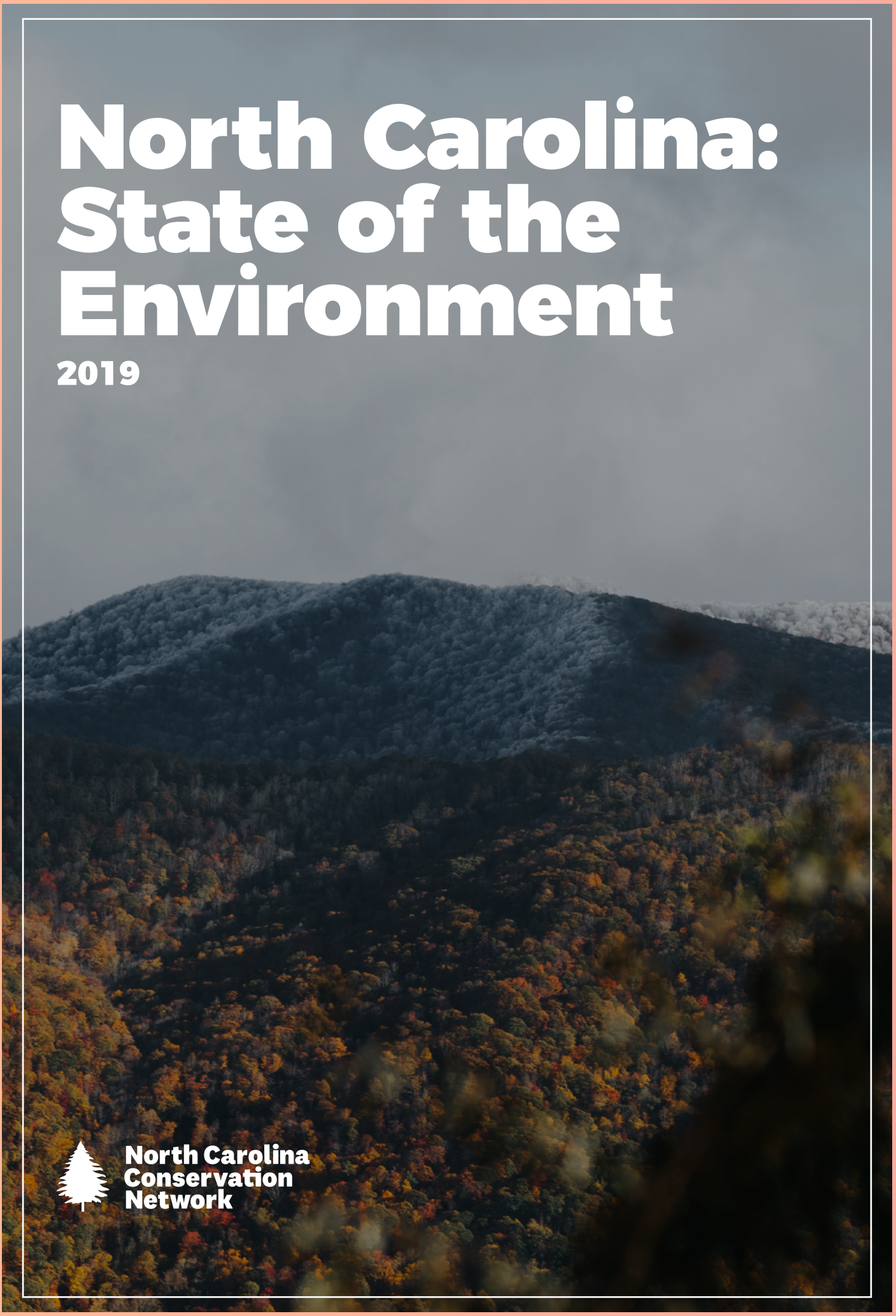
North Carolina: State of the Environment

2019



North Carolina Conservation Network

What's In This Report?

This report evaluates North Carolina's progress towards a vibrant economy, strong social fabric, and a healthy environment using a framework of goals and indicators.

How to read the tables.

CLIMATE	
Goal 1. Rate of change from historic norms slows or stabilizes.	**WEAK**
Indicators: atmospheric carbon dioxide concentrations, global average temperature, rate of sea level rise.	

Goals: Our report is informed by 55 policy-neutral goals or vision statements.

Indicators: The data sets used to assess the state of each goal.

Trends: This portion answers the question: is North Carolina moving toward attainment of this goal, away from it, or do we lack the data to identify a trend?

Subcategory: The report aggregates the goals and their trends into 15 subcategories and 6 categories: Land & Water, Our People, Our Social Fabric, Our Economy, Infrastructure, Energy & Waste.

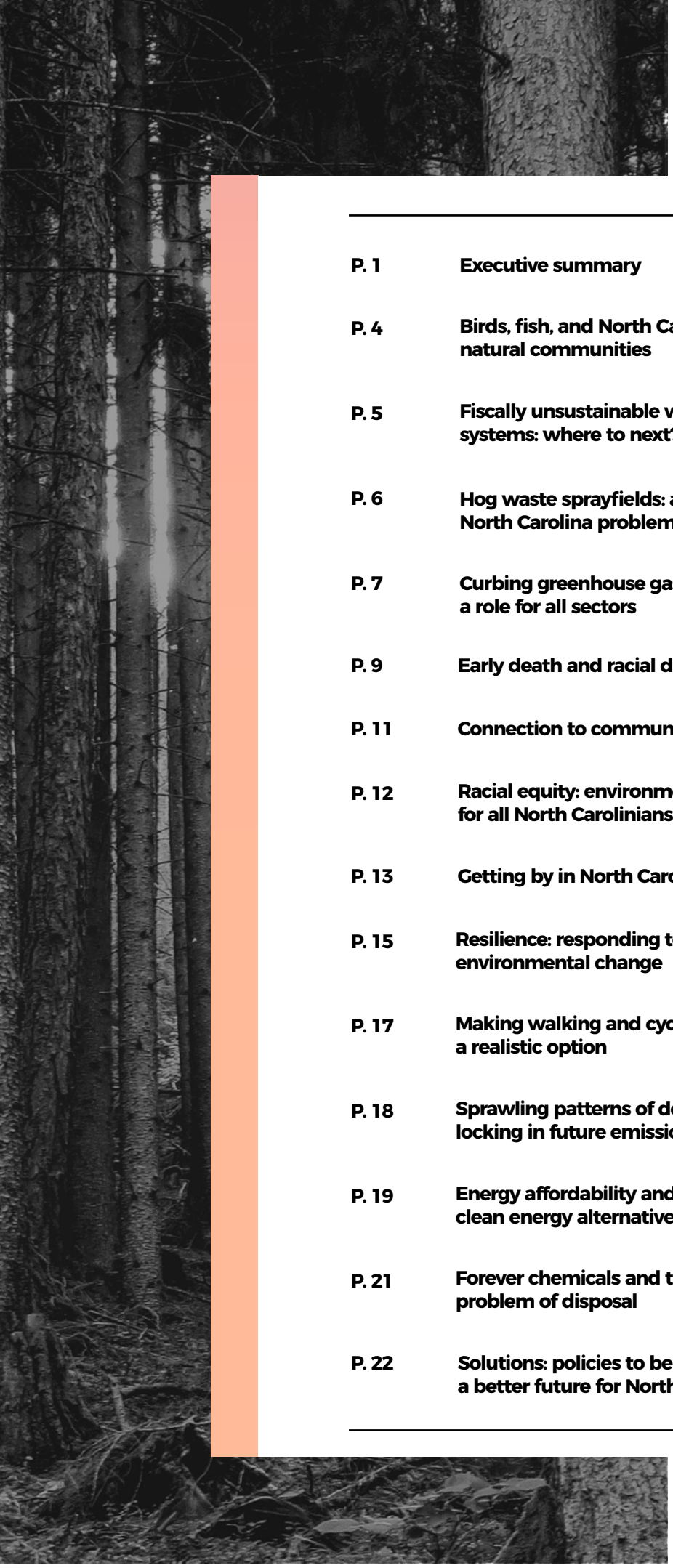
Full details about each indicator, along with data sources, charts, and maps, are in the technical document. For readability, we've omitted footnotes in this report, but indicator numbers are shown in italics and parentheses. All statistics are sourced under the related indicator in the technical document.

Special focus.

On most pages, we've broken out an indicator that we think has something interesting to say about North Carolina's current sustainability, from bird populations (4.1) to energy affordability (49.1).

Solutions.

Most of this report is policy neutral—we evaluate whether things are getting better or worse, but not what, if anything, state government should do about it. On page 22, we list several solutions—policies that, if adopted, will pull North Carolina towards greater sustainability to benefit the economy, the natural environment, and our quality of life. Many more solutions are listed in an appendix to the technical report. To access the technical document, please visit ncconservationnetwork.org/soe.



Executive Summary

North Carolina / 2019

What is "The State of the Environment?"

