

Chapter 16

Arts and Humanities Efforts in the US Long-Term Ecological Research (LTER) Network: Understanding Perceived Values and Challenges

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Abstract Calls for interdisciplinary approaches to environmental problem-solving are common across the biophysical and social sciences. Recently, some of these collaborations have incorporated the creative arts and humanities, including projects across the 24 sites of the US Long-term Ecological Research (LTER) network. A substantial body of artistic and written work has been produced by LTER-affiliated sites. However, there has been no systematic analysis of this work. We used a cross-site, social scientific analysis to understand the extent and nature of arts and humanities inquiry in the LTER network and to assess perceptions about the values and challenges associated with it. We found that 19 of the 24 LTER sites agree or strongly agree that arts and humanities inquiry is important and relevant for the sites. Perceived values of this work include its goodness in and of itself, as well as its ability to foster outreach and public involvement and to inspire creative thinking. Contrarily, participants identified funding, available labor, and available expertise as limiting factors in the growth of arts and humanities inquiry in the LTER network. Respondents highlighted themes relevant to the relationship between ecological science and ethics, including participants' willingness to accept fostering empathy, an identified value of arts and humanities inquiry, as pertinent to LTER network goals and research on some level. This ethical potential of arts and humanities inquiry in the LTER network provides an opportunity to bridge ecological research with arts and humanities inquiry in ways that are meaningful for Earth stewardship.

Keywords Empathy • Ethics • Ecology • Interdisciplinary • Intrinsic value • Place-based

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16.1 Background

Calls for interdisciplinary approaches to environmental problem-solving are common across the biophysical and social sciences (Lubchenco 1998; Klein 2004; Nisbet et al. 2010; Sörlin 2012). Recently, some of these collaborations have included the creative arts and humanities. The US National Science Foundation (NSF) sponsored an extended art-science workshop at San Francisco's Exploratorium and a joint workshop with the National Endowment for the Arts to develop a national agenda for art-science collaboration (Malina 2011; Harrell and Harrell n.d.). Agencies and institutions as varied as the United States Geological Survey, the Joint Fire Sciences Program, the European Organization for Nuclear Research (CERN), the European Science Foundation, and the NSF-funded Long-Term Ecological Research (LTER) network are inviting artists and humanities scholars to participate at their sites and, on occasion, in their research.

16.2 Arts and Humanities in the US LTER Network

The LTER network has made a commitment to a "culture of collaboration" (Collins et al. 2007; Carpenter et al. 2007). While this initiative specifically targets social science inquiry, the interdisciplinary focus creates space for other disciplines as well. The twenty-four sites of the US Long Term Ecological Research (LTER)¹ network represent an array of biomes, from conifer forests to grasslands, tundra to coral reefs. Goals of the network include:

the study of phenomena over long periods of time [and] significant integrative, cross-site, network-wide research....[to] provide the scientific community, policy makers, and society with the knowledge and predictive understanding necessary to conserve, protect, and manage the nation's ecosystems, their biodiversity, and the services they provide. (<http://www.lternet.edu/network/>)

The LTER network conducts ecological research at broad spatial and temporal scales that contributes to understanding, conservation, protection, and management across ecosystems.

The first documented arts and humanities interactions in the LTER network were writer's residencies in the H.J. Andrews Experimental Forest in 2002, hosted by the Spring Creek Project for Ideas, Nature, and the Written Word at Oregon State University. Several sites have since developed arts and humanities programs, including Harvard Forest in Massachusetts, Bonanza Creek in Alaska, and North Temperate Lakes in Wisconsin. In 2010 these sites and others joined to form Ecological Reflections, an informal collection of venues that host science and art interactions (<http://www.ecologicalreflections.com/>). A substantial body of artistic

¹In this chapter, the Long Term Ecological Research (LTER) network refers to the network of 24 sites funded by the US National Science Foundation (NSF) in the United States of America.

and written work has been produced by affiliated LTER sites, examples of which have been displayed at: NSF headquarters in Washington DC in 2013; the 2012 Ecological Society of America meeting in Portland, Oregon; the 2012 LTER All-Scientists Meeting in Estes Park, Colorado; and in galleries across the country, as well as published in *Orion* and *Terrain.org*.

16.3 Survey

To date, however, there has been no systematic analysis of the arts and humanities work emerging across the LTER network. Therefore we have employed a cross-site, social scientific analysis to understand the extent and nature of this work and to assess perceptions about the values and challenges associated with it. In May 2013 we received a grant from the LTER Network Office to explore three guiding questions:

1. What kind of arts and humanities inquiry exists across the Network and where is it taking place?
2. What is the perceived value of this work?
3. What are the perceived challenges to maintaining or further developing arts and humanities inquiry across the LTER Network?

In August 2013 we sent all 24 LTER Principal Investigators a Qualtrics online survey (<http://www.qualtrics.com/>), and encouraged them to use the personnel at their site to respond. The instrument consisted of 14 Likert-scale, draggable bar, and optional short answer questions. It took the respondents between 5 and 25 min to complete. Our response rate was 100 %.

16.3.1 *What Kind of Arts and Humanities Work Exists Across the Network and Where Is It Taking Place?*

Through anecdotal evidence, we assumed that perhaps 50 % of the 24 LTER sites had hosted some kind of arts and humanities inquiry. When we asked participants how their site engaged with arts and humanities inquiry—*Not at all*, *Sporadically*, *Consistently*—only three sites answered *Not at all*. Already the survey was revealing (Fig. 16.1).

