One Hundred Years of *Echinacea angustifolia* Harvest in the Smoky Hills of Kansas, USA[1]

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One Hundred Years of *Echinacea angustifolia* Harvest in the Smoky Hills of Kansas, USA. *Echinacea angustifolia DC. (*Asteraceae) is a major North American medicinal plant that has been harvested commercially in north-central Kansas for 100 years, making it one of the longest documented histories of large-scale commercial use of a native North American medicinal herb. We have compiled historical market data and relate it to harvest pressure on wild *Echinacea* populations. Interviews with local harvesters describe harvesting methods and demonstrate the species' resilience. Conservation measures for *E. angustifolia* also should address the other threats faced by the species and may include restoration and management of its mixed-grass prairie habitat and protection by private landowners.

Key Words: *Echinacea angustifolia*, wild harvesting, medicinal herb, Great Plains

Introduction

The popular medicinal herb *Echinacea* led a dramatic expansion of the U.S. herbal products market from 1994 to 1998. During this time, medicinal plants, sold as herbal dietary supplements in the United States, expanded out of their specialty niche in health food stores to reach the mass market. In the process, sales of herbal products grew from U.S. $360 million per year in 1981 (Tyler 1986) to $1.6 billion in 1994 (Brevoort 1996) and $3.87 billion in 1998 (Brevoort 1998). *Echinacea* (all species) accounted for about 9% of this market, with retail sales totaling approximately $320 million in 1997 (Brevoort 1998). Herbal dietary supplement sales slowed or declined from 1999–2003 but recently have been growing, and *Echinacea* retains its place as the second best-selling botanical supplement (Blumenthal et al 2006).

Echinacea (Asteraceae) is a genus of herbaceous perennials endemic to North American tallgrass and midgrass prairies, glades, and open woodlands (McGregor 1968; Binns et al. 2002; Urbatsch et al. 2005). Three of its nine species are important in commerce: *Echinacea purpurea* (L.) Moench, *E. pallida* (Nutt.) Nutt., and *E. angustifolia* DC. Because it is easy to grow, *E. purpurea* is the species used in greatest quantity and has been procured predominantly from cultivated sources (McGuffin 2001). *Echinacea pallida, E. angustifolia*, and other uncommon species in the genus have been harvested primarily from the wild, with the majority of wild harvest being *E. angustifolia* (Foster 1991; Fuller 1991; McGuffin 2001). *E. angustifolia* still occurs frequently over much of its historic range despite a long commercial harvest. Its global conservation status rank is G4, "apparently secure," based on its wide range and large number of extant populations, although it is reported as declining (NatureServe 2005).

Trade in wild-harvested ("wildcrafted") medicinal herbs is culturally and economically important, yet harvest data are available for few species.

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Wild *Echinacea angustifolia* root harvest reported in a survey of large companies in 1998 was over 90,000 kilograms (kg) (McGuffin 2001); however, harvests were much smaller in subsequent years (American Herbal Products Association 2003).

Echinacea's 100-Year History of Harvest

Although *Echinacea* was one of the most important medicinal plants used by indigenous people in the Prairie Bioregion (Gilmore 1977), the details of its traditional method of harvest are not well known (Kindscher 1989). *E. angustifolia* was introduced to medical use in 1885 when H. C. F. Meyer of Pawnee City, Nebraska sent a sample of his "Blood Purifier" to prominent Eclectic physician John King (King 1887) and a corresponding voucher specimen of *E. angustifolia* to the Lloyd Brothers Pharmacists (J. U. Lloyd 1917; Foster 1991). After King's therapeutic trials convinced him of the plant's value, the Lloyd Brothers began manufacture of *E. angustifolia* preparations (J. U. Lloyd 1904, 1917). By 1897, the plant was well established among the Eclectics (J. U. Lloyd 1897). *E. angustifolia* was the most-prescribed medicine made from an American plant through the 1920s (Foster 1991). Although its use subsequently declined (Foster 1991; Flannery 1999), the resurgence of herbalism in the United States and Europe in the 1980s brought a renewed interest in *Echinacea*. The passage of the Dietary Supplement Health and Education Act of 1994 initiated the expansion of herbal supplements into the U.S. mass market. *Echinacea* was the best-selling medicinal herb in health foods stores and was among the top five in the U.S. mass market from 1995 to 1999 (Richman and Witkowski 1996, 1999; Johnston 1997, 1998a, 1998b; Blumenthal 2000).

