a strength to the community. Guntersville as a recreation center is also a strength to the area, and has the infrastructure to support new industry.

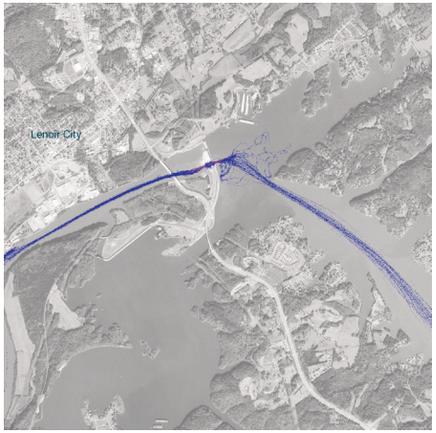
Agriculture is the primary industry within Savannah, and most of the opposite side of the river is farmland. This presents unique conservation challenges in protecting the River, as farmland has widely been viewed as harmful for river ecology and biodiversity. The distance of unprogrammed waterfront in Savannah is an asset, as the community is a "clean slate".

Riverside chemical plants and raw good suppliers separate the city from the Tennessee River. Competitive Paducah, Kentucky Dam Village, and Gilbertsville compete and take Calvert City's outdoor users, leaving the River a bleak landscape.

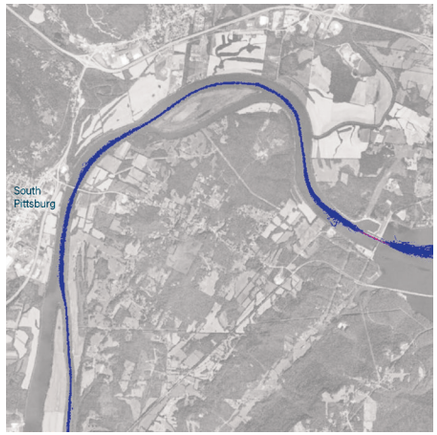
01.2.1_Site Conditions

Although the proposal is seeking to develop a shared infrastructure along the Tennessee River, each community investigated has unique strengths and weaknesses.

Site conditions are crucial in understanding the River's relationship to each city, and how that relates to the region as a whole. Left, diagrams show conditions unique to each community that attribute to its population, demographics, culture, and urban outlook.



Lenoir City, TN



South Pittsburg, TN

Guntersville, AL

Savannah, TN

Calvert City, KY

01.2.2_Commercial Traffic Density

The Tennessee River is a major commercial shipping asset for supply chain systems in North America. Although the upper Tennessee doesn't see as much shipping traffic, towns from South Pittsburg, downstream see barges hauling raw materials, chemicals, and agricultural supplies daily. Guntersville has drop-off locations and tie off points, and Calvert City is an interchange location for cargo-tradeoffs.

The diagrams on the left highlight the importance of each destination to the barge supply chain system, and the importance of understanding these interactions at various points along the River.

01.2.3_Mooring Locations

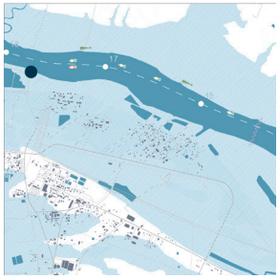
One of the main goals of the project is to catalyze urban renewal through reactivation of the riverfront. As a result, the moments where conventional and aquatic urban spaces merge are pivotal. These studies seek to locate specific locations within each city that would allow the city to embrace new changes and be the most beneficial for renewal.

Lenoir City's proposed mooring location is downstream of Fort Loudon Dam, where an existing boat ramp already exists. The location seeks to capitalize on existing traffic to this area of the city and expand it to become more vital to the urban fabric of the city.

South Pittsburg's proposed location is on axis with a major street in the downtown. In an effort for the various aquatic interventions to spark a downtown renewal, specifically critical for South Pittsburg, it is critically important for this axis to develop.

Guntersville has ample opportunities for river engagement. The east side of the peninsula is primarily commercial traffic, and west of the highway bridge is where the waterfront transitions into public space. Located where these interfaces intertwine, one of the goals is to blend commercial and public space, resulting in a more unified city.

A large portion of the riverfront around Savannah is in a 100 year floodplain, which must be taken into consideration when designing a waterfront interface. The proposed location, south of one of the main entrances into the city, seeks to extend the city to the river, as the highway extends west from the city.



