## appendix

## Appendix

Table 1: Listing of the variables used in the regression models at Hika beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

indicates which summary statistics we	ere comput	ed, a	nd ov	er wha	at time	scales	S.	
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Sheboygan River Discharge								
Diff			$\mathbf{x}$					
Manitowoc River Discharge								
Diff			X					
log Manitowoc River Discharge								
Mean	X	x	X	X	x	X	X	X
Min	X	x	X	X	x	X	X	X
Max					X			
log Sheboygan River Discharge								
Mean	X	X	X	X	X	X	X	X
Min	X	X	X	X	X	X	X	X
Max					X			
Cloud cover								
Lake level	X	Х	X	X	X	X		
Mean Max	X				X			
Min	X				X			
Diff	X				X			
					X			
Surface current, perpendicular Mean	x	x	х	x	x	x	x	x
	A	А.	А	А	А	А	А	
Surface current, parallel Mean	x	x	x	x	x	x	x	x
Subsurface current, perpendicular	Λ					Λ.		
Mean	x	x	x	x	x	x	x	x
Subsurface current, parallel	Λ	А.		Λ	Λ	Λ	Λ.	
Mean	x	x	x	x	x	x	x	x
Wave height	Α	Λ.		Λ.	- Л	Λ.	- А	
Mean	x	x	x	x	x			
Wave height speed, perpendicular	A			21.	21.			
Mean	x	x	x	x	x			
Wave height speed, parallel	A			21.	21.			
Mean	x	x	x	x	x			
Wave speed, perpendicular								
Mean	X	x	x	x	x			
Wave speed, parallel								
Mean	X	x	x	x	x			
Wind speed, perpendicular								
Mean	X	x	x	x	x			
Wind speed, parallel								
Mean	X	x	x	x	x			
Air temperature								
Mean	x	x	x	x	x	x	x	x
St. Dev.		x	x	x	x	x	x	x
Water temperature								
Mean	x	x	x	x	x	x	X	x
St. Dev.			x	x	x	x	X	x
sqrt Rainfall over Manitowoc River								
Sum	X	x	x	x	x	X	x	x
sgrt Rainfall over Hika								
Sum	X	x	x	x	x	X	x	x
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
People in water	Manual							
People on beach	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Algae near shore	Manual							
Algae on beach	Manual							
Julian date	Manual							

Table 2: Listing of the variables used in the regression models at Kreher beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

midicates which summary statistics wer							701	1001
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Whittlesley Creek Discharge								
Diff			X					
log Whittlesley Creek Discharge								
Mean	X	X	X	X	X	x	X	X
Min	X	X	X	X	X	X	X	X
Max					X			
Cloud cover								
Mean	X	X	X	X	X			
Lake level								
Mean	X	x	X	X	x			
Diff					X			
Wind speed, perpendicular								
Mean	x	$\mathbf{x}$	X	X	X			
Wind speed, parallel								
Mean	x	$\mathbf{x}$	X	X	X			
Air temperature								
Mean	x	x	x	X	x	x	X	x
St. Dev.		x	x	x	x	x	x	x
sqrt Rainfall over Kreher								
Sum	x	x	X	X	x	x	X	x
sqrt Rainfall over Maslowski								
Sum	x	x	X	X	x	x	X	x
sqrt Rainfall over Whittlesley Creek								
Sum	x	x	x	x	x	x	X	x
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Number of geese present	Manual							
Number of gulls present	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Lakeshore current velocity	Manual							
Beach specific conductance	Manual							
Bay City Creek specific conductance	Manual							
Algae near shore	Manual							
	Manual							
Algae on beach Julian date	Manual							
Junan date	manual							

Table 3: Listing of the variables used in the regression models at Maslowski beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

listing indicates which summary statistics	were comp	uted	, and	over v	vhat ti	me sca	les.	
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Whittlesley Creek Discharge								
Diff			X					
log Whittlesley Creek Discharge								
Mean	X	X	X	$\mathbf{x}$	$\mathbf{x}$	x	x	X
Min	X	X	x	X	X	x	X	X
Max					X			
Cloud cover								
Mean	X	Х	X	X	X			
Lake level								
Mean	x	X	x	$\mathbf{x}$	x			
Diff					X			
Wind speed, perpendicular								
Mean	x	X	x	x	x			
Wind speed, parallel								
Mean	X	X	x	x	x			
Air temperature								
Mean	x	X	$\mathbf{x}$	$\mathbf{x}$	$\mathbf{x}$	$\mathbf{x}$	X	x
St. Dev.		X	x	x	x	x	x	X
sqrt Rainfall over Maslowski								
Sum	x	X	x	x	x	x	x	X
sqrt Rainfall over Whittlesley Creek								
Sum	x	$\mathbf{x}$	x	X	x	x	X	x
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Number of geese present	Manual							
Number of gulls present	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Lakeshore current velocity	Manual							
Beach specific conductance	Manual							
Fish Creek (north) specific conductance	Manual							
Fish Creek (south) specific conductance	Manual							
Whittlesley Creek specific conductance	Manual							
Fish Creek (south) water elevation	Manual							
Algae near shore	Manual							
Algae on beach	Manual							
Julian date	Manual							
U GITGIT GG00	1,1011001							

