



**THE OHIO STATE UNIVERSITY**

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COLLEGE OF FOOD, AGRICULTURAL,  
AND ENVIRONMENTAL SCIENCES

# **Understanding your water quality analysis report**

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**Water Quality workshop for fish farmers**

Piketon, Ohio



## Why test WQ?

- ☐ Most fish kills are caused by low dissolved oxygen.
- ☐ Waters from wells or springs are often devoid of dissolved oxygen.
- ☐ May also contain high levels of dissolved gasses, such as carbon dioxide and hydrogen sulfide, or metals, such as iron and manganese.
- ☐ It is important to know the source of water sample to interpret the results correctly.



# When to test WQ?

- ☐ Daily/Weekly/Bi-Weekly/Monthly/Annual
- ☐ For accurate results, water quality analyses must be performed within a certain time period after sampling.
- ☐ Holding times vary among parameters, typically ranging from 8 hours to 28 days.



# How to collect samples?

- ☐ A clean plastic bottle with a screw cap.... thoroughly rinsed with water from the source to be tested
- ☐ Partially fill the bottle, cap it, and shake it a few times and discard away from sampling location
- ☐ Completely fill the bottle with water & tightly seal
- ☐ Properly label the water sample
- ☐ Collect at least two or three samples
  - ☐ If not possible - Use a composite sample



# How to collect samples? Do's & Don'ts

- ☐ Send samples to the laboratory as soon as possible
- ☐ Store in cool storage... preferably on ice
- ☐ Collect samples at depth of about  $\frac{1}{2}$  to 1 foot, in a location out several feet from the edge of the pond
  
- ☐ Avoid contamination from debris, mud, or algae in surface films
- ☐ Don't expose to the sun
- ☐ Avoid delays in shipping /delivery



# Sensitivity of parameters to time of shipment

- ❑ Parameters **likely to change** during the shipment:
  - ❑ pH, Electrical Conductivity, Fe (Iron) and Mn (Manganese),  $\text{NH}_3\text{-N}$  (Ammonia-Nitrogen),  $\text{NO}_2$  (Nitrite) and  $\text{NO}_2\text{-N}$  (Nitrite-Nitrogen),  $\text{PO}_4$  (Phosphate)
  
- ❑ Parameters **not likely** change during the shipment:
  - ❑ Alkalinity, Hardness,



# Where to send samples for testing?

- **Certified labs:** <http://www.epa.state.oh.us/ddagw/labcert.aspx>
- **OSU:** [www.southcenters.osu.edu/soil](http://www.southcenters.osu.edu/soil)



Search...



## Certified Laboratories



Certified laboratories analyze drinking water samples for the presence of specific contaminants to help public water systems demonstrate that their water meets health based standards. Ohio EPA's laboratory certification program ensures laboratories are able to perform accurate testing using specific methods which have been approved by U.S. EPA.

Questions? Contact a member of the Laboratory Certification Section  
By phone: 1 (614) 644-4245 or Email: [DWLabCert@epa.ohio.gov](mailto:DWLabCert@epa.ohio.gov)

### QUICK LINKS

- ▶ **Currently Certified Laboratories**  
Microbiological and Chemical
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Monitoring Schedules, Violations, Engineering
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How are we doing?





# OSU Resources

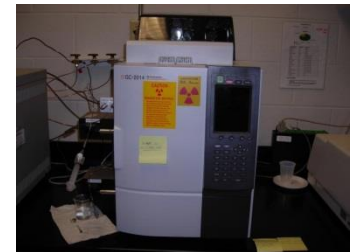
- ☐ Piketon, OH
  - ☐ OSU South Centers (Soil, Water, & BioEnergy Lab)
- ☐ Columbus, OH
  - ☐ ?
- ☐ Wooster, OH
  - ☐ STAR Lab

☐ **OSU does not have commercial lab**





## Piketon: OSU South Centers





# WQ Report - Examples

Parameter analyzed	Results	units
Calcium (Ca)	76	ppm
Magnesium (Mg)	18	ppm
Sodium (Na)	979	ppm
Potassium (K)	71	ppm
Boron (B)	4.02	ppm
Carbonate (CO <sub>3</sub> )	0	ppm
Bicarbonate (HCO <sub>3</sub> )	367	ppm
Sulfate (SO <sub>4</sub> calculated from total S)	601	ppm
Chloride (Cl-)	1471	ppm
Nitrate-N (NO <sub>3</sub> -N)	11.15	ppm
Phosphorus (P)	0.06	ppm
pH	7.33	
Conductivity	4680	µmhos/cm
Hardness	15	grains CaCO <sub>3</sub> /gallon
Hardness	264	ppm CaCO <sub>3</sub>
Alkalinity	301	ppm CaCO <sub>3</sub>
Total Dissolved Salts (TDS)	3598	ppm
SAR	26.2	
Charge Balance (cation/anion*100)	81	

