

## **PAPAZ FREQUENTLY ASKED QUESTIONS**

(The PAPAZ Committee is extremely grateful to the San Diego Plant Atlas team for their support and generous use of their information, from which we have extracted and revised for our project.)

### **What is the Plant Atlas Project of Arizona?**

The Plant Atlas Project of Arizona (PAPAZ) aims to scientifically document the floristic diversity of the state of Arizona by the collection of plant specimens from high priority areas. The project has been designed to provide more accurate and detailed geographic information on the flora of AZ for science, education, the interested public, and land managers.

### **What is the Immediate Goal of the Plant Atlas Project?**

The PAPAZ will start collecting voucher plant specimens from high priority areas, beginning in Northern Arizona. To accomplish this, we have created a “Budding Botanist Program” to train interested volunteers how to collect plants, record appropriate field data and make herbarium specimens. We also have developed a system for Budding Botanists to work alongside professional botanists to deliver the specimens and data to regional herbaria.

### **Who is in Charge?**

The PAPAZ is a partnership between the Arizona Native Plant Society, Grand Canyon Trust, Desert Botanical Garden, Forest Service, Northern Arizona University, and Museum of Northern Arizona. An Advisory Committee composed of representatives from partner organizations provides guidance and oversight.

### **How is the Plant Atlas Project of Arizona Being Paid For?**

The Advisory Committee members will be raising money from many sources to fund PAPAZ. To date, partner organizations have donated in-kind services such as staff time and supplies to make the project happen.

### **What Happens to the Specimens?**

Specimens collected for the Plant Atlas Project in the northern part of the state will be deposited in the Deaver Herbarium (Northern Arizona University), the herbarium at Desert Botanical Garden, and the Museum of Northern Arizona herbarium where they will be available as permanent vouchers for the Plant Atlas Project. This will allow future verification of the identifications, as well as updates as taxonomic changes occur. In

addition, these specimens will be available to researchers and botany enthusiasts.

### **How Can I Find Out More?**

Please refer to the Grand Canyon Trust Volunteer website [www.gctvolunteers](http://www.gctvolunteers) for more information and to apply for the program.

## **BUDDING BOTANIST VOLUNTEER PROGRAM AND TRAINING**

### **Who is a Budding Botanist?**

A Budding Botanist is an official volunteer of the *Arizona Native Plant Society* (AZNPS) who has attended an official PAPAZ training session and who collects plant specimens for the PAPAZ. A person does not have to be a formally-trained biologist or botanist to become a Budding Botanist.

The benefits of becoming a Budding Botanist include the following:

- Training on basic plant identification, on the floristics of Arizona, on plant collecting, on data collection, and on herbarium specimen mounting;
- Working alongside regional botanists to learn hands-on; networking with others interested in botany and natural history;
- Opportunities to purchase field equipment at cost;
- Plus the general benefits of all AZNPS members, such as the semi-annual publication, *The Plant Press*, the quarterly newsletter, *Happenings*, and invitations to regional monthly talks, plant walks, and conservation and educational activities.

### **How Do I Become a Budding Botanist?**

You must attend one of two mandatory training sessions sponsored by the PAPAZ partners. The training provides an overview of the project, and covers topics such as the floristic diversity of Arizona, basic plant identification, field equipment used for plant collecting, reading of maps and finding coordinates, and explains what books and resources are available. The training will also teach you how to do the following: collect and press herbaria-quality plant specimens; and collect data in the field and keep a field notebook. Some strenuous physical activity may be required in order to participate in collecting plants in the field. However, you may also be able to contribute in other ways (see the related FAQ below).

### **When is Your Next Budding Botanist Training?**

2009 training sessions will be held March 28-29 at the Red Rock Ranger Station, Village of Oak Creek, and June 27-28 at the Museum of Northern Arizona. A schedule including details on location and information about upcoming Budding Botanist trainings can be found <http://www.gcvolunteers.org/trainings.html>.

### **What if I Attended a Budding Botanist Training in 2008?**

We would like to encourage as many of you who joined us last year to participate in this year's activities. We are asking that everyone who attends training sign up for at least one project throughout the season. There are several one day local projects and herbarium mounting for those who aren't as physically able. You can find a list of trips and dates [on our website](#).

The way the trainings are structured will be that the first day will provide a project orientation and teaching session where you will learn about plant morphology and plant families from botanists. The second day will be a field session with botanists to learn proper plant collecting techniques and how to record data for the project. If you attended a training last year we are asking budding botanists to refresh their skills (as it has been a long winter!) and join us for at least the second day of either session March 29 or June 28. If you are an alumni of 2008 and would like to do the entire training we will try to accommodate you, however, the number of participants is limited so preference will be given to new Budding Botanists.

