

Sustainability, Encroachment, and Room to Maneuver (SERM)

Tools, Data and Capabilities for both
Military and Civil Works Applications

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<http://www.cecer.army.mil/KD/SERM>



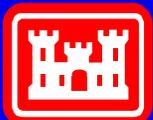
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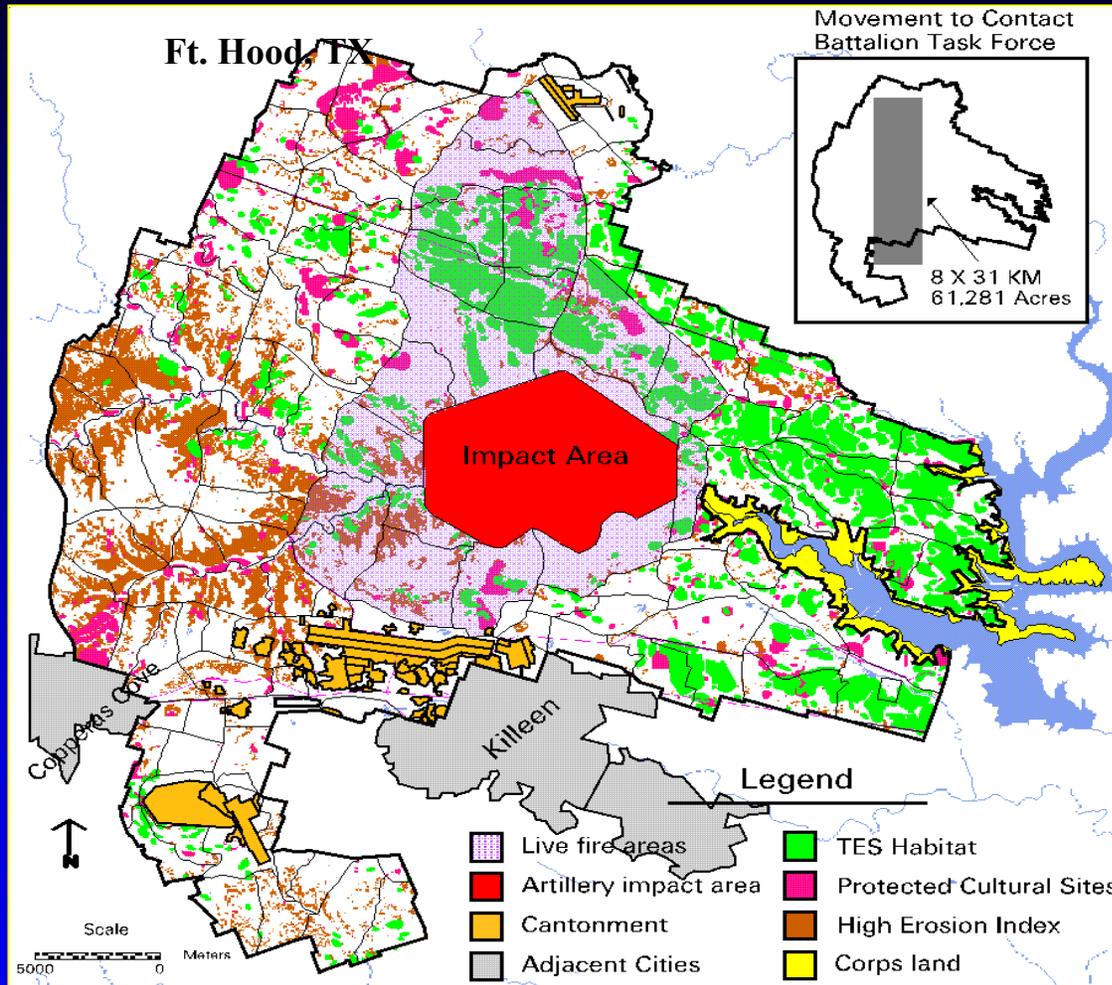
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Enroachment

- External pressures (encroachment) are impacting the military services' ability to maintain force readiness.
- Encroachment is defined as:
“Any outside activity, law, or pressure that affects the ability of military forces to train to doctrinal standards or to perform the mission assigned to the installation”



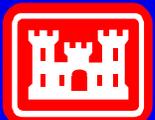
Environmental Pressures



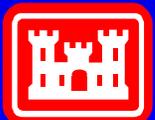
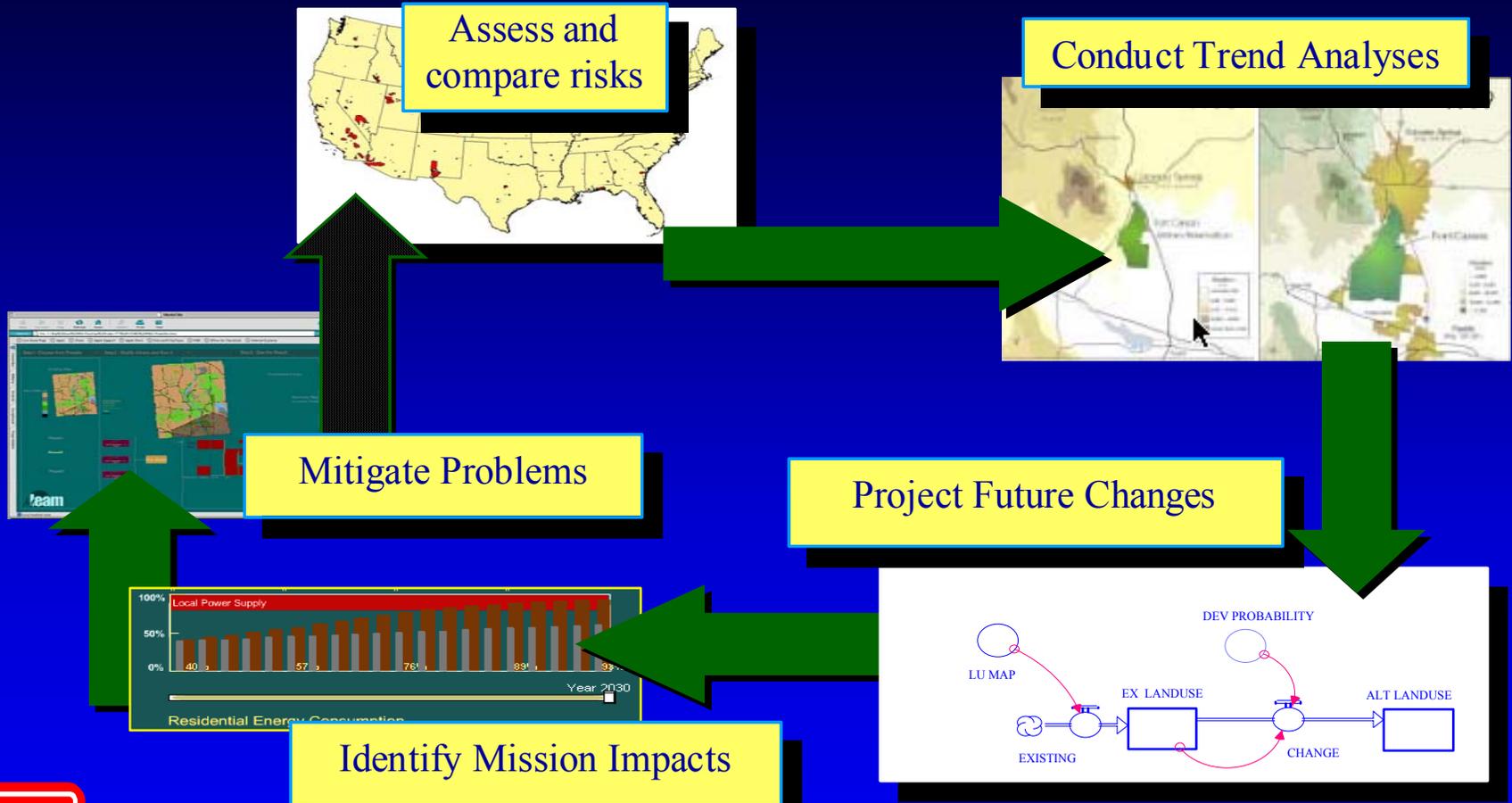
Inside the fence line constraints continue to restrict Mission activities.

