

ANNUAL REPORT: June 1, 2013 – May 31, 2014
(i.e., Summer 2013, AY 2013-2014)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

NAME: Gordon Paterson

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

Course	No. Title	Credit Hrs.	No. Students	No. of Lab. Sections
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SUMMER:

FALL:

SPRING: EFB797 Adaptive Peaks 1 10 N/A

NOTE: PLEASE INDICATE WHICH COURSE(S) HAD A SERVICE-LEARNING COMPONENT AND BRIEFLY EXPLAIN THE NATURE OF THIS COMPONENT. For examples of service-learning in courses, see: <http://www.esf.edu/students/service/courses.htm>. Service-learning is a form of structured experiential education in which students engage with the community to be active learners, to enrich their sense of civic responsibility, and to explore practical application for course content. Faculty oversight, reflective thinking, and reciprocity are key components of service-learning.

2. Non-Scheduled Course Offerings (e.g., 496, 899, 999)

Course No.	Title	Credit Hrs.	No. Students
EFB496	Special Topics in Environmental Toxicology	3	6
EFB611	Special Topics in Environmental Toxicology	3	5

3. Continuing Education and Extension (short courses, workshops, etc.)

4. Guest Lecture Activities

Course No.	Title	No. of Lectures
EFB797	Seminar in Hydrological & Biogeochemical Processes	1
EFB797	Adaptive Peaks	1
EFB496	Senior Synthesis AFS (mock-employment interviews)	1

II. STUDENT ADVISING

A. Number of undergraduates for whom you are the student's official advisor 13 and unofficial advisor 1

B. Graduate Students: (list name, degree sought, starting date, month & year; if a degree was completed, please give

date and full citation for the thesis or dissertation).

MAJOR PROFESSOR

CO-MAJOR PROFESSOR

MEMBER, STEERING COMMITTEE (other than those listed above)

Carolyn Huynh, MS, Environmental Science (Defended May 2014; G. Boyer & K. Doelle Co-MPs)

Kelly Huffman, MS, Fish & Wildlife Biology & Management (J. Farrell MP)

Jessica Saville, PhD, Ecology (D. Leopold MP).

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

Lacey Kucerak, MS, Environmental Science (Defended May 2014; G. Boyer & K. Doelle Co-MPs)

Matthew Gunderson, MS, Fish & Wildlife Biology & Management (K. Kapuscinski MP)

III. RESEARCH COMPLETED OR UNDERWAY

A. Departmental Research (unsupported, boot-legged; title - % time spent)

- i) Estimating individual efficiencies for Great Lakes lake trout, unsupported 5 %.
- ii) Contrasting PCB bioaccumulation patterns in Lake Huron lake trout, unsupported 5 %
- iii) Quantifying resource partitioning among Lake Ontario prey fishes associated with invasive species, unsupported 5%.
- iv) Bioamplification of persistent organic pollutants across biological taxa, unsupported 5%.

B. 1. Grant-supported Research (source, subject, amount - total award and current year, award period starting and ending dates; list graduate research assistants supported by each grant)

Environment Canada, Development of energetics metrics for Great Lakes seabirds from long-term biomonitoring data (1982- 2010), \$10,000, 01/31/2014 – 03/31/2014. **G. Paterson (sole PI)**.

2. Research Proposals pending (include information as in B.1., above).

New York Great Lakes Protection Fund, Understanding and predicting the impacts of dreissenid mussels on Lake Ontario consumer species growth and health. \$13,600. **G. Paterson (PI)**, B. Lantry USGS (Co-PI), D. McGoldrick Environment Canada (Co-PI).

3. Research Proposals submitted, but rejected (include information as in B.1, above)

Great Lakes Fishery Commission, Resource use, age structure and genetics of Lake Huron Deepwater Sculpin, \$85,000. **G. Paterson (PI)**, D. Warner USGS (Co-PI), D. Roy, U. Connecticut (Co-PI), GD Haffner U. Windsor (Co-PI), K. Drouillard U. Windsor (Co-PI).

