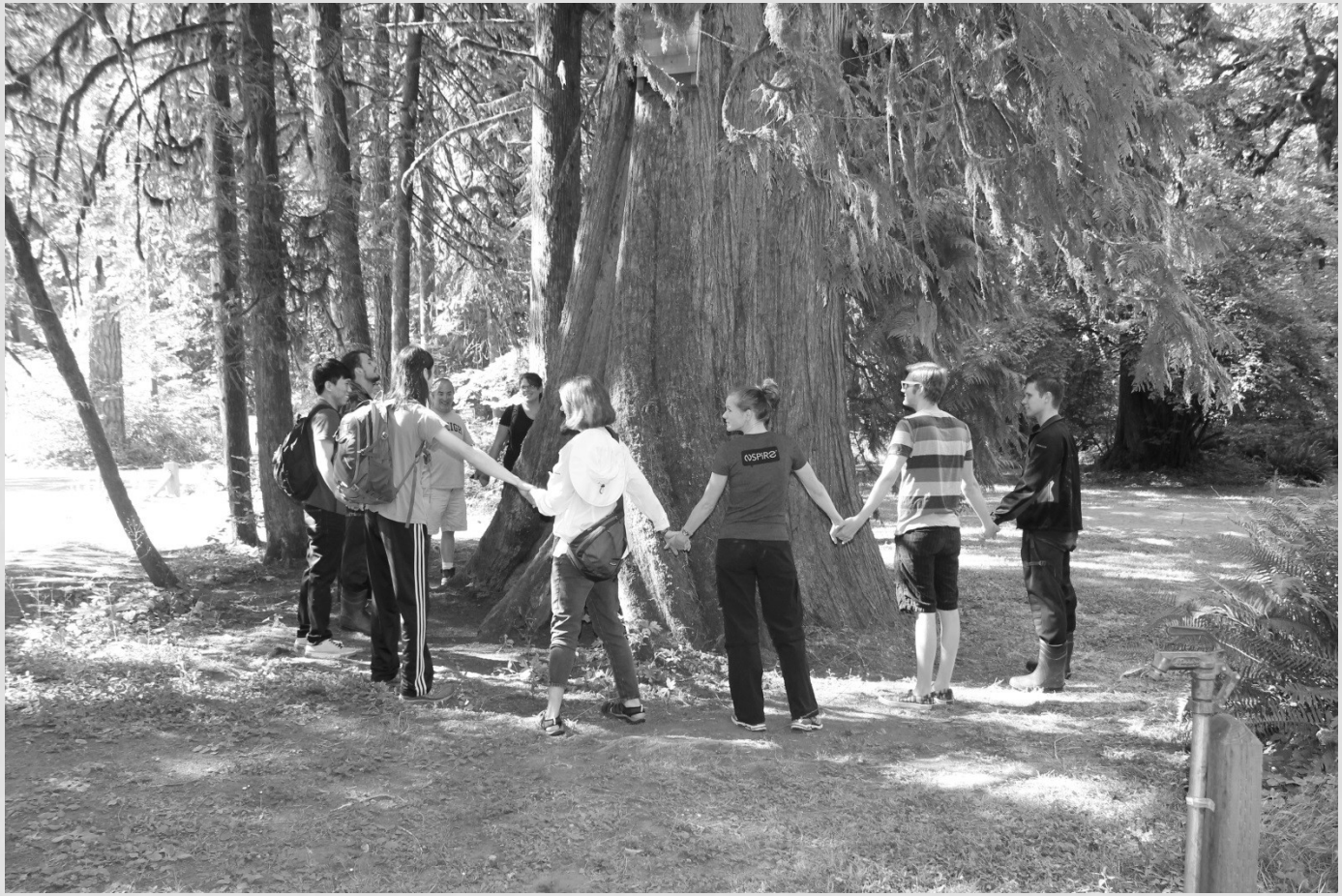
CLACKAMAS RIVER BASIN

SNAPSHOT MONITORING

PRESENTED BY PSU
STUDENT WATERSHED RESEARCH
PROJECT (SWRP)
SUMMER CAPSTONE
AUGUST 2013

PSU SENIOR CAPSTONE STUDENTS



STUDY AREA: LOWER CLACKAMAS RIVER BASIN

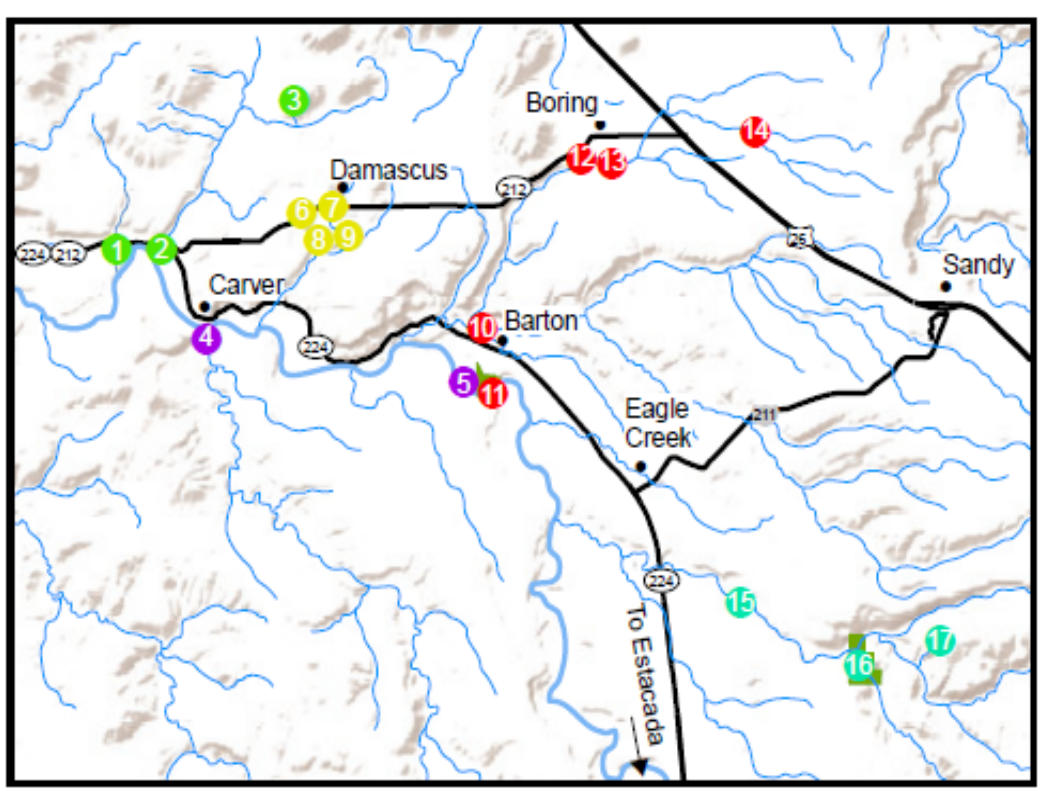
Rock Creek Sub-basin
1. Sieben Creek (SEB002)
2. Rock Creek (RCK000)
3. Rock Creek (RCK002)

Clear Creek Sub-basin
4. Clear Creek (CLE000)
5. Clackamas River (CLA024)

Richardson Creek Sub-basin
6. Richardson Creek (RCK003)
7. Richardson Creek (RCK002)
8. Richardson Creek (RCK005)
9. Richardson Creek (RCK004)

Deep Creek Sub-basin
10. Deep Creek (DEP002)
11. Goose Creek (GCK001)
12. North Fork Deep Creek (NFD001)
13. North Fork Deep Creek (NFD004)
14. North Fork Deep Creek (NFD002)

Eagle Creek Sub-basin
15. Eagle Creek (EGL001)
16. Eagle Creek (EGL005)
17. Eagle Creek (EGL002)



SUB-BASINS TESTED

- Eagle Creek (1 Stream, 3 Sites)
- Clear Creek (2 Streams, 2 Sites)
- Deep Creek (2 Streams, 5 Sites)
- Rock Creek (2 Streams, 3 Sites)
- Richardson Creek (1 Stream, 4 Sites)


WATER QUALITY DATA

CHEMISTRY PARAMETERS AND METHODOLOGY

- Temperature (°C)
- Dissolved Oxygen (O_2 mg/L)
- Turbidity (NTU)
- pH
- Nitrogen
  - Ammonia (N-NH_3 mg/L)
  - Nitrate (N-NO_3 mg/L)
- Phosphorous (SRP mg/L)

