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2017 National Lakes Assessment Site Evaluation Guidelines

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NOTICE

The intention of the 2017 National Lakes Assessment (NLA 2017) project is to provide a comprehensive “State of the Lakes” assessment for lakes, ponds, and reservoirs across the United States. The complete documentation of overall project management, design, methods, and standards and Quality Assurance/Quality Control measures is contained in this document and companion documents, including:

2017 National Lakes Assessment: Field Operations Manual (EPA 841-B-16-002)

2017 National Lakes Assessment: Laboratory Operations Manual (EPA 841-B-16-004)

2017 National Lakes Assessment: Quality Assurance Project Plan (EPA 841-B-16-003)

These documents together comprise the integrated set of QAPP documents. This document (*Site Evaluation Guidelines*) describes the process to compile the final list of candidate lakes for sampling. The process includes locating a candidate lake, evaluating the lake to determine if it meets the criteria for inclusion in the target population and is accessible for sampling, and, if not, replacing it with an alternate candidate lake. These guidelines are revised from those developed for the 2012 NLA (USEPA 2011), and are intended for specific use in the 2017 NLA. Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use

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1 INTRODUCTION

The objectives of the 2017 National Lakes Assessment (NLA) include:

- 1) Using a statistically valid approach, determine the percent of the nation’s lakes that are least disturbed, moderately disturbed, and most disturbed for key indicators of ecological health, trophic state, and recreation;
- 2) Determine the relative importance of key stressors as they relate to the condition of lakes across the United States;
- 3) Evaluate changes and trends in the condition of lakes in the United States since the 2012 NLA and 2007 NLA;
- 4) Expand the capacity of State and Tribal programs to monitor and assess the condition of lakes.

The word *lake* in the remainder of this document includes lakes, reservoirs, and ponds. This document describes the steps involved to evaluate candidate lakes for the NLA, and arrive at a final list of lakes to visit and sample. Evaluation of candidate lakes serves several purposes. Lakes that do not meet the criteria for inclusion in the NLA *target population* are identified and replaced. The target population is that component of the resource (i.e., lakes, ponds, and reservoirs) that could be sampled to assess condition. **Table 1.1** lists the exceptions for inclusion in the target population of lakes, ponds, and reservoirs.

Table 1.1 Exceptions to NLA 2017 Target Population

Exceptions to the NLA 2017 Target Population
Ephemeral waterbodies (i.e., highly likely to be dry between May and September of the sampling year)
Lakes or ponds along the coast or near an estuary (below the head of salt) that are tidally-influenced (i.e., maintained solely by surface inflow of brackish water or seawater)
Run-of-the-river reservoir with retention time < 1 week
Used exclusively for aquaculture
Ponds or reservoirs with no recreational or aquatic life uses
Sewage lagoons
Disposal ponds (e.g., mine tailings)
Evaporation ponds
Storm water retention basins
Constructed solely for storage of drinking water (e.g., up-ground reservoirs, p.8)
Active quarries
Borrow pits
Stock or farm ponds that were constructed where there previously was no waterbody (with no other uses)
Surface area less than 1 hectare
Total area of open water (does not have to be continuous) < 1000 m ² (at time of sampling).
Maximum depth less than 1 m (at time of sampling)

Lakes that meet the criteria, but that cannot be sampled, are also identified and replaced. Information

obtained about important characteristics of candidate lakes (e.g., lake origin) is used to classify lakes for analysis and reporting. All of these activities improve the sample frame and allow the population of lakes assessed for ecological condition to be described more precisely. In addition, the number of field visits to lakes that should not or cannot be sampled is reduced.

The evaluation process for the NLA differs from many other monitoring and assessment studies in that the accounting of candidate lakes that end up not being sampled is almost as important as identifying the lakes that will ultimately be sampled. Accounting for the status of all candidate lakes, sampled or not, provides the means to improve the survey design and site selection process, refine the sampling frame to reduce the number of non-target sites, and acknowledge any potential caveats to interpreting the results of the assessment in terms of sites that were identified as target but could not be sampled. In the 2012 NLA, the final set of sampled lakes represented only 70% of the target population—the other 30% represented a portion of the intended target population that could not be assessed because of lack of permission or physical inaccessibility (USEPA *in prep*). This unassessed portion of the target population is likely biased towards certain types of lakes and/or geographic regions. This constrains the ultimate objective of reporting the condition of all target lakes in the conterminous US. Any activity that reduces the proportion of unassessed lakes results in a more robust and representative assessment.

Given the scale and time constraints of NLA, and the desire to utilize local knowledge about lakes, the evaluation process involves many different persons. It is critical to apply the evaluation process consistently across all lakes and evaluators. To help make the process consistent and efficient, an electronic spreadsheet with drop-down menus and pick lists is used for the NLA 2017. For those lakes ultimately identified for sampling, it is also important to apply a reasonable (and consistent) level of effort to obtain permission when required, and to visit and sample lakes that are difficult to access because of physical barriers to access (e.g., distance, terrain).

1.1 Selection of the Master List of Candidate Lakes

Lakes were chosen from a sample frame of lake polygons represented in the National Hydrography Dataset (NHD), following a Generalized Random Tessellation Stratified (GRTS) survey design for a finite resource (Stevens and Olsen 2004). **Appendix C: National Lakes Assessment 2017 Survey Design** provides additional details regarding the survey design. The final sample frame for 2017 incorporates sampled lakes from both NLA 2007 and NLA 2012 for use in estimating change between and trends among lakes surveys.

The "master" list of sites selected for the NLA 2017 using the survey design contains approximately 8,500 candidate lakes. A sufficient number of lakes from this list must be evaluated in order to produce a final list of approximately 1,000 lakes that will be visited and sampled. The evaluation process is conducted separately for each State to arrive at the required number of sampling sites for the entire NLA. Additional lakes from the list may need to be evaluated if a State will be implementing a more intensive sampling regime in order to produce a State-level assessment of lakes. Approximately 220 of these 1,000 lakes are lakes that were previously sampled as part of the 2012 NLA and approximately 225 lakes were previously sampled as part of the 2007 NLA. These lakes may not require a detailed evaluation for 2017 (other than to confirm each is still target and accessible).

2 LAKE EVALUATION PROCESS

For 2017, the NLA lake evaluation process consists of four phases:

- 1) A **Geographic Information System (GIS)-based evaluation** on candidate lakes to assign an initial status to as many as possible;
- 2) A **Desktop Evaluation** to assign a final status to as many of the remaining candidate lakes as possible;
- 3) A **Field Evaluation** to assign a final status to any remaining candidate lakes;
- 4) A final refinement of the candidate lake list based on the ability to obtain **Permission** to sample, and whether the lake meets open water and depth criteria when visited.

The master list of candidate lakes (1.1) can be apportioned into lists of candidate sites for each State. Each phase assigns a final status to as many candidate lakes on a State list as possible, with the next phase working primarily on the remaining lakes. By the end of the third phase, all candidate lakes evaluated should have a final status assignment. The fourth phase of the process refines the list of candidate lakes to identify those that will be visited and sampled in the NLA.

The general process for conducting the evaluation within any given phase is presented in Figure 1. The process consists of answering a series of Yes/No questions, as shown in Figure 2. A *Yes* answer moves the site to the next question, while a *No* answer generally involves assigning a final site status and selecting a replacement site for evaluation. When a question cannot be answered definitively, the status is classified as *Uncertain*, and the site is moved to the next phase of the evaluation.

For the NLA 2017, the GIS-based evaluation phase will be conducted by the states. Two shape files will be provided for the purposes of GIS-based evaluation: a shape file of points representing the design coordinates for each lake selected to be part of the survey design, and a shape file of lake polygons associated with each sampling point. After the GIS phase, the list of candidate sites will undergo desktop and field evaluations (when required). The GIS-based, desktop, and field evaluation phases are used to determine if a candidate lake is part of the target population, if it is safe to access, and if permission is needed (in the case of no public access). Then, if needed, permission is requested as the fourth phase of the process.

During any given phase, candidate lakes that are determined to be nontarget, or are determined to be part of the target population but cannot be sampled, are replaced with alternate candidate lakes selected from a list of *oversample* lakes. It is important that alternate lakes are selected properly (i.e., from the correct group without skipping over any) to maintain the random nature of the final list of sampled lakes. The procedure for selecting a replacement lake is described in the following section.

Final status determinations should be recorded on each state's site evaluation spreadsheet, which includes the list of candidate sites as well as oversamples for each state. The spreadsheets shall be updated regularly throughout the index period and posted to the NLA SharePoint site. The NLA field logistics contractor will be checking the site evaluation spreadsheets throughout the field season to ensure proper replacement lake selections.

2.1 Lake Replacement

Lakes on the master site list are evaluated separately by State. A sufficient number of lakes on the list for each State must be evaluated in order to arrive at the required number of target and accessible lakes assigned to that State. There are five "base panels" included in the NLA 2017 survey design:

- 1) **NLA 2007 resample lakes (NLA17_07RVT)**: These are lakes that were initially sampled in NLA 2007 and again in NLA 2012. Lakes with the RVT code will be sampled once in 2017.

- 2) **NLA 2007 resample and revisit lakes (NLA17_07RVT2)**: These are lakes that were initially sampled in NLA 2007 and again in NLA 2012. Lakes with the RVT2 code will be “revisit” lakes and sampled two times in 2017.
- 3) **NLA 2012 resample lakes (NLA17_12RVT)**: These are lakes that were initially sampled in NLA 2012. Lakes with the RVT code will be sampled once in 2017.
- 4) **NLA 2012 resample and revisit lakes (NLA17_12RVT2)**: These are lakes that were initially sampled in NLA 2012. Lakes with the RVT2 code will be “revisit” lakes and sampled two times in 2017.
- 5) **NLA 2017 lakes (NLA17_17)**: These are new lakes selected from the 2017 sample frame and will be visited once in 2017.

