Optimizing PNT for Agriculture and Natural Resources

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A General Discussion on Optimizing PNT Capability for Agriculture and Natural Resources Applications

1. How Important is PNT
2. Understanding Actual Performance & System Changes
3. Evaluating Observed Performance
4. Realizing Potential Limitations
   - Government PNT Decision Making
   - Congressional Funding
   - Industry Motivation

Optimizing PNT for Agriculture and Natural Resources

PART 1

How Important is PNT

The ability to describe the applications and benefits of PNT in a meaningful way

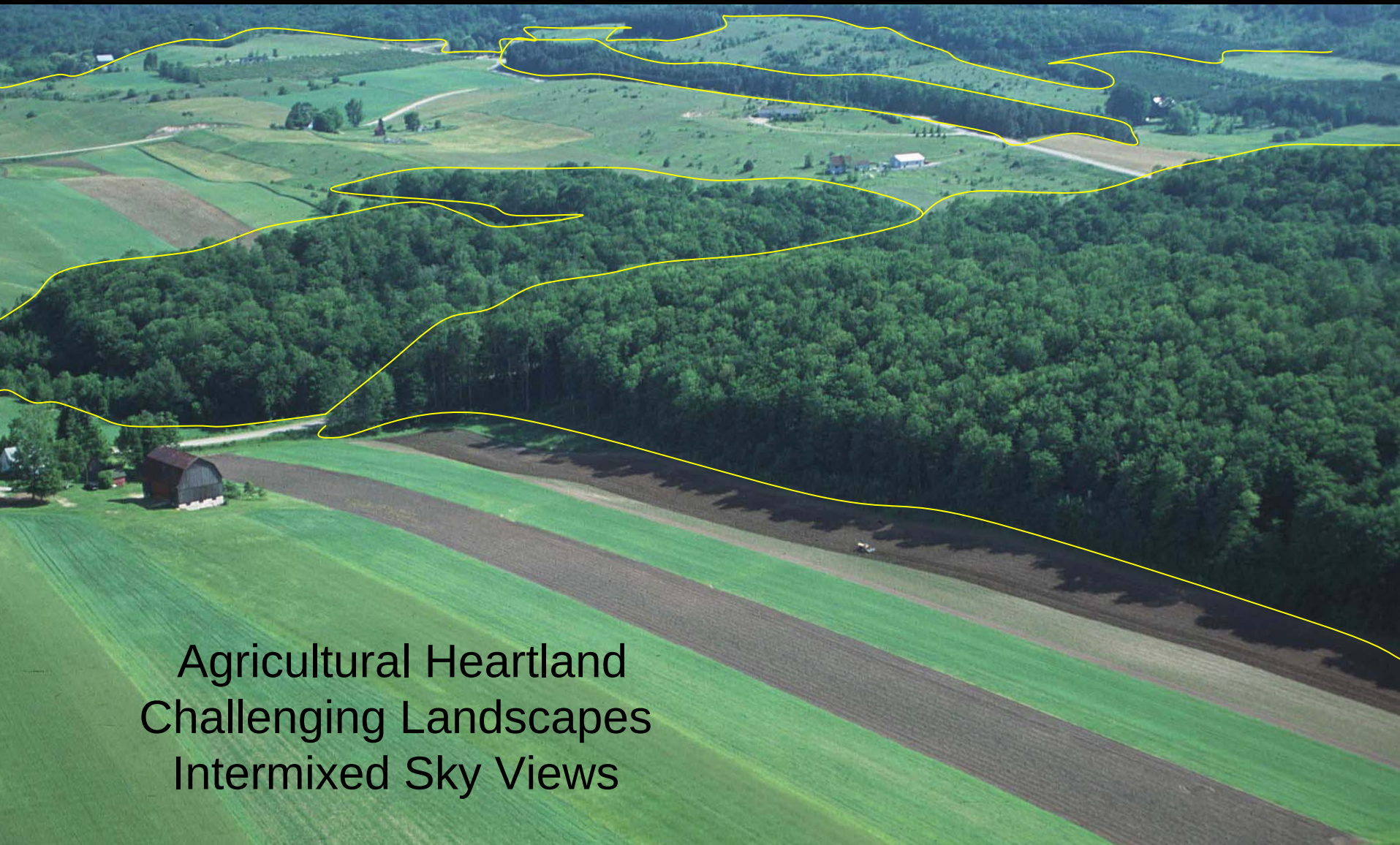
For AG & Natural Resources

The Challenge

- ✓ Achieve Required Horizontal & Vertical Accuracy
- ✓ Correct Representation of Cultural & Natural Features
- ✓ Ability to Repeat / Revisit at Any Time
- ✓ Reduce Potential Threats to Life

