What is a nitrogen footprint?

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Outline

1. Why is nitrogen important?
2. What is a nitrogen footprint?
3. SIMAP: A tool for campuses
4. Opportunities for reduction
What is reactive nitrogen?

All species N except unreactive N₂

Figure by Andrew Greene
Today, reactive N is created by:

- **Natural processes**
  - Images of lightning and a plant root system.

- **Man-made processes**
  - Image of a hand holding coal and a factory.
Humans make 3-4x as much reactive N as nature

Galloway et al., 2003; 2008
Energy Production

Food Production

Slide by Jim Galloway
What are negative impacts from excess N?

- Smog, Haze
- Forest Impacts
- Acidification
- Ozone Hole
- Climate change
- Eutrophication
The Nitrogen Dilemma:

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Drawbacks</th>
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<tbody>
<tr>
<td>Necessary for life</td>
<td>Negative impacts to environmental &amp; human health</td>
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<td>Synthetic fertilizer provides unlimited N supply for food</td>
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Challenge:
Optimize the use of nitrogen, while minimizing the negative impacts
Addressing the nitrogen challenge

1. Technology

2. Policy

3. Personal/institutional Action
What is a nitrogen footprint?

A nitrogen footprint is the amount of reactive nitrogen released to the environment as a result of an entity’s resource consumption.

1. Food*

2. Energy

*Food consumption and production
The impact of FOOD CHOICES on a nitrogen footprint

- **½ cup beans**: 15 g protein
- **3 oz steak**: 15 g protein
Consistent trends across the three footprints

Crop footprints less than meat/animal products
Nitrogen footprint tool for consumers

Available at www.N-Print.org
Food makes up more than 75% of a personal nitrogen footprint

SIMAP: A tool for campuses

SUSTAINABILITY INDICATOR MANAGEMENT & ANALYSIS PLATFORM
SIMAP integrates two campus sustainability tools

**NITROGEN footprint:**

- Developed in 2009 at UVA
- Used by 18 institutions
- Completed pilot testing

**CARBON footprint:**

- Developed in 2001 at UNH
- Used by thousands of institutions
- Excel & web-based tool

*Consumption and production*
Why a combined C & N campus tool?

1. Broader picture of environmental impacts

2. Win-win for most reduction strategies

3. Reduced data entry

4. Aggregated campus data set
Strong correlations indicate win-win for reduction strategies.

Leach et al. 2017

FTE = Full Time Equiv.
SIMPLIFYING SUSTAINABLE DECISIONS

SIMAP™ (Sustainability Indicator Management and Analysis Platform) is a carbon and nitrogen-accounting platform that can track, analyze, and improve your campus-wide sustainability. Our proven algorithms will help you:

- Create a baseline
- Benchmark your performance
- Create reports
- Set goals
- Analyze your progress year over year

Who can participate: Any campus-based organization or institution can take advantage of SIMAP’s tools and functions.

How to participate: Create a new account with SIMAP. Once you’ve logged into the portal, select a subscription level and make a payment. Second Nature members will receive discounts automatically.

YOUR CAMPUS FOOTPRINT

**CARBON**

CO2 emissions from generating power, treating waste, daily commuting, and even the use of paper, contribute to a campus’ carbon footprint. Reducing these greenhouse gas emissions will help slow the effects of climate change and global warming.

**NITROGEN**

Reactive nitrogen can result from everyday activities like food service, energy use, transportation, and ground fertilizer. Reducing your nitrogen footprint can provide benefits to air and water quality, while helping prevent climate change.
3. Results

Track carbon and nitrogen footprints over time

Food data in 2014 only
What can you do?

Calculate your N footprint: www.N-PRINT.org

**Energy:**
- Reduce utility usage
- Public transit
- Reduce, reuse, recycle!

**Food:**
- Recommended protein
- Less animal protein
- Less N-intensive meat
- Food from sustainable farms
- Reduce food waste
Summary and conclusions

Nitrogen challenge: Optimize nitrogen’s benefits while minimizing its negative consequences

Consumers

Personal N footprint model educates consumers

Institutions

Well-positioned to manage N pollution and educate a community

Reductions

Sustainability Indicator Management & Analysis Platform

www.N-Print.org