

**PROGRAM OF RESEARCH EXPERIENCES FOR
UNDERGRADUATES (REU) AND GRADUATES
AT ALABAMA A&M UNIVERSITY AND
NANJING FORESTRY UNIVERSITY**

***Proceedings of the Student Research
&
Trip Reports
August 2013***



**Center for Forest Ecosystem Assessment
Department of Biological and Environmental Sciences
College of Agricultural, Life, and Natural Sciences**

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Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views neither of the National Science Foundation nor of the National Institute of Food and Agriculture.

**Research Experiences for Undergraduates and Graduates in
China**

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Alabama A&M University and Nanjing Forestry University

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REU students, mentors from AAMU and NFU, and NFU student mentors posing on Nanjing Forestry University campus, 2013. **Top row:** Jacob Drucker, Christopher Griffith, Jack Lee, (2) unknown NFU professors; **Middle row:** (1) unknown student mentor, Maya Rudolph, Jason Wang, (1) unknown professor, Dr. Gowang Liaw, (1) unknown professor, Dr. Yulong Ding, Abreeotta Williams, Michael Knotts; **Front row:** Gilda Naka, Melissa Dellatorre, Antionette Fowlkes, Tangelia Hatch, Jonjala Jackson, Dr. Elica Moss, Dr. Malinda Gilmore, (4) unknown student mentors.

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Preface

Alabama A&M University (AAMU) was awarded a three-year grant by the USDA-National Institute of Food and Agriculture (NIFA) International Science and Education Program (ISE) in 2009 (Grant number: 2009-51160-05462) to develop an international exchange program with China. The program is designed to strengthen AAMU's ability to develop globally competent students and faculty through collaborative partnerships with higher education institutions and research organizations in China. The program focuses on the fields of agricultural and environmental sciences. The exchange program also aims to enhance courses with international contexts to prepare and mentor students for international opportunities in agricultural and environmental sciences, as well as to add new dimensions to scientific research and teaching capabilities of AAMU faculty via exposure to international resources and technologies. Our primary Chinese partner for this program is Nanjing Forestry University (NFU), a comprehensive university with a tradition of forestry programs. In the summer of 2010 and 2011, a total of twenty-five students and faculty participated in this program and traveled to China. The development and the opportunities created by this program led to a new three-year program: Research Experiences for Undergraduates (REU) in China, funded by the National Science Foundation (NSF) in 2011 (Grant number: 106310). The goal of the REU program is to expose undergraduate students with an interest in pursuing a graduate research degree in science to hands-on research experiences. With two funding sources, we then created a jointed program "Research Experiences for Undergraduates and Graduates (REUG) in China" by using NIFA funding to support graduates and some faculty mentors. In the summer of 2012, we implemented this program with twelve students from six different institutions across USA and five faculty and staff members.

In the summer of 2013, ten undergraduate students from seven different institutions across the U.S. (including AAMU), three AAMU graduate students, and six faculty and staff participated the REUG program. The program started with a three day orientation to prepare for international travel. Once they arrived at China, students and faculty engaged in language, cultural, and history classes at NFU. Each student was then paired with mentors—including graduate students and faculty from both universities—with similar research interests to conduct a research project. The research projects included a diversity of subjects such as "Effect of Urbanization on the Environment and Local Avifauna of Nanjing", "Foraging Ecology of Bats in Developed and Forested Areas in Nanjing, Jiangsu, China", "Identification of Various Techniques to Identify Oxidative Damage in Bamboo Plants", "Comparative Analysis of Nitrification at Poplar and Metasequoia Plantations in Jiangsu Province," and "The Diversity of Herpetofauna in Cultivated Bamboo Stands and Forested Land in Wuyishan National Nature Reserve, China," among others. Students learned to design research, collect data, operate research equipment, analyze data, and communicate their research results with peers—some even with their newly learned Chinese language skills!

The team took a three-day field tour to northern Jiangsu Province, including the poplar tree plantation and industry base at Shiyang County. In the early 1980s, faculty from NFU helped to introduce a hybrid poplar (genus *Populus*, hybridized in part from eastern cottonwood originating in Mississippi), to Shiyang. Once one of the poorest counties in China because of its high human population density, shortage of natural resources, and frequent flooding, Sheyang's

economy has been transformed, and the poplar has played a major role in its economic growth. A visit to Dafeng National Milu Reserve demonstrated the initiative and interest of Chinese to recover and protect endangered species by setting aside lands necessary for the survival of a species of deer that is extinct in the wild, the Père David's deer (*Elaphurus davidianus*), known simply as *milu* in China. The Chinese are working diligently to increase the population of their small herd, to eventually release individuals back into the wild.

While at Nanjing, the AAMU team experienced the culture, people, and a whole host of foods that they never in their lives dreamed they would eat! They explored the city by foot, bus, taxi, and subway and became intimately familiar with the city in a way that tourists almost never experience when visiting a foreign land. Students climbed Purple Mountain; visited Dr. Sun Yat-sen's Mausoleum; observed as weavers created hand-made silk tapestries in the Jacquard Museum; paid tribute to the fallen victims of the massacre by the Japanese during World War II, as commemorated in the Nanjing Massacre Memorial Hall; posed with enormous hand-carved mythical figures at the Xiaoling Mausoleum of the Ming Dynasty; celebrated the Chinese traditional Dragon Boat Festival with a big crowd of locals and foreign visitors; and visited a wide variety of stunningly beautiful gardens.

During the time in China, the REUG students and faculty visited Xi'an. Xi'an is the capital of Shaanxi province, and a sub-provincial city in the People's Republic of China. One of the oldest cities in China, with more than 3,100 years of history, the city was known as Chang'an before the Ming Dynasty. Since the 1990s, as part of the economic revival of interior China especially for the central and northwest regions, the city of Xi'an has re-emerged as an important cultural, industrial and educational centre of the central-northwest region, with facilities for research and development, national security and China's space exploration program. It is now one of the most populous built-up areas in inland China with 7,168,005 inhabitants. While in X'ian, students and faculty had the opportunity to visit Northwest Agricultural and Forestry University (NAFU), where the REUG students participated in a graduation party with the university's graduating class. Concurrent with the team's visit to Xi'an, AAMU's own President, Dr. Andrew Hugine, Jr. and Dean of the College of Agricultural, Life, and Natural Sciences, Dr. Lloyd Walker, visited China to reinforce on-going partnerships and initiate new ones. The faculty was present for the formal signing of a Memorandum of Understanding (MOU) between NAFU and AAMU by the Presidents of both Universities. The group then visited the Terracotta Warrior museum, the most significant archaeological excavations of the 20th century. Life-sized terracotta figures of warriors and horses arranged in battle formations are the star features at the museum, replicas of what the Imperial Guard looked like in those days of pomp and vigour. We also visited the Shaanxi History Museum, which has collected over 370,000 precious relics which were unearthed in Shaanxi Province, including bronze wares, pottery figures, and mural paintings in Tang tombs.

The team had the opportunity to visit other major cities such as Shanghai, Beijing, and Yangzhou and witnessed the effects of dramatic economic development during last 30 years. In Shanghai, they walked along the Bund and viewed the City from the top floor of the Oriental Pearl Tower. From Nanjing, they travelled to Beijing on a high-speed train at over 300 miles per hour. There, they climbed the Great Wall, walked through the halls of the (once) Forbidden City and the Summer Palace, maneuvered through a crowded Tiananmen Square, and observed the mile-long line of people waiting to see Chairman Mao's body.

Upon returning to AAMU after six weeks abroad, each student completed two reports, research and trip/cultural, and created an individual website. Students had the opportunity to talk about their research and China experiences at two symposiums, once to an NFU auditorium packed with NFU students and faculty and another to the AAMU community including some students' parents and friends.

In short, faculty and students in the program are still reeling from the exchange trip to China that has significantly broadened their research, educational, cultural and language experiences. They are grateful to AAMU faculty and staff for their hard work to develop and coordinate this program and to NFU for hosting us, and for their gracious hospitality.

The documents in this proceeding consist of the students' cultural reports and their scientific research papers. Students and mentors worked together to complete these documents. Each student also created a website with additional information, which can be accessed at: <http://myspace.aamu.edu/users/sha.li/reu/reu2013/reu2013.htm>

Acknowledgements

On behalf of all of the Research Experiences for Undergraduates and Graduates (REUG) program coordinators at Alabama A&M University (AAMU), we would like to thank the Alabama A&M University administration, the Nanjing Forestry University (NFU) administration, and most importantly, the National Science Foundation for their support in the implementation of this program. This program was a great success, and it absolutely would not have transpired without the support and understanding of the aforementioned. Thank you to NFU for allowing the REU program participants into your labs, your office spaces, and being so forgiving of our social faux pas. The students and faculty had a wonderful, once-in-a-lifetime educational and cultural experience in China, and you all contributed significantly to this occurring.

The AAMU professors, Drs. Yong Wang, Elica Moss, William Stone, Khairy Soliman, Malinda Gilmore, and Goang Liaw chose these ten undergraduate students and three graduate students from a highly competitive group of individuals from many universities across the nation. These students were chosen because of their academic strengths, their interest in the areas to be researched, and their compatibility with the project. In addition, we selected three AAMU graduate students to assist with research projects and conduct their own research. We are proud of each of these students and all that they accomplished at Nanjing Forestry University and Alabama A&M University during this time.

Thank you!

Yong Wang, PI of AAMU REU China
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Department of Biological and Environmental Sciences
College of Agricultural, Life, and Natural Sciences

July 30, 2013

REUG Participating Students

Undergraduate Students

Melissa DellaTorre: Ms. DellaTorre is junior majoring in Neuroscience at Bowdoin College in Brunswick, Maine. She was mentored by Dr. Khairy Soliman and Rashidah Farid (AAMU) and Dr. Tongming Yin and Danial Hasani (NFU). Her research focused on cloning genes of *Hydrangea macrophylla* involved in the flavonoid pathways of pink and white flowers. The title of her research paper is “Cloning the flavonoid pathway structure genes for pink and white *Hydrangea macrophylla*.”

Jacob Drucker: Mr. Drucker is a sophomore majoring in Evolutionary Ecology at Hampshire College in Amherst, Massachusetts. Mr. Drucker was an REU student in summer 2013. He was mentored by Drs. Yong Wang and Jianqiang Li (AAMU) and Dr. Xiaojing Li and Yuanxing Ye (NFU). He worked closely with Chris Griffith, another REU student, and they each researched different components of the subject of anthropogenic disturbance of avian communities in Nanjing, Jiangsu Province, China. In addition, he documented his cultural and research experiences in a (very neat and complete) data journal, and submitted two papers, one regarding his cultural experiences in China and the other a scientific paper on his research subject. The title of their joint research paper is “Impact of anthropogenic disturbance on the avian communities of Nanjing, China.”

Antionette Fowlkes: Ms. Fowlkes is a sophomore majoring in Environmental Science/Environmental Health at Alabama A&M University in Normal, Alabama. She was mentored by Dr. Elica Moss, Dr. Shengzuo Fang, and Professor Ye Tian. Her research compared the nitrification of soils at poplar (*Populus deltoides* hybrid) and dawn redwood (*Metasequoia glyptostroboides*) tree plantations in the Jiangsu Province of China. The title of her research paper is “Comparison of nitrification in Poplar and Metasequoia plantations.”

Christopher Griffith: Mr. Griffith is a junior majoring in Animal Science at Tuskegee University in Tuskegee, Alabama. He was mentored by Drs. Yong Wang and Jianqiang Li (AAMU) and Dr. Xiaojing Li and Yuanxing Ye (NFU). He worked closely with Jacob Drucker, another REU student, and they each researched different components of the subject of anthropogenic disturbance of avian communities in Nanjing, Jiangsu Province, China. The title of their joint research paper is “Impact of anthropogenic disturbance on the avian communities of Nanjing, China.”

Tangelia Hatch: Ms. Hatch is a sophomore majoring in Chemistry at Alabama A&M University in Normal, Alabama. She was mentored by Dr. Malinda Gilmore (AAMU) and Dr. Zhang Yinlang (NFU). Her research focused on the effects of heavy metals and pharmaceuticals on agricultural crops, which can lead to phytotoxicity. She examined the effects of one pharmaceutical chemical (5-fluorouracil, a pyrimidine analog used as an anticancer drug), and one heavy metal, cadmium, on a common crop plant in China, cabbage (*Brassica oleracea*). The title of her research paper is “The effect of 5-fluorouracil and cadmium on cabbage.”

Michael Knotts: Mr. Knotts is a junior majoring in Community and Regional Planning at Alabama A&M University. He was mentored by Dr. Wubishet Tadesse (AAMU) and Dr. Mingshi Li (NFU). He examined the urbanization trends in Nanjing, China, from 1995-2011 using remotely sensed data through ArcGIS and ENVI software. China's urbanization level is increasing dramatically. His research attempted to analyze satellite images of land usage to identify the correlation between urbanization trends and land use in Nanjing, China. The title of his research paper is "Urbanization in Nanjing, China from 1995-2011."

Gilda Naka: Ms. Naka is a sophomore majoring in Chemical Engineering at Vanderbilt University in Nashville, Tennessee. She was mentored by Dr. Goang Liaw (AAMU) and Drs. Fei Wang, Yu Zhang, and Qiyang He (NFU). Her research focused on a process of biodiesel production using intracellular lipase as opposed to extracellular lipase, which is an expensive process. She used *Rhizopus oryzae* whole cell, a common detritus decomposer found worldwide, on bean oil to test whether it would be an efficient, cost-effective alternate to current biodiesel production. The title of her research paper is "Effects of Water on *Rhizopus oryzae* whole cell-catalyzed transesterification of bean oil for biodiesel production."

Maya Rudolph: Ms. Rudolph is a junior majoring in Chemistry at Alabama A&M University. She was mentored by Dr. Malinda Gilmore (AAMU) and Drs. Yinfeng Xie and Yulong Ding of NFU. She examined the oxidative damage of chromium in bamboo plants. In addition, she documented her cultural and research experiences in a journal, submitted two papers, one regarding her cultural experiences in China and the other a scientific paper on her research subject. The title of her research paper is "Identification of Oxidative Damage in Bamboo Plants Exposed to Chromium."

Sarah Katherine Springthorpe: Ms. Springthorpe is a sophomore majoring in Biology at Salem College in Winston-Salem, North Carolina. She was mentored by Dr. William Stone (AAMU) and Dr. Dejun Hao (NFU). The focus of her research compared the foraging ecology and species diversity of bats in developed and forested areas around Nanjing, Jiangsu Province, China. She used Anabat© to detect and differentiate different bat species flying overhead, and mist nets to capture live bats and take fecal samples for later diet analysis. The fecal samples were analyzed for arthropods at AAMU. The title of her research paper is "Foraging Ecology of Bats in Developed and Forested Areas in Nanjing, Jiangsu Province, China."

Justin Waraniak: Mr. Waraniak is a junior majoring in Ecology and Evolution at the University of Michigan in Ann Arbor, Michigan. He was mentored by Dr. Yong Wang and PhD candidate Kevin Messenger (AAMU) and Dr. Yulong Ding (NFU). His research required him to travel to south China with Kevin Messenger to survey the herpetofaunal diversity of bamboo forests of Wuyishan National Nature Reserve in Fujian, China. The title of his research paper is "Diversity of Herpetofauna in Bamboo Forests of Wuyishan National Nature Reserve, Fujian Province, China."

AAMU Graduate Students

Jonjala Jackson: Ms. Jackson is an MS candidate in the field of soil microbiology at Alabama A&M University in Normal, Alabama. Ms. Jackson traveled to China as a mentor and research participant in the REU-China program at Nanjing Forestry University in 2012 and again in 2013. She assisted Dr. Elica Moss (AAMU) and their Chinese research partner Dr. Fang (NFU) with mentoring Antionette Fowlkes and conducted her own research as well. They both conducted comparative analyses of the soils of poplar and metasequoia plantations in the Jiangsu Province in China. The title of her research paper is “A Comparative Analysis of Soil N Mineralization at Poplar and Metasequoia Plantations in Jiangsu Province, China.”

Jack Lee: Mr. Lee is an MS candidate in the field of Agribusiness at Alabama A&M University in Normal, Alabama, under the guidance of Dr. Joseph Befecadu. His research focus is on the international corn trade with China. While participating in the REUG program, Mr. Lee worked on nitrogen loss in a forested landscape with Dr. Qingwei Guan in his Soil Science laboratory. The title of Mr. Lee’s research paper is “The Effect of Thinning on Content of Soil Nitrate-nitrogen (NO_3^- -N) in Privet Forests.”

Kevin Messenger: Mr. Messenger is a PhD candidate under the guidance of Dr. Yong Wang. His research focuses on the conservation and natural history of herpetofauna in the heavily populated areas of southern China. He spent more than half of the year in China surveying areas for herpetofauna. Mr. Messenger mentored one of the REU students, Justin Waraniak, who focused his research attention on the diversity of herpetofauna of bamboo forests of the Wuyishan National Nature Reserve in Fujian, China. Both traveled from the home base of Nanjing Forestry University to southern China to survey selected areas, then back to Nanjing to compile and analyze the data collected, and to present it to the NFU community. Mr. Messenger also traveled to Japan after the REU program and attended the 6th Snake Ecology and Group meeting in Okinawa. Mr. Messenger’s research is ongoing and does not have a research paper in these proceedings.

Abreeotta Williams: Ms. Williams is a PhD candidate under the guidance of Dr. Govind Sharma. She traveled to China to participate in research activities and help mentor REU students at Nanjing Forestry University through the USDA-National Institute of Food and Agriculture China Exchange Program grant. She assisted Dr. Khairy Soliman (AAMU) and their Chinese research partner Dr. Lian Xu with mentoring REU student Melissa DellaTorre in her research project that examined the genes responsible for color in the flowers of hydrangea, and in the cloning process. In addition, Ms. Williams also conducted her own research which examined one of the genes (9-Cis-Epoxycarotenoid Dioxygenase) responsible for the saline tolerance of *Ginkgo biloba*. The title of her research paper is “Cloning of the Salt Tolerant Gene 9-Cis-Epoxycarotenoid Dioxygenase in *Ginkgo biloba*.”

Participating REU Mentors

Alabama A&M University Mentors

Yong Wang, PhD: Dr. Wang is professor of biometry, statistics, and wildlife ecology at AAMU. His research interests are behavioral ecology of avian migration; wildlife and habitat relationships and conservation; and natural resource modeling with statistics, Geographic Information System (GIS), and remotely acquired data. His recent research efforts include (1) stopover ecology of migratory birds at the southern Cumberland Plateau of northern Alabama; (2) wildlife (amphibians, reptiles and birds) response to anthropogenic habitat and landscape alternations such as forest management practices and urbanization; (3) breeding distribution and biology of Cerulean Warblers; (4) classification of land types for forest management based on GIS, remotely sensed data and statistical models; and (5) avian biology and conservation in China. Dr. Wang's research has been supported by organizations or agencies such as NSF, USDA, Forest Service, EPA, State of Alabama, TNC, and private landowners. In 2012, Dr. Wang mentored David Farris and Iwo Gross, with the assistance of his PhD student Kevin Messenger and Postdoc Dr. Jianqiang Li. In 2013, Dr. Wang mentored Christopher Griffith, Jacob Drucker, and Justin Waraniak. **(Dr. Changhu Lu, Dr. Zhen Wang; Dr. Yulong Ding)**

Elica Moss, PhD: Dr. Moss is an assistant professor of environmental microbiology. Her research interests are in identifying microbes that contribute to the environment and subsequently effect human health. Her recent research efforts include: Arsenite oxidizing/resistance genes in soils; presence and abundance of pathogenic fecal bacteria in water systems; and biogeochemical nutrient cycling in a disturbed forest ecosystem. She was instrumental in the accreditation of the Environmental Health Science program at Alabama A&M University after only one year in existence; rendering it the only accredited Environmental Health Science Program in the state of Alabama. She is heavily involved in undergraduate research, which is evident in her involvement in the REU and URM programs. Additionally she oversees a program that takes undergraduates to scientific meetings to present their research. Dr. Moss's research has been supported by organizations or agencies such as NSF, USDA, and the State of Alabama. In 2012, Dr. Moss mentored Rakeyta Scales and Nara McCray, with the assistance of masters student Jonjala Jackson. And in 2013, she mentored Antionette Fowlkes with the assistance of Jonjala Jackson **(Dr. Fang Shengzuo and Dr. Ye Tian)**

Khairy Soliman, PhD: Dr. Soliman is professor of plant molecular genetics. His research interests are focused on plant molecular genetics and evolutionary genetics, gene resource conservation and utilization, cytogenetics, and plant breeding. His forest related research is focused on studying the genetic diversity and dynamics of oaks and pool breeding amphibians. In 2012 Dr. Soliman mentored three students (Joanna Kukla and Calvin Means, with the assistance of masters student Rashidah Farid). In 2013 He mentored REU student Melissa DellaTorre and Abreeotta J. Williams, a Ph.D. **(Dr. Tongming Yin and Li-an Xu)**

Malinda Gilmore, PhD: Dr. Gilmore is an Assistant Professor of Chemistry at Alabama Agriculturaland Mechanical University in Huntsville, Alabama. Her research interests are primarily in the effects of atmospheric pollutants on environmental systems (i.e. humans,

animals), and determining the effects of agricultural emissions on ambient air quality. She traveled to China with the 2013 REU program and collaborated with Drs. Yinlang Zhang and Yulong Ding (NFU) to mentor REU students Tangelia Hatch and Maya Rudolph.

Goang Liaw, PhD: Dr. Liaw is professor of Mechanical and Civil Engineering at AAMU. His research interests are Computational Fluid Dynamics (CFD), nanotechnology application in water and air purification, waste to energy and the environment, energy and environmental education. Dr. Liaw collaborated with Dr. Fei Wang, He Qiyang (NFU) and REU student Gilda Naka on a study entitled, “Effects of water on *Rhizopus oryzae* whole cell-catalyzed transesterification of bean oil for biodiesel production” in Nanjing, China.

William Stone, PhD: Dr. Stone is an Associate Professor of Forest Wildlife at Alabama A&M University. He is a certified wildlife biologist and belongs to several natural resources professional societies. His teaching and research focus on habitat relationships of forest-dwelling wildlife, especially bats and other small mammals. In the summer of 2013, he travelled to Nanjing, China and collaborated with Dr. Dejun Hao (NFU) to mentor Sarah Katherine Springthorpe on a project that studied bat foraging and habitat use in urban and forest areas around Nanjing, China.

Dr. Wubishet Tadesse: Dr. Tadesse is an Associate Professor of Remote Sensing/GIS. Dr. Tadesse’s main research focus is on land-use land-cover change detection and modeling; environmental quality assessment using satellite and aerial remote sensing and GIS techniques within a human ecological theoretical framework. Other research interests include modeling of the impacts of climate change on agricultural and forest ecosystems, the implications of scale and scaling in remote sensing and modeling analyses, and human-environment interactions. The main focus is to identify new methods of utilizing remotely sensed data. Dr. Tadesse mentored Michael Knotts with the assistance of Dr. Mingshi Li (NFU) on a project that examined population growth and urban sprawl through analysis of remotely sensed data from 1995-2011.

Nanjing Forestry University Mentors

All NFU faculty from the College of Forest Resources and Environment can be found at <http://eng.njfu.edu.cn/info.php?id=125>

Dr. Lin Cao: Dr. Cao is a professor of GIS of Nanjing Forestry University. He helped to mentor one REU student and lead field trips.

Dr. Yulong Ding: Dr. Ding is Dean of the College of International Education and professor of bamboo silviculture, Department of Forestry and Environmental Science. As the Dean, he is directly involved in the daily operation and management of the AAMU and NFU collaboration. He has been instrumental in getting this Program and our partnership established at NFU. He worked with Dr. Yong Wang, Kevin Messenger, and student Justin Waraniak; also Dr. Malinda Gilmore and student Tangelia Hatch, with Dr. Yinlang Zhang, and lead field trips.

Dr. Ben Fan: Dr. Fan is professor and researcher of molecular biology at Nanjing Forestry University. He mentored one REU student.

Dr. Shengzuo Fang: Dr. Fang is the Director of the Office of International Cooperation and Exchange, and Professor of Silviculture, Department of Forestry and Environmental Science. Dr. Fang's research is focused on the effects of silvicultural regimes on the biomass production, carbon sequestration, and wood quality. He is also interested in the physiological and ecological performance of trees. He is in charge of the operation of the international program and assisted the development and implement of the AAMU REU-China program. Dr. Fang worked with Dr. Elica Moss, graduate student Jonjala Jackson, and REU student Antionette Fowlkes.

Dr. Qingwei Guan: Dr. Guan is a professor of Landscape Ecology in the Department of Ecology and Environment. Dr. Guan's research interests are on the management of urban forest ecosystems and the recovery technologies of urban vegetation. Dr. Guan worked with Jack Lee and Dr. William Stone.

Dr. Dejun Hao: Dr. Hao is a professor of Entomology, and Head of the Department of Forest Protection. Dr. Hao's research interests are on insect-plant interactions, host plant resistance to insects, and in integrated pest management. Dr. Hao worked with Dr. William Stone and Sarah Katherine Springthorpe comparing varieties of bat diets between urban and forested landscapes.

Dr. Qiyang He: Dr. Qiyang He is a professor. Worked with Dr. Goang Liaw and student Gilda Naka along with Dr. Fei Wang.

Dr. Mingshi Li: Dr. Mingshi Li is a professor of GIS in the Department of Forestry and Environmental Science. He worked with Dr. Wubishet Tadesse, Dawn Lemke, and student Michael Knotts.

Dr. Xiaojing Li: Dr. Li is a professor. Worked with Yong Wang and students Chris Griffith and Jacob Drucker, and Dr. Yuanxing Ye.

Dr. Wei Liang: Dr. Liang is a professor from Hainan Normal University. He provided support for the herpetofaunal research of Kevin Messenger, an AAMU PhD student, and an REU student, Justin Waraniak, who participated in the project for his research.

Dr. Changhu Lu: Dr. Lu is a professor of wildlife ecology with the Department of Forestry and Environmental Science. His research interests are on plant-animal interactions, and bird biodiversity and behavior. He worked with Dr. Wang to mentor two REU students, Christopher Griffith and Jacob Drucker, who worked on a project that investigated the effect of urbanization effect on avian community.

Dr. Tian Ye: Dr. Tian Ye is a professor with the Department of Forestry and Environmental Science; Soil/Environmental Sciences. Worked with Dr. Elica Moss, graduate student Jonjala Jackson, and REU student Antionette Fowlkes.

Dr. Fei Wang: Dr. Wang is dean of the College of Chemical Engineering, and Professor of Chemical Engineering. His research interests are chemical processing of forest products and biomass resources, biodiesel production, and multipurpose utilization of both forest and

agricultural biomass. Dr. Wang worked with Dr. Goang Liaw and student Gilda Naka, along with his PhD student Qiyang He.

Dr. Zhen Wang: Dr. Wang is a wildlife professor in the Department of Forestry and Environmental Science. He worked with Dr. Yong Wang and students Christopher Griffith and Jacob Drucker on a project that investigated the effect of urbanization effect on avian community.

Dr. Yongbo Wu: Dr. Wu is an associate professor of Forestry Ecological Engineering of Nanjing Forestry University. He collaborated with Dr. Chen from AAMU on research projects.

Dr. Lian Xu: Dr. Xu mentored one REU student.

Dr. Yuanxing Ye: Dr. Ye is a Professor. He worked with Dr. Yong Wang and students Chris Griffith and Jacob Drucker, and Dr. Xiaojing Li

Dr. Tongming Yin: Dr. Yin is a professor of forest genetics and biotechnology in the Department of Forestry and Environmental Science. He and his research team mentored two AAMU REU students, Melissa Dellatorre and Abreeotta Williams with Dr. Soliman.

Dr. Yuanchun Yu: Dr. Yu is a professor of soils and environmental science. He helped mentor REU students.

Dr. Yinlang Zhang: Dr. Zhang is a professor of environmental chemistry in the Department of Forestry and Environmental Science. He worked with Dr. Malinda Gilmore and student Tangelia Hatch.

Other Participants

From Alabama A&M University

Dr. Sha Li: Dr. Li is a professor from the School of Education of AAMU. He provided training for REU students on webpage development; he is also serving as an evaluator of the REU program and conducted the exit survey.

Dr. Dawn Lemke: Ms. Lemke is a GIS specialist and adjunct professor at AAMU, in the final stages of her PhD. She traveled to China in 2010, and participated in the pre-travel discussion panel on what to expect in China as well as presenting a workshop on how to design posters for oral presentations.

Lisa Gardner: Ms. Gardner was program coordinator and assisted Drs. Wang and Moss in coordinating the REUG program on the AAMU side. She helped set up the website, created documents, organized the three-day pre-travel orientation and the two-week post-China program. She traveled to China to assist students and faculty with their needs and to act as liaison between NFU staff and faculty and AAMU staff and faculty when Dr. Wang was not available. She created the REU Proceedings, and assisted in creating and submitting the REU Annual Report.

Zhou Chen: Mr. Chen was a program assistant from the University of Wisconsin, Madison. As the program assistant, he researched and obtained materials necessary for the program in advance of our arrival. While in China, he assisted PI and Co-PI. for coordinating the program and interacted with professors and students of Nanjing Forestry University; he helped organize and oversaw the student activities; assisted the professors and students with language, communication, local travel, and other logistic arrangements; and took pictures and videos as documentation of the program.

From Nanjing Forestry University

Dr. Chaonian Feng: Dr. Feng is the Chairman of the Nanjing Forestry University. He is in charge of the operation of the university, and provided leadership role for helping AAMU REU-China program. He visited AAMU in August 2012 to promote the strengthening and expansion of collaborative efforts.

Dr. Guofen Li: Dr. Li is professor of civil engineering of Nanjing Forestry University. In August 2012, she visited AAMU to explore opportunities for further collaboration.

Dr. Pingping Li: Dr. Li is the Vice President of Nanjing Forestry University and a professor of Agronomy. She provided guidance and support for the operation of AAMU REU program at NFU.

Dr. Xueqin Liu: Dr. Liu is an associate professor of the Department of Chinese Language and Literature of Nanjing Forestry University. She trained REU students for Chinese language.

Dr. Honghua Ruan: Associate Dean of the College of Forest Resources and professor of soil ecology, Department of Forest Resources and Environmental Science. He coordinated collaboration between AAMU REU faculty and students and the NFU faculty and students.

Mr. Dongrong Shi: Mr. Shi is the Deputy Director of the Office of International Cooperation at Nanjing Forestry University. He is in charge of the operation of the international program and assisted the development and implement of the AAMU REU-China program. He visited AAMU in August 2012 to promote the strengthening and expansion of collaborative efforts.

Ms. Qingyu Wang: Ms. Wang is the past director of the Office of International Cooperation at Nanjing Forestry University. She helped to develop AAMU REU-China program, and provided logistic support.

Ms. Zhiyun Wang: Ms. Wang is Director of the Office of College of International Education at Nanjing Forestry University. She provided logistic support for AAMU REU China program.

Dr. Jianren Ye: Dr. Ye is the Dean of the College of Forest Resources and Environment and a professor of forestry pathology. As the dean, he supervised his staff and faculty to collaborate with AAMU REU-China team. In August 2012, he visited AAMU to explore opportunities for further collaboration.

Dr. Jiangang Zhu: Dr. Zhu is the deputy dean of the College of International Education of the Nanjing Forestry University. He helped to arrange REU program and provided logistic support.

Other Participating Institutions in China

Nanjing Forestry University

Hainan Normal University

Beijing Normal University

Beijing Forestry University

Dafeng National Wildlife Reserve

Sheyong Forestry Bureau

Research

**CLONING THE FLAVONOID PATHWAY STRUCTURE GENES FOR PINK
AND WHITE *HYDRANGEA MACROPHYLLA***

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Abstract

Anthocyanins produce the color we see in flowers via the flavonoid pathway, they play an important role in the flower's survival and reproduction. The purpose of this experiment was to determine which of the major flower genes from the flavonoid pathway are present in the pink and white hydrangea macrophylla flowers. We used the genes chalcone isomerase (CHI), flavanone 3 beta-hydroxylase (F3H), dihydroflavonol reductase (DFR), anthocyanidin synthase (ANS), and UDPG-flavonoid glucosyl transferase (UFGT), which all contribute to produce anthocyanins. This was done by extracting the RNA, purifying it through DNA digestion, constructing a cDNA library, and then performing PCR with the five different gene primers. Gene primers were created by using software in NCBI. The pink and white flowers showed a difference in expression of these five flavonoid pathway structure genes, specifically in the brightness of the CHI gene. If more time was available, we could sequence the genes to compare their nucleotide sequences and run quantitative PCR to compare the levels of expression between the pink and the white hydrangea flavonoid pathway genes of interest.

Introduction

Hydrangea macrophylla are shrubs with large heads of pink, blue, or white flowers that bloom from summer through fall and are native to China and Japan (Bailey, 1992). Flower color is determined through the flavonoid biosynthetic pathway which produces anthocyanins, which are the pigments responsible for flower color. Flavonoids are phenolic, water soluble molecules that occur in almost all vascular plants, more than 9000 are known and they play a wide role of important functions in plants (Miller et al., 2011).

