

# The Sacrificial Bud-Grafting Woody Peonies

Nate Bremer-Solaris Farms



The method of grafting and healing woody peonies Solaris Farms uses is based on the work of David Reath and Bill Seidl. A number of significant variations and changes have been instituted in their procedures to enable a higher success rate presently. At this writing Solaris Farms has used the procedure described herein to graft many thousands of woody peonies successfully. Please note that more changes are likely as I continue to make observations that may yield positive changes to all aspects of grafting and growing woody peonies. The title of this article is reference to collection of buds for use in grafting.

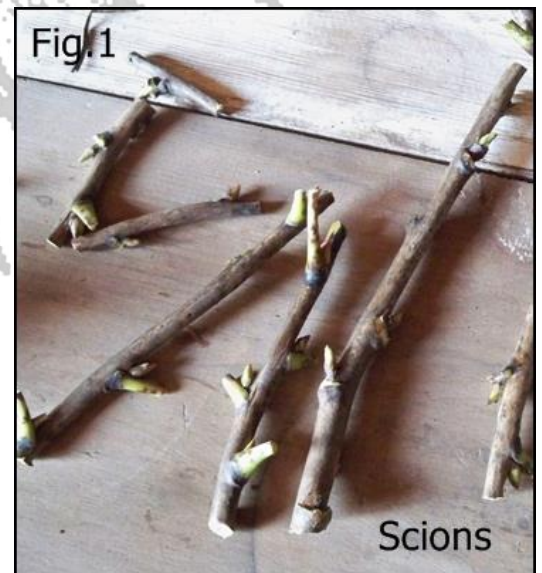
## Scions

Scions are cut with garden pruners/shears and the desired length of the scion is 2" to 3", with a terminal bud and a couple of side buds if possible. Leaves are pushed backward and they snap off at the axillary nodes leaving the buds intact (they may also be trimmed off with shears). The best scions for grafting have mature terminal buds and show splits in their

“bark”. These mature scions often have a woody look to them and have little green tissue on them. The ideal time for grafting in Wisconsin, northern USDA Zone 5, is mid to late August. Any earlier the scions are not mature, later the grafted scions do not grow together well enough before winter and the scions themselves seem less inclined to join with the rootstock. As grafting activities move further away from the optimum period, the success rate becomes markedly lower.

Itoh or Intersectional hybrid scions can also be grafted. Scions from these plants will make use of auxiliary buds found near the bottoms of the stems. Success rates with this group of plants can be expected to be lower. Scions produced on intersectionals are often very green, lacking the woodiness of their tree peony relatives. This may or may not be the reason for difficulty in grafting. However, we have noted a better rate of success by using scions harvested from stems at or just below the soil line. These scions are much woodier and buds are more developed. The same procedure is used to graft these scions as the tree peonies.

A number of woody peony cultivars seldom have terminal buds due to heavy bloom, so a search for larger side buds is carried out. See Figure 1. Terminal bud scions almost always increase the chance of graft success. A side note, if you would like your rockii and other poor scion producers to grow large terminal bud scions, cut the plant you would like to graft to the ground late in the fall, prior to the year you plan to graft. The cut plant will produce an abundance of basal shoots of large size the following spring. Very old plants, that have few stems, may take a year or two longer to produce usable scions. Sometimes mice and voles in our area girdle the plants in the fields, the result is a huge flush of new growth from below the soil line the following spring, creating the same effect as being cut.



# The Sacrificial Bud-Grafting Woody Peonies

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Harvesting scions does not necessarily reduce the number of flowers plants will produce the following year. A positive consequence of scion harvesting is that the donor plants generally show more vigorous growth the next spring and in coming years.

Scions are cut a day or two before grafting (convenience only) and placed in plastic bags with their name written on a label in the bag. Do not place damp paper towel or any other water retentive material in the bag with them, as this quickly degrades the scions. They are better off being somewhat dry than damp. The bagged scions are kept cool, but not refrigerated. I've grafted scions stored in this way which were two or more weeks old, sent from foreign countries (Australia and Germany), with great success.

