Remote Sensing Applications for Environmental Analysis in Transportation Planning: Application to the Washington State I-405 Corridor

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Elizabeth L. Lanzer
Washington State Department of Transportation
Demin Xiong
Oak Ridge National Laboratory

Project Partners

Washington State Department of Transportation

OAK RIDGE NATIONAL LABORATORY

Leica Geosystems

ERDAS
geographic imaging made simple

Puget Sound Regional Council
psrc.org
regional transportation and growth management planning

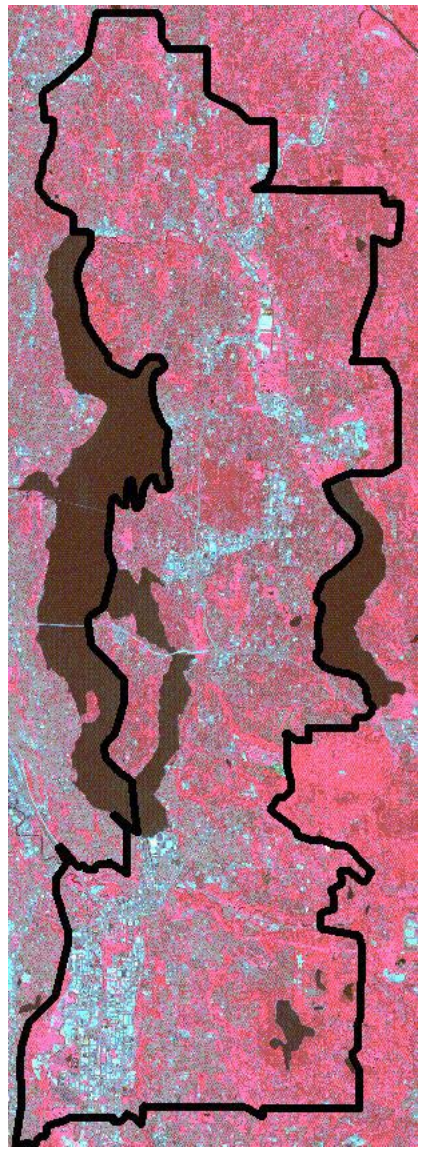
Wisconsin DOT

SPACE IMAGING
Visual Information. Visible Results.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Project Purpose / Need

Evaluate the cost benefit advantages of using remote sensing based information for corridor level, programmatic Environmental Impact Statements in a rapidly developing metropolitan area (“Pugetopolis”).



Project Deliverables

- A data base for use in preliminary site specific EIS work.
- A cost / benefit evaluation of how a remote sensing based approach can help streamline EIS data collection
- Documentation for how to create data for this purpose.

Project Overview

- Collect Data
- Preprocess Data
- Image Fusion
- Unsupervised Classification
- First Phase Fieldwork
- Classification Processing
- Second Phase Fieldwork
- Accuracy Assessment
- Final LULC
- Application to NEPA
- Cost Benefit Assessment

Imagery Resources

High Resolution (1/2 foot) color orthophotography supported by high precision survey control network.

Imagery Resources

Terrain Corrected
Landsat7 EMT+
2000 imagery
(3-2-1 mosaic)

