BUREAU OF WATER

South Carolina Department of Health and Environmental Control

Update Regarding Lead (Pb) Waters of Concern Re: A Review of Lead In Surface Waters

Prepared by
David Chestnut and Bryan Rabon

Technical Report No. 1019-2020

dhec
S.C. Department of Health and Environmental Control

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Summary

The Addendum to the initial Draft 2018 State of South Carolina Integrated Report Part I (SCDHEC, 2020, IR Part I) identified a total of 169 Waters of Concern (WOC) due to total recoverable Lead. From the results presented herein, 156 of those WOC are currently meeting the lead standard with only 13 requiring ongoing monitoring, either due to 2 or more lead (Pb) standards exceedances or insufficient samples to make a determination.

It is clear that concurrent measurements of metals, TSS, and hardness for the calculation of sample specific standards are crucial for the proper assessment of standards compliance and instream conditions. This information for receiving streams is also important for the development of reasonable and protective NPDES permit limits. Accordingly, all freshwater stream metals samples will now be accompanied by concurrent TSS and hardness analyses.

Background

For a more complete and detailed background and discussion of the lead WOC, refer to *Re: The 2018 Integrated Report Part I Pursuant to Federal Clean Water Act (CWA) §303(d) and §305(b) A Review of Lead in Surface Waters* (SCDHEC 2020):

https://www.scdhec.gov/sites/default/files/media/document/final_Pb_report_w_annexes_jan_2020.pdf.

Metals data for aquatic life use support are assessed based on a three (3)-year assessment period. Readily-available data from each monitoring location are compared with the applicable water quality standard in order to determine attainment status (i.e., impaired or unimpaired).

On the draft 2018 303(d) list, three (3) locations were initially identified as having aquatic life impairments due to total recoverable lead in the water column. The total recoverable form of metals is used because it is specified in *Regulation 61-68, Water Classifications and Standards* (SCDHEC 2014).

For individual analytes from toxicant classes (e.g., metals, priority pollutants, chlorine, ammonia), if the analyte-specific acute and/or chronic aquatic life standard is exceeded more than once in three (3) years (i.e., 2014 through 2016 for the 2018 Integrated Report), the location is listed as impaired for the analyte of concern. The Department may also use discretion, considering factors other than excursion magnitude and frequency, in order to determine the impairment status due to toxicants. This approach is consistent with that of other States and is approved by USEPA Region 4.

The assessment methodology for ambient metals (including lead) is particularly complex due to variable instream standards during a given assessment period. Total recoverable metals (TRM) standards are adjusted to account for solids partitioning in freshwater. When instream TSS and hardness data are available, the Department pairs instream TSS and hardness values by site, date, and time to calculate sample-specific instream standards for heavy metals. Calculations are specific for each metal and are based on the equations established to protect the State classified uses as promulgated in the State Water Quality Standards (SCDHEC 2014). Instream TRM values measured on the same date from the same sample as the TSS and hardness are then compared to the calculated acute and chronic standards to

determine if an exceedance of the standard has occurred. Historically, the State has not collected TSS data as part of the statewide surface water quality monitoring program.

An alternate approach may be used in situations where paired instream TSS or hardness data are not available. Under this approach that is consistent with USEPA (Prothro 1993), a default TSS value of 1 milligram per liter (mg/L) or, part per million, is used when no instream TSS data are available, as has been the case for the State. If the TRM standards are hardness-based for a particular metal, a default value of 25 mg/L is used when no hardness data are available. It is important to note that utilizing this alternate method to calculate instream standards does not result in an immediate §303(d) impaired waters listing. Instead, a location found to exceed the instream TRM standard for a given metal more than once in a three (3) year period is considered to be a WOC through the current listing cycle and until such time as additional evaluation is performed to resolve that location's status.

Early in the data assessment activities for the preparation of the 2012 §303(d) List of Impaired Waters (i.e., assessment years for metals 2008 through 2010), it became apparent that, using the default values of 1 mg/L for TSS and 25 mg/L for hardness, there was a significant increase in the number of freshwater locations that exceeded the chronic aquatic life standard for lead [0.7 microgram per liter (ug/L), or parts per billion]. There was no increase in the number of sample results exceeding the saltwater chronic standard for lead (8.5 ug/L). There are no applicable hardness and TSS adjustments to saltwater standards.

During 2009, the reporting limit (RL) for lead in ambient surface water samples changed from 50 µg/L to 2 µg/L in the Department's Environmental Affairs (EA) Laboratory. The change to 2 µg/L aligned with USEPA-approved test methods for Clean Water Act (CWA) work. This RL was not achievable by the laboratory prior to 2009 due to the limitations of the analytical instrumentation used. The laboratory added Inductively Coupled Plasma-Mass Spectrometry (ICP/MS) using USEPA Method 200.8 in 2009 to achieve the lower reporting limit for lead.

The lower RL of 2 µg/L, resulted in measurable concentrations of lead in ambient water samples where it had not been observed previously at the higher RL of 50 µg/L. Due to this increased number of lead detects, the Bureau of Environmental Health Services, Analytical and Radiological Environmental Services Division (ARESD) examined regional laboratory deionized water systems, sample bottle batches, blanks, duplicates and collaborated with the Aquatic Science Programs to evaluate the sample collection procedures to determine if the lead detects were possibly the result of contamination. Evaluation of the associated quality control data indicated that the data were supported. Analysis of lead in stream samples has been performed by the ARESD using the same procedures and methodology since 2009.

Waters of Concern

The initial Draft 2018 State of South Carolina Integrated Report Part I (IR Part I) identified many Waters of Concern for Aquatic Life Use due to exceedances of the chronic lead standard. The initial draft IR Part I was made available for public comment from November 5, 2018 – December 4, 2018.

After the close of the public comment period, an Addendum to the Draft 2018 State of South Carolina Integrated Report Part I (IR Part I) became necessary. Adjustments were made to the draft 2018 303(d) list of impaired waters and associated appendices. Since the initial notice of availability, the Department has determined that some of the 303(d) impaired waters and WOC due to lead have changed. These changes are the result of an assessment of data using updated calculations for instream metals standards.

The addendum to the draft was made available for public comment from January 27, 2020 – February 26, 2020.

In calendar year 2019, TSS was added to all routine ambient freshwater stream samples that include metals and will continue to be part of the parameter suite in the future. Hardness is already a part of the standard suite of parameters collected with metals samples in freshwaters.

The stream Legacy Waters of Concern (LWOC), which did not have current data or were missing TSS results, were also sampled quarterly in 2019 for lead, TSS and hardness.

SCDHEC Technical Report 003-2020, Re: *The 2018 Integrated Report Part I Pursuant to Federal Clean Water Act (CWA) §303(d) and §305(b) A Review of Lead in Surface Waters* (SCDHEC 2020) identified a total of 30 Lake LWOC sites on 21 different lakes in the State. Nineteen of these lakes have either active fixed monitoring locations (BASE sites) or have had additional statistical survey lake sites since the 2014 assessment cycle (years 2010 through 2012). All of the BASE sites and subsequent statistical survey sites show no current sites qualify as WOC with the exception of one (1) 2013 statistical survey site in Lake Wylie. Lake Wylie continues to have active fixed monitoring BASE locations and a more recent statistical survey site that do not show any standards exceedances for lead since the 2016 assessment cycle.

Three (3) small reservoirs, Bushy Park Reservoir (also known as the Back River Reservoir), Lake George Warren and Lake Paul Wallace, did not have new data since the 2012 assessment cycle (years 2008 through 2010). All of these reservoirs have had quarterly monitoring conducted in 2019 for lead, TSS and hardness. A new site was added to Lake Paul Wallace, PD-374, as a surrogate for RL-09100 to allow for more efficient accessibility.

The 2019 data will become part of the dataset and assessed for the 2022 §303(d) List which will rely on metals data for the three (3)-year assessment window (2018 through 2020). At that time, the Department will determine whether these WOC need to be confirmed as impaired and, if so, whether they need to be prioritized for Total Maximum Daily Load (TMDL) development.

Results

General Status Update Assessment Guidelines

BASE freshwater ambient surface water quality monitoring stream sites continue to be sampled and all metals samples now include synchronous samples for TSS and hardness which results in some sites with more than four (4) total samples for this snapshot in time.

LWOC were intended to be sampled quarterly in 2019. Some sites remained active longer and may have more than four (4) total samples.

Some LWOC have less than four (4) samples. Reasons for this include a sample may have been missed due to drought conditions; TSS and hardness samples were accidently missed or failed QA requirements; a sample may have been completely missed accidentally; or, sample results may not have been released by the ARESD laboratory yet.

Two (2) or more standards exceedances in a three (3)-year assessment window are required to result in a §303(d) listing as impaired. This assessment does not represent a §303(d) listing basis, just a status update based on a snapshot in time based on available 2019 and 2020 results.

If there are three (3) samples with zero (0) exceedances, the interpretation is that the water quality standard for lead is being met. Even if a fourth sample is reported with a water quality standard exceedance, the conclusion of meeting water quality standard remains intact.

If there are less than three (3) samples, the determination is that more samples need to be collected.

Status Updates

After the Addendum to the initial Draft 2018 State of South Carolina Integrated Report Part I (IR Part I), there was a total of 169 WOC due to total recoverable lead. Based on this snapshot in time of 2019 and 2020 data, this is the update on the status of these 169 sites.

- Two (2) LWOC sites with all necessary parameters had two (2) or more lead exceedances and will continue to be monitored (Table 1).

- Four (4) LWOC had a very small number of samples and a conclusion on current status cannot be drawn at this time. They will continue to be sampled (Table 2).

- Thirty-five routine ambient surface water quality monitoring BASE sites and one (1) special request site (RQST) met standards based on this snapshot in time (Table 3). These sites will continue to be sampled

- Seven (7) routine ambient surface water quality monitoring BASE sites had a very small number of samples and a conclusion on current status cannot be drawn at this time (Table 4). All BASE sites will continue to be sampled.

- Ninety LWOC sites met standards based on this snapshot in time (Table 5). They will not continue to be sampled.

- Of the 30 identified lake LWOC, one (1) will be sampled again in 2021 at the request of USEPA Region 4 (Table 6). Differences in analytical results from split samples run by two (2) different laboratories using different analytical methods and instrumentation were not comparable to EPA's satisfaction; EPA has requested that site be resampled for lead, TSS, and hardness in 2021.

- Of the remaining 29 lake LWOC, 26 met standards based on either active fixed monitoring locations (BASE sites) or additional statistical survey lake sites since the 2014 assessment. All of the BASE sites and subsequent statistical survey sites show no current sites qualify as WOC (Table 7 and Figures). In the figures there is a separate map for each lake with ongoing monitoring. Individual sites are listed on the vertical (y) axis and the horizontal (x) axis and columns represent specific §303(d) assessment years windows. The green color indicates lead standards were being met for those sites and assessment periods. Orange cells indicate that lead standards were not being met for those specific §303(d) assessment window years.

- The remaining three (3) lake LWOC sites with no post-2014 assessment data met standards based on the 2019 data (Table 8).

The LWOC sites in Table 1 appear to not meet standards based on this snapshot in time (2019-2020 data). They will continue to be sampled.

Table 1. LWOC Stream Sites Not Meeting Lead Standards

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
CW-021	LWOC	KEEP	4	3	BIG PINE TREE CK AT US 521; NW BRIDGE	KERSHAW
RS-13114	LWOC	KEEP	2	2	BRIDGE OVER MORRIS BRANCH AT S-44-163 -DEEP WATER ROAD	UNION

Type = LWOC (Legacy Waters of Concern), Status = KEEP (continue to sample), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

The legacy LWOC sites in Table 2 have a very small number of samples based on this snapshot in time and a conclusion on current status cannot be drawn. They will continue to be sampled.

Table 2. LWOC Stream Sites That Will Continue To Be Sampled For Lead

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
RS-09286	LWOC	KEEP	3	1	VALL BRANCH AT BRIDGE ON SC 28	MCCORMICK
RS-06007	LWOC	KEEP	2	0	SOUTH FORK DUNCAN CREEK AT GRAVEL RD -LITTLE N CAROLINA RD- NEXT TO SEABOARD COAST LINE RR ENTER LITTLE N CAROLINA RD FROM SC 72 11.8 MI E OF CLINTON 3.5 MI W OF WHITMIRE	LAURENS
RS-13162	LWOC	KEEP	1	0	GILKEY CREEK AT S-11-92 -BRIDGE HOUSE RD	CHEROKEE
RS-10356	LWOC	KEEP	0	0	UNNAMED TRIB TO BLACK CK AT S-15-193	COLLETON

Type = LWOC (Legacy Waters of Concern), Status = KEEP (continue to sample), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

Based on this snapshot in time (2019-2020 data) the routine BASE sites in Table 3 appear to be meeting standards. Nevertheless, all routine BASE sites will continue to be sampled.

Table 3. BASE Site WOC Stream Sites Meeting Lead Standards

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
CW-036	BASE	MEETS	5	1	SUGAR CREEK AT S-46-36	LANCASTER
B-042	BASE	MEETS	5	0	BROAD RVR AT SC 18 4 MI NE GAFFNEY	CHEROKEE
B-053	BASE	MEETS	5	0	ENOREE RVR AT SC 72; 121; and US 176; 1 MI NE WHITMIRE	NEWBERRY
CW-014	BASE	MEETS	5	0	CATAWBA RVR AT US 21	YORK
CW-017	BASE	MEETS	5	0	CANE CK AT S-29-50	LANCASTER
CW-041	BASE	MEETS	5	0	CATAWBA RVR AT SC 5 AB BOWATER	LANCASTER
CW-083	BASE	MEETS	5	0	TWELVEMILE CK AT S-29-55 0.3 MI NW OF VAN WYCK	LANCASTER
PD-009	BASE	MEETS	5	0	LYNCHES RVR AT US 1	CHESTERFIELD
PD-251	BASE	MEETS	5	0	BLACK CK AT US 1	CHESTERFIELD
PD-344	BASE	MEETS	5	0	LITTLE LYNCHES RIVER AT SC 341; 3.5 MI SE OF BETHUNE	KERSHAW
S-072	BASE	MEETS	5	0	REEDY RVR ON HWY 418 AT FORK SHOALS	GREENVILLE
SV-192	BASE	MEETS	5	0	LITTLE RIVER AT S-33-19	MCCORMICK
SV-233	BASE	MEETS	5	0	EIGHTEENMILE CK AT 2-04-279	ANDERSON
SV-318	BASE	MEETS	5	0	LONG CANE CK AT S-33-117 7.0 MI NW MCCORMICK	MCCORMICK
SV-354	BASE	MEETS	5	0	STEVENS CREEK AT S-33-88/S-19-143	EDGEFIELD
SV-365	BASE	MEETS	5	0	STEVENS CREEK AT S-33-138	MCCORMICK
SV-371	BASE	MEETS	5	0	HORN CK AT S-19-143	EDGEFIELD
B-044	BASE	MEETS	4	1	BROAD RVR AT SC 211 12 MI SE OF GAFFNEY	CHEROKEE
SV-344	BASE	MEETS	4	1	CHAUGA RIVER AT S-37-34	OCONEE
B-046	BASE	MEETS	4	0	BROAD RVR AT SC 72/215/121 3 MI E OF CARLISLE	CHESTER
B-048	BASE	MEETS	4	0	PACOLET RVR AT SC 105 6 MI AB JCT WITH BROAD RVR	CHEROKEE
B-057	BASE	MEETS	4	0	BUFFALO CK AT SC 5 1 MI W OF BLACKSBURG	CHEROKEE
B-062	BASE	MEETS	4	0	THICKETTY CK AT SC 211 2 MI AB JCT WITH BROAD RVR	CHEROKEE
B-159	BASE	MEETS	4	0	BULLOCK CK AT SC 97 4.8 MI S OF HICKORY GROVE	YORK
B-320	BASE	MEETS	4	0	BIG CEDAR CK AT SC 215	RICHLAND
B-333	BASE	MEETS	4	0	KINGS CREEK AT S-11-209; 3 MI W OF SMYRNA	CHEROKEE

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
BF-008	BASE	MEETS	4	0	FAIRFOREST CK AT S-44-16 SW OF UNION	UNION
E-104	BASE	MEETS	4	0	N FORK EDISTO RVR AT S-38-73	ORANGEBURG
PD-066	BASE	MEETS	4	0	LYNCHES RVR AT S-13-42	CHESTERFIELD
PD-338	BASE	MEETS	4	0	THOMPSON CK AT S-13-148 S OF CHERAW	CHESTERFIELD
PD-370	BASE	MEETS	4	0	BRUNSON SWAMP AT S-26-99	HORRY
ST-016	BASE	MEETS	4	0	SANTEE RVR AT US 52 6.5 MI NNW OF ST STEPHENS	BERKELEY
S-319	BASE	MEETS	4	0	REEDY RVR AT RIVERS ST; DOWNTOWN GREENVILLE	GREENVILLE
SV-004	BASE	MEETS	4	0	CONEROSS CK AT SC 59	OCONEE
CW-072	RQST	MEETS	4	0	BIG WATEREE CK AT US 21	FAIRFIELD
B-075	BASE	MEETS	3	0	SANDY RVR AT SC 215 2.5 MI AB JCT WITH BROAD RVR	CHESTER

Type = BASE (routine fixed ambient surface water quality monitoring site), Status = MEETS (meeting standards for lead), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

The routine BASE sites in Table 4 have a small number of samples based on this snapshot in time and a conclusion on current status cannot be drawn. All routine BASE sites will continue to be sampled.

Table 4. BASE Stream Site WOC That Need More Samples To Draw A Conclusion Of Current Status Of Meeting Lead Standard

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
CW-233	BASE	KEEP	2	0	FISHING CREEK AT S-12-77	CHESTER
CW-236	BASE	KEEP	2	0	ROCKY CK AT S-12-138	CHESTER
B-136	BASE	KEEP	2	0	TURKEY CK AT SC 9; 14 MI NW OF CHESTER	CHESTER
MD-107	BASE	KEEP	2	0	KINGSTON LK NR PUMP STA ON LAKESIDE DR CONWAY	HORRY
PD-337	BASE	KEEP	1	0	GREAT PEE DEE RVR AT US 301/76	FLORENCE
SV-352	BASE	KEEP	1	0	TURKEY CREEK AT S-33-227/S-19-68	EDGEFIELD
CSTL-102	BASE	KEEP	0	0	ASHLEY RVR AT SC 165 4.8 MI SSW OF SUMMERVILLE	DORCHESTER

Type = BASE (routine fixed ambient surface water quality monitoring site), Status = KEEP (continue to sample), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

Based on this snapshot of the legacy WOC sites in Table 5 appear to be meeting standards and will no longer be sampled.

Table 5. LWOC Stream Sites Meeting Lead Standards

Station Number	Type	Status	N Samples	N Exceedances	Site Location	County
S-013	LWOC	MEETS	5	1	REEDY RVR AT S-23-30 3.9 MI SE GREENVILLE	GREENVILLE
SV-349	LWOC	MEETS	5	1	LONG CANE CREEK AT S-01-159	ABBEVILLE
RS-10375	LWOC	MEETS	5	0	BRUSHY CK AT S-23-1973 -DRY POCKET RD	GREENVILLE
B-037	LWOC	MEETS	5	0	ENOREE RVR AT S-42-118 SW OF WOODRUFF	LAURENS
RS-10348	LWOC	MEETS	5	0	ALEXANDER CK AT SC HWY 11	SPARTANBURG
RS-10380	LWOC	MEETS	5	0	UNNAMED TRIB TO MOTLOW CK AT S-42-869	SPARTANBURG
RS-10394	LWOC	MEETS	5	0	PAYNE BRANCH AT S-23-451	GREENVILLE
RS-10403	LWOC	MEETS	5	0	CEDAR SHOALS CK AT S-42-204	SPARTANBURG
RS-11018	LWOC	MEETS	5	0	ENOREE RIVER AT S-30-112 -BEAVERDAM CREEK RD- 1 LANE GIRDER BRIDGE; 0.3 MI W OF US 221	LAURENS
RS-11034	LWOC	MEETS	5	0	TYGER RIVER AT S-42-113; 8.3 MI E OF WOODRUFF	SPARTANBURG
RS-13146	LWOC	MEETS	5	0	SUGAR CREEK AT S-44-223 -BOGAN RD- BRIDGE	Union
RS-14216	LWOC	MEETS	5	0	ROCKY CREEK AT SC 901; MOUNTAIN GAP RD	CHESTER
S-178	LWOC	MEETS	5	0	HUFF CK AT SC 418 1.6 MI NW FORK SHOALS	GREENVILLE
S-323	LWOC	MEETS	5	0	REEDY RVR AT S-23-316 3.5 MI SSW OF MAULDIN	GREENVILLE
CW-243	LWOC	MEETS	5	0	BIG BRANCH AT S-14-41 -SC-047	CLARENDON
E-105	LWOC	MEETS	5	0	CAW CAW SWAMP AT S-38-1032 -1148?	ORANGEBURG
PD-063	LWOC	MEETS	5	0	CROOKED CREEK AT SC 912	MARLBORO
PD-191	LWOC	MEETS	5	0	WHITE CREEKS AT US 1	MARLBORO
RS-10341	LWOC	MEETS	5	0	FOUR HOLE SWAMP AT S-09-90	CALHOUN
RS-10361	LWOC	MEETS	5	0	LITTLE FORK CK AT DIRT RD -S-13-151- OFF OF S-13-39. -DREW BAKER RD ACCORDING TO MAP NOT AT STOP SIGN	CHESTERFIELD
RS-11004	LWOC	MEETS	5	0	GOODMANS CREEK AT US 52; BEST ON DOWNSTREAM SIDE; 3.8 MI NW OF CHERAW	CHESTERFIELD
RS-15256	LWOC	MEETS	5	0	LYNCHES RIVER AT S-13-823 WINTERTIDE DRIVE/S-13-823	Chesterfield
CW-154	LWOC	MEETS	4	0	KELLY CK AT S-28-367 2.9 MI SE OF ELGIN	KERSHAW
RS-09284	LWOC	MEETS	4	0	BRUSHY CK AT BRIDGE ON S-42-194	SPARTANBURG
CW-082	LWOC	MEETS	4	0	SWIFT CK AT S-28-12	KERSHAW

Station Number	Type	Status	N Samples	N Exceedances	Site Location	County
CW-155	LWOC	MEETS	4	0	SPEARS CK AT SC 12 3.6 MI SE OF ELGIN	KERSHAW
CW-166	LWOC	MEETS	4	0	SPEARS CK AT US 601	KERSHAW
CW-237	LWOC	MEETS	4	0	GRANNIES QUARTER CK AT SC 97	KERSHAW
CW-250	LWOC	MEETS	4	0	COLONELS CK AT SC 262	RICHLAND
RS-09312	LWOC	MEETS	4	0	CEDAR CREEK AT BRIDGE ON S-40-2561 NEAR BEULAH CHURCH AND GATE TO MCINTYRE AIRBASE; ROAD NOT ON COUNTY MAP	RICHLAND
RS-13152	LWOC	MEETS	4	0	DAIRY BRANCH AT DEER BRANCH RD OFF US 21	Chester
RS-13168	LWOC	MEETS	4	0	SIXMILE CREEK AT S-29-126 -COLLINS ROAD	Lancaster
RS-14182	LWOC	MEETS	4	0	ZEKIAL CREEK AT SC 110	CHEROKEE
RS-09323	LWOC	MEETS	4	0	LIGHTWOOD KNOT BRANCH AT TRENHOLM RD EXTENSION	RICHLAND
RS-10339	LWOC	MEETS	4	0	WEIR CK AT S-20-90	FAIRFIELD
RS-10387	LWOC	MEETS	4	0	KERR CK AT S-36-436	NEWBERRY
RS-10389	LWOC	MEETS	4	0	BROWN SWAMP AT US 701	HORRY
E-014	LWOC	MEETS	4	0	EDISTO RVR AT US 15 S OF ST GEORGE	COLLETON
E-042	LWOC	MEETS	4	0	BULL SWAMP CK AT S-38-189	ORANGEBURG
MD-124	LWOC	MEETS	4	0	WACCAMAW RVR AT SC 9 7.0 MI W OF CHERRY GROVE	HORRY
PD-027	LWOC	MEETS	4	0	BLACK CK AT S-16-35 5.5 MI SE DARLINGTON	DARLINGTON
PD-029E	LWOC	MEETS	4	0	LITTLE PEE DEE RVR AT S-17-23	DILLON
PD-037	LWOC	MEETS	4	0	WHITE OAK CK AT S-34-31	MARION
PD-060	LWOC	MEETS	4	0	PEE DEE RVR AT PETERS FIELD LANDING OFF S-22-36 US IP PUMP STATION	GEORGETOWN
PD-169	LWOC	MEETS	4	0	BIG SWP AT US 378 and SC 51 0.9 MI W OF SALEM	FLORENCE
PD-170	LWOC	MEETS	4	0	BLACK RVR AT SC 51 11.6 MI NE OF ANDREWS	GEORGETOWN
PD-345	LWOC	MEETS	4	0	LAKE SWAMP AT S-21-38	FLORENCE
PD-355	LWOC	MEETS	4	0	SCAPE ORE SWAMP AT S-31-108	LEE
PD-363	LWOC	MEETS	4	0	SIMPSON CREEK AT SC 905	HORRY
RS-01021	LWOC	MEETS	4	0	MACK BRANCH AT SC 6; 5.5 M W OF ST MATHEWS	CALHOUN
RS-09114	LWOC	MEETS	4	0	LICK CK AT BRIDGE ON S-41-189	SALUDA
RS-09304	LWOC	MEETS	4	0	CULVERT OVER FALL CREEK AT S-23-17	GREENVILLE
RS-09316	LWOC	MEETS	4	0	CHINQUAPIN CK AT BRIDGE ON GARNER RD NEAR N PINE ST	SPARTANBURG
RS-09322	LWOC	MEETS	4	0	HENLEY CREEK AT BRIDGE ON SC 248	GREENWOOD
RS-10331	LWOC	MEETS	4	0	HODGES BRANCH AT S-12-354	CHESTER

Station Number	Type	Status	N Samples	N Exceedances	Site Location	County
RS-10336	LWOC	MEETS	4	0	BULLOCK CK AT S-46-889. THIS IS THE SECOND BRIDGE COMING FROM S-46-1052	YORK
RS-10349	LWOC	MEETS	4	0	LANES CK AT SC 51 JUST NORTH OF OATLAND	GEORGETOWN
RS-10365	LWOC	MEETS	4	0	PEE DEE RVR AT DE WITT BLUFF LANDING	FLORENCE
RS-10377	LWOC	MEETS	4	0	INDIAN CK AT SCOTCH ROAD JUST OFF OF SC 102	CHESTERFIELD
RS-10397	LWOC	MEETS	4	0	LONG BRANCH AT CULVERT AT MOULDS RD. THIS CULVERT IS AT THE END OF PAVEMENT COMING FROM BEULAH RD	WILLIAMSBURG
RS-10402	LWOC	MEETS	4	0	CLEAR CK AT S-01-163	ABBEVILLE
RS-10410	LWOC	MEETS	4	0	SALKEHATCHIE RVR AT SC-641	BAMBERG
RS-11002	LWOC	MEETS	4	0	MILL CREEK AT CULVERT ON OLD OLD HWY 11 ROAD -SIDE ROAD OFF CURRENT SC 11-; 3.75 MI N OF MARIETTA	GREENVILLE
RS-11005	LWOC	MEETS	4	0	CUFFYTOWN CREEK AT SC 67; 10.2 MI ENE OF MCCORMICK	MCCORMICK
RS-11009	LWOC	MEETS	4	0	TWELVEMILE CREEK AT S-39-267; 3.5 MI SW OF PICKENS	PICKENS
RS-11045	LWOC	MEETS	4	0	BEAVERDAM CREEK AT LONG ROAD S-04-18; OFF SC 81; 8.1 MI NE OF ANDERSON	ANDERSON
RS-11050	LWOC	MEETS	4	0	NELLS BRANCH AT S-11-44; 9.1 MI ESE OF GAFFNEY	CHEROKEE
RS-11053	LWOC	MEETS	4	0	WILSON CREEK AT OLD BRIDGE ON S-04-30 -FRED BRADFORD RD- WHICH IS BETWEEN SC 81 AND S-04-668 AND SOUTH OF S-04-156; 2.1 MI SE OF STARR	ANDERSON
RS-11054	LWOC	MEETS	4	0	CORONACA CREEK AT S-24-39; 5.1 MI NNE OF GREENWOOD	GREENWOOD
RS-13136	LWOC	MEETS	4	0	BRIDGE OVER CROWDERS CREEK AT S-46-152 -RIDDLE MILL ROAD	York
RS-13144	LWOC	MEETS	4	0	BRIDGE AT SC HWY 97 OVER CEDAR CREEK -CEDAR CREEK ROAD	Lancaster
RS-14210	LWOC	MEETS	4	0	FAIRFOREST CREEK AT S-44-279 GIST BRIDGE RD	UNION
RS-15284	LWOC	MEETS	4	0	CONRAD CREEK AT S-46-1273 HAWLEY ROAD	YORK
S-304	LWOC	MEETS	4	0	BROAD MOUTH CK AT S-01-111	ABBEVILLE
SV-230	LWOC	MEETS	4	0	EASTATOE CREEK AT S-39-143	PICKENS
SV-348	LWOC	MEETS	4	0	LITTLE RIVER AT S-01-32	ABBEVILLE
SV-362	LWOC	MEETS	4	0	TWELVE MILE CK AT S-39-137	PICKENS
RS-10334	LWOC	MEETS	3	0	UNNAMED TRIB TO UNNAMED TRIB TO EDISTO RVR AT S-38-63	ORANGEBURG
RS-11056	LWOC	MEETS	3	0	FISHING CK AT S-46-1172; 4.7 MI SE OF YORK	YORK
RS-04377	LWOC	MEETS	3	0	PEE DEE RIVER AT PORTS HILL LANDING AT THE END OF CO RD S-22-753 9.5 MI SE OF HEMINGWAY SAMPLE SHOULD BE COLLECTED AS FAR OUT IN THE RIVER AS POSSIBLE	GEORGETOWN

Station Number	Type	Status	N Samples	N Exceedances	Site Location	County
RS-06157	LWOC	MEETS	3	0	PEE DEE RIVER AT PORTS HILL LANDING AT THE END OF PORTS HILL RD S-22-753 9.5 MI SE OF HEMINGWAY SAMPLE SHOULD BE COLLECTED AS FAR OUT IN THE RIVER AS POSSIBLE	GEORGETOWN
RS-10381	LWOC	MEETS	3	0	KINGSTREE SWAMP AT S-21-514	FLORENCE
RS-14200	LWOC	MEETS	3	0	GILLS CREEK AT S-29-51; CAMP CREEK RD	LANCASTER
RS-11041	LWOC	MEETS	3	0	CRIMS CREEK AT BRIDGE AT S-36-170; 2.7 MI E OF POMARIA	NEWBERRY
RS-04544	LWOC	MEETS	3	0	UNNAMED TRIBUTARY TO THE SAVANNAH RIVER AT RIVER BLUFF RD IN THE RAPIDS S/D IN NORTH AUGUSTA. SAMPLE AT THE END OF SERVICE RD FOR TELEPHONE LINES. SEND MORE DETAILED DIRECTIONS TO DISTRICT.	AIKEN
RS-10408	LWOC	MEETS	3	0	BUCKHEAD CK AT SC-419	CALHOUN
SV-072	LWOC	MEETS	3	0	HORSE CK AT S-02-145	AIKEN
PD-024A	LWOC	MEETS	3	0	BLACK CK AT US 401 and 52 6 MI NW DARLINGTON	DARLINGTON
RS-10373	LWOC	MEETS	3	0	BIG BRANCH AT S-18-378	DORCHESTER
RS-11039	LWOC	MEETS	3	0	UNNAMED TRIB TO THE PEE DEE RIVER AT US 701; 0.6 MI NE OF YAUHANNAH	GEORGETOWN

Type = LWOC (Legacy Waters of Concern), Status = MEETS (meeting standards for lead), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

With the exception of RL-10010 (Table 6) the majority of legacy Lake WOC sites are on reservoirs where additional monitoring sites have been collected in subsequent years. Those data show no lead issues (Figures). Based on those conditions they are considered to be meeting standards at this time (Table 7).