## Nurse Roots

The nurse root will serve as a temporary root system and source of energy for the graft's first few years of life-it is not meant to be a permanent root system. Any lactiflora cultivar's roots work, but should have strong and healthy growth habits. Our preferred nurse root has been 'Edulis Superba'. 'Edulis Superba' is well suited to our soil, is disease resistant (we never see botrytis or other disease on these roots), are rapid growers and easily heal to woody peony scions. Other grafters may find that different cultivars work better for them. Intersectional (Itoh) roots may be used as well, but appear to inhibit the growth of own roots on our soils, thus we do not use them. The use of herbaceous hybrid roots is not recommended due to their propensity to produce adventitious growth which become competitors with the woody peony grafted to them.



## Preparation of Nurse Roots

- 1) Cut foliage to the ground and then dig the entire clump of the herbaceous peony cultivar intended for use. Digging should be performed so that most of the roots are removed from the ground undamaged. The loss of the very ends of the roots will not impact the success of grafting. Roots should not be old and woody, but may be large in size. Contrary to printed material on grafting, large roots work equally well as small roots (perhaps better due to their greater energy storage). Remember old roots are often in their twilight years and will not be vigorous. Very young roots that have small diameters will not have enough stored energy to support scion joined to them. Generally roots that are from 3 to 5 years in age work well, but there are always exceptions.
- 2) Clumps are immediately transported to a washing station and cleaned of soil. After cleaning, roots are cut from the crown. It is important to keep track of cut off roots orientation to be used in grafting. Scions in the grafting procedure will be joined to the upward (crown) side of the root. This alignment of scion and root tissues is important for proper growth, thus know what end is up need to be kept track of. So, as the roots are cut, we make sure the top gets a flat cut and the ends of the roots or root segments get an angle cut. We later can then identify the end that receives the scion through the use of this procedure. In hot weather it helps the roots to stay hydrated and healthy by filling the tub with water. At no time should roots that will be used for grafting be allowed to dry out. While other literature sources may recommend drying roots so that they become slightly rubbery, our trials have shown a marked decline in success using this practice. Using rubbery roots makes grafting easier, but not more successful.

In most cases no roots will remain on the donor clumps after harvesting. These rootless 'crown stubs' can be replanted and will grow into nice plants within three years. The left over crown stubs are placed/stored in another

# The Sacrificial Bud-Grafting Woody Peonies

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tub filled with peat and may be divided and planted much later, after grafting has been carried out.

- 3) Place the roots to be used in grafting on a washing table (ours is a large table that has a top made of hardware cloth mesh with half-inch openings). Using a hose with spray nozzle, wash the roots so that no soil is left clinging to the roots.
- 4) Fill a bucket or tub with water and add liquid bleach at a ratio anywhere from 10:1 to 20:1 (water to bleach). Inexpensive bleach works as well as expensive name brands. Mix the solution well, as bleach will stratify toward the top.
- 5) Place nurse roots into the water-bleach solution for 20 to 45 minutes. This will disinfect the roots so that they do not have soil-borne fungi, bacteria, etc... on their surface. The roots will change color from brown to cream or almost white.
- 6) Remove the roots from the solution and rinse them thoroughly on the washing table again.
- 7) Place the roots in a clean bucket or tub and cover it with a bag so that they do not dry out. Roots can be stored in a cool place (the back of our machine shed) until ready for use. We've stored roots for two weeks like this with no ill effects. If they are stored for an extended period before use, they may need to be disinfected again with water-bleach solution. Visual inspection will tell you if this needs to be done.

