SUMMARY REPORT GLEC Project Number: 2410-00

2017 Torch Lake Assessment

Prepared for:

The Watershed Center – Grand Traverse Bay (Principal Contact: Christine Crissman, Executive Director)

Funding Partners:

Dole Family Foundation Three Lakes Association Torch Conservation Center Torch Lake Protection Alliance

Prepared by:



Great Lakes Environmental Center, Inc. (GLEC) Contact: Dennis McCauley

> 739 Hastings Street Traverse City, MI 49686 Phone: (231) 941-2230 Fax: (231) 941-2240

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SUMMARY REPORT

2017 Torch Lake Assessment

Great Lakes Environmental Center, Inc. (GLEC) sampled Torch Lake (Antrim County, Michigan) in July 2017 following the protocols outlined for the National Lakes Assessment (NLA) 2017 field season. The purpose of the work was to sample Torch Lake using the same protocols used for the NLA 2017 so that a comparison could be made between Torch Lake and the lake conditions (i.e., Least Disturbed, Most Disturbed and Intermediate) estimated for lakes within the Upper Midwest Ecoregion (Figure 1)(USEPA 2017). The NLA 2012 data have been published, whereas the NLA 2017 data were only recently collected. Therefore, the results of this study were mostly compared to the NLA 2012 results. A detailed explanation of the protocols used in the assessment may be found at http://water.epa.gov/type/lakes/lakessurvey; and are also outlined in the NLA 2012 field Operations Manual (USEPA 2012a). The analysis of water and sediment samples was conducted following the procedures outlined in the NLA 2012 Laboratory Operations Manual (USEPA 2012b). The raw data forms, summary calculations, and laboratory analysis data are given in Appendices A through C. The NLA 2007 and 2012 Technical reports are given in Appendix D.

Figure 1. Ecoregions Used in the National Aquatic Resource Surveys (USEPA 2015)



Ecoregions used in National Aquatic Resource Surveys

Direct comparisons to other Michigan lakes is difficult in this instance because the NLA protocol is designed to estimate the percentage of lakes within a given ecosystem that are in "Good", "Fair", or "Poor" condition when compared to a calculated reference condition (Table 1). However, the chemical and physical data collected from Torch Lake may be compared to similar northern Michigan lakes of similar size and characteristics, if those data are made available. A qualitative comparison of the "Good", "Fair", and "Poor" scores for two other northern Michigan lakes was made with Torch Lake. Those lakes are Little Glenn Lake (Leelanau County) and

Clear Lake (Montmorency County). Both lakes were included in the NLA 2012 assessments and have similar characteristics with Torch Lake (e.g., oligotrophic, similar geology, similar latitude). Because the 2012 and 2017 NLA assessments were a probabilistic study design, lakes of various sizes (e.g., greater than 1 hectare) were sampled. Torch Lake is a relatively large lake and unique in its own characteristics. Therefore, finding a similar reference condition lake that was sampled using NLA protocols was not possible. Reference condition would typically include lakes that were absent of human influences, however, those types of lakes are becoming increasingly rare. Consequently, EPA has determined that a "least disturbed" condition is the next best alternative to a true reference condition (USEPA 2017).

	TP	TN	Cl	SO4	Turbidity	Hii-NonAg ¹⁰	Hii-Ag ¹¹	Assessment
	(ug/L)	(ug/L)	(ueq/L)	(ueq/L)	(NTU)		_	$(Ag/Res/Ind)^{12}$
WMT ¹	>30@	>400	>100#	>200	>3	>0.6	>0	> 5/5/5
XER ²	>100	>1000	>500	>1000	>5	>1.5	>0.2	> 5/5/5
NPL ³	>150	>2000	>1000		>5	>1.5	>0.5	> 10/6/6
SPL^4	>150*	>2000*	>1000		>5	>1.5	>0.5	> 10/6/6
TPL^5	>120	>2000	>1000	>5000	>5.5	>1.7	>0.15	> 9/9/9
UMW ⁶	<mark>>40</mark>	<mark>>1200</mark>	<mark>>200</mark>	<mark>>200</mark>	<mark>>5</mark>	<mark>>0.6</mark>	<mark>>0</mark>	<mark>> 5/5/5</mark>
CPL ⁷	>50	>1200	>1000	>400	>5	>1.0	>0	> 6/10/6
SAP ⁸	>35	>800	>125	>300	>5	>0.9	>0	> 6/6/6
NAP ⁹	>30	>600	>100#	>300	>5	>0.6	>0	> 6/6/6
1 33 1 17	XX7 ·	2 3		xz · 3	NIDI NI 1	D1	C	

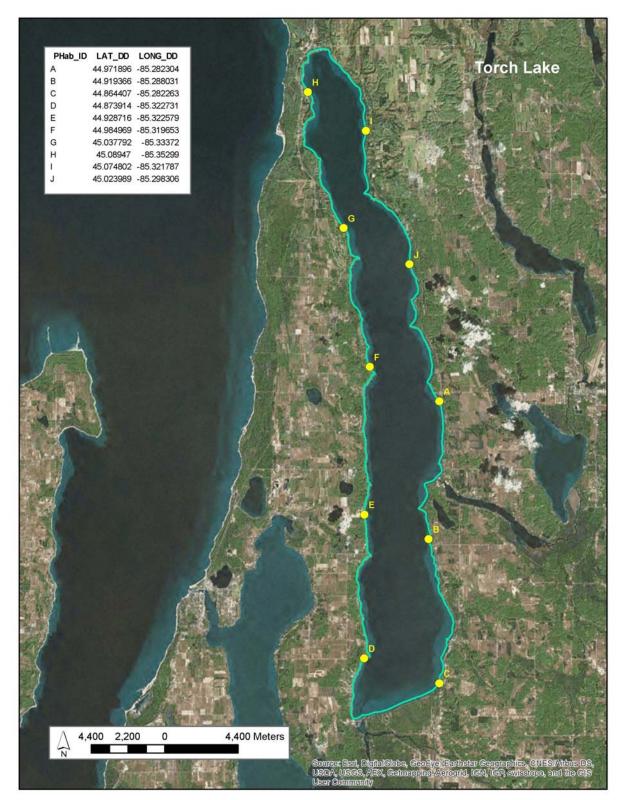
Table 1. Least-disturbed Reference Screening Filter Thresholds for NLA 2012 (Upper Midwest Ecoregion is labeled as UMW in the following table)

¹ WMT = Western Mountains; ² XER = western Xeric, ³ NPL = Northern Plains, ⁴ SPL = Southern Plains, ⁵ TPL = Temperate Plains, ⁶ UMW = Upper Midwest, ⁷ Central Plains, ⁸ Southern Appalachians, ⁹ NAP = Northern Appalachians, ¹⁰ Lakeshore Physical Habitat disturbances; non-agricultural, ¹¹ Lakeshore Physical Habitat disturbances; agricultural, ¹² Sum of agricultural/residential/industrial human disturbances

The size of Torch Lake is published as 18,770 acres (7,596 hectares), with a maximum depth of 87 meters (288 feet), and an average depth of 111 feet, which makes it Michigan's deepest inland lake. There are approximately 41 miles of shoreline and Torch Lake is approximately 2 miles wide (3.2 Km) at its widest point. Torch Lake is Michigan's second largest lake; second to Houghton Lake (20,044 acres).

Torch Lake was sampled on July 5, 2017 at coordinates 44.960000N and -85.29362W (NAD 83). The depth at the index site was 46.0 meters (approx. 151 ft.) which was located near the center of the lake, due west of physical habitat Station A (Figure 2). Equipment limitations prevented sampling at greater depths (NLA protocols also limit sampling depths to 50 meters). At the time of sampling, GLEC performed a limnological profile of dissolved oxygen, temperature, pH and conductivity (Table 3 and Figure 3). At the time of sampling, water samples were also collected from the index site for the analysis of E. coli, algal toxins (microcystin), atrazine pesticides, nutrients, pH, phytoplankton abundance, zooplankton abundance, chlorophyll *a*, sediment TOC, sediment contaminants and sediment grain size. Macroinvertebrates and physical habitat measurements were also taken at 10 randomly selected, equidistant, shoreline stations (Figure 2). Physical habitat measurements were made within a 15 meter riparian plot and within a 10 meter littoral plot at each of the stations (Figure 3).





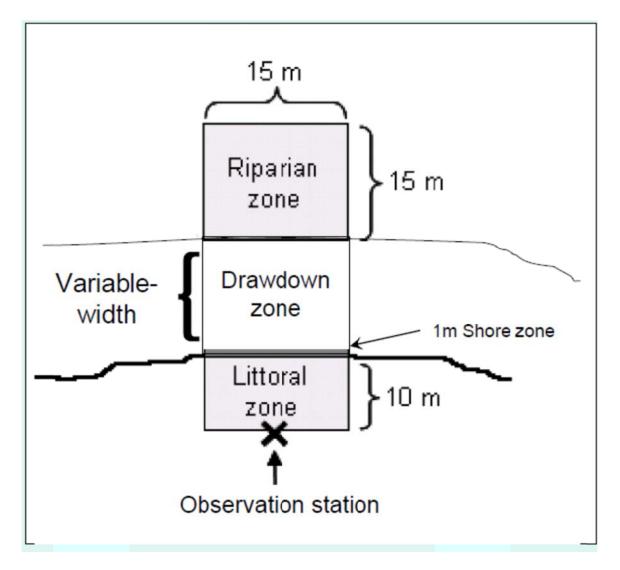
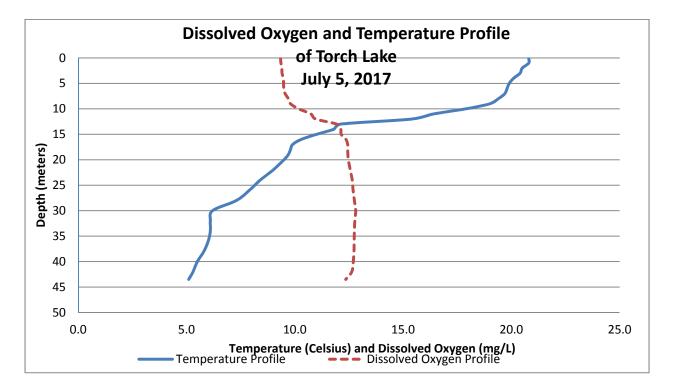
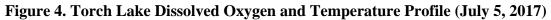


Figure 3. Physical Habitat Monitoring and Assessment Layout

RESULTS AND DISCUSSION

Torch Lake is known as a deep, cold, oligotrophic lake and the dissolved oxygen and temperature profile collected at the index station demonstrated that condition. The temperature profile demonstrated a defined thermocline at approximately 12 meters. Dissolved oxygen concentrations concomitantly increased at the thermocline to approximately 12 mg/L (> 100% saturation). Bottom temperatures were measured at 5.1° C (41 ° F). At that temperature, the 100 percent saturation of dissolved oxygen is 12.79 mg/L. We measured dissolved oxygen at 12.35 mg/L near the bottom. Consequently, the dissolved oxygen status is "high" in Torch Lake.





Water Quality

The water quality samples collected at the index station were analyzed and compared to the same parameters used for the Least Disturbed reference screening thresholds from the 2012 NLA from the Upper Midwest Ecoregion (Table 6). The examination of the Torch lake water chemistry indicators suggest that Torch Lake is a Least Disturbed water body. Measurements were also made for atrazine pesticides, toxic algae (microcystins), total coliforms, and E. coli. Those analyses suggest very little if any contamination of Torch Lake from pesticides, toxic algae or coliforms at the index station. The concentration of metals in the Torch Lake sediment is unremarkable. The metal concentrations are similar to that we would expect to see in any other non-contaminated lake in Northern Michigan. All of the PAH, PCB, pesticide and metals data were significantly less than the published sediment quality guidelines, indicating that none of the analytes were at toxic concentrations.

Table 2. Limnological Profile of Torch Lake; July 5, 2017

DEPTH (m)	\underline{DO}^1	TEMP ²	\underline{PH}^3	COND ⁴ .
Surface	<u>9.3</u>	20.8	8.45	296.6
1	9.4	20.8	8.46	296.6
2	9.4	20.5	8.47	296.5
3	9.4	20.4	8.47	296.4
4	9.5	20.1	8.47	295.9
5	9.5	19.9	8.47	295.7
6	9.5	19.8	8.48	295.4
7	9.6	19.7	8.48	295.5
8	9.7	19.4	8.48	295.4
9	9.8	19.0	8.48	294.4
10	10.2	17.9	8.46	293.5
11	10.7	16.4	8.45	294.3
12	11.0	15.4	8.43	294.1
13	11.9	12.1	8.42	294.5
14	12.1	11.8	8.41	294.8
15	12.1	11.0	8.43	295
16	12.4	10.3	8.42	294.9
17	12.4	9.9	8.42	294.9
18	12.4	9.8	8.41	295
19	12.5	9.7	8.41	295
20	12.5	9.5	8.41	295.6
22	12.6	9.0	8.40	295.5
24	12.7	8.4	8.39	295.5
26	12.7	7.9	8.39	295.5
28	12.8	7.3	8.38	295.7
30	12.8	6.2	8.45	295.9
32	12.8	6.1	8.36	296.1
34	12.8	6.1	8.35	296.1
36	12.7	6.0	8.34	296.1
38	12.7	5.8	8.33	296.3
40	12.7	5.5	8.34	296.5
42	12.6	5.3	8.33	296.6
<u>43.5</u>	<u>12.4</u>	<u>5.1</u>	<u>8.26</u>	296.8
AVG.	11.4	12.5	8.42	295.5
MAX	12.8	20.8	8.48	296.8
MIN solved Oxygen (mg/L), ² To	9.3 emperature ((5.1 ~) ³ nH (standa	8.26 rd units), ⁴ C	293.5 onductivity (umbos

⁰¹ Dissolved Oxygen (mg/L), ² Temperature (C), ³ pH (standard units), ⁴ Conductivity (µmhos/cm)

Table 3. Water and Sediment Quality Analysis: Torch Lake 2017¹

NLA Indicators		Torch Lake Results
Sample Type	Analyses	
Water chemistry	pH	8.24
nutrients	TOTAL PHOSPHORUS	< 0.0007
nutrients	TKN	0.458 mg/L
	Chlorophyll a	0.00033 mg/L
Bacteria	E.coli	<1 (MPN)
Bacteria	Total Coliforms	5.2 (MPN)
Algal Toxin	Microcystin	0.001 µg/L
Sediment	Total Organic Carbon	3.8%
Sediment	grain size	Clay: 26.1%, Sand: 35.0%, Silt: 29.1%
Sediment	Chlorinated Pesticides	<1 ng/dry gram (<mdl)< td=""></mdl)<>
Sediment	Total PCBs	<1 ng/dry gram (<mdl)< td=""></mdl)<>
Sediment	Total PAHs	14.0 ng/dry gram
Sediment	Percent Solids	73.8%
Sediment	Metals (µg/L) : Aluminum	3249/3640
	Antimony	0/0
	Arsenic	4.16/4.12
	Cadmium	0/0
	Chromium	5.9/6.2
	Copper	5.9/7.6
	Iron	5665/5667
	Lead	1.7/1.7
	Manganese	179/178
	Mercury	0.0053/0.0046
	Nickel	3.4/3.4
	Selenium	0.091/0.112
	Silver	0/0
	Tin	0.45/0.52
	Vanadium	10.7/10.9
	Zinc	8.2
Triazine Pesticides (water)	Atrazine Screen	0 μg/L

¹ Water samples were collected from a vertical two meter surface composite sample, with the exception of the bacteria and algal toxin samples which were collected as grab samples 0.5 meter from the surface. Sediment samples were collected from a 3inch core sampler at the index station.