Table 4: Listing of the variables used in the regression models at the Point beaches. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

listing indicates which summary statist								
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Manitowoc River Discharge Diff			x					
Sheboygan River Discharge Diff			x					
log Manitowoc River Discharge								
Mean	x	x	x	X	$\mathbf{x}$	x	x	x
Min	x	$\mathbf{x}$	x	X	$\mathbf{x}$	$\mathbf{x}$	X	x
Max					x			
log Sheboygan River Discharge								
Mean	x	x	x	X	$\mathbf{x}$	x	x	x
Min	x	$\mathbf{x}$	x	X	$\mathbf{x}$	$\mathbf{x}$	X	x
Max					$\mathbf{x}$			
Cloud cover								
Mean	x	$\mathbf{x}$	x	X	$\mathbf{x}$	$\mathbf{x}$		
Lake level								
Mean	x				$\mathbf{x}$			
Max	x				x			
Min	x				x			
Diff					x			
Surface current, perpendicular								
Mean	x	x	x	x	x	x	X	x
Surface current, parallel								
Mean	x	x	x	x	x	x	x	x
Current at depth, perpendicular								
Mean	x	x	x	x	x	x	x	x
Current at depth, parallel								
Mean	x	x	x	x	x	x	X	x
Wind speed, perpendicular								
Mean	x	x	x	x	x			
Wind speed, parallel								
Mean	x	x	x	x	x			
Wave direction, perpendicular								
Mean	x	x	x	x	x			
Wave direction, parallel					21.			
Mean	x	x	x	x	x			
Wave height					21.			
Mean	x	x	x	x	x			
Wave height direction, perpendicular	1			21.	21.			
Mean	x	v	v	v	x			
Wave height direction, parallel	Λ	Х	Х	X	- 1			
Mean	x	x	x	x	x			
Air temperature	Λ	Λ.	А	А				
Mean	v	3.7	37	35	37	37	x	37
St. Dev.	X	X	X	X	X	X		X
Water temperature		Х	Х	X	X	X	X	X
Mean								
St. Dev.		Х	X	X	X	X	X	X
			Х	Х	X	Х	X	X
sqrt Rainfall over Point beaches Sum					**	7.		7.
	X	Х	Х	X	X	X	X	X
sqrt Rainfall over Twin Rivers Sum								
	Monuel	X	Х	X	X	X	X	X
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Lakeshore current velocity	Manual							
Algae near shore	Manual							
Algae on beach	Manual							
Julian date	Manual							

Table 5: Listing of the variables used in the regression models at Thompson beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

Covariate Statistic	l 1h	2h	6h	12h	24h	48h	72h	190%
	111	211	011	1211	2411	4611	1211	120h
Whittlesley Creek Discharge								
Diff			X					
log Whittlesley Creek Discharge								
Mean Min	X	х	X	X	X	X	X	X
Max	X	х	X	X	X	X	X	X
Cloud cover					X			
Mean	X	х	X	X	X			
Lake level								
Mean	X	х	X	X	X			
Diff					X			
Wind speed, perpendicular								
Mean	X	Х	Х	X	X			
Wind speed, parallel								
Mean	X	Х	X	X	X			
Air temperature								
Mean	X	Х	X	X	X	X	X	X
St. Dev.		Х	X	X	X	X	X	X
sqrt Rainfall over Whittlesley Creek								
Sum	X	Х	X	X	X	X		
sqrt Rainfall over Thompson Creek								
Sum	X	Х	X	X	X	X	X	X
sqrt Rainfall over Maslowski								
Sum	X	Х	X	X	X	X	X	X
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Beach specific conductance	Manual							
${\bf Thompson} \ {\bf Creek \ specific \ conductance}$	Manual							
Air temperature	Manuai							
Water temperature	Manual							
viater temperature								
Wave height	Manual							
	Manual Manual							
Wave height	Manual Manual Manual							
Wave height Lakeshore current velocity	Manual Manual Manual							

