

COMPARISON OF THE CULTURAL, TAXONOMIC AND ECOLOGICAL  
ASPECTS OF MEDICINAL PLANTS IN CAMEROON AND NORTH CAROLINA:  
CAUSES OF RARITY AND POTENTIAL SOLUTIONS

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A Thesis

by

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Submitted to the Graduate School

Appalachian State University

in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 1999

Major Department: Biology

WILLIAM LEONARD EURY  
APPALACHIAN COLLECTION

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ASPECTS OF MEDICINAL PLANTS IN CAMEROON AND NORTH CAROLINA:  
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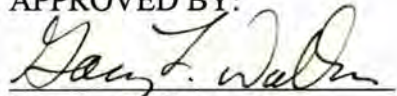
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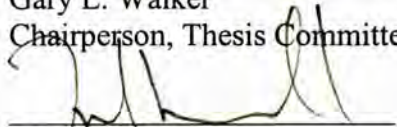
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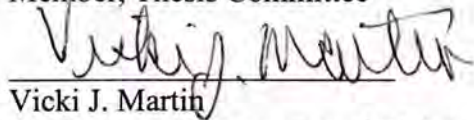
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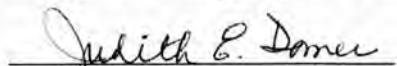
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## ABSTRACT

### COMPARISON OF THE CULTURAL, TAXONOMIC AND ECOLOGICAL ASPECTS OF MEDICINAL PLANTS IN CAMEROON AND NORTH CAROLINA: CAUSES OF RARITY AND POTENTIAL SOLUTIONS (December 1999)

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Humans have traditionally manipulated plant resources for phytotherapeutic objectives. Medicinal plants developed secondary metabolic compounds used as biochemical weapons against pathogens and predators over the centuries. Cameroon and North Carolina have a rich diversity of medicinal plants. Pressure from population growth and abusive land use patterns threaten biodiversity and native flora in both geographic settings. In this study, the cultural, taxonomic and ecological character and utility of phytomedicine in Cameroon and North Carolina were compared. Research objectives were threefold. First, to make a cross-cultural comparison of phytotherapeutic perceptions and attitudes in the two regions in order to reconcile bioscientific research and traditional empirical knowledge. Second, to survey commonly used medicinal plants in the two regions and compare the diversity and similarity of ethnopharmacological taxa. Third, to evaluate the ecological impact of collecting native botanicals and propose conservation strategies to sustain regional and global biodiversity.

Ethnobotanic data from Cameroon were partly derived from literature and complemented with the author's 20 years of observational studies and herb collection under his father who is an herbalist in Cameroon. Data from North Carolina were obtained through unstructured interviews, field exploration, Internet resources, and literature review.

About 80% of Cameroonians rely on botanical therapies for their primary health care. This prevalence of herbalism is partly due to the inaccessibility or unavailability of modern medical facilities. Cameroon has 430 inhabitants per traditional doctor compared to 12,190 inhabitants per conventional physician. The native elite and the bourgeoisie are acculturated to modern medicine while the peasantry maintains substantial faith in the efficacy of ethnomedicine, which still speaks directly to their culture. In North Carolina, alternative herbal medicine is mostly desired by urban elites and alternative life-style baby boomers who frequent herb shops while native Appalachians tend to adopt the idea that herbalism is primitive. Most North Carolinians rely on their modern medical system, which currently has 750 inhabitants per physician and no traditional doctors on record. Medical pluralism involving integrated multicultural biomedical research is suggested to reconcile the biomedical and empirical divide.

A total of 67 ethnobotanical species in 43 families were sampled for both regions. The taxonomic and ecological comparison revealed a correlation of 14 families (32.56% of the total sample) between the two regions. Four groups (9.3% of the sampled families) had similar ethnopharmacological and therapeutic objectives. Two genera (3% of the 67 surveyed) occur in both regions. Species rarity in Cameroon is due to shifting agriculture and is a function of marginal and peripheral locational characteristics such as remote and inaccessible terrain. In North Carolina, species rarity is due to intense commercial exploitation and follows the geography of wildcrafting (harvesting herbs from the wild). Conservation strategies are proposed to harness medicinal plants for the benefit of universal medicine and bioscientific research.

## **ACKNOWLEDGEMENTS**

I am grateful to my Thesis Committee for creating a favorable environment for me to learn in. Thanks to the Cratis D. Williams graduate school at Appalachian State University for providing scholarships for my graduate education and a grant towards this research project. Thanks to the wonderful faculty of the Biology Department for their great support.

## **DEDICATION**

To Dr. Martin Luther King, Jr., whose dream was my inspiration. He died in the prime of his life, still trying to do better what he could do best.

To Dr. Richard Gray, who loved Africa and had a genuine interest in my education.

To Sophina Akum and Nga Tebah, my parents, who gave me all they had.

To Bakadal, Willy, Mariella, Badi and Mona, for their love and prayers.

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## INTRODUCTION

Humans have traditionally used medicinal plants to combat pathogens. These plant taxa have developed secondary metabolic compounds used as biochemical defenses against disease and predators over the centuries. Pressure from population growth resulting in habitat destruction, and increased commercial demand for ethnobotanicals (plants in cultural medicine) threaten biodiversity and native flora. Most plant resources are collected from the wild without regard to sustainability (Dagmar & Uwe, 1997). Only 5000 of the over 250,000 flowering plants in the world have been analyzed for potential pharmacological attributes although 40% of all prescription drugs in developed countries are derived from natural sources (Wachtel *et al.*, 1990). On the average, 25% of prescription drugs sold in the USA contain extracts from higher plants (Farnsworth & Soejarto, 1985).

Global trade in medicinal plants experienced an unprecedented boom that may reach U.S. \$500 billion by the year 2000 (Dagmar & Uwe, 1997). Mbenkum (1996) estimates the world market for pharmaceuticals based on higher plants at U.S. \$30 billion. This impressive market trend may explain the overexploitation of medicinal plants and the resultant genetic depletion of marginal species (Cooper & Harding, 1977). Each plant species is biochemically unique and native endemic species (confined within local geographic ranges) may represent the total genetic diversity of the species.

The Southern Appalachians, with their tremendous botanical diversity, supplies the bulk of commercial botanicals in U.S. native medicinal plant trade (Fuller, 1991). The extinction of threatened and endangered North Carolinian endemics such as the American ginseng (*Panax quinquefolius*) and the Carolina saxifrage (*Saxifraga carolina*

*Gray*) may result from the depletion of their gene pool (Cooper & Hardin, 1977).

Maintaining biodiversity in North Carolina is necessary in order to preserve the natural history of this State.

Similarly, Cameroon is certainly one of the most diverse areas in tropical Africa in terms of biological species. Mount Cameroon, in particular, harbors an enormous number of endemic species because it was one of the very few areas in Africa that was wet enough to survive the dry period of the late Pleistocene (Cheek, 1994). A biological inventory of the Cameroon rain forest in 1992 resulted in the collection of 1,300 plant species of which 20 were new to science. One of the new species, *Ancistrocladus korupensis* has generated excitement beyond taxonomic considerations. The U.S. National Cancer Institute (NCI) screening program for AIDS discovered that the new species, apparently of no known use to Cameroon's indigenous people, showed promise as an effective treatment for AIDS. NCI characterized the active ingredient as Michellamine B. According to Dr. Gordon Craig of the NCI, the Institute has tested 23,000 plants for effectiveness against HIV, and *Ancistrocladus korupensis* is one of the top three leads (Cheek, 1994; Boyd et al., 1994 & Mbenkum, 1996). Such developments demonstrate the need to conserve Cameroon's rain forests and its untapped ethnobotanical resources.

Cameroon's traditional societies are very complex and manipulate their natural environment in sophisticated ways for therapeutic objectives. The practice of herbalism or indigenous medicine in Cameroon will be defined here as all positive efforts of traditional genius to utilize plant and cultural resources to promote the health, welfare and prosperity of the community (Lantum, 1979). Practitioners are often referred to as

traditional doctors, herbalists, healers, native doctors or medicine men. Herbal medicine is often the only health care available in many rural communities in Cameroon.

For centuries, indigenous medicine has been the mainstay of the health care system in Cameroon. The combined forces of European Colonialism and early Christianity in the eighteenth century targeted traditional healers as heathens and Satanists, thus entrenching the Western bias against ethnomedicine (Lantum, 1979; Cohen, 1997; Nga, 1998). Nevertheless, traditional medicine continued to flourish in Cameroon albeit in subjugation and secrecy. About 80% of Cameroonians, especially the rural and urban poor, rely on traditional medicine for their primary health care (Nga, 1989 and Mbenkum, 1996). Lantum (1985) estimated 430 inhabitants per traditional doctor in Cameroon. This contrasts markedly with 12,190 inhabitants per conventional physician (WWWYL Public Health: Africa – Cameroon, 1999).

Despite the introduction of Western medicine into Cameroon a century ago, most people still have faith in the efficacy of ethnomedicine because it speaks directly to their culture and beliefs. Moreover, the inaccessibility or unavailability of modern health care facilities justifies the prevalence of herbalism. The government of Cameroon recognized this reality and integrated traditional medicine as a component of its national primary health care program (Lantum, 1985). For example, there is a traditional medical department in the General Hospital of Yaounde, Cameroon.

