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Urban National Landowner Survey: Methods and Data Quality, 2018

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Abstract

The Urban National Landowner Survey (UNLS) is a component of the National Woodland Owner Survey (NWOS) which is part of the U.S. Department of Agriculture (USDA), Forest Service, Forest Inventory and Analysis (FIA) program. The UNLS is charged with collecting information on the property owners and managers in the urban areas across the United States. Information is collected on ownership and land characteristics, property management activities, tree-related concerns on their property, participation in programs and organizations, information sources, opinions on neighborhood and community characteristics, attitudes towards trees, and demographics. Initial efforts are focused on private, residential property owners in specific urban areas, with Baltimore, MD, being the first to have a fully completed data collection cycle. This report provides details on the methods used to implement the UNLS and on metrics related to data quality. The information in this report applies specifically to the 2018 Baltimore implementation of the UNLS. Future iterations of this report will cover additional years and urban areas.

Keywords: Forest Inventory and Analysis, National Woodland Owner Survey, NWOS, urban forest, landowner

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Cover photo: Community tree and perennial planting at Stillmeadow Fellowship Church, Baltimore, MD. Courtesy photo by J. Morgan Grove, Yale University, School of Environment.

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INTRODUCTION

The Urban National Landowner Survey (UNLS) is an element of the National Woodland Owner Survey (NWOS) program implemented by the U.S. Department of Agriculture (USDA), Forest Service, Forest Inventory and Analysis (FIA) program. The intent of the UNLS is to provide information about who owns the trees and green spaces across America's urban areas, why they own them, what they have done with them in the past, and what they plan to do with them in the future. Initial efforts are focused on private, residential landowners. The intent is to eventually expand to all urban landowners and managers while keeping the content and questions as similar as possible across populations and adapting implementation methods (e.g., mail versus electronic) based on the populations and sample frame information. Information provided by the UNLS is complementary to the Urban FIA program's plot-based forest inventory of the Nation's urban trees and vegetation (<https://research.fs.usda.gov/programs/urbanfia>).

The NWOS currently has three components: base (or rural forests; Butler et al. 2021), large corporate forests (Sass et al. 2021), and urban. Plans are underway for additional components (e.g., surveys of owners/managers of forests within Tribal reservation boundaries and of U.S. territories). As of 2018, the UNLS was implemented in one urban area, Baltimore, MD (Locke et al. 2025); future iterations of the UNLS will include additional urban areas. This implementation of the UNLS involved a spatial intensification, where a full cycle's worth of data were collected in 1 year versus the typical 5 years, in order to test estimation approaches and to develop initial products. This report provides a description of the methods and summaries of the data quality metrics for this urban area and year. The UNLS methods are adapted from the base NWOS methods, which are documented in Butler et al. (2021) and Butler and Caputo (2021). Additional information, including results from the UNLS and other NWOS components and additional background materials, is available on the NWOS website (<https://research.fs.usda.gov/programs/nwos>).

NEEDS ASSESSMENT, AUTHORIZATION, AND APPROVALS

The needs assessment, or scoping, for the UNLS started with a review of the authorizing legislation and all other relevant guidance documents. As with the broader FIA program, the authorization and general guidance comes from the Forest and Rangeland Renewable Resources Research Act of 1978 (Forest and Rangeland Act 1978) and the Agricultural Research, Extension, and Education Reform Act of 1998 (AREERA 1998).

Content for the UNLS was based on previously conducted research and input from stakeholders. Stakeholders included representatives from federal, state, and local government agencies that interact with urban landowners, as well as nongovernmental organizations and researchers that are interested in the topic.

As with all federally sponsored surveys, the UNLS is subject to the Paperwork Reduction Act of 1980 (PRA 1980). This entails providing the documentation for the justification, methods, and burden placed on the public, along with a list of the questions to be asked; review of the materials by experts; and, ultimately, review by the Office of Management and Budget (OMB). The OMB clearance number for the NWOS, which includes approval for the UNLS, is 0596-0078.

The UNLS was implemented by the Family Forest Research Center (FFRC; www.familyforestresearchcenter.org), a joint venture between the USDA Forest Service, Northern Research Station and the University of Massachusetts Amherst (UMass), Department of Environmental Conservation. Because of this arrangement, the UNLS is also subject to the UMass Human Subjects protocols, including review by the UMass Internal Review Board (IRB). The IRB reviews the survey methods and questions being asked with a focus on ensuring that people are not being coerced to participate and there are no threats to human welfare. The UMass IRB clearance number for the NWOS, including the UNLS, is #684 2016-2908.

