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The Wilson Bay Initiative, Riverworks, and the Sturgeon City Partnership: A Case Study for Building Effective Academic-Community Partnerships

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Abstract

This article describes North Carolina State University's Sturgeon City partnership, which has transformed an urban brownfield site into a community civic, recreational, and learning resource. The project was recognized in 2010 with the C. Peter Magrath Community Engagement Award and the Outreach Scholarship W. K. Kellogg Foundation Engagement Award for the Southern Region.

Introduction

Sturgeon City is a community greenspace and environmental education site located on the New River in Jacksonville, North Carolina. In addition to hosting a habitat restoration program, the site serves as an estuarine riverside classroom, economic incubator, and civic learning and meeting place for the region. Sturgeon City hosts many civic and community partnerships, as well as extended engagement activities with its academic partner, North Carolina State University (NC State), and other North Carolina universities. Sturgeon City's development and programs reflect the belief, shared by its partners, that environmental stewardship is compatible with local economic development *(Levine, 2011)*. Sturgeon City serves as a case study of how to build an enduring and effective academic community partnership.

The Evolution of the Sturgeon City Academic-Community Partnership

The Sturgeon City partnership began more than 16 years ago in 1995. In the following sections, the authors provide the context and recount the history of the partnership and its outcomes.

The Geographical Context

Jacksonville, located in Onslow County in eastern North Carolina, was a small town of approximately 800 until the United

States (U.S.) Marine Corps Base Camp Lejeune was established in the county in 1940 *(Watson, 1995)*. The city has grown, and is now considered home to more than 80,000 *(US Census Bureau, 2011)*. Wilson Bay, located on the New River in Onslow County, North Carolina (Figure 1), was historically a recreational water resource for the residents of Jacksonville.

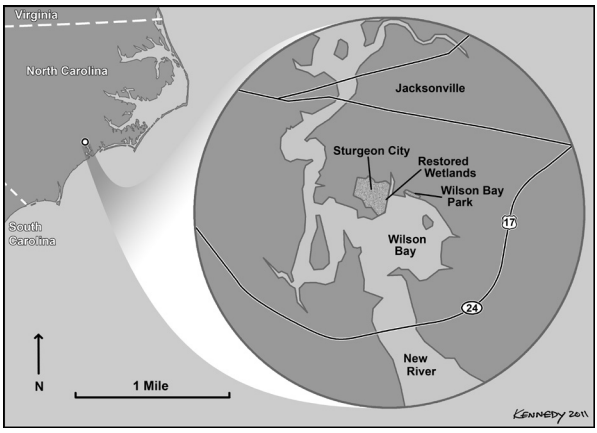

Figure 1. Location of Sturgeon City and Jacksonville, North Carolina, in Onslow County on the North Carolina Coast

Throughout the early and mid 20th century, Wilson Bay and the New River were a focal point for boating, fishing, swimming, and commercial fishing *(Murrell & Murrell, 2001)*. The bay, which is located at the fresh water and brackish water interface in the river, once supported a broad range of aquatic species. However, Wilson Bay also served as the discharge site for Jacksonville's municipal waste treatment facility. Eight additional treatment plants, one a short distance above Wilson Bay, and the others farther downriver, served local military bases. As the city and military base populations grew, the plants proved inadequate to handle the growing volume of wastewater.

Discharges from the plants and runoff from communities degraded water quality, and the bay was closed to recreational use and commercial fishing. Levels of fecal waste routinely exceeded environmental sanitation standards. High loads of organic material accelerated the euthrophication of the bay, depleting oxygen levels on the bottom and markedly reducing its ability to support bottom-dwelling organisms *(Jónasson, 1969)*. Six treatment plants operated by the U.S. Marine Corps were consolidated into a modern tertiary treatment facility, and a seventh was upgraded. Subsequently, to

accommodate the growing needs of the community, the City of Jacksonville invested $50 million to develop a land-waste application system for its waste, and closed the municipal waste facility located on Wilson Bay *(City of Jacksonville, 2011)*. Decommissioning the wastewater treatment plants was the first step toward the recovery of Wilson Bay and the New River.