Available GIS Data

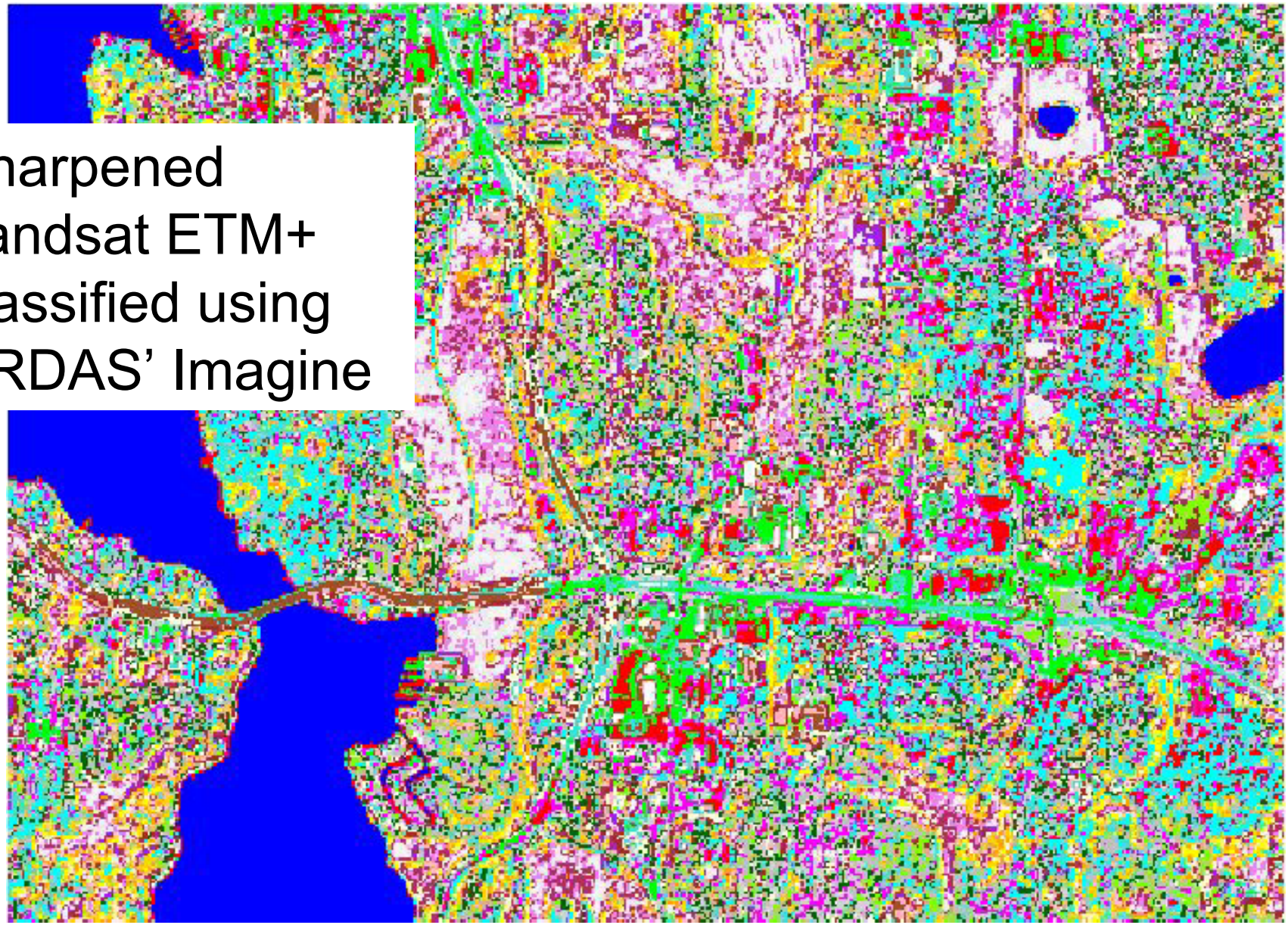
- National Data Resources:
  - USGS GIRAS Land Use Land Cover
  - US Census Bureau TIGER data
  - US Census Bureau Census data
  - USGS 10 meter Digital Elevation Model

- State & Local Data Resources:
  - Wetlands
  - Hydrography & Floodplains
  - Land Use Zoning
  - Elevation (LIDAR)
  - Geologic Hazards
  - Habitat & Species inventory

Image Fusion

IKONOS multi-spectral images sharpened with panchromatic band (same method used for LANDSAT imagery)

