Accuracy

Unbiased

Timeliness

Service

Security

National Agricultural Statistics Service

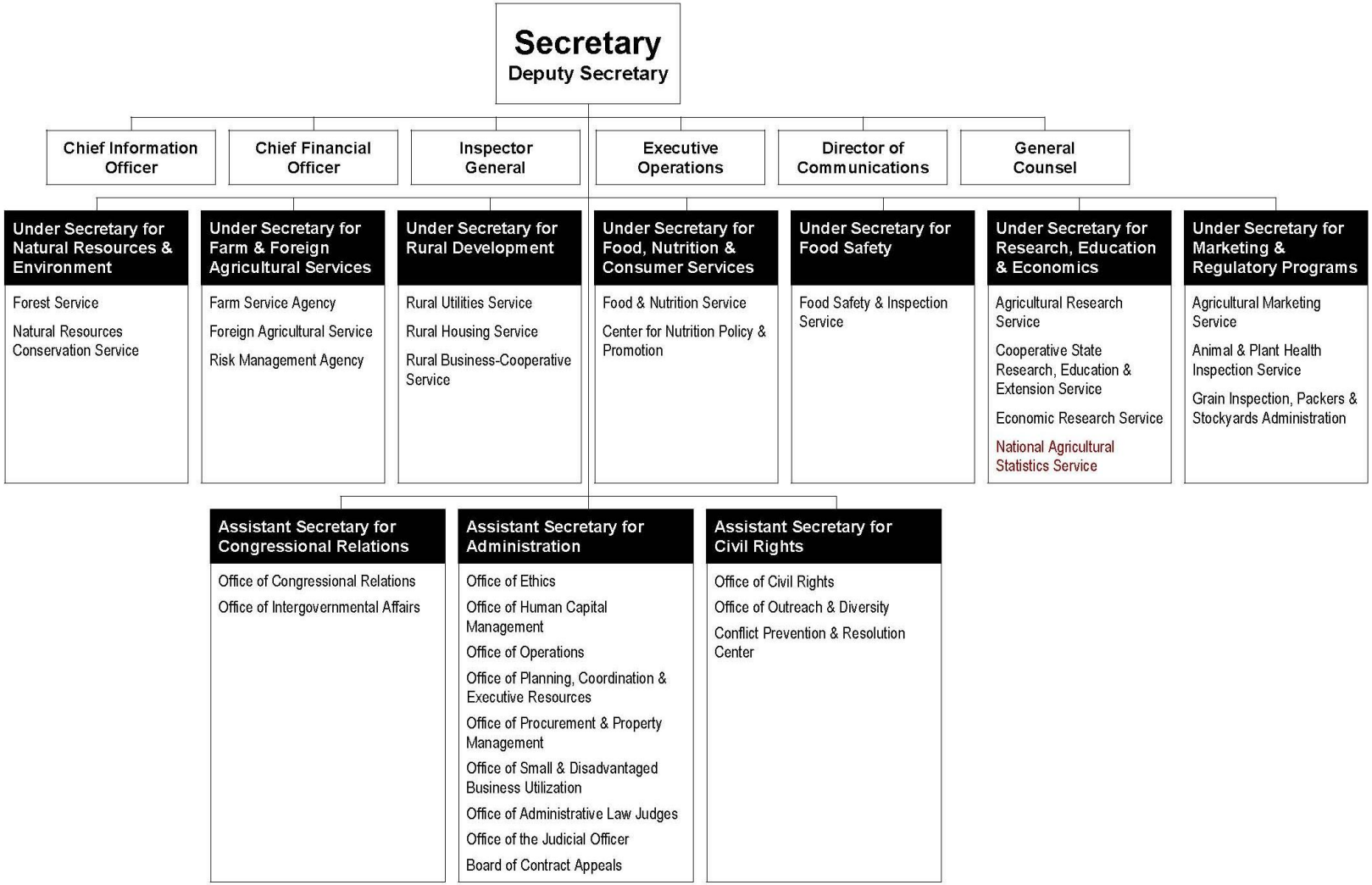
Impartial

Trust

Confidentiality

Team Work

United States Department of Agriculture



July 2006

USDA

Agricultural Marketing Service

quick market information on prices, supply & demand

National Agricultural Statistics Service

basic statistics on crops, livestock,
labor, chemical use, farm demographics, income & expenses