Conservation Concerns and Harvest Practices: Gaps in Understanding

Throughout *Echinacea*'s commercial history, botanists and conservationists have warned that commercial harvests exceed populations' ability to regenerate (Sayre 1903; McGregor 1968; Foster 1991; Boyd 1997; Lantz 1997; Crawford 1998; Kolster 1998; Missouri Department of Conservation 1998; Trager 1998; Klein 1999). While these observations are compelling, they were not accompanied by studies of regeneration, and only Kolster (1998) observed harvest methods. As noted by Anderson (1993, 1997) and Joyal (1996), it is important to learn from harvesters both how they work and what they understand about the plant's growth and ecology. *Echinacea* harvest has never been examined in context of its history, economic constraints, and actual practices used by the harvesters, or "diggers." In this study, our objectives were to (1) learn from harvesters about their methods of harvest and views regarding its sustainability, (2) compile historical information about the trade in *Echinacea* roots, and (3) identify factors that may contribute to the persistence and conservation of wild populations.

Methods

Study Area

The study was conducted from 1996 to 1998 with a follow-up visit in 2002. Our study area was in north-central Kansas, in Rooks County and adjoining counties (39°05'–39°34'N, 99°00'–99°30'W). We selected this area for its 100-year history of *E. angustifolia* harvest and for its continued commercial activity. Located in the Smoky Hills physiographic province, it provides large areas of mixed-grass prairie rangeland habitat for *E. angustifolia* (Hurlburt 1999).

Historical Research and Market Information

We reviewed published literature, wholesale price reports, and unpublished correspondence from ca. 1890 to the present. Unpublished correspondence was obtained from the Kansas Historical Society and from the Lloyd Library, Cincinnati, Ohio (Hurlburt 1999).

To obtain local history and market information, we interviewed four older residents of Rooks County who had been involved in the "root" trade since their youth (Hurlburt 1999), and three others who were second- or third-generation harvesters (Mr. Pat Thrasher, Mr. Pat Thayer, and Mr. T. Houser). Pat Thrasher was the major buyer of *E. angustifolia* roots in Stockton, Kansas, during the time of the study. Initial interviews were conducted in March 1996, and follow-up interviews took place in 1997–1998 and 2002.

Harvest Methods

We learned about harvest methods through semi-structured interviews with 20 harvesters. During the interviews, we inquired about har-

vesters' method of digging, motivation, and views on the abundance, life history, and resilience of *E. angustifolia*. To efficiently obtain qualitative information, we began by interviewing knowledgeable, easily identifiable individuals (root buyers), following the techniques of Patton (1990). The harvesters with whom we consulted constitute a snowball sample (Robson 1993), and generated a pool of respondents through referrals from the root buyer, other harvesters, landowners, and fortuitous meetings. It was difficult to survey harvesters systematically because many of them, responding to the fluctuating market for *E. angustifolia* roots, moved or changed occupations during the period of study.

We participated in *Echinacea* root harvest on four occasions, including two commercial harvests. We used nearest-neighbor techniques at one harvest site to estimate the density of harvested plants ("holes") and remaining plants. At another harvested site, a sample of 20 "holes" was tagged to track regeneration. Two harvested sites were included in a demographic study (Hurlburt 1999).

Results

History of the *Echinacea* Market in Rooks County, Kansas

The earliest published reference to *Echinacea* digging in north-central Kansas is from the diary of Elam Bartholomew, a settler and botanist. In 1894, he dug 45 kg of "*Echinacea* roots for shipment to Lloyd Bros." for which he received $25.00 (Bartholomew 1999). University of Kansas Pharmacy Professor L. E. Sayre (1897) called *E. angustifolia* "the most noteworthy [medicinal] plant growing abundantly in the state" and noted that it "is only gathered in commercial quantities from the northwestern part of the state" (Sayre 1903).

