Amphibian Monitoring Report for the Crossroads at Big Creek Preserve, Door County, Wisconsin: 2021

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American Toad is a common species at the Preserve (photo by G.S. Casper).

Executive Summary

Amphibians can be good environmental indicators for monitoring long-term ecosystem health in the western Great Lakes region. Bioacoustic monitoring is well suited as a monitoring method for frogs and toads, which vocalize during their spring and early summer breeding season. In 2021 acoustic monitoring was conducted at five sites at the Crossroads Preserve to obtain baseline inventory data as habitat restorations commence. Six species of frogs and toads were found: American Toad, Gray Treefrog, Green Frog, Northern Leopard Frog, Wood Frog and Spring Peeper. All are fairly common species in the region. Additional species that are possible at the Preserve but currently absent are Cope's Gray Treefrog, American Bullfrog and Boreal Chorus Frog. Baseline data on calling phenology and abundance are presented with metrics for tracking changes in frog populations across years. These metrics can be utilized to inform ongoing habitat restoration and management recommendations. The resultant acoustic archive is also available for a variety of academic and applied research projects.

Gray Treefrog (*Hyla versicolor*). Photo by G.S. Casper.

1. Introduction

Crossroads at Big Creek, Inc. is a non-profit learning center and nature preserve within the city limits of Sturgeon Bay, Door County, Wisconsin, where the Big Creek Estuary connects with Lake Michigan (Figure 1). Established in 1992, the preserve encompasses approximately 200 acres with Big Creek and its estuary a central feature, and surrounding lands of former agriculture and orchards now representing woodlots, old field, and swamp forest in varying stages of restoration. Wetlands consist of emergent marsh shoreline in the estuary, a stream, swamp forest, wet meadows, and a few ponds. The Door County location is a peninsula along the northeastern coast of Lake Michigan, and an important migratory flyway for birds, bats and insects.

An ecological restoration plan is being implemented for the Preserve, with monitoring and reassessment checkpoints. Improved habitats will include sedge meadow and alder thicket, northern wet-mesic forest, mesic forest, and transitional meadow habitat. The restoration will be guided by Crossroads' significance as a migratory bird stopover site, and by improving habitat for spawning fish. Improved trails and programs to expand community science and empower participation in the restoration work will support and amplify the on-the-ground restoration. Crossroads has received encouragement in this project from many longstanding partners, including the Door County Soil and Water Conservation Department, the City of Sturgeon Bay, The Nature Conservancy, the Door County Land Trust, and a number of state and federal agencies.

This report addresses results of an initial year of baseline acoustic surveys for frogs.

Gray Treefrog (photo by G.S. Casper).

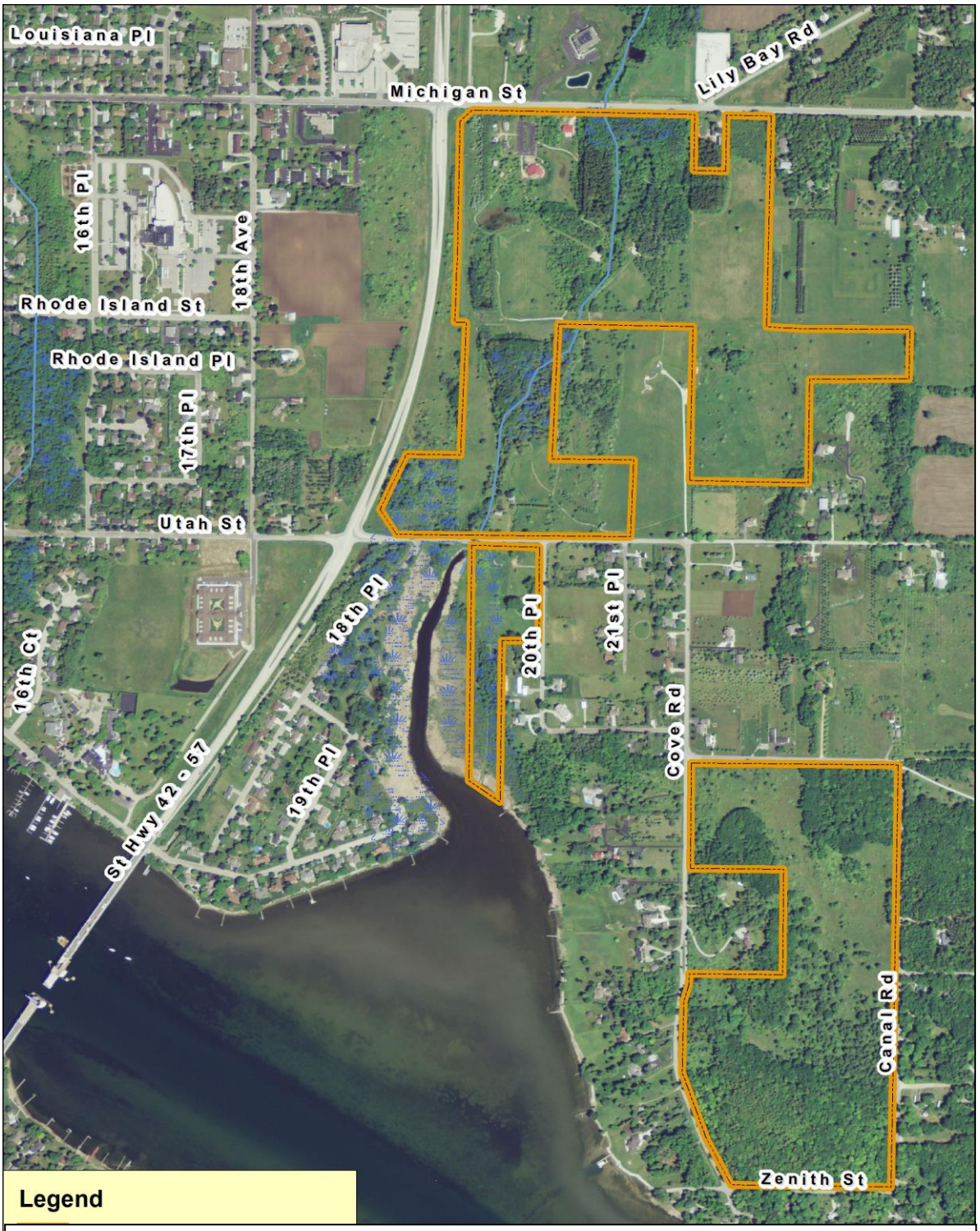


Figure 1. Crossroads at Big Creek Preserve, Door County, Wisconsin.

2. Methods

Five wetland habitat sites were selected for monitoring (Figure 2, Table 1). Four SM4 automated recording systems (ARS) with omnidirectional stereo microphones (Wildlife Acoustics, Inc., Concord, MA USA; Song Meter model SM4; Figure 3) were programmed to record 5-minute samples (WAV files) from 14:00 to 04:00 each day on the top of each hour, with six extra samples from 19:30 to 00:30 on the half-hour marks. Each unit was also programmed to record an additional five 10-minute duration samples each morning for bird song analyses (from 30 minutes before sunrise, and at 4 subsequent 1-hour later intervals). ARS were deployed 19 March and retrieved in mid-August (Table 1, Appendix A).

