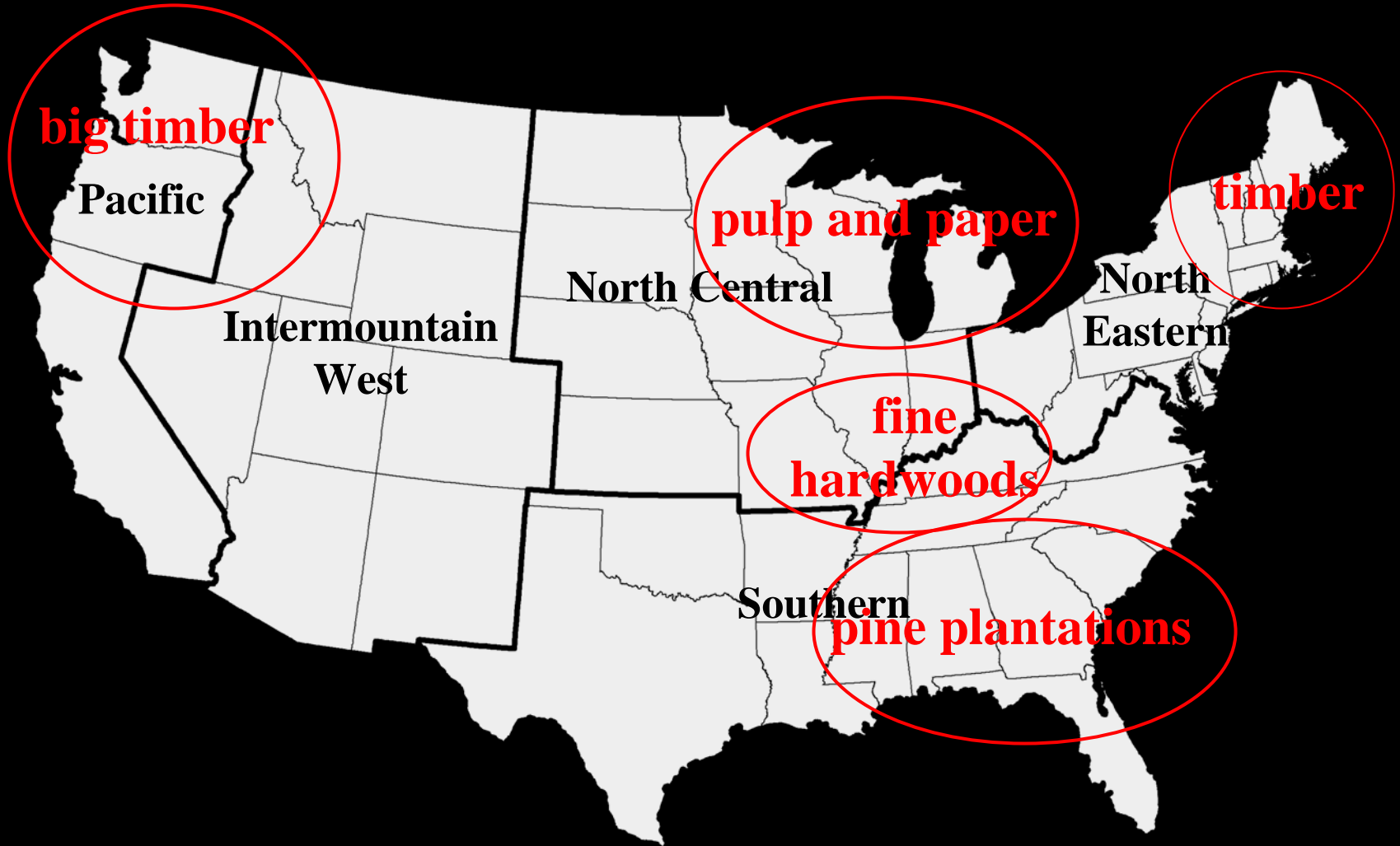


The ***TRUTH*** about how the USA came
to have a standardized and harmonized
national forest inventory program



Ronald E. McRoberts
Forest Inventory and Analysis
Northern Research Station
U.S. Forest Service

The situation in 1990



The situation in 1990

- Periodic state-level inventories
- Regional commodity focus
- Five different:
 - plot configurations
 - sampling designs
 - sets of variables and measurement protocols
 - sets of estimation procedures
 - cycle lengths varying from 10-15 years
 - reporting mechanisms

The situation in 1990

- Complaints from environmental community
- Complaints from forest industry
 - cycle lengths too long (10-15 years)
 - no national consistency
 - no temporal consistency
- Threats to lobby Congress to reduce funding
- Potential competition from public agencies and private companies

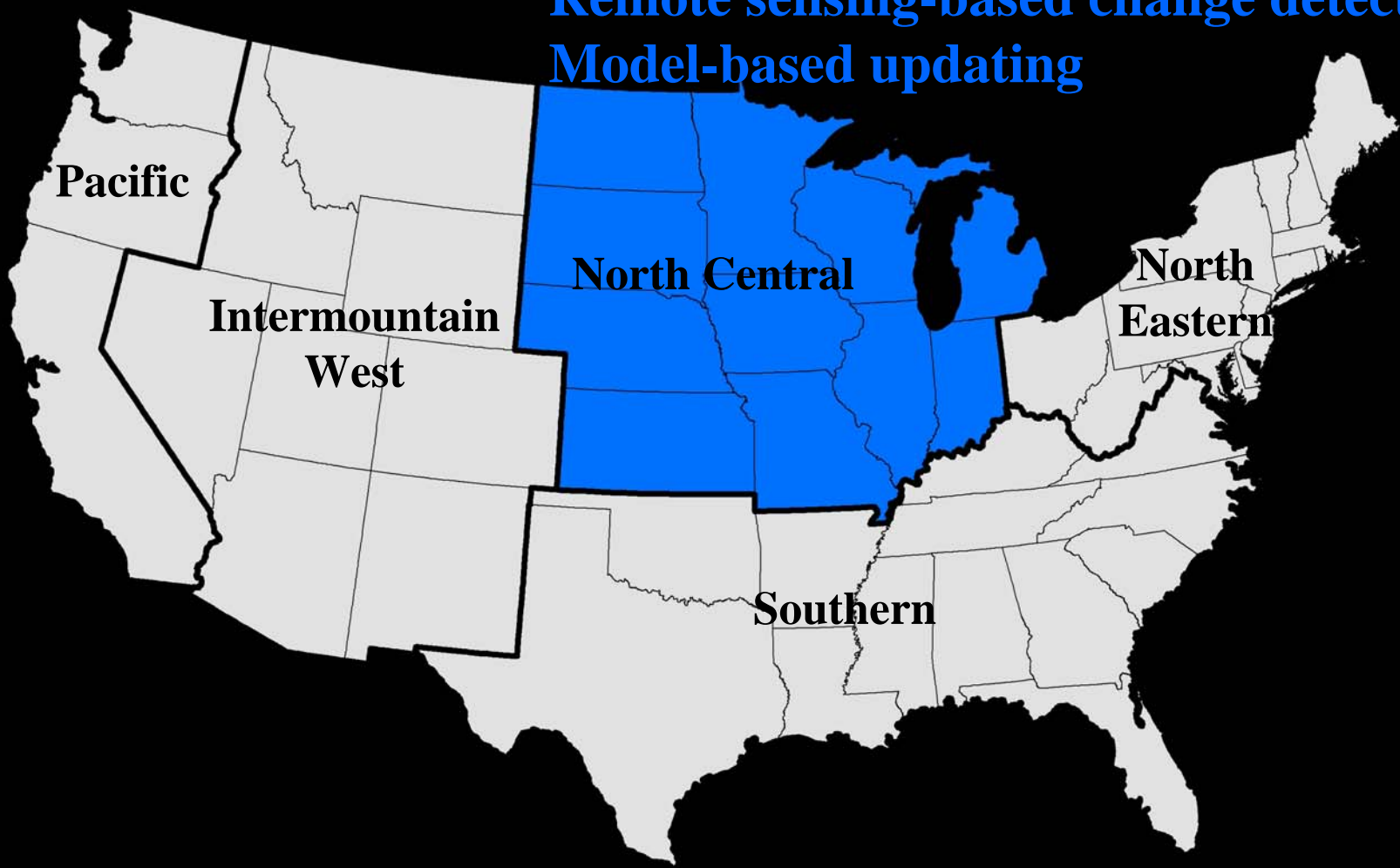
1990:

