RSV Restoration Nursery and Seed Bank Collection Standards and Protocols

Initial Version: Brianna Baker, Summer 2020

Santa Monica Mountains RSV Nursery

Table of Contents

RSV Restoration Nursery

The Rancho Sierra Vista Nursery is the Restoration Nursery for the Santa Monica Mountains National Recreation Area (SAMO). We scout, collect, grow, and plant local natives within the park lands and with our partner organizations. As part of our operations, we operate a small herbarium separate from the main herbarium. Our goal is to collect seed from various local ecotypes both to grow and to build out a seed bank. For us to do that effectively it is necessary for us to have set standard operating procedures, especially regarding location and species data collection from start to finish.

The initial step is to locate our target species in each ecoregion. Targets for collection are set by our Nursery Manager (Antonio Sanchez) and the Restoration Ecologist (Joey Algiers). Generally they are specific to each outplanting restoration site, but we also have some species that fall outside of that category including rare plants for the seed bank or milkweed seed for the public. We send folks into the field to find locations where there is an adequate population of each target (50+) using Inventory and Monitoring data collected by Mark Mendelson and his team. They mark the location, fill out a data sheet, and, if there are flowers present, collect an herbarium specimen. After herbarium specimens are collected, they are processed and stored for later use. The location and date data are entered into a google sheet that tracks how much of the needed material has been collected for any given record. The geolocated point is also used to visualize each target population.

When the time comes, seed is collected from each target using a protocol modeled after the SeedLA and Seeds of Success collection protocols. Timing of collection is based on a combination of knowledge of the plants, field observations, and our [Collection Flora](#) cheatsheet. Finally, the seed is processed, accessioned, and either saved in the seed bank or directly sown to be grown and outplanted.
[SER Standards](#)

GPS Use

We use two different types of GPS here at RSV, so the specifics of their interfaces are a little different from one another. All GPS should be set to use WGS84 and display coordinates as decimal degrees. Please ensure this is the case.

Adding a Point

1. Click Mark Waypoint
2. Change Name field
   a. If you are marking a point that will be written on our datasheet, make sure to use the correct conventions (below).
3. Ensure the coordinates are correct. If you are navigating to a point that someone has given you, "Coordinates" is where you will enter the numbers. Around SAMO, we will always be in N and W. Note: W118 means the same thing as -118.
4. Save it!

Navigating to a Point

1. Click Find
2. Click Waypoints
3. Search or Scroll to your intended point

To easily toggle between screens click the "X" or "QUIT" button. Helpful screens include the map and the compass.

Point Naming Conventions

The naming system is as follows: LOC20-061101A

LOC is a 3 letter code for location (See Table 2 for code)

20 is the year

0611 is the date in MMDD

01 is the point number

A is the GPS you are using (A, B, C, or D)

Using GPS Data on Computer

For general purposes, the data that we take on a GPS can easily be visualized using Google Earth. The GPS units that we use utilize .GPX files whereas Google Earth uses .KMZ files, but conversion between the two is simple.

Inputting GPS Data to Google Earth (Direct)

1. Plug GPS into computer and open Google Earth
2. File>Open
3. Ensure that the file type is "GPS" so that .GPX files will show up
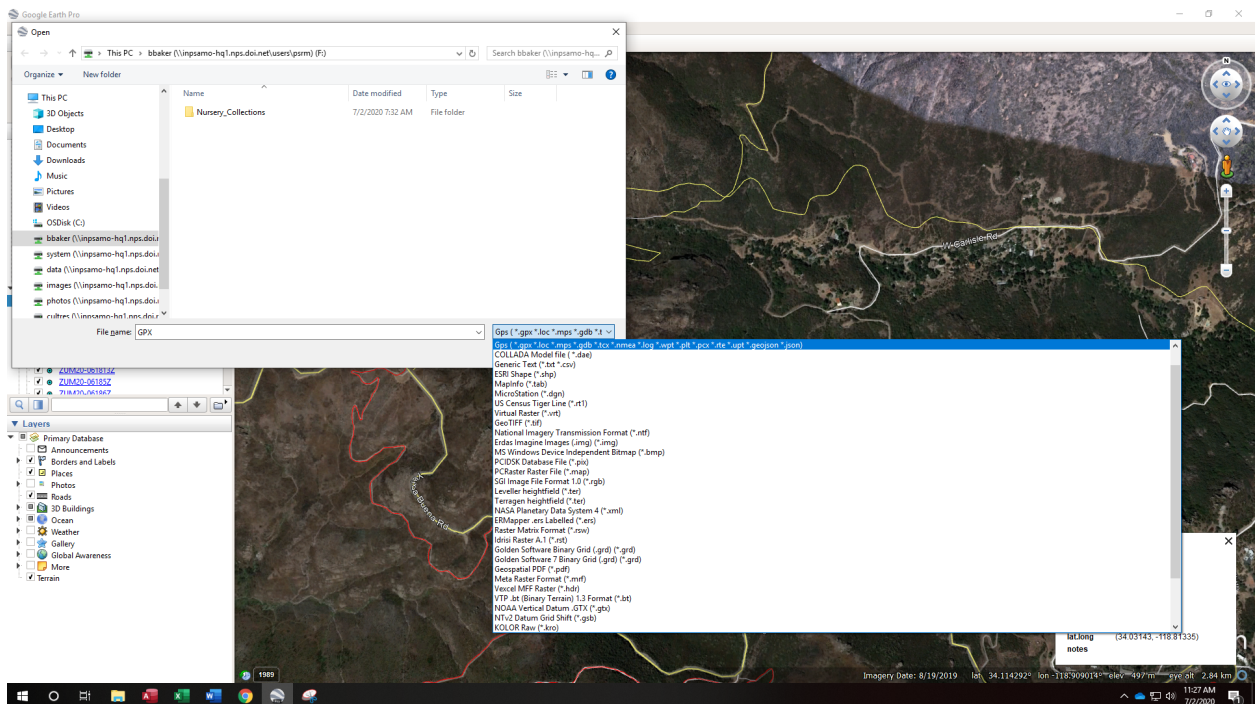
4. Select your file
5. Follow prompts

