

# The Sustainable Sandhills Initiative: A Comparative Analysis of North Carolina to the Sandhills Region

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# **The Sustainable Sandhills Initiative: A Comparative Analysis of the Sandhills Region to North Carolina**

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## **Executive Summary**

The Sustainable Sandhills Initiative (SSI), a regional effort of government, nonprofit, citizen, and private sector representatives, encompassing the North Carolina counties of Cumberland, Harnett, Hoke, Moore, Richmond, and Scotland, was formed in February 2003 to ensure long-term sustainability of this region. Through the formation of a baseline sustainability report including 53 environmental, social, and economic indicators measured over time, the region can gauge where it is in terms of current sustainability and how far it has to go to meet established desired end state goals.

Current indicators were compared to previous regional trends as well as to statewide trends. A ranking system of green star, red alert, or yellow warning was used to evaluate current indicators. A green star classification means the indicator shows significant improvement; a red alert classification displays the indicator's progression away from sustainability; and the yellow warning indicates neutral or inconsistent trends, or those indicators with incomplete information. Results reveal that 10 indicators (8 environmental, 1 social, and 1 economic) deserved green stars, 11 (4 environmental, 2 social, and 5 economic) warranted red alerts, and 32 (10 environmental, 11 social, and 11 economic) do not have enough information to yield consistent trends during the given the study period. These findings suggest that given current trends, the region would not be considered sustainable for long-term efforts given the high number of yellow warning and red alert indicators. These results will further aid in the SSI's efforts to prioritize necessary changes to reach the region's vision.

The original intention of the SSI was to have the Metrics Committee and the air, water, energy, land, and waste community resource teams work closely with me in the development of the indicators. However, the first meeting of the Metrics Committee was not until February 19,

2004, and a more condensed time frame was needed for completion of this project. At the February meeting, the Committee agreed to allow the community resource teams to evaluate the available indicator data to determine how this data fits in with the team's established desired-end states and identify where gaps in information need to be explored further. This was substituted for more substantive community involvement. The data analysis was done strictly for this project and will not be presented to the community resource teams ensuring teams ultimately decide which indicators to use to track long-term goals and how they should be interpreted. Many indicator projects take years to identify appropriate indicators with the purpose of creating community ownership and awareness through indicator development. Therefore, allowing the community resource teams to use the indicator data as a guide will act as the missing forum to empower the community.

The baseline report and indicator information will be updated annually by the Sustainable Sandhills Metrics Committee and used as a tool for public education, as a means for meeting established goals, for prioritizing issues in need of further assessment, and in working towards appropriate policy objectives.

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## **Introduction**

This introduction serves as a mechanism to contextualize sustainability and the use of sustainability indicators in the Sustainable Sandhills Initiative by exploring the history, components, effectiveness, cautions, and relevance to decision-making and policy of indicator use. Also included is a history of the Sustainable Sandhills Initiative and its established goals. The format of this paper includes introductory, methodological, result, and discussion sections however the results section is formatted differently than as seen in many papers. The results section is the entire baseline report for the SSI including graphs, illustrations, data limitations, indicator justification, and indicator interpretation. This was done so that the reader can have full view of the explanations of each indicator. The discussion section covers recommendations and findings not discussed in the results portion of the paper.

### **What is Sustainability?**

The term sustainable is tied to human-centered activities such as agriculture, management of natural resources, health care, etc. To be sustainable can be thought of as “to maintain,” while development can be referred to as “to make better.” These principles all relate to the underlying elements of not compromising the future and are in line with the “sustainability movement.” Therefore often times the terms sustainable development and sustainability are used synonymously, as in the case of this proposal (Bell and Morse, 2003). The Brundtland Report, issued by World Commission on Environment and Development in 1987, defines sustainable development as “development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs” (Brundtland Report, 1987). A common way to assess sustainability is the integration of environmental, social, and economic considerations. A sustainable community is one that manages resources with ecological limits, provides means for citizens to meet economic needs, and promotes socially just and vibrant communities (International Institute for Sustainable Development, n.d.).

### **Use of Sustainability Indicators**

During the 1992 United Nations Conference on Environment and Development (Earth Summit) in Rio de Janeiro, an action plan to address sustainable development was formulated

called Agenda 21. Chapter 40 of Agenda 21 states the need to develop indicators of sustainable development to provide a solid basis for decision-making at all levels and to contribute to sustainability of integrated environmental and developmental systems (Van Wijngaarden, 2001). Sustainability indicators (SI or indicators) now are used by over 200 communities around the country to measure progress towards sustainability (Redefining Progress, n.d.).

## **History**

Prior to the development of SI, other methods were used to assess community health but have been found lacking. In the past a single indicator such as measuring poverty was used to assess community conditions. This approach did not allow for a comparison of how poverty affected the local economy, social and economic relationships, or the environment. In other words, single indicators fail to capture the complexity embodied by the many dimensions of sustainability (Smart Communities Network, n.d.).

There are several ways to gauge progress towards sustainability. One method is an ecological footprint (EF), a spatial unit described in relation to its impact in terms of land area required to support it, based on the notion of carrying capacity. However, the EF indicates little about what could or should be improved. Unlike the EF, a second method incorporates output such as material intensity per unit of service (e.g.: mass material input per total unit of service delivered over the lifetime of a product). In this case, products are only environmentally sound when the amount of material input per amount of services is decreased or the number of services provided is increased. This measurement is more applicable to businesses than communities. Other gauges convert inputs into a common equivalent such as energy as a measure of work done by the environment. Yet another tool is cost-benefit analyses that involve monetization of costs and benefits. However, the most common method to determine process is the use of indicators and indices, which can encompass the above mentioned tools (Bell and Morse, 2003). Using SI provides information on the conflict between shorter-term economic and social goals such as socially desirable high incomes or living standards and longer-term environmental degradation (Pirages, 1996). Indicators help a community quantify where it is, where it is going, and how far it is from goals (Smart Communities Network, n.d.). Indicators are used to simplify, measure,

communicate, and make understandable trends and societal values as they relate to environmental, social, and economic considerations (MacGillivray, 1998).

### **Types and components of indicators**

Indices have an overall single number, encompassing many individual SI. The comparison comes when indices are contrasted to baseline indices (Lawrence, 1998). Diagram indices such as AMOEBA or RADAR can graphically integrate indicators and reduce complexity by helping keep an eye on the big picture and illustrating tradeoffs (Bell and Morse, 2003). SI also can be compared to other locations, such as the case in ranking cities as best or worst using a given SI, such as air quality. However, this type of indicator comparison leaves little motivation for locations with average rankings to improve. The type of indicator used in this project will be directional. The SI will show direction either toward or away from a given benchmark (Lawrence, 1998). SI cannot make a determination on how far a given entity needs to go but can tell what direction in which it is headed (Devuyst, 2001). The baseline sustainability report for Sustainable Sandhills will set benchmarks for use in future annual reports.

### **Indicator selection and presentation**

SI have the ability to create agreement on valued factors of a society, provide a focus and framework for data collection and interpretation, and to generate policy-integrative approaches for considering the balance of environmental, social and economic matters (International Institute for Sustainable Development, n.d.). Indicators can be used to inspire the community to take control of change (Bell and Morse, 2003). It would be ideal to have a set number of indicators applicable to all entities, however this is not possible due to local environmental, social, and economic differences. Therefore, it is important for local communities to choose combinations of relevant indicators based on their values (Devuyst, 2001). Indicator selection should include those persons whose behavior is in need of change. Community members should have the opportunity to evaluate objective data and determine for themselves what it means (Lawrence, 1998) Forming indicators can be a great way to empower people and create community spirit and civic engagement (MacGillivray, 1998).



Indicators can serve a policy planning or a communication goal or purpose (Bell and Morse, 2003). For either purpose, the presentation method needs to be geared to the appropriate audience. Since SI can take the form of raw data, raw data analysis, indicators, or indices, strategically choosing which measures to present is important (International Institute for Sustainable Development, n.d.). Scientists and technicians often find value in raw data, policy makers in indicators, and the general public in indices (Bell and Morse, 2003). SI are good tools to take complex scientific data and make it more comprehensible to the layperson provided the format for presenting the data is understandable to the recipient (Warburton, 1998).

### **Elements of effective indicators**

There are many frameworks in which the indicators can be applied. First of all, a clear picture of sustainability must be painted before SI are chosen. As previously mentioned, sustainability has varied definitions and a specific definition should be agreed upon by those involved. The definition of sustainability should be expanded to include the scope, time and spatial scale of the initiative (Bell and Morse, 1999). Many criteria have been suggested for indicator selection such as those recommended by Lawrence, Guy and Kibert (1998), and the International Institute for Sustainable Development (n.d.). According to Lawrence et al, effective indicator programs have the following characteristics: measure what is to what ought to be; are understandable; use objective information; involve the community in interpreting and responding to data; and use local examples of people's values (Lawrence, 1998). As mentioned under indicator presentation, for an effective indicator program, selection of SI need to be a participatory process. Ideally, by engaging stakeholders, public opposition will decrease, the process will be less costly than hiring professionals, and will lead to public ownership and empowerment to create change (Bell and Morse, 2003). The International Institute for Sustainable Development suggests that indicators should be relevant and understandable, well founded and easily interpreted, responsive to new issues, measurable, available, and cost effective. They also should show trends, have a long-range view, have clear and specific targets, and link social, environmental, and economic aspects (International Institute for Sustainable Development, n.d.). Additionally indicators should have a defined reference, target or direction, keeping in mind indicators are means to an end. Table 1 displays Guy and Kibert's (1997) suggested criterion to help with indicator selection (Bell and Morse, 2003).

Criteria	Questions
Community involvement	Were they developed and acceptable by the stakeholders?
Linkage	Do they link social, economic, and environmental issues?
Valid	Do they measure something that is relevant?
Available and timely	Are the data available on a regular basis?
Stable and reliable	Are they compiled using a systematic method?
Understandable	Are they simple enough to be understood by laypersons?
Responsive	Do they respond quickly and measurably to change?
Policy relevance	Are they relevant to policy?
Representative	Do they cover the important dimensions of the area?
Flexible	Will data be available in the future?
Proactive	Do they act as a warning rather than a measuring of existing state?

Table 1: Guy and Kibert's suggestions for criterion to help in indicator selection (Guy and Kibert, 1997)

### **Cautions of indicator use**

One caution of using indicators is that “in the process of their development, indicators do serve to stimulate community visioning and unite different interests, but they cannot single-handedly bring about change” (Besleme and Mullin, 1977 from Bell, 2003). Little research has been done on the outcomes achieved by indicators (Gahin et al, 2003). There is also little evidence that indicators influence public policy. Much research on indicator methodology and techniques exists but little literature is available on using indicators for improvement or to create change (Bell and Morse, 2003). Often time indicators are seen as numbers, not actions (MacGillivray, 1998). Studies such as those by Gahin et al attempt to fill this literature gap between indicator development and policy action.

Gahin et al. (2003) studied five indicator programs. Outcomes were classified as intangible (provide forum for discussion, bring people together, create new working relationships, increase awareness, etc.), concrete (new agendas or programs, influence decisions, incorporated into planning, changed behavior, etc.) or measurable (change, progress towards sustainability). Findings indicated that most outcomes fell within the intangible range, while concrete results were less frequent, and actual change measured by indicators was not found in any of the cases. Gahin et al. identified key elements for bringing about real change: funding, fostering community ownership, good project decision making process, having a few champions, organization credibility, good content, being culturally sensitive, outreach and education, focus on particular indicators, and creating better ties to action. Even though few measurable or

concrete outcomes resulted from the use of indicators, intangible outcomes provide a foundation for educating the community, measuring progress overtime, building connections between people, and catalyzing action. To bring about change, indicators must be coupled with action (Gahin, 2003).

The Promoting Action for Sustainability Through the Use of Indicators at the Local Level in Europe (PASTILLE) project also tried to research this gap in the literature on linking indicators to policy. Rydin et al. cite Eckerverg and Mineur (2003) who found a number of consequences from this new emphasis on linking policy action and indicators. First is the need to understand the local context and broader range of policy actors and pressures (e.g. characteristic of governance) of location for which indicators are developed. Second, indicator development is no longer a technical issue and involves many inter-related forms of expertise. Finally, indicators are “socially constructed” meaning many different actors seek their own definition of sustainable development. These three consequences show that indicators are no longer only technical tools. The PASTILLE research concluded that indicator sets do not influence decision-making in any significant way however indicators do have a definite set of benefits. Indicators can help organizations understand stakeholder views, help guide policy decisions, and add to governance. This research points out that indicators function inside the government process and can be integrated into the process of governance (Rydin, 2003).

Other aspects include the use of unaggregated indicators and the weak link these indicators sometimes display between environmental, social and economic conditions. The underlying idea is that some of these indicators remain compartmentalized, allowing for little comparison or integration (International Institute for Sustainable Development, n.d.). However, on the flip side, using indices creates concern as well. Although integrating indicators into indices reduces complexity for the viewer, transparency is lost through this process. Only those aspects that are transparent and tangible (readily understandable) relate to people’s lives (Bell and Morse, 2003). SI indices additionally attempt to encapsulate diverse and complex measures into just a few measures (Bell and Morse, 1999).

Another item to be aware of in indicator use is the tendency to lose sight of ultimate goals while getting caught up in details such as what to measure. Additional pitfalls lie in the possibility that regular monitoring of SI becomes routine and no one uses or looks at the data (Bell and Morse, 2003). For political reasons, communities might choose to evaluate safe options and ignore serious problems (MacGillivray, 1998). Final cautions are in the lack of methodology for using non-quantifiable data and valuation for comparison. New frameworks are needed to deal with questions of information availability and conceptual uncertainty (International Institute for Sustainable Development, n.d.).

### **Importance of linking indicators to policy**

According to Andrews, 1999, “human uses of the environment are matters of governance, not merely of individual choice or economic markets.” Past policies promoted economic exploitation of natural resources and caused the trends of environmental degradation. Humans need to take responsibility for managing their impact on the earth through environmental policy. Policy seeks to pit long-term common interests against more immediate individual interests (Andrews, 1999). This is a core principle of sustainability. Policy is implemented to protect public health and welfare, provide collective (public) goods such as clean water, protect environmental assets against “tragedies of the commons,” where individual action in an open access resource available to all leads to degradation of the resource. This baseline report will help the community balance environmental, social, and economic resources and serve as an awareness tool to help decision-makers prioritize competing interests. Many of the priorities to be identified by the baseline report might need the backing and institutionalization of policy to create change.

The indicators will have little value if the baseline document cannot be used as a tool for policy makers to institutionalize determined changes. Even though many issues can be resolved by the market, externalities such as pollution, public goods such as national defense, and distributional and equity issues fail to be truly captured or valued in a market. In situations such as those mentioned above, government and policy are needed to address these market failures. Other market failures arise with the presence of imperfect information, high transaction costs, or a natural monopoly in need of regulation (Swiss, 2000). The intervention of government and

establishment of policy will ensure proper social equity and distribution and the presence of public goods needed for social, environmental and economic health and in turn lead to regional sustainability. Policy, more specifically environmental policy, is necessary to protect public health and ecological well being of the Sandshills through guarding the region against externatiles. Environmental protection policy generally comes in the form of pollution control, sustainable natural resource management, and preservation of natural and cultural heritage (Andrews, 1999).

Government involvement and policy are needed to advance community values for a number of reasons, especially in the case of market failures mentioned above. Government establishes basic market operating conditions such as who holds rights to assets, defines and enforces the rules of the market to ensure protection against dishonesty, and protects public health and safety in guarding against occurrences such as building along waterways or cheap disposal of waste. Government additionally provides public goods such as national defense or clean air that are undervalued by the market, provides collective services such as waste management and allows for redistribution of resources regardless of wealth. Finally, government can correct problems through policy but can also have impacts from its actions (Andrews, 1999). Through a democratic, representative government, citizens elect people and support issues that reflect their values. In turn representative officials create public policy inline with community values. In other words, policy is equivalent to society's attitude toward the environment.

Debate on the role of government in public policy issues is common. Differing opinions over where individual versus collective action is appropriate, the balance of public values and tradeoffs, the evidence needed to justify government action, the decision power at the central versus local level, the appropriate agency responsibility and how to coordinate agencies, the type of policy tool (taxes, incentives, subsidies, etc.), and the existence of government failures such as free-riding where a person avoids paying his or her fair share of a collective service, or transaction cost are ongoing (Andrews, 1999). However, these issues can be discussed and clarified through policy decision-making.

# **Sustainable Sandhills Initiative**

## **History of the Sustainable Sandhills Initiative**

The North Carolina Sustainable Sandhills Initiative (SSI) is a newly formed group of stakeholders from a six-county region (includes Cumberland, Harnett, Hoke, Moore, Richmond, and Scotland counties) dedicated to establishing the Sandhills region as a model for regional sustainability planning. The SSI aims to improve the present and future quality of life in the region by simultaneously preserving natural resources and enhancing economic development. For the purposes of this Initiative, the Sandhills region includes six counties in which the long-leaf pine ecosystem is present. The first meeting of the SSI Steering Committee was on April 3, 2003, and in May 2003, more than one hundred stakeholders took part in a four-day training workshop to learn the internationally recognized sustainability framework, the Natural Step (explained below). Participants joined one of five SSI community resource teams focusing on water, air, land, energy, or waste. In these teams, participants formed desired end-state goals reflecting their view on where the region should be in terms of these resources in the future. The desired end-states will drive the efforts of the SSI. A summary of the desired end-states developed at the May training can be found in Appendix A. The vision the Sandhills region, also formed at the workshop, establishes the direction the SSI wants to head. However, the direction in which the region is currently headed has not been analyzed formally. This baseline report highlighting current and historical conditions from which to assess sustainability progress will aid the SSI to assess current stocks and to create an analysis of the current trends relating to the environmental, economic and social characteristics. This report will enable the SSI to determine which indicators signal areas in need of change. As an example, if historical data show that vehicle miles traveled (VMT) has consistently increased over the years, this could signal the necessity of efforts to reduce VMTs to maintain the air quality and to consider land use planning to encourage smart growth. The increase in VMTs could be compared with other indicators such as bus ridership or the number of bike paths to determine what steps could be taken under those indicators to improve VMTs. The baseline report provides the necessary environmental, economic and social overview vital to the future planning of the SSI.

The Steering Committee oversees the general function of the SSI and the Metrics Committee will review the baseline and future annual reports. After review of the report by the

Metrics Committee, community resource teams will use the baseline data and identify gaps and data needed to measure progress towards desired end-states formed at the initial Natural Step training. The Natural Step principles will not be measured directly but will be used as broad guidelines in indicator analysis.

### **The Natural Step**

The SSI used the Natural Step Framework for training committee members on the principles of sustainability. The Natural Step is a nonprofit organization that works with businesses and governments to integrate sustainability principles into business decisions and operations. The organization promotes sustainability as an opportunity, not a liability. The Natural Step Framework uses four principles or conditions that must be met to have a sustainable society. The principles state that a sustainable society is not subject to systematically increasing: (1) concentrations of substances extracted from the earth's crust, (2) concentrations of substance produced by society, or (3) degradation by physical means. The fourth principle is that human needs are met worldwide, understanding the social and economic dynamics drive the actions that lead to ecosystem change (Natural Step, n.d.).

As a tool for measuring the progress towards each desired end-state, the Steering Committee has committed to an annual report that will track given indicators each year. One of the initial steps towards the annual report will be to select indicators in-line with both the strategies developed during the Natural Step training and the Natural Step format. These indicators will be the baseline indicators and will be selected by looking at the triple bottom line of environment, economic, and social measures. The data then will be compiled into a baseline report. Following completion of this report, SSI subcommittees will analyze indicators that best suit the goals of the Initiative.

