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Office of Water
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National Lakes Assessment 2022

Site Evaluation Guidelines

Version 1.0, November 2021

NOTICE

The intention of the 2022 National Lakes Assessment (NLA 2022) 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:

National Lakes Assessment 2022: Field Operations Manual (EPA 841-B-21-011)

National Lakes Assessment 2022: Laboratory Operations Manual (EPA 841-B-21-010)

National Lakes Assessment 2022: Quality Assurance Project Plan (EPA 841-B-21-009)

This document (*Site Evaluation Guidelines*) contains an overview of the process involved in locating a sampling site (lake) from the survey design, evaluating the site to determine if it should be sampled, and selecting appropriate alternate sites when necessary. These guidelines are revised from those developed for NLA 2012 (USEPA 2011) and NLA 2017 (USEPA 2016), and are intended for specific use in NLA 2022. Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use.

The suggested citation for this document is:

USEPA. 2021. National Lakes Assessment 2022: Site Evaluation Guidelines. EPA 841-B-21-008. U.S. Environmental Protection Agency, Washington, DC.

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1 INTRODUCTION

The objectives of the 2022 National Lakes Assessment (NLA) include:

1. Assess the condition of the nation's lakes;
2. Evaluate change in condition between different surveys;
3. Establish a baseline to compare future surveys for long-term trends assessments; and
4. Help build State and Tribal capacity for monitoring and assessment and promote collaboration across jurisdictional boundaries.

The NLA uses a probability-based survey design in order to achieve the objectives of the survey. In such a design, first a target population is defined. For the NLA, the target population is natural and human-made lakes, pond and reservoirs in the conterminous United States that are:

- at least one hectare;
- at least one meter in depth; and
- and contain a minimum of 1,000 square meters of open water.

Then a sample frame (i.e., shapefile, geodatabase), which contains geographic features of the resource (e.g., lake objects) that meet the definition of the target population is constructed and used in the selection of the survey sites. The NLA sample frame was derived from the National Hydrography Dataset Plus High Resolution (NHDplusHR) data layer and modified to meet the NLA target population requirements. The word *lake* in the remainder of this document includes lakes, ponds, and reservoirs.

This document describes the steps involved to further evaluate candidate lakes in the survey design 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. **Table 1.1** lists the exceptions for inclusion in the target population.

Table 1.1 Exceptions to NLA 2022 Target Population

Exceptions to the NLA 2022 Target Population
Ephemeral waterbodies (i.e., highly likely to be dry between June[a] and September of the sampling year)
Lakes or ponds along the coast or near an estuary 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
Stormwater retention basins

[a] Sampling in May could approved for lakes in areas where lake stratification is expected earlier in the year. Please coordinate these requests with your Regional EPA Coordinator and the NLA Technical Lead.

Exceptions to the NLA 2022 Target Population
Constructed solely for storage of drinking water
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 target population criteria, but that cannot be sampled due to factors such as physical access and landowner access, 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 NARS site evaluation process accounts for all candidate lakes. Documenting lakes in the survey design that will not be sampled and why they will not be 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, 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. Any activity that reduces the proportion of unassessed lakes results in a more robust and representative assessment. Note that lakes that were evaluated as unsampleable or non-target in 2017 are included in the 2022 design. This is because access or physical inaccessibility that made it impossible to sample in 2017 may have changed in 2022; thus, even lakes that were dropped in a previous survey year should be re-evaluated for the NLA 2022.

Given the scale and time constraints of NLA, and the desire to utilize local knowledge about lakes, the evaluation process involves many different people. 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 2022. 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, etc.).

1.1 NLA Survey Design: List of Candidate Lakes

Lakes were chosen from a sample frame of lake polygons represented in NHDPlusHR, following a Generalized Random Tessellation Stratified (GRTS) survey design for a finite resource (Stevens and Olsen 2004). **Appendix C: National Lakes Assessment 2022 Survey Design** provides additional details regarding the survey design. The final sample frame for 2022 incorporates sampled lakes from NLA 2017 for use in estimating change between surveys.

For NLA 2022, 904 lakes will be sampled with 96 of the lakes sampled twice for a total of 1,000 lake visits. Of the master list of candidate lakes (survey design) 808 “base sites” and 96 “revisit sites” were identified. The 96 (2 per state) “revisit sites” will be sampled twice within the index period, but no sooner than two weeks after the first sampling event. All base and revisit sites will need to be evaluated. Approximately 451 of the 904 lakes are lakes that were previously sampled as part of NLA 2017 and will be sampled again in 2022.

The sample frame also contains “oversample sites” which will be used as replacement sites should the base site not be target, accessible, or sampleable or if a state will be implementing a more intensive sampling regime to produce a state-level assessment of lakes. The evaluation process is conducted separately for each state to arrive at the required number of sampling sites for the entire NLA.

2 LAKE EVALUATION PROCESS

The NLA lake evaluation process will be conducted by the state, tribal, regional, and contractor crews and 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 survey design (**Section 1.1**) has been apportioned into lists of candidate sites in the site evaluation spreadsheet for each state. In each phase, evaluators assign a final status to as many candidate lakes on their list as possible. When moving to the next phase, evaluators primarily assess the remaining lakes in their site list. 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 GIS-based evaluation, lake polygons and site points associated with each site ID are available on the NARS SharePoint Site. 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 an alternate candidate lake. It is important that alternate lakes are selected properly (i.e., from the correct group without skipping over any candidate sites) 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 evaluated oversample sites 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.

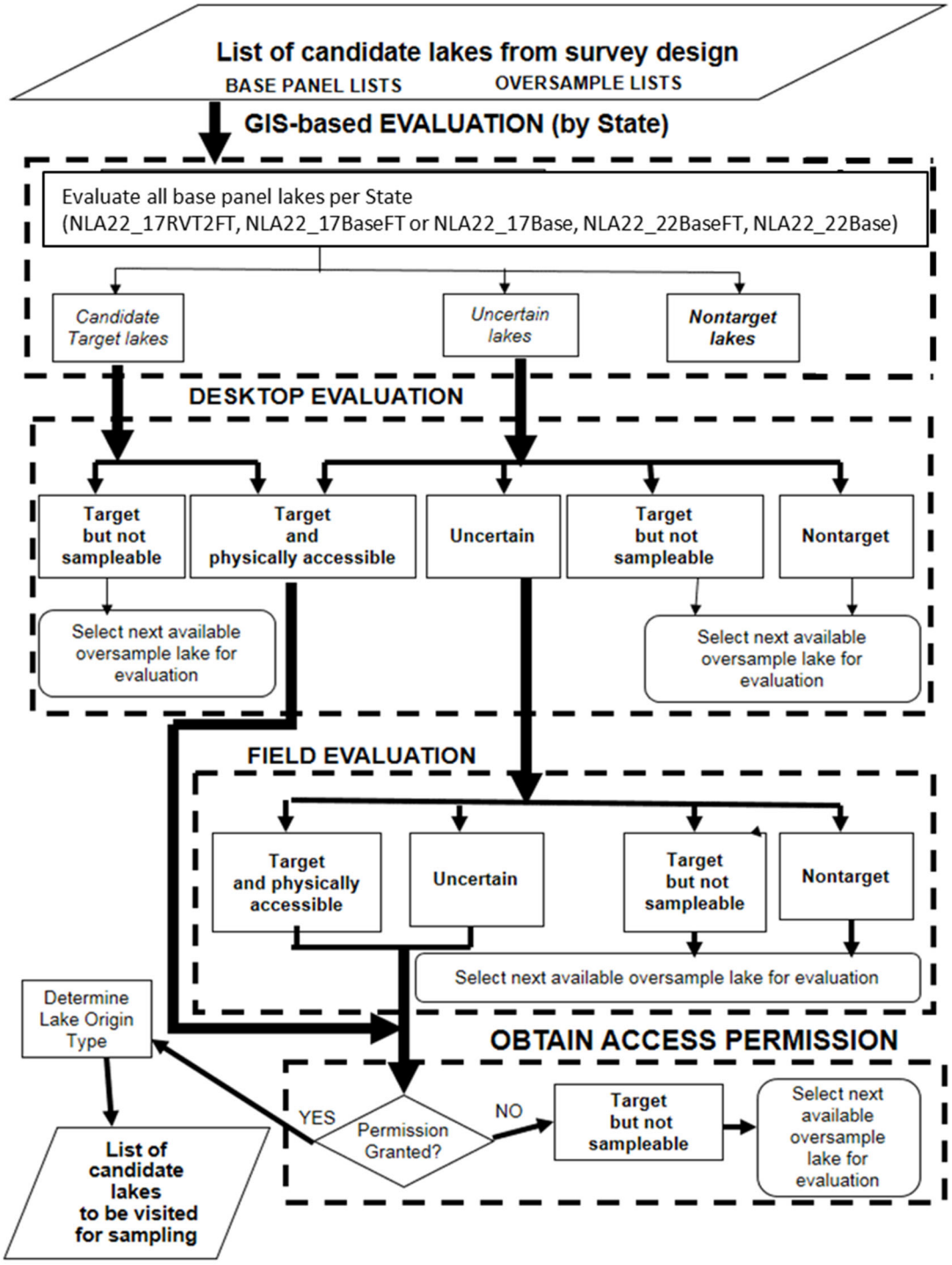


Figure 1. Evaluating a lake.

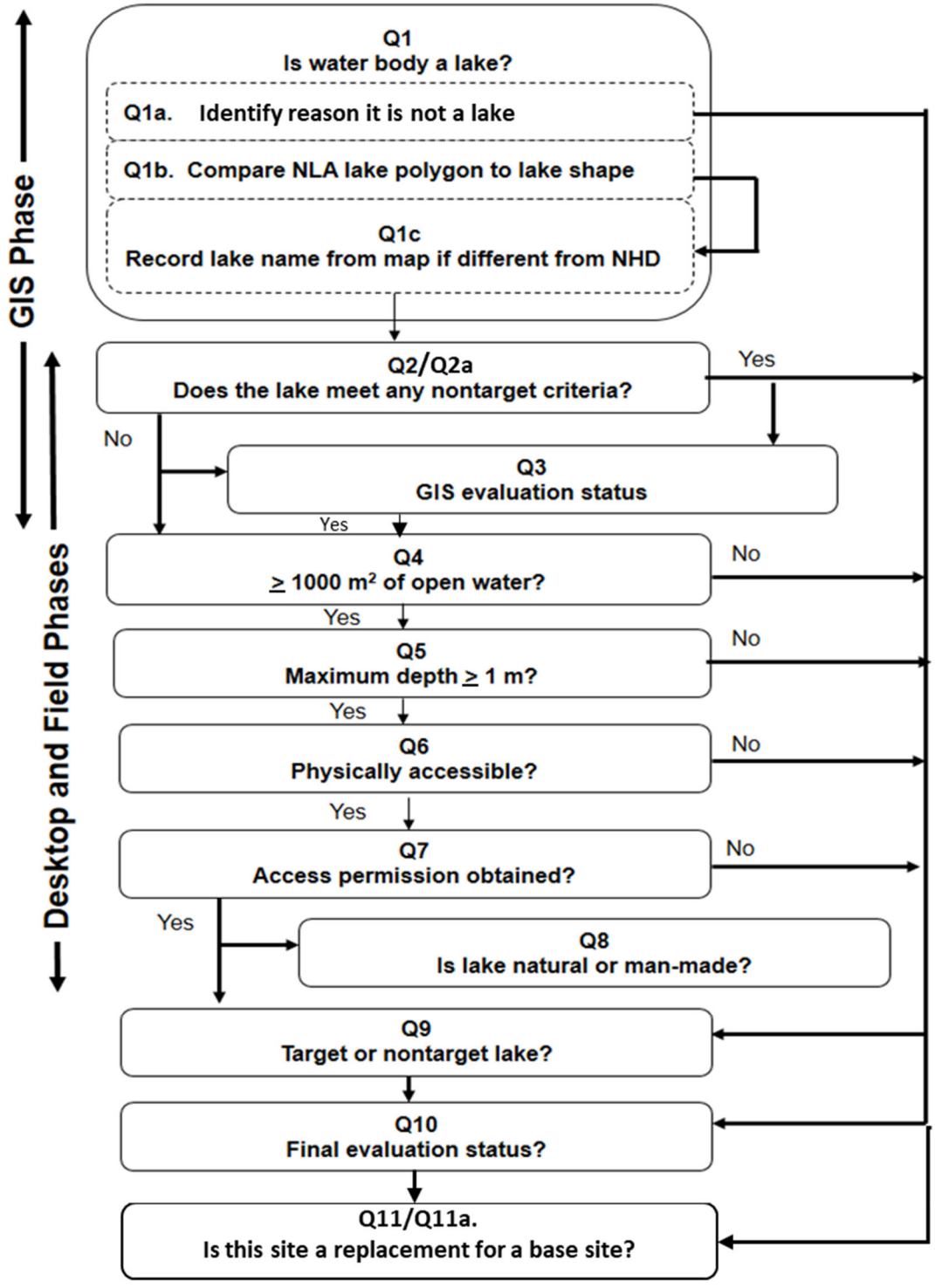


Figure 2. Process Flow of the Lake Evaluation Spreadsheet.