Interviews with older-generation and second- or third-generation harvesters and buyers confirm that *E. angustifolia* harvest was established in Rooks County by 1900. One early buyer of medicinal roots, furs, wool, and horses, Fred Lawson, set up shop in Stockton ca. 1895. This history was confirmed by other diggers, including Thornton Sanders, who began digging with his father in about 1927 at age 10.

Quality, abundance, and economic considerations were important in the establishment of commercial *E. angustifolia* harvest in the Smoky Hills. Felter (1898) stated that "the best quality of root comes from the prairie lands of Kansas and Nebraska." Sayre (1903), referring to the Smoky Hills area of soft limestone, stated that *Echinacea* "root thrives better in the rocky soil of that district." Finally, responses to the Lloyd Brothers' inquiries seeking suppliers emphasize that profitability and the cost of labor determined who would harvest roots. Several correspondents stated that the price offered was insufficient for a person to make a living by collecting *Echinacea* in the rocky areas or thin stands of the Kansas Flint Hills, southeast Kansas, southwest Kansas, and Oklahoma. For example: "The plant in this locality grows only on rocky land and stone ledges and the process of digging is very laborious, and the time required is out of all proportion to what you can pay" (Roberts 1903). Affirmative responses to the Lloyd Brothers' inquiries came from southeastern Kansas, the Smoky Hills (Kirk 1903), and the southern Flint Hills (Luddington 1903). Interestingly, these three areas have continued to experience *Echinacea* harvest up to the present (*E. angustifolia* in the Smoky Hills and southern Flint Hills, and *E. pallida* in southeast Kansas).

History of Market Quantities and Price

E. angustifolia has experienced periods of both intense and weak demand. Figure 1 illustrates a chronology of market and price information. We converted the prices to 2005 U.S. dollars to adjust for inflation using conversion factors provided by Sahr (2006). Sources for price data and further details are listed on our Web site (http://www.kbs.ku.edu/people/html/facweb_kindscher.htm). Short-term changes in market demand are captured during only a few years for which data are available on a monthly basis. The price paid to diggers is a substitute index for scarcity of supply, in the absence of data on quantities demanded by the market (Fuller 1991).

Changing Market Conditions

The correspondence between Elam Bartholomew and the Lloyd Brothers reveals changing market conditions. The earliest price of $0.55/kg of dry root in 1894 was reduced to $0.275/kg by 1901 as more suppliers entered the trade (C. G. Lloyd 1897, 1901). Nevertheless, in years of peak demand, prices returned to their earlier levels. For example, in June 1897 when the Lloyd