For AG & Natural Resources

Complex Cover



For AG & Natural Resources

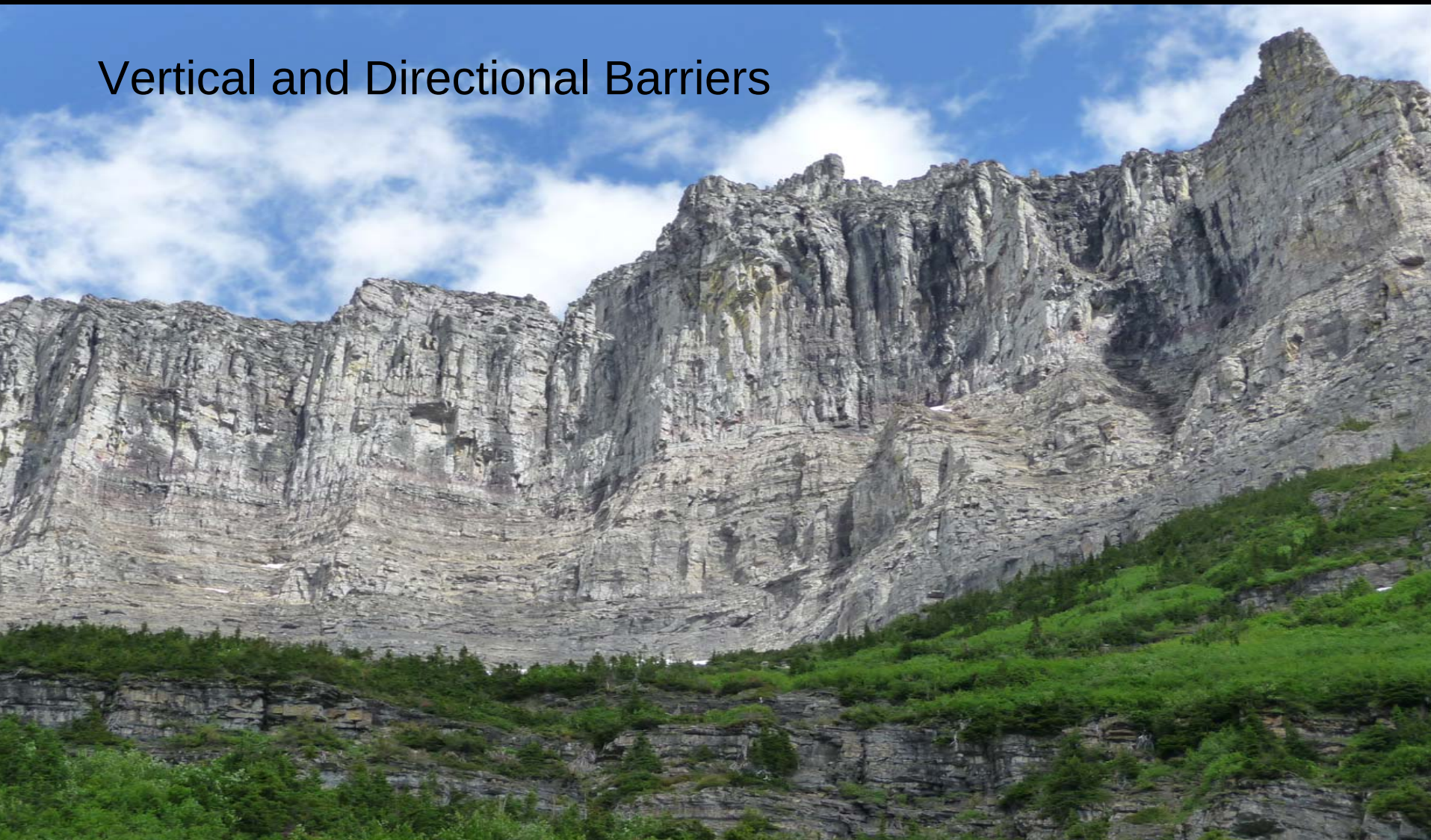
Complex Environments

Riverine

Wetlands

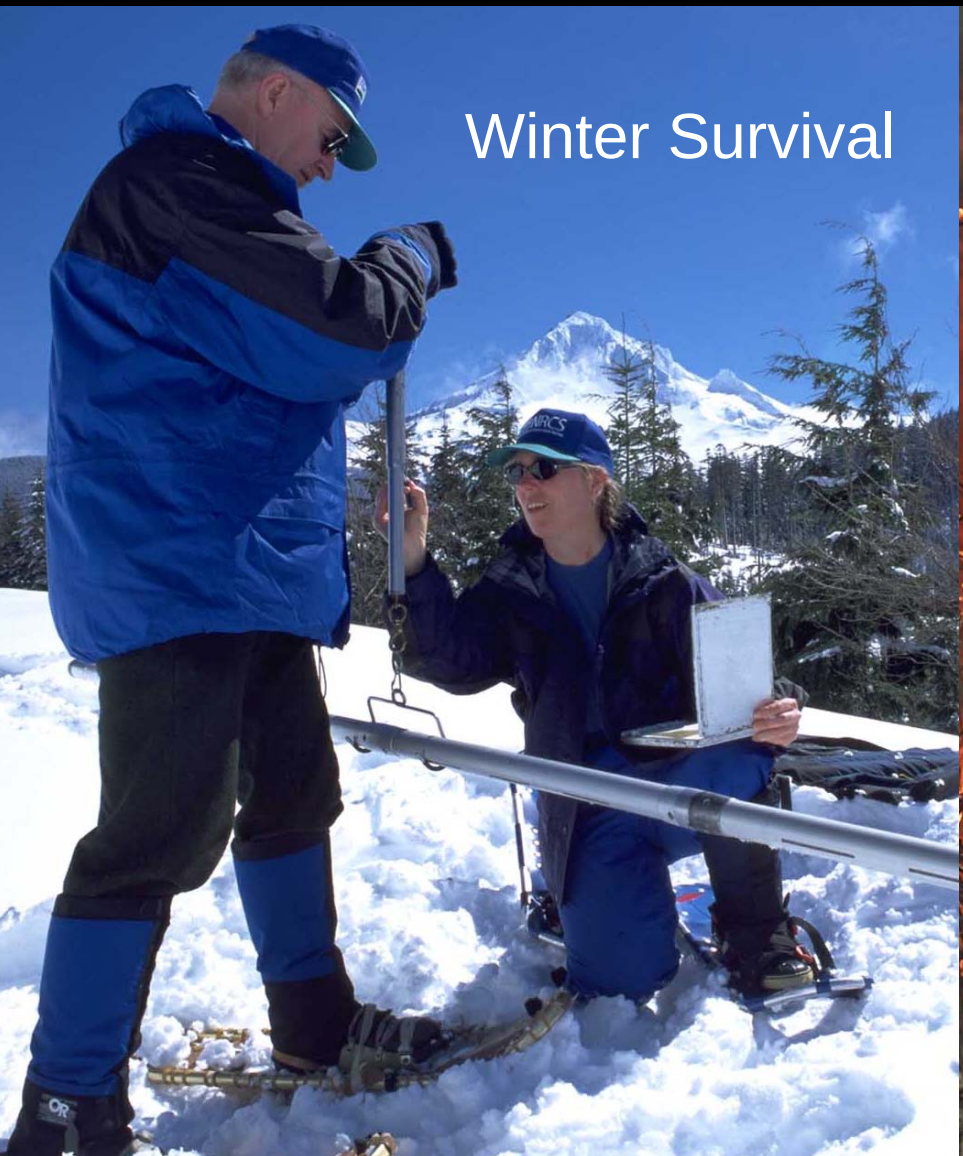
