

Growing American Ginseng (*Panax quinquefolius*) in Forestlands

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Introduction

Farming alternative crops, like American ginseng, is becoming more popular among forestland owners. Ginseng is a native medicinal herb and can be deliberately cultivated under a forest canopy. In recent surveys, over 40 percent of landowners in the Southeastern United States indicated a desire for more information on forest farming (Workman et al. 2003), and over half of the Extension agents and almost 30 percent of foresters in the Mid-Atlantic states have been queried by landowners about ginseng income opportunities (Kays 2004). Extension agents and foresters are the first point of contact for many landowners seeking alternative income opportunities through forest farming of ginseng and other medicinal plants. Kays (2004) found that over 40 percent of foresters and Extension agents in the Mid-Atlantic want more information on ginseng to help these landowners. This article provides Extension agents, foresters and landowners with information on ginseng and how it can be profitably farmed in the forest.

Hankins (2000) wrote Virginia Cooperative Extension (VCE) Publication 354-312 on how to forest farm ginseng. His article details basic biology, markets, risks, fertilizing, and one method of wild-simulated ginseng production. This document is intended to compliment that publication by providing more detail on ginseng ecology, legal regulations, optimal habitat, alternative planting methods, diseases, drying, and profit potential. Refer to Hankins (2000) for background on ginseng and other cultivation methods at <http://pubs.ext.vt.edu/354/354-312/354-312.html>.

Ginseng Ecology

American ginseng (*Panax quinquefolius*) is a long-lived, short-statured, deciduous forb that grows throughout the western two-thirds of Virginia. It rarely exceeds two feet in height

Though most commonly found in the mountains, ginseng grows as far north as Loudon County and east through the Piedmont to Cumberland and Mecklenburg Counties. Figure 1 roughly depicts where ginseng has been documented growing in the state.

Ginseng first emerges in late April or early May and is easily recognized in the fall when its red berries ripen (Persons and Davis 2005). Figure 2 shows a mature, four-leaved plant with ripe berries.



Figure 1. Ginseng's approximate range in Virginia is indicated by gray shading.



Figure 2. Mature *Panax quinquefolius* with berries (Nix n.d.).

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The number of compound leaves, commonly called “prongs,” indicates the plant’s age and root size (figure 3). The more large leaves a plant has, the older the plant is, indicating larger roots and a more valuable plant. First year seedlings have three leaflets at the tip of a small, skinny, purplish stem. They may remain in this stage for one or more years and eventually grow two, three, four, or more leaves (figure 3). Plants usually reach maturity and begin producing seeds after five to 10 years. Mature plants may reach one or two feet in height. They generally have four or more whorled, palmately compound leaves of five leaflets apiece. See figure 4 for a side-view and breakdown of the ginseng plant. A mature plant produces between 60 and 100 seeds that ripen in August and September. These seeds remain dormant for 18 to 20 months and germinate the second spring after ripening (Charron and Gagnon 1991; Division of Scientific Authority Chief 2009; Fritsch and Bamford n.d.; Hankins 2000; Persons and Davis 2005; Pritts 1995).

Today, wild ginseng populations are thought to be less abundant than they were in the 18th and early 19th centuries. Scientific studies disagree whether current population levels are stable or in decline due to extensive habitat loss, harvest pressures and excessive deer browse. The U.S. Fish and Wildlife Service (FWS)