Needs assessments will be conducted periodically to help ensure that the efficacy of the UNLS effort is maximized. In assessing stakeholder needs, a focus will be on consistency of questions asked and implementation methods across iterations to maximize comparability and facilitate analyses of changes over time.

POPULATION OF INTEREST

Based on the needs assessment, it was determined that the overall population of interest for the UNLS is property owners and managers, both private and public, who own or manage land within urban boundaries across the United States. The urban boundaries are established by the Urban FIA program based on data from the U.S. Census Bureau and the municipalities. The overall population is subdivided into stratum and domains. UNLS strata are mutually exclusive groups of owners/managers within a given urban area and include private residential, private nonresidential, and public (Table 1). Parcels of land where no ownership information is available, such as abandoned lots, are classified as public. A domain is a sub-population of interest within a stratum (e.g., private residential owners in Baltimore who have planted one or more trees on their property). Stratum-level estimates can be added together to derive summaries for larger areas (e.g., multiple cities). Similarly, raw data can be combined across strata for modeling or other purposes.

Table 1.—Strata for the Urban National Landowner Survey

Stratum	Description
Private residential (nonforest)	Family, individual, corporate, and other private owners of residential properties in a given urban area, excluding forest land.
Private other nonforest	Family, individual, corporate, and other private owners of nonresidential properties in a given urban area, excluding forest land.
Private forest	Forest land (as defined by FIA ^a) owned by family, individual, corporate, and other private owners in a given urban area.
Public nonforest	Public owners/managers, including federal, state, local, or other public entities, of properties and other public spaces (e.g., public rights-of-way) in a given urban area, excluding forest land.
Public forest	Forest land (as defined by FIA ^a) owned by federal, state, local, or other public entities in a given urban area.
Water (non-census)	Lakes, reservoirs, ponds, and similar bodies of water 1.0 acre to 4.5 acre in size; and rivers, streams, canals, etc., 30 to 200 feet wide, in a given urban area. Bodies of water ≥ 4.5 acres or ≥ 200 feet wide (i.e., Census water) are not considered part of the urban area.

^a Land that “has at least 10 percent canopy cover by live tally trees of any size or has had at least 10 percent canopy cover of live tally species in the past based on the presence of stumps, snags, or other evidence. To qualify, the area must be at least 1.0 acre in size and 120.0 feet wide... Tree-covered areas in agricultural production settings, such as fruit orchards, or tree-covered areas in urban settings, such as city parks, are not considered forest land.” (Burrill et al. 2024).

DESIGN AND TESTING

Survey methods and questionnaire content were based on existing scientific literature and were tested before implementation. Testing of questions involved two stages: pretesting and pilot testing. Pretesting involved focus groups conducted in Baltimore and Austin, TX, in 2016 where the wording and content of the questionnaire were validated. After the questionnaire was finalized, pilot tests were conducted in Austin and four Wisconsin cities: Green Bay (Thostenson et al. 2018a), Madison (Thostenson et al. 2018b), Milwaukee (Thostenson et al. 2018c), and Wausau (Thostenson et al. 2018d). In addition to generating early datasets, these pilot tests allowed for verification of implementation methods and examination of how owners were responding.

The final version of the questionnaire used to implement the 2018 UNLS is available in Appendix 1 and includes questions on the following topics:

- Ownership and land characteristics
- Property management activities
- Tree-related concerns on owners' property
- Participation in programs and organizations
- Information sources
- Opinions on neighborhood and community characteristics
- Attitudes toward trees
- Urban wood use
- Demographics

The 2018 base NWOS (Butler et al. 2021) and the 2018 UNLS have similar categories of questions (e.g., owner attitudes, behaviors, and general characteristics), but the contexts are sufficiently different that most specific questions are not comparable. For example, the forest/tree management activities are quite different in urban versus rural settings. Where possible, the identical, or at least comparable, questions were used (e.g., demographics).

SAMPLING

The target sample size for each urban area was 100 respondents for the private, residential stratum. This target sample size was based on the minimum sample size needed for reporting for a geography for the base NWOS (Butler et al. 2021).