Anthocyanins are a group of flavonoids which supply the pigment in flowers and fruits. They play a significant role in plant development and have a major influence on potential pollinators (Miller et al., 2011). Different colored flowers attract different types of pollinators and have different rates of reproductive success which can influence the biodiversity of our environment. Although the *hydrangea macrophylla* is a sterile species, other types of hydrangeas can be pollinated by wind, insects, bees, birds as well as self-fertilization. This means that their reproductive success can be impacted by their color (Miller et al., 2011). For example, birds are more attracted to red flowers than any other color. This has caused the Australian native flower called the Waratah to evolve its color to red hues to increase its pollination rate (Dyer et al., 2009). In addition to this, insect pollinators like bumblebees have been shown to discriminate against white phenotypes in favor of brighter colors (Clegg & Durbin, 2000). Aside from attracting pollinators, the red coloration can also help to camouflage leaves from herbivores that are blind to red wavelengths. The absorbance pattern responsible for the red color of anthocyanins are complementary to green chlorophyll, which may protect the hydrangea from attacks by plant eaters attracted to green color. In addition, anthocyanins absorb UV light and produce pigment in response to UV exposure to protect the plant from DNA damage from sunlight. Anthocyanins are powerful antioxidants which can provide many health benefits to protect humans against cancer, aging and neurological diseases, diabetes, and bacterial infections. A recent study has shown that anthocyanins in the black raspberry were able to inhibit chemically induced cancer of the rat colon by 80% (Seeram, 2008). This shows the high value that anthocyanins have in a potential cancer therapy. Determining the gene responsible for the anthocyanin pigment could contribute to this type of research.

Anthocyanins are produced by the flavonoid synthetic pathway which is made up of several genes. Side branches of the pathway are important to developing plant defense, pollen viability, and UV protection (Clegg & Durbin, 2000). This study focused on five of the major genes of the flavonoid biosynthetic pathway that are housekeeping genes known to be present in almost all flowers. The first was chalcone isomerase (CHI), followed by flavanone 3 beta-hydroxylase (F3H), then dihydroflavonol reductase (DFR), anthocyanidin synthase (ANS), and lastly UDPG-flavonoid glucosyl transferase (UF3GT) (Figure 1). Based on this it is evident that genetics play a major role in determining the anthocyanins responsible for flower color.

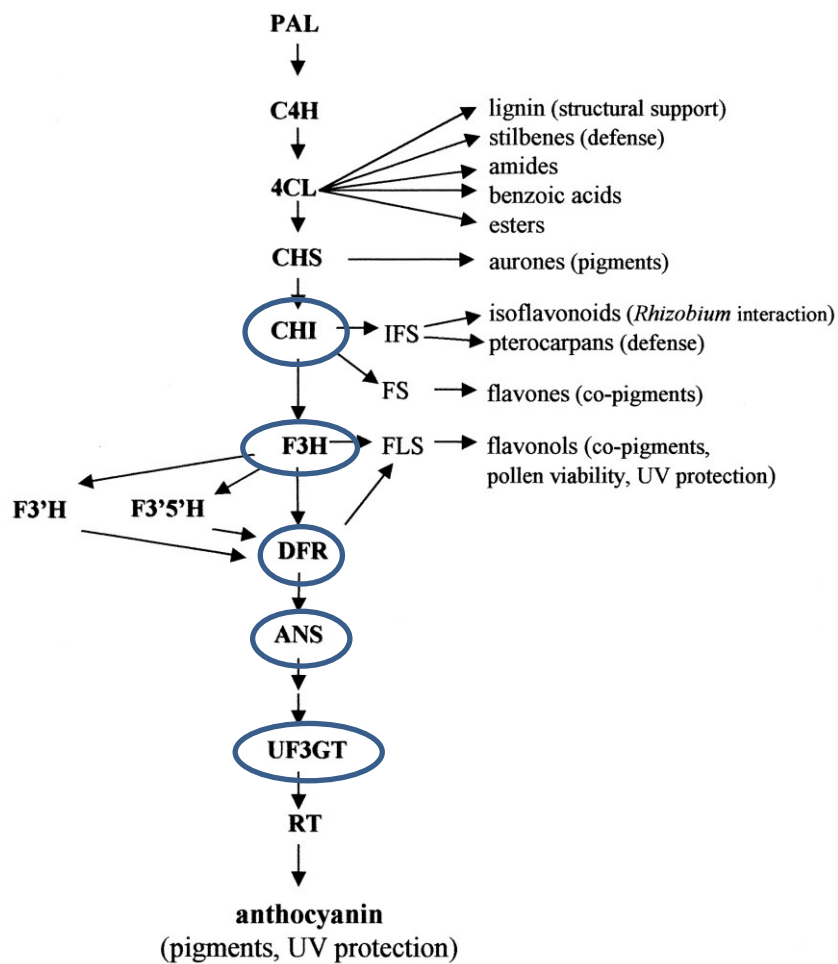


Figure 1. This figure shows the biosynthetic flavonoid pathway of flowers, with our five genes of interest circled (Clegg & Durbin, 2000).

In addition to genetics, flower pigment is also partially determined by the environment. Hydrangeas have the ability to change color based on many environmental factors including temperature, light, pH, sugar and metal content in the soil. Lower temperature has been found to produce more pigments making flowers appear darker. An increase in metals such as aluminum or iron causes a pink hydrangea to turn blue (Toyama-Kato et al., 2003). An increase in soil acidity or sugar uptake could also turn a pink hydrangea to blue, and a white hydrangea to pink. Different colored flowers can be seen on the same plant as it adjusts to a new environment.

Previous research has determined that 99% of mutations which determine phenotypic differences are the results of transposon insertions into a gene (Clegg & Durbin, 2000). Therefore it is predicted that the diversity of flower color of the hydrangea is due to mobile transposon elements that live on the hydrangea genome. The goal of this study was to look at the gene expression of the five genes: CHI, F3H, DFR, ANS, and UF3GT in the pink and the white hydrangea flower to help discover the gene responsible for the pink color. The purpose of this experiment is to help determine the gene responsible for the change in color from pink to white hydrangea. This connection between molecular genetics and ecology through flower color is significant to the biodiversity of our environment, for evolutionary studies and for potential human health benefits.

Methods

RNA Extraction

Flower petals were collected in liquid nitrogen and ground to a fine powder. Approximately 100ng was transferred into 1ml Trizol extraction buffer. The solution was shaken vigorously and incubated at room temperature for 2 minutes. Then 0.2 ml of chloroform was added and after incubating for another 2 minutes the samples were centrifuged for 20 minutes at 2000 rpm 6°C on a Beckman Coulter Allegra X-22R centrifuge. 550 µl of the upper layer was transferred and then 1ml of phenol:chloroform:isoamyl alcohol (25:24:1) was added to the upper layer and vortexed to mix. This solution was centrifuged for 10 minutes at 14,000 rpm. The upper layer was transferred and 0.25 ml of isopropanol and 0.25 ml of 5M NaCl was added to it. Solution incubated for 2 minutes and was then spun at 14,000rpm for 10 minutes. The supernatant was removed and the resulting pellet was washed with 1ml of sterilized 70% ethanol, and dried in air

for 10 minutes. RNA was dissolved in 50ul of ddH₂O and kept at -70 °C. Nanodrop 2000 No. 2000000-258 was used to record RNA concentration and 260/280 ratio.

DNA digestion

DNA digestion was done using Qiagen kit. Five microliters of DNase 1 buffer, 2 µl DNase 1, 1ul RNase inhibitor and 55 µl ddH₂O were added to two separate tubes, one with 50 µl of white hydrangea RNA and one with 50ul of pink hydrangea RNA. These were incubated at 37°C for 30 minutes. Then 100 µl of DEPC H₂O, and 200 µl of phenol:chloroform:isoamyl alcohol (25:24:1) were added and the solutions were centrifuged at 10,000 rpm and 6 °C for 8 minutes. The upper layer was transferred and 200 µl of chloroform was added and the solutions were centrifuged at 10,000 rpm and 4 °C for 8 minutes. Took the upper layer and added 200 µl isopropanol and incubated at -70 °C for 2 hours. After this the samples were centrifuged at 14,000 rpm and 4 °C for 15 minutes. The supernatant was removed and 200 µl of 70% ethanol was used to dry the pellet, and lastly 35 µl of DEPC H₂O was added.

cDNA library construction

The construction of the cDNA library was done following the Normal Protocol. Six microliters of purified RNA, 1ul of oligo dT, and 4 µl of ddH₂O was combined and heated at 70 °C for 5 minutes. Then a solution was added containing 4ul reaction buffer, 2.5 µl MgCl₂, 1µl dNTP mix, 0.5 µl RNase ribonuclease inhibitor, and 1ul reverse transcriptase. This solution was put in GeneAmp PCR system 9700 No. 2010002-487 thermal cycler for 5 minutes at 25 °C, 60minutes at 42 °C, 15 minutes at 70 °C, and then 4 °C until use.

Polymerase Chain Reaction (RT PCR)

PCR was performed by adding the following solutions into five genes, one for each gene: CHI, DFR, F3H, ANS, UFGT for a total volume of 50 µl in each tube.

PCR was done in GeneAmp PCR System 9700 No. 2010002-487 for 3 minutes at 94 °C (1cycle), 30 seconds at 94 °C, 30 seconds at 58 °C, 2 minutes at 72 °C (40 cycles), and then 10 minutes at 72 °C. This was kept at 4°C until use.

10x Ex Taq Buffer	5 μ l
dNTP mix (2.5mM)	4 μ l
MgCl ₂ (25mM)	4 μ l
Fwd Primer (10mM)	1.5 μ l
Rev Primer (10mM)	1.5 μ l
Ex Taq	0.3 μ l
cDNA	3 μ l
H ₂ O	30 μ l

Gel Electrophoresis Analysis

Gels were made using a ratio of 0.20 g Biowest Agarose:20ml TB Buffer: 2 μ l ethidium bromide. Agarose and TB Buffer were heated until solution was clear liquid. After cooling, ethidium bromide was mixed in and the gel set for 25 minutes before use. All gels were set to 120V, 90 mA, and 30 minutes.

Results

The RNA was successfully extracted and purified, shown by the two distinct bands for each color on the gel electrophoresis (Figure 2). The PCR results show successful bands for the DFR, CHI, and ANS genes for the pink hydrangea and successful bands for just the CHI and ANS for

the white hydrangea flowers (Fig. 3). The band for CHI appeared much brighter in the pink flower. When the entire experiment was repeated only changing the number of PCR cycles from 40 to 35, the same results were observed except that the second bands which appeared for the ANS genes when the PCR was run for 40 cycles, was removed when PCR was run for 35 cycles, as expected.

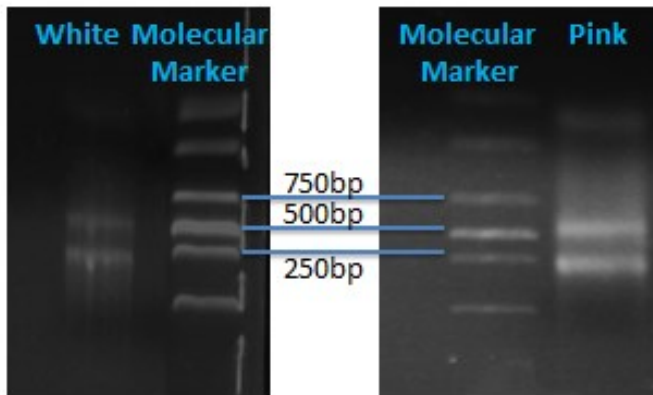


Figure 2. Purified RNA extractions of the white (left) and pink (right) hydrangeas. Each produced two bands, the top one about 550 base pairs, and the bottom about 225base pairs.



Figure 3. Gel electrophoresis after the first PCR showed successful bands for the DFR, CHI, and ANS genes of the pink flower, and the CHI and ANS genes for the white flower. The CHI gene appears to be much brighter in the pink flower.

Discussion

Based on these findings, we can see that the CHI bands are brighter in the pink flower than the white flower which suggests copy number differences. The second band that appeared in the ANS gene for both flower colors disappeared when the cycles of PCR was decreased from 40 to 35 while everything else remained the same, which suggests that too many cycles causes the target product to start denaturing and rebinding to other strands, and resulted in an extra band. In addition, we speculate that the Ex Taq DNA polymerase caused the negative results for F3H and UFGT genes. This is because these two genes were much longer than the other genes, and the Ex Taq reagent is optimized for short genes. If more time was allowed, the experiment would be repeated with La Taq in hopes to observe bands for the F3H and UFGT genes. Quantitative PCR is necessary to prove that there are copy number differences between the pink and white flower CHI expression. Future research should also include gene sequencing in order to compare the nucleotide sequences to find large strands of mismatches which would be helpful to find transposons, which jump into sequences causing mutations that can change flower color (Clegg & Durbin, 2000).

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I would like to thank Dr. Khairy Soliman, Dr. Tongming Yin, and PhD candidate Danial Hassani for their help with this project. Special thanks to Dr. Elica Moss and Dr. Yong Wang, Alabama A&M University and Nanjing Forestry University. This project would not have been possible without the support of the National Science Foundation.

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**IMPACT OF ANTHROPOGENIC DISTURBANCE ON THE AVIAN
COMMUNITIES OF NANJING, CHINA**

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Abstract

In order to survey the effects of urbanization and anthropogenic disturbance on the city's avifauna, we visited 142 randomly selected locations between 10 and 20 kilometers outside Nanjing, Jiangsu, China. Surveys were conducted using ten minute point counts at each location, recording species, count, basic behavior, and distance zone for every individual bird, and recording environmental factors such as habitat percent cover, ambient noise, traffic, light level, and wind speed. We then correlated species richness and abundance with the environmental data. 4,312 individuals representing 13 orders, 39 families, and 84 species were detected including one species which may be new to Nanjing, and one listed as near-threatened by BirdLife International. Wetlands and forest were the most diverse habitats, while wetlands supported the highest abundance. Ambient noise and disturbance were found to have the highest impact on bird distribution.

Introduction

The People's Republic of China is the world's most populous country with at least 1.35 billion people and counting. Because China is committed to its industrialization and development, the landscape is succumbing to urbanization at an extremely fast rate. Though the effects of development have positively helped China's economy and capital, studies on its influence on the local wildlife is lacking. Birds can often be a good mechanism for assessing the environmental health of a changing landscape, as each taxa has evolved certain traits allowing them to thrive in specific environmental settings. Thus, the presence or absence of particular birds may reflect the state quality of an area's habitat, in terms of biodiversity.

Nanjing, located in Jiangsu province, China, is an ideal place to conduct a study on how a rapidly developing city impacts the local avifauna. With a current population of roughly eight million people, it has been growing at a rate of 26% since 1990 (China Census Data, 1995-2011). A large shift from agricultural to urban land use since 1990 reflects this population influx in urban areas (Fig. 1, Michael Knotts, unpublished data).

The city is also significant for bird life. Located along the Yangtze River, it is situated on the northern edge of the Oriental Realm and the Palearctic Realm (Cheng 1987), thus representing the convergence of several species' ranges. In addition, the city is surrounded by several fragmented mountain ranges, such as Laoshan National Forest Park and Purple Mountain, which have largely resisted development and provide at least some haven for forest biodiversity around the city. The Yangtze itself may act as a flyway for migrating waterbirds, and at least historically was bordered by extensive reedbed wetlands (AMNH specimen labels). This combination of a booming city and ornithologically diverse geography provides an excellent location for a study on how urbanization affects a city's avifauna.

Project Goals

For this study, we have several goals. Most basically, we hope to identify and quantify the breeding bird community around Nanjing, pinpoint the key generalist and specialist species, and compare abundance and diversity between habitat types. We also hope to examine how anthropogenic factors such as ambient noise and disturbance influence bird distribution in relation to habitat type.

Hypotheses

1. Noise pollution will be less in areas with large amounts of forest, wetland or agriculture composition.
2. Noise pollution is tied to human activity and disturbance
3. Bird diversity will be higher in areas with large amounts forest and wetland.
4. Bird diversity will be higher in areas with less disturbance (traffic).

Methods

160 points were randomly generated with ArcMap 10, between a zone between 10 and 20 km from the city center, and classified into either ‘agriculture’, ‘forest,’ ‘wetland,’ ‘park,’ or ‘urban’ based on an orthophoto provided by ArcMap and supplemented with Google Earth. For the sake of organization, points were divided evenly into 16 different sections. With time as a concern, we began by surveying every other segment. After traveling around the city once, we had time to survey the remaining eight sections. Due to the difficulty of reaching some points, such as access problems, logistics, or distance, we were only able to survey 142 of the original 160 points.

We navigated to each point using a Garmin GPS unit, with one of the Beijing ornithologists helping a hired cab driver get to each site. Upon arriving at each point two surveys were conducted in a total of ten minutes. Birds were surveyed by one or more observers (min 1, max 3) and species, number, basic behavior, and a specialized distance-zone were recorded for each individual bird or group of birds. Optics used were 8x42 models of several different brands.

The other survey was of the habitat composition in percent, and the measure of the maximum noise pollution at each point (Extech Digital Sound Level Meter, Model: 407736). The temperature, maximum and minimum wind speeds, light intensity (Mini Environmental Quality Meter, Model: 850070) was also measured at each point. Habitat composition for each point was identified by logically determining the percent cover of the habitat within 30 meters. Categories identified were ‘forest’, ‘agriculture’, ‘residential’, ‘wetland’, ‘open water’, ‘construction site’,

and ‘industrial’. At each point if applicable the number of people, cars, trucks, boats, trains, motorcycles and bikes were recorded for seven of the ten minutes as an assessment of disturbance.

Surveys were usually conducted twice daily, from approximately 6:30 a.m. to 10:30 a.m. in the morning, and again in the afternoon from 15:00 p.m. to 17:30 p.m.. This schedule was based on the availability of our two taxi drivers and their shifts. For the first week and a half of surveying, four of us stayed in one group, but for the last few days we split into two groups to cover more ground.

Detailed method: upon arriving at each point the environmental composition was determined, the temperature was recorded, the wind speed was measured for 30 seconds to determine the max and minimum wind speed for the point. Next the light intensity was measured, if the light was too strong the device displayed a (-----) sign and we can assume the light intensity was at least 2001 ft-cd (x10) therefore for measurement purposes 2001 is imputed on the chart instead of (-----). After the light was measured the noise was measured for 30 seconds and the max decibels was recorded.

Results: Environmental

Based on the Table 1 of the 142 points surveyed the average temperature was 28.5 degrees Celsius, the average noise measured was 74.78 decibels with the maximum decibel reading of 90.3. Of the 142 surveyed 23.3% points were forest, 13.77% were agriculture, 22.60% were residential, 10.95% were wetlands, 4.23% were open water,, 12.61% were industrial, and 11.51% were construction sites. On average at each point over three (3) people and over two small cars were recorded at each point. This indicates that there is a considerable amount of human disturbance.

	N	Minimum	Maximim	Mean	Std. Deviation
Temperature (C)	142	21.7	36.5	28.50	3.71
Noise Level (db)	142	0	90.3	74.78	7.83
Forest	142	0	100	23.31	32.63
Agriculture	142	46.8	100	13.77	28.38
Residential	142	0	100	22.60	32.94
Wetland	142	0	100	10.95	23.73
Open Water	142	0	50	4.23	12.165
Industrial	142	0	100	12.61	25,122
Construction	142	0	100	11.51	26.03
Big Vehicles	142	0	12	.95	1.94
Small Vehicles	142	0	25	2.29	4.137
Bikes	142	0	61	1.78	5.61
People	142	0	35	3.75	6.34

Table 1. Environmental Descriptive Statistics.

Figure 1 indicates that as forest percentage increase the noise level decreases. As we were conducting surveys we noted also that as the forest percentage increased human activity and

human presence decreased. Figures 2a and 2b may indicate that as residence and industrial percentages increased the noise levels also increased. Table 2 and figure four show the available land percentage and the bird distribution based off of ArcMap and Google maps classification of the environment. The table and graph indicate that even though there is significantly more space in urban environments bird distribution is not proportional to the amount of space available. This suggests that certain bird species are unable to survive in an urban environment. In forest and agriculture habitats however, bird distribution is relatively proportional to the amount of habitat that is available. This could imply that the birds are nearing the environments carrying capacity (K). While in the wetland environment according to the graph the bird distribution is greater than the available wetland habitat. This suggests that the bird population has exceeded the habitats (K) and will more than likely decrease to a distribution that is proportional to the wetland habitat. It is in our opinion that the wetland habitat in Nanjing China is decreasing more rapidly than the birds.

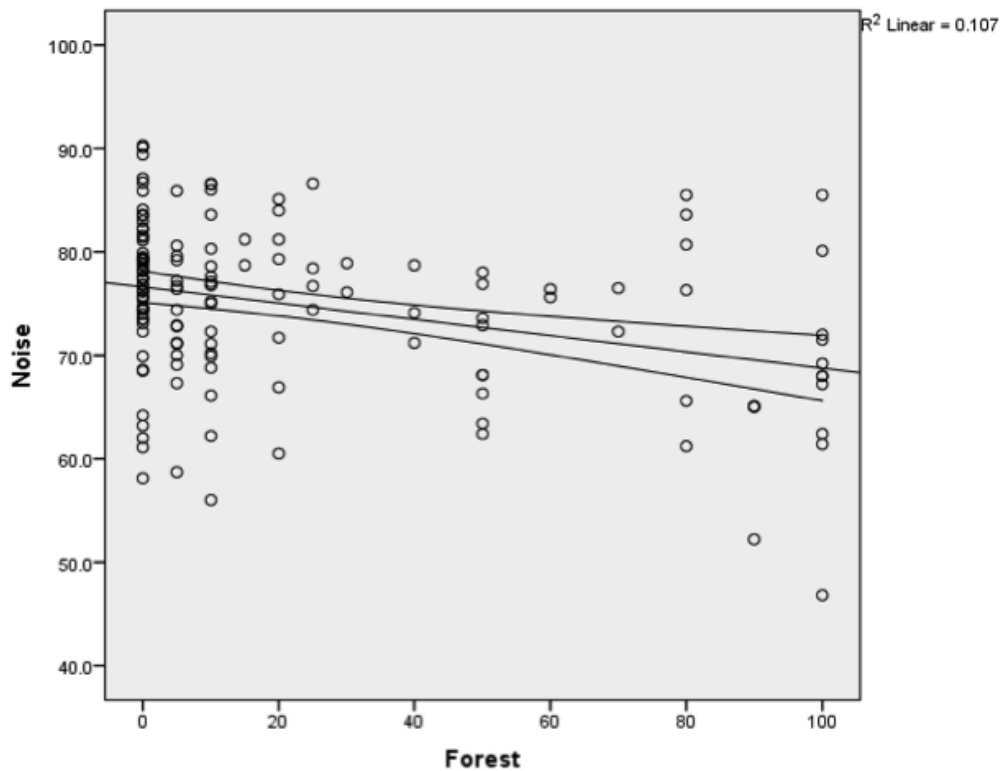


Figure 4. $P < 0.001$

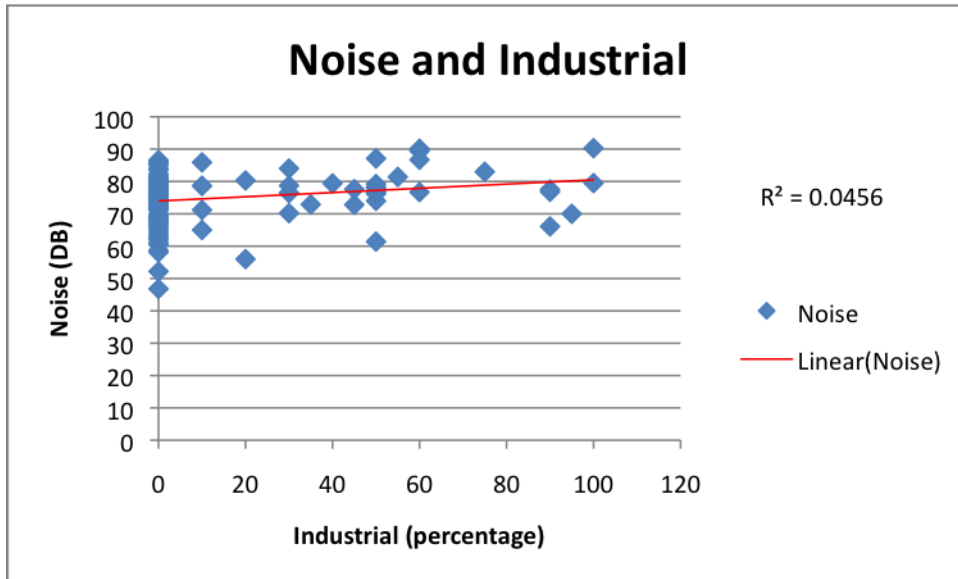


Figure 5a. P = 0.33

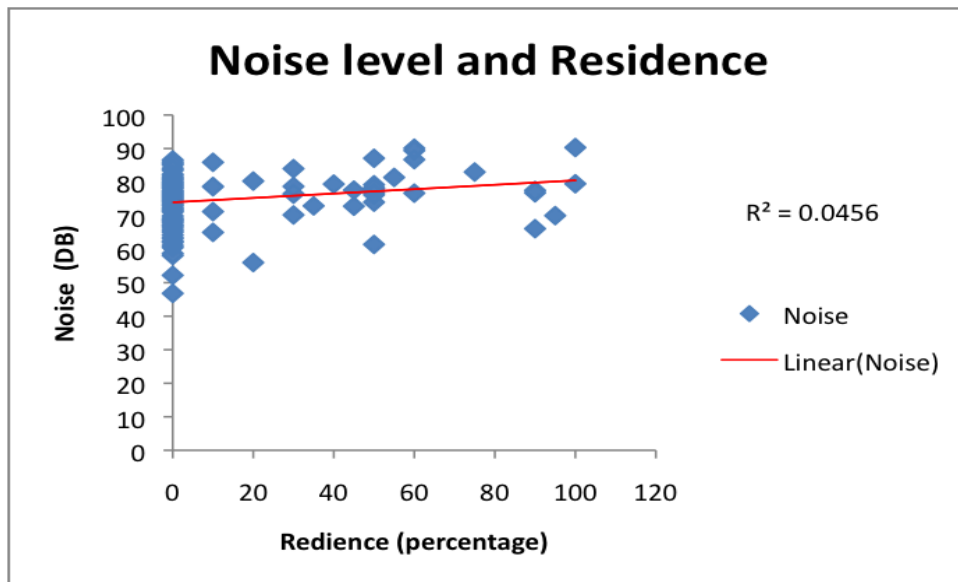


Figure 2b. P = 0.33

Type	Available	Bird Distribution
Forest & Park	23.31	21.5
Agriculture	13.77	20
Wetland	15.2	24.7
Urban	46.7	32.9

Table 2. Available land percentage to bird distribution.

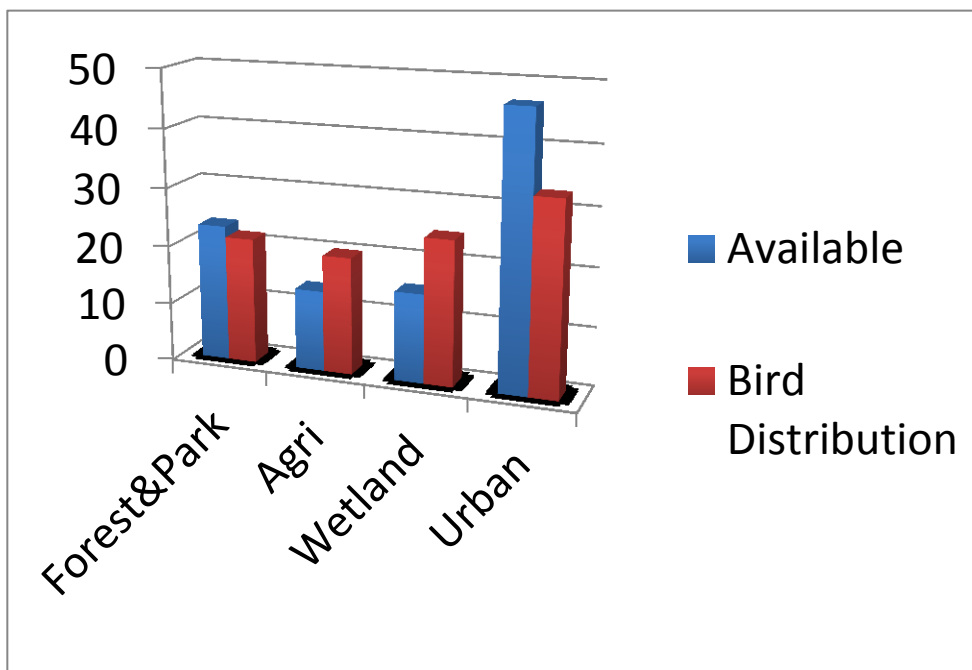


Figure 3.

Results: Birds

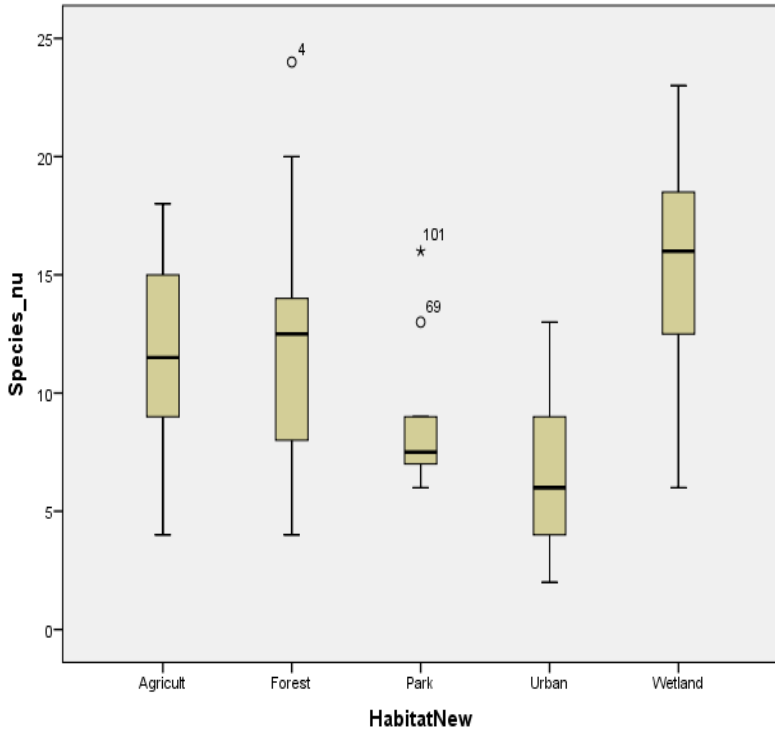
Our surveys detected 13 orders, 39 families, 84 recognized species, and 4,312 individual birds. See table 3 for descriptive statistics for each individual point.

	Min	Max	Mean	St Dev
Num Species	2	24	10.04	4.979
Num Individuals	6	88	31.4745	18.50410

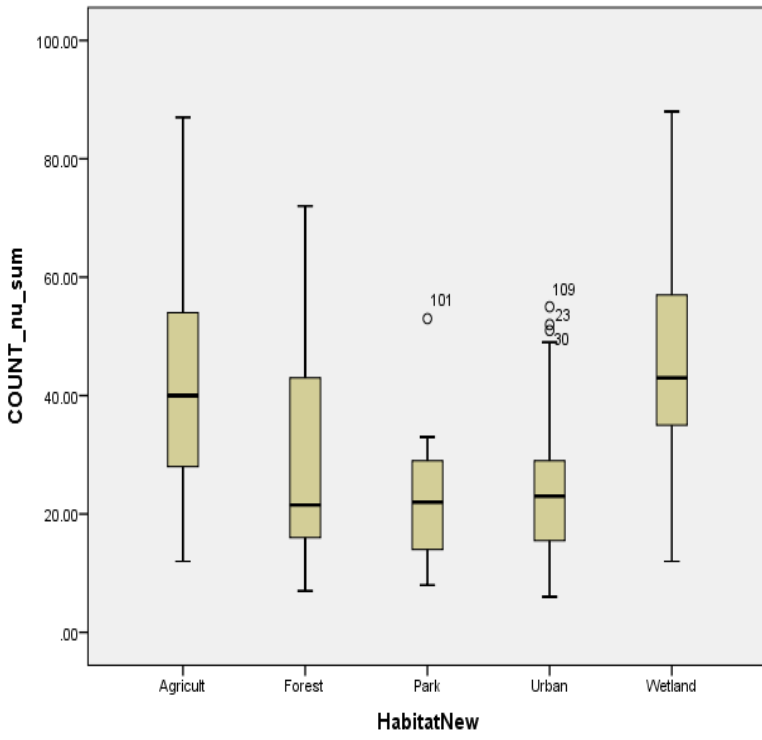
Table 3.

We found species richness to occur in the following hierarchy: wetland> forest> agriculture> park> urban (fig 4a), and abundance in the hierarchy: wetland> agriculture> urban> forest> park (fig 4b).