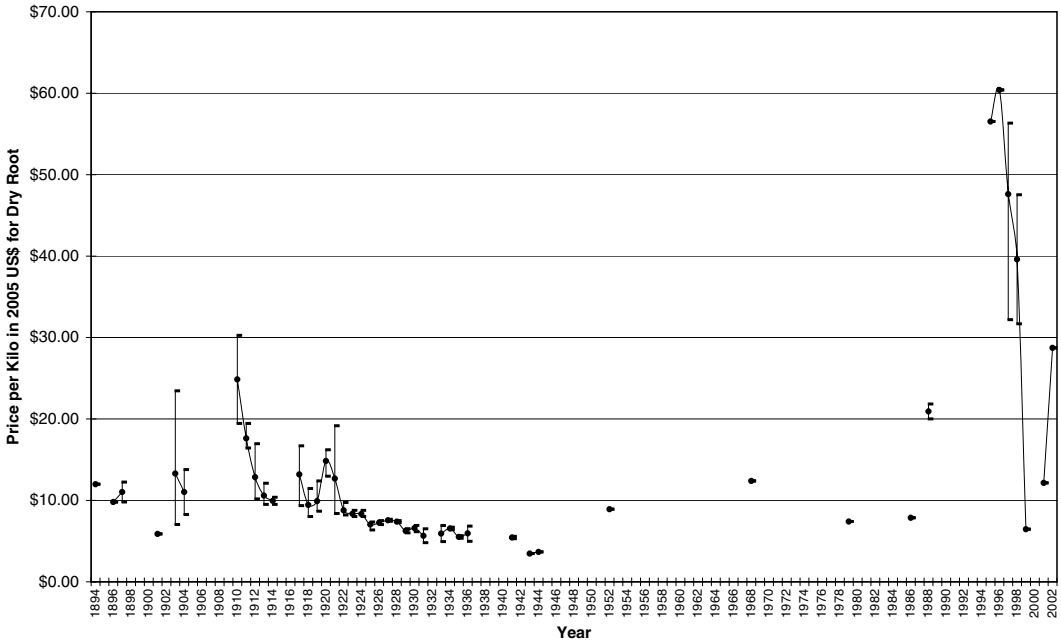

Fig. 1. Price of dry *Echinacea* root (1894–2002) per kilo in US Dollars (converted to 2005 US$). Gaps in data indicated by absence of trend line.

Brothers ran out of *Echinacea*, prices briefly rose to $0.55/kg (C. G. Lloyd 1897; Sayre 1897).

In 1903, the market for *Echinacea* appears to have experienced a very large demand. The Lloyd Brothers sought new suppliers throughout the Great Plains and Midwest (Hurlburt 1999) and the price again reached $0.55/kg. Sayre (1903) reported that *Echinacea* "in one year has brought to the state over $100,000, as over 200,000 pounds have been collected, and it has brought at times as much as fifty cents per pound."

In 1910, *Echinacea* was reported as "scarce" in the New York wholesale market, "with quotations at 65–70 cents" ($1.43–$1.54/kg). Subsequent reports listed the price in slow decline, so that by 1914 it was bringing only $0.48–$0.53/kg. In January 1921 prices peaked at $1.65–$1.76/kg. Wholesale prices then declined, reaching a low of $0.33–$0.35/kg in 1933 (*Oil, Paint and Drug Reporter* 1910–1941). Nevertheless, the prices paid to diggers during the Depression era, 3–4 cents per pound of "wet," fresh root (equivalent to $0.20–$0.26 per kg dry root), meant that "snakeroot digging paid better than a Government job" (Hurlburt 1999).

From this low point, the price of *Echinacea* root appears to have increased steadily (Fig. 1). Nevertheless, the underlying market may have been more complex. For example, the species preferred for harvest (*E. angustifolia* or *E. pallida*) changed historically, as did the part of the plant used (root, aerial parts, or whole plant) and method of shipment (fresh or dry). Further, cycles in the market that occurred during 1894–1903 may have occurred in other years as well. The price of dried *Echinacea* root paid to Kansas diggers reached $46–48/kg in winter–spring 1995–1996. In summer 1996, with excess root on the market, the price plummeted, and no root was bought for several months. In spring 1997, activity resumed at $26/kg. The winter of 1997–1998 again saw the price increase to $44–46/kg, but in May 1998 it began falling again. By September, the price had declined to $26/kg or lower, with no root-buying activity for over two weeks. The market for Echinacea root was weak throughout 1999–2001, reflecting a downturn in the herbal products industry from 1999 to 2000 (Blumenthal 2000, 2001), but digging resumed in 2002 at a price of $26/kg.

Social Aspects of "Snakeroot Digging"

Since the 1890s, *Echinacea*, or "snakeroot," has been one of a few natural commodities that could

provide cash income to rural residents of the Great Plains. Digging was a family enterprise; father-son digging teams and multigenerational family outings to dig root were common (Bartholomew 1999; Hurlburt 1999). Similar family enterprises characteristic to the digging business have been recorded in Montana (Kolster 1998) and for ginseng in West Virginia (Bailey 1999).

A variety of people dig "snakeroot," including those with full-time jobs (Kolster 1998) and college degrees; however, diggers are often self-employed or are not fully employed and may be economically marginalized (Fuller 1991; Bailey 1999). Harvesters reported that youth, underemployed people, agricultural workers in the off-season, and people who want to set their own working conditions are attracted to digging.

