



ERDP's SEMP

Ecosystem Management Project

CS-1114/7

William D. Goran

Rose Kress

**U.S. Army Engineer Research
and Development Center (ERDC)**

Conservation IPR

April 2000



**US Army Corps
of Engineers.**

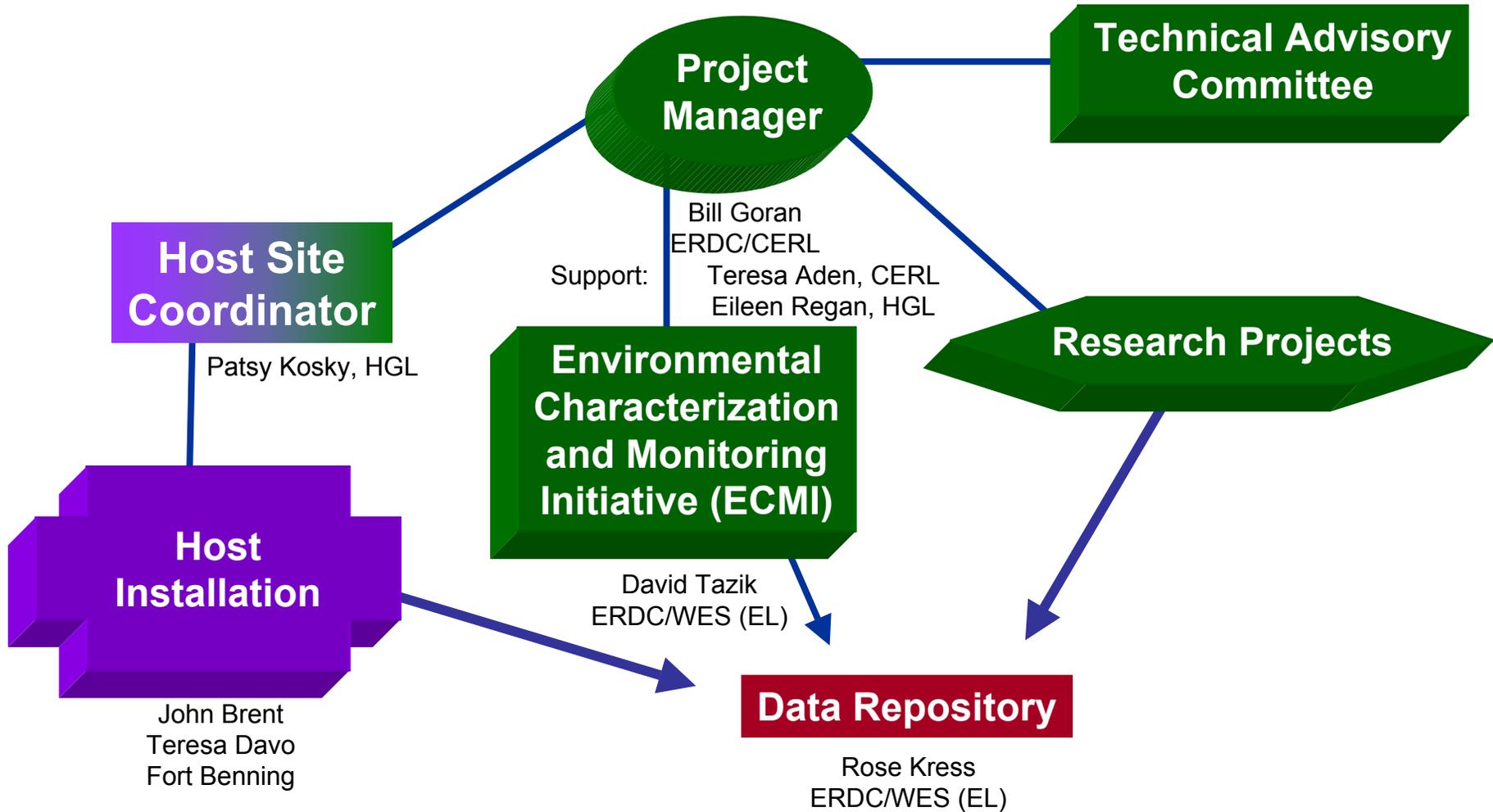
Outline

- SEMP Objectives and Organization
- SEMP Framework
- Status of Activities
 - Research
 - Monitoring
 - Repository
 - FY00 milestones
- 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



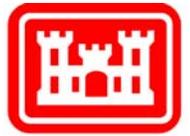
- Dr. Mary Barber, Ecological Society of America, SAB Member
- Mr. Peter Boice, Director of Conservation Programs, Deputy Undersecretary for Defense, Environmental Security, TTAWG Member
- Dr. Roger Dahlman, Program Manager, U.S. Department of Energy, TTAWG Member
- Dr. Mark Fenn, U.S. Department of 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

Action Items

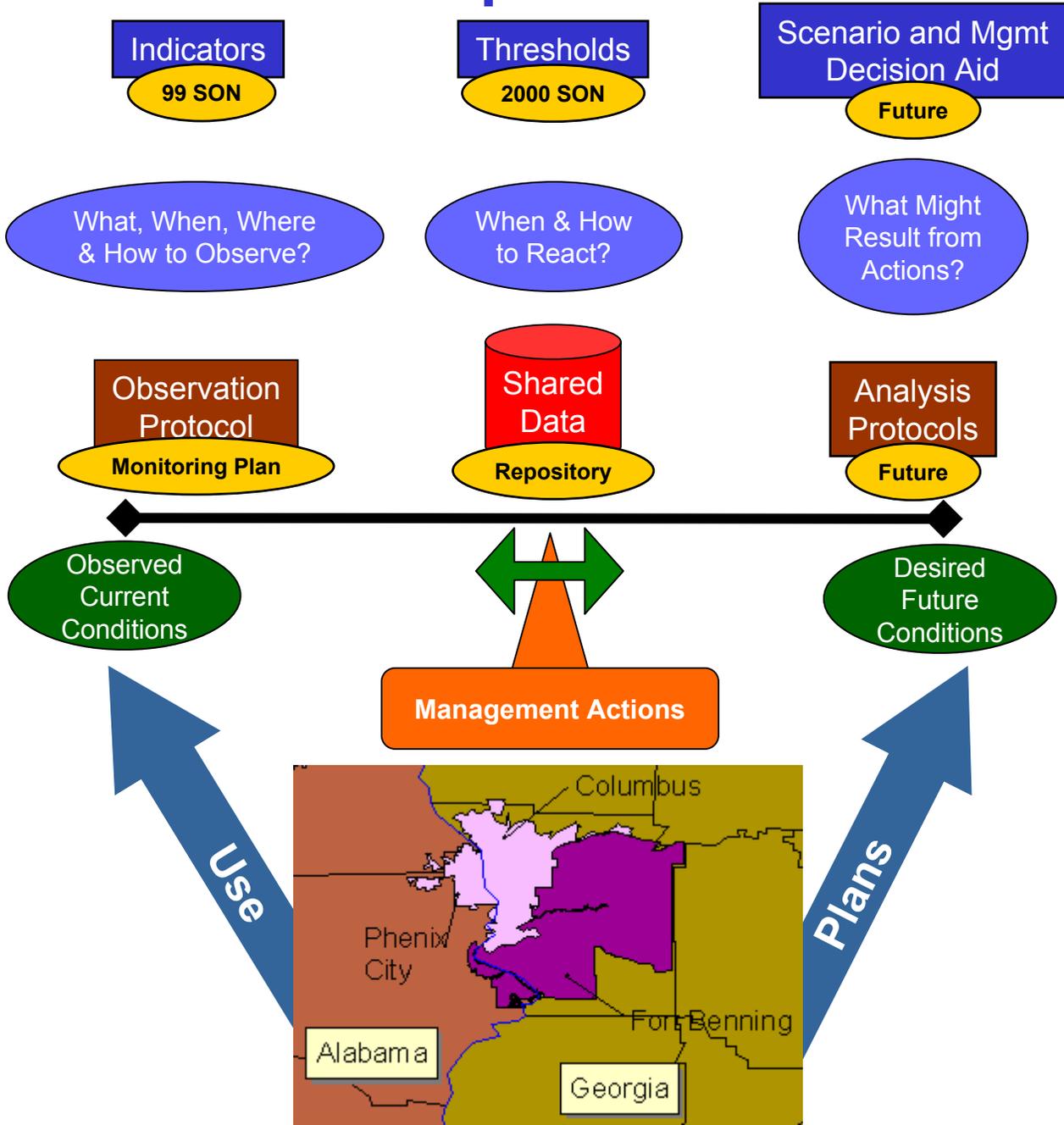


- Provide more details on monitoring and research in order to evaluate and provide recommendations. Also address technical objective, approach, risks, milestones, payoffs, and outyear plans
- Provide a summary of TAC recommendations on new starts, monitoring, and outyear plans. Provide SEMP recommendations on TAC proposed changes
- Identify monitoring variables and their relationship to ecosystem management process and properties. Also identify monitoring variables not selected and rationale
- Address how monitoring data points/data to be collected relate to potential use of data
- Provide details on how monitoring and research projects will coordinate their activities and provide overall plan of action

SEMP Conceptual Framework



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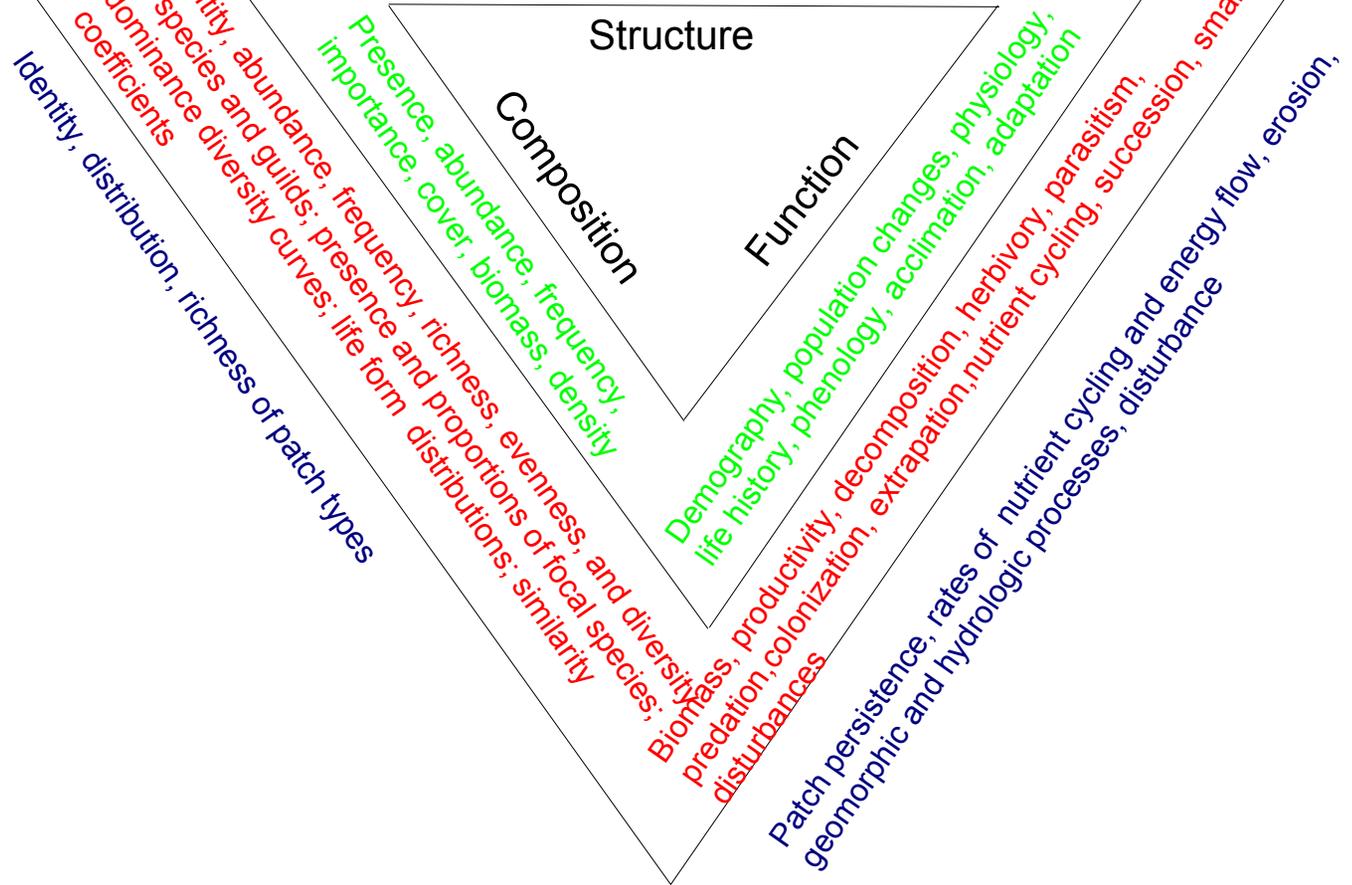
Criteria for Indicators

