Manage Your System

1

Importance of Note Taking

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High Density										
	Tank 1			Trough			Fresh Water Master Test Kit			
Date	pH	EC ppm	Temp F	pH	EC ppm	Temp F	Ammonia	Nitrite	Nitrate	pH
10/21/2016	primed system, added 2 bottles in tank 1 (17 fl oz) of aquarium bacteria and 20 ml of clear ammonia (5 ppm)									
10/23/2016	added more ammonia, about 2 fl oz						0.5	0	-	7.6
10/23/2016	7.8	171	68.8	8.71	175	68.8				
10/24/2016	7.86	175	70.5	7.79	176	70.5	1	0.25	5	7.6
10/25/2016	7.86	177	72	7.82	177	71.8	1	1	5	7.4
10/28/2016	7.76	176	72.5	7.64	175	72.6	0.5	0.25	5	7.6
11/1/2016	7.76	184	75.6	7.76	184	75.5	1	2	20	
11/4/2016	7.56	180	77.4	7.58	180	77.4	1	5	40	
11/6/2016	7.65	178	73.9	7.65	178	73.9	0	2	40	
11/11/2016	7.58	178	70.8	7.58	178	70.7	0	0		
11/17/2016	7.71	195	73.4	7.69	195	73.3	1	0		
11/23/2016	7.27	188	70.9	7.29	189	70.9	0.5	0.25		
11/23/2016	7.1	200	70.2	7.2	200	70.5	0.5	0.25		
11/30/2016	6.51	205	68.5	6.52	205	68.7	0	0.25		7.61
12/12/2016	7.29	159	69.4	7.29	161	69.9	0	5	40	
12/21/2016	6.92	169	71.2	6.98	169	71.2	0.5	2	40	-
1/19/2017	5.5	210	71.1	5.3	209	71.1	2	0		-
1/23/2017	5.13	238	70.9	5.2	212	71.5	0.5	0.25		-
1/26/2017	7.12	233	71.5	7.14	233	71.6				-
2/3/2017	6.79	237	71.7	6.83	238	71.6	0	0.25	40-80	-
2/6/2017	6.86	234	72.2	6.87	234	72.1	0	0	80	-
2/9/2017	6.64	239	73.7	6.71	240	73.8	0.25	0	80	-
2/16/2017	5.47	248	71.6	5.57	248	71.6				
2/23/2017	5.25	249	74.5	5.39	249	74.5	0.5	0	80	-
2/27/2017	7.09	266	73.3	7.16	269	73.4	0.5	0	80	-
3/1/2017	6.92	271	76.5	6.95	271	76.7				
AVG	6.98	207	72.2	7.03	206	72.2	0.5	0.89	25	7.55
SD	0.85	34	2.3	0.89	33	2.2	0.5	1.53	31	0.10

3

Fish Weighing

	HD	LD
original weight	25 lb	5 lb
weight of dead fish	-4.56	-1.6
net weight	20.44	3.4
Actual weight on 1-27-17	22.67	4.28
increase in weight	2.23	0.88
% increase	**0.11**	**0.26**

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Man-Hours = 69.2

	minutes	
construction	1920	2 men x 2 days x 8 hrs
repairs	300	
10/9/2016	40	
10/10/2016	40	
10/14/2016	40	
10/21/2016	40	
10/23/2016	45	
10/24/2016	40	
10/25/2016	40	
10/28/2016	40	
10/29/2016	60	
11/30/2016	120	
11/1/2016	40	
11/4/2016	40	
11/6/2016	40	
11/11/2016	40	
11/15/2016	5	
11/17/2016	40	
11/23/2016	45	
11/30/2016	37	
12/1/2016	25	fix tank covers
12/8/2016	60	fix leak
12/9/2016	60	fix leak
12/10/2016	20	
12/12/2016	40	
12/16/2016	40	repair leak
12/17/2016	30	
12/18/2016	10	feed fish
12/19/2016	170	fix tank covers, weigh fish in system 1
12/21/2016	25	
12/22/2016	180	drill holes (2 hrs), put net cups and starter plugs (1 hr)
1/19/2017	60	measurements, feed fish, refill both systems w water
1/23/2017	45	measurements, feed fish
1/26/2017	35	measurements, feed fish, refill S1 w water
1/27/2017	80	added fish nets in S1, S2 and fed fish
1/28/2017	5	feed fish

