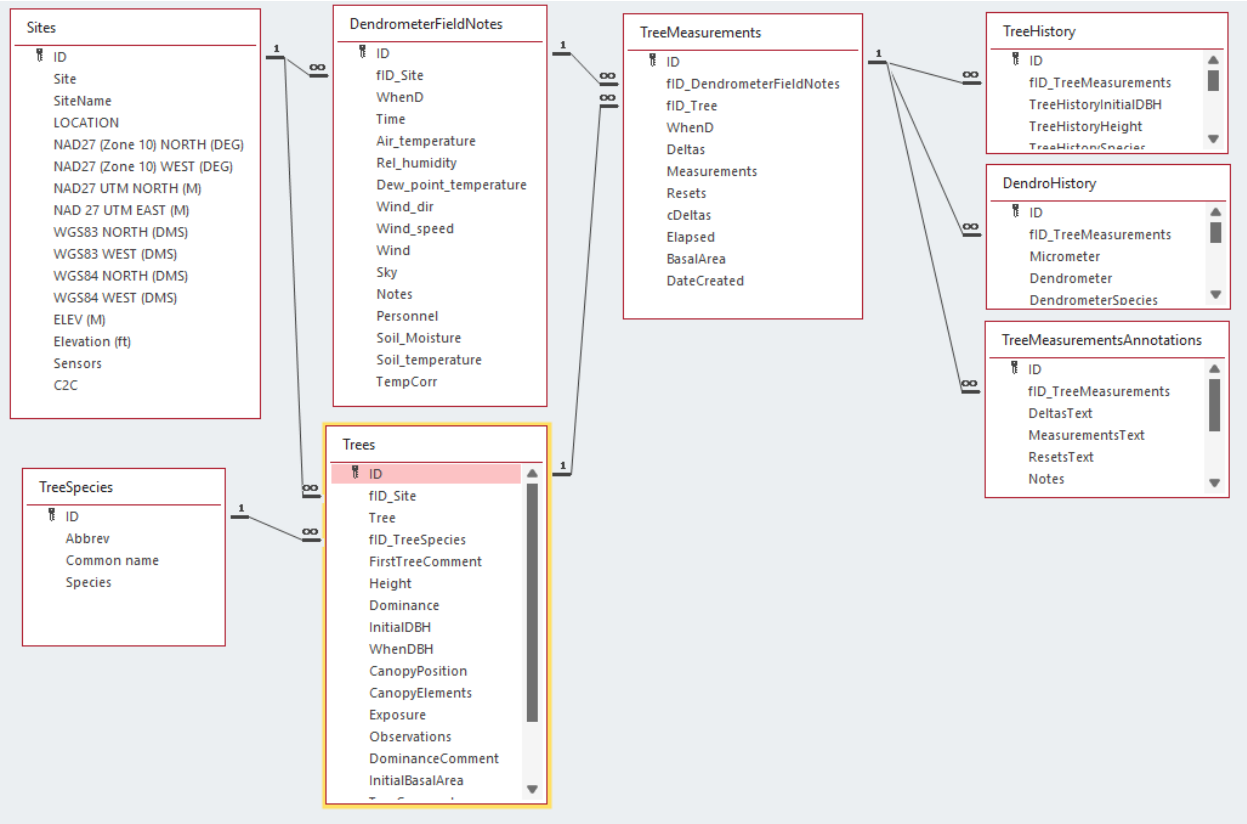
Information about the datasets for Crest to Coast forest monitoring

This project involved long-term monitoring of forest tree growth, meteorological measurements, and soil characteristics at study sites extending from Oregon's Cascades mountain range to the Coast range. There are two kinds of data associated with this project: dendrometer measurements recording changes in tree girth, and meteorological and soil data recorded at the tree study sites.

Dendrometer data:

The data are contained in an Access relational database, and it is recommended that the user view the relationships in the database to understand its structure. After opening the database, the relationships can be view by selecting the menu sequence Database Tools and clicking on the Relationships icon in the application ribbon.

Below is a screen shot of the major relationships in the dendrometer database:



The tables in the database are as follows:

1) **Sites**: Contains information about the sites visited during the study. Sites are referred to in other tables and data by short abbreviations. The abbreviations, full name of the sites, and their geographic coordinates are contained in this table.
2) **TreeSpecies**: This is a lookup table providing abbreviated and full names of the tree species that were measured.

