

ANNUAL REPORT: June 1, 2014 – May 31, 2015
(i.e., Summer 2014, AY 2014-2015)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

*****PLEASE DO NOT INSERT TABLES FOR ANY CATEGORIES*****

NAME: Tom Horton

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

Course No.	Title	Credit Hrs.	No. Students	No. of Lab. Sections
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SUMMER: None

FALL:

EFB 320	General Ecology	4	218	10
EFB 428	Mycorrhizal Ecology	3	20	1
EFB 628	Mycorrhizal Ecology	3	6	1

SPRING: None

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
EFB 298 – Fall	Research Internship in EFB	1	1
EFB 498 – Fall	Independent Research in EFB	1	2
EFB 797 – Fall	Rhetoric in Science	1	5
EFB 797 – Fall	History of Ecosystem Thought	1	8
EFB 899 – Fall	Masters Thesis Research	3	1
EFB 298 – Spring	Research Internship in EFB	1	1
EFB 498 – Spring	Independent Research/EFB	1-5	3
EFB 498 – Spring	Independent Research/EFB	5	1
EFB 899 – Spring	Masters thesis research	1-7	2
FOR 797 – Spring	Forest soils & Nutrient Cycling	1	3

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

4. Guest Lecture Activities

Course No. Title No. of Lectures

II. STUDENT ADVISING

- A. Number of undergraduates for whom you are the student's official advisor __18__ and unofficial advisor _____
- 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

Tomes, Andrew, MS, 08/2013 (Robin Kimmerer MP)
Haynes, Brandon, MS, 08/2013 (Doug Daley MP)

MEMBER, STEERING COMMITTEE (other than those listed above)

Geoffrey Soka, PhD (Mark Ritchie, SU) Successfully defended 12 December 2014
Arrigoni, Jim, PhD (Gibbs)
Dowie, Nicholas, PhD (Miller) University of Wyoming
Oakes, Allison, PhD (Maynard)
Diggs, Franklin, MS (Yanai)
Funmi, Afeluma, MS (Lee Newman)
Gray, Amanda, MS (Briggs)
Smith, Sara, MS, (Kimmerer)

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

Helenbrook, William, PhD – Examiner (Whipps/Shields) Successfully defended 22 October 2014
Bullock, Michael – Chair (Kuhn) Successfully defended 29 July 2014

Bader, Grete, MS – reader (Leopold)
Kwon, Yong Seuk, MS – Chair (Endreny)
Turner, Sara, MS – reader (Kimmerer)

III. RESEARCH COMPLETED OR UNDERWAY

- A. Departmental Research (unsupported, boot-legged; title - % time spent)
- Evaluating the Potential of Mycorrhizae for Increasing Chestnut (*Castanea dentata* [Marsh.] Borkh.) Restoration Success and Modeling Distributions of Ethnobotanically Significant Species Sensitive to Climate Change – 5%.
Andrew Tomes MS student.
- Assessment of Spent Mushroom Waste from *Pleurotus ostreatus* Cultivation for Removal of *E. coli* from Wastewater – 5%.
Brandon Haynes MS student.
- Sporocarp production in forest stands following control burns in Menominee, WI – 1%. Sara Smith MS student.
- Use of a soil bioassay technique as bait for locally adapted ectomycorrhizal fungi for pine establishment at the Albany Pine Bush Preserve. – 1%. Gabriel Smith undergraduate student.

Mechanical Properties of Sheets Comprised of Mycelium: A Paper Engineering Perspective – 1%. Ross Mazur Honors student.

Evaluating the New Transgenic American Chestnut for Mycorrhizal colonization. – 1%. Jolina Pannafino, Honors student

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)

Yanai R, Horton TR. NSF. Collaborative Research: IDBR: Type A: The Nanaphid: A novel aphid-like nanosensor network for real-time measurements of carbohydrates in live plant tissue. \$59,816 2/1/15 – 1/31/16.

Yanai R, Horton TR. USDA McIntire-Stennis Program. The Role of Mycorrhizae in Water Use in Northern Hardwood: Is Transpiration Optimized for Uptake Limiting Nutrients. \$55,229 8/15/15 – 9/30/17.

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

NSF – Environmental Biology, 2015 *Preliminary Proposal: Stable Isotope and radiocarbon analyses link fungivory in small mammals to organic nitrogen cycling*: Invited for full proposal April 2015. Full proposal due August 3, 2015.

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

NSF – Environmental Biology, 2015 Preliminary Proposal: Causes of Nutrient-Enhanced Transpiration in Northern Hardwoods: Leaves, Stems, Roots, or Mycorrhizal Fungi?

