



Multi-Network Exotic Plant Monitoring Protocol

*A Collaboration Among The Southern Plains, Sonoran Desert,
and Chihuahuan Desert Networks*

Standard Operating Procedures Version 1.00

Natural Resource Report NPS/SOPN/NRR—2016/1304.1



ON THE COVER

Cheatgrass Infestation

Photograph by: Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

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Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks
Exotic Plant Monitoring Protocol

SOP #01: Field Preparation and Equipment List

Version 1.0
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This Standard Operating Procedure reviews tasks to be accomplished in preparation for a field season and itemizes the equipment needed to perform exotic plant monitoring in all parks of the Southern Plains, Chihuahuan Desert and Sonoran Desert Networks. There are numerous tasks that must be performed to ensure a smooth and efficient field season, including generating and copying sufficient data sheets for the year, making appropriate logistical plans, and purchasing necessary equipment and supplies to provision the field effort. The equipment list can also be used at the end of field season to verify that all equipment is present and accounted for.

Prior to the field efforts each year, the crew members must review this entire protocol, including all of the SOPs. It is important that each member of the field crew is thoroughly familiar with the elements of the design and standard operating procedures for this program.

The suite of tasks involved in preparing for a field sampling effort include:

1. Preparation of Data Sheets and Mobile Devices
 - Acquire a list of vectors to be monitored for each park from the Principle Investigator (PI).
 - Review previous field forms for these vectors and assemble copies of the existing data needed for the upcoming season. These will include a park map of vectors and notes regarding vector hazards. Additionally, compile detailed revisit information including:
 - Total number of blocks per vector/transect,
 - Side measured,
 - Width of D1 for each block
 - Notes on location of transect/vector start and end points
 - Species previously found per block and/or transect.
 - Prepare appropriate data files for uploading into GPS units and/or digital data collection device. Refer to “Global Operating Procedure: ArcPad Data Check-out/Check-in”. Transect start/end points will be acquired during the first sampling visit and end points will be replicated in future sampling to assure end location of last transect block.
 - Prepare copies of blank field forms needed to collect new data for each plot. These will include Field Data Collection forms (as back-up) and Unknown Plant Species forms.
 - Prepare packets of the compiled information and forms for each park to be sampled. These packets should also contain the necessary collection permits (see below).

2. Prepare Plant Species Lists

- Certified exotic species lists from NPSpecies available from the network data managers and/or the PI should be used to generate species lists for the field. Review exotic species lists and previously unidentified plant species from previous monitoring efforts to identify any unique plants that may be encountered.
- Prior knowledge of at least the common exotic species at a site will facilitate faster recognition and data collection in the field. Each member of the field crew should review the lists and use reference manuals to identify exotic species that will likely be encountered. Copies of these exotic species lists should be carried into the field for quick reference.

3. Prepare Schedules and Notify Parks

- Monitoring will be conducted during the proper phenological period across the Networks. A preliminary schedule should be approved by the PI. Upon approval, resource staff of park units being visited should be notified (via an email message) of the dates the monitoring field crew will be in their parks.
- In addition to submitting the preliminary field schedule, the project manager should also submit requests for park housing, permits (camping), and any other special requests (e.g., boat transportation).
- The PI should have established Collection Permits with the individual parks being sampled for other monitoring projects and a copy of these should be carried into the field by the crew leader.
- Just prior to the time the field crew enters a park unit the resource staff of the park is to be provided with the actual dates field-crew members will be working in the park, a list of their names, and approximate locations of monitoring activity.

4. Prepare Equipment

- All equipment (see list below) should be organized and prepared for the field season at least one month in advance of the field season. This allows time to make needed repairs and to order/replenish equipment.

References

Guidance documents, global operating procedures (GOPs), and forms mentioned in this SOP may be downloaded from the SODN online Data Management Guidance Library at <http://science.nature.nps.gov/im/units/sodn/datamanagement/guidancelibrary.cfm>.

Field Equipment List

Activity	Equipment
Vector Sampling	Digital data collection units Digital Camera Photo board and marker Compass GPS unit Maps Measuring Tapes – 50meter Survey pins Batteries for electronics (including spares) Battery recharger Clip boards Pencils/Pens/Markers Data Collection Sheets Unknown Specimen Forms Hand lens Plant Press Species Identification Manuals and Taxonomy Books Species lists (previous observations, potential observations) Species Master Names and Codes list Field Notebook
Required Miscellaneous Items	Backpacks Bug spray/sulphur sock/clothes treatment Duct Tape First-Aid Kit Nourishment Communication device(s) (cell phone, radio, satellite phone, SPOTs) Sun Screen Towels Water Reflective safety vests Reflective safety cones Brush (for cleaning shoes and clothing of exotic seeds)

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks
Exotic Plant Monitoring Protocol

SOP #02: Method for Collecting Vector Data

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(November 3, 2015)

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Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This Standard Operating Procedure explains the procedures that are performed to collect data using the sample block method in all parks of the Southern Plains, Chihuahuan Desert and Sonoran Desert Networks. Following these procedures is important to collect valid data used in monitoring exotic plant invasions. It is acknowledged that electronic data collection would be preferable to paper data sheets. We are in the process of developing and testing a platform for this which will be presented in the next revision of this protocol. Until that time, instructions for data collection using paper sheets is presented in this SOP.

Sampling Methods

Exotic plant data will be collected at parks and reserves along linear vectors that have been identified as having a high risk of invasion by exotic species. Potential vectors include roads (paved and dirt), trails, fire-breaks, washes, waterways, and boundaries. These vectors, of varying length, are divided into 50-meter sampling blocks (Figure SOP-2.1). Typically each block will have two separately surveyed sides, left and right; however, certain vectors such as park/reserve boundaries may only have one.

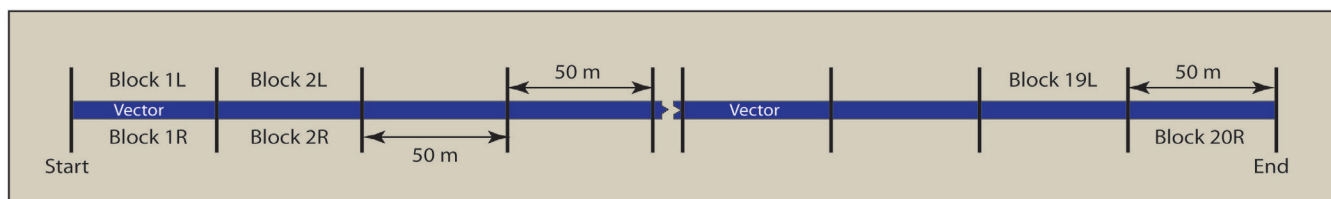


Figure SOP-2.1. General block layout for sampling exotic plants.

Surveys are conducted along a transect located at the outside of the mow strip (Figure SOP-2.2a), or, when no mow strip is present, at 2-m from the edge of the vector (Figure SOP-2.2b). Each block is further divided into distance classes based on the distance from and location of this transect (Table SOP-2.1, Figures SOP-2.2a, and SOP-2.2b). The first distance class (D1) depends on the surface of the vector; maintained road (no vegetation in center of road) vs trails and unmaintained roads (vegetation in center of road).

Surveyors walk the transect within each 50m block and record all exotic species detected within the block. For each side of the transect, species are documented according to their density (Table SOP-2.2) within each distance class (Table SOP-2.1). In addition, surveyors record the dominant phenology of each documented exotic within the sampling block. Surveyors repeat this process for each of the remaining blocks along the vector. Species names are recorded using 6 letter Species Code comprised of the first three letters of the genus name and the first three letters of the species name. For example, *Melilotus officinalis* would have the Species Code of MELOFF.