A healthy natural and human environment both sustains and depends upon having a vibrant economy, strong civil institutions, and a healthy, well-educated populace. This report examines the state of the environment by tracking and analyzing over one hundred data sets that capture various dimensions of well-being for North Carolina's communities and ecosystems.

The 2019 State of the Environment report, and its backing technical document, are available at ncconservationnetwork.org/soe.

A Visual Summary

To understand North Carolina's trends, we grouped the data into 6 categories and 15 subcategories and assigned a grade to each.

1. **Land & Water**
2. **Our People**
3. **Our Social Fabric**
4. **Our Economy**
5. **Infrastructure**
6. **Energy & Waste**

There are three big themes.

Beyond the broad trends, the report identifies three themes for a closer look.

- **Curbing greenhouse gas emissions**
- **Racial equity**
- **Resilience**

What are the categories and their grades?

Each category's grade is an averaged representation of all the subcategory grades. The subcategory grades provide details on successes and shortfalls within the larger categories.

Grade. **Category.**

Mixed

Land & Water:

Land & habitats = Mixed, Coast = Mixed, Water = Mixed, Agriculture = Mixed, Air = Mixed

North Carolina's inland landscapes and the coast are threatened by development and climate change. Many populations of birds and fish are in slow decline. Water quality shows mixed trends. Row crop agriculture is conserving soil and water, but animal agriculture needs to be a better neighbor.

Weak

Our People:

Health = Weak, Education = Mixed

Public health indicators show substantial racial and ethnic disparities, and key indicators are heading in the wrong direction. Children are at risk, and too many North Carolinians lack reliable access to healthy food. Trends in education are more mixed, but net, we see inadequate progress on health and education.

Good

Our Social Fabric:

Community = Good, Governance = Not enough data

North Carolinians benefit from a strong ethic of community, with thriving arts and public service sectors. Data on state and local governance is too limited for us to evaluate this year.

Good

Our Economy:

Economy = Good

At the top of the business cycle, North Carolina's economy isn't working equally well for everyone, but most people are better off than they were a decade ago, in the heart of the Great Recession. We lack data on the answers to questions we'd most like to answer from a sustainability perspective: how big are sustainable business sectors as a part of the state economy, and how fast are they growing?

Weak

Infrastructure:

Housing = Weak, Transportation = Mixed, Land use patterns = Weak

Affordable housing is in short supply across the state, not just in the booming Piedmont cities. Transportation shows mixed trends—but, too often, new construction is driving sprawl into greenfields, increasing costs, locking in future greenhouse gas emissions, and damaging commuters' health.

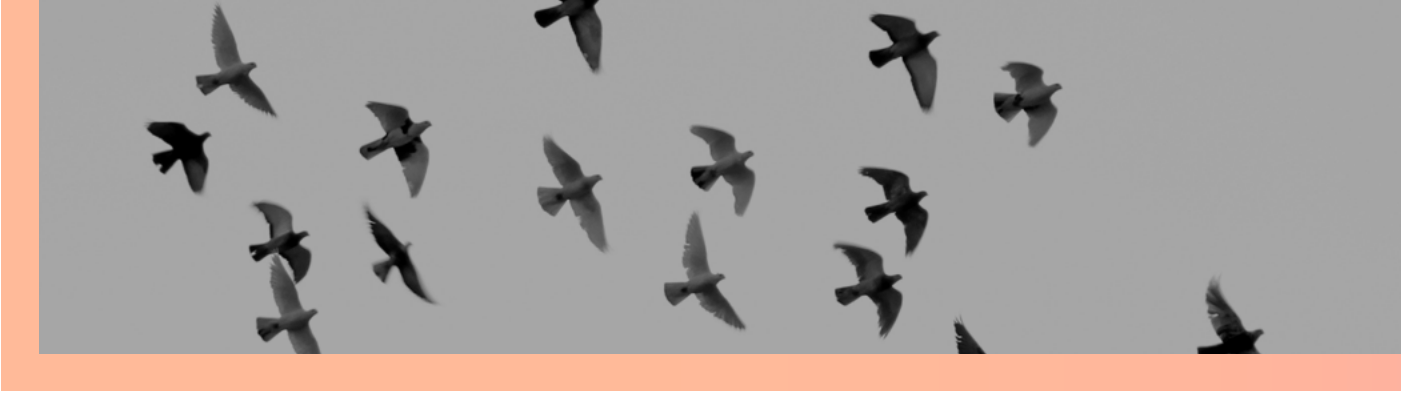
Mixed

Energy & Waste:

Energy = Mixed, Waste = Weak

Grouped together because they deal with flows of energy and matter, these goals and indicators signal looming problems. Renewable energy has enjoyed years of rapid growth from a low baseline. Yet, to avoid climate disruption, the transition to a clean energy economy needs to speed up in depth and breadth. Waste generation continues to grow, with heavy clouds on the horizon for recycling and materials management.

CLIMATE	
Goal 1. Rate of change from historic norms slows or stabilizes. Indicators: atmospheric CO_2 concentrations, global average temperature, rate of sea level rise	WEAK
LAND & HABITAT	
Goal 2. Landscapes support our economy and quality of life. Indicators: loss of open space, forest biomass, urban tree canopy, access to open space, extent of wetlands	MIXED
Goal 3. Landscapes provide healthy habitat. Indicators: extent of non-managed forests, impervious surfaces, percentage of pristine watersheds, biodiversity protected	GOOD
Goal 4. NC retains a full complement of species and biodiversity. Indicators: avian diversity and abundance, freshwater fish	WEAK
COASTS	
Goal 5. NC's coasts and estuaries are healthy and resilient. Indicators: status of shellfish waters, bulkheads and living shorelines, extent of submerged aquatic vegetation, fish populations	MIXED



SPECIAL FOCUS

Birds, fish, and North Carolina's natural communities

The indicators for goal #4—that North Carolina retains a full complement of the state's native species—required some of the most time-consuming analysis of any indicators in this report. At the same time, they are among the most incomplete, given that North Carolina is host to an enormous range of native species. For this report, we look to the health of a small handful of populations, starting with ten species of birds (*4.1*) recommended by Audubon North Carolina as representative of a variety of habitats and geographies (Table 1). We are grateful to Curtis Smalling at Audubon NC for the estimated change for each population.

Table 1.
Annual Population Change for 10 Bird Species.

SPECIES	HABITAT	% CHANGE
Brown-headed Nuthatch	Coniferous Forest	2.03
Wood Thrush	Deciduous Forest	-2.35
Hooded Warbler	Deciduous Forest	1
Prothonotary Warbler	Deciduous Forest	1.8
Eastern Meadowlark	Grassland	-3.19
Eastern Whip-poor-will	Open/Ag	-2.99
Chimney Swift	Urban/Suburban	-2.36
American Oystercatcher	Marsh/Estuarine	*
Brown Pelican	Coastal	6.26
Piping Plover	Coastal	*

Asterisks (*) reflect sample sizes that are too small to project an annual trend. Over the last decade, the Piping Plover has experienced a decline of 46% while the American Oystercatcher has experienced an increase of 27%. Data credit: Curtis Smalling, Audubon North Carolina.

The second indicator—populations of freshwater fish (*4.2*)—is derived from data collected by the state's Fish Community Assessment. Analyzing the last decade of data, we've found a net decline in the quality of fish communities.

Both indicators signal a slow erosion of bird and fish diversity, but with substantial variation. Both merely scratch the surface of what we need to know about how our native ecosystems and species are responding to development pressures and a changing climate.

WATER	
Goal 6. Drinking water is safe. Indicators: Safe Drinking Water Act violations, unregulated chemicals in tap water	MIXED
Goal 7. Water quality and flows support healthy rivers and estuaries. Indicators: surface water quality, benthic health, surface water flows	MIXED
Goal 8. Groundwater levels are sustainable. Indicators: Coastal Plan groundwater levels, statewide groundwater levels	GOOD
Goal 9. Water systems are sustainable and resilient. Indicators: fiscally unsustainable water systems, resilient water infrastructure	NO TREND
Goal 10. North Carolinians have access to affordable water. Indicators: affordability for residents based on household income	NO TREND

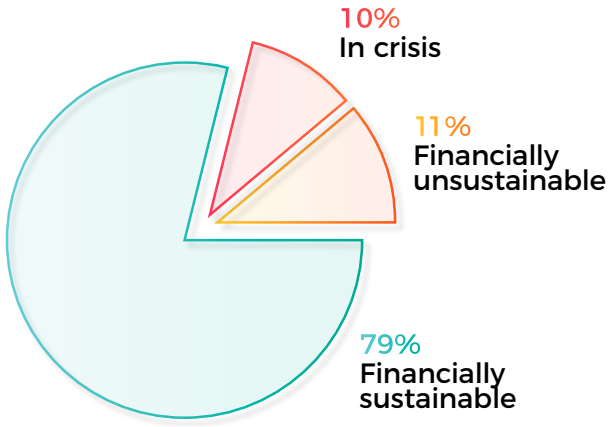
SPECIAL FOCUS

Fiscally unsustainable water systems: where to next?