20% annually

Same precision, no additional cost

Remote sensing-based change detection

Model-based updating



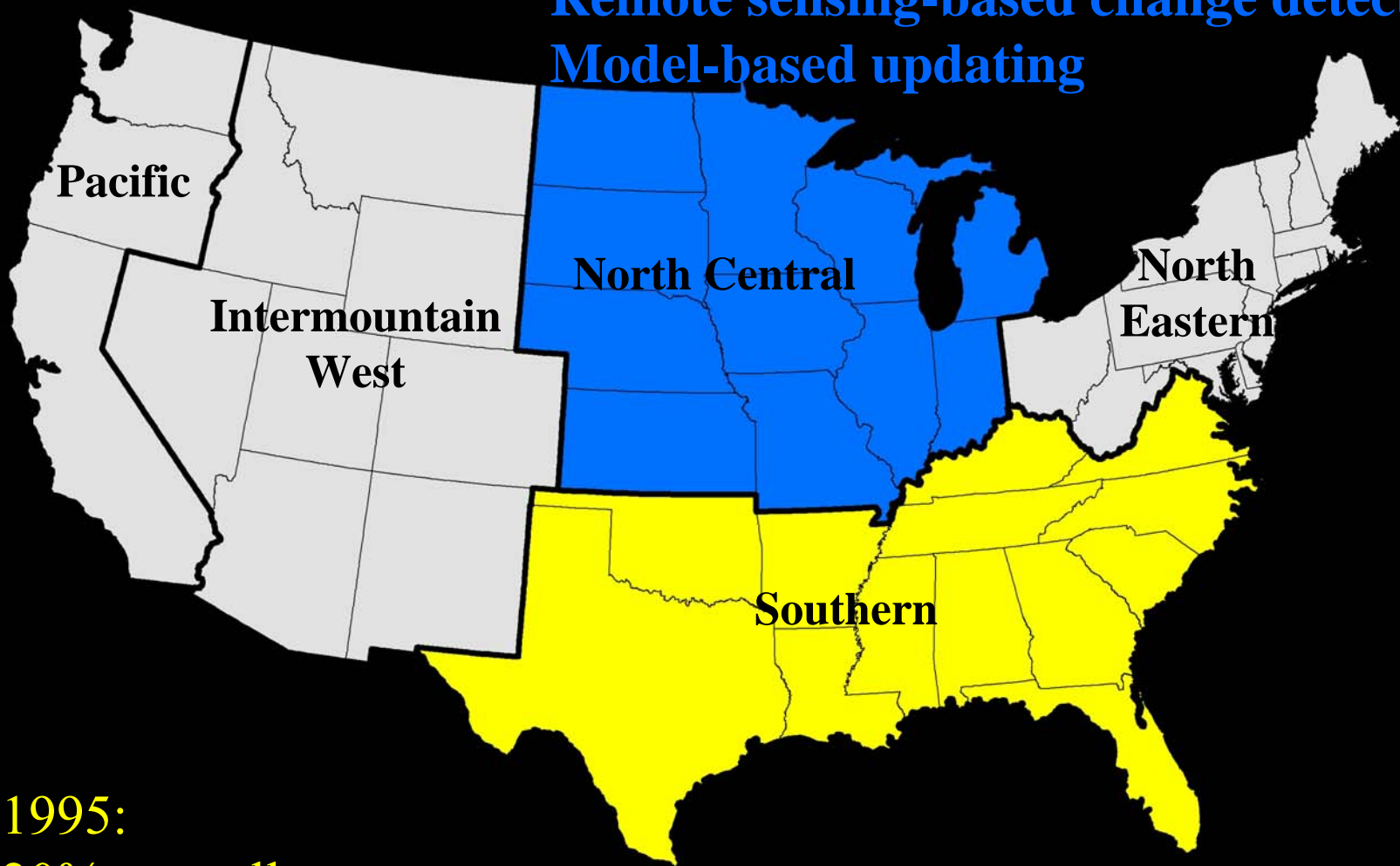
1990:

20% annually

Same precision, no additional cost

Remote sensing-based change detection

Model-based updating



1995:

20% annually

State funding contributions



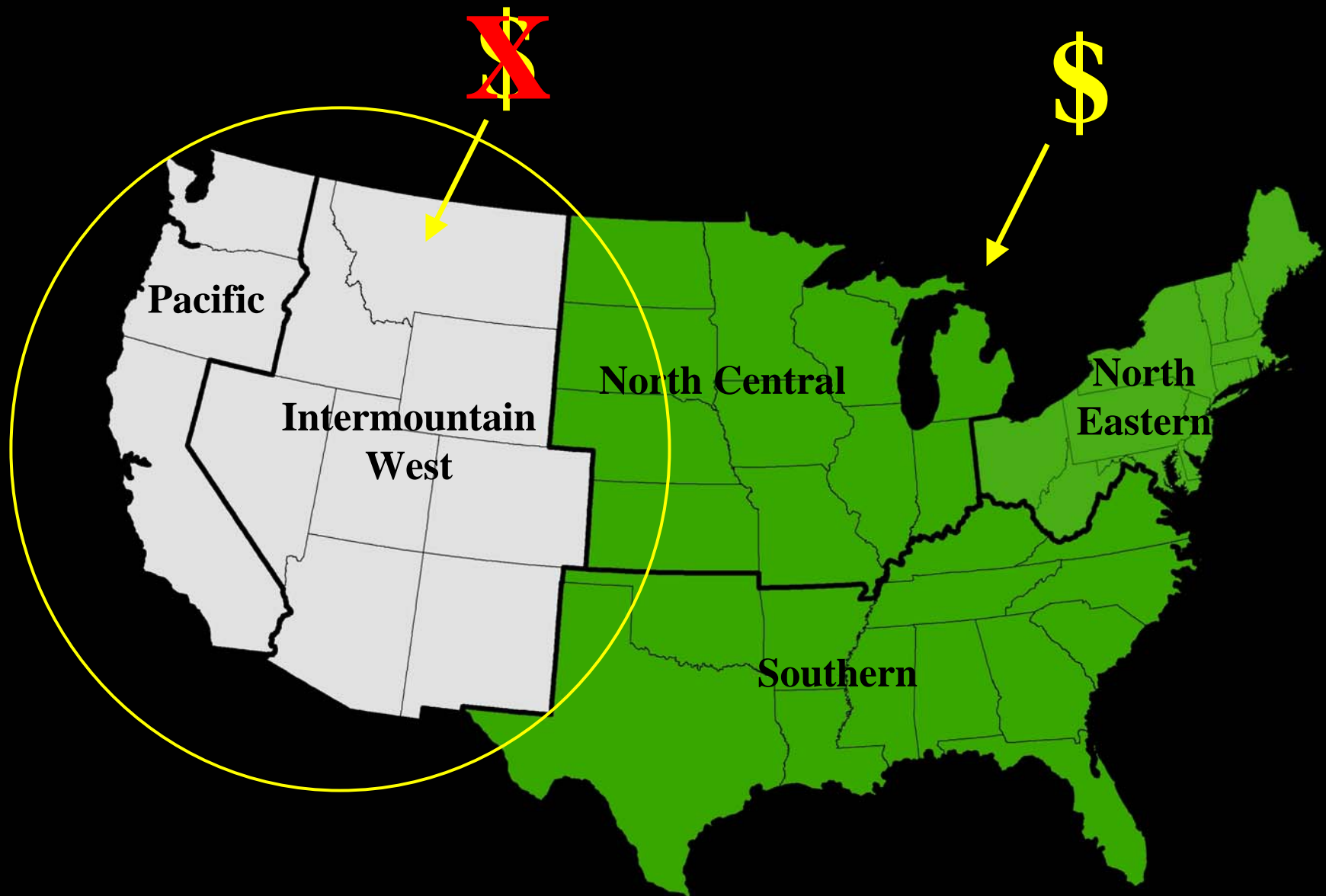
Actions taken

- 1990: Forest Health Monitoring (FHM) program
- 1990: Pilot project at North Central Station
- 1995: Pilot project at Southern Station
- 1995: Adoption of FHM plot configuration
- 1998: Absorption of FHM ground plots
- 1998: Merger of two pilot projects