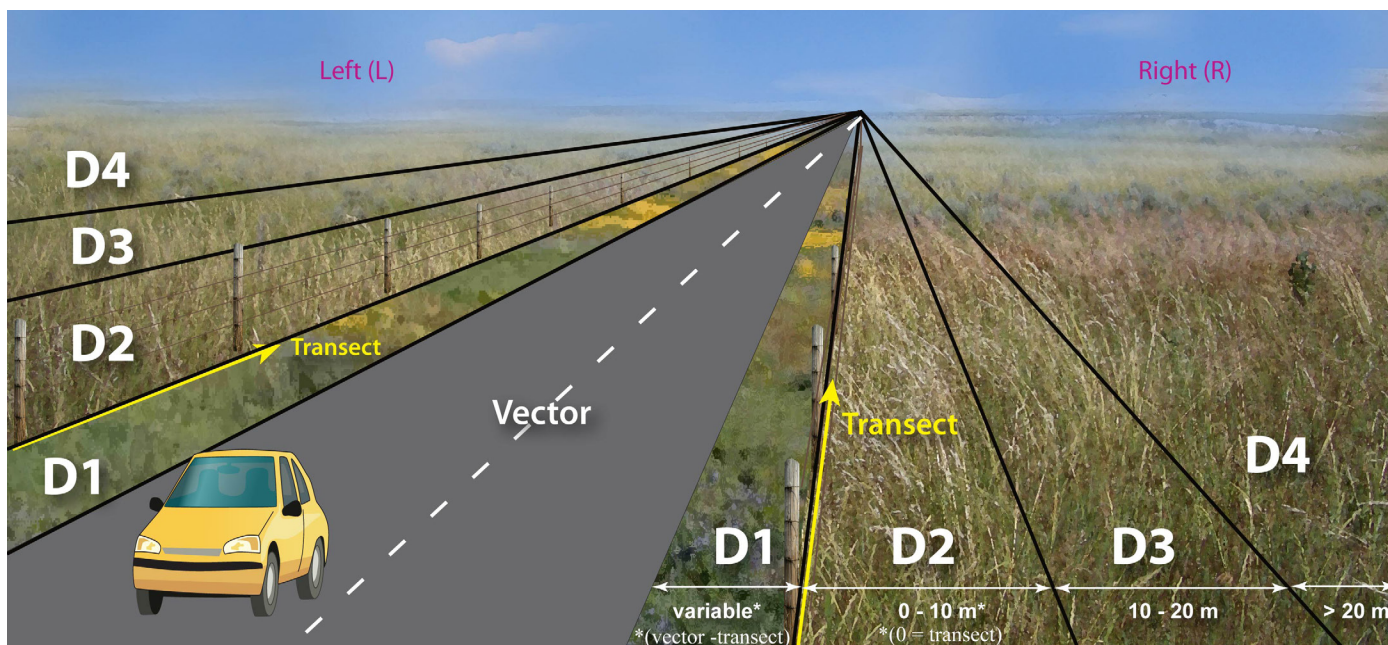


Figure SOP-2.2a. Relation of Distance Class, Vector Block and Transect. In this example, the paved road has a mowed edge so the width of D1 is the width of the mow strip. If no mow strip were present, the default width of D1 is 2m. This applies to all maintained roads (no vegetation in the center).

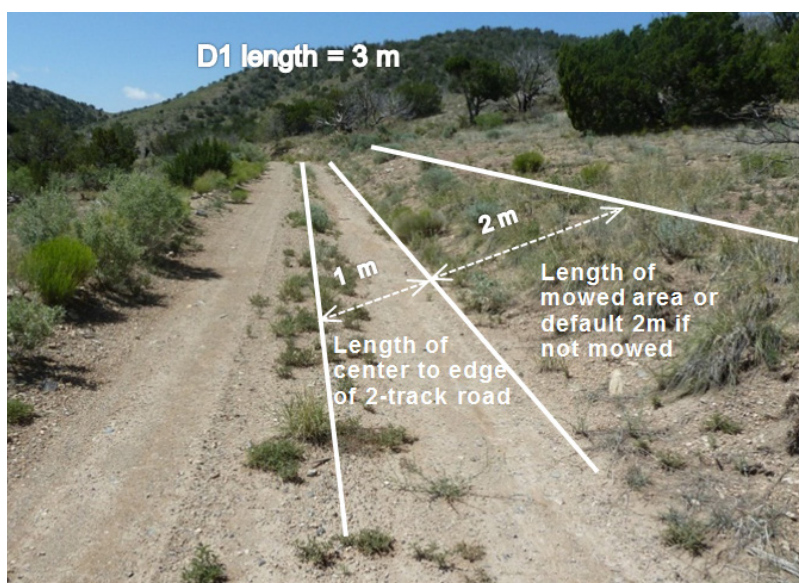


Figure SOP-2.2b. Example of D1 measurement on unmaintained road (vegetation in the center). The reported width of D1 includes the distance from the center of the unmaintained road to the edge plus the default 2m distance as there is no mow strip present. If a mow strip were present, the width of the mow strip would be added to the distance from the center to the edge of the vector. This applies to trails as well.

Table SOP-2.1. Distance Classes

Class	Location
D1	vector edge of paved surface to transect; or center of unpaved road/trail to transect
D2	transect to 10-m,
D3	10-m – 20-m
D4.	> 20-m

Table SOP-2.2. Density Codes

Code	Definition
0	not present
1	1 - 5 individuals
2	Scattered Patchy
3	Scattered Even
4	Matrix

Field Methods

Preparing for the field

5. Prior to all data collections efforts, surveyors must complete the following tasks:
 - a. Prepare copies of blank field forms needed to collect data. These include Unknown Plants Species forms, Photo Log forms (if using), and Survey Data Collection forms.
 - b. Print most recent park exotic species list for all surveyors.
 - c. Gather all field equipment and confirm everything is in working order (See SOP#1 for equipment lists); if using a measuring wheel instead of tape, verify the wheel's accuracy on rough and paved surfaces on a regular basis or if surveyed points appear off in relation to permanent block points).
 - d. Print available revisit data to assist in repeating sample (See SOP#1 for details).
 - e. Acquire the GPS point files from the PI/Data Manager and upload into GPS unit. If using digital data logger, upload the appropriate geodatabase to a GPS unit running ArcPad (See SOP#1).

Calibrating to distance classes

Prior to every daily sampling effort and sporadically throughout the day, observers should calibrate to the 4 distance classes. This step is essential for accurate placement of species into classes and to minimize inter-observer variability. Observer can use either a measuring tape or a digital rangefinder for calibration.

6. Using a measuring tape
 - a. Run measuring tape from transect and perpendicular to vector for 20m.
 - b. One observer stands at 0-m on the transect while the second observer stands at the boundaries between distance classes, 10-m and then 20-m.
 - c. Repeat this process with the observer positions switched until both are accurately estimating the density class boundaries.
7. Using a digital rangefinder
 - a. While standing on the transect, observers will select a plant they believe is at the boundary between two distance classes.
 - b. Using the rangefinder, the observers will determine how close their estimates are to the actual distance class boundaries.
 - c. Observers will repeat this process until they're accurately estimating the location of these boundaries.

Photographing the transect/vector

Photos should be taken during the initial visit and each time the vector is revisited. Photos are taken at the beginning and end of each continuously sampled transect. Every attempt should be made to duplicate the establishing photos.

8. Photographing a transect/vector
 - a. Take one photograph at the start and end point of each transect in the direction of sampling.
 - i. If safe, take photographs from the center of the vector.
 - ii. Compose the photographs in landscape orientation so as to minimize the sky and maximize the landscape.
 - iii. Avoid using zoom or other unusual settings which may make repeating the photograph more difficult.
 - b. Observers will record metadata on the 'Photo Log form' or a spreadsheet on a mobile unit, including:
 - i. Park Unit
 - ii. Date
 - iii. Camera Name
 - iv. File Name/jpeg number
 - v. Transect/Vector name
 - vi. Block number
 - vii. Bearing
 - viii. Notes

Starting/Ending a New Transect – Initial Visit

In the event that a surveyor creates a vector while in the field, a start point must be created prior to collecting data. This may occur when the park natural resource staff chooses a new vector to survey or surveyors find a vector they determine would be important for sampling. A transect can be any linear feature with the same surface type for its full length. There is no limit to the length of the transect.

1. Starting Point

- a. It is best if there is a feature to indicate the starting point (intersection, large rock, etc) to facilitate relocation.
- b. Place a chaining pin to mark the start of the transect
 - i. Take a GPS point.
 - ii. Save as a waypoint
- c. Notate the beginning UTM's on the data sheet
- d. If readings are taken on both sides of the vector, the opposite side will begin in a line perpendicular to the starting point.

2. Setting up vector blocks

- a. **Using a measuring tape** (for all vectors)
 - i. Anchor the 0-meter end of the tape with a chaining pin at start of the vector.
 1. For trails, dirt roads, washes, and boundary vectors, place the chaining pin in the middle of the vector.
 2. For paved roads and waterways, place the chaining pin at the edge of the vector.
 - a. When placed at the edge of a vector, be certain to measure all subsequent blocks along the same side and notate which side measured on the data sheet.
 - b. Measure on the side with the most outside corners along the vector/transect.
 3. Run the tape out 50 m parallel to the vector, using additional chaining pins to maintain any vector curves.
 4. Fasten the tape so it is taut and as close to the ground as possible.

