BII: Evolving Meta Ecosystems (EVOME) Biological Integrating Institute

Strategic Plan
Feb. 10, 2025
Aug. 4, 2025 Update

Core Values

The Evolving Meta Ecosystems (EVOME) Institute is built on the core, interacting values of:

Discovery - Discover new ways for understanding the responses of ecosystems to a changing environment, ranging from genes to populations/communities to meta-ecosystems.

Integration - Integrate across disciplines, skills, approaches, and perspectives to achieve our individual team research goals and the broader goals of the Institute.

Transparency - Commitment to data sharing and transparent communication at all stages of research planning: budgeting, planning, executing, analysis, publishing, and reporting.

Teamwork - Participate in collaborative work with openness, respect, and commitment to best practices in Team Science.

Respect - Acknowledge the importance of differing expertise, experience, knowledge, perspectives, and approaches in contributing to new scientific insights.

Mission Statement

The Evolving Meta-Ecosystems Institute (EVOME) aims to understand how individual species' responses drive broader ecological changes, from genes to ecosystems and across landscapes. Integrating multiple biological subdisciplines, trophic levels, and ecosystems provides a unique opportunity for synthesis in a rapidly changing region — the Arctic. By combining field observations, laboratory and field experiments, and quantitative analyses into a trait-based model EVOME provides a framework for broadly understanding current meta-ecosystem functions and predicting future changes in regions around the globe.

EVOME will train the next generation of scientists to work across disciplines and study biology at multiple levels. EVOME will use multiple points of intersection between research and education, and with science journalists, to educate participants to communicate integrated biology to broad audiences. By partnering with journalists and creating varied outreach content, we will connect research to Arctic communities, the scientific community, and the public, ensuring broad access to new insights into environmental change.

Our decisions are guided by our core values, mission, research, and education and outreach goals. The Executive Committee makes decisions based on Institute-wide discussions and input from the Advisory Team. This process ensures fairness, transparency, and broad participation across all EVOME members, including PIs, postdocs, graduate students, and other researchers.

Vision Statement

Our vision for EVOME is to establish a research framework for understanding how natural selection, genetics, traits, population dynamics, and species interactions shape ecosystems and landscapes. Our work in Arctic stream-riparian ecosystems will serve as a model for studying interconnected ecosystems worldwide. By developing trait-based models, we will link organismal traits to population fitness and predict ecological outcomes under environmental change. Insights from genetic and trait variability within and across species will advance genomics, physiology, evolution, ecology, and conservation, with broad applications across biomes. This research will enable mitigation of threats to humans and the environment from stressors such as environmental, pollution, and land use changes.

Current Challenges, Opportunities, Strengths, and Weaknesses

Challenges

A major challenge for EVOME is coordinating and supporting the logistics of an ambitious field and laboratory research program that spans multiple disciplines and a large geographic region. Each discipline has different needs and timing for field support. This has been made more challenging by the unanticipated need for logistics to be paid from our overall EVOME budget, not from the NSF Polar logistics support program as expected when the proposal was submitted and selected. The need to use grant funds for logistics has also impacted the number of people involved (mostly REUs, journalists, and research assistants). We are also reassessing the equipment needs across EVOME to accommodate the logistics and research plan changes. We have developed a plan that the team feels is balanced across teams and questions. We plan to re-assess this plan after our first year and continue to adjust it yearly.

A major challenge —and opportunity— for EVOME is integrating new scientists from diverse disciplines into newly formed teams, all while fostering innovative collaboration. This expansion introduces valuable expertise and fresh perspectives but also requires careful coordination to navigate team science dynamics effectively. To facilitate this process, we are working closely with our core science team to ensure smooth integration and effective collaboration. That's why, in the first two years, our priority is coalescing the initial team (many of whom have not worked together prior to EVOME), refining core concepts and making substantial progress before bringing in additional researchers to further enhance our work.

A major challenge is the need to construct an aquatic/fish common garden facility at Fairbanks. Originally, this facility was in our OPP logistics plan and would have been built on-site in the Arctic. Due to the lack of logistics support, we are trying to develop a suitable facility at the University of Alaska - Fairbanks.. This will take time and resources, but fortunately, the

University has a building that has environmental chambers that we can modify. Developing the plans for conducting transplant and common garden experiments across species is currently challenging only because our approach is ultimately dependent on the genomic diversity, environmental, and life history data measured in years 1 and 2.