- 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

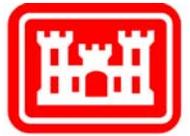
LANDSCAPE /REGION: Spatial heterogeneity; patch size, shape and distribution; fragmentation; connectivity

ECOSYSTEM/COMMUNITY: Substrate and soil conditions, slope, aspect, living and dead biomass, canopy openness, physical features, water, natural resources (e.g., mast), presence and distribution, snow cover

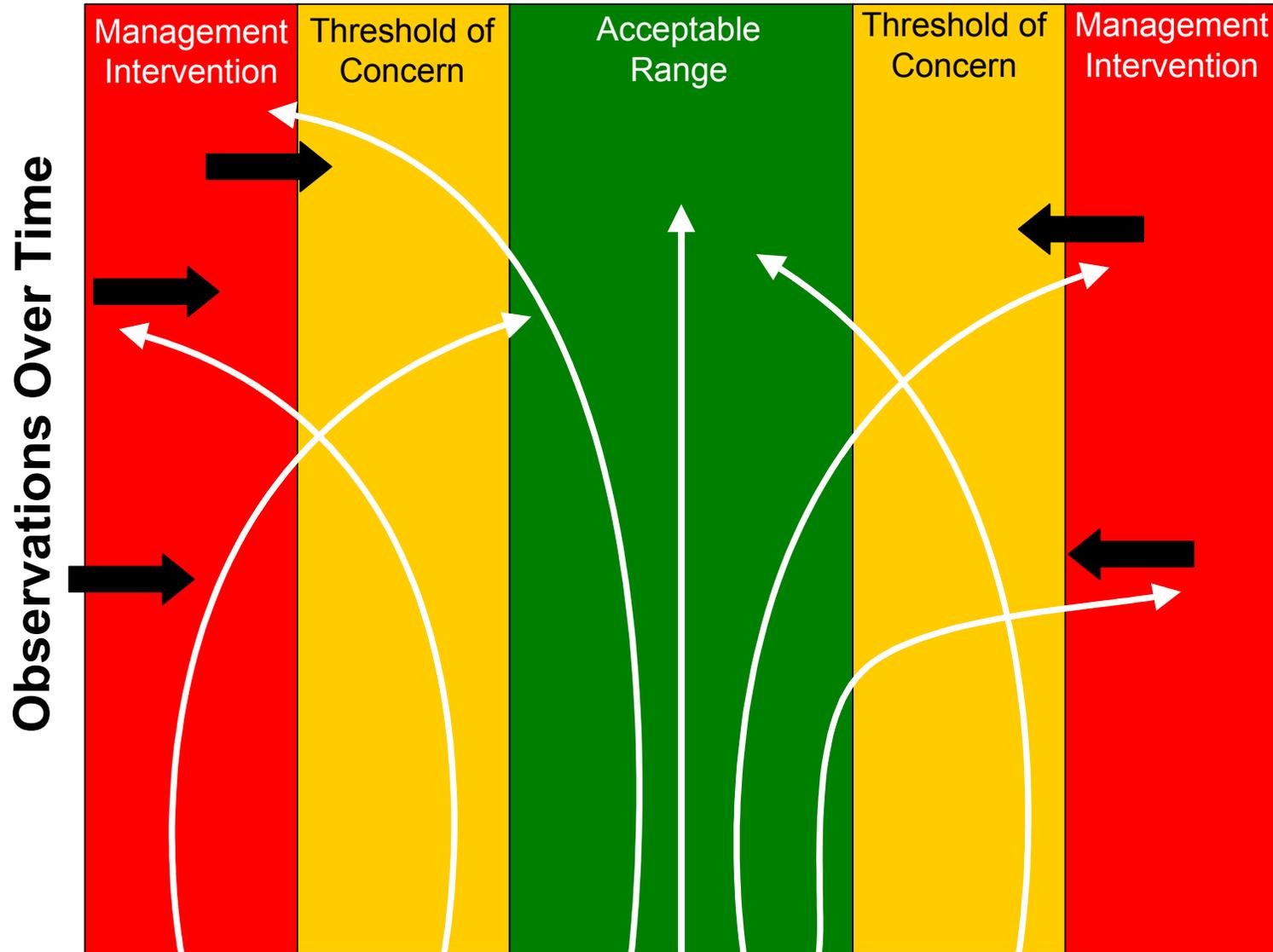
POPULATION/SPECIES: Dispersion, range, population structure, morphological variability



Observed Phenomena



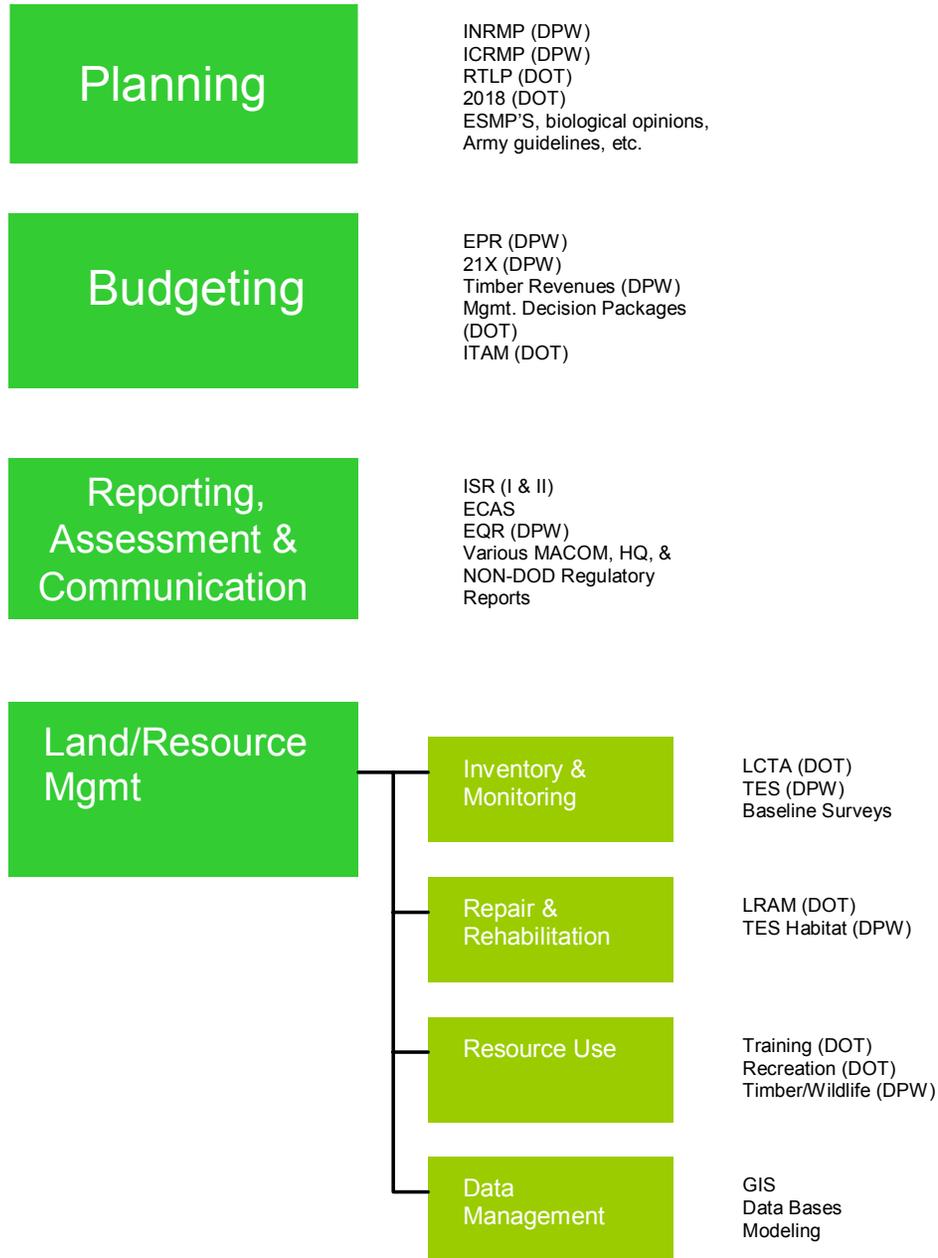
Desired Future Condition



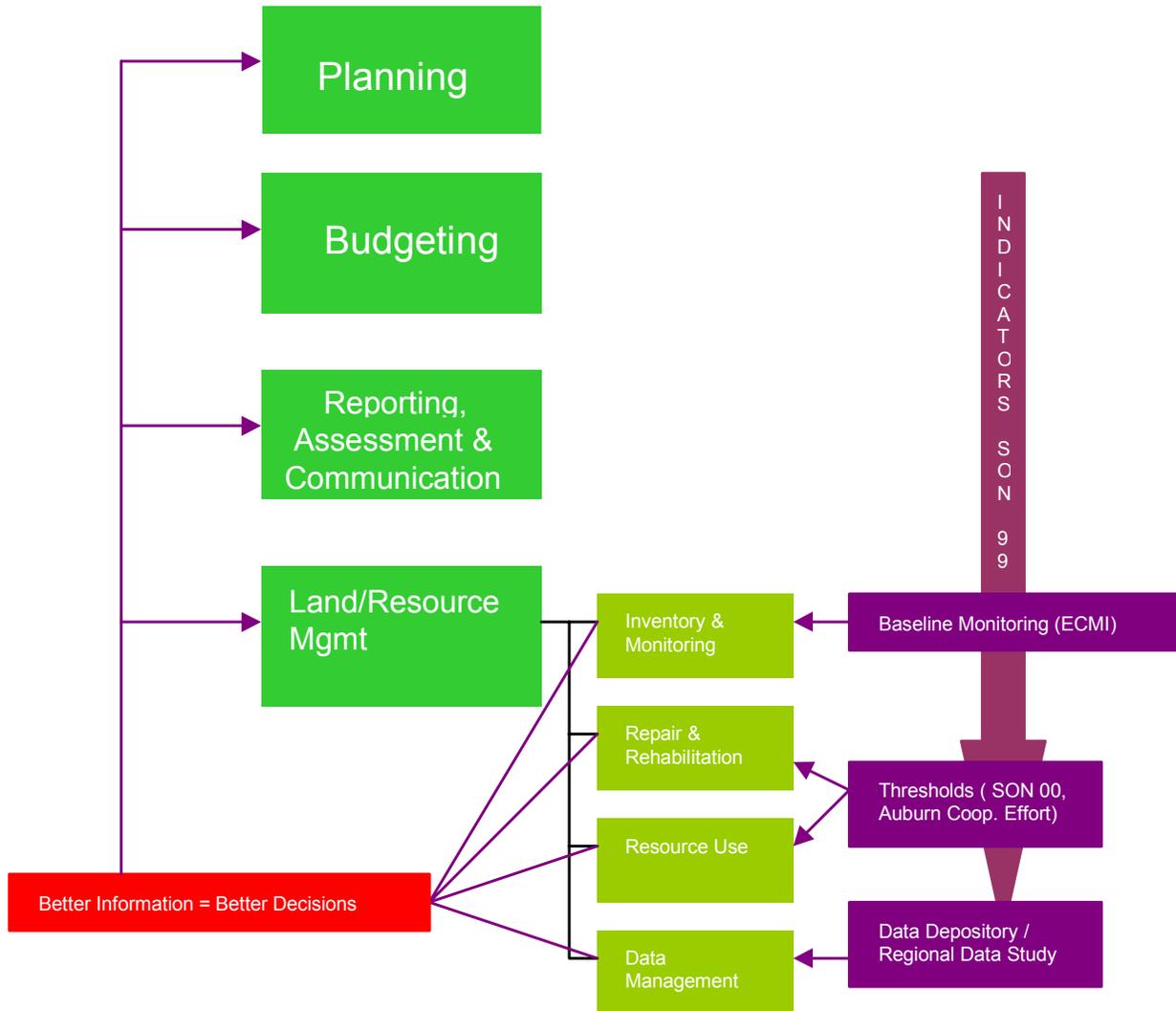
General Processes Across DOT and DPW



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Installation Processes Related to Use and Management of Landscape Resources



