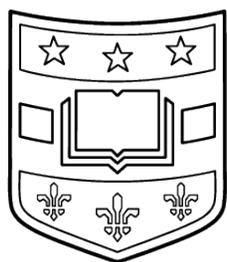


TYSON



RESEARCH CENTER



RESEARCH. EDUCATION. COMMUNITY.
2019-2020 Annual Report

Tyson Research Center is the environmental field station for Washington University in St. Louis. Located just 20 miles from the Danforth Campus on 2,000 acres at the edge of the Ozark Highlands, Tyson provides opportunities for environmental research and education for students and faculty from Washington University and beyond. We facilitate multi-scale research and teaching opportunities and collaboration across disciplines, institutions, and levels of academic training.

On the cover

Summer 2020 undergraduate research fellows. The Tyson community persisted despite the pandemic by using a suite of tech platforms. See the full story on page 20.



Highlights



Tyson researchers publish review on fire ecology

Tyson researchers, past and present, collaborated on a large review recently published in the *Journal of Ecology* that outlines critical priorities for the future of fire ecology research. Co-authors include: Jonathan Myers (WashU Biology faculty), Solny Adalsteinsson (Tyson staff scientist), Rae Crandall (former WashU postdoc, current faculty at University of Florida), and Kevin Smith (former Tyson director, current faculty at Davidson College).

Entomological Society of America descends on STL

Tyson scientists organized and presented in, special symposia on vector biology. The annual meeting brought leading vector biologists from the around the country to downtown St. Louis, fostering new collaborations with Tyson staff.



Tyson scientists in the news

St. Louis on the Air featured the St. Louis Wildlife Project run by Staff Scientists Beth Biro, Solny Adalsteinsson, and University of Health Science and Pharmacy in St. Louis Assistant Professor Whitney Anthonymsamy. Staff Scientist Katie Westby was also interviewed by St. Louis Public Radio and was featured in an essay in *The Common Reader*.

Tyson student group learns about prescribed fire

The Tyson Conservation Corps, together with Tyson staff scientists and local conservation partners, learned about the importance of prescribed fire to help maintain native habitats by removing shrubs and trees to promote new growth of native vegetation. Students were given the opportunity to see how burns are managed and get hands on experience with a small demonstration burn at Tyson.





Undergraduate humanities fellows tell Tyson stories from afar

While working from their homes, Suzanne Loui (Lecturer, Environmental Studies) and her science communication team produced 48 profiles for Humans of Tyson-Remote, exploring the effects of the pandemic and systemic racism on our research community. They also published three articles in *The Ampersand* and a video showcasing a dissertation project based in the Tyson research garden was picked up by *The Record*.



Tyson alum continues disease ecology research as UIUC PhD student

Tyson undergraduate research program alum Derek McFarland graduated from Harris-Stowe State University in May 2020 and then began a PhD program at University of Illinois Urbana-Champaign in the laboratory of Associate Professor Brian Allan, a former Tyson graduate student and WashU postdoc. Derek plans to continue conducting research on tick-borne disease ecology, some of which will take place at Tyson.



Box turtles live longer at Tyson than Forest Park

Researchers from the St. Louis Zoo's Institute for Conservation Medicine (ICM) published their work on three-toed box turtle mortality in *Frontiers in Veterinary Science*. Led by Zoo Research Technician Jamie Palmer, the paper reports lower mortality for three-toed box turtles that live at Tyson compared to those who live in habitats within Forest Park, a large urban park in metropolitan St. Louis. Co-authors include Maris Brenn-White (ICM research fellow), Steve Blake (assistant professor, SLU), and Sharon Deem (director, ICM).



New research on artificial night light gains momentum

Research investigating the ecological effects of artificial light at night (ALAN) has gained momentum at Tyson and across St. Louis. Brett Seymoure, Living Earth Collaborative postdoc and ALAN expert, began new research during summer 2020 at Tyson investigating temporal variability in both light at night and arthropod activity (see field device for this work to the left). Katie Westby (Tyson staff scientist) and Kim Medley (Tyson director) published on ALAN and mosquito diapause in the *Journal of Medical Entomology*. Their work showed that mosquitoes in urban areas laid fewer eggs in diapause than their rural (Tyson) counterparts.