The scope of indigenous medical practice in Cameroon is quite broad. It has disease-preventive, disease-curative, health-promotive, and human-rehabilitative aspects. Indigenous medicine deals with a wide concept of health compatible with the complex nature of the human personality. This involves the physical, intellectual, moral, spiritual,

social, environmental and even the cosmic dimension of human nature (Lantum, 1985). The herbalist is part doctor, pharmacist, psychologist and fortune-teller who blends ancient wisdom, mysticism and herbs to provide community health care. He often reflects his tribal or regional identity and may specialize in one or more areas of the profession.

The resources of indigenous medicine in Cameroon include assorted plant elements, animal parts, such as dried chameleons and other paraphernalia of the healer's craft. Prayer and incantation, divination and sooth-saying mechanisms, and the evocation of ancestral spirits are all summoned in the life-restoring process of ethnomedicine. Using knowledge passed down for generations, practitioners diagnose ailments such as malarial fevers, dermatitis, peripheral vascular diseases, depression, dementia, and victims of bewitchment.

The methodology of indigenous therapeutics is usually simple and primitive. However, it may develop into laborious, sophisticated and elusive techniques. Some of these skills are acquired through long years of apprenticeship or claimed to result from direct revelation. Methods and therapeutic processes are largely determined by the nature of the disease. Disease states such as madness, seizure by evil spirits and social stagnation require protracted investigation for diagnosis and a complex therapy that steps into the arena of African metaphysics (Lantum, 1985). Simple therapeutic methods range from the administration of herbal teas, enemas, poultices rubbed in cuts, geophagy in some circumstances, and the inhalation of assorted herbal fumes. Cases of incest and perverse mental states are treated with potions and bizarre rituals. For example, the author witnessed an incest cleansing ritual in Cameroon where naked victims were

summoned before a great village arena and directed to kill a she-goat by strangulation. Rhinoceros horn-marrow is incorporated into a complicated pharmacopoeia for aphrodisiac potions. Likewise, chameleons are prized for potions that bring desired changes such as winning back a wayward lover since the old-world lizard can change its color!

Cameroon's indigenous medicine has weathered the test of time. Today, it coexists with Western medical systems in a somewhat symbiotic complementarity. Colonial rule and early Christianity perpetrated a form of cultural genocide in Cameroon (Nga, 1998). Traditional healers resisted this change the most, and today, remain the strongest custodians of tribal cultures which are still surreptitiously eroded by social evolution. The general belief in the efficacy of existing indigenous therapies justifies the prevalence of herbal medicine. Some therapies find legitimacy through their high rates of efficacy, the relative short time and dramatic nature with which they are wrought, and their comparative advantage over imported techniques in the treatment of diseases such as epilepsy and culturally-linked madness ( insanity resulting from cultural ostracism or believed-to-be-bewitched) (Lantum, 1985).

Another significant cultural dimension of traditional medicinal practice is the deontology (code of ethics) that surrounds both practitioner and patient. Before any therapeutic regimen, both parties are subjected to a cleansing ritual that confers solemnity and grandeur to the healing exercise. This could range from chanting prayers, burning essence, quiet meditation and kinship analysis, to complex African metaphysical rituals. This deontology centers around the quest for truth and the fear of God and transcends the healer and patient, permeating into the very fabric of community life. In Cameroon

ethnomedicine, life is the most important asset and none is denied the right to life because of poverty. This explains the phenomenon of paying token fees such as a chicken, a calabash of palm-wine, or a symbolic currency for fee. This mechanism ensures that everyone in the community enjoys the dignity of equal access to health care. This approach differs markedly from what occurs frequently in a capitalist society where the physician in private practice will not accept any patient whose consultation fee is not ensured.

The conscience of the entire community is omnipresent in the traditional therapeutic process. The sickness of one member is considered the burden of the entire community. The community in Cameroon is not understood as a collection of human heads in numerical terms alone but as a pool of life, a pool of emotions and responsibilities, a pool of love, health and happiness (Lantum, 1985). Hence, certain calamities such as suicide, death and incest, and happy events such as birth, marriage and the enthronement of a traditional king are all community events that are supported by all. As long as tribal cultures survive in Cameroon, indigenous medicine will flourish because it is culturally relevant, acceptable, and sustainable.

In North Carolina, modern medicine is the dominant health care system. However, alternative medical systems such as holistic health care, chiropractic (nerve manipulative healing), homeopathy (treating with minute doses of a remedy that would produce symptoms of the disease when administered in large doses to healthy persons), and herbal alternatives are available. These alternative therapies evolved from a paradigm shift in dominant biomedical systems across the American economic and socio-cultural landscape (Meade et al., 1998). Following discoveries in germ theory towards



the end of the 19<sup>th</sup> century, modern medicine expanded rapidly and doctors began to enjoy high social and financial status. However, by mid-20<sup>th</sup> century, biomedical systems were under attack and criticized for neglecting the whole person; for overemphasis on reductionistic biologicistic thinking; for a slavish devotion to high-technology cures; and for escalating costs (Meade *et al.*, 1998). Alternative medical systems in North Carolina therefore changed over time in response to cultural change. Modern biomedical practice gained ground while alternative traditional practices declined.

The cultural dimension of this project involved a cross-cultural comparison of phytotherapeutic protocols between Cameroon and North Carolina. The interface between ethnomedicine and modern medicine was analyzed. It was observed that disease perception and therapeutic approaches in each society were influenced by socioeconomic and political factors (Meade *et al.*, 1998), and that medical pluralism exists throughout the world and the various systems overlap in the same space. Further, modern medicine and ethnomedicine both evolve along established techniques and deontologies with highly developed pharmacopoeia (recipes for drugs) to serve the population (Meade *et al.*, 1998). But controversies on the nature and efficacy of both systems still persist. A conceptual framework and practical strategies were proposed to reconcile the modern medical and alternative divide for the benefit of the rural poor and bioscientific research.

Some researchers in science and technology suggest that the world's biosphere acts as a single complex organism. This could justify why biological diversity in Cameroon, North Carolina, and the rest of the earth resulting from 4 billion years of evolution must remain healthy to ensure the survival of the planet's life forms. Conservation of medicinal plant species is necessary at the regional, national and

international levels. The taxonomic and ecological aspect of this study surveyed the ethnobotanical character and utility of Cameroon and North Carolina from a cross-cultural perspective. Conservation strategies were proposed for the rational exploitation of medicinal plants and the stewardship of natural resources. Thus this thesis is intended as a contribution to international plant species conservation.

## MATERIALS AND METHODS

### Approach

Are there differences or similarities in the cultural, taxonomic and ecological aspects of medicinal plants between Cameroon and North Carolina? To answer this question, a holistic approach was adopted to collect and evaluate primary and secondary data.

The author exploited his peasant background and 20 years of apprenticeship in herbalism under his father who is a traditional doctor in Cameroon. Eight years of civil service as a conservator and forest ranger in Cameroon also exposed the author to common medicinal ethnobotanicals. As a participant observer, he took advantage of his experiential and conceptual immersion in indigenous paradigms of health and phytotherapeutics in Cameroon to construct part of the primary data. The author's participation in healing ceremonies, kinship analysis, preparation of traditional pharmacopoeia and the collection of medicinal plants in Cameroon helped to generate insights which were missed during the abstracted conversations about the location and use of medicinal plants in North Carolina. Since traditional pedagogy in ethnopharmacology and therapeutics is typically transmitted verbally and empirically, the data were presented within the limits of the author's environment and respect for public decorum. Some secret or obscene ethnomedical practices were deliberately omitted. Ethnobotanical information on Cameroon and North Carolina was thus obtained from personal knowledge, interviews, field trips, observations, Internet resources and literature review.

## Study Areas

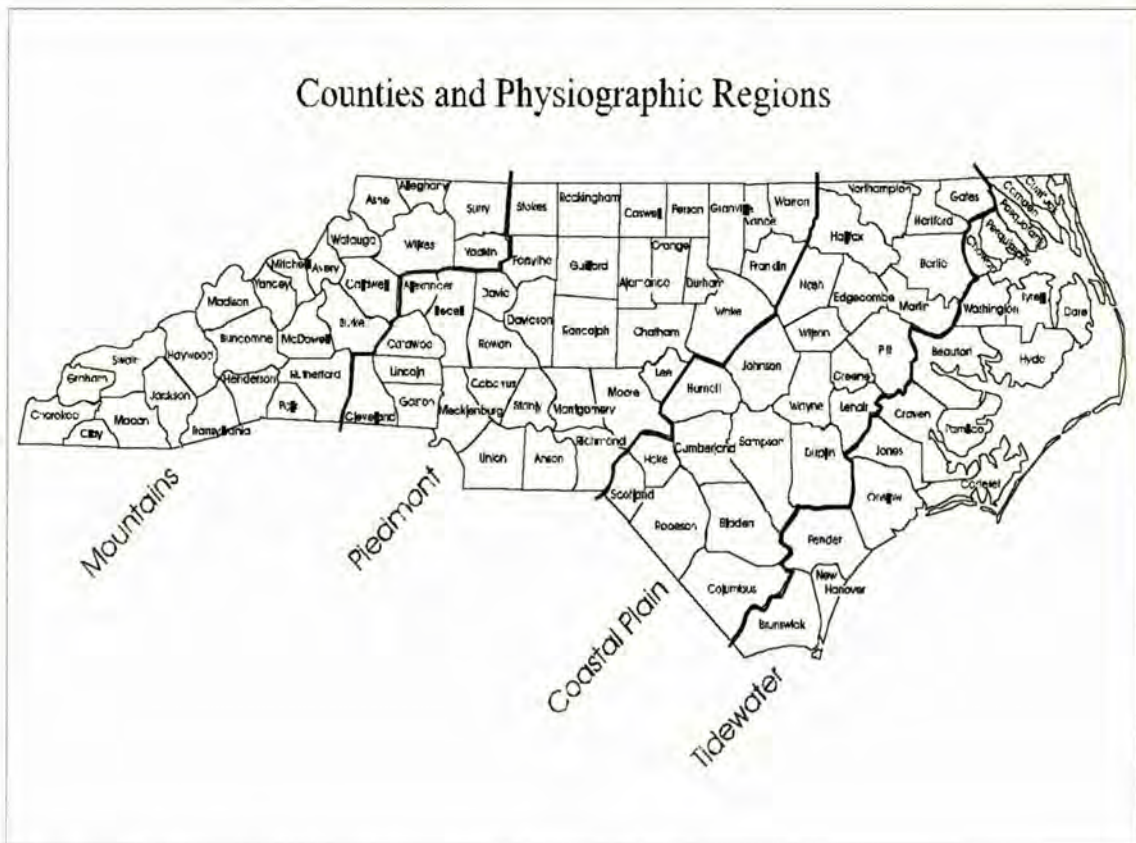
Cameroon and North Carolina were chosen for study because of their accessibility and variety of physiographic characteristics. Cameroon (figure 1) is a country on the West Coast of equatorial Africa.