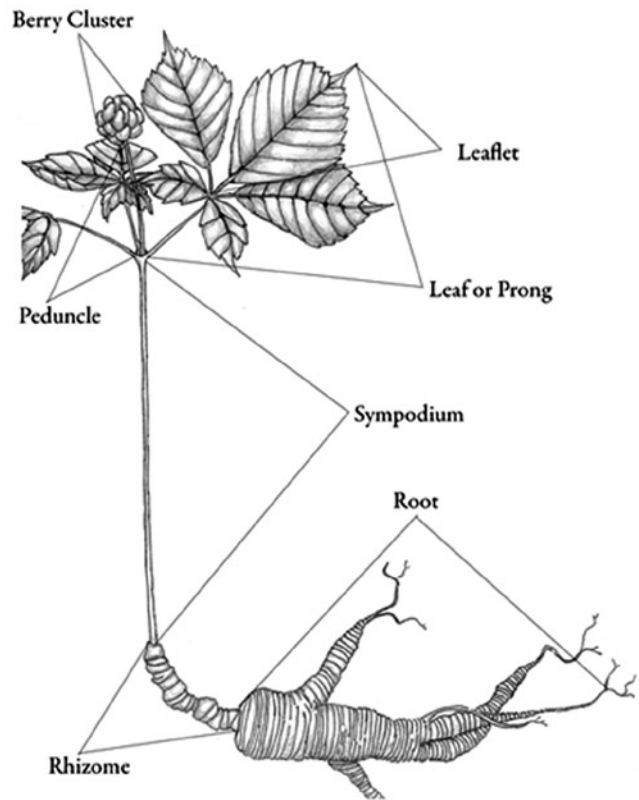
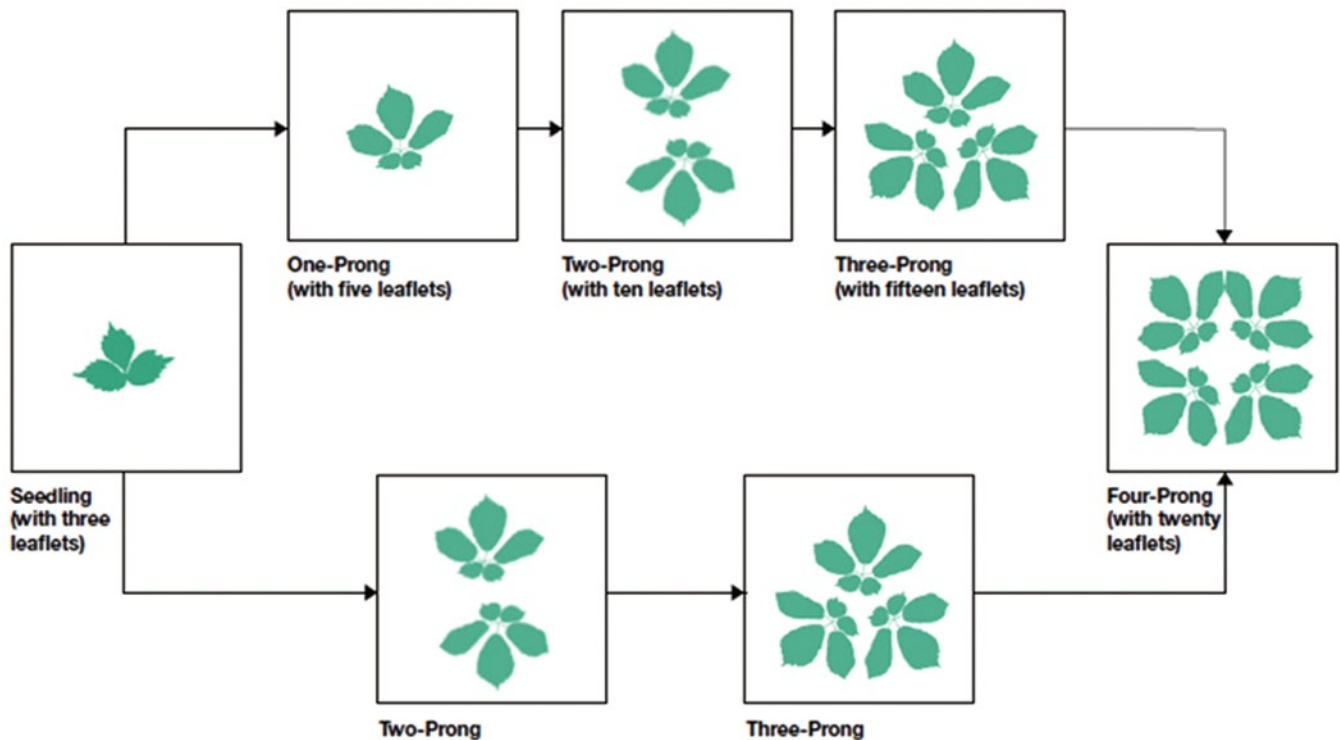


Figure 4. Ginseng plant diagram (McGraw n.d.)



Note: Illustrated here are two pathways of ginseng development. In the first, top, ginseng develops from a seedling to the one-prong stage. In the second, bottom, ginseng “skips” the one-prong stage and moves directly to the two-prong stage. Both pathways may be observed, although the latter is more common where better growing conditions exist. Plants may also develop more than four prongs, but this is uncommon.

Figure 3. Growth stages in American ginseng (Burkhart and Jacobson 2007)

concluded that legal harvesting is not endangering the species with extinction, though they report concern about the impacts of illegal harvesting, called poaching. Further scientific evidence points to declining average plant stature, younger wild ginseng populations, and decreasing genetic variability in at least some geographic areas (Division of Scientific Authority Chief 2009).

Key Points

- Ginseng is a small, long-lived forb.
- Ginseng matures in roughly 8 years.
- Ginseng is native to much of Virginia.

Laws and Regulations

American ginseng is listed in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), an international treaty signed by the United States (CITES Secretariat n.d.). CITES Appendix II regulates trade of species that may become endangered as a result of commerce. The FWS administers CITES in the United States (50 CFR § 23 United States Fish and Wildlife Service Department of the Interior 2007). Because wild and wild-simulated ginsengs are often indistinguishable, the FWS regulates them both as wild ginseng. States are authorized by the FWS to regulate harvests within their borders, and each state has slightly different laws. Harvesting of ginseng in National Parks is strictly prohibited, while harvesting in National Forests is dependent on the management

plans for the individual forest (Division of Scientific Authority Chief 2009). It is illegal to harvest ginseng in National Forests in Virginia (Virginia Department of Agriculture and Consumer Services 2009).

Virginia classifies ginseng as a threatened species on the state watch list (Code of Virginia § 3.2-1007 2008a). Legally harvested wild and wild-simulated ginseng roots must be at least five years old, determined by the presence of four or more bud scars on the root snarl (Virginia Department of Agriculture and Consumer Services 2004). Figure 5 demonstrates how to age ginseng using bud scars.

Ginseng may not be harvested from any state or other publicly-owned lands in Virginia, but harvest is allowed on private property between August 15 and December 31 (Endangered Species Coordinator 2009). Ginseng may be harvested on private property outside the legal harvest season with a signed landowner-seller declaration; it is illegal to possess uncertified ginseng without a landowner-seller declaration between April 1st and August 15th (Virginia Department of Agriculture and Consumer Services 2009). Virginia ginseng laws are enforced by game wardens and law-enforcement officers. Violation of Virginia ginseng laws is a class 1 misdemeanor with a maximum \$2,500 fine and 12 months in prison (Code of Virginia § 18.2-11 2000; Code of Virginia § 3.2-1011 2008b). Further detail and explanations of Virginia’s ginseng laws are available at the Virginia Department of Agriculture and Consumer Services (VDACS) and online (VDACS 2009).

