HIGHLANDS
BIOLOGICAL STATION

STATION UPDATE

HBS Board of Directors & HBF Board of Trustees

Jim Costa, Executive Director
17 June 2023

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1. Budget

• Thanks to continued strong revenue through HBS usage, we have once again exceeded our revenue target, and substantially. Accordingly, our Business Officer Katie Cooke has worked with colleagues in the Provost's Office at WCU to develop a base budget increase request. An increase of **$23,499** was approved by OSBM, raising our current revenue target of $120,874 to **$144,373** effective in the current FY. We also received approval to move an additional amount of up to $14,500 based on actuals without having to make another request to OSBM.

2. Staff

• We recently welcomed Ms. Laura Gamble to HBS as our new staff Horticultural Specialist! Laura succeeds Rachel Martin, who left HBS in September 2022 for a garden position in the DC area. Laura brings expertise from the worlds of both practical landscaping, where she has worked locally, and horticultural science, with two certificates from NC State University.

• We are still without a program assistant after our wonderful colleague David Ford left HBS to take a new position with Educational Outreach on the WCU main campus in February. We're still mad at them. ;-) After one failed search we recognized that we needed to address the classification and compensation associated with this position. But any increased funding for the position necessitated a base budget increase, which as mentioned was finally approved last week. We are now working with HR on a position study and reclassification, and hope to proceed with recruiting soon. In the meantime the vacancy of that position is being keenly felt by all other Station staff.

• We welcomed a large group of summer staff to the Station this year:

1. <u>Summer Research Assistants</u>
    - Heather Pratt – WCU rising senior in Geosciences and Natural Resources. Heather worked for us last summer too.
    - Juliet Spafford – Spring 2023 graduate of UNC-CH in Biology and 2022 Highlands IE student.

- Reagan Jarret – Spring 2023 graduate of UNC-CH in Environmental Studies and 2022 Highlands IE student.
- Grace Kinder – Senior at UNC-CH in Environmental Studies and 2021 Highlands IE student. Grace worked for us last summer too.

2. Botanical Garden Assistants
   - Aster Graham – Sophomore at WCU in Biology.
   - Zoe Morris – Spring 2023 graduate of Warren Wilson College in Math.

3. Nature Center and Camp Assistants
   - Grace Iverson – Spring 2023 graduate of the University of Tampa in Environmental Science with a Marine Biology Minor.
   - Beyla Munach – 2023 graduate of the University of Vermont, with a BS in Environmental Science, Concentration in Ecological Design.
   - Dennis Evans – 2022 graduate of Georgia College & State University, with a BS in Biology.
   - Ellie Whitaker – undergraduate student at the University of Florida, Environmental Science Major.

3. Facilities, Equipment, Infrastructure

This year we are fortunate to have received considerable financial support for facilities, infrastructure, and equipment from WCU and the UNC System Office, on top of our continued NSF support!

- In this FY we received a **$250,000** R&R allocation through WCU/Facilities, intended to be combined with a planned second allocation the next FY and used for Nature Center structural repairs which are expected to cost in the ballpark of $350–$400K.

- WCU/Facilities awarded HBS another **$180,000** in year-end funds to address a range of improvements and mitigation projects:

  General – electrical design plan for backup generators for all HBS residences, comprehensive drainage management design plan.
  Weyman – new HVAC (heating & air), new flooring, new insulation, interior paint job, new apron to weatherize underside of building.
  Nature Center – new radon mitigation system, thorough mold cleaning of salamander research bay, new HVAC in basement that will hopefully reduce future mold issues, removal of old boiler and associated wall heaters upstairs, which will free up space for an office.
  Duplex – new HVAC (heating & air).
  Coker – new HVAC (air conditioning added) for west wing of building, which will help with temperature regulation and moisture issues in the summer.
  Howell Admin – new desk and meeting table for ED.
  Bruce – new HVAC (air conditioning added) to help with moisture issues in the summer.
  Grounds – new steps on Foreman Trail and Plants of the Cherokee Garden; removal of hazard trees in Historic Woodlands, along Lower Lake Road, and behind Coker; gravel and grading of HBS main driveway; stabilization of portion of Creekside Trail.