Inputting GPS Data to Google Earth (Indirect)

Currently (August 2020), we are using two different Garmin models. One (the orange one) can be recognized by any computer and the data can be pulled off it through file explorer. The other (yellow) can only be recognized by computers with Garmin Basecamp installed. Basecamp allows you to receive the GPS data from the device and save it locally on your computer.

Then, you can export the desired points to a .csv and from there append them to our Google Sheet. It is important to make sure that you keep the name the field person attached to the point in case we need to revisit the paper data for some reason. If you want to use data that is in one of our spreadsheets you will need to save it as .csv. Most of our data are in Google Sheets files. To save a google sheet as a .csv, click "file" > "Download" > ".csv" and make sure to save it somewhere you will remember.

When you download gps data, make sure to upload a copy of the file to the google drive so that there is a record in case something happens in all the copying and pasting. Back in Google Earth, click "file">"import". Navigate to where you saved the file. It probably will not show up because Earth automatically shows only .kmz files; you will need to go to the menu in the bottom right and change the file types that are showing to include the .csv extension.

Once you open the file, an import wizard will pop up. Click through it to make sure that everything is importing correctly. Of special note is to make sure that the Latitude and Longitude are correlated with the correct columns on your spreadsheet. Once you go through the wizard, you can click finish. Earth will ask you if you want to make a format file. Say yes and go through that wizard as well to choose what your points will look like. Make sure to set a name field.

After validating your points, you need to save the file. It should be open in "Temporary Places." Right click it and choose "save place as." Name it and save it as a .kmz. If you want to put it into "my places" you can click and drag it there.

Exporting Google Earth Data to a GPS

1. Save the data you want to put on your GPS as a .KMZ file
2. Use GPS Visualizer to convert to .GPX
3. Save the file with an intuitive/descriptive name where you can find it
4. Plug in the GPS
5. Move the .GPX file you made into the GPX folder on the GPS

Making a Layer from a CSV

You will not always have .kmz or .gpx files ready made; sometimes you will have data that you want to use to make your own layer. Google Earth only opens certain file types, so you will need to save your spreadsheet as one of those. I usually use .csv. Most of our data are in Google Sheets files. To save a google sheet as a .csv, click "file" > "Download" > ".csv" and make sure to save it somewhere you will remember. The same place as the layer files is probably a good choice. Back in Google Earth, click "file">"open" (ctl + O). Navigate to where you saved the file. It probably will not show up because Earth

automatically shows only .kmz files; you will need to go to the menu in the bottom right and change the file types that are showing to include the .csv extension.

Once you open the file, an import wizard will pop up. Click through it to make sure that everything is importing correctly. Of special note is to make sure that the Latitude and Longitude are correlated with the correct columns on your spreadsheet. Once you go through the wizard, you can click finish. Earth will ask you if you want to make a format file. Say yes and go through that wizard as well to choose what your points will look like. Make sure to name the file in a way that you will remember in case you want to use it again.

Your points will now show up! Now you need to make sure that all the points are where they belong. When the layer first opens, it will zoom to the full extent of the data, so if it is showing a huge area, that means something is wrong. If any points are misplaced, find out which ones they are and fix them in your datasheet. This process is called data validation. After you fix them, you will need to go through the steps to download your data as a csv and open it up in earth or edit the points within Google Earth (right click>properties)

Now that your data are all validated, you need to save the file. It should be open in "Temporary Places." Right click it and choose "save place as." Name it and save it as a .kmz. If you want to put it into "my places" you can click and drag it there. You now have a .kmz file saved on your computer!

