


ANNUAL REPORT: June 1, 2012 – May 31, 2013
(i.e., Summer 2012, AY 2012-2013)
DEPARTMENT OF ENVIRONMENTAL AND FOREST BIOLOGY
SUNY-ESF

NAME: William A. Powell

I. INSTRUCTIONAL ACTIVITIES

1. Regular Course Offerings

Course No.	Title	Credit Hrs.	No. Students	No. of Lab. Sections
------------	-------	----------------	-----------------	-------------------------

SUMMER:

FALL:

EFB307	Principles of Genetics	3	184	
EFB307	Genetics Lab	1	180	9
BTC132	Orientation Seminar:BTC	1	24	

SPRING:

BTC425	Plant Biotechnology	3	13	1
EFB625	Plant Biotechnology	3	2	1

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. EFB courses currently listed with service-learning components include: 416/6/1, 486, 518, 521, 532, 446/646.

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

Course No.	Title	Credit Hrs.	No. Students
EFB298	Research Internship/EFB	6	5
BTC420	Internships in Biotechnology	15	5
BTC498	Research Problems/Biotech	18	7
EFB798	Research Problems/EFB	2	1
EFB899	Masters Thesis Research	6	2
EFB999	Dissertation Research	2	1

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

Hosted a High School intern, Brittany Welch, over the summer.

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 __21__ and unofficial advisor __59__ (as coordinator of Biotechnology major)___

B. Graduate Students: (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

1. Kristen Russell Steward, MS, started August 2010 (first under MPS and changed to MS in fall 2012)
2. Dale R. Warner, MS, started August 2012.

CO-MAJOR PROFESSOR

1. Allison Oakes, PhD, (with Dr. Maynard), started May 2009

MEMBER, STEERING COMMITTEE (other than those listed above)

- 1.. Arnold Salazar, Ph.D., started 2007; graduated Spring 2013
2. WenJun Cai, MS, started Spring 2013
3. Marian Orlousky, MPS, started 2009
4. Jeremy Dicensa, MS, started 2011; graduate Fall 2012
5. Samuel Tourtellot, MS, started 2009?; graduated Spring 2013

CHAIRMAN OR READER ON THESIS EXAMS, ETC.

1. Adam Hoffman (PhD candidacy exam, Examiner)

III. RESEARCH COMPLETED OR UNDERWAY

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

Continuing research to develop DED and Elm Yellows resistant American elm. Currently unfunded. Approximately 1% of time.

Research using *Bacillus amyloliquefaciens* isolated as a lab contaminate but proved to inhibit fungal growth. This preliminary research lead to a seed grant mentioned in next section. Approximately 1% of time.

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)

1. **New.** SUNY-RF Seed grant program, Protecting Trees from Diseases with *Bacillus amyloliquefaciens*. \$8,000 (5/13/13-5/12/14). PI with Dr. Maynard and Andy Newhouse Co-PIs.
2. **New.** The New York Chapter of The American Chestnut Foundation. Getting Events in the Ground and Tested. \$210,000 (8/1/12-7/31/15). Co-PI with Dr. Maynard as PI.
3. **New.** Forest Health Initiative. Phase II: Base Funding Level - Transgenic American Chestnut. \$87,500 (1/1/13 – 12/31/13) PI with Dr. Maynard Co-PI (Possible extension and increases in following year)
4. **New.** The American chestnut Foundation. Preservation and multiplication of elite backcross American chestnut hybrids by micropropagation. \$2,700 (9/1/12 – 10/1/13) Allison Oakes PI, myself and Dr. Maynard Co-PIs
5. USDA-Biotechnology Risk Assessment Grant program (BRAG), Evaluating Environmental Impacts Of Maturing Transgenic American Chestnut Trees Relative To Chestnut Trees Produced By Conventional Breeding. \$500,000 (9/1/12-8/31/14). PI with co-PIs, Dr. Maynard, Dr. Parry, Dr. Briggs, Dr. Nowak, and Dr Tschaplinski (ORNL)

The grants below have either ended this year or have no-cost extensions to finish the research with the small amounts remaining.