Physical Habitat

Following the protocols outlined in the 2017 Field Operations Manual for the 2017 NLA, physical habitat was assessed at ten randomly selected stations on Torch Lake (Figure 2). The physical habitat observations included the assessment of littoral substrates, aquatic macrophytes, littoral fish cover, riparian canopy and ground cover, and human disturbance (Table 4). Percent cover was categorized as absent (0), sparse (less than 10%; 0.1, moderate (10-40%; 0.4), heavy (40-75%; 0.75), or very heavy (>75%; 1.0). Depth was also measured at a fixed distance from shore at each station.

In addition, four summary physical habitat condition indices: Lakeshore Anthropongenic disturbance Index (Intensity and Extent)(RDis_IX), Riparian Vegetation Cover Complexity Index (RVegQ), Littoral Cover Complexity Index (LitCvrQ) and Littoral-riparian Habitat Complexity Index (LitRipCvQ), were calculated from the field collected data. These indices were qualitatively compared to the 2012 NLA technical report values for least disturbed conditions (Table 6). Quantitative comparisons to other northern Michigan lakes were not completed for each indicator because the data analysis methods for the NLA are designed for comparison on an ecoregion scale. However, a qualitative comparison was made between Torch Lake and two other northern Michigan lakes (Table 5). For trend analysis purposes, these data can be compared to future NLA assessments on Torch Lake.

In the NLA 2012 technical report, contrasts in key NLA physical habitat index values were made among reference (R), intermediate (S), and highly disturbed (T) lakes (Figure 5-5 in the NLA 2012 Report). The summary physical habitat indices calculated for Torch Lake were within ranges outlined for intermediate lakes. This is not surprising given the human influence indicators (e.g., buildings, commercial, park facilities, and shoreline structures and boats) observed within the study transects. Additionally, 7 of the 10 physical habitat sampling stations included at least one human disturbance feature, which largely contributed to a score of "poor" in the LitRipCvrQ index. Riparian ground cover was dominated by lawns (grasses, herbs and forbes). The littoral zone is also very monotypic (mean depth of 0.91 meters +/-0.13 meters), and the substrate is dominated by sand, cobble and gravel throughout the lakeshore with the notable absence of other attributes that make up fish cover such as trees, macrophytes, and vegetation, other than human structures. Consequently, and not surprisingly, Torch Lake is considered to be neither least disturbed nor highly disturbed, based on these criteria. The other two northern Michigan lakes used for comparison were ranked overall nationally in the "Good" category regardless of their relatively poor rankings in physical habitat. Given these indicators and similar scoring, Torch Lake would also likely rank in the "Good" category nationally.

Again, the real value of these data is for trend monitoring purposes. The NLA protocols are easily repeatable, so short and long term trend monitoring of the indicators reported here should be relatively straight forward.

Table 4. Torch Lake 2017 National Lakes Assessment, Physical Habitat Assessment

Form P-1: NLA 2017 PHAB		D	C	D	Б	Б	G	TT	T	T	14	G(L D
Station	A 0.8	B	C 0.7	D 1.0	E 0.8	F 0.9	G	H 0.8	I 1.2	J 0.9	Mean	Std. Dev.
DEPTH (meters)	0.8		0.7	1.0	0.8	0.9	1.1	0.8	1.2	0.9	0.91	0.162
LITTORAL SUBSTRATE												
Bedrock	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Boulders	0	0	0	0	0	0.1	0.4	0	0	0	0.05	0.127
Cobble	0.4	0.4	0	0.4	1	0.4	0.4	0	0.4	0.75	0.42	0.298
Gravel	0.4	0.4	0.1	0.4	0.1	0.1	0.1	0.4	0.4	0.4	0.28	0.155
Sand	0.4	0.4	1	0.4	0	0.75	0.1	0.75	0.75	0.1	0.47	0.338
Silt	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Woody Debris	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Organic	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Vegetation/Other	0	0	0	0	0	0	0	0	0	0	0.00	0.000
AQUATIC MACROPHYTES	T									r	T	
Submergent	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Emmergent	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Floating	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Total Cover	0	0	0	0	0	0	0	0	0	0	0.00	0.000
LITTORAL FISH COVER			1		1			1				
Vegetation	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Woody Debris/Snags	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Woody Brush/Debris	0	0	0.1	0	0	0	0	0.1	0	0	0.02	0.042
Live Trees >0.3	0	0	0	0	0	0	0	0.1	0	0	0.01	0.032
Over Hanging Veg.	0	0.4	0.1	0	0	0	0	0.1	0	0	0.06	0.126
Ledges/Dropoffs	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Boulders	0	0	0	0	0	0	0.1	0	0	0	0.01	0.032
Human Structures	0.75	0.1	0	0.1	0	0	0.4	0	0.4	0	0.18	0.257
RIPARIAN CANOPY (>5m)			1		1			1				
Big Trees	0.1	0.75	0.1	0.4	0	0	0.4	0.4	0.4	0.1	0.27	0.243
Small Trees	0.4	0	0.75	0	0	0.1	0.1	0	0.4	0.4	0.22	0.258
RIPARIAN UNDERSTORY (0.5-5m)											
Woody Shrubs/Saplings	0.75	1	0.75	0.1	0	0.4	0.4	0.1	0.1	0.75	0.44	0.357
Herbs/Grasses/Forbes	0.4	0.4	0.1	0	0.1	0	0.1	0.1	0.1	0.1	0.14	0.143
RIPARIAN GROUND COVE	<u>R (<0.5m</u>)									-	
Woody Shrubs/Saplings	0.4	0.75	0.4	0	0	0.75	0.4	0.1	0.1	0.1	0.30	0.286
Herbs/Grasses/Forbes	0.75	0.4	1	1	0.75	0.1	0.4	1	1	0.75	0.72	0.317
Standing Water/Inundated	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Barren/Buildings	0.1	0	0.1	0	0.4	0.1	0.1	0	0	0.1	0.09	0.120
Mean											0.27	
HUMAN INFLUENCE												
Buildings	1	2	0	1	1	1	2	1	2	0	1.10	0.738
Commercial	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Park Facilities	0	0	2	0	0	0	0	0	0	0	0.20	0.632
Docks/boats	2	2	1	2	1	1	2	1	2	0	1.40	0.699
Walls/Dikes	0	0	2	2	0	1	2	2	0	0	0.90	0.994
Trash	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Roads/Railroad	1	0	1	0	0	1	0	0	1	0	0.40	0.516
Power Lines	1	0	1	1	1	0	0	0	0	0	0.40	0.516
Lawn	2	2	1	2	2	1	2	2	2	0	1.60	0.699
Mean											0.67	
Row Crops	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Pature/Range/Hay Fields	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Orchard	0	0	0	0	0	0	0	0	0	0	0.00	0.000
Mean											0.00	
Other	0	0	0	0	0	0	0	0	0	0	0.00	0.000

Lake	Trophic Status	DO^1	Chl. ² @	Draw- down	LitCvr ³	LitRipCvr ⁴	RDIS ⁵	RVeg. ⁶	Total Phosphorus (mg/L)	Sechi Depth (m)
Torch	Oligotrophic	High	Good (0.00033)	small	Poor (2.91)	Poor (1.5)	Poor (0.427)	Poor (0.11)	< 0.0007	11.5
Clear	Oligotrophic	High	Good	Med.	Poor (0.071)	Poor (0.305)	Fair (0.487)	Poor (0.447)	21	8.8
Glenn	Oligotrophic	High	Good	Small	Poor 0 217)	Poor (0.424)	Poor (0.753)	Fair (0.560)	23	

Table 5. Comparison of Selected Water Quality and Physical Habitat Indices (Rating Over Index Value) From Two Northern Michigan Lakes and Torch Lake

¹ Dissolved Oxygen, ² Chlorophyll @, ³ Littoral Cover, ⁴ Avg. Littoral and Riparian Cover, ⁵ Anthropogenic Disturbance, ⁶ Riparian Cover Complexity

Table 6. Comparison of the Least Disturbed Condition in the Upper Midwest EcoRegion to Torch Lake (2017)

	TD(ug/I)	TN	Cl	SO4	Turbidity
	TP (ug/L)	(ug/L)	(ueq/L)	(ueq/L)	(NTU)
UMW	>40	>1200	>200	>200	>5
Torch	<7	458			>5

As stated, samples were also collected for the analysis of zooplankton, phytoplankton and macroinvertebrates. The zooplankton, phytoplankton and macroinvertebrate data are given in Appendix C. Those data are unremarkable in that they are very much indicative of deep cold water lakes with low densities and low diversity. No metrics were calculated with these data.

REFERENCES

USEPA (United States Environmental Protection Agency). 2009. National Lakes Assessment: a collaborative survey of the Nation's lakes. EPA 841/R-09/001, U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, DC.

USEPA. 2012a. 2012 National Lakes Assessment Field Operations Manual. EPA/841/B-11/004, EPA/841/B-11/004. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 2012b. 2012 National Lakes Assessment Laboratory Operations Manual. EPA/841/B-11/004. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 2017. National Lakes Assessment 2012: Technical Report. EPA 841-R-16-114. U.S. Environmental Protection Agency, Washington, D.C. **Website:** <u>https://www.epa.gov/national-aquatic-resource-surveys/nla.</u>

APPENDIX A

FIELD DATA FORMS

LAKE VERIFICATION INFORMATION Lake shape compares with map? Is there public access? YES O NO Ø Yes O No	Field Crew:
LAKE VERIFICATION INFORMATION Lake shape compares with map? Is there public access? YES O NO Ø Yes O No Access Description:	
Lake shape compares with map? Is there public access? YES O NO Ø Yes O No Access Description:	
YES ONO Ves ONO Access Description:	
ake verified by (Mark all that apply): 🍘 GPS 🐠 Local Contact 🚳 Signs 🛛 🝘 Roads 🔿 Topo. Map	
O Other (Describe Here): O Not Verified (Exp	lain in Comments)
DESIGN COORDINATES Latitude Longitude	
MAP Decimal Degrees	Type of GPS Fix:
AUNCH Decimal Degrees <u>4.4.9.2.8.5.2.8</u> - <u>8.5.3.2.2.7.0.4</u> SITE* NAD 83	O 2D @ 3D
f these are not actual launch site coordinates, explain below:	
NID YOU SAMPLE THIS SITE? YES NO	
	and the second
NO, mark one reason and explain below: O Not Visited O Non-target O Inaccessible O Other (Explain b	elow):
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Very large doop mereational lake.	
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DIRECTIONS TO LAKE & LAUNCH SITE (from nearest main road or town):	and the second
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Name:	
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Leader: Michelle A Moore Julianne Heinlein	
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CALIBRATION	INFORMATION	an an Maria ang sa	as de la poster de	an an thair		ang terretari	Mar Carry				
Instrument manuf	facturer and mode	1: 45	1								
Inst	trument ID numbe	r: <u>2(</u>	1			Operator:	: <u>Jui</u>	IGANL HR	1h leir	2	
TENDEDATUDE	Thermometer Reading (°C) XX.X	Sensor Re		Comments		-				······	
TEMPERATURE						1					
	Elevation	0		rometric re (mm Hg)	Calibra	tion Value		Displayed Value	÷ .	Flag	
DO		, (m)	1	43	0		Omg/L	97.8	O mg/L . Ø %	9	
	Cal. STD 1 Descrip		. <u>La seconda s</u>	Cal. STD 1	Value	Cal. STD 2 [•		Cal. STD 2	2 Value	
	PHTE	ov ffer	fiv	1. 7.	6	PH	10 b	vffer	9	99	
рН	Calibration Verified with Quality Control Sample (QCS)										
	QCS Description						S True	QCS Meas	sured	Flag	
							<u></u>		, 	wasin	
and a second	Cal. STD 1 Descrip	tion		Cal. STD 1	Value	Cal. STD 2 D	Description		Cal. STD 2 \	/alue	
	1413 5	TD		141	3						
CONDUCTIVITY	Calibration Verified	d with Quality	Control S	ample (QCS)							
	QCS Description		e			QCS True (µS	S/cm @25°	C)QCS Measured (µS	/cm @25°C)	Flag	
									University of the second second		
Flag Comme	ents										
			4187a			<u></u>		2. Printer and the line of			
					dan da ar			2/1W2/2			
	. <u></u>										
Flac	g codes: K = No measur	ement or observ	vation made;	U = Suspect m	leasuremen	t or observation;	F1, F2, etc. :	= misc. flags assigned by	field crew.		
04/10/2017			E	Explain all flags	in comment	sections.			3249476	7	
04/10/201/	IS THER ZULT I	INCA FIOTILE									

FORM IP-1: NLA 2017 INDEX PROFILE (Back)

Date: 07 1 05 1 2 0 1 7

Site ID:	NLA17_	TORCH	

Submitted data via eFile O DISSOLVED OXYGEN, TEMPERATURE, AND pH PROFILE

Intervals (m): Surface to 20 m = every 1 m; 20-50 m = every 2 m; last reading 0.5 m above bottom ^a a If the site depth is <3 m, take readings at the surface, every 0.5 m, and 0.5 m above bottom.

