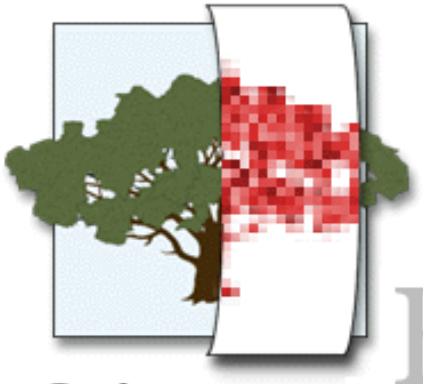
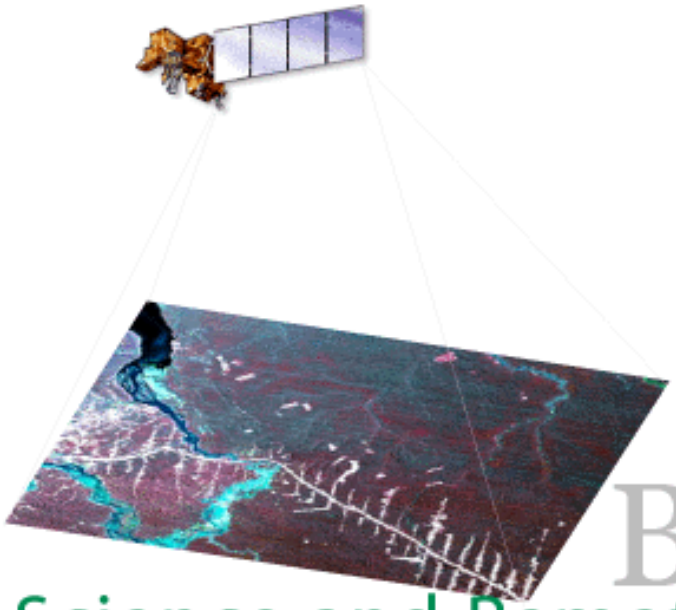


BSRSI

Basic Science and Remote Sensing Initiative



BSRSI

Basic Science and Remote Sensing Initiative

Research Profile
Facilities
Staff Directory
Papers and Reports
Back

BSRSI Overview

The Basic Science and Remote Sensing Initiative (BSRSI) is a global change research program in the Department of Geography at Michigan State University. The goal is to develop an interdisciplinary approach to understanding global change, at both regional and global scales, through the integration of both physical and social sciences.

Research of the BSRSI is focused on:

- Monitoring **land use and land cover change** and analyzing the causes and effects of these changes, with emphasis on both global scale questions and regional issues in the Great Lakes Region
- Development of basic, **remote observation systems** through Landsat 7 and EOS AM-1, as well as international remote sensors and radar applications and commercial high resolution sensors
- Development and implementation of **information technology**, such as the development of a web-based GIS system

The scope of our research spans from local to global analyses of land use and land cover change patterns, biogeochemical cycles, and human dimensions of land use and land cover change and global change. Research on the patterns and process of land use and land cover change exemplifies our interdisciplinary approach. We aim to understand the inter-annual variability in land use and cover change and how such variability affects the global carbon cycle, greenhouse gas emissions, and global climate change.

To gain this understanding, it is necessary to have precise, spatially explicit and dynamic measurements at high temporal and spatial resolution, and to integrate those measurements with process models. Multidisciplinary collaborative research provides the best opportunity to do this kind of problems solving. Remote sensing and GIS are important research tools in the analysis of complex problems. Finally, through the use of information technology developments, such as Internet-2, we can then disseminate the information to researchers, policy-makers, and educators.

Research Profile

Monitoring Change
Causes of Change
Effects of Change
New Sensors and Methods
Information Technology
Back

BSRSI Research Profile

BSRSI research is organized around five central themes in a program which emphasizes a pattern to process approach, with approximately $7.5 Million in external support, and $1.0 Million internal support.

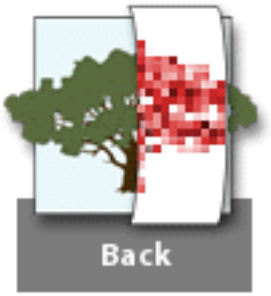
Theme 1: Monitoring Land Use and Land Cover Change. Observations of the patterns of landscape change, where we use earth observations satellites to monitor land cover change at both global and regional scales, and includes both large-area analyses as well as field-level work. Satellite data allow us to sense land cover type as well as characteristics of the vegetation. This theme provides the empirical basis for the next two.

Theme 2: Causes of Land Use and Land Cover Change. The drivers of change and the specific human processes (e.g. economic, demographic, social and institutional factors) which cause land use and land cover change result in the patterns of land cover change in Theme 1. This work is conducted across a range of scales from the local (e.g. farmer) to the global, and includes a heavy field component.

Theme 3: Effects of Land Use and Land Cover Change. The social and environmental effects and outcomes of land cover change, including climate change (from changes in the global carbon cycle), biodiversity (due to habitat fragmentation), food and agriculture. other related issues.

Theme 4: New Methods and Sensors. Research and development into ways to continuously improve our measurements of land cover change, through the development of new satellite systems, new global and regional monitoring programs, and new methods and analytical techniques.

Theme 5: Information Technology. Research and implementation of advances in technology as a way to improve the delivery of information to research, policy, and education. We develop new ways to acquire process and distribute large quantities of data using information systems such as Internet-2, the Web, and internet-based GIS.



Faculty Openings

*** Sorry, no positions at this time, please check back in the future.**

Graduate Studies

Ph.D. Program

M.A. & M.S. Programs

Research Activities

Current Students

BSRSI Pages

BSRSI Graduate Studies in the Department of Geography

As part of the Department of Geography at Michigan State University, the Basic Science and Remote Sensing Initiative offers many options for graduate students. Our research utilizes Remote Sensing and GIS but the department has other research activities as well.

The Department of Geography offers MA, MS, and PhD graduate degrees with concentrations in cartography/GIS/remote sensing, physical geography, regional development, and economic geography and regional science. Through its Urban Planning Program, the department also offers the Master's in Urban and Regional Planning degree. The Landscape Architecture Program is also a component of the Department of Geography; it offers an undergraduate degree. When viewed in its totality, the Department of Geography at MSU provides a unique environment for graduate work. The combination of course offerings and faculty expertise present innovative and stimulating opportunities for graduate students.

Cartography/GIS/Remote Sensing

Offerings in cartography, geographic information systems, and remote sensing are designed to meet a wide range of student needs. Courses address both theoretical and practical aspects of the field including map design, automated map production, computer graphics, spatial data handling, and analysis of airborn and satellite remote sensing. Faculty are actively engaged in both theoretical and applied research.

Economic Geography and Regional Science

The concentration in economic geography and regional science emphasizes the study of the underlying theories of location and spatial interaction of human activities in their economic, social, and policy contexts. This program stresses the analysis of spatial systems related to economic, urban, and transportation geography, location analysis, and regional

science. Study and research in this cluster generally involve the use of mathematical models and quantitative techniques.

Regional Development

The program in regional development emphasizes the study of regional, national, and international dimensions of development and change in regions or countries in which faculty have particular expertise and experience. Specific foci of concern include resource analysis, regional planning, rural development, people-environment interaction, and spatial organization. Study and research within this cluster generally falls within the people-environment framework. Regional emphases include Africa, Latin America, and East Asia.

Physical Geography

Advanced offerings in physical geography focus on synoptic and mesoscale climatology, soil, eolian, and glacial geomorphology, North American plant geography, and Pleistocene and Holocene landforms, especially in the Great Lakes region. Within geomorphology, emphasis is on reconstruction of paleoenvironments. The availability of diverse course offerings in the agricultural, physical, and natural sciences at MSU provides a valuable opportunity for the development and enrichment of student programs.

Additional Information:

- **Application Materials**
- **Contact BSRSI**
- **Masters Program**
- **Ph.D. Program**
- **Academic Standards**

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BSRSI Facilities

Research Facilities

The BSRSI remote sensing research laboratory is a 2500 sq ft facility on the MSU East Lansing campus for a dozen graduate students and technical personnel. The facility includes an SGI Origin 200 server, 4 SGI O2 Unix workstations, 2 SGI Octane Workstations, and 6 NT workstations. The lab utilizes a 500 Gbyte near line robotic server to access datasets, and 200 Gbytes of fixed format disks for real-time access. Output devices include a Tektronix dye sublimation image quality printer, a large format HP photo quality plotter, a large format HP color plotter, a Tektronix color printer, and black printers. Two large format digitizing boards provide data capture.

The lab software includes a site license for Arc/Info, 30 ERDAS licenses, SpaceStats, ESRI MapObjects and other associated spatial analysis software.

Conference and Meeting Facilities

BSRSI also maintains a conference facility for small workshops and meetings, access to dynamic addressing ports so workshop participants can plug their lap top computers directly into the Internet. The BSRSI also has access to video conferencing. BSRSI has access to a complete range of facilities thoughout the university.

Academic Facilities for Teaching and Training

The BSRSI includes access to a dedicated teaching and training facility, which includes 12 NT workstations with ERDAS, Arc/Info, and other remote sensing and GIS software. This facility can be used as a training facility for visiting scientists, mid-career professionals, or any research and applications oriented training. It is often used as a site for ESRI training classes.

Undergraduate and graduate teaching labs are made available through the Department of Geography. A 16-seat NT laboratory is used for GIS and remote sensing training at the undergraduate level. It is also used for graphics and cartographic design courses. A 15-seat Sun Ultra-30 Unix workstation laboratory is used for graduate level teaching and for graduate student research and class projects.

Availability of Data

As one of the lead institutions of the NASA Landsat Pathfinder Project BSRSI has one of the largest Landsat archives outside the federal government, with approximately 3000 scenes. We are currently acquiring a complete Landsat coverage of Michigan and the Upper Great Lakes region, as well as all data within the North American Landscape Charaterization project, which provides complete coverage off North America with co-register triplicates.

The BSRSI also has over 100 Spot scenes from around the tropics, complete coverage of the Amazon basin with JERS radar data. For a complete listing go to the Tropical Forest Information Center page.

BSRSI Staff Directory

BSRSI FACULTY

- David Skole, Professor and Director
- Alan Arbogast, Assistant Professor
- Catherine Lindell, Assistant Professor (Joint appointment with Zoology)
- Carolyn Malmström ,Assistant Professor (Joint appointment with Botany)
- Jiaguo Qi, Assistant Professor
- Robert Walker,Associate Professor

BSRSI STAFF

- Christopher Barber, Research Scientist
- Sam Batzli , RESAC Project Manager, Academic Specialist
- Marcellus Caldas, Visiting Scholar
- Oscar Castaneda, Research Scientist
- Walter Chomentowski, Research Scientist
- Mark Cochrane , Research Scientist
- Diane Cox, Project Coordinator
- Deana Haner, Administrative Secretary

- Jay Samek, Research Scientist
- Amy Sayers, Research Scientist
- Andrea Silva, Visiting Scholar

GRADUATE STUDENTS

- Erin Boydston
- Chris Oliver
- Tom Smucker
- Yushuang Zhou

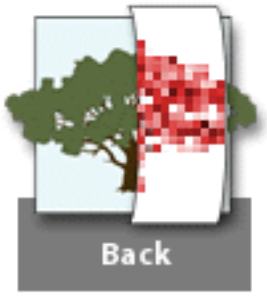
COLLABORATORS AND COLLEAGUES

- Colleagues in Southeast Asia
- Colleagues in Brazil
- Colleagues in the United States

Approach & Methods
Data Acquisition
Data Preprocessing
Data Analysis
Field Validation
Information Management System
Quality Control

BSRSI Procedures

Project Overview



BSRSI Papers, Reports & Proposals

Published Papers

- Skole, D. L., W. A. Salas, and C. Silapathong. 1998. **Interannual Variation in theTerrestrial Carbon Cycle: Significance of Asian Tropical Forest Conversion to Imbalances in the Global Carbon Budget.**Pp. 162-186 in Galloway, J. N. and J. M. Melillo, Eds, *Asian Change in the Context of Global Change*. Cambridge: Cambridge University Press.

- Skole, D. L., C. O. Justice, J. R. G. Townsend, and A. C. Janetos. 1997. **A Land Cover Change Monitoring Program: Strategy for an International Effort.** Mitigation and Adaptation Strategies for Global Change 2: 157-175.

- Chomentowski, W., B. Salas, and D. L. Skole, 1994. **Landsat Pathfinder project advances deforestation mapping.** *GIS World* 7(4):34-38.

- Skole, D. L., W.H. Chomentowski, W. A. Salas and A. D. Nobre, 1994. **Physical and human dimensions of deforestation in Amazonia.** *BioScience* 44(5):314-322

- Skole, D. L. and C. J. Tucker, 1993. **Tropical deforestation and habitat fragmentation in the Amazon: satellite data from 1978 to 1988.** *Science* 260:1905-1910.

Reports

- Skole, D. L., and C. O. Justice, 1994. ***A Land Cover Change Monitoring Program: A Federal Agency Initiative.*** A Report to the CENR

- Skole, D. L., C. O. Justice and J. P. Malingreau, 1993. ***A Satellite-Based Tropical Forest Information System.*** A Report to Office of Science and Technology Policy, The White House

- Skole, D. L. **Mapping the Emission of Carbon Dioxide from Deforestation in Southeast Asia Using Remote Sensing and GIS-Based Numercial Models**

Proposals

- Skole, D. L., R. T. Walker, W. A. Salas, and C. H. Wood. **Pattern to Process in Amazônia: Measurement and Modeling of the Inter-Annual Dynamics of Deforestation and Regrowth.** A Research Proposal Submitted in Response to NRA-97-MTPE-02.

- Skole, D. L., W. A. Salas, M. L. Cropper, A. Karsedi, C. Silapathong, and S. M. S. Abdulla. **Models of the Inter-annual Dynamics of Deforestation in Southeast Asia: Is the Missing Sink for Carbon in Land Cover Change?**

- Wood, C., S. Sanderson, and D. L. Skole. **Human Dimensions of Deforestation and Regrowth in the Brazilian Amazon: Integrating Data from Satellites, Demographic Censuses, and Field Surveys.**

- Skole, D. L., E. Rignot, B. Chapman, and R. Groop. **Tropical Rain Forest Information Center: An Earth Science Information Partnership.**

- Skole, D. L. **Landsat Pathfinder Humid Tropical Forest Inventory Project.**

TRFIC

TROPICAL RAIN FOREST INFORMATION CENTER

The Tropical Rain Forest Information Center is a NASA Earth Science Information Partner (ESIP). Our mission is to provide NASA data, products and information services to the science, resource management, and policy and education communities. We provide Landsat and other high resolution satellite remote sensing data as well as digital deforestation maps and databases to a range of users through web-based Geographic Information Systems. We also provide scientific information on the current state of the world's tropical forests, and value-added expert services. *more...*

Data Port
Landsat archive, radar data, on-line ordering...

Data Brokerage
custom acquisitions, data services, co-op...

Products
Maps, Professor's Corner, Case Studies...

Services
Partnering, Consulting...

News & Information
RFRC, events, activities, documents...

Science Program
BSRSI overview, research, facilities...
Contacts
how to reach us...

This project is part of NASA's Federation of Earth Science Information Partners.

TRFIC has been accessed
211
times since April 5, 2000

TRFIC

Rain Forest Report Card

The Rain Forest Report Card has been visited

times since October 27, 1999.