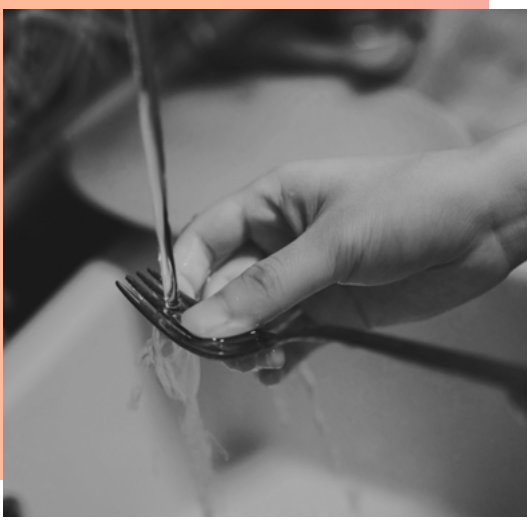
Estimates of the needs for water infrastructure spending are staggering: $17 billion dollars to overhaul systems statewide. But according to data from NC's Local Government Commission, analyzed by the Environmental Finance Center at UNC's School of Government, a subset of water and wastewater utilities face a much more pressing problem (*9.1*).

Of the 341 public systems in North Carolina that supplied data in 2017, 10% (34 systems) did not raise enough operating revenue to cover their operating costs (including depreciation). These systems are in crisis. Another 11% (37 systems) did not raise enough revenue to cover operations, principal, and interest on debt. These systems are fiscally unsustainable. All of these troubled systems have fewer than 10,000 customers.

In its 2018 annual report, the NC Water Infrastructure Authority notes that such systems need to explore combining or contracting with other water systems. System finances affect water affordability on a household scale (*10.1*), discussed as an equity issue in this report on page 12. As the Authority notes, "some of the smallest, most economically distressed communities have some of the highest water and sewer rates in the state." There's no simple answer to this problem, but it also won't go away on its own.



Data credit: UNC Environmental Finance Center, 2018 North Carolina Water & Wastewater Rates Report, January 2018, at 25, 28.



AGRICULTURE	
Goal 11. Agriculture is economically healthy. Indicators: farm income, land in agriculture, preserved farmland	MIXED
Goal 12. Agriculture is environmentally sustainable. Indicators: topsoil erosion, conservation practices, organic sales	GOOD
Goal 13. Animal agriculture is a good neighbor. Indicators: agriculture sector greenhouse gas emissions, swine waste sprayed, antibiotic volumes	MIXED
AIR	
Goal 14. Outdoor air quality is good. Indicators: unhealthful air days, releases of persistent air toxics, number of emissions at industrial facilities	MIXED
Goal 15. Indoor air quality doesn't threaten sensitive populations. Indicators: exposure to poor indoor air quality	DATA GAP
Goal 16. Air pollution is not concentrated in overburdened communities. Indicators: 2011 NATA respiratory hazard index, proximity to traffic	NO TREND
Goal 17. Total greenhouse gas emissions are reduced. Indicators: total NC greenhouse gas emissions	MIXED

SPECIAL FOCUS

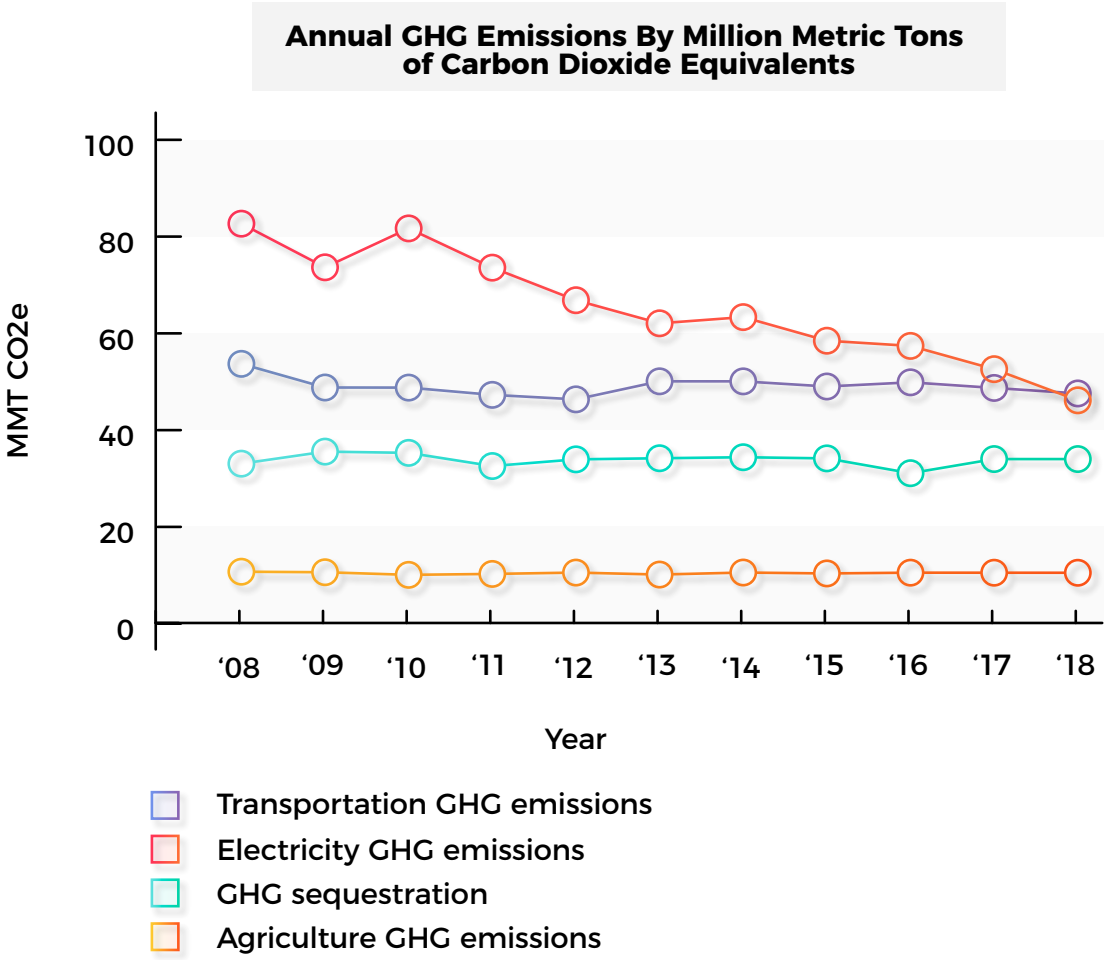
Hog waste sprayfields: a distinctly North Carolina problem

With 2,200 industrial hog operations, North Carolina has the highest concentration of swine operations in the country. Most of these farms manage waste by storing hog feces and urine in open, unlined pits, from which the slurry is pumped and sprayed onto cropland: 9.5 billion gallons of waste each year (*13.2*). Most swine farms in North Carolina are in the coastal plain, where groundwater is close to the surface, and neighbors often depend on wells. NC residents living near large swine operations have elevated risks of disease and death. More than two decades ago, a blue ribbon commission urged that North Carolina phase out sprayfields. That hasn't happened. Meanwhile, swine farms in other states and countries have adopted better systems for waste management.

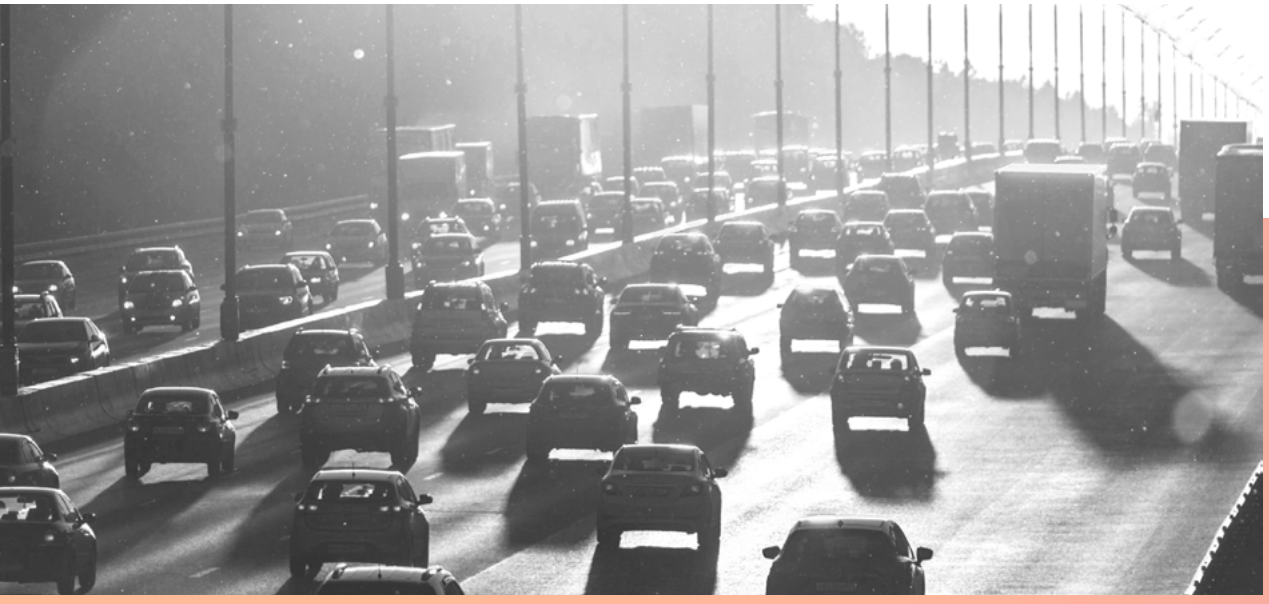
A related concern has been the use of massive quantities of antibiotics in animal agriculture, with the potential to breed antibiotic-resistant pathogens. In 2017, the federal Food and Drug Administration required farmers to stop routine dosing of healthy animals. That has significantly decreased the volume of antibiotics used on swine and poultry (*13.4*), a good trend.