DEQ WATER QUALITY STANDARDS

Water Quality Standards			
Parameters	**Surface Water**	**Spawning**	**Drinking Water**
ph	6.5 - 8.5		6.5 - 8.5
Temperature (°C)	≤ 17.8	≤ 12.8	
DO (mg/L)	≥ 6.0	≥ 11.0	
DO (% sat)	≥ 90%	≥ 95%	
Phosphorus (mg/L)	< 0.1		
Nitrate (mg/L)	< 10		≤ 10

EAGLE CREEK RESULTS

3 SITES TESTED

Parameters	Meets	Does not meet
pH	X	
Temperature	X	
Dissolved Oxygen	X	
Phosphorus	X	
Nitrate	X	

CLEAR CREEK RESULTS

2 SITES TESTED

Parameters	Meets	Does not meet
pH	X	
Temperature		X
Dissolved Oxygen	X	
Phosphorus	X	
Nitrate	X	

- CLE000 (Above Temperature specifications)

DEEP CREEK RESULTS

5 SITES TESTED

Parameters	Meets	Does not meet
pH	X	
Temperature		X
Dissolved Oxygen	X	
Phosphorus	X	
Nitrate	X	

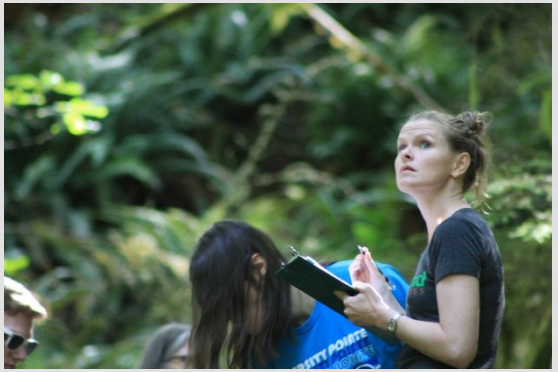
- DEP002 and GCK001 (Above Temperature specifications)

ROCK CREEK RESULTS

3 SITES TESTED

Parameters	Meets	Does not meet
pH	X	
Temperature	X	
Dissolved Oxygen	X	
Phosphorus		X
Nitrate	X	

- RCK000, 002 & SEB002 (Above Phosphorus specification)



RICHARDSON CREEK RESULTS

4 SITES TESTED

Parameters	Meets	Does not meet
pH		X
Temperature		X
Dissolved Oxygen		X
Phosphorus	X	
Nitrate	X	

- RCH005 (Below pH specifications)
- RCH004 (Above Temperature specifications)
- RCH004 & 005 (Below DO specifications)


WATER QUALITY DISCUSSION


MACROINVERTEBRATE
DATA

INTRODUCTION

- Anthropogenic land use activities near streams can have extensive impacts on water quality and the biota living within the stream.

- Benthic macroinvertebrate assemblages have been shown to be good indicators of stream health, as they are sensitive to changes in water quality.

MACROINVERTEBRATE IMPACTS

- Industrial toxins
- Pesticides
- Herbicides
- Excess nutrient loading from fertilizers and other sources
- Riparian disturbance
  - Affects temperature, habitat, and dissolved oxygen and nutrients

OUR STUDY

- This study uses an Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies) (EPT) index calculation, as well as Oregon Watershed Enhancement Board (OWEB) Level 2 biotic water quality assessment methods as a measurement of stream health.

Mayfly larva

Stonefly larva

Caddisfly larva

METHODS

- Three kick technique, 500 micron net, at 25, 50, and 75% widths.
- 18 cell grid, selected at random, and species are tallied as they are being identified.

ANALYSIS

- OWEB scoring table where raw score is the total number of each order found for each metric in each stream sampled.

Metric	Raw Score	5	3	1	Score (circle one)
Taxa Richness		>18	10 - 18	<10	5 3 1
Mayfly Richness		>4	2-4	<2	5 3 1
Stonefly Richness		>3	1-3	0	5 3 1
Caddisfly Richness		>4	2-4	<2	5 3 1
% Diptera		<15	15-30	>30	5 3 1
% Dominance		<30	30-50	>50	5 3 1
					Sum the Score

ANALYSIS (CONT'D)

- OWEB table for estimating stream health based on Sum Score from Table 1.