UPPER GREAT LAKES • REGIONAL EARTH SCIENCE APPLICATIONS CENTE

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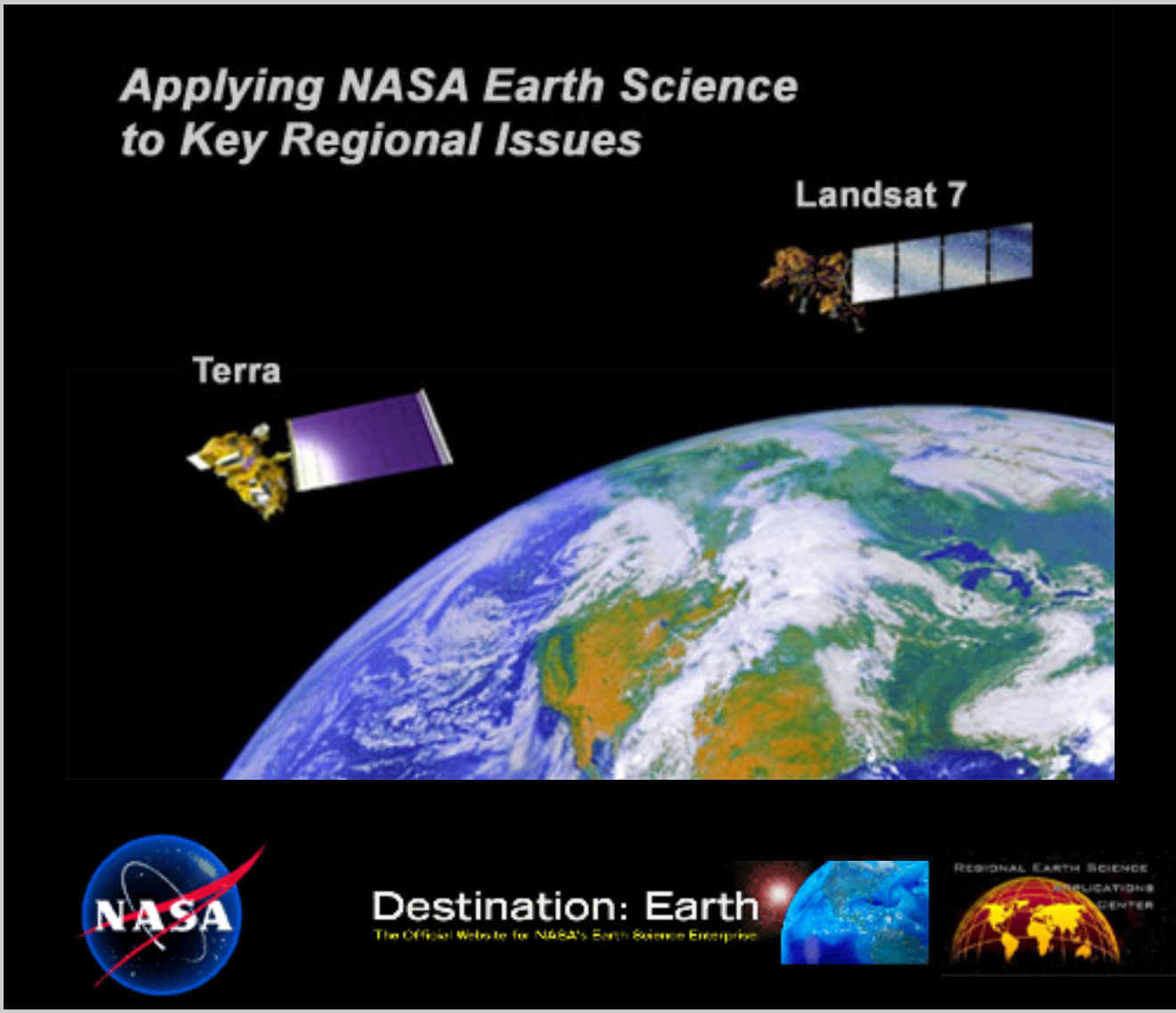
HOME
OVERVIEW
CONTACTS
PROJECTS
DATA & MAPS
CALENDAR & EVENTS
REFERENCE LIBRARY



This site is maintained by Samuel A. Batzli
MSU - RESAC Project Manager, Department of Geography
The home page for this site is http://resac.msu.edu

BSRSI

World Forest Watch

Overview
What is World Forest Watch?

GOFC
Global Observations of Forest Cover

TRFIC
Tropical Rain Forest Information Center

GLFIC
Great Lakes Forest Information Center

- Alaska SAR
- GHRC
- Goddard DAAC
- Land DAAC
- Langley DAAC
- NSIDC
- ORNL DAAC
- PODAAC
- SEDAC

- DODS
- EOS-Webster
- ESP2Net
- ESSW
- GENESIS
- GLCF
- IBM Watson RC
- Ocean ESIP
- PM-ESIP
- SIESIP
- SnowSIP
- TRFIC

- BASIC
- CalSIP
- EDAC
- ELIS
- Museums Teaching
- Planet Earth Sci.
- Reading Info. Tech
- Sci Fish
- Terrain Data
- TerraSIP
- UMAC
- Weather Net 4

- NASA

EARTH SCIENCE INFORMATION PARTNERS

Building a Working Prototype Federation

We believe that society's quality of life, economic opportunities, and stewardship of the planet are enhanced by regular use of scientifically sound Earth science information provided in a timely manner by a federation of partners collaborating to improve their collective services.

ANNOUNCEMENTS

- **Dates for the next Federation Assembly meeting in the News Archive**
- **Dates for the first SCCE meeting in the News Archive**
- **Access the Federation's Data Resources (NEW 2-11-00)**
- **Federation Logo now online for download**
- **4th Federation Meeting Presentations**
- **Adopted Constitution and Bylaws**
- **How to submit Information**

ESIP of the Week

This week's ESIP of the Week is The Global Land Cover Facility. This Type 2 ESIP is located at the University of Maryland.

The mission of the GLCF is to provide information about the Earth's land cover, primarily to the Earth Science community, but also to other users such as schools or businesses. By using emerging information technologies in high performance systems, interaction technologies, and storage management and databases, the GLCF provides products in a timely fashion, thus reducing the gap between research, distribution, and use of data. In addition to providing the traditional user support and distribution services, the GLCF offers innovative information services such as fast search and retrieval across different data products, generation of user-specified products, on-demand processing, and cross-correlation and visualization of different types of land cover data, all within a simple and effective interactive environment.

WebTeam Notes...

We want to hear from you. Help us build a site that reflects the spirit and goals of the Federation. Send your comments and suggestions to the webteam at: feedback@esipfed.org

Home Calendar Library webteam@esipfed.org

TRFIC

OVERVIEW

Our Vision: Scientists of the future will be both producers and users of data - from their desktops. The move to interdisciplinary Earth science interests is expected to lead increasingly to innovative, multi-sensor and multi-source product generation for both science and applications. An enterprise model to best facilitate the public availability (including intermediate availability of multi-source products to higher-level data producers) of data and information from these geographically-dispersed providers is needed to effect the emergence of an Environmental Information Economy capable of providing for the routine exchange of environmental data and information, enhancing the National Information Infrastructure.

As users of environmental information gain wider and easier access, they will use more of it. Not long ago, most scientists would access a single Landsat scene or two in the course of their research or problem solving endeavors. With the advent of large-scale information management systems, GIS, and low cost computers and storage technology, we are able to utilize massive amounts of data. It is customary to use several terabytes of Landsat 7 and other EOS data. This will mean that older models of data dissemination focused on getting the data to the users will be transformed to new models focused on getting the users to the data. Using internet and web-based analytical tools, users will access large data repositories remotely, perform analyses, and take home only the derived products or the answer to their question. TRFIC will be an early proof of this vision.

Who we are: The Federation of Earth Science Information Partners The Tropical Rain Forest Information Center (TRFIC) is part of NASA's Federation of Earth Science Information Partners. The objective of the Federation is to experiment with and evolve processes to make Earth system science data easy to preserve, locate, access and use for all beneficial applications, including research, education, and commercial, many of which may cross the Federation membership.

The TRFIC is one of several distributed collaborating laboratories and data centers located within the government, universities and the private sector, working collectively to provide enhanced datasets, information products, and services primarily to the Earth Science community but also to other users such as schools, NGOs and businesses.

The ESIP Federation intends to facilitate collaboration by providing a forum that allows for greater communication among the various ESIP types and among scientists involved in related work inside as well as outside of NASA. It also promotes a federated governance structure and interaction via interoperability solutions.

As members of the Federation we support the NASA Earth Science Enterprise. The goal of NASA's Earth Science Enterprise (ESE) is to further develop our understanding of the total Earth System, including the effects of natural or human-induced changes to the global environment. The program will draw upon the full range of NASA's unique capabilities to achieve this goal. The ESE will also distribute this information to both the public and the private sectors in order to promote productive use of the gathered data.

What is TRFIC: TRFIC is a Science Data Center organized and lead by the scientists at the Basic Science and Remote Sensing Initiative (BSRSI) at Michigan State University in partnership with the Radar Science group at the Jet Propulsion Laboratory (JPL). W are also partnering with the Environmental Systems Research Institute (ESRI) for development of state of the art web-based GIS services.

As a member of the Federation, the TRFIC provides "domain expertise", value-added products and services to users who need up-to-date information on tropical forest resources - their status, the rate at which they are disappearing, current scientific research results, policy-related issues, and more.

In support of the NASA Earth Science mission, we provide:

- Low cost access to the largest archive of Landsat data outside the federal government
- Low cost access to SAR data
- Derived products in digital formats which depict the spatial extent and rate of deforestation
- Data broker services for ordering Landsat and other data
- Mission planning and research enterprise support and services
- General information services for users who have special data or information needs
- Special information services, including the Rain Forest Report Card and the Professor's corner

Objectives of TRFIC: We will produce and publish/distribute environmental information and/or provide associated user services in support of Earth system science, and which will demonstrate in a working prototype context new and emerging information systems technologies.

Objectives for Enhancement of Earth System Science Research and Applications:

- Design reliable and useful data sets by linking the production closely to scientific drivers, applications, or analyses,

- Increase and improve the number, type, and variety of environmental information products available to the Earth system science and applications research community,
- Enhance the data quality of climate and global change related environmental data sets to be made available by the identification and removal of random and systematic errors from the data sets, as far as is possible,
- Enable the progression of Earth system science and applications through prototyping the facilitation of suites of data sets from multiple ESIPs to address specific interdisciplinary or boundary science questions.

Objectives for Technology Research and Development:

- Enhance innovation and creativity in the provision of environmental information services,
- Identify and test new or emerging information technologies, techniques and/or approaches which offer promise of significantly reducing the future costs of EOSDIS,
- Preserve or enhance functionality of current data systems via functionally equivalent services for lower cost,
- Format data sets and associated documentation in a form suitable for transmission to permanent libraries or archives.

Objectives for a Federated Data Access Model:

- Develop an enterprise model to facilitate innovative, multi-source product location, availability and usability,
- Provide easy location of, access to, and utilization of data from multiple ESIPs,
- Provide user services to a large, diverse user community, encouraging collaborative analysis and research,
- Participate in the evolution of the WP-Federation, e.g. governance structure.

Targets for Success:

We aim to achieve and demonstrate our objectives by:

- Providing data more rapidly and less expensive than current systems and technologies, with lower error rates and with constant quality improvements,
- Developing a core data and information system through rapid prototyping, but with one or more alternative architectures using standards,
- Delivering an automated ordering system as efficient or more so and at lower cost than current ESE systems,
- Maintaining technology flexibility and adaptability through a process of "rapid redeployment" to other applications areas, primarily in the Upper Great Lakes region,
- Providing easy, one-stop shopping for mutli-sensor data, supporting the large-volume user,
- Including data with value-added products and domain expertise -- active linking of data and information,
- Providing a proof of concept that an ESIP can be built from the ground up by science-oriented groups outside the federal government.

Staff and Points of Contact

A sample of organizations from our user community:
Royal Botanic Gardens, Kew,
Woods Hole Research Center,
Office National des Forêts/France,
Conservation & Research Center/VA,

National Institute of Agro-Envir/Japan,
University of Wisconsin Madison,
UCLA Earth and Space Sciences,
Wildlife Conservation Society,
Amazon Network/Brasil,
BioAmazonia conservation Int.,
Centro Internacional de la Papa/Peru,
Laboratory of Forest Management/Japan,
USDA,
Jet Propulsion Laboratory,
Iwai High School

TRFIC

DATA PORT

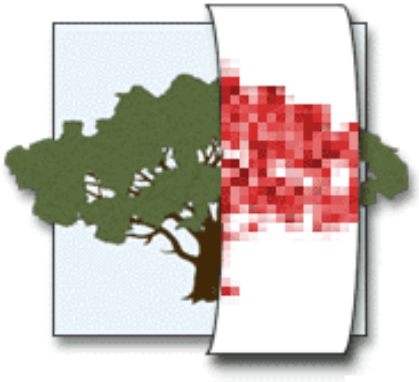
Landsat Data Archive
ETM+, TM, MSS Imagery Browser

Radar Data Archive
JERS-1 Imagery Browser

Pricing & Policy
View before purchasing or aquiring data

TRFIC

DATA BROKERAGE



Data Order Brokering: Let TRFIC assist you in identifying and ordering Landsat data for your science and applications needs. Take advantage of our expertise in searching and ordering high quality data from national and international archives. We have long-standing working relationships with the ground stations throughout the tropics, in Brazil, Thailand, Indonesia, and elsewhere

In addition, TRFIC will order your Landsat ETM+ data and bill you later. We work with NASA and the USGS to get what you need with minimum hassle and maximum efficiency. We keep a copy and can then make it available to your collaborators through our on line services. These scenes also go into our TRFIC Data Cooperative, in which you earn credit for future acquisitions every time someone re-orders your scene. In effect this will lower your cost for future data needs.

Should you need multi-data acquisitions, which combine your Landsat needs with other optical, and SAR data providers, we would be able to assist you. We also provide custom products or subsets.

Contact us for more information: data-brokering@bsrsi.msu.edu

The TRFIC Data Cooperative: Users may participate in our Landsat Data Coop. The Coop provides:

- Data brokering services

- Data archiving and custodial services
- Hassle-free re-distribution to colleagues and project support services
- Off-site backup of your data collection

Users who place MSS, TM and ETM+ scenes into the TRFIC archive will receive credit. For every scene placed into the archive, we will credit your account: one additional Landsat scene from anywhere in our archive. You may redeem your credited scene(s) at any time. Also, every time another user orders the scene you archived, you will be credited ¼ scene; every four orders by others earn you an additional scene from the collection. In addition to enhancing community access to data, the Coop helps lower costs to you.

For more information contact us at: data-coop@bsrsi.msu.edu

TRFIC

PRODUCTS

Map Products for the Legal Amazon
Download PDF & EMF map files

Derived Products for the Legal Amazon
View/Download full resolution coverages

Map Products for Southeast Asia
Download PDF & EMF map files

Derived Products for Southeast Asia
View/Download full resolution coverages

Professor's Corner
Reports, Documents, Powerpoint files...

Media Products
Satellite Morphs & JPG's (coming soon)

Case Studies
View & Download SE Asia LUCC files

TRFIC

SERVICES

Partnering & Services: Staff at TRFIC have domain specific expertise encompassing a wide variety of science applications, research topics and regional foci. Using state-of-the-art computing facilities, remote sensing and GIS techniques, the Tropical Rain Forest Information Center is one of the leading science institutions conducting research on Global Climate Change, Tropical Deforestation, and Land Use and Land Cover Change. Opportunities exist for others to take advantage of more than just the TRFIC Landsat data holdings through partnering or consulting.

Partnering: Our domain specific expertise has been used by the American Museum of Natural History (biodiversity study in Vietnam), World Resources Institute (in support of their Global Forest Watch program) and the United Nations Food and Agriculture Organization (in support of their participation in the Forest Resource Assessment 2000). TRFIC is supporting the international space agencies Global Observation of Forest Cover program (e.g. Leading the high resolution design team and the Forest Cover Implementation Team) and the International Geosphere-Biosphere Program (e.g. A regional CD-ROM for S.E. Asia datasets). TRFIC has also provided documentation and Landsat illustrations for publication (*World Watch, Vol. 18 No.2*). TRFIC encourages collaboration with others and welcomes the possibility of building partnerships. If you are interested in exploring partnering opportunities with TRFIC please contact us at: partnering@bsrsi.msu.edu

Consulting and Contract Services: TRFIC has the facilities, technical expertise and experience in remote sensing and GIS to assist you. For instance, TRFIC provides contract support to Raytheon in their development of the Brazilia SIVAM information system. If you are interested in employing TRFIC for specific consulting or contract work, please contact us at: consulting@bsrsi.msu.edu

Technical Support: If you have technical questions regarding any Landsat scene or product from the TRFIC archive please feel free to contact us at: userservices@bsrsi.msu.edu.

TRFIC

NEWS & INFORMATION

RAIN FOREST REPORT CARD: Rain forests occur throughout the world where there are heavy rains and growing forests. By definition, a rain forest needs to receive more than 2500 mm (8 feet) of rain annually. The Rain Forest Report Card is focused on tropical rain forests occurring between the Tropics of Cancer and Capricorn, 23.5 degrees North and 23.5 degrees South respectively.

PRODUCTS AND SERVICES:

Landsat 7 ETM+ Data are now available

TRFIC is now archiving and distributing ETM+ data for the Amazon region. Follow this link to learn more.

The TRFIC archive tops 5,000 scenes

The TRFIC archive is now the largest Landsat archive outside the federal government, with user access at low costs

TECHNOLOGY:

Web-GIS services are now on-line

A new prototype data search and display engine is now available. This tool, the TRFIC Core System, is the result of close R and D collaboration between TRFIC and ESRI, the industry leader in GIS technology. Follow this link to try it.

The TRFIC GeoZoom™ browser is now available:

This image browser allows users to view scenes at multiple reolutions on-the-fly, including full resolution, to zoom into to their specific site. It also provides custom selection of band combinations. Follow this link to try it.

SCIENCE AND APPLICATIONS:

New Science results using Landsat data to compute Amazon carbon fluxes.

A recent paper in the January issue *Nature,* uses a model and Landsat derived deforestation to estimate lower net fluxes of carbon than pervious caclulations. View or download the paper in PDF format here.