**Figure 1.** Study Area 1: Cameroon  
Source: Levine, 1996, p. 283.

It has a varied landscape, including mountain forests in the west, grasslands in the north and tropical lowlands in the south.

North Carolina (figure 2) is one of the 50 states of the United States of America. It provides a richness of physical and cultural environments in its 500 mile east-west reach from the shores of the Atlantic Ocean to the peaks of the Appalachian Mountains (Gade, 1996).



**Figure 2.** Study Area 2: North Carolina county and physical regions.  
Source: Modified from Chang et al., 1991, p. 151.

Table 1 gives a comparative physiographic and socioeconomic profile of the two settings that are relevant to research objectives.

**Table 1**

**Comparative physiographic and socioeconomic profile of Cameroon and North Carolina.**

<b>Profile</b>	<b>Cameroon</b>	<b>North Carolina</b>
Area	475,000 sq. km. (184,000 sq. mi.)	125,180 sq. km. (52,669 sq. mi.)
Highest Peak	Mount Cameroon (4,095 m.)	Mount Mitchell (2,005 m.)
Population	15 million (1997 est.)	7.5 million (year 2000 est.)
Density	32 per sq. km. (1997 est.)	60 per sq. km. (year 2000 est.)
Life Expectancy	57 years	76 years
Inhabitants per Physician	12,190	750
Inhabitants per Traditional Doctor	450	0 (even naturopathic medicine not licensed in NC)
Infant Mortality	5.5%	0.92% (1996 est.)
Literacy	65%	70% (High School Graduates 1990)

Sources: Lantum, 1985; WWW VL Public Health: Africa-Cameroon, 1999; Bureau African Affairs, Background Notes Cameroon, 1996; American Medical Association: Federation Directory: North Carolina, 1999; Cooper et al., 1977; LeVine, 1996, p. 283; North Carolina Vital Statistics Vol.2-1996, p.95.

### **Sampling Methods and Data Analysis**

Data on the cultural, taxonomic and ecological aspects of commonly used medicinal plants in Cameroon and North Carolina were obtained through observational techniques. The different variables (taxonomic groups, ecological status and phytotherapeutic indications) could not be reduced by randomization as in a designed or controlled experiment. Sample data were therefore collected on targeted variables, then tabulated, classified and graphed into numerical and categorical values.

Data from each geographic setting were further analyzed through exploratory methods using summarizing values such as the range, concentrations and unusual features to define regional characteristics. These regional attributes were the basis for comparison.

### **Development of the Cultural Questionnaire**

The cultural questionnaire was designed to elicit the perception of North Carolinians on herbal or alternative medicine. There were two focal questions:

1. Why do some people, when sick, prefer to be treated with herbal or alternative medicine?
2. What desirable changes do you consider in terms of practice and use of herbal or alternative medicine in North Carolina?

### **Development of the Taxonomic and Ecological Questionnaire**

This questionnaire was constructed to identify commonly used medicinal plants, explore causes of species rarity and elicit collector's perception on conservation.

Principal questions included:

1. Is there a market demand for North Carolinian medicinal plants?
2. Which plants are the highest in demand?
3. Which plants are the most cultivated or harvested from the wild?
4. Do you prefer cultivated or wildcrafted botanicals?
5. Do you think some species are becoming rare? If yes, which?

6. Are you in favor of any conservation measures for medicinal plants? If yes, what measures would you prefer or propose?
7. What do you identify as the most urgent problem concerning medicinal plants in North Carolina?

### **Subjects, Interview Techniques and Response Analysis**

Data from Cameroon were generated from an emic (insider) perspective because the author was partly the observer and the observed. Preexisting information from family and professional background was complemented with research findings on medical botany in Cameroon by Lantum (1979); Mbenkum (1996) and Brush and Stabinsky (1996).

Data from North Carolina were gathered from an etic (outsider) perspective through unstructured interviews (open-ended questions) and literature review. The heterogeneity of variables such as phytotherapeutic indications for similar species within and between regions was problematic in the standardization of a comparative format. This dilemma was reconciled by adopting typical therapeutic indications per species, for each region. The data obtained were somewhat anecdotal and empirical.

Eighteen North Carolina adult residents, 12 females (67%) and 6 males (33%), were formally interviewed between February and July 1999. Surveys were not random but directed to key respondents dealing with herbs and alternative medicine or of the medical profession. Two strategic North Carolinian groups were targeted and incorporated into the sampling design to elicit different layers of ethnobotanical



perceptions: residents with long family histories in the region and more recently arrived residents.

Opportunistic encounters were also exploited to distill information on the ethnobotanical character and utility of North Carolina. Respondents were also interviewed during a three-day herbal festival in Boone from August 1 to 3, 1997 organized by the North Carolina Herb Association (NCHA). Subjects were likewise interviewed at a professional seminar on "Local herbs and botanicals" in Boone on February 16, 1999, also organized by NCHA. An exploratory field trip was made to the Boone Wilcox Natural Products (the largest commercial company in medicinal botanicals in North Carolina) on April 16, 1999 to assess commonly used and marketed botanicals from the company's warehouse and shipping facilities. Subjects were also interviewed here.

The different responses obtained were grouped based upon the variables they were assumed to measure. Relevant data from literature were distilled and extrapolated to complement sampled opinions. Summarized data were then articulated into tabular and graphic form for comparison and analysis.

## RESULTS

### Herbalism and Alternative Medicine in North Carolina

A sample of 18 adult residents of North Carolina was surveyed to elicit perception on herbal and alternative medicine and possible suggestions for improvement.

Alternative answers were summarized by content analysis into the following 4 opinions (numerically coded without any order of magnitude):

1. Alternative herbal medicine is natural, with minimal risks and cheaper than modern medicine. Doctors and hospitals are only concerned with financial gain and burden people with chemicals. Modern medicine cannot ensure sustainable health like herbal alternative medicine.
2. Alternative herbal medicine is only good as a health supplement and cannot be substituted for modern medicine. It is an inappropriate alternative to modern medicine. Herbs only have a medical value if validated by science. There is much superstition in alternative medicine.
3. Many baby boomers and alternative life-style urban elites prefer alternative medicine to cultivate longevity. Many people also collect herbs for commercial reasons. You can make much money from wild botanicals such as the American ginseng and the golden seal without paying taxes (underground economy).
4. Alternative medicine should be structured and licensed like modern medicine in order to give it more credibility. The problem of drug dosage and precision of diagnosis should be examined.

Table 2 shows the frequencies of the numerically coded opinions. There were 18 opinions.

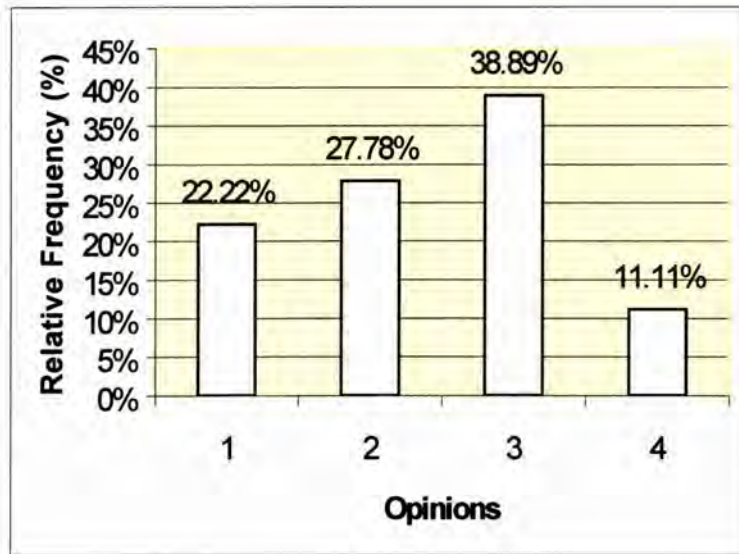
**Table 2****Frequency of Opinions on Herbal and Alternative Medicine in North Carolina**

Opinion	Frequency	Relative Frequency
1	4	22.22%
2	5	27.78%
3	7	38.89%
4	2	11.11%
Total	18	100%

n=4; min=2; max=7

The least frequent was opinion 4 (11.11%) while the most frequent was opinion 3 (38.89%), giving a range of 5.