2.1 Lake Replacement

Lakes in the survey design are evaluated separately by state. Lakes on the list for each state must be evaluated in numerical order to arrive at the required number of target and accessible lakes assigned to that state. All lakes with "Base", "BaseFT", or "17RVT2FT" in the panel name, collectively referred to as "Base" sites hereafter, must be evaluated for sampling. Lakes with "Over" in the panel name will only be evaluated as needed should a base site be determined as non-target or unsampleable within the same panel year combination (NLA22_17 or NLA22_22).

A subset of the lakes in the design are also identified for the collection of a whole fish composite sample. The subsample is 70% of the base lakes selected for the NLA 2022 survey (i.e., 636 lakes of the total 904 lakes selected for the NLA 2022 are designated as fish sampling sites). Approximately 50% of the lakes will be from the subsample of NLA 2017 lakes and 50% from new lakes selected for 2022. These lakes will be assigned to panels that will identify them with the letters "FT" (which corresponds to "fish for tissue analysis").

There are five base panels included in the NLA 2022 survey design which must be evaluated for sampling:

1) **NLA22_17RVT2FT** – Panel of lakes originally sampled in NLA 2017. RVT2 stands for revisit. These revisit sites are lakes that will be sampled twice in NLA 2022 for all indicators **except for fish (for tissue analysis), which will be sampled for only one of the two visits.**
2) **NLA22_17BaseFT** – Panel of lakes originally sampled in NLA 2017 and will be sampled once in NLA 2022 for all indicators including fish.
3) **NLA22_17Base** – Panel of lakes originally sampled in NLA 2017 and will be sampled once in NLA 2022 for all indicators except fish.
4) **NLA22_22BaseFT** – Panel of new lakes to be sampled once in NLA 2022 for all indicators including fish.
5) **NLA22_22Base** – Panel of new lakes to be sampled once in NLA 2022 for all indicators except fish.

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 (with at least two weeks between visits).

There are also two different oversample panels that serve as the source for replacement lakes:

1) **NLA22_17Over** – Oversample lakes to be used as replacements for NLA22_17RVT2FT, NLA22_17BaseFT or NLA22_17Base lakes when they cannot be sampled for any reason. **If the lake being replaced was scheduled to be sampled for fish, then the replacement lake will be sampled for fish.**
2) **NLA22_22Over** – Oversample lakes to be used as replacements for NLA22_22BaseFT or NLA22_22Base lakes when they cannot be sampled for any reason. **If the lake being replaced was scheduled to be sampled for fish, then the replacement lake will be sampled for fish.**

If a lake is determined to be non-target, or target but not accessible, during any phase of the evaluation process, select the next available replacement lake following the appropriate replacement process. **Section 2.2** presents the procedure for selecting replacement lakes. All candidate base lakes must all be evaluated and must be sampled if they are determined to be target and accessible.

2.1.1 Considerations for Sites Designated for Fish Sampling

For sites designated for fish sampling (FT sites), if a lake is determined target and sampleable, but the crew was unable to collect a whole fish composite sample, no site replacement is needed. If a lake designated for fish sampling is dropped (i.e., determined non-target or not accessible), a replacement site is identified following procedures described below.

Note that if a crew anticipates a candidate lake designated for fish sampling will lack fish or if a landowner prohibits the collection of fish, these are not reasons to drop the site. Rather field crews will sample the lake and mark that a whole fish composite sample was not collected and the reason why the sample was not collected in the NLA App.

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 , plus a sequential list of replacement Site ID numbers needed to have the required number of target and accessible lakes from each panel. 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

Each lake selected to be sampled is given unique site identification (SITE_ID). Site identification numbers have the form NLA22_ST-nnnnn where ST is two letter state code and nnnnn is a number between 10001 and 99999. It is critical that 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 SITE_IDs from the largest to the lowest number evaluated within a state and within a PANEL_USE level.

All base panel lakes must be evaluated 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, continue the evaluation process with the first available lake in the appropriate panel (i.e., with the lowest Site ID number) using the proper replacement process listed below and presented in **Figure 3**.

ALABAMA REPLACEMENT EXAMPLE

Within each state (column name=STATE) and panel group (column name=PANEL_USE), lake evaluations must occur in the numerical order of the site IDs (column name SITE_ID) from the lowest to the largest site ID number. For example, Alabama has 14 lakes that need to be sampled from the five base panels :

- two NLA22_17RVT2FT,
- three NLA22_17BaseFT,
- two NLA22_17Base,
- five NLA22_22BaseFT,
- two NLA22_22Base

All 14 lakes need to be evaluated. Should any of the 14 lakes need to be dropped, a replacement lake from the respective oversample panel will need to be evaluated and sampled to ensure that 14 target and sampleable lakes in Alabama are sampled (10 of which will need to be sampled for fish). It is important to select replacement lakes from each panel ***in numerical order of site ID*** (i.e., do not skip over any sites) as well as follow the instructions for replacing a lake as shown in **Section 2.2**.

2.2.1.1 Replacement process for PANEL_USE panels NLA22_17RVT2, NLA22_17BaseFT and NLA22_17Base sites

For these panels, the NLA 2017 site ID is provided along with the 2017 evaluation status. Even if the lake was evaluated in 2017 and could not be sampled, it should be evaluated again in 2022 to determine if the evaluation status changed for NLA 2022.

- **NLA22_17RVT2FT**: NLA22_17RVT2FT*→NLA22_17BaseFT→ NLA22_17Base→ NLA22_17Over

  Any lake that is evaluated and sampled as a replacement for a revisit site must be sampled twice within the index period. All base sites evaluated as a replacement for another base site must be also replaced by an appropriate oversample site to maintain the total number of lakes sampled within a state. Replacement sites for NLA22_17RVT2FT must be sampled for fish on **one** of the visits to the lake. Crews should collect a fish sample during the *first* site visit for a revisit site, to allow for a second opportunity if fish cannot be collected during the first visit. If the crew collects fish on the first visit, they do not need to collect a fish sample on the second visit. If they are unable to collect fish on the first visit, the crew should collect a fish sample on the second visit. **A lake should not be dropped due to lack of fish or if fishing is denied**.

- **NLA22_17BaseFT:** NLA22_17BaseFT→ NLA22_17Over

  Replacement lake must be sampled for fish. If no fish sample is possible at first sampleable replacement site, then the crew will collect the rest of the parameters and a note will be made in the comment section of the lake evaluation spreadsheet that no fish sample will be collected at this site. **A lake should not be dropped due to lack of fish or if fishing is denied**.

- **NLA22_17Base**: NLA22_17Base→ NLA22_17Over

  If a NLA22_17Base site cannot be sampled, it must be replaced with a NLA22_17Over site. In the rare event that the design has an insufficient number of 17Over sites, the evaluator must go to the first available sampleable NLA22_22Over sample site in the design.

2.2.1.2 Replacement process for PANEL_USE panels NLA22_22BaseFT and NLA22_22Base sites

- **NLA22_22BaseFT**- NLA22_22BaseFT→ NLA22_22Over (sampled for all indicators INCLUDING fish).
- **NLA22_22Base**- NLA22_22Base→ NLA22_22Over (all indicators EXCLUDING fish).

The same oversample list (NLA22_22Over) will be used for both the NLA22_22BaseFT sites and the NLA22_22Base sites. The sites must be evaluated in order by the Panel_Use. Should an oversample site be used as a replacement for a fish sampling site, the crew will collect a fish sample at this oversample site. If they are unable to catch any fish, the site will not be dropped.

NOTE: all replacements must occur within the same state as the original base site and from the correct panel based on the flowchart below.

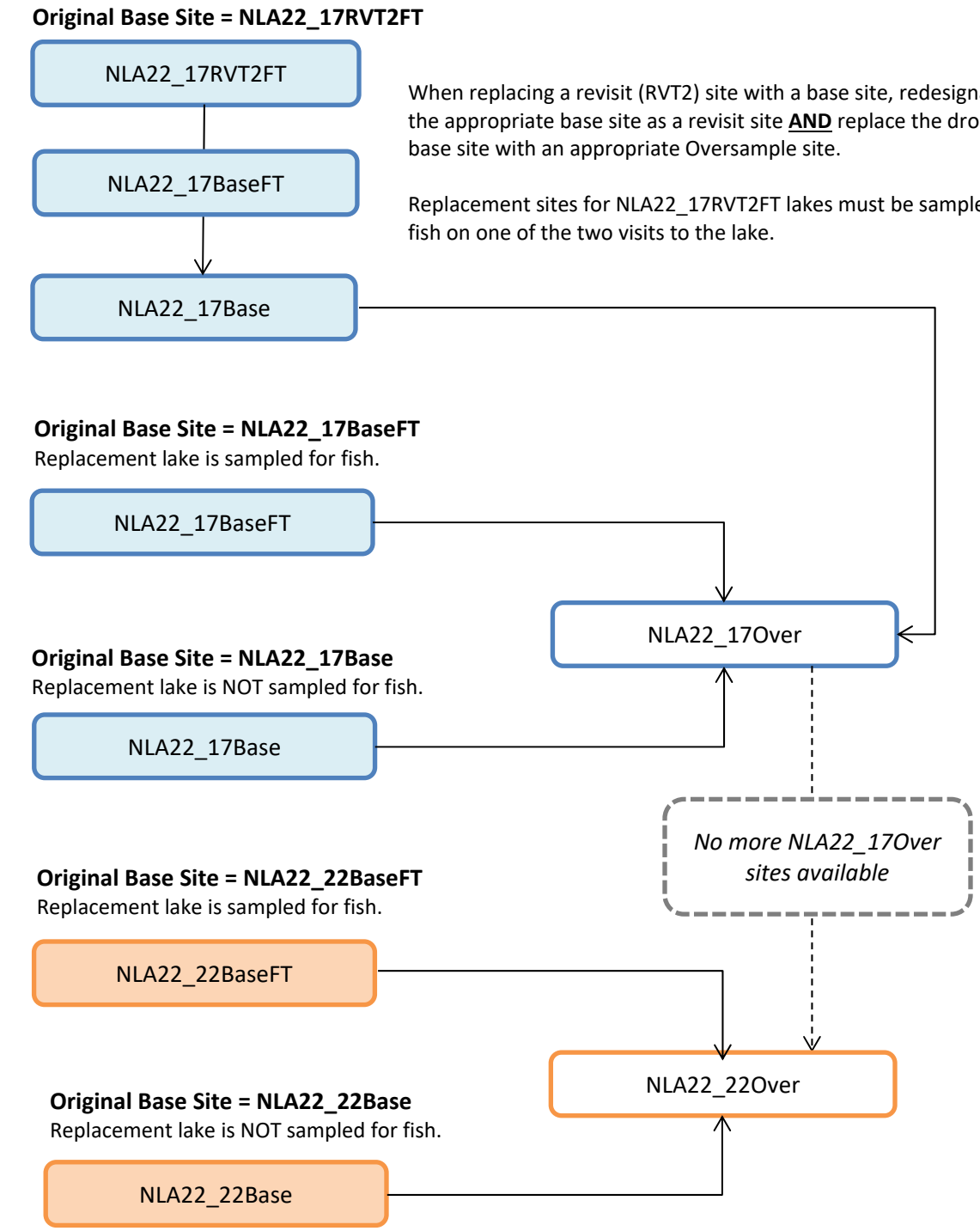
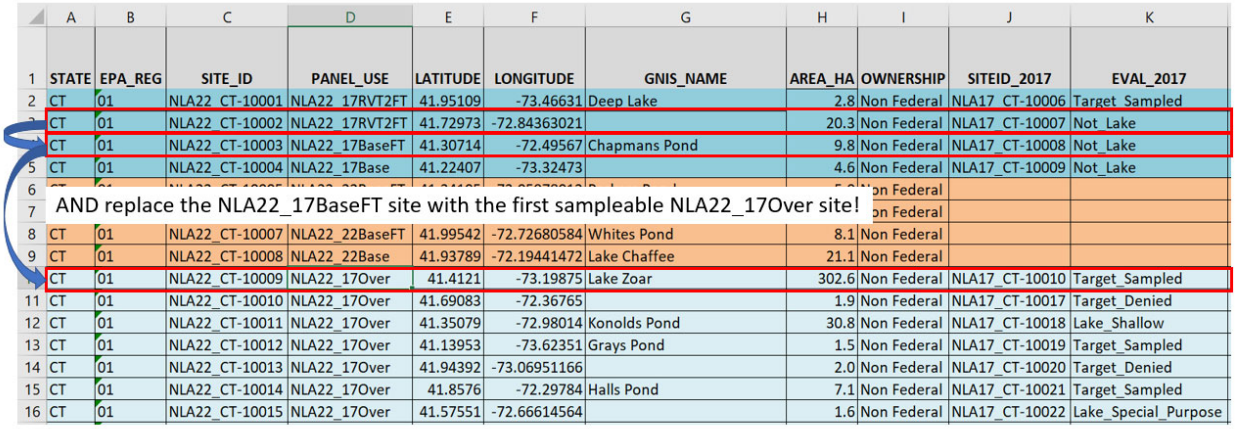


