

SEA GRANT PROJECT SUMMARY FORM 90-2 DEVELOPMENT PROPOSAL

- (1) INSTITUTION: Purdue University (1a) ICODE: 10022369
(2) TITLE: Evaluation of Phosphorus Loading Following a Manure Spill and an In-Stream Sediment Amendment to Reduce Phosphorus Desorption
(3) PROJECT NUMBER: (4) REVISION DATE:
(5) PROJECT STATUS: (6) INITIATION DATE: 9/30/09
(7) COMPLETION DATE: 9/30/10
(8) SUB PROGRAM:
- (9) PRINCIPAL INVESTIGATOR: S. Armstrong (9a) EFFORT: 95%
(9b) AFFILIATION: School of Agriculture, Purdue University
(9c) AFFILIATION CODE:
- (10) CO-PRINCIPAL INVESTIGATOR: Phillip Owens (10a) EFFORT: 5%
(10b) AFFILIATION: School of Agriculture, Purdue University
(10c) AFFILIATION CODE:
- (11) ASSOCIATE INVESTIGATOR 1: (11a) EFFORT:
(11b) AFFILIATION:
(11c) AFFILIATION CODE:
- (12) ASSOCIATE INVESTIGATOR 2: (12a) EFFORT:
(12b) AFFILIATION:
(12c) AFFILIATION CODE:
- (13) S.G. FUNDS: \$6,000 (14) STATE MATCHING FUNDS:
(15) LAST YEAR'S SG FUNDS: (16) LAST YEAR'S MATCHING FUNDS:
(17) PASS-THROUGH FUNDS: (18) LAST YEAR'S PASS-THROUGH FUNDS:
(19) RELATED PROJECTS:
(20) PARENT PROJECTS:
(21) SEA GRANT STRATEGIC PLAN CLASSIFICATION: Water Quality 2009-10

(22) OBJECTIVES: The goals of this research are to advance the decision making of manure spill first responders through the elucidation P and N dynamics within a fluvial system during and after a manure spill and to evaluate the effectiveness of the current manure spill remediation plans to reduce P and N desorption following a manure spill. In addition, we plan to develop supplemental in-stream chemical treatments that will mitigate phosphorus (P) and nitrogen (N) transport downstream following manure spills that reach fluvial systems. Therefore, the objectives this study are (i) to develop a comprehensive understanding of P partitioning between fluvial sediments and the overlying water column during and following manure spills using circulated and uncirculated manure spill simulations; (ii) to determine the volume of subsequent flow that would remediate the P concentration of the water column below the United State

Environmental Protection Agency (USEPA) nutrient criteria (0.076 mg L^{-1}) for rivers and streams following a manure spill (iii) to determine adequate application rates of chemical amendments [$\text{Al}_2(\text{SO}_4)_3 \cdot 14\text{H}_2\text{O}$] (alum) and CaCO_3 for fluvial sediments with different particle size distributions and P concentrations; (iv) to evaluate the effectiveness of alum with CaCO_3 as a sediment amendment to minimize downstream P loading following a manure spill.

(23) PROBLEM:

(24) RATIONALE (IMPACT OF PROBLEM): Within the last two decades the transition in livestock production technology and intensity has resulted in an increase in annual livestock production and a drastic decrease in number of livestock operations. Consequently, the susceptibility of current livestock operations to experience manure spills are far greater relative to livestock farms twenty years ago, due to the increased herd size per farm. Therefore, manure spills in agricultural communities have become a pervasive issue and have been a major contributor to hypoxia in the Gulf of Mexico and accelerated algae blooms in the Great lakes. For example, In Iowa, from 1992 to 2002, 304 manure spills were reported, in Ohio, 98 manure spills reached surface waters in a 3 year span (2000-2003), and in Illinois, a 1998 survey concluded that 15 of 24 lagoon reservoirs were illegally discharging animal waste to surface waters. Furthermore, manure spills have lead to the catastrophic contributions of nutrients to ground waters, human health issues, and large fish kills.

