SERDP
Strategic Environmental Research and Development Program
Improving Mission Readiness Through Environmental Research

US Army Corps of Engineers

SERDP's SEMP

Ecosystem Management Project

CS-1114/7

William D. Goran
Rose Kress
U.S. Army Engineer Research and Development Center (ERDC)

Army Conservation Technology Team
9-10 May 2000

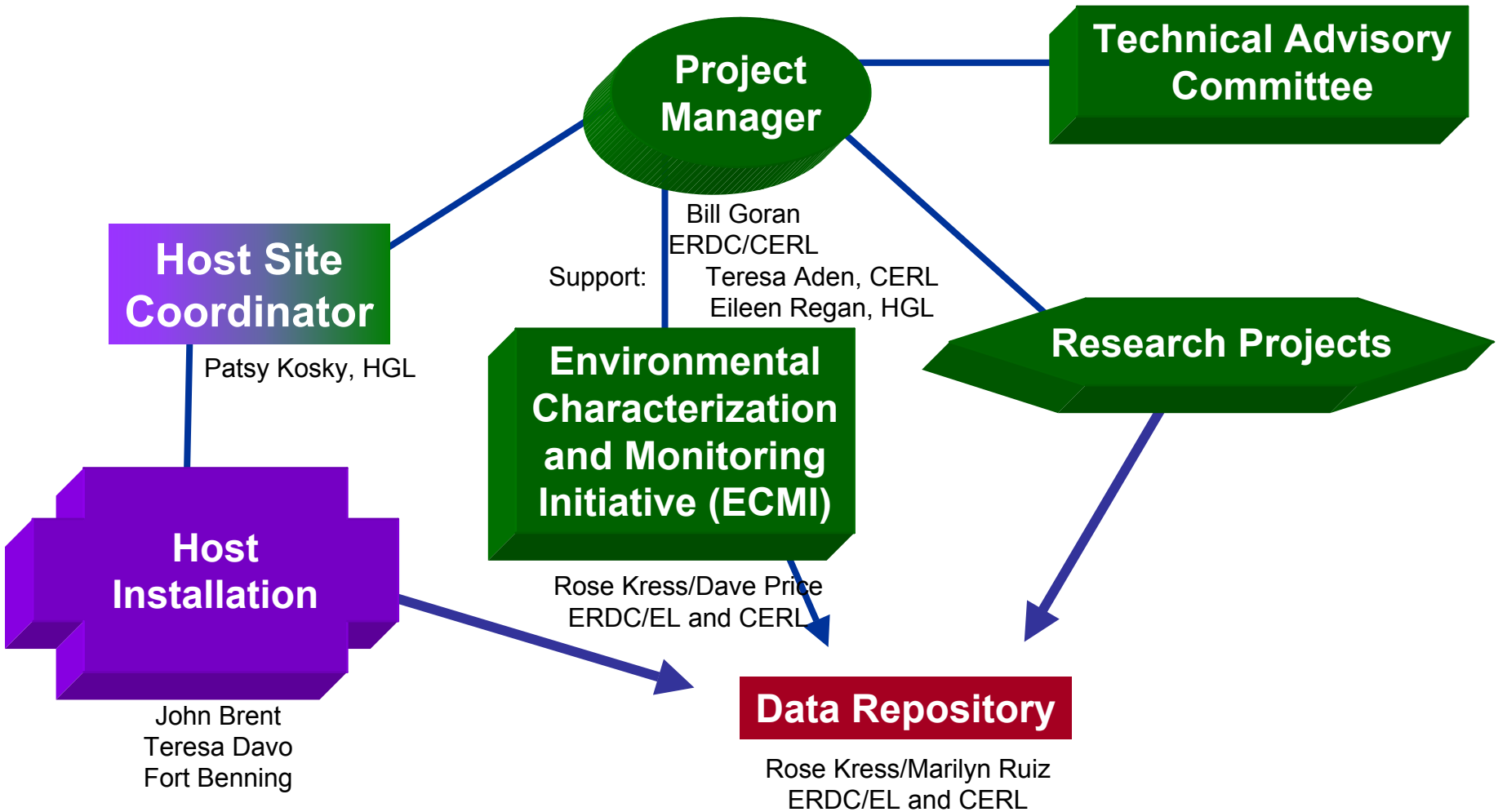
Outline

- SEMP Objectives and Organization
- SEMP Framework
- Status of Activities
  - Research
  - Monitoring
  - Repository
- FY2001 and Future Plans

Purpose of SEMP

- To Address Knowledge Gaps Related to Ecosystem Management on Military Lands
- To Design and Test a Long-Term Baseline Monitoring Program on DOD Lands
- To Infuse Outcomes into DOD Ecosystem Management Processes and Practices

SEMP Organization Chart



Technical Advisory Committee for SEMP

- Dr. Mary Barber, Ecological Society of America, SAB Member
- Mr. Peter Boice, Director of Conservation Programs, Deputy Undersecretary for Defense, Environmental Security, TTAWG Member
- Dr. Roger Dahlman, Program Manager, U.S. Department of Energy, TTAWG Member
- Dr. Mark Fenn, U.S. Department of Agriculture, Forest Service
- Dr. Penny Firth, National Science Foundation
- Dr. John Hall, The Nature Conservancy
- Mr. Richard McWhite, Natural Resources Chief, Eglin Air Force Base
- Ms. Kim Michaels, Army Environmental Center, Conservation Branch
- Dr. Doug Ripley, Headquarters, Air Force, TTAWG Member
- Dr. James Spotila, Drexel University
- Dr. J. Whitfield Gibbons, Savannah River Ecology Lab and University of Georgia

SEMP Conceptual Framework

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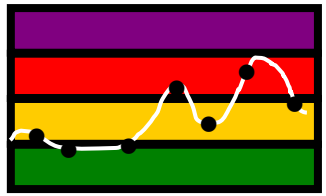
Indicators
99 SON



Scenario and Mgmt Decision Aid
Future

What, When, Where & How to Observe?

When & How to React?

What Might Result from Actions?

Observation Protocol
Monitoring Plan

Shared Data
Repository

Analysis Protocols
Future

Observed Current Conditions

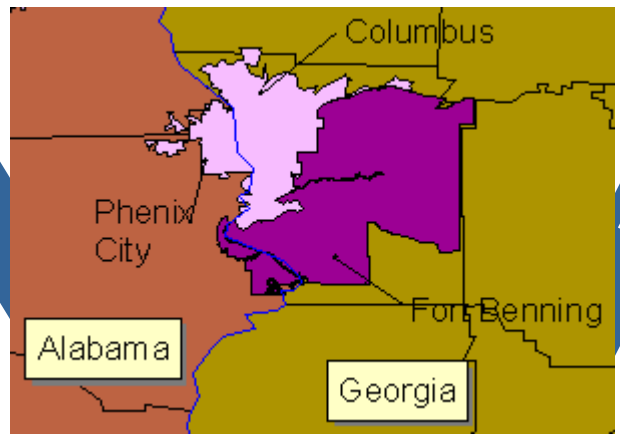
Management Actions

Desired Future Conditions

Use

Plans

Thresholds
2000 SON



SEMP Research Projects

FY99 Topic -- Change Indicators

Organization	PI	Title
ornl	Dr. V. Dale	Indicators of Ecological Change
University of Florida	Dr. W. DeBusk	Determination of Indicators of Ecological Change
Embry-Riddle Aeronautical University	Dr. T. Krzysik	Development of Ecological Indicator Guilds for Land Management