Economic Research Service

economic analysis for the U.S. agricultural sector

National Agricultural Statistics Service

the statistical survey agency of the U.S. Department of Agriculture

non-political
non-policy making
independent-objective-unbiased appraisers of U.S. agriculture

a cooperative statistical survey agency

State departments of agriculture
agricultural colleges & universities

Mission:

to provide
timely, accurate and useful statistics
in service to U.S. agriculture

administer USDA's domestic agricultural statistics program

over 450 reports each year

120 crop items

45 livestock items

Agricultural census every 5 years

Farm & ranch irrigation survey every 5 years

Horticultural census every 10 years

Aquaculture census

Agricultural economics & land ownership survey

coordinate federal & state agricultural statistics needs

statistical & survey consulting

other USDA agencies
other government agencies
private organizations
other countries

statistical research

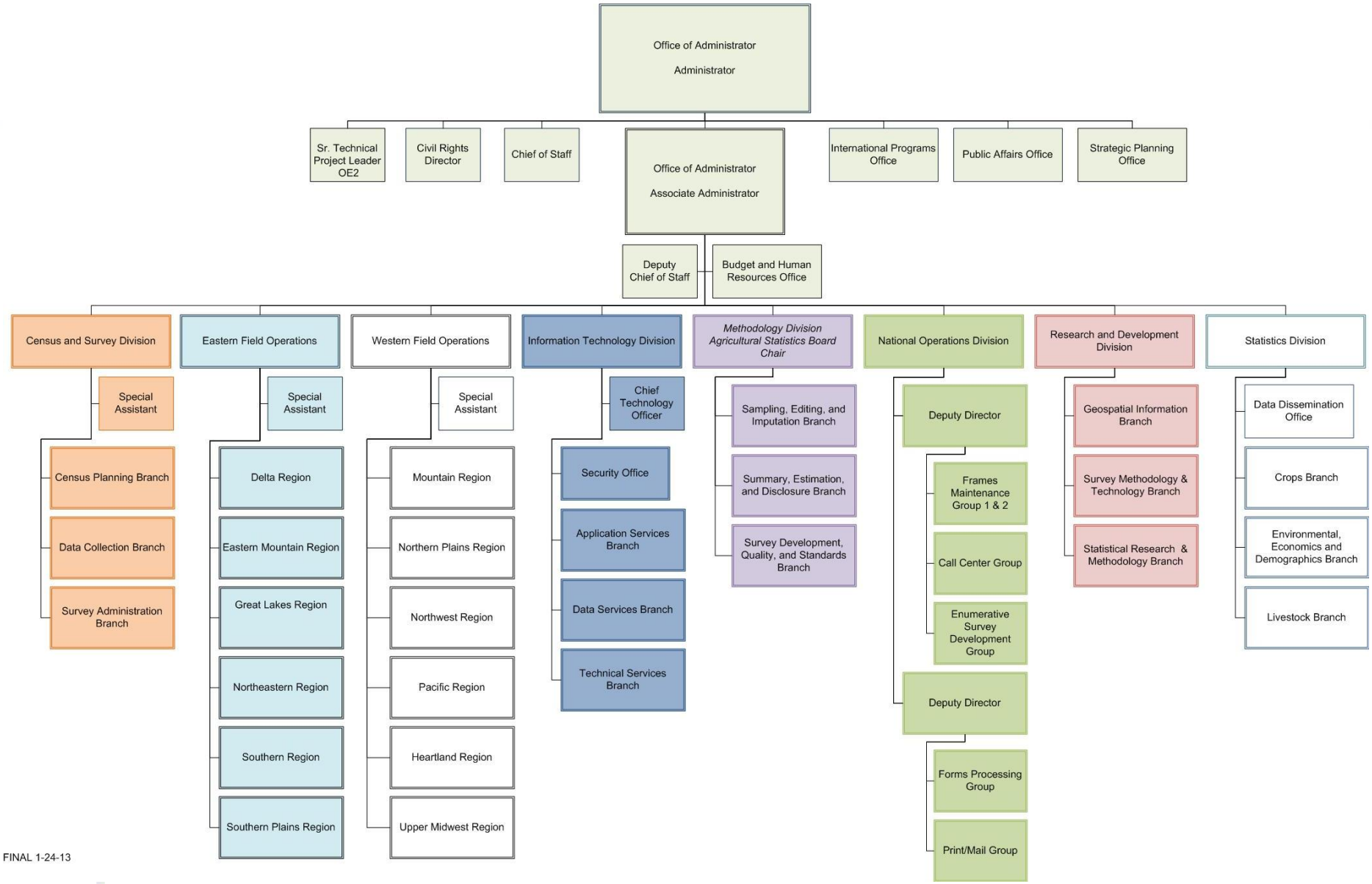
Headquarters in Washington D.C.