The situation in 1998

- Common:
 - plot configuration
 - FIA/FHM ground sampling
- Different:
 - sampling designs
 - 5-year annual programs in two Stations
 - 10-year periodic programs in three Stations
- Causal mechanisms:
 - threat of funding loss
 - threat of competition
 - national mandates





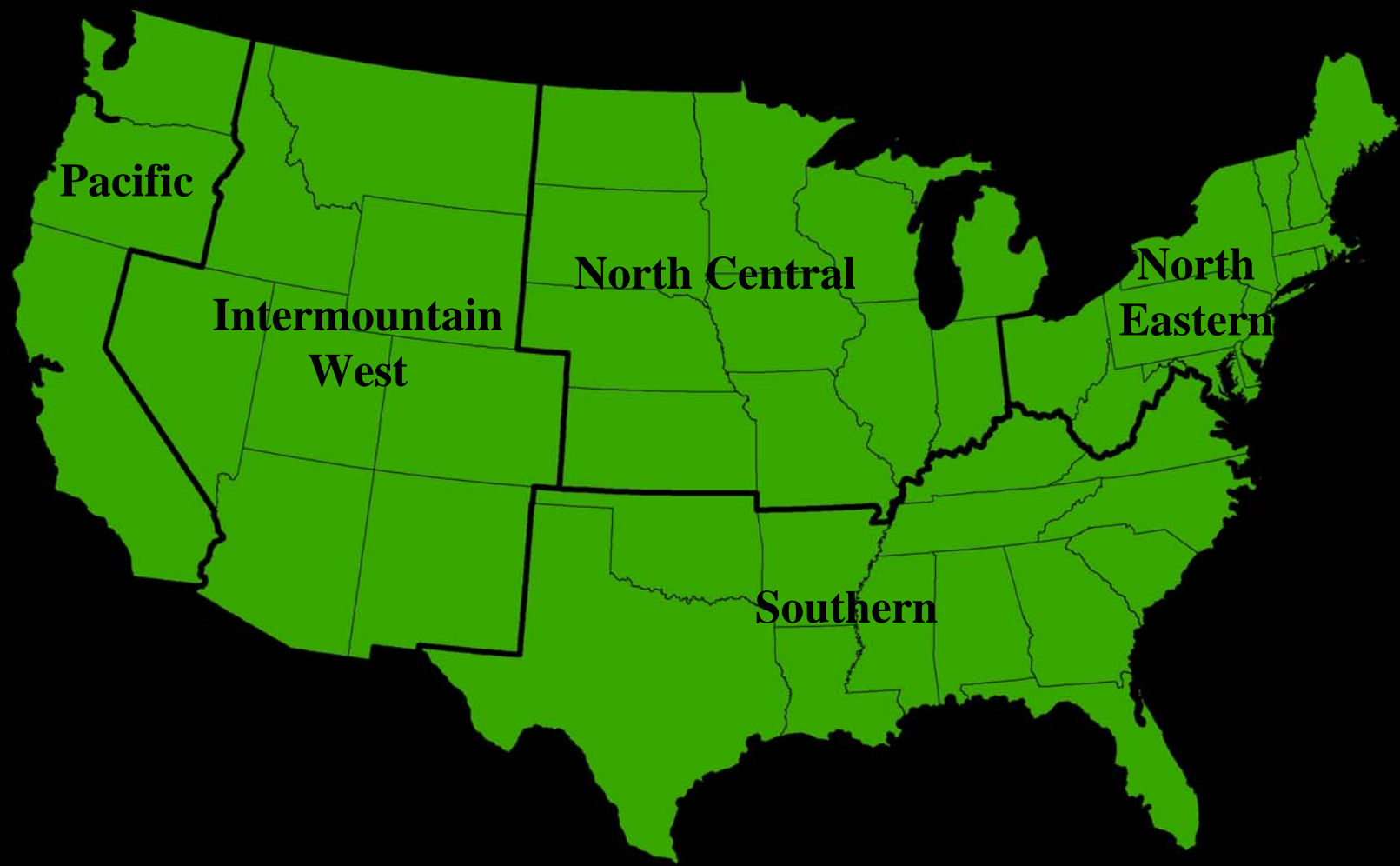
Pacific

Intermountain
West

North Central

Southern

North
Eastern



Pacific

Intermountain
West

North Central

Southern

North
Eastern



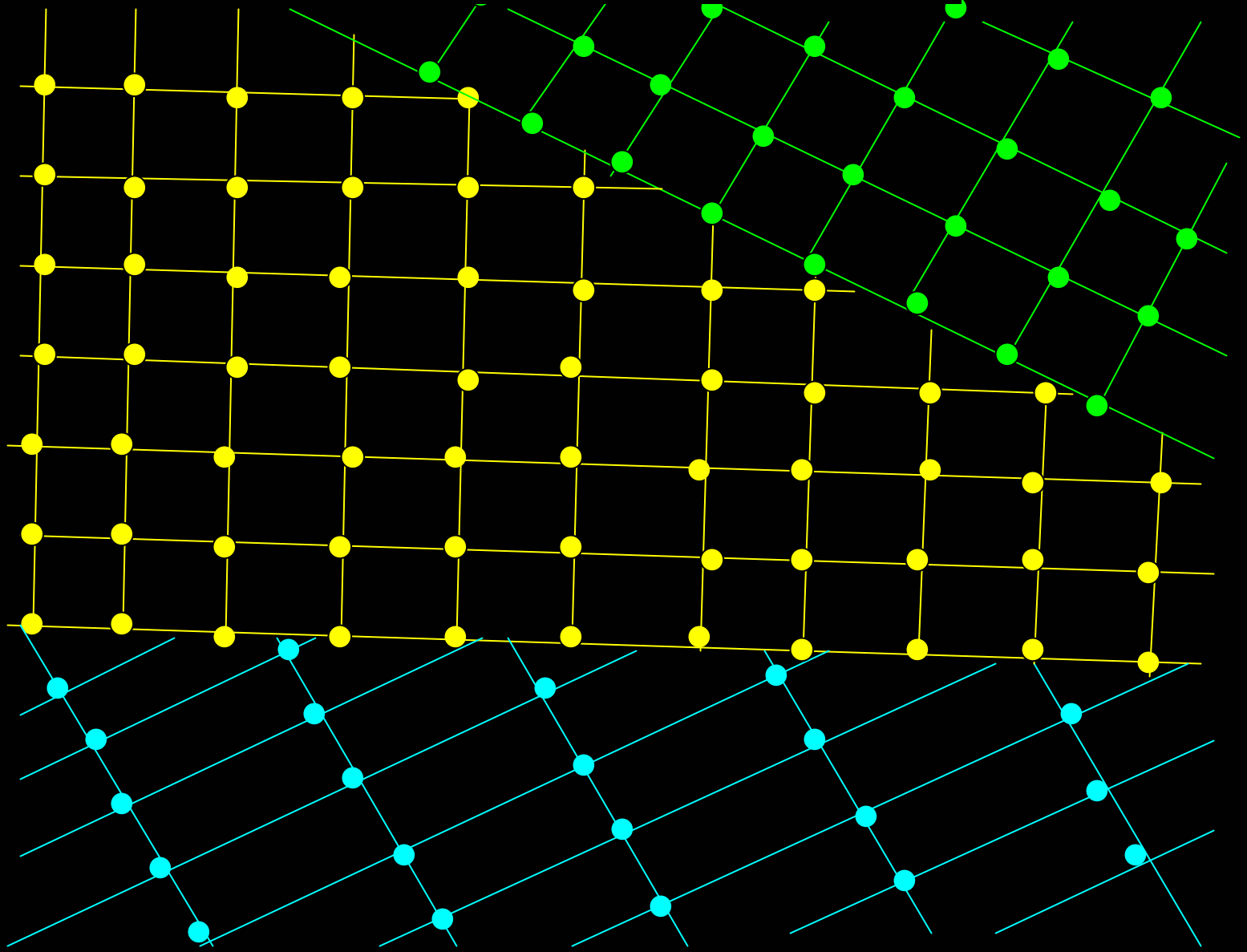
Pacific