TRFIC selected to support the International Global Observations of Forest Cover program.

The GOFC program is a collaboration of space agencies around the world to build an operational forest monitoring system. For more information follow this link.

The TRFIC Technology adapted for use by the Upper Great Lakes Regional Earth Science Applications Center.

The same technology developed for tropical forest data access and analysis has been redeployed to use in local and regional applications in Michigan and the Great Lakes Region. Follow this link to learn more.

PUBLISHED PAPERS AND REPORTS

TRFIC

SCIENCE PROGRAM

@ BASIC SCIENCE AND REMOTE SENSING INITIATIVE (BSRSI)

Staff

BSRSI directory & profiles

TRFIC

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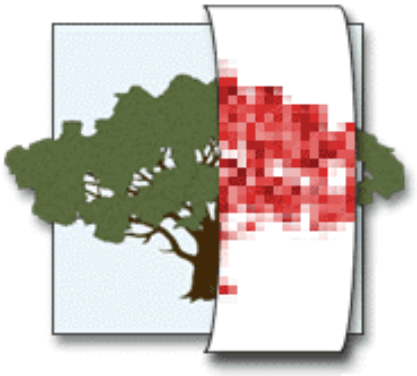

TRFIC is a NASA Earth Science Information Partner (ESIP). It is located at the Basic Science and Remote Sensing Initiative (BSRSI) of the Department of Geography at Michigan State University.

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Comments & Questions:

- Partnering Opportunities
- Map Products
- TRFIC Data and Services
- This web site

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Welcome to the Department of GEOGRAPHY at Michigan State University

Welcome

to the Home Page of the Department of Geography at Michigan State University. The Department of Geography, in the College of Social Science, supports programs of study leading to Bachelor's, Master's, and Ph.D. degrees in Geography, Landscape Architecture, and Urban and Regional Planning. Detailed information on the various aspects of the department may be obtained by selecting the general area of interest from the list on the left.

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David J. Campbell- Associate Chairperson
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Webmaster- Update/Correct Webpage Information

Last revised 29 September 1999.

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Welcome to Michigan State University, a research-intensive, land-grant institution. Founded in 1855, MSU is one of only 62 members of the Association of American Universities and a member of the Big Ten conference. As provided in the Constitution of the State of Michigan, MSU is under the general supervision of its Board of Trustees.

Six Guiding Principles were established by the university in 1994 to guide MSU into the next century. We will:

- Improve Access to Quality Education and Expert Knowledge
- Achieve More Active Learning
- Generate New Knowledge and Scholarship Across the Mission
- Promote Problem Solving to Address Society's Needs
- Advance Diversity within Community
- Make People Matter

Peter McPherson, President

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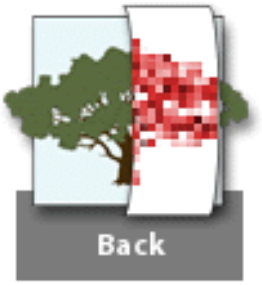

BSRSI Questions and Comments

We welcome any questions or comments about the web pages, data availability, or general questions.

Questions about the web pages of BSRSI, TRFIC, GLFIC, the Rain Forest Report Card, or any others in this site should be sent to webmaster@bsrsi.msu.edu

Questions about data availability from TRFIC or GLFIC should be sent to orders@bsrsi.msu.edu

TRFIC
Rain Forest Report Card

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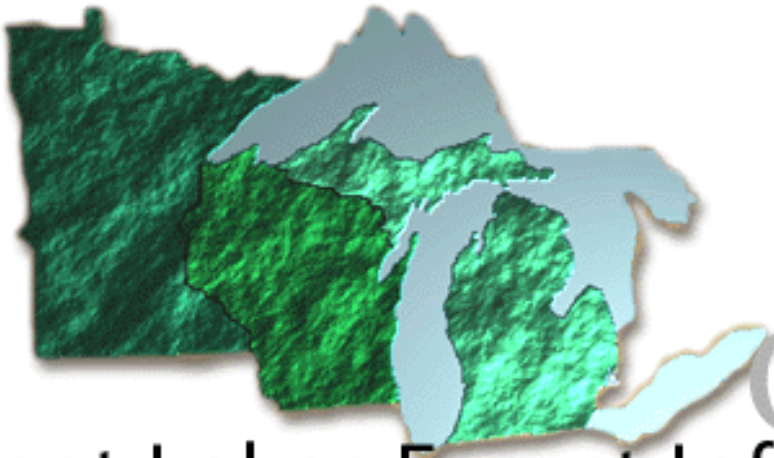
10277
times since October 27, 1999.



GLFIC
Great Lakes Forest Information Center
@ Michigan State University

The Upper Great Lakes
introduction to the region

Data Archive
Great Lakes satellite imagery

Great Lakes Ecological Assessment
environmental and socioeconomic information

Great Lakes Links
information on the web

BSRSI
World Forest Watch

BSRSI

Rain Forest Report Card

Topics:

- What is a Rain Forest?
- Rain Forest Geography
- Humans in the Rain Forest
- Rain Forest Animals
- Rain Forest Plants

BSRSI

Rain Forest Report Card

Deforestation of Tropical Rain Forests

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Throughout the tropics, rain forests are being cut down. By different methods and for different reasons, people in tropical regions of the world are cutting down, burning, or otherwise damaging the forests. The process in which a forest is cut down, burned or damaged is called "deforestation."

Global alarm has arisen because of tropical rain forests destruction. Not only are we losing beautiful areas, but the loss also strikes deeper. Extinction of many species and changes in our global climate are effects of deforestation. If the world continues at the current rate of deforestation, the world's rainforests will be gone within 100 years-causing unknown effects to the global climate and the elimination of the majority of plant and animal species on the planet.

How Deforestation Happens

Deforestation occurs in many ways. The majority of rain forest cut down is cleared for agricultural use-grazing of cattle, planting of crops. Poor farmers chop down a small area (typically a few acres) and burn the tree trunks, a process called "Slash and Burn" agriculture. Intensive, or modern, agriculture occurs on a much larger scale, sometimes deforesting several square miles at a time. Large cattle pastures often replace rain forest to grow beef for the world market.

Commercial logging is another common form of deforestation, cutting trees for sale as timber or pulp. Logging can occur selectively-where only the economically valuable species are cut-or by clearcutting, where all trees are cut. Commercial logging uses heavy machinery, such as bulldozers, road graders, and log skidders, to remove cut trees and build roads. The heavy machinery is as damaging to a forest as the chainsaws are to the trees.

There are other ways in which deforestation happens, such as the building of towns and flooding caused by construction of dams. These represent only a very small fraction of total deforestation.

The Rate of Deforestation

The actual rate of deforestation is difficult to determine and has been the focus of NASA-funded scientists for many years. NASA projects to study the deforestation of tropical forests are conducted by analyzing Satellite Imagery (pictures taken by satellites in space) to view areas of forest that have been cleared. Figure 1 shows part of a satellite scene, showing how scientists classify the landscape. There are both patches of deforestation and a "fishbone" of deforestation along roads. Forest fragments are isolated forest pieces left by deforestation, where the plants and animals are cut off from the larger forest area. Regrowth-also called secondary forest-is abandoned farmland or timber cuts that are growing back to become forest. The majority of the picture is undisturbed, or "primary," forest, with a network of rivers draining it.

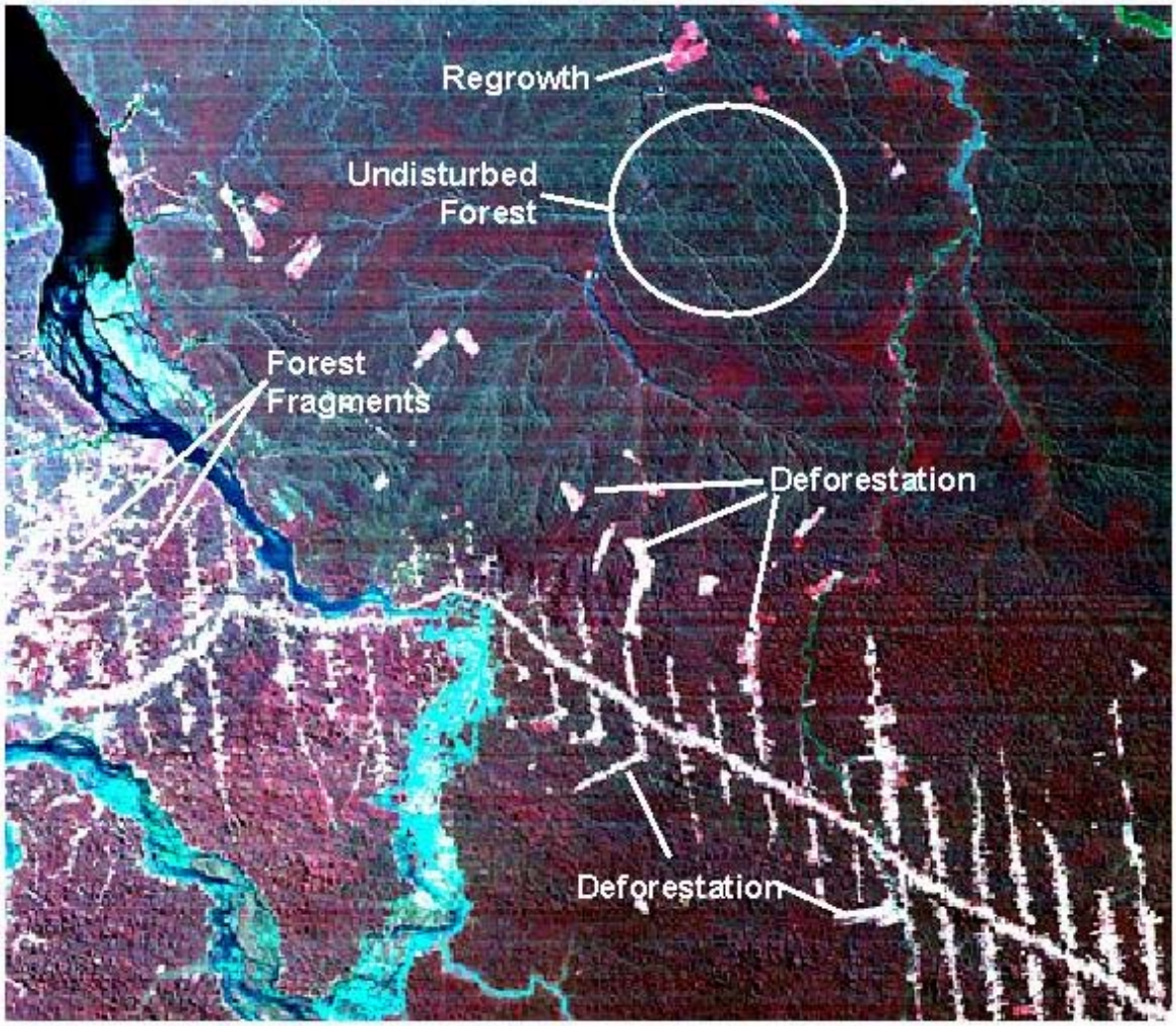

Figure 1. Satellite image of deforestation in the Amazon region, taken from the Brazilian state of Para on July 15, 1986. The dark areas are forest, the white is deforested areas, and the gray is regrowth. The pattern of deforestation spreading along roads is obvious in the lower half of the image. Scattered larger clearings can be seen near the center of the image.

The most recent figures by the Food and Agriculture Organization (FAO) estimate tropical deforestation (rain forest and other tropical forests) at 53,000 square miles per year (15.4×10^6 ha/yr) during the 1980s (FAO 1993). Of this, they estimate that 21,000 square miles (6.2×10^6 ha/yr) were deforested annually in South America, most of this in the Amazon Basin. Based on these estimates, each year an area of tropical forest large enough to cover North Carolina is deforested. Each year!

The rate of deforestation varies from region to region. Our research showed that in the Brazilian Amazon, the rate if deforestation was around **6200 square miles per year** (1.8 x 10^6 ha/yr) from 1978-1986, but fell to 4800 sq. miles per year (1.4 x 10^6 ha/yr) from 1986-1993 (Skole and Tucker 1993). By 1988, **6% of the Brazilian Amazon had been cut down** (90,000 square miles, about the area of New England). However, due to the isolation of fragments and the increase in forest/clearing boundaries, a total of 16.5% of the forest (230,000 square miles, nearly the size of Texas) was affected by deforestation. NASA-funded scientists are currently analyzing rates of deforestation for the current decade, as well as studying how deforestation changes from year to year.

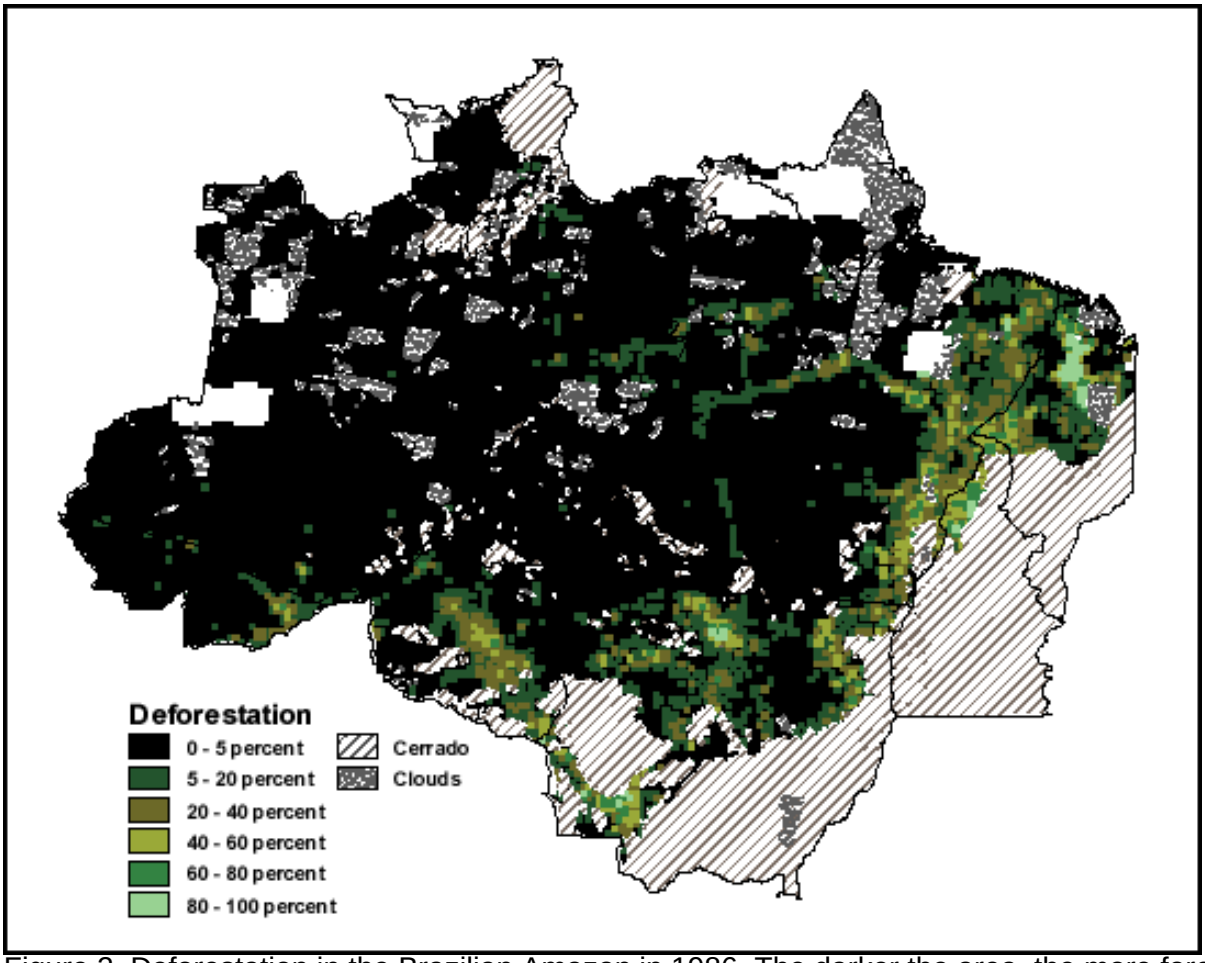

Figure 2. Deforestation in the Brazilian Amazon in 1986. The darker the area, the more forest remaining.

The much smaller region of Southeast Asia (Cambodia, Indonesia, Laos, Malaysia, Myanmar, Thailand, and Vietnam) lost nearly as much forest per year from the mid 1970s to the mid 1980s, with 4800 square miles per year (1.4 x 10^6 ha/yr) converted to agriculture or cut for timber.

