

## A case study of stakeholder perspective and experience with wild American ginseng (*Panax quinquefolius*) conservation efforts in Pennsylvania, U.S.A.: limitations to a CITES driven, top-down regulatory approach

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**Abstract** Following its inclusion in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the harvest, sale and trade of wild ginseng (*Panax quinquefolius*) for international commerce has been restricted by law in Pennsylvania since the late 1980s. Since then, exports from the state have declined driving the need to better understand the impact of CITES listing and related state and federal laws. Between 2004 and 2010, we conducted a mixed-methods study in Pennsylvania of stakeholder perspectives on state and federal government conservation efforts and experiences relating to enforcement of harvest and trade restrictions. Results from a survey, key informant interviews, and facilitated group discussions indicate widespread support for ginseng conservation efforts but, not with the CITES driven, top-down regulatory approach. It was widely asserted that ginseng stewardship has been, and will continue to be, governed by personal experience, family teachings, and industry norms and not CITES driven restrictions per se. Moreover, study participants were unable to cite instances where prosecution for ginseng-related “crimes” had occurred within their networks and most believed laws are an ineffective deterrent to “bad behavior.” This emic is externally validated by the fact that agency enforcement is constrained by limited personnel and jurisdictional boundaries, not least of which is an inability to enforce on private lands in the state. These findings suggest that a CITES driven regulatory approach has limitations in actually conserving wild ginseng in Pennsylvania, and suggests that this approach should be complemented by stakeholder supported “bottom-up” partnerships involving greater stakeholder participation, such as government-sponsored or supported ginseng planting programs to counter over-exploitation by collectors and/or extirpation resulting from habitat loss.

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## Introduction

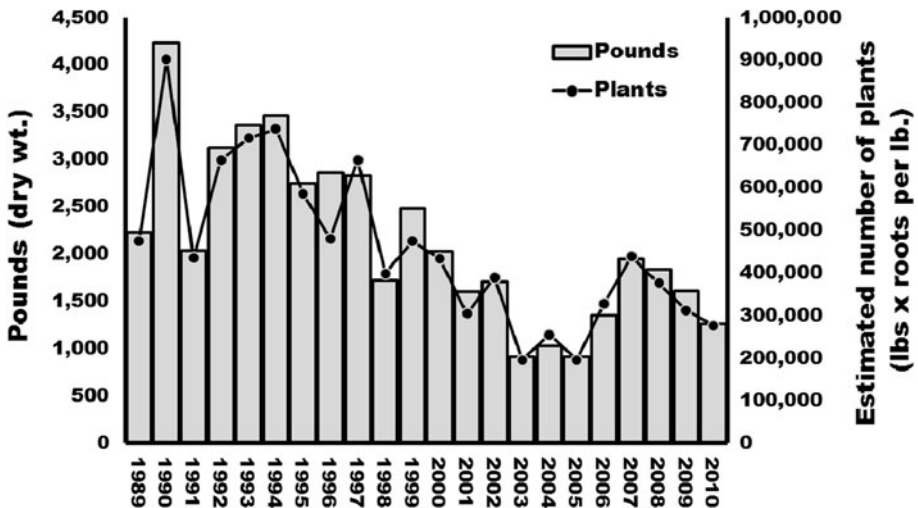
American ginseng (*Panax quinquefolius*) is an herbaceous perennial plant indigenous to eastern North America that has been traded internationally for nearly 300 years. Continued demand by Asian consumers, in particular, for roots exhibiting “wild” traits, as determined by taste, shape, color and texture (Guo et al. 1995; Hu 1976; Roy et al. 2003), coupled with a geographic wild distribution that is limited to eastern North America, continues to drive a wild ginseng industry centered in the United States. Estimates are that as much as 90 % of the annual wild ginseng harvest in the United States is exported and 98 % of these exports destined for East Asia (Robbins 1998). This demand persists even though there appears to be no difference in overall ginsenoside levels (a widely used “marker” constituent) reliably ascribed to “wild” versus “cultivated” roots (Assinewe et al. 2003; Lim et al. 2005). The market price for wild-appearing ginseng roots originating from eastern North America forestlands nevertheless continues to be as much as 100 times greater than for cultivated roots (Burkhart and Jacobson 2009). Such price disparities continue to stimulate interest in wild collection as well as various forms of plant husbandry.

Since 1975, American ginseng has been included in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).<sup>1</sup> In the United States, the Fish and Wildlife Service (FWS) has both Scientific and Management Authority for CITES and thus is responsible for implementation requirements (Walsh 2005). FWS in turn requires that all export states track commerce through point-of-sale reporting mechanisms and urges export states to enact laws and state level trade restrictions in accordance with current scientific understandings. The information gathered through such programs is used by each respective state and FWS to examine trends in the wild ginseng supply.

Between 45,000 and 159,000 pounds of wild roots, originating from nineteen eastern states was annually certified for export between 1990 and 2011 (FWS 2012). An examination of available ginseng trade data (PA DCNR 2011; FWS 2012) indicates that reported wild exports from Pennsylvania have declined since 1990 (Fig. 1). The cause of this decline is unclear and this study therefore explored the role of CITES-driven regulations on influencing collector and industry behaviors and activities. A better understanding of this response is needed since case studies of other CITES-listed species have highlighted a variety of shortcomings associated with program implementation (i.e., timber (c.f., Blundell 2007; Stewart 2009), plants (c.f., Walsh 2005) and animals (c.f., Abensperg-Traun 2009; Shepherd and Nijman 2008)). Moreover, an understanding of any limitations associated with this “top-down” approach could help identify “bottom-up” conservation mechanisms more likely to be followed voluntarily and promulgated by stakeholders.

The purpose of this study was to examine the central question of whether a CITES-driven top-down regulatory approach to wild American ginseng conservation is having intended impacts on industry and stakeholder behaviors for Pennsylvania exports. To answer this question, we conducted a concurrent mixed-methods study (Creswell 2009) incorporating a survey instrument, key informant (KI) interviews, and facilitated group discussions (FGDs) to gather stakeholder (i.e., collector, planter-grower, buyer-trader,

<sup>1</sup> CITES web-site: <http://www.cites.org/>.



**Fig. 1** Reported pounds and estimated number of wild ginseng plants harvested in Pennsylvania: 1989–2010 (PA DCNR 2011)

enforcement) perspective and experience regarding ginseng conservation efforts in the state. Specifically, we wanted to determine: (1) What are stakeholder attitudes towards existing state and federal harvest and trade restrictions? (2) What are stakeholder experiences with actual enforcement of these restrictions? (3) What are stakeholder suggestions for improving enforcement; and (4) What are stakeholder attitudes towards ginseng conservation in general?

## Background

CITES implementation for American ginseng in the United States (U.S.)

In the U.S., the American ginseng trade is monitored by both state and federal governments (Robbins 1998, 2000) following its 1975 listing in CITES. Appendix II status is reserved for “species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid utilization incompatible with their survival” (CITES 2011). The FWS is responsible for CITES implementation in the United States. The FWS has the Division of Management Authority to address policy and permitting issues, and the Division of Scientific Authority (DSA) to deal with scientific issues relating to CITES implementation. Under CITES, ginseng exports must be legal and not detrimental to the survival of the species in the wild. The FWS has approved export of wild ginseng from the United States on a state-by-state basis since 1978. By making its “non-detriment” determination, a responsibility of the DSA, the FWS relies upon state harvest data as well as research findings.

Because collector husbandry practices that encourage sexual reproduction are essential to ensuring harvest sustainability (Farrington 2006; McGraw et al. 2005; Nantel et al. 1996; Van Der Voort et al. 2003), export states including Pennsylvania have established harvest restrictions intended to facilitate wild reproduction and recruitment by limiting the

time and stage of harvest. Most states also require seed or berry planting from harvested plants at the location of harvest (Robbins 1998, 2000). In an effort to dissuade juvenile plant harvesting and to allow plants to reach reproductive maturity and produce seeds before harvest, the FWS has since 1999 required roots to be at least 5 years old to be legally exported. This requirement was increased to 10 years in August 2005, but reinstated to 5 years in June 2006. The federal government also prohibits interstate commerce in ginseng not certified by the state in which it was harvested.