(25) METHODOLOGY: Objectives 1 and 2 of this study have been completed; however, funding from this opportunity would improve the comprehensive application of the study by aiding in the completion of objectives 3 and 4. In order to understand the partitioning of P and N in fluvial system during and after a manure spill, we constructed stream simulators ($0.75\text{m} \times 0.23\text{m}$) that were used to conduct manure spill simulations under base flow conditions. Sediments used in the spill simulations were collected from two drainage ditches within the Cedar Creek subwatershed of the St. Joseph River watershed located in Northeast Indiana. Three sampling locations along two tile fed agricultural drainage ditches captured differences in sediment particle size distribution, physiochemical properties, and contributing drainage area. The manure spill simulations were conducted in two phases, adsorption and desorption. The adsorption phase consisted of packing sediments in the stream simulator to a depth of 2 cm, exposing sediments to 23 hr of circulated flow contaminated with swine manure, and sampling the water column every 1 hr to evaluate the fate of P and N with time. In addition, the adsorption phase of the manure spill simulation was employed to determine the contaminate depth of P and N following a manure spill. To determine the effectiveness of the current remediation method to mitigate P and N desorption in subsequent flow, the current manure spill clean-up method was simulated upon completion of the adsorption phase. The contaminated water column was removed from the stream simulator using a peristaltic pump. Phosphorus and nitrogen desorption from manure exposed sediments were evaluated using two different methods flow, circulated and uncirculated. The 23 hr circulated flow was conducted to determine differences in P and N desorption from sediments vary in particle size distribution and the 12 hr uncirculated flow determined differences in the volume of water needed to remediate manure contaminated sediments below the USEPA total P standard.

Batch experiments will be conducted to determine an adequate application rate of alum with CaCO_3 for P enriched sediments with different particle size distributions. All sediments will be contaminated by shaking sediments with swine manure for 24 hr, centrifuged for 5 min at $9820 \times g$, and extracted with a 2 mM CaCl_2 solution that simulates the salt content of the natural ditch water. In addition to a control, sediments will be amended with alum (alone), CaCO_3 (alone), and both alum and CaCO_3 at application rates that yield 0.25:1, 0.5:1, and 1:1 molar ratios of Al to soluble P in the contaminated sediments. Amended Sediments will be shaken for 1 hr with 100 ml of simulated ditch water, extracted, and analyzed for soluble P (desorbed fraction) to determine the effectiveness of each treatment to mitigate P desorption and impact of each treatment of the water column chemistry. The most effective treatment rates, as a result of the last experiment, will be applied to contaminated sediment following an adsorption phase manure spill experiment and evaluated in flow during desorption phase experiments.

(26) EXPECTED RESULTS AND IMPACT:

SEA GRANT PROJECT SUMMARY FORM

(Continued)

PAPERWORK REDUCTION ACT, PRIVACY ACT, AND PUBLIC BURDEN

NOAA's National Sea Grant College Program exists to increase the understanding, assessment, development, utilization, and conservation of the Nation's ocean, coastal, and Great Lakes resources. It does this by providing grant monies to promote a strong educational base, responsive research, and training. The information requested on this form is required in order to be considered for an award under the authority of the National Sea Grant College Act, as amended. The Project Summary provides information on the project status (for continuing projects applying for additional funding), the investigators and their level of effort, the objectives and methodology of the project, and similar summary information. The information requested may be disclosed to qualified reviewers and staff assistants as part of the application review process; to applicant institutions/grantees to provide or obtain data regarding the application review process, award decisions, or the administration of awards; to government contractors, experts, volunteers and researchers as necessary to complete assigned work; to other government agencies needing information as part of the review process or in order to coordinate programs; and to another Federal agency, court or party in a court or Federal administrative proceeding if the Government is a party. Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

Public reporting burden for this collection of information is estimated to average 20 minutes per response, including the time necessary for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions to reduce this burden, to National Sea Grant College Program, R/SG, NOAA, 1315 East-West Highway, Silver Spring, MD 20910 (Attn: Paperwork Reduction Act - Dr. Fritz Schuler).