Great Lakes Fishery Commission, Effects of Round Goby on growth and contaminant bioaccumulation rates in Smallmouth Bass. \$96,600. AJ. Bramburger (PI) St. Lawrence River Institute for Environmental Science PI. **G. Paterson (Co-PI)**, M. Windle (SLRIES; Co-PI), KG. Drouillard U Windsor (Co-PI).

IV. PUBLICATIONS (Full bibliographic citation, i.e., do not use "with Jones," or "Jones, et al."; please list only publications published, in press, or actually submitted during this reporting period --- **do not list manuscripts in preparation**).

A. Refereed Publications

- i) **Paterson G.**, Rush SA., Arts MT., Drouillard KG., Haffner GD., Johnson TB., Lantry BF., Hebert CE., McGoldrick DJ., Backus SM. and Fisk AT. Ecological tracers quantify resource partitioning among four Lake Ontario prey fish species. *Freshwater Biology* *accepted pending revision*.
- ii) **Paterson G.**, Ryder M., Drouillard KG. and Haffner GD. Biological and ecological properties regulate steady- and non-steady state polychlorinated biphenyl (PCB) bioaccumulation kinetics in Lake Huron lake trout (*Salvelinus namaycush*). Submitted to *Environmental Toxicology and Chemistry* *in review*.
- iii) **Paterson G.**, Hebert CE., Drouillard KG., and Haffner GD. 2014. Congruent energy density trends of birds and fish reflect ecosystem change. *Limnology and Oceanography* *in press*.
- iv) Kapuscinski KL., Farrell JM., Wilkinson MA., **Paterson G.**, Skinner LC., Richter W., Gudlewski AJ. 2014. Low concentrations of contaminants in an invasive cyprinid, the rudd, in a Great Lakes area of concern, the upper Niagara River. *Bulletin of Environmental Contamination and Toxicology* *in press*.
- v) McLeod AM., **Paterson G.**, Drouillard KG., and Haffner GD. 2014. Ecological factors contributing to persistent organic pollutant variability within forage fish communities of the Detroit River, Ontario, Canada. *Environmental Toxicology and Chemistry* *in press*.
- vi) Daley JM., **Paterson G.** and KG. Drouillard. 2014. Bioamplification as a bioaccumulation mechanism for persistent organic pollutants in wildlife. *Reviews in Environmental Contamination and Toxicology* 227:107-155.
- vii) Olin JA., Beaudry M, Fisk AT., and **Paterson G.** 2014. Age related PCB dynamics in immature bull sharks (*Carcharhinus leucas*). *Environmental Toxicology and Chemistry* 33: 35-43.
- viii) McPhedran KN., Grgicak-Mannion A., **Paterson G.**, Briggs T., Ciborowski J., Haffner G.D., and Drouillard, K.G. Field validation of multi-chemical hazard metrics for predicting benthic invertebrate toxicity in the Detroit River, Ontario, Canada. Submitted to *Environmental Science & Technology*.

B. Non-refereed Publications

C. Papers Presented at Science Meetings (give title, date, occasion, and location)

- i) **Paterson G.**, Drouillard KG. and Haffner GD. Investigating temporal responses of Lake Huron lake trout energy densities during ecosystem change. 57th Annual Conference of the International Association for Great Lakes Research, McMaster University, Hamilton, Ontario Canada. May 26-30, 2014.
- ii) **Paterson G.**, Drouillard KG, and Haffner GD. Individual efficiencies and lake trout responses to fluctuating prey fish biomass. 57th Annual Conference of the International Association for Great Lakes Research, McMaster University, Hamilton, Ontario Canada. May 26-30, 2014.
- iii) McLeod AM., **Paterson G.**, Drouillard KG. and Haffner GD. The offshore phosphorus shunt: the influence of lake trout on nutrient recycling. 57th Annual Conference of the International Association for Great Lakes Research, McMaster University, Hamilton, Ontario Canada. May 26-30, 2014.
- iii) **Paterson G.**, Roy D., Warner DM., Drouillard KG. and Haffner GD. Resource use, age structure and genetics of Lake Huron Deepwater Sculpin, Great Lakes Fishery Commission, Board of Technical Experts Meeting, Ann Arbor Michigan, March 4, 2014.

