Intensifying Pond Production Systems in the Midwest

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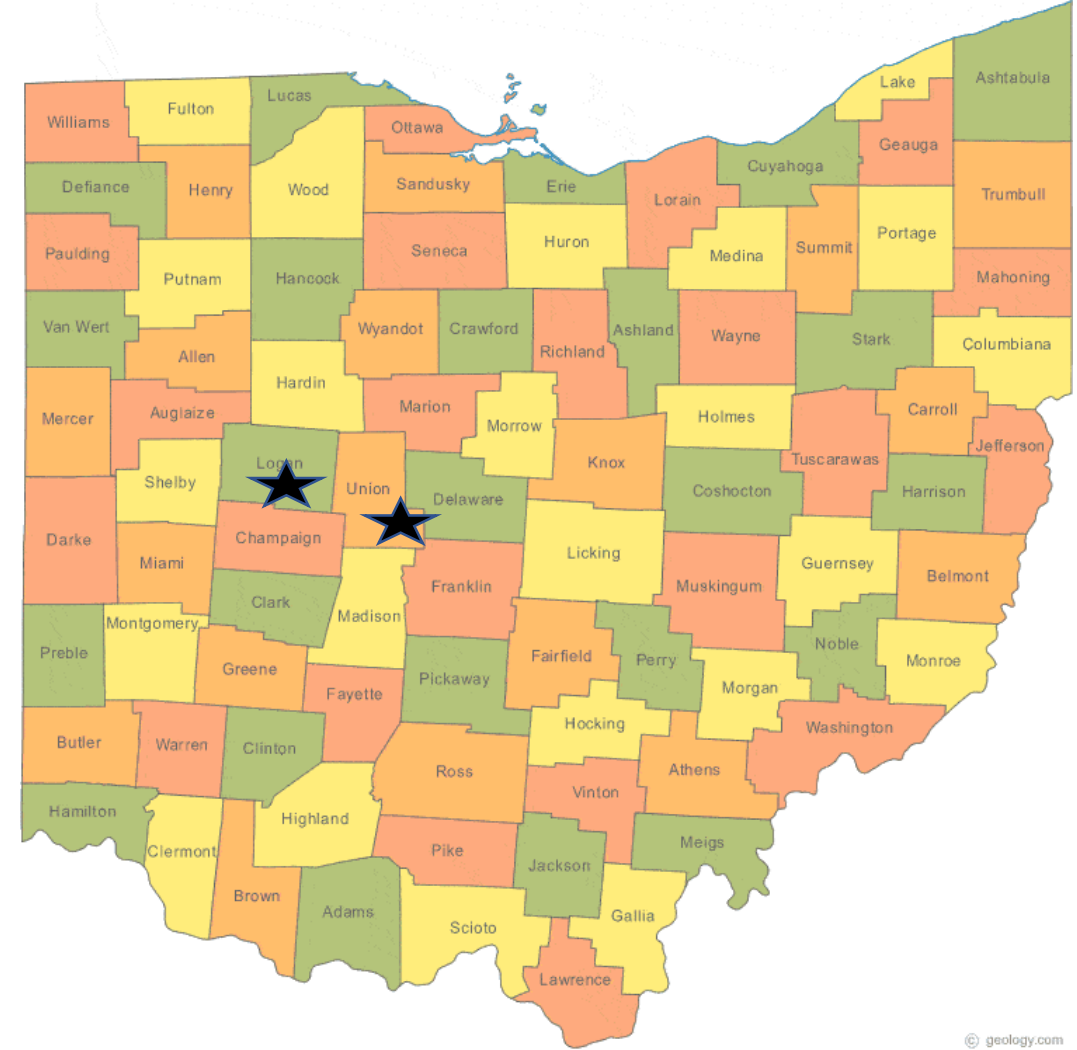CFAES

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Ponds in the projects

➢ 1st year yellow perch fingerling ponds

   ➢ Newly feed habituated

   ➢ 3 fingerling ponds at Brehm's Perch Farm

   ➢ 2 fingerling ponds at Millcreek Perch Farm

➢ Central Ohio farms

Objectives

1. Evaluate production utilizing two systems on two farms in Ohio (split and intensive)

2. Compare gathered data to historical data

3. To immediately disseminate results to industry via final termination report, fact sheet, presentations, and other information technology transfer strategies.

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Timeline

Event	Date
Stocked Brehm's Split-Pond	June 1, 2018
Stocked Millcreek Intensive Ponds	June 3, 2018
Sampled Brehm's Split-Pond	July 9, 2018
Sampled Millcreek Intensive Ponds	July 9, 2018
Sampled Brehm's Split-Pond	August 15, 2018
Sampled Millcreek Intensive Ponds	August 15, 2018
Sampled Brehm's Split-Pond	September 25, 2018
Sampled Millcreek Intensive Ponds	September 25, 2018
Harvested Brehm's Split-Pond	October 25, 2018
Harvested Millcreek Intensive Ponds	November 12, 2018
Brehm's = 146 days **Millcreek = 162 days**	

First, what's a split pond?

➢ Dr. Torrans explained both a split pond and intensively aerated ponds very well at the last OAA meeting


Dissolved oxygen and oxygen management – intensive production of catfish.

Les Torrans

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Ohio Aquaculture and Fish Management Conference, Jan. 26-27, 2018, Columbus OH
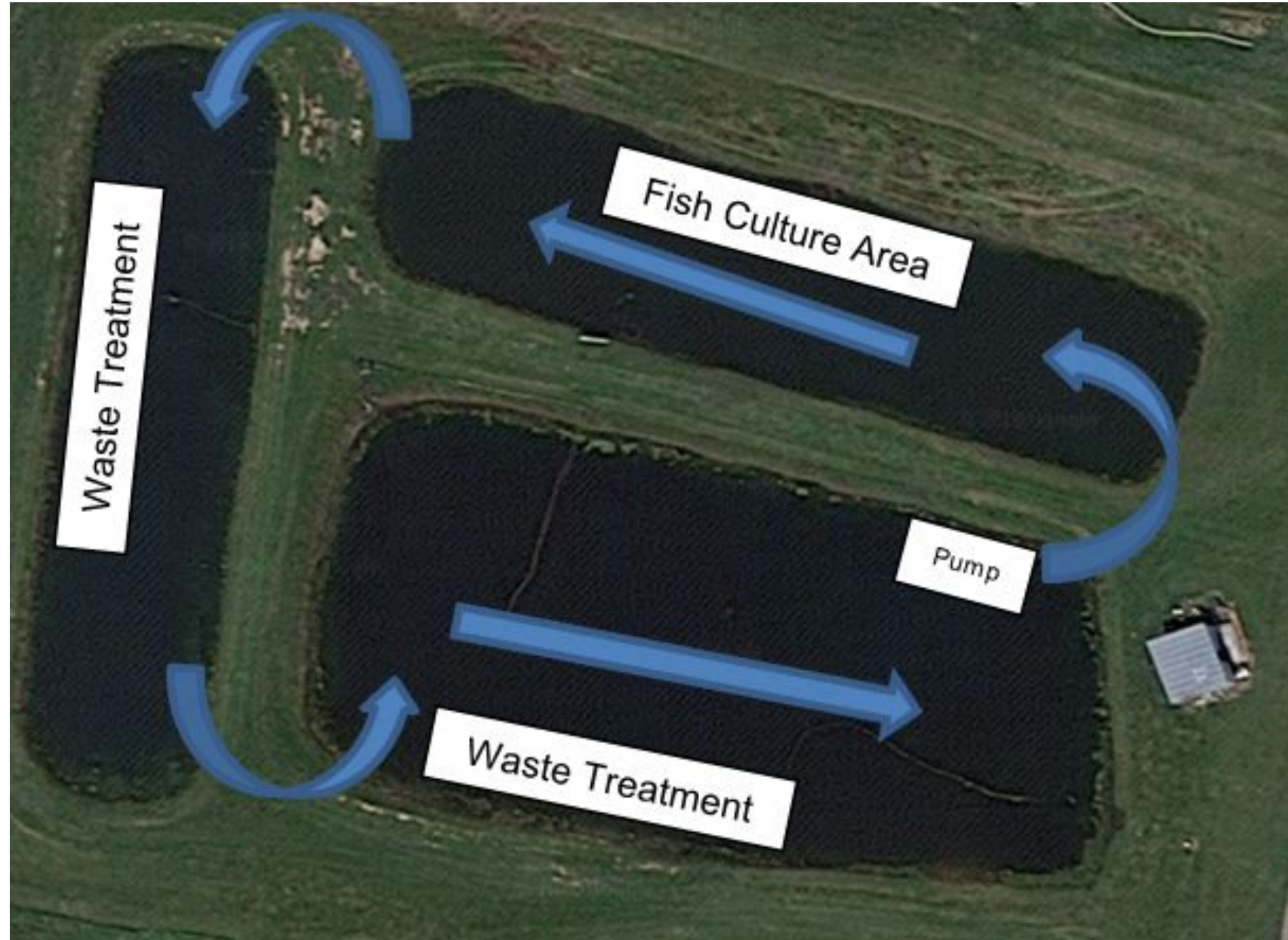
From Dr. Les Torrans' talk at the 2018 OAA meeting