SEA GRANT BUDGET FORM 90-4

| | | | | |
|---|----------------------|-------------------------|--|-----------------------|
| GRANTEE: Purdue University | | | GRANT/PROJECT NO.: MP-02-10 | |
| PRINCIPAL INVESTIGATOR: Shalamar Armstrong Co-PI: Phillip Owens | | | DURATION: 12months Cumm 10/1/09-9/30/10 | |
| A. SALARIES AND WAGES: | | | man-months | |
| | No. of People | Amount of Effort | Sea Grant Funds | Matching Funds |
| 1. Senior Personnel | | | | |
| a. (Co) Principal Investigator | 0 | 0 | 0 | 0 |
| b. Associate (Faculty or Staff): | 0 | 0 | 0 | 0 |
| Subtotal: | 0 | 0 | 0 | 0 |
| 2. Other Personnel | | | | |
| a. Professionals: | 0 | 0 | 0 | 0 |
| b. Research Associates: | 0 | 0 | 0 | 0 |
| c. Res. Asst./Grad Students: | 0 | 0 | 0 | 0 |
| d. Prof. School Students: | 0 | 0 | 0 | 0 |
| e. Pre-Bachelor Student(s): | 0 | 0 | 0 | 0 |
| f. Secretarial-Clerical: | 0 | 0 | 0 | 0 |
| g. Technicians: | 0 | 0 | 0 | 0 |
| h. Other: | 0 | 0 | 0 | 0 |
| Total Salaries and Wages | 0 | 0 | 0 | 0 |
| B. FRINGE BENEFITS: | | | 0 | 0 |
| Total Personnel (A and B) | | | 0 | 0 |
| C. PERMANENT EQUIPMENT: | | | 0 | 0 |
| D. EXPENDABLE SUPPLIES AND EQUIPMENT: | | | 0 | 0 |
| E. TRAVEL: | | | | |
| 1. Domestic | | | 1000 | 0 |
| 2. International | | | 0 | 0 |
| Total Travel | | | 1000 | 0 |
| F. PUBLICATION AND DOCUMENTATION COSTS: | | | 0 | 0 |
| G. OTHER COSTS: | | | | |
| Communications | | | 0 | 0 |
| Copying | | | 500 | 0 |
| Postage/Mailing | | | 0 | 0 |
| Contractual Services | | | 0 | 0 |
| Membership/Sponsorship Fees | | | 0 | 0 |
| Training/Continuing Education | | | 0 | 0 |
| Project/Person Recognition | | | 0 | 0 |
| Housing/Board/Research | | | 0 | 0 |
| Tuition Remission | | | 0 | 0 |
| Other: 10. Instrumentation | | | 850 | 0 |
| Other: 11. Lab Supplies | | | 2062 | 0 |
| Total Other Costs: | | | 3412 | 0 |
| TOTAL DIRECT COST (A through G): | | | 4412 | 0 |
| INDIRECT COST | | | | |
| On Campus 36.00% | | | 1588 | 0 |
| Off Campus 0.00% | | | 0 | 0 |
| Total Indirect Cost: | | | | |
| TOTAL COSTS | | | 6000 | 0 |

Budget Narrative

Salary and Wages, Fringe Benefits: No funds were requested for salary, wages and fringe benefits.

Permanent Equipment: No permanent equipment with a cost greater than \$5,000 will be purchased

Other Operating Expenses

Instrumentation includes:

- Ion Selective Electrodes- for the determination of ammonium and phosphate in the water column without intensive sample collection.
 - NH₄ ion electrode, unit:1, unit price \$446.00
 - Phosphate electrode, unit :1, unit price \$404.00

Lab supplies & Expenses include:

- Computer for simultaneous data collection, data analysis, and publication and presentation preparation.
 - Computer, unit: 1, unit price \$650.00
 - Materials needed to perform routine water and soil analysis such as extraction chemicals, sample bottles, filter paper, and syringes will require the remainder of funds allocated for lab supplies and expenses \$ 1,412.00.

The total cost of Expendable supplies and equipment will not exceed \$2,912.