Letter from the director

This reporting year* presented challenges that stimulated us to become more nimble, think more creatively, and act more compassionately. Faced with a global pandemic and ongoing racial injustice, research and education at Tyson took a brief, but important, pause. In early March, we shut down the field station entirely while public health protocols were put in place. Our maintenance team returned on site first, where they shifted their focus from typical maintenance activities to deep cleaning, and took advantage of the reduction in traffic to take on some big projects (e.g. refinishing floors, much-needed road maintenance). Faculty and staff converted spaces at home into their remote offices and learned how to communicate via Zoom and Slack. We didn't know how long this was going to last.

At the same time, acts of violence and police brutality were perpetuating 400+ years of oppression for people of color. As a field-station community who aspires to a culture of inclusion, equity, and respect we could not operate—remotely or on site—independently of this ugly reality. As we transitioned into virtual programming (see pg. XX), we took time to discuss and process current events, and to support one another as well as our colleagues and students affected by these events. And we looked inwardly. We are committed to doing better, and as a matter of accountability, we have articulated our goals for action (<https://tyson.wustl.edu/deai>).

In spite of these and other challenges, research continued. Researchers limited by travel restrictions and access to field sites got creative, and even shifted their research entirely to continue to pursue interesting and relevant questions during the pandemic (see pg. 14). Our team of staff scientists continued to capture data through the St. Louis Wildlife Project; these data are being used to understand the impacts of the pandemic, via reduction in human activity, on urban wildlife. As the global community learned more about the virus, on-site research methodically came back to life. The Myers lab resumed data collection within the Smithsonian ForestGEO plot, graduate students in the Pencsykowski lab resumed field experiments, and environmental chambers began to hum again in the lab. As we move forward, still facing uncertain times, we are heartened by our ability to tackle challenges and move forward with our mission of fostering community, providing educational experiences for students, and supporting world-class research.

