

# Multi-Scale Archaeological Monitoring: Stressors, Indicators and Triggers

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## The GRSLE Project

*Integrating natural and social sciences to promote ecological and economic sustainability through transdisciplinary research, education, and stewardship initiatives in northwestern Wyoming's Greater Yellowstone Ecosystem.*



Natural resource monitoring is customarily undertaken as a series of independent assessments of temporal condition change. Heritage resources assessment is more often based on single observations with little systematic monitoring. The GRSLE project emphasizes combining heritage resource monitoring (with multiple observations) with documentation of other basic system properties allows for a more comprehensive, coupled view of both past and contemporary landscape processes.

- Anthropogenic Stressors**
  - hunters, hikers, & herders (etc)
  - trails and trailheads
  - cabins
  - roads
  - range projects (erosion, fences, water tanks)
  - camping locations & outfitter camps
  - livestock
- Biotic Stressors**
  - game trails
  - rodent burrows
  - roots
- Abiotic Stressors**
  - erosion/deposition
  - mass wasting
  - fire
  - climate change
  - cryogenic processes

In designing protocols to monitor archaeological site condition, actions of biological and physical processes and human activities (including resource managers) need to be assessed. Of these three domains of stressors, the anthropogenic can be the most damaging, but also have a greater potential for effectively mitigated.

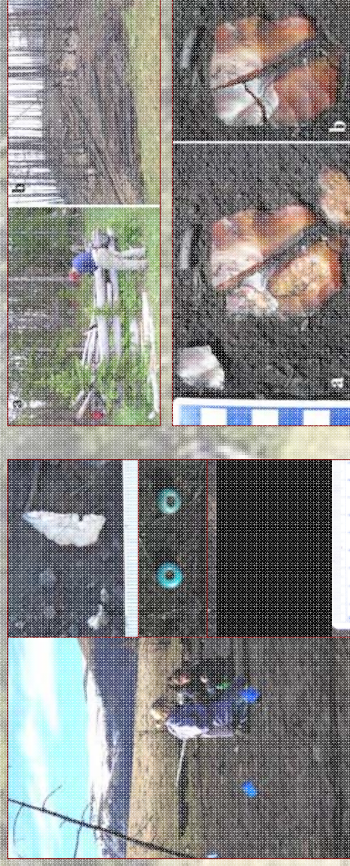
## Anthropogenic Stressors



## Biotic Stressors

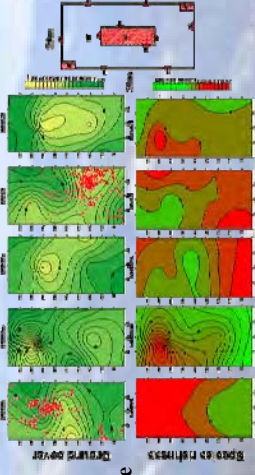


## Abiotic Stressors

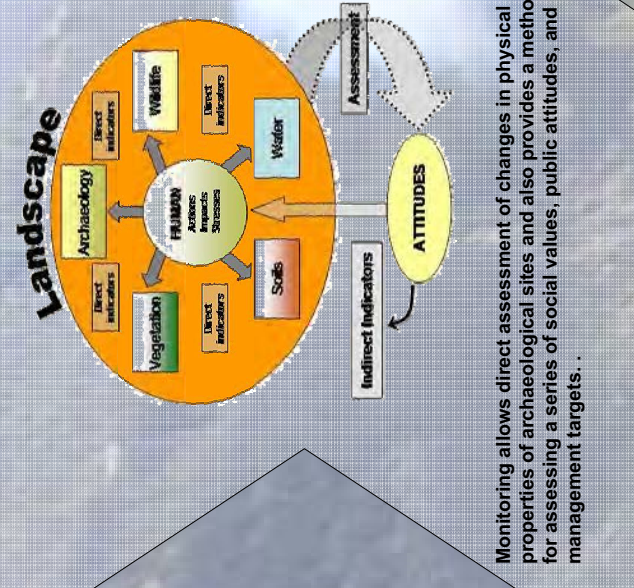
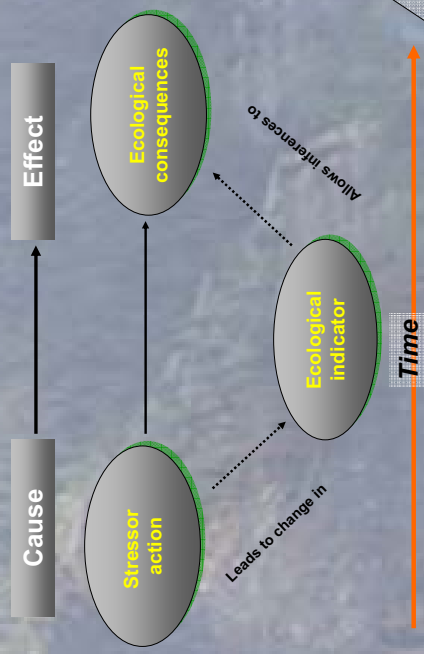


