## Appendix <mark>X.</mark> Focal Terrestrial Plant Communities Monitoring Protocol Database Documentation

The database for this project consists of three types of tables: core tables describing the "who, where, and when" of data collection, project-specific tables, lookup tables that contain domain constraints for other tables, and cross reference tables that link lookup tables with data tables. Although core tables are based on PACN standards, they may contain fields, domains or descriptions that have been added or altered to meet project objectives.

The database includes the following standard tables:

| | |
|---|---|
| tbl_Sites | Sample sites – location aggregates, i.e. individual parks. |
| tbl_Locations | Sampling frame locations – sampling areas within the parks. |
| tbl_Plot | Sampling frame plot locations. |
| tbl_Events | Data collection event for a given location. |
| tbl_QA_Results | Quality assurance query results for the working data set. |
| tbl_Edit_Log | Edit log for changes made to data after certification. |
| tbl_Images | Plot photo information linked to a sampling event. |

The following are project-specific data tables:

| | |
|---|---|
| tbl_Basal_Sprout | Sprout size data collected in recently disturbed sites for individuals that have been top killed and are alive only by basal sprouts. |
| tbl_Debris_Species | Individual species of dead downed wood and tree fern logs with a diameter >=7.6 cm at the point of planar intersection. |
| tbl_Lg_Woody_Individual | Tree density information collected for small trees (subalpine), large trees (forest, coastal, subalpine), and large tree ferns (forest). |
| tbl_Multiple_Boles | Bole DBH for trees that have multiple boles. |
| tbl_Presence | List of species present within plot. |
| tbl_Segment_Slope | Slope values for the different segments of a plot transect. |
| tbl_Sm_Woody_Tally | Foliar and rooting height class data tallied for seedlings and shrubs (forest, coastal, subalpine), small trees (forest, coastal), and small tree ferns (forest). |
| tbl_Tree_Canopy_Height | Tree canopy height data. |
| tbl_Understory_Cover | Understory cover species and substrate data along transects in coastal and forest communities. |
| tbl_Woody_Debris | Transect information on dead downed wood and tree fern logs with a diameter >=7.6 at the point of planar intersection. |

The following are standard lookup tables:

| | |
|---|---|
| tlu_Contacts | Contact data for project-related personnel. |
| tlu_Enumerations | Enumerated lookup table. |
| tlu_Species | Lookup table of plant species. |
| tlu_Points_Coastal | Point identification table for coastal plots. |
| tlu_Points_Forest | Point identification table for forest plots. |

The following are cross reference tables:

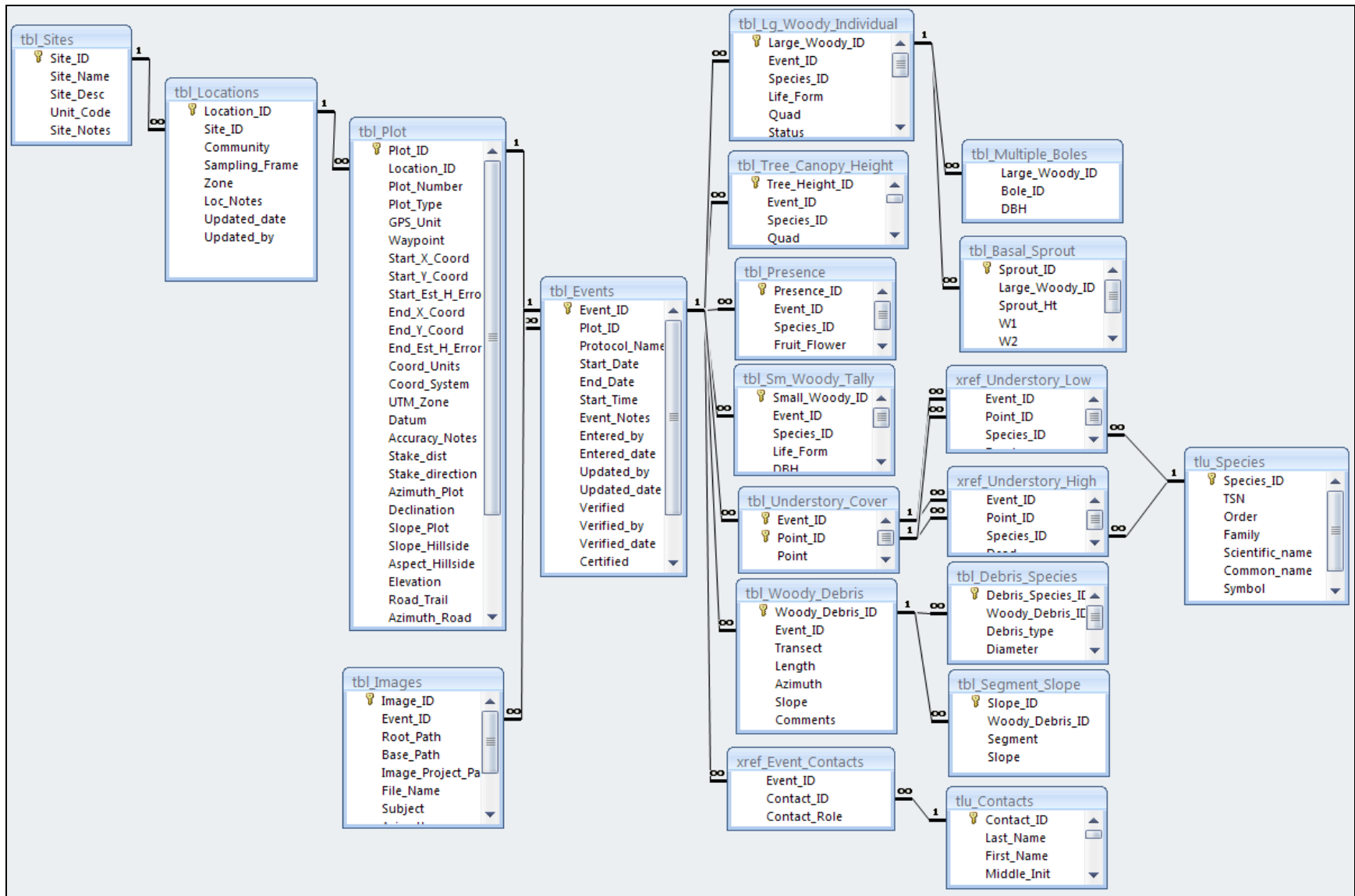| | |
|---|---|
| xref_Understory_High | Cross reference table between tbl_Understory and tlu_Species. Records at which points species less than 1 m tall were found. |
| xref_Understory_Low | Cross reference table between tbl_Understory and tlu_Species. Records at which points species 1 - 2 m tall were found. |
| xref_Event_Contacts | Cross-reference table between events and contacts. |
| xref_Park_Species_Nativity | Cross-reference table between parks and nativity of a species. |

Figure 1.  Entity Relationship Diagram of the project database.

## Database Tables

**tbl_Basal_Sprout** — **Sprout size data collected in recently disturbed sites for individuals that have been top killed and are alive only by basal sprouts.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Sprout_ID | Yes | Text | 50 | Unique record identifier |
| Area | No | Double | 8 | Sprout elliptical crown area calculated frm W1 and W2 distances |
| Large_Woody_ID | No | Text | 50 | Link to tbl_Lg_Woody_Individual |
| Sprout_Ht | No | Long Integer | 4 | The longest basal sprout per tree (cm) measured from the base to the apical meristem |
| Volume | No | Double | 8 | Sprout crown volume (cm3) calculated by multiplying the height of the tallest sprout by the elliptical crown area. |
| W1 | No | Long Integer | 4 | Widest horizontal distance (cm) or maximum diameter across the sprout crown |
| W2 | No | Long Integer | 4 | Perpendicular diameter to W1 horizontal distance (cm) across the sprouts |

**tbl_Debris_Species** — **Individual species of dead downed wood and tree fernn logs with a diameter >=7.6 cm at the point of planar intersection.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Debris_Species_ID | Yes | Text | 50 | Unique record identifier |
| Comments | No | Memo | 0 | Comments about debris species. |
| Debris_type | No | Text | 10 | Debris type, i.e. wood or tree fern. |
| Decay_Class | No | Text | 6 | Decay class of the woody debris, i.e. sound or rotten. |
| Diameter | No | Double | 8 | Diameter of woody debris |
| Woody_Debris_ID | No | Text | 50 | Link to tbl_Woody_Debris |