Approximately 80% of the installation has environmental restrictions. Most of the land has multiple constraints.

Sustainability Factors



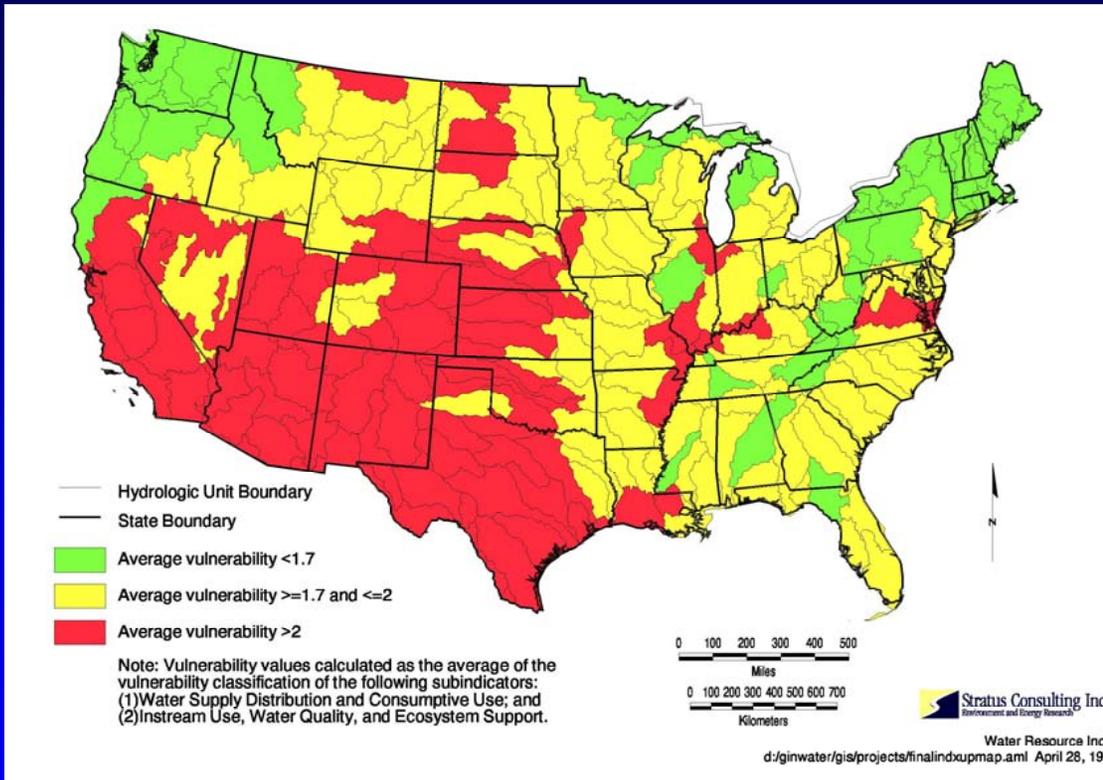
SERM Approach



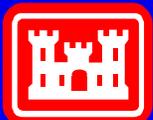
Sample Criteria: Water Quality

Issue	Stressor	Indicator
Water Resource	Quality	EPA Index of Water Indicators (IWI) Database

Data
Waters meeting designated uses Fish & wildlife consumption advisories Indicators of source water condition Contaminated sediments Ambient water quality - toxics Ambient water quality - conventional Wetlands loss Aquatic and wetlands species at risk Loads over limits - toxics Loads over limits - conventional Urban runoff potential Agriculture runoff potential Population change Hydrologic modification caused by dams Estuarine pollution susceptibility Atmospheric deposition



16 indicators are combined in one index of water quality

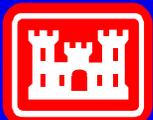
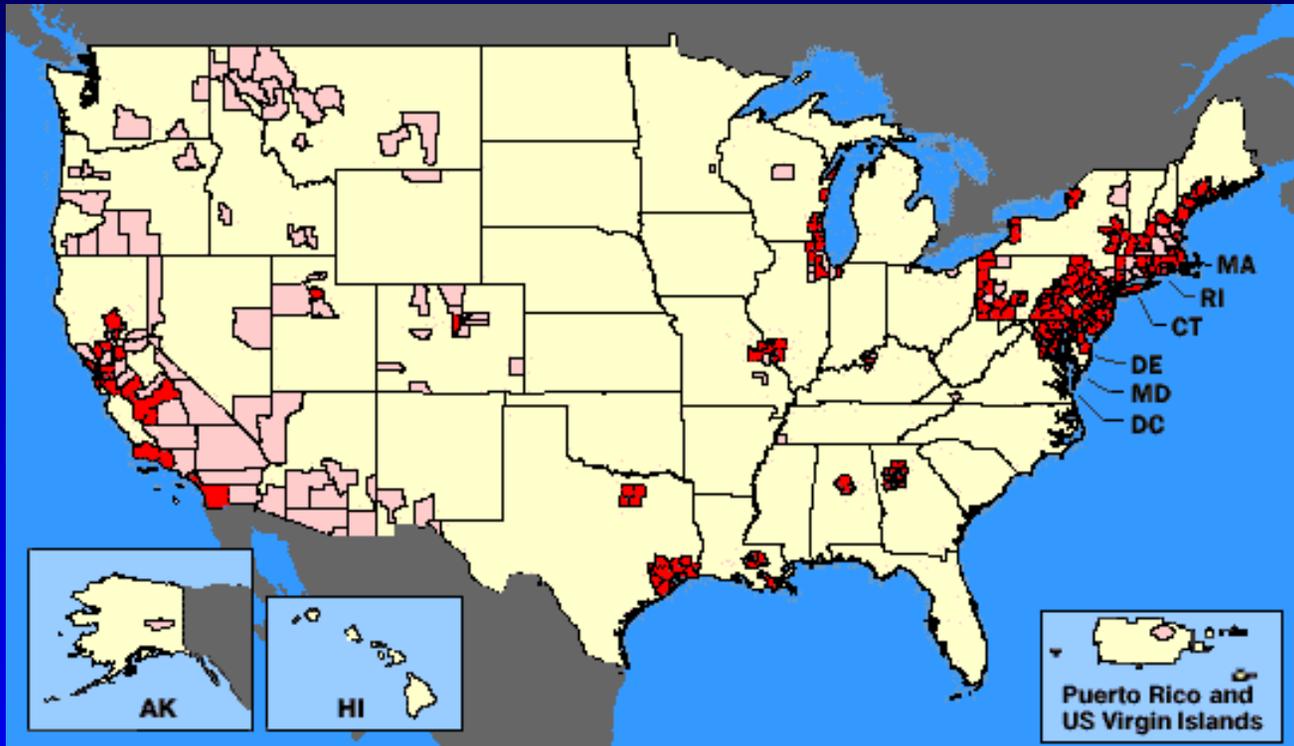


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Sample Criteria: Air Quality

Issue	Stressor	Indicator	Data
Air	Quality	EPA Non-Attainment for Criteria Pollutants	Maximum value of any criteria pollutant



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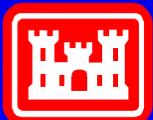
[Red square]	Entire county is non-attainment
[Pink square]	Part of county is non-attainment

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Sustainable Installation Risk Assessment

