

**Habitat Conditions: Data Visualization Tool (DVT) and Fish Space**

The fish space metric is useful for tracking changes in habitat based on DO and temperature, two variables that are necessary, but not sufficient to maintain a population. Available habitat for the cold water fish community is calculated as a percent of the theoretical total, using volume-days as the measurement. For example; if half the lake’s water volume had suitable DO and temperature conditions for half of the selected time period, the metric is 25% for a given year. The six month period from May 15 through November 15 (185 days) is used because it encompasses the summer season when the upper waters of the lake can reach temperatures that are potentially stressful to the coldwater fish community. Moreover, the County monitoring probes are deployed over this period and high frequency data are available. Two metrics illustrate this approach: (1) coldwater fish habitat (Table A, Figure A), and (2) coolwater fish habitat (Table B, Figure B). In both graphics, the blue color represents depth and temporal location of water temperatures and dissolved oxygen concentrations suitable for cold and cool water fish habitat, respectively. Yellow shows where and when temperatures are out of range, while green shows where and when dissolved oxygen is out of range. Orange represents conditions where both temperature and dissolved oxygen are out of the range suitable for fish habitat.

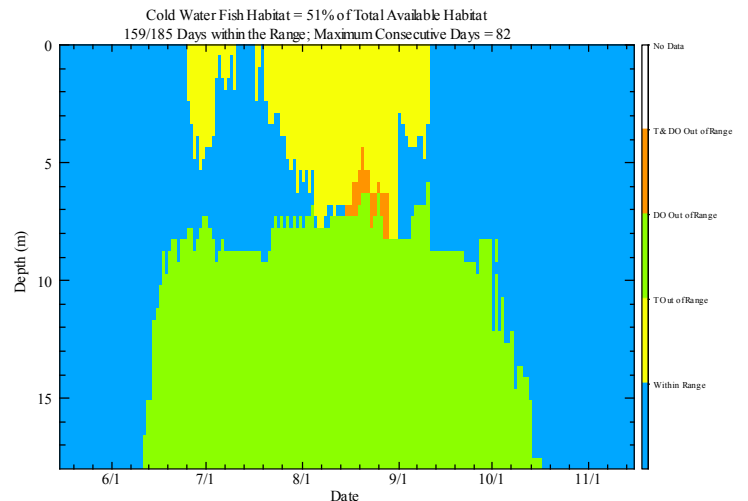
**Table A.** Habitat availability for coldwater fishes in Onondaga Lake from 2000 to 2009 based on default DVT criteria<sup>1</sup>.

Year	Coldwater Habitat		
	% Available Habitat <sup>2</sup>	Total # Days In Range <sup>3</sup> (max 185 days)	# Consecutive Days In Range <sup>3</sup> (max 185 days)
2000	40	161	72
2001	39	140	72
2002	35	112	50
2003	34	129	51
2004	40	175	71
2005	37	124	59
2006	42	132	80
2007	41	150	67
2008	43	131	67
2009	51	159	82

1 default DVT criteria: temperature ≤ 22°C and dissolved oxygen > 5 mg/L between May 15 and November 15.

2 Assumes entire volume of the lake from May 15 to November 15 is available.

3 Number of days where temperature and DO are within range in at least a one meter vertical section of the lake.



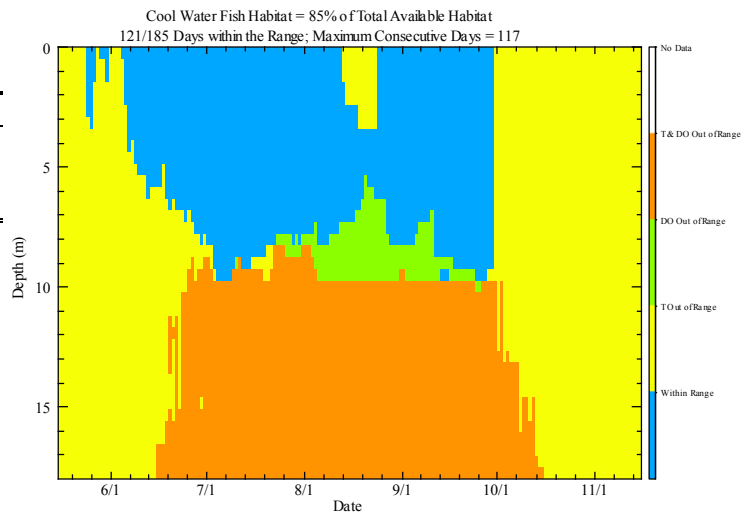
**Figure A.** Coldwater Fish Habitat in Onondaga Lake in 2009.

*Optimal Range: Water temperature < 22°C and dissolved oxygen > 5.0 mg/L between May 15 and Nov 15.*

**Table B.** Habitat availability for cool water fishes in Onondaga Lake from 2000 to 2009 based on default DVT criteria<sup>1</sup>.

Year	Coolwater Habitat		
	% Available Habitat	Total # Days In Range <sup>2</sup> (max 185 days)	# Consecutive Days In Range <sup>2</sup> (max 185 days)
2000	77	114	109
2001	76	117	114
2002	75	101	47
2003	69	102	61
2004	80	134	124
2005	77	115	52
2006	80	116	50
2007	87	141	141
2008	88	118	118
2009	85	121	117

<sup>1</sup> Default values: temperature between 18° - 25°C and dissolved oxygen > 6 mg/L between May 15 and November 15.  
<sup>2</sup> Number of days where temperature and DO are within range in at least a one meter vertical section of the lake.



