

# Appendix A: Cover Sheet



## NORTH CAROLINA RESILIENT COASTAL COMMUNITIES PROGRAM

FY 2020-2021 Application

**TO REQUEST DIRECT TECHNICAL ASSISTANCE SERVICES FOR COMPLETION OF PROGRAM PHASES I & 2**

<b>Lead Applicant:</b> <i>Locality</i>	<b>Town of Duck, NC</b>
<b>Partner Applicant(s):</b> <i>If Applicable</i>	n/a
<b>Point of Contact:</b>	
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# Appendix B: Application Questions



## NORTH CAROLINA RESILIENT COASTAL COMMUNITIES PROGRAM

### FY 2020-2021 Application

Please provide answers to the following questions in your application. Each question should be answered separately, and the applicant should indicate which question their answer corresponds to. If multiple localities are partnering on this application, provide an answer for each participant separately. Applications must be limited to no more than 15 pages, not including supplemental documentation.

#### Risk and Vulnerability

1. **Of the following risks, which are most applicable and impactful to your community and why? Storm surge, heavy precipitation events, sea level rise, tidal flooding, erosion, and riverine flooding.**

The Town of Duck has been impacted by many of the listed risks. However, each type of risk carries different levels of concern and impacts to the community.

The most frequently occurring risks are soundside, wind-driven flooding events that are exacerbated by higher water levels resulting from sea level rise. These flooding events and sea level rise have contributed to the erosion of coastal wetlands along the entire six miles of Currituck Sound frontage in Duck.

Depending on the severity of the storm, these soundside flooding events have resulted in a variety of impacts to the community:

- Wave action and overwash have caused flooding and closure of N.C. Highway 12 (Duck Road).
- Low-lying neighborhood streets have also been flooded in the northern areas of the Town.
- Individual soundfront properties including homes, businesses, and associated improvements (bulkheads, piers, docks, etc.) have received substantial damage from soundside flooding.
- Natural vegetation and wildlife habitat have been lost due to shoreline erosion as a result of sea level rise, wave action, and soundside flooding.

N.C. Highway 12 has recently experienced flooding during the following storm events:

- Hurricane Matthew: October 8-9, 2016
- Hurricane Dorian: September 9, 2019
- Fall Storm: October 14-16, 2019
- Winter Storm: February 7, 2020

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In recent years, the Town of Duck has seen an increase in the frequency of repetitive flooding in certain areas of certain neighborhoods throughout the Town due to heavy precipitation events. This type of flooding typically occurs when a series of heavy rainfall events raises the groundwater table, leaving only a minimal amount of storage capacity when additional heavy precipitation occurs. In these instances, stagnant polluted floodwaters can remain standing as long as several weeks, greatly hampering access along these neighborhood streets and creating potential health and safety issues.

This type of rain-driven, neighborhood spot flooding has occurred in association with the following storms in recent years:

- Hurricane Matthew: October 8-9, 2016
- Unnamed Storm: July 23, 2018
- Hurricane Dorian: September 16, 2019

While storm surge presents a significant threat to oceanfront properties, as well as the Town's beach and dunes, the Town is well-protected by a substantial primary dune system and has not seen significant damage from this type of risk since 2012. Damage from storm surge has been minimal in recent years due to the proactive efforts of the Town in implementing a beach management program that includes beach/dune nourishment and dune stabilization efforts, as well as the funding mechanisms necessary to support these significant expenditures.

### **2. What efforts has your community undertaken to understand its level of flooding risk? If none, what are the barriers?**

In February 2020, the Town of Duck completed a vulnerability assessment of public infrastructure and commercial buildings in partnership with the Program for the Study of Developed Shorelines at Western Carolina University. See details below in #3.

