



Natural Resources Conservation Service
U.S. DEPARTMENT OF AGRICULTURE

National Resources Inventory (NRI) Program Technical Manual

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Chapter 1 – Introduction

Purpose

This technical manual provides a single source of information for a wide range of details about [National Resources Inventory \(NRI\)](#) data from USDA's Natural Resources Conservation Service (NRCS). It comprises all the information that would normally be included in a user manual, including a quality profile and metadata for the NRI database. It also includes complete descriptions of the definitions of the characteristics being assessed, the survey design, the data collection methods, the estimation methods, and aspects of the resulting data quality in the completed database.

This technical manual will serve to comply with Standard 7.3 (Survey Documentation) of the Office of Management and Budget (OMB) Standards and Guidelines for Statistical Surveys (https://www.whitehouse.gov/wp-content/uploads/2021/04/standards_stat_surveys.pdf). The NRI meets the definition of a statistical survey, which is defined as such: "A statistical survey is a data collection whose purposes include the description, estimation, or analysis of the characteristics of groups, organizations, segments, activities, or *geographic areas*."

1.2 Legislation and Executive Mandates

- **Soil Conservation and Domestic Allotment Acts.** The Soil Conservation and Domestic Allotment Act of 1935 (P.L. 74-46) established the Soil Conservation Service under the Department of Agriculture, which took over responsibilities previously carried out by the Soil Erosion Service under the Department of Interior to administer provision of the National Industrial Recovery Act of 1933. It specifically mentioned conducting surveys, investigations, and research. The Soil Conservation and Domestic Allotment Act of 1936 (P.L. 74-461) further amended the law.
- **Secretary of Agriculture Memorandum No. 1396.** In April 1956, a memo from the Secretary of Agriculture stated that, "A National Inventory of Soil and Water Conservation Needs will be made and kept current by the Department of Agriculture." It went on to say, "From it the Department could arrive at reasonable estimates of the magnitude and urgency of the various conservation measures needed to maintain and improve the country's productive capacity for all the people." This mandate led to the 1958 Conservation Needs Inventory as a cooperative effort of eight agencies: the Agriculture Conservation Program Service, the Commodity Stabilization Service, the Soil Conservation Service, the Agriculture Marketing Service, the Agriculture Research Service, the Federal Extension Service, the Farmers Home Administration, and the Forest Service.
- **Rural Development Act of 1972 (P.L. 92-419).** In section 302 of this Act, it indicated, "the Secretary of Agriculture is directed to carry out a land inventory and monitoring program to include, but not be limited to, studies and surveys of erosion and sediment damages, flood plain identification and use, land use changes and trends, and degradation to the environment resulting from improper use of soil, water, and related resources. The Secretary

shall issue at not less than 5-year intervals a land inventory report reflecting soil, water, and related resource conditions.”

- **Forest and Rangeland Renewable Resources Planning Act of 1974 (P.L. 93-378).** This Act specifies certain requirements on the Forest Service including a Renewable Resource Program. It specifically indicates that information from section 302 of P.L. 92-419, i.e. the NRI, feed into this program.
- **The Soil and Water Resources Conservation Act (RCA) of 1977 (P.L. 95-192).** This Act further reinforced the inventory activities authorized by the Rural Development Act and went on to require continuing appraisals (known as RCA appraisals) at five year intervals, and added that the appraisals shall include: (1) Data on the quality and quantity of soil, water, and related resources, including fish and wildlife habitats. (2) Data on the capability and limitations of those resources for meeting current and projected demands on the resource base. (3) Data on the changes that have occurred in the status and condition of those resources resulting from various past uses, including the impact of farming technologies, techniques, and practices.
- **Forest and Rangeland Renewable Resources Planning Act of 1978 (P.L. 95-307).** As can be expected by the title, this Act focuses on Forest and Rangeland and includes a requirement for collecting data on their present condition. This affects the NRI only in that it enhances the requirements under P.L. 93-378.
- **Food Securities Act of 1985 (P.L. 99-198).** Extended requirements for RCA appraisals to 2008.
- **Food, Agriculture, Conservation, and Trade Act of 1990 (P.L. 101-624).** This act expanded on the Food Security Act of 1985 by requiring the Secretary of Agriculture to provide an assessment to Congress by June 30, 1993 that, among some other things, “assess the progress made toward the national objective of nondegradation of the soil resources through the implementation of the relevant provision of this title, identify obstacles to the attainment of such goal, and recommend ways in which to overcome such obstacles,” as well as “perform on-site evaluations of 5 percent, or such reasonable amount as necessary to produce a statistically valid survey, of (A) all affected acreage of conservation practices on highly erodible lands; (B) estimates of erosion reductions that may result from the implementation of conservation plans; and (C) the technical adequacy and feasibility of such plans.”
- **Government Performance and Results Act of 1993 (P.L. 103-62).** This act affects the NRI only in that it requires agencies to measure their performance effectiveness, and the NRI provides such measures or input to such measures like the RCA appraisals and the Conservation Effects and Assessment Project analyses.
- **Data Quality Act of 2001, Part of the Treasury and General Government Appropriations Act of 2001 (P.L. 106-554, Section 515).** This act affects the NRI in that

each agency is required to issue information quality guidelines and provide a mechanism for challenging the quality of released data. The USDA Information Quality Guidelines are given at <https://www.usda.gov/ocio/guidelines-and-compliance-resources/information-quality-activities>.

- **Farm Security and Rural Investment Act of 2002 (P.L. 107-171).** This act added an explicit confidentiality requirement for the NRI into 7 USC 2276, in that it identifies the National Resources Inventory in a line item.
- **Office of Management and Budget Statistical Policy Directive No. 2, Standards and Guidelines for Statistical Surveys (September 2006).** The NRI is required to comply with these standards.
- **Food, Conservation and Energy Act of 2008 (P.L. 110-246).** This act updated the requirement for RCA report to include a report due by 31 December 2010 and 2015. (The same change was in P.L. 110-234, but that was repealed by this law and the change made again.)
- **NRCS General Manual Part 400.** In addition to reiterating the above mandates, this policy dictates some specifics about how the National Resources Inventory (NRI) will be carried out, as well as roles and responsibilities. The text of this policy is provided in Appendix A.

1.3 Overview of the NRI

1.3.1 Background

The current NRI evolved from a need for information to guide decisions about resources conservation after the “Dust Bowl” of the 1930s. After evolving through several iterations, the NRI was formally mandated in the 1972 Rural Development Act and its current design began in 1982. In 2000, it converted from a 5-year collection to an annual design. Throughout that period its scope expanded from a heavy focus on cropland erosion to a much wider assessment of resources described herein. A detailed account of the history of the NRI can be found on the [NRI Website](#), specifically, the Soil and Water Conservation Society (SWCS) report, “[A History of Natural Resource Inventories Conducted by the USDA’s Soil Conservation Service and Natural Resources Conservation Service](#)” compiled by Max Schnepf in 2008 and updated by NRCS’ Dr. Patrick Flanagan in 2016.

1.3.2 The Baseline NRI

As of FY 2017, the NRI program houses a database of surface-level information about the non-Federal natural resources of the US and provides the infrastructure and overall process to collect updated information about those resources. The information consists of characteristics of land, that which covers it, including water, and how it is used. The database is a longitudinal data set containing variables from 1982, 1987, 1992, 1997, and annually from 2000 through 2017. The variables consist of raw collected data, data derived from the raw data, estimates, and administrative data for a two-stage sample of geographic areas, called segments, and sample points on the ground within those segments. At this point, the NRI covers the 48

conterminous States, Hawaii, Puerto Rico, and the Virgin Islands for all of the aforementioned years and Alaska for 2007.

1.3.3 On-Site and Special Studies

Several NRI recurring on-site and special studies have grown out of initiatives to collect focused data beyond what is possible using the methods used in the baseline NRI. The primary ones are related to mandated requirements to assess the effectiveness of conservation practices. As of FY 2017, the two major data collections projects of this type are the [Conservation Effects Assessment Project \(CEAP\) Farmer Survey](#) and the NRI Grazing Lands On-Site Survey.

The CEAP Farmer Survey initially focused on a national assessment (2003 – 2006) and then more intensely on a number of regional watersheds to assess the effectiveness of farm-related conservation practices. Regional studies included Chesapeake Bay Watershed (2011), Des Moines River and Western Lake Erie Basins (2012), California Bay Delta (2013), and Lower Mississippi-St. Francis River Watershed (2014). A second national assessment was conducted in 2015 and 2016.

The Grazing Lands On-Site Survey is an annual rangeland and pastureland on-site national survey. The rangeland on-site survey has been in national production annually since 2003. Its purpose is to collect data to assess the current and changing conditions on rangeland health, native and non-native species, bare ground, inter-canopy gaps, and soil aggregate stability. The pastureland on-site survey started collecting national production data in 2013. The purpose for the pastureland on-site is similar to the rangeland on-site in that it is designed to collect data to assess the current and changing conditions on pastureland health, native and non-native species, bare ground, and inter-canopy gaps.

1.4 Confidentiality

Because the NRI survey program is based on scientific and rigorous sample survey protocols, it is of utmost importance to maintain and protect the integrity and confidentiality of the NRI data gathering sites. USDA and NRCS policy states that, the NRI program will be conducted so as to “Maintain confidentiality of and administer access to information and materials pertaining to locations of data collection sites, with site locations identified by coordinate systems, depicted on maps or photographs, described by direct observation of local conditions, and other materials assembled for inventories not constituting public information and to be used and managed only for official inventory purposes or for such purpose approved by the Secretary of Agriculture.” All NRI leaders and data gatherers are required to sign *confidentiality agreements*, which define levels of access to program-sensitive information for staff involved in NRI data collection. NRI data that identify owners, operators, or data collection sites are not to be released outside of USDA. The confidentiality laws governing the entire NRI program are contained in 7 U.S.C. 2276, as amended specifically for the NRI by the Farm Security and Rural Investment Act of 2002, Section 2004(b).