Twenty-one of 24 sites have engaged with arts and humanities inquiry in some way. Six sites reported hosting this type of interdisciplinary inquiry consistently, including: (i) a long-running writers-in-residence program at the H.J. Andrews Experimental Forest in Oregon, (ii) an ongoing Arts and Ecology research experience for undergraduates (REU) program at Sevilleta LTER in New Mexico, (iii) Art and Ecology workshops for public school art teachers and an artist-in-residence

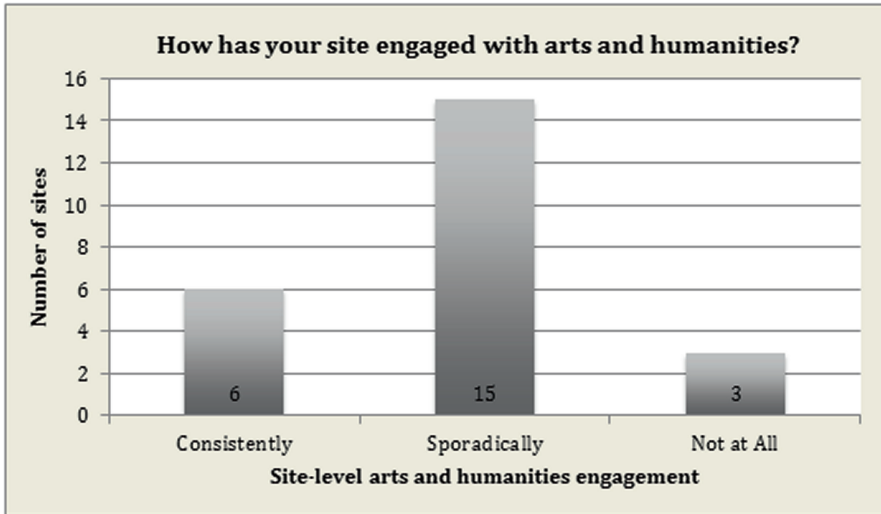


Fig. 16.1 Level of site participation with arts and humanities efforts

program at Virginia Coastal LTER, and (iv) a yearly visual and performing arts exhibit connected to Bonanza Creek LTER in Fairbanks, Alaska. Though they did not describe their programs in the survey, the other two sites that identified themselves as hosting consistent arts and humanities inquiry were (v) Baltimore Ecosystem Study LTER, where they host an artist-in-residence program and visiting artist field trips through their BES Art and Science Integration Program (BES-ASIP) and (vi) Harvard Forest LTER, where they also host an artist-in-residence program and ongoing historical research, as well as house the Fischer Museum.

We also asked respondents about the types of work their sites have hosted (Fig. 16.2). We provided lists of visual, literary, and performing art genres and offered *Other* for categories we might have missed. The most prevalent genres were: painting (15 sites), photography (10 sites), and literary prose (8 sites). Respondents also wrote-in: observational drawing, ephemeral art/meditation, electronic visual arts, participatory art/digital art, and legend/myth.

The general nature of the survey precluded some nuance in the data and this flaw suggests a potential challenge in cross-network approaches to fostering arts and humanities inquiry in the future. In an open comments section at the end of the survey one respondent wrote: “One problem with this survey ... is that it mixes too many different types of scholarship, art and humanities. There is no way to broadly articulate answers to the questions above when painting, poetry, photography, film and history are all merged.” The function, intent, impact, and audience of arts and humanities work varies across genres and individual participants. As sites nurture specific projects, there will be opportunities to ask how these diverse approaches can come together to tell a connected story across landscapes, similar to the way cross-site science aims to do.

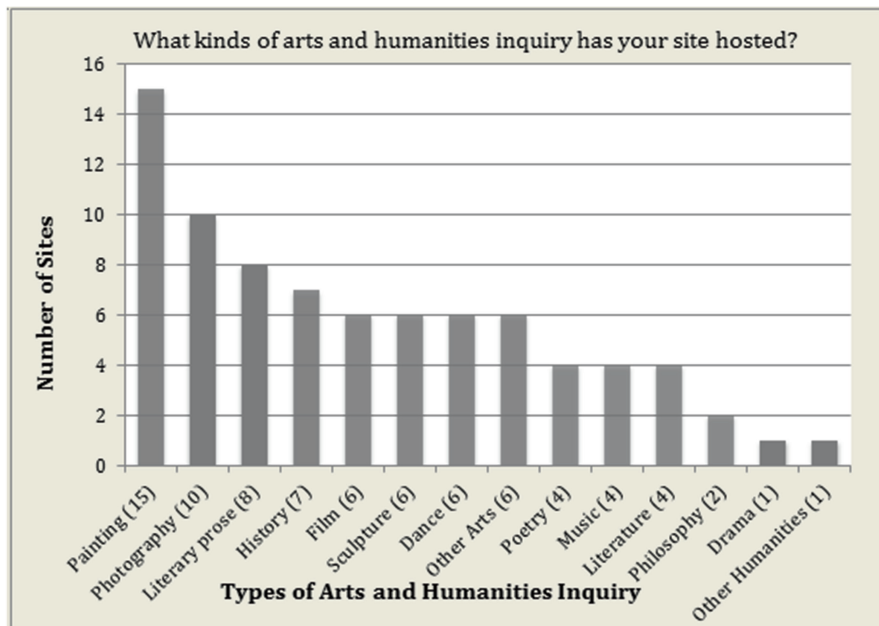


Fig. 16.2 Description of site engagement with arts and humanities inquiry by genre

In our survey, we were also interested in how participants perceive the relevance of arts and humanities inquiry within the LTER network. To answer this question, we asked participants to respond to the following statement: Arts and humanities inquiry is relevant to and important for LTER sites (Fig. 16.3).

Nineteen of the 24 sites agree or strongly agree that arts and humanities inquiry is important and relevant for the sites. No site disagrees.

16.3.2 What Is the Perceived Value of This Work?

We used a draggable bar question, which allows respondents to rank statements between 0 and 100, to understand the relative importance of a series of potential values for arts and humanities inquiry (Fig. 16.4). This question type is useful because it is interactive and allows for relatively easy ranking of multiple items. While research on the response consistency between this and other question types is somewhat mixed (Downes-Le Guin et al. 2012), we found it a worthwhile tool to observe trends across the field of responses. To facilitate analysis, we grouped results in a 7-category Likert-style format (Figs. 16.5, 16.6, 16.7 and 16.8).²

²We implemented the Likert conversion to facilitate our analysis. Therefore the scale was not available for participants during their survey experience.