Note the subtle but important distinction between *resample* and *revisit* lakes: *Resample* lakes are visited and sampled in different years. *Revisit* lakes are visited and sampled twice within a single year. None of the “new” NLA 2017 lakes will be revisited in 2017.

There are also four different “oversample” panels that serve as the source for replacement lakes:

- 1) **NLA 2007 resample lake oversample (NLA17_07RVT_OverSamp)**: This list is used to replace either NLA 2007 resample or resample and revisit lakes that are either non-target or that cannot be sampled in 2017.
- 2) **NLA 2012 resample lake oversample (NLA17_12RVT_OverSamp)**: This list is used to replace either NLA 2012 resample lakes that are either non-target or that cannot be sampled in 2017.
- 3) **NLA 2012 resample and revisit lake oversample (NLA17_12RVT2_OverSamp)**: This list is used to replace NLA 2012 resample and revisit lakes that are either non-target or that cannot be sampled in 2017. NOTE: This panel is not present in all states. If a state does not have this panel, replace NLA17_12RVT2 lakes using the NLA17_RVT Oversample list.
- 4) **NLA 2017 lakes oversample (NLA17_17_OverSamp)**: This list is used to replace NLA 2017 lakes that are either non-target or that cannot be sampled in 2017.

Within each state(column name=STATE) and base panel group (column name=PANEL17), lakes evaluated for potential sampling must have all site IDs (column name SITEID_17) from the lowest to the largest number evaluated. For example, Alabama has eight lakes that need to be sampled (two NLA17_07RVT, one NLA17_07RVT2, one NLA17_12RVT, one NLA17_12RVT2, and three NLA_17_17 lakes). A sufficient number of base and oversample sites from each panel needs to be evaluated to end up with the required number of sampled lakes. It is important to select oversample lakes from each panel **in numerical order of site ID** (i.e. do not skip over any).

If you determine a lake to be non-target, or target but not accessible, during any phase of the evaluation process, select the next available replacement lake from the appropriate oversample list. **Section 2.2** presents the procedure for selecting replacement lakes. The replacement process differs slightly based on whether the lake being replaced is part of the national NLA 2017 design versus a state-level design (intensified sampling to allow a State to perform its own assessment). Candidate lakes identified as part of the national design must all be evaluated and sampled if they are determined to be target and accessible. For a state-level design, all candidate lakes identified as part of the national design and all candidate lakes identified as part of the state-level design must be evaluated and sampled if they are determined to be target and accessible.

2.2 Procedure for Selecting Replacement Lakes from the Oversample List

At the end of the evaluation process, you should have a list of lakes for your state that includes the list of "base" sites (**Section 2.2.1**), plus a sequential list of replacement Site ID numbers needed to have the required number of target and accessible lakes. If your State is planning to do a separate State-scale assessment, the "base" list of sites is expanded to include additional sites (**Section 2.2.2**) that must also be evaluated (and replaced if necessary).

2.2.1 National Design

1. The initial list of candidate "base panel" lakes within a state that are required for the national assessment are identified by the following values for the column name= PANEL17:
 - a. **NLA17_07RVT**: NLA 2007 resample lakes that will be sampled once in 2017.
 - b. **NLA17_07RVT2**: NLA 2007 resample and revisit lakes that will be sampled two times in 2017.
 - c. **NLA17_12RVT**: NLA 2012 resample lakes that will be sampled once in 2017.
 - d. **NLA17_12RVT2**: NLA 2012 resample and revisit lakes that will be sampled two times in 2017.
 - e. **NLA17_17**: NLA 2017 lakes that will be sampled once in 2017
2. You must evaluate **all of these base panel lakes** within your State to meet the sample size requirements for the national assessment. If the evaluation for a lake results in it being assigned a final status of nontarget or target but not accessible, select the first available lake (i.e., with the lowest Site ID number) from the appropriate oversample list and evaluate it.
 - a. If you need to replace a 2007 resample and revisit site (NLA17_07RVT2), attempt to replace this revisit from the NLA 2007 resample lake oversample list (**NLA17_07RVT_OverSamp**).
 - b. If you need to replace a 2012 resample and revisit site, attempt to replace this revisit from the NLA 2012 resample and revisit lake oversample list (**NLA17_12RVT2_OverSamp**). This will become your new 2012 revisit site. This may not always be possible. If not, replace it as you typically would and make the replacement lake a revisit site.
 - c. If all replacement lakes with PANEL17 = NLA17_17 have been evaluated, and additional replacement lakes are needed, begin using lakes with PANEL17 = **NLA17_17_OverSamp**

2.2.2 State Level Design (Intensification)

1. As of fall 2016, nine intensifications and two State-specific survey designs have been identified for inclusion in the 2017 NLA. This is subject to change before the 2017 NLA is actually implemented.
2. For a State-level (intensified) design, the "base" list of candidate lakes includes all lakes identified as part of the national design (see **2.2.1** above), plus those with PANEL17=NLA17ST.
3. You must evaluate **all of these lakes** within your State to meet the sample size requirements for both the national and your State-specific assessments. If the evaluation for a lake results in it being assigned a final status of nontarget or target but not accessible, select the first available lake (i.e., with the lowest Site ID number) with PANEL17= **NLA17_17_OverSamp** and evaluate it.

- d. **NOTE:** If your State elects not to include lakes with surface area less than 4 ha (which are part of the national design), or have some other deviation from the national target lake criteria, you must still evaluate (and sample if target and accessible) all lakes (regardless of surface area) identified as part of the national design, including any replacement lakes needed for these.
- e. For the additional State-level lakes (PANEL=NLA17ST), you can exclude those that do not meet your State-specific target criteria (e.g., with surface areas < 4 ha), and skip over any replacement lakes (PANEL17= **NLA17_17_OverSamp**) that do not meet your State-specific target criteria). Assign a final evaluation status of *Nontarget_State* to these excluded lakes.

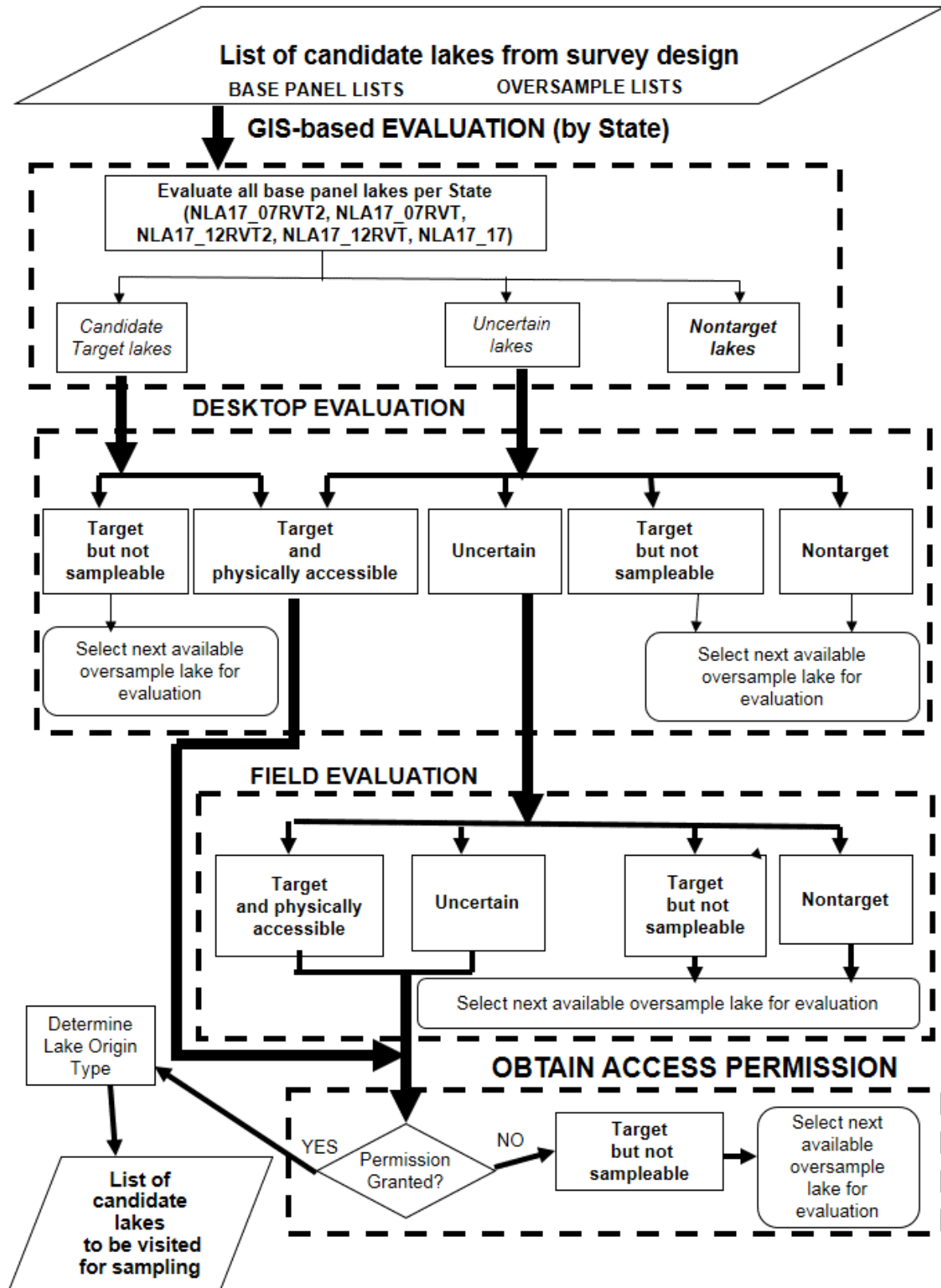


Figure 1. Evaluating a lake.