Figure 3. NLA 2022 Site Replacement Plan

Example 1: Replacement of NLA22_17RVT2FT site (Figure 4).

Revisit sites that are dropped require an evaluation of the next available **base** site within the NLA22_17BaseFT column and, should there be no target, sampleable sites available, the evaluator will move to the NLA22_17Base sites. **This is the only scenario where the evaluator will need to consider replacing a base site with another base site.**

In the example below, if the second Connecticut revisit site, NLA22_CT-10002, cannot be sampled, the evaluator will look at the next **base** site, NLA22_CT-10003, in the NLA22_17BaseFT panel, and this will be evaluated as a replacement for the revisit site. If this next base site is sampleable, NLA22_CT-10003 will be sampled **twice** and a fish sample should be collected at one of the visits. Additionally, as all base sites must be conserved within a state, NLA22_CT-10003 must be replaced with the first sampleable target oversample site, NLA22_CT-10009, within the NLA22_17Over panel and it will be sampled once. **This site will also be sampled for fish because the original base site was designated as "FT," representing a fish sampling site.** In this way, the total number of sites is maintained as is the number of sites targeted for fish sampling.

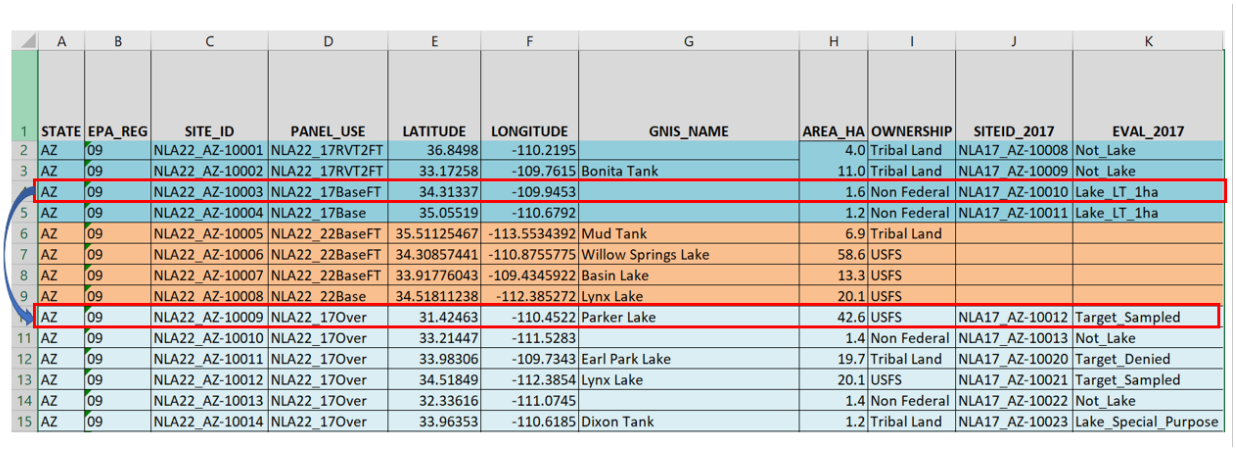


	A	B	C	D	E	F	G	H	I	J	K
1	STATE	EPA_REG	SITE_ID	PANEL_USE	LATITUDE	LONGITUDE	GNIS_NAME	AREA_HA	OWNERSHIP	SITEID_2017	EVAL_2017
2	CT	01	NLA22_CT-10001	NLA22_17RVT2FT	41.95109	-73.46631	Deep Lake	2.8	Non Federal	NLA17_CT-10006	Target_Sampled
3	CT	01	NLA22_CT-10002	NLA22_17RVT2FT	41.72973	-72.84363021		20.3	Non Federal	NLA17_CT-10007	Not_Lake
4	CT	01	NLA22_CT-10003	NLA22_17BaseFT	41.30714	-72.49567	Chapmans Pond	9.8	Non Federal	NLA17_CT-10008	Not_Lake
5	CT	01	NLA22_CT-10004	NLA22_17Base	41.22407	-73.32473		4.6	Non Federal	NLA17_CT-10009	Not_Lake
6									on Federal		
7									on Federal		
8	CT	01	NLA22_CT-10007	NLA22_22BaseFT	41.99542	-72.72680584	Whites Pond	8.1	Non Federal		
9	CT	01	NLA22_CT-10008	NLA22_22Base	41.93789	-72.19441472	Lake Chaffee	21.1	Non Federal		
10	CT	01	NLA22_CT-10009	NLA22_17Over	41.4121	-73.19875	Lake Zoar	302.6	Non Federal	NLA17_CT-10010	Target_Sampled
11	CT	01	NLA22_CT-10010	NLA22_17Over	41.69083	-72.36765		1.9	Non Federal	NLA17_CT-10017	Target_Denied
12	CT	01	NLA22_CT-10011	NLA22_17Over	41.35079	-72.98014	Konolds Pond	30.8	Non Federal	NLA17_CT-10018	Lake_Shallow
13	CT	01	NLA22_CT-10012	NLA22_17Over	41.13953	-73.62351	Grays Pond	1.5	Non Federal	NLA17_CT-10019	Target_Sampled
14	CT	01	NLA22_CT-10013	NLA22_17Over	41.94392	-73.06951166		2.0	Non Federal	NLA17_CT-10020	Target_Denied
15	CT	01	NLA22_CT-10014	NLA22_17Over	41.8576	-72.29784	Halls Pond	7.1	Non Federal	NLA17_CT-10021	Target_Sampled
16	CT	01	NLA22_CT-10015	NLA22_17Over	41.57551	-72.66614564		1.6	Non Federal	NLA17_CT-10022	Lake_Special_Purpose

Figure 4: Example replacement of NLA revisit site.

Example 2: Replacement of NLA22_17BaseFT and NLA22_17Base sites (Figure 5).

Replacements for the NLA22_17BaseFT and NLA22_17Base sites will use the same oversample panel (NLA22_17Over). Once an oversample site is evaluated as a potential replacement, it will not be evaluated again. If a base site designated for fish sample collection (NLA22_17BaseFT) needs to be replaced, the crew must collect a fish sample at the replacement oversample site (NLA22_17Over). For example, if NLA22_AZ-10003 should be dropped, it would be replaced with the first available oversample site, NLA22_AZ-10009, as long as it is target and sampleable. Crews are not allowed to skip sites within the same panel year during the evaluation process.

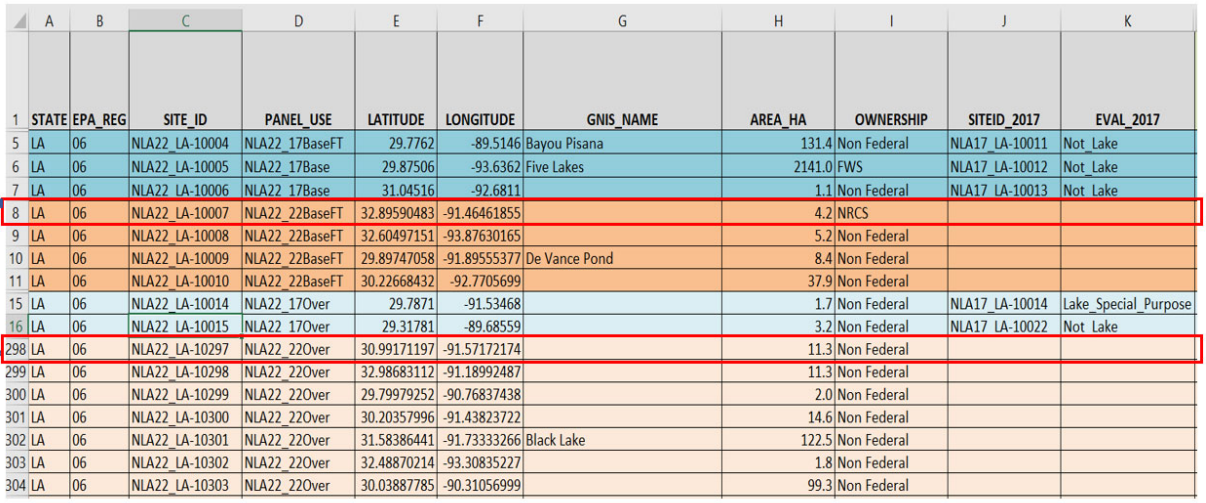


	A	B	C	D	E	F	G	H	I	J	K
1	STATE	EPA_REG	SITE_ID	PANEL_USE	LATITUDE	LONGITUDE	GNIS_NAME	AREA_HA	OWNERSHIP	SITEID_2017	EVAL_2017
2	AZ	09	NLA22_AZ-10001	NLA22_17RVT2FT	36.8498	-110.2195		4.0	Tribal Land	NLA17_AZ-10008	Not_Lake
3	AZ	09	NLA22_AZ-10002	NLA22_17RVT2FT	33.17258	-109.7615	Bonita Tank	11.0	Tribal Land	NLA17_AZ-10009	Not_Lake
4	AZ	09	NLA22_AZ-10003	NLA22_17BaseFT	34.31337	-109.9453		1.6	Non Federal	NLA17_AZ-10010	Lake_LT_1ha
5	AZ	09	NLA22_AZ-10004	NLA22_17Base	35.05519	-110.6792		1.2	Non Federal	NLA17_AZ-10011	Lake_LT_1ha
6	AZ	09	NLA22_AZ-10005	NLA22_22BaseFT	35.51125467	-113.5534392	Mud Tank	6.9	Tribal Land		
7	AZ	09	NLA22_AZ-10006	NLA22_22BaseFT	34.30857441	-110.8755775	Willow Springs Lake	58.6	USFS		
8	AZ	09	NLA22_AZ-10007	NLA22_22BaseFT	33.91776043	-109.4345922	Basin Lake	13.3	USFS		
9	AZ	09	NLA22_AZ-10008	NLA22_22Base	34.51811238	-112.385272	Lynx Lake	20.1	USFS		
10	AZ	09	NLA22_AZ-10009	NLA22_17Over	31.42463	-110.4522	Parker Lake	42.6	USFS	NLA17_AZ-10012	Target_Sampled
11	AZ	09	NLA22_AZ-10010	NLA22_17Over	33.21447	-111.5283		1.4	Non Federal	NLA17_AZ-10013	Not_Lake
12	AZ	09	NLA22_AZ-10011	NLA22_17Over	33.98306	-109.7343	Earl Park Lake	19.7	Tribal Land	NLA17_AZ-10020	Target_Denied
13	AZ	09	NLA22_AZ-10012	NLA22_17Over	34.51849	-112.3854	Lynx Lake	20.1	USFS	NLA17_AZ-10021	Target_Sampled
14	AZ	09	NLA22_AZ-10013	NLA22_17Over	32.33616	-111.0745		1.4	Non Federal	NLA17_AZ-10022	Not_Lake
15	AZ	09	NLA22_AZ-10014	NLA22_17Over	33.96353	-110.6185	Dixon Tank	1.2	Tribal Land	NLA17_AZ-10023	Lake_Special_Purpose

Figure 5: Example replacement process for NLA22_17BaseFT sites.