3. Using a measuring wheel (only for roads and well maintained trails)

- a. Place a pin flag or reflective cone at the start of the block.
- b. With the measuring wheel zeroed and on the ground, walk along the vector until you have reached 50-m and place another pin flag or cone.
 - i. The wheel must be in contact with the ground and turning to accurately measure the distance.
 - ii. For trails, dirt roads, washes, and boundary vectors, measure along the middle of the vector if safety permits.
 - iii. For paved roads and waterways, measure on the side with the most outside corners along the extent of the vector/transect. Notate for future reference.
 - iv. Be certain to measure all subsequent blocks of the same transect along the same path (left, right, or center). Notate for future reference.

4. End Point

- a. When the entirety of the transect/vector has been completed additional spatial data are taken to mark the end of the transect/vector.
 - i. Place a chaining pin to mark the end of the transect
 - ii. Take a GPS point.
 1. Save as a waypoint
 2. Notate the ending UTM's on the data sheet
 3. If using a data logger, refer to instructions provided by your data manager.

5. Important Notes

- a. Add any notes in the Note Field about the start or end of the transect/vector that may help in relocating in the future.
- b. For end points, be sure to note length of block if not usual 50m.
- c. When sampling along a loop where start and end points may fall near one another, note the direction of travel around the loop.

Preparing Data Collection Forms

Field data is collected with paper data sheets. If using a data logger, refer to instructions provided by your data manager.

Prior to data collection, the following must be completed on each data sheet:

1. Park Code = Standard four-letter code for park or refuge
2. Vector ID = Standard name assigned to transect
3. Vector Type = Paved road, unpaved road, paved trail, unpaved trail, boundary, etc.
4. Observer = Person doing the survey
5. Page number
6. Date
7. Measured Side = side of vector used to delineate 50 m block
 - a. Left or right for paved road and waterway vectors.
 - b. Center for trail, boundary, dirt road, and wash vectors.
8. Surveyed side = the side you are monitoring, either left or right, determined by standing at the transect start and looking down the vector
9. Photos = the number of photo taken at start and finish of transect.

Notate the width of the D1 distance class.

1. For maintained roads with mow strips, the value is the width of the mow strip.
2. For maintained roads without mow strips, the value is always 2-m.
3. For trails and unmaintained roads (vegetation in center) with mow strips, the value is $\frac{1}{2}$ the width of the road/trail plus the width of the mow strip.
4. For trails and unmaintained roads without mow strips, the value is $\frac{1}{2}$ the width of the road/trail plus the default of 2m.
5. Barring a change such as mowing where none was previously or a wider mow strip from previous years, this width should be consistent between visits. Check the revisit information for previous sampling data, and if different, be sure to note reason for change in 'Note' tab.

Enter the pre-assigned block number followed by "L" or "R", determined by which side of the vector the observer is monitoring.

Collecting Data

Surveyors slowly walk the transect of the block taking note of all exotic species present, their location, their density within each of the distance classes, and their average phenology.

1. Walk slowly along the 50-m stretch of transect within the block.
 - a. If terrain or vegetation impedes your movements or creates an unsafe environment, walk closer to the vector.
 - b. You may walk away from the transect/vector to confirm a species identification. However, tabular data should only be reported for species and densities as observed from the transect. If you see a species or densities not visible from transect, add information to the appropriate notes field, but do not include in the tabular data.

2. Record exotic species as they are encountered
 - a. Use the appropriate 6 letter code.
 - i. A species is only written once per block
 - ii. If an unknown species is encountered,
 1. SODN and SOPN: record a descriptive morphological code with the prefix 'Unk', fill out the unknown plant sheet, and make a collection (See SOP_03_UnknownPlants). For example, an unknown species of Bromus could be recorded as UnkBromus.
 2. CHDN: Record the Collection ID, complete the unknown plant log and label, and make a collection. The Collection ID comprises of the Transect ID followed by a letter in consecutive order, ex. GUMO_EX_045_A.
 - b. Phenology = the average phenology of the exotic species across the block in all distance classes. (See below for more detailed instruction)
 - c. Distance Class D1, D2, D3, D4 = the density of the exotic species within each of the distance classes is assessed during the block survey. (See below for more detailed instruction.)
 - i. For maintained roads, record exotic species detected within the vector (i.e. in a crack in the pavement) in D1 and make note of it's location in the notes field.
 - ii. For trails and unmaintained roads, the D1 width includes distance from center of trail or unmaintained road to vector edge plus distance of mowed area or 2m if unmowed (Figure 2b) so there is no need to note it's location.
 - d. Notes = record any species specific notes.

Density Classes

As you walk along the transect, take notice of the density and distribution of each species in all distance classes (Figure SOP-2.3.). At the end of the 50 m transect assign a density class to all detected exotic species for each distance class. Types of Density Class are as follows:

- 0 = Not present
- Observer was able to see the landscape within the distance class and did not detect the targeted species. This must be noted in the data sheet - do not leave a space blank.
- 1 = 1-5 plants present in specific Distance Class
- 2 = Scattered in patches in specific Distance Class
- 3 = Scattered fairly evenly throughout specific Distance Class
- 4 = Forming a matrix in specific Distance Class
- X = Not detectable
 - a. Observer was unable to see the landscape within the distance class due to features of terrain or dense vegetation, and did not detect the species. Therefore, determining presence is not possible.
 - i. Use when over 50% of the distance class is blocked
 - ii. Estimate percentage of blockage in the Notes section

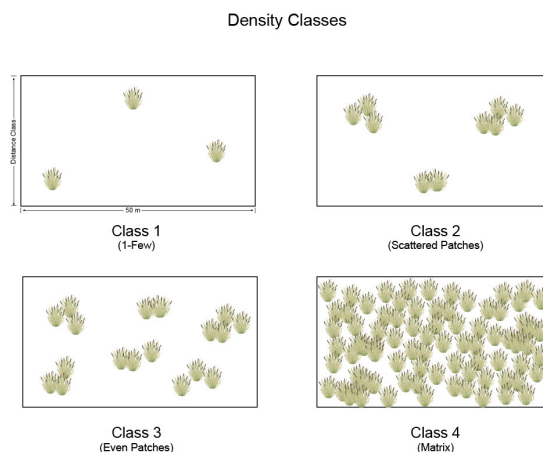


Figure SOP-2.3. Examples of density classes

Phenology

1. Take note of the dominant phenology for each species documented within the block.
 - a. Average across all distance classes in which the species is detected.
 - b. Select the most dominant phenology for the species being recorded.
 - c. Depending on the life form of the species, some of the phenology types may not be applicable.
 - d. If the phenology appears evenly split between two types, select the one furthest along in the plant life cycle.
For example, if 50% of plants within the block are flowering and 50% are fruiting, record the dominant phenology as fruiting.
 - e. Phenology types are as follows:
 - i. Vegetative = A “greened up” living individual (except trees) with no flowering or fruiting structures from the current growing season.
 - ii. Flowering = A living individual (except trees) with at least one flower or bud and no fruit from the current growing season.
 1. Consider bolting individuals to be in flower.
 - iii. Fruiting = A living individual (except trees) with at least one fruiting structure from the current growing season.
 - iv. Dead = A non-living individual of any life form. This type is mainly for annual and biennial species.
 - v. Living = A living species of any life form.
 1. This type is only used for networks not using all phenology types.
 - vi. Senesced = A “brown” living perennial species where portions of the aboveground ground biomass have died due to environmental factors, such as changing seasons or drought, in favor of a more robust below ground structure that may resprout the following growing season or when conditions improve.
 1. Remnant fruits may still be present on senesced individuals. If the individual is “brown” and has dropped most of its fruits, consider it to be senesced.
 2. It may be difficult to differentiate between a living, senesced individual and a truly dead one; so, always consider perennials that appear dead to be senesced.
 - vii. Seedling = A living tree species with a basal diameter < 1 cm.
 - viii. Sapling = A living tree species with a basal diameter > 1 cm and < 10 cm without any evidence of reproductive structures.
 - ix. Mature = A living tree species with a basal diameter > 10 cm and/or with evidence of reproductive structures.