## Grafting

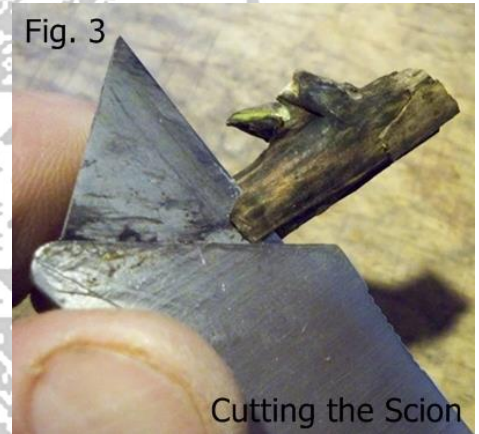
1) The following materials are used during the grafting process: A utility razor knife, new blades, budding strips (rubber bands about 5 inches long and 3/8<sup>th</sup> inches wide), garden pruners/shears, rubbing alcohol, Parafilm or grafting tape (waxy tape material that may be stretched), quart size or larger plastic bags, hardwood cutting boards, a container of water, aluminum foil plant tags, pencil and markers. Nurse roots (in tubs) are placed on the ground next to us for ease of selection. Scions (in their bags, with their labels) are in a basket and we work on a single cultivar at a time.

2) Select a herbaceous nurse root, generally a root of 3" to 6" works well. Short roots may not need to be cut to the desired length, but long roots can be cut to shorter segments. Once again it is important to keep track of the up facing and down facing ends. Cut the down ends on an angle and the up ends on a flat perpendicular angle.

3) Keep the scions that are being worked with in a bag until they are to be used. Select a scion and find a good matching nurse root. If the scions are large in diameter, the nurse roots should also be large in diameter. The nurse root diameter can be equal to or much larger than the scion's.

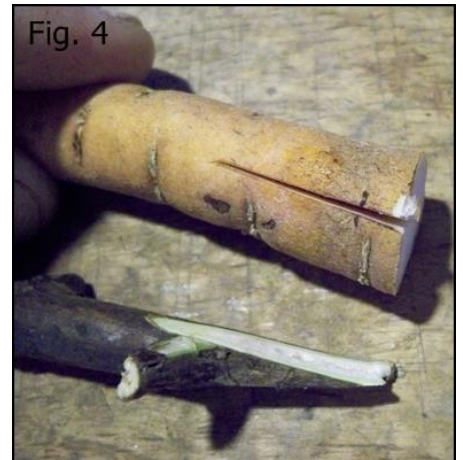
4) Place the nurse root on a clean cutting board. Flat-cut the top of the nurse root with a razor knife, so that the surface is fresh and clean. Then, from the top downward, using a razor knife, make a cut 3/4" to 1" in length through the center of the root. This divides the top part of the root into two portions. See figure 4. These portions will spread apart to accommodate the incoming "V" or wedge shaped scion. In his APS bulletin article, Bill recommended making two cuts and removing a wedge-shaped chip. Creating this type of 'cut out' in the nurse root is not necessary. Making the more simple cut saves time and provides two smooth, flat, matching surfaces without whittling away to remove

Fig. 3



Cutting the Scion

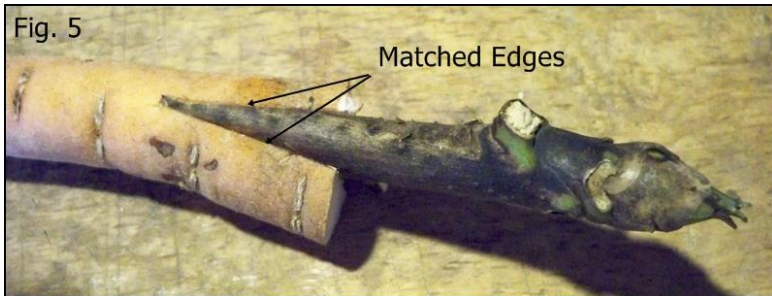
Fig. 4



# The Sacrificial Bud-Grafting Woody Peonies

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a chip. In some instances, if the scion is very short, fat, and stubby, chip-removal might be advantageous so that scion stays seated in the nurse root. The bisected portion can be spread apart to accommodate almost any scion. This is a departure from cutting a wedge that needs to accurately match the scion's cut. See figure 4.