^b METALIMNION = The region of the profile where the temperature changes at the rate of 1 °C or greater per meter of depth. Indicate the depth of the top of the metalimnion with a 'T', and the bottom of the metalimnion (when the rate change becomes less than 1 °C per meter) with a 'B'. After the metalimnion is encountered, take readings every 1 m until bottom of the metalimnion is reached.

	Depth XX.X	O₂ (mg/L) XX.X	Temp. (°C) XX.X	pH X.XX	Cond. (µS/cm@ 25°C) XX	Meta- limnion ^t (T, B)	Flag		Depth XX.X	O₂ (mg/L) XX.X	Temp. (°C) XX.X	pH X.XX	Cond. (µS/cm@ 25°C) XX	Meta- limnion ^b (T, B)	Flag	
	Surface	9.34	20.8	8.45	296.6				20	12.47	9.5	8.41	295			
	١	9.36	20.8	8.46	296.6				22	12.56	9	C.Y	295.6			
	2	9.4	20.5	8.47	296.5				24	12.65	8.4	8.39	2955			
	3	9.41	26.4	8.47	290.4				26	12.69	7.9	8.39	295.5			
	Ч	9.47		8.47	295.9				28	12.75	7.3	8.38	295.7			1
	5	9.48	19.9	8.47	2157				30	12.81	6.2	8.45	295.9			
	ما	9.49	19.8	9,48	295.4				32	12.77	6.1	836	296.)			
	7	9.55	19.7	8.48	295.5				34	12.75	6.1	8.35	296.1			
	8	9.7	19.4	8.48	295.4				36	12.74	6	8.34	296.1			
	٩	9.8	19	9.48	295		+		3.8	12.13	5.8	8.33	296.3			
	10	16.18	17.9	9.46	294.4				40	12.7	5.5	834	296.5			
	11	(0.74	16.4	8.45	243.5				42	12.63	5.3	\$.33	296.6			
	12	10.96	(5.4	8.13	294.3				43.5	12.35	5.1	8.24	296.9			
	13	11.93	12.1	8.42	29411		B									<u> </u>
2 	14	12.12	11.8	8.41	294.5											
	15	12.14	1	8.43	294.8			-								
	14	12.30	1013	8.42	295											
	17	12.44	9.9	8.42	ZAYA											
	18	12.44	9.8	8.41	29.4.9											
	19	12.95	9.7	8.41	295				Dup Surface	9.42	20.9	8.48	296.7			
	ls	the Dupli	icate O₂ ı	reading w	ithin ±0.5 mg		nitial surf o, calibra					O NO O NO				
Flag	Co	mments											je di A		·. ·	
													3			
		Flag codes:	K = No me	asurement	or observation n		Suspect mean all flags in				F1, F2, etc	. = misc. fla	gs assigned by fi	eld crew.		
	04/10/	2017 li	P-1: NLA 2	2017 Index	(Profile								8	868494	760	

	FORM IS-1: NLA 2017 INDEX SAMPLE COLLECTION (Page 1 of 3)
Site ID: NLA17_	Toech Date: 07 / 05 / 2017
measuring the remaining le	ARENCY s <1.0 meter, determine the depth to the nearest 0.05 meter by marking the line at the nearest depth marker and ngth with a tape measure or meter stick. Otherwise, estimate the disappearance depth to the nearest 0.1 meter.
	MPLE (SECCHI REAPPEARANCE DEPTH X 2 OR 2 METERS, WHICHEVER IS LESS)
E. COLI (BACT)	th is < 2 m (secchi < 1 m), take multiple "short" integrated samples to collect the required volume of water (8L total).
(Target Volume = 200ml	L) No Sample Collected C
Sample ID	Comments
856084	
FISH eDNA (FDNA) (Target Volume = 1000n	nl) No Sample Collected @
Sample ID	Comments
1 1 1 1 1 1 1	`
ALGAL TOXIN (Microc (Target Volume = 500m	No Sample Collected V.
Sample ID	Comments
8,5,6,0,8,2	
ALGAL TOXIN (Microc (Target Volume = 500m	No Sample Collected w
Sample ID	Comments
ATRAZINE PESTICIDE (Target Volume = 60mL	
Sample ID	Comments
NUTRIENTS (NUTS) (Target Volume = 250m	L) No Sample Collected C
Sample ID	Number of Ampoules (Max 2) pH <2 Comments
850086	
CHEMISTRY (CHEM) (Target Volume = 4L)	No Sample Collected C
Sample ID	Comments
856080	
	omment section to explain: Suspect measurement, observations or no measurements taken. 7718295661

•	FORM IS	6-1: NI	A 2017 INDEX SAMPLE COLLECTION (Page 2 of 3)	Reviewed by (initial):
Site ID: NLA17_	TOR	CH	Date: 0 7 / 0 5 / 2 0 1	4
DISSOLVED GAS CON (Two Samples:Target V				No Sample Collected 🧭
Sample ID - GSCA	Water Tem	p (°C) מו	Comments	
	Mator Tom		Comments	
Sample ID - GSCB	Water Tem	ip (C)	Comments	· · · · · · · · · · · · · · · · · · ·
<u></u>				
DISSOLVED GAS ISOT (Two Samples:Target Vo	•			No Sample Collected Ø
Sample ID - GSIA	Water Tem	np (°C)	Comments	
<u> </u>				
Sample ID - GSIB	Water Tem	np (°C)	Comments	
1 1 1 1 1 1 1				
AIR (GSAA & GSAB)				
(Two Samples:Target Vo	olume = 30i	mL gas	5)	No Sample Collected 🖉
Sample ID - GSAA	Comments			
1 1 1 1 1 1				
Sample ID - GSAB	Comments			
<u></u>				
PHYTOPLANKTON (PH (Target Volume = 1000r				No Sample Collected ()
Sample ID	Lugols C	Commen	ts	
850087	O			
CHLOROPHYLL-a (CHI (Target Volume = 1000r		I = 200	0 mL)	No Sample Collected 🔿
Sample ID	Volume Filter	red (mL)	Comments	
.8.5.6.0.8.1.	75	0		
Use c	omment sec	tion to e	explain: Suspect measurement, observations or no measurements tal	ken.
				-

	FORM IS-1: NLA 2017 INDEX	SAMPLE	COLLECTION	(Page 3 of 3)	Reviewed by (initial):
Site ID:	TOECH	Date	»: <u>0.7</u> ′ <u>0</u>	5 / 2 0 1	7
ZOOPLANKTON COAF	RSE (150 micron mesh) (ZOCN)				No Sample Collected 〇
Sample ID	Number and length of tow:	# of Jars	Narcotized (CO ₂)	Preserved (ETOH)	
856094	 1 tow (5m) 2 tows (2.5m/ea.) 10 tows (0.5m/ea.) 	(۲	۲	
Comments					
ZOOPLANKTON FINE	(50 micron mesh) (ZOFN)				No Sample Collected 🔿
Sample ID	Number and length of tow:	# of Jars	Narcotized (CO ₂)	Preserved (ETOH)	· ·
856095	 1 tow (5m) 2 tows (2.5m/ea.) 10 tows (0.5m/ea.) 	41 Taylord		Ø	
Comments					
		-			
SEDIMENT ORGANIC (Target Volume = 50mL		-			No Sample Collected 🔿
Sample ID	Comments				
856096					
SEDIMENT CONTAMI (Target Volume = 100m		······			No Sample Collected ()
Sample ID	Comments				
856097					
SEDIMENT GRAIN SIZ (Target Volume = 100m					No Sample Collected 🔿
Sample ID	Comments				
856098					
Use c	omment section to explain: Suspect m	easurement,	observations or	no measurements ta	ken.

FORM LS-1: NLA 2017 LITTORAL SAMPLE COLLECTION											
Site ID:	NLA17_	TOPE	H			Date	.07	105	/ 2 0	1 7	
BENTHIC MACROINVERTEBRATES (BENT) No Sample Collected ()											
Sample ID Number of jars Preserved (ETOH) Comments											
856099 0											
STATIONS SUBSTRATE CODES: R - Rocky/Cobble/Woody debris; M - Macrophyte beds; F - Fines (sand, mud, organic); L - Leaf Pack; O - Other (Flag and explain in comments) COLLECTION CODES: B - Boat; W - Wading											
Α	В	С	D	Е	F	G	н	I	J		
Sub	Sub	Sub	Sub	Sub	Sub	Sub	Sub	Sub	Sub	Sub	Sub
@ R	@ R	OR	@ R	🕲 R	OR	🕲 R	OR	() R	🕲 R	OR	OR
ОМ	ОM	ОМ	ОМ	ОМ	ОМ	<u>о</u> м	ОM	() M	ОМ	ОМ	ОМ
() F	OF	🛞 F	OF	OF	€ F	OF	🛞 F	Ø F	OF	OF	OF
ΟL	OL	ΟL	OL	OL	OL						
00	00	00	00	00	00	00	00	00	00	00	00
Coll Ов	Coll O B	Coll ⊖ в	Coll O B	Coll ⊖ в	Coll ⊖ B	Coll ⊖ B	Coll ⊖ в				
@ W	© W	69 W	© w	Øw	⊗ w	🕲 W	ØW	@ W	© w	0 W	0 W
Flag Flag Flag Flag Flag Flag Flag Flag Flag Image: Imag											
										,	

٦

	FORM P-1: NLA 2017 PHAB (Front)					
Site ID: NLA17_ TORCH	Site ID: NLA17_ TORCH Date: 07 / 0 5 / 2 0 1 7 Reviewed by (initial)/MM					
STATION: O A O B O C O D O E O F O G O H O I O J STATION RELOCATED: O						
IS IT AN ISLAND? Yes 🔿 No 🥔	DROPP	ÈD: (O NEW STATION (K, L)			
STATION () S (Dec	D83 simal LAT: リリー. rees)	9-	7174 LONG: 85.28	255		
Shoreline Flooding: Yes O No @ Depth:	Horizonta (m)	I Dist.:	(m) Bank Angle (see diagram b			
Drawdown: Yes O No 🍘 🛛 🖳 – – –	(m) Dist:	LL	Bank Angle (see diagram t O Flat (<5°) @ Gradual (5-30°) O (m) O Near vertical/undercut (>75°)			
LITTORAL ZONE Surface film type: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: None O H2S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O Black O Gray Ø Brown O Red O Other						
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate (Littoral Bottom	10-40%) Flag	3 = Heavy (40-75%) 4 = Very Heavy (>75%) 1 Meter Shoreline Zone Flag			
Bedrock (>4000mm; larger than a car)				V = Near		
Boulders (250-4000mm; basketball-car)			⊙ ④ ③ ④ ≤=546 (30.75) ④ ● ● ● ● ● ≤=546 >	ep Vertical/ Undercut		
Cobble (64-250mm; tennis ball-basketball)				, <u>(</u> , , , , , , , , , , , , , , , , , , ,		
Gravel (2-64mm; ladybug to tennis ball size)	0 0 0 0 0		0 (1) ((5.30) G = Gradual (5.30)	\searrow		
Sand (0.06 - 2mm; gritty between fingers)	0 0 0 0 0		○ ○ ○ ○ F= Flat (<5')			
Silt, Clay, or Muck (<0.06mm; not gritty)				(ANGLE ASSES		
Woody Debris						
Organic (Leaf Pack, Detritus)						
Vegetation or Other						
AQUATIC MACROPHYTES			15 m .			
Do macrophytes extend lakeward more than 1 Yes O No 📢	0 meters from shore?		Riparian zone 15 m			
	Littoral Zone	Flag	Variable-			
Submergent			width { zone im Shore zone			
Emergent Floating			Littoral zone 10 m			
Total Aquatic Macrophyte Cover			†			
			Observation station			
FISH 0 = Absent (0%) 1 = Sp COVER	oarse (<10%) 2 = Moderate (Littoral Zone	10-40%) Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) Drawdown Zone (if present) Flag			
Aquatic and Inundated Herbaceous Veg.			$\bigcirc \bigcirc \bigcirc 2 \bigcirc 3 \bigcirc 4$			
Woody Debris/Snags > 0.3 m Dia.						
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)			$\bigcirc (1) (2) (3) (4)$			
Inundated Live Trees >0.3 m dia			$\bigcirc \bigcirc $			
Overhanging Veg. within 1 m of Surface			$\bigcirc \bigcirc $			
Ledges or Sharp Dropoffs						
Boulders						
Human Structures - Docks, Landings, etc			$\bigcirc \bigcirc $			
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fro	Explain all flags in		= misc. flags assigned by each field crew. ont section on back page. 0159613	3454		