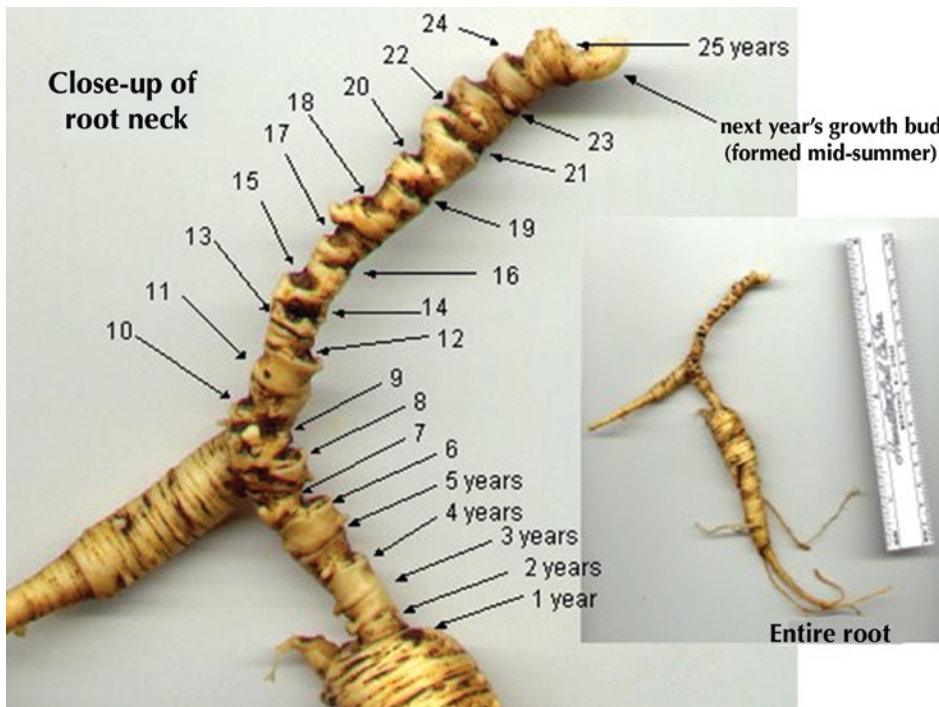


Figure 5. Estimating ginseng root age based on bud scars (Pennsylvania Department of Conservation and Natural Resources n.d.)

Virginia law regulates ginseng buyers more than it does ginseng harvesters. Dealers must purchase a \$10 annual license, available online, from VDACS (VDACS Office of Plant and Pest Services 2007). All sales must be inspected by a VDACS inspector from the Office of Pest and Plant Services to authenticate its legality and document average size, county of origin, and price. Ginseng buyers must keep transaction records for three years, send in copies monthly, and report total transactions to VDACS annually. Records include whether roots were wild or cultivated, whether they were purchased dry or green, the total weight, county or state of origin, and cross-state shipment ID numbers when applicable. More information on Virginia's ginseng management program and examples of regulatory forms can be found at VDACS or online (VDACS 2009). International export of more than eight ounces of American ginseng requires certification from the FWS in addition to dealer certification through VDACS. Full detail of export certification requirements can be found online on FWS form 3-200-34 (Department of the Interior U.S. Fish and Wildlife Service 2010).

The FWS is currently working with the state of Virginia to revise its ginseng laws. Virginia is the only state that does not require re-seeding or a minimum plant size. The FWS recommends all wild and wild-simulated plants be three-pronged or larger to ensure that plants are at least five years old. The FWS wants to require that diggers re-plant seeds after harvesting ginseng to ensure the future presence of ginseng plants. It also recommends changing the start of harvest season from August 15 to September 1 so ginseng berries have time to ripen before harvest (Division of Scientific Authority Chief 2009).

Key Points

- Ginseng is regulated internationally by CITES.
- Ginseng is listed as a threatened species in Virginia.
- Harvest is only legal between August 15 and December 31.
- Harvested plants must be 5 or more years old.
- Roots must be sold to a certified dealer in the state.
- Dealers must work with the state and keep transaction records.

Growing Ginseng

Wild ginseng roots are much more valuable than field-grown roots. For more information on wild versus cultivated roots and market prices, please refer to Hankins

(2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html>. Plants can be intentionally grown to look like wild ginseng using a method called wild-simulated cultivation. Wild-simulated cultivation can yield up to 160 pounds of dried root per acre that sell for wild ginseng prices. In 1998, there were more than 3,330 growers across the United States tending more than 905 acres of wild-simulated ginseng (Persons 1998).

Sites

Good ginseng growth begins with a productive planting site. The best soil condition for growing ginseng is moist, well-drained soil that is high in calcium and high in organic matter. Planting sites should have deep, dark soil that is loose and covered with a good layer of leaf litter. Ginseng will not grow in waterlogged soil, compacted areas (such as old roadbeds), leaf-filled depressions, rocky outcrops, water flows, or heavy clay soils (Charron and Gagnon 1991; Fritsch and Bamford n.d.; Persons and Davis 2005; Pritts 1995; Stoltz 1994). For information on soil pH and fertilizing, please refer to Hankins (2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html>.

The most fertile sites tend to be north or east facing, not too steep, and near the bottom of slopes (Charron and Gagnon 1991; Fritsch and Bamford n.d.; Persons and Davis 2005; Stoltz 1994). A slope is too steep when it cannot maintain fertile topsoil due to erosion. Slopes facing to the north and east are typically cooler and moister than southern or western facing slopes. Flatter areas typically hold more moisture and have deeper soil than steep slopes; however, flat sites with poor drainage or a history of flooding will not support ginseng growth (Apsley and Carroll 2004). Hollows (also called hollows, dells, and vales) are often productive sites for ginseng because they retain moisture, are shady and have deep, fertile soil.

