THE STATE OF HERITAGE TREE PROGRAMS IN THE ROCKY MOUNTAIN/INTERIOR PLAIN PROVINCE

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1   ABSTRACT

Heritage tree programs serve communities by recognizing and protecting significant trees. Despite the benefits of these programs, little research has investigated contributing factors in heritage tree planning policy. Through analysis of descriptive data generated from a survey questionnaire sent to professionals and those in elected or appointed services that might directly inform heritage tree policy, this research measured the regulatory environment in the Rocky Mountain/Interior Plain Province region of Montana, Colorado, New Mexico, and Wyoming, and sought to establish a regional "current state" baseline in designating significant trees. Only 7% of respondents answered that their local government has a heritage tree program, while half of the respondents indicated they were unaware of the possible benefits of such programs. Heritage tree programs were only found in cities having a staff arborist/forester and a college or university. Within professions, support for heritage tree programs was highest among arborists and lowest among landscape architects/designers, and was consistently higher for programs on streets/parks than for those on private property. These findings suggest that although a majority of those surveyed support Heritage Tree policy implementation, efforts to increase awareness, promote advocacy, and administer incentives in public sector services could well determine the success or failure of a Heritage Tree program.

1.1   Keywords

Arboriculture, urban forestry, urban planning, historic preservation, heritage tree

2   INTRODUCTION

Trees serve many purposes in the urban environment. They contribute to ecological quality by improving soil, creating wildlife habitat (Trowbridge and Bassuk, 2004), mitigating stormwater and wind; they also provide climate control (Girling and Kellett, 2005), reduce pollution (Nowak et al., 2006), and in the United States alone total urban tree carbon storage is estimated as 643 million tonnes (Nowak et al., 2013). Trees also promote human health (Donovan et al., 2013; Seamans, 2013), decrease crime (Donovan and Prestemon, 2012) and increase real estate values (Anderson and Cordell, 1988; Jones, Davis, and Bradford, 2013; Neely, 1988). In total urban forests in the United States, which have been aptly referred to as our green infrastructure, are worth an estimated $2.4 trillion (Nowak et al., 2002).

Trees also play a role in our social and natural connectivity (Rogers, 2001; Lawrence, 2006). Historically, people have planted and maintained trees from a desire for aesthetic pleasure and beauty in fashioning gardens, to create visions of paradise, to exhort power and control over private and public urban space, and to establish cultural and national identity (Rogers, 2001). Trees create a meaningful site (Girling and Kellett, 2005; Jim, 2004a) and have a dynamic, significant role in the human condition (Kaplan, Kaplan, and Ryan, 1998; Spirn, 1998); and whether we connect by observing their seasonal rhythms, standing in their shade, or using them as informal gathering spaces (Watson, Plattus, and Shibley, 2003), trees embody an essence of place.

As a result of increased social awareness towards the value of trees (Grado, Measells, and Grebner, 2013; Seamans, 2013), heritage and champion tree programs have emerged in an effort to protect and preserve unique individuals or groups of trees on public and private land. While champion tree programs often qualify tree protection based on size, heritage tree designation and programs include a broader list of qualifying features including botanical, ecological, aesthetic, cultural and/or historical significance. Similar to landscape and tree protection ordinance legislation that intends to establish standards to promote environmental quality and natural resources (Abbey, 1998), heritage tree preservation policy typically identifies, promotes, maintains and protects designated significant trees on both public and private land. Program policy can range from non-binding recognition such as a published record, to legal protection regulated under state or city law with resulting monetary fines and/or mitigation measures if the tree is harmed or removed without public hearing and city commission approval.

Despite growing interest to protect important trees in the United States and the larger world community (Jim, 2004b), little information is available regarding the current state of local government planning policies and public sector opinions regarding heritage tree program implementation, and even less research has investigated specific regional preservation (Thaiutsa, et al. 2008). This study, with its origins in developing a heritage tree planning policy to designate, protect and preserve significant trees for Bozeman, Montana, measured the state of heritage tree policy in an area whose landscape personae is often one of "bare pasture with a splendid view of shear space in all directions" (Lippard, 1997, p. 41). In such environments, heritage trees often arise like a 'wolf tree' whose canopy stands as an unique relic attesting to its age and ability to survive a sea of change, in essence becoming urban sign posts of our history and culture. This study sought to summarize the current state of heritage tree programs in the Rocky Mountains and Interior Plain Province through two primary goals: first, to measure awareness and attitudes of those in Montana and similar geological regions whose professional or service work directly informs heritage tree public policy; and second to provide insight on possible incentives and advocacy measures for regional heritage tree preservation.