D. Public Service Presentations (lectures, seminars, etc. to and for the public; give group or occasion, date(s), and attendance).

- i) **Paterson G.** Working the way up the food web: Ecotoxicology at SUNY-ESF. College of Environmental Science and Forestry Chapter of the American Fisheries Society, March 19, 2014 (20).
- ii) **Paterson G.**, What's in my water? Pharmaceuticals and how they get in our H₂O. College of Environmental Science and Forestry First Year Experience - Water Lecture Series, November 6, 2013 (100).

iii) **Paterson G.**, Drouillard KG. and Haffner GD. Trophic collapse and the bioaccumulation dynamics of PCBs in Lake Huron. Clarkson University, September 23, 2013. Invited Seminar (75).

V. PUBLIC SERVICE

A. Funded Service (include consulting activities)

1. Government Agencies (Federal, State, Local):

2. Industrial and Commercial Groups, etc.

B. Unfunded Service to Governmental Agencies, Public Interest Groups, etc.

Advisor to National Wildlife Research Centre, Herring Gull biomonitoring program (Environment Canada)
Collaborator with Lake Ontario Biological Station (United States Geological Survey)

VI. PROFESSIONAL DEVELOPMENT

A. Professional Honors and Awards (for teaching, research, outreach, etc.)

B. 1. Activities in Professional Organizations (offices held, service as chairman, member, participant or consultant)

2. Professional Society Membership

Society of Environmental Toxicology and Chemistry
International Association for Great Lakes Research
American Society of Limnology and Oceanography

3. Other Professional Activities

a. Editorial activity

Journal (s)

Bulletin of Environmental
Contamination & Toxicology.

Responsibility

Senior Editor: Editorial review, processing,
and final decision for 32 manuscripts.

Other (books, symposia, etc.)

b. Reviewer

Journal(s)

Canadian Journal of Fisheries & Aquatic Sciences
Science of the Total Environment
Journal of Great Lakes Research
Frontier in Ecology and Environment

No. of manuscripts

1
1
1
1

Agency

No. of proposals

Other

c. Participation (workshops, symposia, etc.)

Name of workshop, etc.

Date

Place

Session Chair: Salmonid Feeding Ecology in Great Lakes Food Webs. 57th Annual Conference of the International Association for Great Lakes Research, McMaster University, Hamilton, Ontario Canada. May 26-30 2014.

Society of Environmental Toxicology and Chemistry 34th Annual Meeting, Nashville, Tennessee, November 17 – 21, 2013.

Transborder Research University Network Water Stewardship Consortium Great Lakes Futures Workshop, October 3, 2013, University of Buffalo.

C. Further Education/Re-training Undertaken, Leaves, Workshops, etc.

National Science Foundation Day: Grant Writing Symposia, Rochester Institute of Technology & The University of Rochester, November 8, 2013.

US Coast Guard Auxiliary: Boater Safety Training Course, March 31 – April 4, 2014.

D. Foreign Travel (Where, When, Purpose)

McMaster University, Hamilton, Ontario Canada. May 26-30 2014. 57th Annual Conference of the International Association for Great Lakes Research.

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

Robert Burgess Graduate Scholarship in Ecology (Candidate review and selection)

B. College-level

Ad-hoc Library Council (Committee).

Faculty position search, EFB representative, Environmental Chemist, Department of Chemistry (Committee).

Environmental Health Program information session, College Open House, October 26, 2013 (Orientation Seminar).

Environmental Health Program information session. College Open House – Transfer Student Opportunities., January 6, 2014 (Orientation Seminar).

Hosted hydrofracking webinar in absence of Chemistry Department chair. February 27, 2014.

Spotlight on Student Research Conference April 15-16th (Judge).

