New Geospatial Methods Used to Improve the Stratification of U.S. State Area Sampling Frames for the National Agricultural Statistics Service (NASS)

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History

Since the 1950s, NASS has used state Area Sampling Frames (ASFs) for agricultural surveys. ASFs are used to gather information on crop acreage, cost of production, farm expenditures, livestock inventories, grain yield/production, and other items.

Process

An Area Sampling Frame (ASF) is a listing (delineation on a map) of all parcels of land in a state. There is an ASF for all conterminous U.S. states, Hawaii and Puerto Rico. NASS surveys 11,000 randomly sampled segments of land across the U.S. in an annual June Agricultural Survey (JAS), and every five years in the Census of Agriculture (most recent, 2012).

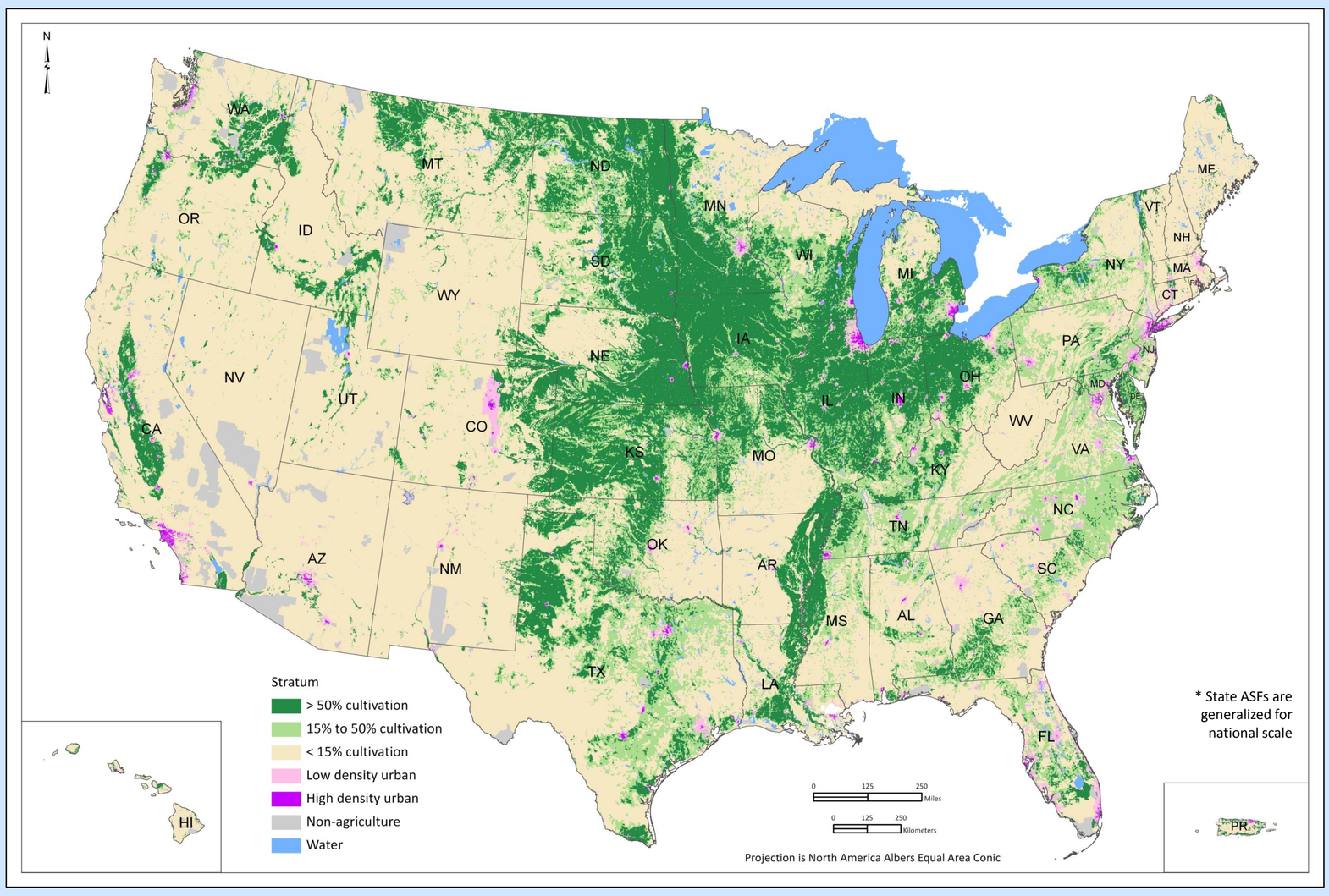
Stratification is the division of land into land-use strata based on percent cultivation:
- Cultivation (cropland)
- Natural vegetation (woods/rangeland)
- Cities/Towns
- Non-agricultural land (military, parks, water).