#### CITES implementation for American ginseng in Pennsylvania

Of the nineteen states permitted to legally export ginseng from the United States under CITES, Pennsylvania has ranked eighth to fourteenth (1990–2010) in export volume (FWS 2012). Although Pennsylvania has exported ginseng for more than 250 years, trade data are only available from 1989 onwards at the state level and from 1991 onwards at the county level. The annual certified harvest between 1989 and 2010 was between 915 and 4,236 dry pounds. Pennsylvania export program data indicate that between 50 and 480 plants are required to yield one pound of dried wild roots, an average of 214 plants per dried pound (PA DCNR 2011). Several variables including plant age and stage at harvest, as well as growing conditions and post-harvest handling practices, influence the number of plants needed for one dry pound of product (Anderson 2003; Lewis 1987).

The ginseng management program in Pennsylvania was initiated during the 1980s as a result of the 1982 Wild Resource Conservation Act, 32 P.S. §§ 5301–5314. The Act directed the Department of Environmental Resources (predecessor to the current Department of Conservation and Natural Resources, a.k.a. DCNR) to classify native wild plants and determine management directives necessary for sustained production (32 P.S. § 5307.). In 1987, pursuant to this mandate, the Department of Environmental Resources, through the Environmental Quality Board, promulgated regulations establishing the native wild plant program (17 Pa. Code Chapter 45 (“Conservation of Pennsylvania native wild plants”). Section 45.2 establishes the “vulnerable” classification for “plant species which are in danger of population decline within this Commonwealth because of their beauty, economic value, use as a cultivar or other factors which indicate that persons may seek to remove these species from their native habitats.” Ginseng is one of three species classified as “vulnerable” (17 Pa. Code § 45.15.).

Subchapter E of Chapter 45 regulates commerce involving vulnerable plants in general and ginseng in particular. It establishes restrictions on harvesting ginseng (i.e., limits harvest stage, time, and seed removal) to allow for reproduction and recruitment in wild populations (Table 1). Under the Wild Resource Conservation Act, restrictions on harvesting vulnerable plants do not apply to the owners of the land or to any person having a bona fide interest in the land (32 P.S. § 5311 (a).). In addition, Chapter 45 prohibits engaging in vulnerable plant commerce without a commercial vulnerable plant license; requires licensees to maintain records of their vulnerable plant activities; requires persons who export ginseng from Pennsylvania to obtain a ginseng certificate for each shipment; and requires licensees who engage in ginseng commerce to keep records of unsold ginseng. DCNR uses information collected through its ginseng management program to track the quantity of wild ginseng collected for export from Pennsylvania forestlands. As required by CITES, DCNR provides this information on an annual basis to FWS DSA. Stakeholder honesty is critical to data accuracy since neither identification nor a license is required for buyer–seller transactions.

**Table 1** American ginseng wild harvest restrictions in Pennsylvania and the intent of each restriction

Harvest restriction	Intent of harvest restriction
A person may harvest ginseng plants only from August 1 through November 30.	To permit reproduction in wild plants since fruit mature in late summer and early fall.
Only mature ginseng plants with at least three leaves of five leaflets each may be harvested and only when the seeds are red.	To permit plants to reach reproductive maturity and contribute to population viability. Establishes a developmental stage class or minimum stage limit for harvest to take place.
Persons harvesting ginseng plants shall plant the seeds from the plants in the immediate vicinity of the collection site.	To ensure that local populations do not go extinct because collectors have removed seeds and sowed them elsewhere.
A person may not possess harvested, green ginseng roots between April 1 and August 1 of a calendar year.	To limit collection to a season (August 1–November 30).

*Source:* Pennsylvania Code, Subchapter E. Vulnerable Plants (§45.69. Vulnerable plant harvest seasons and conditions)

In addition to these regulations in the Wild Resource Conservation Act, DCNR has promulgated regulations specifically applicable to state parks and forests. Under state parks regulations, plant removal is prohibited except for certain edible plants, none of which are species classified in Chapter 45 (17 Pa. Code § 11.211., natural resources). State forest regulations currently allow edible plant removal for personal or family consumption (17 Pa. Code § 21.31., prohibitions).

The Wild Resource Conservation Act authorizes “any enforcement officer employed or designated by [DCNR] or any police officer of the Commonwealth or any municipality within the Commonwealth” to enforce the Act (32 P.S. § 5311 (c)). Pursuant to the Conservation and Natural Resources Act, 71 P.S. §§ 1340.101–1340.1102, DCNR authorizes its enforcement officers (State Forest Officers and DCNR Rangers) to exercise their enforcement authority only on lands administered by DCNR (i.e., state parks and forests). Therefore, DCNR enforcement personnel do not enforce provisions of the Wild Resource Conservation Act and regulations restricting harvesting and possession of ginseng where violation occurs on non-DCNR land.

## Research methods

This study used a mixed methods approach (Creswell 2009) to collect data through simultaneous use of a survey instrument, KI interviews, and FGDs. Specifically, the survey instrument was used to quantify attitudes and behaviors pertinent to conservation efforts/regulations while KI interviews and FGDs were concurrently conducted to elucidate the values and beliefs underlying attitudes and behaviors (Creswell 2009; Vaske 2008). This combination of methods was used to gain an understanding of the cognitive underpinnings (Vaske 2008) that drive compliance (or non-compliance) with harvest and trade restrictions. This approach was also employed to explore the attitudes surrounding specific conservation mechanisms with the goal of determining which are more likely to be followed or adhered to voluntarily by stakeholders (i.e., “bottom-up” mechanisms). In this regard, it should be noted that attitudes are imperfect predictors of actual behavior, and the

degree to which these are linked continues to be part of a long-running discourse in social psychology research (c.f., Ajzen and Fishbein 2005; Ajzen and Cote 2008).

### Sample frame identification

The main sample frame used for survey distribution was identified in collaboration with the Pennsylvania DCNR, which provided names and addresses gathered under their Vulnerable Plant licensing program between 1990 and 2006. In this program, transaction logs containing names and addresses of individuals who sold ginseng during the previous year are annually submitted to DCNR by licensed buyers-traders. To help compensate for sample limitations, a second sample frame was developed by combining targeted media and outreach activities. Between 2003 and 2007, this study was featured in numerous outdoor magazine and newspaper articles appealing for public participation (e.g., Blankenship 2005; Burkhart 2003; Burkhart and Jacobson 2005; Mulhollem 2004). KIs and FGD participants were solicited using “snowball sampling” through methods further described in the following sections. In snowball sampling, existing study subjects recruit future subjects from among their acquaintances. This sampling technique can often be helpful in accessing hidden populations which are difficult for researchers to access (Weisberg 2005).

### KI interviews

The KI method is based on obtaining information from a community resident who is in a position to know the community as a whole, or a particular portion of interest (Creswell 2009). Between 2004 and 2010, 25 KI interviews were conducted with individuals from three “ginseng community” stakeholder groups in Pennsylvania: collectors ( $n = 10$ ), planters-growers ( $n = 10$ ) and buyers-traders ( $n = 5$ ). Each KI was purposefully selected (Creswell 2009) based upon the following criteria: (1) he/she must have had at least 10 years of experience with ginseng or the ginseng trade; (2) he/she was considered to be a “very knowledgeable” informant by others encountered during the course of this study (i.e., recommended as someone to interview, i.e., “snowball sampling”); (3) he/she considered him/herself to be “representative” or “typical” of his/her regional ginseng network or community (with an effort made to include KIs from around the state); and (4) he/she was predominantly from one stakeholder category since it is common for roles to overlap (e.g., collectors might also be planters and/or buyers-traders and vice versa).