Travel: The requested travel cost of \$1,000.00 will be required for trips to the study area for sediment samples and stream data collection. Four trips to the study area, approximately 120 miles from the lab location and at a travel cost of approximately \$50.00 per round trip, will result in \$200.00 for sample collection travel. The remainder of the travel funds will be used for travel to professional scientific meetings to present the research from this proposal.

Publication Cost: Funds totaling \$500 are requested for publication in refereed scientific journals. The titles of the proposed manuscripts are:

- Phosphorus and nitrogen contamination depth determination using fluvarium techniques.
- In-flow evaluation of sediment chemical treatments as a supplemental manure spill remediation method.

Other Cost: Not applicable

Indirect Cost: A copy of the approval rate will be provided.

August 06, 2008

RE: Shalamar Armstrong, Sea Grant Proposal

Dear Committee,

I would like to offer my strongest support for the proposal titled "Evaluation of Phosphorus Loading Following a Manure Spill and an In-Stream Sediment Amendment to Reduce Phosphorus Desorption" submitted by Shalamar Armstrong. This proposal focuses on a water quality issue that affects the Great Lakes Region yet largely goes unnoticed. This Ph.D. student has a passion for his research and continues to strive for a better understanding of this issue. He monitors the newspapers daily to determine if a manure spill has occurred. When he finds one he will leave campus immediately to get water samples to respond as quickly as possible.

I met Shalamar while he was a M.S. student at Alabama A&M University working on a collaborative research project with the Waste Management and Forage Research Unit at Mississippi State University. He worked in my laboratory for two summers sampling and analyzing samples. When I arrived at Purdue University in 2005, I recruited him as a Ph.D. student. His intelligence, work ethic, natural curiosity and positive attitude were all desirable traits I was looking for in a graduate student.

Shalamar has demonstrated his academic credibility and his desire to learn by being awarded the two research internships with Dr. William Pan at Washington State University and Dr. Rattan Lal at Ohio State University. Both are leaders in the field of carbon sequestration related to soils and agriculture. These experiences broadened his background and prepared him well for a research career. Shalamar maintained a high GPA at Southern University and Alabama A&M University and filled leadership roles within the Departments and the Colleges which demonstrated leadership amongst his peers and his dedication to becoming a professional.

Mr. Armstrong has been an asset to my program since he arrived in January, 2006. He has maintained at 3.6 GPA while working 30+ hours in the laboratory each week. He has been developing preliminary data for his research project to determine fate and transport of nutrients, derived from animal waste spills, within fluvial sediments. My philosophy for Ph.D. students is to give them a problem and allow them to develop their own ideas about scientific questions and methods to resolve these problems. Shalamar has truly exceeded my expectations and has developed this proposal with little outside input from the faculty. His research questions within his proposal that would elucidate speciation and transport mechanisms of nutrient sorption and fate in fluvial sediments following a manure spill. When these spills occur, they immediately impact the water quality; however, the lasting impacts are not yet know. With support of this proposal, we can elucidate some of the impacts on stream sediments to provide better management practices.



College of Agriculture

For all of the aforementioned reasons, I strongly recommend Mr. Armstrong for funding of this proposal. He has a unique desire to learn and would utilize this opportunity to develop multi-disciplinary research to provide much needed tools for accidental manure spills, further his research career and broaden his perspectives. I have no doubt that Mr. Armstrong will have a wonderful career and will provide leadership in a grossly underrepresented African American minority community within the water quality area of science.

Sincerely,

A handwritten signature in cursive script that reads "Phillip R. Owens". The signature is written in black ink and is positioned above the typed name.