1.5 Goals and Objectives

The primary goal of the NRI will be to comply with the initial mandate from the Rural Development Act of 1972 that directed the Secretary of Agriculture “to carry out a land inventory and monitoring program to include, but not be limited to, studies and surveys of erosion and sediment damages, flood plain identification and utilization, land use changes and trends, and degradation of the environment resulting from improper use of soil, water, and related resource conditions.”

The NRI, as otherwise carried out, is a scientific statistical survey designed to help gauge natural resource status, condition, and trends on the Nation’s non-Federal lands. The NRI is conducted for the USDA-NRCS in cooperation with Iowa State University’s Center for Survey Statistics and Methodology. The NRI is carried out under the authority of the aforementioned Rural Development Act of 1972, as well as the Soil and Water Resources Conservation Act of 1977, the Federal Agriculture Improvement and Reform Act of 1996, and the Farm Security and Rural Investment Act of 2002.

The primary objective of the NRI is to provide natural resource managers, policy makers, and the public with scientifically valid, timely, and relevant information on natural resources and the environment. The NRI is unique because of its established linkages to NRCS soil survey data. Information about specific properties and characteristics of the soil and surrounding landscapes is utilized to develop NRI data elements and interpretations.

NRCS operates the NRI program on the basis of rigorous, scientifically developed sample survey (statistical) principles and protocols. To that end, the NRI –

- utilizes the independent, objective expertise of internationally recognized experts in survey statistics via a cooperative agreement with the Center for Survey Statistics and Methodology (Iowa State University).
- utilizes probability sampling techniques to ensure that inventory results are scientifically credible.
- follows strict quality assurance protocols.
- protects the integrity and confidentiality of the data collection.
- provides databases and statistical summaries that allow data users to make statistically valid analyses and inferences.

An additional consideration is the support of climate change measurement and, more specifically, the USDA Greenhouse Gas Inventory. That inventory is particularly focused on land cover/use change and the use of NRI points as a statistical framework for the inventory.

Chapter 2 –The NRI Sample Design and Selection

2.1 Target Universe

The NRI target universe is the land area of the US and its territories, where land area includes land covered by anything including water. The exception is coastal territorial water. Portions of water along the coast are included in the target universe, but only to the extent that they have the potential to change to land area or become part of the estuarine system. Many large bays are included that are primarily interior to the coastline, e.g., Chesapeake, Delaware, San Francisco, and Mobile bays. Most gulfs are not included, e.g., Gulf of Maine. Islands off of the coast are included, but the water areas surrounding them are not. The Great Lakes and Saint Lawrence Seaway are treated the same way as the oceans. Since this a longitudinal data set, the Universe is the above over time from 1982 to the present at specific time intervals: 1982, 1987, 1992, 1997, and yearly 2000 – 2017.

2.2 NRI Foundation Sample

The Foundation NRI sample is a two-stage stratified area sample of all States, Puerto Rico, and the Virgin Islands. The primary sampling units (PSUs) are areas of land called “segments.” The segments in the sample were selected from a collection of grids covering all land and water area in the target universe. Within the sample segments, points were selected in the geographically balanced random process described below. For most segments, three points are selected, but that varies to some degree dependent on the segment size. The foundation sample for 1997 contained about 300,000 segments and 800,000 points. The samples each year from 2000 to 2017 are core and rotation subsamples of about 72,000 segments selected from the 1997 “foundation” sample. The annual sampling process is further described below.

2.3 Selection of Sample Primary Sampling Units (PSUs)

The NRI evolved into a longitudinal data collection going back to the same sources of data over and over to get both cross-sectional data for each release and have the ability to compare the data over time to assess change at local levels. The sources of data for the 2017 NRI were almost entirely selected for the 1982 NRI, so the sampling details below reflects sample selection in 1982.

2.3.1 The Sampling Frame

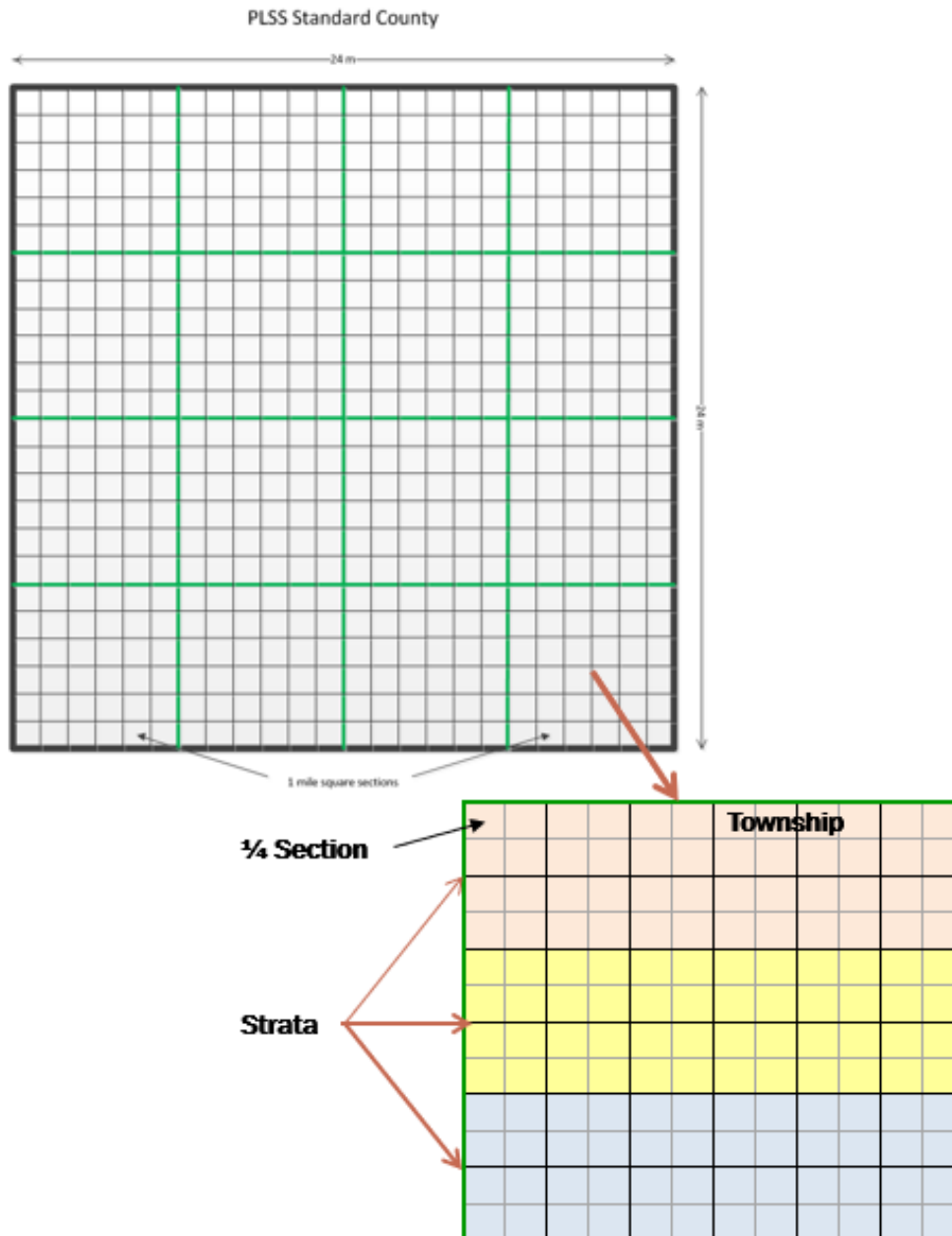
The surveys from which the NRI data is collected are entirely area frames with a two-stage selection, intending that data collection take place at each stage level. The first stage is a selection of primary sampling units (also called segments), which are subsets of each of the 3,100+ counties in the 48 contiguous states, Hawaii, Puerto Rico, and the Virgin Islands. To construct the first stage frame, each county is first divided up into non-overlapping portions ranging in size from 40 to 640 acres.

2.3.2 Defining the Primary Sample Units (PSUs) and PSU Strata

2.3.2.1 Standard County

For those parts of the country defined by the Public Land Survey System (PLSS) and for a standard county that is square and 24 miles on each side, the county would be divided into 16 square townships, each 6 miles on a side. Each township is then divided into 36 sections, each

one mile on a side. The sections are numbered from 1 to 36 starting in the Northeast corner and proceeding back and forth horizontally in a serpentine manner. For sampling, 3 strata of 12 sections are then formed in each township, with the two top rows being one stratum, the second two rows as the second stratum and the last two rows as the third stratum. Each of the sections is then divided into four PSUs, each $\frac{1}{2}$ mile on a side. See diagrams below.



2.3.2.2 PLSS Non-Standard Counties

In irregularly shaped (non-square) PLSS counties, as many regular (6 mile by 2 mile) strata are formed and then the remaining sections or partial sections are formed into 12 section groups.

2.3.2.3 PLSS Counties with Varying PSU/Segment Sizes

Due to the heterogeneity in some irrigated land and homogeneity in forest, range, and barren land in the west, some strata were constructed with differing PSU/segment sizes of as small as 40 acres up to 640 acres, though only 3 sizes were used (40, 160, and 640) beyond some variation due to non-square county borders.

2.3.2.4 Non-PLSS Counties in Ohio & Southern States

In Ohio, Louisiana, and Arkansas, a grid pattern was superimposed on the county maps and then sampled similarly to PLSS counties.

2.3.2.5 Non-PLSS Counties in the 13 Northeastern States

The strata in the 13 northeastern states are areas of land two minutes of latitude by four minutes of longitude in size. The PSUs are rectangular areas of land 20 seconds of latitude by 30 seconds of longitude. The PSUs range in size from 96 acres in northern Maine to 113 acres in southern Virginia.

2.3.3 Original PSU Sample Selection Methods

Within each PSU stratum, PSUs (segments) were selected either using a simple random sample without replacement for strata with equal sized PSUs, or for strata with some differing in PSU size, they were sampled with probability proportional to size. Initially, a 2, 3, and 4 percent samples were selected. This was done to facilitate choices in sample reduction in some PSUs before making the final sample choices.