## Methodology

In conjunction with the SSI Steering Committee members and staff, relevant environmental, economic, and social indicators and measurement techniques were identified. Indicators were selected by reviewing other sustainability reports such as the Bay Area Alliance For Sustainable Communities, the Regional Sustainability Report, Southwestern Pennsylvania (A Project of Sustainable Pittsburgh), and organizations such as the Global Reporting Initiative (GRI) and other guides to sustainability measures.<sup>1</sup> Indicators from these reports were evaluated in the context of applicability to the six-county Sandhills region. Indicators were measured over a five-year period, as data were available. Each indicator was assessed using appropriate measurement techniques specifically chosen to represent the individual indicator. Annual data were collected when feasible on a county-by-county basis for each of the six counties and on a statewide basis. The data were totaled for a region-wide versus state comparison. As an example, waste disposal, was assessed by yearly measurements of hazardous waste per capita, percent waste recycled, and waste per capita for each county and as a region-wide total. Using the same data source to measure the same indicators each year provides a reliable set of trends for the Sandhills region. The trends will be used to assess the SSI's success or failure towards goals.

In the case of varying data from different sources, data used for official state or federal reporting requirements was selected. Due to the loss of variability in aggregating regional and state measures into a single figure, the comparison will show little other than how the regional trends compare to statewide trends. As a way of standardizing regional and state information indicators were analyzed on a per capita or per square mile basis.<sup>2</sup> The primary comparison is that of the region to its previous years with the state comparison being of secondary consideration. The goals set by the region might significantly differ from those of the state due to

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<sup>1</sup> Bay Area Alliance For Sustainable Communities. <http://www.bayareaalliance.org/indicators.pdf>  
Regional Sustainability Report, Southwestern Pennsylvania (A Project of Sustainable Pittsburgh). <http://203.147.150.6/>

<sup>2</sup> Square mile figures were taken from 2000 estimates from the U.S. Census and per capita information were taken from N.C. State demographics



localized regional conditions. It is beyond the scope of this project to evaluate the state's goals. Data limitations are stated for each indicator and should be evaluated carefully upon further data analysis or decision-making.

Indicators were evaluated in terms of progress towards sustainability. Sustainability judgment was made based on the region's trends in the previous years and state trends as to whether the region is doing well or poorly in relation to a given indicator. A green star suggests that the indicator displayed significant improvement within the region and is in-line with or better than the statewide comparison. A red warning denotes the indicator is showing signs of heading against sustainability and is lacking in comparison with statewide data. The classification of yellow warning was assigned if trends were not consistent enough to warrant significant improvement (green star) or a red alert or if the region demonstrated improving trends but still was not up to par with state trends.

Due to the timeframe of this project, I conducted individual data analysis, separate from the SSI Metrics Committee and community resources teams. Ultimate data analysis and interpretation for the SSI baseline report will include the input of the community through the Metrics Committee and the community resource teams.

### **Future work for the SSI beyond this project**

At the first meeting of the Metrics Committee on February 19, 2004 the Committee decided to send the baseline indicator data to the community resource teams for input. Each community resource team (air, land, water, energy, and land) is scheduled to meet over the month of March to evaluate where additional data is needed. The community resource teams will be charged with connecting the data available to desired-end states.

## **Results**

### **Clean Air**

#### **Indicators**

- Percent of color-coded Air Quality Index days
- Percent of code red, orange, and yellow ozone days
- Total air emissions from facilities

- Ozone concentration
- Carbon Monoxide concentration
- Particulate Matter<sub>2.5</sub> concentration
- Particulate Matter<sub>10</sub> concentration

### **Why are these indicators important?**

Air pollution is harmful to the health of humans, wildlife, plants and other environmental elements. Air pollution substances are both naturally occurring and attributed to manmade activities. Those substances result from manmade activities are considered pollutants. In determining various air quality trends connected to health and the levels of selected pollutants and their known sources, the Sandhills region can determine where improvement should be focused to reach long-term sustainable air quality goals. Since many of the air quality data are available only for locations with monitors (primarily Cumberland County for the region), total air emissions is measured for all six-counties of the region to present a more well-rounded picture of the region's air quality.

### **How is the Sandhills performing?**

#### **Green star**

The Sandhills is showing improvement in regards to concentrations of carbon monoxide, particulate matter<sub>2.5</sub>, and particulate matter<sub>10</sub> and total air emissions from facilities. Carbon monoxide and particulate matter<sub>10</sub> average concentrations for both the region and the state remain below the threshold exceedence value and continue to decline. The state average PM<sub>2.5</sub> concentration has shown a gradual decrease starting in exceedence of the standard in 1999 to a continuing decline in concentration through 2000 and 2001. Since data were not available after 2001, more recent trends are not available. The regional average PM<sub>2.5</sub> concentration is below the exceedence standard. The state as a whole has seen an increase in total emissions and then a leveling beginning in about 1998. The Sandhills region seems to be faring a bit better than the state in that total air emissions have decreased from 3,083,170 pounds in 1996 to 2,315,040 pounds in 2001, with a slight increase in 2000.

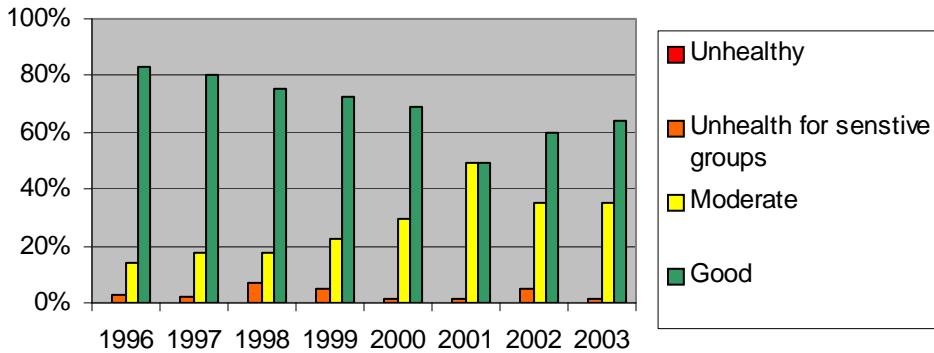
#### **Red alert**

Both the regional and state average ozone concentrations generally exceed the .085 ppm standard from 1994 to 2003. For the time period of 1999 to 2003, although the region exceeds the standard value, the ozone concentration seems to be more stable than previous periods. In 2001-03 the state average drops below the standard to .082 ppm while the previous time period of 2000-02 saw an exceedence of .095 ppm. The decline in the past few years could be a sign of improvement however, this will only be confirmed upon future data collection.

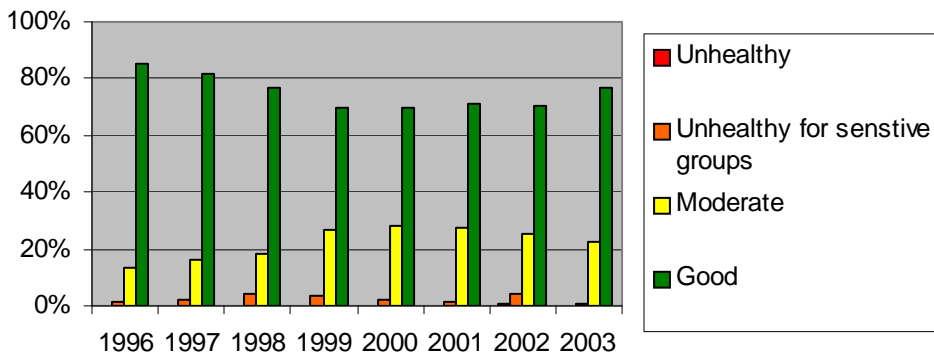
#### **Yellow warning**

In reviewing mainly the very unhealthy, unhealthy, and unhealthy for sensitive group days the Air Quality Index (AQI) and Ozone category day data do not yield consistent trends to determine the direction in which the region or the state is headed. When evaluating the AQI and ozone, unhealthy for sensitive group category, Cumberland County sees a gradual decline in percentage of days except for an increase in 2002.

**Percent of Total Monitored Cumberland County Air Quality Index Days in Each Category**



**Percent of Total Monitored North Carolina Air Quality Index Days in Each Category**

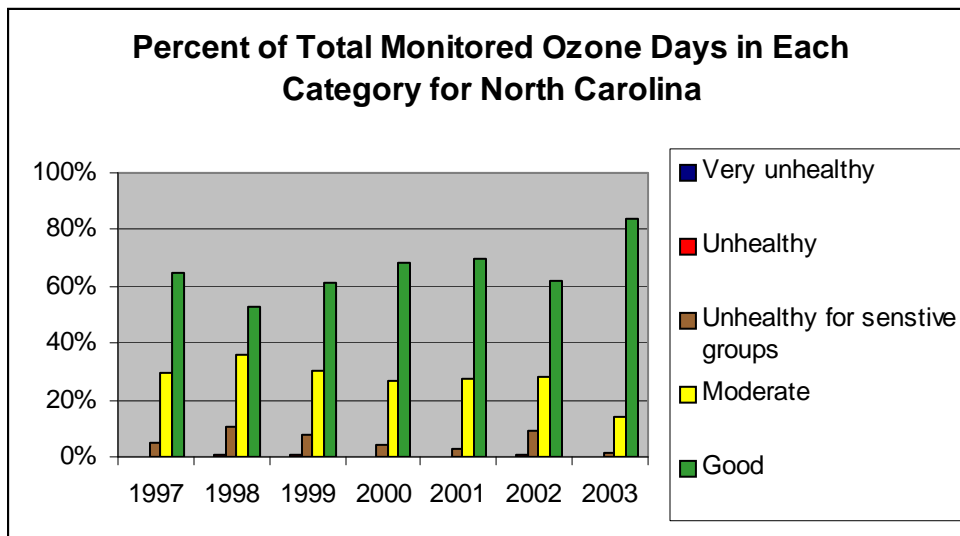
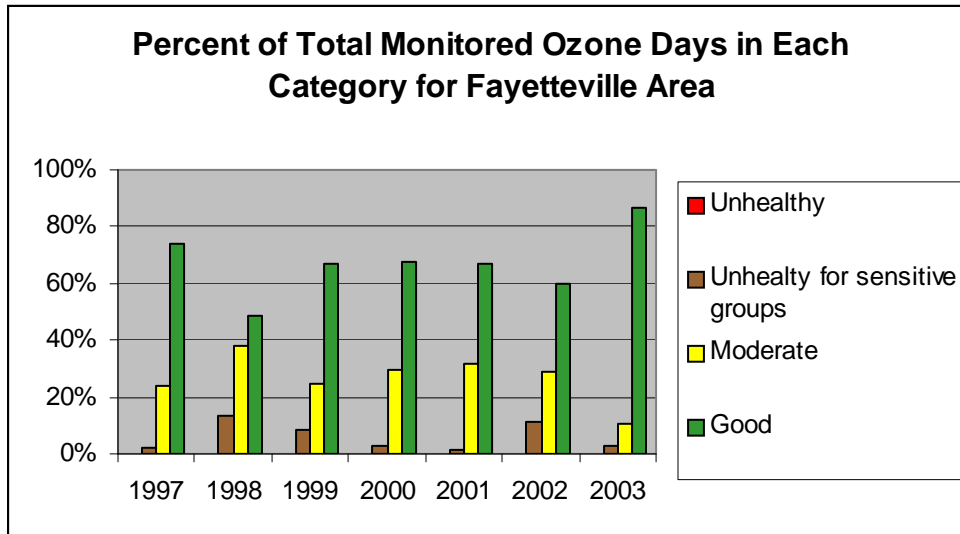


**Notes:** The Air Quality Index (AQI) is an approximate indicator of overall air quality, because it takes into account all of the six major air pollutants regulated by the Clean Air Act: ground-level ozone, particulate matter <sub>2.5</sub>, particulate matter <sub>10</sub> carbon monoxide, sulfur dioxide, and nitrogen dioxide. The AQI values, the associated level of concern, and color are as follows:

AQI value	Level of concern	Color
0-50	Good	Green
51-100	Moderate	Yellow
101-150	Unhealthy for sensitive groups	Orange
151-200	Unhealthy	Red
201-300	Very unhealthy	Purple
301-500	Hazardous	Maroon

**Limitations:** Regional data only is available for Cumberland County. Some Harnett County data was available but not used because of the lack of current data. State data is available for all North Carolina monitoring sites.

**Source:** U.S. Environmental Protection Agency, <http://www.epa.gov/air/data>

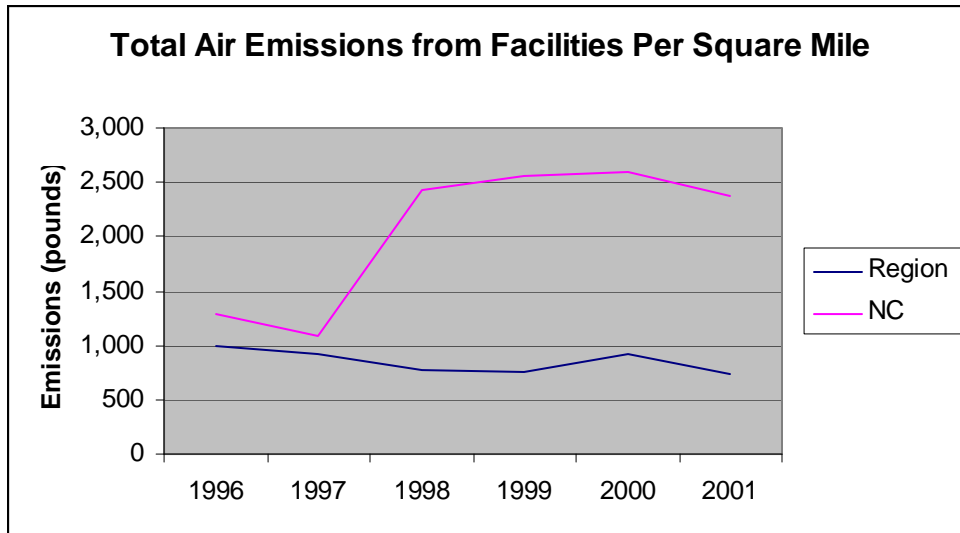


**Notes:** Number of ozone days reflects the total number of red, orange, yellow, and green ozone days for all three Fayetteville area monitor sites (Fuquay-Varina, Golfview, and Wade). Ozone season forecasting is from May 1 to September 30.

**Limitations:** Data is only available for monitored sites (only Cumberland County in the region).

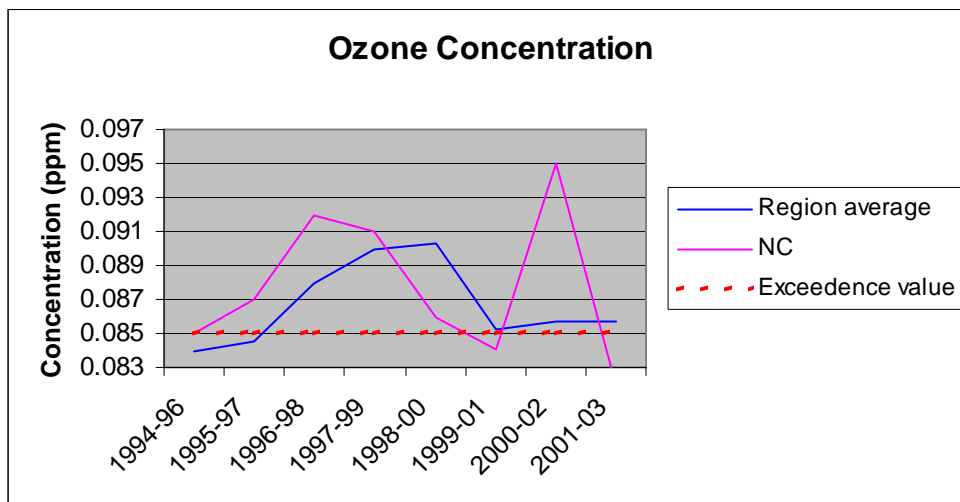
**Source:** N.C. Department of Environment and Natural Resources, Division of Air Quality Ozone Forecast Center, Ozone Concentration Data (Ozone Monitor Statistics)

<http://daq.state.nc.us/airaware/ozone/o3data.shtml>



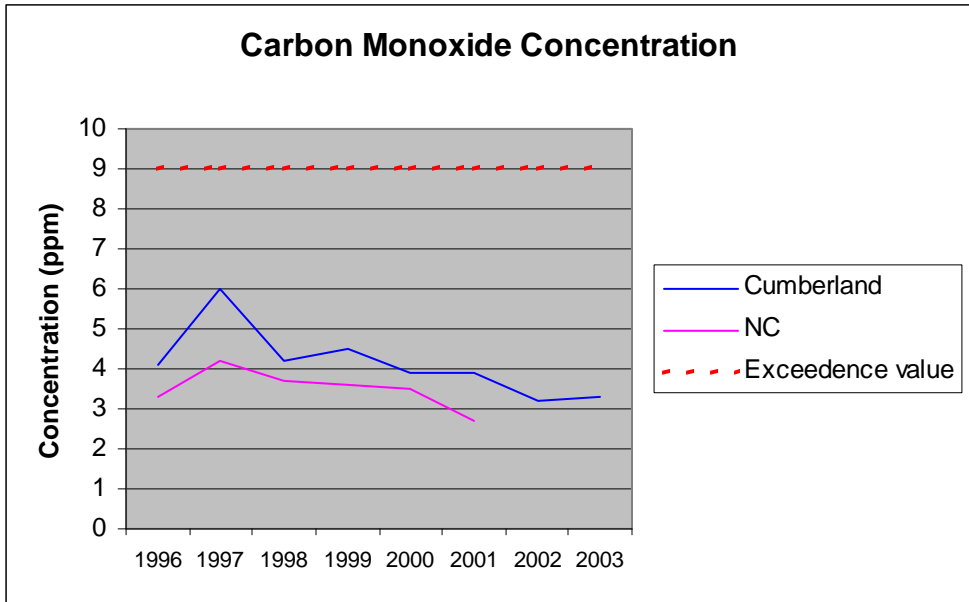
**Notes:** The definition of total air releases according to the Toxic Release Inventory is the “sum of fugitive air and stack air release amounts (in pounds for all chemicals other than Dioxin and Dioxin-like compounds).”

**Source:** U.S. Environmental Protection Agency, Toxic Release Inventory (TRI Explorer), [www.epa.gov/tri](http://www.epa.gov/tri)



**Notes:** Monitoring sites surrounding Cumberland County such as sites in Chatham and Wake Counties were included to obtain a more holistic view. **Limitations:** Regional ozone concentration data is available only for the Wade (Cumberland County), Hope Mills (Cumberland County), Pittsboro (Chatham County), and Fuquay-Varina (Wake County) monitors. The average regional ozone concentration is based on these monitors. State data is based on all North Carolina monitors.