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Flow Rate

pump is rated at 24 l/min or 380 gph						
		Time (sec)	water collected (ml)	flow rate (gpm)	flow rate (gph)	Avg flow rate (gph)
High Density	Tank 1 (IN)	5.15	933.2	2.9	172.3	
		5.34	1002	3.0	178.5	
		5.17	1003.2	3.1	184.5	178
System 1	Trough (OUT)	5.26	1021.6	3.1	184.7	
		5.28	992.8	3.0	178.8	
		5.21	982	3.0	179.3	181
Low Density	Tank 1 (IN)	5.22	970.8	2.9	176.9	
		5.25	1002	3.0	181.5	
		5.21	944.4	2.9	172.4	177
System 2	Trough (OUT)	5.58	1066.4	3.0	181.8	
		5.43	1029.2	3.0	180.3	
		5.38	1034.4	3.0	182.9	182

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Fish No.

	HD		LD	
	No.	lb	No.	lb
11/28/2016	201	25	37	5
11/29/2016	-11	-0.63	-2	-0.21
11/30/2016	-11	-0.45		
12/1/2016	-2	-0.30		
12/2/2016	-5	-0.16	-2	-0.04
12/3/2016	-3	-0.14		
12/5/2016	-3	-0.07	-2	-0.05
12/11/2016	-2	-0.22		
12/16/2016	-1	-0.16	-3	-0.11
12/17/2016	-2	-0.33	-1	-0.06
12/19/2016	-1	-0.26		
12/20/2016	-17	-0.84		
12/21/2016	-1	-0.02		
12/22/2016	-1	-0.06		
12/23/2016	-1	-0.02		
1/18/2017	-6	-0.79	-2	-0.26
1/20/2017	-1	-0.11		
2/2/2017	-1	-0.12		
2/6/2017	-2	-0.07		
2/7/2017	-2	-0.17		
2/16/2017	-1	-0.09	-1	-0.07
2/20/2017	-1	-0.02	-1	-0.18
3/1/2017	-1	-0.04		
3/3/2017	-1	0.05		
3/4/2017	**-8**	**-0.47**		
3/5/2017	**-30**	**-3.38**		
3/6/2017	**-49**	**-8.80**		
3/7/2017	**-19**	**-4.25**		
3/9/2017	**-2**	**-0.81**		
	16	2.27	23	4.02

What happened here?

7

On 3-3-17

From my notes on 3-4-17:

removed nets from S1 on 3-3-17, water became murky, filters got plugged, trough drained, 8 fish died

Remind me to show in the tour how the tanks can overflow and the trough drains

8

Research Results

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Comparing HD to LD Systems

August – September 2015

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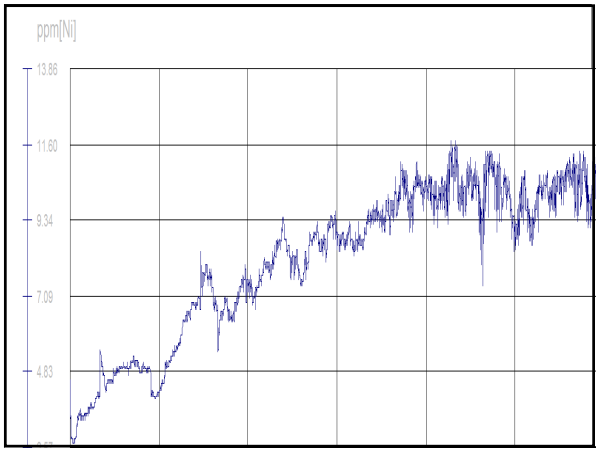

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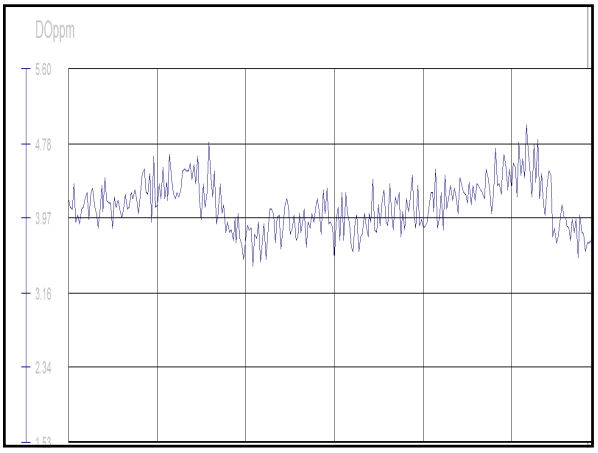