SEMP Research Projects



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FY99 Topic -- Change Indicators

<u>Organization</u>	<u>PI</u>	<u>Title</u>
	Dr. V. Dale	Indicators of Ecological Change
	Dr. W. DeBusk	Determination of Indicators of Ecological Change
	Dr. T. Krzysik	Development of Ecological Indicator Guilds for Land Management

FY00 Topic -- Disturbance Thresholds

<u>Organization</u>	<u>PI</u>	<u>Title</u>
	Mr. C. Garten, Jr.	Disturbance of Soil Organic Matter and Nitrogen Dynamics: Implications for Soil and Water Quality
	Dr. B. Collins	Thresholds of Disturbance: Land Mgmt Effects on Vegetation and Nitrogen Dynamics

Determination Of Indicators Of Ecological Change: Ft. Benning, GA (CS-1114A-99)

- Lead PI: Dr. William DeBusk, University of Florida
- Technical Objectives:
 - Identify physical, chemical and biological variables (properties and processes) associated with soil, surface/subsurface hydrology and vegetation that may be used as indicators of ecological change
 - Evaluate potential ecological indicators based on sensitivity, selectivity, ease of measurement and cost effectiveness
- Status
 - Phase I monitoring is being conducted within 6 watersheds of order 3 or 4, corresponding to ECMI monitoring units.

Spatio-temporal change

- Intrinsic/natural factors
- Extrinsic/anthropogenic factors



Ecological Indicators

Hydrologic

Soil

Vegetation

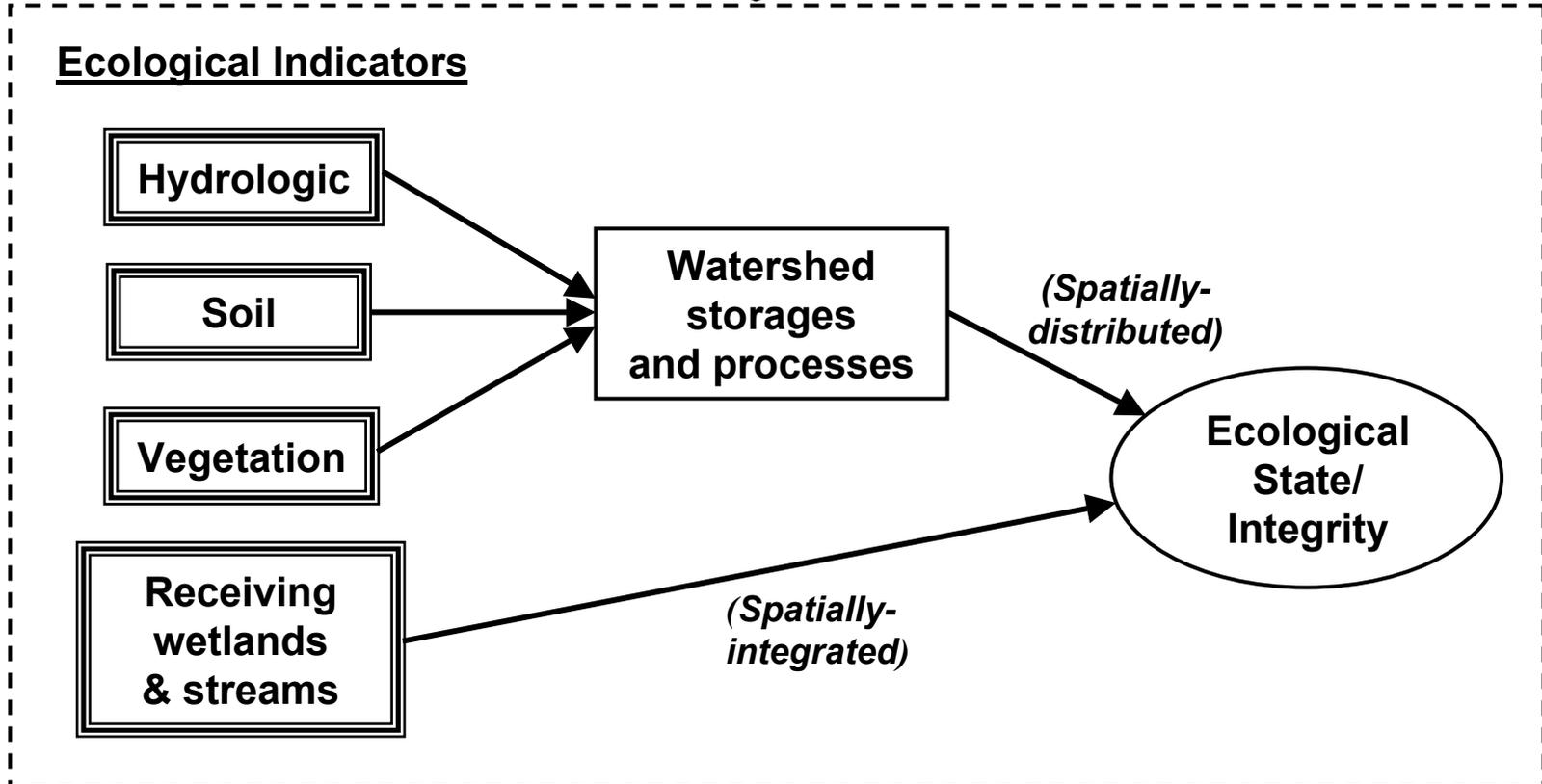
Receiving
wetlands
& streams

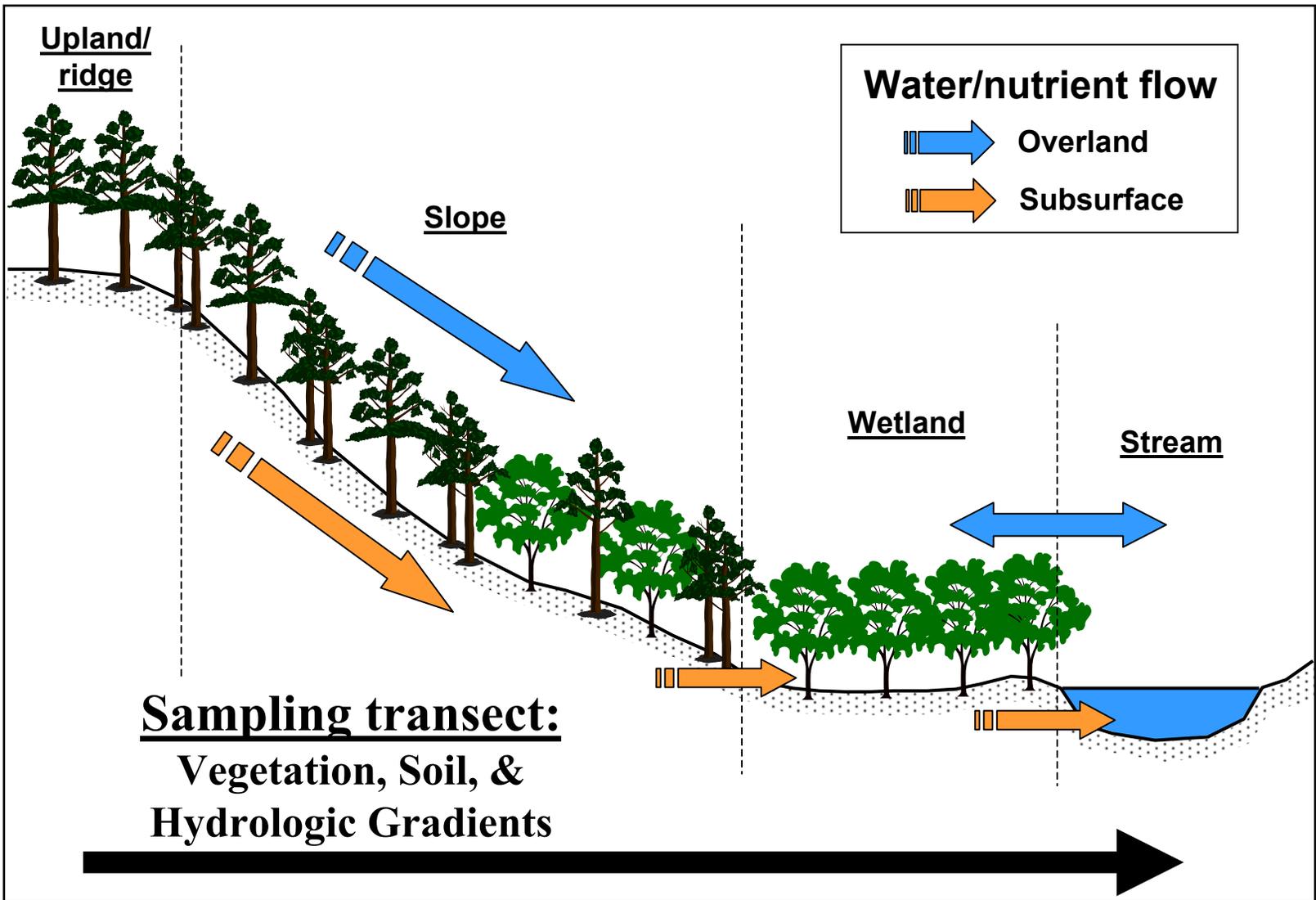
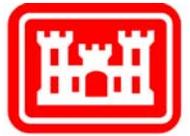
Watershed
storages
and processes

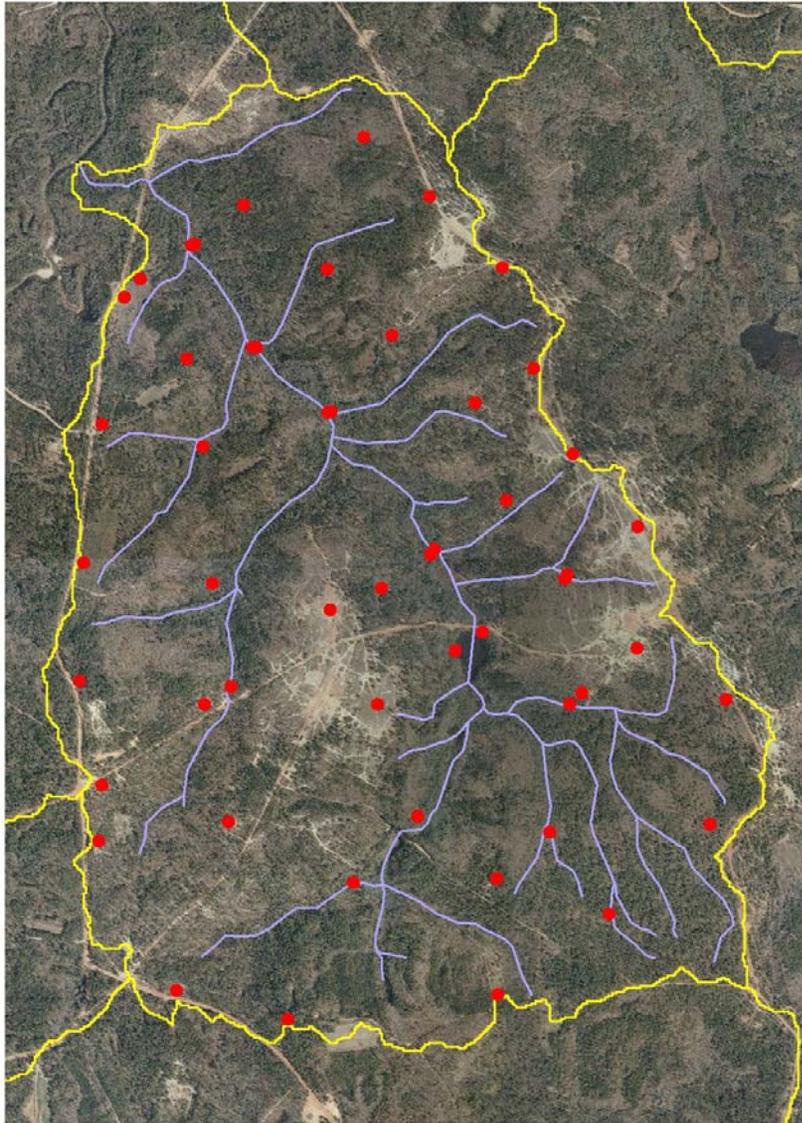
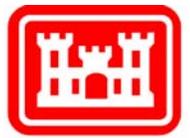
*(Spatially-
distributed)*