Landowners' views of *Echinacea* root diggers appear to be more negative now than in the past. The harvesters we interviewed complained about being viewed as not having "steady" jobs and said that restricting digging amounted to "trying to take away our buffalo." Traditional diggers said that they seek out known digging areas and always obtain the owner's permission. Newcomers to the trade who trespass to dig were said to be "ruining it for people who've been doing it for years" (P. Thrasher, quoted in the *Lyons Daily News* [1996]). An older harvester commented that "people's attitude has changed"; while once "people would help each other out and I never had any problems with anyone I asked going on their land," now people "don't want diggers around" (Hurlburt 1999).

Landowners' negative reactions to increased digging pressure during times of peak demand reflect complaints including trespass digging, gates being left open, trash left in the pastures, holes left uncovered, and the threat of fire when vehicles are driven over dry grass in search of *Echinacea* (Crawford 1998; Kolster 1998; Hurlburt 1999). As a result, many landowners in Kansas no longer allow harvest on their properties and prosecute trespassing diggers. Of seven landowners we contacted during the study, three had allowed a relative to dig on their property, one allowed a nonrelative to dig, and three did not allow harvest at all. Landowners who permit digging generally restrict this to one person or group, who then keeps others out (Hurlburt 1999). While we did not estimate the frequency of trespass digging, another study recorded that three of four large ranch managers who had encountered diggers reported trespass digging (Loring et al. 1999).

Harvest Methods and Economics of Digging

Harvesters' economic motivation to obtain a good hourly return from their efforts has several implications. Speed of work and the quantity of root dug per hour or per day is important. The usual harvesting rate was said to be 0.9–1.35 kg per hour, or up to 2.25 kg per hour in a good stand; similar rates were reported by Kolster (1998). Hourly yield is influenced by search time, distance traveled, plant density, time spent extracting the root, and size of the root. The depth to which a root can be dug is limited by rocky soil and the depth of a swing of the pick. Most harvesters prefer to dig large roots; however, seeking out very large roots, called "carrots," may require increased search time. Harvesters repeatedly stated that "you can't get all the root": the entire root of any one plant is not harvested, and it is not possible to harvest all the plants in a population. This statement acknowledges that it is not profitable to search out every plant or to spend time digging the entire root of any single plant.

The desired pace of work influences the qualities of stands in which a harvester prefers to dig. Many diggers work in rocky areas with little vegetation where *E. angustifolia* is easier to find and dig. However, some prefer digging in the larger and heavier "sod root" in grassy areas. Many harvesters prefer to obtain permission to dig on a large ranch where they can work for many weeks or months, while one harvester was said to be good at finding and digging little patches.

All the harvesters we encountered during this study used a pick mattock as a digging tool. The pick has been the tool of choice historically, as recorded by Sayre (1903). The harvesters we interviewed believe that it is a quicker method of digging and has less impact on the grassland than either a shovel or the specialized digging tool in use in the Northern Plains, a metal bar with a thin, sharpened blade (Kolster 1998).

Resilience of *Echinacea angustifolia* Plants

Most currently active diggers were optimistic about the abundance and resilience of *E. angustifolia* and illustrated their point by referring to tra-

ditional, longtime digging areas. We visited several of these areas, including a pasture that had been harvested since the 1930s. In 1999, we observed thousands of plants at a ranch that was heavily harvested in 1996, and the roots are abundant in many other harvested areas.

Older harvesters, however, recalled their fathers' friendly competitions, with daily harvests exceeding 45 kg (K. Lawson, interview). This is double the amount that currently could be harvested from a good stand (at 2.25 kg/hr) in a 10-hour day. In traditional digging areas as well as in stands close to Stockton, plants were said to be fewer and smaller than in the past (Hurlburt 1999). Though these men thought that overharvesting had caused the declines, they recognized other causes of *Echinacea* population declines, such as spraying the pastures with herbicides.