85%
fishless
waste lagoon

15% fish basin
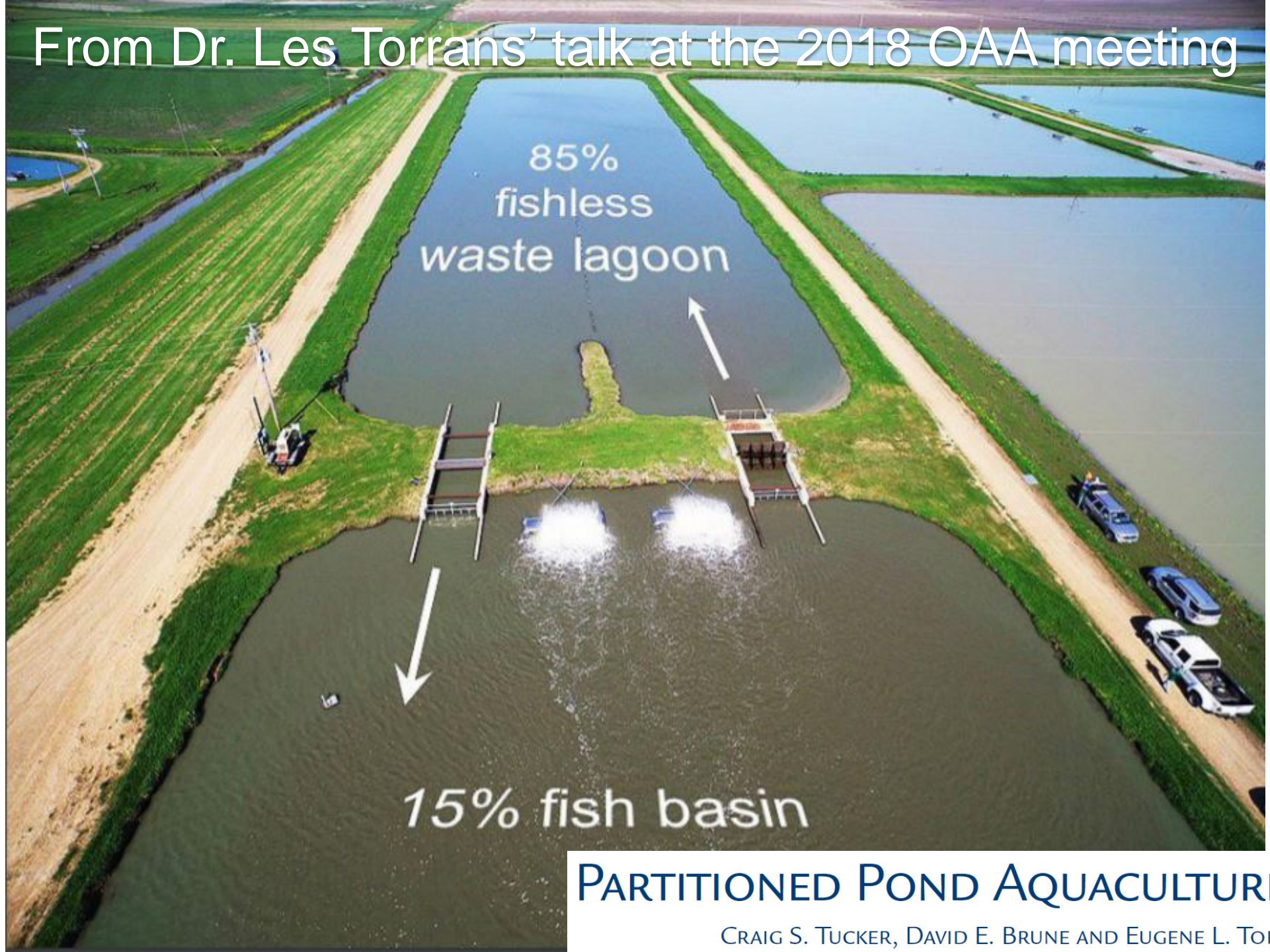
PARTITIONED POND AQUACULTURE SYSTEMS

CRAIG S. TUCKER, DAVID E. BRUNE AND EUGENE L. TORRANS

Brehm's Split Pond

- 1 ac total w/ 0.25 acre

- Perch will likely never hit
  10-15,000 lbs/acre but....