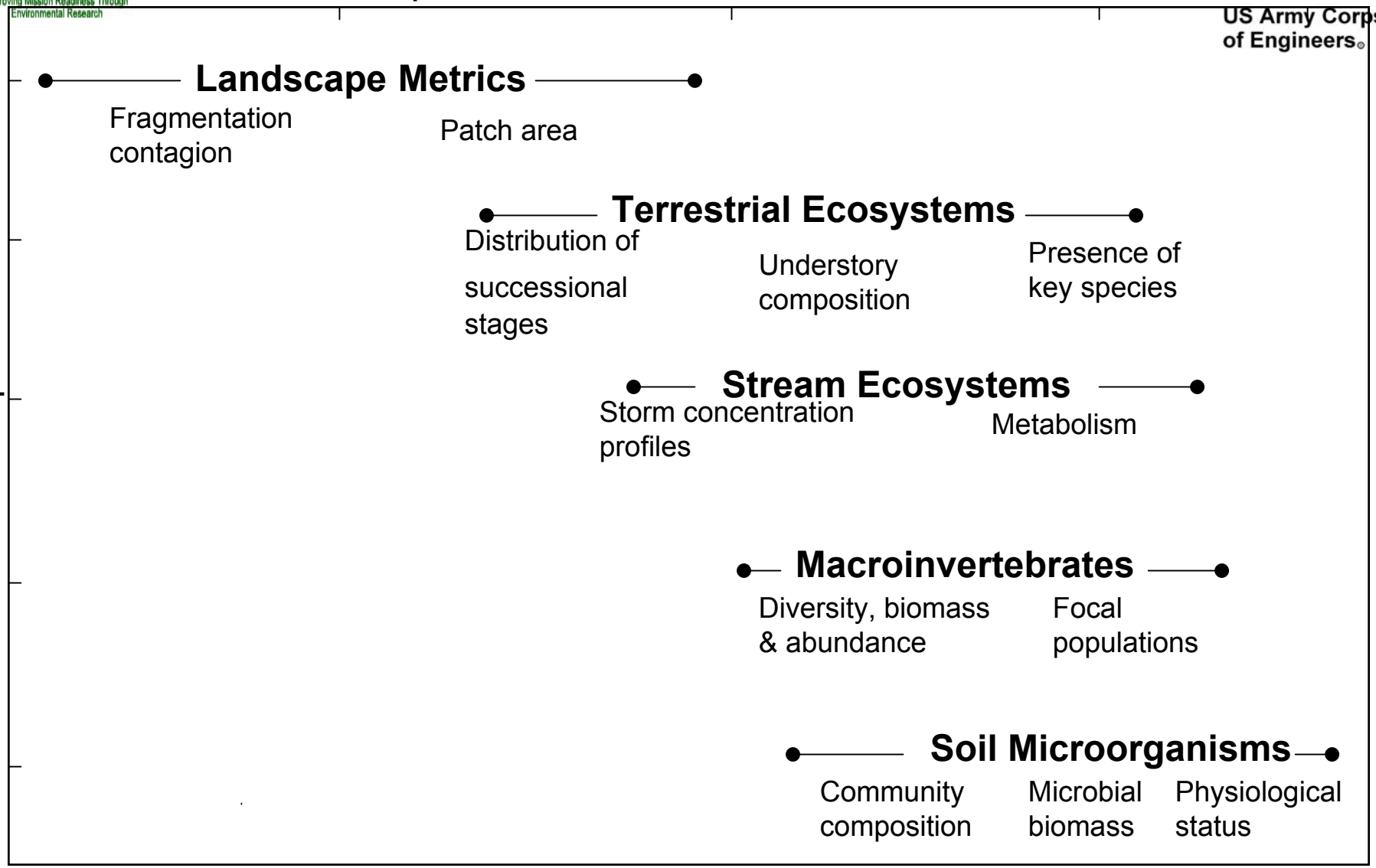
FY00 Topic -- Disturbance Thresholds

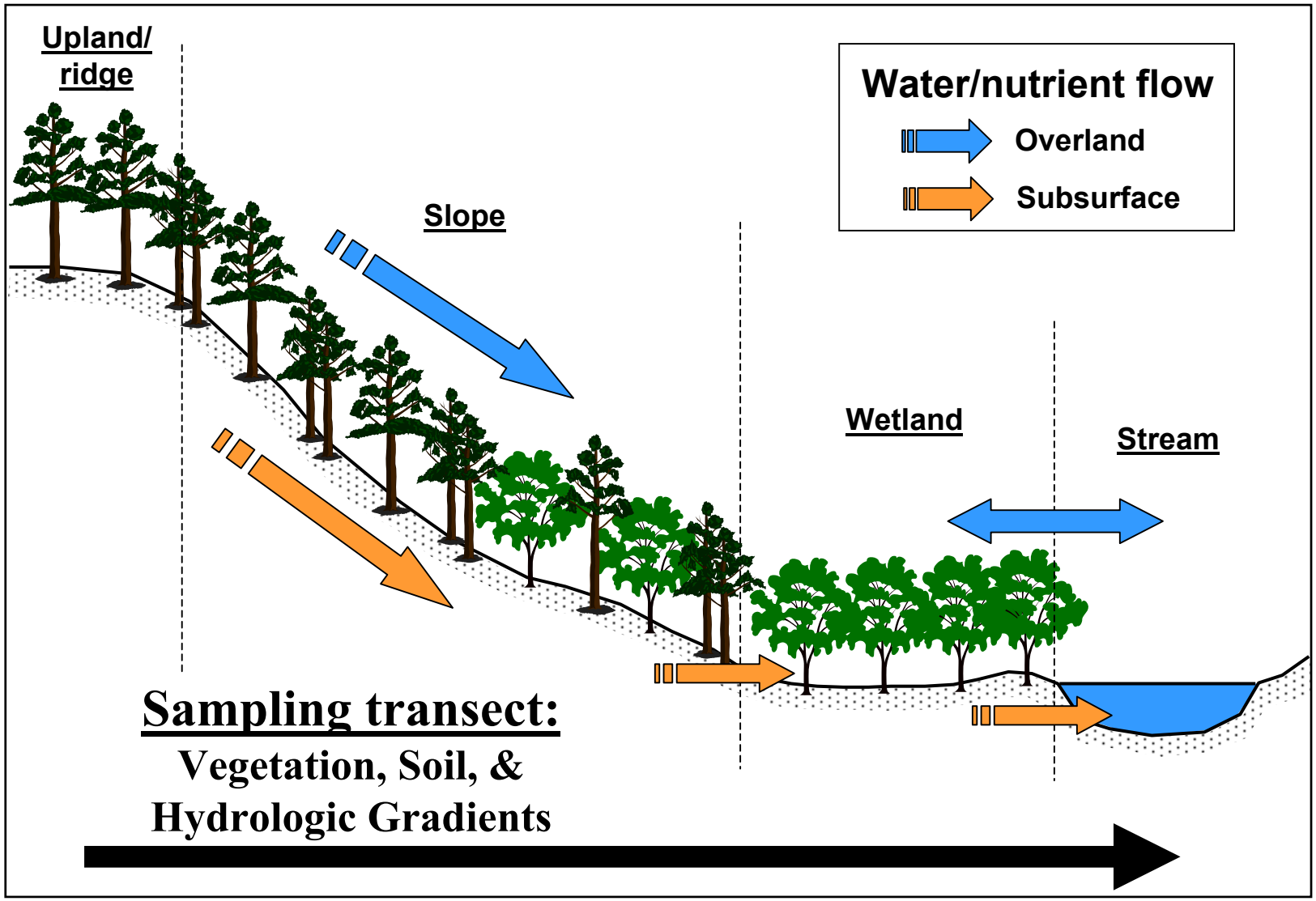
Organization	PI	Title
ornl	Mr. C. Garten, Jr.	Disturbance of Soil Organic Matter and Nitrogen Dynamics: Implications for Soil and Water Quality
The University of Georgia, Savannah River Ecology Laboratory	Dr. B. Collins	Thresholds of Disturbance: Land Mgmt Effects on Vegetation and Nitrogen Dynamics