The best wild-simulated ginseng habitat is native forestland with a relatively open understory, a tall canopy that maximizes air circulation, and light levels around 25 percent sunlight. The presence of dense, woody shrubs may indicate that light levels are too high for ginseng (Charron and Gagnon 1991; Division of Scientific Authority Chief 2009; Fritsch and Bamford n.d.; Persons and Davis 2005; Stoltz 1994). Too much sunlight burns ginseng leaves and increases competition from other understory plants. Long-lived tree species that develop few canopy gaps make better ginseng habitat than short-lived tree species (Stoltz 1994). Sugar

maple, tulip poplar, and black walnut stands make the most productive habitat because they are long-lived, tall, and release calcium into the soil when their leaves senesce in the fall (Nadeau et al. 1999; Persons and Davis 2005). Other good canopy species include beech, basswood, buckeye, white ash, slippery elm and northern red oak (Apsley and Carroll 2004).

The following understory species indicate a habitat suitable for ginseng: jack-in-the-pulpit, trillium, bloodroot, solomon's seal, lady's slipper, mayapple, baneberry, spicebush, jewelweed, galax, ferns, wild yam, black cohosh, wild ginger, pea vines, Indian turnips and goldenseal. As long as understory plants do not overtake the site, they should be left to grow alongside the ginseng. Ferns, however, may exude toxins that kill adjacent ginseng plants, so it may be prudent to remove them from the ginseng growing site (Hankins 2000; Persons and Davis 2005).

Key Points

- Good sites have moist, rich, well-drained soil.
- The best sites are usually eastern or northern facing and not overly brushy.
- Ginseng needs forests with 75 percent shade.
- Optimal overstory trees species are black walnut, sugar maple, and tulip poplar.
- Ferns may poison adjacent ginseng plants.

Seeds

Viable seeds are necessary to start a successful ginseng patch. One pound of ginseng seeds contains between 6,000 and 8,500 seeds and costs from \$60 to \$220 per pound. It is important to find a reputable seed source because improperly stratified seeds germinate poorly. Local seed sources may be hardier than imported seeds, and imported seeds may harm the fitness of wild populations (Grubbs and Case 2004; Mooney and McGraw 2007). Other growers and ginseng publications can advise new forest farmers on recommended seed suppliers. Cheap seeds are more likely to be improperly stratified and likely to germinate inconsistently. Sometimes bad seeds can be detected by a foul smell, moldy husks, or milky/cheesy interiors when the seeds are split open (Persons and Davis 2005). Viable seeds should be firm and off-white to dark brown in color. Viable seeds may also have tiny white tendrils showing (Pritts 1995). Good seeds usually lead to at least 70 percent germination. Before planting, seeds should be stored in a refrigerator between 36 and 50 degrees,

kept moist, and aerated. Some growers like to treat their seeds with fungicide for added protection, and some suppliers sell pre-treated seed (Persons and Davis 2005; Stoltz 1994). For further details on how to separate viable seeds from bad ones, how to obtain seeds, and how seeds are stratified, please refer to Hankins (2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html>.

Key Points

- Find a reputable dealer.
- Seeds generally cost between \$60 and \$220 per pound.
- There are approximately 6,000 to 8,000 seeds per pound.
- Seeds should be kept refrigerated.

Sowing

Plant seeds as soon as possible after purchase. Planting is best in October and November, but seeds may be sown between mid-August and mid-December before the ground freezes. Before sowing seeds, heavy vegetative competition on the planting site should be thinned either mechanically or with herbicide (Persons and Davis 2005). On steeper slopes, it may be beneficial to lay deadfall or wood along the contours of the slope to retain topsoil and build up natural terraces over time (Fritsch and Bamford n.d.).

No two growers plant ginseng using the exact the same method, and preferred planting methods and densities vary by grower (Persons and Davis 2005). Planting method and density depends on the quality of the site, labor and startup capital available, and the objectives of the ginseng forest farmers. We present three different wild-simulated methods of varying intensities to demonstrate potential options:

Method 1

Hankins (2000) details how to efficiently hand-plant 10 pounds of seed per acre in 5-foot wide beds with 3-foot walkways laid out up-and-down a slope. This method is particularly effective on sub-optimal sites, where scattered seeds germinate poorly and dense plantings grow slowly (Persons and Davis 2005). This method will also maximize the germination rate of seeds and minimize seed costs. This planting method is moderately labor-intensive per plant grown.

Method 2

For larger planting areas it may be easier to use a less labor-intensive approach to planting ginseng (Persons and Davis 2005). One method requires raking back the leaves and scattering seeds on the surface of the soil rather than planting individual seeds. First, a rectangular section 40 feet wide and 5 feet across is marked off across the bottom of the planting site (figure 5, row 1). The leaves are then raked downhill off this 200-square-foot rectangle. The exposed soil surface should be scratched with the rake's teeth to help the seeds contact the soil. Two ounces of seed are measured out in a small bag and scattered across the 200-square-foot bed. This results in approximately four or five seeds per square foot, 1 ounce per 100 square feet, and 25 pounds of seed per acre. The next planting section is laid out directly above and adjacent to this first row so that the leaves raked off of row two cover the seeds just sown in row one, as depicted by row 2 in figure 5. This method requires roughly 25 hours of site preparation and planting per half-acre sown.

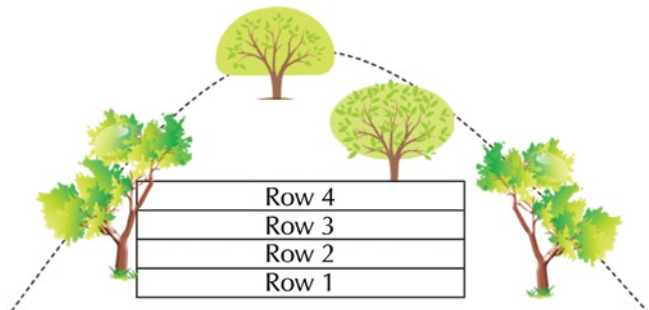


Figure 6. Spatial depiction of planted rows according to Persons' (2005) planting method.