Each state has a unique frame design, with some including strata based on: specific crops, farm size, potential land-use, demographics, etc. This can provide for more efficient sampling and estimation for livestock, crops, and farm counts.

The land is divided into Primary Sampling Units (PSUs) and assigned a specific strata. Three main criteria are considered: stratum definition, boundary choices (physical boundaries), and PSU area.

Stratification resources:
- Aerial photography (most current/multiple years)
- Cropland Data Layer (CDL) (most current)
- CDL cultivated layer (five consecutive years)
- Satellite Imagery (most current/cloud free)
- Assorted vector data sets (roads, hydrography, rail)
- Topographic maps (state/county)
- Farm Service Agency (FSA) Common Land Units
- National Land Cover Dataset (NLCD)(2006)
- U.S. Census Housing Numbers, per Tract (2010)
- County Parcel data sets

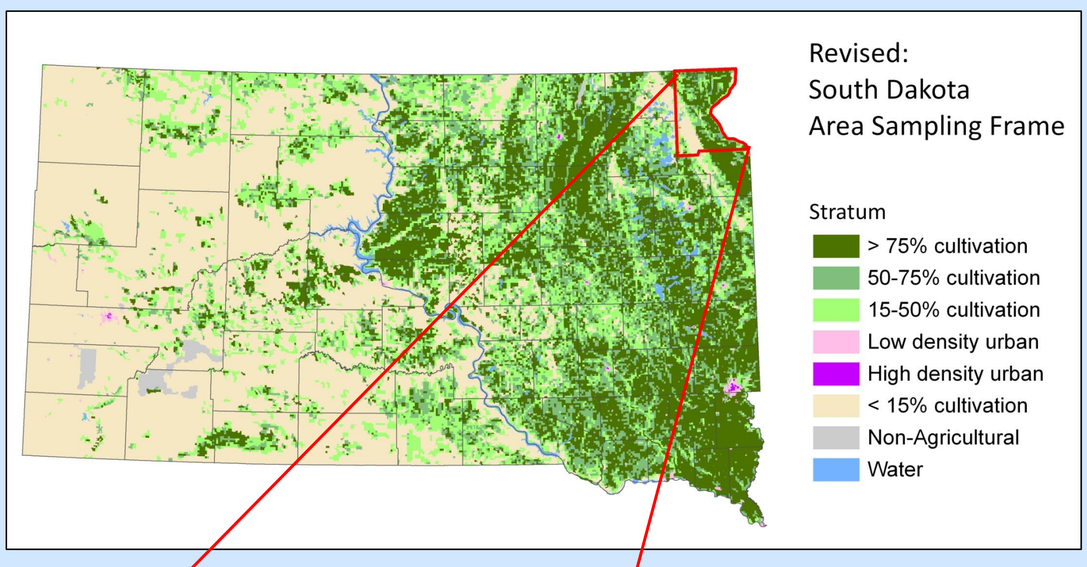
United States National Land Use Area Sampling Frame