- Can we do...
  - 4,000 lbs/acre?
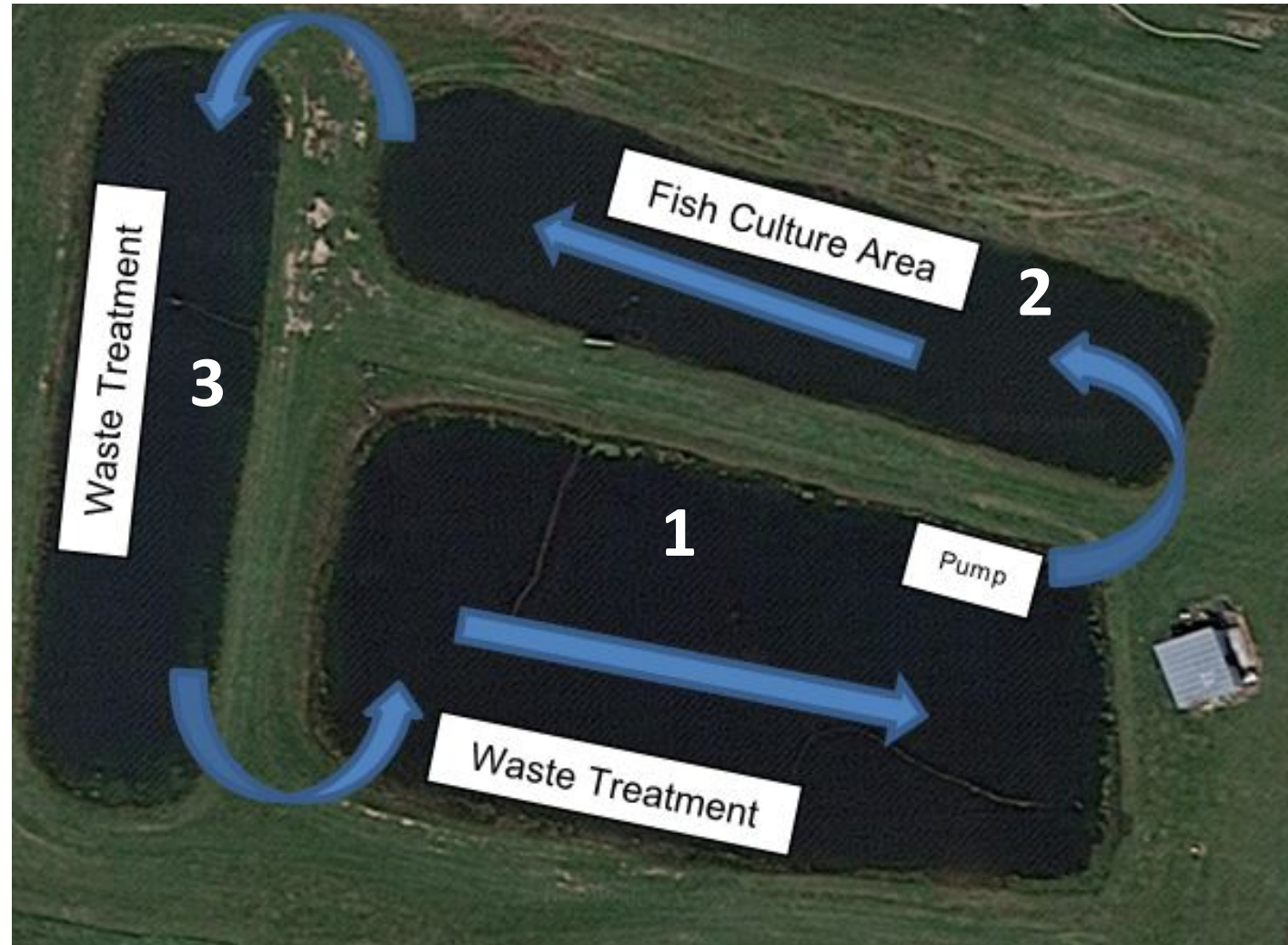 - 5,000 lbs/acre?
  - 7,000 lbs/acre?

Methods – Brehm's

- 300 individual lengths/weights

- Perch averaged **3.6 cm** (1.4 inches)

- Average weight of **0.52 grams**

- Stocked at **79,954 fish/ac (91.85 lbs)**

Methods – Sampling

- 100 individual lengths/weights

- About monthly

Methods – Brehm's

- Floating automatic feeders used for 21 days and then removed

- 2 hp aerator running in fish culture pond at the start

- No aeration at the start in the waste treatment ponds

Water quality methods – Brehm's

➢ Dissolved oxygen

  ➢ All 3 ponds

  ➢ Morning and afternoon daily

➢ pH – afternoon daily

➢ CO_2 - every 3 days, fish

➢ TAN - every 3 days, fish

➢ Nitrite - every 3 days, fish

➢ Un-ionized - every 3 days, fish

➢ Alkalinity/Hardness – once

➢ If parameters got high, parameters were
tested more often and in other locations

✓ Fed twice daily – Zeigler mostly; Purina at
the end
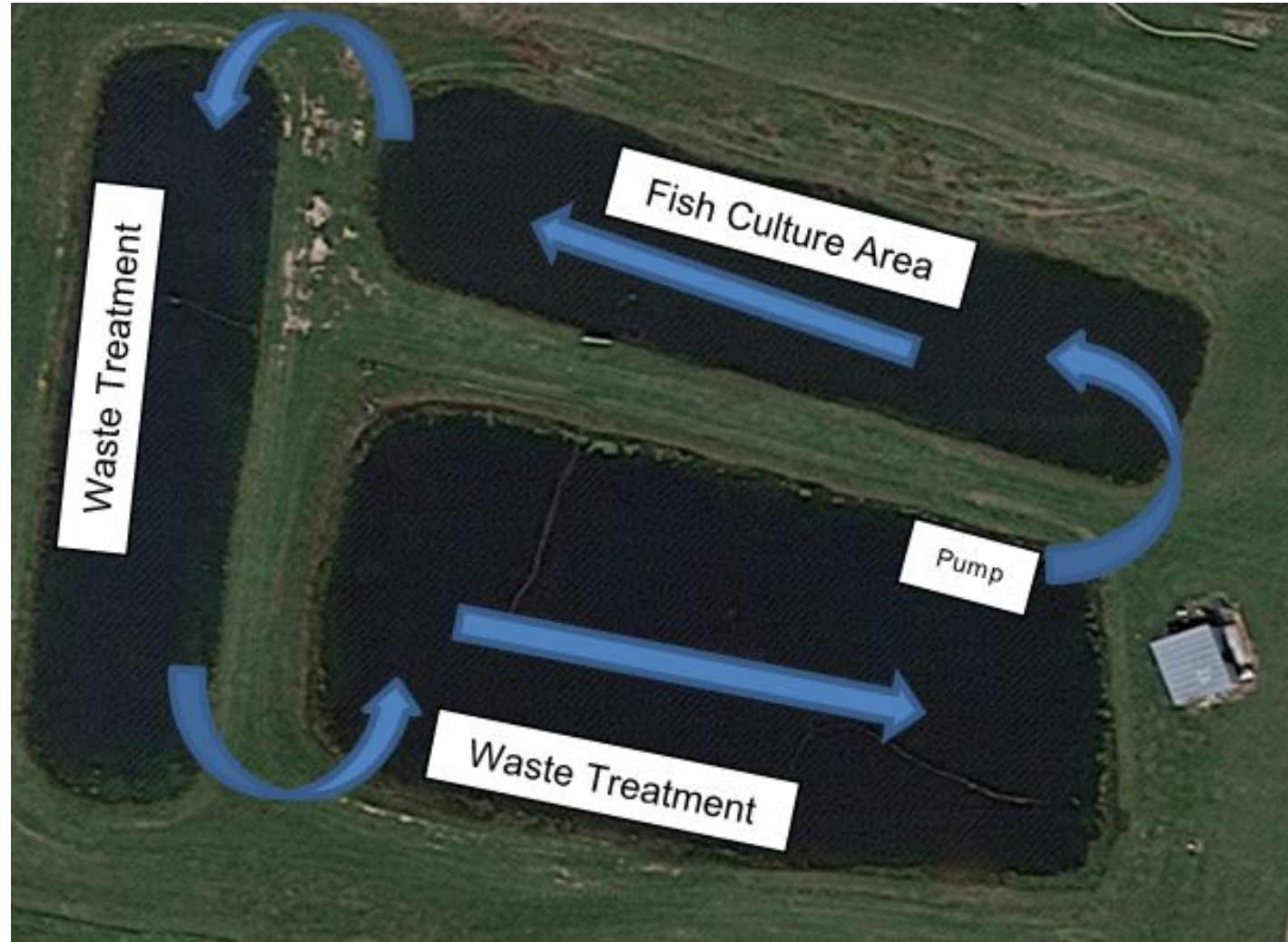
Pond amendments – Brehm's