* Aug. 2019-Aug. 2020



Kim Medley, PhD
Director

Tyson Research Center



Photo by Susan Flowers

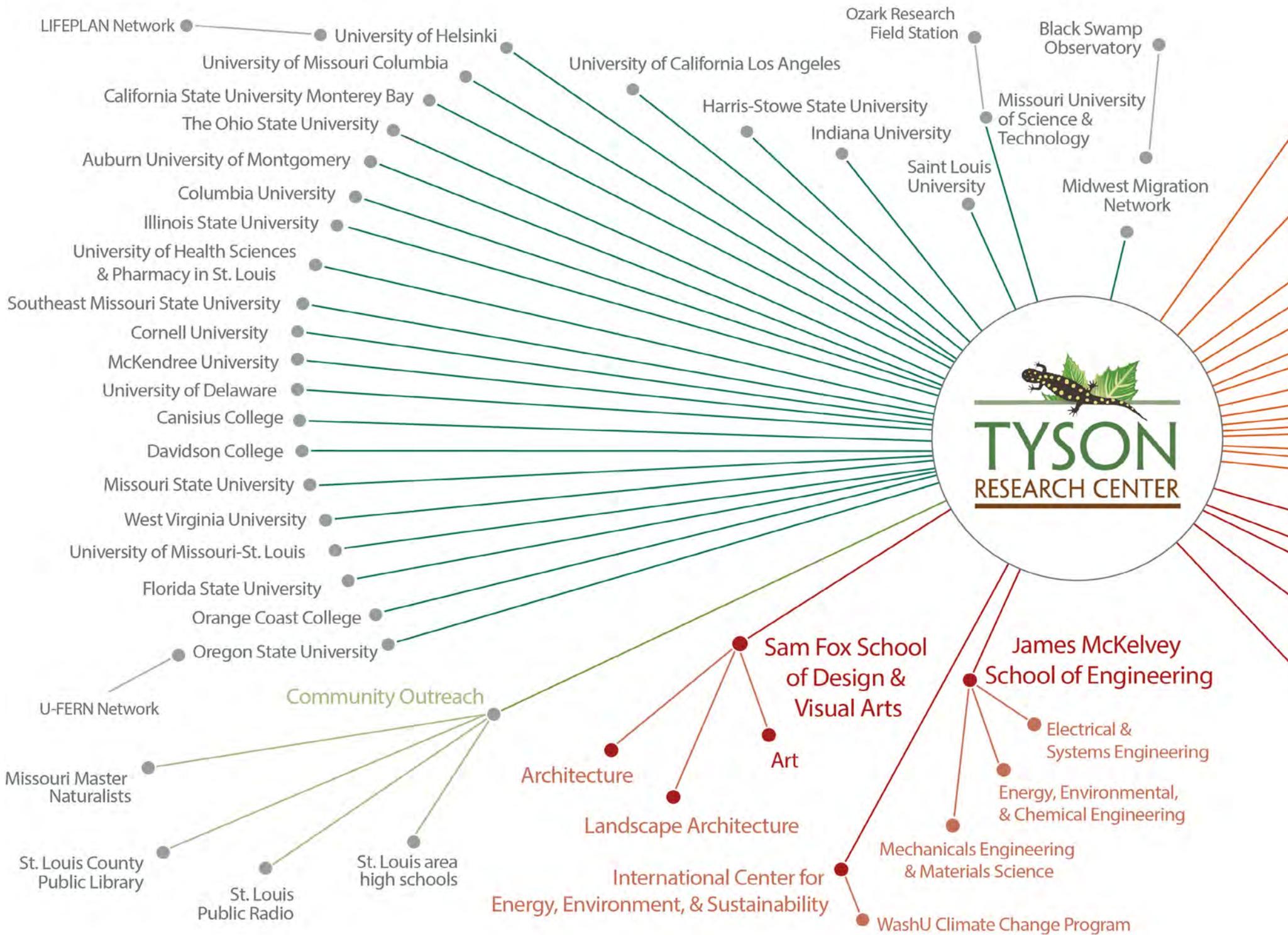
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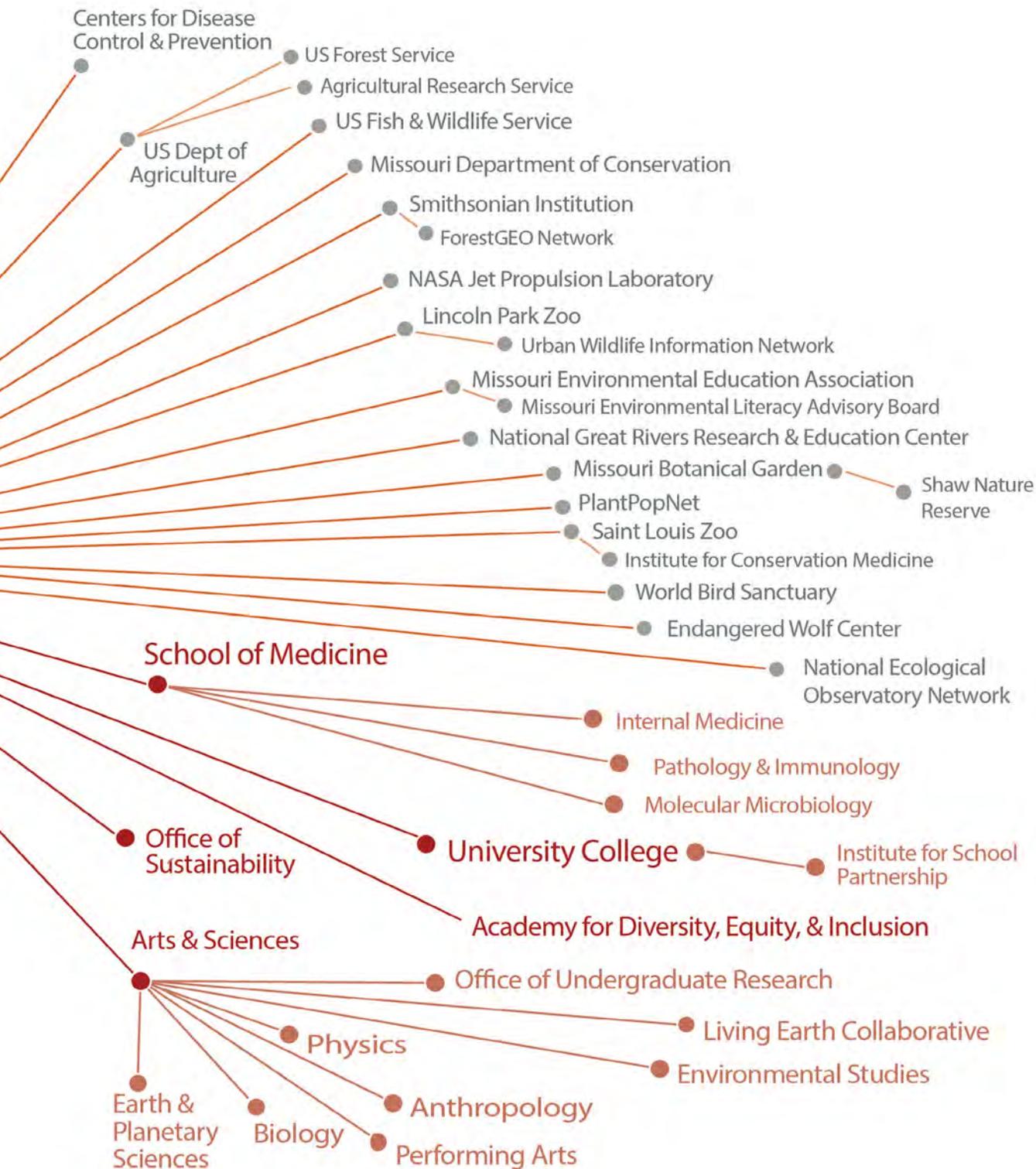
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Photo by Jamie Palmer