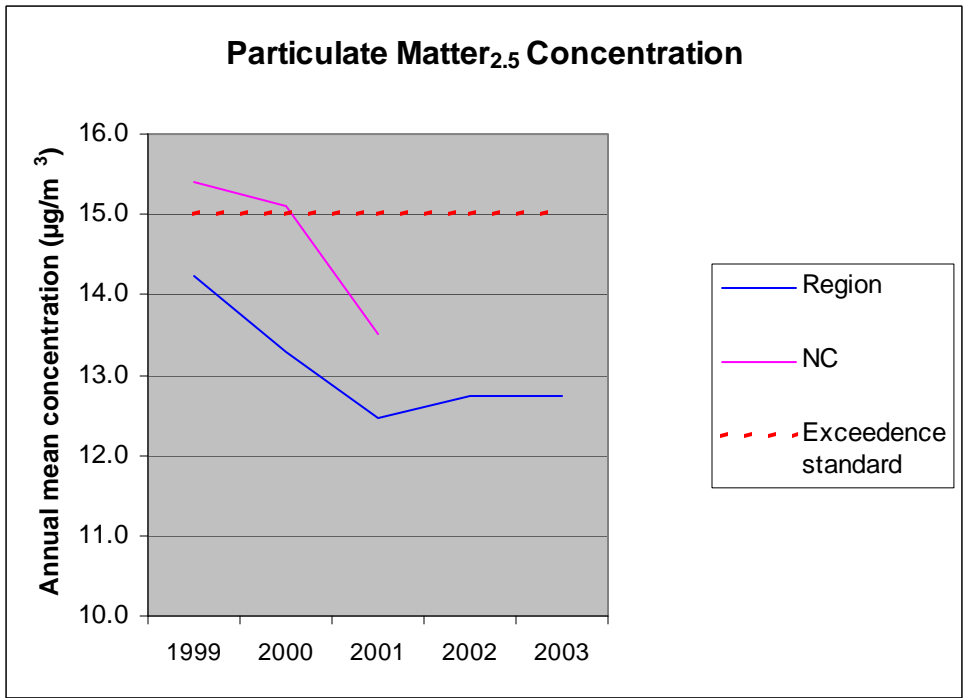
**Source:** N.C. Department of Environment and Natural Resources, Division of Air Quality (use design value summary over three-year period) for concentration data and the U.S. Environmental Protection Agency Monitor Locator Report was used to determine monitors in the vicinity of the defined six-county Sandhills region, [www.epa.gov/air/data](http://www.epa.gov/air/data)



**Notes:** The 9 ppm exceedence value is based on the 2nd Max 8-hr (the second-highest nonoverlapping 8-hour concentration in parts per million (ppm) for the year. Nonoverlapping means that the highest and second-highest 8-hour values do not have any hours in common - they are separated in time by at least eight hours. State data is based on all North Carolina monitors.

**Limitations:** Regional Carbon Monoxide concentration values available for Cumberland County only.

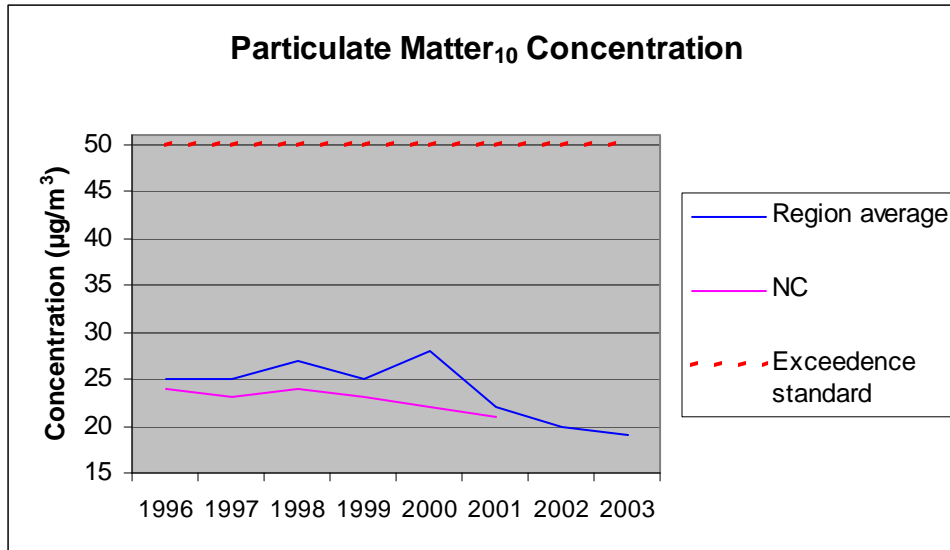
**Source:** U.S. Environmental Protection Agency Monitor Summary Report, [www.epa.gov/air/data](http://www.epa.gov/air/data)



**Notes:** The 15.0  $\mu\text{g}/\text{m}^3$  exceedence standard is based on the annual mean (mean of the 24-hour values for the year).

**Limitations:** Particulate Matter ( $\text{PM}_{2.5}$ ) data is available only for Cumberland, Montgomery, Robeson, and Chatham County monitors. The average regional  $\text{PM}_{2.5}$  concentration is based on these monitors. State data is based on all North Carolina monitors.

**Source:** U.S. Environmental Protection Agency Monitor Summary Report was used for concentration values and the Monitor Locator Report was used to determine monitors in the vicinity of the defined six-county Sandhills region, [www.epa.gov/air/data](http://www.epa.gov/air/data)



**Notes:** The 50  $\mu\text{g}/\text{m}^3$  exceedence standard is based on the annual mean (weighted arithmetic mean of 24-hour values for the year). The method of calculation compensates for scheduled sampling that did not occur.

**Limitations:** Particulate Matter ( $\text{PM}_{10}$ ) data is available only for Cumberland and Harnett County monitors. The average regional  $\text{PM}_{10}$  concentration is based on these monitors.

**Source:** Environmental Protection Agency Monitor Summary Report, Environmental Protection Agency Monitor Summary Report was used for concentration values and the Monitor Locator Report was used to determine monitors in the vicinity of the defined six-county sandhills region, [www.epa.gov/air/data](http://www.epa.gov/air/data)

## Clean Water

### Indicators

- Miles (or acres) of waters on 303(d) list by sub river basin
- Number of fish killed by county
- Total number of septic systems installed, expanded, or repaired by county
- Wastewater treated (reported effluent flows) per county
- Wastewater spills (sanitary sewer, pump station, and WWTP spill or bypass) by county

### Why are these indicators important?

By measuring the health of the region's waters through a variety of indicators, the region can assess whether the waters will be protected and available for present and future best-intended

uses. Indicators pointing to water impairment could be increases in 303(d) list waters not meeting the current total maximum daily load (TMDL) water quality standards and an increase in fish kills resulting from stressful water quality conditions. By analyzing the volume of wastewater spills and treated wastewater and the number of new and upgraded septic systems over time, the region can gauge the demands being put on the quality of the waters.

### How is the Sandhills performing?

#### Green star

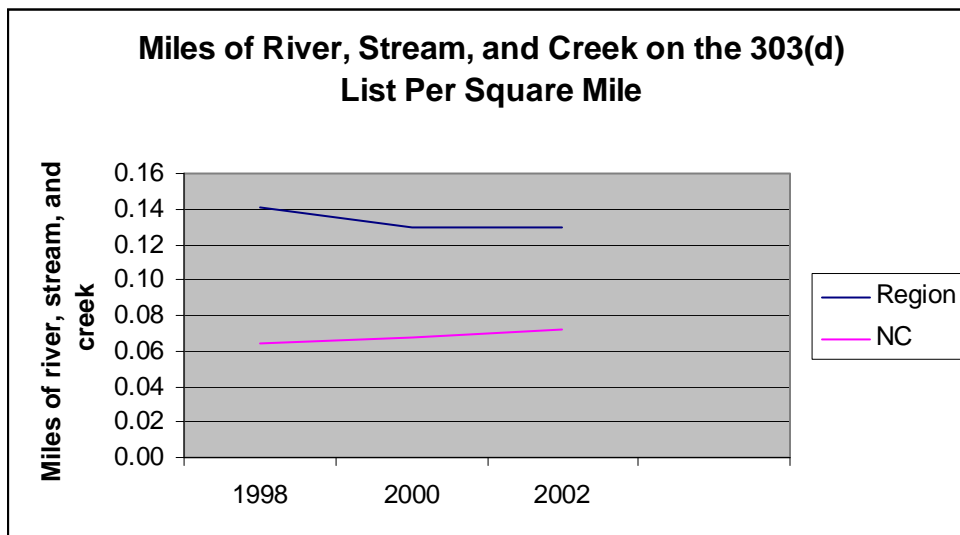
The region seems to be doing comparatively better than the state with regards to acres of water on the 303(d) list and number of fish killed. The region has also seen a steady decline in the volume of sanitary sewer, pump station, and waste water treatment plant spills or bypasses from 24,776,870 gallons in 1999 to 1,423,813 gallons in 2002 while the state has seen an increase in this same indicator.

#### Red alert

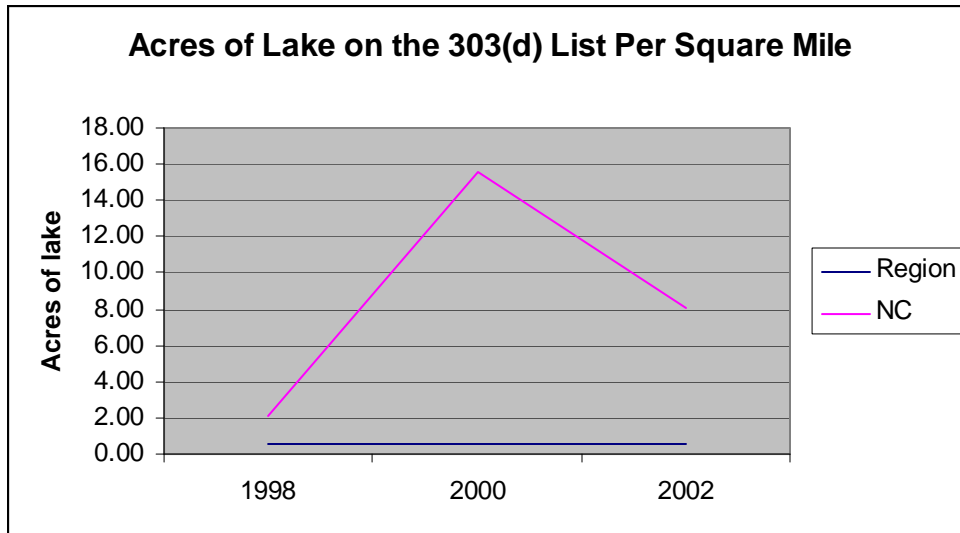
The general declining volume of wastewater effluent treated between 1996 and 2002 raises a red alert until determination of the decline is justified. With a general increase in water use this decline leaves open the question of what is happening to the water that typically flowed through the treatment facility. Statewide data was not available for comparison.

#### Yellow warning

Although the regional miles of river, stream, and creek on the 303(d) list appears to decline, the trend remains above state comparisons. Additionally, the number of new, expansion, and repair septic system trends are not consistent to classify the indicators as receiving a green star or red alert.





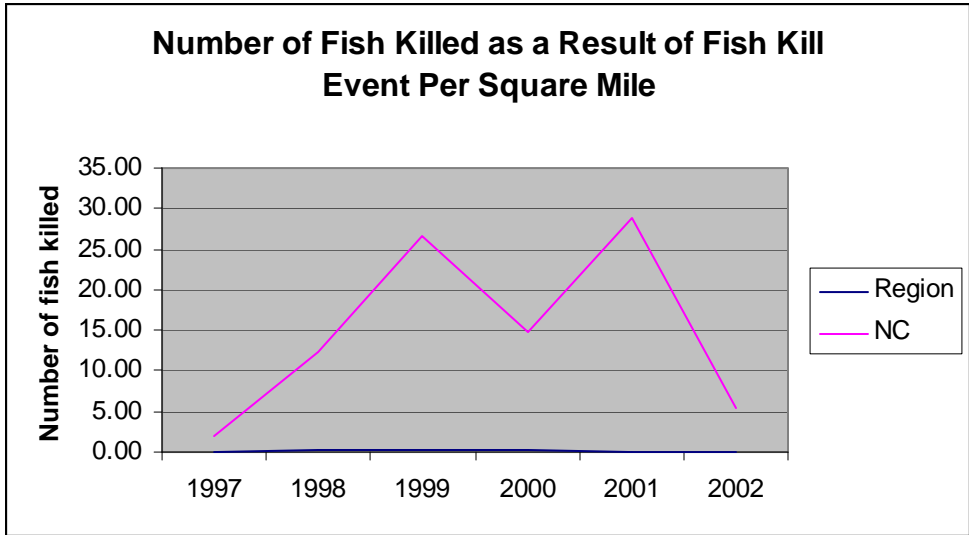


**Notes:** Regional miles of rivers, streams, and creeks and lake acreage were determined using the sub basins within the Cape Fear, Yadkin-Pee Dee, and Lumber river basins that cover counties of the Sandhills region. The following sub basins were used in this analysis: 6-7, 6-10, 6-13, 6-14, 6-15, 6-16, 6-18, 7-10, 7-16, 7-50, 7-51, 7-52, 7-53, and 7-55).

**Limitations:** The 303(d) list misses degrading waters. Older river, stream, and creek calculations used to determine mileage are less accurate and might present comparability problems with more recent maps with much higher resolution. Total watershed area including miles and acres of waters are available for some more recently assessed river basins but due to differing reporting formats for earlier reports, consistent data were not available for state square miles of waters therefore this data based on a comparison to land area per square mile. Since some sub basins extend beyond the defined Sandhills region, a slight inaccuracy in using regional square mile of land totals is possible.

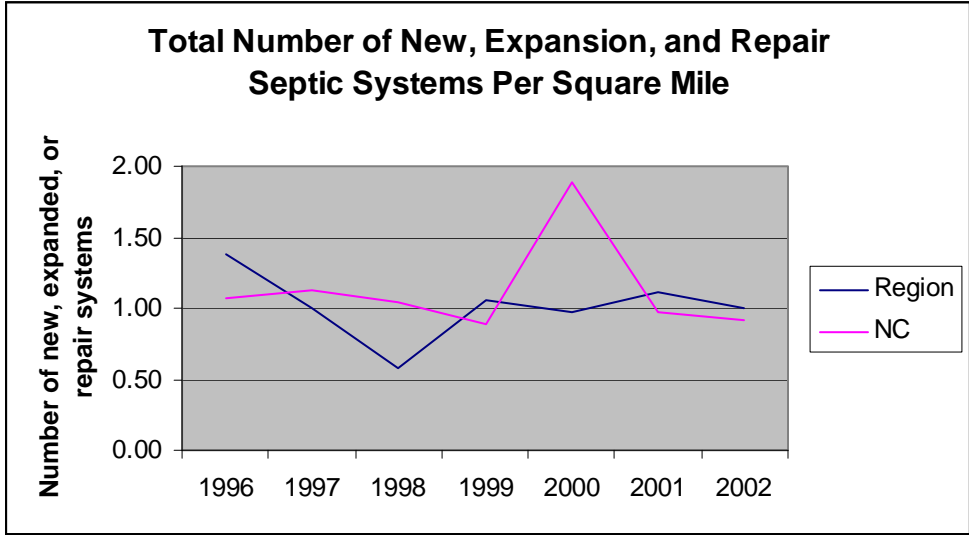
**Future recommendations:** Use the Basin Water Quality Plans to determine where problems exist for those waters not yet on the 303(d) list. These plans classify waters according to their best intended uses (use values). The current use value format was started in 2001 and therefore comparison to previous years was not possible.

**Source:** N.C. Department of Environment and Natural Resources, Division of Water Quality, Modeling and TMDL Unit, 303(d) list, <http://h2o.enr.state.nc.us/tmdl/>



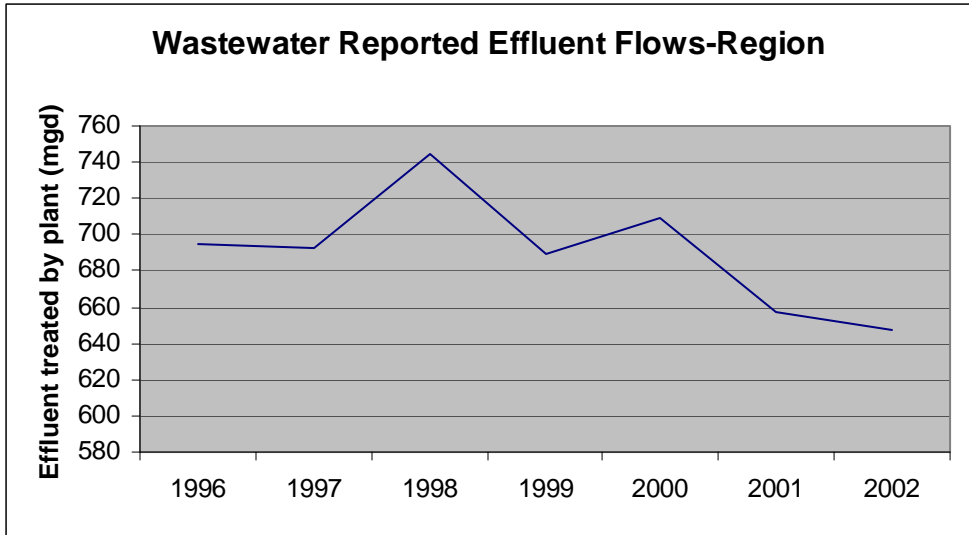
**Limitations:** Total watershed area including miles and acres of waters are available for some more recently assessed river basins but due to differing reporting formats for earlier reports, consistent data were not available for state square miles of waters therefore this data based on a comparison to land area per square mile.

**Source:** N.C. Department of Environment and Natural Resources, Division of Water Quality, Environmental Sciences Branch, Historic Events and Annual Fish Kill Reports, <http://www.esb.enr.state.nc.us/Fishkill/fishkillmain.htm>



**Limitations:** Not all counties reported new, expanded, or repaired septic systems for each year. Harnett County did not report in 1997; Hoke County did not report in 1998; and Moore County did not report from 1996 to 2000.

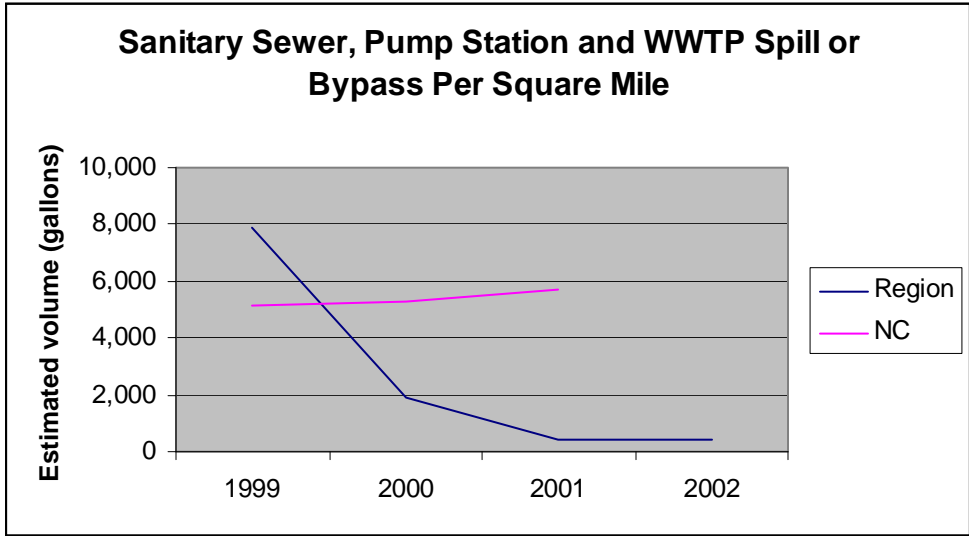
**Source:** County Monthly On-Site Activity Reports, [http://www.deh.enr.state.nc.us/oww/Program\\_improvement\\_team/Pit\\_Index.htm](http://www.deh.enr.state.nc.us/oww/Program_improvement_team/Pit_Index.htm)



**Source:** Vanessa Manuel, N.C. Department of Environment and Natural Resources, Division of Water Quality, NPDES Section

**Limitations:** Data not able to be queried for statewide totals.

**Future source:** Public access to the Basin wide Information Management System (BIMS) is in progress and can be used for future data collection.



**Limitations:** This information does not capture unreported spills or the correlation between spills and extreme weather fluctuations such as droughts and hurricanes.

**Source:** N.C. Department of Environment and Natural Resources, Division of Water Quality, Nondischarge

**Future source:** Public access to the Basin wide Information Management System (BIMS) is in progress and can be used for future data collection.

# Energy Efficiency

## Indicators

- Energy consumption
- North Carolina renewable energy development scenarios

## Why are these indicators important?

Increasing energy demand correlates to an increasing demand for natural resources. Since the use of fossil fuel contributes to air and water pollution and global warming, interest in alternate forms of energy and energy efficiency have gained momentum. Understanding the energy use trends of each energy sector and the projected alternate energy forms will enable the region to prioritize energy goals and take action towards the desired-end states.