The Town of Duck has also documented areas of repetitive flooding. This information was used to develop a comprehensive floodwater management discharge plan that identifies many areas prone to spot flooding in neighborhoods throughout the Town. The plan describes the elements of emergency floodwater pumping operations (including pump, hose, and outfall locations as well as operating procedures). Approved by the N.C. Division of Water Resources (most recently in February 2020), the floodwater management discharge plan covers seven (7) basins stretching over portions of 14 neighborhoods.

In August 2020, the Town entered into an agreement with the North Carolina Department of Public Safety (NCDPS) to have a water level gauge installed along its soundfront boardwalk. This installation is expected to occur in Spring 2021 and will tie into the State's FIMAN system. In addition, the Town of Duck is partnering with the American Shore and Beach Preservation Association (ASBPA) on a SECOORA funded proposal to develop a water level observation network across the southeast. One of these low-cost water level sensors will be installed at a future project site that is currently the subject of a BRIC grant. This gauge is intended to help Town officials plan for and reduce risk from community

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flooding using real-time water level data. This effort aims to develop a decision support tool that provides real-time, hyper-local data and tidal predictions to coastal managers' cell phones through a user-friendly app.

- 3. Has your community conducted a risk and vulnerability assessment (other than your regional Hazard Mitigation Plan), or components of an assessment, within the last 10 years? (If yes, please attach an electronic copy, if available).**

In January 2019, the Town of Duck was awarded a \$20,000 grant from the N.C. Division of Coastal Management to partner with the Program for the Study of Developed Shorelines at Western Carolina University to produce a vulnerability assessment of public infrastructure and commercial buildings. Completed in February 2020, the assessment focused on roads and a subset of commercial, professional, retail, and public buildings in and around Duck Village, the Town's center of activity. Most of the buildings evaluated are concentrated along N.C. Highway 12 (Duck Road) near Currituck Sound.

In total, 65 buildings and 308 road segments (almost 32 miles) were included in the vulnerability assessment. The study found three high vulnerability buildings and an additional 20 buildings with high-moderate vulnerability. Almost one-third of the evaluated buildings have moderate vulnerability, while an additional 21 buildings have low-moderate vulnerability.

The highest vulnerability road segment is a short portion of Duck Road in the northern section of Duck Village. An additional 6 road segments (totaling over one mile) were found to have high-moderate vulnerability, including several portions of Duck Road. In total, 2.60 miles of road have moderate vulnerability, 13.65 miles of road have low-moderate vulnerability, and 7.31 miles have low vulnerability. Nearly 7 miles of road have minimal vulnerability to coastal hazards due to lack of proximity and exposure.

The vulnerability assessment was first unveiled to the public at the Town's Annual Retreat in February 2020 and formally adopted by the Town Council in September 2020. A copy is attached for your reference.

- 4. Describe the economic impact of flooding or other coastal hazards to your community. If available, provide the economic analysis upon which the description is based.**

Disruptions and damage caused by flooding have varied and substantial impacts on the Town of Duck and surrounding communities. First, hurricanes and other coastal storms can cause direct damage and economic loss to public and private property. To use a recent example, during Tropical Storm Michael, the Town of Duck received nearly \$62,000 of damage to its public piers and docks along the soundside boardwalk. During the same storm, it was estimated that approximately \$450,000 in additional damage occurred to privately owned piers, docks, and bulkheads throughout the Town. Many property owners also lost belongings or equipment stored beneath their homes. Due to flooding and wave action during

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Hurricane Dorian, the Town's nourished beach and dune system lost over 170,000 cubic yards of sand valued at nearly \$800,000.

Secondly, in the aftermath of a storm, the Town of Duck and private citizens have additional expenses associated with flooded areas. Following several recent flooding events, the Town of Duck has used many dozens of hours of staff time and equipment to engage in road clean-up, conduct traffic control, facilitate emergency pumping of floodwater, and remove debris from flooded areas. For example, the Town of Duck spent over \$45,000 for debris removal following Tropical Storm Michael and an additional \$22,000 following Hurricane Dorian. Individual property owners also face similar types of time and expenses when addressing issues on their properties.