- In the simplistic case of a stratum with 48 equal sized PSUs, a 2 percent sample would be the selection of one PSU, while a 4 percent sample would be the selection of 2 PSUs.
- Within a township, a 3 percent sample was also selected by selecting 2 PSUs in one of the three strata, and 1 PSU from the other two.
- Other schemes were employed for non-standard counties to choose 2, 3, and 4 percent samples.
- The final sample of 300,000 PSUs for the 48 coterminous States, Hawaii, and the Caribbean territories (Puerto Rico and the Virgin Islands) was determined by a fixed budget estimate and sample choices that would minimize variance of key variables.

2.3.4 Sample Changes and Sub-Sampling over Time

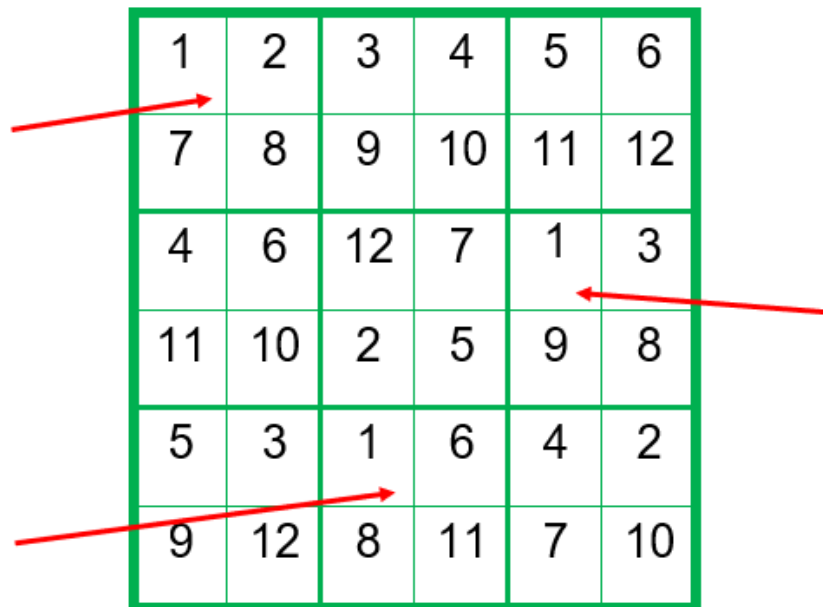
Between 1982 and 1992, the original sample of 320,000 PSUs in 1982, were reduced to 300,000 PSUs with some augmentation in selected counties where analysis showed a need for additional sample size.

2.4 Selection of Sample Points in the Sample PSUs

The last step in selecting the sample was to locate three sample points within each PSU. There were exceptions-two points were selected from 40-acre PSUs and only one point was selected per PSU in Louisiana and northwestern Maine.

The procedure for selecting the points within a PSU was as follows:

1. A grid consisting of squares formed with three rows and three columns was superimposed on the PSU. Each square was subdivided into four equal blocks. The numbers 1 to 12 were assigned to the blocks in each row with a number appearing once in each row and once in each column. No adjoining blocks had the same number.
2. Two numbers between 1 and X were selected at random, where X is the width of the side of the PSU in feet. These two numbers determine the coordinates of sample point #1 in feet north and east from the PSU's southwest corner.
3. Points #2 and #3 were located in the blocks with the same label as the block for point #1. They were positioned in the same relative position within the blocks as point #1. Steps for selection of two sample points within a PSU were similar, except the PSU was divided into 4 blocks. Instead of 36.

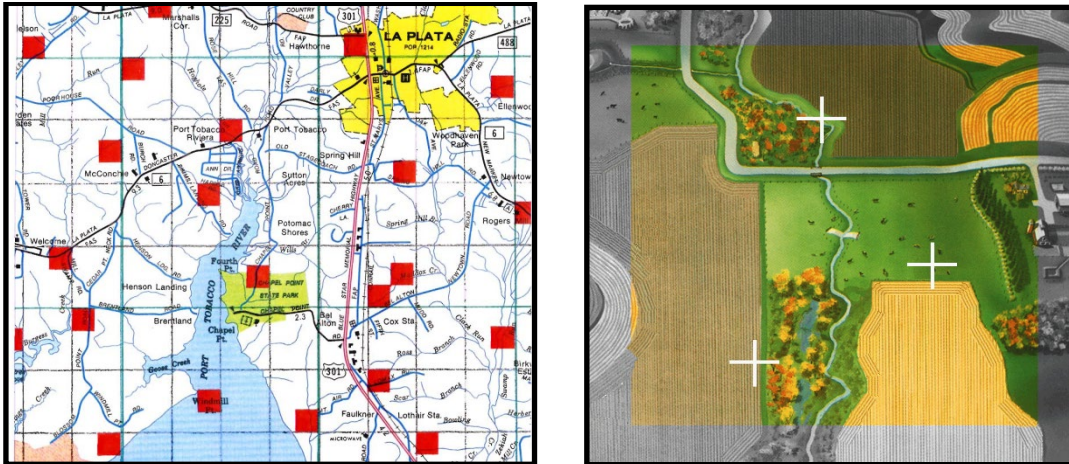


A 6x6 grid of numbers 1 through 12. The numbers are arranged in a Latin square pattern. Red arrows point to the cells containing the numbers 1, 11, and 8.

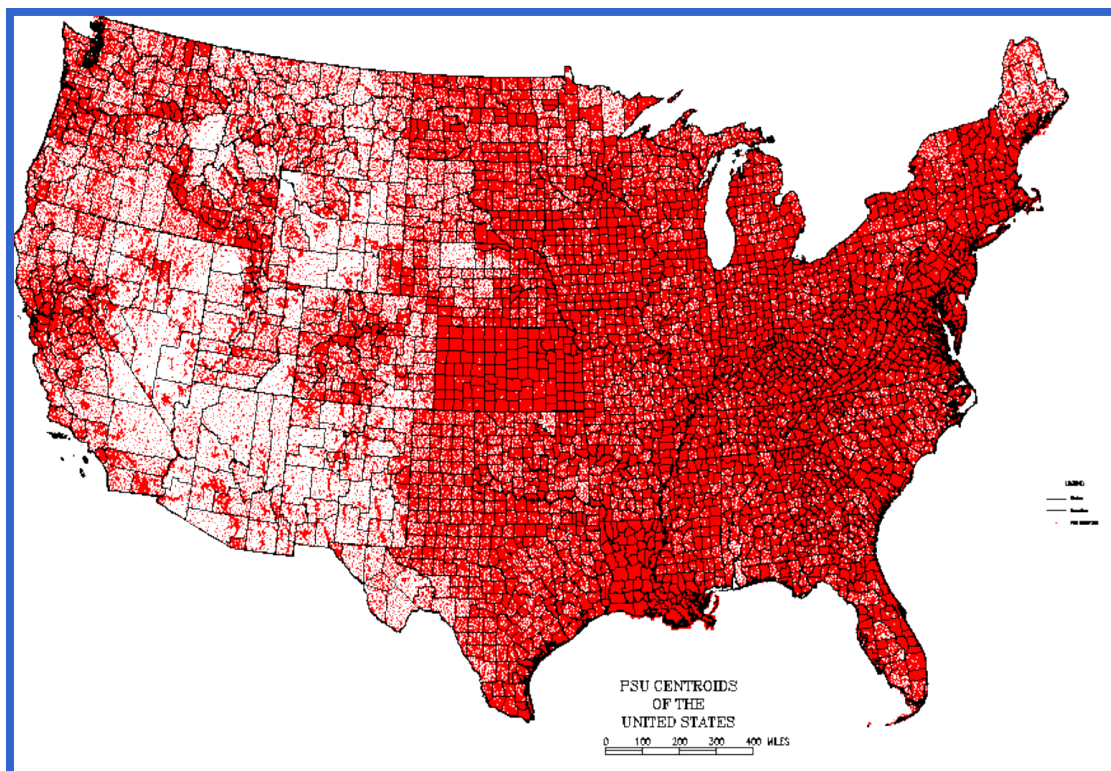
1	2	3	4	5	6
7	8	9	10	11	12
4	6	12	7	1	3
11	10	2	5	9	8
5	3	1	6	4	2
9	12	8	11	7	10

2.5 Sample Results

The resulting PSU selection is a random area sample of segments in every county across the country. The localized idea is depicted below in the first illustration. Within each segment, the points are selected in a balanced fashion resulting in points as depicted in the second illustration.



The distribution of segments throughout the country is as follows:



2.6 The 2000 and Later Annual Samples

Prior to 2000, in 1982, 1987, 1992, and 1997, the entire sample of about 300,000 segments and over 800,000 points were collected in one year. That presented a huge resource impact both in use of personnel and in the cost of the collection. In addition, such a large collection and the strain it puts on resources tends to have a negative impact on data quality. For all of those reasons, starting in 2000, the NRI Program changed to an annual sample approach. After extensive research documented in Breidt and Fuller (1999), a rotating panel design was shown to produce the best results, consisting of a fixed sample of “core” segments that are included in the collection every year, combined with a sample of “rotating” segments which rotate in and out of the annual sample over time.

The core sample of segments consists of just over 41,000 segments. To construct the core sample, segments were selected in every county using a stratified selection from the following strata:

- Wetland (contains one or more wetland point)
- CRP (contains one or more CRP points and no wetland points)
- Developed Land Change (not in above)
- Urban (Urban in segment, not in above)
- High Erosion (Not in above, but has high erosion cropland point)
- Cropland (not in above and has one or more cropland points)
- Pasture (not in above and has one or more pasture points)
- Range (not in above and has one or more range points)
- Forest (not in above and has one or more forest points)
- 100% Urban
- 100% Federal or Water
- Remainder

A similar approach is used annually to select the rotating panel of around 31,000 segments. Details of this entire process are provided in Fuller (2003).

