TECHNICAL NOTES

U.S. Department of Agriculture **Natural Resources Conservation Service**

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PLANT MATERIALS COLLECTION GUIDE

Whorled buckwheat (*Eriogonum heracleoides*) seed. Photo by Derek Tilley.

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Contents

INTRODUCTION

The collection of seed or vegetative plant parts of potential conservation plant species is the basis for plant selection and improvement, and for the revegetation of disturbed areas. This Technical Note provides information on the proper procedures for collecting various types of plant materials.

Planning is crucial to the success of providing appropriate, adapted materials to conservation problems and needs. Plant improvement goals and species need to be identified well in advance of the collection process. A "wish list" of potential species should be prioritized to identify the most appropriate plants for a given revegetation goal. Little information is available regarding the germination, establishment and culture of many native plants. Once project goals are determined and background information gathered, geographic distribution and collection locations need to be identified. When appropriate sites supporting viable populations of a target species are located, the plants should be monitored regularly to determine the optimum stage of maturity. Allow adequate time and material resources to monitor plant growth and development in order to successfully collect seeds or other reproductive plant parts at the optimum stage of development.

Locating Collection Sites

Collection sites should be accessible so collectors can get to the site and move around to make collections. Natural plant populations on unstocked or rested rangeland, forestland or riparian exclosures are excellent sites to make collections. Areas burned by wildfire may also be good sites for seed collection for several seasons after the fire. If a goal of the revegetation effort is to restore the site, plant materials should be collected as close to the target planting area as possible. It may also be advisable to identify several sites with various elevations, aspects, or soils from which to collect. **Areas with heavy weed infestations should be avoided to prevent the unintentional gathering of weed seeds that could contaminate the collection**. Do not collect from sites that have been previously planted, research areas, or from areas with threatened or endangered plants. Always obtain permission from the landowner on private lands and obtain collection permits on public lands prior to making collections.

Plant Collection Information Form NRCS-ECS-580, (Appendix) must be completed and accompany each collection. This form provides critical information for each collection including plant and collection site information. If possible, use Global Positioning System (GPS) coordinates to locate collection sites. Each collection that is sent to a Plant Materials Center must have this data in order to track the collection through the evaluation, seed increase, and potential release process. The plant materials center will assign a unique accession number to establish the identity of each viable collection. This process also allows for returning to the original site to collect additional plant material if needed.

Parent Plants

Verify that the plant material being collected is the species desired. Confirmation may require the assistance of a botanist, range scientist, or other plant expert. Positive identification may require that plants be examined during flowering and may also require examination of the entire plant, including flowers, seed, stems and leaves and roots. Avoid mixing multiple species in a single collection because it is effectively impossible to separate species during the processing stage.

Collecting from many parent plants will help to capture inherited and environmental variation and ensure genetic diversity. For each collection site, <u>randomly</u> collect seed from at least 50 to 100 individual plants. If this is not possible, collection should take place from a larger area. However, choose sites carefully so that they are reasonably similar. Collections from different sites should be kept separate. The decision to mix collections from different sites can be made after they are evaluated and factors of difference or similarity can be made. Also, avoid collecting just the big plants. The plant that looks small in one year may be the plant with important genes for disease resistance, while the big plant may be trading disease resistance for size. This sampling approach will provide a higher level of sampling confidence within and among populations. If the collection is to be used directly for revegetating a site, seed collection from at least 200 plants may be required to ensure a representative sample of the genetic material of the population. Do not collect seed or other vegetative reproductive material from diseased or insect-infested plants.

Native willow and cottonwood stands located near the rehabilitation site are the most common source of cuttings. Native stands of willow and cottonwood are adapted to local conditions, but may have or have had insect and disease infestations which can stress the plants in the potential "mother" stand. Low water years and long periods of drought may also stress the plants. This stress means that the stem cuttings may not have peak energy reserves. Low energy reserves translate into lower establishment success. When planning the number of cuttings to harvest, take these stress indicators into account. Always obtain permission to harvest from the landowner, private or public, before starting to cut.

