

program introduction  
building codes  
concept + theory  
community  
history + context  
tectonics  
economics

[charleston]  
VERTICAL FARM

# What does vertical farming mean for Charleston?

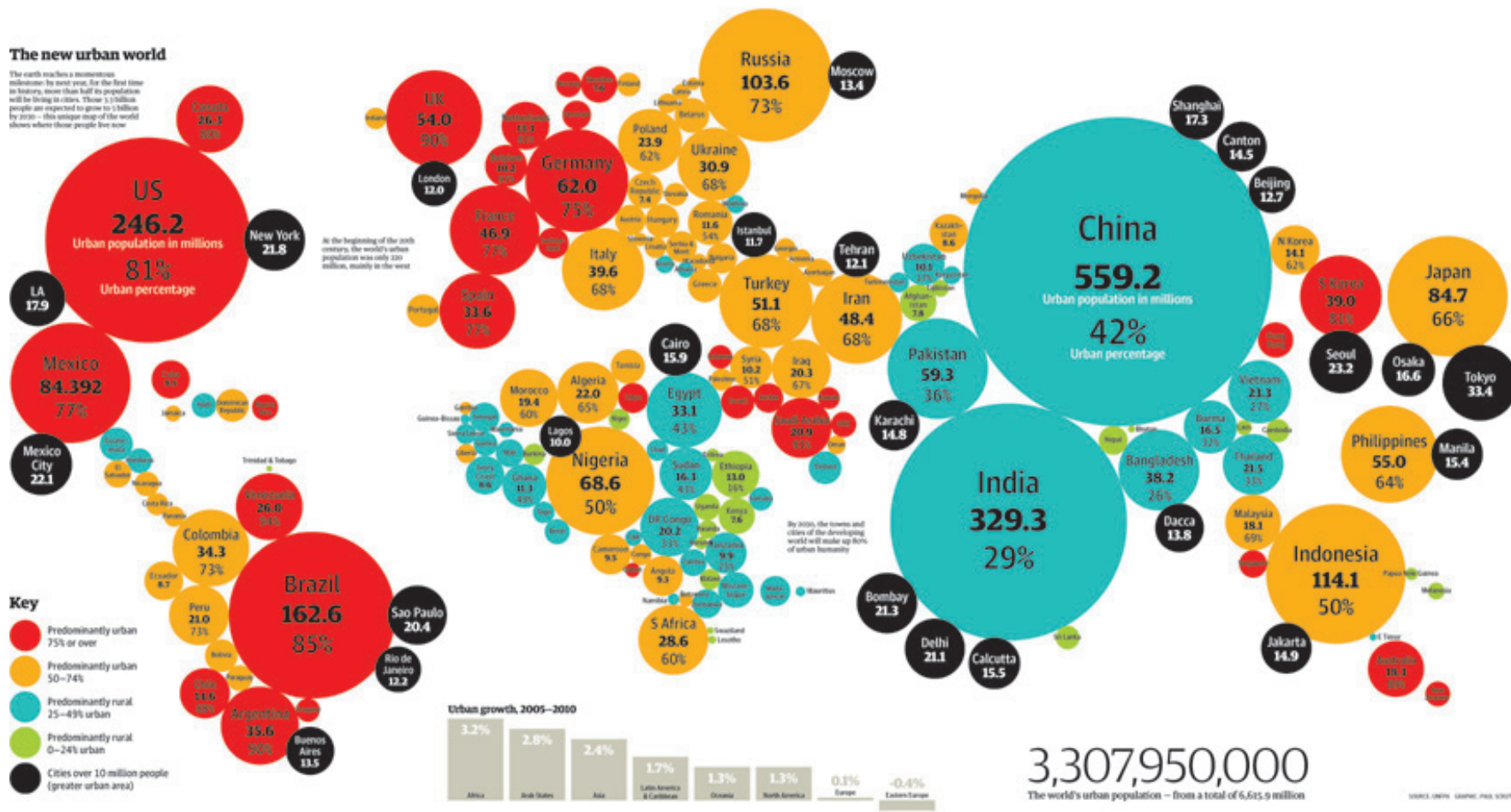
**restored ecosystems**  
**reduced transportation**  
**less hunger**