**Intermountain
West**

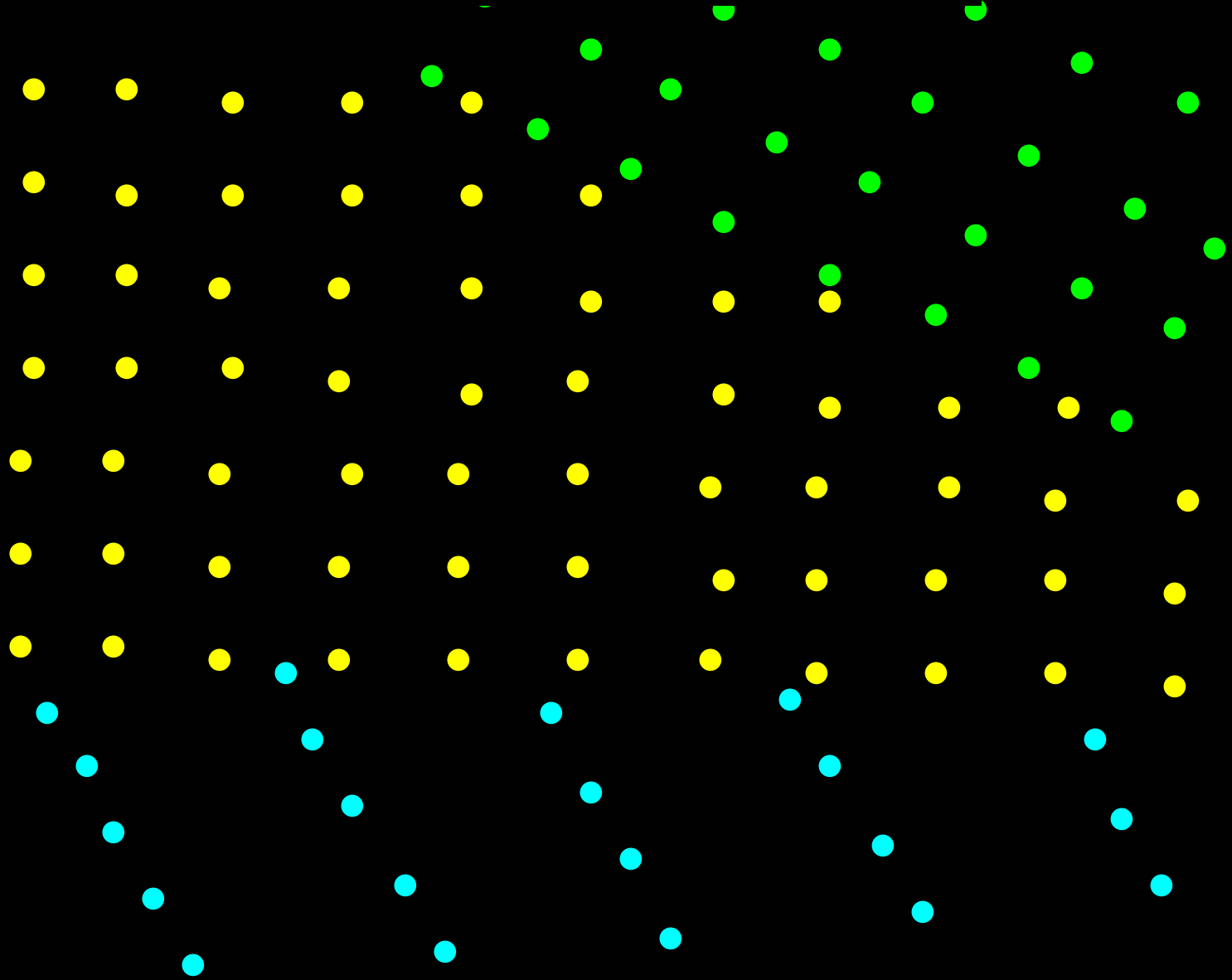
Northern

Southern

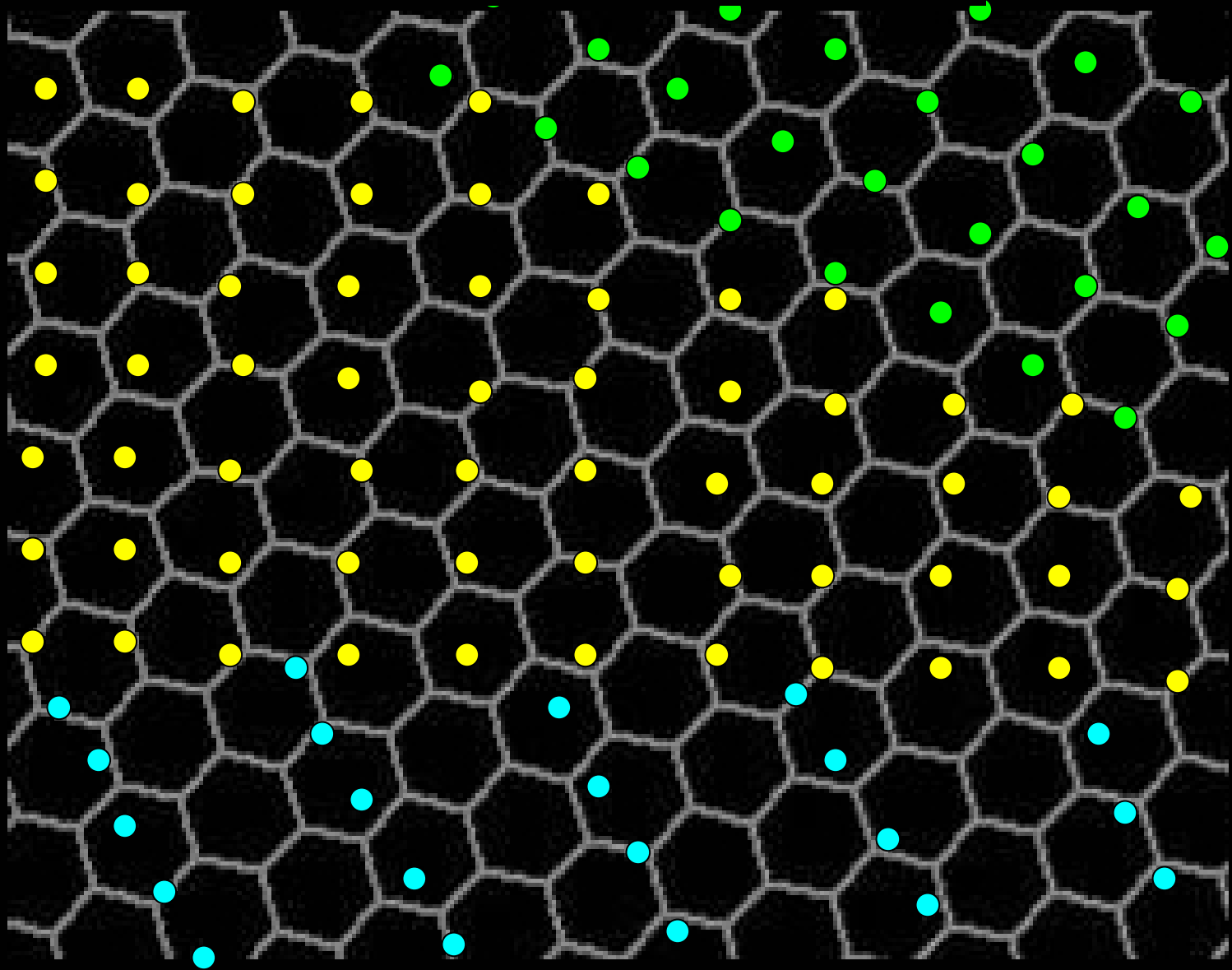
Common sampling design



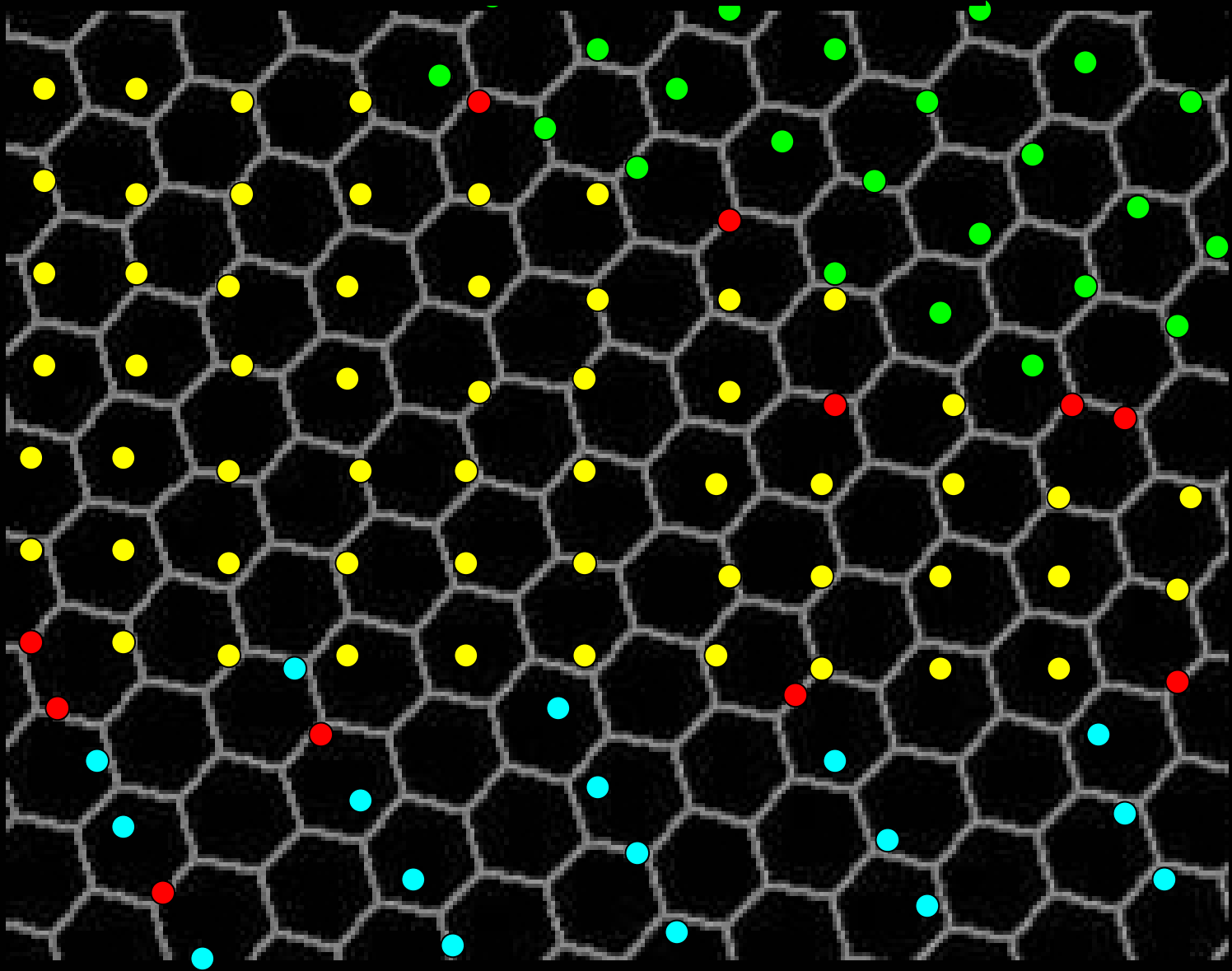
Common sampling design



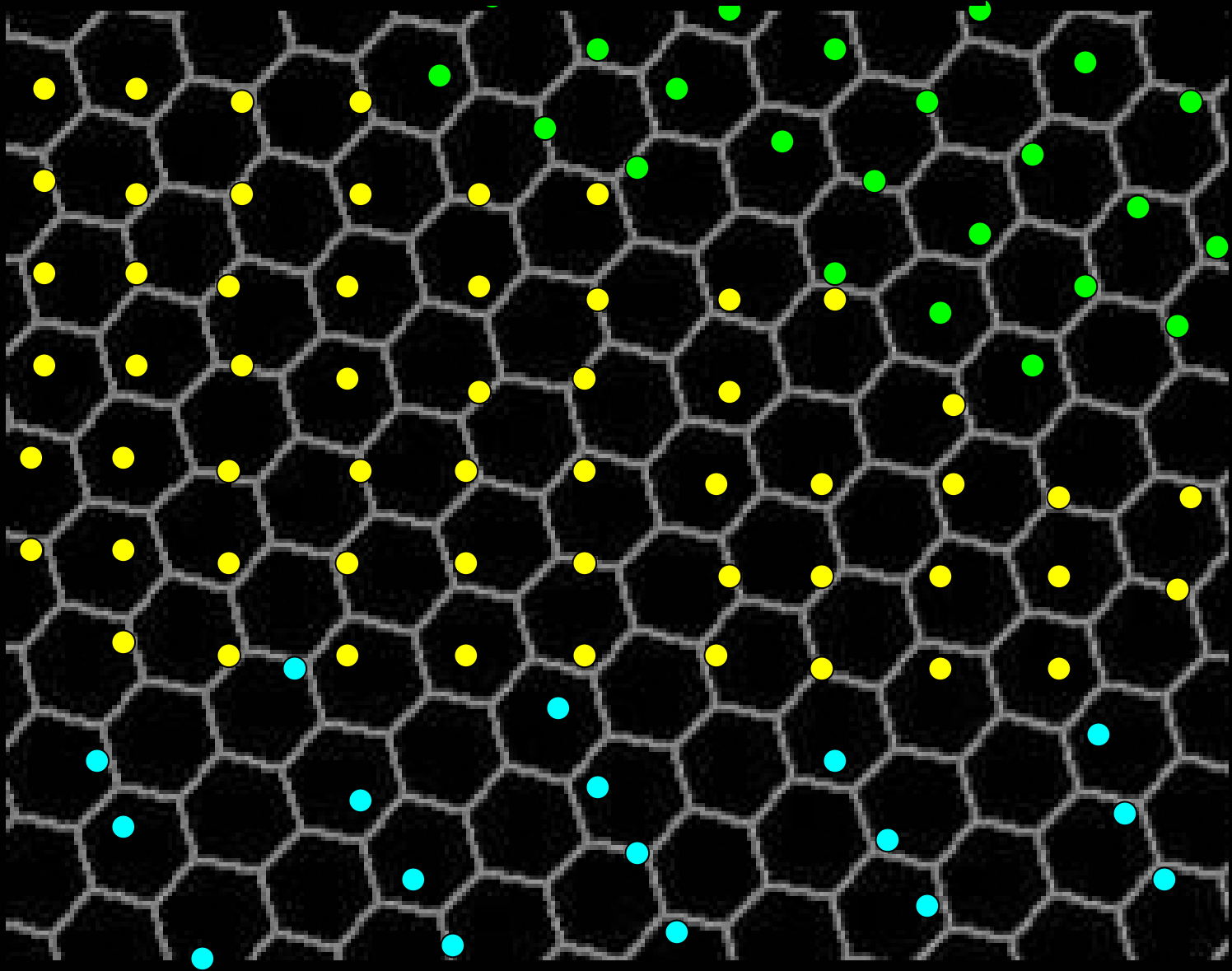
Common sampling design



