

Plant Identification and Submission in a Digital World

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INTRODUCTION

Plant identification is like a puzzle; the more pieces that are put together, the more complete the picture. Traditional plant identification involves submitting a whole plant sample (plant + flowers + seedheads/pods + root system) to a diagnostic facility. Experts then have all the puzzle pieces needed for identifying the plant. With the rapidly evolving digital world, and a camera in nearly every pocket, photographic plant submissions are becoming ever more common. However, a photo may only capture a single view or piece of the identification puzzle.

Additionally, pictures are frequently taken without the level of detail required for experts to adequately use identification keys, such as in the *Flora Neomexicana III* (Allred et al., 2020) for accurate identification. This article is intended to give tips and tricks for the photographic submission of plants that will potentially save time for both the inquirer and the identifier.



Figure 1. Whole plant (Courtesy Kert Young)

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Extension personnel at New Mexico State University (NMSU) enjoy using their plant knowledge and experience to identify unknown plants for clientele. A combination of high-quality pictures of a plant while vigorously growing, combined with a complete plant specimen for physical examination, is preferred. Nevertheless, when a physical plant specimen cannot be collected, high-quality pictures of plants can be used effectively. This publication includes helpful hints for taking pictures of plants and how to submit those photos for identification.

Taking Photographs

- Ideally, search for a live, mature, and complete (i.e. have flowers/seedheads, entire leaves, roots for herbs and forbs or fruits) plant specimen to photograph. Dead, immature, or incomplete specimens can still be submitted but are more difficult to properly identify.
- Set the camera to the highest resolution with the largest file size.
- Make sure to have enough storage capacity in the camera. Multiple high-resolution pictures with the plant in clear focus are needed.
- Take a picture of the whole plant, which shows characteristics like plant structure and size (Fig 1.). Sometimes it is best to include a scaled size reference (i.e. coin or dollar bill, keys, ruler, etc.) in the photograph to help determine the plant's actual size.
- After taking a picture of a complete plant, move the camera closer to the plant. The part of the plant being photographed should fill most of the picture. A white or light blue backdrop can be held behind close-up photos to give better contrast and focus to the details of the photos.
- It is helpful to have pictures of as many plant parts as possible. Take the following pictures if available:
 - 1) Flower in bloom from top (Fig. 2) and side views (Fig. 3)
 - 2) Reproductive structures (e.g., seeds, seed-pods, cones, fruit; Fig. 3 and 4)
 - 3) Upper and lower leaf surfaces (Fig. 5 and 6)
 - 4) connection points between leaves and stems (Fig. 7)
 - 5) Stem shape, pattern, and texture (Fig. 8)
 - 6) Roots connected to the stem, if possible (Fig. 9)

- 7) Any unique features of the plant (e.g., thorns, spines, winged stems)
- On touchscreen cameras like mobile phones, it is often necessary to hold the camera steady and touch the point on the screen displaying the specific part of the plant being photographed to provide maximum focus.
- Review pictures before leaving the site where the plant is located so that pictures can be re-taken as necessary.
- To ensure pictures clearly display the level of detail needed for plant identification, ask the following questions:
 - A) For pictures of flowers, “Are the flower petals in clear focus and easy to count?”
 - B) For leaf and stem pictures, “Are the minute hairs on the leaves when present, in clear focus?”
 - C) Lastly, “Does the photo adequately portray what I see without the camera?”

Notes on the Environment of Plant

- Take notes about the location and environmental setting of where the plant grows. This informa-

Table 1. Environmental information to include with examples when submitting plants for identification.

Information	Examples
Locality	Dona Ana County, NMSU Leyendecker Farm.
GPS coordinates	32.199167, -106.741944
Elevation & Slope	3860 feet or 1177 meters; steep, moderate, flat, variable
Land Type	Rangeland, cropland, pasture, orchard, forest, garden, urban landscape, turf, parks and recreation, roadway, industrial
Land Use	Grazed or non-grazed, dryland or irrigated, intensively cultivated, wetland, non-use
Soil Characteristics	Heavy soil (e.g., clay), light soil (e.g., sand), gravelly, gypsum, alkali, dry, wet, compacted
Plant Characteristics	Mature or young, flowering or bearing fruit, green or withered
Other information	Arroyo, mesa, playa, cliff, in ditch, along fence, within crop

tion should be included with photo submission and is important with plant identification accuracy. Include facts about the location, environmental use and conditions, plant condition and how it is used, and other information that may be helpful. Examples of information to include can be found in Table 1.

