# Medicine from U.S. Wildlands:

*An Assessment of Native Plant Species Harvested in the United States for Medicinal Use and Trade and Evaluation of the Conservation and Management Implications*

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*The Nature Conservancy*

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A report from TRAFFIC North America prepared for
The Nature Conservancy

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TRAFFIC North America
Prepared by Christopher Robbins for The Nature Conservancy
(July 1999)

## Introduction

North America is a major consumer and producer of medicinal plants offered in myriad over-the-counter (OTC) herbal preparations. At least 175 native North American plants are offered on the non-prescription medicinal market in the United States; more than 140 medicinal herbs native to North America have been documented in herbal products and phytomedicines in foreign countries. The market for medicinal herbs in the United States is worth US$600 million and is growing at an annualized rate of more than 100 percent (NBJ 1998; Brevoort 1998). The popularity of herbs and herbal products can be partially attributed to growing global appreciation for and adoption of naturopathic medicine, which is often perceived and publicized as a less-expensive and less-invasive form of treatment than modern medicine. Favorable public opinion of herbs combined with effective marketing of herbal preparations by industry has resulted in explosive consumption of medicinal plants. While commercially important and therapeutically promising, the utilization of medicinal plants raises valid questions about the environmental implications of this practice on wild populations, species and the ecosystems from which they are sourced.

## Background

Dozens and possibly hundreds of medicinal plants native to North America are collected in large amounts from wild lands in Canada, Mexico and the United States. The majority of this raw plant material enters commercial trade and is eventually purchased in a variety of forms by consumers in and outside of North America. The potential conservation problems, resource management issues and opportunities for economic development that may arise from this trade are not well understood, as information is lacking or difficult to acquire.

TRAFFIC North America, with assistance from The Nature Conservancy, is examining the collection, commercialization and conservation of medicinal plants in the United States to: gain a better understanding of which native species sourced from U.S. wildlands are potentially at risk from commercial U.S. trade; review the permitting, monitoring and management mechanisms for medicinal plants harvested on federal lands and identify gaps in these systems; and recommend steps for improving long-term conservation of affected species.

## Methodology

Input from two major U.S. federal land management agencies, the U.S. Forest Service (USFS) and Bureau of Land Management (BLM), was the main source of information used to identify species and assess amounts of medicinal plants harvested from U.S. federal lands. The summary and evaluation of information on permits issued for the collection of medicinal plants from BLM and USFS lands is part of a more comprehensive study by TRAFFIC North America, with assistance from The Nature

Conservancy (TNC). TRAFFIC's study, funded in part by the National Fish and Wildlife Foundation, is focusing on the exploitation, market, conservation and management of native North American medicinal plants. The review of permit information provided: 1) a profile of commercially popular medicinal plants that occur on BLM lands and National Forests; and 2) a preliminary set of observations and recommendations for improving aspects of the permitting process that appear inadequate from the standpoint of monitoring species and volumes of medicinal plants harvested from these federally managed wildlands.

Surveys were distributed to 67 BLM field offices and nine regional USFS offices for information on "fee" permits and amounts sold for approximately 180 medicinal plants that had been previously identified by TRAFFIC in its review of the U.S. market. While "free" or "special use" permits are issued by both agencies for biological, genetic or pharmaceutical research or personal use, these permits do not represent the largest volume of raw plant material sourced from federal wild lands and therefore were excluded from this analysis.

**Results**

*Species Selection for Further Study*

TRAFFIC, with assistance from The Nature Conservancy (TNC), carried out an inventory of the U.S. botanicals market to document the identities of native North American plants that are commercially available to consumers as herbs or in herbal products. This review identified approximately 180 species (including species added by reviewers) of various herbs, shrubs and trees that are available in medicinal herbs and/or foods in the United States. The aim of this exercise was to document the most popular and widely used species of medicinal plants, and did not attempt to catalog species used at the regional or local level. An effort was made to remove from the list species of little or no conservation concern, while prioritizing and retaining others for further research and analysis. To this end, four individuals possessing extensive and intimate knowledge of the U.S. botanicals trade were sent the list of 180 medicinal plants identified in U.S. commerce. Reviewers were asked to comment on each species, providing information on the size of their trade, patterns in demand over the past decade, establishment and levels of commercial cultivation, parts of plants traded and evidence of population and species decline. Reviewers' input was computerized for analysis and prioritization of species for Part III, which will involve a more rigorous review of species' conservation and commercial status.

Admittedly, the information provided by reviewers is qualitative and the information categories upon which reviewers were requested to comment are subject to a fair degree of interpretation. However, this phase of research is a preliminary assessment and is intended to remove or retain species through peer-review prioritization process. Upon analysis of reviewers' comments, 80 species were selected for more detailed review under Part III. The following criteria, taking into account information provided by expert reviewers, were used to determine species meriting further study:

- Trade in species is characterized as medium, medium-large or large

*And*

- Commercial demand for species has increased in past 10 years

**And/Or**

- Wild populations of species have purportedly declined in past 10 years

*And/Or*

- Species has purportedly declined in past 10 years

Eighty (80) species have been selected from the original list reviewed by experts under Part I for a more systematic and scientific assessment of prioritization for conservation attention under Part III (Table 1). Cross-referencing the names of 80 species listed in Table 1 with those reportedly collected from lands managed by BLM or USFS reveals 25 common species (Table 2). In addition, six native plant species and two genera (*Leucothoe, Rhododendron*) not previously identified in the market review (Part I), but, according to permit data, are reportedly collected from U.S. federal lands managed by the Bureau of Land Management (BLM) and the U.S. Forest Service Service (USFS), have been included as candidates for further review (Table 3). Species in Table 3, with the exception of *Galax* spp. *Vitis* spp. and possibly *Leucothoe* spp. and *Rhododendron* spp., which are primarily collected for the nursery, floral and furniture trade, are harvested from BLM and USFS lands and have reported or potential medicinal value (Kauffman pers. com. 1999). The literature indicates limited local or indigenous medicinal use of *Leucothoe* spp. and *Rhododendron* spp. Therefore, these genera and their potential use as commercial medicinals will be explored further in Part III (Foster and Duke 1990; Mabberley 1997).

A total of 86 native North American species and two genera (Tables 1 and 3) will be subject to further analysis in Part III to determine whether and to what extent commercial trade, as well as other critical issues, pose a legitimate threat to these resources.

Table 1. Medicinal Plant Species in U.S. Commerce Identified as Priorities by TRAFFIC and The Nature Conservancy for Further Study.

| **BOTANICAL NAME** | *COMMON NAME* | *FAMILY* | **CRITERIA FOR SELECTION OF SPECIES** | | | | |
|---|---|---|---|---|---|---|---|
| | | | TRADE IS MEDIUM, MEDIUM/LARGE OR LARGE | DEMAND INCREASE IN PAST 10 YEARS | POPULATION DECLINE IN PAST 10 YEARS | SPECIES DECLINE IN PAST 10 YEARS | REVIEWER† COMMENTS |
| *1. ACORUS CALAMUS* | SWEETFLAG | ACORACEAE | | | ✔ | ✔ | |
| *2. ALETRIS FARINOSA* | WHITE-TUBED COLICROOT | LILIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *3. ANEMOPSIS CALIFORNICA* | YERBA MANSA | SAURURACEAE | ✔ | ✔ | ✔ | ✔ | California populations are diminishing in polluted habitat |
| *4. ARALIA CALIFORNICA* | CALIFORNIA SPIKENARD | ARALIACEAE | | | ✔ | ✔ | |
| *5. ARALIA NUDICAULIS* | WILD SARSAPARILLA | ARALIACEAE | ✔ | ✔ | ✔ | | |
| *6. ARALIA RACEMOSA* | AMERICAN SPIKENARD | ARALIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *7. ARCTOSTAPHYLOS UVA-URSI* | BEARBERRY | ERICACEAE | ✔ | ✔ | ✔ | | |
| *8. ARISTOLOCHIA SERPENTARIA* | VIRGINIA SNAKEROOT | ARISTOLOCHIACEAE | ✔ | ✔ | ✔ | ✔ | Declining throughout natural range |
| *9. ASARUM CANADENSE* | CANADA WILD GINGER | ARISTOLOCHIACEAE | | | ✔ | ✔ | |
| *10. ASCLEPIAS TUBEROSA* | BUTTERFLY MILKWEED | ASCLEPIADACEAE | ✔ | ✔ | ✔ | ✔ | |
| *11. BAPTISIA TINCTORIA* | YELLOW WILD INDIGO | FABACEAE | ✔ | ✔ | ✔ | ✔ | |
| *12. CASTANEA DENTATA* | AMERICAN CHESTNUT | FAGACEAE | | | ✔ | ✔ | |
| *13. CAULOPHYLLUM THALICTROIDES* | BLUE COHOSH | BERBERIDACEAE | ✔ | ✔ | ✔ | ✔ | Declining throughout natural range in U.S. |
| *14. CEANOTHUS AMERICANUS* | NEW JERSEY TEA | RHAMNACEAE | ✔ | ✔ | | | Questionable decline in North Carolina |
| *15. CHAMAELIRIUM LUTEUM* | DEVIL'S BIT | LILIACEAE | ✔ | ✔ | ✔ | ✔ | Declining in U.S. Appalachian states |
| *16. CHELONE GLABRA* | WHITE TURTLEHEAD | SCROPHULARIACEAE | | | ✔ | ✔ | |
| *17. CHIMAPHILA MACULATA* | SPOTTED WINTERGREEN | PYROLACEAE | ✔ | ✔ | ✔ | ✔ | |