• We were awarded **$60K** + an additional **$25K** for research equipment from the UNC Research Office. These funds enabled us to make the following equipment purchases:

Chiller/heaters for Living Streams – 6 at $9K/each (half came from the grant and half from donated funds)
Hach Stream flow meter – $6,800
Calipers and DBH tapes – ~$1,500
Atmospheric deposition collectors for microplastics research – 3 at $6,500/each + batteries and solar panels ($5,500)
Supplies for microplastics (filters and filter holders) – $350
10 trail cameras to use at HBS and wetlands research project – $700
1 song meter acoustic recorder for birds/frogs for wetlands research – $900
Various calibrants, lab supplies, etc.
Acoustic bat detectors (15 @ $1000/each) and acoustic bird/frog detectors (5 @ $900/each), plus associated locks, armor for the units, SD cards, etc.

The bat detectors will be used in a project to monitor bat activity in abandoned mine shafts in the region in cooperation with the USFS and NC Wildlife Resources Commission. The bird/frog detectors will be deployed in wetlands along the Little Tennessee River as part of a long-term monitoring research project.

• Progress on our NSF-funded environmental chamber project proceeds, but slowly. Demolition of the old chambers took place in February, and a team from Darwin Chambers (St. Louis, MO) arrived in March to commence construction of the new chambers. The new chambers are highly complex, capable of precisely regulating such environmental parameters as temperature, humidity, and photoperiod. WCU Facilities has provided considerable support, from inspections to installation of a new set of electrical panels. We also have funding in our NSF grant for equipping the new units, including new floor-to-ceiling shelving, full spectrum grow lights, USB port strips, and power strips.

• We are one of 5 beneficiaries of a generous donation of a brand new Cardinal Health –80C freezer (retailing nearly $5K) from ThermoFisher, coordinated by Sandar Leung of Manna Food Bank in Asheville. WCU Facilities is facilitating the transport of the new freezer. We will be surplusing the oldest of our current –80C freezers.

• At long last the "north campus" improvements received State Construction Office approval! With inspection finally passed last month, the "ground lease" is effectively terminated and full responsibility for the site reverts back to the State (WCU). Care and upkeep of the gardens will be contracted out by the Foundation, but under the authority of the HBS horticulturist and Gardens & Grounds Planning and Advisory Committee.

• Working with the WCU public art committee, artists Lily and Jim Kuonen were awarded a contract for a beautiful maple samara sculpture to be placed on the pedestal at the HBS "n. campus" Lower Lake Rd. entrance.

• Brainstorming continues over improvements for our main facilities priorities, Weyman Building and Valentine House, per our strategic plan.

–Weyman:
The new-and-improved Weyman is well on the way! We have now insulated the building, added HVAC, painted the interior, and will soon have new flooring and a foundation apron. We will next install A/V equipment and a kitchenette, and new furniture including tables and chairs, stackable chairs that can be set up for seminars, upholstered couches and chairs, and floor lamps. At a later date we may add a deck out back. We are still considering the possibility of moving the Reinke Library to Weyman, freeing up space in Coker for potential office expansion.

–Valentine:
Of our medium- to long-term options for Valentine, complete replacement is most likely.

4. HBS Research and Related Activities

• Research publications. We track scientific publications that result from HBS support, including Grants-in-Aid and/or facilities use, as well as HBS personnel (https://highlandsbiological.org/publications/). These papers typically cite HBS support in the Acknowledgements section. Here's a shout-out to HBS researchers with publications in 2022 and 2023 to date (GIA recipients in bold):

Brown, S. P., S. L. Clark, E. Ford, A. Jumpponen, A. M. Saxton, S. E. Schlarbaum, and **R. Baird**. 2022. Comparisons of interspecies field performance of Fagaceae (Castanea and Quercus) planted in the southeastern United States with attention to soil fungal impacts on plant performance. *Forest Ecology and Management* 525: 120569

Brown, S. P., S. L. Clark, E. Ford, N. Mirza, A. Odeh, S. E. Schlarbaum, A. Jumpponen, and **R. Baird**. 2023. Convergent shifts in soil fungal communities associated with Fagaceae reforestation in the Southern Appalachian Mountains. *Forest Ecology & Management* 531 (2023): 120805 DOI: 10.1016/j.foreco.2023.120805.