Table 2: *Location Codes*

Location	Code
Rancho Sierra Vista	RSV
Zuma	ZUM
Paramount	PAR
Chesboro	CHE
Circle X	CIX
Rocky Oaks	ROO
Solstice Canyon	SOC
Peter Strauss Ranch	PSR
King Gillette Ranch	KGR
Hennesy	HEN

Herbarium Collection *Rhay Flores, Last updated January 2021*

When collecting a voucher, remember that its purpose is to be a representative sample. Think of it like a snapshot of what the plant was up to when you visited. In addition to the leaves, a voucher specimen should also include any structure present on the plant/in the population at the time of collection. This includes new growth, old growth, flowers, fruits at all stages present, leaves, and branching structure. For annuals and grasses, it also should include roots.

When pressing a specimen, allow each structure to be visible. This is especially important with floral structure. Allow for a front view, side view, and dissected view. Both sides of the leaves should also be visible. Other structures can also be dissected before pressing to give a better view. Specimens should be cut and trimmed appropriately in order to fit well in the press. Structures that will not press well can be stored and dried outside of the press.

The written data that we collect when we take a voucher sample are just as important as the pressing itself. These data give us, and anyone else using our collections, an idea of where the plant was growing. Identification can sometimes rely on this as do reconstructions of species distribution.

Voucher Collection Process
1. Take samples of representative structures of target species
2. Label physical collection with a sticky note or write directly on the paper. Include date, general location and species ID
3. Press between newspaper, drying paper, and cardboard
4. Fill out Section A of [Collection Sheet](#) form in the field. Not included on the sheet, but implied and necessary for botanical specimens are Country (US), State (CA), and Jepson Geographic Subregion (South Coast)

Specimen Preparation

After a specimen has been collected and has been pressed and dried, it is ready for processing. This process includes matching a collected specimen with its voucher, creating a label from that voucher, and finally mounting the specimen.

Creating Labels

An herbarium specimen's label should concisely contain all pertinent data from the voucher that was filled out during the field collection. Specimen labels are essential in communicating location data, the collector's information, and what specific collection the specimen itself belongs to. The information that you will need will be found on the [Collection Sheet](#).

There are various formats of herbarium labels, but for the purposes of the SAMO Herbarium collections, the following template must be used:

A) PLANTS OF CALIFORNIA

Santa Monica Mountains NRA

B) *Genus species* Describer (TSN)

C) FAMILY

D) USA. CA, COUNTY: Landowner General Area name.
Succinct Locality Description

E) LAT, LONG location accuracy (DATUM), El. Elevation

F) Plant Description (include height, petals, etc); phenology.
G) Distribution.
H) Soil; slope/aspect; exposure
I) Habitat. Associate spp.
J) Collector (CN)   DD MONTH, YEAR

A) Name of the collection

B) Scientific name of the specimen followed by the appropriate describer with their Taxonomic Serial Number (TSN). These data can be found on the Integrated Taxonomic Information System site here.

C) Appropriate family names can also be found on the ITIS site. Family names should be cross-referenced with Calflora and Jepson e-flora.

D) Data should be found on the voucher. Locality description should be concise and specific.

E) GPS data should be on the voucher. Note that any gps coordinates must always be accompanied by the appropriate DATUM. For collections with SAMO, the datum will always be WGS84. In addition, location accuracy with the GPS models used for our collections is ± 15 m. Optional: See here for additional information regarding datums, coordinate reference systems, and map projections.

F) Information regarding plant descriptions can be found on Jepson e-flora. Once you've found the appropriate species on this site, navigate to the table titled "Higher Taxonomy". Click on the "View Description" link corresponding to the species name. Relevant information and applicable botanical terms regarding the species' description can be found here.

Additional plant description information can be found on the "ANF Descriptions" button found on the bottom of a species' page on the SMM Wildflowers app or site. See example here.

A glossary of botanical terms is available here.

The following are appropriate examples of plant descriptions:

1) Petals yellow to orange turning reddish toward the base of the petal; flowering. Small (6 individuals), scattered population. (plant description for *Mentzelia veatchiana*)

2) Native perennial herb. Stems woody. Leaf base claspin; triangle-ellipse shaped; adaxial bright green, abaxial white. Inflorescence clustered, bell shaped; flowers white, approximately 30 flower heads on a cluster. Specimen flowering and budding. (plant description for *Pseudognaphalium bioletti)*

Data regarding phenology will be found on the voucher. Phenology refers to an organism's seasonal or temporal phase in its life cycle. We will use the following terms to describe a plant's phenology: Budding, Flowering, or Fruiting. Note that descriptors regarding phenology can be much more specific than the terminology we will be using.

G) Data regarding the species' distribution as well as its estimated population size will be found on the voucher.

H) Data will be found on the voucher.

