Sustainability and Climate Change

Thinking Critically about Science, Policy, and Ethics

Michael A. Bryson, Sustainability Studies

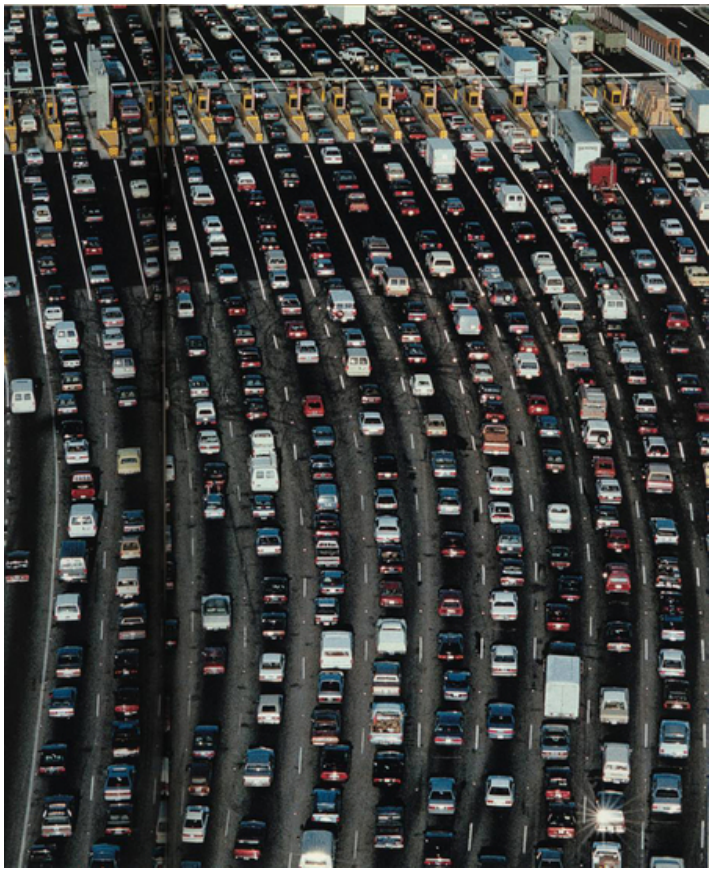
First Year Seminar Guest Lecture

10 November 2011

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Sustainability Defined



This is not sustainable . . .

. . . but this is.

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Sustainability Defined

Not so good.

Ah, much better.

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Sustainability Defined

Nope.

Yep.

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

In a Sustainable Future:

The green roof of Chicago's City Hall
(source: City of Chicago)

Environmental resources are conserved for both future human generations as well as non-human biota.

Economic development occurs not at the expense of the natural environment, but in a way to mitigate ecological costs and impacts.

Equity – social, economic, and environmental justice – governs the process of sustainable development.

Discussion: How do some of these images relate to climate change?

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

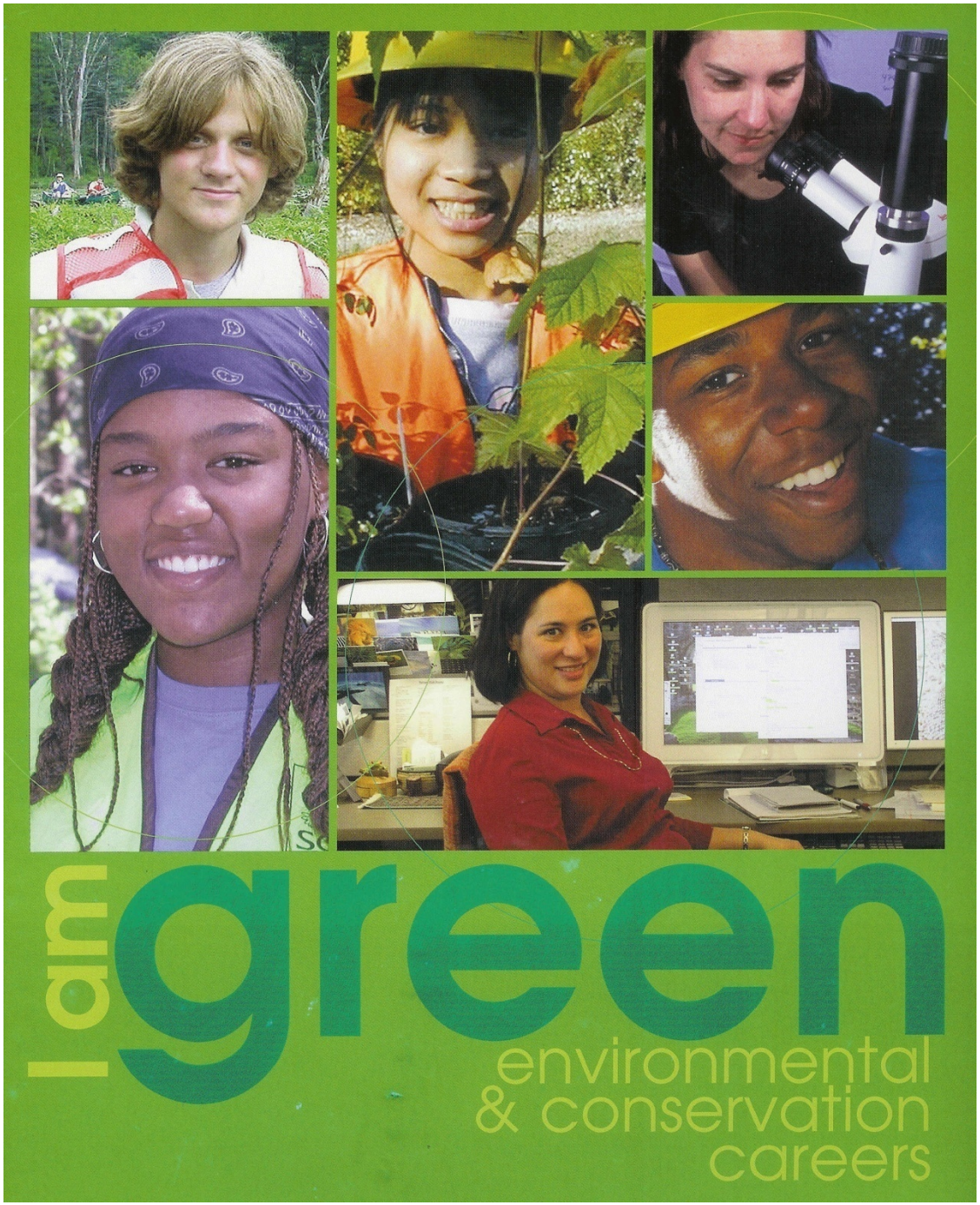
Sustainable Business and the Green Economy