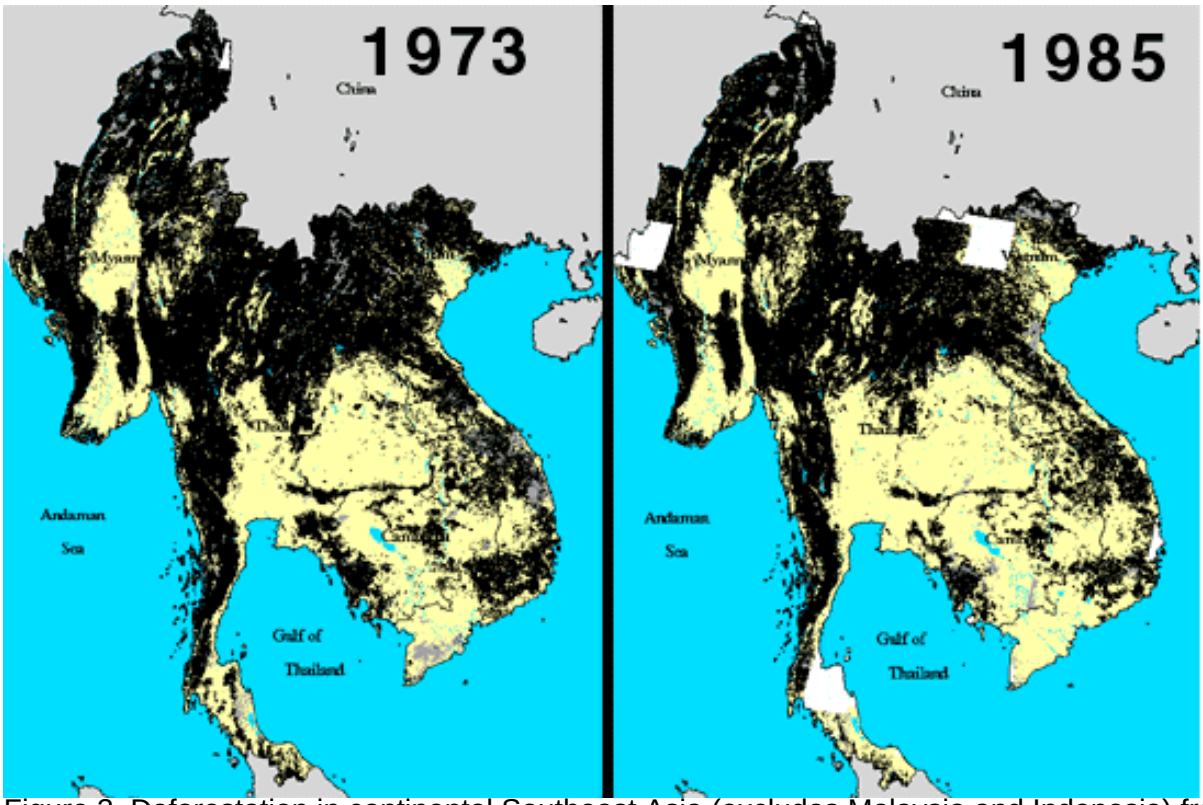

Figure 3. Deforestation in continental Southeast Asia (excludes Malaysia and Indonesia) from 1973 to 1985. The black represents forest, the lighter areas deforestation. The dark gray represents cloud cover, and white areas are places for which no satellite information was available. During this time period, about 50,000 square miles was deforested. China and India are included on the map but no assessment of their forest cover was made.

Why Deforestation Happens

The cause of deforestation is a very complex subject. A competitive global economy forces the need for money in poorer tropical countries. At the national level, the governments sell logging concessions to raise money for projects, to pay international debt, or to develop industry. Brazil had an international debt of $159 billion in 1995, on which it must make payments each year. The logging companies seek to harvest the forest and make profit from the sales of valuable hardwoods (such as mahogany) and pulp.

Deforestation by a peasant farmer is often done to raise crops for self-subsistence, and is driven by the basic human need for food. Most tropical countries are very poor by U.S. standards, and farming is a basic way of life for a large part of the population. In Brazil, for example, the average annual earnings of a single person in is US $5400, compared to $26,980 per person in the United States (World Bank, 1998). In Bolivia, which holds part of the Amazon rain forest, the average earnings per person is $800. Farmers in these countries do not have the money to buy necessities and must raise crops for food and to sell.

Deforestation and the Global Carbon Cycle

Carbon dioxide (CO_2) is the major gas involved in the greenhouse effect, which causes global warming. All the things that produce CO_2 (like a car burning gas) and the things that consume CO_2 (growing plants) are involved in the "Global Carbon Cycle."

Tropical forests hold an immense amount of carbon, which joins with oxygen to form CO_2. The plants and soil of tropical forests hold 460-575 billion metric tons of carbon worldwide (McKane et al. 1995). Each acre of tropical forest stores about 180 metric tons of carbon.

Deforestation increases the amount of CO_2 and other trace gases in the atmosphere. When a forest is cut and replaced by cropland and pastures, the carbon that was stored in the tree trunks (wood is about 50% carbon) joins with oxygen and is released into the atmosphere as CO_2.

The loss of forests has a great effect on the global carbon cycle. From 1850 to 1990, deforestation worldwide (including in the United States) released 122 billion metric tons of carbon into the atmosphere, with the current rate being between 1.6 billion metric tons per year (Skole et al. 1998). In comparison, all of the fossil fuels (coal, oil, and gas) burnt during a year release about 6 billion tons per year.

Releasing CO_2 into the atmosphere increases the greenhouse effect, and may raise global temperatures (see Climate Change fact sheet). The role of fossil fuel burning in cars and industry is well known, but tropical deforestation releases about 25% of the amount released by fossil fuel burning. Tropical deforestation, therefore, contributes a significant part of the increasing CO_2 in the atmosphere.

Deforestation and Biodiversity

Worldwide, there are between 5 to 80 million species of plants and animals, which make up the "biodiversity" of planet Earth (Lawton and May 1995). Most scientists believe the number of species to be between 10 and 30 million. Tropical rain forests-covering only 7% of the total dry surface of the Earth-hold over half of all of these species (Lovejoy 1997). Of the tens of millions of species believed to be on Earth, scientists have only given names to about 1.5 million of them (Stork 1997). Even fewer of the species have been studied in depth.

Many of the rain forest plants and animals can only be found in small areas, because they require a special habitat to live. This make them very vulnerable to deforestation. If their habitat is cut down, they may go extinct. Every day species are disappearing from the tropical rain forests as they are cut. We do not know the exact rate of extinction, but estimates range from one to 137 species disappearing worldwide per day (Stork 1996, Rainforest Action Network 1998).

The loss of species will have a great impact on the planet. For humans, we are losing organisms that might have us how to prevent cancer or cure AIDS. Other organisms are losing species they depend upon, and thus face extinction themselves.

After Deforestation

What happens after a forest is cut is very important in the regeneration-growing back-of that forest. Different types of cutting and different uses of the land have very different effects on the ground and surviving organisms that make up a rain forest.

In a tropical rain forest, nearly all of the life and life-sustaining chemicals, called nutrients, are found in the plants and trees, not in the ground as in a northern, or temperate forest. When the plants and trees are cut down to plant crops, small farmers usually burn the tree trunks to release the nutrients necessary for growing plants into the ground, or "soil." This process is referred to as "Slash and Burn" agriculture. When the rains come, they wash away most of the nutrients and leave the soil much poorer. After a few years, the ground can no longer support crops, and the farmer has much poorer crops. The time for the soil to "go bad" can be from 3 to 20 years.

When the fertility of the ground becomes low, farmers seek other areas to clear and plant, abandoning the poor soil. The area previously farmed is left to grow back to a rain forest. However, just as the crops did not grow well because of low nutrients, the forest will grow back slowly because of poor nutrients. After the land is abandoned, the forest typically takes less than 50 years to grow back.

Another type of farming practiced in rain forests is called "shade agriculture." In this type of farming, many of the original rain forest trees are left to provide shade for shade-loving crops like Coffee or Chocolate. When the farm is abandoned, the forest grows back very quickly, because much of it was left unharmed in the first place. After this type of farming, forests can grow back as quickly as 20 years.

Other types of farming can be much worse for forest regrowth. Intensive agricultural systems use lots of chemicals like pesticides and fertilizers. The pesticides kill a lot of the living organisms in the area, and pesticides and fertilizers wash into the surrounding areas. In banana plantations, pesticides are used on the plants and in the soil to kill pest animals. However, these pesticides also kill other animals as well, and weaken ecosystem health. Banana plantations also use irrigation ditches and underground pipes for water transport, changing the water balance of the land. After the abandonment of a banana plantation, or other intensive agricultural system, it can take a great deal of time for a forest to regrow, possibly even centuries.

When commercial logging of a rain forest occurs, the results are different. Under selective logging, only a few trees are cut down for timber. However, the use of heavy machinery-like bulldozers-in the cutting and hauling of logs tears up the ground and knocks down or damages many other trees. In a study in Indonesia, Andrew Johns found that when cutting down only 3% of the trees, a logging operation damaged 49% of all the trees in the forest (Johns 1989). Yet even with all that damage, the rain forest will grow back relatively quickly if left alone after selective logging, because there are still many trees to provide seeds and protect young trees from too much sun.

Clearcutting is much more damaging to a tropical rain forest. When the land is commercially clearcut and all of the trees removed, the bare ground is left behind with very little that can grow on it. Unlike when the farmer cleared the land, there are almost no nutrients left behind because all the tree trunks were removed. A clearcut forest can require many years to regenerate-in fact, scientists do not know how long it takes for a clearcut forest to grow back.

Activity	Factors	Time to Regrow
Slash-and-Burn Agriculture	Abandoned rapidly	Less than 50 years
Perennial Shade Agriculture	Some trees left	20 years
Intensive Agriculture (e.g. Banana Plantation)	Many pesticides, alteration of hydrology	More than 50 years
Cattle Pasture	Degradation of soils	More than 50 years
Selective Logging	Few trees cut	Less than 50 years
Clearcut Logging	No trees or nutrients left	More than 50 years

The Future

The deforestation of tropical rain forests is a threat to life worldwide. Deforestation may have profound effects on global climate and cause the extinction of thousands of species annually. Stopping deforestation in the tropics has become an international movement, seeking ways to stop the loss of rain forests.

Because the loss of rain forests is driven by a complex group of factors, the solutions are equally complex. Simple solutions that do not address the complex nature of world economics and rain forest ecology have little chance of succeeding. The future requires solutions based in solving the economic crises of countries holding rain forests, as well as improvement of the living conditions of the poor people often responsible for deforestation.

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Rain Forest Report Card

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Statsitics on Forest Loss

Tropical rain forests are disappearing rapidly around the world. The information provided in these pages comes from a variety of sources, including the Landsat Pathfinder research projects of the University of New Hamphsire and University of Maryland, research of the Basic Science and Remote Sensing Initiative at Michigan State University, the World Resources Institute, and other sources.

World Rain Forest Resources

Southeast Asia Deforestation 1973-1985

Legal Amazon Deforestation 1978-1986

Legal Amazon Deforestation 1992

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Indonesian Fires Darken Skies with Smoke

Virtual Rain Forest
Online Rain Forest Tour

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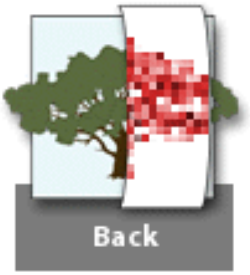
Welcome to the **VirtualRainForest**. You can choose between two online tours of the rainforest, filled with beautiful pictures and interesting facts. Click on the crocodile's head to start the tour.

The first option is the true **VirtualRainForest**, recommended for people who like interactive programs. It works best with a fast modem or ethernet connection because it will take too long to load on a slow modem.

Option 1:

The second option is a directed tour--a slide show--leading you through the rainforest step by step. It runs a little faster than the VirtualRainforest and has some different information.

Option 2:

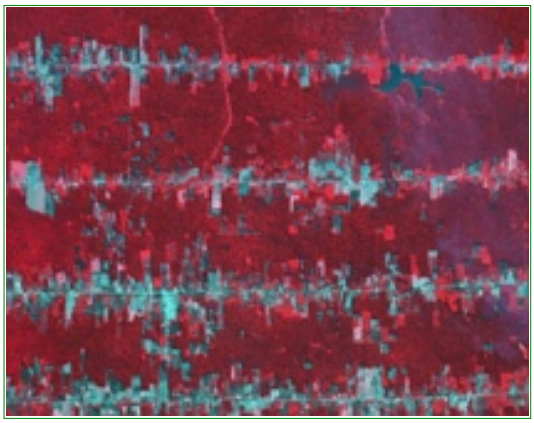


TRFIC

Satellite Image Morphs

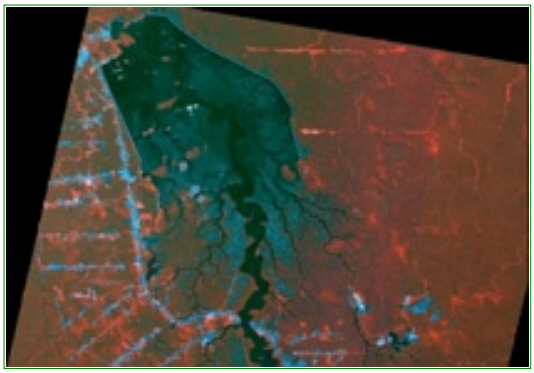
Quicktime Movies of Land Cover Change

For optimum effect, set your Quicktime viewer to loop back and forth.



A morph between five scenes (1986, 1988, 1989, 1991, & 1992) of a region near the town of Pariso in the Brazilian state of Rondonia.

size: (640x502, 15.2MB, 16 Seconds)



A morph between four scenes (1986, 1988, 1989, & 1991) of the Samual Dam region near the city of Porto Velho in the Brazilian state of Rondonia.

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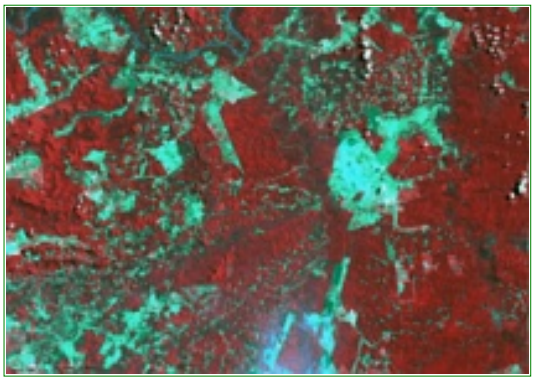
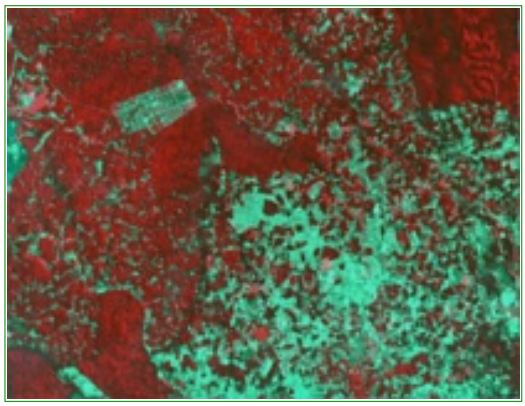


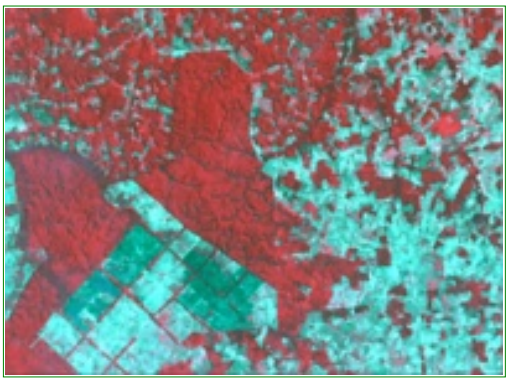
A morph between three scenes (1972, 1986, & 1992) of a region South of the city of Maraba in the Brazilian state of Para.

size: (640x451, 8.4MB, 10 Seconds)



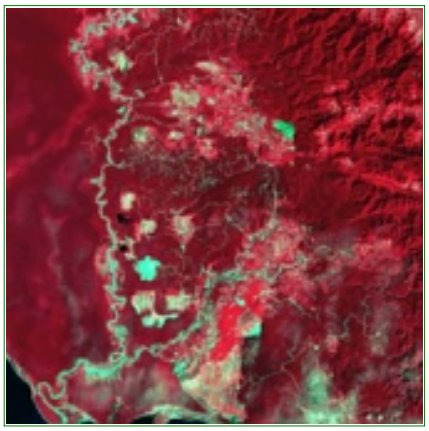
A morph between two scenes (1986 & 1992) of a region South of the city of Maraba in the Brazilian state of Para.

size: (640x451, 8.4MB, 10 Seconds)



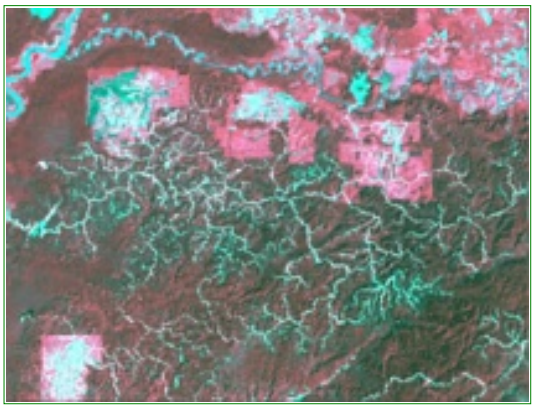
A morph between two scenes (1986 & 1992) of a region South of the city of Maraba in the Brazilian state of Para.

size: (610x450, 2.0MB, 6 Seconds)



A morph between two scenes (1986 & 1992) of a region Southwest of Toba Lake on the island of Sumatra in Indonesian.

size: (511x511, 2.3MB, 6 Seconds)



Close up of previous Indonesian region.

size: (640x482, 2.4MB, 6 Seconds)

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The 21st Century

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Determining the future of the rain forests is a difficult question, to which our scientists will only contribute partially. The purpose of this section of the report card is to aid in the understanding of possible scenarios for the future.