I) Habitat information will be found on the voucher. Associated species data on the voucher may be in

the format of six-letter codes, e.g. ESCCAL. Our labels must use the full scientific name in the appropriate format, e.g. Eschschulzia *californica.* List all associated species included in the voucher.
J) Collector, their respective collector number, and the date the specimen was collected ill be found on the voucher.

Included below are examples of completed specimen labels. Note that annotations included within these protocols are for instructive purposes and should not be included in completed labels.

A) PLANTS OF CALIFORNIA

Santa Monica Mountains NRA

B) *Salvia mellifera* Greene (32724)

C) LAMIACEAE

D) USA. CA, LOS ANGELES COUNTY: ZUMA. Zuma Canyon Trailhead.

E) N 34.03143°, W -118.81335° ±15 m (WGS84), El. 40 m.
F) Native shrub, approximately 1-2 m tall. Leaf oblong- elliptic. Inflorescence wide elliptical, spiny; each containing 4-5 florets. Flowers clustered, 2-3 cm from other inflorescence. Petals tubular, white/purple. Specimen flowering. G) Population: 150.
H) Clay soil, Gentle slope, Full sun.
I) Coastal Sage Scrub; Associate spp.: *Acmispon glaber, Encelia californica, Malosma laurina, Artemisia californica, Malacothrix saxatilis, Malacothamnus fasciculatus, Hesperoyucca whipplei, Solanum xanti, Elymus condensatus, Isocoma menziesii, Eriogonum cinereum, Adenostoma fasciculatum.*

J) Collector: B. Brown (No. 001)   08 APRIL, 2020

PLANTS OF CALIFORNIA

Santa Monica Mountains NRA

Salvia spathacea Greene (32744)

LAMIACEAE

USA. CA, LOS ANGELES COUNTY: NPS. Kanan Dume.

N 34.06030°, W 118.80408° ±15 m (NAD83), El. 430 m.
Perennial herb; Stems four or more sided, green and glandular hairy; Leaves opposite and blade oblong-hastate; Inflorescence condensed cymes; Flowers red to salmon and strongly bilateral. Specimen flowering. Population large ~100 individuals.
Clay soil; Steep slope; Semi-shade.
Coastal Sage Scrub; Associate spp.: *Venegasia carpesioides, Diplacus longiflorus, Malacothrix saxatilis, Eriogonum cinereum, Sambucus nigra, Keckiella cordifolia, Prunus ilicifolia, Marah macrocarpus, Malacothamnus fasciculatus, Spartium junceum.*

Collector: B. Brown (No. 005)   8 APRIL, 2020

Mounting Specimens

Materials

- Archival quality paper (resume paper)
- Completed label
- Fully dried specimen

- Paintbrush or sponge
- Herbarium sheet
- Herbarium glue
- Normal glue

- Water in tray/cup/container
- Empty press + straps
- Fragment envelope (if needed)
- Weights (if needed)

Steps

1. Wash your hands. Always handle herbarium supplies and specimens with clean, dry hands in order to keep fully processed specimens as clean as possible.

2. Prior to mounting, print your labels onto archival quality paper and trim them using the paper cutter. Labels should be cut to have approximately ⅛" to ¼" of a border surrounding bodies of text.

3. Assemble all required materials on a clean work station.
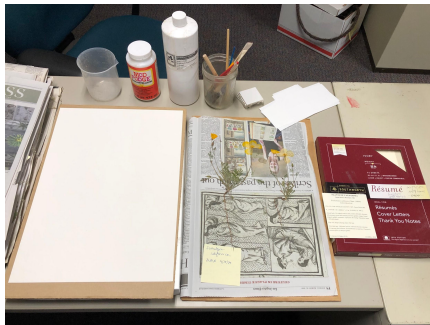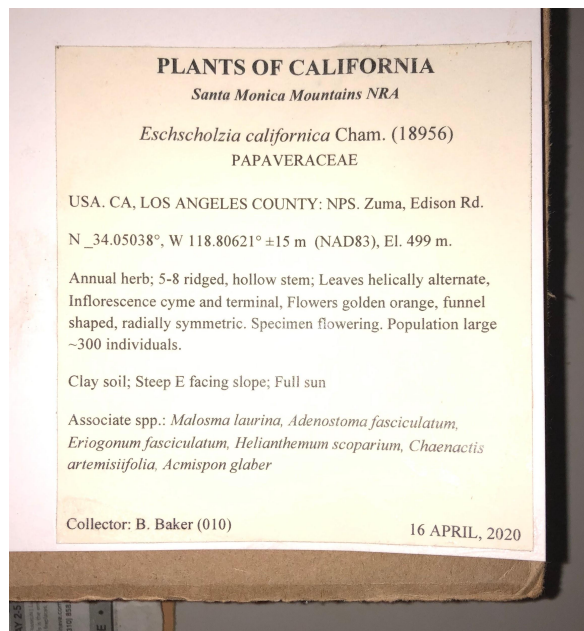