Frame Revision Methodology

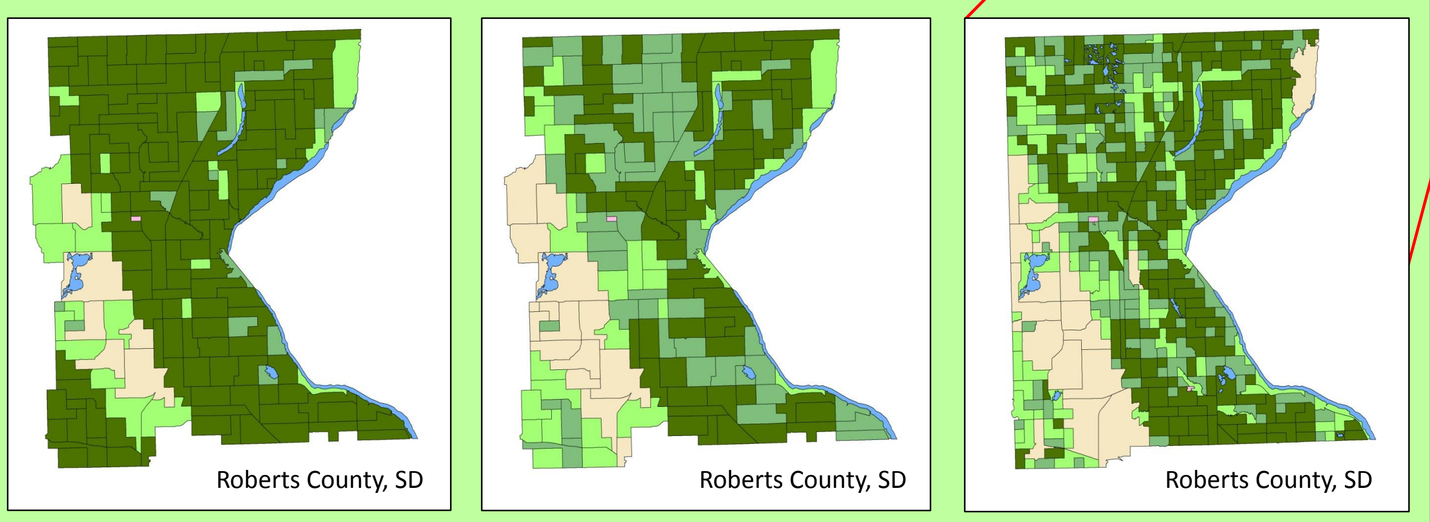
South Dakota

This ASF was revised for use starting in the 2014 JAS. It was designed to reduce variability to provide more precise agricultural estimates. Our new frame revision methodology and new data sources allow for a more efficient revision with reductions in cost and time.



Automated Stratification

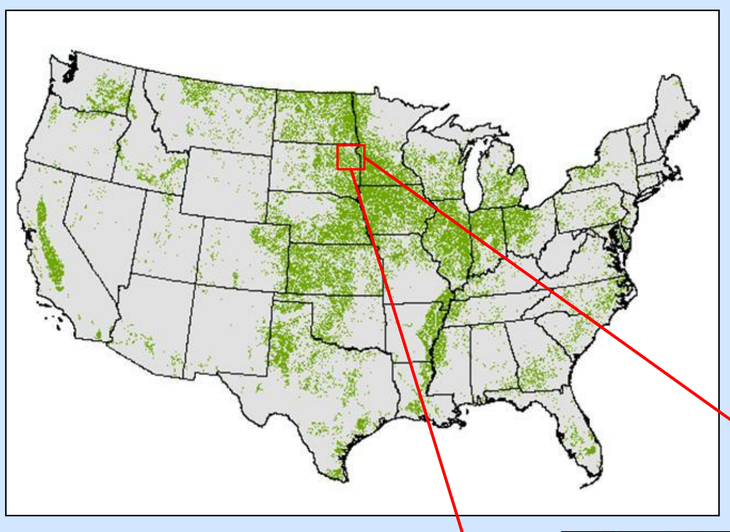
A method to stratify U.S. State Area Sampling Frames by automatically calculating percent cultivation at the PSU level based on CDL data.



Geospatial Stratification

Following 'automated stratification', this method is where an ASF is further refined by a cartographer using newer geospatial tools to strengthen strata homogeneity, ensure PSU size reduction, and more efficiently classify land-use.

