



NDF WORKSHOP CASE STUDIES
WG 2 – Perennials
CASE STUDY 6

Panax quinquefolius
Country – UNITED STATES
Original language – English

THE YIN AND THE YANG OF GINSENG – MAKING A NON-DETRIMENT FINDING FOR PANAX QUINQUEFOLIUS: A CASE STUDY WITH TWO PERSPECTIVES (UNITED STATES OF AMERICA AND CANADA).

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I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

1.1. Scientific name: *Panax quinquefolius* L. (family Araliaceae).

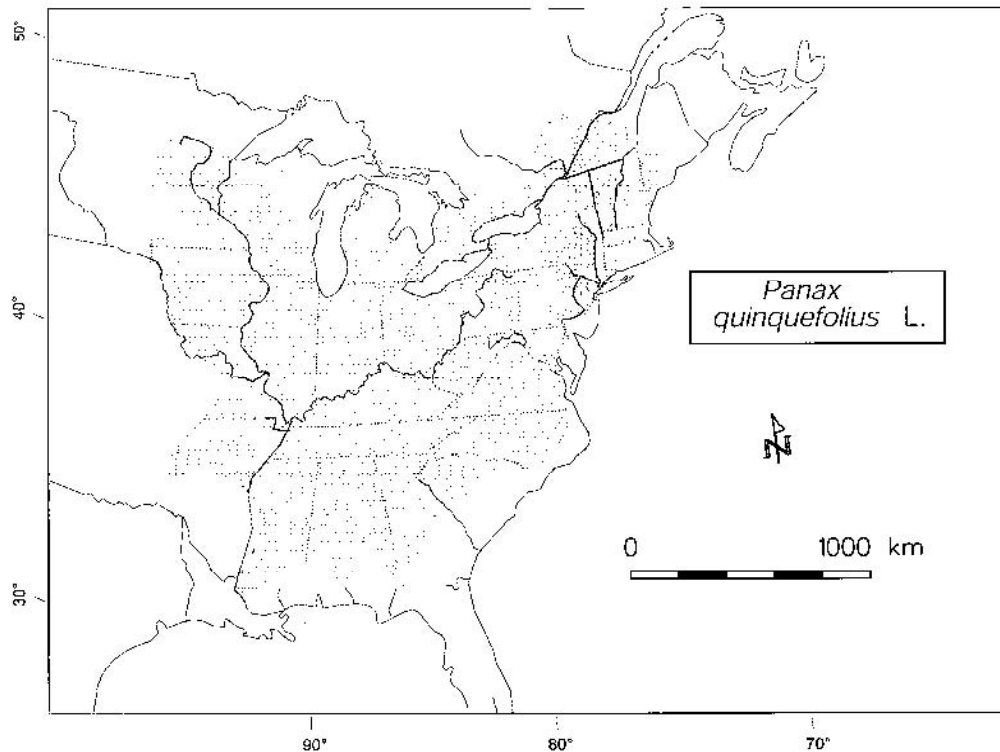
COMMON NAMES: English: American ginseng, Canadian ginseng, sang, five-fingers; French: Ginseng d'Amérique; and Spanish: Ginseng americano.

1.2. Distribution (Specify the currently known range of the species. If possible, provide information to indicate whether or not the distribution of the species is continuous, or to what degree it is fragmented. If possible, include a map).

Panax quinquefolius is endemic to Eastern North America between 30° and 50°N (Small and Catling 1999). The species' range extends from southern Canada (Ontario and Quebec) south to the United States of America. In the United States, the species' range covers 34 States; from the Canadian border south to Georgia, and from the Midwest States to the east coast (Kartesz 1999). The primary range of *P. quinquefolius* in the United States is the southern Appalachian Mountains (Kentucky, North Carolina, Tennessee, Virginia, and West Virginia) and the Ozark Plateau region (Arkansas, Kansas, Missouri, and Oklahoma) (NatureServe 2005).

In the United States, *P. quinquefolius* occurs primarily as small populations that are broadly distributed across extensive forest habitat (McGraw et al. 2003; NatureServe 2005). Unoccupied suitable habitat for *P. quinquefolius* exists throughout the species' range.

Distribution Map of *Panax quinquefolius* (Small and Catling 1999).