We defined generalist species as those that occur on at least 5% of all lists from four out of the five habitat types, and specialist species as those occurring in only one out of the four habitat types (See appendix 1). We detected the most specialist species in wetlands and forests. Though our data shows a few ‘specialists’ in park and agriculture, these species are woodland and wetland species respectively that were found in their normal microhabitat. Additionally, similar to the expected ecological trend, numbers of generalists usually exceeded numbers of specialist species. Five species in particular occurred in greater numbers on a larger percentage of checklists: Eurasian Tree Sparrow (*Passer montanus*), Light-vented Bulbul (*Pycnonotus sinensis*), Red-rumped Swallow (*Cecropius daurica*), Barn Swallow (*Hirundo rustica*), and Eurasian Magpie (*Pica pica*). The proportions of these top five generalists in relation to the specialists detected are shown by habitat in figure 5.



a



b

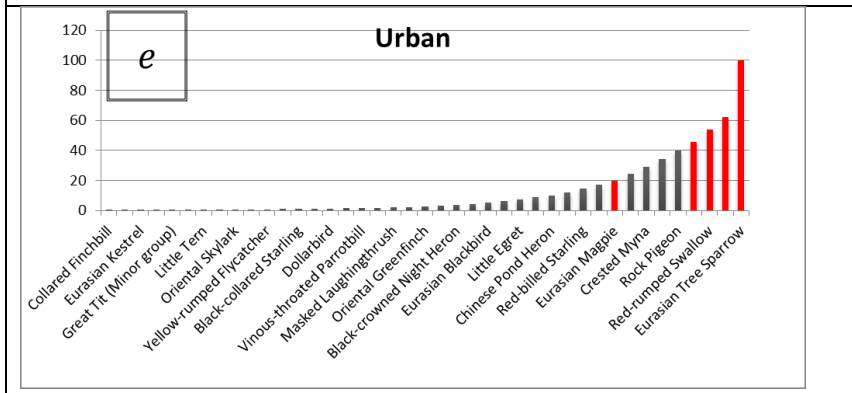
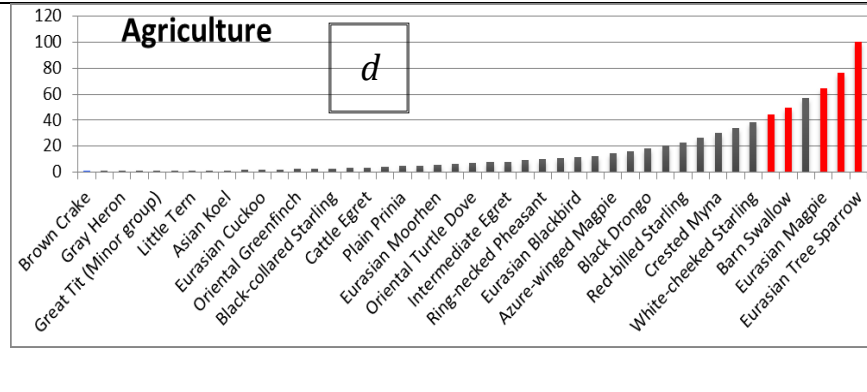
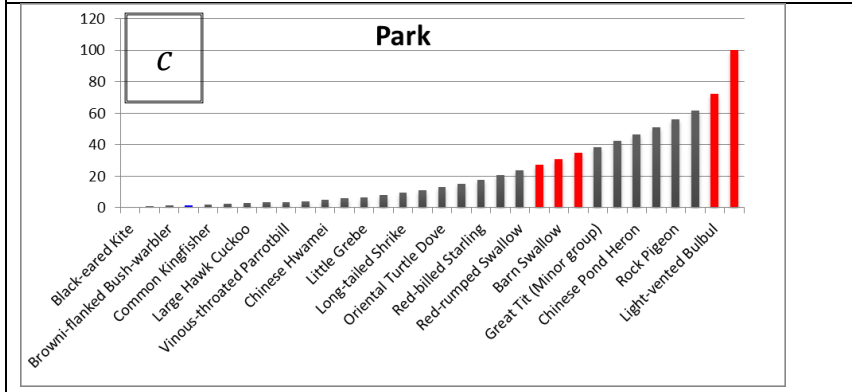
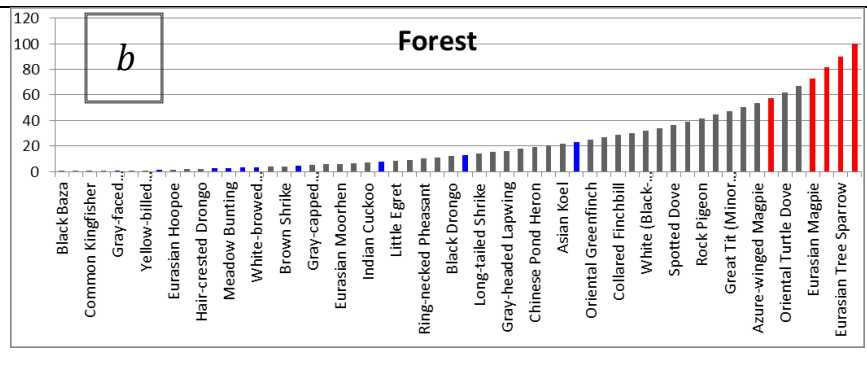
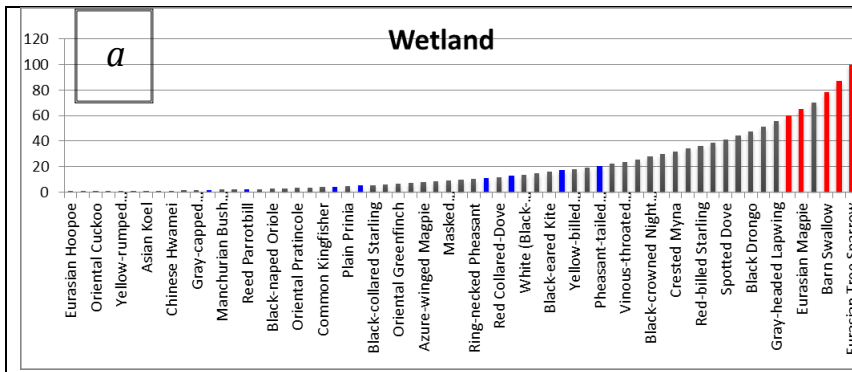


Figure 5 (a-e).

Results: Birds and Environmental

The biggest negative correlate to bird occurrence was disturbance. Points with the most traffic tended to have less diversity (figure 3).

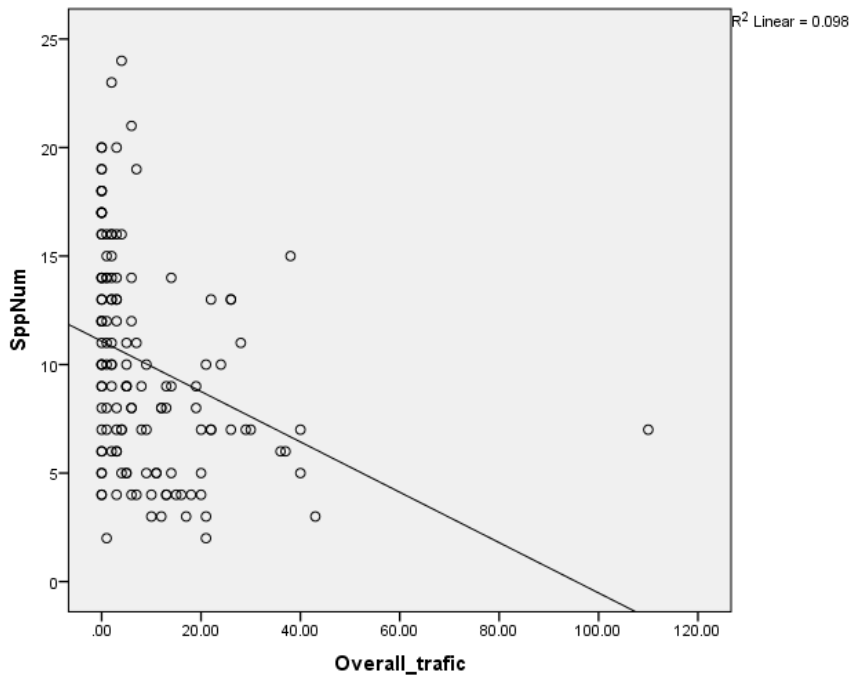


Figure 6. Pearson correlation .313. ($p < .01$).

Discussion

All of the results we found supported the logical hypothesis that urbanization negatively affects bird diversity and abundance, and that wetland and forest habitat hold the highest species diversity, while wetland holds the highest abundance. This trend goes hand in hand with change in land use since the 1990's (Michael Knotts, unpublished data). However, the biggest changes have been the conversion of agricultural areas to urban ones. Conversions such as these allow for a more gradual shift in avian communities, as agricultural areas provide an early foothold for generalist species, who can move into an area, and survive through the area's shift to a more urban environment. Knotts' data (unpublished) shows that forest habitat has experienced a slower rate of transition than agriculture, so it is likely that these avian communities have been

subject to less change, probably due to the mountainous terrain of the forested areas around Nanjing. Knott's work does not address wetland habitat, but given the state of wetlands around the world, and the development we saw firsthand in the field, their rate of loss is also very high.

Disturbance was another key factor influencing bird distribution (fig 3). Naturally, the areas with the most traffic were the more urbanized areas. Disturbance likely affects birds in several different ways. Bioacoustically, it outcompetes birdsong, potentially blurring the lines between territories, mate choice, and dialect. Traffic—whether on foot, bike, or vehicle, often forces birds and other animals to flee, a basic intuition that then affects prey availability for organisms at a higher trophic level. Disturbance can also destroy organisms at a lower trophic level, as well as potential nesting habitat. This limits the availability of disturbed habitat to only the most generalist species.

Out of the 84 species detected, 26% were considered specialists under our criteria, and 36% considered generalists. Despite a rather small difference in species percentage, the ratio of generalists to specialists in each habitat was very skewed (fig 2). This represents well the issue of global homogenization, the process the world is facing, where as naturally occurring, mosaic-like habitat is replaced by a single expanse of crop or city, it is unable to support a diverse suite of species. Other projects on this REU have found the same issue in the case of bats in urban areas (Springthorpe unpublished data), and the herpetofauna of Wuyishan NNR (Justin Waraniak, unpublished data).

China has the unique opportunity to learn from the West and their mistakes. As China becomes more urbanized they are destroying the natural habitat for many Avian species. We, the West are just now realizing the effects of urbanization on the environment and we are wondering how we can address these situations and make changes. China can become a leader for its people and developing nations in making an effort to preserve its natural as it joins the modern world.

Future directions

The results described and discussed above are the preliminary findings of a study that was rushed in planning, execution and analysis. Thus there is much room for improvement, as well as many other ways to interpret the data.

In 2012, bird data was collected for the inner part of Nanjing (as opposed to the outer portion this year), and in the future, other REU students will continue to work on this project as well, adding to and improving the current data set. This will allow for a larger-scale analysis of Nanjing's avifauna over a broader period of time, and will hopefully prove more valuable than this year's data alone.

In addition, with the combination of detailed bird and habitat data, the opportunity for studies using computer modeling to visualize and predict changes in species richness and abundance is ripe. With more time and data, we hope to perform some of these analyses.

Acknowledgements

This research was made possible by the National Science Foundation's Research Experience for Undergraduates Program, hosted by Alabama A&M University and Nanjing Forestry University. Thanks to our advisors Dr. Yong Wang and Dr. Jianqiang Li, for helping us set up and supervise the research. Ye Yuanxing and Dr. Li Xiaojing of Beijing Forestry University were essential to the survey process, as we could not have navigated around Nanjing and covered as much ground in the surveys without them. Several graduate students from Nanjing Forestry University also helped with navigation, and their help is greatly appreciated.

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Table 1. Species distribution by habitat type, Nanjing, China 2012.

Species	Agriculture	Forest	Park	Urban	Wetlands	Total	% total	Cum%
Tree Sparrow	93	37	19	325	15	489	30.7	30.7
Light-vented Bulbul	38	54	23	96	9	220	13.8	44.5
Black-billed Magpie	28	44	17	44	4	137	8.6	53.0
Red-rumped Swallow	23	23	13	43	8	110	6.9	59.9
Turtle Dove	23	23	3	17	3	69	4.3	64.3
Eurasian Blackbird	7	19	11	26	0	63	3.9	68.2
White-cheeked Starling	5	14	5	27	6	57	3.6	71.8
Spotted Dove	14	4	2	25	0	45	2.8	74.6
Myna	5	7	14	14	1	41	2.6	77.2
Masked Laughingthrush	6	14	12	7	0	39	2.4	79.6
Azure-winged magpie	7	6	2	13	0	28	1.8	81.4
Large Hawk-Cuckoo	6	17	4	1	0	28	1.8	83.1
Great Tit	2	20	3	2	0	27	1.7	84.8
Barn Swallow	10	1	11	4	0	26	1.6	86.5
White Wagtail	8	7	1	1	1	18	1.1	87.6
Indian Cuckoo	14	0	0	0	3	17	1.1	88.7
Vinous-throated Parrotbill	2	8	3	1	2	16	1.0	89.7
Common Koel	3	0	3	7	2	15	0.9	90.6
Chinese Pond- Heron	9	0	1	4	0	14	0.9	91.5
Black-crowned Night Heron	2	8	1	0	0	11	0.7	92.2
Brownish-flanked Bush Warbler	5	0	3	1	0	9	0.6	92.7
Ashy Drongo	1	7	0	0	0	8	0.5	93.2

Common Pheasant	0	8	0	0	0	8	0.5	93.7
Yellow-billed Grosbeak	0	8	0	0	0	8	0.5	94.2
Yellow-rumped Flycatcher	1	3	0	2	1	7	0.4	94.7
Red-billed Blue Magpie	3	2	1	1	0	7	0.4	95.1
Long-tailed Shrike	3	2	0	0	1	6	0.4	95.5
Black Bulbul	2	2	1	1	0	6	0.4	95.9
Grey-capped Greenfinch	1	1	0	3	0	5	0.3	96.2
Swinhoe's Minivet	0	3	2	0	0	5	0.3	96.5
Black-naped Oriole	1	0	0	1	2	4	0.3	96.7
Common Moorhen	0	2	1	1	0	4	0.3	97.0
Grey-capped Woodpecker	0	4	0	0	0	4	0.3	97.2
Black Drongo	0	0	0	0	3	3	0.2	97.4
Great Spotted Woodpecker	2	0	0	0	1	3	0.2	97.6
Japanese White-eye	1	0	1	0	1	3	0.2	97.8
Black-throated Tit	0	2	1	0	0	3	0.2	98.0
Eurasian Cuckoo	0	3	0	0	0	3	0.2	98.2
Hwamei	1	2	0	0	0	3	0.2	98.4
Little Grebe	0	2	1	0	0	3	0.2	98.6
Silky stanling	0	0	0	0	2	2	0.1	98.7
Black-eared Kite	0	0	2	0	0	2	0.1	98.8
Common Kingfisher	0	0	1	1	0	2	0.1	98.9
Manchurian Bush Warbler	1	1	0	0	0	2	0.1	99.1
Yellow Bittern	0	0	0	0	1	1	0.1	99.1
Brown Shrike	1	0	0	0	0	1	0.1	99.2

Cattle Egret	0	1	0	0	0	1	0.1	99.2
Dollarbird	0	1	0	0	0	1	0.1	99.3
Grey-headed Lapwing	0	1	0	0	0	1	0.1	99.4
Hair-crested Drongo	0	0	0	1	0	1	0.1	99.4
Large Egret	0	1	0	0	0	1	0.1	99.5
woodpecker-a	0	1	0	0	0	1	0.1	99.6
woodpecker-b	0	1	0	0	0	1	0.1	99.6
woodpecker-c	1	0	0	0	0	1	0.1	99.7
woodpecker-d	1	0	0	0	0	1	0.1	99.7
woodpecker-e	0	1	0	0	0	1	0.1	99.8
woodpecker-f	0	1	0	0	0	1	0.1	99.9
woodpecker-g	0	1	0	0	0	1	0.1	99.9
woodpecker-h	0	1	0	0	0	1	0.1	100.0

Appendix 1. Bird species list of detected species within summer of 2012, Nanjing, China.

Species-Common name	Scientific Name
Ashy Drongo	<i>Dicrurus leucophaeus</i>
Azure-winged magpie	<i>Cyanopica cyanu</i>
Barn Swallow	<i>Hirundo rustica</i>
Black Bulbul	<i>Hypsipetes leucocephalus</i>
Black Drongo	<i>Dicrurus macrocercus</i>
Black-billed Magpie	<i>Pica pica</i>
Black-crowned Night Heron	<i>Nycticorax nycticorax</i>
Black-eared Kite	<i>Milvus lineatus</i>
Black-naped Oriole	<i>Oriolus chinensis</i>
Black-throated Tit	<i>Aegithalos concinnus</i>
Brown Shrike	<i>Lanius cristatus</i>
Brownish-flanked Bush Warbler	<i>Cettia fortipes</i>
Cattle Egret	<i>Bubulcus ibis</i>
Chinese Pond- Heron	<i>Ardeola bacchus</i>
Common Kingfisher	<i>Alcedo atthis</i>
Common Koel	<i>Eudynamys scolopaceus</i>
Common Moorhen	<i>Gallinula chloropus</i>
Common Pheasant	<i>Phasianus colchicus</i>
Dollarbird	<i>Eurystomus orientalis</i>
Eurasian Blackbird	<i>Turdus merula</i>
Eurasian Cuckoo	<i>Cuculus canorus</i>
Great Spotted Woodpecker	<i>Dendrocopos major</i>
Great Tit	<i>Parus major</i>
Grey-capped Greenfinch	<i>Carduelis sinica</i>
Grey-capped Woodpecker	<i>Dendrocopos canicapillus</i>
Grey-headed Lapwing	<i>Vanellus cinereus</i>
Hair-crested Drongo	<i>Dicrurus hottentottus</i>
Hwamei	<i>Garrulax canorus</i>
Indian Cuckoo	<i>Cuculus micropterus</i>
Japanese White-eye	<i>Zosterops japonicus</i>
Large Egret	<i>Casmerodius albus</i>
Large Hawk-Cuckoo	<i>Hierococcyx sparverioides</i>
Light-vented Bulbul	<i>Pycnonotus sinensis</i>
Little Grebe	<i>Tachybaptus ruficollis</i>
Long-tailed Shrike	<i>Lanius schach</i>
Manchurian Bush Warbler	<i>Cettia canturians</i>
Masked Laughingthrush	<i>Garrulax perspicillatus</i>

Myna	<i>Gracula religiosa</i>
Red-billed Blue Magpie	<i>Urocissa erythrorhyncha</i>
Red-rumped Swallow	<i>Cecropis daurica</i>
Silky starling	<i>Sturnus sericeus</i>
Spotted Dove	<i>Spilopelia chinensis</i>
Swinhoe's Minivet	<i>Pericrocotus cantonensis</i>
Tree Sparrow	<i>Passer montanus</i>
Turtle Dove	<i>Streptopelia orientalis</i>
Vinous-throated Parrotbill	<i>Paradoxornis webbianus</i>
White Wagtail	<i>Motacilla alba</i>
White-cheeked Starling	<i>Sturnus cineraceus</i>
woodpecker-a	<i>Unknown</i>
woodpecker-b	<i>Unknown</i>
woodpecker-c	<i>Unknown</i>
woodpecker-d	<i>Unknown</i>
woodpecker-e	<i>Unknown</i>
woodpecker-f	<i>Unknown</i>
woodpecker-g	<i>Unknown</i>
woodpecker-h	<i>Unknown</i>
Yellow Bittern	<i>Ixobrychus sinensis</i>
Yellow-billed Grosbeak	<i>Eophona migratoria</i>
Yellow-rumped Flycatcher	<i>Ficedula zanthopygia</i>

**COMPARISON OF NITRIFICATION IN POPLAR AND *METASEQUOIA*
PLANTATIONS**

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Abstract

Understanding nitrification rates and their regulation is a key area of research for assessing the increasing impact of nitrification in the N cycle. This study reviews the net nitrification rate and inhibitors responsible for nitrification in Poplar and Metasequoia plantations in the National Wetland Park (119°15' E, 33°22' N) in Baoying, Yangzhou City, Jiangsu Province. The effects on nitrification rates in both plantations are affected by temperature, pH, soil moisture and microbial biomass. With this general understanding of the factors affecting nitrification rates, a comparison of the characteristics of soil N nitrification and NO_3^- -N production between Poplar and Metasequoia plantations in riparian zones was studied. Furthermore, this experiment includes the ability to effectively evaluate the relative importance of autotrophic and heterotrophic nitrification in Poplar and Metasequoia plantations.

Introduction

How nitrification is regulated and how environmental change affects it is a major area of study in forest ecology, because the net N availability often limits the primary production of plants in many forest ecosystems. The nitrification studies are being extensively highlighted because of growing concerns regarding elevated N deposition in forest ecosystems on a global scale (Binkley and Hart 1989). The goal for research conducted on the Comparison of the Characteristics of soil N Nitrification and NO_3^- -N production, between Poplar and Metasequoia plantations, is to compare the characteristics of soil N nitrification and Ammonium Nitrate between Poplar and Metasequoia plantations in riparian zone and effectively evaluate the relative importance of autotrophic and heterotrophic nitrification in Poplar and Metasequoia plantations.

Nitrification

Nitrification is the process by which ammonium is oxidized to nitrite (NO_2) and nitrate (NO_3) by ammonia-oxidizing bacteria. Nitrification occurs in a two -step process. Step one of nitrification occurs when ammonium nitrosomonas oxidize ammonia to nitrite via hydroxylamine. Hydroxylamine is an inorganic compound with the formula NH_2OH . The pure material is a white, unstable crystalline, hygroscopic compound. It is also an intermediate in biological nitrification. Step two of nitrification occurs when nitrobacter oxidize nitrite oxidizing bacteria from nitrite to nitrate. The soil nitrification processes includes autotrophic nitrification and heterotrophic nitrification. Autotrophic nitrification produces NO_3^- -N from NH_4^+ -N consumption. Heterotrophic nitrification produce NO_3^- -N directly from organic N consumption.

Poplar Trees

Poplars are broad-leaved deciduous trees with rounded contours. There are various species of poplar growing in a range of soil types under different situations. Poplar trees belong to the genus *Populus*, which includes species also known as aspens and cottonwoods, all members of the willow family, Salicaceae and native to most of the Northern Hemisphere. The deciduous Poplar tree can grow to heights exceeding 150 feet. Most Poplars range between 50 and 165

feet and feature large, sturdy trunks that measure up to eight feet in diameter. In addition to their towering size, Poplar trees feature other distinguishable characteristics, including leaves, flowers, fruit and bark. Poplar leaves range in size and shape, though most are oval to heart-shaped and have fine teeth along the edges. The leaves are green in the spring and summer, but turn yellow and gold in the fall. The trees have both male and female flowers, which bloom in the spring before the leaves appear. The pretty yellow blossoms grow in clusters and hang from the branches. Like the flowers, the Poplar fruit appears before the leaves are fully grown. The fruits are small, thick-skinned capsules that feature four valves. Each green to reddish-brown capsule contains dozens of tiny seeds covered with silky white hairs. The fine hairs help the seeds disperse on windy days. The bark of Poplars is smooth and soft and range in color from white to dark grey. As the tree matures, the bark becomes rough and uneven; it can also become cracked and wrinkled depending on weather conditions.

Metasequoia Trees

Metasequoia is a fast-growing, critically endangered deciduous tree. It is the sole living species of the genus *Metasequoia*, and is one of three species of conifers known as redwoods. It is native to the Sichuan-Hubei region of China. Metasequoia has proved an easy tree to grow in temperate regions, and is now widely planted as an ornamental tree. Planted specimens have already reached 25-40 m in height and 1-1.3 m in diameter, despite being in cultivation for under 60 years. This rapid rate of growth has led to consideration for using the tree in forestry plantations. It has been discovered that Metasequoia will thrive in standing water, much like the baldcypress, and if left branched to the ground in full sun, will develop the large, contorted boles that have made it famous. While the bark and foliage are similar to the closely related redwood genus *Sequoia*, *Metasequoia* differs from the California redwood in that it is deciduous. The leaves are opposite, 1-3 cm long, and bright fresh green, turning a foxy red-brown in fall. The cones are globose to ovoid, 1.5-2.5 cm in diameter with 16-28 scales, arranged in opposite pairs in four rows, each pair at right angles to the adjacent pair; they mature in about 8-9 months after pollination. The pollen cones are 5-6 mm long, produced on long spikes in early spring; they are only produced on trees growing in regions with hot summers.

Soil Quality

Soil quality, also referred to as soil health, is how well soil does what we want it to do. More specifically, soil quality is the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation. Soil moisture is instrumental in controlling the exchange of water and heat energy between the land surface and atmosphere through evaporation through and plant transpiration. Soil microbial biomass is an early indicator of changes that may occur in the long term with regards to soil fertility. Soil pH is probably the most important chemical soil parameter. It reflects the overall chemical status of the soil and influences a whole range of chemical and biological processes occurring in the soil. Each of these components makes up the fundamental basics of this experimental research.

Materials and Methods

Two adjacent Poplar and Metasequoia plantations were selected for this research. The Poplar Plantation was established in 1989 with a plantation density of 417 tree/hm² and mean Diameter Breast Height (DBH) of 35.5 cm. The Metasequoia plantation was established in the later 1970s with a plantation density of 625 tree/hm² and mean DBH of 36.1 cm. Soil bulk densities were 1.12 g/cm³ and 1.10 g/cm³ in the top 0-20 cm for Poplar and Metasequoia plantations, respectively. Poplar and Metasequoia plantations are usually established on riparian land for timber production and for maintaining healthy aquatic ecosystems as buffer zones. The research sites were set up in the National Wetland Park in Baoying, Yangzhou City, Jiangsu Province. The park is located in humid subtropical monsoon climate with annual mean temperature of 14.4°C and annual precipitation of 938.6 mm. The soil is classified as flood alluvial loess formed from the parent material of fluvial and alluvial materials of Baoying Lake.

Research began in June 2013 at the National Wetland Park in Baoying, Yangzhou City, Jiangsu Province. Field-work included taking fresh soil samples (0-10 cm and 10-20 cm) from 3 random soil profiles in both the Poplar and Meatasequoia plantations. Samples were

collected and taken to the laboratory and stored at 4 °C until the time of analyses. Soil samples were prepared by grinding through a 2 mm-sieve bagged and stored at room temperature. We began by taking the soil analysis of pH (Figure 1). The pH of soil was first analyzed by measuring ten grams of each soil in triplicates. 50 mL of water was then added and stirred to each soil, and after 30 minutes the pH was measured and data was recorded (Figure 1). Gravimetric Water Content to determine soil moisture was also analyzed (Figure 2). Initially the weight of a small mason jars were recorded and approximately 18.5 g of fresh, sieved soil was measured in triplicates and added to each jar. Soil samples were then oven dried at 65°C for 48 hours. Next, microbial biomass N (Figure 3). The analysis began by measuring five grams of soil in triplicates. Two milliliters of KCl (potassium chloride) was added to each sample. Samples were then covered and secured with Styrofoam and placed in a shaker and allowed to mix for 30minutes. The last the net nitrification rate in both the Poplar and Metasequoia plantations were determined by the incubation method using different substrates (Figures 4 & 5). Ten grams of fresh soil was weighed, placed in small mason jars and triplicated in four groups based on substrates. The four substrates were ammonium chloride, glycine, nitrapyrin and actidione. One milliliter of ammonium chloride was added to Group A1. One milliliter of glycine was added to Group A2. One milliliter of nitrapyrin was added to Group A3. One milliliter of actidione was added to Group A4. Samples were then incubated for one week and run on the ammonium nitrate analyzer.

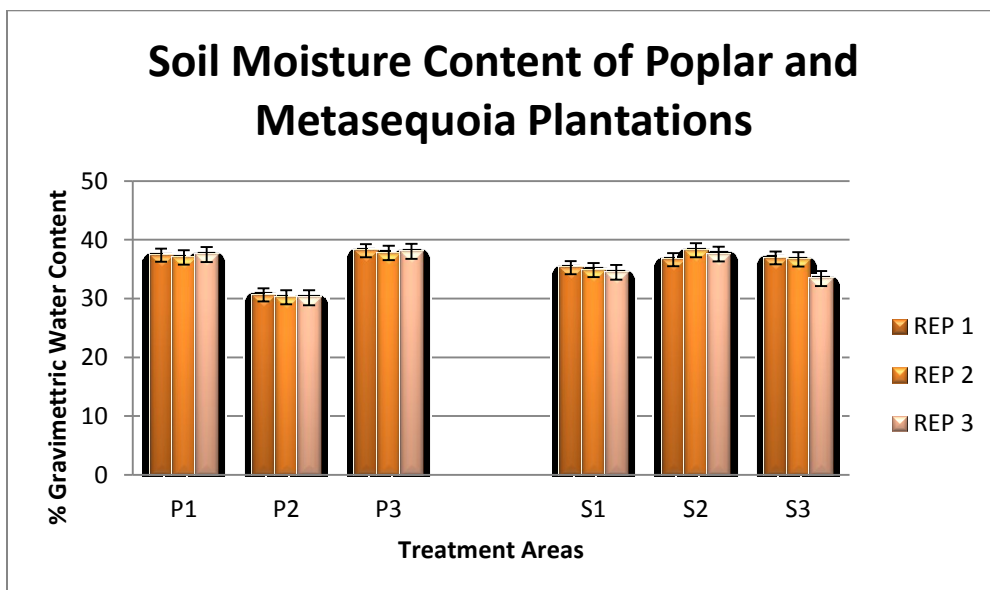


Figure 1. Soil pH of Poplar (P) and Metasequoia (S) Plantations.

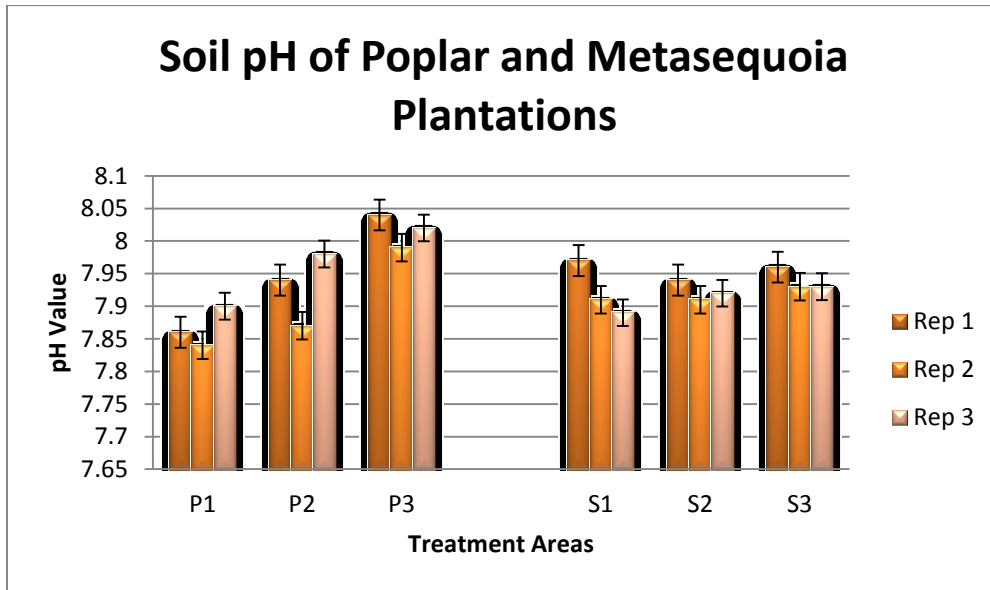


Figure 2. Soil moisture of Poplar (P) and Metasequoia (S) Plantations.

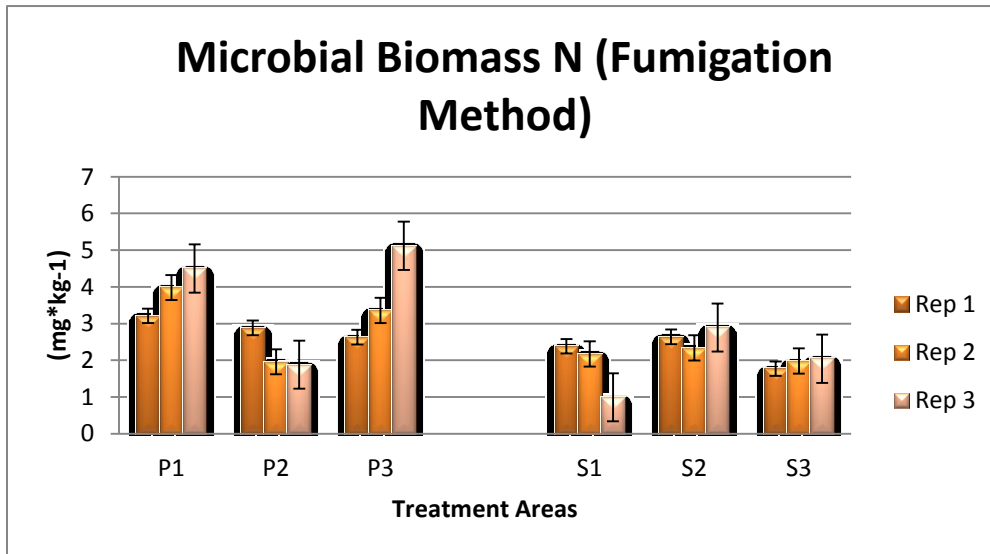


Figure 3. Microbial Biomass N (Fumigation Method) Poplar (P) Metasequoia (S).