Table 6.Lake LWOC Site That Will Be Sampled For Lead in 2021

Site Number	Type	Status	Site Location	County
RL-10010	LWOC	KEEP	LAKE MARION 0.65MI SSE OF SOUTHEAST END OF GREEN ISLAND	CLARENDON

Type = LWOC (Legacy Waters of Concern) Status = KEEP (continue to sample)

Table 7. Lake LWOC Sites Meeting Lead Standards

Site Number	Type	Status	Site Location	County
RL-13088	LWOC	MEETS	TORRENCE BRANCH ARM OF LAKE WYLIE EVEN WITH CUL-DE-SAC AT END OF WTER TRACE DR	YORK
RL-09071	LWOC	MEETS	COVE OF LAKE MURRAY BETWEEN WISE FERRY ROAD AND BRADY PORTH ROAD 0.75 MILES SOUTH OF THE TIP OF BUNDRICK ISLAND. ON THE BUNDRICK ISLAND SIDE OF THE COVE JUST OFF THE WEST BANK.	LEXINGTON
RL-09084	LWOC	MEETS	SALUDA RIVER ARM OF LAKE MURRAY 1.2 MILES SOUTHEAST OF S-223 JUST BEFORE THE CONFLUENCE WITH THE LITTLE SALUDIA RIVER ARM.	NEWBERRY
RL-09085	LWOC	MEETS	J. ROBINSON LAKE 1.2 MILES SOUTHEAST FROM THE BRIDGE AT S-23-113 AND 1.3 MILES NORTHWEST OF CL-100	GREENVILLE
RL-09100	LWOC	MEETS	LAKE WALLACE 0.6 MILES NORTH OF THE SKI IMPOUNDMENT BOAT LANDING. SITE IS LOCATED ABOUT MID CHANNEL OF THE LAKE.	MARLBORO
RL-10001	LWOC	MEETS	LAKE GREENWOOD 1.9MI WSW OF JCT OF SC-39 AND SC-56	NEWBERRY
RL-10002	LWOC	MEETS	LAKE SECESSION 3.5MI WSW OF JCT OF SC-28 AND SC-284	ABBEVILLE
RL-10004	LWOC	MEETS	LAKE RUSSELL 100M WNW OF SC END OF US 29 BRIDGE OVER LAKE RUSSELL	ANDERSON
RL-10006	LWOC	MEETS	LAKE RUSSELL 6MI WSW OF BROWN OAKS CHURCH AT JCT OF SC-81 AND S-01-900	ABBEVILLE
RL-10009	LWOC	MEETS	LAKE MURRAY 5.75MI EAST OF NORTH END OF SC-391 BRIDGE OVER LAKE MURRAY	NEWBERRY
RL-10012	LWOC	MEETS	LAKE WYLIE 1.15MI NE OF ENDING OF S-46-154 AT SOUTH POINT	YORK
RL-10013	LWOC	MEETS	LAKE; CLARKS HILL RESERVOIR 2.6MI NNW OF JCT OF US 221 AND SC-23	MCCORMICK

Site Number	Type	Status	Site Location	County
RL-10014	LWOC	MEETS	LAKE MARION 2MI NORTH OF WEST END OF I-95 BRIDGE OVER LAKE MARION	ORANGEBURG
RL-10015	LWOC	MEETS	LAKE BOWEN 2.65MI NE OF JCT OF US 26 AND SC-292	SPARTANBURG
RL-10016	LWOC	MEETS	LAKE KEOWEE 1.25MI SE OF NEW HOPE CHURCH	OCONEE
RL-10017	LWOC	MEETS	LAKE GREENWOOD 2.95MI WSW OF LAURENS/NEWBERRY COUNTY LINE ON SC-39	LAURENS
RL-10018	LWOC	MEETS	LAKE SECESSION 4.75MI WSW OF JCT OF SC-28 AND SC-284	ABBEVILLE
RL-10101	LWOC	MEETS	LAKE; JUNIPER 1.4MI SSE OF JCT OF US 1 AND US 52	CHESTERFIELD
RL-10102	LWOC	MEETS	LAKE; CEDAR CK RESERVOIR 2.60MI SSE OF JCT OF US 21 AND SC-97 ON EAST SIDE OF GREAT FALL RESERVOIR	LANCASTER
RL-10103	LWOC	MEETS	LAKE BLALOCK 450M ENE OF BUCK CREEK CHURCH	SPARTANBURG
RL-10105	LWOC	MEETS	LAKE; BROADWAY 1.3MI SW OF JCT OF US 76 AND US 178	ANDERSON
RL-10107	LWOC	MEETS	LAKE CUNNINGHAM 2.1MI NNE OF JCT OF SC-101 AND SC-290	GREENVILLE
RL-10109	LWOC	MEETS	LAKE RABON 3.75MI SE OF HICKORY TAVERN AT JCT OF US 76 AND SC-101	LAURENS
RL-10110	LWOC	MEETS	LAKE COOLEY 2.75MI SSW OF JCT OF US 176 AND SC-292	SPARTANBURG
RL-11113	LWOC	MEETS	LAKE RABON NEAR NORTH RABON CREEK INFLOW	LAURENS
RL-11117	LWOC	MEETS	GREAT FALLS RESERVOIR 40 YARDS FROM DAM AND 70 YARDS WEST OF SHORE OF POINT	CHESTER
RL-11119	LWOC	MEETS	GREAT FALLS RESERVOIR 1.0 MILES SOUTH OF SC 97 IN THE MIDDLE OF THE RESERVOIR.	CHESTER

Type = LWOC (Legacy Waters of Concern), Status = MEETS (meeting standards for lead

Three (3) small reservoirs, Bushy Park Reservoir (also known as the Back River Reservoir), Lake George Warren and Lake Paul Wallace, did not have any active monitoring and did not have new data since the 2012 assessment cycle that put them on the WOC list. A new site was added to Lake Paul Wallace, PD-374, as a surrogate for RL-09100 to allow for more efficient accessibility. Based on this snapshot in these reservoirs appear to be meeting standards and will no longer be sampled.

Table 8. Lake LWOC Meeting Lead Standards Based On New Data

Site Number	Type	Status	N Samples	N Exceedances	Site Location	County
CSTL-075	LWOC	MEETS	4	0	LAKE GEORGE WARREN; BLACK CK ARM; AT S-25-41 5 MI SW OF HAMPTON	HAMPTON
PD-374	LWOC	MEETS	4	0	LAKE PAUL WALLACE AT THE SKI IMPOUNDMENT BOAT LANDING DOCK (REPLACEMENT FOR WOC SITE RL-09100)	MARLBORO
CSTL-124	LWOC	MEETS	3	0	BUSHY PARK RESERVOIR IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES	BERKELEY

Type = LWOC (Legacy Waters of Concern) , Status = MEETS (meeting standards for lead), N Samples = number of samples with full suite of parameters necessary to calculate sample-specific lead standard, N Exceedances = number of samples exceeding the sample-specific lead standard

Conclusion

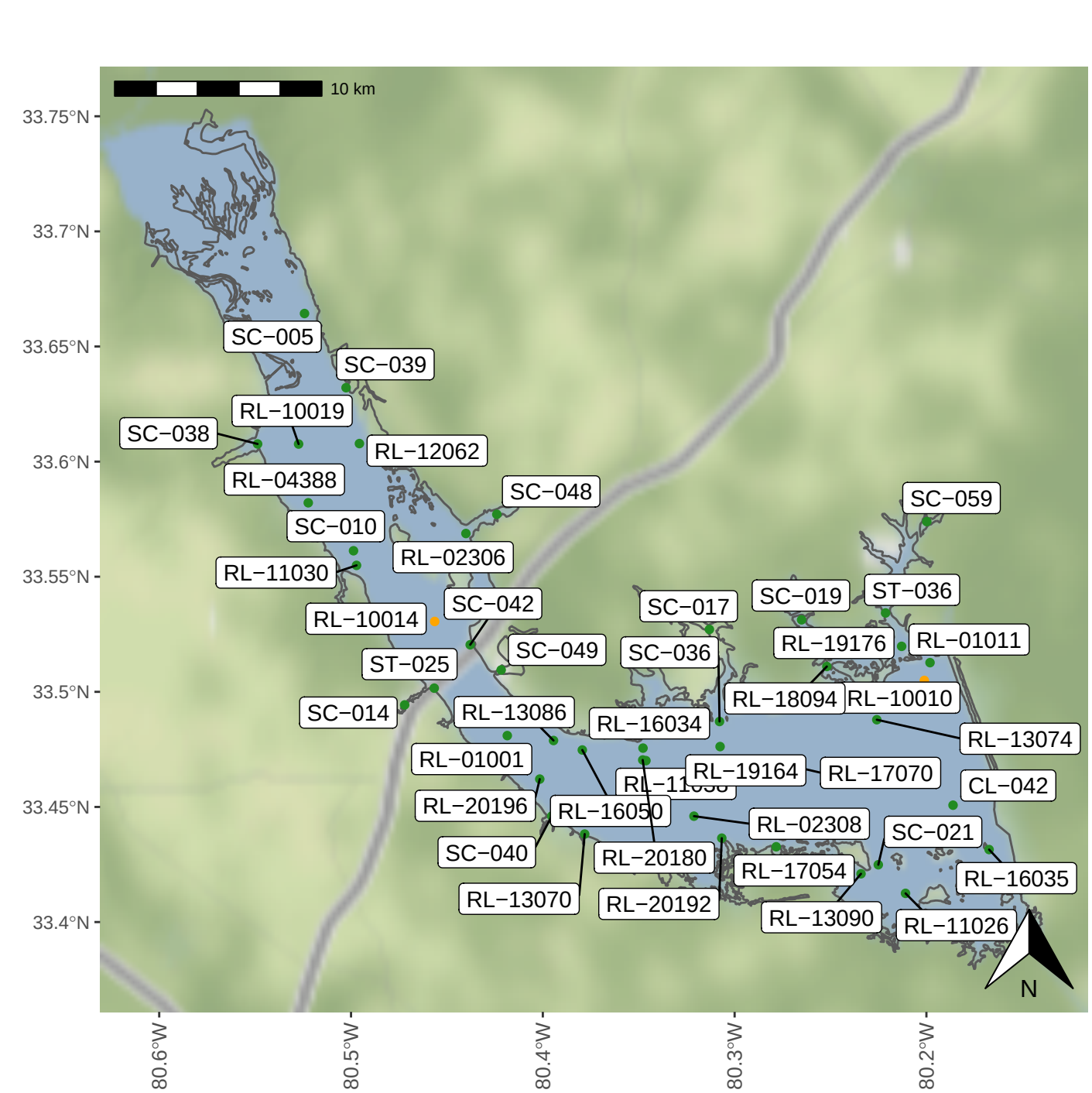
The Addendum to the initial Draft 2018 State of South Carolina Integrated Report Part I (SCDHEC, 2020, IR Part I) identified a total of 169 Waters of Concern (WOC) due to total recoverable Lead. From the results presented herein, 156 of those WOC are currently meeting the lead standard with only 13 requiring ongoing monitoring, either due to 2 or more lead (Pb) standards exceedances or insufficient samples to make a determination.

It is clear that concurrent measurements of metals, TSS, and hardness for the calculation of sample specific standards are crucial for the proper assessment of standards compliance and instream conditions. This information for receiving streams is also important for the development of reasonable and protective NPDES permit limits. Accordingly, all freshwater stream metals samples will now be accompanied by concurrent TSS and hardness analyses.

Figures

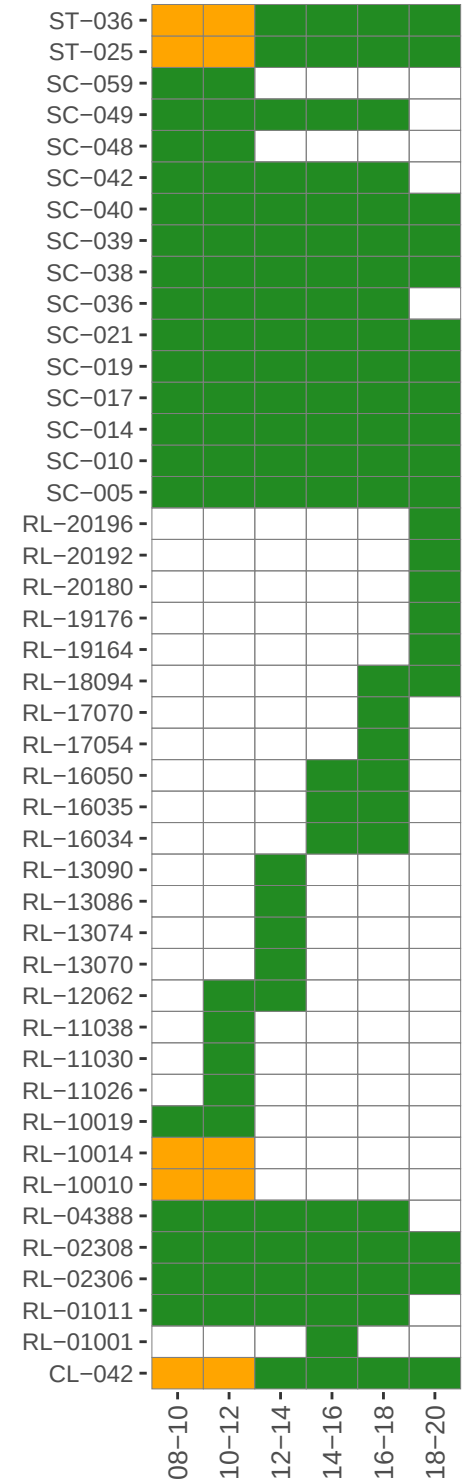
In the figures there is a separate map for each lake with ongoing monitoring. Individual sites are listed on the vertical (y) axis and the horizontal (x) axis and columns represent specific §303(d) assessment years windows. The green color indicates lead standards were being met for those sites and assessment periods. Orange cells indicate that lead standards were not being met for those specific §303(d) assessment window years.