NSF – Environmental Biology, 2015 Preliminary Proposal: Legacies of plant invaders and disruptions of belowground mutualisms

SUNY-ESF Seed Grant – 2015 Use of NextGen Sequencing to Identify Mycorrhizal Fungi from Mixed Assemblages of Spores in Small Mammal Diets. \$5252.

NSRC Theme 4: Biodiversity and Protected Area Management - 2015 Preliminary Proposal: Mycophagy and consumer competition: small mammals as ecosystem engineers of ectomycorrhizal fungal diversity.

NSF – Environmental Biology, 2014 invited full proposal: Collaborative Research: Causes of Nutrient-Enhanced Transpiration in Northern Hardwoods: Leaves, Stems, Roots, or Mycorrhizal Fungi? \$418,520 to Horton/ESF (\$1,252,512 total). 36 months.

NSF – Environmental Biology, 2014 invited full proposal: Collaborative Research: Stable isotope and radiocarbon analyses link fungivory in small mammals to organic nitrogen cycling. \$263,187 to Horton/ESF (\$750,000 total), 35 months.

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

Hayward J, Horton TR, Nuñez M (2015) Ectomycorrhizal communities coinvasion with Pinaceae species in Argentina: Gringos bajo el bosque. *New Phytologist*: 10.1111/nph.13453

Hayward J, Horton TR, Pauchard A, Nuñez MA (2015) A single ectomycorrhizal fungal species can enable a *Pinus* invasion. *Ecology* 96: 1438-1444.

D'Amico KM, Horton TR, Maynard CA, Stehman SV, Oakes AD, Powell WA (2015) Comparisons of ectomycorrhizal colonization of transgenic American chestnut with that of the wild type, a conventionally bred hybrid, and related fagaceae species. *Appl Environ Microbiol* 81:100-108. doi:10.1128/AEM.02169-14.

Rivera Y, Kretzer AM, Horton TR (2015) New microsatellite markers for the ectomycorrhizal fungus *Pisolithus tinctorius* sensu stricto reveal the genetic structure of US and Puerto Rican populations. *Fungal Ecology* 13:1-9
doi:<http://dx.doi.org/10.1016/j.funeco.2014.07.001>.

Hayward J, Horton TR (2014) Phylogenetic trait conservation in the partner choice of a group of ectomycorrhizal trees. *Molecular Ecology* 23: 4886-4898.

B. Non-refereed Publications

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

Horton et al. Spore dispersal in ectomycorrhizal Basidiomycota. Invited Symposium Oral Presentation, International Mycological Congress. Thailand Bangkok, August 2014 – Cancelled.

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

Horton TR. SUNY Geneseo Biology Seminar Series. Primary succession on coastal sand dunes: interactions involving *Pinus contorta*, suilloid fungi and deer. October 31 2014. ~75+

Quentin Wheeler Inaugural Bioblitz at Onondaga Lake Park. 9/12/2014. 1 (A photographer from the Syracuse Post Standard tagged along with my group taking photos of fungi we found, many of which wound up on the web site covering the event for the paper).

Horton TR. Charles Horton Peck Foray. Ectomycorrhizal fungi: How do the spores get around? A summary of 20+ years of research. 9/13/14. ~ 20+

Horton TR. Vince O'Neil Mushroom Festival at Beaver Lake Nature Center with Central New York Mycological Society and Mid-York Mycological Society. 9/28/2014. 100+ (mushroom walk had about 20)

V. PUBLIC SERVICE

A. Funded Service (include consulting activities)

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

Ongoing project at the Albany Pine Bush Preserve to help with pine restoration effort.

2. Industrial and Commercial Groups, etc.

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

Scientific advisor – Central New York Mycological Society

Scientific advisory board – Mianus River Gorge Preserve

In Defense of Plants Podcast (<http://www.indefenseofplants.com/podcast/>), Episode 12: Parasitic Plants, posted March 28, 2015

Interviewed for an SU iBook project due out this summer: Ethnobotany.

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)

Student Awards Committee, Mycological Society of America. 2013-2017.

2. Professional Society Membership

Mycological Society of America

International Mycorrhiza Society
Botanical Society of America

3. Other Professional Activities

a. Editorial activity

<u>Journal (s)</u>	<u>Responsibility</u>
Mycorrhiza	Editorial Board

Other (books, symposia, etc.)

Springer Ecological Studies Series: Mycorrhizal Networks -- Now in review with subject editor at Springer.

b. Reviewer

<u>Journal(s)</u>	<u>No. of manuscripts</u>
New Phytologist	2
Journal of Ecology	1
Molecular Ecology	1
Mycologia	1
Fungal Biology	1
Biological Invasions	1

<u>Agency</u>	<u>No. of proposals</u>
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Other

c. Participation (workshops, symposia, etc.)