We are working to recruit graduate participants from among many disparate programs across the involved institutions on a relatively short timescale. Each graduate program has different timelines and requirements, which we are working through this recruiting cycle. Despite this challenge, we have applicants and acceptances from several very well-qualified individuals.

Opportunities

We will leverage rapid advances in genomic technology and understanding that are providing new approaches to estimating genomic diversity and heritability. This approach may be used in conjunction with or instead of a traditional common garden approach for estimating the heritability of key traits, providing more robust estimates and providing estimates where common garden approaches are impractical.

We will collaborate with and leverage the prior work by the Arctic Long-term Ecological Research program and the National Ecological Observational Network (NEON) co-located at our primary field location at the Toolik Field Station. Toolik Field Station is primarily supported by NSF and operated by the University of Alaska Fairbanks.

We have a great opportunity to involve new scientists from the regions as we will hold an EVOME meeting at the University of Alaska prior to fieldwork this year. We have already had interest from several faculty at UA-Fairbanks.

Strengths

Our topic is timely, particularly as rapid environmental changes across the globe threaten biodiversity, ecosystems, human health and wellbeing, and environmental resilience. We are working in the Northwest Arctic, which is one of the most rapidly warming places on Earth. Already, we have witnessed the impact of this heat, including longer summers, thawing permafrost, blocked streams and mass fish mortality events, and the expansion of large bushes and species previously prevented from colonizing this harsh landscape. Building on our decades of experience in the region, we are well-positioned to document these changes and understand how they are mediated by biological mechanisms of resilience. We will also create the baseline data for future research to understand these changes on an even deeper level, for example, by collecting whole-genome information across many taxa across the full Arctic gradient.

Our collaborative team of experts is uniquely positioned to tackle the challenges of the ambitious EVOME research, education, and outreach goals. Our team includes experts who span biological disciplines and also have a deep understanding of the natural history of taxa and Arctic ecosystems. Our strengths in genomics, evolution, ecology, and modeling are world-class. Together, these strengths will allow us to integrate our findings to understand how species and evolution shape landscape resilience to environmental change. We are already attracting postdocs, students, and collaborators whose different expertise and enthusiasm will further enrich our research.

Weaknesses

The need to move logistics inside the EVOME budget has meant that we have had to curtail our use of helicopters to reach some potential sites that currently exhibit extreme environmental characteristics and limit the number of people who can be involved in field and laboratory work. Unfortunately, the warmest springs are located far from the road in remote sections of the western Brooks Range. The lack of helicopter support limits the environmental gradient we can use for comparing adaptation to environmental conditions. We are hoping that this limitation can be overcome in later years.

The late funding (April 2024) relative to the Arctic growing season (May) prevented us from requesting logistics support from Polar Field Services and curtailed our ability to fully establish sites across the genomic/environmental gradient in Year 1. The timing of funding also meant that the recruitment of most graduate students did not fit into University schedules and for the most part was delayed until Year 2. However, we now have a logistics plan in place for next year, and we used this time to advertise and attract a large pool of qualified candidates for our student positions, from which we are now recruiting.

Building a data management system that integrates multiple datasets and ensures team-wide access requires significant time and expertise. However, we have built on expertise from the bioinformatics field and are devising a system that works not just for genomics but also for all of our measurements. Moreover, this system could be expanded to other BIIs or integrated groups that are collecting diverse data across landscapes. Our upcoming field studies will offer a chance to test and refine the system we have developed.

Management

Roles and responsibilities

Linda Deegan, lead PI of the EVOME NSF Biology Integration Institute, serves as the primary NSF contact and oversees all Institute management and reporting. She makes final budget decisions with input from the Executive Committee. Co-lead Mark Urban assists with leadership and NSF meetings.

Heidi Golden, EVOME Project Manager at Woodwell Climate Research Center, coordinates field research, recruitment, and permits, while managing meetings and documentation. She is an Ex Officio member of the Executive Committee and may participate in research.