PLANT MATERIALS COLLECTION PROCEDURES

Seed Collections

Timing

The timing of seed collection is crucial to ensure that the seeds collected are viable and have good germination vigor. Collection of immature seed results in low seed viability. Delayed harvesting may result in seed loss from shatter or dispersal after ripening. Plant phenology (the sequence of plant development) must be judged to determine the stage of maturity for the proper timing of seed collection.

Plants with determinate inflorescence are those in which the terminal or central flower is the oldest and blooming and seed maturation is downward, outward, and fairly uniform.

Indeterminate maturation of milkvetch fruit. Photo by Derek Tilley.

Determinate flowering is common in many crop plants. Indeterminate flowering is a common trait in native plant species. With this type of maturation, the basal or outer flower is the oldest with blooming and seed maturation occurring in an upward or inward pattern. Indeterminate plants generally have many different stages of flowering on the same stalk with the most mature near the base or outer regions of the stalk which can make seed collection of viable seeds more difficult.

Flowering, which is the first stage of seed phenology is obvious for many herbaceous and woody plant species that have colorful petals, bracts or sepals. Flowering in grasses is more difficult to observe and careful attention is required to identify the flowering stage (anthesis) of grasses when pollen is being shed. In cross-pollinated grasses, the male and female flowering structures are visible and need only close inspection to determine when pollen is being shed. In self-pollinated grasses, both sexual structures are contained within the palea and lemma, and the floret must be dissected to assess the stage of anthesis. Generally, grass seed is mature and ready to harvest 4 to 6 weeks after flowering is completed. Seed fill can be checked by cross-sectioning several seeds with a knife or fingernail clipper to observe the presence of endosperm.

Basin wildrye flowering (anthesis). Photo by Susan Winslow.

For plants with fleshy fruits, changes in color, taste, odor, or texture often signal seed ripening. Changes in color from green to red, blue, purple, or white often indicate seed maturity. Other fruits, whose seeds are wind-dispersed, usually change from green to brown or straw color. Some woody species (pine, juniper) require two years to reach maturation.

Grass seed progresses through a sequence of developmental stages following flowering:

1) Milk stage - Seeds squeezed between the thumb and forefinger exude a milky substance. These seeds have no viability.

2) Soft-dough stage - Seeds squeezed between the thumb and forefinger exude a soft,

dough-like endosperm. These seeds have low to no viability.

3) Hard-dough stage - Seeds squeezed between the thumb and forefinger do not exude endosperm. The endosperm is firm and retains its shape when squeezed or rubbed. Seed collection should begin at the transition from the soft-dough to hard-dough stages. At this stage, the amount of plump, fully matured seed can be increased by <u>not</u> stripping the seed from the plant. Cutting seed heads (inflorescences) with the stem attached allows maturation to continue as the collected plant material dries.

4) Mature - Seeds are usually very hard. Unfortunately, maturity and seed shatter often occur simultaneously.

By starting seed collection efforts at lower elevations and following maturation up slope, the optimum seed collection period can be extended. If seeds of the target species have shattered on south- or west-facing slopes, seed of the same species may still be available for collection on north- or east-facing slopes.

Techniques
Grass seeds can be harvested by stripping seed off the stem or by clipping the seed culm (stem) just below the spikelet. The seeds of many broadleaf herbaceous plants can be collected by holding a bag or tray under the plant and shaking seeds from the plant. For species that dehisce explosively, the entire inflorescence must be cut before maturity and allowed to dry in mesh bags. Pods from species having spike-type inflorescences (eg. *Penstemon*) may be stripped in the same manner as grasses. The pappus bearing (parachute-type) seeds of many species in the Composite (sunflower) family can be swept or brushed into bags if timing of collection is ideal. For very small annual plants, the simplest method may be pulling the entire plant and bagging in cloth or paper bags. Seeds of many woody, non-fleshy-fruited plants are collected by holding a tray or bag under the branches and flailing the branches with a stick or tennis racket, knocking the seed into the receptacle.

Seed collecting using grass clippers on tapertip hawksbeard (left) and hand stripping whorled buckwheat (right). Photos by Loren St. John.

Seed collecting with racquet and hopper (above and right), and motorized seed stripper (below). Photos by Scott Jensen and Chris Hoag.