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The new urban world

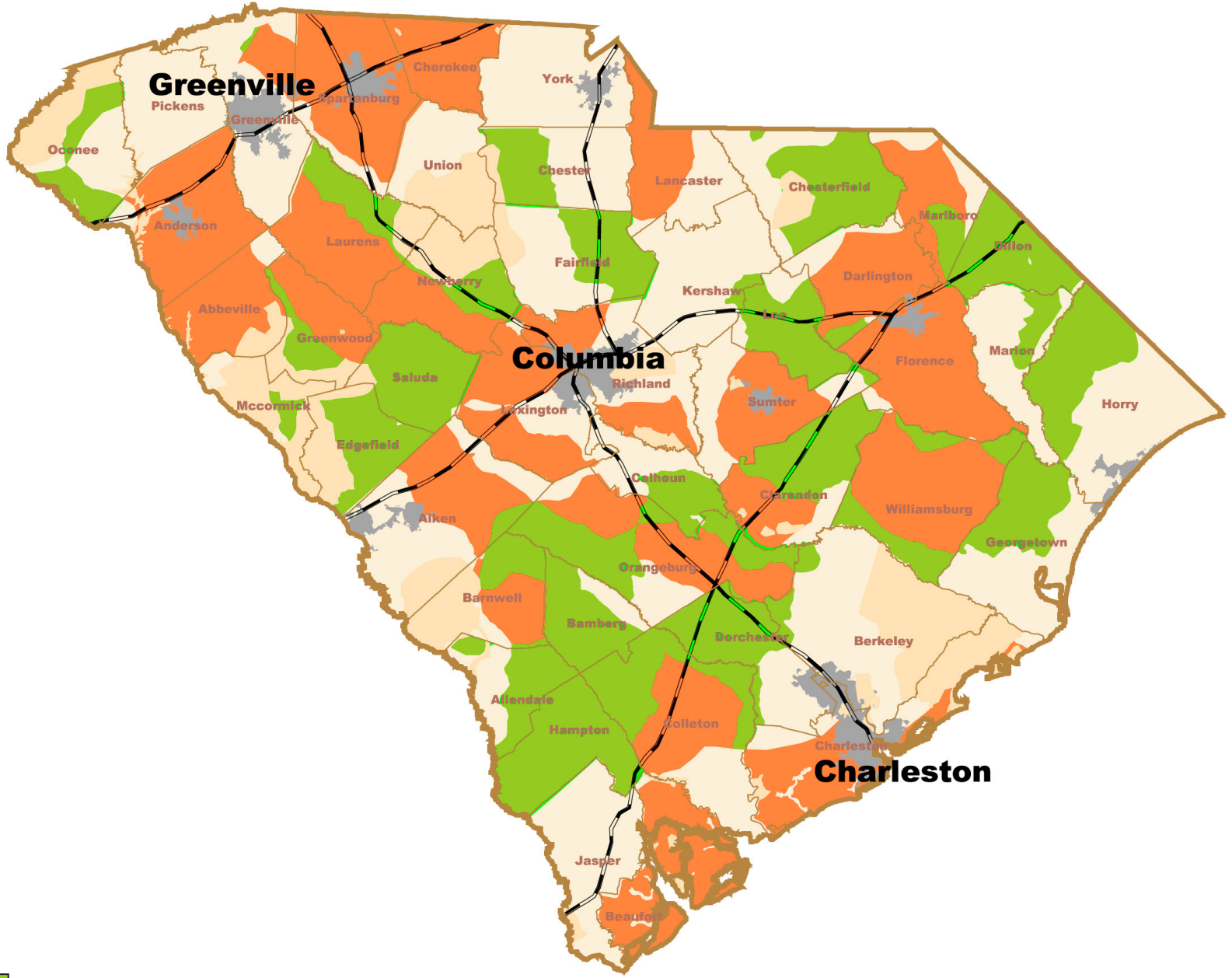
The earth reaches a momentous milestone: by next year, for the first time in history, more than half its population will be living in cities. These 3 billion people are expected to grow to 4 billion by 2020 - this unique map of the world shows where those people live now.



