



HUMAN ENVIRONMENT REGIONAL OBSERVATORY

Summer Research Experience for Undergraduates [REU] at Clark University



About the HERO Program [Human Environment Regional Observatory]

The Human-Environment Regional Observatory (HERO) program is a unique undergraduate-graduate-faculty experience that engages in research on human-environment relationships in Massachusetts. HERO Fellows conduct hands-on research under the mentorship of Clark University faculty. The research conducted by HERO Fellows often leads to scholarly publications, presentations at academic conferences across the USA, and awards and honors. This eight-week curriculum is sponsored by Clark University O'Connor Fund.

Summer 2017 Program Dates
May 22nd - July 14th

Note from the HERO Directors

Welcome to the 18th year of the Human Environment Regional Observatory (HERO) program at Clark University!

The HERO program has been chiefly supported over the 18 years by an endowment from the late John O'Connor ('78). This year marks our first installment of the HERO Newsletter to communicate our achievements and research goals to our sponsors, collaborators, and alumni. The theme of HERO 2017-2018 is Greening the Gateway Cities where will extend our previous analysis of juvenile tree health and stewardship from Worcester to three Massachusetts Gateway Cities: Chelsea, Revere and Holyoke. We expect this particular research focus to be a multi-year effort. This tree inventory and stakeholder assessment complements the previous several years of re-

search conducted in Worcester in collaboration with the Department of Conservation and Recreation, and the Worcester Tree Initiative. We are joined this year by six Clark undergraduate students and two students from the University of Massachusetts, Amherst. We look forward to a challenging yet rewarding year of research in these new locations, while maintaining our monitoring work in Worcester. We thank our local collaborators who have worked with us to make this a ground breaking and successful year, namely the USDA, the Department of Conservation and Recreation, and the Worcester Tree Initiative.

Sincerely,
Deborah Martin
& John Rogan

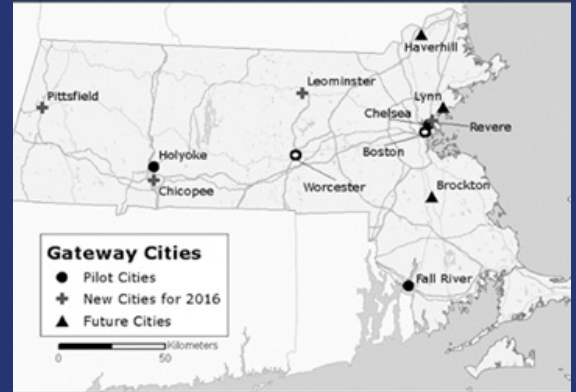
Clark Graduate School
of Geography

HERO 2017-18

"Greening the Gateway Cities". This year, our newest HERO members will spend the summer researching three gateway cities outside of Worcester: Chelsea, Revere, and Holyoke.

Our 2017-18 cohort includes:

- Eli Baldwin
- Meyru Bhanti
- Hannah Corney
- Joe Mogel
- Miles Weule Chandler
- Gemma Wilkens



Eli Baldwin, GEOG '19

Major: Geography
Minor: Economics

I applied to the HERO program because I want to gain experience doing geographical research and learn valuable skills. I am most excited about doing work that I find meaningful.



Meyru Bhanti, ES '18

Major: Geography & Environmental Science
(Conservation Biology track)

I wanted to be a part of the HERO program because I am interested in learning more about urban ecology! I am most looking forward to having the opportunity to do field work this summer.



Hannah Corney, GES '18

Major: Global Environmental Studies
Concentration: Spanish

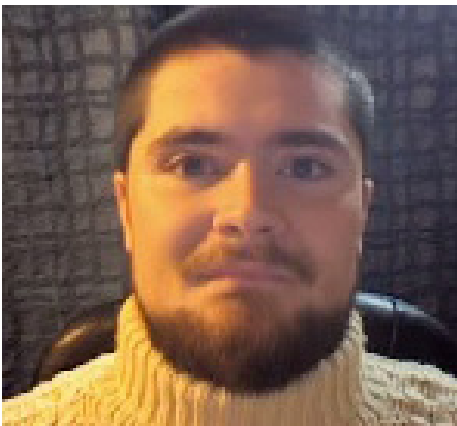
I'm most looking forward to being involved in an undergraduate research program for the first time, and am excited to learn and delve into a new topic! Working in HERO will be a great opportunity to gain experience in the field and in post-research work too. I'm also excited to spend my first summer in Worcester and collaborate with a new group of students, and hopefully open some doors to other interests & research opportunities.

Why be a HERO?

HERO Fellows analyze the causes and consequences of global environmental changes at local scales in faculty led research projects. Each Fellow is paired with a Clark faculty mentor and other researchers on the HERO team. Fellows will learn how to use various research methods such as GIS, remote sensing, geostatistical modeling, interviews and focus groups.