The real future of the rainforests will be determined by the citizens of the world. Global, regional, and local economics, political policies, and human needs, along with countless other factors contribute to current deforestation. Addressing these issues is paramount in efforts to conserve tropical rain forests.

As this section expands, we will provide information on what the current causes of deforestation are and how they need to be modified in order to control deforestation.

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Rain Forest Links

Forestry Advisors Network of Canada (CFAN)
CFAN focuses on analysis of forestry issues but also maintains an excellent KIDS page for K-12.

World Resources Institute
WRI provides data and analysis on current world trends in population, economics, and forest issues.

Conservation International
Conservation International (CI) is a field-based, non-profit organization that protects the Earth's biologically richest areas and helps the people who live there improve their quality of life.

BSRSI

Basic Science and Remote Sensing Initiative

The Initiative
structure and research of BSRSI

Tropical Rain Forest Information Center (TRFIC)
tropical forest data and information

Rain Forest Report Card
state of the science

Great Lakes Forest Information Center (GLFIC)
regional forest data and information

World Forest Watch
global forest data and information

Job Openings
faculty positions for 1999

Seminars
BSRSI seminars for 1999-2000

BSRSI

Great Lakes Forest Watch

THE UPPER GREAT LAKES REGION

The Upper Great Lakes States of Minnesota, Wisconsin and Michigan comprise one of the most ecologically, socio-economically, and culturally diverse and dynamic regions of the nation. These factors and associated development pressures present a compelling need to develop and apply state-of-the-art information technology to ensure sustainable development and conservation of the varied resource bases that support the region's, and ultimately the nation's, economic well-being.

The northern Lake States are a resource-rich and diverse region. It is one of the most densely forested regions of the nation, with 41% of the total area, or 50.5 million acres in forested lands. About 46 million acres of the forest land is considered commercial forest, and 52% of this commercial forest land is owned by the non-industrial private sector. Forest diversity ranges from the cold, boreal forests of Minnesota to the warm, oak-hickory forests of southern Wisconsin and Michigan. Nearly 200,000 people are employed in the forestry sector, producing over $24 billion dollars in forest products annually. Expectations for continued development are high, particularly given increasing national demand for forest products, decreasing supply from the Pacific Northwest, and the already high production from the neighboring southern and southeastern regions of the United States. The second and third-growth forests of the Lake States are reaching commercial maturity, and substantial timber volume gains have been recorded in the last several inventories. Surveys indicate

that the majority of Americans who live within urban areas perceive a need for increased emphasis on non-commodity values (e.g., recreation, aesthetics, and biodiversity), yet rural users depend upon forests for employment and community development. And while both standing volume and demand for forest products continue to increase in the Lake States, lands available for timber production continue to decrease due to urban and industrial expansion, development of second homes, and the emergence of conflicting land uses.

Characterized by its vast inland freshwater seas, Lakes Superior, Michigan and Huron, the tens of thousands of inland lakes, and its networks of rivers and streams, the Great Lakes Region contains 16% of the world's freshwater. This resource, combined with the forested setting, supports recreational and commercial industries, and affects the quality of life for the region’s inhabitants and visitors. Over 32,000 cubic feet per second of the regional water supply is used for manufacturing, consumption, and power. More than 80% of the Great Lakes’ shoreline is privately owned, and shoreline development on inland lakes has accelerated at unprecedented rates in the past decade. The biodiversity maintained by these water systems is also important to the American people. For example, the Mississippi River flyway is the migration corridor for 40% of North America's waterfowl and shorebirds, and is also a critical migration corridor for raptors and neotropical songbirds. Maintaining this biodiversity must be balanced with other human values, such as the need to ship between 70 and 85 million tons of cargo annually, including agricultural commodities, petroleum products, and coal, between Minneapolis and the mouth of the Missouri River.

The forest and water resources of the Great Lakes region result in the nearly $30 billion dollars generated annually from tourism. In addition to forest production and tourism, agriculture is also an important part of the region’s economic base. The roughly 200,000 farms in the region produce approximately $15 billion dollars annually in agricultural products, accounting for nearly 7% of total U.S. agriculture production. The three states rank in the top five nationwide for the production of corn, soybeans, dairy, sugar beets, turkeys, apples, hogs, cattle, cranberries and wild rice.

Demographically, the northern Great Lakes region is within a day’s drive of 50 million people, or one-fifth of the American population, leading to weekend and seasonal immigration of tourists, hunters, fishermen, snowmobilers, and other outdoor recreationalists. Furthermore, this region is one of four national centers of concentration for recreational or second homes, and more than 50% of the houses in the northern Lake States are second homes. Many of these homes are owned by urban Americans from nearby cities such as Chicago, Minneapolis, and Detroit, resulting in a mix of neighbors that oftentimes have differing perceptions of natural resource values and acceptance of resource management practices. This confluence of rural and urban Americans, the unique and highly dispersed interface of wildland-human dominated environments, and the local and regional

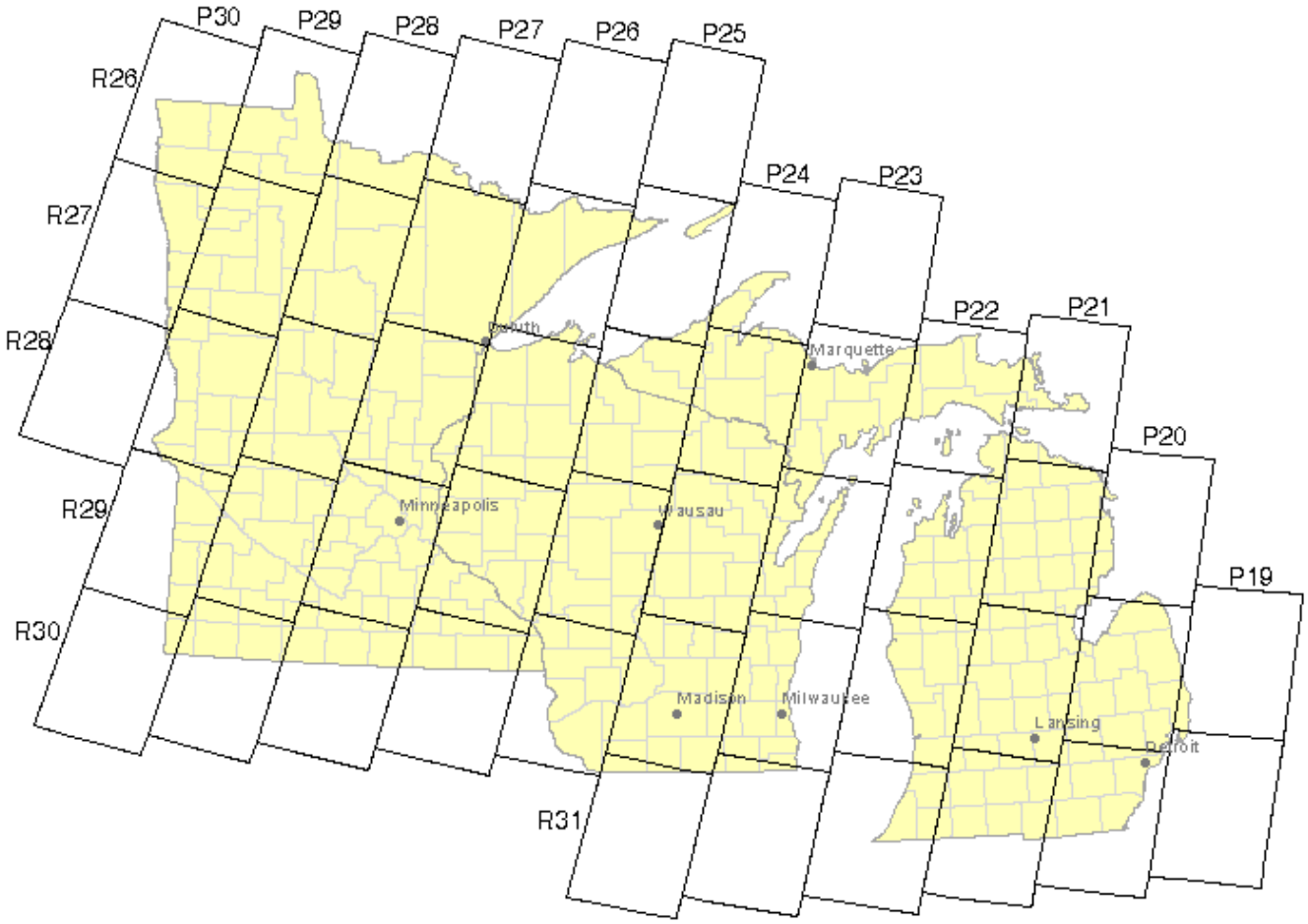
economic dependencies on both recreational and commodity based production lead to competing and frequently conflicting land use emphasizes. Land use policy and practices can have far reaching economic and ecological implications.

Addressing the divergent expectations, and associated issues calls for high quality, comprehensive and timely information for sustainable natural resource development and conservation in the Great Lakes region. The development and application of remote sensing and related geospatial technologies has great potential to assist in this need.

GLFIC

Data Archives

GREAT LAKES FOREST INFORMATION CENTER



Great Lakes Ecological Assessment

The Great Lakes Assessment is an interagency effort to collect and consolidate new and existing environmental, biological, and socioeconomic information to provide a scientific basis for resource planning and management in the Northern Lake States.

This page has moved to a new location http://www.ncfes.umn.edu/4804/gla/index.html.

In a few moments you will be redirected:

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Home
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Feedback

Select a theme
--GLA Themes--

North Central Research Station

Great Lakes Ecological Assessment

Home Page

The Great Lakes Ecological Assessment is an interagency effort to collect and consolidate new and existing environmental, biological, and socioeconomic information in the Northern Lake States. The project is envisioned as one part of an overall program of adaptive planning, management, monitoring, and research supporting ecosystem management.

Funding for the project has been received from various sources. Most notably, support has been received from the National Partnership for Reinventing Government, the USDA Forest Service, and the USDA and USDI Joint Fire Science Program.

Background and Objectives
Participating Organizations
Principal Study Contacts
Acknowledgments
Legal Information/Disclaimers

Photo Gallery
GIS Maps
Data Availabilty
Reports
About this Site
Related Web Sites

Customer Service Comment Card--we welcome your comments on our customer service and your suggestions for improvement

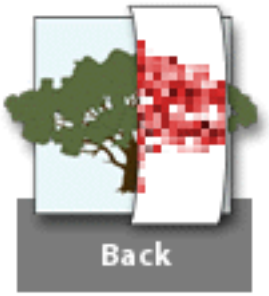
BSRSI Great Lakes Forest Watch

Great Lakes Information on the Web

- Great Lakes Environmental Research Laboratory NOAA's GLERL, Links to other sources on Great Lakes Research Topics
- Topographic Map of the Great Lakes Region From GLERL.
- Great Lakes Beaches and Dunes Several photographs.
- Great Lakes CoastWatch Program Overview, news, products, user registration, publications. Source of current satellite imagery.
- Great Lakes Forecasting System Several map products related to physical characteristics
- Great Lakes Information Management Resource (GLIMR) Provides an index of Environment Canada's Great Lakes programs, publications, and databases, and is a window to other environmental networks.
- Great Lakes Information Network Links to many sources of regional information provided by agencies and organizations. Includes calendars of events, bibliographies of research, directories, news, many others.
- International Association for Great Lakes Research (IAGLR) Objective: the promotion of all aspects of Great Lakes Research and the dissemination of research information through publications and meetings.
- Institute of Water Research At Michigan State University.
- Center for Great Lakes and Aquatic Sciences. University of Michigan Research Program.
- Sea Grant - UW Overview, research, communications, advisory services, education, Great Lakes resources, national network.
- Great Lakes Publications/Resources Links provided by University of Wisconsin-Sea Grant Program. Also a link to their home page.
- Great Lakes Reference Desk Regional links to facts/figures, news/events/weather, agencies/organizations, bibliographies, more.
- Great Lakes Shipping Today Overview, annual report of Lake Carriers Association, vessel rosters of LCA and non-LCA fleets.
- Great Lakes Shipwrecks Annotated linklist of locations and site descriptions, research, maritime history, scuba sites.
- Great Lakes Shipping facts and figures, Includes photo gallery, museums, passages, the U.S. Mail Boat, and a review of the recent shipping season.

- Harbor Guide The Michigan Department of Natural Resources Harbor Guide. Includes photographs and facility information.
- Institute for Watershed Management for highlights of current projects.
- Islands of the Great Lakes Management, research, projects, law & policy, and specific island information, plus a list of other island links.
- Marine Observations: Great Lakes Click on a buoy or CMAN station on a map to receive the current meteorological and oceanographic data being reported for stations in the Great Lakes. From NOAA.
- Environment of the Great Lakes Region Great-Lakes.net's page on the Environment.

***Provided by the* Department of Geography**

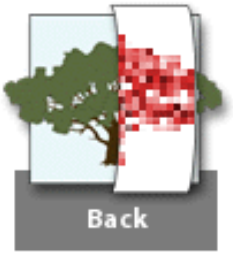


World Forest Watch

World Forest Watch is an initiative at Michigan State University to collaborate with other universities and research organizations in monitoring global forest cover change. The loss of forest resources has been a major contributor of greenhouse gases to the atmosphere during the last three centuries, and has resulted in the extinction of many species of plants and animals.

Since 1972, satellites orbiting the Earth have been providing remotely-sensed data of the Earth's biosphere and atmosphere. Using remotely-sensed data from satellites observing the world's surface characteristics, we are quantifying the amount of forest and measuring forest cover change over time.

World Forest Watch will be a distribution center for data on global forest resources, in an attempt to support such initiatives as the Global Observations of Forest Change (GOFC). GOFC is a international effort to closely monitor and study the changes in forest cover and their effects on global climate.



GOFC Global Observations of Forest Cover

Sustainable development of forests has emerged as one of the most difficult, serious, and pressing environmental issues of our time. Human-induced (direct and indirect) changes in Earth's forests have an impact on natural resource availability, biodiversity, atmospheric composition, and climate. Through feedback processes, it is likely that climate change will have adverse effects on forests, which may induce further climate change. Observation of forests by satellites provides the best hope of monitoring changes over extensive areas and understanding the complex processes involved. Observations from space can help policy makers document the current situation and judge long-term trends. Observations from space also provide forest managers with the information they need to assess the current state of the forests, weigh the requirements of multiple uses by multiple stakeholders, and manage forestland resources sustainably.

Global Observations of Forest Cover (GOFC) is an international initiative aimed and measuring and analyzing changes in forest cover worldwide. Using remotely-sensed data from satellites, scientists are monitoring the changes in forest cover and modeling the effects of forest cover change. GOFC will integrate scientific efforts in an attempt to develop an interdisciplinary and interregional analysis of forest cover change.

Documents:

A Strategy for Global Observations of Forest Change

Fine Resolution Data and Product Design Strategy

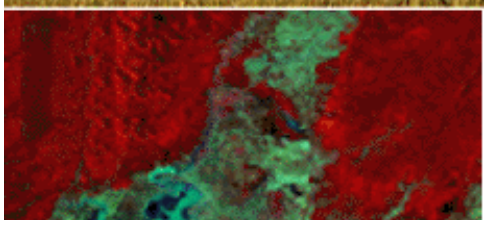
TRFIC
Rain Forest Report Card

The Rain Forest Report Card has been visited
10277
times since October 27, 1999.