**tbl_Edit_Log** — **Edit log for changes made to data after certification.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Data_edit_ID | Yes | Text | 50 | Unique identifier for each data edit record |
| Data_edit_notes | No | Memo | 0 | Comments about the data edits |
| Edit_date | No | Date/Time | 8 | Date on which the edits took place |
| Edit_reason | No | Text | 100 | Brief description of the reason for edits |
| Edit_type | No | Text | 12 | Type of edits made: deletion, update, append, reformat, tbl design |

| | No | Text | 200 | Description of the fields affected |
|---|---|---|---|---|
| Fields_affected | No | Text | 200 | Description of the fields affected |
| Records_affected | No | Text | 200 | Description of the records affected |
| Table_affected | No | Text | 50 | Table affected by edits |
| User_name | No | Text | 50 | Name of the person making data edits |

## tbl_Events      Data collection event for a given location.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Event_ID | Yes | Text | 50 | Unique record identifier |
| Certified | No | Boolean | 1 | If the data is certified |
| Certified_by | No | Text | 50 | Who certified the data |
| Certified_date | No | Date/Time | 8 | When the data was certified |
| End_Date | No | Date/Time | 8 | Ending date for the event |
| Entered_by | No | Text | 50 | Who entered the data |
| Entered_date | No | Date/Time | 8 | When the data was entered |
| Event_Notes | No | Memo | 0 | Notes about the sampling event |
| Plot_ID | No | Text | 50 | Link to tbl_Plots |
| Protocol_Name | No | Text | 100 | The name or code of the protocol governing the event |
| QA_notes | No | Memo | 0 | Notes about the quality assurance procedure |
| Start_Date | No | Date/Time | 8 | Starting date for the event |
| Start_Time | No | Date/Time | 8 | Starting time for the event |
| Updated_by | No | Text | 50 | Who updated the data |
| Updated_date | No | Date/Time | 8 | When the data was updated |
| Verified | No | Boolean | 1 | If the data is verified |
| Verified_by | No | Text | 50 | Who verified the data |
| Verified_date | No | Date/Time | 8 | When the data was verified |

## tbl_Images      Plot photo information linked to a sampling event.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Image_ID | Yes | Text | 50 | Unique record identifier for image records |
| Azimuth | No | Long Integer | 4 | The azimuth from the plot origin that the photo was taken |
| Base_Path | No | Text | 255 | The base file path for the linked image file.  This will stay the same no matter where the root folder is. |

| | | | | |
|---|---|---|---|---|
| Camera_Type | No | Text | 50 | The camera type used to take photo |
| Comments | No | Memo | 0 | Any additional information about the photo, i.e. camera type, lens, ASA. |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| File_Name | No | Text | 50 | The file name |
| Image_Project_Path | No | Text | 255 | Location of the image from the main project folder or image library |
| Root_Path | No | Text | 255 | The root path for the linked image file. This will change upon re-linking of database. |
| Subject | No | Text | 50 | The subject of the photo |
| Time | No | Date/Time | 8 | The time the photo was taken |

### tbl_Lg_Woody_Individual  Tree density information collected for small trees (subalpine), large trees (forest, coastal, subalpine), and large tree ferns (forest).

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Large_Woody_ID | Yes | Text | 50 | Unique record identifier |
| Boles | No | Long Integer | 4 | The number of tree trunks |
| Comments | No | Memo | 0 | Any additional comments about the species |
| DBH | No | Double | 8 | The diameter of the tree measured to the nearest tenth of a centimeter, or the total DBH of multiple boles. |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Foliar | No | Text | 2 | The foliar height class |
| Fruit_Flower | No | Boolean | 1 | Is the plant fruiting or flowering? |
| Height | No | Double | 8 | Height of the tree, only populated for dead trees (snags) |
| Life_Form | No | Text | 15 | The life form of the species; i.e. seedling, shrub, small tree, etc. |
| Quad | No | Text | 255 | The quad number the species was found in. |
| Rooting | No | Text | 2 | The rooting height class of the tree |
| Species_ID | No | Text | 50 | Link to tlu_Species |
| Status | No | Text | 4 | Is the tree live or dead? |
| Stem_Length | No | Double | 8 | The stem length measured to the nearest tenth of a meter |
| Vigor | No | Text | 2 | The vigor class of the tree |

## tbl_Locations — Sampling frame locations – sampling areas within the parks.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Location_ID | Yes | Text | 50 | Unique record identifier |
| Community | No | Text | 50 | Focal community type; i.e. wet forest, subalpine shrubland, coastal, limestone forest, mangrove wetland |
| Loc_Notes | No | Memo | 0 | General notes on the location |
| Sampling_Frame | No | Text | 100 | Name of the sampling frame |
| Site_ID | No | Text | 50 | Link to tbl_Sites |
| Updated_by | No | Text | 50 | Who updated the Location information |
| Updated_date | No | Date/Time | 8 | Date of entry or last change |
| Zone | No | Text | 50 | Name of the zone if applicable |