4. Ensure that labels are matched to the appropriate specimens.
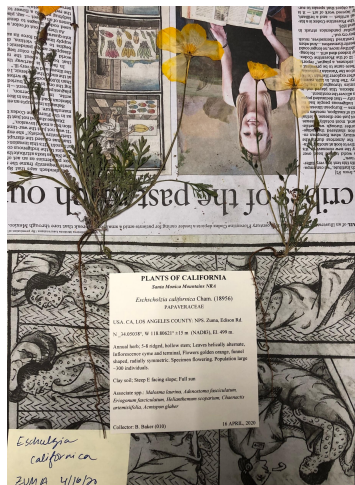
5. Dilute herbarium glue with water to a thinner, workable consistency. Glue should not be too watery or too thick. It's best to gradually add water until reaching the appropriate consistency- a dilution which has excess water would require adding additional herbarium glue which would potentially go to waste.
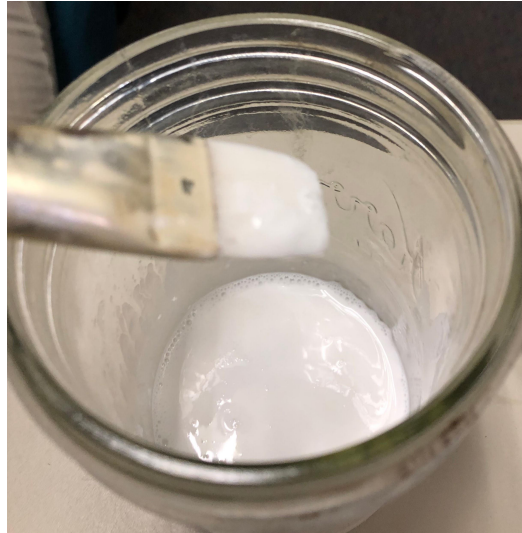
6. Before attaching your specimen to your herbarium sheet, glue the label onto the bottom right corner of the herbarium sheet. It's not necessary to use herbarium quality glue for the label, any kind of lower quality glue is sufficient. Glue the label approximately ⅛" to ¼" from the edge of the herbarium sheet.

PLANTS OF CALIFORNIA
Santa Monica Mountains NRA

Eschscholzia californica Cham. (18956)
PAPAVERACEAE

USA. CA, LOS ANGELES COUNTY: NPS. Zuma, Edison Rd.

N _34.05038°, W 118.80621° ±15 m (NAD83), El. 499 m.

Annual herb; 5-8 ridged, hollow stem; Leaves helically alternate, Inflorescence cyme and terminal, Flowers golden orange, funnel shaped, radially symmetric. Specimen flowering. Population large ~300 individuals.

Clay soil; Steep E facing slope; Full sun

Associate spp.: *Malosma laurina, Adenostoma fasciculatum, Eriogonum fasciculatum, Helianthemum scoparium, Chaenactis artemisiifolia, Acmispon glaber*

Collector: B. Baker (010)   16 APRIL, 2020

7. Lay out the specimen on the herbarium sheet to visualize how you want it to be glued. Make sure not to cover any portion of your label when laying out the specimen. In addition, leave space on the upper right corner for a fragment envelope. Fragment envelopes are not always necessary for all specimens, but it's ideal to leave space for them in the event that fragments of your specimen eventually fall off and need to be stored.

8. Flip your specimen over onto a clean sheet of paper so that you are facing the surface of the specimen which will be glued down onto the sheet. Brush your thinned herbarium glue all over this back surface of the specimen, making sure to not use excessive amounts of glue. Next, attach this specimen to the herbarium sheet and hold the specimen down until it feels firmly attached. You may add small amounts of glue over the top of the specimen in order to help the specimen stay glued down.

9. Once the entirety of your specimen is glued onto the sheet, cover the entire sheet with wax paper. Place weights over the wax paper onto any portion of the specimen as needed in order to ensure the specimen fully adheres to the sheet.
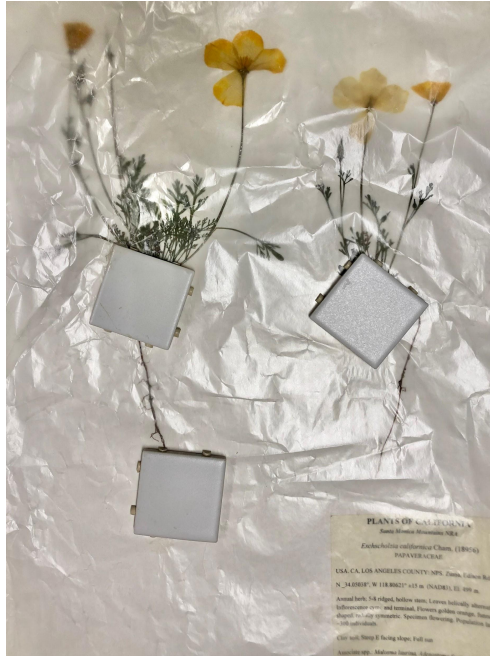
10. Put the sheet, wax paper, and weights between two corrugates and place all of this into a press.