Costa, J. T. and G. Beccaloni. 2023. Alfred Russel Wallace's unrealized last book: Insights from the plan for *Darwin & Wallace*. *Notes and Records of the Royal Society* DOI: 10.1098/rsnr.2022.0053.

Gade, M. R., Q. Zhao, and **W. E. Peterman**. 2022. Spatial variation in demographic processes and the potential role of hybridization for the future. *Landscape Ecology* DOI: 10.1007/s10980-022-01503-y.

Gould. P. R., M. R. Gade, A. J. Wilk, and **W. E. Peterman**. 2022. Short-term responses of riparian salamander populations to wildfire in the southern Appalachians. *Journal of Wildlife Management* DOI: 10.1002/jwmg.22282.

Schultz, M., R. J. Warren II, J. T. Costa, B. Collins, and M. Bradford. 2022. Myrmecochorous plants and their ant seed dispersers through successional stages in temperate cove forests. *Ecological Entomology* DOI: 10.1111/een.13159.

Warren II, R. J., J. T. Costa, and M. Bradford. 2022. Seeing shapes in clouds: the fallacy of deriving ecological hypotheses from statistical distributions. *Oikos* 2022: e09315. DOI: 10.1111/oik.09315.

Whitenack, L. E., S. J. Snell Taylor, A. Tomcho, & A. H. Hurlbert. 2023. Comparing multiscale, presence-only habitat suitability models created with structured survey data and community science data for a rare warbler species at the southern range margin. *PLoS ONE* 18(4): e0275556. DOI: 10.1371/journal.pone.0275556

Wilburn, D. B., C. L. Kunkel, R. C. Feldhoff, P. W. Feldhoff, and B. C. Searle. 2022. Recurrent co-option and recombination of cytokine and three finger proteins in multiple reproductive tissues throughout salamander evolution. *Frontiers in Cell and Developmental Biology* 10: 828947.

• Grants-in-Aid 2023. We had fewer submissions than usual this year, just 6, of which 5 were recommended for support. These include faculty, PhD, and MS student researchers representing diverse research areas (salamanders [locomotion, courtship behavior], gall wasps, wetland ecology, and bees) as well as diverse schools: Pennsylvania State University, Clemson University, Duquesne University, George Washington University, and UP-York / Smithsonian. Their HBS residency periods are also temporally diverse, from spring to fall.

• Other research groups recently visiting or scheduled to visit this summer:
Dr. Brian Arbogast, UNC-Wilmington (mammalogy)
Dr. Robbie Burger, University of Kentucky (mammalogy)
Dr. Vadim Viviani, Universidade Federal de São Carlos, Brazil (entomology/biochemistry)
Dr. Marketa Zimova, Appalachian State University (mammalogy/climate change ecology)
Drs. Caroline Kennedy, Rebecca Hale, & Jennifer Ward, UNC-Asheville (botanical)
Drs. Rick & Pam Feldhoff, Univ of Louisville, Dr. Damien Wilburn, Ohio State (herpetology)

Ongoing In-house Research:

• *Bird banding* as part of the *Monitoring Avian Productivity and Survivorship* (MAPS) program is now in its 4th year. The HBS MAPS project is funded for 7 years thanks to HBF. This year we are collecting ticks on behalf of the Southeastern Cooperative Wildlife Disease Study (SCWDS) – they are particularly interested in Asian Longhorned ticks, which were first found in North America in 2017. As part of MAPS, we also participate in the *Caterpillars Count!* project led by Dr. Allan Hurlbert at UNC-CH, who will give the inaugural Zahner Lecture of the season on Thursday June 15th: "Birds, Big Data, and Citizen Science: Understanding the Impacts of Global Change."

• *Microplastic concentrations and dynamics in southern Appalachian headwater streams* project with Jason, Jerry Miller (WCU), Austin Gray (VT), and Robert Youker (WCU). The team will be deploying 3 atmospheric deposition collectors this summer to quantify abundance of microplastics falling from the atmosphere. The collectors will differentiate between wet and dry deposition. The collectors will be placed along a precipitation gradient: one will be deployed at HBS (~90 inches of rain/year), one at Coweeta Hydrologic Laboratory (~70 inches of rain/year), and another in the Richland Creek watershed in Haywood County (~50 inches of rain/year). The collectors were purchased as part of the $60K end-of-year equipment funding. We'll also be collecting stream water during storm events to assess MP concentrations and loads.