1.3. Biological characteristics

Panax quinquefolius is a slow-growing, long-lived herbaceous perennial geophyte (i.e., an herbaceous plant with an underground storage organ) with a life expectancy of more than 20 years once established (Anderson et al. 1993; Carpenter and Cottam 1982; Lewis and Zenger 1982). The species exhibits low reproductive potential because of a relatively long pre-reproductive period of 3 years or more, slow growth rate, low fecundity, and high seed and seedling mortality (Carpenter and Cottam 1982; Charron and Gagnon 1991; Dunwiddie and Anderson 1999).

Plants of *P. quinquefolius* produce a single unbranched stem, 20-40 cm tall (Gagnon 1999) that terminates with a whorl of 1-4 palmately compound leaves with 3-4 leaflets (Radford et al. 1981). The aerial stem appears after the forest canopy has fully developed in late spring (Charron and Gagnon 1991). *P. quinquefolius* progresses through a

series of growth stages in which leaf number is closely associated with size (Carpenter and Cottam 1982; Charron and Gagnon 1991; Anderson *et al.* 1993). Plants have been classified into four stage classes based on their numbers of leaves: seedlings (1 leaf with 3 leaflets), juveniles (2 leaves with 3-5 leaflets), small adults (3 leaves with 3-5 leaflets), and large adults (3 and 4 leaves with 3-5 leaflets) (Anderson *et al.* 1993; McGraw and Furedi 2005). A plant with two or more leaves usually produces an inflorescence, although it may not produce fruit (Charron and Gagnon 1991; Lewis and Zenger 1982; Schlessman 1985).

Plants can produce the same number of leaves for multiple years, decrease or increase the number of leaves produced, or not produce leaves for one or more growing seasons (Charron and Gagnon 1991; Farrington 2006; McGraw and Furedi 2005). Leaves of plants can senesce (a natural die-back of the plant) due to drought or other factors (Carpenter and Cottam 1982). However, the determinate growth pattern of *P. quinquefolius* prevents the production of additional leaves during the growing season.

Below ground, a plant's root system consists of a primary storage root that is joined at its apex to a vertical rhizome. From the rhizome grows a single aerial stem per growing cycle (Charron and Gagnon 1991; Lewis and Zenger 1982). The rhizome is characterized by permanent scars that form as a result of the annual abscission or accidental loss of the aerial stem (Anderson *et al.* 2002; Charron and Gagnon 1991; Lewis and Zenger 1982). The stem scars can be counted to calculate the number of years a plant has produced an aerial stem, which roughly equates to the age of the plant. The number of leaves that a plant has and the size of the plant can be good estimators of the root biomass underground (Anderson *et al.* 1993).

The inflorescence is a solitary umbel of greenish-white flowers that bloom during the summer; an individual flower produces a 1–3-seeded fruit (*i.e.*, drupe) (Gleason and Cronquist 1963; Radford *et al.* 1981). The flowers are perfect, having both stamens (male) and carpels (female) (Carpenter and Cottam 1982; Lewis and Zenger 1982; Schlessman 1985). *Panax quinquefolius* has a mixed-mating breeding system of self-fertilization and cross-fertilization (Carpenter and Cottam 1982; Lewis and Zenger 1983; Schlessman 1985). Recent research has reported that the genetic profile of *P. quinquefolius* is consistent with a predominant life-history strategy of self-pollination, which results in low genetic variation within populations, but high genetic variation among populations (Grubbs and Case 2004).

Fruit production increases with age and size of plants (Anderson *et al.* 1993; Carpenter and Cottam 1982; Lewis and Zenger 1982; Schlessman 1985). Although fruit maturation is variable across the spe-

cies' range, typically it begins in mid to late summer with fruits turning red at maturity in late summer to early fall (Charron and Gagnon 1991; McGraw *et al.* 2005). Natural dispersal of fruits is passive with fruits falling beneath the parent plant (Anderson *et al.* 1993; Lewis and Zenger 1982).

The seeds exhibit morphophysiological dormancy (Baskin *et al.* 1995) that prevents seeds from germinating for up to 22 months (Anderson *et al.* 1993, 2002; Lewis and Zenger 1982). To germinate, seeds require an after-ripening process and cold-stratification period (i.e., warm-cold sequence of seasonal temperature changes) to allow the embryo to fully develop and then to break seed dormancy (Charron and Gagnon 1991; Lewis and Zenger 1982; Schlessman 1985). Seed mortality of *P. quinquefolius* can be significant and the species is not known to form a long-term seed bank (i.e., over 4 years) (Van der Voort 2005). The most vulnerable stages of the life cycle of *P. quinquefolius* appear to be seed germination and seedling establishment (Carpenter and Cottam 1982; Charron and Gagnon 1991; Lewis and Zenger 1982).

