

Predicting Loss of Installation Training Capacity - Based on Today's Regional Planning

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Project Participants

- ERDC-CERL
 - Kyle Brock - student
 - Jim Westervelt

- U of Ill - Dept of Urban and Regional Planning
 - Brian Deal - LEAM Lab Director
 - Woonsup Choi - student
 - Jeff Terstriep - Senior programmer



Project Support

- SERDP (Strategic Env. R&D Program)
 - Develop and publish approaches to predict urban growth and impacts on installations
 - Develop and test prototype models for Benning, Bragg, Carson, and Ripley

- Army Corps direct R&D funds
 - Fort Future
 - Develop Web-based ability to simulate installation processes
 - Building
 - Cantonment
 - Ranges
 - Regional



Challenge

Influence regional planning ...

... to sustain tomorrow's training

Need tools to

Test proposed regional investments and policies with respect to future changes in training opportunities - 20-50 years out



Cause-Effect Chain

$$\begin{array}{l} \text{Training/} \\ \text{Testing} \\ \text{Capacity} \end{array} = f \left(\begin{array}{l} \text{Soil, weather, weapons, doctrine, terrain,} \\ \text{vegetation, habitat, regional habitat, noise} \\ \text{effects, dust/smoke effects, ambient light, RFI} \end{array} \right)$$

$$\text{regional habitat} = f (\text{urban patterns})$$

$$\text{noise effects} = f (\text{urban patterns})$$

$$\text{dust/smoke effects} = f (\text{urban patterns})$$

$$\text{ambient light} = f (\text{urban patterns})$$

$$\text{RFI} = f (\text{urban patterns})$$

$$\begin{array}{l} \text{Urban} \\ \text{Patterns} \end{array} = f \left(\begin{array}{l} \text{free-market land development} \end{array} \right)$$

$$\text{Development} = f \left(\text{regional land use investments and policies} \right)$$



Therefore:

$$\text{Training and testing capacity} = f \left(\begin{array}{l} \text{regional land use} \\ \text{investments and policies} \end{array} \right)$$

- Ultimate goal of the mLEAM program:
 - Allow users to interactively propose regional investments and policies
 - Provide rapid feedback on the training/testing capacity implications



Regional Investments and Policies

■ Investments

- Construction of highways
- Construction of ramps on limited access highways
- County, state, and federal land purchases
- Purchase of development rights