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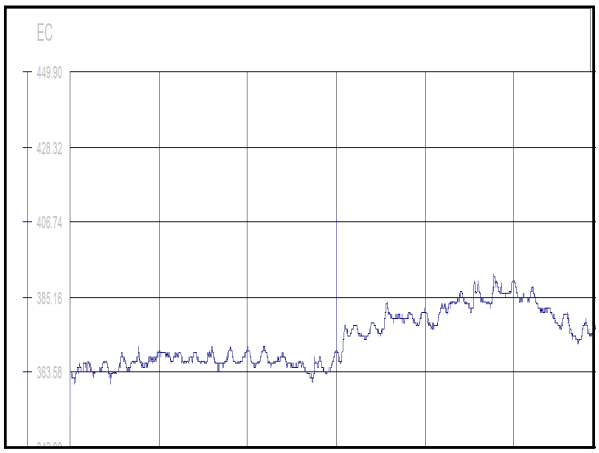

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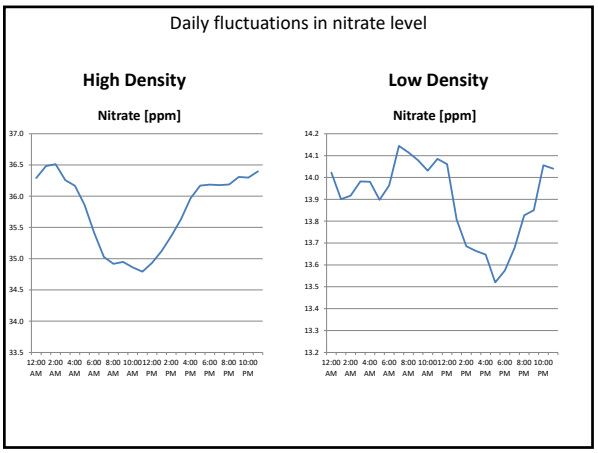

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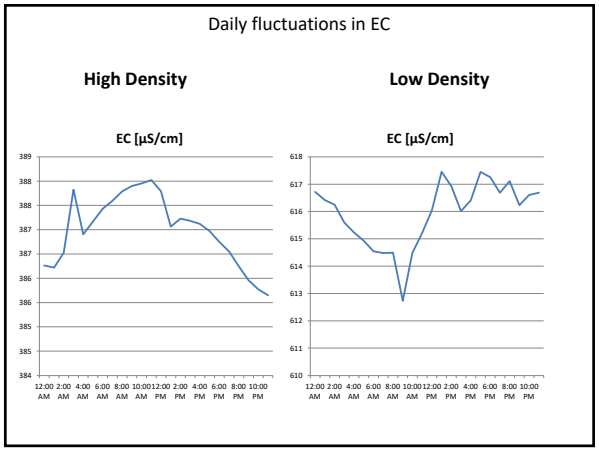

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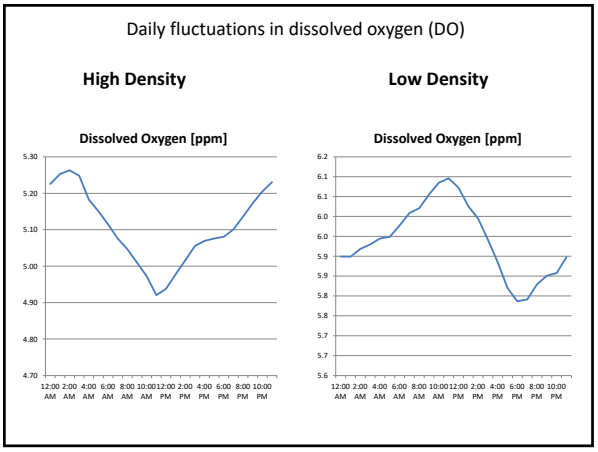