The EVOME Executive Committee serves as the Institute's principal management team, representing diverse scientific expertise. It includes the lead PI (chair), four senior personnel (three-year terms), the Project Manager (Ex Officio), a rotating member (one-year term), and an early-career member. The committee meets biweekly to set research goals, oversee the budget, plan events, and manage NSF-required documents. Decisions are made by consensus or majority vote, with the lead PI casting tiebreakers. Final budget decisions rest with the lead PI, but major changes require committee approval.

Meeting Schedules and Transparency

The EVOME Science Team will meet virtually once per month. The Executive Committee will meet twice per month in addition to monthly Team meetings. Agendas for these meetings will be set by the PI and Project Manager in consultation with the Executive Committee and be shared in advance with all Institute members. Notes will be taken at all meetings and will be available for all Institute members to view.

Working Groups

Much of EVOME's work will take place within working groups. Working groups will be created to tackle specific research challenges and cross-cutting Institute goals and meet either weekly or bi-weekly to discuss issues and resolve challenges. Some working groups may dissolve when work is completed, while others will become standing groups. Each working group will have members from all career stages and multiple disciplines. Each working group will have a leader selected by consensus. Working group leaders will report on group activities at monthly Project Meetings. Each leader will also attend annual *Team Science Retreats* and *Annual Meetings*.

RCN Participation

EVOME team members will participate in the BII RCN as appropriate. EVOME has representatives that attend the Project Manager (current H. Golden), Early Career (current I. Shuman, graduate student), and PI meetings (current Deegan or Urban).

Goals, Initiatives And Objectives

Long-term goals

Research

The proposed research in EVOME will create a framework based on integrating multiple biological subdisciplines, trophic levels, and ecosystems, grounded in individual species' responses that drive broader ecological changes, from genes to ecosystems and across landscapes. After 6 years, we will have created a framework for integrative research that unites research and researchers across disciplines, techniques, and scales to build knowledge within a tractable system. Finally, by creating an institute in which we interact with the wider scientific community we will extend our framework to trophic subsidies in other systems to learn which parts are generalizable and which are specific to our system.

By the end of our grant, we will have:

- Published reference high-quality, chromosome-level genome assemblies for focal species (including key species of willow, mayflies, Arctic grayling, and beetles) using Whole Genome Sequencing

- Developed a comprehensive understanding of aquatic/riparian ecosystem interdependencies across a genomic/thermal gradient
- Contributed datasets across multiple species to the growing atlas of traits and phenology to improve understanding of trait variability across environmental gradients and underlying aquatic and terrestrial ecosystems
- Developed a modular modeling approach called Models of Evolving Meta Ecosystems (MEMEs) grounded in Trait Driver Theory (TDT) that can accommodate multiple species, mechanistic sub-models, and climate data streams to identify future scenarios of how evolution broadly affects meta-ecosystems
- Involved at least 4 new investigators with different expertise and backgrounds in EVOME
- Established multi-PI collaborations, within and beyond EVOME, that will have resulted in more than a dozen multi-PI publications that integrate across 2 or more disciplines.

Education and Outreach

Education, outreach and community engagement projects provide opportunities to disseminate the work of EVOME, emphasizing the links between environmental change and ecosystem function and resilience that support humans. Just as importantly as the research, we will have created a community of biology integrators that have learned to work together across disciplines and scales to arrive at new knowledge and share that knowledge with students, broader audiences, and local communities.

At the end of our grant, we will have:

- Trained more than 15 REU students, with additional students trained in laboratory environmental and genomic techniques, 20 - 60 graduate students including those involved in courses, 4 postdoctoral fellows, and 8-10 post-baccalaureate trainees
- Established a successful interdisciplinary training pathway for students
- Conducted an immersion program in interdisciplinary science for up to 18 journalists
- Completed 3 or more outreach events for regional community members via radio broadcasts and other media
- Developed a strong communication plan to explain to lay audiences the power of integrated research using social media, including blog posts and videos.