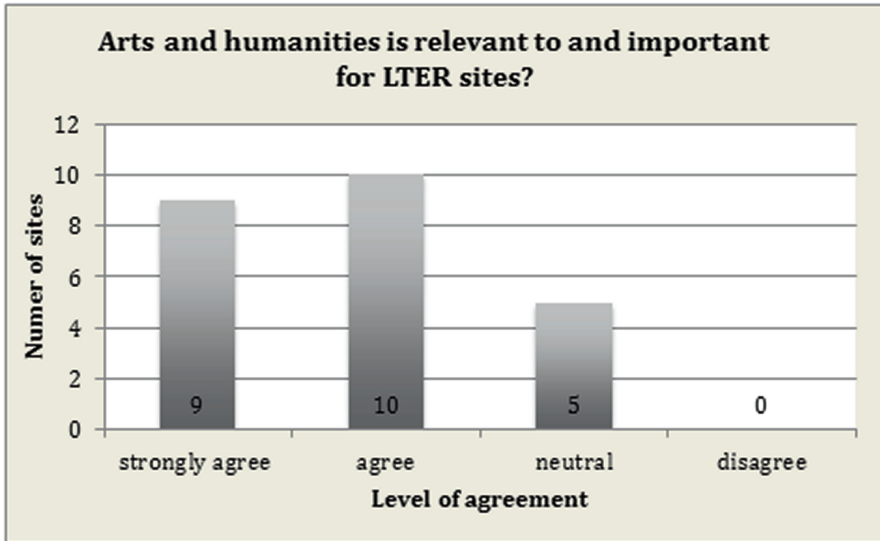


Fig. 16.3 Perceived value of arts and humanities inquiry for LTER sites

As illustrated in Fig. 16.7, respondents perceive arts and humanities inquiry to be valuable. Among the 13 values defined in the questionnaire,³ three proposed values were ranked $\geq 80\%$ by 14 of the 24 respondents. These values included: (1) *Arts and humanities inquiry fosters outreach and public involvement*, (2) *Is good in and of itself*, and (3) *Inspires creative thinking*. Arts and humanities inquiry is also valued because it: (4) *Provides opportunities for education* and (5) *Broadens our understanding of the natural world*. Half the respondents rated these five responses $\geq 80\%$. There were twice as many responses in the top tier of $\geq 80\%$ relative value than in the lowest tier of responses $< 20\%$ relative value.

The three least valuable perceived attributes of arts and humanities inquiry are its ability to: (1) *Play a role on grants*, (2) *Stimulate collaboration*, and (3) *Enhance site science in important ways*. Eight or more respondents rated these responses $\leq 20\%$ importance. A number of other values were close behind, including: (4) *Contributes to environmental problem-solving*, (5) *Enables interdisciplinary scholarship*, and (6) *Stimulates empathy*. Six or more respondents ranked all six of these proposed values $\leq 20\%$ relative importance.

To demonstrate whether arts and humanities inquiry actually facilitates these outcomes would require additional research. However, the perception is that the value of arts and humanities inquiry lies more in fostering education, under-

³Proposed values provided on the survey were determined by the researchers with consultation from several colleagues and then refined during survey development and pilot testing.

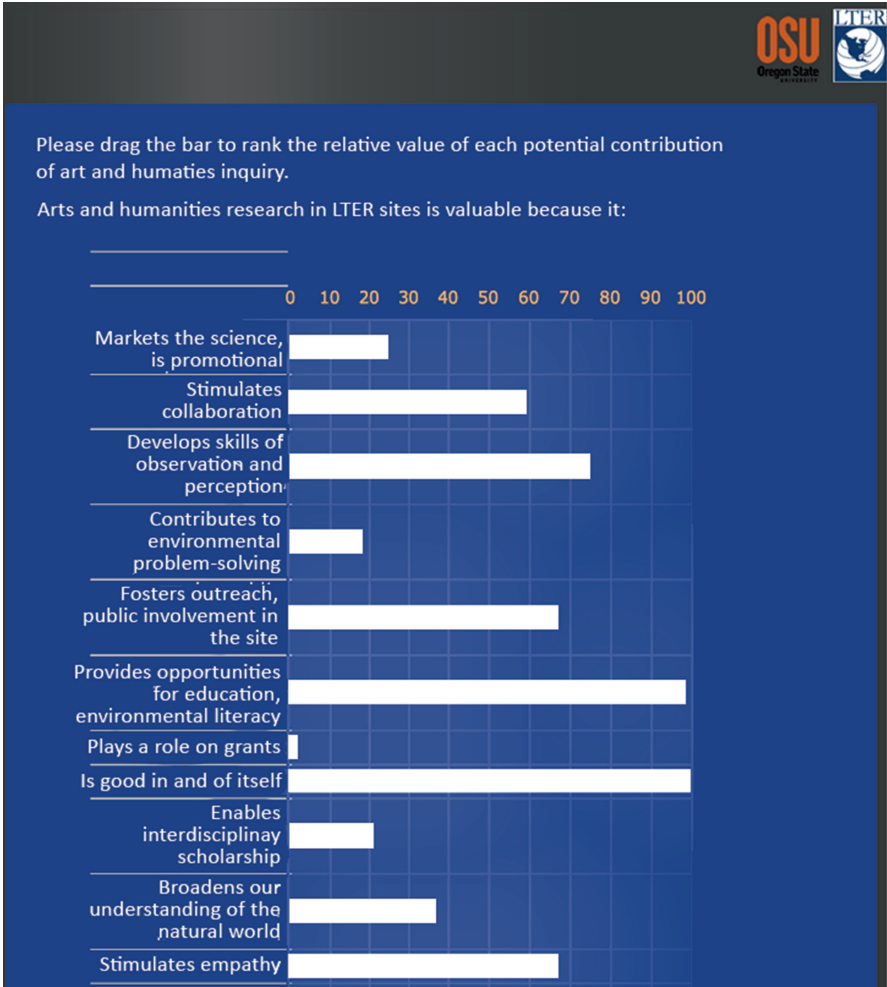


Fig. 16.4 Example of a draggable bar question

standing, and outreach than it does in enabling more traditional scientific metrics of grant-funding, collaboration, and problem-solving. Stimulating empathy stands outside these broad categories. Not only does it fall in the middle of all received responses, but its relevance to ethics—especially within a question about values—is particularly interesting, as is the relationship between participant response to empathy here and to a related question later in the survey, discussed below.