5) Cut the basal end of the scion into a "V" or wedge shape. The "V" should be longer than it is wide and must be able to fit into the cut in the nurse root. The "V" cut may be done in two strokes, if you are practiced, by simply holding the scion with the base facing away from you and cutting down and away with the razor knife. It is important that the surface that is created on the scion be flat. A fast and firm cutting motion generally produces this, while

"whittling" often creates ridges, high points and a variety of problematic surfaces. If the "V" is longer on one side than the other, this is usually not a problem. In fact the "V" can even be off center, looking wider on one side than the other. The cut in the nurse root will accommodate this as well. The length of the "V" does not need to match the length of the cut in the nurse root. However, the "V" cut of the scion cannot be longer than the cut in the nurse root, or the cut surfaces of the scion will not be covered. See figures 3 through 7.

Sometimes side buds will need to be cut away in order to make the "V" cut to the scion. This is another form of the 'Sacrificial Bud'. As long as there are other well developed buds above the cut, no extra thought should be given to it's loss.



6) Once the scion has its "V" cut and the nurse root has its cut, slide the scion into the cut. You may need to push the scion into the nurse root with some force. Make sure that the entire

"V" surface is below the top of the nurse root. Figure 7 shows a scion that is not seated deeply enough, the entire cut surface needs to make contact with the nurse root. It is fine if the "V" is well below the perpendicular cut top of the nurse root. Align an uncut edge of the scion with one of the outer edges of the nurse root. This practice assumes the vascular bundles that carry water and nutrients through the roots are near the outer portion of the nurse root, thus centering the scion would cause no contact between scion and the area that will accept growing material. Press the two sides (portions) of the nurse root against the "V" of the scion to visually inspect the way the scion and nurse root contact each other. See Figure 5 and 6. In most instances, if the "V" has good flat surfaces, there will be a perfect matching of nurse root to scion surface. If you can see light shining between surfaces or there isn't a clean match, remove the scion, re-cut your 'V' and repeat the insertion.



7) With the scion inserted into the nurse root start at the top and firmly wrap a budding strip or rubber band around the entire cut area. This will pull the nurse root and scion surfaces together tightly and increase the chances that they will heal together. Some gaps between the wound strip or loops are O.K. Enough of the budding strip needs to be left over to tuck it under the last loop (this takes a little practice).

Some larger roots may need to have a strip of greater length. This can be accomplished by tying two strips together or simply using two strips and applying them independently. When the girth of the scion is less than that of the rootstock, the sides on one side of the cut will match; the opposite sides will

# The Sacrificial Bud-Grafting Woody Peonies

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not. This projection of unmatched rootstock (shoulder) need not be cut off, as doing so does not make a difference in the success of the graft.



8) Using a strip of Parafilm<sup>1</sup> or grafting tape<sup>2</sup> wrap the entire area from the bottom of the cut to the first 1/4<sup>th</sup> inch of the scion protruding from the nurse root. More of the scion may be covered without impingement. In fact, the entire scion can be covered with Parafilm or grafting tape. The tape (film) acts as a barrier that keeps disease and water from entering the area that needs to heal. As the plant grows, covered buds will grow through the tape with ease. Note: The use of budding strips and tape (film) is a two step process. Others have reported success without the use of Parafilm or grafting tape.

9) Place the finished graft in a bag with label. Add a few drops of water to the bag to keep the grafts moist. We've found that grafts that dry out, even slightly, often do not heal.

10) Clean and disinfect your cutting tools and surface with rubbing alcohol before starting to graft another cultivar. This helps prevent the possibility of spreading a disease from one cultivar to another. You may also need to replace you cutting blade after 20 or 30 grafts are made.