BSRSI GATI
1999-2000
Seminar Series

1999-2000 Seminar Series

- Seminar Series
- What is LUCC ?
- Pattern to Process
- Speakers
- Sponsors
- Contact



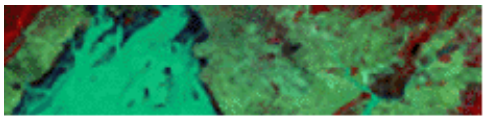
Pattern to Process

Global and International Dimensions of Land Use and Cover Change

The Pattern to Process seminar series will bring leading national and international scholars on land use and cover change to the Michigan State University (MSU) community. Invited speakers will address a wide spectrum of interests in the MSU research community including sustainable development, institutions, environmental policy, food security, ecology, and spatial analysis (geographic information systems, remote sensing and cartography).

The speaker series will provide a dynamic meeting point for social and biophysical scientists. The series will also highlight the diversity of approaches to the study of land use and cover change at multiple spatial scales.

Lectures will be scheduled each month. The seminar times and locations will vary. Please consult this web page for the updated list of dates, times, locations and speakers.



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What is LUCC ?

During the course of the last three decades, there has been a growing recognition in the scientific community of the need to understand the ways in which human action impacts the global environment. Land use and cover change (LUCC) research focuses on changes in human land use, impacts on the biophysical cover of the Earth's surface, and consequences for interactions between land cover and both human and biogeochemical systems. LUCC science brings together the human processes of land use change and the physical processes of environmental change under a single conceptual umbrella in an effort to understand the fundamental processes of anthropogenic global environmental change.

LUCC, as a fundamental aspect of global environmental change, effects the major processes of the biosphere and holds important implications for human societies. LUCC research covers a broad spectrum of disciplines and perspectives in the social and biophysical sciences, including: empirical measurement via spatial analysis, modeling of human and biophysical systems, and case studies of the social dynamics of land use change.

Pattern to Process

The pattern to process approach merges spatial analysis, remote sensing, and geographic information science with ground level studies of the processes which drive land use and land cover change. It also considers how spatial patterns of LUCC within landscapes influence social and ecological processes, such as, for example: biodiversity, climate change, food security, human health, economic development. One aim of the pattern to process investigations at Michigan State University is to address LUCC at the global scale with a fundamental understanding of causes and effects of patterns of landscape change.

To date, we have very little observational information on the spatial and temporal characteristics of land use and cover change. Moreover, our models are mainly predicated on a view of the world in aggregate terms, while our theoretical assumptions, such as they are, are rarely tested given their focus on economic “agents” who operate at micro-scale. Land use and cover change data are often in the form of tables of numbers from census and statistical summaries, or from isolated and disconnected cases studies. The former provide a means for doing large-area estimations, but is lacking in insight into the fine-scale patterns. The latter may provide detailed spatial information, but cannot be used to frame a large-area investigation. Thus, the potential for assessing the fine-scale processes and patterns of land use and cover change over very large regions has not been a focus for geographical inquiry, in part due to a lack of observational data at fine spatial resolution over large areas.

In recent years, the study of global change has focused attention on the needs to understand the drivers and dynamics of land use and cover change. Although there is a relevant theoretical literature in economic geography and regional science, it has rarely been brought to bear on the issue of land use and land cover change. This may in large part be due to data limitations, which have restricted research to case studies or to statistical analyses based on geographic units. Thus, our empirical work to date is compromised by the ecological fallacy, as well as by the lack of generality. To contribute to the global change community, we must adapt our theories to new methods that lend themselves to global scale analyses, and to do so in a way that is sensitive to theory and the dictates of scientific method. Clearly, the proximate causes and processes of land use change are inherently fine-scale, even if the cumulative effects are manifested globally. Our goal in the proposed work is to outline an approach that provides for scaling up from the operative realm of theory to regional and even global accounts of land use and land cover change. This is what the new technologies enable.

Speakers

Speaker	Affliation	Title	Date and Time	Location
Mark Cochrane	Woods Hole Research Center, Woods Hole, Massachusetts	The Troubling Truth about Forests Fires in the Brazilian Amazon	August 30, 1999 3:00 PM*	201 International Center
Norman Myers †	Fellow at Green College, Oxford University, UK and Andrew D. White Professor at Large at Cornell University, USA	Environment, Population, and Consumption: The Challenges of Our Time	October 28, 1999 3:00 PM	108 Bessey Hall
Susanna Hecht	School of Public Policy and Social Research and Associate Director of the Latin American Center, University of California, Los Angeles, USA	The New Dynamics of Deforestation: Technical Change, Regional Integration,and Globalization in Forest Clearing	November 11, 1999 4:30 PM*	Room 106 Kellogg Center
Stephen H.Schneider †	Department of Biological Sciences and Senior Fellow at the Institute for International Studies, Stanford University, USA	The Global Warming Debate: Separating the Scientific Signal from the Political Noise	November 16, 1999 3:00 PM	326 Natural Science
Karen Litfin ††	Political Science, University of Washington, Seattle, USA	Seeing the Earth with New Eyes: A Feminist Perspective on Earth Observing Satellites	November 22, 1999 4:00 PM*	Room 106 Kellogg Center
B. L. Turner II	Graduate School of Geography, Clark University, USA	Bridging the Disciplines Through Land-Use/Cover Change: The Southern Yucatan Peninsular Region Project	December 6, 1999 4:30 PM*	Lincoln Room Kellogg Center
Oliver Coomes	Department of Geography, McGill University, Canada	Tropical Forests and Shifting Cultivation: Secondary Forest Fallow Dynamics Among Traditional Farmers in Western Amazonia	January 20, 2000 4:30PM*	Room 105 Kellogg Center
Richard A. Schroeder ††	Geography and Center for African Studies, Rutgers University, USA	Shady Practices: Gender and Agroforestry Politics in The Gambia	March 2, 2000 4:30PM*	Centennial Room, Kellogg Center
Emilio Moran	Anthropology and Environmental Science, Indiana University, Bloomington, USA	Advances in Property-Level Analysis of Land Use and Land Cover Change	March 30, 2000 4:30PM*	Room 104 Kellogg Center
Vandana Shiva ††	Research Foundation for Science Technology and Natural Resource Policy, India	Global Markets Versus An Earth Democracy: Globalisation, Feminism, and Ecology	April 13, 2000 7:00PM	NEW VENUE: N130 Business College Complex

† speaker co-sponsored by the Departments of Zoology, Geological Sciences, and Fisheries and Wildlife, and the MSU Honors College

†† speaker co-sponsored by the "Gender, Justice, and Environmental Policy" seminar series through the Women in International Development (WID) Program, Michigan State University

* The seminar will be preceded by a 30 minute reception with refreshments.

Sponsors

The Basic Science and Remote Sensing Initiative (BSRSI) is a global change research program in the Department of Geography at Michigan State University. Its objective is to develop an interdisciplinary approach to understanding global change, at both regional and global scales, through the integration of both physical and social sciences.

Global Area and Thematic Initiatives (GATI) is a concerted effort of four MSU Area Centers to support comparative and thematically-oriented programs that are relevant to the globalizing world and that will simultaneously increase MSU's expertise in the world's regions. GATI began at MSU in 1998 as a consortium of multi-disciplinary interest groups of faculty and students, all under the leadership of the four US Department of Education-funded Title VI international area centers: African Studies Center (ASC), Center for Advanced Study of International Development (CASID), Center for Latin American and Caribbean Studies (CLACS), and the Women and International Development Program (WID). The GATI Program's initial focus has been on three thematic areas: 1) Global Restructuring: Processs and Impacts; 2) Environment, Resource Management, and Sustainability and 3) Local and Global Identities: Ethnicity, Race, Gender, and Inequality.

Michigan State University
Department of Geography

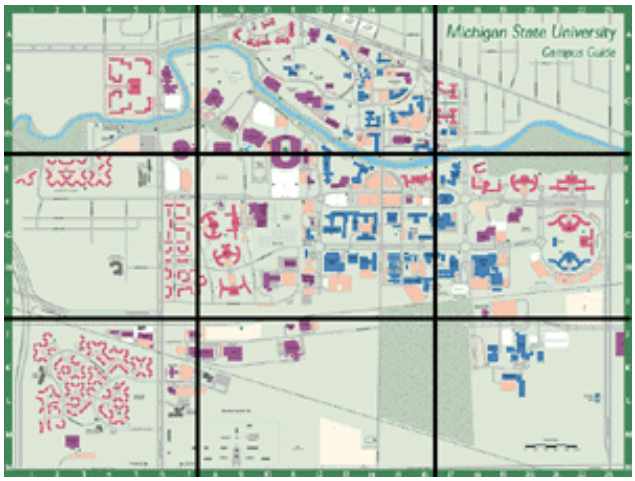
Michigan State University Campus Map

Buildings are listed in alphabetical order. Please use the LETTER-NUMBER coordinates to look up the location in the map.

Expanded Maps:
Click a section to see an expanded view.

(Each section has a printable version as well.)

- Lansing Area Map
- CATA Bus transportation
- Printable Campus Map
- Expanded Maps
- Drop-Down Menu
- Large Clickable Map



Drop-Down Menu:

Select an item of interest and click "Go There".

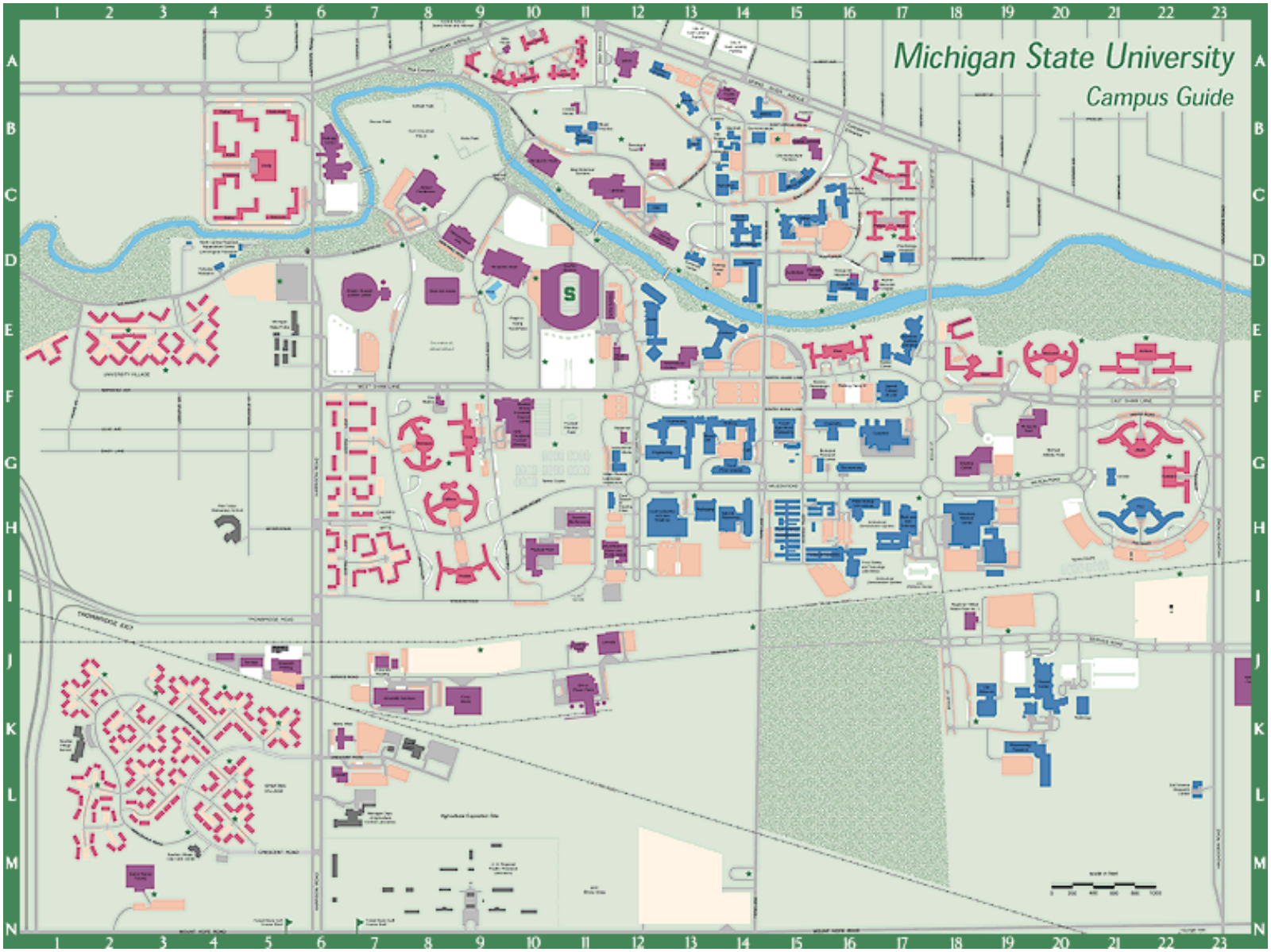
4-H Children's Gardens H-17 Go There

Large Clickable Map:

Click on any building for more information.

Legend

TEACHING & RESEARCH BUILDINGS	PUBLIC & ADMINISTRATION BUILDINGS	UNIVERSITY HOUSING BUILDINGS	NON-UNIVERSITY BUILDINGS	FACULTY/STAFF PARKING	RESIDENT PARKING	STUDENT PARKING	VISITOR PARKING


Michigan State University
Campus Guide

Welcome to the Department of
GEOGRAPHY
at Michigan State University

Welcome

to the Home Page of the Department of Geography at Michigan State University. The Department of Geography, in the College of Social Science, supports programs of study leading to Bachelor's, Master's, and Ph.D. degrees in Geography, Landscape Architecture, and Urban and Regional Planning. Detailed information on the various aspects of the department may be obtained by selecting the general area of interest from the list on the left.

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Tel: (517) 355-4649
Fax: (517) 432-1671

geo@pilot.msu.edu- General Information
Richard Groop- Chairperson
David J. Campbell- Associate Chairperson
Randall Schaetzl- Graduate Supervisor
Sharon Ruggles- Graduate Secretary
Webmaster- Update/Correct Webpage Information

Last revised 29 September 1999.

GEOGRAPHY
at Michigan State University

Academic Programs

The Geography Department at Michigan State University, the oldest Geography PhD program in the state of Michigan, offers programs in the discipline of geography leading to the Bachelor of Arts, Bachelor of Science, Master of Arts, Master of Science, and Doctor of Philosophy degrees. Additionally, a geography-urban studies program leads to the Master of Arts degree. Research concentrations are offered in ***physical geography***, ***cartography/ remote sensing/ GIS***, ***regional development*** and ***economic geography***. Students interested in recreation and tourism, US migration, land use change, tropical deforestation, and environmental ethics are also encouraged to apply. Regional specializations include Africa, Latin America and China.

APPLICATION MATERIALS

UNDERGRADUATE PROGRAM

The undergraduate program is designed to prepare students for various careers in business, industry, education and government. Career- oriented specializations are available in cartography, geographic information systems, remote sensing, and regional development.

GRADUATE PROGRAMS

The department offers MA, MS and PhD degrees as part of a graduate program. The Master's programs in geography are designed to enable the student to achieve professional competence in the discipline. These programs are intended to increase substantive and technical proficiency in the general fields of geography.

The PhD program is designed to develop the student's ability to conduct original research with special reference to:

1. understanding of scientific inquiry;
2. knowledge of the geographic discipline;
3. understanding of a specialized area of geography such as cartography, physical geography, regional development, or economic- regional science;
4. proficiency with analytical and technical skills;
5. skills in communicating the results of research.

GEOGRAPHY
at Michigan State University

Research

Physical Geography

- Climatology
- Geomorphology and Soils
- Plant Geography

Geographic Information Science: Cartography/Remote Sensing/GIS

- Cartography
- Remote Sensing (Basic Science and Remote Sensing Initiative (BSRSI))
- Geographic Information Systems

Regional Development

- Africa
- Latin America
- East Asia
- Global Change

Economic Geography

- Regional Science
- Migration and Demographics
- Spatial Organization

GEOGRAPHY
at Michigan State University

RESOURCES

Computing Facilities

The Department houses three main computing laboratories, which serve in instructional and research capacities.

The ***Geography Advanced Computer Lab*** is primarily used as a teaching and training facility. The machines in this lab are setup to run a variety of GIS and image processing application packages, including ARC/INFO, PCI, and IMAGINE. Some of the machines are configured to run graphical weather analysis tools such as McIDAS-X and WXP. Equipment includes six SUN SparcStation20 workstations, three SUN SparcStation5 workstations, a SUN SparcStation2 workstation, and a SUN SparcStationIPX workstation. Data storage facilities include two 8mm and one 4mm tape drive, and two CD-ROM drives. The room also contains a digitizing tablet connected to one of the workstations.

The ***Geography Research Computer Lab*** is primarily a research facility for both faculty and graduate students. UNIX machines in this lab are setup to run a variety of GIS and image processing packages including ARC/INFO and PCI. The lab includes several SUN Ultra Systems, along with a 25-Gbyte MultiPack (external disks) and two CD-ROM drives. Output devices include a Tektronix Phaser 220i (color phaser printer) and a Lexmark laser printer. Also in this lab are a number of PC's with GIS software loaded.