Interviews with KIs were semi-structured and occurred at private residences and/or on forestlands via forest walks and/or ginseng hunts. Each interview consisted of eight to twelve questions relating to ginseng conservation efforts. Some questions were open-ended probes (e.g., “Do you think that having a ginseng collection season makes a difference?”) while others were more targeted (e.g., “Do you agree with the current ginseng collection season dates?”). Each KI was interviewed on at least two occasions between 2004 and 2010, with each interview lasting from one to 3 h. Multiple interviews with KIs were conducted to develop a relationship with them to garner trust and honesty and also to allow for iterative exploration of important themes/findings. Notes were taken either concurrently or immediately subsequent to each interview. KIs were invited to submit perspective and experience (e.g., stories) using written comments. When included in the discussion that follows, these are identified through the use quotations or blocked text with footnotes. Those included were included because they represent summative and broadly shared stakeholder perspectives.

## FGDs

A FGD is a type of focus group discussion but differing in this case due to the group size being larger than a conventional focus group (e.g., 8–12 participants). As with a conventional focus group, the discussion was led by a moderator (the first author) and the group was presented with open-ended questions so as to trigger discussion around ginseng related topics. Four FGDs were held during 2005 and 2006. Two FGDs (March 19, 2005 in State College, PA; January 30, 2006 in Pittsburgh, PA) included only buyers and traders. A planter-grower FGD included ginseng planters and growers from Pennsylvania, West Virginia, Maryland, and Ohio (October 15, 2005 at Cooper's Rock State Park, WV). A final enforcement FGD drew upon a cross-section of individuals and agency personnel responsible for enforcing and prosecuting ginseng-related crimes in Pennsylvania (July 17, 2006 in State College, PA). Participants in this FGD included DCNR rangers and legal counsel, Allegheny National Forest rangers, Game Commission officers, Pennsylvania State Police and a retired Fish and Boat Commission officer with extensive experience with ginseng and ginseng enforcement. A total of 15, 20, 45 and 20 individuals participated in each FGD, respectively. During each, attendees were asked to discuss their views on topics relating to ginseng conservation and management efforts using probe questions (e.g., "What do you feel is the best approach to conserving ginseng?"). During these FGDs, opinions, quotations and/or statements that elicited broad consensus and/or passionate discussion amongst participants were immediately written down.

## Survey development and delivery

Discussions with DCNR along with a literature review (both academic and popular) were used to guide survey topic, question, and language usage. A draft survey was pre-tested with 10 stakeholders (i.e., collectors, planters and dealers) who were solicited early in the study to help identify and address instrument ambiguities. This pre-test group included five collectors, three planters/growers, and two buyers-traders, all of whom had been active in the industry for at least 10 years. The final survey consisted of 12 pages, containing 40 questions organized into four sections). Question formats included three-point Likert scales (e.g., very important, important, not important), binary response (e.g., agree/disagree, yes/no), and requests for short explanations. A four-stage survey delivery method (i.e., "Tailored Design Method") was used to encourage a high return rate (Dillman 2000). During the first stage, a letter was sent by Pennsylvania DCNR to households notifying individuals a survey was forthcoming along with an appeal for participation. During the second stage, a cover letter, survey, and return postcard were mailed to individuals as a packet. Approximately 3 weeks after this packet was mailed, a reminder postcard was sent to households, representing a third stage. In the fourth and final stage all households that had not returned a survey were sent a second survey packet with a final letter of appeal for participation. Surveys were annually distributed to new participants over a 3 year period (2004–2006) representing a cross-sectional rather than a longitudinal sampling approach (Vaske 2008; Weisberg 2005).

## Data analysis and internal validation

Survey responses from each year were coded according to the year received (i.e., 2004, 2005, 2006) and sampling frame (e.g., DCNR transaction logs, individual requests) when compiled to create a master data set. Responses to each survey question were analyzed



using year and sampling frame as variables of interest to determine if any differences in question responses might be associated with these variables or if it would be reasonable to pool all respondents for greater analytical power. No significant differences were found for any survey questions according to year or sampling frame and thus data were pooled for analysis.

The continuous variables age and number of years collecting and/or planting were re-coded into three discrete categories for analysis. This was done because numerous KIs and FGD participants suggested different attitudes and/or behaviors are associated with these variables (discussed further in Sect. “[Sample characteristics](#)”). Category breaks were selected to permit examination of possible response differences based upon levels of experience (1–10 years = inexperienced, 11–30 = experienced, 31+ = very experienced) and/or age group (18–40, 41–60, 61+ years of age), while providing for sufficient samples in each partition.  $\chi^2$  tests of Independence were used to test for relationships between categories and question response. The Statistical Package for the Social Sciences (v. 15, SPSS Inc. 2007) was used for data analysis with the significance level set at 10 % (i.e.,  $P \leq 0.10$ ).

Key informant and FGD interview text transcripts were studied for attitudes, opinions, experiences, and recommendations regarding government conservation efforts and regulations. Once identified, these were numerically coded for basic statistical analysis to identify the most widespread and representative (Creswell 2009). Results from this analysis are included in the results and discussion alongside survey results and the percentage of KIs who shared a particular attitude, view, or experience is given. We include direct quotations from KIs and FGD participants where these serve to highlight shared attitudes, ideas, or suggestions. These quotes are attributed via footnotes to indicate a survey comment, KI, or FGD contribution. To protect the confidentiality of study participants, KI or FGD participant names are not included.

In accordance with the concurrent triangulation approach (Creswell 2009) adopted in this study, results from all KI and FGD research activities were compared after summarizing with each other, and with survey results, to cross-validate key findings, themes, attitudes, and experiences. Results from KI and FGD findings are presented alongside survey results in the following sections to provide both quantitative and qualitative understanding and insights into the major social phenomena uncovered by this mixed-methods research approach. Additional information about the survey instrument, KI and FGD questions, and methods utilized in this research is available in Burkhart (2011).

## Results and discussion

### Sample characteristics

A principle methodological challenge inherent in all survey and social research is to minimize coverage error (Dillman 2000; Vaske 2008; Weisberg 2005). Since there were/are no comprehensive lists of those involved in ginseng related activities in Pennsylvania, nor are there reliable data regarding the number of people involved, a stratified random sampling design could not be employed. Instead, sampling frames were comprised of availability or convenience samples, drawn from Pennsylvania DCNR ginseng buyer–seller transaction logs and through a targeted media solicitation. Possible biases resulting from the use of these availability samples include over-representation of commercially oriented individuals; self-selection or exclusion by those with strong beliefs (negative or



**Table 2** Survey return rates by delivery method for total survey period, 2004–2006<sup>a</sup>

	Totals	Returned	Not returned	Not deliverable <sup>b</sup>	Not applicable <sup>b</sup>	Response rate (raw) <sup>c</sup>	Response rate (adjusted) <sup>d</sup>
PA DCNR dealer transaction logs	954	243	575	125	11	25.5 %	29.7 %
Individual requests	161	120	40	1	0	79.8 %	80.6 %
PA DCNR licensed dealers (current and former)	69	20	33	11	5	29.0 %	37.7 %
Totals	1,184	383	648	137	16	32.3 %	37.1 %

<sup>a</sup> Survey participation by year: 2004 = 150 individuals (40.7 %); 2005 = 158 individuals (42.8 %); 2006 = 61 individuals (16.5 %). Final participation totaled 369 individuals; 14 returned surveys were excluded from the sample

<sup>b</sup> “Not deliverable” surveys were returned due to inaccurate or outdated addresses; “not applicable” surveys included deceased individuals, those no longer active, or those considering themselves not knowledgeable enough to complete a survey

<sup>c</sup> “Raw” return rates include “not deliverable” and “not applicable” numbers in percentage calculations