Example 3: Replacement of NLA22_22BaseFT and NLA22_22Base sites (Figure 6).

The NLA22_22Over sites will be used to replace the NLA22_22BaseFT sites and the NLA22_22Base sites. If a base site designated for fish sample collection (NLA22_22BaseFT) is replaced, the crew must collect a fish sample at the replacement oversample site (NLA22_22Over). Once a site has been evaluated as a potential replacement for one base site, it cannot be evaluated or used as a replacement for another base site. Therefore, if NLA22_LA-10007 was replaced by NLA22_LA-10297, then NLA_LA-10297 cannot be evaluated as a replacement for NLA22_LA-10008 or any other NLA22_22BaseFT or NLA22_22Base site.



	A	B	C	D	E	F	G	H	I	J	K
1	STATE	EPA_REG	SITE_ID	PANEL_USE	LATITUDE	LONGITUDE	GNIS_NAME	AREA_HA	OWNERSHIP	SITEID_2017	EVAL_2017
5	LA	06	NLA22_LA-10004	NLA22_17BaseFT	29.7762	-89.5146	Bayou Pisana	131.4	Non Federal	NLA17_LA-10011	Not_Lake
6	LA	06	NLA22_LA-10005	NLA22_17Base	29.87506	-93.6362	Five Lakes	2141.0	FWS	NLA17_LA-10012	Not_Lake
7	LA	06	NLA22_LA-10006	NLA22_17Base	31.04516	-92.6811		1.1	Non Federal	NLA17_LA-10013	Not_Lake
8	LA	06	NLA22_LA-10007	NLA22_22BaseFT	32.89590483	-91.46461855		4.2	NRCS		
9	LA	06	NLA22_LA-10008	NLA22_22BaseFT	32.60497151	-93.87630165		5.2	Non Federal		
10	LA	06	NLA22_LA-10009	NLA22_22BaseFT	29.89747058	-91.89555377	De Vance Pond	8.4	Non Federal		
11	LA	06	NLA22_LA-10010	NLA22_22BaseFT	30.22668432	-92.7705699		37.9	Non Federal		
15	LA	06	NLA22_LA-10014	NLA22_17Over	29.7871	-91.53468		1.7	Non Federal	NLA17_LA-10014	Lake_Special_Purpose
16	LA	06	NLA22_LA-10015	NLA22_17Over	29.31781	-89.68559		3.2	Non Federal	NLA17_LA-10022	Not_Lake
298	LA	06	NLA22_LA-10297	NLA22_22Over	30.99171197	-91.57172174		11.3	Non Federal		
299	LA	06	NLA22_LA-10298	NLA22_22Over	32.98683112	-91.18992487		11.3	Non Federal		
300	LA	06	NLA22_LA-10299	NLA22_22Over	29.79979252	-90.76837438		2.0	Non Federal		
301	LA	06	NLA22_LA-10300	NLA22_22Over	30.20357996	-91.43823722		14.6	Non Federal		
302	LA	06	NLA22_LA-10301	NLA22_22Over	31.58386441	-91.73333266	Black Lake	122.5	Non Federal		
303	LA	06	NLA22_LA-10302	NLA22_22Over	32.48870214	-93.30835227		1.8	Non Federal		
304	LA	06	NLA22_LA-10303	NLA22_22Over	30.03887785	-90.31056999		99.3	Non Federal		

Figure 6: Example replacement of NLA22_22BaseFT or NLA22_22Base site.

2.2.2 State Level Design (Intensification)

Five states requested a sample size large enough to complete a state-level assessment. The five states are Idaho, Oregon, Vermont, Washington and Wisconsin. The states did not request any change from the NLA 2022 survey design. Consequently, for those states the oversample size was increased to ensure at least 50 lakes could be evaluated and sampled.

2.3 GIS-based Evaluation (Q1-Q3)

Figure 7 presents an overview of the GIS-based phase of lake evaluation. At this phase, evaluate all base lakes on each state list. The GIS-based evaluation phase makes use of either 1) the EPA provided state leaflet maps (new in NLA 2022; no GIS software needed) or 2) the design lake polygon and lake site shapefiles for use in ArcGIS or other software. The state leaflet maps, design lake polygon shapefile, and lake site shapefile are available for download from the NLA 2022 SharePoint Design folder (National Aquatic Resource Surveys - NLA\NLA 2022\Design_2022).

The state leaflet maps are interactive state-specific maps shared as an html file. They show the 2022 design lake points and polygons, as well as displaying all waterbody features in NHDPlusHR as a web map service. Note that you must be zoomed in for the NHDPlusHR map service to be visible. All three of these layers can be toggled on or off in the table of contents for the map in the upper left below the '+' and '-' zoom symbols. In addition to being able to toggle these three layers on or off in the map, you may change the background for the map to ESRI imagery, OpenStreetMap, or OpenTopoMap. Additional instructions for use are provided in the file. Crews are to examine each candidate lake point (and polygon) in in the leaflet map using background topographic maps and imagery and document answers to the questions in **Figure 2** in the evaluation spreadsheet. The GIS-based phase is designed primarily to address questions Q1 and Q2 of the evaluation questionnaire, but may also address Q4-Q6 with the use of the different layers provided in the state leaflet map. All lakes evaluated during the GIS phase are assigned a GIS status in Q3 of the questionnaire. The list of questions and answers in the site evaluation spreadsheet can be found in **Appendix D: Site Evaluation Spreadsheet Questions and Possible Answers.**

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* move to the Desktop phase of the evaluation process. For lakes that have been sampled previously (in 2017) and for large, named lakes, the GIS review should be very fast. For "new" lakes being sampled for the first time in 2022, 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 shapefile 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 NHDPlusHR that have not been corrected in the NLA sampling frame, or to more recent changes in basin morphology as a result of precipitation patterns. It is critical that the lake identified be the lake in the sampling frame (i.e., in the NLA 2022 site points and lake polygons file, represented by the points and polygons in the html file map). While this is typically obvious, that is not always the case. 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 (**Appendix F: Contacts**) 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.

Examples of lakes that **are not** part of the target population include (see **Table 1.1** for the full list of exceptions):

- Ephemeral lakes that are expected to be dry during the index period[b] (June through September) of the sampling year are not part of the target population;
- Tidally-influenced lakes near the coast or estuary that are maintained solely by the surface inflow of brackish or salt water due to water level changes during tidal cycles;
- Waterbodies along the coast that are considered to be estuarine or part of a larger coastal wetland area;
- Oxbow lakes that have either flowing water or a wetland connection to a river; and
- 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.

Examples of lakes that **are** part of the target population include:

- Permanent lakes near the coast or near an estuary below the head of salt, with no surface connection to the ocean at high tide (even if saline);
- Dune lakes *(*primarily located along the Gulf Coast) that 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.
- Inland lakes that are saline or have high conductivity (> 1000 µS/cm @ 25 °C) (the Great Salt Lake has already been excluded as part of the survey design);
- Oxbow lakes when they are completely separated from a river (no surface connection); and
- Abandoned mine lakes used for recreation or other beneficial uses (e.g., wildlife).

The GIS-based phase may 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. If questions come up during the site evaluation process, contact Marc Weber.

[b] Sampling in May could be approved for lakes in areas where lake stratification is expected earlier in the year. Please coordinate these requests with your Regional EPA Coordinator and the NLA Technical lead.

2.3.1 Lake Evaluation Spreadsheet

1) Download the state-specific NLA 2022 site evaluation spreadsheet available on the NARS SharePoint to your computer (National Aquatic Resource Surveys - NLA\NLA 2022\Site Evaluation Materials).
2) For each state, evaluate all lakes in each base panel using the state leaflet map or design shapefile.
   a. On the site evaluation spreadsheet, the base lakes are color coded in a darker teal (NLA22_17RVT2FT and NLA22_17BaseXX lakes) and dark orange (NLA22_22BaseXX), where their respective oversample sites are colored in a lighter teal (NLA22_17Over) and orange (NLA22_22Over) color. Evaluate lakes in order according to if they are resample sites (sites from 2017) or new sites (sites from 2022) and filling in columns in the spreadsheet. Most of the evaluation questionnaire columns have drop down lists for entries.
3) The GIS evaluation involves answering the first two sets of questions of the lake evaluation questionnaire and assigning a status of Nontarget, Candidate Target, or Uncertain in 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 and proceed with evaluating the site.
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.
6) When the initial evaluations are complete, the complete site evaluation spreadsheet shall be uploaded to NARS SharePoint site (National Aquatic Resource Surveys - NLA\NLA 2022\Site Evaluation Materials\Crew Submitted Site Evaluation Spreadsheets) with the upload date at the end of the file name using the _MMDDYYYY format.
7) Any edits to the initial evaluations need to be documented. Once the crew has sampled all their lakes, a final site evaluation spreadsheet shall be uploaded to NARS SharePoint site (National Aquatic Resource Surveys - NLA\NLA 2022\Site Evaluation Materials\Final State Site Evaluation Spreadsheets) with the upload date at the end of the file name using the _MMDDYYYY format.