This method requires the least planting labor per seed sown, but may result in poor germination, particularly on dry, sub-optimal sites. Scattering the seeds rather than individually planting them often results in poorer germination, with rates around 50 percent expected. Assuming average germination rates, juvenile mortality, and seed size, this method should eventually yield 2,000 mature roots per pound of planted seed. This is the same as one or two mature plants per square foot surviving until harvest (Persons and Davis 2005).

Method 3

The Appalachian Ginseng Foundation (AGF) recommends very sparse plantings to reduce ground disturbance, curtail spread of ginseng diseases, and minimize the need for fertilizer. This planting method is most like wild ginseng densities, requires the least labor per acre due to the sparse planting density, but also requires the

most labor per seed planted. AGF recommends hand-planting seeds 14-18 inches apart in an offset pattern over a five-year period (figure 7). According to this method, 1/2 pound of seed is planted per acre, per year, for five years. Plant seeds individually 3/4 inch below the surface using a knife blade or dibble stick. Leaves on top of the planting spot should be kicked aside before planting and returned after planting. Sown correctly, about 70 percent of these seeds should germinate. This method requires sixteen to twenty hours of work for each acre planted (approximately 3,700 seeds). Ultimately, these ginseng beds will self-propagate and not require re-planting (Fritsch and Bamford n.d.).

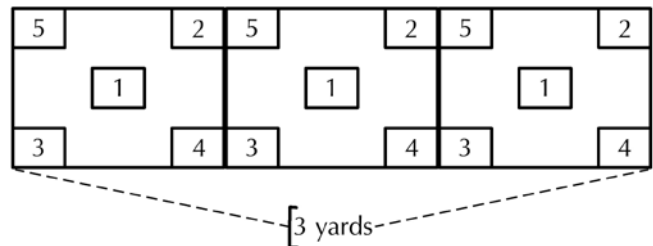


Figure 7. Seed sowing guideline for Appalachian Ginseng Foundation method. Numbers refer to the year in which a seed is sown at each location (adapted from Fritsch and Bamford n.d.).

Regardless of planting method, leaf litter should be returned on the planted site to protect and insulate the seeds. These leaves need to be less than two inches thick so that the seedlings can emerge in spring (Persons and Davis 2005).

Key Points

- Several planting methods exist.
- Seeds may be scattered on bare soil and covered with leaves, or sown 1/2- to 1-inch deep.
- Densities range from 120 plants per acre to 43,560 plants per acre.

Patch Health and Security

Plants need to grow for roughly ten years to achieve a profitable size. During this time, wildlife, diseases, and poaching are the major risks to the ginseng crop.

Wildlife

Deer prefer to eat 1-year-old plants. Browsed juvenile plants usually die, while older browsed plants often resprout after losing a year's growth. Browsed plants usually do not produce seeds. Heavy deer populations may inhibit ginseng cultivation in some areas.

Slugs are typically the only pest that regularly attack ginseng plants; problematic slug populations can be controlled with repellants such as iron phosphate certified for use on ginseng (Division of Scientific Authority Chief 2009; Fritsch and Bamford n.d.; Persons and Davis 2005).

Disease

The major diseases are leaf blight, damping-off, and root rot. Blight is the most common. Blight spores sprout on ginseng leaves during hot, humid conditions. They begin as dark, oily-looking or yellow spots on plant stems and leaves (figure 8). These spots may become light brown and up to two inches long, eventually killing their host leaf by inhibiting nutrient uptake. Blight lesions are often circular or wedge shaped and surrounded by yellow margins. Blight spreads quickly within just a few weeks. The most common blight spores (*Alternaria*) are spread by wind and overwinter in leaf litter, so the disease remains around infested populations. Removing leaf litter around infested populations and replacing it with a sterile substitute in the fall or winter may help reduce the return of *Alternaria* blight year to year. Blight caused by *Phytophthora* is spread through water contact. Fortunately, affected plant roots will re-sprout the next year. Blight is best controlled by planting the ginseng sparsely enough to allow air movement around leaves (Oregon State University Extension 2009c; Persons and Davis 2005).



Figure 8. Ginseng plant with leaf blight (Oregon State University Extension 2009c).

Damping-off fungus is the second-most-common disease. This fungus targets 1-year old stems during cold, wet springs, causing their stems to collapse and tops to wilt (figure 9). Prevent damping-off by planting ginseng in well-drained sites. A light mulch may also reduce incidence of damping-off, while heavy mulches may increase the disease (Oregon State University Extension 2009a; Persons and Davis 2005).



Figure 9. Ginseng plants with damping-off fungus (Oregon State University Extension 2009a).

Root rot is the least common among ginseng's major diseases. Infected plants may fail to sprout in the spring. During the growing season, root rot may cause discolored leaves, red perimeters around leaves, or wilted, droopy leaves. The foliage droops and develops red, yellow, or brown spots. Affected roots may develop rusty lesions or an off-white color, become spongy or rubbery, turn into black stubs, exude smelly liquid, or completely disappear. Dig up the entire diseased plant and remove it to stop the spread of root rot. If diseased roots are not removed, root rot will return to the site the next year. Root rot may best be controlled by neutralizing overly acidic soils with lime, minimizing root damage during planting or harvest, and keeping away from poorly drained planting areas. Planted areas with bad root rot infections should not be reused (Oregon State University Extension 2009b; Persons and Davis 2005; Pritts 1995).