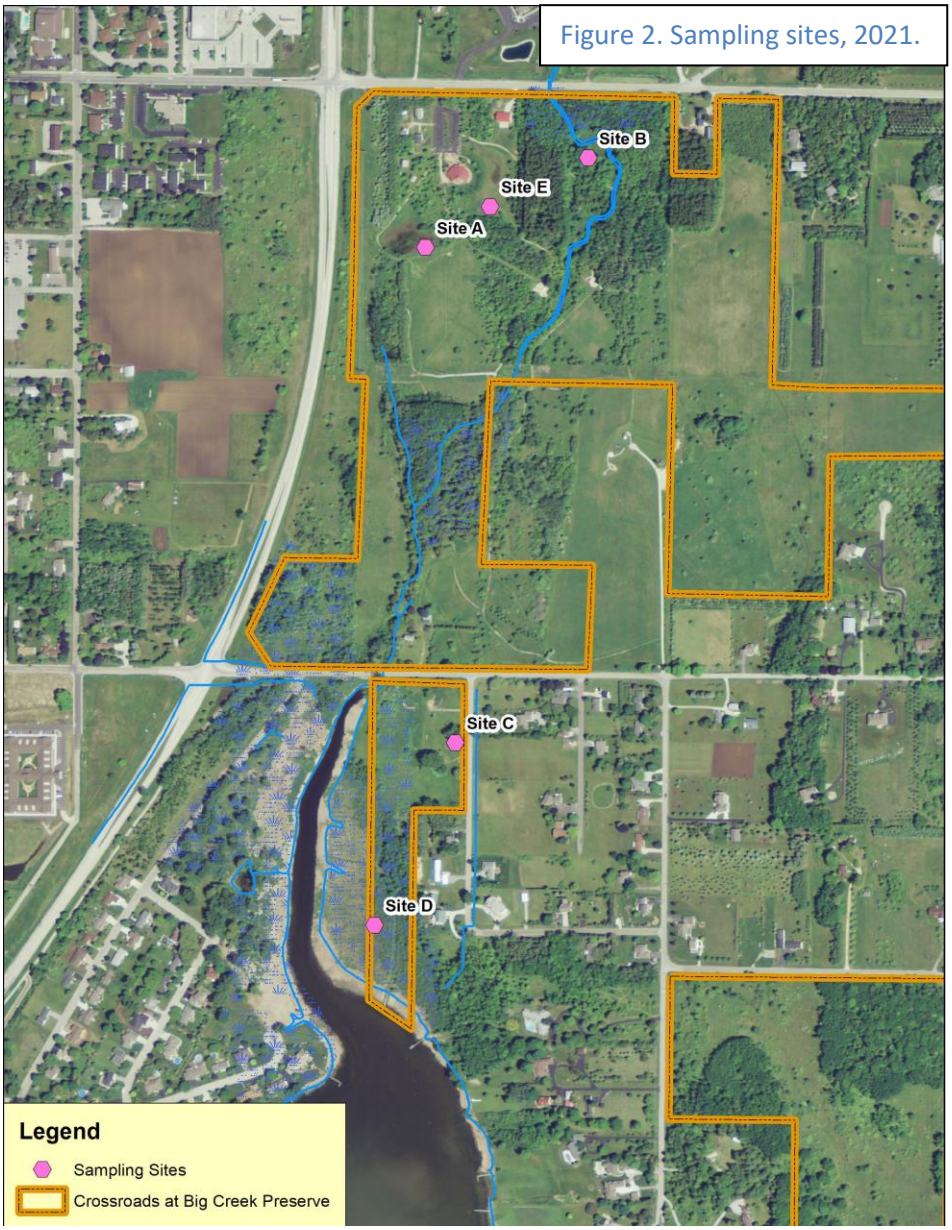


Figure 2. Sampling sites, 2021.

A fifth SM3 model unit (Wildlife Acoustics, Inc., Concord, MA USA; Song Meter model SM3; figures 2 and 3) was set up near the nature center at an ephemeral wetland swale, in part as an educational display (Site E). It was programmed to record 5-minute samples (WAV files) from 15:00 to 04:00 each day on the top of each hour, with four extra samples from 19:30 to 22:30 on the half-hour marks. This ARS was deployed 13 April and retrieved on 20 August (Table 1, Appendix A).

Table 1. Sampling Sites and Data Collected, Crossroads at Big Creek, 2021.

Site	Model_SN	LatDD	LongDD	Deploy Date	Data Start	Data End	Habitat
A	SM4_15507	44.832991	-87.345420	3/19	3/19	8/15	Tree/shrub line between old field and wetland swale.
B	SM4_15646	44.834108	-87.342602	3/19	6/2	8/13	Wet meadow open area along Big Creek near woodlot.
C	SM4_15686	44.826871	-87.344862	3/19	3/19	8/13	Semi-permanent pond along roadway mostly shaded by trees, shrub and grassland surround.
D	SM4_15974	44.824613	-87.346257	3/19	6/2	8/13	Along estuary shoreline, emergent wetland, small trees, and shrubs.
E	SM3_300054	44.833500	-87.344300	4/13	4/3	8/20	Open ephemeral wetland in grassland surround near woodlot.

A temperature logger (HOBO models OA-002-08 Pendant Light/Temp, and OA-002-64 Pendant Light/Temp; Onset Computer Corporation, Bourne, Massachusetts, USA) was deployed alongside each ARS and programmed to log data once each hour, or every 30 minutes, and the resultant temperature logs used for filtering data for analyses, where only samples with an ambient air temperature of ≥40°F qualify for manual surveys. Loggers were hung in a shaded location alongside each ARS.

American Toad tadpoles. Photo by G.S. Casper.

Figure 3. Automated recording devices (ARS) deployed in the field. SM4 on left, SM3 on right. Loggers are visible attached underneath SM4 and on the backboard of the SM3.

Data Analysis

A simplified workflow for acoustic data analysis is outlined below. For detailed analysis steps see Casper and Nadeau (2019).

Acoustic analysis steps:

1. Obtain recordings and temperature logs (field component).
2. Filter recordings to a subset of those collected after sunset and run recordings through the automated recognition procedure (automated survey).
3. Proof automated output by manually confirming at least one auto-detection for each species at each site in each year, thereby eliminating false presences for occupancy in this data set. Manual confirmation involves an experienced surveyor visually examining the place in the spectrogram where the algorithm reports a detection, then playing it back to confirm a correct species identification. Both first and last auto-detections are confirmed at each site for each species, with proofing limited to within species' generally accepted calling periods determined from regional analyses (unpublished data). Note that false presences still persist on an individual sample level (between the first and last confirmed detections), but not on a site occupancy level (additional false presences do not matter if the site is already confirmed to be occupied). False absences for site occupancy also occur for most species (although mostly at low rates), but site occupancy can nevertheless be modeled with high confidence due to the large sample size. The next step eliminates most false absences.
4. Perform a manual scan of the same data and assign a Call Index Value (CIV) for each acoustic file. For this survey 30 samples are equally distributed from the first auto-detection date for any frog species at the site, through 31 July, and where air temperature is ≥40°F. CIV is scored for each species detected in each sample, and annotations are made for sample quality (i.e., noise) and any CIV or identification uncertainties. These survey results are then checked by a second observer, and if concurrence is not reached, they are checked by a third observer. This survey

detects all species, including species with low auto-detection rates (i.e., Northern Leopard Frog). It also identifies to species pairs that are not separated by auto-detection (i.e., Cope's vs. Gray treefrog).

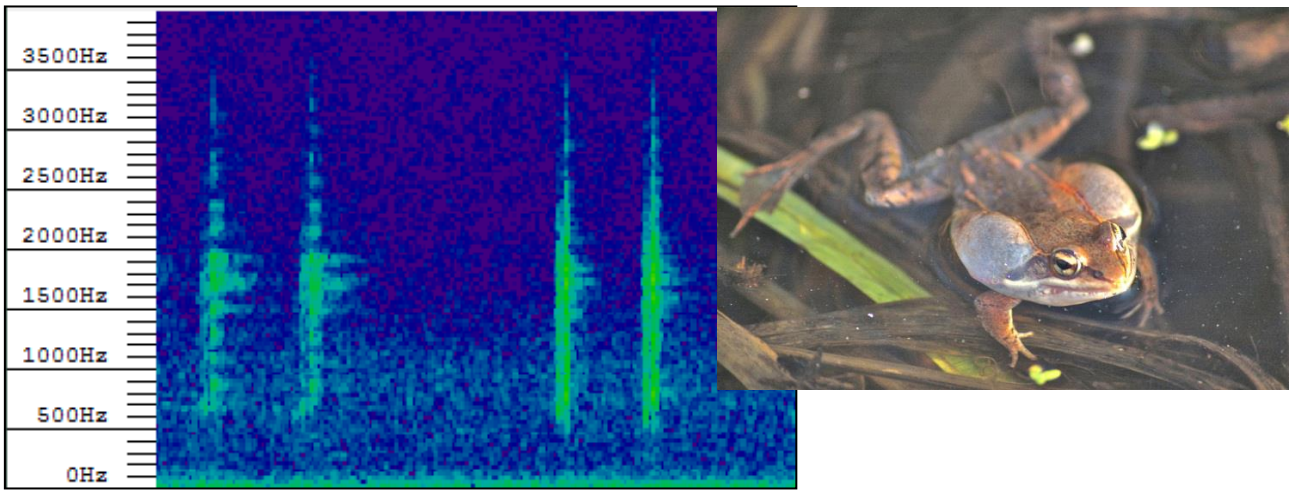
3. Results

Data Collection

Appendix A provides data collection results. In sum, data collection in 2021 was successful as programmed with the following exceptions:

- On two units (15646 and 15974; sites B and D, respectively) Card A became corrupted, likely due to defective firmware. Data were recovered normally from Card B on each ARS, beginning on 2 June.
- There was a small gap in recording on ARS 300054 (Site E) from 23–30 May due to batteries running out. Batteries were replaced and normal recording resumed on 31 May.
- Various truncated recordings were made on most ARS that were less than the programmed settings of 5 or 10 minute durations. This is normal and typically due to read-write errors when electronic interference occurs, such as static charge, or when SD Card write too fast for firmware to handle.