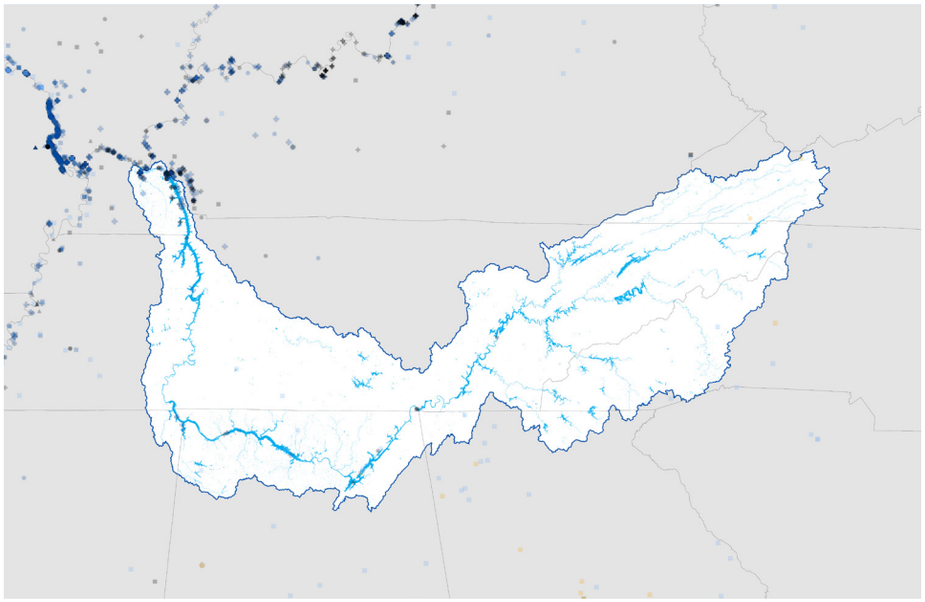
The entire waterfront is in a 100 year floodplain in Calvert City, and there is little public use. Most of the occupation is by chemical plants and other river-related industry. However, a public boat ramp at the specified location is one of the few recreational entry points, and the effort will capitalize and expand outward from this location, taking advantage of the industrial river vernacular along the shores.

01.2.4_Invasive Biology

In designing profitable and constructive interventions for processing and capturing Asian Carp, it is important to understand their behavior as a species.

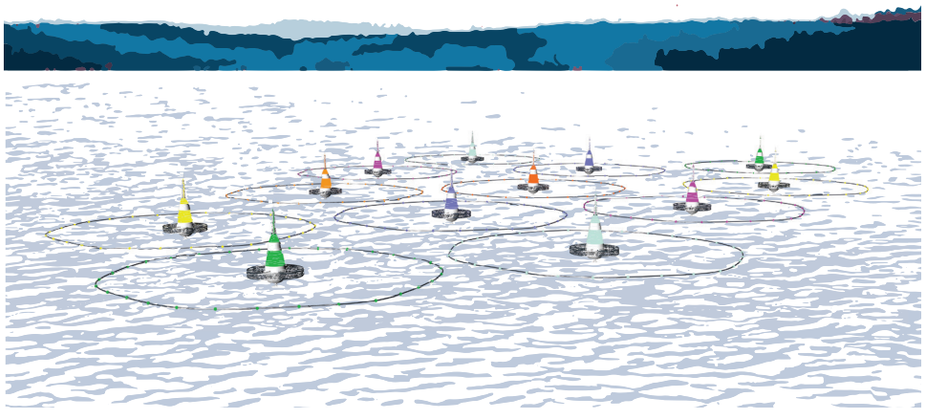
Studied in intial research, Asian Carp filter feed, and out compete native fish for resources. They multiply exponentially, and in some waterbodies, making up 90% of the biomass. Shoaling behavior includes feeding in the shallows, and the easily startled fish leap out of the water when startled, often injuring boaters (MAISRC).