<sup>1</sup>Parafilm is sold as Parafilm 'M' laboratory film. It's general use is for sealing lab-ware, such as: petrie dishes, test tubes, flasks, etc... It is a soft material that stretches easily and has self adhesion properties. Gardeners have discovered Parafilm is much easier to work with than beeswax and other grafting waxes that require melting and careful controlled application. The Parafilm we've worked with comes on large rolls and the material must be cut from the roll into useable sized strips (usually 1" x 3" in size) and then the backing is removed.

<sup>2</sup>Grafting tape is sold specifically for grafting and is available in many sizes and materials. Parafilm also makes nursery grafting tape. The properties of different kinds of grafting tape vary widely. Since Peonies are relatively soft, it is recommended that the material be one that is soft and stretches. Vinyl or Poly tapes are quite inexpensive, but can be quite rigid a difficult to work with, thus it is important to do some research before selecting a grafting tape. The type that I've found works best is 'budding tape' and has the same elastic, self adhesive properties of Parafilm. Budding tape is more expensive, but is easy to work with and highly effective for grafting woody Peonies. It is usually sold on a roll with perforated strips, which require no cutting.



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## Planting and Healing Grafts

Grafted woody peonies need a period of warm/damp time to heal. During this time the woody scion and herbaceous nurse root 'knit' together and become a single plant. This knitting of tissues is known as 'callusing'. Often given enough attention, the healing of the graft is easily as important as accurately joining the scion with the nurse root.

### **Method 1 (open field or garden):**

- 1) Soil in the area that the grafts will be planted should be prepared to receive them a couple of weeks in advance.
  - A. Consideration should be given to the moisture content of the soil. Even moisture is important. Water the soil if it is overly dry.
  - B. Cover the area with black or clear plastic during this period to warm the soil. Covering the edges of the plastic with soil helps to trap heat that might escape during the day. This creates a 'greenhouse effect' under the plastic which nicely holds heat and water in the soil below the plastic.
  - C. Rototill or dig the area deeply just before planting is to occur. The goal is to break soil particles down to a

# The Sacrificial Bud-Grafting Woody Peonies

Nate Bremer-Solaris Farms

small workable size. This makes planting easier and allows soil to be evenly filled around the new grafts. Chunky or blocky soil is difficult to work with and often leaves air spaces in the grafting bed that causes uneven heating, drying, etc... At this time, some people work peat, perlite or other amendments into the soil, but not fertilizer.