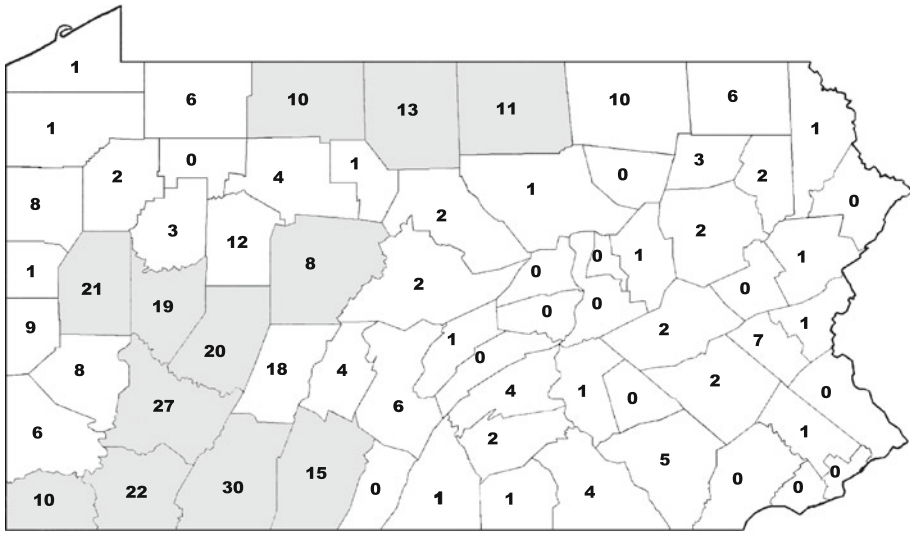
<sup>d</sup> “Adjusted” return rates exclude “not deliverable” and “not applicable” numbers from percentage calculations

positive) regarding government involvement in ginseng trade; and under-representation of certain demographic groups or regions. While it is acknowledged that there may be some biases contained in the findings presented here, due to these and other sampling frame limitations, the stakeholder perspective contained herein is nevertheless useful for better understanding the ginseng trade in Pennsylvania and attitudes and beliefs underlying this trade.

Of the 1,184 surveys mailed to postal addresses between 2004 and 2006, 383 (32 %) were returned by the conclusion of the survey period (January 1, 2007). Most surveys were received during 2004 and 2005 (Table 2). Return rates include adjustments for surveys returned as “non-deliverable” (12 %) or “not applicable” (1 %). “Non-deliverable” surveys occurred despite screening for obvious illegitimate, duplicate, and insufficient names and addresses. Surveys considered “not applicable” were received from relations of deceased individuals, no longer active, or considered (by their own judgment) not knowledgeable enough to participate. The highest return rate (81 %) was associated with individuals who requested a survey after learning about the study in the media (“individual requests”). However, most (71 %, after adjusting for non-usable surveys) survey respondents were solicited using PA DCNR mailing lists.

Fourteen surveys were excluded from the sample due to only partial completion, or because the survey could not be matched using the visible and unique identification code on the outside of the survey return envelope (c.f., Dillman 2000) with a name and address contained in one of the sampling frames. This resulted in final *n* of 369. In the cover letter included with the survey, respondents were told they could freely choose to not answer any question. This, and the fact that not all survey sections and questions were applicable to a respondent, altered the sample size for each question.

Usable surveys were received from 52 (78 %) counties, representing all geographic regions of Pennsylvania. Most survey participants were from counties where commerce data indicate harvesting for sale has been greatest (Fig. 2). Four respondents were



**Fig. 2** The number of survey respondents from each county ( $n = 359$ ). An additional 10 respondents did not give their county of residence ( $n = 6$ ) or were a non-resident of Pennsylvania ( $n = 4$ ). The top 12 ginseng export counties (1991–2010) are indicated in *shading*

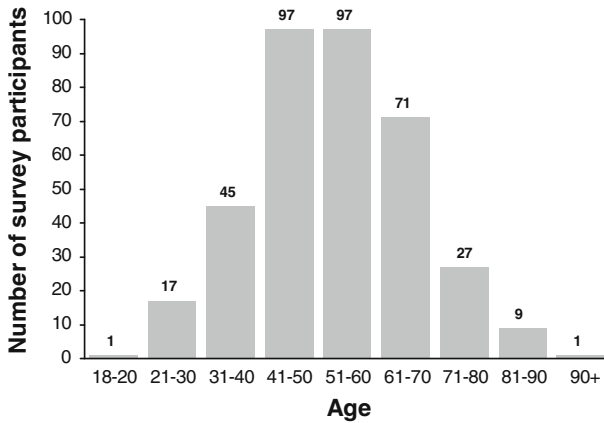
non-residents who collected or planted in Pennsylvania. Survey respondents were overwhelmingly male (96 %,  $n = 352/369$ ).

Respondent age varied widely from 18 to 95 years although the mean, median, and mode were similar at 53 ( $\sigma = 14$  years), 52, and 50 years, respectively (Fig. 3). Nearly three-quarters (73 %) of survey participants were between 41 and 70 years old; more than half (53 %) were 41–60 years of age. All of the KIs and FGD participants in this study were at least 30 years old (range 30–71, mean = 46). It is unclear to what degree the generally older ages associated with study represents sample bias, self-selection among older individuals, or whether it reflects true underlying trends in the socio-demographic context of ginseng harvesters and planters. For example, KIs and FGD participants frequently suggested a “generational gap” exists in the ginseng trade in which young people “just aren’t interested in the outdoors or ginseng anymore.” KIs suggested this was due to a “lack of patience,” “greater mobility of young people today,” and/or a “fading interest in the out-of-doors.” Nearly one-quarter of the KIs (24 %,  $n = 6/25$ ) attributed the general decline in reported ginseng exports from Pennsylvania since 1990 to this fading interest among younger people.

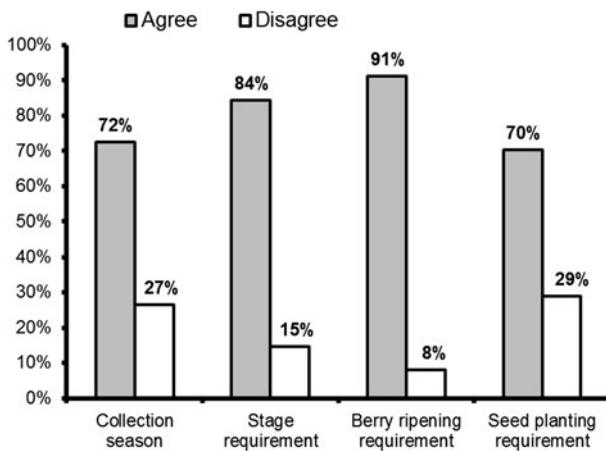
#### Attitudes towards ginseng harvest restrictions

Survey results indicate that at least 7 of 10 respondents across stakeholder groups agreed with each existing Pennsylvania ginseng harvest restriction (Fig. 4). The greatest agreement (91 %,  $n = 336/366$ ) was with the requirement that “berries must be ripe” prior to harvesting plants, while the least (70 %,  $n = 259/366$ ) support was found for the restriction that “berries must be planted in the immediate vicinity of the collection location.”

Respondent age and number of years collecting or planting were significantly associated with agreement with the “collection season,” “stage,” and/or “vicinity” restrictions (Table 3). Because this study employed a cross-sectional rather than longitudinal sampling



**Fig. 3** The age distribution of survey respondents ( $n = 365$ )



**Fig. 4** The percentages of survey respondents agreeing/disagreeing with each existing ginseng harvest restriction in Pennsylvania ( $n = 366$ )

design, it is not possible to determine from these data whether the observed pattern of declining support with age and/or experience reflects differences in attitudes associated with greater experience among older individuals or reflects generational changes in attitude. Some KIs (16 %,  $n = 4/25$ ), for example, suggested that since ginseng restrictions were only recently established, older individuals, having witnessed both regulated and unregulated eras, are reluctant to accept government involvement in the trade. A KI from south-central Pennsylvania offered the following observation: “A [collection] season is just now becoming accepted practice among people in my area. Many people from my generation still dig whenever they see fit whereas the younger people are more accepting of the new laws.<sup>2</sup>”

Another explanation offered by KIs, and perhaps one better supported by the survey results, was that as individuals gain more experience with ginseng collecting and planting,

<sup>2</sup> KI from Mifflin County, Pennsylvania (verbal communication).