Wal-Mart Unveils Plan to Make Supply Chain Greener
February 26, 2010 / The New York Times
By Stephanie Rosenbloom

Wal-Mart, the nation's largest retailer, announced on Thursday that **it would cut some 20 million metric tons of greenhouse gas emissions** from its supply chain by the end of 2015 — the equivalent of removing more than 3.8 million cars from the road for a year. . . .

Essentially, **suppliers are being asked to examine the carbon lifecycle of their products**, from the raw materials used in manufacturing all the way through to the recycling phase. . . .

Wal-Mart's sustainability executives will work with suppliers to help them figure out what measures to take.



Science/Engineering:
- Energy manager/technician
- Hydrologist
- Restoration ecologist
- Toxicologist
- Water/wastewater engineer

Business/Professional:
- Brownfields real estate developer
- Corporate recycling manager
- Environmental quality certification specialist
- GIS specialist
- Risk manager
- Sustainability officer

Social Science:
- Geographer
- Museum curator
- Parks and recreation specialist
- Planner
- Policy analyst

Arts and Humanities:
- Environmental communications
- Landscape architect
- Technical environmental writer

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Sustainability Studies at RU

- **Fosters environmental literacy** through interdisciplinary work in the natural sciences, social sciences, and humanities;
- **Engages public policy** concerns surrounding consumption, energy usage, and viable economic growth;
- **Explores social justice** issues on a range of fronts, including environmental justice, resource allocation, urban development, and social equity;
- **Educates students to be leaders** on issues of sustainability, one of the critical issues of the 21st century.

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Greening the University: A Three-fold Process

Greening the Physical Campus

Launching Sustainability Studies

Making Community Connections

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

SUST Curriculum

Core Courses

SUST 210 Sustainable Future
SUST 220 Water
SUST 230 Food
SUST 240 Waste

Advanced Courses

SUST 310 Energy and Climate Change
SUST 320 Sprawl, Transportation, and Planning
SUST 330 Biodiversity
SUST 340 Policy, Law, and Ethics

Special Options

SUST 350 Service Learning
SUST 390 Special Topics

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

SUST Curriculum

Crosscutting Themes

Science and Environmental Literacy
Environmental and Social Justice
Urban and Suburban Systems

Pedagogical Highlights

Interdisciplinary Learning
Field Trip Experiences
Service Learning Opportunities
F2F, Online, and Hybrid Classes

SUST field trips

Hands-on education using the urban and suburban environments as learning laboratories

Cultivation of academic-community partnerships / service-learning opportunities

Des Plaines River Wetlands Demonstration Project (spring 2009)

Exploring the waters of the Des Plaines River Wetlands Demonstration Project (fall 2010)

Testing the water quality of the **Chicago River's North Branch** (May 2010)

Chicago Center for Green Technology – learning about sustainable design (Feb. 2011)

Canoe trip down Bubbly Creek, an industrialized tributary of the South Branch of the Chicago River (May 2009)

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

The Chicago River

Nature, Science, Policy, and Community

Understanding the Chicago River as a modified natural ecosystem (natural sciences)

Developing policies regarding water quality, river use, manure treatment (social and natural sciences)

Representing the river as a cultural resource (humanities)

Restoring the river: water quality, biodiversity, riparian zone vegetation, citizen access and recreation (all disciplines)

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Service Learning and the Community

Curriculum

- **SUST 230 Food** (community gardens and urban agriculture)
- **SUST 220 Water** (watershed monitoring and stream restoration)
- **SUST 330 Biodiversity** (non-native species control)
- **SUST 350 Service and Sustainability** (environmental justice and social activism)

(at right: RU students and faculty at the Chicago Lights Urban Farm)

Partnerships

- Chicago Lights Urban Farm
- Field Museum of Natural History
- Friends of the Chicago River
- Chicago Wilderness
- Local Community Colleges