3,307,950,000  
The world's urban population - from a total of 6,515.9 million

SOURCE: UNITED NATIONS, WORLD POPULATION PROSPECTS

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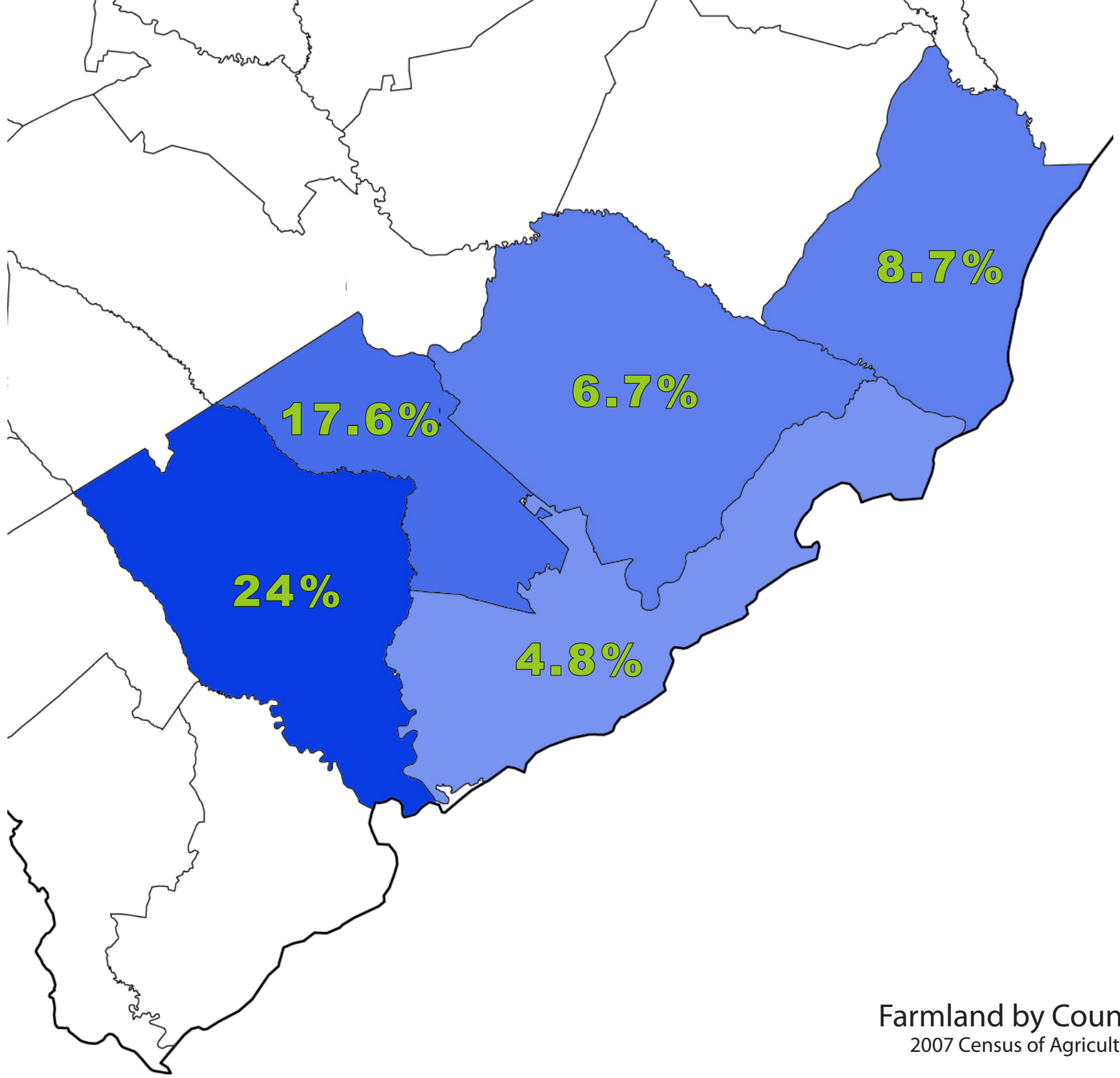