Phillip R. Owens,
Assistant Professor, Department of Agronomy

SHALAMAR ARMSTRONG

2334 Hopkins Dr.
West Lafayette, Indiana 47906
Work Phone: (765) 494-5158; Home Phone: (225) 921-1962
Sarmstro@purdue.edu

Education

Ph. D. Candidate **Agronomy** **December 2009**
Purdue University, West Lafayette, IN

- Dissertation Title: Phosphorus and Nitrogen Portioning in a Fluvial System Before and After a Manure Spill and the Evaluation of an Alternative In-Stream Manure Spill Remediation Method
- Current GPA: 3.58

Master of Science **Environmental Soil Science** **December 2005**
Alabama A&M University, Normal, AL

- Thesis title: Comparison of Broadcast and Band Application of Broiler Litter On Cotton
- Cumulative GPA: 3.74

Bachelor of Science **Plant and Soil Science** **December 2001**
Southern University, Baton Rouge, LA

- Cumulative GPA : 3.29

Work Experience

Graduate Teaching Assistant **Lead Teacher: Dr. George Van Scoyoc** **August 2008-Present**
Purdue University; Department of Agronomy

- Lecture, tutor, and guide undergraduate students to develop a comprehensive understanding of soils science within the course objectives of Agronomy 255, Introductory Soil Science.

Graduate Research Assistant **January 2006-Present**
USDA-ARS National Soil Erosion Research Laboratory; West Lafayette, IN

- Developed soil and water sample protocol including collection, preparation, and chemical analysis of Conservation Effects Assessment Program (CEAP) watershed research.

Student Trainee Agricultural Scientist **May 2003-December 2005**
USDA-ARS Waste Management and Forage Research Unit; Mississippi State, MS

- Completed collaborative research between Alabama A&M University and USDA-ARS Waste Management and Forage Research Unit.
- Provided technical and laboratory assistance in ongoing waste management research experiments and developed soil and plant sampling method to evaluate plant nutrient uptake and soil nutrient distribution after fertilizer application.

Biological Technician **January 2002- December 2002**
USDA-ARS Soil and Water Research Unit; Baton Rouge, LA

- Supported agricultural drainage research experiments through collecting, preparing, and evaluating soil and water samples.
- Assisted in the implementation automatic water samplers, flow and velocity monitors, subsurface drainage systems and field flumes. Collected and statistically analyzed experimental data.

Research Internships

Washington State University, Department of Crop & Soil Science, Pullman, WA **Summer 2000**

- Mentor: Dr. William Pan: The Effect of Different Crops and Agricultural Systems on Carbon Sequestration.

The Ohio State University, School of Natural Resources, Columbus, Ohio **Summer 2001**

- Mentor: Dr. Rattan Lal: The Effect of Cropping Systems on Soil Physical Properties.

Publications

Thesis:

Armstrong, S. D., 2005. Comparison of sub-surface band and surface broadcast application of broiler litter on cotton. M.A. thesis. Alabama Agricultural and Mechanical University, Huntsville AL.

Refereed Publications:

Haile, T., **S.D. Armstrong**, T.R. Way, D.E. Rowe, K. R. Sistani. 2009. Cotton response to poultry litter applied by subsurface banding relative to surface broadcasting. *Soil Sci. Soc. Am. J.* 73:384-389.

Armstrong, S.D., D. R. Smith, P. R. Owens, B., Joern, and C. Williams. 2009. Manure spills in streams: current practices and remediation methods to minimize water quality degradation - A Review. *Sustainable Agriculture* (Accepted for publication).

Armstrong, S. D., D. R. Smith, and P. R. Owens. 2007. Strategies to reduce nitrogen and phosphorus losses from land applied animal manure. *Water Practice* 1:1-13.

Publications in Progress:

Owens, P.R., R. A. Cohen, D. R. Smith, **S.D. Armstrong**, J. Iqbal, J. Read. 2009 Spatial distribution of soil phosphorus and copper following long-term broiler litter applications. *Environmental Pollution* (Submitted to the *Journal of Environmental Pollution* Feb. 2009).

Armstrong, S. D., D. R. Smith, B. C. Joern, P. R. Owens, A. B. Leytem, C. H. Huang, and L. Adeola. Transport and fate of phosphorus during and after manure spill simulations. (Submitted to *Journal of Environmental Quality* June 2009)

Armstrong, S. D., D. R. Smith, B. C. Joern, P. R. Owens, A. B. Leytem, C. H. Huang, and L. Adeola. Adsorption and desorption of ammonium from fluvial sediments during and following a swine manure spill. (Submitted to *Journal of Soil and Water Conservation* by Aug., 2009)

Armstrong, S.D., Tewolde, H., T. Way, K. R. Sistani, and D. E. Rowe. 2009. Subsurface band and surface broadcast applications of broiler litter effect on soil nitrogen spatial distribution and cotton nitrogen uptake (Submitted to *SSJA* by Aug., 2009).

