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# **The National Woodland Owner Survey Database: Database Description and Users' Guide, Version 1.0**

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**NOTE: NWOS data are confidential and must be handled using appropriate protocols, including storing any downloaded data on USDA computers or encrypted external media (e.g., flash drives, CDs). Accessing NWOS data without proper credentials is strictly forbidden.**

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## **ABSTRACT**

The National Woodland Owners Survey (NWOS) is part of the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis program. This document describes the National Woodland Owners Survey Database (NWOS-DB), the official repository for NWOS data. In addition to explanations of the purpose and usage of the database, documentation of the table structure and logic are provided. Examples are presented for using the nwos R package to download and manipulate data. The database contains raw questionnaire responses and sample-level data. Access to these data require appropriate USDA credentials and access protocols.

**Keywords:** National Woodland Owner Survey, Forest Inventory and Analysis, database guide, users' guide

## Preface

The National Woodland Owner Survey (NWOS) is one of the primary elements of the USDA Forest Service, Forest Inventory and Analysis (FIA) program. The objectives of the survey are to increase our understanding of private forest landowners, including their number, their objectives, and their past and future activities. In the past, the NWOS was implemented on a periodic or cyclic basis. As of 2019, it is being implemented on an annual basis across the entire United States.

The Forest Service provides the public with published estimates of NWOS results aggregated by State and region as well as nationwide (Butler et al. 2016; Butler et al., in press). In addition to these aggregated results, the Forest Service grants access to the raw data to certain employees as well as those with appropriate data-protection agreements in place. The data are not publicly available due to the confidential nature of survey responses as well as the presence of personally identifiable information (PII). This report describes the database in which these data are stored, including the logic and structure among the constituent tables. Additionally, this document provides guidance on how data can be accessed and manipulated using a custom package for the R statistical language (R Core Team 2019).

## Acknowledgments

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The format for this report—as well as phrasing and terminology—was adopted largely from Burrill et al. (2018). This work was conducted largely by the Family Forest Research Center, a joint venture between the USDA Forest Service and the University of Massachusetts Amherst. Funding was provided by the USDA Forest Service, Northern Research Station (16-JV-11242305-041).

## Section 1

### Introduction

#### Purpose of This Guide

This guide is intended to serve as the official guide to the National Woodland Owner Survey database (NWOS-DB). It serves two broad purposes. The first is to provide guidance for the access, use, and interpretation of data by those with access privileges. At present time, this is limited to some USDA employees and a small number of research partners with appropriate data-protection agreements in place. The second purpose is to provide transparency and reference for those interested in the operational and statistical methodology underlying the NWOS (Butler and Caputo, in review; Butler et al., in press)

This guide has four sections. This section provides a general introduction to the NWOS and NWOS-DB. It provides a brief summary of the place of the NWOS within the larger FIA program. It also provides an overview of the design philosophy behind NWOS-DB as well as the broader system of data and tools within which it functions. Section 2 provides a brief overview of the NWOS sample and the process of survey implementation. In a fundamental sense, these define the types of data that are stored in the database. Section 3 describes the tables that constitute the database, their functions, and the conceptual logic that links them together. The final section provides guidance on accessing NWOS data using the `nwos` R package (Butler and Caputo 2019). It is hoped that it provides sufficient guidance for a user to access NWOS data in a standardized and convenient format, given basic familiarity with R usage and syntax.

The names of tables and table fields (i.e., columns or attributes) are by convention capitalized in this report (e.g., `PLOT_OWNER` or `OWNCD`). In most cases, the association of a given field with a given table is clear given the verbal context (e.g., "In the `SAMPLE` table, the field `NWOS_STUDY` is used for..."). Where the association needs to be made explicit, the report uses a naming convention consisting of the table name followed by the field name, separated by a period (e.g., `PLOT_OWNER.OWNCD`).

#### The National Woodland Owner Survey(s)

The NWOS is part of the USDA Forest Service, Forest Inventory and Analysis (FIA) program. It is one of the three primary components of the program, along with the Timber Products Output (TPO) survey and the core FIA plot-based forest inventory. The purpose of TPO is to provide estimates of wood products production; the survey is administered to primary wood products manufacturers and is designed to elicit the type and quantity of wood products produced as well as other attributes (Coulston et al. 2018). The plot-based forest inventory (sometimes referred to generically as "the" FIA sample) at its most basic conception consists of a national network of ground plots that are used to estimate *"the extent, condition, volume, growth, and depletions of*

*timber*" (Burrill et al. 2018) across the entire United States, including affiliated territories (e.g., the Pacific Islands). The NWOS was developed to complement these other two components. Its intended purpose is to better understand the self-reported motivations, activities, intentions, and demographics of private U.S. forest landowners. The primary instruments of the NWOS are landowner questionnaires.

The main module<sup>1</sup> of the NWOS (called the “base” or “rural” NWOS) has historically been tied to the network of FIA ground plots (excluding U.S. territories). The NWOS population of interest is private forest landowners and the survey sample frame is derived from the subset of FIA plots that are both forested and privately owned, as determined by the plot-based inventory. Contact information associated with these FIA points is used to develop the NWOS mailing list. This approach has a number of advantages, including the adoption of a rigorous, pre-existing sample and the ability to link questionnaire responses back to measures of physical attributes of the land. When necessary to achieve adequate sample sizes, this base sample was intensified using a complementary methodology (a more detailed description of the NWOS sampling methodology can be found in Section 2 or Westfall et al., in review).

In recent history, FIA—including the NWOS—has been expanding its purview beyond rural forests. A network of Urban FIA ground plots (similar to the standard network of rural ground plots) has been established in multiple cities to assess urban tree cover and forest resources. Subsequently, an urban version of the NWOS module (the Urban National Landowner Survey) was piloted in multiple cities before being implemented fully in six cities in 2019 and 2020. This module is aimed at understanding the values, activities, and perspective of the private owners of urban green space.

The Urban National Landowners Survey is only the first of several new modules of the NWOS that are in various stages of development. In 2019, a pilot test of the NWOS was administered to large corporate ownerships, defined as ownerships owning more than 45,000 acres (Caputo et al. 2017). This marked the first time that a separate, custom survey instrument was created for a specific sub-group of the NWOS sampling frame. In the past, a single, generalized instrument was administered to family, corporate, nonprofit, and other private ownerships alike. There is interest in creating customized survey instruments for each group. Currently, surveys are being discussed or developed for island territories and tribal ownerships. In the future, similar efforts for other private forest ownerships, nonforest (i.e., "all-lands") ownerships, or even public ownerships may be undertaken. NWOS-DB is being developed as a common repository for all surveys falling under the NWOS banner.

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<sup>1</sup> A survey “module” is also referred to more generally as a “survey,” or as a “study” within portions of the NWOS database and associated literature.

## The NWOS Database

In this report, the word "database" refers to a group of multiple, interlinked tables with a common theme and common function within the FIA's production space, an Oracle® instance (Oracle 12c.2) hosted on Forest Service servers. The NWOS database (NWOS-DB) consists of a group of tables belonging to a single schema (or user), FS\_NWOS, within the FIA production space. Oracle is a relational database system, accessible through SQL (standard query language).

When designing any database structure, a primary consideration is the degree of normalization that will be pursued. Normalization is a foundational database concept that refers very generally to how disaggregated (or decomposed) data are among multiple tables. In a highly normalized database, one would generally find a greater number of (relatively simpler) tables with very specific logic relating them. This allows for reduced redundancy, reduced storage requirements, more optimized performance, and often greater flexibility in the types of data that can be accommodated. There is a tradeoff, however, between normalization and the overall accessibility of the underlying data. Highly normalized databases often require complex relations among tables, and users may find it very difficult to write concise, intuitive queries that correctly return the data the user requires. Views are one way to resolve this tradeoff. Views are essentially pre-established queries that run on-the-fly and that can be referenced like tables (without any redundancy in data storage). Views are often written by the database managers or creators and can be seen as official, "approved" queries with the correct relations accounted for properly. Users can query views directly, often using simple, intuitive queries, while having some degree of assurance that their queries are correct, while the database retains a more normalized underlying table structure.

The NWOS database was deliberately designed to have only a moderate degree of normalization. This main rationale behind this choice was the desire to create a simpler, more accessible structure for querying. Having only a few tables with simple and intuitive relations makes it easy to write queries that correctly return the data the user requires. Secondly, NWOS-DB is quite small and streamlined by industry standards and will likely remain so for the foreseeable future. The performance and storage benefits of further normalization do not outweigh the concomitant increase in complexity and loss of accessibility in any meaningful way. For similar reasons, NWOS-DB does not contain any built-in views. While this is partly because of the simple underlying table structure, it is largely because the database was designed to be primarily accessed not through an SQL client, but through an R package containing a few simple, standardized functions. These functions provide many of the same benefits of database views. They allow users a simple, intuitive mechanism to download the data they want, with joins correctly and automatically made in the background (more on the package below).

NWOS-DB is to be considered a work in progress and must remain responsive and flexible as the needs of the program evolve and as additional surveys and survey instruments are developed. As the total amount and diversity of data increase, it is likely that additional normalization and

the inclusion of views will be adopted. These will improve performance and flexibility, while remaining compatible with a model in which an R package is used as the primary front end and point of access. The tradeoff between normalization and simplicity will be continually assessed over time.

The raw NWOS data are not available publicly due to confidentiality concerns and the presence of personally identifiable information (PII). Access requires a Forest Service Oracle username with basic connection privileges. This username must also be granted an appropriate role within NWOS-DB. There are two such roles, Admin and Analyst. The Admin role has full read and write privileges to all tables. This role is primarily intended for those directly involved in the uploading, cleaning, and management of NWOS data. The Analyst role, on the other hand, has only read (i.e., select) privileges and is intended for researchers and users of NWOS data. The Analyst role is sufficient for accessing raw data using the R package (see below and Section 4 for step-by-step directions).

## **The Database "Ecosystem"**

As mentioned above, the database can be directly accessed through an SQL client (such as PL/SQL or SQL\*Plus). Users with either the Admin or Analyst role will be able to run select queries on one or more tables. Users with the Admin role will also be able to update, insert, or delete records through the client. There are certain limitations to accessing the data this way. One is that it is possible to relate tables incorrectly because of the absence of views –, resulting in datasets that may be mismatched to a user's purpose. The second is that only “raw” data are stored in the database itself. Weights, imputation sets, and other data sources used for making population-level estimates and analyses are stored outside the database. These data sources, along with tools for accessing, analyzing, and managing NWOS data, comprise a larger NWOS "ecosystem" (Figure 1).