Completing a Transect/Vector

1. Data QA/QC
 - a. Before moving on to another transect (or transect/vector for SODN) surveyors will:
 - i. Confirm that data for all blocks are present.
 - ii. Confirm that pictures were taken and photo log completed.
 - iii. Confirm that all unknown species were collected and properly documented.
 - iv. Confirm both a transect start and end point exist

Park Code	Site Name	Date
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[illegible]

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks

Exotic Plant Monitoring Protocol

SOP #03: Management of Unidentified Taxa (Unknowns)

Version 1.00
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This standardized operating procedure (SOP) gives step-by-step instructions on how to collect field samples, enter unidentified taxa (referred to hereafter as “unknowns”) into the protocol database and how to edit the records once the unknowns have been identified. .

1. Collect field sample of unknown plants

It may be difficult or impossible to determine the specific identify of individual plants encountered during sampling. When this situation occurs, search the immediate area surrounding the transect, looking for specimens of the unknown plant that are more readily identifiable (e.g., due to the presence of flowers or fruits from current or previous seasons). These may assist in correctly identifying the species in the transect. Collect a sample of the plant with leaves, flower and/or fruit, place it in a press or field notebook, attach a sample label it and fill in the requested information. Assign an unknown code that is unique from all other unknown codes in the park. This specific code will be used whenever the same plant is encountered again during monitoring in that park

2. Assign/create an unknown taxonomic record

Use the attached Unknown Plant Species Tracking Log to manage the record number assignments and identification of unknowns. When digital data entry is performed, refer to instructions provided by the Data Manager. For SODN and SOPN, the field crew assigns a code that has meaning only to the field crew to each unidentified taxon (e.g., UNKWHITEFLOWER for an unidentified plant with white flowers). Suspected Family or Genus names and/or numbers may also be used. For CHDN, the field crew assigns a collection ID which is a combination of the Trasect ID and a unique, consecutive letter. The same assigned code is used for every record of each unknown taxon entered into the database.

3. Identify unknowns from the field

As soon as possible following collection, the field crew identifies the unknowns collected from the field. When possible, digital scans of the fresh specimen are made at 600 dpi to preserve the specimen’s identifying features. Scans should be labeled as PARKCODE_UNKCODE_DATE (mmddyyyy). Further identification is done either at the network office with the assistance of the plant ecologist or at the local approved herbarium.

4. Edit the unknown taxonomic records

4.1. Unknowns identified to species (or sub-species)

4.1.1. The species matches an existing record in the protocol’s species list – Go to step 4.1.4.

4.1.2. The species does not exist in the protocol’s species list – Go to step 4.1.3.

4.1.3. Notate the species name on the corresponding data sheet (UNKXXX = Genus species)

- 4.1.4. Add the appropriate scientific nomenclature and associated information for the new species into the Field database species table.
- 4.1.5. Use the Edit function in the protocol database to change the field-assigned unknown code to the correct species code.
- 4.1.6. Notify the project lead that the Field database is ready to be appended to the Current database.
- 4.2. Unknowns identified to general unknown categories
 - 4.2.1. If unknowns cannot be identified then the records need to be deleted from the geodatabase tables, as they could be natives.
 - 4.2.2. If the unknown was the only species recorded in that block, the “unkcode” should be changed to “NP” indicating no plants, and the density codes should all be changed to zeros.
 - 4.2.3. Use the Edit function in the protocol database to change the field-assigned unknown code to the general unknown code already available in the protocol database (e.g., UNKSHR for an unknown shrub).
 - 4.2.4. Notify the project lead that the Field database is ready to be appended to the Current database.

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Scientific Name:

MorphoName:

Collector:

Park:

Date:

Site:

Tran./sub.:

Elevation:

Aspect:

Habitat/Associates:

Habit:

Flower/Fruit:

Root:

Notes:

Unknown Plant Specimen Tracking Log

Proofread by: _____
Copied by: _____
Entered by: _____
Verified by: _____

Location and Event Information

Protocol Name:		Park Code:		Date:	
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Collection Information

Lifeform: A = Annual, P = Perennial, F=Forb, G=Grass, SS=Subshrub, S = Shrub, T=Tree, V=Vine

Collection ID		Morpho Name Temporary Use Only	Collector Initials	Lifeform	Description Habitat, Flower, Fruit, Root	Photo #s Check if No Specimen	Scientific Name	Initial & Date			
Plot/Polygon/ Transect ID	Letter (A,B,C,...)							Identified	Updated Datasheets	Rescanned Datasheets	Updated Database
						☐					
						☐					
						☐					
						☐					
						☐					
						☐					
						☐					
						☐					

Plot/Polygon/Transect ID: Unique ID assigned to location where sampling occurred.

Letter (a,b,c...): When added to Plot ID, creates unique Collection ID.

Morpho Name: Short name that will help in remembering specimen, usually based on morphology.

Collector Initials: Who collected the specimen.

Lifeform: A = Annual, P = Perennial, F=Forb, G=Grass, SS=Subshrub, S = Shrub, T=Tree, V = Vine

Description: Include key parts, especially flower color. Habitat may also be helpful.

Photo #: If photos were taken, record the frame numbers. If No specimen was collected and only photos were taken, check box.

Scientific Name: Once identified, record lowest taxonomic level.

Identified: Who identified plant and when? Initial & Date

Updated Datasheets: Who amended the datasheets with the identified name and when? Initial & Date

Rescanned Datasheets: Who rescanned the datasheets and replaced the old files and when? Initial & Date

Updated Database: Who updated the database with scientific name and when? Initial & Date

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks
Exotic Plant Monitoring Protocol

SOP #04: Collecting Plant Voucher Specimen

Version 1.00
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This document details the appropriate collection and curation protocol for voucher specimen collections made in the course of research activities conducted by the Sonoran Desert Network (SODN), Chihuahuan Desert Network (CHDN) and Southern Plains Network (SOPN). Plant collections provide primary documentary evidence for the presence of a vascular plant species at the park unit. This document details the appropriate protocol for voucher specimen collections from collection in the field, through identification, to curation at appropriate herbaria.

Field Data Collection

Voucher specimen collection is a necessary component of any integrated data collection system for research on vascular plants. For Network researchers, this includes voucher specimen collections made in the course of monitoring, Vegetation mapping, and opportunistic collection efforts conducted at park units. Prior to any collection effort, appropriate collection permits must be obtained for each park by the Project Manager and carried in the field by the crew leader.

Voucher Specimens

Voucher specimens are to be collected at the discretion of the field research crews. All crews have appropriate equipment to make voucher specimen collections, including a field press and newspapers for specimen collection, GPS device for location information, and sufficient data sheets. Crews will follow this procedure for collecting plants:

1. Identify the plant as best as possible in the field, taking care to note if it is potentially rare, threatened or endangered. Potential T&E plants should not be collected. These plants should be photographed and precise location should be recorded. The 10% rule should always be observed in the collection of all plants, such that no entire plant should be collected if there are fewer than 10 specimens in the immediate vicinity.
2. Care should be taken to obtain flowers, fruits, and roots as practicable.
3. Using a single fold of newspaper per plant, the specimen should be laid out and arranged to display all floral parts for ease of future identification. Arrangement should take care to have half the leaves up and half down, resemble actual plant architecture (where appropriate given size limitations) and carefully open flowers so that all floral parts are visible upon drying. Each newspaper should be labeled with the best guess of specimen identification, the date, park code, and collector initials.
4. Fill out the Voucher Specimen Documentation Form (see SOP #03) in its entirety using pencil. Record the plant's identity, all appropriate location information using UTM coordinates, elevation may be in feet or meters, and note the plant's status in the park, and whether you took a photo. Additionally, take care to fill out habitat description as clearly as possible, referring to both community type and associated species. This form remains with the specimen.

Care of Voucher Specimens post-collection

Appropriate handling of voucher specimens does not end with collection in the field. At the earliest practical opportunity, those collections that have been made using a field press need to be transferred to an appropriate herbarium press for further drying and curing of the specimen. At the time of transfer, if no firm identification of the specimen has been made, another attempt at identification should be made using appropriate floras and literature. This identification (if different than the field identification) should replace the original on the form, do not consider this an annotation, but note the determiner (if different from the collector) in the appropriate field on the data sheet. Properly secure the specimens and allow them to cure. Upon return to the office, notify the Network botanist of the collections that have been made for transfer to the herbarium and once the plants are dried and ready for transfer place in the herbarium cabinet in the office.