Score Range	Stream Condition
>23	**No impairment**: passes Level 2 assessment. Indicates good diversity of invertebrates and stream conditions with little disturbance. Further sampling will help confirm the site's condition as unimpaired.
17 – 23	**Moderate Impairment**: Evidence of some water quality impairment exists. Requires further study and more detailed analysis.
<17	**Severe Impairment**: Fails levels 2 assessment. Evidence of stream disturbance exists. Further study may be warranted to confirm level of impairment and potential causes.

EAGLE CREEK MACROS

Eagle Creek Macroinvertebrate Assessment		
OWEB Assessment	Raw Score	Ranking
Taxa Richness (# of Families)	16	3
Mayfly Richness	3	3
Stonefly Richness	2	3
Caddisfly Richness	3	3
% Diptera	12.5	5
% Dominance	55.2	1
Sum total score		**18**
EPT Assessment	0.58	2

- Highest richness of benthic invertebrates of the four sub-basins sampled at 16.
- OWEB score of 17-23 indicates moderate impairment.
- Some water quality impairment exists.
- Healthiest Watershed Observed

CLEAR CREEK MACROS

Clear Creek Macroinvertebrate Assessment		
OWEB Assessment	Raw Score	Ranking
Taxa Richness (# of Families)	7	1
Mayfly Richness	2	3
Stonefly Richness	0	1
Caddisfly Richness	1	1
% Diptera	0	1
% Dominance	81.8	1
Sum total score		**8**
EPT Assessment	0.64	1

- Had the lowest richness of benthic invertebrates of the four sub-basins sampled at 7.
- EPT index of 0.64, the highest of the sub-basins.
- Lowest score of sub-basins in the OWEB level 2 assessment with a score of just 8 which indicates possible impairment
- Evidence of stream disturbance exists, but requires further study

DEEP CREEK MACROS

Deep Creek Macroinvertebrate Assessment		
OWEB Assessment	Raw Score	Ranking
Taxa Richness (# of Families)	8	1
Mayfly Richness	3	3
Stonefly Richness	0	1
Caddisfly Richness	0	1
% Diptera	16.7	3
% Dominance	55.6	1
Sum total score		**10**
EPT Assessment	0.33	4

- Second lowest richness of benthic invertebrates of the four sub-basins sampled at 8.
- EPT index of 0.33, severely low as stream health indicator and lowest of the sub-basins sampled here.
- Scored second lowest of the four sub-basins in the OWEB level 2 assessment with a score of just 10, indicates possible severe impairment.

ROCK CREEK MACROS

Rock Creek Macroinvertebrate Assessment		
OWEB Assessment	Raw Score	Ranking
Taxa Richness (# of Families)	10	3
Mayfly Richness	4	3
Stonefly Richness	1	3
Caddisfly Richness	1	1
% Diptera	18.5	3
% Dominance	73.8	1
Sum total score		**14**
EPT Assessment	0.55	3

- Second highest richness of benthic invertebrates of the four sub-basins sampled at 10.
- EPT index of 0.55, average for the sub-basins sampled.
- Scored second of the four sub basins in the OWEB level 2 assessment with a score of 14, indicates possible severe impairment.

FURTHER DISCUSSION


DAMASCUS DAYS

DAMASCUS DAYS

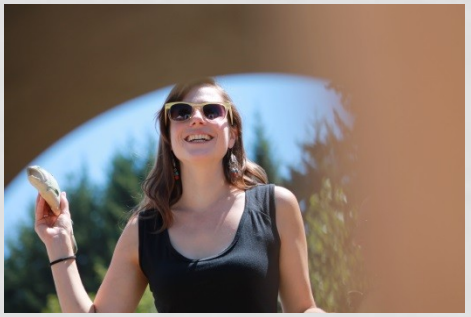
- Our role in the event was to educate the community about watershed health and provide educational activities for families.

- Students conducted on sight testing for Rock, Richardson and Deep Creeks.

SPECIAL THANKS

- Mary Ann Schmidt; Instructor of PSU Senior Capstone Stream Monitoring Course

- Clackamas River Basin Counsel; Outreach Specialist Chelsea White-Brainard



- Private and Public Land Owners

QUESTIONS AND COMMENTS