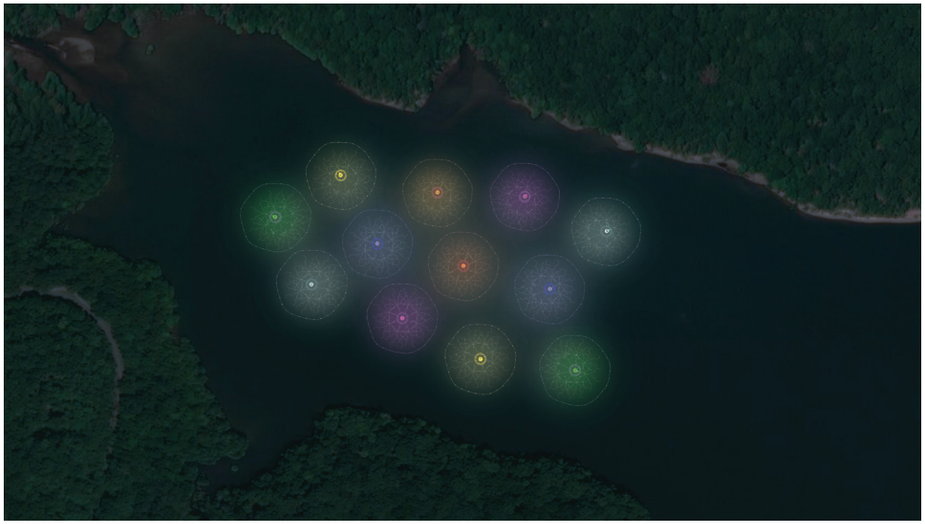
Separating these fish from recreation areas of the River and ultimately catching them requires a strategic process and series of methods.



01.2.4_Invasive Biology

Left, a diagram shows the presence that Asian Carp already have in regional waterways. Much of the Mississippi, Ohio, and Illinois rivers are already riddled with Carp. Within the watershed, a small presence has been discovered in Kentucky Lake, but other than scattered appearances in tributaries and lakes along the Tennessee, infiltration hasn't taken place, but that is rapidly changing, as Carp have been found as far east as Chickamauga, near Chattanooga.





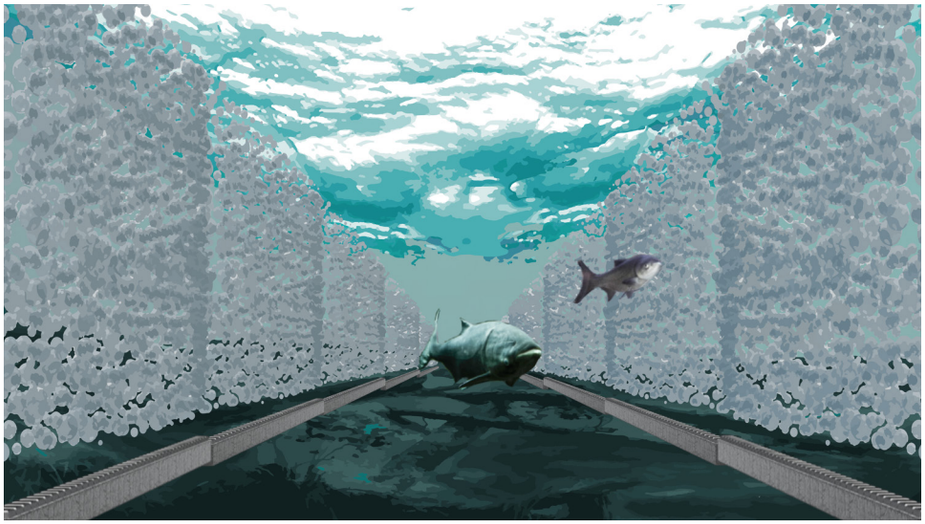
02.1_TopCarp

Left, a perspective view from a boat shows a configuration of shocker buoys with tentacles that reach into the water. Taken from earlier studies into the Jellyfish Barge, where tentacles brought water up into the urban garden, bringing life to the plants, the shocker tentacles follow that same language, where the buoys help purify the water. Bottom left, a configuration plan shows an example layout for the buoy field.

After temporarily stunning the fish, users can shoot them in a conventional bowfishing method to earn points and compete with other boats.

Drawing from the popular TopGolf, the activity will be called TopCarp, in hopes of using tourism to catalyze water purification by helping provide a fun way to remove fish from waterways.