## How is the Sandhills performing?

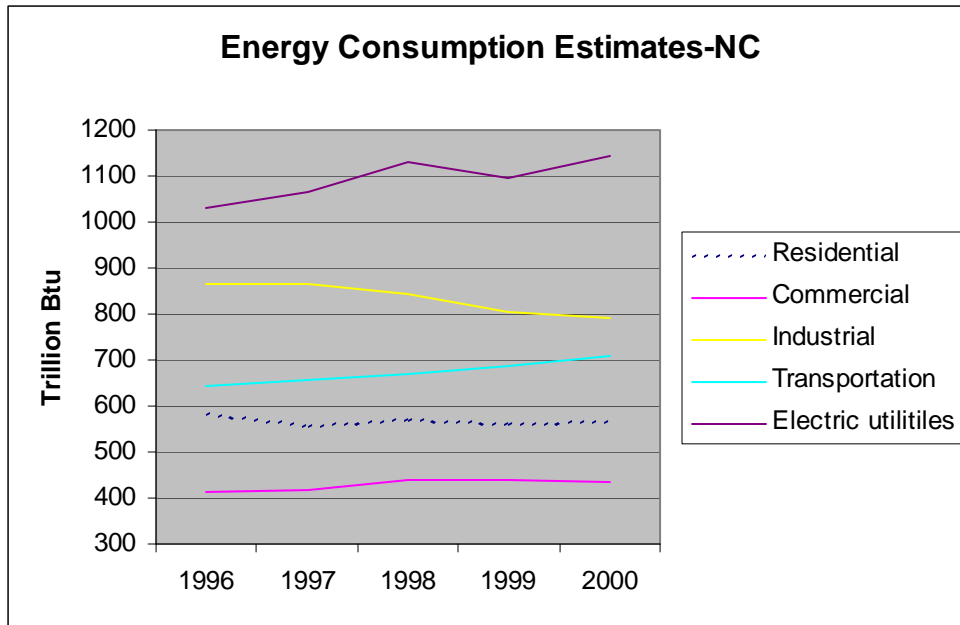
Since data were not available on a county or regional basis, only state data could be analyzed. To get regional data the state data were scaled using population trends therefore both state and regional trends for the energy use indicator are the same. To measure energy use trends, sectors that use energy from most to least consumption are: electric utilities, industrial, transportation, residential, and commercial (U.S. Department of Energy, Energy Information Administration, 1996-2000).

## Red alert

As one of the SSI's goals is to shift use more towards alternative or renewable energy sources, the figure depicts three scenarios for renewable energy development. If the existing scenario is followed no increase in renewable energy use is seen and the baseline shows a slight increase. If the state and the region want to see more use of renewable energy they will have to take a more aggressive development strategy.

## Yellow warning

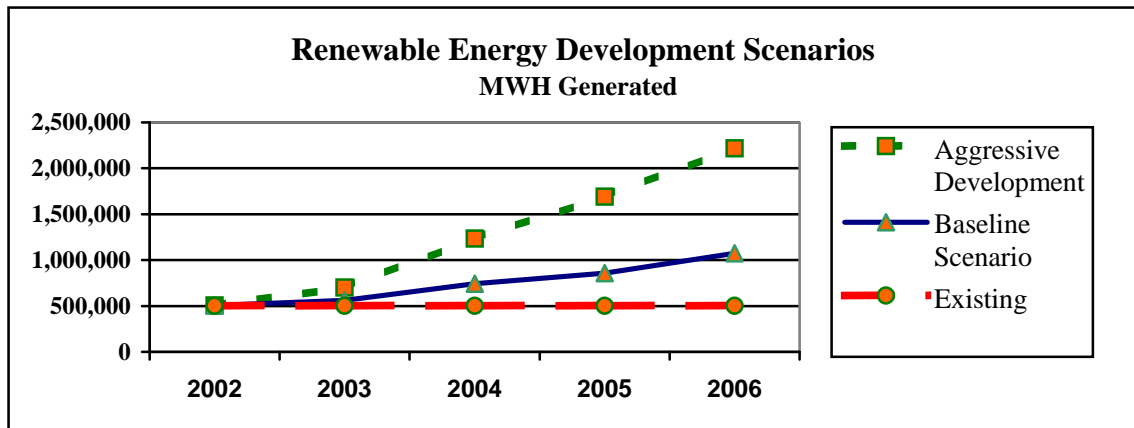
There is an increase in electricity consumption from electric utilities and transportation sectors, and a slight increase in the commercial sector. The industrial sector shows a decline in energy consumption while residential consumption does not yield consistent trends. The question here might be further analyzed by considering the magnitude of consumption based on the larger energy using sectors.



**Notes:** Residential consumption includes coal, natural gas, distillate fuel, kerosene, LPG (liquefied petroleum gases), wood, geothermal, solar, electricity, and electrical system energy losses. Commercial consumption includes coal, natural gas, distillate fuel, kerosene, LPG, motor gasoline, residential fuel, wood, geothermal, electricity, and electrical system energy losses. Industrial consumption includes coal, natural gas, asphalt and road oil, distillate fuel, kerosene, LPG, lubricants, motor gasoline, residential fuel, hydroelectric power, wood and waste, electricity, electrical system energy losses, and other consumption (16 petroleum products, geothermal, wind, photovoltaic, solar thermal energy). Transportation consumption includes coal, natural gas, aviation gasoline, distillate fuel, jet fuel, LPG, lubricants, motor gasoline, residential fuel, ethanol, electricity, and electrical system energy losses. Electric utility consumption includes coal, natural gas, residential fuel, distillate fuel, petroleum coke, nuclear electric power, hydroelectric power, wood and waste, geothermal energy, and other consumption (electricity generated from wind, photovoltaic, and solar thermal energy).

**Limitations:** County-by-county data was not available therefore the region's energy consumption was deduced from the North Carolina total energy use (in trillion Btu) in proportion with the region's population. Therefore the same trends will apply to both the state and the region.

**Source:** U.S. Department of Energy, Energy Information Administration, Energy Consumption Estimates by Source, Selected Years, 1960-2000, North Carolina, [http://www.eia.doe.gov/emeu/states/main\\_nc.html](http://www.eia.doe.gov/emeu/states/main_nc.html)



**Limitations:** Renewable energy data is available only from the Baseline Renewable Energy Study and only at a statewide level.

**Source:** Graph generated by North Carolina's Renewable Choice, Baseline Renewable Energy Study prepared for Green Power Advisory Committee with the support of Advanced Energy Corporation, Cardinal Energy Service, November 2001.

**Future sources:**

- The North Carolina Renewable Energy Registry, started in 2003, will serve as a reference and research tool, and to gauge progress towards the Million Solar Roofs Initiative, [http://www.ncsc.ncsu.edu/information\\_resources/renewable/](http://www.ncsc.ncsu.edu/information_resources/renewable/)
- N.C. Green Power started offering blocks of green power in 2003.

## Sustainable Land Use

**Indicators**

- Change in land distribution (in progress by land use community resource team)
- Population density

**Why are these indicators important?**

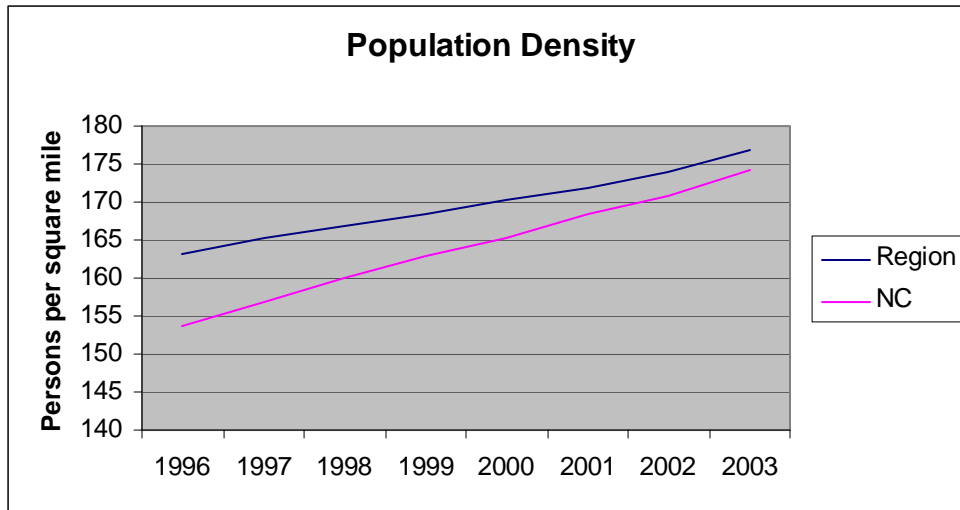
Sustainable use of the land will reduce poorly managed growth and will balance the environmental, social, and economic needs of the community such as maintaining air quality through fewer vehicle miles traveled, creating recreation space, and taking land-dependent occupations into consideration. Evaluating the changes in land distribution and the population density will aid the region in assessing whether the balance of land distribution is sustainable to meet long-term needs.

**How is the Sandhills performing?**

**Yellow warning**

With regards to population density both the region and the state see a gradual increase. For the purposes of reducing sprawl, this indicator would point towards a green star. However, if the density were located in areas where services cannot support the population, this would signify a red alert.

**Change in land distribution** (in progress by subcommittee)



**Source:** Log Into North Carolina (LINKS State Data Center), used N.C. Office of the Governor data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)

## Wise Water Use

### Indicators

Public supply water use per capita

Total water use per capita (includes industrial, agriculture, etc).

Average Daily Demand as Percent of Supply

### Why are they important?

An abundant and reliable water supply is vital for long-term sustainability. Water is used in many day-to-day activities from drinking water to agricultural irrigation to industrial processes. By considering the effects of population on water supply, the total water regional use, and the projected demand versus supply of water, the region can evaluate the long-term sustainability of current water use.

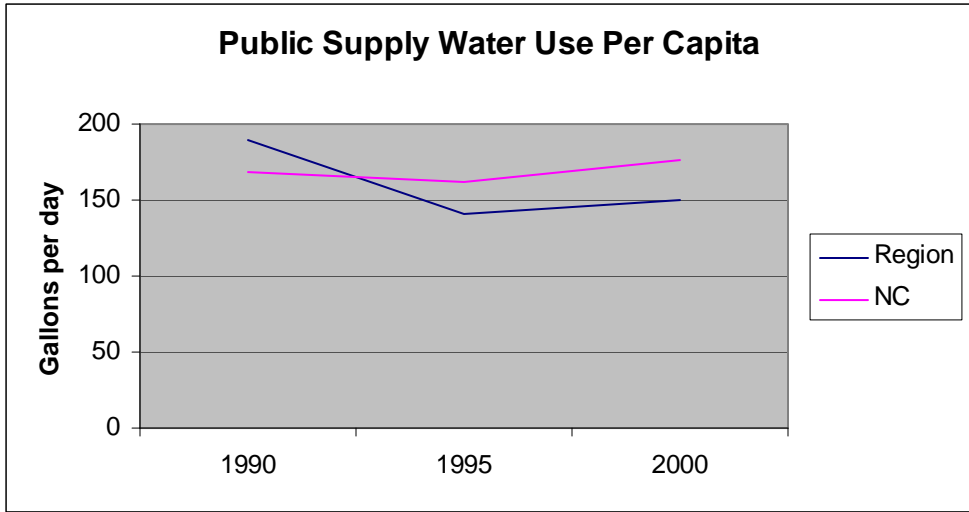
### How is the Sandhills performing?

#### Red alert

Projections show that in measuring the same number of cities (49 cities for the years 2000 through 2020) that there is a general shift towards cities having higher average daily demands as a percent of supply. Statewide data was not available for this indicator comparison.

#### Yellow warning

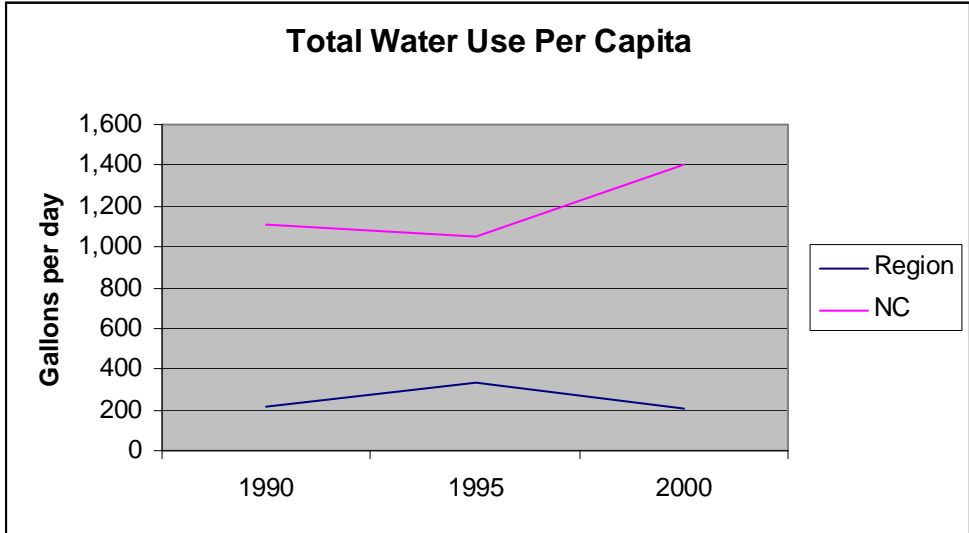
Both measures of water use per capita indicate a yellow warning classification. The regional public water use per capita, reflecting average residential use, has declined from 190 gallons per day in 1990 to 140 and 150 gallons per day in 1995 and 2000 respectively while the state's regional water use per capita ranges from 162 gallons per day in 1995 to 177 gallons per day in 2000. Although the region remains below state averages in 1995 and 2000, the per capita use increases in that time period. Total water use per capita including public supply, domestic, commercial, industrial, mining, livestock, irrigation, and thermoelectric, remains below state per capita use however there is not a continuous regional decline in water use from 1990 to 2000.



**Notes:** In order to obtain a more accurate representation of the average person's water use, this data reflects ground and surface water withdrawals of public supply only. Total water use is assessed in a separate indicator.

**Limitations:** 1995 Harnett County original data point rejected and adjusted to reflect average of 1990 and 2000 data. Several sources indicate no large water users in this area for that time period and suggest original point could have been mistyped. The 2000 inventory is a more accurate inventory as it was checked for errors for any water use per capita exceeding 250 gallons per day, whereas the 1990 and 1995 data were not verified.

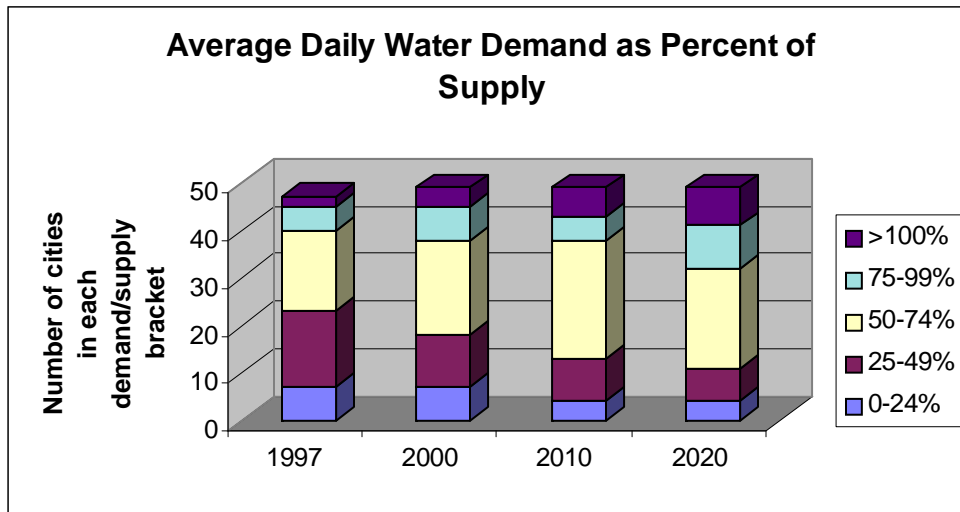
**Source:** U.S. Geological Survey, North Carolina Water Use Data Tables, Source Totals by County, <http://nc.water.usgs.gov/wateruse/> and Rich Marella, U.S. Geological Survey



**Notes:** Total water use includes public supply, domestic, commercial, industrial, mining, livestock, irrigation, and thermoelectric.

**Source:** U.S. Geological Survey, North Carolina Water Use Data Tables, Category Totals by County, <http://nc.water.usgs.gov/wateruse/>





**Notes:** Supply includes surface and groundwater, purchase contracts, and future supply. Demand is based on service area demand, sales contracts, and future sales contracts

**Limitations:** This information reflects projections of public supply only (does not include irrigation, livestock, etc.). The data includes only major water-using municipalities who reported in a given year.

**Source:** N.C. Department of Environment and Natural Resources, Division of Water Resources, Local Water Supply Plans, [http://www.ncwater.org/Water\\_Supply\\_Planning/Local\\_Water\\_Supply\\_Plan/](http://www.ncwater.org/Water_Supply_Planning/Local_Water_Supply_Plan/)

## Zero Waste

### Indicators

- Solid waste disposal per capita
- Local government per capita recovery
- Hazardous waste generation

### Why are these indicators important?

Many of today's unused materials will be disposed of in landfills. As landfills fill up additional landfills will need to be created. One alternative to landfilling waste is to recycle. By measuring the trends in solid waste disposal and recovery (recycling) the region can understand its solid waste demands and best take steps toward the SSI desired end state goal of zero waste.

### How is the Sandhills performing?

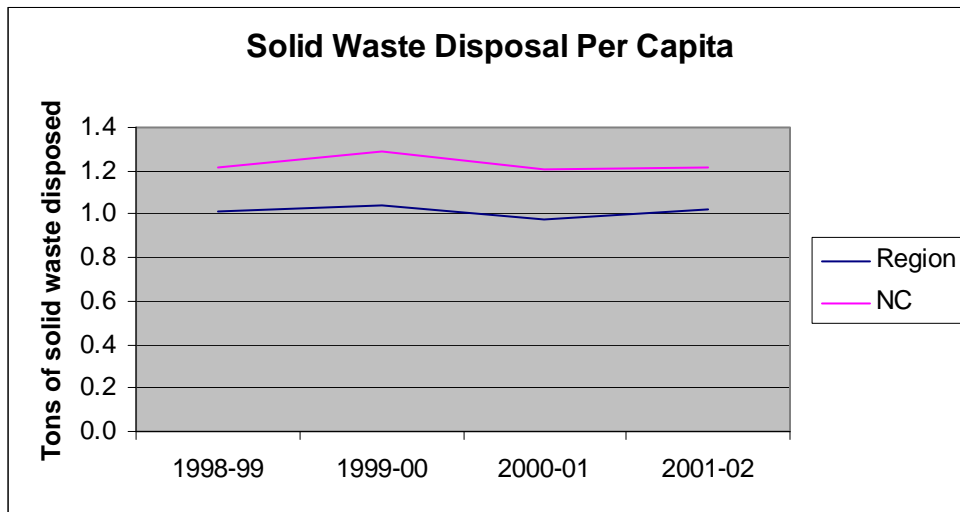
#### Green star

Hazardous waste generation for the region has shown a continual decrease from 4448 tons in 1997 to 1291 tons in 2001. This green star classification is emphasized by the fact that the state hazardous waste generation sharply increased for the same time period.