The annual design was implemented as indicated from 2000 to 2003. After that, some variations were implemented by using some repeated rotation panels in their entirety.

Chapter 3 – Data Elements

3.1 Point Identifiers

State = Point's location state's FIPS code when the sample was selected, which is also its actual location state FIPS code for every point in the sample.

County = Point's location county's FIPS code when the sample was selected, which is not always the same as its actual location county's FIPS code for every point in the sample. In a fairly limited number of cases there has been a change in the point's county FIPS code due to name change or an alteration in the county.

Primary Sampling Unit = The 1st stage geographic area in which the point is located. It is identified by a code consisting of the format AABBB_CCDDEEF, as follows:

- The five digit FIPS state (AA) & county code (BBB) as describe above
- An underscore
- The County sample row (CC) numbered from bottom to top.
- The County sample column (DD) numbered from left to right.
- The chosen segment number (EE)
- The color of the sampling level (F) – R = Red (2%), B = Blue (2%), G = Green (3%), P = Purple (4%), and U = Umber (Special)

This scheme does not apply to Louisiana, which was sampled using a different method.

Point = The number of the point. For most segments, it is 1, 2, or 3.

Point Latitude = The latitude of the point to five decimal places.

Point Longitude = The latitude of the point to five decimal places.

FIPS Current = As discussed above, the state and county FIPS used to identify the segment has changed in some cases since the segment was sampled due to county name change or adjustments to the county (splitting, combining, boundary shifts, etc.). This variable is the FIPS identifier for the segment when the database was released.

3.2 Sample Variables

Sample 2000 – 2015 = A flag indicating whether the point's segment was in sample for the year indicated.

Killed = Most points that area “killed” and removed from the database have conflicting data collected over time and are deemed to have sufficient bias to warrant removal. Retention points (see below) that have such conflicts are kept in the database for continuity, but data collected since 1997 is replaced by the 1997 status and the point is flagged as “killed” to identify it.

Weight (xfact) = Weights are provided for each point in the database. They were calculated to account for the complex design where each point is not selected with equal probability and numerous adjustments were applied to mitigate various forms of bias. Any total or proportion estimates should be computed using these weights. Weights should probably be used in model estimates; however, the NRI technical staff should confirm that before application.

Retention = A flag identifying a retention point. A retention point is a point that has had one of the following cover/uses in 1997 or earlier: Federal, Large Water, Large Stream, Large Urban, Small Urban, Small Water, Small Stream, Farmstead, Road, or CRP, as well as any point that changes into or out of Federal, large water or large stream between 1997 and the current year. They are called retention points because they are retained in the sample even if inconsistencies would otherwise have killed the point. This is to ensure change over time is accurately reflected for segment level cover/uses.

3.3 Land Cover/Use (LCU)

Detailed Land Cover/Use (LCU) – Detailed land cover/uses (see code list in Appendix B). Code # in parenthesis.

- (0) *Federal* = Point is on land within the Federal layer, determined during estimation process.
- (1) *Horticulture/Fruit* = Point determined as cropland, hayland, or CRP in data collection and identified as a fruit orchard (vs. LCU 4, bush fruit) in local data. It includes apples, bananas, cherries, coffee, grapefruit, lemons, limes, mangos, oranges, papayas, peaches, pears, etc.
- (2) *Horticulture/Nut* = Point determined as cropland, hayland, or CRP in data collection and identified as tree nuts in local data. It includes almonds, cashews, chestnuts, hazelnuts, macadamias, pecans, walnuts, etc.
- (3) *Horticulture/Vineyard* = Point determined as cropland, hayland, or CRP in data collection and identified as a vineyard in local data. It includes grapes, kiwi, passion fruit, hops, etc.
- (4) *Horticulture/Brush Fruit* = Point determined as cropland, hayland, or CRP in data collection and identified as fruit growing on woody shrubs or bushes in local data. It includes blueberries, blackberries, guava, raspberries, etc.
- (5) *Horticulture/Berries* = Point determined as cropland, hayland, or CRP in data collection and identified as a berry grown in bogs or non-woody shrubs in local data. It includes cranberries and strawberries.
- (6) *Horticulture/Other* = Point determined as cropland, hayland, or CRP in data collection and identified as horticultural misc. like commercial flower operations in local data.
- (11) *Row crop/Corn* = Point determined as cropland, hayland, or CRP in data collection and identified as corn in local data. It includes corn for silage, decorative corn, field corn, grain corn, popcorn, seed corn, and sweet corn.
- (12) *Row crop/Sorghum* = Point determined as cropland, hayland, or CRP in data collection and identified as Sorghum in local data.
- (13) *Row crop/Soybeans* = Point determined as cropland, hayland, or CRP in data collection and identified as Soybeans in local data.
- (14) *Row crop/Cotton* = Point determined as cropland, hayland, or CRP in data collection and identified as Cotton in local data.
- (15) *Row crop/Peanuts* = Point determined as cropland, hayland, or CRP in data collection and identified as Peanuts in local data.

- (16) *Row crop/Tobacco* = Point determined as cropland, hayland, or CRP in data collection and identified as Tobacco in local data.
- (17) *Row crop/Sugar Beets* = Point determined as cropland, hayland, or CRP in data collection and identified as Sugar beets in local data.
- (18) *Row crop/Potatoes* = Point determined as cropland, hayland, or CRP in data collection and identified as Potatoes in local data.
- (19) *Row crop/Other vegetable/truck crops* = Point determined as cropland, hayland, or CRP in data collection and identified as other vegetables or truck crops in local data. It includes artichokes, arugula, asparagus, beans (other than soybeans), broccoli, Brussels sprouts, cabbage, celery, cucumber, kale, melons, peas, pumpkins, radishes, romaine, spinach, tomatoes, yams, zucchini, etc.
- (20) *Row crop/All other row crops* = Point determined as cropland, hayland, or CRP in data collection and identified as other row crops in local data. It includes ginger root, pineapple, safflower, sugar cane, taro, etc.
- (21) *Row crop/Sunflower* = Point determined as cropland, hayland, or CRP in data collection and identified as Sunflowers in local data.
- (111) *Close grown/Wheat* = Point determined as cropland, hayland, or CRP in data collection and identified as Wheat in local data.
- (112) *Close grown/Oats* = Point determined as cropland, hayland, or CRP in data collection and identified as Oats in local data.
- (113) *Close grown/Rice* = Point determined as cropland, hayland, or CRP in data collection and identified as Rice in local data.
- (114) *Close grown/Barley* = Point determined as cropland, hayland, or CRP in data collection and identified as Barley in local data.
- (116) *Close grown/All other close grown* = Point determined as cropland, hayland, or CRP in data collection and identified as other close grown in local data. It includes alfalfa, canola, dill, flax, seed grass, herbs, mint, mustard, rye, sod, watercress, etc.
- (140) *Hay* = Point determined as cropland, hayland, or CRP in data collection and identified as Hay in local data.
- (170) *Other crop/Summer fallow* = Point determined as cropland, hayland, or CRP in data collection and identified as Summer fallow in local data.
- (171) *Other crop/Aquaculture* = Point determined as cropland, hayland, or CRP in data collection and identified as Aquaculture in a crop rotation in local data.
- (180) *Other crop/Other-setaside etc.* = Point determined as cropland, hayland, or CRP in data collection and identified as Other cropland not planted in local data.
- (210) *Pasture* = The area the point is in does not meet the canopy cover criteria for forest; does meet the criteria for scrub shrub (30% non-tree woody plant canopy); or does meet the criteria for grassland (not scrub shrub and 50% grass coverage); and is not defined as rangeland by management and climate.
- (250) *Rangeland* = The area the point is in does not meet the canopy cover criteria for forest; does meet the criteria for scrub shrub (30% non-tree woody plant canopy) or

does meet the criteria for grassland (not scrub shrub and 50% grass coverage); and is defined as rangeland by management and climate.

- (341) *Forestland/Grazed* = The area the point is in meets the canopy cover criteria (25%) for forest, is larger than one acre, and wider than 100 feet at some portion. In addition, the area shows evidence of grazing.
- (342) *Forestland/Not grazed* = The area the point is in meets the canopy cover criteria (25%) for forest, is larger than one acre, and wider than 100 feet at some portion. In addition, the area does not show evidence of grazing.
- (401) *Other farmland/Other land* = The point is located in an area clearly associated with farmland, such as on an agricultural related structure, other farmstead, on a nursery, an area of agroforestry (e.g., Christmas trees, plantations), feedlots, etc.
- (410) *Other farmland/General CRP* = Point determined as cropland, hayland, or CRP in data collection and identified as General CRP in local data.
- (611) Barren/Salt flats = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of flats in closed basins in arid regions, provided it is at least one acre in size and 100 feet wide.
- (612) Barren/Bare exposed rock = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of rock cover, provided it is at least one acre in size and 100 feet wide.
- (613) Barren/Strip mines etc. = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of a current or former strip mine operation, provided it is at least one acre in size and 100 feet wide.
- (614) Barren/Beaches = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of area adjacent to the shore of an ocean, sea, large river, or lake, provided it is at least one acre in size.
- (615) Barren/Sand dunes = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of an area with an accumulation of loose sand, provided it is at least one acre in size and 100 feet wide.
- (616) Barren/Mixed barren lands = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of some combination of the other barren land categories, provided it is at least one acre.
- (617) Barren/Mud flats = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of flats made from exposed layers of bay mud, resulting from deposition of estuarian silts, clays, and marine animal detritus (remains) , provided it is at least one acre in size and 100 feet wide.
- (618) Barren/River wash = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of deposits of clay, silt, sand, and gravel left by flowing streams, provided it is at least one acre in size.
- (619) Barren/Oil wasteland = Land with less than 5 percent vegetative cover and at least an acre in size, consisting of oil-stained land, provided it is at least one acre in size and 100 feet wide.