		1 	HAB (Back)			
Site ID: NLA17_ TORCH	Date:(07	10,5 / 2017 Reviewed by (initial): MM			
STATION: () A OB OC OD OE OF	0 G (он с	DIOJ NEW STATION (K, L)			
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%)	2 = Moderate	(10-40%)) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)			
Riparian Zone		1.	vdone Zone (if present)			
O Deciduous O Broadleaf Evergreen O Coniferous	Mixed FLAG	O Decid	duous O Broadleaf Evergreen O Coniferous O Mixed FLAG			
Big Trees (Trunk >0.3 m dBH) 💿 🚳 📀 🔾	0		00000			
Small Trees (Trunk <0.3 m dBH) 0 1 0 3	0		<u> </u>			
Understory (0.5-5m)						
Riparian Zone		Draw	vdone Zone (if present)			
O Deciduous O Broadleaf Evergreen O Coniferous	Mixed FLAG		duous O Broadleaf Evergreen O Coniferous O Mixed FLAG			
Woody Shrubs & Saplings 🕚 🕦 📀 🏈			0 0 0 0 0			
Tall Herbs, Grasses, & Forbs 💿 🚳 💈 🕙	\odot					
Ground Cover (<0.5m)			호텔에서는 관련하는 것은 가장에 가지 않는 것 같아요. 전체가 전체가 전체가 있는 것은 것은 것이 있는 것이다. 이 것은 것 같아요. 			
Riparian Zon	FLAG	Draw	vdown Zone (if present) FLAG			
Woody Shrubs & Saplings 💿 🕦 🕥	\bigcirc		$\bigcirc \bigcirc $			
Herbs, Grasses and Forbs 💿 🕦 📀 🐠	\bigcirc		00000			
Standing Water or Inundated Vegetation 🖉 (1) (2) (3)	\bigcirc	$\bigcirc \bigcirc $				
Barren, Bare Dirt, Litter Duff or Buildings 💿 🚳 📀 🜖	\odot		$\bigcirc \bigcirc $			
Human Influence 0 = Not Present P = Present out	tside plot C	=Presen	it within plot			
Riparian Zone D	rawdowr	n Zone	e (if present)			
FLAG		FLAG				
Buildings Image: Object with the second se						
Park Facilities/Man-made beach	$\overline{0}$					
Docks/Boats 0 P 0	\overline{O}					
Walls, dikes or revetments 🕢 🕑 💿	\odot		P _R			
Trash/Landfill 🕘 🕝 📀	\odot		P _R			
Roads or Railroad Image: Orgen series Image: Orgen series Power lines Image: Orgen series Image: Orgen series	0 () 0 ()					
Power lines Image: Orgon set of the	<u> </u>		Vore Pint I Water Line i			
Pasture/Range/Hay Field 🛞 🕐 📀 📀	00		$\begin{array}{c c} \hline \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $			
	0 0		Kine Pioi			
Lawn 💿 🖻 🚳 💿			$P_R C_R P_R$			
Other (Flag & explain in comments)	0		Ne Drawdowe Zon: Present			
Flag Comments		Flag	Comments			
The second s						
Flag codes: K = No measurement made, U = S	Suspect measur plain all flags in	rement., F	F1,F2, etc. = misc. flags assigned by each field crew. t section. 0406186511			

	FORM P-1: NLA	201	7 PHAB (Front)			
Site ID: NLA17_ TORCH Date: 07 / 05 / 2017 Reviewed by (initial): MM						
STATION OA OB OC OD OF OF OR ON ON ON ON						
IS IT AN ISLAND? Yes O No 🞯		PPED:				
	AD 83	PED:	O NEW STATIO	N (K, L)		
STATION (D		. 9	1955LONG: 85	528806		
Shoreline Flooding:						
Yes O No Ø Depth:	Horizon Horizon	tal Dis	t.:			
Drawdown:				see diagram below): ual (5-30°) 〇 Steep (30-75°		
Yes O No 🔊 Height:	· (m) Dist:		(m) O Near vertical/under	cut (>75°)		
LITTORAL ZONE Surface film type:	None O Scum O A			Flag:		
Substrate Odor: 🕥 None	OH ₂ S O Anoxic O O	il	O Chemical O Other			
Substrate Color: O Black	O Gray Srown O R	ed	O Other			
SUBSTRATE 0 = Absent (0%) 1 = S	parse (<10%) 2 = Moderate	(10-40%	%) 3 = Heavy (40-75%) 4 = Very Heavy (>7	75%)		
	Littoral Bottom	Flag				
Bedrock (>4000mm; larger than a car)				· · · · · · · · · · · · · · · · · · ·		
Boulders (250-4000mm; basketball-car)			$\bigcirc \bigcirc $	S = Steep V = Near Vertical/ Undercut		
Cobble (64-250mm; tennis ball-basketball)	0 0 0 0 0			(30-75*)		
Gravel (2-64mm; ladybug to tennis ball size)				G = Gradual (5-30°)		
Sand (0.06 - 2mm; gritty between fingers)	○ ○ ○ ○ ○		· · · · · · · · · · · · · · · · · · ·	F = Flat (<5°)		
Silt, Clay, or Muck (<0.06mm; not gritty)				BANK ANGLE CLASSES		
Woody Debris			0 0 3 4			
Organic (Leaf Pack, Detritus)			$\odot \bigcirc \bigcirc$			
Vegetation or Other			$\odot \bigcirc \odot \bigcirc \odot \odot \odot$			
AQUATIC MACROPHYTES						
Do macrophytes extend lakeward more than	10 meters from shore?					
Yes O No Ø			Riparian zone	• 15 m		
	Littoral Zone	Flag	Variable-			
Submergent			width zone	1m Shore zone		
Floating			Littoral zone }	10 m		
Total Aquatic Macrophyte Cover	$\bigcirc \bigcirc $		↑ ×			
		a baaling	Observation station			
FISH 0 = Absent (0%) 1 = Sp	250 (<10%) 2 - Moderate	40.400/				
COVER	Littoral Zone	Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75 Drawdown Zone (if present) Flag	5%) a		
Aquatic and Inundated Herbaceous Veg.	(1) (2) (3) (4)					
Woody Debris/Snags > 0.3 m Dia.						
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)						
Inundated Live Trees >0.3 m dia						
Overhanging Veg. within 1 m of Surface	• • • • • • • • • • • • • • • • • • •		$\bigcirc \bigcirc $			
Ledges or Sharp Dropoffs			$\bigcirc (1) (2) (3) (4)$			
Boulders			$\bigcirc (1) \bigcirc (3) \bigcirc (4)$			
Human Structures - Docks, Landings, etc	0 0 0 0					
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fror	Explain all flags in	F2, etc. = comme	= misc. flags assigned by each field crew. nt section on back page.	0159613454		

Site ID: NLA17_ TORCH Date: 2	2017 PHAB (Back)
	<u>. </u>
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone Deciduous O Broadleaf Evergreen O Mixed FLAG	Drawdone Zone (if present) O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH) 💿 🕧 😟 🏈	$\bigcirc \bigcirc $
Small Trees (Trunk <0.3 m dBH)	$\bigcirc \bigcirc $
Understory (0.5-5m)	
Riparian Zone	Drawdone Zone (if present)
Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Woody Shrubs & Saplings 💿 🕦 🕄 🔞	
Tall Herbs, Grasses, & Forbs 💿 🍘 😧 🜖 🔄	
Ground Cover (<0.5m)	
Riparian Zone FLAG	Drawdown Zone (if present) FLAG
Woody Shrubs & Saplings 💿 🕦 🙄 🚳 🕢	
Herbs, Grasses and Forbs 💿 🕦 🕲 🕚 (
Standing Water or Inundated Vegetation 🕘 1 2 3 4	
Barren, Bare Dirt, Litter Duff or Buildings 🛞 1 2 3 4	
Human Influence 0 = Not Present P = Present outside plot C	
	n Zone (if present) _{FLAG}
Buildings 🕢 🖻 🞯 问 😳	†
Commercial P C O P C	
Park Facilities/Man-made beach 🕘 P C 0 P C	
Docks/Boats 0 P Ø 0 P C Walls, dikes or revetments Ø P C 0 P C	P _R
Trash/Landfill @ @ C @ @ C	
Roads or Railroad () () () () () () () () () () () () ()	P _R
Power lines @ P C 0 0 0 C	
Row Crops 🕐 🕑 😳 😶 😳	Vater Life i
Pasture/Range/Hay Field 🔘 P C 0 P C	Littoral Lit
Orchard 🖉 🖓 😳 💿 🕞 📀	KCREPIOL NAME LEVEL 1
Lawn 💿 🖻 🎯 🕞 😳	$P_{R} \stackrel{\text{restricted}}{=} P_{D} \text{restri$
Other (Flag & explain in comments)	Ns Drandown Zons Fresect
Flag Comments	Flag Comments
Flag codes: K = No measurement made, U = Suspect measur Explain all flags in	commont contion
04/10/2017 P-1: NLA 2017 Phab-Back	0406186511

	FORM P-1: NLA 2017 PHAB (Front)					
Site ID: NLA17_ TORCH Date: 07 / 0.5 / 2 0 1 7 Reviewed by (initial): mm						
STATION: OA OB OC OD	OE OF OG C	ngan di a co ao - c	I O J STATION RELO		0	
IS IT AN ISLAND? Yes 🔿 No 🔊	IS IT AN ISLAND? Yes O No 🔊 DROPPED: O NEW STATION (K, L)					
STATION O 7 (Dec	DEPTH AT NAD 83					
Shoreline Flooding: Yes O No O Depth: Horizontal Dist.: (m) Bank Angle (see diagram below):						
Drawdown: Yes O No Ø Height:	(m) Dist:	L L		O Gradual	(5-30°) O Steep (30-75°)	
LITTORAL ZONE Surface film type:	None O Scum O Alg	al Mat C	Oily O Other		Flag:	
Substrate Odor: Substrate Odor:	OH₂S OAnoxic OOil	С		, se transfer a frank	en e	
Substrate Color: O Black) Gray 🕜 Brown 🔿 Rec	ı C) Other		2007 - 100 -	
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate (Littoral Bottom	10-40%) 3 Flag	= Heavy (40-75%) 4 = Very H 1 Meter Shoreline Zon)	
Bedrock (>4000mm; larger than a car)				Ð		
Boulders (250-4000mm; basketball-car)		<u>,</u>	0 0 0 0	Ð	V = Near Vertical/ S = Steep Undercut	
Cobble (64-250mm; tennis ball-basketball)				Ð	(30-75") (>75")	
Gravel (2-64mm; ladybug to tennis ball size)	0 🖉 2 3 4			•	G = Gradual (5-30°)	
Sand (0.06 - 2mm; gritty between fingers)			0 0 0 0 0	4	F = Flat (<5")	
Silt, Clay, or Muck (<0.06mm; not gritty)				•	BANK ANGLE CLASSES	
Woody Debris			0 1 🕲 3 (J		
Organic (Leaf Pack, Detritus)			0 1 🕲 3 (•		
Vegetation or Other			0 0 0 0 0	• •		
AQUATIC MACROPHYTES				15		
Do macrophytes extend lakeward more than 1	0 meters from shore?	<u> </u>	Ē	15 m		
Yes O No 😰				iparian zone	m	
	Littoral Zone	Flag	Variable C	awdown	and the second se	
Submergent			width	zone	- 1m Shore zone	
Emergent				ittoral zone	m	
Floating Total Aquatic Macrophyte Cover			L	× †		
		L	Obser	vation station		
FISH 0 = Absent (0%) 1 = Sp COVER	oarse (<10%) 2 = Moderate (Littoral Zone		s = Heavy (40-75%) 4 = Very H Drawdown Zone (if pres)	
Aquatic and Inundated Herbaceous Veg.			0 1 2 3 (•		
Woody Debris/Snags > 0.3 m Dia.					· ·	
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)	0 0 2 3 4		0 1 2 3 (•		
Inundated Live Trees >0.3 m dia				Ð		
Overhanging Veg. within 1 m of Surface	0 0 2 3 4		0 (1 (2 (3 (4		
Ledges or Sharp Dropoffs			0 () () () ()	•	· · ·	
Boulders				<u> </u>		
Human Structures - Docks, Landings, etc				<u>ع</u>		
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fro	Evolain all flage is	,F2, etc. = r n comment	nisc. flags assigned by each field section on back page.	crew.	0159613454	

FO	FORM P-1: NLA 2017 PHAB (Back)					
Site ID: NLA17_ TORCX	Site ID: NLA17_ Top Date: 0 7 7 Reviewed by (initial): Mm					
STATION: OA OB ØC OD OE	OF OG C	OHOLOJ NEW STATIO	ЭN (K, L)			
Canopy (>5m) 0 = Absent (0%) 1 = Sparse	(<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)			
Riparian Zone O Deciduous O Broadleaf Evergreen O Coniference	ous 🟉 Mixed FLAG		Coniferous O Mixed			
Big Trees (Trunk >0.3 m dBH) 💿 🚳 (2 3 4					
Small Trees (Trunk <0.3 m dBH) 💿 🕦 ($\bigcirc \bigcirc $				
Understory (0.5-5m)						
Riparian Zone		Drawdone Zone (if present)				
O Deciduous O Broadleaf Evergreen O Coniferen	ous @ Mixed FLAG	O Deciduous O Broadleaf Evergreen O	Coniferous O Mixed			
Woody Shrubs & Saplings 💿 🕦 (2 0 (1	$\bigcirc \bigcirc $				
Tall Herbs, Grasses, & Forbs 💿 🙆 (3 3 4	$\bigcirc \bigcirc $				
Ground Cover (<0.5m)						
Riparia	n Zone FLAG	Drawdown Zone (if present)	LAG			
	0 0 0	$\odot \bigcirc \odot \odot \odot \odot$				
Herbs, Grasses and Forbs 💿 🕦 (2 3 0	$\bigcirc \bigcirc $				
Standing Water or Inundated Vegetation 🖉 🕦 (3 3 4	$\bigcirc \bigcirc $	n an			
Barren, Bare Dirt, Litter Duff or Buildings 🧿 🍘 (2 (3) (4)	$\bigcirc \bigcirc $				
Human Influence 0 = Not Present P = Pr Riparian Zone	Drawdowr	=Present within plot Zone (if present) FLAG				
Buildings D C						
Commercial 🙆 P 📀	$\overline{0}$ $\overline{0}$ $\overline{0}$					
Park Facilities/Man-made beach 💿 🖻 🚳	$\bigcirc \bigcirc \bigcirc \bigcirc$					
Docks/Boats 💿 🌒 📀			n			
Walls, dikes or revetments 💿 🕑 🛞			P _R			
Trash/Landfill 🖤 🕑 😋	<u> </u>	P _R	Piparian			
Roads or Railroad () () () Power lines () () ()		office normal High	P _R C _R P _R ^{Zone Plot}			
Row Crops 🕲 🕐 🕑	0000	Voter Line				
Pasture/Range/Hay Field	$\bigcirc \bigcirc \bigcirc \bigcirc$	Uttoral P _R C _R P _R	PD CD PD Zone Plot			
Orchard 🞯 🖓 📀	$\bigcirc \bigcirc \bigcirc \bigcirc$	Zone Flot Ourcent Water Level				
Lawn 🗿 🔞 🖸		$P_{R} C_{R} P_{R}$	PD CD PD Littoral Zone Flot			
Other (Flag & explain in comments)		Ns Drandown Zone Presect				
Flag Comments		Flag Comments				
·						
	· · · · · · · · · · · · · · · · · · ·					
Flag codes: K = No measurement ma	ade, U = Suspect measur	ement., F1,F2, etc. = misc. flags assigned by each fie	ld crew.			
04/10/2017 P-1: NLA 2017 Phab-Back	Explain all flags in	comment section.	0406186511			