Within this ecosystem, the preferred method for accessing the database (particularly for users with the Analyst role) is through the `nwos` R package. This package, freely available through GitHub (<https://github.com/familyforestresearchcenter/nwos>), allows an authenticated user to access the raw plot-level, sample-level, and questionnaire-level NWOS data. These are downloaded to a user's computer in the form of a custom R object (of type “`nwos.object`”), which also contains sample weights, imputation sets, and metadata. Additional functions allow users the abilities to generate custom “wide” or “long” datasets, generate metadata tables, run population-level estimates, or complete datasets (i.e., append weights and imputed values) for statistical analyses. There are also functions for exporting datasets, accessing the complete and up-to-date database catalog, and other purposes. For users with the Admin role, the package also contains functions for inserting, updating, and deleting data in the database. Section 4 provides additional information on using the `nwos` package to access the database, including step-by-step guidance on many of the key functions.

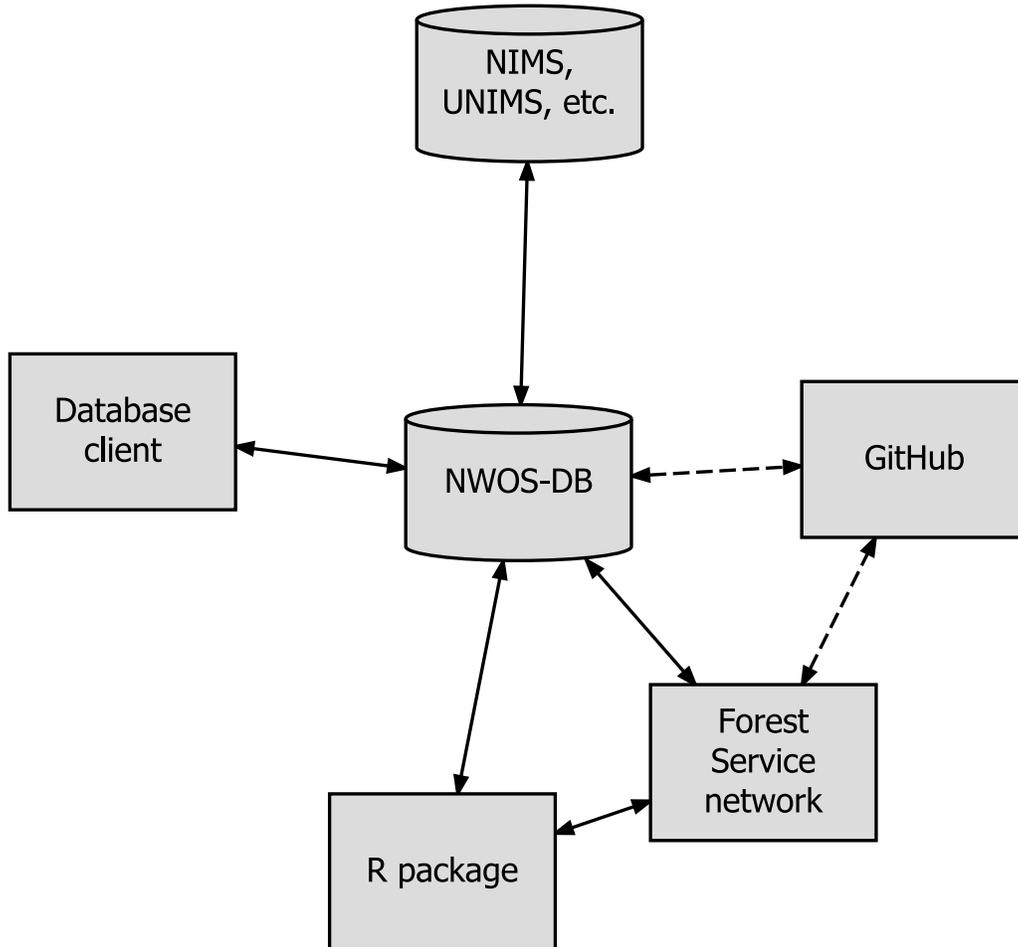


Figure 1.—Relationships among elements in the NWOS-DB "ecosystem." Data are accessed directly through a database client (e.g., PL/SQL, SQL\*Plus) or by using the nwos R package. The database is updated, in turn, through the use of the same package, through the client, or through implementation scripts stored on the Forest Service network. A repository on the internal Forest Service GitHub contains a copy of these implementation scripts as well as the scripts and tools defining the database. Linkages to NIMS, UNIMS, and other FIA databases can be made directly from within the Oracle production space. Solid lines refer to transfer of data. Dashed lines refer to transfer of scripts/code.

The nwos package accesses a number of data tables other than those stored in the database itself. These are stored on the Forest Service network<sup>2</sup>, accessible to employees and credentialed cooperators, along with a large library of additional scripts used in the implementation of the NWOS (e.g., scripts for drawing the sample, cleaning addresses, generating mailing lists, and

<sup>2</sup> Many of these are likely to be transferred to new tables in a future version of NWOS-DB. The goal is for all tabular data to be stored within the database itself.

logging returns). This library can also be found in a repository on the Forest Service's internal<sup>3</sup> GitHub ([https://code.fs.usda.gov/forest-service/FS\\_NWOS](https://code.fs.usda.gov/forest-service/FS_NWOS)). This repository also contains the scripts used to define, create, and update the database in the Oracle production space, as well as an up-to-date version of this guide.

NWOS-DB can be directly joined to tables in other FIA databases (NIMS, UNIMS, etc.) from within the Oracle production space. These are an important part of the NWOS-DB ecosystem, allowing rich analysis that includes both social (e.g., ownership attributes) and biophysical (e.g., tree inventory) data. See Section 3 for more about these linkages.

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<sup>3</sup> This is a private repository; the associated hyperlink is only accessible to those on a Forest Service network and possessing a Forest Service Github account.

## Section 2

### NWOS Sampling and Implementation

The primary sampling unit of the base NWOS is a zero-dimensional sample point (Westfall et al., in review). These points are derived from two different sources: FIA field plots and augmented/intensified sampling points. The FIA field plots, often called Phase 2 or P2 plots from the three-phase sample design adopted by FIA (Bechtold and Patterson 2005), are distributed nationwide using a hybrid of random and systematic sampling approaches. First, a hexagonal sample frame is established across the United States. Within each cell of this grid, a single sample point is located randomly. At each point, a measurement plot is established. Each measurement plot contains one or more condition classes, defined by a discrete combination of land use, forest type (if forested), ownership group, and other condition class variables (see Bechtold and Patterson 2005 for a complete description of the FIA sampling design). To determine the land use of a given condition class, FIA has established the following definition of forest: *"Land that has at least 10 percent canopy cover by live tally trees of any size or has had at least 10 percent canopy cover of live tally species in the past, based on the presence of stumps, snags, or other evidence. To qualify, the area must be at least 1.0 acre in size and 120.0 feet wide"* (USDA Forest Service 2016).

The nucleus of the NWOS sample is derived from the measurement (i.e., P2) plots. These are stratified by the land use and ownership group of the first condition, which is conventionally located at the center of the measurement plot. The main stratum of interest consists of those plots that are determined to be forested and privately owned. Since only the attributes of the plot center are relevant to the NWOS, each sample plot is in effect no more than a sample point. For the sake of consistency, then, the term sample point will be used in the remainder of this report. Similar sampling designs have been adopted for Urban FIA (and consequently, the Urban National Landowners Survey), albeit with different sampling intensities (i.e., different grid sizes) and condition class definitions.

In 1999, FIA switched its sampling methodology from a periodic one to an annual one, in which a subset of plots (i.e., a panel) is measured each year such that any individual year or group of years within a cycle constitutes an independent sample. Starting in 2019, an annual sampling methodology was established for the NWOS, using P2 data from 2 years prior as the core of the sample. For periodic surveys (2018 and earlier), the NWOS sample has been organized around a survey "cycle", a period of 5 or fewer years that constitutes an independent sample. At least initially, annual NWOS surveys are also being organized around a 5-year survey cycle for operational reasons, even though each year or group of years also constitutes an independent sample.

In addition to those points derived from FIA field plots, the NWOS sample also contains augmented and/or intensified points. These refer to additional sets of sample points that are generated exclusively for the NWOS (i.e., they are not associated with any ground plots) to

increase the sample size. Augmented points are generated to increase the base sample to an adequate size; intensified sample points are generated for additional purposes, including implementation of custom versions of the base instrument. The terms intensified points and intensification will be used hereafter to refer to both. The process of intensifying the sample frame is similar to the process for locating the original FIA sample points. A hexagonal grid with smaller cell size is overlaid on the initial FIA grid, and one point is located randomly in each empty (i.e., not containing a P2 point) cell. These additional points are iteratively added to the sample until the desired intensity is achieved.

The secondary sampling unit for the NWOS is the ownership: a group of one or more owners that jointly own land. Ownerships may be associated with more than one sample point but will receive only one survey for a given survey spatial unit (i.e., city for the Urban National Landowners Survey or State for the base NWOS). Therefore, the sample contains fewer unique ownerships than sample points. Points derived from P2 plots are already associated with owner names and contact information; in the case of intensified points, these are derived from commercial data vendors. Ownerships may be part of the sample for multiple cities/States. Each ownership sampled<sup>4</sup> is mailed two copies of the questionnaire according the Tailored Design Method (Dillman et al. 2014), with an option to respond to a web-based version. A given ownership may only receive a single copy of the questionnaire if they answer quickly enough (and consequently are removed from the second mailing), or more than two if they request an additional copy or opt to submit the electronic version later in the process. A subset of nonrespondents is also contacted for a phone interview, primarily for post-hoc nonresponse assessment. More information on the implementation of the NWOS, including information on weighting and estimation procedures, can be found in Butler and Caputo (in review) and Butler et al. (in press).

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<sup>4</sup> The term “sample” has more than one meaning in this report. It refers in a strict sense to the entire set of sample points and ownerships (regardless of land use and ownership). It also refers in a more general sense to the substrata of interest, those landowners who actually received questionnaires (e.g., for base NWOS, private owners of forested land). The name of the SAMPLE table (see Section 3) is predicated on this second meaning.

## Section 3

### Database Structure

This section provides information about the structure of NWOS-DB. The database catalog includes detailed descriptions of all fields in each table-and is accessible in an up-to-date format through the nwos R package (see Section 4). A description of the database catalog is included in the appendix of this document. Each field (also known as a column or attribute) and its description are listed in these documents. For those fields that are coded, a list of the codes and their meanings are also included.