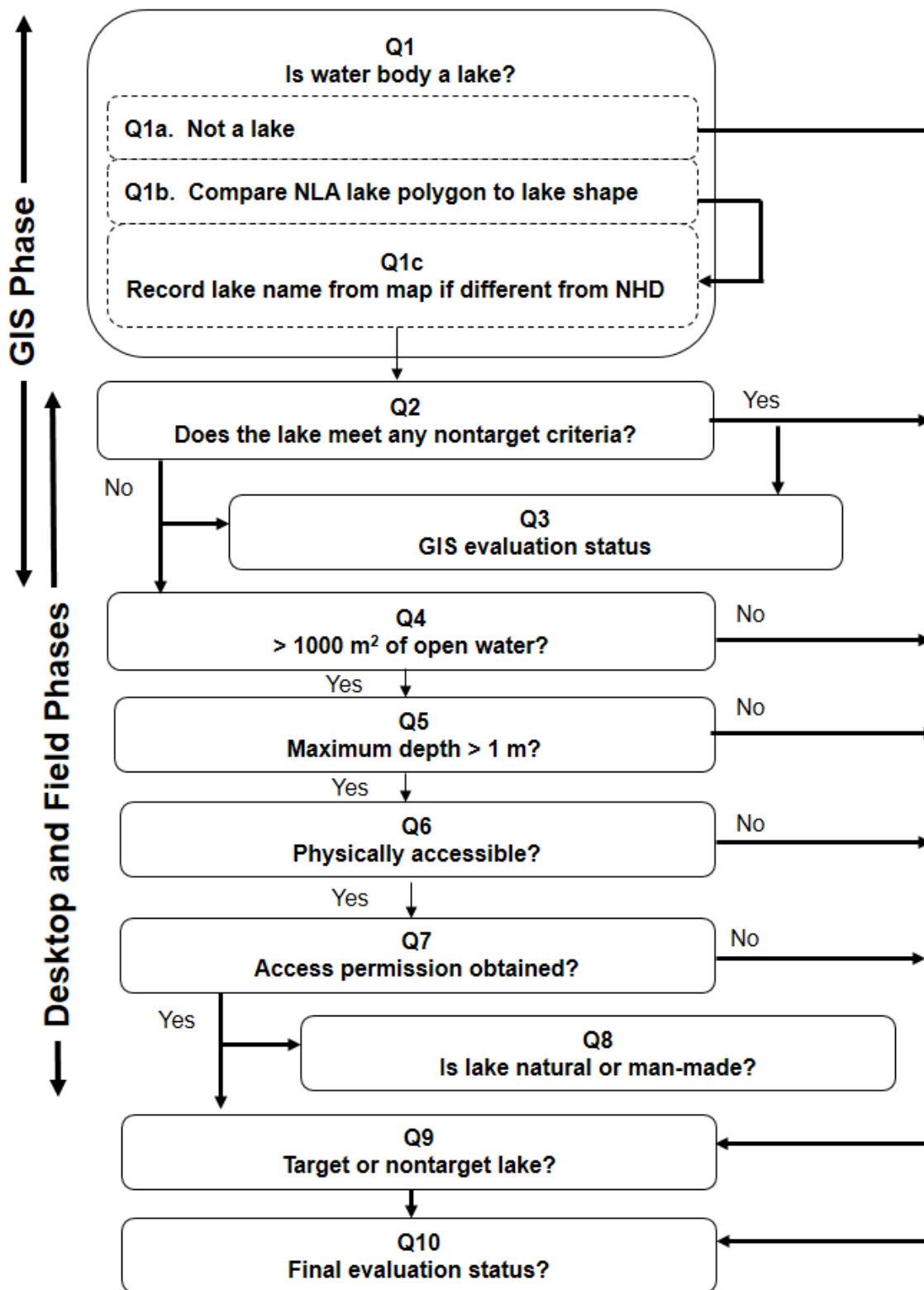


Figure 2. Process Flow of the Lake Evaluation Spreadsheet.

2.3 GIS-based Evaluation (Q1-Q3)

Figure 3 presents an overview of the GIS-based phase of lake evaluation. At this phase, evaluate all base lakes on each State list (i.e., those with PANEL17= NLA17)07RVT2, NLA17_07RVT, NLA17_12RVT2, NLA17_12RVT, and NLA17_17). In addition to the two shape files provided by EPA (NLA 2017 site points and lake polygons), the GIS-based phase makes use of two ESRI map service layers loaded in ArcMap®: a background United States Geologic Survey (USGS) topographic map service and a map service of world imagery from ESRI loaded as layer files in ArcMap®. Examine each lake point (and polygon) in ArcMap® using background topographic maps and imagery. Use the procedure presented in **Section 2.3.1** to attempt to answer the questions in the evaluation spreadsheet file (see **Figure 2**) based on just these layers in ArcMap®. The GIS-based phase is designed primarily to address questions Q1 and Q2 of the evaluation questionnaire (**Figure 2**). All lakes evaluated during the GIS phase are assigned a GIS status (Q3 of the questionnaire).

The intent of the GIS phase is to reduce the number of candidate lakes that must be reviewed in more detail during the Desktop and Field phases of the evaluation. Ideally, decisions will be made quickly for the vast majority of lakes based on background topographic maps and imagery alone. For any lake in the initial list of base lakes to which you cannot definitively assign a GIS status of *Candidate target* or *Non-target*, assign a GIS status of *Uncertain*. Lakes with GIS status of *Candidate target* and *Uncertain* are moved to the Desktop phase of the evaluation process. For lakes that have been sampled previously (in 2007 and/or 2012) and for large, named lakes, the GIS review should be very fast. For “new” lakes being sampled for the first time in 2017, and for smaller lakes and unnamed lakes, responding to the evaluation questionnaire will likely take more time and there may be more lakes assigned to a GIS status of *Uncertain*.

The GIS phase also identifies instances where the lake polygon as rendered in the NLA lake polygon shape file does not match up with the lake shape depicted on either the image and/or the topographic map. Examples include:

- 1) where part of a lake (an arm or other embayment) is not represented within the lake polygon;
- 2) where part of a lake is not represented by a polygon because of a bridge or causeway; or
- 3) a single polygon encompasses more than one lake.

These inconsistencies may be due to mapping or delineation errors in NHDPlus that have not been corrected in the NLA sampling frame, or to more recent changes in basin morphology as a result of precipitation patterns. In the case of the latter, it may not become evident until the desktop evaluation (**Section 2.4**) or even later (i.e., when you visit the lake to sample it). If you encounter one of these errors during the GIS evaluation (Q1b of the evaluation questionnaire), notify Marc Weber of the NLA design staff at WED-Corvallis so the error can be corrected in the sample/analysis frame, and then proceed with evaluating the lake. These errors affect the sampling frame in two ways: they result in an incorrect delineation of the catchment, and, in the case of a single polygon representing more than one lake, they might impact the weighting factor.

Ephemeral lakes that are expected to be dry during the index period (May through September) of the sampling year are not part of the target population. Coastal lakes, or lakes near an estuary that are under tidal influence, are not part of the target population. A tidally-influenced lake is operationally defined as being maintained solely by the surface inflow of brackish or salt water due to water level changes during tidal cycles. Permanent lakes near the coast, or near an estuary below the head of salt, with no surface connection to the ocean at high tide are considered part of the target population (even if saline). *Dune lakes* (primarily located along the Gulf Coast), are part of the target population. These lakes are permanent and almost always isolated from the ocean, but periodically will flood or “blow

out," forming a connection with the ocean or estuary and incur an influx of brackish or salt water. Waterbodies along the coast that are considered to be estuarine or part of a larger coastal wetland area are not part of the target population. Inland lakes that are saline or have high conductivity ($> 1000 \mu\text{S}/\text{cm}$ @ 25°C) are part of the target population (the Great Salt Lake has already been excluded as part of the survey design). Oxbows are considered target lakes if they are completely separated from a river (no surface connection). However, oxbows that have either flowing water or a wetland connection to a river are not lakes, and should be assigned a GIS evaluation status (Q3) of *Nontarget*. Side-channel reservoirs and drinking water reservoirs (where water is pumped from nearby rivers, termed upground reservoirs in some parts of the US) that do not have recreation or aquatic life uses are not considered part of the target population. Abandoned mine lakes used for recreation or other beneficial uses (e.g., wildlife) are considered to be part of the target population.

The GIS-based phase (**Section 2.4**) will likely not provide definitive information to address whether a candidate lake is ephemeral, has sufficient open water, or a maximum depth of at least 1 m, especially for smaller lakes. You can attempt to use the surrounding topography to make these determinations – if there is not much relief, chances are it will not be very deep. Do not answer the open water or lake depth questions (Q4 and Q5), or conclude the lake is ephemeral, unless you are sure that a *Yes* or *No* response applies based on the available imagery for the lake. Lakes that are assigned a status of *Uncertain* during the GIS evaluation phase are further evaluated as part of the Desktop evaluation phase of the evaluation process.

2.3.1 Lake Evaluation using GIS Layers and Imagery

This procedure describes the GIS phase of the evaluation process that will be conducted by the states. If questions come up, contact Marc Weber (541-754-4469) or Dave Peck (541-754-4426).

From the NLA 2017 SharePoint Maps folder, download 'NLA_GIS_files_2017.zip' to the folder of your choice. Right-click the zip file and click 'WinZip' 'Extract to Here'. You'll then see three folders and one map package (.mpk).

If you are familiar with working in ArcGIS, double-click the 'NLA_Design_Sites_for_Evaluation.mpk'. This will open an ArcMap project that includes all NLA sites and design polys, as individual state layers. Expand the 'Base', 'Oversample' and 'Design Polys' group layers, by clicking the plus sign next to the names. Then scroll down until you see the appropriate state. Click the plus sign next to the chosen state. You'll then see the symbol used for the layer. Click the check box next to the layer to make it visible. To zoom to your state, right-click the desired state layer and choose 'Zoom to Layer'.

