

PD/A CRSP: Pond Fertilization Algal Bioassay Workshop (June/July 2002)
Introduction to the Workshop

Pond Fertilization Algal Bioassay Testing Workshop

Sponsored by:

Pond Dynamics/Aquaculture

Collaborative Research Support Program

418 Snell Hall, Oregon State University
Corvallis, OR 97331-1643 USA

<http://pdacrsp.orst.edu>

PD/A CRSP is funded through a grant from USAID



Workshop presented by:

Christopher F. Knud-Hansen, Ph.D.

Dept. of Fisheries & Wildlife

Michigan State University

East Lansing, MI 48824 USA

&

Aquatic Solutions, LLC

3215 Heidelberg Dr.

Boulder, CO 80305 USA

cknudhansen@worldnet.att.net

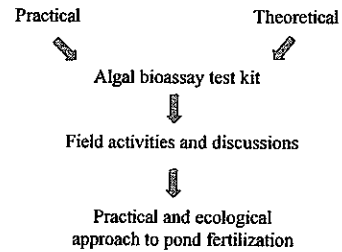
Aquatic Solutions



Workshop Objectives

- To better understand:
 - pond ecology as it relates to pond fertilization strategies,
 - why some fertilizers are better than others,
 - how to use the *Algal Bioassay Test Kit* to determine when a fertilizer is needed (or not needed) to turn a pond green, and,
 - how to optimize a pond fertilization strategy

Workshop Activities



Introduction

- **Environment**
 - earthen ponds
- **Semi-intensive fertilization**
 - Addition of fertilizers to stimulate algal (phytoplankton) growth for natural food production
 - Converting energy from sun to produce natural foods for fish
 - Maximize nutrient and economic efficiencies
- **Pond ecology**
 - Understand dynamic processes of biological production and nutrient cycling to achieve fertilization goals

Workshop Discussion Topics

During the workshop, there will be 4 discussion topics:

1. How Does a Pond Work?

- **Biological production**
 - Primary and secondary
 - Detritus and decomposition
- **Physical properties**
 - Temperature
 - Turbidity
- **Algal nutrients (making ponds green)**
 - Phosphorus, nitrogen, carbon



2. Choosing Fertilizers

- **Important factors**
 - Fertilization goals
 - Cost-efficiency analysis
 - Maintaining a favorable growth environment
 - Dissolved oxygen (DO) and ammonia
- **Fertilizers**
 - Manures (animal and green)
 - Chemical fertilizers



3. Pond Characteristics Which Affect Fertilization Decisions

- **Pond:**
 - Location
 - Source water
 - Size (area and depth)
 - Sediments
- **Structures put in ponds:**
 - Cages, pens, hapas, and artificial substrates



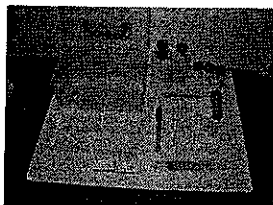
4. How to Determine Fertilization Rates

- **Trial and error**
 - Bigger fish, it worked, smaller fish, it didn't work.
- **Fixed rates**
 - Fertilization rates fixed for growout period
- **Water chemistry**
 - Fertilization rates based on routine measurements
- **Computer modeling**
 - Models usually require routine water chemistry monitoring
- **Algal bioassay**
 - Fertilization rates based on pond water responses to nutrient enrichment



Algal Bioassay Test Kit

- **Nutrient Spikes**
 - Dry N, P, C ingredients
 - Solutions
- **Filtering**
 - Filters
 - Filtering apparatus
- **Interpretation**
 - Visual table




Algal Bioassay Method

- First, collect pond water and put into 8 clear plastic bottles




Algal Bioassay Method

- Then, add nutrient spikes:
 - N, P, C, N+P, N+C, P+C, N+P+C, and one bottle with nothing added (control)



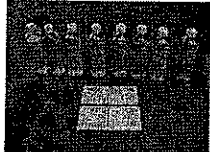
Algal Bioassay Method

- Next, incubate samples for about 3 days under indirect sunlight
 - Mix samples regularly

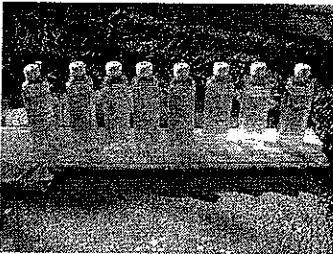


Algal Bioassay Method

- After 2-3 days, visually compare bottles
 - water in the bottle
 - filter
- Then, compare visual results to table
 - fertilize according to table



For Example, A Nitrogen Limited Pond



Algal Bioassay Interpretation Table

Table 2. Guide for diagnosing primary (P) and secondary (S) limiting conditions based on algal bioassay results. Values strongly impacted in the control. Blue color after 2-3 days growth. No color response are indicated by 0. 0 = 0% response similar to control (blue), 1 = partial algal response, and 2 = maximum algal response. Comparing algal response (0, 1, 2) between P and S columns. (S) indicates high response and (P) indicates low response. 1 = full response, and 2 = no response for the limiting nutrient. "0" for the (S) column indicates possible limitation of other (P) or (S) nutrients. Full color observations variability. See text for further discussion.

Control	Primary Response						Secondary Response			Diagnosis	
	P	C	N	P+C	N+P	N+C	P	S	C		
1	0	0	0	0	0	0	0	0	0	1	P
2	0	0	0	0	0	0	0	0	0	1	P
3	0	0	0	0	0	0	0	0	0	1	P
4	0	0	0	0	0	0	0	0	0	1	P
5	0	0	0	0	0	0	0	0	0	1	P
6	0	0	0	0	0	0	0	0	0	1	P
7	0	0	0	0	0	0	0	0	0	1	P
8	0	0	0	0	0	0	0	0	0	1	P
9	0	0	0	0	0	0	0	0	0	1	P
10	0	0	0	0	0	0	0	0	0	1	P
11	0	0	0	0	0	0	0	0	0	1	P
12	0	0	0	0	0	0	0	0	0	1	P
13	0	0	0	0	0	0	0	0	0	1	P
14	0	0	0	0	0	0	0	0	0	1	P
15	0	0	0	0	0	0	0	0	0	1	P
16	0	0	0	0	0	0	0	0	0	1	P
17	0	0	0	0	0	0	0	0	0	1	P
18	0	0	0	0	0	0	0	0	0	1	P
19	0	0	0	0	0	0	0	0	0	1	P
20	0	0	0	0	0	0	0	0	0	1	P
21	0	0	0	0	0	0	0	0	0	1	P
22	0	0	0	0	0	0	0	0	0	1	P

Algal Bioassay Test Kit

- Nutrient Spikes**
 - Dry N, P, C ingredients
 - Solutions
- Filtering**
 - Filters
 - Filtering apparatus
- Interpretation**
 - Visual table