A Civic-Community-University Partnership is Established

Municipal and community interactions with academic institutions frequently originate from problems that impact a community *(Bringle & Hatcher, 2002)*. The effort to support the recovery of Wilson Bay began as an outgrowth of a faculty member's research efforts with the North Carolina Division of Marine Fisheries. A declining commercial oyster industry heightened interest in oyster farming as an alternative to oyster harvesting. A cooperative technology exchange program funded by the Florence Gould Foundation was established to introduce North Carolina commercial fishermen to techniques being used to grow oysters in France, an international leader in oyster production. Concurrently, Coastal Carolina Community College (Community College) in Jacksonville, North Carolina, had developed an aquaculture technology program with Dixon High School in Onslow County to introduce students to techniques that can be used to farm oysters. A chance interaction at an aquaculture development meeting brought the NC State University faculty member coordinating the French exchange program together with the Community College program sponsors and teachers. This was the origin of the Wilson Bay–Sturgeon City civic-community-university partnership.

Grower forums for potential oyster farmers were hosted by NC State and the Jacksonville-Onslow Economic Development office, and a sister-community program was established with a town with a history of oyster farming, La Tremblade, France.

The Wilson Bay Water Quality Initiative

The challenge of restoring Wilson Bay was posed after the return from one of the visits to France. Jacksonville's local economic development office director at the time, Walter Timm, an NC State alumnus, recognized how the public's view of the degraded bay ecosystem limited entrepreneurial interest in the adjacent "old downtown" Wantland business and residential district. He and the NC State faculty member with whom he had traveled to France

began to build a cooperative program to support the restoration of Wilson Bay. Initial activities focused on identifying potential key partners with expertise needed to design and implement the restoration effort, and on acquiring grant funds to support the initiative.

Jacksonville is adjacent to U.S. Marine Corps Base Camp Lejeune, and its economy reflects the benefits and struggles of a typical military-support town *(Murrell & Murrell, 2001; Watson, 1995)*. A community summit was held to discuss the views and aspirations of Jacksonville residents for the city. Jacksonville residents articulated the importance of the adjacent New River and Wilson Bay to the city, and the need to meet the challenge of cleaning up the river, a challenge that the mayor at the time, George Jones, viewed as a "moral responsibility." The partnership between Jacksonville and NC State was initiated to help restore the Wilson Bay ecosystem. Funds ($572,000) were obtained from the North Carolina Clean Water Management Trust Fund for the restoration effort.

Support from the university took many forms, including faculty and staff project oversight and active participation in field activities; laboratory analytic resources; and access to boats and equipment for field implementation. Local community forums were held with residents of a subdivision located adjacent to the bay to educate them about the effects of stormwater on the bay ecosystem as well as to garner their commitment to take ameliorative actions in their community. Engineered stormwater devices were installed. Local residents established rain gardens.

Building on the project coordinator's experiences in France, a large-scale effort using oysters as living filters to improve water quality was also initiated to help the recovery of the bay ecosystem. Degraded wetlands around the perimeter of the wastewater treatment plant were cleared and replanted with native species to provide additional nutrient processing and support the recovery of the bay.

Additional partners were engaged that could provide complementary expertise. The U.S. Marine Corps aided the effort by providing funds to conduct a survey for potential pollutants in the bay, and to remove an old Marine Corps creosote-treated dock. More than 400 pilings leaching polyaromatic hydrocarbons into the bay were removed. Wilson Bay Park, a wooded recreational greenspace, was resurfaced to improve soil infiltration, the bulkhead was restored, and a new boardwalk was constructed.

Large aeration units designed by Battelle Institute were purchased to improve circulation within the bay. Battelle provided

a support team to ensure appropriate placement of the units and monitor the outcome of their installation.

Grants and direct payments from the State of North Carolina's Wetlands Restoration Program provided funds to expand the reestablishment of wetlands around the bay. The restored wetlands transformed the bay's appearance. Students from throughout the community became actively involved in the process. Middle school, high school, and community college students have helped with monitoring oyster growth, sorting and bagging oysters to be placed in the bay, and replanting the wetlands. Student volunteers have logged more than 10,000 hours of community service time in support of the water quality initiative and efforts to restore the wetlands.

"Student volunteers have logged more than 10,000 hours of community service time in support of the water quality initiative and efforts to restore the wetlands."