3   METHODS

3.1   Study Area

The study area was delineated based on the geologic provinces delineated by the United States Geological Survey that comprise Montana's landscape (USGS, 2004). This composite region (Figure 1) consisted of states with both Rocky Mountains and Interior Plain Province and included Montana, Colorado, New Mexico and Wyoming for a total of 470,560 mi2 (Bureau, 2014). Although climates in the study region vary considerably in both USDA hardiness, zones 3a to 9a (USDA, 2012), and total urban tree canopy cover with a range between 6.4% in Montana, 5.5% in Colorado's, 1.2% in New Mexico, and less than 1% in Wyoming (Dwyer, 2000), these states share many similar challenging growing conditions affecting tree growth, longevity, and the likelihood of a city having significant trees. In the prescribed

region soils are often alkaline and annual precipitation is relatively low, with between 12.9 to 15.9 inches annually (CDNR, 2013; NMSCU, 2013), and all four states rank in the top 12 for average wind speed (Energy, 2013).
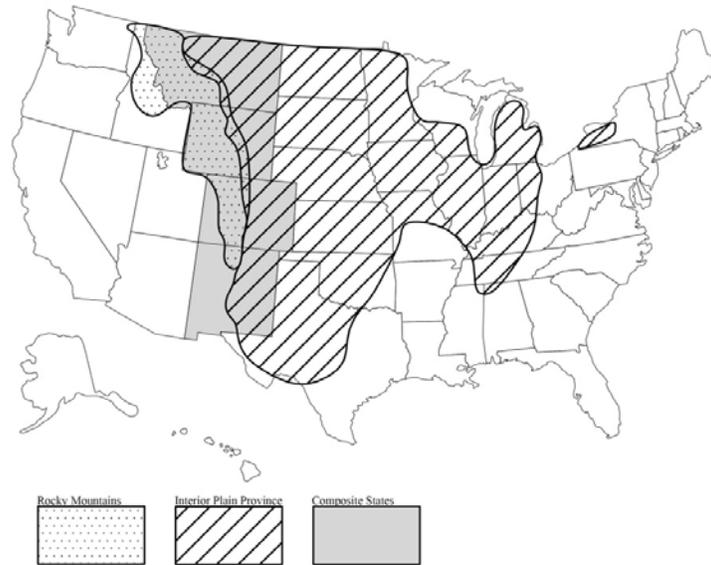

Figure 1. Study Region Map: Montana, Colorado, New Mexico, and Wyoming

The population demographic profile of the study region varies. In terms of political affiliation, New Mexico is a "solid" Democrat political party affiliation at 49.9%/36.1% (Democrat/Republican), as is Colorado with 48.8%/38.2%, Montana is categorized as a "competitive" state at 44.5%/40.5% while Wyoming is a "solid" Republican at 36.6%/49.9% (Gallup, 2009). Population density also ranges per state, with three out of four states ranking with lowest population density in the United States: Colorado is 37th with a population density of 47.62 per square mile, New Mexico is 45th with 16.35, Montana is 48th with 6.65, and Wyoming is 49th with 5.49. Median household incomes from 2010-2012 ranged from a high in Colorado of $60,180, $56,004 in Wyoming, New Mexico at $44,605, and Montana the lowest at $43,226 (Bureau, 2012b). Homeownership rates also varied between states with Wyoming the highest at 70.3%, 68.9% in New Mexico, and 68.5% in Montana, with Colorado lowest at 65.9% (Bureau, 2014).