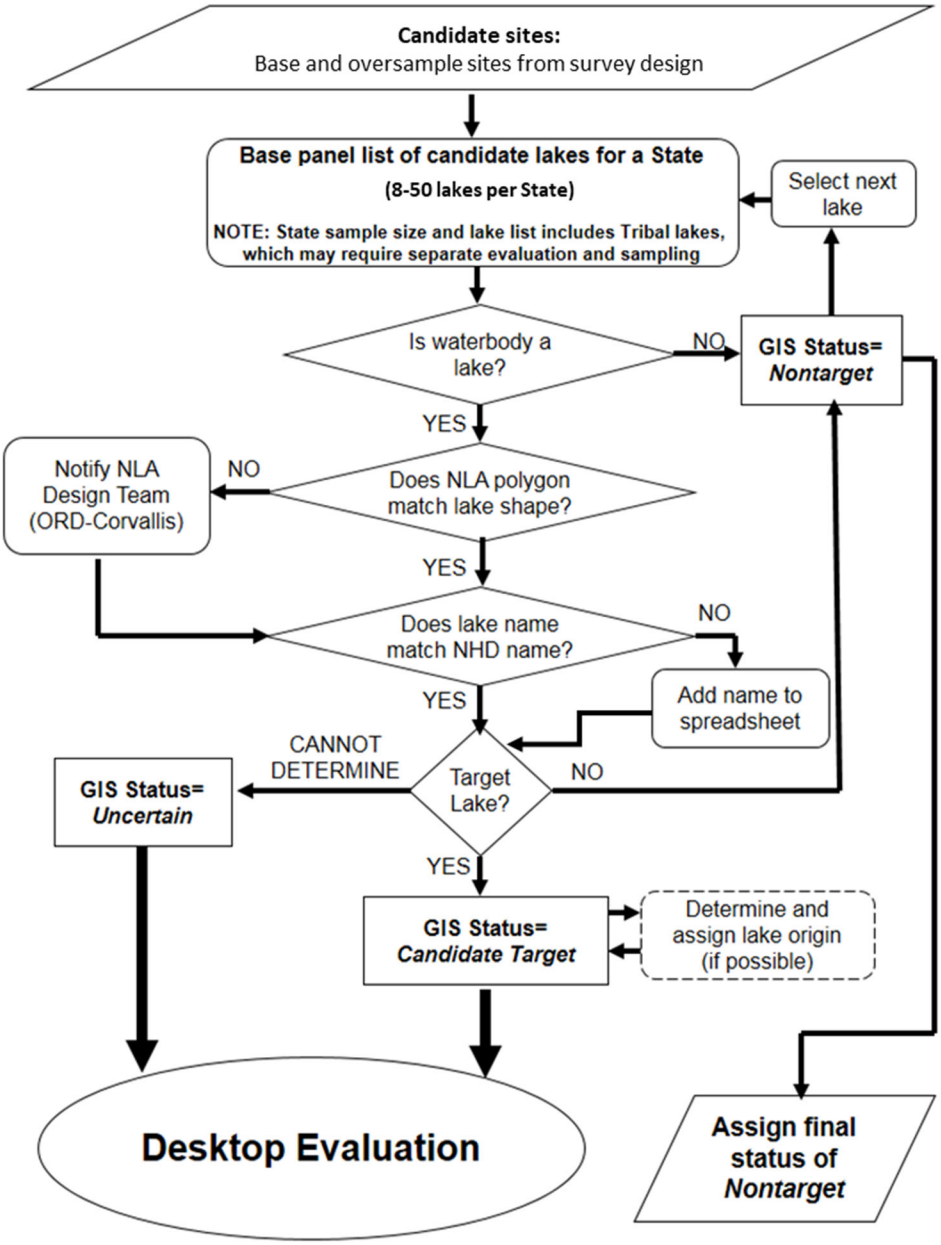


Figure 7. GIS-based evaluation.

2.4 Desktop Evaluation (Q2, Q4-6)

Continue the second phase of the evaluation process to complete the evaluation questionnaire for all *Uncertain* and *Candidate Target* lakes identified during the GIS-based phase. The general process for conducting the desktop phase is presented in **Figure 8**. Use a variety of available information sources including the state leaflet map to proceed through the evaluation questionnaire (**Figure 2**). Google Earth® and other ancillary layers (e.g., Wikipedia®, Panoramio® photos, geographic features, etc.) may provide additional information to answer all of the questions in the evaluation questionnaire successfully.

Web searches may need to be conducted 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 at least 1 week; if less, it is considered to be nontarget and requires replacement.

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 m^2 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 Marc Weber 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 NHDPlusHR labeling point associated with it and treat this basin as the "official" lake for the purposes of evaluating and sampling in 2022. 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 Marc Weber 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.

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**). 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.

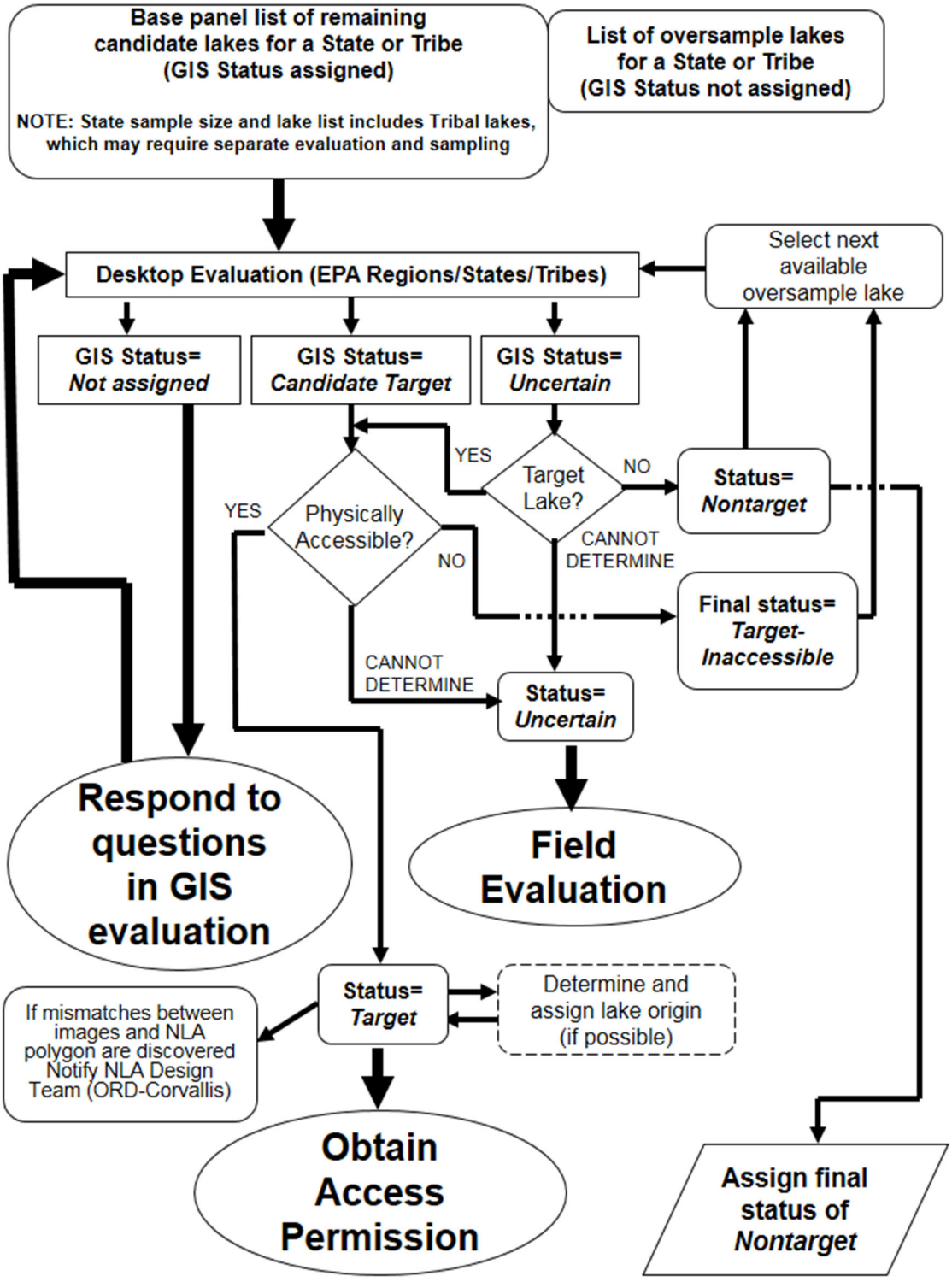


Figure 8. Desktop evaluation.

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 9**. 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.

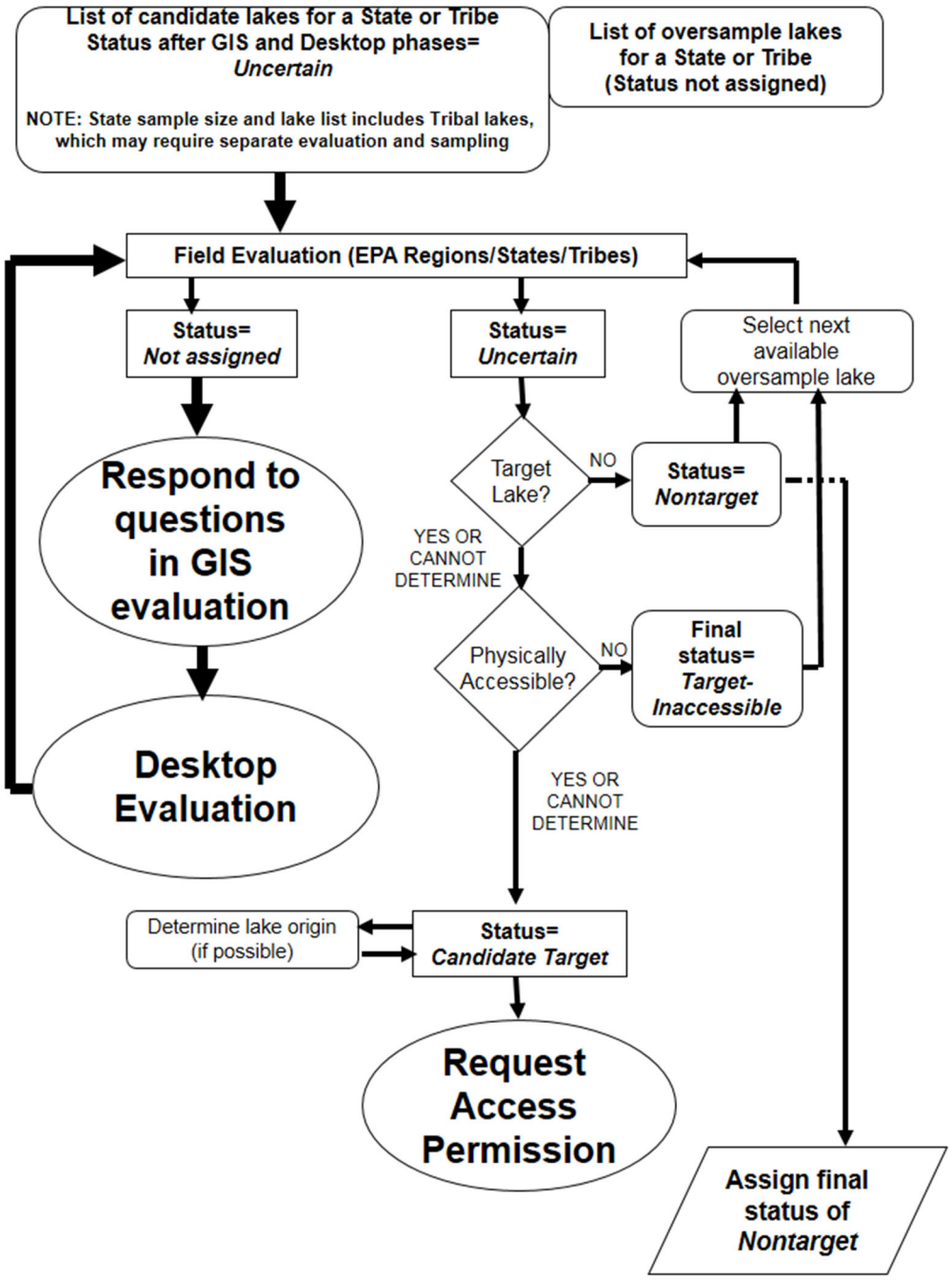


Figure 9. Field evaluation.

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.

3 DETERMINING IF A LAKE IS PHYSICALLY ACCESSIBLE (Q6)

Lakes for the NLA 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.

It is also important to not automatically drop a lake based on a previous evaluation. Information from NLA 2017 is provided in each state's site evaluation spreadsheet but is meant to be ancillary data. Please evaluate every lake as if it were a new lake.

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/Crew 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 *Inaccessible-Effort* 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 or email, 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.

4.3 Contact Landowners

The initial contact with the landowner may be done in a variety of ways (phone call, letter with request to sample, or an “in-person” visit). If you choose to do an in-person visit, you may ask a local representative [e.g., state or county official, National Resources Conservation Service (NRCS) county agent, district fish and game biologist, etc.] to make the initial contact as these people are usually more familiar with landowners in their jurisdictions and are sometimes 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. Landowners may be more likely to grant permission if they actually meet and speak with a study representative instead of receiving a phone call or letter.