TOPCARP

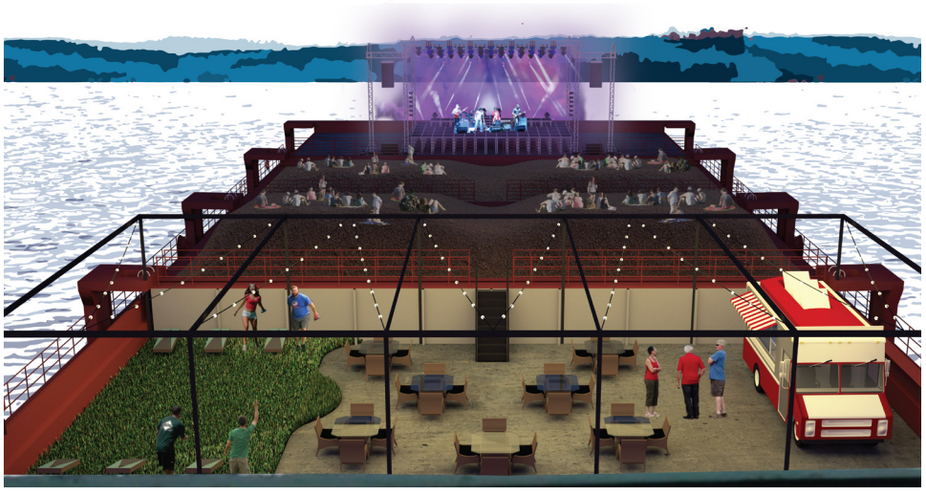


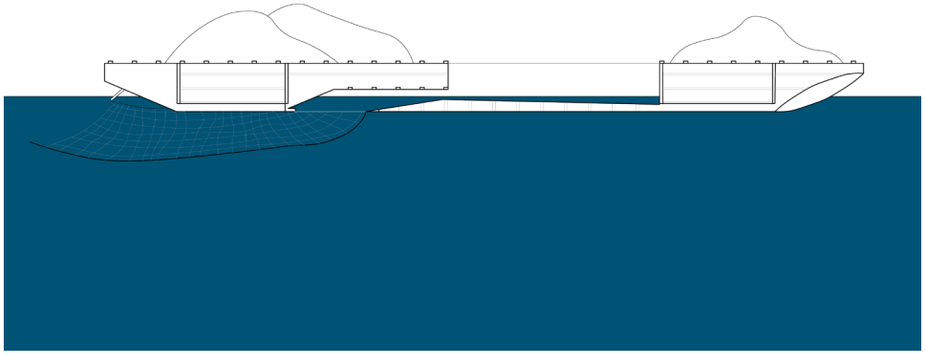
02.2_Bioacoustic Fish Fence

A method that is currently starting to be used by state and federal officials is the bioacoustic fish fence. A system emulating a bubble screen and loud noises, the screens currently exist as barriers and walls, in efforts to prevent fish from entering waterways, primarily currently in use at Kentucky Dam.

Instead of acting solely as a barrier, how could these fish fences be used as installations within the Tennessee River, to lead Carp into strategic locations for removal?

The system is redesigned into a lighter construction to create a lane for the fish within the larger context of the River.



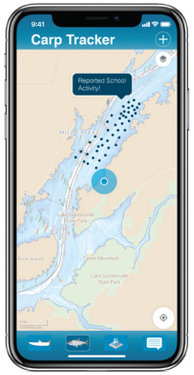


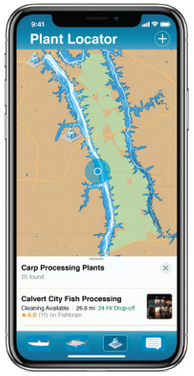
02.3_Concert Netting

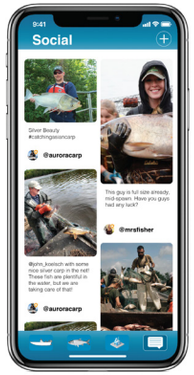
Due to Asian Carp resistance to traditional fishing bait, one productive strategy is netting. Due to the infeasability of isolating each waterbody within the Tennessee River due to commercial traffic, breaches and vulnerabilities occur at TVA dams.

Barge traffic is infrequent in the upper-Tennessee, so the strategy utilizes the traditional barge as floating, mobile urban space, capable of traveling to cities in the entire system, with the potential for large-scale program components such as concert staging equipment, to be shared and pooled by multiple towns.

Below the water's surface, a filter system dredges a net in front of the barge. Attracted by the moving water from the barge and the deep riverbeds in which barges travel, Carp are trapped in the nets and are taken inside the body of the barge, where excess water is pumped out. The process is similar to the filter-feeding methods by which Carp eat. From there, the fish can be sorted and transported to processing facilities. A section is shown of the system to the left.