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Climate Change Issues

Climate change vs. global warming

The nature of science

Policy and economics

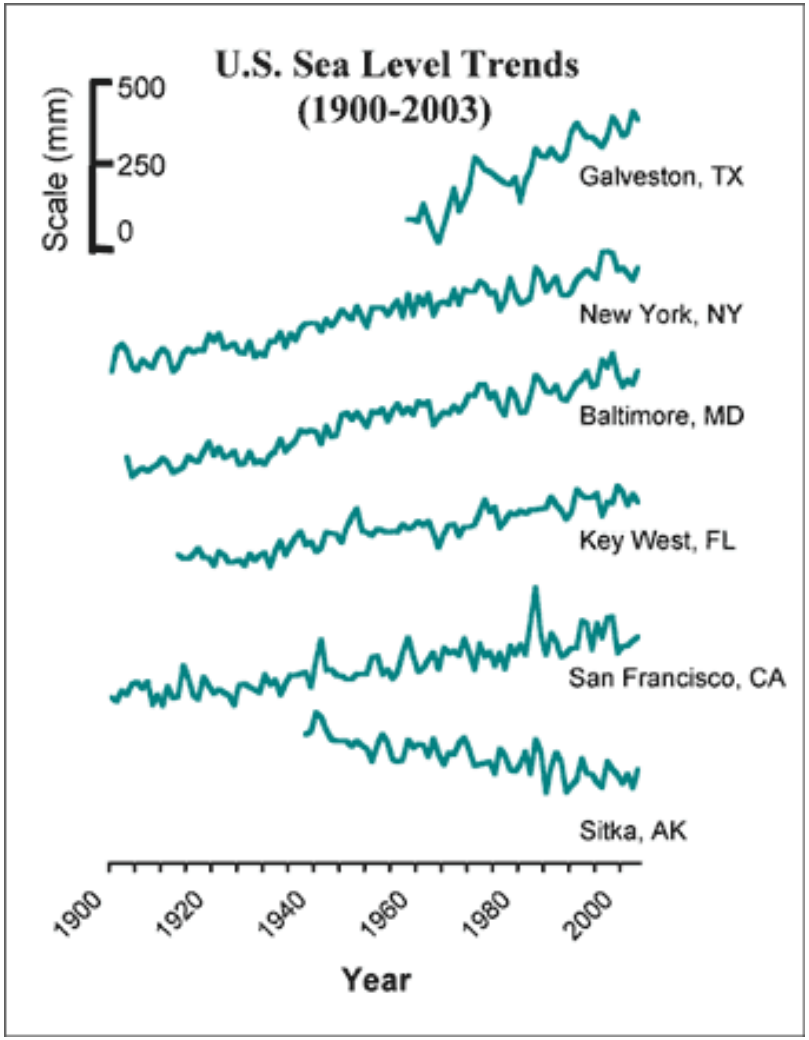
Rhetoric and public discourse

Sustainable development and climate change mitigation

Local responses to climate change

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Learning about Climate Change



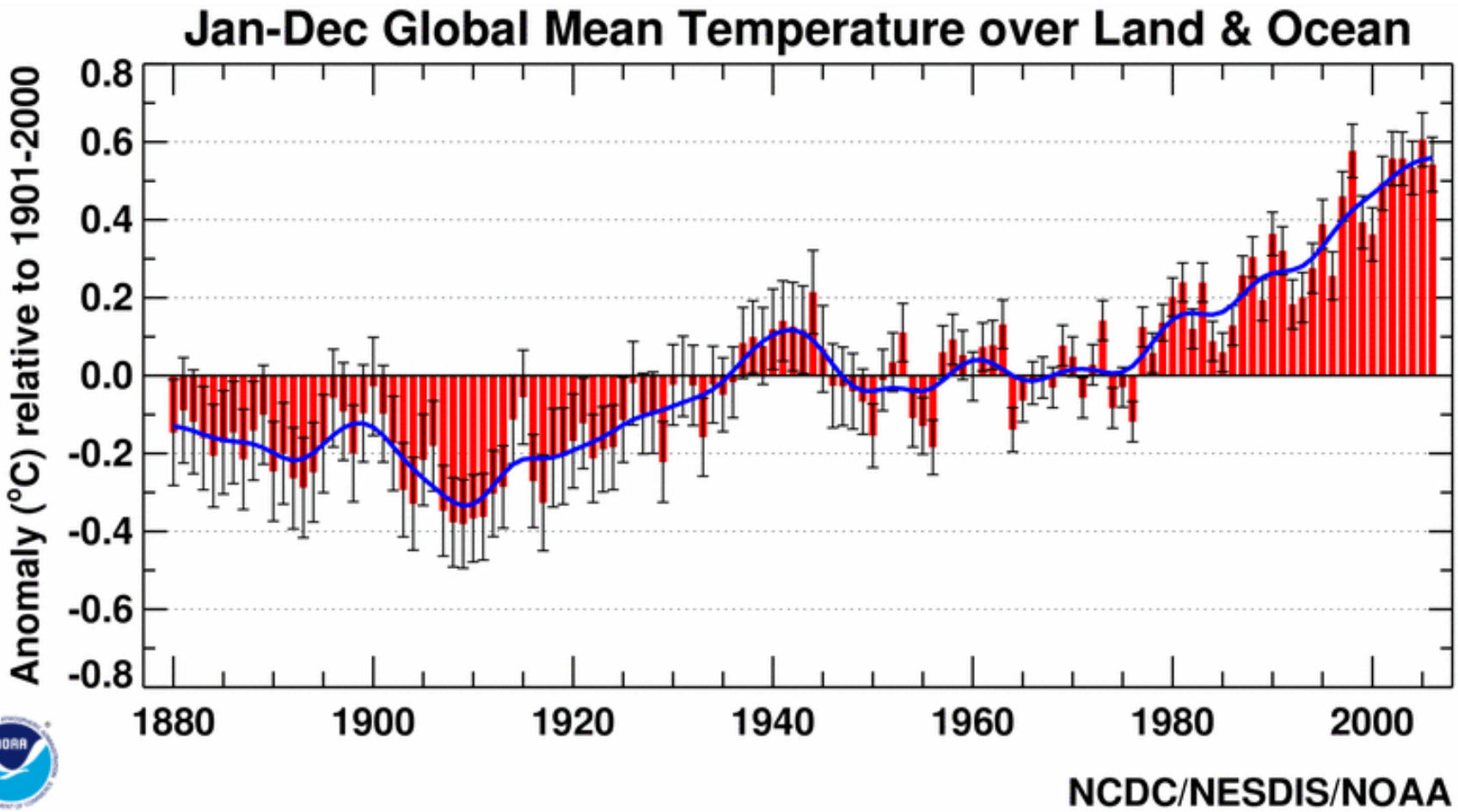
The EPA's website on climate change provides a Basic Information section that's a good place to start learning about this global process. From here, you get a global overview of the science and policy of global warming and climate change (these are related, of course, though not the same thing) as well as a plethora of links to data, analysis, and other sources. This page, then, is a good jumping off point for learning more about climate change, gathering primary information, etc.

