# *Recreation Ecology, Heritage Resource Management, and Environmental Monitoring: The GRSLE Project, Northwestern Wyoming*

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## THE GRSLE

Beginning in 2001, field teams from Colorado State University have undertaken research along the Greybull River Drainage in Northwestern Wyoming (Figure 1). The majority of this three-year project has been on the Shoshone National Forest, with much of it taking place in the Washakie Wilderness, which is a important part of the Greater Yellowstone ecosystem. Limited work has also been undertaken of BLM lands within the arid interior Big Horn Basin. While the central focus of the project is prehistoric archaeology, our ultimate goals are to information that may contribute to long-term social, economic, and ecological sustainability. Therefore, we've chosen the name Greybull River Sustainable Landscape Ecology (GRSLE) to express these broader concerns.

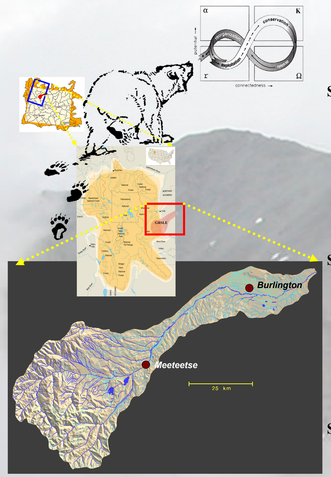


**FIGURE 1.** *Greybull River Drainage in north-western Wyoming.*

## TRIPLE S ARCHAEOLGY

The primary objectives of this project, are:

**S1.** To develop a better understanding of long-term human impacts with a unique landscape that has yet to have been heavily modified by 20th-21st century developments. Although the area has yet to receive heavy Euro American use, all indications are that recreational visitation and associated alteration of the archaeological landscape are on the verge of expanding rapidly. Success at this goal will aid in modeling options for ecosystem **sustainability.**

**S2.** To implement a coordinated program of K-12, local, regional, and national education and outreach in order to fulfill our research goals but also to meet professional responsibly to advocate for the appreciation, conservation, and protection of archaeological resources as important components of this fragile ecosystem. If successful, this will lead to a greater sense of local **stewardship** of the diverse sets of processes related to landscape systems.

**S3.** To build a regional perspective on human paleoecology in which multiple, tightly coupled data sets can be created within the constraints of limited funding and personnel. Achieving this goal will provide cost-effective **science** that yields solid baseline datasets, foundations for monitoring landscape change, and the potential to span many of the gaps that need to be closed between social and natural sciences in order to provide a unified approach to conservation of biological, heritage, and physical resources.

## LANDSCAPE TAPHONOMY

Our archaeological research program focuses on developing and implementing a concept of *Landscape Taphonomy* in which landscape is defined as resulting from *a complex, evolving, and integrated set of cultural, biological, climatological, chemical and geological processes*. Investigating landscape emphasizes research into tightly coupled, on-going placing contemporary human actions into analytical domains amenable for integration with the other processes. In this realm, archaeology provides an appropriate body of concepts and techniques for aspects of landscape formation. Using the classic definition of taphonomy as investigation *of biosphere processes transitioning into records preserved within the lithosphere,* archaeology also is in an appropriate disciplinary space to provide methodological and analytical tools for bridging studies of contemporary landscape processes to long-term perspectives (Figure 2).

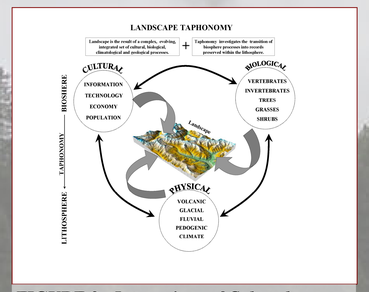


**FIGURE 2.** *Interactions of Cultural, Biological, and Physical Processes in the formation of Landscapes, and the taphonomic study of their formational histories.*

This model guides development of the GRSLE project in several ways:

- Landscapes are complex formational mosaics that cannot be seen exclusively as cultural, biological, or physical entities.
- Non-trivial landscape research, regardless of its ultimate goals – whether archaeology, geological, or biological – must incorporate aspects of each of the major contributory realms.
- Landscape properties are constantly in flux at multiple spatial and temporal scales and require continuous monitoring.
- Methods to research landscapes must be collaboratively developed with significant inputs from disciplines based in the social, biological, and physical sciences.