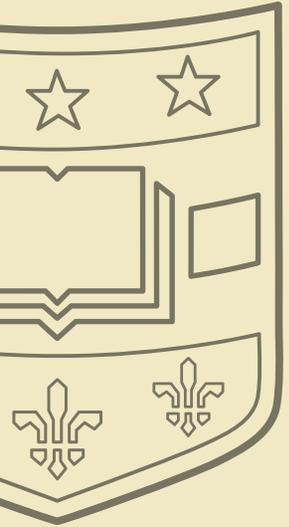


Tyson Research Center serves as a hub of environmental research and education for numerous partners across the St. Louis region and the U.S. During 2019-2020, Tyson facilitated work across 5 Washington University schools, 21 Washington University departments or centers, 22 external universities, and 17 public agencies or private institutions/networks. We communicated our work to the St. Louis community through 2 public outlets. Prior to the pandemic, we mentored youth from 27 high schools in the St. Louis metropolitan area,



RESEARCH

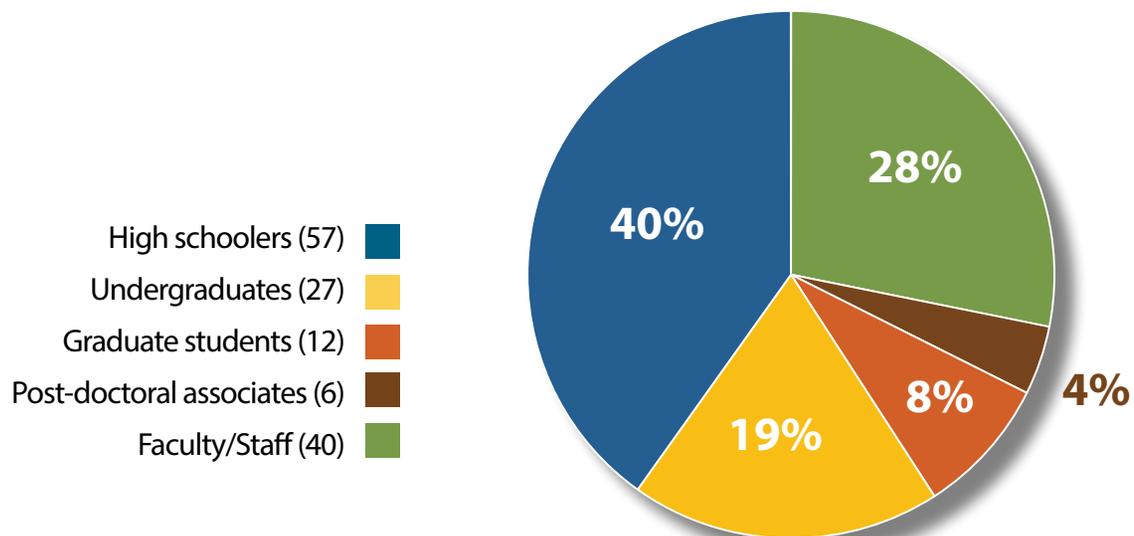
*Advancing
discovery in a
changing world*





Tyson studies led to
32
peer-reviewed
publications and
2,905
citations in academic journals.