For AG & Natural Resources

Complex Terrain



For AG & Natural Resources

Safety of Life Applications



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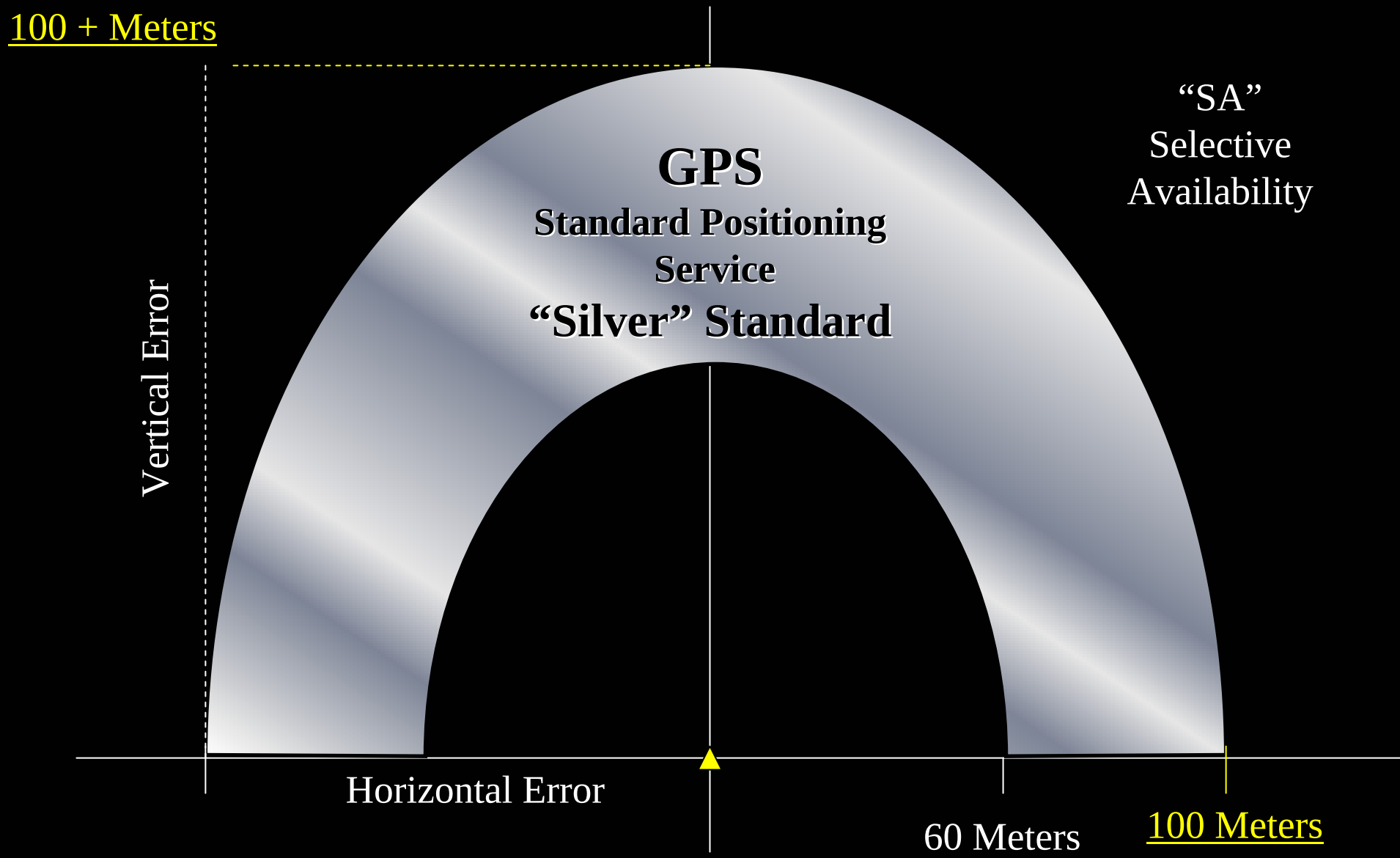
PART 2

