

Long Term Ecological Research Network: A Vision and Roadmap for the Next Decade (2026–2035)

Toward 50 years of understanding the changing life-support systems of our planet

To effectively manage ecosystems, we need to understand the mechanisms that govern their behavior. Collaborating across a wide variety of terrestrial, marine, and aquatic ecosystems, the NSF-funded Long Term Ecological Research Network conducts experiments, maintains observational datasets, and develops models vital to maintaining food security, biodiversity, and ecosystem health.

ENABLER A

Strategic partnerships across sectors and networks

ENABLER B

Next-generation tools for information gathering, analysis, and synthesis (incl. AI)

ENABLER C

Expanded opportunities for a new generation of ecologists



STRATEGIC PRIORITY 1

Leverage long-term research across biomes to understand and compare the pace, drivers, and mechanisms of ecological change

GOAL A — CROSS-SITE SYNTHESIS

Promote synthesis of long-duration data among sites to reveal generalizable processes or sources of context-dependent patterns

- Increase efficiency and scope of hypothesis-driven synthesis to uncover general ecological principles
- Accelerate data collection and cross-site use via exchange of knowledge, methods, and emerging technologies (incl. AI)

GOAL B — COORDINATED EXPERIMENTS

Facilitate coordinated cross-system long-term mechanistic experiments to identify common drivers and context-dependency

- Leverage existing experiments with similar designs to synthesize mechanisms of change
- Assess potential for new cross-site experiments to test generalizable mechanisms



STRATEGIC PRIORITY 2

Understand how ecosystems will respond to rapidly changing drivers, including conditions not previously encountered

GOAL A — FORECASTING "NO-ANALOG" FUTURES

Integrate mechanisms and multi-decadal data with modeling and scenarios to advance the science of forecasting

- Assemble updated site histories and visualizations of long-term variation (incl. Indigenous knowledge)
- Extend mechanistic knowledge to forecast responses to no-analog conditions
- Develop a community of AI practitioners for modeling and forecasting non-analog futures

GOAL B — EVOLUTIONARY MECHANISMS

Improve consideration of evolutionary mechanisms in interpretation of LTER data and design of experiments

- Integrate evolutionary mechanisms into ecological and ecosystem-scale studies through deliberate synthesis and collaboration



STRATEGIC PRIORITY 3

Expand partnerships to enhance the use of long-term ecological science in managing environmental resilience

GOAL A — NETWORK-LEVEL PARTNERSHIPS

Amplify the societal impact of LTER science through partnerships with users of LTER science and data

- Identify regional, national, and international partners with mutual benefits and shared environmental objectives
- Clarify pathways toward Network-level partnerships; align public communications

GOAL B — SITE-LEVEL CAPACITY

Build LTER sites' capacity to establish and steward effective partnerships with users of science and data

- Identify existing partnerships with mutually beneficial outcomes and characterize elements of success
- Hold workshops with engagement experts; maintain regular resource-sharing among site personnel



STRATEGIC PRIORITY 4

Cultivate generations of collaborative scientists and educators grounded in long-term, interdisciplinary, site-based research

GOAL A — CAREER GROWTH AT ALL STAGES

Support career advancement and growth of scientists from all career stages

- Provide orientation, communication, and leadership opportunities across career stages
- Build capacity for team science via workshops in computing, AI, mentoring, and collaboration (incl. SSECR course)
- Foster broader career paths in academic, public, and private sectors through partnerships

GOAL B — UNDERGRADS & K-16 EDUCATORS

Build scientific literacy and engagement through authentic research experiences, data, and networks

- Develop cross-site professional development for undergraduate research cohorts