Lake Marion

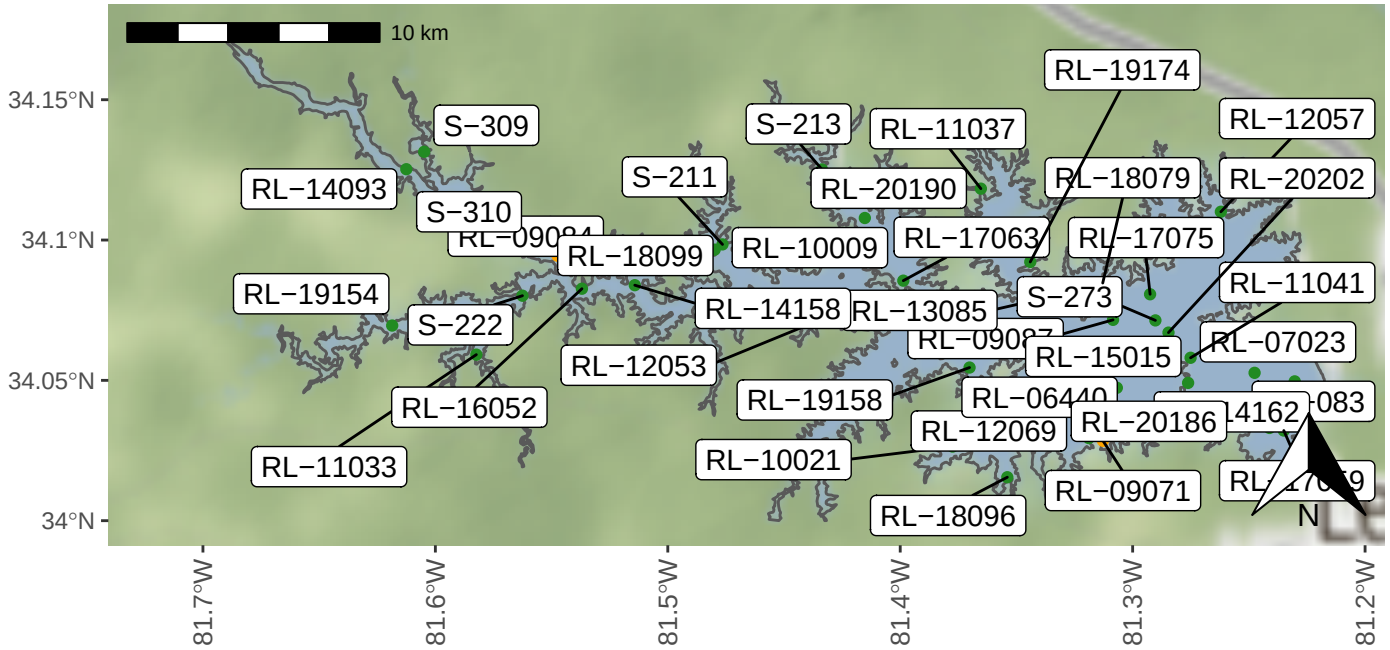


Support

- Meets
- Not Meeting

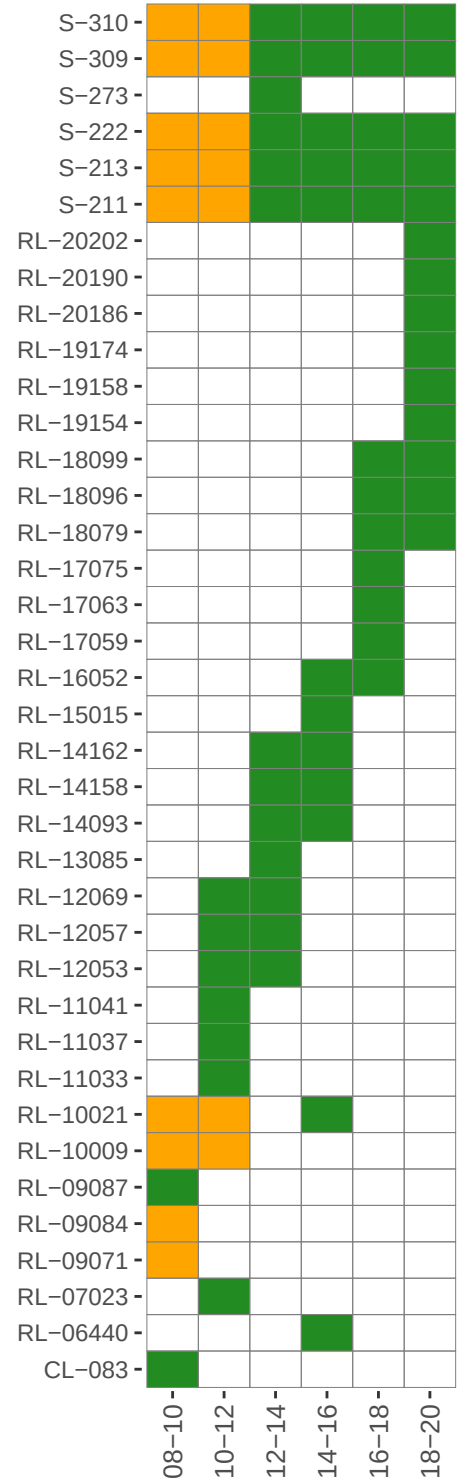


Lake Murray

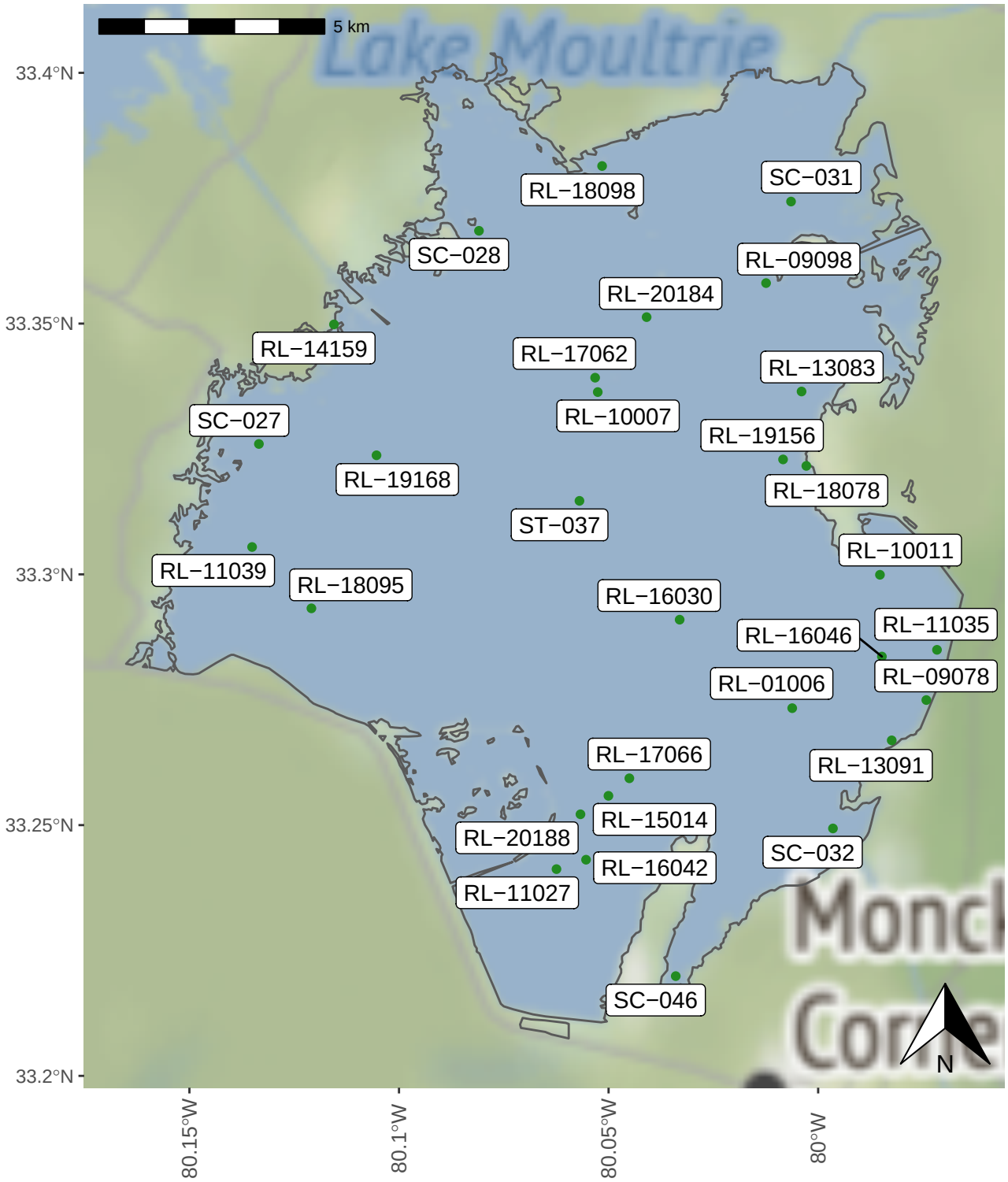


Support

- Meets
- Not Meeting

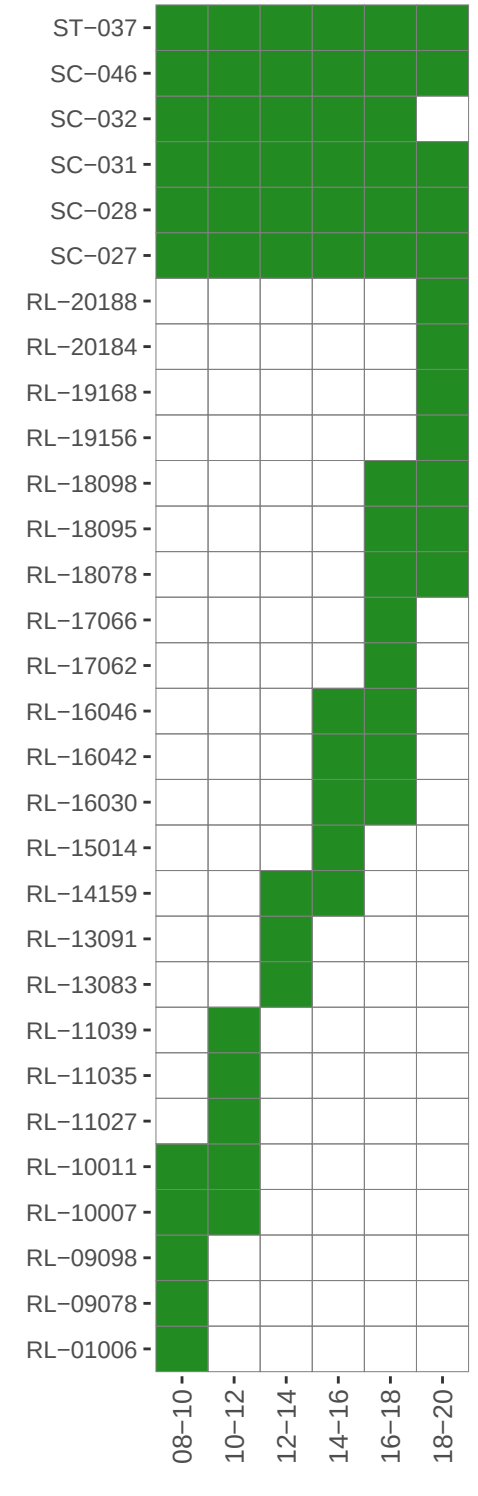


Lake Moultrie

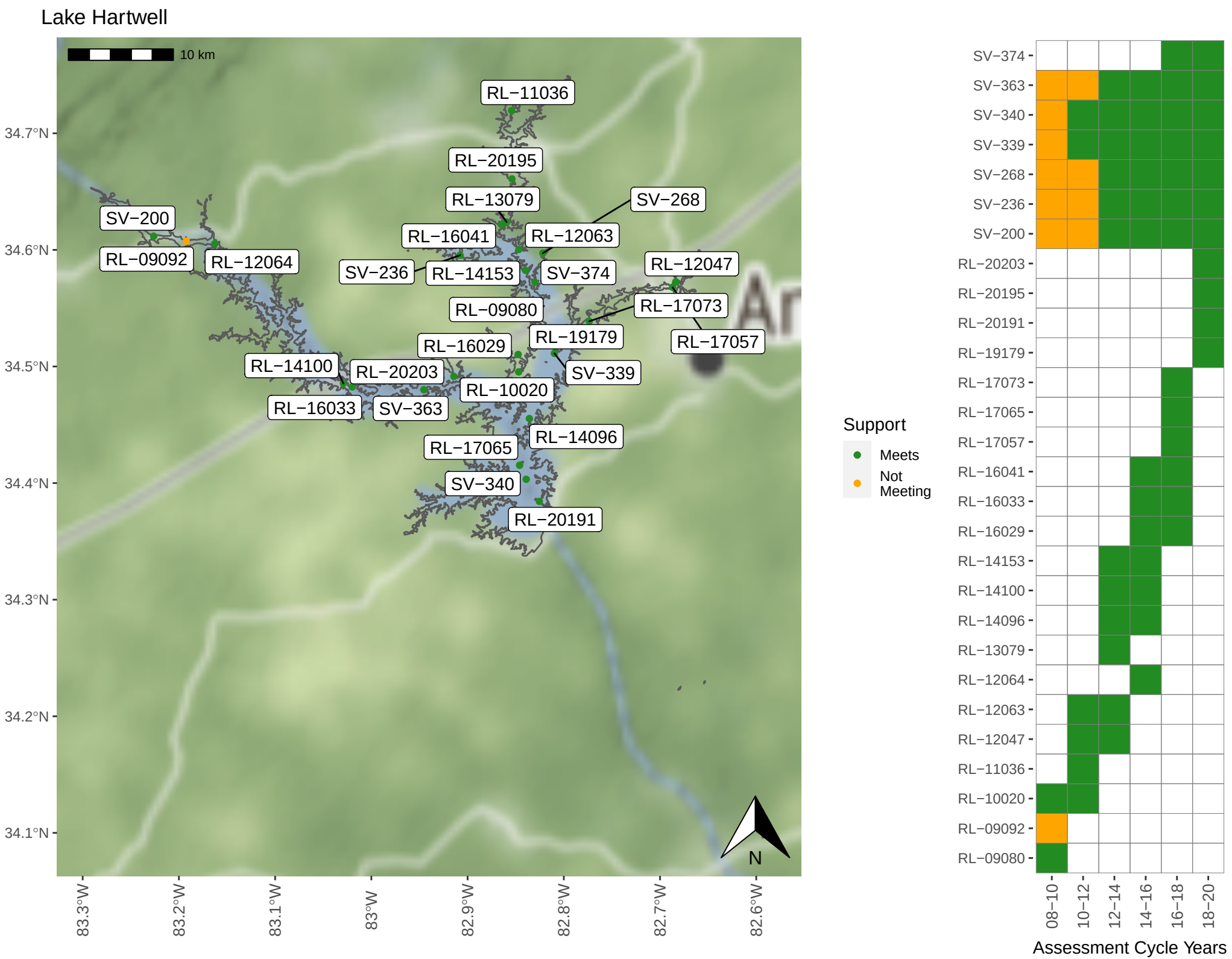


Support

Meets



Assessment Cycle Years


Lake Hartwell
10 km
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RL−20195
RL−13079
SV−268
SV−200
RL−16041
RL−12063
RL−09092
RL−12064
SV−236
RL−14153
SV−374
RL−12047
RL−09080
RL−17073
RL−19179
RL−17057
RL−16029
RL−14100
RL−20203
SV−339
RL−10020
RL−16033
SV−363
RL−14096
RL−17065
SV−340
RL−20191
34.7°N
34.6°N
34.5°N
34.4°N
34.3°N
34.2°N
34.1°N
83.3°W
83.2°W
83.1°W
83°W
82.9°W
82.8°W
82.7°W
82.6°W
N
Support
Meets
Not Meeting
SV−374
SV−363
SV−340
SV−339
SV−268
SV−236
SV−200
RL−20203
RL−20195
RL−20191
RL−19179
RL−17073
RL−17065
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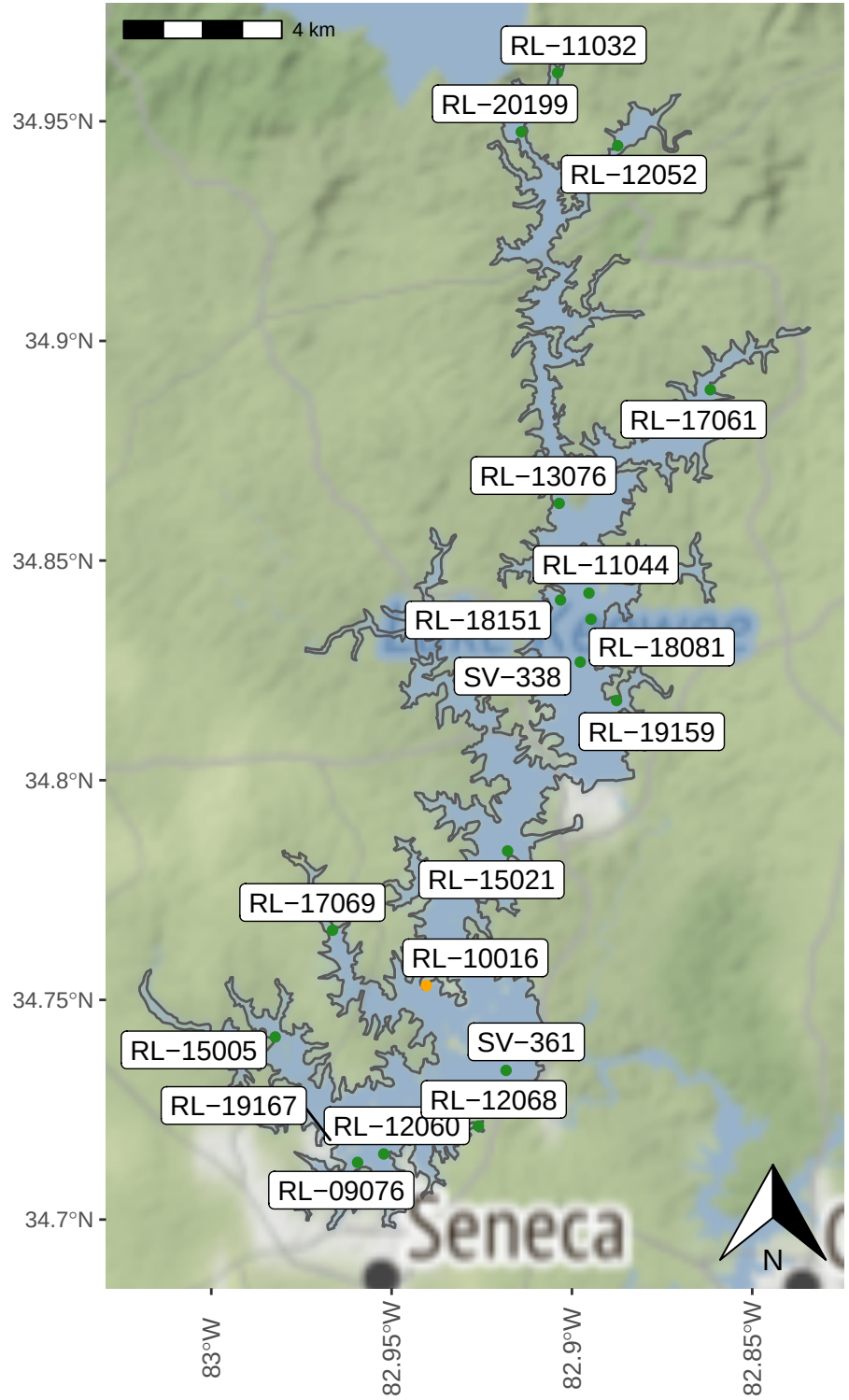
RL−12047
RL−11036
RL−10020
RL−09092
RL−09080
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

Lake Keowee


4 km
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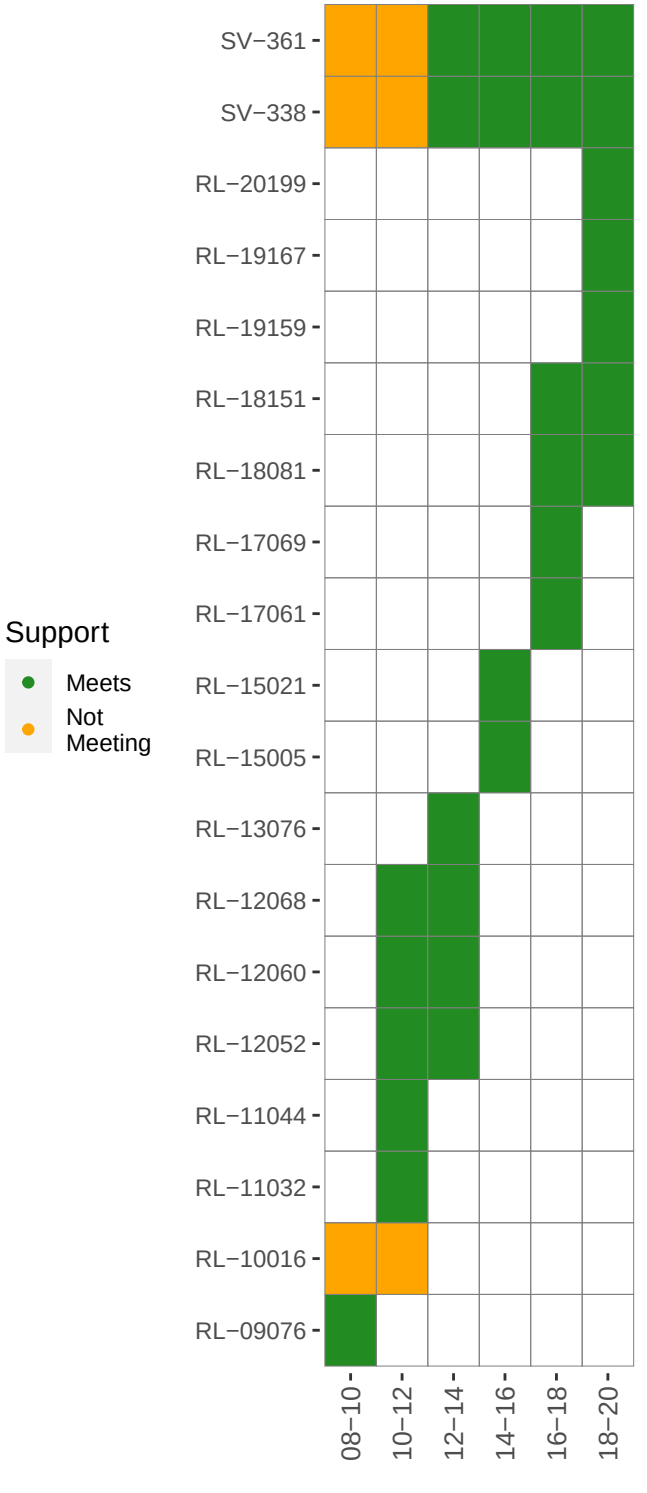
RL−20199
RL−12052
RL−17061
RL−13076
RL−11044
RL−18151
RL−18081
SV−338
RL−19159
RL−15021
RL−17069
RL−10016
SV−361
RL−15005
RL−19167
RL−12068
RL−12060
RL−09076
Seneca
N
34.95°N
34.9°N
34.85°N
34.8°N
34.75°N
34.7°N
83°W
82.95°W
82.9°W
82.85°W


Support
Meets
Not Meeting
SV−361
SV−338
RL−20199
RL−19167
RL−19159
RL−18151
RL−18081
RL−17069
RL−17061
RL−15021
RL−15005
RL−13076
RL−12068
RL−12060
RL−12052
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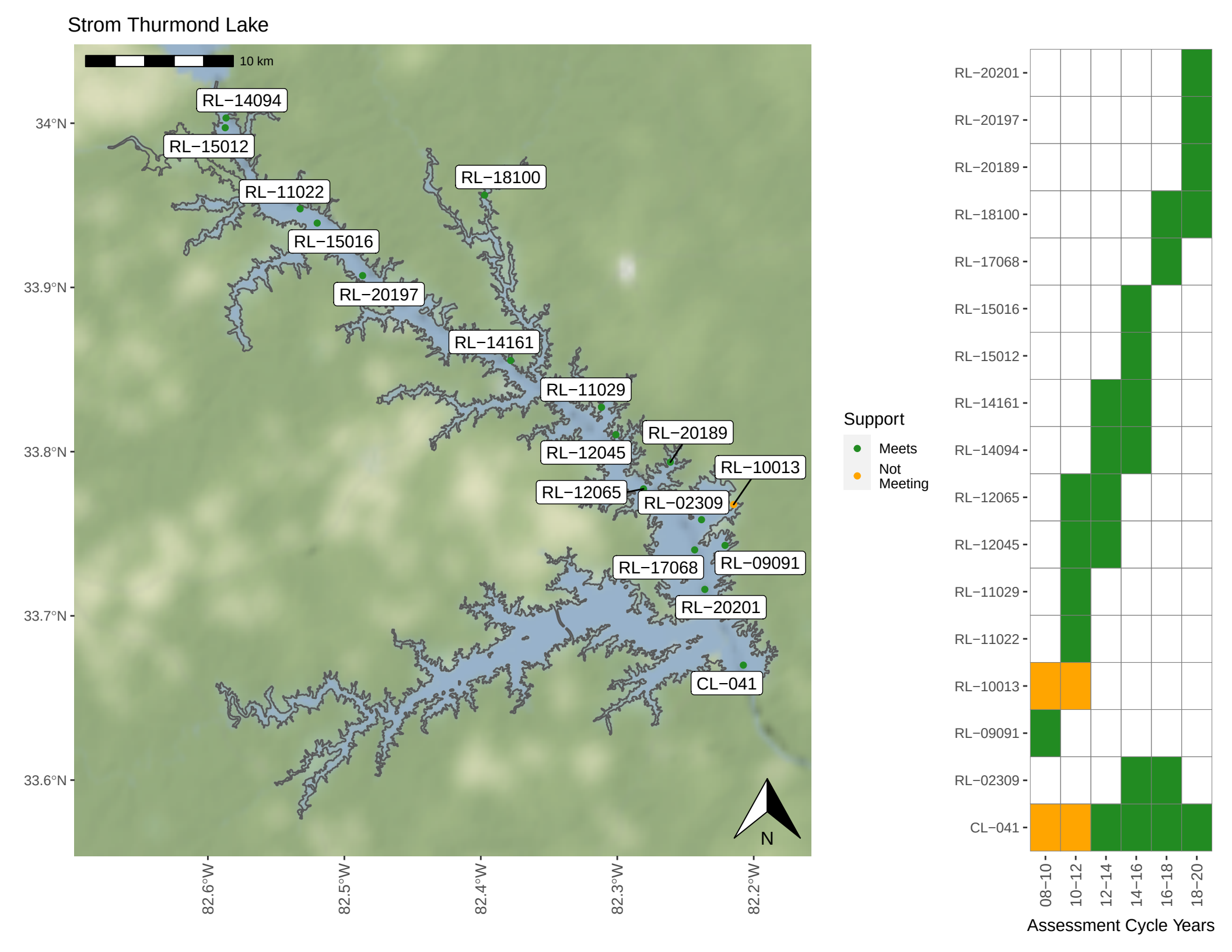
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years


Strom Thurmond Lake
10 km
RL−14094
RL−15012
RL−11022
RL−18100
RL−15016
RL−20197
RL−14161
RL−11029
RL−20189
RL−12045
RL−10013
RL−12065
RL−02309
RL−17068
RL−09091
RL−20201
CL−041
34°N
33.9°N
33.8°N
33.7°N
33.6°N
82.6°W
82.5°W
82.4°W
82.3°W
82.2°W
N
Support
Meets
Not Meeting
RL−20201
RL−20197
RL−20189
RL−18100
RL−17068
RL−15016
RL−15012
RL−14161
RL−14094
RL−12065
RL−12045
RL−11029
RL−11022
RL−10013
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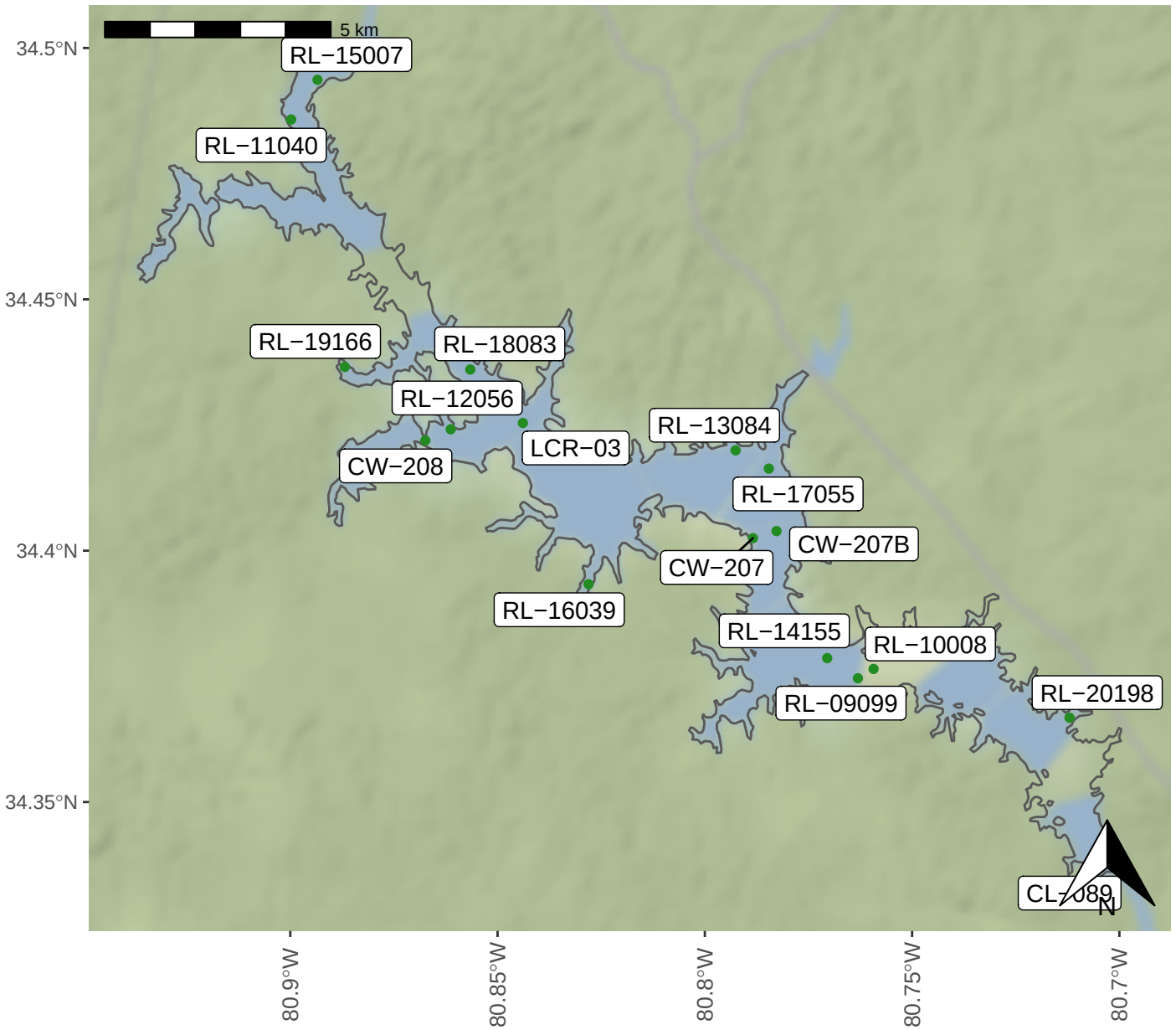
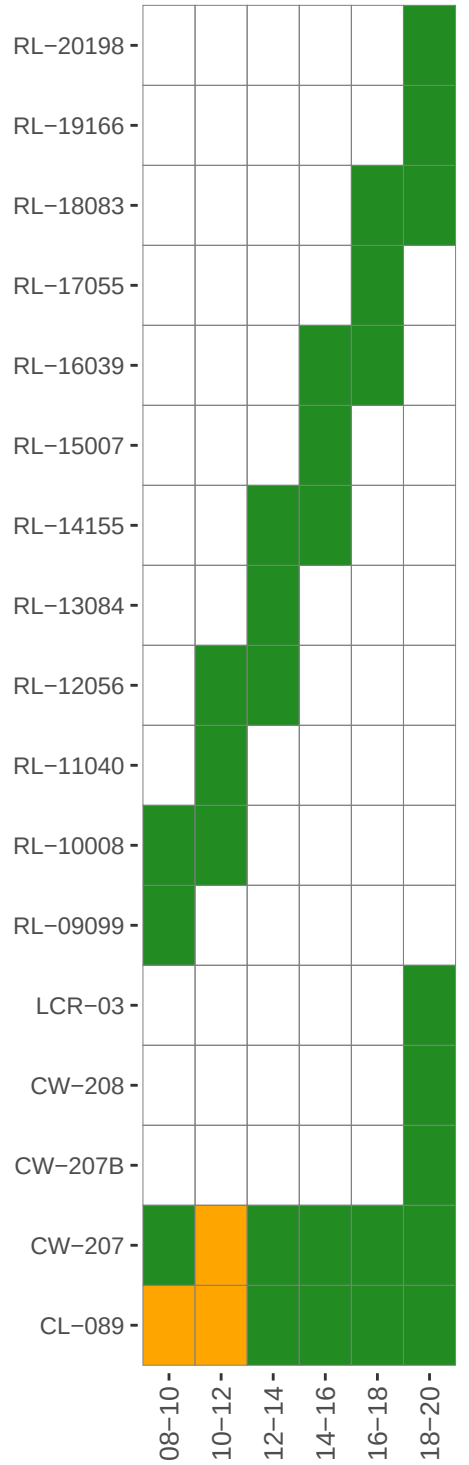
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