Understanding Actual Performance & System Changes

How has GPS and GPS Augmentations Changed Over Time

General Performance Before May 1, 2000



“Better Technology Through Encryption”

NRCS
1st Generation GPS
PLGR s

1992 - Development
94-96 - Procurement
96-06 - Operational
2007 - Decommissioned

Vertical Error

16 Meters

Precise
Positioning
Service

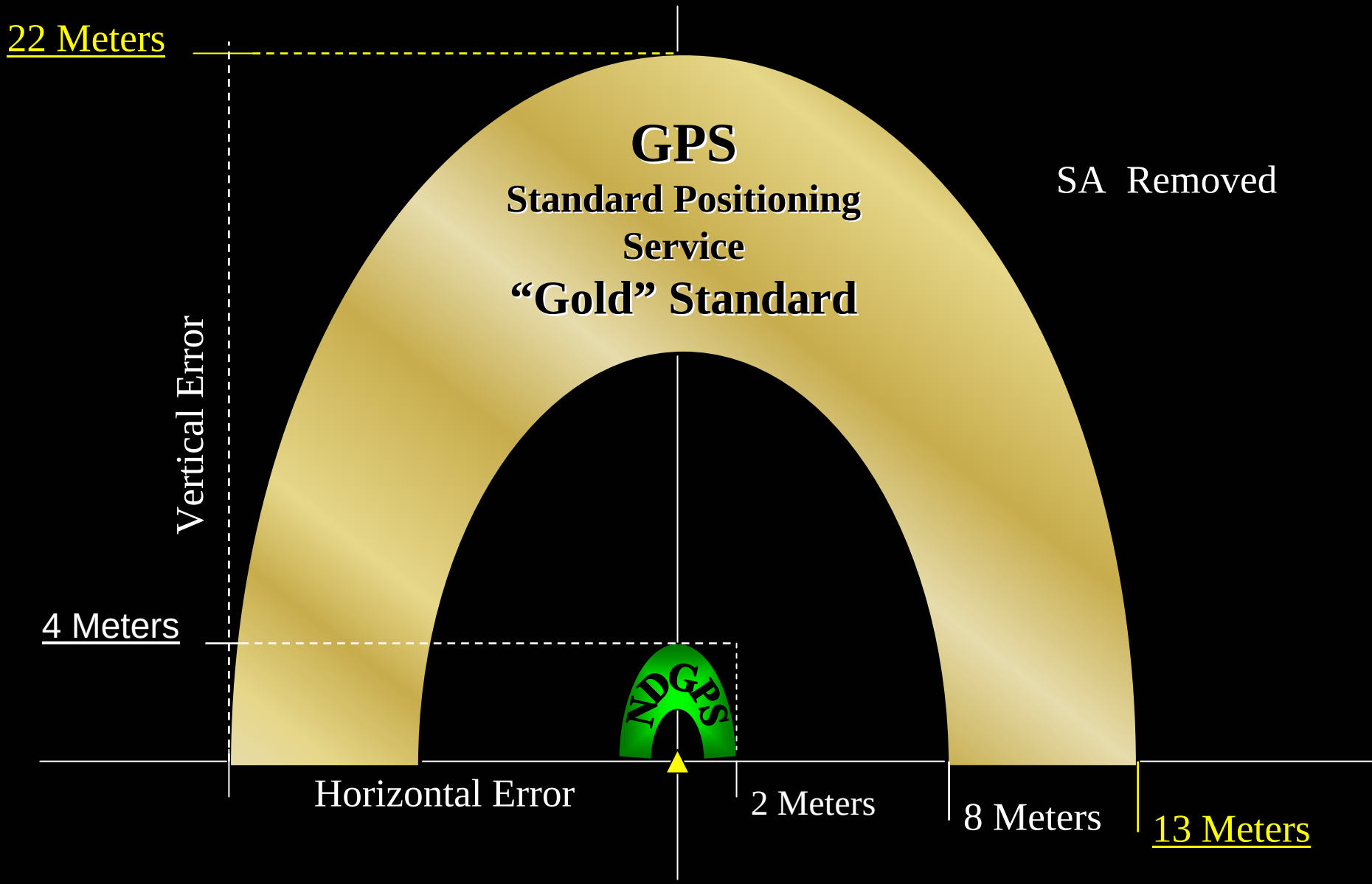
PPS

10 Meters

Horizontal Error

6 Meters

General Performance After May 1, 2000



Optimizing PNT with Augmentations

1996 - Development

2000 - Solicitation

2001 - Contract Awarded