The above listed data collection issues did not affect data analyses except that we obtained insufficient data from sites B and D to analyze early calling frog species.



Example Wood Frog spectrogram. The distinctive pattern, which resembles ducks quacking, is easily recognized when analyzing data.

Species Richness

Data were successfully analyzed using the dual observer method (Appendix B). Six frog and toad species were confirmed in 2021 (Table 2). American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*) and Spring Peeper (*Pseudacris crucifer*) were confirmed at all monitored sites, and can be considered common and well established under current conditions. These species calls carry far and some detections were of distant individuals.

Green Frog (*Lithobates clamitans*) was detected at all sites except Site A, which is likely too ephemeral to support the extended larval development period of this species. Northern Leopard Frog (*Lithobates pipiens*) was found only at Site C; however, no conclusions should be drawn regarding its presence at sites B and D as this species calls early and data were not available for April and May from those sites. It has a quiet call that is often obscured by noise, and therefore it is often missed in acoustic surveys.

Wood Frog (*Lithobates sylvaticus*) was confirmed only at Site A. However, like Northern Leopard Frog, no conclusions should be drawn regarding its presence at sites B and D as this species calls early and data were not available for April and May from those sites.

Table 2. Occupancy Metrics: Crossroads at Big Creek Preserve, 2021

Site	Year	American Toad	Gray Treefrog	Green Frog	Northern Leopard Frog	Wood Frog	Spring Peeper	N Species	Sampling Period
A	2021	AM	AM	0	0	AM	AM	4	3/19 - 7/31
B	2021	AM	AM	A	X	X	AM	4	6/2 - 7/31
C	2021	AM	AM	AM	A	0	AM	5	3/19 - 7/31
D	2021	AM	M	AM	X	X	AM	4	6/2 - 7/31
E	2021	AM	AM	AM	0	0	AM	4	4/3 - 7/31; gap 5/23-30

A = automated detection, M = manual detection, 0 = no detections, X = insufficient data for occupancy conclusion.

Call Intensity

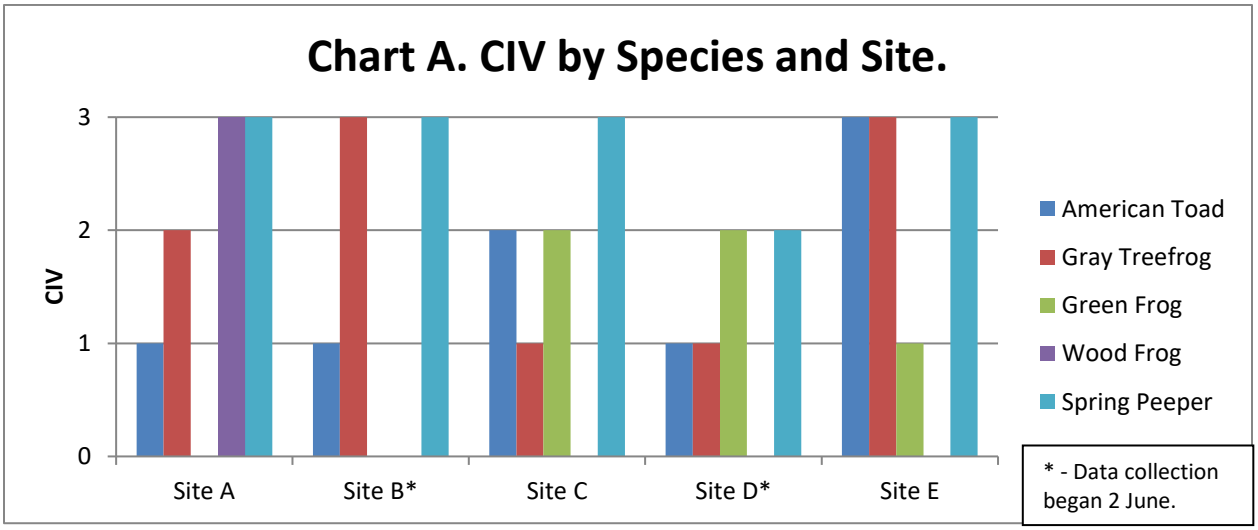
Calling intensity levels are recorded on manual surveys as a useful metric for tracking abundance. Call Index Value (CIV) is a standard measure of calling activity used by most state and national programs. Trends in the maximum CIV reached annually can be assessed for each site monitored, which provides a ranked measure of the number of calling males at each site over time. Note however that the relationship between this calling activity metric and actual population size varies among species, with some species calling loud and often, and others quietly and/or infrequently. Therefore, this metric is useful for measuring the relative abundance of species across years, but not for comparing abundance between species.

Maximum CIV values in 2021 suggest that American Toad is more active at Site 3, and Gray Treefrog at sites B and E (Table 3, Chart A). Green Frog values are moderate overall, and Spring Peeper is abundant throughout the Preserve. Wood Frog is abundant at Site A. Future analyses can assess how patterns of calling activity change at each monitored wetland and among sites.

Table 3. Maximum CIV, 2021. Crossroads at Big Creek Preserve.

Site	American Toad	Gray Treefrog	Green Frog	Wood Frog	Spring Peeper
A	1	2		3	3
B	1	3			3
C	2	1	2		3
D	1	1	2		2
E	3	3	1		3
All Sites	3	3	2	3	3

Call Index Value (CIV) scores:
0 = no calls detected
1 = individuals of the species can be counted and there is silence between calls
2 = calls of individuals can be distinguished, but there is some overlapping of calls
3 = full chorus for the species with calls constant, continuous, and overlapping.



Northern Leopard Frog calling. Photo by G.S. Casper.

Phenology

Phenology is a branch of science dealing with the relationship between climate and periodic biological phenomena such as frog calling, bird migration, or plant flowering. Animal behaviors and movement patterns are often triggered by seasonal weather changes, and many evolved in response to the seasonal availability of critical food resources. These behaviors and movement patterns are often triggered by changes in day length and temperature, and ongoing climate change resulting in abnormal or new climate patterns can put organisms out of synch with the food resources they depend upon. Therefore, tracking phenology is generally considered an important component of a long term monitoring program. For frog monitoring, a good metric is the first calling date for each species each year (Table 4). These data will become more useful with time as additional years of data accumulate.

Table 4. First Calling Date, 2021. Crossroads at Big Creek Preserve. ND = no data, blanks = no detections.

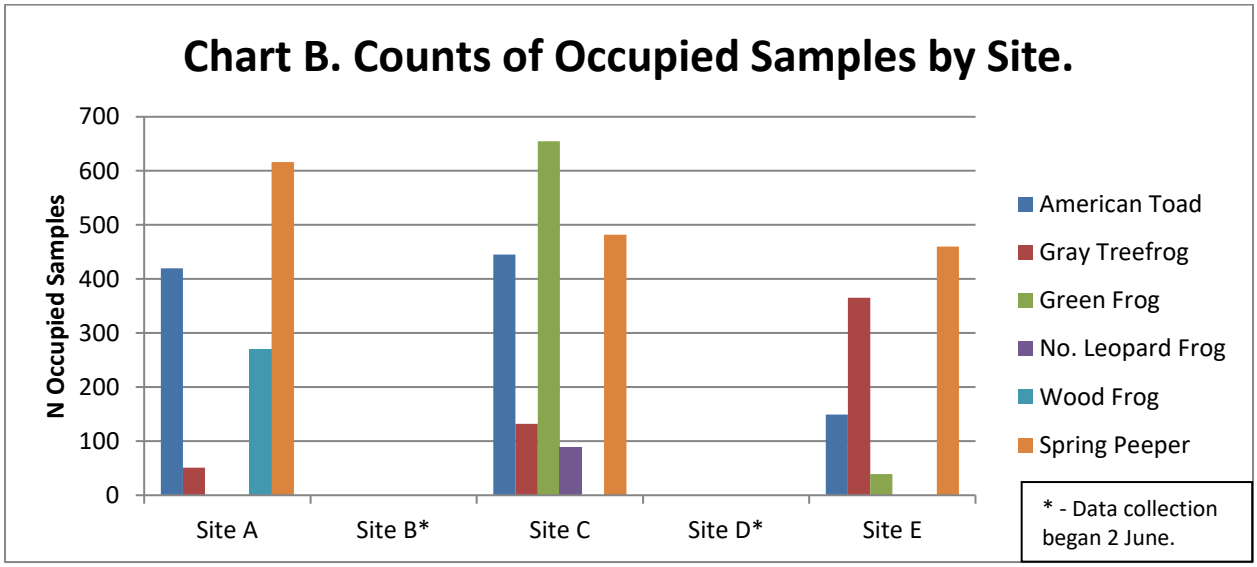
Site	American Toad	Gray Treefrog	Green Frog	Northern Leopard Frog	Wood Frog	Spring Peeper
A	4/19	5/19			3/23	4/7
B	ND	ND	ND	ND	ND	ND
C	5/7	5/21	5/19	4/11		4/13
D	ND	ND	ND	ND	ND	ND
E	5/2	5/20	5/17			4/9
All Sites	4/19	5/19	5/17	4/11	3/23	4/9