The first step in implementing the UNLS in an urban area was to generate the sample, i.e., the list of landowners who were to be contacted. The UNLS sample design is a derivative of the FIA (Bechtold and Patterson 2005) and base NWOS (Butler et al. 2021) sample designs and can be summarized as an area-based sample design with inclusion probabilities proportional to size of holdings within the geographic boundary.

The sample generation process was initiated by creating a “net” of non-overlapping, contiguous hexagons that covered each urban area. The size of each hexagon was calculated to provide a sufficient number of sample points to reach the target number of respondents by considering the percentage of the urban area covered by private, residential properties (the stratum used to define sample sizes) and the anticipated response rates. One sample point was located within each hexagon. If an Urban FIA plot was located in the hexagon, that point was used, otherwise a new point was randomly generated within the hexagon. The ownership of each point was determined using property tax records. Residential status was determined using spatial overlays with data identifying residential properties provided by the municipality. High resolution aerial photography was used to assess the land use (forest, nonforest, or water) per FIA definitions (Table 1) (Burrill et al. 2024) at each sample point. The complete sample consisted of all sample points regardless of ownership or land-use status, but only residential owners were sent surveys. Forest land of 1 acre or more was excluded from the UNLS because it is included in other (e.g., base) components of the NWOS. Census water, as defined in Table 1, is not considered part of the urban areas and was not sampled.

For the initial implementation of the UNLS in Baltimore, the entire sample of residential owners was contacted in 2018, which is equivalent to the contemporaneous implementation of the base NWOS (e.g., 2018) (Butler et al. 2021) and older periodic implementations of the FIA forest inventory. Beginning in 2019, the UNLS has been implemented on an annualized basis, as is done for the FIA forest inventory and base NWOS. Twenty percent of sample respondents, randomly distributed across each urban area, are asked to participate each year. To minimize burden on owners, no ownership will be asked to respond more than once per 5-year cycle.

Once a full cycle of data collection is completed (i.e., the full sample is contacted), remeasurement will commence the following year. For remeasurement, the same sample points will be used. Where the same person/entity owns the sample point, they will be resurveyed. If a new owner/manager is encountered, this new person/entity will be invited to participate. Sample points that enter or exit a stratum (e.g., associated with parcels that are converted to residential or are converted to nonresidential uses, respectively) are added or subtracted from strata and sample, respectively; no sample points are replaced, regardless of status.

The UNLS can be spatially intensified or temporally accelerated, but outside interest and resources are typically required. Baltimore was accelerated in 2018 to provide a full set of data to test data estimation procedures and develop an initial set of products.

LANDOWNER CONTACTS

As with the rest of the NWOS components, Dillman's Tailored Designed Method (Dillman et al. 2014) was used to contact potential respondents. This involved up to four waves of contacts: a prenotice postcard, a first questionnaire packet, a reminder/thank you postcard, and a second questionnaire packet. The following outlines the timing for each wave:

Day 1: The prenotice postcard was mailed. This postcard let potential respondents know that a survey would soon be arriving and provided some basic background information.

Day 7: The first questionnaire packet was mailed. This packet contained the questionnaire along with a cover letter explaining the purpose of the survey and the importance of their response, and a postage-paid envelope to return the completed survey.

Day 12: A thank you/reminder postcard was sent.

Day 28: The final mailing was a replacement questionnaire packet that included a second survey, a return envelope, a modified cover letter, and an insert indicating that the survey could be completed online and that a Spanish language version was available.

A toll-free phone number, postal address, email address, and the address for the NWOS UNLS website were included in each mailing. Copies of the postcards and cover letters are provided in Appendix 2.

DATA ENTRY AND VERIFICATION

Returned survey questionnaires were logged into a database. Questionnaires were then scanned, and data were extracted using optical character/mark recognition software. All data were subsequently verified by a person to ensure that the responses were recorded correctly. If multiple questionnaires are returned by the same ownership (which did not happen during implementation of the Baltimore 2018 UNLS), the first returned questionnaire is retained. The data were then uploaded to the NWOS database (NWOS-DB) (Caputo et al. 2020).

Quality control checks were performed on a randomly selected set of questionnaires. The number of questionnaires to review was initially set at an arbitrary 5 percent of the questionnaires. Low error rates (discussed in the following paragraphs) suggested that this number was sufficient, so no additional questionnaires were reviewed. All responses on each selected questionnaire were compared to the database records. These checks indicated a verifier error rate of less than 0.1 percent, which was mostly due to minor typing errors when entering open response answers. Where identified, errors were corrected.