THEME

Curbing Greenhouse Gas (GHG) Emissions: A Role for All Sectors



Data credit: NC DEQ, North Carolina Greenhouse Gas Emissions Inventory (Final), January 2018, Table A-2.



Human emissions of greenhouse gasses are changing the global climate, and North Carolina is along for the ride. We're also major contributors, with annual per capita emissions of 11.3 tons of CO2, and total state annual emissions comparable to those of Argentina, Norway, or Nigeria.

Last October, Governor Roy Cooper issued Executive Order 80 (EO 80), directing his cabinet agencies to slash their emissions 40% (from a 2005 baseline) by the year 2025. EO 80 also calls for a state plan to reduce the state's total emissions 40% by 2025. That is a good start but will not be enough to meet our global obligations. The chart titled "Annual GHG Emissions" on the facing page shows the current trends for North Carolina's emissions from each sector: energy, transportation, agriculture, and the benefits of carbon sequestration—the uptake of carbon by North Carolina's forest and wetlands.

Keeping carbon on the ground. The cheapest way to keep climate change from getting worse is to keep current stocks of carbon on the ground, not in the air. In North Carolina, this means biomass in forests (*2.2*)—a positive trend currently—and biomass in wetland soils and vegetation (*2.5*), which North Carolina continues to lose. Preventing the logging of North Carolina's forests for export as wood pellets is key to keeping this carbon out of the atmosphere.

Transitioning to clean energy. Emissions from North Carolina's energy sector (*47.1*) are declining primarily due to retirement of old coal-fired power plants, which released more emissions per unit of energy than the natural gas and renewables facilities that have replaced them. Flat demand for electricity since 2000 has also helped. The contribution of renewables to North Carolina's energy generation mix reached 9% in 2016 (4% hydro, 4% solar, and 1% wind energy) (*48.1*). However, forecasting predicts that after declining through 2025, energy sector emissions will increase from 2025 to 2030. Improving the electric grid to support distributed generation could accelerate the growth of renewables (*48.2*).

Limiting emissions from the built environment. Transportation is now the largest source of greenhouse gas emissions (*41.2*). Transportation emissions are falling too slowly and are projected to increase after 2035, when population growth will overwhelm gains in vehicle efficiency. Vehicle miles traveled are a direct artifact of sprawling land use patterns (*45.1, 45.2*) and lack of transportation alternatives (*44.1, 44.2*). Governor Cooper's EO 80 promotes electric, zero-emission vehicles, but those offer only limited benefits as long as the electric grid is mostly served from fossil fuel generation. Land use changes are critical.

Limiting emissions from other sectors. Animal agriculture's main impact on climate is through the release of methane rather than carbon dioxide (*13.1*). Diversion of organic solid wastes to composting also helps reduce methane emissions (*51.2*). Neither showed much progress in 2018.

HEALTH	
Goal 18. North Carolinians have long lives and good health. Indicators: diabetes, obesity, asthma, cancer, early death, suicide, vector-borne illness	MIXED
Goal 19. All North Carolinians have access to good health care. Indicators: health insurance	GOOD
Goal 20. Children's development is protected. Indicators: low birthweight, children's health, children's exposures	WEAK
Goal 21. All North Carolinians have access to sufficient and healthy food. Indicators: household food insecurity, healthy food access	WEAK
EDUCATION	
Goal 22. All North Carolinians receive a quality education. Indicators: preschool, 8th grade achievement, high school graduation, college	MIXED
Goal 23. North Carolinians understand and apply sustainability concepts. Indicators: environmental educators per capita, sustainable consumers	NO TREND

SPECIAL FOCUS

Early death and racial disparities

People and communities of color in North Carolina have long experienced public health, economic, and environmental barriers. One of the most disturbing indicators we track is years of premature death by race and ethnicity (*18.5*). Table 2 aggregates the years by which people in the state are dying short of age 75, per 100,000 residents. The effect of this indicator is to explicitly mark the extent of loss when a young life is cut short, weighing the deaths of young people heavier than middle-aged or elderly residents.

As the table suggests, Black and Native American residents die, on average, at substantially younger ages than white residents. From an environmental perspective, a key question is the extent to which marginal exposures to higher levels of pollution, or built environments that limit exercise or access to healthy food, accumulate and contribute to the disparity in early deaths. We don't have a clear answer, but the discussion of equity on page 12 describes a number of the exposures that we know Black and Native American North Carolinians face at higher rates than white and other North Carolinians.

Table 2.

YEARS OF LIFE LOST PER 100,000 RESIDENTS	
All	**7,300**
White	**7,100**
Black	**9,900**
Native American	**10,200**
Asian	**2,900**
Latino	**3,600**

"Black and Native American residents die, on average, at substantially younger ages than white residents."

Data credit: Robert Wood Johnson Foundation, 2018 County Health Rankings: North Carolina, Premature Death.

COMMUNITY	
Goal 24. Communities are safe. Indicators: violent crime, incarceration rate, people feel safe at night	GOOD
Goal 25. Social organizations have adequate capacity. Indicators: adequately resourced nonprofits, volunteerism	GOOD
Goal 26. Arts and culture are thriving. Indicators: arts establishments and employment, natural and cultural heritage visits	GOOD
Goal 27. All communities are treated with respect. Indicators: residential segregation, disparate burdens, gentrification pressures	NO TREND
Goal 28. Individuals are socially connected. Indicators: people are connected, people feel connected	GOOD
GOVERNANCE	
Goal 29. North Carolinians are empowered to participate in government. Indicators: voter registration, voter turnout	GOOD
Goal 30. Elected representatives are accountable to their constituents. Indicators: gerrymandering limited	NO TREND
Goal 31. Elected bodies generally reflect the demographics of the electorate. Indicators: NC House and NC Senate composition	NO TREND
Goal 32. Government institutions are transparent, accountable, and not corrupt. Indicators: state integrity index	NO TREND

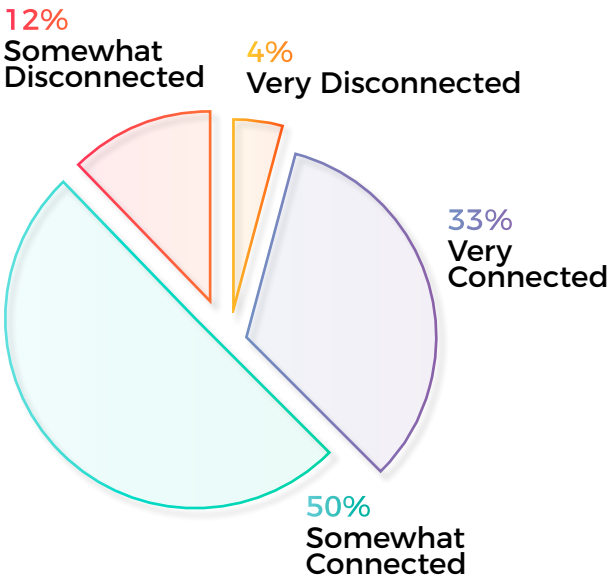
SPECIAL FOCUS

Connection to community

Social connections knit our social fabric together. In 2015, North Carolina boasted an average of 11.5 organizations (churches, clubs, civic groups, and professional organizations) for every 10,000 state residents (*28.1*). That's pretty connected.

We wanted to know whether North Carolinians also *feel* connected, so we asked a representative sample via a statewide poll. The pie chart to the right shows what they said. Here's the good news: 83% of North Carolinians feel very or somewhat connected to community beyond their immediate families, and only 16% feel somewhat or very disconnected.

This is a question we plan to poll in future years to track changes over time, but it's a good sign for this year.



"83% of North Carolinians feel very or somewhat connected to their community."

