Forest Watch: 20 Years in the Public Schools
A New Hampshire Space Grant Consortium Success Story
Forest Watch gives teachers and students:

Exposure to academic challenges:
• Botany
• Math
• Statistics
• Physics
• Satellite imagery
• Calculus
• Social studies
• Comparative Forestry
• Art and Literature

“Wind combers”

Forest Watch Goals:
• Hands-on/minds-on research
• Authentic science
• An interdisciplinary approach to learning
• A true student and scientist partnership
• An opportunity for students to become active contributors to an on-going research project.
New perspectives on nature

- The size of the air pollution issue
- The size of the organism affected
- The power of students
- The power of long-term studies
- The power of analysis
- The limits of knowledge
- Daily change in the environment

Oliver Morton says, “The tree’s form tells the truth. The tree grows into the air because it grows out of the air.”
Lessons in the School Yard

Sant Bani School trees in Sanbornton, NH, increased in girth or diameter at breast height (DBH) by 18.28 cm or 1.08 cm a year. The school's five white pines grew 0.58 meter taller year by year, adding 9.9 meters in height over the 17 years.

Observation  Safety
Questioning   Teamwork
Journaling   Sampling
Collecting   Measuring

258 schools in New England and the mid-Atlantic.
367 teachers
1767 white pine trees
3,497 field samples
6,994 needle samples.
Learning in the Laboratory

196,132 bits of data from needle length to percent of tip necrosis.

Biometric measures
Microscopy
Plant anatomy
Ozone damage
Data results
Graphing
Critical Thinking
21st Century Technologies

Image sets for each school.
Multispec interpretation and classification.
Ground-truthing.
Earth Systems Science

$\text{NO}_x + \text{VOCs} \implies \text{O}_3$

High T
“Can anyone explain what the Red Edge Inflection Point is?,” Dr. Rock asked.
“A longer wavelength means this tree has more chlorophyll,” Sierra, 7th grader.
Why Forest Watch Works

28,000 students in 20 years.
Teachers can incorporate modules into required curriculum.
A teacher’s talents and skill come to bear.
Timing is flexible.
The tree is in the school yard.
Little or no costs.
Supportive training and staffing.
Web site resources.
What’s Next for Forest Watch?

New technologies?  
New pollutants?  
Unexpected occurrences?  
Phenologic change?  
An imperative need for more master teachers to teach and prepare the American public.
Teaching Climate Change

“Climate change is a highly interdisciplinary, pedagogically challenging subject that does not fit easily into discipline-based science curricula or assessments. However, a variety of factors—chief among them being barriers introduced by local STEM education policies and inadequate teacher preparation in this subject matter—prevent widespread exposure of learners to effective instruction on climate, or engagement of the most talented minds in climate-related education and career paths.” (NSF, 2010)
“Student experiences should model the nature of science to illustrate the wonder and connections that make science real,” Louise James, 4th grade teacher, Sewall-Anderson School, Lynn, Massachusetts, laid off when science program was cut, 2008.