Optimal Living Conditions for Trout

Norbu Globus, Nicole Yoshimura,
Fia Swanson, Morgan Ruff

Purpose/ Guiding Questions

How do different abiotic conditions in each pool affect the organisms which live there?

Why did we find so few organisms at certain sites?

What are the optimal living conditions for trout?

Photo Gallery

Background Information: Abiotic Review

general optimal pH values: 6.7-8.6

optimal pH range for freshwater fish: 5.5-7.2

optimal alkalinity levels: 50-200 ppm

degrees of hardness:

- 0-60 ppm is soft
- 61-120 ppm is moderately hard
- 121-180 ppm is hard

Background Information: Biotic Review

Trout!

- cool deep pools (high levels of D.O.)

Algae

- found in eutrophic waters
- high levels of nutrients (nitrate) -> assimilated by algae -> algal growth

Methods

Select Pools

Find Pool Dimensions: width/length/depth

Test Pool pH, alkalinity, hardness, nitrite/nitrate levels, turbidity, temperature

Qualitative Observations: pool color, presence of organisms (algae, frogs, trout, catfish!!!!!)

Materials

pH strips, Alkalinity strips

Hardness strips. Nitrate/ Nitrite strips

Secchi tube

Thermometer

Measuring Tape

Measuring Stick

Results pt. 1

	pool 1	pool 2	pool 3	pool 4	pool 5	pool 6
number of trout	50	0	15	4	0	2
number of toads	0	4	0	4	0	0
pH level	6.5	6.25	6.25	6.25	6	6.3
temperature (deg. C)	10	11	11	11	9.25	11
turbidity (m)	1.08	1.2	1.2	1.5	1.02	0.92
depth (m)	1.39	0.27	0.52	1.17	0.55	0.59
length(m)	68	5.7	27	24	9	7.5
width(m)	4.4	1.9	2.7	4	2.3	4.3
alkalinity(ppm)	0	0	0	0	0	0
nitrite(ppm)	0	0	0	0	0	0
nitrate(ppm)	0	0.5	0.5	0.4	0.4	0.25
color	murky green/ grey	reddish brown + algae	clear	grey-ish & murky	green/brown	murky brown
hardness(ppm)	20	20	20	20	20	20

Results pt. 2

	pool 7	pool 8	pool 9	pool 10	pool 11
number of trout	10	30	50	30	0
number of toads	0	0	0	0	0
pH level	6.3	6.5	6.3	6.4	6
temperature (deg. C)	12	11	12.5	11	9
turbidity (m)	1.09	1.2	1.2	1.2	1.2
depth (m)	0.67	0.97	0.74	0.76	0.83
length(m)	15	13.35	17	30	15
width(m)	3.4	4.45	3.7	5.6	5.2
alkalinity(ppm)	0	0	0	0	0
nitrite(ppm)	0	0	0	0	0
nitrate(ppm)	0.3	0.2	0.3	0.2	0.1
color	brown/grey/blue, low in brown algae	lots of floating yellow/green/brown algae	orange/brown/ bright green algae	neon green algae grey water	brown algae some bright green algae
hardness(ppm)	20	20	20	20	20

Turbidity

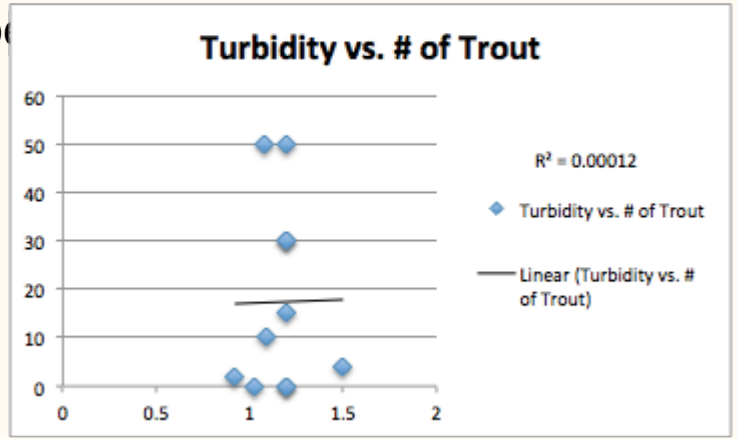
	pool 1	pool 2	pool 3	pool 4	pool 5a	pool 5b	pool 6	pool 7	pool 8	pool 9	pool 10
number of trout	50	0	15	4	0	2	10	30	20	30+ (catfish)	0
turbidity	1.08 m	1.2m	1.2m	1.5m	1.02m	0.92m	1.09	1.2m	1.2m	1.2m	1.2m

Hypothesis: Higher turbidity (cloudiness) means lower number of trout (inverse), because turbidity can signify pollutants and organic matter.