### **What Is My Responsibility as a Budding Botanist?**

If you decide that you want to become a Budding Botanist, you will be responsible for the following: 1) attending one mandatory training; 2) reading and following the instructions provided; 3) adopting at least one of the project areas; 4) acting as a responsible representative of AZNPS and other partner organizations; 5) contributing to our long-term, overall goal which is to provide the partner herbaria with one voucher plant specimen of each native and naturalized plant species growing within the determined project areas; 6) helping to mount dried and pressed plant specimens; 7) conducting yourself safely and responsibly when doing field work; and 7) keeping track of your volunteer hours on the project. You may occasionally be required to perform strenuous physical activity if you choose to participate in plant collecting.

### **Am I Covered by Liability Insurance while Engaged in Fieldwork as a Budding Botanist?**

As a Budding Botanist Volunteer with the Plant Atlas Project of Arizona, you will sign a waiver and release agreement agreeing to assume all risks of loss and injury that may arise out of your participation and agree to waive all claims against the participating partner organizations. If a project is sponsored by a federal agency you can sign up as an official VIP and have limited liability coverage while you are in the field.

### **How Much Time will it Take to be a Budding Botanist?**

Budding Botanist volunteers officially working on PAPA Z must commit to completing one mandatory training session (a minimum of 2 full days). Budding Botanists from 2008 may want more training and decide to attend the 2nd-day refresher class in the field of either training. Beyond that, the time commitment varies from person to person depending on whether you opt to do field work, or choose to contribute in some other way, such as mounting plants in the herbarium or entering data. We would like each participant to adopt at least one project area; trips will vary from week-long backpacking trips to day trips around Flagstaff.

### **I am a Professional Biologist – Why Do I Have to Take Your Training?**

We respect and appreciate the fact that PAPA Z has had a very positive response from professional biologists and botanists. Your contributions and enthusiasm have already proven to be a great asset to the project and we want you to continue to be involved. If you are a professional botanist we require that you just do the second day that covers field techniques and data collection protocols. The reasons that we require everyone officially participating in PAPA Z to go through our training program is that for the sake of consistency we need all participants to be “on the same page.” with respect to the procedures we have developed for collecting and pressing plants and recording and submitting field data; we need everyone to understand clearly what they are being asked to do, and what not to do; and we want the agencies to be comfortable that we are consistently providing all of our volunteers with certain information (e.g., about permits, access, safety, and special status species).

### **What if I Don't Know How to Identify Plants?**

The ability to identify plants is not a requirement! Throughout the project you will be working alongside professional botanists who will verify the identity of all plants submitted to herbaria. You are encouraged to try to

learn the families and names of plants you have collected if you wish, and to assist with entering information into the online data submission form. One of the benefits of volunteering as a Budding Botanist is that your plant identification skills will probably improve as you go along, with opportunities to work more independently should the opportunity arise.

### **Do I Have To Buy Expensive Equipment to Participate?**

No. Plant collecting has been successfully carried out through history using only the most basic technology. The partner organizations will be supplying all of the equipment and materials. If you would like to invest in your own equipment, an adequate setup can be put together from simple materials, or fancier gear may be purchased. We may be able to arrange bulk purchase of some supplies that we can sell at low prices. You will receive more information about equipment and supplies at the training session.

### **I Want to Photograph Plants as I go—Do You Want Copies of the Pictures?**

We would love to have photographs of the plants to submit with herbarium specimens and to catalogue online. We will want the files in digital form, in high resolution or raw format either from a digital camera or scans of prints. Please make a habit using the collection number to label each photo, either written on the print or as a filename for a digital file. This will ensure linking the photo to the specimen for correct identification of the plant in the picture.

## **VOLUNTEER OPPORTUNITIES**

### **How Do I Apply to Be a Budding Botanist?**

You can apply online by downloading the form from the Grand Canyon Trust Volunteers website. Simply fill out the forms and return the originals by mail to Grand Canyon Trust Volunteer Program, 2601 N. Fort Valley Rd., Flagstaff, AZ 86001. Someone from the project will contact you after your forms have been received.

To sign up for a training session and trips to project areas, visit the Local Trainings and Other Programs page on the Grand Canyon Trust Volunteer website. Click on the training session you would like to do and hit “apply now.” (There are two training sessions so hopefully one will work with your

schedule.) Remember you **MUST** complete a training session before signing up for any of the trips associated with the Plant Atlas Project. Then you can browse the 2009 projects and sign up for those trips by clicking on the dates and contacting the coordinating agency directly by email to reserve your spot.