The next step was to run the data through a series of range and logic checks. First, all open-ended questions, including “Other (please specify)” fields, were manually inspected to identify if responses provided additional information that allowed filling-in of skipped questions or adjusting of the raw responses in nonskipped questions. For example, a respondent may not have answered a question about residential structures on the property but may have provided the same information in a text or comment field, allowing the reviewer to correct the omission. This procedure resulted in changes to 0.02 percent of the question responses in the Baltimore 2018 UNLS.

Next, data were checked for errors associated with value ranges, skip-patterns, and between-question inconsistencies. Range errors resulted from response values being outside logical bounds and were most commonly associated with inaccurate scanning of handwriting in open response answers. Skip-pattern errors resulted from a respondent answering questions they should have skipped, based on their answers to root questions, or from not answering questions they should have. Between-question errors arose when a respondent’s answer to one question was not logically consistent with the answer to another question. Where possible, errors were fixed based on reviews of the questionnaires for potential errors associated with handwriting and consideration of responses to other questions. Errors that could not be unambiguously resolved were handled by setting the ambiguous values to null (i.e., item nonresponse). The range and logic error rate (the percentage of questions that generated one or more errors) was 0.53 percent of the question responses for the Baltimore 2018 UNLS.

NONRESPONSE BIAS ASSESSMENT

Nonresponse, or missingness, is an issue that impacts nearly all surveys. Nonresponse occurs when a potential respondent does not respond at all (unit nonresponse) or when they decline to respond to specific questions (item nonresponse). The impact of the nonresponse depends on whether there is a systematic difference between those who responded and those who did not. Assessing unit and item nonresponse is important for evaluating potential biases in the data and, if deemed necessary, developing approaches for mitigating these biases.

Unit Nonresponse Assessment

For the 2018 UNLS, unit nonresponse was assessed by comparing early (first 25 percent) and late (last 25 percent) respondents. Fisher's Exact Test (Fisher 1970) was used to compare 12 questions/variables:

- Type of residential structure (RESTYPE)¹
- Property has a backyard (FEAT_BACK)
- Has eliminated or removed invasive plants in the previous 5 years (PAST_INVASIVE)
- Gardening has happened on the property (ACTV_GARDEN)
- Regularly attended a neighborhood or community meeting (COMM_MTG)
- Received landscaping advice in the previous 5 years (ADVICE_PAST)
- Familiarity with public tree planting programs (FAMIL_PROG)
- Agreement with the statement that good landscaping increases property values (CARE_PROPVALUE)
- Agreement with the statement that trees make neighborhoods better places to live (CARE_LIVE)
- Agreement with the statement that the trees on the property are healthy and attractive (CARE_HEALTHY)
- Agreement with the statement that the neighborhood is safe (NEIGH_SAFE)
- Familiarity with local environmental improvement groups (FAMILIAR_GROUP)

Likert-scale questions were condensed into binary variables, with the top two categories (e.g., very important and important) recoded as 1 and other categories (e.g., moderately important, of little importance, not important, and not applicable) recoded as 0. To control for multiple comparisons, the method proposed by Holm (1979) was used to adjust

¹ All capital letters are used to differentiate database variable names and other computer-related terms. Variable names are included in the annotated questionnaire (Appendix 1) and the metadata for the NWOS database (Caputo et al. 2020).

p-values, with a base (uncorrected) threshold used as the cutoff for significance. Effect sizes were calculated using Cohen's d (Cohen 2009).

Of the 12 variables tested, none significantly differed (p-value >0.05) between the early and late respondents (Appendix 3). Based on comparing early and late respondents, the 2018 Baltimore UNLS appears to capture a representative sample of landowners in terms of the variables tested.

Item Nonresponse Assessment

Question missingness was calculated as the percentage of the qualifying respondents who did not answer a specific question. Qualifying respondents were those who saw a specific question and were not instructed to skip it due to answers to earlier questions in the questionnaire. Respondent missingness was calculated as the percentage of qualifying questions not answered for each respondent. Qualifying questions were those that were seen by respondents and were not skipped due to answers to previous questions.