In addition, flooding can lead to much greater economic impacts due to road closure and damage. As a coastal resort community, any limitation to access to and through the Town along N.C. Highway 12 (the only north-south artery) has substantial economic impacts to the Town of Duck and coastal communities further to the north in Currituck County. If access is restricted, then residents and visitors may be unable to access their properties and choose to cancel visits to the Town. Having fewer visitors results in a loss of income to businesses and associated taxes to the Town of Duck and Dare County for lodging/occupancy, meals, and retail sales. In addition, these residents and visitors are cut off from the only storm evacuation route, medical services, and emergency services.

### Critical Assets

#### 5. What utilities are owned and managed by your jurisdiction?

Other than the utilities located on its properties, the Town of Duck does not own or manage any traditional public utilities such as water, sewer, or electricity. Although the Town does not maintain any streets, the Town does maintain alternative transportation infrastructure including seven (7) miles of pedestrian/bicycle improvements (sidewalks/shared use paths) and nearly a mile of public boardwalk and associated improvements adjoining Currituck Sound.

#### 6. What critical facilities are in your jurisdiction (facilities critical to the health and safety of the public)?

Critical Facility	Brief Description
Duck Town Hall 1200 Duck Road	Houses public records and administrative offices, serves as secondary emergency operations center
Keller Meeting Hall 1200 Duck Road	Public meeting space, location of Council meetings/decision-making center
Public Safety Building 1259 Duck Road	Houses police, fire, and surf rescue departments, serves as primary emergency operations center
Dare County Water Tower 1230 Duck Road	Public water utility facility serving northern Dare County
CenturyLink Substation	Private telecommunication facility

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1239 Duck Road	
CenturyLink Substation 1438 Duck Road	Private telecommunication facility
U.S. Army Corps Research Pier 1259 Duck Road	Research facility operated by the U.S. Army Corps of Engineers, contains scientific equipment
Other facilities	

### Community Engagement

- 7. Describe the impact of flooding or other coastal hazards on socially vulnerable groups in your community.**

The Town of Duck is a seasonal beach resort community with a very small year-round population (estimated at 400 by the N.C. State Demographer) that grows up to 25,000 people during the summer tourist season. The Town does not contain any pockets or neighborhoods facing poverty or similar social issues. However, a very large percentage of the Town’s residents are retired and elderly. These groups have a greater and more frequent need for emergency and medical services. When substantial flooding occurs along N.C. Highway 12 (Duck Road) or on neighborhood streets, the temporary blockage of roads has cut off access for emergency services such as first responders (Duck Police and Fire departments) and ambulance service (Dare County EMS). In addition, access is cut off from hospitals or medical centers, all of which are located south of Duck.

- 8. Please describe any efforts your locality has undergone to engage with or educate the public regarding coastal resilience, storm preparedness, and/or hazard mitigation.**

Eight (8) local governments including Dare County, Currituck County, and the towns of Duck, Southern Shores, Kitty Hawk, Kill Devil Hills, Nags Head, and Manteo meet bi-monthly to discuss flood management issues and opportunities as part of the Outer Banks Community Rating System (CRS) Users Group. During these meetings and follow-up communication, the communities have presentations from outside experts, receive updates on changes, share ideas and best practices, and discuss common issues. Members from the related professional community (home builders, engineers, surveyors, real estate and insurance agents) are often invited to participate, collaborate and take back information developed to their profession. The CRS Users Group participants have collaborated to provide a coordinated outreach effort, essentially broadcasting the same message to the community from a variety of sources, thereby ensuring consistency related to hazard mitigation, storm preparedness and coastal resiliency. The CRS Users Group developed and implemented the multimedia “Low Risk is Not No Risk” (LRNR) educational campaign in 2017 (brochures, websites, news articles, social media, bumper stickers). A LRNR brochure continues to be distributed to property owners, realtors, insurance agents and contractors as an educational tool and serves as the cornerstone for local CRS outreach activities. Additionally, CRS Users Group members were instrumental in the development and adoption

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of the Outer Banks Regional Hazard Mitigation Plan that was adopted on June 3, 2020 by the Town of Duck.