FORM P-1: NLA 2017 PHAB (Front)						
Site ID: NLA17_ TORCH Date: 07 / 05 / 2017 Reviewed by (initial): Mm						
STATION: O A O B O C O D O E O F O G O H O I O J STATION RELOCATED: O						
IS IT AN ISLAND? Yes O No 🕖 DROPPED: O NEW STATION (K, L)						
DEPTH AT NAU STATION (Dec (10 m offshore) , , , , , , , , , , , , , , , , , , ,		8	7.63.6 LONG: 8	5.32034		
Shoreline Flooding: Yes O No Ø Depth:	Horizonta	ıl Dist.	: (m) Bank Ang			
Drawdown: Yes O No @ Height:	(m) Dist:	<u>1 </u>		Gradual (5-30°) 🛿 Steep (30-75°)		
LITTORAL ZONE Surface film type: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: None O H ₂ S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O Black O Gray Brown O Red O Other						
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate (Littoral Bottom	10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy 1 Meter Shoreline Zone	y (>75%) Flag		
Bedrock (>4000mm; larger than a car)				V = Near		
Boulders (250-4000mm; basketball-car)				S = Steep (30.75') (>75')		
Cobble (64-250mm; tennis ball-basketball)	$\bigcirc \bigcirc $		0 () 2 3 🕲			
Gravel (2-64mm; ladybug to tennis ball size)	0 1 0 3 4			G = Gradual (5-30")		
Sand (0.06 - 2mm; gritty between fingers)	0 (1 () () ()			F = Flat (<5")		
Silt, Clay, or Muck (<0.06mm; not gritty)				BANK ANGLE CLASSES		
Woody Debris						
Organic (Leaf Pack, Detritus)						
Vegetation or Other						
AQUATIC MACROPHYTES			15 m	1		
Do macrophytes extend lakeward more than 1	0 meters from shore?]		
Yes O No 😰			Riparia zone			
Submergent	Littoral Zone	Flag	Variable- width			
Emergent		-		Im Shore zone		
Floating			zone			
Total Aquatic Macrophyte Cover			Observation	n station		
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate Littoral Zone	(10-40%) Flag) 3 = Heavy (40-75%) 4 = Very Heav Drawdown Zone (if present			
Aquatic and Inundated Herbaceous Veg.		Τ	0 1 2 3 4			
Woody Debris/Snags > 0.3 m Dia.			0 1 2 3 4			
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)						
Inundated Live Trees >0.3 m dia						
Overhanging Veg. within 1 m of Surface						
Ledges or Sharp Dropoffs						
Boulders						
Human Structures - Docks, Landings, etc	0 0 2 3 4		0 1 2 3 4			
Flag codes: K = No measurement made, U = Suspect measurement., F1,F2, etc. = misc. flags assigned by each field crew. 0159613454 04/10/2017 P-1: NLA 2017 Phab-Front Explain all flags in comment section on back page. 0159613454						

	017 PHAB (Back)
Site ID: NLA17_ TORCH Date: O	<u>7 / 0 5 / 2 0 1 7</u> Reviewed by (initial): <u>MM</u>
STATION: OA OB OC OD OE OF OG O	OHOIOJ NEW STATION (K, L)
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone	Drawdone Zone (if present)
Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH) 0 1 🕢 3 0	$\bigcirc \bigcirc $
Small Trees (Trunk <0.3 m dBH) 🔗 🕦 🖓 🕢	$\bigcirc \bigcirc $
Understory (0.5-5m)	에 가지 않는 것은 것은 것이 있는 것이 있는 것은 것이 있는 것이 있는 것이 있는 것이 있는 것이 있는 것이 있다. 이 이 이 같은 것은 것이 같은 것이 있는 것이 있는 것이 같은 것이 있는 것이 없을까? 것이 있는 것이 없는 것이 있는 것이
Riparian Zone	Drawdone Zone (if present)
Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed
Woody Shrubs & Saplings 💿 🚳 💈 🔇	
Tall Herbs, Grasses, & Forbs 🕐 🕦 🔇 🕄 🔇	
Ground Cover (<0.5m)	2017년 1월 201 1월 2017년 1월 2017년 1월 1월 2017년 1월
Riparian Zone FLAG	Drawdown Zone (if present) FLAG
Woody Shrubs & Saplings 🚳 🕦 🔹 🕙	
Herbs, Grasses and Forbs 💿 🕦 🔇 3	
Standing Water or Inundated Vegetation 🛞 🕦 🕄 🕄 🕙	00000
Barren, Bare Dirt, Litter Duff or Buildings 🜘 🕦 😧 🕚	$\bigcirc \bigcirc $
Human Influence 0 = Not Present P = Present outside plot C	=Present within plot
	n Zone (if present)
FLAG Buildings Image: Control of the second secon	FLAG
Commercial O	
Park Facilities/Man-made beach	
Docks/Boats 0 P 🕲 0 P C	
Walls, dikes or revetments 0 P 0 O C	P _R
Trash/Landfill	P _R / Piparian
Roads or Railroad	
Power lines Image: O Image: O <thimage: o<="" th=""> Image: O Image: O</thimage:>	Jora Plot
Pasture/Range/Hay Field 🕑 🕑 😳 💿	Uttoral P _R C _R P _R Uttoral P _D C _D P _D Zone Plot
Orchard @ 0 0 0 0 0	CCREPIO: Water Level
Lawn 0 P 0 P 0	$P_R C_R P_R$ $P_D C_D - Lateral$
Other (Flag & explain in comments)	No Drandowa Zoni Presert
Flag Comments	Flag Comments
Flag codes: K = No measurement made, U = Suspect measur	amont E1 E2 atc = misc flags assigned by each field grow
Explain all flags in	
04/10/2017 P-1: NLA 2017 Phab-Back	

FORM P-1: NLA 2017 PHAB (Front)					
Site ID: NLA17_ TORCH Date: 07/05/2017 Reviewed by (initial): 1007					
STATION: OA OB OC OD			OI OJ STATION RELOCATED: O		
IS IT AN ISLAND? Yes 🔿 No 🜘	DROPF	ED:	O NEW STATION (K, L)		
DEPTH AT STATION (10 m offshore)		9	2886 LONG: 85.32259		
Shoreline Flooding:	Horizonta		•		
Yes O No Ø Depth:			(m) Bank Angle (see diagram below):		
Drawdown: Yes O No 🗭 Height:	Dist:	<u> </u>	O Flat (<5°) O Gradual (5-30°) Ø Steep (30-75° (m) O Near vertical/undercut (>75°)		
LITTORAL ZONE Surface film type: Image: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: Image: None O H_2S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O Black O Gray Image: None O Red O Other Image: None Image: None					
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate(Littoral Bottom	10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) 1 Meter Shoreline Zone Flag		
Bedrock (>4000mm; larger than a car)			① ③ ③ ④ □		
Boulders (250-4000mm; basketball-car)			③ ① ③ ④ S = Steep (30.75) Vertical/ Underturn (275)		
Cobble (64-250mm; tennis ball-basketball)					
Gravel (2-64mm; ladybug to tennis ball size)			Image: Constraint of the second sec		
Sand (0.06 - 2mm; gritty between fingers)			○ ① ② ③ ④ F=Fbat (<5)		
Silt, Clay, or Muck (<0.06mm; not gritty)			BANK ANGLE CLASSES		
Woody Debris					
Organic (Leaf Pack, Detritus)					
Vegetation or Other		L	0 0 2 3 4		
AQUATIC MACROPHYTES			15 m		
Do macrophytes extend lakeward more than 1 Yes O No Ø	0 meters from shore?		Riparian zone }15 m		
	Littoral Zone	Flag	Variable- Drawdown		
Submergent			width zone im Shore zone		
Emergent Floating			Littoral zone } 10 m		
Total Aquatic Macrophyte Cover			Observation		
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate Littoral Zone	(10-40 % Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) Drawdown Zone (if present) Flag		
Aquatic and Inundated Herbaceous Veg.			$\bigcirc \bigcirc $		
Woody Debris/Snags > 0.3 m Dia.					
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)					
Inundated Live Trees >0.3 m dia					
Overhanging Veg. within 1 m of Surface					
Ledges or Sharp Dropoffs		<u> </u>			
Boulders			$\bigcirc \bigcirc $		
Human Structures - Docks, Landings, etc		1 52	Image: State sector field crew		
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-From	Explain all flags i	n comm	. = misc. flags assigned by each field crew. 0159613454		

FORM P-1: NLA 2	017 PHAB (Back)			
Site ID: NLA17_ TEECH Date:	27 / 0.5 / 2017 Reviewed by (initial): <u>MM</u>			
STATION: OA OB OC OD OPE OF OG O	OHOLOJ NEW STATION (K, L)			
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)			
Riparian Zone O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	Drawdone Zone (if present) O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG			
Big Trees (Trunk >0.3 m dBH) 🕢 🕧 🕢				
Small Trees (Trunk <0.3 m dBH) 🔮 🕦 2 3 4				
Understory (0.5-5m)				
Riparian Zone	Drawdone Zone (if present)			
O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG			
Woody Shrubs & Saplings 🔘 🕦 😧 🔇				
Tall Herbs, Grasses, & Forbs 📀 🙆 😳 🕄 🕢	$\odot \bigcirc \bigcirc$			
Ground Cover (<0.5m)				
Riparian Zone FLAG	Drawdown Zone (if present) FLAG			
Woody Shrubs & Saplings 🚳 1 2 3 4				
Herbs, Grasses and Forbs 💿 🕦 😧 🕢	$\odot \odot \odot \odot \odot \odot$			
Standing Water or Inundated Vegetation 🕢 🛈 😳 😗 🕢				
Barren, Bare Dirt, Litter Duff or Buildings 💿 🕦 🌒 🗿 🧿				
Human Influence 0 = Not Present P = Present outside plot C Riparian Zone Drawdown FLAG Drawdown	=Present within plot Zone (if present) FLAG			
Buildings 🗿 🚳 💿 💿 💿 📀	<u>+</u> +			
Commercial O C C C C C C C C C C C C C C C C C C				
Park Facilities/Man-made beach P C 0 P C Docks/Boats 0 0 0 0 0 0 0				
Docks/Boats Image: Object state Image: Object state Walls, dikes or revetments Image: Object state Image: Object state	P _R			
Trash/Landfill 🖉 🕑 😳 💿 💿 💮				
Roads or Railroad	P _R			
Power lines 0 0 0 0 0 0	Riveran P. C. P. C. P.			
Row Crops 🖉 🕑 😳 💿 💮	JosePick PR CR PR WaterLife			
Pasture/Range/Hay Field P C 0 0 0 0 0	Uttoral Zene Plot			
Orchard P C 0 P C Lawn 0 P 0 0 P C	$P_R C_R P_R$ Water Level $P_D C_D + P_D$ Listonal			
Lawn O P O O P O	Ne Drawdown Zont Present			
Flag Comments	Flag Comments			
Flag codes: K = No measurement made, U = Suspect measur Explain all flags in	ement., F1,F2, etc. = misc. flags assigned by each field crew. comment section. 0406186511			
04/10/2017 P-1: NLA 2017 Phab-Back	0400100511			

	FORM P-1: NLA 2	2017	PHAB (Front)				
Site ID: NLA17_ TORCH	Date:	7	/ 0 5 / 2 0 1 7 Reviewed by (initial): MM)			
STATION: OA OB OC OD	OE ØF OG C	H	OI OJ STATION RELOCATED: O				
IS IT AN ISLAND? Yes 🔿 No 🌰	DROPP	ED:	O NEW STATION (K, L)				
STATION (Dec	ова simal LAT: ЦЦЦ. rees)	9	8516 LONG: 85.3196	5			
Shoreline Flooding: Yes O No 🞯 Depth:	Horizonta	I Dist.	: (m)				
Drawdown: Yes O No Ø Height:		II		-75°)			
LITTORAL ZONE Surface film type: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: Image: None O H ₂ S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O Black O Gray Image: Brown O Red O Other Image: Imag							
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate(Littoral Bottom	10-40% Flag	6) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) 1 Meter Shoreline Zone Flag				
Bedrock (>4000mm; larger than a car)							
Boulders (250-4000mm; basketball-car)			(30.75)	ical/ ircut			
Cobble (64-250mm; tennis ball-basketball)	0 1 🚳 3 4			- /			
Gravel (2-64mm; ladybug to tennis ball size)	0 0 0 0		() () () () () () () () () () () () () (\forall			
Sand (0.06 - 2mm; gritty between fingers)	0 1 2 0 4		○ (1) (2) (3) (45) F = Plat (45)				
Silt, Clay, or Muck (<0.06mm; not gritty)			BANK ANGLE CLASSES				
Woody Debris			$\odot \bigcirc \odot \odot \odot$				
Organic (Leaf Pack, Detritus)							
Vegetation or Other			0 0 0 0				
AQUATIC MACROPHYTES			15 m				
Do macrophytes extend lakeward more than 1	0 meters from shore?						
Yes O No 🕲			Riparian zone 15 m				
	Littoral Zone	Flag	Variable- width Drawdown				
Submergent Emergent			- Im Shore zone				
Floating			Littoral zone 10 m				
Total Aquatic Macrophyte Cover			Observation station				
FISH 0 = Absent (0%) 1 = Sp COVER	barse (<10%) 2 = Moderate (Littoral Zone	10-40% Flag	6) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) Drawdown Zone (if present) Flag				
Aquatic and Inundated Herbaceous Veg.			$\bigcirc \bigcirc $				
Woody Debris/Snags > 0.3 m Dia.			$\bigcirc \bigcirc $				
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)							
Inundated Live Trees >0.3 m dia			$\bigcirc \bigcirc $				
Overhanging Veg. within 1 m of Surface			$\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$				
Ledges or Sharp Dropoffs			$\bigcirc \bigcirc $				
Boulders			$\bigcirc \bigcirc $				
Human Structures - Docks, Landings, etc			$\odot \bigcirc \odot \odot \odot \odot$				
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-From	Explain all flags in	,F2, etc. 1 comme	a = misc. flags assigned by each field crew. 0159613454				