C. University-wide, including Research Foundation

VIII. SUMMARY OF SIGNIFICANT ACTIVITIES AND ACCOMPLISHMENTS DURING THIS REPORTING PERIOD, ESPECIALLY THOSE MOST NOTEWORTHY AND RELATIVE TO THE COLLEGE'S AND DEPARTMENT'S MISSION.

One paragraph on each of the following (i.e., **three paragraphs total**) would be most helpful: this past year, what have you done for our students, department/college, and self professionally? NOTE: The information in this section (along with the supporting specific information elsewhere in this report) should be your strongest case for being considered for a discretionary raise (when available), which I'll continue to award based on your contributions to the department and college this reporting period.

Students:

Introducing myself to the student community as a new member of the College's teaching and research faculty was an important component of this reporting segment. This included presenting a teaching lecture in the Fall semester in the Water Lecture series for First Year Experience students. The lecture topic introduced students to the mechanisms that result in the release and presence of pharmaceuticals and personal care products in the aquatic environment and their potential toxicity and fate in these ecosystems. In the Fall semester I also contributed to the EFB graduate program's Adaptive Peaks (EFB797) course giving a research lecture regarding the long-term impacts of multiple stressors such as invasive species and nutrient remediation on the structure of and energy flow within a Great Lake food web. I also co-taught Adaptive Peaks with Dr. Shannon Farrell this past Spring semester. This Spring also I taught a special topics course in Environmental Toxicology (EFB496/611) offered at both the senior undergraduate and graduate instructional levels. Feedback from students and other departmental faculty indicate that the course content was well received and provided a valuable contribution to the EFB curriculum. This summer I am looking forward to contributing to teaching the aquatic sampling/biology component of the EFB202 field course at Cranberry Lake. With respect to course administration, I revised the course proposal for EFB400/600 (Toxic Health Hazards) in order to better align the course content with the new Environmental Health major. I am teaching this course in Fall 2014 and currently have 27 students registered in it. As part of the Environmental Health major, I am also developing the course proposal and curriculum content for Environmental Risk Assessment (tentatively ENS470) which I will be teaching as a special topics course in the Fall of 2014 prior to its approval for the curriculum. This proposal is at final revision stage and will be ready for final committee review for the start of the Fall 2014 semester. During the Fall 2013 and Spring 2014 semesters, I acted as a project advisor for senior Environmental Science student enrolled in ENS494/498 (Research Problems in Environmental Science & Capstone). This student successfully completed a research project titled "A meta-analysis of pharmaceuticals and personal care products in the aquatic environment" and also his capstone seminar. As part of the Environmental Scholars program, I mentored two undergraduate students whom volunteered in my lab and greatly assisted with its cleanup and preparation for organic analyses. One of my most enjoyable student experiences in the spring 2014 semester was participating in Dr. John Farrell's Senior Synthesis AFS course as interview panel member thereby helping students gain experience in a professional interview setting. For graduate students, I am involved as a steering committee member for three students and also as an external reader for two MS thesis. Two of the MS student's whose committees I have been involved with have now successfully defended and completed their theses. I also acted as an academic/professional reference for one of these students who recently accepted a position with an environmental consulting firm in Brooklyn, NY. Beginning in the Fall of 2014, I will be acting as co-major professor with Dr. Don Stewart for an incoming PhD candidate. The dissertation project will investigate factors leading to the divergent life-history of the regionally extirpated Great Lakes cisco (*Coregonus hoyi*) and the potential for this species' rehabilitation in Lake Ontario. I had previously agreed to act as major professor for an MS candidate accepted into the EFB graduate program, however, the student has since decided to postpone attendance at graduate school.