From Field Collection to Herbarium

Upon receipt of the specimens, the Network botanist will verify the collections and identifications prior to their transfer to the appropriate herbarium of record. The following procedures will be followed once the specimens are transferred to the herbarium:

1. Obtain the vouchering protocol from the appropriate herbarium and follow all instructions.
2. The collections are packaged appropriately and placed in the freezer to guard against insect infestation. This process takes a minimum of a week.
3. At the completion of the freezing process, the specimens are removed and placed on Network/NPS holding shelves. If further identification of unknowns is necessary, at this point an effort is made by Network botanists to clarify and identify all specimens. All those specimens deemed of insufficient quality are discarded.
4. All satisfactory specimens are then given to herbarium staff for verification of identity. All verification and annotation (if necessary) take place prior to accessioning into the appropriate herbarium collection and NPS cataloging. Once verification has taken place, all specimens will be collected by Network staff and sorted into park-specific batches.
5. For SODN vouchers: At the completion of this initial identification and verification process, the original data sheets will be provided to curators at the Western Archaeological and Conservation Center (WACC) in order to be cataloged in the Department of the Interior Collections Management System. Each specimen will receive an NPS catalog number and a copy of the completed original data sheet will be made and returned to SODN. The original will remain at WACC as a record of the specimen for archival purposes. SODN will make a copy for its own internal archives, and the completed data sheet will be returned the University of Arizona Herbarium for accessioning.
6. All specimens that have received appropriate NPS catalog numbers will then be accessioned into the herbarium collection. All labeling of these specimens will utilize appropriate NPS labels which prominently bear the arrowhead logo and the NPS catalog number.
7. As per the loan agreement, specimens will remain at the herbarium for the duration of that agreement.

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks
Exotic Plant Monitoring Protocol

SOP #05: Daily Data Management

Version 1.00
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This SOP outlines specific, daily data management tasks that must be completed **at the end of each field tour** for all data collected in the field, including tabular data, spatial data, and photographs. If you are out in the field for an extended time, complete these steps on the field laptop you were given and ensure backups to either a flash drive or FTP server or both. If using data loggers, follow instructions provided by the Data Manager.

Verification and Validation

At the end of each field day, it is important that each data sheet be checked for accuracy and completion. A description of any changes made to the data and the initials of the person checking the data, as well as the date verified/validated, is to be notated on each data sheet.

1. Use this data management checklist to complete steps for the following quality assessment
 - a. Ensure Start and End points for transects are present
 - b. Verify data in the field, Vector_Name, are filled in and correctly associated with Site_ID.
 - c. Verify that Surface_Type is correct (e.g. This is key as a transects with Surface_Type of “boundary” are measured on a single side).
 - d. no data cells should be left blank.
 - e. Check that all transects and survey sides (L or R) expected to be surveyed are included (i.e., none missing) and correct; note that surveys along boundary lines will include only one side surveyed (L or R).
 - f. Ensure that correct Park Code was assigned.
 - g. Ensure that no blocks were skipped within a transect and/or have anomalies in numbering (e.g. skipping a point may cause the points on transect side to be off by 1 number for the rest of the line).
 - h. Ensure the Measured_Side value is consistent for all blocks within a single transect.
 - i. Ensure the D1_Width_m is correct for all blocks within a a transect.
 - j. If an inconsistency is found, check the field reports for any instances where changes to a D1-Width occurs within a transect.
 - k. Verify that any changes in Observer for a given side of a transect is accurate.
 - l. Check plant species for spelling anomalies.
 - m. Ensure no cells are left blank for the fields, Species_Code, Senesced, D1, D2, D3, and D4.

Unknown Plant Management

1. If the unknown plant is identified as a non-native; replace the unknown code with the appropriate 6 digit one.
 - a. If the unknown plant is identified as a native:
 - i. Notate this on the datasheet(s) and update the database.
 - ii. If the identified native is the only species for that block; replace unknown code with “No Plant”.
 - b. If this is a new exotic plant for the network and/or park, update the appropriate lists:
 - i. Ensure Species Codes not in the Plant List are reviewed by either a botanist or land management resource staff.
 - ii. Make any corrections to the master plant list as specified.
 - iii. Add to the Park List and notify the park’s natural resource contact.
 - iv. If the Park/Network has a Targeted Exotic List, determine with the park staff and network botanist if this plant needs to be added.

Compile data sheets

1. Data sheets are compiled and placed into a manila folder labeled “Exotic–UnitCode–PanelYear”.
 - i. Data sheets are sorted in alphabetical order by park, then plot and then chronologically by each event.
2. Verify all datasheets are legible and attempt to verify any unknown plants. Adjust datasheets and database as needed.
3. Scan datasheets to provide a backup and store separately from originals.

Transfers Photos

1. Download photos (en masse) into a folder(s) named:
 - i. CHDN: P:\P:\Projects\ExoticPlants\Images\[Year]\[Park_Working] and ...Images\RAW\
 - ii. SODN: V:\Exotic_Plant\Photographs\Data and the name the folder with the Unit Code.
 - iii. SOPN: C:\Exotic_Plant\Photographs\Data and the name the folder with the Unit Code.
2. If required by Network, process photos according to respective network procedures. (ie. CHDN_TI_MetaImageProcessing.docx)
3. Verify that all appropriate metadata for the photos has been collected.
4. Scan photo logs and place in labeled (network-specific) manila folder.

New and Notable

1. While out in the field, as the observer you might note something of interest, either pertaining to the protocol or resource management in general. Confirmed new plant species to park should also be mentioned. This type of information should be shared with the crew lead, protocol lead and park resource staff via written notice or email.
2. This information will be evaluated and hence summarized for field summary report.
3. CHDN and SOPN requires field crew lead to provide a short field report after each tour with overall impressions, any issue that should be communicated to future crews, and if done, the results of any rapid assessment info.

Update Protocol Tracking Form

Each I&M program will have their own method for project tracking. For assistance please ask the Data Manager of each program.

1. Fill out the project tracking form for the field work just completed:
 - iv. CHDN: <http://inpchdnms03/CHDN/Exotics/Lists/ExoticsCheckList/AllItems.aspx>
 - v. SODN: V:\Exotic_Plant\Exotics (Working)\Exotic_Tracking.xlsx
 - vi. SOPN: No tracking required at this time.

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks

Exotic Plant Monitoring Protocol

SOP #06: Data Management

Version 1.00
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This standard operating procedure (SOP) describes the procedures for managing and maintaining data collected by the Multi-Network Exotic Plant (Exotic) monitoring protocol for the Sonoran Desert, Chihuahuan Desert and Southern Plains Networks. The SOP was developed in accordance with strategies and guidance for data processing and quality assurance/quality control (QA/QC) specified in the network data management plan (Angell 2005). The instructions are presented within the framework of the typical annual workflow for a monitoring project, which includes three phases: 1) implementation, 2) product integration, and 3) evaluation and closure. Staff role(s) primarily responsible for ensuring the completion of each step are indicated in parentheses. Refer to SOP #05 for detailed instructions on specific daily data management tasks.

Project Implementation

The project leader oversees all aspects of the project implementation phase, which is repeated each field season. Data management staff acts primarily as facilitators to support database applications, GIS, GPS, data QA/QC and certification procedures, data summarization, and data analysis. The implementation phase is further subdivided into three stages: 1) preparation, 2) data acquisition and processing, and 3) product delivery and review.

Preparation

1. Conduct the kick-off meeting for the current field season approximately one month prior to beginning sampling. Schedule at least two pace meetings during the field season to assess progress and address any problems that may affect completing the work on schedule. Save the kick-off meeting notes in the **Project_Mgmt** subfolder of the project **Admin** folder on the Active drive. Refer to Section 8.1 of the protocol narrative for additional information on the annual project schedule and workflow. **(Project Leader)**
2. Ensure that the “product tracking” portion of the kick-off meeting notes is completed. **(Project Leader)**
3. Ensure that the “project tracking” web application has been reset and is ready for the current field season. Update this application during the season to track the progress of work through the three phases of the monitoring project. **(Project Leader/Data Manager; Project and Data Management Staff)**
4. Ensure that the Exotic project workspace is in place on the Active drive and contains only files relevant to the current year/season. Files from the previous year should have been transferred to the master Exotic project file on the Archive drive. **(Project Leader/Data Management Staff)**
5. Ensure that the current front-end database and a blank copy of the current back-end database are installed in the project workspace and on any field computer(s) that will be used for data entry in the field. Refer to the “Database Work Flow” SOP for the recommended file structure. **(Data Manager)**
6. Upload necessary GIS layers/maps and associated background layers to the project GPS units. **(Data Manager or Field Crew Leader)**