Wateree Lake



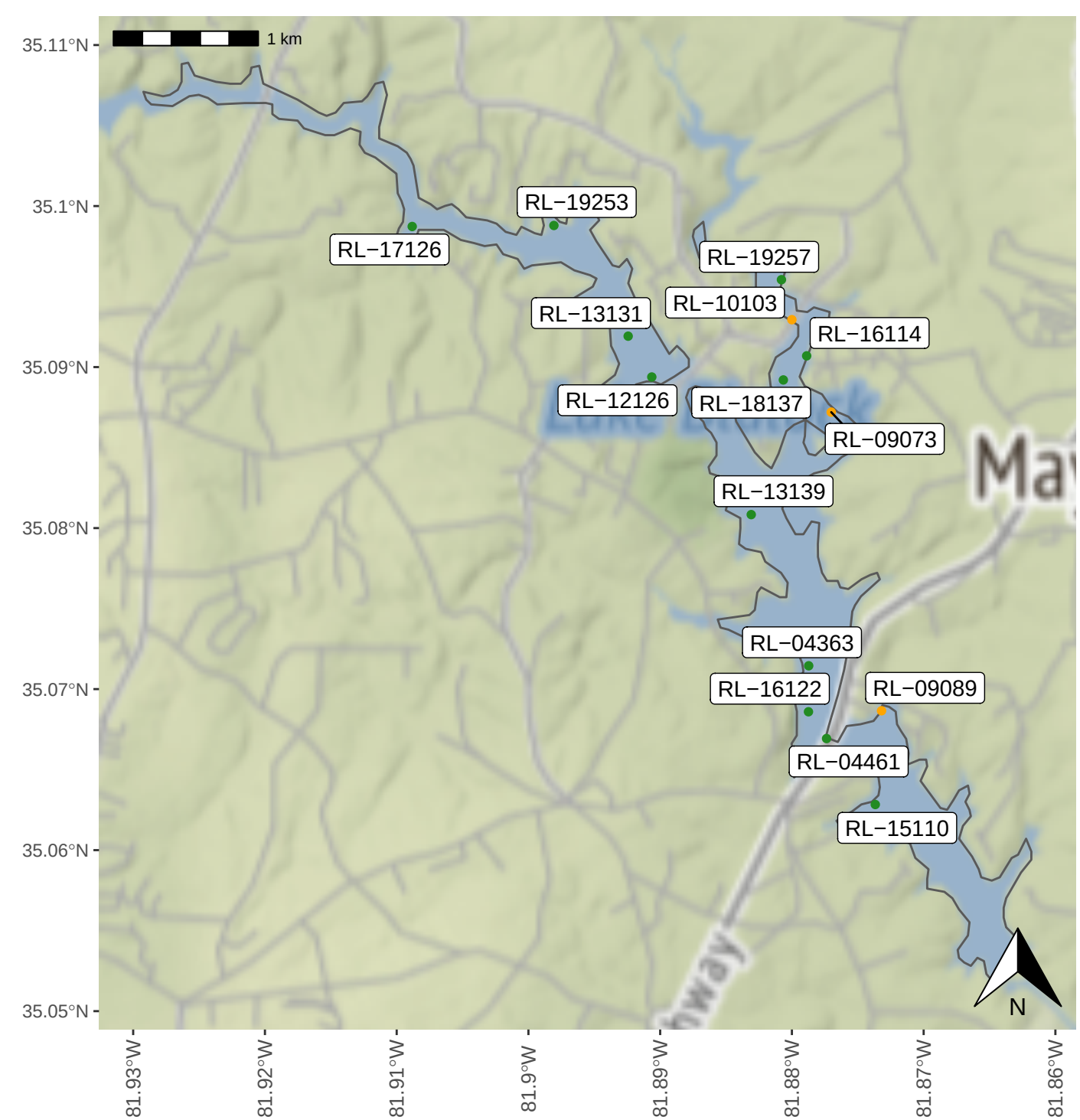
Support

Meets



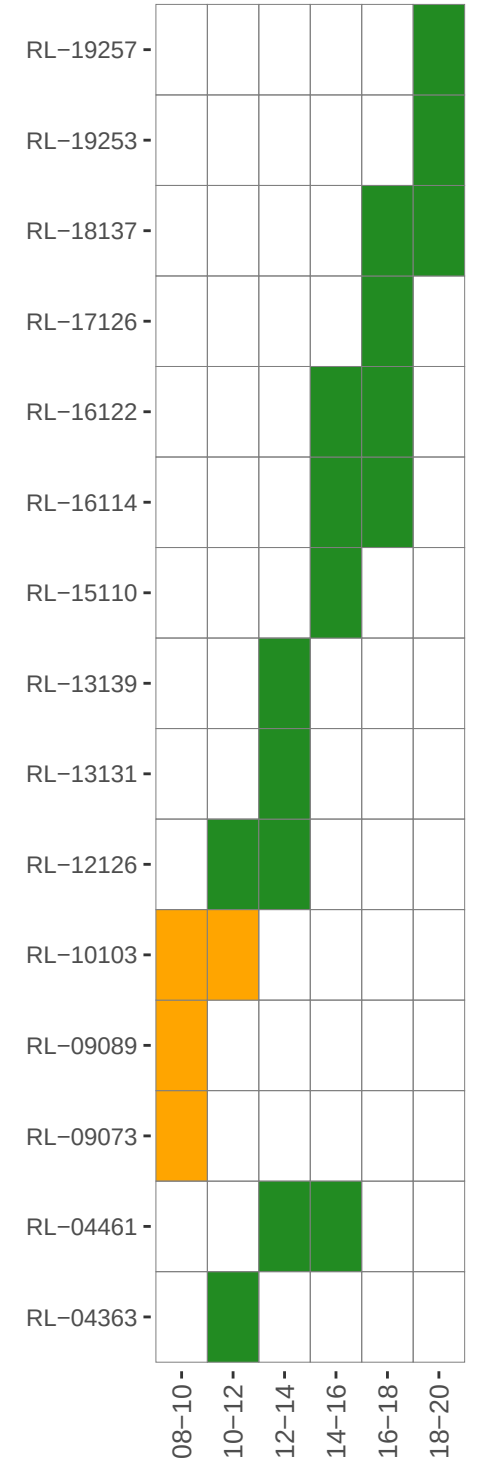
Assessment Cycle Years

Lake Blalock

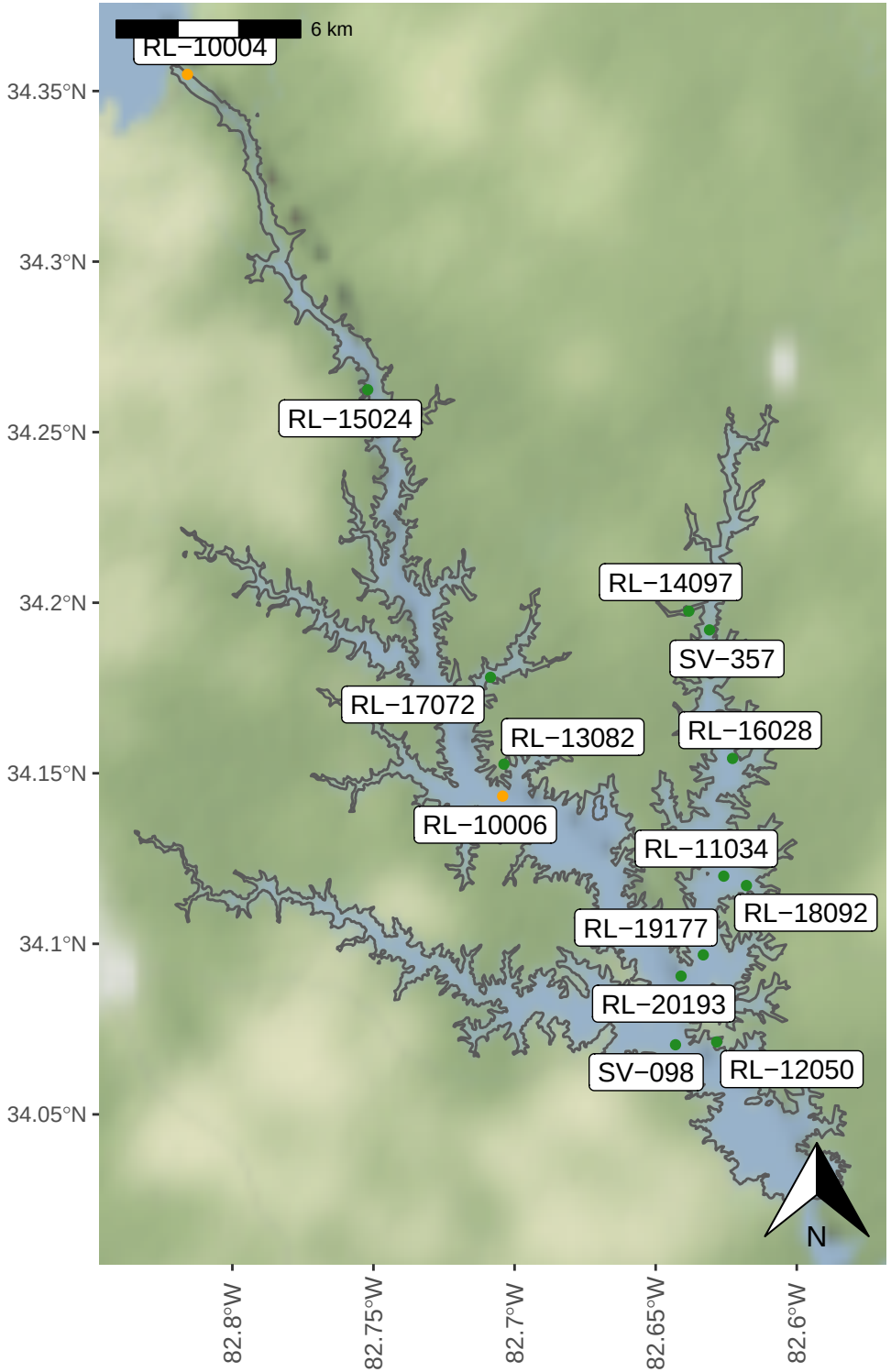


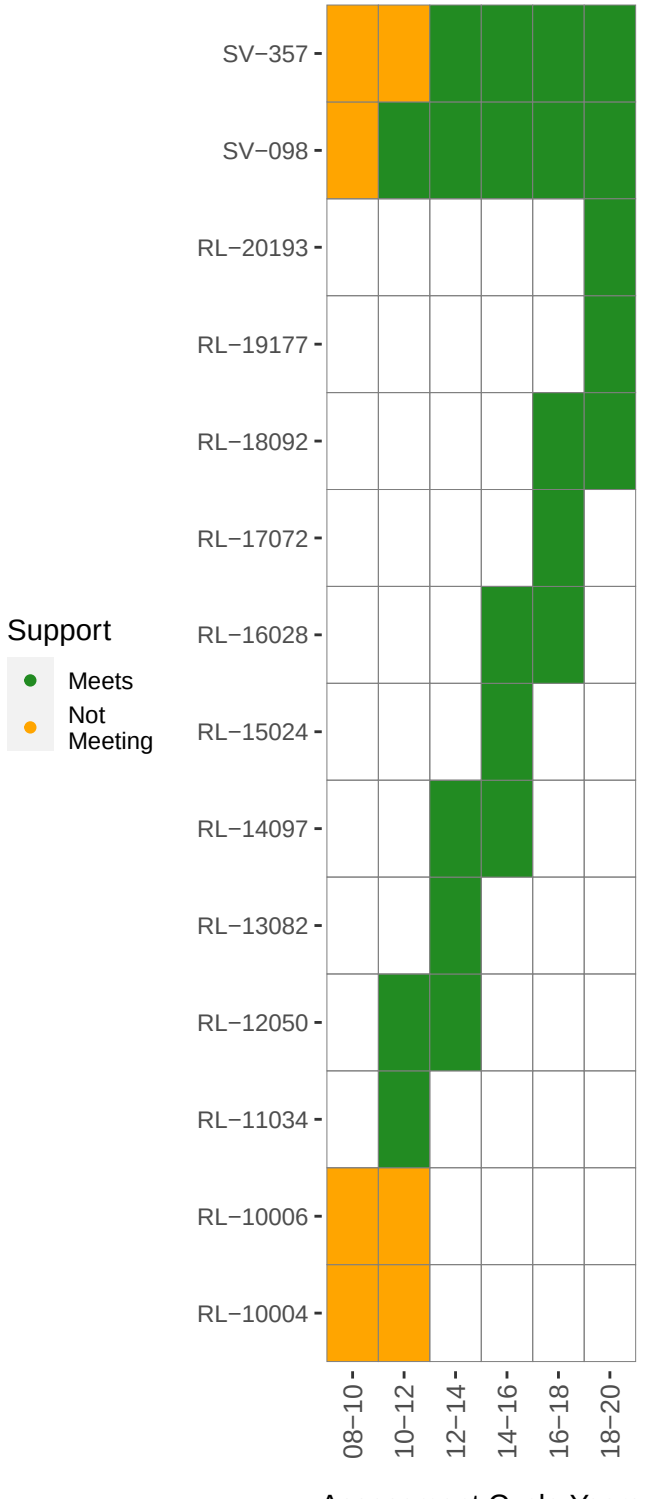
Support

- Meets
- Not Meeting

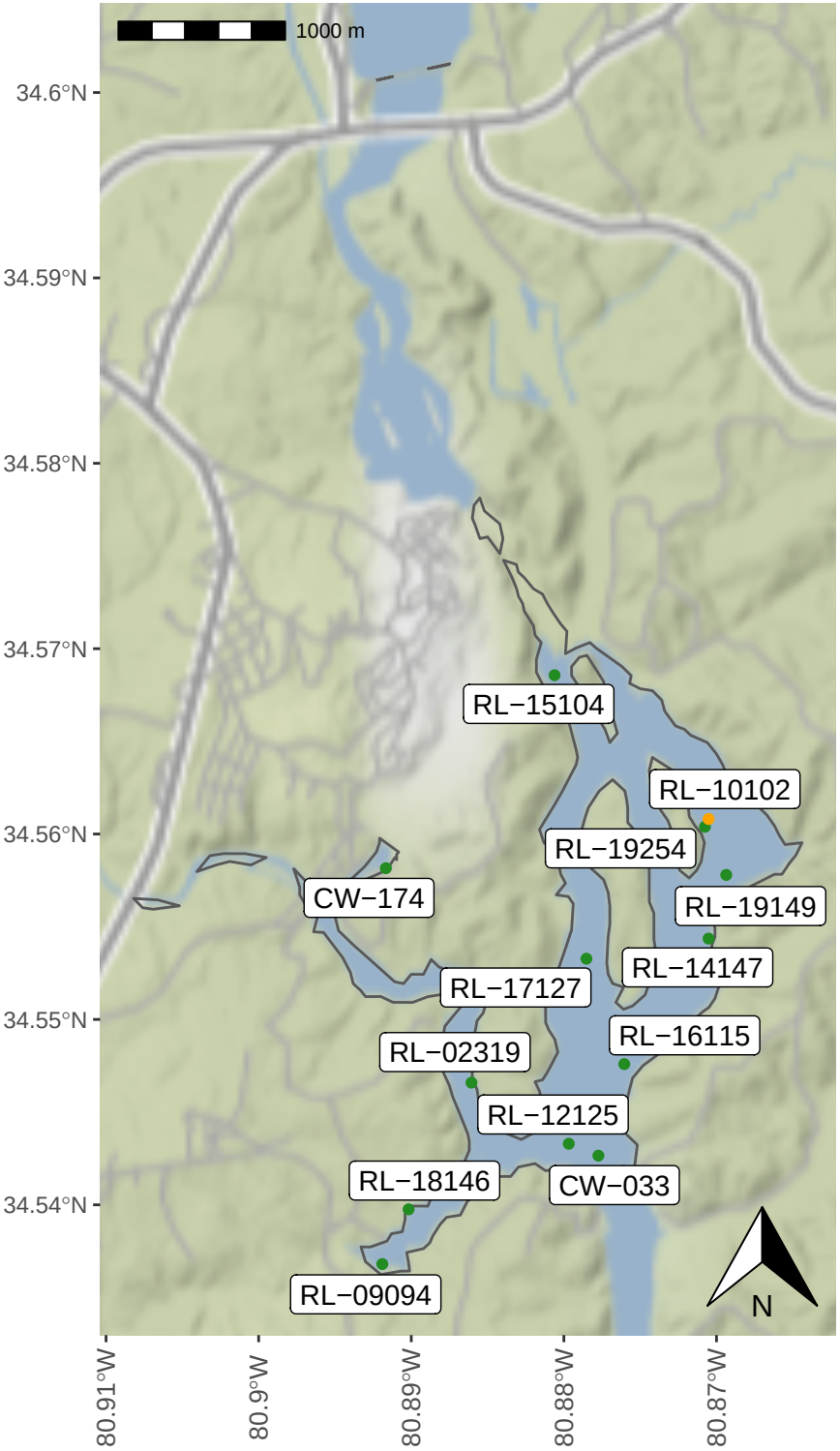


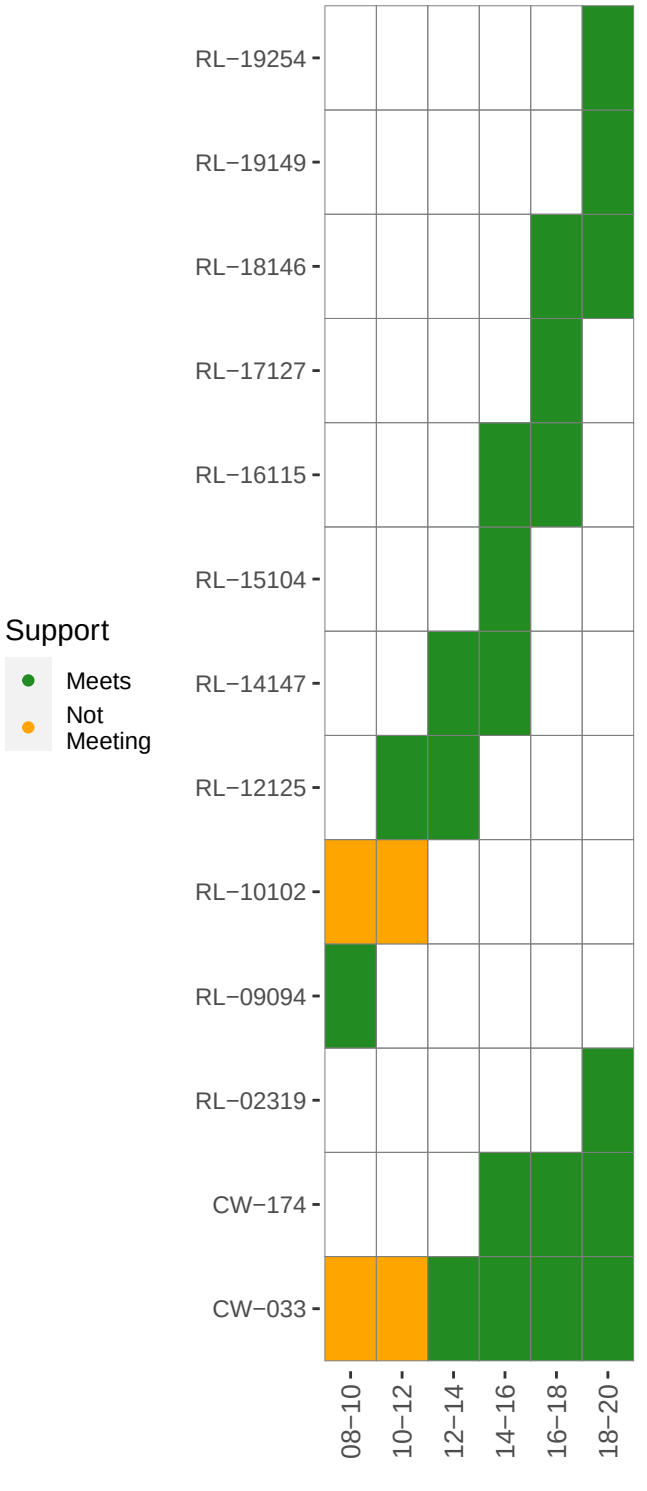
Richard B. Russell



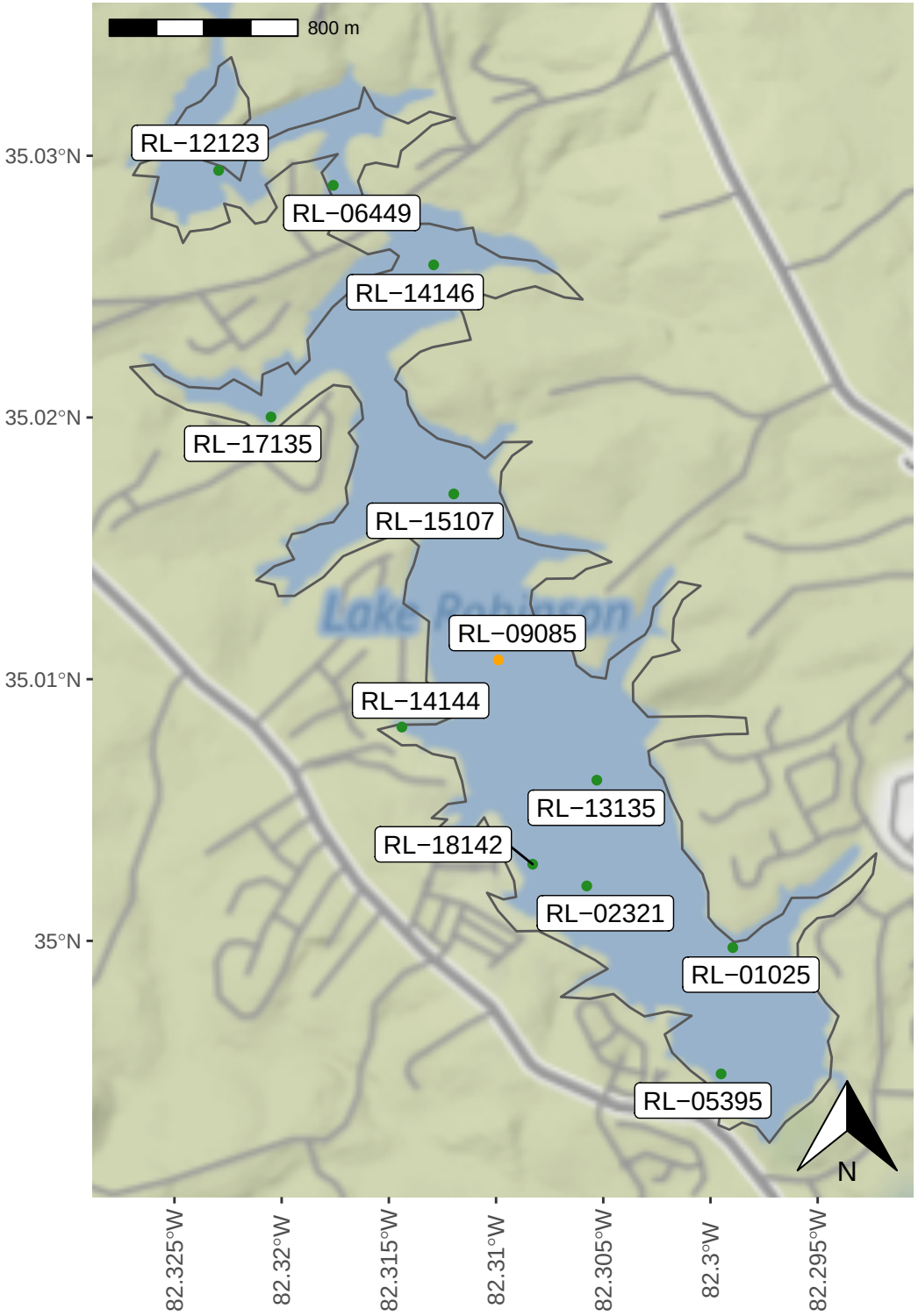


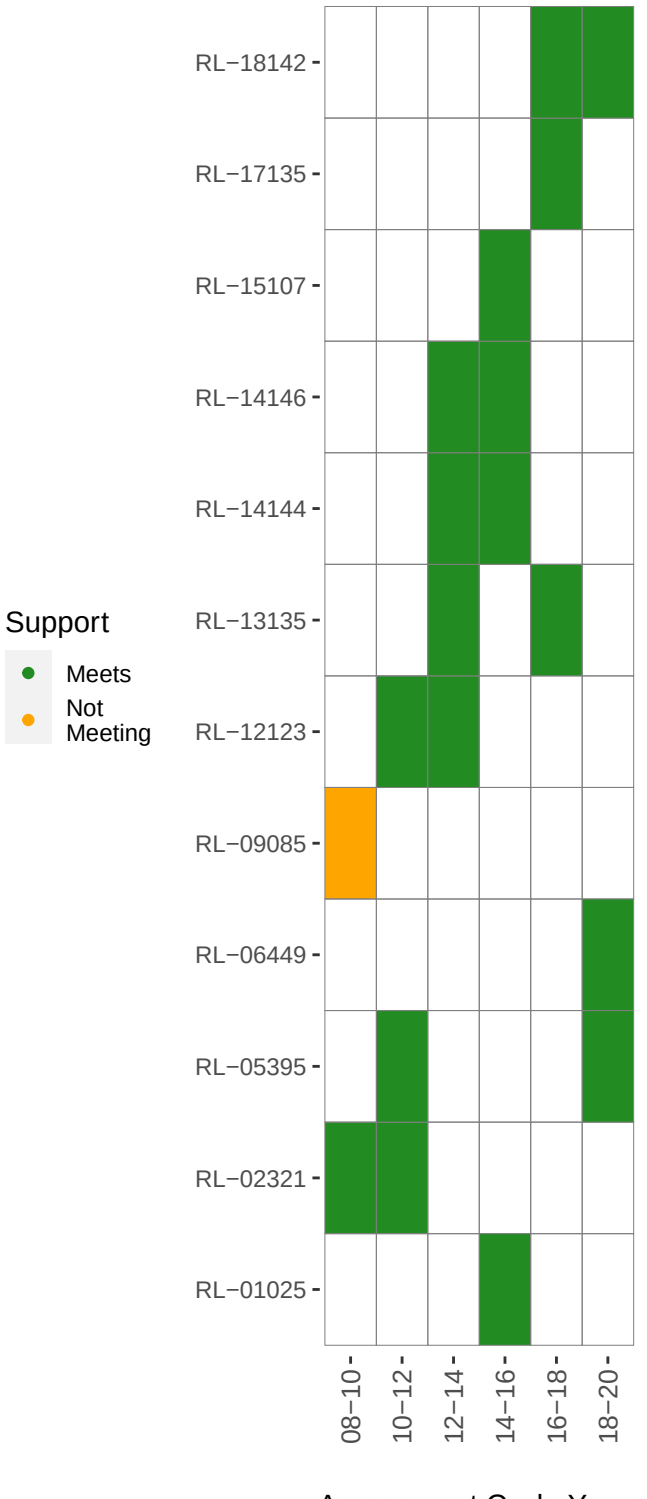
Cedar Creek Reservoir



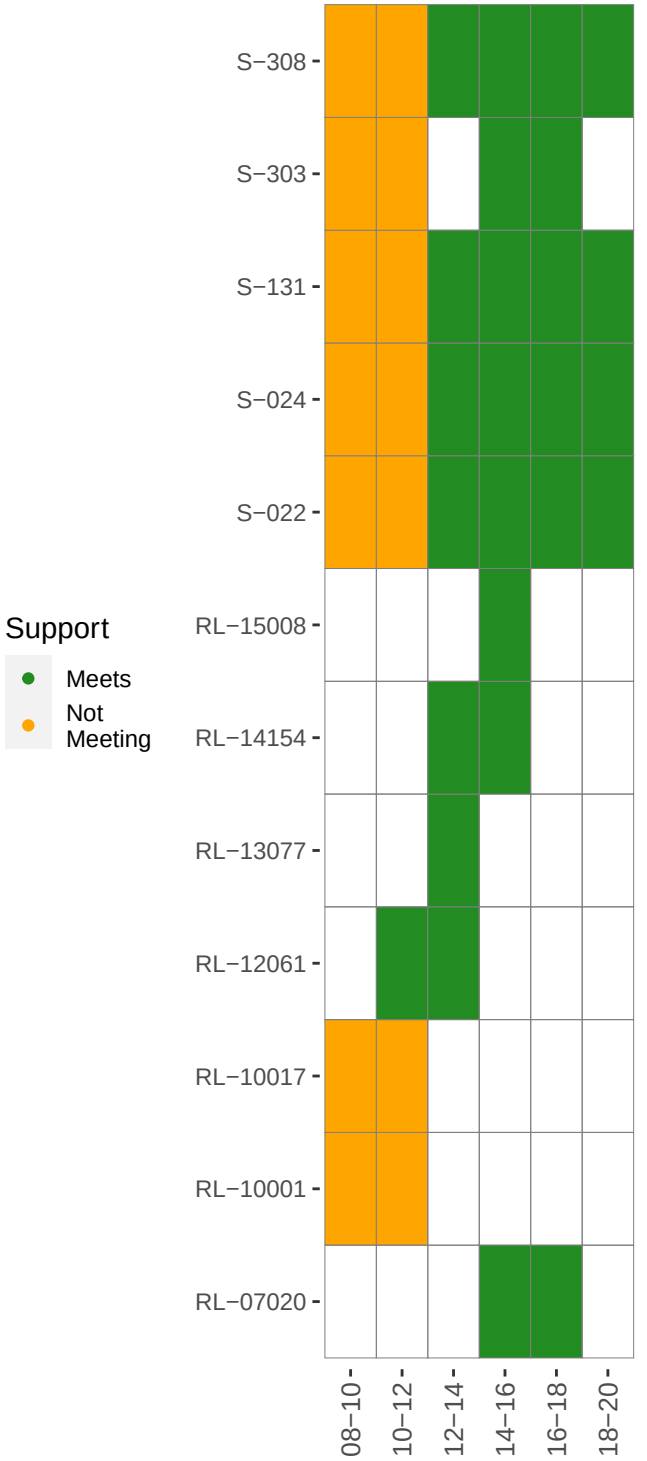


J. Robinson Lake

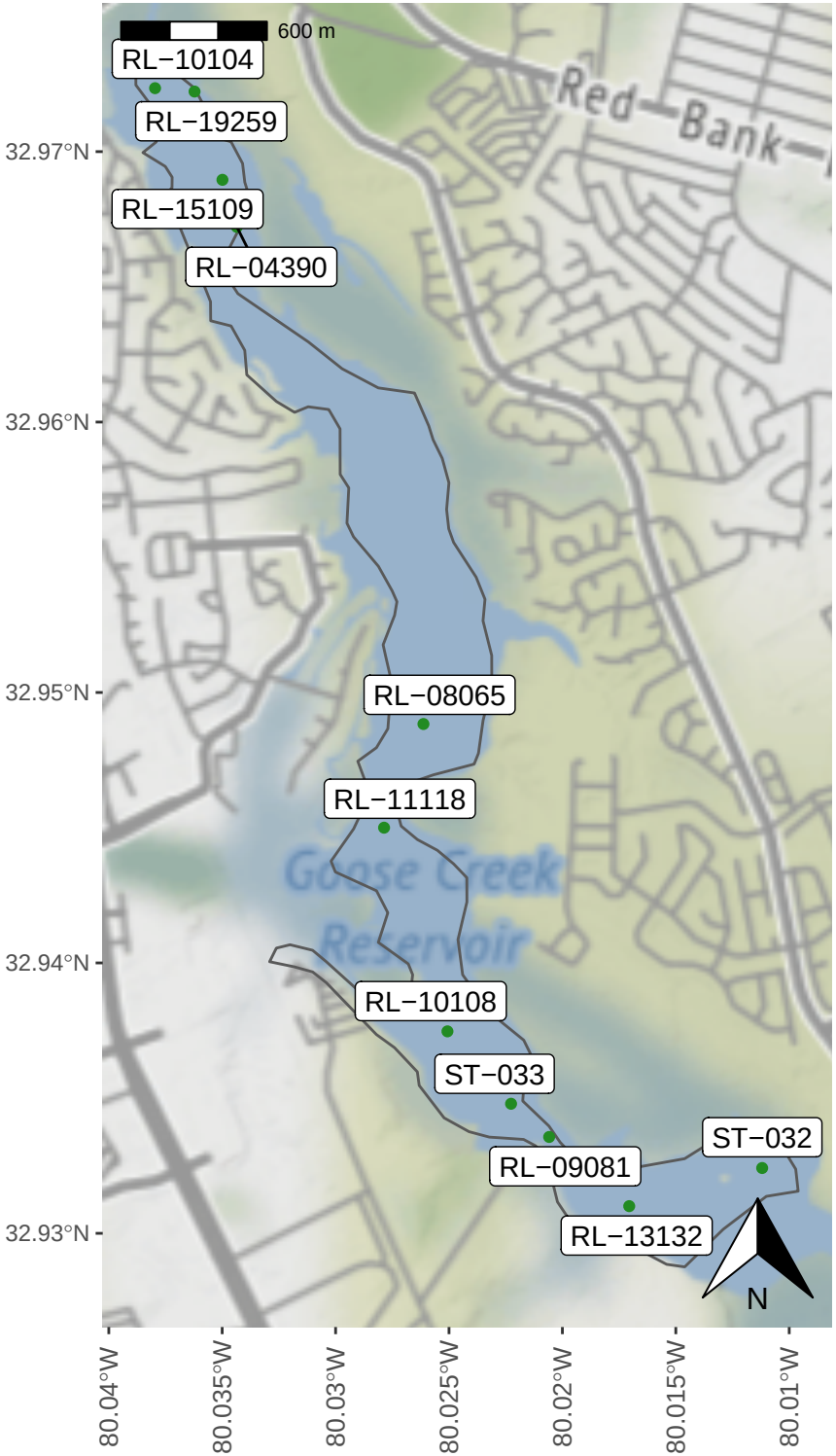


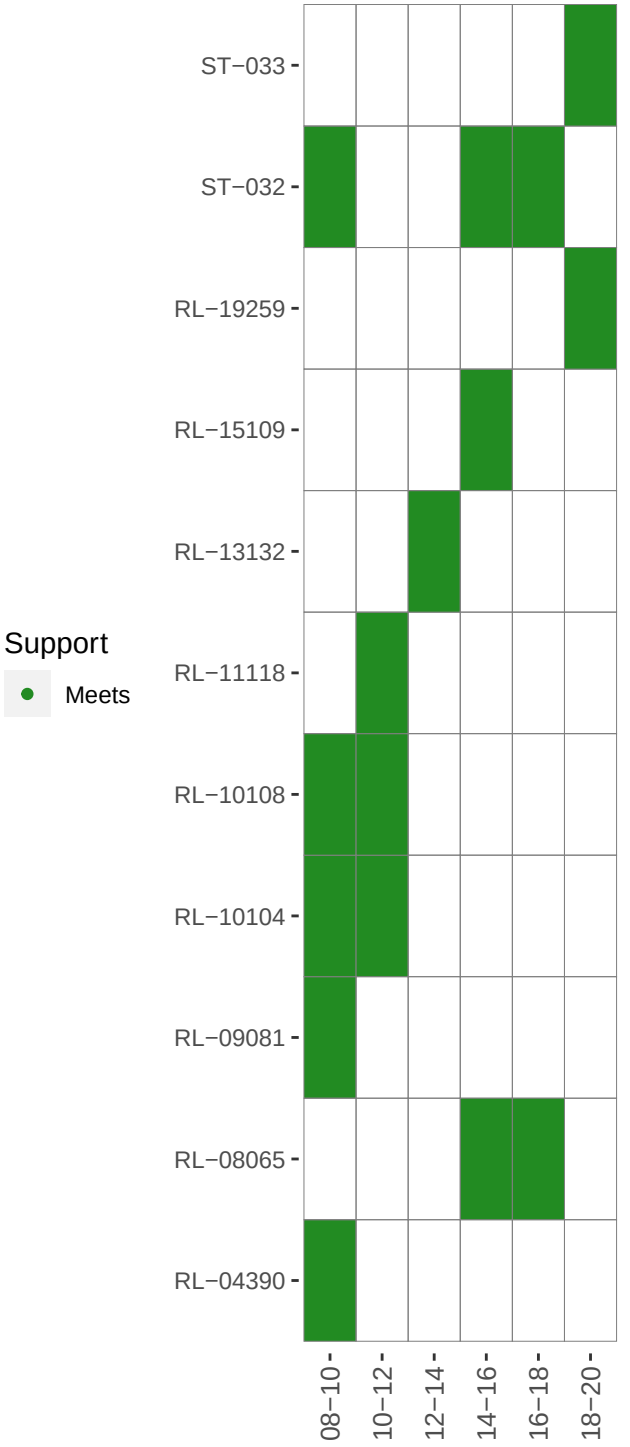


Lake Greenwood

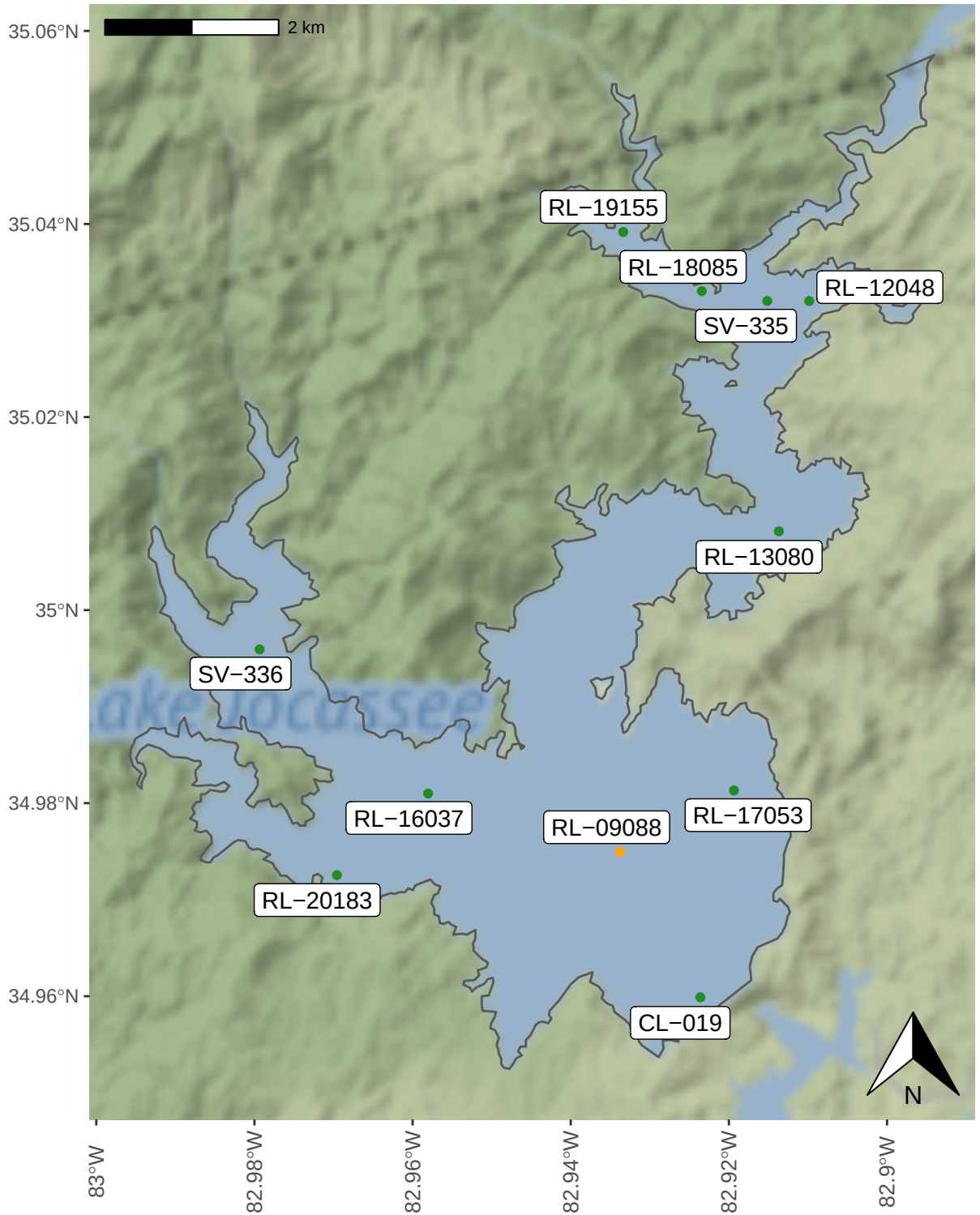


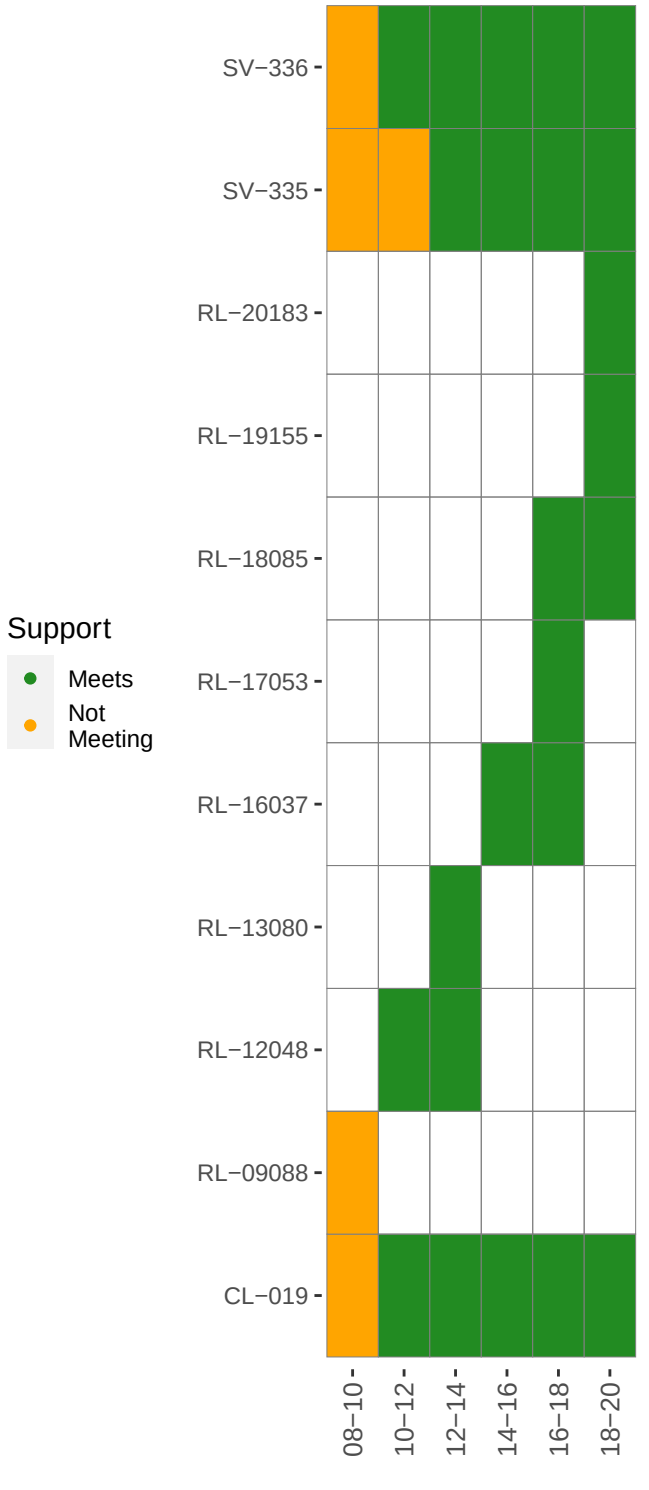
Goose Creek Reservoir



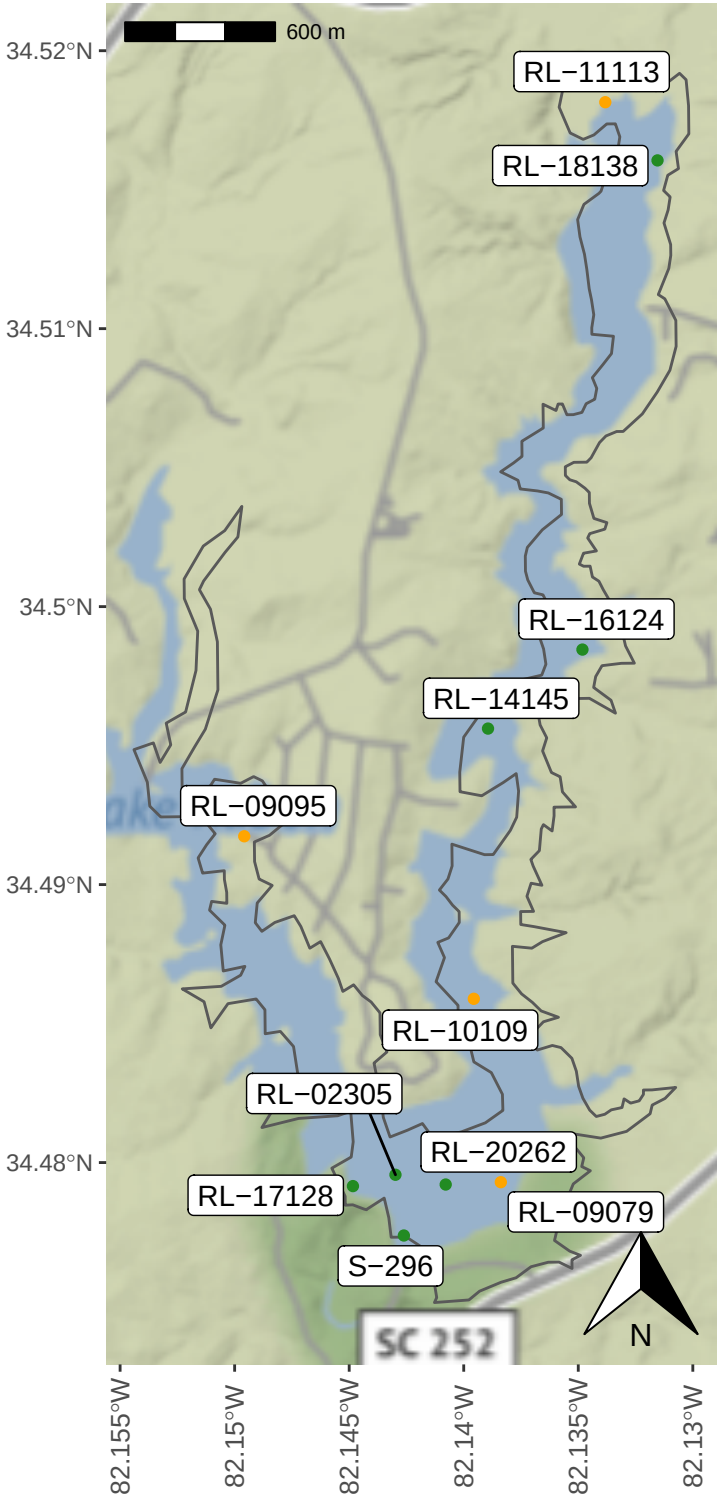


Lake Jocassee





Lake Rabon


600 m
34.52°N
34.51°N
34.5°N
34.49°N
34.48°N
RL−11113
RL−18138
RL−16124
RL−14145
RL−09095