• Two malaise traps were deployed 3 years ago to provide a baseline of arthropod diversity at HBS. They are collected monthly and sorted to order by students. Our last collection will be in July.

New In-house Research Projects:

• *Using multiple criteria to assess degraded vs. reference wetlands in the Little Tennessee River floodplain*. Rada Petric and Jason Love are working with WCU student/summer research assistant Heather Pratt and former IE students/summer research assistants Reagan Jarrett, Grace Kinder, and Juliet Spafford to conduct surveys of odonates (both adults and nymphs), flying insects (using malaise traps), butterflies, wetlands macroinvertebrates, invasive exotic plants (including Marsh Dewflower, *Murdannia keisak*, a newly established wetland exotic that is quite aggressive), and water quality. They are also deploying sonic bat detectors and bird/frog detectors, as well as wildlife cameras. Heather is using this as her senior thesis project. Since the degraded wetlands are slated for restoration over the next few years, they'll be collecting "pre-treatment" data as well as comparing degraded and reference wetlands. End-of-year equipment funding was used to purchase song/frog recorders for this project.

• *Assessing bat use of abandoned mine shafts*. Rada Petric and Jason Love are working with US Forest Service biologist Johnny Wills and NC Wildlife Resources biologist Katherine Etchison to locate and survey abandoned mines in the area for bats using acoustic bat recorders. Most bats that use these mines are either federally listed or soon will be due to White Nose Syndrome. They will continue this project in the fall as an IE research project. We were approved/awarded approximately $25K of additional end-of-year money to purchase the bat detectors and associated accessories.

• Summer research assistant and former IE student Grace Kinder is leading the "Batpacking" project where she is coordinating backpacking trips along the Appalachian Trail to deploy acoustic bat recorders to assess the diversity of bats foraging along the trail. This initiative is being spearheaded by Rada Petric.

• Summer research assistant and former IE student Juliet Spafford is continuing her IE independent project that looked at bat activity along water bodies with different levels of anthropogenic activity and noise. Rada Petric is serving as the lead PI for this project.

• In addition to some of the above projects Rada Petric also continues her research into the effects of anthropogenic noise on bat foraging, small mammal life history, and assessing MOTUS tower bat detection probability using drones.

• This summer, starting June 12th and running for 5 weeks, Rada, Jim, and Jason are mentoring 3 North Carolina School of Science and Math (NCSSM) high school students as part of their internship program. The students will assist with the projects listed above and will be blogging about their experiences.

• Jim continues working with WCU MS student and GIA recipient Curtis McGehee, assessing impacts of invasive Asian Needle Ants on local forest communities in Jackson and Macon Counties, in collaboration with Robert Warren (Buffalo State).

• We are making progress developing an IACUC agreement with UNC-CH, to facilitate the review of animal care and use protocols for any UNC affiliated researchers, such as Rada.

5. Gardens & Grounds

• The HBS Gardens & Grounds Planning and Advisory Committee continues to do excellent work under the leadership of Chair Ken Conover. Noteworthy activities, guided by the Botanical Garden "roadmap" planning document, are briefly summarized here, but **see separate Committee report** for details:

– The Wayfinding and Interpretive Signage "Phase I" project with Equinox Environmental is complete, and we now have a comprehensive signage plan! We also have the funds to implement it...

– We were awarded a **$147,000** grant for ARPA funds from the NC Science Museums Program to implement the signage project, and fund a design for the new "south gateway" entrance to the Station adjacent to the Nature Center where the current "wildflower meadow" is located. In the process we will remove the informal and eroding trail along the Amphitheater and reclaim that area for plantings, while re-designing the trail through the "Azalea Garden" area as the primary trail from the entrance to the Gardens at the Nature Center.

– With donated funds we are acquiring an Epilog Fusion Maker 12 laser printer/engraver. This will enable us to make plant labels and different kinds of garden signs in-house.