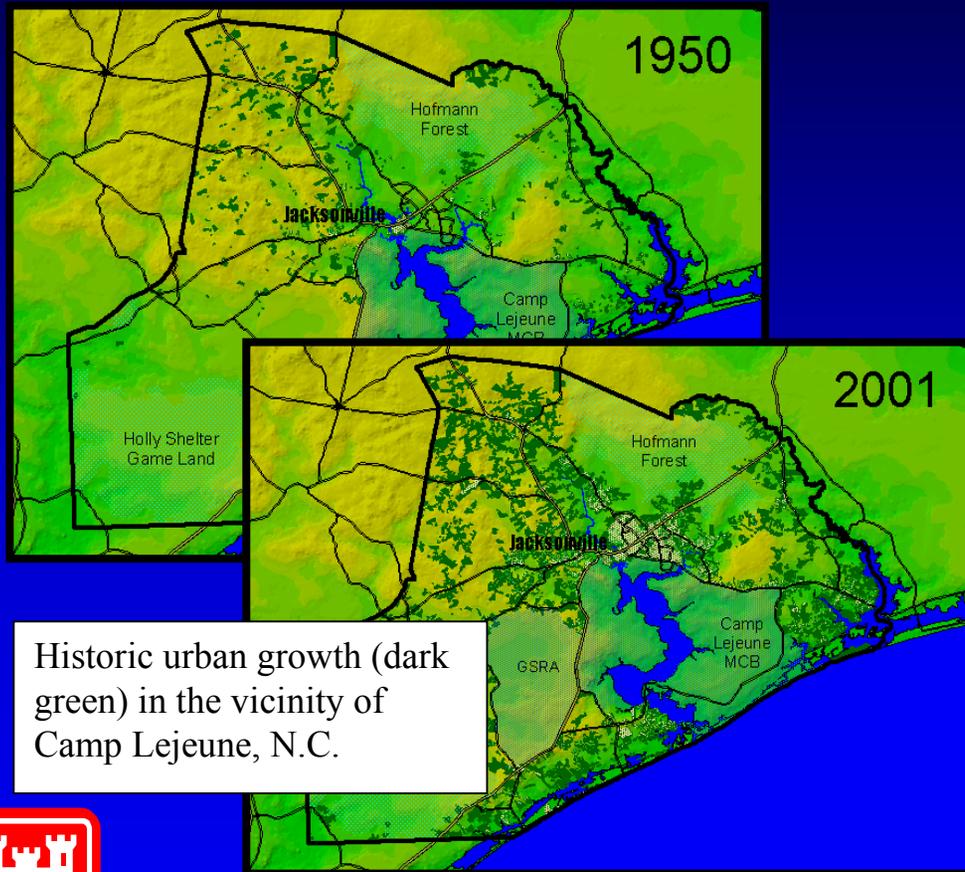
Supports Objective Force Training Requirements							Strategic Response Capability																	
Facilities and Mission Support							White Sands Missile Range	Yuma Proving Grounds	Rock Island Arsenal	Redstone Arsenal	Fort Drum	Fort Carson	Pinyon Canyon Maneuver S	Fort Lewis/Yakima	Fort Richardson	Fort Stewart/Hunter AAF	Fort Polk	Fort Benning	Fort Bliss	Fort Riley	Fort Knox	Fort Campbell	Fort Bragg	Fort Hood
Indicator Number	Issue	Indicator Number	Group	Stressor	Indicator																			
N1	Air																							
N2	Air																							
UD1	Lanc																							
UD2	Lanc	EA1	Energy	EE1	Facilities	Energy Efficiency	Progress Toward Goals																	
UD3	Lanc	EA2	Energy	LI2	Facilities	Locational Issues	Seismic Zones																	
UD4	Lanc	EA3	Energy	LI3	Facilities	Locational Issues	Natural Disasters																	
UD5	Lanc	EA4	Energy	AQ1	Env Quality	Air Quality	Non-Attainment Status																	
		ES1	Energy	AQ2	Env Quality	Air Quality	Air Quality Index																	
		WS1	Water	TE1	Env Quality	TES Restrictions	TES Species																	
		TA1	Infras	TE2	Env Quality	TES Restrictions	TES Impacts																	
		TA2	Infras	TE3	Env Quality	TES Restrictions	Critical Habitat																	
		TRR1	Infras	TE4	Env Quality	TES Restrictions	Species of Concern																	
		TRR2	Infras	WQ1	Env Quality	Water Quality	IWI All Indicators																	
		TR1	Infras	WA1	Env Quality	Water Availability	Resource Vulnerability																	
		TR2	Infras	SH1	Env Quality	Stakeholders	# of Lawsuits																	
		TR3	Infras	SH2	Env Quality	Stakeholders	Biological Opinions																	
		SP1	Infras	DP1	Quality of Life	DoD Economic Presence	Military Employment%																	
				QL1	Quality of Life	Quality of Life	Crime Rate																	
				QL2	Quality of Life	Quality of Life	Housing Availability																	
				QL3	Quality of Life	Quality of Life	Healthcare Costs																	
				QL4	Quality of Life	Quality of Life	Job Availability																	
				QL5	Quality of Life	Quality of Life	Educational Attainment																	
				QL6	Quality of Life	Quality of Life	Commute Times																	
				QL7	Quality of Life	Quality of Life	Cost of Living																	
				QL8	Quality of Life	Quality of Life	Community Economic Strength																	

Risk Legend	
	Low
	Medium
	High

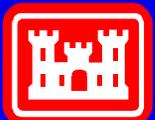


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Conduct Trend Analyses

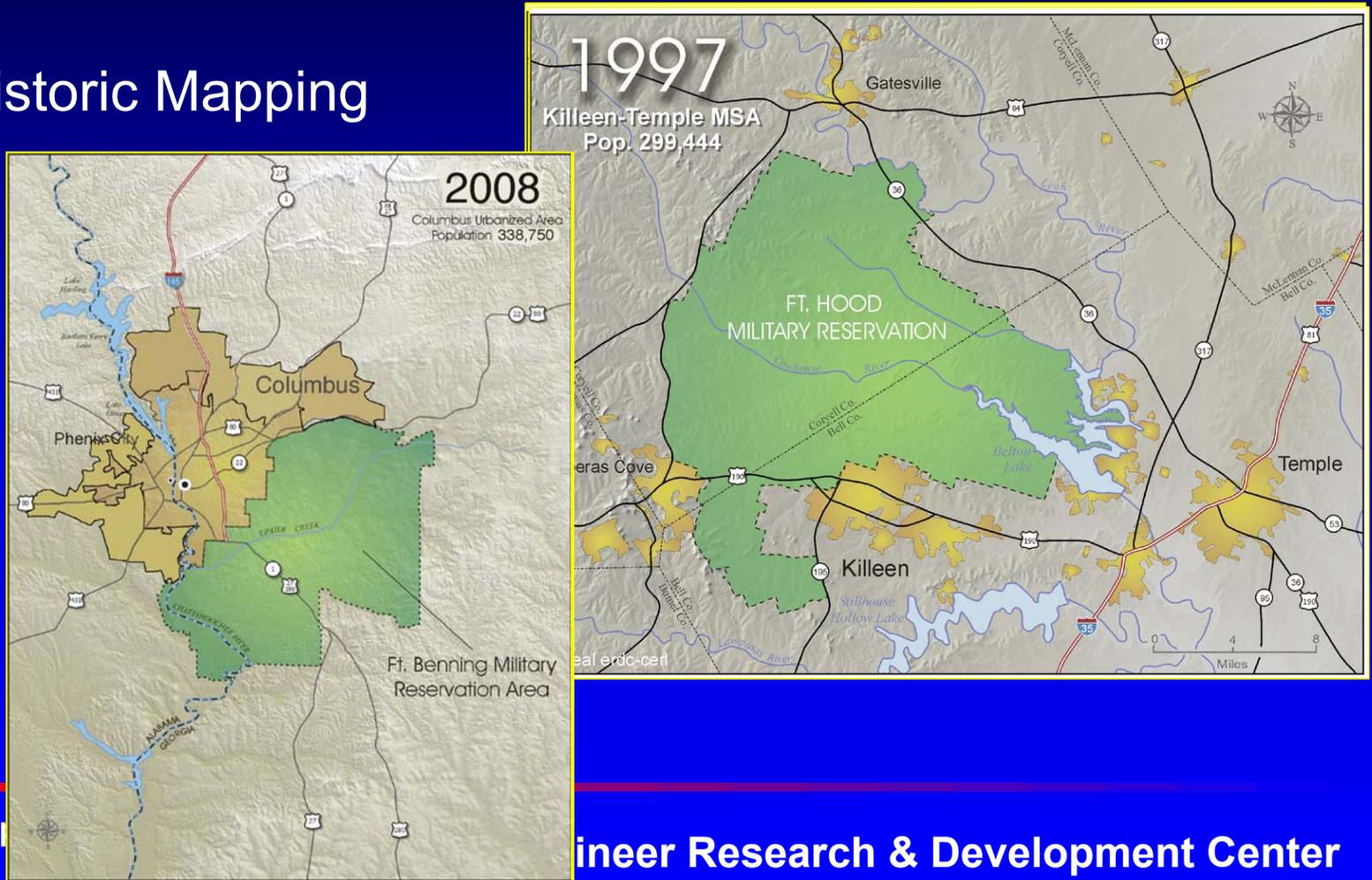


- Trends are drawn from the analysis of:
 - historic land use
 - land cover
 - satellite imagery
- Results are presented in images and video