RL−10109
RL−02305
RL−20262
RL−17128
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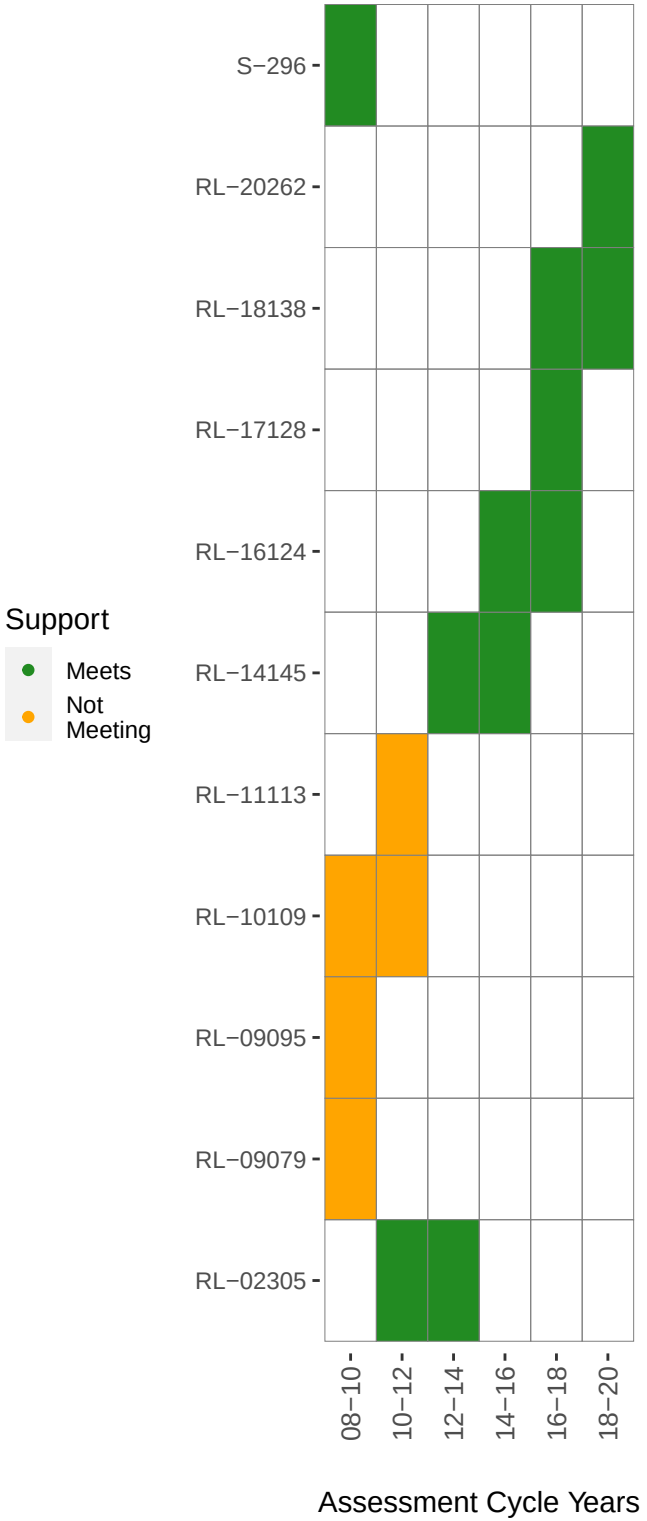
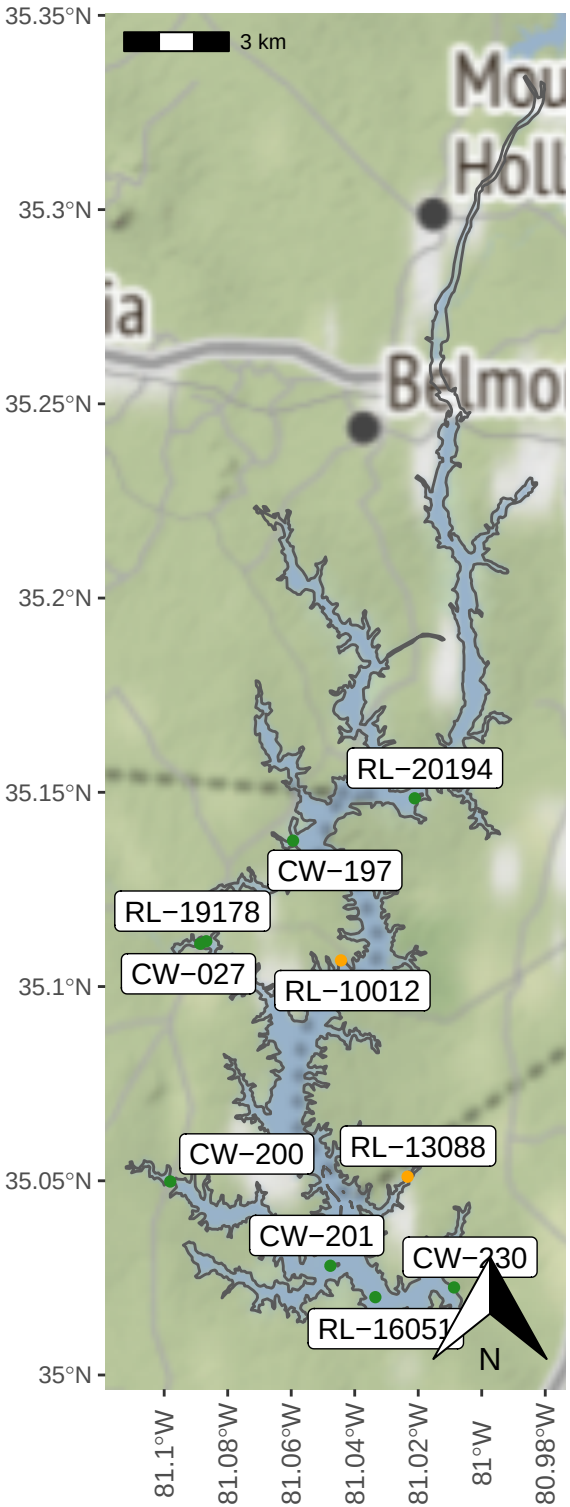
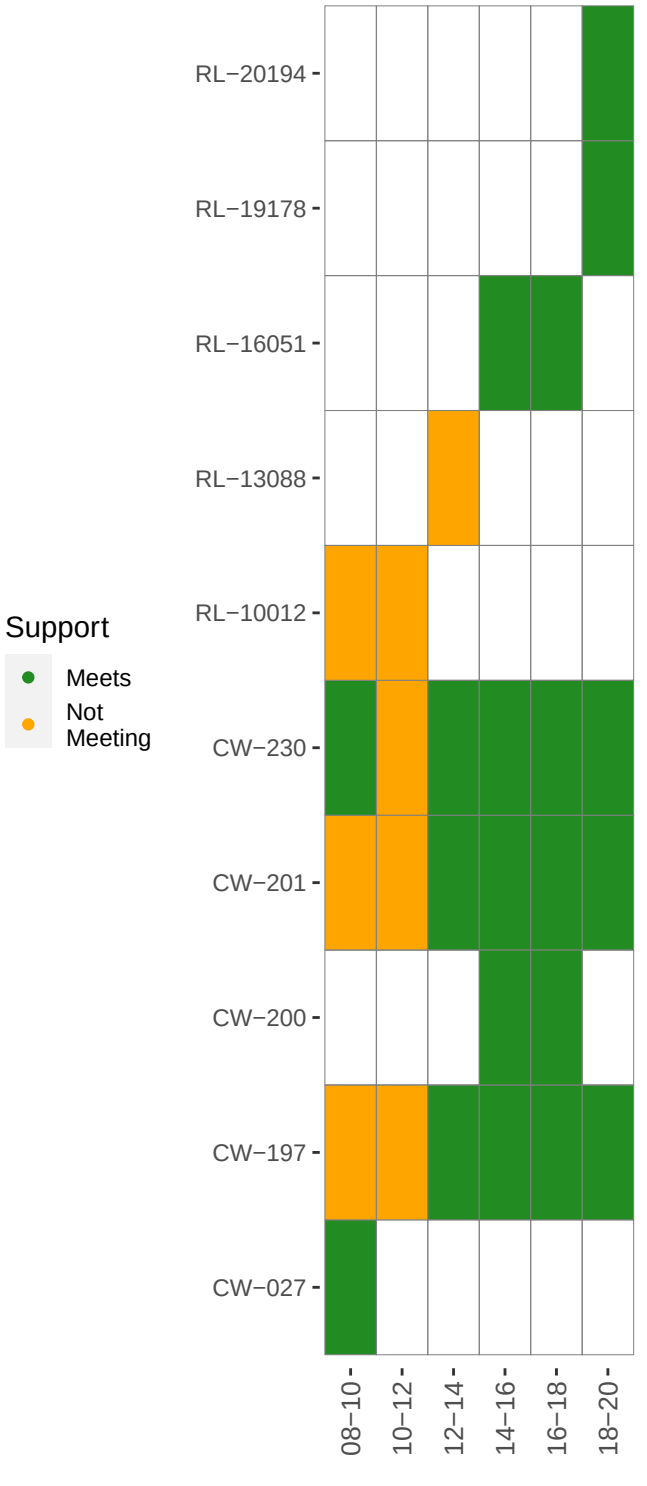
82.145°W
82.14°W
82.135°W
82.13°W

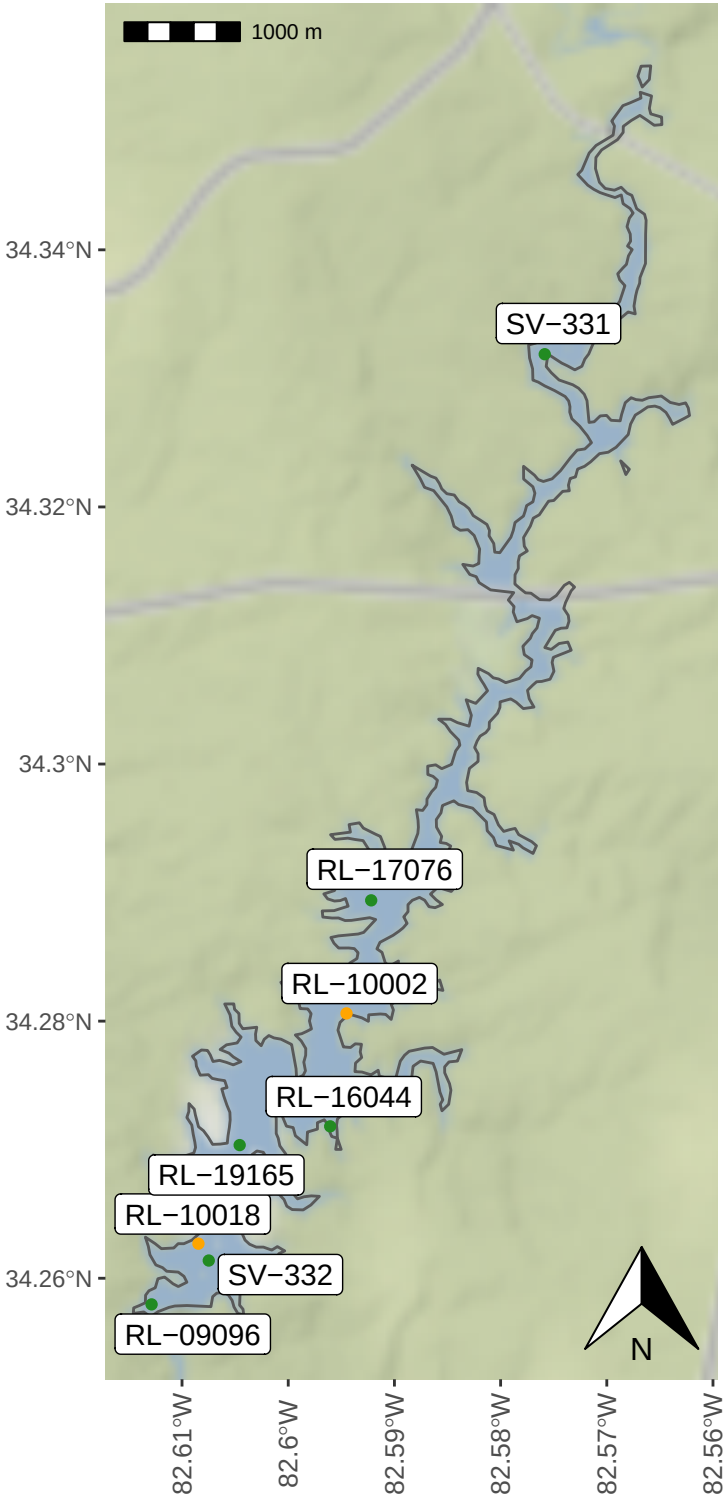

Support
Meets
Not Meeting
S−296
RL−20262
RL−18138
RL−17128
RL−16124
RL−14145
RL−11113
RL−10109
RL−09095
RL−09079
RL−02305
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

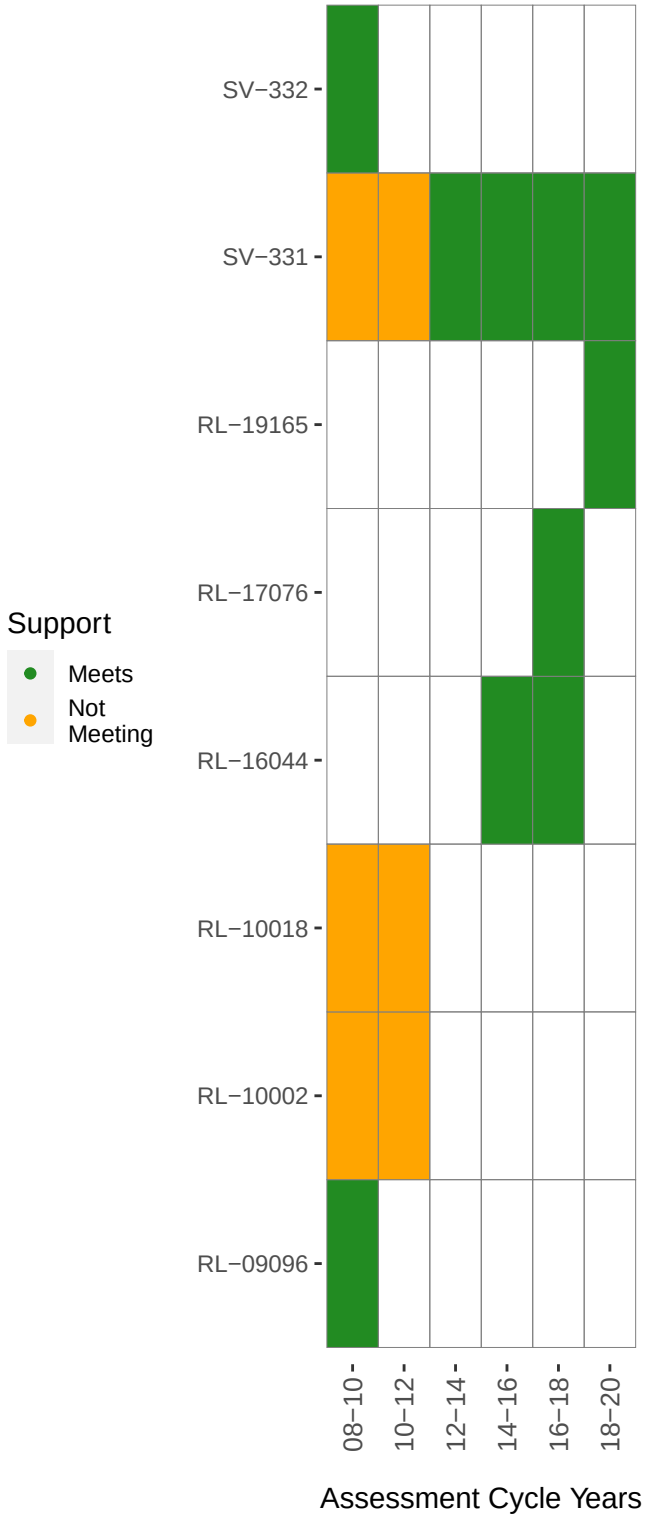
Lake Wylie


3 km
35.35°N
35.3°N
35.25°N
35.2°N
35.15°N
35.1°N
35.05°N
35°N
81.1°W
81.08°W
81.06°W
81.04°W
81.02°W
81°W
80.98°W
RL−20194
CW−197
RL−19178
CW−027
RL−10012
CW−200
RL−13088
CW−201
CW−230
RL−16051
N

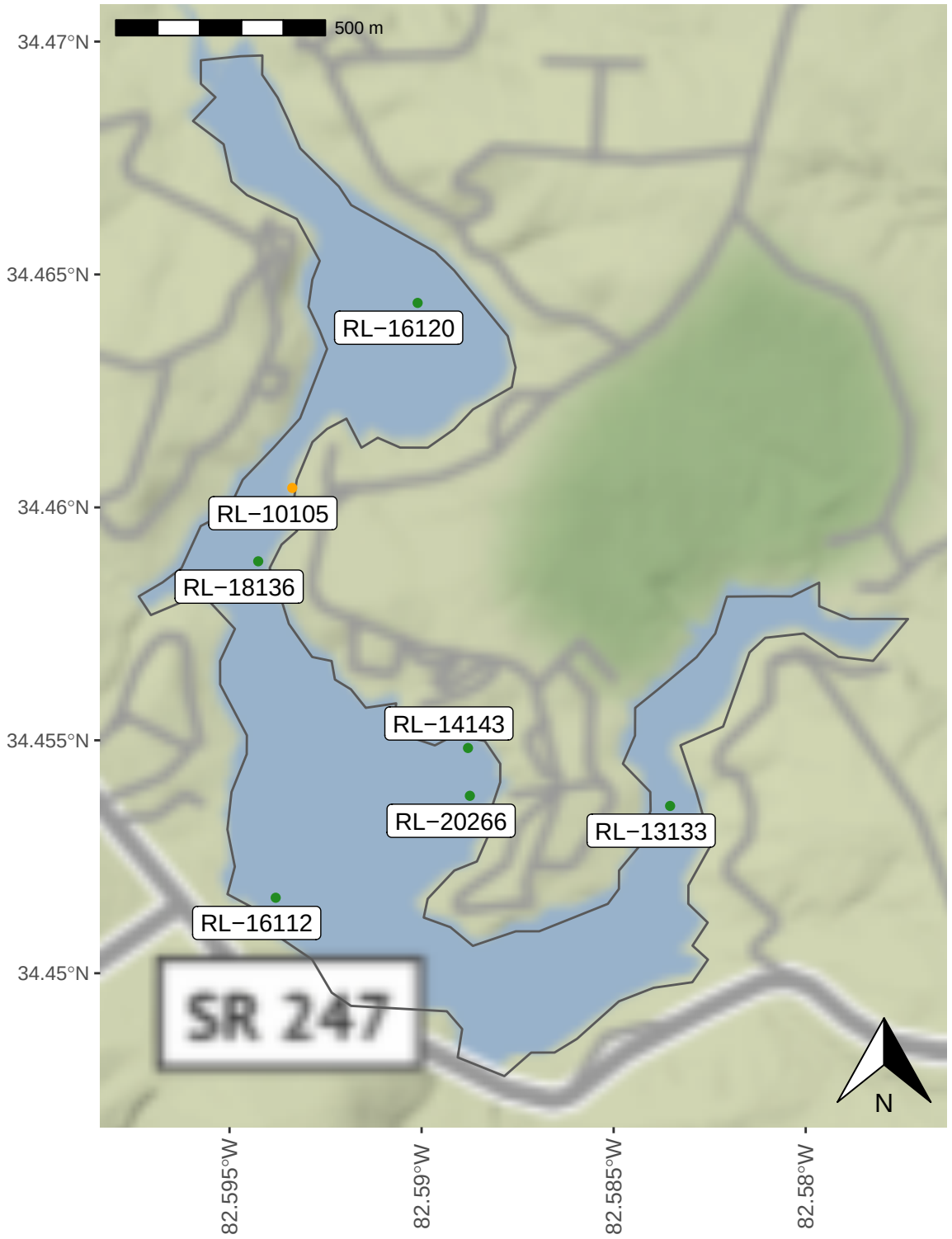

Support
Meets
Not Meeting
RL−20194
RL−19178
RL−16051
RL−13088
RL−10012
CW−230
CW−201
CW−200
CW−197
CW−027
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

