High Rock Lake pH Standard

Evaluation of Depth Average Approach

Presented to NC Nutrient Criteria SAC

September 27, 2017

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Key Factors in Setting pH Standard

1. The pH value that may begin to affect the biological community of High Rock Lake
2. Capacity of fish and many aquatic organisms to move to areas where the pH value does not exert a stress
3. Spatial or vertical pattern where pH values of potential concern occur
4. Other factors that may limit utilization of habitat in which pH values support growth (e.g. dissolved oxygen)

Integrative factor = habitat to support aquatic life

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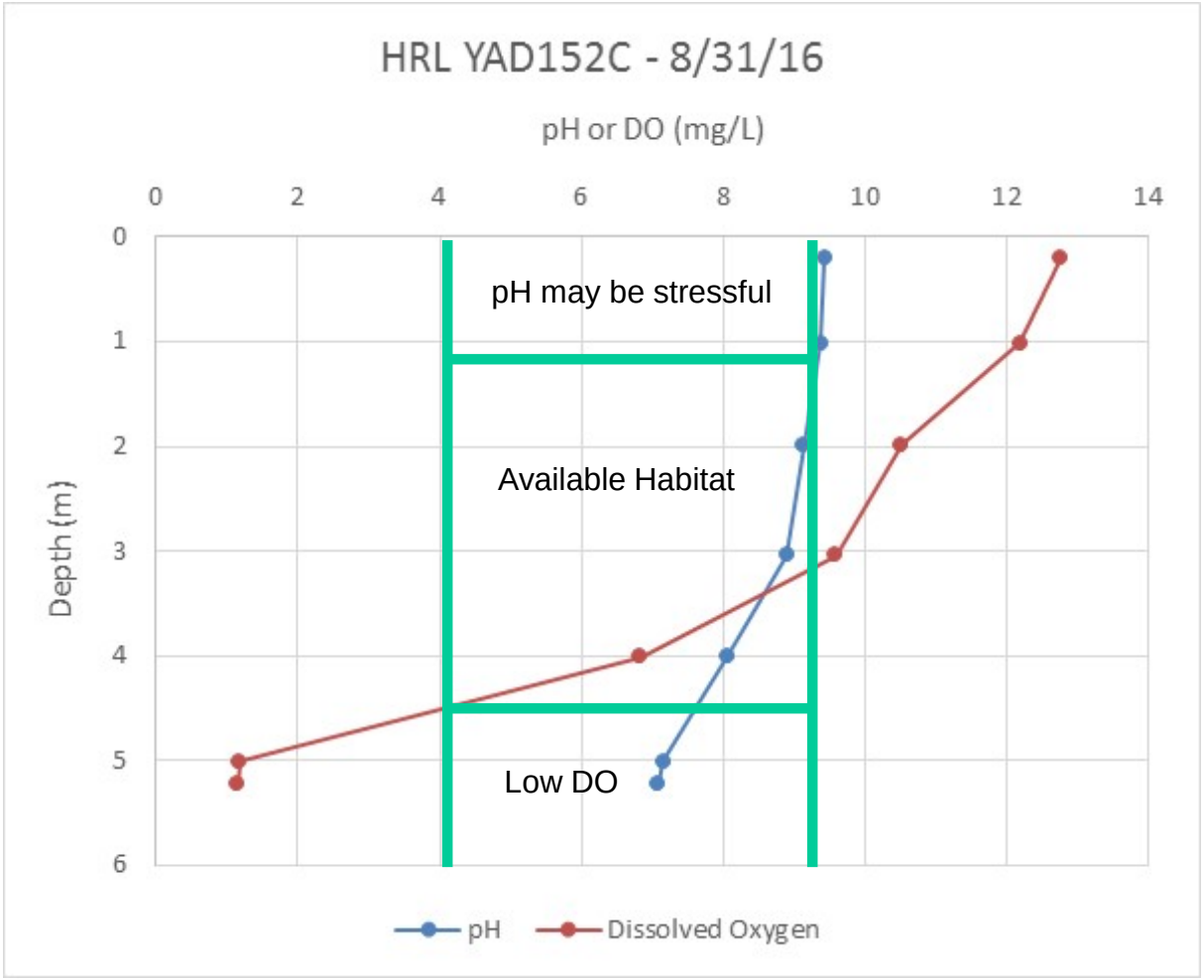
High Rock Lake – pH and DO



Example plot – is there adequate habitat in terms of DO and pH?

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Evaluation – Can Average pH < 9.0 Protect Habitat for Aquatic Life?