Graph Source: EPA, Climate Change Science: Sea Level Changes.

Originally from Monthly and Annual Mean Sea Level Station Files from the Permanent Service for Mean Sea Level (PSMSL) at the Proudman Oceanographic Laboratory

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

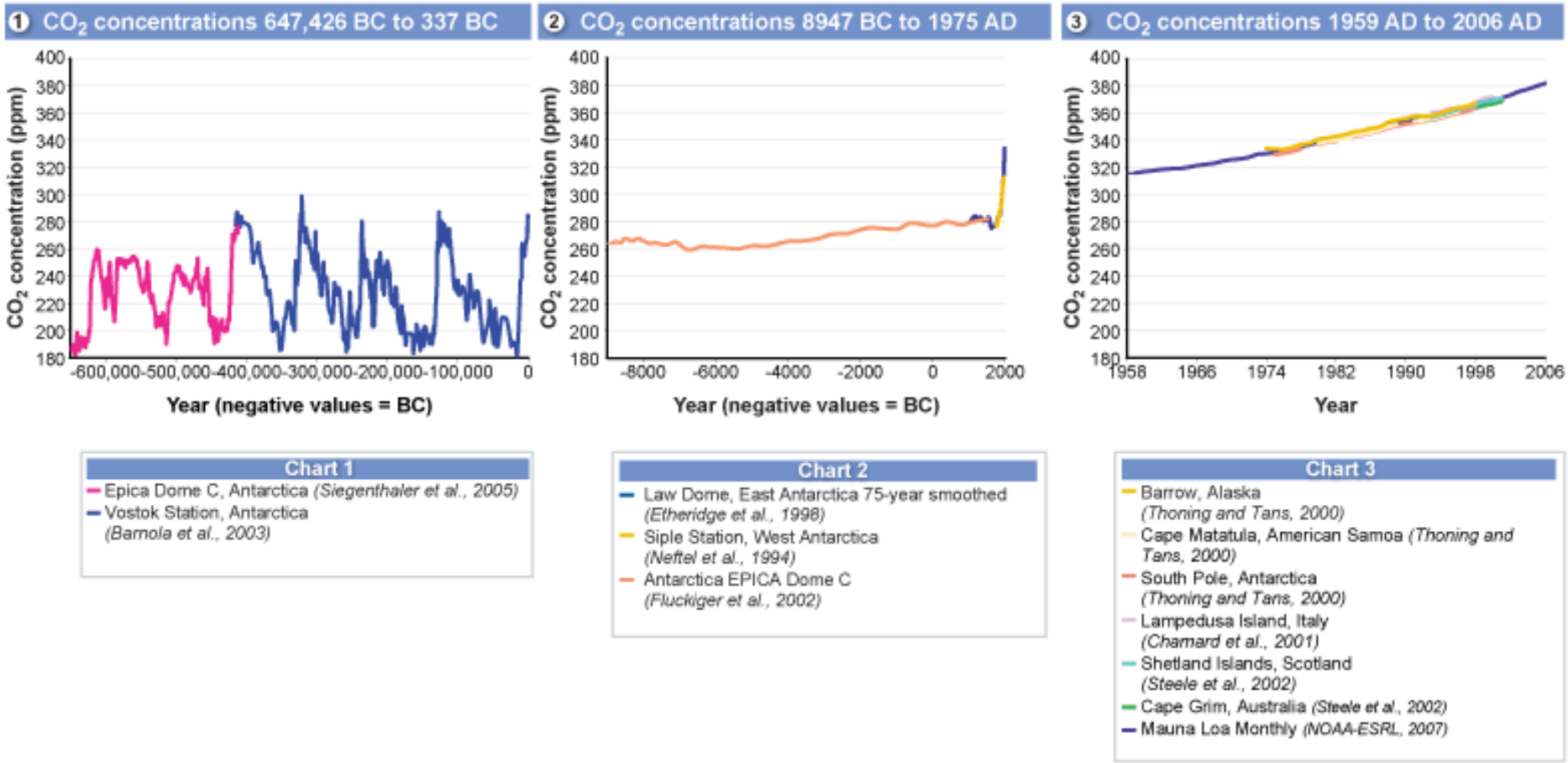
Climate Change Data



Here's a **global temperature graph** that maps the increase in the Earth's temperature, but in a different way than you may have seen before. Note that the blue line tracks the difference between the annual average temp of the Earth and the 100-year average temp from 1901-2000. Since the late 1970s, temps are well above the 100-year global average – and climbing steadily.

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Climate Change Data



Another way to track climate change is by looking at Greenhouse Gases such as **carbon dioxide**. Such gases serve to retain heat within the Earth's atmosphere. They occur naturally, of course, but their concentrations have been increased of late by various human actions. These graphs depict the fluctuating CO^2 levels historically, the recent spike in levels since the industrial revolution, and the very recent trends of the latter 20th century. (Source: EPA | Science)

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

The Nature of Science

Arguments about climate change and other politically-charged issues often stem from misunderstandings about the nature of scientific inquiry.