3.2   Data Collection Strategy

This study generated descriptive data from a survey questionnaire (Levy and Lemeshow, 1991). To create the sample, cities of Montana, Wyoming, Colorado, and New Mexico were listed according to population size and divided into three population categories: > 80,000, 80,000 to 20,000, and < 20,000 (Brinkhoff, 2011; Bureau, 2012a). The parameters of these three categories were chosen both to achieve a relatively even distribution across the population range and to align with sizable gaps existing within the overall rank of populations. The "large city" tier established the base-line with a total of 17 in the >80,000 population category. Subsequently, within the two additional categories 17 cities were randomly selected for the "mid" and "small" cities. This sample provided for a total of 51 cities (n=51). The city sample distribution per state included nine cities from Montana, 26 from Colorado, 11 from New Mexico, and five from Wyoming (Table 1). Although this study's sample is low, it is in-line with similar studies in the United States and Europe (Kuhns, 1998; Schmied, 2003) and also mirrors the low population density characteristic of the study area.

Table 1. States and cities surveyed in the Rocky Mountain/Interior Plain Province

Montana:	Colorado:	Colorado:	New Mexico:	Wyoming:
Billing	Alamosa	Evans	Albuquerque	Casper
Bozeman	Aurora	Federal Heights	Artesia	Cody
Great Falls	Arvada	Fort Collins	Belen	Kemmerer
Kalispell	Boulder	Fountain	Carlsbad	Laramie
Libby	Broomfield	Greeley	Clovis	Rock Springs
Missoula	Burlington	Lafayette	Deming	
Plentywood	Castle Rock	Lakewood	Gallup	
Polson	Centennial	Longmont	Las Cruces	
White Sulphur	Cherry Hills Village	Loveland	Portales	
Springs	Colorado Springs	Parker	Rio Rancho	
	Commerce City	Pueblo	Roswell	
	Dacono	Thornton		
	Denver	Westminster		
Total: 9		Total: 26	Total: 11	Total: 5

To further stratify the sample, additional subgroups created comprised of individuals in the city and university public sector who through professional and/or service work might influence heritage tree policy and planning. Professions included: architect/architectural designer, arborist/forester, landscape architect/designer, planner, city council member/ mayor, advisory board member, and an optional "other" category to allow for flexibility in job titles with similar and relevant responsibilities. Each local government office and higher education facility was then called to request contact information for appropriate personnel resulting in a 168 total surveys sent.

3.3   Survey Design

The survey questionnaire was designed to investigate four possible contributing factors influencing heritage tree policy implementation: awareness and attitude towards heritage trees programs, and potential incentive and advocacy measures. For example, the survey asked respondents if they were aware that heritage tree programs allow a community to identify, protect, maintain and promote protection of significant trees, if they would support a heritage tree program in their community, if so under what conditions, and if their local government has a current means to promote heritage tree program policy.

Questions were in one of five closed-end formats: multiple choice; agree/disagree; rank order; yes/no descriptive; and questions along a continuum of one to five to indicate a positive to negative rating. A final open-ended question provided the opportunity for further comment (Tables 2 through 5). Skip-logic questions allowed for additional data collection dependent on response, therefore the survey length varied from 22 to 27 total questions. An initial trial was performed to validate the question comprehension and process standards (Levy and Lemeshow, 1991). Each participant was emailed an orientation paragraph and SurveyMonkey URL link. The survey was administered from February 12, 2013 through April 2, 2013.

Table 2. Awareness questions

Q3: Does your community have a tree ordinance that requires the local government to review and/or issue a permit for removals?
Q4: Are you aware that a heritage tree program allows a community to identify, protect, maintain and promote awareness of significant trees
Q5: Does your community have a heritage tree program
Q6: My community's heritage tree program allows nomination in…
Q7: How successful is the heritage tree program?
(On scale of 1 to 5, 1 indicating very successful and 5 indicating not successful at all.
Q8: What incentives does your local government provide for your Heritage Tree Program? Choose all which apply. I don't know; Property tax reduction/abatement; Landmark designation; Signage/certificate; Reduction in Planning, Design Review and Building Permit Application Fees; Payment of Public Hearing Notice Cost for development; Setback flexibility for development; Local government responsible for maintenance; Other (please specify) [z]
Q9: Did your community ever have a heritage tree program?
Q10: Why is there no longer a heritage tree program?
Q14a: Does your community have an elected... (city council)
Q14b: Does your community have an elected... (mayor)
Q15a: Does your local government staff have a/an...(forester/arborist)
Q15b: Does your local government staff have a/an...(historic preservation officer)
Q16: Is there a tree advisory board in your community?
Q17a: Does your local government provide... (guidelines for street tree selection?)
Q17b: Does your local government provide... (a voucher or cost share program for buying trees?)
Q18: Is your local government responsible for street/park tree maintenance?
Q19: Is there a college or university in your community?
Q20: Does the college/university have a forestry, horticulture, or landscape architecture/design program?
Q22: I am an active member in my local professional organization.
Q23: My community has calculated/mapped our canopy/tree inventory.