| BOTANICAL NAME | *COMMON NAME* | *FAMILY* | CRITERIA FOR SELECTION OF SPECIES | | | | |
|---|---|---|---|---|---|---|---|
| | | | TRADE IS MEDIUM, MEDIUM/LARGE OR LARGE | DEMAND INCREASE IN PAST 10 YEARS | POPULATION DECLINE IN PAST 10 YEARS | SPECIES DECLINE IN PAST 10 YEARS | REVIEWER† COMMENTS |
| *18. CHIMAPHILA UMBELLATA* | COMMON WINTERGREEN | PYROLACEAE | ✔ | ✔ | ✔ | ✔ | |
| *19. CHIONANTUS VIRGINICUS* | FRINGE TREE | OLEACEAE | ✔ | ✔ | ✔ | ✔ | |
| *20. CIMICIFUGA RACEMOSA* | BLACK BUGBANE | RANUNCULACEAE | ✔ | ✔ | ✔ | ✔ | Significant increase in demand |
| *21. COLLINSONIA CANADENSIS* | CANADA HORSE BALM | LAMIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *22. CYPRIPEDIUM PUBESCENS* | LARGE YELLOW LADY'S SLIPPER | ORCHIDACEAE | ✔ | ✔ | ✔ | ✔ | Documented population increase, ornamental is endangered in wild, declining throughout range in U.S. |
| *23. DIONAEA MUSCIPULA* | VENUS' FLY TRAP | DROSERACEAE | ✔ | ✔ | ✔ | ✔ | |
| *24. DIOSCOREA VILLOSA* | YELLOW YAM | DIOSCOREACEAE | ✔ | ✔ | ✔ | ✔ | |
| *25. ECHINACEA ANGUSTIFOLIA* | NARROW-LEAVED PURPLE CONEFLOWER | ASTERACEAE | ✔ | ✔ | ✔ | ✔ | |
| *26. ECHINACEA PALLIDA* | PALE-PURPLE CONEFLOWER | ASTERACEAE | ✔ | ✔ | ✔ | ✔ | |
| *27. EPIGAEA REPENS* | TRAILING ARBUTUS | ERICACEAE | | | ✔ | ✔ | |
| *28. ERIODICTYON CALIFORNICUM* | CALIFORNIA YERBA-SANTA | HYDROPHYLLACEAE | ✔ | ✔ | ✔ | ✔ | Populations in South California potentially at risk |
| *29. EUPHORBIA IPECACUANHAE* | WILD IPECAC | EUPHORIBIACEAE | | | ✔ | ✔ | |
| *30. FRANGULA PURSHIANA* | CASCARA BUCK THORN | RHAMNACEAE | ✔ | ✔ | ✔ | ✔ | |
| *31. GAULTHERIA PROCUMBENS* | TEABERRY | ERICACEAE | ✔ | ✔ | | | Local wild populations experienced decline |
| *32. GELSEMIUM SEMPERVIRENS* | YELLOW JESSAMINE | LOGANIACEAE | | | ✔ | ✔ | Local wild populations experienced decline |
| *33. GENTIANA VILLOSA* | STRIPED GENTIAN | GENTIANACEAE | | | ✔ | ✔ | |
| *34. GERANIUM MACULATUM* | WILD CRANE'S BILL | GERANIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *35. HAMAMELIS VIRGINIANA (=VERNALIS)* | AMERICAN WITCH-HAZEL | HAMAMELIDACEAE | ✔ | ✔ | ✔ | ✔ | |

| BOTANICAL NAME | *COMMON NAME* | *FAMILY* | CRITERIA FOR SELECTION OF SPECIES | | | | |
|---|---|---|---|---|---|---|---|
| | | | TRADE IS MEDIUM, MEDIUM/LARGE OR LARGE | DEMAND INCREASE IN PAST 10 YEARS | POPULATION DECLINE IN PAST 10 YEARS | SPECIES DECLINE IN PAST 10 YEARS | REVIEWER[†] COMMENTS |
| *36. HYDRANGEA ARBORESCENS* | WILD HYDRANGEA | HYDRANGEACEAE | | | ✔ | ✔ | |
| *37. HYDRASTIS CANADENSIS* | GOLDENSEAL | RANUNCULACEAE | ✔ | ✔ | ✔ | ✔ | |
| *38. IRIS VERSICOLOR* | BLUEFLAG | IRIDACEAE | | | ✔ | ✔ | |
| *39. JEFFERSONIA DIPHYLLA* | TWINLEAF | BERBERIDACEAE | | | ✔ | ✔ | |
| *40. JUGLANS CINEREA* | BUTTERNUT | JUGLANDACEAE | | | ✔ | ✔ | |
| *41. JUGLANS NIGRA* | BLACK WALNUT | JUGLANDACEAE | ✔ | ✔ | ✔ | ✔ | Characterized as weed by one reviewer |
| *42. LIGUSTICUM PORTERI* | PORTER LOVAGE/OSHA | APIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *43. LOBELIA INFLATA* | INDIAN TOBACCO | CAMPANULACEAE | ✔ | ✔ | ✔ | | Characterized as weed by one reviewer |
| *44. LOMATIUM DISSECTUM* | FERN-LEAVED DESERT PARSLEY | APIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *45. LYCOPODIUM CLAVATUM* | RUNNING PINE | LYCOPODIACEAE | | | ✔ | ✔ | |
| *46. MAHONIA AQUIFOLIUM* | OREGON GRAPE | BERBERIDACEAE | ✔ | ✔ | ✔ | ✔ | Characterized as weed by one reviewer |
| *47. MAHONIA NERVOSA* | OREGON GRAPE | BERBERIDACEAE | ✔ | ✔ | ✔ | ✔ | |
| *48. MAHONIA REPENS* | CREEPING OREGON GRAPE | BERBERIDACEAE | | | | | Added by reviewer for further study |
| *49. MITCHELLA REPENS* | PARTRIDGE BERRY | RUBIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *50. MONOTROPA UNIFLORA* | INDIAN PIPE | MONOTROPACEAE | | | ✔ | ✔ | |
| *51. OPLOPANAX HORRIDUS* | DEVIL'S CLUB | ARALIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *52. PANAX QUINQUEFOLIUS* | AMERICAN GINSENG | ARALIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *53. PODOPHYLLUM PELTATUM* | MAY APPLE | BERBERIDACEAE | ✔ | ✔ | ✔ | ✔ | |
| *54. POLYGALA SENEGA* | SENECA SNAKEROOT | POLYGALACEAE | ✔ | ✔ | ✔ | ✔ | Declining in Saskatchewan, Canada; cultivated in Japan |

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| *55. POLYGONATUM BIFLORUM* | COMMON SOLOMON'S SEAL | LILIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *56. PRUNUS SEROTINA* | WILD BLACK CHERRY | ROSACEAE | ✔ | ✔ | | ✔ | |
| *57. PRUNUS VIRGINIANA* | CHOKE CHERRY | ROSACEAE | ✔ | ✔ | | ✔ | |
| *58. PTEROCAULON VIRGATUM* | WAND BLACKROOT | ASTERACEAE | ✔ | ✔ | ✔ | ✔ | |
| *59. QUERCUS ALBA* | WHITE OAK | FAGACEAE | ✔ | ✔ | | ✔ | Declining throughout entire U.S. range |
| *60. SALVIA APIANA* | WHITE SAGE | LAMIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *61. SAMBUCCUS CANADENSIS* | COMMON ELDERBERRY | CAPRIFOLIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *62. SANGUINARIA CANADENSIS* | BLOODROOT | PAPAVERACEAE | ✔ | ✔ | ✔ | ✔ | Local decline in populations |
| *63. SASSAFRAS ALBIDUM* | SASSAFRAS | LAURACEAE | ✔ | ✔ | | ✔ | Declining throughout entire U.S. range |
| *64. SCROPHULARIA MARILANDICA* | CARPENTER'S SQUARE FIGWORT | SCROPHULARIACEAE | | | ✔ | ✔ | |
| *65. SCUTELLARIA LATERIFLORA* | MAD DOG SKULLCAP | LAMIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *66. SERENOA REPENS* | SAW PALMETTO | ARECACEAE | ✔ | ✔ | ✔ | ✔ | Species may be declining locally |
| *67. SPIGELIA MARILANDICA* | WOODLAND PINKROOT | LOGANIACEAE | | | ✔ | ✔ | |
| *68. STILLINGIA SYLVATICA* | QUEEN'S DELIGHT | EUPHORBIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *69. THUJA OCCIDENTALIS* | NORTHERN WHITE CEDAR | CUPRESSACEAE | ✔ | ✔ | ✔ | ✔ | |
| *70. TORREYA CALIFORNICA* | CALIFORNIA TORREYA | TAXACEAE | | | ✔ | ✔ | |
| *71. TRILLIUM ERECTUM* | ILL-SCENT TRILLIUM, BETH/BIRTH ROOT | LILIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *72. ULMUS RUBRA* | SLIPPERY ELM | ULMACEAE | ✔ | ✔ | ✔ | ✔ | |
| *73. VACCINIUM MACROCARPON* | LARGE CRANBERRY | ERICACEAE | ✔ | ✔ | ✔ | ✔ | Species decline is local |
| *74. VACCINIUM OVATUM* | EVERGREEN BLUEBERRY | ERICACEAE | ✔ | ✔ | | ✔ | |

| BOTANICAL NAME | *COMMON NAME* | *FAMILY* | CRITERIA FOR SELECTION OF SPECIES | | | | |
|---|---|---|---|---|---|---|---|
| | | | TRADE IS MEDIUM, MEDIUM/LARGE OR LARGE | DEMAND INCREASE IN PAST 10 YEARS | POPULATION DECLINE IN PAST 10 YEARS | SPECIES DECLINE IN PAST 10 YEARS | REVIEWER† COMMENTS |
| *75. VACCINIUM OXYCOCCOS* | SMALLCRANBERRY | ERICACEAE | ✔ | ✔ | ✔ | ✔ | Species decline is local |
| *76. VALERIANA SITCHENSIS* | SITKA VALERIAN | VALERIANACEAE | | | ✔ | ✔ | |
| *77. VERONICASTRUM VIRGINICUM* | CULVER'S ROOT | SCROPHULARIACEAE | | | ✔ | ✔ | |
| *78. VIBURNUM PRUNIFOLIUM* | SMOOTH BLACK HAW | CAPRIFOLIACEAE | ✔ | ✔ | ✔ | ✔ | |
| *79. XANTHORHIZA SIMPLICISSIMA* | (SHRUBBY) YELLOW-ROOT | RANUNCULACEAE | | | ✔ | ✔ | |
| *80. YUCCA SCHIDIGERA* | MOJAVE YUCCA | AGAVACEAE | ✔ | ✔ | ✔ | ✔ | |

Source: TRAFFIC North America and The Nature Conservancy

† - Reviewers included: Richard A. (Richo) Cech, James A. Duke, Steven Foster and Gregory Tilford

Table 2. Species identified as priorities for further study and collected from federal lands managed by BLM and or USFS from 1995-1997.