Geographic Time Series Analysis

- Historic Mapping



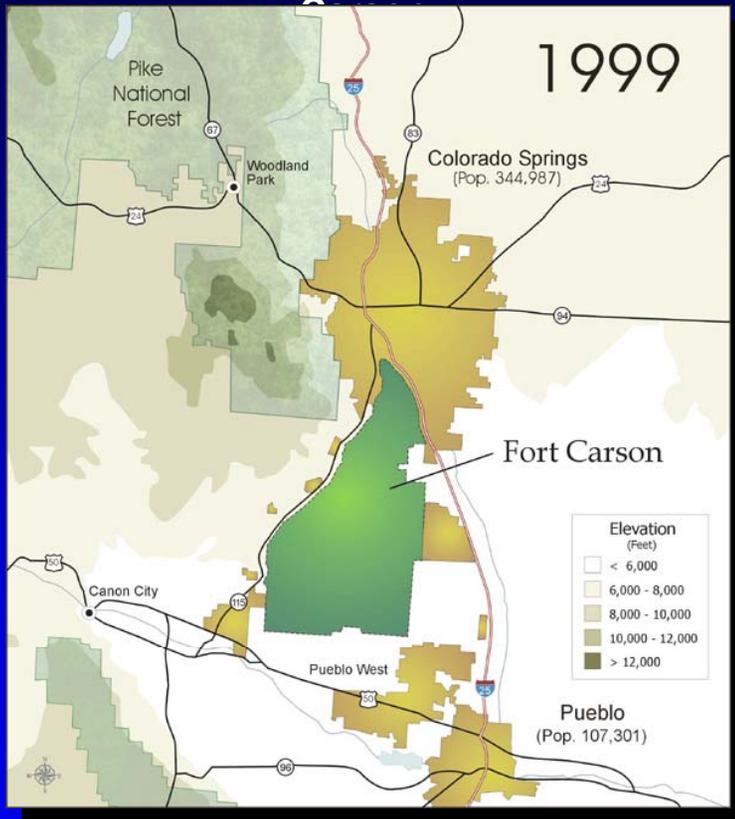
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Encroachment and Room to Maneuver Assessment Capability