In addition to the CRS Users Group, LRNR campaign efforts, the development of the Hazard Mitigation Plan and coordination with the professional community, the Town of Duck promotes annual educational campaigns and event specific information through its Department of Public Information. These campaigns, as detailed below, are disseminated at a minimum on an annual basis, through our website, e-news, direct text and email (REGROUP), social media platforms, direct mailings, and newspaper advertisements.

- Hurricane Prep Week in coordination with the National Weather Service (NWS)
- Floodplain mapping services, flood risk and insurance information offered by the Town of Duck
- Ready.gov resources (including severe weather)
- Beach Safety Week (USLA)
- Rip Current Safety

The Town of Duck also provides an annual direct mail service to property owners in historically flood prone areas. This mailing offers guidance and property protection measures to reduce risks from flooding. It also provides information related to financial assistance in the event of flood losses, recommendations and details related to flood insurance, permit requirements when damage is sustained, and relevant information related to substantial improvement and damage from flood losses.

Event-Specific education is provided as needed utilizing our website, e-news, direct text and email (REGROUP) and social media platforms. Event-specific education may often occur multiple times per day leading up to and during a storm event. Common event-specific themes include the following:

- Tropical Systems – Sharing forecast, local warnings, local risks, protection measures
- Coastal Flooding events - Sharing forecast, local warnings, local risks, protection measures
- Severe Weather events - Sharing forecast, local warnings, local risks, protection measures
- Rip Currents

### Planning and Policy

9. **Which of the following plans and ordinances related to land use and development has your locality adopted? Please check and denote adoption date(s).**

- |   |                                |
|---|--------------------------------|
| <input type="checkbox"/> Resilience Plan  | (Adopted ___ / ___ / ___)      |
| <input type="checkbox"/> Watershed Restoration or Stormwater Plan                 | (Adopted ___ / ___ / ___)      |
| <input checked="" type="checkbox"/> Comprehensive or Land Use Plan                | (Adopted <u>08 / 05 / 20</u> ) |
| <input type="checkbox"/> Unified Development Ordinance                            | (Adopted ___ / ___ / ___)      |
| <input checked="" type="checkbox"/> Hazard Mitigation Plan                        | (Adopted <u>06 / 03 / 20</u> ) |
| <input checked="" type="checkbox"/> Capital Improvement Plan                      | (Adopted <u>06 / 18 / 20</u> ) |
| <input checked="" type="checkbox"/> Other Plan: Flood Damage Prevention Ordinance | (Adopted <u>05 / 20 / 20</u> ) |

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### Internal Capacity & Partnerships

10. Does your community have a certified floodplain manager?

Yes  No  Name: Sandy Cross

11. List your community planning staff members, their position titles, and their professional certifications (AICP, CFM, etc.). If you rely on the county, a Council of Government/Regional Commission, or a contractor for planning support services, provide their information.

Joe Heard, Director of Community Development, AICP, CAMA LPO  
Sandy Cross, Senior Planner, CFM, CAMA LPO, CZO

12. Identify staff and officials that would be willing and able to participate in the program.

Drew Havens, Town Manager  
Joe Heard, Director of Community Development  
Christian Legner, Director of Public Information, Marketing & Special Events  
Sandy Cross, Senior Planner

13. Briefly describe any partnerships your community has built with any agencies or organizations to help address flooding hazards.

The State of North Carolina and FEMA released updated preliminary flood maps for Dare County in June 2016. The flood map amendments in the Town of Duck and other communities on the Outer Banks showed a very significant reduction in the number of properties located in a special hazard flood area (A or V zones). Over the next three years, planners and floodplain managers from all the towns and Dare County met to consider concerns about the large number of properties being shifted from V zones to A zones, being shifted from A zones to X zones, and significant lowering of the base flood elevation in remaining A flood zones. There were concerns that property owners might construct significant improvements without flood prevention measures in areas at risk of flooding or decide to drop flood insurance.