THEME

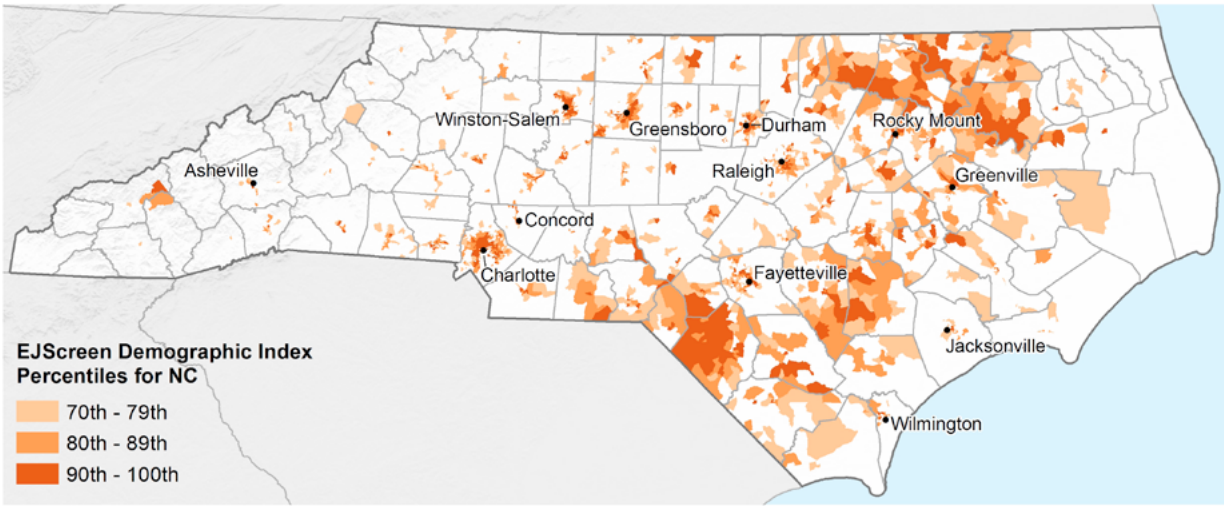
Racial Equity: Environmental Justice for All North Carolinians

As noted on page 9, years lost to early death shows major variation based on race and ethnicity (*18.5*). Not all of those early deaths reflect losses to pollution, but exposure to pollutants is also not equally distributed. North Carolina was the birthplace of the environmental justice movement in 1982, and the state has made some progress since then, but we still experience plenty of environmental injustice by multiple measures.

Disparate impacts. The US EPA's Environmental Justice Screen (EJScreen), an online mapping tool, includes a demographic index that ranks all of North Carolina's 6,000+ census blocks based on low-income and minority race populations. The map below shows the distribution of these 'environmental justice' (EJ) tracts from the 70th percentile (meaning more low-income or minority race residents than 70% of other tracts) through the 100th percentile (meaning more than all other tracts). The distribution of EJ tracts has a mild positive correlation with proximity to sources of respiratory toxics (*16.1*), heavy vehicle traffic (*16.2*), and sites handling storage and disposal of hazardous wastes (*54.1*), implying that residents of these tracts are somewhat more likely to be exposed to these risks than the general population. A 2014 US EPA analysis found that people of color in North Carolina are more likely than whites to live within a mile of a facility that releases toxic pollution into the local environment (*27.2*). Finally, the distribution of industrial swine farming, overlaps EJ tracts in the southern Coastal Plain.

Children's exposures. Children of color suffer significant disparities in health outcomes, as measured by both low birthweight (*20.1*) and parental reports of their health (*20.2*). Key data on indoor air exposures (*15.1*) and children's exposures to toxic chemicals (*20.3*) are lacking. However, peer-reviewed research has found that early exposure of children to a variety of toxics may contribute to obesity later in life, which has also continued to increase and shows large racial disparities (*18.2*). Every year more chemicals are introduced into consumer products with little or no safety testing (*55.1*). When these turn out to be toxic, surplus stocks are often dumped at stores serving low-income, Black, and Latino families.

Affordability of water and energy. A third critical aspect of equity is the cost of basic environmental services: water and energy. While trend data is lacking for water affordability (*10.1*), a recent survey by the Environmental Finance Center at UNC found that 57% of responding utilities charged more than 2.5% of median household income (EPA's standard for affordability) for a modest level of water consumption. We discuss energy affordability (*49.1*) in the breakout on page 19.



Map credit: prepared by Andrew Pericak using demographic layers from US EPA's EJScreen.

ECONOMY	
Goal 33. Economic activity is strong across business cycles. Indicators: per capita gross domestic product growth and state rank	GOOD
Goal 34. Sustainable sectors are expanding as a share of the economy. Indicators: sustainable sectors as a percentage of the economy	NO TREND
Goal 35. The business sector is robust. Indicators: business starts and failures, payrolls, research and development investment	GOOD
Goal 36. Household incomes are improving. Indicators: median household income, adults and children in poverty	GOOD
Goal 37. Income inequality is not too extreme. Indicator: ratio of 80th percentile income to 20th percentile income	NO TREND
Goal 38. North Carolina's economy supports quality jobs. Indicator: unemployment and underemployment, sufficiency of median income	GOOD

SPECIAL FOCUS

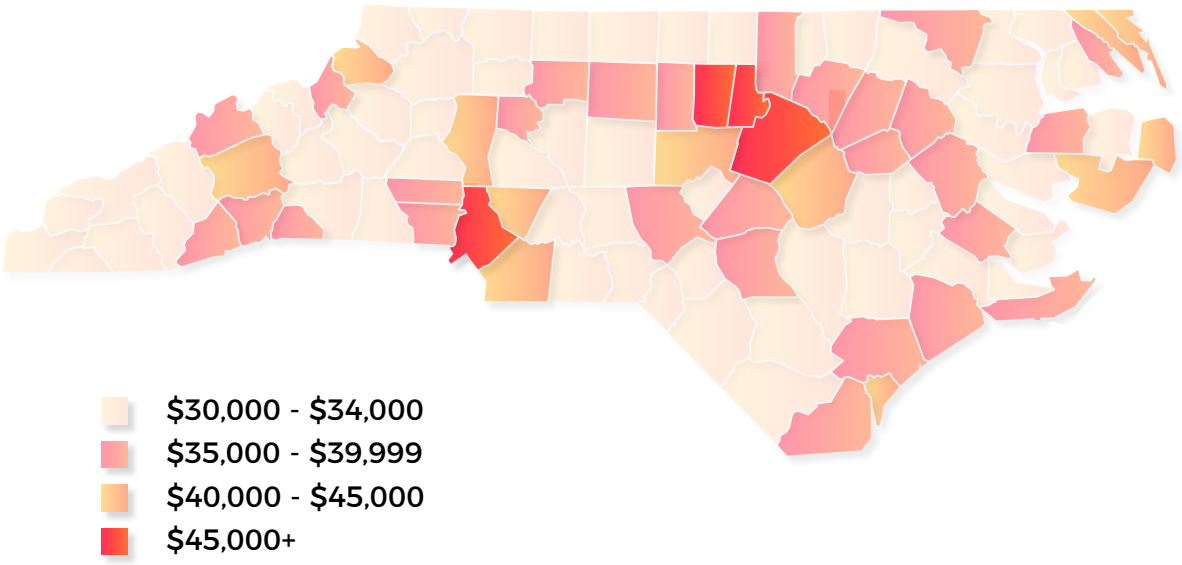
Getting by in North Carolina's economy

The national economy is at the top of the business cycle, but even during this expansion, many North Carolinians have struggled. In 2017, the United Way of North Carolina published a sophisticated analysis (*38.2*) of what it actually costs families of various sizes to live in various parts of the state: not just costs for housing and food, but also for child care, transportation, health care, and taxes. The analysis showed that for a single adult or a couple with two young children, the income sufficient to cover basic necessities—without help from the government or generous relatives—is often above median household income. For example, in 2017, the sufficiency income for a single adult with two kids was above the median income in 26 counties; the sufficiency income for a two-adult family with two kids was above the median income in 36 counties.

On the one hand, this is a strong argument for the various state and federal programs that close the gap: free pre-school, smart transportation investments, and wider health care. On the other, it's also an argument for bulking up sectors of the economy that pay above median income, and those that keep wealth circulating in the state. Those include many jobs in sustainable sectors (*34.1*): restoring watersheds, reforesting landscapes, designing and upgrading failing infrastructure, and building and operating wind and solar energy generation.

"For a single adult or a couple with two young children, the income sufficient to cover basic necessities–without help from the government or generous relatives–is often above median household income."