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- High Quality Farmland + Low Development
- High Quality Farmland + High Development
- Urban Areas

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Farmland by County  
2007 Census of Agriculture

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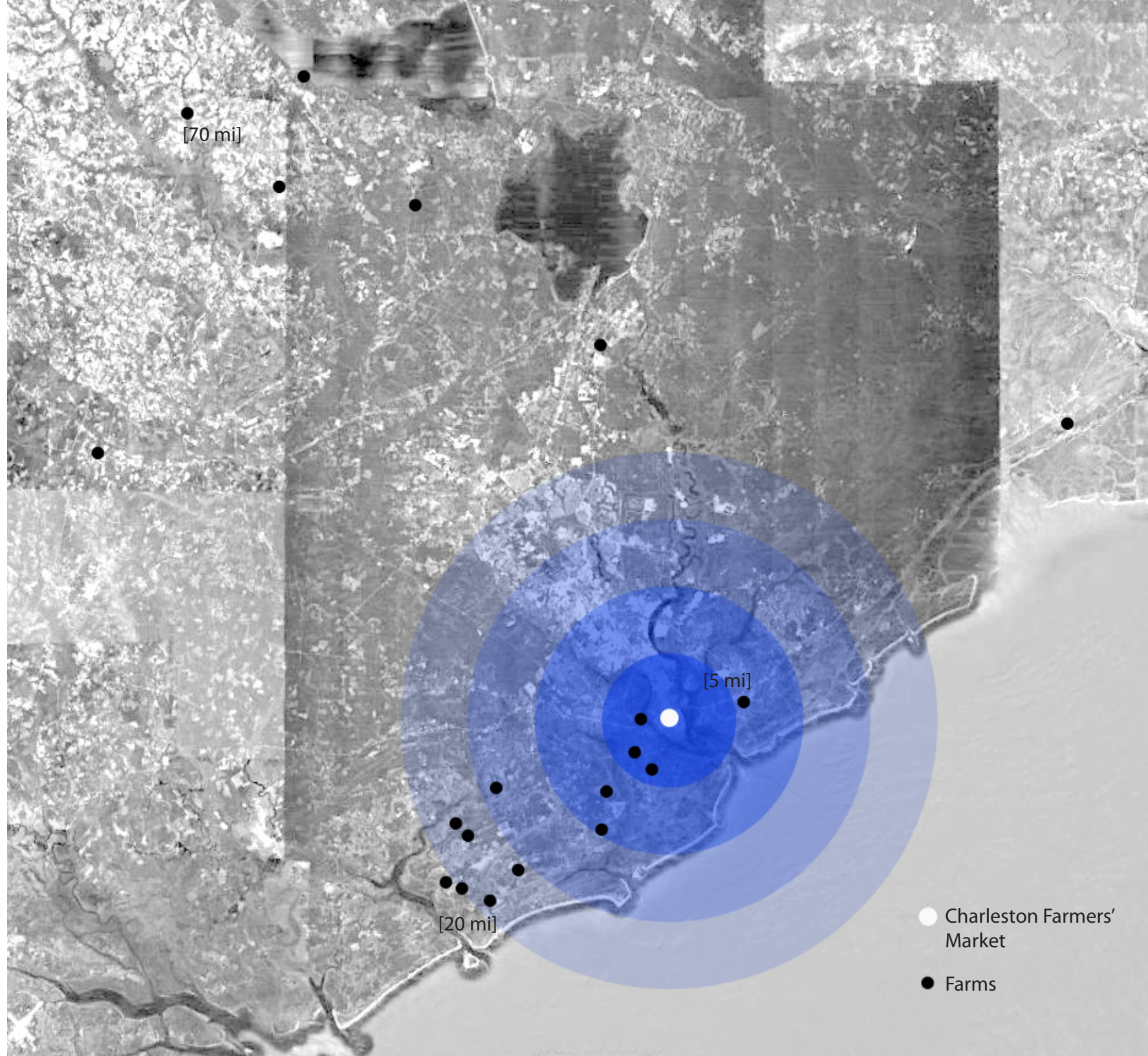
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# 2000 - 2010 population growth