| SCIENTIFIC NAME | COMMON, TRADE NAME | FAMILY | FEDERAL AGENCY REPORTING COLLECTION |
|---|---|---|---|
| *Alertis farinosa* | White-tubed colicroot, star root, star grass | Liliaceae | USFS |
| *Aralia racemosa* | American spikenard | Araliaceae | USFS |
| *Aristolochia serpentaria* | Virginia snakeroot | Aristolochiaceae | USFS |
| *Asarum canadense* | Canada wild ginger | Aristolochiaceae | USFS |
| *Baptisia tinctoria* | Yellow wild-indigo | Fabaceae | USFS |
| *Caulophyllum thalictroides* | Blue cohosh | Berberidaceae | USFS |
| *Cimifuga racemosa* | Black cohosh/bugbane | Ranunculaceae | USFS |
| *Dioscorea villosa* | Yellow yam | Dioscoreaceae | USFS |
| *Geranium maculatum* | Wild crane's-bill | Geraniaceae | USFS |
| *Hydrastis canadensis* | Goldenseal | Ranunculaceae | USFS |
| *Hamamelis virginiana* | American witch-hazel, beadwood | Hamamelidaceae | USFS |
| *Jeffersonia diphylla* | Twinleaf | Berberidaceae | USFS |
| *Juglans nigra* | Black walnut | Juglandaceae | USFS |
| *Lobelia inflata* | Indian-tobacco | Campanulaceae | USFS |
| *Lycopodium clavatum* | Running pine | Lycopodiaceae | USFS |
| *Mahonia nervosa* | Oregon grape | Berberidaceae | BLM |
| *Mitchella repens* | Partridge-berry | Rubiaceae | USFS |
| *Panax quinquefolius* | American ginseng | Araliaceae | USFS |
| *Podophyllum peltatum* | May apple | Berberidaceae | USFS |
| *Polygonatum biflorum* | Common solomon's-seal | Liliaeceae | USFS |
| *Prunus serotina* | Wild black cherry | Rosaceae | USFS |
| *Quercus alba* | White oak | Fagaceae | USFS |
| *Sanguinaria canadensis* | Bloodroot | Paperveraceae | USFS |
| *Sereona repens* | Saw palmetto | Arecaceae | USFS |
| *Zanthorriza (=Xanthorhiza) simplicissima* | Yellow root | Ranunculaceae | USFS |

Source: Bureau of Land Management, U.S. Forest Service

Table 3. Taxa of reported or potential medicinal value not previously identified for further study but collected from federal lands managed by BLM or USFS from 1995-97.

| SCIENTIFIC NAME | COMMON, TRADE NAME | FAMILY | FEDERAL AGENCY REPORTING COLLECTION |
|---|---|---|---|
| *Allium tricoccum* | Ramp, wild leek | Liliaceae | USFS |
| *Arctostaphylos pungens* | Pointleaf manzanita | Ericaceae | BLM |
| *Aristolochia tomentosa* | Dutchman's-pipe, smokevine | Aristolochiaceae | USFS |
| *Artemisia filifolia* | Sand sagebrush | Asteraceae | BLM |
| *Eriodictylon angustifolia* | Narrowleaf yerbasanta | Hydrophyllaceae | BLM |
| *Galax* spp.* | | Diapensiaceae | USFS |
| *Leucothoe* spp.* | Dog hobble, fetter bush | Ericaceae | USFS |
| *Rhamnus purshiana* | Cascara buck-thorn | Rhamnaceae | BLM |
| *Rhododendron* spp.* | Mountain laurel | Ericaceae | USFS |
| *Trilisa odoratissima* | Deer's tongue | Asteraceae | USFS |
| *Vitis* spp.* | Grape (vine) | Vitaceae | USFS |

Source: Bureau of Land Management, U.S. Forest Service
* - Primary use is likely for non-medicinal purposes

Expert reviewers described other factors that they believe should be considered in an evaluation of the extent and biological significance of trade in native North American medicinal plants. For instance, observations were made concerning the overlap in species traded as medicinals and ornamental garden plants (e.g., wildflowers) and the degree to which the horticultural trade contributes to species exploitation (Duke in litt. 1998). The same reviewer alluded to the introduction and colonization of exotic species as a growing threat to native woodland medicinal plants.

A genuine concern about the ancillary harvest of endemic species related to target species in trade was raised. For instance, this problem involves *Echinacea*, whereby the *Echinacea angustifolia* trade is reportedly supplied with misidentified *Echinacea* species, including *E. pallida*, *E. atrorubens*, *E. simulata*, *E. paradox* and possibly *E. sanguinea*. The problems of species substitution and adulteration may also be the case for *Cimicifuga racemosa* (as *C. americana*), *Lomatium dissectum* (as dozens of other *Lomatium* spp. found in the Pacific Northwest), *Scutellaria lateriflora* (as other blue-flowered *Scutellaria* species) and *Achillea millefolium* (as the indigenous *A. lanulosa*) (Foster in litt. 1998). Habitat alteration and conversion was another concern mentioned by reviewers that poses a significant threat to wild populations and species of medicinal plants.

The justifiable concerns raised by reviewers will be addressed in the next phase of work (III) when the issues and threats facing medicinal plants, their wild populations and the ecosystems from which they are gathered will be examined more closely. To that end, information on species biology, ecology, distribution, conservation and population status, supply/demand, availability, cultivation, changes in price will be gathered from field botanists, commercial vendors and recent price lists during Part III to determine whether and to what extent medicinal plant species are susceptible to and affected by overexploitation, among other threats.

*Plant Species of Medicinal Interest from Public Lands*

Economic opportunities and activities surrounding the utilization of non-timber forest products (NTFPs) from public lands in the United States comprise an important industry to many rural communities and collectors. Federal agencies that manage public lands for these resources also stand to gain financially. In 1996, the amount of revenue generated by sales of permits for NTFPs collected from lands managed by the Bureau of Land Management in 11 western states (excluding Alaska) was $227,800. Approximately $146,400 in revenue was generated from the sale of “fee” permits issued for the collection of special forest products in southern National Forests (Region 8) (Cobb 1998).

Among the largest beneficiaries are corporate entities, which obtain a wide variety of raw plant materials, including medicinal plants, from public lands for commercial resale. Examples include the procurement of pine trees for the extraction of a common compound in pine that is used in the manufacture of a cholesterol-lowering food and the collection of ladies’ tresses orchid (*Spiranthes diluvialis*) for use in commercial essences (USFS 1998). The commercial collection of NTFPs is largely under-monitored, although some level of reporting occurs in the field depending on the economic significance of NTFPs to specific regions.

TRAFFIC surveyed two U.S. federal land management agencies, the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) to ascertain the amount of material or number of commercial permits sold for as many of the 180 species of medicinal plants identified in its review of the U.S. market (Appendix I). TRAFFIC received more responses from the Bureau of Land Management (BLM) than the U.S. Forest Service (USFS). However, data compiled and submitted by USFS was generally more detailed and comprehensive than BLM's submission of information. This is partly attributed to the comparatively greater botanical diversity and economic value of medicinal plants growing in deciduous forests of the eastern United States where USFS manages the preponderance of federal land. By focusing on medicinal plants, an economically important group of special forest products, it is hoped that this review will provide some indication as to the level of interest in or demand for certain medicinal plants collected from lands managed by BLM and USFS. Moreover, this study aims to reveal gaps in the reporting, monitoring and management of medicinal plants so that follow-up research and appropriate steps can be identified and taken to prevent or reverse unsustainable collection, while ensuring future supplies of botanicals.

Bureau of Land Management (BLM)

A checklist of medicinal plant species prepared by TRAFFIC was distributed to 67 field offices of the Bureau for Land Management (BLM). Forty (60 percent) BLM field or district offices responded. Written responses were received from BLM in the following Western states: California, Colorado, Idaho, Nevada, Oregon, Utah and Wyoming. A review of information submitted by BLM field offices indicates that collection permits were issued during the period 1995-97 for: a) medicinal plant species in TRAFFIC's checklist; and b) plant species not listed in the checklist. It is believed that the species in the latter group were reported by BLM to TRAFFIC because they have known medicinal and/or culinary value and are likely harvested for these reasons. A third category of plants for which permits were reportedly issued by or requested from BLM includes various plants, or parts of plants, gathered for genetic and pharmaceutical research, nursery stock, landscaping, firewood or decoration. For example, the BLM District Office in Las Vegas, Nevada had received from a botanical garden two requests for collecting small amounts of non-specific plants for screening of medicinal properties.

BLM offices providing information on species and amounts of medicinal plants collected are: Montrose (Uncompahgne) Field Office, Colorado; Dixie Resource Area, Utah; Eugene District Office, Oregon; and Coos Bay Resource Area, Oregon. The latter three provided the majority of information to TRAFFIC. The BLM Field Office in Elko, Nevada indicated that several of the species in TRAFFIC's list are collected in its district, but was unable to provide further information because collections are unauthorized and therefore undocumented. The Coos Bay BLM District Office in Oregon marked a number of species found in its district that are of commercial interest to collectors but did not provide any information on permits issued or amounts sold.

Medicinal plants (plants known to be valued and used medicinally) for which permits were sold by BLM and the amount of material authorized for collection under each permit sold or issued are summarized in Table 4. There is a fairly high probability that the reported amount of plant

material approved for collection of specified species under BLM permits differs from, and may be lower than, the actual amount of material collected for species on BLM lands. This is based on the assumption that a portion of individuals gathering wild plants do so without obtaining the necessary permits. However, it is also conceivable that the amount of material actually collected for a plant falls short of the amount approved under a permit, as manual checking of material harvest is not carried out on a routine basis.

The information summarized in Table 4 indicates that a total of nine plant species valued for medicine were targeted by collectors on lands managed by BLM. Six species had been previously identified by TRAFFIC on the U.S. herb market, while three previously unidentified species were also documented from permits issued to prospective collectors. While all species have known medicinal value and were likely collected for such purpose, at least two species (*Juniperus monosperma*, *Populus tremuloides*) were likely sought for greenery (decoration) or fuelwood, as is indicated by the units (boughs, cords) used to record amounts authorized for collection.

Table 4. Species of medicinal plants collected on BLM lands for 1995-1997

| ***SPECIES[1] IN TRAFFIC'S CHECKLIST*** | | | | | |
|---|---|---|---|---|---|
| **SCIENTIFIC NAME** | **COMMON NAME** | **FAMILY** | **PERMITS ISSUED OR AMOUNT SOLD** | | |
| | | | ***1995*** | ***1996*** | ***1997*** |
| *Ephedra viridis* | Green mormon-tea | Ephedraceae | 2,000 lb. | 5,000 lb. | 5,000 lb. |
| *Juniperus monosperma* | One-seeded juniper | Cupressaceae | 200 cords<br>5,000 lb. (boughs)<br>2,000 lb. (berries) | 200 cords<br>6,720 lb. (boughs)<br>5,000 lb. (berries) | 200 cords<br>6,720 lb. (boughs)<br>5,000 lb. (berries) |
| *Larrea tridentata* | Creosote bush | Zygophyllaceae | 2,000 lb. | 5,000 lb. | 3,000 lb. |
| *Mahonia nervosa* | Oregon grape | Berberidaceae | 70 lb. | 285 lb. | 335 lb. |
| *Populus tremuloides* | Quaking aspen | Salicaceae | 35,000 cords | 41,000 cords | 43,000 cords |
| *Rhamnus purshiana* | Cascara buck-thorn | Rhamnaceae | 2,650 lb. | 1,175 lb. | 500 lb. |
| ***SPECIES[1] NOT IN TRAFFIC'S CHECKLIST BUT REPORTED AS COLLECTED BY BLM*** | | | | | |
| **SCIENTIFIC NAME** | **COMMON NAME** | **FAMILY** | **AMOUNT SOLD OR PERMITS ISSUED** | | |
| | | | ***1995*** | ***1996*** | ***1997*** |
| *Arctostaphylos pungens* | Pointleaf manzanita | Ericaceae | 2,000 lb. | - | 1,000 lb. |
| *Artemisia filifolia* | Sand sagebrush | Asteraceae | - | - | 1,000 lb. |
| *Eriodictylon angustifolia* | Narrowleaf yerbasanta | Hydrophyllaceae | 2,000 lb. | 5,000 lb. | 3,000 lb. |
| Edibles and Medicinals | | | 70 lb. | 40 lb. | 40 lb. |

Source: Bureau of Land Management

NOTES:

[1] While all species have reported medicinal utility, it could not be ascertained from permit information whether species were specifically sought for medicinal use

BLM field offices in Montrose (Uncompahgne), Colorado and Coos Bay Resource Area, Oregon reported that the following medicinal plant species in TRAFFIC's checklist are collected but no specific information on amounts collected or permits issued were provided: *Achillea millefolium* (Common yarrow) Asteraceae; *Aralia californica* (California spikenard) Araliaceae; *Artemisia dracunculus* (Dragon wormwood) Asteraceae; *Ephedra antisyphilitica* (Mormon tea), Ephedraceae; *Prunus emarginata* (Bitter cherry) Rosaceae; *Prunus virginiana* (Chokecherry) Rosaceae; *Sambucus canadensis* (Common elderberry) Caprifoliaceae; *Sambucus cerulea* (Blue elderberry) Caprifoliaceae; *Grindelia squarrosa* (Broadleaf gumweed) Asteraceae;

*Chimaphila umbellata* (Common wintergreen) Pyrolaceae; *Oplopanax horridus* (Devil's-club) Araliaceae; *Vaccinium ovatum* (Evergreen blueberry) Ericaceae.