- 2 submersible pumps added to Pond 1

- One 2 hp & one 1.5 hp

- 100% turnover every 24 hours
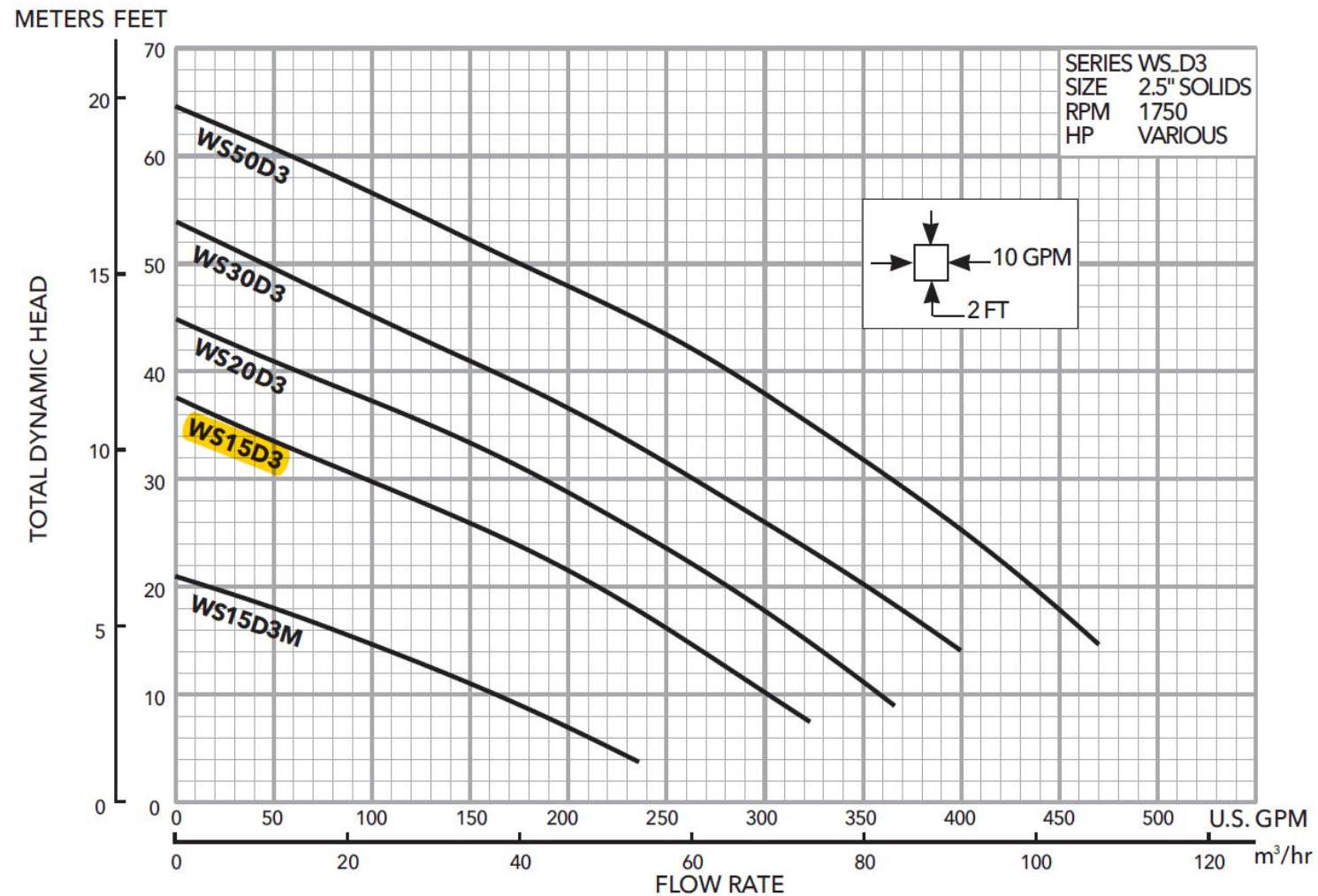
Pond amendments – Brehm's

6" pipe laid to connect the three ponds together

- Two 6" pipes connecting Pond 2 to Pond 3 and then two 6" pipes connecting Pond 3 to Pond 1

Pond amendments – Brehm's

Aeration moved to pond 1 and water flow from pumps adjusted in July

Millcreek stocking – Pond 1B

- 300 individual lengths/weights

- Perch averaged **4.0 cm** (1.6 inches)

- Sub-sample (635 fish) average weight of **0.58 grams**

- Stocked at **39,699 fish** (51. 02 lbs) in Pond 1B

Google maps

Millcreek stocking – Pond 2

- 300 individual lengths/weights

- Perch averaged **3.6 cm** (1.4 inches)

- Sub-sample (635 fish) average weight of **0.46 grams**

- Stocked at **80,039** (81.07 lbs) in Pond 2

Google maps

Water quality methods – Millcreek

➢ Dissolved oxygen

  ➢ **Both ponds**

  ➢ **Morning and afternoon daily**

➢ pH – afternoon daily

➢ CO_2 - every 3 days, fish

➢ TAN - every 3 days, fish

➢ Nitrite - every 3 days, fish

➢ Un-ionized - every 3 days, fish

➢ Alkalinity/Hardness – monthly

✓ If parameters got high, parameters were tested more often and in other locations

✓ Fed twice daily – Zeigler mostly; Purina at the end

Millcreek pond amendments

Aeration protocol for Millcreek and Brehm's

➢ Traditionally: 1 hp aerators usually in place but only used <15 nights p/year (oxygen profiles)

➢ Traditionally: Utilize bottom aeration mostly to destratisfy and provide some oxygen

➢ 2018: Surface aeration to 2 hp/acre 24/7 for the duration of the study

➢ Dr. Torrans **"Aeration doesn't cost money – it makes money!!"**

Does DO affect FCR???

- Poor FCR with very low morning DOs (maintenance ration)

- Poorer feeding response at lower DOs, or with sick fish, making over-feeding more likely