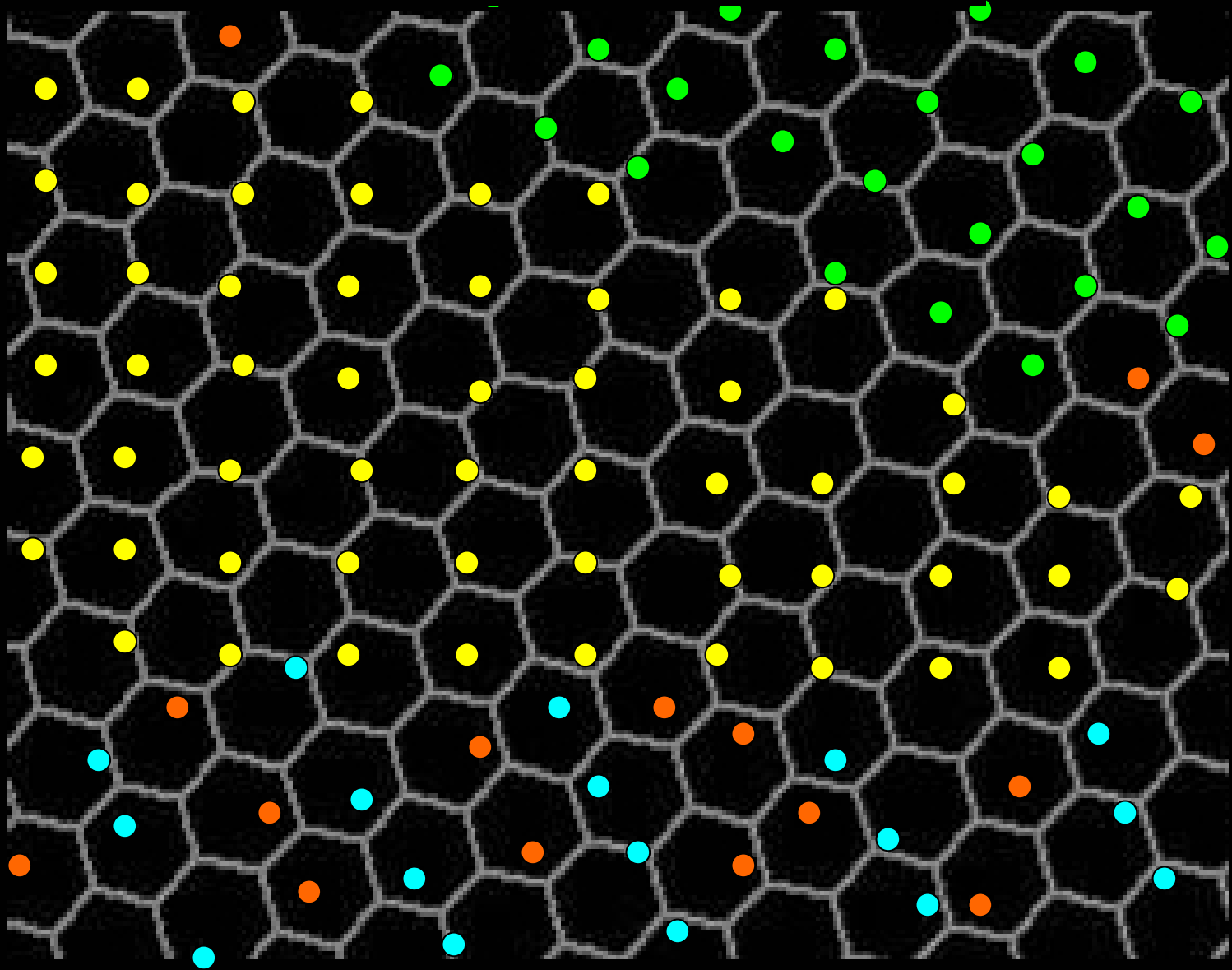
Common sampling design



Common sampling design

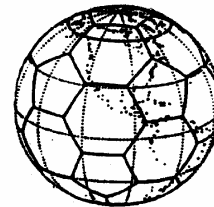
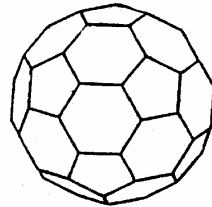


Common sampling design

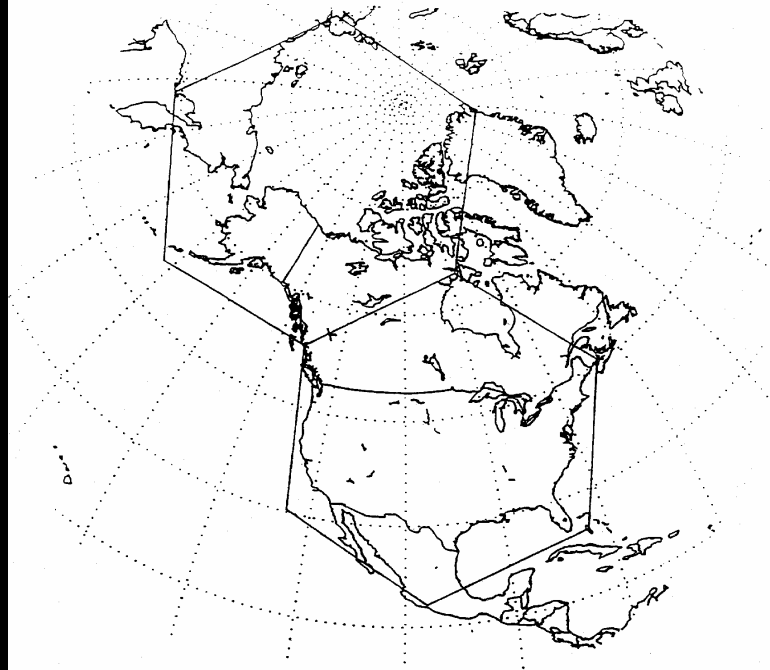


Why hexagons?