Department/College:

I have very much enjoyed and appreciated the reception I have received since arriving in the department and from the wider ESF community. As a new faculty member, I have endeavored to become as involved as possible in departmental and college level service contributions. At the departmental level, I served on the Burgess Award committee in the role of reviewing candidate applications and the selection process. I also was a committee member on the ad-hoc Library Council Committee regarding budgeting and allocations during the transition from shared resources with Syracuse University to SUNY/ESF independent management. During ESF fall and spring open house sessions, I gave overview presentations for incoming and transfer students during information sessions for the Environmental Health program. I greatly enjoyed participating as a judge during the Spotlight on Student Research Conference and was a thoroughly impressed by the quality of research presented by ESF undergraduate and graduate students. I am also currently participating as a committee member on the candidate search for an Environmental Chemist faculty position in the Chemistry Department. During the Fall 2014 semester, I will be hosting an editorial board meeting for the Springer publication the Bulletin of Environmental Contamination and Toxicology. This meeting will host editorial board members from across the US and also from Canada, Mexico, Sweden and Germany. Arrangements are being made to help showcase ESF's new Gateway Center facilities to the board members.

Self:

I am approximately 75% toward the completion of establishing my research lab which is primarily focused on the use of persistent organic pollutants as indicators of species bioenergetics. The lab infrastructure has been developed specifically for the extraction of pollutants such as polychlorinated biphenyls and organochlorine pesticides. Lab methods also permit for the determination of animal lipid, moisture and lean dry weight (protein) contents that contribute directly to my overall research goals. This past year has been relatively productive with five research manuscripts accepted for publication as of the composition of this annual report and revised submissions for two more still pending final decision. These publications have expanded my collaborative network to include USGS scientists (Oswego NY & Alpena MI), Louisiana State University, Mississippi State University in addition to building on existing relationships with research collaborations from my previous academic institutions. I was also invited to give a research seminar at Clarkson University which was a rewarding experience for meeting additional researchers around the Great Lakes basin and also colleagues interested in the importance of overwintering biology/limnology. I enjoyed success in acquiring some funding (\$10,000) that will be used to help further establish lab infrastructure in addition to contributing to student training in both laboratory and field research. I anticipate developing the required lecture materials for Environmental Risk Assessment over the summer 2014 in preparation for teaching this course in the fall 2014 semester which will expand my teaching portfolio and also enhance my pedagogical skills.

IX. A. FUTURE PLANS, AMBITIONS, AND POTENTIAL CONTRIBUTIONS FOR YOUR OWN PROFESSIONAL DEVELOPMENT AND THE ENHANCEMENT OF THE PROGRAM IN ENVIRONMENTAL AND FOREST BIOLOGY (brief summary)

In developing my lab and working with undergraduate and graduate students, I will establish myself as a leader for the use of persistent organic pollutants as ecological tracers for quantifying the bioenergetic consequences of multiple stressors in aquatic food-webs. The bioaccumulation of persistent organic pollutants such as PCBs represents an individual's life history record of energy acquisition, assimilation and growth efficiency. Consequently, pollutant concentrations and profiles provide an integrated record of individual, community and population level responses to multiple stressors which can be used to further investigate primary concepts such as resource partitioning, optimal foraging and ecological efficiencies. One area of pollutant ecotoxicology that has been consistently overlooked involves the importance of overwintering and latitudinal bioenergetics on the patterns and magnitude of pollutant bioaccumulation at local, regional, and global scales. For poikilothermic species, the extent of the overwintering period and associated changes in tissue composition that occur during cold-temperature exposures have the capacity to greatly alter pollutant bioaccumulation patterns in a range of biota. Especially for hydrophobic organic pollutants that accumulate in lipid reserves. I am also now working with Operation Wallacea in order to expand my research program into Dominica and tropical climates in order to contrast pollutant bioaccumulation relationships in a tropical warm water food web with those observed in North Temperate latitudes and ultimately across to Arctic/polar scales. I have developed a collaboration with Drs. Randy Jackson and Lars Rudstam of Cornell University's Oneida Lake Biological Station to develop a project that will investigate temporal changes in PCB tissue distribution in yellow perch as fish proceed through the summer growing season and enter the cold-water slow/zero growth season. I also will be establishing to establish a Finger Lakes research program specifically targeting the freshwater mysid shrimp (*Mysis diluviana*) in these ecosystems. This macroinvertebrate has been identified as a key component leading to the biomagnification of persistent organic pollutants in Great/Finger Lakes type food webs. However, very little is known of the role of this species' life history characteristics on pollutant bioaccumulation and biomagnification in freshwater food webs. I also fully anticipate expanding my research programs in order to help support and contribute to the teaching and research facilities available at the Thousand Islands Biological Station and Cranberry Lake facilities. Through this research program, I will lead studies and train students that investigate the importance of central ecological concepts such poikilothermy, resource partitioning, optimal foraging and invasion biology on the patterns and extent of pollutant bioaccumulation observed in aquatic species and food webs.