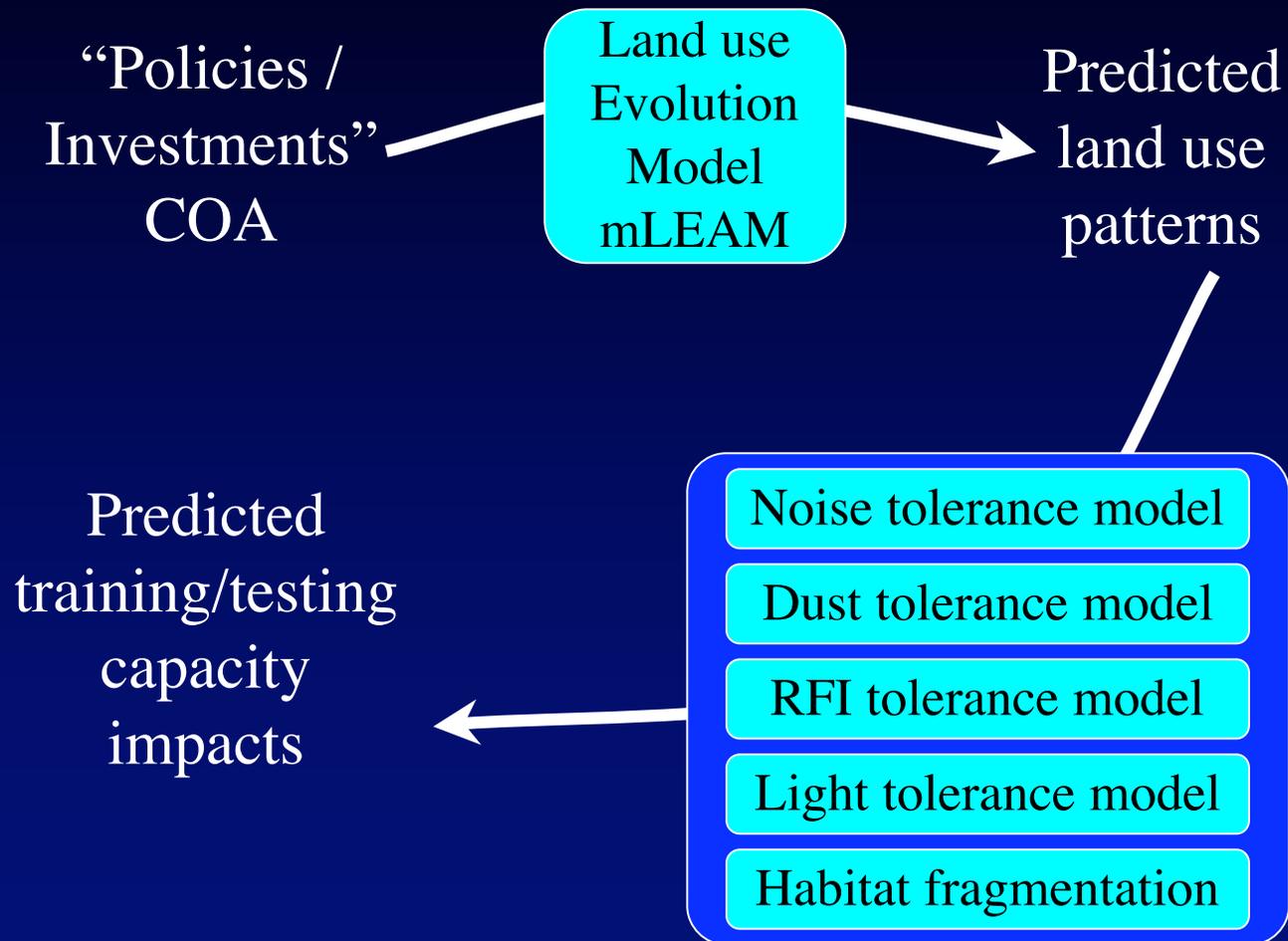
■ Policies

- Zoning
- Level of growth stimulus

*One present -
Many possible futures*



Overall Process



Preparation of Input Maps

Land Cover (2-3 decades)
USGS NLCD
Digital Elevation
USGS DEM
Boundary
Census bureau UA/UC
Road Network
Census bureau Tiger
Property Ownership
USGS, DoD, BLM, etc
Floodplain
FEMA

GIS scripts

- Boundary
- Nogrowth
- Landcover
- Water_dist
- Forest_dist
- Slope
- Cities_att
- Highway_att
- Intersection_att
- Metrobuffer
- Ramp_att
- CountyRoad_att