The spherical problem



Truncated Icosahedron

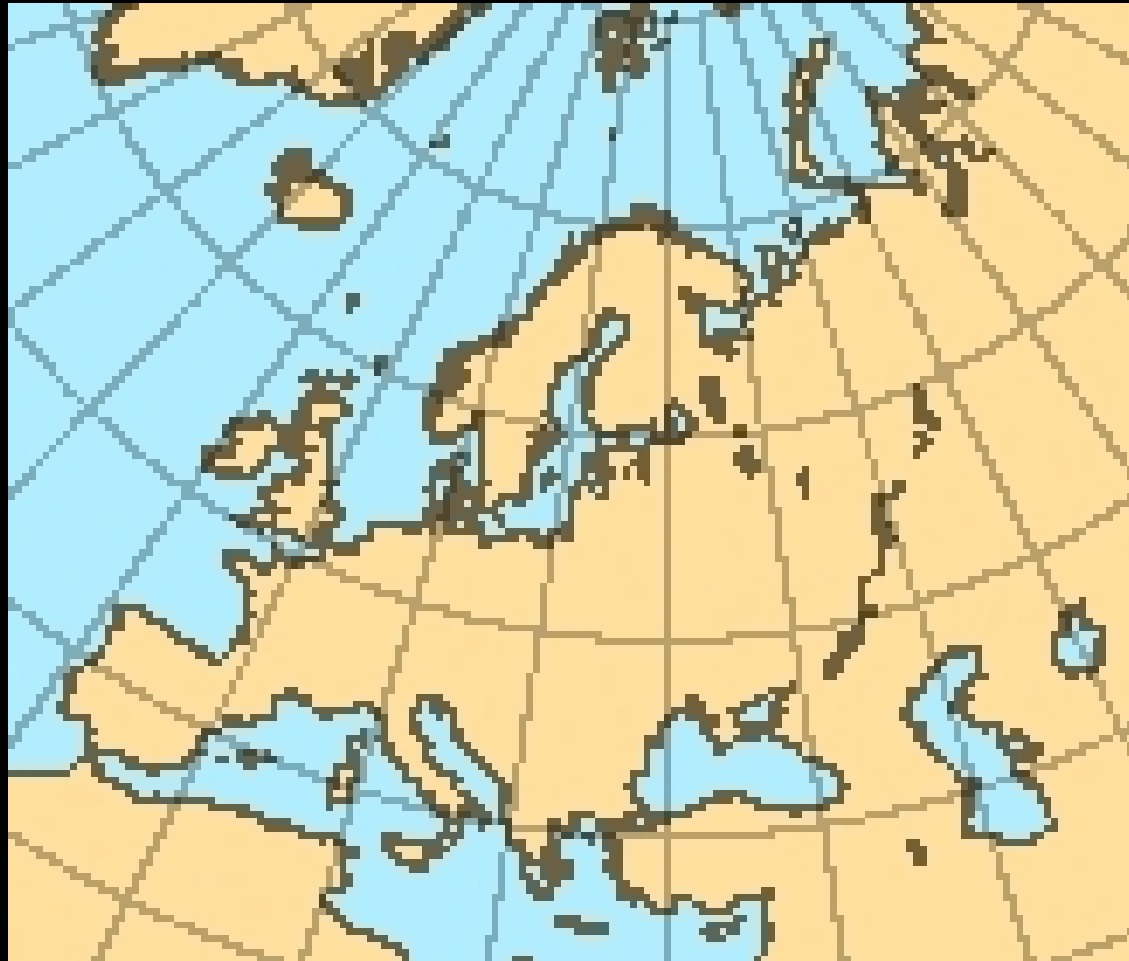


Hexagons of the truncated icosahedron covering North America.

*With thanks to:
Tony Olsen
US EPA*

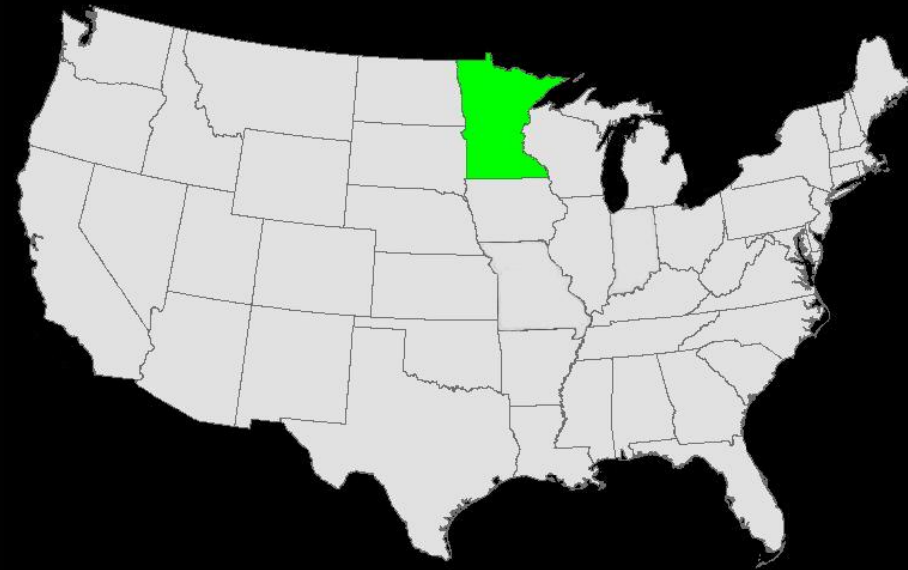
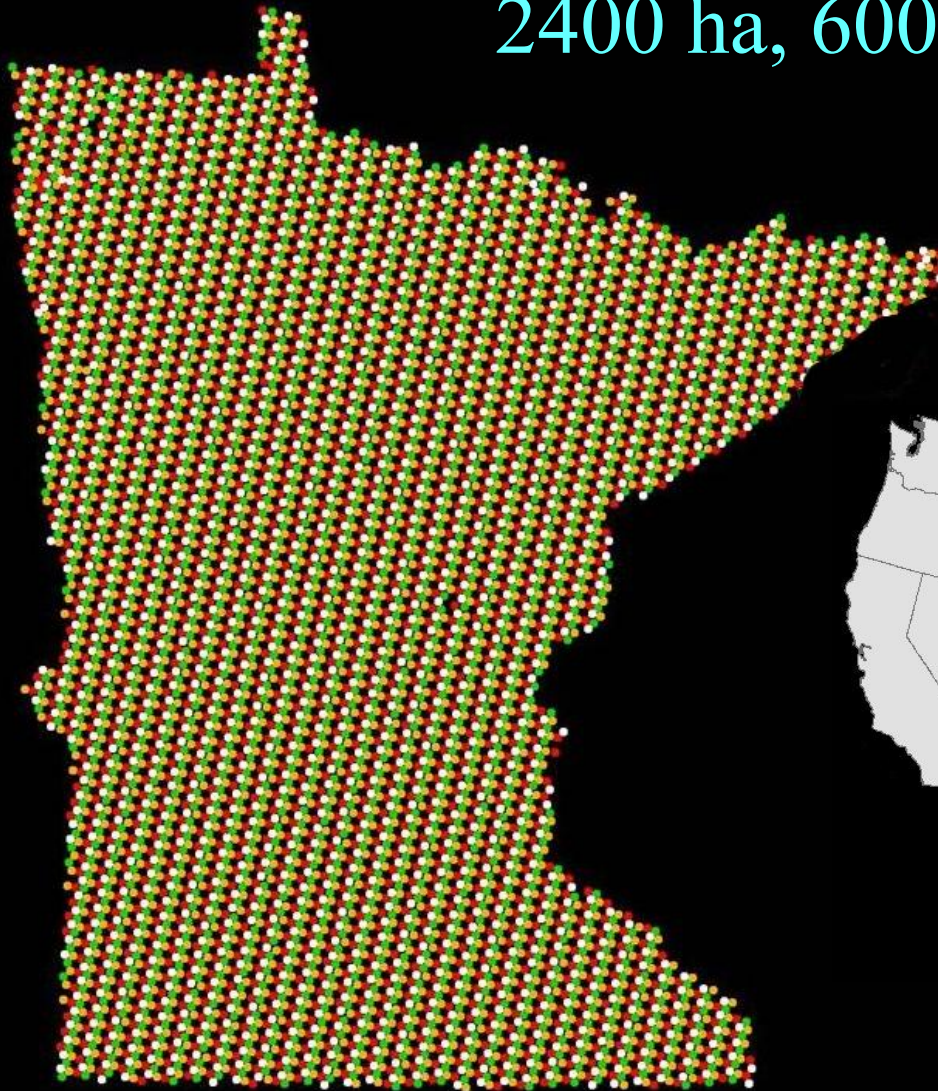
Why hexagons?