– Bench dedication. This summer we are dedicating one bench in the Botanical Garden overlooking the lake to Ralph & Louise Sargent, who were instrumental in establishing and fostering the HBS Botanical Gardens beginning in the 1940s, and another, in the Moss Garden, to bryologist Lewis Anderson of Duke University, who conducted extensive moss research based at HBS in the 1950s and 1960s and served as an officer of the corporation. (Special thanks to Lynda Anderson for design work as well as her efforts in helping maintain the Moss Garden.)

– Priority Garden improvements, ongoing in 2023:
  i. Nature Center "east bed" makeover
  ii. Cherokee Garden improvements.
  iii. Amphitheater "trail" removal and reclamation
  iv. Rock Outcrop Garden inventory and amendments

• Jason spearheaded a successful application to name the Coker tract to the **Old-Growth Forest Network** (https://www.oldgrowthforest.net/), a great way to raise awareness of this gem of a forest at HBS. A dedication ceremony is planned for 13 July, prior to the Zahner

lecture by Buzz Williams, Emeritus Executive Director of the Chattooga Conservancy, honoring Bob Zahner. Dr. Sarah Aldoo, Executive Director of the Old-Growth Forest Network, will participate in the dedication.

• In March HBS staff took part in the annual Dulany Bog workday together with conservation partners from the US Forest Service, Highlands-Cashiers Land Trust, and the NC Plant Conservation Program.

• We are part of a *Sarracenia* (Pitcher-plant) working group organized by Dr. Natalie Ramirez-Bullon, plant ecologist with the USFWS, to consider approaches to mitigating hybridization of threatened Pitcher-plant species in the HBS Botanical Gardens and other sites. The UNC-Asheville team conducting research at HBS determined using genetic markers that Mountain sweet pitcher-plant (*S. jonesii*) hybridizes readily with the common Mountain purple pitcher-plant (*S. purpurea* var. *montana*), and that the hybrid plants are fertile, threatening to swamp parental populations where the two grow in proximity.

• Volunteers. We have a dedicated volunteer group, assisting mainly in the Botanical Garden and the Archives. 528 hours were logged between 1 Jan and 6 June 2023:

Archives	53	Garden Maintenance	293
Garden Planning/design	77.5	Meeting	99.5
Native Plant Symposium	2	Other	3

According to the latest national survey, mean volunteer "pay" is valued at $31.80/h, which puts the value of these volunteer hours at **$16,790.40.**

• The new HBS campus map developed by Concept3D is complete, although needs refining. The map is up on our website, and the WCU website: https://www.wcu.edu/discover/locations/main-campus/campus-map.aspx

6. Education, Outreach, and Public Engagement

• HBS January Term course: After a 3-year hiatus the "Sense of Place" writing course taught by Dr. Hannah Rogers for Univ of Virginia engineering students had a successful return in January 2023.

• In March & April HBS hosted the Little Tennessee Native Fish Conservation Partnership meeting, of which Jason is current Chair. We also hosted a group of lichenology students from NY Botanical Garden, and student groups from Oglethorpe University and USC-Aiken.

• HBS Summer 2023 courses. Our summer 2023 course lineup is a mix of standard HBS courses and experimental new courses. Enrollment is strong for most, and we once again have several recipients of the John E. Fairey Biological Field Station Scholarship from the Southern Appalachian Botanical Society and the Highlands Plateau Audubon Society Scholarship for selected students taking the HBS Biology & Conservation of Birds course!

• Several general-interest workshops are also on offer in 2023: "Mushrooms of the Carolinas" with Alan & Arleen Bessette (authors of *Mushrooms of the Carolinas*), "Writing the Appalachians" with biologist and novelist Dr. Sylvia Torti (University of Utah), and "George Masa's Wild Vision: His Photographic Journey on the Highlands Plateau" with Brent Martin, Alarka Expeditions and author of *George Masa's Wild Vision: A Japanese Immigrant Imagines Western North Carolina.*

A series of shorter workshops and special programs are also on offer to benefit the HBS Botanical Gardens:

"HBS Oconee Bells 2023" — *The Lost Shortia* talk and expedition to Devil's Fork State Park with Jim Costa; 19 March 2023, 10:00 AM-6:00 PM.