Automated Counts

A final abundance metric estimates the number of occupied samples from automated surveys. This metric tracks the number of samples with any detection (the 5-minute samples typically have many detections within them). Automated detection counts are estimated for each species by first calculating error rates by comparing results from automated and manual surveys on the same 30 samples per site, where manual survey results are assumed to be correct (at least two observers agree on the determination). Note that this process evaluates filtered rather than raw automated results, and comparisons between automated and manual surveys are made at the sample occupancy level rather than the individual call level. Filters are applied to acoustic data before automated surveys are run in order to increase detection rates, and include acoustic parameters such as duration of the call, and time of day and temperature parameters that increase the chances that frogs are calling (see Casper et al. 2020). The proportion of the manually scanned samples where automated detection returned a species when it was not present is calculated (commission error or false presence), as well as the inverse (automated results return an absence when the species was actually present; false absence or omission error). Automated detection counts were then corrected (reduced for commission errors, increased for omission errors) using these species-specific error rates, to obtain final estimated counts of occupied samples for each species and site. See Casper et al. (2020) for more details regarding detection error analyses.

At the Crossroads Preserve in 2021, commission error rates (false positive) were quite low for automated surveys, while omission errors (false negatives) were fairly high (Table 5). This is typical and was the intent during algorithm development, as false positives are much more difficult to correct for in statistical trend analyses. Comparisons of counts can be made on a site or property basis to track trends across years. Note that agreement rates between manual and automated surveys for simple site occupancy are much higher than shown in Table 5, as false positives are completely eliminated by proofing steps for site occupancy (Table 2), and false negatives for site occupancy are greatly reduced by the dual survey approach.

The count metric is a measure of frog breeding activity (how often males are calling), and is useful for evaluating a species' abundance between sites and across years. It should not be used to make species to species comparisons however, as some species call less frequently and of shorter duration than others. At Crossroads Preserve in 2021, this metric indicates that American Toad was less active at Site C, Green Frog more active at Site D than Site C, and Spring Peeper most active at Site A (Chart B).



Green Frog. Photo by G.S. Casper.

Table 5. Counts of Occupied Samples and Error Rates by Site, Automated Surveys: Crossroads at Big Creek Preserve, 2021

Species	Omission* Error Rate	Commission** Error Rate	Automated Sample Count	N Samples Run (automated)	Reduction for Commission Error	Addition for Omission Error	Estimated Count
American Toad - All	0.500	0.065	804	1406	52.26	301.00	1053
Site A			299	580	19.44	140.50	420
Site C			307	622	19.96	157.50	445
Site E			109	204	7.09	47.50	149
Gray Treefrog - All	0.618	0.000	209	1530	0.00	816.38	1025
Site A			82	783	0.00	433.22	515
Site C			3	212	0.00	129.16	132
Site E			89	535	0.00	275.63	365
Green Frog - All	0.760	0.016	393	881	6.29	370.88	758
Site C			106	831	1.70	551.00	655
Site E			4	50	0.06	34.96	39
Northern Leopard Frog - Site C only	0.000	0.013	90	287	1.17	0.00	89
Wood Frog - Site A only	0.750	0.014	87	333	1.22	184.50	270
Spring Peeper - All	0.182	0.053	1562	2779	82.79	221.49	1701
Site A			554	1055	29.36	91.18	616
Site C			396	985	20.99	107.20	482
Site E			426	739	22.58	56.97	460

* - false negative, ** - false positive

4. Discussion

Amphibians can be good environmental indicators for monitoring long-term ecosystem health in the western Great Lakes region. Bioacoustic monitoring is well suited as a monitoring method for frogs and toads, which vocalize during their spring and early summer breeding season. In 2021 acoustic monitoring was conducted at five sites at the Crossroads Preserve to obtain baseline inventory data as habitat restorations begin.

Amphibians are sensitive to habitat quality due to their requirement for multiple habitats within close proximity (hopping distance) for completing their life cycle. Most species have an aquatic larval stage, but as adults occupy shoreline and adjacent terrestrial habitats, often over-wintering on land. They are therefore sensitive to land use, which may contribute to movement barriers and pollutant loads, and to upland and wetland habitat quality, particularly good hibernating sites that are insulated from deep frost depths. At the Crossroads Preserve Green Frog and Northern Leopard Frog hibernate in permanent waters, usually flowing water or otherwise well oxygenated. The remaining frog species (American Toad, Gray Treefrog, Wood Frog and Spring Peeper), and any salamanders present except Common Mudpuppy (*Necturus maculosus*), hibernate on land and are somewhat freeze tolerant. The insulating duff of organic soils, as well as snow cover, moderates deep frost depth and is important for amphibian winter survival. Duff development is directly correlated with habitat quality, where good leaf and grass litter, limited invasive species, and high plant diversity favor soil and duff development which is a critical amphibian microhabitat.

This survey identified six species of frogs and toads currently present at the Crossroads Preserve (Table 2): American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Green Frog (*Lithobates clamitans*), Northern Leopard Frog (*Lithobates pipiens*), Wood Frog (*Lithobates sylvaticus*) and Spring Peeper (*Pseudacris crucifer*). All are fairly common species in the region (Vogt 1981, Harding 2017). Additional species that are possible at the Preserve but currently absent are Cope's Gray Treefrog (*Hyla chrysoscelis*), American Bullfrog (*Lithobates catesbeianus*) and Boreal Chorus Frog (*Pseudacris maculata*).

Baseline data on calling phenology and abundance are presented with metrics for tracking changes in frog populations across years. These metrics can be utilized to inform ongoing habitat restoration and management recommendations. The resultant acoustic archive is also available for a variety of academic and applied research projects.

Spring Peeper is a common species at the Crossroads Preserve. Photo by G.S. Casper.

5. Habitat Management Recommendations

Monitoring

The current 2024 work plan includes repeating acoustic monitoring at the five wetland stations, for both frogs and birds. Additional recorders and additional years of monitoring may be considered if resources are available, as well as human nighttime calling surveys, and incidental visual surveys, to bolster the data record. Use of the HerpMapper app is recommended for any supplementary surveys for ease of data access.

Habitat Restoration and Management

Monitoring Sites:

Sites A and E – These are important amphibian breeding sites, supporting ephemeral pond obligates such as Wood Frog and high frog diversity. They are also connected by a drainage swale and are prominent showcase wetlands near the education center. Maintaining an ephemeral hydroperiod that excludes fish colonization is important, as well as managing for native plant communities. Because they are close to managed grassland habitat, these are good candidates for supporting Boreal Chorus Frog and Northern Leopard Frog, neither of which was detected in 2021. Because of their proximity to the education center, these wetlands are also good candidates for expanded amphibian monitoring to include salamander egg searches and trapping, and nocturnal calling frog surveys.

Site B – This emergent wetland along Big Creek has limited amphibian breeding habitat owing to a lack of still water pools, but does provide summer foraging habitat along the shoreline and within the adjacent wetland and upland habitats. While limited count data (data only available for June and July) suggest low frog abundance here, Spring Peeper and Gray Treefrog had strong call choruses in 2021. Creating an isolated pool, or semi-isolated backwater, would improve breeding opportunities.

Site C – This isolated semi-permanent pond is an important amphibian breeding site. American Toad and Spring Peeper were prominent in the 2021 metrics. Currently it is impacted by road runoff. It receives groundwater input and is mostly shaded, keeping it cooler and more permanent. More amphibians could be supported by creating a second, shallower, warmer basin along the overflow channel in the southwest corner, and continuing to restore the surrounding landscape to native plant communities. The second basin would add hydroperiod and temperature diversity, both important factors for amphibians.

Site D – This shoreline area supports frogs utilizing the permanent waters of the estuary and adjacent wetland habitats. American Toad and Green Frog were prominent in the 2021 metrics. If American Bullfrog appears, it will be here. Managing for native plant communities is recommended.