There were 14 “check group” questions for the 2018 Baltimore UNLS questionnaire where respondents were asked to “check all that apply,” and the responses were recorded as separate binary variables in the database. To avoid overcounting these questions/variables in the missingness assessment, each check-group bank of questions was collapsed to a single variable indicating whether respondents checked one or more of the options, including “none of the above,” or failed to check any option (i.e., item nonresponse). After collapsing these variables, there were a total of 92 questions or variables.

Response missingness ranged from 0 to 99 percent with a mean of 16.3 percent (median = 3.4 percent) (Fig. 1). Looking to maximize the number of responses retained and minimize the amount of data imputed (see Imputation section), a threshold of 25 percent was selected based on a visual interpretation of Figure 1. Records with response missingness of greater than 25 percent were recoded as “Nonresponse - excessive missingness” and dropped from further analyses. This resulted in the removal of 29 records (16.7 percent) due to excessive missingness.

If a respondent indicated that their property type was anything other than residential, the response was recoded and treated as nonresponse. Due to this response check, PROPTYPE (i.e., whether the ownership was residential) was the only required variable. If this question was not answered, the reply was recoded and treated as nonresponse.

Question missingness ranged from 0 percent to 75 percent with an average of 4.5 percent (median = 2.3 percent). One question, URBAN_INT_OTH had a missingness values of greater than 75 percent. This question was intended to capture issues not listed in the URBAN_INT (interest in purchasing local urban wood products) check-group bank of questions and to be assessed in a qualitative manner. The missingness associated with this

question supports not generating quantitative summary statistics for this variable, so it was excluded from the summary tables. Seven additional questions had missingness values greater than 10 percent, four of which were also part of the URBAN_INT question bank. These variables were retained in the summary tables, but this missingness should be considered when interpreting the results.

After the item nonresponse assessment, a final check of the raw data was completed. This was to ensure that the entire sample was accounted for such that all ownerships were attributed to one, and only one, stratum and all ownerships were linked to a single, valid (i.e., sufficiently complete) survey or else were attributed with the appropriate nonresponse code.

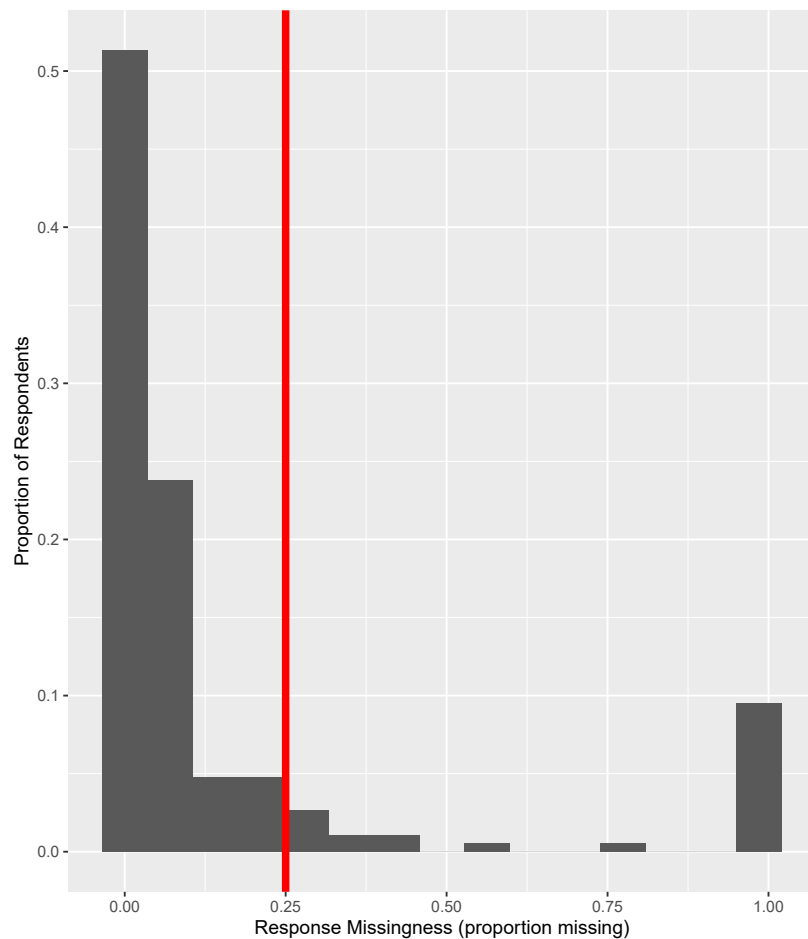


Figure 1.—Response missingness for the Urban National Landowner Survey, Baltimore, 2018. The red vertical line represents 25 percent missingness, which is the threshold used to identify responses with excessive missingness.