United States Forest Service

Medicinal plant checklists were mailed to nine U.S. Forest Service regional offices for information on permits issued or sold in 1995, 1996 and 1997 for the collection of approximately 180 species. Regional USFS offices were requested to elicit information from National Forests and individual Ranger Districts, of which there are more than 600 nationwide. Two USFS regions, Regions 8 and 9, which together comprise 33 states in the eastern and southern United States, were the only regions that provided TRAFFIC with information from National Forests within their jurisdiction. TRAFFIC summarized species information based on the issuance of "fee" or "charge" permits only, which generally represent plants intended for commercial resale. "Special use" and "free" permits, which typically involve small-scale collections of plants for personal use or research purposes, are not analyzed in any great detail given the low volumes of plant material collected.

The following National Forests in Region 9 reviewed the checklist and submitted written responses: Chequamegon National Forest (Wisconsin), Hoosier National Forest (Indiana), Monongahela National Forest (West Virginia), and Wayne National Forest (Ohio). Forest Districts in the Chequamegon National Forest, of which there are three, reportedly issued no special use permits for the collection of medicinal plants specified in the checklist. However, anecdotal evidence suggests that American ginseng (*Panax quinquefolius*) has been poached in the Forest, while other medicinal plants are gathered by the public for personal use (Sheehan in litt. 1998). The Treaty Rights tribes have access to medicinal plants in the Chequamegon National Forest under a special arrangement with the federal government.

Approximately 19 National Forests in 11 southern states in Region 8 responded to TRAFFIC's request for information on medicinal plant permit sales, although not every National Forest reported pertinent or substantive information. The following National Forests submitted relevant and useful information: Chattahoochee-Oconee National Forest (Georgia), Cherokee National Forest (Tennessee), Daniel Boone National Forest (Kentucky), George Washington and Jefferson National Forest (Virginia), Ocala National Forest (Florida), Osceola National Forest (Florida), Ozark-St. Francis National Forest (Arkansas), Nantahala National Forest (North Carolina), and Pisgah National Forest (North Carolina).

While there were no reported permit sales in the Kistatchie National Forest (Louisiana) for specified medicinal plants in TRAFFIC's checklist from 1995-97, free use permits were issued for sassafras (*Sassafras album*) leaves, honeysuckle (*Lonicera* spp.) and grapevine (*Vitis* spp.) during this period. No permits were reportedly sold for specific medicinal plants in any of the National Forests (Bienville, Delta, De Soto, Homochitto, Holly Springs, Tombigbee) in Mississippi from 1995-97, though permits were issued for a variety of non-timber forest products, including magnolia (*Magnolia* spp.) leaves, honeysuckle (*Lonicera* spp.) plants, cane (*Arundinaria* spp.) plants and pine kindling. The Ouachita National Forest (Arkansas) reported no permit sales for specific medicinal plants in 1995, 1996 or 1997, but issued permits for moss in 1995 and permits for a number of other forest products such as cedar (*Juniperus* spp.) posts, hay (Poaceae), pine (*Pinus* spp.) knots, dogwood (*Cornus* spp.) and Xmas trees from 1995-97.

The National Forests in Alabama, particularly the Shoal Creek Ranger District, reported permits issued for kudzu collection in 1996 and 1997.

As is the case for plants collected on BLM lands, most of the plants included in Table 6 are known to be traded as medicinal herbs or have reported medicinal use or value. A total of 40 species for which permits had been issued or sold by USFS had been previously identified on the U.S. market and circulated in the form of a checklist to BLM and USFS for feedback. The species, genera and groups of plants not previously identified by TRAFFIC for circulation and comment to BLM and USFS are defined as "Species Not in TRAFFIC's Checklist but Reported as Collected by USFS." While several of these may in fact be collected and traded as medicinal herbs, much less is known about the medicinal utility of these plants. It is likely that a few (*Galax* spp., *Kalmia latifolia*, *Leucothoe* spp., *Rhodondedron* spp. and *Vitis* spp.,) are collected primarily for non-medicinal purposes. Of this latter group, 13 plants are identifiable to the species or genus level, while the others fall into one of three general plant categories (cane, fern, moss) or a catch-all category (non-specified roots, leaves, herbs or medicinal herbs). Permits issued for special forest products that are clearly not collected for medicine were not quantified or analyzed in this report.

It is virtually impossible to quantify harvest levels of medicinal plants collected in National Forests owing to the lack of available information on the number of plants or actual amount of plant material sourced from these areas. A more accurate measure of collection would be reporting and monitoring the actual amount of plant material collected. In lieu of harvest data, however, permit information, such as number of permits issued and/or amount of plant material approved for collection under each permit, can be used as a general indicator of popularity or demand for certain species. The number of permits issued by USFS from 1995-97 for the collection of the most popular plants of known, reported or unconfirmed (yet potential) medicinal value in National Forests throughout the eastern and southern United States is displayed in Table 5. Species for which fewer than 50 permits were issued are listed in Table 6.

The plants and plant groups itemized in Tables 5 and 6 represent those species for which "fee" permits have been issued to collectors who intend to resell plants for profit. With the exception of *Galax* spp., *Kalmia latifolia*, moss, *Vitis* spp. and possibly *Rhododendron* spp. and *Leucothoe* spp., which are also collected for the nursery and floral products trade, most plants in Table 5 are valued botanicals for which there are well-established local, domestic and overseas markets.

It is interesting to note that a few National Forests and specific ranger districts within National Forests have taken steps to reduce potentially unsustainable collection of some high-value medicinal plants from the wild. These regulatory measures may be in response to methods, intensities or levels of collection that may be incompatible with the sustainability or even survival of sensitive species. Biological or ecological constraints and environmental threats (e.g., habitat alteration, invasive species) may exacerbate conservation concerns for species already impacted by collecting. The following is a summary of actions taken by various National Forests to protect high-demand, vulnerable and/or sensitive species prone to exploitation.

American ginseng (*Panax quinquefolius*) and goldenseal (*Hydrastis canadensis*) are two such plants for which permits are no longer issued in the Hoosier National Forest in Indiana.

Biologists recently evaluated the status of American ginseng in the Hoosier and determined that its population within the National Forest cannot be sustained at current harvest levels. The large number of permits issued (Table 6) by the Hoosier for ginseng from 1995-97 indicates significant demand for both species. According to surveyed permittees, there is less wild ginseng in the Hoosier National Forest now than in previous years. Furthermore, a field survey of 400 acres in the Forest revealed three ginseng plants (Day in litt. 1997). The Cherokee National Forest in Tennessee no longer allows the commercial collection of witch-hazel (*Hamamelis virginiana*) and the Unaka Ranger district within in the Cherokee no longer issues permits for ginseng, moss, pink-lady's slipper (*Cypripedium acaule*), *Trillium*, and hazelnut (*Corylus americana*). Further harvest restrictions apply to ginseng, Solomon's seal (*Polygonatum biflorum*), fire pink (*Silene virginica*), pokeweed (*Phytolacca americana*), mountain laurel (*Kalmia latifolia*), branch lettuce (*Saxifraga pensylvanica*) and ramp (*Allium tricoccum*). Ginseng diggers are also subject to harvest rules in the George Washington and Jefferson National Forests in Virginia; individual ranger districts have reported several violations and incidents involving illegal or questionable ginseng harvest in recent years.

Table 5. Popular Species of Medicinal Herbs or Foods Sought from National Forests for 1995-97.

| **Species** | **1995 Permits** | **1996 Permits** | **1997 permits** | **Total** | **Source Identified as Medicinal** |
|---|---|---|---|---|---|
| American ginseng | 1,483 | 2,272 | 1,660 | 5,415 | M, F/D, C |
| Goldenseal | 254 | 781 | 512 | 1,547 | M, F/D, C |
| Ramps, Wild leeks | 351 | 345 | 362 | 1,058 | F/D, I |
| Moss | 135 | 125 | 148 | 408 | U |
| Bloodroot | 35 | 168 | 155 | 358 | M, F/D, C |
| Rhododendron | 82 | 75 | 113 | 270 | F/D, M |
| Mountain laurel | 65 | 58 | 79 | 202 | F/D, M |
| Blue cohosh | 3 | 42 | 43 | 88 | M, F/D, C |
| Black cohosh, bugbane | 4 | 33 | 50 | 87 | M, F/D, C |
| Yellow root | 12 | 55 | 17 | 84 | M, F/D |
| Dutchman's-pipe, Smokevine | 19 | 18 | 30 | 67 | F/D |
| Running pine, club moss | - | 29 | 30 | 59 | M, F/D, C |

Source: U.S. Forest Service

Source Identified as Medicinal (Key): C (trade catalogs); F/D (Foster, S. and Duke, J. 1990. Eastern/Central Medicinal Plants. Peterson Field Guide, Hougton Mifflin Company, New York, USA); I (The Internet); M (Mabberley, D.J. 1997. The Plant Book. Cambridge University Press, Cambridge, United Kingdom); U (Unconfirmed, possible medicinal).