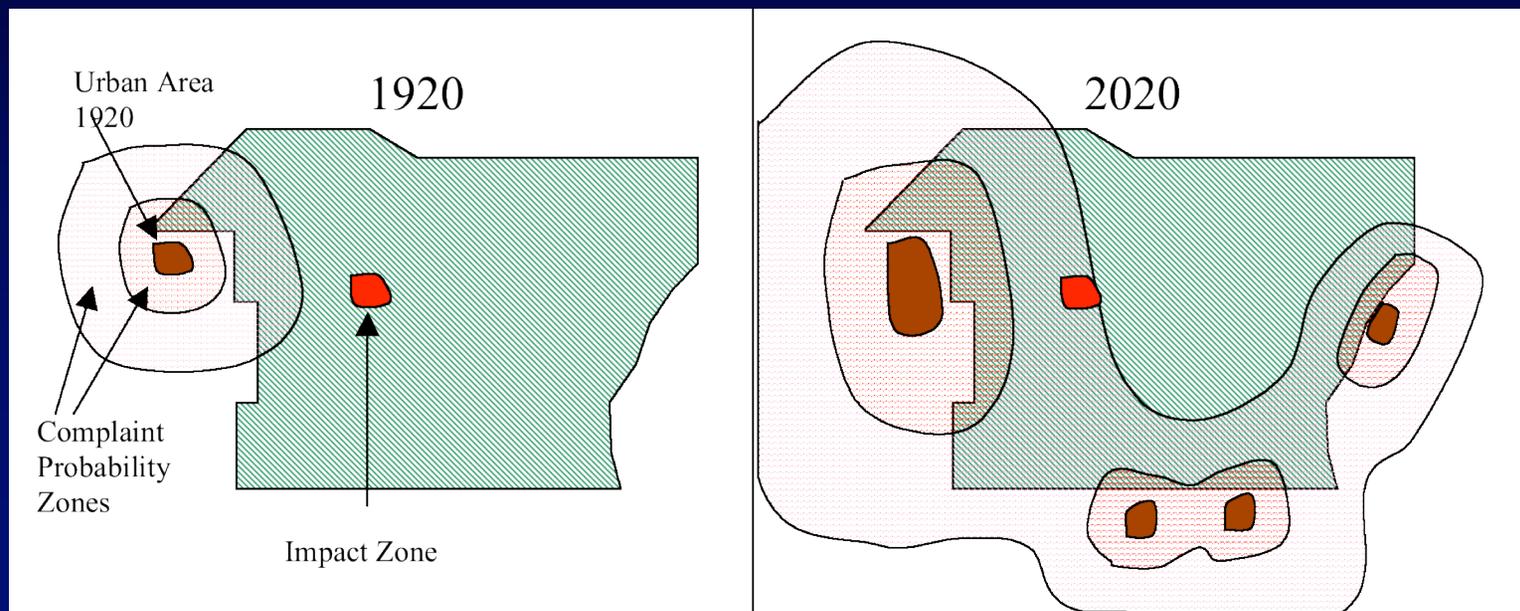
Projection and coordinate
conversion



Training Tolerance Prediction

Tolerance decreases with inverse square of receptor

- Can be useful for noise, dust, smoke, RFI



Hypothetical Fort Bragg Example

Consider three highway options

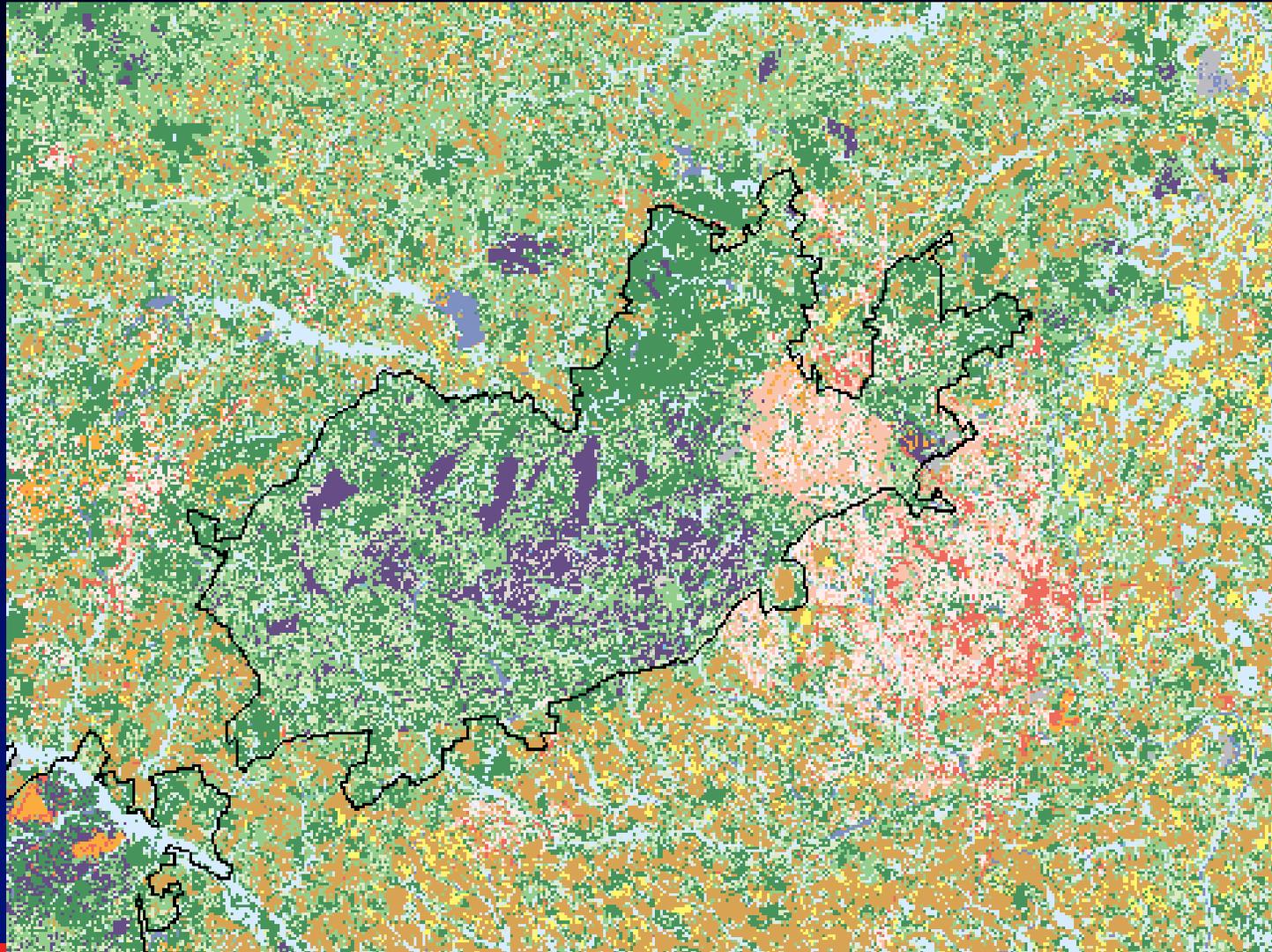
- No highway
- Highway going mostly away from the installation
- Highway going along the southern edge of the installation

Questions

- How will future residential patterns be different?
- How will my opportunity to train change? Urban Development Approach