**Table 3** Interrelationship between survey respondent age, years collecting or planting, and agreement with existing Pennsylvania ginseng harvest restrictions

	Number of respondents ( <i>n</i> ) and percentage (%) who agreed with:							
	Collection season		Stage requirement		Berry ripening requirement		Vicinity requirement	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
<b>Age</b>								
18–40 ( <i>n</i> = 62)	43	69	<b>55</b>	<b>89</b>	58	93	49	79
41–60 ( <i>n</i> = 192)	148	77	<b>169</b>	<b>88</b>	179	93	130	68
61+ ( <i>n</i> = 107)	72	67	<b>83</b>	<b>78</b>	95	88	77	71
<b>Years collecting</b>								
1–10 ( <i>n</i> = 87)	67	77	<b>82</b>	<b>94</b>	81	93	<b>75</b>	<b>86</b>
11–30 ( <i>n</i> = 144)	107	74	<b>119</b>	<b>83</b>	132	92	<b>97</b>	<b>67</b>
31+ ( <i>n</i> = 113/114)	74	65	<b>92</b>	<b>81</b>	104	91	<b>74</b>	<b>65</b>
<b>Years planting</b>								
1–10 ( <i>n</i> = 111)	<b>87</b>	<b>78</b>	<b>104</b>	<b>94</b>	<b>106</b>	<b>95</b>	<b>86</b>	<b>77</b>
11–30 ( <i>n</i> = 127)	<b>88</b>	<b>69</b>	<b>98</b>	<b>77</b>	<b>112</b>	<b>88</b>	<b>79</b>	<b>62</b>
31+ ( <i>n</i> = 46/47)	<b>29</b>	<b>63</b>	<b>35</b>	<b>76</b>	<b>40</b>	<b>85</b>	<b>27</b>	<b>57</b>

Numbers and percentages are for those agreeing with each restriction

Bold-face indicates observed difference in agreement/disagreement between age/experience groups is significant at 0.10 level or higher,  $\chi^2$  test

they witness more scenarios in which a particular harvest restriction does not correspond with harvester reality and consequently reject the restriction outright (one KI used the expression “toss the baby out with the bath water” in this regard). The fact that there were significant differences among groups associated with years planting across all restrictions in survey results, and among years collecting for two of four restrictions, suggests experience may be more integral than age. A better longitudinal understanding of the connection between age, experience, and agreement with ginseng harvest restrictions would help answer an assertion frequently (48 %, *n* = 12/25) made by KIs that “younger ginseng diggers are less conservation-minded” compared with older ones. Survey results from this study appear to contradict this assertion.

#### *Berry ripening requirement*

A Pennsylvania harvest restriction requiring that ginseng berries must be ripe (i.e., red) before plants are legally harvested was the most widely (91 %) supported restriction among survey respondents. Those (including some KIs) who did not agree with this restriction claimed to have successfully germinated seed using green berries (e.g., “I’ve planted green berries at right stage that did grow” [sic]<sup>3</sup>) or asserted that green berries continue to ripen after plants are harvested (e.g. “Put stock in ground with soil around it, berries will ripen up” [sic]<sup>4</sup>). McGraw et al. (2005) found that seed germination from green

<sup>3</sup> Survey respondent (written comment from the instrument).

<sup>4</sup> KI from Somerset County, Pennsylvania (verbal communication).

berries does occur, but germination is greatly ( $3\times$ ) improved if berries are allowed to ripen on the stalk before seeds are collected. Whether or not berries will continue to ripen after removing them from the stalk has not been studied.

A few who disagreed with the berry ripening requirement did so because they believed it shortens the collection season if they wait for berries to mature (e.g., “Even in late Sept if berries are still present some are still green. I feel plants are ready to pick roots as early as mid-July as long as berries are full size, green or red” [sic]<sup>5</sup>). One survey respondent commented: “berries often never ripen in PA [sic].<sup>6</sup>” This and other similar perspectives (e.g., “You shouldn’t be able to hunt when berries are red because it makes it a lot easier to find. The season should be from June 1 to Aug. 1” [sic]<sup>7</sup>), if they are taken seriously, suggest a lack of understanding among some collectors about the reproductive requirements of ginseng and highlights a need for outreach and education.

### *Ginseng collection season*

Despite widespread support for a berry ripening requirement, there was considerably less (72 %) support for a collection season in Pennsylvania among survey respondents. However, opposition to the collection season was largely due to the current start and end dates of August 1 through November 30, rather than any collection season per se. Many respondents indicated August 1 is “too early” and should be changed to sometime between August 15 and September 15 (e.g., “Start no sooner than Aug. 15. Some seeds (pods) are still unripe” [sic]<sup>8</sup>). This sentiment was echoed by nearly all (96 %,  $n = 24/25$ ) KIs as well. One KI expressed his long-standing disagreement with the August 1 collection start date through the following anecdote:

You must change the time for digging wild ginseng. If you dig August 1st you may as well dig anytime of the year. Any ginseng dug at this time is destroyed forever. I came from a family of father + 3 brothers and we all collected ginseng. If you dug a stalk in Aug and dad found out you got your backside paddled [sic].<sup>9</sup>

It should be noted that this KI was speaking of a time prior to ginseng regulations in Pennsylvania (i.e., pre-1989). Currently, Pennsylvania is the only export state with a harvest season beginning August 1; all other export states have collection seasons that open later (FWS 2012). These include New York (September 1), Ohio (September 1), West Virginia (September 1), and Maryland (August 20). The only published field study (McGraw et al. 2005) on berry ripening in eastern North America suggests August 1 is probably too early most years in Pennsylvania.

In addition to the season start date, respondents had other concerns pertaining to the Pennsylvania collection season. Many survey respondents indicated that the season should “only apply to wild” rather than planted or cultivated sources (e.g., “OK for wild only” [sic]<sup>10</sup>) a sentiment also shared by all KIs and many FGD participants. Some considered the current season “too long” since the Pennsylvania season runs through November 30

<sup>5</sup> Survey respondent (written comment from the instrument).

<sup>6</sup> Survey respondent (written comment from the instrument).

<sup>7</sup> Survey respondent (written comment from the instrument).

<sup>8</sup> Survey respondent (written comment from the instrument).

<sup>9</sup> KI from Somerset County, Pennsylvania (written communication).

<sup>10</sup> Survey respondent (written comment from the instrument).

(e.g., “Can’t find plants in this area after Nov 1 anyway” [sic]<sup>11</sup>). There were also concerns that a single season was not suitable for the entire state, and that “zones” featuring different dates may be more appropriate (e.g., “This should be zoned. Bedford is ready. But Somerset County usually isn’t ready till the 2nd or 3rd week of Aug” [sic]<sup>12</sup>).

#### *Ginseng harvest stage requirement*

A Pennsylvania requirement that harvested plants have “at least three leaves of five leaflets” (or three “prongs” or “branches” as commonly referred to by stakeholders) was supported by 84 % of survey respondents. Those who did not agree with this restriction indicated there was often inconsistency between the above and below ground appearance of a plant. That is, a plant could look immature based on the number of leaves or prongs present; but the root could nevertheless be of commercial age and size (e.g., “Occasionally, plants in a state of decline will have only small top but a large root and be very old. Usually found where the plants are being shaded out” [sic]<sup>13</sup>). The following comment from a KI was typical of many ginseng collectors:

“I have dug plants that have no stems while digging one that does and they didn’t even have a new start on them so there is no telling how long it has sat dormant. But I have dug up smaller plants that only have 2 prongs to find out that it is a 30–40 year old plant. So you can’t always go by the prongs [sic].<sup>14</sup>”

Other respondents disagreed not with the restriction itself, but with its wording, suggesting it was confusing and “out-of-touch” with the language collector’s use (e.g., “Should be “plants must have at least 3 branches”” [sic]<sup>15</sup>). Still others said that stalk diameter is more useful than the number of leaves for gauging root size (e.g., “I don’t go by that, if the stem is not as big as a pencil, don’t dig it” [sic]<sup>16</sup>).