**What if I Cannot Do Field Work? Can I Still Participate?**

Absolutely. Doing the field work is only one component of the Plant Atlas Project. The project also needs volunteers who can work in the herbarium to mount plants and enter data. You may work for a company, or belong to an organization that could benefit the project by donating equipment and supplies (such as computer equipment, GPS units, cardboard, or promotional materials like pins, hats or T-shirts), services (like copying and printing), staff time (GIS work, for instance), or money. You may also be able to help facilitate agreements for legal access to property, or help us obtain permits. You could also encourage other people from your school, church, or service club to get involved in the project.

**How do I Record My Volunteer Hours as a Budding Botanist?**

It is very important for the Plant Atlas Project to keep track of volunteer hours because it will help partner agencies demonstrate the person-power contributing to the project and help us use volunteer hours as a match when we apply for funding. While you are on official field trips it is the responsibility of coordinating Botanist to keep track of the participants' volunteer hours. However, throughout the year Budding Botanists may work on their own and in that case it is that individual's responsibility to submit the hours to the project lead botanist at the end of the year. In your training packet you will receive a volunteer hours form and learn all about recording your hours at the training session.

## PLANT COLLECTING

### **What Plants am I Supposed to Collect?**

The goal of the Plant Atlas Project of Arizona is to provide selected herbaria with one voucher specimen of each native or naturalized vascular plant species that grows in selected areas within Arizona. Naturalized plants are those introduced species that have escaped into our natural areas and successfully grow in the backcountry without any help from us. You, as the Budding Botanist (or BB), are being asked to collect both native and non-native plant species but not plants that are being grown in horticulture (like roses or daffodils etc). The reason for collecting non-native plants is that we are interested in finding out about new plants that are arriving in Arizona and becoming established here, because they may end up becoming problem weeds or “pest plants” of some kind.

### **What Happens to the Specimens?**

The plant specimens will be permanently housed in appropriate Arizona herbaria as decided by the Coordinating Botanist (or CB), (but will always include DES). For the Colorado Plateau projects, specimens will be housed at ASC (Deaver Herbarium), DES (Desert Botanical Garden), MNA (Museum of Northern Arizona), and GCNP, if collections are from Grand Canyon National Park.

### **What is a Collection Number? How is it Used?**

Botanists use a system when collecting their specimens that assigns a unique number to each specimen. This is done so that the information recorded in their field notebook can forever be linked to the specimen. The specimen will receive a number from either the CB or BB (this will be decided prior to collecting). The CB or BB will enter the collection numbers of the specimens as part of the online data entry process. To help you learn the plants, it is recommended that, should the CB use her/his own number, you write that number in your notebook for later reference (many plants may not be identified at the time of collecting). The most important thing is that there is only one number that corresponds to the herbarium specimen.

### **What is the Difference between a “Sensitive” Plant and a “Special Status” Plant?**

The main difference is the legal definition. “Special Status” plants are legally protected under the *Endangered Species Act*. Plants are listed as

“Threatened” or “Endangered” under this act and permits are required from the U.S. Fish and Wildlife Service to collect specimens of listed plants. Without proper, separate permits, listed threatened or endangered species are not to be collected. However, good photographs (habit, close-ups) with accompanying locality data are appropriate; the photos may be used as herbarium specimens for documentation. On the other hand, “Sensitive” plants may be rare, at risk, or very limited in distribution. In order to protect populations, Sensitive plant species may be collected under permit from the land management agency only if so doing will not negatively affect the population and if the species has not been documented from that site or general area.

### **What Do We Do about Special Status and Sensitive Plant Species?**

For this PAPAZ program to work, there must be effective communication between the CB and you, the Budding Botanist. The CB is responsible for knowing what plants are Endangered, Threatened, or considered Sensitive by the respective land management agency and if such a plant has been collected from the site.

Budding Botanists are strongly encouraged to become better informed about the plants in the selected area, especially those that are listed as Endangered, Threatened, or Sensitive. The CB may provide a list, with photos and descriptions, of listed Endangered, Threatened, Sensitive, or rare species that occur or may occur within the respective area. The Arizona Native Plant Society (AZNPS) published an “*Arizona Rare Plant Field Guide*”, prepared by the Arizona Rare Plant Committee, that has plenty of information about the status of Sensitive and listed plants, as well as discussions/definitions of rarity. In addition, the Arizona Game and Fish Department Heritage Data Management System has considerable information on rare plants of Arizona. (see handouts for references or do an Internet search of the plant name since there is a lot of information about these plants available online).

### **What is a Naturalized Plant Species?**

A naturalized plant species is one that has become established in a region where it had not previously lived so that it becomes a permanent part of the community, successfully reproducing and competing with native species. In Arizona, some familiar examples of naturalized species that we see are Sahara mustard (*Brassica tournefortii*), Red brome (*Bromus rubens*) and buffelgrass (*Pennisetum ciliare*).