Figure 3 graphically illustrates the opinion data from table 2. Opinion 3 suggesting commercial motivations for herb collection and the preference of herbal medicine by baby boomers had the highest frequency (38.89%). The lowest was opinion 4 (11.11%) which advocated the restructuring and licensing of herbal alternative medicine.



**Figure 3**

**Frequency Distribution of Opinions on Herbal Alternative Medicine in North Carolina**

Opinion 2 and 3, which considered alternative herbal medicine as both a natural and cheap health supplement and a market product, respectively had the highest frequencies (27.78% and 38.89%). Opinion 4 (11.11%) was atypical while 2 and 3 were representative.

## TAXONOMIC AND ECOLOGICAL ASPECTS

### Sample Classification of Common Medicinal Plant of Cameroon.

Table 3 summarizes 22 families and 33 species of common medicinal plants sampled for Cameroon. The table is simplified to reflect their taxonomic, therapeutic and ecological attributes.

**Table 3**

#### Sample Classification of Common Medicinal Plants of Cameroon.

FAMILY	SPECIES	THERAPEUTIC INDICATIONS	ECOLOGIC STATUS
Acanthaceae	<i>Asystaria gangelcia L.</i>	wounds, scabies, hemorrhage	
	<i>Brillantaisia patula T.</i>	Menstrual disorders, dermatitis	
Amaranthaceae	<i>Acherantes aspera L.</i>	Dysentery, rheumatism, diuretic	
	<i>Celosia trigyna L.</i>	Antihelmintic, diarrhoea	
Ancistrocladiaceae	<i>Ancistrocladus Korupensis</i>	HIV-1 and HIV-2	Endemic
Apocynaceae	<i>Alstonia congensis E.</i>	malaria, filaria	
	<i>Cathayanthus roseus L.</i>	(rose periwinkle) used for diabetes, diuretic and leukemia	
Asteraceae	<i>Ageratum conzoides L.</i>	Dysmenorrhoea, rheumatism	
	<i>Spilanthes acmella L.</i>	toothache	
Bignoniaceae	<i>Newbouldia Laevis S.</i>	syphilis, encephalitis	
	<i>Stereospermum Kunthianum C.</i>	dysentery, diuretic	
Clusiaceae	<i>Garcinia Kola</i>	diabetes, whooping cough, palpitations	
Cucurbitaceae	<i>Momordica charantia</i>	diabetes, febrifuge roots antisiphilitic	
Euphorbiaceae	<i>Uapaca guineensis M.</i>	emetic and aphrodisiac	
	<i>Phyllanthus amarus</i>	jaundice, dysentery, diuretic	
Fabaceae	<i>Cassia alata L.</i>	Eczema, jaundice	
	<i>Cassia occidentalis L.</i>	malaria, dysentery	
	<i>Erythrina senegalensis D.</i>	Labor pains, sterility, STD	
Labiatae	<i>Ocimum basilicum</i>	ear ailments	
Liliaceae	<i>Aloe vera</i>	sap laxative, antipoison	
	<i>Gloriosa superba L.</i>	filaria, abortifacient	

Meliaceae	<i>Khaya senegalensis</i>	irregular menstruation syphilis	
Menispermaceae	<i>Chondodenron</i>	antitetanic, anticonvulsant	
Myrsinaceae	<i>Embelia schimperi</i>	vermifuge	
Ochnaceae	<i>Lophira alata A.</i>	febrifuge, antibacterial, antifungal	
Rosaceae	<i>Prunus africanum</i>	prostate hypertrophy	threatened
	<i>Gardenia ternifolia S.</i>	rheumatism, syphilis	
Rubiaceae	<i>Pausinystalia Yohimbe K.</i>	erectile dysfunction	
Sapotaceae	<i>Baillonella toxisperma</i>	toothache	
Simaroubaceae	<i>Balanites aegyptiaca D.</i>	anti syphilitic	
Ulmaceae	<i>Trema guineensis</i>	dysentery, cough	
Zingiberaceae	<i>Costus lucanusianus J.</i>	bronchitis, filaria	
	<i>Zingiber officinale</i>	antitussive, analgesic, anti emetic	

Sources: Nga, 1991; Mbenkum, 1996; and personal communications.

### Sample Classification of Common Medicinal Plants of North Carolina

The 21 families and 34 species of medicinal plants sampled in North Carolina are summarized in table 4 following their taxonomic, therapeutic, and ecologic attributes.

**Table 4**

#### Sample Classification of Common Medicinal Plants of North Carolina

FAMILY	SPECIES	THERAPEUTIC INDICATION	ECOLOGIC STATUS
Aceraceae	<i>Acer pennsylvanicum L.</i>	skin eruptions	
	<i>Acer spicatum L.</i>	bark anthelmintic and ophthalmiatric	
Amaranthaceae	<i>Achyranthes repens ell</i>	decoction used as diuretic	
	<i>Amaranthus hybridus L.</i>	leaves used for menorrhagia, diarrhoea, leucorrhoe	
Apiaceae	<i>Angelica atropurpurea L.</i>	colic, heartburn	
	<i>Angelica villosa B.</i>	seeds carminative, stimulant	
Apocynaceae	<i>Apocynum cannaberum</i>	(Indian hemp) used as diuretic, cathartic, diaphoretic and evacuant	
	<i>Vinca minor L.</i>	(small periwinkle) used as a tonic and astringent	
Asteraceae	<i>Echinaceae purpurea M.</i>	root alternative and antisiphilitic, immunostimulant	highly exploited
	<i>Anaphalismargaritacea</i>	Aphrodisiac, diaphoretic,	

	<i>B.</i>	antiseptic	
Araliaceae (ginseng family)	<i>Panax quinquefolia L.</i>	demulcent, alternative expectorant, deobstruent, nervine, analeptic	threatened and highly exploited
	<i>Panax trifolium L.</i>	demulcent, alternative expectorant, deobstruent, nervine, analeptic	threatened and highly exploited
Bignoniaceae	<i>Catalpa bignoniodes</i>	cardiac sedative, anthelmintic	
	<i>Catalpa cordifolia Ell.</i>	Cardiac sedative, anthelmintic	
Caprifoliaceae	<i>Diervilla Lonicera M.</i>	Leaves used as gargle for catarrhal angina, narcotic	threatened
	<i>Lonicera Caprifolium</i>	asthma, emetic and cathartic	
Ericaceae	<i>Rhododendron nudiflorum T.</i>	leaves and flowers astringent	threatened endemic
	<i>Vaccinium stamineum L.</i>	root diuretic, fruit antiscorbutic	
Euphorbiaceae	<i>Buxus sempervivens L.</i>	epilepsy, antisyphilitic, cathartic	
	<i>Euphorbia preslii</i>	Dysentery	
Lamiaceae	<i>Dracocephalum virginianum L.</i>	has cataleptic properties	
Liliaceae	<i>Asparagus officinalis L.</i>	laxative, diuretic, cardiac stimulant	
	<i>Chamaelium luteum L.</i>	vermifuge, antiscorbutic	
Meliaceae	<i>Melia azedarach</i>	cathartic, narcotic anthelmintic	
Ranunculaceae	<i>Hydrastis canadensis L.</i>	typhoid, dyspepsia, spermatorrhoea	threatened and highly exploited
Rosaceae	<i>Prunus americana</i>	narcotic, vermifuge	
	<i>Prunus caroliniana</i>	sedative	
Rubiaceae	<i>Zanthoxylum americana</i>	rheumatism, gonorrhoea	
	<i>Zanthoxylum clava H.</i>	rheumatism, gonorrhoea	
Sapotaceae	<i>Sarracenia flava L.</i>	stomachic, diuretic and antispasmodic	
Saxifragaceae	<i>Saxifrage caroliniana</i>	diuretic	endangered endemic
Simaroubaceae	<i>Ailanthus glandulosa</i>	devils walking stick, tree of the gods	
Ulmaceae	<i>Ulmus americana L.</i>	tonic, alternative and diuretic	
Violaceae	<i>Viola hastata</i>	roots emetic and cathartic	

Sources: Marion and Burlage, 1958; Cooper and Hardin, 1977; Nga, 1999; Novak, 1999; and personal communications.

## QUANTITATIVE AND QUALITATIVE COMPARISON

Table 5 summarizes the total count of medicinal plant families and species in the two geographic settings.

**Table 5**

### Number of Medicinal Plant Families and Species per Region

REGION	NUMBER OF FAMILIES	NUMBER OF SPECIES
CAMEROON	22	33
NORTH CAROLINA	21	34
TOTAL	43	67

A taxonomic comparison of Cameroon and North Carolina (see table 4 and 5) indicates that 14 families (32.56% of the total surveyed) occur in both regions. Two genera (3% of the 67 surveyed) occur in both regions. These include; *Acherantes aspera* L. (Cameroon), *Acherantes repens* (NC) and *Prunus africanum* (Cameroon) and *Prunus americana* (NC).

A correlation was established between 4 ethnopharmacological groups (9.3% of the 43 families) assessed. These comprised families with identical therapeutic objectives in both regions as summarized in Table 6.