If you cannot visit the landowner to obtain permission, you may attempt to contact them 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 a fact sheet (**Appendix E: National Lakes Assessment 2022 Fact Sheet**) and a permission slip (**Appendix B: Example Landowner Permission Slip**) for the landowner to return.

4.4 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.

4.5 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, a lack of response after a sufficient time is considered denial. Note, however, that crews should anticipate that landowners may submit a delayed approval (often during the field season) and crews may need to adjust their plans to attempt to sample lakes previously thought to be dropped. If, however, the required number of sites (or the last required oversample site) in a panel has already been sampled, crews do not need to make any changes that would require more than the original number of sites to be sampled.

5 Notating Replacement Sites (Q11)

If a site has been evaluated as a replacement for a dropped base lake, information is needed to determine the panel associated with the dropped base site. If a site was used as a replacement for a base site, the evaluator must enter the Site ID of the site replaced in question Q11a. If a site was evaluated as a replacement but was not determined to be target and/or sampleable, the evaluator should mark No in Q11 and leave Q11a blank. The goal of this process is to have one (and only one) site listed as a replacement site for each dropped base site. **As a reminder, at a site that was selected as a replacement for a fish sample (FT) site, field crews should collect a fish sample; however, the replacement site should not be dropped if no fish can be caught at that site.**

5.1 Frequently Asked Questions

Some frequently asked questions pertaining to the overall evaluation process are presented in **Appendix G: 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 F: Contacts**). He or she will either answer your question or pass it along to someone who can answer it.

6 LITERATURE CITED

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APPENDIX A: EXAMPLE LETTER REQUESTING PERMISSION TO ACCESS A LAKE

Dear Landowner,

The US Environmental Protection Agency, in cooperation with State Agencies and tribes, is conducting an environmental assessment of lakes across the United States. A total of 904 randomly selected lakes were selected for sampling in 2022. Water quality, chemistry, aquatic life, recreational 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. Information on this study is available on the EPA's National Lakes Assessment website (https://www.epa.gov/national-aquatic-resource-surveys/nla).

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 or Field Crew Lead

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 2022 SURVEY DESIGN

National Lake Assessment 2022 Survey Design

Target Population

For purposes of this survey, the target population of "lakes" includes natural and man-made freshwater lakes, ponds, and reservoirs greater than one hectare (approximately 2.5 acres), greater than 1,000 square meters of open water, greater than one meter in depth, non-saline due to salt water intrusion or tidal influence, and not used for aquaculture, disposal-tailings, mine-tailings, sewage treatment, evaporation or other unspecified disposal use that are within the conterminous U.S., excluding the Great Lakes.

Survey Design

NLA 2022 uses a spatially balanced survey design where lakes are viewed as a finite population (i.e., each lake is viewed as a point identified by the centroid of the lake polygon. The design is stratified by state. Within each state, lakes are selected using unequal probability categories based on lake area. In addition, the survey design includes a subsample of lakes sampled in NLA 2017 and a new sample of lakes for NLA 2022. The subsample of lakes from NLA 2017 are taken from the new lakes selected for NLA 2017. The reason for restricting the subsample to new lakes is that the sample frame for 2017 not only includes all lakes >1ha but also includes NHD high resolution lakes for 1-5ha. This sample frame more closely matches the sample frame for NLA 2022.

Unequal probability categories used for the NLA 2017 subsample are 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. For new NLA 2022 lakes, the unequal probability categories are 1 to 4 ha, 4 to 10 ha, 10 to 50 ha and greater than 50 ha. The collapsing to four lake area categories reflects that no differences in percent of non-target lakes nor in landowner access were found. Given that weight adjustment on all evaluated sites is likely to use lake area categories, having fewer categories will result in more stable weight adjustments since they will be based on more evaluated lakes within a category.

Fish Tissue Study: A subset of the lakes selected using the above survey design will have fish sampled for the analysis of fish tissue contaminants. The subsample is approximately 2/3 of the base lakes selected for the main NLA 2022 survey. Approximately 50% of the lakes will be from the subsample of NLA 2017 lakes and 50% from new lakes selected for 2022. These lakes will be assigned to panels that will identify them.

The survey design has five base and two over sample panels:

- **NLA22_17RVT2FT** – Panel of lakes originally sampled in NLA 2017. These lakes will be sampled twice in NLA 2022 for all indicators except for fish which will be sampled for only one of the two visits.
- **NLA22_17BaseFT** – Panel of lakes originally sampled in NLA 2017 and will be sampled once in NLA 2022 for all indicators including fish.

- **NLA22_17Base** – Panel of lakes originally sampled in NLA 2017 and will be sampled once in NLA 2022 for all indicators except fish.
- **NLA22_22BaseFT** – Panel of new lakes to be sampled once in NLA 2022 for all indicators including fish.
- **NLA22_22Base** – Panel of new lakes to be sampled once in NLA 2022 for all indicators except fish.
- **NLA22_17Over** – Over sample lakes to be used as replacements for NLA22_17RVT2FT or NLA22_17BaseFT or NLA22_17Base lakes when they cannot be sampled for any reason. If the lake being replaced was scheduled to be sampled for fish, then the replacement lake will be sampled for fish.
- **NLA22_22Over** – Over sample lakes to be used as replacements for NLA22_22BaseFT or NLA22_22Base lakes when they cannot be sampled for any reason. If the lake being replaced was scheduled to be sampled for fish, then the replacement lake will be sampled for fish.

See below for description of the lake replacement process when a base lake cannot be sampled for any reason.

Expected Sample Size

For NLA 2022, 904 lakes will be sampled with 96 of the lakes sampled twice for a total of 1000 lake visits. Consequently, 904 unique sites will be sampled with 808 sampled only once and 96 sites being sampled twice during 2022 resulting in 1000 (808 + 2*96) total site visits. Reporting will be nationally as well as for nine aggregated ecoregions (CPL, NAP, SAP, UMW, NPL, SPL, TPL, WMT and XER). Approximately 100 lakes will be sampled in each aggregated ecoregion. For each aggregated ecoregion, the number of lakes assigned to each state within the ecoregion will be proportional to the number of lakes in the sample frame within the state. The total lakes for a state will be the sum across all ecoregions in the state. In addition, the minimum number of lakes for a state will be 8 and the maximum will be 50. With these constraints and with proportional allocation, two states (TX and MN) are allocated more than 50 lakes and 13 states (AZ, CT, DE, IA, MD, NH, NJ, NM, NV, RI, TN, VT, WV) have 8 or fewer. For these states, lakes in the sample frame are allocated by ecoregion within each state to get minimum of 8 and maximum of 50. Then the remaining states are re-allocated lakes by ecoregion to satisfy the total sample size. The final allocation by state and aggregated ecoregion is given in Table 1. Approximately 50% of the lakes will be lakes sampled in NLA 2017. The survey design does not select lakes based on aggregated ecoregions; only the total number of lakes for a state is specified in the survey design. For new lakes, approximately an equal number of lakes by the four lake area categories are selected with unequal probability within each state. For new lakes sampled in 2017, the lakes selected are the first lakes evaluated in 2017 to meet the sample size requirement for 2017 lakes to be resampled in 2022. Note that these are the expected number of lakes and not the final number of lakes selected by the survey design (see section “Final Survey Design Summary”).

Table 1. Number of lakes to be sampled by state and aggregated ecoregion.

St	CPL	NAP	NPL	SAP	SPL	TPL	UMW	WMT	XER	Total	2017	New
AL	6	0	0	8	0	0	0	0	0	14	7	7
AR	5	0	0	5	0	0	0	0	0	10	5	5
AZ	0	0	0	0	0	0	0	2	6	8	4	4
CA	0	0	0	0	0	0	0	16	32	48	24	24
CO	0	0	0	0	4	0	0	11	4	19	10	9

CT	0	8	0	0	0	0	0	0	0	8	4	4
DE	7	0	0	1	0	0	0	0	0	8	4	4
FL	11	0	0	0	0	0	0	0	0	11	6	5
GA	16	0	0	17	0	0	0	0	0	33	16	17
IA	0	0	0	0	0	8	0	0	0	8	4	4
ID	0	0	0	0	0	0	0	8	8	16	8	8
IL	0	0	0	0	0	17	0	0	0	17	8	9
IN	0	0	0	3	0	16	4	0	0	23	12	11
KS	0	0	0	0	10	10	0	0	0	20	10	10
KY	0	0	0	6	0	3	0	0	0	9	4	5
LA	13	0	0	0	0	0	0	0	0	13	6	7
MA	1	8	0	0	0	0	0	0	0	9	4	5
MD	5	0	0	3	0	0	0	0	0	8	4	4
ME	0	15	0	0	0	0	0	0	0	15	8	7
MI	0	0	0	0	0	1	28	0	0	29	14	15
MN	0	0	0	0	0	6	44	0	0	50	25	25
MO	0	0	0	4	0	10	0	0	0	14	7	7
MS	11	0	0	0	0	0	0	0	0	11	6	5
MT	0	0	30	0	0	0	0	15	0	45	22	23
NC	3	0	0	9	0	0	0	0	0	12	6	6
ND	0	0	31	0	0	7	0	0	0	38	19	19
NE	0	0	3	0	23	3	0	0	0	29	14	15
NH	0	8	0	0	0	0	0	0	0	8	4	4
NJ	3	2	0	3	0	0	0	0	0	8	4	4
NM	0	0	0	0	2	0	0	3	3	8	4	4
NV	0	0	0	0	0	0	0	1	7	8	4	4
NY	0	29	0	1	0	0	0	0	0	30	15	15
OH	0	6	0	4	0	3	0	0	0	13	6	7
OK	1	0	0	3	27	4	0	0	0	35	18	17
OR	0	0	0	0	0	0	0	13	8	21	10	11
PA	0	8	0	5	0	0	0	0	0	13	6	7
RI	0	8	0	0	0	0	0	0	0	8	4	4
SC	3	0	0	5	0	0	0	0	0	8	4	4
SD	0	0	31	0	0	9	0	0	0	40	20	20
TN	2	0	0	6	0	0	0	0	0	8	4	4
TX	15	0	0	0	34	0	0	0	1	50	25	25
UT	0	0	0	0	0	0	0	5	9	14	7	7
VA	2	0	0	9	0	0	0	0	0	11	6	5
VT	0	8	0	0	0	0	0	0	0	8	4	4
WA	0	0	0	0	0	0	0	15	12	27	14	13
WI	0	0	0	0	0	3	24	0	0	27	14	13
WV	0	0	0	8	0	0	0	0	0	8	4	4
WY	0	0	5	0	0	0	0	11	10	26	13	13
Sum	104	100	100	100	100	100	100	100	100	904	451	453

The total number of lakes sampled in NLA 2022 will equal the expected total sample size for each state. The number of lakes expected from NLA 2017 and from new lakes for each state may differ from the expected sample size depending on the outcome of the site evaluation process, although the expectation is that they will match. The number of lakes sampled by aggregated ecoregion are expected to differ, since the survey design does not stratify by aggregated ecoregion and the lake replacement process does not replace lakes within the same aggregated ecoregion.

State Level Assessments

Five states requested a sample size large enough to complete a state-level assessment. The five states are ID, OR, VT, WA, and WI. The states did not request any change from the NLA 2022 survey design. Consequently, for those states the over sample size was increased to ensure at least 50 lakes could be evaluated and sampled.

Final Survey Design Summary

While the expected sample size and survey design, provides the survey design requirements, the final number of sites depends on the lake selection. The numbers may differ due to the use of unequal probability categories in the survey design which does not guarantee the expected number of lakes in each category. It also differs since the survey design includes lakes from new lakes selected for NLA 2017. That design, while similar to the NLA 2022 new lake survey design, was different. In particular, it selected more lakes in small lake area categories than large area categories with the expectation that more of the smaller lakes would be non-target or not have landowner access. The tables below summarize the "base" lakes.

Table 2. Number of lakes in Base sample by lake area category and aggregated ecoregion.