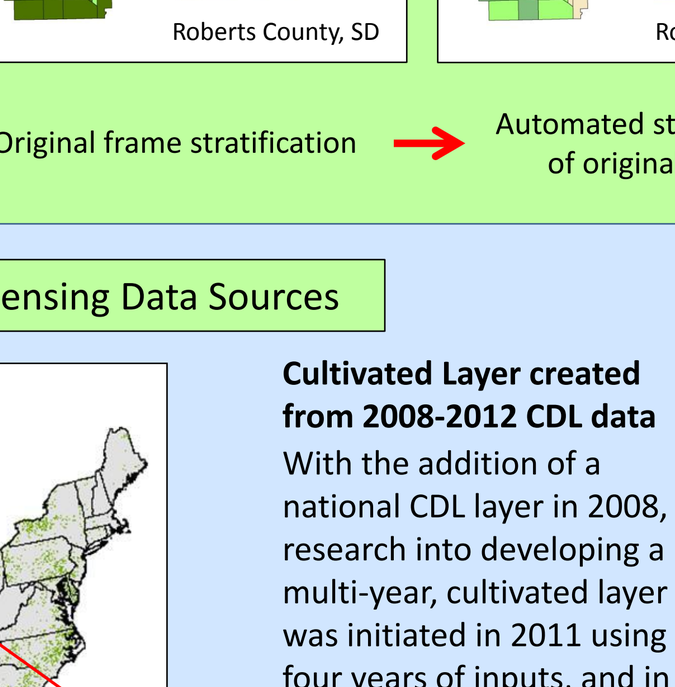
Remote Sensing Data Sources



Cultivated Layer created from 2008-2012 CDL data

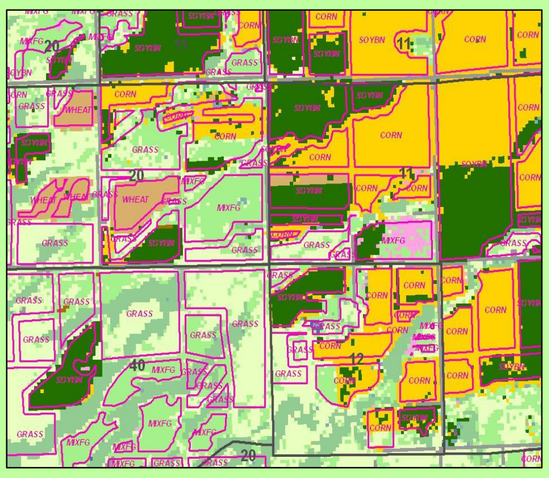
With the addition of a national CDL layer in 2008, research into developing a multi-year, cultivated layer was initiated in 2011 using four years of inputs, and in 2012 using five years of inputs. *www.nass.usda.gov/research/Cropland/Release/*

To create a cultivated layer, all pixels representing cultivation (green) are merged together and all pixels representing non-cultivation (white) are merged together. The number represents the resulting percent cultivation for each PSU (red outlines), which is derived utilizing ESRI's ArcGIS spatial analysis' zonal statistics tool.

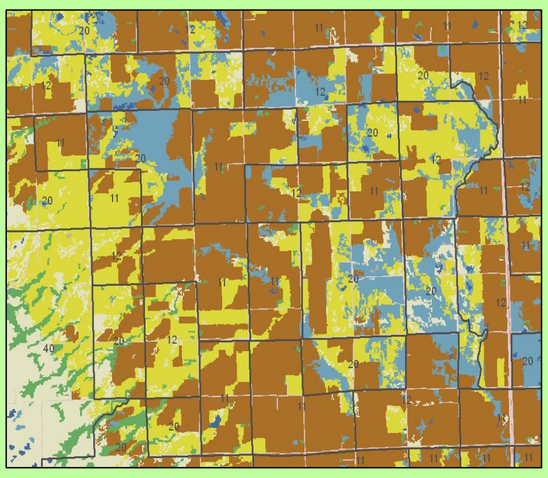


Detail - Automated Stratification Method
Roberts County, SD Revised ASF
(shown with 2008-2012 CDL cultivated layer)

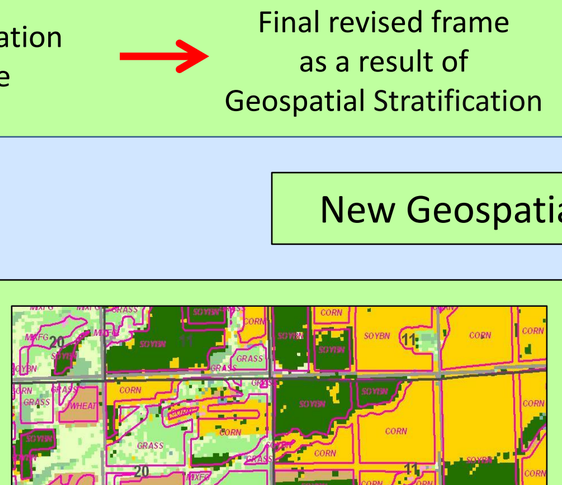
New Geospatial Data Sources



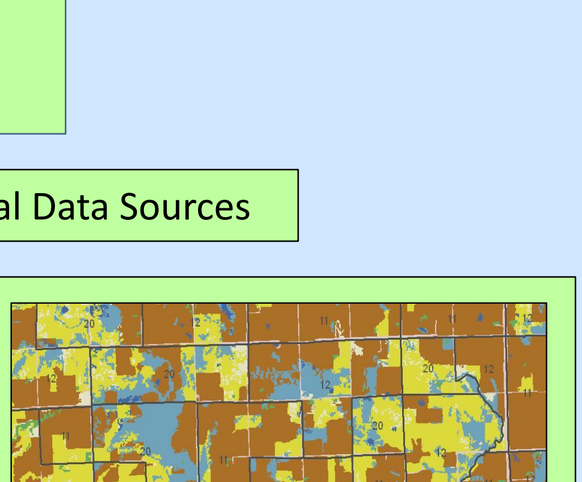
Farm Service Agency
Common Land Unit (CLU) Data
(with 2012 CDL as background)



2006 National Land Cover Dataset



U.S. Census Housing Data, 2010
(Denotes Number of Homes in Each Tract)



Detail of parcel data in Sioux Falls, SD
(with 2012 NAIP Aerial Image)

(FSA, NLCD, and Census images are of Roberts County, SD)

For further information, please refer to this web address: http://www.nass.usda.gov/research/stratafront2b.htm