12 regional offices serving 50 states

900 Federal employees

60 State employees

3,500 contract employees


Office of Administrator
Administrator
Sr. Technical Project Leader OE2
Civil Rights Director
Chief of Staff
Office of Administrator
Associate Administrator
International Programs Office
Public Affairs Office
Strategic Planning Office
Deputy Chief of Staff
Budget and Human Resources Office
Census and Survey Division
Special Assistant
Census Planning Branch
Data Collection Branch
Survey Administration Branch
Eastern Field Operations
Special Assistant
Delta Region
Eastern Mountain Region
Great Lakes Region
Northeastern Region
Southern Region
Southern Plains Region
Western Field Operations
Special Assistant
Mountain Region
Northern Plains Region
Northwest Region
Pacific Region
Heartland Region
Upper Midwest Region
Information Technology Division
Chief Technology Officer
Security Office
Application Services Branch
Data Services Branch
Technical Services Branch
Methodology Division
Agricultural Statistics Board Chair
Sampling, Editing, and Imputation Branch
Summary, Estimation, and Disclosure Branch
Survey Development, Quality, and Standards Branch
National Operations Division
Deputy Director
Frames Maintenance Group 1 & 2
Call Center Group
Enumerative Survey Development Group
Deputy Director
Forms Processing Group
Print/Mail Group
Research and Development Division
Geospatial Information Branch
Survey Methodology & Technology Branch
Statistical Research & Methodology Branch
Statistics Division
Data Dissemination Office
Crops Branch
Environmental, Economics and Demographics Branch
Livestock Branch

FINAL 1-24-13

Field Operations

NASS Ongoing Agricultural Statistics Program

Crops:

grains
hay
oilseeds
cotton
tobacco
potatoes
sugar
other field crops
citrus fruit
non-citrus fruit
nuts
vegetables
floriculture

crop progress

acreage
- prospective plantings
- planted
- harvested

yield & production
- forecasts
- final
- by utilization

stocks
disposition

processing

prices received by farmers

agricultural chemical use

Livestock:

cattle
hogs
sheep
goats
equine
poultry
milk & dairy products
aquaculture
bees & honey
mink

inventory
- total
- by class
- births
- deaths
- predator losses

marketings
slaughter

production/disposition
- meat
- other products
  (milk, dairy products, wool, mohair, eggs, honey, etc.)

prices received by farmers
inventory/production values

Other:

number of farms
land in farms

land values
cash rents

agricultural labor
- number of workers
- hours worked
- wages paid

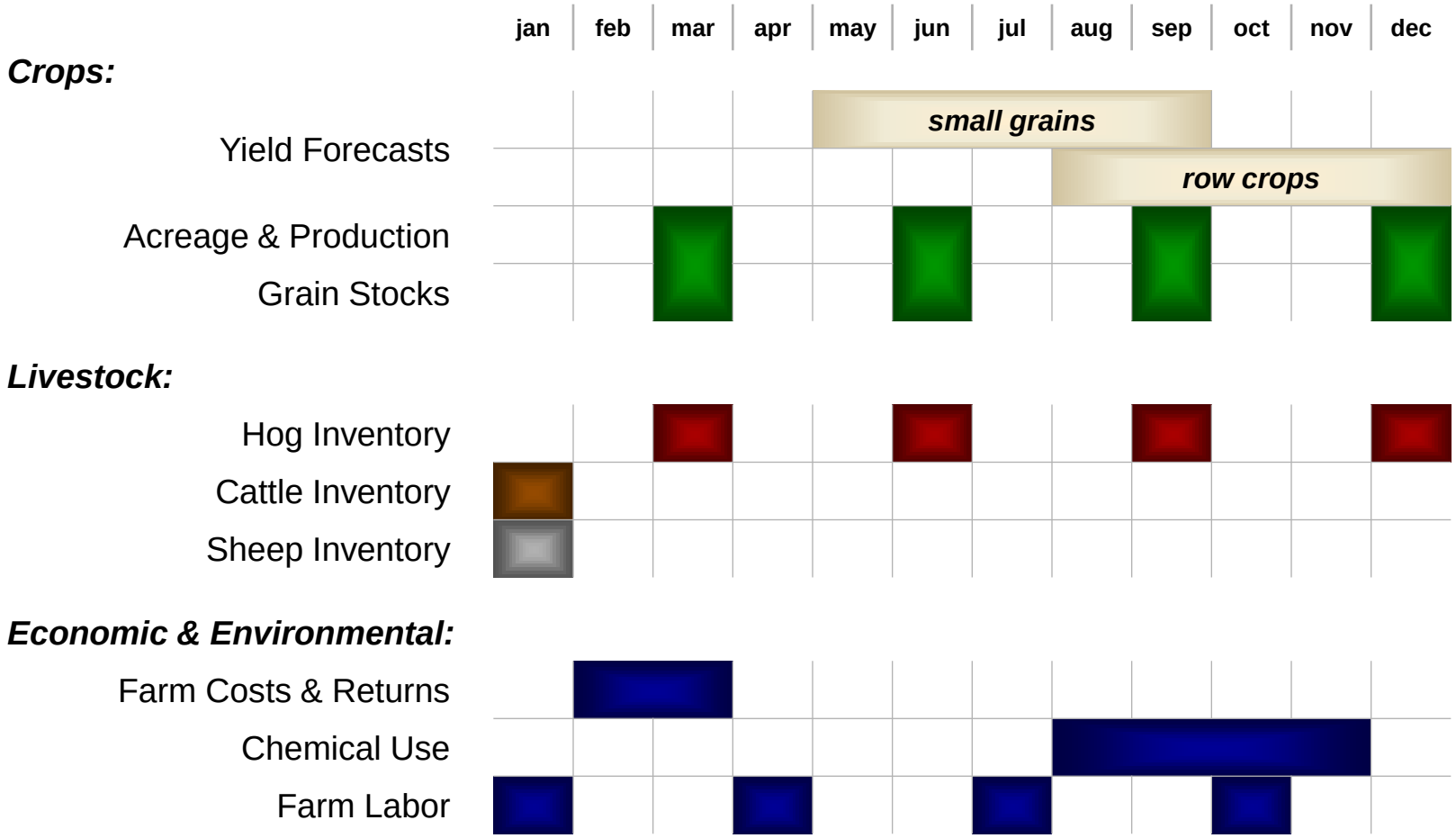
cold storage
- holdings
- capacity

cash receipts

production expenditures

weekly ~ monthly ~ quarterly ~ annual

NASS Survey Program for Major Data Series



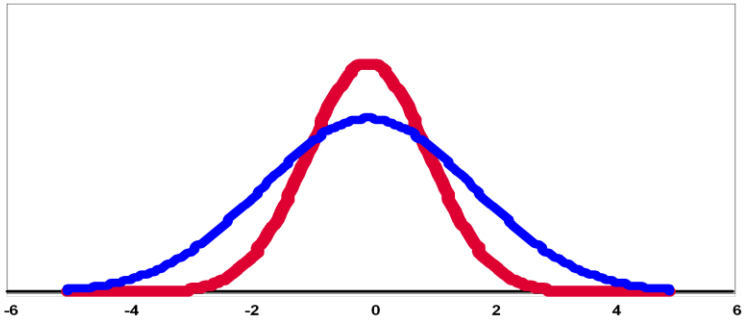
estimates based on data from
agricultural producers & agri-businesses

surveys
administrative sources

sample & census procedures

scientifically proven sampling techniques

lists of producers & businesses
segments of land



Statistical Inference

The process of using data obtained from a sample to make estimates or test claims about the characteristics of a population.

Target Population

The group about which information is sought, or about which we want to make inferences; the group we intend to sample. all the items (people, farms, animals, businesses, etc.) about which information is needed.

Examples

- All farms and ranches in the United States
- All hog owners on in the United States

Farm:

any place that produced and sold,
or normally would have produced and sold,
$1,000 or more of agricultural products
during the calendar year

~ currently about 2.2 million farms ~

Sampling Frame

- A listing of elements of the population that allow one to select a sample with known probabilities
- Effective if Complete and Unique
- NASS Frames: List, Area, Multiple Frame

NASS List Frame

What is it?

data to identify, locate & contact farmers & agri-businesses

name
address
telephone number
state, district & county
Employer Identification Number

data about the farm/business

total acres
individual crop acres
grain storage capacity
peak livestock inventories
peak number of hired workers
⋮

NASS List Frame

How is it constructed?

sources for new names & data

growers organizations
farm program lists
state & local tax records
state & local license records
lists from other federal, state & local agencies
newspaper & magazine articles

sources for updating names & data

on-going NASS surveys
Census of Agriculture

NASS List Frame

How is it used?

❶ classify	identify farmers &/or agri-businesses likely to have item(s) of interest
❷ stratify	group similar units together based on size or amount of item(s) to be measured
❸ sample	select units from each group
❹ survey	collect data for selected units
❺ summarize	expand data using probabilities of selection

Iowa: MPPS Crops/Stocks Sample

Multivariate Probability Proportion to Size (MPPS)

Targets	Sample Size
Cropland	725
Capacity	675
Calculated Land in Field Crops	650
Hay	475
Corn	740
Soybeans	880
Oats	1,275
Oats for Grain	550
Winter Wheat	275
Total	2,264

Example: Hogs and Pigs Stratificatoin

Stratum	Boundaries	Population	Sample Size	Sample Weight
80	Hogs 1-99	1,402	75	18.69
82	Hogs 100-499	736	100	7.36
84	Hogs 500-999	286	75	3.81
86	Hogs 1,000-4,999	845	375	2.25
88	Hogs 5,000-14,999	265	150	1.77
90	Hogs 15,000-49,000	81	81	1.00
98	Hogs 50,000+	43	43	1.00
	Total	**3,658**	**1,571**	

