

RESEARCH/PD ANNUAL REPORT - PROGRESS REPORT

2015 annual report - progress

John Stark

The Biological Effectiveness of Bioretention for Stormwater Pollution Control

R/RCE-3

Submitted On: 04/28/2016 02:05:07 PM

METRICS & MEASURES

Metric/Measure	Value	Note
Acres of coastal habitat	0	
Fishermen and seafood industry personnel	0	
Communities - economic and environmental development	0	
Stakeholders - sustainable approaches	0	
Informal education programs	0	
Stakeholders who receive information	2840	As a result of outreach activities including invited presentations, approximately 2840 stakeholders were directly reached in the current reporting period. An additional estimated 2 million were potentially reached by media reports including radio and print stories on our research. • The Seattle Times, Print and online, Oct 8, 2015 http://www.seattletimes.com/seattle-news/environment/whats-killing-coho-study-points-to-urban-road-runoff/ • Civil Engineering, academic journal, Print, March 2015, Vol 85(3): 31 Bioretention systems protect sensitive aquatic species from runoff, studies show • KUOW radio - The Record, Radio and online, Feb 12, 2015 http://kuow.org/post/chemical-cocktail-thats-killing-salmon
Volunteer hours	0	
P-12 students reached	0	We participated in an outreach effort led by the Sustainability Ambassadors who filmed a brief lecture on our research for dissemination to K-12 curricula. http://www.sustainabilityambassadors.org/apps/videos/videos/show/18820331-toxics-in-stormwater-pollution
P-12 educators	0	

REQUESTED INFORMATION

Publications

Severe coal tar sealcoat runoff toxicity to fish and reversal by bioretention filtration

Publication Type: Peer-reviewed: Journals (incl. articles), Books, Proceedings, and Other Documents

Publication Year: 2016

Publication Authors:

Publisher Info:**Notes:****Related URLs:****Keywords:****Publication URLs:****Abstract:**

Citation: McIntyre JK, Edmunds RC, Anulacion BF, Davis JW, Incardona JP, Stark JD, Scholz NL. 2016. Severe coal tar sealcoat runoff toxicity to fish and reversal by bioretention filtration. *Environmental Science & Technology* 50(3): 1570-1578.

Citation for Coverage:**SG can post PDF online?:****Uploaded File:** [McIntyre_2016_Coal_tar_bioretention.pdf](#)

Confirmation of stormwater bioretention treatment effectiveness using molecular indicators of cardiovascular toxicity in develop**Publication Type:** Peer-reviewed: Journals (incl. articles), Books, Proceedings, and Other Documents**Publication Year:** 2016**Publication Authors:****Publisher Info:****Notes:****Related URLs:****Keywords:****Publication URLs:****Abstract:**

Citation: McIntyre JK, Edmunds RC, Redig MG, Mudrock EM, Davis JW, Incardona JP, Stark JD, Scholz NL. 2016. Confirmation of stormwater bioretention treatment effectiveness using molecular indicators of cardiovascular toxicity in developing fish. *Environmental Science & Technology* 50(3): 1561-1569.

Citation for Coverage:**SG can post PDF online?:****Uploaded File:** [McIntyre_et_al_2016_Molecular_effectiveness.pdf](#)

Coho salmon spawner mortality in western U.S. urban watersheds: Bioinfiltration prevents lethal stormwater impacts**Publication Type:** Peer-reviewed: Journals (incl. articles), Books, Proceedings, and Other Documents**Publication Year:** 2015**Publication Authors:****Publisher Info:****Notes:** Open Access: <http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12534/epdf>**Related URLs:****Keywords:****Publication URLs:** <http://onlinelibrary.wiley.com/doi/10.1111/1365-2664.12534/epdf>**Abstract:**

Citation: Spromberg J, Baldwin D, McIntyre J, Damm S, Anulacion B, Davis J, Scholz N. 2015. Coho salmon spawner mortality in western U.S. urban watersheds: Bioinfiltration prevents lethal stormwater impacts. *Journal of Applied Ecology* 53(2): 398-407.