- (620) Barren/Other barren land = Land with less than 5 percent vegetative cover and at least an acre in size, does not meet one of the other barren land categories, and is at least one acre in size and 100 feet wide.
- (630) Other rural/Permanent snow-ice = Land that has at least a 25 percent year-long cover of snow and/or ice as determined by the current image and by historical imagery or the National Hydrography Dataset (NHD).
- (640) Other rural/Marshland = Land in a non-forested area, not classified as rangeland or pastureland, and partially or intermittently covered with water characterized by monocotyledons, like sedges and rushes.
- (650) All other land = Land that does not meet the criteria of any other classification.
- (700) Urban/10 acres or larger = Point is located in a “eligible area” 10 acres or larger or is a residence in a residential polygon 10 acres or larger.
- (730) Urban/Small built-up = Point is located in a “eligible area” less than 10 acres or is a residence in a residential polygon less than 10 acres.
- (800) Rural transportation = Point is on a transportation polygon that is not within an urban polygon.
- (900) Water body <= 40 acres = Point is within a water body less than or equal to 40 acres.
- (910) Streams <= 660 feet wide = Point is in a stream less than or equal to 660 feet
- (920) Census water = Point is located in a waterbody that is greater than or equal to 40 acres.

Broad LCU = This is a collapsed set of land cover uses created from the more detailed LCU variable into the following 12 mutually exclusive categories:

- *Cultivated Cropland* = Land with row, close-grown crops, or other crop (LCU codes 11 – 116 & 170 - 180), horticulture crops (LCU codes 1 – 6) that are double cropped with row or close-grown crops, hayland (LCU code 140) with a cropping history (3 year including current) with row or close-grown crops, or pasture (LCU code 210) with a cropping history (3 year including current) of row or close-grown crops.
- *Noncultivated cropland* = Land with horticulture (LCU codes 1 - 6) that is not double cropped with row or close-grown crops, or hayland (LCU code 140) that does not have a cropping history (3 year including current) with row or close-grown crops.
- Pastureland = Pastureland (LCU code 210) that does not have a cropping history (3 year including current) with row or close-grown crops.
- Rangeland = Rangeland (LCU code 250).
- Forest land = Forest land (LCU codes 341 and 342).
- Minor land = Other farmland/Other land (LCU code 401), Barren land (LCU codes 611 – 620), Other rural (LCU codes 630 & 640), and All other land (LCU code 650).
- Urban and built-up land = Urban/10 acres or larger (LCU code 700) and Urban/Small built-up (LCU code 730).
- Rural transportation = Rural Transportation (LCU code 800).
- Small water areas = Water body <= 40 acres (LCU code 900) and Streams <= 660 feet wide (LCU code 910).

- Large water areas = Census Water (LCU code 920).
- Federal land = Federal land (LCU code 0)
- General Conservation Reserve Program (CRP) = Other farmland/General CRP (LCU code 410)

3.4 Soils Related Data

Soil Name = Soil series name, as defined in the Soil Survey Manual, [Soil Survey Manual | Natural Resources Conservation Service \(usda.gov\)](https://www.nrcs.usda.gov/soil-survey-manual/).

Texture = The soil texture and texture modifiers. A list of entries is located in Appendix C.

Slope Low = The minimum value for the range of slope for the soil.

Slope High = The maximum value for the range of slope for the soil.

Flood Frequency = Soil Flooding Class (NONE, VRARE, RARE, OCCAS, FREQ, VFREQ)

Local Phase = Phase terms added to map unit component names convey important information about a map unit and differentiate it from other map units on the map unit legend. A property of a taxon that has too wide a range for the interpretations needed or some feature outside the soil itself that is significant for use are a basis for phasing map units. Phases commonly include only part of the range of features exhibited by a taxon within a soil map unit. Soil phases can be based on attributes, such as frost hazard, character of the deeper substratum, or physiographic position, that are not characteristics used to identify taxa but nevertheless affect use and management. Common phases are slope, surface texture, flooding and ponding, surface fragments, degree of erosion, and climate (see table 4-3 in the "Naming Map Units" section). Overlying water depth is used as a phase term for some subaqueous soils. Phases such as "filled," "graded," or "landscaped" are used for some map units consisting of soils that formed in human-altered or human-transported material.

Soil Survey Area ID (ssaid) = The identifier for the soil survey area in which the point is located. It consists of the two letter state abbreviation followed by a three digit designator.

Map Unit Symbol = Within a soil survey area, there are a number of map units delineating the various soils and slopes. Each has a symbol consisting of a four digit number.

Land Capability Class Variables = The land capability class and subclass are provided as one 2-character entry for each collection year, where:

- the first character is the soil suitability rating for agriculture, between 1 and 8.
 - class 1 soil has few restrictions that limit its use.
 - Class 2 soil has some limitations for cultivation.
 - Class 3 soil has severe limitations for cultivation.
 - Class 4 soil has very severe limitations for cultivation.
 - Class 5 soil unsuited to cultivation, although pastures can be improved and benefits from proper management can be expected.
 - Class 6 soil unsuited to cultivation, although some may be used provided unusual intensive management is applied.

- Class 7 soil unsuited to cultivation and their use is limited largely to grazing, woodland, or wildlife.
- Class 8 soil has limitations that nearly preclude its use for commercial production.
- the second character is the chief limitation of the soil.
 - Blank = Not applicable
 - E = Erosion
 - W = Water
 - S = Shallow, drought, or stony
 - C = Climate

Prime Farmland = A flag identifying whether the point is on land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. In the NRI, it was determined as of 1997 and has been updated during every data collection as follows:

- If it was set to true, it would be changed to false if:
 - The land cover use is now set to greater than 410, or
 - The land capability class is now set to greater than 4, or land that was formerly irrigated becomes not irrigated for more than two consecutive years.
- If it was set to false, it would be changed to true if the land capability class = 1.

3.4.1 Erosion Variables

T Factor (tfact) = The maximum rate of annual soil loss that will permit crop productivity to be sustained economically and indefinitely on a given soil. It is imported from the most recent soil survey database.

Erodibility Index (eiYY) = Maximum of the wind and water erodibility indices.

Erodibility Index – Water (eiwatrYY) = Water Erosion Loss Rate divided by the (T Factor*C Factor*P Factor), or zero if (T Factor*C Factor*P Factor) = 0.

Erodibility Index – Wind (eiwindYY) = Wind Erosion Loss Rate divided by the T Factor.

Slope Length (splenYY) = The distance from the point of origin of overland flow to the point where either the slope gradient decreases enough that deposition begins, or the runoff water enters a well-defined channel that may be part of a drainage network or a constructed channel. For the NRI, length of slope is taken through the *sample point*.

Slope Percent (slopeYYYY) = The vertical distance divided by the horizontal distance, multiplied by 100.

Soil Loss Estimate (soillossYYYY) = Soil loss due to water erosion calculated using the Universal Soil Loss Equation (USLE) prior to 2006. Thereafter it is based on the Revised USLE2 model. These are only calculated on cropland, pastureland, and land in the General Conservation Reserve Program.

3.4.1.1 Universal Soil Loss Equation (USLE) Variables

USLE C Factor (CfactYYYY) = The cover and management factor is between 0 and 1 and is based on the ratio of soil loss from an area with the specific cover and management to that from an identical area in tilled continuous fallow. Prior to the shift from USLE to RUSLE2 in 2007, the C Factor was collected as part of the local data collection. After the change to RUSLE2, it is modeled from the RUSLE2 output.

USLE P Factor (PfactYYYY) = The practice factor is a figure from 0 to 1 and is based on the ratio of soil loss from with a support practice like contouring, stripcropping, or terracing, to soil loss with straight-row farming up and down the slope. Prior to the shift from USLE to RUSLE2 in 2007, the P Factor was collected as part of the local data collection. After the change to RUSLE2, it is modeled from the RUSLE2 output.

USLE R Factor (Rfact) = The rainfall and runoff factor is a quantification of the erosivity effect of rainfall based on location.

USLE K Factor (Kwfact) = An erodibility factor which quantifies the susceptibility of soil particles to detachment and movement by water. This factor is used in the *universal soil loss equation* (USLE) to calculate soil loss by water. This factor comes from the Soil Survey for the point.

USLE Modifier Flag (USLEFlag) = Modified version of USLE applied (0 = None, not applicable; 1 = Modified LS, for frozen ground; 1 = Version for R-1 and R-2 areas).

3.4.1.2 Wind Erosion Equation Variables

WEQ Loss Estimates (WEQLossYYYY) = Soil loss due to water erosion calculated using the Wind Erosion Equation (WEQ). The WEQ is an erosion model designed to predict long-term average annual soil losses from a field having specific characteristics, using the equation $E = f(IKCLV)$, where each of those factors are described below and $f()$ denotes a complex non-linear combination of those inputs.

WEQ C Factor (WCFact) = Characterizes climatic erosivity, specifically wind speed and surface soil moisture. The factor for any given locality is expressed as a percentage of the C factor for Garden City, Kansas, which has a value of 100.

WEQ I Factor (IFact) = The potential soil loss, in tons per acre per year, from a wide, level, unsheltered, isolated field with a bare, smooth, loose, and non-crustured surface, under climatic conditions like those in the vicinity of Garden City, Kansas. Source: Soil Survey.

WEQ K Factor (WKFactYYYY) = A measure of the effect of ridges made by tillage and planting implements. It is expressed as a decimal from 0.5 to 1.0. Ridges, especially those at right angles to the prevailing wind direction, absorb and deflect wind energy and trap moving soil particles.

WEQ L Factor (WLFactYYYY) = The unsheltered distance along the prevailing wind erosion direction across the field or area to be evaluated. For the NRI, the unsheltered distance is

expressed in feet, measured through the *sample point*, parallel to the prevailing wind direction during the critical wind erosion period.

WEQ V Factor (WVFactYYYY) = The effect of vegetative cover in the *wind erosion equation* is expressed by relating the kind, amount, and orientation of vegetative material to its equivalent in pounds per acre of small grain residue in reference condition (small grain equivalent).