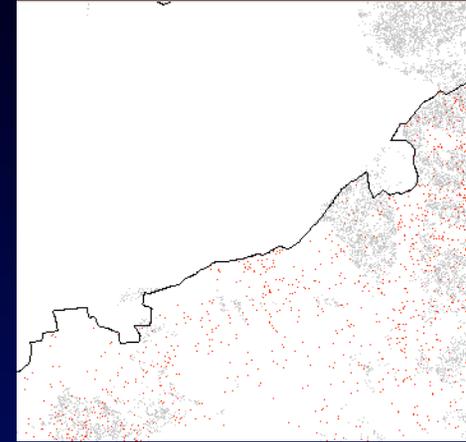
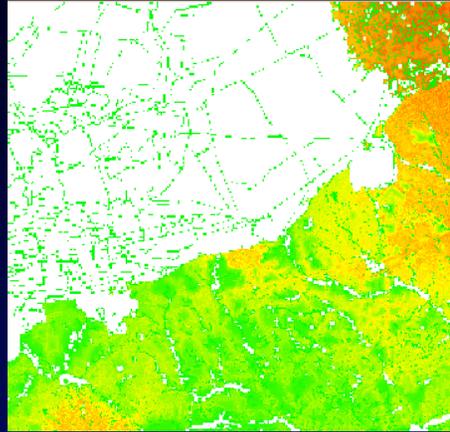
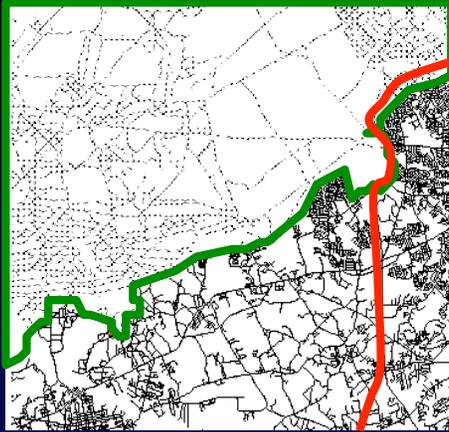


Fort Bragg

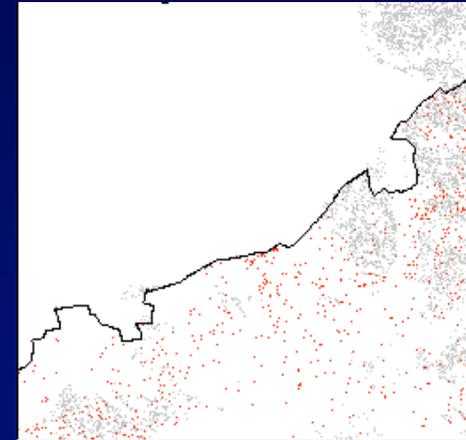
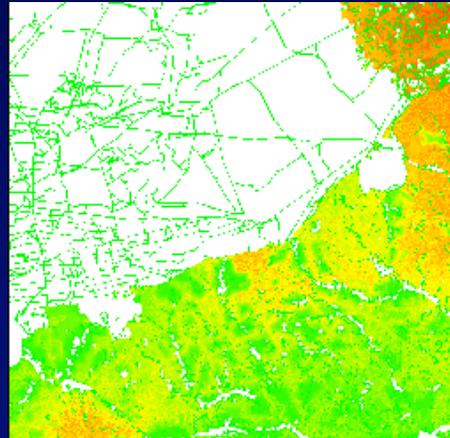
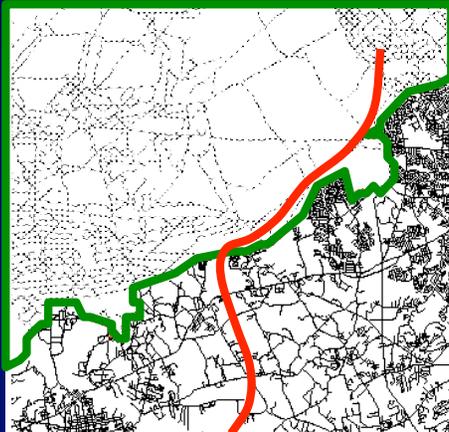


Gross Analysis Steps

South



SW



Roads

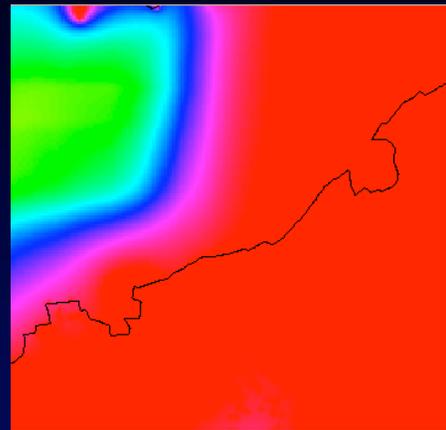
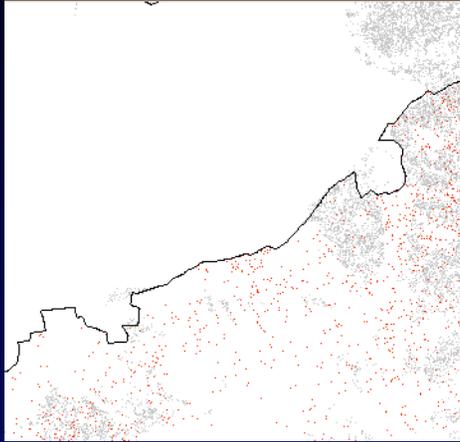
Residential
Attractiveness