IMPUTATION

Imputing missing values is a common technique used for many surveys. Missing values for the UNLS, as with all NWOS results starting in 2018 (Butler et al. 2021), were imputed using multivariate imputation by chained equations (MICE) (van Buuren 2018). This approach builds separate models for each variable and uses these models to predict missing values. The specific modeling method selected was random forests (Breiman 2001), an approach that can be used for numeric and categorical variables, has few statistical assumptions, and is a robust predictor. Five imputations were generated, a number that van Buuren (2018) and Rubin (1987) suggest is sufficient for datasets that have relatively low missingness and the missingness patterns do not create issues with convergence of the imputation models. These assumptions are true for the 2018 Baltimore UNLS. The number of imputations also needs to be weighed against the additional data processing time. Imputation was implemented using the MICE package in the R statistical environment (van Buuren and Groothuis-Oudshoorn 2011). On average, 2.7 percent (median = 1.4 percent) of the values for a given variable were imputed.

The procedure for logic checking imputed values was similar to that done on the observed data described in the proceeding paragraph, with a few key differences. The primary difference was that if an error was detected between an imputed and observed variable, the value for the observed value always took precedence and the imputed value was changed accordingly. Errors that could not be resolved unambiguously were addressed by setting values to the modal or mean value for that variable, i.e., imputation to the mode/mean.

COOPERATION RATE

For the 2018 Baltimore UNLS, there were 1,427 ownerships in the private, residential sample. Of this sample, 667 had no or insufficient ownership/address information. Of the remaining 750 sample points, 145 were associated with sufficiently complete responses (i.e., missingness ≤ 25 percent), 30 with partial responses (which were subsequently dropped), and 585 with nonresponses. This yielded a cooperation rate of 19.1 percent. Cooperation rate was calculated as the number of complete responses divided by the summation of the numbers of complete responses, partial responses, and nonresponses per the American Association for Public Opinion Research (AAPOR) equation COOP3 (AAPOR 2023, p. 87).

ESTIMATION

Population- and stratum-level estimates were generated using a weighting approach, and variances were estimated using a bootstrapping approach. In addition, the weights were adjusted to account for response rates and nonresponse biases. The UNLS estimation approach follows the weighting methodology outlined by Valliant et al. (2013) and is identical to the approach used for the base NWOS (Butler et al. 2021). A package for the R statistical environment used to generate the weights, estimates, and associated variances is available at <https://github.com/familyforestresearchcenter/nwos> (Butler and Caputo 2020).

The UNLS uses an area-based sample design that results in inclusion probabilities that are proportional to ownership size. In other words, the greater the property area of an ownership, the greater its probability of being selected. The inclusion probability for an ownership is equal to the size of the selected property (taken from the GIS layer used to generate the sample) divided by the sampling intensity, which is the land area in the stratum divided by the number of sample points in the stratum (Eq. 1).

$$\pi_{si} = \frac{a_{si}}{A_s/n_s} \quad (1)$$

Where

π_{si} = the inclusion probability for ownership i in stratum s ,

a_{si} = area of the property owned by ownership i in stratum s ,

A_s = total area of stratum $s = \sum_{i=1}^{N_s} a_{si}$,

n_s = the sample size, or number of sample points, in stratum s , and

N_s = total number of ownerships in stratum s .

The design-based weight is the inverse of the inclusion probability multiplied by a response rate adjustment (Eq. 2).

$$\omega_{si} = \frac{1}{\pi_{si}} \times \frac{1}{r_s} \times \psi_{si} \quad (2)$$

Where

ω_{si} = weight for ownership i in stratum s ,

r_s = response rate adjustment for stratum $s = n_{sr} / n_s$,

n_{sr} = number of respondents in stratum s ,

ψ_{si} = nonresponse bias adjustment for ownership i in stratum s , and other variables are defined above.

In the rare cases where more than one sample point falls on the property of an ownership, the weight was multiplied by the number of sample points, as is done in the base NWOS (Butler et al. 2021). This was the case for 2 percent ($n = 3$) of the respondents during the implementation of the 2018 Baltimore UNLS.