0%	Definitely Disagree
1-19%	Strongly Disagree
20-39%	Disagree
40-59%	Neutral
60-79%	Agree
80-99%	Strongly agree
100%	Definitely agree

Fig. 16.5 Likert conversion of draggable bar response values

Arts and humanities research in LTER sites is valuable because it:	
1	Markets the science, is promotional
2	Stimulates collaboration
3	Develops skills of observation and perception
4	Contributes to environmental problem-solving
5	Fosters outreach, public involvement in the site
6	Provides opportunities for education, environmental literacy
7	Plays a role on grants
8	Is good in and of itself
9	Enables interdisciplinary scholarship
10	Broadens our understanding of the natural world
11	Stimulates empathy
12	Enhances our science in important ways
13	Inspires creative thinking

Fig. 16.6 Provided responses for perceived value of arts and humanities research in LTER sites

16.3.3 *What Are the Perceived Challenges to Maintaining or Further Developing Arts and Humanities Inquiry Across the LTER Network?*

In addition to understanding the perceived value of arts and humanities inquiry, we also wanted to know about perceived challenges. Toward this end, using a draggable bar question we asked respondents to rank eleven provided challenges that may impact the integration of arts and humanities inquiry in LTER sites⁴; we also offered an *Other* category for challenges we did not anticipate (Fig. 16.9).

⁴The list of proposed challenges were determined by the researchers and refined during survey development and pilot testing.