7. Print paper data sheets, sampling point maps, and lists of park-taxa for use in the field. **(Project or Field Crew Leader)**
8. Ensure that names and contact information for field crew members are entered into the Contacts data table. **(Project Leader/Data Manager)**

Data acquisition and processing

Acquire field data as specified in this protocol and associated SOPs. Data are acquired using one of three methods: 1) manually recording data on paper field data sheets, 2) entering data directly into the project database on the field computer(s), or 3) downloading data from handheld or automated sensors. **(Field Crew)**

Tabular data collection and entry

Paper field data sheets (also refer to the “Paper Data Sheet Management” guidance document for further details)

1. Record data neatly and legibly on the data sheet in the appropriate spaces, including all fields in the **Location and Event Information** box. Record data in the correct formats and use only values from printed code lists, where applicable. **(Field Crew)**
2. Before moving to the next field data sheet or sampling location, review each data sheet to ensure that all required parameters have been recorded and there are no obvious errors. If corrections are required, incorrect values may be erased and replaced with correct values. **(Data Recorder)**
3. At the end of each field day, review all the field data sheets for that day. If corrections are required, incorrect values may be erased and corrected on the data sheet. Initial and date the “proofread by” space on each data sheet. **(Project or Field Crew Leader)**
4. At the end of each day or other logical period of time, photocopy and/or scan each data sheet, ensuring that the copies are legible and complete (i.e., nothing is cut off at the edges). Initial and date the “copied by” space on the original data sheet before making the copy. File the originals in the seasonal fireproof file cabinet, and retain the copies for data entry and verification. **(Field Crew)**
5. Conduct a data entry trial and quality review after one day (or another logical period) of manual data collection.
 - a. Enter the test data into the database and verify them according to the instructions in the “tabular data verification, validation, and certification” section of this SOP. **(Field Crew)**
 - b. Review the test data set. **(Project Leader/Data Manager)**
 - c. If the data meet overall project quality requirements, continue data collection. **(Field Crew)**
 - d. If data quality is not acceptable, provide additional training to the observers, who then repeat the data-entry trial and quality test. **(Project Leader/Data Management Staff)**
 - e. If data quality has not improved to meet standards after the second trial, examine other aspects of the protocol and the database for factors that may be contributing to the difficulty in meeting data-quality requirements. Implement any desired changes and repeat the steps in this section until data quality meets the requirements. **(Project Leader/Data Management Staff)**
6. Regularly enter the data into the project database according to the instructions in the “Exotic Monitoring Database User Guide.” Do not wait until the end of the field season to begin entering data. Keeping current with data entry aids in finding and correcting errors while the information is still fresh in the minds of the field crew. Initial and date the “entered by” space on each data sheet after the data are entered. **(Field Crew)**

Electronic data entry (also refer to the “Digital Data Sheet Management” guidance document for further details)

1. Use the data entry forms to enter data directly into the digital project database. The database has built-in checks and drop-down lists to streamline data entry and help ensure data quality. **(Field Crew)**
2. Before moving to the next field form or sampling location, review each digital data form to ensure that all required parameters have been entered and there are no obvious errors. If corrections are required, make them at this time. **(Field Crew)**
3. At the end of each day, print out the digital data forms for that day and review them. If corrections are required, make them in the digital database using the Edit data function and print a new copy of the data form. Initial and date the “verified by” space on each data sheet. **(Project or Field Crew Leader)**
4. Photocopy and/or scan each printed data sheet, ensuring that the copies are legible and complete (i.e., nothing is cut off at the edges). Initial and date the “copied by” space on the original printout before making the copy. File

the printouts and the copies in the seasonal fireproof file cabinet. **(Field Crew)**

5. The first day of electronic data collection serves as the data entry trial. The field crew leader's review of the data collected that day serves as the quality review. If data quality is not acceptable, follow the procedures in Step 5 of the previous section ("Conduct a data entry trial and quality review after one day (or another logical period) of manual data collection"). **(Field Crew, Project or Field Crew Leader)**
6. Transfer the field back-end database(s) to the V:\ drive at regular intervals and append the data to the current back-end project database. Refer to the "Database Work Flow" GOP for step-by-step instructions. **(Project Leader/ Data Manager)**

Automated data collection (e.g., data loggers) – In Development

1. Download the data according to the instructions in the SOPs. **(Field Crew)**
2. Perform any field validation routines specified in the SOPs. **(Field Crew)**
3. Transfer the files to the **Raw_Data** subfolder of the **Data_Nonspatial** folder in the project workspace on the V:\ drive. **(Field Crew)**
4. If applicable, import the data into the project database. **(Field Crew Leader/Data Manager)**

Tabular data verification, validation, and certification

Paper field data sheets

1. Follow the instructions in the "QA/QC Procedures for Digital Data Entered from Paper Field Sheets" SOP to verify, validate, and certify the seasonal data set. **(Field Crew/Project Leader)**
2. File the copied data sheets and the verification printouts in the seasonal fireproof file cabinet after the data are certified. **(Field Crew)**

Electronic data entry

The need for data verification has been eliminated by entering data directly into the database, and the data set has been partially validated during data entry and subsequent reviews of the data forms.

1. Follow any additional validation procedures specified in the data collection SOPs, and run any automated database validation checks. **(Project Leader)**
2. Review the results and make any necessary changes. **(Project Leader)**
3. Keep a list of all corrections made and relevant comments about the data set. Make note of any extreme values determined to be correct to confirm their validity for future users of the data. Report this information in the "quality assurance review" section of the "Project Data Certification" form. **(Project Leader)**
4. Certify the seasonal data set by completing all sections of the "Project Data Certification" form and submitting it to the data manager. (See Section 3 in the "QA/QC Procedures for Digital Data Entered from Paper Field Sheets" GOP for further details.) **(Project Leader)**

Automated data collection (e.g., data loggers)

1. Validate the data set according to the validation procedures specified in the SOPs, including any automated database validation checks. **(Project Leader)**
2. Keep a list of any inconsistencies or problems with the data set, all corrections made, and relevant comments about the data set. Make note of any extreme values determined to be correct to confirm their validity for future users of the data. Report this information in the "quality assurance review" section of the "Project Data Certification" form. **(Project Leader)**
3. Certify the seasonal data set by completing all sections of the "Project Data Certification" form and submitting it to the data manager. (See Section 3 in the "QA/QC Procedures for Digital Data Entered from Paper Field Sheets" GOP for further details.) **(Project Leader)**

Spatial data collection

1. Collect spatial data of the highest possible quality according to the instructions in the data collection SOPs and the network GOPs on using the various handheld units. **(Field Crew)**
2. Download the data to the **Raw_Data** subfolder of the **Data_Spatial** folder in the project workspace on the V:\ drive. **(Field Crew or Data Manager)**
3. Inform the assistant data manager if post-processing is needed. **(Field Crew Leader)**
4. Post-process the data, if needed. **(Data Manager)**

Photograph acquisition

1. Take digital photographs of the highest possible quality, as specified in the SOPs. Refer to the “Taking Quality Photos” GOP for further guidance on using SODN cameras for project photos. **(Field Crew)**
2. Download the images daily (if possible; if not, as soon as practical) to the appropriate subfolder (**Data**, **General**, or **Identification**) in the **Photographs** folder of the project workspace. **(Field Crew)**
3. Review the photos and delete poor-quality or unnecessary duplicate photos of the same subject. You may retain a poor-quality photo if the subject is highly unique or unusual. **(Project or Field Crew Leader)**
4. Rename the photos as specified in the SOPs or, if not specified in an SOP, in the “Digital Photograph Management Strategy” document. **(Project or Field Crew Leader)**

Sensitive data

1. Evaluate the data set according to the information and procedures in the “Sensitive Data Management Strategy” guidance document, “Director’s Order #66”, and “Reference Manuals 66A and 66B” to determine whether it includes any potentially sensitive data or policy implications that should be withheld from public distribution. **(Project Leader/Data Manager)**
2. Document the results of this evaluation in the “sensitive data” section of the “Project Data Certification” form, so that appropriate steps may be taken when reporting and distributing the data. **(Project Leader)**

Voucher specimens and photographs

1. Process any voucher specimens collected during field work according to the instructions in the “Collection and Processing of Specimens” guidance document. **(Project or Field Crew Leader)**
2. Process any voucher photographs taken during field work according to the instructions in the “Digital Photograph Management Strategy” guidance document. **(Project or Field Crew Leader)**

Master database

1. Append seasonal certified data to the master database in the project directory on the S:\ drive. Refer to the “Database Work Flow” GOP for detailed instructions. **(Data Manager)**
2. Notify the project leader and data manager that the data are ready for analysis and reporting. **(Data Manager)**

Product development, delivery, and review

Analysis and reporting

The project leader is responsible for analyzing monitoring data and reporting the results, with support from the data management staff. Refer to the “Report Management Strategy” guidance document for the workflow.