3.5 Cropland Data

General Conservation Reserve Program (CRP) Flags (CRPYYYY) = Point falls under a General CRP contract in year YYYY, yes or no. Years covered are 1992, 1997, 2000 – Present.

General CRP Signup Number (CRPNumYYYY) = General CRP signup number 1 – 49, Years covered are 1992, 1997, 2000 – Present.

General CRP Cover Practice (CRPCovYYYY) = General CRP contracted cover practice for YYYY. Years covered are 1992, 1997, 2000 – Present.

- “.” = Not applicable
- 1 = Grasses and legumes
- 2 = Trees
- 3 = Wildlife and components
- 4 = Shallow water cover
- 5 = Native grasses

Double Cropped Flags (DblCropYYYY) = Double cropped for year YYYY., yes or no.

Second Crop Variables (ScdCropYYYY) =

- “.” Not applicable
- (0) Not Double Cropped
- (1) *Horticulture/Fruit* = Point determined as cropland, hayland, or CRP in data collection and identified as a fruit orchard (vs. LCU 4, bush fruit) in local data. It includes apples, bananas, cherries, coffee, grapefruit, lemons, limes, mangos, oranges, papayas, peaches, pears, etc.
- (2) *Horticulture/Nut* = Point determined as cropland, hayland, or CRP in data collection and identified as tree nuts in local data. It includes almonds, cashews, chestnuts, hazelnuts, macadamias, pecans, walnuts, etc.
- (3) *Horticulture/Vineyard* = Point determined as cropland, hayland, or CRP in data collection and identified as a vineyard in local data. It includes grapes, kiwi, passion fruit, hops, etc.
- (4) *Horticulture/Brush Fruit* = Point determined as cropland, hayland, or CRP in data collection and identified as fruit growing on woody shrubs or bushes in local data. It includes blueberries, blackberries, guava, raspberries, etc.
- (5) *Horticulture/Berries* = Point determined as cropland, hayland, or CRP in data collection and identified as a berry grown in bogs or non-woody shrubs in local data. It includes cranberries and strawberries.

- (6) *Horticulture/Other* = Point determined as cropland, hayland, or CRP in data collection and identified as horticultural misc. like commercial flower operations in local data.
- (11) *Row crop/Corn* = Point determined as cropland, hayland, or CRP in data collection and identified as corn in local data. It includes corn for silage, decorative corn, field corn, grain corn, popcorn, seed corn, and sweet corn.
- (12) *Row crop/Sorghum* = Point determined as cropland, hayland, or CRP in data collection and identified as Sorghum in local data.
- (13) *Row crop/Soybeans* = Point determined as cropland, hayland, or CRP in data collection and identified as Soybeans in local data.
- (14) *Row crop/Cotton* = Point determined as cropland, hayland, or CRP in data collection and identified as Cotton in local data.
- (15) *Row crop/Peanuts* = Point determined as cropland, hayland, or CRP in data collection and identified as Peanuts in local data.
- (16) *Row crop/Tobacco* = Point determined as cropland, hayland, or CRP in data collection and identified as Tobacco in local data.
- (17) *Row crop/Sugar Beets* = Point determined as cropland, hayland, or CRP in data collection and identified as Sugar beets in local data.
- (18) *Row crop/Potatoes* = Point determined as cropland, hayland, or CRP in data collection and identified as Potatoes in local data.
- (19) *Row crop/Other vegetable/truck crops* = Point determined as cropland, hayland, or CRP in data collection and identified as other vegetables or truck crops in local data. It includes artichokes, arugula, asparagus, beans (other than soybeans), broccoli, Brussels sprouts, cabbage, celery, cucumber, kale, melons, peas, pumpkins, radishes, romaine, spinach, tomatoes, yams, zucchini, etc.
- (20) *Row crop/All other row crops* = Point determined as cropland, hayland, or CRP in data collection and identified as other row crops in local data. It includes ginger root, pineapple, safflower, sugar cane, taro, etc.
- (21) *Row crop/Sunflower* = Point determined as cropland, hayland, or CRP in data collection and identified as Sunflowers in local data.
- (111) *Close grown/Wheat* = Point determined as cropland, hayland, or CRP in data collection and identified as Wheat in local data.
- (112) *Close grown/Oats* = Point determined as cropland, hayland, or CRP in data collection and identified as Oats in local data.
- (113) *Close grown/Rice* = Point determined as cropland, hayland, or CRP in data collection and identified as Rice in local data.
- (114) *Close grown/Barley* = Point determined as cropland, hayland, or CRP in data collection and identified as Barley in local data.
- (116) *Close grown/All other close grown* = Point determined as cropland, hayland, or CRP in data collection and identified as other close grown in local data. It includes alfalfa, canola, dill, flax, seed grass, herbs, mint, mustard, rye, sod, watercress, etc.

Irrigation Flags = Irrigation is not a separate variable, but is identified as a choice under irrigation type flag by year.

Irrigation Delivery System Variables (IrrSysYYYY) = Irrigation delivery system to filed in YYYY.

- “.” = Not applicable
- 1 = Canal or ditch
- 2 = Pipeline

Irrigation Source Variables (IrrSrcYYYY) = Irrigation Source for year YYYY.

- “.” Not applicable
- 1 = Well
- 2 = Pond, lake, or reservoir
- 3 = Stream, ditch, or canal
- 4 = Lagoon, or waste (not tailwater)
- 5 = Combination
- 6 = Ground
- 7 = Surface

Irrigation Type Variables (IrrTypeYYYY) = Irrigation and irrigation type for year YYYY.

- “.” = Not applicable
- 0 = Not irrigated
- 1 Gravity irrigated
- 2 = Pressure irrigated
- 3 = Gravity & pressure irrigated

3.6 Wetland Data

Cowardin Codes (CowYYYY) = Classification codes for wetlands in accordance with the Cowardin classification system (Cowardin, et. Al. 1979) using the codes below for each collection year that include a reference to the vegetation.

- 0 = Not a wetland system
- 10 = Marine – None or other
- 20 = Estuarine – None or other
- 21 = Estuarine – Emergent
- 22 = Estuarine – Scrub-shrub
- 23 = Estuarine – Forested
- 30 = Riverine – None or other
- 31 = Riverine – Emergent
- 40 = Lacustrine – None or other
- 41 = Lacustrine – Emergent
- 50 = Palustrine – None or other
- 51 = Palustrine – Emergent
- 52 = Palustrine – Scrub-shrub
- 53 = Palustrine – Forested
- 99 = Federal

Broad Cowardin Codes (NewCowYYYY) = Classification codes for wetlands in accordance with the Cowardin classification system (Cowardin, et. Al. 1979) using the codes below for each collection year.

- 0 = Not a wetland

- 1 = Palustrine
- 2 = Estuarine wetland'
- 3 = Estuarine deepwater habitat
- 4 = Riverine
- 5 = Lacustrine
- 6 = Marine
- 9 = Federal

Wetland/Deepwater Codes (WLDYYYY) = Classifying the distinction between wetland and deepwater habitat by year.

- 0 = Not a wetland or deepwater
- 1 = Wetland
- 2 = Deepwater habitat
- 3 = Federal

Aquatic Codes (AquaYYYY) = Classifying aquatic habitat between estuarine/palustrine wetland and other forms of aquatic habitat by year.

- 0 = Not an aquatic habitat
- 1 = Palustrine or estuarine wetlands
- 2 = Other aquatic habitat
- 9 = Federal

Wetland Size Variables (WLSIZEYYYY) = Size of the contiguous are of wetland perimeter for years 1997 and 2000 – present.

- 1 = Less than or equal to 1 acre
- 2 = Greater than 1 and less than or equal to 5 acres
- 3 = Greater than 5 and less that or equal to 20 acres
- 4 = Greater than 20 acres

Wetland Loss Codes (NewWLGLossYYYY) = Cause for loss of wetland for the years 1997 and 2000 – present.

- 0 = Not applicable (not a wetland loss)
- 1 = Loss due to agriculture (cropland, pastureland, CRP land, farmsteads, or other farmland)
- 2 = Loss due to silvaculture (forestland)
- 3 = Loss due to development (urban and built-up or rural transportation)
- 4 = Loss due to miscellaneous causes (rangeland, barren land, or other rural land)
- 5 = Conversion to other aquatic habitat
- 6 = Conversion to federal ownership

Wetland Change Codes (WetChangeYY_ZZ) = Reason for Gain/Loss of Wetlands between annual collections starting in 2000.

- "." = Not applicable
- 1001 = Gain due to Agriculture
- 1002 = Gain due to development
- 1003 = Gain due to other reasons
- 1004 = Gain due to Federal Ownership change
- 2001 = Loss due to agriculture

- 2002 = Loss due to Development
- 2003 = Loss due to Other reasons
- 2004 = Loss due to Federal ownership change

Tidal (TidalYYYY) = Tidal classification by year starting in 1997 and continuing from 2000 to the present.

- “.” = Not applicable
- 1 = Intertidal (intermittently exposed)
- 2 = Subtidal (permanently submerged)

Low Water (LowWaterYYYY) = Low water depth at the point for years 1997 and 2000 – present.

- “.” = Not applicable
- 1 = Less than 2 meters (6.6 ft.)
- 2 = Greater than 2 meters

Wetland Canopy Cover (WCanopyYYYY) = Canopy cover of nonpersistent emergent plants starting in 1997 and continuing from 2000 – present.

- “.” = Not applicable
- 1 = Less than 30%
- 2 = Greater than 30%

3.7 Conservation Variables

Conservation Practice Flags (CPract##YYYY) = Conservation practices affecting the point on cropland, pastureland, and CRP for the years 1997, and 2000 – present, with the numbers ## as listed below. The years each has been collected are indicated if not all of the years above. The NRCS conservation practice code is given in parenthesis for each.