To utilize Google Earth in reviewing the NLA GIS files, use the .kmz files in the three folders: 'Base_KMZ', 'Oversample_KMZ' and 'Design_Polys_KMZ'. Double-clicking on any of the state files within these folders will launch Google Earth (if you already have the software installed). Once Google Earth is open, additional .kmz files can be dragged into the interface from Windows Explorer. Locate the 'Places' pane on the left side of Google Earth and expand the .kmz layer you're viewing by clicking on the triangle next to the layer. Next, click on the triangle next to the layer below the .kmz layer. This will list the features within the layer by 'NLA17_ID'. Clicking on any of these links in the 'Places' pane will bring up a pop up of the layer's attributes. Double-clicking on any of these links in the 'Places' pane will pan and zoom to that specific feature.

Then

1. Open the NLA 2017 Lake Evaluation Spreadsheet available on the NARS SharePoint (NLA_2017_LAKE_EVAL_FORM_20160517.xlsx, or the corresponding State workbook if not being done centrally).
 - a. The worksheet has key variables from the shape file, sorted in the same order
 - b. The evaluation questionnaire begins with the column labeled *Q1. Is Waterbody a Lake?*
2. For each State, evaluate all lakes in each base panel using just the imagery provided in ArcMap[®]. Evaluate lakes in order, looking at lakes in ArcMap[®] and filling in columns in the spreadsheet. All of the evaluation questionnaire columns have drop down lists for entries.
3. The GIS evaluation involves answering the first 2 questions of the lake evaluation questionnaire and assigning a status of *Nontarget*, *Candidate Target*, or *Uncertain* as Q3 of the evaluation.
 - a. If the polygon for the lake from the NLA lake polygon shape file does not match up with the lake outline as shown on either the imagery or the topographic map, notify Marc Weber so corrections can be made to the shape file and sampling frame.
4. If you can determine a final status of *Nontarget* (e.g., a nontarget evaporation pond), assign the appropriate responses to Q3, Q9 and Q10 of the evaluation questionnaire and proceed to evaluate the next site on the list.
5. If the responses to questions Q1 and Q2 indicate that the lake is a candidate target lake, or you cannot determine its status, assign a GIS status (Q3) of *Candidate Target* or *Uncertain*, respectively. Proceed to the next lake on the list. Lakes categorized as *Candidate Target* or *Uncertain* will be evaluated further during the Desktop phase.

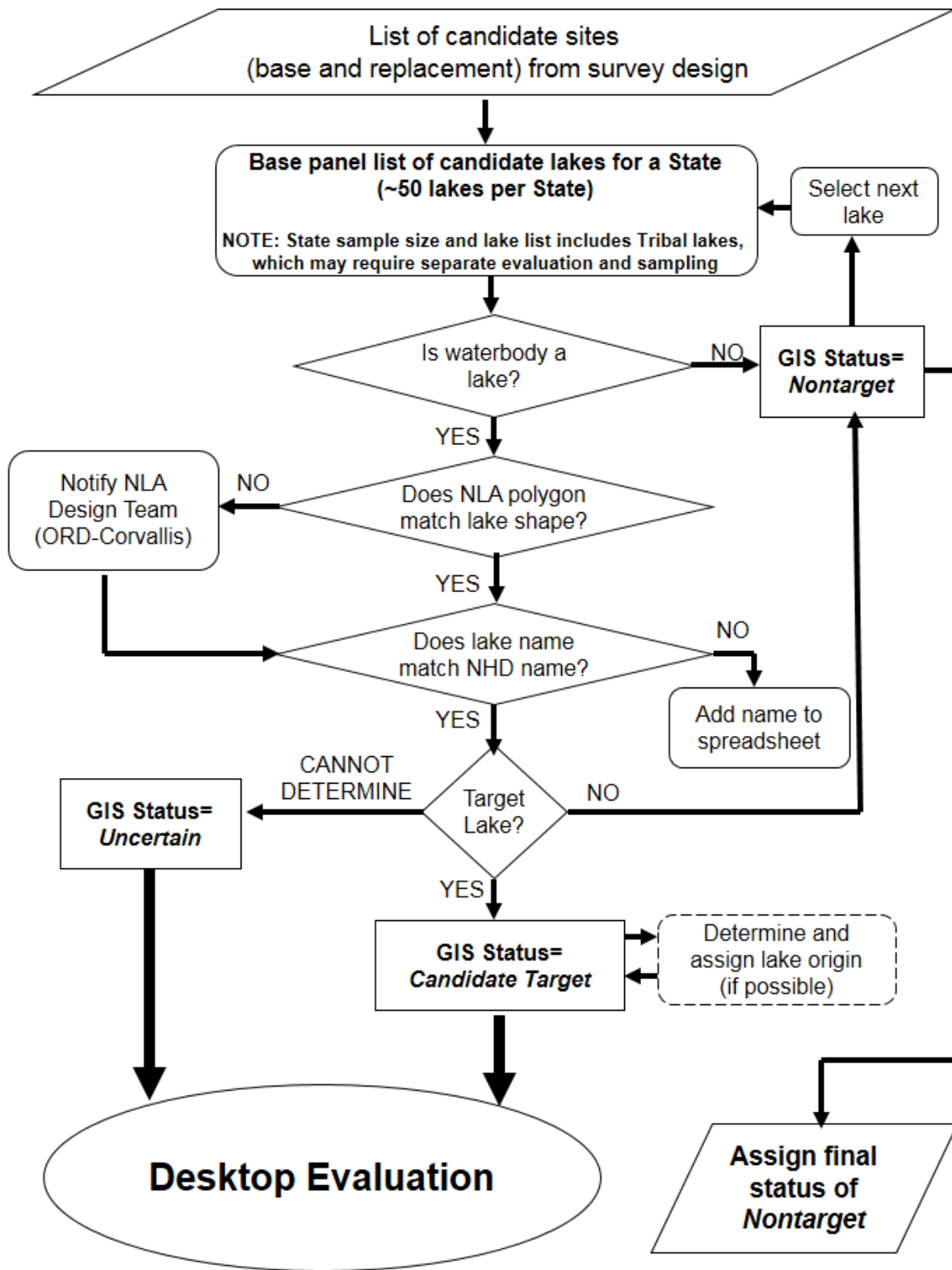


Figure 3. GIS-based evaluation.

Lake Evaluation Process

2.4 Desktop Evaluation (Q2, Q4-6)

Continue the second phase of the evaluation process to complete the evaluation questionnaire for any remaining lakes assigned an interim status of *Uncertain* during the GIS-based phase, and to continue to complete the evaluation for candidate lakes during the GIS phase. For the desktop evaluation, the master evaluation file will be split into separate files for each state. The general process for conducting the desktop phase is presented in Figure 4. Use a variety of available information sources to proceed through the evaluation questionnaire (Figure 2). Google Earth[®] and other ancillary layers (e.g., Wikipedia[®], Panoramio[®] photos, geographic features, etc.) may provide sufficient information to answer all of the questions in the evaluation questionnaire successfully. A Google Earth[®] kmz (or kml) file of all lake polygons will be made available.

In addition to Google Earth[®], conduct Web searches for each remaining lake based on the lake name or location information to try to answer the questions in the evaluation questionnaire and assign a final status category for each lake. Some lakes may require an investigation of maps, reports, or conversations with local experts who are familiar with the current conditions of the lake being evaluated. Obtaining information from local experts will help to minimize the number of lakes that will require a field visit. If possible, determine the lake origin using these resources. For a run-of-the-river reservoir, it is important to determine if the estimated residence time is greater than 1 week; if less, it is considered to be nontarget and requires replacement.

For the NLA, the status of a lake is that existing **in the year (and ultimately on the day) of sampling**. There will be lakes (more likely smaller ones) that will meet the target criteria one year but not meet them in another year due to precipitation (or lack of) or other natural causes. **Temporary changes to a lake's status due to deliberate management/restoration activities (e.g., weed control, rotenone application, dredging, etc.) do not render a lake as nontarget for that year.** Criteria pertaining to open water area and maximum depth may not be able to be determined until you actually visit the lake to sample. Note that the open water criterion is based on a total area of 1000 m²; and does not have to be continuous.

In some areas, there is the possibility that neighboring lake basins may become joined during periods of heavy precipitation, and this will be evident from the available images. In these cases, treat the combined lakes as a single waterbody and sample it if it meets the target criteria. Do not just consider the part of the lake represented by the NLA polygon. Note the presence of the combined waterbodies and the reason (e.g., is it temporary or does it appear to be a permanent change). Notify the NLA design staff in Corvallis so that the sample/analysis frame can be adjusted if necessary.

There is also the possibility that a single lake may become divided into two or more neighboring basins because of drought conditions. You must look at the NLA polygon coverage and determine which basin has the NHDPlus labeling point associated with it and treat this basin as the "official" lake for the purposes of evaluating and sampling in 2017. If the basin meets the target criteria, sample it (but not any of the neighboring basins). If the basin does not meet the target criteria, assign it as non-target and select a replacement lake. In either case, note the presence of the separated waterbodies and the reason (e.g., is it temporary or does it appear to be a permanent change). Notify the NLA design staff in Corvallis so that the sample/analysis frame can be adjusted if necessary. Lakes on Tribal lands require some additional considerations. Tribal lakes are included as parts of individual state lists (and are part of the total sample size assigned to the state). Tribal lakes need to be evaluated by someone (the Tribal nation, EPA Region, State, or a third party), and a final status assigned. For lakes identified as target, distinguish between those lakes where no permission to sample was ever sought (Tribal-Other), from lakes where permission was requested from a Tribal nation, but was not granted (Target-Access denied).

At this phase of the evaluation, you should begin to compile a dossier of access-related information for each lake that has been definitively identified as target and accessible. This information includes any issues associated with accessing the lake such as steep terrain; livestock; thick, nuisance vegetation; locked gates and the presence and type of boat ramps available at a lake. You can obtain some of this information from a local expert during the Desktop phase, from the Field evaluation (if needed), or when you attempt to obtain permission to sample a lake (Section 4.0). Lakes that are still assigned a status of *Uncertain* after the Desktop evaluation phase are moved to the Field evaluation phase of the evaluation process.