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2014

a. Course(s) to be offered

EFB202 (Ecological Monitoring and Biodiversity Assessment) Contribute to aquatics program teaching.

b. Proposed research activity

Complete lab set-up and calibration for sample processing and pollutant extraction and analyses.

Collection of Oneida Lake yellow perch in collaboration with Cornell University's Biological Field for temporal PCB analyses.

Collection of *Mysis diluviana* from Keuka and Owasco Lakes to contrast life history strategies, stable isotope profiles and PCB bioaccumulation patterns.

Collection of Lake Ontario lake trout in collaboration with Dr. Brian Lantry of USGS biological station in Oswego to characterize individual predator foraging efficiencies and population structure.

Complete research manuscript contrasting mercury bioaccumulation profiles in Lake Huron lake trout.

Complete research manuscript investigating the long-term biological responses of Lake Ontario lake trout to the multiple non-indigenous species invasions that have occurred between 1989 – 2008.

Continue modeling simulation for determining ecological efficiencies of Great Lakes top predators

c. University, professional society, and public service

Continued participation as EFB department representative in Chemistry Department search committee Environmental Chemist faculty position

2. Fall Semester 2014

a. Course(s) to be offered

EFB400/600 (Toxic Health Hazards) 27 Students

EFB498 (Independent Research Projects in Environmental Biology) 2 students

EFB797 (Adaptive Peaks; Co-taught with Dr. Shannon Farrell) 10 Students

ENS496 (Environmental Risk Assessment) 3 students

b. Proposed research activity

Submit NSF Catalyzing New International Collaborations (CNIC) grant for support of Dominica food web research in collaboration with Operation Wallacea.

Submit proposal to NYSERDA funding opportunity investigating acid deposition and mercury: data development and publication pilot grant program.

Mentorship and training of undergraduate students completing Independent Research Projects in my laboratory (Ms. Erin Reidy – Life history trends in Finger Lakes *Mysis diluviana*; Mr. Eric Culver. Seasonal trends in PCB contamination in dorsal muscle of Yellow perch)

Mentorship, training and co-supervision of PhD candidate.

Continued research on summer 2014 projects investigating individual and ecological efficiencies.

Recruit MS candidate for project investigating maternal offloading of persistent organic pollutants in Gulf of Mexico bonnethead sharks (G. Paterson PI; Collaboration with Louisiana State University and Florida Fish and Wildlife).

Contribute to composition and publication of research manuscript describing the extent of maternal offloading of chlorinated pesticides to juvenile bull sharks (Collaboration with Louisiana State University and Florida Fish and Wildlife).

c. University, Professional society, and public service

Library council committee, continued role as senior editor with Bulletin of Environmental Contamination and Toxicology.

3. Spring Semester 2015

a. Course(s) to be offered

EFB496/611 (Special Topics in Environmental Toxicology)

b. Proposed research activity

Continued mentorship and training of undergraduate students completing research projects in my laboratory.

Submit grant proposal to Great Lakes Fishery Commission investigating life history characteristics of Great Lakes cisco populations for support of PhD candidate.

Begin preparation and composition of NSF CAREER grant application for Summer 2015 submission.

Continued research into individual and food web ecological efficiencies.

Completing field and lab research for temporal PCB trends in Oneida Lake yellow perch.

Preparation for potential field research in Dominica investigating latitudinal effects on the food web bioaccumulation of persistent organic pollutants.

c. University, professional society, and public service

Anticipate continued commitment to Bulletin of Environmental Contamination and Toxicology in senior editor role and various departmental, College and public outreach service requirements as they arise throughout the academic year.