- Charleston**  
13%
- Colleton**  
1.6%
- Dorchester**  
41.6%
- Berkeley**  
24.7%
- Georgetown**  
7.8%

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only  
**10%**  
of vendors  
within  
**5 miles**

average  
vendor  
travels  
**25**  
miles

**35%**  
of vendors  
more than  
**20 miles**  
from market



# FOOD DESERT

low income - low access

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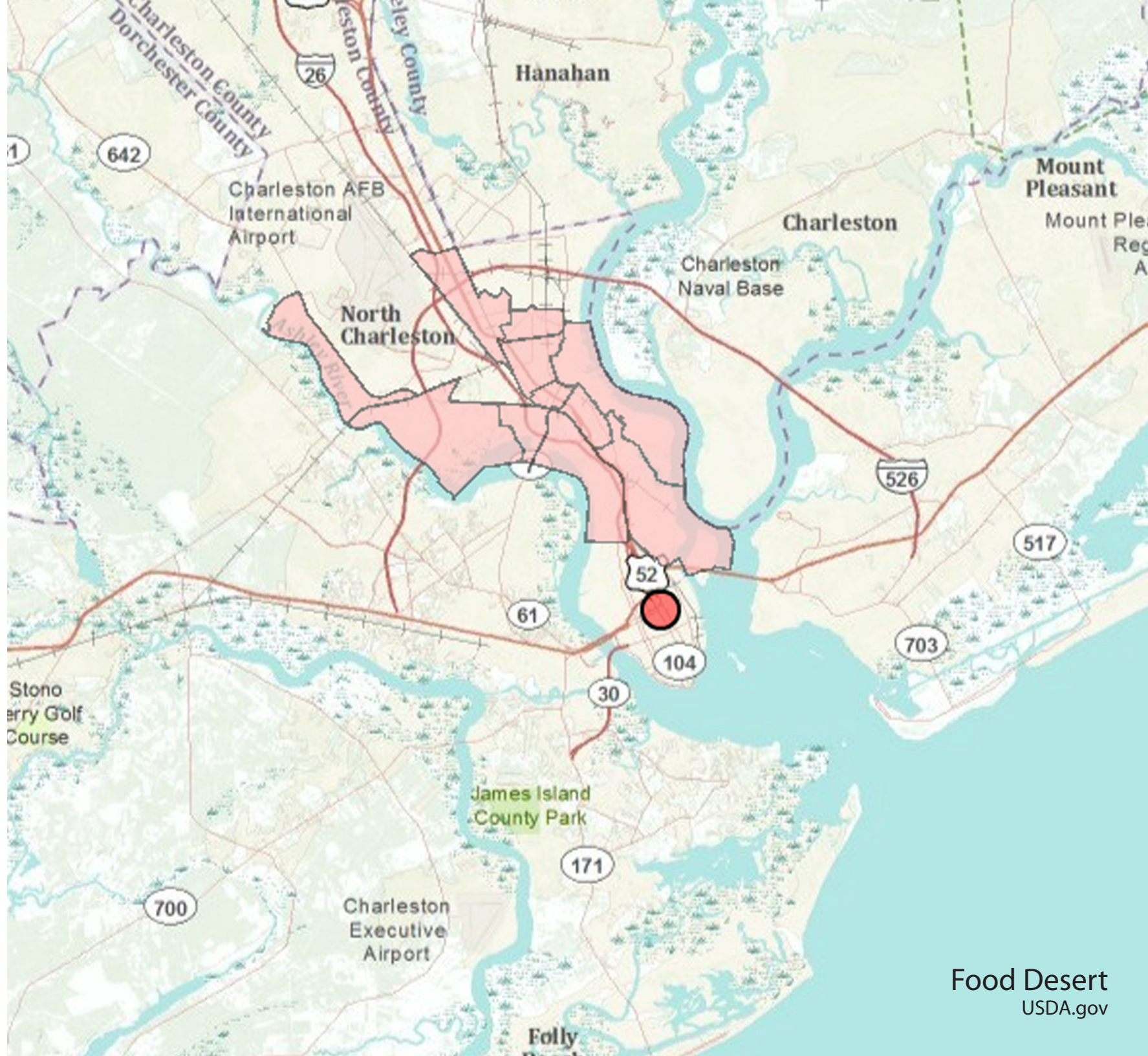
poverty  
rate over  
**20%**