Future Residential

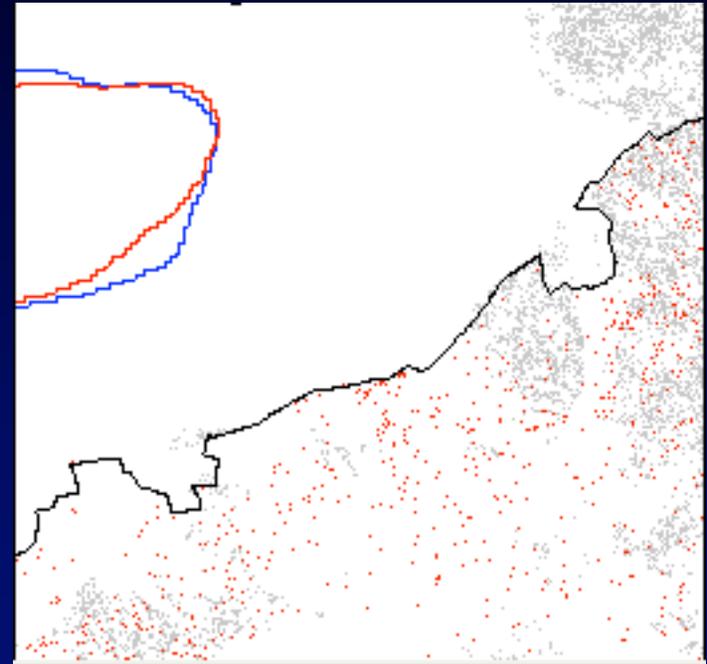
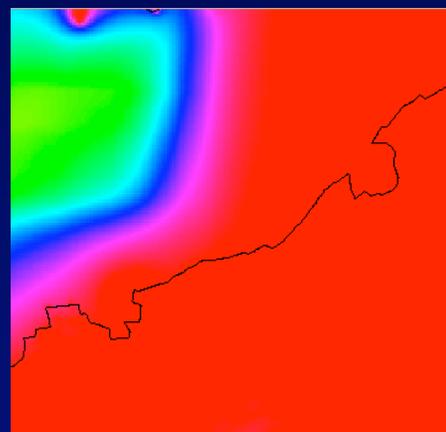
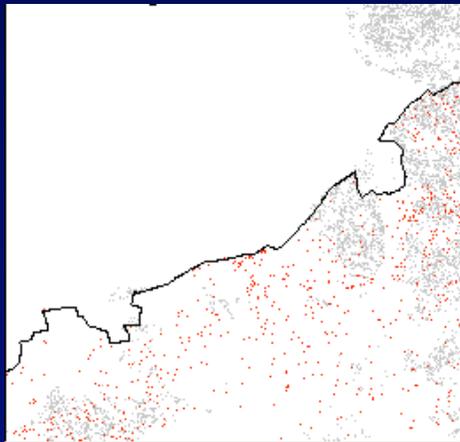


Gross Analysis Steps

South



SW



Difference

Future Residential

Training Tolerance



Potential Scenarios

- Land (or development right) purchases
- Proposed zoning
- Proposed highway locations
- Proposed subdivisions
- Proposed utilities investments
- Proposed state parks

Your ideas!! --- Your future!!



Summary

- Today's regional investments (e.g. infrastructure) and policies (e.g. zoning) affects future training opportunities
 - On and Off installation
- Use the computer to test your ideas on your future

