



USDA-DOI GPS Challenge Team

Real Time Positioning & Navigation in Challenging Environments

48th Meeting
Civil GPS Service Interface Committee
September 15, 2008



USDA-DOI GPS Challenge Team

GPS Challenge Team Overview

- Purpose of the GPS Challenge Team
 - Supporting Agencies Pos/Nav Requirements
- Concept of the Investigations
 - Real Time Positioning
 - Landscape Characterization
 - Ecosystem Based
 - Improving Operational Capability
 - GPS Challenge Team Data



USDA-DOI GPS Challenge Team

USDA – DOI Cooperative Research Project

USDA – Natural Resources Conservation Service

USDA – Agricultural Research Service

USDA – U.S. Forest Service

DOI – National Park Service

DOI – U.S. Geological Survey

Sponsors

Interagency GPS Executive Board

USAF GPS - Wing Civil Applications Office



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Project

Real Time Positioning & Navigation in Challenging Environments

Tongass National Forest – Douglas Island Alaska
Pacific Gulf Coastal Forest / Meadow Province – *Northern Latitude*



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Purpose

Designed to Observe and Analyze the Effects
of Relief and Vegetation
on GPS Performance

Redwoods National Park, Arcata, CA
California Coastal, Steppe, Mixed-Redwood Forest Province



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Result

Provide Information and Guidance
to GPS Users to Improve
Positioning and Navigation Capability
Relative to Individual Environments

Hoosier National Forest, Bedford, IN
Eastern Broadleaf Forest (Continental) Province – *Central Rolling Hills*



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Concept

GPS Investigation Based on Ecosystems

U.S. Forest Service Test Site – Bakerville, CO
Southern Rocky Mountains Steppe – Coniferous Forest Province



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Concept

Observations Versus Truth Logging Static Data at Fixed Points

Acadia National Park, ME
Laurentian Mixed Forest Province – *Northern Latitude*



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Concept

Unique – Site Characterization
Hemisphere Photography and
Leaf Area Index Determination at Each Point



Acadia National Park, ME
Laurentian Mixed Forest Province – *Northern Latitude*



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Concept





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Concept

Improving Observation Capability



El Yunque National Park, PR Puerto Rico Province – *Rain Forest*



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Concept



Tandem Survey Control Points
Arcadia National Park – National Park Service Headquarters