#### *Planting location requirement*

A majority of respondents indicated support (70 %) for a harvest requirement that “seed must be sown in the vicinity of harvested plants.” Disagreement with this requirement occurred because respondents believed that they should be able to plant at least some berries or seeds in other appropriate locations to begin “patches” (e.g., “I feel not all berries need to be planted at site. Planting some elsewhere expands range” [sic]<sup>17</sup>) or where others could not find them (e.g., “Berries should be replanted but diggers should be able to plant them in areas they see suitable to scatter the species over an area rather than confining them to some areas which may fall prey to greedy harvesters” [sic]<sup>18</sup>). Many survey respondents and KIs disagreed because collection areas were sometimes destined to be altered or destroyed (e.g., “This is not always practical; you may know the area is to be

<sup>11</sup> Survey respondent (written comment from the instrument).

<sup>12</sup> Survey respondent (written comment from the instrument).

<sup>13</sup> Survey respondent (written comment from the instrument).

<sup>14</sup> KI from McKean County, Pennsylvania (written communication).

<sup>15</sup> Survey respondent (written comment from the instrument).

<sup>16</sup> Survey respondent (written comment from the instrument).

<sup>17</sup> Survey respondent (written comment from the instrument).

<sup>18</sup> Survey respondent (written comment from the instrument).

surface mined or developed” [sic]<sup>19</sup>). Many study participants also indicated they were unsure about what “immediate vicinity” implies (e.g., “How is immediate vicinity defined?” [sic]<sup>20</sup>).

### Stakeholder experience with enforcement

Enforcement of ginseng harvest and trade restrictions in North America is complicated by a variety of factors not least of which is the area that must be “policed” (Bilger 2002; Bourne 2000; Corbin 2002). In Pennsylvania, for example, there are 16.6 million acres of forestland of which 3.8 (23 %) are managed by PA DCNR (McWilliams et al. 2007). In relation, there are 33 DCNR Bureau of Forestry rangers responsible for enforcing regulations on state forestlands (J. Hall, pers. comm. 2010) and about 50 full-time and 100 seasonal rangers available to enforce regulations in State Parks (P. Ashford, pers. comm. 2010). To put these numbers into perspective, each DCNR ranger is therefore responsible for enforcing ginseng regulations on roughly 20,213 acres of public land.

An additional constraint to enforcing ginseng “crimes” on Pennsylvania forestlands stems from land ownership and associated jurisdictional boundaries. In Pennsylvania, DCNR does not have authority to enforce ginseng harvest restrictions on private lands, a caveat which is not generally acknowledged nor well understood outside of DCNR law enforcement. That DCNR does not have jurisdiction on private lands is critical to ginseng enforcement on 11.7 million acres (71 %) of privately owned forestlands in Pennsylvania (McWilliams et al. 2007). Because of these complex jurisdictional boundaries, enforcing ginseng harvest restrictions on private forestlands depends on cooperation with other natural resource management agencies as well as state and local police. A private landowner must report theft or out-of-season harvesting, for example, to local or state police who would then coordinate enforcement or evidence gathering activities with Pennsylvania DCNR (pers. comm., “enforcement” FD).

The KIs interviewed in this study provided comments relating to the failure of jurisdictional enforcement related to ginseng. KIs frequently (84 %,  $n = 21/25$ ) cited situations where there was a failure to enforce ginseng harvest and/or trade restrictions. One widely heard complaint was that the harvest restrictions that “make the most sense” (e.g., collection season) are not sufficiently enforced or, if they happen to be enforced, there are no resulting prosecutions. None of the KIs participating in this study knew of anyone actually prosecuted for violating ginseng harvest restrictions in Pennsylvania (e.g., “No one cares and too hard to enforce” [sic]<sup>21</sup>), although all knew of instances where he/she or someone had violated a restriction (e.g., “Good but who can enforce this rule [referring to the “stage” restriction]. I know people who pick every plant they find” [sic]<sup>22</sup>). A Bedford County KI summed it up this way: “ginseng is an honor system; there is no enforcement.” A wildlife conservation officer with the Pennsylvania Game Commission shared the following related experience:

Sang hunting is highly popular in Bedford County and much of it is done illegally. Several local people also cultivate it for sale. Some also plant and encourage it in their private woodlots. A few summers ago, I caught two men in a State Game Land

<sup>19</sup> Survey respondent (written comment from the instrument).

<sup>20</sup> Survey respondent (written comment from the instrument).

<sup>21</sup> Survey respondent (written comment from the instrument).

<sup>22</sup> Survey respondent (written comment from the instrument).



with 219 roots, many from very small (immature) plants. This occurred in Late June. As a WCO for the PGC, I prosecuted them for one count of removing plants from the SGL and referred the case to DCNR. Nothing more was done. That is, no other action was taken by DCNR. This same thing has happened to me before when I reported a man for harvesting many large plants in early May. In actuality, there is no enforcement of the Pennsylvania laws protecting this important plant. That needs to change [sic].<sup>23</sup>

Stakeholder experience is externally validated by DCNR reports submitted to FWS each year as part of CITES requirements; they confirm “no violations have been recorded or prosecuted” since 2005—the year when the FWS began requesting information on ginseng-related violations on state export reporting forms (supplied by PA DCNR 2005–2011). These findings were also corroborated externally by recent multi-state monitoring efforts (which included wild ginseng populations in Pennsylvania) that found frequent harvest violations with no apparent enforcement (McGraw et al. 2010).

Regarding enforcement of trade restrictions, 13 % ( $n = 44/343$ ) of survey respondents knew someone who is not a Pennsylvania resident but harvests ginseng in the state; of these, 48 % ( $n = 21/44$ ) indicated they did not know where these roots were sold. The remainder reported that roots were sold within Pennsylvania (32 %,  $n = 14/44$ ) or in another state (30 %,  $n = 13/44$ ) (Note: respondents could respond to more than one item and so percentages do not sum to 100 %). Nearly half of KIs (48 %,  $n = 12/25$ ) and many FGD participants noted that the early (relative to surrounding states) season opening date in Pennsylvania facilitates and encourages illicit ginseng transport into the state ahead of the opening date in adjacent states. KIs living near state borders were especially familiar with interstate commerce and believed it was unavoidable. One KI from the southern border region explained:

Talked with 4 rooters [harvesters] today (July 30). They are not happy with [a licensed buyer] offering \$250 lb. They all said they will sell in W. Va. These is po folk, they go where the money is, legal or otherwise, they have no choice [sic].<sup>24</sup>

Because interstate commerce without an accompanying license and certificate is prohibited by federal law, KIs revealed product is often recorded as originating from Pennsylvania even when it is not. This obviously casts doubt upon the accuracy and reliability of existing trade data.

#### Stakeholder suggestions for improving enforcement

Ultimately, all of the stakeholders in this study believed that actual enforcement of ginseng restrictions and laws in Pennsylvania was lacking; however, while there was widespread sentiment among study participants that ginseng restrictions are not enforced, the “patrolling” of private forestlands by DCNR or other government agencies was not generally supported. The principal reason for this was a widely shared belief in “private property rights” and that private lands should be considered differently than public lands. The following KI quote was representative of many study participant beliefs with respect to enforcement of a “collection season,” for example, on private forestlands:

<sup>23</sup> FGD “enforcement,” Pennsylvania Game Commission (written communication).

<sup>24</sup> KI from Greene County, Pennsylvania (written communication).

Ginseng harvesters are like any other farmer in PA. They know the best time to harvest their crops. Noone tells my neighbor when to harvest his corn and beans. Why is that? We don't think the DCNR should tell us how or when to harvest the Ginseng we bought and planted on our own property! Do you honestly think we would harvest our Ginseng in June or July and waste all our seed stock and money? WILD GINSENG ON PUBLIC OR STATE LAND IS ONE THING. WILD ON OUR PROPERTIES IS ANOTHER. WE THINK THE RULES OF HARVEST SHOULD STATE THAT [sic]<sup>25</sup>!

