

Additional Teacher Resources

Lesson Three-Activity 2

I. SALMONID WATERS	Dissolved Oxygen
A. Embryo and larval stages	
No production impairment	11
Slight production impairment	9
Moderate production impairment	8
Severe production impairment	7
Limit to avoid acute mortality	6
B. Other life stages	
No production impairment	8
Slight production impairment	6
Moderate production impairment	5
Severe production impairment	4
Limit to avoid acute mortality	3
II. NON-SALMONID WATERS	
A. Early life stages	
No production impairment	6.5
Slight production impairment	5.5
Moderate production impairment	5
Severe production impairment	4.5
Limit to avoid acute mortality	4
B. Other life stages	
No production impairment	6
Slight production impairment	5
Moderate production impairment	4
Severe production impairment	3.5
Limit to avoid acute mortality	3
III. INVERTEBRATES	
No production impairment	8
Moderate production impairment	5
Limit to avoid acute mortality	4

Showing the Effects of Dissolved Oxygen on Salmon and Other Aquatic Life

(Water on the Web)

Lesson Three-Activity 3

Natural Conditions that Contribute to the Amount of Dissolved Oxygen in the Water		
Season Spring Fall		
Water Flow		
How fast is the water flowing?	Fast	Slow
Turbulence		
Wind Mixing	Yes	No
Wave Action	Yes	No
Turbulent flow over rocks or waterfall	Yes	No
Plants		
Aquatics plants, algae, and phytoplankton	Few	Many
Water Temperature	Cold	Warm
Sediment	Little	Lots
Prediction: How much dissolved oxygen is available to the fish in the river?	Little	Lots

How Much Dissolved Oxygen is Available for Fish in the Water?

Lesson Three-Activity 4

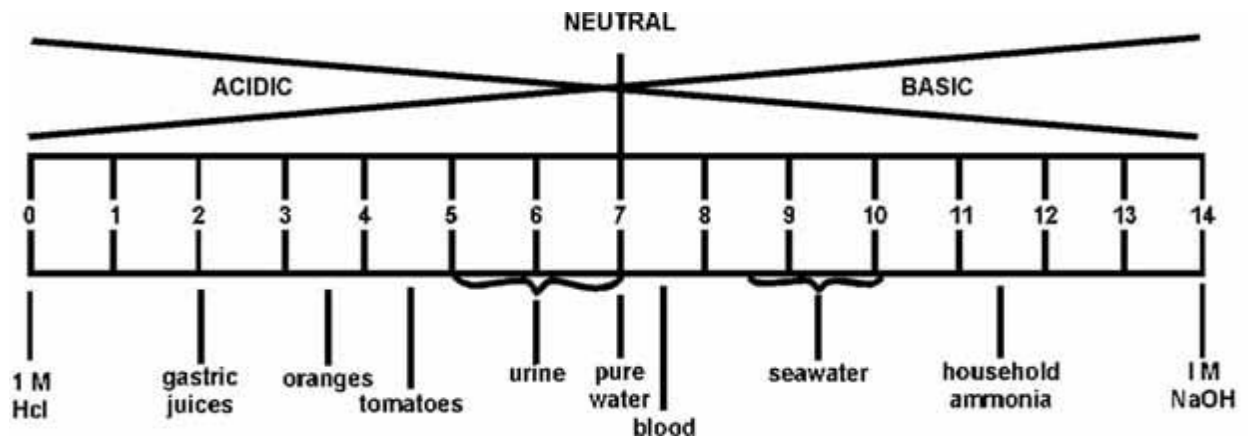
Species	Max. weekly average temp. for growth (juveniles)	Max. temp. for survival of short exposure (juveniles)	Max. weekly average temp. for spawning ^a	Max. temp. for embryo spawning ^b	Table 5.5
					Maximum average temperatures for growth and short-term maximum temperatures for selected fish (°C and °F)
Atlantic salmon	20 °C (68 °F)	23 °C (73 °F)	5 °C (41 °F)	11 °C (52 °F)	
Bluegill	32 °C (90 °F)	35 °C (95 °F)	25 °C (77 °F)	34 °C (93 °F)	
Brook trout	19 °C (66 °F)	24 °C (75 °F)	9 °C (48 °F)	13 °C (55 °F)	
Common carp	---	---	21 °C (70 °F)	33 °C (91 °F)	
Channel catfish	32 °C (90 °F)	35 °C (95 °F)	27 °C (81 °F)	29 °C (84 °F)	
Largemouth bass	32 °C (90 °F)	34 °C (93 °F)	21 °C (70 °F)	27 °C (81 °F)	
Rainbow trout	19 °C (66 °F)	24 °C (75 °F)	9 °C (48 °F)	13 °C (55 °F)	
Smallmouth bass	29 °C (84 °F)	---	17 °C (63 °F)	23 °C (73 °F)	
Sockeye salmon	18 °C (64 °F)	22 °C (72 °F)	10 °C (50 °F)	13 °C (55 °F)	
^a - Optimum or mean of the range of spawning temperatures reported for the species ^b - Upper temperature for successful incubation and hatching reported for the species ^c - Upper temperature for spawning					