6. The New York Chapter of The American Chestnut Foundation. Supplemental grant for technician support for Chestnut research. \$20,000 (1/1/11-12/31/13). PI with Dr. Maynard as co-PI.
 7. Forest Health Initiative. Supplemental funding to develop an early blight resistance-screening assay for American chestnut. \$105,000 (7/1/10 – 6/30/12). PI with Dr. Maynard as Co-PI. **(Ended)**
 8. ArborGen LLC. Transformation of American chestnut with genes encoding transcription factors. \$20,000 (1/1/11-12/31/13) PI with Dr. Maynard as Co-PI. Another year of 10 years of support beginning in 2002 totaling \$500,000.
 9. Forest Health Initiative. First and second-generation transgenic American chestnut trees. \$900,000 (8/1/09 – 7/31/12). PI with Dr. Maynard as Co-PI. Currently supporting 2 MS students. This is our part of a multi-institutional grant totaling \$5.2 million. Opportunity to renew an additional three years if progress is sufficient. **(Ended, current continuation is in #3 above)**
 10. The New York Chapter of The American Chestnut Foundation. Testing Transgenic Events for Gene Copy Number, Gene Expression, and Blight Resistance. \$100,000 (5/08-12/31/12). PI with Dr. Maynard as co-PI. Supports summer graduate student in my lab and a technician. **(Ended)**
 11. The New York Chapter of The American Chestnut Foundation. Regenerating Transformation Events into Whole Plants and Expansion of Field Trials. \$300,000 (5/08-12/31/13). Co-PI with Dr. Maynard, PI. This is in addition to the grant above. It will support a technician in Dr. Maynard's lab, a summer graduate student in my lab, and hourly undergraduate students for field research.
2. Research Proposals pending (include information as in B.1., above).
1. USDA AFRI. Elucidating the Mechanism for Enhanced Pathogen Resistance in American Chestnut Using an Oxalate Oxidase Transgene. \$500,000. 10/1/13-9/30/16. PI with Dr. Maynard Co-PI
 2. USDA AFRI. Identification of genes and alleles for disease resistance in *Castanea* spp. - subcontract: chestnut transformations. \$100,000. 10/1/13-2/28/15. PI with Dr. Maynard Co-PI
3. Research Proposals submitted, but rejected (include information as in B.1., above)
1. Pre-proposal for the McIntire-Stennis Research Program. Gene promoter replacement, a unique method for enhancing pathogen resistance and other traits in tree species. \$90,000 (3 years) PI with Kathleen Baier and Dr. Maynard co-PIs.

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

Newhouse, AE, JE Spitzer, CA Maynard, **WA Powell**. 2013. Leaf Inoculation Assay as a Rapid Predictor of Chestnut Blight Susceptibility. Plant Disease (in review)

Zhang B, AD Oakes, AE Newhouse, KM Baier, CA Maynard and **WA Powell**. 2013. A threshold level of oxalate oxidase transgene expression reduces *Cryphonectria parasitica* - induced necrosis in a transgenic American chestnut (*Castanea dentata*) leaf bioassay. Transgenic Res (in press) (open access at <http://link.springer.com/article/10.1007%2Fs11248-013-9708-5#>)

Nelson, CD, **WA Powell**, CA Maynard, KM Baier, AE Newhouse, SA Merkle, CJ Nairn, L Kong, JE Carlson, C Addo-Quaye, ME Staton, FV Hebard, LL Georgi, AG Abbott, BA Olukolu. 2013. The Forest Health Initiative, American chestnut (*Castanea dentata*) as a Model for Forest Tree Restoration: Biological Research Program. Acta Hort (in press)

Oakes, AD, **WA Powell**, and CA Maynard. 2013. Doubling Acclimatization Survival of Micropropagated American Chestnuts with Darkness and Shortened Rooting Induction Time. J. Environ. Hort. 31(2):77-83

Baier, K.M., C.A. Maynard, and **W.A. Powell**. 2012. Early flowering in Chestnut species induced under high intensity, high dose light in growth chambers. Journal of The American Chestnut Foundation 26:8-10

B. Non-refereed Publications

Many "news" articles including:

New Scientist 6/25/12

The Wall Street Journal 8/20/12

Nature 10/3/12

The Economist 5/4/13

Any many local TV (YNN), newspapers, websites (like Northern Woodlands), and radio reports (like WRVO NPR news)

Note: I was just interviewed for **The Atlantic** (5/23//13) and Landscape Architecture Magazine (5/24/13)

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

Chestnut proposal workshop at Clemson, SC 8/2/12 – 8/3/12. Presented an update on our chestnut research to about 22 attendees.

Forest Health Initiative Board Meeting, Washington DC. 8/9/12 -8/10/12. Updated the board on our transgenic chestnut research progress and participated in discussions about restoration and regulation with researchers, NGO representatives, lawyers, and USDA, EPA, and FDA regulators.