Nonresponse bias adjustments, ψ_{si} , were made using a propensity score-matching approach (Brick 2013). Based on population density, median income, race, and ethnicity (U.S. Census Bureau 2022), a random forest model (Buskirk and Kolenikov 2015) was used to predict response propensities, and these values were in turn used to adjust weights. Race and ethnicity were the most important predictor variables. The relative importance of the predictor variables and the Tjur goodness-of-fit statistic (Tjur 2009) for each model are included in Appendix 4. Estimates were generated for totals and proportions in terms of ownerships for all questions asked on the Baltimore UNLS questionnaire. All estimates used the weights described above to account for the sample design and adjust for nonresponse biases. Totals were the products of the weights and binary variables which indicated whether respondents were in the domain of interest (e.g., ownerships with one or more trees on their property) and provided the relevant response to the question of interest (e.g., have participated in tree planting program) (Eq. 3).

$$\hat{T}_{sd} = \sum_{i=1}^{n_{sr}} (\omega_{si} d_{si} v_{si}) \quad (3)$$

Where

$\hat{T}_{sd}$ = estimated number of ownerships in domain d of stratum s ,

d_{si} = a binary, or dummy, variable indicating ownership i is in domain d in stratum s ,

v_{si} = a binary, or dummy, variable indicating the presence of variable v for ownership i in domain d in stratum s , and other variables as defined above.

Other statistics, such as means, were estimated using variants of the total equations as described in Butler and Caputo (2021).

In addition to the point estimates, variances were calculated in order to quantify the variation around the estimates. Variance estimation followed the bootstrapping approach outlined by Efron and Tibshirani (1986) based on 1,000 replicates; details are provided in Butler and Caputo (2021). Point and variance estimates were combined across the multiple imputations using the rules outlined in van Buuren (2018) and Rubin (1987).

PRODUCTS

The core products from the UNLS are urban area reports and data summaries. In addition, the data will be used in peer-reviewed journal articles, results will be presented at professional conferences, and other outlets for sharing the results will be pursued. The reports will be published following the completion of each full cycle of data collection and will include summaries of selected findings and tabular summaries for all questions. The first of these reports is for Baltimore, 2018 (Locke et al. 2025). Data summaries, including custom visualizations, will be available via a companion to the NWOS-DASH interactive dashboard (Caputo and Butler 2019; <https://ffrc.shinyapps.io/NWOSdashboard>). Links to these materials and other NWOS-related products are available on the NWOS website (<https://research.fs.usda.gov/programs/nwos>).

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Survey Instrument for Urban National Landowner Survey: Baltimore, 2018

National Landowner Survey



USDA Forest Service, National Landowner Survey

160 Holdsworth Way, Amherst MA 01003
Phone (toll-free): (855) 233-3372
Email: nwos@fs.fed.us
Internet: www.nrs.fs.fed.us/fia/urban/#nls



OMB No. 0596-0078 Approval Expires 11/30/2018

APPENDIX 2

Materials Mailed to Landowners

Prenotice Postcard (Front)

URBAN NATIONAL LANDOWNER SURVEY
USDA FOREST SERVICE
160 HOLDSWORTH WAY
AMHERST, MA 01003

OFFICIAL BUSINESS

FIRST-CLASS MAIL
US POSTAGE PAID
AMHERST, MA
PERMIT NO. 5

Prenotice Postcard (Back)



Dear Landowner:

Within the next few days you should receive a questionnaire in the mail from the Urban National Landowner Survey. You are one of only a few landowners in your city who will receive it. The questionnaire is designed to give you an opportunity to let policy makers, land managers, and public and private service providers better understand your concerns.

We invite you to participate in the survey by completing the questionnaire when it arrives. Your participation is voluntary. All responses will be held in strict confidentiality.

If you have any questions regarding the survey, please call us toll-free at 1-855-233-3372, write us at USDA Forest Service, National Landowner Survey, 160 Holdsworth Way, Amherst, MA 01003, or visit our website at www.nrs.fs.fed.us/fia/urban/#nls.

Brett J. Butler, Survey Director

Cover Letter with First Questionnaire Packet



United States
Department of Agriculture

Forest
Service

Dear Landowner:

We invite you to participate in the Urban National Landowner Survey conducted by the U.S. Forest Service. Your participation will help policy makers, land managers, and public and private service providers better understand and address the needs and concerns of America's private landowners.