The latitude problem



FIA sampling hexagons

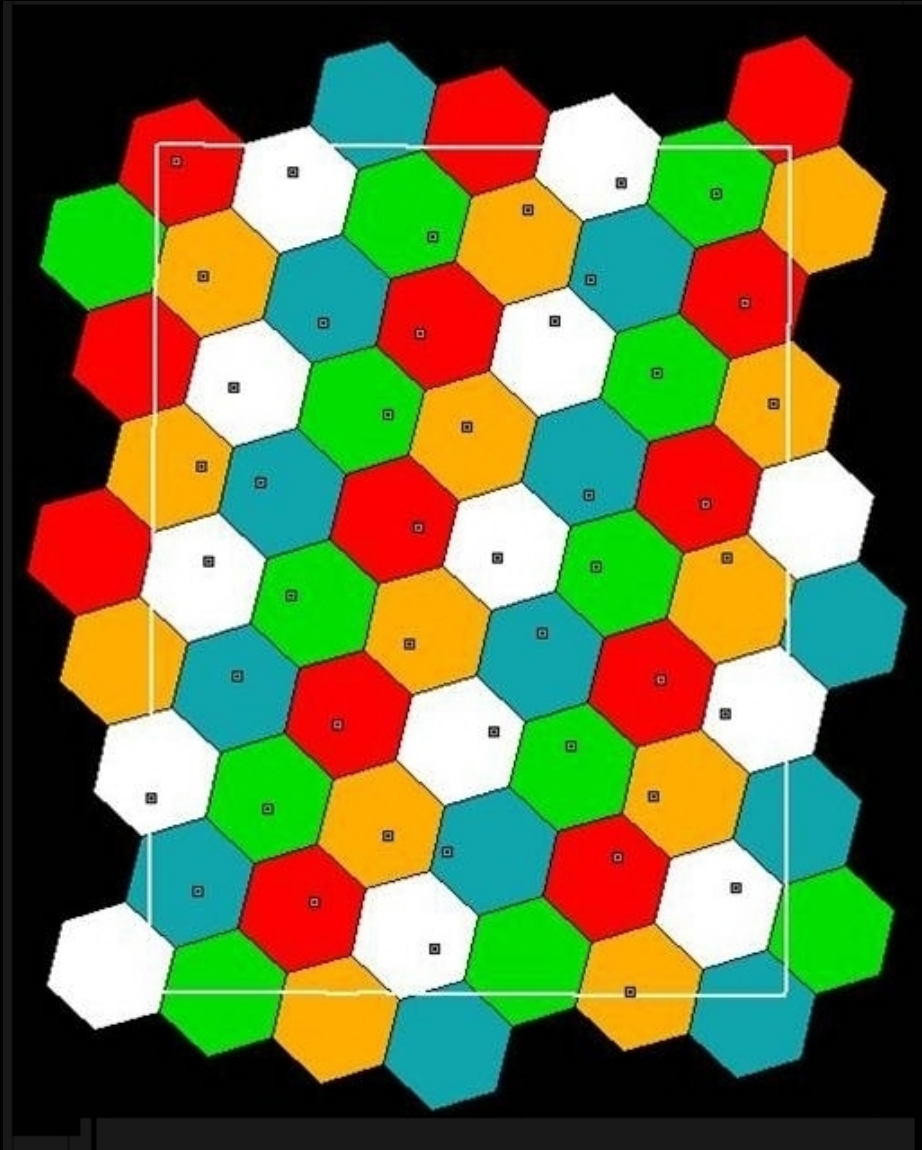
2400 ha, 6000 ac



425 km

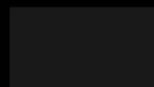
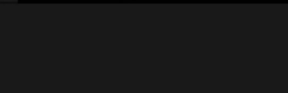


Interpenetrating panels



Plots 

Panels



United States
Department of
Agriculture

Forest Service

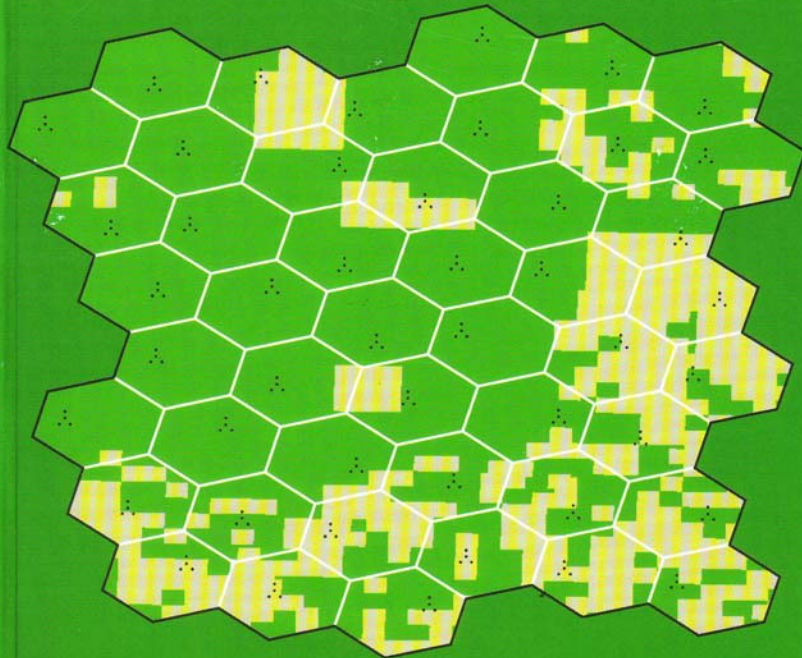


Southern
Research Station

General Technical
Report SRS-80

The Enhanced Forest Inventory and Analysis Program—National Sampling Design and Estimation Procedures

William A. Bechtold and
Paul L. Patterson, Editors



McRoberts.

The Enhanced FIA Program

Reams et al.

FIA Sampling Frame

Bechtold and Scott.

FIA Plot Design

Scott et al.

FIA Estimators

Patterson and Reams.

Combining panel data

The Enhanced Forest Inventory and Analysis Program of the USDA Forest Service: Historical Perspective and Announcement of Statistical Documentation

Ronald E. McRoberts, William A. Bechtold, Paul L. Patterson, Charles T. Scott, and Gregory A. Reams

ABSTRACT

The Forest Inventory and Analysis (FIA) program of the USDA Forest Service has initiated a transition from regional, periodic inventories to an enhanced national FIA program featuring annual measurement of a proportion of plots in each state, greater national consistency, and integration with the ground sampling component of the Forest Health Monitoring (FHM) program. The transition has required conceptual and technical changes in the statistical methodology that supports the program. This article provides a brief historical perspective on the FIA program, announces publication of the statistical documentation supporting the program, previews individual chapters in the documentation, and provides a brief discussion of areas where investigations are continuing.

Keywords: End-survey means, sampling estimation, remote sensing

Forest inventories conducted under the auspices of the Forest Inventory and Analysis (FIA) program of the USDA Forest Service historically have been commodity oriented, with emphasis on estimating the area and volume of the nation's timber supply. These statewide inventories typically have been conducted on productive timberland but not on other forestlands, not on reserved lands, and, depending on the region, not on National Forest lands. The design and implementation of FIA inventories have been the responsibility of the five regional FIA programs that administer them with plot configurations, sample designs, measurement protocols, analytical

techniques, and reporting standards frequently tailored to regional requirements. These inventories were characterized as periodic surveys because field crews were concentrated in one or two states until the measurement of all plots was completed. States were selected for inventories on a rotating basis with time intervals between inventories for the same state ranging from 6 to 18 years. The plot measurement component of periodic inventories required from 1 to 4 or more years, with the analysis component requiring an additional 2–5 years.

The timeliness, quality, and usefulness of estimates obtained from periodic surveys came under scrutiny in the 1980s and

1990s. Estimates were degraded by the effects of conducting inventories over multiple years, and the bias and uncertainty of estimates increased over time because of factors such as change in land use, tree growth, tree mortality, and removals between inventories. The periodic nature of these inventories made consistent interstate estimation difficult, even within regions, and interregional estimation was even more difficult because of varying plot configurations, sample designs, and measurement protocols. When compounded by the lack of measurements on all forested lands and the inconsistency in measurements of National Forest System lands in some regions, these factors caused national compilations to depend on a variety of ad hoc techniques. Finally, the environmental and forest ecosystem health interests of groups challenging the commodity focus of FIA inventories were difficult to address using only traditional FIA measurements. FIA clients recognized the deficiencies inherent in these regional, periodic inventories and registered their dissatisfaction.

In response to user concerns regarding the health of forest ecosystems, the Forest Health Monitoring (FHM) program was initiated in 1990 as a cooperative effort

McRoberts, Bechtold, Patterson, Scott, and Reams. 2005.

The Enhanced FIA Program of the USDA Forest Service.

Journal of Forestry 103: 304-308.

The situation in 2008

- Common plot configuration
- Common sampling design
- Common variables and measurement protocols
- Annual program:
 - 20% per year in East
 - 10% per year in West
- Common estimators and software
- Common 5-year reporting cycle
- Common, publicly accessible, annually updated database

Summary

- Initial motivation:
 - political pressure
 - fear of competition
 - fear of loss of funding
- North Central pilot: good science
- Southern pilot: more money
- Northeastern participation: politics
- Western participation: funding
- Plot configuration: national mandate
- Sampling design: good science

Conclusion

In addition to *good science*,
harmonization may require:

- political pressure
- political will
- fear of competition
- fear of loss of funding

Remember



..... only YOU can prevent forest fires!