**Table 6**

### Taxa with Similar Ethnopharmacological Objectives in Cameroon and North Carolina

TAXA	THERAPEUTIC INDICATIONS	
	CAMEROON	NORTH CAROLINA
Amaranthaceae	Diuretic, diarrhoea	Diuretic, diarrhoea
Apocynaceae	Diuretic	Diuretic
Euphorbiaceae	Dysentery	Dysentery
Liliaceae	Sap laxative	Laxative

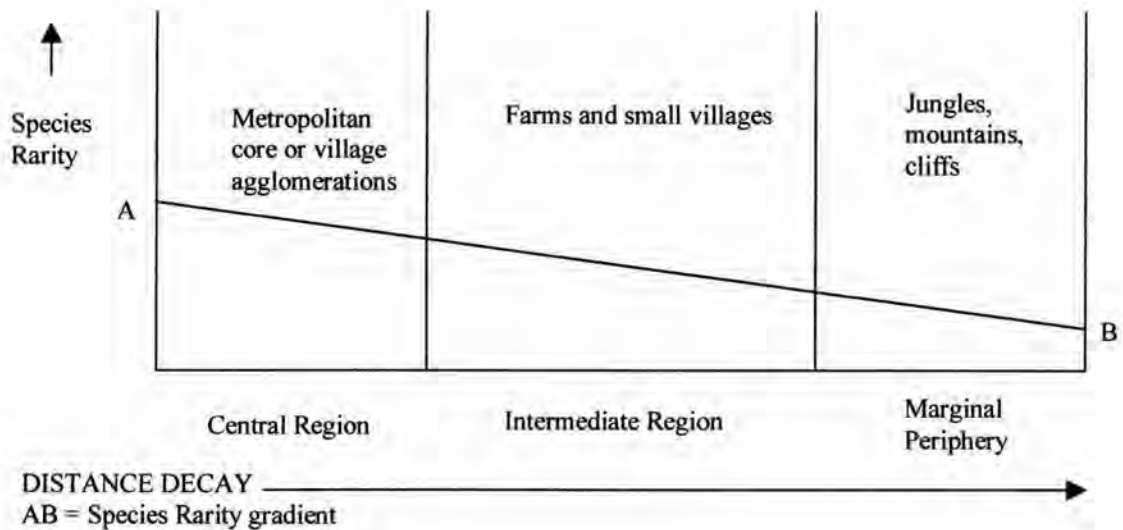


Each region has additional species with unique attributes. *Ancistrocladus korupensis* is an endemic of Cameroon with a great promise against HIV-1 and HIV-2. *Prunus africana* is a Cameroon threatened medicinal plant in international trade used for the treatment of benign prostatic hyperplasia. Cameroon is the most important exporter of *Prunus africana* bark (3900 tons per year) (Cunningham & Mbenkum, 1993). *Catharanthus roseus L.* (Rose periwinkle) which is now a chemical base for the cure of Hodgkin's disease and childhood leukaemia occurs in Cameroon (Nga, 1998). *Panax quinquefolia L.* (American ginseng), the only significant indigenous U.S. medicinal plant that is both in trade and protected by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has its main ranges in North Carolina (Fuller, 1991).

### **Ecological Status of Medicinal Plants in Cameroon**

In the absence of ethnobiological data on the role of humans in limiting the distribution of medicinal plants in Cameroon, an empirical and conceptual appraisal was adopted. A medicinal endemic of Cameroon such as *Ancistrocladus korupensis* became the object of scientific inquiry because the American National Cancer Institute was interested in its promise as a cure for HIV, otherwise a comprehensive inventory and ecological surveys of Cameroon's medicinal plants is pending. Meanwhile, population growth, deforestation, slash and burn agriculture and the unsustainable harvesting of medicinal plants in high demand such as *Prunus africana* cause environmental deterioration and imperil biodiversity. *Prunus africana* is a widespread afro-montane forest tree of Cameroon whose bark is unsustainably extracted for the international market (3900 tons per year) (Cunningham and Mbenkum, 1993). The author's father

now goes far afield to collect herbs which were collected in the neighborhood a few years ago. He bemoans the rarity of some taxa which his own father taught him to use. This isolated case is a significant indicator that species diversity in Cameroon is under threat from over-collection of medicinal plants. Figure 4 is a conceptual diagrammatic expression of species rarity in Cameroon. Species rarity is a function of distance decay from major settlements to marginal peripheral areas. The most inaccessible and marginal areas (not suitable for agriculture or grazing) have maximum species diversity and abundance while human agglomerations and areas under pressure have the highest degree of species rarity. Marginal land, even within dense human settlements has considerable diversity because of little accessibility and disturbance.



**Figure 4**

**Extended Center-Periphery Continuum for Species Rarity in Cameroon**

## Ecological Status of Medicinal Plants in North Carolina

An inventory of the medicinal plants of North Carolina was done by Marion and Burlage (1958) while Cooper and Hardin (1977) surveyed endangered and threatened plants. Nga (1999) mapped the medicinal phytogeography of the mountain region of North Carolina and established ecological and cultural patterns. Opinion pools from my survey were reconciled with the above works to identify 6 medicinal plant taxa of primary ecological concern for North Carolina.

Table 7 summarizes the 6 medicinal plant taxa of primary ecological concern according to their taxonomic and ecological characteristic.

**Table 7**

### Six North Carolinian Medicinal Plants of Primary Concern According to Their Taxonomic and Ecological Characteristics

Species	Common Name	Ecologic Status
<i>Saxifrage caroliniana</i>	Carolina Saxifrage	Endangered endemic
<i>Hydrastatis canadensis</i>	golden seal	Threatened and highly exploited
<i>Echinacea purpurea</i>	Purple cone flower	Threatened and highly exploited
<i>Panax quinquefolia</i>	Ginseng	Threatened and highly exploited
<i>Rhododendron nudiflorum</i>	pink azalea	Threatened endemic
<i>Diervilla Lonicera M.</i>	Bush honey suckle	Threatened

Sources: Modified from Marion and Burlage, 1958; Cooper and Hardin, 1977; Nga, 1999.

There was a wide distribution of highly exploited and threatened taxa such as golden seal and purple cone flower. Ginseng was highly exploited and threatened throughout the Carolinas. It was spatially distributed in the rich woods of slopes and coves of Ashe, Burke, Durham, Jackson, Mitchell, Orange, Transylvania, Watauga and Wake counties. There was a spatial incidence of endemism for Carolina saxifrage in the moist rocks and seepage slopes of Alleghany, Ashe, Haywood, Jackson, Macon, and

Mitchell counties. Carolina saxifrage is a rare, endangered endemic found in restricted habitats of the Southern Appalachian Mountains.

Another highly threatened North Carolina high mountain medicinal endemic was the pink azalea. Its geographic distribution follows the bogs and spruce forests at high elevations in Ashe, Avery, Mitchell, Transylvania and Watauga counties. The Bush honey-suckle is threatened throughout and occurs in the woodlands and bluffs of Mitchell and Yancey counties.

All respondents surveyed cited the commercial exploitation of native botanicals as a leading cause of their rarity. According to Donoghue (1995), native Appalachians had a lucrative business for decades collecting herbs to sell to Wilcox Drug Company in Boone, North Carolina. What do they think about conservation? They universally express willingness to support Non-Governmental Organizations (NGOs) or State institutions that are willing to help restore their mountain heritage. Modern Wilcox Natural Products now advocates sustainability for the collection of botanicals. Their recommendations range from propagation, the respect of ecological principles, federal, state and local laws to sustainable harvesting techniques.

## DISCUSSIONS

### CULTURAL ASPECTS

#### North Carolina

Survey results in North Carolina suggest that socioeconomic factors such as education, religion, and economic status determine people's perception of herbs and alternative medicine. Opinion 2 and 4 generated by university professors and doctors recognized the importance of herbs as a health supplement and objects of scientific inquiry. The ultraconservative opinions (1) still believe modern medicine is a setback because it burdens humans with chemicals and exploits people economically. For example, Ray Hicks, an Appalachian octogenarian, has little faith in medical doctors (Cozzo, 1998). The average opinion (2 and 3) does not recognize herbs as a viable alternative to modern medicine.

The practice of alternative medicine in North Carolina is gendered. Women, especially older women are the most involved in herbal preparations (Cozzo, 1998) while most men are probably ginseng commercial poachers since no state licenses are issued for their collection.

The survey also suggests that herb collection in the Carolinas is more a commercial activity than a community health issue. For example, Donoghue (1995), a third generation herb gatherer and cultivator claims that for many decades native Appalachians have done lucrative business by gathering herbs for Wilcox Natural Drug Company. Southern Appalachia supplies the bulk of commercial botanicals in U.S. native medicinal plant trade (Fuller, 1991).

## Cameroon

In Cameroon, people choose modern medical systems according to availability and perceptions of efficacy for particular health problems. Cultural norms are as important as the biological characteristics of a disease in determining health and therapeutic protocols (Meade, 1998). About 80% of Cameroonians rely on indigenous phytotherapeutics for their primary health care (Nga, 1989; Mbenkum, 1996) because of its cultural relevance and environmental accessibility. Indigenous people comprehend their biotic environment and manipulate plants for therapeutic objectives. Their traditional pharmacopoeia incorporates assorted plant organs and animal parts.