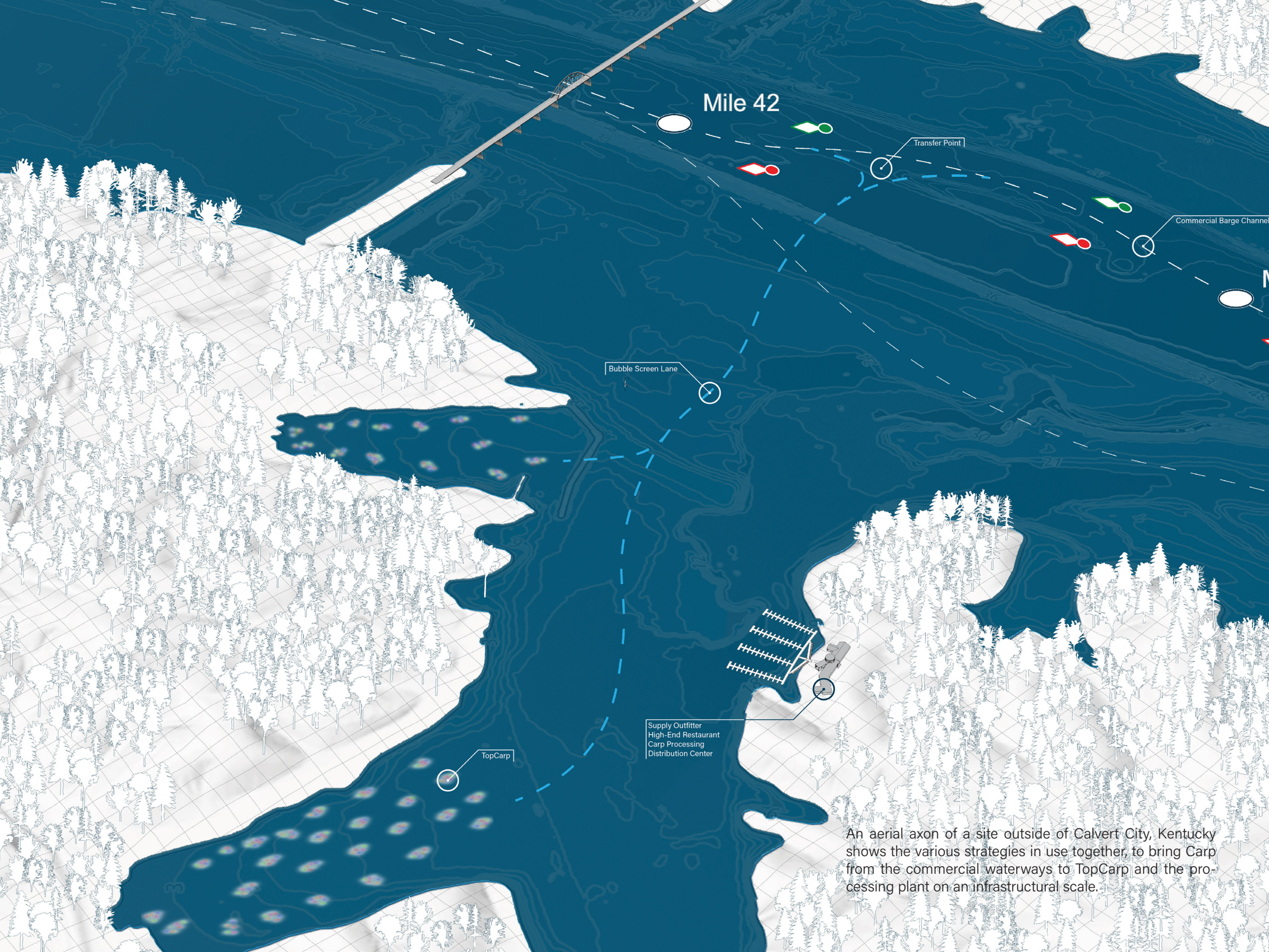


02.4_Farm-To-Table Processing

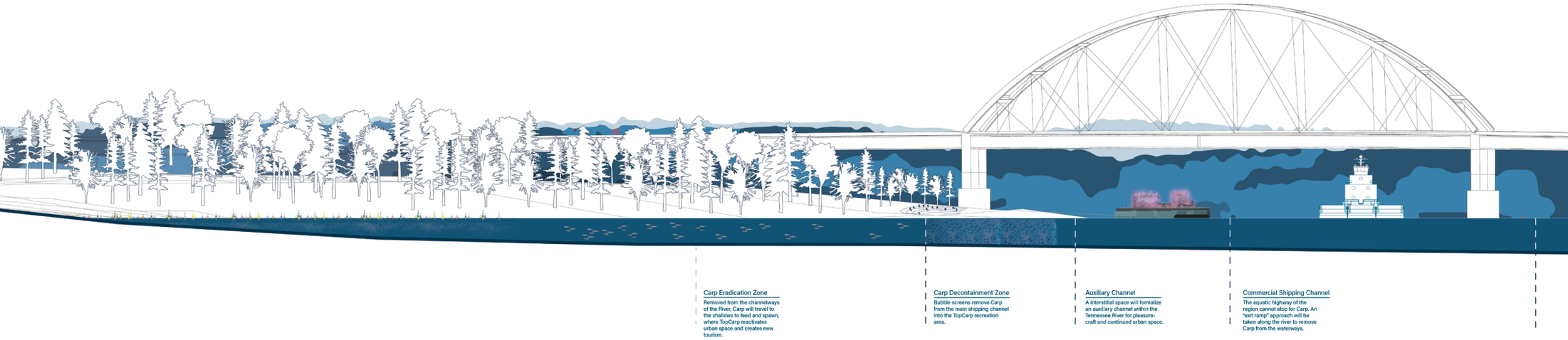
After a series of methods to control, route, and capture the Carp, a farm-to-table concept proposes processing facilities to partner with supply shops and luxury restaurants. This effort will support and equip Carp enthusiasts and will capitalize on access to the River for quick catch-to-table turnaround. One of the important considerations for marketing Asian Carp as a commodity is the fresh availability of the meat, and the facility seeks to capitalize on that.