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Degrees of Challenge

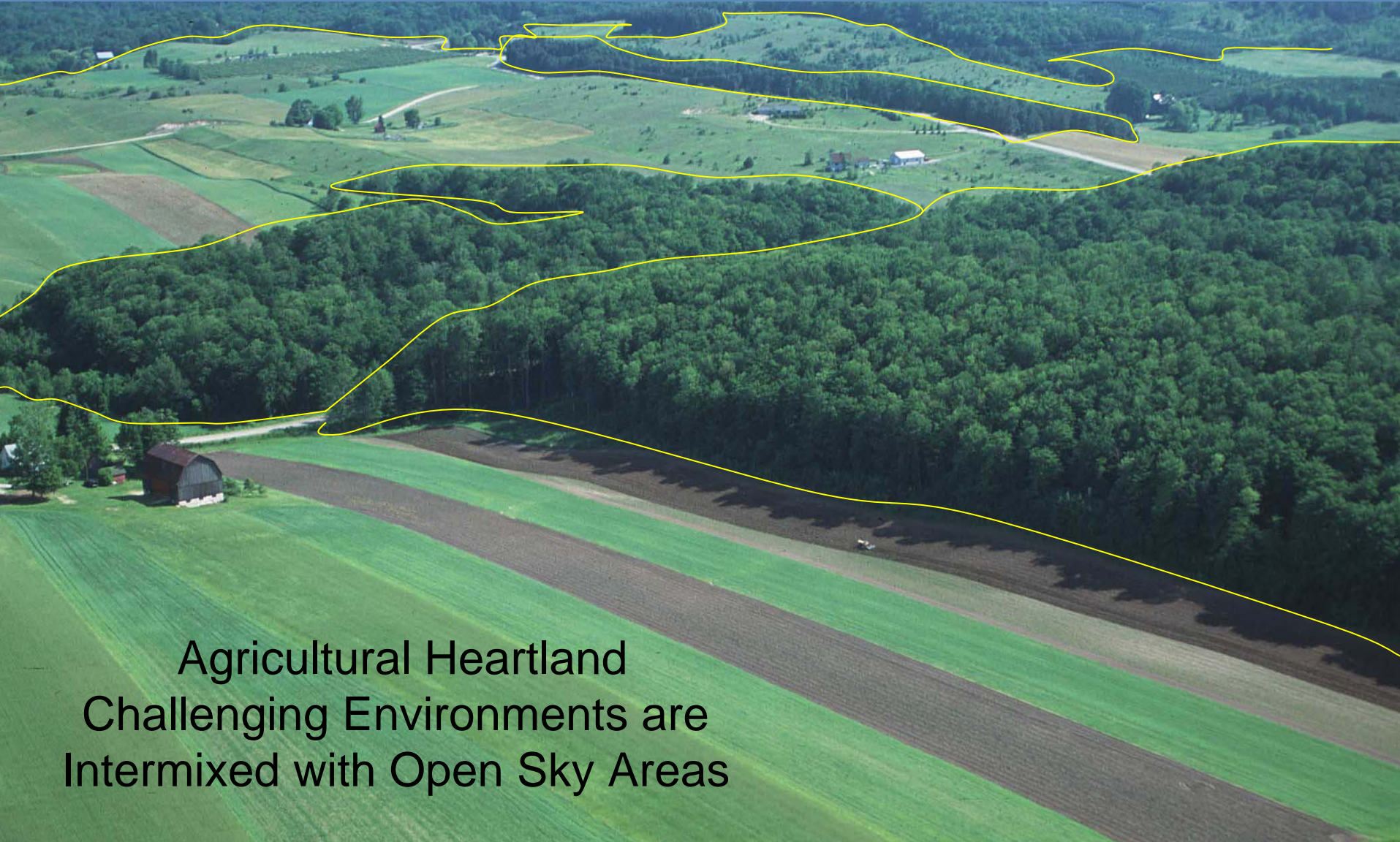
Open Sky Environment

Challenge – Horizontal and Vertical Accuracy



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Degrees of Challenge

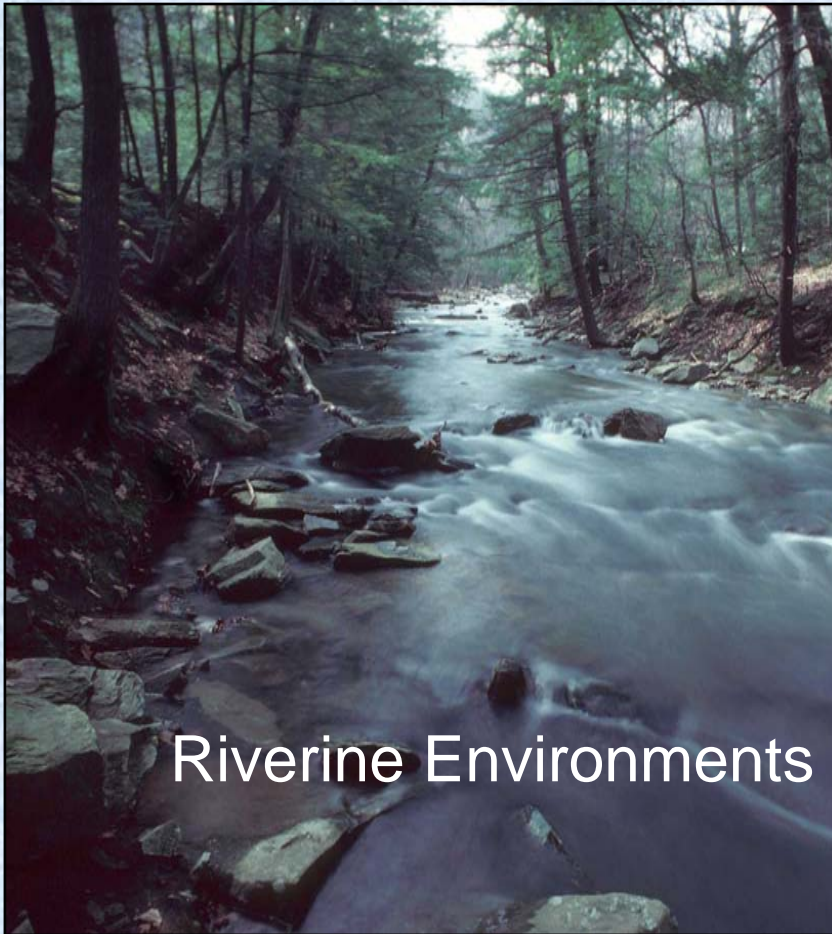


Agricultural Heartland
Challenging Environments are
Intermixed with Open Sky Areas