1.3.1. Habitat types: Specify the types of habitats occupied by the species and, when relevant, the degree of habitat specificity.

Panax quinquefolius occurs in mid- to late-successional deciduous forests, in moist sites of low evapotranspiration loss with 70-90% shade (Anderson *et al.* 1993, 2002). Plants prefer well-drained soils rich in organic matter and with moderate to high calcium content, on slopes from 10-40% (Anderson *et al.* 1993, 2002). Availability of suitable habitat is not a limiting factor for the continued viability of the species.

1.3.2. Role of the species in its ecosystem

Panax quinquefolius is a long-lived late-successional understory species that occurs in stable habitats (Gagnon 1999). The species is adapted to grow in low light conditions characteristic of mature forests (Anderson *et al.* 2002). Fruits are eaten by small mammals and wild turkeys (*Meleagris gallopavo*); leaves and fruit are browsed by white-tailed deer (*Odocoileus virginianus*) (Farrington 2006; Furedi and McGraw 2004; McGraw and Furedi 2005); and small halictid bees and syrphid flies pollinate its flowers (Carpenter and Cottam 1982; Lewis and Zenger 1983; Schlessman 1985).

1.4. Population:

1.4.1. Global population size: (Population size may be estimated by reference to population density, having due regard to habitat type and other methodological considerations, or simply inferred from anecdotic data).

According to NatureServe (2005), a U.S.-based non-profit organization that compiles and assesses data on plants, animals, and ecological communities collected by State Heritage Programs in the United States and associated entities in Canada, the population of *Panax quinquefolius* is perhaps a billion plants.

In Canada, population abundance of *Panax quinquefolius* is low (Environment Canada 2000). In the United States, the species is widely distributed, with hundreds if not thousands of occurrences, typically having few plants per occurrence, primarily in the major portions of its range (i.e., Appalachian Mountains and Ozark Plateau region) (NatureServe 2005).

1.4.2 Current global population trends

increasing decreasing stable unknown

Populations of *P. quinquefolius* have declined in the past two centuries from historic levels. Because range-wide surveys have not been conducted in the United States, we do not have the empirical data to report the overall population trend in more recent times. However, *P. quinquefolius* is currently managed to maintain current population levels through regulation of harvest and trade.

1.5. Conservation status

1.5.1. Global conservation status (according to IUCN Red List):

Critically endangered Near Threatened
 Endangered Least concern
 Vulnerable Data deficient

- *Panax quinquefolius* has not been categorized by the IUCN.

1.5.2. National conservation status for the case study country.

According to the conservation status ranking system used by NatureServe, the conservation status of *P. quinquefolius* in the United States is “vulnerable to apparently secure” (N3N4). This ranking is not a legal designation, but is based on a variety of biological factors (e.g., species’ abundance and distribution, population trends, threats, and number of protected and managed occurrences) (NatureServe 2005). NatureServe defines vulnerable as: A species is vulnerable in the state due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation; apparently secure is defined as: Uncommon but not rare; some cause for long-term concern due to declines or other factors.

1.5.3. *Main threats within the case study country*

- No Threats
- Habitat Loss/Degradation (human induced)
- Invasive alien species (directly affecting the species)
- Harvesting [hunting/gathering]
- Accidental mortality (e.g. bycatch)
- Persecution (e.g. pest control)
- Pollution (affecting habitat and/or species)
- Other- herbivory by native white-tailed deer (*Odocoileus virginianus*)
(Farrington 2006; Furedi and McGraw 2004; McGraw and Furedi 2005)
- Unknown

2. **SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED.**

2.1. **Management measures**

2.1.1. *Management history*

With the exception of populations of *P. quinquefolius* that occur on Federal lands, the management of the species is under the jurisdiction of State regulatory agencies. (The federal government of the United States is the centralized U.S. governmental body; a state is any one of the fifty subnational entities of the United States of America that share sovereignty with the federal government.) Nineteen of the 34 States within the range of the species have promulgated laws and regulations for the harvest and sale of roots of *P. quinquefolius*. These States have designated specific natural resource or agricultural agencies that are responsible for implementing the States' laws and regulations for *P. quinquefolius* within their jurisdictions.