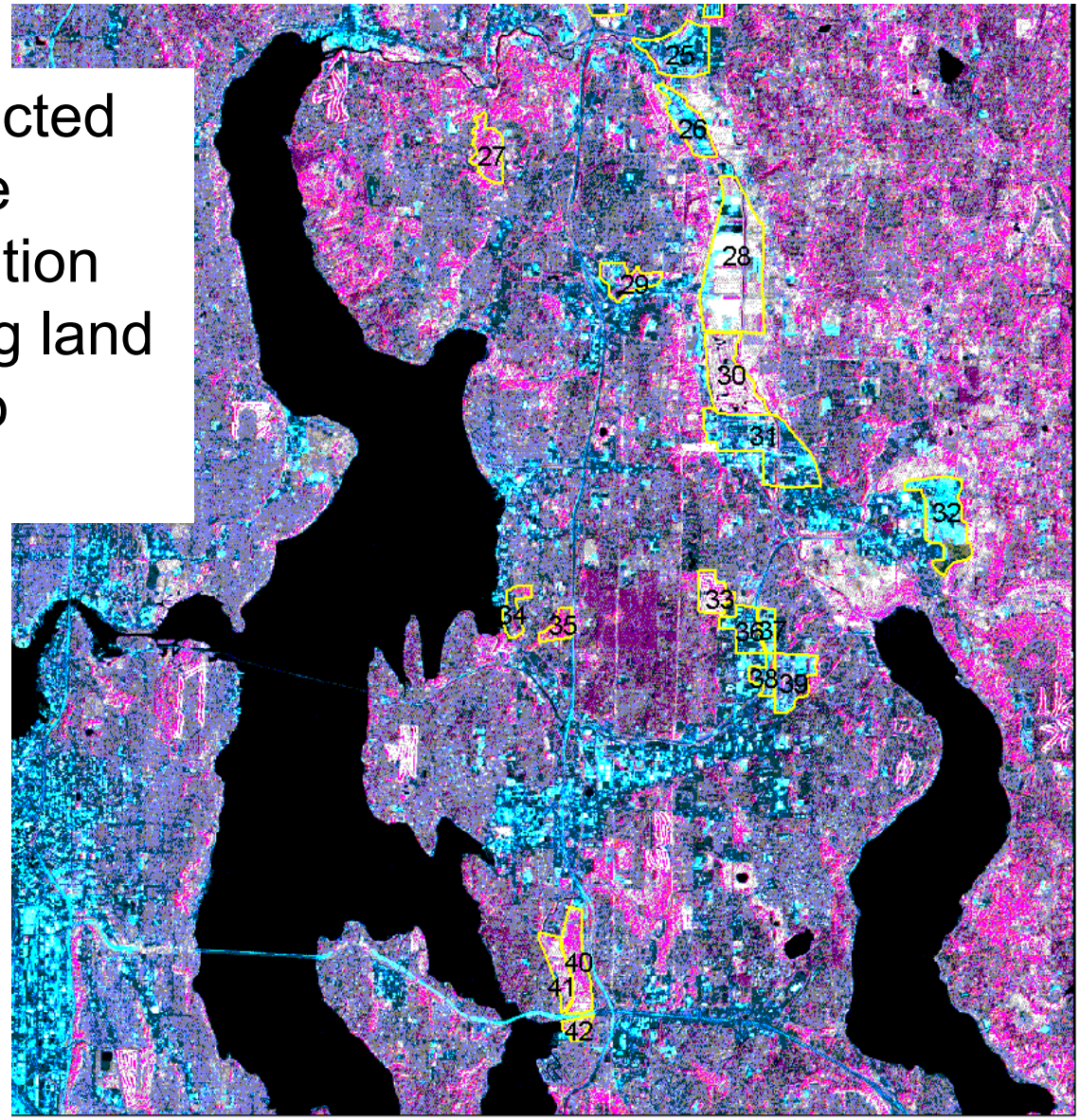
Unsupervised Classification



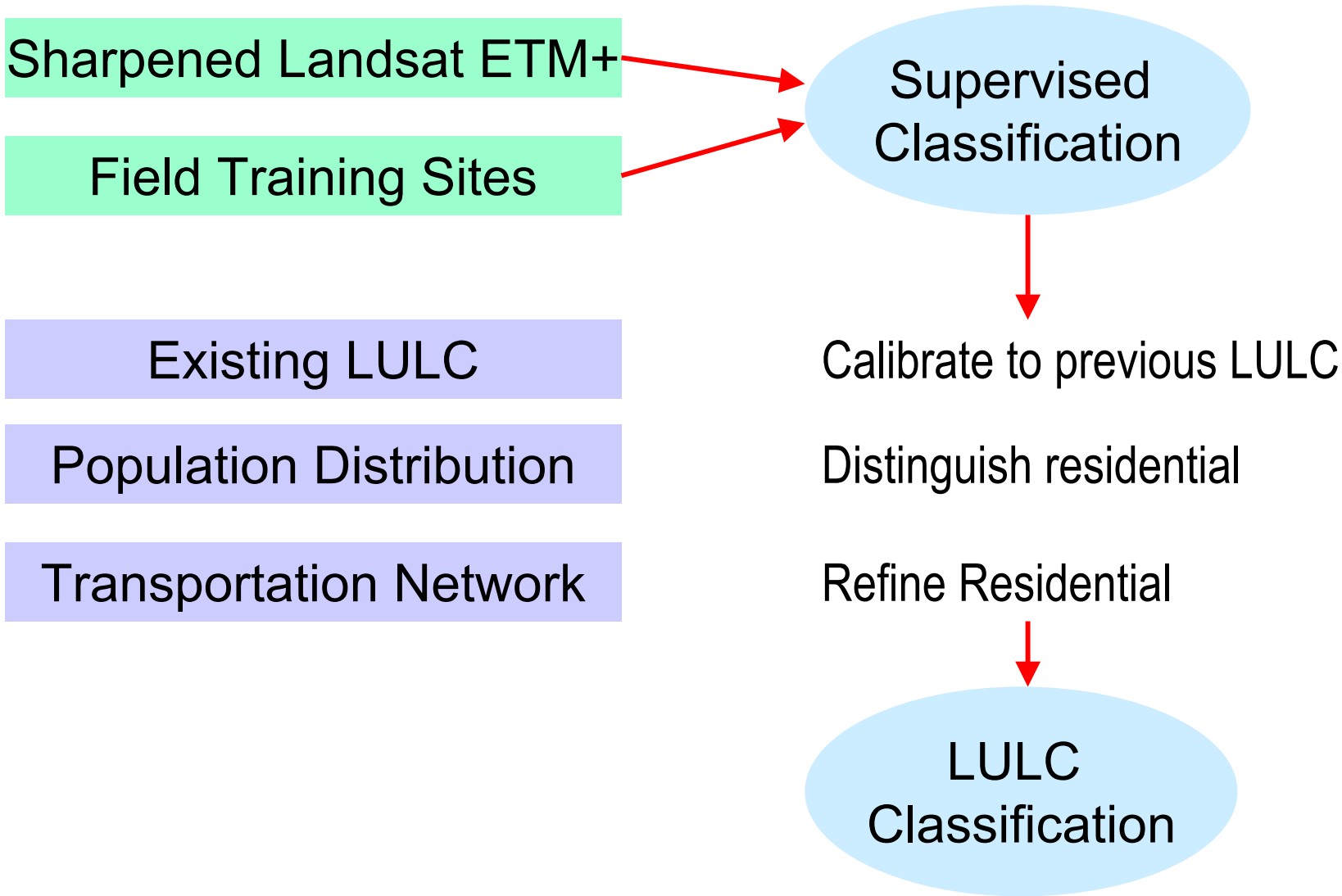
Sharpened Landsat ETM+ classified using ERDAS' Imagine

First Phase Fieldwork

Sample sites were selected for field survey from the unsupervised classification and referencing existing land use / land cover data to narrow field findings.