KIs and FGD participants argued that state and local police should be better aware of and enabled to enforce violations upon landowner “tips” or invitations. In these cases, DCNR would coordinate evidence gathering and cross-agency collaboration. This enforcement approach was supported by participants in the “enforcement” FGD, who agreed that “policing” private lands for ginseng “crimes” is impractical. One participant offered the following advice:

DCNR needs to distinguish between “guidelines” versus “regulations.” What is enforceable versus not enforceable (or unrealistic). A season is enforceable. Seed planting requirements and the “three-prong rule” are questionable. DCNR needs to be confident that it knows what it is talking about. When public confidence waivers or regulations are perceived as unreasonable and/or unenforceable, widespread violations occur or are promoted [sic].<sup>26</sup>

Another participant recommended: “DCNR needs to determine whether a violation constitutes a “way of life” or a criminal behavior. Criminal behaviors are more likely to be impacted by enforcement.” And, yet another FGD participant offered:

DCNR needs to distinguish between “infractions” versus “crimes.” An example of an infraction would be harvesting plants while berries are green. A crime, on the other hand, would be theft from someone’s property. The two are not the same and should warrant different punishment and enforcement efforts.<sup>27</sup>

There was a consensus among all stakeholders that DCNR and government should first focus on building “good will” with the ginseng industry by “shifting from an enforcement mentality” toward an educational role. Buyer-traders suggested that DCNR work closely with them to distribute educational materials (e.g., annual newsletter with updates and stewardship guidelines) and improve information gathering about the industry. “Take care of the dealers,” one buyer-trader KI offered, “and the dealers will work for DCNR.” Another buyer-trader KI offered the following advice: “Work with ginseng buyers as “gate-keepers” to the local ginseng public...Build upon the buyer-collector relationship rather than try to invent a DCNR-collector relationship.<sup>28</sup>” Buyer-trader FGD participants proposed they should be recognized as an important link between government and public. “Buyers,” one FGD participant noted, “can serve as coaches and advise diggers” and added “pressure from buyers can be important tool for changing behaviors.<sup>29</sup>” As an example, he explained that he reprimands collectors who bring in small or juvenile roots

<sup>25</sup> KI from Butler County, Pennsylvania (written communication).

<sup>26</sup> FGD “enforcement,” Pennsylvania State Police (written communication).

<sup>27</sup> FGD “enforcement,” Pennsylvania State Police (verbal communication).

<sup>28</sup> FGD “buyer-trader” from Fayette County, Pennsylvania (verbal communication).

<sup>29</sup> FGD “buyer-trader” from Wisconsin (verbal communication).

and suggested that by refusing to buy such roots, or plants collected out of season, he is able to dissuade collectors from engaging in these behaviors. Another FGD participant proposed: “buyers can serve as communication liaisons much more effectively than DCNR since they are often more trusted by collectors.”<sup>30</sup>

For this approach to be effective, participants from all FGDs warned that buyers must be “vetted” and the unethical ones “reigned in” or they could undermine behavioral pressure created by “ethical” buyers. When KIs and FGD participants were asked for suggestions on how to improve buyer-trader compliance, all suggested a combination of efforts was needed (e.g., “carrot and stick” or “double barreled” approach) with both benefits and penalties. The following advice was given by an “enforcement” FGD participant:

“DCNR needs to better scrutinize dealers. If dealers are not complying with laws then the criminals will have a mechanism/impetus for violating as well. DCNR should take seriously any reports of dealer violations and investigate. Dealers who receive stolen ginseng, for example, should be prosecuted and the case should be “high profile” in newspapers around the state. DCNR needs to cite dealers or revoke dealer licenses for those who do not complete paperwork properly and completely. PA Fish and Boat Commission, for example, will commonly cite fishing license vendors and buyers for not completely filling out required information. There is no slack given. If DCNR goes after the 10 % of violators, then the remaining 90 % will do it right.”<sup>31</sup>

#### Stakeholder perspectives regarding ginseng conservation in general

An important finding from this study was that KIs unanimously shared a frustration that government agencies such as DCNR and FWS seemingly “target” ginseng collectors/planters through a regulatory approach while ignoring the broader issues relating to ginseng habitat loss and degradation. DCNR and government policy was viewed as inconsistent, a view that one FGD member summed up by asking: “Should vulnerable plants only be vulnerable because of collectors?”<sup>32</sup> For a few KIs (12 %,  $n = 3/25$ ), the “targeting” of collectors was attributed to collusion between industry and government. One KI, for example, wrote the following:

I have hunted ginseng since 1937. We hunted ginseng to buy hunting and fishing supplies. I have hunted since retiring in 1988 to stay in shape, and to locate turkey and deer hunting areas. I walk in the mountains 4–8 h a day, fishing, hunting, berry picking, mountain biking and ginseng picking and just hiking. You are 40–50 years too late to save the ginseng. You should concentrate on saving the forests in order to save the ginseng. The timber, coal, insurance, and politician lobbyists are in control of DCNR and Pa. Game Commission. Those who are to protect are ruining the forests [sic].<sup>33</sup>

These and other similar comments received during this study highlight an important public confidence related challenge regarding ginseng conservation efforts—one which emanates from a perceived failure of natural resource agencies such as DCNR to recognize and stop

<sup>30</sup> FGD “buyer-trader” from Somerset County, Pennsylvania (verbal communication).

<sup>31</sup> FGD “enforcement,” Pennsylvania Fish and Boat Commission (verbal communication).

<sup>32</sup> FGD “buyer-trader” from Fayette County, Pennsylvania (verbal communication).

<sup>33</sup> KI from Blair County, Pennsylvania (written communication).

ginseng habitat loss. For many KIs (92 %,  $n = 23/25$ ), failure to address habitat loss and degradation serves as justification to adopt critical attitudes toward any government involvement in the trade. Pokladnik (2008) found similar stakeholder frustrations in her ginseng “poaching” study in Appalachia, with study participants suggesting that the government should recognize habitat destruction (e.g., “mountaintop removal”) as a type of ginseng “poaching.” One KI in the present study admonished: “The government should enforce its own regulations against itself!”<sup>34</sup> Accurate or not, the perception of disproportionate scrutiny of ginseng collectors and planters, without equal attention to habitat loss and degradation, undermine compliance with harvest restrictions and other laws intended to foster stewardship in the industry. During the 2006 “enforcement” FGD, an officer offered the following advice: “Collectors have no impetus to protect the resource if resource agencies do not. There needs to be attention given to protection of ginseng habitat or DCNR will not be able to “sell” stewardship to the public.”<sup>35</sup> Similarly, a KI (and veteran law enforcement officer) shared the following perspective:

Habitat loss and woodland clearing are the greatest threats to Pennsylvania’s wild ginseng population. Wildcrafters do not pose as great a risk to wild Pennsylvania ginseng as land developers. If the resource is truly to be protected, habitat loss and clearing of wild ginseng sites must be regulated above all else. Some of our law-abiding natural resources agencies are more destructive to ginseng than law-abiding wildcrafters. There are places on state land where ginseng has been mowed and cut away so trails “look nice”. I have seen ginseng patches bulldozed for buildings on several occasions. Wildcrafters rarely dig a colony of ginseng out of existence. Bulldozers always do [sic].<sup>36</sup>

This view was affirmed by survey results in that at least two-thirds of survey respondents cited “timber removal” (68 %) and “land development” (66 %) as activities that they had personally observed leading to the “elimination” of ginseng from collection/planting areas (Table 4) and by broader findings such as a The Brookings Institution Center on Urban and Metropolitan Policy 2003 report which indicated that 1.1 million acres of “natural land” was developed in Pennsylvania between 1982 and 1997. A 2004 forest inventory analysis found that more than 663,000 acres of forestland were lost to residential and industrial development in Pennsylvania between 1989 and 2004, a rate of about 44,000 acres annually (McWilliams et al. 2007).

