HARVESTING OF MEDICINAL PLANTS IN THE SOUTHERN APPALACHIAN MOUNTAINS – is it a threat to the long-term viability of wild American ginseng populations in the National Parks and Forests, and the Southern Appalachians in general - the core of the species' distribution?

by Janet Rock, Botanist, National Park Service, Great Smoky Mountains National Park
Gary Kauffman, Botanist, US Forest Service, National Forests in North Carolina
Nora Murdock, Ecologist, National Park Service, Appalachian Highlands Inventory and Monitoring Network

The Southern Appalachian Mountains are well known for their diversity of native medicinal herbs. Federal land-managing agencies (National Park Service, US Forest Service) operate under different legal mandates, with the National Forests allowing controlled commercial harvest of some plants, and the National Parks not allowing such harvest. However, all land managers are working to maintain viable populations of native plants. Managers and biologists from different agencies are expressing concern over the increasing level of harvesting (and poaching) occurring on public lands. In the National Parks, poachers are penetrating deeper into the most remote backcountry, as more accessible populations of target species are disappearing.

No species has as rich a history of commercial harvest as American ginseng (*Panax quinquefolius*), which has been wild-harvested for over 250 years. Native to eastern North America, ginseng is a long-lived perennial herb that typically requires a minimum of 5-9 years before it produces viable seed in the wild. Due to sustainability concerns the species was included on the CITES (Convention on International Trade in Endangered Species - Appendix II) list in 1975. With the recent economic downturn, in combination with rising export prices, increases have been observed in both legal collections from National Forests and private lands, as well as illegal harvest from National Parks and other protected lands. During the last two years, the Nantahala and Pisgah National Forests have issued a historic number of permits to harvest ginseng. North Carolina National Forests issue more permits for special forest products, including medicinal herbs, than any other National Forests in the US.

This article details three different studies that have been conducted recently to assess the potential vulnerability of ginseng to current levels of harvest, both legal and poaching. Also included are notes on several other heavily harvested species. The three studies used different approaches to the question: 1) National Park Service – Blue Ridge Parkway – a landscape-level survey of ginseng occurrence and population structure at 200 sites; 2) National Park Service – Great Smoky Mountains National Park – a detailed demographic study, tracking all individual ginseng plants in multiple wild populations across several years; and 3) US Forest Service-National Forests in North Carolina – an 8-year study measuring recovery, following a single controlled harvest.

BLUE RIDGE PARKWAY

The National Park Service's Appalachian Highlands Inventory & Monitoring Network (APHN) is monitoring several plant species known to be significant poaching targets,

including galax (*Galax urceolata*), black cohosh (*Actaea racemosa*), bloodroot (*Sanguinaria canadensis*), several trillium species (*Trillium* spp.), and ginseng. The early results of monitoring are alarming, especially for ginseng: over the past two years, 200 sites predicted to be suitable habitat for ginseng have been visited and evaluated, with only 42 ginseng populations being found. Virtually all of these have shown signs of heavy poaching, even in remote areas that were miles from the nearest roads or trails. Population age structure was skewed toward younger, non-reproducing plants, in all populations. In the wild, plants are usually at least 5-9 years old (often much older) before they add the 3rd prong (leaf) and begin to produce berries (with seeds). Since ginseng reproduces only from seeds, this is a critical life stage in any population. In protected ginseng populations (no harvesting), 3 and 4-pronged plants are usually the dominant size classes. At 93% of the APHN sampling sites, there were no 4-pronged plants, and three-pronged plants were uncommon; 30% of the populations had no reproductive plants left. Only one of the 42 populations contained more than 30 plants, and the vast majority had less than a dozen plants remaining.

GREAT SMOKY MOUNTAINS NATIONAL PARK

Great Smoky Mountains National Park (GSMNP), at over half a million acres, is the largest fully protected reserve for wild ginseng in the US. Even though the park has been protected for 75 years, ginseng poaching has always occurred at some level.

Since 1991, GSMNP law enforcement rangers have confiscated over 13,000 wild American ginseng roots from poachers. Resource Management staff have aged these roots and replanted undamaged ones back into the park. The average age has increased in the last decade from 9 years to 11 years, suggesting that poaching is occurring in more remote locations. In 2010, rangers intercepted two poachers with over 800 roots that they had removed while camping for several days in the park's most remote backcountry. 116 of these roots were 20 years old or older; the oldest root was 45 years. In 2011, the average age of ginseng roots in two poaching cases was even greater, 13.5 years, because these seizures contained roots up to 50 years old.