TYSON RESEARCHERS (REMOTE AND ON SITE)





Researchers pivot during pandemic

In March 2020, activity at Tyson came to a halt in response to the pandemic. As a result, researchers got creative in order to pursue interesting new research and to ensure long-term research projects persisted without major data gaps. Many research programs were affected by this shift; below are just a few examples of creativity and flexibility, but most importantly perseverance, in continuing research safely during the pandemic.

St. Louis Wildlife Project and the Urban Wildlife Information Network (UWIN): Data collection via camera traps for this project continued unaffected during the pandemic, primarily because of the remote nature of the data capture. Trap deployment is done by one person and data are captured automatically as wildlife pass in front of cameras. The data themselves are evaluated remotely by trained volunteers and members of the Tyson Conservation Corps. Continuity of this project during the pandemic allowed for some very rare

and valuable questions to be asked. In collaboration with members of UWIN in cities across the US, principal investigators Beth Biro (Tyson), Whitney Anthonysamy (University of Health Sciences and Pharmacy in St. Louis), and Solny Adalsteinsson (Tyson) are currently using the data to study the effects of reduced human activity on wildlife behavior during the pandemic.

“ There were so many anecdotal stories on social media of animals taking over places without humans, but the St. Louis Wildlife Project and the Urban Wildlife Information Network has the ability to actually study how wildlife responded to the variability of human activity.” -Beth Biro, Tyson staff scientist



Smithsonian ForestGEO and Myers lab: The Myers lab maintained an ambitious research agenda at Tyson despite a delayed field season and a 75% reduction in the size of their field crew. They took much-needed time to curate data early on in the pandemic. As work on-site was allowed again, the team shifted their annual seedling census from fall to summer because it could be achieved efficiently and would allow them to easily stop the work without loss of data integrity in the event of another shutdown. In the ForestGEO plot, unfortunately, two months of data collection were lost, although the loss was consistent across the entire global network.

“Many of our projects are part of long-term research and so missing a year of data collection would leave gaps in these datasets. With this in mind, we strategically prioritized our field data collection”

-Erin O’Connell, Lead technician for the Myers lab

Living Earth Collaborative (LEC) postdocs at Tyson: Tyson is both a place for LEC postdocs to conduct research and a community within which LEC postdocs collaborate, lead, and mentor. The LEC postdocs were affected by the pandemic in a variety of ways, but generally pivoted into new and fruitful research directions.



Dr. Sacha Heath had planned to visit homes throughout the St. Louis metro area to conduct in-person bird surveys and sentinel prey experiments. Instead, she completely reworked her methodology and deployed AudioMoths, a pre-programmed bioacoustics recording device into the back yards of research participants. Dr. Heath executed no-contact deliveries of the equipment and prepared an instructional video to aid homeowners in deploying the devices. As a result, this work has opened up bioacoustics and soundscape ecology as new avenues of research for Dr. Heath's research program over the long term.

Dr. Mike Moore had planned to travel across the US to collect a single dragonfly species, the blue dasher (*Pachydiplax longipennis*), to understand how dragonflies adapt to warmer climates. In particular, he was interested in how the colorful patches on the species' wings have evolved as the species recolonized North America following the last Global Ice Age using genomic analyses on dragonflies collected from multiple sites. In response to travel restrictions, Dr. Moore ramped up a project he had already begun using data available through iNaturalist to characterize patterns

of adaptation in 10 dragonfly species. This was a continuation of a project he began in collaboration with several WashU undergraduate students, but it became his primary focus during the pandemic. This shift allowed the team to test some relevant hypotheses that might not have been considered in the original plan. The paper on this work was recently accepted to PNAS and will be in press soon. Dr. Moore also started an entirely new project examining the evolution of wax that dragonflies use like a sunscreen to protect against extreme climates, again using iNaturalist data.