Criteria for Indicators

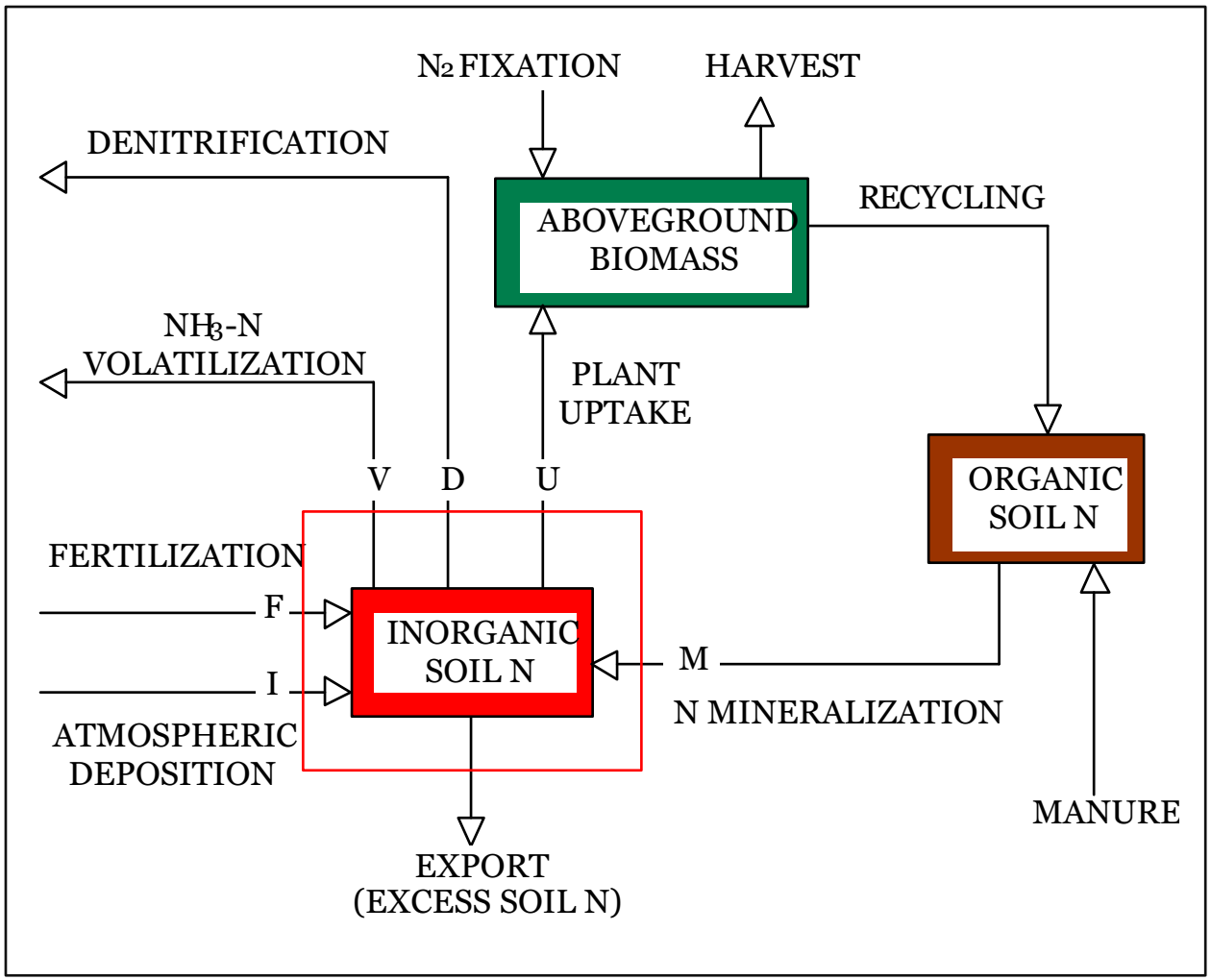
- Are easily measurable
- Are sensitive to stresses of system
- Respond to stress in a predictable manner
- Signify an impending change in key characteristics of the ecological system
- Experience changes that can be averted by management actions
- Together with the full suite of indicators, provide a measure of coverage of the key gradients across the ecological systems (e.g., soils, vegetation types, temperature, etc.)
- Have a known response to natural disturbances and changes over time
- Have low variability in response

Hierarchical Overlap of Suite of Ecological Indicators

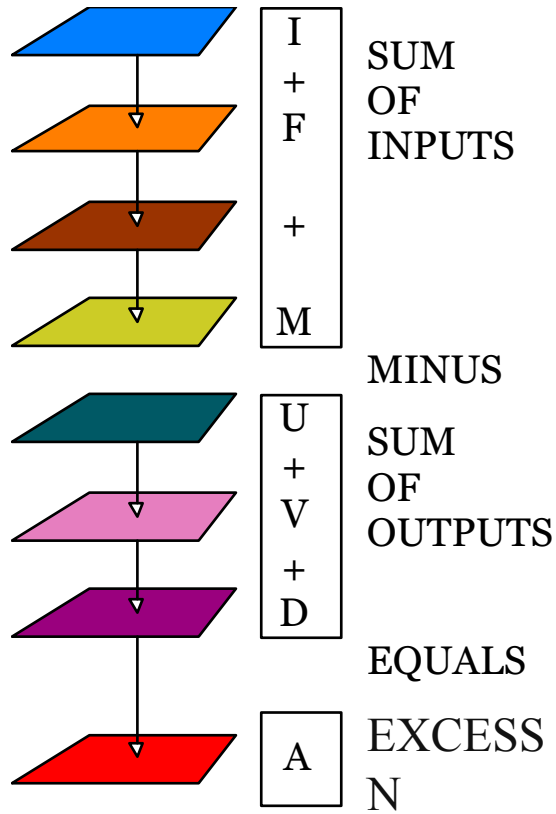



Upland/
ridge
Slope
Wetland
Stream
Water/nutrient flow
Overland
Subsurface
Sampling transect:
Vegetation, Soil, &
Hydrologic Gradients

Field Studies Are Essential Foundation Coupling GIS Tools and Modeling for Analysis of Soil Quality at Multiple Spatial Scales at Fort Benning



GIS Approach to Landscape Based-Mass Balance Nutrient Model



Land Management for Longleaf Pine Savanna

Thinning (9 year cycle)

Burning (3 year cycle)

Monitoring Phases

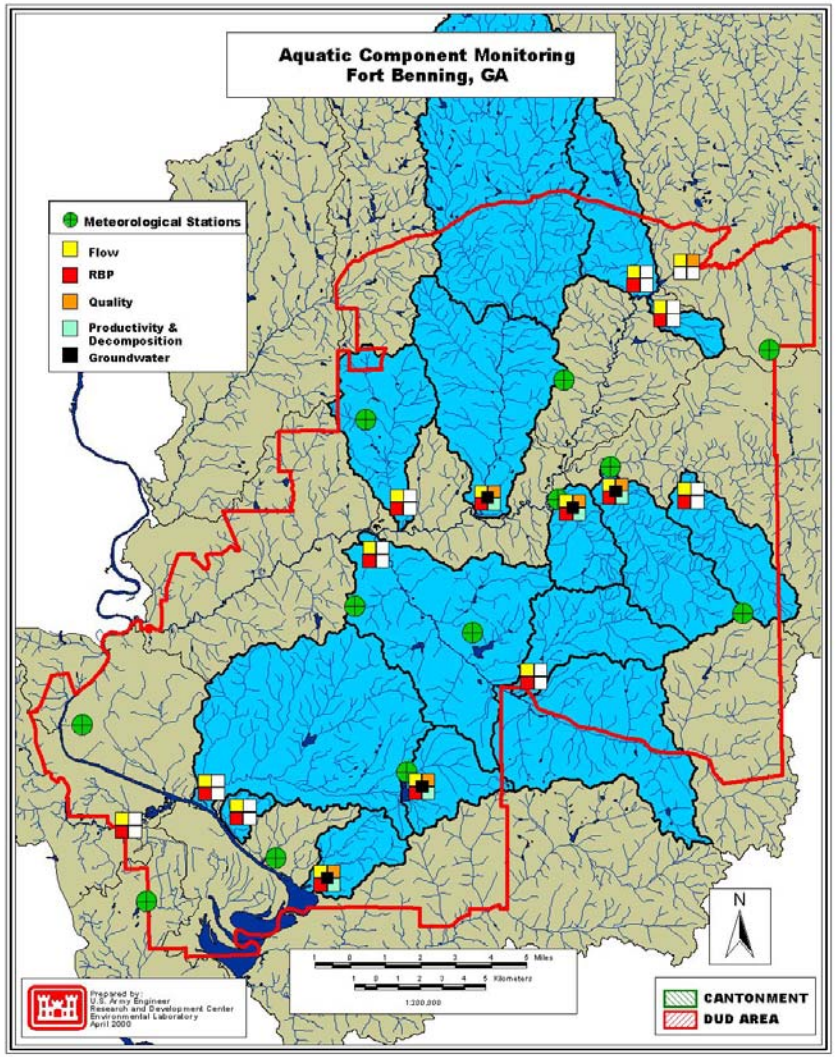
PHASE I 1999 - 2001 **DESIGN**	PHASE II 2002 - 2005 **ADAPT**	PHASE III 2006 - **MAINTAIN**
Extended design, implementation and documentation	Adaptation based on: a) initial monitoring results b) SEMP research results c) land management experience	Long-term maintenance and technology upgrades