Table 3. Attitude questions

11a: Would you support a heritage tree program for...(streets and parks)
Q1b: Would you support a heritage tree program for...(private property)
Q13: If you were to initiate a heritage tree program, how would you prioritize the following: (1 indicating most important and 3 .least important) Establish guidelines for nominating trees; Determine maintenance protocols; Facilitate public education about the value of trees.
Q24: Check all that reflect your beliefs about trees. Trees are aesthetically pleasing; Trees are replaceable, thus I can use them as I see fit; Trees provide wildlife habitat and are integral to ecological systems; Tree planting/removal on streets/parks should be regulated by government; Trees enhance property values; Trees create a unique sense of place; Trees are a liability and require too much maintenance.
Q25: How important to you is public open space such as parks/trail systems? (1 indicating very important, 5 indicating less important)
Q26: How sensitive are people in your community towards private property rights? (1 indicating very sensitive, 5 indicating less sensitive)

Table 4. Incentive questions

Q12: Under what conditions or with which incentives would you be interested in a heritage tree program? Choose all which apply.[z] I don't need an incentive; Property tax reduction/abatement; Landmark designation; Signage/certificate; Reduction in Planning, Design Review and Building Permit Application Fees; Payment of Public Hearing Notice Cost for development; Setback flexibility for development; Local government responsible for maintenance; Other (please specify) [x]

Q17a: Does your local government provide... (guidelines for street tree selection)

Q17b: Does your local government provide... (a voucher or cost share program for buying trees)

Q18: Is your local government responsible for street/park tree maintenance

Table 5. Advocacy questions

Q15a: Does your local government staff have a/an...(forester/arborist)

Q15b: Does your local government staff have a/an...(historic preservation officer)

Q16: Is there a tree advisory board in your community?

Q20: Does the college/university have a forestry, horticulture, or landscape architecture/design program?

Q22: I am an active member in my local professional organization.

3.4   Data Analysis

Data compilation and analysis was exported from the survey instrument as a summary of responses for each question with additional cross-tabulation between questions. Correlation analysis was performed using Fisher's Exact probability test to determine a two-sided p-value. The measure of associations between answers was determined using a Cramer's V coefficient. All analyses were performed with SAS for Windows v. 9.2 using an experiment-wise error rate of α= 0.05.

4   RESULTS

The 62.7% city response rate obtained in this survey is within the range found by other surveys investigating urban forestry, e.g. 58.2% in Utah (Kuhns, Lee, and Reiter, 2005) and 71% in the Pennsylvania (Elmendorf et al., 2003). By state, the total survey response rate was 88.8% for Montana, 53.9% for Colorado, 72.7% for New Mexico and 100% for Wyoming. A total of 75 individuals responded and results showed that 34 respondents were city council member/ mayor, followed by 15 planners, 12 arborist/forester, four were advisory board member, three were landscape architect/designer, and seven respondents specified "other," which included relevant professional positions such as a manager for landscaping & grounds, two maintenance worker in grounds department, two arborist supervisors, and a facilities director. Our variation in *N* per city and profession can be attributed to differences in municipality size and staffing numbers, which resulted in certain categories having a low *N*.

4.1   Awareness

Although 36.1% of respondents answered their local government has a tree ordinance requiring review and/or permit issuance for tree removals, and 64.2% indicated having guidelines for street tree selection, only 7% of respondents answered that their municipality has a heritage tree program. Of these respondents, 40% were from cities in the largest population, 40% from midsize cities, and 20% from small cities. All respondents who indicated having a heritage tree program also indicated having a college or university and a city staff arborist/forester. Our study found a positive correlation between local governments staffed with an arborist/forester and tree protection ordinances, active tree advisory boards, and available tree incentive programs. In addition all respondents in cities with an arborist/forester also indicated the "value belief" that trees aid property valuation, offer habitat, are integral to ecological systems, and create a unique sense of place.