Counties by Level of Annual Self-Sufficiency Wage



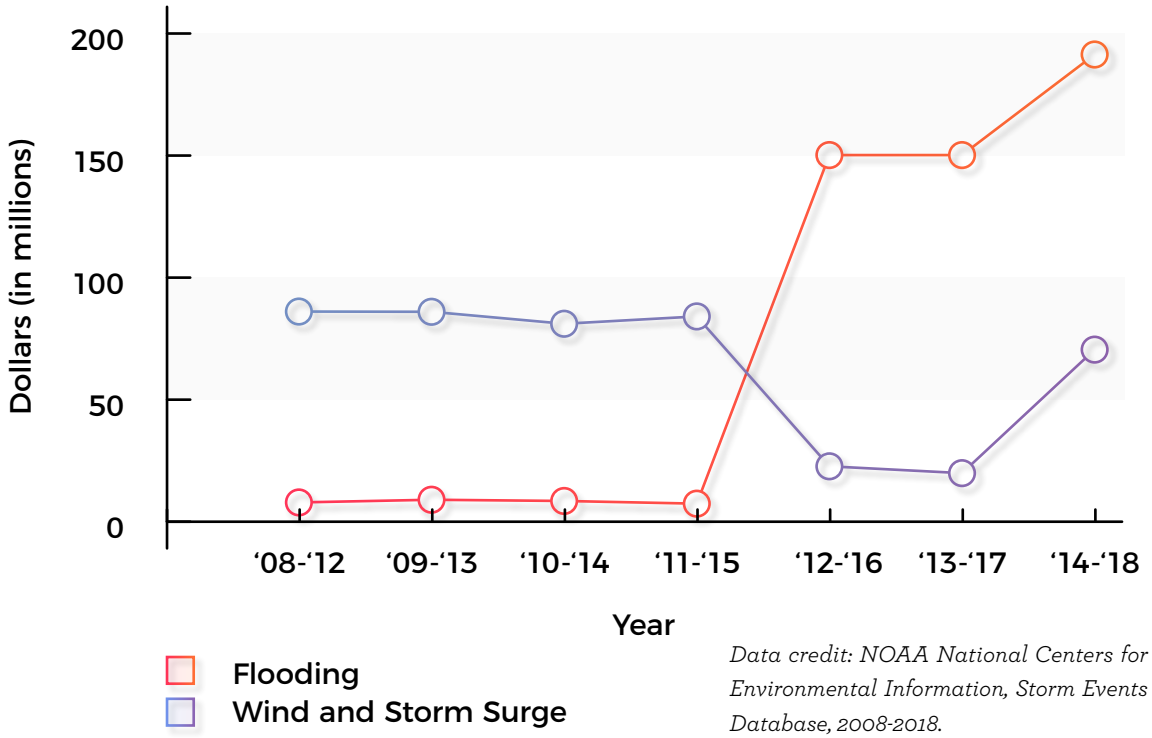
Map credit: adapted from Diana Pearce, the Self-sufficiency Standard for North Carolina, 2017, Figure A, Sufficiency income for one adult and one pre-schooler.

THEME

Resilience: Responding to Environmental Change

Climate change is already bringing disruption to North Carolina. Increased concentrations of carbon dioxide (*1.1*) and other greenhouse gases in the atmosphere are warming the planet (*1.2*). A warmer atmosphere holds more water, leading to more intense storms. A warming ocean expands, contributing to sea level rise (*1.3*). Finally, a warmer climate increases the intensity of periodic drought and ensuing wildfires.

Moving Five Year Average Annual Damage From Flooding, Storm Surge, and Wind



Data credit: NOAA National Centers for Environmental Information, Storm Events Database, 2008-2018.

'Resilience' can mean many things; in this report, we use the term to mean strategies that decrease the vulnerability of human health and property to our rapidly-changing climate. The term can also apply to natural systems, such as how well individual species and ecosystems are adapting. We have not found good data on these, but scientists are now identifying natural sites that they'll use to track ecological resilience in coming years.

In the wake of 500+ year flooding from both Hurricanes Matthew and Florence, floodplains are a key focus for resilience work. Over 6% of North Carolina's housing stock is in the 500-year floodplain (*40.1*), with over 20% in some coastal counties. The above line graph shows rolling five-year average for damage from floods and flash floods (*46.1*) and wind and storm surge (*46.2*) as estimated by the National Weather Service. If North Carolina gets ahead of these threats—by buying out vulnerable properties in floodplains, restoring floodplains, and siting new infrastructure wisely—these numbers should fall over time.

Risks on the drier end of climate variability seem more remote right now in North Carolina, but they are real, including the adequacy of groundwater supplies (*8.2*) and surface water flows (*7.3*), and the threat to lives and property from wildfire (*46.3*). North Carolina ranks first in the nation in the number of acres of the state in the 'wildlands urban interface', where houses and natural vegetation intermingle, and fifth in the nation in the absolute number of homes in the interface.

Significant harm from wind and storm surge (*46.2*) are a marker of our coast's vulnerability. One direct measure of resilient response is the degree to which landowners are opting to protect estuarine properties with living shorelines (*5.2*). Living shorelines absorb wave energy. Bulkheads, in contrast, reflect energy, causing increased erosion nearby and on the estuarine bottom. The choice offers a strong metaphor for how North Carolina addresses new threats: do we join together and build smart solutions that work with nature, or does everyone fend for themselves, leaving us all ultimately worse off?

INFRASTRUCTURE - HOUSING	
Goal 39. North Carolinians have safe and affordable housing choices. Indicators: jobs to afford a 2 bedroom apartment, homes with deficiencies	**WEAK**
Goal 40. Housing is resilient to climate change. Indicators: housing stock in floodplains	**NO TREND**
INFRASTRUCTURE - TRANSPORTATION	
Goal 41. North Carolina's transportation system is efficient. Indicators: vehicle miles traveled per dollar of gross domestic product, transportation greenhouse gas emissions	**MIXED**
Goal 42. North Carolina's transportation infrastructure is well-maintained. Indicators: roads in good condition, bridges in good condition	**MIXED**
Goal 43. North Carolina's transportation system is resilient. Indicator: damages to the transportation system from disasters	**NO TREND**
Goal 44. North Carolinians have multiple transportation options. Indicator: mode split in funding, workers driving alone, bike/pedestrian accidents	**MIXED**

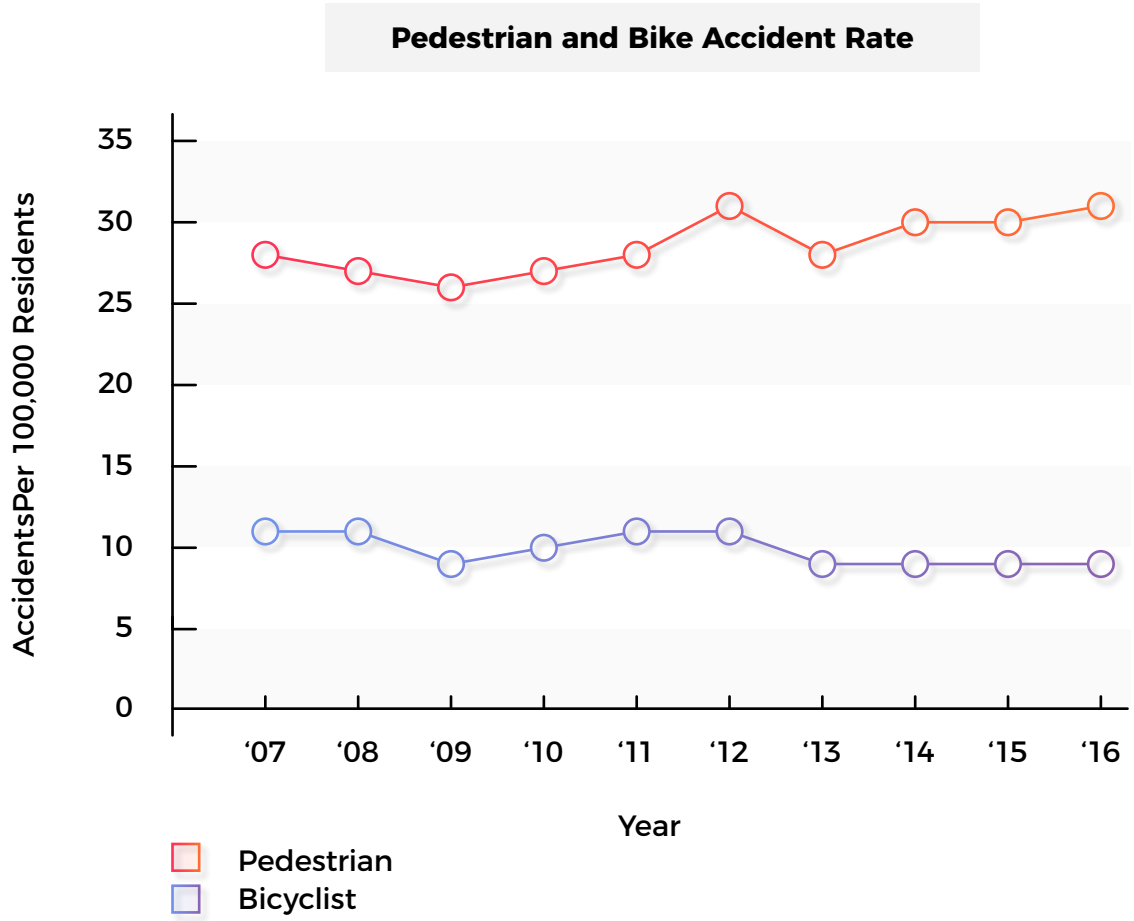
SPECIAL FOCUS

Making walking and cycling a realistic option

Creating conditions that allow for just a few percent more North Carolinians to walk or bike safely to our destinations would result in less congested roads, lower emissions, and better public health. Research across the country confirms that a key factor in people's decisions to bike or walk is the degree of safety they feel en route to their destinations. Some 60% of the public would be interested to bike more, if they could feel safe and protected from fast-moving cars.