How much to collect

The amount of raw material that is needed for a collection depends on its anticipated use and method of collecting, but in general the more seed you can get the better. Anywhere from 50 to over 90% of the weight from a seed collection ends up being inert matter such as sticks, leaves and immature seed. For evaluation at a PMC, raw collections that are taken using clipped stems or other techniques that take up significant amounts of plant matter should fill a paper grocery sack. Seed collections using standard seed envelopes are almost never enough to make a usable collection. Other techniques that pick up less trash such as shaking seed heads over the bag require less material, but keep in mind, the PMC may need enough seed for multiple row, replicated studies, purity tests, germination tests and other procedures.

Processing and storage

It is important to use paper or cloth bags to store non-fleshy seed collections. The moisture content of freshly collected seed is quite high and plastic or other nonporous containers trap moisture and cause spoilage of the seed. Seed should be spread out to dry in a ventilated, well-lit room, but avoid prolonged temperatures greater than 90º F because desiccation and high temperatures will kill the seed. The layer should be only a few inches thick to provide adequate airflow through the drying plant material, reduce heat buildup and to minimize the incidence of mold. To speed the drying process, turn the material occasionally (once or twice daily). If materials are dried outdoors, it may need to be brought indoors or covered at night to prevent re-hydration of the material from higher nighttime humidity and dew. The material may also need to be protected from rodents and wind. If the seed collection is small and fits in a paper grocery sack, the material can be arranged into a donut shape around the sides of the bag with a hole created in the middle to allow air circulation. Ship dried seed to the PMC as soon as possible.

Seed drying on plastic tarps. Photo by Derek Tilley

Fleshy fruits spoil quickly if not stored properly after collection. Place containers of fleshy seed in a cool, shady place while collecting. Overheating can kill seed. Place non-dried fleshy fruits into a non-porous plastic bag and chill prior to shipment. When ready to ship, place the plastic bag into a heavy cardboard box. Material must be shipped to the Plant Materials Center within 24 hours. Avoid shipment late in the week that might result in weekend storage in a post office.

If dried seed must be stored for an extended time (usually less than 5 years) it should be stored in cool, dry conditions that remain relatively constant. A commonly used equation for determining storage conditions is:

$$(^{\circ}\text{F} + \%\ \text{relative humidity} < 100).$$

If the sum of temperature in degrees F and percent relative humidity is less than 100, then conditions are probably adequate for long term storage for most grasses. However, a good example of a species that does not store well for extended periods is winterfat (*Krascheninnikovia lanata*). Storage life for winterfat is limited to no more than about 2 years, even under ideal storage conditions.

Vegetative Collections

Asexual or vegetative propagation is the reproduction of complete plants from the vegetative parts of the original plant. These include pieces of stems, rhizomes, tubers, corms, bulbs, leaves, or roots. There may be situations when it is impossible to collect or use seeds for plant production. These include: 1) the plant does not produce seeds or produces seeds infrequently; (2) the seeds are not viable; (3) the seeds have already been dispersed from the plant prior to collection; and, (4) insects or animals have consumed or damaged the seeds. Vegetative propagation may be desirable to avoid long periods of juvenility; control growth form; produce a large plant within a relatively short period of time; avoid long, seed-dormancy-breaking periods; and decrease the cost of certain bioengineering practices on riparian corridors.

There also may be a need to clonally reproduce some specific attribute that is unique to an individual plant, which could be lost through sexual reproduction. In these situations it is often possible to make collections from the vegetative portions of plants and then propagate them asexually. Asexual regeneration is commonly used for redosier dogwood (*Cornus sericea* spp. s*ericea*), willow (*Salix* spp.) and cottonwood (*Populus* spp.) in conservation work. It is also used in agriculture and horticulture when the exact performance or appearance of a particular plant is desired. A limitation of asexual propagation is the potential to restrict the genetic expression of a plant population. Adequate population sampling is particularly important when the goal of the project includes maintaining the genetic diversity of a given plant community. Another drawback of vegetative propagation is that it is generally more expensive than propagation from seed.

Harvesting wetland sod. Photo by Chris Hoag

Vegetative collections include whole plants, divisions, cuttings (hardwood, softwood, leaf, leaf bud and root) scions and buds for grafts.