7000 Configuration 1
2000 Configuration 2

2006 – End 0f life

2007 - Systematic Problems
NDGPS Availability?
Equipment Failure

Vertical Error

4 Meters

Real Time
Performance

NDGPS

Horizontal Error

2 Meters

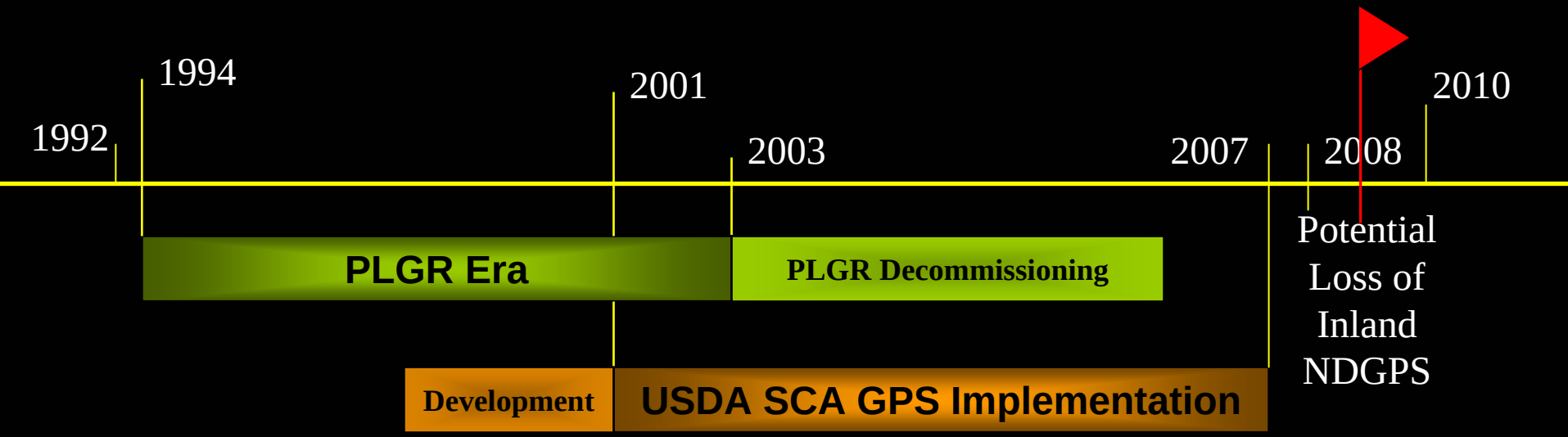
1 Meter

NRCS
2nd Generation GPS

GPS / NDGPS

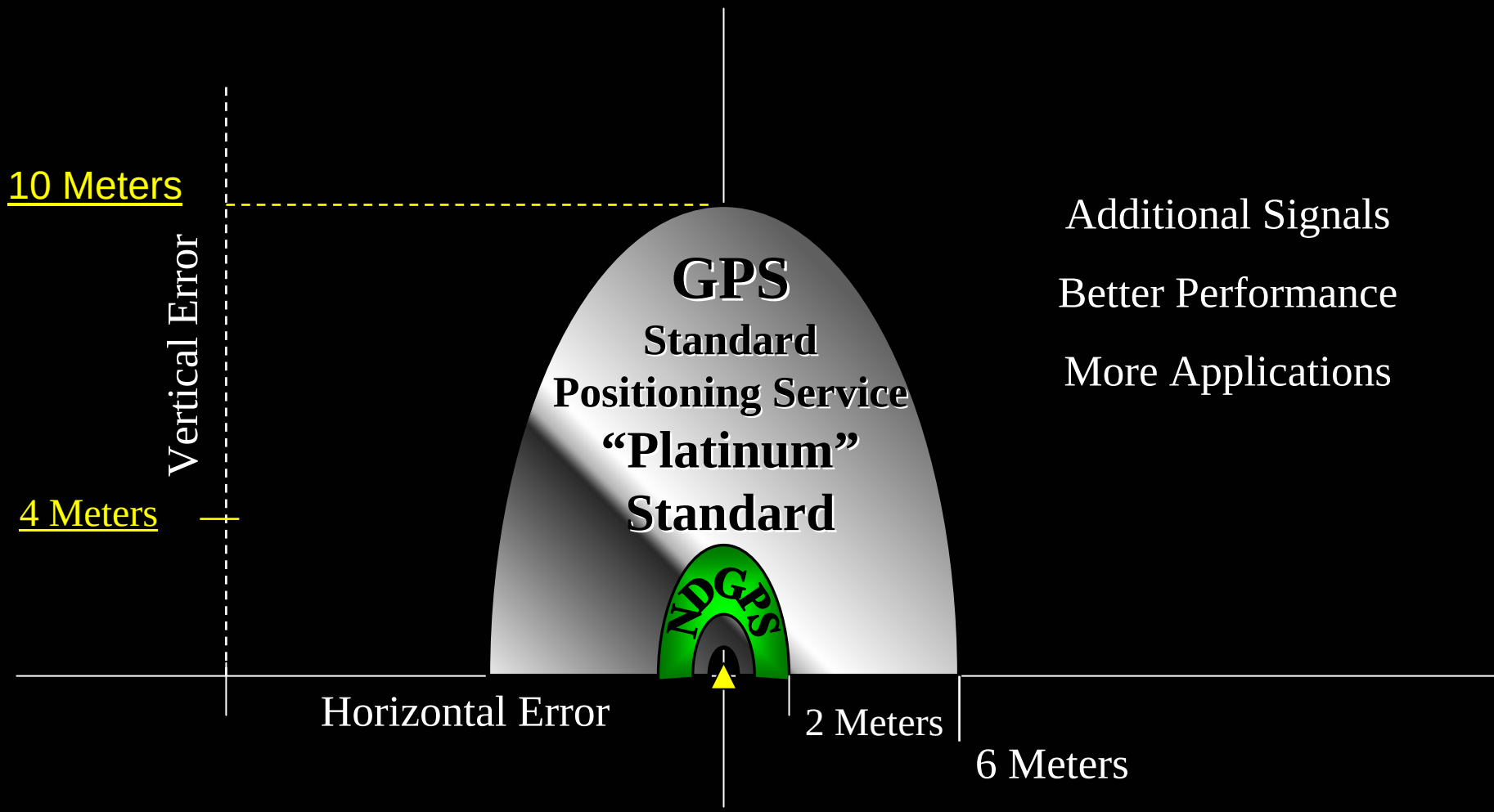
Optimizing PNT Capability

NRCS Positioning & Navigation Timeline



	1st Generation	2nd Generation	3rd Generation
Horizontal	6-10 Meters	1-2 Meters	1-2 Meters
Vertical	20-30 Meters	4-5 meters	4-5 Meters
Precision	Very High	High	“Acceptable”