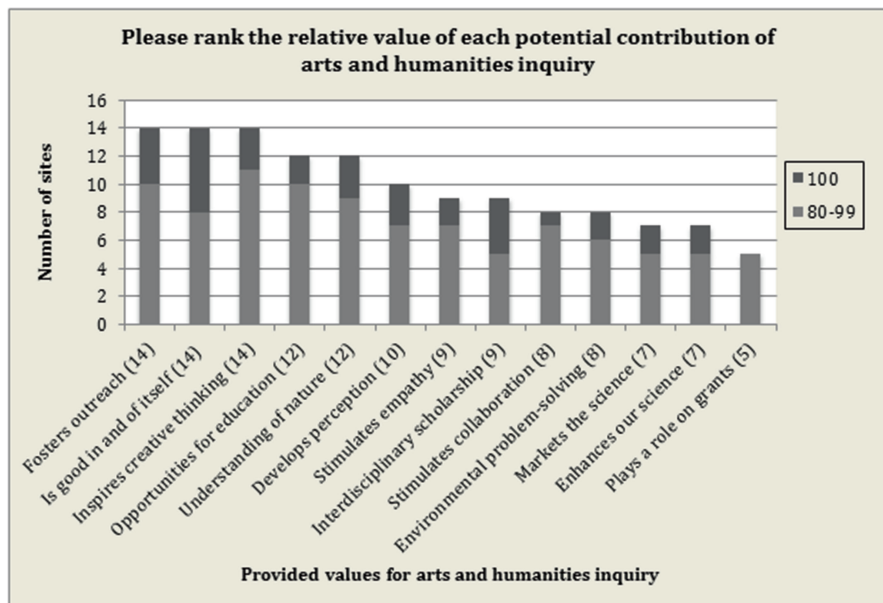


Fig. 16.7 Perceived value responses ranked >80 % relative value

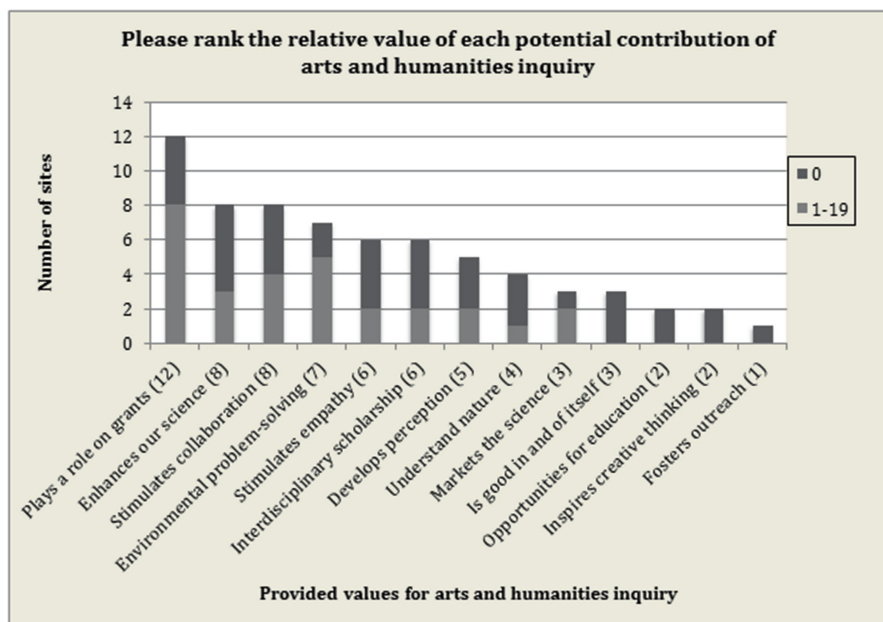


Fig. 16.8 Perceived value responses ranked <20 % relative value

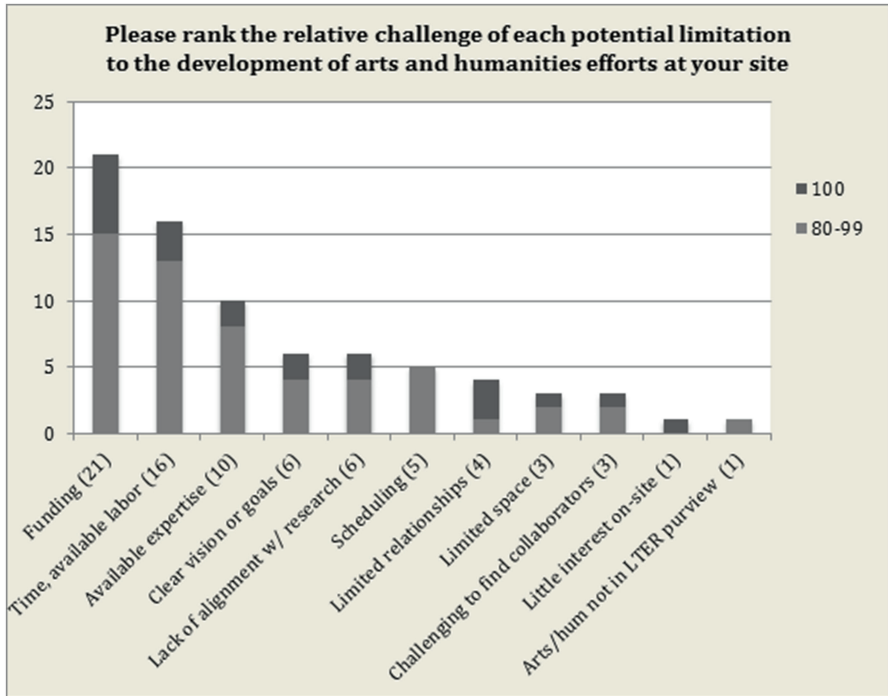


Fig. 16.9 Perceived challenge responses ranked >80 % relative value

Participants consistently ranked three challenges—*Funding*, *Time or Available Labor*, and *Available Expertise*—much higher than the other responses. We expected these responses to top the list, both because LTER sites are grant-funded and research requires input, including money and labor, and also because these are standard responses to limitations in academic settings. This result, though, is important, because with the right resources, these perceived hurdles could also be addressable.

Challenges seem to fall into three general categories: practical, logistical, and ideological. Practical challenges include funding, available labor, and expertise; these kinds of challenges primarily involve external resources. Logistical challenges include internal resources and procedure, like site space and scheduling. Both these categories of challenges present obstacles that are potentially surmountable. Grants exist, experts are available, schedules and appointments can be restructured. Ideological challenges, however, are more difficult to address. If sites are just not interested in this work, then the work has little future. Only two sites ranked the ideological challenge “Do not view arts and humanities within the purview of LTER sites” with a relative value $\geq 80\%$. This particular challenge ranked lowest of all 11 responses. Therefore, the majority of LTER sites perceive the challenges presented by arts and humanities inquiry to be primarily practical and logistical.

Only one participant answered *Other*, but ranked it at 91 %, therefore it deserves mention. The respondent wrote that arts and humanities inquiry does not: “Match with mission as defined by university administration,” suggesting that universities themselves might stand in the way of these kinds of broad interdisciplinary collaborations. This statement raises a crucial question: If this work is not done at universities, then where might it be done? The amount of freedom sites have to nurture projects may be limited by constraints outside their control, including university administration, LTER grant protocol, network research agendas, or the research foci of their site. Welcoming arts and humanities scholars to implement independent projects is a different proposition than diverting resources to support this inquiry, and some of the sites do not believe they have the freedom to do the latter.

These challenges were echoed in an open comments section at the end of the survey. We received written responses from 17 of the 24 participants, nearly all of whom think that arts and humanities inquiry in the LTER Network is a good idea. But a number of recurring themes illuminate why the future development of arts and humanities inquiry in the LTER Network will require more than just the belief in a good idea.

The most consistent refrain in the open comments pertained to funding: “If funds were available, we could strengthen collaborations with visiting and local artists,” wrote one site. Another explained: “We would like to curate and present this work at ... the national level but funds are non-existent.” A third emphasized that they would be interested in this work “only if it pays for itself.” These responses, coupled with an equally consistent refrain about a lack of labor, parallel responses from the survey. A remote site explained: their limited arts and humanities engagement as due to “extreme constraints on space, time, and effort that we can devote to ANY activity.” The demands of current workloads lead to “sporadic rather than sustained” efforts. One site offered that they would be interested in this work if it “does not lead to further diffusion of our already too-diffuse efforts.”

Participants also discussed the absence of a “clear vision or goals,” which was tied as the fourth highest ranking challenge on the survey. Some sites have broad ideas about program expansion or project development but lack vision or expertise. One site has “interest in taking that next step and doing work that is truly synthetic, though it’s not clear to any of us what that means, looks like, or what would facilitate that kind of work.” Another repeats this sentiment: “At the site level there is interest, but we could strongly benefit from guidance/leadership from those with greater experience and a clearer vision of what role the humanities can actually play in research beyond appeal to the senses.” Several sites are just initiating engagement, while others are “in the process of thinking these important issues through right now” or “have started a working group.” There is forward motion, but the common direction is undeveloped.

Another hurdle identified in the open comments section is a lack of relationships with artists or humanists, which did not rank highly on the survey, tying with “limited space” for third to last of the provided challenges. “We have reached out to artists/humanists with varied results,” one site shares. Another explains that they are “grappling a bit with ... finding the right relationships. There are a lot of artists

working on urban and environmental issues in our ecosystem. The trick for us is to how to engage them in our work—what is in it for them when they appear to be doing quite well on their own.” This feedback loop between the art and the science, and a clear picture of how they might inform each other, is a persistent theme that would benefit from further thought. “We have sporadically tried to connect with artists/humanists with variable success” one site explains. “Distance is a problem, but also conceptual barriers on both sides as to what the inherent value and or intent is of the effort is.” Both physical and ideological distance can present a barrier. But sites appear to realize the potential benefit of these relationships for their understanding of their particular site. One site shares that there is a “rich history of art involving nature which we would like to connect to.”

Despite these challenges, participants were enthusiastic about the development of arts and humanities inquiry. Several sites expressed energy for a network-wide initiative to help with momentum and direction, and a number of sites described current project- and relationship-building. Our “program is developing rapidly with tremendous interest and participation from the community,” writes one site. Others are “establishing an artist-in-residence program,” collaborating with regional colleges to do work “involving ecology, music and visual arts,” “Plan[ning] to expand current Art and Ecology workshops....[, and] adding a Nature Writing class this winter.” A number of sites plan to nurture current projects, while others intend to develop new work by seeking research opportunities, adding genres, or developing programming. This momentum creates opportunities for research on the impact and effectiveness of this work, potential collaborations between artists and scientists, and participation with the LTER network by wider and more diverse audiences.