- _Reduced food consumption_ with morning DOs below **4?** ppm, resulting in _reduced growth_, a _longer production cycle_, _greater mortality_, and a _poorer FCR_.
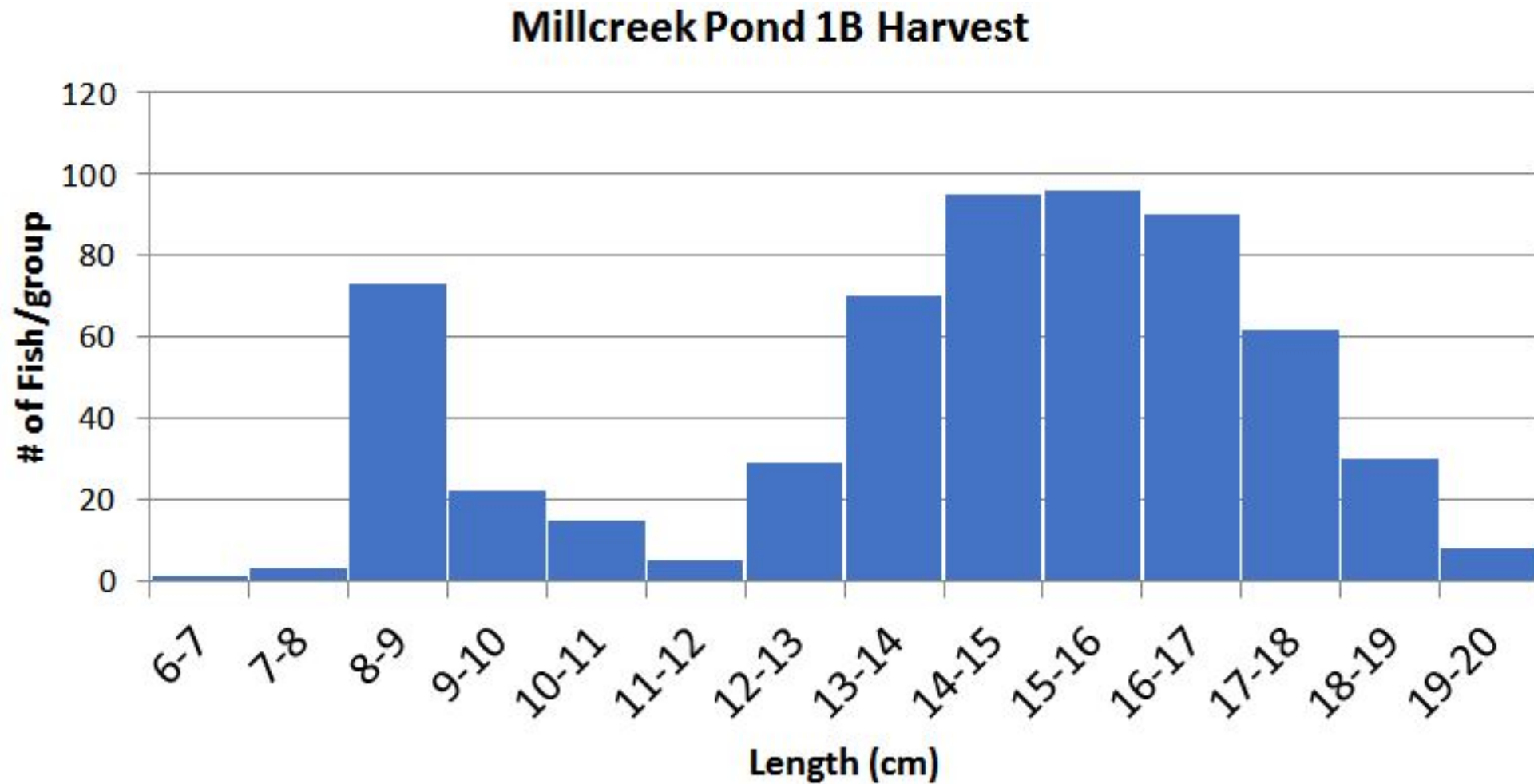
From Dr. Torrans – OAA 2018
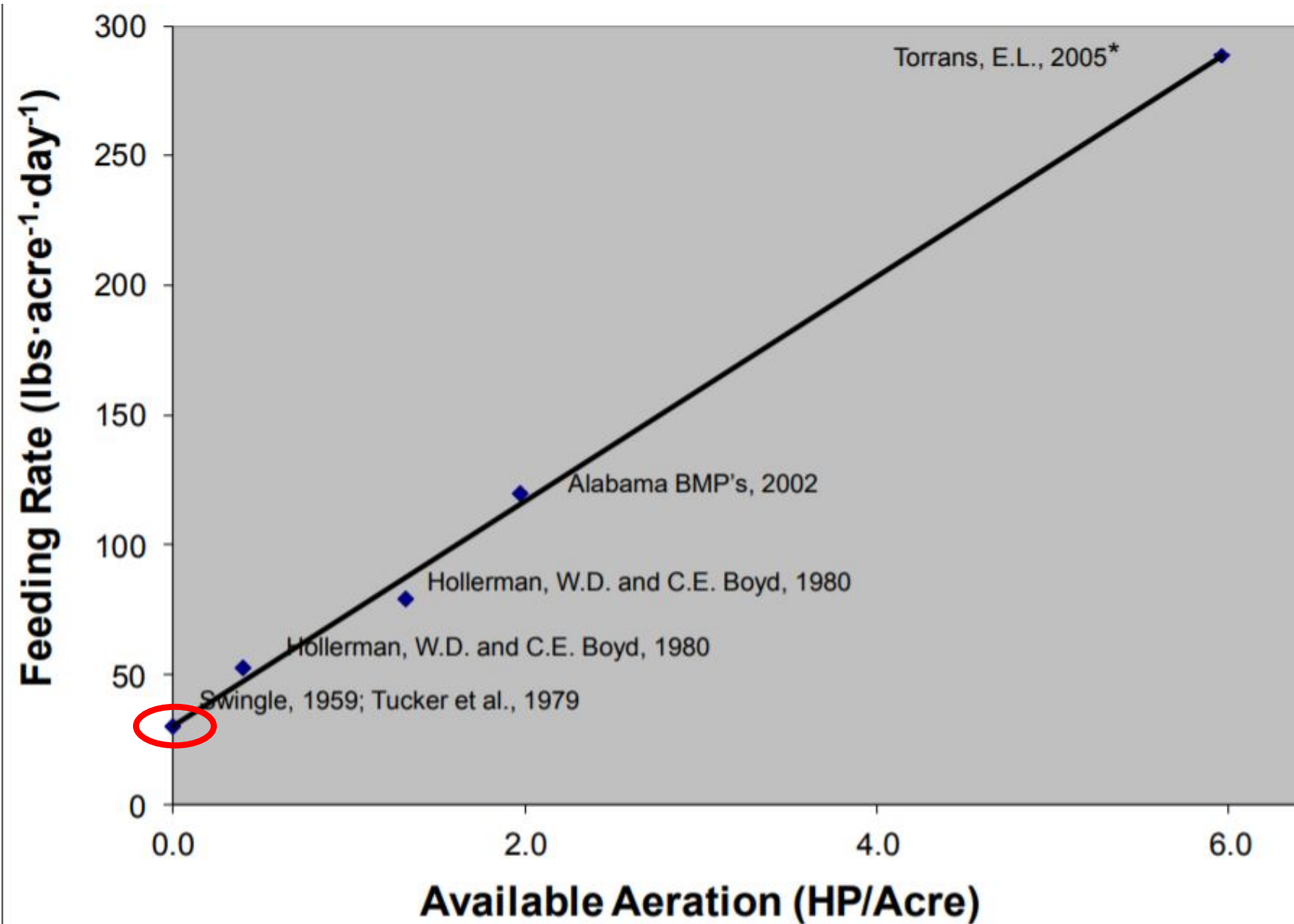
Results

typically
2nd year fish average 3,000 lbs/acre

1st year fish average substantially less

Production Numbers	Millcreek (Pond 1B)*	Millcreek (Pond 2)	Brehm's (Split-Pond)
Stocking density (fish)	39,699	80,039	79,954
Yield (lbs/ac) (net)	3,503 (3,452)	4,209 (4,128)	3,941 (3,849)
Ind. harvest length (cm) (in)	14.3 (5.6)	14.2 (5.6)	11.9 (4.7)
Ind. harvest weight (g)	39.3 ± 22.4	34.0 ± 15.8	25.1 ± 21.2
Fish/lb	11.1	13.3	18.2
Total feed fed (lbs)	1,870	4,038	3,802
Feed conversion ratio	1.1	0.98	0.99
Fulton's condition factor	1.16	1.00	1.11
Survival (%)	51	71	89
	*1B is ½ ac		

6 cm = 2.4 in | 9 cm = 3.5 in | 12 cm = 4.7 in | 15 cm = 5.9 in | 18 cm = 7.1 in

Results – Millcreek (599 fish) * ½ acre

Millcreek Pond 1B Harvest

6 cm = 2.4 in | 9 cm = 3.5 in | 12 cm = 4.7 in | 15 cm = 5.9 in | 18 cm = 7.1 in

Results – Millcreek (600 fish)