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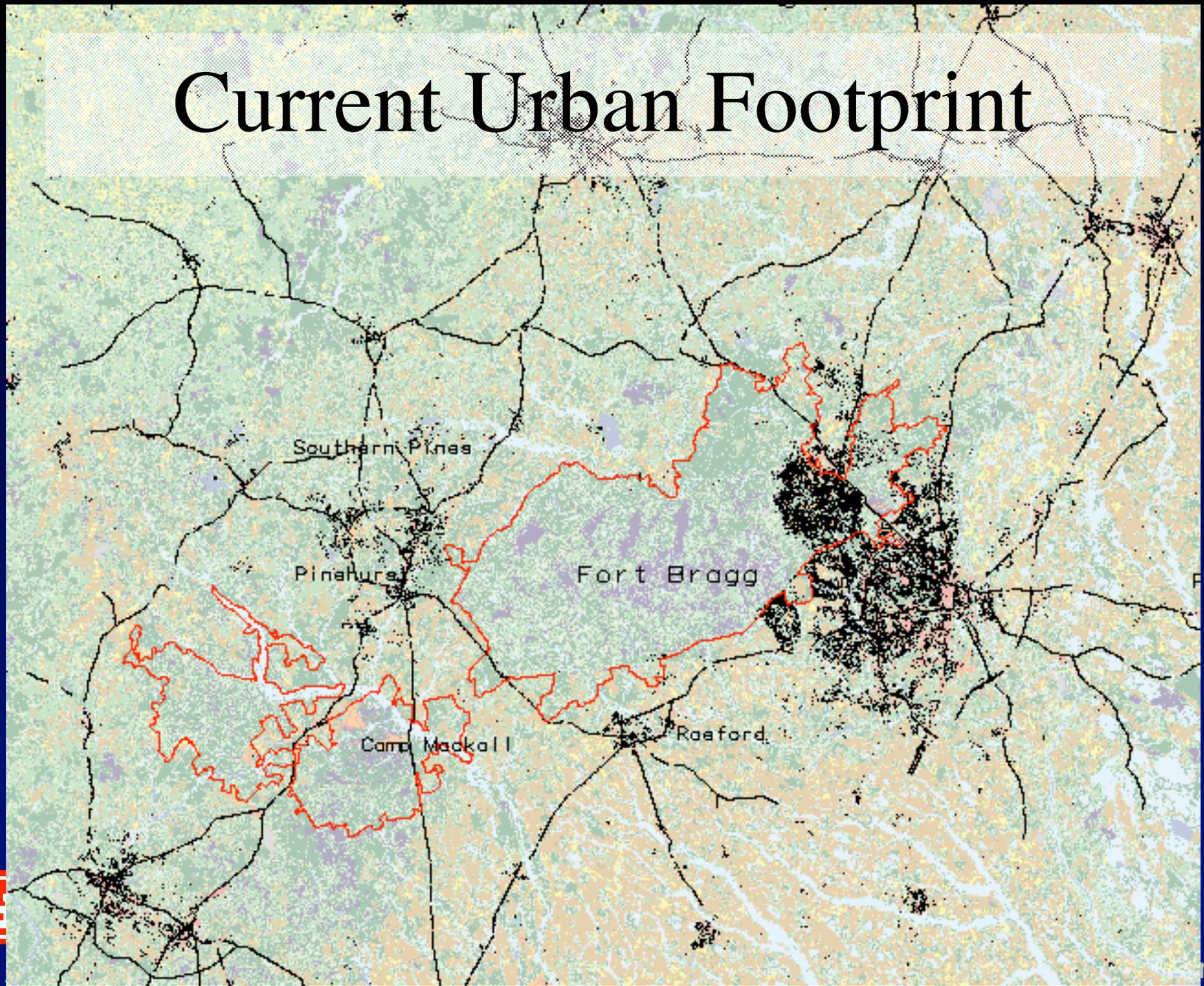