## ABSTRACT

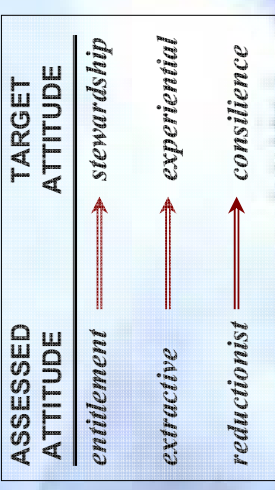
Monitoring is a component of most natural resources management programs and numerous protocols have been developed, stressors and indicators identified, and responses to change in condition developed. On the other hand, conceptual and methodological approaches to monitoring heritage resource condition, such as prehistoric archaeological sites, are very weakly articulated. Beginning in 2002, survey and site documentation within the eastern margins of the Greater Yellowstone Ecosystem (Shoshone National Forest) have developed a series of baseline data sets to help monitor changes in heritage resource condition. As initially conceived, the project focused on evaluating anthropogenically-induced changes such as artifact collection, or unintentional site damage from campsites, trails, and range improvement projects. However, the relevance of collection of baseline datasets on heritage resources using frameworks comparable with monitoring natural resources was highlighted when large portions of the project area burned in the Little Venus wildland fire in June-August 2006. Using multi-scale, nested sample plots provides opportunities to monitor and evaluate either short-term dramatic events, such as floods or fires, as well as longer-term processes such as vegetation changes or alteration of human landuse patterns. In addition to basic, in-field monitoring of resource condition, this approach also provides clear examples of the necessity for conceptualizing landscape condition as being the result of a complex, integrated series of anthropogenic, biotic, and abiotic processes.



## An archaeological "indicator species"



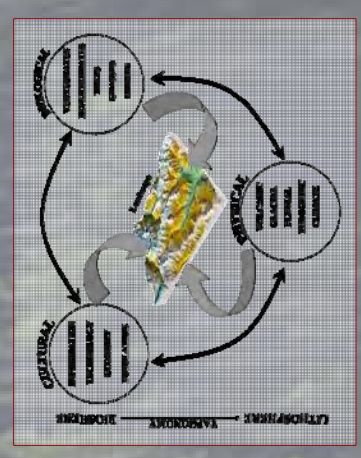
Designing and implementing effective monitoring programs for archaeological resources entails working not only with human, biotic and abiotic actions, but also with fundamental public attitudes about the nature and degree of human interaction with other components of landscape evolution and structure. Common perceptions of artifact collection can be argued to be indicative of other more general attitudes to resources. Such attitudes are extremely important to consider in terms of all other resource classes. Key damaging attitudes are: 1) a feeling of personal entitlement, 2) a basic extractive view of landscape use, 3) and ideas that "natural" and "cultural" management issues are distinct, separate, independent domains that can each be managed in near isolation of the other. A goal of our work is to foster education to help shift these to less damaging views.



What responses should come into play when significant anthropologically induced changes in the archaeological record are documented?

- removal of the archaeological resource?
- alternative, adaptive management?

A basic indicator of changing conditions of archaeological sites can be provided by monitoring surface artifact frequencies. In order to evaluate causes of differences in artifact frequencies, information must be collected on both biotic factors (e.g., vegetation ground cover, game animal grazing intensity, or rodent activity) and abiotic influences (e.g., rates of erosion or deposition, or changes produced by wildland fires). In general, these processes are most likely to produce small scale changes in artifact visibility and positioning, but may not cause the more severe consequences produced by human artifact collection, which often focuses on only a limited number of artifact classes and removes them entirely and irreversibly alter an important landscape component.



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