Table 6. Species of medicinal plants collected from National Forests in Regions 8 and 9 of the U.S. Forest Service for 1995-1997

| *SPECIES IN TRAFFIC'S CHECKLIST* | | | | | |
|---|---|---|---|---|---|
| **SCIENTIFIC NAME** | **COMMON NAME** | **FAMILY** | **PERMITS ISSUED**[1] | | |
| | | | ***1995*** | ***1996*** | ***1997*** |
| *Adiantum pedatum* | Northern maiden-hair fern | Pteridaceae | 1 permit❶ | 2 permits❶ | |
| *Alertis farinosa* | White-tubed colicroot, star root, star grass | Liliaceae | 2 permits (1,000 lb.) ⓾ | 2 permits (1,000 lb.) ⓾ | |
| *Aralia racemosa* | American spikenard | Araliaceae | 1 permit (500 lb.) ⓾ | | |
| *Aristolochia serpentaria* | Virginia snakeroot | Aristolochiaceae | 19 permits❶ | 20 permits❶ | 6 permits❶ |
| *Asarum canadense* | Canada wild ginger | Aristolochiaceae | | 25 permits❸ | 6 permits❸ |
| *Asimina triloba* | Pawpaw | Annonaceae | | 1 permit❶ | |
| *Baptisia tinctoria* | Yellow wild-indigo | Fabaceae | | | 2 permits (200 lb.) ❻<br>3 permits (1,650 lb.) ① |
| *Caulophyllum thalictroides* | Blue cohosh | Berberidaceae | 3 permits❶ | 4 permits❶<br>38 permits❸ | 2 permits❶<br>41 permits❸ |
| *Cimifuga racemosa* | Black cohosh/bugbane | Ranunculaceae | 3 permits (500 lb.)❹<br>1 permit (1,500 pieces)❻ | 1permit❶<br>30 permits❸<br>1 permit (200 lb.) ❹<br>1 permit (1,500 pieces)❻ | 46 permits❸<br>1 permit (300 lb.)❹<br>2 permits (1,700 lb., 1,500 pieces) ❻<br>1 permit (100 lb.) ⓾ |
| *Conyza canadensis* | Canada horseweed | Asteraceae | | 2 permits❶ | |
| *Dioscorea villosa* | Yellow yam | Dioscoreaceae | 8 permits❶ | 5 permits❶ | 1 permit❶ |
| *Eupatorium perfoliatum* | Common boneset | Asteraceae | 1 permit❶ | 2 permits❶ | 1 permit❶ |
| *Eupatorium purpureum* | Sweet joe-pye weed | Asteraceae | 1 permit❶ | 1 permit❶ | 2 permits❶ |
| *Fraxinus americana* | White ash | Oleaceae | 316 mbf❷ | 387 mbf❷ | 409 mbf❷ |
| *Geranium maculatum* | Wild crane's-bill | Geraniaceae | 2 permits | | 2 permits |
| *Hydrastis canadensis* | Goldenseal | Ranunculaceae | 254 permits❶ | 505 permits❶<br>274 permits (274 lb.) ❸<br>2 permits (66 gallons)❺ | 317 permits❶<br>193 permits❸<br>2 permits (10 lb., 33 gallons)❺ |
| *Hamamelis virginiana* | American witch-hazel, beadwood | Hamamelidaceae | 4 permits (2,000 lb.) ⓾ | 1permit❶ | 2 permits (1 ton - leaves and roots) ❻<br>2 permits (1,000 lb.) ⓾ |
| *Jeffersonia diphylla* | Twinleaf | Berberidaceae | | 1 permit❶<br>1 permit❸ | |
| *Juglans nigra* | Black walnut | Juglandaceae | | | 1-2 trees❷ |
| *Lactuca canadensis* | Canada lettuce | Asteraceae | 17 permits❶ | 16 permits❶ | 11 permits❶ |
| *Lactuca floridana var. villosa* | Wild lettuce | Asteraceae | | 2 permits❶ | |
| *Lindera benzoin* | Spicebush | Lauraceae | | 1 permit❶ | |
| *Lobelia inflata* | Indian-tobacco | Campanulaceae | 1 permit❶ | 3 permits❶ | 3 permits❶ |

| | | | | | |
|---|---|---|---|---|---|
| *Lycopodium clavatum* | Running pine | Lycopodiaceae | | 29 permits (222 -100 lb. feed bags) ❷ | 30 permits (269 – 100 lb.feed bags) ❷ |
| *Mitchella repens* | Partridge-berry | Rubiaceae | 2 permits❶ | 4 permits❶ | |
| *Panax quinquefolius* | American ginseng | Araliaceae | 249 permits❶<br>175 permits (60 lb.)❸<br>54 permits (98 lb.)❹<br>121 permits (85 bushels, 225 lb..)❺<br>85 permits (517 lb.)❻<br>7 permits (7 lb.) ❽<br>87 permits (86 lb.) ❿<br>403 permits (403 lb.) ①<br>302 permits (922 lb.)② | 519 permits❶<br>72 permits❷<br>310 permits (100 lb.) ❸<br>118 permits (234 lb.) ❹<br>131 permits (230 bushels, 884 lb.)❺<br>28 permits (28 bushels) ΨC<br>160 permits (155 lb.) ❻<br>6 permits (6 lb.) ❽<br>20 permits (328 lb.) ❿<br>602 permits (602 lb.) ①<br>306 permits (924 lb.) ② | 318 permits❶<br>67 permits❷<br>194 permits❸<br>119 permits (208 lb.) ❹<br>170 permits (2,131 gallons, 745 lb., 8 bushels)❺<br>143 permits (9500 lb.??) ❻<br>10 permits (10 lb.) ❽<br>83 permits (95 lb.) ❿<br>195 permits (199 lb.)①<br>361 permits (488 lb.) ② |
| *Pinus strobus* | Eastern white pine | Pinaceae | <100 mbf❷<br>1 permit (6,000 lb. of boughs) ❺ | <100 mbf❷<br>1 permit (6,000 lb. of boughs)❺ | <100 mbf❷<br>1 permit (6,000 lb. of boughs)❺ |
| *Podophyllum peltatum* | May apple | Berberidaceae | 4 permits❶ | 8 permits❶ | 9 permits❶<br>9 permits❸ |
| *Polygonatum biflorum* | Common solomon's-seal | Liliaeceae | 2 permits❶ | 4 permits❶ | 3 permits❶ |
| *Populus tremuloides* | Quaking aspen | Salicaceae | | 1-2 trees❷ | |
| *Prunus serotina* | Wild black cherry | Rosaceae | 3,487 mbf❷ | 2,828 mbf❷ | 3,035 mbf❷ |
| *Quercus alba* | White oak | Fagaceae | 523 mbf❷ | 592 mbf❷ | 313 mbf❷ |
| *Quercus rubra* | Northern red oak | Fagaceae | 4,471 mbf❷ | 6,692 mbf\❷ | 5,707 mbf❷ |
| *Rhus glabra* | Smooth sumac | Anacardiaceae | 2 permits❶ | | 2 permits❶ |
| *Sanguinaria canadensis* | Bloodroot | Paperveraceae | 35 permits❶ | 105 permits❶<br>62 permits❸<br>1 permit (330 gallons)❺C | 97 permits❶<br>57 permits❸<br>1 permit (33 gallons)❺C |
| *Sanicula marilandica* | Black snake-root | Apiaceae | | 5 permits❸<br>1 permit (330 gallons)❺C | 26 permits❸ |
| *Sassafras albidum* | Sassafras | Lauraceae | 4 permits❶<br>600 pieces② | 2 permits❶<br>1,200 pieces② | 6 permits❶<br>1 permit❸ |
| *Sereona repens* | Saw palmetto | Arecaceae | 1 permit (4 bushels)④ | 4 permits (6,400 lb.)③<br>5 permits (4,000 lb.) ④ | 2 permits (3,200 lb.)③<br>2 permits (2,000 lb.) ④ |
| *Zanthorriza (=Xanthorhiza) simplicissima* | Yellow root | Ranunculaceae | 11 permits (66 lb. gn)❺<br>1 permit (100 lb.)❻ | 26 permits (3, 729 gallons, 54 lb. gn)❺<br>28 permits (28 bushels)❺C<br>1 permit (700 lb.) ① | 11 permits (132 gallons, 10 lb., 36 lb. gn)❺<br>1 permit (33 gallons) ❺C<br>1 permit (100 lb.) ❻<br>4 permits (100 lb.) ① |
| *Zanthoxylum americanum* | Northern prickley ash | Rutaceae | | 2 permits❶ | |

| ***SPECIES[2] NOT IN TRAFFIC'S CHECKLIST BUT REPORTED AS COLLECTED BY USFS*** | | | | | |
|---|---|---|---|---|---|
| *Allium tricoccum*[3] | Ramp, wild leek | Liliaceae | 10 permits (20 pokes)❽<br>318 permits (1,570 lb., 4 bushels) ❿<br>33 permits (33 bushels) ① | 3 permits (12 pokes)❽<br>314 permits (1,545 lb., 5 bushels) ❿<br>31 permits (27 bushels) ① | 17 permits (68 pokes)❽<br>338 permits (23 bushels, 1,660 lb.) ❿<br>24 permits (62 bushels) ① |
| *Aristolochia tomentosa* | Dutchman's-pipe, smokevine | Aristolochiaceae | 6 permits (1,000 lb., 60 pieces)❻<br>3 permits (1,000 lb.) ❿<br>10 permits (291 lb.) ① | 5 permits (2,357 lb.) ❻<br>1 permit (400 lb.) ❿<br>12 permit (319 lb.) ① | 6 permits (3,228 lb.) ❻<br>7 permits (2,400 lb.)❿<br>17 permits (197 lb.) ① |
| *Betula* spp. | Birch | Betulaceae | 1 permit (1,000lb./twigs) ❻ | | 1 permit (10 lb.) ❻ |
| Cane | | | 1 permit (1 lot) ❺ | | 2 permits (2 lots)❺ |
| Ferns | | | 1 permit (100 pieces) ❻<br>4 permits (100 plants)❽<br>2 permits (12 plants) ❿<br>19 permits (606 plants) ① | 2 permits (60 plants) ❽<br>10 permits (640 plants) ① | 3 permits (90 plants) ❽<br>5 permits (290 plants) ① |
| *Galax* spp. | | Diapensiaceae | 10 permits (8,560 pieces) ❻<br>432 permits (101 tons) ❿<br>17 permits (6 tons, 20 pieces)① | 9 permits (17,050 pieces) ❻<br>596 permits (141 tons) ❿<br>25 permits (5 tons, 15 pieces) ① | 3 permits (24 each/1,000) ❻<br>1 permit (200 lb.) ❽<br>3 permits (900 lb.) ❽<br>530 permits (139 tons)❿<br>11 permits (4 tons, 15 pieces) ① |
| *Juglans* spp. | Walnut | Juglandaceae | | 1 permit (2 bushels) ① | 2 permits (2 bushels/walnuts) ① |
| *Kalmia latifolia* | Mountain laurel | Ericaceae | 1 permit (500 branches) ❹<br>23 permits (5,400 lb.)❽<br>11 permits (160 plants, 750 roots)❽❍<br>25 permits (7 tons, 22 cords, 5300 sticks)❿<br>5 permits (20 plants, 8000 posts)① | 1 permit (500 branches) ❹<br>3 permits (100 pieces, 2,500 lb. of sticks)❻<br>5 permits (2,500 lb. of leaves)❽<br>7 permits (130 plants, 300 roots)❽❍<br>42 permits (10 tons, 72 cords of sticks, 700 individual sticks) ❿ | 5 permits (2,200 lb.)❽<br>22 permits (915 plants)❽❍<br>52 permits (11 tons, 92 cords of sticks, 800 sticks, 48 plants)❿<br>1 permit (15 pieces)① |
| *Leucothoe* spp. | Dog hobble, fetter bush | Ericaceae | 6 permits (3,000 lb.) ❿ | 8 permits (4,000 lb.) ❿ | 1 permit (500 lb.) ❿ |
| Moss[4] | | | 1 permit (10 bushels) ❹<br>6 permits (1500 lb.) ❻<br>2 permits❼<br>25 permits (6,133 lb.) ❿<br>101 permits (10 tons) ① | 2 permits (25 bushels) ❹<br>7 permits (350 lb.)❺<br>6 permits (1556 lb.) ❻<br>31 permits (8, 233 lb.) ❿<br>79 permits (8 tons) ① | 1 permit (15 bushels)❹<br>15 permits (3,993 lb.) ❻<br>1 permit (1,250 lb.) ❽<br>16 permits (4,614 lb.)❿<br>115 permits (17 tons) ① |
| *Myrica* spp. | Myrtle | Myricaceae | 4 permits (6,770 pieces)③ | | 1 permit (260 pieces) ④ |
| *Pueraria lobata* | Kudzu | Fabaceae | | 1 permit (500 lb.) ❻<br>1 permit❾ | 1 permit❾ |