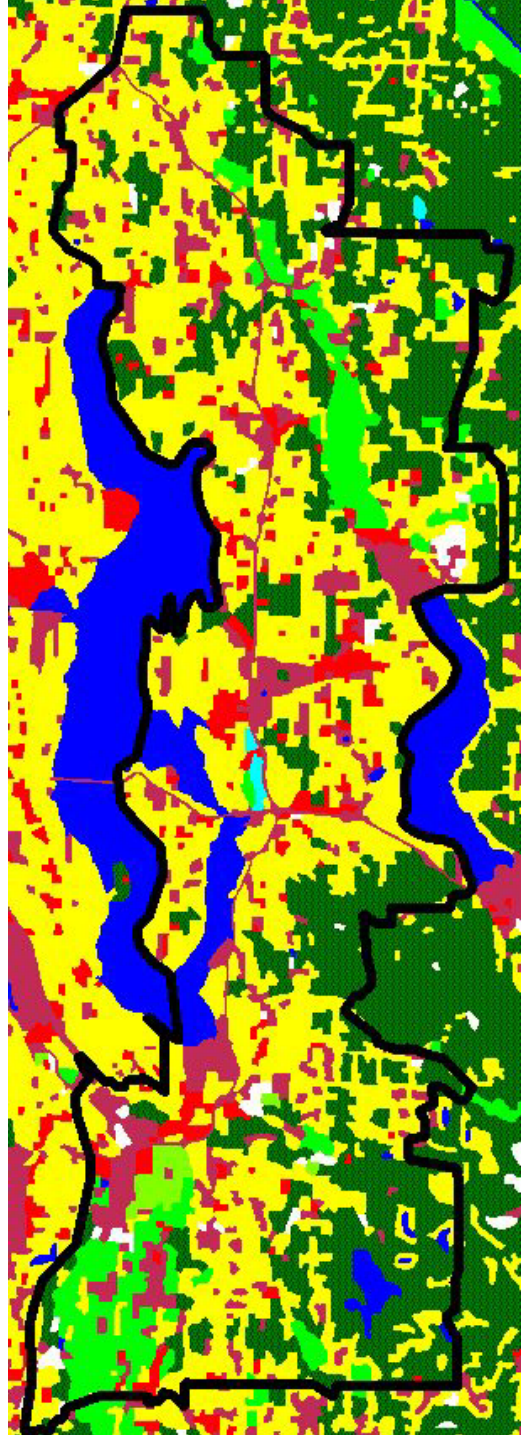
Classification Processing



Calibrate with Previous Land Use / Land Cover Mapping

USGS' GIRAS Land Use / Land Cover data used due to national availability.

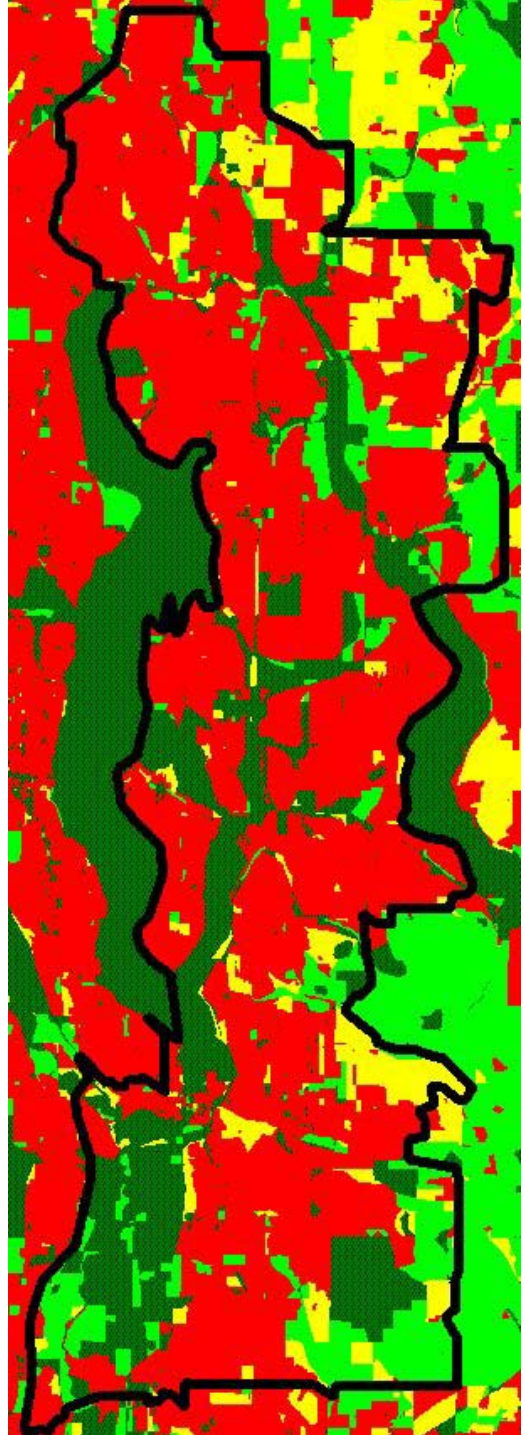
- Yellow – Residential
- Red – Commercial
- Purple – Industrial / Other Urban
- Light Green – Agriculture
- Dark Green – Forest Land
- Light Blue – Wetland
- Dark Blue – Water
- White – Barren / Quarries / etc.