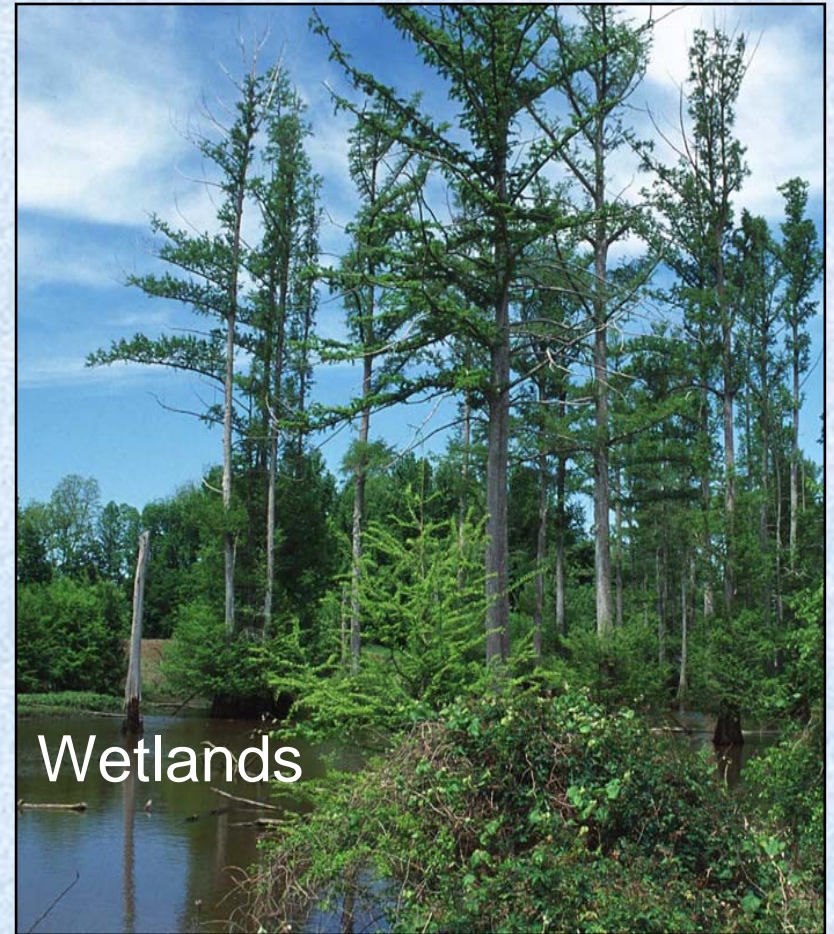


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Degrees of Challenge



Riverine Environments



Wetlands



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Degrees of Challenge

Complex Terrain
Vertical and Directional Barriers





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Degrees of Challenge

How Challenging Can a Environment Be?



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Degrees of Challenge

Safety of Life Applications

Fire Management





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Degrees of Challenge

Safety of Life Applications



Extreme Cold – Winter Survival



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Ecosystem Based Investigations