**33%**  
live over  
**1 mile** away  
from supermarket



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Food Desert  
USDA.gov



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Okra  
Peanut  
Green Onion  
Radish  
Apples  
Pecans  
Tomatoes  
Peas  
Corn  
Cucumbers  
Watermelons  
Leaks  
Squash  
Sweet Potatoes  
Wheat  
Beans  
Peaches  
Oats  
Grapes

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### Clean 15 Lowest in Pesticide

- 1  Onions
- 2  Sweet Corn
- 3  Pineapples
- 4  Avocado
- 5  Asparagus
- 6  Sweet peas
- 7  Mangoes
- 8  Eggplant
- 9  Cantaloupe  
- domestic
- 10  Kiwi
- 11  Cabbage
- 12  Watermelon
- 13  Sweet potatoes
- 14  Grapefruit
- 15  Mushrooms

### Dirty Dozen Buy these organic

- 1  Apples
- 2  Celery
- 3  Strawberries
- 4  Peaches
- 5  Spinach
- 6  Nectarines  
- imported
- 7  Grapes - imported
- 8  Sweet bell peppers
- 9  Potatoes
- 10  Blueberries  
- domestic
- 11  Lettuce
- 12  Kale/collard greens

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# Pesky Pesticides

A USDA survey found samples of various fresh fruits and vegetables contained pesticide residues at the following rates:\*

Apples	98%
Grapes	97
Strawberries	96
Cilantro	94
Potatoes	92
Oranges	92
Cucumbers	85
Green onions	66
Sweet potatoes	48
Lettuce (organic)	20
Asparagus	10
Sweet corn	0.1

\*After washed in water for 10 seconds

Source: Department of Agriculture, Annual Summary for 2009 (published May 2011)

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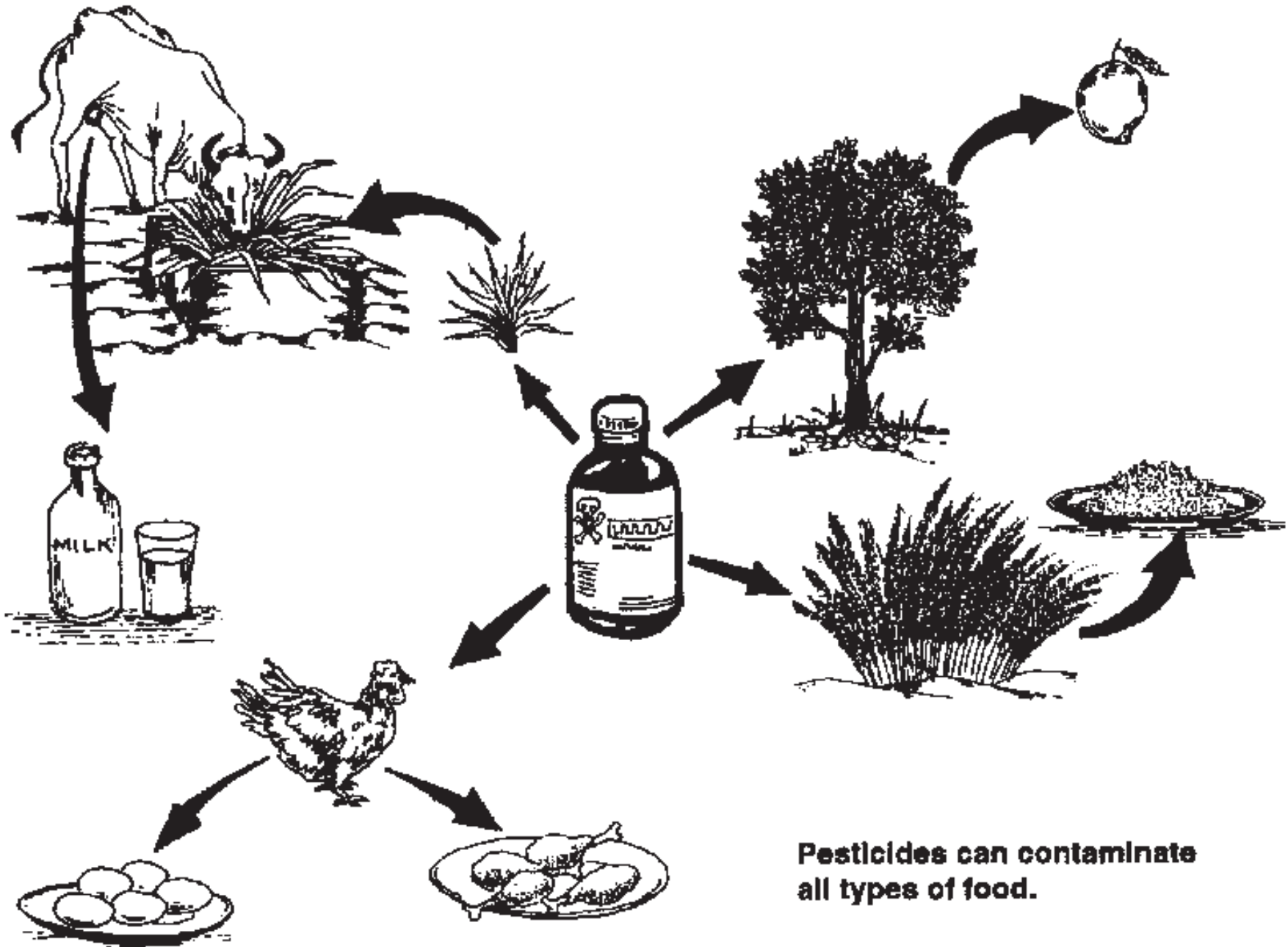