The ***Undergraduate Teaching Computer Lab*** is used for lab assignments in large to medium enrollment courses. This lab contains 14 Pentium PCs with a variety of GIS, mapping, and statistical software packages. Black and white laser and color inkjet output devices are available.

Physical Geography Facilities

The physical program is supported by a wide array of laboratory and field-based equipment and facilities that are used in support of teaching and research.

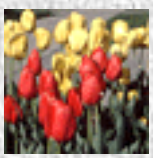
Within Climatology, the Department receives real-time meteorological information, such as the National Weather Service DIFAX and Domestic Data Plus Services, along with satellite imagery. We are configured and setup to run UNIDATA's LDM software package which captures and decodes meteorological data from satellite and Internet feeds. The data are displayed and analyzed on a SUN SparcStation20 (data capture and analysis) and a SUN SparcStation5 (research compute server). Data storage is achieved by using an 8mm and a 4mm tape drive, and two CD-ROM drives. A local area network is linked with a SUN SPARC workstation via Ethernet. Also, a large archive of upper-air reports, radar observations, cloud-to-ground lightning strikes, model initialization fields, and general circulation model output are available in computer-readable form and on microfilm. Climatological research is further facilitated by the presence within the department of the Michigan Meteorological Resources Program, including the Michigan Department of Agriculture Climatology Office.

Field equipment in support of soils and geomorphological fieldwork include a diesel-powered backhoe, a new Honda All-terrain vehicle, and a vibra-coring device. Geomorphology lab facilites are new as of 1996 and provide faculty and students with the resources necessary to perform most standard characterization analyses. Standard binocular, petrographic and projection petrographic microscopes are housed within the Geomorphology lab, along with digital image enhancement and analysis software hard-wired to them. Most standard wet chemical extractions and mineralogical analyses can be performed within the current setup. X-ray diffraction units, a DCP and a mass spectrometer, and several SEMs are available either within the building (Geology Department) or on campus (Soils Department).

The University supports a number of facilities outside the Department, including:

- The Map Library
- The Center for Remote Sensing and GIS
- The Institute of Water Research

GEOGRAPHY
at Michigan State University



COURSES

Course Listings

Click here for MSU Course Catalog Search.

113. Introduction to Economic Geography

Fall, Spring, 3 credits

Spatial distribution of resources, population, enterprise, trade, consumption, and production. Interaction of those distributions at local to global scales.

151. Cultural Geography

Fall, and Spring of even-numbered years, 3 credits

Systematic approach to the spatial distribution of cultural features, processes, and relationships.

203. Introduction to Meteorology

Fall, 3 credits

Fundamentals of meteorology. Energy balance, adiabatic processes, horizontal motion, cyclogenesis, and severe weather.

206. Physical Geography

Fall, Spring, 3 credits

Geographic and functional interrelationships within the physical environment: earth-sun relationships, weather, climate, soils, vegetation, and landforms (terrain characteristics).

206L. Physical Geography Laboratory

Fall, Spring, 1 credit, P: GEO 206 or concurrent enrollment

Geographic aspects of weather, climate, soil, vegetation, and terrain. Interpretation and application of maps and remotely sensed imagery.

221. Introduction to Geographic Information

Fall, Spring, 3 credits

Principles and methods of spatial data collection, handling, analysis, and display. Introduction to remote sensing, geographic information systems, and cartography.

230. Geography of the United States and Canada

Fall, Spring, Summer, 3 credits

Regional analysis. Evolution and status of environmental, demographic, economic, and sociocultural patterns and processes.

233. Geography of Michigan

Fall of odd-numbered years, 3 credits

Physical and cultural geography of Michigan.

259. Geography of Recreation and Tourism

Fall of even-numbered years, 3 credits

Cultural, physical, and biotic factors affecting the distribution of recreation and tourism resources and participation. US and international examples and case studies.

306. Environmental Geomorphology

Spring, 3 credits. Interdepartmental course with Geological Sciences.

Relationships of running water, weathering, gravity, ice, waves, wind, and biota (including humans) to terrain and soils. Evolution of landscapes. Classical and modern interpretations.

324. Remote Sensing of the Environment

Fall, Spring, 4 credits, R: not open to freshmen

Features and interpretation methods of remotely-sensed imagery, especially

black-and-white and color infrared airphotos. Basic features of radar, thermal, and multispectral imagery. Interpretation for agricul- ture, archaeology, fisheries, forestry, geography, landscape architecture, planning, and wildlife manage- ment.

326. Thematic Cartography

Fall, 4 credits, P: GEO 221

Principles and techniques of map making. Decision making in designing thematic maps.

335. Geography of Latin America

Fall, 3 credits, R: not open to freshmen

Physical and human geography of Latin America. Current development issues, especially people-environment interaction in urban and rural areas. Topics include migration, urbanization, and industrialization.

336. Geography of Europe

Fall of odd-numbered years, 3 credits, R: not open to freshmen

Major regions and nations, including their physical resources, peoples, political structures, and economies, and environmental problems.

337. Geography of East Asia

Spring, 3 credits, R: not open to freshmen

Spatial patterns and processes of physical and human geography in China, Japan, Korea, and Taiwan. Emphasis on development problems, especially since 1950.

338. Geography of Africa

Fall, 3 credits, R: not open to freshmen

Physical and human geography of Africa. Current development issues, especially people-environment interaction in urban and rural areas. Topics include drought, agricultural patterns, hunger, rural development, migration, and urbanization.

401. Plant Geography

Spring of even-numbered years, 3 credits, R: not open to freshmen or sophomores

Geography of forests in North America with emphasis on the East. Related ecological principles, soils, and post-cretaceous geologic history. Some field instruction.

402. Agricultural Climatology

Fall of even-numbered years, 3 credits, P: MTH 116, R: not open to freshmen or sophomores. Interdepartmental course with Agricultural Engineering.

Relationship between climate and agriculture as related to resource assessment, water budget analysis, meteorological hazards, pests, crop-yield, modeling and impacts of global climate change.

404. Synoptic Climatology

Fall, 4 credits, P: GEO 203

Global climate patterns and their controls. Emphasis on the relationship between upper air flow and weather in the Northern Hemisphere westerlies.

405. Applied Synoptic Climatology: Principles and Methods

Spring of odd-numbered years, 4 credits, P: GEO 404, MTH 116

Dynamic and thermodynamic principles of atmospheric science applied to the development and evolution of extratropical cyclones. Laboratory sessions include analysis of current observations and satellite imagery.

407. Regional Geomorphology of the United States

Fall of odd-numbered years, 3 credits, P: GEO 206 or GLG 201 or GLG 301 or ISP 203

Geomorphic characteristics of physiographic regions of the United States.

408. Soil Geomorphology Field Study

Fall, 4 credits, P: GEO 206 or GLG 201 or CSS 210, R: not open to

freshmen or sophomores

Common geographic relationships among soils, landforms, and vegetation in lower Michigan. Description, analysis, and genesis of soils and landscapes. Surficial processes. Required field trips, incurring some student expenses.

412. Glacial and Quaternary Geology

Spring , 4 credits, P: GLG 201 or GLG 306 or GEO 408, R: not open to freshmen and sophomores. Interdepartmental course with Geological Sciences.

Glacial and Quaternary geology with emphasis on North America and Europe. Laboratory focuses on glacial processes. One weekend field trip required.

413. Urban Geography

Fall, 3 credits, P: GEO 113

Theories and models of urban spatial form. Underlying structures and processes. Socio-spatial dimensions of modern urbanites. Differentiation and locational conflict in residential, commercial, and industrial space.

414. Geography of Transportation

Fall of odd-numbered years, 3 credits, P: GEO 113, R: not open to freshmen

Spatial principles of transportation. Theories of interaction, network structure, and location-allocation models. Role of transport and transport planning.

415. Location Theory and Land Use Analysis

Fall 3 credits, P: GEO 113, R: not open to freshmen

Classical and neoclassical, static and dynamic models of industrial location and spatial organization. Land rent theory, central place theory, multilocational organization, growth transmission.

418. The Ghetto

Fall of odd-numbered years, 3 credits, P: not open to freshmen

Analysis of the ghetto including its spatial organization, structure, and distribution of nonwhite and ethnic populations with an emphasis on US cities.

423. Map Production and Design

Spring, 4 credits, P: GEO 223

Manual and automated techniques. Design solutions, map planning, overlay construction, user issues, typography, color theory, and color selection.Examples of class projects.

Fall Semester, 1998.

424. Advanced Remote Sensing

Fall, 4 credits, P: GEO 324, R: not open to freshmen and sophomores

Interaction of solar radiation with the atmosphere, lithosphere, hydrosphere, and biosphere. Introductory digital image processing. Earth-resources satellite sensors, data products and applications. Radar and thermal remote sensing.

425. Geographic Information Systems

Spring, 4 credits, P: GEO 221

Technical and theoretical issues in the design, evaluation and implementation of geographic information systems for research and application.

428. Digital Terrain Analysis

Fall of even-numbered years, 3 credits, P: GEO 324 or GEO 424; GEO 221, R: not open to freshmen or sophomores.

Theoretical and technical issues of collection, management, analysis, and display of terrain data. Application of photogrammetry, geographic information systems, and cartography.

445. Environment and Development Policy

Spring of even-numbered years, 3 credits, P: GEO 113 or GEO 335 or GEO

336 or GEO 337 or GEO 338. Interdepartmental course with Resource Development.

Interaction between environmental, social, economic, and political factors in the development process. Land degredation, deforestation, technology, and renewable natural resources. Policy implications.

454. Spatial Aspects of Regional Development

Spring of odd-numbered years, 3 credits, P: GEO 113 or GEO 151 or GEO 230 or GEO 233 or GEO 335 or GEO 336 or GEO 337

Spatial patterns and processes associated with regional development in selected world areas.

459. Tourism in Regional Development

Spring of odd-numbered years, 3 credits

The role of tourism in regional development. Examples from Michigan, the United States, and other nations. Environmental considerations.

463. Quantitative Methods in Geography and Planning

Fall, 3 credits, P: University math requirement

Basic quantitative techniques in the analysis and classification of geographic data.

480. Senior Seminar

Fall, 3 credits, R: open only to seniors in Geography

History, philosophy, and methodology of the geographic discipline as it has evolved within academic and social contexts.

490. Independent Study

Fall, Spring, Summer, 1 to 4 credits, may earn a maximum of 12 credits, R: approval of department

Supervised individual study in an area supplementary to regular courses.

492. Geographic Research Problems

Fall, Spring, Summer, 1 to 4 credits, may earn a maximum of 12 credits, P: not open to freshmen or sophomores, approval of department

Supervised original research on selected aspects of geography.

495. Field Study

Fall, Spring, Summer, 1 to 4 credits, may earn a maximum of 8 credits

Supervised field study in Geography.

498. Internship in Geography

Fall, Spring, Summer, 1 to 4 credits, may earn a maximum of 8 credits, P: approval of department, R: not open to freshmen and sophomores

Individual experience in geography at an approved organization.

806. Advanced Geomorphology

Spring of even-numbered years, 3 credits, P: GEO 306, GEO 408, GEO 412, or approval

Advanced study in geomorphology, surficial processes and soils.

809. Seminar in Physical Geography

Spring, 3 credits, may earn a maximum of 9 credits for this course

Review of research on topics in physical geography such as climatology, geomorphology, soils, or plant geography.

813. Seminar in Urban and Economic Geography

Spring, 3 credits, may earn a maximum of 9 credits for this course, P: two of GEO 413, GEO 414, GEO 415, GEO 416, GEO 417, GEO 418

Review of research on selected topics in urban and economic geography.

823. Map Automation

Fall of even-numbered years, 3 credits

Use of computers in cartography. Cartographic algorithms, interpolation, and line generalization. Program intelligence. Cartographic data bases.

825. Geoprocessing

Fall of odd-numbered years, 4 credits

Integration of digital remote sensing data, geographic information systems, spatial analysis, and expert systems in solving research problems. Class research project.

826. Seminar in Cartography and Geoprocessing

Spring, 3 credits, may earn a maximum of 9 credits for this course

Review of research in cartography, geographic information systems, and remote sensing.

836. Microclimate and Its Measurement

Spring, 4 credits, Interdepartmental with Agricultural Technology and Systems Management. Administered by Agricultural Technology and Systems Management.

The climate near the Earth's surface. Energy balance, thermal radiation exchange, heat fluxes, temperature sensors, wind speed and direction, humidity and evapotranspiration and their measurement.

850. Seminar in Regional Geography

Fall of even-numbered years, Spring, 3 credits, may earn a maximum of 9 credits for this course

Review of research on contemporary geographic issues in different world regions.

865. Advanced Quantitative Methods in Geography

Spring, 4 credits, P: GEO 463

Statistical and mathematical approaches. Multiple regression, principal components and factor analysis, discriminant analysis. Related taxonomic methods.

867. Methods and Modelling in Regional Science

Spring of even-numbered years, 3 credits, P: (GEO 865 or AEC 820 or STT

820 or EC 820) and (RD 461 or GEO 415)

Techniques for regional research. Economic base analysis, input-output analysis, mathematical programming, econometric and simulation analysis.

886. Research Design in Geography

Spring, 3 credits

Research and writing in geography. Identification of geographic problems and their relative importance. Structuring and stating hypotheses. Data acquisition and tests for validity.

890. Advanced Readings in Geography

Fall, Spring, Summer, 1 to 4 credits, may enroll for a maximum of 12 credits for this course

Advanced independent readings.

892. Advanced Research in Geography

Fall, Spring, Summer, 1 to 4 credits, may earn a maximum of 12 credits for this course.

Advanced independent research.
GEO 892 (001): Environmental Applications of Remote Sensing, Spring 1999. (Credit: 3)

899. Master's Thesis Research

Fall, Spring, Summer, 1 to 12 credits, may earn a maximum of 12 credits for this course.

986. Theory and Methods in Geography

Spring, 3 credits, R: open only to Ph.D. students in Geography

Historical development of the discipline within social and intellectual contexts. Current methodological and philosophical approaches to geographic research.

999. Doctoral Dissertation Research

Fall, Spring, Summer, 1 to 24 credits, may earn a maximum of 24 credits for this course.

Updated 8/10/97

The course number is not in this list!

Click here for MSU Course Catalog Search.

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PEOPLE

- FACULTY
- STAFF
- GRADUATE STUDENTS
- EMERITUS FACULTY
- ALUMNI
- MSU DIRECTORY (Pilot)

GEOGRAPHY
at Michigan State University

Related Units at MSU

- College of Social Science
- Landscape Architecture
- Urban and Regional Planning
- Basic Science and Remote Sensing Initiative (BSRSI)
- Center for Remote Sensing and GIS
- Institute of Water Research
- The Cartography Center

GEOGRAPHY
at Michigan State University

Geography Links

GEOGRAPHY
at Michigan State University

Latest Information @ Geography

- **Link to AAGs' What's New! What's News!**
- **MSU Libraries Magic 2 online catalog system**
- **Regional Development @ Geography**
- **GIS @ Geography**
- **Basic Science and Remote Sensing Initiative (BSRSI)**
- **Graduate Students, Fall 1999**
- **GEO 892 (001): Environmental Applications of Remote Sensing, Spring 1999. (Credit: 3)**
- 

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Welcome

to the

College of Social Science

Michigan State University

GEOGRAPHY
at Michigan State University

Faculty Positions Available (.pdf)

POSITION SS 102

Assistant Professor. academic-year tenure-system appointment, Geographic Information Science, beginning August 16, 2000.

Ph.D. in geography or closely-related field by August 15, 2000. Interests in theoretical and applied GISci required. Candidate is expected to participate in the department's campus-wide leadership in GISci and to interact in a multidisciplinary (geography, landscape architecture, and urban planning) department. A commitment to high scholarly productivity and excellence in teaching is expected. The successful candidate will teach undergraduate and graduate courses in GISci. An ability to teach other introductory and advanced courses for the department is desirable.

The department is exceptionally well equipped with modern computers and related equipment for GIS, cartography, remote sensing, climatology, physical geography, human/environment and regional analysis. It includes facilities of the department's Basic Science and Remote Sensing Initiative which focuses on the use of earth observation satellites, geographic information systems, field studies, and

POSITION SS 817

Assistant Professor in Remote Sensing and Geographic Information Science, beginning August 16, 2000.

Applicants should have experience and expertise in the basic science of global environmental change and have a Ph.D. in geography or a closely-related field at time of appointment. The successful candidate will be expected to conduct and manage externally-funded research, including interdepartmental and inter-college collaboration, and will have demonstrated expertise in some combination of the following: application of earth observation satellites to global change research; GIS technology applied to environmental problems; land-use and -cover change models. Teaching assignments will include introductory, advanced, and graduate courses.