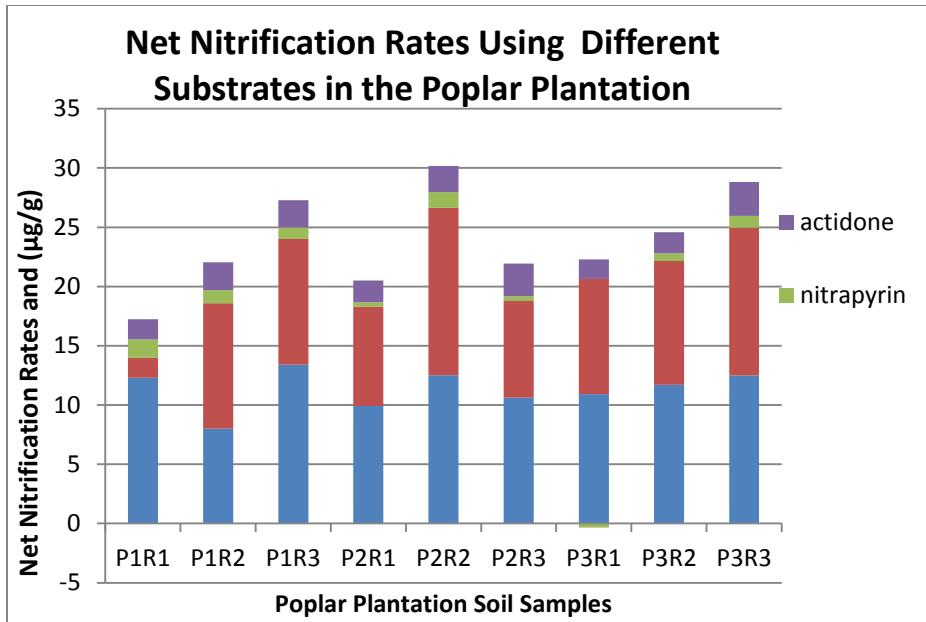


Figure 4. Net Nitrification of Different Substrates in the Poplar Plantation.

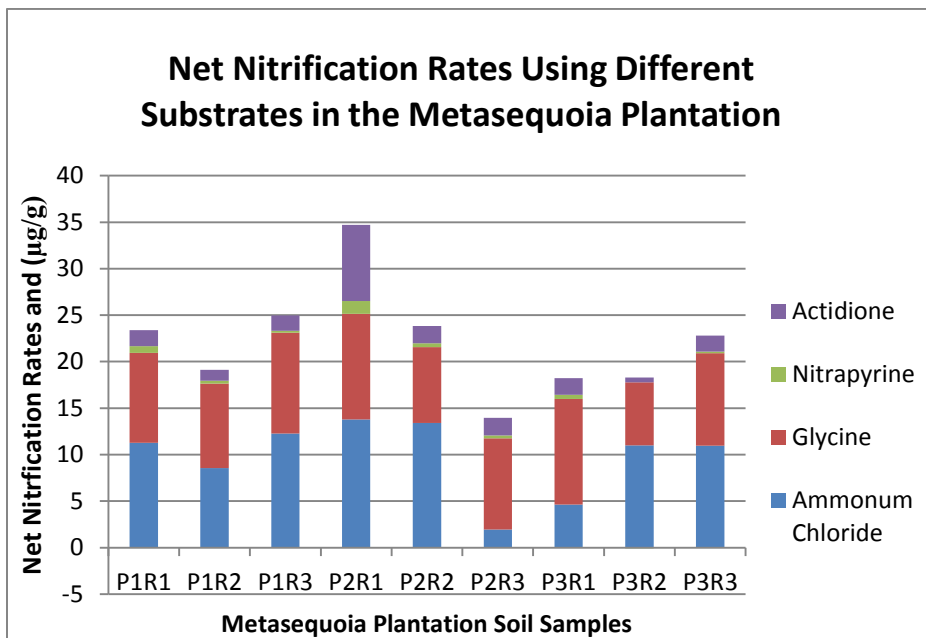


Figure 5. Net Nitrification of Different Substrates in the Metasequoia Plantation.

Discussion and Conclusion

Previous studies indicate that soil nitrification is regulated by several factors such as temperature, moisture, microbial biomass and pH. In this study both sites have an annual

mean temperature of 14.4 °C and are similar in pH and moisture content. Soil moisture is one of the important factors affecting rates of N cycling in soils. This same observation has been made in many studies (Binkley and Hart 1989). Our findings also indicate that the Poplar plantation is slightly higher in microbial biomass N. Previous studies show there is a high net nitrification rate when glycine and ammonium chloride substrates are added to soil samples. This is evident in the higher net nitrification rate in the Poplar and the Metasequoia plantations when those substrates were added. Studies also indicate that acidic soils amended with glycine are nitrified more readily than soils that contain ammonium chloride. One of the four substrates added actidione, is an antibiotic that is known to be and inhibitor to microbial growth. nitrapyrin one of the four substrates added during incubation can be used as a nitrogen nitrification inhibitor and soil bactericide, and can delay the nitrification of ammonium ion in soil. In conclusion, a possible reason for the higher MBN and net N nitrification in the Poplar plantation may be because the trees are rapidly-growing, but relatively short-lived, which suggest that leaves frequently fall, causing high organic matter, leading a higher MBN and thus a higher net N nitrification.

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URBANIZING IN NANJING, CHINA FROM 1995-2011

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Abstract

This study was conducted as an analysis of the correlation between land usage and urbanization trends in Nanjing, China. Census data, land use and landscape patterns were analyzed for the period 1995 to 2011, to identify significant variations and changes. The analysis was facilitated by the use of satellite images and Geographic Information System (GIS) software. Several classification techniques and operations were performed with ArcGIS and ENVI software. The results showed that as urban area increased dramatically, other land areas, including forestland, grasslands declined modestly, while farmland areas declined sharply.

Key Words: Urbanization, Geographic Information Systems, Clipping, Region of Interest (ROI), Classification, Unsupervised Classification, Supervised Classification, Post-Classification, Support Vector Machine, Majority Analysis, Tagged Image File Format (TIFF)

Introduction

For centuries, urban living in China was a privilege afforded to a small minority of the population. As recently as 1980, the entire country had fewer than 250 cities and an urbanization level of 20 percent. By 1995, China's urbanization level had increased to 29 percent. Since 1995, China has experienced accelerated urbanization that is projected to continue throughout the current decade. Each year, from 1996 to 2006, more than 20 million rural people migrated to urban areas, marking an annual growth rate of 1.3 percent.

This paper, through analyzing satellite images of land usage, seeks to identify the correlation between urbanization trends and land usage in Nanjing, China, from 1995 to 2011. (*See Fig. 1*) More importantly, it seeks to measure the impact of urbanization upon land usage within the period. The paper is organized as follows: The following section introduces materials and methods used to gather, classify and analyze data and statistics and land images. In the results and discussion sections, the findings are presented and interpreted.

Materials & Methods

ArcGIS 10. ENVI 4.7. Google Earth. Toshiba: Satellite M505-S4940. Pentium® Dual-Core CPU. 64-bit Operating System. National Bureau of Statistics of China. Mastering ArcGIS by Maribeth Price.

Stage 1: Image Collection and Manipulation

The images were provided by Dr. Mingshi Li. He obtained them through the use of United States Geological Survey (USGS) Maps. Dr. Li also created the shapefile for the main urbanized area of Nanjing. (*See Figure 2*) All of the images were organized into separate folders and loaded into ArcMap 10 (ESRI for manipulation. A folder connection had to be created in order to carry out this process. Every satellite image was clipped to the shape of the provided shapefile using the clipping tool in ArcMap 10. The three years 1995, 2005 and 2011 were all set as input rasters for raster processing and clipping. In addition, the output extent was set to the provided shapefile for the urbanized area. Once this task was complete, the new clipped images were named by year and prepared for band manipulation. (*See Fig. 3*).

The clipped images symbology was changed in order to show difference in reflectivity. All Channels (Red, Green, and Blue) Bands' layers, for each clipped image, were switched. Red band was switched to Layer 4. Green band was switched to Layer 3. Blue band was switched to Layer 2. These changes show significant variation in land use types. Red and Dark red reflectivity represent vegetation. Blue and Dark blue represent water's reflectivity. High infrared or bright colors represent man-made developments and urbanization (See Fig. 4).

Stage 2: Classification of Images

The use of ENVI 4.7 software aided in the classification process of the provided images. Several supervised and unsupervised classification methods were attempted in this study. Unsupervised methods included K-Means and ISODATA. Supervised methods included Maximum Likelihood and Support Vector Machine (SVM).

The application of K-means unsupervised classification resulted in skewed maps. To produce these K-means images the number of classes selected was set to 15 and maximum iterations were set to 10. After the image was completed, the 15 classes were combined based on their relationship to one another. The pixels that had been clumped into each class created inaccurate images after being compared to Google Earth images of Nanjing.

ISODATA also created several faulty images based on the given parameters. The number of classes that were set to create ranged from 15 to 25. Maximum iterations were set to 10 for accuracy. Additionally, the minimum number of pixels allowed in each class was set to 50 pixels. Once these rules were set and the images were generated, they were compared with one another. They were also compared with satellite images from Google Earth. These ISODATA images were slightly inexact.

Before any of the supervised classification methods could be attempted, Regions of Interest (ROIs) had to be selected from each image. Selecting the ROI for each image is a process which requires basic knowledge and familiarity with the area of selection. Google Earth facilitated the proper positioning of the ROIs. This process involved the creation of 5 separate classes including: Forest Land, Grassland, Farmland, Water and Urbanization. Each class was given a color code. Forest Land was given Dark Green. Grassland was given Green. Farmland was given Brown. Water was given Blue. And Urbanization was given Gold. After each class

was created, ROIs were drawn as polygons upon the images. Once all of the ROI polygons were completed, the ROIs were saved and then prepared for Supervised Classification.

After the use of two separate types of unsupervised classification, Maximum Likelihood was attempted as a classification method. Before this step could be completed, the saved ROIs were overlaid across the image of the map that they were created with. When Maximum Likelihood was selected to be performed, the boundaries were based on that of the ROIs for each specific year. The images gained from this form of supervised classification were somewhat less than optimal. This tool provided images that contained pixels of grassland in areas where water should be placed. Maximum Likelihood also assumed that some pixels of Urbanization should be classified as Water.

Support Vector Machine was employed as a classification method after Maximum Likelihood showed some negative results. After all of the ROIs for each year were loaded into SVM, then it began to normalize the data that was provided. All of the images created by SVM were very accurate and compared well with one another. They also had good relation with Google Earth. The SVM images were prepared for post classification after they were finished (See Fig. 5).

Stage 3: Urbanization Image Analysis

Post-Classification was used in order to analyze all images. A Post-Classification tool called Majority Analysis was set up to clump pixels together that dominated a 3x3 pixel radius. This action only created a clearer SVM image. This method simply enhanced the image by taking pixels away from the image that may cause slight distortion in the results after analysis. (See Fig. 6) In addition to this analysis, Classification Reports were obtained for each of the images that had been placed under majority analysis. Each classification report contained a class distribution summary and statistics for every class. These statistics were used to gain results for this study. Microsoft Excel was used to calculate the results from the classification reports. It was also used to create the graphs for the results.

Finally, all classified images were exported to ArcMap 10 for the application of map legends, scale bar and text, north arrow and title. Before this operation could be completed, the images had to be converted to Tagged Image File Format (TIFF). After all images were converted, they were uploaded into ArcMap 10. The symbology was changed in unique values for all 5

of the classes. All of the classes: Forest Land, Grassland, Farmland, Water and Urbanization were given the appropriate color code as discussed in Stage 2 (See Figs. 7, 8 , and 9).

Results

Classification Reports: Forest Land made a slight decrease from the years of 1995 to 2011. Grassland also sustained subtle loss from 1995 to 2011. Farmland, however, had significant decline in land from 1995-2011. Water endured a gradual reduction of space from 1995-2011. Urbanization has risen considerably from 1995-2011 (See Table 1).

Population Comparison: The total registered population growth in Nanjing, China has also endured some noticeable change from the years of 1995 to 2011. In this time period, population in Nanjing has risen from over 5,000,000 in the year 1995 to over 6,000,000 in 2011.

Discussion

The land mass of Nanjing is 2,547 square miles. Based on comparisons of digital imaging data derived from classified maps of the city in 1995 and 2011, Nanjing experienced the following shifts in land distribution: Forest - 1.6% loss, Grassland - 0.3% loss, Water - 2.3% loss, Farmland - 13.0 % loss, and Urbanization - 8.3% gain. The most significant land use shifts lie in the gain of urban-use land of 211 square miles, 135,297 acres; and the disparate and dramatic corresponding loss of farmland equivalent to 331 square miles or 211,910 acres (See Table 2).

Conclusion

Based on official statistics and data from satellite imagery, this paper documents and analyzes the pattern of shifting land use in Nanjing, China since 1995. It is concluded that Nanjing's

cultivated land has declined at a dramatic rate, demonstrating that rapid urbanization (and associated waste disposal) has posed a considerable threat to farmland availability. This progressive loss of land usage over the period will have a sustained impact on grain production to support a population which now stands at more than 8.1 million.

To remain viable in the intermediate- and long-term future, and maintain a proper balance of supply and Nanjing will have to rigidly adhere to a series of measures (some of which are already in place). Such measures include importing food from other regions, strict control of population growth, increasing current grain production and improved agricultural technology.

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**EFFECTS OF WATER ON RHIZOPUS ORYZAE WHOLE CELL-
CATALYZED TRANSESTERIFICATION OF BEAN OIL FOR BIODIESEL
PRODUCTION**

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Abstract

Biodiesel production produced by the methanolysis of plant oils has received a lot of research attention due to its potential as a renewable and environmentally-friendly energy resource. The use of a whole-cell biocatalyst eliminates the need for purification that is necessary for most modern industrial processes and appears to be a more efficient and promising technique in the process of producing biofuel through the transesterification of triglycerides. The effect of water on biodiesel production was investigated with the use of bean oil and *Rhizopus oryzae* whole cell with polyurethane foaming plastic as a whole-cell biocatalyst. The optimal water content was found to be 10% after 60 hours. The results presented could be beneficial to producing an optimally efficient and cost-effective biodiesel production technique.

Introduction

Biodiesel production has received a lot of attention due to its potential as a domestic, biodegradable, renewable energy resource with countless environmental benefits. Many industries today use chemical methanolysis with alkalicatalysis for biodiesel production. This involves difficult catalyst removal and excessive energy requirements. The use of lipase has received interest due to the simple purification of fatty methyl esters and the easily recovered glycerol by-product. However, extracellular lipase has proven to be expensive due to extensive recovery, purification, and immobilization processes. In this study, intracellular lipase was used with a whole-cell biocatalyst. The effect of water on biodiesel production was investigated with the use of bean oil and *Rhizopus oryzae* whole cell with polyurethane foaming plastic as a whole-cell biocatalyst.

Materials and Methods

Step 1. Fermentation Medium Preparation

The fermentation medium was prepared with the following chemicals by mass percent: tryptone 2%, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ 0.05%, NaNO_3 0.1%, KH_2PO_4 0.1%, and bean oil 3%. The medium was set to a pH of 5.5. Four beakers with 80 mL of medium were prepared. 0.6g of polyurethane foaming plastic cubes with a side length of 5-7 mm were placed in three of the beakers, with the fourth beaker designated as a control.

The four beakers were autoclaved for 20 minutes at 121 °C.

Step 2. Breed Cultivation of Rhizopus oryzae

The cultivation medium consisted of 2% D-(+)-Glucose and 20% potato juice by mass. A potato was cooked in boiling water, packed into gauze, and the juice was extracted. The medium was placed in a petri dish with 2% (by mass) agar for solidification and autoclaved for one hour. *Rhizopus oryzae* was then inoculated and placed in an incubator at 28°C at 180 rpm until mold was visible.

Step 3. Introducing *Rhizopus oryzae* to the Fermentation Medium

The beakers that were prepared in step 1 were placed under a UV sanitation hood for 10 minutes. The *R. oryzae* breed cultivation was inoculated into the four beakers, and the beakers were placed in a constant-temperature shaker for 60 hours at 28°C at 180 rpm.

Step 4. Whole Cell Biocatalyst Retrieval

The polyurethane foaming plastic was retrieved from the four beakers prepared in step 3. The plastic was washed 3-5 times with water and then the water was promptly removed. 200 mL of glutaraldehyde (1%) was added. The dish was covered with gauze and incubated for 1 hour at 25 °C, 180 rpm.

Phosphate buffer (diluted 10 times) consisting of 6.5 mL of KH_2PO_4 and 50 mL of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ was added to the foam and placed in an ice water bath for 5 minutes. The foam was then dried in a multi-thermo incubator for 10 hours at 30 °C.

Step 5. Biodiesel Production

Six beakers were filled with 15 g of bean oil and 680 mL of methanol. Beakers were labeled 0%-20% in increments of 5, with the corresponding percent of water added to each beaker. Each beaker had 25 pieces of *R. oryzae* foaming plastic obtained in step 2.4. One beaker without foam or water was designated as the control. The beakers were placed in the constant-temperature shaker for 12 hours.

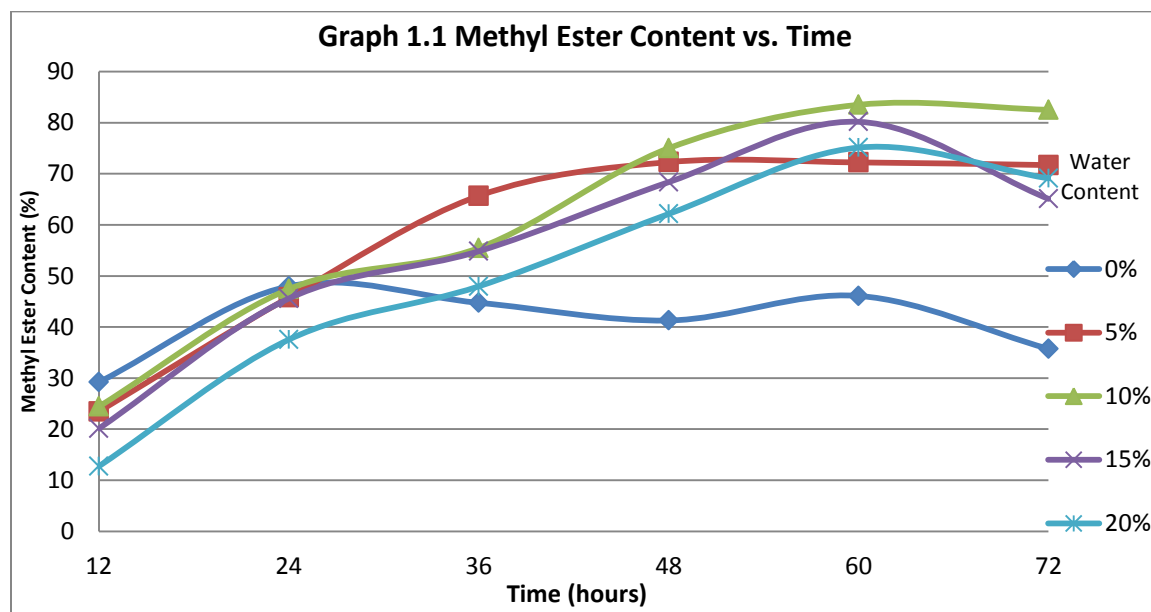
Stepwise sampling in the form of 150 μL was obtained from every beaker and 680 μL methanol was added every 12 hours. Gas chromatography was performed on every 12 hours sample to measure the methyl ester content. Methyl heptadecanoate was used as the interior label.

Results

Rhizopus oryzae was successfully cultivated in the polyurethane foam. The following data was obtained from GC analysis.

Table 1. Effect of time and water on methyl ester content.

Water Content	Time (hours)					
	12	24	36	48	60	72
0%	29.20	47.97	44.74	41.28	46.09	35.72
5%	23.45	45.80	65.68	72.29	72.23	71.71
10%	24.42	47.42	55.47	75.01	83.51	82.53
15%	20.12	45.58	54.84	68.37	80.18	65.09
20%	12.74	37.54	47.96	62.14	75.14	69.10



*The control showed no peaks throughout sampling.

Conclusion

The effect of water on biodiesel production was investigated with the use of bean oil and *Rhizopus oryzae* whole cell with polyurethane foaming plastic as a whole-cell biocatalyst. The optimal water content was found to be 10% after 60 hours. Further studies need to be conducted in order to examine the optimal time stages for the stepwise addition of methanol and for the best type of foaming plastic to be used as a whole-cell biocatalyst. The use of cheaper oils or other sources of triglycerides is another area for future experimentation in order to develop the cheapest and most efficient biodiesel production process.

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**IDENTIFICATION OF OXIDATIVE DAMAGE IN BAMBOO PLANTS
EXPOSED TO CHROMIUM**

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Abstract

Through industrial manufacturing, waste disposal, and human agricultural activities, plants have been exposed to excessive amounts of heavy metals, leading to toxic conditions. Chromium is a heavy metal component in soil and is required by plants as micronutrients. High chromium concentrations in soils result in a decrease of plant growth and development. Previous studies have shown methods used for phytoremediation of heavy metals in plants. The overall goal of this research is to determine the level of oxidative damage exposed to chromium in *Indocalamus barbartus* McClure bamboo species, and to determine if silicon can serve as a protectant to the exposed bamboo. The overall goal of this research was to evaluate the malondialdehyde (MDA) and chlorophyll content of the bamboo. Collectively, the chromium caused oxidative damage to the bamboo and silicon proved that it could be used to protect the bamboo against the oxidative damage exposed to chromium.

Keywords: *chromium, oxidative damage, silicon, bamboo, phytoremedian*

Introduction

Heavy metals are elements with metallic properties and an atomic number >20 . The most common heavy metal contaminants are Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Lead (Pb) and Nickel (Ni). Through industrial manufacturing, waste disposal, and human agricultural activities, plants have been exposed to excessive amounts of heavy metals, leading to toxic conditions. Metals are natural components in soil with a number of heavy metals being required by plants as micronutrients. Heavy metal contamination to water and soil poses a major environmental and human health problem. In addition, excessive metal concentrations in contaminated soils result in decreased soil formation. Chromium is a heavy metal and is the sixth most abundant element in the earth's crust. It is used in metal alloys, automobile brake production and leather tanning. Plants and animals are primarily exposed to chromium through waste disposal, atmospheric deposition and groundwater contamination. Chromium concentrations in contaminated soils result in a decrease of plant growth and development, and negatively affect the plant's photosynthesis.

Heavy metals cannot be destroyed or degraded but are only transformed from one oxidation state to another. Studies have shown of some methods used for the remediation of heavy metals in plants. Thus, these methods has caused large destruction of soil structure and fertility, therefore new experimental phytoremediation strategies are necessary.

Phytoremediation is a concept involving the use of plants to remove chemical contaminants in a bio matrix. Silicon plays a significant role in soil formation processes In addition to improving uptake of nutrients and contaminants; the improved silicon plant-nutrition reinforces the plant's protection against diseases, insect attack and unfavorable climatic conditions.

Oxidative damage of plants could be tested in ways that use different assays such as Malondialdehyde (MDA) or measure the chlorophyll content. MDA is a widely used marker of oxidative lipid injury whose concentration varies in response to biotic and abiotic stress. Chlorophyll content is an index used to diagnose the plant nutrients' status or damage of a plant.

Materials and Methods

The Nanjing Forestry University graduate students planted the bamboo species *Indocalamus barbatus* McClure in September 2012. Twenty bamboo plants were potted in 1 kg of dry soil each. Five plants were allotted for each Cr exposure level, which included the following levels: 0 g (control), 200 g, 400 g, and 800 g. The students observed and allowed the plants to grow for 60 days. The bamboo plants were watered twice daily with 150 mL of water. After collecting the data from each plant, the students selected the 800 g Cr exposure level to use as the experimental group to test the effects of silicon on the bamboo exposed to Cr. Four 800 g Cr pots had a different level of silicon added to it, including the following levels: 0 g (control), 100 g, 300 g, and 500 g. The students observed and allowed the bamboo exposed to silicon to grow for 60 days. The bamboo plants were watered twice daily with 150 mL of water.

To test the oxidative damage of the bamboo plants using MDA, a sample preparation was required. I first collected 2-3 leaves of *I. barbatus* McClure. I then cut the bamboo leaves into small pieces using a pair of scissors. From these cut pieces of bamboo leaf, I measured out 0.200 g of bamboo using a digital balance. To pulverize the measured leaf, I used a small amount of quartz sand to assist with the process in a mortar and pestle. After grinding the sample, I poured it into a 10 mL test tube. I then used a 20 mL graduated cylinder to measure out 5 mL of 7.5 buffer solution, then pour into test tube with sample. Each sample was centrifuged at 6,000 rpm for 15 minutes in Anke TGL-16G, then decanted. I poured the supernate into a clean 15 mL test tube and discarded the precipitate, and kept the supernate as the sample. I repeated these steps for the other concentration bamboo samples. To test MDA of the bamboo, I measured 3 mL of tert-butyl alcohol (TBA) into a clean 15 mL test tube. I then added 2 mL of bamboo sample to the test tube. I heated the mixture for 15 minutes in a hot water bath at 100 °C, then centrifuged at 6,000 rpm for 15 minutes in Anke TGL-16G. After, I placed 2 mL of the mixture into a cuvette and measure absorbance at 532 nm, 450 nm and 600 nm using a 2802 UV/VIS Spectrophotometer, place 2 mL of the mixture in a cuvette. I repeated these steps for the other concentration bamboo samples to test MDA. To test the chlorophyll content of the bamboo, I used a digital chlorophyll meter on each bamboo leaf to determine chlorophyll content.

Results and Discussion

The effect of chromium stress on MDA in the bamboo exposed to 800 g of chromium caused the highest oxidative damage to the bamboo. The effect of silicon on MDA in bamboo exposed to 800 g of chromium decreased with 500 g of silicon shows that the silicon served a protectant of the bamboo exposed to chromium. The effect of chromium stress on chlorophyll content in bamboo decreased the exposed to 800 g of chromium, which showed oxidative damage in the bamboo. The effect of silicon on chlorophyll content in bamboo exposed 800 g of chromium increased at 500 g of silicon, which showed that silicon served as a protectant to the bamboo and release chlorophyll back into the plant.

Chromium is both a micronutrient for bamboo plants and a heavy capable of stress induction. The first visible symptom of chromium toxicity of the bamboo plants was the discoloration of the leaves due to the decreased rate of chlorophyll content. Chromium induced degradation of chlorophyll through damage on chlorophyll structure and function. Photosynthesis has been found to be very sensitive to heavy metal toxicity. The MDA was the main peroxidation product of membrane lipids when plants were subjected to several stresses. Therefore, MDA content was commonly considered as a general indicator of the stress level increase. Excess chromium led to the increase of MDA content. With the increasing concentration of chromium amounts, the increase of MDA content identified that the bamboo suffered from oxidative damage.

Conclusion and Summary

The bamboo being exposed to chromium caused oxidative damage. The bamboo exposed to silicon proved that silicon protected the bamboo against the oxidative damage caused by chromium exposure. The degree of change in the bamboo plants' physiological properties, the decrease of chlorophyll content and the increase of MDA content, reflect that chromium is capable of causing oxidative damage to bamboo plants. Silicon was proven that it could serve a method of phytoremediation activity towards bamboo plants.

Tables and Figures

Table 1. The effects of chromium stress on MDA in bamboo.

Control	Experiment 1	Experiment 2	Experiment 3
	200g	400g	800g
6.6386±0.3137	7.9003±0.3867	7.9546±0.3032	8.1652±0.1510

Table 2. The effects of silicon on MDA in bamboo exposed to 800 g of chromium.

Control	Experiment 1	Experiment 2	Experiment 3
	100g	300g	500g
6.6386±0.3137	6.5221±0.1785	5.7410±0.1790	6.6870±0.2579

Table 3. The effects of chromium stress on chlorophyll content in bamboo.

Control	Experiment 1	Experiment 2	Experiment 3
	200g	400g	800g
1.47±0.07	1.08±0.01	1.04±0.02	1.13±0.01

Table 4. The effects of silicon on chlorophyll content in bamboo exposed 800 g of chromium.

Control	Experiment 1	Experiment 2	Experiment 3
	100g	300g	500g
1.47±0.07	1.21±0.02	1.21±0.01	1.15±0.05

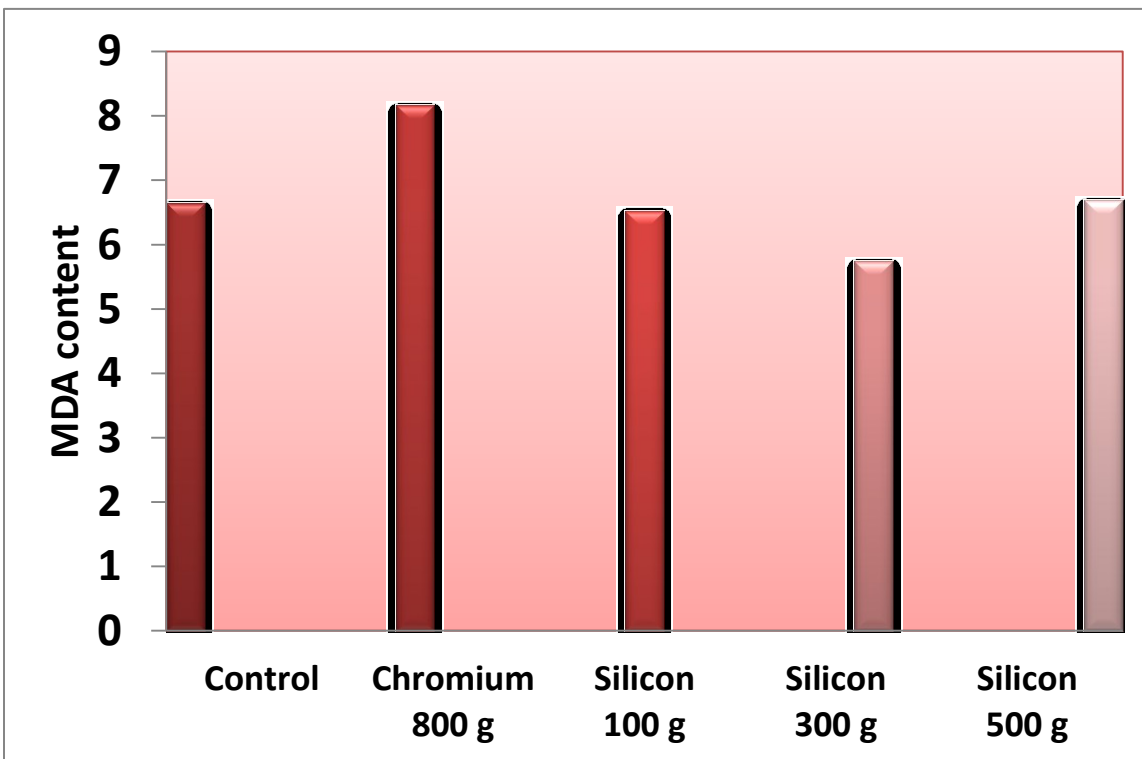


Figure 1. Shows the increase in MDA content with exposure to 800 g of chromium which indicated damage, then shows the decrease in MDA content with the exposure of silicon, which indicate that it protected the bamboo from the oxidative damage caused from the exposure of 800 g chromium.