"Ocean Crust in the Mountains? HBS Buck Creek Serpentine Barrens Tour" with Jim Costa and Kathy Mathews; 18 May 2023, 10:00 AM-3:30 PM.

"Heathlands of the Highlands Plateau" — Sunset Rock botany walk with Dr. Paul Manos; 23 June 2023, 10:00 AM – 12:00 PM.

"Jurassic Garden: North Carolina Botany in Deep Time" — paleobotany of North Carolina with Dr. Jim Mickle, NC State University; 25 July 2023, 10:00 AM – 4:00 PM.

• NSF-funded research/education collaborations with HBS, bringing students to the Station this summer and beyond:

– Dr. Mark Dugo (Center for Renewable Energy & Sustainability, Johnson C. Smith University) will hold his 3rd Summer Sustainability Science Camp at HBS this summer. This NSF-funded program is aimed at African-American students majoring in environmentally related STEM disciplines.

– Last year Drs. Jessi Allen (Eastern Washington Univ.) & James Lendemer (NY Botanical Garden) received NSF funding for their grant "Leveraging Next-Generation Sequencing & Biodiversity Exploration to Understand Connectivity in the Imperiled Appalachian Migration Corridor." HBS will continue in the role of collaborator by holding courses and workshops taught by James & Jessi to increase professional lichen competency.

– Dr. Dan Johnson, University of Georgia's Warnell School of Forestry, received NSF funding to hold a plant hydraulics workshop with 5 instructors and 25 students at HBS in July 2024.

– NSF/LSAMP project "Mountain to Sea North Carolina Louis Stokes Alliance for Minority Participation" – a collaboration between WCU and 4 other UNC schools to promote STEM education for minority students; Funded, $3.4 million. (Heather Coan, WCU Biology, and Cheryl Waters-Tormey, WCU Geosciences/NRCM are among several co-PIs). HBS will serve as a venue for advisory board meetings and student symposia.

– Pending: Drs. Brian Byrd (WCU) & James Vonesh (Virginia Tech) have re-submitted an NSF-REU grant that would support HBS-based (1) short courses for vector biology, mosquito control, & public health professionals, and (2) continuing education courses for REHS specialists relating to mosquito and tick-borne diseases.

• In August 2023 HBS will host the Richard P. Korf Memorial North American Ascomycete Foray ("Korf Foray") spearheaded by Danny Newman (UT-Knoxville), in coordination with The Mountain Retreat & Learning Center.

• IE Program

– We had 15 excellent students in the fall 2022 IE program, led by Rada, Jason, and Jim. The program concluded on 8 December with a celebratory closing event at which the students presented their research. Several of the students from 2021 & 2022 have also presented their research at professional conferences and meetings, including:

-NC Bat Working Group (3 students)
-National Military Fish & Wildlife Association (2 students)
-NC chapter of The Wildlife Society (6 students)
-Association of Southeastern Biologists (2 students)
-UNC Undergraduate Student Expo (3 students)

– 2021 IE Highlands field site program alum Chloe Hall received 1st place in the best student presentation out of almost 400 participants across all disciplines at UNC! She was also featured by UNC: https://ie.unc.edu/2023/05/23/surf-grant-advances-unc-microplastics-research-in-western-north-carolina/

– Among 2022 program alums...

Kristina Hefferle received the prestigious Molchanov Scholarship
Marie Young received a UNC SURF grant
Grace Kinder received HBS small equipment grant

– We have a full house of 15 students once again for the fall 2023 program. Jim will not teach in the 2023 program as his semi-sabbatical and book-related travels continue, but he will be back for the 2024 program.

– We now have a signed MOU between HBS/WCU and UNC/IE setting the parameters for program fees and HBS facilities usage.

• HBS Nature Center and School Outreach program

– HBS school outreach programming continues to thrive under our Outreach Education Specialist Patrick Brannon **(see separate Outreach Annual Report)**. In addition to delivering a diversity of high-quality in-person and virtual science programs to schools and other organizations across the state (58 schools across 12 NC counties), in 2022-2023 Patrick also reached schools in Georgia, South Carolina, and Florida. He also continues his weekly "Nature Notes" column in *The Highlander* newspaper, collaborates with the Macon Co. Schools STEM program, participated in the NC Science Festival, STEM-E Elementary & Middle/High School Annual Conferences, and NC Arboretum Mountain Science Expo, taught a diversity of Adult / Educator Workshops for HBS and other organizations, and was selected as 2023 Keynote Speaker for the WNC Regional Science Fair.