"...this summer definitely opened even my eyes to the power that iNaturalist holds for studying geographic patterns of evolution. I imagine that iNaturalist data will become a major way that I conduct research moving forward: from identifying natural history patterns, directly testing specific hypotheses, and even monitoring organism's responses to climate change in real time."

-Mike Moore, LEC postdoc



Peer-reviewed publications

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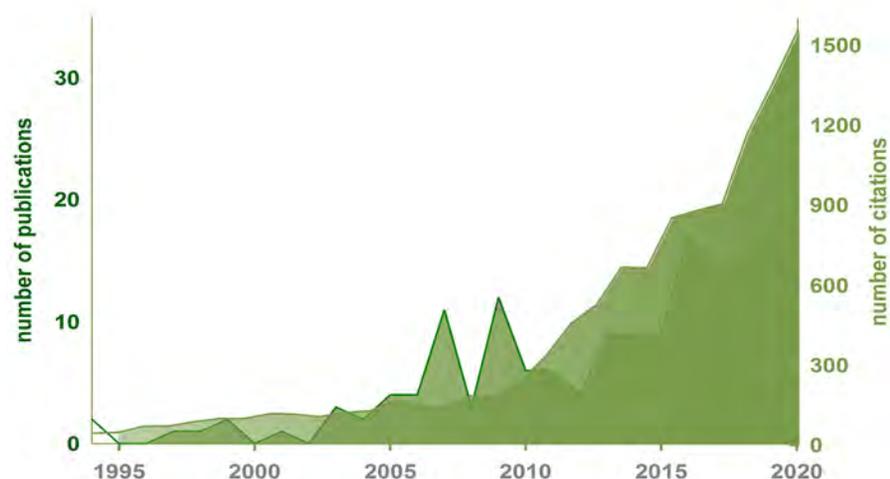
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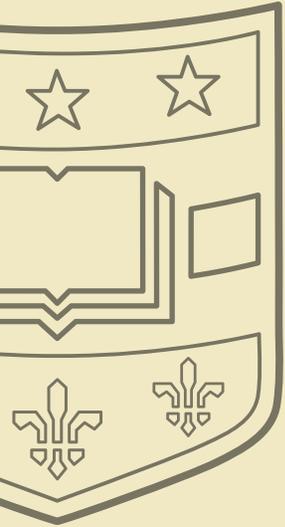


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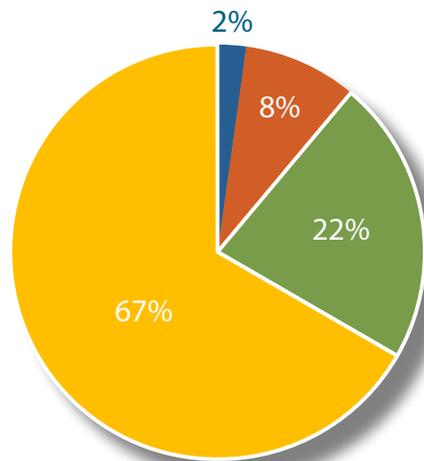
* >10 authors

EDUCATION

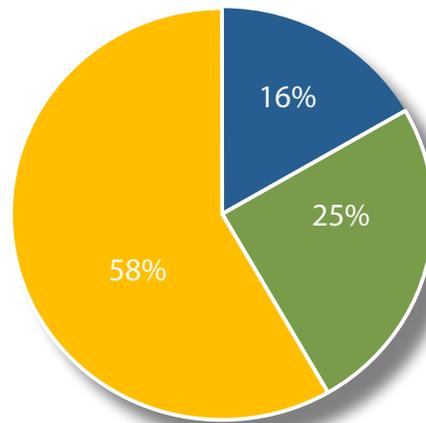
Learning through science in action



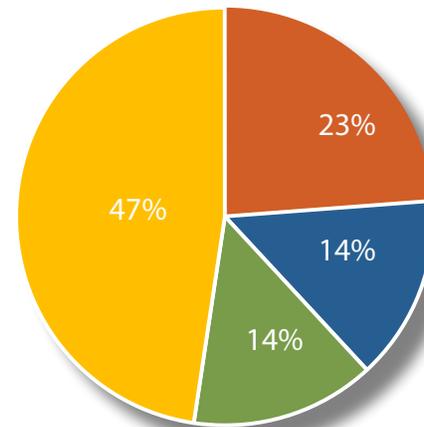
2019-2020 Education programs



**HIGH SCHOOL
SIFT**



**HIGH SCHOOL
TERA**



**UNDERGRADUATE
Fellows**

Racial/Ethnic/Cultural Self-Identification



56%

of high school program participants identified as female.