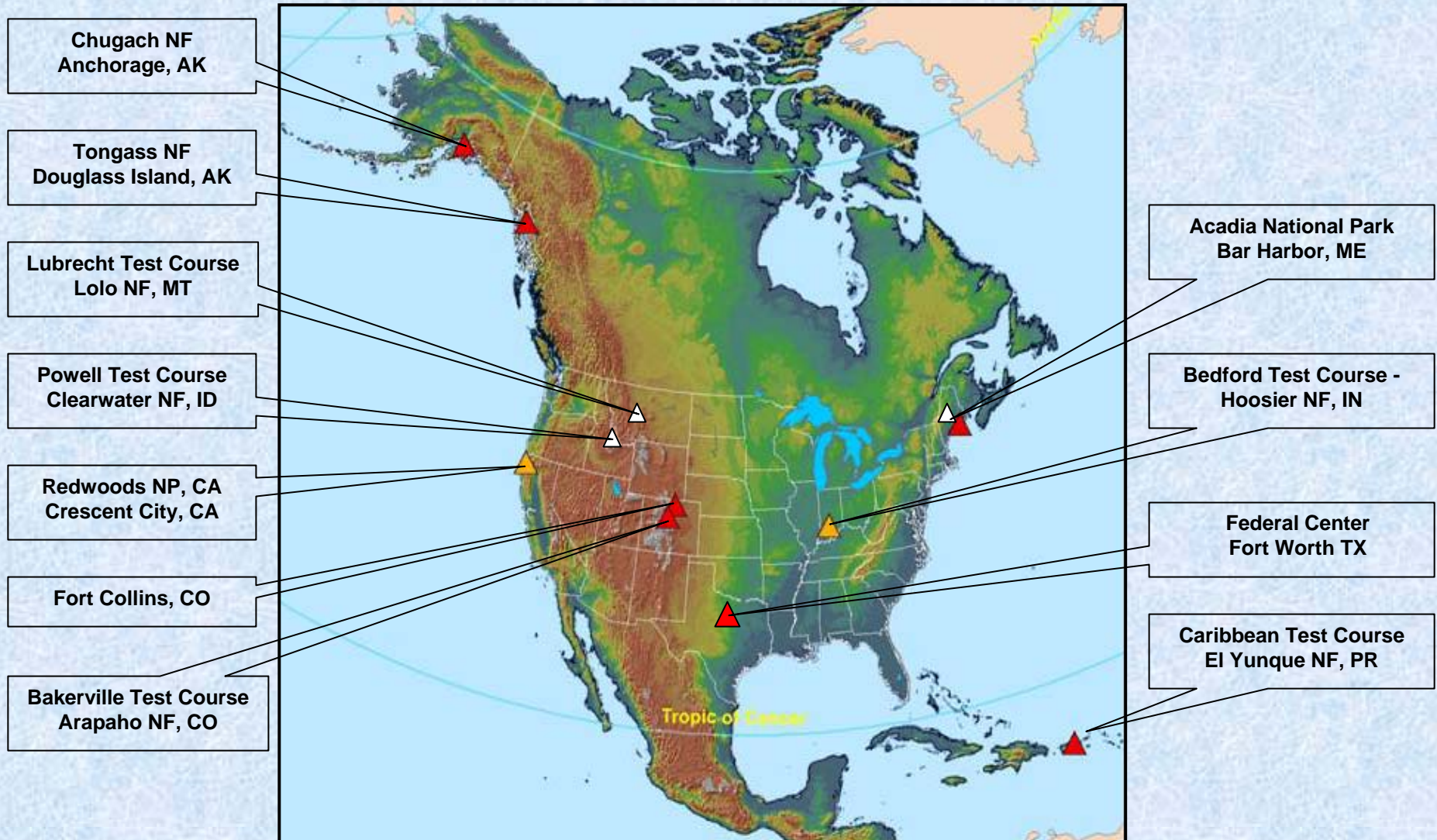
Site Selection Criteria

- Landscape Features
 - High Relief / Directional Formations
 - Vegetation (Open to Closed Canopy)
- Federal Land
- Monumentation
- NDGPS Coverage
- Areas of National Importance
- Local Support