FORM P-1: NLA 2	017 PHAB (Back)
Site ID: NLA17_ TORCH Date: C) 7 / 0 5 / 2 0 1 7 Reviewed by (initial):
STATION: OA OB OC OD OE ØF OG O	
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone O Deciduous O Broadleaf Evergreen O Coniferous	Drawdone Zone (if present) O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH)	
Small Trees (Trunk <0.3 m dBH) 💿 🔞 💿 🧿	$\bigcirc \bigcirc $
Understory (0.5-5m)	
Riparian Zone	Drawdone Zone (if present)
O Deciduous O Broadleaf Evergreen S Coniferous O Mixed	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Woody Shrubs & Saplings 💿 🕦 🊳 🕙	
Tall Herbs, Grasses, & Forbs 🕘 🕦 🕄 🔇 4	
Ground Cover (<0.5m)	
Riparian Zone FLAG	Drawdown Zone (if present) FLAG
Woody Shrubs & Saplings 💿 🕦 🕗 👔	$\bigcirc \bigcirc $
Herbs, Grasses and Forbs 💿 🚳 2 🕄 🕢	
Standing Water or Inundated Vegetation	
Barren, Bare Dirt, Litter Duff or Buildings 💿 🚳 😧 🧿 🕢	$\bigcirc \bigcirc $
Riparian Zone FLAG Drawdown Buildings Image: Commercial Image:	FLAG
Park Facilities/Man-made beach @ P C 0 0 P C	
Docks/Boats 0 0 0 0 0	
Walls, dikes or revetments 💿 🕼 📀 🛛 💿 📀	P _R
Trash/Landfill 🖉 🕑 💿 💿 💿	P _R / Fiparian
Roads or Railroad 0 6 0 0 0 0 0	
Power lines P C 0 P C Row Crops P C 0 P C	i WaterLine i
Pasture/Range/Hay Field 🖉 P C 0 0 0 0 0	$\begin{array}{c c} \hline \\ \hline $
Orchard D P C 0 P C	Zene Plot
Lawn 🛈 🛞 🖸 🗍 🕑	$P_{R} C_{R} P_{R}$
Other (Flag & explain in comments)	Ne Drandown Zono Fresen
Flag Comments	Flag Comments
1 Juniper	
Flag codes: K = No measurement made, U = Suspect measure Explain all flags in	rement., F1,F2, etc. = misc. flags assigned by each field crew. comment section. 0406186511
04/10/2017 P-1: NLA 2017 Phab-Back	0400100311

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	FORM P-1: NLA 2	017 P	HAB (Front)	, •		
Site ID: NLA17_ TOPCH Date: 07 / 05/2017 Reviewed by (initial): hm						
STATION: OA OB OC OD	OE OF ØG C	он С	OJ STATION RELOCAT	ED: O		
IS IT AN ISLAND? Yes O No 🕖	DROPP	ED: O	NEW STA	TION (K, L)		
STATION (Dec	ова imal LAT: Ц 5. rees)	03	78 y LONG: 8	5.33322		
Shoreline Flooding: Yes O No Ø Depth:	Horizonta	I Dist.: ∟	(m) Bank Ang	n shangalar na shi sa shi s		
Drawdown: Yes O No 🤗 Height:	(m) Dist:	EE		Gradual (5-30°) 🛛 🐨 Steep (30-75°)		
LITTORAL ZONE Surface film type: Image: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: Image: None O H ₂ S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O'Black O Gray Image: Brown O Red O Other Image: Color: Image: Color:						
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate (Littoral Bottom	10-40%) 3 Flag	B = Heavy (40-75%) 4 = Very Heav 1 Meter Shoreline Zone	y (>75%) Flag		
Bedrock (>4000mm; larger than a car)				V = Near		
Boulders (250-4000mm; basketball-car)				S = Steep Undercut (30-75*) (>75*)		
Cobble (64-250mm; tennis ball-basketball)						
Gravel (2-64mm; ladybug to tennis ball size)				G = Gradual (5-30°)		
Sand (0.06 - 2mm; gritty between fingers)				F = Flat (<5")		
Silt, Clay, or Muck (<0.06mm; not gritty)				BANK ANGLE CLASSES		
Woody Debris						
Organic (Leaf Pack, Detritus)						
Vegetation or Other		101 × 1				
AQUATIC MACROPHYTES		an a	15 m	1		
Do macrophytes extend lakeward more than 1 Yes O No @	0 meters from shore?		Ripari			
	Littoral Zone	Flag	Variable-	J		
Submergent			width { zone	Im Shore zone		
Emergent Floating			Liitora zona	1 C 10 m		
Total Aquatic Macrophyte Cover			Observatio	a station		
			CD3cl valo			
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate (Littoral Zone	10-40%) Flag	3 = Heavy (40-75%) 4 = Very Heav Drawdown Zone (if present	y (>75%) ;) Flag		
Aquatic and Inundated Herbaceous Veg.			$\bigcirc \bigcirc $			
Woody Debris/Snags > 0.3 m Dia.			$\bigcirc \bigcirc $			
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)			$\bigcirc \bigcirc $			
Inundated Live Trees >0.3 m dia			$\bigcirc \bigcirc $			
Overhanging Veg. within 1 m of Surface						
Ledges or Sharp Dropoffs						
Boulders						
Human Structures - Docks, Landings, etc						
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fro	Explain all flags in	,⊢2, etc. = i comment	misc. flags assigned by each field crev section on back page.	v. 0159613454		

FORM P-1: NLA 2	017 PHAB (Back)
Site ID: NLA17_ TOKEN Date: C) 7 / 0 5 / 2 0 1 7 Reviewed by (initial): MM
STATION: OA OB OC OD OE OF OG O	OHOIOJ NEW STATION (K, L)
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone Ø Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	Drawdone Zone (if present) O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH) 💿 🕤 🎯 🕄 🔇	$\bigcirc \bigcirc $
Small Trees (Trunk <0.3 m dBH) 🕜 🖉 🔾 🕙 🕧	
Understory (0.5-5m)	방법은 가장 방법을 위한 것이다. 이렇게 가지 않는 것은 것은 것은 것을 가지 않는 것이다. 같은 것은 것은 것은 것은 것은 것은 것은 것은 것은 것이다. 것은
Riparian Zone	Drawdone Zone (if present)
Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Woody Shrubs & Saplings 💿 🕦 🎯 🕙 🕢	$\bigcirc \bigcirc $
Tall Herbs, Grasses, & Forbs 💿 🐼 💿 🚯	$\bigcirc \bigcirc $
Ground Cover (<0.5m)	
Riparian Zone FLAG	Drawdown Zone (if present) FLAG
Woody Shrubs & Saplings 💿 🕦 🎯 🗿 🕘	
Herbs, Grasses and Forbs () () () () ()	
Standing Water or Inundated Vegetation (() () () () () () ()	$\bigcirc \bigcirc $
Barren, Bare Dirt, Litter Duff or Buildings () () () () ()	
Human Influence 0 = Not Present P = Present outside plot C	
	n Zone (if present)
FLAG	
Buildings 🕢 🖻 🔘 💿 🕝	<u>+</u> +
Commercial 🕢 P 🕤 0 P 🕤	
Park Facilities/Man-made beach 🕘 P C 0 P C	
Docks/Boats 0 P Ø 0 P C Walls, dikes or revetments 0 P Ø 0 P C	P _R
Trash/Landfill @ P C 0 0 0 C	
Roads or Railroad @ P C 0 P C	P _R
Power lines 🕘 P 🖸 🧿 P C	Riparian Normal High PR CR PR
Row Crops	Jone Plot P. C. P. Water Line Drawdow
Pasture/Range/Hay Field 🚳 🕑 😳 💿 📀	
Orchard 🕢 🕑 🕤 💿 📀	
Lawn 0 0 0 0 0 0	I CR CR PR LTD CD TPD- Littoral Zone Flot
Other (Flag & explain in comments)	Na Drawdowa Zani Fresoci
Flag Comments	Flag Comments
•	
· · · · · · · · · · · · · · · · · · ·	
· · · · · · · · · · · · · · · · · · ·	
Flag codes: K = No measurement made, U = Suspect measurement Finance Function all flags in	rement., F1,F2, etc. = misc. flags assigned by each field crew.
04/10/2017 P-1: NLA 2017 Phab-Back	0406186511

	FORM P-1: NLA 2	2017	PHAB (Front)				
Site ID: NLA17_ TORCH	Date:	7	10512017	Reviewed by (initial):			
STATION: OA OB OC OD	OE OF OG	ЭH	OI OJ STATION RELOCATE	D: O			
IS IT AN ISLAND? Yes 🔿 No 🍘	DROPF	ED:	O NEW STATI	ON (K, L)			
DEPTH AT STATION (10 m offshore)		0	8958 LONG: 8	5.3528			
Shoreline Flooding:							
Yes O No 🎯 Depth:	Horizonta (m)	II DIST.	ریں (m) Bank Angle				
Drawdown: Yes O No @ Height:	(m) Dist:	<u>1</u>	Bank Angle O Flat (<5°) O G (m) O Near vertical/und	adual (5-30°) 🖤 Steep (30-75°)			
LITTORAL ZONE Surface film type: None O Scum O Algal Mat O Oily O Other Flag: Substrate Odor: None O H ₂ S O Anoxic O Oil O Chemical O Other Flag: Substrate Color: O Black O Gray Ø Brown O Red O Other							
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate(Littoral Bottom	10-40% Flag	3 = Heavy (40-75%) 4 = Very Heavy 1 Meter Shoreline Zone	(>75%) Flag			
Bedrock (>4000mm; larger than a car)							
Boulders (250-4000mm; basketball-car)			0 1 🕲 3 4	V = Near Vertical/ S = Steep (30-75") (>75")			
Cobble (64-250mm; tennis ball-basketball)			$\odot (1 \bigcirc 3 \bigcirc 4$				
Gravel (2-64mm; ladybug to tennis ball size)	0 0 0 0 0			G = Gradual (5-30*)			
Sand (0.06 - 2mm; gritty between fingers)				F = Flat (<5")			
Silt, Clay, or Muck (<0.06mm; not gritty)				BANK ANGLE CLASSES			
Woody Debris							
Organic (Leaf Pack, Detritus)							
Vegetation or Other		L					
AQUATIC MACROPHYTES			15 m				
Do macrophytes extend lakeward more than 1 Yes O No @	0 meters from shore?		Riparían zone } 15 m				
	Littoral Zone	Flag	Variable-				
Submergent			width { zone	In Shore zone			
Emergent Floating		-	Littoral zone	} 10 m			
Total Aquatic Macrophyte Cover			Observation	dation			
			Observation				
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate Littoral Zone	(10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy Drawdown Zone (if present)				
Aquatic and Inundated Herbaceous Veg.							
Woody Debris/Snags > 0.3 m Dia.							
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)			0 1 2 3 4				
Inundated Live Trees >0.3 m dia	0 0 2 3 4						
Overhanging Veg. within 1 m of Surface	0 0 2 3 4						
Ledges or Sharp Dropoffs			0 1 2 3 4				
Boulders							
Human Structures - Docks, Landings, etc							
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fro	Explain all flags i	1,F2, etc. n comm	= misc. flags assigned by each field crew. ent section on back page.	0159613454			

Site ID: NLA17_ TOK	P	ORN	VI P-1				PHAB (Back)
STATION: OA OB OC C	O D O	E	OF			Sector 1 to 1	OIOJ NEW STATION (K, L)
Canopy (>5m) 0 = Absent (0%)) 1 = Spars	se (<1	10%) 2	= Mo	derate	(10-40%	6) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone O Deciduous O Broadleaf Evergreen	O Conife	erous	6	Vixed	FLAG	Drav O Dec	wdone Zone (if present) iduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH)		0		<u>Ə</u>			
Small Trees (Trunk <0.3 m dBH)		2	<u>() (</u>	<u>) (</u>			
Understory (0.5-5m)	e falsalara <u></u>			<u> </u>			7
Riparian Zone O Deciduous O Broadleaf Evergreen	O Conife	erous	6	Mixed	FLAG	Dra\ O Dec	wdone Zone (if present) iduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Woody Shrubs & Saplings	0	2	0 (•			$\bigcirc \bigcirc $
Tall Herbs, Grasses, & Forbs	0 @		0 (•			
Ground Cover (<0.5m)	al and so its		C. W. C. C.				
	Ripar	ion	Zona		FLAG	Dray	wdown Zone (if present) FLAG
Woody Shrubs & Saplings		2		$\overline{\mathbf{D}}$	FLAG	Diav	
Herbs, Grasses and Forbs		$\overline{()}$		0			$\begin{array}{c c c c c c c c c c c c c c c c c c c $
			-				
Standing Water or Inundated Vegetation	• •	(2)					
Barren, Bare Dirt, Litter Duff or Buildings Human Influence 0 = Not Pres		2		<u>)</u>			Image: Original system Image: Orig
Buildings 🗿 🕼		I E FLAG	0	\bigcirc	\odot	FLAG	e (if present)
Commercial 🕢 🥐			\bigcirc		<u>()</u>		
Docks/Boats	<u> </u>		0	<u>()</u>	0		
Walls, dikes or revetments ()			$\overline{\bigcirc}$	\bigcirc	$\overline{0}$		P _R
Trash/Landfill				$\overline{\bigcirc}$	$\overline{\odot}$		
Roads or Railroad 🔘 🤆)		0	\bigcirc	\odot		P _R Riparian Zons Plet
Power lines 🖉 🕐			\odot	\bigcirc	\odot		Risorian Normal High P _R C _R P _R
Row Crops			$\left \bigcirc \right $	$\underline{\bigcirc}$	\odot		Jone Plot P _R C _R P _R Water Line D C D Drawdow
Pasture/Range/Hay Field	<u> </u>		\bigcirc	$\underline{\bigcirc}$	\odot		Uttoral Control Por Control Zone Mor
Orchard 🕘 🤆			$ \bigcirc $	Θ	0		
Lawn 🕐 🥐			$\overline{\bigcirc}$	\bigcirc	<u> </u>		Zone Flot
Other (Flag & explain in comments)			0	\odot	<u></u>		Ne Drandown Zon: Fresect
Flag Comments						Flag	Comments
······································							
						<u> </u>	
						ŀ	·
					•••••	· · · · · · · · · · · · · · · · · · ·	
			11 2			<u> </u>	F1,F2, etc. = misc. flags assigned by each field crew.
Flag codes: K = No me	asurement	made.	u = S0	SUBCE	measur	ement	E LEZ, EU UUSC HAUS ASSIGNED DV EACH DEU GFEW.