To address these potential issues, Outer Banks' communities partnered to implement a two-pronged approach involving (1) a comprehensive educational campaign about flood hazards and flood insurance; and (2) adoption of local flood damage prevention ordinances with standards ensuring that future development occurs in a less risky, more sustainable manner. Outer Banks' planners worked with building inspectors, Outer Banks Home Builders Association, Outer Banks Association of Realtors, local engineers and surveyors, and local insurance and financial institutions in discussions during the development of higher flood damage protection standards (even in X flood zones). Duck's flood damage prevention ordinance was adopted in May 2020.



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As previously referenced in #8, the Town of Duck participates as one of eight (8) local governments that meet monthly to discuss flood management issues and opportunities as part of the Outer Banks Community Rating System (CRS) Users Group. Members from related professional communities (home builders, engineers, surveyors, real estate and insurance agents) are often invited to participate, collaborate and take back information developed to their profession. The CRS Users Group developed and implemented the multimedia “Low Risk is Not No Risk” (LRNR) campaign educating property owners, realtors, insurance agents and contractors about flooding, flood risks, and flood insurance.

Over the past decade, the Town of Duck has consistently budgeted funds annually to complete stormwater management projects that address flooding situations along N.C. Highway 12 (Duck Road), the only north-south artery through the Town. Projects have included cleaning of drainage ditches, installation of underground drainage improvements, creation of retention ponds/swales, installation of pumps, and replacement of asphalt multi-use paths with permeable concrete. Completion of these projects has involved coordination with and approval by the N.C. Department of Transportation (NCDOT), which owns the right-of-way. In addition, several of these stormwater projects have involved partnerships with adjoining neighborhood associations and/or property owners to implement stormwater retention, stormwater diversion, or other best management practices.

In January 2019, the Town of Duck was awarded a \$20,000 grant from the N.C. Division of Coastal Management to partner with the Program for the Study of Developed Shorelines Western Carolina University to produce a vulnerability assessment of public infrastructure and commercial buildings. Completed in February 2020, the study identified a stretch of N.C. Highway 12 as the most vulnerable section of roadway in the Town of Duck. To address this vulnerable section of roadway, the Town has pursued the design and funding of a multi-faceted resiliency project that includes:

1. A living shoreline element that involves construction of near-shore sills and restoration of eroded coastal wetlands along a 1,000-foot stretch of the Currituck Sound shoreline. The sills are designed to protect the existing native marsh and restored marsh fringe consisting of similar, native species. The living shoreline will help prevent further erosion and protect the shoreline adjoining N.C. Highway 12.
2. A sidewalk and bicycle lane element that involves construction of approximately 1,500 feet of sidewalk, dedicated bike lane, and ADA accessibility improvements completing a connection with existing sidewalk and crosswalk improvements along the west side of N.C. Highway 12. These improvements will offer public access and educational opportunities in the project area.
3. A highway elevation element that involves raising the elevation of the N.C. Highway 12 roadway above the 100-year floodplain and installing associated stormwater management improvements. Raising the roadway elevation will lessen the likelihood of flooding and minimize impacts to travelers along N.C. Highway 12. The stormwater management features will reduce roadway flooding and improve water quality in the adjoining Currituck Sound by reducing runoff.

The Town of Duck has already received significant financial support for this resiliency project through grants from the National Fish & Wildlife Foundation (NFWF) and Dare County Tourism Board. Additional funding is being sought through a grant application to FEMA through the Building Resilient Infrastructure & Communities (BRIC) program and the Dare County Soil & Water Conservation District. All impacted neighborhood associations and other property owners have already granted necessary

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easements in support of the project. The NCDOT is partnering with the Town on the design/engineering and granting use of its right-of-way to accommodate the proposed improvements. The N.C. Coastal Federation will be partnering with the Town on coastland wetland plant selection and project monitoring upon completion. In support of its BRIC grant application, the Town received 14 letters of support for this resiliency project from an array of stakeholders including the NCDOT, nonprofit organizations, business/community organizations, state/federal elected officials, and local governments.