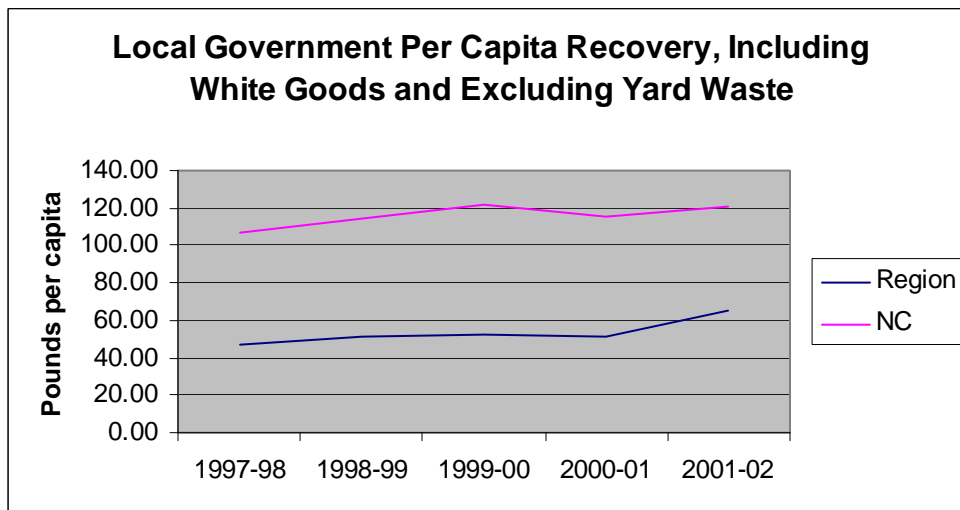
#### Yellow warning

Both the regional and statewide averages for solid waste disposal and local government per capita recovery (including white goods and excluding yard waste) per capita remain fairly consistent over time. However the Sandhills' rate remains lower than the state average. Local

government per capita recovery is on the cusp of being a green star since in more recent years a slight increase in recovery is observed.

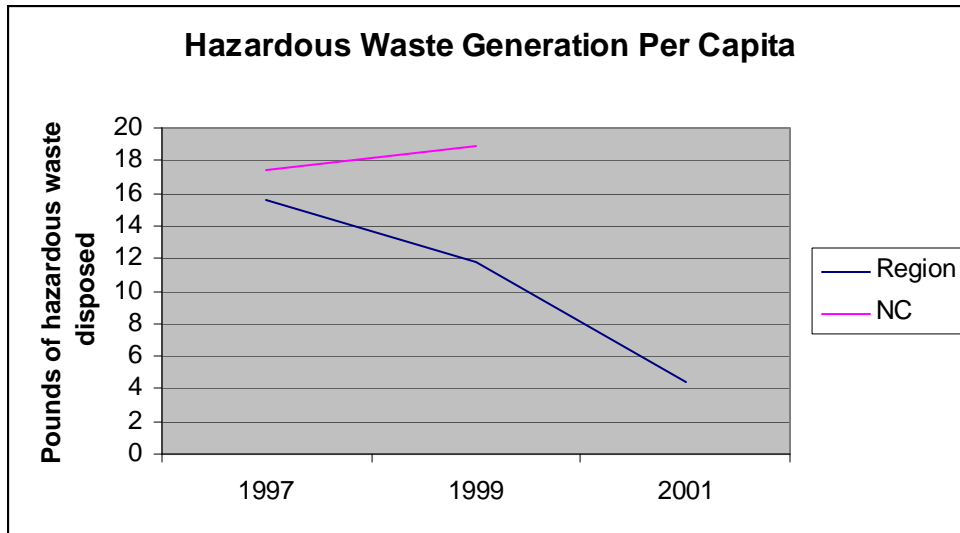


**Source:** N.C. Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Reports, [http://wastenot.enr.state.nc.us/DATARPTS2003\\_3CoIA.HTM](http://wastenot.enr.state.nc.us/DATARPTS2003_3CoIA.HTM)



**Limitations:** Richmond County data for 1997-98 and 1998-99 were not used due to a reporting error. Per capita Recovery does not include private recycling, which could be up to 50 percent of recycling, or composting, or mulching.

**Source:** N.C. Department of Environment and Natural Resources, Division of Pollution Prevention and Environmental Assistance.



**Notes:** Richmond County had no reported hazardous waste.

**Limitations:** Hazardous substances are added and deleted each year and reflecting the change in a trends analysis is difficult. The data captures only hazardous waste generation from large generators and probably some permit facilities. Small-scale hazardous waste is not tracked.

**Source:** Bud McCarty, N.C. Department of Environment and Natural Resources, Division of Waste Management, Hazardous Waste Section

**Future contact:** Helen Cotton, N.C. Department of Environment and Natural Resources, Division of Waste Management, Hazardous Waste Section

## SOCIAL INDICATORS

### Community Participation

#### Indicator

- Percent of voters who voted in last general election
- Percent of voting age population registered to vote

#### Why are these indicators important?

Voting is one way of participating in the community. By voting, a person is contributing to the shared values and goals they would like reflected in the government. In analyzing the percent of registered voters and the percent of registered voters who voted in the last general elections, a feel for the community participation can be derived.

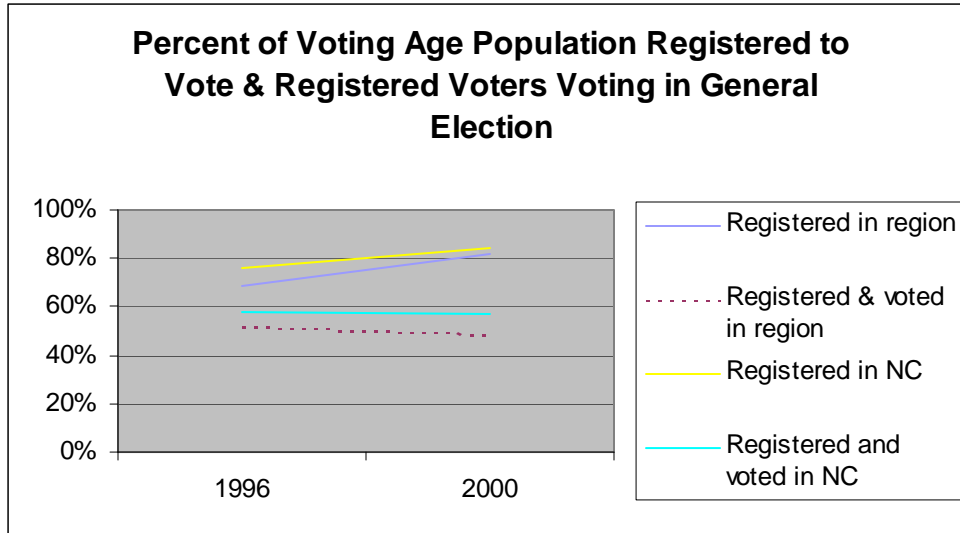
#### How is the Sandhills performing?

##### Green star

The percent of the voting age population registered to vote has increased in the region from 69 percent in 1996 to in 82 percent 2000. An increase in statewide voter registration is seen as well.

### Yellow warning

The percent registered voters who voted in the last election have dropped slightly from 52 percent to 48 percent in 1996 and 2000 respectively. The statewide percent of registered voters has remained constant over the same time period.



**Source:** Log Into North Carolina (LINKS State Data Center), used N.C. State Board of Elections Data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)

## Educated Citizens

### Indicators

- Public school drop out rates
- Percent of high school graduates to pursue higher education
- Percent teacher turnover

### Why are these indicators important?

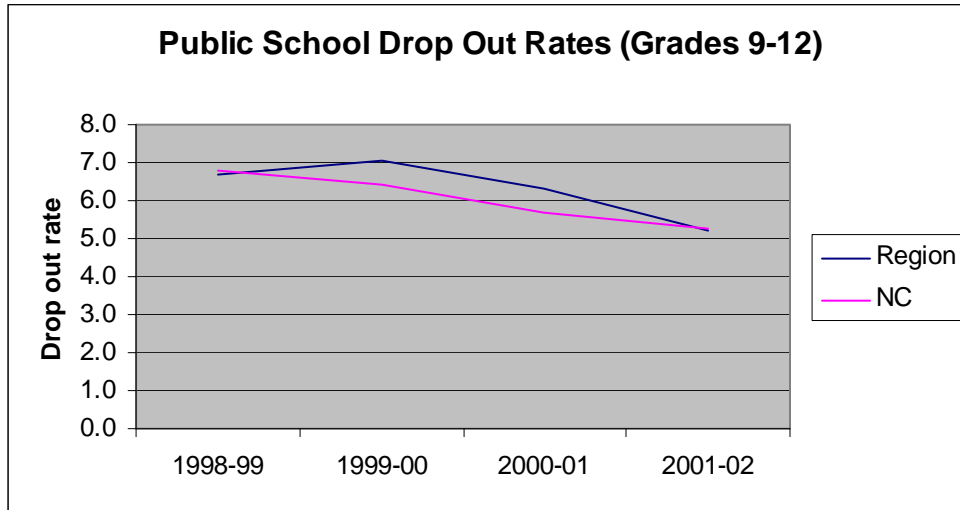
Knowledge arrives through many avenues however, education is one of the core foundations for creating new wisdom. Education enables people to make better decisions. The foundations of education start early in a child's life and can be a platform on which the future is built. Looking at public high school drop out rates and the percent of students that choose to pursue higher education serve as indicators of how the region's educational system is doing at preparing young minds for the future. Assessing the teacher turnover rate serves as a basis to understand the satisfaction of the teachers that are vital to the success of education.

### How is the Sandhills performing?

#### Yellow warning

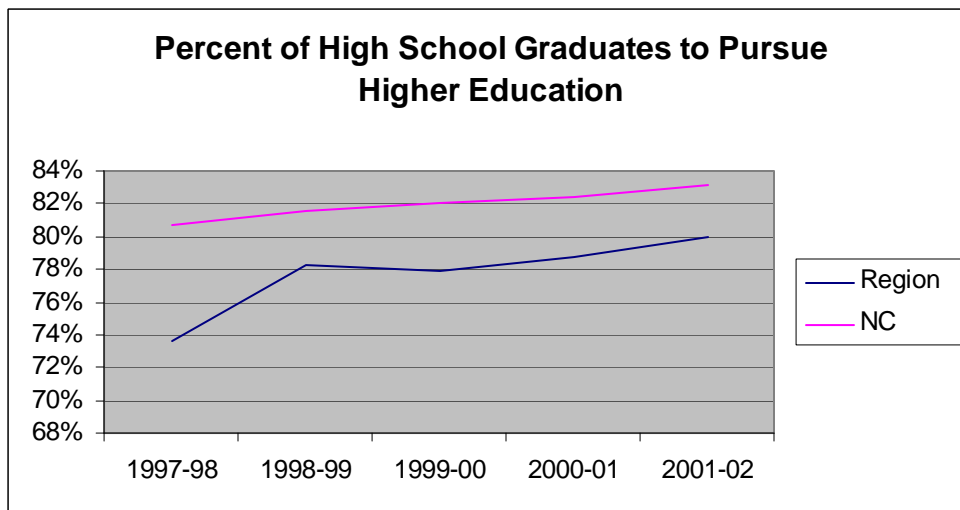
Although the region is seeing improving trends in public school dropout rates, an increase in the percent of high school students to pursue higher education, and decreasing percent teacher turnover, the region consistently ranks below the state average in each of these indicators.

The region's public high school drop out rate ranges from 0.1 of a rating (1998-99) to 0.6 (1999-01) of a rating higher than the state drop out rates. The percent of high school students to pursue education out of state ranges from 3 percent, in 1998-99, to percent to 7 percent, in 1997-98, lower in the region compared to the state. Regional teacher turnover average remains generally around 2 percent higher than state averages.



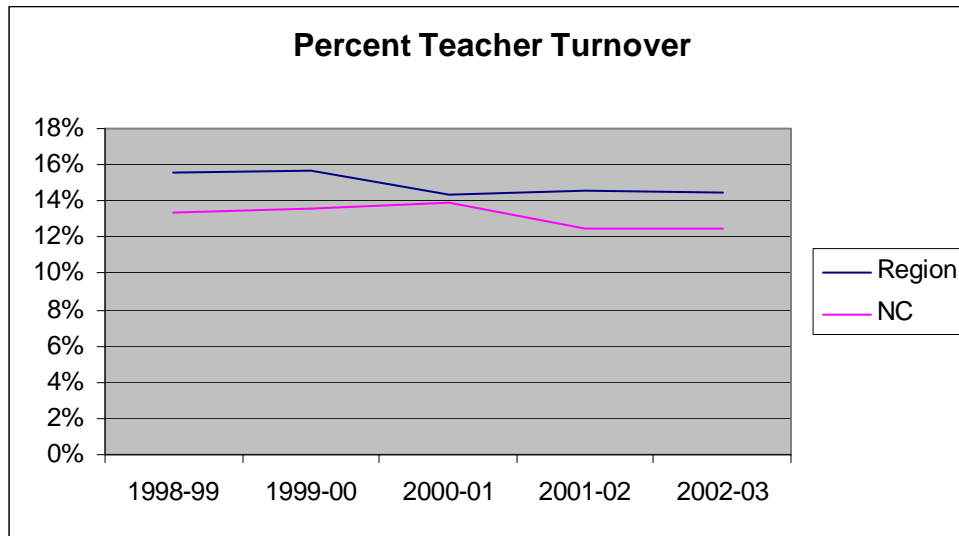
**Limitations:** Data represents public school drop out rates for grades 9 through 12 only. These data reflects a duplicated count of drop outs meaning it includes all students who fit the definition of a drop out for the reporting year, regardless of whether or not the student had also been reported as a dropout in previous years. The Department of Public Instruction ended reporting of unduplicated drop out rate.

**Source:** N.C. Department of Public Instruction, Statistical Profiles, <http://www.ncpublicschools.org/fbs/stats/>



**Notes:** This data is based on the sum of high school graduate intentions of students to go to public or private senior institutions, community/technical colleges, junior college, or trade/business schools.

**Source:** N.C. Department of Public Instruction, North Carolina Statistical Profile, <http://www.ncpublicschools.org/fbs/stats/>



**Source:** N.C. Department of Public Instruction, Human Resources Management, Center for Recruitment and Retention, Annual Teacher Turnover Report, Appendix C, [http://www.ncpublicschools.org/SBE\\_meetings/0309/0309\\_QP03.pdf](http://www.ncpublicschools.org/SBE_meetings/0309/0309_QP03.pdf)

## Healthy Citizens

### Indicators

- Percent of population without health insurance
- Childhood asthma hospitalization rate
- Heart disease, cancer, and diabetes death rate
- Infant death rate

### Why are these indicators important?

Health is a vital aspect of citizens being able to lead longer and more productive lives. In addition, a healthy citizenry could lead to a more productive economy where fewer work hours are lost to illness and the community does not pay the price of the uninsured. Health also is tied to environmental conditions where childhood asthma, infant mortality rates, or rates of heart disease, cancer, or diabetes might signal degrading environmental conditions in terms of human health.

### How is the Sandhills performing?

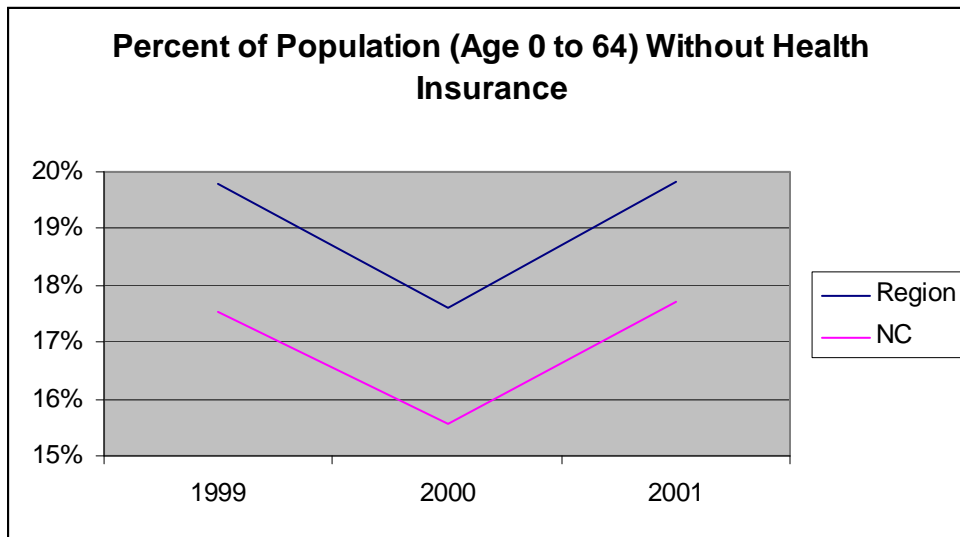
#### Red alert

Although the percent of the population, age 0 to 64 without health insurance and childhood asthma rate indicators do not indicate strong trends, the percent without health insurance does remain consistently higher than the statewide average throughout the 1999 to 2001 time period as do the child asthma rates from 1996 to 2002.

The percent of population without health insurance in the region remains approximately 2 percent above state averages. The region's childhood asthma hospitalization rate ranges from 54 in 1996 to 104 per 100,000 residents in 2001 cases higher than the state average.

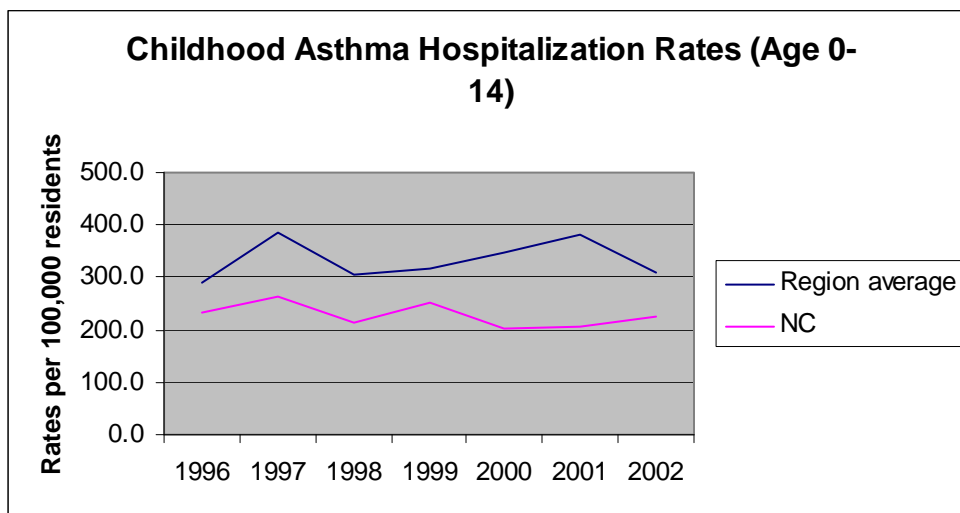
**Yellow warning**

The average heart disease and cancer rate for both the region and the state decline over the 1989 to 2001 time period while the diabetes rate slightly increases. The region's infant death rate is higher than the North Carolina average except for the year 2000 and seems to have more fluctuation than the statewide rate. From 1998 to 2002, the average statewide infant death rate is declining.

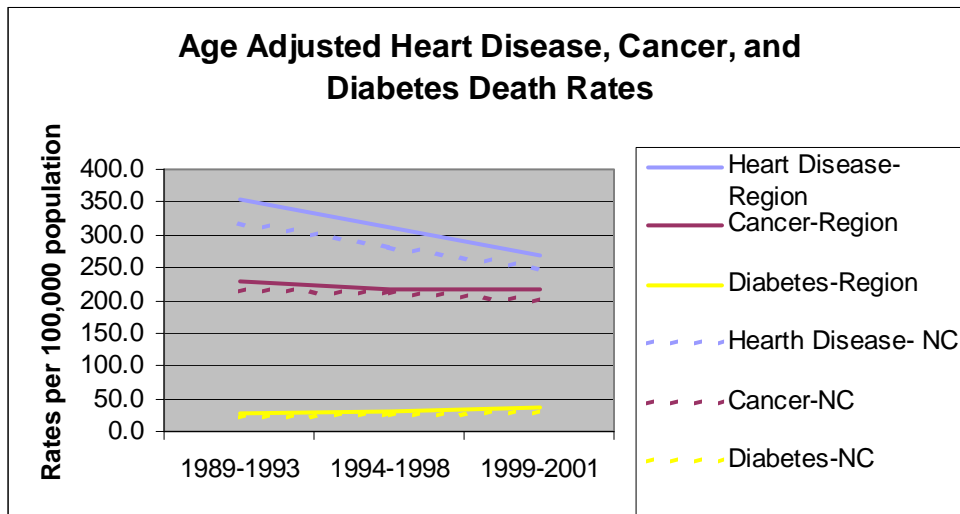


**Limitations:** This study, based on the March 2000-2002 Current Population Surveys, might not be done in the future. The prior study (1995-99) is not comparable to 1999-2001 study. The age of less than 65 was used due to Medicare edibility.