Fifteen States do not allow the harvest of wild roots of *P. quinquefolius*. Of those States, five have formally designated *P. quinquefolius* as either endangered or threatened within their jurisdictions due to declines in populations in those States. Eight States have designated the species as a "species of concern," "rare," or on their "watch list"; harvest is prohibited or is discouraged due to the status of *P. quinquefolius* within those States. Two of the 15 States have no special designation for the species.

In addition, two Federal agencies, the U.S. Forest Service (USFS) and the National Park Service (NPS), manage the species on their respective lands. The USFS allows the harvest of roots of *P. quinquefolius* on certain National Forests, whereas harvest is prohibited on other National Forests. No harvest is allowed on NPS lands.

The U.S. CITES Authorities in the U.S. Fish and Wildlife Service rely to a large extent, but not exclusively, on other State and Federal agencies to provide information on the legal and illegal harvest of roots of *P. quinquefolius*, the status of the species in the wild, and population trends. The U.S. Scientific Authority makes its non-detriment findings for *P. quinquefolius* by using information received annually from the 19 States that allow harvest as well as information from various other sources (including other Federal and State agencies, industry representatives and associations, other non-governmental organizations, and researchers) on the status and biology of the species

2.1.2. Purpose of the management plan in place

To be approved for export of *P. quinquefolius*, a State must provide to the U.S. CITES Authorities documentation that its management program is designed to monitor and protect populations of *P. quinquefolius* from over-harvest. Currently, 19 States are approved for the export of wild-harvested roots. For those States, the U.S. Scientific Authority makes a programmatic non-detriment finding on a State-by-State basis, rather than requiring individual applicants to provide the information on a permit-by-permit basis. These findings have generally been made on an annual basis, but in 2006, the finding was made to cover a 3-year period. This change was made to recognize that population trends cannot be measured in annual increments, and significant new information is not likely to arise every year. Provision exists, however, for the finding to be rescinded and modified if significant new information suggests that it is prudent to do so.

2.1.3. General elements of the management plan

According to U.S. Federal regulations (50 Code of Federal Regulations, Part 23.68), for a State to be approved to export roots of *P. quinquefolius* it must provide certain biological and regulatory information to the U.S. CITES Authorities. States must provide an assessment of the condition of the population and trends of *P. quinquefolius* in their State, including a description of the types of information on which the assessment is based. States must provide an assessment of the historic, present, and potential distribution of wild ginseng on a county-by-county basis, and also information on the flowering and fruiting periods of *P. quinquefolius* in their State.

States must have regulations in place to ensure that exported roots are from plants that were at least 5 years of age or older at the time of harvest (i.e., with at least 4 bud-scale scars on the rhizome) and have personnel to determine the age of roots of all wild-collected *P. quinquefolius* harvested in their State.

States approved for the export of roots of *P. quinquefolius* must annually submit to the U.S. CITES Authorities a report with detailed information on the previous harvest season and any changes to the State regulatory procedures over the past year. State reports include the following information on *P. quinquefolius* that is used by the U.S. Scientific Authority in making its non-detriment finding:

- The weight of the total amount of wild-harvested roots;
- The average number of roots per pound; and
- Trends in abundance and distribution of populations.

The majority of the 19 States that allow the harvest of wild roots of *P. quinquefolius* require harvesters to plant the seeds of harvested plants near the vicinity of where plants are removed. Most States prohibit the harvest of roots on State-owned lands. States require that all harvested roots intended for sale be inspected and certified by the appropriate State authorities.

On lands managed by the USFS, the harvest is based on the status of *P. quinquefolius* on National Forest lands. National Forests that allow the harvest issue collection permits for specified weight limits of roots (e.g., 0.45-0.91 kg). No harvest is allowed on National Forests that classify the species as uncommon or rare.