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	High Density (HD)	Low Density (LD)
Nitrate (ppm)		
Average	35.76 ± 18.21	13.9 ± 6.78
Min.	2.70	0.15
Max.	74.10	76.55
EC (µS/cm)		
Average	387 ± 14	616 ± 207
Min.	175	341
Max.	485	1103
Temperature (F)		
Average	70.2 ± 7.3	71 ± 6.8
Min.	58.4	59.5
Max.	84.7	86.4
Dissolved Oxygen (DO)		
Average	5.11 ± 1.5	5.94 ± 2.0
Min.	1.6	2.9
Max.	7.9	11.5
Lettuce Harvest Weight (oz)	3.8 (37 days old)	7.9 (80 days old)
Leaf Nitrate Content (ppm)	5,253	7,321
Feeding Rate	4.7 lb/day	1.6 lb/day

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Fixing Leaks

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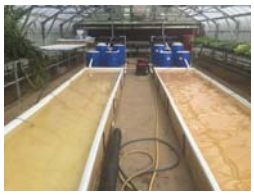

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Equipment

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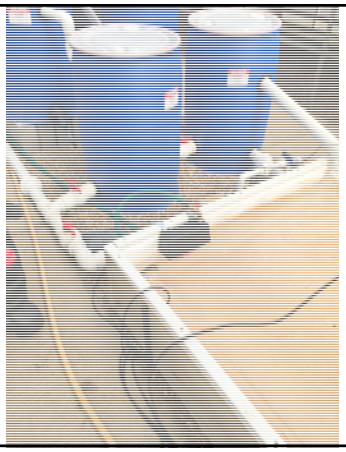

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1st disaster

12-5-16

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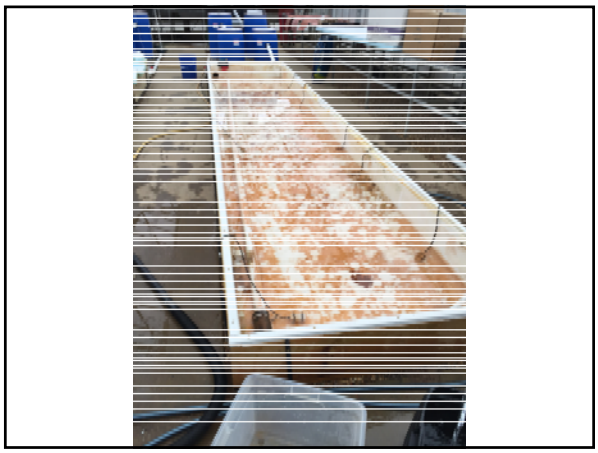

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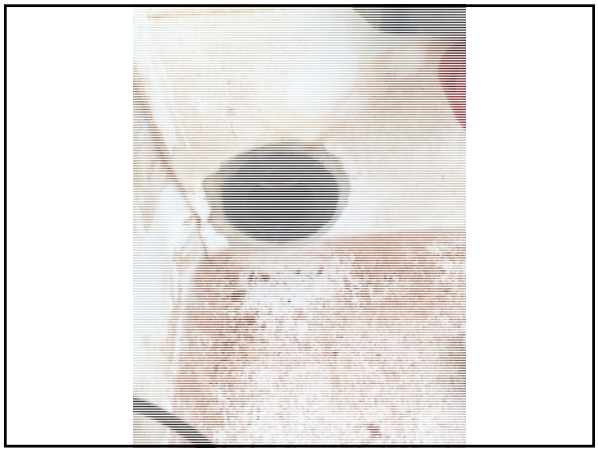

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2nd Disaster

12-16-16

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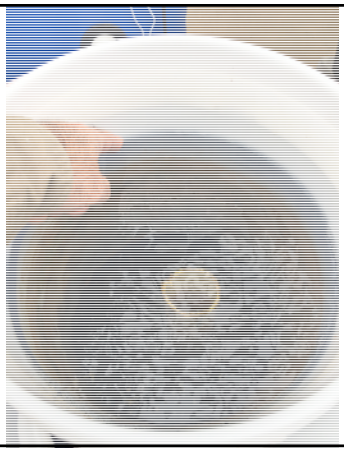