ACKNOWLEDGEMENTS: *Participants in the CSU Summer Field Class in Archaeology and dedicated volunteers have been have cheerfully helped us work out many of our concepts and methods outlined here. Allen Madril of the Shoshone National Forest and Mike Bies (BLM, Worland District) have provided invaluable assistance. CSU Summer Programs has provided support and the citizens of Meeteetse, Wyoming have welcomed the project into their community.*

## ABSTRACT

*Archaeology has a history of including an "applied" component. Usually, however, this applied archaeology has been in the rather narrowly defined realm of cultural resource management or sometimes even the more narrowly operationalized "salvage" activities. We offer examples of a broader applicability of archaeology as a discipline with a great deal to contribute to monitoring environmental status and trends, with a more central role in assessment of a wider array of both biotic and abiotic resources. Using examples from the Greybull River drainage in northwestern Wyoming, we argue that basic attributes needed to adequately monitor archaeological resources requires a range on non-archaeological data sets that are tightly coupled with observations on the archaeological record. For example, evaluation of archaeological site sensitivity to recreational impacts in Wilderness areas requires reliable information on ground surface visibility. Therefore, effective archaeological monitoring must be bundled with repeated assessments of vegetation cover, species diversity, and invasive species. As a first step in such a long-term, trans-disciplinary monitoring program, which is a fundamental stage in the development of any effective adaptive management plan, we have conducted survey and infield analysis focusing primarily on trail systems within the Shoshone National Forest, including backcountry survey in the Washakie wilderness. These baseline data are used as a springboard for discussion of archaeology's potential role as a "keystone discipline" in environmental monitoring and stewardship programs.*

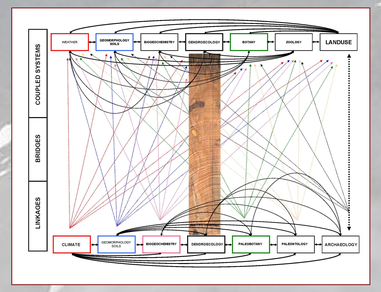


**FIGURE 3.** *Model of GRSLE research framework.* **Coupled systems** *are processes that must be studied in contemporary, dynamic ecological settings; Linked data are the connections inferred among paleoecological proxies;* **Bridges** *provide estimates for key values that are relevant to both the coupled and linked datasets – the primary bridging data to by used during 2004-2005 are dendroecological and geomorphology, but there are a multiplicity of other options.*

## COUPLING, LINKING AND BRIDGING

**COUPLING:** In order understand the operation of prehistoric systems, a basic understanding of coupled interactions within dynamic, contemporary systems is an appropriate starting point. It makes little sense to accept uncertainty derived from application of global scale process studies to the development of fine-grained local situations. Research in this observational domain puts interpretations of past systems states on a much firmer empirical base, and also has the potential of developing inferential insights, and research questions that are not intuitively obvious. Coupled systems studies are the common mode of investigation in ecological research.

**LINKING:** As both a conceptual and pragmatic distinction, we adopt a position that although coupled systems can be observed, documented, and modeled in contemporary setting, the complexity of such coupled processes make them somewhat inaccessible in paleoecological studies. Therefore, we refer to the search for diachronic patterning as seeking linked proxy measures that are in turn used to make inferences about past systems. Linked pattern studies are a common mode of investigation in paleoecological and archaeological research.

**BRIDGING:** The conceptual unpacking of coupled systems research from linked pattern studies has the potential for creating two methodologically disjunctive bodies of information, and contributing nothing to the broader, cross-disciplinary issues of understanding pattern in terms of process. In order to mitigate this possibility, we employ a number of empirical bridges to span the temporal gap between the complexity of the present and the opacity of the past. While a number of bridging data sets can eventually be brought on on-line (e.g., pollen profiles, spleotherm series, or paloesol studies), we have selected dendroecology and geomorphology as providing appropriate first planks to allow us to address issues of multi-generational scales of landscape along the Greybull river corridor.

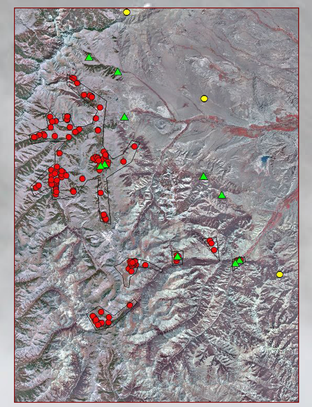

**FIGURE 4.** *Prehistoric archaeological sites along the Upper Greybull Drainages.*
*Yellow – previously recorded, non-forest*
*Green – previously recorded, forest*
*Red – GRSLE sites, forest*

## BACKCOUNTRY SURVEY & IMPACTS ASSESSMENT

Preliminary survey along the Greybull has emphasized investigation of areas thought to be most prone to direct impact by recreational uses (e.g., camping, hiking, fishing, etc) and to the indirect, but often more severe, impacts caused by artifact collection by often well-intentioned, curious recreational backcountry visitors. Therefore our focus has been on linear surveys centered on major trail and/or road systems into and through the area. In some areas, where trail survey indicated high densities of materials, larger, block survey areas have been examined (Figure 5).