Overall, Ginseng health is best managed by planting on sites with high canopies, good air circulation, and good soil drainage. Widely spaced plants minimize the spread of disease. Plants should be monitored for disease, though frequent visits should be minimized to prevent spreading diseases between plants and patches. When visiting patches, growers should be careful not to step on foliage or spread pathogens by walking from diseased patches into healthy ones. Remove diseased plants immediately to prevent spread. If needed, chemical and biological controls for the major ginseng diseases can be found online at Oregon State University Extension's website on Plant Disease Control, <http://plant-disease.ippc.orst.edu/> (Fritsch and Bamford n.d.; Persons 1998; Persons and Davis 2005).

Poaching

In many places poaching, or illegal digging, is a major threat to ginseng forest farming. The best security against poaching is to locate patches where they can be easily monitored, out-of-the-way, and where strangers are unlikely to visit (Apsley and Carroll 2004). Some growers alert their neighbors, install fences, and otherwise make plantings public to claim their patches and deter theft (Persons and Davis 2005). Other growers prefer to keep their forest farming a secret so that they do not become targets. Some growers have had success installing real or fake cameras, keeping guard dogs, or investing in wireless alarm systems (Taylor 2006). The North Carolina Department of Agriculture has also developed microchips to track stolen specimens. Microchipping may be most effective when coupled with signs that indicate the patch has been marked for monitoring (Persons and Davis 2005). For more information on security, refer to Hankins (2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html>.

Poaching risks increase as plants get older, larger, and more valuable. Wild-simulated ginseng is usually harvested after seven to eleven years because plant growth slows considerably once plants reach four-prongs.

Key Points

- Deer and slugs eat ginseng.
- Minimize diseases by picking well-aerated sites, not planting too densely, not damaging plants, and removing sick plants.
- Poaching is a big problem in some areas.

Harvesting and Drying

Roots are most easily harvested after rain when the soil is moist and loose. Digging may be done using a sharp needle-nosed spade, shovel, spadefork, flathead screwdriver, or mattock. The digging implement should be placed six inches from the base of the stem to ensure no damage to the root. The root is the most valuable part of the plant, so take special care not to nick the root during harvest. One wet pound of wild-simulated ginseng requires about an hour to harvest. Because drying reduces root weight by two-thirds, it takes roughly three hours to harvest one pound of dried, wild-simulated root. Harvesting all the ginseng on 1 acre (with plants spaced at one to two plants per square foot) should take roughly 700 man-hours (Hankins 2000; Persons and Davis 2005). Refer to Hankins (2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html> for information on self-propagating patches.

Carefully harvest, wash, and dry ginseng roots to maintain as many root hairs as possible and maximize the root's value. Rinse with low-pressure water and never scrub. Over washed roots develop a sheen that can reduce value (Fritsch and Bamford n.d.; Persons and Davis 2005). Figure 10 shows a large, well-dug, and well-washed green root retaining many of its root hairs.



Figure 10. Properly washed and carefully dug large, green ginseng root (Carroll and Apsley 2007)

Most ginseng is sold dry (figure 11). Dried roots weigh about one-third of their green weight. Roots should be dried at temperatures between 70 and 95 degrees Fahrenheit in an area with good air circulation. Roots need to be flipped after their first thirty-six hours of drying to prevent moisture build-up and mold growing on the bottom surface. At temperatures below 60 or 70 degrees, roots will mold before they dry. Above 95 degrees, root exteriors will over-dry and become brittle while the interior remains green. Roots dried too quickly can be identified in the cross-



Figure 11. Dried, medium-low-value ginseng root lacking most of its root hairs.

section by a thick brown ring around a white root interior. Properly dried ginseng snaps cleanly apart by hand and has a milky white interior. Ginseng dealers often break one or two apart before purchase to ensure that the roots were properly dried. Small roots may dry in just a few days, but large roots can take as long as six weeks to properly and completely dry. On average, 1 pound of dried ginseng contains around 285 roots. Once dried, the ginseng should be stored in paper bags or boxes. Plastic bags may cause mold if the humidity inside the bag increases (Persons and Davis 2005; Pritts 1995).

Key Points

- Digging is easiest after rainfall when the soil is moist.
- Be careful not to harm the root.
- Remove dirt without over-washing.
- Dry at temperatures between 70 and 95 degrees.
- Flip roots after their first 36 hours drying.
- Drying may take from days to weeks.
- Roots will dry to one-third of their green weight.
- Store dry roots in paper bags.

Marketing Ginseng

Selling ginseng requires very little marketing and is easily sold to any one of the state’s certified ginseng dealers. The Virginia Department of Agriculture and Consumer Services publishes a list of all certified ginseng buyers in the state. Because green roots are more difficult to store and handle, most roots are sold

dried. Harvesters get better prices from dealers if they sell in bundles of at least one pound (Bailey 1999). Direct sales to consumers or export markets typically earn 15 to 20 percent higher prices but require marketing effort and obtainment of a dealer’s license to comply with state, federal, and CITES rules (Robbins 1998).

Ginseng prices fluctuate by locality, season, and year of purchase. Fluctuations of 30 to 40 percent within a season are not unusual (Bailey 1999). Prices usually fall during the harvest season and peak about \$50 higher in March. Prices also tend to follow the stock market and decrease when the general economy slumps. Wild-simulated ginseng has historically sold between \$200 and \$400 per lb, depending on its physical resemblance to wild ginseng and prevailing market conditions (Dix et al. 1997).