Citation for Coverage:**SG can post PDF online?:****Uploaded File:** [Spromberg_et_al-2015-Journal_of_Applied_Ecology.pdf](#)

Students Supported

Jack Domeika (New Student)
jackdomeika@gmail.com
No institution, No department

Field of Study:

Advisor:
Degree Type: High School
Degree Year:

Student Project Title: Tires as sources of toxic chemicals to juvenile coho salmon

Involvement With Sea Grant This Period (capstone, fellow, intern, etc.):

Post-Graduation Plans (employer, grad school, etc.):

Was this thesis/dissertation supported by Sea Grant?: No

Thesis / Dissertation:

New or Continuing?: New

Degree awarded this reporting period?: No

Financially supported?: No

Evelyn Davis (New Student)
evelyndavis2@gmail.com
No institution, No department

Field of Study:

Advisor:

Degree Type: High School

Degree Year:

Student Project Title: Tires as sources of toxic chemicals to juvenile coho salmon

Involvement With Sea Grant This Period (capstone, fellow, intern, etc.):

Post-Graduation Plans (employer, grad school, etc.):

Was this thesis/dissertation supported by Sea Grant?: No

Thesis / Dissertation:

New or Continuing?: New

Degree awarded this reporting period?: No

Financially supported?: No

Michelle Chow (New Student)
mchow01@uw.edu
University of Washington, School of Aquatic and Fishery Sciences

Field of Study:

Advisor: Graham Young

Degree Type: MS

Degree Year: 2017

Student Project Title:

Involvement With Sea Grant This Period (capstone, fellow, intern, etc.): adult/embryos studies; looking at blood chemistry of fish and get sick

Post-Graduation Plans (employer, grad school, etc.):

Was this thesis/dissertation supported by Sea Grant?: No

Thesis / Dissertation:

New or Continuing?: New

Degree awarded this reporting period?: No

Financially supported?: Yes

Narratives

Stark WSU Annual Report 2016

Uploaded File: [WSG_Annual_Report_2016_WSU-Puyallup.docx](#)

Partners This Period

US Fish and Wildlife Services (US DOI, FWS)

Types: Government

Scale: FEDERAL or NATIONAL

Notes:

NOAA Northwest Fishery Sciences Center

Types: Government

Scale: FEDERAL or NATIONAL

Notes:

The Suquamish Tribe

Types: Other

Scale: Tribal

Notes: Grovers Creek Salmon Hatchery

STANDARD QUESTIONS

Impacts and Accomplishments

(1)

Type	impact
Title	Washington Sea Grant research inspires corporate campus to filter runoff from a nearby highway to improve salmon survival
Relevance	Juvenile salmon in urban creeks and adult salmon returning to spawn suffer devastating mortality rates—up to 90 percent of adults die before spawning. The chief culprit appears to be stormwater runoff that carries fish-killing pollution from roads and impervious surfaces into urban waterways. Bioretention systems that filter runoff through soil are often used to treat stormwater in low-impact development and can prevent hazardous materials from reaching salmon-bearing streams. But can they also protect salmon?

Response	Washington Sea Grant-funded researchers used coho salmon adults and embryos to test the effectiveness of bioretention materials — 60 percent sand and 40 percent compost, overlying gravel aggregate, topped with bark mulch — in removing toxicity from runoff. The team used blood chemistry to track injury in adult coho and developed molecular tools to identify exposure and cardiac injury in developing fish.
Results	Each type of untreated runoff killed all exposed juvenile and adult salmon within 24 hours, but all fish exposed to soil-filtered runoff survived. In addition, impacts to embryo size, development and survival were mitigated by bioretention system filtration. These exciting research results garnered significant interest from media and public officials. The research results showing effectiveness of bioretention systems has inspired an increased use of low-impact development methods in construction projects. Tableau, a Seattle software firm, redesigned their new campus to incorporate filtration of runoff from nearby Highway 99, benefiting the entire community.
Recap	Washington Sea Grant-funded researchers developed effective tools to test and prevent toxicity from urban stormwater runoff, improving water quality for coho salmon.
Comments	
Primary Focus Area	Resilient Communities and Economies
Secondary Focus Areas	Healthy Coastal Ecosystems
Goals	Ocean and coastal habitats are protected, enhanced and restored. Coastal water resources sustain human and ecosystem health.
Partners	Northwest Fisheries Science Center (US DOC, NOAA, NMFS, NWFSC) Suquamish Tribe US Fish and Wildlife Service (US DOI, FWS)
PI Draft	* Type accomplishment * Title Found that bioretention systems stop prespawn mortality in Coho salmon * Relevance Stormwater is implicate in causing mortality in Coho salmon that are entering lowland urban streams to spawn. We conducted a study to determine whether we could mitigate this mortality . * Response We evaluated a means to eliminate pre-spawn mortality in Coho salmon. Our principal partners were USFW and NOAA * Results This is an important finding because pre-spawn mortality in Coho salmon reduces salmon population size. The ability to reduce or stop this mortality increases salmon population size * Recap We found that we could eliminate pre-spawn mortality in Coho salmon by passing stormwater through simple soil-