| | | | | | |
|---|---|---|---|---|---|
| *Quercus* spp. | Oak | Fagaceae | | | 1 permit (2 bushels) ① |
| *Pinus* spp. | Pine (needles) | Pinaceae | | | 1 permit (10 boughs) ❹ |
| *Rhododendron* spp. | | Ericaceae | 67 permits (7,645 pieces)❻<br>11 permits 160 plants, 750 roots)❸◔<br>4 permits (36 plants, 500 posts) ① | 67 permits (5,290 pieces) ❻<br>7 permits (130 plants, 300 roots)❸◔<br>1 permit (500 posts) ① | 87 permits (7,742 pieces) ❻<br>22 permits ( 915 plants) ❸◔<br>2 permits (2 bushels) ❿<br>2 permits (48 plants) ① |
| *Rosmarinus officinalis* | Rosemary | Lamiaceae | | | 1 permit (2,500 pieces) ④ |
| Non-specified roots, leaves, herbs, or medicinal herbs | | | 2 permits (2,000 pieces) ❻<br>2 permits (1 bushel, 2 bunches) ❿<br>4 permits (30 lb.) ① | 41 permits (4,100 lb.) ❺<br>1 permit (1 lb.) ① | 52 permits (5,200 lb.)❺<br>2 permits (66 gallons)❺<br>1 permit (100 lb.) ❿<br>2 permits (2 lb.)① |
| *Trilisa odoratissima* | Deer's tongue | Asteraceae | 8 permits (800 lb.) ③ | 2 permits (200 lb.) ③ | 2 permits (200 lb.) ③ |
| *Vitis* spp. | Grape (vine) | Vitaceae | 6 permits (5,000 ft., 1 pu trucks) ❺<br>30 permits (20,800 lb.) ❻<br>1 permit (600 lb.)❽<br>1 permit (500 lb.) ❿ | 1 permit (1000 ft) ❹<br>7 permits (3,000 ft., 12 pu trucks)❺<br>27 permits (9,000 lb., 5257 pieces) ❻<br>2 permits (1,000 lb.) ❿<br>1 permit (1 piece) ① | 10 permits (28 pu trucks)❺<br>23 permits (4,600 lb.)❺<br>33 permits (6,920 lb.) ❻<br>1 permit (600 lb.) ❽<br>1 permit (500 lb.) ❿ |

Source: U.S. Forest Service

Key:

❶ - Hoosier National Forest (Indiana)
❷ - Monogahela National Forest (West Virginia)
❸ - Wayne National Forest (Ohio)
❹ - George Washington and Jefferson National Forest (Virginia)
❺ - Daniel Boone National Forest (Kentucky)
❻ - Cherokee National Forest (Tennessee)
❼ - Ouachita National Forest (Arkansas)
❽ - Chattahoochee-Oconee National Forest (Georgia)
❾ - National Forests (Shoal Creek Ranger District) in Alabama
❿ - Pisgah National Forest (North Carolina)

① - Nantahala National Forest (North Carolina)
② - Ozark-St. Francis National Forest (Arkansas)
③ - Osceola National Forest (Florida)
④ - Ocala National Forest (Florida)

Notes:

[1] - Figures in parentheses represent total amount of material authorized for collection under all permits issued for that year.
[2] - It is not known whether species were specifically sought for medicinal use or some other purpose
[3] - Includes free use permits as volume collected under such permits is large and may involve some level of trade
[4] - It is possible that permits were issued for more than one type of plant known as moss: 1) non-vascular bryophytes (tree moss, log moss); or 2) vascular club-mosses (*Lycopodium* spp.); it is likely most permits were issued for bryophytes
◔ - Indicates that permit(s) was issued for collection of multiple species

*Preliminary Recommendations for Improving Species Monitoring/Permitting*

There is extensive and continuing interest in the collection of bulk raw plant material from public lands managed by BLM and USFS for certain species, some of which are valuable medicinals and enter domestic and international commerce as such. Gaining a better understanding of BLM and USFS lands as a source of plant material for the commercial trade in medicinal herbs, foods and cosmetics and studying the sustainability of this activity should be priorities for both federal agencies.

During Part IV, a more thorough analysis of the permit review and issuance process for medicinal plants in select National Forests in the Klamath-Siskiyou and Appalachian/Blue Ridge regions will be undertaken. The upcoming analysis should help to validate, refine or refute the observations and recommendations made in this report and might identify other areas and needs for improving the USFS system under which medicinal plants harvested from National Forests are monitored and prioritized for management attention. Based on an assessment of USFS permits obtained during Part II, TRAFFIC has identified gaps or deficiencies in the permitting process. Using medicinal plants as a case study, TRAFFIC is recommending that the proposed modifications be implemented to improve the quality and utility of information available to USFS for managing commercially popular special forest products.

- The fee for permits (or cost per unit of biomass) is not always consistent with the fair market value of the plant nor does it take into account biological or management considerations. For instance, the part of a plant that permittees intend to collect may result in the destruction of that plant, which places the resource at greater risk from harvest pressure and practices. If harvest destroys a plant then the cost to the resource, and to the management of the resource, increases. Moreover, permit fees/prices per pound in many instances are disproportionately lower than the value of the medicinal plant to the commercial broker and much lower than the end market price of the resource to consumers.

  This is the case for American ginseng, whose permit fee and price per unit of biomass is determined by each National Forest and, in some cases, individual Ranger Districts within National Forests (Table 7). The price for collecting ginseng roots in National Forests in North Carolina is $30 per (wet) pound, or one-third the value of the price ($90/lb.) that dealers pay diggers for ginseng roots (Kauffman pers. comm. 1999). The fee of $30/lb. (wet) is the highest reported for any National Forests. It has also been documented that certain National Forests sell permits for the collection of a minimum amount of plant material. The requirement that a collector pays for a minimum amount of plant material before collection is authorized or permits are issued does not appear to be related to any biological criteria. Setting arbitrarily limits for the minimum number of plants or amount of plant material that may be collected could undermine the management of resources subject to such policies. For instance, the George Washington and Jefferson National Forests in Virginia authorize ginseng collection for a minimum of two pounds of wet (fresh) roots ($20/lb.).

  The socioeconomic and cultural backgrounds of harvesters and the importance of a transparent permitting process to Forest Service managers suggests that fees for collecting medicinal plant should not be unreasonably or prohibitively high but should reflect the value

of the resource and impact of harvest. Where applicable, policies requiring that a minimum amount of raw plant material be purchased as a condition of collection should be reviewed and modified according to scientific guidelines and biological criteria.

- Another documented problem with permits is the disparity in the amount of plant material authorized for collection versus actual amount harvested. This is an issue applicable to both BLM and USFS. The amount of plant material or number of plants authorized for collection should be manually checked against actual harvest so that BLM and USFS staff can make management decisions using actual versus projected harvest data. Permittees should report back to field offices from which permits were obtained for verification and validation of plant material collected. Post-harvest feedback also provides these federal agencies with another opportunity to ask harvesters about the status, condition and availability of the resource.

  The number of permits issued can be a general indicator of species popularity, but it is not necessarily the best reflection of volume of plant material harvested under each permit. A comparison of permits issued for American ginseng (*Panax quinquefolius*) and saw palmetto (*Serenoa repens*) illustrates this point. While more than 5,400 USFS fee permits were issued for American ginseng roots from 1995-97, authorized collection amounts, with a few exceptions, were about 1-2 lb. of roots for each ginseng permit. Contrastingly, only 13 USFS fee permits were issued for an average authorized collection of 1,200 lb. of saw palmetto berries during the same period. The large volume of saw palmetto berries and comparatively smaller amount of ginseng roots approved for collection suggests that the number of permits issued do not correspond with the amounts approved under each permit. For management and enforcement purposes, pre-approved harvest amounts should be compared with amounts actually harvested from BLM lands and National Forests.

- Standardization of units used to quantify the amount of plant material authorized for collection should be encouraged so that units of measurement correlate and compare more accurately with the number of plants harvested. Greater uniformity in units on BLM and USFS permits would also improve the validity of comparisons in permit data, reports and analyses among lands managed by BLM and USFS. A few of the units presently used to quantify estimated harvest are arbitrary and cannot be used to extrapolate the number of plants harvested (Table 7); and

- Where applicable and feasible, it might improve the transparency and management utility of permit information if managers reported the following additional information when approving special forest products (e.g., medicinal plants) for collection: scientific and common names of plants, desired plant part(s) and site(s) targeted for collection. This information could help federal land management agencies determine whether, which and where plants are subject to destructive harvest practices. Examples of plants for which identification to the species and even genus level was difficult to ascertain from permit information are: *Betula* spp., cohosh, ferns, *Galax* spp., *Juglans* spp., *Leucothoe* spp., moss, *Myrica* spp., *Pinus* spp., *Quercus* spp., *Rhododendron* spp. and *Vitis* spp.