- Science is a process, not simply a body of knowledge
- New observations can displace old theories
- Testing / improving / discarding of theories is normal
- Absolute truth vs. "increasingly accurate approximations" of the truth → scientists assess data in terms of levels of certainty

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

The IPCC's 2007 Report

The IPCC codifies the state of knowledge about climate change in terms of various degrees of certainty:

- What's **Known** – virtual but not absolute certainty (>99% probability)
- What's **Very Likely** – high probability (>90%)
- What's **Not Certain** – a broad range of levels of uncertainty, from "likely" (>66% probability) to "unlikely" (<33% probability)

Discussion: How much data are enough? When does our knowledge empower us to act (in the form of concerted policy)?

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

IPCC's State of Knowledge (2007)

Scientists know with **virtual certainty** that:

- Human activities are changing the composition of Earth's atmosphere. Increasing levels of greenhouse gases like carbon dioxide (CO2) in the atmosphere since pre-industrial times are well-documented and understood.
- **The atmospheric buildup of CO2 and other greenhouse gases is largely the result of human activities such as the burning of fossil fuels.**
- An "unequivocal" warming trend of about 1.0 to 1.7°F occurred from 1906-2005. Warming occurred in both the Northern and Southern Hemispheres, and over the oceans (IPCC, 2007).
- The major greenhouse gases emitted by human activities remain in the atmosphere for periods ranging from decades to centuries. It is therefore virtually certain that atmospheric concentrations of greenhouse gases will continue to rise over the next few decades.
- Increasing greenhouse gas concentrations tend to warm the planet.

Quoted directly from: EPA | Climate Change | Science | State of Knowledge

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

IPCC's State of Knowledge (2007)

Scientists determine the following are **very likely**:

The Intergovernmental Panel on Climate Change (IPCC) has stated "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" (IPCC, 2007).

In short, a growing number of scientific analyses indicate, but cannot prove, that rising levels of greenhouse gases in the atmosphere are contributing to climate change (as theory predicts).

In the coming decades, scientists anticipate that as atmospheric concentrations of greenhouse gases continue to rise, average global temperatures and sea levels will continue to rise as a result and precipitation patterns will change.

Quoted directly from: EPA | Climate Change | Science | State of Knowledge

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

IPCC's State of Knowledge (2007)

What's **Not Certain**:

Important scientific questions remain about how much warming will occur, how fast it will occur, and how the warming will affect the rest of the climate system including precipitation patterns and storms. Answering these questions will require advances in scientific knowledge in a number of areas:

- Improving understanding of natural climatic variations, changes in the sun's energy, land-use changes, the warming or cooling effects of pollutant aerosols, and the impacts of changing humidity and cloud cover.
- **Determining the relative contribution to climate change of human activities and natural causes.**
- Projecting future greenhouse emissions and how the climate system will respond within a narrow range.
- Improving understanding of the potential for rapid or abrupt climate change.

Quoted directly from: EPA | Climate Change | Science | State of Knowledge

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Sustainable Development and Local Responses

Chicago's Greenhouse Gas Emissions:
An Inventory, Forecast, and Mitigation Analysis for Chicago and the Metropolitan Region
Center for Neighborhood Technology, 2008
http://www.cnt.org/climate/

Chicago Climate Action Plan
http://www.chicagoclimateaction.org/

CHICAGO CLIMATE ACTION PLAN

CNT
Sustainable Communities
Attainable Results

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Chicago's Greenhouse Gas Emissions