Problem

Historical Urban Growth at Fort

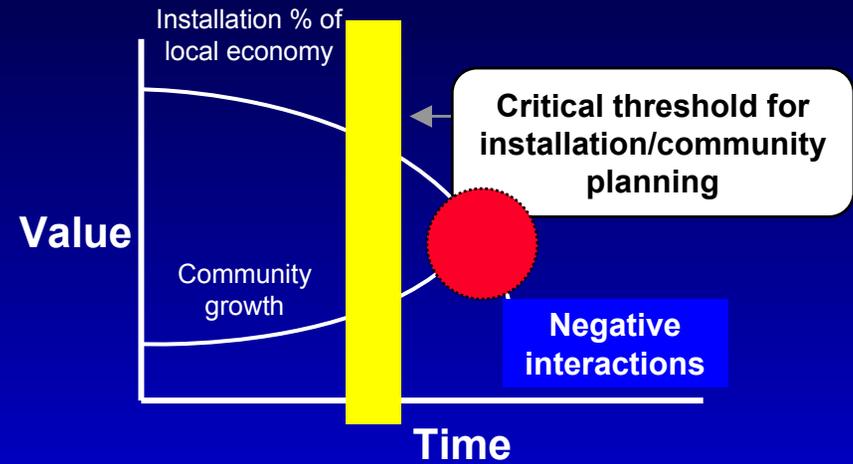


1956 - 1999

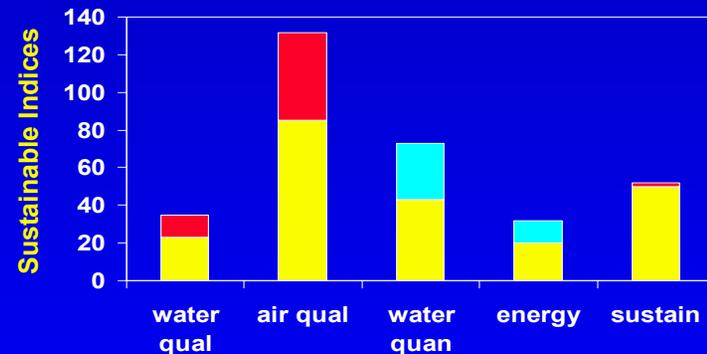


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Solutions



Notional Impact Analysis Capability

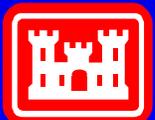
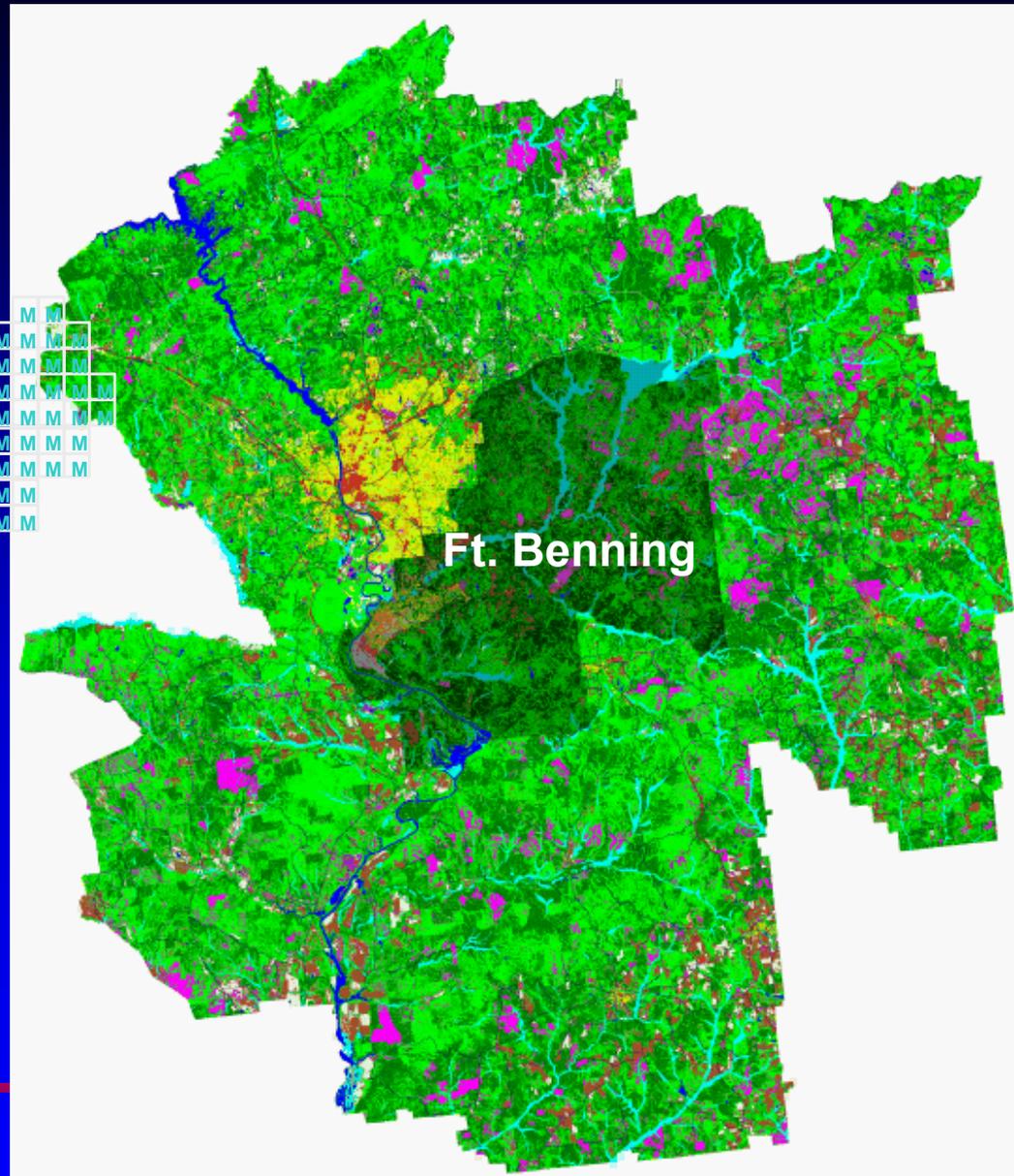
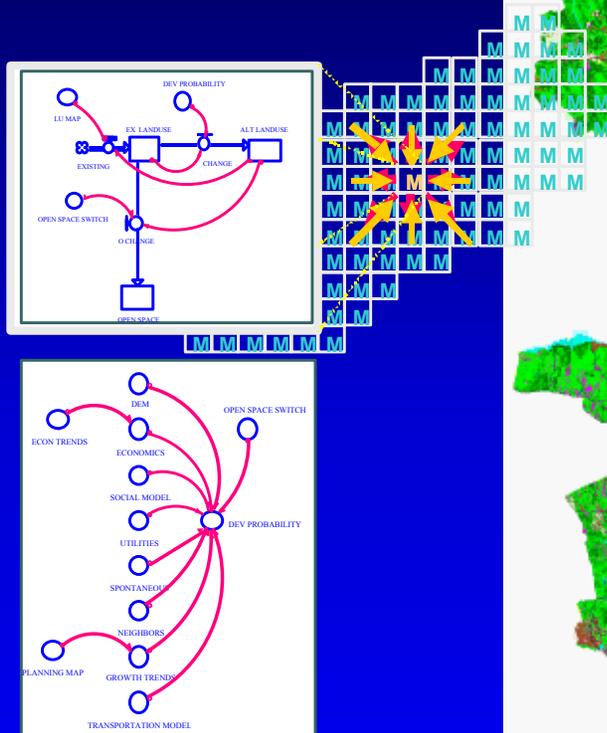


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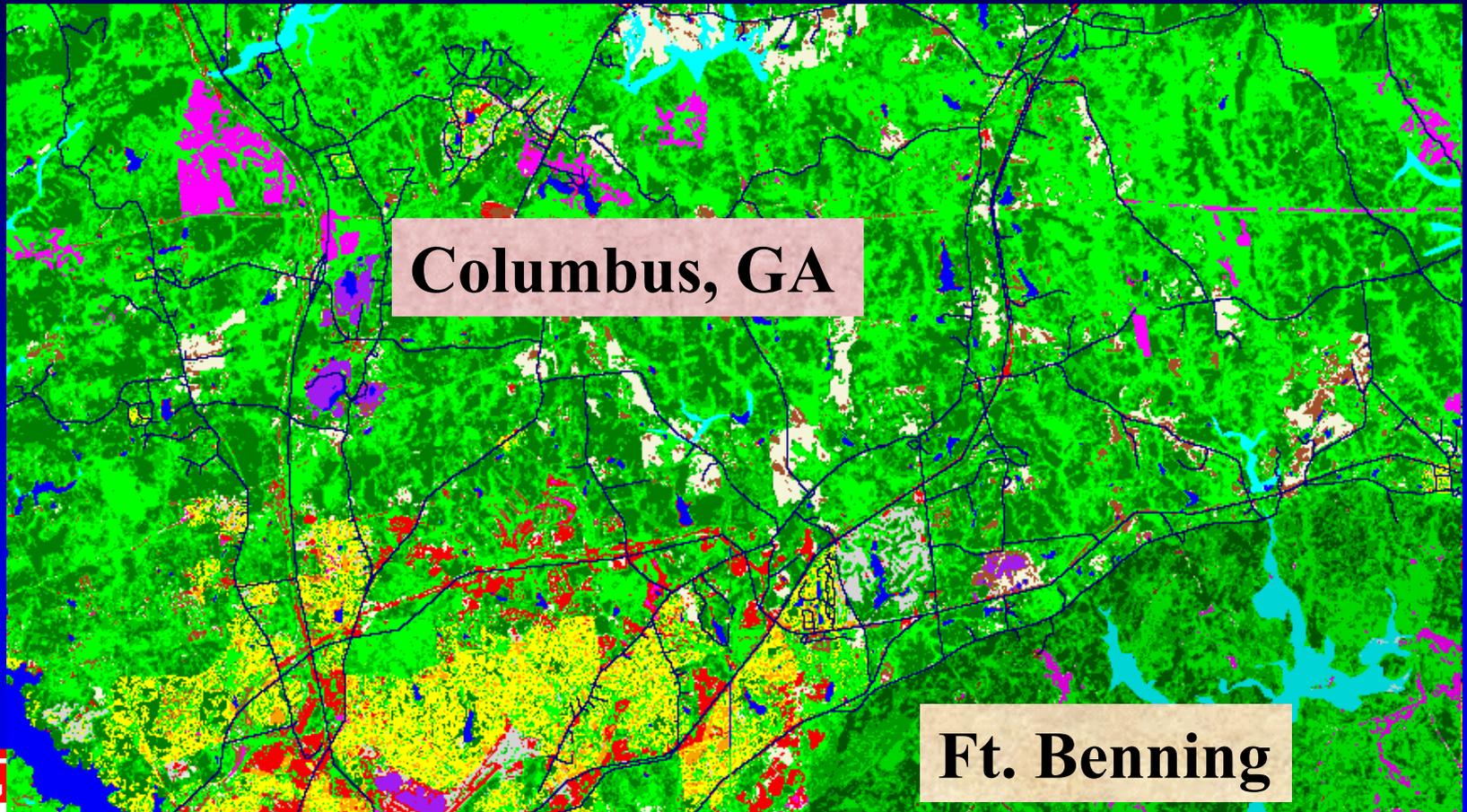
current model