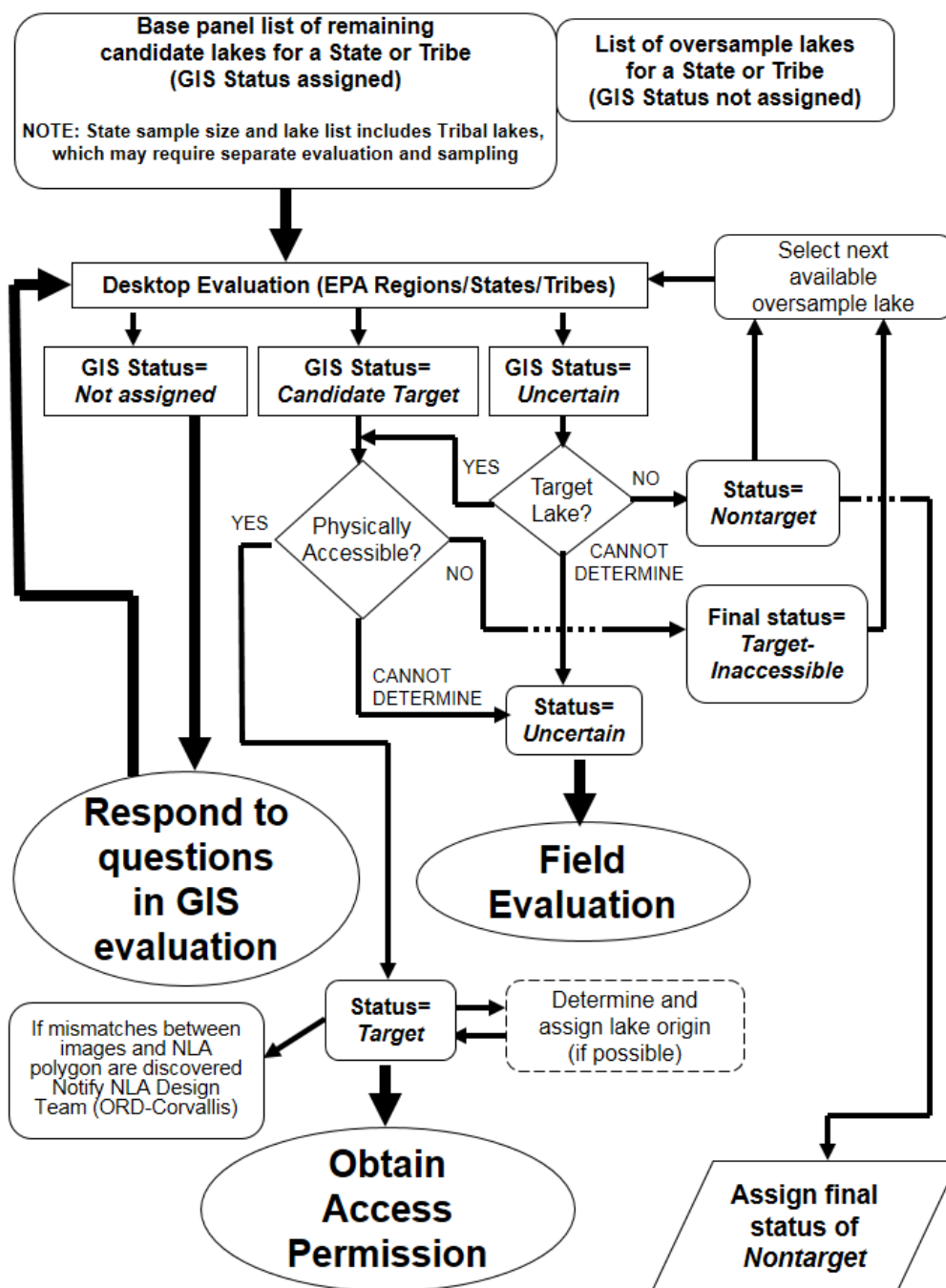


Figure 4. Desktop evaluation.**2.5 Field Evaluation (Q2, Q4-6)**

Continue the third phase of the evaluation process to complete the evaluation questionnaire for any remaining lakes assigned an interim status of *Uncertain* during the Desktop phase. The general process for conducting the Field phase is presented in **Figure 5**. The field evaluation phase differs from previous phases in that lakes whose status is still uncertain after a field visit are considered candidate target lakes. The final status of these lakes may not be determined until a field crew actually visits the lake with the intent to sample it.

Get as close as you can to the lake during a field visit. For remote lakes, this may require hiking to, or possibly flying over, the lake. For other lakes, you may be able to drive near the lake and use binoculars to conduct the evaluation. Determine the lake origin during the field visit if it has not been determined in a previous phase. While at the lake, remember to gather information that will be useful to a field crew when they come to sample it (e.g., launch facilities, surrounding terrain, best access routes, etc...).

After completing the field evaluation phase, you will have a list of candidate lakes that are physically accessible. The last phase of the process involves obtaining access permission for those lakes that require it.

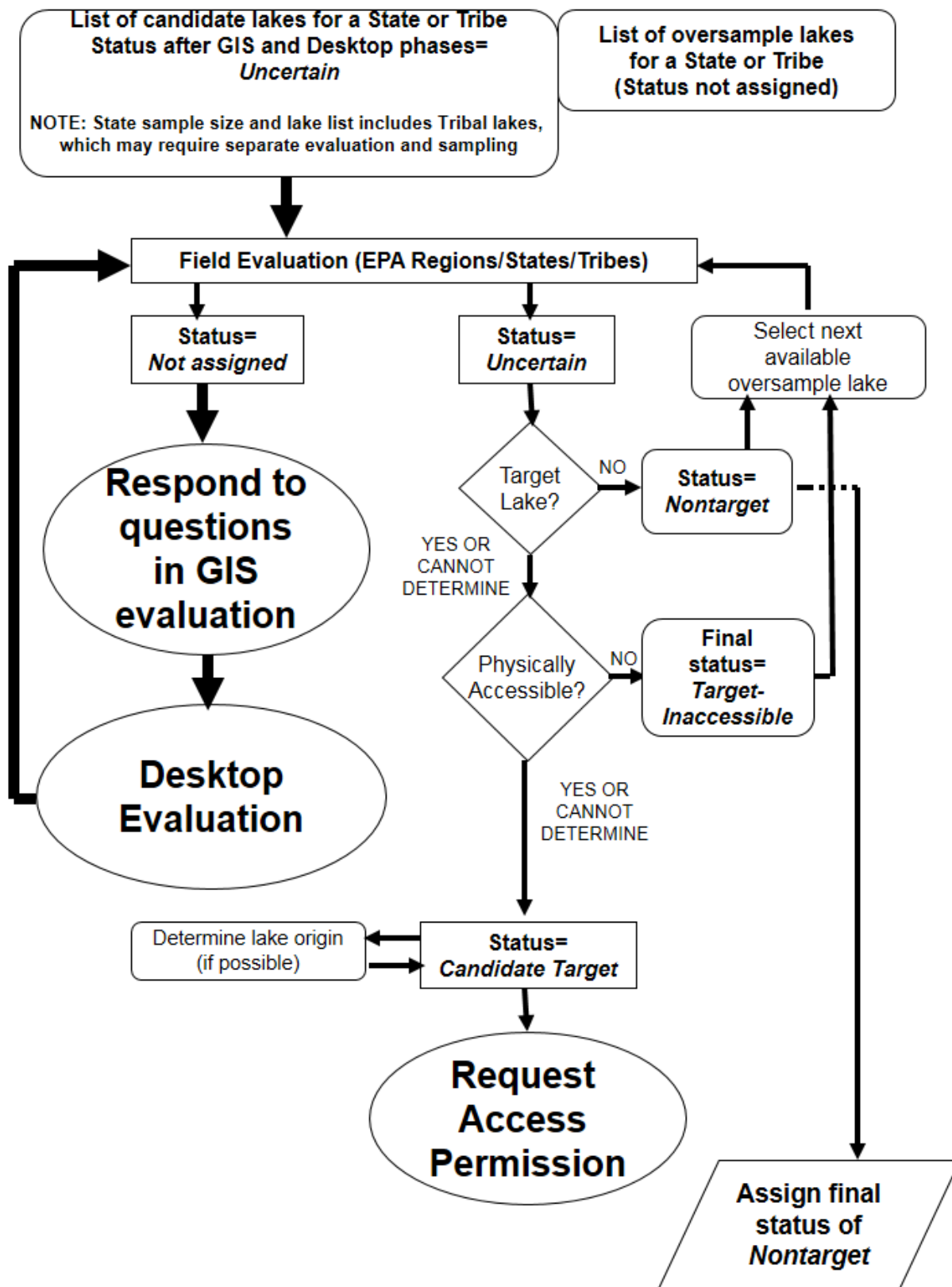


Figure 5. Field evaluation.

3 DETERMINING IF A LAKE IS PHYSICALLY ACCESSIBLE (Q6)

Lakes for the National Lakes Assessment were selected from the population of lakes across the U.S. through a probabilistic survey design. In order to achieve the most robust results possible with the probabilistic sampling design, a concerted effort is required to sample the base lakes on your list.

It is very important not to reject a lake that meets the criteria for the target population based on inconveniences in access. At some lakes, a field crew can drive its truck to a boat ramp and launch. Other lakes may require a lengthy hike or portage with a small boat. Some lakes in extremely remote areas are impossible to safely access (e.g., trail conditions, temperature extremes). A lake is considered permanently inaccessible if it is unlikely to be sampled by anyone due to physical barriers that prevent access (e.g., cliffs). Safety concerns that may prohibit access include the presence of dangerous wildlife or potentially threatening groups of people.

Physically inaccessible lakes may be target lakes.