Preserve-wide Restoration and Management:

Forest – As long term goals, replacement of dying ash with native tree species is recommended to benefit Gray Treefrog, Spring Peeper and Wood Frog. Additionally, significant expansion of upland and swamp forest, as recommended in the current Ecological Restoration Plan (Landscapes of Place 2021), will create larger forest patches as existed pre-settlement. This will benefit most amphibians (including salamanders); birds such as warblers, vireos, thrushes, owls, and woodpeckers; and mammals such as squirrels, weasels, foxes, and bats. Mature forest patches are especially important for supporting roosting bats.

Grasslands – The history of agriculture and orchards on this landscape has resulted in many old field habitats. Some of these areas will be maintained and enhanced as native grassland communities per the current Ecological Restoration Plan (Landscapes of Place 2021), which will improve habitat diversity for amphibians such as Northern Leopard Frog and Boreal Chorus Frog.

Invasive Shrub Control – The invasive Common Buckthorn (*Rhamnus cathartica*) leaches a chemical (emodin) that can compromise tadpole mobility and increase mortality. For this reason it is important that no cuttings from Common Buckthorn are left in wetlands where emodin may leach into the water. Common Buckthorn cuttings should be removed, or placed in upland areas where they can be burned or left to decompose. Other invasive shrubs such as non-native honeysuckle (*Lonicera* spp.) should be replaced with native shrubs. Shrub thickets are important habitat for Gray Treefrog.

Wetlands – A wide variety of wetlands exist on the Preserve. Of most importance to amphibians are ephemeral and semi-permanent wetlands, and shoreline habitat. In general wetlands on the Preserve are impacted from encroachment of non-native invasive plant species, which should be controlled and replaced with native species to the extent possible. In particular, native wetland shrub thickets will support more amphibians than will Buckthorn thickets, and native emergent marsh comprised of diverse rushes, sedges and grasses will support more amphibians than will monotypic stands of cattail or non-native reed grass. Wetland breeding sites are critical to the amphibian breeding cycle. At the Preserve, isolated ephemeral wetlands are scarce and important hubs of breeding activity. Enhancement of the wetland at Site C is recommended to better support amphibians (see above).

Wood Frog requires ephemeral wetlands. Photo by G.S. Casper.

6. Literature Cited

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7. Appendices

Appendix A: Data Collection Results

Appendix B: Analysis Results

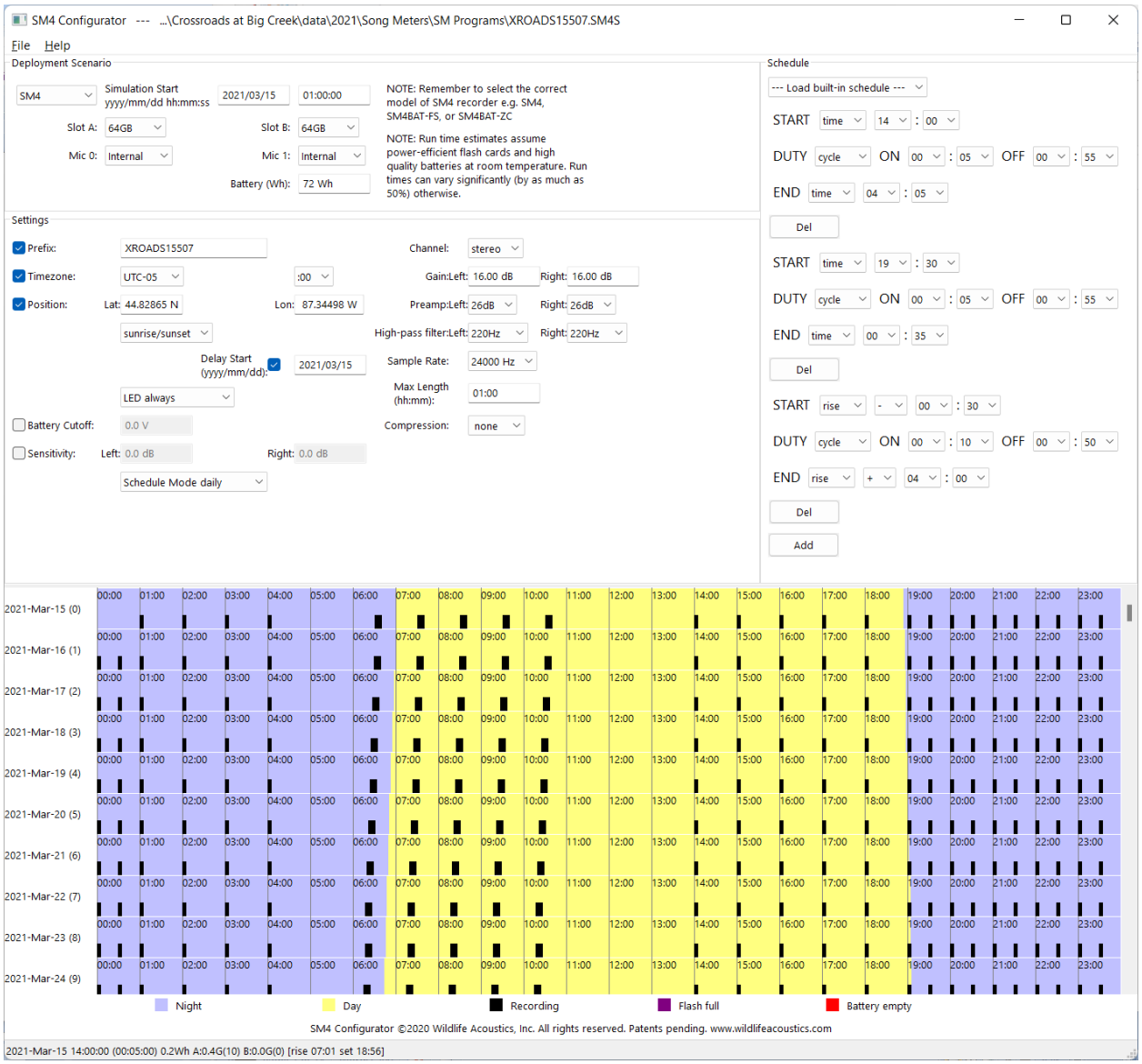
Boreal Chorus Frog is a potential species at the Crossroads Preserve. Photo by G.S. Casper.

Appendix A: Acoustic Data Collection Summary for the Crossroads at Big Creek Preserve - 2021