While habitat loss and degradation were most commonly cited by study participants as “threats” to ginseng in Pennsylvania, there was also widespread acknowledgement that improper and/or unethical collection practices were also problems (Table 4). In the survey results, “collection by diggers” was considered a threat by more than half (60 %) of respondents. KIs and FGD participants widely shared the belief that while there are “bad diggers,” they are fewer in number than “good diggers.” KIs frequently asserted that ginseng collectors and planters were important for conserving the species because of their local knowledge of “patches” and their active attentiveness to planting berries and seeds in these patches. One KI, for example, wrote the following related anecdote:

Ginseng when I was a kid was 1/4 of our living. All day digging was generally 8–10 lbs green. We always planted the berries. Almost always we stuck the stem

<sup>34</sup> KI from Cambria County, Pennsylvania (verbal communication).

<sup>35</sup> FGD “enforcement,” Pennsylvania State Police (verbal communication).

<sup>36</sup> FGD “enforcement,” Pennsylvania Fish and Boat Commission (verbal communication).

**Table 4** Survey respondent (i.e., collectors, planters and buyers) observations regarding the reasons for loss of wild ginseng in Pennsylvania ( $n = 349$ )

	Yes	No
Timber removal	68 % ( $n = 238$ )	32 % ( $n = 111$ )
Herbicide applications on forestlands	13 % ( $n = 45$ )	87 % ( $n = 304$ )
Surface mining	48 % ( $n = 167$ )	52 % ( $n = 182$ )
Land development	66 % ( $n = 230$ )	34 % ( $n = 119$ )
Deer browsing	25 % ( $n = 87$ )	75 % ( $n = 262$ )
Competition from other plants	23 % ( $n = 79$ )	77 % ( $n = 270$ )
Collection by diggers:	60 % ( $n = 208$ )	40 % ( $n = 141$ )
Harvest out of season ( $n = 208$ )	61 % ( $n = 126$ )	39 % ( $n = 82$ )
Not planting seed from harvested plants ( $n = 208$ )	54 % ( $n = 113$ )	46 % ( $n = 95$ )
Harvest before berries are ripe ( $n = 208$ )	77 % ( $n = 160$ )	23 % ( $n = 48$ )
Harvest of young plants ( $n = 208$ )	75 % ( $n = 155$ )	25 % ( $n = 53$ )
Harvest of too many plants in an area ( $n = 208$ )	74 % ( $n = 154$ )	26 % ( $n = 54$ )

Respondents were asked to respond to an activity only if they had personally observed it had caused losses or extirpation of ginseng from an area

with berries on it down in the ground and the berries then would ripen and onto that loose ground and nature did the rest. We would come back apast where we stuck stem in the ground in a couple years and see one prongers everywhere close together. Every year we hunted over the same territory, this shows we done the right thing. I've told people all my life how to plant ginseng berries [sic].<sup>37</sup>

Such assertions are supported by harvest models that suggest conscientious harvesters/ planters can strongly enhance population growth rates and thus long-term viability of harvested patches or populations (Van der Voort and McGraw 2006).

## Synthesis and implications

Although Pennsylvania's wild American ginseng industry has been regulated for more than 20 years, there has never been any solicitation for stakeholder input on the appropriateness or efficacy of existing regulations. This study represents the first effort to gather such input. In doing so, we found general support for existing harvest restrictions among all stakeholders, with the strongest support indicated for a restriction stipulating that berries must be mature (i.e., red) before plants are harvested. Support for harvest restrictions generally declined in survey results as stakeholder age and experience increased, suggesting that both play a role in stakeholder acceptance and compliance. When asked about these interactions, KIs frequently asserted that older stakeholders were less accepting of regulations because they resented recent government involvement, having lived during unregulated historical times, while those with greater experience were allegedly less likely to agree with regulations because of the unreliability or impracticality of harvest restrictions when compared with actual "real-world" scenarios gained through experience.

<sup>37</sup> KI, Somerset County, Pennsylvania (written communication).

While we found general support for government harvest restrictions, participants in this study widely shared the belief that harvest restrictions are “irrelevant in the woods” and only reinforce existing stewardship behaviors (where they exist) rather than encourage them. KIs and FGD participants across stakeholder groups (including members of the “enforcement” community) believed restrictions are in practice “unenforceable” and thus collection and husbandry represent “a scout’s honor tradition,” especially on private lands. This emic is externally validated by the fact that enforcement in Pennsylvania is constrained by complex jurisdictional boundaries resulting in the inability of DCNR to enforce harvest restrictions on private lands. Even if these issues regarding jurisdiction were resolved, however, the extensive land-base to “police” (~ 16.6 million acres) suggests that such efforts would continue to challenge limited personnel and resources indefinitely into the future. Due to these limitations, stakeholders suggested that Pennsylvania DCNR focus on ‘scrutinizing’ licensed buyer-traders and build relationships with those “ethical” buyer-traders who can serve as “liaisons” and/or “coaches” with the public. It was contended that ethical buyer-traders can discourage unsustainable behaviors more effectively than restrictions by simply refusing to purchase juvenile roots or roots collected out of season, for example.

Underlying these circumstances, this study uncovered a widely shared stakeholder emic that government agencies seemingly focus on collectors as the primary threat to ginseng, without paying equal or more attention to loss of ginseng through continued habitat conversion and/or degradation. This perception, accurate or not, generates considerable friction between stakeholders and government agencies in charge of wild ginseng management with the consequence that disregard and/or distrust of government driven regulatory efforts exists throughout this industry.

The most common suggestion for conserving ginseng documented in this study, supported by all KIs and FGD participants, is to involve stakeholders proactively as “partners” in planting and restoration (“conservation through cultivation” approach, *c.f.* Alcorn 1995). All KIs believed that such an approach would help to “take the pressure off” of any remaining wild populations and suggested that such efforts would ideally be aided by “government sponsored” planting stock supply programs developed using regionally sourced, nursery propagated genetic material. In the absence of any stock supply program(s), stakeholders suggested that “government” agencies should at least support planting and cultivation on private forestlands by recognizing forest-based ginseng production as a legitimate, albeit incipient, industry and better align ginseng management programs so that this industry can operate more transparently and securely in the future. Nearly all study participants, regardless of stakeholder group, believed the only way to counter overexploitation and habitat loss (both considered inevitable) is to increase the amount of ginseng planted on forestlands via “stocking” or agroforestry (e.g., “forest farming”) programs, rather than by “piling-on” regulations. Moreover, stakeholders believed strongly that additional regulations, or a CITES ban on exports, would serve to “drive the good people out” of this industry resulting in “black market trade” and acrimonious relations between government agencies such as DCNR and FWS and private citizens who might have otherwise helped to contribute to ginseng’s preservation through partnerships.

In conclusion, the impact of a CITES-driven “top-down” regulatory approach to wild ginseng conservation appears to be limited as currently implemented in Pennsylvania. Moreover, this scenario is not likely to change due to deeply embedded cultural emics (e.g., the primacy of personal experience over government regulation) as well as practical constraints to enforcement (e.g., limited jurisdiction and personnel, challenges in enforcing harvest restrictions). The willingness of many stakeholders to act as partners in “bottom-

up” ginseng planting and restoration efforts should be explored by Pennsylvania DCNR (and similar agencies in other states) as a proactive mechanism for achieving greater conservation gains than are probably currently attainable through the existing “top-down” regulatory approach. The inclusion of planting programs as part of any comprehensive conservation effort is not without precedent with CITES listed plants, particularly where socio-economic drivers underlie wild exploitation (c.f., Entwistle et al. 2002; Pandey et al. 2007). This approach to wild plant conservation also has the potential to concomitantly contribute to sustainable livelihoods in forested regions of Pennsylvania (and the eastern US) by providing economic incentives for forest retention and stewardship on privately owned lands (Brennan et al. 2005; Burkhart and Jacobson 2009).

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