Millcreek Pond 2 Harvest

6 cm = 2.4 in | 9 cm = 3.5 in | 12 cm = 4.7 in | 15 cm = 5.9 in | 18 cm = 7.1 in

Results – Brehm's (300 fish)
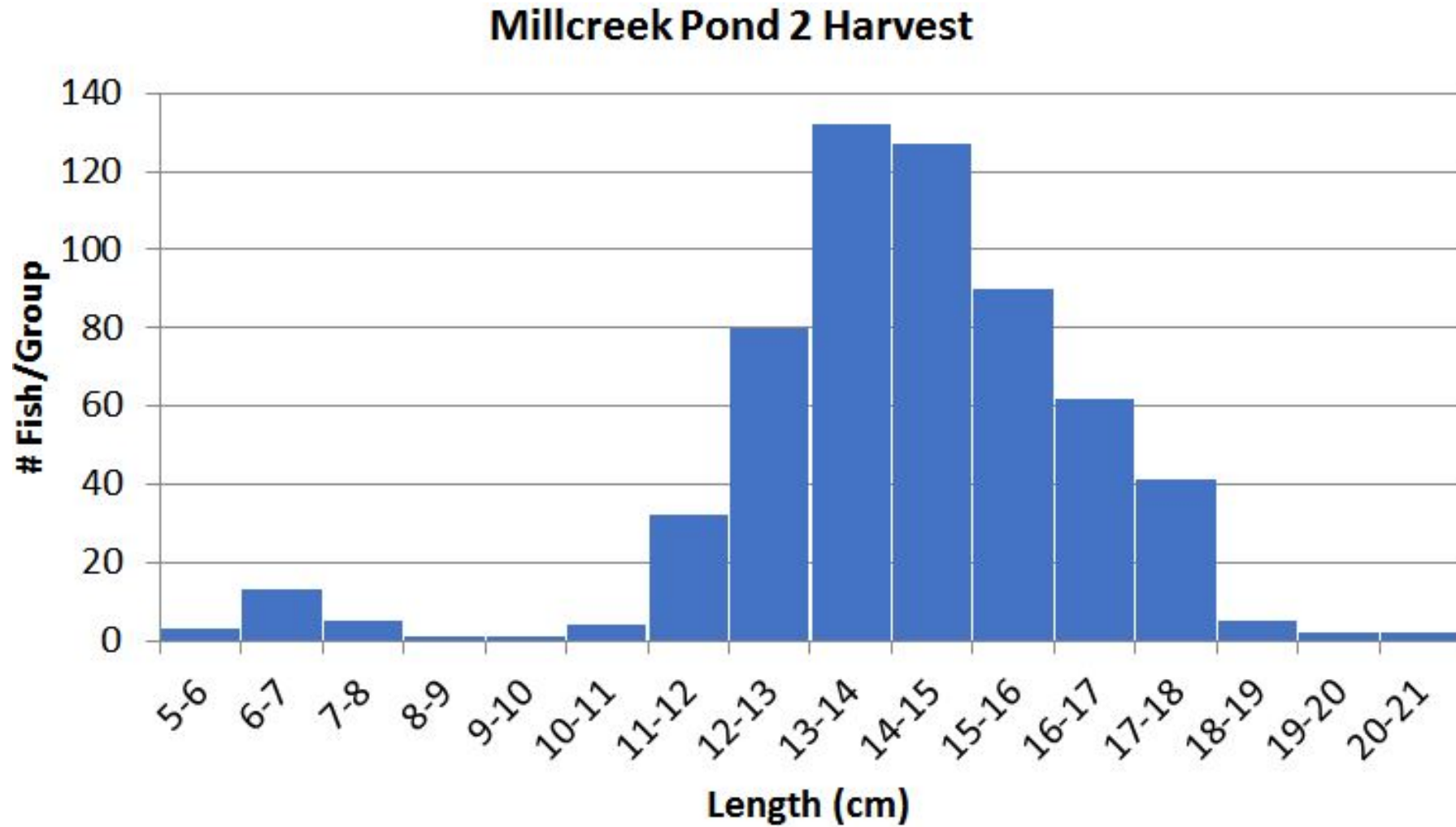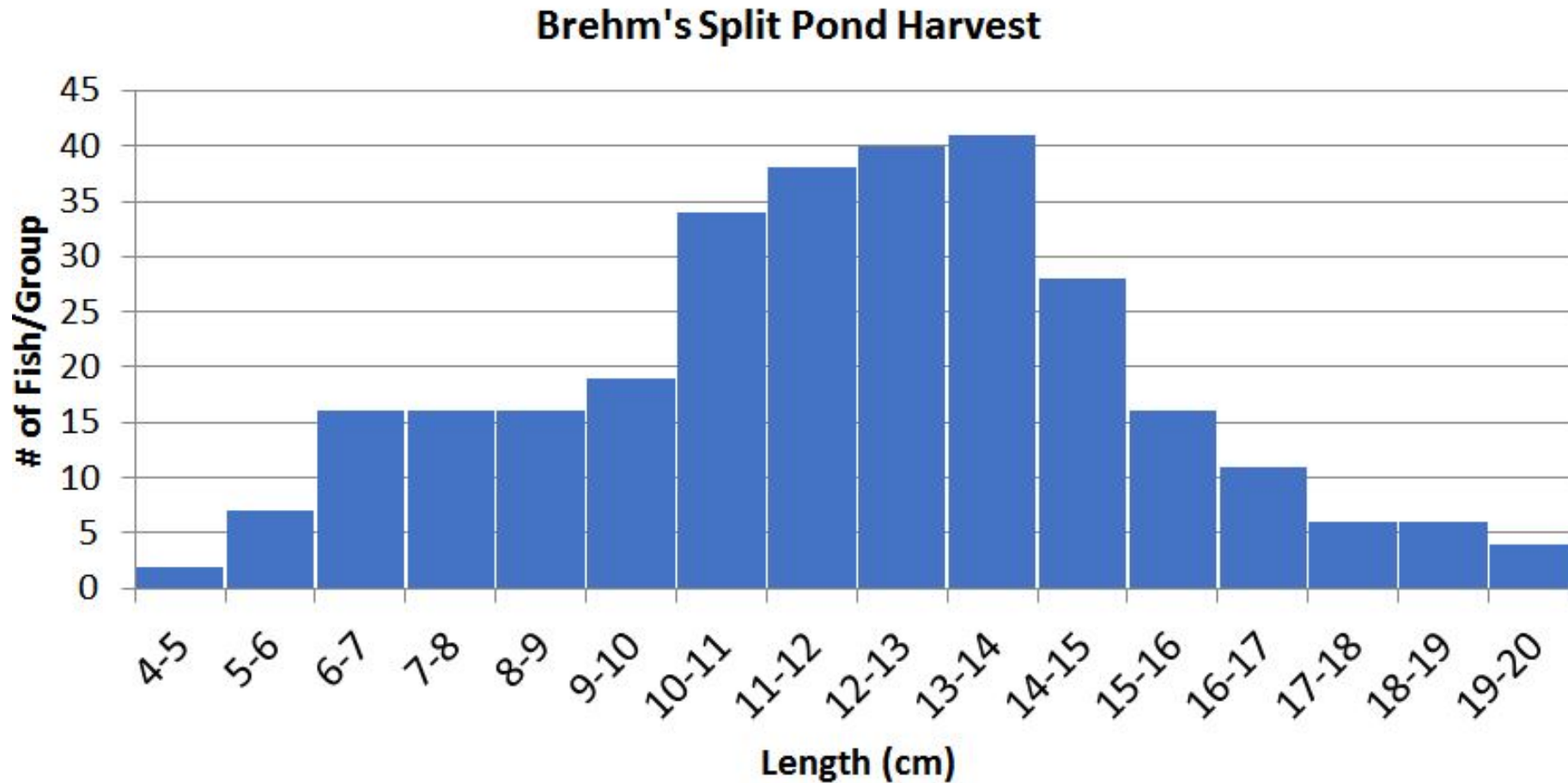