Results: There was no apparent relationship b
populations

0% correlation

ranged from 0.92m - 1.2m+



Temperature

Hypothesis:

as temperature decreases, number of trout increase because low temperature means more dissolved oxygen as temperature increases, so does number of trout

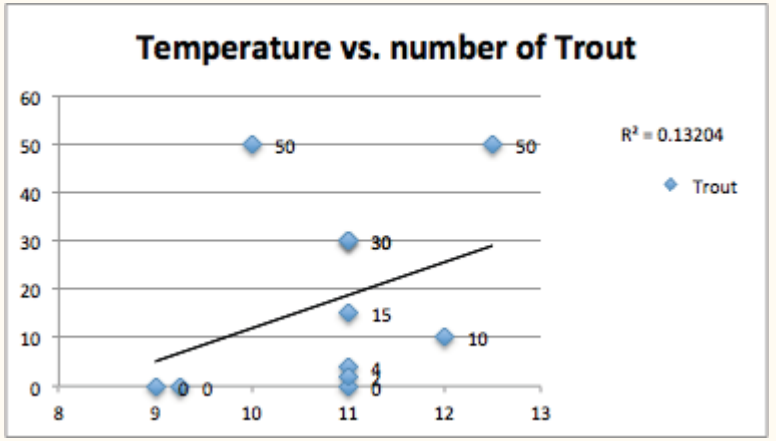
Results:

pretty stable temperature in all pools

ranged from 9.0 C to 12.5 C

13% correlation Ground Water!!

little temperature variation cold



pH

Hypothesis: As pH increases, the number of trout increases (direct)

Results: As pH increases (becomes less acidic) trout population also increases.

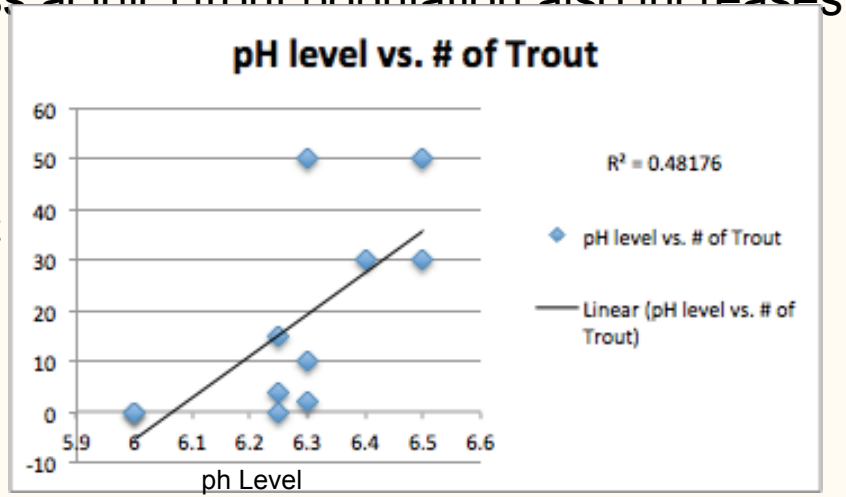
direct relationship

pH range of 6.0-6.5

really strong correlation

48.1%

further investigation!



pH is slightly low (acidic). Why?

	pool 1	pool 2	pool 3	pool 4	pool 5a	pool 5b	pool 6	pool 7	pool 8	pool 9	pool 10
number of trout	50	0	15	4	0	2	10	30	20	30+ (catfish)	0
pH level	6.5	6.25	6.25	6.25	6	6.3	6.3	6.5	6.3	6.4	6

regular pH range: 6.7-8.6

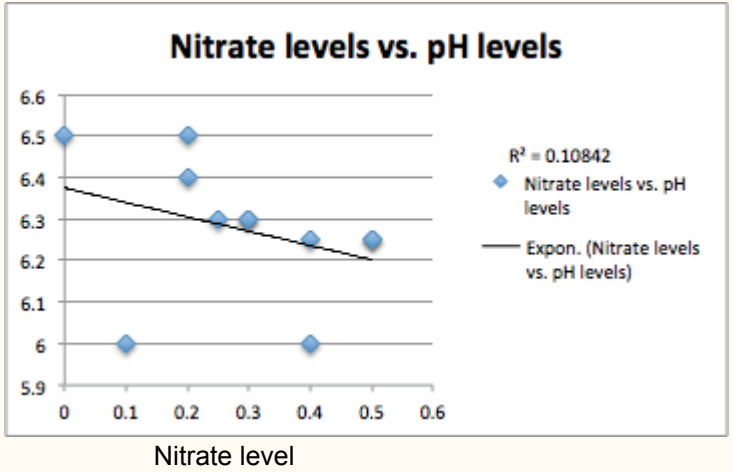
regular pH range for freshwater fish: 5.5-7.2

Our average pH levels: 6.2

range: 6-6.5

nitrate affects pH level:

11% correlation



Alkalinity

Hypothesis: As alkalinity increases so does the number of trout (direct), because alkalinity is the neutralization of acids (CO2->carbonic acid -> bicarbonate/carbonate -> alkalinity)

Results: alkalinity levels in EVERY pool= 0 ppm

no apparent relationship between alkalinity and trout population

Low alkalinity. Why?