Distinguish Residential with Population Data

Used to distinguish suburban low density residential from forest lands, etc.

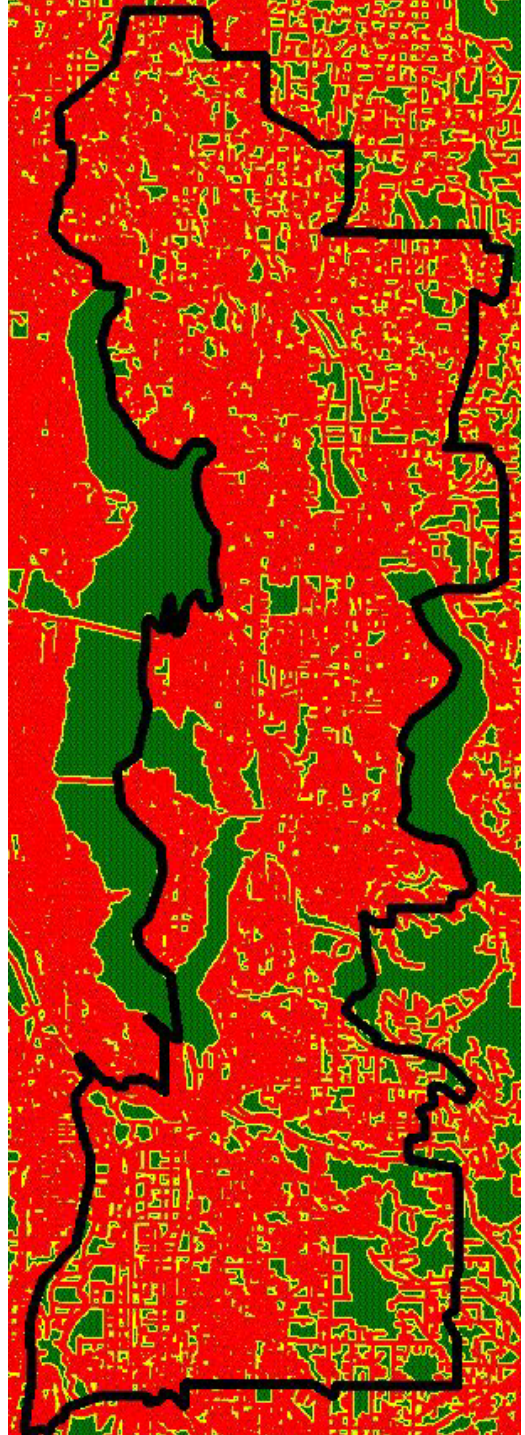
- Dark Green – lowest population density
- Light Green – low population density
- Yellow – high population density
- Red- highest population density



Refine Residential With Road Network

Areas over 150 meters from a road were seen as unlikely residential areas.

- Red – 0-75 meters from roads
- Yellow – 75-150 meters from roads
- Green – over 150 meters from roads



LULC Classification

Classification completed to 30 categories (generalized here).