Brehm's Split Pond Harvest

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6 cm = 2.4 in | 9 cm = 3.5 in | 12 cm = 4.7 in | 15 cm = 5.9 in | 18 cm = 7.1 in
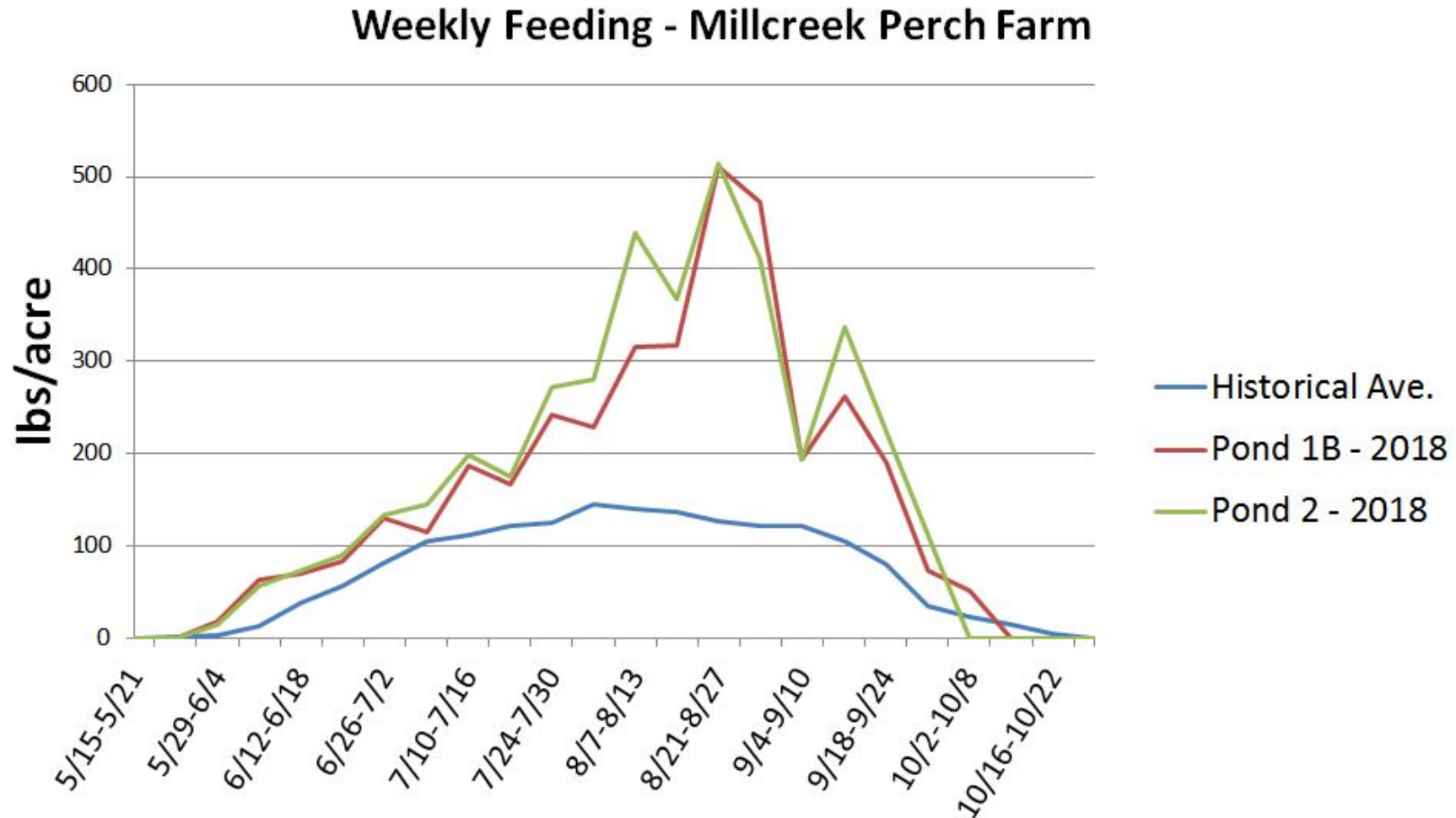
Millcreek Feeding

Weekly Feeding - Millcreek Perch Farm

Y-axis: lbs/acre (0 to 600)

Legend:
- Historical Ave.
- Pond 1B - 2018
- Pond 2 - 2018

X-axis: 5/15-5/21, 5/29-6/4, 6/12-6/18, 6/26-7/2, 7/10-7/16, 7/24-7/30, 8/7-8/13, 8/21-8/27, 9/4-9/10, 9/18-9/24, 10/2-10/8, 10/16-10/22

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>72 lbs/day at peak in **2018**
20 lbs/day at peak **historically**

Results

| Water Quality	Millcreek (Pond 1B)	Millcreek (Pond 2)	Brehm's (split-pond)
Temperature (°F)	**74.7** | 85.8 | 46.9	**73.9** | 85.5 | 47.1	**76.3** | 86.7 | 63.7
Oxygen (mg/L)	**6.4** | 11.6 | 3.5	**10.0** | 14.7 | 6.3	IN: **6.6** | 10.1 | 3.2
Oxygen (mg/L)			OUT: **5.9** | 8.2 | 3.4
CO_2 (mg/L)	**12.4** | 27.0 | 0.0	**14.9** | 27.0 | 0.0	**12.0** | 35.0 | 0.0
pH	**8.5** | 9.7 | 7.7	**8.3** | 9.2 | 7.8	**8.8** | 10.2 | 7.0
Nitrite (mg/L)	**0.2** | 0.7 | 0.0	**0.1** | 0.6 | 0.0	**0.02** | 0.07 | 0.0
Total Ammonia-N (mg/L)	**0.2** | 1.2 | 0.0	**0.2** | 0.6 | 0.0	**0.5** | 2.3 | 0.0
Un-ionized Amm. (mg/L)	**0.0** | 0.3 | 0.0	**0.0** | 0.1 | 0.0	**0.1** | 1.2 | 0.0
Alkalinity (mg/L)	**159** | 206 | 110	**175** | 238 | 103	154
Hardness (mg/L)	**542** | 612 | 478	**553** | 598 | 462	222
	Average, Maximum, Minimum		

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Brehm's is averaged over all 3 ponds involved, except DO

Morning DO (Brehm's)