The author's father uses several strategies to nurture individual and community health. His ethnomedical practice is integrated into the cultural complex. Besides administering herbs and other manipulative therapies, he mediates between the spiritual and the earthly and constantly prays for a solid ethical bond between him and his community. In severe psychosomatic diseases, clinical symptoms may first be ignored in favor of a diagnosis which takes the form of kinship analysis and psychoanalysis to assess if there has been any violation of community mores. For example, if a manic-depressive psychosis is diagnosed, a combined phytotherapy and psychotherapy involving cathartic confessions is administered. This is important for both the patient's healing process and the community's survival since life in the village is very close-knit.

Though the ethnomedical practice of the author's father cannot be generalized to the rest of Cameroon, some of his ideas and techniques such as using herbs, prayer, knowledge of intracommunity relations and diagnosis without a laboratory are widespread. The knowledge of the herbs he administers and of the disease they cure is

empirical. He knows what happens but cannot explain why. He knows that a potion prepared from a particular herb will cure a specific disease but the nature and action of the constitutive elements of the herb are not known. Apart from the external manifestations of the disease, its internal nature or subclinical symptoms remain a mystery. It is not clear whether the ailment is functional or organic. Whenever he perceives symptoms and administers a specific potion or therapy, his patient improves more often than not. To explain the phenomenon and its cause is beyond his universe.

Besides inherited ethnobotanical knowledge, other skills are used to discover new medicinal plants. These include: the trailing of sick pets such as dogs and cats to discover medicinal herbs which they use; dreams and revelations; and the famous doctrine of plant signatures. The doctrine of signatures explains that the medicinal values of a plant stand out if the signature or outer appearance is observed carefully. Some signatures are readily discernible: the yellow color of saffron suggests usefulness for jaundice, and the brain-like surface of a walnut indicates its value for head ailments (Crellin and Philpott, 1989). The signature doctrine is still pervasive in Cameroon. However, it should be remembered that plant signatures are only suggestive in the rationality of certain plant combinations for therapeutic objectives. This rationale may not be unraveled through an ethnopharmacologic inquiry. The power and special meanings of plants are embedded in the cultural matrix. Certain indigenous constructs determine how particular plants are identified, prepared and administered. The cultural significance of certain plant colors, textures, and organoleptic qualities (plant organs ) that determine their selection for therapeutic objectives may not be relevant to phytochemistry (Etkin, 1993).

Traditional medicine in Cameroon is not limited to the use of plant products. The author's father customarily incorporates dried chameleons into a potion claimed to win back disenchanted lovers since the capricious and changing colors of the old world lizard may cause a change of heart. This therapy has reportedly been combined with counseling to foster good relationships. Some patients who underwent this combined therapy developed sober moods and reconciliation in their broken homes. Another significant signature therapy for which he is famous is the use of rhinoceros horn marrow in aphrodisiac potions to cure erectile dysfunctions. The African mammal is well known for its prolonged and sustained nuptial display. A hot decoction is prepared from rhinoceros horn marrow, cayenne pepper, and other aromatic spices from the jungle. It is claimed that any man who takes a potion of this concoction will be cured of impotence. Demand for this traditional aphrodisiac has always been more than supply, leading to the endangered status of this species.

### **Comparison**

Some fundamental socioeconomic differentials between Cameroon and North Carolina (NC) may influence the interaction between people and their environment (see table 1). The number of inhabitants per doctor (12,190 for Cameroon and 750 for NC); life expectancy (57 for Cameroon and 76 for NC) and infant mortality rates (5.5% for Cameroon and 0.92% for NC) are critical indicators of community and regional health. The 5.5% infant mortality for Cameroon is unusual and probably symptomatic of a regional health problem worth investigation. The paucity of modern medical facilities in



Cameroon may explain why the only significant source of public subsidized medicine is an indigenous therapeutic system that relies heavily on an expansive herbal pharmacopoeia. In North Carolina, the population's utilization of native flora may only occur within a limited nutritional and therapeutic context. Table 8 empirically compares ethnomedicine in Cameroon and alternative medicine in North Carolina. The practice of indigenous medicine in Cameroon or alternative medicine in North Carolina have both undergone changes in the course of social evolution.

**Table 8**

**Empirical Cross-cultural Comparison of the Present Use of Ethnomedicine in Cameroon and Alternative Medicine in North Carolina**

<b>Cameroon</b>	<b>North Carolina</b>
Practice called herbalism, traditional healing, indigenous medicine, native medicine, bone setting, fetishism	Same practice colored with modern names such as alternative medicine, holistic health care, homeopathy, chiropractic, naturopathic medicine, natural or organic alternatives, herbal alternatives
Practice plagued by charlatans, fortune tellers, and soothsayers	Besieged by quacks, scientific illiterates or pseudoscientists and money mongers
Approach empirical and superstitious	Approach crafty, ingenious and loaded with marketing hyperbole
Male hegemony	Mostly women involved
Plant material mostly consumed fresh and green, or preserved in the form of dry backs, nuts or powder	Plant material generally processed into capsules, tablets, tinctures, etc.
Practice community centered with practitioners considered public servants	Practitioners mostly individualistic
Prayer and spiritual healing common	Spiritual healing exists
Herbalists are utility maximizers	Herb collectors are profit maximizers
Dreams, revelation and the doctrine of signature used to discover medicinal plants	Dreams, revelations and the doctrine of signatures used to discover new medicinal plants

## **Taxonomic and Ecological Aspect**

### **Taxonomic Overview**

A comparative taxonomic appraisal of medicinal plant taxa in the two regions revealed notable commonalities in 14 families (32.56% of the samples). Two genera (3% of samples) occur in both regions. Four taxa (9.3% of sampled families) had similar ethnopharmacologic use. The number of families bearing a taxonomic relationship (14 or 32.56% of the samples) was an interesting indicator for further research considering the continental and transatlantic difference between Cameroon and North Carolina. The taxonomic focus of this research contributes to the study of systematics and the understanding of the evolution of life. The identification of common taxa on separate continents could be utilized to study the evolutionary history of these species by comparing their molecular and biochemical pathways of secondary compounds.

### **Ecological Considerations**

Humans play a major role in medicinal plant distribution in Cameroon and North Carolina. Only two medicinal plant species of concern were identified for Cameroon due to the paucity of scientific research. There are likely others that have not been studied. Six threatened or endangered species were identified for North Carolina (see table 8). Locational and peripheral characteristics such as remote or inaccessible terrain influence species rarity in Cameroon while the same phenomenon follows the geography of wildcrafting (wild harvesting of botanicals) in North Carolina. Certain universal parameters such as population growth, increased per capita demand for economic

productivity and commercial demand for native botanicals cause habitat destruction resulting in species rarity in both geographic settings.

Wildcrafting, often practiced by poor rural inhabitants to supplement income, could create a disturbance in native plant community structures and exacerbate the destruction of ecosystems. Each plant species is biochemically unique with attributes not possessed by other species. Careless stewardship of the plant diversity of Cameroon and North Carolina will result in the loss of economic pharmacological potential and the erosion of other options for future generations. There are many ecological arguments for maintaining plant diversity. Native endemic species may represent the total genetic diversity of the species (Cooper and Hardin, 1977). Some plants escape extinction by retaining enough genetic variability to adapt to environmental changes while some rare species persist with low levels of genetic diversity. When genetic diversity is lost, the vulnerability of some species increases until a threshold where they become functionally extinct. The abusive exploitation of *Prunus africana* in Cameroon and ginseng in North Carolina will likely lead to loss of genetic variation in the years ahead. Al Gore (1992) argued that extinction of species is more of a process than an event. So, we have to arrest the process before it is too late.

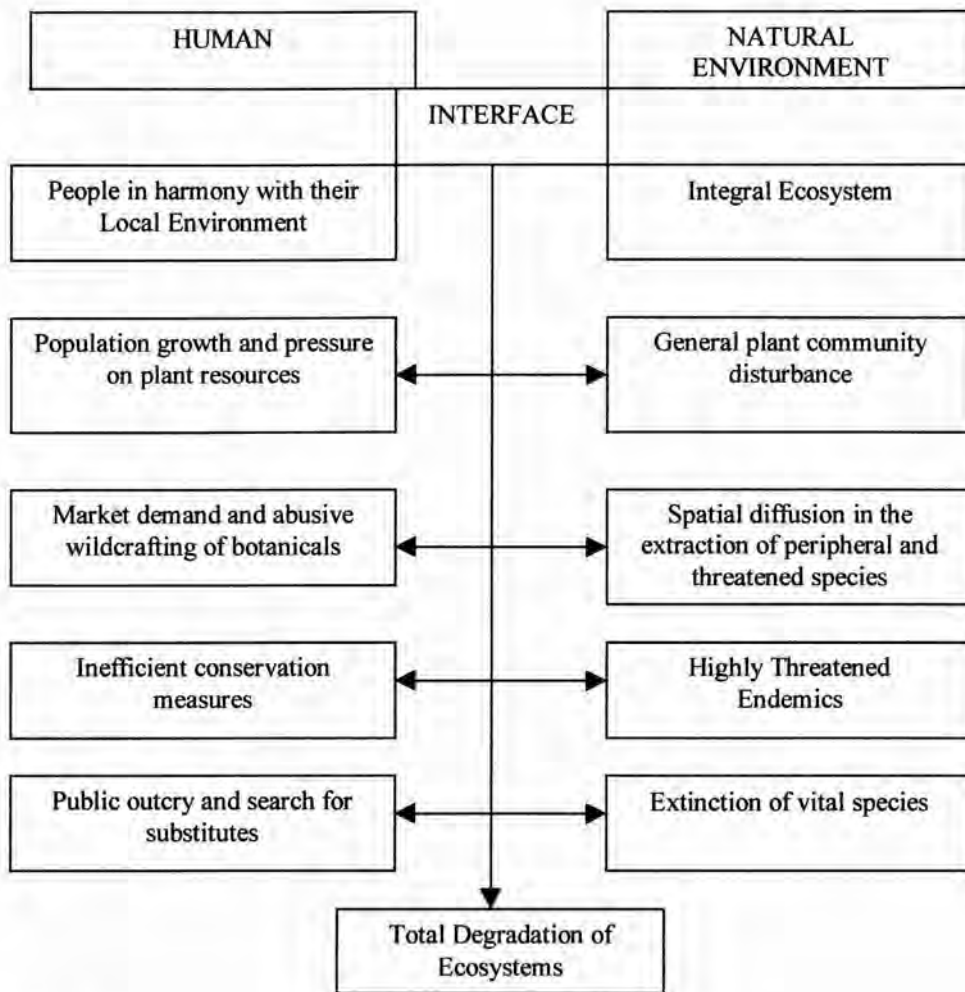
There is a general belief among consumers of phytomedicine that wildcrafted botanicals are superior to the cultivated. Herbs harvested from the wild are said to have more potent therapeutic properties. It is also claimed that herbs harvested in spring, just at their flowering peak, are richest in nutrients and healing efficacy. Harvesting of root and tuberous botanicals are recommended in winter because leaf shading and hibernation causes plants to concentrate all their healing minerals in the root system. Southern