The need to allow populations to recover after harvest was noted by several diggers, with two or three years mentioned as a practical harvest interval. Harvesters all claimed that plants whose roots have been dug will resprout and can be harvested again in two to three years.

Participation in Harvest

Participation in harvest confirmed the methods described by diggers and many of their observations. In contrast to the team approach used by Montana harvesters (Kolster 1998), the diggers in this study worked individually. They swing their pick once or twice to cut or loosen the root below ground, pull it up by its top, clip or pull off the aerial portions, and toss the root into a bag tied at the hip. This method enables the digger to move quickly from plant to plant.

The diggers did not appear to either select or avoid flowering plants; instead, they looked for plants with multiple shoots or large rosettes of green and dead leaves. Smaller rosettes were skipped over, as were plants that would have been difficult to dig, such as those growing in dense sod or next to the sharply pointed leaves of yucca (*Yucca glauca* Nutt.) plants.

Many harvested roots appeared to have regrown following earlier harvest. These roots had smaller-diameter upper portions attached abruptly to a larger-diameter lower portion. Shoots emerging from last year's pick holes were further evidence of regrowth. Our observations of tagged "holes" confirmed regrowth (see photos on our Web site). Two years after digging, 5 of 14 "holes" whose tags remained had resprouted shoots (Hurlburt 1999). Our estimate of harvest density based on nearest neighbor sampling was 26.5% of the apparent population (Hurlburt 1999). These data were collected in the fall when many tagged plants at other sites were dormant and likely overestimates harvest intensity. These observations support the harvesters' assertions that harvest is incomplete and that some plants grow back after harvest.

Discussion

Economics of Digging, Harvest Intensity, and Recovery

Echinacea angustifolia harvesting in Kansas meets three of Godoy and Bawa's (1993) four criteria that encourage "judicious use" of wild-harvested resources: secure property rights, low population density, and simple harvesting technology. However, lacking traditional rules that would govern *Echinacea* harvest practices, economic criteria influence the intensity of harvest. For *E. angustifolia*, these economic factors are the price per kilogram of *Echinacea* root relative to available wages, the effort required to dig the roots, the size and density of the plants, and the accessibility of land where the plants grow.

The economics of digging may explain why *Echinacea angustifolia* harvesting became established in the Smoky Hills but not in some other parts of the species' range. The cost of labor in Kansas in 1903 was $1.50 to $3.00 per day (Kirk 1903). At $0.33 per dry kg and assuming that roots dry to one-third of their fresh weight, a person would have to dig 13.5–27 kg per day to earn an acceptable wage. While this was probably possible in a dense, unexploited *Echinacea* population in the Smoky Hills, it would not have been possible in sparse populations or in areas where digging was difficult. Earnings from digging at today's typical rate of 1.5 kg fresh root/hr (equivalent to 0.5 kg dry) compare favorably to other local employment when the price per kilogram of dry root is at least twice the going hourly wage. This assumes that jobs are available and travel costs do not exceed those of going to a wage-earning job. Kolster (1998) reported that high unemployment (40% on the Ft. Peck Assiniboine and Sioux Reservation in 1989) in northeast Montana led to harvesting even when root prices were lower. In contrast, Rooks County, Kansas had unemployment of only 3.9% in 1998 (U.S. Department of Agriculture 2006). During peri-

ods of little demand, most Kansas diggers find other work until the price becomes favorable again.

The method of digging *Echinacea angustifolia* roots in the Smoky Hills moderates the intensity of harvest. Plants and populations are harvested selectively based on apparent size, lack of recent harvest, and accessibility, leaving many plants untouched in the variable terrain. Diggers use an optimal foraging strategy, maximizing acquisition of the resource while minimizing their time costs. This strategy is similar to that noted by Runk (1998) for collection of vegetable ivory, tagua (*Phytelephas aequatorialis* Spruce) seeds.