- Yellow – Residential
- Red – Commercial
- Purple – Industrial / Other Urban
- Light Green – Agriculture
- Dark Green – Forest Land
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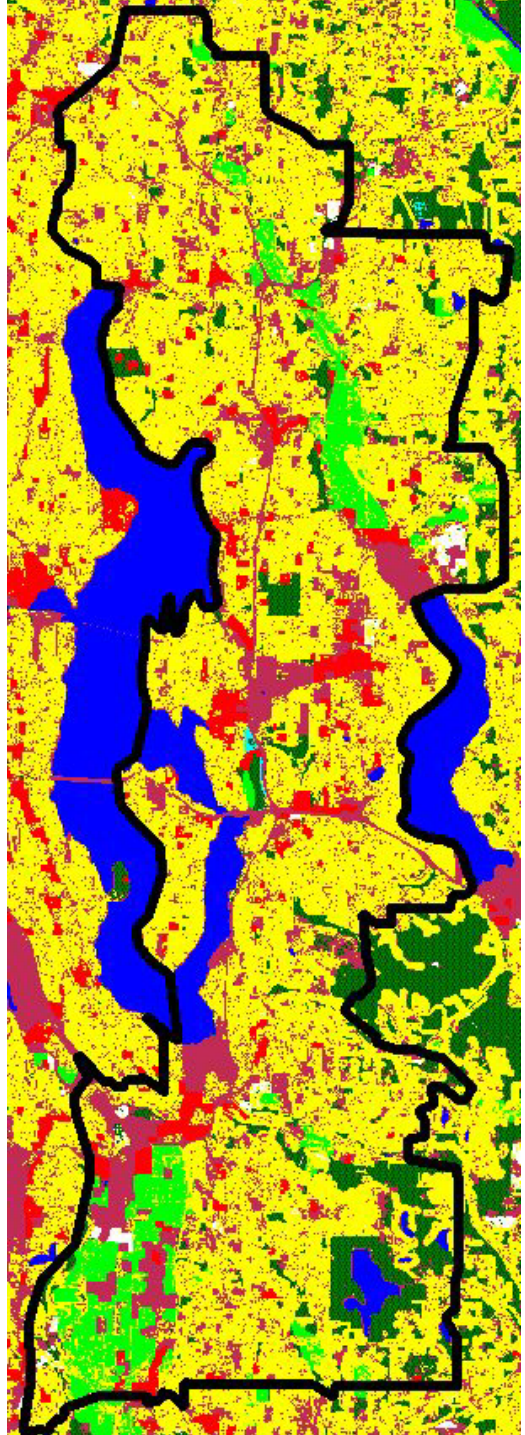

Project Status

- Method documents drafted and being revised
  - Classification
  - Data Analysis
  - Cost Benefit Assessment
- Land Use / Land Cover Classification 95% done
- Gearing up for second phase fieldwork
- Preparing for NEPA applicability evaluation
- Preparing for cost benefit assessment

Project Budget

	To Sept 2002	FEDERAL SHARE		
Project Task		Cumulative Expenditures	Partner Shares to Date	Cumulative Project Total
1	Field Study	$11,301.25	$8,409.76	$19,711.01
2	Data Collection	$10,218.84	$197,818.61	$208,037.45
3	Image Processing	$21,497.01	$15,179.01	$36,676.01
4	Applicability to NEPA	$4,437.22	$3,662.97	$8,100.19
5	Cost Benefit Comparison	$4,746.21	$5,989.15	$10,735.36
6	Documentation & Tech Transfer	$0.00		
Project Management (WSDOT)		$2,775.87	$2,057.20	$4,833.07
	Totals	$32,625.70	$233,116.70	$288,093.10

Project Contacts

Project Management:
Elizabeth L. Lanzer
Washington State DOT
LanzerE@wsdot.wa.gov
360.705.7476

Project Technical Specifics:
Demin Xiong, Ph.D.
Oak Ridge Natl Lab
xiongd@ornl.gov
865.574.2696

Project Website (being moved to):
http://www.wsdot.wa.gov/environment/EAO/envinfo/envinfo_I405.htm