Left, a view of a proposed on-land processing facility, restaurant, and supply store is shown. High-end anglers will interact with commercial fishermen, who will experience fish cleaning as an industrial process, in conjunction with a fine-dining restaurant. The space seeks to catalyze blending of these different demographics.

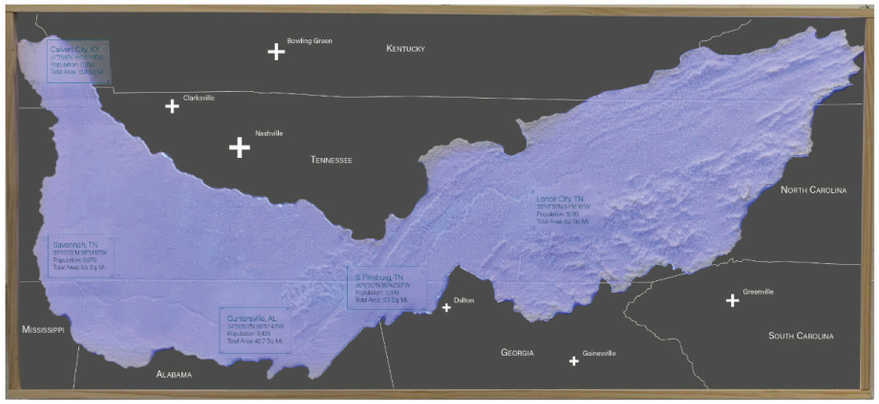
Asian Carp are not viewed as a delicacy within the United States currently, and that is in large part due to the branding. The invasive nature of the species deters many potential consumers. Left, four screenshots of an app development seek to organize Asian Carp catching and hunting, all culminating in this space, to raise the price floor of a future luxury food commodity.