1. Use High Rock Lake profile data for pH and DO from 1981 to 2016 – all stations
2. Calculate average pH for samples with DO ≥ 4 mg/L
3. Determine fraction of habitat with DO ≥ 4 mg/L that has pH less than potential thresholds (9.0 to 9.3)
4. Express as available habitat for each profile
5. Note – the proposed approach ignores spatial movement of fish and is, thus, a conservative approach to protect aquatic life habitat

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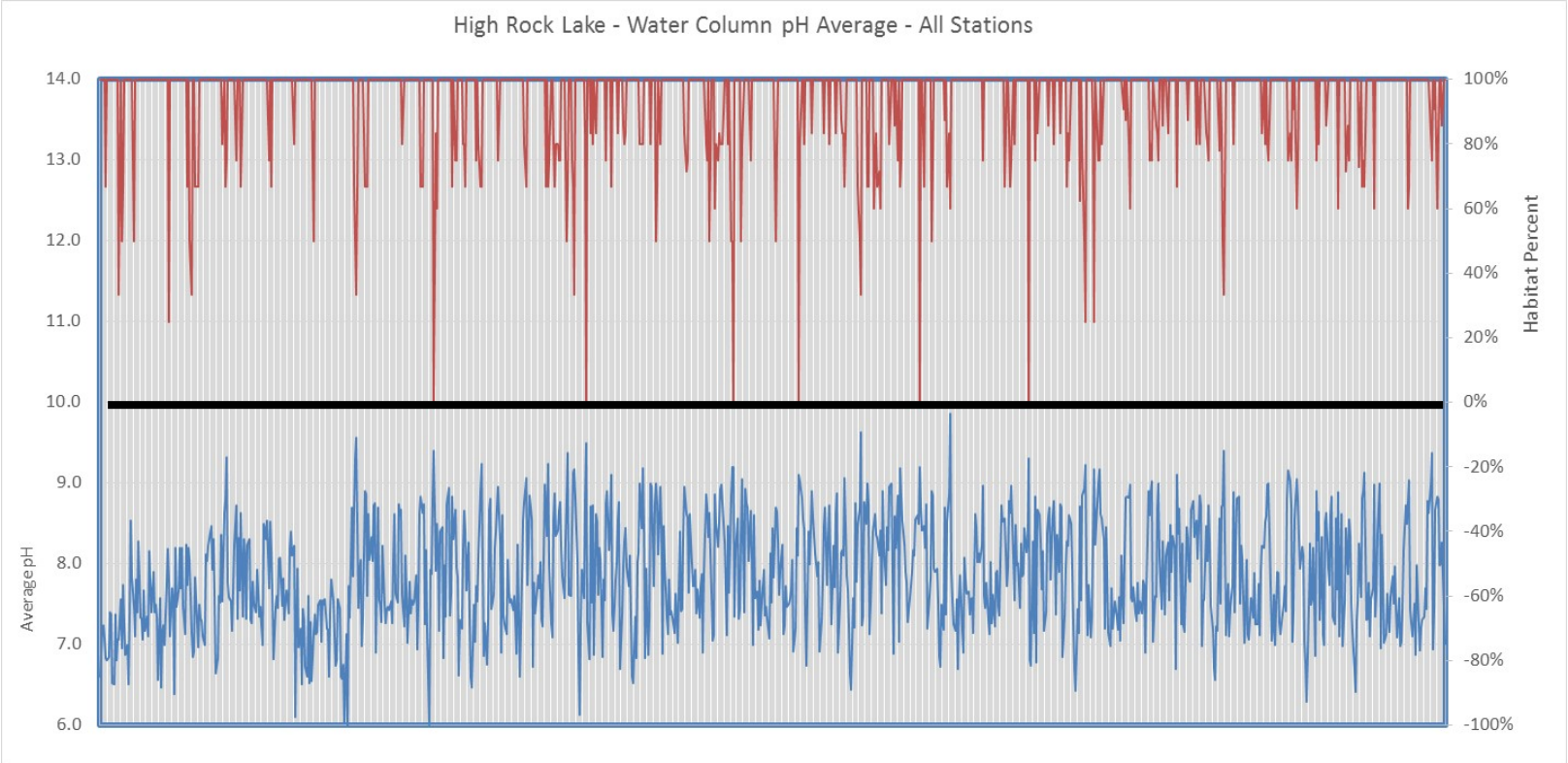
Overall Picture – All Available Profiles



Habitat Percentage for waters DO > 4 mg/L by pH threshold

pH Max	>25%	>50%	>75%	>90%
9.0	0.99	0.97	0.88	0.79
9.1	0.99	0.98	0.90	0.83
9.2	0.99	0.98	0.93	0.88
9.3	1.00	0.99	0.97	0.94

Greater than 50% of habitat protected 97% to 99% of total profiles for inferred pH effect thresholds of 9.0 to 9.3

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Result of Analysis for 1981-2016 by Station

Summary Statistics for Water Column Average pH values by Station 1981-2016

Station	50%	75%	90%	Maximum	Samples
HRL051	7.35	7.70	8.16	8.53	79
HRL052	7.76	8.30	8.51	9.33	69
YAD139	6.10				1
YAD1391A	7.20	7.50	7.57	7.93	36
YAD139C	6.39				2
YAD146A	6.53				2
YAD152	7.75	8.63	8.74	9.57	58
YAD152A	7.92	8.50	8.83	9.40	105
YAD152Aa	8.30	8.80		9.37	5
YAD152Ab	8.45	9.13		9.17	5
YAD152C	7.96	8.57	8.89	9.50	114
YAD1561A	7.81	8.46	8.87	9.20	58
YAD156A	8.13	8.54	8.76	9.63	62
YAD169A	7.93	8.52	8.85	9.86	105
YAD169B	7.90	8.60	8.84	9.30	111
YAD169E	7.90	8.48	8.81	9.40	106
YAD169F	7.58	8.41	8.82	9.38	107

Note - pH values when DO is below 4 mg/L are excluded from calculation.

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