- 00 = Alley cropping (311), for 2000 – present
- 01 = Bedding (310), for 2000 – present
- 02 = Contour buffer strips (332), for 2000 - present
- 03 = Contour Farming (330)
- 04 = Contour Orchard/Other Fruit Area (331)
- 07 = Cross Wind Trap Strips (589C)
- 08 = Diversion (362)
- 10 = Field Border (386)
- 11 = Filter Strip (393)
- 12 = Grassed Waterway (412)
- 13 = Hedgerow planting (422) for 2000 - present
- 14 = Herbaceous Wind Barriers (603)
- 15 = Hillside Ditch (423)
- 16 = Irrigation System, Tailwater Recovery (447)
- 17 = Lined Waterway or Outlet (468)
- 18 = Riparian forest buffer (391), for 2000 - present
- 19 = Stripcropping (585)
- 21 = Surface Drainage, Field Ditch (607)
- 22 = Terrace (600)
- 23 = Tree/shrub establishment (612), for 2000 - present
- 24 = Water and Sediment Control Basin (638)

- 25 = Windbreak/Shelterbelt Established (380)

3.8 Resource Concerns

Resource Concerns Flags (Concern##YYYY) = A resource concern is an identified conservation problem used to set quality criteria and treatment needs for a resource management system. The ones collected for the NRI are divided into general resource categories of Soil, Water, and Plants. The resource concerns noted for each point are flagged for years 2000 – present, with the numbers ## as listed below. Each concern is further defined by the [NRCS National Resource Concern List and Planning Criteria](#).

- 00 = Soil - Sheet and rill erosion
- 01 = Soil - Wind
- 02 = Soil - Concentrated flow
- 03 = Soil – Classic gullies
- 04 = Soil – Streambank
- 05 = Soil – Irrigation induced
- 06 = Soil – Contaminants, chemical
- 07 = Soil – Onsite damage
- 08 = Water – Seeps
- 09 = Water – Ponding/flooding
- 10 = Water – Excess subsurface water
- 11 = Water – Inadequate outlets
- 12 – Water – Water management
- 13 = Water – Restricted capacity, lakes/streams
- 14 = Water – Surface contaminants, nutrients/organics
- 15 = Water – Contaminants, turbidity
- 16 = Water – Surface contaminants, salinity
- 17 = Plants – Adapted to site
- 18 = Plants – Health and vigor
- 19 = Plants – Plant damage by wind

3.9 Miscellaneous

Forest Group Type Variables (ForestYYYY) = A classification of forest land based on the species presently forming a plurality of the live tree stocking. The classifications are listed below.

- “.” = Not forest land
- 01 = White, Red Jack Pine
- 02 = Spruce, Fir
- 03 = Slash Pine
- 04 = Shortleaf pine
- 05 = Oak, Pine
- 06 = Oak, Hickory
- 07 = Oak, Gum, Cypress
- 08 = Elm, Ash, Cottonwood

- 09 = Maple, Beech, Birch
- 10 = Aspen, Birch
- 11 = Douglas Fir
- 12 = Hemlock, Sitka Spruce
- 13 = Ponderosa Pine
- 14 = Western White Pine
- 15 = Lodgepole Pine
- 16 = Larch
- 17 = Fir, Spruce
- 18 = Redwood
- 19 = Noncommercial (other softwoods)
- 20 = Western hardwoods
- 21 = Pinyon, Juniper
- 30 = Tropical hardwoods
- 90 = Non-stocked

Hydrologic Unit Code (Hydunit) = The 8 – digit subbasin as determined by the USGS, which is a hierarchical unit code consisting of two digits that define the region, two digits that define the subregion, two digits that define the basin, and two digits that define the subbasin.

Major Land Resource Area (MLRA) = In United States conservation policy, [MLRAs are geographically associated land resource units delineated by the Natural Resources Conservation Service](#) and characterized by a particular pattern that combines soils, water, climate, vegetation, land use, and type of farming. The MLRAs in the NRI database are the 1981 version. However, each point can be matched to the most recent version of MLRAs using the point location and the MLRA shape file. Since weights are not controlled to MLRA area totals, if estimates are to match to those precise totals, the weights will have to be adjusted.

Ownership Variables (OwnYYYY) = A simple ownership indicator consisting of three levels given below. More advanced current-time ownership information can be made by matching NRI by location to another source like the Protected Areas Database (PAD).

- 1 = Federal
- 5 = Non-Federal
- 7 = Water

Plantation Flags (PlantationYYYY) = A flag identifying a location as a forest plantation for the year indicated. A forest plantation is land used for the production of trees for commercial purposes where the vegetative community has been planted by human activity or is even-aged because of clear cutting.

Use of Land Flags (UseLand##YYYY) = The specific kind of activity that takes place on the land. Each use noted for each point are flagged for years 1997 and 2000 – present, with the numbers ## as listed below.

- 01 = Agricultural business (Includes granaries, farmer cooperatives, farm machinery dealers, sale barns, and other agribusinesses. Landscape and other ornamental operations, such as sod farms, nurseries, and Christmas tree farms are included.)
- 02 = Agricultural facility (Includes farmstead and ranch headquarters, livestock facilities, feedlots, confinement operations (poultry, hogs), pens, corrals, grain bins, and other buildings and structures associated with agricultural production.)

- 03 = Aquaculture (The production of fish, shell fish, and aquatic plants in a controlled environment and includes fish farming, fish hatcheries, and aquaculture in rotation with farming and crawfish farming.)
- 04 = Agricultural waste (Includes animal waste lagoons, settling ponds, poultry disposal pits, and other waste storage or treatment facilities associated with agricultural operations.)
- 05 = Biomass (Includes land reserved for production of energy-producing herbaceous or woody crops.)
- 06 = Concentrated development (Includes closely spaced urban and suburban houses, apartments, condominiums, and strip and cluster residential development in rural areas.)
- 07 = Commercial/industrial (Includes downtown areas, industrial shopping malls/centers, strip shopping/businesses, lodging facilities, resorts, marinas, manufacturing buildings or plants, warehouses, docks or port facilities, truck terminals, and tank farms.)
- 08 = Food/feed/fiber/seed (Includes production and harvest of crops for human consumption, animal feed, seed, and fiber such as cotton, jute, flax, hemp, etc., for agricultural production. Wood fiber is excluded. Cover crops grown to increase organic matter, or improve soil tilth, fallow conditions on land used for crop production, and hay are also included.)
- 09 = Hay (Includes hay fields with either annual or perennial forage species, as well as hay mechanically harvested from pastureland and rangeland.)
- 10 = Institutions (Includes churches, cemeteries, schools, hospitals, museums, civic centers, and other public service facilities.)
- 11 = Livestock grazing (Includes post-harvest gleaning of cropland fields, and grazing pastures, rangeland, woodland, and marshlands.)
- 12 = Land based recreation (Includes such facilities as golf courses, stadiums, athletic fields, parks, zoos, forts, entertainment parks, campgrounds, and racetracks. Also includes land used for fish and game lands, upland and big game hunting, backpacking, climbing, hiking, biking, and nature study.)
- 13 = Mineral extraction (Includes surface strip mines, gravel pits, borrow areas, quarries, placer mines, extraction wells, injection wells, tailings, piles, salt mines, and oil wasteland.)
- 14 = Non-agricultural waste (Includes waste collection and treatment sites and facilities, such as wastewater treatment ponds, recycling facilities, filtration facilities, nuclear and other hazardous waste sites, settling ponds, sewage treatment lagoons, and other waste handling systems not associated with agricultural operations.)
- 15 = Reserved/agriculture (Includes land in the Conservation Reserve Program (CRP), and land in other USDA set-aside programs, and long-term agricultural easement protection programs.)
- 16 = Rural estates (Includes rural residences that are 1.5 to 10 acres, are not part of an operating farm, and have no intensive agricultural enterprises. They may include small pastures for grazing and may have structures, such as garages or barns, with no special use buildings, such as poultry or hog houses or mink ranches.)
- 17 = Reserved/forestry (Includes areas in state and local forest reserve programs and similar applications.)
- 18 = Reserved/research or military (Includes research and experiment stations, military installations, and associated facilities.)
- 19 = Reserved/natural or environmental (Includes permanent vegetative or structural soil and water conservation measures for the protection or enhancement of the environment for erosion and sediment control, water quality improvement, flood prevention,

constructed wetlands, drainage, water filtration, watershed protection, ground water recharge, or other land and water uses reserved for environmental purposes.)

- 20 = Reserved/wildlife (Includes areas designated and managed for wildlife habitat. May include game reserves, wildlife parks, or wildlife food, and cover.)
- 21 = Undeveloped rural sites (Includes housing or other planned developments where the streets have been laid out. Some utilities may have been installed, but few if any structures have been constructed. The land appears idle with no management for livestock grazing, or harvesting of wood products or cultivated crops.)
- 22 = Wood, harvested (Applies to land showing evidence of partial-cut, clear-cut, or other timber management practices within the last 5 years. Wood harvest is only recorded if the NRI point intersects the portion of the forestland that was harvested or thinned.)

Chapter 4 – Data Collection Procedures

4.1 Basic Data Collection Features

Given the segments in a sample for a given year's data collection, the data collection consists of the following processes:

- Aerial Imagery Acquisition and Preparation
- Remote Sensing Laboratories Data Collection
- NRCS State Offices Local Data Collection for some segments

4.2 Data Collection Instruments

The data collection is done using a computer application called NRI_Collect, maintained by Iowa State University.

4.3 Aerial Imagery Collection and Preparation

Most imagery used for data collection is an aerial photograph of each sample segment. The contractors currently take the segment photograph using direct digital photography delivered orthorectified at a resolution of 15 cm ground sample distance. Below is the history of aerial imagery prior to 2020, going back to 1982:

- 2015 to 2019 => Contractors used color negative film scanned at 600 dpi and had to be orthorectified after delivery.
- (prior to 2015, it was color positive film) and the film, along with a scanned version at 600 pixels per inch, is delivered which achieves a 34 cm ground sample distance for most of the segments.