Ecological
State/
Integrity

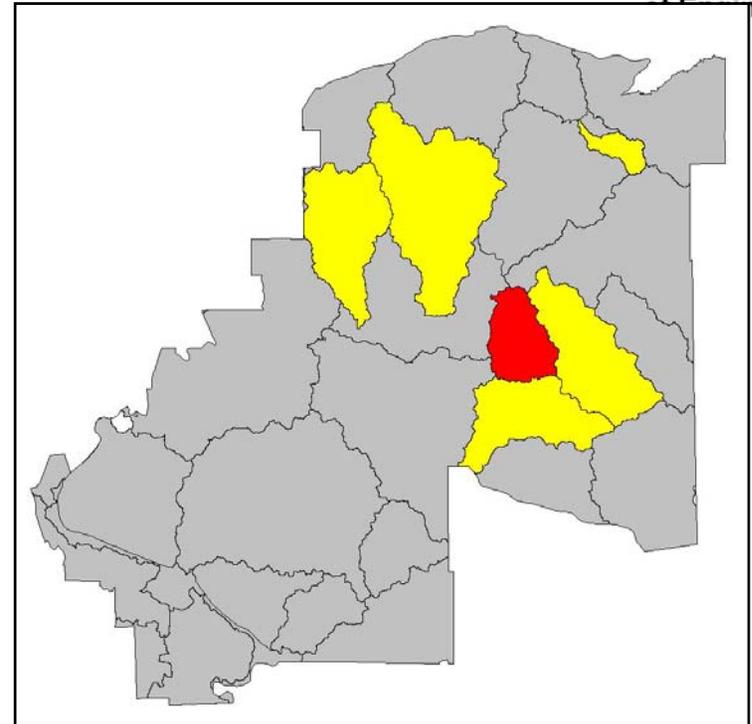
*(Spatially-
integrated)*





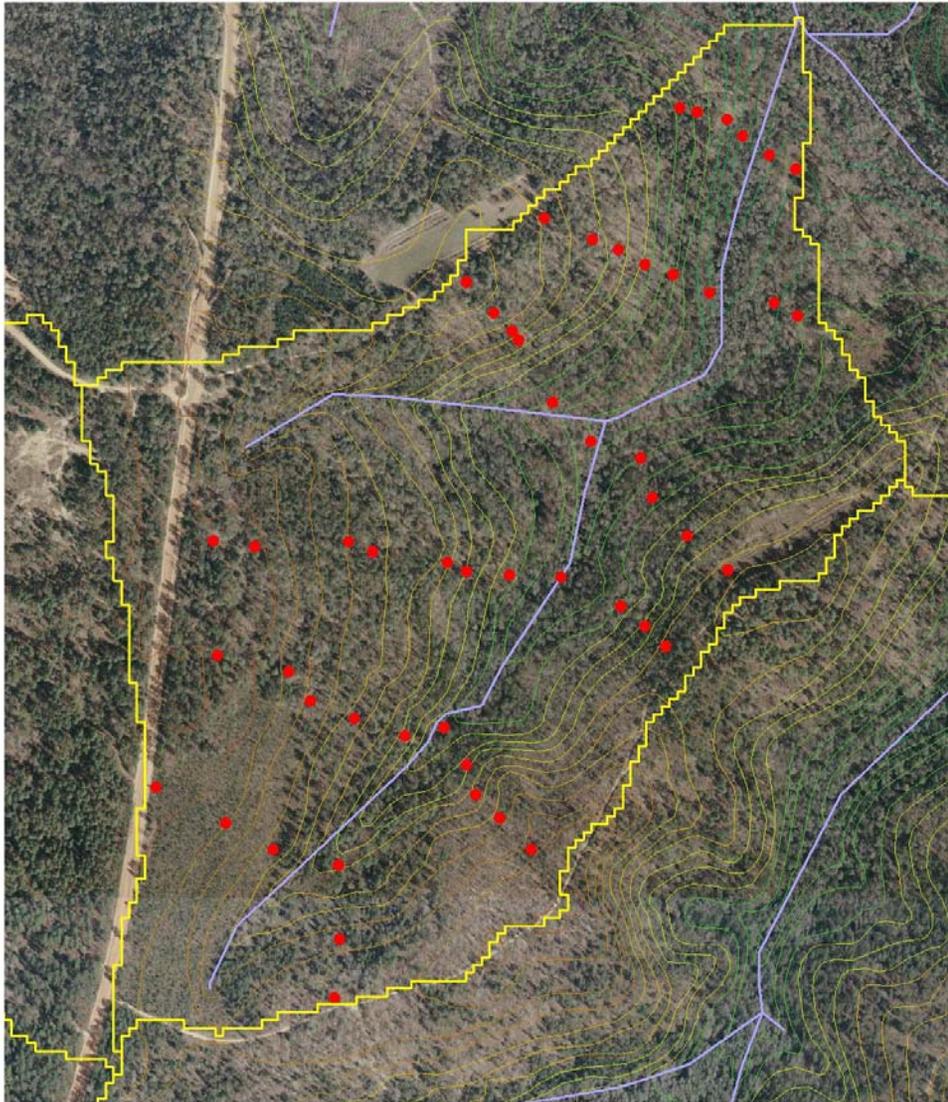


0 0.5 1 1.5 2 Kilometers



Phase I Sampling

**Bonham Creek Watershed
ECMI Monitoring Unit 11**



0 200 400 600 800 Meters

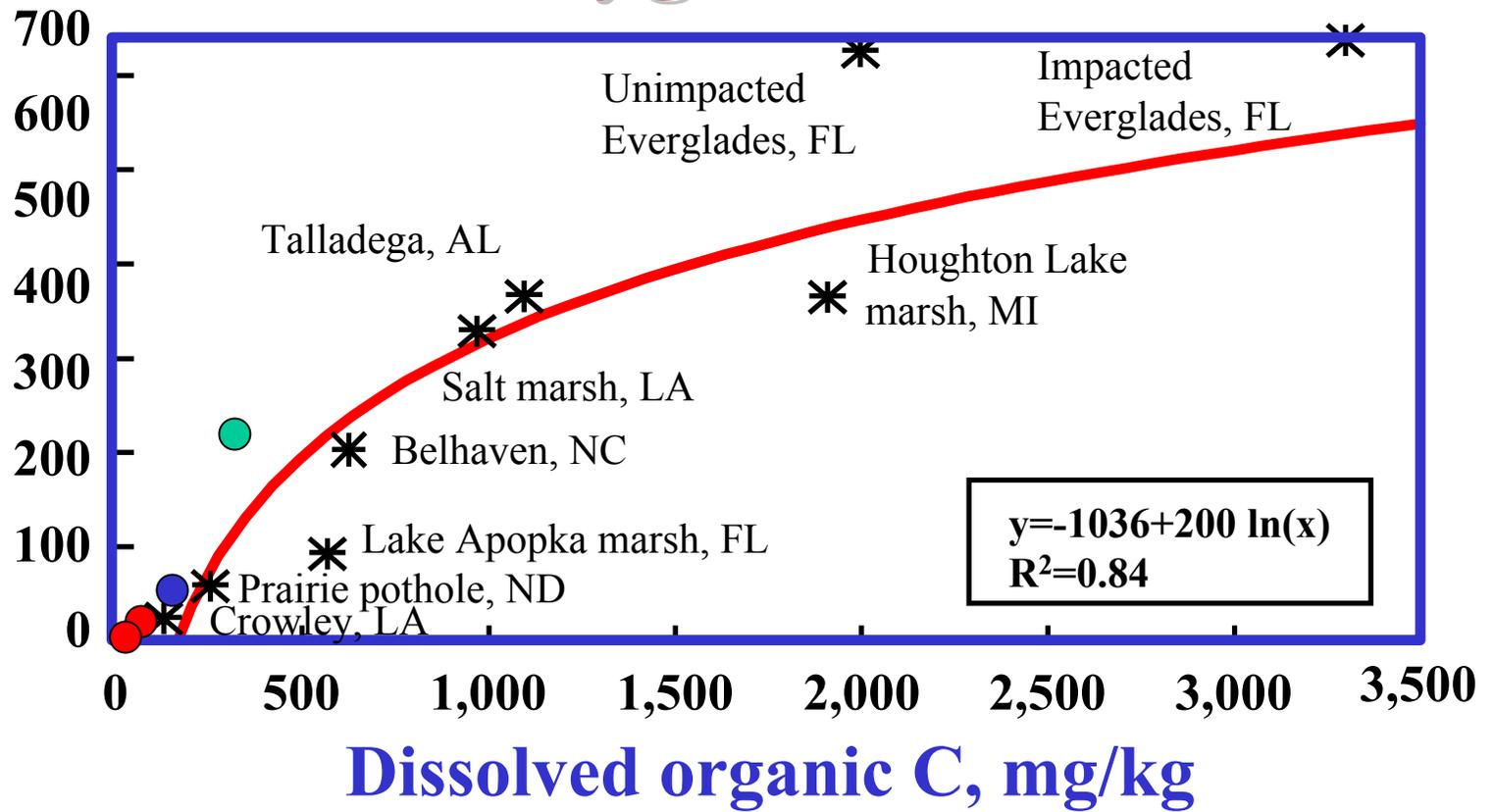


Phase II Sampling

**Low-impact,
2nd order watershed
Bonham Creek**

Soil Oxygen Demand

Oxygen consumption, mg/kg day

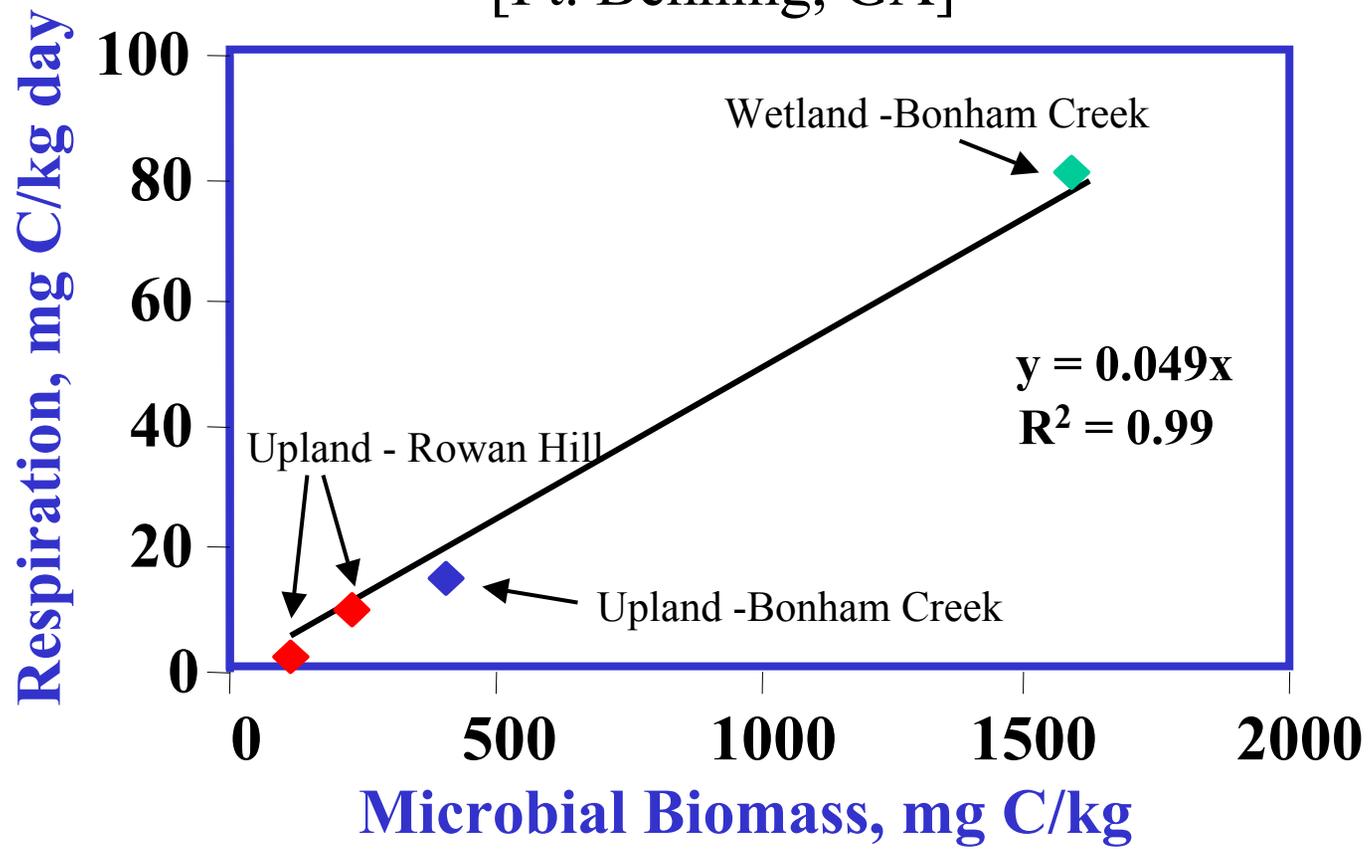


Ft. Benning, GA

- Wetland - Bonham Creek
- Upland - Bonham Creek
- Upland - Rowan Hill

Aerobic Respiration

[Ft. Benning, GA]



Development of Ecological Indicator Guilds for Land Management (CS-1114B-99)

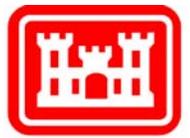


- Lead PI: Dr. Anthony Krzysik, Embry-Riddle University
- Project Management: Dr. Harold Balbach, USAERDC
- Technical Objective:
 - Develop “ecological indicator guilds” based on ecosystem-relevant design criteria and landscape scales, for the purpose of monitoring biological viability, long-term productivity, and ecological sustainability of military training and testing lands
- Status
 - Site “scoping” investigations at Fort Benning
 - Conducted initial pilot study for development instability; result were presented at the August 1999 TAC meeting
 - Teams acquired field data and developed analytical tools
 - Intensive experimental field studies scheduled May 2000

Overview of Concept

- Ten Ecological Indicator Systems (EIs) will be researched, developed, and integrated as a “Guild System” for the purpose of assessing and monitoring ecological changes and thresholds relevant to landuse management decisions
- Nine extant EIs to be used; applicable to different systems and scales
- Tenth “EI” is a synthesis of the first nine working in combination

Ecological Indicators to be Used