With the improvement of the Wilson Bay ecosystem, oxygen levels now consistently support bottom dwelling aquatic life in the bay, which is once again used for commercial and recreational fishing and boating. The restored wetlands are now a haven for waterfowl and other coastal wetland wildlife. These wetlands also support the environmental education mission of Sturgeon City by providing a living classroom for student exploration and hands-on learning.

The Founding of Sturgeon City

The NC State team's familiarity with the decommissioned waste treatment plant site kindled the idea to repurpose it as a coastal center for recreation, and for civic and environmental education. The team realized that the treatment plant's tanks could be used to rear native endangered fish and other species, so that the site could support endangered species conservation, environmental education, and outdoor recreation. The NC State team encouraged Jacksonville City's economic development coordinator, mayor, and city council members to abandon demolition plans for the brownfield site and consider its alternative reuse. The mayor and city manager recognized the potential of this proposed transformation. The project could build civic pride and, perhaps, encourage

young people to stay in Jacksonville. The argument that environmental stewardship is compatible with local economic development *(Levine, 2011)* supported efforts to promote the idea to other city officials. The repurposed site would serve as a celebration of the New River as a natural resource and as a seedbed for urban renewal.

To develop alternative visions for the site, NC State College of Design faculty organized community charrettes. Students in a semester-long design studio course developed a variety of plans, which were presented to the city council and public. The vision to readapt the site was embraced, and a civic-community-university partnership evolved. A steering committee was established to move the project forward. The student designs were reviewed, and although no single design was selected from those presented, individual elements were carried to the next stage of discussion. An architectural consultant with prior experience developing waterfront projects was brought in to coalesce the ideas, and create a visual representation that could be used to build community support for the idea.

Sturgeon, an imperiled prehistoric-like fish native to the New River, and once popular as a game fish, were selected as a novel species identifier for the project. The city manager at the time, Jerry Bittner, coined the name "Sturgeon City" for the site. Funds were secured from the North Carolina State Parks and Recreation Trust Fund, the North Carolina Department of Tourism, other agencies, and community business partners. City leaders formalized Jacksonville's commitment to the project by providing $4 million, and by establishing a nonprofit, Sturgeon City of Jacksonville, Inc., to support project development. An executive site director was hired. Adjacent land was purchased by Jacksonville to protect the land from development, and to extend the park's borders.

A professional landscape design firm and an architectural and engineering firm were hired to establish the design plans needed to convert the decommissioned wastewater treatment plant into a functional asset for Jacksonville's residents. A multifunctional facility with an aquarium that celebrated the New River, its species, and its ecosystems was envisioned that would also include classroom and meeting

"The goal was to retain a sense of history as well as the industrial nature of the wastewater treatment plant."

room space. The goal was to retain a sense of history as well as the industrial nature of the wastewater treatment plant. The site's administrative building was renovated and now houses Riverworks offices, and serves as a civic meeting place. The building also features a 40,000-gallon recirculating aquarium system with exhibits of sturgeon, gar, and bowfin.

The Site Today

Three universities, two community colleges, Camp Lejeune Marine Corps Base, the New River Foundation, numerous local businesses, and local residents have united in a partnership that has transformed the 26-acre site. Although the metamorphosis is not complete, the site is frequented by city residents for walks and picnics, and by school groups for hands-on science education sessions. Located on site are paths for walking and jogging, a playground, and an extensive boardwalk that passes through the wetlands of the site and progresses through adjacent wetlands to a local elementary school. The site also supports university-led applied research, graduate training, and the transfer of aquaculture technologies to the business community.

Sturgeon City is also supporting efforts to conserve Jacksonville's natural heritage by working to encourage the protection and reestablishment of native species that have been depleted or displaced from the New River. One effort funded by the National Oceanographic and Atmospheric Administration focuses on establishing artificial reef habitats for aquatic species in Wilson Bay and the New River. Another focuses on rearing aquatic vegetation (*Ruppia spp.*) to restore natural vegetation beds in rivers that serve as habitat for numerous estuarine species *(Wyda, Deegn, Hughes, & Weaver, 2002)*. Between 2008 and 2011, 35 million seeds were collected from other coastal habitats in North Carolina, and Ruppia spp., red-head (*Potamogeton perfoliatus*), and sago pondweed (*Potamogeton pectinatus*) grasses have been grown and planted in the bay.