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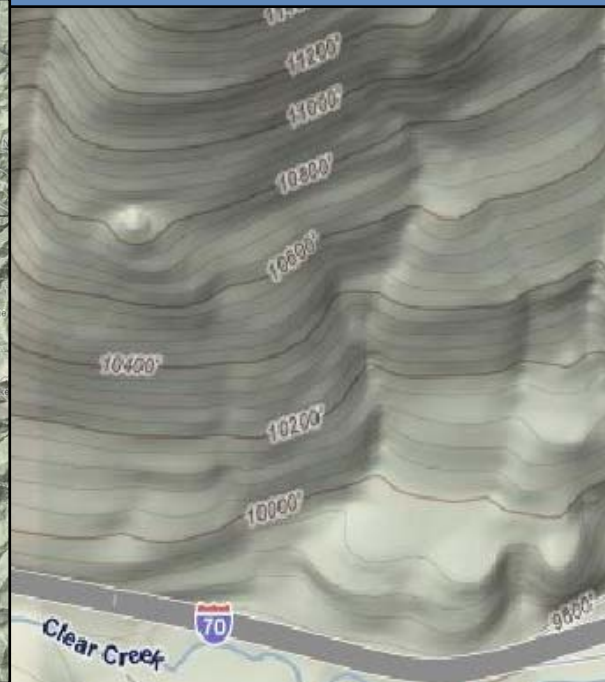
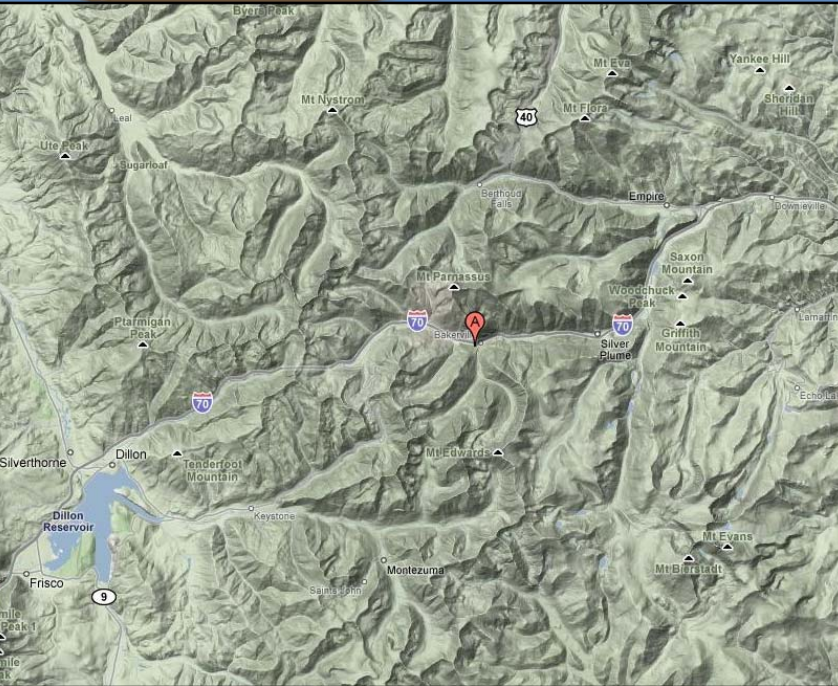
GPS Investigation Sites





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Bakerville CO

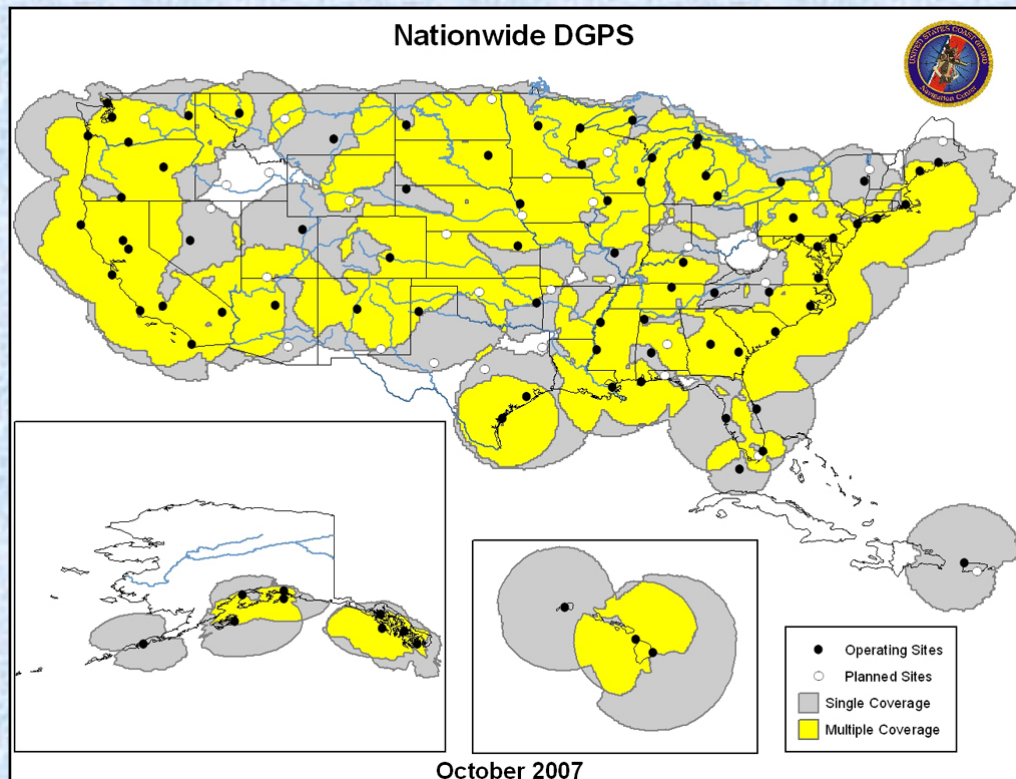




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DGPS

Nationwide Differential GPS (NDGPS)