NASS List Frame

Strengths:

- ✓ can use inexpensive data collection methods (mail, telephone)
- ✓ can target specific or rare commodities
- ✓ can reduce variability due to sampling
- ✓ cost efficient
- ✓ Efficient for large farms

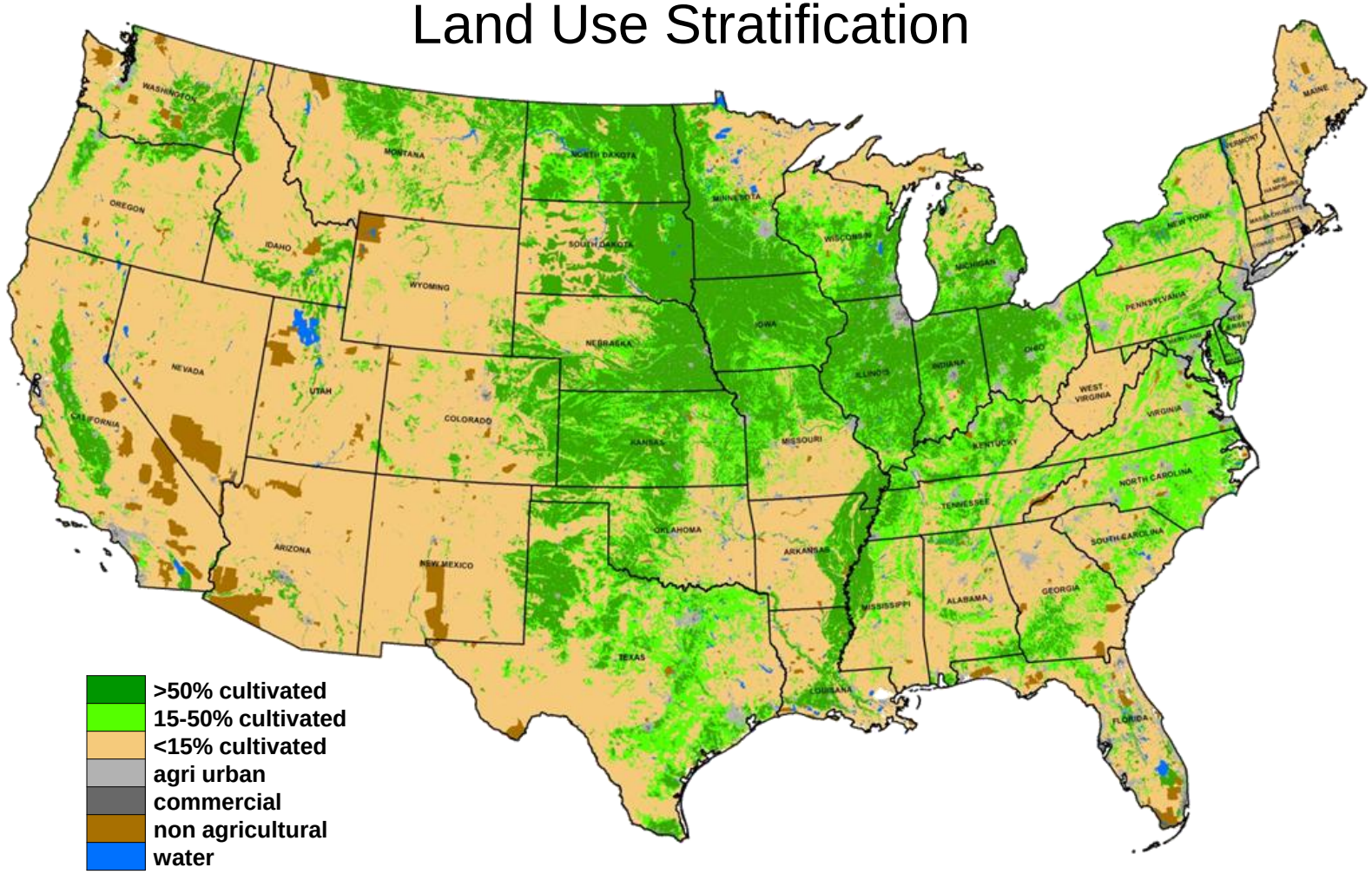
NASS List Frame

Weaknesses:

- Incomplete, does not cover entire population
- goes out-of-date quickly
- increased non-sampling errors due to data collection methods
- requires on-going maintenance
  - build
    - update
      - remove duplication
        - remove out-of-scope records
- Expensive to maintain

NASS Area Frame

Land Use Stratification



NASS Area Frame

What is it?

land area of the U.S
divided into segments
using physical boundaries

associate farms, crops, animals, etc.
with land inside the segments

NASS Area Frame

How is it constructed?