Fifth International Chestnut Symposium, Shepherdstown, WV, My talk and talks I contributed are below:

Developing transgenic American chestnut (*Castanea dentata*) to enhance blight resistance,

W.A. Powell, C.A. Maynard, S.A. Merkle, C.J. Nairn, A.E. Newhouse, K.M. Baier, B. Zhang, L.C. Northern, K.M. D'Amico, A.D. Oakes, L.D. McGuigan

The Forest Health Initiative, American chestnut as a model for forest tree restoration: biological research program, **C.D. Nelson**, F.V. Hebard, L.L. Georgi, S. Fitzsimmons, T. Zhebenteyayeva, M.E. Staton, P. Sisco,

C.A. Maynard, C.J. Nairn, S.A. Merkle, W.A. Powell, J.E. Carlson, and A.G. Abbott

Scaling up somatic embryogenesis and gene transfer to help restore the American chestnut. S.A. Merkle, C.J. Nairn, W.A. Powell, L. Kong, A.R. Tull, P.M. Montello, H.J. Gladfelter, H. Houke and **C.D. Nelson**

The American Chestnut Foundation's Board and Annual Meeting, Asheville, NC. 10/18/12 – 10/21/12. Four posters presented:

1. Enhancing blight resistance in American chestnut using an oxalate oxidase gene from wheat. W.A. Powell, A.E. Newhouse, B. Zhang, K.M. Baier, L.D. McGuigan, A.D. Oakes, H. Liang, W. Rottmann, & C.A. Maynard
2. Detached Leaf Assay: Quick Screen for Blight Susceptibility in Transgenic American Chestnuts. Andrew E Newhouse, Charles A Maynard, and William A Powell
3. Assessing Ectomycorrhizal Associations on Transgenic American Chestnut Compared to the Wild-Type, a Conventionally-Bred Hybrid, and Related *Fagaceae* Species. Katherine M D'Amico, Charles A Maynard, Thomas R Horton, William A Powell
4. Introducing FT1, an Early Flowering Gene, into American Chestnut as a Tool for Accelerated Breeding. L.C. Northern, A.D. Oakes, K.M. Baier, A.E. Newhouse, C.A. Maynard, and W.A. Powell

National Geographic "de-extinction" workshop, Washington DC, 10/22/12-10/25/12. New York State American Chestnut Research and Restoration Program at SUNY-ESF. Note: **This presentation lead to the TEDx talk later.**

The New Chapter of The American Chestnut Foundation Annual meeting, which we also hosted at SUNY-ESF, Syracuse. 10/26/12 – 10/27/12. American Chestnut Research and Restoration Project at SUNY-ESF. **Gave the first announcement that we achieved enhanced blight resistance I our transgenic American chestnut trees.**

Invited speaker, **TEDx DeExtinction, National Geographic**, Washington DC. 3/14/13 – 3/15/13. Reviving the American forest with the American chestnut. This TEDx talk was with an audience of over 300 in the auditorium and a live feed to over 3000 viewers on the web. The TEDx talk is on YouTube at <http://www.youtube.com/watch?v=WYHQDLCmgyg&noredirect=1> and so far has over 2000 views.

Invited speaker at annual meeting of the Pennsylvania chapter of The American Chestnut Foundation. Hershey, PA. 4/5/13- 4/7/13. American Chestnut Research and Restoration Project at SUNY-ESF. Approximately 40 attending.

CNY Biotechnology Symposium 2013. Syracuse, NY. 5/17/13. Chaired the Agricultural Biotechnology Session. Invited Speaker: Enhancing blight resistance in American chestnut. Approximately 30 attending.

Invited speaker at the IUFRO Tree Biotechnology 2013 conference. Asheville, NC. 5/26/13 – 6/1/13. Transgenics or cisgenics, which will save the American chestnut?

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

Alumni Tours of chestnut plantings at the Lafayette Road Experiment Station. 10/6/12

Invited speaker, Asa Gray Biological Seminar Series, Utica College, NY. 12/3/12. American Chestnut Research and Restoration Project at SUNY-ESF.

Leaf Assay Workshop. 3/28/13. We hosted a leaf assay workshop on the ESF campus where we trained members of The American Chestnut Foundation on how to perform a leaf assay, developed in our lab, that helps determine the level of blight resistance. Six people attended our workshop and now will be able train the members in their state chapters.

Invited Speaker, SUNY Cortland biology lecture series. Cortland, NY. 4/8/13. "Where there be mountains, there be

chestnuts.” Approximately 30 attended.

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.