Appalachian herb collectors (in the manner of Cameroon harvesters of *Prunus africana*) are manipulated to overcollect by wholesale distributors with monopolized control over prices in order to obtain reasonable returns on their investments (Bannerman, 1990). The observation that most wildcrafters are poverty stricken can explain their incentive to overharvest in particular populations and at inappropriate seasons (Fuller, 1991, Mbenkum, 1996, Nga, 1999). Inappropriate seasonality harvesting (e.g. during peak flowering and hibernation) disrupts the life cycle of plants and compromises their ecological equilibrium. Furthermore, consumer preference for wild botanicals in general and for herbs from specific local environments in particular, raises market prices pushing collectors deeper into the jungle. This state of affairs aggravates environmental deterioration.

Bennett *et al.* (1990) examined the role played by geographic variation in the concentration of active compounds in plants in determining the magnitude of wild harvesting. They examined the geographic variation in alkaloid content in bloodroot (*Sanguinaria canadensis*), which contains the active compound sanguinarine (bloodroot is traditionally used as an expectorant, stimulant and emetic). They found that sanguinarine content increases with decreasing latitude, with highest concentrations found in Southern Appalachian populations (Fuller, 1991). Consumer perception that wild-harvested botanicals are superior to cultivated ones is partly fueled by market propaganda where explicit labeling informs consumers of the geographic origins of wild collected plant parts and derivatives. Perhaps the most dramatic example is that of Asian consumers who are willing to offer triple as much for wild American ginseng (*Panax quinquefolia*) than for cultivated varieties (Fuller, 1986). It is likely that a high demand

and escalating prices for any medicinal plant species is a powerful indicator of its rarity and potential ecological catastrophe. More research is required to ascertain whether the results of Bennett *et al.* could be generalized to taxa in North Carolina other than *S. canadensis*, otherwise the popular belief in Cameroon and North Carolina in the nature, seasonality and phylogeographic efficacy of some herbs is likely rooted in a gamut of superstitions and empirical knowledge still requiring scientific investigation and validation.

Unsustainable harvesting from wild populations, high demand for slow growing species such as *Panax quinquefolia*, and a craving for habitat specific species pose the greatest conservation threat for most species. Species loss through this unfortunate process has global implications including unforeseen consequences for other taxa of the ecosystem involved. Figure 5 predictively illustrates a hypothetical socio-cultural and ecological continuum of trends in medicinal plant exploitation. The author speculates that most medicinal plants of primary ecological concern will soon be at the end of their utility continuum if present trends are not redressed.



**Figure 5**

**Typology of a Conceptual Vertical Socio-cultural and Ecological Continuum of Medicinal Plant Exploitation.**

At the beginning of the human-natural environment interface continuum, people live in harmony with their biotic environment. Crises begin with population growth and pressure on plant resources. This creates an ecological disruption in plant community structures. Economic needs exacerbate environmental crises. Where economic needs collide with environmental interests, the latter is often sacrificed. Overexploited species are pushed to the periphery of their natural ranges. Resultant

ecological symptoms include disjunctions and threatened endemics. Administrative conservation measures often fail because they lack proper planning, funding and community collaboration. In this melee, the community and the state government find themselves in a quagmire where they must choose between economic development or environmental integrity. But the two objectives are not antithetical. Conservation is sustainable development where the future resource base is protected.

The socio-cultural, taxonomic and ecological significance of medicinal plants in Cameroon and North Carolina deserve regional, national and international attention for a number of reasons. The World Health Organization (WHO) estimates that 80% of people in developing countries rely on herbal and indigenous medicine for their primary health care and that 40% of all U.S. prescriptions depend on natural sources (WWF, 1990). WHO compiled a list of more than 21,000 plant species which are globally used in medicine (Groombridge, 1992). Two global trends could be recognized in the search for new pharmaceuticals. First, ethnobotanical studies are being undertaken to document and preserve indigenous paradigms of health and phytotherapeutics (Boom, 1987, Chadwick and Marsh, 1990, Akerele and al., 1991, Milliken and al., 1992, Cunningham, 1993, Cox and Balick, 1994, Prance, 1994). Also, some plant taxa are the subject of scientific inquiry (Balandrin and al., 1985, Chadwick and Marsh, 1990, Cunningham, 1993).

Only 10% of the more than 250,000 worldwide plant species have been investigated for their pharmacological activity (WWF, 1990, Dagmar and Uwe, 1997). Meanwhile, habitat loss and over-harvesting continue to wreak genetic havoc on promising species. A Cameroonian threatened species (*Prunus africana*) and a Carolinian endangered species (*Panax quinquefolia*) have been listed for protection under

the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (Fuller, 1991, Dagmar and Uwe, 1997).



## SUMMARIES AND RECOMMENDATIONS

The cultural aspects of this study surveyed people's utilization of plant resources for therapeutic objectives. The use of plants in indigenous pharmacopoeia is a universal cultural trait of humanity (Botsaris, 1997). But there is a polemical dichotomy between indigenous paradigms of health and modern medicine.

Most ethnocentric westerners view traditional healers as voodoo practitioners or charlatans preying on the ignorant and superstitious (Cohen, 1997). Attacks by the American Medical Association on chiropractors is one example of a clash among medical systems to control resources and patients (Meade, 1998). Hence ethnomedicine is still described by some as primitive and dangerous.

Herbal and indigenous medicine serves most of the world's health needs and are accepted by their societies as efficacious, otherwise they would not be tolerated (Aregbeyen, 1996; Botsaris, 1997; Cohen, 1997; Meade, 1998). Almost every African city, town, or village has a thriving market for the roots, herbs, dried chameleons and other paraphernalia of the healers craft. The World Health Organization acknowledges that traditional medicine, which is culturally relevant and accessible, provides significant primary health care across the developing world (Crellin and Philpott, 1990; Cohen, 1997; Meade, 1998). Attempts to extend modern medical influence to all parts of the globe have been unsuccessful because of prohibitive costs and cultural irrelevance.

Recent research trends in the epistemology of traditional healing systems indicate an overall high degree of efficacy for indigenous pharmacopoeia although some individual remedies seem ineffective or toxic (Barsh, 1997). Traditional pharmacopoeia

around the world have yielded a large number of drugs effective against cancer, heart disease, parasites, and neural dysfunctions (Huxtable, 1992; Amato, 1992; Martson et al., 1993; Phillipson, 1994). Yet a Eurocentric attitude in which professional physicians accept nothing short of European medical practices has been hindering scientific inquiries into native cures except when isolating particular compounds (Cozzo, 1998; Meade, 1998). Early medical practice in Africa had a relative degree of sophistication before the arrival of European biomedical doctors in the 19<sup>th</sup> Century. Indigenous Buganda surgeons in Uganda were already performing a highly developed surgical procedure with complete anesthesia long before the arrival of European missionary doctors. One Robert W. Felkin, a Scottish medical anthropologist who witnessed Buganda surgeons performing a caesarian section in 1879, documented his observations in a dissertation titled "Postures and Positions at Birth" which he submitted to Maburg University in Germany in 1885. An English translation of Felkin's report was reproduced by Dr. Chipfakacha (1989) in the February edition of the Central African Journal of Medicine.

Visiting Buganda, Felkin reported:

A 20-year-old woman, carrying her first pregnancy, lay on an inclined bed. She was supplied with banana wine and was in a semi-intoxicated state. She was perfectly naked. A band of mbugu (bark-cloth) fastened her chest to the bed, while another mbugu band fastened down her thighs and a man held her ankles. A man standing on her right side steadied her stomach, while the operator stood on the left side holding his knife aloft and muttering an incantation.

The operator washed his hands and the patient's abdomen first with wine and then with water. Then having uttered a shrill cry which was taken by the crowd assembled outside the hut, he proceeded to make a rapid cut in the middle line. The whole abdominal wall and part of the wall of the uterus was severed by this incision, and the amniotic fluids shot out.