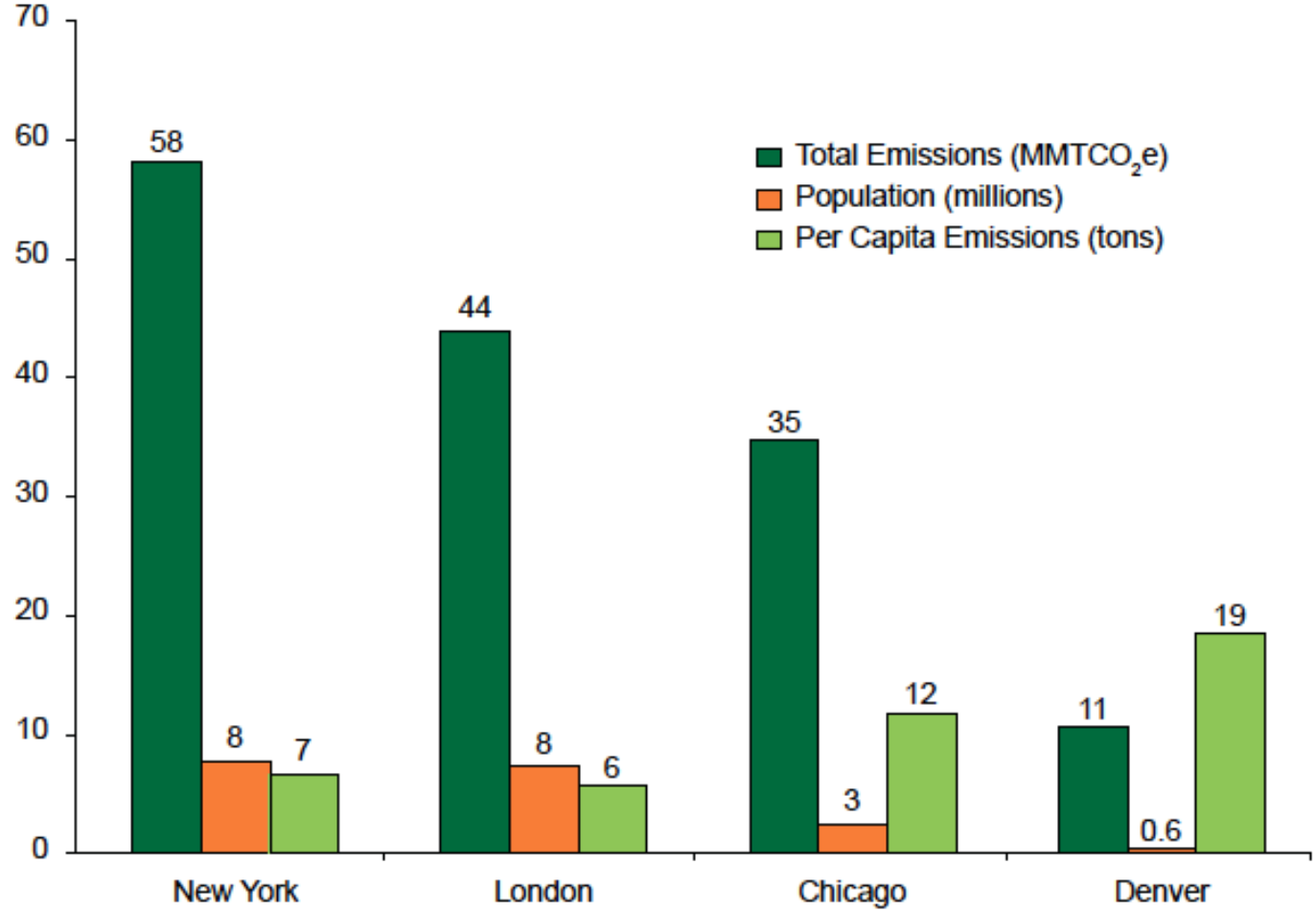


Figure 1 Greenhouse gas emissions of cities.

Source: CNT, "Chicago's Greenhouse Gas Emissions," p5

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Chicago's Greenhouse Gas Emissions

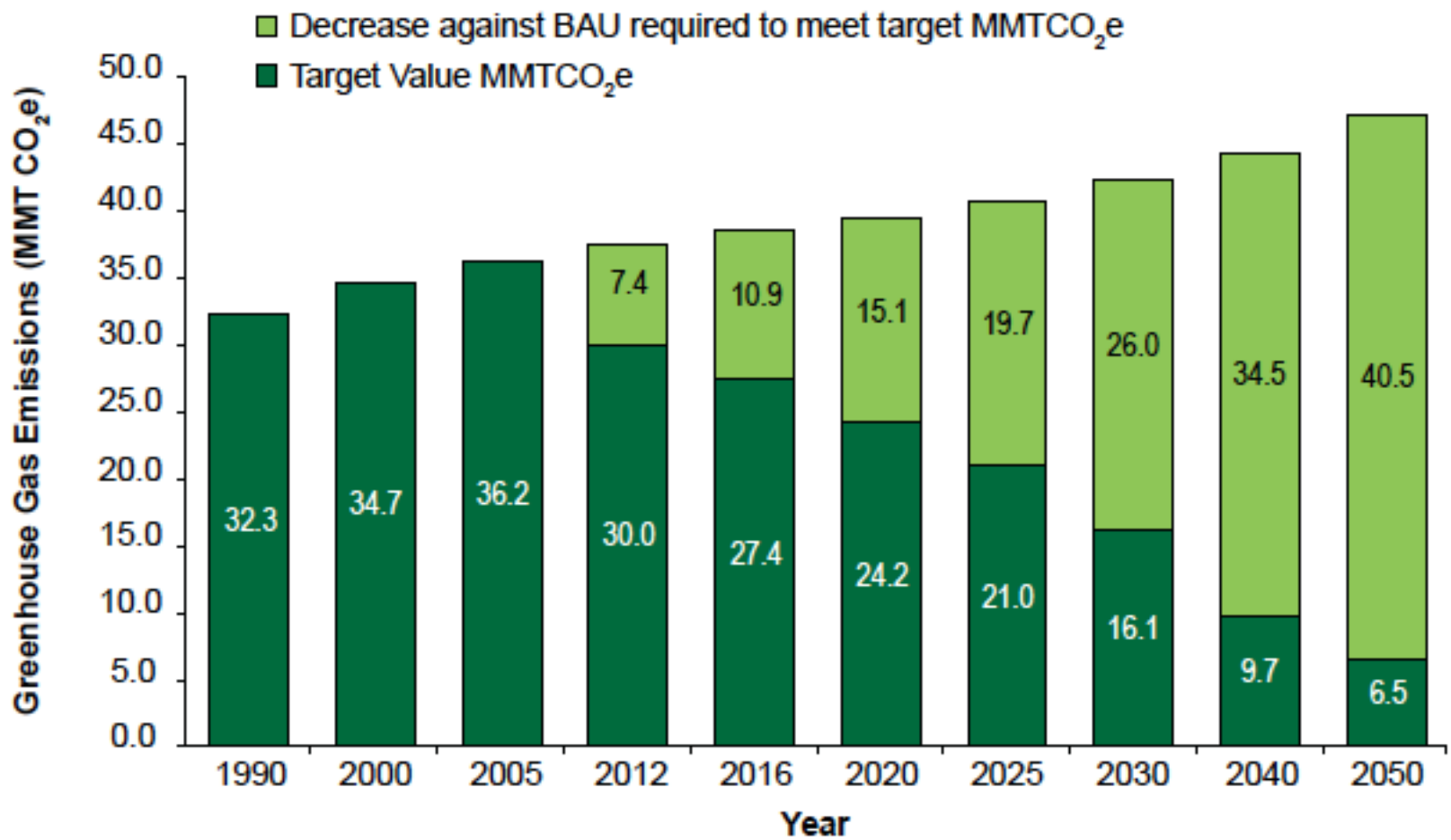


Figure 5: Chicago Business as Usual Greenhouse Gas Emissions and Reduction Targets