11. Leave the finished specimens to dry in the press for at least an hour, check on these specimens and reinforce glue as needed. After the specimen is completely dry, carefully peel the wax paper off the specimen making efforts to not rip parts of the specimen which may be stuck to the wax paper.

Seed Collection

When collecting seed, bring the appropriate Collection Sheet and fill Section B. If a sheet does not exist, this likely means that there is no voucher for the species/location combination you are collecting at. You will need to take one.

Seed Collection Process

1. Assess the size of the population. Are there at least 50 individuals?
2. Assess the seed viability.
    a. Do they look mature? Green seed/fruit usually indicates that it is immature. The color of mature seed/fruit varies depending on species
    b. Are the seeds full? Do a lot of them look desiccated? If the seed is large enough, squeeze them between your fingers. They should be firm. If it gives easily, it may be empty.

    c. Perform a cut test using seed from at least 3 different individuals. To perform a cut test, place 3 seeds on a strip of tape attached to a wooden block. Cut them in half lengthwise with a boxcutter and inspect the contents with a hand lens. The interior of the seed should be full.

    d. If most of the seeds are healthy and mature, you are good to go! There will be some situations when we will collect immature seed. In those cases, collect a few inches of stem, and even leaves rather than just the fruit.

3. Determine the number of individuals you will need to collect from to reach 30,000 seed by following the steps on the form to approximate the number of seeds/fruit and the amount of seed you can collect per individual plant (20%).

4. To adequately capture the genetic diversity of the population, we will need to collect from at least 50 individuals. As such, when determining the number of plants to collect from, choose the larger number (50 or the number of individuals to reach 30,000 seed)

5. Do your best to collect efficiently and in a manner that will make cleaning the seed easiest. The techniques that you use will change depending on the species. Fleshy fruit should be collected in plastic bags, all other material should be collected in paper bags. Make sure to write the date, species, and location on the bags so that no material gets lost or mislabeled down the line.

Seed Scouting

In order to collect any samples or seed, we need to have a sense of where there are populations large enough for us to pull from. To do this, we often do preliminary scouting in areas where we think that there will be viable populations of our target species. We have a [collection tracking sheet from 2020](#); however, since we are looking to conserve genetic diversity, we will not want to collect from those exact locations again in the future. That means that each spring we will want to re-scout, using previous years as a guide.

Scouts should be trained in herbarium collection practices as often it is most parsimonious to collect herbarium samples and fill out Section A on the Collection Sheet as populations are found. Even if no herbarium sample is taken, scouts should keep detailed notes of what they find. This information will go into a collection tracking sheet that can be used to make a .kmz file that field folks can use to find the populations.

Notes should include:
- GPS Point (name and coordinates)
- Taxon at point
- Size of population at point
- Ease of access (1-easy, 2-medium, 3-hard)

Field Checklists and Forms

The following documents are in the Google Drive folder. You may not have access to them all.
Seed Collecting Checklist: Lists gear needed for a seed collecting trip
Scouting Checklist: Lists gear needed for a seed scouting/voucher collection trip
Nursery Field Contact Sheet: Lists Emergency, Supervisory, and Assistance contact information including current nursery interns and staff.
Nursery Collection Sheet: Form where data on voucher specimen and seed collection is taken
Nursery Seed Collection Summary: Form where seed collection expeditions are summarized at the end of a field day
Nursery Collection Accession: Form where seed cleaning information is recorded

Collection Form

The Collection Form follows a collection through its life in our collections, encompassing both voucher and seed collection. This ensures that there is a voucher that pairs with each conservation collection of seed and that all pertinent botanical information is taken. The fields present on the form have been carefully reviewed to ensure that they are useful to our purposes. As such, none should be left blank. Table 1 enumerates the fields and the format in which data should be recorded in them. Make sure to familiarize yourself with them.

Table 1: *Collection Form Metadata*

Form Field	Description	Format/Units
Voucher Collection Date	Date voucher collected	Day Month Year *19 Jun 2020*
Species	Taxon of species, identified to species level	Genus species(6 Letter code) *Artemisia californica(ARTCAL)*
Habitat	Prominent habitat type at collection site	Sage Scrub, Grassland, Oak Woodland, Riparian, Chaparral
Collector	Name of lead collector. Typically will be the individual who identifies the species	First Initial Last Name *B Baker*
Collector #	Number identifier of botanical collection in lead collector's personal collection history. Start from the beginning if you haven't been counting. Keep track of your collections, the enumeration should follow you through	Number