Still, the overall characterization of awareness towards heritage tree programs was low. 35.2% of respondents indicated they were unaware if their community had a program and half of the respondents were unsure of the benefits of heritage tree programs, including 73% of planners, 52.9% of city council/mayor, and 25% of arborist.

4.2   Attitude

Among questions gauging attitude, participants showed a high support of heritage tree program implementation, with a significant correlation between tree programs for streets/parks and cities that staffed a forester/arborist. In addition, respondents in cities with universities/colleges had a higher support rate for heritage tree programs for street/parks, 97.9 %, vs. 76.9%. There was also a significant correlation between cities with a college or university and a preference for tree regulation administered through local government.

Of the surveyed professions, 100% of arborists indicated they would support a heritage tree program on streets and park, with similar support from city council mayors (93.5%), planners answered with less support (80.0%) and landscape architects/designers were lower still at 66.7%. Across all professions, respondents showed less support for heritage tree programs on private property: arborists (88.9%), landscape architects/designers (50%), city council (39.3%), and planners showed the lowest support level at 14.3%. A majority of respondents (81.5%) also indicated they viewed their cities' populace as highly sensitive to private property rights and preferred directing heritage tree programs towards streets/parks.

Within the qualitative questions, a majority of respondents answered they considered trees to be beneficial rather than a nuisance and indicated they viewed trees as aesthetically pleasing, creating a unique sense of place, and integral to ecological systems and wildlife habitat. Only a small percent of respondents (16.9%) viewed trees as replaceable and 3.1% of respondents view trees as a liability requiring too much maintenance. In terms of establishing a heritage tree program, responses indicated the most important priority would be to 1) establish guidelines for nominating trees (49.2%), 2) facilitate public education about the value of trees (38.1%), and 3) determine maintenance protocols (12.7%).

4.3   Incentive

Although 75% of respondents indicated not knowing what tree incentive programs are provided by their local government, 44.1% answered that incentives were not needed. Of those who showed interest in incentives, 39% indicated interest in landmark designation, 32.2% setback flexibility for development, 30.5% signage/certificate, 22% property tax reduction/abatement, 20.3% reduction in planning design review and building permit review fees, and 20.3% local government responsible for maintenance. A majority of respondents (88.1%) indicated their local government is currently responsible for street/park tree maintenance and in one significant positive correlation, cities that currently have tree protection ordinances also typically provide a tree cost share or voucher program, indicating that municipalities at present provide tree-related incentives to promote government policy and planning.

4.4   Advocacy

In measuring which individuals might be in a position to advocate a heritage tree program, 56% percent of respondents indicated their city staffs an/a arborist/forester, 37.9% staff a historic preservation officer, and 44.8% indicated they have a tree advisory board in their community. No city had a heritage tree program without a staffed arborist/forester and results further indicated cities with a staffed arborist/forester have a greater likelihood of having a calculated/mapped canopy (66.7%), guidelines for street tree selection (86%), and are somewhat more likely to have a tree advisory board (54.1%) but not necessarily a voucher incentive program (50%). Furthermore there was a positive correlation between communities with tree advisory boards and the calculation or mapping of tree inventory, utilization of vouchers or cost share for buying trees, and established policy for street tree selection. This suggests that tree advisory boards provide a valuable service which could benefit heritage tree planning. Although the majority of respondents indicated high activity in their local professional organizations, this study found no significant correlation between activity in professional organization and implementation of heritage tree programs.

5   DISCUSSION

This study's results clearly demonstrate a need for improved clarification and information dissemination about heritage tree program benefits and planning in government agency. Across professions there was a general lack of awareness towards the benefits of heritage tree programs.