2.1.4. *Restoration or alleviation measures*

In most States, harvesters are required and encouraged to plant seeds of harvested plants near the vicinity of where plants are growing (e.g., within 30 m). Seeds that passively fall from plants are vulnerable to predation and desiccation. The most vulnerable stages of the life cycle of *P. quinquefolius* appear to be seed germination and seedling establishment (Carpenter and Cottam 1982; Charron and Gagnon 1991; Lewis and Zenger 1982). Seeds planted by harvesters at the recommended depth of 2 cm experience higher rates of germination and emergence than seeds scattered on the forest floor (Farrington 2006; McGraw 2000). Computer simulation models have shown a 72% increase in population growth rate when seeds of mature fruits are planted at a depth of 2 cm.

Most States prohibit the harvest of roots on State-owned lands and harvesters are discouraged from planting cultivated seeds of *P. quinquefolius* on such lands. The USFS has established harvest moratoriums on certain National Forests and also prohibits planting of cultivated seeds on its lands. To discourage poaching on NPS lands and on USFS lands where harvest is not allowed, some roots of *P. quinquefolius* are permanently marked with silicon microchips and color-coded phos-

phorescent dyes. Marked roots have resulted in the successful prosecution of poachers and have deterred the incidence of poaching.

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

States are required to report to the U.S. CITES Authorities the total weight of roots harvested for resale in each county of the State (a county is a geographic entity that performs State-mandated duties). County harvest data are used to monitor regional fluctuations in harvest levels, which may indicate a change in the abundance of *P. quinquefolius*. County harvest data can also be used to detect discrepancies between levels of harvest authorized by the USFS and actual amounts reported by the State, since even roots of *P. quinquefolius* harvested on Federal lands within a State is reported by the State. Such discrepancies could indicate illegal harvest on Federal lands. States are also required to report the average number of dried roots per pound calculated for each harvest season. This information is used to monitor whether root weights are decreasing, remaining stable, or increasing, which can indicate the effect of harvest on populations of *P. quinquefolius*. An increase in the number of roots per unit weight could indicate that smaller roots are being harvested and that larger plants may be less abundant.

2.2.2. *Confidence in the use of monitoring*

The harvest data obtained and reported by the States provide reliable information to monitor trends over time. A recent study initiated by the U.S. Scientific Authority found a positive relationship between State county harvest data and predicted abundance levels of *P. quinquefolius* based on field census data and availability of suitable habitats (Thatcher et al. 2006).

Greater populations of *P. quinquefolius* may occur on private lands than occur on Federal and State lands, although access to survey populations on private lands is usually restricted and therefore not quantified. Furthermore, we believe a portion of the wild roots exported annually may actually be “wild-simulated” roots (i.e., roots from plants derived from cultivated seeds planted in a natural forest environment and tended with minimal care so that roots retain a wild appearance) harvested from plants on private lands.

Although State certificates for inspected roots of *P. quinquefolius* are reviewed at the port of export by inspectors from the U.S. Department of Agriculture-Animal and Plant Health Inspection Service (USDA-APHIS) to ensure that root weights as reported on State certifi-

cates match the weights on the CITES export permits, and to ensure that wild roots are not being exported as artificially propagated roots, wild-simulated roots are typically visually indistinguishable from truly wild roots. Copies of the State certificates that have been cleared by USDA-APHIS are sent to the U.S. CITES Authorities to further monitor the exports of *P. quinquefolius*. However, States do not have reporting mechanisms or regulations in place to accurately track and report quantities of wild-simulated roots separate from wild roots. Therefore, the U.S. Scientific Authority is unable to quantify the amount of wild-simulated roots of *P. quinquefolius* reported as “wild.”

2.3. Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species.

NATIONAL: Nineteen States with approved CITES programs have established laws and regulations for the harvest and sale of roots of *P. quinquefolius* within their respective jurisdictions. The U.S. Forest Service and the National Park Service have regulations for the management and conservation of the species on their respective lands.

Panax quinquefolius is subject to protection under the U.S. Lacey Act. Under the Lacey Act, for any species listed under CITES or protected by State law, it is prohibited to import, export, sell, receive, acquire, purchase, or engage in the interstate commerce of any plant taken, possessed, or sold in violation of any law, treaty, or regulation of the United States, any Indian tribal law, or any law or regulation of any State.

Panax quinquefolius is designated as “Endangered” in Canada (the other range country); the export of wild-harvested ginseng roots is prohibited (Canadian Wildlife Service).

