

Does Prior Experience Matter for Volunteers in Collecting Urban Forest Data?

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Abstract

Utilizing volunteers to monitor the urban forest can reduce management costs, but is the data they collect accurate? To evaluate the effect of volunteer prior experience in data collection accuracy, six novice and six intermediate volunteers were provided the same level of training and tasked with collecting basic tree data in Lombard, IL. Results show that volunteer prior experience level does not impact data accuracy. Data accuracy was acceptable for all volunteers for identification to genus-level, measuring diameter of single-stemmed trees, and evaluating the mortality and dieback status of trees. Data accuracy was not acceptable for identification to species-level, evaluation of wood condition or assessing crown transparency.

Introduction

Urban forests afford a multitude of benefits to metropolitan areas^{1,2}, yet management programs are rarely allocated more than 1% of municipal budgets. In the face of limited financial resources, reliable and current data becomes an essential component of any urban forest management strategy. Volunteers can serve as a major source of essentially free human capital for urban forest monitoring programs, but it is unknown if participation should be limited only to those who possess prior experience in urban forestry field work. This research utilizes the Minimum Data Set of the Urban Tree Monitoring Protocols developed by the Urban Tree Growth and Longevity Working Group^{3,4}.

Our hypothesis was (given the same level training), volunteers with prior experience in collecting tree data will provide more accurate data when compared to novices with no prior experience.

Methods

Sixteen volunteers were recruited and divided into two experience levels. The novice group included those with little to no experience in urban forestry fieldwork, and the intermediate group included those with 1-5 years experience in urban forestry field work. Volunteers were grouped into pairs of like experience for three groups in each experience level.

All volunteers were given the same seven hour training program in order to collect the following urban tree attributes:

- Genus and species
- Diameter: measure of diameter of the main stem at breast height (1.37 m)
- Mortality: whether the tree is alive, dead, removed or missing
- Dieback: how much of the visible crown has recently died (Fig. 1)
- Transparency: how much visible sunlight comes through the canopy (Fig. 2)
- Wood Condition: a measure of a structure and health of the main stem (Fig. 3)

During July of 2014, the volunteers collected urban tree attributes on 167 trees in the central core or Lombard, IL. Expert data was also collected on these same 167 trees in order to compare volunteer accuracy. Experience level was compared against expert data for agreement for the qualitative data and percent variance was computed for the quantitative diameter measurements.



Figure 1. Dieback classes from left to right: <25%, 26-50%, 51-75% and >75%.



Figure 2. Transparency classes from left to right: <25%, 26-50%, 51-75% and >75%.



Figure 3. Wood condition classes from left to right: fair (co-dominant stems >10 cm), poor (damage to main stem) and in critical (decay within co-dominant stem).

Table 1. Percent agreement with expert for intermediate (INT) and novice (NOV) volunteers in identifying tree genus and species.

| Identity | INT 1 | INT 4 | INT 6 | NOV 2 | NOV 3 | NOV 5 |
|----------|-------|-------|-------|-------|-------|-------|
| Genus | 75% | 75% | 88% | 68% | 80% | 70% |
| Species | 20% | 50% | 35% | 38% | 52% | 29% |

Table 2. Percent agreement with expert for intermediate (INT) and novice (NOV) volunteers in qualitative tree ratings of mortality, dieback, crown transparency and wood condition.

| Rating | INT 1 | INT 4 | INT 6 | NOV 2 | NOV 3 | NOV 5 |
|-----------|-------|-------|-------|-------|-------|-------|
| Mortality | 91% | 94% | 97% | 96% | 91% | 78% |
| Dieback | 78% | 85% | 89% | 82% | 80% | 67% |
| Transp. | 50% | 68% | 64% | 65% | 58% | 50% |
| Wood con. | 16% | 26% | 11% | 23% | 26% | 18% |

Table 3. Within five and ten tolerance limits for agreement with expert for intermediate (INT) and novice (NOV) volunteers in tree diameter measurements of single-stemmed trees.

| Diameter | INT 1 | INT 4 | INT 6 | NOV 2 | NOV 3 | NOV 5 |
|------------|-------|-------|-------|-------|-------|-------|
| Within 5% | 82% | 80% | 72% | 87% | 75% | 75% |
| Within 10% | 90% | 93% | 87% | 95% | 86% | 87% |

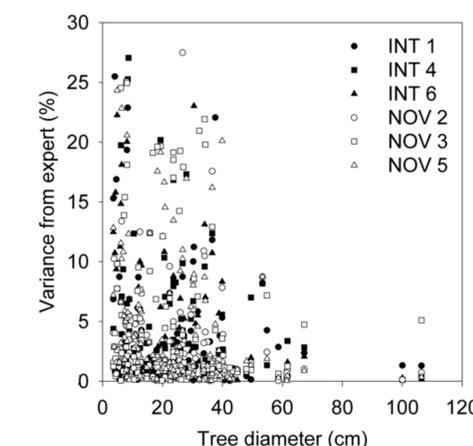


Figure 4. Variance from expert for intermediate (INT) and novice (NOV) volunteers in tree diameter by tree diameter.

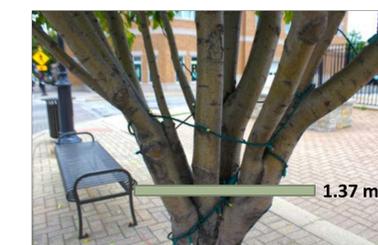


Figure 5. Variance from expert in diameter may arise from difficulty in locating dbh (1.37 m), identifying the main stem (multi-stem tree pictured), improper use of dbh tape, etc.

Results

Our hypothesis was not supported in that level of training did not appear to impact data accuracy for the response parameters we evaluated. Volunteers were most accurate when identifying trees to the genus-level and when evaluating the mortality and dieback status of trees (Tab. 1 and 2). The poorest accuracy was found when volunteers evaluated the wood condition and transparency of trees. Volunteers were reasonably accurate at measuring diameter of single-stemmed trees (Tab. 3) within acceptable variances of 5 and 10%. Percent error in diameter tended to be greater with smaller trees (Fig. 4).

Conclusions

It appears that prior experience may not be necessary and most volunteers can be trained to collect certain urban tree attributes, such as identification to genus, mortality status, dieback and diameter at breast height for single-stemmed trees. However, for other parameters such as identification to species, crown transparency and tree condition volunteers, regardless of prior experience, may not be suited to collect this data with only a seven-hour training session. Volunteers were asked to self-identify for their experience level in this study, which may have contributed to the minimal effect of prior experience on data accuracy for urban tree monitoring. Since the influence of prior experience on the quality of data collected by volunteers appears insignificant, opportunities for broader community involvement in urban forest monitoring are encouraged.

Acknowledgements

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