Although the study did find a relationship between participant activity in professional organizations and an increased awareness of the benefits of a heritage tree program, heightened professional activity did not translate into practical implementation of heritage tree programs. Thus, while 100% of arborist/foresters are participatory in their professional organizations and 75% indicated awareness of heritage tree program benefits, 92.9% indicated not having a heritage tree program. This breakdown between activity level in professional organization and awareness of heritage tree program benefits was even more pronounced in the other surveyed professions. For example 72.7% of planners responded they are participatory in their professional organization but only 26.7% indicated awareness of heritage tree program benefits. This could be symptomatic of specialization, but also suggests that professional organization venues are not a current method for promoting heritage tree awareness and advocacy. However, since municipalities staffed with an arborist/forester indicated having a higher likelihood of general tree protection ordinances (62%) the results may suggest that cities with an arborist/forester have an increased capacity and ability to implement a heritage tree program. A majority of respondents (80.3%) indicated there was a college/university in their town and 47.2% indicated their institution had forestry or landscape architecture/design program, yet only 14.7% of these respondents indicated having a heritage tree program. However, there was a high correlation between respondents who indicated having a college/university and a positive, receptive attitude toward implementing heritage tree policy.

Despite low general awareness, our study showed a positive attitude toward heritage tree program implementation with a majority of participants answering they would support such program with very little incentive. These results did show variable support levels towards heritage tree programs between professional and appointed/elected groups within a government body, suggesting a conflict between city staff and elected officials. For example, a large majority of arborists/foresters supported implementing heritage tree programs on private property, while city councils/mayors responded with less support and city planners showed the least amount of support. This illustrates possible conflict in policy implementation between city staff. Also since a large majority of surveyed cities elect their city council (98.5%) and mayor (89.2%), this could indicate disconnect between public opinion and public agencies, which previous studies have shown is common (Dwyer et al., 1992; Heynen, Perkins, and Roy, 2006; Kielbaso, 2008; Jones et al., 2013).

It is also possible that local populations may not support legislation they view as restricting freedom. As municipalities grow and development pressure conflicts with preservation, elected officials may be less inclined to continue their support of a heritage tree program if they believe their constituents place high value on property ownership rights. Our study showed a large majority of city councils/mayors (60.6%) view their constituents as highly sensitive to private property rights, suggesting that an elected politician's perception of public values could influence heritage tree policy implementation and effectiveness. However, respondents did indicate interest in mitigation incentives such as flexibility on property set-backs and reduced property taxes, which may prove effective measures to assuage concern over heritage tree programs involving private property. Although the influence of socio-demographics towards urban forestry management programs have shown mixed results in other studies (Moskell and Allred, 2013; Zhang et al., 2007), our study's demographic trended more toward a Democrat/Competitive partisan view, which may suggest a higher likelihood of comfort with government regulation (Jones et al., 2013). In addition, only a small percent of respondents viewed trees as replaceable or as a liability requiring too much maintenance, and a majority viewed public open spaces such as parks/trail systems as very important, suggesting a prevailing attitude of support towards green space, which could prove a beneficial underlying ideological belief in protecting significant trees.

5.1   Action Plan: Practical Implications for Heritage Tree Program Implementation

Since a small number of cities surveyed have established legislative tools that attempt to regulate tree plantings and/or natural resource protection (Abbey, 1998), cities identified in the study area may need to create stand-alone policy specific to heritage trees. This approach could be similar to Ontario, Canada's legislative tools that function through a variety of zoning by-laws, easements, and government acquisition (Ontario Heritage Tree, 2011). Likewise, although local government participation is necessary to build program awareness, administer incentives, and support advocacy, cities may choose to collaborate with advocates in allied industries and professions such as nurseries, tree care businesses, university extension services, state forestry agencies (Kuhns et al., 2005), and local and state historic preservation officers. One respondent commented that their city has a historic protection program, but the

designation was for buildings rather than for trees. Yet broadly defined, heritage trees are after all historic assets, and a collaborative effort between city departments could help with resource and asset management.