	your botanical career.	
Locality	Description of location where voucher specimen is located. Be as specific as you can while still being succinct. Ideally someone else should be able to find your collection point without the aid of a GPS.	Descriptive instructions. *By the large rock 2 meters to the North of the Medea Trail, 500 m from trailhead.*
Voucher Point Name	Name of point where voucher was taken using the standard RSV Collections [Point Naming Conventions]().	LOCYear-monthdayPointGPS *CHE20-061901D*
Latitude (N)	Latitude of collection point using WGS84	Decimal Degrees *34.17115*
Longitude (W)	Longitude of collection point, using WGS84	Decimal Degrees *-118.74243*
Landowner	Indicates ownership of land	Acronym/Name *NPS*
County	County that land is in. Ventura County or Los Angeles County	Acronym *VC*
Aspect	Aspect of slope on which collection was made. Aspect is the compass direction that a slope faces (N, S, E, W)	Compass direction *N-NW*
Elevation	Elevation of point voucher was collected at in meters	Meters *200m*
Slope, Exposure & Soil	Qualitative categories for prevailing biogeographical variables in collection location.	Circle on sheet
Pop Size	Estimated total size of continuous population. Can be a range if you have trouble with estimation.	Approximate numerical value *500*
Clusters/points	Description of distribution of individuals. Either in clusters or individual points	Circle on sheet
Flowers & Seed	Binary indicating phenology. Presence/absence of flowers and seed bearing fruit	Circle on sheet
Associated Species	List of associated species, both native and invasive. If you do not know the flora well	6 letter codes *Native: ACMGLA, ERICON,*

	yet, try to at least list the three most common natives and three most common invasives	*SOLXAN* *Invasive: CENMEL, BRASP, ANNGRA*
Notes	Any pertinent notes about collection	
Seed Collection Date(s)	Dates seed is collected on	Day Month Year *19 Jun 2020*
Lead Collector(s)	Name of lead collector on respective dates	First Initial Last Name *B Baker*
Associate Collectors	List of names of collectors	First Initial Last Name *A Sanchez, H Ortmeyer*
Seed Point Name	Name of point where seed collection was taken using the standard RSV Collections Point Naming Conventions. Make a new point, separate from the voucher point.	LOCYear-monthdayPointGPS *CHE20-061901D*
Count Accessible Plants & Cut Test	Categories describing population and seed health	Circle on sheet
Healthy Seed	Estimated healthy seed count per fruit/inflorescence	Number
Average Collectable Fruit/Seed	Average number of fruits/seeds you can collect per plant (~20% of total)	Number
Min Plants to Collect	Minimum number of plants to sample from to reach 30,000+ seeds (30,000/(A x B))	Number
Individuals Sampled	Total count of individuals seed was collected from	Number
Area Sampled	Approximate area collected from	Number
Date Identified	Date of voucher identification/mounting	Day Month Year
Identified By	Name of Identifier	First Initial Last Name

Using Field Maps for Mapping Plant Populations

FieldMaps by Esri allows us to accurately map the plant's population versus a GPS waypoint. The population polygon is useful when we are sending different seed collecting groups or ensuring you collect seed from the entire population. The metadata are mostly the same the Metadata above; certain fields are omitted because they will auto calculate when you initial collect the data, i.e., area sampled and elevation.

To collect data on Field Maps, you will need an IPad & a GPS receiver (if it isn't built into the iPad). It is very important that the offline area is downloaded prior to leaving the base site. You will need internet connection to download the offline area.

Downloading an offline area:
1. Sign into ArcGIS online with your NPS credentials
2. Open the correct map, our map is "SAMO_Plant_Populations"
3. Click the three dots on the map and select "Download Offline Area"
4. Zoom to your area of interest
   a. Note that you can pick the resolution by choosing the Room Size
5. Once the map is downloaded onto the IPad, you are ready to collect data offline

Collecting Data on FieldMaps:
1. Once you are at your plant population of interest, click on the blue "+" sign on the bottom right of the screen
2. A vertex will be placed where you are currently located and new vertices can be placed if you physically walk around the border of the population and select the blue bar that states "Start Averaging"
   a. Start Averaging takes multiple GPS points of your current location and averages them to give the most accurate position
      i. Don't move while averaging!
3. Alternatively, if you can accurately draw the polygon using landmarks on the satellite view, you can draw the polygon by moving the crosshair around the border of the population and select "Add Point"
4. After you map your population, collect the associated metadata

Seed Collection Summary Form

The Seed Collection Summary form is used to track what a field crew intended to find and collect versus what they actually did find and collect. These forms (in the Forms folder) are incredibly useful when the folks who are collecting are not the same as those planning the outings. They also allow the supervisor to perform quality control on collections before they are dried and cleaned.

Seed Accession Form

The accession form helps us to keep track of what seed collections we have cleaned and put away in the seed bank. Because some seed is sown before it is completely cleaned, it may be assigned an accession number before being properly accessioned. The next available accession number can be found on the [Accessions List](#).