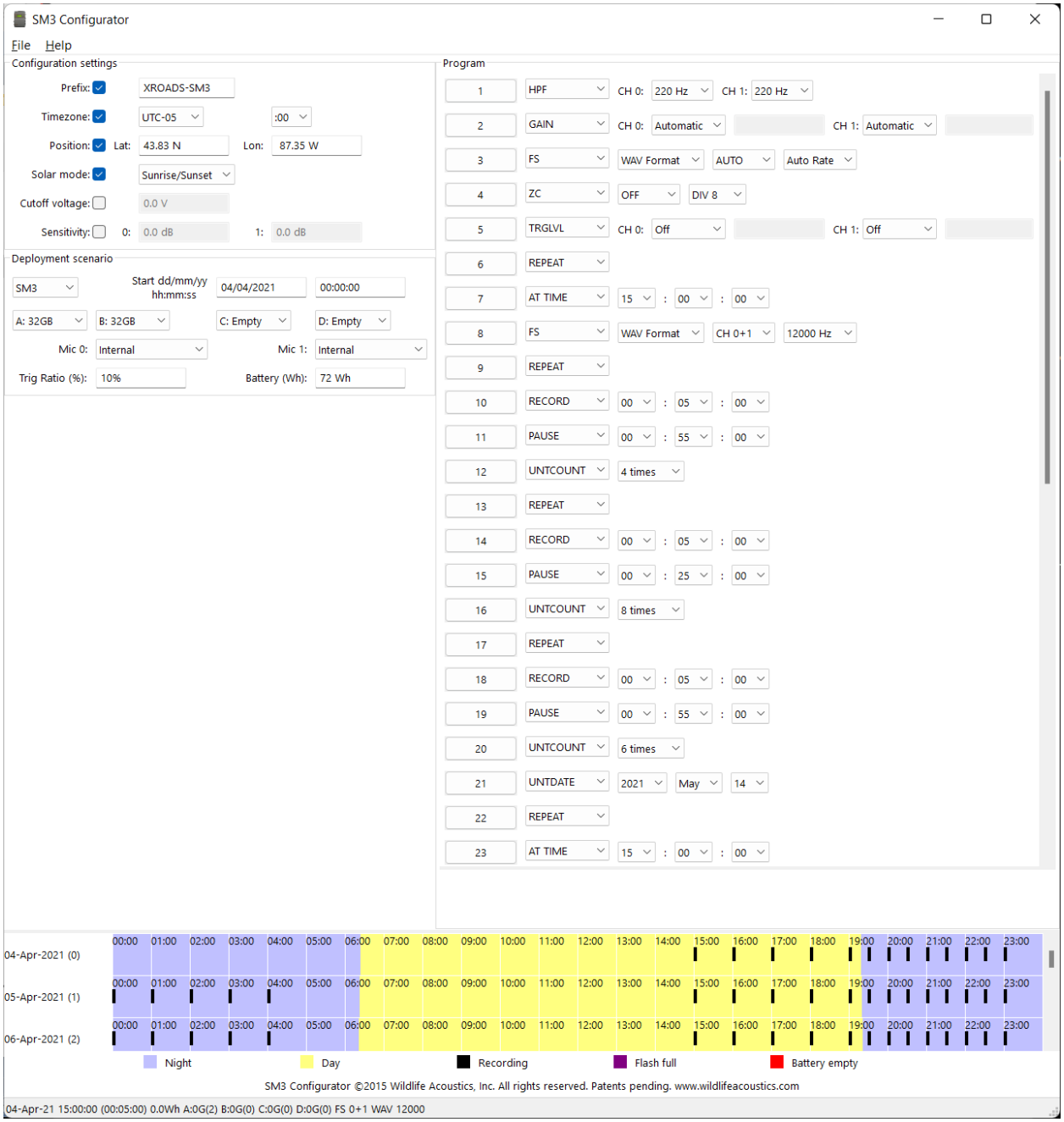
ARS = Automated Recording System

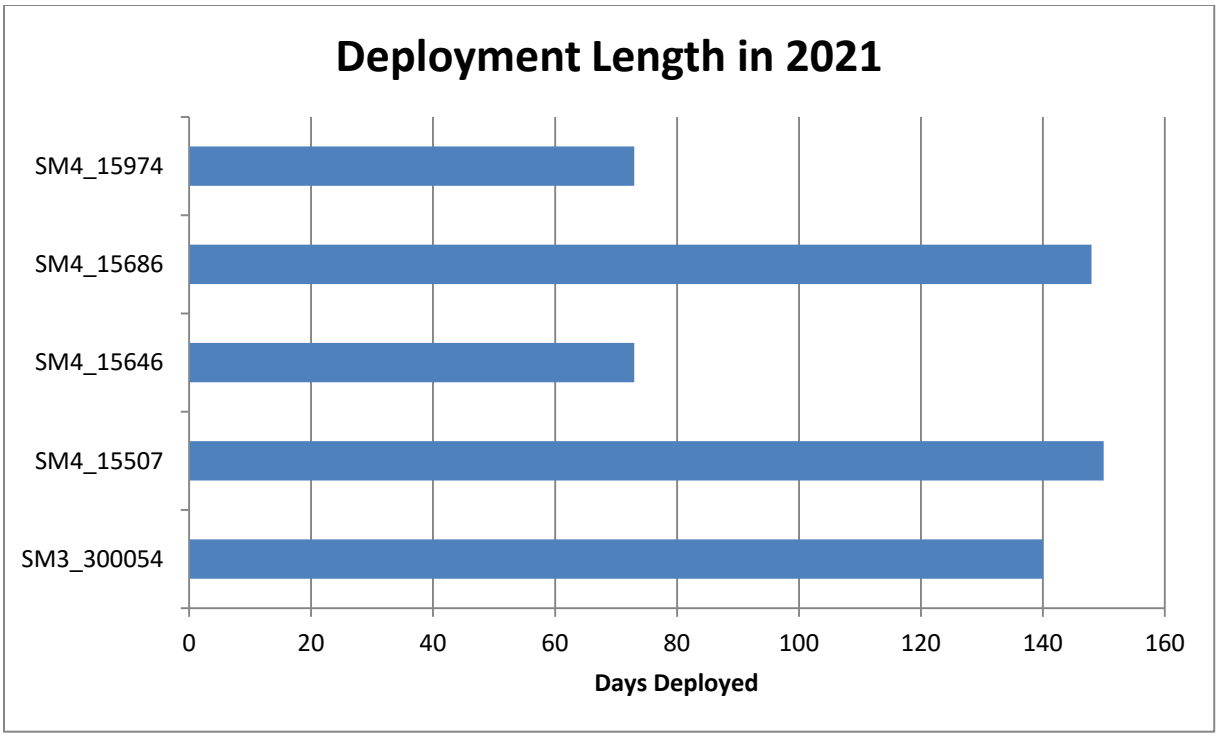
Program Screen Shots

2021 programming for SM4 units: Narrow bars are 5-minute samples, thicker bars are 10-minute samples, program continues until batteries fail or recorder is stopped. Programming was identical on all four recorders in 2021.



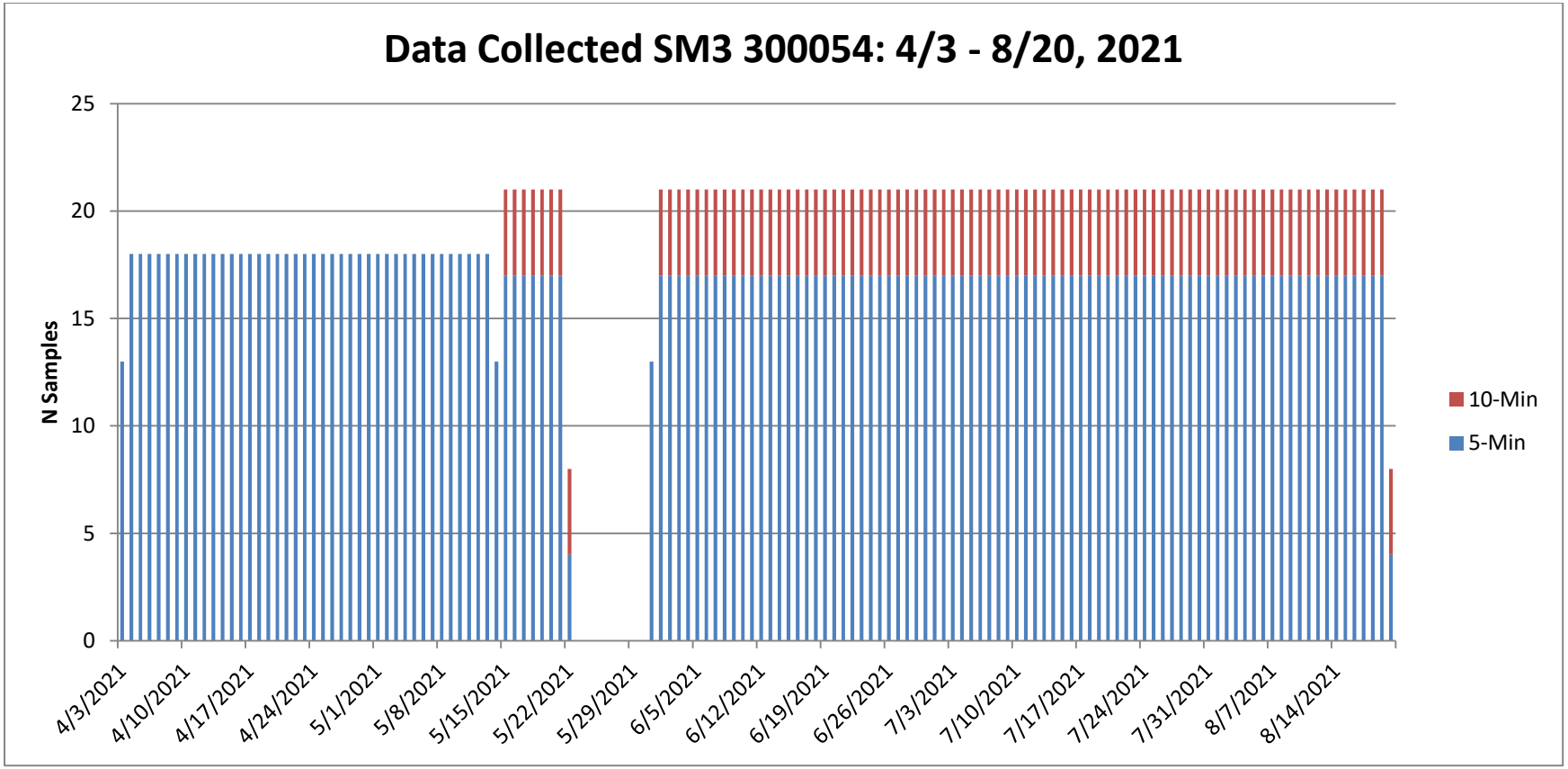
2021 programming for SM3 unit: Bars are 5-minute samples, program continues until batteries fail or recorder is stopped.





Data Collection Period, Crossroads at Big Creek, 2021.