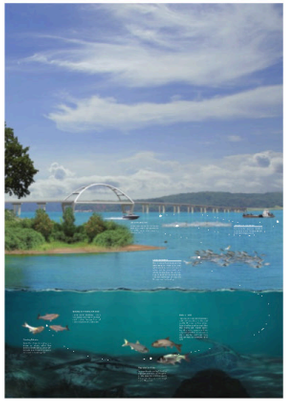


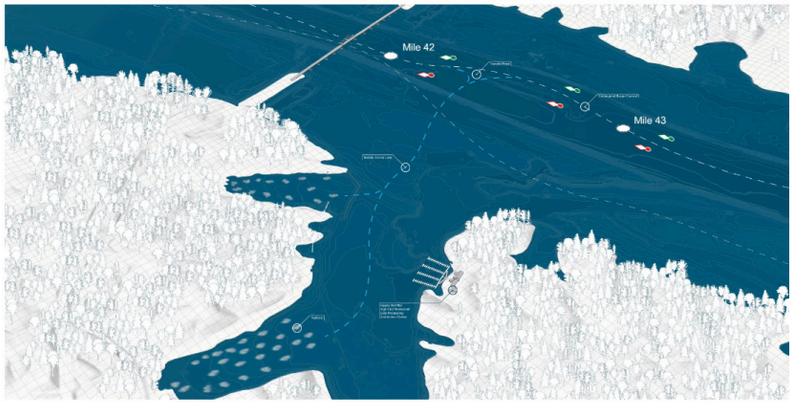
An aerial axon of a site outside of Calvert City, Kentucky shows the various strategies in use together, to bring Carp from the commercial waterways to TopCarp and the processing plant on an infrastructural scale.



A section shows the relationship between the commercial barge channel and some of the various interstitial zones that begin to develop as a result of the proposal.


Bowling Green
Kentucky
Clarksville
Nashville
Tennessee
North Carolina
Lenoir City, TN
Population: 6000
Total Area: 62.56 Mi
Savannah, TN
Population: 6870
Total Area: 65 Sq Mi
S. Pittsburg, TN
Population: 3000
Total Area: 0.5 Sq Mi
Guntersville, AL
Population: 8400
Total Area: 42.7 Sq Mi
Dalton
Greenville
Mississippi
Georgia
Gainesville
South Carolina
Alabama

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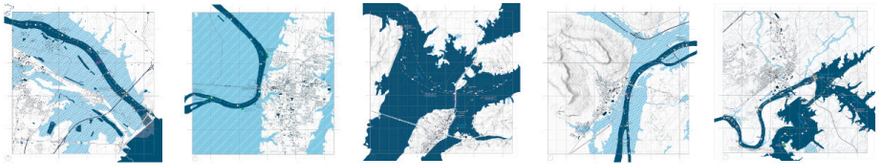
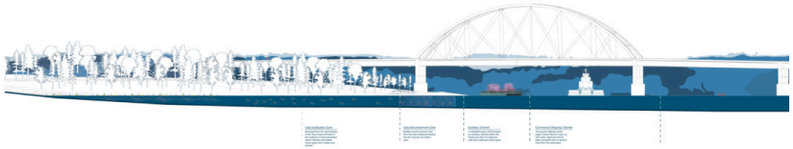
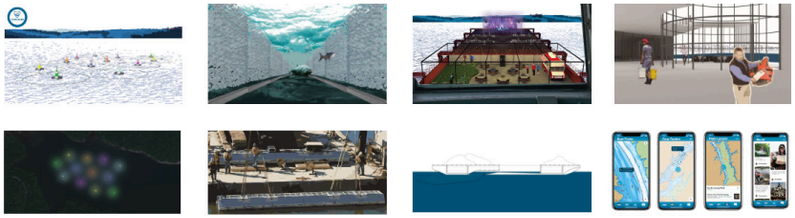




Calvert City, KY
Savannah, TN
Guntersville, AL
S. Pittsburg, TN
Lenoir City, TN

Abstract



03.0_Conclusions & Reworkings

Although the project was effective in programming typologies that could be used throughout the Tennessee River, one thing that the thesis did not investigate is the time component of invasive species inhabitation. Imagining a speculative future of varying extremes could have challenged the design, as well as opened new doors for investigation.

Additionally, most of the programmed interventions in the project were adaptations of existing infrastructure and were designed processes, where the spatial implications were secondary. Supplemental investigation could be conducted that pushes the architecture within the project, and creates moments where architecture interacts more with each specific intervention.

Developments were made in a typologic sense that could be applied to multiple communities within the Tennessee River watershed, which was intentional. However, in doing so, aspects of the project lost the specificity that was apparent in the first part of the project. Additional explorations could embrace the typological interventions regarding Asian Carp, but form bridges back to the communities in which they would be located.

06.1_Appendix

Vitruvius Pollio., and M. H. 1859-1910 Morgan. Vitruvius: *The Ten Books On Architecture*. New York: Dover Publications, 1960

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