Columbus/Ft Benning
8 million cells – 40 years

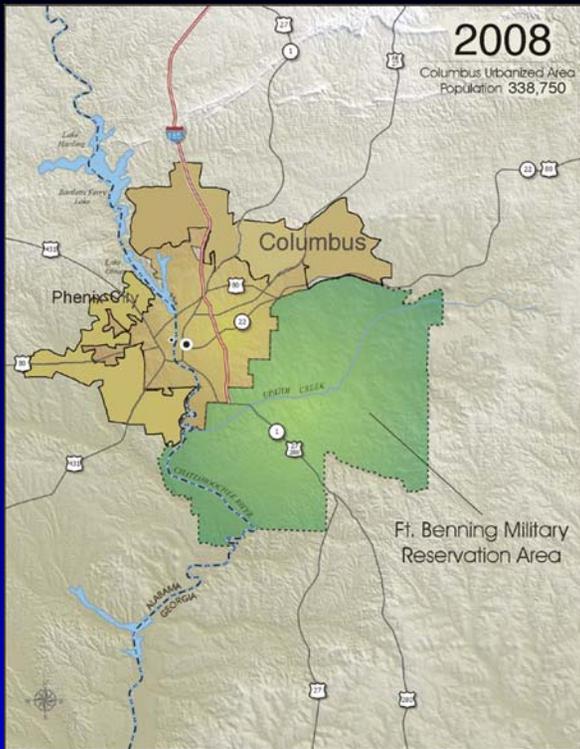


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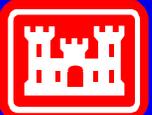
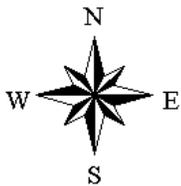
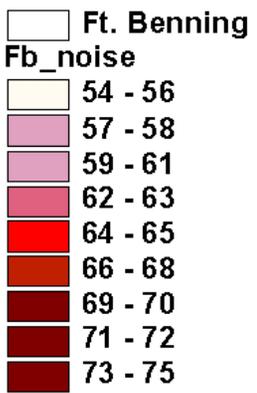
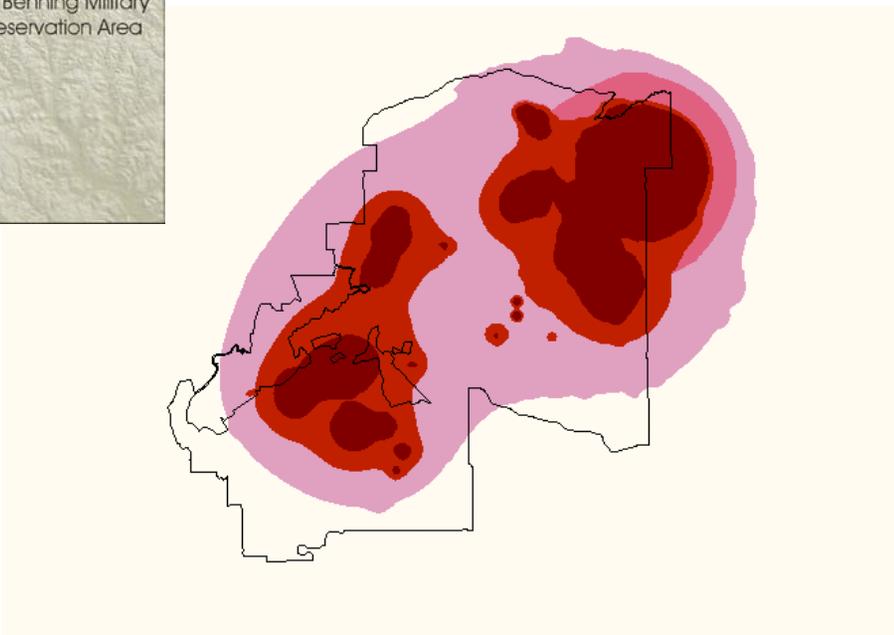
Ft Benning Simulation Results



Planned Multi-Purpose Range Complex, Ft. Benning, GA



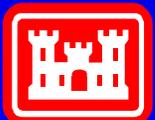
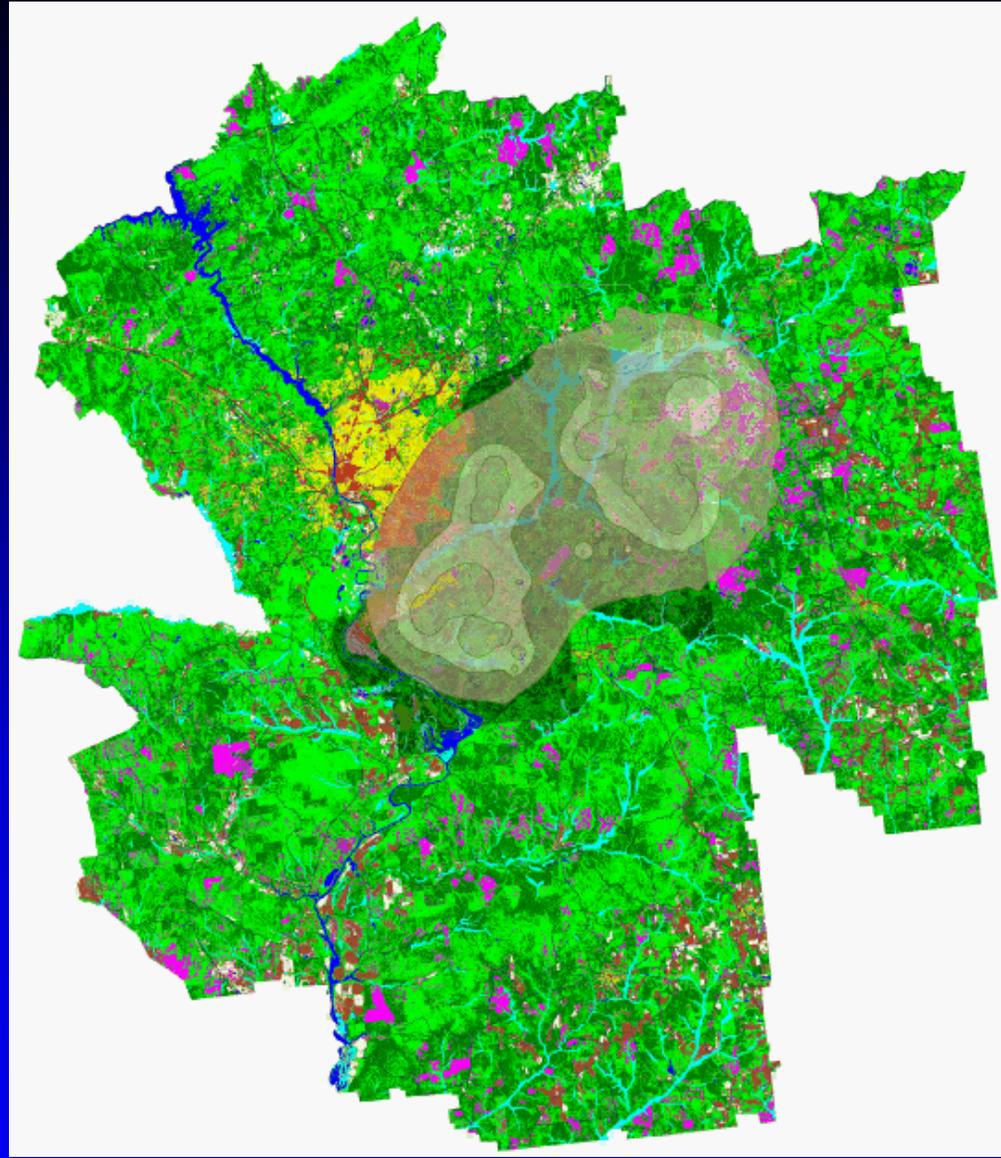
Noise