Short term goals to be revisited each year to be assured of achieving the long term goals

Research

Year 1: Hire a Project manager/Scientific coordinator and other staff. Coalesce an interactive team with strategic cross-membership in topical areas. Hold regular monthly meetings of the science team and frequent meetings (monthly or biweekly depending on need) of sub-teams on either focal species or a deep dive into a topic of key importance to develop individual and integrated research plans. Convene the All-Team EVOME Science Symposia, including the Science Advisory Board (SAB) and evaluator, and the Team Science team. Develop and adopt foundational documents, modes of engagement, and Team norms. Perform initial genomic and ecological surveys for sites across the genomic/thermal gradient and identify locations for long-term monitoring that begin in Y2 and transplant and ecosystem experiments that will begin in Year 3. Conduct collections of four species (willow, mayfly, beetle and Arctic grayling) for genome assembly and annotation. Conduct studies that test field sampling methods and feasibility, data collection, DNA extraction protocols, and metagenomics analysis. Begin Field Safety and Team Science Training. Apply for required land use permits from BLM and the State of Alaska and IACUC approval. Begin development of databases and field apps for data collection in a georeferenced framework.

Year 2: Finalize initial sites across the genomic/thermal gradient by analyzing available data, and maps and assessing gaps. Conduct field studies across the gradient to confirm the appropriateness of sites, and determine environmental conditions, biotic community variation across multiple trophic levels, species traits, and genomic variation. Test the field app that is being developed for the collection of data in a georeferenced framework. Revisit research themes considering new discoveries, new methods, and practical aspects. Develop plans for evaluation of the heritability of key traits through genomics and experiments based on initial genomic and population assessments. Conduct pilot work on feasibility and apply for permits for transplants/common gardens. Convene the All-Team EVOME Science Symposia, including the Science Advisory Board (SAB) and evaluator, and the Team Science team.

Year 3: Continue field studies across the genomic/thermal gradient. Initiate experiments to determine heritability, including genomics, transplants, and common gardens. Initiate mechanistic modeling by species using a trait-based approach and the data obtained in Years 1 and 2 from field studies. Convene the All-Team EVOME Science Symposia, including the Science Advisory Board (SAB) and evaluator, and the Team Science team.

Year 4: Continue field studies across the genomic/thermal gradient. Continue experiments to determine heritability, including genomics, transplants, and common gardens. Incorporate heritability into trait modeling. Convene the All-Team EVOME Science Symposia, including the Science Advisory Board (SAB) and evaluator, and the Team Science team.

Year 5: Continue transplants, common gardens, and field surveys across the genomic/thermal gradient to understand the implications of inter-annual variation in weather on interactions. Synthesize field and laboratory data into Models of Evolving Meta Ecosystems (MEMEs) that accommodate multiple species, mechanistic sub-models, and environmental data to identify future scenarios of how evolution affects meta-ecosystems. Convene the All-Team EVOME Science Symposia, including the Science Advisory Board (SAB) and evaluator, and the Team Science team.

Year 6: Complete goals articulated above and assess overarching research and training achievements.

Education and Outreach

Year 1: Develop strategies for recruitment of graduate students and REU students. Hire one postdoctoral fellow to coordinate the genomics assembly. Develop a public-facing communications strategy and plan across the Institute. Onboard graduate student if possible.

Year 2: Onboard graduate students. Conduct Team science and field safety training for all trainees. Onboard 3 REU students to work in the Arctic in conjunction with postdocs, graduate students and faculty in different disciplines. Initiate a cross-disciplinary field sampling program to immerse all field personnel in the needs and approaches of different disciplines. Initiate the development of a cross-institutional, interdisciplinary Integrating Biology course and Colloquia for graduate students and postdocs. Develop a strategy for recruitment of journalists for the Biology Behind the By-lines Arctic immersion course and development of radio programs. Begin the Notes from the New Biology social media blog.

Year 3: Continued mentoring and training of REU, MS, and graduate students in new approaches, Team science, and cross-disciplinary training, with modifications as necessary to streamline and improve outcomes. Onboard 3 new REU students. Conduct the *Integrating Biology* for graduate students and *Biology Behind the By-lines* for journalists courses and continue public outreach. Award first graduate student/postdoc Integration Incentive Award.