**Figure B.** Coolwater Fish Habitat in Onondaga Lake in 2009.

*Optimal Range: Water temperature between 18-25°C and dissolved oxygen >=4.0 mg/L between May 15 and Nov 15.*

The following graphics (Figures C and D) illustrate the temporal fluctuations of temperature and dissolved oxygen using high-resolution data obtained from the in-situ monitoring buoy at the South Deep station of Onondaga Lake.

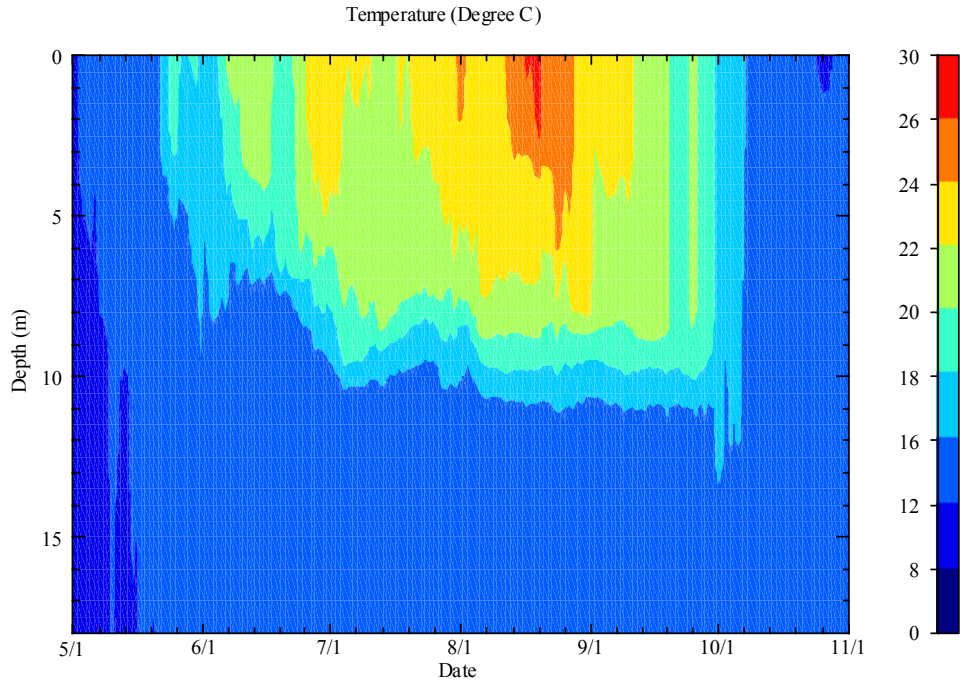


Figure C. Contour of Temperature at Onondaga Lake South Station in 2009.  
*Note: Concentrations are daily averaged.*

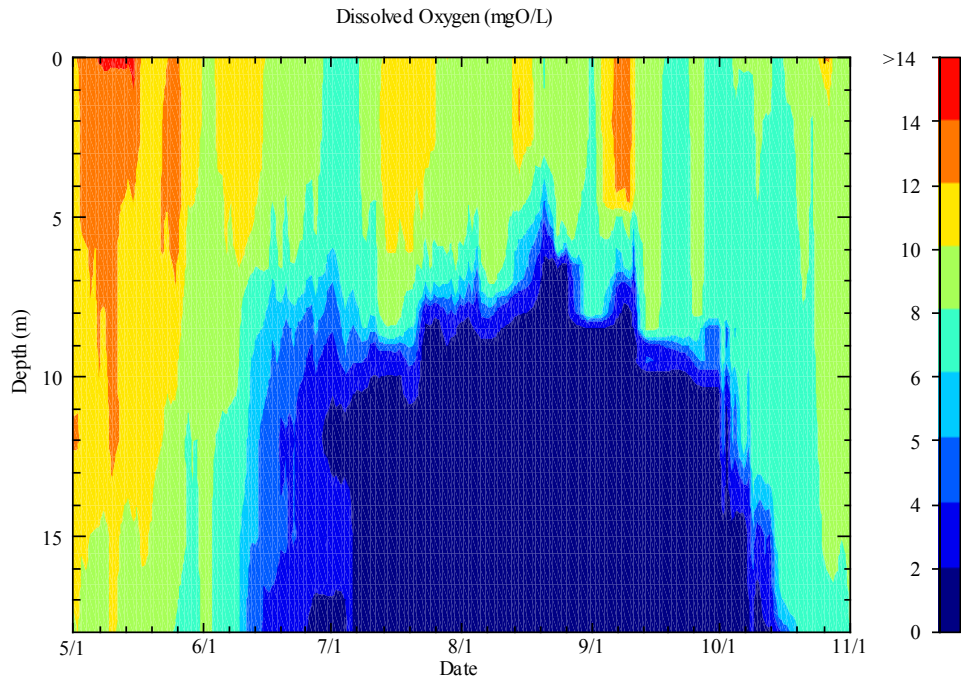


Figure D. Contour of Dissolved Oxygen at Onondaga Lake South Station in 2009.  
*Note: Concentrations are daily averaged. Lower waters probes were removed on July 6 when anoxic conditions became prevalent, to protect the probes from damage. The probes were re-installed on Oct 1, in anticipation of fall turnover.*