Sturgeon City Institutes. Sturgeon City Institutes were established to provide summer environmental education for Jacksonville middle and high school students. The initial program was designed around a week of field and classroom activities that complemented the celebration of the New River, and the ongoing restoration work in Wilson Bay. One goal of the program was to encourage personal and civic environmental stewardship. The success of the program led to other Sturgeon City Institutes programs (Table 1). For

example, media and communications institutes engage students in journalism, photography, and video development. A physics institute focuses on understanding the math and physics of environmental engineering problems related to the overall Sturgeon City effort.

Table 1. Sturgeon City Summer Institutes Programs

Sturgeon City Institutes® Institutes & Programs	Targeted Group	Notes
Student Leadership Development Institute – Sturgeon City	*Open to 9th grade graduates*	Designed to help build young leaders by empowerment of skills and an understanding of our community.
Sturgeon City Science Institute	*Open to 8th grade graduates*	Designed to help develop the scientific method and to foster consideration of science as a career.
The Young Leaders Institute	*Open to Alumni of the Leadership Institutes and City youth activities*	Designed to advance volunteerism, special leadership skill sets and to provide opportunities for leadership.
Youth Mapping	*Open to entering freshmen*	Designed to introduce the community to students through a series of self discovery activities encouraged by instruction in negotiation, interview and social skills.
The Institute for Media Studies	*Open to students who have demonstrated a desire to learn more about American Media. High School Juniors and Seniors, & college students.*	Designed to impart an understanding of media processes with a 'hands on' environment.
Sturgeon City Science Explorers	*Open to Junior High students who have demonstrated an interest in science.*	Provides hands-on program for the scientific method over 5 Saturdays during the school year. 3 sessions are held during the year.
Wilson Bay Keeper	*Open to Junior High School students who want to work with the Wilson Bay Initiative.*	Provides hands on experience with the oyster, aerators, water sampling and scientists who operate the Wilson Bay Initiative. Held during the school year and one session during the summer.
Sturgeon City Art Institute	*Open to high school students.*	Provides exploration of the artistic process, composition, digital art techniques and traditional methods of artistic expression.

In a 2009 survey of 1,191 students 5 years after their participation in Sturgeon City Institutes, 89% of the 558 students who responded were enrolled in or had graduated from college.

Riverworks at Sturgeon City. Sturgeon City has become a hub of activity. It supports civic meetings; hands-on student learning activities for school groups, after-school activities, and weekend programs; teacher continuing education programs; and

community group meetings. Riverworks is the event coordinating office for Sturgeon City. Today, Riverworks at Sturgeon City coordinates

- River Run, an environmental science web-based computer modeling program used by students and teachers statewide;
- The Teacher Immersion Program, a partnership with the Watson School of Education at University of North Carolina-Wilmington (UNC-Wilmington);
- Science Explorers and Wilson Bay Watchdogs;
- The Street Science program; and
- Science Excites.

Riverworks is also a conduit for engagement with other effective programs for middle school and high school students. In association with Riverworks, the NC State Science House (www.sciencehouse.org/) now provides programs for the professional development of teachers at Sturgeon City.

Aquaculture Technology Transfer Program. Aquaculture is the fastest growing animal production agricultural sector *(Pulvenis de Séligny, Gumy, Grainger, & Wijkström, 2009)*. A cooperative aquaculture program supported by UNC-Wilmington and NC State has been established at Sturgeon City on the site of the old drying beds used by the wastewater treatment facility. Using aquaculture and systems designs developed at NC State, a building and wet laboratory were constructed to serve as a resource for applied finfish aquaculture research and technology transfer training for producers. Southern flounder are being reared on site. Faculty members and graduate students from UNC-Wilmington are working to refine flounder diets and rearing techniques. Markets are being tested to encourage entrepreneur interest in developing flounder farms and a flounder aquaculture industry in North Carolina.

The Impact of the Sturgeon City Academic-Community Partnership

The Sturgeon City academic-community partnership has yielded benefits to North Carolina State University and the Jacksonville community, and are described below.