Year 4 - 6: Continued mentorship, training of REU, MS, graduate participants, journalists and research associates. Onboard 3 new REU students. Graduate first cohort of graduate students. Expanded social media presence and lay press articles to publicize activities.

Projects and Initial Objectives

EVOME is organized around four integrated projects, each of which involves research that bridges across biological disciplines and different levels of organization, links aquatic and terrestrial ecosystems, and requires integration of field observations and field and laboratory experiments into quantitative analyses and trait-based modeling.

In *Project 1,* we will measure *Ecological Dynamics* by assessing population abundances, community compositions, productivity, and trophic subsidies between streams and riparian ecosystems across genomic/thermal regions.

In *Project 2, Landscape Variation in Traits and Genetics*, we will measure trait (phenotypic) and genomic (genotypic) variation across regions for the dominant organisms in stream-riparian meta-ecosystems – willow, mayfly, ground-beetle, Arctic grayling – to understand how this variation correlates with ecosystem processes measured in Project 1.

In *Project 3, Adaptive Responses to Future Climate Change*, we will build on the observed spatial variation in phenotypes and genotypes from *Project 2* to develop transplant and common garden experiments between contrasting environments to understand local adaptation and phenotypic plasticity in thermal response curves for key traits and to estimate selection and heritability in order to understand the role of plasticity, genetics, and their interaction in species responses to climate change.

In *Project 4*, *Evolving Meta Ecosystems*, we will synthesize results and insights from *Projects 1–3* to predict meta-ecosystem dynamics under future scenarios of climate change using newly developed Models of Evolving Meta Ecosystems (MEMEs) based on traits, determined by both plasticity and genetics and ecological interactions.

Below we describe the roles of funded Institute members by Project and Objectives and Milestones for Years 1 & 2.

Project 1: Ecological Dynamics

Objectives: Years 1-2 study design and sample collection; Establish sites along the geospatial genomic/thermal gradient; collect samples for whole genome development, preliminary assessment of genomic variation. Develop an observing system to measure environmental conditions (i.e., weather, stream water level, DO, chlorophyll, temperature, soil moisture).

Timeline: Initiate site selection, sampling, and securing permits for work on federal and state lands.

Outcomes: Sampling individuals of 5 species at up to 15 sites in three genomic/thermal regions will generate thousands of samples for analysis of ecology, traits and genetic variation related to environmental characteristics. These analyses will allow us to test how populations, communities, and ecosystem function vary across genomic/thermal regions.

Milestones: Obtain state and federal permits. Development of sampling strategies and sample processing protocols; sampling to bioinformatics completion of whole genome sequencing of 4 species; development of standardized nomenclature for sample labeling; and completion of the first version of our data management plan.

Personnel: Deegan and Urban will lead site selection and overarching comparisons across regions. Experts will conduct specific measurements: Atkinson - aquatic insects; Lozier - terrestrial insects; Heskel and Boelman - willow ecophysiology, structure and phenology; Schoen and Westley, Arctic grayling distribution and traits; Boelman and Krause - birds; Neill, terrestrial and aquatic biogeochemistry; Deegan, Atkinson and Neill, trophic subsidies, aquatic ecosystem function and biogeochemistry. Everyone will participate in data analysis and interpretation.

Resource allocation: Salary and logistical (trucks, field station charges) support of investigators, graduate and undergraduate students, postdoctoral fellows and research assistants; purchase and construction of lab and field equipment, sampling supplies, and analysis and bioinformatics support.

Project 2: Landscape Variation in Traits and Genetics

Objectives: Perform genomic, trait and ecological surveys for sites across the genomic/thermal gradient and collect specimens for landscape genomic analysis. Process samples for ecology, trait and genomics.

Timeline: Conduct sampling and completion of initial genomic variation assessment.

Outcomes: Whole genome assembly and annotation for willow, mayfly, beetle and Arctic grayling. Genetic variation will be assessed in 40 individuals in 4 focal species from up to 15 populations (5 stream/riparian systems within each genomic/thermal region resulting in 3,840 libraries). Development of databases for traits of four species; Initial bioinformatic analysis of genomic samples. Analysis tests our hypotheses about population connectivity and traits variation across the thermal-connectivity landscape are related to generation times and dispersal capacity for key species.