16.4 Relevance to LTER Goals and Mission

If arts and humanities inquiry is consistent with established LTER network goals, then demonstrating its relevance and value gets easier, and so might addressing some of the logistical and practical challenges. In a draggable bar question, we provided participants a list of 12 responses related to the goals and mission of the LTER network: six (*Understanding, Synthesis, Information, Legacies, Education, Outreach*) taken directly from the “LTER Goals” on the LTER network website (LTER Goals n.d.), three (*Conservation, Communication, Environmental Impact*) using language from the “LTER Network Vision and Mission Statements” (LTER Network Vision and Mission Statements n.d.), and three (*Relationship Building, Human Dimensions, Long-term Ecological Research*) written to reflect the LTER network’s commitment to place-based, long-term research (Wattchow and Brown 2011; Billick and Price 2010; Farnum et al. 2005; Kurdryavtsev et al. 2012; Cross 2001) (Fig. 16.10).

Similar to the earlier question about perceived value, respondents associated arts and humanities inquiry most closely with (1) *Outreach* and (2) *Communication*, followed by (3) *Relationship Building*, (4) *Human Dimensions*, and (5) *Education*

Please rank the relative value of each potential contribution of arts and humanities inquiry to LTER goals. Arts and humanities research contributes to or enables:	
Understanding	To understand a diverse array of ecosystems at multiple spatial and temporal scales
Synthesis	To create general knowledge through long-term interdisciplinary research, synthesis of information, and development of theory
Information	To inform the LTER and broader scientific community by creating well-designed and well-documented databases
Legacies	To create a legacy of well-designed and documented long-term observation, experiments, and archives of samples and specimens for future generations
Education	To promote training, teaching, and learning about long-term ecological research and the Earth's ecosystems, and to educate a new generation of scientists
Outreach	To reach out to the broader scientific community, natural resource managers, policymakers, and the general public by providing decision support, information, recommendations and the knowledge and capability to address complex environmental challenges
Conservation	To protect or manage ecosystems, biodiversity, and environmental services
Communication	To foster dialogue between the scientific community, policy makers, and society
Environmental Impact	To contribute toward the advancement of the health, productivity, and welfare of the global environment
Relationship Building	To develop empathetic relationships with the natural world and stimulate inspiration, awe, and wonder
Long-Term Ecological Research	To participate in studies of ecological processes that play out at time scales spanning decades to centuries, provide a context to evaluate the nature and pace of ecological change, interpret its effects, and forecast the range of future biological responses to change
Human Dimensions	To understand human drivers on natural systems, investigate the impacts of ecosystems on humans, and explore human perceptions of and attitudes about the natural world

Fig. 16.10 Provided list of LTER goals, mission, and intellectual commitments

(Fig. 16.11). While we expected *Outreach*, *Communication*, and *Education* to rank highly, we were surprised by the high ranking of both (3) *Relationship Building* (“To develop empathetic relationships with the natural world and stimulate inspiration, awe, and wonder”) and (4) *Human Dimensions* (“To understand human drivers on natural systems, investigate the impacts of ecosystems on humans, and explore human perceptions of and attitudes about the natural world”). Both responses relate to human-nature relationships and they represent either new or implicit commitments of the LTER Network. However, eleven sites, nearly half, ranked these responses $\geq 80\%$ relative value.

Alternatively, the LTER goals and mission statements least relevant to arts and humanities inquiry, as identified by respondents, are (1) *Information* and (2) *Long-Term Ecological Research*. These are followed closely by (3) *Legacies*, (4) *Synthesis*, and (5) *Understanding* (Fig. 16.12). It is not clear if respondents see these responses as unrelated to arts and humanities inquiry, or whether instead they think LTER science already does these well, and therefore arts and humanities can (and should) contribute in different ways. It is clear that respondents identify a strong relationship between arts and humanities inquiry and several stated LTER goals, specifically *Outreach*, *Communication*, and *Education*, as well as to *Human Dimensions*