Each table includes one primary key titled "CN" (for sequence number). Foreign keys reference the primary key of the table to which they join (e.g., PLOT\_OWNER\_CN, SAMPLE\_CN). Keys are character fields and consist of a concatenation of a three-digit code (which is a table prefix) and a unique number. For example, a value of CN = "RES1" is interpreted as the first record in the RESPONSE table. These table-specific prefixes are listed in Table 1. Keys for each table are also described in the catalog.

**Table 1. Table-specific primary key prefixes in NWOS-DB. Each value of a table's primary key consists of the appropriate prefix followed by a unique number.**

Table	Prefix
PLOT_OWNER	PLT
OWNER	OWN
SAMPLE	SAM
CONTACTS	CON
RESPONSE	RES
QUEST_METADATA	QMD
QUEST	QST
QUEST_TEXT	TXT
MODIFICATIONS	MOD
NOTES	NOT
TABLES	TAB
FIELDS	FLD
CODES	COD

### Table Descriptions

There are 13 data tables in the database in two table groups: administrative tables (five tables), and survey tables (eight tables). The latter contain data pertaining to the sampling frame, survey organization, and questionnaires. Administrative tables contain database-level metadata as well as notes and modification records for the entire database. All tables belong to the FS\_NWOS schema in the Forest Service production space. Figures 2 and 3 illustrate the relationships among these tables.

The eight survey tables are as follows:

- **PLOT\_OWNER** table—contains one record for each sample point in an NWOS study. Each record contains point-level attributes (e.g., coordinates, land use) as well as the original (unedited) ownership information for that point. This table contains all sample points for all studies. As such, data originate from multiple sources, including other FIA databases and commercial ownership data products (for intensified points). Where data for P2 (and urban) points originate from other FIA databases in the production space (e.g., NIMS, UNIMS), it is possible to directly link these tables to the PLOT\_OWNER table. PLOT\_OWNER contains a number of foreign keys to facilitate these joins. These keys are what make it possible to link NWOS survey responses back to plot and condition-level FIA data, including tree inventory data. More information on these keys is contained in the database catalog. More information on the tables to which these keys join can be found in Burrill et al. 2018. Despite the presence of foreign keys linking the PLOT\_OWNER table to plot, condition, and ownership tables elsewhere in the production space, copies of the raw data from these tables are stored directly in PLOT\_OWNER. This redundancy was deliberate, as it makes it possible to fully analyze NWOS data *without* joining to tables outside of FS\_NWOS. This is useful if an NWOS user is unfamiliar with these tables or does not have sufficient privileges to access them. This also means that a locked-down version of the primary NWOS sample is maintained, even if the original data are dropped or altered for any reason. Finally, it allows for a consistent format for the storage of data originating from within and without FIA in the same table.
- **OWNER** table—contains one record for each unique ownership associated with one or more valid sample points in PLOT\_OWNER. Owner-level attributes such as owner type, industrial status, and whether an ownership should be contacted, are stored in this table. Names and address fields in this table are cleaned and formatted to appear on mailing labels (raw, point-level versions of these fields are stored in PLOT\_OWNER). Where names and contact information are incomplete or unknown, the OWNER table contains a dummy record containing null data. This is necessary because the OWNER table is the link between the sample points (contained in PLOT\_OWNER) and the SAMPLE table (see below). Thus, all valid sample points are associated with an ownership, even if the details of that ownership are unknown and cannot be surveyed. Where the same

ownership is associated with plots in more than one study or study unit<sup>5</sup>, there may be separate OWNER records for each.

- SAMPLE table—contains one record for each unique ownership in the sample of a given study, year/cycle and spatial unit (e.g., State). For example, in the base NWOS, there is a record in SAMPLE for each unique ownership in each State that owns one or more private, forested plots in that State. By joining the SAMPLE table with the cleaned contact information in OWNER and filtering out the ownerships that should not be contacted or for whom there is no contact information, it is possible to generate a mailing list for sending questionnaires.
- CONTACTS table—records the occurrence and progress of official contacts with survey recipients. This includes phone calls, emails, and letters. The mailing and receiving of survey instruments (the most numerous form of contact) are recorded in the RESPONSE table (below).
- RESPONSE table—contains one record for every survey instrument sent or administered to an ownership as part of a given sample. In most cases, there will be at least two records (i.e., two survey instruments) associated with each ownership. In some cases, there will be only one (if the first is returned before the second batch is mailed) or more than two, if an ownership responds to a phone or web-based instrument. Each record contains information about the mode of the instrument, the dates sent or administered, and the dates received. Additional fields record whether an instrument prompted a valid response and, if not, the type of nonresponse (e.g., undeliverable, refusal). By joining the RESPONSE table to the SAMPLE table, it is possible to calculate response and cooperation rates for a study (see Butler et al., in press).
- QUEST\_METADATA table—contains one record for each unique question asked in one or more survey instruments. This table contains the text of the questions, their type (e.g., open-ended, check box, text box.), possible responses, and response units. Additional fields contain the questions' allowable range, data type (e.g., numerical, character), whether they are part of a check box grouping, and whether they are dependent (i.e., skip-pattern) questions. Although the QUEST\_METADATA table is partly intended to be a reference guide for interpreting survey results, it also serves a central role in the processes of data cleaning and logic checks (Butler et al., in press). By comparing each question response to the fields in QUEST\_METADATA, implementation scripts automatically identify and (in some cases) correct responses that are out of range or that demonstrate illogical dependencies (e.g., skip-pattern errors). There is an inherent many-to-many relationship between survey instruments and survey questions (i.e., an instrument contains many questions and a question may appear in more than one instrument). By joining the QUEST\_METADATA table to the RESPONSE table on an

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<sup>5</sup> Study unit refers generally to a spatial unit within which an independent sample has been established. In the case of NWOS, the study unit is the State. In the case of the urban survey, the study unit is the city.

instrument's identifier field, it is possible to identify all of the questions that were contained in the instrument or instruments administered to an ownership in a given sample.

- **QUEST** table—contains one record for each individual response to a question in a survey instrument. The QUEST table contains what is usually meant when a user refers monolithically to *'the'* NWOS data, the actual response values from returned questionnaires. For a number of reasons, however, this table should not be queried and analyzed independently of other tables. The QUEST table is one of the larger tables in the database and a deliberate choice was made to pursue a greater degree of normalization with this table than with many others. The table itself contains mostly foreign keys and a single field containing response values. It is necessary to join this table to QUEST\_METADATA to determine the meaning of response codes, identify appropriate data types, etc. The QUEST table also contains the responses to all returned questionnaires, regardless of study, cycle, or sample unit. Furthermore, valid and invalid (or incomplete) surveys are stored alike (see Butler et al. in press for more about what constitutes a valid survey). To query only the valid responses associated with a particular study, it is necessary to join QUEST to RESPONSE and SAMPLE. Making this join correctly is one of the primary functions of the nwos R package (see Section 4), the recommended means of accessing the QUEST table.
- **QUEST\_TEXT** table—contains text of comment/text fields in questionnaires. To reduce the size of the QUEST table, responses to open-ended text and comment fields are not stored in the QUEST table. Instead, these values are recoded on a binary scale indicating whether a response was provided by the respondent. Where responses were provided, the actual text of the response is stored in the QUEST\_TEXT table. This improves the efficiency of working with the QUEST table, particularly as data in the comment field are rarely used. The same structural relations that exist between the QUEST table and the SAMPLE and RESPONSE tables also exist between these tables and QUEST\_TEXT.

The five administrative tables are as follows:

- **MODIFICATIONS** table—records details of modifications to individual table cells or groups of cells. These records include the date of the modification(s), a description of the modification(s) (including reasons for making them), the names of any scripts that were used, and the new and old values of the cell or cells. The modifications table can be joined to any other table, using two fields, one referencing the table modified and the other referencing the record-level CN. Where modifications refer to individual cells, records usually contain non-null values referencing the tables, records, and fields that were modified, as well as non-null values for the old and new (i.e., modified) data. In these cases, the MODIFICATIONS table can be used to roll back modifications to an earlier state. Where modification records refer more broadly to modifications across multiple tables, records, or fields, many of these attributes will be left null.

- NOTES table—contains notes on records in all tables. Notes can be recorded for any record in any table, using a two-field key (similar to the MODIFICATIONS table, above). Consequently, notes can be joined directly to their associated records in a query.
- TABLES table—contains one record for every table in the database. This metadata table stores the name, type (survey vs. administrative), and description of every table in the database.
- FIELDS table—contains one record for every field in every table in the database. This metadata table contains the name, description, and Oracle data type [e.g., NUMBER(22), VARCHAR(255)] of every field in every table in the database.
- CODES table—contains one record for every code in every coded field in the database, with the important exception of the coded response values contained in the QUEST table. These are contained in the QUEST\_METADATA table (see above). The TABLES, FIELDS, and CODES tables are joined and queried to generate the database catalog (see Section 4).

In addition to these 13 data tables, the database also includes 13 update tables. There is one update table corresponding to each of the data tables; each is named using the convention of the name of the corresponding data table followed by the phrase “\_UPDATE” (e.g., SAMPLE\_UPDATE, NOTES\_UPDATE). The update tables are identical in structure to the data tables, but do not normally contain any data. They are used to load, drop, and alter records as part of routine data management.