1. Maintain the automated data analysis and reporting queries in the master project database. **(Data Management Staff)**
2. Design new analysis and report functions when necessary (refer to the “Data Maintenance/Database revisions” section of this SOP). **(Project Leader/Data Management Staff)**
3. Store the results of summaries and analyses in the **Analysis** folder in the project workspace. **(Project Leader)**
4. Store current-season project reports, resource briefs, and similar products in the appropriate subfolders in the **Reports** folder in the project workspace. **(Project Leader)**

Spatial data development

1. Create spatial data layers required by the project in the **Processed_Data** subfolder in the **Data_Spatial** folder. Retain final products in the **Processed_Data** folder; delete interim layers that are no longer needed. (**Field Crew/Project Leader**)
2. Validate spatial data using ArcGIS 9.x (ESRI, Inc.). Visually check the positions of point, line, and polygon features against a backdrop of other spatial layers, such as digital raster graphics, DOQQs, park boundary layers, etc. Certify all spatial data sets by completing a “Project Data Certification” form. (**Project Leader**)
3. Append any new spatial data to the master shapefile. (**Assistant Data Manager**)

Photographs

1. Catalog project photos using a photo management software. Refer to the “Digital Photograph Management Strategy” guidance document for detailed information on adding keywords during cataloging. (**Project or Field Crew Leader**)
2. Ensure that photos are appropriately organized in the **Photographs** subfolders; you may create additional subfolders as needed. (**Project Leader**)

Metadata development

Project database

Update the FGDC-compliant metadata record and the data dictionary for the tabular database. (Data Manager/Project Leader)

Other digital data sets

Create an initial FGDC-compliant metadata record and a data dictionary for the digital data set using the NPS Metadata Tools & Editor and the NPS Database Metadata Extractor. Update these documents as needed after each field season. (Data Manager/Project Leader)

Spatial data

1. Create an FGDC-compliant metadata record for each newly-created shapefile using the NPS Metadata Tools & Editor and ESRI's ArcCatalog software. Update existing metadata records as needed. (**Project or Field Crew Leader/Assistant Data Manager**)
2. Include the Biological Data Profile, if appropriate. (**Project or Field Crew Leader/Assistant Data Manager**)

Photographs

Create metadata for each photo using a photo management software program. Refer to the “Digital Photograph Management Strategy” document for detailed instructions on creating photo metadata. (Project or Field Crew Leader)

Data delivery and product review

1. Review all raw and derived data products (tabular and spatial), metadata, photographs, reports, and other products to ensure that they fulfill the project objectives and meet the Networks product specifications. Digital files should be clearly named according to network standards and stored in the appropriate folders in the project workspace. Return products that do not pass the review to the originator for revision. (**Project Leader/Assistant Data Manager**)
2. Deliver the final products by entering the delivery date in the “product tracking” portion of the kick-off meeting notes, and notify the data manager via e-mail that they are complete. (**Project Leader**)
3. Review the completed products to ensure they have all been received, are in the right formats, and are ready for cataloging, integration, and distribution. Return products that do not pass the review to the project leader for revision. (**Data Manager/Science Writer-Editor**)

Product Integration

Data management staff is responsible for most of the tasks in the product integration phase, with some assistance from the project leader and staff. During this phase, project data are integrated into national databases and metadata records and non-sensitive products are cataloged, archived, stored, and distributed to their intended audiences. Follow the guidance in the “Sensitive Data Management Strategy” guidance document and handle sensitive data products appropriately.

National databases and applications

IRMA (Integration of Resource Management Applications)

Use the online IRMA Natural Resource Information Portal (NRPortal) to catalog and upload metadata and products:

NPSpecies Database

Add new species and supporting evidence recorded during the field season through the NRInfo NPSpecies Application (Data Manager)

OR

Submit the entire seasonal database to NPSpecies staff for uploading to the database. (Data Manager)

NRInfo Reference Application

1. Catalog annual and synthesis-and-trend reports and upload the pdf(s). **(Data Manager)**
2. Catalog and upload the project database and metadata. **(Data Manager)**
3. Catalog and upload spatial data and metadata. (Assistant Data Manager)

Network databases and applications

Network Web Sites

The Networks' Internet and Intranet web sites automatically query the NR Reference Application and display links to the uplands monitoring project reports.

Notify parks of report publication. (Project Leader)

Learning Center of the American Southwest (LCAS) Web Site

The LCAS web site automatically queries the NR Reference Application and displays links to all Networks' monitoring project reports.

1. Add links to resource briefs (and other LCAS products as listed in Table 6.1 of the protocol narrative) and upload the pdfs to the LCAS repository. **(LCAS Webmaster/Data Management Staff)**
2. Notify parks when these products are available. **(Project Leader)**

Networks' Reference Library

Store a printed copy of each annual and synthesis-and-trend report in individually labeled folders in the Network Reference Library files. (Data Management Staff)

Archiving and records management

Project folder review

Go through the seasonal folders and ensure that all files are appropriately named and versioned. Determine which ones to retain on the Active drive, which ones to transfer to the master project file on the Archive drive (refer to the "Archiving Instructions" guidance document for more information), and which files to delete (refer to "Director's Order #19" and the accompanying "Records Disposition Schedule" and "Management Handbook" for detailed information on what constitutes a record and which records may be destroyed). (Project Leader/Data Management Staff)

Seasonal files

1. Transfer digital files to the master project folder on the Archive drive. **(Data Management Staff)**
2. Export the tables in the master project database as ASCII text files and store them with the master project database. **(Data Manager)**
3. Transfer copies of paper files (e.g., paper data sheets) to the central project files in the SODN conference room (refer to the "Archiving Instructions" guidance document for more information). **(Data Management Staff)**
4. Transfer original paper and other project files to the designated off-site repository. **(Data Management Staff)**

Backup procedures

1. Store a copy of the master project database on a CD or DVD in the on- and off-site Networks' media cabinets. **(Data Management Staff)**
2. Make external tape backups of data on the Archive drive on a quarterly basis and store at an appropriate off-site location between scheduled backups. At the end of each calendar year, send this backup tape to the Washington Support Office for permanent off-site storage. **(Data Management Staff)**
3. Make external tape backups of all data on the Active drive daily (Monday-Friday) and store in an on-site, fireproof file cabinet. **(Data Management Staff)**

Evaluation and Closure

The evaluation and closure phase involves all project and data management staff in an annual review to evaluate the success of the field season and to verify that all data and products are complete and available.

Season close-out meeting

1. Conduct the season close-out meeting within two weeks of completing the product integration phase to assess how well the project met its objectives and to determine what might be done to improve various aspects of the methodology, implementation, and formats of the resulting information. Refer to the close-out meeting checklist for additional information on evaluating the field season. **(Program Manager, Project Staff, and Data Management Staff)**
2. Create a list of action items to be addressed before the next field season begins. Assign responsibility for each item and set a target completion date. **(Program Manager, Project Staff, and Data Management Staff)**

Data Maintenance

Although all data are carefully checked before being analyzed and reported, certification does not guarantee that the data are entirely free of errors; the next section provides guidelines for making and tracking edits to certified data, if necessary. Similarly, changes in sampling methods and techniques may lead to revisions of the structure or functions of the database; the next section also provides guidelines for making and documenting necessary revisions to the project database.