GPS Modernization, *"The Future"*



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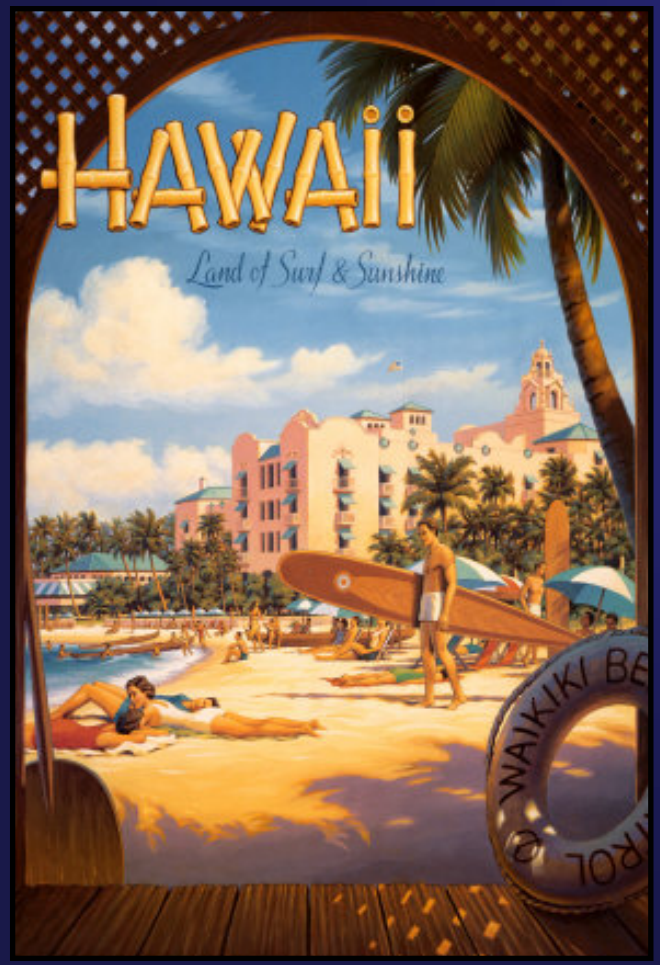