3) **Trees**: This table holds information about the trees that were measured during the study, including tree number, site where the tree is located, and the tree species. Initial characteristics of the trees are also contained in this table, such as the first DBH (diameter at breast height), canopy type, etc.
4) **DendrometerFieldNotes**: This table contains a record for every date a site was visited during the study. The field *WhenD* holds the date of the site visit.
5) **TreeMeasurements**: This table holds the individual tree measurements recorded from the dendrometers. The field *Measurements* holds the dendrometer reading, and the field *Resets* records if the dendrometer was reset because it has reached the end of its scale. The fields *Deltas*, *cDeltas*, *Elapsed*, and *BasalArea* are calculated when data are processed using the Visual Basic routine CalcDelta, which is contained in the database.
6) **TreeHistory**: This table contains supplemental observations about a tree that were recorded during the site visits.
7) **DendroHistory**: This table contains supplemental information about the dendrometer used on the tree, such as the kind of dendrometer used.
8) **TreeMeasurementAnnotations**: This table contains the detections of individual trees in the study. This table, along with the TreeHistory and DendroHistory, contains any notes or remarks that were recorded on the datasheets. In some cases, these annotations were combined into a single comment.

The database also contains some forms that can be used to view and edit the data.

Meteorological data:

This data is referred to as meteorological data, although it contains information about soil characteristics at the study sites. The data are contained in a zip file, which contains individual Excel files. There is a file named *Sites.xlsx* that contains the same site information that is contained in the dendrometer database table *Sites*.

A wide variety of environmental sensors were used to collect this data. Documentation concerning the sensors is contained in the file *Crest to Coast sensors.xlsx*. Information in this file includes the sensor identification (abbreviation), the manufacturer, calibration records, and dates of sensor maintenance at the field sites.

The naming convention for the Excel files is that each file name begins with the site abbreviation, followed by ‘Surface’ or ‘Soil’ depending on whether the file contains surface observations (air temperature, rainfall, PAR, etc.) or soil data (soil temperature and moisture at various depths in cm). As an example, the file *CH14_Soil.xlsx* contains soil observations at Cascade Head Site 14. Weather instrumentation was placed in a tree canopy at some sites, and these file names are prefixed with *UC_*, e.g., the file *UC_CH14_Surface.xlsx* contains data from instruments mounted in the tree canopy at Cascade Head Site 14.

The structure of the sheets within each Excel file is identical for all sites, and are as in the following example:

1) Sheet *CH14_Soil_Variables* holds the variable names that were recorded at the site. Typically, the instrument that recorded the information is appended to the variable name. For example, the variable *Soil_temp_HP* holds information about soil temperature recorded by the Hydroprobe instrument.
2) The sheet *CH14_Soi_Field_Notes* provides information about the instrumentation installed at the site, including its identity, when it was installed, and the depth at which it was placed.
   a) The soil sensor depths are specified in multiple formats which are provided under the heading S*ensorLoc*. A single numerical value provides the sensor depth in centimeters. Some sensors were installed to record of a range of depths, and an example would be that a value of 60_80 indicates the sensor recorded information between depths of 60 and 80 centimeters. Soil scientists use a standard identification system to identify strata of soil, and these are given as AB, A2, etc. Finally, some depths were recorded as "Litter" (the leaf litter stratum) or "Surface" which is the top of the soil layer.
3) The sheet *CH14_Soil_Varinfo* contains summary statistics about each variable's data series. This includes the starting and ending dates and times of the data, the number of observations, the number of missing values, the data units, and the minimum and maximum observed values.
4) The following sheets hold the recorded data. Due to Excel limitations the data are broken down by years, with each year's data on a single sheet. The naming convention for these sheets includes the year, site, and type of data. For example, the sheet *_1999_CH14_Soil* holds the data recorded in 1999.
   a) The column headers in each of these sheets correspond to the variable names on the *CH14_Soil_Variables* sheet. There are three columns for each variable:
      i) The data itself, e.g. *Diode_temp_HP*.
      ii) A column where the letter *R* is prefixed to the variable name, e.g. *R_Diode_temp_HP*. This column provides a code to indicate why that data point was rejected. These codes are:
         (1) **I**: Data value identified as erroneous during initial data processing
         (2) **L**: Data value considered too low to be acceptable.
         (3) **H**: Data value considered too high to be acceptable.
         (4) **J**: Data value showed large jump from preceding value.
         (5) **R**: Ratio-scale data where the instrument reported a value slightly less than zero. Value changed to be zero. An example would be a PAR value less than zero that was recorded during early morning hours of darkness.
      iii) A column where the letter *O* is prefixed to the variable name, e.g. *O_Diode_temp_HP*. This column holds the original data value in the case where the original data was rejected.

The following pages were created using the Access Database Documenter utility, which provides detailed information about the contents of the database, including the characteristics of tables, their fields, and the relationships among tables.