After an image is accepted and delivered, the image must then be orthorectified and aligned via a process called 'image to image registration'. Orthorectification is the process of removing the effects of image perspective (tilt) and relief (terrain) effects for the purpose of creating a planimetrically correct image to enable proper data collection. Once this is created, the orthorectified image is compared to a reference image from a prior collection to see if the two

align comparing key geographical features. Once this process reaches a successful conclusion the image is ready for data collection.

4.4 Remote Sensing Laboratory Data Collection

During data collection, the image is used to gather some data from the overall segment, called “area data” and other data is collected at each of the points in the segment. Since change over time is critical in the NRI, these data are collected for the current image and the data from the previous collection image is recollected. Disagreements between the recollection and the data collected in the previous collection are resolved during processing.

4.4.1 Area Data Collection

During area data collection, data are collected on waterbodies, streams, transportation, and developed land. Each of them is collected by drawing polygons using the collection instrument. Then, additional information about the item is entered to go along with the measured area within the polygons as discussed below.

Waterbodies & Streams. For both of these, the data collector identifies the water areas’ mean water level using various sources of information ensuring that only true long-term changes in the water body are indicated vs. temporary changes. All are collected by drawing polygons. Once that is done, additional information is entered about the size and type of the water body, and reasons for changes.

Transportation. Public roads and railroads are collected using polygons that include rights-of-way. Once that is done, additional information is entered about the size and type of the transportation, and reasons for changes.

Developed Land. Data to identify developed land other than transportation is collected in two ways: eligible areas and eligible structures. Eligible areas are identified using polygons around areas that fit one of 13 types of areas. Eligible structures are identified using a marker at the center of the structure; these structures are residential buildings or their equivalent. These markers are converted to developed land area during estimation.

4.4.2 Point Data Collection

For each point within a sample segment, a wide array of data is collected covering land cover/use, wetlands and deep-water habitats, erosion estimation input factors, use of land, conservation practices, and resource concerns.

- Land cover/use. Identify one of 39 non-overlapping categories that describe the type of land cover/use where the point is located. Additional information for the categories may then be collected in the State Data Collection.
- Wetlands and deep-water habitats.
- Erosion factors.
- Use of land.
- Conservation practices.
- Resource concerns.

4.5 State Data Collection

Points for which a land cover/use is determined to be cropland, grassland that is not rangeland, hayland, or CRP are sent to the appropriate State for local data collection. Administrative records from the Farm Service Agency and NRCS are used along with local knowledge from the State collectors to collect the following information about the point or the area surrounding it (common land unit (CLU), field, or sub-field):

- Verify RSL land cover/use determination
- CRP Signup number and practice
- Cropping history
- Irrigation information (yes/no and type)
- Conservation Practices – point is “impacted” by one of the following conservation practices:
 - Contour farming
 - Contour orchard/Other Fruit area
 - Contour buffer strips
 - Diversion
 - Filter strip
 - Hillside ditch
 - Strip cropping
 - Terraces
 - Vegetative barrier
- RUSLE2 Management System, sequence, & support practices
- WEQ input data
- Sub-surface drainage

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Land Cover/Use Codes 2020

0	Federal	650	All other land
1	Hort/Fruit	700	Urban/10 acres or larger
2	Hort/Nut	730	Urban/Small built-up
3	Hort/Vineyard	800	Rural Transportation
4	Hort/Brush fruit	900	Water Body <= 40 acres
5	Hort/Berries	910	Streams <= 660 ft. wide
6	Hort/Other	920	Census Water
11	Row/Corn		
12	Row/Sorghum		
13	Row/Soybeans		
14	Row/Cotton		
15	Row/Peanuts		
16	Row/Tobacco		
17	Row/Sugar beets		
18	Row/Potatoes		
19	Row/Other veg/truck crops		
20	Row/All other row crops		
21	Row/Sunflower		
111	Close/Wheat		
112	Close/Oats		
113	Close/Rice		
114	Close/Barley		
116	Close/All other close grown		
140	Hay		
170	Other crop/Summer fallow		
171	Other crop/Aquaculture		
180	Other crop/Other-setaside etc.		
210	Pasture		
250	Rangeland		
341	Forestland/Grazed		
342	Forestland/Not grazed		
401	Other farmland/Other land		
410	Other farmland/General CRP land		
611	Barren/Salt flats		
612	Barren/Bare exposed rock		
613	Barren/Strip mines, etc.		
614	Barren/Beaches		
615	Barren/Sand dunes		
616	Barren/Mixed barren lands		
617	Barren/Mud flats		
618	Barren/River wash		
619	Barren/Oil wasteland		
620	Barren/Other barren land		
630	Other rural/Permanent snow-ice		
640	Other rural/Marshland		

Soil Surface Textures and Modifiers

The NRI texture data element contains both the soil surface texture and any texture modifiers associated with the texture. A texture may be entered without a modifier, such as "SL". If a modifier is specified, the format will be "modifier-texture", such as "GR-SL". In some cases, the texture can have more than one modifier specified as "modifier1-modifier2-texture", such as "ASHY-ST-FSL". In a few cases, the texture is specified as stratified with more than one texture specified in the format "SR- modifier-texture1 modifier-texture2", such as "SR- GRX-COS GRV-S".

Soil Surface Textures

Code	Definition
C	Clay
CL	Clay loam
COS	Coarse sand
COSL	Coarse sandy loam
FS	Fine Sand
FSL	Fine sandy loam
L	Loam
LCOS	Loamy coarse sand
LFS	Loamy fine sand
LS	Loamy sand
LVFS	Loamy very fine sand
S	Sand
SC	Sandy clay
SCL	Sandy clay loam
SI	Silt
SIC	Silty clay
SICL	Silty clay loam
SIL	Silt loam
SL	Sandy loam
VFS	Very fine sand
VFSL	Very fine sandy loam

Terms Used in Lieu of Texture

Code	Definition
APUM	Ashy-pumiceous
ART	Artifacts
ASHY	Ashy
ASK	Ashy-skeletal
BR	Bedrock
BY	Boulders
CB	Cobbles
CE	Coprogenous earth

CEM	Cemented
CIND	Cinders
CN	Channers
CNDY	Cindery
CGM	Coarse gypsum material
CPF	Consolidated permafrost (ice rich)
DE	Diotomaceous earth
DUR	Duripan
FGM	Fine gypsum material
FL	Flagstones
FRAG	Fragmental material
G	Gravel
GR	Gravel
GYP	Gypsiferous material
HM	Hemic material
HPM	Highly decomposed plant material
HPUM	Hydrous-pumiceous
HSK	Hydrous-skeletal
HYDR	Hydrous
IND	Indurated
MARL	Marl
MAT	Material
MEDL	Medial
MPM	Moderately decomposed plant material
MPT	Mucky-peat
MPUM	Medial-pumiceous
MSK	Medial-skeletal
MUCK	Muck
OPWD	Oxide protected weathered bedrock
OR	Ortstein
PBY	Paraboulders
PC	Petrocalcic
PCB	Paracobbles
PCN	Parachanners
PDOM	Partially decomposed organic matter
PEAT	Peat
PF	Petroferric

PFL	Paraflagstones
PG	Paragravel
PGP	Petrogypsic
PL	Placic
PST	Parastones
PUM	Pumiceous
SG	Sand and gravel
SP	Sapric material
SPM	Slightly decomposed plant material
ST	Stones
U	Unknown texture
UDOM	Undecomposed organic matter
UWB	Unweathered bedrock
VAR	Variable
W	Water
WB	Weathered bedrock

Soil Surface Texture Modifiers

Code	Definition
ART	Artifactual
ARTV	Very artifactual
ARTX	Extremely artifactual
ASHY	Ashy
BY	Bouldery
BYART	Bouldery-artifactual
BYV	Very bouldery
BYVART	Very bouldery-artifactual
BYX	Extremely bouldery
BYXART	Extremely bouldery-artifactual
CB	Cobbly
CBA	Angular cobbly
CBART	Cobbly-artifactual
CBV	Very cobbly
CBVART	Very cobbly-artifactual
CBX	Extremely cobbly
CBXART	Extremely cobbly-artifactual
CEM	Cemented
CN	Channery
CNART	Channery-artifactual
CNV	Very channery
CNVART	Very channery-artifactual

CNX	Extremely channery
CNXART	Extremely channery-artifactual
COP	Coprogenous
CR	Cherty
CRV	Very cherty
CRX	Extremely cherty
CY	Cindery
DIA	Diatomaceous
FL	Flaggy
FLART	Flaggy-artifactual
FLV	Very flaggy
FLVART	Very flaggy-artifactual
FLX	Extremely flaggy
FLXART	Extremely flaggy-artifactual
GR	Gravelly
GRART	Gravelly-artifactual
GRC	Coarse gravelly
GRF	Fine gravelly
GRM	Medium gravelly
GRV	Very gravelly
GRVART	Very gravelly-artifactual
GRX	Extremely gravelly
GRXART	Extremely gravelly-artifactual
GS	Grassy
GY	Gritty
GYP	Gypsiferous
HB	Herbaceous
HE	Hemic
HO	Highly organic
HYDR	Hydrous
IND	Indurated
MEDL	Medial
MK	Mucky
MR	Marly
MS	Mossy
PBY	Parabouldery
PBYV	Very parabouldery
PBYX	Extremely parabouldery
PCB	Paracobbly
PCBV	Very paracobbly
PCBX	Extremely paracobbly
PCN	Parachannery
PCNV	Very parachannery
PCNX	Extremely parachannery
PF	Permanently frozen
PFL	Paraflaggy
PFLV	Very paraflaggy
PFLX	Extremely paraflaggy
PGR	Paragravelly

PGRV	Very paragravelly
PGRX	Extremely paragravelly
PST	Parastony
PSTV	Very parastony
PSTX	Extremely parastony
PT	Peaty
SH	Shaly
SHV	Very shaly
SHX	Extremely shaly
SR	Stratified
ST	Stony
START	Stony-artifactual
STV	Very stony
STVART	Very stony-artifactual
STX	Extremely stony
STXART	Extremely stony-artifactual
SY	Slaty
SYV	Very slaty
SYX	Extremely slaty
WD	Woody

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