Key Properties and Processes

- Those for which fundamental understanding is required to ensure goals of sustainability can be met
  - Hydrologic flux and storage
  - Biological productivity
  - Biogeochemical cycling and storage
  - Decomposition
  - Maintenance of biological diversity

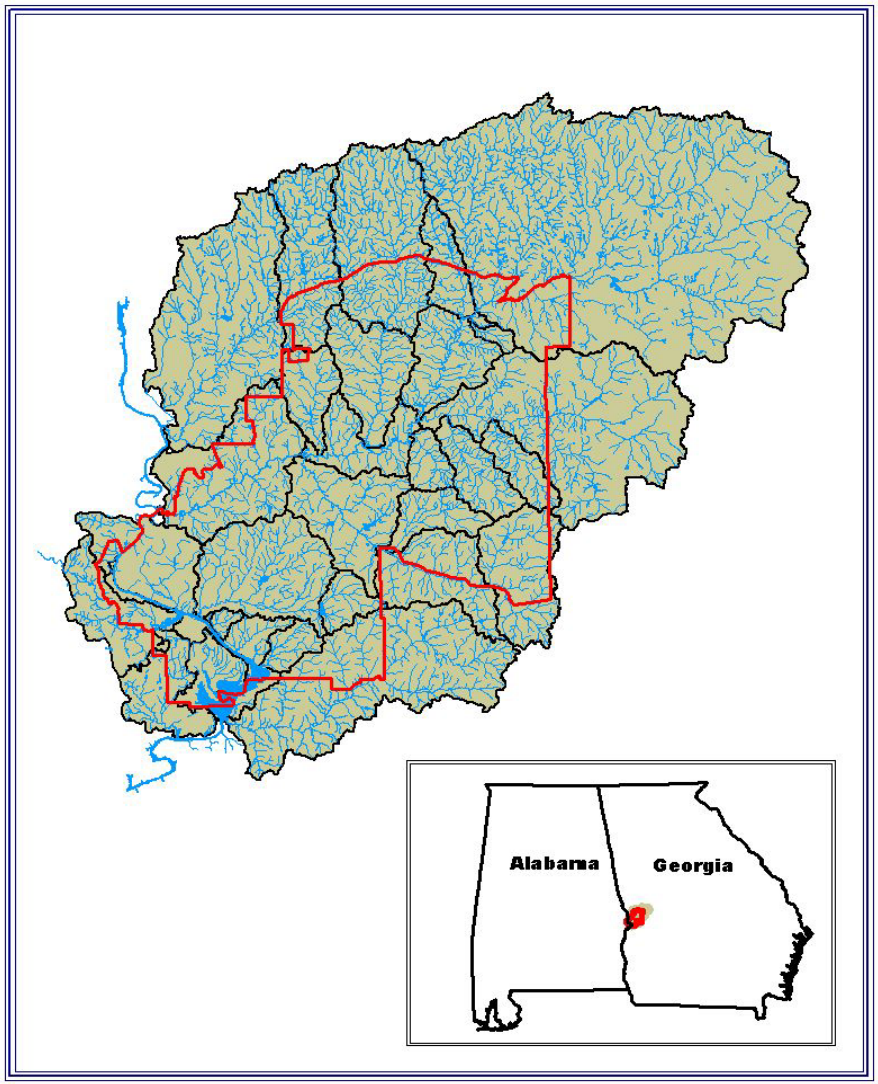
(Christensen, N.L. et. al. 1996. The Report of the Ecological Society of America Committee on the Scientific Basis for Ecosystem Management. Ecological Applications 6(3):665-691.)

Aquatic Component Status



- **Meteorology**
  - ***-Status:*** 10 stations operational
- **Surface flow/quality**
  - ***-Status:*** 2 stations operational; additional sites selected
- **Aquatic macros**
  - ***-Status:*** method, sites selected
- **Aquatic prod/decomp**
  - ***-Status:*** method, sites selected
- **Ground water**
  - ***-Status:*** methods, sites selected

Terrestrial - Remote



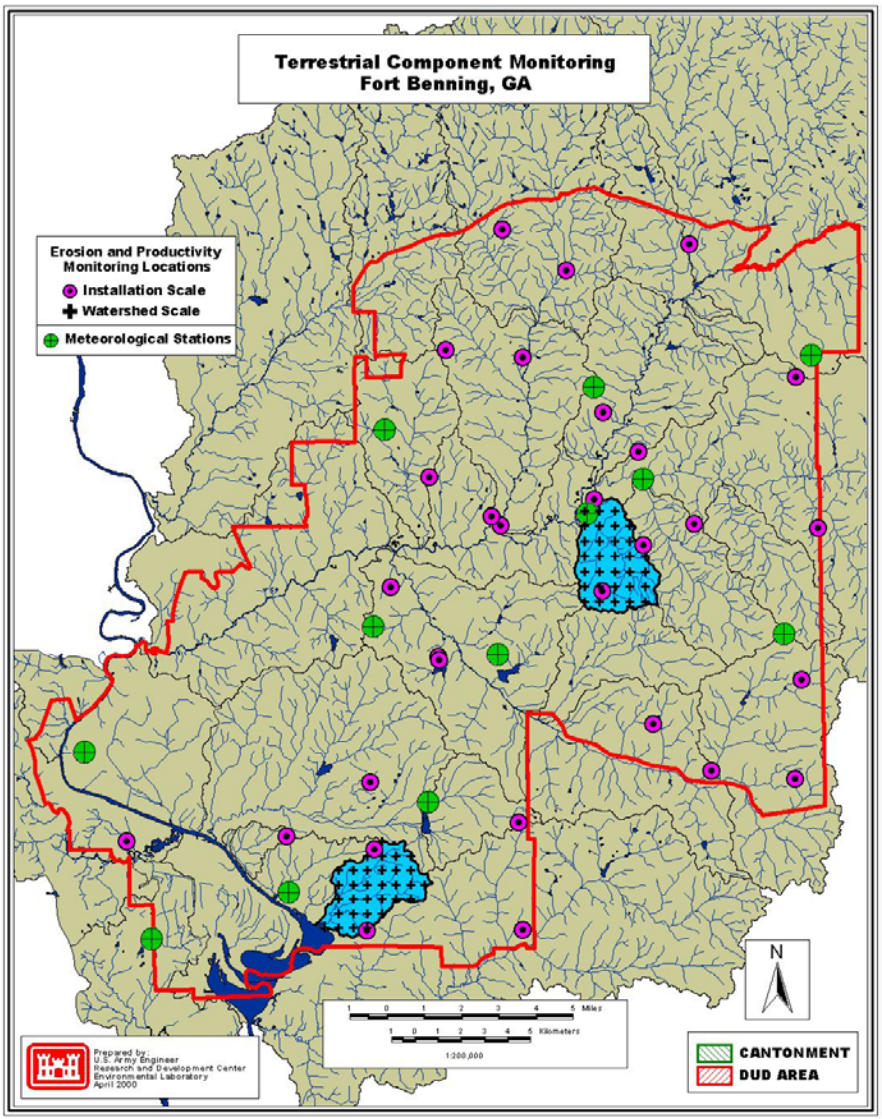
- **NPP** Net primary productivity

  –***Status:*** MODIS data streaming; /calibration by NASA ongoing; product dates TBA