## **RECORDING DATA IN THE FIELD**

### **What is the Purpose of Collecting Data in the Field?**

Your plant specimens will be permanently housed in the appropriate Arizona herbaria. Researchers from all over the world use our collections and botanical data. Your job is to convey to those researchers exactly what you see around you as you collect the plant specimen. You are their eyes, and you must remember that they may not be familiar with local vegetation or place names. So you must “draw a picture” in their mind’s eye of what the plant is like when you collect it, and describe where you are, and what else is there at the time. For example, is the plant tall, short, erect, sprawling, branched, or not? Is it growing in grassland, or woodland or some other habitat? Is it growing in water, or in sand, on a mudflat, or on a rock outcrop? Is it growing on a steep cliff face, or a gentle slope, or in a swale? Is the slope facing north or south? What is the exposure like (e.g., exposed or shaded)? What are the dominant plant species growing with it? Is it a parasitic plant and if so, what host species is it growing on? What is the closest major city and landmark? All this is the kind of information that can help describe the specimen and its surroundings to people in the future.

### **What Happens to the Data I Collect in the Field?**

You are responsible for submitting the field data to the CB on the day of collecting. The data that you record in the field when you collect your plant specimen is used in two ways: 1) it is printed on the label that is affixed to the herbarium sheets along with your specimen so that someone looking at the specimen in years to come can read about where it was found, who collected it, when it was collected, and what type of habitat it was growing in etc., and 2) after the identity of the specimen has been verified by the professional botanist, the data are stored into a permanent database. The database is searchable, so that other BB and the public can find out what species have been collected in different areas. The database may also be used by researchers who are studying the floristics of various areas of the state, or by students and teachers etc.

### **What do I need to consider when putting information on the Specimen Label?**

Be aware that the information that you provide to the CB will appear (along with your name!) on the printed label that is glued to each herbarium sheet exactly as you enter it. Please remember that these labels will be read by people from all over the world for generations to come, so do the best you

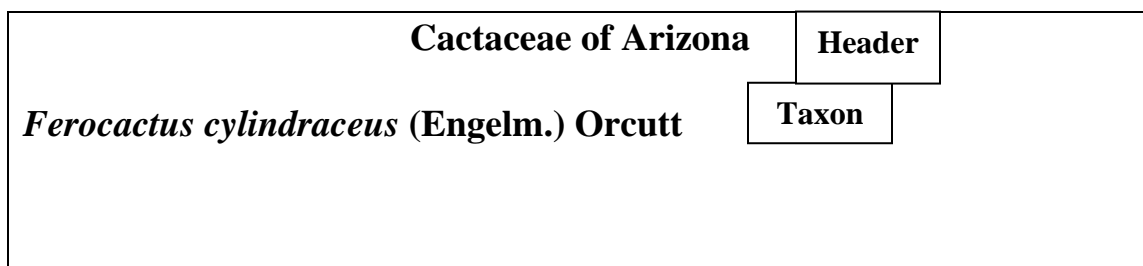
can to be concise and accurate. Do not use slang or short-form words, or put “I don’t know” – it is better to leave a field blank than to put in ?? or “unknown” etc. Try to avoid exclusive use of vague localities (like “Sycamore Canyon” of which there are several in Arizona) or historical place names (like Deer Pass Ranch, for example). Do not use names that may be known only to locals as stand-alone descriptions without including more detailed information such as the name of the closest town or natural feature like a mountain or lake (please see the related FAQ “What Do I Write Down for Locality” below). Finally, do not refer to landmarks that are not likely to be there in decades to come (e.g., “near the old corral and well on jeep trail”) as stand-alone locality information. Try to use concise language. For example, if you wrote down “above Stoneman Lake” the reader unfamiliar with local geography may not understand whether you meant to say “on hillside at 6000 ft elevation above Stoneman Lake” or “north of Stoneman Lake.”