1. Developmental Instability
2. Functional Diversity of Microbial Activity
3. Nutrient Flux / Leakage
4. Plant Physiology - Stress Metrics
5. Community Interactions and Integrity
6. Ecological MultiScale Metrics
7. GeoIndicators
8. EcoFunction Groups
9. Indicator Taxa and Communities
10. Integration of EI Systems 1 to 9

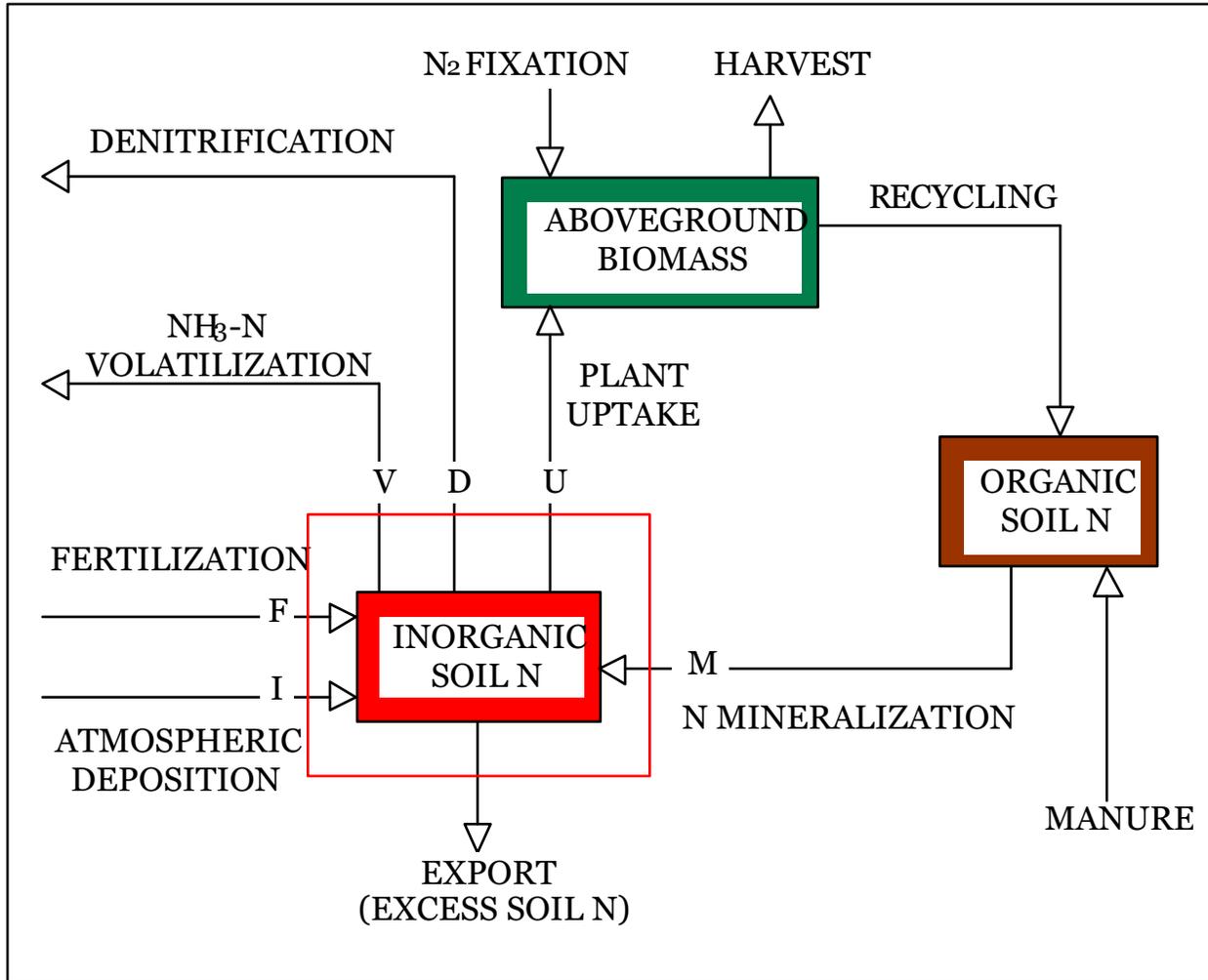
Indicators of Ecological Change (CS-1114C-99)

- Lead PI: Dr. Virginia Dale, Oak Ridge National Lab
- Technical Objective:
 - To identify indicators that signal ecological change in intensely versus lightly used ecological systems
 - To ensure that these indicators are feasible for the installation staff to measure and interpret and thus can become a part of the ongoing monitoring system at the installation
- Status
 - Sites have been selected at Fort Benning for the field tests
 - Criteria for indicators have been developed and a procedure for selecting indicators is well underway
 - Initial field surveys of aquatic organisms, understory vegetation, and soil microbes have been conducted

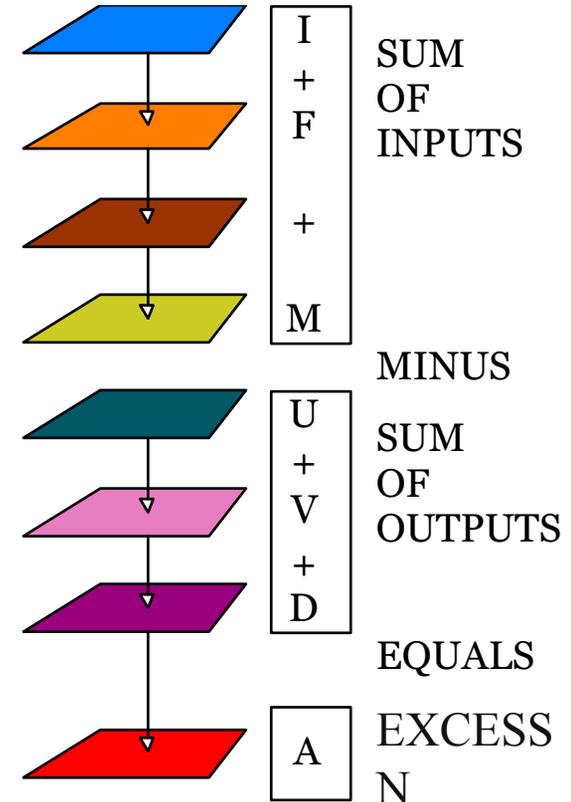
Disturbance of Soil Organic Matter and Nitrogen Dynamics: Implications for Soil and Water Quality (CS-1114D-00)

- Lead PI: Mr. Chuck Garten, Jr., Oak Ridge National Lab
- Technical Objective
 - Characterize the effect of disturbances and land use on key measures of soil quality
 - Determine whether there are thresholds associated with natural and/or anthropogenic disturbance that establish the potential recovery of soil quality on disturbed lands
- Status
 - Sites selected (co-located with LCTA)
 - Field sampling of soils starting March 2000

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



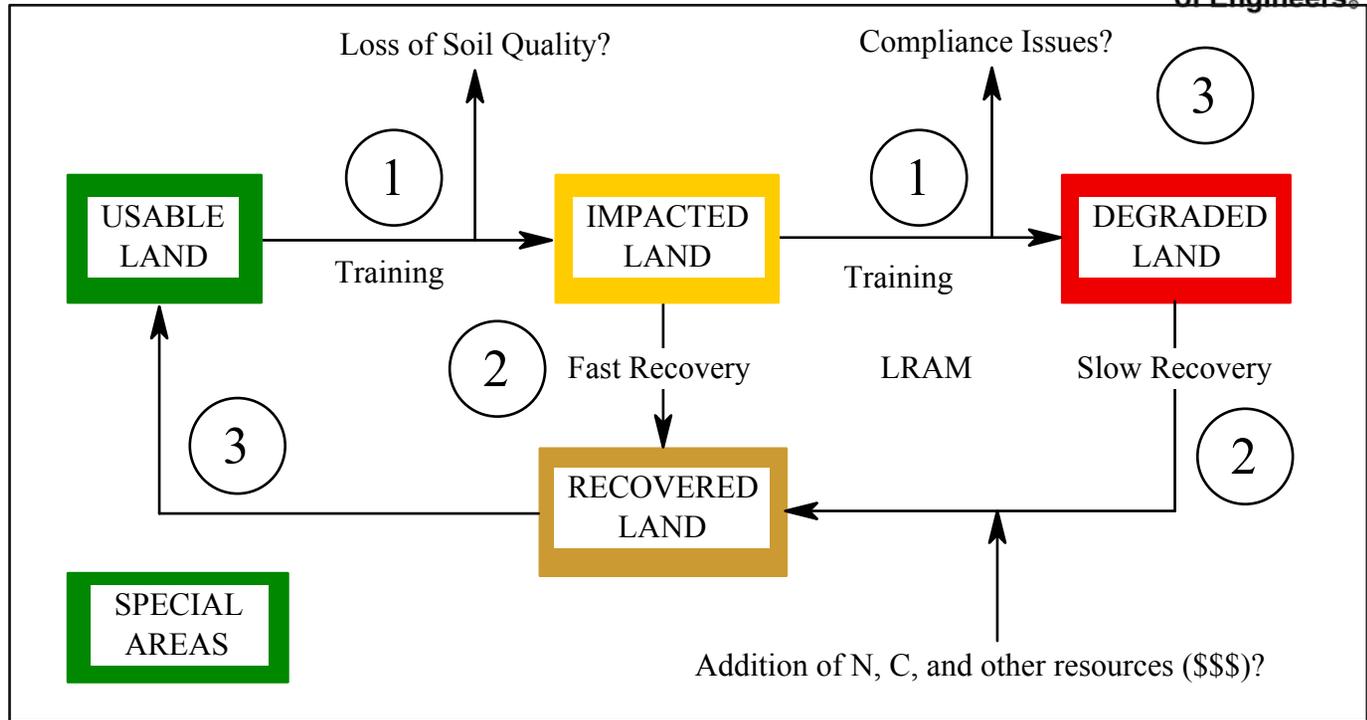
GIS Approach to Landscape Based-Mass Balance Nutrient Model