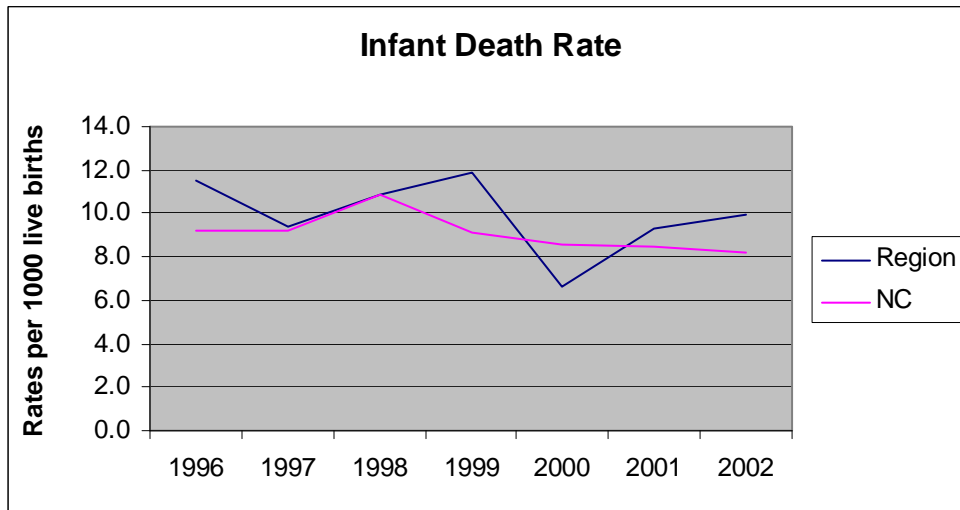
**Source:** University of North Carolina at Chapel Hill, Cecil G. Sheps Center for Health Services Research



Source: North Carolina Center for Health Statistics



Source: North Carolina Center for Health Statistics, North Carolina Statewide and County Trends in Key Health Indicators 2001, <http://www.schs.state.nc.us/SCHS/healthstats/trends/2001/>



Source: North Carolina Center for Health Statistics, North Carolina Statewide and County Trends in Key Health Indicators 2001, <http://www.schs.state.nc.us/SCHS/healthstats/trends/2001/>

## Safety

### Indicators

- Crime rate
- Adult and juvenile arrests



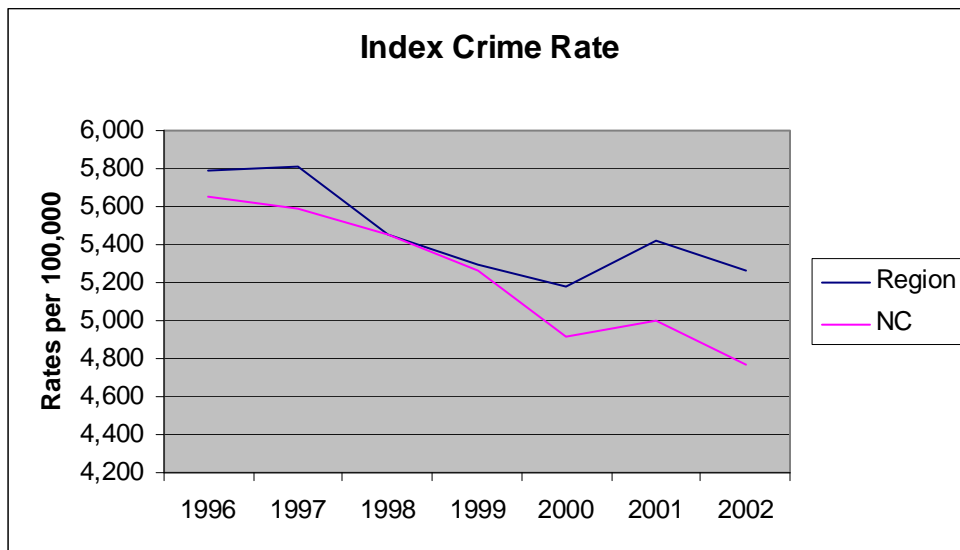
### Why are these indicators important?

Residents of a community place value on safety and security in their homes, work life, and activities and are not overly threatened by crime. By measuring indicators related to safety over time, trends in crime and arrests can be used to determine the progress towards a safer community.

### How is the Sandhills performing?

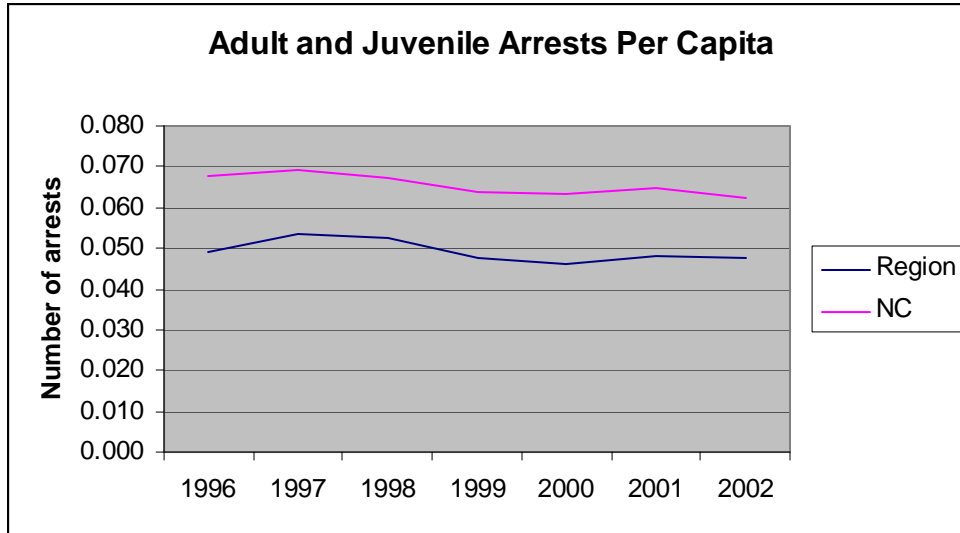
#### Yellow warning

Although the Sandhills' crime rate is declining it declines at a slower rate than that of the state. Neither the statewide nor regional number of arrests maintains a consistent trend to be classified as red alert or green star.



**Notes:** Index crime includes the total number of violent crimes (murder, rape, robbery, and aggravated assault) and property crimes (burglary, larceny, and motor vehicle theft).

**Source:** N.C. State Bureau of Investigation, Division of Criminal Information, North Carolina Crime Statistics, Crime Trends - Offenses and Rates per 100,000, <http://sbi2.jus.state.nc.us/crp/public/Default.htm>



**Source:** N.C. State Bureau of Investigation, Division of Criminal Information, North Carolina Crime Statistics, Arrests by Offense by Adult and Juvenile, <http://sbi2.jus.state.nc.us/crp/public/Default.htm>

## Sustainable Population

### Indicators

- Total population estimates
- Percent of total population under 18 years of age
- Percent of total population over 65 years of age

### Why are these indicators important?

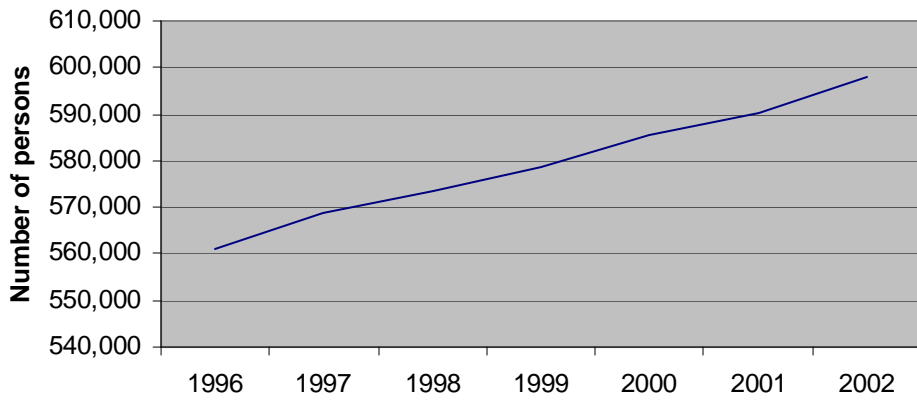
A sustainable population will ensure that the community has the resources to meet the needs of its citizens. By evaluating population trends based on total population estimates, persons over the age of 65, and persons under the age of 18, the region can respond to the specific needs of each age group to make sure the balance of the community is intact. Population trends affect environmental, social, and economic sustainability.

### How is the Sandhills performing?

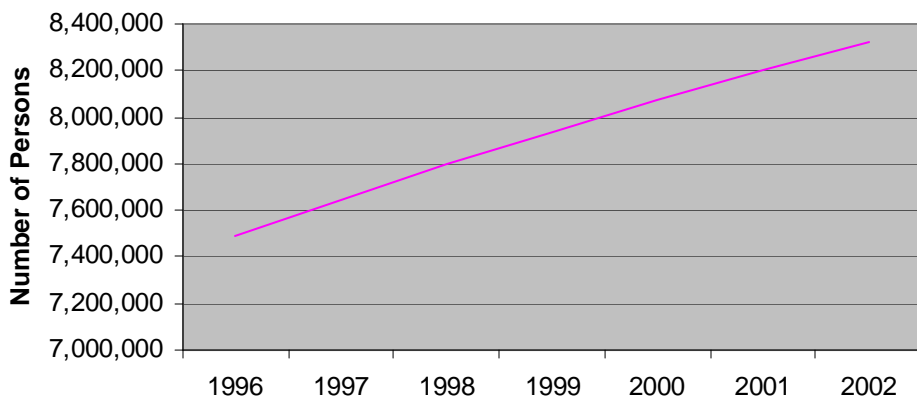
#### Yellow warning

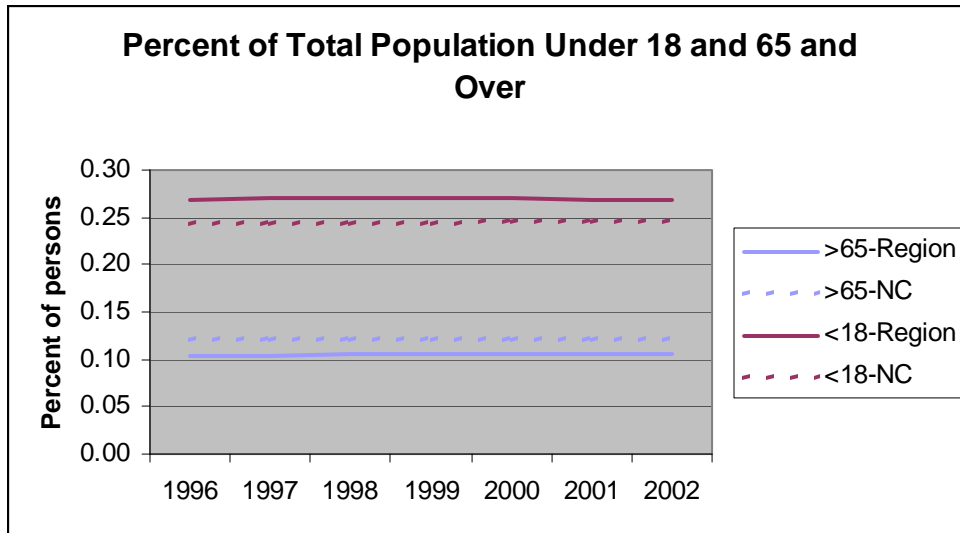
The region and the state see a steadily increasing population. The regional under 18 population remains approximately 3 percent lower than the state averages while the regional over 65 populations are 2 percent higher than state averages.

### Total Population-Region



### Total Population-NC





**Limitations:** This data represents demographic projections.

**Source:** North Carolina State Demographics, [http://demog.state.nc.us/frame\\_start.html](http://demog.state.nc.us/frame_start.html)

## ECONOMIC INDICATORS

### Affordable and Suitable Housing

#### Indicator

- Percent of rental and owner households with a housing problem

#### Why are these indicators important?

Essential to the success of any community is citizen access to suitable housing and housing affordable to their income. The U.S. Department of Housing and Urban Development collects data on a number of housing-related problems such as cost burden, overcrowding, or housing without complete kitchen or plumbing facilities. By measuring housing problems over time, the community can work towards suitable and affordable housing.

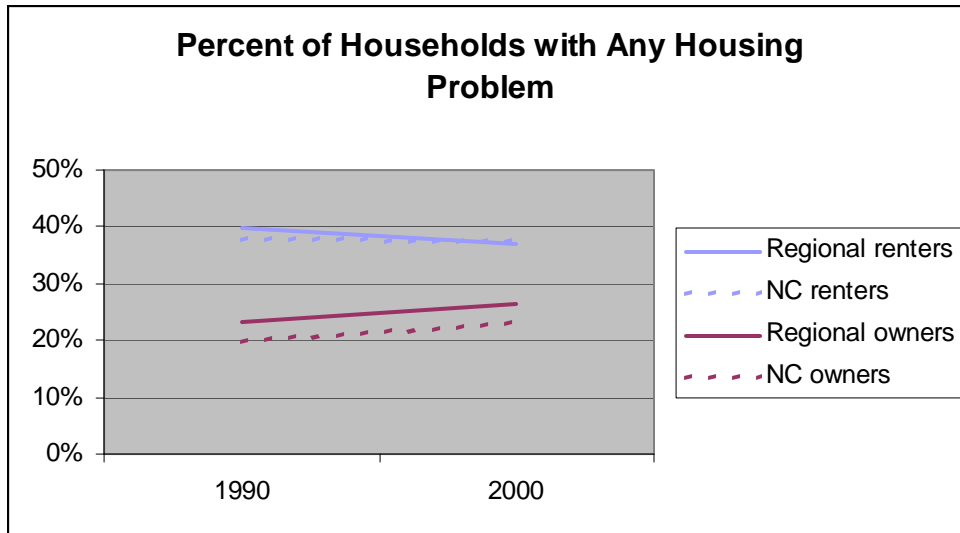
#### How is the Sandhills performing?

##### Green star

The percent of regional renter households with any housing problem has decreased from 40 percent in 1990 to 37 percent in 2000 and is equal to state averages in 2000.

##### Red alert

The percent of regional owner households with any housing problem increases from 23 percent in 1990 to 27 percent in 2000 while remaining above state averages in both years.



**Notes:** Any housing problem is defined as a household having a cost burden greater than 30 percent of income and/or overcrowding and/or without complete kitchen or plumbing facilities.

**Limitations:** Data are only available for census years.

**Source:** U.S. Department of Housing and Urban Development, State of the Cities Data Systems, Comprehensive Housing Affordability Strategy (CHAS), <http://socds.huduser.org/scripts/odbic.exe/chas/index.htm>

## Economic Diversity

### Indicators

- Annual total tax revenue and other financing
- Percent employment by industry sector

### Why are these indicators important?

Maintaining a diverse employment mix and strong tax base enables the community to have the flexibility to meet future demands and to adjust to economic fluctuations. Analyzing the total revenue generated and the industry breakdown of the region's workforce will demonstrate the community's ability to react to the economy.

### How is the Sandhills performing?

#### Red alert

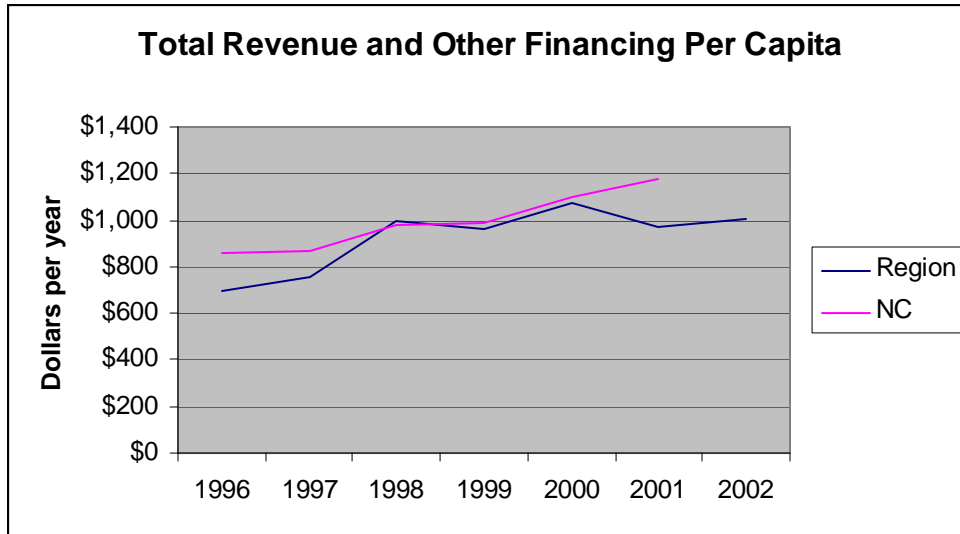
The regional total revenues and employment in the manufacturing sector indicate red alerts in terms of economic diversity.

The region's total revenues per capita increased from 1996 to 2000 and then saw a decline in 2000 and 2002 levels were less than 2000. The regional revenues additionally lag behind steadily increasing state averages.

Both regional and statewide employment in the manufacturing sector is on the decline. The region has seen a decline in the percent of manufacturing employment from 21 percent of total employment in 1996 to 15 percent in 2002. The state has seen a similar decline in manufacturing employment.

### Yellow warning

The agricultural, utility, and other sector employment percentages remain consistent for both regional and statewide data. The sectors of construction, finance, professional, and wholesale remain consistent but slightly below state percentage averages. The retail and public administration sectors percentage employment remain slightly above state averages and the education and health care sectors have demonstrated an increase in the percentage of the region's employment. The transportation and information sectors have also seen an increase while the state's sectors remain steady.