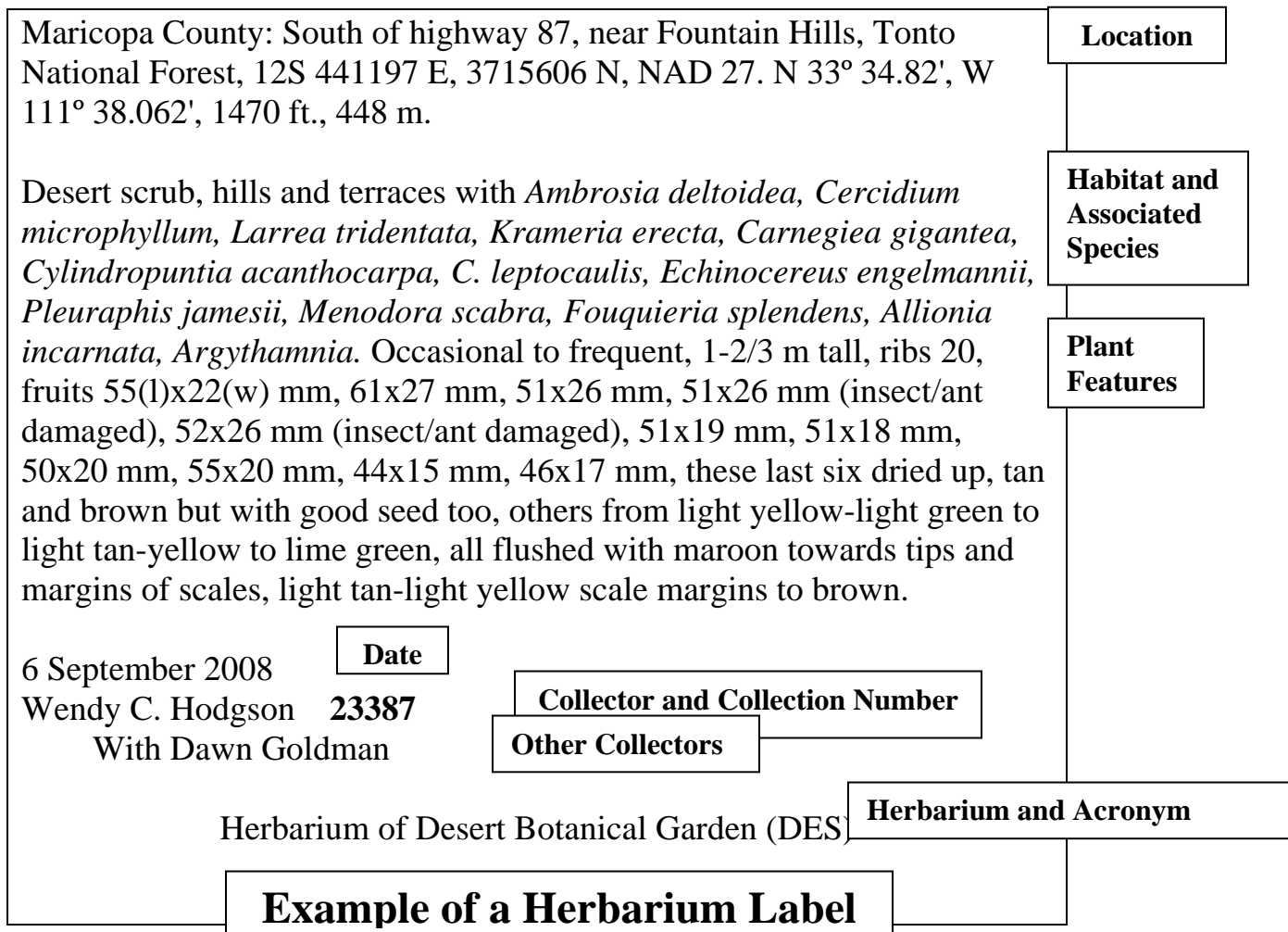
### Who Enters my Data Before Printing Labels?

The CB will proofread your data before she/he enters it into the database, where labels will then be printed. It is important that all data be written legibly. Data on the label that will be attached to your specimen for a century or more will be exactly as the CB types it into SEINet. The respective herbarium curators/assistants may contact the CB if the data entered seems to be contradictory or erroneous, but they will not correct spelling, rewrite text, or check for accuracy of details. While they may be able to help identify your plant for you, they cannot edit your field data because they were not there and don’t know what you saw. So please make sure your entries are as clear, complete, and accurate as possible.

### What Does a Specimen Label Look Like?

The specimen label is about 4.25 in. wide by 4 in. tall and it is fixed to the bottom right corner of the 11 in. by 17 in. herbarium sheet on which the plant is affixed with glue (label height will vary according to the amount of information provided). Here is an example of what our labels look like, to give you an idea where your information ends up.





### Why Use a Field Notebook?

We recommend that you get into the habit of using a field notebook to record your observations and data, in addition to recording your data on the plant data form. This will not only help hone your skills in observing key information, but your journal will also provide another backup for our information/data. Using a notebook is like keeping a journal – it keeps the events in chronological order, keeps them from getting lost or jumbled, and provides a quick refresher of where you left off the last time. A small, hardcover bound notebook is sturdy enough to be lugged around on hikes and can fit easily into your pack or pocket. You can tape or write important information inside the cover for quick reference (like a printout of a field data form, or a map). We highly recommend that you photocopy the contents of your notebook and keep that record in a safe place.