Vision of Benefits for Military Land Management at Fort Benning

Improving Mission Readiness Through Environmental Research

1 Better understanding of how land use and training intensity affect soil quality as indicated by measures of soil organic matter and nitrogen availability



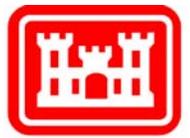
2 Effects of soil disturbance on soil organic matter and nitrogen dynamics and the potential for recovery of soil quality following disturbance (thresholds and rates)

3 Predictive tools for management decisions on how land use may impact soil quality, water quality, the potential for soil C sequestration, and the sustainability of terrestrial ecosystems

Thresholds of Disturbance: Land Management Effects on Vegetation and Nitrogen Dynamics (CS-1114E-00)

- Lead PI: Dr. Beverly Collins, Savannah River Ecology Laboratory
- Technical Objective
 - Evaluate the ecological effects of military training and forest management for longleaf pine, to determine if there are thresholds beyond which upland ecosystems cannot sustain the combined effects of thinning, burning and military traffic disturbances
- Status
 - FY00 new start; funds received in March

Land Management for Longleaf Pine Savanna



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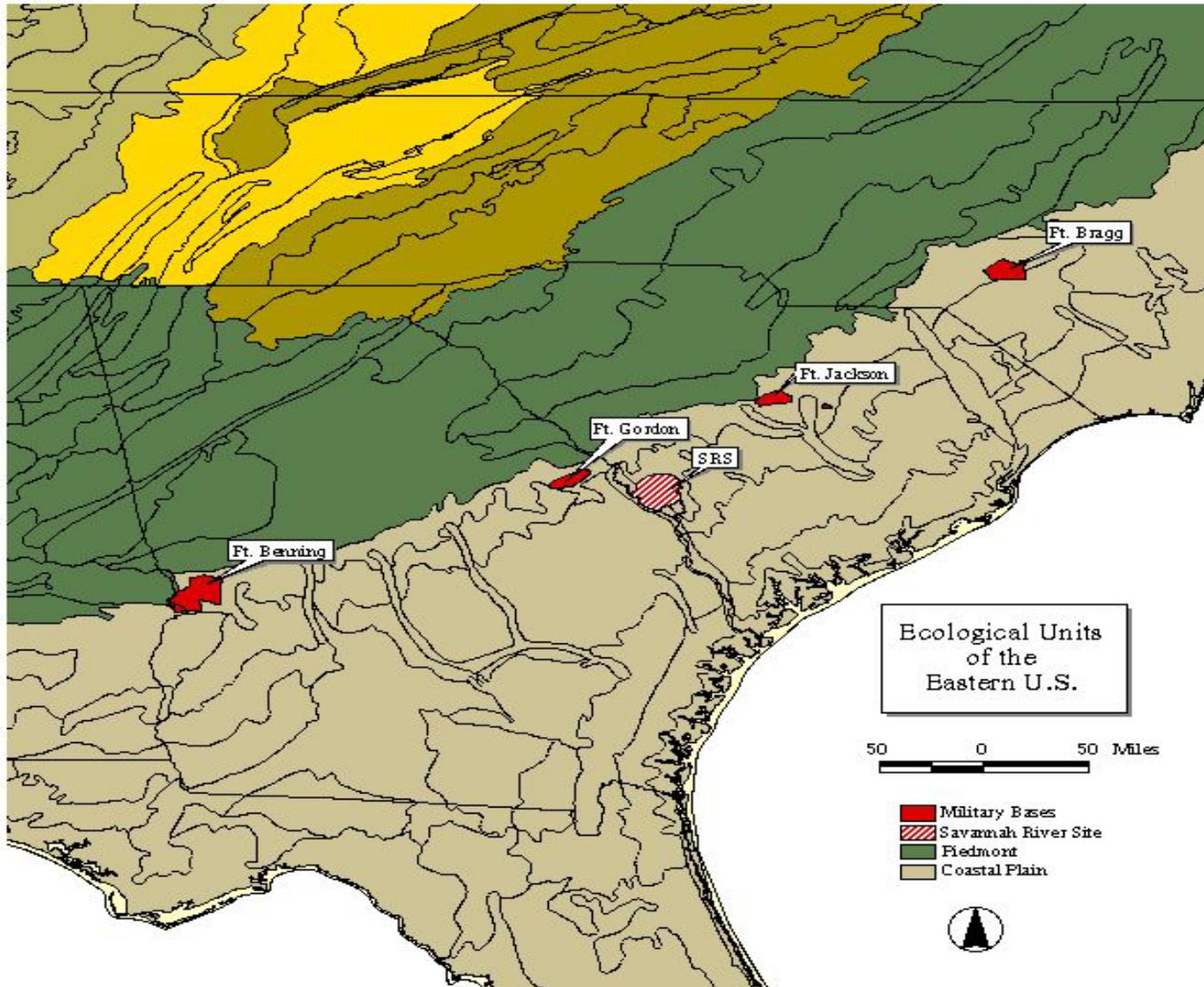
Thinning (9 year cycle)



Burning (3 year cycle)



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Ecosystem Characterization and Monitoring Initiative

Rose Kress

US Army Engineer Research & Development Center

SERDP In Progress Review
27 April 2000

ECMI Phases

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

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

Monitoring Objective

- Characterize the long-term spatial and temporal dynamics of key ecosystem properties and processes
 - conduct baseline ecosystem monitoring in support of SEMP research
 - contribute to host site integrated monitoring plan at the ecosystem level
 - develop long-term ecological data set

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.)

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

Terrestrial and Aquatic Monitoring

- **Terrestrial**

- Land cover type
- Land cover pattern
- Vegetation density
- Net primary productivity
- Erosion/ deposition
- Woody productivity

- **Aquatic**

- Meteorology
- Surface water flow
- Surface water quality
- Aquatic
macroinvertebrates
- Aquatic productivity
- Aquatic decomposition
- Groundwater level

Aquatic

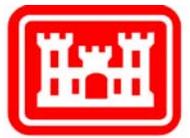


Component	sites	%	note
Meteorology	10	100	
Surface water flow	15	42	13 wshed+Upatoi+Uchee
Surface water quality	6	14	5 wshed +Upatoi
Aquatic macros	14	42	13 wshed +Uchee
Aquatic productivity	5	14	5 wshed
Aquatic decomposition	5	14	5 wshed
Groundwater level	5	14	5 wshed

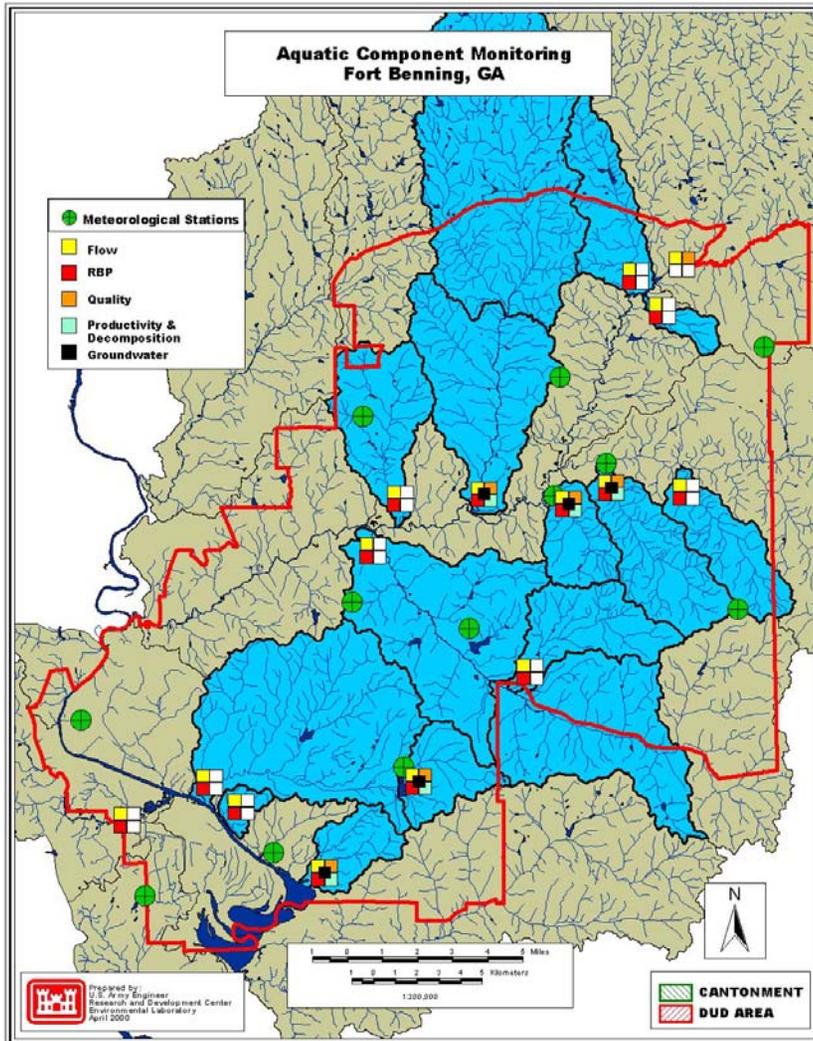
Terrestrial

• Component	sites	%		note
		installation		
– Land cover type		100		
– Land cover pattern		100		
– Vegetation density		100		
– Net primary productivity		100		
– Erosion/ deposition	90	3		2 wshed +30 LCTA
– Woody productivity	90	3		2 wshed +30 LCTA

Aquatic Component Status



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- **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