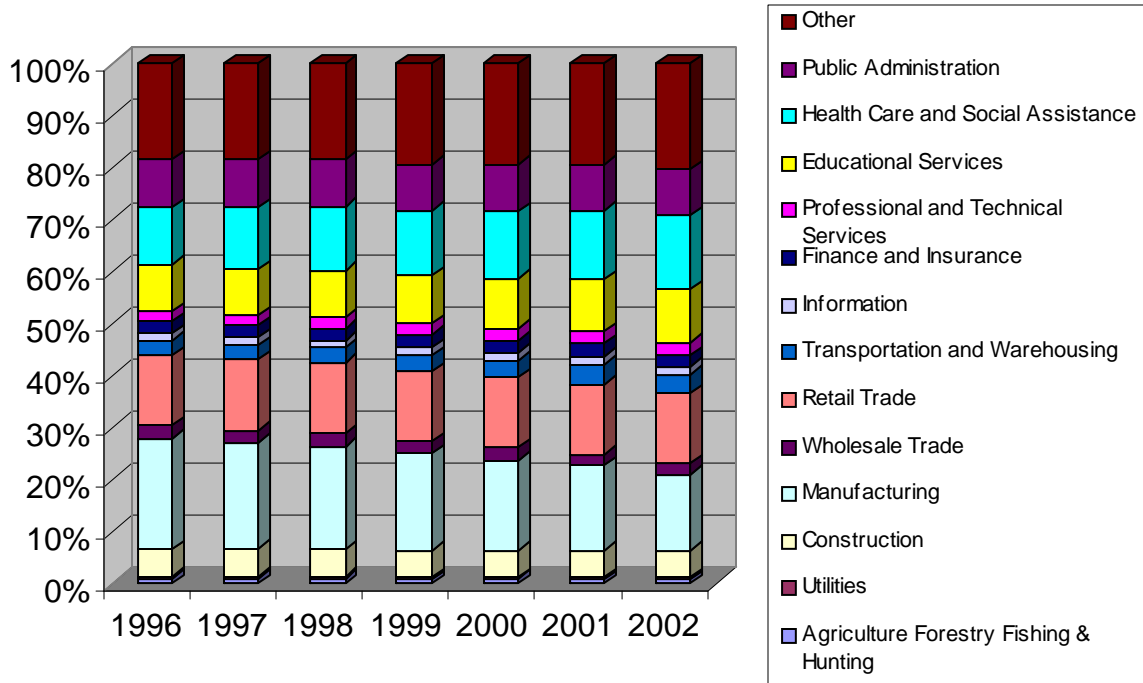


**Notes:** Total revenues and other financing is the total of all the county or municipal government's revenues.

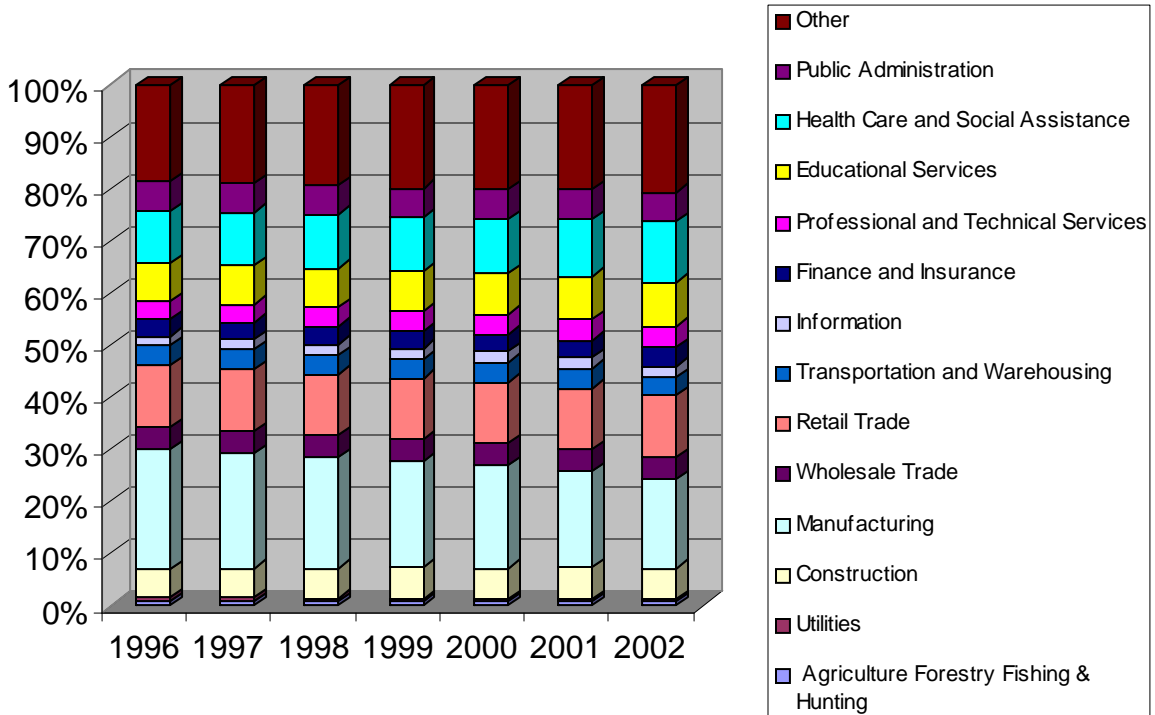
**Limitations:** The total tax revenue for the state of North Carolina in 2002 was significantly lower than previous years. Given the discrepancy, this data was omitted from the analysis.

**Source:** Log Into North Carolina (State Data Center), used N.C. Department of State Treasurer data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)

**Percent Employment By Industry Sector-Region**



**Percent Employment by Industry Sector-NC**



**Notes:** This data represents employment by North American Industry Classification System (NAICS). For this analysis not all NAICS codes have an individual category on the graph. The

industries classified as mining, real estate and rental and leasing, management of companies and enterprises, administrative and waste services, arts entertainment and recreation, accommodation and food services, other services, and unclassified were aggregated under the “other category” to narrow the data on industry employment.

**Source:** North Carolina Employment Security Commission, Labor Market Information Division (researched by aggregated type then 2-digit sector), <http://eslmi12.esc.state.nc.us/ew/EWYear.asp?Report=1>

## **Livable Wage and Prosperity**

### **Indicators**

- Per capita personal income
- Median household income
- Percent of families in each income distribution bracket
- Percent of persons living in poverty

### **Why are these indicators important?**

Indicators of livable wage such as measures of personal and household income are basic measures of the prosperity of individuals and health of the local economy. By measuring per capital personal income and median household income, livable wage is reflected both in light of the total amount of personal average averaged across the population and as the amount earned by a middle household where one half all house holds earn less and one half all households earn more. The percent of persons in poverty displays the trends in the ability of people to provide themselves with material needs. Evaluating the family income distribution will illustrate the gap in earnings between the more advantaged and the less advantaged by examining the number of families in each income bracket.

### **How is the Sandhills performing?**

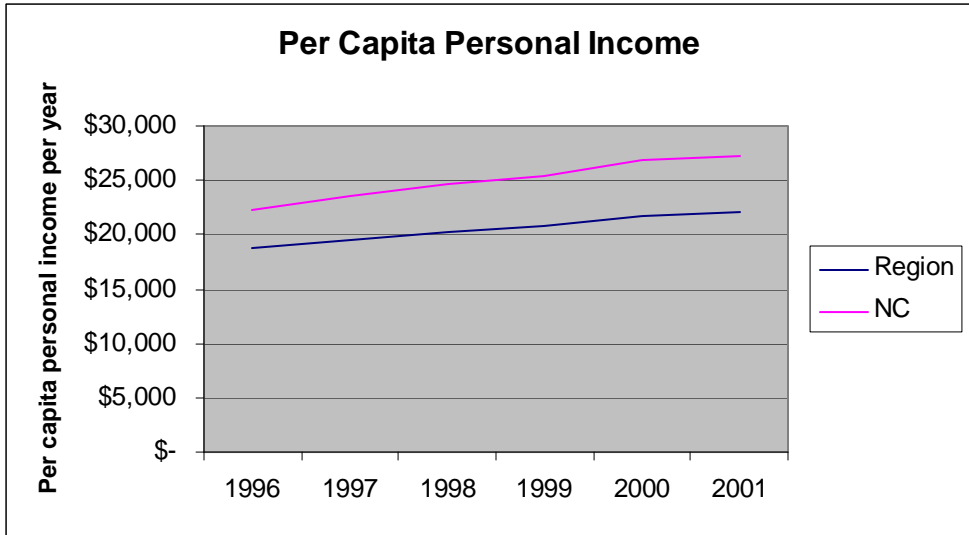
#### **Yellow warning**

Although the region’s per capita personal income and median household income are consistently increasing, and the percent of persons in poverty is improving each of these indicators remain below the state income. A shift in the percent of families in each income bracket is also present.

The region’s per capita income ranges from \$3,597 (1996) to \$5,289 (2000) lower than the state per capita income; showing an increasing gap between the regional and state averages. Regional median household income remains \$3,218 in 1998 to \$4,724 in 1999 below state averages. The region’s poverty rate remains approximately 3 percent higher than the state’s rate for the years measured; the region’s 1999 rate is closer to 4 percent higher than the state.

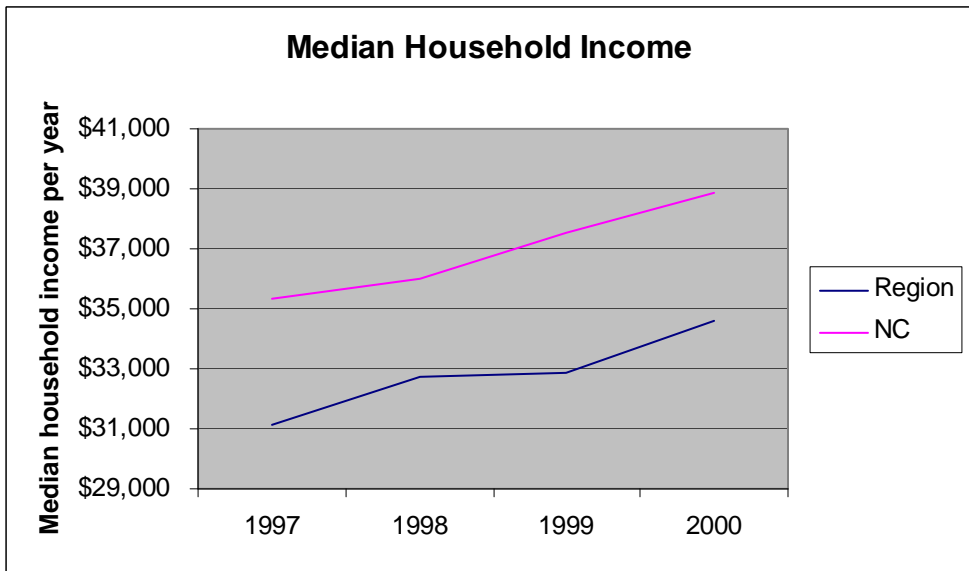
The percent of regional families in the \$10-14,999, \$15-24,999, and \$25-49,999 brackets decreases and families in the greater than \$50,000 bracket increases from 1990 to 2000. Compared to the state, percentage of families in the region in the \$10-14,999 and \$15-24,999 is higher than state averages while percentage of families in the \$25-49,999 and greater than \$50,000 is lower than the state average.





**Notes:** Per capita personal income is income received by persons from all sources averaged across the population.

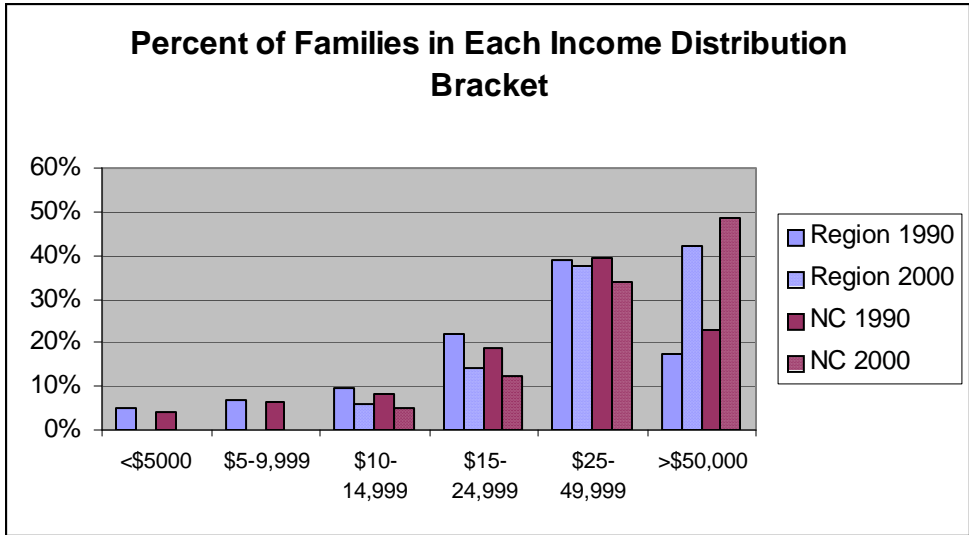
**Source:** U.S. Department of Commerce Bureau of Economic Analysis, Regional Economic Accounts, Local Area Annual Estimates, <http://www.bea.doc.gov/bea/regional/reis/drill.cfm>



**Notes:** Median household income is the amount earned by the middle household or family, where which one half of all households or families earn more and one half earns less.

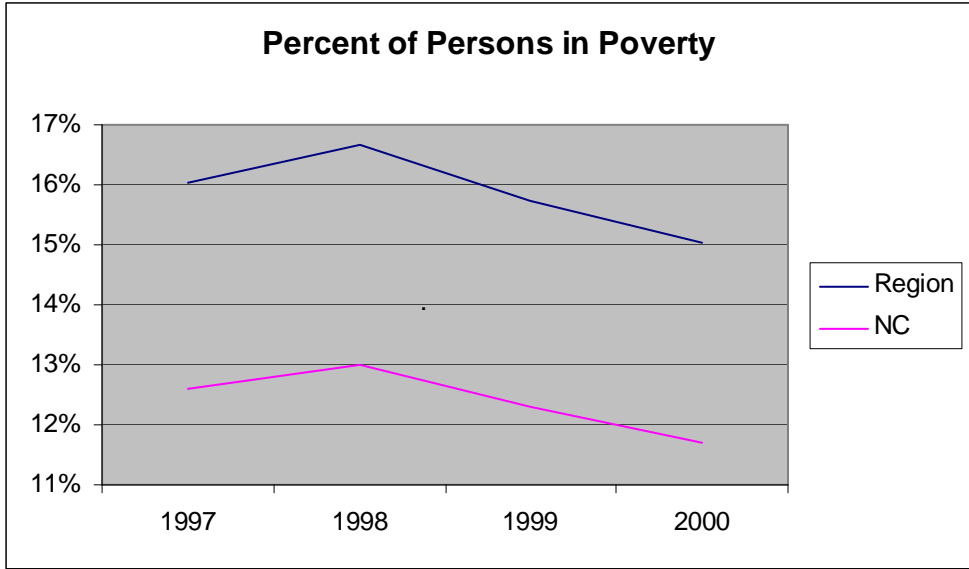
**Limitations:** This data is based on model-based estimates at 90 percent confidence intervals.

**Source:** U.S. Census Bureau, Small Area Income and Poverty Estimate, Tables for States and Counties by Income and Statistic, <http://www.census.gov/hhes/www/saie/stcty/estimate.html>



**Source:** Log Into North Carolina (State Data Center), used U.S. Census of Population and Housing data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)

**Limitations:** 2000 data was not available for lowest two income brackets (less than \$5,000 and \$5-10,000).



**Notes:** The percent of people in poverty is based on the number of people earning less than the federal threshold for poverty in a given year.

**Source:** U.S. Census Bureau, Small Area Income and Poverty Estimate, Tables for States and Counties by Income and Statistic, <http://www.census.gov/hhes/www/saipe/stcty/estimate.html>

## Mobility

### Indicators

- Daily vehicle miles traveled
- Bus ridership

### Why are these indicators important?

Transportation and mobility is necessary for people to go to work, get to family members, and to attend to day-to-day activities. Transportation is tied into community planning where planning can aid in reducing reliance on single occupancy cars, traffic congestion, and air and water pollution. To capture the amount of driving done on a daily basis by people, vehicle miles traveled is recorded. To determine the use of public transportation as an alternative to single occupancy vehicles, bus ridership numbers are measured.

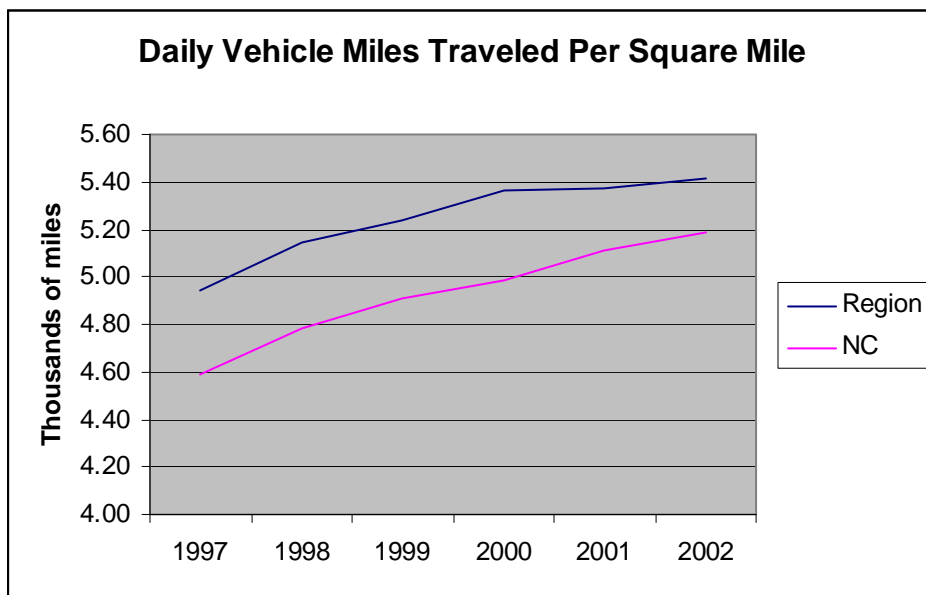
### How is the Sandhills performing?

#### Red alert

Both the regional and statewide daily vehicle miles traveled per capita are consistently increasing and regional VMTs per capita remain above state averages.

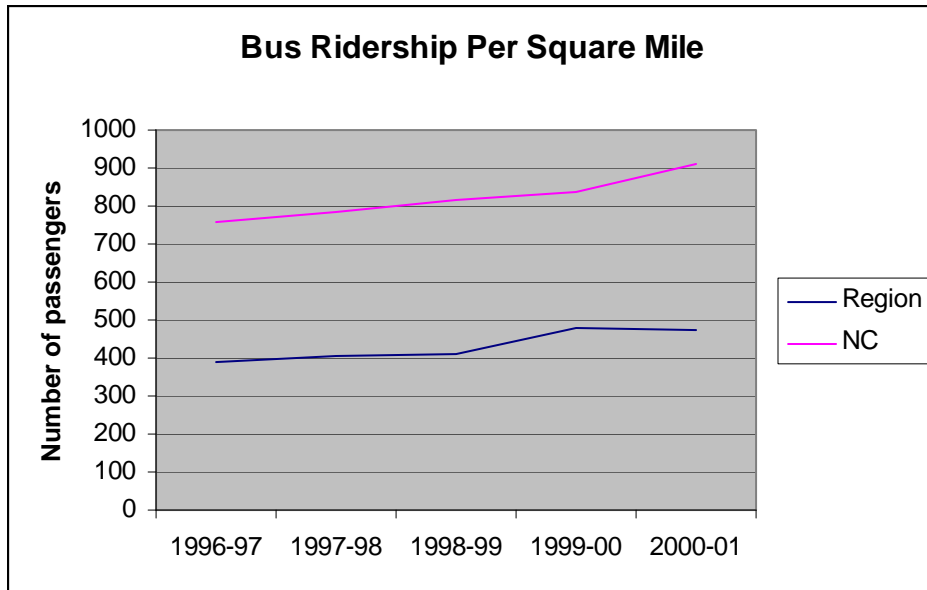
#### Yellow warning

The number of bus passengers per square mile has increased from 388 in 1996 to 474 in 2000 however the region remains below the average state rider increase from 756 in 1996 to 909 in 2000.



**Limitations:** the vehicle miles traveled (VMT) only represent on-system, state and federally, maintained roads. Non-system roads are not included and could represent up to a five percent difference.

**Source:** N.C. Department of Environment and Natural Resources, Division of Air Quality



**Notes:** The data in the reports is split into rural (county systems) and urban (city systems). Fayetteville is the only city in the region so the Fayetteville passengers were added to the Cumberland County total. The reports to provide rationale for the increase or decrease in bus ridership for each county.