There are two sections of our Accession form, one with the information collected while the seed was collected about where and when it was found. The second section serves to track how long it took to clean the seed and what methods were utilized. Eventually, this will allow us to build out a seed cleaning manual.

Seed Cleaning

When cleaning, the goal is to reach a 9:1 seed to chaff ratio. We utilize a variety of methods to do so which are documented on the seed cleaning page (Section B of the Seed Accession Form). During the cleaning process, we document the time to clean as well as the techniques that were utilized to clean during that round.

After cleaning, the seed is stored in envelopes ordered by accession number in the freezer. On each envelope write the Accession Number, Taxon, Date Collected, Location, count of seeds per ¼ tsp, and the total tsp initially in the bag. The Seed Accession Sheet will be filed and stored in a Seed Accession Binder.

Seed Bank Organization

Currently, the entirety of our seed bank is stored (rather haphazardly) in a single freezer. This is partially due to inconsistent filing methods in the past, and partially due to size difference in seeds. Ideally, we reach a point where the seed bank is well organized and safe from various natural hazards. Here at RSV, our biggest concern is fire, followed closely by earthquakes. Seeds need to be stored at a constant low

temperature to maintain efficacy, so the loss of power is a major concern as is moving the collection in the event of fire evacuation. Other seed banks, like the one at SBBG, have solved the problem by keeping their collection organized in tote boxes within freezers with a top that opens upwards. While we may not currently have this sort of situation set up, we can start to organize our seed bank to make it easier to implement in the future.

Below is an outline of some ways we can improve our organizational structure:

1. **Reconcile database with physical collections.** Over time, what is shown in the database as present has become out of sync with what can actually be found in the seed bank. We need to determine which seeds are still in the bank and which are no longer present. Then, we can tell the database what seed has been used up. One way to expedite this process a bit is to use recently emptied seed envelopes and input those accessions as used up. Then we can make a printout of the seed currently in the seed bank and reconcile from there.
2. **Assign accessions to all seed in freezer.** Every collection in the freezer should be documented and accessioned so that we can track it and potentially use it when needed
3. **Store in appropriately sized and labeled containers.** All but the largest collections/seed can be stored in the small orange envelopes. On them should be *Accession Number, Taxon, Date Collected, Location, count of seeds per ¼ tsp, and the total tsp initially in the bag*. Each time seed is removed, the new tsp count should be written on the bag.
4. **Order collections by accession number sequentially**
5. **Put as many seed collections into boxes as possible**

Filling and Filing Protocol

1. Herbarium Collection
   a. Label physical collection with a sticky note. Include date, general location and species ID
   b. Fill out Section A of *Collection Sheet* form in the field
   c. Copy *Sample Collectio*n form and file both *Original* and *Copy* alphabetically in respective files within the correct current location folder
2. Seed Collection
   a. Take *Original* of intended collection(s) into field
   b. When collection is made, fill out Section B of *Collection Sheet* form in the field
   c. Verify whether the collection is complete.
   d. If complete, make a copy of the *Collection Sheet* form on colored paper and staple (in this order bottom to top) *Copy(s), Original,* and *Final Copy*. File alphabetically in *Uncleaned*.
   e. If incomplete, make a copy and file new copy alphabetically in respective *Copy,* paper clipped to the previous copy and return *Original* to its respective place.
3. Seed Cleaning
   a. Use complete *Collection Sheet* form to fill out *Seed Accession* form and **file in Seed Accession folder, make sure to write the Accession Number, Taxon, Date Collected,**

Location, count of seeds per ¼ tsp, and the total tsp initially in the bag on the seed envelope.

    b. Place *Collection Sheet* file (alphabetically) in *Unverified*.

4. Voucher Identification and Mounting

    a. Fill Section C on colored *Sample Collection* sheet, make a digital copy and store in a TBD location. Store hard copy in Archives for appropriate year (alphabetically)

5. Digitizing

    a. Each form should be digitized...still working on the best setup for this. Ideally we would actually input everything onto forms on an ipad directly and cut out all these intermediary steps. Likely for now it will be data entry of the forms into an excel or access sheet/database. Currently we have a few Google Sheets

Note: there is an NPS Nursery Database where the Seed Accession Sheets are input. There is also a table in said database where herbarium info can be stored. This is just difficult to access without a PIV card.

NPS Nursery Database

The database on the NPS servers keeps track not only of the inventory of plants in the nursery, but also of the seed bank. The nursery inventory is mostly up to date (as of 9/17/20 only planting sheets are left to enter), but the seed bank is somewhat disordered and out of date. Even if nursery folks are unable to regularly access the database, we can compile the data to be entered when the chance is presented (see Seed Bank Organization).

The filepath to find the database on the NPS SAMO servers is:
H:\DIVISION\psrm\Plant_Ecology\Nursery\RSV Nursery\Nursery Forms and Database

Note: Each time you intend to enter the database, you must make a copy to the archives and update the working filename with the current date prior to making any edits.