PART 3
Evaluating Observed Performance

How Comprehensive and to what depth of understanding

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

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 Service

Sponsors

Interagency GPS Executive Board

USAF GPS - Wing Civil Applications Office

USDA-DOI GPS Challenge Team

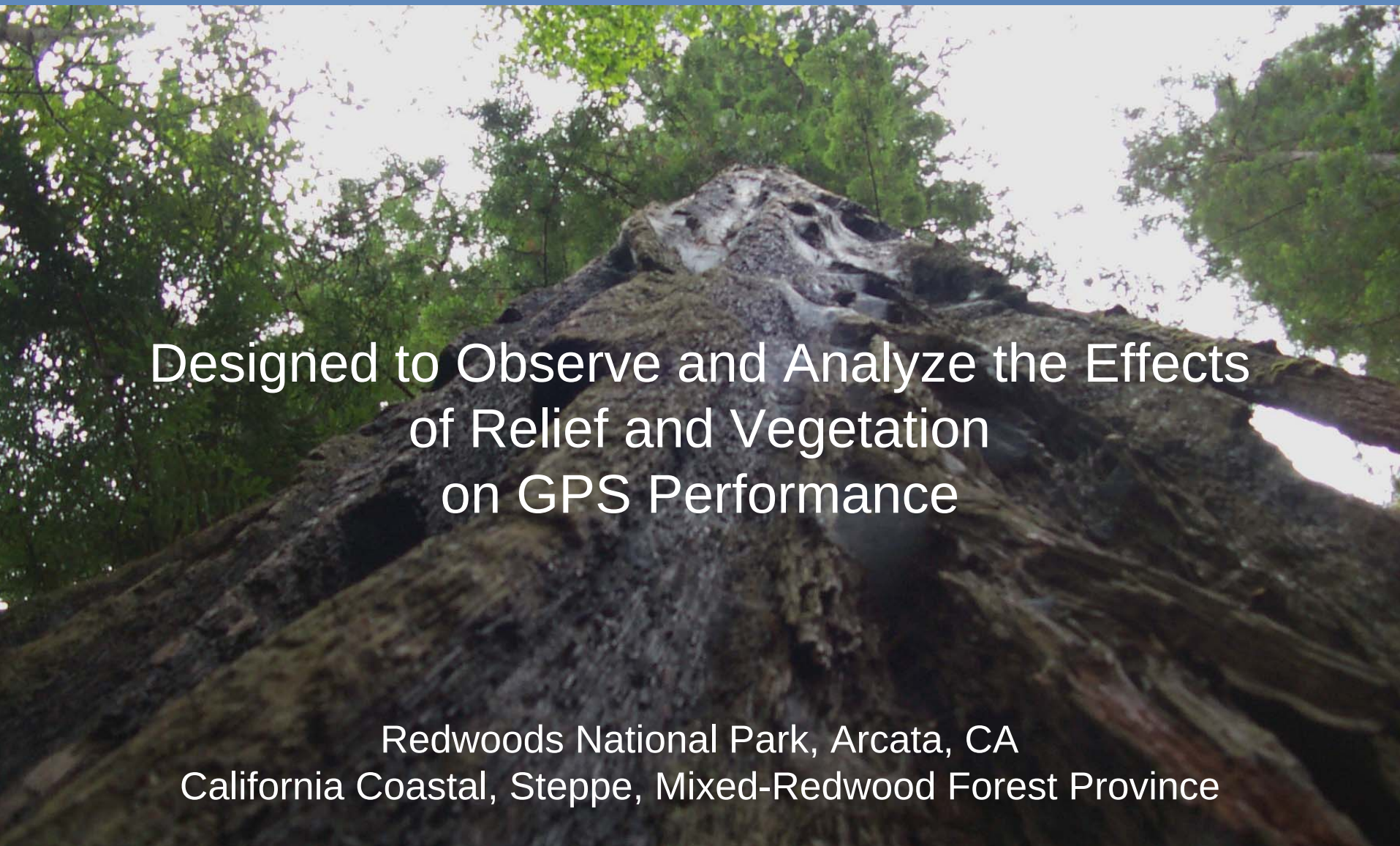
Purpose

Real Time Positioning & Navigation in Challenging Environments

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

USDA-DOI GPS Challenge Team

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

USDA-DOI GPS Challenge Team

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*

USDA-DOI GPS Challenge Team

Concept

First Ever GPS Investigation Based on Ecosystems

U.S. Forest Service Test Site – Bakerville, CO

Southern Rocky Mountains Steppe – Coniferous Forest Province

USDA-DOI GPS Challenge Team

Concept

USDA-DOI GPS Challenge Team

Concept

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

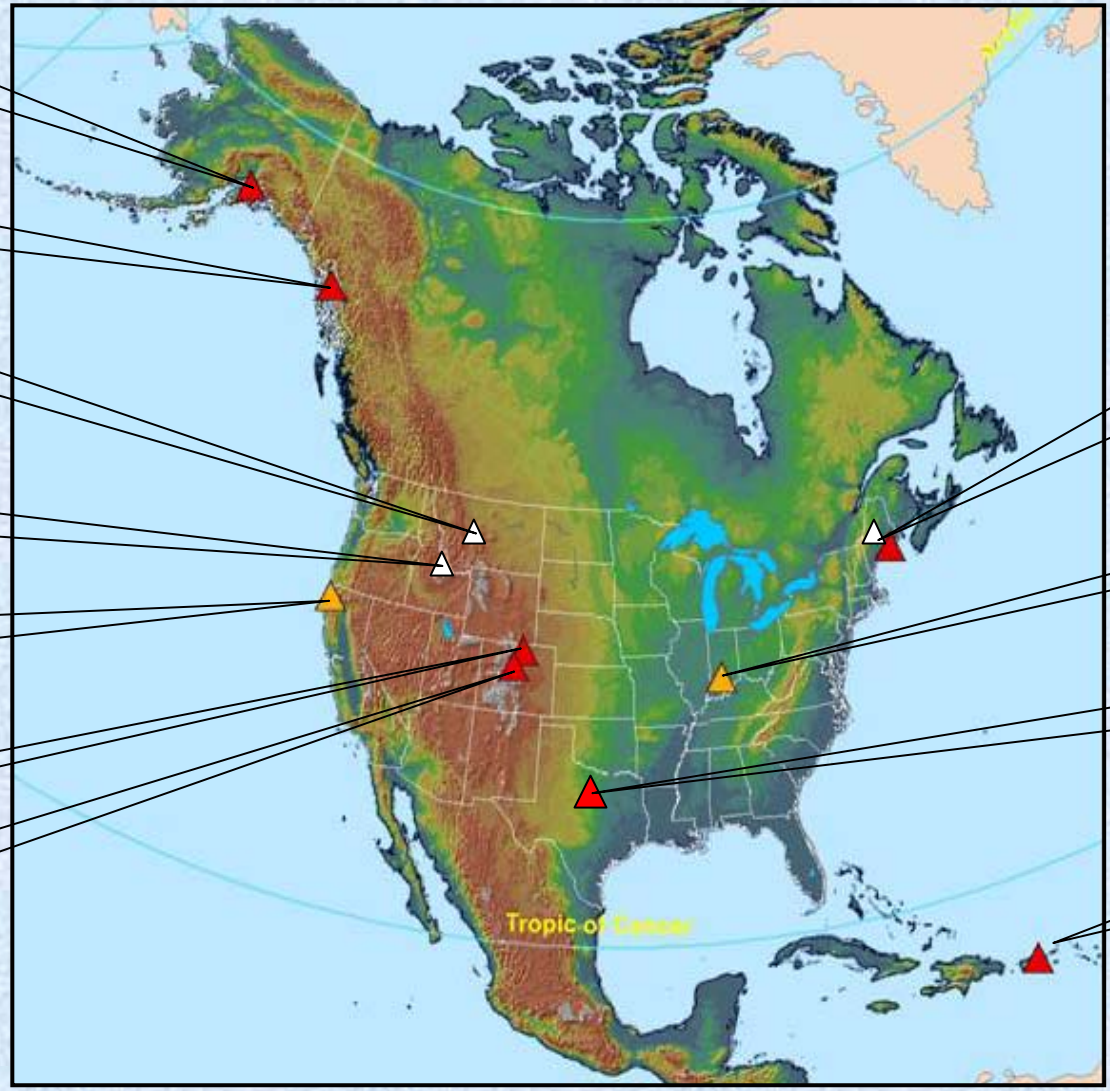
Acadia National Park, ME
Laurentian Mixed Forest Province – *Northern Latitude*