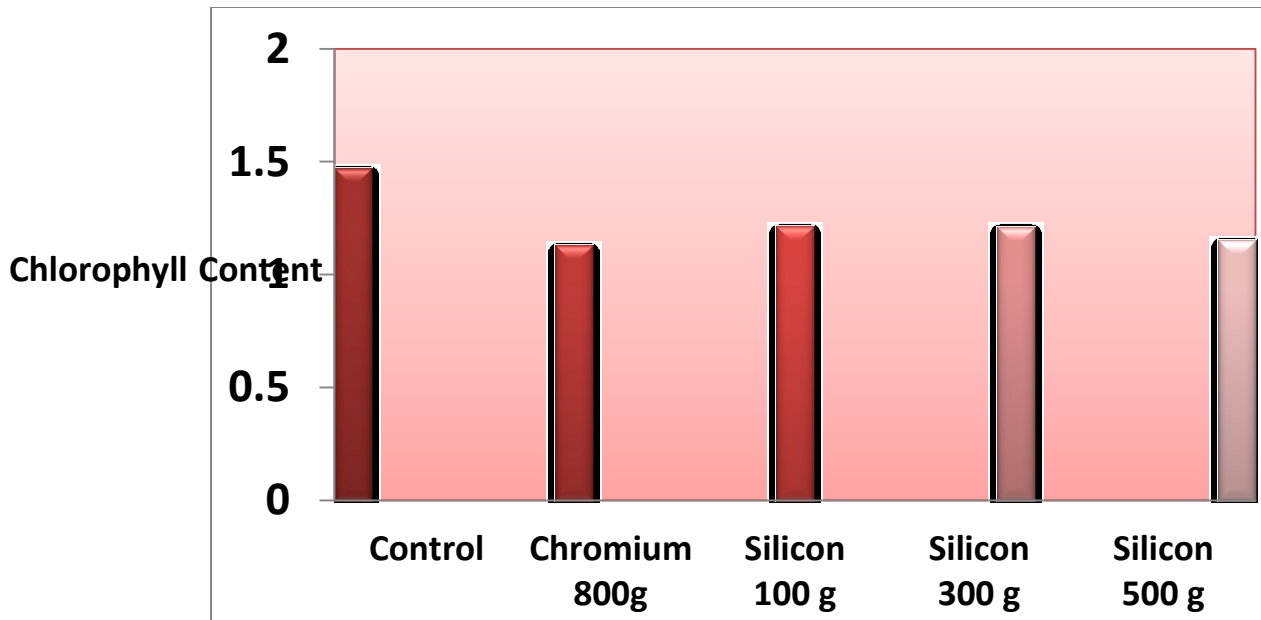


Figure 2. Shows the decrease in chlorophyll content with exposure to 800 g of chromium which indicated damage, then gradually shows increase in chlorophyll content with the exposure of silicon, which indicate that it protected the bamboo from the oxidative damage caused from the exposure of 800g of chromium.

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**FORAGING ECOLOGY OF BATS IN DEVELOPED AND FORESTED
AREAS IN NANJING, JIANGSU PROVINCE, CHINA**

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Abstract

Bats play key roles in many ecosystems, but the rapid urbanization that has been occurring in China may have detrimental effects on their species composition, habitat, and foraging activity. To determine if there has been an impact, this study was conducted to determine what different bat species are eating in Nanjing and if there is a difference in their diets and the foraging activity in developed and forested habitats. Bat foraging activity was assessed at 9 sites on 13 nights by measuring the number of echolocation calls with an Annabat II bat detector per one minute every five minutes for an hour at twilight. Nine bats were captured using mist nets while recording calls at these same sites. Guano was collected from these bats and analyzed for diet composition using a nine-point grid overlay on eleven magnified photos of the processed scat for each bat. Three species were caught: three *Pipistrellus abramus*, which had a generalist foraging strategy, five *Eptesicus serotinus*, which consumed 64% Coleoptera in its diet, and one *Rhinolophus pearsonii*, which consumed 68% Lepidoptera.

The results of a t-test revealed that bat foraging activity was significantly higher in developed sites (nights=7) than in forested sites (nights=6, $p=0.02$). Results also reveal that there were no significant differences between the diets of *P. abramus* in forested habitats ($n=1$) and developed habitats ($n=2$, $p>0.05$). Evidence of ground gleaning on a Springtail was found in one *P. abramus*. Future work needs to examine the foraging strategies of the *P. abramus* and to focus on getting a larger sample size.

Keywords: *Bats, urbanization, foraging, diet, China, Rhinolophus pearsonii, Eptesicus serotinus, Pipistrellus abramus*

Introduction

Bats (Order Chiroptera) have long played ecologically and economically important roles throughout the world. As they can often fly long distances in a single night, they are able to disperse nutrients throughout ecosystems and their guano deposits can supply nutrients to the caves in which they roost (Food and Agriculture Organisation of the United Nations 2011). In addition, these guano deposits have economic value as fertilizer for agriculture, with a large bat population producing as much as \$3.5 million USD in guano annually (Food and Agriculture Organisation of the United Nations 2011). Furthermore, as many bats are insectivores, bats provide regulation of nocturnal insect populations, including many agricultural pests. One study conducted in Texas found that the population of Brazilian free-tailed bats in an 8 country region provided up to \$1.725 million USD a year in pest control (Cleveland et al. 2006) and another study calculated the value of bats to the United States' agricultural industry as a whole to be as much as \$22.9 billion dollars a year (Boyles et al. 2011) In fact, their role as insectivores, in addition to their sensitivity to environmental stressors, has led some to suggest that bats are ideal bioindicators of the ecological and environmental health of a system (Jones et al. 2009).

Bats not only have significance in terms of the services they provide, but also in terms of their meaning to people. In some places, such as China where this study was conducted, bats have assumed a very positive cultural importance. Throughout China, the bat has long been incorporated into artwork as a symbol for happiness and good fortune, as well as for longevity and wisdom (Kern 1988).

Despite these important roles that bats play, there is relatively little known about their ecology or their conservation, particularly in China. It has been found, however, that bats do not respond well to urbanization. One study found that bat activity in city centers was significantly lower than bat activity in the low density housing areas and river areas (Gaisler et al. 1998), while another study indicates that insect abundance, a main food staple for many bats, was also negatively influenced by development (Kalcounis-Rueppell 2007). These studies suggest that many bats may be experiencing some detrimental effects with the rapid urbanization that has been occurring in China since the 1970s. Knowing where, and on what,

bats feed is essential knowledge to aiding in their conservation as China becomes increasingly more developed. As such, the goals of this study were to determine the diets of the bats present in Nanjing, to determine if there was a difference in diets in developed and forested habitats, and to determine if there was a difference in bat foraging activity in developed and forested habitats. Given that Nanjing, Jiangsu, China is rapidly developing with a growing population of 8 million people but has still retained some forested areas like Purple Mountain, it was an ideal location to examine these objectives.

Methods

The study was conducted in Nanjing, Jiangsu, China from June 4th-June 21st, 2013. Sites were located either on the Nanjing Forestry University campus or on Purple Mountain. There were a total of nine different sites, with three of those sites sampled more than one time due to high bat catch rates there. There was a total of 13 netting nights. Of those 13 sample nights, six of the habitats were defined as being forested habitat and seven conducted on the campus of Nanjing Forestry University were considered developed. For a site to be considered developed, it had to be within 100 m of human activity or structures, most often streetlights, roads, or buildings. Our best site was in view of four high-rise men's dorms and exhibited pre-construction activities during the three times we netted it.

Bat Foraging Activity

Bat foraging activity was measured as the mean number of echolocation calls per minute. This was measured using an Anabat SD2 CF Bat Detector on all 13 mist netting nights from 19:30 to 21:00. The number of calls heard were tallied in one minute intervals every five minutes and then the activity for a particular site was calculated by finding the mean for all that night's observation intervals. A *t*-test between the bat foraging activity means for developed sites and forested sites was then performed using Microsoft Excel 2010.



Figure 1. A map of the study area. Sites 1, 2, 4, and 9 were considered to be developed habitats and Sites 3, 5, 6, 7 and 8 were considered to be forested habitats.

Bat Capture

Bats were captured using two 12-m long mist nets that were set up approximately one hour before sunset and taken down between 21:00 and 22:00. All captured bats were identified to species, aged, sexed, weighed and measured for forearm and ear length. The morphometrics and a key to the bats of South Asia (Srinivasulu 2010) were used to identify any bat not identified at the time of capture. Later examination of the frequency of recorded echolocation calls also helped confirm species identification. Once the bats had been measured, they were placed in a paper bag for 0.5-1 hour for guano collection. Once the guano had been collected, the bats were released at the site.

Guano Analysis

All guano samples were placed in vials of 70% alcohol until time of analysis. Samples were crudely broken apart by lightly shaking the sample in the vial before filtering through a fine wire mesh sieve. Samples were washed and then transferred to a microscope slide for viewing under a dissection scope. The samples were then teased apart. For each bat, 11 digital photos

were taken using the microscope camera of the insect parts contained within the guano. A 9-point grid system was then overlaid on each of the pictures (Figure 2). For each grid cell, the insect part that was closest to the center circle would be considered as 1.01% of that individual's diet with a total of 99 grid cells for each bat. Once percent composition for all bats had been quantified, t tests between the percentages of the insect orders found were performed between developed and forested habitats using Microsoft Excel 2010.

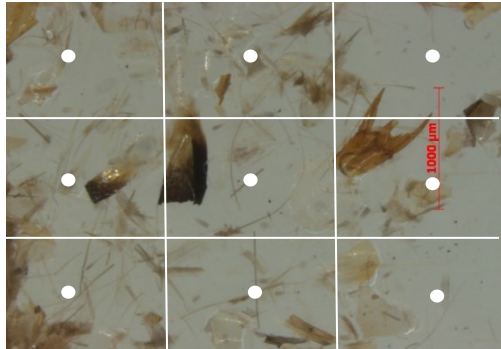


Figure 2. A representative picture of the guano sampling techniques. Each grid cell represented approximately 1% of each bat's diet with the insect part closest to each cell's center circle comprising its composition.

Results

Bat Foraging Activity

The mean amount of bat foraging activity per minute in forested habitats (n=6) was 1.4 calls per minute. This was significantly less than the foraging activity of 6.3 calls per minute found in developed habitats (Figure 3, n=7, p=0.02).

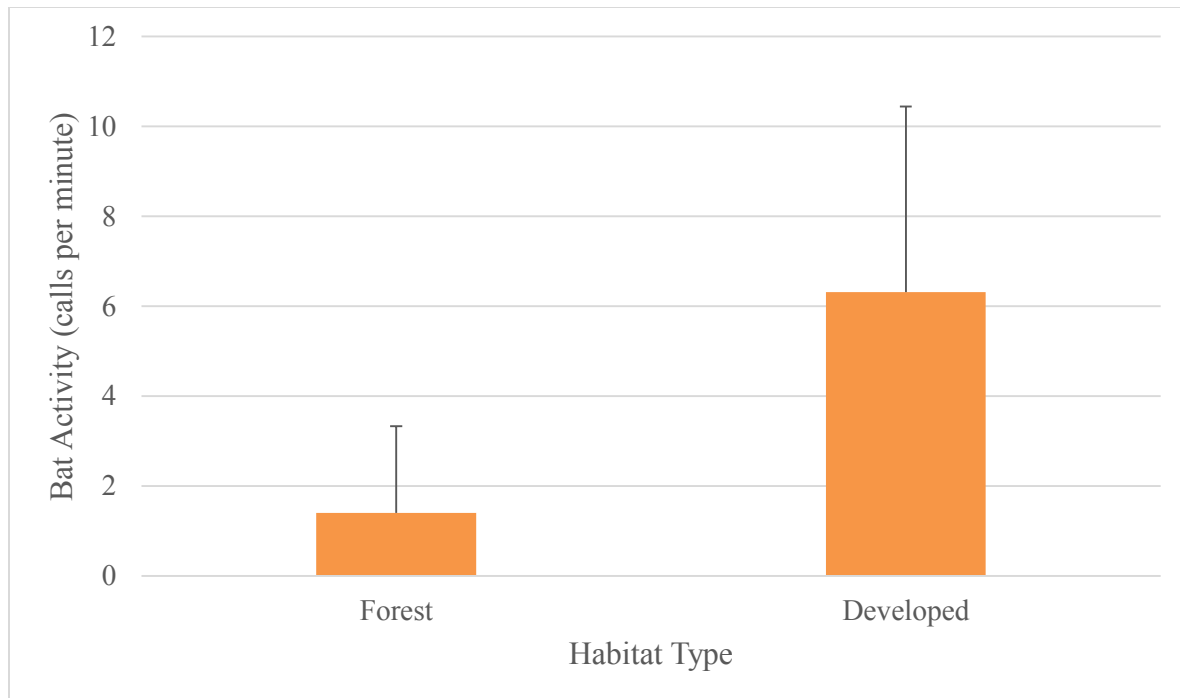


Figure 3. The comparison of bat foraging activity as measured by echolocation calls per minute in forested habitats (n=6) as compared to the foraging activity in developed habitats (n=7, p=0.02).

Diet Composition by Species

There were three different species of bat captured during the study: *Pipistrellus abramus* (Japanese pipistrelle), *Eptesicus serotinus* (common serotine), and *Rhinolophus pearsonii* (Pearson’s horseshoe bat). For *P. abramus*, there were two adult males caught in developed habitats and one adult female caught in a forested habitat. The range of their weights was 3.5-7 g with forearm lengths of 32-36 mm and ear lengths of 5-10 mm. There were five adult male *E. serotinus* captured, all in developed habitats with weights ranging from 19-25 g, forearms from 46-59 mm and ear lengths of 12-17 mm. There was only one juvenile *R. pearsonii* captured in a forested habitat. It weighed 6.5 g with a forearm length of 38 mm and an ear length of 13 mm.

The diet of *P. abramus* was very diverse, showing a generalist feeding strategy (Figure 4). It was composed of predominantly Coleoptera (27%), Lepidoptera (23%) and Hemiptera (20%) with some Diptera (13%), Ephemeroptera (3%), Tricoptera (2%) and Collembola (1%). The

presence of Ephemeroptera and Trichoptera indicated that the bats were feeding on aquatic species. There was also evidence of one entire springtail (Order Collembola) in the diet of a *P. abramus*, which indicated gleaning on the ground (Fig. 5).

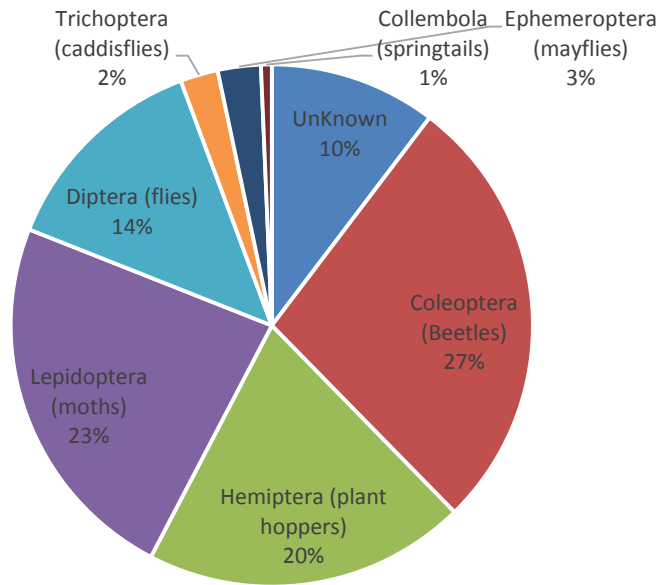


Figure 4. The diet composition of the *P. abramus* (Japanese pipistrelle, n=3) indicates shows the diverse diet of a generalist forager.

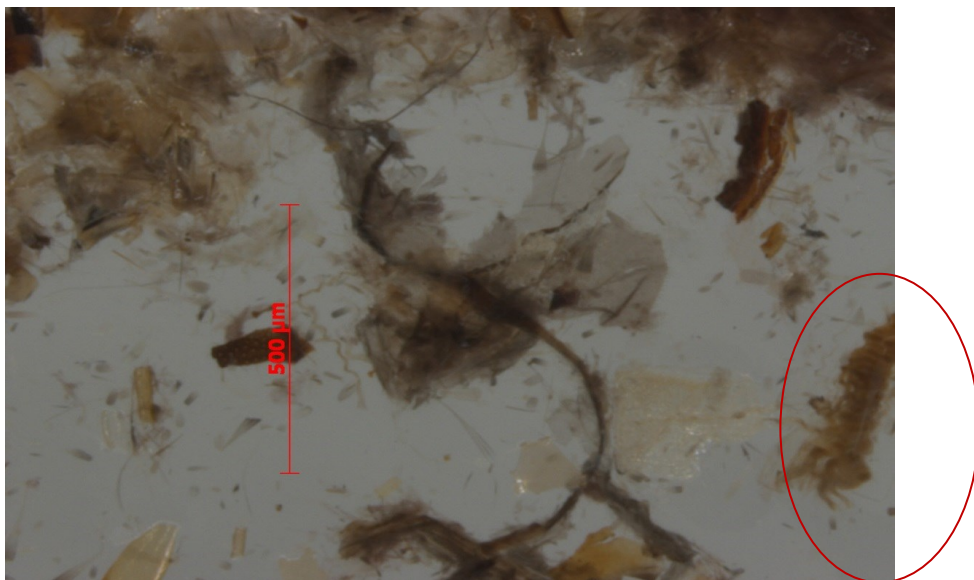


Figure 5. The picture of the springtail (Order Collembola) found in the guano of a *P. abramus* individual.

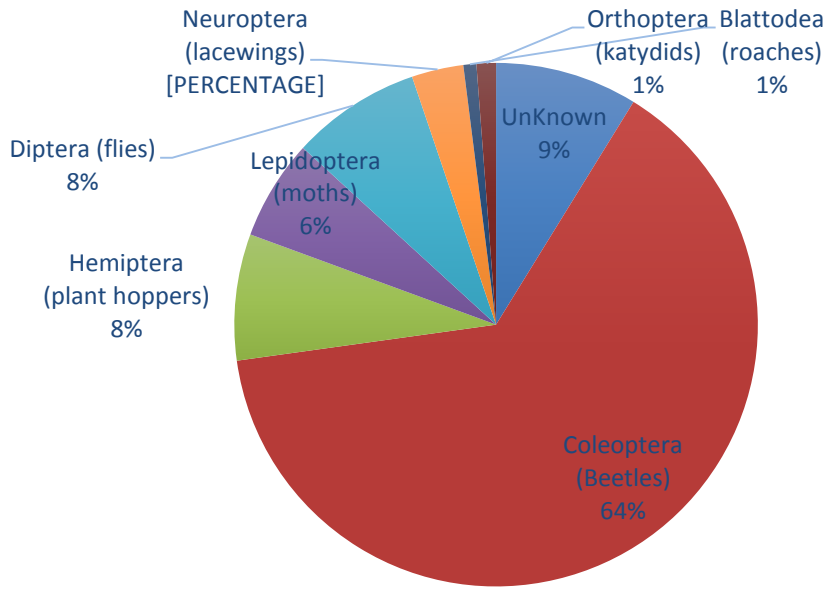


Figure 6. The diet composition of *E. serotinus* (Common serotine, n=5) indicates a preference for Coleoptera, which makes up 64% of the diet.

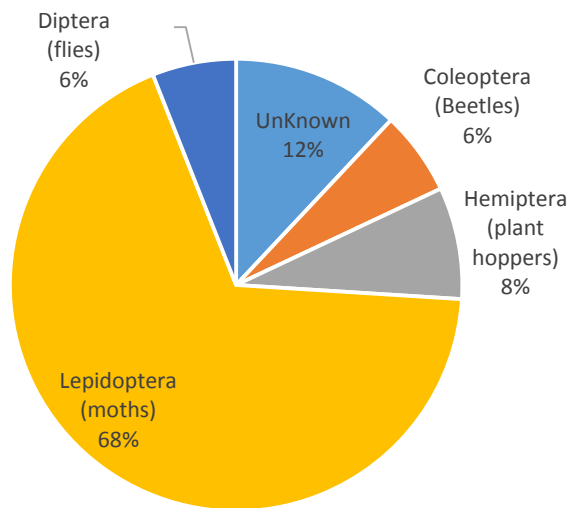


Figure 7. The diet composition of *R. pearsonii* (Pearson's horseshoe bat, n=1) indicates a preference for moths, with 68% of the diet being comprised by Lepidoptera.

The diet of *E. serotinus* showed a disposition towards beetles, with Coleoptera comprising 64% of the diet (Figure 6). Other orders included in the diet were Hemiptera (8%), Diptera (8%), Lepidoptera (6%), Neuroptera (3%), Blattodea (1%) and Orthoptera (1%). The diet of *R. pearsonii* showed a clear preference for moths, with 68% of its diet coming from Lepidoptera (Figure 7). Other insect orders consumed were Hemiptera (8%), Coleoptera (6%), and Diptera (6%).

Diet Composition by Habitat

Because *P. abramus* was the only species caught in both developed and forested habitats in the study, it was the only one that could be used for diet comparisons by habitat. The diets of the two males in developed habitats and the diet of the female in the forested habitat both showed a generalist foraging strategy (Figure 8). The diets were not significantly different from each other ($p > 0.05$ for all Orders).

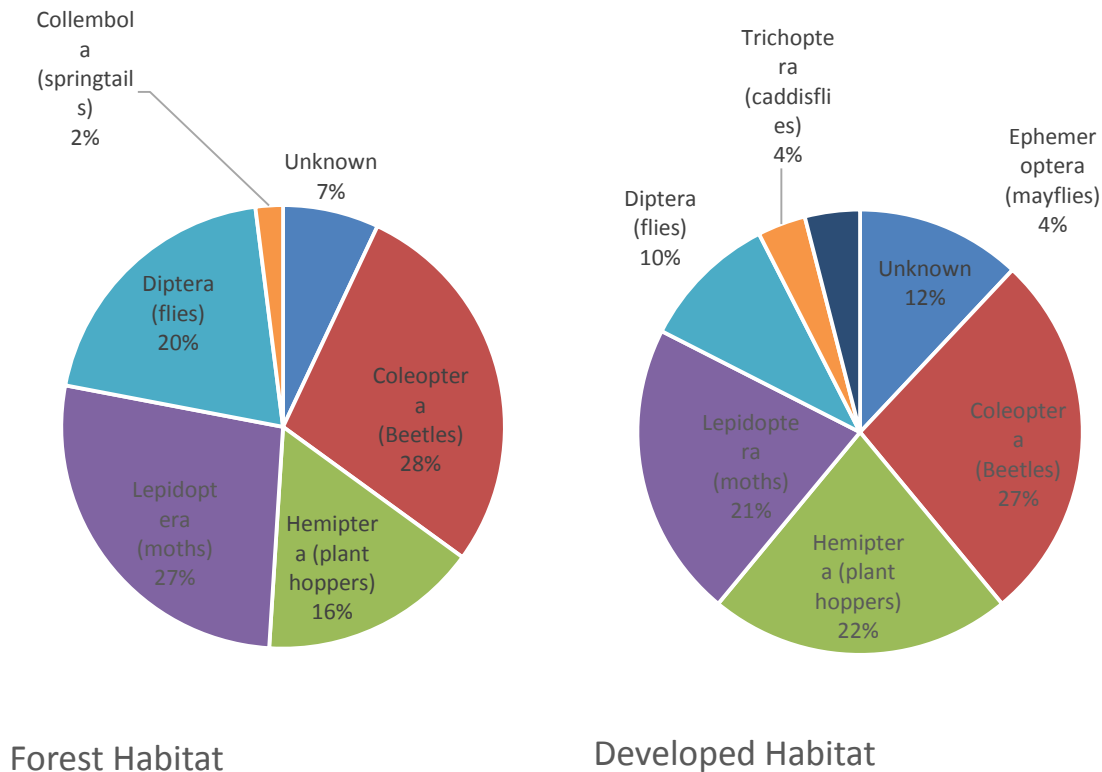


Figure 8. The percent composition of various insect orders in the diet of *P. abramus* with the figure on the left showing the diet in forested habitats (n=1) and the figure on the right showing the diet in developed habitats (n=2, $p > 0.05$).

Discussion

Based on the previous studies done on bats and urbanization, it was expected that bat foraging activity would be significantly lower in the developed sites when compared to the forested habitats. However, the results show that the opposite occurred in the study. The developed habitats have significantly more foraging activity than the forests. More bats were also captured in developed sites. Bats were not captured at several forested sites. One possible explanation may be that urbanization has pushed out all but a few select bat species in both forested and developed habitats in the Nanjing area so that only bats adapted to urban settings remain. These bats would do better in more developed habitats than in those with more clutter, so perhaps they tend to forage away from those forested sites.

Additionally, most of the diets from the three bat species found matched previous studies for either the same species or one within the same genus. Studies looking at the diet of the *E. serotinus* found that they had a clear beetle preference (Vaughn 1997; Robinson and Stebbings 1993) and studies examining the diet of *R. ferrumequinum*, a close relative of *R. pearsonii*, found a preference for moths (Jin et al. 2005). One study that examined *P. abramus* diets in Northern Taiwan found a very similar, diverse diet indicative of a generalist predator (Lee and Lee 2005), which matches what was found in the *P. abramus* diets in this study. Beyond a diverse diet, the *P. abramus* diet did contain a few notable points. First, the diet included Tricoptera and Ephemeroptera, both of which are aquatic species that are used to assess water quality (Cain et al. 1991). This lends credence to the argument of using bats as bioindicators as discussed by Jones et al. (2009) and the *P. abramus* may become useful to Chinese water quality studies. In addition to this finding, *P. abramus* also showed evidence of eating Collembola or springtails, which are wingless precursors to insects that cannot fly. They live either on the ground or on trees, so for a bat to eat one means that the bat would have had to land. This foraging strategy, known as gleaning, has not been documented before in *P. abramus*.

Finally, the diet composition comparison between forested habitats and developed sites of *P. abramus* did not reveal any significant differences between the two habitats. Bats in both habitat types were still generalist predators with very similar percentages for insects

consumed. This may mean that the study site area may have insect abundances that are very homogenized throughout, so differing food abundances within Nanjing may not be a limiting factor for bats.

One of the biggest limitations of this study was the very limited time span in which it was conducted and the small sample size. There were only a total of 13 sampling nights and 9 bats caught and analyzed for the study. Future work should focus on expanding the time range of the study to track temporal change in foraging habits as well expanding the sample size. Other work could also focus on determining the value of *P. abramus* as a bioindicator or on its gleaning strategy.

Acknowledgements

I would like to thank my NSF-REU mentors Dr. William Stone and Dr. Dejun Hao, their labs, Dr. Yong Wang, Dr. Elica Moss, Dr. Yulong Ding, Alabama A&M University, Nanjing Forestry University and the National Science Foundation.

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**Diversity of Herpetofauna in Bamboo Forests of Wuyishan
National Nature Reserve, Fujian Province, China**

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Abstract

With the growing economy of China, it is important to examine the effects of expanding cultivated areas on the biological diversity of the ecosystems that are being changed. In the Wuyishan National Nature Reserve in Fujian Province, China, some of the natural forest is being replaced by bamboo plantations. At three different sites of different elevation for a total of nine survey days, we surveyed the diversity of reptile and amphibian species present in these bamboo plantations and compared them to the natural forest in the surrounding areas. Of the 116 species of herpetofauna recorded in Wuyishan NNR, we found 43 species, 28 of which were found during the surveys. Chi-squared tests revealed that there was a significant drop in diversity when our findings from the bamboo forest were compared to the findings from the natural forest. Of the 28 species found during the survey, only three were found to be living in the bamboo. Elevation data was also analyzed between the three sites. Chi-squared tests only showed that the species makeup changed significantly between the lowest elevation site and the highest elevation site.

Introduction

Reptiles and amphibians are useful subjects for a diversity survey such as this one for a number of reasons. First, they are the most speciose group of land vertebrates and fill a diverse number of roles in different ecosystems. They tend to be quite susceptible to environmental change and require complex ecosystems in order to exhibit a large diversity of species. This makes them good indicators of overall environmental health and habitat quality. Wuyishan National Nature Reserve is known for its wide diversity of reptiles and amphibians, and many species are not considered threatened because their ranges include Wuyishan NNR and other nature reserves in the Wuyi Mountains. They are a target for conservation as well as indicator species for the rest of the park, making them a prime subject to study how the development of bamboo agriculture is affecting the park's ecosystem.

Wuyishan National Nature Reserve encloses an area of 56,527 ha in the Wuyi Mountains located in the northwestern corner of Fujian Province in southeastern China. The reserve includes permanent settlements of about 2500 residents living in the buffer areas of the nature reserve. The reserve was established by the Fujian provincial government in 1987 and became a UNESCO World Heritage Site in 1999 based on its high degree of ecological diversity and several archaeological sites located on the reserve. Wuyishan NNR was closed to tourists in 2009 to protect the core area of the reserve, though the transition areas are still open to tourists. Subtropical and temperate rainforests comprise the majority of the habitat types found in Wuyishan National Nature Reserve, though cultivated tea plantations and mao bamboo stands are also common.

Mao bamboo cultivation is a considerable source of income for the residents of Wuyishan NNR. The demand for bamboo is high as construction material and raw material for other goods such as chopsticks. It grows very quickly and is one of the few crops that can be grown on the steep slopes of the mountains. As of 1994, bamboo plantations covered about 14% of the land area of Wuyishan NNR, and it has likely increased since then. Unfortunately, it has also been shown that mao bamboo stands are very poor habitat for many species. Aside from being a monoculture, cultivated bamboo stands must occasionally be cleared of ground vegetation for optimal bamboo growth. This drives away most herbivorous species, including

insects, making bamboo stands incapable of supporting complex faunal communities. So far, it is unclear what the impacts of expanding bamboo forests are on the Wuyishan's ecosystem as a whole.

Materials & Methods

We conducted a nine day survey from June 9-June 19 spent between three different sites, using three consecutive days to survey each site. This also includes one holiday and one day of travel when no surveys were performed, but any new specimens were still recorded for the unofficial count. There were two two-hour surveys per day, one in the afternoon from about 14:00-16:00 and one after dark from around 19:30-21:30. Each site had a bamboo component and a road component that transected natural forest. The site was split into three survey types: the road, bamboo periphery, and bamboo core. One surveyor would walk the road while the other surveyed the bamboo, then we would switch the next day. All live and dead specimens were recorded, including frog calls that could be heard but not seen. Additionally, for every survey, weather data (temperature, humidity, and atmospheric pressure), locations, and habitat type were recorded. For unique or rare specimens found not during the survey time, position information was still recorded, but this information was not used in the final analysis. To determine statistically significant differences between data sets, chi-square tests were used.

Results

The species richness of different habitat types were compared with each other using chi-squared tests to see if there was any significant difference between them. The same process was repeated on the species tallies for the different sites to determine if there was any significant difference in species composition due to change in elevation. Weather data and surveyor data was then used to examine for error and possible confounding factors.

Species	Site A (738-849m)	Site B (857-1263m)	Site C (459-638m)	Habitat type
<i>Acanthosaura lepidogaster</i>		x	x	road, periphery
<i>Amolops sp.</i>	x	x	x	road, periphery
<i>Bufo gargarizans</i>	x		x	road, core
<i>Eumeces chinensis</i>	x			road
<i>Eumeces elegans</i>	x		x	road
<i>Fejervarya limnocharis</i>			x	road
<i>Hylarana adenopleura</i>			x	road
<i>Hylarana latouchii</i>	x			road
<i>Leptolalax liui</i>	x	x	x	road, periphery
<i>Limnonectes fujianensis</i>	x	x	x	road, periphery
<i>Lycodon ruhstrati</i>	x			road
<i>Macropisthodon rudis</i>	x			road
<i>Megophrys boettgeri</i>		x		core
<i>Megophrys kuatunensis</i>	x	x	x	road, periphery
<i>Odorrana livida</i>	x		x	road
<i>Odorrana schmackeri</i>	x	x	x	road, periphery
<i>Odorrana versabilis</i>			x	periphery
<i>Opisthotropis kuatunensis</i>			x	road
<i>Paa spinosa</i>	x	x	x	road, core, periphery
<i>Philautus rhododiscus</i>		x	x	core
<i>Polypedates megacephalus</i>			x	road
<i>Protobothrops muscosquamata</i>			x	road

<i>Scincella modestum</i>		x	x	road, periphery
<i>Sinonatrix percarinata</i>			x	road
<i>Sphenomorphus indicus</i>	x	x	x	road
<i>Takydromus septentrionalis</i>	x	x	x	road
<i>Trimeresurus stejnegeri</i>		x		road
<i>Vibrissaphora liui</i>	x			road

Table 1. List of species found during the survey showing what sites they were recorded at as well as the habitat category they were found in.

Discussion

The survey strongly suggests that bamboo plantations are not capable of supporting a high diversity of herpetofauna. Of the 28 species recorded during the surveys, only three species were found in the bamboo core: *Bufo gargarizans*, *Philautus rhododiscus*, and *Megophrys boettgeri*. Interestingly, *P. rhododiscus* and *M. boettgeri* were only found in the bamboo core. The species richness of the bamboo core was significantly lower than both the road ($p=1.2791E-8$) and the bamboo periphery ($p=0.04153$). Even the bamboo periphery was strongly shown to be less diverse than the road ($p=3.02948E-6$). Aside from *P. rhododiscus* and *M. boettgeri*, the other species found in the core and periphery were common habitat generalists like *Bufo gargarizans*, *Limnonectes fujianensis*, *Scincella modestum*, and *Odorrana schmackeri*. Most of the rarer species, *Protobothrops muscosquamata* and *Vibrissaphora liui*, were found on the road. Additionally, only species from the Order Anura were found in the bamboo core, members of the Order Squamata, the snakes and lizards were completely absent. This lack of diversity in the bamboo core makes a strong argument against it as productive habitat.