A citizen-science phone application (app), iFlood, was developed in partnership with the Town of Duck and the Town of Nags Head to collect locations, depths, and photographs of flooding on the North Carolina Outer Banks. Through its website, electronic newsletter, direct mailings, and social media, the Town encouraged citizens to use the iFlood app to document flooding conditions. Between September 2019 and February 2020, 34 citizen reports associated with seven different storms showed flooding on natural (permeable) land surfaces. The data will be used to develop an analytical model that predicts the impacts of flooding events. The model will be used to examine vulnerability of the Outer Banks to coastal groundwater flooding resulting from future extreme events.

The Town entered into an agreement with the North Carolina Department of Public Safety (NCDPS) in August 2020 to have a water level gauge installed along its soundfront boardwalk. This installation is expected to occur in Spring 2021 and will tie into the State's FIMAN system. In addition, the Town of Duck is partnering with the American Shore and Beach Preservation Association (ASBPA) on a SECOORA funded proposal to develop a water level observation network across the southeast. One of these low-cost water level sensors will be installed at a future project site that is currently the subject of the previously referenced BRIC grant. This gauge is intended to help Town officials plan for and reduce risk from community flooding using real-time water level data. This effort aims to develop a decision support tool that provides real-time, hyper-local data and tidal predictions to coastal managers' cell phones through a user-friendly app.

On a broader scale, the Town of Duck has been an active member of the Currituck Sound Coalition since its establishment in 2019. The members of the Currituck Sound Coalition include environmental agencies (N.C. Wildlife Resources Commission, U.S. Army Corps of Engineers & U.S. Fish and Wildlife Service), nonprofit organizations (Audubon Society, Ducks Unlimited, National Wildlife Refuge Association, The Nature Conservancy, N.C. Coastal Federation & N.C. Sea Grant), educational institutions (ECU Coastal Studies Institute & Chowan University), and local governments (Town of Duck & Currituck County). Individually and collectively, members of the Coalition have supported the Town's efforts to construct a model resiliency project for the region including the above-referenced living shoreline and N.C. Highway 12 elevation projects.

- 14. Based on existing community efforts, describe any locally approved/prioritized community resilience projects that need a more detailed design and engineered drawings. Classify these projects as nature-based/non-nature-based or hybrid solutions.**

In its recently adopted Hazard Mitigation Plan (adopted 6/3/20) and Comprehensive & CAMA Land Use Plan (adopted 8/5/20), the Town of Duck identified an issue with repetitive spot flooding in certain

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neighborhoods due to heavy precipitation events with a goal of successfully addressing stormwater management in the identified areas. At recent Town Council meetings, the Duck Town Council expressed interest in pursuing these stormwater management projects with assistance through the NCORR program. The Town is seeking to have an engineering firm conduct a stormwater management study that identifies the underlying flooding issues and recommends potential solutions to minimize flooding in the affected areas. Although it is likely that the stormwater management solutions can be nature-based or hybrid solutions (swales/rain gardens/retention ponds), detailed designs or specifications are not available at this time.

- 15. If this application is being submitted by multiple localities, describe why the localities chose to partner on this application.**

n/a

- 16. List any contractors or universities that you would prefer to work with on the project.**

Depending on the type of project envisioned, the Town of Duck has positive previous working relationships with planning/engineering firms Vanesse Hangen Brustlin (VHB) and Stewart. The Program for the Study of Developed Shorelines at Western Carolina University completed a previous vulnerability assessment for the Town of Duck and has a great deal of relevant background information and data.