## tbl_Multiple_Boles — Bole DBH for trees that have multiple boles.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Bole_ID | No | Text | 50 | The identification of the bole (1, 2, top, etc.) |
| DBH | No | Double | 8 | The diameter of the bole measured to the nearest tenth of a centimeter. |
| Large_Woody_ID | No | Text | 50 | Link to tbl_Lg_Woody_Individual |

## tbl_Plot — Sampling frame plot locations.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Plot_ID | Yes | Text | 50 | Unique record identifier |
| Accuracy_Notes | No | Text | 255 | Positional accuracy notes |
| Aspect_Hillside | No | Text | 50 | Direction the hillside is facing |
| Azimuth_Plot | No | Long Integer | 4 | Azimuth of the plot origin |
| Azimuth_Road | No | Text | 50 | Azimuth where road and trail is left to access plot |
| Coord_System | No | Text | 50 | Coordinate system |
| Coord_Units | No | Text | 50 | Coordinate distance units |
| Datum | No | Text | 5 | Datum of mapping ellipsoid |
| Declination | No | Double | 8 | Declination of the plot origin |
| Elevation | No | Long Integer | 4 | Elevation of the plot origin |
| End_Est_H_Error | No | Single | 4 | Estimated horizontal accuracy for ending coordinates |
| End_X_Coord | No | Double | 8 | The X coordinate for the end of the plot |
| End_Y_Coord | No | Double | 8 | The Y coordinate for the end of the plot |

| GPS_Unit | No | Text | 255 | What GPS unit was used to collect the plot coordinates |
|---|---|---|---|---|
| Location_ID | No | Text | 50 | Link to tbl_Locations |
| Plot_created_date | No | Date/Time | 8 | Time stamp for record creation |
| Plot_discontinued | No | Date/Time | 8 | Date the plot was discontinued |
| Plot_established | No | Date/Time | 8 | Date the plot was established |
| Plot_Notes | No | Memo | 0 | Any additional information about the plot; i.e problems encountered, changes, etc. |
| Plot_Number | No | Long Integer | 4 | Plot identification number |
| Plot_Type | No | Text | 50 | What type of plot it is, i.e. fixed or rotational |
| Plot_updated | No | Date/Time | 8 | Date of the last update to this record |
| Plot_updated_by | No | Text | 50 | Person who made the most recent edits |
| Road_Trail | No | Text | 255 | Road and trail used to travel to the plot |
| Route | No | Memo | 0 | The route to the plot.   Includes plot layout and any reference features used to access the plot |
| Slope_Hillside | No | Long Integer | 4 | Percent slope along hillside |
| Slope_Plot | No | Long Integer | 4 | Percent slope along center transect azimuth |
| Stake_direction | No | Long Integer | 4 | Stake offset direction in degrees |
| Stake_dist | No | Long Integer | 4 | Stake offset distance in centimeters |
| Start_Est_H_Error | No | Single | 4 | Estimated horizontal accuracy for starting coordinates |
| Start_X_Coord | No | Double | 8 | The X coordinate for the start of the plot |
| Start_Y_Coord | No | Double | 8 | The Y coordinate for the start of the plot |
| UTM_Zone | No | Text | 50 | UTM Zone |
| Waypoint | No | Text | 50 | GPS waypoint |

**tbl_Presence**          **List of species present within plot.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Presence_ID | Yes | Text | 50 | Unique record identifier |
| Comments | No | Memo | 0 | Any additional comments about the species |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Fruit_Flower | No | Boolean | 1 | Is the plant fruiting or flowering? |
| Species_ID | No | Text | 50 | Link to tlu_Species |

**tbl_QA_Results**  **Quality assurance query results for the working data set**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Is_done | No | Boolean | 1 | No description |
| QA_user | No | Text | 50 | Name of the person doing quality assurance |
| Query_description | No | Memo | 0 | Description of the query |
| Query_expression | No | Memo | 0 | Evaluation expression built into the query |
| Query_name | No | Text | 100 | Name of the quality assurance query |
| Query_result | No | Text | 50 | Query result as the number of records returned the last time the query was run |
| Query_run_time | No | Date/Time | 8 | Run time of the query results |
| Query_type | No | Text | 20 | Severity of data errors being trapped: 1=critical, 2=warning, 3=information |
| Remedy_date | No | Date/Time | 8 | When the remedy description was last edited |
| Remedy_desc | No | Memo | 0 | Details about actions taken and/or not taken to resolve errors |
| Time_frame | No | Text | 30 | Field season year or range of dates for the data being passed through quality assurance checks |