## Water Analysis Report: Fish

### (Example)

pH .....-7.24  
 Electrical Conductivity ---205 µSiemens/cm  
 Alkalinity, Total ----- 100.00 mg/l as CaCO<sub>3</sub>  
 Hardness, Total -----103.80 mg/l as CaCO<sub>3</sub>  
 CO<sub>3</sub> (Carbonate) ----- 0.09 mg/l as CaCO<sub>3</sub>  
 HCO<sub>3</sub> (Bicarbonate) -- 99.90 mg/l as CaCO<sub>3</sub>  
 Fe (Iron) ----- -0.05 mg/l  
 Mn (Manganese) ----- -0.01 mg/l  
 F (Fluoride) ----- -0.15 mg/l  
 Cl (Chloride) ----- -3.13 mg/l  
 SO<sub>4</sub> (Sulfate) ----- 3.21 mg/l  
 NO<sub>3</sub> (Nitrate) ----- 0.04 mg/l  
 NO<sub>3</sub>-N (Nitrate-Nitrogen) ----- 0.01 mg/l  
 NH<sub>3</sub>-N (Ammonia-Nitrogen) ----- 0.11 mg/l  
 NO<sub>2</sub>-N (Nitrite-Nitrogen) ----- 0.00 mg/l  
 PO<sub>4</sub> (Phosphate) ----- 0.06 mg/l

There is no standard list of water quality parameters that are measured, and units of measure will vary among laboratories.



# Ranges of water quality parameters for fish

Parameters	Desirable Range	Acceptable Range
pH	6.5-9.5	5.5-10.0
Electrical Conductivity	100-2,000 $\mu$ Siemens/cm	30-5,000 $\mu$ Siemens/cm
Alkalinity (Total)	50-150 mg/l as $\text{CaCO}_3$	20-400 mg/l for ponds >10 mg/l for hatchery water as $\text{CaCO}_3$
Hardness (Total)	50-150 mg/l as $\text{CaCO}_3$	> 10 mg/l as $\text{CaCO}_3$
Cl (Chloride)	Above 60 mg/l (for catfish ponds)	10 times the nitrite concentration (for catfish ponds)
$\text{NH}_3\text{-N}$ (Ammonia-Nitrogen)	Total $\text{NH}_3\text{-N}$ : 0-2 mg/l	Total $\text{NH}_3\text{-N}$ : Less than 4 mg/l
	Un-ionized $\text{NH}_3\text{-N}$ : 0 mg/l	Un-ionized $\text{NH}_3\text{-N}$ : Less than 0.4 mg/l



# Ranges of water quality parameters for fish

Parameters	Desirable Range	Acceptable Range
Fe (Iron) and Mn (Manganese)	For hatchery water: Ferrous iron: none Ferric iron: none	For hatchery water: No ferrous iron Ferric iron: Less than 0.1 mg/l for fry, less than 1.0 mg/l for most fish
	<sup>3</sup> For pond water: Any level of ferric iron, no ferrous iron.	For pond water: Any level of ferric iron, presence of ferrous iron acceptable if limited to zone around water Inlet
	Manganese: 0-0.01 mg/l	Manganese: Up to 1 mg/l
NO <sub>2</sub> (Nitrite) and NO <sub>2</sub> -N (Nitrite-Nitrogen)	0-1 mg/l NO <sub>2</sub>	< 4 mg/l NO <sub>2</sub>



# Ranges of water quality parameters for fish

Parameters	Desirable Range	Acceptable Range
F (Fluoride)	Levels at or above 3 mg/l are reported to cause losses of some fish species, depending upon complex water conditions.	
SO <sub>4</sub> (Sulfate)	A wide range of sulfate concentrations	
CO <sub>3</sub> (Carbonate) and HCO <sub>3</sub> (Bicarbonate)	The relative amount of each of these compounds depends upon the pH of the water sample.	
NO <sub>3</sub> (Nitrate) and NO <sub>3</sub> -N (Nitrate-Nitrogen)	Nitrate is relatively nontoxic to fish and is not a health hazard except at exceedingly high levels (above 90 mg/l NO <sub>3</sub> -N)	
PO <sub>4</sub> (Phosphate)	Phosphorus is an essential plant nutrient, and because it is often in limited supply, adding phosphorus to water will stimulate plant (algae) growth. This growth of algae can be undesirable, as in the case of pristine streams, or desirable, as in ponds for fish culture.	



# Importance of the water quality for fish:

- ☐ A low pH (<4.5) - there is strong mineral acidity, which is harmful to fish & difficult/expensive to neutralize.
- ☐ As pH increases, risk of ammonia toxicity to fish.
- ☐ Some minimum salt content is desirable to help fish maintain their osmotic balance.
- ☐ The amount of calcium hardness is important in pond fertilization because higher rates of phosphorus fertilizer are required at higher calcium hardness concentrations.
- ☐ Chloride is a common component of most waters and is beneficial to fish in maintaining their osmotic balance.



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