USDA-DOI GPS Challenge Team

Concept

USDA-DOI GPS Challenge Team

GPS Investigation Sites



Chugach NF
Anchorage, AK

Tongass NF
Douglass Island, AK

Lubrecht Test Course
Lolo NF, MT

Powell Test Course
Clearwater NF, ID

Redwoods NP, CA
Crescent City, CA

Fort Collins, CO

Bakerville Test Course
Arapaho NF, CO

Acadia National Park
Bar Harbor, ME

Bedford Test Course -
Hoosier NF, IN

Federal Center
Fort Worth TX

Caribbean Test Course
El Yunque NF, PR

Optimizing PNT for Agriculture and Natural Resources

PART 4

Realizing Potential Limitations

Three potential limitations that can have profound impacts on optimizing GPS and GPS Augmentations.

Optimizing PNT for Agriculture and Natural Resources

PNT Decision Makers

Are requirements understood

Are requirements supported

Is process inclusive

Are stakeholders represented

Optimizing PNT for Agriculture and Natural Resources

Congressional Funding

You may become blue too thinking about this one

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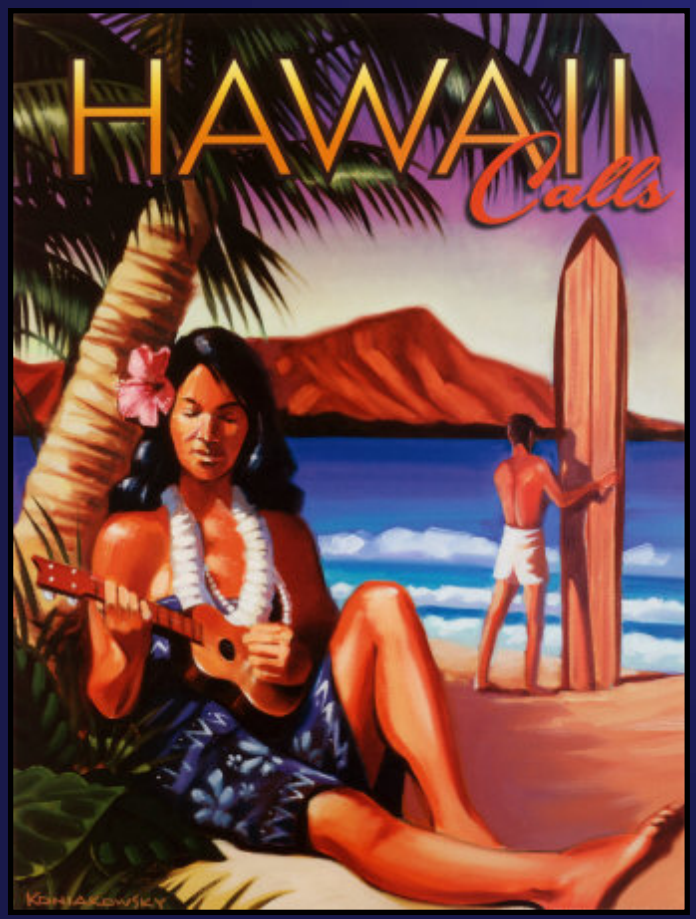

Industry Motivation

Who is bring what to market, when

Will Industry be ready for the new civil signals

Will industry support research

Who wants to lead and who is going to follow

“Optimizing” PNT

- Maintain technical expertise and stay current with PNT developments – “*Increase Capability*”
- Actively support PNT information needs for Senior Leadership – *“Make it Important”*
- Develop robust assessments to understand performance – *“Know the Facts”*
- Participate on PNT committees and working groups – *“Collaborative Development”*
- Think strategically; develop an investment and implementation plan – *“Work the Plan”*

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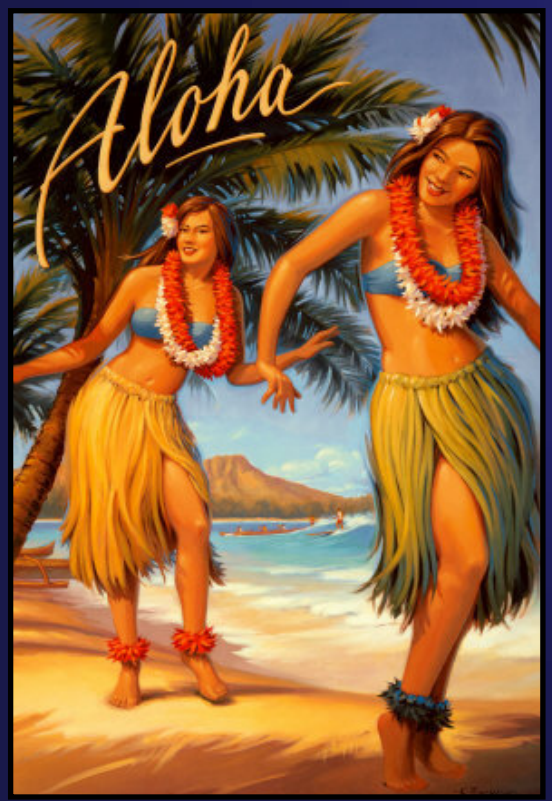

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