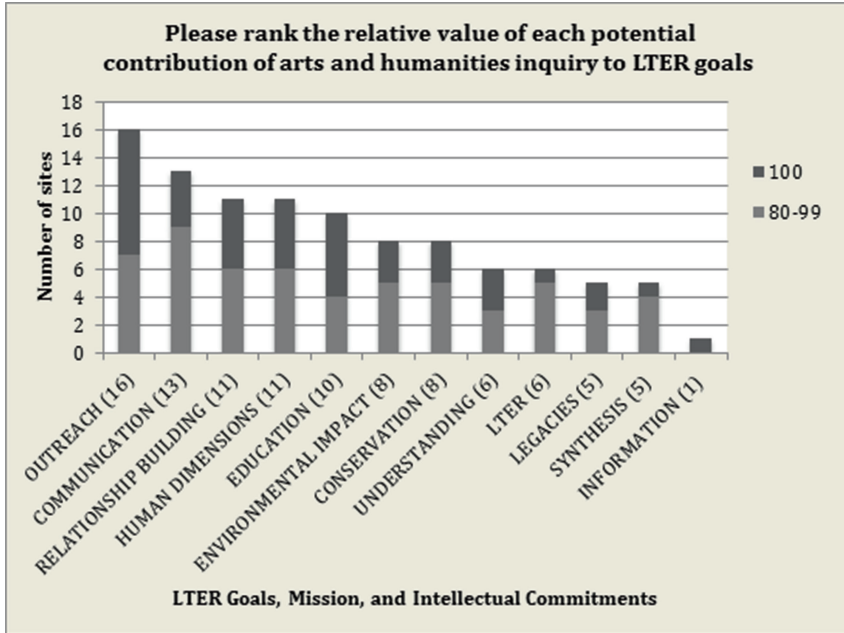


Fig. 16.11 Responses ranked >80 % relative value

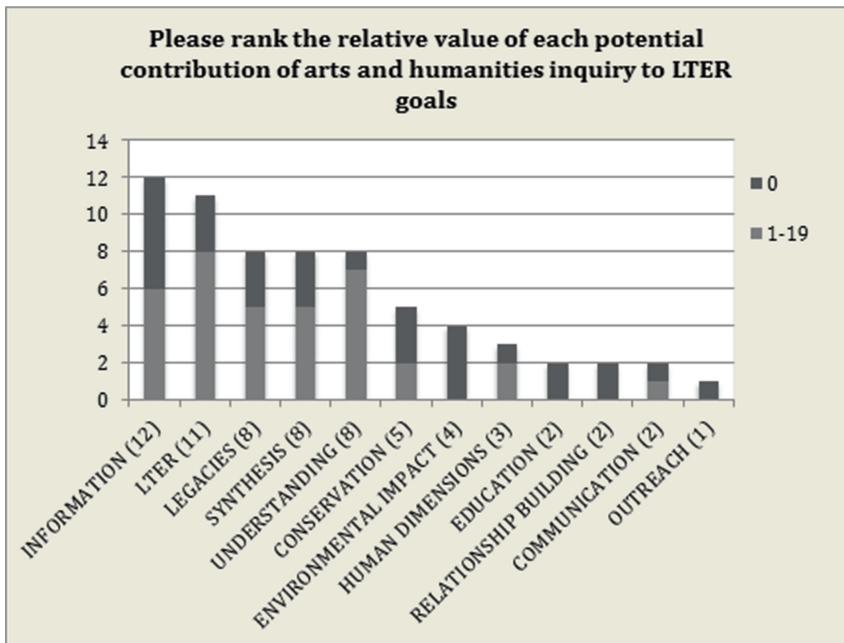


Fig. 16.12 Responses ranked <20 % relative value

and *Relationship Building*. All five of these responses were ranked $\geq 60\%$ relative value by 17 of 24 sites. This level of response seems to confirm that the arts and humanities are perceived as having a meaningful role in contributing to LTER goals and mission.

16.5 Discussion

The survey illuminated several themes relevant to the relationship between ecological science and ethics that will inform the future steps of this research. Two of the most interesting themes relate to ethically-relevant perceived values of arts and humanities inquiry.

More than half the participants, 14 of 24, ranked arts and humanities inquiry $\geq 80\%$ relative value because it *Is good in and of itself*, placing this response alongside *Fosters Outreach* and *Inspires Creative Thinking* as the three highest ranked perceived values of this work. This is a nod toward the intrinsic value of arts and humanities inquiry, distinct from its contributions to science, outreach, or environmental- or conservation problem-solving. Two of these three highest ranked values—*Is good in and of itself* and *Inspires creative thinking*—are intangible outcomes, thus not easily observed products that directly serve the science or the sites. As the LTER network guides future arts and humanities inquiry, there will be opportunities to discuss how these kinds of outcomes might be assessed or honored, so arts and humanities projects can best be nurtured in these ways and as integral elements of the LTER program.

Another ethically-relevant theme is the participants' willingness to accept fostering empathy, on some level, as relevant to LTER network goals and research. Common definitions of empathy (*Oxford, Merriam-Webster*) include an imaginative quality, emotion or feeling, understanding, awareness, sensitivity, experience, and an *other*, whose feelings or experience are shared. Thus empathy is described as an imaginative affective awareness of another's experience. This perspective, scholars argue (Hoffman 2000; de Waal 2006, 2009; Slote 2007) provides entrance to moral judgments and agency. When we inhabit another's point of view we are better able to understand the *other's* needs and act wisely on their behalf (see Aguirre Sala 2015 in this volume [Chap. 15]).

It is worth considering whether arts and humanities inquiry in the LTER network can (or should) be doing the work of ethical reflection and development, e.g. stimulating qualities like empathy or relationship-building with the natural world, or if this is perhaps a more desirable outcome than the consequentialist contributions of outreach or education, which relegate arts and humanities inquiry to serving as a means to an end in support of the science. These kinds of consequentialist roles might even be at odds with the strong support for the value of art and humanities inquiry as "good in and of itself."

If arts and humanities inquiry is perceived as valuable for its ability to stimulate empathy for the natural world, then it still functions as a means to an end, in this case empathetic relationships. There is nothing inherently wrong with serving as a means to an end, and this kind of indirect moral valuation does not necessarily contradict direct, or intrinsic, moral valuation, in this case valuing arts and humanities efforts in and of themselves. For example, one can value a family dog as a being worthy of direct moral consideration and also value it for the joy it brings to one's life as a pet. But the two kinds of valuation can conflict when decision-making requires prioritization. For example, if promoting arts and humanities inquiry as an educative tool requires restrictions on this work that preclude it from manifesting the characteristics we value as good in and of itself, then we must choose either to facilitate arts and humanities inquiry as a means to particular end, e.g. education, or to allow it to flourish in its own way.

Empathy as a means to an end might, however, enable a kind of middle ground. Empathetic awareness of the natural world is not an outcome that serves sites or the science directly, so the stakes are a little different than considering arts and humanities as valuable for other instrumental contributions, like education or outreach. The 'end' is a new ethical relationship with the natural world in general, not just with a specific place. This is quite different than an 'end' in the form of a product or a service. Therefore arts and humanities inquiry facilitated for the development of empathetic awareness would serve as a catalyst for sensitivity, imaginative understanding, and emotional engagement with the natural world, all of which might lead us to act wisely on its behalf. This approach seems compatible with a valuation of the work as good in and of itself.

Because empathy figures meaningfully in ecological sciences, arts, and both ecology and arts education literature, it might also provide a bridge to connect interdisciplinary approaches to long-term inquiry about place. In ecological literature empathy is often associated with natural history learning and knowledge. Scholars argue that good ecological research depends on a sensitivity to natural patterns and processes, an ability to listen to the natural world, careful description, and highly developed skills of observation. All of these qualities reflect an empathetic awareness of the natural world and are cultivated through natural history learning about place (Cooper 2000; Dayton and Sala 2001; Fleischner 2011).