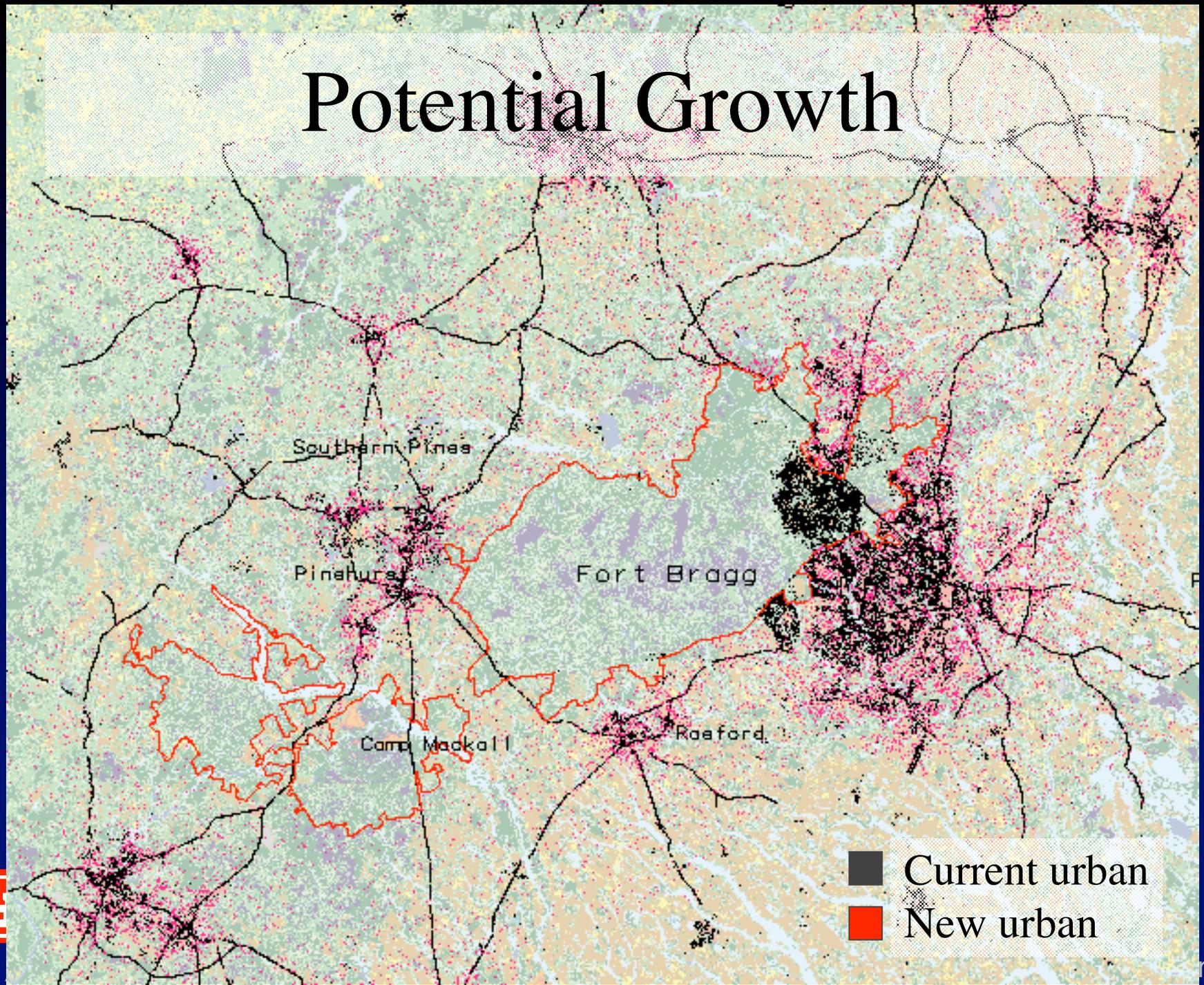
US Army Corps of Engineers

Engineer Research & Development Center

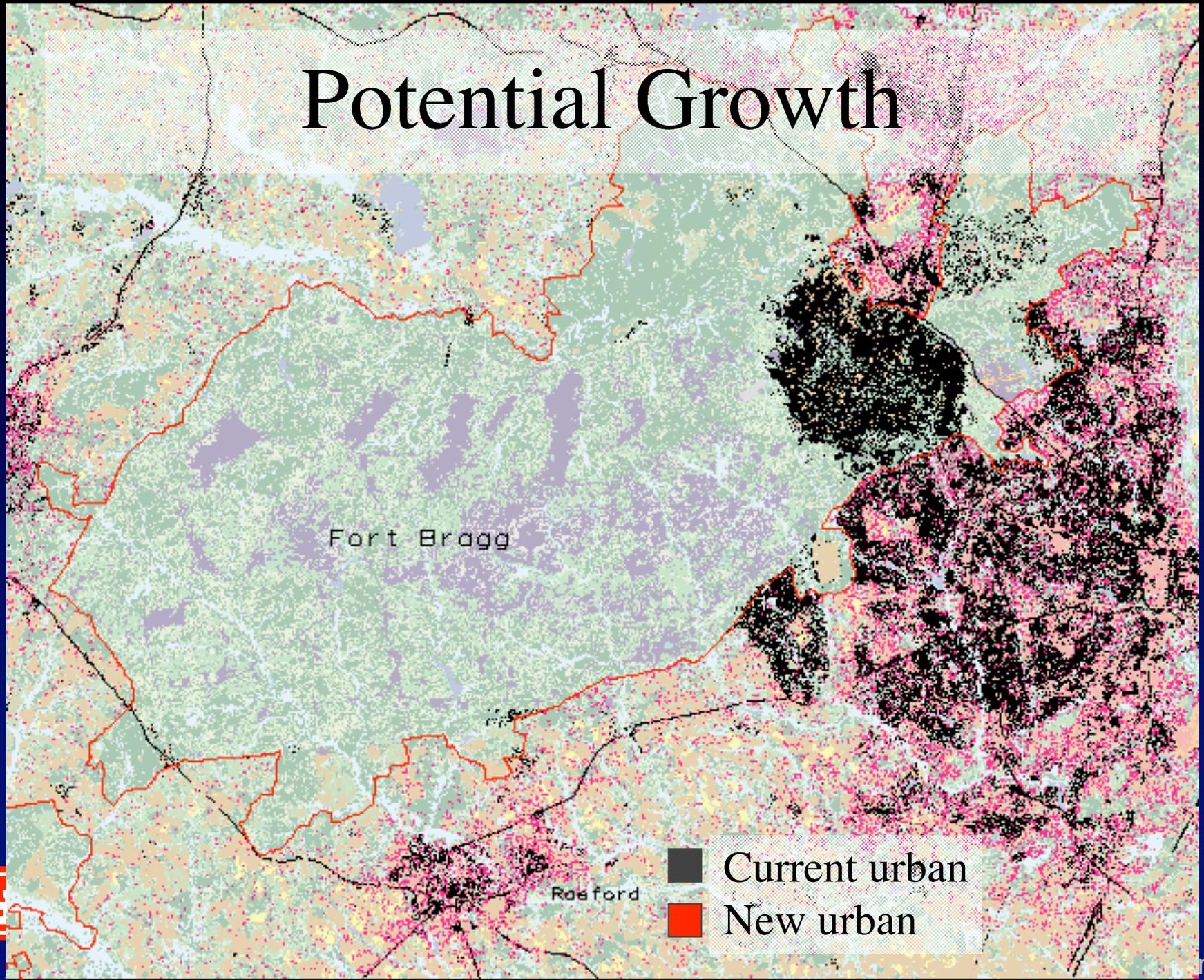
Current Urban Footprint



Potential Growth



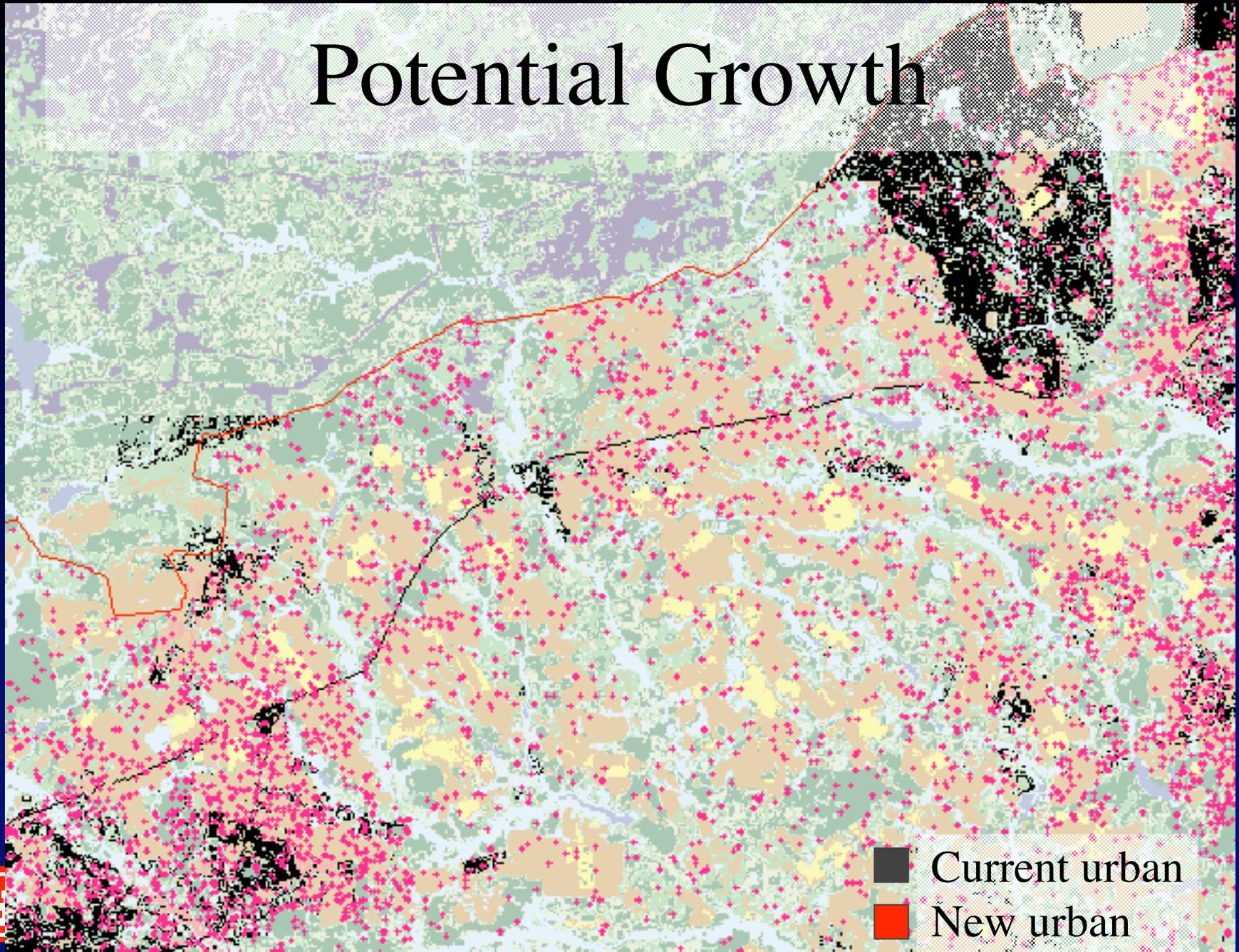
Potential Growth



- Current urban
- New urban



Potential Growth



■ Current urban

■ New urban



Futures

- Many scenarios can be tested
- Ft. Bragg GIS shops can use and adapt our approach
- Refinements and modifications can increase usefulness and accuracy
- Local knowledge is critical to appropriate calibration and application

- Many thanks for Fort Bragg assistance/advice!!



User? Questions?

■ Users

- Installation planners, range control, and environmental offices
- HQ Planners

■ Question

- How will proposed regional plans and investments affect future training/testing carrying capacity on installations?



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