Profit Potential

Wild-simulated ginseng production is the most profitable and ecologically sustainable means of meeting market demand for ginseng roots. Growers can make a profit on as little as 1/4 acre of wild-simulated ginseng production (Burkhart and Jacobson 2009). One-half acre may yield about 80 pounds of dried root in about nine years (assuming a density of one or two plants per square foot). This yield should more than cover the expense of commuting to the site, buying tools, drying roots, and providing labor. The financial risks of ginseng growing can be low because half of the costs and labor needs occur during the final harvest. This half of

Table 1. Projected nine-year budget for one-half acre of wild-simulated ginseng (*adapted from Persons & Davis, 2005, p. 86*)

	Description	Volume	Price	Total Costs	Total Profits
Seed		12.5 lbs	\$80/lb	\$1,000	-
Labor	Site Prep & Planting	25 hrs	\$7.25/hr	\$181	-
	Inspection & Troubleshooting	200 hrs	\$7.25/hr	\$1,450	-
	Digging roots	350 hrs	\$7.25/hr	\$2,538	-
Materials & Equipment	Rake, Pulaski, Digging Tools	-	\$50	\$50	-
	Backpack sprayer & pest control	-	\$300	\$300	-
Drying	Add insulation & drying racks to existing room or shed	-	\$400	\$400	-
	Heating cost	80 lbs	\$0.50/lb	\$50	-
Expected Yield	Dry wgt of roots	80 lbs	\$350/lb	-	\$28,000
Net Profit					\$22,031

cultivation cost is realized only once harvest is assured. Hankins (2000) estimates a budget for 1/2 acre of hand-planted ginseng. A financial projection is shown below in table 1 for 1/2 acre of wild-simulated ginseng planted using method 2 on a nine-year rotation.

Historically, this example budget has netted around \$44,000 per cultivated acre, a potentially high return. However, these high returns are not ensured; profits rely on weather patterns, wildlife browsing, habitat suitability, labor costs, ginseng prices, and other external factors that forest farmers cannot control. About 30 to 40 percent price variability within a season is normal (Bailey 1999), and annual average prices over the past decade have fluctuated between \$220 and \$400 (Persons and Davis 2005).

Please read Hankins (2000) at <http://pubs.ext.vt.edu/354/354-312/354-312.html> for information on the risks involved in wild-simulated ginseng growing.

Key Points

- Sell to a dealer certified by the Virginia Department of Agriculture and Consumer Services.
- Prices generally range from \$200 to \$400 per lb.

Conclusion

This article provides an overview of ginseng's basic biology, uses, applicable laws, habitat, planting techniques, harvest method, costs, diseases, marketing, and profit potential. Growers and harvesters need to be aware of laws regulating this CITES-listed species. Appropriately shaded sites should be selected based on existing species composition, aspect, and soil characteristics. Seeds should be planted in the fall using one of several methods to best meet landowner objectives. Harvest generally occurs when the plant is between seven and eleven years old. Profits depend on careful harvesting techniques, good growing conditions, and market circumstances. Table 2 summarizes the key points of each section.

Table 2. Summary of key points	
Ginseng Ecology	Ginseng is a small, long-lived forb. Ginseng matures in roughly 8 years. Ginseng is native to most of Virginia.
Regulations	Ginseng is regulated internationally by CITES. Ginseng is listed as a threatened species in Virginia. Harvest is only legal between August 15 and December 31 Harvested plants must be five (5) or more years old. Dealers must work with the state and keep transaction records. Roots must be sold to a certified dealer in the state.
Site selection	Good sites have moist, rich, well-drained soil. The best sites are usually eastern or northern facing and not overly brushy. Ginseng needs forests with 75% shade. Optimal overstory trees species are black walnut, sugar maple, and tulip poplar. Ferns may poisonous adjacent ginseng plants.
Seeds	Find a reputable dealer. Seeds generally cost between \$60 - \$220 per pound. There are approximately 6,000 - 8,000 seeds per pound. Seeds should be kept refrigerated.
Planting	There are several planting methods. Seeds may be scattered on bare soil and covered with leaves or sown 1/2 - 1 inch deep. Densities range from 120 plants/acre to 43,560 plants/acre.
Patch maintenance	Deer and slugs eat ginseng. Minimize diseases by picking well-aerated sites, not planting too densely, not damaging plants, and removing sick plants. Poaching is a big problem in some areas.
Harvesting	Digging is easiest after rainfall when the soil is moist. Be careful not to harm the root.
Washing	Remove dirt without over-washing.
Drying	Keep temperatures between 70 and 95 degrees. Flip roots after their first 36 hours drying. Roots will dry to one-third of their green weight. Drying may take from days to weeks. Store dry roots in paper bags.
Marketing	Sell to a dealer certified by the Virginia Department of Agriculture and Consumer Services. Prices have historically ranged from \$200 to \$400/lb.