using…

satellite imagery
topographic maps
GIS software
aerial photography

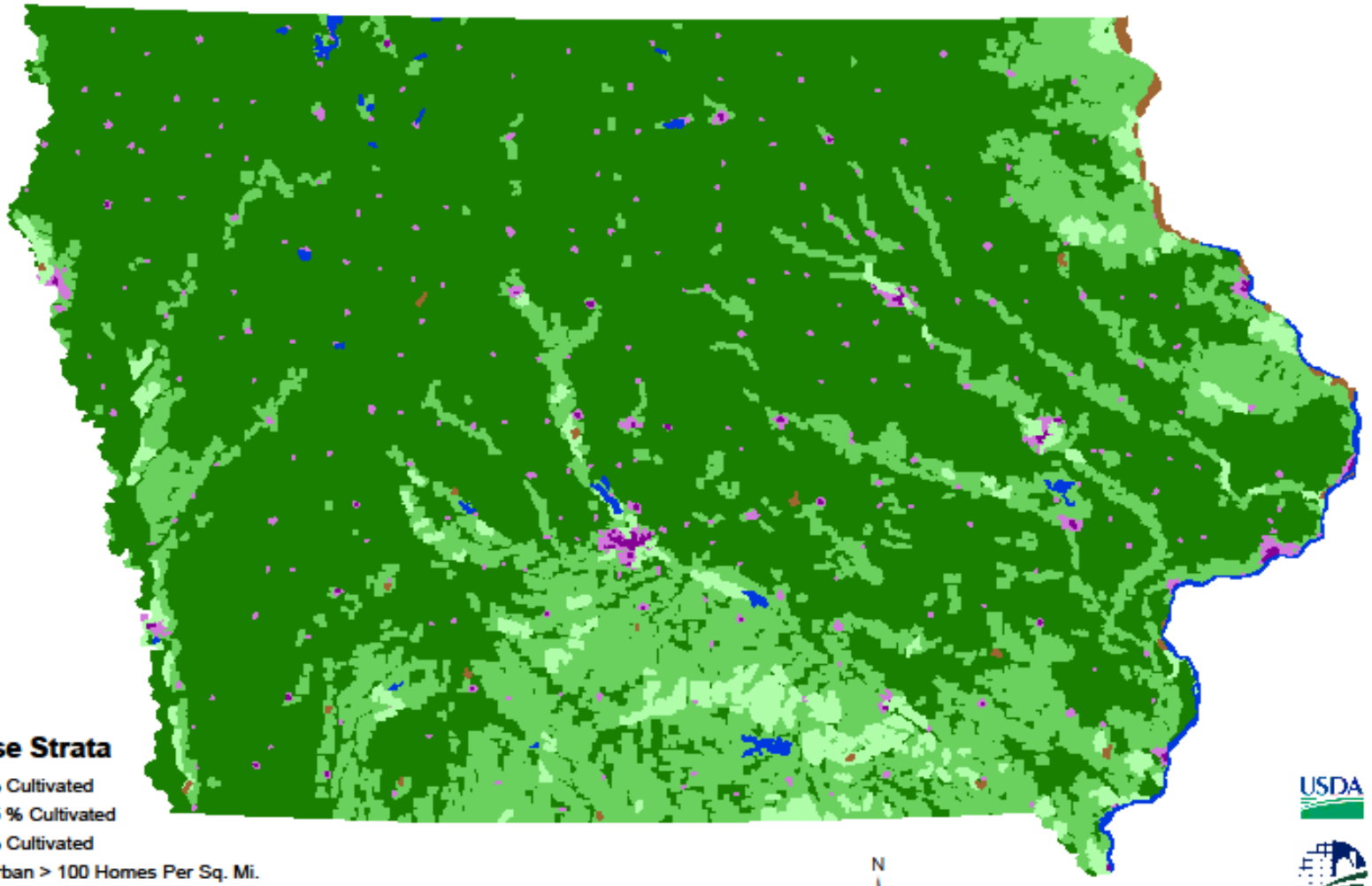
❶ divide land area into strata based on land use & likelihood of finding agriculture