Photo Submission

- Submit photos and all descriptive words and information through email to your county Extension Agent, appropriate Extension Specialist, or to the NMSU Plant Diagnostics Clinic with a downloadable submission form (<https://aces.nmsu.edu/ces/plantclinic/documents/nmsu-pdc-form-012-001-plant-specimen-submission-form.pdf>).
- Email the pictures as attachments rather than embedded in body of the email. Attached pictures are easier to zoom in and magnify on computer screens when examining minute details.
- Ensure that the original file size of the picture is maintained during the emailing process. Check that the software used to email the pictures does not reduce the file size from that of the original picture.

Picture file sizes should be in the megabyte (MB) range, which means that multiple emails may be required to send several original-size pictures. The maximum size of an email sent within the NMSU email system is 30 MB. If the email is not delivered or “bounced back”, you will need to send more emails with fewer attached pictures per email. Additional sharing options other than email (e.g., Dropbox) are available. Contact the intended recipient for these options to make sure their company firewalls and security features will allow the download of images from these sources.



Figure 2. Flowers, top view, photo scale background (Courtesy Kert Young)



Figure 3. Flowers, side view with fruit (Courtesy Casey Spackman)



Figure 4. Reproductive structures, fleshy cones (Courtesy Casey Spackman)

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Figure 5. Leaves, showing structure and margins/edges, photo scale background (Courtesy Leslie Beck)



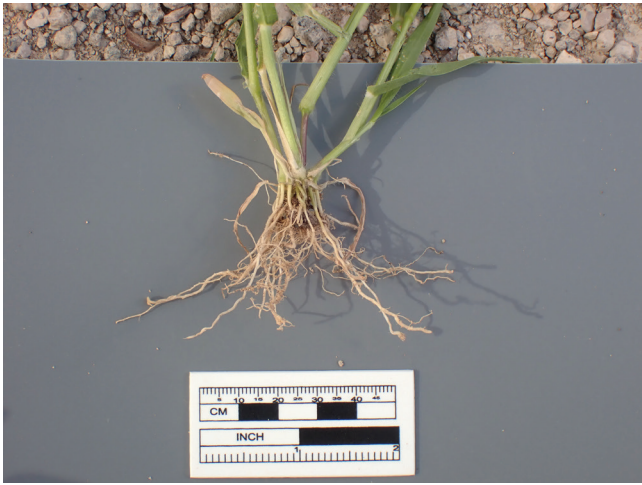
Figure 7. Stems, point where leaves connect (Courtesy Casey Spackman)



Figure 6. Leaves, backside and hairs (Courtesy Kert Young)



Figure 8. Stem, patterns and textures (Courtesy Casey Spackman)



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Figure 9. Stems connected to roots (Courtesy Casey Spackman)

We acknowledge and thank former NMSU Extension Specialist Kert Young for his editing and photo contributions.

References

Allred, K.W., Jercinovic, E.M., Ivey, R.D., 2020. Flora Neomexicana III : An Illustrated Identification Manual, 2nd ed.



Casey Spackman is an Assistant Professor and Extension Range Management Specialist at New Mexico State University. He earned his Ph.D. at Utah State University. His Extension efforts aim to assist producers, land managers, and agency personnel in monitoring and developing management objectives that maintain or improve natural resource health and sustainability.



Leslie Beck is the Extension Weed Specialist at New Mexico State University. Her research program focuses on integrated weed management systems in landscape, horticultural, and agronomic crops. Her Extension work provides the citizens of New Mexico with accurate, applicable, and effective weed identification and management strategies in multiple cropping systems.

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