**tbl_Segment_Slope**  **Slope values for the different segments of a plot transect.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Slope_ID | Yes | Text | 50 | Unique record identifier |
| Segment | No | Text | 255 | Slope segment length |
| Slope | No | Long Integer | 4 | Slope of the segment |
| Woody_Debris_ID | No | Text | 255 | Link to tbl_Woody_Debris |

**tbl_Sites**  **Sample sites – location aggregates, i.e. individual parks.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Site_ID | Yes | Text | 50 | Unique record identifier |
| Site_Desc | No | Text | 255 | Description for a site |
| Site_Name | No | Text | 100 | Unique name or code for a site |
| Site_Notes | No | Memo | 0 | General notes on the site |
| Unit_Code | No | Text | 12 | Park, Monument or Network code |

**tbl_Sm_Woody_Tally**  **Foliar and rooting height class data tallied for seedlings and shrubs (forest, coastal, subalpine), small trees (forest, coastal), and small tree ferns (forest).**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Small_Woody_ID | Yes | Text | 50 | Unique record identifier |

| | | | | |
|---|---|---|---|---|
| Comments | No | Memo | 0 | Any additional comments about the species |
| Count | No | Long Integer | 4 | The count of the species observed for the height class |
| DBH | No | Text | 10 | The DBH class of small trees. |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Foliar | No | Text | 2 | The foliar height class |
| Life_Form | No | Text | 15 | The life form of the species; i.e. seedling, shrub, small tree, etc. |
| Rooting | No | Text | 2 | The rooting height class of the tree |
| Species_ID | No | Text | 50 | Link to tbl_Species |
| Status | No | Text | 4 | Is the tree live or dead? |

## tbl_Tree_Canopy_Height    Tree canopy height data.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Tree_Height_ID | Yes | Text | 50 | Unique record identifier |
| Base | No | Long Integer | 4 | Base percent, used to calculate canopy height if clinometer is used |
| Base_ht | No | Double | 8 | The height of the base of the tree (meters) that is used for the canpoy height calculation |
| Comments | No | Memo | 0 | Any additional comments about the tree canopy height |
| DBH | No | Double | 8 | Diameter basal height |
| Distance | No | Double | 8 | Distance, used to calculate canopy height if clinomete is used |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Height | No | Double | 8 | Height of the canopy |
| Method | No | Text | 50 | Method used to record canopy height; i.e. measuring rod, clinometer, occular estimate, other |
| Quad | No | Text | 255 | The quad number the species was found in. |
| Species_ID | No | Text | 50 | Link to tlu_Species |
| Status | No | Text | 4 | Is the tree live or dead? |
| Top | No | Long Integer | 4 | Top percent, used to calculate canopy height if clinometer is used |

## tbl_Understory_Cover    Understory cover species and substrate data along transects in coastal and forest communities.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Point_ID | Yes | Text | 50 | Link to tlu_Points |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Point | No | Long Integer | 4 | The point where the understory was observed |
| Substrate | No | Text | 50 | The substrate that the understory is growing on |

**tbl_Woody_Debris**      **Transect information on dead downed wood and tree fern logs with a diameter >=7.6 at the point of planar intersection.**

| Field | Primary? | Data Type | Size | Description |
|-------|----------|-----------|------|-------------|
| Woody_Debris_ID | Yes | Text | 50 | Unique record identifier |
| Azimuth | No | Long Integer | 4 | Azimuth of the transect |
| Comments | No | Memo | 0 | Comments on the woody debris transect |
| Event_ID | No | Text | 50 | Link to tbl_Events |
| Length | No | Text | 255 | Length of the transect. For all forest and shrubland plots, will be either 50 or 20 meters. For coastal plots, will be either 20 or 10 meters. |
| Slope | No | Long Integer | 4 | Slope of the transect |
| Transect | No | Text | 2 | Transect number |