Source: CNT, "Chicago's Greenhouse Gas Emissions," p9

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

Chicago's Greenhouse Gas Emissions

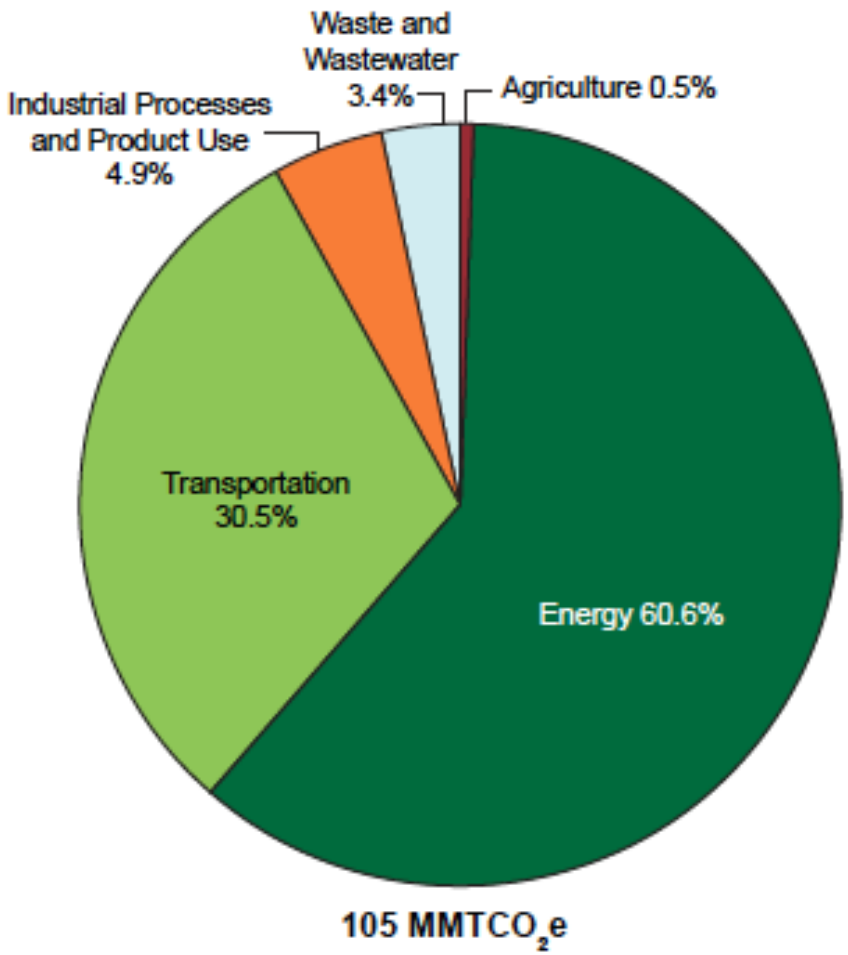


Figure 4: Chicago Region's Greenhouse Gas Emissions 2000

Discussion:

What are some of the ways we (as a region) could decrease our GHG emissions?

What are the ecological, economic, and/or ethical benefits of doing so?

What about risks?

Source: CNT, "Chicago's Greenhouse Gas Emissions," p8

ROOSEVELT UNIVERSITY
EVELYN T. STONE COLLEGE
OF PROFESSIONAL STUDIES

A Green Vision for RU's Suburban Campus

Schaumburg campus (established 1996) is the only comprehensive college campus in Chicago's northwest suburban region

Visionary Possibilities:

Sustainable landscape plan: native plants, prairie plots, walking paths, wetland, orchard,

Water conservation strategies: bioswales, cisterns, rain gardens, pervious paving

Outdoor education / recreation: experimental wetland restoration, native plant gardens, aquaponics pond, greenhouse, urban farm

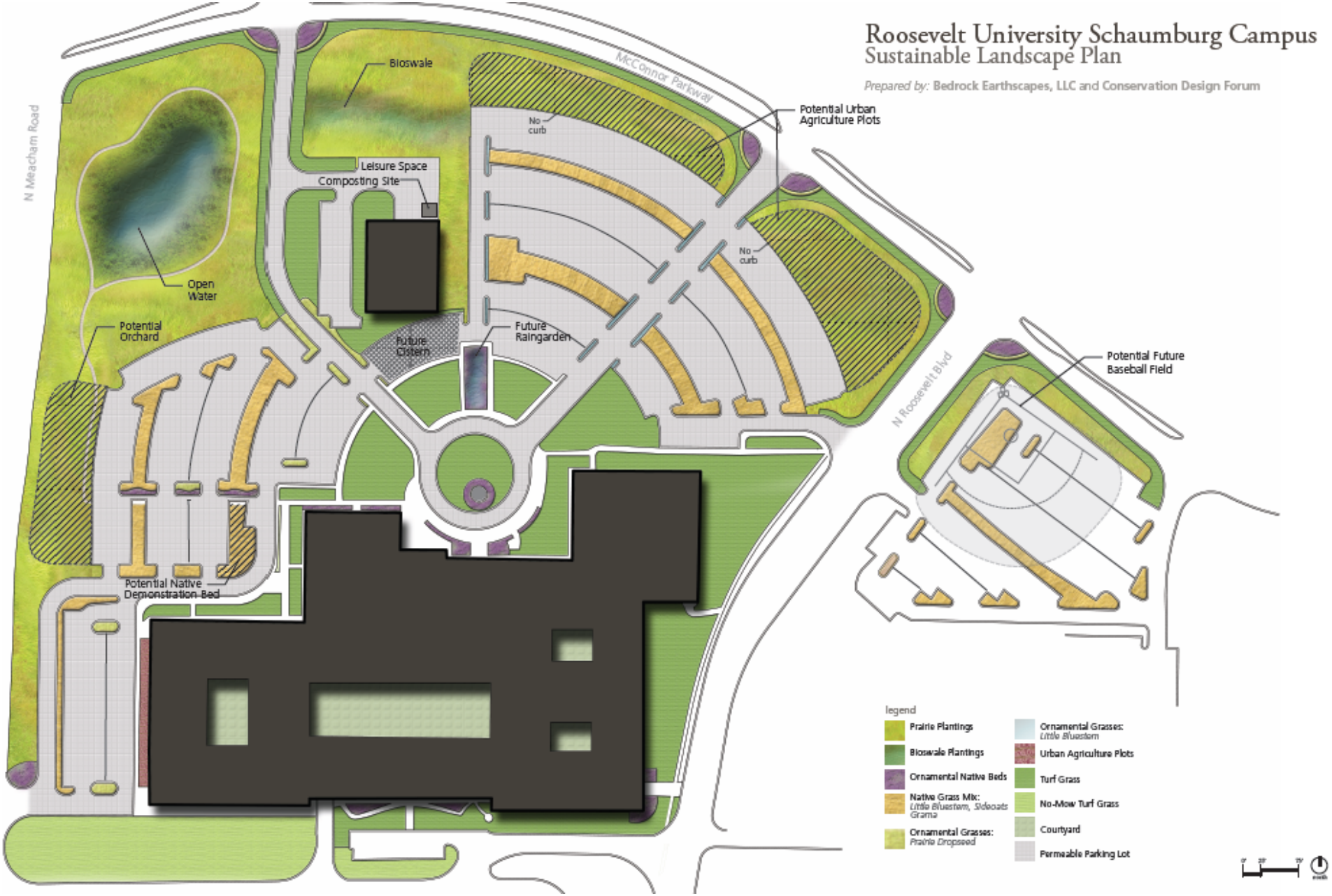
The Existing Foundation:

SUST undergraduate major/minor/credential

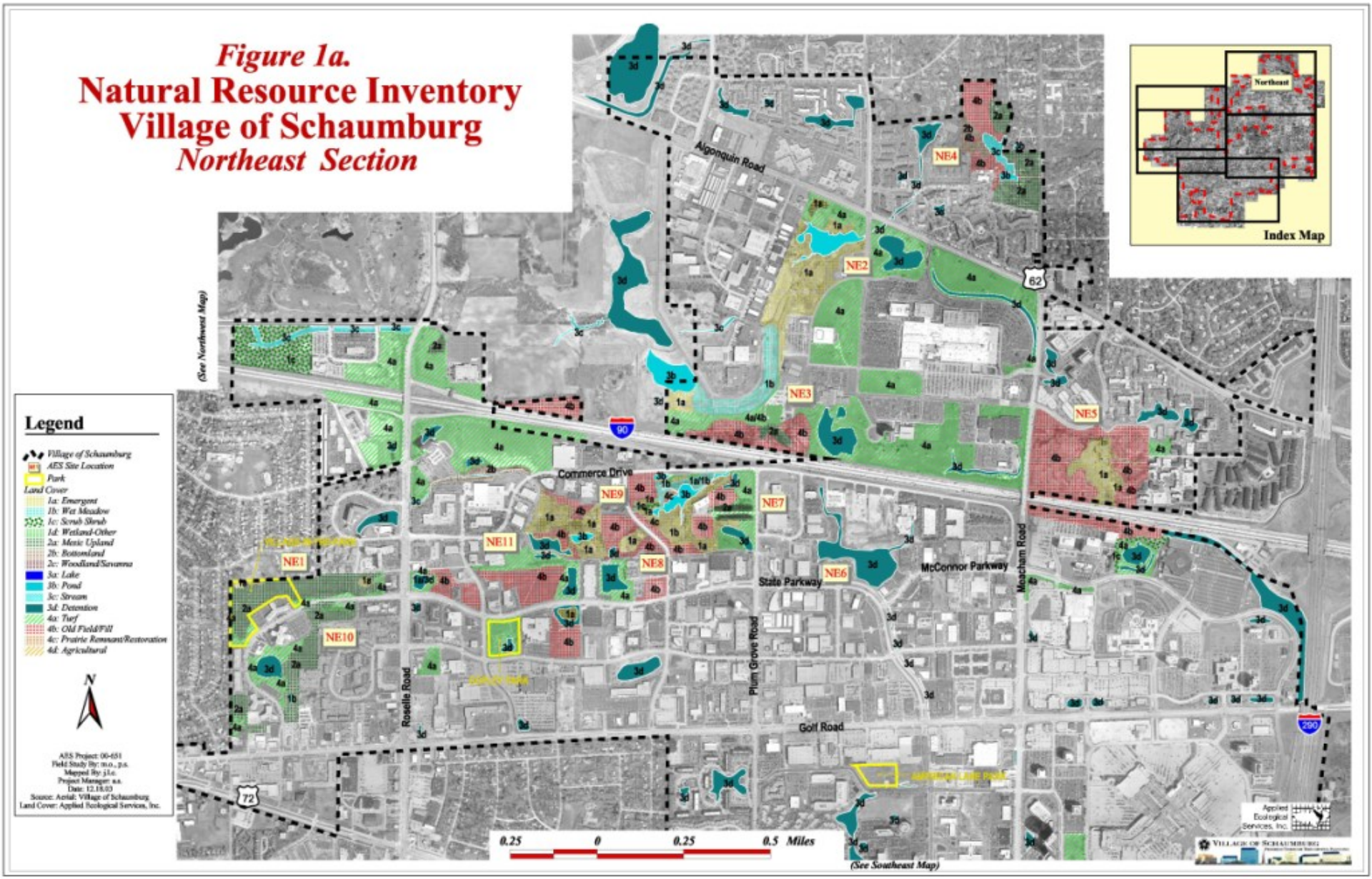
Strong science programs: biology, chemistry, pharmacy

Underutilized green space

Schaumburg's Biodiversity Plan (2004) and Green Action Plan (2008)



Revised Plan / 17 February 2011



Source: Schaumburg Biodiversity Plan (2004)