INTERNATIONAL: *Panax quinquefolius* was listed in Appendix II of CITES in 1975. In addition to whole live or dead specimens, the listing includes whole and sliced roots and parts of roots.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED.

3.1. Type of use (origin) and destinations (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens.

The root of *P. quinquefolius* is prized for its medicinal and aphrodisiac properties (Van Wyk and Wink 2004). The aromatic root has been used in East Asia for over 200 years for a wide variety of health concerns

caused by stress, overwork, poor diet, sleep difficulties, traumatic injuries, and aging (Small and Catling 1999; Howell 2006). *Panax quinquefolius* contains the bioactive chemical constituents collectively known as ginsenosides (Van Wyk and Wink 2004).

The main destination for U.S. exports of roots of *P. quinquefolius* is Hong Kong, with minor amounts exported to Singapore, Taiwan, and other East Asian countries (U.S. Management Authority annual CITES reports). In Hong Kong, roots are sorted, graded, and shipped to China and other destinations for further sorting and processing (Novelli 2003).

Wild-harvested roots are exported as whole intact roots. Specimens of artificially propagated plants include whole roots and parts thereof, including ground roots. Roots from artificially propagated plants are used for capsules and liquid extracts, and also for the manufacture of teas and other products such as chewing gum, candy, cigarettes, and soft drinks (Robbins 1998). Cosmetics, soaps, cologne and perfumes are also reported to contain extracts from roots (Robbins 1998). Seeds, which are not covered by the CITES listing of the species, are exported for cultivation purposes.

3.2. Harvest:

3.2.1. Harvesting regime (extractive versus non-extractive harvesting, demographic segment harvested, harvesting effort, harvesting method, harvest season).

The 19 States that allow harvest of roots of *P. quinquefolius* require plants to have a minimum of 3 leaves, which is considered an adult plant (i.e., 5 years of age or older). The whole root with its attached rhizome is harvested, thus killing the plant. The harvest season begins in late summer to early fall; the specific harvest season in each of the 19 States is designated by State law. All but three States require harvesters to plant seeds at the same location or nearby vicinity of where roots are harvested.

3.2.2. Harvest management/control (quotas, seasons, permits, etc.).

Although harvest regulations vary by State, the 19 States with approved CITES programs have established laws and regulations for the harvest and sale of roots of *P. quinquefolius* within their respective jurisdictions. Harvested roots must be certified by State Government officials, and most States prohibit harvest on State-owned lands. The requirement for harvesters to have a permit varies by State; some States require harvesters to obtain a permit whereas other States do not.

Harvest on USFS lands requires the issuance of a harvest permit by the USFS. Collection permits are generally limited to a specified weight

of roots (e.g., 0.45-0.91 kg), and harvesters must follow State harvest regulations (i.e., harvest season, age of plants, and planting of seeds).

Since 1983, the U.S. CITES Authorities have required that all roots of *P. quinquefolius* to be exported be certified as either wild or artificially propagated. In 1999, to further protect wild populations, the U.S. Scientific Authority determined that only wild roots of *P. quinquefolius* of 5 years of age or older (i.e., with at least 4 bud-scale scars on the rhizome) can be exported. None of the 19 States have nor have the U.S. CITES Authorities implemented an annual harvest quota for *P. quinquefolius*.

3.3. Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature.

LEGAL TRADE LEVELS: From 2000 to 2007, following implementation of the 5-year minimum-age restriction, the average annual legal export of wild-harvested roots was 29,660 kg (65,389 lbs). In the previous 5-year period (1995 to 1999), the average annual export was 44,275 kg (97,610 lbs) (U.S. Management Authority annual CITES reports). For the period 2000 to 2007, an average of 250 roots per pound, at a one-to-one ratio of root to plant, indicates that the average annual harvest removed 16,347,250 individual plants from the wild (based on annual State harvest data submitted to U.S. CITES Authorities).

ILLEGAL TRADE LEVELS: The rate and intensity of illegal harvest is difficult to quantify and fluctuates annually depending on local economies and the price paid for roots. Illegal harvest occurs to varying amounts on private, State, and Federal lands. To discourage poaching on National Park Service lands and on Forest Service lands where harvest is not allowed, some roots of *P. quinquefolius* are permanently marked with silicon microchips and color-coded phosphorescent dyes. Buyers of *P. quinquefolius* roots are informed to not purchase suspicious roots, which could be seized by State and Federal law enforcement officials. Marked roots have resulted in the successful prosecution of poachers and have deterred the incidence of poaching.