## **What Should I Write in my Field Notebook?**

People are going to differ on the level of detail that they like to record in their field notebook, depending on their experience, training, and personality. That said, however, here is some essential information that you should always write down each day that you go out collecting. Each day, record the date, the members of your team (if applicable), and the number of hours spent (you will be asked to report your volunteer hours when you submit your specimens). The following is the minimum information to record about every collection event (or collecting location, if you prefer that term): locality, latitude/longitude, elevation, vegetation, and geology. This is what you need to record about every specimen that you collect: collection number, phenology (i.e., is it flowering, fruiting, vegetative? etc.), and description of plant. If you have an idea what plant family the specimen belongs to, or what the Latin or common name is, you may write that down as well.

## **The Data Entry Form Has a Heading Called “Common Data for the Collection Event? What is a “Collection Event”?”**

We ask you to collect field data of two different types: 1) your collecting location; and 2) your plant. Likewise, the data entry form is also divided into two parts:

1) Common Data for the Collection Event (i.e., information about the location); and 2) Specimen Details (i.e., information about the plant). On any day, you may collect more than one plant at the same basic location – in other words, the location information may be identical for several different plant specimens. Think of it this way: when you stop at a good spot to collect some plants and write down the information about that location – that is your first “collection event” (or collection location) of the day. So write in your notebook “Location #1” and the details (such as location, UTM coordinates, elevation, surrounding vegetation, geology etc). Proceed to collect your specimens in that location and record a collection number for each plant (along with the details about the plant itself). As soon as you hike away from that location, and factors like the slope, elevation, aspect, surrounding vegetation type, geology, or UTMs change significantly, you will know that you have moved on to a different “collection event” (collecting location) and you will need to write down the details (like location, UTM coordinates, elevation, surrounding vegetation, geology etc) all over again. That will now become “Location #2” in your notebook. When

you move away from there, and conditions change again, then that will become the next “collection event” and you will call that “Location #3” and write down the information describing that site, and so on.

### **What Do I Write Down for “Location”?**

Write down a description of where the collection site is located. Remember that when your specimen is part of a herbarium, it will be used by researchers who may be from anywhere in the world, who are not familiar with the Plant Atlas project or with this region, and who may not speak English very well. You need to include enough information for them to be able to find the approximate location on a map and go to the same general area; it doesn't have to be so detailed that they can find the same plant you collected from.

The label will automatically say "Arizona." You should begin with the county, followed by a general landmark (preferably one listed on a standard topographic map) such as the name of the closest town/city, or a natural feature like a mountain or lake. After that, include additional detail adequate for other people to find the general area where you collected the specimen. If you know the plant was collected on public lands, you should include the land ownership name (for example, Dead Horse State Park, or Tonto National Forest). You should avoid landmarks that can't be expected to exist a few decades from now ("end of pavement on Suchandsuch Road") or that are meaningful only to you ("north pasture on Gibson ranch" or "where the old Starbucks used to be"). Here are some examples of well-written localities (note - ca. is short for “circa” which means “approximately”):

Fresnal Canyon, 2 miles south of Link Park Drive, on sandy bank, west edge of Derrio Wash.

Grand Canyon National Park, ca 1 mile below Bright Angel Trailhead and Rim, along the Bright Angel Trail.

Cactus Plain, ca 0.5 miles northeast of Midway along BLM road 105, south side of road.

### **What Do I Write Down for “Others in Team”?**

If you go out collecting with other people, make sure you write down the CB name and other peoples' names in your group (both first and last, or initials and last name). Once entered into the online data entry form, this

information is printed on the specimen label exactly as you wrote it, so don't put down things like "my uncle", or "my dog Fido", or "Steve" that won't be meaningful to some international visitor to the herbarium 100 years from now.

### **What Do I Write Down for "UTM Coordinates"?**

You need to record the coordinates of each collecting location (collection event) accurately – your CB will assist you if needed. Coordinates are necessary to enable searches of the database by location (and you can't search on a description like "3 miles east of Mt. Elden") and they are also commonly used to map known occurrences. In other cases, a future researcher (possibly someone from another country who isn't familiar with local place names) may have a reason to go back to the same area that you collected your plant. To report locations we use UTM coordinates primarily, although it is acceptable to use latitude and longitude, recorded either as "degrees, minutes, seconds" OR as "decimal degrees, minutes." **Datum** describes the default datum setting you are using on your GPS. Please set your default datum to NAD 83/WGS 84 (not NAD 27). If you for some reason did not have your GPS set to NAD 83, record the datum you are in so it can be converted.