Average alkalinity: 50-200 ppm

Our alkalinity (for every site): 0 ppm

Alkalinity:

measurement of productivity (low alkalinity: low productivity)

low productivity: few organisms

(cellular respiration-> Carbon Dioxide-> Bi/carbonate-> alkalinity)

Headwaters: few nutrients (pollutants) or caused by error

Nitrate vs. Trout

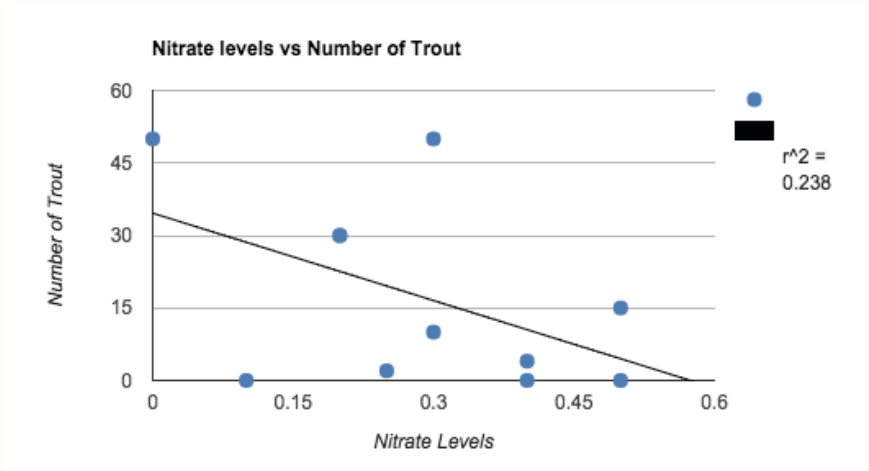
Hypothesis: As nitrate levels increase, so will the number of trout (and algae!)

Results:

nitrate/trout correlation

Pools with more observable trout had lower levels of nitrate

nitrate levels ranges from 0-0.5ppm



Algal Growth and Nitrate Levels

Sites 9 and 10

Algal Blooms!

low levels of nitrate (0.3 and 0.1 ppm respectively)

Nutrients (nitrate) assimilated by algae; results in crazy algal growth

Numbers don’t look that different but the test color strips were!

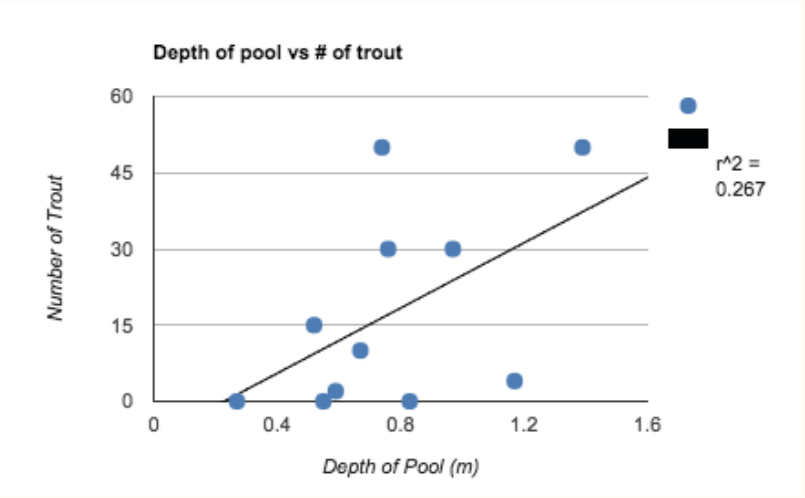
Depth

Hypothesis: As depth increases, trout population would increase as well (direct)

Results:

26.7% correlation

positive



Number of Trout vs. General Size (length/width)

	pool 1	pool 2	pool 3	pool 4	pool 5a	pool 5b	pool 6	pool 7	pool 8	pool 9	pool 10
number of trout	50	0	15	4	0	2	10	30	20	30+ (catfish)	0
length	68m	5.7m	27m	24m	9m	7.5m	15m	13.35m	17m	30m	15m
width	4.4m	1.9m	2.7m	4m	2.3m	4.3m	3.4m	4.45m	3.7m	5.6m	5.2m

Small: Pool 2, Pool 5a, Pool 5b, -> between 0-2 trout

Medium: Pool 6, Pool 7, Pool 8, Pool 4, Pool 10 -> between 10-30 trout

Large: Pool 1, Pool 3, Pool 9 -> between 15-50 trout

Hardness

Hypothesis: As hardness increases, the number of trout in pools will decrease

because hardness indicates magnesium/calcium ions (from city runoff)

Results: The hardness of EVERY pool=20 ppm

no observable correlation between hardness and trout population

20 ppm is considered “soft”

no city runoff

Discussion –Improvements

- Quantitative measuring of algae
- Measuring clearness/color using scale
- Location accuracy
- Experimental error
    - Temperature
    - Faulty pH/alkalinity/hardness strips (colors)
    - Guesstimating on how many trout counted in each pool

Thank you!!!