3.1 Target, Inaccessible-Barrier/Safety

Occasionally, a lake is determined to be target, but cannot be sampled due to physical barriers or safety concerns. Assign these lakes a response of *NO* to Q6, *Target* to Q9, and *Inaccessible-Barrier/Safety* to Q10 (Figure 2). Describe why the lake is inaccessible in the *COMMENTS* column of the evaluation spreadsheet. You will then need to select and evaluate a replacement lake.

3.2 Target, > 1 Day Needed

Very large lakes may require either more than one day to sample completely (including travel time), or require more than one field crew to complete the sampling in a single day (including shoreline stations). Assign these lakes a response of *YES, BUT > 1 DAY/CREW NEEDED* to Q6 (Figure 2). If you determine that these lakes cannot be sampled, assign a response of *Target* to Q9 and a final status of *TargetOther* for Q10. Remember that on large lakes (>10,000 ha), shoreline stations are not established, so these lakes should be sampled at the index site if at all possible.

3.3 Target, Extreme Effort Required, Inaccessible-Effort

Some remote lakes may be physically accessible, but the effort required to reach them to sample is prohibitive in terms of the time and or cost required, or because an extreme effort (in terms of time and/or cost), as opposed to inconvenience, is required to obtain access. Assign these lakes a response of *YES, BUT EXTREME EFFORT IS REQUIRED* to Q6, *Target* to Q9, and *Inaccessible-Effort* to Q10 (Figure 2). Describe the extreme effort constraint (i.e., the time or cost that would be needed) in the *COMMENTS* column of the evaluation spreadsheet. You will then need to select and evaluate a replacement lake.

4 OBTAINING PERMISSION TO ACCESS CANDIDATE LAKES (Q7)

Many of the lakes will be publicly accessible with either boat ramps or convenient small boat access. In these cases, explicit permission to access the lake is not needed and little prior work needs to be done outside of determining the best access routes for the sampling crew. However, for those lakes on privately owned land, landowner permission is required to obtain access and sample these lakes. Obtaining permission well in advance of the sampling day is important to minimize loss of time on the part of the field team. Many states have an existing protocol for securing landowner permission; if this is the case for your state, use the existing protocol for this study.

4.1 Identify Landowner

The initial lake list file contains an initial assignment of ownership as federal (and which agency has jurisdiction), non-Federal, or possibly Tribal. For non-Federal ownership, determine whether the lake is publicly accessible or located on private property. If the lake is on private property, you will need to obtain the name and address of the landowner. Some states or EPA Regions may provide you with additional identification of public versus private lakes and some landowner information. If no landowner information was obtained for a lake, contact the county office. The county office can direct you to the agency that is responsible in your state/county for holding landowner records, and you can work with the appropriate agency to obtain the information.

Be aware that this process can be time consuming, as you may need to work with several different agencies and numerous people. Be prepared to submit maps via fax machine, as some counties do not have landowner information in a GIS database and are unable to use coordinates to obtain the information. In addition, if your state or county uses the township/range/section system for identifying parcels of land, you will need to know this information for your lake also, and this may require contacting yet another agency. You may need to visit the records office to obtain this information. Each county will be different in terms of the organization of its records and its ability (and willingness) to assist you.

4.2 Request Permission to Access Lake

Once you identify the landowner and confirm that a lake is part of the target population and is physically accessible, you can begin to request permission to access and sample the lake following whatever protocol is in effect for your organization. If no protocol exists, use the most personal contact practicable. Obtaining permission (or denial) early does provide you with more time to select and evaluate any replacement lakes before sampling begins.

4.2.1 Contact Landowner through In-Person Visit (when possible)

The initial contact with the landowner is best done through an “in-person” visit. You can ask a local representative (e.g., state or county official, NRCS county agent, district fish and game biologist, etc.) to make the initial contact. These people are usually more familiar with landowners in their jurisdictions, and are usually more effective at getting access permission than a federal agent or a contractor. You can also make the initial contact as part of the field evaluation for those lakes that require one. This visit provides an opportunity to explain the purpose of the study, answer any questions or concerns a landowner may have, and obtain written permission to access the lake during the sampling season, which could be a part of the field evaluation. Landowners are much more likely to grant permission if they actually meet and speak with a study representative instead of receiving a phone call or letter.

Note: With advanced planning, it may be possible to schedule landowner visits during other

fieldwork in the area that is occurring before the NLA sampling begins. This would maximize efficiency and ensure the best possible responses from the landowners.

4.2.2 Contact Landowner through Other Means

If you cannot visit the landowner to obtain permission, attempt to contact him or her by telephone. A local representative may be more effective in securing permission, so it is important to request assistance at this level if you are not local to the area. If you cannot reach the landowner by telephone, prepare and mail out a cover letter (**Appendix A: Example Letter requesting Permission to Access a Lake**) with an updated fact sheet (

Appendix D: National Lakes Assessment 2017 Fact Sheet) and a permission slip (**Appendix B: Example Landowner Permission Slip**) for the landowner to return.

4.2.3 Signed Permission Slip

A signed permission slip is important for the field crew to use as documentation on the day of sampling if questions arise about the field crew's presence on a lake.

4.3 Denials

If one landowner denies access, check to see if there are other landowners that may allow access to the lake via their property. If no other landowner options exist, or all other landowners deny access, select NO as the response to Q7, Target as the response to Q9, and Access Denied as the response to Q10 in the evaluation spreadsheet (**Figure 2**). Select the next available replacement lake to evaluate. For landowners contacted by phone or mail, no response is considered denial.

4.4 Frequently Asked Questions

Some frequently asked questions pertaining to the overall evaluation process are presented in Appendix F: Frequently Asked Questions. Use this as the first resource to try to answer any questions that may come up as you attempt to evaluate a lake. If you cannot find an answer there, contact the EPA NLA Regional Coordinator (**Appendix E: Contacts**). He or she will either answer your question or pass it along to someone who can answer it.

5 LITERATURE CITED

Stevens, D. L., Jr. and A. R. Olsen. 2004. Spatially balanced sampling of natural resources. *Journal of the American Statistical Association* 99:262-278.

USEPA (United States Environmental Protection Agency). 2012. Survey of the Nation's lakes: lake evaluation guidelines. EPA 841-B-11-003, U.S. Environmental Protection Agency, Office of Water and Office of Environmental Information, Washington, DC.

USEPA (United States Environmental Protection Agency). *in prep.* National Lakes Assessment: a collaborative survey of lakes in the United States. EPA 841-R-16-004, U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, DC.

APPENDIX A: EXAMPLE LETTER REQUESTING PERMISSION TO ACCESS A LAKE

(Date)

Dear Landowner,

The US Environmental Protection Agency, in cooperation with State Agencies, is conducting an environmental assessment of lakes across the United States. A computer was used to randomly select these lakes. A total of 910 sampling lakes were selected for sampling in 2017. Water quality, chemistry, aquatic life, recreation use and habitat will be evaluated at each lake. The findings of the study will be used to give a broad scale picture of the health of our nation's lakes and are not intended for enforcement or regulatory purposes.

We are contacting you to request your permission to access a lake from your property. The sampling of your lake will be used to help guide the protection of waters across the United States. We will respect your landowner rights at all times, ensure that you know in advance when the sampling will occur, and recognize that access to your property is a privilege granted by you..

Enclosed with this letter is a map of the sampling location and an Access Permission Form. Please return the completed Form in the enclosed, postage paid envelope by (DATE). If you have any questions concerning this request, please feel free to contact me at (phone / e-mail). I look forward to your reply and appreciate your help in this important survey.

Sincerely,

(Name)

Regional Monitoring Coordinator

APPENDIX B: EXAMPLE LANDOWNER PERMISSION SLIP

I grant permission to the biological field crew from (state agency or contractor) to access the lake sampling lake located on my property as part of the EPA's National Lakes Assessment project.

_____ Do grant permission

_____ Do grant permission but with the following restrictions:

_____ Do not grant permission

Landowner Name (Please print): _____

Landowner Signature: _____

Date: _____

Phone Number: _____

Address: _____

APPENDIX C: NATIONAL LAKES ASSESSMENT 2017 SURVEY DESIGN

NATIONAL LAKES ASSESSMENT 2017 SURVEY DESIGN

Target Population

All lakes, reservoirs, and ponds within the 48 contiguous United States greater than 1 hectare in surface area that are permanent waterbodies. The word “lake” in the remainder of this document includes lakes, reservoirs and ponds. Lakes used for aquaculture, disposal-tailings, sewage treatment, evaporation, or other unspecified disposal use are excluded.

Survey Design

A Generalized Random Tessellation Stratified (GRTS) survey design for a finite resource was used with stratification and unequal probability of selection defined below.

Stratification

The survey design is stratified by state.

Panels

The survey design has five base panels:

- **NLA17_07RVT2** – Panel of lakes originally sampled twice in NLA 2007, were also sampled in NLA 2012 and **will be sampled twice in NLA 2017**. Note that these lakes will be sampled twice again in NLA 2022.
- **NLA17_07RVT** – Panel of lakes originally sampled once in NLA 2007, were also sampled in NLA 2012 and **will be sampled once in NLA 2017**. Note that these lakes will be sampled again in NLA 2022.
- **NLA17_12RVT2** – Panel of lakes originally sampled twice in NLA 2012 and **will be sampled twice in NLA 2017**. Note that these lakes will be sampled twice again in NLA 2022 and in NLA 2027.
- **NLA17_12RVT** – Panel of lakes originally sampled once in NLA 2012 and **will be sampled once in NLA 2017**. Note that these lakes will be sampled again in NLA 2022 and in NLA 2027.
- **NLA17_17** – Panel of new lakes **to be sampled once in NLA 2017**. Note that these lakes will be sampled again in NLA 2022 and in NLA 2027.