Milestones: Sampling, processing of samples, and development of ecological, species traits and genomic data sets by community and species. Geospatial analysis of initial genomic variation and traits.

Personnel: Wegrzyn and O'Neill will lead genomics analysis of all species and work with experts on taxa who will measure the traits: Atkinson - aquatic insects; Lozier - terrestrial insects; Heskel, Wegryzn - willow; Westley and Schoen - Arctic grayling; Everyone will participate in data analysis and interpretation.

Resource allocation: Salary and logistical (trucks, field station charges) support of investigators, graduate and undergraduate students, postdoctoral fellows and research assistants; purchase and construction of lab and field equipment, sampling supplies, and analysis and bioinformatics support.

Project 3: Adaptive Responses to Future Climate Change

Objectives: Initiate transplant and common garden experiments; continue genomic, trait and ecological surveys and data analysis.

Outcomes: Establishment of long-term common garden for Arctic willows available for other researchers. The development of an aquatic garden facility at UAF will benefit the UA community. Provision of estimates of heritability for four wild-type species. Provide detailed understanding of the plasticity and potential for adaptive evolution of traits in four species across current and future climates via common garden and transplant experiments.

Milestones: Well-curated datasets for evaluation of geospatial analysis of traits and genomic variation across multiple species; development of the aquatic common garden facility at UAF for Arctic grayling. Short-term pilot studies of GXE experiments as needed.

Personnel: Urban will lead GXE experiments and interpretation and work with taxon experts who will conduct common garden and transplant experiments: Atkinson - aquatic insects; Lozier - terrestrial insects; Wegrzyn, Heskel, Neill - willow; Westley, Schoen, Deegan, Golden Arctic grayling. O'Neill and Wegryzn will lead genomic analysis. Bolnick will provide expertise on heritability and data analysis programs; Everyone will participate in data analysis and interpretation.

Resource allocation: Salary and logistical (trucks, field station charges) support of investigators, graduate and undergraduate students, postdoctoral fellows and research assistants; purchase and construction of lab and field equipment, sampling supplies, and analysis and bioinformatics support.

Project 4: Evolving Meta Ecosystems

Roles: Merow and Urban will lead the modeling and work with ecology and taxon experts (Atkinson - aquatic insects; Lozier - terrestrial insects; Heskel, Boelman, Neill, Wegrzyn -

willow; Schoen, Westley, Deegan, Golden - Arctic grayling; Boelman and Krause, birds) who will provide the data needed to parameterize, calibrate and validate models. Everyone will participate in data analysis and interpretation.

Objectives: Develop initial modeling framework and discussions with taxon experts on data needed for IPM modeling.

Outcomes: Development of an initial template for modeling eco-evo interactions. By synthesizing observations, experiments, and models, we aim to reveal not just direct connections between ecology and evolution, but also any complex feedback loops or dead ends that we can then design future studies to test.

Milestones: Conduct an overarching modeling session with all team personnel; meet individually or as small teams with ecology and taxon experts to ensure needed data is collected.

Resource allocation: Salary and logistical (trucks, field station charges) support of investigators, graduate and undergraduate students, postdoctoral fellows and research assistants; purchase and construction of lab and field equipment, sampling supplies, and analysis and bioinformatics support.

Assessment, Timelines and Dissemination

Assessment

Research assessments will take place before and during the annual symposia, led by the leadership team (Deegan, Urban, Neill, Wegrzyn, Boelman) with input from the scientific advisory board. Reviews will measure progress using predefined metrics (sampling accomplished, samples processed, datasets, experiments conducted, training of undergraduates and graduate students) and milestones, especially in the first two years. These assessments will be managed by the Program Coordinator (Golden) using the Dashboard. As the program evolves, we will refine our approach to ensure objective evaluations which will guide the continuation or initiation of new efforts aligned with EVOME's goals.