Whole Plants

Techniques for collecting whole plants differ depending on the plant type. Wetland plants, because of their tremendous root systems are easily harvested and can be transplanted directly to a new site or used for divisions in containerized plantings. In general, harvesting 1ft² of material per 9 ft² area is recommended. Collecting the top 5 to 6 inches of soil and root mass will provide enough roots for good establishment and allows the remaining roots to reestablish plants in the harvest hole which will fill naturally within one growing season.

For other plant types, it is possible to transplant entire plants and then grow them under cultured conditions in a container or production field; however, transplanting wildland plants is often unsuccessful for one or more reasons. Native plants are often found growing under stress conditions and cannot recover from transplanting shock as well as cultivated plants. Wildland plants often contain smaller, coarser root systems than their cultivated counterparts. Successful transplanting requires experience, skill, proper handling, ideal temporary storage, and proper care. Transplanting of wildland plants is most successful with herbaceous species grown under relatively ideal conditions, such as deep, moist soils along a riparian corridor. Successful transplanting typically increases as plant size decreases, and is most successful when the plants are fully dormant in fall or late winter. Transplanting of large shrubs and trees is usually unsuccessful.

Divisions
Grasses and forbs may be propagated by splitting the foliage and corresponding root system into multiple pieces and then transplanting. This process works with rhizomes, stem tubers, and tuberous roots. The entire plant may be removed and then divided, or part of the mother plant removed and the rest left in place to continue growing. Transplanting, transport, temporary storage, and growing conditions are the same as those described for whole plants.

Vegetative divisions of sedge. Photo by Chris Hoag.

Cuttings
Cuttings can be made from true stems, modified stems (rhizomes, tubers, corms, and bulbs), leaves, leaf-buds, or roots. Stem cuttings can be categorized by various parameters including the part of the plant from which they are taken, the time of year that they are harvested, and the physiological condition of the tissue at the time of removal. Stock (donor or parent plants) should be healthy, free from serious insects or diseases, of moderate vigor, and of a known identity. The following four types of cuttings are most commonly used in conservation work: 1) hardwood, 2) semihardwood or greenwood, 3) softwood and 4) herbaceous cuttings. Emphasis here will be placed on hardwood cuttings due to their widespread use in riparian restoration activities.

(1) Hardwood or dormant hardwood are the preferred type of perennial woody plant cuttings because they are rugged, transport and store well, are less perishable than active tissue, and are the easiest to prepare. Dormant, hardwood cuttings are taken from non-active stems after leaves have fallen off and before bud break in the spring, usually in the late fall to late winter. This type of cutting is especially useful with willow and cottonwood species because of the high concentration of pre-formed, dormant root primordia located throughout the length of the stems.

Timing
For collection of woody riparian species for bioengineering treatments, establishment success is significantly increased if cuttings are taken from live, dormant willows or cottonwoods either after leaf fall in late fall, winter, or very early spring before the buds start to break. In some cases, when access to the stream is limited due to regulatory concerns or during fish migration periods (i.e. during salmon migration runs in the spring and the fall), planting may be restricted to non-dormant periods. Rather than do nothing, consider harvesting the cuttings when the plants are in full leaf. When cuttings are harvested during these growth stages, expect the establishment

success rate to decrease. Experiments at the Aberdeen Plant Materials Center have shown that when the plants are leafed out and harvested, the establishment success is about 40-50%. If you plan to plant during the active growing season consider planting more cuttings to make up for the lower success rate.

Cutting Size

Cuttings should generally be 3/4 inch diameter or larger depending upon the species. Rhizomatous or spreading willow stems however will rarely get much bigger than 3/4 inches in diameter and the largest diameter available should be used. Tree-type willows can be several inches in diameter. Larger diameter cuttings have more energy and stored reserves than smaller diameter cuttings. Highest survival rates are obtained using cuttings 1 to 3 inches in diameter. Cuttings as large as 8 inches in diameter have also been tested with excellent success; however, the larger the cutting diameter, the longer the cutting should be, and the deeper the hole should be to support it. The deciding factor for selecting the cutting diameter is the planting method to be used. Larger diameter and longer cuttings will be needed for more severely eroding sites and where the water table is deeper. When planting into rock riprap cuttings should be at least 3 to 5 inches in diameter. Cuttings this size will not bend or break when pushed between the rocks in the riprap.