The HERO Program offers:

- Unique hands on research experience working with graduate students and faculty
- Opportunities for publications, presentations, honors, and awards
- Stipend for 8 weeks of research, plus academic credit
- Funding for attendance to present research at Association of American Geographers (AAG) annual scholarly meetings



Joe Mogel, MATH & HIST '18

Major: Mathematics & History

Minor: Geography

The reason I want to work on the HERO program is, first and foremost, my curiosity. Opportunities to do extensive research into a complex topic, such as environmental change in my home state of MA. There is also my belief that interdisciplinary study is the most productive form of study. What I'm most looking forward to is the end conclusion of our research! Our work's value, and what good it can do for state policy, will depend on our results!



Miles Weule Chandler, GEOG '18

Major: Geography

Minor: German Studies & Asian Studies

HERO offers a unique program with hands-on data collection, direct local community interaction and GIS analysis, which are skills that I hope to use in my career. I look forward to working in the field and collecting data this summer.



Gemma Wilkens, ECON '18

Major: Economics

I want to work in HERO because it combines many of my interests and it will expose me to the tools used to explore those interests.

AAG ANNUAL MEETINGS

HERO students have the opportunity to present their research at the American Association of Geographers (AAG) annual meetings



Above: Savannah Sanford presenting research at AAG 2017 in Boston, MA



Above (L-R): Eli Goldman, Ali Filipovic, Yuka Fuchino, and Chung Truong at the AAG 2016 Physical Geography Poster Session in San Francisco, CA

LOCAL PARTNERS

HERO collaborates with the Worcester Tree Initiative, USDA, and local government agencies



Above: 2015-16 HERO fellows at a Worcester Tree Initiative site (L-R): Eli Goldman, Isabel Miranda, Yuka Fuchino, Hannah Rosenblum, Ali Filipovic, Chung Truong, & Arthur Elmes



HERO 2016-17

The HERO 2016-17 Cohort includes Tyler Anderson, Emma Freud, Savannah Sanford, Eli Simonson, and Rishi Singh

In Summer 2016, HERO focused on a continued analysis of tree survivorship, looking at trees planted by the Worcester Tree Initiative (WTI) and the Department of Conservation and Recreation (DCR), including street trees; tree inventory and mapping mixed with surveys and interviews; and dynamics of the tree planting programs and stewardship. These particular focus areas have incorporated research skills such as tree surveying and GIS/RS analysis, social research (e.g. interviews or focus groups), and qualitative data analysis. This HERO cohort continued their research throughout

the 2015-16 academic year and presented at the AAG Annual Meeting in Boston, MA.

Research Areas:

- Tyler Anderson: Characterizing Juvenile Tree Mortality on Residential Property in ALB Quarantine Zone, MA
- Emma Freud: Sociospatial inequity of urban tree cover: policy implications for community forestry in Worcester, Massachusetts
- Savannah Sanford: Worcester's Juvenile Tree Vulnerability to Environmental Phenomena with Climate Change
- Eli Simonson: Prioritizing tree planting locations in Worcester, Massachusetts
- Rishi Singh: Modeling ecosystem services of juvenile trees in Massachusetts using i-Tree Eco



Stakeholder Summit

Annual HERO Research Presentation

[Excerpt from Worcester Telegram & Gazette]

By Cyrus Moulton

Five students in the Clark Human Environment Regional Observatory program spent the last eight weeks checking on samples of trees planted by the Massachusetts Department of Conservation and Recreation and by the Worcester Tree Initiative in the wake of the infestation. They presented their findings Thursday morning at Clark.

In a random sampling from the 9,000 trees whose planting was overseen by the DCR, the students traveled throughout the city to record the height, condition, spread, and any notable damage to 318 trees planted in residents yards.

Full Article at telegram.com/news/20160714/clark-students-track-survival-rate-of-trees-planted-after-beetle-scourge-in-worcester

To view past and upcoming Stakeholder Summit presentations, visit us online at clarku.edu/departments/HERO



HERO 2015-16

The HERO 2015-16 Cohort includes Ali Filipovic, Yuka Fuchino, Eli Goldman, Isabel Miranda, Hannah Rosenblum, and Chung Truong.

Students in the 2015 HERO summer program presented their findings on July 30, 2015. Coverage of the tree replanting efforts in Worcester post-ALB infestation were the topics of this year's summer study. Students assessed the health of the tree replanting initiative conducted by Mass DCR and WTI (Worcester Tree Initiative) to replace trees the USDA APHIS (Animal Plant Health Inspection Service) had to removed to eradicate the beetle. As part of their study these students went into the field conducting interviews with neighbors and other Stakeholders as well as surveying the health of the newly planted trees and how to continue to care for them. In the fall, HERO Students will present their research to the office of the USDA APHIS in Massachusetts; at Fall Fest, an on campus university wide research presentation program; and in the spring traveled to San Francisco for

the American Association of Geographers Annual meeting.