<b><i>E. coli</i> O157:H7</b>	Hemorrhagic colitis or <i>E. coli</i> O157:H7 infection	1-8 days	Severe (often bloody) diarrhea, abdominal pain and vomiting. Usually, little or no fever is present. More common in children 4 years or younger. Can lead to kidney failure	5-10 days	Undercooked beef (especially hamburger), unpasteurized milk and juice, raw fruits and vegetables (e.g. sprouts), and contaminated water
<b>Hepatitis A</b>	Hepatitis	28 days average (15-50 days)	Diarrhea, dark urine, jaundice, and flu-like symptoms, i.e., fever, headache, nausea, and abdominal pain	Variable, 2 weeks-3 months	Raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with an infected food handler; shellfish from contaminated waters
<b><i>Listeria monocytogenes</i></b>	Listeriosis	9-48 hrs for gastro-intestinal symptoms, 2-6 weeks for invasive disease	Fever, muscle aches, and nausea or diarrhea. Pregnant women may have mild flu-like illness, and infection can lead to premature delivery or stillbirth. The elderly or immunocompromised patients may develop bacteremia or meningitis	Variable	Unpasteurized milk, soft cheeses made with unpasteurized milk, ready-to-eat deli meats
<b>Noroviruses</b>	Variously called viral gastroenteritis, winter diarrhea, acute non-bacterial gastroenteritis, food poisoning, and food infection	12-48 hrs	Nausea, vomiting, abdominal cramping, diarrhea, fever, headache. Diarrhea is more prevalent in adults, vomiting more common in children	12-60 hrs	Raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with an infected food handler; shellfish from contaminated waters
<b><i>Salmonella</i></b>	Salmonellosis	6-48 hours	Diarrhea, fever, abdominal cramps, vomiting	4-7 days	Eggs, poultry, meat, unpasteurized milk or juice, cheese, contaminated raw fruits and vegetables
<b><i>Shigella</i></b>	Shigellosis or Bacillary dysentery	4-7 days	Abdominal cramps, fever, and diarrhea. Stools may contain blood and mucus	24-48 hrs	Raw produce, contaminated drinking water, uncooked foods and cooked foods that are not reheated after contact with an infected food handler
<b><i>Staphylococcus aureus</i></b>	Staphylococcal food poisoning	1-6 hours	Sudden onset of severe nausea and vomiting. Abdominal cramps. Diarrhea and fever may be present	24-48 hours	Unrefrigerated or improperly refrigerated meats, potato and egg salads, cream pastries
<b><i>Vibrio parahaemolyticus</i></b>	<i>V. parahaemolyticus</i> infection	4-96 hours	Watery (occasionally bloody) diarrhea, abdominal cramps, nausea, vomiting, fever	2-5 days	Undercooked or raw seafood, such as shellfish
<b><i>Vibrio vulnificus</i></b>	<i>V. vulnificus</i> infection	1-7 days	Vomiting, diarrhea, abdominal pain, bloodborne infection. Fever, bleeding within the skin, ulcers requiring surgical removal. Can be fatal to persons with liver disease or weakened immune systems	2-8 days	Undercooked or raw seafood, such as shellfish (especially oysters)