- **LAND COVER** type/pattern/density

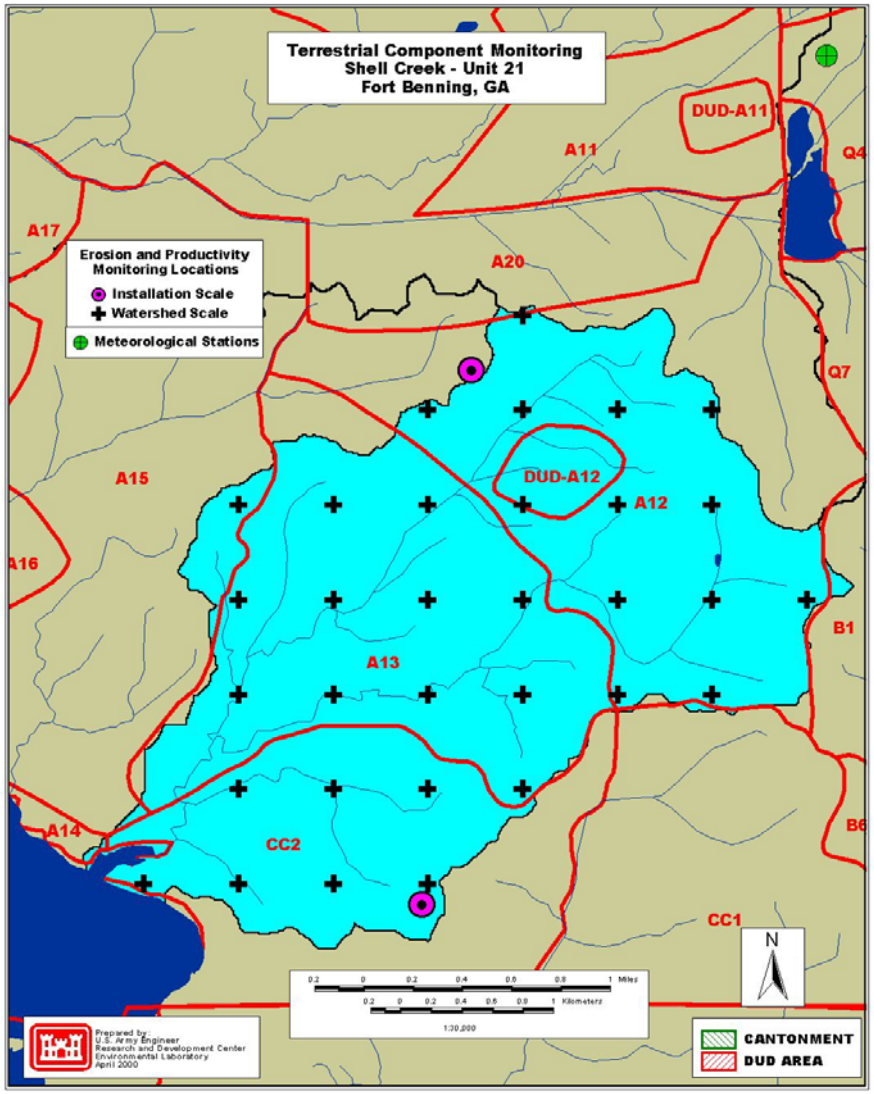
  –***Status:*** ETM +15 acquired; analysis scheduled

Terrestrial - Ground



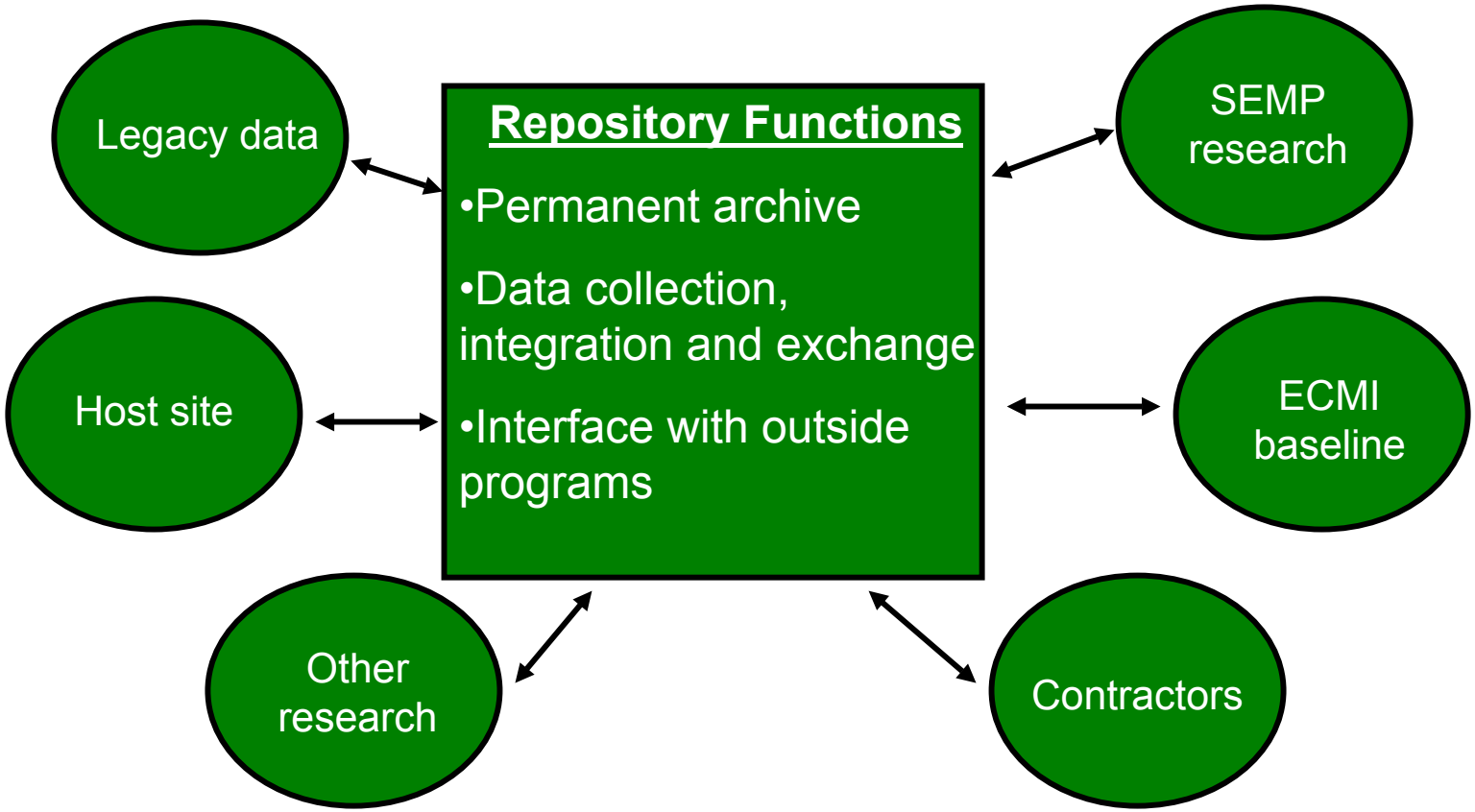
- Erosion/deposition
- Woody productivity
  - –***Status:*** Method and sampling design complete; sites selected