Site	Start	End	Day Count
SM3_300054	4/3/2021	8/20/2021	140
SM4_15507	3/19/2021	8/15/2021	150
SM4_15646	6/2/2021	8/13/2021	73
SM4_15686	3/19/2021	8/13/2021	148
SM4_15974	6/2/2021	8/13/2021	73


Data Collected SM3 300054: 4/3 - 8/20, 2021
N Samples
25
20
15
10
5
0
4/3/2021
4/10/2021
4/17/2021
4/24/2021
5/1/2021
5/8/2021
5/15/2021
5/22/2021
5/29/2021
6/5/2021
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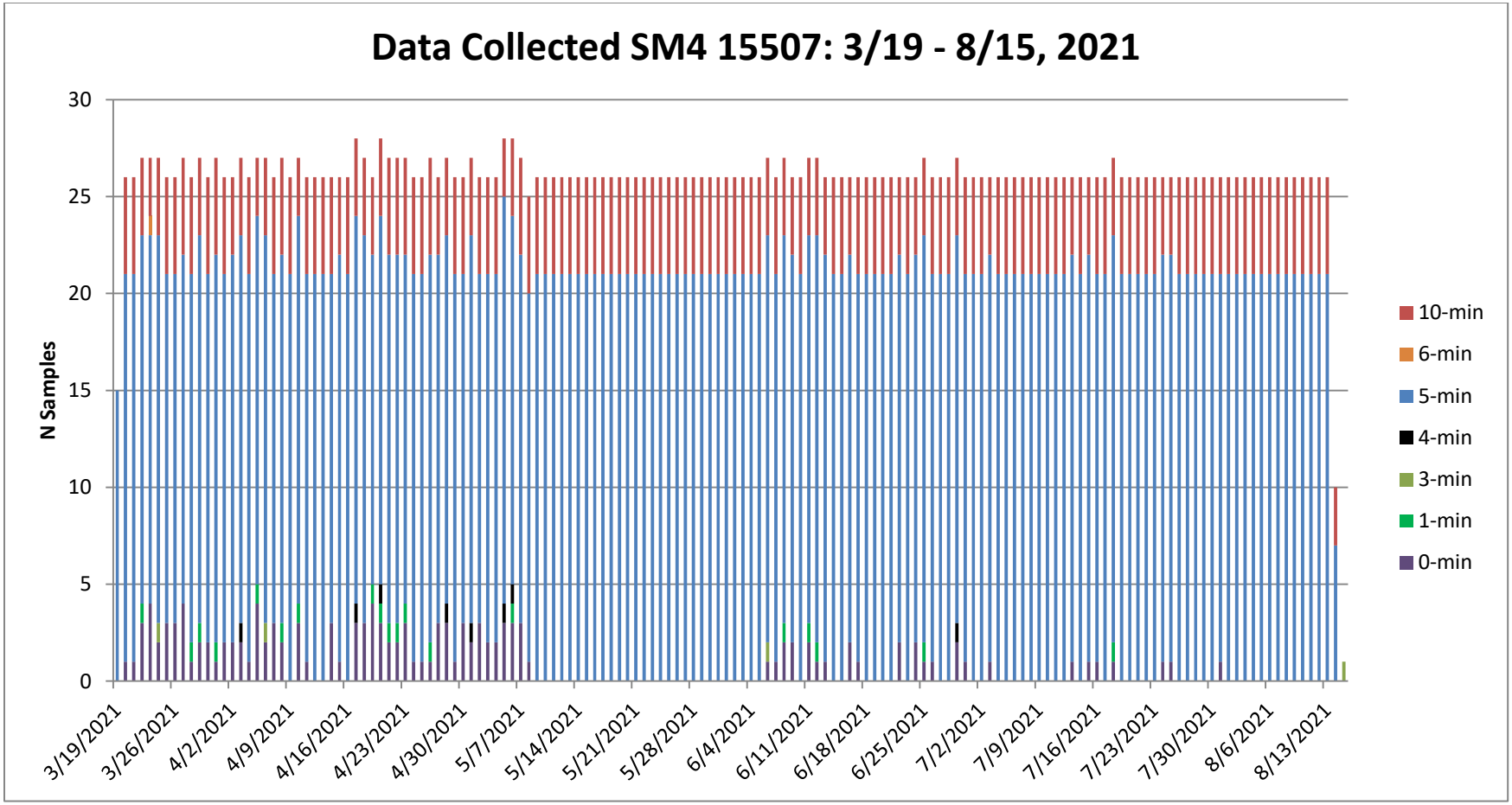
10-Min
5-Min


Data Collected SM4 15507: 3/19 - 8/15, 2021
N Samples
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25
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15
10
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3/19/2021
3/26/2021
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4/9/2021
4/16/2021
4/23/2021
4/30/2021
5/7/2021
5/14/2021
5/21/2021
5/28/2021
6/4/2021
6/11/2021
6/18/2021
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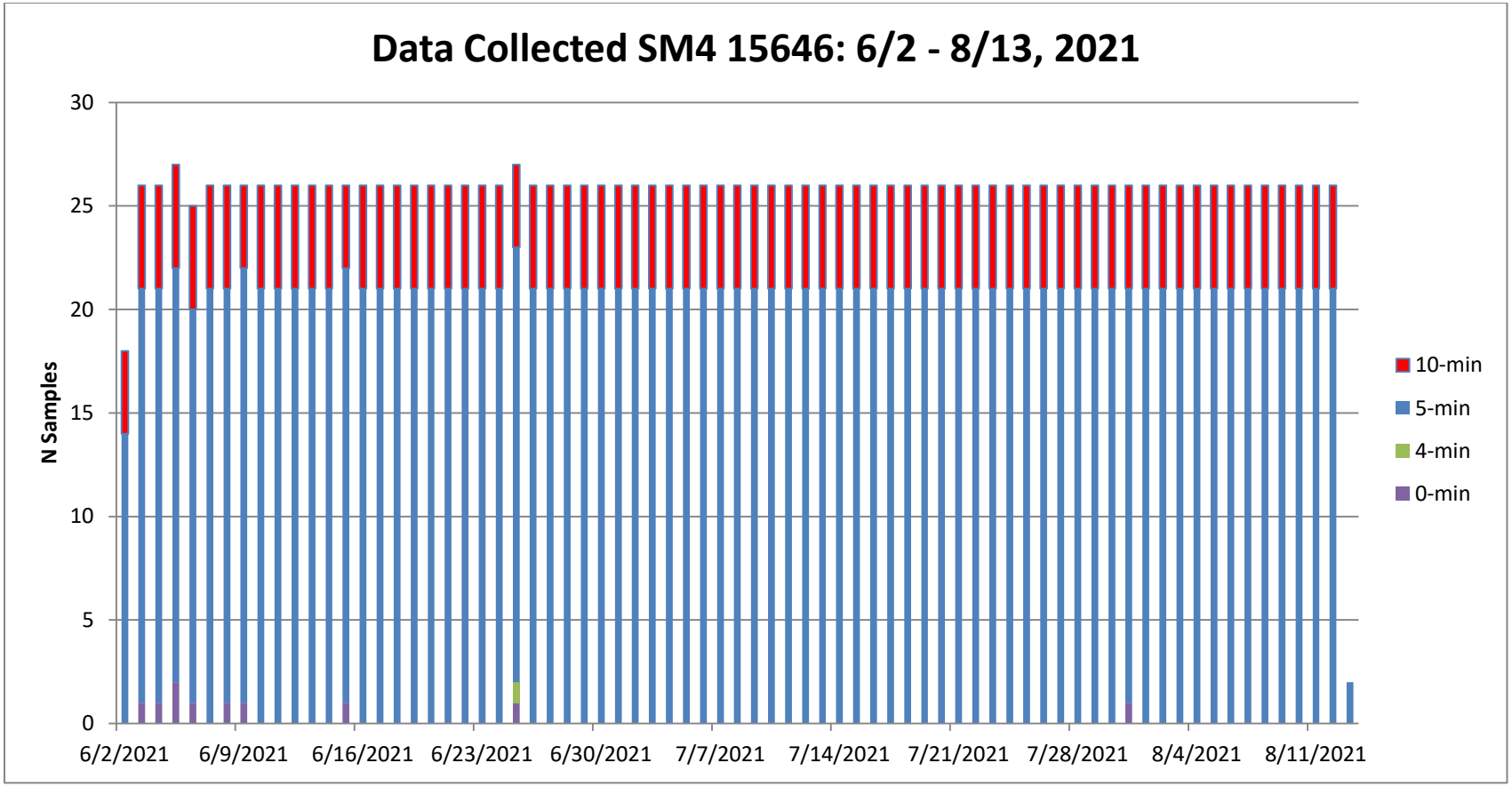
7/2/2021
7/9/2021
7/16/2021
7/23/2021
7/30/2021
8/6/2021
8/13/2021
10-min
6-min
5-min
4-min
3-min
1-min
0-min