No matter how much land you own, we are interested in hearing from you! We are contacting only a few owners in your city. Because of the limited number of owners contacted, your answers are especially important. You were identified as a landowner from public ownership records. This survey is conducted once every 5 years to understand new topics and changes over time. If you responded during the last cycle, we ask that you respond again.

This is an official U.S. Forest Service survey, but your participation is voluntary. Your answers will be confidential and will be combined with others. The results will only be used to determine patterns and trends. Completing the questionnaire takes, on average, 25 minutes.

If you do not currently own property in this city, please return the questionnaire using the postage-paid return envelope and write on the cover "No Property Owned."

If you would like to receive a copy of the results from this survey, write your name and address on the back of the return envelope.

We greatly appreciate your valuable assistance. If you have any questions please call us toll-free at 1-855-233-3372, visit our website at www.nrs.fs.fed.us/fia/urban/#nls, or write us at USDA Forest Service, National Landowner Survey, 160 Holdsworth Way, Amherst MA 01003.

A handwritten signature in black ink that reads "Brett J. Butler".

Brett J. Butler, Survey Director

Reminder/Thank You Postcard (Front)

URBAN NATIONAL LANDOWNER SURVEY
USDA FOREST SERVICE
160 HOLDSWORTH WAY
AMHERST, MA 01003

OFFICIAL BUSINESS

FIRST-CLASS MAIL
US POSTAGE PAID
AMHERST, MA
PERMIT NO. 5

Reminder/Thank You Postcard (Back)

Dear Landowner:

About a week ago, a questionnaire was mailed to you asking about property that you own. You were one of a small number of people randomly selected from public property ownership records.

If you have already completed and returned the questionnaire, please accept our sincere thanks. If not, we ask that you please do so today.

Although your participation is voluntary, we are especially grateful for your help because it is only by hearing from people like you that we can better understand the perspectives of you and your fellow landowners.

If you did not receive a questionnaire, or if it was misplaced, please call us toll-free at 1-855-233-3372 and we will send you another one.



A handwritten signature in black ink that reads "Brett J. Butler".

Brett J. Butler, Survey Director

Cover Letter for Final Mailing



United States
Department of Agriculture

Forest
Service

Dear Landowner:

Several weeks ago we sent you a questionnaire inviting you to participate in the Urban National Landowner Survey. You may have intended to complete the questionnaire, but perhaps you misplaced it or simply forgot about it. If you have already returned the completed questionnaire, we apologize for contacting you again, sincerely thank you for your participation, and ask that you disregard this mailing.

However, if you have not returned your questionnaire, we ask you to consider doing so now. For your convenience we have enclosed another copy of the questionnaire and postage-paid return envelope. On average, the survey takes 25 minutes to complete.

Your participation is voluntary, but because of the limited number of landowners in your city asked to participate in the survey, your answers are especially important. This survey is conducted once every 5 years. If you responded during the last cycle, we ask that you respond again.

Your responses will be kept strictly confidential and will be combined with the responses of others. The results will be used by policy makers, land managers, and public and private service providers to better understand and address issues that are important to property owners like yourself.

If you do not currently own the property, please return the questionnaire using the postage-paid return envelope and write on the cover "No Property Owned."

If you have questions regarding the survey, please call us toll-free at 1-855-233-3372, visit our website at www.nrs.fs.fed.us/fia/urban/#nls, or write us at USDA Forest Service, National Landowner Survey, 160 Holdsworth Way, Amherst MA 01003.

A handwritten signature in black ink that reads "Brett J. Butler".

Brett J. Butler, Survey Director

APPENDIX 3

NONRESPONSE ASSESSMENT

Convergence plots used as model diagnostics for item imputation for the “Urban National Landowner Survey, Baltimore, 2018” are available online and can be accessed from the link found on the Treesearch landing page at <https://doi.org/10.2737/NRS-GTR-230>.

APPENDIX 4

UNIT NONRESPONSE MODEL ADJUSTMENTS

A summary of the coefficients and goodness of fit statistics for state-level, unit nonresponse models for “Urban National Landowner Survey, Baltimore, 2018” are available online and can be accessed from the link found on the Treesearch landing page at <https://doi.org/10.2737/NRS-GTR-230>.

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