<u>Name of workshop, etc.</u>	<u>Date</u>	<u>Place</u>
Invited to co-organize symposium on Mycorrhizal Networks –ICOM8	Aug 3- 8 2015	Flagstaff, AZ

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

D. Foreign Travel (Where, When, Purpose)

VII. ADMINISTRATIVE AND SERVICE RESPONSIBILITIES (include committee participation)

A. Department-level

Faculty mentoring committees: Martin Dovciak, Rebecca Rundell, Gordon Paterson

Promotion and Tenure Committee

Environmental Microbiologist Search Committee (Hyatt Green hired June 2014)

B. College-level

Academic Research Building Committee

Strategic Planning: What are Earth's Species and Dynamics committee

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

I hope my efforts teaching EFB 320, General Ecology, pay off and make a difference to the students in the course. I certainly enjoy those students who I get to know. This past fall I also taught Mycorrhizal Ecology, EFB 428/628. This is an upper division course in my area of specialization. Based on conversation with the students in EFB 428/628 and seeing them pursue research opportunities in mycorrhizal systems, I believe this course is having a positive impact. I led an EFB 797 seminar, A History of Ecosystem Thought, a seminar designed to be particularly helpful for students in several of our graduate disciplines as they prepared for their various graduate exams. It was a very active year in my lab and it was a pleasure working with such capable students. Undergraduate students are coming to get experience working in a research lab, including several students working towards an undergraduate Honors Thesis. Graduate students are also seeking training in the lab, with students conducting successful graduate level research in the lab. I had four graduate students from other departments camping out in my lab as they pursued mycological questions methods in their research (2 from ERE and 2 from FNRM). I again chaired the awards committee for the Lowe-Wilcox, Zabel, Morrell and Silverborg scholarship awards. The awards ceremony and graduation is probably the best day of the year for me. Lastly, I highlight one undergraduate who really excelled. Gabriel Smith was accepted to work with a colleague at the University of New Mexico. Even more exciting, he will postpone his start date for his graduate program to work as a Fulbright scholar with colleagues in Sweden. Gabriel is the first undergraduate Fulbright scholar from ESF. I could not be happier for him and us! He told me last year he came to ESF to work on mycorrhizal fungi, and he leaves ready to make a real difference in the field.

Department/College

I again highlight first my effort for the college with respect to General Ecology. Teaching such a large course is not trivial, and while specialized courses such as my Mycorrhizal Ecology take up just as much time, my impact for the college is really felt in General Ecology with the large student population that crosses departments. Equally important is the time I put into the Promotion and Tenure committee. The work on clarifying criteria for Promotion and Tenure is ongoing, but is very close to being complete. We also reviewed the dossier for one faculty member who was promoted to Associate Professor with continuing appointment. I also conducted third-year teaching reviews for one Assistant Professor. The Academic Research Building committee was revived and we are now finalizing the plan for placing the building east of Illick Hall. I suspect activity on the ARB committee will continue into the 2015-2016 academic year. It is hugely important to have EFB representatives on this committee to provide advice during the planning process from an occupants viewpoint and to report back to the department. I get a lot of informal queries from colleagues! I threw my hat in for a new committee assignment, the Strategic Planning: What are Earth's Species and Dynamics committee. My unique contribution was to raise the importance of unseen organisms both in terms of diversity estimates on the planet, but also in terms of the importance of the ecological roles these organisms play.

Self

This has been a great year for me. I learned that the EFB 797 courses I've been organizing, especially History of Ecosystem Thought and Origin of the Species have been well received from the graduate students. I had a feeling that was true based on the enrollment and dynamic in the classroom, but to get such positive feedback from the GPAC was very rewarding. I have had an army of undergraduate students knocking on my door for research experiences in my lab and I really enjoy guiding the students through a research effort. With respect to publications, it has been a very good year with 5 refereed articles published in journals with an average impact factor of 4.6 (New Phytologist, Ecology,

Applied and Environmental Microbiology, Fungal Ecology, Molecular Ecology). My work continues to influence the field as evidenced by a relatively H-index value. In addition to journal articles, I am very happy to be at the tail end of my book project on Mycorrhizal Networks. I sent the manuscript to Dr. Harold Mooney, the subject editor for the Springer Ecological Studies Series, who got back within one week with a positive assessment. I look forward to putting this in the out box. The book itself is already generating interest as evidenced by my invitation to run a symposium on the topic at this summer's International Conference on Mycorrhiza and a recent interview by a journalist with the journal Science interested in writing an article on forest health and mycorrhizal networks. With respect to granting, I am happy to have coauthored two successful grants totaling \$115,000. These are relatively small and I am actively seeking a larger award. Fortunately, a co-authored pre-proposal submitted with a colleague at UNH has been invited for a full proposal and with any luck, we will be successful this time around. I am very excited about the chance to conduct research at the Albany Pine Bush Preserve where I will be able to apply my knowledge on pine fire ecology, mycorrhizal ecology, and restoration ecology. I am also excited to do my first round of NextGen Sequencing to characterize soil fungal communities. This is possible through the new McSten funding, but will also be supported with funding from other sources from colleagues at UNH. Finally, I am very excited to have attracted a new student, Taylor Patterson, who has excellent ideas and goals for his graduate experience.