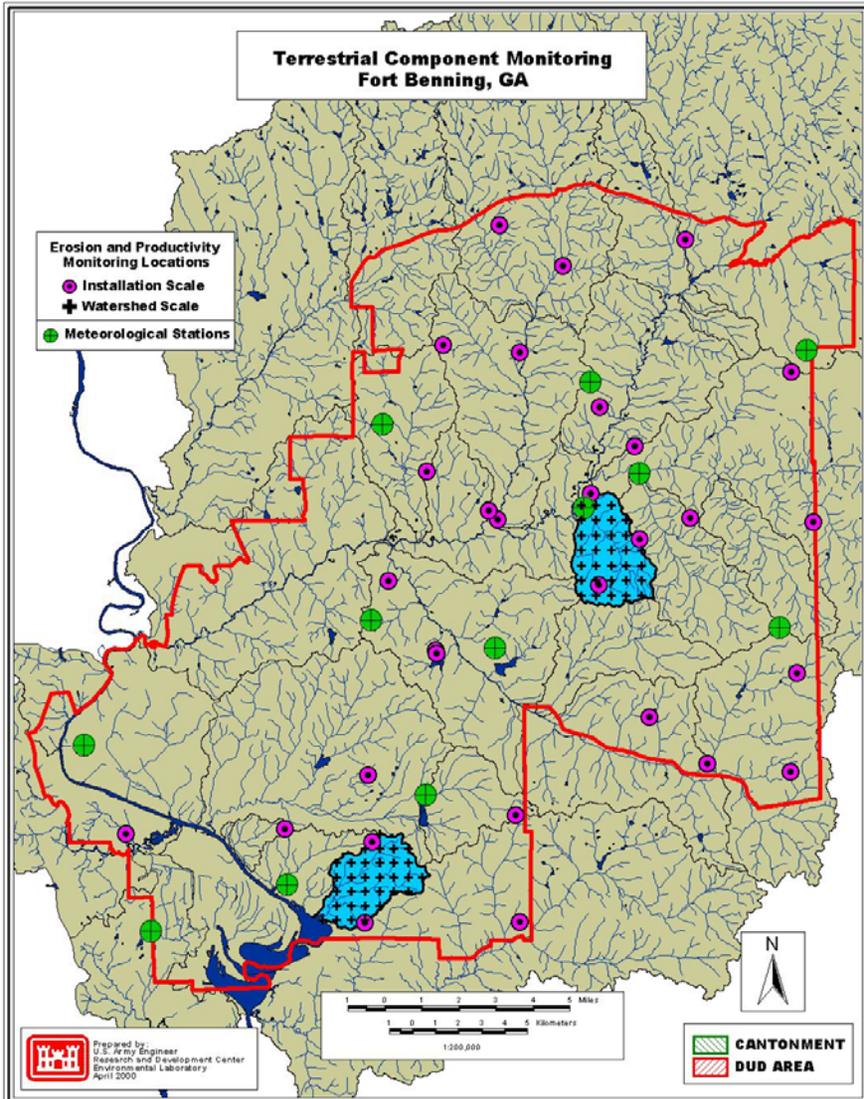
Terrestrial - Remote



- **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

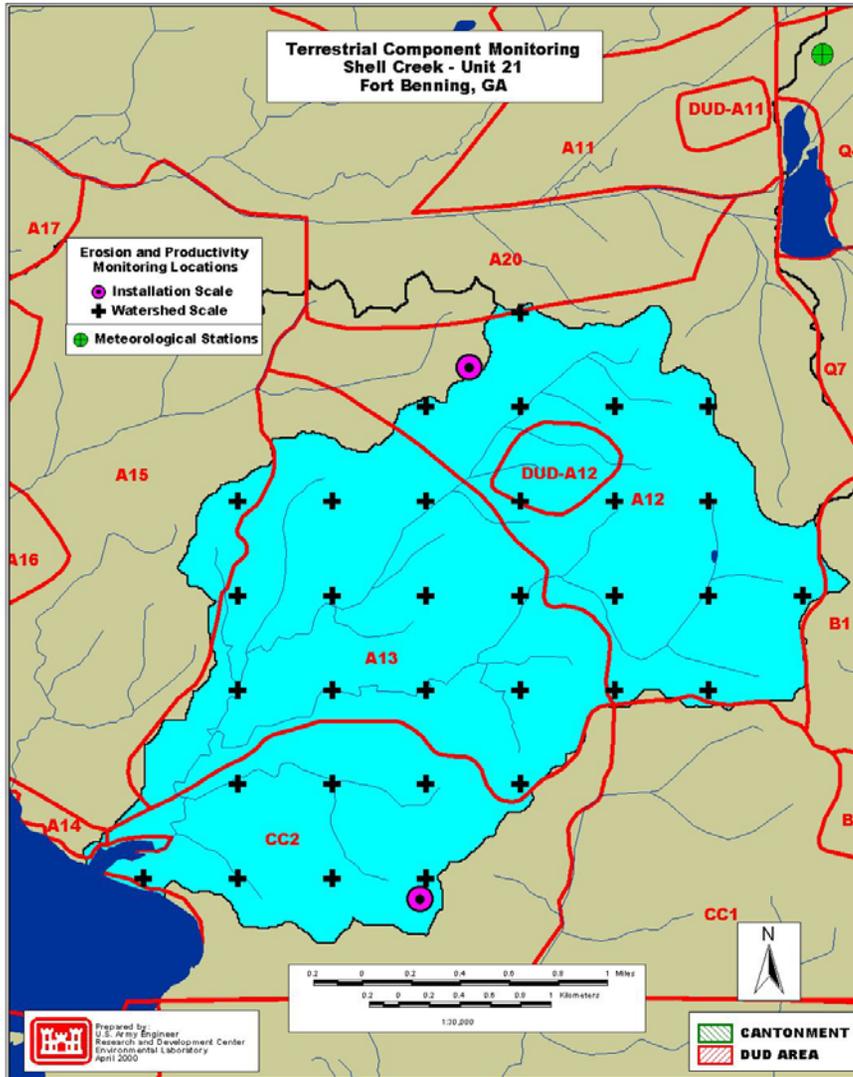
- Erosion/deposition
- Woody productivity
 - Status:** Method and sampling design complete; sites selected



Shell Creek

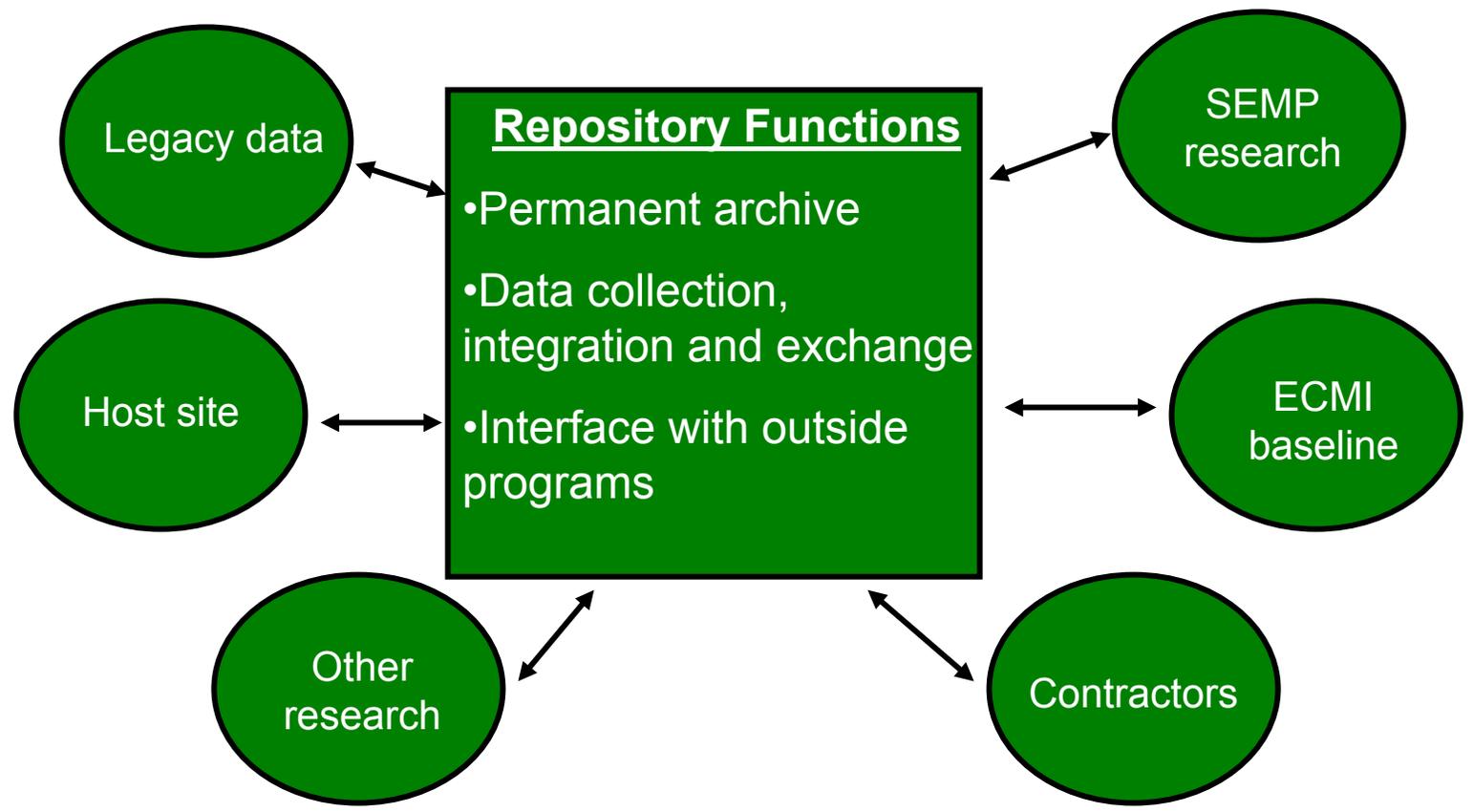


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- Erosion/deposition
- Woody productivity
 - co-located sampling
 - systematic sample from random starting point
 - 30 points per watershed
 - also 30 random LCTA plots from those with woody veg

Data Management



Repository Status

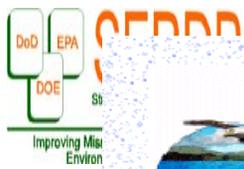
- Prototype functional 11/99
- Operational demo 02/00
- Secure logon SEMP access test 03/00
- Operational 04/00
 - limited, secure access
 - existing data populated (ongoing)
 - user guide available (draft)
- Second generation 04/01

Repository Characteristics

- File-based system; indexed content
- Secure access - migrate to open/secure portions
- Central database - migrate to distributed
- Multiple file formats accepted
- Submit, search, extract functions
- Data indexed upon submission
- Browse, search based on index items (keyword, contributor etc.), read metadata
- Metadata required for submission
- Web-based access; NT server; COTS

Information Infrastructures

- **SEMP GOAL**: be compatible with and contribute to where reasonable; use lessons learned
- National Biological Information Infrastructure (USGS)
- National Spatial Data Infrastructure (FGDC)
- Fish and Wildlife Information Exchange (USGS)
- Master Environmental Library (DOD)
- State Heritage Program Network (TNC)
- National Geospatial Data Clearinghouse (USGS)
- LTER Data Exchange Network (NSF)
- EIMS Environmental Info Management Sys (EPA)



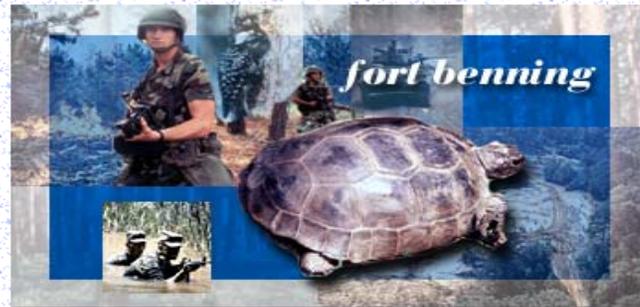
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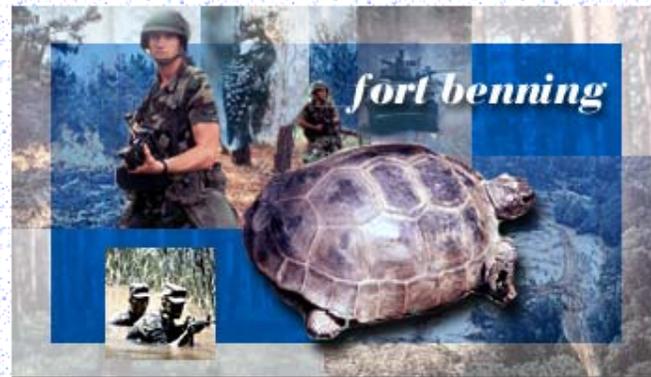
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SERDP Ecosystem Management Project (SEMP) - Ecosystem Characterization and Monitoring Initiative Data Repository

(Please use Microsoft Internet Explorer to visit this site. If Netscape is used, some plug-in components from Microsoft needs to be installed)



Welcome to the SEMP - ECMI Data Repository site. This is a U.S. Government site to support scientists in their research efforts within the DoD, EPA, and DOE. Until further notice, the repository is restricted to those involved with the SEMP project. To participate in the repository, please submit a request for a user-id.