– Summary of HBS outreach and public engagement program attendance for calendar year 2022:

	PROGRAM OFFERING	# PEOPLE	# PROGRAMS
NATURE CENTER:	WALK-IN VISITATION:	16,864	--
	GARDEN TOURS:	261	22
	SPECIAL EVENTS:	523	22
	PUBLIC PROGRAMS:	874	63
	ZAHNER LECTURE SERIES:	643	10
	SUMMER CAMPS:	145	15
	AFTERSCHOOL PROGRAMS:	383	29
OUTREACH:	STEM OUTREACH PROGRAMS:	9293	306
	EDUCATOR / ADULT WORKSHOPS:	384	17
	COMMUNITY SERVICE:	2369	14
	TOTALS:	**31,739**	**498**

– We have recently submitted a proposal for the next round of NC Science Museums grants supporting the HBS school outreach program.

• The **HBS Education & Outreach Planning and Advisory Committee** is expected to be implemented this year as we finalize our MOU and "facilities use" agreement with the HBF. This committee will help provide input and oversight for HBS and HBF public engagement programming.

7. Foundation

• The revised (v. 3.1) draft MOU between WCU/HBS and the HBF is at the time of this writing in review in the Provost's Office at WCU. A revised draft Facilities Use Agreement pertaining to the Nature Center is also under review.

• Other HBF highlights will be separately presented by John Michener, in his inaugural HBS Board of Directors meeting. We thank outgoing HBF President Jennie Stowers for her considerable efforts on behalf of the Station and Foundation over the past 2 years.

8. Other Initiatives and Events

• We have two exciting WCU/HBS-sponsored international trips to benefit the Station coming up:

— **Galápagos Islands** aboard the yacht La Pinta (December 6-15, 2023) [Brochure: https://highlandsbiological.org/wp-content/uploads/2023/04/2023-Galapagos_Highland-Biological-Station_r2-WEB.pdf]

— **Chile's Lake District & Patagonia: In Darwin's Footsteps at World's End** (February 27-March 10, 2024) [Brochure available soon]

• On **10 August 2023** we will host an event in the Sto Pavilion at HBS with WCU Chancellor Dr. Kelli Brown to thank area friends of WCU and HBS.

• HBS Story video. Thanks to the support of former HBF Trustee Glenn Murer, our short promo film telling the HBS story is now on our website: https://highlandsbiological.org/

• HBS Archives project. Volunteer Bryding Adams has continued leading the Archives project, curating and organizing our historical correspondence, photographs, maps & blueprints, etc. Ralph Sargent's HBS history, *Biology in the Blue Ridge*, has been OCR-scanned, and volunteer Leslie Costa is creating an index for the book.

• In March Jim and Jason were exhibitors for HBS at the Association of SE Biologists (ASB) meeting in Winston-Salem, NC, where Jason also presented a research poster.

• This spring HBS staff joined in several community volunteer efforts, including the annual Audubon Christmas Birdcount and the Plateau Litter Pickup.

9. Director and Associate Director's Scholarly (and Related) Activities

• Jim was named winner of the 2023 Stephen Jay Gould Prize of the Society for the Study of Evolution (SSE), a prize awarded annually "to recognize individuals whose sustained and exemplary efforts have advanced public understanding of evolutionary science and its importance in biology, education, and everyday life in the spirit of Stephen Jay Gould." Jim will deliver the Gould Prize Plenary Address at the SSE meeting in Albuquerque, NM, where the prize will be awarded.

https://www.evolutionsociety.org/news/display/2023/5/13/gould-prize-winner-james-t-costa/
https://www.wcu.edu/stories/posts/News/2023/05/jim-costa-awarded-gould-prize-from-the-society-for-the-study-of-evolution.aspx

In January-February 2023 Jim visited the University of Hamburg as Senior Research Fellow with a DFG-Kolleg Research Group, the Center for Advanced Studies “Imaginaria of Force” project. He gave several lectures in Germany, including at the Center for Advanced Studies, the Leibniz Institute for the Analysis of Biodiversity Change (Hamburg), and the Museum für Naturkunde (Berlin). Jim also completed a co-authored paper while in residence in Germany, which has subsequently been published: Costa & Beccaloni (2023), Alfred Russel Wallace's unrealized last book: Insights from the plan for *Darwin & Wallace*. *Notes and Records of the Royal Society*, DOI: 10.1098/rsnr.2022.0053.