The bleeding points in the abdominal wall were touched with red-hot iron by an assistant. The operator then swiftly increased the size of the incision in the womb; meantime, another assistant held separated abdominal walls with his hand, and proceeded to hold the separated wall of the womb with two of his fingers but at the same time holding the abdominal wall apart.

The child was rapidly removed and given to an assistant and the umbilical cord was then cut. The operator put his knife away and seized the contracting womb with both hands giving it a squeeze or two. He next put his right hand into the cavity of the womb and using two or three fingers

dilated the part of the womb which connects to the vagina from within outwards. He then cleaned the uterus and uterine cavity of clots and lastly removed the placenta which had separated by now.

His assistant was endeavoring, but to no avail, to prevent the intestine from escaping the incision. The red-hot iron was used once more to stop the bleeding from the abdominal wound, carefully avoiding the healthy tissue. The operator then let loose the womb which he had been pressing the whole time. No sutures were applied into the wall of the womb.

The assistant holding the abdominal walls now let go and a porous grass mat was placed over the wound and secured. The mbugu bands were untied and the woman was brought to the end of the bed where two assistants took her in their arms and held her upside down so as to let the fluid in the abdominal cavity drain out onto the floor.

She was then returned to the original position. The edges of the wound were brought together into close opposition, using seven well polished iron pins which were fastened by a string made from mbugu.

A paste prepared by chewing two different roots and spitting the pulp into a bowl was then quickly plastered over the wound and a warmed banana leaf was placed on top of the paste. A firm bandage was applied to the wound and dressing using mbugu cloth. During the whole operation the patient never uttered a moan or cry. She was comfortable after the operation. Two hours later she was breast-feeding her newborn.

On the third day after the operation, the dressing was changed and one pin was pulled out. This procedure was repeated on the fifth day after the operation but this time three pins were removed. The rest of the pins were removed six days after the operation. At every dressing, new pulp was applied and pus was removed using foam from the same pulp.

Eleven days after the operation the wound was entirely healed; the patient had no fever and was very comfortable. The secretions from the birth canal were normal.

The year was 1879, yet modern medical doctors and nurses have no trouble following this account. What Felkin witnessed was not different, in principle at least, from what modern obstetricians do. The use of banana wine for both anesthesia and to cleanse the woman's abdomen prior to operating demonstrates an understanding, however rudimentary, of the principles of anesthesia and microbiology. The red-hot iron, the polished irons for closing the wound, and the mats for dressing have very close equivalents in modern surgery. Of course we do not know how many women died during or soon after such operations. However, given that the woman whom Felkin witnessed, survived long enough to start breast-feeding her child, it is apparent that Buganda

medicine and surgery had reached a fairly advanced level before the arrival of the first European doctors.

When colonized African countries gained independence in the 1960's, the native elite had acculturated to Western medicine (modern medicine) and some had studied medicine in Europe and North America (Meade, 1998). This privileged elite perpetuated the Western medical influence though other medical systems were tolerated by their societies because of their relative efficacy. That is why a new paradigm shift from medical polarization to medical pluralism may be appropriate. A serious cross-cultural medical research might bridge gaps in medical systems and contribute to the epistemology and philosophy of science. The World Health Organization supports cooperation between modern and traditional practitioners (Meade, 1998). No medical system has all the answers to our health dilemma. Complementary health care, instead of alternative medicine should be the right approach. Research institutions and universities should embark on systematic surveys of both systems to evaluate, challenge, reconcile or validate all positive aspects. For instance, more ethnobotanical surveys should be undertaken to identify plants for phytochemical screening. This will shed light on phytotherapeutic activity and pharmacological possibilities. A multicultural interface between modern medicine and indigenous paradigms of health is recommended. Humankind will benefit from a medical pluralism that is ecologically, economically and culturally sustainable.

The ethnobiological comparison of Cameroon and North Carolina revealed the different ways in which indigenous people comprehend their biotic environments and manipulate plants for therapeutic objectives. The study showed that herbal medicine,

though not scientific, exhibit a cultural logic that can guide ethnopharmacologic research. While researchers are interested in the discovery of new compounds, traditional healers have already assembled relatively complete pharmacopoeia within limits set by their environments (Barsh, 1997). A cross-cultural comparison of phytotherapeutic perceptions and attitudes in the two settings revealed a perceived dichotomy between modern medicine and indigenous or alternative medicine.

Modern medicine has dramatically brought down mortality rates around the world. It relies on a systematic approach using scientific knowledge and has made impressive advances in surgery and the effective use of high technology. On the negative side, modern medicine emphasizes technology and reductionistic cures at prohibitive prices to the majority of humankind. Most physicians were not trained to deal with the cultural, political, and economic environments in which disease was experienced and help sought (Meade, 1998). Most Cameroonian western-trained doctors, for example, are part of the national elite. They control the ministry of health and perpetuate modern medical hegemony. For instance, building a prestigious and expensive reference hospital often takes precedence over the provision of minimum primary health care facilities that are accessible to all citizens.

Conversely, alternative medicine is popularly acceptable and accessible in many cultures. Indigenous medicine is relevant to the cultural ecology of the people within its jurisdiction. Traditional medicine is holistic. It treats the body and the mind, and attempts to integrate the person, society and the physical environment. However, alternative medicine also has blatant shortcomings. Popular perceptions and attitudes on

the nature and efficacy of some herbs and therapeutic protocols are rooted in a gamut of superstitions and a litany of pseudoscientific demagoguery.

The apparent dichotomy between the two medical systems could be better appraised through a creative cross-cultural dialogue. Biomedicine relies on the scientific method, using common perceptions and terms to describe, measure, test and quantify a medical phenomenon. The system operates within the general premise that a phenomenon only exists when it is measurable, testable and quantifiable. But quite often, the lack of evidence by conventional scientific standards is not necessarily proof that the phenomenon does not exist.

The taxonomic and ecological appraisal of Cameroon and North Carolina revealed a great diversity of medicinal plants and endemics. The paucity of scientific data on Cameroon's ethnobotany may have influenced the fewer endemics and threatened species identified (2) compared to the 6 taxa of primary ecological concern identified in North Carolina. The concurrence of 14 family taxa (32.56% of sample) in both settings during the opportunistic survey was indicative of possible biophytogeographic commonalities between Cameroon and North Carolina. Joint ventures in ethnobotanical research and conservation strategies between the two regions will certainly pay dividends.

Taxa in popular use and demand have become threatened, endangered or endemic in both regions. They are in critical need of monitoring and conservation. It is hoped that findings on the distribution of rare and expensive taxa such as ginseng and golden seal will not encourage greedy citizens to track their locations and dig them up for markets or private gardens. Commercial interest should emulate the example of Wilcox

Natural Products and turn to controlled propagation rather than extirpate plants from their native habitats. Wildcrafters are often people on marginal incomes and will exploit local flora for survival. Legal and policy making agencies should incorporate economic incentives and alternative resources as measures to boost conservation. Indigenous people deserve intellectual property rights and fair compensation as incentive to preserve their unique knowledge and continue the stewardship of biological resources (Brush and Stabinsky, 1996). Conservation education should encourage prudent harvesting along with propagation because the long-term impact of herb collection on wild populations is unknown.

Other resource management strategies include in-situ conservation and ex-situ conservation. In-situ conservation of medicinal plants involves the establishment of protected areas to safeguard populations of botanical drug species. India's establishment of 36 nature reserves for medicinal plants is a good example (Dagmar and Uwe, 1997). Ex-situ conservation of medicinal plants means preserving them in gene banks or botanical gardens. Priority for ex-situ conservation should be given to endemics, plants under threat, or to taxa whose natural habitat have been destroyed.

Further ethnobotanical research in Cameroon and North Carolina is highly recommended. This will compensate for the paucity of analytical literature on ethnobotany in the regions and help identify plants that could be screened for therapeutic activity and pharmacological possibilities. Researchers are recommended to collect plant specimens from all over the world to complement existing collections in university herbaria. This will eventually serve to document habitat distribution patterns, as well as morphological and genetic variability. Integrated ethnobotanical and ethnobiological

field data is also crucial for understanding spatial processes and local synergies indispensable for health planning, conservation policy formulation and decision making. Conserving the ethnobotanical wealth of Cameroon and North Carolina will preserve their regional identity, biological diversity, and enhance their cultural sustainability.



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**Appendix 1: List of unstructured (open-ended ) survey questions to elicit the cultural perception North Carolinians on herbal or alternative medicine:**

1. Why do some people, when sick, prefer to be treated withherbal or alternative medicine?
2. What desirable changes do you consider in terms of practice and use of herbal or alternative medicine in North Carolina?

**Appendix 2: List of unstructured (open-ended) survey questions to elicit taxonomic and ecological aspects of medicinal plants in North Carolina:**

1. Is there a market demand for North Carolinian medicinal plants?
2. Which plants are the highest in demand?
3. Which medicinal plants are the most cultivated or harvested from the wild?
4. Which are the peak seasons for cultivating or harvesting from the wild?
5. Do you prefer cultivated or wildcrafted botanicals?
6. Do you think some species are becoming rare? If yes which? What do you think are probable causes of rarity?
7. Are you in favor of any conservation measures for medicinal plants? If yes what measures will you prefer or propose?
8. What do you identify as the most urgent problem concerning medicinal plants in North Carolina?

## VITA

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