Benefits to North Carolina State University

For NC State, the project began as an outgrowth of a faculty member's research efforts focused on aquatic animal and ecosystem health issues. It reflected the personal commitment of the faculty member to support environmental stewardship and a belief that an understanding of the societal importance of each person's role as a steward of the environment needs to begin at a young age. Sturgeon City has provided the faculty member and the university with the opportunity to make a difference, and to demonstrate that sound environmental stewardship is compatible with local economic development and other civic interests. The site houses conservation research projects and is a living laboratory for NC State students.

Faculty and staff members from several NC State departments have been integral in initiating and sustaining the Sturgeon City partnership through such activities as cowriting the initial proposals, coordinating the Wilson Bay Initiative, and participating in Sturgeon City Institutes and other programs. Faculty members from the Department of Environmental and Molecular Toxicology assisted with contaminant assessments in Wilson Bay; the Department of Biological and Agricultural Engineering served as consultants for the initial assessment of the waste treatment facility as well as the design of the aquaculture technology building and aquatic systems.

Faculty and staff members from the University of North Carolina-Wilmington support environmental education programs, and coordinate the aquaculture technology transfer programs and related graduate student projects. Faculty members from the UNC-Chapel Hill Institute of Marine Sciences, Coastal Carolina Community College, and Carteret Community College (located in Morehead City, North Carolina) also have been engaged in Wilson Bay and Sturgeon City programs and projects. The benefits to NC State and the other participating universities include the professional development of participating faculty members, and their positive view of the role of university faculty in civic-community partnerships. Positive changes in the view of college administration about the role of university outreach also have been realized.

Benefits to the Community

The effect of Sturgeon City on the quality of life in Jacksonville is visible in the increased recreational use of Wilson Bay, the New River, and the waterfront park. Restoration of the wetlands and the creation of Wilson Bay Park have significantly broadened

opportunities for outdoor activity in the community. The overall appearance of the area is markedly improved.

Project-driven student experiences have paved the way for Jacksonville elementary, middle, and high school student environmental science enrichment programs featuring hands-on learning activities. The year 2010 saw 6,500 students, teachers, and other participants benefit from Sturgeon City programs. Real life experiences in science at Sturgeon City have provided students with a view of alternative career paths in biology and other disciplines and have led students to seek higher education degrees in math and science. The site, the story of its development, and its transformation also provide students with an example of civic responsibility, civic leadership, and the difference individuals and groups can make when they are committed to being good stewards of the environment.

"Real life experiences in science at Sturgeon City have provided students with a view of alternative career paths. . . and have led students to seek higher education degrees in math and science."

Although difficult to assess due to marked fluctuations in housing values during recent years, property values and interest in the building potential of the area have improved, and new residential construction has developed in the vicinity of the Sturgeon City Park.

For Jacksonville, Sturgeon City provided an opportunity to take full advantage of a waterfront coastal property, provide a recreational resource for residents, and support urban renewal of an economically challenged area. Approximately $700,000 was originally targeted for demolition of the concrete structures at the treatment plant. The Sturgeon City partnership has demonstrated how human and financial resources can be recycled and reinvested in a community.

These initiatives have been a catalyst for more than $6.2 million in additional funding from the state (e.g., North Carolina Department of Parks and Recreation), federal agencies (e.g., U.S. Army Corps of Engineers), foundations (e.g., Burroughs Wellcome Fund), corporations (e.g., Smithfield Foods, Walmart), and local business (e.g., Golden Corral) for Sturgeon City site and facilities

restoration or enhancement. Another $750,000 has been secured for educational and civic programs.

Conclusion

The impact of the Sturgeon City partnership is reflected in the value-added way it supports environmental stewardship, experiential learning and education, the North Carolina State University's mission, the city of Jacksonville, North Carolina, and the coastal residents of North Carolina. It is an effective model of sustained university-community engagement.

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J. P. McCann serves as the executive director of Sturgeon City of Jacksonville, Inc. In his role as executive director, he is responsible for all matters related to the nonprofit and for Riverworks education programs.

Pat Donovan Potts helped implement the Wilson Bay restoration effort and currently works with the city of Jacksonville, North Carolina, as stormwater manager, having transitioned from water quality supervisor for the city. The position was created to manifest the city's commitment to continued habitat restoration, and stewardship of the New River.

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