Supported Data File Formats

File Format	Member_Listing	Data Catalog	SearchByCategory	SearchByKeyword	Download Data	Data Submission
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File Type		Description	Examples of Software Needed
GIS	*.e00	This file is an ARC/INFO export file; to get a free GIS program called ArcExplorer (which can read these exports), visit Environmental Systems Research Institute, Inc. To import *.e00 files for use into ArcView or ArcExplorer, you will need a copy of Import 71. This program comes w/ ArcView, but must be downloaded separately with ArcExplorer .	GIS software such as ARCView , MapInfo , ER Mapper Import 71
	*.dgn	This file is an Intergraph (Microstation/MGE) Design file. You will need the Microstation software to view or work with these files.	Microstation/MGE
	*.dxf	This file is a Drawing Interchange File. This file format will allow you to import these files into many CAD software applications.	Most CAD and GIS programs support this file format.
Compression	*.zip, *.gz, *.tar	This file was compressed using a PC zip utility, gnu utilities, or Unix/MKS tar utilities.	PKZIP , WinZIP , gzip, tar
Documents	*.doc *.ppt *.txt / *.asc	Microsoft Word Document Microsoft PowerPoint Document General Text or ASCII data	
Tabular	*.xls	Microsoft Excel Spreadsheet	



*To download and save a local copy of a particular file, right click on the file link and select "save target as".
To display a particular file, left-click on the file link. For proper display of the selected data,, a software
package may be needed. Otherwise, the data will be displayed in text or ASCII format using best available
method.*

Category:	Boundary
Type:	Spatial
Abstract:	
Title:	
Date:	
File Name:	http://206.166.205.170/projects/ECMI/data/boundary/burnunit.e00
MetaDataFileName:	http://206.166.205.170/projects/ECMI/metadata/boundary/boundary001.pdf

Category:	Boundary
Type:	Spatial
Abstract:	
Title:	
Date:	
File Name:	http://206.166.205.170/projects/ECMI/data/boundary/burn9396.e00
MetaDataFileName:	http://206.166.205.170/projects/ECMI/metadata/boundary/burn9399.pdf

Category:	Boundary
Type:	Spatial
Abstract:	
Title:	
Date:	
File Name:	http://206.166.205.170/projects/ECMI/data/boundary/boundary001.e00
MetaDataFileName:	http://206.166.205.170/projects/ECMI/metadata/boundary/boundary001.pdf

[Home](#)

SEARCH BY KEYWORDS

KeyWord Exact Keywords

Title	Abstract	Date	Type	Category	City	State	File Name	MetaDataFileName
			Spatial	Boundary	Fort Benning	GA	http://206.166.205.170/projects/ECMI/data/boundary/boundary001.e00	http://206.166.205.170/projects/ECMI/metadata/boundary/boundary001.pdf
			Spatial	Boundary	Fort Benning	GA	http://206.166.205.170/projects/ECMI/data/boundary/burn9396.e00	http://206.166.205.170/projects/ECMI/metadata/boundary/burn9399.pdf
			Spatial	Boundary	Fort Benning	GA	http://206.166.205.170/projects/ECMI/data/boundary/burnunit.e00	http://206.166.205.170/projects/ECMI/metadata/boundary/boundary001.pdf
			Spatial	Boundary	Fort Benning	GA	http://206.166.205.170/projects/ECMI/data/boundary/burn9799.e00	http://206.166.205.170/projects/ECMI/metadata/boundary/boundary001.pdf

Data Submission

Please provide the following Author's information:

First Name

Last Name

Middle Initial

Title

Organization

E-mail

Please provide information on submitted data:

Report Title

Report Abstract

Enter the date of report: – mm/dd/yy

Data Category:

Document Type:

Enter Data Start Date: – mm/dd/yy

Enter Data End Date: – mm/dd/yy

City/Installation:

State:

Keyword 1:

Keyword 2:

Enter filename:

Enter metadata filename:

Submit Form

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User Specified File Upload

Data file to be uploaded for submission to the ECMI Repository

Example: DATAFILENAME.EXTENSION (use appropriate file name extension)

Accompanying meta data file to be uploaded for submission to the ECMI Repository

Example: DATAFILENAME.MET (use MET as metadata file name extension)

Upload

Program Plan



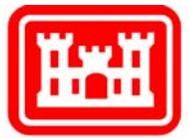
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Description	FY99	FY00	FY01	FY02	FY03	FY04
Management						
Plans, Reports and Communication	182	129	131.2	131.5	132.9	153.8
Meetings (TAC, SAB)		25	25	25	25	25
Host Site Coordinator	70	75	72	75	75	75
Lessons Learned Workshop	0	50	150	0	0	150
Characterization, Monitoring and Repository						
Characterization and Monitoring	893	665*	300	275	275	275
Repository and Analysis		100	50	25	25	25
FY99 SON -- "Change Indicators"						
Determination of Indicators of Ecological Change (Univ. of FL) -- CS-1114A-99**	400	426	431.5	425.2	419.9	406.2
Developing Ecological Indicator Guilds (CERL) -- CS-1114B-99**	392	403	409.3	409.3	388.2	0
Indicators of Ecological Change (ORNL) -- CS-1114C-99	400	400	400	400	400	400
FY00 SON -- "Disturbance Thresholds"						
Thresholds of Disturbance: Land Mgmt Effects on Vegetation and Nitrogen Dynamics -- CS-1114D-00	0	258	267	280	285	241
Disturbance of Soil Organic Matter and Nitrogen Dynamics: Implications for Soil and Water Quality -- CS-1114E-00	0	200	290	195	195	0
Future SONs						
FY02 SON	0	0	0	800	800	600
FY04 SON	0	0	0	0	0	800
Total Funding	2337	2731	2526	3041	3021	3151

* From the teleconference dated March 2, we are showing the increase of \$75 for adding the shallow groundwater monitoring wells, with a bottom line change for FY2000.

** On the FY99 research projects (CS-1114A and CS-1114B) we are showing 5.5% charge for contracting costs. This amount is subtracted from the plans, reports and communication (management) section, so the bottom line is unchanged.

FY2001 Plans for SEMP

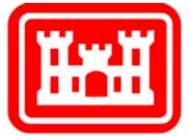


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OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
SAB Briefing					SAB Briefing	TTAWG IPR					
	SON FY02 Announced		SON Pre- proposals		SON Full Proposal	Peer Review Process			TAC SON Review		TAC SON Recommend ations
		TAC Meeting							TAC Meeting		
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

Technology Insertion Criteria



US Army Corps of Engineers

Website
 Software Environment (e.g. LMS)
 Publications
 Workshop or Course
 Support Resource
 Implementation Plan

Typical Project
Project #1114

Product Delivery Framework

Title: SERDP Ecosystem Management Project
Delivery Framework: All
Infusion Risk: High Beyond Ecoregion
Type of Outcome: Data, Software Tools and Facility
End User: Installation Managers
Business Process Impacted: INRMP

Infusion Risk Frequency of Use

High
 Medium
 Low

Implementation Cost/Benefit

Business Process Impacted

MACOM or Service

School, PM, Service Provider, Troops

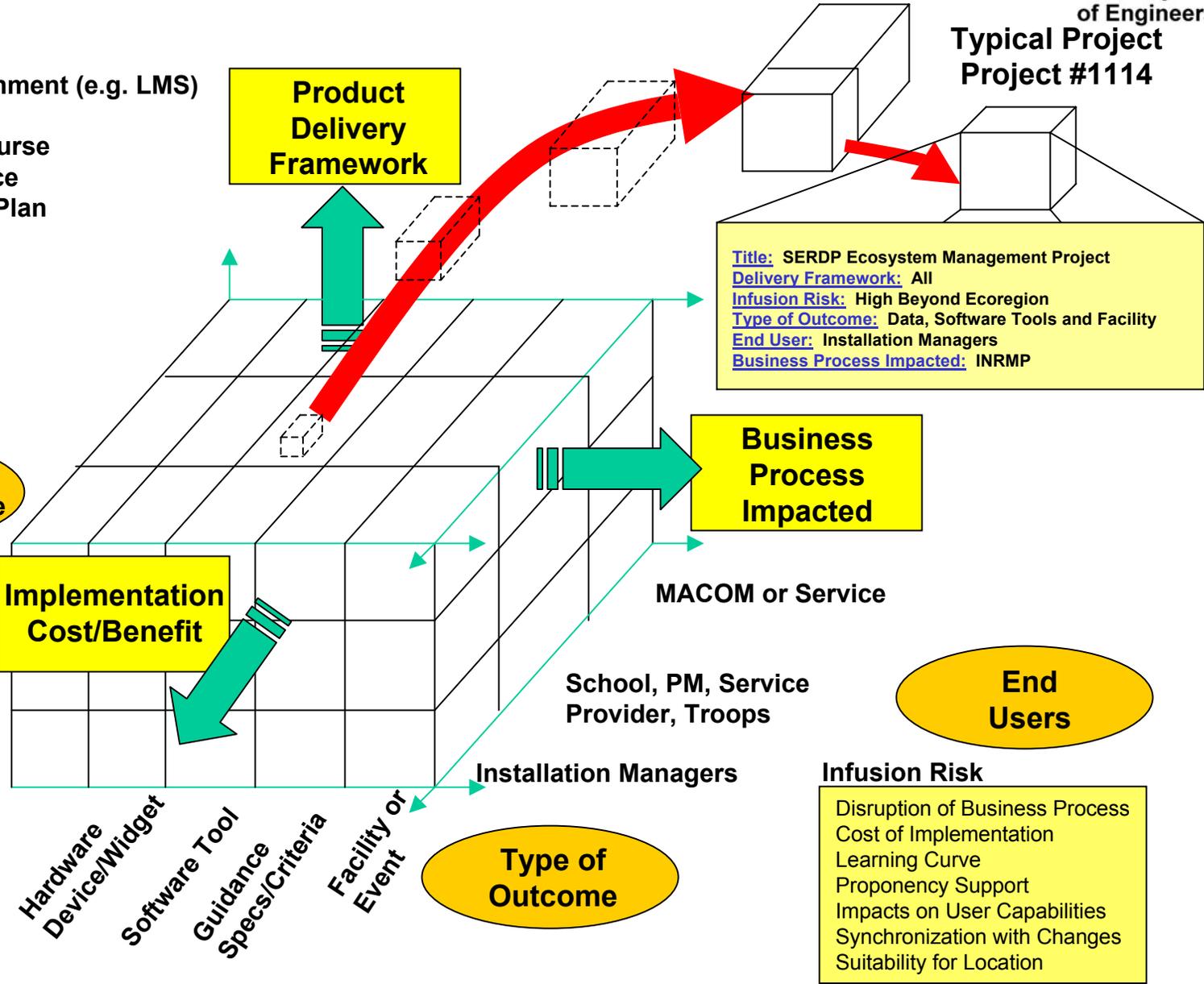
End Users

Installation Managers

Data
 Hardware Device/Widget
 Software Tool
 Guidance Specs/Criteria
 Facility or Event

Type of Outcome

Infusion Risk
 Disruption of Business Process
 Cost of Implementation
 Learning Curve
 Proponency Support
 Impacts on User Capabilities
 Synchronization with Changes
 Suitability for Location



SEMP Website



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<http://www.denix.osd.mil/SEMP>

File Edit View Go Favorites Help

Back Forward Stop Refresh Home Search Favorites History Channels Fullscreen Mail Print Edit

Address <http://www.denix.osd.mil/denix/Test/Diana/SEMP/sem.html> Links

SERP Ecosystem Management Project (SEMP)

SEMP

about

research

locations

publications

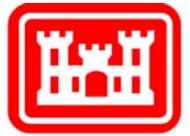
calendar

links

DoD EPA SERDP DoD US Army Corps of Engineers Engineer Research and Development Center

Internet zone

Questions?

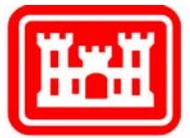


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Backup Slides



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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

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