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Weighing Fish

12-19-16

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Seeding Bok Choi

12-22-16

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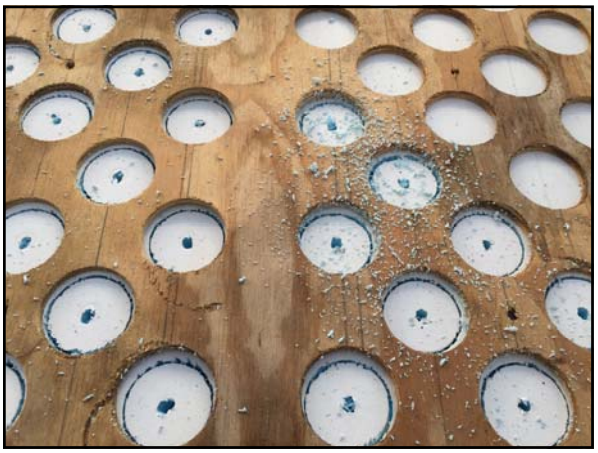

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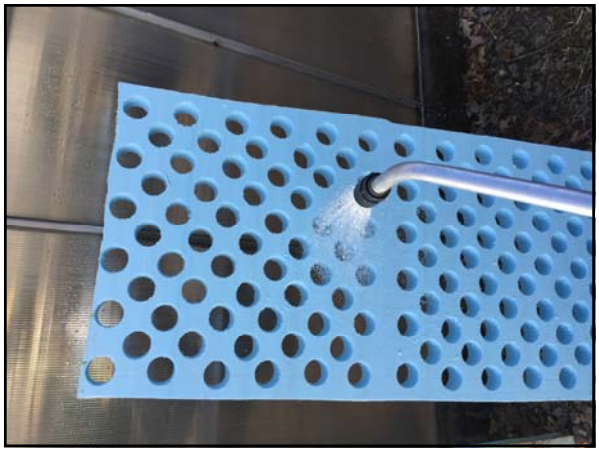

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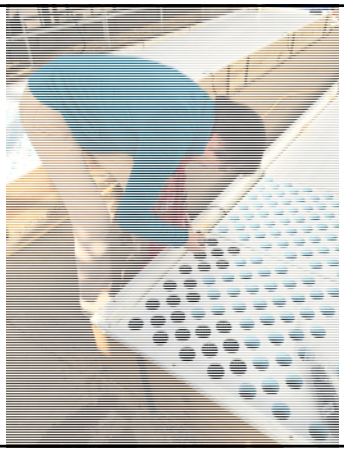

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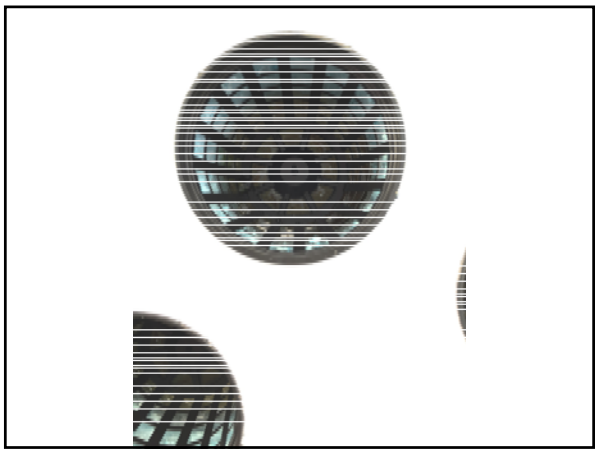

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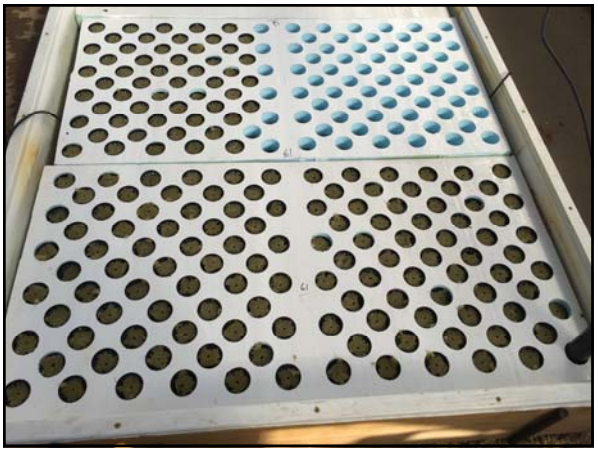