Table 7. Collecting fees and units of measurement for ginseng collection in select National Forests

| State | National Forest | Collecting Fee | Unit of Measurement[1] |
|---|---|---|---|
| North Carolina | Pisgah, Nantahala | $30.00 | Pound |
| Kentucky | Daniel Boone (Stearns Ranger District) | $10.00 | 33 Gallon Bag |
| | Daniel Boone (London Ranger District) | $1.00 | Pound |
| | Daniel Boone (Somerset Ranger District) | $10.00 | Bushel |
| | Daniel Boone (Redbird Ranger District) | $10.00 | Pound |
| | Daniel Boone (Stanton Ranger District) | $2.00 | Gallon |
| | Daniel Boone (Morehead Ranger District) | $10.00 | ½ Pound |
| Virginia | George Washington, Jefferson | $20.00 | Pound |
| Arkansas | Ozark-St.Francis | $15.00 | Pound |
| Georgia | Chattahoochee-Oconee | $25.00 | Pound |
| Tennessee | Cherokee (Hiswassee, Ocoee, Watauga Ranger Districts) | $15.00 | Pound |
| | Cherokee (Tellico Ranger District) | $15.00 | Permit |

Source: U.S. Forest Service

[1] Refers to wet or green weight

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**Appendix I.** List of Native North American Plants Identified on U.S. Herb Market and Distributed to BLM and USFS for Information on Permits Issued or Sold for Each Species

**USFS Ranger District or BLM District/Area**

**If you have no amount data other than the number of permits issued, insert that number in the Amount Sold column and insert the maximum amount that could have been collected through the permit in the space below.**

| WWF/TNC Medicinal Plant List | | Permit Maximum Amount | Amount Sold 1995 | Amount Sold 1996 | Amount Sold 1997 |
|---|---|---|---|---|---|
| **BOTANICAL NAME** | **FAMILY** | **Common Name** | | | |
| POLYGONUM BISTORTOIDES | POLYGONACEAE | AMERICAN BISTORT | | | |
| CASTANEA DENTATA | FAGACEAE | AMERICAN CHESTNUT | | | |
| PARTHENIUM INTEGRIFOLIUM | ASTERACEAE | AMERICAN FEVER-FEW | | | |
| PANAX QUINQUEFOLIUS | ARALIACEAE | AMERICAN GINSENG | | | |
| PORTERANTHUS STIPULATUS | ROSACEAE | AMERICAN IPECAC | | | |
| HEDEOMA PULEGIOIDES | LAMIACEAE | AMERICAN PENNYROYAL | | | |
| ARALIA RACEMOSA | ARALIACEAE | AMERICAN SPIKENARD | | | |
| NYMPHAEA ODORATA | NYMPHAEACEAE | AMERICAN WATER-LILY | | | |
| HAMAMELIS VIRGINIANA | HAMAMELIDACEAE | AMERICAN WITCH-HAZEL | | | |
| Arnica spp. | | Arnica | | | |
| POPULUS BALSAMIFERA SSP TRICHOCARPA | SALICACEAE | BALSAM POPLAR | | | |
| POPULUS BALSAMIFERA | SALICACEAE | BALSAM POPLAR | | | |
| ARCTOSTAPHYLOS UVA-URSI | ERICACEAE | BEARBERRY | | | |
| CERASTIUM BEERINGIANUM | CARYOPHYLLACEAE | BERING SEA CHICKWEED | | | |
| Pedicularis groenlandica | | Betony | | | |
| IPOMOEA PANDURATA | CONVOLVULACEAE | BIG-ROOT MORNING-GLORY | | | |
| PRUNUS EMARGINATA | ROSACEAE | BITTER CHERRY | | | |
| CIMICIFUGA RACEMOSA | RANUNCULACEAE | BLACK BUGBANE | | | |
| ILEX VERTICILLATA | AQUIFOLIACEAE | BLACK HOLLY | | | |
| SANICULA MARILANDICA | APIACEAE | BLACK SNAKE-ROOT | | | |
| NYSSA SYLVATICA | NYSSACEAE | BLACK TUPELO | | | |
| JUGLANS NIGRA | JUGLANDACEAE | BLACK WALNUT | | | |
| SANGUINARIA CANADENSIS | PAPAVERACEAE | BLOODROOT | | | |
| CAULOPHYLLUM THALICTROIDES | BERBERIDACEAE | BLUE COHOSH | | | |
| SAMBUCUS CERULEA | CAPRIFOLIACEAE | BLUE ELDERBERRY | | | |
| VERBENA HASTATA | VERBENACEAE | BLUE VERVAIN | | | |
| IRIS VERSICOLOR | IRIDACEAE | BLUEFLAG | | | |
| GRINDELIA SQUARROSA | ASTERACEAE | BROADLEAF GUMWEED | | | |
| ALNUS SERRULATA | BETULACEAE | BROOK-SIDE ALDER | | | |
| ASCLEPIAS TUBEROSA | ASCLEPIADACEAE | BUTTERFLY MILKWEED | | | |
| JUGLANS CINEREA | JUGLANDACEAE | BUTTERNUT | | | |
| ESCHSCHOLZIA CALIFORNICA | PAPAVERACEAE | CALIFORNIA POPPY | | | |
| ARALIA CALIFORNICA | ARALIACEAE | CALIFORNIA SPIKENARD | | | |
| TORREYA CALIFORNICA | TAXACEAE | CALIFORNIA TORREYA | | | |
| ERIODICTYON CALIFORNICUM | HYDROPHYLLACEAE | CALIFORNIA YERBA-SANTA | | | |

| WWF/TNC Medicinal Plant List | | Permit Maximum Amount | Amount Sold 1995 | Amount Sold 1996 | Amount Sold 1997 |
|---|---|---|---|---|---|
| **BOTANICAL NAME** | **FAMILY** | **Common Name** | | | |
| SOLIDAGO CANADENSIS | ASTERACEAE | CANADA GOLDENROD | | | |
| COLLINSONIA CANADENSIS | LAMIACEAE | CANADA HORSE-BALM | | | |
| CONYZA CANADENSIS | ASTERACEAE | CANADA HORSEWEED | | | |
| LACTUCA CANADENSIS | ASTERACEAE | CANADA LETTUCE | | | |
| ASARUM CANADENSE | ARISTOLOCHIACEAE | CANADA WILD-GINGER | | | |
| SCROPHULARIA MARILANDICA | SCROPHULARIACEAE | CARPENTER'S SQUARE FIGWORT | | | |
| FRANGULA PURSHIANA | RHAMNACEAE | CASCARA BUCK-THORN | | | |
| GALIUM APARINE | RUBIACEAE | CATCHWEED BEDSTRAW | | | |
| CAPSICUM ANNUUM | SOLANACEAE | CAYENNE PEPPER | | | |
| ACACIA GREGGII | FABACEAE | CATCLAW ACACIA | | | |
| Prunus virginiana | | Chokecherry | | | |
| APOCYNUM CANNABINUM | APOCYNACEAE | CLASPING-LEAF DOGBANE | | | |
| CELASTRUS SCANDENS | CELASTRACEAE | CLIMBING BITTERSWEET | | | |
| EUPATORIUM PERFOLIATUM | ASTERACEAE | COMMON BONESET | | | |
| SAMBUCUS CANADENSIS | CAPRIFOLIACEAE | COMMON ELDERBERRY | | | |
| HUMULUS LUPULUS | CANNABACEAE | COMMON HOP | | | |
| PHYTOLACCA AMERICANA | PHYTOLACCACEAE | COMMON POKEWEED | | | |
| POLYGONATUM BIFLORUM | LILIACEAE | COMMON SOLOMON'S-SEAL | | | |
| CHIMAPHILA UMBELLATA | PYROLACEAE | COMMON WINTERGREEN | | | |
| ACHILLEA MILLEFOLIUM | ASTERACEAE | COMMON YARROW | | | |
| YUCCA FILAMENTOSA | AGAVACEAE | COMMON YUCCA | | | |
| LARREA TRIDENTATA | ZYGOPHYLLACEAE | CREOSOTE BUSH | | | |
| CASTELA EMORYI | SIMAROUBACEAE | CRUCIFIXION THORN | | | |
| VERONICASTRUM VIRGINICUM | SCROPHULARIACEAE | CULVER'S-ROOT | | | |
| SILPHIUM PERFOLIATUM | ASTERACEAE | CUP-PLANT | | | |
| CHAMAELIRIUM LUTEUM | LILIACEAE | DEVIL'S-BIT | | | |
| OPLOPANAX HORRIDUS | ARALIACEAE | DEVIL'S-CLUB | | | |
| ARTEMISIA DRACUNCULUS | ASTERACEAE | DRAGON WORMWOOD | | | |
| ECHINACEA PURPUREA | ASTERACEAE | EASTERN PURPLE CONEFLOWER | | | |
| JUNIPERUS VIRGINIANA | CUPRESSACEAE | EASTERN RED CEDAR | | | |
| PINUS STROBUS | PINACEAE | EASTERN WHITE PINE | | | |
| ARGENTINA EGEDII | ROSACEAE | EGEDE CINQUEFOIL | | | |
| Pedicularis bracteosa | | Elephant's head | | | |
| VACCINIUM OVATUM | ERICACEAE | EVERGREEN BLUEBERRY | | | |
| LOMATIUM DISSECTUM | APIACEAE | FERN-LEAVED DESERT-PARSLEY | | | |
| EQUISETUM ARVENSE | EQUISETACEAE | FIELD HORSETAIL | | | |
| VIOLA BICOLOR | VIOLACEAE | FIELD PANSY | | | |
| CORNUS FLORIDA | CORNACEAE | FLOWERING DOGWOOD | | | |
| RHUS AROMATICA | ANACARDIACEAE | FRAGRANT SUMAC | | | |
| CHIONANTHUS VIRGINICUS | OLEACEAE | FRINGE TREE | | | |
| POLYGONATUM BIFLORUM VAR COMMUTATUM | LILIACEAE | GIANT SOLOMON'S SEAL | | | |
| HYDRASTIS CANADENSIS | RANUNCULACEAE | GOLDEN-SEAL | | | |