• Jim's new biography of Alfred Russel Wallace was published by Princeton University Press in March: *Radical by Nature: The Revolutionary Life of Alfred Russel Wallace* (https://press.princeton.edu/books/hardcover/9780691233796/radical-by-nature). It has been getting strong reviews thus far, including a *Kirkus* starred review and an excellent write-up in the *Wall Street Journal*: https://www.wsj.com/articles/radical-by-nature-book-review-the-evolution-of-alfred-russel-wallace-4c154fde.

Jim has been speaking and interviewing widely and giving interviews on the book, including thus far at the Oxford Natural History Museum (UK), Museum für Naturkunde (Berlin), UC-Berkely, Harvard Univ/Museum of Comparative Zoology, NC Museum of Natural Sciences (Raleigh), Dahlonega Science Cafe (Dahlonega GA), and Oak Spring Garden Foundation

(VA). Forthcoming talks are scheduled for the North Carolina Arboretum (July 21st, in cooperation with Malaprop's Bookstore, Asheville), Univ of Colorado, Linnean Society of London, Blackwell's Bookshop (Oxford), the Bath Royal Literary and Scientific Society (UK), and the Milner Centre for Evolution (Univ of Bath, UK).

• An excerpt of Jim's Wallace book was published in the May 2023 issue of *Natural History Magazine*, and he is currently working on an article for *Undark Magazine*.

• Jim was interviewed by the *Times of India* for a "Times Evoke" feature on Costa Rica, where he has conducted research. The feature was published in the 14 January 2023 issue.

• Jim was invited to spend ~2 weeks this fall lecturing on Darwin, Wallace, and the history and philosophy of evolutionary thinking in France, at the Université Toulouse Paul Sabatier (Toulouse) and the Research Theoretical & Experimental Ecology Station, a biological station located in Moulis. He was invited through the "LabEx" program of TULIP, a collaboration of six French universities and other scientific institutions.

• Jim's newest book, *Darwin and the Art of Botany* (co-authored with Bobbi Angell, and published by Timber Press), is scheduled to be out this fall. We will hold a book launch celebration in Highlands on Saturday 16 September with a joint talk by Jim & Bobbi, and book and plant sales to benefit the HBS Botanical Gardens.

• Local talks & tours. Jason and Jim have led 8 tours or presentations since January 1st that reached 167 individuals. These range from garden clubs to WCU departments visiting HBS.

• Jason is Chair of the Little Tennessee Native Fish Conservation Area Partnership (LT-NFCP: https://www.littlet.org/), a group of academics, non-profit conservation groups, and state & federal biologists who are working together to conserve the rich biodiversity of the Little Tennessee River basin, including the upper Little Tennessee and its tributaries in Macon and Rabun Counties, and the Tuckasegee River.

• Jason has continued working with Dr. Bill McLarney and Jason Meador (Mainspring Conservation Trust) on a paper that examines the recovery of a fish community after a catastrophic debris on Peeks Creek, a tributary of the Cullasaja River. They are collaborating with Dr. Akira Terui (UNC-Greensboro) as a co-PI to help them with the stats. Dr. Terui and his PhD student Ashely joined the team as they sampled Peeks Creek one last time.

• Jason will soon rotate out of his position as Chair of the Board of Mainspring Conservation Trust. The mission of Mainspring Conservation Trust is to conserve the waters, forests, farms and heritage of the Upper Little Tennessee and Hiwassee River Valleys. A noteworthy major project being undertaken by Mainspring in collaboration with other organizations is removal of the Ela Dam on the Oconaluftee River, which drains the southeast part of Great Smoky Mountains NP, as well as all the waters of the Qualla Boundary.