	FORM P-1: NLA 2	017	PHAB (Front)	
Site ID: NLA17_ TOPCH	Date: 6	7	// 2 0 1 7 Reviewed by (initial): <u>//</u>	n
STATION: OA OB OC OD	OE OF OG C		I OJ STATION RELOCATED: O	
) IS IT AN ISLAND? Yes 🔿 No 🗶	DROPP	ED: (O NEW STATION (K, L)	
DEPTH AT STATION (10 m offshore)		0,	7.4.9.4 LONG: 8.5.3.2.2	0
Shoreline Flooding:	Horizonta		•	
Yes () No @ Depth:	(m)	I DISL.	(m) Bank Angle (see diagram below	
Drawdown: Yes O No @ Height:	(m) Dist:		O Flat (<5°) O Gradual (5-30°) Ø Steej (m) O Near vertical/undercut (>75°)	p (30-75°)
LITTORAL ZONE Surface film type:	None O Scum O Alg	al Mat	O Oily O Other Flag:	이 가지 않는 것이다. 같은 이 가 있는 것이다.
이 같이 잘 못 하는 것 같아요. 것 같아요. 정책에 가지가 많이 많이 가지는 것 같아. 가지 않는 것 같아. 것 같아.	H ₂ S O Anoxic O Oil		O Chemical O Other	
Substrate Color: O Black C) Gray 🥥 Brown 🔿 Rec	l	O Other	1)
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate(Littoral Bottom	10-40%) Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) 1 Meter Shoreline Zone Flag	
Bedrock (>4000mm; larger than a car)				V = Near
Boulders (250-4000mm; basketball-car)			S = Steep (30-75)	V = Near Vertical/ Undercut (>75°)
Cobble (64-250mm; tennis ball-basketball)	0 0 0 0 0			
Gravel (2-64mm; ladybug to tennis ball size)	0 (1 (2) (3) (4)		(i)	$\overline{\mathbf{A}}$
Sand (0.06 - 2mm; gritty between fingers)	• • • • •		() ()	
Silt, Clay, or Muck (<0.06mm; not gritty)			BANK ANG CLASSE	
Woody Debris				
Organic (Leaf Pack, Detritus)				
Vegetation or Other			0 0 0 0	· · ·
AQUATIC MACROPHYTES			15 m	
Do macrophytes extend lakeward more than 1	0 meters from shore?			
Yes O No 🕑			Riparian zone } 15 m	
	Littoral Zone	Flag	Variable- Drawdown	
Submergent			width zone Im Shore zone	
Emergent Floating			Littoral zone } 10 m	
Total Aquatic Macrophyte Cover			Observation station	
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate (Littoral Zone	10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75%) Drawdown Zone (if present) Flag	
Aquatic and Inundated Herbaceous Veg.			$\bigcirc \bigcirc $	
Woody Debris/Snags > 0.3 m Dia.				
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)			$\bigcirc \bigcirc $	
Inundated Live Trees >0.3 m dia			$\bigcirc \bigcirc $	
Overhanging Veg. within 1 m of Surface			$\bigcirc \bigcirc $	
Ledges or Sharp Dropoffs				
Boulders				
Human Structures - Docks, Landings, etc	 ○ ○ ○ ○ ○ ○ ○ ○ ○	ļ.,		<u> </u>
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-Fro	Explain all flags i	,F2, etc. n comme	. = misc. flags assigned by each field crew. 0159613454 ent section on back page.	4

FORM P-1: NLA 2	017 PHAB (Back)
Site ID: NLA17_ TORCH Date: 0	7 / 0 5 / 2 0 1 7 Reviewed by (initial)
STATION: OA OB OC OD OE OF OG O	H I O J NEW STATION (K, L)
Canopy (>5m) 0 = Absent (0%) 1 = Sparse (<10%) 2 = Moderate	(10-40%) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
Riparian Zone O Deciduous O Broadleaf Evergreen O Coniferous Mixed FLAG	Drawdone Zone (if present) O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH) 💿 🕦 🔞 🔾	$\bigcirc \bigcirc $
Small Trees (Trunk <0.3 m dBH) 💿 🕦 🗿 🕙 🕘	
Understory (0.5-5m)	
Riparian Zone	Drawdone Zone (if present)
O Deciduous O Broadleaf Evergreen O Coniferous I Mixed	O Deciduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Woody Shrubs & Saplings 💿 🍘 😮 🔇	
Tall Herbs, Grasses, & Forbs 💿 🕼 🕄 3 🕙	
Ground Cover (<0.5m)	
Riparian Zone FLAG	Drawdown Zone (if present) FLAG
Woody Shrubs & Saplings 💿 🛞 2 🕄 🕢	$\bigcirc \bigcirc $
Herbs, Grasses and Forbs 💿 🕦 2 🕄 🗶	$\bigcirc \bigcirc $
Standing Water or Inundated Vegetation 🕥 (1) (2) (3) (4)	
Barren, Bare Dirt, Litter Duff or Buildings 🕼 🕦 🕦 😧	$\odot \odot \odot \odot \odot$
Human Influence 0 = Not Present P = Present outside plot C	=Present within plot To Zone (if present)
Riparian Zone Drawdowr	FLAG
Buildings 💿 🕝 🙆 💿 😳	<u> </u>
Commercial O P C O	
Park Facilities/Man-made beach 🕖 🕑 🕑 📀 💿	
Docks/Boats O P O P C Walls, dikes or revetments Image: Color P Image: Color P Image: Color P Image: Color P Image: Color P	
Trash/Landfill 🕲 🕑 😳 😳 😳	
Roads or Railroad 0 0 0 0 0	P _R
Power lines 🕢 P 😳 🛛 📀 P 📀	Riperian Normal High PR CR PR
Row Crops 🕖 🕐 💿 🕚 🕐 😳	Voire Pixt PR CR PR Water Line D C Drawdow
Pasture/Range/Hay Field P C 0 0 C C	Ettoral ZenePlot
Orchard @ P C 0 P C	$P_{R} C_{R} P_{R}$ Water Level $P_{D} C_{D} + P_{D}$ Literaal
	Zone Flot
Other (Flag & explain in comments)	Ne Grandown Zom Presont
Flag Comments	Flag Comments
Eleg as des: K = No manufament mode. LI = Support mageu	rement., F1,F2, etc. = misc. flags assigned by each field crew.
Flag codes: K = No measurement made, U = Suspect measurement Explain all flags in	comment section. 0406186511
04/10/2017 P-1: NLA 2017 Phab-Back	

	FORM P-1: NLA 2	2017	PHAB (Front)			
Site ID: NLA17_ TORCH Date: 07/05/2017 Reviewed by (initial): MM						
STATION: OA OB OC OD	OE OF OG (ЭН	OI ØJ STATION RELOCATED:	0		
IS IT AN ISLAND? Yes 🔿 No 🐠	DROPP	ED:	O NEW STATION	(K, L)		
STATION (Dec	D 83 simal LAT: <u>LAS</u> . rees)	0	2-3.7.5.LONG: 85	.29839		
Shoreline Flooding: Depth:	Horizonta	l Dist	••			
	(m)		(m) Bank Angle (se	o diagram bolow):		
Drawdown: Yes O No Ø Height:	(m) Dist:			al (5-30°) O Steep (30-75°)		
LITTORAL ZONE Surface film type:	None O Scum O Alg	al Mat	O Oily O Other	Flag:		
Substrate Odor: 🕥 None 🤇	H₂S O Anoxic O Oil		O Chemical O Other			
Substrate Color: O Black C) Gray 🕑 Brown 🔾 Red	đ	O Other			
SUBSTRATE 0 = Absent (0%) 1 = Sp	arse (<10%) 2 = Moderate (Littoral Bottom	10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75 1 Meter Shoreline Zone Flag	그는 일상은 전문에서 한 것이 있는 것이 집을 가지 않는 것이 없는 것이 없다.		
Bedrock (>4000mm; larger than a car)						
Boulders (250-4000mm; basketball-car)				S = Steep		
Cobble (64-250mm; tennis ball-basketball)				(30-75*)		
Gravel (2-64mm; ladybug to tennis ball size)			0 1 2 3 🞯	G = Gradual (5-30*)		
Sand (0.06 - 2mm; gritty between fingers)	0 0 2 3 4			F = Flat (<5°)		
Silt, Clay, or Muck (<0.06mm; not gritty)				BANK ANGLE CLASSES		
Woody Debris						
Organic (Leaf Pack, Detritus)						
Vegetation or Other						
AQUATIC MACROPHYTES			15 m			
Do macrophytes extend lakeward more than 1	0 meters from shore?					
Yes O No 🖗			Riparian zone	15 m		
	Littoral Zone	Flag	Variable-	and the second		
Submergent Emergent			width	Im Shore zone		
Floating			Littoral zone	10 m		
Total Aquatic Macrophyte Cover			Observation station			
FISH 0 = Absent (0%) 1 = Sp COVER	arse (<10%) 2 = Moderate (Littoral Zone	10-40% Flag) 3 = Heavy (40-75%) 4 = Very Heavy (>75 Drawdown Zone (if present) Fla			
Aquatic and Inundated Herbaceous Veg.		Γ				
Woody Debris/Snags > 0.3 m Dia.						
Woody Brush/Woody Debris <0.3 m dia. (alive or dead)						
Inundated Live Trees >0.3 m dia			0 1 2 3 4			
Overhanging Veg. within 1 m of Surface						
Ledges or Sharp Dropoffs						
Boulders				_		
Human Structures - Docks, Landings, etc						
Flag codes: K = No measurement made, 04/10/2017 P-1: NLA 2017 Phab-From	Explain all flags in		= misc. flags assigned by each field crew. ent section on back page.	0159613454		

Site ID: NLA17_		OR M P		•		PHAB (Back)
		E OF		Storage of the second	en la seconda de la second La seconda de la seconda de	/ 0,5 / 2 0 1 7 Reviewed by (initial): ₩₩) ΟΙ ØJ NEW STATION (K, L)
					1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -	6) 3 = Heavy (40-75%) 4 = Very Heavy (>75%)
		(n an trainn an tha tha ann an trainn an t Tha tha tha tha tha tha tha tha tha tha t
O Deciduous O Broadleaf Evergreen	O Conif	erous 🥨	Mixed	FLAG		wdone Zone (if present) iduous O Broadleaf Evergreen O Coniferous O Mixed FLAG
Big Trees (Trunk >0.3 m dBH) Small Trees (Trunk <0.3 m dBH)			() ()			
Understory (0.5-5m)			<u> </u>			
Riparian Zone					Drav	wdone Zone (if present)
O Deciduous O Broadleaf Evergreen	O Conif	ferous 🥻	Mixed 🕈	l FLAG	O Deci	가 있다고 이번에서 그 가지는 것은 것이 가지는 것이 가지는 것이 없을 것 것이 같다.
Woody Shrubs & Saplings	\bigcirc ()		0			$\bigcirc \bigcirc $
Tall Herbs, Grasses, & Forbs	00		\bigcirc			
Ground Cover (<0.5m)						
	Ripar	rian Zor	ne	FLAG	Drav	wdown Zone (if present) FLAG
Woody Shrubs & Saplings			\bigcirc			\odot \odot \odot \odot \odot \odot
Herbs, Grasses and Forbs			\bigcirc			$\bigcirc \bigcirc $
Standing Water or Inundated Vegetation						$\bigcirc \bigcirc $
Barren, Bare Dirt, Litter Duff or Buildings	00		\bigcirc			$\odot \odot \odot \odot \odot \odot$
Commercial Image: Commercial Park Facilities/Man-made beach Image: Commercial Docks/Boats Image: Commercial Walls, dikes or revetments Image: Commercial Trash/Landfill Image: Commercial Roads or Railroad Image: Commercial Power lines Image: Commercial					FLAG	P_{R} Riserian Normal High Vater Line P_{R} P_{R
Pasture/Range/Hay Field		\odot	P	\odot	-	
		\odot	\overline{O}	\odot	- -	D C D Waterlevel D C D
	$\overline{\mathbf{O}}$			<u>()</u>	-	- Va Parton Zon Present
	<u> </u>			<u> </u>		
Flag Comments					Flag	Comments
Elag codes: K = No m	easurement	t made. U =	Suspect	t measur	ement.,	F1,F2, etc. = misc. flags assigned by each field crew.
Flag codes: K = No m 04/10/2017 P-1: NLA 202		E	ouspect	i measur I flags in	commer	r1,F2, etc. = misc. hags assigned by each neid crew. out section. 0406186511