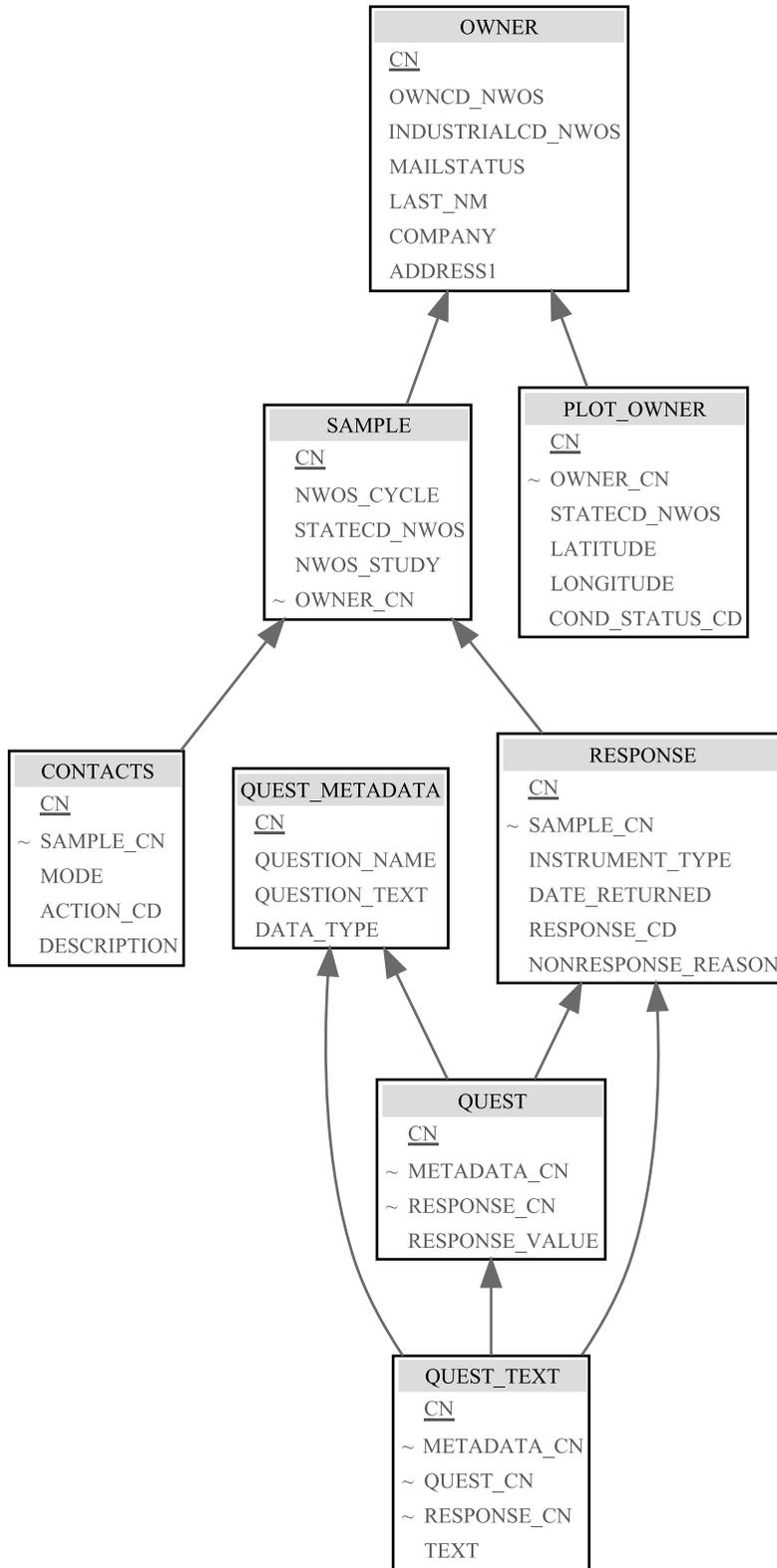


Figure 2.—Relationships among NWOS-DB survey tables. The figure shows primary keys (underlined), foreign keys (identified with a tilde), and a subset of additional fields.

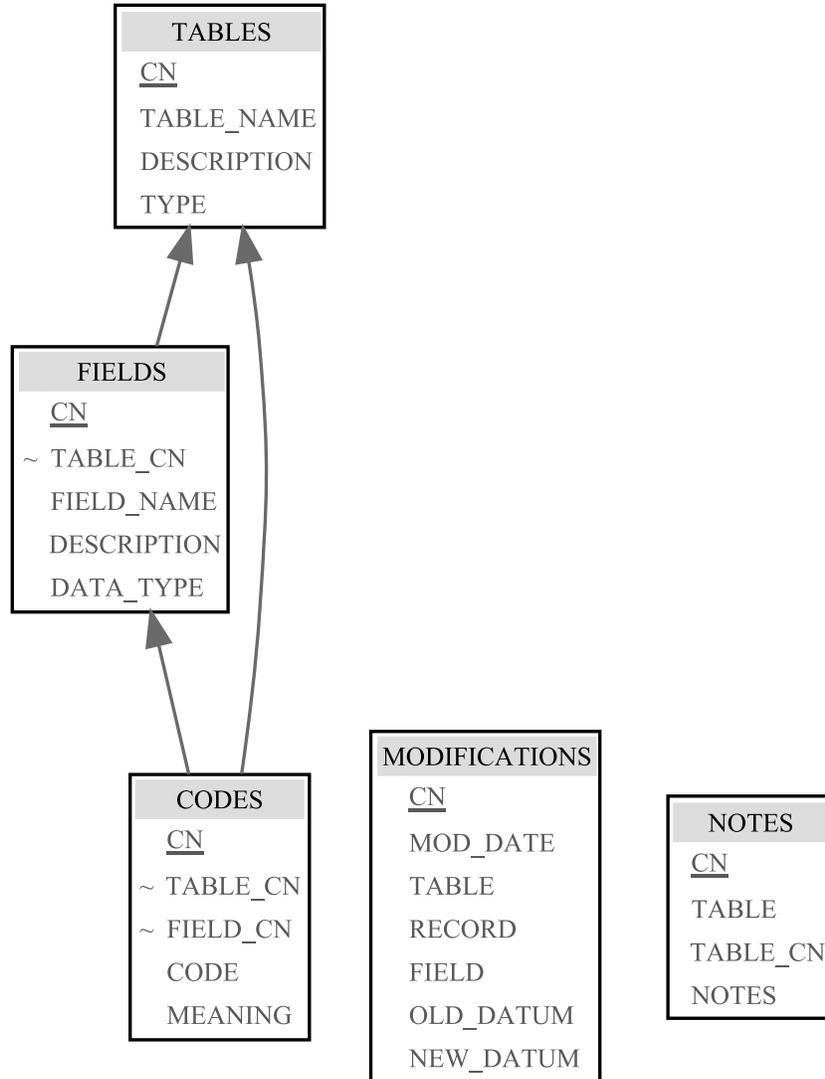


Figure 3.—Relationships among NWOS-DB administrative tables. The figure shows primary keys (underlined), foreign keys (identified with a tilde), and a subset of additional fields are shown. The MODIFICATIONS and NOTES tables can be joined to any other tables, including survey tables, through the RECORD and TABLE\_CN fields.

## Section 4

### Accessing NWOS-DB

NWOS-DB can be queried using a database client and SQL (standard query language) scripts. For administrative users, this is often a useful and necessary means of access, particularly for special-purpose or infrequent tasks. For the average user, however, a more reliable method is to use the `nwos` R package (Butler and Caputo 2019). This R package contains a number of standardized functions for downloading, manipulating, and analyzing NWOS data in a straightforward and consistent manner.

To use the full capacity of the package, the user must have access to a USDA computer that has been mapped to the internal Forest Service network (i.e., T drive), with read permissions for the NWOS folder space. The computer must be configured with the correct DSN (data source name) for the Forest Service production space (i.e., Oracle instance). In addition to the base R installation, the user will need the “RODBC” (Ripley and Lapsley 2019) and “devtools” (Wickham et al. 2019) packages. Finally, it is necessary for the user to have connection privileges to the Forest Service production space and to have been assigned a role within NWOS-DB. With these in place, the user should be able to connect to the production space from a desktop installation of R (R Core Team 2019). The remainder of this chapter is written from the perspective of a user with the Analyst role. Note: NWOS data are confidential and must be handled using appropriate protocols, including storing any downloaded data on USDA computers or encrypted external media (e.g., flash drives, CDs). Accessing NWOS data without proper credentials is strictly forbidden.

### Installing the `nwos` Package

The first step is to install the `nwos` package. This is available as a public repository on GitHub. Start R and run:

```
devtools::install_github('familyforestresearchcenter/nwos',
  build_vignettes=T)
```

This should install the package, including a number of vignettes (a long-form guide to using an R package). These can be viewed using the command:

```
browseVignettes(package='nwos')
```

One vignette (`nwos-db-guide`) consists of a current version of this guide, which may be updated periodically. Another (`'get-NWOS-data'`) follows the examples in the remainder of this chapter closely.

## Downloading and Preparing NWOS Data

The primary function for downloading data is `get_nwos()`. This function creates and passes a query to NWOS-DB to obtain the raw questionnaire results for a particular study and cycle. This query joins the QUEST, SAMPLE, and RESPONSE tables and filters them by study and cycle variables. For example:

```
library(nwos)

quest <- get_nwos(cycle='2018', study='base')
```

will download the raw responses for the 2018 base survey. Additional “states”<sup>6</sup> and “questions” parameters can be used to limit the download to a narrower slice of the data (improving transfer speed). For example:

```
quest <- get_nwos(cycle='2018', study='base', states=c('44'),
questions=c('AC_WOOD', 'AC_LAND'))
```

would retrieve data for two questions (AC\_WOOD and AC\_LAND) and only for the State of Rhode Island (statecd = 44). The function `get_nwos()` returns an “nwos.object” object, a type of list object containing several different datasets in individual 'slots.' These include slots for the raw response data, sample-level data, and metadata. If weights and imputations for the study of interest have already been calculated (see Butler et al., in press), these will also be included in additional slots. The nwos.object is of limited utility to most users in its raw form. A number of helper functions, which can be used to transform the raw object into more usable forms, are included in the package. One of the most powerful of these is `nwos_wide()`. This function creates an R dataframe in a wide format suitable for most common types of data analysis. Here, wide format means a format in which every row corresponds to one respondent's questionnaire and every column corresponds to either a question or an attribute of the respondent. Survey weights are included and imputed values can also be inserted. For example, the command:

```
qwide <- nwos_wide(quest, imputations='1')
```

will return a wide table with all null values (i.e., nonresponse) replaced with the values of the first imputation set. As part of the base survey, five imputation sets were created (see Butler et al., in press, for more on imputation). In addition to the numbers 1 through 5, the imputations parameter can be set to "none", in which case no imputed values will be inserted and

---

<sup>6</sup> The name of the “states” parameter is derived from the STATECD\_NWOS field in the PLOT\_OWNER and SAMPLE tables. Both refer more broadly to study units where these are other than State (e.g., cities for the urban NWOS).

unanswered questions will appear as null values (i.e., “-1”) – and "random", in which case of the five imputation sets will be randomly selected.

The wide table will, in most cases, have a large number of columns (more than 250 in the case of base NWOS). Many of these are coded and a large number have names that may not be intuitive to a new user. A useful function, therefore, is `nwos_wide_metadata()`. This function, when applied to the original “nwos.object” object, will generate a dataframe containing all the metadata that relate to the wide format. This includes a description of each column, the data type for each column, the factor levels for the coded responses, and other attributes. The `DATA_TYPE` and `UNITS_FACTORS` columns are particularly important because the question columns in the wide table are generated as character fields, with categorical questions also being coded.

```
qwmd <- nwos_wide_metadata(quest)
```

The wide format contains one record for every valid, returned survey and one column for every question and every piece of metadata.