D. Cover the area with clear plastic if grafts are to be planted in the bed a day or two later.

- 2) On the day the grafts will be planted, remove the plastic from the prepared area and rework the soil. Take a moment to check that the soil feels warm to an approximate depth of 6 inches. Soil temperatures of 75°F to 85°F is an acceptable range to promote callusing of the graft. Unfortunately, the heating of the soil with this method is at the mercy of mother nature's ability to warm it adequately and in cold seasons less success may be experienced. The soil may need to be reworked with a rototiller or through digging to create a fine textured planting area.
- 3) Plant grafts in damp and warm open ground. An important point to remember is that dry or overly wet soil is a killer of new grafts. Plant grafts 1" to 3" apart, to limit the space needed to care for them during their first year of growth. Wide spacing of grafts also works, but requires more materials and a greater space to take care of. Since 100% of the grafts generally do not grow, large spacing between them will often leave even larger spaces where failure has occurred. The entire graft should be buried on it's side (horizontally, parallel to the ground) to a depth of 3" to 4". Grafts should be planted so that the top of the scion is 2" to 4" inches below the surface. Grafts buried on their sides will grow out of the soil the following year in an upright position, while the roots will remain parallel to the surface. This technique has proven to promote faster own root production from the scion after 2 or 3 years.
- 4) Press the soil down firmly on the grafts. Don't be a wimp, push hard, it creates better soil contact-thus better rooting.
- 5) Tightly cover the planted area with clear plastic to keep the soil warm, thus promoting healing of scion to nurse root. The edges of the plastic may be buried with soil to keep it sealed and prevent the wind from catching it. Remember that the optimum temperature for healing is between 75 and 85 degrees. In warmer areas of the United States overly warm conditions may require that the plastic is covered with mulch to keep the warming rays of the sun from overheating the grafts. Remember to label your scions carefully so that you know what your hard work has produced in coming years. The plastic cover keeps out rain water, which would course through the soil, waterlogging it and penetrating the wrapping of the grafts (---not 100% waterproof---contaminating the joined surface with decay organisms). The grafting bed should remain covered for approximately two weeks. If winds blow off part of the plastic, repair it quickly, continuous warmth and freedom from rainwater is essential at this stage.
- 6) After two weeks the grafts are now presumed callused, the plastic sheeting can now be lifted and removed so air can cool the soil below. Mulch, with approximately 2" of material. Our recommendation for mulch is wood chips or bark; straw or hay tends to mold and holds moisture excessively. During this period, the soil will continue to cool (due to the low angle of the sun) and the nurse roots can begin to grow. If healing was successful, the buds on the scions will swell and elongate slightly. Note: Leaving the plastic on the grafting bed for a longer period often causes the grafts to begin growth, something that should not occur until the following spring.
- 7) As fall frosts begin to occur regularly, reapply the plastic for winter by mounding soil along the edges. This prevents water getting into the area over the winter and creates a barrier to animals. Some people apply another layer of mulch on top of the plastic for the winter as further insulation, but we have found this unnecessary. Freezing is O.K., but freeze-thaw cycles should be avoided.
- 8) In spring, as soon as you can possibly get into the garden, remove the plastic covering. We do this as soon as the snow is off and the ground may still be frozen. Since tree peonies begin growth when soil temperatures are very low, they may begin to grow and emerge in their protected environment. Removing the plastic will put them in

# The Sacrificial Bud-Grafting Woody Peonies

Nate Bremer-Solaris Farms

synch with the season. Avoid digging around in the mulch, as this often will damage the new peony growth arising from the ground.

- 9) New grafts will begin to appear soon after the frost leaves the ground. Some late risers can be expected, so don't be impatient and begin digging around looking for them.
- 10) Leave the grafts in their bed for 2 to 3 years and transplant them to their final growing location. At this time they should be planted more deeply, so that further root formation can take place from the woody stems.

## Method 2 (indoor healing):



1) Place grafts in shallow containers, such as cat litter pans, filled with moist sand. The entire graft is covered with damp sand (depth is not important—they just need to be covered). Grafts may be placed on their sides for ease. Due to time constraints involved in late August this is a good choice for late season healing when outdoor temperatures are too low for success. . Bags are used to cover the containers to eliminate evaporation.

2) Place the shallow containers on a seed-starting heating pad. This supplies bottom heat, but heats the entire container. An inexpensive thermostat can be purchased to control the heating pad's output and is recommended. A thermostat setting of approximately 75F to 80F has proven successful. The containers could also be placed in a warm location

instead of using a heating pad.

Check the moisture of the sand occasionally, as some drying will occur with the use of bottom heat. If the sand is showing signs of drying, carefully add some water along the edges of the healing containers.

3) Once the two weeks of heating/healing time has been completed, the grafts are planted in the field as in method 1 or held over winter packed in peat, for spring planting. Note: Spring planting is problematic due to lack of root growth in the grafts and many young grafts may be lost due to poor climate synchronization.

This method works well for gardeners that have fewer grafts to deal with and should provide good results.