### **What Do I Write Down for "Elevation"?**

Record the elevation of each collecting location in either feet or meters (there is a feet-to-meter converter available on the online data entry form of SEINet). Unfortunately, Topozone no longer provides elevation information for free so you must either obtain elevation from your GPS, or estimate it by using the contour lines on a topographic map. Contours are lines on a map that connect points of equal elevation and help describe the shape of the land. USGS 7.5" quad maps show contours at intervals of 20 feet.

### **What Do I Write Down for "Vegetation Community Type"?**

While you are out in the field, you need to look around you and record information describing the dominant vegetation that surrounds the plant specimen you just collected (note that the details *about the specimen* belong elsewhere on the form – see the related FAQ below "What Do I Write for "Morphological notes"?). Once the specimen is mounted by itself on its herbarium data sheet, nobody can tell what was originally growing along with this specimen, so you must write that down for the benefit of those people (who may even be from another country) many years from now who were not there with you at the time you collected it. For our purposes, you

may record a general habitat type/vegetation community (e.g., chaparral, desert scrub, riparian scrub, oak woodland, freshwater marsh, pinyon-juniper, etc.). To help you, here are some commonly used terms with their definitions shown in brackets: forest (closed trees), woodland (open trees), chaparral (closed, evergreen shrubs), scrub (open to sparse shrubs), marsh (aquatic shrubs and/or herbs in slow-moving water), swamp (a wetland dominated by woody plants such as trees or shrubs), meadow (an area covered primarily with grass). Be aware that your data will be entered exactly as it is into SEINet database and on the printed label on the herbarium sheet. Here are some good examples that give a general vegetation type plus some of the dominant species:

“Mixed chaparral with *Quercus turbinella*, *Agave chrysantha*, and *Arctostaphylos* sp.”

“Disturbed area with *Salsola kali*, *Pectocarya recurvata*, *Vulpia octoflora*, *Brassica tournefortii*, and *Larrea tridentata*”

“Riparian scrub with *Salix lasiolepis*, *S. gooddingii*, *Pluchea sericea*, *Populus fremontii* and *Platanus wrightii*.

### **What Do I Write Down for “Abiotic/ecological notes”?**

While you are out in the field, you need to look around you and record information about the physical habitat (substrate) that the plant specimen you just collected was growing in. To us, this refers to abiotic features (abiotic means non-living, physical factors like geology, soil type, moisture, etc.) and may include things such as “dry creek bed”, “granite outcrop”, “flood plain”, “mudflat”, “sand dune” etc. It may also include key information about local topography like slope and aspect (e.g., “steep S-facing slope” or “toe of NW-facing slope”) or exposure (e.g., exposed, partly shaded or shaded). If you are knowledgeable about soil, and know how to determine the soil texture from the proportion of sand, silt, and clay (e.g., medium sandy loam, fine silty clay, coarse loamy sand, etc.) you may record that but it is not necessary. Similarly, if you are trained in geology and know how to determine what the “parent material” is (e.g., granite, basalt, sandstone, shale, alluvium, etc.) go ahead and record it but it is not necessary. Do not guess what the geological features are – do not record any information for which you are not sure or are clueless.

### **What Do I Write for “Associated Species”?**

This is a space to record the other plant species that are occurring in your collecting location. Record as many plants as you can in this space, including trees, grasses and shrubs, keeping in mind that on the label you will also include the other species that were collected from that same location. Spell out the plants by their scientific names Genus and Species, if possible. If you only know the Genus name of a plant, that is fine. If you only know the common name, you can record it in pencil and then look up the scientific name when you get back from the field.

### **Specimen Details**

This is the place on the form where you record information specific to each plant you are collecting. Each plant is assigned a unique **Collection Number**, which will usually be given by the CB, if you are collecting under someone else for the project, which is usually the case with the Plant Atlas Project. We also encourage Budding Botanists to start numbering their own collections and you can record your number as well, usually using your initials.

### **What Do I Write for “Plant ID If Known”?**

#### **What Do I Write for “Description and Morphological Notes”?**

When you remove the plant from the collecting site, some information that seems obvious at the time may be lost, especially if you are only taking a sample of the whole plant (e.g., clipping branches from a tree or shrub). Similarly, some details (like flower color) may fade or change appearance over time so they need to be recorded at the time the plant is collected. You should make note of the phenology (is the plant flowering and/or does it have fruit on it?), the habit (is it a herb, shrub, subshrub, vine, tree, bulb or tuber?), the duration (annual, biennial, or perennial), the height from ground level (if you only took part of the plant), and any distinguishing features of the branching pattern that are not apparent from the specimen itself. Be sure to describe any obscure features, or those that may be lost once the specimen is dried and mounted. If it is a parasitic plant (like dodder or mistletoe) please include the host plant as part of the specimen, and make note of the host (e.g., “parasite on *Artemisia bigelovii*”). Remember that you must report what you see before you to the person who is standing in the herbarium later, holding onto your mounted specimen. Was the plant erect, or sprawling? If it is a grass, was it growing in tufts, or was it spreading? If it is a cactus, how many ribs were there on it, how tall was it, was it branching? And so on.