**Limitations:** Only urban data for Fayetteville available in 2002 at time of data collection so data ends with 2001.

**Source:** N.C. Department of Transportation, Public Transportation Division, Urban Public Transportation System, Regional Transportation System, Rural General Public Transportation System, Human Service Transportation System, Operating Statistics Summary

## Stable Society

### Indicators

- Estimated Percent Net Migration
- Percent high school graduates to pursue higher education out-of-state

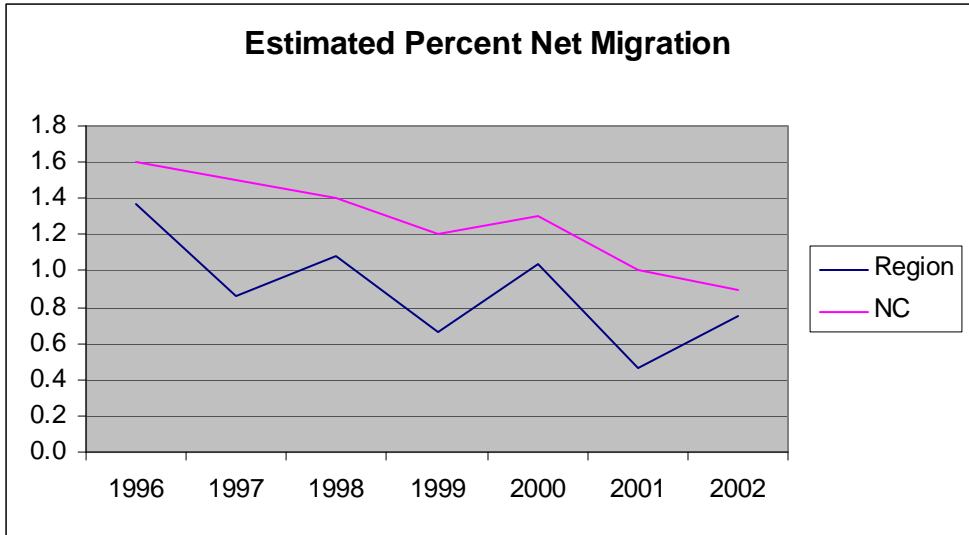
### Why are these indicators important?

A stable society refers to a community where there is an appropriate balance between individuals leaving and entering the community to work, attend school, etc. Estimated percent net migration reflects this concept. To take this indicator a step further, the percent of high school graduates that pursue higher education out-of-state additionally measures the mobility of the population.

### How is the Sandhills performing?

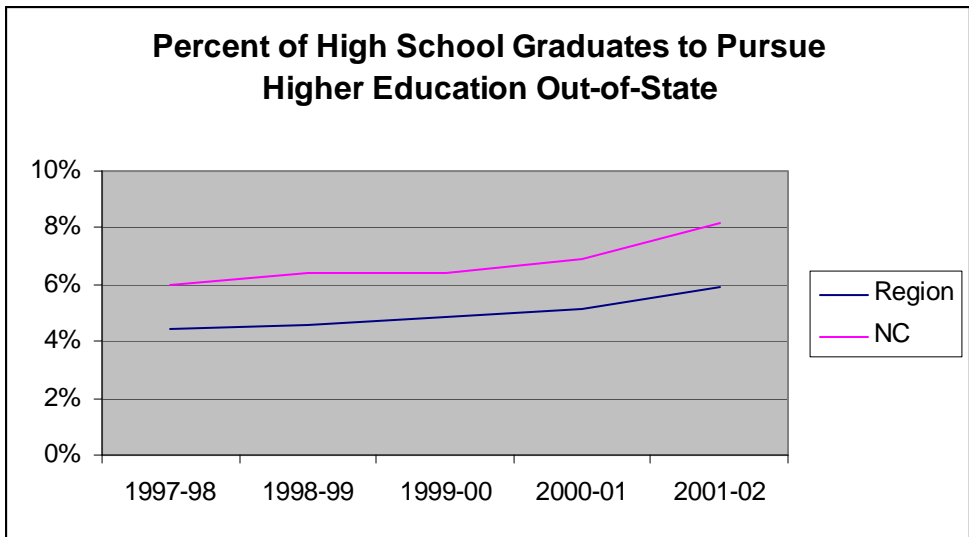
#### Yellow warning

An increasing percent of regional and statewide high school graduates are pursuing higher education out-of-state. However, the regional percentage is consistently lower than the state percent ranging from 1.5 percent lower in 1999-00 to 2.3 percent lower in 1997-98. Regional percent net migration also remains below state averages.



**Notes:** Net migration represents the difference between two consecutive population totals after accounting for the change due to births and deaths, i.e., natural increase.

**Source:** Log Into North Carolina (State Data Center), used N.C. Office of the Governor data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)



**Notes:** Percentage data is based on the sum of high school graduate intentions to attend any of the following out-of-state: public or private senior institutions, community/technical colleges, junior college, or trade/business schools. The data does not include intentions to enter into military service or employment.

**Source:** N.C. Department of Public Instruction, North Carolina Statistical Profile, <http://www.ncpublicschools.org/fbs/stats/>

## Strong Workforce

### Indicators

- Unemployment rate

- Estimated number of new employees due to new and expanded industry
- People affected by announced business closings and layoffs
- Wage and salary employment (jobs)

### **Why are these indicators important?**

A strong labor force that is able to meet the employment needs of its citizens' supports a strong workforce. Looking at unemployment rates displays the overall health of the region while examining the number new jobs, jobs lost, and average annual number of jobs displays the employment characteristics of the region.

### **How is the Sandhills performing?**

#### **Red alert**

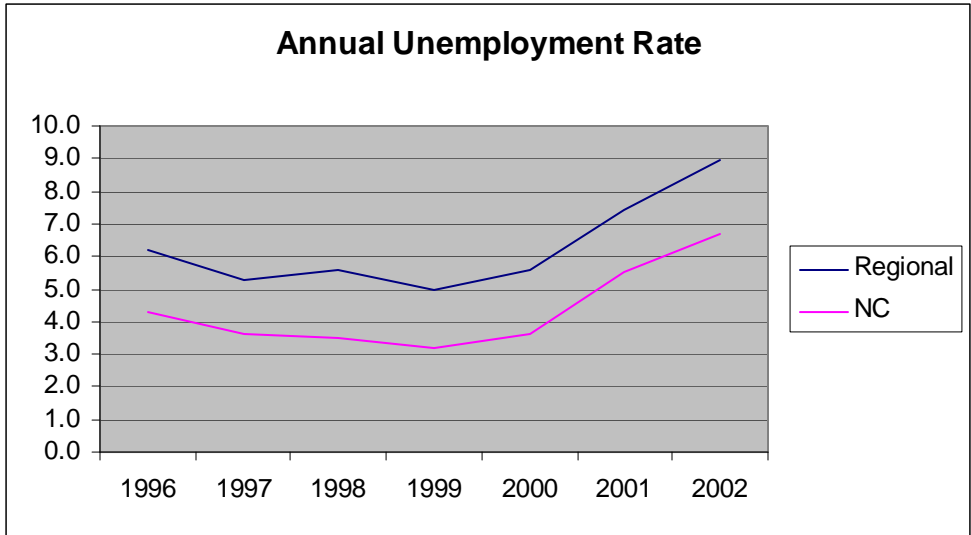
The regional unemployment rate is increasing and is consistently higher than the state rate and the number of new employees due to new or expanded industry has declined, remaining below state averages.

The regional unemployment rate is consistently higher than the state average and has been steadily increasing since 1999. The regional unemployment rate ranges from 1.7 rates higher in 1997 to 2.3 rates higher in 2003 than the state rate. Additionally, the number of people affected in the region by announced business closings increased from 262 people in 1997 to 1774 people in 2002. Regional decreases were seen in the years of 2000 and 2003, where 617 and 2371 fewer people from the previous year were affected.

The number of new employees per capita in the region as a result of new or expanded industry declined from 1996 to 2000 and then increased in 2001. The state saw similar trends over this time period however the regional averages remain below the state in terms of the number of new employees.

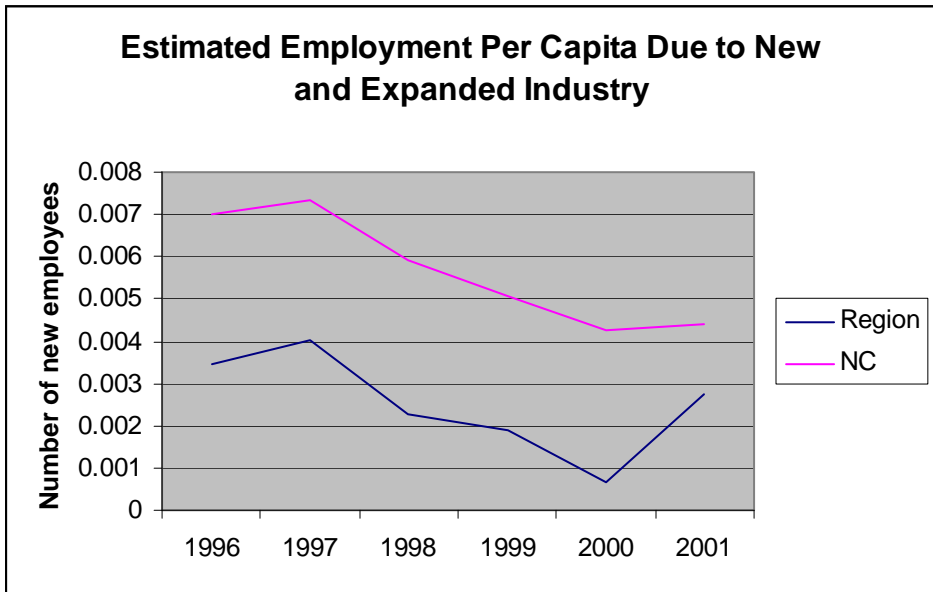
#### **Yellow warning**

The region is doing better than the state in terms of the number of people affected by announced business closings and layoffs, except in 2002. The number of jobs in the region and the state appears to be fairly steady however the region's wage and salary employment remains below the state averages.



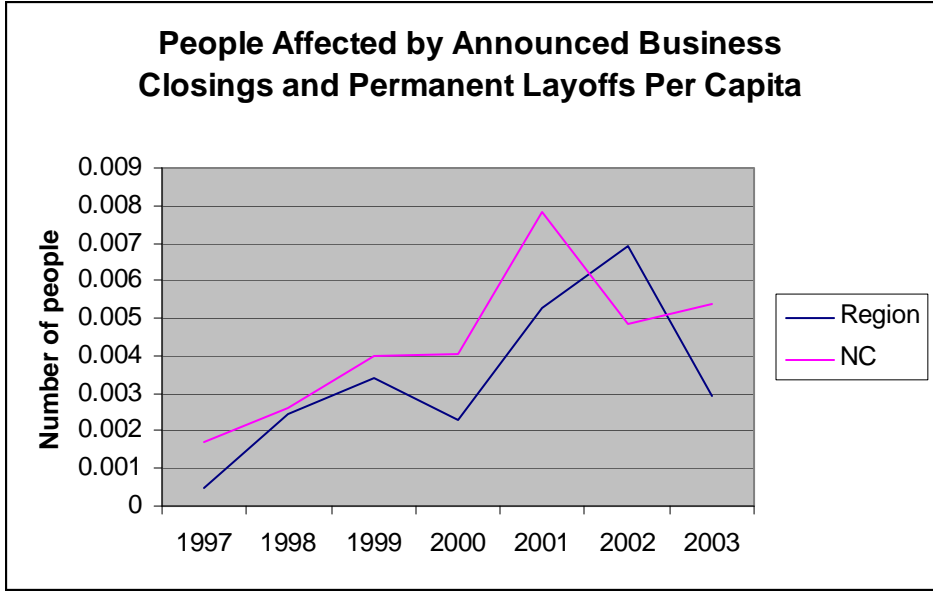
**Limitations:** County data was not seasonally adjusted.

**Source:** U.S. Department of Labor, Bureau of Labor Statistics, Local Area Unemployment Statistics, <http://data.bls.gov/labjava/outside.jsp?survey=la>



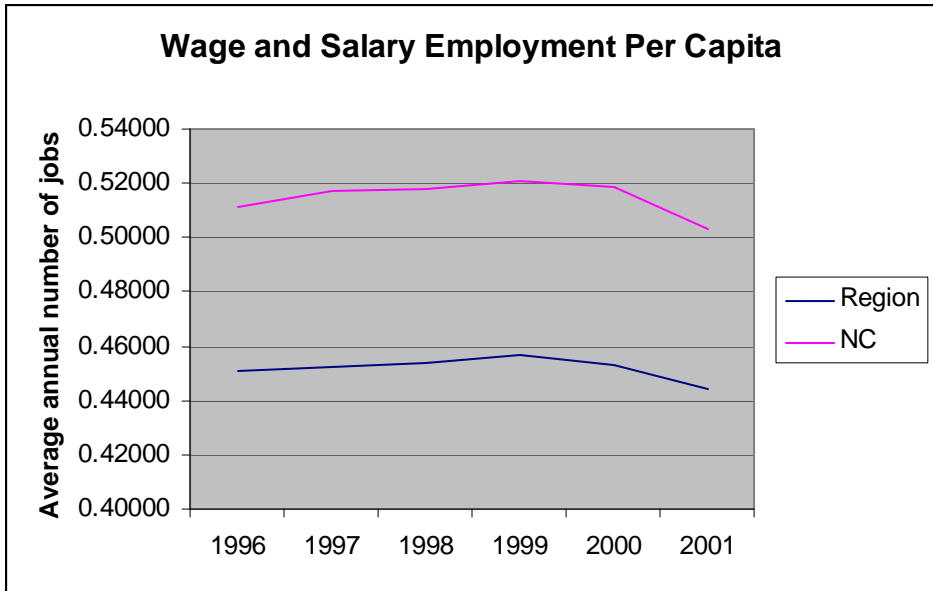
**Notes:** The data reflects the number of new employees estimated and reported to the Department of Commerce at the time an industry announces location or expansion plans. The county figures are provided for two-year sums ending in odd years, e.g., 1970 + 1971 listed under 1971.

**Source:** Log Into North Carolina (State Data Center), used N.C. Department of Commerce Data, [http://data.osbm.state.nc.us/pls/linc/dyn\\_linc\\_main.show](http://data.osbm.state.nc.us/pls/linc/dyn_linc_main.show)



**Limitations:** The data are not comprehensive and do not meet the labor market information division standards for accuracy. Data are derived from a statewide survey of newspaper accounts of closings and layoffs, and from information supplied to the Employment Security Commission of by the employing units experiencing the closings/layoffs. The "Number Affected" cannot be used for a count for all workers experiencing layoffs in North Carolina during the stated period as it represents only those workers experiencing layoffs as reported by the above-stated sources.

**Source:** N.C. Employment Security Commission, Announced Business Closing and Permanent Layoffs, <http://eslmi12.esc.state.nc.us/mls/MLSFrame.asp?contentsFrame=5>



**Notes:** Wage and salary employment (jobs) measures the average annual number of full-time and part-time jobs in each area by place-of-work. All jobs for which wages and salaries are paid are counted. Full-time and part-time jobs are counted with equal weight.



**Source:** U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, <http://www.bea.doc.gov/bea/regional/reis/default.cfm#notes>

## **Discussion**

The summary of results indicates that 10 indicators (8 environmental, 1 social, and 1 economic) classify as worthy of a green star, 11 (4 environmental, 2 social, and 5 economic) warrant a red alert, and 32 (10 environmental, 11 social, and 11 economic) do not have a consistent enough trend during the given time frame to yield either a green star or red alert and therefore received a yellow warning. Appendix B is a summary of results from this study. Evaluating the classification results, environmental indicators dominate the green star classification where 8 out of 10 green star indicators are environmental. The yellow warnings are almost evenly distributed. Red alerts consisted of 4 environmental, 2 social, and 5 economic indicators. The summary does not include indicators awaiting completion by the SSI Community Resource Teams (change in land distribution). The spread of the data suggests some areas are more sustainable than others and some indicators raise issues of sustainability concern, however, the seemingly dominant status quo (yellow warning) trend, is not sustainable in the long run.

To determine the effectiveness of the indicators selected for the SSI, it would be prudent to evaluate these indicators in light of theoretically successful indicator projects using such criteria as suggested by Guy and Kibert's suggestions, as highlighted in the introductory section.

The data are valid and representative in that they measure relevant characteristics of the region relating to environmental, social, and economic considerations. Only data available on a regular basis from reputable sources were selected, adding to the availability, timeliness, stability, and reliability of the data. The indicators were selected and illustrated with the objective of being understandable to a wide variety of stakeholders, including the general public. Adding to the responsiveness, flexibility, and proactiveness criteria, the baseline data will be added to and adapted annually. The indicators in the baseline report are arranged and intentionally designed to be simple to have the ability of comparison across environmental, social, and economic indicators, suggesting the linkage and policy relevance criterion are met. However, even though the indicator report is designed and presented to enhance policy relevance

and linkage, much of the success of these two aspects will depend on the use of the document following its final revision. As mentioned in the introduction, much research has focused on the technical side of indicator development but research on linking indicators to policy is still in its infancy.

The main criterion lacking in this report is that of community involvement. Due to time constraints for the completion of this document versus the time flexibility of the SSI, I primarily formed, measured, analyzed, and interpreted the indicators. It was the original intention of the SSI to have the Metrics Committee work closely with me through each phase. However, the first meeting of the Metrics Committee was February 19, 2004. At the meeting, the Committee decided to send the indicator data to the community resources teams so the teams could select indicators in-line with desired-end states. By bringing the community resource teams into the analysis, the teams identify and understand problems associated with measuring some of the formed desired-end states. The teams also will narrow or expand data as necessary and determine gaps or holes in the data. The review and reworking of the indicators might provide the community involvement lacking earlier in the process. The team meetings will begin in March 2004 and data analysis and interpretation will be done through collaboration with the community resource teams.

Community involvement is vital to indicator projects, and I would suggest this could have been organized better to create additional buy-in from the community. The indicator selection process usually is allowed much more time for community involvement and empowerment but due to the deadlines of this project, the timeline was significantly condensed.

## **Conclusion**

In answering the question, “is the Sandhills region sustainable compared to the state,” there is no straightforward answer. The breakdown of environmental, social, and economic indicators suggests that the region could be advancing towards sustainability in a few areas however, indicators might not be equal in weight. Given the fact that there are a high number of yellow warning indicators, possibly suggesting a status quo type situation, with fewer green star than red alert classifications, it would be safe to say that the overall specific sustainability status

is unclear. However, the question that could be proposed to the SSI members, is that since many of the indicators are classified as yellow warning, is status quo sustainable? The likely answer would be no, the Sandhills region is not sustainable. It is obvious the Sandhills region is not advancing towards sustainability given the breakdown and classification of indicators.

### **Recommendations**

The low number of social and economic green star indicators signals the need for further investigation into these aspects of the community, understanding that indicators are not weighted on importance to the community. The most striking result is the absence of green star social and economic indicators. In evaluating this absence in the green star classification, the SSI should determine the greatest needs to be met among environmental, social, and economic factors. The SSI tends to be more environmentally focused however, these results indicate environmental concerns could be secondary to social and economic concerns. More investigation into the economic and social status of the region is needed. An explanation could be that the Sandhills is a military area and military areas are often placed in economically disadvantaged locations. Perhaps the fewer number of green star economic and social indicators is due to less economic development and social opportunity. If this is true, perhaps the high number of environmental green star classifications could be explained by underdevelopment as development often leads to environmental degradation. The Sandhills should look more closely into what is driving what in terms of economic, environmental, and social interactions. If the regional effort continues to focus mostly on environmental issues, when the true problems are with economic and social factors, the SSI might not be seen as a successful regional sustainability effort. Further study by the SSI should include benchmarking data against another region with similar community considerations. The state bench mark served as a mechanism of comparison but might not truly reflect local and regional variation.

This baseline information should be used as educational tool to communicate what trends are present in the Sandhills to the general public, industries, businesses, and decision makers to guide community priorities and policy. The information presented in this document allows for the combination of different indicators to display different trends. The classification system results will enable the region to set priorities in working towards long-term sustainability.

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