For nursery stock, approximately 8 inch long cuttings are taken from the terminal end of branches and should contain at least two internodes (buds or bud pairs). Longer sections of stems may be taken and later trimmed into multiple cuttings. The size of the basal end of the cutting is important, and should measure at least 0.25 to 0.40 inches in diameter. The basal cut is made 0.5 to 1 inch below a node.

For bioengineering applications, cutting length is largely determined by the depth to the mid-summer water table and erosive force of stream at the planting site. Plantings can occur at the water line, up the bank, and on top of bank in relatively dry soil, as long as cuttings are long enough to reach into the mid-summer water table. The cutting should be long enough for 6 to 8 inches of cutting to be in the mid-summer water table and 3 to 4 buds to be above the ground. No less than one half the total length of the cutting should be in the ground. If long periods of inundation exceeding 30 days are likely, the cuttings should be long enough to extend 6-12 inches above the expected high water level. If weeds are a problem, the cutting should extend above herbaceous growth in summer to receive adequate light and below the weed root mass to minimize competition. When planting for bank stabilization, the cutting should extend 2 to 3 feet above ground so as it leafs out, it can provide immediate bank erosion protection. The cutting should be planted as much as 3 to 5 feet into the ground (sometimes deeper to ensure they are in the mid- summer water table). If they are not planted this deep, moving water can erode around cutting and rip it out of the ground.

Harvesting and Processing Cuttings

The size of the cuttings will determine what you use to harvest them. Lopping shears, pruning shears, a small wood saw, brush cutters, or a chain saw can be used to harvest cuttings.

Ensure all equipment is sharp and make clean cuts. Use live wood at least 2 year old or older; however, very old wood should not be used. Some research indicates that larger and older wood is required to propagate species that are difficult to root; the best wood being 2 to 7 years old with smooth bark which is not split or deeply furrowed. Avoid whips and suckers (current year's growth), because they lack the stored energy reserves necessary to consistently sprout when planted. Care should always be taken to select materials free of splitting, disease, and insect damage.

No more than one third of any individual plant should be removed. In the case of rhizomatous species, no more than 40 to 50% of the stand should be removed. Select branches which will not impair the source willows health and appearance. When harvesting from native stands, ensure the stand will not be denuded or destroyed by your cutting activity. Consider removing cuttings from inside the crown area rather than the more visually obvious exterior area. Try to spread your harvesting activity throughout the stand.

Dipping the TOP of dormant willow cuttings in a 1:1 mix of latex paint and water. Photo by Chris Hoag.

The apical bud (bud at the tip of the branch) plus the next several inches of the cutting should be removed. The apical bud draws too much energy from stored reserves, reducing the chance of survival. Its removal will reroute energy to the side buds including the root buds. The upper part of the stem also has the flowering parts. By cutting it off, energy is also redirected to the root and branch primordia in the older parts of stem. Trim off all side branches so the cutting is a single stem.

Following pruning, a good idea is to paint the tops of the cuttings. Dipping the <u>top</u> 1-2 inches of cutting into a 1:1 mix of light colored latex paint and water, does a number of things. Perhaps the best reason for painting the top of cuttings is it helps inexperienced planting crews plant cuttings properly, with the top up! It also helps locate the cuttings more easily for future planting evaluations. It may also prevent excessive transpiration of water from cutting (the literature is mixed on this point).

Storage

Small cuttings for nursery use should be stored in plastic bags in a cooler during transport and prior to planting in the propagation bench. Long term storage should be in a cooler maintained at 33 to 37°F and 80 to 95 percent relative humidity. Cuttings stored for more than several days should be treated with a broad spectrum fungicide prior to cold storage.

To minimize storage time of restoration size cuttings, cuttings should be harvested in late winter to early spring and planted as soon as possible. However, cuttings can be harvested in late fall or winter and stored in a large cooler at 33-40°F for up to 3 to 4 months until just before planting. In some areas, cuttings are stacked outside and covered with snow until they are planted in the spring. Whether cuttings are kept in a cooler, root cellar, garage, or shop floor, make sure the storage area is dark, moist, and cool at all times. If cuttings are stored at higher temperatures, a fungicide should be applied to prevent damage caused by pathogens or saprophytes.