The "ecology of place" (Billick and Price 2010), which is place-based long-term ecological research, much like that across the LTER network, relies on a similar appreciation of natural history. Esteemed ecologists (Pulliam and Waser 2010; Pecharsky et al. 2010; Paine et al. 2010; Krebs 2010; Louda and Higley 2010) are re-placing the value of natural history in contemporary ecological scientific progress by describing its integral role in the practical and theoretical success of their work. Understood alongside the relationship between natural history and empathy (Cooper 2000; Fleischner 2011; Dayton and Sala 2001), these ecologist-authors are affirming the importance of empathetic relationships in the facilitation of deep understanding of the natural world and in conservation practice. In essence, they are arguing for an emotional, as well as an intellectual, engagement with the natural world.

This element of emotional affiliation with the natural world connects scholarship in ecology with scholarship in the environmental arts and humanities. Emotional connections to the natural world can take many forms, but often they manifest as inspiration, awe, and wonder (Carson 1965; Moore 2005; Vucetich and Nelson 2013; Dayton and Sala 2001; Vucetich 2010), which is the language we included in our survey. This kind of relationship is accessible to all people, not just scholars, artists, or environmentalists (Dayton and Sala 2001), and it can be enabled by art (Curtis 2009). But art is capable of inspiring more than just warm and fuzzy feelings about nature.

Often when we think about emotional relationships with the natural world, we think of romantic vistas and childhood exploration. But right action on behalf of the natural world ought to be driven by the way the world is, not the way we wish it to be; the natural world is more complex than romantic notions of grandeur. Art can communicate this complexity. In addition to stimulating feelings of love and awe, “Art can also increase an emotional indignation about insufficient nature protection or can increase a cognitive interest in nature” (Reid et al. 2005 qtd. in Curtis 2009, p. 182). This cognitive interest alongside emotional investment is a catalyst for moral engagement with the natural world (Gruen 2009). Therefore art can prompt us to care about the natural world in ways that have the potential to inform action.

Based on these interconnections between awe and wonder, empathy, ecology, and the arts in the literature we included two different references to empathy on the survey. One, which we proposed as a potential value of arts and humanities inquiry, did not include a definition of empathy. We simply asked if respondents felt arts and humanities research in LTER sites is valuable because it: *Stimulates Empathy*. The second included a definition of empathy and was proposed as an LTER goal. We asked respondents if arts and humanities research contributes to or enables *Relationship Building: To develop empathetic relationships with the natural world and stimulate inspiration, awe, and wonder*. The first reference ranked in the middle tier of responses; the second reference ranked in the top tier of responses.

We were encouraged that participants did not reject notions of empathy outright. In fact, in the first question, 9 of 24 participants ranked the reference to empathy $\geq 80\%$ relative value, and in the second question 11 of 24 participants ranked the reference to empathy $\geq 80\%$ relative value. Of course, we are not sure what empathy meant to the participants in this context or how they considered it in relation to their work as ecologists. Does their acceptance of the concept suggest they see their work as related to empathy? Or do their answers suggest they see empathy within the realm of LTER goals and research? If they do consider empathy as an acceptable, even operational, element of the LTER program, do they think arts and humanities might facilitate this kind of relationship with the natural world in ways LTER science is not yet doing?

Vucetich and Nelson (2013, p. 19) describe empathy as, “A vivid knowledge-based imagination of another’s circumstance, situation, or perspective.” This is “a capacity that depends on objective, empirical knowledge...about the conditions and capacities of others.” In many ways this definition describes the domain of ecology. The connection between ecology and empathy, filtered through the relationship

between empathy and ethics (Gruen 2009; Moore and Nelson 2010), clarifies the bond between ecological research and ethics. If arts and humanities inquiry can enhance the empathetic quality of ecological work for scientists and also inspire empathetic awareness for audiences, then arts and humanities inquiry is both contributing to the work of ecology and doing work ecologists deem important. Teasing out these connections and perhaps even demonstrating them empirically could further illuminate the role of arts and humanities within the LTER Network. The open reception the respondents gave empathy on the survey, likely an unfamiliar metric for environmental inquiry, invites further work.

16.6 Implications for an Earth Stewardship Initiative

The relationship between empathy, ethics, and ecology—facilitated by long-term observation of and commitment to place—underlies the goals of the Earth Stewardship Initiative. For Earth stewardship is the effort to “respectfully cohabitate with” the planet with the goal “to maintain not only human welfare but the welfare of the whole community of life” (Rozzi et al. 2012, p. 234). This notion of community building and maintenance is central to contemporary environmental ethics (Leopold 1949; Moore 2004; Goralnik and Nelson 2011) and lies at the heart of the kind of empathetic relationship-building we discuss here.

As well, the goal of Earth stewardship is “to enhance ecosystem resilience and human well-being” (Earth Stewardship) and “to rapidly reduce anthropogenic damage to the biosphere” (Power and Chapin 2009). Certainly, such a stewardship effort demands a great deal of ecological information about the world, and across multiple scales. Ecologists and ecological networks can contribute to Earth stewardship by learning how ecosystems work and how the resilience of those ecosystems is likely to be altered in the near future. But information alone cannot deliver Earth stewardship. Stewardship is “bigger than ecology” (Power and Chapin 2009). It is as much an ethic as it is about science—a decision about how we *ought* to live in relationship to the world around us.

In order to “profoundly reorient our endeavors” we must “radically redefine our relationship with the planet” (Power and Chapin 2009, p. 399). In short, “Earth stewardship requires a new ethic of environmental citizenship” (Earth Stewardship). This kind of commitment to relationship demands work, for relationships are reciprocal, contextual, and require virtues like humility, empathy, and patience. The pursuit of Earth stewardship, therefore, logically requires a fusion of the biophysical and social sciences with the humanities (most notably with ethics). The history of ecological science is populated with leaders who opened the door to ethics, who recognized “the choices faced by human society are ethical ones, for which the ecological sciences provide essential knowledge to inform responsible societal decisions” (Rozzi et al. 2012, p. 233). As noted above, empathy is a moral framework amendable to ecology. As well, the LTER network appears amenable to the

empathy framework, and therefore to at least some kind of ethical exploration of our relationship with and obligations to the natural world. Findings from our survey indicate that the important and “inevitable fusion” (to quote Aldo Leopold) of ecology and ethics – a pillar of Earth stewardship – might be realized within the LTER network.

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