For other purposes, including certain plotting and statistical functions, a long table may be preferred. This is a table where each question—not each questionnaire—is represented by an individual row. A long table (and corresponding metadata table) can be generated by the following code:

```
qlong <- nwos_long(quest, imputations='1')
qlmd <- nwos_long_metadata(quest)
```

In addition to the raw response data, an analyst will sometimes need access to the raw point-level data. This data can be retrieved using the `get_nwos_plots()` function:

```
plots <- get_nwos_plots(cycle='2018', study='base')
```

The function will return an "nwos.plots.object" object. As with an "nwos.object" object, this is a custom list object with multiple slots. In this case there are two slots, one containing raw point-level data and one containing sample/response-level data. As before, the raw list object is of limited utility in terms of analysis. Here, we will use the `nwos_plots_complete()` function:

```
plcomp <- nwos_plots_complete(plots)
```

This returns a dataframe with a single row for each sample point in the sample, along with point-level land and ownership attributes. The dataframe also includes sample-level attributes, such as strata and response category (for calculating response and cooperation rate). For those points that are associated with a valid response, there will be a non-null value in the `RESPONSE_CN` field. This is particularly useful as it can be used to join response data to the point data. One common use for this is to attach sample point coordinates to survey responses for spatial analysis:

```
quest.coord <- merge(x=plcomp, y=qwide, by.x='RESPONSE_CN',
by.y='CN')
```

## Other Functions

In addition to functions for retrieving data and preparing it for analysis, the 'nwos' package contains a number of functions for use and analysis of data. There are a number of functions for making population-level estimates, calculating response and cooperation rates, and other purposes. For users with the Admin role, there are functions for loading, altering, and deleting records to and from the database. You can use the `help()` function to access a menu with a list of functions and links to the documentation for each:

```
help(package='nwos')
```

One function that may be useful to readers of this document is the `get_nwos_db_catalog()` function. This function will render a current, up-to-date copy of the database catalog on the user's hard drive. The catalog is generated as an HTML file, readable in any web browser or text editor. This catalog lists all the tables, fields, and codes relevant to the database, equivalent to the information in the appendix. As the database evolves and changes, however, it is useful to be able to periodically generate an up-to-date version.

```
get_nwos_db_catalog(dir='C:/my_nwos_analyses',
file='NWOS_DB_catalog')
```

Finally, many users will want to be able to export quest data in other formats to use with software other than R. Fortunately, prepared response data (both long and wide formats), “completed” plot tables, and individual slots of `nwos.objects` and `nwos.plot.objects` all take the form of regular R dataframes and can be exported in a number of formats using standard R functions. Additionally, the `nwos_export()` function can be used to export response data as text in any of the wide, long, or full formats:

```
nwos_export(quest, dir='C:/my_nwos_analyses', format='wide',
imputations='1')
```

This will export a copy of the formatted response data in the listed directory as a CSV file, along with a copy of the corresponding metadata (also in CSV). This provides the user with the fundamental data necessary to begin analysis elsewhere. The `nwos_export()` function will pass the 'imputations' parameter through any format.

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## Appendix

The following is an itemized catalog of tables, fields, keys, and codes in NWOS-DB. General descriptions of these tables are included in Section 3 of this document. A current version of this catalog is accessible using the `nwos R` package (see Section 4). Tables include for each column/field, that column's name, a description, and the Oracle data type (and maximum character length) of the field.

### Plot Owner table. Oracle table name is `FS_NWOS.PLOT_OWNER`.

	Column name	Descriptive name	Oracle data type
1	CN	Sequence number	VARCHAR2(255)
2	PLT_CN	PLOT sequence number	VARCHAR2(255)
3	COND_CN	COND sequence number	VARCHAR2(255)
4	OWN_CN	OWNER sequence number	VARCHAR2(255)
5	STATECD	State code	VARCHAR2(255)
6	STATECD_NWOS	State code, NWOS adjusted	VARCHAR2(255)
7	UNITCD	Survey unit	NUMBER(22)
8	COUNTYCD	County code	NUMBER(22)
9	PLOT	Plot number	NUMBER(22)
10	INVYR	Inventory year	NUMBER(22)
11	PREV_INVYR	Inventory year of previous plot record	NUMBER(22)
12	LATITUDE	Latitude	BINARY_DOUBLE(8)
13	LONGITUDE	Longitude	BINARY_DOUBLE(8)
14	P2PANEL	Phase 2 panel	NUMBER(22)
15	INTENSITY	Plot intensity	NUMBER(22)
16	CONDID	Condition ID	NUMBER(22)
17	COND_STATUS_CD	Condition status code	NUMBER(22)
18	COND_ST_REASON	Nonsampled reason code	NUMBER(22)
19	NONFOREST_LAND_USE_CD	Land use code for nonforest conditions	NUMBER(22)
20	OWNCD	Owner class code	NUMBER(22)
21	OWNCD_NWOS	Owner class code, NWOS adjusted	NUMBER(22)
22	OWNGRPCD	Owner group code	NUMBER(22)
23	OWNSUBCD	Owner sub-class code	NUMBER(22)
24	FORINDCD	Forest industry code	NUMBER(22)
25	PSDS_CN	FIA study sequence number	BINARY_DOUBLE(8)
26	STUDY_NAME	FIA study name	VARCHAR2(255)
27	OWNERID	Owner ID	VARCHAR2(255)
28	OWNER_CN	Owner sequence number	VARCHAR2(255)
29	CONDLIST_SRS	Condition list	NUMBER(22)

30	INDUSTRIALCD	Industrial private forest owner code	NUMBER(22)
31	MILLCD	Mill code	NUMBER(22)
32	TIMOREITCD	TIMO / REIT code	NUMBER(22)
33	COMPANY	Company	VARCHAR2(255)
34	FIRST_NM	First name	VARCHAR2(255)
35	LAST_NM	Last name	VARCHAR2(255)
36	ADDRESS1	First address line	VARCHAR2(255)
37	ADDRESS2	Second address line	VARCHAR2(255)
38	ADDRESS3	Third address line	VARCHAR2(255)
39	CITY	City	VARCHAR2(255)
40	OWNER_STATEAB	State abbreviation	VARCHAR2(255)
41	ZIP_CD	Zip code	VARCHAR2(255)
42	PROVINCE	Canadian province	VARCHAR2(255)
43	COUNTRY	Country	VARCHAR2(255)
44	PHONE1	Phone number 1	VARCHAR2(255)
45	PHONE1_EXT	Phone number 1 extension	NUMBER(22)
46	PHONE1_TYPE_CD	Phone number 1 type code	VARCHAR2(255)
47	PHONE2	Phone number 2	VARCHAR2(255)
48	PHONE2_EXT	Phone number 2 extension	NUMBER(22)
49	PHONE2_TYPE_CD	Phone number 2 type code	VARCHAR2(255)
50	EMAIL	Email address	VARCHAR2(255)
51	COMPANY_PNWRS	Company	VARCHAR2(255)
52	JOB_TITLE_PNWRS	Job title of company contact	VARCHAR2(255)
53	OWNER_ATTEN_PNWRS	Mailing label attention line	VARCHAR2(255)
54	AGENCY	Public agency	VARCHAR2(255)
55	MANAGEMENT_UNIT	Agency or company management unit	VARCHAR2(255)
56	OWNER_TYPE_CD	Owner type code	VARCHAR2(255)
57	CONTACT_NAME	Contact name	VARCHAR2(255)
58	CONTACT_METHOD_CD	How contact was made	VARCHAR2(255)
59	NOTES	Notes on ownership	VARCHAR2(255)
60	NWOS_CYCLE	NWOS cycle	NUMBER(22)
61	NWOSYR	NWOS survey year	NUMBER(22)
62	ORIGIN	Record source	VARCHAR2(255)
63	ORIGIN_DETAILS	Details of record source	VARCHAR2(255)
64	ORIGIN_OTHER_REASON	Record source information	VARCHAR2(255)
65	PARCEL_AC	Plot parcel acreage	BINARY_DOUBLE(8)
66	PARCEL_WOOD_AC	Plot parcel woodland acreage	BINARY_DOUBLE(8)
67	CREATED_BY	Name of individual who created record	VARCHAR2(255)
68	CREATED_DATE	Date of record creation	DATE

Type of key	Column(s) order	Tables to link
Primary	(CN)	N/A
Foreign	(OWNER_CN)	PLOT_OWNER to OWNER

**NOTE:** Many of the fields in the plot owner table correspond to similar or identical fields in tables outside of the FS\_NWOS schema. More information on some of these fields can be found in Burrill et al. 2018.

1. CN  
Sequence number. A unique sequence number used to identify a plot owner record.
2. PLT\_CN  
Plot sequence number. For FIA field-based points, this is the corresponding sequence number from the PLOT table in NIMS/FIADB (Burrill et al. 2018) or UNIMS. For intensified points, this is a point-specific unique identification (id) that is generated from the NWOS intensification procedure.
3. COND\_CN  
Condition sequence number. For FIA field-based points<sup>7</sup>, this is the corresponding sequence number from the Condition table in NIMS/FIADB (Burrill et al. 2018) or UNIMS.
4. OWN\_CN  
Owner sequence number. For FIA field-based points, this is the corresponding sequence number from the Owner table in NIMS/FIADB (Burrill et al. 2018) or UNIMS. For intensified points, this is the owner-specific id field from the commercial vendor.
5. STATECD  
State code. Bureau of the Census Federal Information Processing Standards (FIPS) two-digit code for each State. Other geographies (cities, etc.) have unique NWOS-specific identifiers. Refer to Burrill et al. 2018 for more information.
6. STATECD\_NWOS  
State code, NWOS adjusted. This variable identifies those States that are split into multiple geographies (e.g., 48.1 and 48.2 for east and west Texas).
7. UNITCD  
Survey unit. FIA survey unit identification. Survey units are usually groups of counties within each State. For periodic inventories, survey units may be made up of lands of particular owners (for P2 plots). Refer to Burrill et al. 2018 for more information.
8. COUNTYCD  
County code. The identification number for a county, parish, watershed, borough, or similar governmental unit in a State. FIPS codes from the Bureau of the Census are used (for P2 plots). Refer to Burrill et al. 2018 for more information.

---

<sup>7</sup> Many variables are identified as being relevant to field-based (e.g., P2) plots only. For intensified points, these fields will generally be null.