Research Areas:

- Ali Filipovic: Modeling Hydrological Ecosystem Services of Juvenile Trees in Worcester, Massachusetts
- Yuka Fuchino: Characterizing the Social-Environmental Risks to the Urban Forest in Worcester, MA
- Eli Goldman: Characterizing the Role of the Built Environment in Determining Juvenile-Tree Survivorship in Worcester, Massachusetts
- Isabel Miranda: Characterizing tree cover change in response to urban greening initiatives using an in situ tree inventory, WorldView-2 and LiDAR data in Worcester, Massachusetts
- Hannah Rosenblum: Determining Detectability of Juvenile Trees with Airborne LiDAR
- Chung Truong: Identifying Optimal Planting Locations in Worcester, MA using Multi-Criteria Decision Analysis

GRADUATE RESEARCHERS

Meet our HERO Graduate Research Assistants

This year we have three Geography doctoral students/candidates who will work closely with our undergraduate HERO fellows



Arthur Elmes, Ph.D., M.A. Geography, West Virginia University, USA. B.A. Geography, West Virginia University, USA. Research Interests: Remote sensing, landscape ecology, invasive species, GIS.



Marc Healy B.A. Geography, University of Utah, USA. Research Interests: Remote Sensing, Land Use/Cover Change, LiDAR, GIS



Zhiwen Zhu: B.Eng. Remote Sensing Information Engineering, Wuhan University. M.Sc. Cartography & GIS, Graduate University of Chinese Academy of Sciences. Research Interests: remote sensing of vegetation, applications of remote sensing and GIS in ecology.

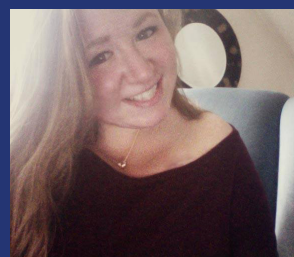
HERO Faculty & Staff



John Rogan, Ph.D.
Professor of Geography
HERO Director/Co PI



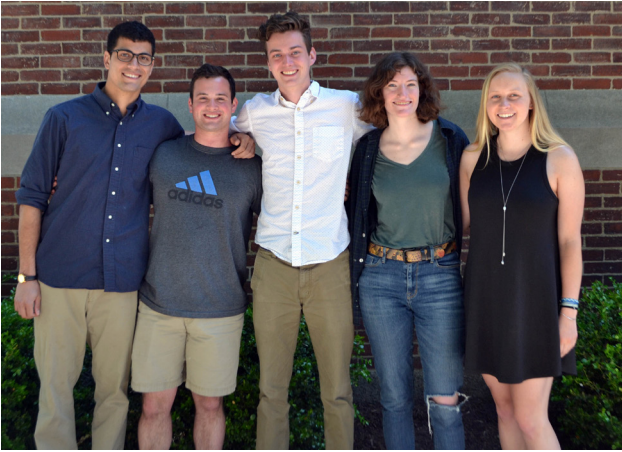
Deborah Martin, Ph.D.
Director, Graduate School of
Geography
Assoc. Director of HERO/Co PI



Rachel Levitt
Undergraduate Program
Coordinator of Geography
HERO Program Assistant



Pamela Dunkle
Operations and Budget anager
George Perkins Marsh Institute
HERO Budget Manager



Words from Recent HERO Undergrads

We have had many wonderful HERO cohorts in the past -- here is what our current undergraduate HERO alumni have to say about the program!

Tyler Anderson, ESS '18

Major: Environmental Science: Earth System Science

The part of HERO I enjoyed the most was the great team that we had, and the really amazing opportunities to do research in an area I love as an undergrad. I learned so much about Worcester's ecological history. Also, through surveying I was able to discover parts of the city that I never knew existed.

This summer I am taking part in another Clark Fellowship, the NOAA Fellowship through the Mosaowski Institute. I will be working in Silver Springs, MD at the NOAA Headquarters on a project called "Rapid bathymetry for safer navigation: Developing an automated process to get water depth from satellite.

Emma Freud, GEOG '17

Major: Geography

After essentially 12 months of hard labor, both physical and intellectual, I can retrospectively acknowledge all that I've learned through the HERO program. Not only did HERO teach me how to conduct field work, interviews, and eventually my own research project, but it also enabled me to hone in on my real passions for researching the interactions between humans and the environment while advocating for environmental justice. If you enjoy collaborative work, and truly thinking about the complex interactions of human-ecological systems, you have found the right program.

This summer, I plan to farm at a local, organic vegetable farm in my hometown in Illinois. I will continue to learn about and personally engage in environmental stewardship as I gear up to pursue a Master's Degree in Urban and Environmental Planning in the coming years.