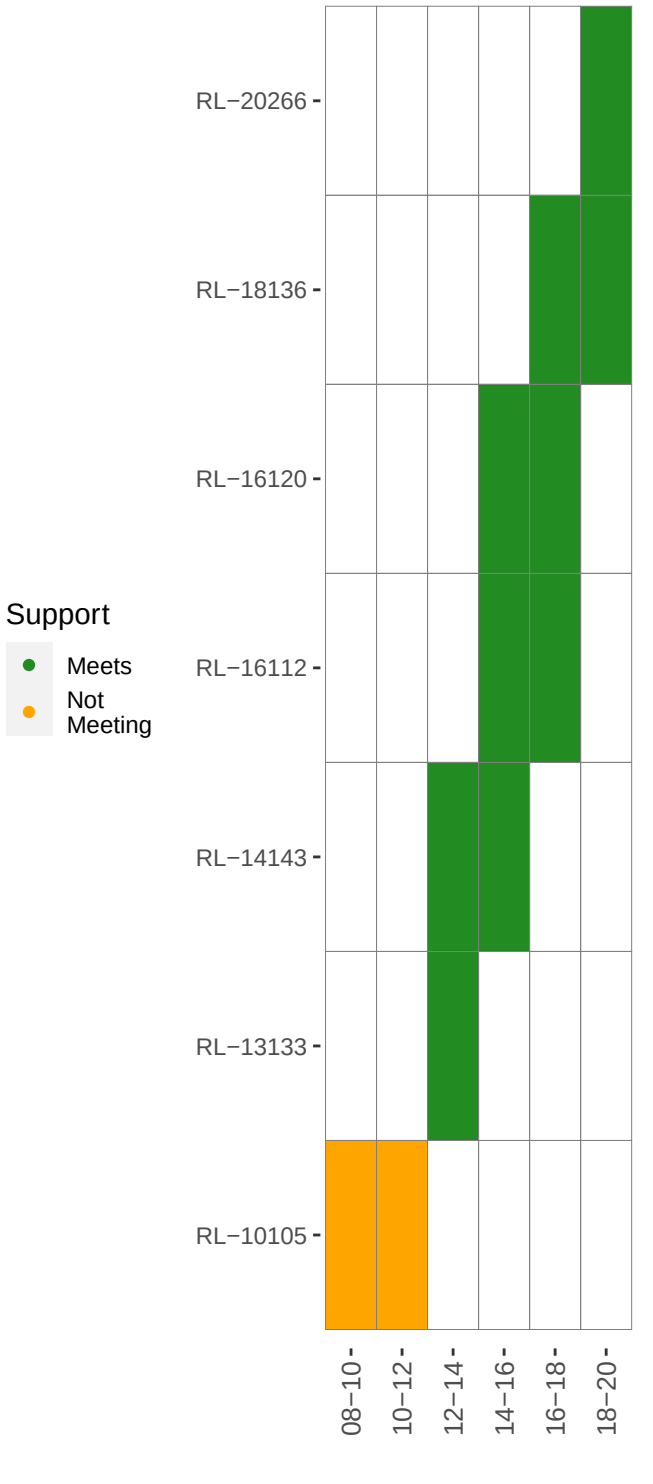
Secession Lake



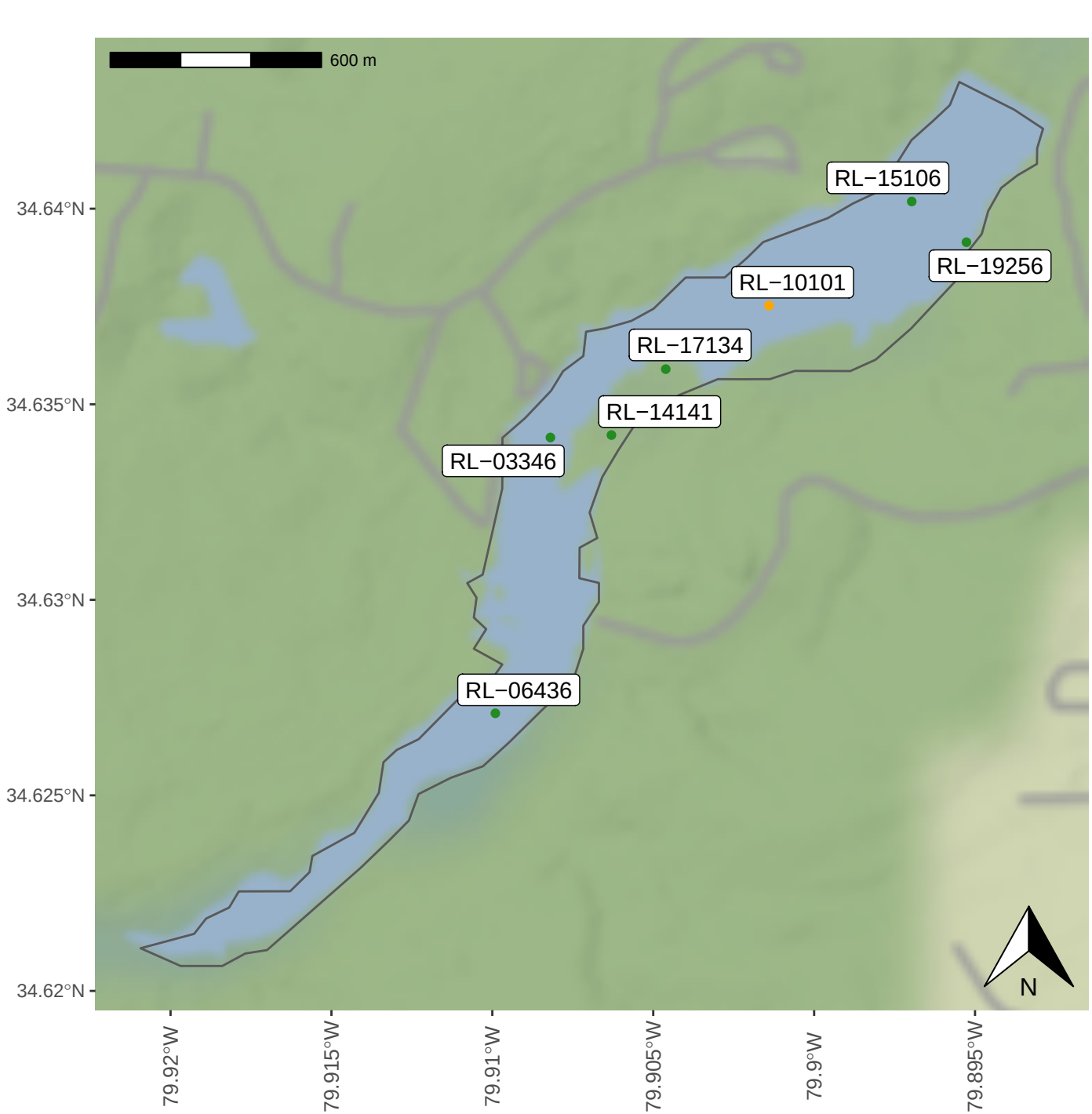


Broadway Lake



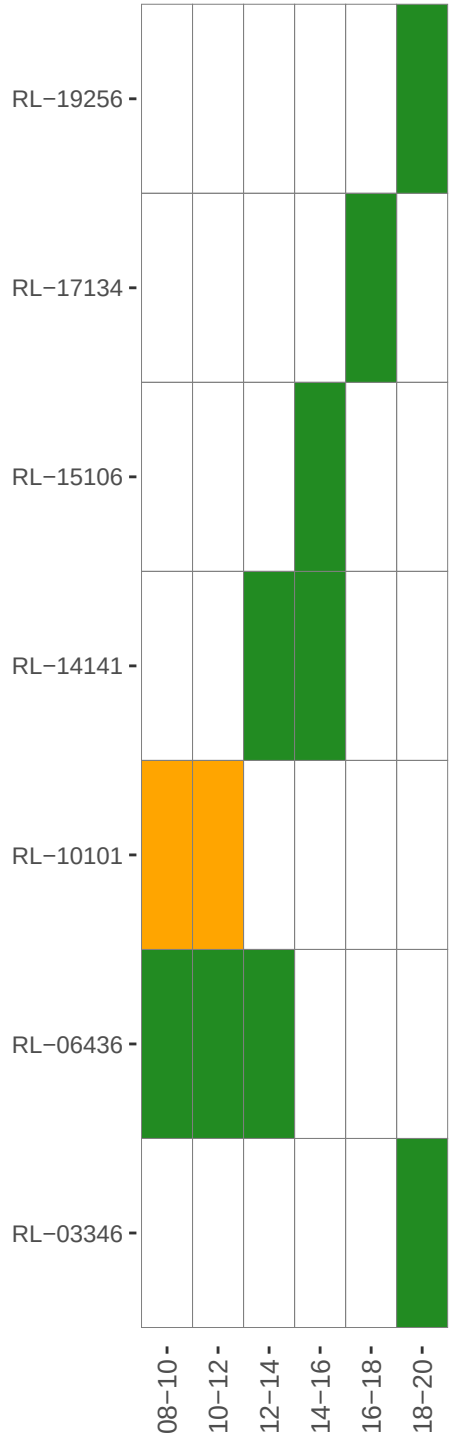


Lake Juniper



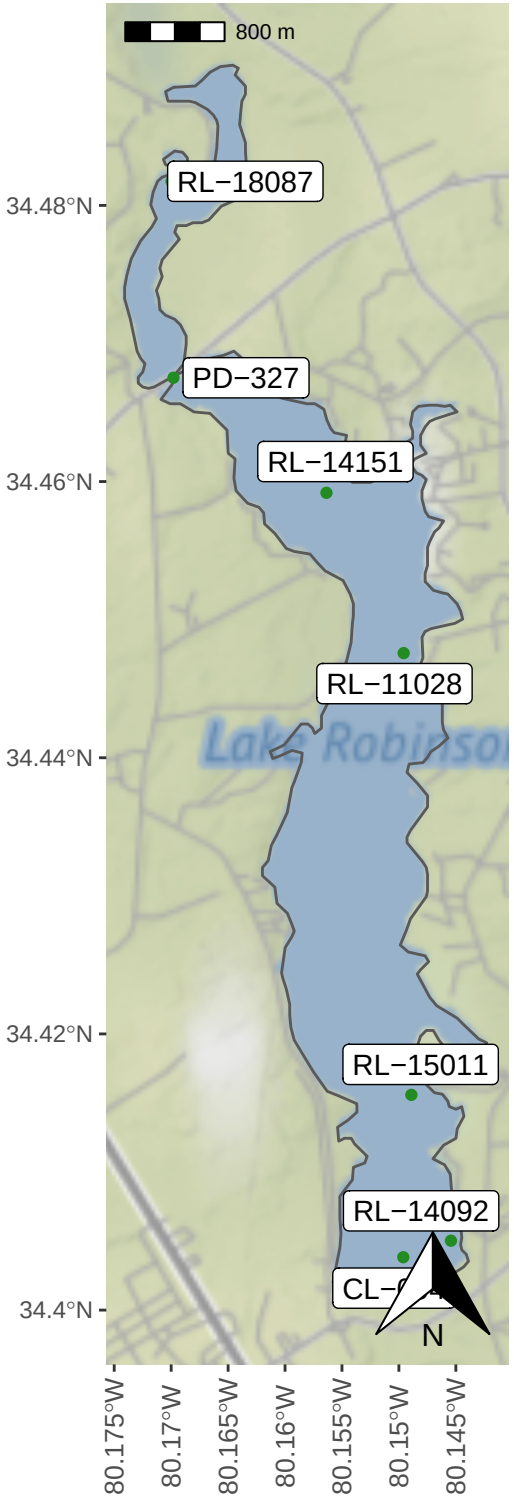
Support

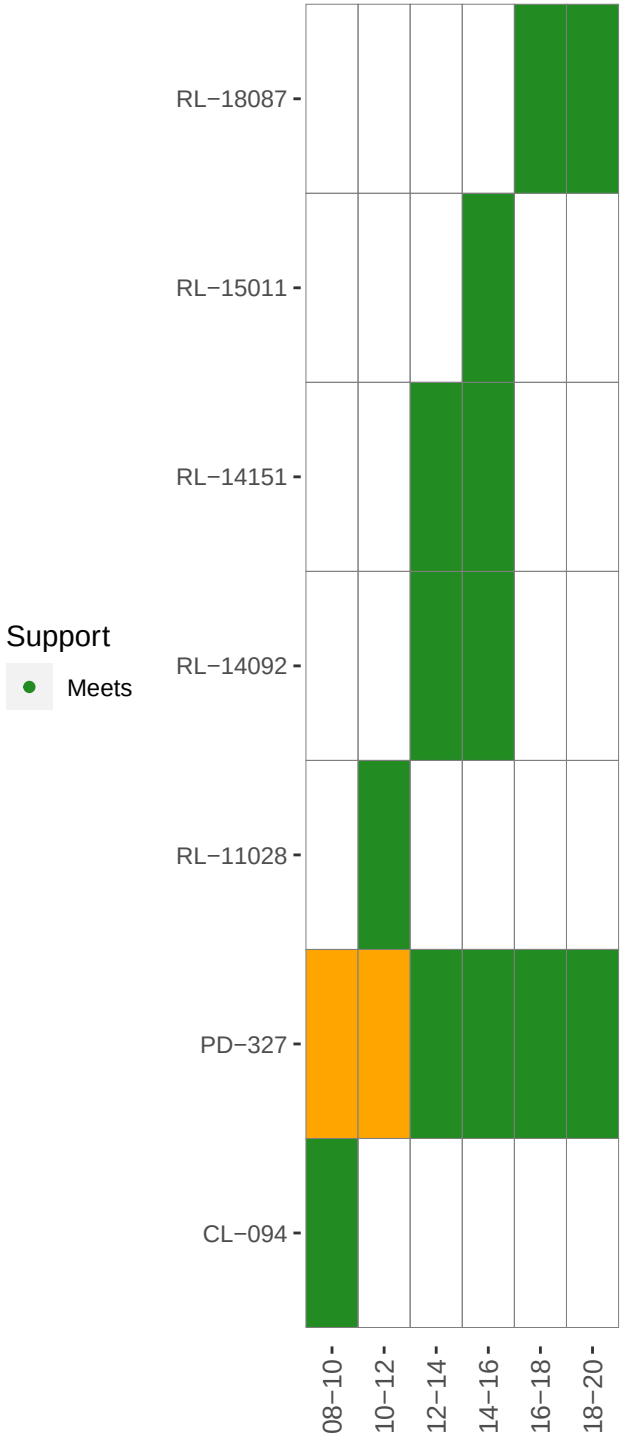
- Meets
- Not Meeting



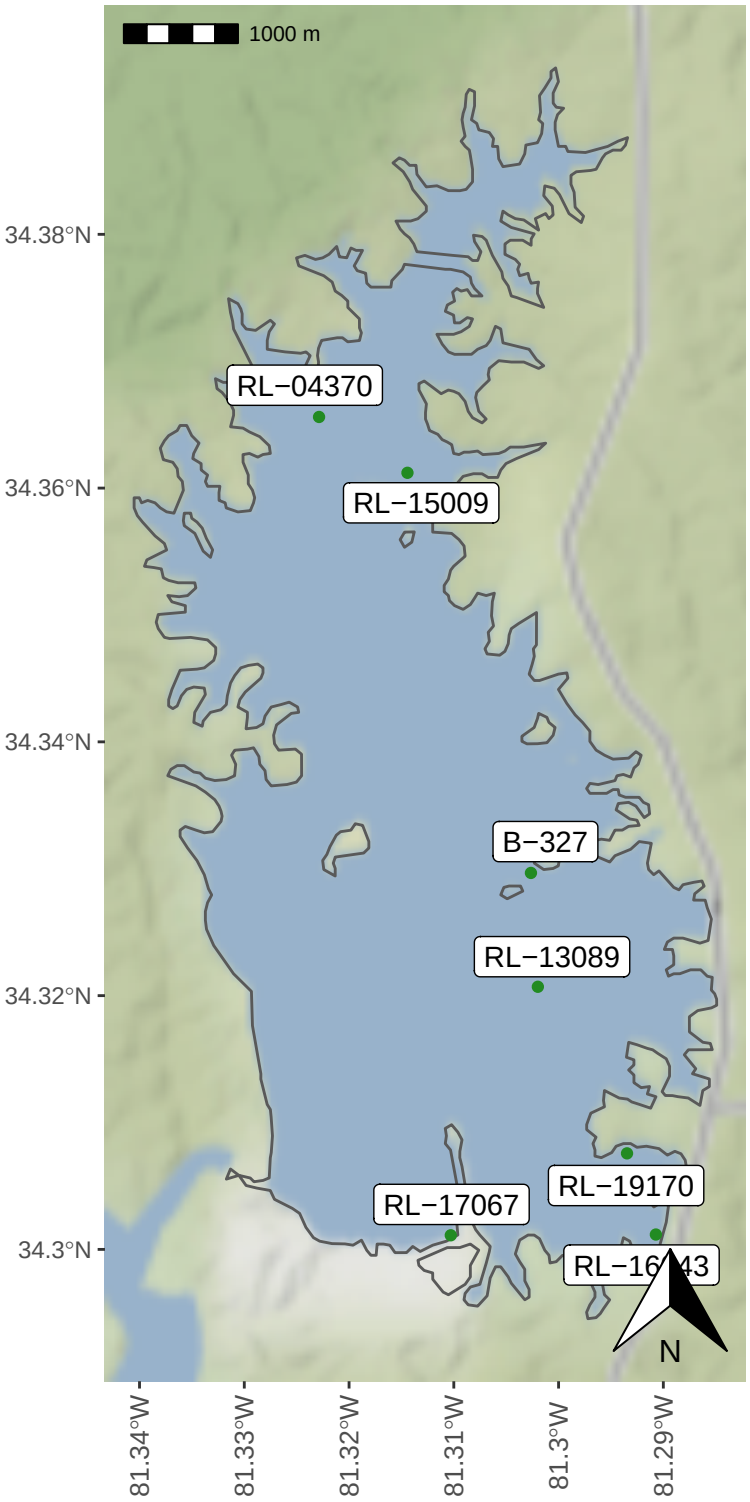
Assessment Cycle Years

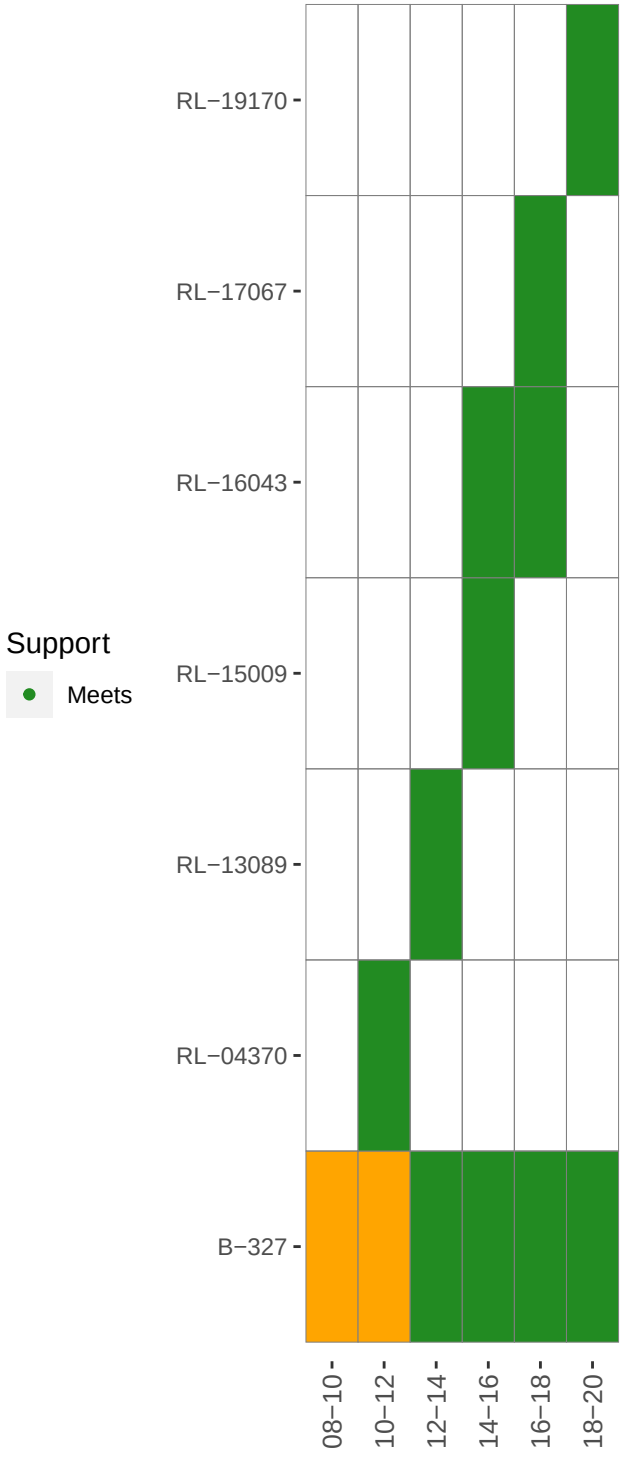
Lake Robinson



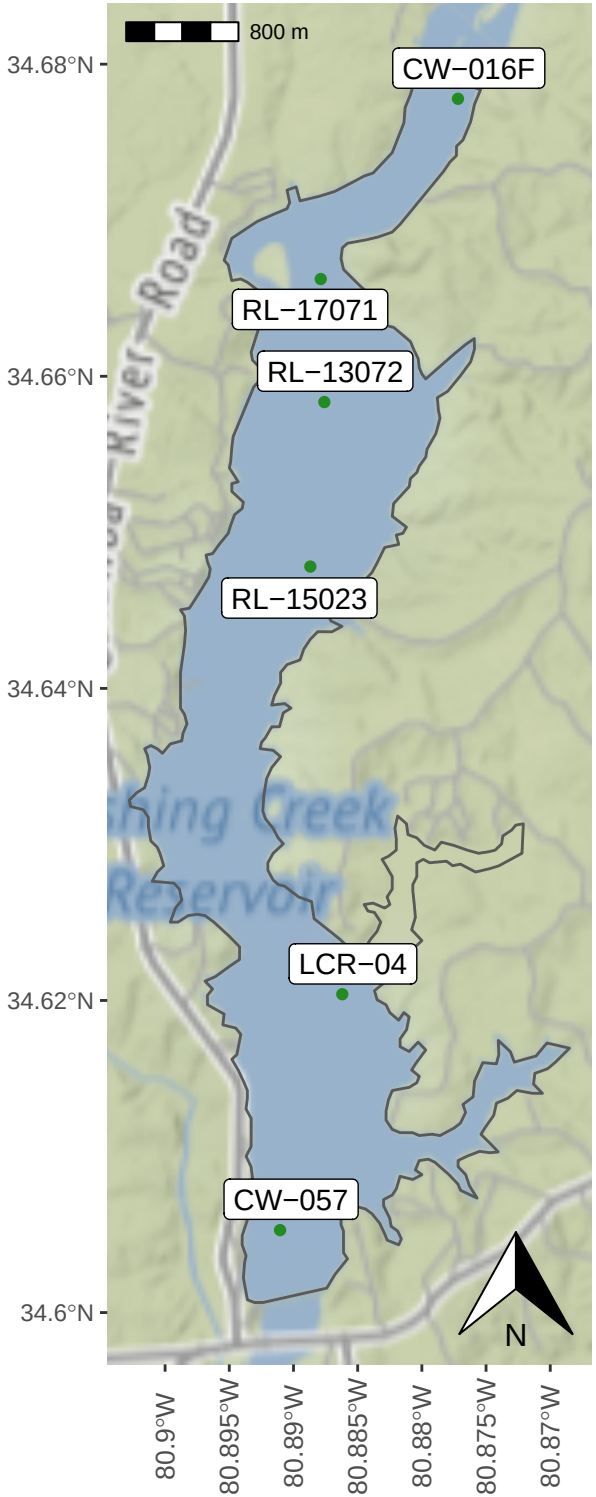


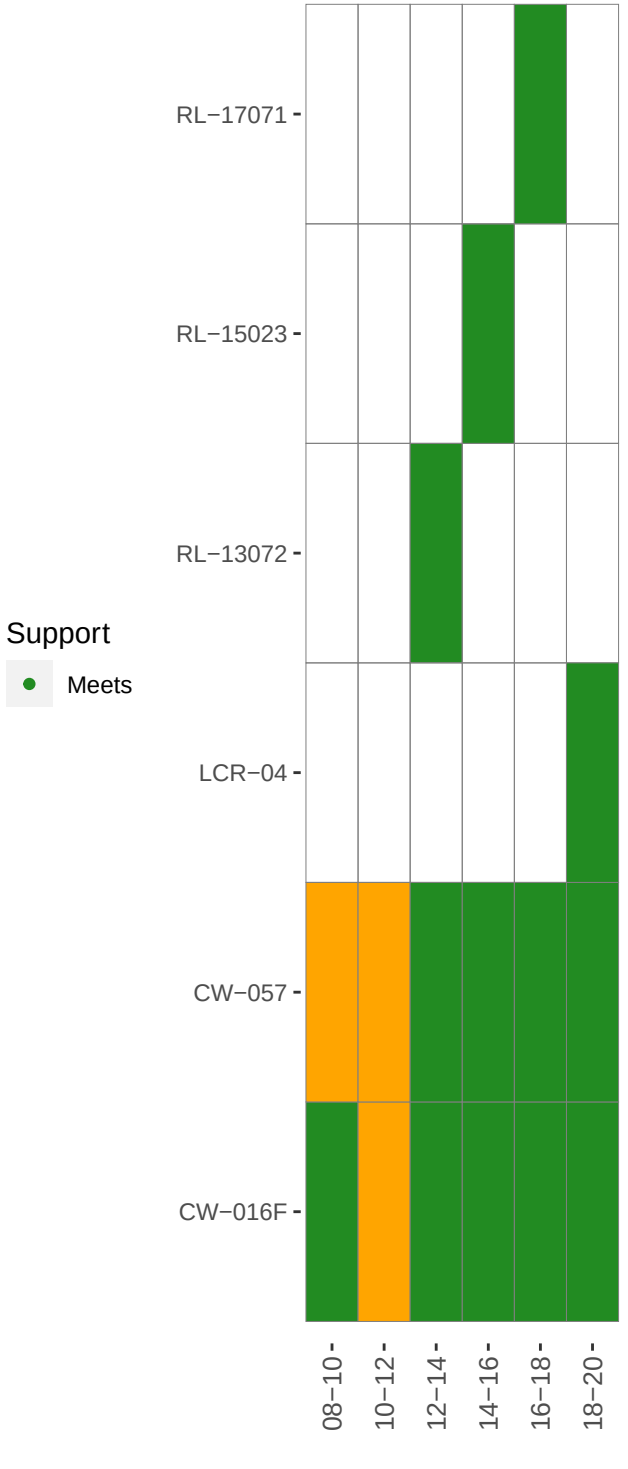
Monticello Reservoir



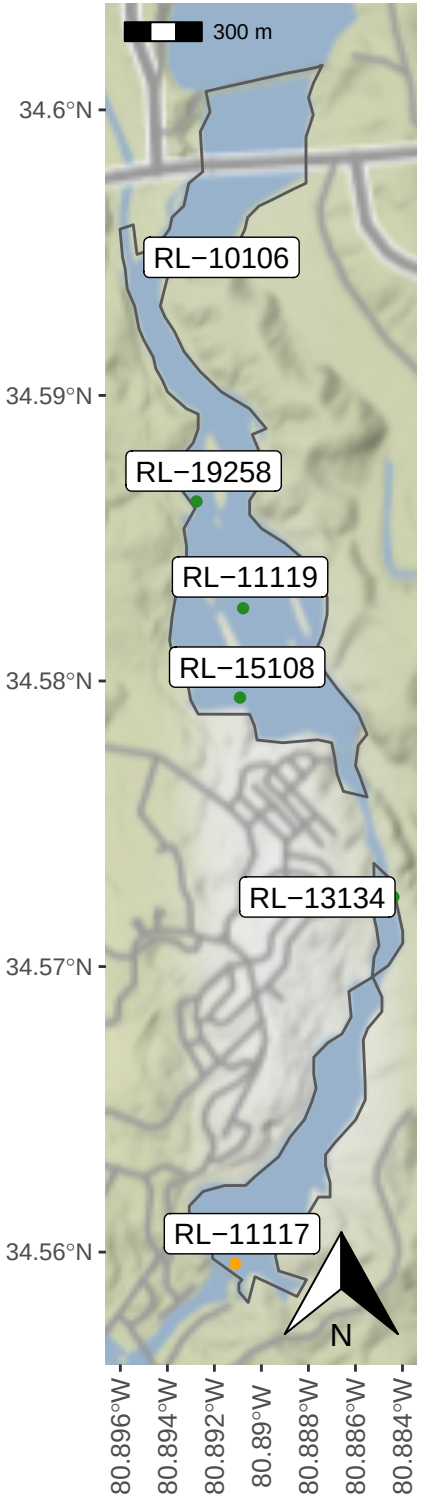


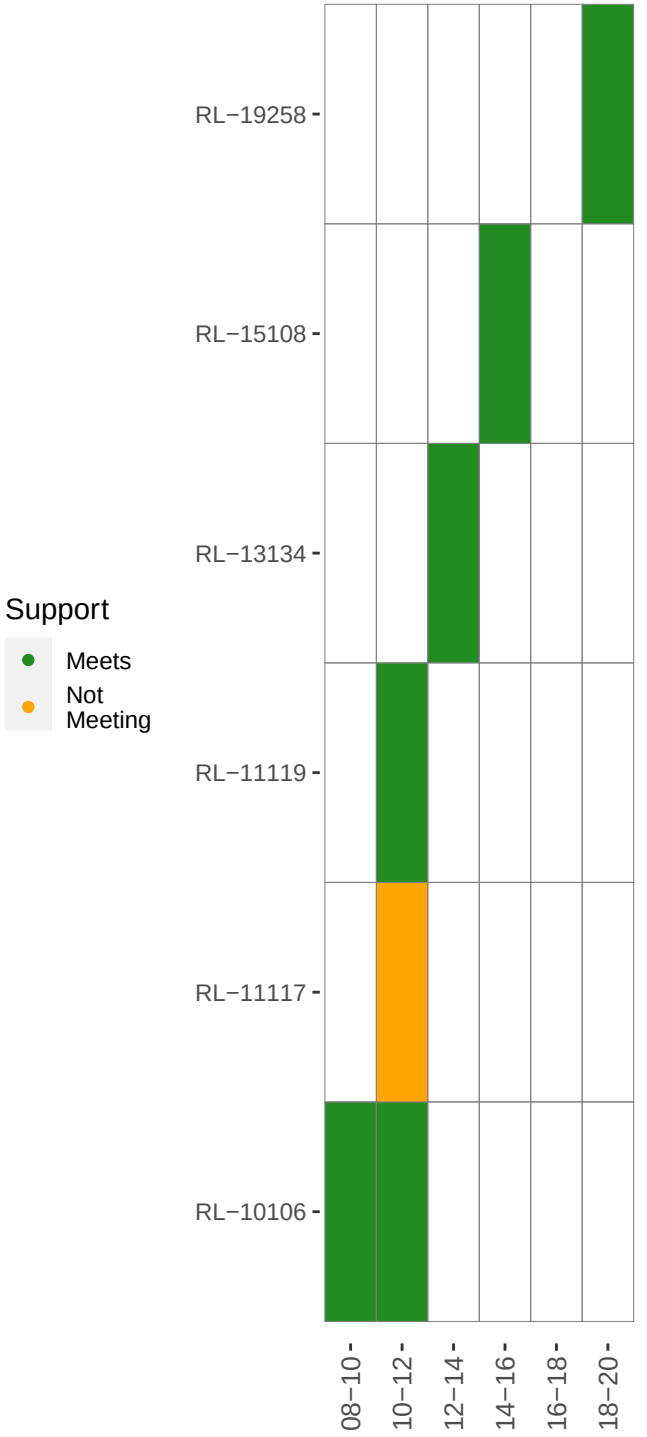
Fishing Creek Reservoir



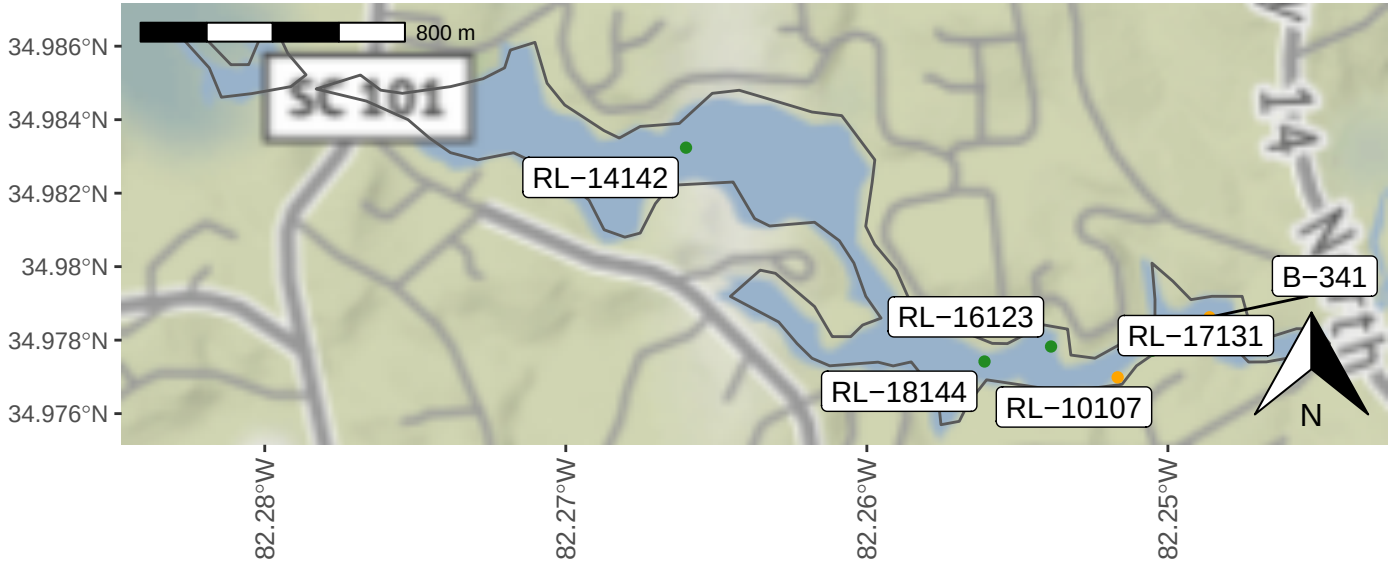


Great Fall Reservoir

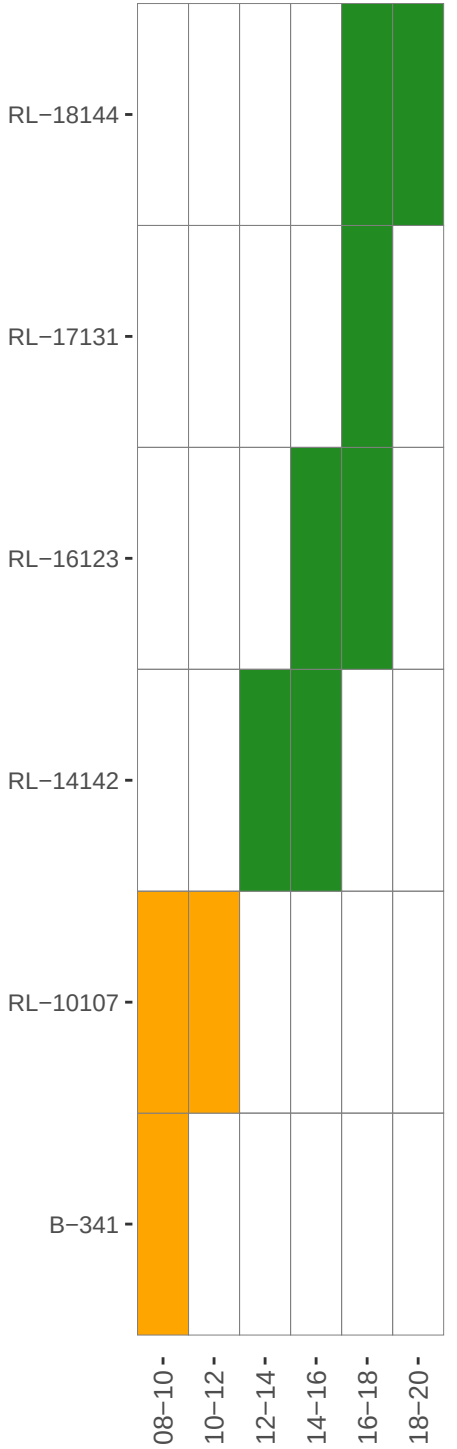




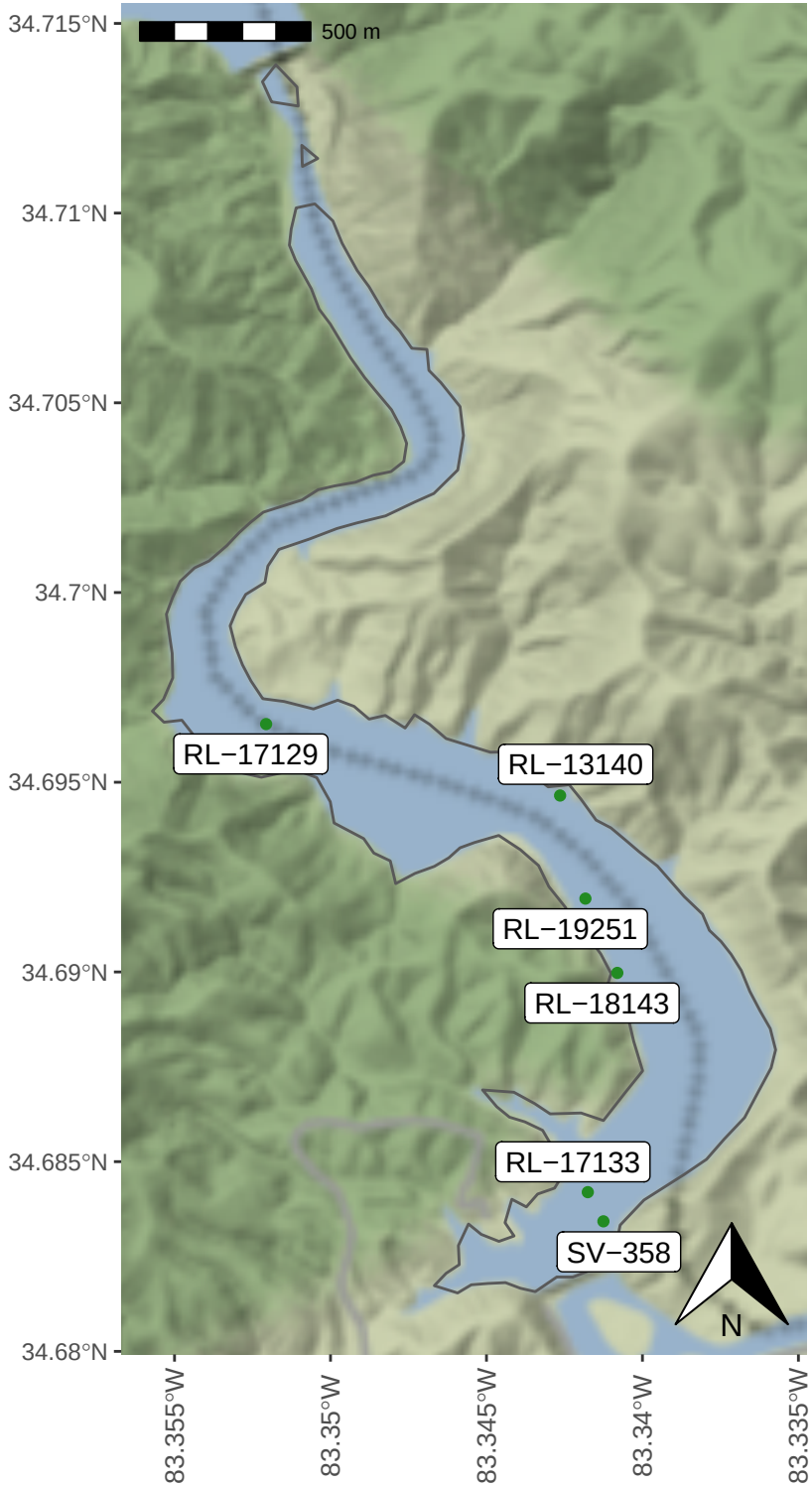
Lake Cunningham

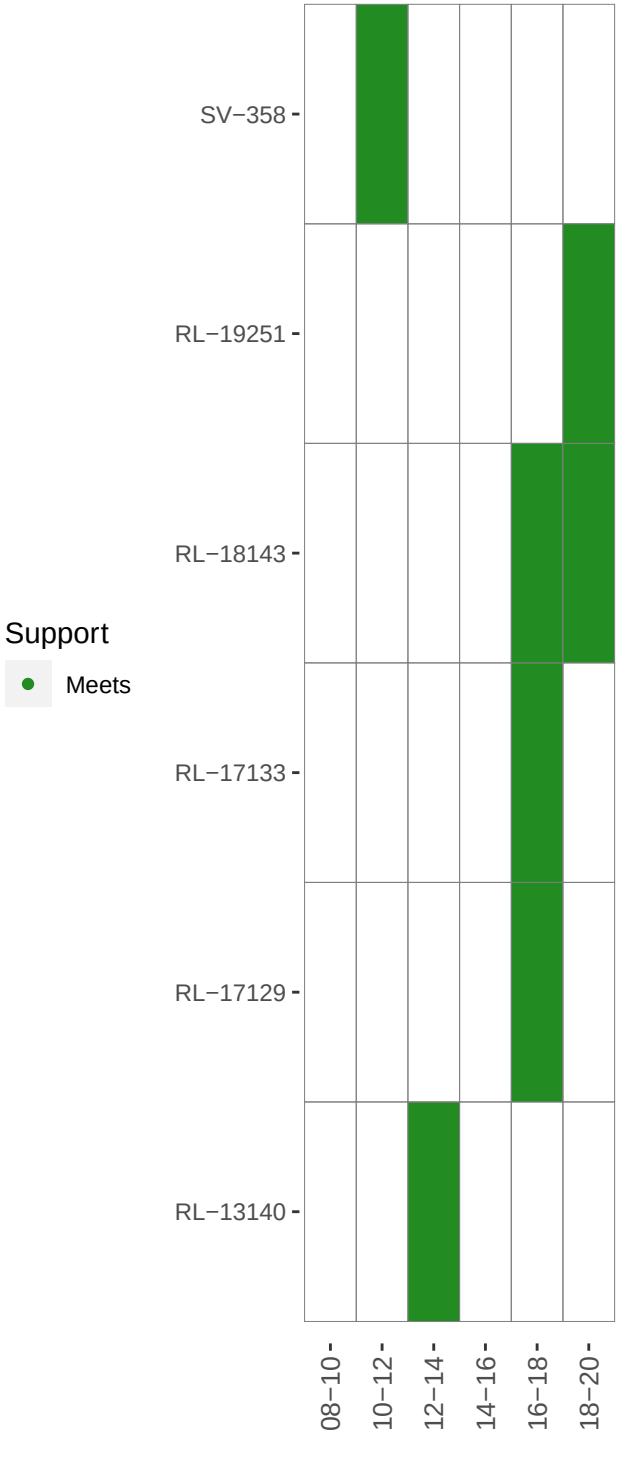


Support
- Meets
- Not Meeting