❷ subdivide land use strata into strata blocks

❸ select a sample of strata blocks

❹ subdivide selected strata blocks into segments

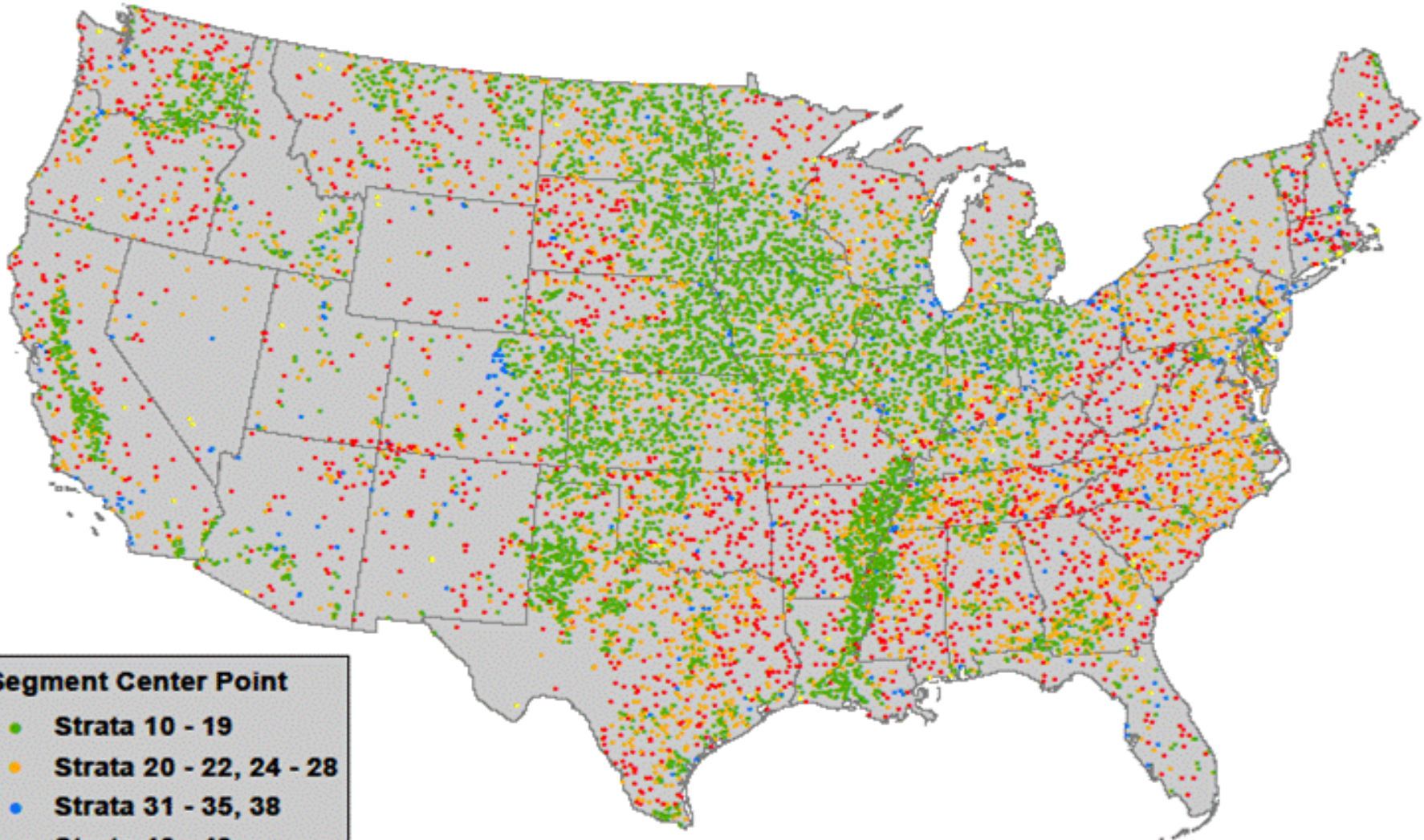
Stratification of Iowa
1989



Iowa – Area Sample Design (1989)

stratum	boundaries	total area square miles	segment size	total number of segments	number of sampled segments	expansion factor
11	>75% cultivated	43,163	1.0	43,128	336	128
20	25-75% cultivated	10,902	1.0	10,885	60	181
31	agri-urban: >100 homes/mi^2	409	0.25	1,618	2	809
32	commercial: >100 homes/mi^2	48	0.10	474	2	237
40	<25% cultivated	1,447	2.0	722	2	361
50	non-agricultural	120	pps	31	2	16
	TOTAL			56,858	404	

JAS Segment Center Points by Stratum



How is it used?

❶ sample — select a sample of segments – generally keep segments in sample for 5 years, rotate 20% of sample each year

❷ survey — account for all land inside segment boundaries, obtain information about all farms with land inside segments

❸ Summarize — expand data using probabilities of selection (based on land area)

* tract level and farm level

NASS Area Frame

Strengths:

- ✓ complete coverage
- ✓ reduced non-sampling errors
- ✓ estimates well for commonly produced commodities
- ✓ versatility
- ✓ longevity

NASS Area Frame

Weaknesses:

- ✗ expensive (frame construction & data collection)
- ✗ difficult to target specific or rare commodities
- ✗ sensitive to outliers
- ✗ can be inefficient
- ✗ requires definable physical boundaries