Literature Cited

- Punishment for conviction of misdemeanor In: Virginia State Code 18.2-11 (2000).
- Endangered plant and insect species act. In: Code of Virginia 3.2-1007-1008 (2008a).
- Endangered plant and species act. In: Code of Virginia 3.2-1011 (2008b).
- Apsley D., and C. Carroll. 2004. *Growing American Ginseng in Ohio: Selecting a Site*. Columbus: Ohio State University.
- Bailey B. 1999. Social and Economic Impacts of Wild-Harvested Products. In: College of Agriculture, Forestry, and Consumer Sciences. Morgantown: West Virginia University.
- Burkhart, E. P., and M. G. Jacobson. 2007. *Forest Finance 5: Opportunities From Ginseng Husbandry in Pennsylvania*. University Park: Pennsylvania State University.
- Burkhart, E. P., and M. G. Jacobson. 2009. Transitioning from Wild Collection to Forest Cultivation of Indigenous Medicinal Forest Plants in Eastern North America is Constrained by Lack of Profitability. *Agroforestry Systems* 76:437-53.
- Carroll, C., and D. Apsley. 2007. *Growing American Ginseng in Ohio: Harvesting, Washing, and Drying*. Columbus: Ohio State University.
- Charron, D., and D. Gagnon. 1991. The demography of northern populations of *Panax quinquefolium* (American ginseng). *British Ecological Society* 79:431-45.
- CITES Secretariat. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (n.d.) www.cites.org (accessed May 18, 2010).
- Department of the Interior U.S. Fish and Wildlife Service. Federal Fish and Wildlife Permit Application Form (2010) www.fws.gov/forms/3-200-34.pdf (accessed December 12, 2009).
- Division of Scientific Authority Chief. General Advice for the Export of Wild and Wild-Simulated American Ginseng (*Panax Quinquefolius*) Harvested in 2009 and 2010 From States with Approved CITES Export Programs (2009) Washington, DC: United States Fish and Wildlife Service.
- Dix M. E., Hill D. B., Buck L. E., Rietveld W. J. *Forest Farming: An Agroforestry Practice* (1997) Lincoln, Nebraska: National Agroforestry Center, USDA Forest Service, Rocky Mountain Station.
- Endangered Species Coordinator. Virginia Ginseng Management Program. (2009) Richmond, VA.
- Fritsch A. J., Bamford S. *A Manual for Ginseng Growers and Trainers: How to Grow Virtually Wild Ginseng* (n.d.) www.a-spi.org/AGF/manual1.htm (accessed September 19, 2009).
- Grubbs H. J., Case M. A. Allozyme Variation in American Ginseng (*Panax Quinquefolius* L.): Variation, Breeding System, and Implications for Current Conservation Practice. *Conservation Genetics* (2004) 5:13-23.
- Hankins A. *Producing and Marketing Wild Simulated Ginseng in Forest and Agroforestry Systems* (2000) Blacksburg, VA: Virginia State University.
- Kays J. S. Alternative Income Opportunities: Needs of County Agents and Foresters in the Mid-Atlantic Region. *Journal of Extension* (2004) 42.
- McGraw J. *Wild Ginseng Conservation* (n.d.) www.wild-ginsengconservation.com (accessed April 6, 2010).
- Mooney E. H., McGraw J. B. Effects of Self-Pollination and Outcrossing with Cultivated Plants in Small Natural Populations of American Ginseng, *Panax Quinquefolius* (Araliaceae). *American Journal of Botany* (2007) 94:1677-1687.
- Nadeau I., Olivier A., Simard R. R., Coulombe J., Yelle S. *Growing American Ginseng in Maple Forests as an Alternative Land Use System in Quebec, Canada*. *Agroforestry Systems* (1999) 44:345-353.
- Nix S. *Identifying Wild American Ginseng* (n.d.) www.wildgrown.com/how_to_identify_wild_American_ginseng.htm (accessed December 28, 2009).
- Oregon State University Extension. Ginseng- Damping-Off (2009a) <http://plant-disease.ippc.orst.edu/disease.cfm?RecordID=490> (accessed April 6, 2010).
- Oregon State University Extension. Ginseng -- Cylindrocarpon Root Rot (Disappearing Root Rot) (2009b) <http://plant-disease.ippc.orst.edu/disease.cfm?RecordID=1477> (accessed April 6, 2010).

- Oregon State University Extension. Ginseng (Panax sp.) -- Alternaria Leaf and Stem Blight (2009c) <http://plant-disease.ippc.orst.edu/disease.cfm?RecordID=1318> (accessed April 6, 2010).
- Pennsylvania Department of Conservation and Natural Resources. How to Estimate the Age of a Ginseng Plant (n.d.) www.dcnr.state.pa.us/Forestry/wildplant/ginseng_age.aspx (accessed January 6, 2010).
- Persons W. S. Growing Ginseng in its Native Woodland Habitat. In: Proceedings of the North American Conference on Enterprise Development through Agroforestry: Farming the Forest for Specialty Products--Josiah SJ, ed. (1998) Minneapolis, Minnesota: Center for Integrated Natural Resource and Agricultural Management. 74-84.
- Persons W. S., Davis J. M. Growing and Marketing Ginseng, Goldenseal, and Other Woodland Medicinals. (2005) Fairview, North Carolina: Bright Mountain Books, Inc.
- Pritts K. D. Ginseng: How to Find, Grow, and Use America's Forest Gold. (1995) Mechanicsburg, PA: Stackpole Books.
- Robbins C. S. American Ginseng: The Root of North America's Medicinal Herb Trade. (1998): TRAFIC North America.
- Stoltz I. P. Commercial Production of Ginseng and Goldenseal. In: New Crops News (1994).
- Taylor D. A. Ginseng, the Divine Root. (2006) Chapel Hill, NC: Algonquin Books of Chapel Hill.
- United States Fish and Wildlife Service Department of the Interior. Wildlife and Fisheries Act (2007): Code of Federal Regulations 50.23.
- VDACS. Guidelines for the Virginia Ginseng Management Program (2009) <http://townhall.virginia.gov/l/ViewGDoc.cfm?gdid=750> (accessed January 28, 2010).
- VDACS Office of Plant and Pest Services. Permit Application Form (2007) www.vdacs.virginia.gov/forms-pdf/cp/plantpest/permitapplication.pdf (accessed January 28, 2010).
- Virginia Department of Agriculture and Consumer Services. Virginia Ginseng Management Program. (2004) Richmond, VA.
- Virginia Department of Agriculture and Consumer Services. Guidelines for Virginia Ginseng Management Program. (2009).
- Workman S. W., Bannister M. E., Nair P. K. R. Agroforestry Potential in the Southeastern United States: Perceptions of Landowners and Extension Professionals. *Agroforestry Systems* (2003) 59:73-83.