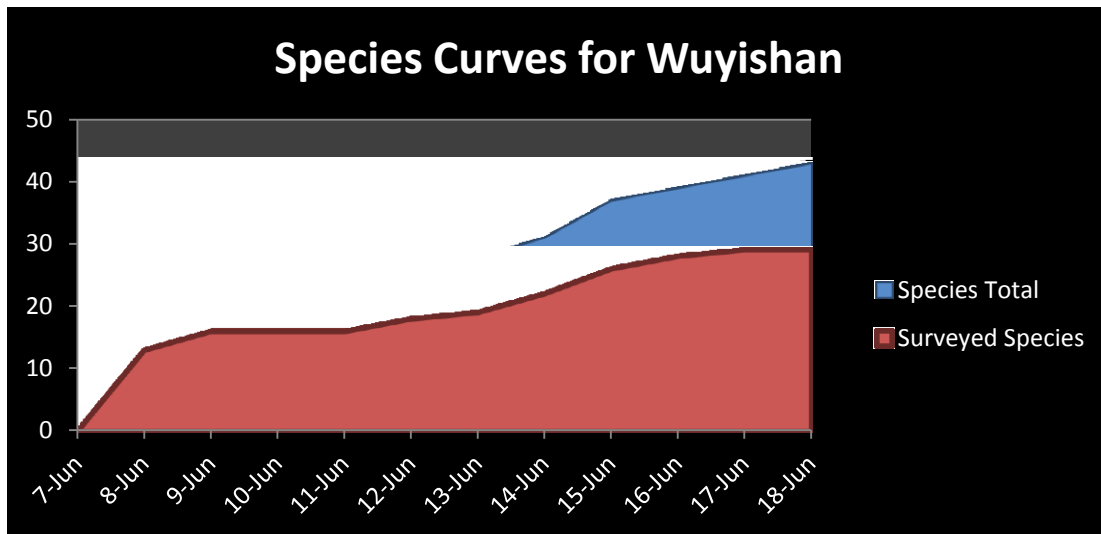
The species composition of each site was compared to the others to see if there was a significant difference between them. The only significant difference between the site was between Site B and Site C ($p=0.009024$), which is likely due to the difference in elevation.

The difference between Site A and Site C also neared significance ($p=0.068047$), but this is also likely due to differences in elevation, since Site A is more similar to Site B than Site C.

See graphs 1 & 2 for further information.



Graph 1. Shows the number of species found in each of the different habitat classifications at each site, as well as totals for individual sites as well as all of the sites combined.



Graph 2. The species curve for the 11 days spent in Wuyishan NNR. 43 species were found in all, 28 were recorded during the survey. The number of new species found per day began to level off towards the end of the survey, indicating that the survey represented a reasonably complete account of the species that lived in the survey sites.

Error Analysis

One of the possible sources of bias in the findings is the difference in skill levels of the surveyors. The experimental design attempted to account for this by having the surveyors switch between the road and bamboo plot surveys on alternating days, but a significant difference in the surveyors could still skew the results. However, the difference in the species recorded between Justin Waraniak and Kevin Messenger was not significant ($p=0.38443$). Justin recorded a total of 22 species (five unique) while Kevin recorded a total of 23 species (six unique).

Another possible source of error was due to weather. The weather data collected indicates that there was no significant difference between Site A and Site B, but Site C had significantly higher nighttime temperatures than either site ($p=0.0455966$, $p=0.02698477$) and significantly higher daytime temperatures than Site B ($p=0.01919547$). While this difference may be partially explained by the difference in elevation, it is primarily due to the natural variation in daily weather. Also, the surveys at Site C were different from the other two because they did not include a rain day. Out of the three survey days at Site A and Site B, one survey day had been conducted during a rain shower, while all three survey days at Site C were dry. Usually, rain makes lizards and snakes more difficult to find, so the dry conditions at Site C could partially explain why more species of herpetofauna, especially from the order Squamata, were found at Site C.

Future Work

While this survey provided strong evidence suggesting that mao bamboo stands were poor habitat for the reptile and amphibian species of Wuyishan, it was a very short survey and there are ways in which it could be improved to build a more accurate picture of the diversity of herpetofauna in Wuyishan NNR. The survey was only conducted in early-mid June and does not account for any seasonality in the activity levels of different species. For example, when Kevin was in Wuyishan NNR a few weeks earlier from May 20-25, frogs from the genus *Amolops* were the most common frog calls heard. However, when we visited, *Amolops* were

calling less frequently, and *Megophrys kuatunensis* and *Leptolalax liui* were more commonly heard. As the summer and other seasons progress, it is likely that other species that might not have been represented during our survey will become more active. Additionally, due to time and resource constraints, the sample size for this survey was relatively small, with a total of only 172 recordings. The sample size could be made larger by adding more surveyors, adding an extra daily survey in the mornings, and extending the survey to last longer than nine days.

This study, along with others, are showing that mao bamboo is unfit habitat for many species that the Chinese nature reserves are trying to protect, so the next step is to determine measures that could be taken to improve this threat to the biodiversity of the parks. One possible solution is to increase the complexity of the vegetation in bamboo stands so that they might be able to support a greater diversity of the local fauna. This hypothesis has to be tested to see if the higher vegetation complexity does in fact lead to greater faunal diversity and is still economically viable. The other solution would be to allow the forest to reclaim the bamboo plantations. This would harm the economic position of the resident villagers who rely on bamboo sales for a large portion of their income, but it may be the only way to preserve the ecological integrity of the park and support high biodiversity.

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**A COMPARATIVE ANALYSIS OF SOIL N MINERALIZATION AT
POPLAR AND METASEQUOIA PLANTATIONS IN JIANGSU PROVINCE,
CHINA**

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Abstract

In this analysis, soil N mineralization was compared between Poplar and Metasequoia plantations in a riparian zone around the National Wetland Park in Baoying, Yangzhou City, Jiangsu Province. The objectives were to evaluate different factors that influence soil N mineralization in agricultural soils and to compare the net N mineralization between Poplar and Metasequoia plantations. This was accomplished by determining the net soil N mineralization by using the microbial biomass N the fumigation and incubation methods. Previous studies indicate that soil N mineralization is regulated by several factors including, temperature, moisture, microbial biomass, and pH (Sulkava et. al, 1996). Both sites had an annual mean temperature of 14.4 °C and are similar in pH and moisture content. However, the Poplar plantation was slightly higher in microbial biomass N and net N mineralization than that of the Metasequoia plantation, indicating more microbial activity. A possible reason for the higher MBN and net N mineralization in the Poplar plantation may be because the trees are rapid-growing, but relatively short-lived, which suggest that leaves frequently fall, causing high organic matter, leading to a higher MBN and thus a higher net N mineralization.

Introduction

Studies of soil nitrogen (N) mineralization have attracted worldwide attention in the context of global climate change. Soil nitrogen (N) availability has significant influences on plant growth, thus limiting net primary productivity (Cole et al. 2008) through altering the efficiency of plant N use (Aerts et al. 1994).

Nitrogen (N) is one of the most abundant and important macronutrients for the growth and development of plants (Ingestad, 1981). Nitrogen mostly comes from the soil organic matter from decomposed microorganisms (Rashid and Scheafer, 1988). Most of the nitrogen (N) in the environment is in forms that are unavailable for plant uptake. Nitrogen is a very dynamic element that undergoes many transformations in and out of the soil. These transformations are known as the nitrogen cycle, which includes mineralization, immobilization, volatilization, nitrification, and denitrification. In undisturbed natural environments, plants obtain N for their growth from two microbial processes, one of which is N mineralization. Nitrogen mineralization is the process by which organic N is converted to plant-available inorganic forms and directly affects the supply of soil available N.

The N availability is influenced by many factors such as soil temperature humidity, vegetation type, litter quality and disturbance regimes (Sulkava et. al, 1996). N mineralization plays a major role in plant N availability (Kolberg et al, 1997). The availability of N limits biomass production in many forest ecosystems (Chapin, 1996).

This research is being conducted at Nanjing Forestry University to establish the best method used to determine net soil N mineralization. Soil N mineralization is regulated by several factors including, temperature, moisture, microbial biomass, and pH. The objectives of this study are to evaluate different factors that influence soil N mineralization in agricultural soils and to compare the net N mineralization between Poplar and Metasequoia plantations.

Objectives of the Study

1. To evaluate different factors that influence soil N mineralization in agricultural soils
 - Temperature

- Moisture
- Microbial biomass (Fumigation vs. Incubation)
- pH

2. To compare the net N mineralization between Poplar and Metasequoia plantations

Experimental Site

The research site was located in the National Wetland Park (119°15' E, 33°22' N) in Baoying, Yangzhou City, Jiangsu Province. This site has a humid subtropical monsoon climate with an annual mean temperature of 14.4 °C and annual precipitation of 938.6 mm. The soil belongs to flood alluvial loess formed from the parent material of fluvial and alluvial materials of Baoying Lake. Two adjacent Poplar and Metasequoia plantations were selected for this research. Poplar and Metasequoia plantations are usually established at riparian land for timber production and for maintaining healthy aquatic ecosystems.

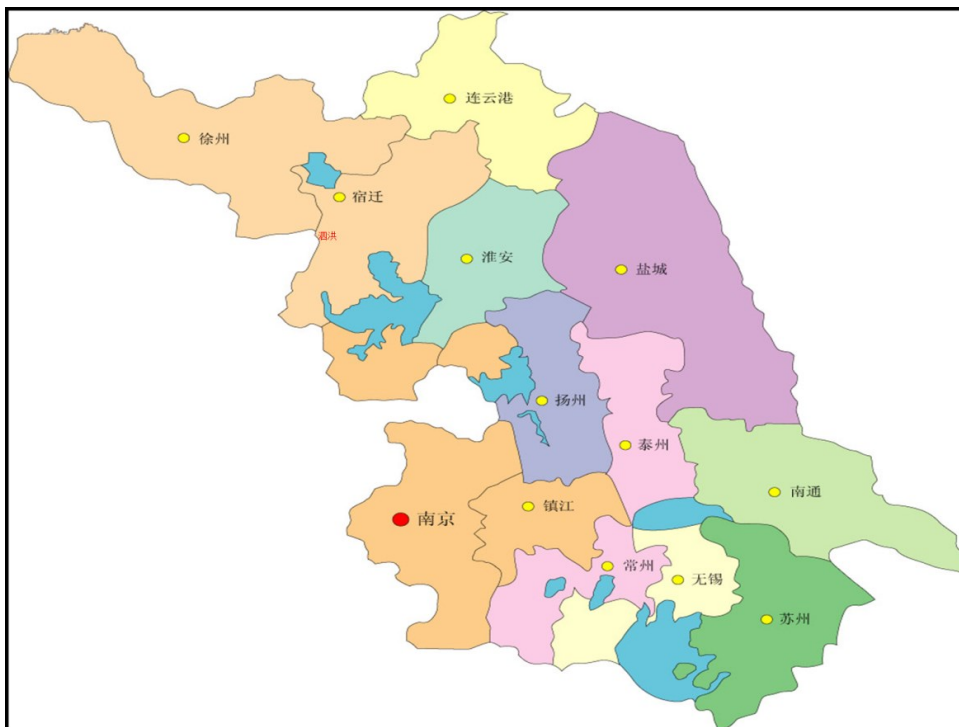


Figure 1. Location of the National Wetland Park Located in Baoying, Yangzhou City, Jiangsu Province.

Materials and Methods

Several methods have been developed for determining microbial biomass nitrogen. However, we used the most common, which are fumigation and incubation methods.

Sample Collection

Field trips were arranged to collect soil samples from the National Wetland Park in Baoying, Yangzhou City, Jiangsu Province. The samples were taken in June 2013 from the two plantations. The soil samples were taken in triplicates from the upper 0–10 cm soil layer. The collected samples were taken to the laboratory and stored at 4 °C until the time of the analyses



Figure 2. Graduate students from Nanjing Forestry University collecting soil samples.

Soil Preparation

Soil samples were prepared for analyses by making the fresh soils to pass through a 2 mm-sieve. The samples were then bagged and refrigerated at 4 °C until the time of the analyses.

Laboratory Work/Procedure

Determining Soil pH. The soil pH is the negative log of the hydronium ion activity in soil solution. Soil pH is a measure of the acidity or alkalinity of the soil. A soil is classified as acidic if its pH is less than 7 on the pH scale. An alkaline soil, on the contrary, has a pH greater than 7. pH is one of the most basic soil properties. The pH determination evaluates one of the major factors affecting soil microorganisms. In agriculture, it is very important to know the soil pH because many plants and soil microorganisms prefer either alkaline or acidic conditions.

Ten grams of soil were measured in triplicates for each sample. 50 mL of deionized water was added to each sample. After the thirty minutes was due, the soil water suspension was stirred thoroughly, and the standardized pH electrode was lowered into the suspension. The pH electrode was rinsed and blotted after each reading. The reading of the soil was taken once the pH meter reading stabilized.

Gravimetric Water Content (Soil Moisture)

Soil water content is one of the most important factors affecting the soil's physical characteristics: it regulates the activity and composition of the soil biotic community; influences pH, salinity, and solidicity levels; affects the activity and composition of surface ecosystem (plants and animals), and modulates both soil temperature and temperature change. Beyond the ways in which water indirectly influences microbial ecosystems via its influence on soil behavior, water directly affects the microorganisms within the soil as well. The water is essential for soil microorganisms. Without the water, there would be no microbial activity. Identifying and understanding the mentioned soil characteristics is of critical importance to managing, researching, and effectively utilizing the soil and the ecosystems it supports.

The weight of small mason jars was recorded. Approximately 18.5 g of fresh, sieved soil was measured in triplicates and added to each jar. The soils were oven dried for 48 hours at 65°C and then reweighed. The weighing dishes were removed from the oven and placed in a desiccator while the dishes cooled enough to permit weighing. The dishes were reweighed, containing the oven dried soil. The percent gravimetric moisture was calculated.

Microbial Biomass N (Fumigation Method)

Soil microbial biomass is an important component of soil quality assessment because of its important roles in nutrient dynamics, decomposition of natural and synthetic organic amendments and physical stabilization of aggregates (A.J. Franzluebbbers et al.1999). Five grams of each soil sample was weighed, placed in small mason jars, and replicated three times each. 20 mL of 0.5 M K_2SO_4 was added to each jar. Samples were placed in a shaker for 30 minutes. The samples were then vacuumed and filtered with 0.45 mm filter paper. Samples were then stored at 4 °C and later analyzed on the Ammonium Nitrate Analyzer for N.

Microbial Biomass N (Incubation Method)

Ten grams of fresh soil of each soil sample was weighed, placed in small mason jars, and replicated three times each. One mL of distilled water was added to each jar. Samples were then covered and incubated for one week and then analyzed on the Ammonium Nitrate Analyzer for NH^4 and NO^3 .



Figure 3. Weighing soil samples to measure MBN.

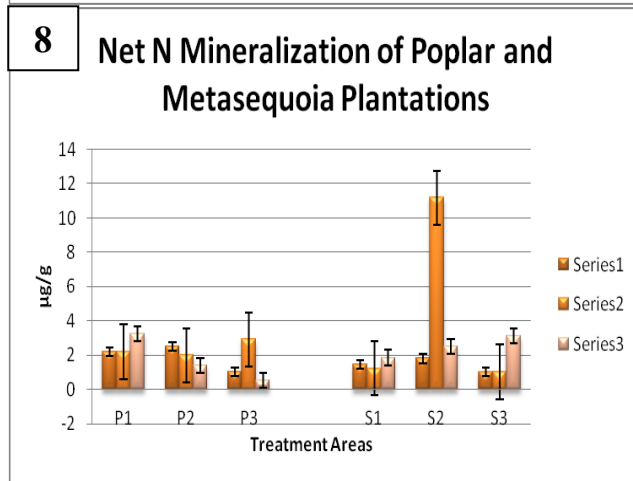
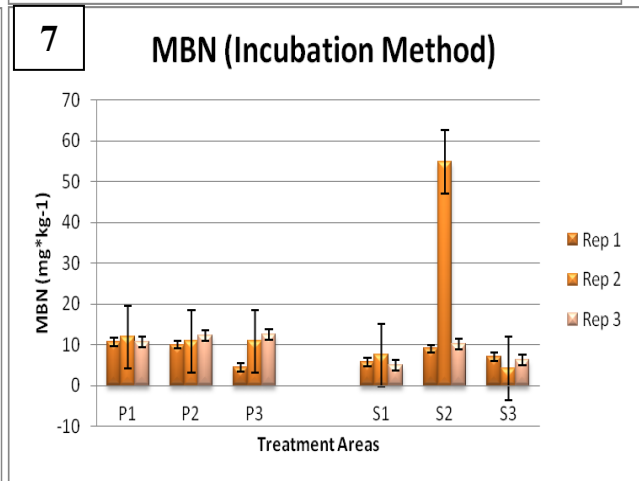
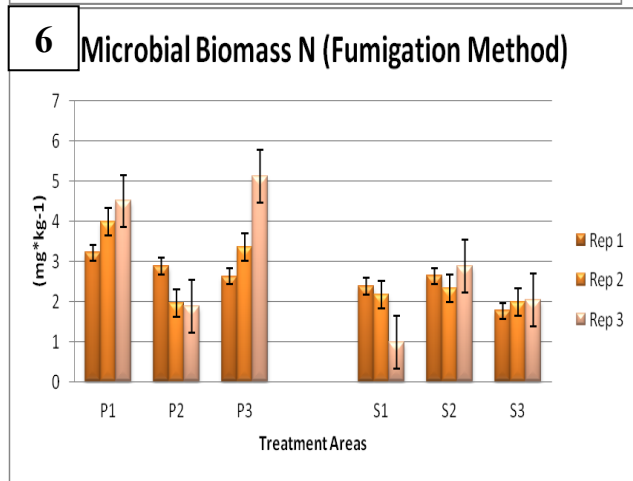
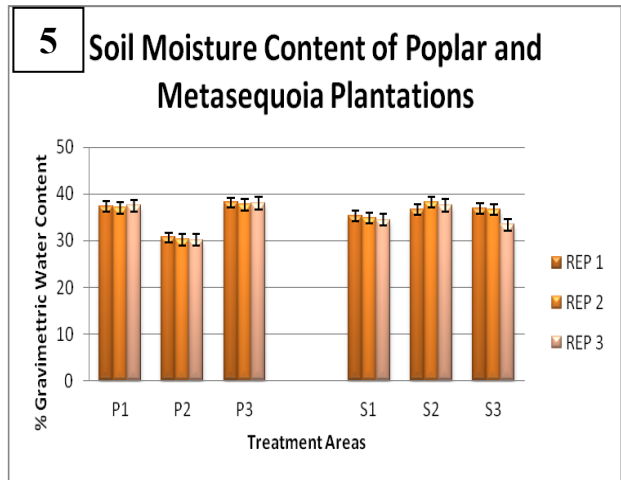
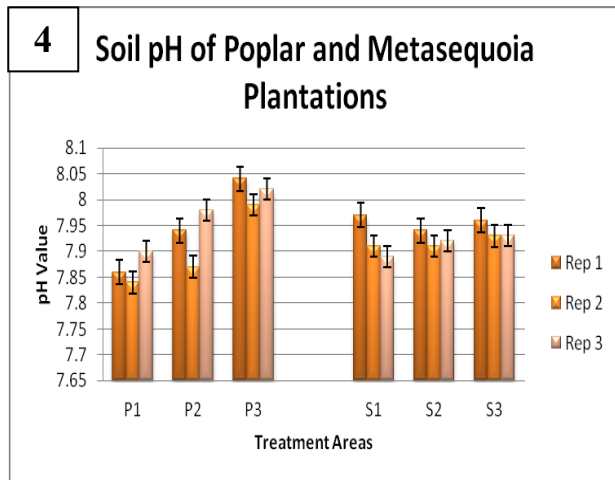


Figure 4. Soil pH Comparison between the experimental sites. The vertical bars indicate standard errors. **Figure 5.** Soil Moisture Content comparison between the experimental sites; The vertical bars indicate standard errors; **Figure 6.** Results of MBN (Fumigation) comparison between the experimental sites. The vertical bars indicate standard errors; **Figure 7.** Results of MBN (Incubation) comparison between the experimental sites. The vertical bars indicate standard errors; **Figure 8.** Net N Mineralization comparison between the experimental sites. The vertical bars indicate standard errors.

Discussion and Conclusion

Soil pH affects the quantity of microorganisms. This is vital because microbes are accountable for the nutrient cycle. The most diverse and abundant populations have been reported to be in near-neutral soils. Figure 4 shows the pH of the soils from the National Wetland Park tested to be alkaline. Soils with a pH near 7 are well-matched for nutrient availability, crop tolerance and soil microorganism activity.

The percent water moisture is expressed as what percentage of the dry soil weight would be accounted for by the weight of water. As shown in Figure 5, the soil samples from the National Wetland Park contained an average of 35% gravimetric water content. The preliminary findings show that microorganisms are present due to the amount of moisture in the soil.

Soil temperature has an intense effect on N mineralization, indicating an influence of thermal conditions on the degree of microbial exploitation of organic N sources. Microbial activity is limited at soil temperature near freezing and increases with rising soil temperature.

Previous studies indicate that soil N mineralization is regulated by several factors, temperature, moisture, microbial biomass, and pH (Sulkava et. al, 1996). Both sites have an annual mean temperature of 14.4 °C and are similar in pH and moisture content. However, the Poplar plantation is slightly higher in microbial biomass N and net N mineralization than that of the Metasequoia plantation, indicating more microbial activity. The interaction of the N mineralization process is closely correlated to the carbon (C) cycle, because decomposing microorganisms obtain their energy from carbon compounds they find in soil organic matter. In conclusion, a possible reason for the higher MBN and net N mineralization in the Poplar plantation may be because the trees are rapid-growing, but relatively short-lived, which suggest that leaves frequently fall, causing high organic matter, leading to a higher MBN and thus a higher net N mineralization.

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**CLONING OF THE SALT TOLERANT GENE 9-CIS-EPOXYCAROTENOID
DIOXGENASE IN *GINGKO BILOBA***

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Abstract

Ginkgo biloba is tolerant to soil salinity. Multiple genes cause this tolerance. One of these genes, 9-Cis-Epoxy-carotenoid Dioxygenase, is thought to be approximately 2000 bp. Approximately 1044 bp of the 3' end have been obtained. The goal of this experiment is to obtain the sequence of the 5' end. To this end quality RNA was extracted from Ginkgo leaves at Nanjing Forestry University using the CTAB method exhibiting nano drop quality scores of 2.25 and quantity scores of 1915 ng/ μ L. From this RNA cDNA was transcribed using the 5' Race kit by Takara. The 5' cDNA and specific primers constructed from the sequence of 3' end were used in nested PCR for obtaining target fragments. The fragment is approximately 1200 bp. An agarose gel showed bands respectively. The fragments were transformed into competent cells and cloned into a pMD19-T simple vector. Several colonies developed on LB media containing ampicillin, thus rendering cloning successful. PCR was then run on the clones to ensure institution on target sequence. An agarose gel showed this incorporation successful. Cells were sequenced using 454 high-throughput DNA sequencer to obtain the sequence of the 5' end. These sequences were analyzed using Basic Local Alignment Search Tool (BLAST). Sequences did not provide the gene of interest. Thus, targeted salt tolerance gene was not obtained

Introduction

Ginkgo biloba- also called maidenhair tree- is a deciduous tree of the Gymnosperm group in the family Ginkgoaceae (Fan et. Al 2004). It is the only extant member of the order Ginkgoales (Shen et al., 2006). It is used in modern and ancient medicine to improve cognitive function (Cupp 1999). The standard leaf contains about 24% flavonoid and 6% isoprenoids (ginkgolides and bilobalide). The isoprenoids are used to make the Alzheimer's disease, and vascular dementia drugs (Strømgaard and Nakanishi, 2004). *G. biloba* is a living fossil. There are records dating back to the Middle Jurassic period (180 million years ago)(Tredici 2000). Individuals have been found to live more than 3500 years (Jaggy and Koch, 1997).

Through the years these trees have had to adapt to the factors of their environment, one being high salinity (Shen et al., 2006). Ginkgo's native land, China, (Tredici, 2000) has high soil salinity (Peng, 1998). The Ginkgo, however, has shown much tolerance to soil salinity (Guibin 2006).

Materials and Methods

Plant Material

Ginkgo biloba leaves were harvested from a tree on the campus of Nanjing Forestry University. They were flash frozen in liquid nitrogen and stored at -80 for later use.

Solution and glassware preparation

All glass was treated with 0.1% DEPC overnight, autoclaved, and dried before use. The tips were RNase-free and DNasefree. The extraction buffer contained 3% CTAB (W/V), 3% PVP (W/V), 25 mM EDTA, 2.0 M NaCl, 100 mM Tris-HCl (pH 8.0), 0.5 g/L spermidine, and 0.1% DEPC (V/V) at pH 8.0. Also, 0.5% SDS (W/V), 10M LiCl, and the mixture of chloroform and isoamyl alcohol (24: 1, V/V) were also prepared. All reagents were prepared with 0.1% DEPC water. All the buffers and solutions were incubated at 37 °C overnight to equilibrate. Solutions were then autoclaved. Four percent (4%) β-mercaptoethanol was then added to the extraction buffer.

RNA Extraction

A modified CTAB method was used to extract RNA from young *Gingko* leaves. Two grams of leaf tissues was placed in a clean mortar and ground to very fine powder with liquid nitrogen. The material was then transferred to a 50 mL polypropylene tube containing 20 mL of preheated (65 °C) extraction buffer. Tube was incubated in a 65 °C water bath for 10 min shaking often. One volume of chloroform and isoamyl alcohol (24:1, V/V) was added to the mixture and gently mixed for 10 min. Centrifuge at 12,000 g for 10 min. The supernatant was transferred to a new tube, one volume of chloroform and isoamyl alcohol was again added to the supernatant and gently mixed for 10 min. The mixture was then centrifuged at 12,000 g for 10 min. and transferred to a new tube containing 1/4 volume 10 M LiCl. The contents were mixed thoroughly and stored at 48 °C overnight. RNA was then pelleted at 12,000 g for 30 min. The RNA pellet was gently dissolved in 500 mL 0.5% SDS. Chloroform and isoamyl alcohol (1 volume) was again added, and then centrifuged at 12,000 g at 48 °C for 10 min. The supernatant was again transferred to a new tube, and 2 volumes of ethanol was added and mixed thoroughly. RNA was precipitated at -20°C for 2 hr. RNA was pelleted at 12,000 g at 48 °C for 30 min, washed in 75% ethanol twice, dried in a vacuum, re-dissolved in 200 mL DEPC-treated MiniQuantum water, and stored in -80 °C for further use. The quantity and quantity of total RNA were detected using a Thermo Scientific Nanodrop 2000c and agarose gel electrophoresis.

cDNA Synthesis

The cDNA synthesis was accomplished using the 5' Full RACE (Rapid amplification of cDNA ends) system (TaKaRa, D315, Tokyo, Japan) according to the manufacturer's instruction. Using Reverse Transcriptase M-MLV, 50 µL of *Gingko* total RNA was reverse transcribed into cDNA.

Nested PCR

To amplify the obtained cDNA and ensure the desired target, nested PCR was performed with the following parameters:

Reagent	Volume
LA PCR Buffer	5 µl

Temperature	Time	
94 °C	3:00	

MgCL ₂ (25mM)	4 µl
dNTP Mixture	4 µl
3' RACE outer Primer	2 µl
ACP-3' outer Primer	2 µl
cDNA	2 µl
Water	30.7 µl
LA-TAQ Polymerase	0.3 µl
Total Volume	50 µl

94 °C	0:30	30 cycles
52 °C	0:30	
72 °C	1:30	
72 °C	4:00	
4 °C	99:99	

PCR was again set up with the following parameters:

Reagent	Volume
LA PCR Buffer	5 µl
MgCL ₂ (25mM)	4 µl
dNTP Mixture	4 µl
3' RACE inner Primer	2 µl
ACP-3' inner Primer	2 µl
Outer PCR Product	2 µl
Water	30.7 µl
LA-TAQ Polymerase	0.3 µl

Temperature	Time	
94 °C	3:00	
94 °C	0:30	35 cycles
60 °C	0:30	
72 °C	1:30	
72 °C	4:00	
4 °C	99:99	

Total Volume	50 μ l
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A 1% TEA gel was run to for quality control size selection. Gel purification was achieved with TIAN gel Midi Purification Kit. The column was equilibrated by adding 500 μ l Buffer BL to a Spin Column CB2 seated in a 2 ml Collection Tube. The column was then centrifuged at 12,000 rpm for 1 min. Flow-throw was discarded and the Spin Column CB2 seated in the collection tube. The band was extracted from agarose gel with sharp scalpel and weighed in a colorless tube. One volume of Buffer PC was added to the tube. Solution was incubated at 50 °C for 10 min while pipette mixing to completely dissolve agarose gel. The solution was then transferred to a Spin Column CB2. The sample was centrifuged at 12,000 rpm for 1 min. Flow through was then discarded and the Spin Column CB2 was seated in the collection tube. Exactly 600 μ l of Buffer PW was added to Spin Column CB2 and centrifuging at 12,000 rpm for 1 min. Flow through was discarded and the Spin Column CB2 seated in the collection tube. Buffer PW (600 μ l) was again added to the Spin Column CB2 and centrifuging at 12,000 rpm for 1 min. Flow through was discarded and the Spin Column CB2 seated in the collection tube. A dry spin at 12,000 rpm for 2 min was performed to remove residual wash buffer. Flow through was discarded and column was air dried for several minutes. DNA was eluted in enough water.

Cloning

Exactly 5 μ L of cDNA were directly added to 50 μ L of pMD19-T competent cells, mixed by tapping gently, and incubated on ice for 30 minutes. Cells were then heat shocked for 30 seconds in the 42 °C water bath and transferred to ice for 20 minutes. Pre-warmed SOC medium (250 μ l) was added to the tube of cells and DNA. Tube was placed in the shaker at 37°C for exactly 1 hour at 150 rpm. Tube was centrifuged at 3,000 rpm for 4 mins. The supernatant was carefully removed so as not to disturb the pellet, leaving 100 μ l. The mixture was then mixed by gently pipeting up and down. Tube content was then moved to a LB agar plate containing ampicilian. The plate was inverted and incubated at 37 °C for 12 hours. From this, plate single colonies were selected. They were placed in liquid LB media and allowed to incubate at 37 °C overnight.

Bacterial PCR

Reagent	Volume
10X Buffer	2 μ l
MgCL ₂ (25mM)	1.6 μ l
dNTP Mixture	1.6 μ l
Forward Primer	0.5 μ l
Reverse Primer	0.5 μ l
PCR Product	2 μ l
Water	11.5 μ l
TAQ Polymerase	0.3 μ l
Total Volume	20 μ l

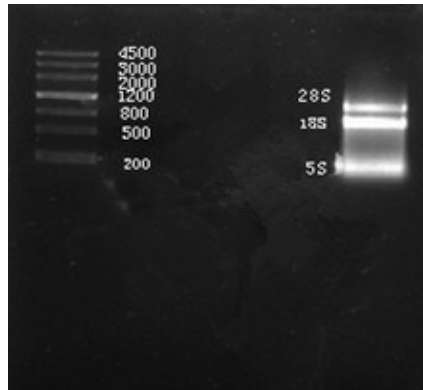
Temperature	Time	
94 °C	3:00	
94 °C	0:30	25 cycles
55 °C	0:30	
72 °C	1:30	
72 °C	4:00	
4 °C	99:99	

Sequencing

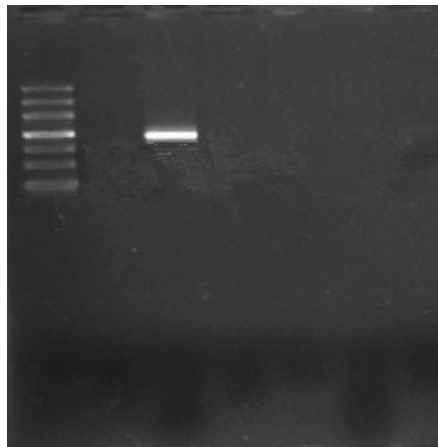
Sequencing was contracted out to BGI LifeTech co. The sequences were blasted with bacterial and Gingko sequences to ascertain the sequences of the 5' end.

Results

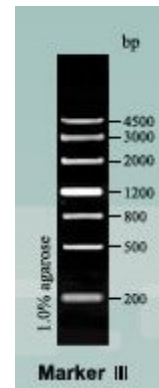
Quality RNA exhibits a quality score (260/280 ratio) of ~2. RNA from this study exhibited a score of 2.005. According to the CTAB method approximately 0.4 mg of RNA/g of tissue should be extracted. RNA from this study consistently exhibited a quantity of at least 1915 ng/ μ L. A gel also exhibited sharp 28S, 18S, and 5S bands.



Figures 1a and 1b. Nested PCR was run. They were successful as below shown in clear bands.



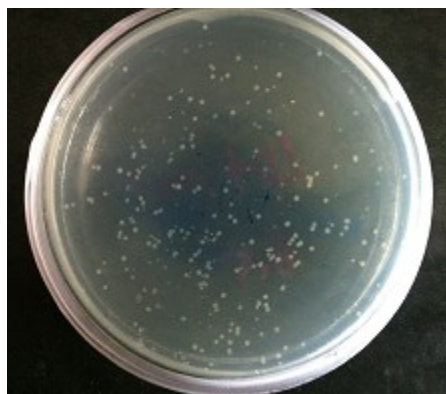
1b.