The survey design has four Over Sample panels:

- **NLA17_07RVT_OverSamp** – Over sample lakes to be used as replacements for NLA17_07RVT lakes when they cannot be sampled for any reason.
- **NLA17_12RVT2_OverSamp** – Over sample lakes to be used as replacements for NLA17_07RVT2 lakes when they cannot be sampled for any reason.
- **NLA17_12RVT_OverSamp** – Over sample lakes to be used as replacements for NLA17_12RVT lakes when they cannot be sampled for any reason.
- **NLA17_17_OverSamp** – Over sample lakes to be used as replacements for NLA17_17 lakes when they cannot be sampled for any reason.
- Note that no lakes were available for NLA17_07RVT2 over sample lakes.

Unequal Probability Categories

Unequal probability categories were used in the NLA 2007 and NLA 2012 survey designs. The documentation for those survey designs should be consulted for their definition. For the NLA17_17 new lake design, unequal probability categories were defined based on lake area: 1 to 4 ha, 4 to 10 ha, 10 to 20 ha, 20 to 50 ha and greater than 50 ha.

Expected Sample Size

In NLA 2017 904 lakes will be sampled; and 96 of the lakes will be sampled twice for a total of 1000 lake visits. The 904 lakes consist of three sets of lakes. The first set are 226 lakes that were originally sampled in NLA 2007, resampled in NLA 2012 and will be resampled again in NLA 2017. Of these 43 lakes will be sampled twice in NLA 2017. The second set are 218 lakes originally sampled in NLA 2012 and will be resampled again in NLA 2017. Of these 53 lakes will be sampled twice in NLA 2017. The third set are 460 new lakes that will be sampled for the first time in NLA 2017. The intent is to have four main NLA panels with 226 lakes each for a total of 904 lakes: NLA07_TS4, NLA12_TS4, NLA17_TS4 and NLA22_TS4. Each panel name designates the year the panel is first sampled, that it consists of lakes that were sampled and that the lakes will be sampled for 4 NLA cycles. That is, NLA07_TS4 will be lakes sampled in 2007, 2012, 2017 and 2022 and NLA12_TS4 will be lakes sampled in 2012, 2017, 2022, and 2027.

For the NLA17_17 new lake design, the expected number of lakes in each of the five lake area categories was approximately 90 lakes. Based on NLA experience with lake evaluations in 2007 and 2012, an adjustment was made to achieve approximately 90 target and sampled lakes in each category. The number of lakes expected in the five categories were multiplied by 8, 4, 3, 2 and 2. That is, 720, 360, 270, 180 and 180 lakes for 1 to 4ha, 4 to 10 ha, 10 to 20 ha, 20 to 50 ha and >50 ha categories. The first 90 of these were then designated to be “base” and the remaining designated at “Over Sample”. Additional over sample lakes were selected to provide sufficient lakes for states who implement a state-level design and for new lake panel in the NLA 2022 design.

State Level Assessments

Minnesota and New Hampshire will do state level assessments. Both states provided their state sample frame. Minnesota sample frame is NHD High Resolution sample frame. It was combined with NLA 2017 sample frame where SOURCE variable identifies whether lake in sample frame is in NLA 2017 sample frame or in additional lakes in Minnesota sample frame. New Hampshire sample frame is state specific to meet their state law requirements. It was combined with NLA 2017 sample frame where SOURCE variable identifies whether lake in sample frame is in NLA 2017 sample frame in additional lakes in New Hampshire sample frame. Note that this results in some lakes less than 1 ha in area.

Minnesota will sample 50 lakes for state level assessment using NLA 2017 field protocols as well as Minnesota field protocols if protocol differs. An additional 100 lakes will be sampled using Minnesota field protocols. New Hampshire will sample required 11 lakes using NLA 2017 field protocols and an additional 39 lakes using New Hampshire field protocols.

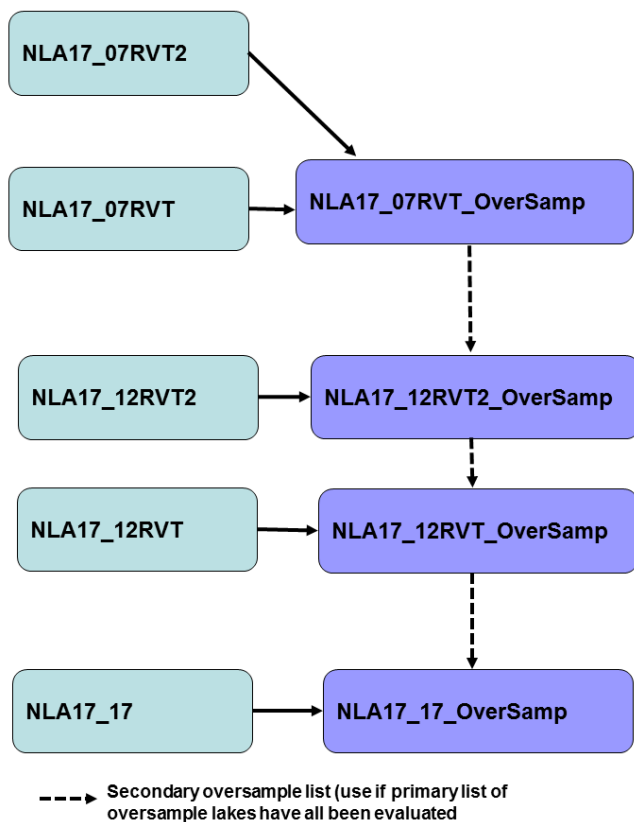
Lake Use and Replacement

Each lake selected to be sampled is given unique site identification (NLA17_ID, formerly named siteID). Site numbers consist of NLA17_ST-nnnnn where ST is two letter state code and nnnnn is a number between 10001 and 99999. It is critical this lake ID be used in its entirety to make sure that the lakes are

correctly identified. Lakes evaluated for potential sampling must have all NLA17_ID s from the largest to the lowest number evaluated within a state and within an NLA17_PNL level (see figure as well):

- Within a state, lakes in panel NLA17_07RVT2 must all be evaluated and sampled if possible. There is no NLA17_07RVT2_OverSamp panel. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_07RVT_OverSamp must be evaluated. If all lakes in NLA17_07RVT_OverSamp have been used, then the lowest NLA17_ID available within the state from NLA17_12RVT2_OverSamp must be evaluated.
- Within a state, lakes in panel NLA17_07RVT must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_07RVT_OverSamp must be evaluated.
- Within a state, lakes in panel NLA17_12RVT2 must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_12RVT2_OverSamp must be evaluated. If none are available within NLA17_12RVT2_OverSamp, then lakes in panel NLA17_12RVT_OverSamp must be evaluated.
- Within a state, lakes in panel NLA17_12RVT must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_12RVT_OverSamp must be evaluated. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_17_OverSamp must be evaluated.
- Within a state, lakes in panel NLA17_17 must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest NLA17_ID available within the state from NLA17_17_OverSamp must be evaluated.

Since the lakes in NLA17_07 and NLA17_12 panels have been sampled previously, the expectation is that most of them will be available to be sampled again in 2017. Lakes in the new NLA17_17 panel have not previously been evaluated so the expectation is that many of them will not be able to be sampled; hence increasing the number lakes that must be evaluated to meet the sample size requirements.



For Minnesota and New Hampshire, the lake replacement will follow the above process. In additional lakes in NLA17_12RVT_MN lakes will be replaced with NLA17_12RVT_MN_OverSamp lakes.

Sample Frame

The sample frame was derived from the National Hydrography Dataset (NHD). Sample frames for NLA 2007 and 2012 designs were based on NHDPlus and are documented as part of those designs. Note that updates to the sample frame were made based on lake evaluations from those surveys. That updated sample frame was combined with NHD High Resolution lakes with lake areas from 1 to 5 ha. This was done to rectify the known deficiency in NHDPlus for small lakes due to the 1:100,000 scale mapping. Lakes that were in NHD High Res that were also in NHDPlus were eliminated. The NLA 2017 sample frame preserves the lake polygons from prior surveys while improving the coverage for small lakes.

Once the initial shape file that included all lake objects in NHD was prepared additional attributes were created to identify lakes included in the sample frame and other properties used to construct the survey design. First, lakes that were less than or equal to 1 hectare were excluded.

Lakes included were DES_FTYPES:

Lake/Pond

Lake/Pond: Hydrographic Category = Perennial

Lake/Pond: Hydrographic Category = Perennial; Stage = Average Water Elevation

Lake/Pond: Hydrographic Category = Perennial; Stage = Date of Photography

Lake/Pond: Hydrographic Category = Perennial; Stage = Normal Pool

Lake/Pond: Hydrographic Category = Perennial; Stage = Spillway Elevation

Lakes excluded were:

Estuary

Playa

Swamp/Marsh

Lake/Pond: Hydrographic Category = Intermittent

Lake/Pond: Hydrographic Category = Intermittent; Stage = Date of Photography

Lake/Pond: Hydrographic Category = Intermittent; Stage = High Water Elevation

Reservoir

Reservoir: Construction Material = Earthen

Reservoir: Construction Material = Nonearthen

Reservoir: Reservoir Type = Aquaculture

Reservoir: Reservoir Type = Cooling Pond

Reservoir: Reservoir Type = Disposal

Reservoir: Reservoir Type = Disposal; Construction Material = Earthen

Reservoir: Reservoir Type = Evaporator

Reservoir: Reservoir Type = Evaporator; Construction Material = Earthen

Reservoir: Reservoir Type = Tailings Pond

Reservoir: Reservoir Type = Tailings Pond; Construction Material = Earthen

Reservoir: Reservoir Type = Water Storage

Reservoir: Reservoir Type = Water Storage; Construction Material = Earthen; Hyd*

Reservoir: Reservoir Type = Water Storage; Construction Material = Nonearthen

Reservoir: Reservoir Type = Water Storage; Hydrographic Category = Perennial

Reservoir; Reservoir Type = Treatment"

Next lakes were excluded that were evaluated during the NLA 2007 and were identified as lakes that did not meet definition of a lake for NLA 2017. These were lakes with evaluation codes of Lake_Saline, Lake_Shallow, Lake_Special_Purpose, Lake_Vegetated, Non_Target, or Not_Lake".