Savannah Sanford, ESS '17

Major: Environmental Science: Earth System Science

Minor: Geography

Graduate Plans: Clark M.S. Environmental Science & Policy 5th year program

What I enjoyed the most about HERO was the amount of independence I gained through this year of research. The program is structured perfectly so that we get instruction and guidance, but we are still encouraged to be creative in our thinking and required to take initiative in order to find the best results from our research. I think the HERO program is great preparation for graduate school and a career in Geography, because there will always be people to work with and ask questions, but as a researcher you need to be ambitious and take action yourself. We were pushed and supported by our advisers, allowing us to accomplish amazing goals (presenting to the USDA, presenting at the AAG annual meeting, and writing an honor thesis) which honestly seemed scary when we first started! I am so happy to have worked with the four other HERO fellows, as well as Professor Rogan and Professor Martin, and am fortunate to have had this opportunity.

This summer I will be working on my master's research project. Myself and three other ES&P students will be working with Professor Downs, analyzing the Environmental Impact Reports for the Keystone XL, and Dakota Access Pipelines. We will assess what was and was not considered when analyzing the potential environmental, cultural, and social impacts of the pipelines. Our end result will be a document critiquing the overall impact of the project, and our recommendations for alternate routes or construction methods. Our ideal audience would be the U.S. Army Corps of Engineers, oil and gas industry members, advocacy groups, and indigenous people affected by these pipelines.

Eli Simonson, ECB '17

Major: Environmental Science: Conservation Bio

Graduate Plans: Clark M.S. GIS 5th year program

HERO provided me with the opportunity to get involved with high level ongoing research that speaks

to local environmental issues that I care about. There is incredible support and strong guidance to help HERO students produce meaningful work. I have learned so much about urban forestry and about the Worcester community, and I have loved every step of the way.

This summer, I will be a full time intern for the NASA Develop Program at the NASA Langley Research Center in Hampton, Virginia.

Rishi Singh, GEOG '17

Major: Geography

Minor: Asian Studies

Graduate Plans: Clark M.S. GIS 5th year program

My favorite HERO experience was tree surveying throughout Worcester and surround towns during the Summer. It was fun to be out in the field measuring trees and engaging with residents about issues of urban tree coverage and proper tree stewardship. It was also rewarding to have self-collected data that could be used for meaningful analysis with local applications.

HERO introduced me to many aspects of research and research procedure. I think the most meaningful skill I developed during HERO was effective research communication. I also learned a lot about Worcester's urban tree canopy history, tree identification/evaluation, and local planting organizations.

This summer I will be working as a research assistant at Clark Labs (Worcester, MA) mapping coastal habitats and mariculture in Myanmar using remote sensing.



Above: 2015-16 HERO fellows Ali Filipovic (L) and Isabel Miranda (R)

Ali Filipovic, GEOG '17

Major: Geography

Graduate Plans: M.S. GIS 5th year program (Clark University)

The title of my Honors research is "Modeling Hydrological Ecosystem Services of Juvenile Trees in a Watershed of Northern Worcester, MA". The goal of my work was to analyze the relationship between canopy cover loss and stormwater runoff in the Burncoat and Greendale neighborhoods. Particularly, I am interested in the tree planting program initiated by the Massachusetts Department of Conservation and Recreation and the Worcester Tree Initiative. I hope to communicate important information about the hydrological benefits provided by these newly planted trees, and to support the planting program as a whole.

This summer, I will be working at DigitalGlobe as the Production Coordinator Intern. I am very excited to be able to spend the summer in Colorado working for a company that collects and distributes much of the satellite imagery that I use.

Isabel Miranda, GEOG & ART '17

Major: Geography & Studio Art

Graduate Plans: M.S. GIS 5th year program (Clark University)

My HERO cohort consisted of six undergraduate students, and the program provided us all with a great opportunity to learn from each other and collaborate with our various levels of expertise. I enjoyed learning and becoming more involved with the city of Worcester, meeting residents, and becoming more familiar with the local initiatives aimed at addressing impacts of the ALB infestation.

Overall, the HERO program made me realize the significant impact that this particular research has on the Worcester community. During HERO, we met with the Department of Conservation and Recreation (DCR) and discussed what they wanted to get out of the research we were conducting before we started, and we brainstormed how they could use the results for their work. This made the research even more purposeful, as we were able to contribute information valuable for assessing the experience and health of trees planted by the tree planting programs. This summer, I will be in Athens, Georgia doing an Internship with NASA DEVELOP.

To learn more about the HERO program, visit us online at clarku.edu/departments/HERO, or email Rachel Levitt [HERO Program Assistant] at RLevitt@clarku.edu.



HERO @ CLARK UNIVERSITY

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