(2) Semihardwood or greenwood– Semihardwood cuttings are taken from actively growing and partially matured tissue of perennial, woody plants. Semihardwood cuttings break when bent into a “U” shape, in contrast to softwood cuttings that will bend without breaking, or must be bent more severely to cause breakage. Semihardwood cuttings tend to root better than hardwood cuttings of the same species, but are more perishable, requiring careful handling, transport, temporary storage, and shipping. Cuttings should be taken in the cool early morning hours of the day and kept out of direct sun. Cuttings should be 3 to 5 inches long, contain two or more nodes, and have a basal diameter as large as possible given the size of the current season’s growth. Semihardwood and softwood cuttings are normally shorter than hardwood cuttings because they typically consist only of the current season’s growth. The basal cut should be made below a node. The cuttings should be placed in a ziplock bag moistened with water and then placed in the cooler with ice in a shaded location. Use a towel or other insulating material between the ice and cuttings to prevent freezing. Ideal temporary storage is between 33 to 37°F with relative humidity 90 percent or more. Do not allow the cuttings to heat up or become desiccated during transport to the propagation facility. Attempt to minimize the interval between removal from the donor plant and arrival at the propagation facility.

(3) Softwood– Softwood cuttings consist of actively growing tissue (current season’s growth) at the terminal end of stems prior to full maturity. They are removed relatively early in the growing season. Immature softwood tissue can be bent in a “U” shape without breaking, although it is at the optimum stage of maturity for use as cuttings when it snaps when bent sharply. Many species of difficult-to-root woody plants root faster and better from softwood cuttings. A limitation of softwood cuttings is that they are highly perishable and easily damaged during handling. Softwood cuttings are taken, handled, temporarily stored, transported, and shipped as described for semihardwood tissue - under cool, moist conditions. Storage should be minimized to assure viability. These cuttings should be delivered as quickly as possible to the production facility to guarantee success. Same day delivery is best, although overnight express is often adequate.

(4) Herbaceous - Many herbaceous forb (wildflower) species can be propagated from leafy cuttings taken during active growth in late spring to late summer. Flowering stalks and leafy stems with large basal diameters (>0.25 in) work best. This material is also highly perishable, and should be considered more delicate than softwood cuttings from perennial woody plants. Handle, temporarily store, transport, and ship as described for semihardwood and softwood tissue - under cool, moist conditions.

4a) Leaf Cuttings

Many herbaceous species, primarily tropical plants, can be propagated from leaf cuttings. Leaf cuttings include the leaf blade, or leaf blade and petiole. This technique is seldom used to propagate northern temperate species, and limited information is available on the successful use of this technique for other than tropical species.

4b) Leaf-Bud Cuttings

A leaf-bud cutting consists of a leaf blade, its petiole, and a short piece of stem with an attached axillary bud. This technique has been used successfully for the propagation of several species including some perennial woody plants found growing in northern temperate climates (*Rubus* species). This technique is valuable when cutting material is limited, producing more plants per unit of cutting material than stem cuttings. Softwood, greenwood, and herbaceous stem cuttings can be taken and then prepared into leaf-bud cuttings at the propagation facilities. These perishable cuttings are taken during the growing season and are handled, stored, transported, and shipped in the same manner as softwood and herbaceous cuttings.

4c) Root Cuttings

This type of cutting material is generally less preferred than stems because of the limitations imposed by their growth in the soil. Although most vegetative propagation is from stem cuttings, there are several northern temperate species that propagate well from root cuttings (aspen *Populus tremuloides*, apple *Malus* species, *Phlox* species, white poplar *Populus alba*, flowering almond *Prunus glandulosa*, sumac *Rhus* species, rose *Rosa* species, blackberry *Rubus* species, lilac *Syringa vulgaris*, and others). Root cuttings are best taken from young donor plants in late winter or early spring prior to new growth. Avoid taking root cuttings during active growth. It is helpful to make a straight cut at the end of the root cutting nearest the crown and a slanted cut on the other end of the cutting so that the propagator will know how to properly orient the cutting during propagation. Long lengths of root can be taken and later trimmed at the propagation facility. Root cuttings are handled, stored, transported, and shipped in the same fashion as dormant hardwood stem cuttings.