Since one of our goals is to provide baseline date for monitoring human impacts to the drainage, we have employed a non-collection survey methodology with intensive in-field documentation protocols (Figure 6). During the three-season's fieldwork, we have recorded nearly 150 previously undocumented archaeological sites (N=148) along the Upper and Middle Greybull (Figure 4), and have gathered basic descriptive information on over 21,000 pieces of chipped stone. Of the new sites, 68% are in the Washakie Wilderness and most are at high elevations (mean site elevation = 2825 m).

Given our interest in landscape taphonomy, our surveys have also begun to document other linked data sets. Examples of botanical data collected in several Modified Whittaker sampling plots are shown in Figure 7.

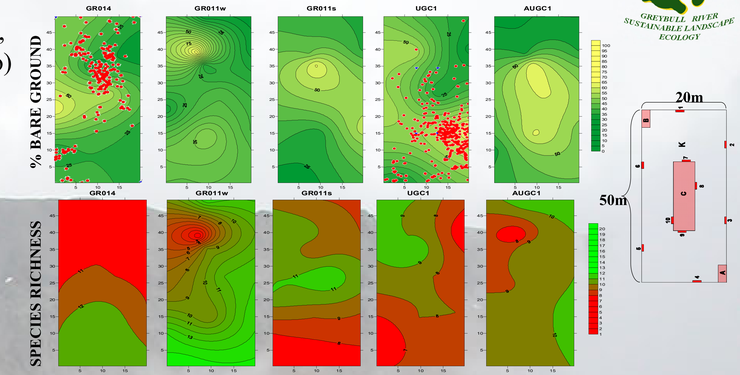


**FIGURE 7.** Data from 5 Modified-Whittaker plots documented on the Upper Greybull. In addition to the archaeological artifact distributions, ground cover, and species richness data illustrated here, each plot had attributes of species diversity, vegetation height, game and domestic animal pellet counts, and soils depths recorded. Prehistoric artifact distributions are shown for GRO14 and UGC1 plots only.

**FIGURE 5.** Survey in high mountain basin.

**FIGURE 6.** In-field analysis and non-collection survey.

## BUNDLING: $ AND DATA

A concern expressed by many of our colleagues when we've discussed this type of transdisciplinary archaeological survey, in which archaeological remains are not the exclusive focus of documentation, but rather as one of a suite of equally relevant data sets, deals with the costs in terms of both time and money. It has been our experience, however, that is a uniform, hierarchical sampling framework is employed, and multi-disciplinary field crews are assembled, that the overall cost per unit of information is not prohibitive. In fact, given that most of the costs involved in backcountry fieldwork revolve around logistics, the overall data-benefits of bundled sampling frames produces much more information per unit effort or cost than traditional, single discipline monitoring efforts (Figure 8). It should also be stressed that these bundled datasets are not just useful – they are essential to developing a realistic view of either the contemporary archaeological record or of past system dynamics.

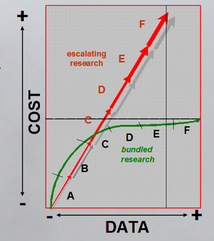


**FIGURE 8.** Bundled data collection yields both more, and more widely applicable data than single discipline resource monitoring.

## ARCHAEOLOGY AS KEYSTONE DISCIPLINE

Stakeholder attitudes about landscape use play a significant role in determining the actions taken when people are in the wilderness. The common techniques to monitor attitudes and to assess the effectiveness of policy and educational programs to modify attitudes use indirect indicators such as questionnaires and surveys. Archaeological approaches, which monitor physical effects of human actions provide more direct indicators for monitoring how attitudes and values play out in terms of physical alterations to components of the landscape.

Archaeological remains are direct manifestations of behavior – they represent attitudes materialized (Figure 9). For example, monitoring the condition of prehistoric heritage resources, which are susceptible to severe, irreparable damage by even a casual visitor with a more "extractive" versus more "experiential" attitudes toward a wilderness or back country setting, can provide valuable insights into programs designed to provide information on the potential impacts of a variety of human actions.

Bundled field research can position archaeology as a key player monitoring multiple resource states and evaluating impacts across a variety of fields. The unique set of methodological and conceptual demands of archaeological research sets the stage for development of approaches that can help integrate the socio-economic, ecological, and physical sciences. This positions the discipline at an unique domain space in helping break down disciplinary boundaries in order to conduct effective ecological monitoring, to help develop frameworks for investigating long-term consequences of policy decisions, and to provide value, empirically-based transdisciplinary insights for alternative futures analyses.

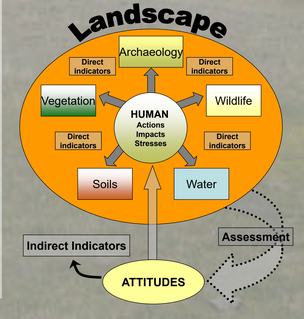


**FIGURE 9.** Incorporation of archaeological resources into framework of recreational ecology provides opportunities to simultaneously monitor a variety of

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