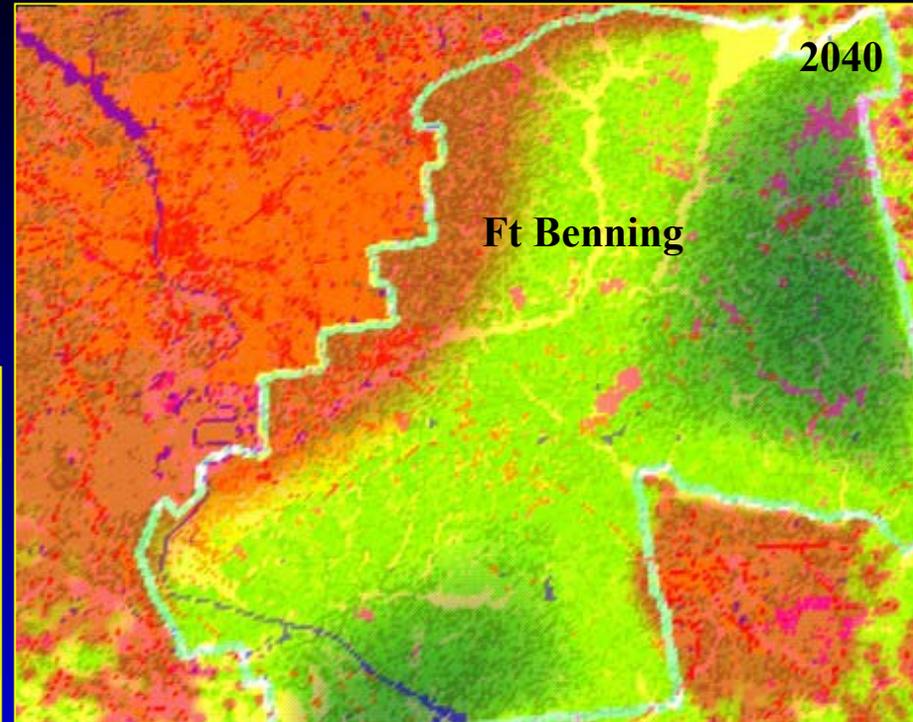
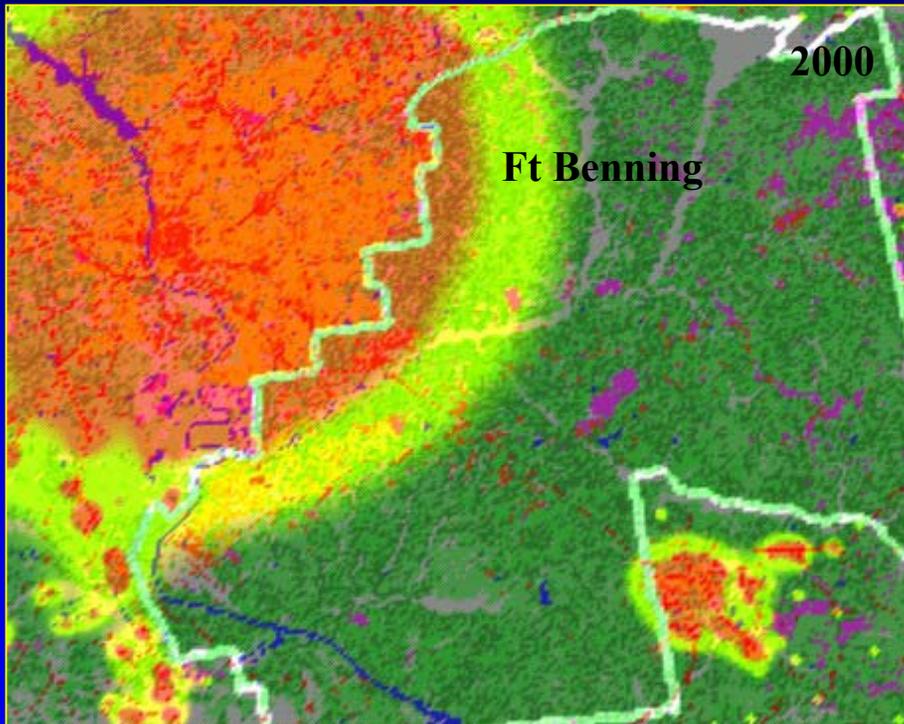
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Identify Impacts on Training and Testing

- Impact on current/planned training
 - Noise vs Community Growth



Identify Impacts on Training and Testing

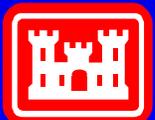


- Loss of future training opportunities due to possible noise related conflicts



Data Requirements for LEAM Projections

- Land Use Land Cover. Source: USGS, National Coverage 1993 and 2000.
- Population and Population Trends. Source: Census Bureau, every decade, every county.
- Digital Elevation Models. Source: USGS, National level, multiple resolutions.
- Public Land Holding: Federal, State, Local sources.



SERM Analysis Options



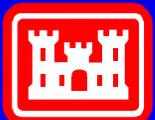
Community/Installation Planning

- Coordinated planning not currently “common practice” except where required (e.g. NEPA, etc).
- Installations are “magnets” for community growth, because of stable economic inputs (jobs, purchases).
- Communities will surround installations with urbanization, which will constrain mission activities, unless communities and installation plan together.
- Processes, policies and tools needed to nurture coordinated planning.



Develop Mitigation Plans

- At the multiple-decade scale, long-term mitigation options can include a number of options including:
 - Changes or constraints of property right ownership
 - Expansion of installation lands (to increase buffer areas and ensure sustained use)
 - Safe harbors, conservation easements, third party acquisitions of lands
 - Collaborative development of parks, wildlife areas, forests
 - Altered location of highways and utilities

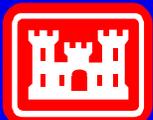


PONDS

Proactive Options with Neighbors for Defense Installation Sustainability



- **Legislative actions**
- **Relevant national, regional and local data sources**
- **Case studies**
- **Lessons learned from partnering actions**
- **Mitigation guidance**



System-Wide Modeling, Assessment, and Restoration Technologies (SMART): *A Strategic Research Initiative*



SMART Application For Decision-Making

Make a Decision



Alternative Futures

Conduct Analyses



System-wide Scaling

**Apply Tools
Link Tools
Modify Tools**



Data Integration

**Evaluate Data
Identify Tools**



Discipline-specific Data

Dissolved
Oxygen

River
Stage

Wetland Area

Soil Type

Maintenance
Cost

Daily Flow

Visitor Days

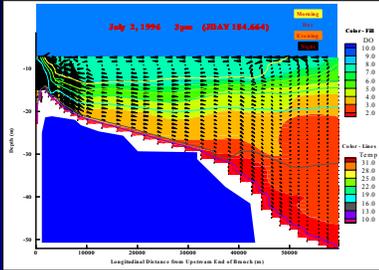
Fish
Census

**Compile Relevant
Data Fill Data Gaps**

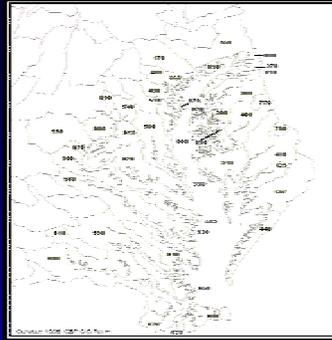


Water Quality Models

- CE-QUAL-W2
- ICM



TOOLS



Index Models

- HGM
- Empirical Models
- BATHTUB
- PROFILE
- FLUX
- EUTROMOD

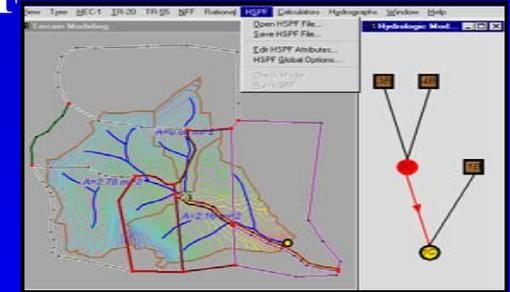
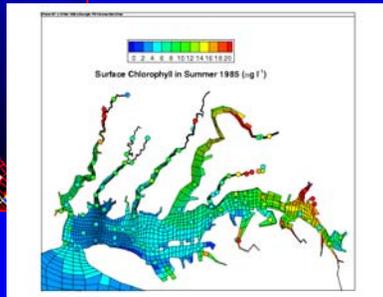
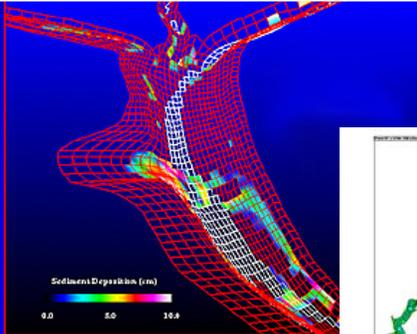
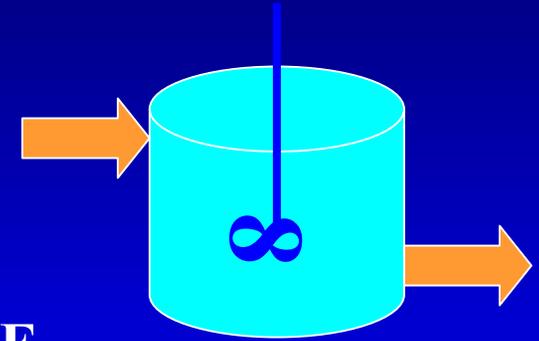
IWR/HEC Tools
Economic Models
Planning Model