Arnell Garrett (Delmarva Associates) serves as the EVOME Institute outside evaluator who will focus primarily on educational and team dynamics. Garrett will annually conduct formative (pre-activity) and summative (post-activity) interviews and surveys of project participants. These assessments will include participants across the activities of EVOME, including research, trainees (students, postdocs), the REU program, Team Science, Biology Behind the By-lines and the Science Symposium. These assessments will be based on a logic model of self-efficacy, which determines how individuals think, motivate, and perform, which is linked to success and persistence. Garrett will conduct interviews and surveys based on her prior work and metrics and instruments developed with the Evaluation Committee (Led by Urban and Neill) and the ExCom. This will assess participants' understanding of integrated biology and best practices of team science (cognitive gains) and will ask participants to reflect on how their participation has changed their perceptions (affective gains, mindfulness and intent). She will meet with the Executive Committee at least twice per year and will attend annual EVOME all-Institute meetings. Our Team Science coordinators will provide additional feedback on team dynamics. Chris Olex (The Point) is the EVOME team science interpersonal skills facilitator. She will provide training and lead exercises designed to promote interpersonal interactions in team science. Kathleen Weathers (Carey Institute) is the EVOME team science scientific team science consultant. Olex and Weathers will attend annual EVOME All-Institute meetings in which time will be devoted to these activities. Additional sessions will be scheduled as needed over video.

The evaluation will translate findings into feedback for leadership teams and suggest appropriate actions, such as training, to address current weaknesses. The results of each evaluation assessment will be shared with the Executive Committee for discussion and reflection, then shared with individual team leaders or full teams for discussion and action.

Timeline/Milestones

Year	Milestones
1	Hire staff and postdocs; Coalesce the team by holding monthly science team meetings and focused working group meetings; complete initial assessment of potential field sites across the genomic/thermal gradient; Initiate genomics sampling for whole genome development and geospatial genomic variation (Project 1 & 2); begin development of data pipelines; initiate Team science training; sequence project priority and field sites for multi-year studies; convene first annual EVOME symposium. Recruit undergraduate and graduate students.
2	Initiate environmental, ecological and genomic sampling at field sites and test sample collection and analysis protocols; report first georeferenced genomic variation across sites (Themes 1, 2); conduct pilot studies for evaluation of adaptive responses (Project 3); recruit and enroll first cohort of graduate/undergraduate students; hold second EVOME symposium; Continue Field Safety and Team science training.
3	Continue environmental, ecological and genomic sampling at field sites (Project 1 & 2), begin studies of adaptive responses (Project 3), and develop a framework for mechanistic models by species (Project 4); hold third EVOME symposium; establish outreach activities with journalists and radio shows; enroll a second cohort of REU students; Recruit and enroll journalists.
4	Final environmental, ecological and genomic collections at field sites (Project 1 & 2); continue field and experimental-based studies of adaptive responses (Project 3); Integrate field and experimental results into IPM models by species; enroll a second cohort of REU students and journalists. ; hold 4th EVOME symposium
5	Continue data assimilation and modeling analysis of individual species and merge across themes into Models of Evolving Meta Ecosystems (MEMEs) that can accommodate multiple species; continue adaptive responses experiments for longer-lived biota such as fish and willows; enroll fourth cohort of students/journalists; hold fifth EVOME symposium.
6	Complete synthesis of individual models; Complete graduate studies for the first cohort. Assess the research, education and outreach goals across the Institute.

Dissemination

The results of the EVOME Institute will be disseminated to multiple audiences in a variety of formats.

1. Scientific Community Engagement: Our EVOME website will provide in-depth information on science and provide new opportunities for new faculty and students. To encourage interactions among a broad range of scientists, we will host four webcast Colloquia each year that feature invited speakers. We will also hold an annual EVOME Science Meeting which will rotate among institutions and be open to other scientists, the public and journalists to facilitate participation from beyond EVOME. Faculty and students will participate broadly in traditional scientific meetings including organizing special meeting sessions and larger symposia.

2. Community Outreach. To improve communication about the integration of multiple levels of biological organization that influence landscape function, we will create a first-of-its-kind program in which professional journalists, students, and researchers work together to enhance each other's communication skills. The power of interdisciplinary research will be to scientific and lay audiences through print (newspaper and magazine stories), radio interviews, videos and a variety of social media (Bluesky, blog posts on the EVOME website, etc.)