This position is part of the Basic Science and Remote Sensing Initiative. The Department and University have invested considerable resources to build this new initiative, which focuses on the use of earth observation satellites, geographic information systems, field studies, and models for global change research. Strong emphasis is being placed on the study of land use and cover change, including its global and regional

models for global change research. The department is also associated with MSU's Center for Remote Sensing and Geographic Information Science. Detailed information about the department can be found on the Web at http://www.geo.msu.edu.

Send resume and have three letters of reference sent to:

Judy M. Olson
Search Committee Chairperson
Department of Geography
315 Natural Science Building
Michigan State University
E. Lansing, MI 48824-1115

Email: olsonj@pilot.msu.edu (confirm with mailed original)
Ph: 517/353-8757 (direct), 517-355-4649 (office staff)
Fax: 517-432-1671 (confirm with mailed original)

Review of applications will begin December 1, 1999.

Michigan State University is an affirmative action/equal opportunity employer. Minority and women candidates are encouraged to apply. Handicappers have the right to request and receive reasonable accommodation.

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aspects, with a focus on using satellite observations from existing and planned earth observing systems. The Initiative is an integral part of MSU's overall emphasis on increasing research capacity, and it meshes with existing departmental strengths in cartography/GIS, land use and cover change, human-environment interaction, economic geography, geomorphology and climatology.

Salary will be competitive and commensurate with qualifications and experience. Send curriculum vitae, pertinent publications, and a letter of application discussing research and teaching interests to:

Professor Randall Schaetzl
Department of Geography
Michigan State University
315 Natural Science Building
East Lansing, MI 48824-1115

Ph: (517) 353-7726,
Email: schaetzl@pilot.msu.edu (confirm with mailed original)
Fax: 517-432-1671 (confirm with mailed original)

Please arrange for three letters of recommendation to be sent. Review of applications begins December 1, 1999, and continues until the position is filled.

Michigan State University is an affirmative action/equal opportunity employer. Minority and women candidates are encouraged to apply. Handicappers have the right to request and receive reasonable accommodation.

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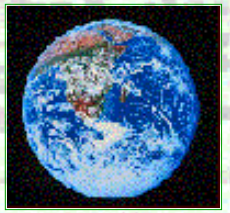
Back to the MSU Geography Dept homepage

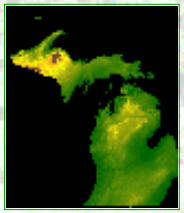
Landscape Architecture 1999-2000

101 Years--Over A Century of Education & Scholarship

MSU Landscape Architecture

MICHIGAN STATE UNIVERSITY





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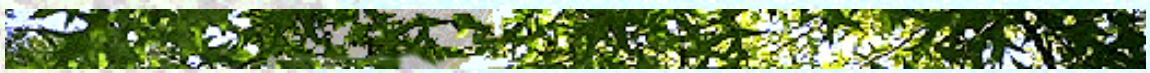

101 Urban and Regional Planning & Landscape Architecture Building, MSU, East Lansing, Michigan, U.S.A. 48824-1221

Telephone: (517) 353-7880; Fax: (517) 353-0006; Email: mezga@pilot.msu.edu

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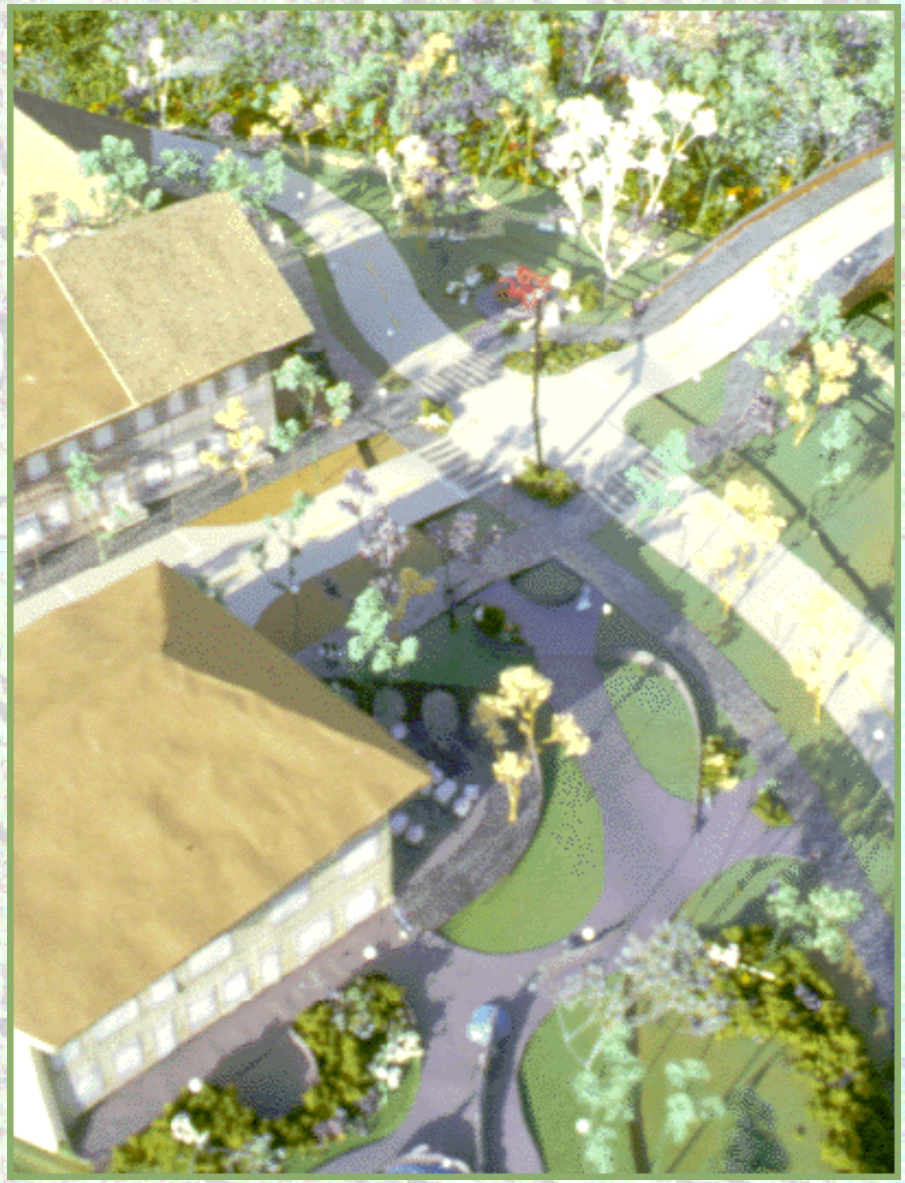
Student models from LA 240 Spring 1999 and LA 443 Fall 1998



Sarah Witzke and Andrew Deer completed this model of a possible solution for a New Urbanism development and the reclamation of a Grand Rapids' gravel mine.

This Model was completed by Ken Akley. Mastering spaces is one of the first elements of Landscape Architecture that Second year students are taught.

Welcome to the Home Page of the Landscape Architecture Department at Michigan State University. The LA Dept., is in the College of Social Science, which supports programs of study leading to Bachelor's, Master's, and Ph.D. degrees in Geography and Urban Planning and a Bachelor's of Landscape Architecture. (Course and Credit Hour Requirements for Various Degree Programs.) Detailed information may be obtained by selecting the general area of interest from the list below. An extensive listing of links to servers of interest to Geographers is included as a research tool at this site. Connections to federal financial aid and employment information are also provided.

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LA Projects and Classroom Activities

Fall 1999 Pyramid News

- **Spring 2000 the new Millenium 3 Studio Pyramid Project is here.**

- Student Landscape Planning GIS Project in LA 446 concerning environmental multiple land-use planning issues related to recreation, wildlife habitat, water quality, and forestry in west Michigan.
- Student advice concerning the use of computers and computing for landscape architectural students at MSU.
- A synopsis of a published research project concerning a land-use planning GIS investigation of residential building suitability within a portion of the Colorado front range.
- LA Overseas Study Spring 1998

LA Program Announcements and Business

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- Sissi Foster
- Dr. Mary Ann Kniseley
- Duane Mezga
- Dr. Trisha Machemer
- Paul Nieratko
- Warren Rauhe
- Mim Rutz
- Dr. Jo Westphal

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- Admission Policies
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Environmental Cognates

Geography

Urban and Regional Planning

DesignNet Journal

M.S.U. Courses, Academic Programs, and Graduate School Information

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Landscape Architecture: the Profession

Landscape Architecture is the design profession which applies artistic, cultural, scientific, and technical knowledge and skills to the analysis, design, planning, development, and management of the land. Landscape architects accept certain responsibilities related to the health, safety, and welfare of the public and are concerned with resource conservation and stewardship of the land. The practice of landscape architecture requires an appreciation and understanding of natural and social processes, a creative imagination, technical expertise, and a commitment to preserve or improve the physical environment for optimum human use and enjoyment.

Landscape architects are employed by private professional offices, public planning agencies, land development companies, industrial or commercial firms, educational and research institutions, park and recreation authorities, and a variety of other organizations which require land use planning and site design services. The landscape architect's professional activities include consultations with clients, resource inventories and site analyses, site development programming, development of design concepts and land use proposals, provision of design implementation drawings and specifications, preparation of contracts and reports, and supervision of projects under construction. The landscape architect often collaborates with other professionals, including architects, engineers, naturalists, geographers, and planners, in the design and development of urban and rural land areas.

The undergraduate Bachelor of Landscape Architecture program provides a diverse learning experience which strives for a balance between philosophy, theory, and application of concepts related to past, present, and future problem-solving in landscape architecture and allied environmental planning and design professions.

The program includes professional courses in the areas of design theory and graphic communications, environmental perception, history, and plant materials and their uses; technical aspects of site development, design applications for representative land uses; site

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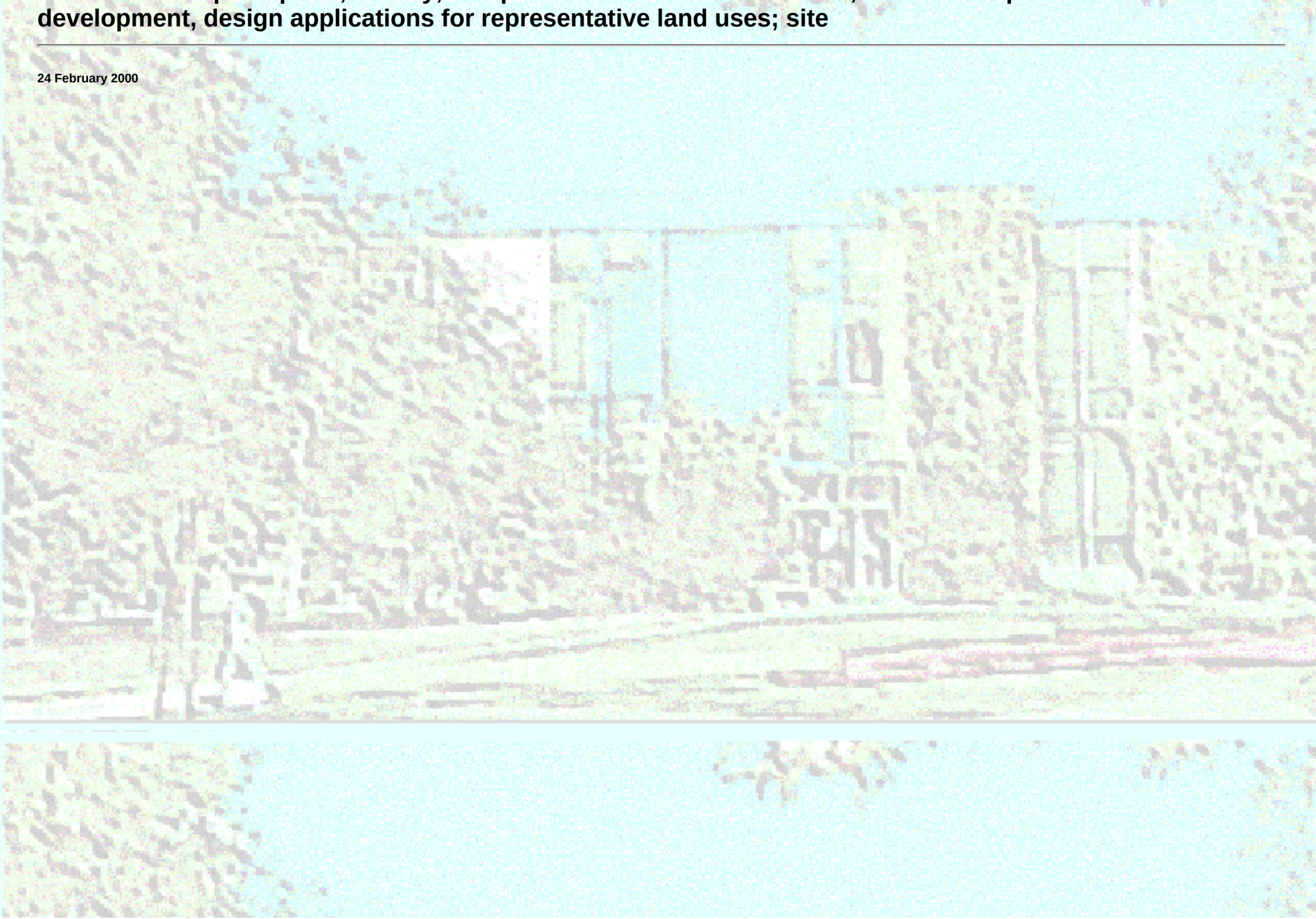
24 February 2000



MICHIGAN STATE UNIVERSITY

Welcome to the MSU

Urban and Regional Planning Program

Michigan State University | College of Social Science | Department of Geography

Welcome

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Outreach

Urban Collaborators (UC), Urban Planning Partnerships (UPP), Practicum

---

Research

Individual research publications can be found within URP faculty web sites, please see the faculty/staff directory.

Alumni

Please direct site questions to urp@msu.edu
Last updated: 11/17/99

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Latest Netscape Browser Software

Netscape Communicator 4.72

Includes Navigator, Messenger, Composer, AOL Instant Messenger 3.0, Netscape Radio, RealPlayer G2, Winamp (Windows only), PalmPilot Synch tools (Windows only), plus multimedia plug-ins.

56 bit Standard Encryption

Win 95/98/NT	MacPPC 7.6.1 or Later	Other Platforms

128 bit Strong Encryption*

Win 95/98/NT	MacPPC 7.6.1 or Later	Other Platforms

Netscape 6 Preview Release 1

The first Internet software to seamlessly integrate browsing, email, and instant messaging. *Plus*, Netscape 6 has a smaller download size and industry-leading standards support. New features include My Sidebar, enhanced Search, and access to multiple email services and accounts.
Download Netscape 6 PR1.

New 128-bit Strong Encryption Availability

Netscape Communicator with 128-bit strong encryption is now available worldwide. In addition to the U.S. and Canada 4.72 version, Netscape Communicator 4.7 with strong encryption is available in:

Japanese	German	French
English UK	Dutch	More...

Windows 95, 98, and NT operating systems only.

Netscape Calendar Users: Important Notice!

As of Netscape Communicator 4.72, Enterprise Calendar is no longer included with your download. Please click here for more information about Enterprise Calendar and Netscape Calendar Server.

Netscape Software Index
On page below

Netscape Navigator 4.08

Navigator 4.08 is the latest English version of the classic Netscape stand-alone browser for Windows 3.1 and 68k Macintosh computers:

40 bit Standard Encryption

Win 95/98/NT	Mac PowerPC	Other Platforms

128 bit Strong Encryption*

Win 95/98/NT	Mac PowerPC	Other Platforms

NEW! Attention AOL and Microsoft Internet Explorer 3.0 Users! Your version of Internet Explorer may not allow you to download files that exceed 12.4MB. But you can still download Communicator 4.72 using Netscape SmartDownload! Or you can receive Communicator 4.7 on CD-ROM.

***Strong encryption** enables you to make secure transactions, used in online banking and trading.

Attention online banking customers: Financial institutions differ in how soon they accept new browser versions. We anticipate that most popular institutions will update their browser acceptance information within 30 business days of the public release of Netscape Communicator version 4.72, or by Feb. 22, 2000.

SmartUpdate, the fastest way to upgrade your 4.x browser, delivers:

- The latest browser upgrades and plug-ins
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- Email notification of new software

Not running Communicator? Try our easy **upgrade** to get the basic version for your language and platform with one click of the mouse.

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- AOL Image Support Update for Windows 2000

Windows 98

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- Outlook Express Year 2000 Update
- Updated Microsoft Virtual Machine for Internet Explorer 4 and 5
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- Administration Kit (IEAK)

Windows 95 and Windows NT 4.0

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Macintosh

- Macintosh Download Center

UNIX

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