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)

B. PROJECTED ACTIVITIES FOR NEXT YEAR

1. Summer 2015

a. Course(s) to be offered

b. Proposed research activity

Present work on spore dispersal at 8th International Conference on Mycorrhiza in August

Co-lead symposium on Mycorrhizal Networks at 8th International Conference on Mycorrhiza in August

Finish book on Mycorrhizal Ecology

Full proposal: Hobbie EA, Rowe R, Epps CW, Horton TR. Stable isotope and radiocarbon analyses link fungivory in small mammals to organic nitrogen cycling. Invited full proposal due August 3 2015.

Use of mycorrhizal fungi to restore pine stands at Albany Pine Bush following removal of invasive locust.

Assessment of new transgenic lines for their ability to form mycorrhizal associations.

c. University, professional society, and public service

Illick Hall Electrical Shutdown – lab freezer organization

ARB – EFB representative

Mycorrhiza Editorial Board

Ad hoc reviewer for various journals and funding agencies

Assess hazelnut harvested from a local *Tuber aestivum* hazelnut plantation for truffle mycorrhizae (public service)

Service on graduate committees

Assessment of Removal of *E. coli* in Water using *Pleurotus ostreatus* Spent Mushroom Waste, with Brandon Haynes (CoMP Doug Daley)

Assessment of fungal community in transgenic chestnut leaf litter, with Amanda Gray (MP Russ Briggs)

Comparison of mycorrhizal colonization of willow grown at Solvay waste beds versus Tully willow plots, with Marie Schoenenberger (MP Doug Daley)

Mycorrhizal colonization and nutrient uptake of American beech and sugar maple following nutrient additions, with Jerome Barner (MP Ruth Yanai).

Smaller roles on numerous other graduate steering committees.

2. Fall Semester 2015

a. Course(s) to be offered

EFB 320 General Ecology
EFB 496 Advanced Mycology: Basidiomycetes
EFB 298 Research Internship
EFB 498 Independent Research
EFB 899 Masters Experience
ESF 499 Honors Thesis

b. Proposed research activity

Use of mycorrhizal fungi to restore pine stands at Albany Pine Bush following removal of invasive locust.
Assessment of new transgenic lines for their ability to form mycorrhizal associations.
Initiate NextGen sequencing experiments as part of McSten funding (assess fungal communities under nutrient addition experiments).
Help my new graduate student Taylor Patterson initiate his research program.

c. University, Professional society, and public service

EFB P&T Committee
ARB – EFB representative
Strategic Planning: What are Earth's Species and Dynamics committee
Mycorrhiza Editorial Board
Ad hoc reviewer for various journals and funding agencies
Assess hazelnut harvested from a local *Tuber aestivum* hazelnut plantation for truffle mycorrhizae (public service)
Service on graduate committees
Comparison of mycorrhizal colonization of willow grown at Solvay waste beds versus Tully willow plots, with Doug Daley and Marie Schoenenberger
Mycorrhizal colonization and nutrient uptake of American beech and sugar maple following nutrient additions, with Ruth Yanai and Jerome Barner.
On numerous graduate steering committees.

3. Spring Semester 2016

a. Course(s) to be offered

EFB 797 Graduate Seminar in Ecology or Evolutionary Biology
EFB 298 Research Internship
EFB 498 Independent Research
EFB 899 Masters Experience
ESF 499 Honors Thesis

b. Proposed research activity

Use of mycorrhizal fungi to restore pine stands at Albany Pine Bush following removal of invasive locust.
Assessment of new transgenic lines for their ability to form mycorrhizal associations.
Continue work on NextGen sequencing experiments as part of McSten funding (assess fungal communities under nutrient addition experiments) – dig into bioinformatics with the data we generate.
Help my new graduate student Taylor Patterson initiate his research program.

c. University, professional society, and public service

EFB P&T Committee
ARB – EFB representative

Strategic Planning: What are Earth's Species and Dynamics committee

Mycorrhiza Editorial Board

Ad hoc reviewer for various journals and funding agencies

Mycorrhiza Editorial Board

Ad hoc reviewer for various journals and funding agencies

Service on graduate committees

Mycorrhizal colonization and nutrient uptake of American beech and sugar maple following nutrient additions, with Ruth Yanai and Jerome Barner.

On numerous graduate steering committees.