(Brungs and Jones 1977)

Limiting Temperatures for Fish

(EPA Volunteer Stream Monitoring Manual)

Lesson Three-Activity 5



pH Table of Some Common Liquids

(EPA Volunteer Stream Monitoring Manual)

Lesson Three-Activity 6

Turbidity in the Water <i>(Turbidity is a measure of how clear the water is)</i>				
Season	Spring	Summer	Fall	
Water Flow				
How fast is the water flowing?			Fast	Slow
Appearance				
What does it look like?			Clear	Muddy
How much light can pass through?			Yes	No
What is in the water?				
Amount of sediment particles			Few	Many
Size of sediment particles			Small	Large
Aquatics plants, algae, and phytoplankton			Little	Lots
Water Temperature			Cold	Warm
Prediction: Is the turbidity of the water possibly impacting the fish populations?			Yes	No

Is the Turbidity of the River Impacting the Fish Populations?

Ranges of Conductivity for Fish

(Understanding Your Fish Pond Water Analysis Report)

Lesson Three-Activity 8

Electrical Conductivity



Desirable Range	Acceptable Range
100-2,000 μ Siemens/cm	30-5,000 μ Siemens/cm

Lesson Five-Activity 7

The water quality standard category	Parameter that is being tested.	Test results for sampling site # ____	The water quality standard for salmon.	Does the parameter meet the water quality standard? Yes/No
Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	Dissolved oxygen (DO) in the river		DO level cannot be greater than 7 mg/liter in the river	
Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	Dissolved Oxygen (DO) at spawning grounds		DO level cannot be less than 5 mg/l to a depth of 20 cm at the spawning grounds	
Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	PH in the river		May not be less than 6.5 or greater than 8.5 in the river	
Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife	Temperature (T) in the river		May not exceed 20° C at any time in the river	

Water Quality Standards Sampling Table for Salmon

Lesson Five-Activity 8

 <p>1 2 3 4 5 6</p> <p>With this Multi-Parameter Probe, Possible Water Quality Meter (Copyright © Environmental)</p>	<p>Parts of a water quality meter to label</p>
 <p>Screen Menu (polymer) Case Cable that connects probe to meter Probe that takes water quality measurements</p> <p>Bring Onboard TDS Measurement! TDS that Multi-Parameter Probe, Possible Water Quality Meter</p>	<p>Parts of a water quality meter labeled</p>

Lesson Six-Activity 3

Name of pollutant	Possible problems	Take care of it now?	Is the problem growing?	Can you track the changes over time?
1. Abandoned vehicles	Leaking fluids spill into water			
2. Batteries	Lead acid leaches into water			
3. Chemicals	Contaminate water			
4. Fertilizers	Contaminate water			
5. Four wheelers	Leaking fluids spill into water			
6. Gasoline	Contaminate water			
7. Human waste	Bacteria in water			
8. Landfill	Metals leach into water			
9. Metal in the river	Metals leach into water			
10. Oil barrels or cans	Contaminate water			
11. Old four wheelers	Leaking fluids spill into water			
12. Old snowmachines	Leaking fluids spill into water			
13. Trash bags	Contents contaminate water			
List other pollutants below				

Sources of Pollution that Affect Water Quality in the Community