June Area Survey

- ✓ One of the most important survey we conduct in NASS
  - Full Area Frame Sample, n = ~12,000 Segments
- ✓ Provides key Indications for:
  - Acreage
  - Number of Farms and Land in Farms
  - Land Values and Cash Rents
  - NOL Component for the July Cattle and Sheep Surveys
- ✓ Measures incompleteness of NASS List Frames
  - Provides coverage measures used for the NASS Red Book
  - Tracts Not on a NASS list are sub-sampled for follow-on surveys
    - Follow-on Surveys: Collect farm level data only
- ✓ Identifies sample fields for the Corn and Soybean Objective Yield Surveys
- ✓ Both Tract level and Farm Level data are collected
  - Accurate tract and farm acres for weighting purposes
  - Accurate Name of Operators is critical for OL/NOL procedures

Multiple Frame

The Joint use of two or more sampling frames

Multiple Frame = List Frame + Area (NOL) Domain

Key Points:

- **Must have procedure to count each reporting unit once and only once**
- **Translate the Area Frame into the List Frame**
- **Determine which records are Not On List**
- **Complete Name and Address information on the Area Frame**
- **INDEPENDENCE**
  - **Area Frame Provides a measure of List Incompleteness (Undercoverage!)**

NASS Multiple Frame

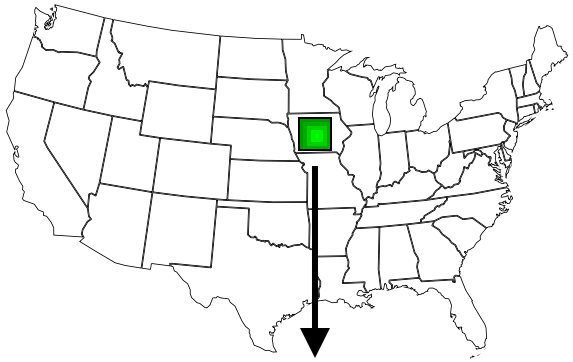
How is it used?

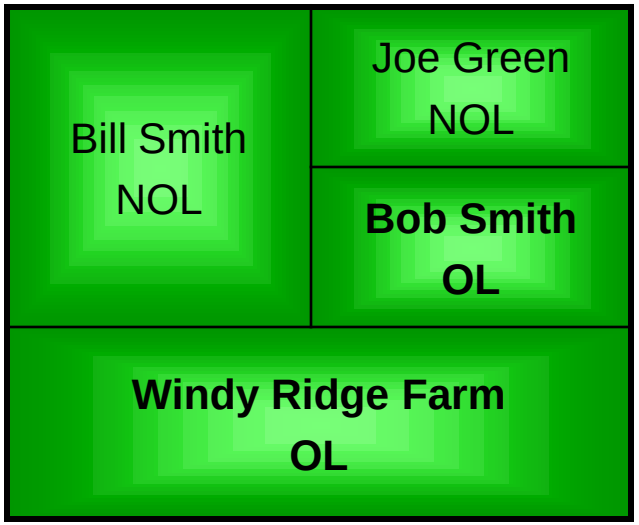
❶ sample	select list & area samples
❷ survey	collect data for selected units from both frames – determine if operations in area sample are on list (OL)
❸ summarize	expand data for list samples & area operations not on list (NOL) using probabilities of selection

MF expansion = list expansion + NOL expansion

NASS Multiple Frame

Area





List

Windy Ridge Farm
John Brown
1234 Farm Rd
Anywhere, US 00000

Richard Jones
789 Ranch Rd
Anystate, US 99999

Bob Smith
56 Orchard Rd
Anywhere, US 00000

Dave White
123 Farm Rd
Anywhere, US 00000

NASS Multiple Frame

Strengths:

- ✓ together frames cover target population
- ✓ can control variability due to sampling
- ✓ can control costs with large list, small area samples
- ✓ can target specific or rare commodities

NASS Multiple Frame

Weaknesses:

- ✗ NOL can be too small
- ✗ overlap determination can be difficult
- ✗ errors in overlap determination can bias estimates
- ✗ list and area frames must be maintained independently

Precision

- Measures how close the indication from one sample would to indications from another sample using the same survey procedures.

- Measured by the **Sample Variance**
  The **variance** is a measure of the variability of measurements in a sample or population. The variance of an item is the average value of the square of the deviation between a randomly selected measurement of a population and the true value.

Target CV's

- **Standard Error** (square root of variance)
  - same units as indication
  - estimates the variability between samples

- **Coefficient of Variation: CV:** Relative measure of dispersion

$$\text{c.v.} = \frac{\text{Standard Error}}{\text{Indication}} \times 100$$

- **Sample Size Allocations: Target CV's**

National Level	1.0 - 3.0 %
State Level	5.0 -10.0 %

One measure of Agency Performance!