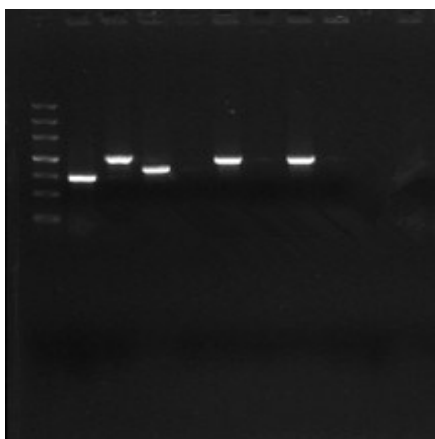
1c. DNA

marker used to analyze size of band.

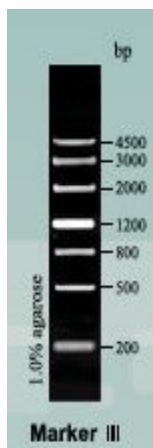
These Amplicons were transformed into *Ecoli* and grown on LB media containing ampicillin.



Figures 2a. and 2b. Clear bands are seen after Bacterial PCR at 1360 bp.



2b.



2c. DNA marker used to analyze size of band.

Sequencing

Basic Local Alignment Search Tool (BLAST) results of these sequences did not provided the sequences for the 5' end of the gene. The sequences contained the known 3' end and bacterial DNA. Experiment will be repeated after the following are considered: Nested PCR temperature parameters and reagents, Heat shock time and temperature parameters.

Conclusion

Although the product recovered was of expected size, BLAST results of these sequences did not provided the gene of interest. Thus, targeted salt tolerance gene was not obtained. We believe the possible causes to be: error in primer design or nested PCR conditions.

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Cultural Experiences

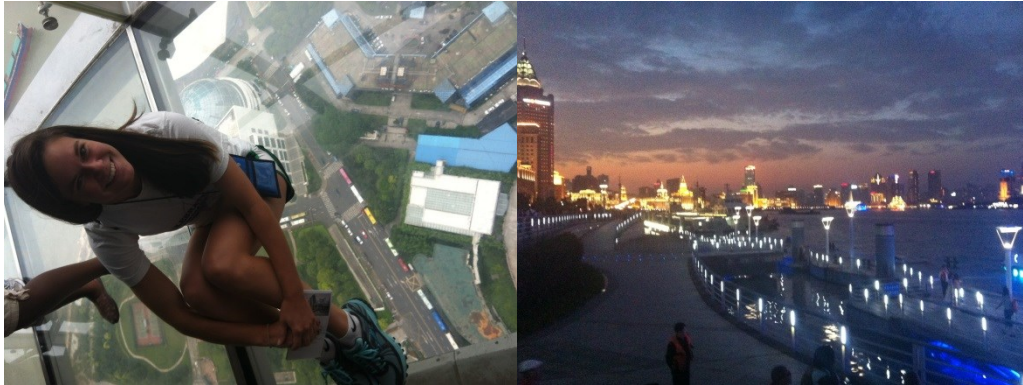
Melissa Dellatorre
Trip and Cultural Report
REU China 2013

Travelling to China and having the opportunity to do research with Chinese students while exploring the major cities has been one of the most eye opening experiences in my life. Never having travelled outside of North America, I had no idea what to expect. This was a life changing trip that taught me many valuable life skills both socially and academically. Throughout our time in China we visited Shanghai, Nanjing, Shiyang, Yangzhou, Xian, and Beijing. Each city was unique and provided us with further knowledge of China's culture and history.

Shanghai

When we first landed in China the population size and traffic were the first things I noticed that were much different than the U.S. There seemed to be no traffic rules, the vehicles were taking up any space they could fit into, even using sidewalks and constantly beeping. Every turn we took on the bus was literally just inches from being an accident, and crossing the street by foot gave everyone an adrenaline rush. In this city we got to do the skywalk on the third tallest building in the world, which gave us an incredible view of the buildings and the Yangtze River. Shanghai was also where I got my first practice using chopsticks, which started as a struggle but became progressively easier thankfully. Shanghai exposed us to new varieties of food, specifically our very first dinner when we mistook shredded jellyfish for noodles. This was the first of many unique and sometimes mysterious dishes we would try in China. I enjoyed the adventurous eating that was inevitable with the lazy Susan dining, where several dishes would be placed on a circular revolving table for us to share. Shanghai also introduced me to my first experience at a bargaining market. While casually looking into a shop, each worker would pull you into their store and force you to look at their products, using all their English skills to

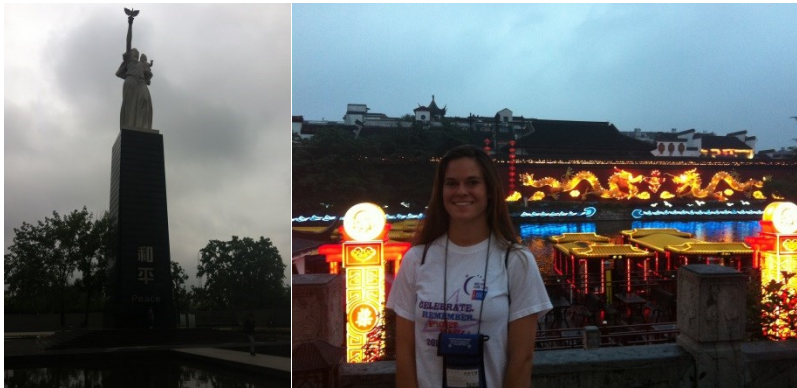
persuade you to buy their items. They would type prices into their calculator and sometimes even followed us down the street while lowering their price hoping to make a sale. Experiencing this type of food and shopping was new and exciting, and I thoroughly enjoyed the days we spent in Shanghai acclimating to our new environment.



Nanjing

As soon as we got settled in to our dorms and acquainted with the people and the surroundings, I knew I was going to have an amazing summer. Nanjing was where we spent most of our stay during China, so it was there that we encountered the most obstacles when we went out exploring. Learning how to read the bus signs was a great accomplishment, but it often wasn't enough to know how to get to our destinations. I was blown away by how generous the Chinese people were in making sure we got to the place we wanted to go. On more than one occasion they stopped whatever they were doing and got onto the bus with us, stayed with us so they could tell us when to get off, and where to walk from there. We met one couple that called our university to ask which bus and stop we should take; one man typed our destination into his phone and walked with us all the way to our destination using his map. Even the people that could not speak English well enough to tell us how to get somewhere would help us find somebody who could be more helpful. The generosity of the Chinese people made us feel very comfortable and we were not afraid of going sightseeing around the city, which to me was one of the best parts of this experience. Upon returning to the U.S., I hope to be as helpful and generous to visitors in my area. We went to several temples, parks, shopping centers, restaurants, museums, a silk factory, Underwater World, the zoo, and local tea shops during our time in

Nanjing. From this we learned about Chinese history and their way of life while also picking up a few Chinese words. After adjusting to the wooden beds, warm drinks, and the lack of napkins, toilet paper, soap, and the necessity to stand uncomfortably close behind the person in front of you in line, we began enjoying the lifestyle. We often went out in the evening to participate in Karaoke, American music, dancing, performers, although I could not get used to massive smoking in public places. Nanjing Forestry University offered an incredible learning experience that I would not change anything about, except to add safety measures in the lab!



Northern Jiangsu Province

The trip we made to see the poplar trees and production sites in Shiyang, and the wildlife reserves with milu deer and birds, along with the beautiful scenery and boat ride in Yangzhou was a lot of fun, and exposed me to the different species of plants and animals in China that I had never seen before, and learned their importance in society. We also entered into some parts of China that were not a tourist attraction and thus exposed us to another social level.



Xi'an

The trip to Xian and the Northwest Agricultural & Forestry University confirmed the generosity of the Chinese students, who gave us a great tour of their university, invited us to their graduate concert and gave us front row seats, and then wrote notes for us to thank us for coming and exchanged emails and Skype names with us and were adamant about staying in contact. The highlight of this trip was by far the Terracotta Warriors discovered as recently as 1974. I was so impressed that they were able to make 8,000 warriors 6 feet tall and all with different and intricately detailed faces in order to protect the emperor in the underworld. Xian also had my favorite meal in China, the city was known for their dumpling banquets and we were able to try 14 different dumplings which were shaped and decorated to let us know what was inside.



Beijing

Our short time in Beijing left the most significant impression on me out of all the cities. Climbing the Great Wall of China had always been a dream of mine and to see the view of the wall across the mountains after climbing a particularly steep section was extremely satisfying. I felt a great sense of accomplishment and happiness after our limited time on the wall. Even though we were only able to spend a short time in Beijing, we were fortunate to visit all of the top tourist attractions. This was the city that had by far the most foreigners to China, yet surprisingly this was the location where the Chinese people asked for our pictures most

frequently. Anytime we were standing around, and multiple times when walking up the wall, the Chinese people would point to their cameras and grab our arms for a photo with them.



Conclusion

Overall my trip to China was an overwhelming and remarkable opportunity that I am very lucky to have experienced. I have gained a great appreciation for the Chinese culture, and my appreciation for my own culture and fresh air has grown much stronger. I am extremely thankful for Alabama A&M University, Nanjing Forestry University, National Science Foundation, all of the faculty members, my peers, and all of the Chinese people I encountered who made this trip a wonderful one that I will always look back on and smile.

Christopher Griffith
Trip and Cultural Report
REU China 2013

Being an avid traveler, I was very excited when I learned about the opportunity to travel to China. This experience of traveling for free and also getting paid to do research was something I couldn't turn down. When I told people I would be going to China for the summer their reactions surprised me. Most of the time when I informed them I would be traveling, they immediately congratulated me and commented how they wished they could come with me. When I told my friends and family about the opportunity to travel to China and that I would be gone for six weeks their reactions were a little different. They consisted of the questions and comments such as: "Don't you know China is a communist country? Why would you want to go to China? Six weeks? Don't get taken over there". Fortunately, I didn't allow these pessimistic attitudes to deter me from the excitement of being able to not only travel once again, but to also conduct research in another country; something very few people have the opportunity to do.

The excitement started when our flight from Huntsville to Chicago was delayed, which as a result made it impossible for us to catch our flight to Shanghai. Therefore, at 5:00 am, a customer service representative worked frantically to book 14 people on to the 6:30 am flight from Huntsville to Houston to Los Angeles to Shanghai. I was happy because as a result we got great seats on a 15 hour flight. Once arriving in Shanghai we traveled to our hotel, settling in for a few minutes before heading to a very late dinner. Our first Chinese meal was banquet style, with several dishes set out on a lazy Susan in the middle of the table. From mandatory chopstick usage, a sole drink option of tea, to unidentifiable plates of food and eating watermelon, this meal was incomparable any meal I had ever eaten before. But it was interesting and new, and I tried just about everything on the table. This type of meal recurred throughout the trip, but there did come a point at which the excitement wore off and I wished for a fork. We always had help

and encouragement from our Chinese hosts, who would at times explain the contents of a dish or where it originated. They were very forceful at times when they wanted us to try a special dish that could only be found in that particular providence.

We were fortunate to have the opportunity to travel to multiple cities in China which included Shanghai, Nanjing, Shiyang, Yangzhou, Xian and Beijing.

Shanghai

Shanghai is China's largest city by population and it is known as the financial district of China or China's Wall Street. In Shanghai I came to the realization that in China necessity and comfort do not come hand in hand like in the US. I realized this when we arrived in our hotel room and it was barely big enough for two people, next in order for you to have electricity in your room you have to put your key card in the wall to activate the power. They only give you one key card so when you leave your room you lose your power which means your air conditioning stops. The next thing I realized was that the beds may have looked comfortable but they were not. I was shocked when I sat down on my bed and the mattress didn't even move. Fortunately however, I adapt quickly to new environments so it didn't take me long to get use to my current situation. In Shanghai we visited the oriental pearl tower which is located at the tip of Lujiazui in the Pudong district, by the side of Huangpu River. The tower stands about 468 meters tall and it is the best place to go if you want to get a bird's eye view of Shanghai. While at the Pearl Tower I was reminded of my trip to Japan and visiting the Tokyo Tower. It was also in Shanghai where we had the opportunity to do some local shopping and many of us bought authentic Chinese chopsticks. One thing I loved about traveling is being able to barter and negotiate prices with local shop keepers.

Nanjing

Upon arriving in Nanjing we went to Nanjing Forestry University and were assigned our apartments. I thought the bed in the hotel at Shanghai was hard, but the beds in our apartments were worse. I can only relate them to prison beds, nothing but a little cot on a wooden frame. It was in Nanjing where we conducted our research projects and spent the majority of our time in China. My particular project was the bird survey; I worked on the project with another individual Jacob. We spent a total of 15 days conducting surveys over a four week period and I can say that

it was during this time where I saw the best and the worst of Nanjing. It is because of the things I witnessed during surveying I believe my culture experience in my belief is quite different from the other members of this program. While conducting the survey we are required to go to multiple locations called points that are generated randomly and located all through out Nanjing. Many of the locations that were suppose to be a particular habitat had changed because of China's relentlessness to become modernized. For example, if Google Earth showed us that a site was a wetland in 2011, we would arrive to find out that it was now a construction site. I believe China has the unique opportunity to consider their effects on nature as they become more urbanized. In the USA and other developed countries we are just now realizing the negative effects urbanization has on the environment. China can learn from our mistakes and become a leader in preserving the environment as they become more modernized.

In an over populated country things that would make us Americans upset are particularly unheard of in China. For example, personal space is a luxury here in China and pushing into people is not considered rude or disrespectful it's expected. Everywhere you go in China it's crowded from the houses to the streets to the stores people are constantly bumping into one another. Of all my travels I have never experienced anything quite like China. One thing that also disturbed me while in Nanjing is in the rural areas people still use outhouses, and carry buckets to the rivers or ponds to get water. I don't understand how 10% of our nation's debt is owed to a country whose citizens don't have access to clean tap water or even running water in some areas.

In Shiyang and Yangzhou we visited the Defang National Wildlife Reserve and the Shiyang Poplar research and production sites. At the poplar research and production sites we learned about how Poplars are one of the most commonly planted species of tree in China. They are an important raw material and are used for veneer wood, plywood and building timber. As a fast-growing tree, they also have an important role to play in the reforestation of deserts. Decades of intensive logging have accelerated desertification, especially in north China. However, the cultivation areas, which are arranged as plantations, favor the rapid development of pests, which cause severe damage to leaves and trunks. In the future, to limit the reproduction and spread of the pests, parts of the plantations are to be planted with genetically modified Poplars which have proved resistant to leaf-eating pests. Upon seeing the plantations of Poplars we questioned how it would benefit the environment as a whole. One thing the Poplar trees do help combat the

pollution in China but having one tree species creates one niche which can't support animal or plant diversity. At the Defang Wildlife reserve we had the opportunity to see David's Deer also known as Milu deer and the Red Crowned Crane. It was at the reserve where we learned about the Milu and their struggle to remain present in this world. At one point the deer were almost extinct and now on the reserve there are almost two thousand and about two hundred live in the wild. The Milu were extinct in China, but fortunately thirty were returned and the species has since flourished in their native habitat. The Red Crowned Crane is also housed at the reserve. They have both wild Crane that migrate to the reserve each year and Crane that were artificially hatched that do not migrate but remain on the reserve year round. I was amazed when some of the people at the reserve did a demonstration for us. They released the Crane from their cages and let them fly around the park, they were able to call the crane back and have them return to their cages. This shocked me because I thought they were gone for good when they let them out of their cages.

Xi'an

Traveling to Xian was quite the experience. From Nanjing to Xian was a twelve hour train ride. We had to take a sleeper train which is a train with beds on it. So there are different compartments with six beds in each compartment three on one side and three on the other side and there were no doors to the compartments. Many of the professors found these accommodations on the train unacceptable, but to me I viewed it as part of the China experience. Upon arriving in Xian we visited Northwest Agricultural and Forestry University, there we had the opportunity to speak with Chinese students whose major was English. I have to say I was truly impressed with their English skills and their willingness to learn about American culture. The next day we visited the Terracotta Warrior Museum; this was my favorite part of the trip. I really enjoy seeing something on TV and then having the opportunity to see it in person. I remember when the Terracotta Warriors were featured on the movie *The Mummy: Tomb of the Dragon Emperor*. What truly impressed me was when I learned that the warriors were once painted and each warrior not only has a different height and facial expressing but also a different facial appearance making each and every one of the warriors unique and different from one another just like people. The weather in Xian was very hot and dry. It reminded me much of California and made me realize how much I missed home.

Beijing

My favorite part of Beijing was the Great Wall. After hearing so many stories about the Great Wall I was very excited to have the opportunity to travel there and see its wonder. When I was climbing it I could not truly understand how hard it must have been to build this magnificent wall by hand. Today we have all this machinery and equipment that make our lives easier, but they only had their hands and probably the help of animals such as donkeys and horses, it's no wonder over a million people died in the construction of the great wall. We also visited many other places which because of time restraints we could not appreciate everything. One thing I noticed while in Beijing was the increase number of military personnel and security which was interesting because very few people carry guns.

In all I can say without a doubt the six weeks spent in China were truly amazing. Although there were many trials and tribulations, I am very honored to have had the opportunity to travel to China and experience all it has to offer. This trip, like most of my international trips, has made me realize how fortunate I am to be an United States citizen. Every individual I got to know and talk with mentioned how they wished they could visit the USA. The level of respect you receive when people notice you are American surprised me. The Chinese people are very nice, open and very giving and it is because of this, that I have the utmost respect for Chinese culture.

Jacob Drucker
Trip and Cultural Report
REU China 2013

As one of the largest countries in the world, with the largest documented human population, and some of the most diverse geography as well, the cultural diversity of the People's Republic of China comes as no surprise. Being able to experience this variety with the added element of 21st century melding has been truly eye-opening, particularly as a citizen of the U.S.A. Since China's communist modernization in the late 1970's, the apparent standard of living hoped for by the average Chinese citizen seems to comprise many elements of American capitalism, and witnessing the way both these standards were incorporated into the rampant urbanization and development of the country was one of the most fascinating aspects of the trip.

Any time there was an urban area in sight (and many times not), there would almost be some sort of apartment complex being erected. Scaffolding, cranes, trucks, hard-hats and other assorted construction devices were a constant reminder of the rate of urbanization in the country and provided an ominous motive to get out and do our bird surveys to see how one part of the environment was reacting to such dramatic change. One project consisted of several rows of apartment buildings over fifty stories tall, towering over adjacent structures, and when viewed from above (i.e. Purple Mountain), were conspicuously large even compared to downtown Nanjing. Many of the newer projects were advertised with names such as 'Forest Palace,' 'Nature's Paradise,' and 'Eagle Mansions'—a great irony given the lack of quality habitat in the areas surrounding such developments. It was only the larger complexes that were adorned with such titles. The smaller ones were not, and as we traveled around Nanjing we could see the difference in quality between lower and higher income housing.

Not all the residential areas we visited were high-rise complexes. Many areas along the Yangtze River Islands and Lvshui Bay were still relatively poor farm communities, with some even classifiable as slums. All these communities seemed to be tied to agriculture in some way, which may be reason they've been preserved thus far, but it will be interesting to see how long they resist the change the rest of the city is seeing.

Other than differences in class, many of these projects look markedly similar. One day while looking over the comic section of a local newspaper, Ye, one of my co-workers laughed and pointed out a strip with a cartoon of a Westerner looking up at one such cluster of buildings with a confused look on his face, wondering how to tell them all apart! I could certainly relate to the cartoon, and it seemed like Ye did too, with the message behind the drawing mocking the horrendous residential architecture.

Monotony appears to be a huge aspect of China's development. Once outside the city (as we saw on our tour of northern Jiangsu province and from the train to Beijing), the vast majority of the land use is cropland with hardly any gaps or fringes for successional habitat to occur naturally. The efficiency of the land use was remarkable.

One of the most mind-blowing crops were Poplar plantations. In my mind, these stands—which often span for hectare upon hectare—epitomize the issue of global homogenization and the partially misled attitude towards environmental health shown not just by China but by much of the world as well. These plantations were literally genetically engineered forests, consisting of a single genotype manufactured to provide stronger, longer-lived, faster-growing, straighter trees. Poplars are a diverse genus of trees that show all these characteristics but scientists have been able to fine-tune them to a single, manageable, 'superior race' of tree. This is great for industry, as these super-trees are an invaluable resource in a country with rapid deforestation and high population. They also provide oxygen and air-improvement—also much needed in China. Despite these perks, such forests can support little biodiversity, as they are manipulated specifically to harbor the poplar, and sometimes a handful of herbs that can be grown in the shade of the trees. When our group toured one of these plantations, we were told it was heralded as an 'EcoPark,' which caught me off guard. Though it may be a feat of genetic engineering, and a good investment for the lumber industry, I do not believe such plantations should be celebrated

for their ‘eco’ aspect. In my mind, that would imply a place with great variety of flora and fauna, that is not managed explicitly for the improvement of air quality and lumber. This misconception that any area that is literally ‘green,’ with lots of planted trees, flowers, etc. is not just a problem in China, but all over the modern world, particularly with the prefix ‘Eco’ being used as a way to sell environmental legitimacy. Such tactics come straight from the capitalist realm of the U.S.

The influence of the U.S.’s pop culture (of capitalist origins) on China was also fascinating to behold. Especially among younger people, American pop culture was everywhere. The theme song to ‘Titanic’ seemed to be regarded as the ultimate epic at several of the student ceremonies and gatherings we went to, striking passion into the eyes and hearts of the Nanjing and Xi’an youth. The crowd at the graduation ceremony at Nanjing Forestry University went wild to a bunch of glittering gals dancing to a Ke\$ha song. Most Chinese students we met had chosen an English name, several of which coming directly out of pop culture, such as one girl who called herself ‘Katy’ after Katy Perry. And when I introduced myself as ‘Jacob,’ many people immediately recalled the werewolf character in the ‘Twilight’ series.

Despite my strong dislike for Twilight, Katy Perry, and Ke\$ha, spending time with the student body at NFU and Northwest Agricultural and Forestry University was a blast, as their kindness and hospitality was unmatched.

Perhaps my favorite person the entire trip was Ye Yuanxing, a graduate student from Beijing Forestry University who was around to help us conduct the bird surveys. Aside from being incredibly knowledgeable about China’s birds, and navigating us to all of our points, Ye was a blast to spend time with, due to his experience, open mind, patience, and most of all his enthusiasm. Our mutual love of birds, other wildlife, and conservation made working together a true pleasure and aside from having a great contact for the next time I return to China, I have made what I’m sure is a lifelong friend.

One day, Ye, Li Xiaojing (a postdoc from BFU, also helping us with surveys) and I finally stumbled across some good-quality wetlands, with some super cool specialist birds, after days of trying to find decent wetland habitat but only finding construction sites upon our arrival. Just as we were looking at mind-blowing birds like Pheasant-tailed Jacana and Greater Coucal, a little boy and his father came up to us, wondering what we were doing. We showed them the Jacana

and Coucal, and then before we could show the boy their pictures in the Birds of China field guide, he grabbed the book right out our hands, searching for them himself, but not without getting distracted by the incredible array of species illustrated. Situations like these warm my heart, as it is people like that boy, Ye, and Li, that show that there is hope for biodiversity in a place like China.

Antionette Fowlkes
Trip and Cultural Report
REU China 2013

Introduction

“Congratulations, Antionette, you have been selected to be a part of the 2013 Research Experience Undergraduate Program”. These were the words that would change my life forever in just one short summer. My first reaction to spending six weeks in China was curiosity and apprehension. There were many reasons for me to be apprehensive; a communist government, a formidable language barrier, and inescapable, unpalatable Chinese food. For me, it was simply a lack of knowledge about this vast and ancient place that kept me at a distance. But, when the time arose to make my decision on whether to spend my summer doing research in China, I quickly took advantage of the once in a life time opportunity. I was nervous about the countless uncertainties, ready to learn about both culture and science, and overflowing with the exhilaration of preparing to travel to the other side of the world. I was clueless about the relationships I would form with the people and the history that I would learn in such a short time. This trip to China forced me out of my comfort zone and introduced me to a new way of thinking and viewing of life. This experience gave me the opportunity to realize a society that is very rich in history, culture, tradition and an exponentially growing economy. The people I met were some of the most polite and generous locals I have interacted with in a foreign country. They were open to conversation about the United States, and most of all, the way my hair was styled. I learned so much in such a short time about this great nation and some of the significant events that contributed to their modern society today. Throughout the five weeks, we traveled to various cities in China including: Shanghai, Nanjing, Yangzhou, Xi’an and Beijing. Although they seemed very similar, they each offered something new for us to indulge in and become

captivated by whether it was the everyday life or taste in the food each city had something new to offer.

Shanghai the Spectacular

Our first two days were spent in Shanghai, where we did some sightseeing and began to get acquainted with life in China. I can say that I adjusted rather quickly than most. However I could tell that my senses were heightened the moment I stepped off the plane. The smell was unfamiliar to me and the heat is something that I didn't want to get used to. On the bus ride, from the airport to the hotel, I rode in silence as I was in awe of the extremely tall buildings and all of the lights throughout the city. Later that night, I ate my first Chinese meal at a local restaurant where I encountered a lazy Suzan for the first time. I also made my first Chinese friend, Yong. Yong was our tour guide for majority of our time in Shanghai and Nanjing. After dinner, we returned to our hotel. As I sat in my hotel room, in the mist of all the smells the heat and the noise from cars and scooters, I realized that I was in an unfamiliar yet spectacular place that had so much to show from the Oriental Pearl to the boat ride of the city at night. Without a doubt this is a city that when given the chance to visit, one should take full advantage of the opportunity.

Adventures in Nanjing

Nanjing is a 3hour bus ride from Shanghai. We spent a little over five weeks in Nanjing and got to experience the most of what China had to offer in that city. Just a few days into our stay aone of the graduate students, Jonjala took us downtown to Xinjiekou to explore. On our first trip to downtown is when I experienced the true Chinese driving culture. I was so shocked and scared at the same time as I watched cars bob and weave in and out of traffic. It felt like everyone was very aggressive and would switch lanes whenever they felt like it without regarding any of the other drivers. The buses were like the bullies on a school playground. They drove around like they owned the streets and everyone had to get out of their way. The scariest part was all the bikes and motor scooters that drove right beside the road, inches away from the other cars. It amazes me how they can drive down a three lane street with four cars going across in three lanes. It fascinated me that I never saw a major accident. That is what I like to call the true art of perfected wreck less driving. After a few more trips downtown, I was more at ease about the

driving and being in such a large and busy city. I felt confident that we could make our way there and back without asking for any help thanks to our own personal tour guide Jonjala. We were also lucky enough to be in town for their national Dragon Boat Festival. It was exciting to see all the people gathering together at Mochou Lake, and the different ways everyone celebrated this holiday.

Beijing the Beautiful

Although we only spent 4 days in Beijing, it was by far the most incredible city out of all the ones we visited. It was filled with much history and culture. My favorite experience was climbing the Great Wall and being able to look out over the mountains and picture in my head what it might have looked like when the Mongols attacked China. Later that evening we visited the Pearl Market. This experience was very exciting because it was a store full of salesmen who were eager to make a sale. The workers were very good at bargaining and trying to get you to pay a higher price, so you as the buyer had to be smart and bargain back at them with a lower price. They were very emotional people and sometimes would raise their voice but as long as I stuck to my original price and talked to them calmly they usually ended up giving me the lower price. We also visited Tiananmen Square and the Forbidden City. They were both larger than as seen on television. It was amazing to be in a place where so much political history took place. Following the Forbidden City we experienced a tea ceremony that allowed us to taste many traditional teas. On our last day in Beijing we were able to watch a Chinese Kung Fu show at the Red Theatre. At the end of this trip we were sad we did not have more time in Beijing but also very excited to get back home.

The Food

One of the most interesting characteristics about Chinese culture, that I realized almost immediately, was the amount of food that was served and consumed at every meal. We were told that the Chinese thought you weren't satisfied and would pressure you to eat more if everything on your plate was finished. One of our Chinese professors told us about how when he was a student there was not enough food to feed the large and growing population and many people suffered from starvation. The Chinese are very proud now of their ability to support society and

therefore they often indulge in large and extravagant portions when eating. They also eat anything, literally anything. I ate some of the strangest things I never thought I would ever dream of eating. The pictures below are just a few of the many interesting platters including: pig ear, eel, chicken feet and other parts, duck neck, interesting mushrooms, lotus root, sea cucumber, and many more.

Final Thoughts

This experience was exceptional and taught me how to appreciate other cultures how to better work within a team setting, and grow as a person socially and professionally. The greatest part of China for me was learning to admire the history and culture. I am very thankful to the National Science Foundation, Alabama A&M University, Nanjing Forestry University and all that contributed to this eye opening opportunity.

Michael Knotts
Trip and Cultural Report
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Shanghai

Shanghai was my first experience in China. We all stayed at the Jinjiang Inn where we had a delicious breakfast every morning and a beautiful view to compliment it. In Shanghai, we had an opportunity to visit the famous Oriental TV Tower. This tower was breath-taking and amazing so I took several pictures of this visit. We also had an opportunity to do some shopping in one of China's biggest shopping markets. Lastly, we took a short cruise around the Huangpu River. On this cruise, the group and I had the chance to see the beautiful city of Shanghai illuminated in the night time. This city was a great start to my trip to China.

Nanjing

I experienced the campus of Nanjing Forestry University before I had the chance to visit the rest of the city. On this campus, I visited laboratories, health facilities, took cultural classes, ate wonderful food, played basketball and much more. Even learning from the wonderful graduate students at NFU was like a cultural experience for me. One of the students took me to Nanjing University for a visit. The campus there was enormous and stacked with large buildings and a state of the art library. This campus even had an Americanized restaurant where I enjoyed some hot wings.

Other than these wonderful college campuses, I visited places in Nanjing like the Presidential Palace and several shopping districts that I will always remember. There was one day that I even saw the opening ceremonies of the great Dragon Boat Festival. I took great pictures at each of these places. One place that I will never forget is the Nanjing Massacre Museum. Before my trip

to Nanjing, I had no knowledge of the massacre or how bad it really was. But after going to the museum, I had a greater respect and understanding for how important Nanjing is to the nation of China. That museum will forever be a part of my memories.

Yangzhou

We had an opportunity to see Oriental White Storks up close. This experience made me appreciate the beauty of the birds and the scenery of nature surrounding them. Also, I had a healthy laugh when mosquitoes began to swarm our temporary bus driver. In addition to this part of nature, we got the chance to see the unique Milu Deer. We were told the story of how they were moved across the world; away from their first home.

Later, we stopped on the side of the road to enjoy the view of some water, grass, and windmills. The group and I also went on a smooth boat ride in Yangzhou the next day. Everybody took several pictures of the stunning scenery. The boat ride was magnificent and so was the monks who let virtually all 13 of us take pictures with them.

Yancheng

The city of Yancheng gave me the opportunity to visit a real factory for the first time in my life. This city also had many Poplar trees. I have never seen a forest dedicated to cultivating only one type of tree. It was truly a great experience.

Xi'an

My visit to Xi'an involved traveling by train for my first time. The train station was full of people who were attempting to commute to different areas of the country. We got to visit the Northwest Agricultural and Forestry University. At this university we made several friends. There were a lot of beautiful women at this university. In this city, we had an experience of a lifetime. We got a first-hand look at the famous and historical Terracotta Warriors. We went to the Terracotta Warriors museum and saw the site where the warriors had been preserved. We also got to see many other historic artifacts in the Shaanxi Historical Museum.

Beijing

I had a wonderful opportunity to climb the Great Wall of China on my trip to Beijing. It was an overwhelming experience to not only climb to the top, but also go further on to the area where tourists are not allowed access. This is where I stopped and turned around. I also had a chance to visit the Beijing Olympic Park. Going there made me realize just how awesome the city of Beijing really was. These two visits, if nothing else, made my trip to Beijing a special once.

Gilda Naka
Trip and Cultural Report
REU China 2013

Introduction

This trip to China was my first trip to Asia. It was truly one of the greatest experiences of my life. Not only was I lucky enough to be able to fully experience a different culture and take part in their long-held traditions, but I was also able to see the modern side of Chinese society and how rapidly cities were developing in Nanjing and surrounding areas. The Chinese people were so welcoming and friendly. I got lost in the city multiple times, and there was always someone who was willing to give you directions, and a few people even took an unnecessary bus rides to make sure that we got to our desired destination. All of the people that I met in my lab or at the other universities that we visited were so excited to get to know us, and they jumped at any opportunity they could to practice their English. I honestly can't say how lucky we were and how really helpful it was to be in a country where English was the unofficial second language. Most students have to study English in primary school and being able to communicate with them was a crucial component to my trip and overall experience.

Words cannot describe the amazing food and sights (see the photo gallery on my webpage)! We traveled to various cities including Shanghai, Nanjing, Yangzhou, Xian, and Beijing. Each city had its own story to tell, and this was truly an experience that I will never forget!