Shell Creek

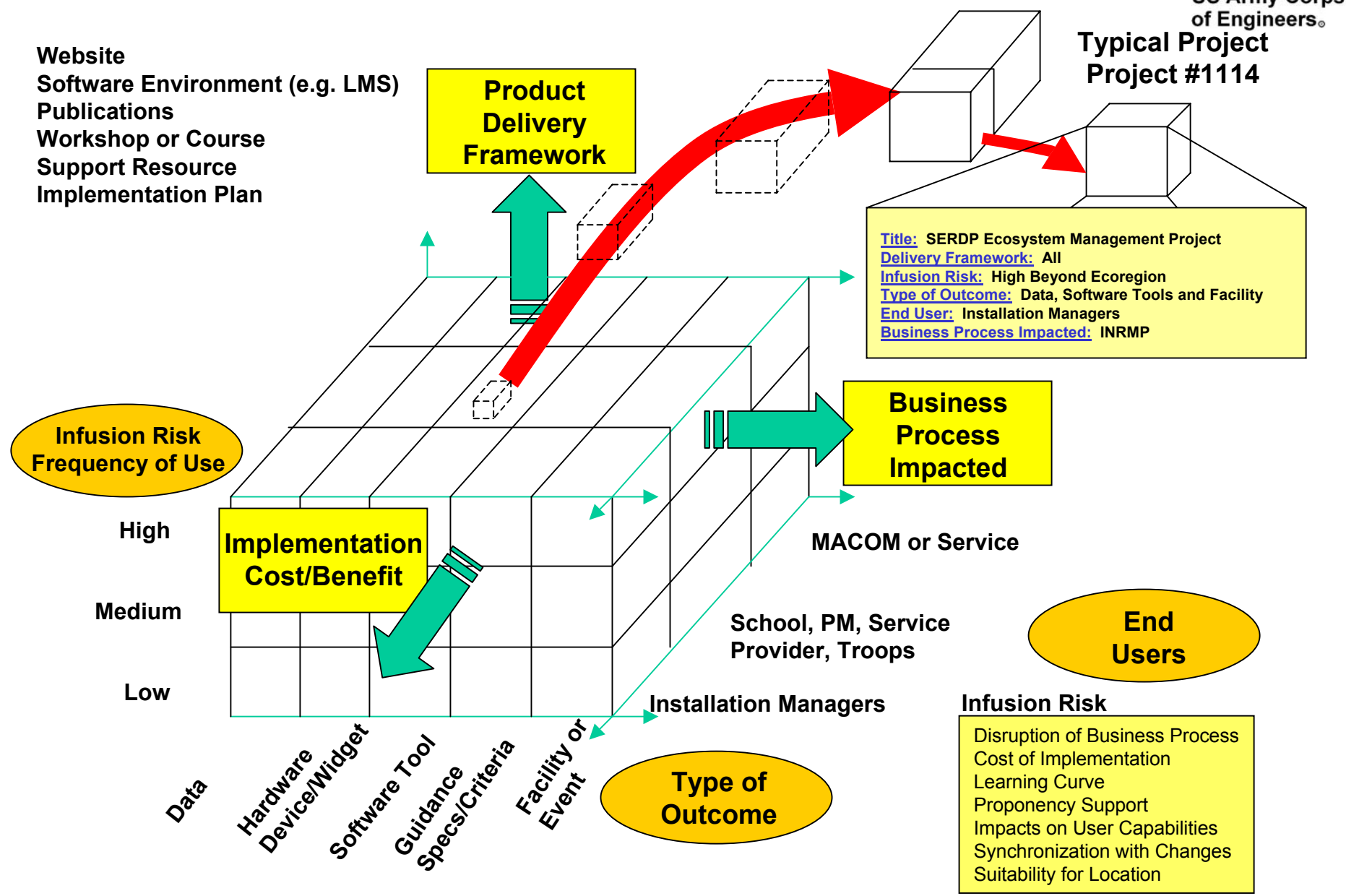


- Erosion/deposition
- Woody productivity
  - co-located sampling
  - systematic sample from random starting point
  - 30 points per watershed
  - also 30 random LCTA plots from those with woody veg