In recent years a greater emphasis by law enforcement officers in identifying illegal harvests, falsification of records, and unlawful transactions of *P. quinquefolius* has resulted in apprehending more harvesters and buyers (dealers) in violation of State and Federal laws. Undercover operations have been and will continue to be used to identify illegal activities and prosecute violators. Violations include: harvesting, selling, and purchasing prior to the lawful season; purchasing without a dealers license; harvesting without a permit; harvesting under-age roots; exporting without a permit; and falsifying transaction

II. NON-DETRIMENTAL FINDING PROCEDURE (NDFs)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?

yes no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

The U.S. Scientific Authority uses a wide range of information to ensure that the species remains at healthy population levels throughout its range and to determine whether export of roots will not be detrimental to the survival of the species. The status of *P. quinquefolius* is assessed by direct means, such as ongoing research studies, field inventories, population assessments, and scientific literature, and through indirect means, such as monitoring State harvest levels, and State and Federal conservation and protection efforts. State officials and academic and government researchers are routinely consulted to obtain the latest information on the status and biology of the species.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The U.S. Scientific Authority uses a wide range of information to evaluate the status of *P. quinquefolius* and to determine whether the export of roots will not be detrimental to the survival of the species. To be approved for export, States must provide to the U.S. Scientific Authority sufficient information to determine that their management and harvest programs are appropriate to ensure that populations of *P. quinquefolius* within their jurisdictions will not be overharvested, and that there are procedures in place to minimize the risk that wild-harvested plants would be reported as cultivated.

States are required to report the total weight of roots purchased in each county of the State, which is used to detect trends in harvest levels and changes in species' abundance. States are also required to report the average number of dried roots per pound calculated for each annual harvest season. This information is used to determine whether root weights are decreasing, remaining stable, or increasing, which can indicate the effect of harvest on populations of *P. quinquefolius*.

The U.S. Fish and Wildlife Service (designated as the CITES Management and Scientific Authorities for the United States of America) has funded field research and/or obtained funding for research by other entities to examine various aspects of the species' biology and population status. Current research includes a multi-State study by the Biological Resources Discipline of the U.S. Geological Survey to assess the genetic diversity and population abundance of *P. quinquefolius*.

The U.S. CITES Authorities host meetings, biennially or triennially, with State program coordinators, other Federal agencies, researchers, industry representatives, and the general public to provide a forum to present current research and field studies on *P. quinquefolius* to improve the collective knowledge base of the species.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT.

The information contained in the State annual reports submitted to the U.S. CITES Authorities is used by the U.S. Scientific Authority to evaluate State programs, monitor harvest levels, assess impacts of harvest on populations, and determine whether the export of roots will be detrimental to the survival of the species. The U.S. Scientific Authority also uses ongoing research studies, field inventories, population assessments, and peer-reviewed scientific literature in making its non-detriment findings. A recent study initiated by the U.S. Scientific Authority found a positive relationship between State county harvest data and predicted abundance levels of *P. quinquefolius* based on field census data (Thatcher et al. 2006).

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF.

- More robust and uniform field monitoring of populations throughout the States that allow harvest, particularly on private lands, would provide useful information.
- The inability to quantify the amount of wild-simulated roots of *P. quinquefolius* that is reported as "wild."

6. RECOMMENDATIONS

Scientifically-based non-detriment findings should be based on species' biology, life history traits, distribution and abundance, harvest regime, and other pertinent factors as necessary.

Its important to stay abreast of current research (including published and unpublished); maintain communications and share informa-

tion with stakeholders and local and national authorities; have the ability to assess illegal and legal harvest levels; and monitor the effects of international trade on species.

Information exchange and cooperation among stakeholders, government entities, non-governmental organizations, and researchers is essential to share information on the biology and trade status of CITES-listed species in order to maintain self-sustaining populations and make scientifically based non-detriment findings.

In order to ensure that the harvest is sustainable and does not impact the long-term viability of the species, an adaptive management approach that provides flexibility for relevant institutions and stakeholders to react to changing conditions (e.g., invasive species, disease, predators) is useful so that adjustments can be made in a timely manner (e.g., revise harvest regulations, restrict exports, establish annual quotas, or etc.).

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