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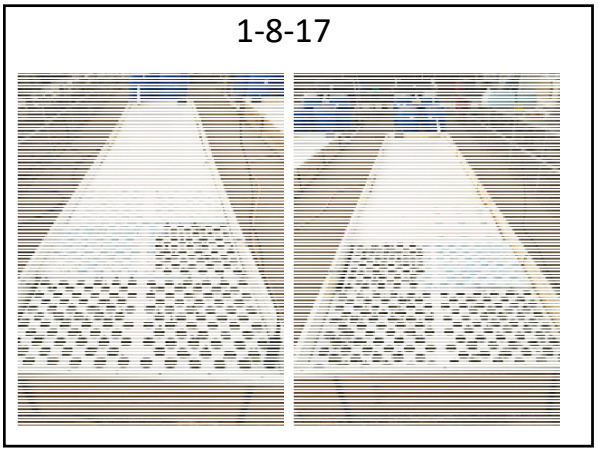

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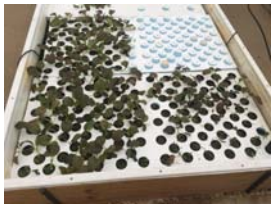
1-19-17



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1-25-17

- Yellow-margined leaf beetle

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2-8-17

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3-1-17

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3-6-17

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Drain Pipes

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Filter Bags

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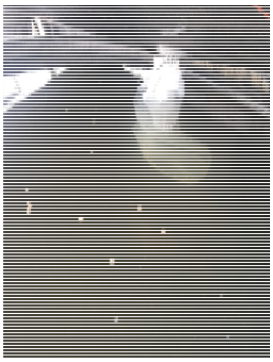

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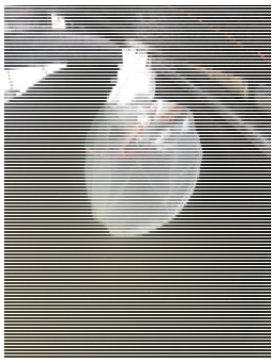

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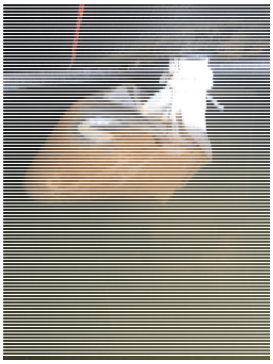

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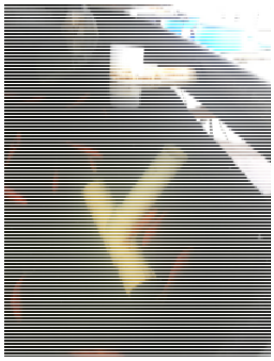

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When All Goes Well

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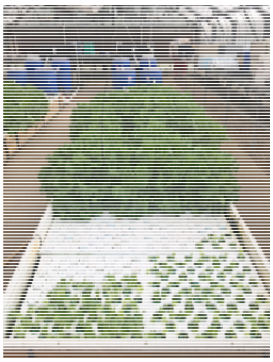

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Then you get another problem, millipede infestation

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Then, good news

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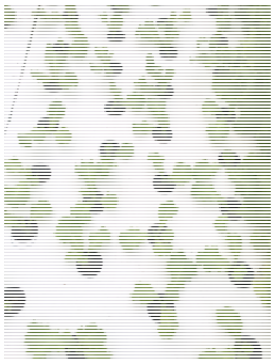

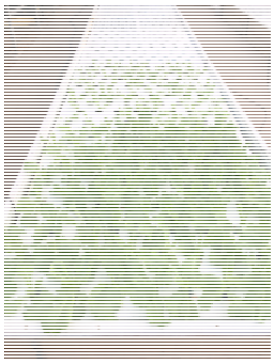

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3rd disaster

Power Outage

7-2-17

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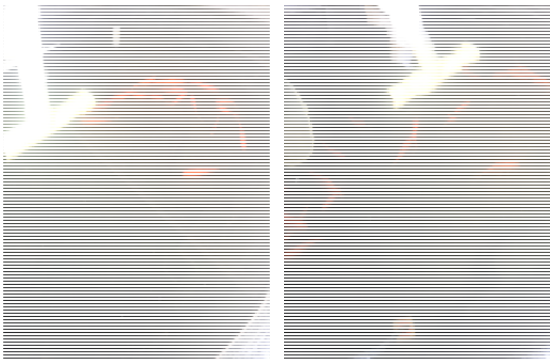

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Unexpected Surprises

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Conclusion

- Expect 6 months of successes and failures before your system is stable
- Expect 1 year before you learned how to deal with all situations
- Measure water quality between 3-5 days
- Daily walk-through even if everything is automated

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