Recent Abstracts:

Armstrong, S. D., D. R. Smith, B. C. Joern, P. R. Owens, A. B. Leytem, C. H. Huang, and L. Adeola. 2009 Phosphorus adsorption and desorption during and after a manure spill simulation. *In Annual Meeting Abstracts. Sera-17 and The Great Lakes Phosphorus Forum.*

Armstrong, S.D., Smith, D.R., Owens, P.R., Joern, B.C., Huang, C. 2008. Impacts of a swine manure spill on phosphorus partitioning in a fluvial system: Evaluation of an alternative Manure spill remediation method. *In Annual Meetings Abstracts [CD-ROM]. American Society of Limnology and Oceanography, Society of Canadian Limnologists, North American Benthological Society.*

Newsletter:

Armstrong, S. D., Phillip Owens, Javed Iqbal and Douglas Smith. Spatial variability of nutrients in soils following long-term poultry litter applications. 2006. Site Specific Management Center Newsletter.

http://www.agriculture.purdue.edu/ssmc/frames/ssmcnewsletter12_2006.pdf

Awards

- Nominated for The Research Student of the Year, (2009) Purdue University.
- Alliance Graduate Education and Professoriate Scholarship recipient, (2009) Purdue University.
- Recipient of the Alliance Graduate Education and Professoriate Scholarship Research and Travel Grant, (2009) Purdue University
- Recipient of the Purdue University Frederick N. Andrews Environmental Travel Grant (2008), Purdue University.
- Agronomy Society of America environmental science graduate student poster contest winner (First place) (2007).
- Scarseth Travel Award (2007), Purdue University
- Graduate Student Fellowship Incentive Grant (2006), Purdue University
- Nominated for The Chancellor's List (2005), Alabama A&M University

Professional Organizations

- American Society of Agronomy
- North American Benthological Society

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|---|
| Shalamar Armstrong Unofficial Transcript of Graduate Education at Alabama A&M and Purdue University |
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STUDENT INFORMATION

Student Type: Continuing

Curriculum Information

Current Program

Doctor of Philosophy

Program: Agronomy-PHD
College: Graduate Studies
Campus: West Lafayette
Major: Agronomy

***Transcript type:EXTL External is NOT Official ***

DEGREE AWARDED

Sought: Doctor of Philosophy **Degree Date:**

Curriculum Information

Primary Degree

Program: Agronomy-PHD
College: Graduate Studies
Campus: West Lafayette
Major: Agronomy

TRANSFER CREDIT ACCEPTED BY INSTITUTION

1: Alabama Ag&Mech Univ Normal

| Subject | Course | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|---------------------------|-------|--------------|----------------|---|
| GRTR | 50000 | Sps 591 Grad Seminar | TR | 1.000 | 0.00 | |
| GRTR | 50000 | Sps 529 Statistics | TR | 3.000 | 0.00 | |
| GRTR | 50000 | Sps 539 Sas Programming | TR | 3.000 | 0.00 | |
| GRTR | 50000 | Sps 502 Scientific Writin | TR | 3.000 | 0.00 | |
| GRTR | 50000 | Sps 570 Soil Plant Water | TR | 4.000 | 0.00 | |
| GRTR | 50000 | Sps 563 Plant Nut & Water | TR | 3.000 | 0.00 | |
| GRTR | 50000 | Sps 552 Soil Fertility | TR | 3.000 | 0.00 | |
| GRTR | 50000 | Sps 560 Soil Chemistry | TR | 3.000 | 0.00 | |

| | | | | | |
|------|-------|---------------------------|----|-------|------|
| GRTR | 50000 | Sps 506 Soil Microbiology | TR | 4.000 | 0.00 |
| GRTR | 50000 | Sps 530 Prin Of Experimen | TR | 3.000 | 0.00 |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|---------------|--------------|--------------|-----------|----------------|------|
| Current Term: | 30.000 | 30.000 | 30.000 | 0.000 | 0.00 | 0.00 |