| WWF/TNC Medicinal Plant List | | Permit Maximum Amount | Amount Sold 1995 | Amount Sold 1996 | Amount Sold 1997 |
|---|---|---|---|---|---|
| **BOTANICAL NAME** | **FAMILY** | **Common Name** | | | |
| GRINDELIA CAMPORUM | ASTERACEAE | GREAT VALLEY GUMWEED | | | |
| EPHEDRA VIRIDIS | EPHEDRACEAE | GREEN MORMON-TEA | | | |
| JUNIPERUS COMMUNIS | CUPRESSACEAE | GROUND JUNIPER | | | |
| ZANTHOXYLUM CLAVA-HERCULIS | RUTACEAE | HERCULES-CLUB | | | |
| TRILLIUM ERECTUM | LILIACEAE | ILL-SCENT TRILLIUM | | | |
| MONOTROPA UNIFLORA | MONOTROPACEAE | INDIAN-PIPE | | | |
| LOBELIA INFLATA | CAMPANULACEAE | INDIAN-TOBACCO | | | |
| PEDICULARIS DENSIFLORA | SCROPHULARIACEAE | INDIAN WARRIOR | | | |
| ASCLEPIAS SYRIACA | ASCLEPIADACEAE | KANSAS MILKWEED | | | |
| VACCINIUM MACROCARPON | ERICACEAE | LARGE CRANBERRY | | | |
| CYPRIPEDIUM PUBESCENS | ORCHIDACEAE | LARGE YELLOW LADY'S-SLIPPER | | | |
| PROBOSCIDEA LOUISIANICA | PEDALIACEAE | LOUISIANA UNICORN-PLANT | | | |
| SCUTELLARIA LATERIFLORA | LAMIACEAE | MAD DOG SKULLCAP | | | |
| DRYOPTERIS FILIX-MAS | DRYOPTERIDACEAE | MALE FERN | | | |
| ERYNGIUM AQUATICUM | APIACEAE | MARSH RATTLESNAKE MASTER | | | |
| PODOPHYLLUM PELTATUM | BERBERIDACEAE | MAY APPLE | | | |
| YUCCA SCHIDIGERA | AGAVACEAE | MOJAVE YUCCA | | | |
| EPHEDRA ANTISYPHILITICA | EPHEDRACEAE | MORMON TEA | | | |
| SPIRAEA ALBA | ROSACEAE | NARROW-LEAVED MEADOW-SWEET | | | |
| ECHINACEA ANGUSTIFOLIA | ASTERACEAE | NARROW-LEAVED PURPLE CONEFLOWER | | | |
| CEANOTHUS AMERICANUS | RHAMNACEAE | NEW JERSEY TEA | | | |
| ADIANTUM PEDATUM | PTERIDACEAE | NORTHERN MAIDENHAIR-FERN | | | |
| ZANTHOXYLUM AMERICANUM | RUTACEAE | NORTHERN PRICKLEY ASH | | | |
| QUERCUS RUBRA | FAGACEAE | NORTHERN RED OAK | | | |
| THUJA OCCIDENTALIS | CUPRESSACEAE | NORTHERN WHITE CEDAR | | | |
| FOUQUIERIA SPLENDENS | FOUQUIERIACEAE | OCOTILLO | | | |
| POTENTILLA SIMPLEX | ROSACEAE | OLD-FIELD CINQUEFOIL | | | |
| JUNIPERUS MONOSPERMA | CUPRESSACEAE | ONE-SEEDED JUNIPER | | | |
| GERANIUM OREGANUM | GERANIACEAE | OREGON CRANE'S-BILL | | | |
| Berberis nervosa | | Oregon grape | | | |
| Ligusticum canbyi | | Osha | | | |
| ECHINACEA PALLIDA | ASTERACEAE | PALE-PURPLE CONEFLOWER | | | |
| MITCHELLA REPENS | RUBIACEAE | PARTRIDGE-BERRY | | | |
| ASIMINA TRILOBA | ANNONACEAE | PAWPAW | | | |
| DIOSPYROS VIRGINIANA | EBENACEAE | PERSIMMON | | | |
| LIGUSTICUM PORTERI | APIACEAE | PORTER LOVAGE | | | |
| CEANOTHUS HERBACEUS | RHAMNACEAE | PRAIRIE REDROOT | | | |
| GRINDELIA INTEGRIFOLIA | ASTERACEAE | PUGET-SOUND GUMWEED | | | |
| POPULUS TREMULOIDES | SALICACEAE | QUAKING ASPEN | | | |

| WWF/TNC Medicinal Plant List | | Permit Maximum Amount | Amount Sold 1995 | Amount Sold 1996 | Amount Sold 1997 |
|---|---|---|---|---|---|
| **BOTANICAL NAME** | **FAMILY** | **Common Name** | | | |
| STILLINGIA SYLVATICA | EUPHORBIACEAE | QUEEN'S DELIGHT | | | |
| ALNUS RUBRA | BETULACEAE | RED ALDER | | | |
| RUBUS IDAEUS | ROSACEAE | RED RASPBERRY | | | |
| EQUISETUM HYEMALE | EQUISETACEAE | ROUGH HORSETAIL | | | |
| LESPEDEZA CAPITATA | FABACEAE | ROUND-HEAD BUSH-CLOVER | | | |
| LYCOPODIUM CLAVATUM | LYCOPODIACEAE | RUNNING PINE | | | |
| SASSAFRAS ALBIDUM | LAURACEAE | SASSAFRAS | | | |
| SERENOA REPENS | ARECACEAE | SAW PALMETTO | | | |
| ZOSTERA MARINA | ZOSTERACEAE | SEA-WRACK | | | |
| POLYGALA SENEGA | POLYGALACEAE | SENECA SNAKEROOT | | | |
| XANTHORHIZA SIMPLICISSIMA | RANUNCULACEAE | SHRUBBY YELLOW-ROOT | | | |
| Valeriana sitchensis | | Sitka valerian | | | |
| SYMPLOCARPUS FOETIDUS | ARACEAE | SKUNK CABBAGE | | | |
| ULMUS RUBRA | ULMACEAE | SLIPPERY ELM | | | |
| VACCINIUM OXYCOCCOS | ERICACEAE | SMALL CRANBERRY | | | |
| VIBURNUM PRUNIFOLIUM | CAPRIFOLIACEAE | SMOOTH BLACK-HAW | | | |
| RHUS GLABRA | ANACARDIACEAE | SMOOTH SUMAC | | | |
| MYRICA CERIFERA | MYRICACEAE | SOUTHERN BAYBERRY | | | |
| ADIANTUM CAPILLUS-VENERIS | PTERIDACEAE | SOUTHERN MAIDENHAIR-FERN | | | |
| LINDERA BENZOIN | LAURACEAE | SPICEBUSH | | | |
| IMPATIENS CAPENSIS | BALSAMINACEAE | SPOTTED JEWEL-WEED | | | |
| CHIMAPHILA MACULATA | PYROLACEAE | SPOTTED WINTERGREEN | | | |
| CHAEROPHYLLUM PROCUMBENS | APIACEAE | SPREADING CHERVIL | | | |
| VACCINIUM STAMINEUM | ERICACEAE | SQUAW HUCKLEBERRY | | | |
| GENTIANA VILLOSA | GENTIANACEAE | STRIPED GENTIAN | | | |
| ARISAEMA TRIPHYLLUM | ARACEAE | SWAMP JACK-IN-THE-PULPIT | | | |
| BETULA LENTA | BETULACEAE | SWEET BIRCH | | | |
| SOLIDAGO ODORA | ASTERACEAE | SWEET GOLDENROD | | | |
| LIQUIDAMBAR STYRACIFLUA | HAMAMELIDACEAE | SWEET GUM | | | |
| EUPATORIUM PURPUREUM | ASTERACEAE | SWEET JOE-PYE WEED | | | |
| MAGNOLIA VIRGINIANA | MAGNOLIACEAE | SWEETBAY MAGNOLIA | | | |
| ACORUS AMERICANUS | ACORACEAE | SWEETFLAG | | | |
| ACORUS CALAMUS | ACORACEAE | SWEETFLAG | | | |
| AGRIMONIA GRYPOSEPALA | ROSACEAE | TALL HAIRY GROOVEBUR | | | |
| Berberis AQUIFOLIUM | BERBERIDACEAE | Tall Oregon grape | | | |
| GAULTHERIA PROCUMBENS | ERICACEAE | TEABERRY | | | |
| PRENANTHES TRIFOLIOLATA | ASTERACEAE | THREE-LEAVED RATTLESNAKE-ROOT | | | |
| EPIGAEA REPENS | ERICACEAE | TRAILING ARBUTUS | | | |
| JEFFERSONIA DIPHYLLA | BERBERIDACEAE | TWINLEAF | | | |
| DIONAEA MUSCIPULA | DROSERACEAE | VENUS' FLY-TRAP | | | |
| IRIS VIRGINICA | IRIDACEAE | VIRGINIA BLUE FLAG | | | |
| LYCOPUS VIRGINICUS | LAMIACEAE | VIRGINIA BUGLEWEED | | | |
| ARISTOLOCHIA SERPENTARIA | ARISTOLOCHIACEAE | VIRGINIA SNAKEROOT | | | |
| EUONYMUS ATROPURPUREUS | CELASTRACEAE | WAHOO | | | |

| WWF/TNC Medicinal Plant List | | Permit Maximum Amount | Amount Sold 1995 | Amount Sold 1996 | Amount Sold 1997 |
|---|---|---|---|---|---|
| **BOTANICAL NAME** | **FAMILY** | **Common Name** | | | |
| PTEROCAULON VIRGATUM | ASTERACEAE | WAND BLACKROOT | | | |
| CAREX AQUATILIS | CYPERACEAE | WATER SEDGE | | | |
| ALETRIS FARINOSA | LILIACEAE | WHITE-TUBED COLICROOT | | | |
| FRAXINUS AMERICANA | OLEACEAE | WHITE ASH | | | |
| QUERCUS ALBA | FAGACEAE | WHITE OAK | | | |
| SALVIA APIANA | LAMIACEAE | WHITE SAGE | | | |
| CHELONE GLABRA | SCROPHULARIACEAE | WHITE TURTLEHEAD | | | |
| VACCINIUM MYRTILLUS | ERICACEAE | WHORTLE-BERRY | | | |
| MONARDA FISTULOSA | LAMIACEAE | WILD BERGAMOT BEE-BALM | | | |
| PRUNUS SEROTINA | ROSACEAE | WILD BLACK CHERRY | | | |
| GERANIUM MACULATUM | GERANIACEAE | WILD CRANE'S-BILL | | | |
| HYDRANGEA ARBORESCENS | HYDRANGEACEAE | WILD HYDRANGEA | | | |
| EUPHORBIA IPECACUANHAE | EUPHORBIACEAE | WILD IPECAC | | | |
| ARALIA NUDICAULIS | ARALIACEAE | WILD SARSAPARILLA | | | |
| LACTUCA FLORIDANA v VILLOSA | ASTERACEAE | Wild Lettuce | | | |
| SPIGELIA MARILANDICA | LOGANIACEAE | WOODLAND PINKROOT | | | |
| VIOLA SORORIA | VIOLACEAE | WOOLLY BLUE VIOLET | | | |
| GELSEMIUM SEMPERVIRENS | LOGANIACEAE | YELLOW JESSAMINE | | | |
| TAENIDIA INTEGERRIMA | APIACEAE | YELLOW PIMPERNELL | | | |
| Zanthorriza simplicissima | | Yellow root | | | |
| BAPTISIA TINCTORIA | FABACEAE | YELLOW WILD-INDIGO | | | |
| DIOSCOREA VILLOSA | DIOSCOREACEAE | YELLOW YAM | | | |
| ANEMOPSIS CALIFORNICA | SAURURACEAE | YERBA MANSA | | | |