compost bioretention systems before the stormwater enters rivers and streams. Comments Primary Focus Area Healthy Coastal Ecosystems Secondary Focus Areas Goals Partners

Tools, Technologies, Information Services / Sea Grant Products

(1)

Description	Molecular tools to detect cardiovascular toxicity in developing fish.
Developed (in the reporting period)?	Yes
Used (in the reporting period)?	Yes
Used for EBM?	Yes
ELWD product?	No
Number of managers	0
Description/Names of managers	
Reported in previous year?	

Economic Impacts

No **Economic Impacts** information reported

Community Hazard Resilience

No **Community Hazard Resilience** information reported

Meetings, Workshops, Presentations

(1)

Type of Event	Public or professional presentation
Description	Title: Stormwater pollution & solutions International Erosion Control Association (IECA) Annual Conference, Portland, OR Feb 16, 2015
Event Date	02-16-2015
Number of Attendees	80

(2)

Type of Event	Public or professional presentation
Description	Title: Stormwater runoff – Toxicity and treatment Keynote address at Northwest Environmental Business Council (NEBC) conference on Managing

	Stormwater in Washington, Tacoma, WA, Mar 11, 2015
Event Date	03-11-2015
Number of Attendees	150

(3)

Type of Event	Public or professional presentation
Description	Title: Where municipal stormwater hits the road and the salmon. Webinar. Washington Stormwater Center, Lunchtime Municipal Webinar Series. July 16, 2015 http://www.wastormwatercenter.org/lunchtime-muni-webinar-series
Event Date	07-16-2015
Number of Attendees	40

(4)

Type of Event	Public or professional presentation
Description	Title: Solutions to stormwater pollution. WRIA 8: Salmon Recovery Council meeting, WA Dept Ecology NW Regional Office, Bellevue, WA, Jul 16, 2015
Event Date	07-16-2015
Number of Attendees	50

(5)

Type of Event	Public or professional presentation
Description	Title: Mitigating effects of stormwater runoff on salmonids Cedar River Salmon Journey volunteer training, Seattle Aquarium, Sep 17, 2015
Event Date	09-17-2015
Number of Attendees	30

(6)

Type of Event	Public or professional presentation
Description	Oral presentation at Green Gardening Workshop, South Seattle Community College, Seattle, WA Oct 21, 2015 https://www.youtube.com/watch?v=qpoQTiiXcoc&list=PLO5EstoEwik1hloyLv0T8gVqDpuikN39W&index=4
Event Date	10-21-2015

Number of Attendees	200
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(7)

Type of Event	Public or professional presentation
Description	Congressional Caucus on Stormwater Impacts to Salmon Presentation to US Representatives Kilmer and Heck and regional leaders in stormwater management and the health of Puget Sound, WSU Puyallup, WA Nov 10, 2015
Event Date	11-10-2015
Number of Attendees	40

Leveraged Funds

(1)

Purpose	The Biological Effectiveness of Bioretention for Stormwater Pollution Control
Source	EPA
Amount	98221
Start Date	02-01-2015
End Date	01-31-2016

(2)

Purpose	The Biological Effectiveness of Bioretention for Stormwater Pollution Control - additional toxicity pilot project
Source	Washington State Department of Ecology
Amount	2520
Start Date	01-01-2016
End Date	01-31-2016

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