Access to *Echinacea*, like other wild-harvested resources, affects the intensity of its harvest (Milner-Guland and Mace 1998). *E. angustifolia* populations along roadsides, in public areas, and in reservation lands, have proven problematic to protect from harvest in Missouri, Oklahoma, and Montana (Lantz 1997; Kolster 1998; Traeger 1998). Kolster (1998) reported near-complete harvest of some populations and increased travel times to harvest roots as local stands became depleted on the Ft. Peck reservation. However, in Kansas, where most *E. angustifolia* grows on private land, conservation is accomplished by landowners who restrict harvest and prosecute trespassers, creating refuges for *E. angustifolia*.

This interplay of market price and cycles, harvesters' effort, and access to the resource determines the intensity of harvest on *Echinacea angustifolia* populations. The marketing cycles that we observed during this study have been reported for other medicinal plants (Fuller 1991). *Echinacea* species' tolerance of drought and environmental stress (Weaver et al. 1935; Baskauf and Eickmeier 1994; Chapman and Auge 1994; Little 1998) and *E. angustifolia*'s ability to resprout after harvest (Kolster 1998) likely contribute to harvested populations' ability to recover. Nevertheless, without a long-term demographic study, we do not know whether the periods of reduced harvesting pressure during market downturns provide sufficient recovery time for harvested populations.

Conservation Measures for *Echinacea angustifolia*

Restoration and Management

E. angustifolia continues to be locally common in central Kansas but faces threats to its abundance and persistence. Loss of mixed-grass prairie, which is less than that of tallgrass prairie, has been estimated from 30% to 77% across the Great Plains states (Samson and Knopf 1994). Alteration of the remaining native mixed-grass prairie has occurred under a management system that focuses solely on production of grass and cattle. Normally, fire is not used as a management tool in Smoky Hills pastures, and encroachment of woody vegetation or "brush" into the grassland is apparent (Loring et al. 1999). Landowners in the area are increasing their use of herbicides to combat brush and the noxious weed, musk thistle (*Carduus nutans* L.). Harvesters have reported that *E. angustifolia* has disappeared from sprayed pastures. Finally, we observed that when pastures are grazed heavily in the spring, flowering stalks of *E. angustifolia* are more often damaged and seed production is lower compared to *E. angustifolia* in pastures that were not grazed until mid- or late summer (Hurlburt 1999). We believe that conservation measures for *E. angustifolia* need to address these issues as well as harvesting.

The Future of Wild Harvest

Replacing wild harvest with cultivation as a source of *Echinacea* root is commonly advocated (Foster 1991; Hobbs 1994; Crawford 1998). We do not expect cultivated *Echinacea angustifolia* to replace wild harvest entirely. Wild harvest appears to be driven by rapid increases in demand (associated with higher prices) that would be impossible to meet quickly enough with cultivation. There is a specific market demand for wild-harvested *Echinacea*, particularly from small local companies and the European market.

Finally, we believe that there are important reasons why wild harvest should continue. Family and cultural ties encourage people in areas with large populations of *Echinacea* to continue to harvest. This local harvest provides cash income for people who are not involved in full-time, year-round jobs. Concern for the *Echinacea* on their land is driving some landowners to be more careful stewards of biodiversity. In this study, we met landowners who were controlling brush manually or with spot spraying of herbicides rather than aerial application. We have observed that long-term diggers have a strong conservation ethic and appreciation for the native prairie. This is one of two activities (hunting being the other) that encourages local people to be out on foot in the rural prairie landscape observing and valuing biodiversity.

Conclusion

Echinacea angustifolia harvest in north-central Kansas has a 100-year history that represents one of the longest periods of use recorded for a major wild harvested species in the United States. Interviews with harvesters and observations of harvest and harvested populations suggest that experienced diggers use practices that moderate harvest intensity by rotating harvest areas and selectively harvesting at low density. Landowners also aid in the conservation of this species by restricting digging on their land. Periodic market downturns translate to periods of reduced digging pressure when populations can regenerate. Some *E. angustifolia* plants resprout within two years after harvest, contributing to population resilience. Cultivation and conservation measures such as habitat restoration are also necessary to conserve the species in face of its diminishing and altered habitat. If restoration, stewardship, and responsible harvest techniques are practiced, the valuable cultural tradition of wild harvesting *Echinacea* can continue.

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