62%

of undergraduate program participants were female.

Participants represented

27

high schools in the St. Louis area and

9

colleges/universities.

Learn more about Tyson programs here <https://tyson.wustl.edu/education-overview>.



Building a virtual Tyson community: the summer of Slack and Zoom

Transitioning to remote operations during spring 2020 presented us with quite a challenge. How do we facilitate our summer program for undergraduates, support our mentoring researchers, and build community during a pandemic? And how do we stay true to our values during a time of social upheaval? We found our solutions in technology and transparency.

A suite of tech platforms helped us during the spring planning stage with our mentors and throughout the summer with our entire community. We moved our synchronous interactions to Zoom, our asynchronous communications and files to Slack workspaces, and considered equity of access at every point. Colloquium and Lunch & Learn recordings and slides were made easily available in case of unstable internet connectivity. We migrated the Tyson Summer Seminar Series to a livestream on our YouTube channel and our speakers generously agreed to our sharing of the recordings. We hosted a weekly mentor support Zoom, replaced our anonymous comment boxes with an anonymous Google form, and created a biodiversity challenge on iNaturalist to get us away from our computers and out into the natural world.

“All of my mentors were great. Our schedule was laid out well, tasks were well outlined, and they were always available to answer questions.”

All of our teams had to make significant adjustments to their summer agendas, but three researchers were new Tyson mentors while breaking ground on new projects. Natalie Mueller, PhD (assistant professor of Anthropology) and Brett Seymoure, PhD (Living Earth Collaborative postdoctoral fellow) each had to contend with remote mentoring their teams while working independently to establish field sites at Tyson. Jackson Potter, PhD (lecturer in Mechanical Engineering and Materials Science) had to figure out how his team could fabricate prototypes of field equipment without working side-by-side or directly with their client scientists. In the end, mentees were mentored and research was conducted, although in limited but creative ways.

Honest and open discussion about the challenges of the moment were critical to keeping our community together while sheltering in place separately. We knew that during this time it was doubly important that we attend to the needs of the individuals who make up our Tyson community. On the first day of the summer program we talked about attending to our mental and physical health, the difficulty of work/life balance while working at home, and the reality of Zoom fatigue.



SLACK WORKSPACES



WEEKLY COLLOQUIUM



LUNCH & LEARN SESSIONS



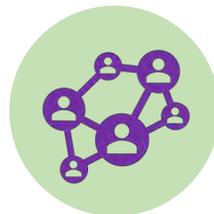
TYSON SUMMER SEMINAR SERIES



MENTOR SUPPORT



LOCAL OBSERVATIONS



BUILDING A VIRTUAL TYSON SUMMER COMMUNITY

We also addressed increased anxiety as our country grapples with continuing graphic evidence of systemic racism and consequent unstable social conditions.

The Tyson community “actually does the work of cultivating and celebrating diversity instead of just paying lip service to it.”

We found it critical to move forward with our DEAI (diversity, equity, accessibility, and inclusion) work transparently and in real time. Virtual spaces were created for our undergraduate fellows to share resources and perspectives on current events. Many mentors held discussions of systemic racism and the connection to environmental justice. We listened to our community and adapted to allow for participation in the #ShutDownAcademia/#ShutDownSTEM action, virtual vigils, and celebration of Juneteenth. The Humans of Tyson-Remote project tackled the coronavirus pandemic and systemic racism head on with interview questions designed to place each person’s profile within the current social climate. The resulting gallery is a true reflection of how our thoughtful, caring community came together to learn and grow during this extraordinary time.