	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	58	32	38	18	146
NAP	33	27	23	10	93
NPL	32	19	16	7	74
SAP	38	12	18	13	81
SPL	31	20	25	12	88
TPL	45	35	30	10	120
UMW	32	25	34	15	106
WMT	46	26	33	14	119
XER	30	16	17	14	77
Sum	345	212	234	113	904

Table 3. Number of lakes in Base sample by aggregated ecoregion and state.

	CPL	NAP	NPL	SAP	SPL	TPL	UMW	WMT	XER	Sum
AL	11	0	0	3	0	0	0	0	0	14
AR	7	0	0	3	0	0	0	0	0	10
AZ	0	0	0	0	0	0	0	4	4	8
CA	0	0	0	0	0	0	0	25	23	48
CO	0	0	0	0	9	0	0	8	2	19
CT	0	8	0	0	0	0	0	0	0	8
DE	7	0	0	1	0	0	0	0	0	8
FL	11	0	0	0	0	0	0	0	0	11
GA	22	0	0	11	0	0	0	0	0	33
IA	0	0	0	0	0	7	2	0	0	9
ID	0	0	0	0	0	0	0	10	6	16
IL	0	0	0	1	0	15	1	0	0	17
IN	0	0	0	2	0	16	5	0	0	23
KS	0	0	0	0	5	14	0	0	0	19
KY	0	0	0	8	0	1	0	0	0	9
LA	13	0	0	0	0	0	0	0	0	13

MA	1	7	0	0	0	0	0	0	0	8
MD	6	0	0	2	0	0	0	0	0	8
ME	0	15	0	0	0	0	0	0	0	15
MI	0	0	0	0	0	1	28	0	0	29
MN	0	0	0	0	0	3	48	0	0	51
MO	2	0	0	5	0	7	0	0	0	14
MS	11	0	0	0	0	0	0	0	0	11
MT	0	0	28	0	0	0	0	17	0	45
NC	5	0	0	7	0	0	0	0	0	12
ND	0	0	23	0	0	15	0	0	0	38
NE	0	0	0	0	24	5	0	0	0	29
NH	0	8	0	0	0	0	0	0	0	8
NJ	4	0	0	4	0	0	0	0	0	8
NM	0	0	0	0	2	0	0	2	4	8
NV	0	0	0	0	0	0	0	0	8	8
NY	1	28	0	1	0	0	0	0	0	30
OH	0	4	0	3	0	6	0	0	0	13
OK	2	0	0	5	23	5	0	0	0	35
OR	0	0	0	0	0	0	0	15	6	21
PA	0	7	0	6	0	0	0	0	0	13
RI	1	8	0	0	0	0	0	0	0	9
SC	8	0	0	0	0	0	0	0	0	8
SD	0	0	18	0	0	21	0	1	0	40
TN	4	0	0	4	0	0	0	0	0	8
TX	26	0	0	0	23	0	0	0	1	50
UT	0	0	0	0	0	0	0	6	8	14
VA	4	0	0	7	0	0	0	0	0	11
VT	0	8	0	0	0	0	0	0	0	8
WA	0	0	0	0	0	0	0	20	7	27
WI	0	0	0	0	0	4	22	0	0	26
WV	0	0	0	8	0	0	0	0	0	8
WY	0	0	5	0	2	0	0	11	8	26
Sum	146	93	74	81	88	120	106	119	77	904

Lake Use and Replacement

Each lake selected to be sampled is given unique site identification (SITE_ID). Site identification numbers have the form NLA22_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 SITE_IDs from the largest to the lowest number evaluated within a state and within a PANEL_USE level:

For PANEL_USE panels NLA22_17RVT2, NLA22_17Base and NLA22_17Over

- Within a state, the two lakes in panel NLA22_17RVT2FT must be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest SITE_ID from NLA22_17BaseFT that can be sampled within the state must be sampled twice. If none are available to be sampled within NLA22_17BaseFT then the lowest SITE_ID from NLA22_17Base must be sampled twice. If none are available to be sampled within NLA22_17Base, then the lowest SITE_ID from NLA22_17Over that can be sampled within the state must be sampled twice.

- Within a state, lakes in panel NLA22_17BaseFT and NLA22_17Base must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the lowest SITE_ID available within the state from NLA22_17Over must be evaluated. If the lake is from NLA22_17BaseFT panel, then the replacement lake must be sampled for fish if possible. If no fish sample is possible, then no fish sample will be collected.

Note that for these panels, the NLA 2017 site ID is provided along with the 2017 evaluation status. Even if the lake was evaluated in 2017 and could not be sampled, it should be evaluated again in 2022 to determine if the evaluation status changed for NLA 2022. Within a state, it is possible that after all lakes in panels NLA22_17RVT2FT, NLA22_17BaseFT, NLA22_17Base and NLA22_17Over are evaluated, additional lakes must be evaluated to ensure that the number of lakes in NLA22_17RVT2FT, NLA22_17BaseFT and NLA22_17Base can be sampled. If not, then the remaining lakes required to be sampled will be added to the number of lakes in NLA22_22Base to ensure that the total number of lakes required for the state are sampled.

For PANEL_USE panels NLA22_22BaseFT, NLA22_22Base and NLA22_22Over

- Within a state, lakes in panel NLA22_22BaseFT must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the next available lowest SITE_ID within the state from NLA22_22Over must be evaluated and sampled for all indicators including fish.
- Within a state, lakes in panel NLA22_22Base must all be evaluated and sampled if possible. If a lake in the panel cannot be sampled, then the next available lowest SITE_ID within the state from NLA22_22Over must be evaluated and sampled for all indicators excluding fish.

Sample Frame

The sample frame was derived from the National Hydrography Dataset (NHD) High Resolution data layer. Once the initial GIS layer 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. Next lakes were included or excluded based on the NHD FTYPE.

Lakes included were 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
Stream/River: Hydrographic Category = Perennial

Lakes excluded were FTYPEs:

Estuary
Playa
Inundation Area: Inundation Control Status = Not Controlled
Lake/Pond: Hydrographic Category = Intermittent
Lake/Pond: Hydrographic Category = Intermittent; Stage = Date of Photography
Lake/Pond: Hydrographic Category = Intermittent; Stage = High Water Elevation

Lake/Pond: Hydrographic Category = Perennial; Stage = Normal Pool
Reservoir
Reservoir: Construction Material = Earthen
Reservoir: Construction Material = Nonearthen
Reservoir: Reservoir Type = Aquaculture
Reservoir: Reservoir Type = Cooling Pond
Reservoir: Reservoir Type = Decorative Pool
Reservoir: Reservoir Type = Disposal
Reservoir: Reservoir Type = Disposal; Construction Material = Earthen
Reservoir: Reservoir Type = Disposal; Construction Material = Nonearthen
Reservoir: Reservoir Type = Evaporator
Reservoir: Reservoir Type = Evaporator; Construction Material = Earthen
Reservoir: Reservoir Type = Filtration Pond
Reservoir: Reservoir Type = Settling Pond
Reservoir: Reservoir Type = Sewage Treatment Pond
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 = Earthen; Hydrographic Category = Intermittent
Reservoir: Reservoir Type = Water Storage; Construction Material = Earthen; Hydrographic Category = Perennial
Reservoir: Reservoir Type = Water Storage; Construction Material = Nonearthen
Reservoir: Reservoir Type = Water Storage; Hydrographic Category = Perennial
Reservoir; Reservoir Type = Treatment
Swamp/Marsh
Swamp/Marsh: Hydrographic Category = Intermittent
Swamp/Marsh: Hydrographic Category = Perennial"

Note that excluding lake objects that are coded “Reservoir” by NHD does not exclude run-of-the-river reservoirs or constructed ponds.

The total number of lake objects in NHDPlus High Resolution is 596,565 with 450,925 being included in the NLA 2022 sample frame (Table 4) with 145,640 lake objects being excluded (Table 5).

Table 4. Number of lake objects included in NLA 2022 sample frame (subset of all lake objects in NHDPlus High Resolution)

	Lake area category (ha)				
ECO	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	100771	21152	10853	2592	135368
NAP	19855	6105	4689	1940	32589
NPL	23490	4387	2312	660	30849
SAP	36741	5066	2259	722	44788
SPL	34932	6056	2889	669	44546
TPL	50852	10582	6239	1811	69484
UMW	29708	10836	9773	4061	54378
WMT	16576	4888	2830	968	25262
XER	8993	2307	1619	742	13661
Sum	321918	71379	43463	14165	450925

Table 5. Number of lake objects excluded from NLA 2022 sample frame that were lake objects in NHDPlus High Resolution.

	Lake area category (ha)				
ECO	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	31403	7821	3652	632	43508
NAP	333	75	72	35	515
NPL	23592	4170	1564	215	29541
SAP	1147	292	207	43	1689
SPL	13825	5229	2757	213	22024
TPL	19615	3497	1373	211	24696
UMW	928	297	142	31	1398
WMT	3215	701	392	145	4453
XER	12438	2909	1854	615	17816
Sum	106496	24991	12013	2140	145640

Comparison to NLA 2017 Sample Frame

The NLA 2017 sample frame is summarized by aggregated ecoregion and lake area categories for comparison (Table 6 and Table 7). A total of 586,678 lake objects are in NHD source for the sample frame with 465,901 being included in the sample frame. This compares to 596,565 lake objects in NHDPlusHR for 2022 with 450,925 being included and 120,777 being excluded from the sample frame. Note that the newer NHDPlusHR includes 9,887 more lake objects than NHD used for 2017. The number of lake objects included in the NLA 2022 sample frame includes 450,925 compared to 465,901 for NLA 2017. Hence even though NHDPlusHR includes more lake objects fewer of them are included in the sample frame compared to NLA 2017.

Table 6. Number of lake objects from NHD included in NLA 2017 sample frame by aggregated ecoregion and lake area categories.

	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	117535	23614	11070	2731	154950
NAP	18837	5658	4324	1877	30696
NPL	23288	5257	2138	496	31179
SAP	35568	4747	1973	641	42929
SPL	37927	6625	2712	607	47871
TPL	44383	9921	5160	1562	61026
UMW	30895	11761	9653	3872	56181
WMT	17911	5042	2687	898	26538
XER	10264	2319	1320	628	14531
Sum	336608	74944	41037	13312	465901

Table 7. Number of lake objects from NHD excluded from NLA 2017 sample frame by aggregated ecoregion and lake area categories.

	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	10716	2670	1340	358	15084
NAP	265	60	39	16	380
NPL	23946	5265	1824	188	31223

SAP	678	188	131	17	1014
SPL	15969	5465	2473	201	24108
TPL	22362	4997	1749	146	29254
UMW	446	321	192	68	1027
WMT	2827	677	406	125	4035
XER	10699	2104	1379	470	14652
Sum	87908	21747	9533	1589	120777

The source for the NLA 2022 sample frame was integrated with the source for the NLA 2017 sample frame by intersecting overlapping polygons. This resulted in 99,715 lake objects being added (Table 8). These lake objects were included in the overall GIS layer to ensure that the additional attributes added to NHDPlus High Resolution were also added for these lake objects. These added lake objects were not included in the NLA 2022 sample frame. Their addition was to ensure that the same GIS data layers were used to define these attributes for NLA 2022 new lakes and for NLA 2017 lake objects that were to be evaluated for resampling in 2022. Note that most of the additional lakes are 1-4 ha lake objects. Given that approximately, 100,000 lake objects were added and the difference between the sample frame sources for 2017 and 2022 only differed by approximately 8,000 lake objects, the new NHDPlusHR also did not include approximately 100,000 lake objects from the earlier NLA 2017 snapshot of NHD sample frame source.

Table 8. Number of lake objects that were in NLA 2017 sample frame source but are not lake objects in NHDPlus High Resolution.