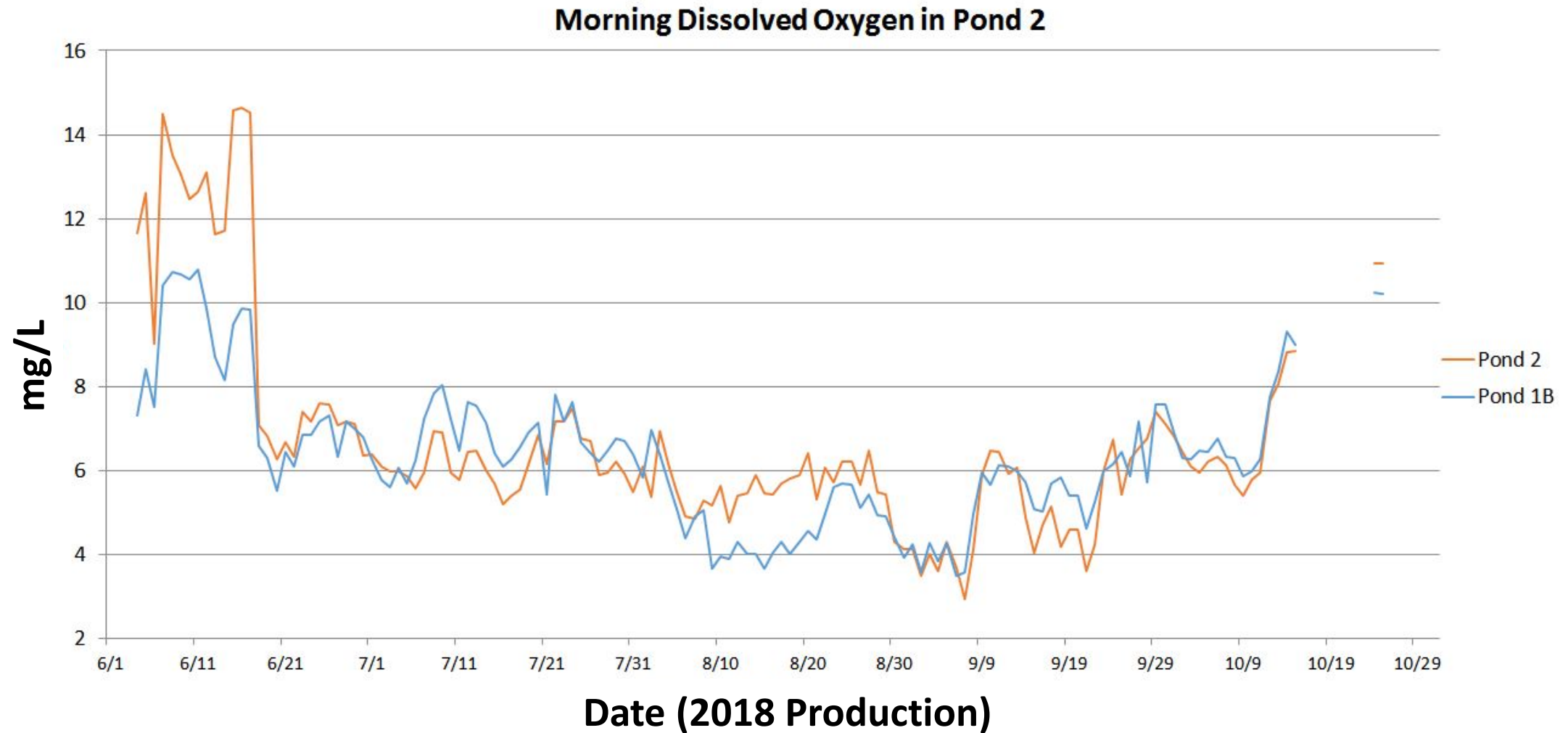Morning Dissolved Oxygen in Pond 2
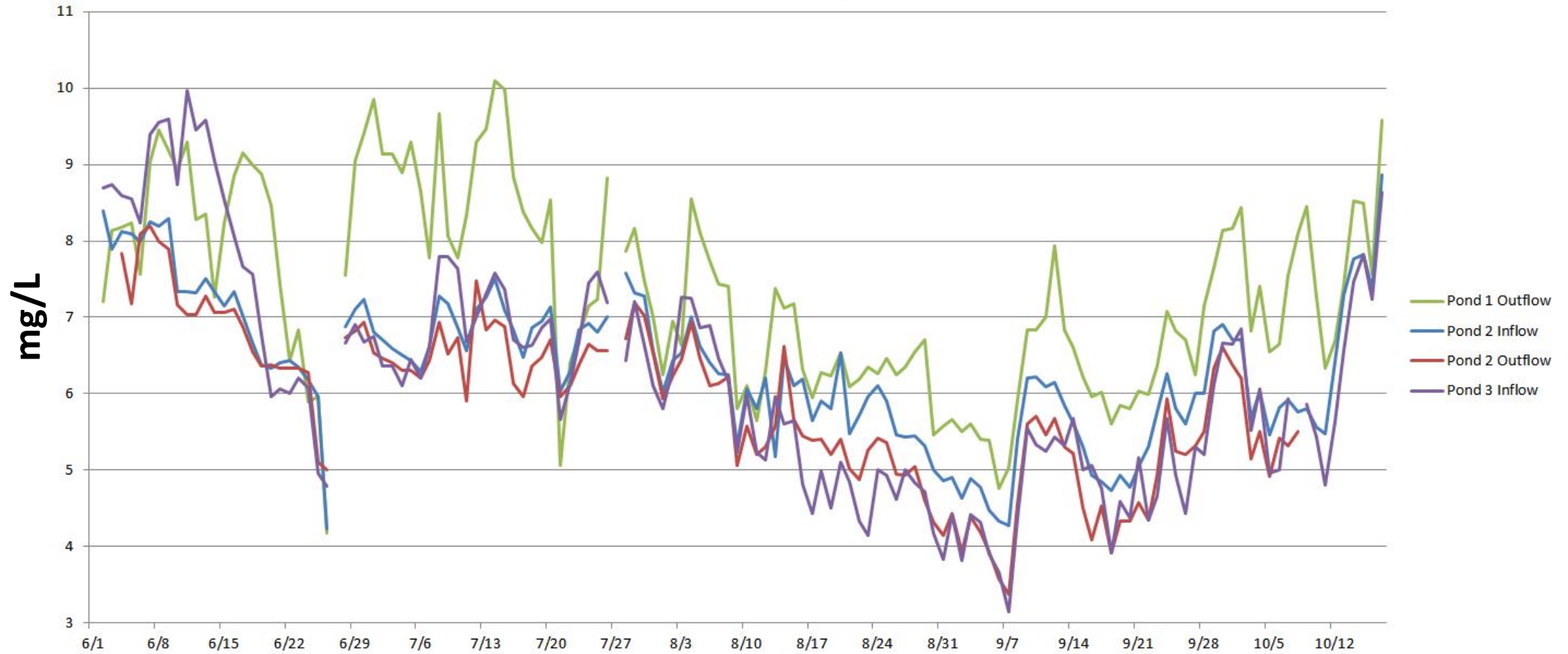
Morning DO (Millcreek)

Morning Dissolved Oxygen in Pond 2

Discussion:

- Survival was determined at 51% for 1B, 72 % for Pond 2, and 89% for split pond

- Double stocking with the amendments seems very feasible from these on-farm Extension demonstrations projects

- **Remember that there was a significant amount of time and effort dedicated to testing and maintaining good water quality by the farmers**

- This is just the first step and more years of on-farm data and hopefully university work will support these first findings

- Economics?

Thank you

- The Extension Aquaculture Program at OSU thanks the farmers,
  - Jim Brehm | Matt Brehm | William Lynch

for their support in this project. Their patience and willingness to work with me is much appreciated. Also, thanks for Alycia and other's who helped obtain data and assist with stocking/harvest

USDA
NIFA
United States Department of Agriculture
National Institute of Food and Agriculture

NCRAC

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Questions?

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Learning curve