COMMUNITY







The Tyson Team



Solny Adalsteinsson, PhD
Tick and wildlife ecologist and network coordinator



Tim Derton
Maintenance technician



Andrew Johnstone
Business manager



Beth Biro, MS
Staff scientist and natural resource coordinator



Susan Flowers, MA
Education and outreach coordinator



Katie Westby, PhD
Disease and vector ecologist



Ruth Ann Bizoff
Administrative coordinator



Pete Jamerson
Facilities manager



Dan Walton
Maintenance technician



Kim Medley, PhD
Director



Feng Sheng Hu, PhD
*Dean of the Faculty of Arts
& Sciences*
*Professor of Biology and
of Earth and Planetary
Sciences*
*Lucille P. Markey
Distinguished Professor in
Arts & Sciences*

On July 1, 2020, Tyson Research Center shifted its reporting structure from the Office of the Provost to Arts & Sciences, led by Dean Feng Sheng Hu.



Appendix A: Courses and other usage

WORKSHOPS/TOURS/RETREATS

Auxin Group Annual Meeting
Bear Beginnings Small Group Experience planning retreat
Endangered Wolf Center Annual Wolf Fest
Harris-Stowe State University visit and tour of Tyson
Living Earth Collaborative: Andean Forest Diversity and Dynamics
Living Earth Collaborative: Effects of Parasites on Nutrient Cycling
Midwest Migration Network bird banding workshop
Missouri S&T Ozark Research Field Station tour of Tyson
NatureWorks tour of Tyson
St. Louis Audobon Society meeting
Writing retreat for early/mid-career women (Amanda Koltz)
WashU Alumni tour of Tyson
WashU Emergency Management Staff retreat
WashU Police Department retreat
Soldan High School tour of Tyson
Tyson Conservation Corps bush honeysuckle removal event
Tyson Writing Retreat for Women in Ecology & Evolution
University of Missouri-St. Louis Conservation Biology class
University of Missouri-St. Louis Ornithology class

WASHU COURSES USING TYSON AS A FIELD LABORATORY

Art 1186: Black and White Photography
(Stan Strembicki)
Art 583C: Special Topics
(Stan Strembicki)
Arts & Sciences L61 Focus 2431: Missouri's Natural Heritage
(Dr. Stan Braude)
Biology 4193: Methods in Experimental Ecology
(Dr. Scott Mangan)
Electrical & Systems Engineering 498/499: Senior Design
(Dr. Jim Feher)
Earth & Planetary Sciences 413: Introduction to Soil Science
(Dr. Jeff Catalano)
Environmental Studies 215: Introduction to Environmental Humanities
(Dr. Suzanne Loui)
Environmental Studies 365: Applied Conservation Biology
(Doug Ladd)
Chemical Engineering 408: Environmental Engineering Laboratory
(Dr. Dan Giammar)
Landscape Architecture 553: Integrated Planting Design
(Carolyn Gaidis)
University College U65 English Literature 313: Topics in English and American Literature: Nature and the American Literary Imagination
(Dr. Matthew DeVoll)
University College U29 Biology 323: Advanced Wilderness Medicine
(Dr. Stanton Braude)

Appendix B: 2020 virtual seminar series



The 2020 summer seminar series was shortened to 8 weeks and pivoted to an all-virtual format due to the Covid-19 pandemic. Each seminar was recorded, and can be found using the QRcode below.

June 4: David Inouye (*University of Maryland*)

Effects of climate change on subalpine wildflowers in the Rocky Mounts, and consequences for their pollinators

June 11: Rachel Nuwer (*freelance journalist*)

Of tigers and trade: wildlife reporting in the time of COVID-19

June 18: Michael Moore (*Living Earth Collaborative, WashU*)

Climate drives the diversification of animal beauty

June 25: Anny Chung (*University of Georgia*)*

From phenomenon to mechanism: what is the role of plant-soil feedbacks in plant community dynamics?

July 2: Samniqueka Halsey (*University of Missouri*)

Understanding disease emergence patterns by combining long-term datasets and computational approaches

July 9: Megan Mueti (*The Ohio State University*)

The molecular regulation and ecological applications of season responses in mosquitoes

July 16: Andres Lopez-Sepulcre (*WashU Department of Biology*)

Unravelling the interactions between ecology and evolution in Trinidadian guppies: the role of mesocosm experiments

July 23: Martha Munoz (*Yale University*)

Behavior is a motor and a brake for evolution

*graduate student invited speaker



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