Because the freedom to bike or walk reflects in part this sense of safety, one indicator we used to evaluate whether state residents have multiple transportation options is the rate of bike and pedestrian accidents (*44.3*). Over the last decade, NC Department of Transportation (NCDOT) data shows a slight increase in the rate of pedestrian accidents and an essentially flat rate for bicycle accidents, per 100,000 residents (as shown in the line graph below). Pedestrian and bicycle fatalities are much rarer; even so, the Governors Highway Safety Association ranked North Carolina 14th in the nation for pedestrian fatalities for the first six months of 2018, with a pedestrian fatality rate of 0.98 per 100,000 residents.

We know how to make roads and streetscapes safer for cyclists and pedestrians: design them as 'complete streets' that welcome pedestrians, cyclists, and all kinds of transit. The NC Board of Transportation adopted a Complete Streets policy for the state in 2009, but it was largely ignored for a decade. NCDOT is in the process of updating the policy and integrating it into project planning and design.



Data credit: NCDOT, North Carolina Pedestrian and Bicycle Crash Data Tool, 2010-2016.

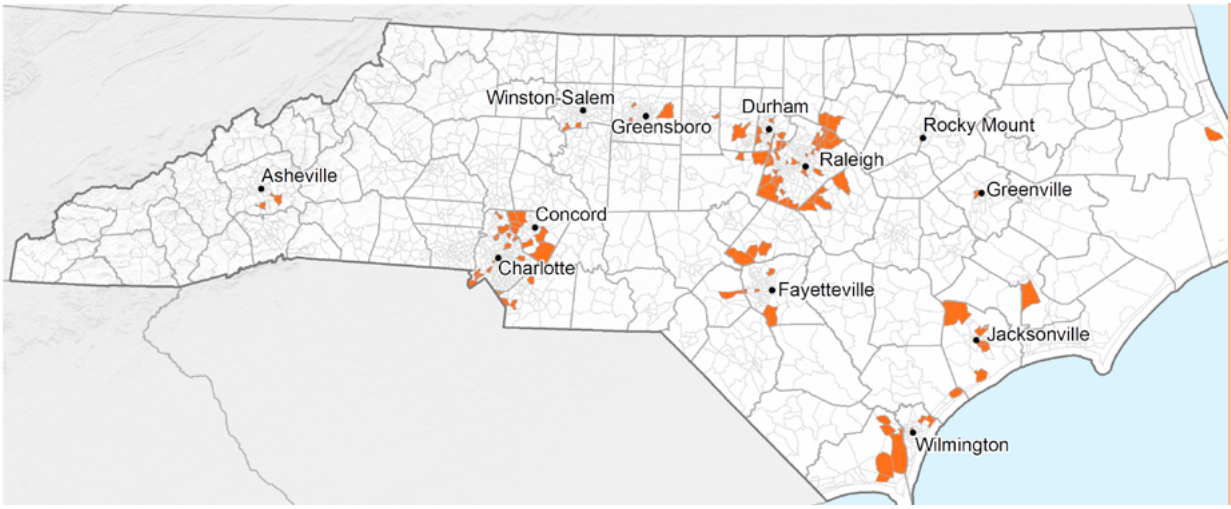
INFRASTRUCTURE – LAND USE PATTERNS	
Goal 45. North Carolinians have safe and affordable housing choices.	**WEAK**
Indicators: where growth is happening, commuting distance	
Goal 46. Communities are resilient to climate change.	**MIXED**
Indicators: damage from floods, damage from storm surge, damage from wildfire	

SPECIAL FOCUS

Sprawling patterns of development: locking in future emissions

Roughly 81.3% of North Carolinians commute to work alone (*44.2*), a figure that hasn't changed much in recent years even as the state's population has grown. Roughly 30% of those solo commuters drive more than 30 minutes each way (*45.2*), with impacts to our collective health as well as quality of life. A 2017 study of 162 American cities (based on data from the year 2000), found three North Carolina cities among the ten most sprawling: Fayetteville, Winston-Salem, and Hickory. When factoring in data from 2010, a fourth city (Charlotte) is added on to that list. For this report, we wanted to see where net household growth has gone in the state since 2010 (*45.1*). We looked to see whether new households went to census tracts that were already fairly densely settled in 2010, or to relatively sparsely-settled tracts. We sorted tracts by 2010 household density and divided them into six parts (hexiles). We found that the least dense group of tracts lost households, but all others gained. The greatest number of households went to tracts with quite low densities in 2010, just 100 – 243 households per square mile.

In fact, just 5% of census tracts account for over half of the net increase in households since 2010. Those 107 tracts are shown on the map below. These tracts include a handful of downtown neighborhoods at the heart of Charlotte and Raleigh. But much more of the growth is in exurban tracts, well out from city centers — often tracts opened to rapid development by the construction of new highways or expressways. Those developments have now locked in patterns of greenhouse gas emissions for decades, as those tracts are generally not served by transit and require long-distance commutes.



Map credit: prepared by Andrew Pericak using data from the 2013-2017 American Community Survey and the 2010 US Census.

"81.3% of North Carolinians commute to work alone."

ENERGY & WASTE - ENERGY	
Goal 47. Risks to the environment from energy extraction and use are minimized.	GOOD
Indicators: greenhouse gas emissions from energy consumption, energy efficiency of the economy	
Goal 48. North Carolina transitions to a diverse mix of renewable energy sources.	MIXED
Indicators: energy from renewable sources, quality of grid modernization	
Goal 49. Energy rates are affordable, with costs fairly distributed.	MIXED
Indicator: household affordability of energy	
Goal 50. Energy infrastructure is reliable and resilient.	WEAK
Indicator: outages/reliability of grid	

SPECIAL FOCUS

Energy affordability and the clean energy alternative

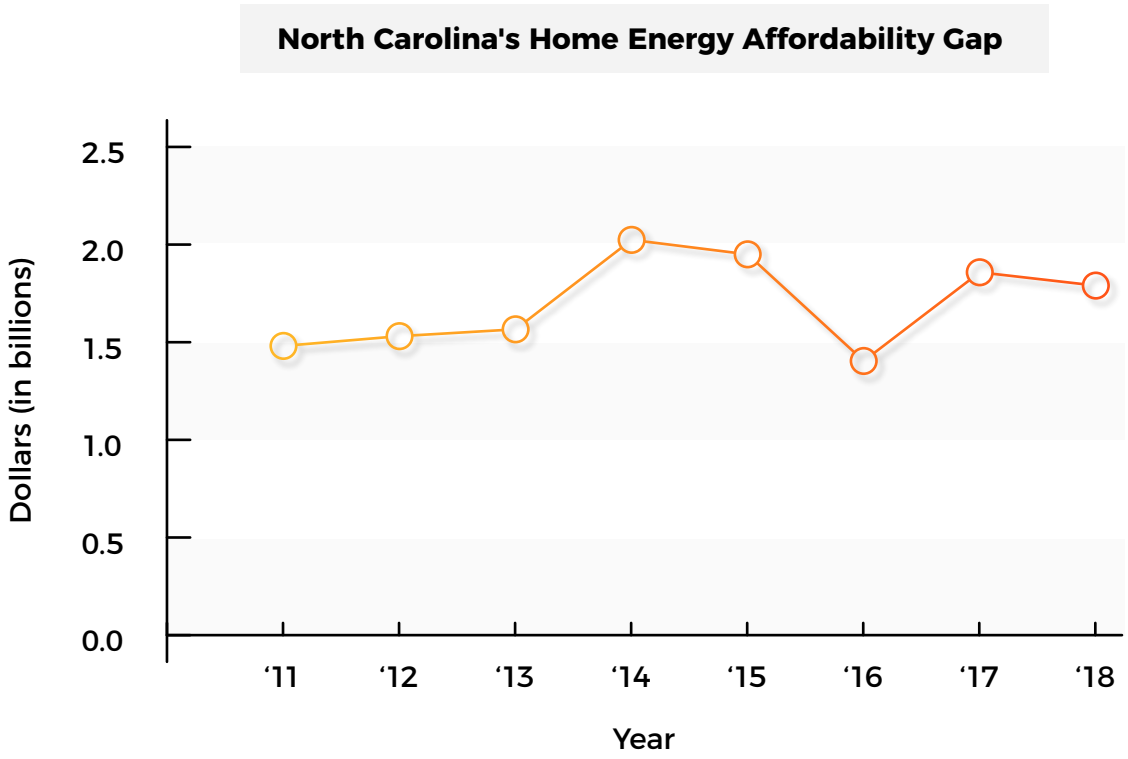
The portion of household income that a family spends on energy offers a pragmatic measure of energy affordability (*49.1*).