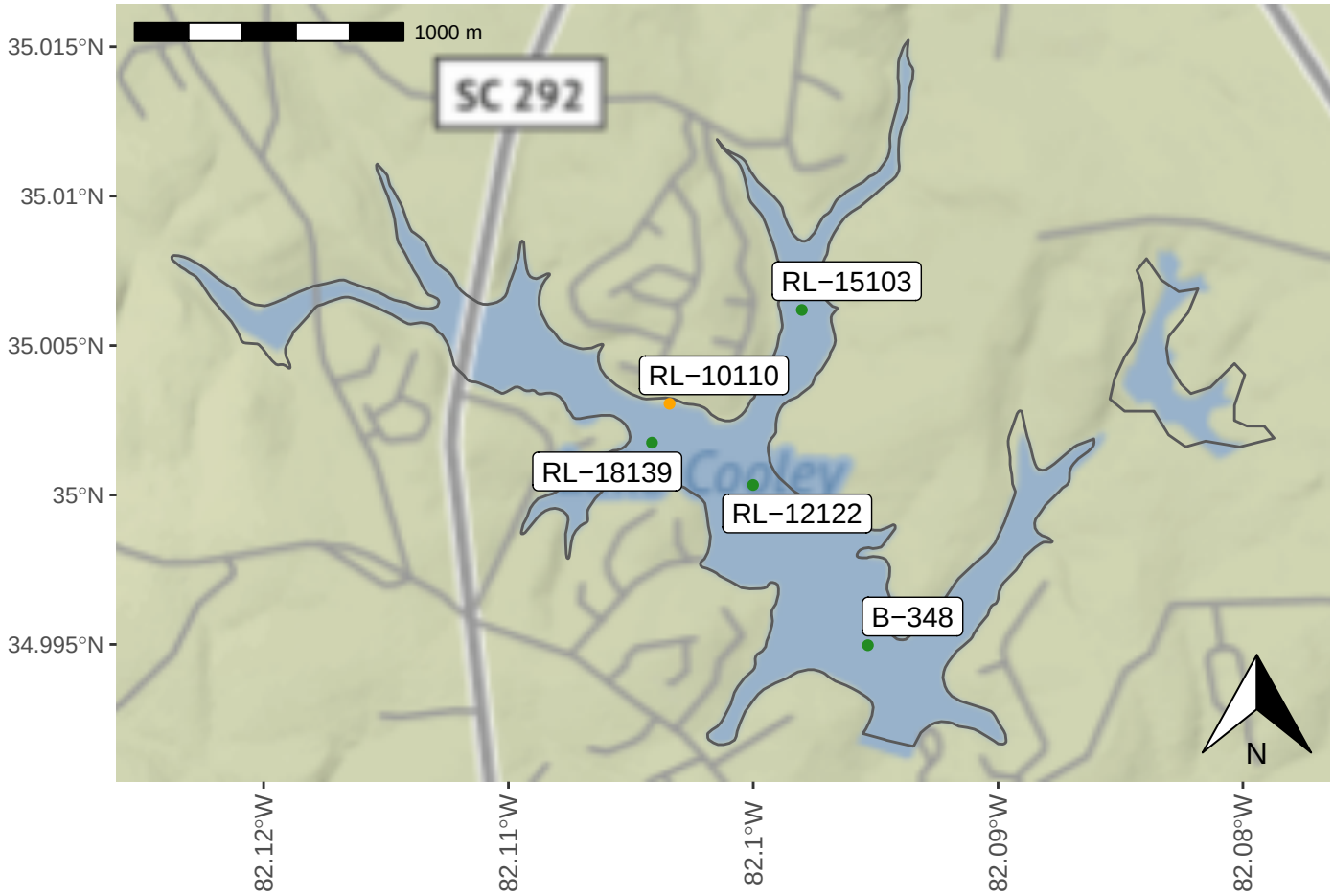


Yonah Lake

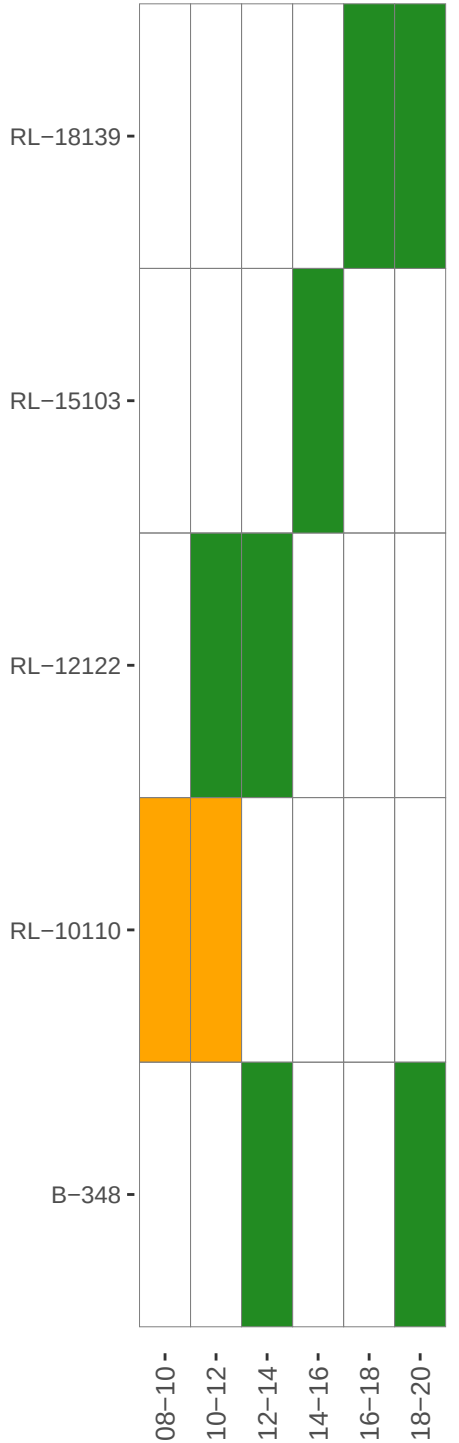

500 m
34.715°N
34.71°N
34.705°N
34.7°N
34.695°N
34.69°N
34.685°N
34.68°N
83.355°W
83.35°W
83.345°W
83.34°W
83.335°W
RL−17129
RL−13140
RL−19251
RL−18143
RL−17133
SV−358
N


Support
Meets
SV−358
RL−19251
RL−18143
RL−17133
RL−17129
RL−13140
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

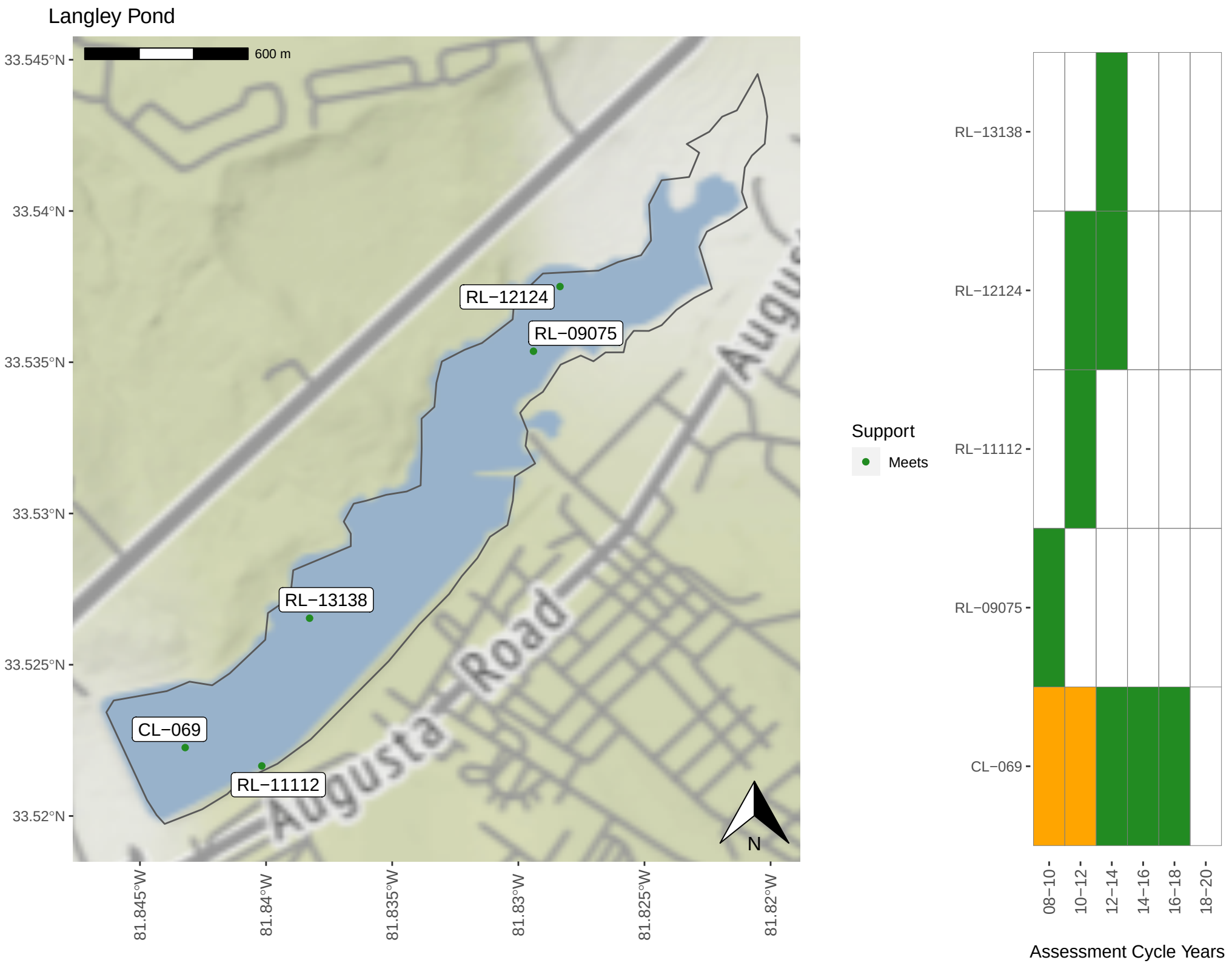
Lake Cooley



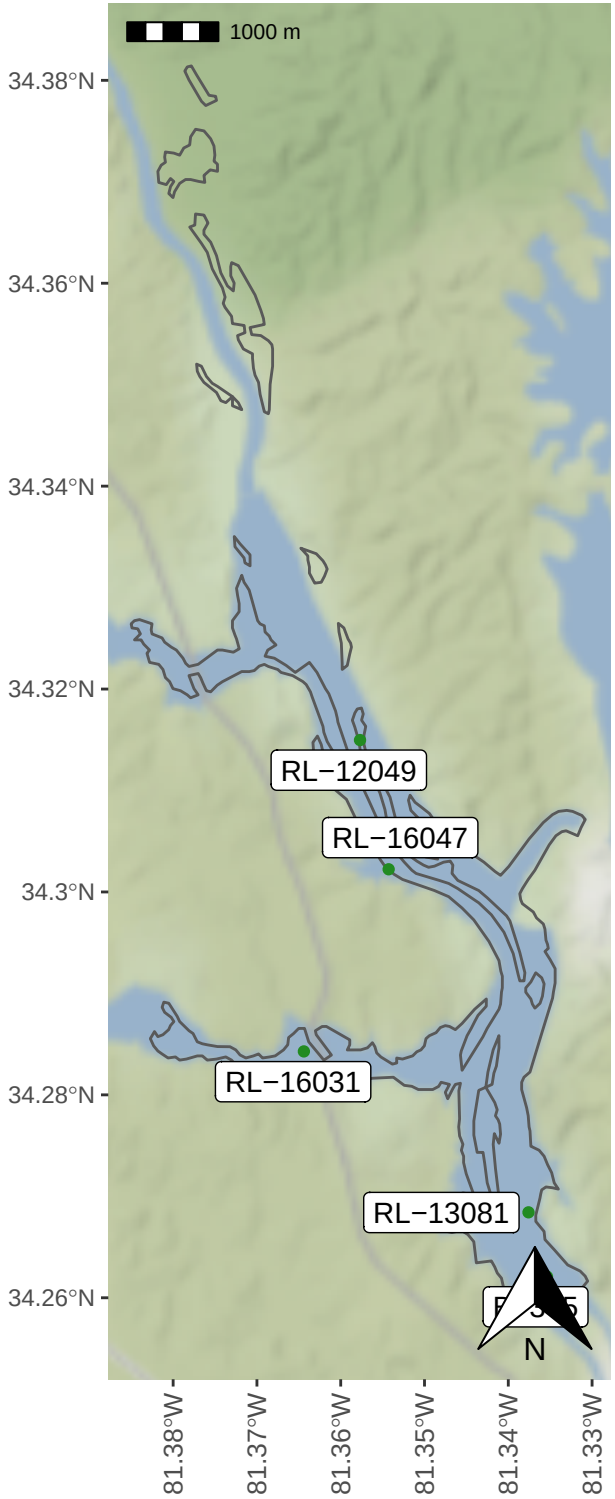
Support
Meets
Not Meeting

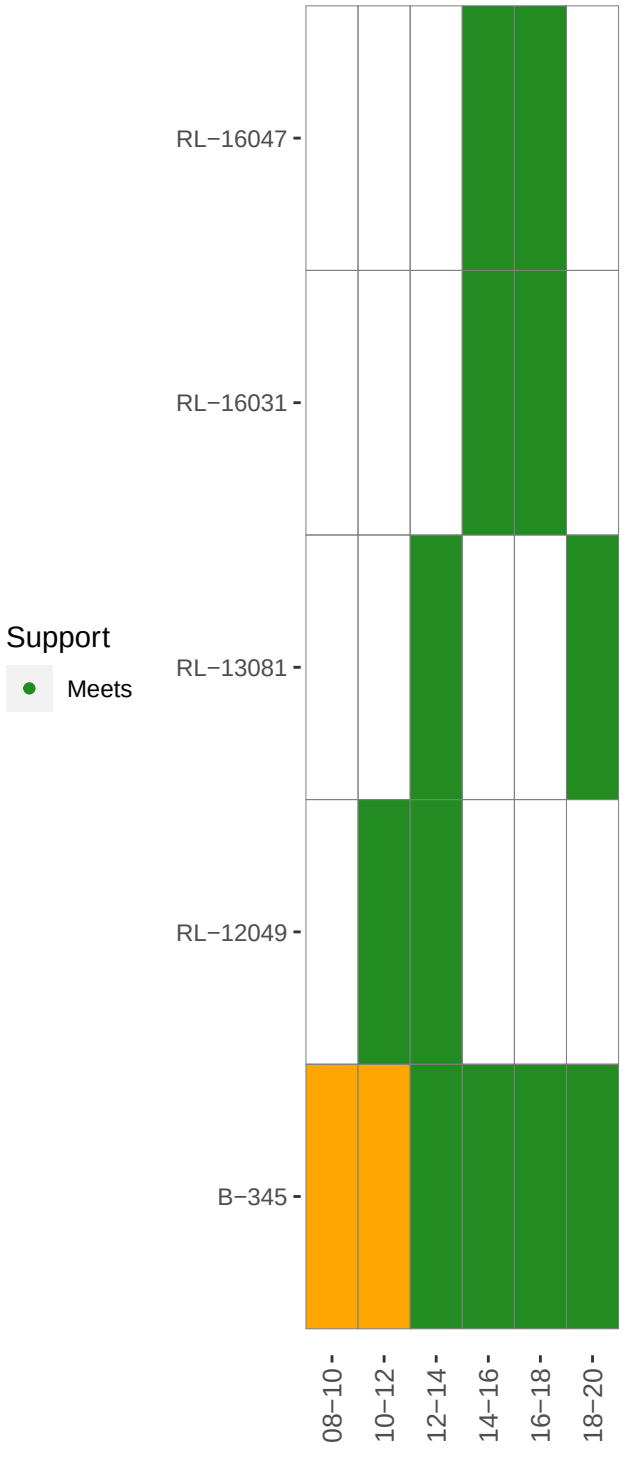


Assessment Cycle Years

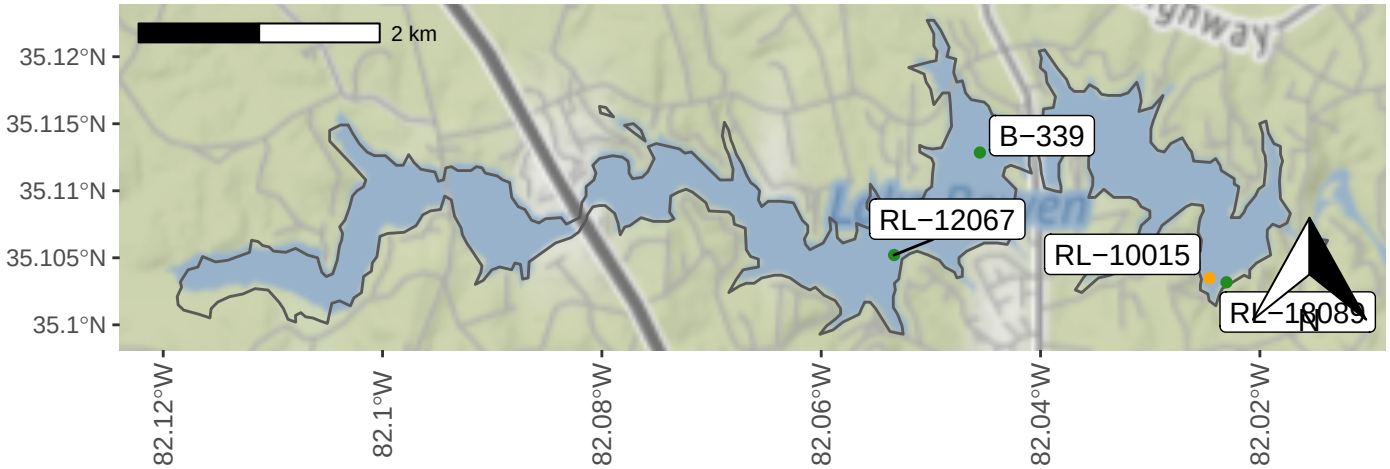

Langley Pond
600 m
33.545°N
33.54°N
33.535°N
33.53°N
33.525°N
33.52°N
RL−12124
RL−09075
RL−13138
CL−069
RL−11112
Augusta Road
N
81.845°W
81.84°W
81.835°W
81.83°W
81.825°W
81.82°W
Support
Meets
RL−13138
RL−12124
RL−11112
RL−09075
CL−069
08−10
10−12
12−14
14−16
16−18
18−20
Assessment Cycle Years