4d) Scions and Buds for Grafting

Scions (stem cuttings) and buds can be grafted onto appropriate rootstocks to clonally reproduce a given parent plant. Although this technique requires specialized skill, collecting scions and buds is simple and similar to making vegetative stem cuttings. Since the rootstock must be in the proper physiological state at grafting time, close coordination is needed with the propagator.

Use the following guidelines when making vegetative collections:

1) Given the perishable nature of vegetative collections, be sure to coordinate timing of collection with the production facility to assure that facilities, supplies, equipment, and labor are readily available once vegetative collections are harvested.
2) Scout plants in advance of harvesting material. Use only healthy, turgid, moderately vigorous, and adequately sized material.
3) Sample from enough individual plants to assure adequate population sampling. Depending on sample size, 25 to 50 percent of the population or from 50 to 100 individual plants should be collected.
4) Make sure the basal ends of stem cuttings are at least 0.25 inches in diameter, if possible.
5) Keep vegetative materials cool and moist. Collect in the cool early morning hours. Minimize handling and storage.
6) Be able to properly identify each mother plant. Verify the species and attach a permanent label and/or use GPS technology to verify the location of each donor

plant. Keep collections in separate bags by parent plant. Place a label inside the sack and label the outside of the sack to verify identity.

7) Avoid unhealthy, low vigor, or stressed plants.
8) With dioecious species (male and female flowers on separate plants), make sure to sample both male and female plants if seed production or on-site plant reproduction is a project goal.

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Appendix. Plant Collection Information Form

United States Department of Agriculture
Natural Resources Conservation Service

NRCS-ECS-580
(4/98)

Plant Collection Information
(seed or vegetative)

PLANT INFORMATION

Scientific Name ____________

____

Common Name ____________

Cultivar/Release ____________

Plant type: ____________

Number of Plants from which collected ____________
(minimum population of 30 plants is preferred)

☐ Seed ☐ Vegetative Material

COLLECTION INFORMATION

Date Collected ____________

Collector's Name ____________

____

Collector's Headquarters ____________

____

COLLECTION SITE INFORMATION

State	Section	N. Latitude	
County	Range	W. Longitude	
Township	Site Location (ie. landmarks, roads, etc.)		MLRA
Elevation (ft or m)	Slope (%)	Exposure (N,S,E,W)	Precipitation (in or mm)

Plants Growing in Association

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Soils Information

Soil Series & Texture	Soil Survey Sheet #	Soils Mapping Unit Symbol

Remarks

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Please complete the above form as completely as possible, following the instructions below for collecting and handling seed and vegetative material.

Watch for superior plants that display unusual characteristics and record observations. Seed or cuttings from an individual plant or from several plants in the same colony can constitute a collection if warranted. Make separate collections of the same species if the growing site or location is different.

Use the back of this sheet to sketch the collection area or record additional information.

Be sure to label each collection as it is made so collections do not get mixed up. Send seed to the Plant Materials Center serving the state, unless other specific instructions are provided.

Seed Collection: Check each collection for filled seed and then attempt to get the equivalent of one-fourth pound of seed. Collection should be from a minimum population of 30-50 plants if possible. Mature seed is typically dry and hard and has separated from the rachis (grasses) or loosens easily from the pods, capsules, or flower heads. Do not collect unripe seed. Fleshy seed from woody species should be enclosed in a plastic bag and kept in a cool place out of direct light.

Vegetative Material Collection: Collect only good healthy material. Use a sharp knife, scissors or pruners for cutting vegetative material. Root cuttings should be a minimum of 6" in length. Stem cuttings should be 6-8" or longer and have a minimum of 2 nodes. Wrap roots or cuttings with moist paper or cloth. Place material in a plastic bag with a few small holes in it. Refrigerate or keep cool until shipped. Material should be shipped or delivered as soon as possible so that it does not dry out.