9. **PLOT**  
Plot number. An identifier for a plot (for field plots).
10. **INVYR**  
Inventory year. The year that best represents when the inventory data were collected (for field plots). Refer to Burrill et al. 2018 for more information.
11. **PREV\_INVYR**  
Inventory year of previous plot record. The year that best represents when inventory data were last collected on this plot (for field plots).
12. **LATITUDE**  
Latitude. The latitude of the point in decimal degrees according to the NAD83 datum (EPSG:4269).
13. **LONGITUDE**  
Longitude. The longitude of the point in decimal degrees according to the NAD83 datum (EPSG:4269).
14. **P2PANEL**  
Phase 2 panel. For P2 plots, the value for P2PANEL ranges from 1 to 7 for annual inventories and is null for periodic inventories. A panel is a sample in which the same elements are measured on two or more occasions. Panels can be used to independently sample the population. For intensified points, panels are assigned randomly as part of the NWOS intensified procedure.
15. **INTENSITY**  
Plot intensity. For P2 plots, a code used to identify sampling intensity relative to a base grid of slightly more than 5,900 acres. At INTENSITY = 1, a single plot is located within each unit of the base grid.
16. **CONDID**  
Condition class id. This is a unique identifying number assigned to each condition on a plot. Only the first condition (CONDID=1) for each field plot is included in the NWOS sample (for field plots).
17. **COND\_STATUS\_CD**  
Condition status code. A code indicating the basic land cover. See Burrill et al. 2018 for more detail.

<b>Code</b>	<b>Description</b>
1	Forest land
2	Nonforest land
3	Noncensus water
4	Census water
5	Nonsampled

18. **COND\_ST\_REASON**  
Nonsampled reason code. A code indicating the reason a condition class was not sampled (for field plots). See Burrill et al. 2018 for more detail.

<b>Code</b>	<b>Description</b>
01	Outside U.S. boundary
02	Denied access area
03	Hazardous situation
05	Lost data
06	Lost plot
07	Wrong location
08	Skipped visit
09	Dropped intensified plot
10	Other
11	Ocean

#### 19. NONFOREST\_LAND\_USE\_CODE

Land use code for nonforest conditions. This field is currently null for all points other than points associated with urban studies.

<b>Code</b>	<b>Description</b>
100	Agricultural land
120	Pasture
130	Idle farmland
200	Rangeland
300	Developed
311	Residential
312	Multi-family residential
313	Institutional
314	Commercial
316	Cemetery
320	Rights-of-way
322	Utility
330	Recreation
331	Park
332	Golf courses
420	Wetland
900	Water
910	Nonsampled

#### 20. OWNCD

Owner class code. A code indicating the class in which the landowner (at the time of the physical inventory) belongs.

<b>Code</b>	<b>Description</b>
0	Undifferentiated public
11	National Forest System

12	National Grassland
13	Other Forest Service
21	National Park Service
22	Bureau of Land Management
23	Fish and Wildlife Service
24	Department of Defense/Energy
25	Other Federal
31	State
32	Local (county, municipal, etc.)
33	Other non-Federal public
41	Corporate
42	Nongovernmental conservation/natural resources organization
43	Unincorporated local partnership/association/club
44	Native American
45	Individual, family

21. OWNCD\_NWOS

Owner class code, NWOS adjusted. OWNCD as corrected as part of the NWOS cleaning procedures.

22. OWNGRPCD

Owner group code. A broader group of landowner classes (field plots). See Burrill et al. 2018.

23. OWNSUBCD

Owner sub-class code. An optional variable providing more resolution to OWNCDCD. Currently null.

24. FORINDCD

Forest industry code. For P2 points, a code indicating whether the landowner owns and operates a primary wood-processing plant in any commercial operation that conducts the primary processing of wood on a regular and continuing basis.

25. PSDS\_CN

FIA study sequence number. For P2 points, this is the corresponding sequence number from the generic plot-tagging (i.e., study) table in NIMS.

26. STUDY\_NAME

FIA study name. A study can refer to any group of plots that constitute a valid sample and which can be analyzed together. For P2 plots, the study is listed as "P2". For other points, this field is left null.

27. OWNERID

Owner identification. An identification field carried over from NIMS.

28. OWNER\_CN

Owner sequence number. Foreign key linking the plot owner record to the owner record.

29. CONDLIST\_SRS  
Condition list. A string containing all of the condition numbers associated with this owner.
30. INDUSTRIALCD  
Industrial private forest owner code. A code designating whether an owner is a large corporate owner.
31. MILLCD  
Mill code.
32. TIMOREITCD  
TIMO/REIT code. A code designating whether an ownership is a Timber Investment Management Organization (TIMO) or Real Estate Investment Trust (REIT).
33. COMPANY  
Company. Contact information for the ownership associated with the point.
34. FIRST\_NM  
First name. Contact information for the ownership associated with the point.
35. LAST\_NM  
Last name. Contact information for the ownership associated with the point.
36. ADDRESS1  
First address line. Contact information for the ownership associated with the point.
37. ADDRESS2  
Second address line. Contact information for the ownership associated with the point.
38. ADDRESS3  
Third address line. Contact information for the ownership associated with the point.
39. CITY  
City. Contact information for the ownership associated with the point.
40. OWNER\_STATEAB  
State abbreviation. Contact information for the ownership associated with the point.
41. ZIP\_CD  
Zip code. Contact information for the ownership associated with the point.
42. PROVINCE  
Canadian province. Contact information for the ownership associated with the point.
43. COUNTRY  
Country. Contact information for the ownership associated with the point.
44. PHONE1  
Phone number 1. Contact information for the ownership associated with the point.
45. PHONE1\_EXT  
Phone number 1 extension. Contact information for the ownership associated with the point.
46. PHONE1\_TYPE\_CD  
Phone number 1 type code. Contact information for the ownership associated with the point.
47. PHONE2  
Phone number 2. Contact information for the ownership associated with the point.

48. PHONE2\_EXT  
Phone number 2 extension. Contact information for the ownership associated with the point.
49. PHONE2\_TYPE\_CD  
Phone number 2 type code. Contact information for the ownership associated with the point.
50. EMAIL  
Email address. Contact information for the ownership associated with the point.
51. COMPANY\_PNWRS  
Company. Additional contact information for points measured by FIA-PNWRS.
52. JOB\_TITLE\_PNWRS  
Job title of company contact. Additional contact information for points measured by FIA-PNWRS.
53. OWNER\_ATTEN\_PNWRS  
Attention line for mailing label. Additional contact information for points measured by FIA-PNWRS.
54. AGENCY  
Public agency.
55. MANAGEMENT\_UNIT  
Agency or company management unit.
56. OWNER\_TYPE\_CD  
Owner type code.
57. CONTACT\_NAME  
Contact name.
58. CONTACT\_METHOD\_CD  
How contact was made. A variable indicating how the original contact was made (phone, in person, email, etc.)
59. NOTES  
Notes on ownership.
60. NWOS\_CYCLE  
NWOS cycle.
61. NWOSYR  
NWOS survey year.
62. ORIGIN  
Record source. Variable identifying whether record was derived from base FIA plots, urban FIA plots, or other source.
63. ORIGIN\_DETAILS  
Details of record source.
64. ORIGIN\_OTHER\_REASON  
Record source information. Where ORIGIN = other, this variable provided further information regarding the intention behind acquiring the record.
65. PARCEL\_AC  
Plot parcel acreage. The acreage of the parcel that contains this sample point.

66. PARCEL\_WOOD\_AC

Plot parcel woodland acreage. The wooded acreage of the parcel that contains this sample point.

67. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

68. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Owner table (Oracle table name is FS\_NWOS.OWNER)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	OWNCD_NWOS	Owner code, NWOS adjusted	NUMBER(22)
3	INDUSTRIALCD_NWOS	Industrial private forest owner code, NWOS adjusted	NUMBER(22)
4	MAILSTATUS	A variable designating whether an ownership should be contacted or not	NUMBER(22)
5	COMPANY	Company	VARCHAR2(255)
6	FIRST_NM	First name	VARCHAR2(255)
7	LAST_NM	Last name	VARCHAR2(255)
8	FIRST_LABEL_LINE	First line of mailing label	VARCHAR2(255)
9	ADDRESS1	First address line	VARCHAR2(255)
10	ADDRESS2	Second address line	VARCHAR2(255)
11	ADDRESS3	Third address line	VARCHAR2(255)
12	CITY	City	VARCHAR2(255)
13	STATEAB	State abbreviation	VARCHAR2(255)
14	ZIP_CD	Address, zip code	VARCHAR2(255)
15	PROVINCE	Address, Canadian province	VARCHAR2(255)
16	COUNTRY	Address, country	VARCHAR2(255)
17	PHONE1	Phone number 1	VARCHAR2(255)
18	PHONE1_EXT	Phone number 1 extension	NUMBER(22)
19	PHONE1_TYPE_CD	Phone number 1 type code	VARCHAR2(255)
20	PHONE2	Phone number 2	VARCHAR2(255)
21	PHONE2_EXT	Phone number 2 extension	NUMBER(22)
22	PHONE2_TYPE_CD	Phone number 2 type code	VARCHAR2(255)
23	EMAIL	Email address	VARCHAR2(255)
24	AGENCY	Public agency	VARCHAR2(255)
25	MANAGEMENT_UNIT	Agency or company management unit	VARCHAR2(255)
26	OWNER_TYPE_CD	Owner type code	VARCHAR2(255)
27	CONTACT_NAME	Contact name	VARCHAR2(255)
28	CONTACT_METHOD_CD	How contact was made	VARCHAR2(255)
29	CREATED_BY	Name of individual who created record	VARCHAR2(255)
30	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A

## 1. CN

Sequence number. A unique sequence number used to identify an owner record.

## 2. OWNCD\_NWOS

Owner class code, NWOS adjusted. A code indicating the class in which the landowner (at the time of the physical inventory) belongs.

<b>Code</b>	<b>Description</b>
0	Undifferentiated public
11	National Forest System
12	National Grassland
13	Other Forest Service
21	National Park Service
22	Bureau of Land Management
23	Fish and Wildlife Service
24	Department of Defense/Energy
25	Other Federal
31	State
32	Local (county, municipal, etc.)
33	Other non-Federal public
41	Corporate
42	Nongovernmental conservation/natural resources organization
43	Unincorporated local partnership/association/club
44	Native American (Indian)
45	Individual, family

## 3. INDUSTRIALCD\_NWOS

Industrial private forest owner code, NWOS adjusted. A binary code designating whether an owner is a large corporate owner (1) or not (0). Large corporate owners are defined as those owning an estimated 45,000 acres or more, nationally.

## 4. MAILSTATUS

A variable designating whether an ownership should be contacted or not.