Watershed Models

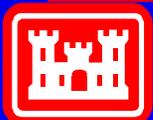
- HSPF
- GSSHA

Frameworks

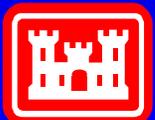
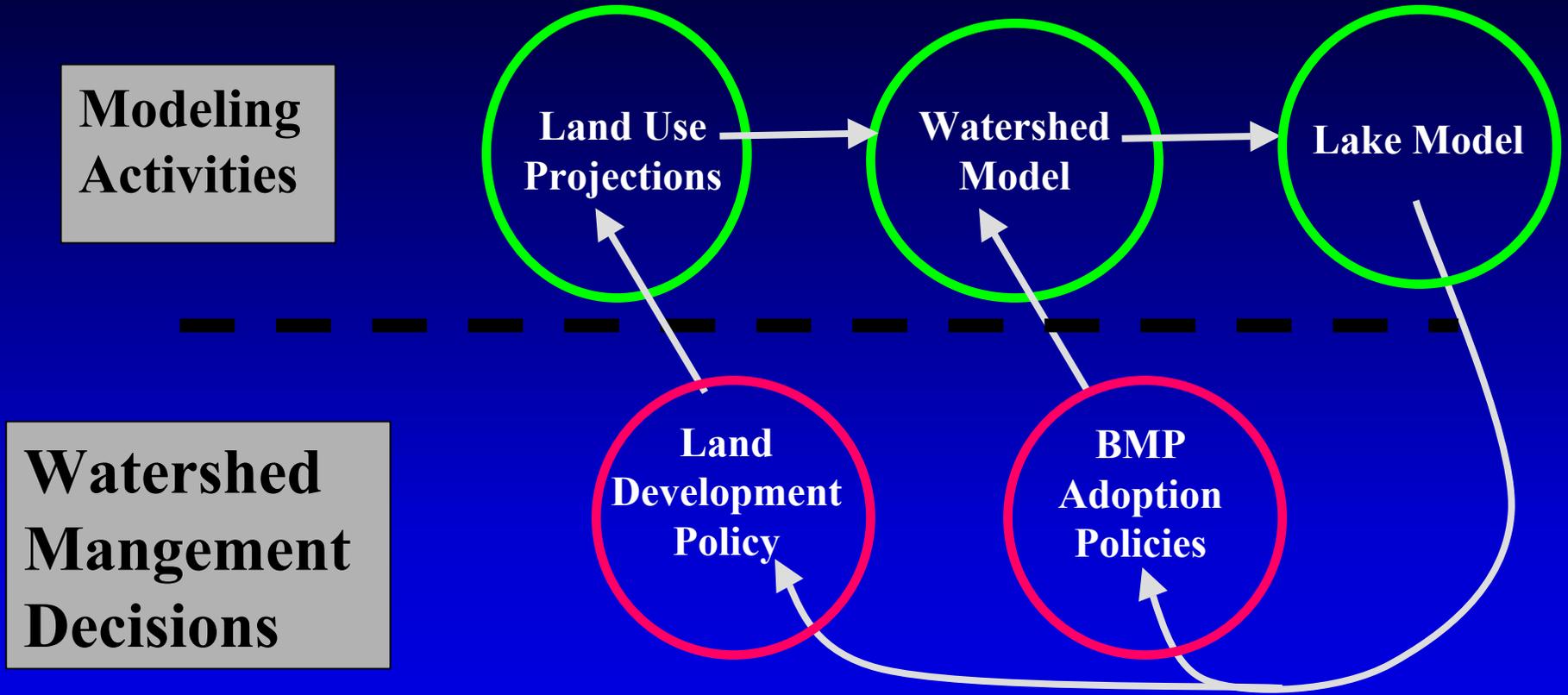
FRAMES, WMS, BASINS, CDF



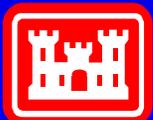
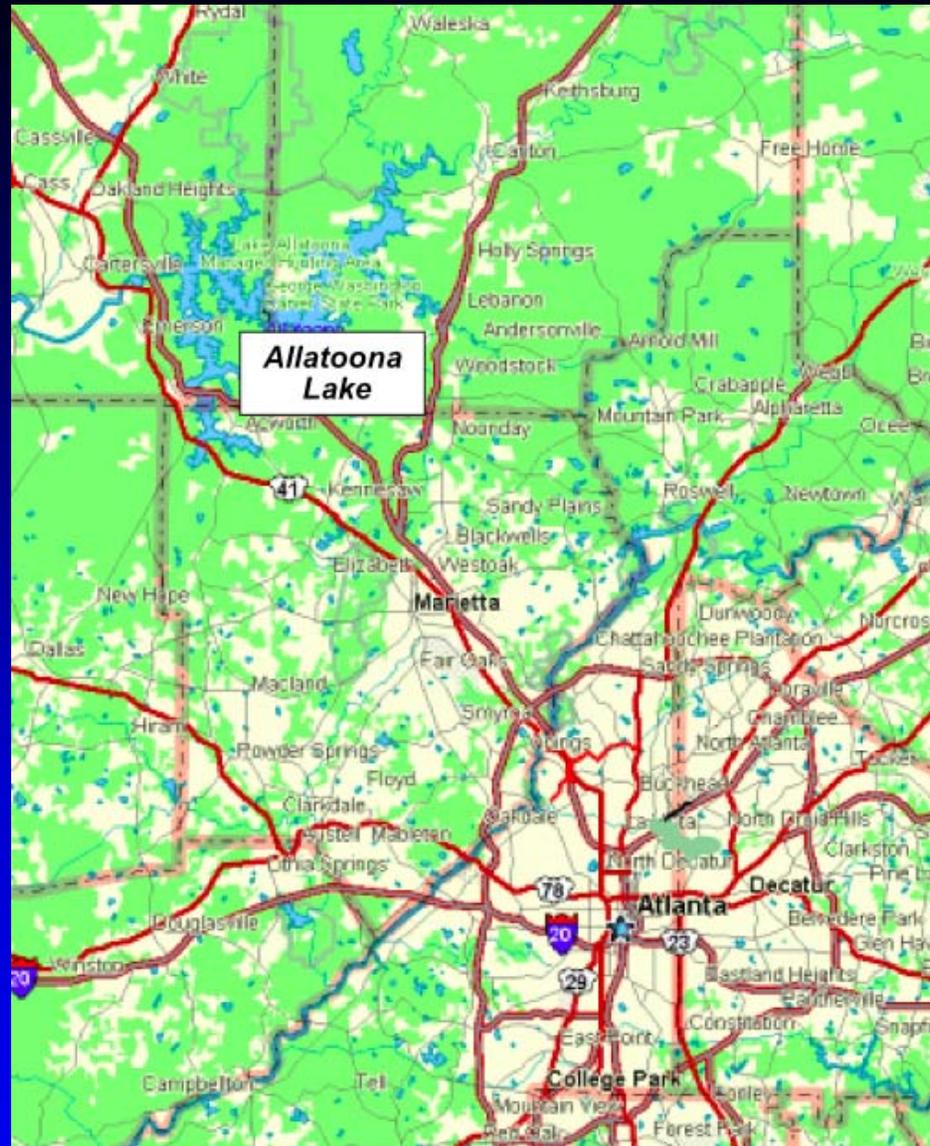
GIS Analyses



Modeling and Decision Processes for Lake Allatoona Watershed



Allatoona Lake, North of Atlanta



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North Atlanta Regional Growth Pattern

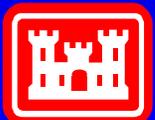


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Watershed Planning and Analysis

- Water issues dependent on land uses and practices in contributing watershed.
- Watershed dynamics involves understanding of cumulative processes and linkages across many jurisdictions. Current understanding and state of predictive tools is limited, as are current coordination efforts.
- Many organizations required to work together – to achieve improvements in water quality, water supply, recreation, reduced flooding and sustained water resource use.
- Multiple objectives not always complimentary.





Questions?