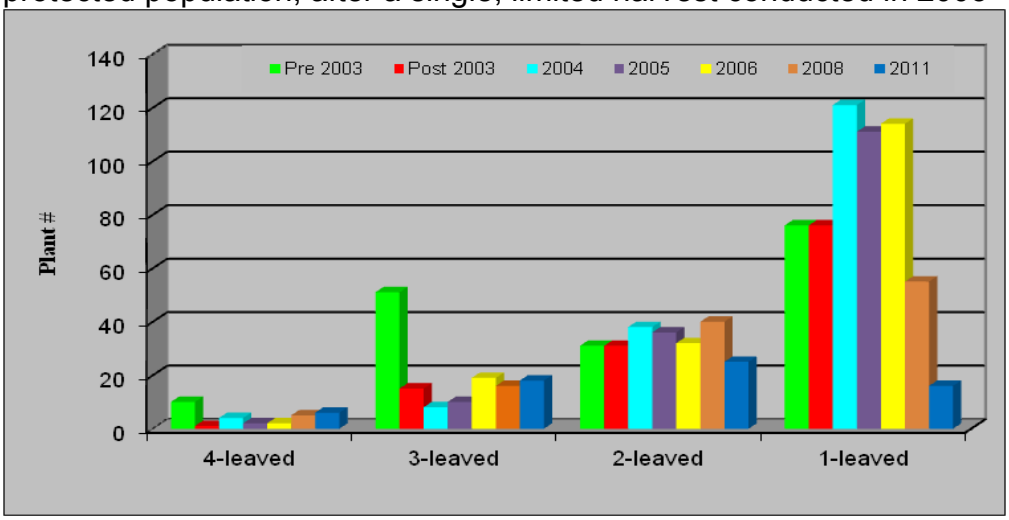
A 4-year American ginseng demographic study was conducted in GSMNP from 1998 to 2001 to determine whether populations were declining, increasing, or stable. Data was collected on almost 900 plants from 6 wild populations (seedlings to 4-pronged plants), including number of leaves, stem height, flower count, and seed set. Dormancy in ginseng was confirmed for the first time during this study with 8% (average) of all plants entering dormancy in any given year. Most dormant plants emerged after 1 year of dormancy with a decrease in size, but 12% remained dormant for 2 years. Seed production was very low (ginseng reproduces exclusively by seeds), compounded by a seedling mortality rate of 90%. Larger plants, 3 and 4-pronged, contribute the most to population growth, because they are the only ones that produce any appreciable seed. Population projections (a simulation of population growth) for various harvesting scenarios indicate that the Smokies' populations are currently barely maintaining themselves and cannot tolerate any harvesting, either annually repeated or a one-time large harvest of 3 and 4-pronged plants. Based on detailed demographic data from Smokies populations, the estimated minimum viable population size (to ensure long-

term survival), in ideal climate conditions, is between 200 and 500 plants, which is larger than most existing populations within or outside the park. In less than ideal conditions, particularly during periods of drought, the minimum number of plants needed for long-term population survival is even higher.

US Forest Service – National Forests in North Carolina

Very few controlled harvest studies have been done across the range of American ginseng. In 2003, US Forest Service botanists in NC began a simulated harvest study within a remote population of 168 plants on the Pisgah National Forest. All fruiting three- and four-pronged plants, 46 in total, were harvested. The average age of the harvested ginseng was 13.8 years for the 3-pronged plants and 22-23 years for the 4-pronged plants, with one of the 4-prongs being 45 years of age. All mature seeds were carefully planted two centimeters deep during the initial harvest and during each subsequent monitoring in 2004-2006, 2008, and 2011. No further harvesting was conducted and no evidence of poaching was seen. Prior to the harvest, non-flowering one- and two–pronged plants represented 63% of the population. By comparison, in 2004 and 2005, these individuals represented 93% of the population (Figure 1). After 8 years, less than half the original number of 3- and 4-prong plants were present, compared to pre-harvest conditions, indicating a very slow recovery rate, even from this conservative, one-time harvest of 28% of the population.

Figure 1. Representation of American ginseng size classes from 2003-2011 within a protected population, after a single, limited harvest conducted in 2003



While American ginseng is the most well-known collected species within the National Forests in the Southern Appalachians, other species are also experiencing increasing collection pressures. For instance, in the last 6 months, permits have been issued to collect over 2 tons of black cohosh within NC federal forests. Requests have recently been made to collect hundreds of pounds of partridge berry (*Mitchella repens*) seed. *Galax* leaves are harvested for the floral industry (both domestic and international), and there have been recent increases in permit requests. Previous estimates of the number of annually harvested leaves exceeded ½ billion in the early 2000's. These levels may

be increasing currently. Galax poaching on the Blue Ridge Parkway is increasing as well, with 85% of the 100 monitored populations having been poached heavily and repeatedly over the last 5 years. Due to changes in harvest pressures the National Forests in North Carolina have periodically revised collection policies. For instance the ginseng harvest season was recently reduced to 1 month and only 1 dried pound was allowed per individual harvester. A 2-month moratorium on collection of Galax leaves was instituted during the early spring, when young leaves are expanding and particularly vulnerable to damage. Log moss collection was banned following a study that demonstrated a very long (up to 20 years) rate of recovery. But even with these changes, it may be necessary to re-examine the current harvest policies for some species on the National Forests.

****

Individual ginseng plants are very long-lived (plants over a century old have been documented), but are slow to reach maturity and reproduce in the wild, which intensifies the impact of heavy or repeated harvesting on populations. For populations that are already dropping to dangerously low numbers in the wild as a result of heavy harvesting, the effects of severe consecutive drought years (like 2007 and 2008), added to harvesting impacts, could result in annihilation of the species in some areas.

Within the core of the species' range, the Southern Appalachians, on lands where the species is legally protected from any harvest (the National Parks), or from unsustainable harvest (the National Forests), monitoring data from the three separate studies described above is indicative of a disturbing trend of widespread decline in this species in the wild.