Data editing

1. The project leader and data management staff work together on any edits to certified archived data. At this stage, printed, original, and copied data sheets are not altered. Field data sheets are reconciled to the database using the edit table and reports. **(Project Leader/Data Manager)**
2. Before beginning the edits, make a backup copy of the database so the original data may be recovered in case mistakes are made during the editing process. Store the backup copy in the **Backups** folder in the **Processed_Data** folder on the Archive drive. **(Assistant Data Manager)**
3. Make the changes in the master digital database. **(Project Leader/Data Management Staff)**
4. Track changes in tbl_Db_Data_Edits in the master project database. **(Project Leader/Data Management Staff)**
5. Print a copy of the "Data Edit Report" and file it with the field data sheets; file a copy of the report with the copied data sheets. **(Project Leader/Data Management Staff)**

Database revisions

1. Before making any major revisions to either the structure or functions of the front- or back-end database, make an archive copy to allow tracking of changes over time. **(Assistant Data Manager)**
2. Store the archive copy in the **Archive** folder in the **Processed_Data** folder on the Archive drive. **(Assistant Data Manager)**
3. Rename the master database using the next appropriate version number, and make the changes. Refer to the "Digital File Management Strategy" guidance document for detailed instructions on database versioning. **(Data Management Staff)**
4. Track changes in tbl_Db_Revisions in the master project database. **(Data Management Staff)**
5. Notify frequent users of the database about the updated version. **(Data Management Staff)**

References

Angell, Deborah L. 2005. Sonoran Desert Network data management plan. National Park Service Inventory and Monitoring Program, Sonoran Desert Network, Tucson, AZ. <http://science.nature.nps.gov/im/units/sodn/datamanagement.cfm>

Guidance documents, global operating procedures (GOPs), and forms mentioned in this SOP may be downloaded from the SODN online Data Management Guidance Library at <http://science.nature.nps.gov/im/units/sodn/datamanagement/guidancelibrary.cfm>

Southern Plains, Sonoran Desert, and Chihuahuan Desert Networks
Exotic Plant Monitoring Protocol

SOP #07: Protocol Revision

Version 1.00
(November 3, 2015)

Revision History Log

Previous version #	Revision date	Author	Changes made	Reason for change	New version #

This SOP explains how to make and track changes to the protocol narrative and related SOPs. Following these guidelines ensures that previous data collection and processing procedures are documented and retained for use and interpretation of historical data sets. Similarly, clear articulation of new methods is crucial to credible interpretation of data acquired since the implementation of changes.

Project staff should refer to this SOP when any changes to an approved protocol document are necessary. They must ensure that the proper level of review is conducted and that documentation standards are followed. They should also understand protocol versioning methods to ensure that the active version of a protocol document is revised and make the revisions in a timely manner in order to minimize disruptions to project operations.

Protocol Review

This protocol attempts to incorporate the soundest methodologies for collecting, managing, analyzing, and reporting terrestrial vegetation and soils data. However, the protocol will be updated as necessary when new technologies, methods, or equipment is adopted. Changes should first be evaluated in terms of cost and benefit, then subjected to appropriate review and, if approved, implemented in a timely manner.

All modifications should be reviewed for clarity and technical soundness. Small changes to existing documents, such as formatting, simple clarification of existing content, minor changes to the monitoring schedule or budget, or general updates to data management SOPs, are reviewed in-house by appropriate Network staff and cooperators. More substantial changes that are significant in scope and impact, such as those made to the sampling design, data-collection methods, or analysis techniques, generally require an outside review coordinated by the NPS Intermountain Regional Office, using reviewers familiar with terrestrial vegetation and soils monitoring and data analysis.

Document Life Cycle

Protocol documents are maintained as separate MS Word files for each component (e.g., narrative, SOP). During its life cycle, each document can be classified into one of six life cycle stages:

1. Draft documents: Documents that have been drafted or revised but have not yet been reviewed and approved.
2. Review documents: Draft documents distributed for peer or administrative review.
3. Active documents: Documents that have been reviewed and approved and are currently implemented for active monitoring projects.
4. Archived documents: Comprehensive set of active protocol documents, published NPS Natural Resource Report (NRR) series versions of the complete protocol, and inactive documents (see above). These are stored on

the S:\ drive as read-only and provide the history of protocol components through time.

5. Distribution copies: .pdf versions of approved protocol components for posting to web sites or otherwise sharing outside the NPS.

Revision Procedures

The project leader is primarily responsible for protocol revisions, including making the actual edits and ensuring document review at the appropriate level. The process for revising protocol documents is shown in Figure 1 (adapted from J. Boetsch, North Coast and Cascades Network) and explained below.

Be aware that a change in one document may trigger changes in other documents. For example, a change in the protocol narrative may require edits in several SOPs, or renumbering an SOP may require changing references to that SOP in other protocol documents. Remember that appendices may also require updating.

1. Discuss changes. Project staff should evaluate proposed modifications prior to revising any documents. Consulting with the data management staff is particularly important prior to making changes to ensure that data set integrity and continuity will be maintained. To avoid interference with project operations, advance notice of changes is also important, because they may lead to revisions to the database structure or functions that require a significant amount of time to complete. Project and data management staff should agree on who will make the changes and establish a timeline for completion.
2. Revise document.
 - a. Create the draft of the protocol document to be revised by making a copy of the active MS Word document. Change the version number and add “_Draft” to the base file name of the protocol document. Refer to the SODN “Digital File Management Strategy” guidance document for accepted naming standards and conventions.
 - b. Turn on the Track Changes feature in MS Word prior to making any edits.
 - c. Change the version number in the document header and title sections; change the effective date. Refer to the SODN “Digital File Management Strategy” guidance document for detailed instructions on protocol versioning.
 - d. Add “– Draft” to the document header and “(Draft)” after the version number in the title section.
 - e. Update the file name and path in the document footer.
 - f. If desired, you may also add “D R A F T” to display as a diagonally printed watermark on each page.
 - g. Make the agreed-upon revisions.
3. Track revision history. Use the “Revision History Log” to document edits in only the document that is modified. Record the previous version number, date of revision, author of revision, a brief description of the changes, paragraphs and pages where changes were made, the reason(s) for the changes, and the new version number.
4. Circulate for review.
 - a. For minor changes, circulate the revised draft among network staff and cooperators.
 - b. If changes are substantial enough to merit peer review, create the review copy of the document by replacing “_Draft” with “_Review” in the file name.
 - c. Submit the document for peer review according to the instructions in the “Report Management Strategy” guidance document.
5. Finalize document. After approval and final changes:
 - a. Ensure that version numbers, file names, etc., are updated appropriately throughout the protocol documents.
 - b. Remove “_Draft” or “_Review” from the file name to designate it as the active document. Remove the “D R A F T” watermark, if one was used.
 - c. Remove all editing markup and comments for the final (active) version.
 - d. Enter all narrative and SOP version changes in the Master Version Table (MVT), which is maintained at the end of this SOP. Create and record a new Version Key number (VK#) in the MVT, along with the date of change and the version of the current narrative and each SOP. The VK# increases incrementally by integers (e.g., 1, 2, 3, 4, 5; no zeroes). NOTE: The Version Key number is essential for project information to be properly analyzed and interpreted. Do not distribute the protocol narrative, SOPs, or data independently of

this table.

- e. Update the “Protocol Version” to the new VK# on the master copy of all field data sheets and in the project database.
 - f. Inform the data manager which protocol documents have been updated.
 - g. For minor edits to only the protocol’s SOP(s) proceed to the distribution portion of this SOP. For any major edits to the SOP(s) or for any edits to the protocol’s narrative; refer to the “Reports Management Strategy” guidance document for procedures to follow if the protocol is to be republished in the Natural Resource Report (NRR) series.
6. Create distribution copies. Data management staff is responsible for document distribution and archiving (Step 7).
- a. Create a pdf version of the new active MS Word document for posting to the SODN Internet site for sharing with others. This pdf should have the same name as the MS Word file.
 - b. A pdf version of this SOP, with the updated MVT, which will also be posted to the SODN Internet site.
 - c. Replace the previous distribution copy on the SODN monitoring web page with the revised pdf.
 - d. Notify known users of the former version of the revised document that a new version is now available.
7. Archive document.
- a. On the S:\ drive; under the project’s protocols folder in the Narrative_SOP folder, create a new folder with the name of the new Master Version Key.
 - b. If the revision to any of the protocol’s SOP(s) causes the protocol to be republished, than a pdf and Indesign version of the entire protocol will be placed into this folder, along a pdf copy of the protocol narrative and each SOP. Ensure that each file is named in accordance with “Digital File Management Strategy.”
 - c. If the protocol has been republished, catalog the NRR in the online NRInfo Reference Application and upload the new pdf.
 - d. Place a printed copy of the NRR in the SODN Reference Library.
 - e. If the protocol was not republished; place the pdf of the protocol’s narrative and each SOP in the folder.

References

Guidance documents, global operating procedures (GOPs), and forms mentioned in this SOP may be downloaded from the SODN online Data Management Guidance Library at <http://science.nature.nps.gov/im/units/sodn/datamanagement/guidancelibrary.cfm>

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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National Park Service
U.S. Department of the Interior



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