Parr Reservoir

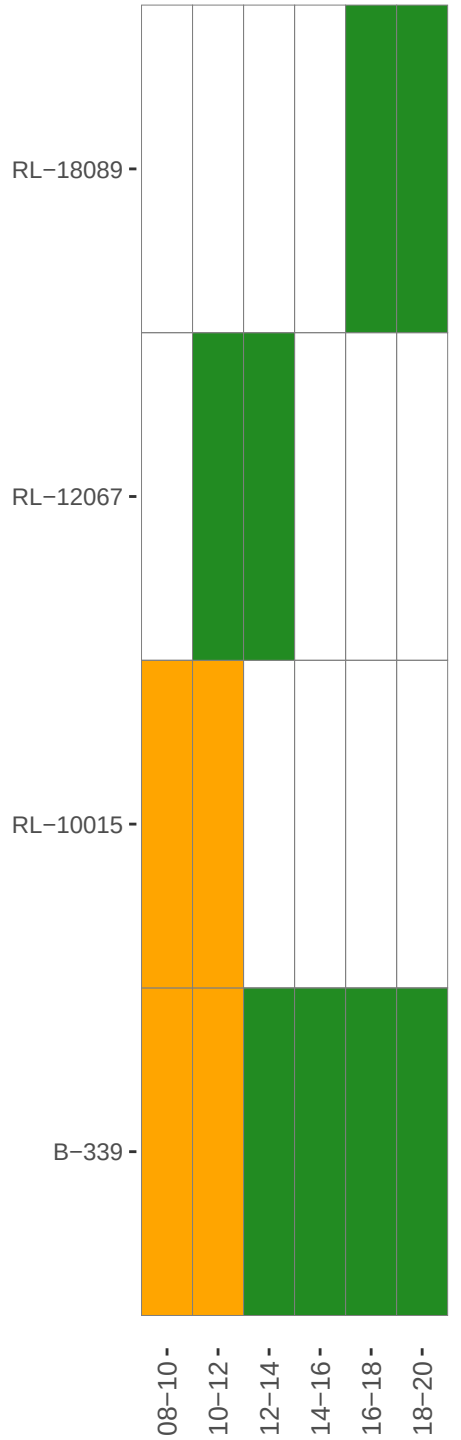




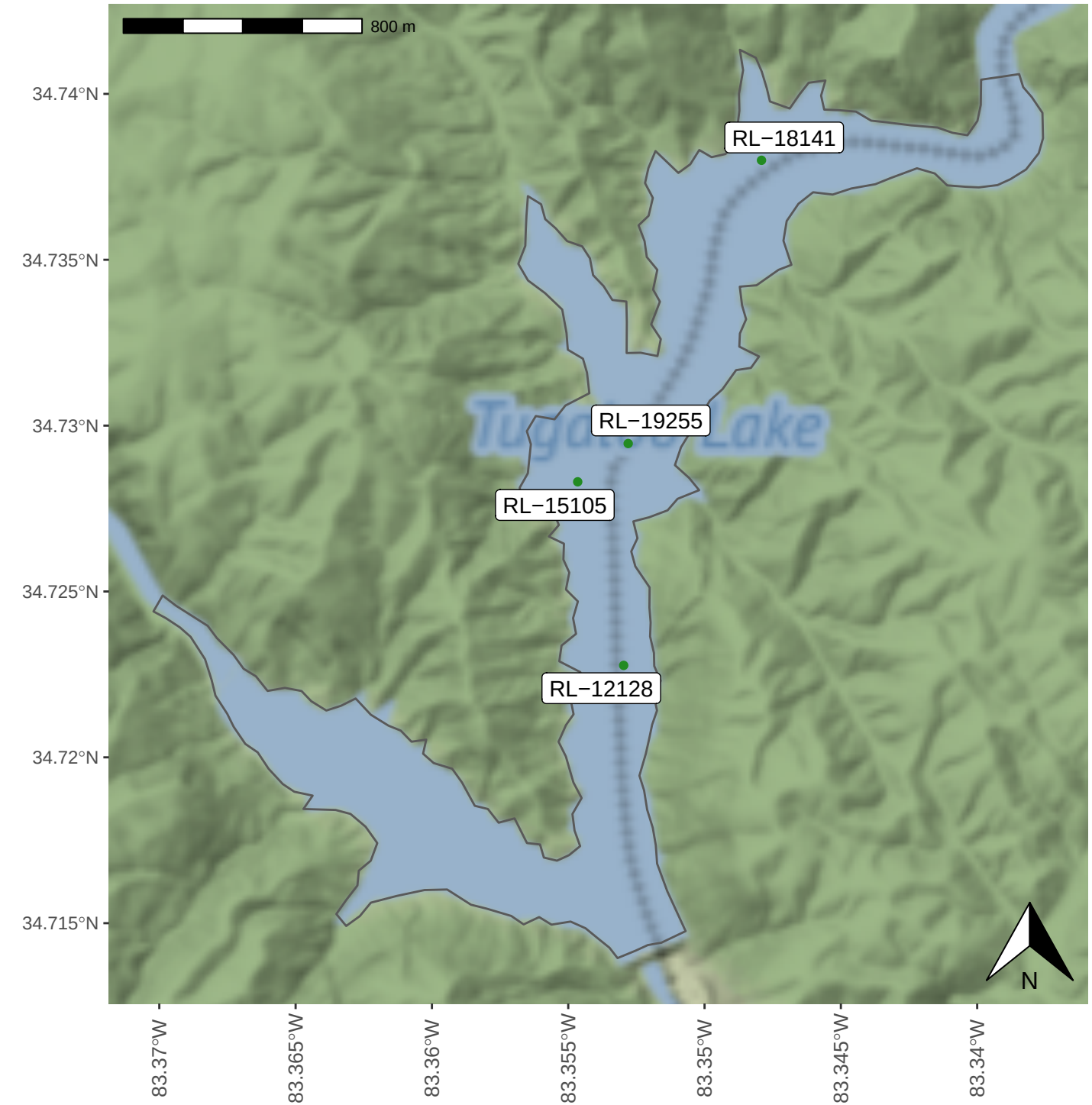
Lake Bowen



Support
Meets
Not Meeting

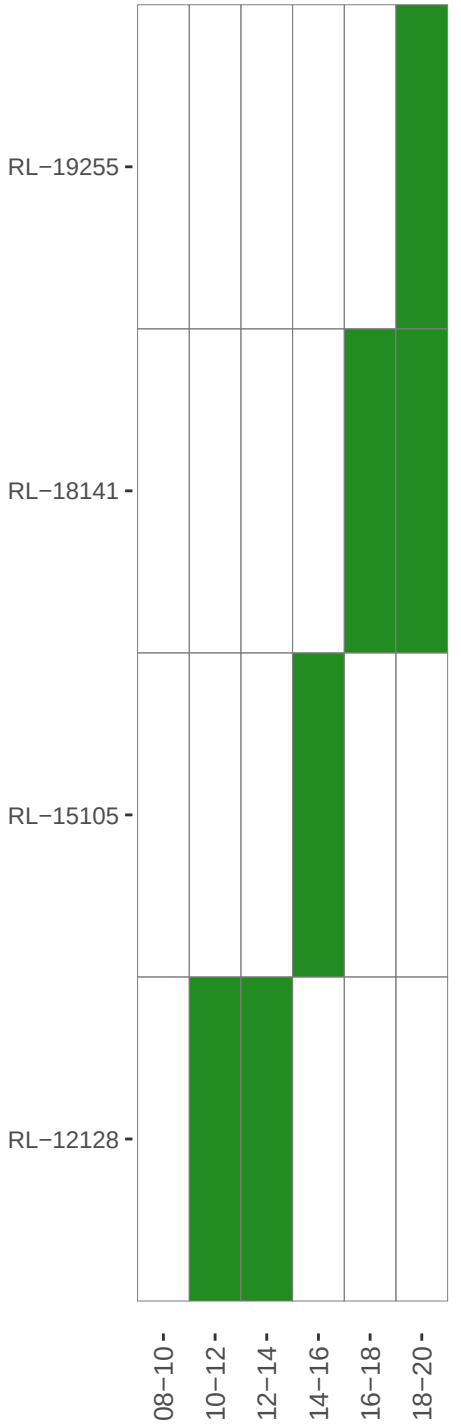


Lake Tugaloo



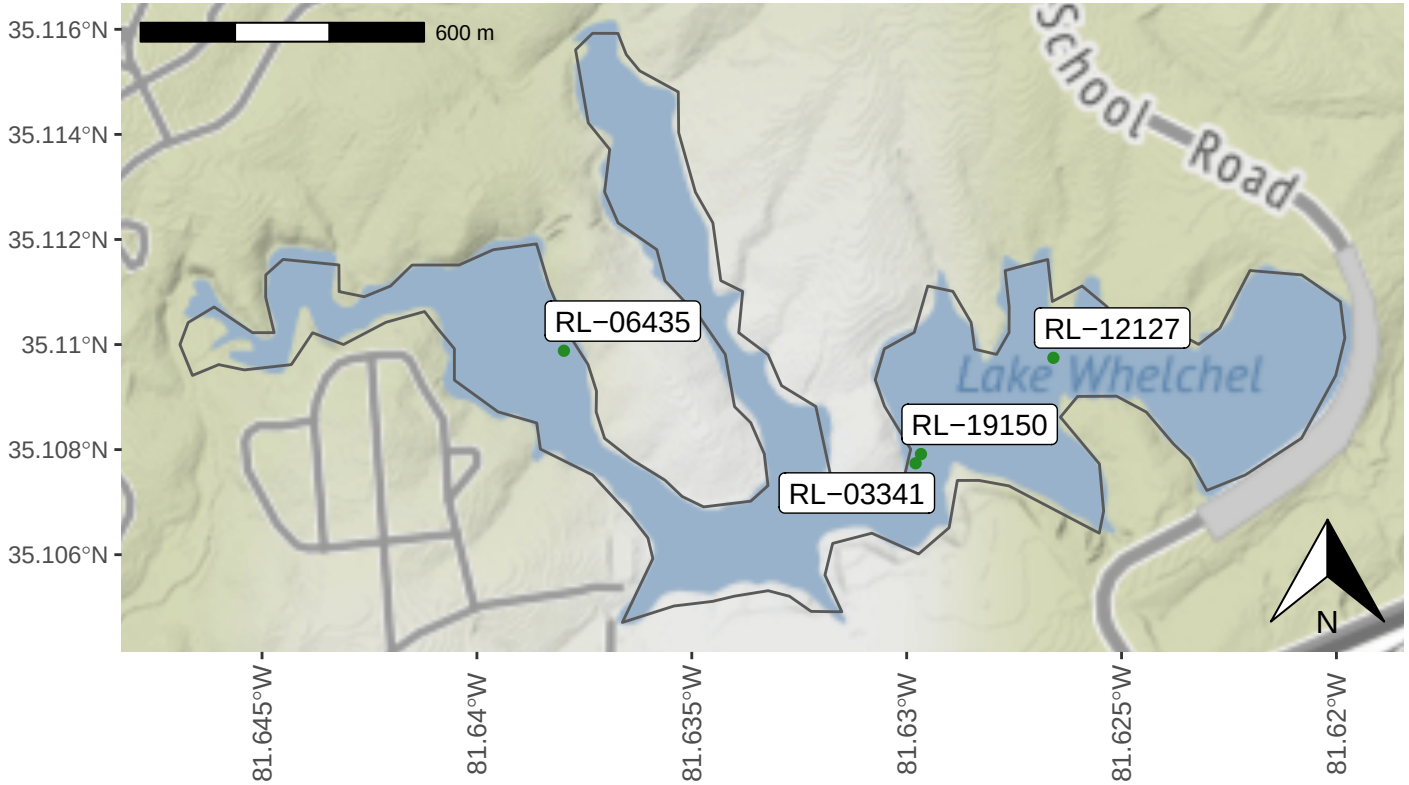
Support

Meets



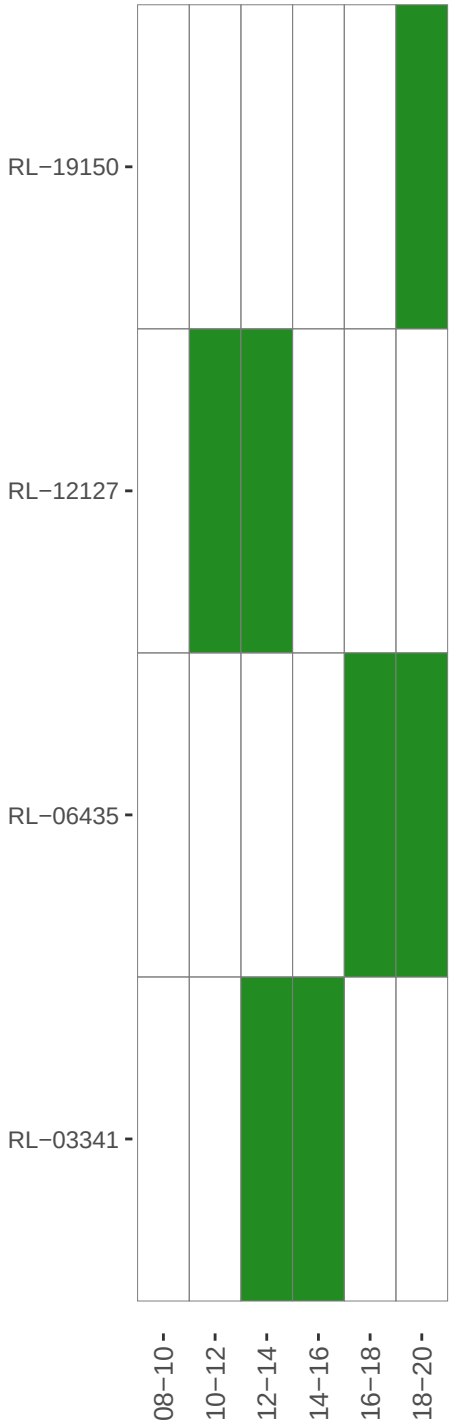
Assessment Cycle Years

Lake Whelchel

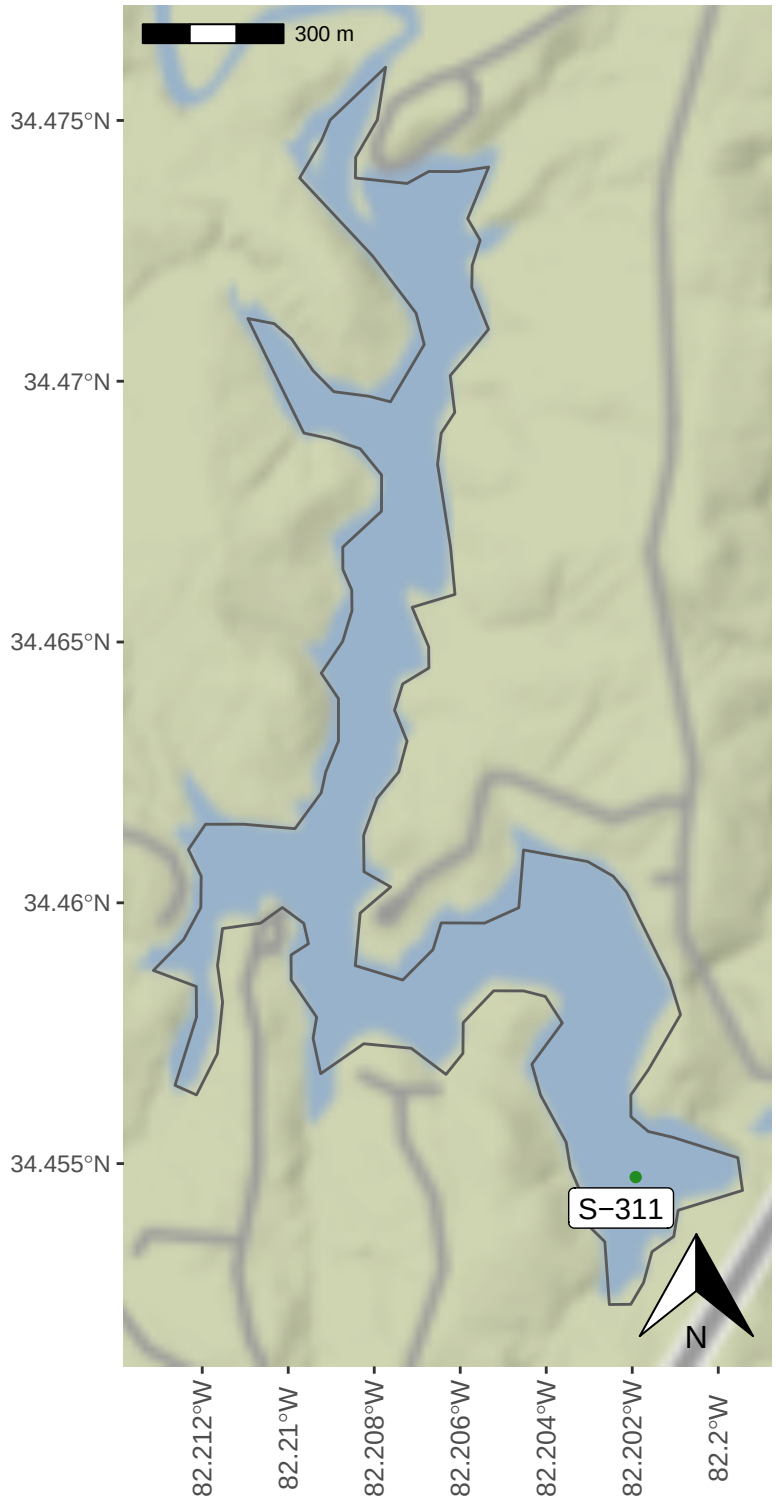


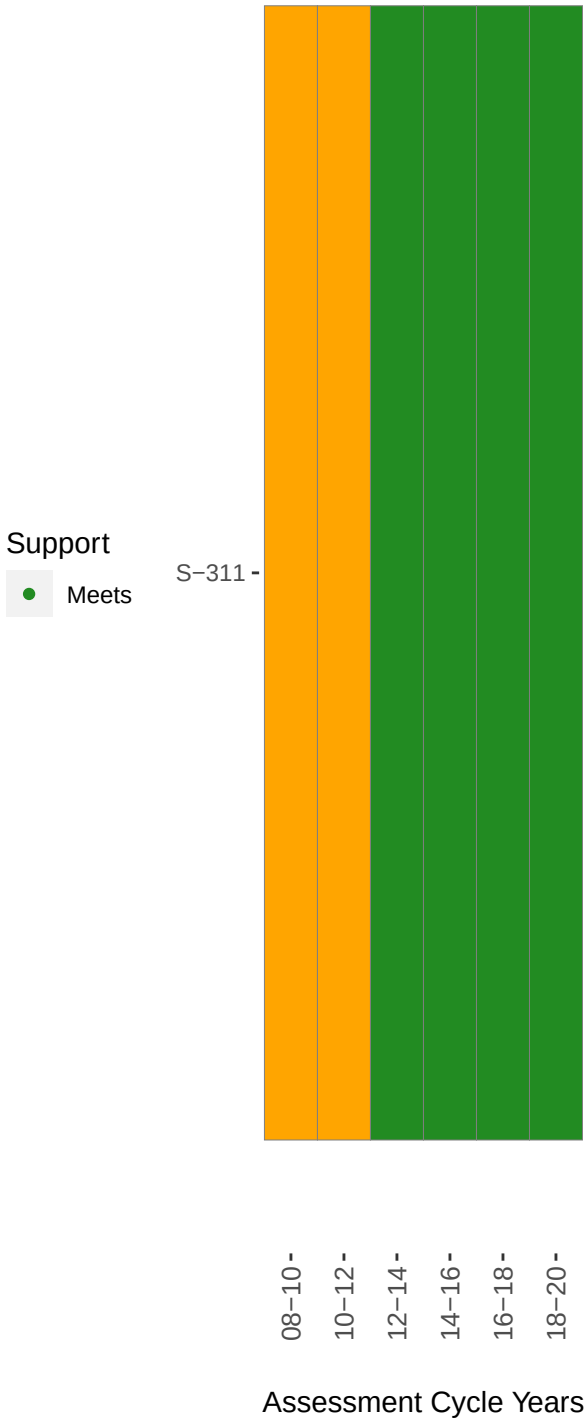
Support

Meets

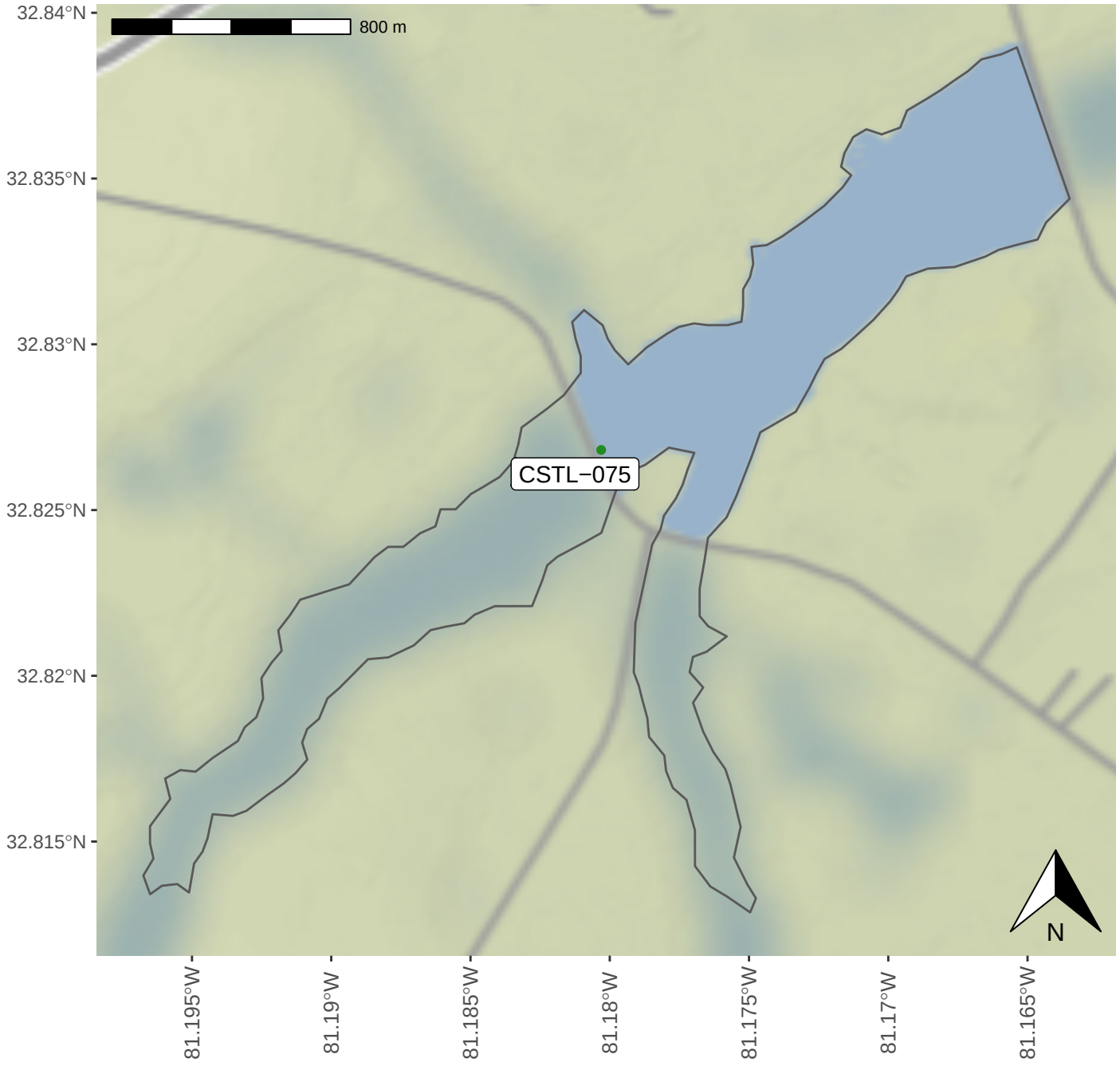


Boyd Mill Pond



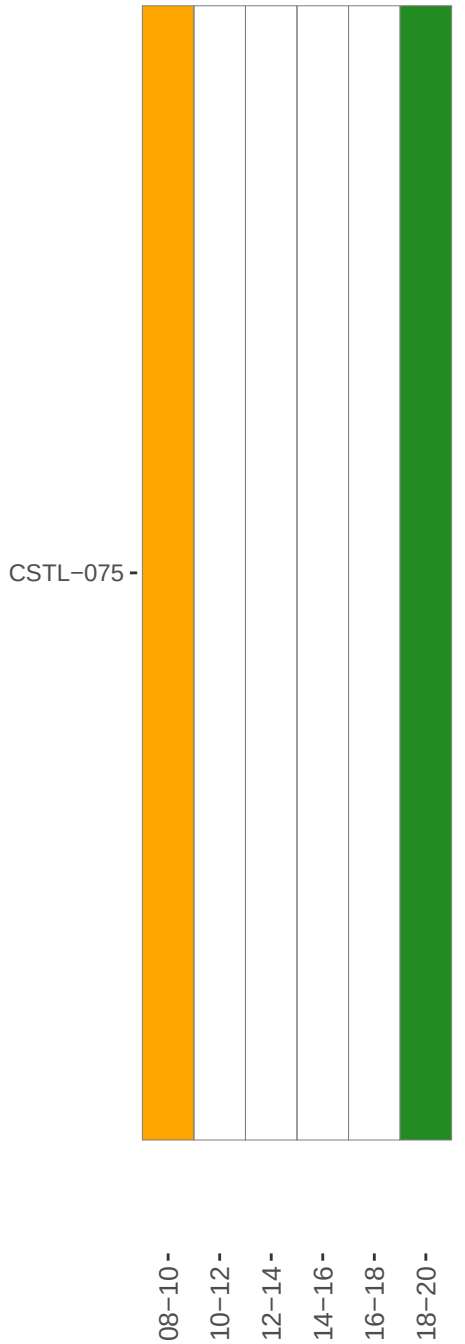


Lake George Warren

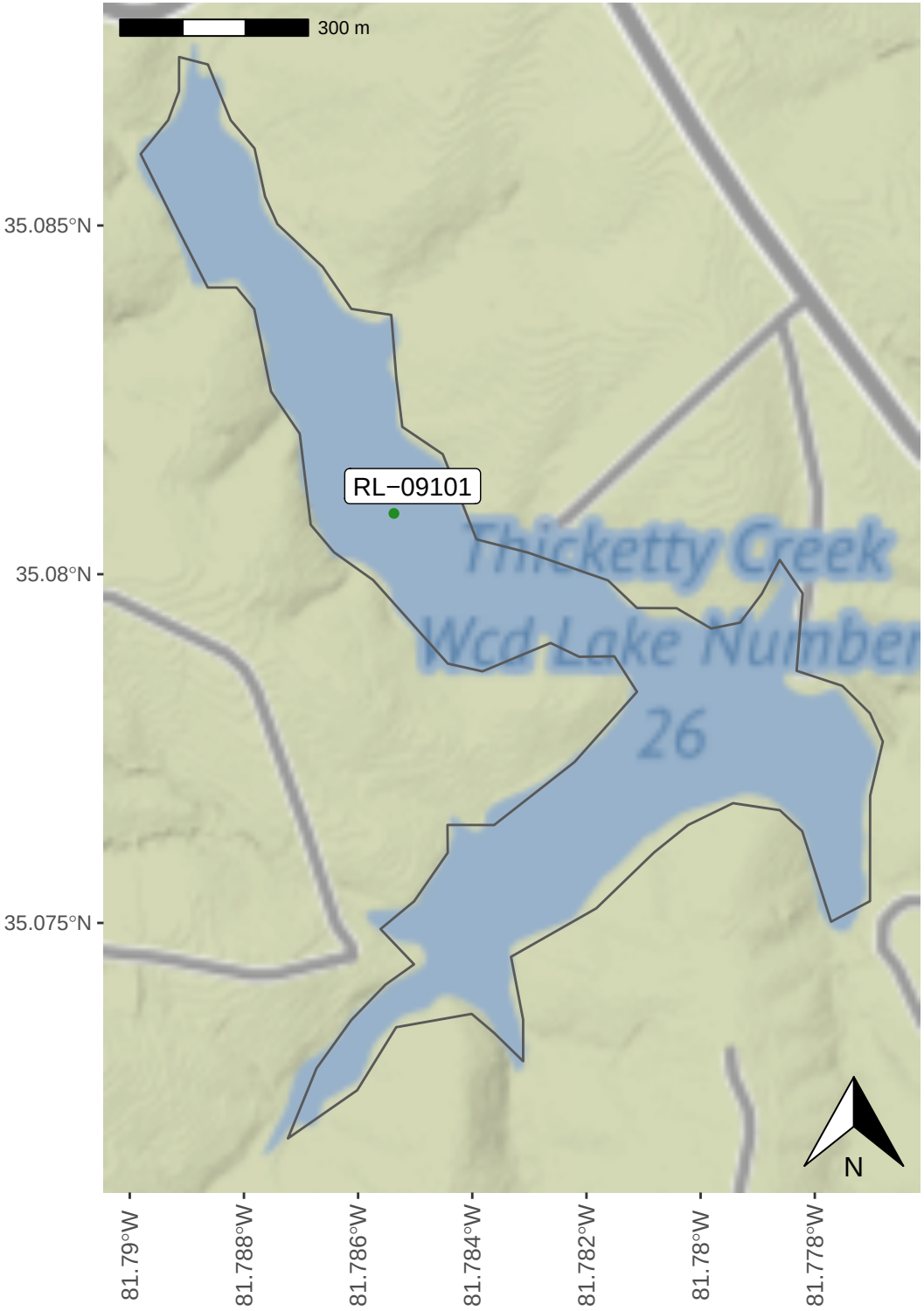


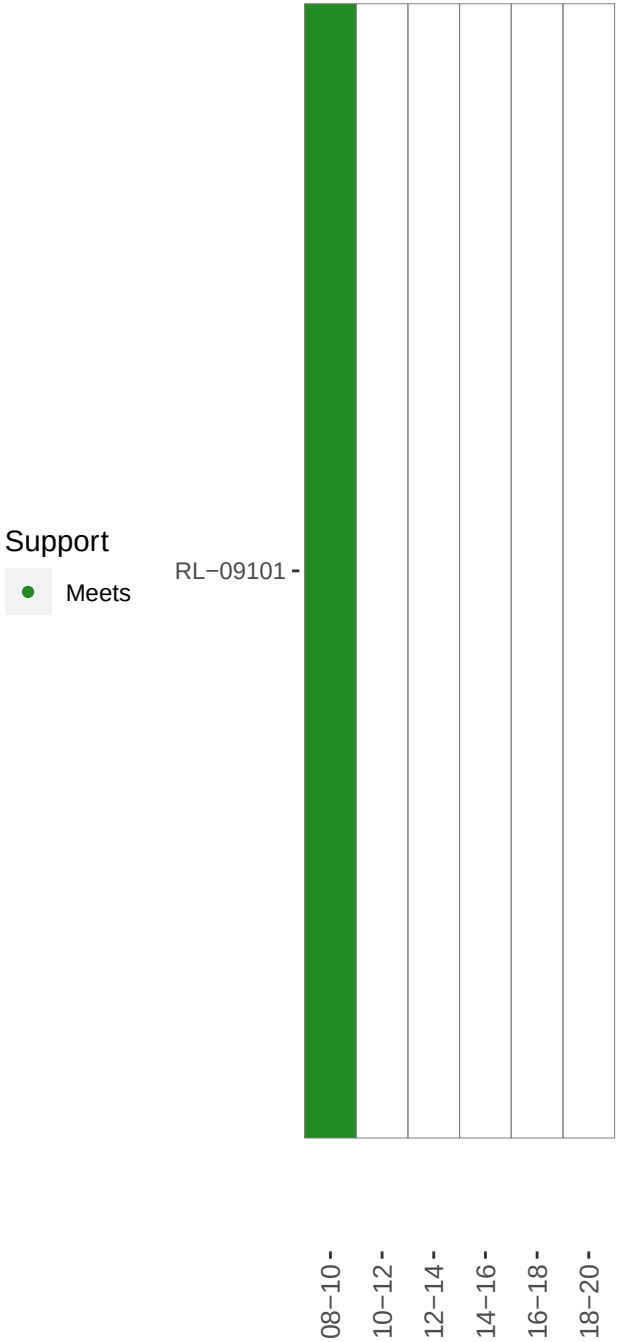
Support

Meets



Lake Thicketty





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