For more information, contact: The U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition  
 Food Information Line at 1-888-SAFEFOOD (toll free), 10 AM to 4 PM ET, Monday through Friday.  
 Or visit the FDA Web site at [www.fda.gov](http://www.fda.gov).

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**Pesticides can contaminate all types of food.**

# Drinking Water



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# What's in Runoff Pollution?

- Bacteria
- Trash
- Heavy Metals
- Mercury
- Pesticides
- Fertilizers & *Nutrients*
- *Sediment*
- Motor Vehicle Fluids

## Bacteria

**Source:** Raw sewage from failing septic systems, overflowing sewer lines, pet waste, farm animals and wildlife can all be sources of bacteria.

**Effect:** Stormwater contaminated from these sources can contain bacteria and viruses that may cause illnesses in people following swimming in contaminated lakes, rivers or the ocean. Illnesses may also occur after the consumption of raw or improperly cooked shellfish from these contaminated areas.

**Table 3.6. Average Pollutant Loading for Various Land Uses (mg/L)**

Land Use	Pollutant Loading (mg/l)											
	BOD	COD	TSS	TDS	TP	DP	TKN	NO2 / NO3	Pb	Cu	Zn	Cd
Forest/ Rural Open	3	27	51	415	0.11	0.03	0.94	0.80	0.000	0.000	0.000	0.000
Urban	3	27	51	415	0.11	0.03	0.94	0.80	0.014	0.000	0.040	0.001
Agricultural/ Pasture	3	53	145	415	0.37	0.09	1.92	4.06	0.000	0.000	0.000	0.000
Low Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.057	0.026	0.161	0.004
Medium Density Residential	38	124	70	144	0.52	0.27	3.32	1.83	0.180	0.047	0.176	0.004
High Density Residential	14	79	97	189	0.24	0.08	1.17	2.12	0.041	0.033	0.218	0.003
Commercial	21	80	77	294	0.33	0.17	1.74	1.23	0.049	0.037	0.156	0.003
Industrial	24	85	149	202	0.32	0.11	2.08	1.89	0.072	0.058	0.671	0.005
Highways	24	103	141	294	0.43	0.22	1.82	0.83	0.049	0.037	0.156	0.003
Water/ Wetlands	4	6	6	12	0.08	0.04	0.79	0.59	0.011	0.007	0.003	0.001

Adapted from NURP (1983), Horner et. al (1994), and Cave et. Al. (1994)

- |                                 |  |
|---------------------------------|--|
| BOD = Biochemical Oxygen Demand | TKN = Total Kjeldahl Nitrogen                          |
| COD = Chemical Oxygen Demand    | NO <sub>2</sub> /NO <sub>3</sub> = Nitrates / Nitrites |
| TSS = Total Suspended Solids    | Pb = Lead  |
| TDS = Total Dissolved Solids    | Cu = Copper  |
| TP = Total Phosphorus           | Zn = Zinc  |
| DP = Dissolved Phosphorus       | Cd = Cadmium   |

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[lowcountrylocalfirst.org](http://lowcountrylocalfirst.org)



[LimeHouseproduce.com](http://LimeHouseproduce.com)