Hosted an USDA APIS BRS workshop on biotechnology permits and BQMS at the ESF campus (7/16 – 7/17/12) 14 attended plus 4 representatives from the USDA.

Advisor to the NY chapter of The American Chestnut Foundation

Science advisory board member of the national American Chestnut Foundation

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

American Phytopathological Society

American Association for the Advancement of Science

3. Other Professional Activities

a. Editorial activity

Journal (s)

Other (books, symposia, etc.)

Responsibility

b. Reviewer

Journal(s)

Tree Physiology

Tree Genetics and Genomes

ISHS Acta Horticulturae

No. of manuscripts

1

2

2

Agency

No. of proposals

Other

c. Participation (workshops, symposia, etc.)

Name of workshop, etc.

Date

Place

- 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 representative on ARB building Committee

Coordinator for the undergraduate Biotechnology major

Awards Ceremony: Gave the Distinguished Scholar in Biotechnology.

Represented the Biotechnology major at the Spring Open house.

B. College-level

Director of the Council on Biotechnology in Forestry

IBC (Institutional Biosafety Committee) member

C. University-wide, including Research Foundation

- D. Foreign Travel (Where, When, Purpose)

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 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, which I'll continue to award based on your contributions to the department and college this reporting period.

The most significant accomplishment this year came from our field trials of two-year-old transgenic American chestnut trees that express an oxalate oxidase enzyme. We were able to show for the first time that it is possible to enhance resistance to chestnut blight. This is the culmination of 23 years worth of research by myself, Dr. Maynard, and our excellent research team. But this isn't the most exciting result. The 'Darling 4' trees tested in the field demonstrated significantly enhanced resistance compared to wild-type American chestnut trees, but still not quite as high as Chinese chestnut trees, and their smaller branches are still susceptible to girdling. The good news is that seven of our newer tree lines, 'Darlings 2, 11, 13, 18, 23, 24, and 311', planted in the field this spring make much more of the oxalate oxidase (OxO) than 'Darling 4' and, in leaf assays, appear to be even more resistant than Chinese chestnut. We still need to grow these for two to three years so that field assays can confirm these results, but these American chestnut trees are looking very promising. There is still much work to be done. The next step is to petition the regulatory agencies for non-regulated status, a complicated process that can take 3 years or more, depending on help and funding support. But once the trees are deregulated, they can then be used freely in a restoration program that would return this keystone species to the forests. In addition, we are continuing work to find additional genes to stack with the OxO gene to ensure sustainable resistance. This year, using leaf assays of transgenic American chestnut, we have identified two genes from Chinese chestnut, a laccase-like gene and a proline-rich protein gene, that enhance blight resistance to an intermediate level. We are now making pyramidal vectors to put these paired genes into the

next generation of trees. So there is plenty of work to do, but we have surpassed the biggest hurdle, proving we can enhance resistance, during this past year.

These results described and the chestnut research in general has had a significant impact on our students, department and college, and myself professionally. This has led to a National Geographic sponsored TEDx talk and many articles in significant publications such as The Wall Street Journal, The Economist, The Atlantic, and Nature, as well as news reports on NPR. This enhances the reputation of our department and college and will help attract future students. This research has brought close to \$5 million of research to the college since the beginning of the chestnut project in 1990, which has supported and was used to train visiting scientists, postdocs, graduate students, undergraduate students, and even high school students. Professionally, I have learned to be a much more effective speaker at all levels, from giving talks to scientists and to the general public. The key now is to ride this wave of success to continually benefit our college, students, and the environment. It would be very easy to have a gap in funding or support that could make the project collapse by losing some of our highly trained professionals or campus research space. This is not expected to happen as long as we continue to have the full support of ESF.

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 2012

a. Course(s) to be offered

I will continue to offer research projects at the graduate and undergraduate levels and plan on having two high school interns.

b. Proposed research activity

I will continue to focus the chestnut research including the new breeding component added last year to increase the genetic diversity of our blight resistance enhanced, transgenic American chestnut trees.

c. University, professional society, and public service

Same high standards as before.

2. Fall Semester 2011

a. Course(s) to be offered

Principles of Genetics & Genetics Lab; Freshman Seminar for Biotech majors; Guest lectures as before.

b. Proposed research activity

Same high standards as before focusing on chestnut.

c. University, Professional society, and public service

Same high standards as before.

3. Spring Semester 2012 –

a. Course(s) to be offered

Plant Biotechnology

b. Proposed research activity

I will continue all my research as before

c. University, professional society, and public service
as before