Shanghai

Shanghai was one of the biggest cities I have ever seen in my life. I've been to New York City before but Shanghai is on a different level. It still puzzles me as to how so many people can coexist peacefully and be somewhat immune to the negative aspects of city life. Cigarette smoke was everywhere, but the city does have its own charm. The Pearl Tower was definitely the highlight of the trip because it allowed us to be able to see the entire city from a bird's eye view. Shanghai was also where most of us first became familiar with bargaining. You have to be able to hold your ground in order to get a good deal. This is also one of the few cases where our American label worked against us because shopkeepers usually charge three to four times as

much to foreigners. Regardless of all the fun, new experiences that I had in Shanghai, I was really excited to leave for Nanjing because big cities are not quite my forté.

Nanjing

I really can't say enough about how amazing Nanjing was. There were so many adventures to be had in this incredible city. I went out every single day of this trip, and there were still temples, parks, and museums that I didn't get the chance to visit. Some of the best memories from Nanjing, however, weren't from the monuments or attractions, but rather from the time I spent bonding with my lab mates. My host lab was always so welcoming and always so full of energy. They took me out to different locations and restaurants in an attempt to get me to experience the more "local" side of Nanjing. Every day I spent with them was a blast. Luckily some of them are coming to America soon for some lab research here, and I'm really excited to get the chance to show them around my amazing country.

Yangzhou

Yangzhou was one of the most educational field trips we've had during this entire program. Not only did I learn a lot about the potential use of poplar trees in China's production industry, but I also learned quite a bit about their local wildlife, such as the red-crowned crane and the Milu Deer. It was really nice to be able to take a step back from the busy city life and breathe in some fresh air and see how farmers and fishermen live. The Dafeng National Wildlife Reserve was definitely one of my favorite places on this entire trip.

Xian

The group this year was beyond lucky to be able to make a trip down to Xian. We went down to Northwest Agricultural and Forestry University to meet some of the local students and take a tour around campus. The students were super eager to meet us and wanted to know everything they could about life in America. What was really striking was how many things we had in common. We liked the same American TV shows and American music artists. Another highlight of this trip was the Terracotta Warriors. I honestly believe that you can't leave China without seeing the Great Wall and the Terracotta Warriors, so it was really humbling to be given this opportunity. It was amazing to see how much time and effort was put into preparing the emperor

for his afterlife, and it's interesting to see how these beliefs have transcended time and other cultures.

Beijing

The capital of China was breathtaking. Beijing was one of my favorite cities that we visited. It appeared to be much smaller than Shanghai, even though statistically there is no real difference between the population sizes in these two cities. This could be accounted for the fact that Beijing does a good job of integrating its old city layout with its need for rapid urbanization and development. Many of the buildings were low-rises, and the traffic was controlled by eliminating fifty percent of vehicles on any given day via a lottery and license plate system. The Great Wall of China is too amazing for words. It stood out as the single best day on my entire trip. We visited several other historical landmarks, such as Tiananmen Square, Olympic Park, Forbidden City, Summer Palace, and the Temple of Heaven. Each site was so fun and rich with history and culture, and even though our schedule was really tight, I'm very happy that we got to visit all of them.

Thank you!

This was truly a once in a lifetime opportunity, and I am so blessed to have been able to participate in it! Thank you to everyone who made this trip possible. It is something that I will never ever forget! There are some many people that I would like to thank, but I especially would like to thank Dr. Elica Moss, Dr. Yong Wang, Dr. Fei Wang, He Qiyang, Alabama A&M University, Nanjing Forestry University, and of course, the National Science Foundation for making this all possible. Thank you, thank you, THANK YOU!!!! ☺

Maya Rudolph
Trip and Cultural Report
REU China 2013

“Flight AA 183 is now boarding.” When I heard these words while sitting in the waiting area of the Los Angeles airport, butterflies instantly came to my stomach. Being a first time passenger of an airplane many thoughts ran through my head, “Wow, my first time flying and I’m going to China!”, “How does it feel to be on a plane”, “Will the plane crash?” The excitement of traveling to China had my nervous shocked. After boarding the plane and taking off, I finally calmed down and I was ready for this new cultural experience in my life to begin.

Before departing for China, we attended Chinese cultural and language classes. These classes were quite interesting and intimidating, because my expectations of China were mistaken. Never having been out of the United States before, let alone not having any previous research experience, this opportunity was a once in a lifetime experience. Upon arriving to China, I was eager to explore every aspect China had to offer.

The westernized version of Chinese food is contradicting from actual Chinese food we were served. It took me quite a time to adjust to the food, but when I familiarize myself with my favorite dishes lunch and dinner time was my favorite part of the day. During every meal chopsticks were used as eating utensils. The silverware setup usually consisted of a small plate, a spoon and small bowl, chopsticks, a cup for tea, glass for a drink and on special occasions a small shot glass for liquor or wine. At restaurants food was served on large, spinning circular disk place in the center of table called a lazy Susan. The lazy Susan allowed everyone seated at the table to grab a portion of various food dishes. Throughout the meal more dishes would be added to the lazy Susan, which spunk excitement and anticipation of what was being served next. Watermelon was the last dish served and was consider the dessert.

The attraction sites in China were built to perfection and full of history. From visiting temples, to bargaining at markets, to touring museums, everything in China represented some value or idea. One of the most amazing aspects of the Chinese culture was the pervasiveness of symbolism throughout life. Certain colors, animals, flowers, and even foods have a special significance that stood for something. For example, the bamboo plant stands for longevity and good luck. My favorite attractions sites were the Nanjing Massacre and the Great Wall of China. The city of Xi'an, which was my favorite city we visited, stood for the city of peace. Xi'an was a very beautiful and ancient city, were the Terracotta warriors museum was a major landmark there.

Exploring and taking adventures through the city always gave me a sense of nervousness. The careless behaviors of drivers in China always frighten me. Scooters, bikes, pedestrians, cars, and taxis were all apart of traffic. The streets were constantly packed with people walking, stray animals, and also homeless people. Public transportation was inexpensive and convenient, unlike America. Living conditions were different from America. The beds to our dormitory were wooden planks were a thin layer of cotton cushion. The Chinese dorms had up to 6 people living in one room with no air conditioning. Many buildings had five floors or more with no access to an elevator. Washing clothes was either done by hand or by a small washing machine. There were no dryers so clothes had to be hung outside to dry.

I noticed that many Chinese people did not keep up on their hygiene, but it never fazed them. They were so content with their lifestyle. They repeat the same pair of clothes daily, and wasn't always sanitary. Despite their dress, my NFU mentor and graduate students were the nicest people that I have ever met. They were always available to lend a helping hand. Their warmness and hospitality they showed towards me was appreciated and I was able to feel comfortable around them.

The experiences of China made my summer of 2013 a one to remember. From this trip abroad, I have learned how to be appreciative of the American customs because many countries are not as fortunate. The cultural education component of this research experience has made me into a better communicator and I now know a bit of Chinese. Most importantly this experience has guided me to new interests as far as my future career aspirations. I am truly thankful for this

opportunity to have conducted research internationally, which became a life changing experience.

Sarah Katherine Springthorpe
Trip and Cultural Report
REU China 2013

During my trip to China, I was able to experience and learn so much about Chinese culture and heritage. However, the most important thing that China showed me was actually about myself and my own culture. Prior to leaving the United States, I thought that this was going to be one of the biggest culture shocks of my life. I had traveled before, but that was only to western nations where I could actually communicate with the local people. And based on all of the accounts that I had heard about living in China, I was convinced that I would be huddled in my bed at night just wishing to go home as quickly as possible. Never have I been so wrong.

What I actually found in China was a culture full of vibrancy and life. It was welcoming and all of the people that I met were just as intrigued by me as I was by them. I didn't feel the superficiality that social interactions with strangers back home have. I felt like they actually wanted to know more about me and for me to learn more about them. And while things are different than back in small town North Carolina, there is such a plethora of things that are the same. When I would talk to people, I found out that they were trying to find the same things and that they had the same concerns as people back home. They were just as concerned about their family and friends, about fitting in within their society, and about making ends meet. All of the graduating seniors were feeling the same emotions that I know the seniors at my college felt and that I know I'll feel when I get to that point as well. It was just so incredibly impressive to find that, in a country that I've been told is so drastically different from my own, people were really the same.

More importantly than that, I learned a lot about myself. You will never learn more about how you think and feel than when you're dropped into a situation where you are completely helpless,

and I was really happy to find that I could adapt so quickly. Even with the Chinese language classes, the amount of Chinese that I could understand, much less speak, was minimal at best. I could say hello and chicken and I could count to ten. In the grand scheme of navigation and survival in China, that doesn't get you exceedingly far (although it will get you 2 chicken dishes, which is better than nothing at all). But, I learned so much by getting lost and not knowing all the time what I would find at the end of an adventure. And by far, the best times occurred when I did get lost and had no earthly idea of how to get what I wanted. And it certainly made hot pot more interesting when I found out the random thing that I pointed to on the menu was actually fish so fresh that they were still wriggling on the plate when they came out to me. Or when we taught the street food vendor how to make French fries and we ended up getting not only one order of the stuff, but two and an order of either goat or mutton (we're still not entirely sure as to which one it was; all that matters is that it was delicious). Despite my fears before China, I actually found that my life was so much more interesting and entertaining when I had no schedule and no idea what was going on. And for a person like me that likes to have everything mapped out well in advance, it was so invigorating to have to figure things out on the fly and hope that everything would turn out all right in the end (which it usually ended up turning out better than I expected).

I also thought it would be really difficult to leave technology behind and it was at first. The lack of consistent internet has definitely made me grateful for the connection I have back home.

When I first got here, I had this mental checklist of all of the television shows I was missing and I was afraid of going into withdrawal from the lack of TV and movies. In reality, though, I found I didn't even miss it that much. When we would go to the hotel rooms and they had a television, I found myself more excited to leave the room to go explore the random back alleys lined with food and bars and small knick knack shops than to sit and turn on the television. In fact, I really only found myself using technology for work rather than entertainment. I also discovered how much of a social crutch my phone had become for me over the past few years. Back at home, whenever a situation was awkward or I didn't want to talk to someone, I would just pull out my phone and fiddle with Facebook, my email or the games on it. There it made sense because I always had access to them with my data plan, so no one would bat an eye if I was playing with it. But, in China, I couldn't do that because it was just way too expensive. I even found myself pulling out my phone in a few uncomfortable situations to find that it was going to help me out and I would have to awkwardly put it back in my pocket. So, I had to learn how to deal with

those situations and it was probably one of the better things that happened to me. I learned so much more about people and about my surroundings and it led to some really interesting conversations. In fact, I'm really glad for the lack of decent Wi-Fi in China solely for that reason. Because of that, I paid more attention to the people around me and I got to learn about all of the things that they liked to do. I saw more of my environment, which happened to involve a really interesting and odd interface between the old and the new, the east and the west, that was rampant everywhere I went.

This interface was really a thing to behold because the things that were affected by it had turned into these weird hybrids that completely lacked any authenticity, which seemed to me to be degrading the original cultures. The places that were really bad for it were these market like places that were usually centered about some historically significant place like a temple. They usually had architecture that mimicked the ancient style that you always think of finding in China and the temple that was located in the center was usually open for business. These temples were busy too, full of tourists grabbing their free three sticks of incense and lighting it in the candles haphazardly and of the people who were actually there to pray to their gods. It was almost like the tourists were making a mockery of people's beliefs by turning them into a sideshow to buy a 10 yuan ticket to on a Saturday morning. In fact, I felt so weird just being in the temple and observing these people as they prayed. It was like I was trespassing on something sacred that I didn't need to see at all, but it was several times worse because I had paid to trespass. But it wasn't just the temples that had this strange hybridization; it was throughout the entire market. You had so many Chinese people selling gimmicky things that were imitating traditional Chinese culture to tourists right next to a KFC selling fried chicken which was right next to a Lacoste selling fine leather goods and Polos. But, nothing was purely authentic. It all seemed very degrading to both cultural aspects comprising it because it wasn't true to either one. The small Chinese items didn't have the same value as just seeing the historical sites did and the Western items didn't have the same feel as back home (though I will admit that a dragon twister from KFC was mighty good chicken).

It was also really interesting to look at how the Chinese people viewed their history and how they dealt with it. For most of the people I talked to and based on the way in which China markets itself, it seems that their long history is of great importance to them. They tout how

many dynasties there were and how long they lasted and the great many artifacts left preserved from each one. But, when you look at the sites and the buildings left over, you find that they aren't preserved in the form that shows them aged. You would expect that a temple over 500 years old would have wear and tear on it with chipping paint and worn down characters. But not in China. In China, there is more emphasis on making artifacts look as they did when they were brand new, which in a way degrades the fact that it is an ancient item. It seems the focus is more on what makes the item pretty as opposed to what makes the item culturally and historically significant. Also, they only seem to preserve the things that sell the most to tourists. Everything else is sacrificed to the great need for urbanization, which is consuming everything in its path, including history and habitat. When you look out from the city walls of these great cities, you look out towards the horizon and all you can see is sky rises. Everything else has been obliterated and the urbanization continues right up to the edge of these sites. Looking down within the walls of the building was the only way to see any history. In a way, it's a good thing that they are protecting their history from the onslaught of development, but even then, they're very choosy about what gets protected. For example, in Beijing, all that remained of their city wall was the main gate (which also looked pretty). The rest of the wall had been converted into a high way. And, my bet is, that if I go back to China in ten or so years, all of the buildings that I saw being built will have already been replaced or in the process of being so. It's kind of disconcerting to find that nothing has any real staying power and is always in the process of being renewed to pander to people's ideals.

Despite having to accept how urbanization is wreaking havoc in China, my life in China was really enjoyable and was one of the most defining points of my life. I loved every minute of every experience I had while I was there. Not everything was comfortable and not everything was familiar, but there wasn't anything on the trip that I would look back on with regret.

Justin Waraniak
Trip and Cultural Report
REU China 2013

China, previously a very traditional, conservative nation, underwent great changes in the 20th Century, and continues on a path of rapid development in this century. China is a place where old meets new, ancient meets modern, and traditional culture meets new development. The Chinese enjoy a long and rich cultural heritage, which until relatively recently, was demonized by the Communist regime. Modern China is experiencing a revival in its traditional cultural heritage, a degradation of Communist philosophy being replaced by capitalism, and Westernization of its popular culture. With all these changes, life in China is improving, but they also bring along some serious problems.

One of the most apparent parts of the culture in China is the integration of the traditional with the modern. In the wealthy section of Xi'an, traditional Ming architecture houses shops selling Lamborghinis, Rolls Royce, Gucci, and other symbols of modern wealth. In Nanjing, Xi'an, and Beijing, skyscrapers spill out around the ancient city walls. Even the people exhibit this phenomenon. They hold ancient superstitions and values alongside their connections to the modern world. People drink alcohol brewed with dead snakes to gain strength and protection from their venom, and drinking traditional herbal teas to lose weight and control blood pressure, while at the same time wearing facemasks to protect themselves from the flu and other airborne contaminants. Even in hospitals, this dichotomy exists. When my mentor Kevin was bitten by a venomous snake last year, traditional Chinese medicine was administered alongside antibiotics and fluids. Though the holding of these traditional beliefs may sometimes make the Chinese people appear backwards, they can also show the wisdom of Chinese thought.

Since the Great Reform and Opening Up in the 1980s, Western pop culture has invaded the psyche of the Chinese youth. I found it relatively disappointing that they've only been exposed to pop culture since the 80s, missing out on Bob Dylan, the Rolling Stones, Star Wars and Jaws. They have no knowledge of what I consider the classics, only the relatively newer films and artists that have made enough money to cross over to the Chinese market, like Transformers, Twilight, Katy Perry, and Ke\$ha. Another unfortunate side effect of this is that it's given the Chinese youth a colored perception of American culture. From the questions students asked me and the comments they made, I got the sense that their picture of young American society was based mostly on imported episodes of racy ABC teenage dramas and MTV semi-reality shows. It made me realize that our media sends a message about how American society works, and it disheartened me to think that right now, China was getting the message that we were self-absorbed, sex-obsessed, and emotionally vapid people from the likes of Twilight and Teen Mom. Despite the negative effects of the selection of American media that made it to China, our shared knowledge of pop songs was able to bring us together and allowed us to identify with each other using something familiar.

Whereas most of what I had talked about earlier applies mainly to the cities, my richest cultural experiences came from spending time in the outer reaches of civilization in the small villages nestled in the Wuyi mountains. Foreigners were not allowed into the natural protected area of Wuyishan without permits, so Kevin Messenger and I were possibly the only Americans that some of the villagers had ever met, or at least the only ones this year. Despite the obvious fact that we were outsiders in this small community, we were welcomed warmly by the locals, even those who made no financial gain from interacting with us. We made friends with the owner of a small family restaurant, and had some good conversations with her despite our broken Chinese and the villagers' limited English. Some of the villagers would invite us for some delicious Wuyishan wild black tea just to see if we had caught any new snakes for us to show them. While the herpetology of Wuyishan made the trip worthwhile, the friendliness and curiosity of the people we met made it something special.

Wuyishan was not all lollipops and sunshine, however. This was supposed to be a nature reserve, but unlike national parks in the United States, people lived on the protected land. Even worse, the land was dominated not by natural forests, but by tea and bamboo plantations that ran along

the mountain roads for miles. The population of the protected area isn't getting smaller to lessen the environmental impact; it's getting larger, prompting the destruction of more natural environment to make room for more houses and tea factories. Right now, the Chinese government is letting money cloud its decisions about environmental protection, and there will be dire consequences if it does not change. Luckily, the young park liaison we worked with, Xiepong, recognized this, knew what needed to be done to fix it, and felt a strong desire to bring about this change, which gave us hope that perhaps the next generation of environmental administrators in China will be more conscious of the implications of their decisions and seek to preserve what's left of China's ecological wealth.

Tangelia Hatch

Trip and Cultural Report

REU China 2013

My time in China has been an amazing and unforgettable experience. I enjoyed and took full advantage of everything China had to offer. There was so much to explore, to experience and none the less adjust to. I took advantage of experiencing different things such as the food, the people, and the many entertaining attractions.

The most important thing I knew I wanted to partake in was of course the food. This was so important because I love American Chinese food dearly, so I was anxious to discover any similarities and differences, but with a high level of discretion. The very first night at our first dinner in Shanghai, I quickly came to the conclusion that Chinese food in America is totally different from authentic Chinese food. The seasoning, noodles, and things they choose to use as an appetizing dish blew my mind and taste buds. My first shocking experience with food was when I saw a dish that looked very familiar. I thought I would really enjoy it. So I quickly indulged in what I obviously thought was noodles. One bite into it and I realized I was sadly mistaken. The dish was cold and unusually crunchy. I immediately came to the conclusion that it was not noodles. What was it?... Jelly fish! Ever since that night every dish was a mystery to me and every meal was a game. Will I like this? I bet this is pork? I bet this is spicy? I believe I won at my own game, because I left almost every meal full and satisfied.

The people of China are very interesting, yet not very different from the people of America. They work to earn what they need and want. After meeting students from Nanjing Forestry University and Northwest A&F University, we found that they are just like most college students. They have goals, dreams, and aspirations just as we do. On the other hand the people outside of campus were fun. They were very amazed by seeing American people. They would stare, and touch some of the females' braided hair. Some would also sneak pictures and ask to

take pictures with us. The people are very friendly in my opinion. They were willing to help us in any way possible. The help was often very limited being that I spoke very little Chinese and they spoke little to no English. They would help us order food in the cafeteria on campus, and assist in doing certain things the Chinese way.

Some of our most memorable times took place at some of the many attractions China has to offer. Our first stop was Shanghai. There we visited the Oriental Pearl tower, the temple, and took a boat ride that was very relaxing. Nanjing was where we spent most of our time in China since the research was being done at Nanjing Forestry University. I really enjoyed going to KTV, which is equivalent to our karaoke, and taking trips to Xijiekou for food, and shopping. During our Nanjing city tour, we visited the Presidential Palace and Confucius Temple. Other activities include going to the Dragon Boat Festival at Mochou Lake, the Nanjing Massacre Museum, and NFU's Graduate Farewell Concert. On our first cultural field trip we went to the Poplar City and Yongzhou. While in the Poplar City we saw the Poplar Forest which is one of their greatest sources of revenue. They also took us to visit the poplar factory where they make wooden floors. On that same trip we also traveled to Yongzhou where we visited the Red Crown Crane Conservation, Pere David's deer (Milu deer) Conservation, and the Bamboo Botanical Garden. One of my favorite cultural field trips was our trip to Xi'an. Xi'an was famous for their dumplings and the Dumpling Banquet. While there we visited the Terra Cotta Museum, the Agriculture Farm, and the South Lake. We also visited Northwest A&F University where we were able to mix and mingle with some of their students who spoke English. One of my favorite meals during the whole trip was in Xi'an at the Tang Dynasty Restaurant. I also became addicted to the steamed bun pork dumplings while in Xi'an. My favorite trip was of course the trip to Beijing. There we visited the Forbidden City, the Summer Palace, the Ming Tomb, the Pearl Market, Tiananmen Square, the Temple of Heaven, and we also attended a kungfu show. Let us not forget about the Great Wall of China. That was my favorite memory of the whole trip.

Participating in this program granted me the opportunity to come to China, I'm just glad I took advantage of everything China had to offer. Of course there were obstacles we had to overcome when we first arrived; however, I am unable to remember any obstacles due to the fact that I enjoyed myself so much. I have learned and enjoyed myself tremendously. I would definitely visit China again, and I would tell the world they should too.

Jonjala Jackson
Trip and Cultural Report
REU China 2013



Leaving for China on May 31st, I thought I knew what to expect when I arrived for the second time. I was somewhat familiar with the environment, the food, and the people. However, China still had new things to show me.

Revisiting the Presidential Palace, The Confucius Temple, gardens, and museums were astounding. I honestly enjoyed seeing the pictorial history and artifacts again. Newly visited Jiangsu Province, Xi'an and The Terracotta Warriors Museum added to the enjoyment of my second time around in China.

My favorite place was the Oriental Pearl Tower in Shanghai. I was fortunate enough to visit this site again. This time around, we were privileged enough to take a boat ride to see the beauty of Shanghai at night. The scenery was truly magical!

I also had a chance to go to the Dragon Boat Festival once more. Duanwu or Dragon Festival is a part of a national Chinese holiday. We really enjoyed ourselves viewing the park and watching the races and the people perform Chinese dances and martial arts on the streets. The locals really enjoyed the races.

The climate in China was still hot and humid, not to mention smoggy; however, it was not as hot as it was last year. In the first few weeks, it rained a lot. There were still major pollution issues, specifically concerning water. Even now, it was unsafe to drink. Every tour guide urged us not to drink from the tap. Hot and humid temperature also poses a risk for insects. This year, mosquitoes seemed to be worse than last year. I don't recall ever seeing as many mosquitoes ever in my life. We always had to wear mosquito spray no matter where we went, even during the day.

When speaking with the students at Nanjing Forestry University, they told us about their educational system. They informed us that their parents were very strict about their education and that they hardly had any fun when they were younger due to entrance exams they had for high school and college. They told us that they had to finish their homework before leaving school, return early the next day, and leave late at night. Sometimes, they even have Saturday classes. They stated that the exams were very difficult. Many students expressed interest in continuing their education in America, but the entrance exams proved to be difficult as well as funding. This year, I was not surprised when a majority of the students stated that they had either English or Tourism majors. Because admittance into America is so difficult, those majors are the closest that the students can get to America.

This year, I was more open to try more Chinese cuisines. I particularly favored the cabbage, cauliflower, and the sweet and sour pork. Even though I was fond of these dishes, I longed for the taste of American fast food. As a result, I ate at several Americanized restaurants on occasion such as McDonald's, Pizza Hut, Subway, KFC, Coldstone Creamery and Burger King.

Once more, the most pleasant part of my trip was the Chinese people as a whole. They were so welcoming and receiving of us. Yet again, the students were given short notice of our arrival; they fit us into their busy schedules and made us feel welcomed and wanted. They always made sure that we were okay and comfortable. When out to eat, they thought about us first and made

sure the eating arrangements were satisfactory for us. They were generous and helpful in every aspect of our daily routine, from ordering our food in the cafeteria to giving directions to downtown.

When working in the lab, there were several “gladiators” that came to our rescue. The two most helpful people were Lin and Yan. They were there daily overseeing our projects, making sure we completed and understood everything. They were a tremendous help in completing our projects.

The most welcoming person that I met was our program coordinator, Chen. He is Chinese and attends school in Wisconsin. He was there to help with the language barrier and assist with our travel arrangements. He was so nice and timid. He had a great smile and sense of humor. Chen was a joy to be around. Chen gave us more in depth information about their culture, especially in the aspect of dating. I was amazed at the traits that one must possess to be considered beautiful. After speaking with Chen, I realized how superficial the Chinese people are as a whole and how money determines whether a guy will date a certain type of female. I was really saddened by their low self-esteem.

This summer, we took three day trips to other cities. In Jiangsu Province, Yangzhou, a sweet lady by the name of Jenny Lee was our tour guide. We visited the Poplar production base, The Dafeng National Wildlife Reserve and The Milu Deer Park. The most fascinating site was the Milu Deer Park. I was simply amazed at its history and how they were taken away from their native land and almost faced extinction. The Milu Deer have a striking appearance with a camel's neck, donkey's tail, cow-like Hooves and horns of stags. I found this to be the most interesting fact that I've heard on this entire trip.

On another day trip, we visited the city of Xi'an, which is considered to be at the center of China and our tour guide was named Alex. He was a very energetic and fun person to be around. While there, we visited the historical Terra Warrior Museum. It was amazing, like nothing I had ever seen. Also, we visited Northwest A&F University; one of their students was appealed by me. She was an English major and she was very interested in African American culture and customs. We discussed and compared each other's customs. I was really intrigued by her English and her views on life.

The last and most beautiful place was visited was Breath Taking Beijing. We climbed 888 meters of the Great Wall! It was really exciting. We also visited the Forbidden City, Summer Palace, and the Temple of Heaven. Beijing was truly breathtaking!

Overall, the trip had its pros and cons, as does any trip. However, this was an experience of a lifetime and I took so much away from the trip. In addition, I am very grateful to have had such an amazing opportunity and to be able to share this experience again.

The trip had many difficulties just as any trip. The major challenges were understanding the language and adjusting to the cuisines. The language barrier was overcome by using gestures; however, the most difficult challenge was the difference in the food. However, I overcame this challenge this year after finding some delicious cuisines. Yet again, I really appreciated being able to have some American food while in China. This trip allowed many of the students to experience international travel for the first time and for that, we are so grateful. However, next year I would like to see the program more organized. I would like to see everyone on one accord: Alabama A&M University and Nanjing Forestry University. I would like for AAMU and NFU have projects prepared for the students to research before arriving in China and have a tentative lab schedules in place.

Jack Lee
Trip and Cultural Report
REU China 2013

A Single Step

When I walked out of my front door I was reminded of a quote from the Chinese philosopher Confucius. "The journey of a thousand miles begins with a single step." I was taking that first step toward a journey that would take me halfway around the globe.

Once I arrived at the airport I prepared myself for the long flight that was to come. The part that stood out to me was the fact that due to the direction we traveling and at the great speed at which we did it, the sun never set on us. It was very refreshing to spend more than 24 hours in daylight.

Shanghai gave me my first taste of what the far East had to offer. I was taken aback by how homogenous all of the natives seemed to be, a huge difference from the "melting pot" of the U.S. It was in the "New York City" of China that I immersed myself in everything they had to offer. The style of shopping was so intense that every transaction felt like a battle they you had to win by getting the best price you could negotiate. The driving style seemed to match this aggressiveness where the bigger car and louder horn had the right of way. I was eager to move on to Nanjing, the city that I would call home for the next month.

Nanjing was a welcome contrast to that of Shanghai, it was a much slower pace that did not have metropolitanism as its main attraction. I soaked in as much of the language and history as I could from our classes at NFU. I rose with the sun each morning in search of a group of people to learn the ancient art of Tai Ji Jian. In that search I found the running track. It was interesting to see the style of clothes that the locals wear to work out in. it was not uncommon to see people jogging in jeans, flip-flops, and flannel shirts. My perseverance paid off when I found a group of

elderly people to practice my swordsmanship. There is a huge language gap, but there was no need for lots of words. We spoke with movements, form and skill take the place of language and sound.

I chose to spend my time at tombs and museums rather than restaurants and shopping districts. The Ming tomb had a road almost a kilometer long of amazing stone statues of animals, both the real and mystical. Each one had a symbol and a purpose in the history of this emperor. Giant monuments showed how very much appraised the civil servant was to the people of ancient China. Along with the great generals they made up the brains and brawn that set this dynasty above the rest.

History is not always pleasant and nothing proved that more than the Nanjing Massacre Museum. The bones of the fallen still litter the ground of a mass grave. Thousands upon thousands of innocent men, women, and children came to an untimely end because of the invading Japanese soldiers. What shocked me the most was not the staggering body count, but rather how quickly those who survived were able to forgive.

The time we spent in Yangzhou spoke to the outdoorsman and animal lover in me. I witnessed the grace and beauty of the red crown crane up close and personal as their trainers had them fly and land right next to the group. It was here that I saw an animal that seem like it came from a book of mythically, the Milu deer. It is said to have the body of a deer, the face of a horse, the feet of an ox, and the tail of a donkey. They are the most endangered deer on the planet and I had the opportunity to see them in the wild.

The train to Xi'an was one of the highlights of my journey. I never had a big "personal bubble" so I enjoyed being so close to strangers. It gave me a chance to meet some new people. I got to sleep next to a mother and her child. The mother spent most of the night singing to her new 18 months old. Her voice was very relaxing. While many in our group tossed and turned throughout the night. I slept like a rock.

In a world where we safeguard ourselves behind locked doors to sleep, it's great to be so vulnerable and exposed to the community. I feel that is lack of openness is severely lacking in American.

My favorite person that I met in china was a girl from Northwest Agricultural and Forestry University. I had an amazing time performing with Rita in front of her graduating class. I was honored that she asked me to sing a duet with her and gave up her solo spot. We sang a song from Glee. It is great to see how a silly pop show from the USA can bring people together.

We spent little time in Beijing but it reminded me very much of Shanghai. It seemed to be more about the tourist and places to see rather than the people who lived there. Seeing the Great Wall did make up for the hustle and bustle of capital.

As I took the single step on my way back home I knew that this would be a journey that I would not soon forget.

Abreeotta Williams
Trip and Cultural Report
REU China 2013

“A whole new world, a new fantastic point of view... A whole new world, a dazzling place I never knew.”

~Aladdin

Open your eyes!!! See what dazzles surround you. Understand that you are LOST! In the middle of China, a foreign land, only open to foreigners thirty years ago! My decision to explore left me horribly lost, but culturally rich. I was afforded the opportunity to explore the thoughts of others and see the past that caused these ideals. They are proudly perched upon the shoulders of their ancestor and embody their principles. I was afforded a glimpse into that history when I visited the Nanjing Massacre Museum, Terracotta Horses and Soldiers Museum, and the Ming Dynasty Palace, and a realistic view of today through my lab mates.

The Nanjing Massacre Museum taught me of a peaceable nation. As we traversed the hallowed grounds of the mass grave, the gravity of the situation was incomprehensible. The bodies of 10,000 people were buried there. No one was exempt; these corpses represented men, women, children, and the elderly. In 1937 and 1938 there was no 4th Geneva Conventions, so there were repercussions for mistreatment of civilians. Over 300,000 corpses have been unearthed as a result of the Japanese invasion of Nanjing. Along with these corpses items for everyday life such as beer bottles, coins, and toys were exhumed, lending to the assumptions of brutality. Yet, 75 years later peace reigns supreme. The Japan-China Association facilitates the planting of Plum Blossom trees in Nanjing by yearly to demonstrate Japanese repentance. Peace is displayed by the Shikinsou (February Orchid) Garden.

The sheer opulence of this nation was displayed in the Ming Tomb. Nestled at the foot of Zhongshan Mountain is the final resting place of the emperor Zhuoaming. A winding tale of meditation, makeup, pavilions, servicemen, and mythical beast unfolds right before your eyes. This tale illuminates the beginning of makeup in China. Princess Shouyang first used the pollen of a winter sweet blossom. Massive granite statues of servicemen in their regalia and mythical

beast such as the elephant, lion, and Xiezhi lined an 865 meter road leading to the palace gate. A Tia Chi session performed on the meditation pavilion stole my attention. The fluidity and gracefulness of the art is most captivating.

A belief in the presence of an afterlife is exhibited at the Terracotta Warriors and Horses Museum. The first emperor ordered this army constructed to protect him in the afterlife. Each warrior and horse was different. No two had the same facial expression. Great attention to detail was portrayed as even the bottoms of the shoes were carved. It was amazing to gaze upon the mountains from which the clay was unearthed and know that to them life was so much greater than earth.

Life and culture outside of our own does exist. It would behoove us all to not only understand that fact, but also embrace it. Although we are taught that life in China is so different, the truth is they too are humans. They have dreams, aspirations, expectations, stereotypes, and customs. They are revolutionaries, stuck in the pits of the past, and clawing their way out. This generation is changing China for the better. They are abolishing the oppressions of yesterday and creating prosperity. The only true difference between the two societies is they know their history and we are still attempting to segregate ours.

“You think the only people who are people are the people who look and think like you. But if you walk the footsteps of a stranger, you'll learn things you never knew, you never knew.”

~Pocahontas

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