Table 6: Listing of the variables used in the regression models at Neshotah beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales.

listing indicates which summary statist								1001
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Manitowoc River Discharge								
Diff			Х					
Kewaunee River Discharge								
Diff			Х					
log Manitowoc River Discharge								
Mean	X	X	X	X	X	X	X	X
Min	X	X	х	X	X	X	X	X
Max					X			
log Kewaunee River Discharge Mean								
Min	x x	X X	x x	X X	X X	x x	x x	X X
Max	, A	Λ	А	А	X	А	А	Α.
Cloud cover					Λ			
Mean	x	x	x	x	x	x		
Lake level	Α	А	Λ	А.	А			
Mean	x				x			
Max	Α				X			
Min					X			
Diff					X			
Surface current, perpendicular								
Mean	x	X	x	x	X	x	x	X
Surface current, parallel								
Mean	x	X	x	x	X	x	x	x
Current at depth, perpendicular								
Mean	x	X	x	x	X	x	x	x
Current at depth, parallel								
Mean	x	x	x	x	X	x	x	x
Wind speed, perpendicular								
Mean	x	x	x	x	X			
Wind speed, parallel								
Mean	x	x	x	x	X			
Wave direction, perpendicular								
Mean	x	X	x	x	X			
Wave direction, parallel								
Mean	x	X	X	X	X			
Wave height								
Mean	x	X	X	X	X			
Wave height direction, perpendicular								
Mean	x	$\mathbf{x}$	X	X	$\mathbf{X}$			
Wave height direction, parallel								
Mean	x	X	X	X	X			
Air temperature								
Mean	x	X	X	X	X	X	x	$\mathbf{x}$
St. Dev.			X	X	X	X	X	X
Water temperature								
Mean	x	X	X	X	X	X	X	X
St. Dev.			X	X	X	X	X	X
sqrt Rainfall over Neshotah								
Sum	X	X	X	X	X	X	X	X
sqrt Rainfall over Twin Rivers								
Sum	X	X	X	X	X	X	X	X
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Number of gulls present	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Lakeshore current velocity	Manual							
Algae near shore	Manual							
Algae on beach	Manual							
Julian date	Manual							

Table 7: Listing of the variables used in the regression models at Red Arrow beach. For each variable, the listing indicates which summary statistics were computed, and over what time scales

listing indicates which summary statist								
Covariate Statistic	1h	2h	6h	12h	24h	48h	72h	120h
Manitowoc River Discharge								
Diff			X					
log Manitowoc River Discharge								
Mean	X	X	X	X	X	X	X	X
Min	X	Х	X	X	X	X	X	X
Max					X			
Cloud cover								
Mean	X	Х	Х	X	X	X		
Lake level								
Mean	X				X			
Max	X				X			
Min D:G	X				X			
Diff					X			
Surface current, perpendicular								
Mean	X	Х	Х	X	X	X	X	X
Surface current, parallel						7.		
Mean	X	Х	Х	X	X	X	X	X
Current at depth, perpendicular								
Mean	X	Х	Х	X	X	X	X	X
Current at depth, parallel								
Mean Wind speed, perpendicular	X	Х	Х	X	X	X	X	X
Mean								
Wind speed, parallel	X	Х	Х	X	X			
Mean		7.						
Wave direction, perpendicular	X	Х	Х	X	X			
Mean	v	37	3.7	37	v			
Wave direction, parallel	X	Х	Х	X	X			
Mean	x	37	3.7	37	x			
Wave height	Α	Х	Х	X				
Mean	x	x	x	x	x			
Wave height direction, perpendicular	Α	Λ.	- Л	Λ	А			
Mean	x	x	x	x	x			
Wave height direction, parallel								
Mean	x	x	x	x	x			
Air temperature								
Mean	x	x	x	x	x	x	X	x
St. Dev.		x	x	x	x	x	x	X
Water temperature								
Mean	x	x	x	x	x	x	x	x
St. Dev.			x	x	x	x	x	x
sqrt Rainfall over Manitowoc River								
Sum	x	x	x	x	x	X	x	x
sqrt Rainfall over Red Arrow beach								
Sum	x	x	x	x	X	X	x	x
log Turbidity	Manual							
Wind speed, perpendicular	Manual							
Wind speed, perpendicular	Manual							
Number of people in water	Manual							
Number of people on beach	Manual							
Number of gulls present	Manual							
Air temperature	Manual							
Water temperature	Manual							
Wave height	Manual							
Lakeshore current velocity	Manual							
Algae near shore	Manual							
Algae on beach	Manual							
Julian date	Manual							
o anan aanc	Manual							