<b>Code</b>	<b>Description</b>
1	contact
-2	do not contact (dead/refusal)
-3	bad address

## 5. COMPANY

Company.

## 6. FIRST\_NM

First name.

## 7. LAST\_NM

Last name.

8. FIRST\_LABEL\_LINE  
First line of mailing label. The ownership's name and/or company, formatted for the first line of a standard mailing label.
9. ADDRESS1  
First address line.
10. ADDRESS2  
Second address line.
11. ADDRESS3  
Third address line.
12. CITY  
City.
13. OWNER\_STATEAB  
State abbreviation.
14. ZIP\_CD  
Zip code.
15. PROVINCE  
Canadian province.
16. COUNTRY  
Country.
17. PHONE1  
Phone number 1.
18. PHONE1\_EXT  
Phone number 1 extension.
19. PHONE1\_TYPE\_CD  
Phone number 1 type code.
20. PHONE2  
Phone number 2.
21. PHONE2\_EXT  
Phone number 2 extension.
22. PHONE2\_TYPE\_CD  
Phone number 2 type code.
23. EMAIL  
Email address.
24. AGENCY  
Public agency.
25. MANAGEMENT\_UNIT  
Agency or company management unit.
26. OWNER\_TYPE\_CD  
Owner type code.
27. CONTACT\_NAME  
Contact name.

28. CONTACT\_METHOD\_CD

How contact was made. A variable indicating how the original contact was made (phone, in person, email, etc.)

29. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

30. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Sample table (Oracle table name is FS\_NWOS.SAMPLE)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	NWOS_CYCLE	NWOS cycle	NUMBER(22)
3	NWOSYR	NWOS survey year	NUMBER(22)
4	STATECD_NWOS	State code, NWOS adjusted	VARCHAR2(255)
5	NWOS_STUDY	Name of NWOS study to which sample is assigned	VARCHAR2(255)
6	OWNER_CN	Owner sequence number	VARCHAR2(255)
7	CREATED_BY	Name of individual who created record	VARCHAR2(255)
8	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Unique	(NWOS_STUDY, NWOS_CYCLE, STATECD_NWOS, OWNER_CN)	N/A
Foreign	(OWNER_CN)	SAMPLE to OWNER

1. CN  
Sequence number. A unique sequence number used to identify a sample record.
2. NWOS\_CYCLE  
NWOS cycle. The final year of the (nominal or actual) 5-year cycle for this sample unit.
3. NWOSYR  
NWOS survey year. The measurement year for this sample unit.
4. STATECD\_NWOS  
State code, NWOS adjusted. A unique identifier for each spatial survey unit (cities and other spatial units as well as State). At the State level, the code corresponds to the FIPS code, with some States broken into multiple units (designated by a period followed by an integer).
5. NWOS\_STUDY  
Name of NWOS study to which sample is assigned. The study of which the sample unit is a part.
6. OWNER\_CN  
Owner sequence number. Foreign key linking the sample unit record to the ownership record.
7. CREATED\_BY  
Name of individual who created record. The employee or associate who created the record.

8. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Contacts table (Oracle name is FS\_NWOS.CONTACTS)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	SAMPLE_CN	SAMPLE sequence number	VARCHAR2(255)
3	NWOS_CYCLE	NWOS cycle	NUMBER(22)
4	DATE	Date of contact	DATE
5	MODE	Mode of communication	VARCHAR2(255)
6	ACTION_CD	Action code	NUMBER(22)
7	DESCRIPTION	Description of contact	VARCHAR2(2000)
8	ADD_CON_INFO	Additional contact information	VARCHAR2(2000)
9	REASON_CD	Reason code	NUMBER(22)
10	CREATED_BY	Name of individual who created record	VARCHAR2(255)
11	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Foreign	(SAMPLE_CN)	CONTACTS to SAMPLE

1. CN  
Sequence number. A unique sequence number used to identify a contacts record.
2. SAMPLE\_CN  
Sample sequence number. Foreign key linking the contacts record to the sample record. May be left null where a contact was made with somebody outside of the sample.
3. NWOS\_CYCLE  
NWOS cycle. The final year of the (nominal or actual) 5-year cycle for this sample unit.
4. DATE  
Date of contact. Date that contact was first made.
5. MODE  
Mode of communication. How was contact first made (mail, phone, email)?
6. ACTION\_CODE  
Action code. Identifies whether a response is necessary or has been provided.

<b>Code</b>	<b>Description</b>
1	awaiting response
2	responded
3	no response needed

7. DESCRIPTION  
Description of contact. A brief description of why the contact was made, who initiated it, and how it was or when it will be resolved.

## 8. ADD\_CON\_INFORMATION

Additional contact information. Updated or alternative names, addresses, and other contact information.

## 9. REASON\_CODE

Reason code. A code indicating why the contact was made.

<b>Code</b>	<b>Description</b>
1	question regarding NWOS
2	request removal from survey
3	requests new survey
4	would like to see results from NWOS

## 10. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

## 11. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Response table (Oracle table name is FS\_NWOS.RESPONSE)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	SAMPLE_CN	Sample sequence number	VARCHAR2(255)
3	INSTRUMENT_TYPE	Type of survey instrument	VARCHAR2(255)
4	INSTRUMENT	Instrument code	VARCHAR2(255)
5	INSTRUMENT_NUMBER	Instrument number	VARCHAR2(255)
6	DATE_SENT	Date instrument mailed	DATE
7	DATE_RETURNED	Date instrument returned or completed	DATE
8	RESPONSE_CD	Response code	VARCHAR2(255)
9	NONRESPONSE_REASON	Reason response was not returned or deemed invalid	VARCHAR2(255)
10	CREATED_BY	Name of individual who created record	VARCHAR2(255)
11	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Foreign	(SAMPLE_CN)	RESPONSE to SAMPLE

1. CN  
Sequence number. A unique sequence number used to identify a response record.
2. SAMPLE\_CN  
Sample sequence number. Foreign key linking the response record to the sample record.
3. INSTRUMENT\_TYPE  
Type of survey instrument. Describes the survey mode associated with a response record (mail, phone, web, etc.).
4. INSTRUMENT  
Instrument code. An identifier for a particular instrument manifested within a particular mode.
5. INSTRUMENT\_NUMBER  
Instrument number. A unique identification number for an individual questionnaire, principally used for paper surveys, on which it is printed in numeric and barcode form. This is the number that is used to identify surveys as part of scanning and optical character recognition (OCR) processes. Previously called QUESTNUM.
6. DATE\_SENT  
Date instrument mailed. The date on which a survey is mailed or sent.
7. DATE\_RETURNED  
Date instrument returned or complete. The date on which a survey is returned (paper) or completed (phone or internet).

## 8. RESPONSE\_CD

Response code. A code identifying whether a survey was returned or completed and whether that return was valid or invalid.

Code	Description
0	nonresponse
1	response
-2	invalid response

## 9. NONRESPONSE\_REASON

Reason response was not returned or invalid. A code identifying the reason a survey was not returned (RESPONSE\_CD=0) or is invalid (RESPONSE\_CD=-2).

Code	Description
1	nonresponse, no survey returned
2	undeliverable
3	survey returned null or incomplete
4	survey appears to have been completed by someone else
5	deceased
6	refusal to participate
7	does not own minimum acreage of woodland
8	no land owned or land sold
9	not part of the sample (public land, FIA nonforest, etc.)
10	owner was previously determined to be deceased or had previously asked not to be contacted
11	insufficient data to mail
12	multiple surveys returned
13	wooded acreage was left null
14	excessive discrepancy between expected (i.e., point count) and reported acreage
15	survey administered for nonresponse analysis

## 10. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

## 11. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Quest metadata table (Oracle table name is FS\_NWOS.QUEST\_METADATA)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	QUESTION_NAME	Question name	VARCHAR2(255)
3	QUESTION_TEXT	Text of question	VARCHAR2(2000)
4	DATA_TYPE	Data type of question response	VARCHAR2(255)
5	RANGE	Acceptable response range	VARCHAR2(255)
6	UNITS_FACTORS	A string containing units or a factor key	VARCHAR2(2000)
7	ITEM_TYPE	Type of survey item	VARCHAR2(255)
8	CHECK_GROUP	Grouping variable for check bank questions	VARCHAR2(255)
9	SKIP_ROOT	For skip-pattern questions, CN of question root	VARCHAR2(255)
10	SKIP_TRIGGER	A vector of responses to SKIP_ROOT that trigger skip	VARCHAR2(255)
11	INST_LIST	A string containing a list of instrument codes that contain this question	VARCHAR2(2000)
12	CREATED_BY	Name of individual who created record	VARCHAR2(255)
13	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A

1. CN  
Sequence number. A unique sequence number used to identify a quest metadata record.
2. QUESTION\_NAME  
Question name. The short name of the question.
3. QUESTION\_TEXT  
Text of question. The text that appears in the survey instrument.
4. DATA\_TYPE  
Data type of question response. Types included numeric and character.
5. RANGE  
Acceptable response range. For continuous and categorical questions, the range of valid responses for the question.
6. UNITS\_FACTORS  
A string containing units or a factor key. A string containing either the units appropriate to the question (continuous variables) or else a verbal description of the factor levels (categorical variables).
7. ITEM\_TYPE  
Type of survey item. A code identifying broad types of survey items (i.e., questions).

**Code Description**

- |   |                                     |
|---|-------------------------------------|
| 1 | check one (including Likert scales) |
|---|-------------------------------------|

2	check all that apply
3	open-ended
4	text

8. CHECK\_GROUP

Grouping variable for check bank questions. An identifier for individual check bank items (ITEM\_TYPE = 2) that belong to the same question.

9. SKIP\_ROOT

For skip-pattern questions, CN of question root. If an individual item is a dependent question in a skip-pattern relationship, this field identifies the CN of the root question in the same relationship.

10. SKIP\_TRIGGER

A vector of responses to SKIP\_ROOT that trigger skip. A string containing all of the valid responses to the root question that would trigger a skip of the current questions.

11. INST\_LIST

A string containing the instrument identification (id) of all the instruments that contain this question. A semicolon-delimited string containing the ids. (RESPONSE.INSTRUMENT) of all instruments that contain this question.

12. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

13. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Quest table (Oracle table name is FS\_NWOS.QUEST)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	INSTRUMENT_NUMBER	Instrument number	VARCHAR2(255)
3	RESPONSE_CN	Response sequence number	VARCHAR2(255)
4	METADATA_CN	Metadata sequence number	VARCHAR2(255)
5	QUEST_NAME	Question name (annotation)	VARCHAR2(255)
6	RESPONSE_VALUE	Response to question	VARCHAR2(255)
7	CREATED_BY	Name of individual who created record	VARCHAR2(255)
8	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Unique	(RESPONSE_CN, METADATA_CN)	N/A
Foreign	(RESPONSE_CN)	QUEST to RESPONSE
	(METADATA_CN)	QUEST to QUEST_METADATA

1. CN  
Sequence number. A unique sequence number used to identify a quest record.
2. INSTRUMENT\_NUMBER  
Instrument number. The instrument number (RESPONSE.INSTRUMENT\_NUMBER) containing this question response. Previously called QUESTNUM.
3. RESPONSE\_CN  
Response sequence number. Foreign key linking the quest record to the response record.
4. METADATA\_CN  
Quest metadata sequence number. Foreign key linking the quest record to the quest metadata record.
5. QUEST\_NAME  
Question name. The short name of the question.  
(QUEST\_METADATA.QUESTION\_NAME). This matches the name found in the annotated version of the survey instrument.
6. RESPONSE\_VALUE  
The response to the question. Nonresponse is coded as -1; skips due to skip-pattern logic are coded as -2. Open-ended comment and text fields as coded with a 1 if text was provided by the response or 0 if the field was left null.
7. CREATED\_BY  
Name of individual who created record. The employee or associate who created the record.
8. CREATED\_DATE  
The date the record was created. Date will be in the format of DD-MON-YYYY.

**Quest text table (Oracle table name is FS\_NWOS.QUEST\_TEXT)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	INSTRUMENT_NUMBER	Instrument number	VARCHAR2(255)
3	RESPONSE_CN	RESPONSE sequence number	VARCHAR2(255)
4	METADATA_CN	QUEST_METADATA sequence number	VARCHAR2(255)
5	QUEST_CN	QUEST sequence number	VARCHAR2(255)
6	QUEST_NAME	Question name	VARCHAR2(255)
7	TEXT	Response text	VARCHAR2(2000)
8	CREATED_BY	Name of individual who created record	VARCHAR2(255)
9	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Unique	(RESPONSE_CN, METADATA_CN)	N/A
Foreign	(RESPONSE_CN)	QUEST to RESPONSE
	(METADATA_CN)	QUEST to QUEST_METADATA
	(QUEST_CN)	QUEST_TEXT to QUEST

1. CN  
Sequence number. A unique sequence number used to identify a quest text record.
2. INSTRUMENT\_NUMBER  
Instrument number. The instrument number (RESPONSE.INSTRUMENT\_NUMBER) containing this question response. Previously called QUESTNUM.
3. RESPONSE\_CN  
Response sequence number. Foreign key linking the quest record to the response record.
4. METADATA\_CN  
Quest metadata sequence number. Foreign key linking the quest record to the quest metadata record.
5. QUEST\_CN  
Quest sequence number. The foreign key linking the quest text record to the quest record.
6. QUEST\_NAME  
Question name. The short name of the question.(QUEST\_METADATA.QUESTION\_NAME). This matches the name found in the annotated version of the survey instrument.
7. TEXT  
Response text. The verbatim response to an open-ended comment or text field.

8. **CREATED\_BY**  
Name of individual who created record. The employee or associate who created the record.
9. **CREATED\_DATE**  
Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Modifications table (Oracle table name is FS\_NWOS.MODIFICATIONS)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	MOD_DATE	Date of modification	DATE
3	TABLE	Name of table modified	VARCHAR2(255)
4	RECORD	Name of record modified	VARCHAR2(255)
5	FIELD	Name of field modified	VARCHAR2(255)
6	NEW_DATUM	Value of new datum	VARCHAR2(255)
7	OLD_DATUM	Value of old datum	VARCHAR2(255)
8	DESCRIPTION	Description of modification	VARCHAR2(2000)
9	SCRIPT	File name of script or query file used	VARCHAR2(255)
10	CREATED_BY	Name of individual who created record	VARCHAR2(255)
11	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A

1. CN  
Sequence number. A unique sequence number used to identify a modification's record.
2. MOD\_DATE  
Date of modification. The date that the record was modified.
3. TABLE  
Name of table modified. The table in which one or more cells were modified.
4. RECORD  
Name of record modified. The CN of the record that was modified. If more than one record were modified, this field is left null.
5. FIELD  
Name of field modified. The field name of the record or records that were modified. If records in more than one field were modified, this field is left null.
6. NEW\_DATUM  
Value of new datum. The new (i.e., modified) value of the record or records. If the new value is null, the string "NULL" is recorded. If more than one record are modified and the new values are not identical, this field is left null.
7. OLD\_DATUM  
Value of old datum. The original (i.e., unmodified) value of the record or records. If the original value was null, the string "NULL" is recorded. If more than one record are modified and the old values are not identical, this field is left null.
8. DESCRIPTION  
Description of modification. A brief description of what was modified as well as the context for the modification.
9. SCRIPT  
File name of script or query file used. A string containing the file of the script that was

used to make the modification (if applicable). Scripts themselves are contained on the USDA Forest Service T drive.

10. CREATED\_BY

Name of individual who created record. The employee or associate who created the record.

11. CREATED\_DATE

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Notes table (Oracle table name is FS\_NWOS.NOTES)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	TABLE	Name of table	VARCHAR2(255)
3	TABLE_CN	CN of record in table which is being noted	VARCHAR2(255)
4	NOTES	Notes on record	VARCHAR2(2000)
5	CREATED_BY	Name of individual who created record	VARCHAR2(255)
6	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A

1. CN  
Sequence number. A unique sequence number used to identify a note's record.
2. TABLE  
Name of table. The table containing the record to which a note is being attached.
3. TABLE\_CN  
CN of record in table which is being noted. The sequence number of the record in the table to which a note is being attached.
4. NOTES  
Notes on record. The text of the note that is being attached to a record in a table.
5. CREATED\_BY  
Name of individual who created record. The employee or associate who created the record.
6. CREATED\_DATE  
Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Tables table (Oracle table name is FS\_NWOS.TABLES)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	TABLE_NAME	Table name	VARCHAR2(255)
3	DESCRIPTION	Description of table	VARCHAR2(2000)
4	TYPE	Type of table	VARCHAR2(255)
5	CREATED_BY	Name of individual who created record	VARCHAR2(255)
6	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A

1. CN  
Sequence number. A unique sequence number used to identify a table's record.
2. TABLE\_NAME  
Table name. The name of a table in the FS\_NWOS schema.
3. DESCRIPTION  
Description of table. A brief description of the table and its purpose within the FS\_NWOS schema.
4. TYPE  
Type of table. The table group containing the table.
5. CREATED\_BY  
Name of individual who created record. The employee or associate who created the record.
6. CREATED\_DATE  
Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Fields table (Oracle table name is FS\_NWOS.FIELDS)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	ISPK	Primary key status	VARCHAR2(255)
3	TABLE_CN	TABLES sequence number	VARCHAR2(255)
4	TABLE_NAME	Table name	VARCHAR2(255)
5	COLUMN	Position in table	NUMBER(22)
6	FIELD_NAME	Field name	VARCHAR2(255)
7	DESCRIPTION	Description of field	VARCHAR2(2000)
8	DATA_TYPE	The data type associated with this field	VARCHAR2(255)
9	UNIT	The measure unit associated with this field	VARCHAR2(255)
10	CODED	Indicates whether this is a coded field, with corresponding codes stored in CODES	VARCHAR2(255)
11	CREATED_BY	Name of individual who created record	VARCHAR2(255)
12	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Unique	(TABLE_NAME, FIELD_NAME)	N/A
Foreign	(TABLE_CN)	FIELDS to TABLES

1. CN  
Sequence number. A unique sequence number used to identify a field's record.
2. ISPK  
Primary key status. A field identifying whether the field is a primary key (1) or not (0).  
Primary keys are equivalent to sequence numbers (CNs).
3. TABLE\_CN  
TABLES sequence number. A foreign key linking the fields record to the tables record.
4. TABLE\_NAME  
Table name. The name of the table containing the field.
5. COLUMN  
Position in table. The column index of the field in its table.
6. FIELD\_NAME  
Field name. The name of the field (i.e., column).
7. DESCRIPTION  
Description of field. A short description of the purpose of the field.
8. DATA\_TYPE  
The data type associated with this field. The ORACLE data type of the field.
9. UNIT  
The measurement unit associated with the field. If the field is numeric, this field contains the associated unit. Otherwise, the field is generally left null.

**10. CODED**

Indicates whether this is a coded field. Corresponding codes are stored in the CODES table. This specifically does not include the field QUEST.RESPONSE\_VALUE, which has codes that vary depending on the value of QUEST.METADATA\_CN. Codes for this field are included in the QUEST\_METADATA table.

**11. CREATED\_BY**

Name of individual who created record. The employee or associate who created the record.

**12. CREATED\_DATE**

Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.

**Codes table (Oracle table name is FS\_NWOS.CODES)**

	<b>Column name</b>	<b>Descriptive name</b>	<b>Oracle data type</b>
1	CN	Sequence number	VARCHAR2(255)
2	TABLE_CN	TABLES sequence number	VARCHAR2(255)
3	TABLE_NAME	Table name	VARCHAR2(255)
4	FIELD_CN	FIELDS sequence number	VARCHAR2(255)
5	FIELD_NAME	Field name	VARCHAR2(255)
6	CODE	Code value	VARCHAR2(255)
7	MEANING	Meaning of code	VARCHAR2(2000)
8	CREATED_BY	Name of individual who created record	VARCHAR2(255)
9	CREATED_DATE	Date of record creation	DATE

<b>Type of key</b>	<b>Column(s) order</b>	<b>Tables to link</b>
Primary	(CN)	N/A
Unique	(TABLE_NAME, FIELD_NAME, CODE)	N/A
Foreign	(TABLE_CN)	CODES to TABLES
	(FIELD_CN)	CODES to FIELDS

1. CN  
Sequence number. A unique sequence number used to identify a code's record.
2. TABLE\_CN  
TABLES sequence number. The foreign key linking the code's record to the table's record.
3. TABLE\_NAME  
Table name. The name of the table containing the coded field.
4. FIELD\_CN  
FIELDS sequence number. The foreign key linking the code's record to the fields record.
5. FIELD\_NAME  
Field name. The name of the coded field.
6. CODE  
Code value. This is the actual value that is stored in the coded field.
7. MEANING  
Meaning of code. This is the conceptual meaning of the code that is stored in the coded field.
8. CREATED\_BY  
Name of individual who created record. The employee or associate who created the record.
9. CREATED\_DATE  
Date of record creation. The date the record was created. Date will be in the format of DD-MON-YYYY.