## Closing thoughts and experiences...

- 1) We have tried using a hand held grafting tools on a number of occasions. The tool was designed to streamline cutting time and make uniform cuts. The tool did save cutting time, however, the cuts were not uniform and produced ragged surfaces on the scions. These 'rough' surfaces create a poor contact between sicon and root, preventing callusing. Not a recommended choice for grafting tree peonies.
- 2) Switch blades in the cutting knife often and definitely between different cultivars to avoid spreading viral and bacterial diseases. Blades generally only stay sharp for 20-40 grafts and clean, fresh razor blade makes a world of difference. Grafting knives that do not utilize replaceable blades need constant disinfection and sharpening, thus I do not recommend them.



# The Sacrificial Bud-Grafting Woody Peonies

Nate Bremer-Solaris Farms

- 3) Damp soil is a must in the grafting bed. Dry soil, in our experience, has always produced fewer successful grafts. If soil is dry we make sure to water the soil a day or two before planting. If soil remains dry within the bed after planting, dig a trench around the outside of the bed or between grafts and fill it with water. Water will wick through the soil without flowing down over new grafts.
- 4) Not all woody peony cultivars have the same success rates in grafting. The lutea hybrids produce higher success rates than the moutans, and the moutans are easier than the rockii cultivars. 'Anna Marie' has time and again shown nearly a 100% graft success rate. Angel Emily, a rockii x suffruticosa hybrid is highly variable from year to year (25% success in poor years to 80% in successful years).
- 5) Avoid peaking at grafts in the spring by removing soil. Curiosity often gets the best of grafters who begin digging around in grafting beds, only to break off newly emerging shoots (I speak from experience). There's nothing worse than snatching defeat from the mouth of success. Be patient, the plants will come up in a short time anyway.
- 6) Newly grafted plants will often look small and weak the first year of growth. Leaves are almost always small, underdeveloped and they may lose them early. Stems are usually narrow and short. Some cultivars may even lose their stems the first winter, only to produce new growth from below the surface. After another year of growth the plants will show more vigor. Patience!
- 7) Many new grafts will make an effort to bloom their first year. We recommend removing buds as you see them. The flowers that would be produced will not look anything like a mature plant's anyway and the energy saved can certainly be used by the plant for growth.
- 8) Grafted peonies almost never flower in their second year of growth. During the third and fourth year flowers can be expected.
- 9) Make every effort to keep your grafts well organized and labeled. The newly grafted plants often look very similar (unlike their adult donors) and identification can be problematic. Labels should be long lasting to since they will remain with the grafts for a minimum of 3 years in the grafting bed.
- 10) Share scions of rare varieties with others whenever possible. Example: Bill Seidl's 'Fuchsia Ruffles' became extinct in his garden, fortunately he shared a scion or two with a friend who successfully grafted the plant and reintroduced it to his garden (and the world). In this way the plant did not become an extinct cultivar.
- 11) In the third year of growth, grafts are dug and budding strips need to be cut away so that they do not girdle the graft union. Girdling has been problematic for us with certain cultivars which grow quickly. More observation and trialing is being done to determine if there is a better technique that can be used that will not girdle young vigorous grafts. After removing the budding strips the young grafts can then be planted with greater spacing or shared with others. While a number of businesses sell younger plants, even one year olds, we find that these plants are more likely to fail or lack the needed vigorous root system of 3 to 5 year olds.
- 12) Experiment. Allow yourself to try variations in all steps of grafting and growing. I'm sure there are other practices that will produce success and may work better in varied climates and situations.





# The Sacrificial Bud-Grafting Woody Peonies

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13) Persist! Generally first year grafters of woody peonies experience less success than more seasoned grafters. Be observant, learn from your mistakes, and allow yourself some practice.

In closing, grafting woody peonies is not difficult and a rather high rate of success can be experienced with a little practice. On average, our success rates have averaged 75% to 90% and I've learned a great deal from failures. Further experimentation will likely produce more information toward even better results. Anyone that is willing to put in a little time will quickly become adept at the entire process and can increase their tree peony collection quickly. Go forth and sacrifice a bud to create a new beauty!

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