Once collected, the specimens are given to the CB, along with your plant collection data forms (do not turn in your notebook – your notebook is for your own benefit). The CB will dry, sort, and identify the specimens and enter your data into the SEINet database, produce labels and sort duplicates for the various herbaria.

**What Do I Write Down for “Morphological Notes”?**

The choices include flowering, fruiting, fruits and flowers, vegetative and unknown. So if your plant specimen had flowers and/or fruits then record that information. If it was vegetative (no reproductive structures visible) then write that down.

## Coordinates and GPS

### **How Does a GPS Work?**

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of satellites that orbit the Earth twice a day and transmit information to the Earth. For North America, there is a “constellation” of about 24 navigation satellites (called NAVSTAR) orbiting the earth that is maintained by the U.S. military. Your hand-held GPS unit is basically an antenna that picks up radio transmissions sent out by these satellites and uses them to triangulate a position on the ground.

### **Do I Need to Buy a GPS Unit?**

No. Those folks who own a GPS are welcome to use it for this project but it is not required. If you do use a GPS, please make sure to set the datum to NAD83 or WGS84 (do NOT use NAD 27) and set it for “decimal degrees” (DD.DDDD) or “degrees, minutes, seconds” (D/M/S) or Universal Transverse Mercator coordinates (UTMs).

### **How Accurate is my GPS?**

Even fancy electronic gadgets can give you incorrect information; so don't trust your GPS readings until you become very familiar with your unit and its behavior. How close your GPS reading gets to where you are actually standing depends upon a number of factors, including the following:

The type of GPS; the antenna your unit has; where the antenna is located, and whether you are holding it in the optimal orientation (i.e., horizontally or vertically); the number of satellites acquired at the time you are taking your reading (the minimum is 4) and their “physical position overhead; whether or not the sky is unobstructed by trees, canyon walls, hills, buildings, car windows, etc.; and other factors.

Make sure your unit is set to the proper settings for the collecting area and that the differential GPS feature is enabled if you have it. The more satellites you get a signal from, the smaller the error in your reading. Typically, inexpensive recreational GPS units are capable of giving you coordinates within 50 feet (15 meters) of the spot you are actually standing but in reality, the readings are often much farther off (i.e., 100 feet or more).

### **Can I Use My GPS to Get the Elevation?**

Modern hand-held GPS units often do provide elevation; however, you must be aware that it is very often not accurate. Most low-cost GPS receivers advertise that they will provide elevation that is within 50 feet (15 meters) of the actual elevation, but sometimes the error in the reading will be much greater. The elevation reading on your GPS at a given fixed point may vary by hundreds of feet – and this is normal, not a malfunction. On top of that, about one in every 20 times, your GPS will give you a completely random number, from zero to you-name-it, so please keep this in mind! You need to be sure that you have a clear and unobstructed view of the sky, but even if you do, the accuracy may still vary widely because of random errors caused by atmospheric delay, incorrect satellite positioning, or poor geometry in the satellite constellation. As a rule, vertical error (i.e., error in elevation) is about one and a half times that of horizontal error (i.e., error in position) so you certainly should not trust your elevation readings any more than you trust your position readings.

### **How Should I Record Elevation in the Field?**

Given the error associated with elevation when determined by a GPS, how should you record elevation? You can go ahead and use your GPS if you wish, but you should take the time to verify the readings on a map to ensure they are not way off (at least until you become confident with using your GPS and you clearly understand how it behaves). Every time you go out in the field you should be taking along a topographic map of the collecting area. Elevation is also shown on those maps by contours (lines that are drawn to join areas of similar elevation). The main contours (dark lines with numbers written in them) typically are 200 feet apart, and four finer lines that are in increments of 40 feet separate them. With the typical GPS error being (plus or minus) 50 feet at the best of times, and the smallest contour intervals on topographic maps being 40 feet, this means that it is not reasonable to record elevation at less than 40- or 50-foot intervals. Even if your GPS gives you a reading with decimals or in one-foot increments, in reality it does not have that level of precision. So round off elevation to the nearest 40 feet if you are relying on the topo map, or 50 feet if you are using a GPS (e.g., as 5500 ft, or 5550 ft, or 6600 ft, or 6650 ft. etc.).