**tlu_Contacts**      **Contact data for project-related personnel.**

| Field | Primary? | Data Type | Size | Description |
|-------|----------|-----------|------|-------------|
| Contact_ID | Yes | Text | 50 | Unique record identifier |
| Active | No | Boolean | 1 | Allows users to choose which names show up in the drop down list |
| Address | No | Text | 50 | Street address |
| Address_Type | No | Text | 50 | Address (mailing, physical, both) type |
| Address2 | No | Text | 50 | Address line 2, suite, apartment number |
| Cell_Phone | No | Text | 50 | Cell phone number |
| City | No | Text | 50 | City or town |
| Contact_created | No | Text | 50 | Date the contact record was created |
| Contact_Location | No | Text | 255 | Contact's work location |
| Contact_Notes | No | Memo | 0 | Contact notes |
| Contact_updated | No | Date/Time | 8 | Date the contact recorcd was updated |
| Country | No | Text | 50 | Country |
| Email_Address | No | Text | 50 | E-mail address |
| Fax_Number | No | Text | 50 | Fax number |
| First_Name | No | Text | 50 | First name |
| Initials | No | Text | 50 | Three letter initials of observer |
| Last_Name | No | Text | 50 | Last name |
| Middle_Init | No | Text | 4 | Middle initial |
| Organization | No | Text | 50 | Organization or employer |
| Position_Title | No | Text | 50 | Title or position description |
| State_Code | No | Text | 8 | State or province |
| Work_Extension | No | Text | 50 | Phone extension |

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Work_Phone | No | Text | 50 | Phone number |
| Zip_Code | No | Text | 50 | Zip code |

### tlu_Enumerations — Enumerated lookup table.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Enum_Group | Yes | Text | 50 | Category for lookup value |
| Enum_Code | No | Text | 50 | Code for lookup values |
| Enum_Description | No | Memo | 0 | Lookup value description |
| Sort_Order | No | Integer | 2 | Order in which to sort lookup values |

### tlu_Points_Coastal — Point identification table for coastal plots.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Point_ID | Yes | Text | 50 | Unique record identifier |
| Point | No | Long Integer | 4 | Point identification |
| Tape | No | Text | 50 | Distance in meters from the start of the transect |
| Transect | No | Long Integer | 4 | Transect identification |

### tlu_Points_Forest — Point identification table for forest plots.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Point_ID | Yes | Text | 50 | Unique record identifier |
| Point | No | Long Integer | 4 | Point identification |
| Tape | No | Text | 50 | Distance in meters from the start of the transect |
| Transect | No | Long Integer | 4 | Transect identification |

### tlu_Species — Master look-up table for plant species names and taxonomic information.  Derived from NPSpecies.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Species_ID | Yes | Text | 50 | No description |
| Code | No | Text | 255 | 6 letter code to identify the plant species.  First 3 letters of genus and the first 3 letters of species. |
| Common_name | No | Text | 255 | No description |
| Family | No | Text | 255 | No description |
| Order | No | Text | 255 | No description |
| Scientific_name | No | Text | 255 | No description |
| Symbol | No | Text | 255 | No description |
| TSN | No | Double | 8 | No description |

### xref_Event_Contacts — Cross-reference table between events and contacts.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Contact_ID | No | Text | 50 | Link to tlu_Contacts |
| Contact_Role | No | Text | 50 | The contact's role in the protocol |

| | | | | |
|---|---|---|---|---|
| Event_ID | No | Text | 50 | Link to tbl_Events |

### xref_Understory_High

**Cross reference table between tbl_Understory and tlu_Species. Records at which points species less than 1 m tall were found.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Dead | No | Boolean | 1 | Is the species dead? |
| Event_ID | No | Text | 50 | Together with Point_ID, a link to tbl_Understory |
| Point_ID | No | Text | 50 | Together with Event_ID, a link to tbl_Understory |
| Species_ID | No | Text | 50 | Link to tlu_Species |

### xref_Understory_Low

**Cross reference table between tbl_Understory and tlu_Species. Records at which points species 1 - 2 m tall were found.**

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Dead | No | Boolean | 1 | Is the species dead? |
| Event_ID | No | Text | 50 | Together with Point_ID, a link to tbl_Understory |
| Point_ID | No | Text | 50 | Together with Event_ID, a link to tbl_Understory |
| Species_ID | No | Text | 50 | Link to tlu_Species |

### xref_Park_Species_Nativity    Cross-reference table between parks and nativity of a species.

| Field | Primary? | Data Type | Size | Description |
|---|---|---|---|---|
| Nativity | No | Text | 255 | Nativity of the species |
| Park | No | Text | 255 | 4 letter park abbreviation |
| TSN | No | Double | 8 | Taxonomic serial number of the species |