For this indicator, we look to the Home Energy Affordability Gap, issued annually by the consulting firm of Fish, Sheehan, and Colton (FSC). Starting from the assumption that affordable energy should not exceed 6% of household income, the FSC model estimates, for every county and every state, the total amount by which household energy bills exceed the threshold of affordability. That figure is the home energy affordability gap. The data for North Carolina (as shown in the graph titled "North Carolina's Home Energy Affordability Gap") shows an overall increase in costs since 2011, but a decline over the last few years.

The gap falls heaviest on low-income families. On average, in 2017 the 30% of North Carolina households at or below 200% of the federal poverty level spent at least 7% of their income on energy. Households at federal poverty level or below spent 18% or more of their income on energy.

Smart investments in energy efficiency could reduce that burden. Less directly, investment in a combination of solar generation and battery storage could eliminate the need for expensive gas peaking plants, and help insulate ratepayers from volatile natural gas prices. Both of those strategies would also reduce greenhouse gas emissions.

"Households at federal poverty level or below spent 18% or more of their income on energy."



Data credit: FSC, Home Energy Affordability Gap, 2011-2019.

ENERGY & WASTE - WASTE	
Goal 51. North Carolina minimizes solid waste production. Indicators: volume of solid waste generated, waste diverted to composting	MIXED
Goal 52. North Carolina maximizes reuse and recycling of wastes. Indicators: ratio of recycling: disposal	MIXED
Goal 53. Hazardous wastes are managed well, and past contamination remediated. Indicator: hazardous waste reduction, net change in contaminated sites	WEAK
Goal 54. Risks from the waste cycle are distributed equitably. Indicator: proximity to transportation, storage, and disposal sites	NO TREND
Goal 55. Unnecessary production of and exposures to toxics are minimized Indicator: unstudied chemicals in the marketplace	WEAK

SPECIAL FOCUS

Forever chemicals and the problem of disposal

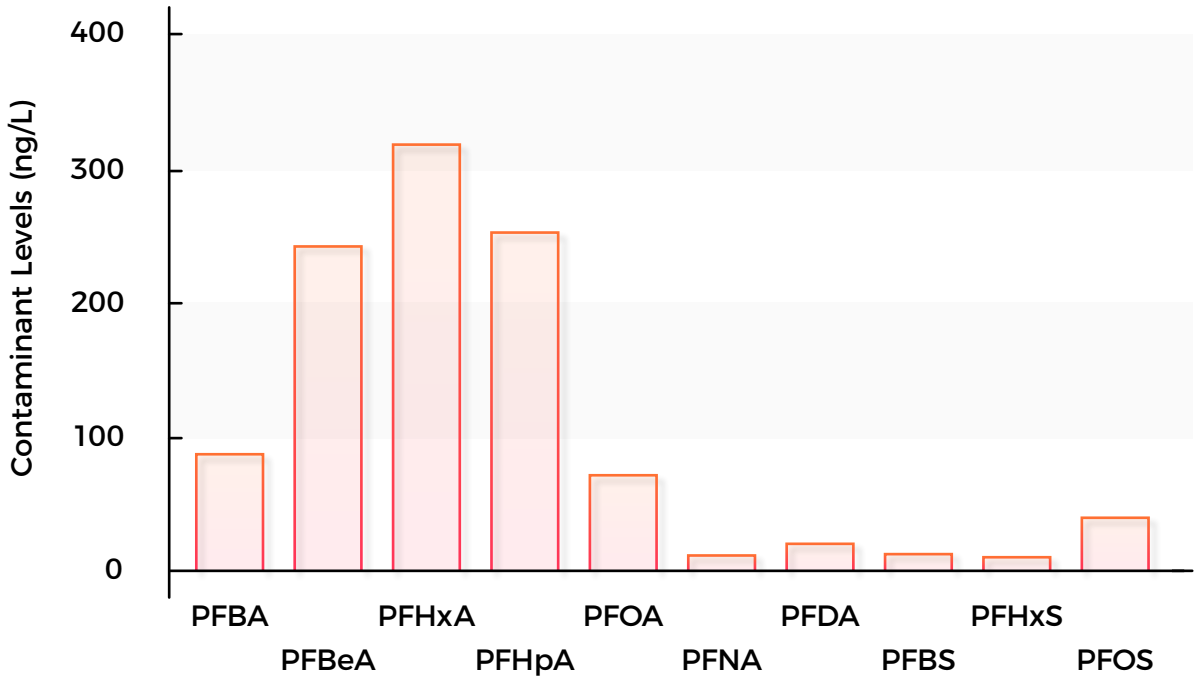
On March 7, 2019, the NC Department of Environmental Quality finalized a consent decree that requires a chemical company, Chemours, to substantially eliminate its discharges of GenX and related chemicals into the Cape Fear River. The consent decree doesn't address, however, the numerous other perfluorinated substances (PFAS) coming down the river from multiple sources upstream. The bar graph below shows levels of several PFAS found in Pittsboro's raw water through sampling conducted by the Haw Riverkeeper.

Because PFAS take decades or centuries to break down, these pollutants have been dubbed 'forever chemicals'. Most lack health data, but those we know about are toxic. In North Carolina, PFAS are discharged in wastewater from certain manufacturers, or (as a component of sludge removed from wastewater) are applied to farm fields, from which they leach back into waterways.

Perhaps the most challenging source of PFAS to manage is landfill leachate. Products dosed with PFAS, like non-stain carpets, are sent off to municipal solid waste (*51.1*) or construction & demolition landfills, where toxics will leach from them for centuries. If leachate is not periodically removed, the landfill will overflow. Currently, leachate is dumped at wastewater treatment plants, even though treatment doesn't remove the toxics. The result is that, a few miles downstream, PFAS can show up in another community's drinking water.

Ultimately, the problem of forever chemicals illustrates the need to screen chemicals before allowing them into consumer products (*55.1*). When products aren't designed to be safely recycled (*52.1*) or composted (*51.2*), every toxic product eventually becomes contaminated waste, imposing years of economic and environmental costs.

PFAS Levels in Pittsboro



Data credit: adapted from chart, data provided by Emily Sutton Paynter, Haw River Assembly.

Solutions: policies to bend trends towards a better future for North Carolina

This report describes trends towards and away from a sustainable, prosperous future for North Carolina. Advocates across the state, including partners and allies of the NC Conservation Network, are working to shape these trends for the better. Here, we present nine solutions, reflecting the goals and indicators featured in this report, along with contacts from our partners for more information about each.

Invest in floodplain restoration.
The best defense against staggering economic losses from floods is to invest in reconnecting and restoring floodplains, letting them serve their natural role of collecting and holding floodwaters.

Contact: Paxton Ramsdell
Environmental Defense Fund
pramsdell@edf.org

Promote living shorelines over bulkheads.
Living shorelines offer a way for coastal landowners to respond to rising seas and storms without increasing erosion of neighboring properties or wiping out vital underwater habitat.

Contact: Lexia Weaver
North Carolina Coastal Federation
lexiaw@nccoast.org

Transition swine farms away from sprayfields.
It is time for the state's 2,200 swine farms to move to environmentally superior technologies and away from sprayfields that simply can't absorb the nitrogen and phosphorus pollution they receive.

Contact: Will Hendrick
Waterkeeper Alliance
whendrick@waterkeeper.org

Prioritize environmental justice.
To ensure environmental equity, North Carolina should add consideration of cumulative impacts and evaluation of disparate and disproportionate risks to the basic procedures agencies follow when drafting rules, setting policy, and issuing permits.

Contact: Jamie Cole
North Carolina Conservation Network
jamie@ncconservationnetwork.org

Limit the discharge of 'forever chemicals'.
Over 3,000 perfluorinated substances (PFAS) are in commerce; at least a dozen are in our rivers. State regulators should use existing authority to curb discharges of PFAS to protect North Carolina's rivers and public health.

Contact: Geoff Gisler
Southern Environmental Law Center
ggisler@selcnc.org

Expand renewable energy and storage.
North Carolina should increase the share of electric power generation that comes from renewables and retire coal plants. The transition will save ratepayers and cut greenhouse gas emissions.

Contact: Will Scott
North Carolina Conservation Network
will@ncconservationnetwork.org

Curb wood pellet facilities.
Cutting timber for wood pellets returns minimal value to the state's economy, damages habitat, burdens nearby communities, and releases carbon into the atmosphere. North Carolina should disapprove new or expanded wood pellet facilities.

Contact: Rachel Weber
Dogwood Alliance
rachel@dogwoodalliance.org

Implement Complete Streets.
NCDOT is currently updating a 2009 'Complete Streets' policy, which calls for non-highway roads to accommodate multiple modes: cars, transit, bike, pedestrian, and personal mobility. Implementing Complete Streets can reduce greenhouse gas emissions and reduce bike and pedestrian injuries.

Contact: Kym Hunter
Southern Environmental Law Center
khunter@selcnc.org

Resolve fiscally non-viable water systems.
Water and wastewater systems that do not earn enough revenue to cover their costs of operation and debt service are on borrowed time. State and local leaders should adopt and implement transition plans for fiscally non-viable systems.

Contact: Peter Raabe
American Rivers
praabe@americanrivers.org

For other issues, or general questions about this report, please contact:
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