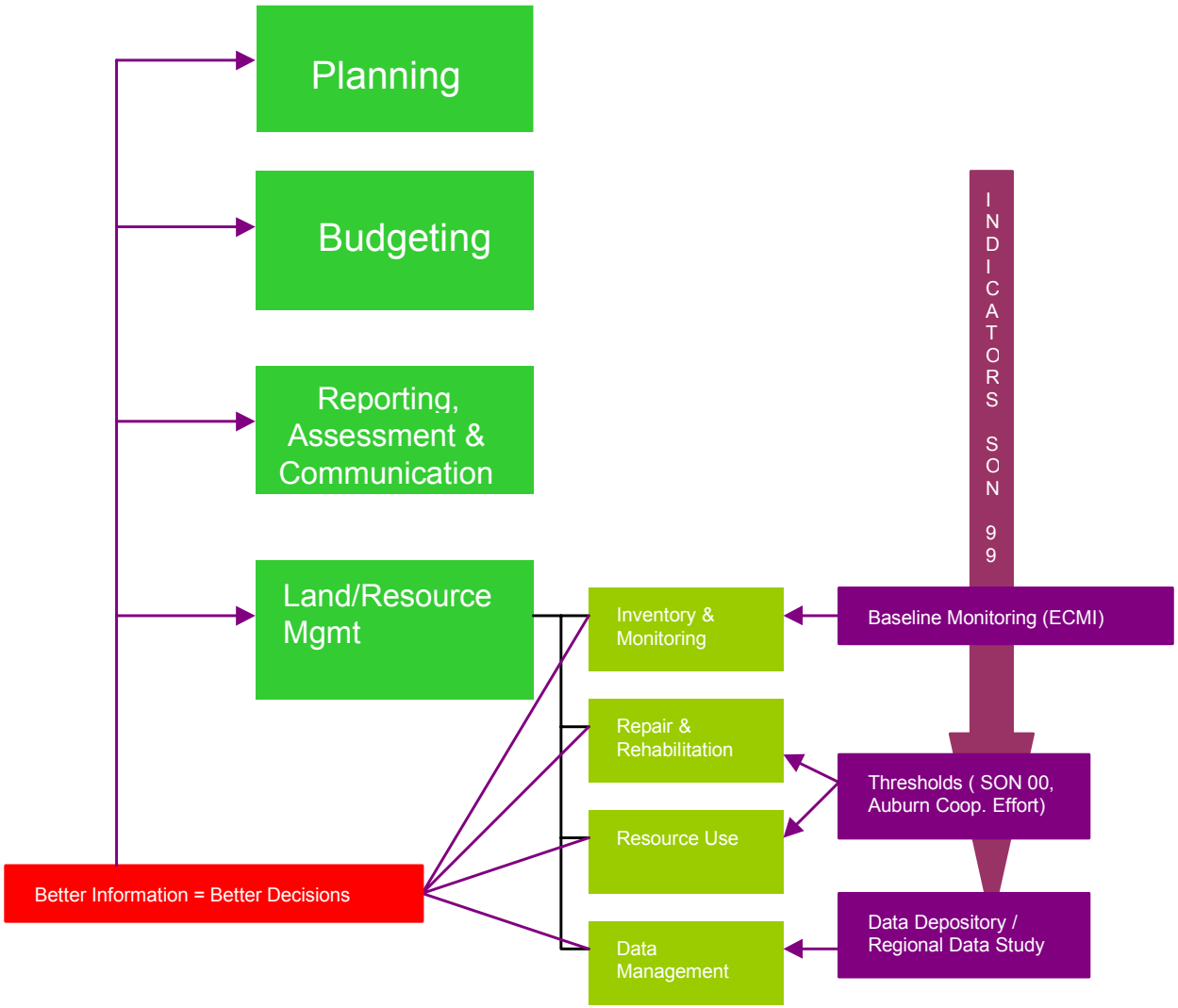
Data Management

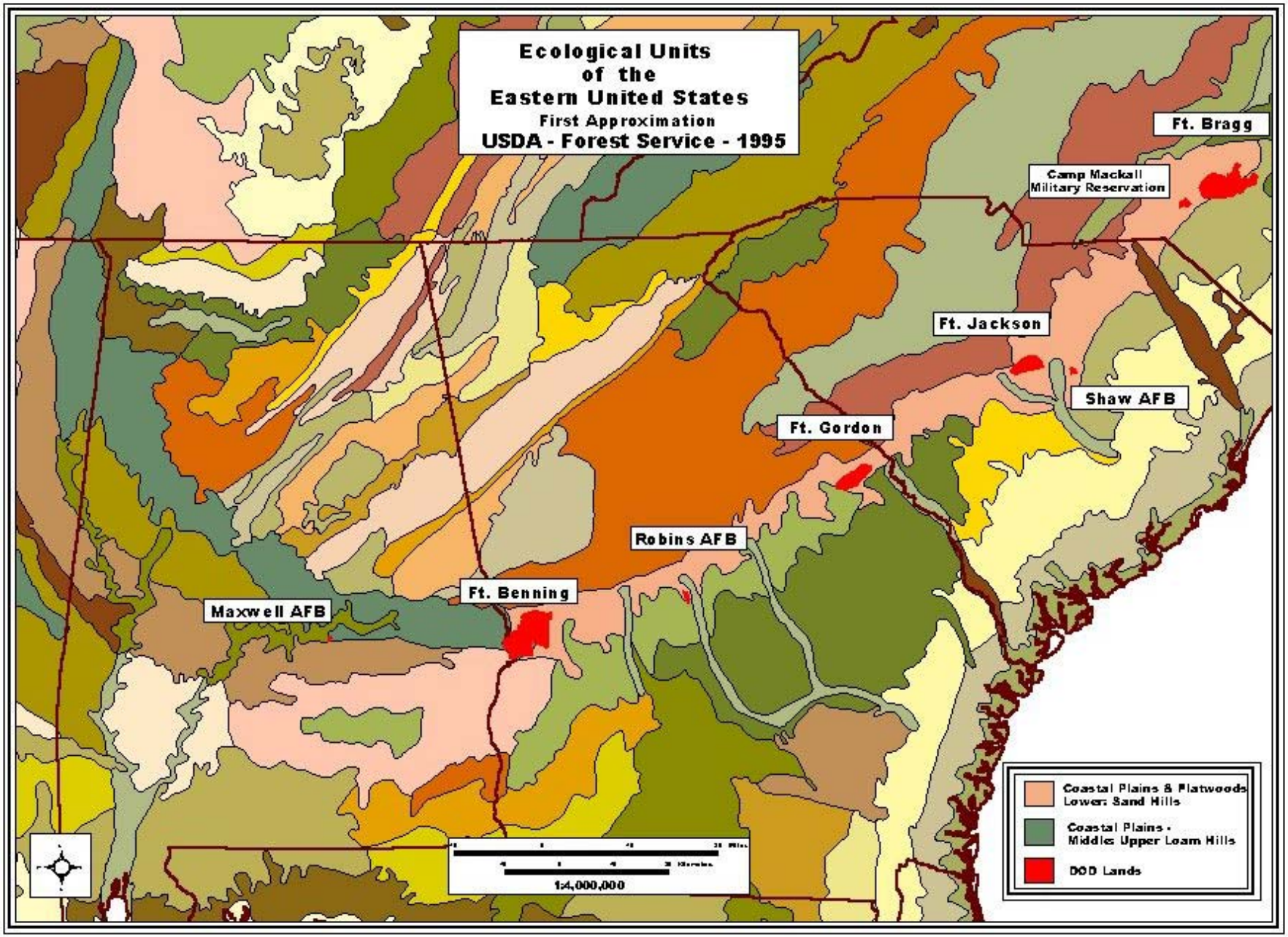


Technology Insertion Criteria

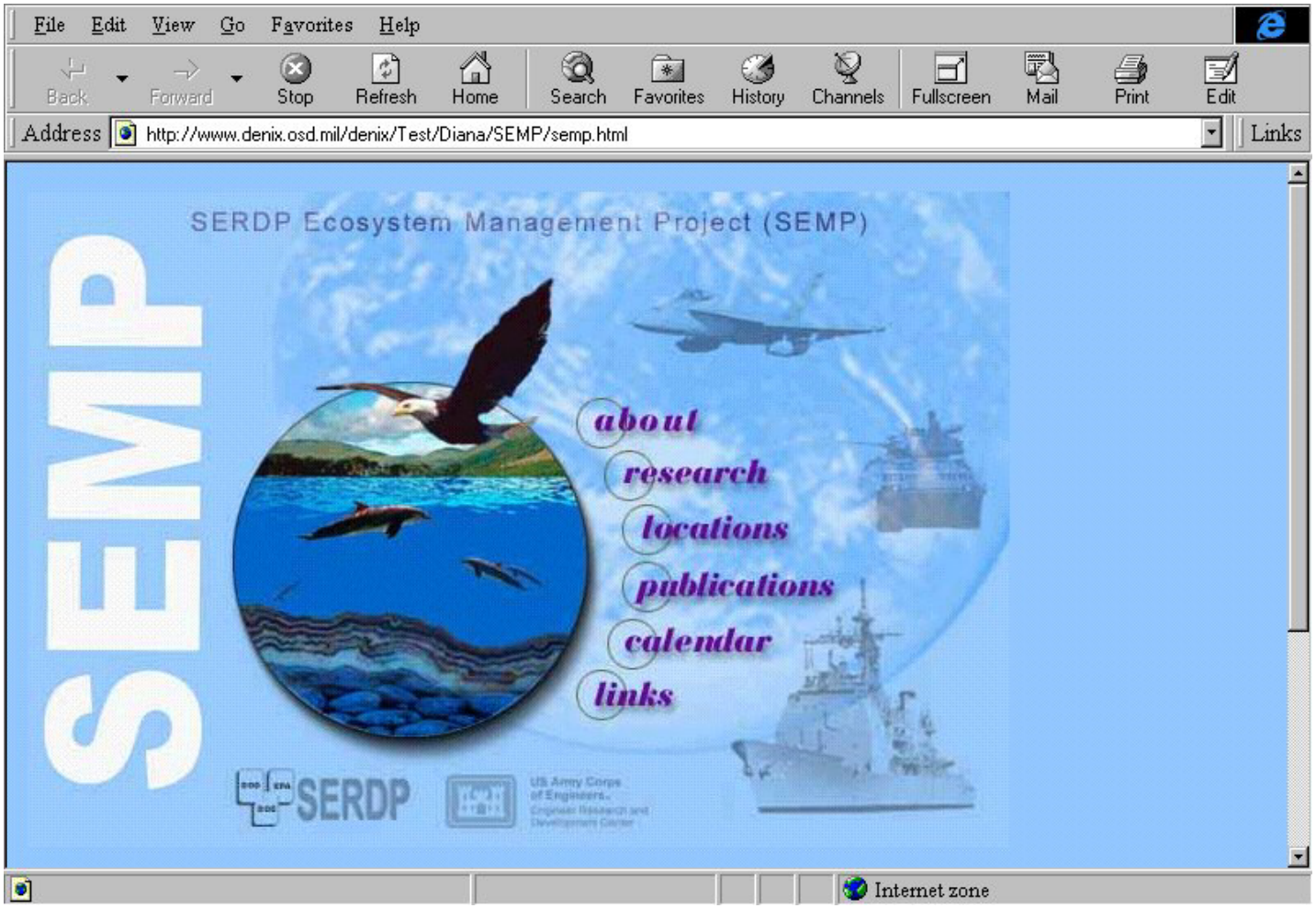


Installation Processes Related to Use and Management of Landscape Resources




Ecological Units
of the
Eastern United States
First Approximation
USDA - Forest Service - 1995
Ft. Bragg
Camp Mackall
Military Reservation
Ft. Jackson
Shaw AFB
Ft. Gordon
Robins AFB
Ft. Benning
Maxwell AFB
1:4,000,000
Coastal Plains & Flatwoods
Lower Sand Hills
Coastal Plains -
Middle Upper Loam Hills
DOD Lands

SEMP Website
http://www.denix.osd.mil/SEMP



Backup Slides

FY2001 Plans for SEMP

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
SAB Briefing					SAB Briefing	TTAWG IPR					
	SON FY02 Announced		SON Pre-proposals		SON Full Proposal	Peer Review Process			TAC SON Review		TAC SON Recommend ations
		TAC Meeting							TAC Meeting		
SEMP Newsletter	Along the Fall Line Ecoregional Planning Session			Research Collaboration Session		SEMP Newsletter	Sharing SEMP Results Workshop				
American Society of Agronomy Presentation/ Session		SERDP ESTCP Symposium			Military Fish and Wildlife Meetings/ Session					Ecological Society of America Meeting/ Session	
		Research Results Reported			Research Results Reported			Research Results Reported			Research Results Reported
		FY00 Annual Report	Repository Plan and Approach			Guidelines for Baseline Monitoring Programs					

- SAB and TTAWG Briefings
- SON Activities
- TAC Activities
- Communication Notes and Workshops
- Scientific Meetings and Exchange
- Research Results Reported
- Publications/Reports