Data Collected SM4 15646: 6/2 - 8/13, 2021
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6/2/2021
6/9/2021
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6/23/2021
6/30/2021
7/7/2021
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8/11/2021
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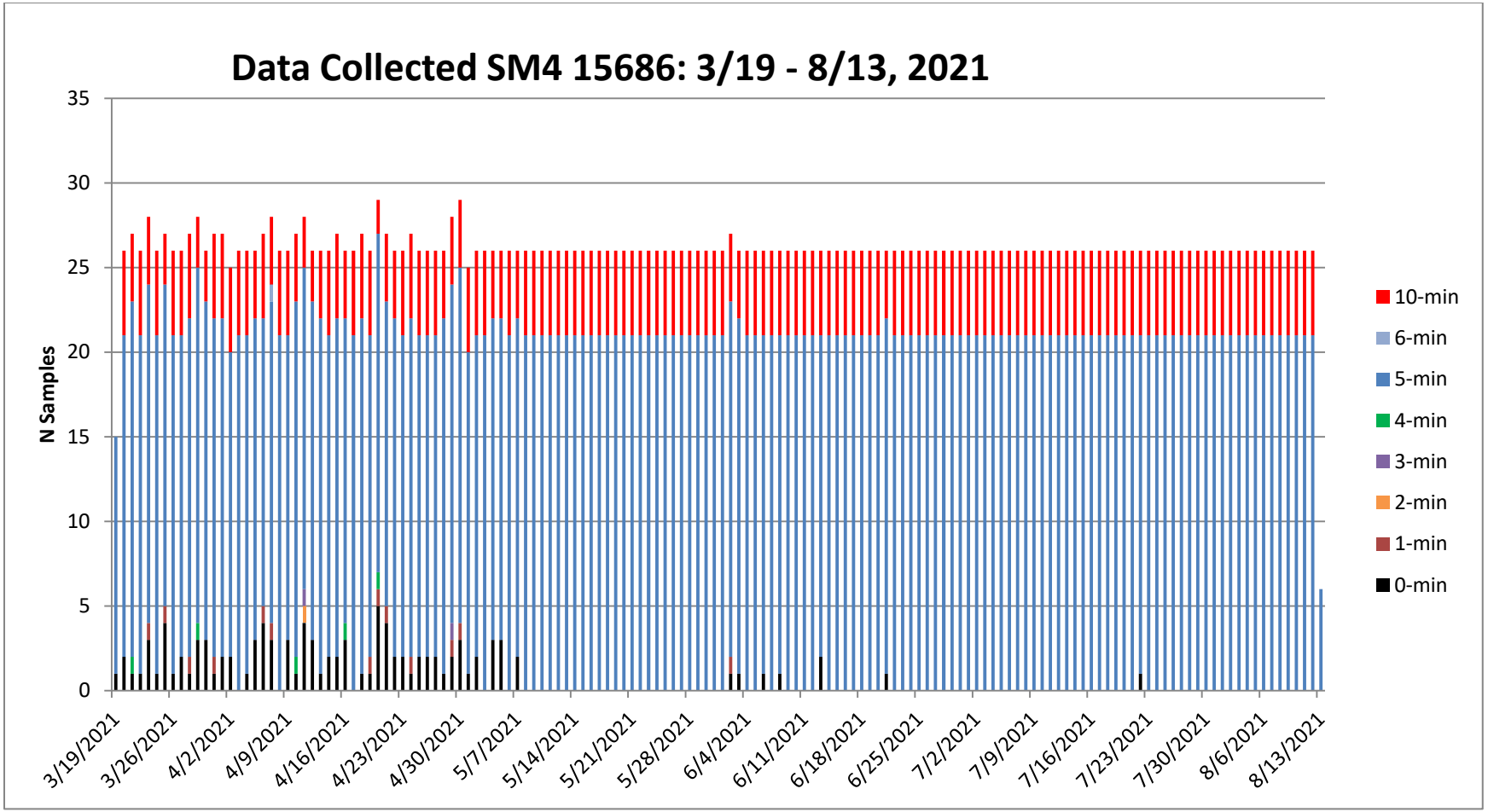
0-min


Data Collected SM4 15686: 3/19 - 8/13, 2021
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5/14/2021
5/21/2021
5/28/2021
6/4/2021
6/11/2021
6/18/2021
6/25/2021
7/2/2021
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7/23/2021
7/30/2021
8/6/2021
8/13/2021
10-min
6-min
5-min
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3-min
2-min
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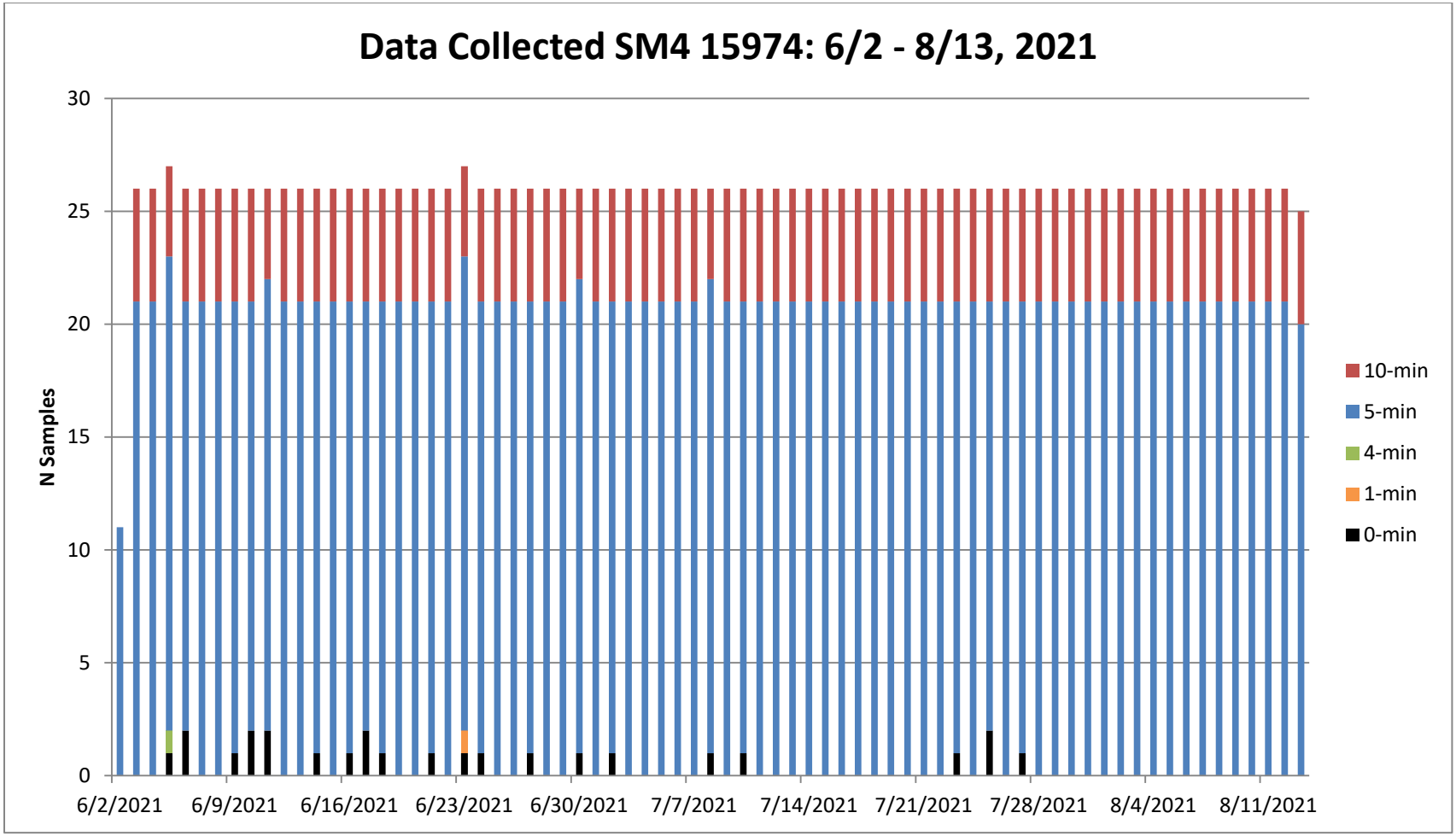
Data Collected SM4 15974: 6/2 - 8/13, 2021
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8/11/2021
10-min
5-min
4-min
1-min
0-min