Unofficial Transcript

INSTITUTION CREDIT

Spring 2006

College: Graduate Studies

Major: Agronomy

Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|----------------------|-------|--------------|----------------|---|
| AGRY | 54000 | West Lafayette | GR | Soil Chemistry | A | 3.000 | 12.00 | |
| AGRY | 65000 | West Lafayette | GR | Clay Mineralogy | B | 4.000 | 12.00 | |
| AGRY | 65500 | West Lafayette | GR | Soil Genesis Classif | A | 3.000 | 12.00 | |
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 8.000 | 0.00 | I |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|---------------|--------------|--------------|-----------|----------------|------|
| Current Term: | 18.000 | 18.000 | 18.000 | 10.000 | 36.00 | 3.60 |
| Cumulative: | 18.000 | 18.000 | 18.000 | 10.000 | 36.00 | 3.60 |

Unofficial Transcript

Summer 2006

College: Graduate Studies

Major: Agronomy

Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|---------------------|-------|--------------|----------------|---|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 9.000 | 0.00 | I |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|--|---------------|--------------|--------------|-----------|----------------|-----|
|--|---------------|--------------|--------------|-----------|----------------|-----|

| | | | | | | |
|----------------------|--------|--------|--------|--------|-------|------|
| Current Term: | 9.000 | 9.000 | 9.000 | 0.000 | 0.00 | 0.00 |
| Cumulative: | 27.000 | 27.000 | 27.000 | 10.000 | 36.00 | 3.60 |

Unofficial Transcript

Fall 2006

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|---------------------|-------|--------------|----------------|---|
| AGRY | 56000 | West Lafayette | GR | Soil Physics | B | 3.000 | 9.00 | |
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 12.000 | 0.00 | I |
| STAT | 51200 | West Lafayette | GR | Appl Regr Analysis | B | 3.000 | 9.00 | |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|---------------|--------------|--------------|-----------|----------------|------|
| Current Term: | 18.000 | 18.000 | 18.000 | 6.000 | 18.00 | 3.00 |
| Cumulative: | 45.000 | 45.000 | 45.000 | 16.000 | 54.00 | 3.38 |

Unofficial Transcript

Spring 2007

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|-----------------------|-------|--------------|----------------|---|
| AGRY | 69600 | West Lafayette | GR | Agronomy Grad Seminar | A | 1.000 | 4.00 | |
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 14.000 | 0.00 | I |
| MA | 22300 | West Lafayette | GR | Intro Analysis I | P | 3.000 | 0.00 | |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|---------------|--------------|--------------|-----------|----------------|------|
| Current Term: | 18.000 | 18.000 | 18.000 | 1.000 | 4.00 | 4.00 |
| Cumulative: | 63.000 | 63.000 | 63.000 | 17.000 | 58.00 | 3.41 |

Unofficial Transcript

Summer 2007

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R | | | |
|----------------------|--------|----------------|-------|---------------------|-------|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 9.000 | 0.00 | I | | | |
| | | | | | | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
| Current Term: | | | | | | 9.000 | 9.000 | 9.000 | 0.000 | 0.00 | 0.00 |
| Cumulative: | | | | | | 72.000 | 72.000 | 72.000 | 17.000 | 58.00 | 3.41 |

Unofficial Transcript

Fall 2007

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R | | | |
|----------------------|--------|----------------|-------|------------------------|-------|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 12.000 | 0.00 | I | | | |
| EAS | 59100 | West Lafayette | GR | Writ Success Proposals | A | 3.000 | 12.00 | | | | |
| MA | 22400 | West Lafayette | GR | Intro Analysis II | P | 3.000 | 0.00 | | | | |
| | | | | | | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
| Current Term: | | | | | | 18.000 | 18.000 | 18.000 | 3.000 | 12.00 | 4.00 |
| Cumulative: | | | | | | 90.000 | 90.000 | 90.000 | 20.000 | 70.00 | 3.50 |