	(1,4]	(4,10]	(10,50]	>50	Sum
CPL	32482	7308	3334	750	43874
NAP	3026	495	225	42	3788
NPL	3780	966	265	14	5025
SAP	5186	573	185	16	5960
SPL	9852	1889	483	23	12247
TPL	10888	2276	639	66	13869
UMW	4529	1032	380	80	6021
WMT	2969	519	167	37	3692
XER	3877	800	442	120	5239
Sum	76589	15858	6120	1148	99715

APPENDIX D: SITE EVALUATION SPREADSHEET QUESTIONS AND POSSIBLE ANSWERS

QUESTION	POSSIBLE ANSWERS
Q1. Is Waterbody A Lake?	YES (Go To Q1b)
	NO (Go To Q1a)
Q1a. If Q1 Is No, Select Most Applicable Reason, Go To Q8, Then Evaluate Next Available Replacement Lake	Map Error (No Waterbody At Or Near Coordinates)
	Nontarget Reservoir (Side Channel Or Run Of River)
	Oxbow Or Backwater With Flowing Water Or Wetland Connectivity To River
	OTHER (Explain In Comments)
Q1b. If Q1 Is Yes, Does Lake Polygon Match Up With Lake Shape From Imagery Or Topo Map? If Yes, Go To Q1c. If No, Go To Q8.	YES Go To Q1c, Then To Q2
	NO NHD Polygon Does Not Coincide With Image Or Topo Map And Requires Revision. Go To Q2.
Q1c. If Q1 Is Yes, Record Lake Name If Different From That Given On The Lake List (Column G)	The Evaluator Will Record The Name Of The Lake.
Q2. Does Lake Meet Any Of These Criteria? (Select Only One That Is Most Applicable)	(A) Lake Polygon Has A Surface Area < 1 Ha (0.25 Acres)
	(B) Lake Almost Certainly Goes Dry During Index Period (May-September)
	(C) Coastal Salt Pond, Dune Lake, Or Under Tidal Influence
	(D) Exclusively Used For Aquaculture
	(E) Sewage Treatment Lagoon
	(F) Constructed For Disposal (Mine Tailings Or Other Unspecified Material)
	(G) Active Quarry
	(H) Borrow Pit With No Recreational Or Aquatic Life Uses
	(I) Constructed Drinking Water Reservoir With No Recreational Or Aquatic Life Uses

QUESTION	POSSIBLE ANSWERS
	(J) Constructed Stormwater Treatment Pond
	(K) Evaporation Pond With No Recreational Or Aquatic Life Uses
	(L) Constructed Stock Pond With No Other Recreational Or Aquatic Life Uses
	Cannot Determine Without A Field Visit
Q2a. For Q2, Did You Select Any Choices Between (A) and **(L)?**	Yes (Lake Is Not Target; Select And Evaluate Next Available Replacement Lake)
	Uncertain (Go To Q3 If Gis Phase, Q4 If Desktop Or Field Phase)
	No (Go To Q3 If Gis Phase, Q4 If Desktop Or Field)
Q3. GIS Evaluation Status	Candidate Target (Continue With Desktop Evaluation)
	Nontarget (Complete Q9 And Q10)
	Uncertain (Desktop Evaluation Required)
Q4. Does Lake Appear To Have At Least 1000 M2 (Ca. 10,500 Ft2 Or 0.25 Acres) Of Open Water?	YES (Go To Q5)
	NO (Lake Is Not Target; Select And Evaluate Next Available Replacement Lake)
	UNCERTAIN (Field Visit Required)
Q5. Does Lake Appear To Have A Maximum Depth ≥1 M?	YES (Go To Q6)
	No (Lake Is Not Target; Select And Evaluate Next Available Replacement Lake)
	Uncertain (Field Visit Required)
Q6. Is Lake Physically And Safely Accessible To Crew And Boats?	Yes (Go To Q7)
	No (Status Is Inaccessible-Barrier/Safety; Select And Evaluate Next Available Replacement Lake)
	Yes, But > 1 Day/Crew Needed (Go To Q7)
	Yes, But Extreme Effort Is Required (Status Is Inaccessible-Effort; Select And Evaluate Next Available Replacement Lake)
	Uncertain (Field Visit Required)

QUESTION	POSSIBLE ANSWERS
Q7. Do You Have Permission To Access And Sample The Lake?	Yes
	No (Select And Evaluate The Next Available Replacement Lake)
	Uncertain (Follow-Up Required)
Q8. Determine The Origin Of The Lake	Natural
	Natural_Enh
	Man_Made
	Reservoir
	Man_Made_Aban
	Uncertain
Q9. Target Status	Target
	Nontarget
	Uncertain
Q10. Final Evaluation Status	Target sampleable
	Inaccessible-Barrier/Safety
	Inaccessible-Effort
	Access denied
	Target-other
	Nontarget-Too small
	Nontarget-Ephemeral
	Nontarget-Coastal Saline
	Nontarget-Too shallow
	Nontarget-Vegetated
	Nontarget-No recaquatuse
	Nontarget-Not lake
	Nontarget-Map error
	Nontarget-Other

QUESTION	POSSIBLE ANSWERS
	Not needed
Q11. Is This Site A Replacement For A Base Site?	Yes, This Is Replacing A NLA22_17RVT2FT Site
	Yes, This Is Replacing A NLA22_17baseft Site
	Yes, This Is Replacing A NLA22_17Base Site
	Yes, This Is Replacing A NLA22_22baseft Site
	Yes, This Is Replacing A NLA22_22Base Site
	No
Q11a.What Was The Site Id Of The Non-Target/Target Non-Accessible Site Which Was Replaced?	The Evaluator Will Type In The Site ID Of The Base Site Replaced.

APPENDIX E: NATIONAL LAKES ASSESSMENT 2022 FACT SHEET

The original fact sheet file is available for download on the NLA SharePoint site.

EPA United States Environmental Protection Agency

National Lakes Assessment 2022: A Fact Sheet for Communities

During the summer of 2022, the U.S. Environmental Protection Agency (EPA), states, tribes and other partners will conduct the fourth nationwide survey of the condition of the nation's lakes. The National Lakes Assessment (NLA) will help citizens and governments measure the health of our waters, take actions to prevent pollution, and evaluate the effectiveness of protection and restoration efforts. The NLA 2022 is one in a series of national surveys of the condition of the nation's waters (see https://www.epa.gov/national-aquatic-resource-surveys).

Designed to estimate the percentage of lakes that are in good, fair, or poor condition, the survey will serve as a scientific report card on America's lakes. It will examine ecological, water quality, and recreational indicators, and assess how widespread key stressors (such as nitrogen, phosphorus, and acidification) are across the country.

The survey is a collaborative effort that involves dozens of state environmental and natural resource agencies, federal agencies, universities and other organizations. In most states, state water quality staff will conduct the water quality sampling and habitat assessments.

Tranquil lake sampled during the National Lakes Assessment.

How were the lakes selected?

Distribution of base sites in the 2022 National Lakes Assessment.

A total of 904 natural lakes, ponds, and reservoirs across the lower 48 states are included in the survey. To be included in the survey, these lakes must be at least one meter deep and over 2.5 acres (1 hectare) in size. The survey does not include the Great Lakes or the Great Salt Lake. Lakes were selected randomly using a statistical survey design to represent the population of lakes in their ecological region – the geographic area in which climate, ecological features, and plant and animal communities are similar. In addition to these 904 sites, some sites will be re-sampled for quality assurance purposes; reference sites representing least-disturbed conditions will also be sampled.

What about my lake?

If your lake is sampled for this survey, it was most likely part of the randomly selected sites based on the population of lakes in your part of the country. There are a number of hand-selected sites (around 100), called reference sites, included in the survey as representative of the least-disturbed condition. Sites were not selected because the lake exhibits any particular problem or water quality condition. When the final report on the NLA 2022 is written, data from your lake will contribute to the regional and national picture of lake condition.

If your lake is not sampled for this survey, it was not omitted for any particular reason, but rather because it was not randomly selected or did not fit into the target population of lakes (e.g., those greater than 2.5 acres in area and at least one meter deep).

Many volunteer monitoring groups and lake associations have years of sampling data for their lakes, data vital to local lake management activities. This survey will provide a regional and national – and in some cases, statewide – assessment of lake condition. It will also allow those with sampling data on their lake to compare the condition of their lake to the range of lakes in their region or state.

What will researchers measure?

Field crews take many measurements at each selected lake. They use consistent procedures at all sites so that results can be compared across the country. They measure such things as:

- Temperature, dissolved oxygen, nutrients, chlorophyll a, water clarity, turbidity, and color
- Condition of the habitat along the shoreline
- Zooplankton and phytoplankton—microscopic animals and plants in the water that are an important part of the food chain
- Aquatic macroinvertebrates—small animals such as insects and snails that are a source of food for fish and birds
- Microcystin and Cylindrospermopsin—two common types of algal toxin, often associated with algal blooms
- Enterococci—indicator of fecal contamination from animals or humans
- Pesticide Screen—occurrence of Atrazine pesticide in water samples
- Environmental DNA– genetic indicator collected via water sample to look at potential variety of aquatic species including fish, invertebrates, algae.
- Fish – collected in 70% of waterbodies and tested for mercury, metals and other contaminants which may impact human health

For more information on the National Lakes Assessment, including the findings of the previous surveys:

For more information on the National Aquatic Resource Surveys, visit https://www.epa.gov/national-aquatic-resource-surveys

U.S. Environmental Protection Agency
Office of Water
Monitoring Branch (4503T)
Washington, DC 20460

Sampling is scheduled for the summer of 2022. EPA intends to issue a report on the findings in 2024. Between the time that lakes are sampled and the national report is published, samples will be analyzed in the lab, the data entered into a database and analyzed, and the results will be made public via the NLA website.

Lake sampled during the National Lakes Assessment.

APPENDIX F: CONTACTS

Title	Name	Contact Information
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EPA HQ Site Evaluation Lead	Danielle Grunzke, OW	Grunzke.danielle@epa.gov 202-566-2876
EPA ORD Site Evaluation Lead	Marc Weber, ORD	Weber.marc@epa.gov 541-754-4469
Contract Field Logistics Coordinator	Chris Turner, Great Lakes Environmental Center, Inc.	cturner@glec.com 715-829-3737
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APPENDIX G: FREQUENTLY ASKED QUESTIONS

1. ***If questions arise concerning lake status, who should I contact?***

Please e-mail a detailed description of your concerns about the lake to your EPA Regional NLA Coordinator, the site evaluation coordinator, and to Lareina Guenzel of the EPA Office of Water (Guenzel.Lareina@epa.gov). They will work with the EPA ORD lab to help you determine the final status of the lake.

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

Reservoirs that are expected to be more than 1 m deep and more than 1 ha during the index period (June 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.

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

Inland lakes that are saline or have high conductivity (>1000 µS/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.

4. ***Should oxbows, backwaters, and side-channel reservoirs be sampled?***

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.

5. ***Should ephemeral lakes be sampled?***

Ephemeral lakes are operationally defined as being highly likely to be dry during the index period (June-September) 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.

6. Should mining pits be sampled?

Actively used quarry pits, mine tailing disposal lakes, borrow pits, and stormwater 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.

7. ***What constitutes difficulty of access in sampling a lake?***

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, 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 should be replaced.

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.

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

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.

9. *What if boats are not allowed on a publicly-accessible lake?*

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.

10. 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?

If a lake is dropped, replace it with the first available replacement site following the site replacement process and conduct a GIS, desktop and/or field evaluation; DO NOT skip lakes on your oversample list. All dropped lakes must be recorded on your Site Evaluation Spreadsheet.

11. How should lakes on international boarders be evaluated?

If 50% of the lake is in the United States, it is considered a target lake even when the site coordinates are not on the U.S. portion of the lake.

12. How do I determine which lake to sample when the point occurs between two lakes?

If the point occurs between two lakes, the question is what does the sample frame identify for the lake or lakes?

It may be that the sample frame identifies both lakes as a single lake (which may not be reality) or the point is associated with only one of the lakes. Review the NLA 2022 sample frame and lake polygon in the leaflet maps to determine the target lake.