Lake Selection and Sample Frame Summary

See accompanying spreadsheet NLA2017 Design Summary 20160215.xlsx

Evaluation Process

The survey design weights that are given in the design file assume that the survey design is implemented as designed. Typically, users prefer to replace sites that cannot be sampled with other sites to achieve the sample size planned. The site replacement process is described above. When sites are replaced, the survey design weights are no longer correct and must be adjusted. The weight adjustment requires knowing what happened to each site in the base design and the over sample sites. EvalStatus is initially set to “NotEval” to indicate that the site has yet to be evaluated for sampling. When a site is evaluated for sampling, then the EvalStatus for the site must be changed. Recommended codes are:

EvalStatus Code	Name	Meaning
TS	Target Sampled	Site is a member of the target population and was sampled
LD	Landowner Denial	Landowner denied access to the site
PB	Physical Barrier	Physical barrier prevented access to the site
NT	Non-Target	Site is not a member of the target population
NN	Not Needed	Site is a member of the over sample and was not evaluated for sampling
Other codes		Many times it is useful to have other codes. For example, rather than use NT, may use specific codes indicating why the site was non-target.

Statistical Analysis

Any statistical analysis of data must incorporate information about the monitoring survey design. In particular, when estimates of characteristics for the entire target population are computed, the statistical analysis must account for any stratification or unequal probability selection in the design. Procedures for doing this are available from the Aquatic Resource Monitoring Web page <http://www.epa.gov/nheerl/arm>. A statistical analysis library of functions is available from the Web page to do common population estimates in the statistical software environment R.

For further information, contact:

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APPENDIX D: NATIONAL LAKES ASSESSMENT 2017 FACT SHEET

APPENDIX E: CONTACTS

Title	Name	Contact Information
EPA HQ Project Lead	Amina Pollard, OW	pollard.amina@epa.gov 202-566-2360 EPA Wetlands, Oceans, and Watersheds 1200 Pennsylvania Ave NW (4503T) Washington, DC 20460
EPA HQ NARS QA Lead	Sarah Lehmann, OW	lehmann.sarah@epa.gov 202-566-1379 EPA Wetlands, Oceans, and Watersheds 1200 Pennsylvania Ave NW (4503T) Washington, DC 20460
EPA HQ Logistics Lead	Colleen Mason, OW	mason.colleen@epa.gov 202-343-9641 EPA Wetlands, Oceans, and Watersheds 1200 Pennsylvania Ave NW (4503T) Washington, DC 20460
EPA ORD Site Evaluation Coordinator	Dave Peck, ORD Marc Weber, ORD	peck.david@epa.gov 541-754-4426 weber.marc@epa.gov 541-754-4469
Contract Field Logistics Coordinator	TBD	
NARS Information Management Coordinator	Marlys Cappaert, SRA International Inc.	cappaert.marlys@epa.gov 541-754-4467 541-754-4799 (fax)
EPA Regional NLA Coordinators	Hilary Snook, Region 1	snook.hilary@epa.gov 617-918-8670 EPA Region 1 11 Technology Drive North Chelmsford, MA 01863
	Jim Kurtenbach, Region 2	kurtenbach.james@epa.gov 732-321-6695 EPA Region 2 2890 Woodbridge Avenue Edison, NJ 08837

Title	Name	Contact Information
	Frank Borsuk, Region 3	borsuk.frank@epa.gov 304-234-0241 EPA Region 3 1060 Chapline Street, Suite 303 Wheeling, WV 26003
	William Richardson, Region 3	Richardson.william@epa.gov 215-814-5675 EPA Region 3 1650 Arch Street Philadelphia, PA 19103
	David Melgaard, Region 4	melgaard.david@epa.gov 404-562-9265 EPA Region 4 61 Forsythe Street SW Atlanta, GA 30303
	Mari Nord, Region 5	nord.mari@epa.gov 312-886-3017 EPA Region 5 77 West Jackson Blvd Chicago, IL 60604
	Robert Cook, Region 6	cook.robert@epa.gov 214-665-7141 EPA Region 6 1445 Ross Avenue, Suite 1200 Dallas, TX 75202
	Gary Welker, Region 7	welker.gary@epa.gov 913-551-7177 EPA Region 7 901 N. Fifth Street Kansas City, KS 66101
	Kris Jensen, Region 8	jensen.kris@epa.gov 303-312-6237 EPA Region 8 1595 Wynkoop Street Denver, CO 80202
	Jeff McPherson, Region 8	mcperson.jeffrey@epa.gov 303-312-7752 EPA Region 8 16194 West 45 th Drive Golden, CO 80403
	Janet Hashimoto, Region 9	hashimoto.janet@epa.gov 415-972-3452 EPA Region 9 75 Hawthorne Street San Francisco, CA 94105

Title	Name	Contact Information
	Lil Herger, Region 10	herger.lillian@epa.gov 206-553-1074 EPA Region 10 1200 Sixth Avenue, Suite 900 Seattle, WA 98101

APPENDIX F: FREQUENTLY ASKED QUESTIONS

Frequently asked questions

Q ~ *If questions arise concerning lake status, who should I contact?*

A ~ Please e-mail a detailed description of your concerns about the lake to your EPA Regional NLA Coordinator and the project lead, Amina Pollard (Pollard.Amina@epa.gov). They will work with the EPA ORD lab to help you determine the final status of the lake.

Q ~ *Some reservoirs may be < 1 m deep or < 1 ha in area late in the irrigation season – should these lakes be sampled?*

A ~ Reservoirs that are expected to be more than 1 m deep and more than 1 ha during the index period (generally May through September) ARE part of the target population and should be scheduled for sampling. However, on the day of the sampling visit, if the depth at the deepest point is less than 1 m (or the lake area is < 1 ha), then the lake is assigned a status of *Nontarget* and is not sampled. Select the next available replacement lake, evaluate it, and schedule it to be sampled.

Q ~ *What criteria should be used to determine if a lake should be dropped from the sample population due to salinity?*

A ~ Inland lakes that are saline or have high conductivity (>1000 $\mu\text{S}/\text{cm}$) ARE part of the target population, with the exception of the Great Salt Lake.

In the case of a coastal lake or lake adjacent to an estuary, tidally-influenced lakes are not part of the target population. A tidally-influenced lake is operationally defined as being maintained solely by the surface inflow of brackish or salt water due to water level changes during tidal cycles. Permanent lakes near the coast or near an estuary below the head of salt, with no surface connection to the ocean at high tide are considered part of the target population (even if saline). Dune lakes (primarily located along the Gulf Coast), are part of the target population. These lakes are permanent and almost always isolated from the ocean, but periodically will flood or "blow out" forming a connection with the ocean or estuary and incur an influx of brackish or salt water. Waterbodies along the coast that are considered to be estuarine or part of a larger coastal wetland area are not part of the target population. These represent waterbodies that should be included in the sampling frames for the National Coastal Condition Assessment or the National Wetland Condition Assessment.

Q ~ *Should oxbows, backwaters, and side-channel reservoirs be sampled?*

A ~ Oxbows ARE lakes if they are separated from a river and ARE part of the target population and should be scheduled for sampling. However, oxbows that have either flowing water or a wetland connection to a river are NOT lakes and should be assigned a status of *Nontarget* and not sampled. Side-channel reservoirs and drinking water reservoirs where water is pumped from a nearby river that does not have recreation or aquatic life uses ARE NOT part of the target population and should be assigned a status of *Nontarget* and not sampled.

Q ~ *Should ephemeral lakes be sampled?*

A ~ Ephemeral lakes are operationally defined as being highly likely to be dry during the index period of the sampling year, but you may not be able to make this decision until you actually visit the lake to sample it. Lakes that do not meet the inclusion criteria on the date of a sampling visit ARE NOT part of the target population.

Q ~ *Should mining pits be sampled?*

A ~ Actively used quarry pits, mine tailing disposal lakes, borrow pits, and storm water treatment ponds ARE NOT in the target population. Abandoned mine lakes that are used for recreation or other beneficial uses (e.g., wildlife) ARE part of the target frame. The lake evaluation spreadsheet includes a place (Q8) to note lake origin to assist in data interpretation.

Q ~ *What constitutes difficulty of access in sampling a lake?*

A ~ The objective of the National Lake Assessment is to sample lakes that are representative of the full range of conditions found across the country. Therefore, field crews should make a concerted attempt to sample remote lakes that are identified as being part of the target population. Lakes that pose safety risks because of their remoteness or where the cost and effort required are prohibitive in terms of completing the rest of the NLA sampling, are considered to be target but not accessible and are replaced with a lake from the oversample list.

It is recognized that sampling remote lakes may result in samples being shipped and/or received past the target holding times (esp. for water chemistry). As long as you can keep the samples cold and in darkness (or as close to frozen as possible if the sample requires it), there is a high probability that the samples will maintain their integrity past the target holding times.

Q ~ *What if extreme weather hits, the lake is in flood stage, or there are other unsafe conditions?*

A ~ If it is unsafe to sample the lake and the lake cannot be re-scheduled within the index period, then it is considered to be target but not accessible and should be replaced with a lake from the oversample list.

Q ~ *What if boats are not allowed on a publicly-accessible lake?*

A ~ Try to gain permission to sample by boat or other means such as rafts. If permission cannot be obtained, then assign the lake a final status of *Target Other* and select a replacement lake from the oversample list.

Q ~ *If a lake drops from my list, can I replace it with the next oversample site, or do I need to wait until the replacement is assigned by my Regional Lake Coordinator?*

A ~ If a lake is dropped, replace it with the first available site on your state's oversample list and conduct a GIS (if necessary), desktop and/or field evaluation; DO NOT skip lakes on your oversample list. Please record the dropped lake on your Site Evaluation Spreadsheet.