As costs associated with the identification, conservation and maintenance of heritage trees may prove to be the biggest limiter, especially in rural areas with low median incomes, communities need to determine if municipalities have the financial resources to fulfill ordinance requirements (Ontario Heritage Tree, 2011). As this will vary by location, effective policy may need to include measures such as cost-sharing grants from government agencies and trained volunteers in a significant role to mitigate expenses. As one respondent wrote, they would not support an "unfunded mandate," suggesting socio-economics plays a strong role in determining policy feasibility. So although respondents indicated maintenance protocols as the least important priority to establish a program, similar to other studies (Swiecki, 2001).our results show expense management in heritage tree conservation is best addressed from the start

In terms of educating professionals and the general public, arborists/foresters and tree advisory boards may play the most critical role in building awareness, shaping attitudes, advocating and incentivizing heritage tree programs. Not only did this study's impetus originate at the request of the City of Bozeman's Tree Advisory Board, but our results suggest that together arborist/foresters and tree advisory board may be the most effective resource in providing service for new tree-related policies. Similarly, advocacy from citizen grassroots efforts and private and non-profit coalitions can serve as outreach partners offering seminars, conferences, school curricula, tours, special events or fieldtrip can help to fill the gaps in service left by government budget limitations (Jones et al., 2013; LeRoux, 2007; Seamans, 2013). For instance, American Forests, the oldest national nonprofit conservation organization in the United States, offers a Tree Protection Toolkit for grassroots activism that provides steps for overburdened city personnel to empower communities in shouldering some responsibility (American Forests, 2013).

For a heritage tree program to have gravitas, effective planning needs to begin with survey and research to identify significant trees, followed by nomination with established parameters for evaluation, listing, and recording (Schuster et al., 1997; Ontario Heritage Tree, 2011). This process and the resulting documentation can then act as a planning trigger for incentives and/or regulation. To then determine the best policy approach, a front-end discussion between policy-makers and the general public may prove critical in addressing ideological and fiscal concerns. As one survey respondent commented, "trees preserved under this type of preservation program can and will be viewed as limiters to development," and depending upon receptivity, cities may need to create their own adaptive management of incentives (non-prescriptive) and legal (prescriptive) approaches.

To incentivize programs that foster receptivity and mitigate potential conflict, preservation policies typically utilize strategic planning to determine an appropriate reward/penalty approach. This study showed respondents were receptive to soft reward incentives such as landmark designation, and more aggressive monetary incentives such as development setback flexibility or property tax reduction/abatement. Respondent receptivity to positive reinforcement illustrates municipalities are amenable to using incentives as a tool in promoting tree preservation. Penalty incentives are typically of a regulatory nature with review from the city arborist, tree advisory boards or at times full design review boards. These include a wide range of enforcement tactics within heritage tree programs such as the City of Portland, Oregon where explicit code finds it "unlawful for any person, without a prior written permit from the Forester, to remove, destroy, cut, prune, break, or injure any Heritage Tree, to injure, misuse or remove any device set for the protection of any Heritage Tree, or to cause or authorize or procure any person to do so" (City of Portland, 2004). While our study did not investigate opinions regarding penalty effectiveness, a majority of survey participants responded they would prefer government oversight of a heritage tree program, which may indicate openness to a more stringent regulatory environment. This result also aligns with that of Moskell and Allred (2013) who found residents often view tree care a government responsibility.

In light of this study's findings, municipalities pursuing heritage tree policy might ask themselves the following feasibility questions: 1) Do we have the service of a city arborist/forester or is there a tree advisory board that can help identify and advocate for significant trees? 2) Are there tree guidelines or protection ordinances already in place? 3) Do we have other departments or organizations which might pool resources? 4) Can we build contacts with a college or university, interested professionals, and/or non-profit organizations that may help facilitate public education about the value of trees through positive

advocacy? 5) Can professional societies play a stronger role in educating the community about the benefits of heritage tree programs? These questions are not a comprehensive list, but they do represent overall patterns that emerged when this study attempted to identify awareness levels, prevailing attitudes, incentives and advocacy measures. They may serve as guidance in planning for heritage tree program implementation.

6   CONCLUSIONS

From measuring the state of heritage tree programs, this study suggests protection of heritage trees has significant support and that heritage tree programs in Rocky Mountain/Interior Plain Province are both possible and timely. Yet, implementing effective heritage tree policy that balances the static character of preservation and nature's dynamics does make protecting significant trees one of the most intriguing and difficult types of preservation (Tyler, 2000). As a result, drafting protection policy may mean reaching beyond typical strategies. If government is to respond to escalating urban environmental problems by including heritage tree protection in sustainable ecosystem-based management and stewardship (Konijnendijk, 2003), not only do communities need support from those whose professional or service work directly informs heritage tree policy, but equally important is public sector awareness, advocacy, and incentive management.

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