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DGPS

Wide Area Augmentation System (WAAS)

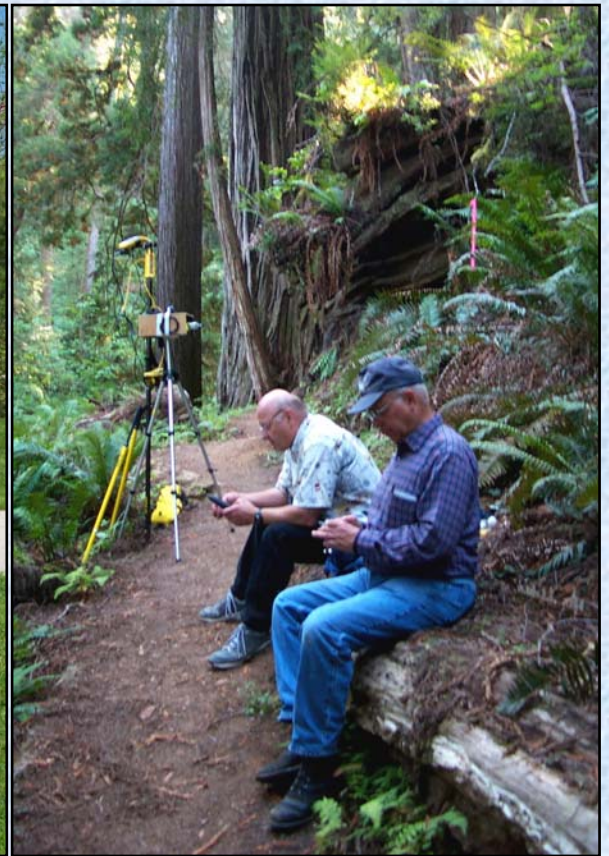




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Data

How Much Data Can You Collect?





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Data

GPS Challenge Team Data Asset

Represented by:

- 176 FTE days
 - Does not include travel, preparation, or analysis
- Data collection on 96 points on 11 sites
- 1021 Hours of observation
- 1885 Data files
- 22 Million lines of raw data
- 1.7 Million lines of processed data

4 Years of GPS Investigations



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Degree of Difficulty



Terrain

Rain

Weight

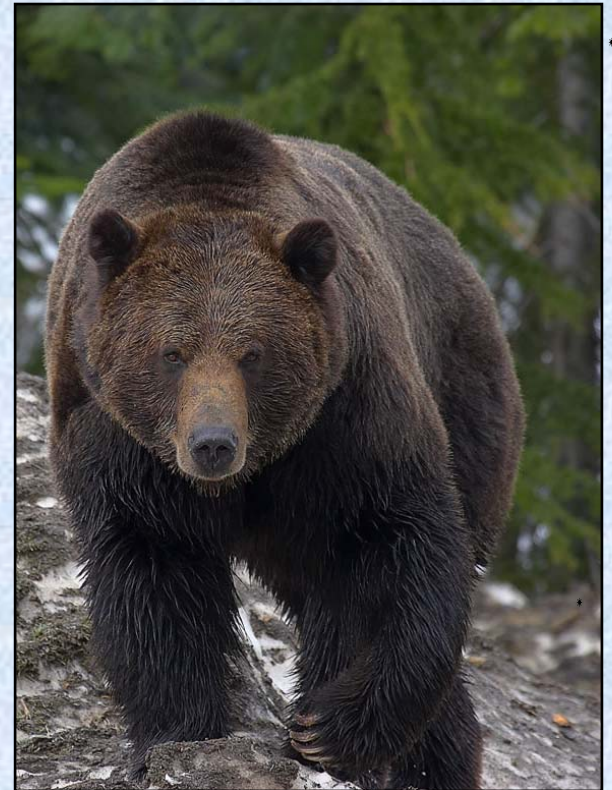




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Degree of Difficulty

“Things that Bite”





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Techniques, Results, and Lessons Learned



States and Localities Meeting
September 15, 2008 - 10:35am

Observation Methodology

Gary Hallbauer, USDA - NRCS

Point Characterization

Wayne Dulaney, USDA - ARS

U.S Forest Service Findings

Gary Boyack, USFS - FMFC

Dick Karsky, USFS - MTDC

National Park Service Findings

Karl Brown, NPS

Tim Smith, NPS



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“The End”

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