	FORM A-1: NLA 2017 ASSESSMENT (Front) Reviewed by (initial)						
Site ID:	Site ID: NLA17_ TOECH Date: 07/05/2017						
	SITE ACTIVITIES AND DISTURBAI rved, L=Low, M=Moderate, H=Heavy)	NCES OBSERVED	BLANK FIELD I				
Residential	Recreational	Agricultural	Industrial	Lake Management			
C M Residences	U O Hiking Trails	C 🕢 🕑 Cropland	Industrial Plants	🖸 🕲 🕒 Liming			
🕓 🔘 🍘 Maintained La		🕒 🐼 🕑 Pasture	€ Mines/Quarries	🕒 🐵 🕒 Chemical Treatment			
Onstruction	🕓 🕲 🕒 Primitive Parks, Campin	g 🛈 🐼 🕑 Livestock Use	L M H Oil/Gas Wells	🛈 👩 🕑 Angling Pressure			
🕒 😡 🕑 Pipes, Drains	🙆 🕲 🕲 Resorts	🕒 🛞 🕀 Orchards	1 🛞 🕀 Power Plants	🛈 🐵 🕑 Drinking Water Treatment			
🕒 😡 🕑 Dumping	🎒 🛞 🖯 Marinas	🛈 🞯 🕀 Poultry	🕒 🖌 🕑 Logging	🕒 🐵 🕑 Macrophyte Control			
🕒 🕲 🕑 Roads	🛈 🐼 🤂 Trash/Litter	🕒 🛞 🕀 Feedlot	🕒 🐵 🕑 Evidence of Fire	e 🛈 😡 🕑 Water Level Fluctuations			
🕒 阏 🕑 Bridges/Caus		🕓 🛞 🕑 Water Withdrawal	🛈 🞯 🕀 Odors	🕒 🐵 🕑 Fish Stocking			
🛈 🕲 🙂 Sewage Trea	or Slicks		C 🛞 🕞 Commercial				
GENERAL LAKE II	FORMATION		and a start of the second s				
Hydrologic Lake Typ	e: O Reservoir 🛛 🐵 Drainage (ou	utlets present) O Seepa	ge (no outlets observed)				
Outlet Dams: O No	ne O Artificial O Natural						
Low Elevation Flight	Hazards: O Yes O No						
Motor Boat Density:	High O Low						
Motor Boat Restricti	-) Banned					
Swimmability: 🚳 G	ood O Fair O Not Swimmable	9					
Lake Level Change	S: O Zero O Elevation Ch	ange = n	1				
SHORELINE CHAR	ACTERISITCS (% of shoreline)					
Forest O Rare (<5	%) O Sparse (5 to 25%) 🌘 M	oderate (26 to 75%) OI	Extensive (>75%)	· · · · · · · · · · · · · · · · · · ·			
Grass O Rare (<59	6) 🔿 Sparse (5 to 25%) 🚳 Mo	oderate (26 to 75%) O E	xtensive (>75%)				
Shrub O Rare (<5	6) 🔞 Sparse (5 to 25%) 🛛 O M	oderate (26 to 75%) O E	Extensive (>75%)				
Wetland O Rare (<	Wetland O Rare (<5%) O Sparse (5 to 25%) O Moderate (26 to 75%) O Extensive (>75%)						
Bare Ground 🕲 Ra		O Moderate (26 to 75%)	O Extensive (>75%)				
Agriculture O Ran		O Moderate (26 to 75%)	O Extensive (>75%)				
-				$\Gamma_{\rm standing}$ (> $759($)			
Shoreline Mods (doo	ks, riprap) O Rare (<5%) O S		, , , , , , , , , , , , , , , , , , ,	Extensive (>75%)			
Development (Resid	ential & Urban) O Rare (<5%)	O Sparse (5 to 25%)) Moderate (26 to 75%)	Extensive (>75%)			
QUALITATIVE MACROPHYTE SURVEY							
Emergent/Floating Coverage (% Lake Area) O Rare (<5%) O Sparse (5 to 25%) O Moderate (26 to 75%) O Extensive (>75%) Submergent Coverage (% Lake Area) O Rare (<5%) O Sparse (5 to 25%) O Moderate (26 to 75%) O Extensive (>75%)							
Macrophyte Density	Absent O Sparse O Me	oderate O High					
WATERBODY CH	RACTER		·				
Pristine O 5	○ 4 ● 3 ○ 2	O 1 Highly Di	sturbed				
Appealing 🛛 🚯 5	O 4 O 3 O 2	O 1 Unappea	ling				
				4221106602			

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	FORM A-1: NLA 2017 ASSESSMENT (Back) Reviewed by (initial):
Site ID: NLA17_	TORCH Date: 07 / 05 / 2017
QUALITATIVE ASSESS	SMENT OF ENVIRONMENTAL VALUES
Ecological Integrity:	O Excellent Sood O Fair O Poor
General Assessment:	Longe deep, oligotrophic lake with heavy Accreational Use, mostly motorized. Shoreline mostly residences.
Wildlife Observed:	2. bra mussel
Trophic State: @	igotrophic O Mesotrophic O Eutrophic O Hypereutrophic
Visual Assessment:	Highly modified Storeline, Apropidocks, etc. No macrolyd
Algal Abundance & Type:	Highly modified Storeline, mpropiclocks, etc. No moundy
Nutrient Sources:	Runoff through ferlilized lawns, possible septic.
Other:	
Recreational Value:	Excellent O Good O Fair O Poor
Conditions and Local Contacts:	
Observations (e.g. accessibility, boating, fishing, swimming, health concerns):	Easily accessible. Boating and Swimming
COMMENTS	
ang	
	8610106507
04/10/2017 A-	1: NLA 2017 Assessment 8610106507

APPENDIX B

LABORATORY CHEMISTRY DATA (WATER AND SEDIMENT)

Project Number: 2410-00



September 11, 2017

Torch Lake-NLA

Attention: Peg Comfort

Project Description: Water Quality Sampling

Dear Client,

Enclosed is a copy of your laboratory report relating to samples, as they were received. All tests were performed within the maximum holding times and have met or exceeded QC criteria. Visit our web site for a full list of tests for which we are accredited by the National Environmental Laboratory Accreditation Conference (NELAC).

Please don't hesitate to call if you have questions or require further information.

Data Qualifiers:

U = Analyte not detected J = Estimated result below the RL but above the MDL

Sincerely,

Michelle A. Moore Laboratory Coordinator and Research Scientist/Nutrient Chemistry



Client ID:	2410-00
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Torch Lake NLA

739 Hastings St., Traverse City MI 49686 - (231) 941-2230 - FAX: (231) 941-2240

REPORT OF ANALYSIS

Total Kjeldahl Nitrogen

LabSampleID	SampleDescription	Sample Date Result	Units	Rep Limit M	IDL Lab Qualifie	AnalysisDate Comments	Initials
TO07050002	856086	7/5/2017 0.458	mg/L	0.3	0.08	7/28/2017	BSC

LabQualifiers:

U - Analyte not detected.

J - Result between MDL and RL should be considered estimated.

Page 1 of 1

Method: EPA 351.2

Monday, September 11, 2017

Client ID:	2410-00
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Torch Lake NLA

739 Hastings St., Traverse City MI 49686 - (231) 941-2230 - FAX: (231) 941-2240

REPORT OF ANALYSIS

pН

LabSampleID	SampleDescription	Sample Date Result	Units	Rep Limit MD	L Lab Qualifie	AnalysisDate Comments	Initials
TO07050001	856080	7/5/2017 8.24	SU	0.1	0.1	7/6/2017	BSC

LabQualifiers:

U - Analyte not detected.

J - *Result between MDL and RL should be considered estimated.*

Monday, September 11, 2017

Page 1 of 1

Method: SM 4500-H+-B

Client ID:	2410-00
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Torch Lake NLA

739 Hastings St., Traverse City MI 49686 - (231) 941-2230 - FAX: (231) 941-2240

REPORT OF ANALYSIS

Chlorophyll a

LabSampleID	SampleDescription	Sample Date Result	Units	Rep Limit	MDL Lab Qualifie	AnalysisDate Comments	Initials
TO07050003	856081	7/5/2017 0.00033	mg/L	0.0007	0.0002 _J	7/25/2017	BSC

LabQualifiers:

U - Analyte not detected.

J - *Result between MDL and RL should be considered estimated.*

Page 1 of 1

Method: SM 10200 H

Monday, September 11, 2017

Client ID:	2410-00
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Torch Lake NLA

739 Hastings St., Traverse City MI 49686 - (231) 941-2230 - FAX: (231) 941-2240

REPORT OF ANALYSIS

Total Phosphorus

LabSampleID	SampleDescription	Sample Date Result	Units	Rep Limit 1	MDL Lab Qualifie	AnalysisDate Comments	Initials
TO07050002	856086	7/5/2017 <0.0007	mg/L	0.003	0.0007 U	7/31/2017	BSC

LabQualifiers:

U - Analyte not detected.

J - Result between MDL and RL should be considered estimated.

Page 1 of 1

Monday, September 11, 2017

Method: SM 4500-P F



Field Data Sheet - BACTERIA Project: 2410-00 Torch Lake, Michigan

Great Lakes Environmental Center, Inc. collected and analyzed one bacteria sample from the index site on Torch Lake in Michigan. The sample was collected and analyzed for E. Coli and Total Coliforms utilizing the 2017 EPA National Lakes Assessment (NLA) protocol.

Site ID: NLA17_Torch Lake Sample ID: 856084 GLEC BS #: 760 Date Collected: 07/05/2017 Date Received: 07/06/2017

Results

	Total Coliforms	5	Escherichia Coli					
Large Wells	Small Wells	MPN	Large Wells	Small Wells	MPN			
5	0	5.2	0	0	<1			

Notes: MPN – Most Probable Number Minimum Reporting Limit = 1.0 Maximum Detection Limit = 2419.6

APPENDIX C

ZOOPLANKTON DATA MACROINVERTEBRATE DATA PHYTOPLANKTON DATA

Balcer Taxonomy - Macro-zooplankton Identification Sheet for National Lakes Assessment Samples

Coarse Net NLA Sample ID #_	8560944		_Lake CodeNLA 17	7 Torch			Tow depth (m) Tow Volume	Ę	i
Date ColleIcted7-52017		Split Level1/2				m3	0.1571		
Analyzed byM Balcer			Date Analyzed	_26 Sept 2017					
Taxon	Sex	Count A	Count B	Count C	Total	#/Jar	Density #/m3	Biomass/ind ug	Biomass/m3 ug
Daphnia mendotae		0	2		2	2	12.7	0.980	12
Bosmina longirostris		60	50		110	110	700.3	0.988	692
Diacyclops thomasi	male	1	0		1	1	6.4	3.410	22
	female	1	1		2	2	12.7	4.550	58
Leptodiaptomus minutus	male	4	8		12	12	76.4	3.484	266
	female	3	5		8	8	50.9	3.727	190
Calanoid copepodids (Diaptomus)		252	267		519	519	3304.1	1.493	4,934
Cyclopoid copepodids		61	60		121	121	770.3	1.402	1,080
Epischura copepodids		1	1		2	2	12.7	7.647	97
Total		383	394		777	777	4,947		7,351
General Comments									
Calanoid copepodids are Diaptomo		spp, no Mesocyclops	adults in sample						

Balcer Taxonomy - Micro-zooplankton Identification Sheet for National Lakes Assessment Samples

Fine Net NLA Sample ID #	Lake CodeNLA17 Torch			_						
Date Collelcted7-5-2017	Split Level1			Tow Depth m	5					
Working volume (ml) 19.28		Subsample size (ml) 2.14			Tow Volume m3	0.1571				
Analyzed byM Balcer		Date Analyzed9-	22-2017							
Taxon	Subsample A	Subsample B	Total	#/Jar	Density #/m3	Biomass/ind (ug)	Biomass/m3(ug)			
Asplanchna priodonta	34	22	56	252.3	1605.9	0.9318	1496.40	5.651056	12.77516	11713.38
Ascomorpha ovalis	6	5	11	49.6	315.5	0.0119	3.76	1.110029	0.032059	
Collotheca mutabilis	34	33	67	301.8	1921.4	0.0147	28.31	6.761085	0.241672	
Conochilus unicornis	7	14	21	94.6	602.2	0.0314	18.94	2.119146	0.161678	
Kellicottia longispina	5	3	8	36.0	229.4	0.0083	1.90	0.807294	0.016203	
Keratella cochlearis	56	59	115	518.0	3297.9	0.0014	4.69	11.60485	0.040056	
Keratlla crassa	9	18	27	121.6	774.3	0.0037	2.88	2.724617	0.024577	
Gastropus stylifer	29	26	55	247.8	1577.3	0.0153	24.19	5.550145	0.206511	
Ploesoma truncatum	1	3	4	18.0	114.7	0.0156	1.78	0.403647	0.01523	
Ploesoma hudsoni	1	2	3	13.5	86.0	0.8495	73.09	0.302735	0.623949	
Polyarthra vulgaris	19	12	31	139.6	889.0	0.0493	43.79	3.128263	0.373836	
Polyarthra remata	1	0	1	4.5	28.7	0.0264	0.76	0.100912	0.006465	
Synchaeta spp	7	11	18	81.1	516.2	0.0411	21.23	1.816411	0.181263	
Dreissenid veliger	62	66	128	576.6	3670.7	0.1593	584.90	12 9167	4.993399	
Dreissenid postveliger	45	57	102	459.5	2925.1	0.2962	866.35		7.396249	
Copepod nauplii	164	180	344	1549.6	9865.1	0.8657	8540.42	34.71363	72.9117	
TOTAL	480.00		511.00 991.00 4464.13		28,420		11,713			
					_					
General Comments										