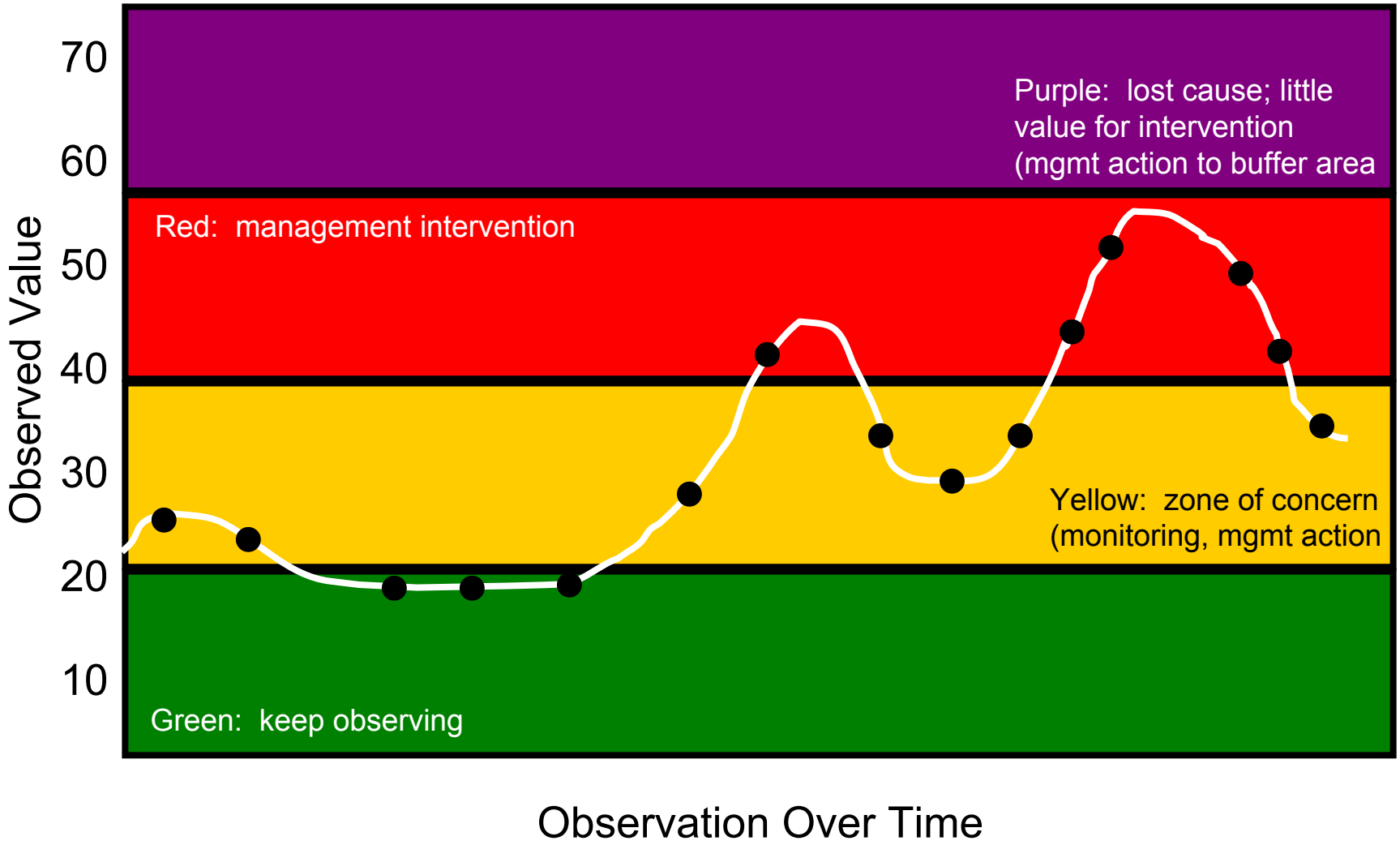
Ecosystem Processes and Properties	ECMI Thematic Monitoring Components	Component Description
Hydrologic flux and storage	Meteorology	Permanent, automated, full feature weather stations
	Surface water flow	Automated recorders; depth and velocity measured, stage-discharge calibrated
	Groundwater	Automated recording shallow wells; level only
Biological productivity	Net primary productivity	Regional images produced by NASA
	Aquatic productivity	Field measurements of periphyton primary productivity rate and algal food quality index
	Woody productivity	Field measured; rate calculated from dbh, height, crown, species relationships; co-located with erosion/deposition transects
	Vegetation density	Standard vegetation density indices derived from Landsat Thematic Mapper imagery
Biogeochemical cycling and storage	Surface water quality	Automated recorders; temperature, pH, nitrate, turbidity, dissolved oxygen, specific conductivity
	Soil Erosion / deposition	Field measured erosion/deposition rates along permanent transects; co-located with woody productivity plots
Decomposition	Aquatic decomposition	Field measurements of weight loss of submersed litter bags; decomposition rate, litter food quality , litter fragmentation rate
Maintenance of biological diversity	Aquatic macroinvertebrates	EPA standard Rapid Bioassessment Protocol (RBP) for benthic macroinvertebrates
	Land cover type	National Vegetation Classification System formation level land cover map derived from Landsat Thematic Mapper imagery
	Land cover pattern	Fragmentation/spatial pattern metrics calculated from land cover map

Monitoring Design Team

- **ECMI Design Team**
- Dr. Rose Kress, Physical Scientist, ERDC
- Dr. Jean O'Neil, Ecologist,ERDC
- Dr. Dave Price, Ecologist, ERDC
- Dr. Dave Tazik, Ecologist, ERDC
- Dr. George Gertner, Biometrician, Univ. of Illinois
- **Coordination & Review**
- Peer Review Group
- SEMP TAC/SAB
- SEMP Researchers
- Fort Benning Staff

- **Consultants**
- Dr. Jim Gosz, LTER Program Coordinator, University of New Mexico
- Dr. Dave Coleman, LTER Site Coordinator, Coweeta Hydrologic Laboratory
- Dr. Dale Magoun, Statistician, University of Louisiana
- Dr. Tony Krzysik, Ecologist, ERDC, CERL

Management Thresholds



Research Team

- **Suresh Rao**, Purdue University, Subsurface hydrology, modeling
- **Jennifer Jacobs**, University of Florida, Surface hydrology
- **Wendy Graham**, University of Florida, Subsurface hydrology, spatio-temporal modeling
- **Bill DeBusk**, University of Florida, Project Coordinator, Soil biogeochemistry
- **Ramesh Reddy**, University of Florida, Soil biogeochemistry
- **Andy Ogram**, University of Florida, Soil microbiology
- **Debbie Miller**, University of Florida, Vegetation ecology, habitat integrity, biodiversity
- **George Tanner**, University of Florida, Vegetation ecology, habitat integrity

Research Team

- John M. Emlen, U.S. Geological Survey -- Theoretical Ecology
- D. Carl Freeman, Wayne State University -- Plant Ecology and Physiology
- John H. Graham, Berry College -- Population Genetics
- David A. Kovacic, University of Illinois -- Ecosystem Ecology
- Lawson M. Smith, U.S. Army ERDC, Geotechnical Lab -- Geomorphology/Geology
- John C. Zak, Texas Tech University -- Soil and Microbial Ecology
- Harold Balbach, U.S. Army ERDC, Plant Ecology

Research Team

- Virginia Dale, Environmental Sciences Division, Oak Ridge National Laboratory — Landscape ecology
- Suzanne Beyeler, Institute for Environmental Studies, Miami University, Ohio — Terrestrial indicators
- Thomas Foster, Anthropology Department, Pennsylvania State University — Historical land cover
- Patrick Mulholland, Environmental Sciences Division, Oak Ridge National Laboratory — Aquatic ecology
- Jack Feminella and Ken Gray, Department of Zoology, Auburn University — Macroinvertebrates
- David White and Sarah McNaughton, Center for Environmental Technology, University of Tennessee — Soil microbiology
- Teresa Davo, Fort Benning — Current monitoring programs, technology transfer
- John Hall, The Nature Conservancy — Liaison between science and management, technology transfer

Research Team

- T. Ashwood, Oak Ridge National Lab -- GIS
- B. Lu, Oak Ridge National Lab -- Lab Technician

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Savannah River Ecology Laboratory

US Army Corps of Engineers

Research Team

- T. Hinton, Savannah River Ecology Lab (SREL) -- Radioecology
- R. Sharitz, SREL -- Plant Ecology
- J. McArthur, SREL -- Microbial Ecology
- C. Romanek, SREL -- Geochemistry
- J. Seaman, SREL -- Soil Chemistry
- M. Cadenasso, Institute of Ecosystem Studies (IES) -- Landscape-level Disturbance Consequences
- D. Imm, U.S. Forest Service Sav. River Institute (SRI) -- Botany
- P. White, University of North Carolina -- Disturbance Ecology