Unofficial Transcript

Spring 2008

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|--------|-------|-------|-------|--------------|----------------|---|
|---------|--------|--------|-------|-------|-------|--------------|----------------|---|

| | | | | | | | | |
|------|-------|----------------|----|------------------------|---|--------|-------|---|
| AGRY | 54400 | West Lafayette | GR | Environmt Organic Chem | A | 3.000 | 12.00 | |
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 11.000 | 0.00 | I |
| PHYS | 22000 | West Lafayette | GR | Gen Physics | P | 4.000 | 0.00 | |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
| Current Term: | 18.000 | 18.000 | 18.000 | 3.000 | 12.00 | 4.00 |
| Cumulative: | 108.000 | 108.000 | 108.000 | 23.000 | 82.00 | 3.57 |

Unofficial Transcript

Summer 2008

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|---------------------|-------|--------------|----------------|---|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 9.000 | 0.00 | I |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|----------------------|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
| Current Term: | 9.000 | 9.000 | 9.000 | 0.000 | 0.00 | 0.00 |
| Cumulative: | 117.000 | 117.000 | 117.000 | 23.000 | 82.00 | 3.57 |

Unofficial Transcript

Fall 2008

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R |
|---------|--------|----------------|-------|------------------------|-------|--------------|----------------|---|
| AGRY | 59600 | West Lafayette | GR | Professnl Presentation | A | 1.000 | 4.00 | |
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 13.000 | 0.00 | I |
| PHYS | 22100 | West Lafayette | GR | Gen Physics | P | 4.000 | 0.00 | |

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|--|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
|--|----------------------|---------------------|---------------------|------------------|-----------------------|------------|

| | | | | | | |
|----------------------|---------|---------|---------|--------|-------|------|
| Current Term: | 18.000 | 18.000 | 18.000 | 1.000 | 4.00 | 4.00 |
| Cumulative: | 135.000 | 135.000 | 135.000 | 24.000 | 86.00 | 3.58 |

Unofficial Transcript

Spring 2009

College: Graduate Studies
Major: Agronomy
Academic Standing: Continued Good Standing
Last Academic Standing: Continued Good Standing

| Subject | Course | Campus | Level | Title | Grade | Credit Hours | Quality Points | R | | | |
|----------------------|--------|----------------|-------|---------------------|-------|----------------------|---------------------|---------------------|------------------|-----------------------|------------|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | S | 14.000 | 0.00 | I | | | |
| CHM | 37200 | West Lafayette | GR | Physical Chemistry | C | 4.000 | 8.00 | | | | |
| | | | | | | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
| Current Term: | | | | | | 18.000 | 18.000 | 18.000 | 4.000 | 8.00 | 2.00 |
| Cumulative: | | | | | | 153.000 | 153.000 | 153.000 | 28.000 | 94.00 | 3.36 |

Unofficial Transcript

TRANSCRIPT TOTALS (GRADUATE) [-Top-](#)

| | Attempt Hours | Passed Hours | Earned Hours | GPA Hours | Quality Points | GPA |
|---------------------------|---------------|--------------|--------------|-----------|----------------|------|
| Total Institution: | 153.000 | 153.000 | 153.000 | 28.000 | 94.00 | 3.36 |
| Total Transfer: | 30.000 | 30.000 | 30.000 | 0.000 | 0.00 | 0.00 |
| Overall: | 183.000 | 183.000 | 183.000 | 28.000 | 94.00 | 3.36 |

Unofficial Transcript

COURSES IN PROGRESS

Summer 2009

College: Graduate Studies
Major: Agronomy

| Subject | Course | Campus | Level | Title | Credit Hours |
|---------|--------|----------------|-------|---------------------|--------------|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | 9.000 |

Unofficial Transcript

Fall 2009

College: Graduate Studies

Major: Agronomy

| Subject | Course | Campus | Level | Title | Credit Hours |
|----------------|---------------|-------------------|--------------|---------------------|---------------------|
| AGRY | 69900 | West Lafayette | GR | Research PhD Thesis | 18.000 |

Unofficial Transcript