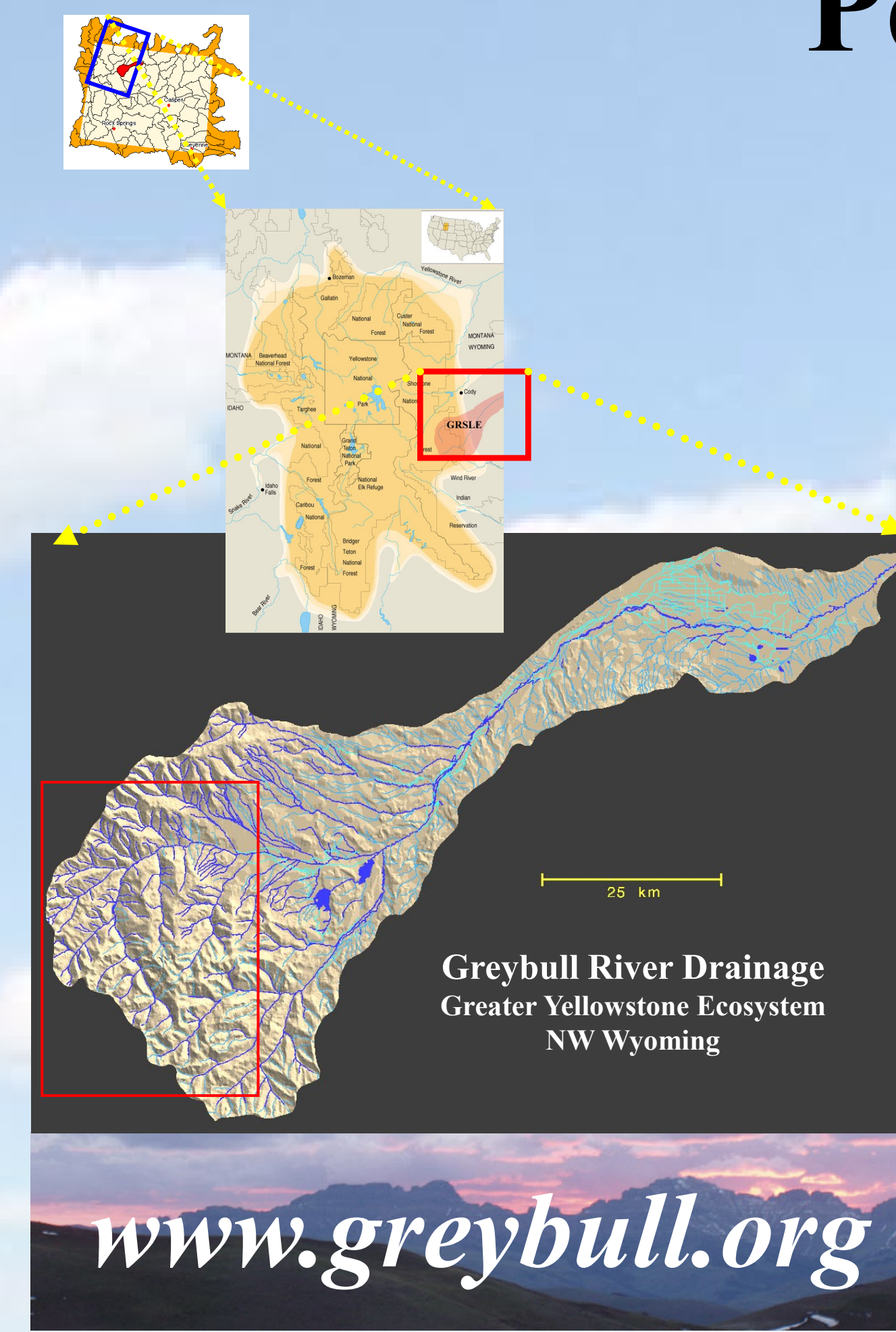


Peopling the Wilderness: Bridging the Social and Natural Science Divide

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Figure 1. Inventory and monitoring of Wilderness settings in the Greater Yellowstone Ecosystem documents the long term interplay of physical, biological, and cultural processes. Copies of this poster and additional information on the project are available at
www.greybull.org



ABSTRACT
Protection of wilderness settings from severe human impacts is a fundamental component of many programs for conservation of biophysical systems. Effective management of such areas requires information on both long-term (century to millennial scale) and contemporary human impacts (annual to decadal scale). Archaeological research in the Washakie Wilderness and surrounding backcountry in Wyoming's Greater Yellowstone Ecosystem provides unambiguous evidence that these areas, although marginally used today, have been used extensively in the past. Indeed, the classic perception of these montane settings as remote, isolated, and nearly inaccessible stands in sharp contrast to the prehistoric archaeological record. The abundance of archaeological remains suggests instead that since the terminal Pleistocene, humans have been integral, active components of these ecosystems. Documenting this presence, however, introduces a series of issues that must be taken into consideration by adaptive management strategies. First, better information on how cultural and biophysical processes have interacted to produce today's wilderness settings is required. Second, once a long-term human presence in wilderness areas becomes part of the conceptual framework of wilderness management, methods to monitor the status of the heritage resources need to be developed and implemented in ways that are comparable and compatible with those used to assess the status of biophysical condition of wilderness. Finally, implementation of management and policy must simultaneously consider both the "natural" and "cultural" components of wilderness landscape. Since 2001, field studies by the Greybull River Sustainable Landscape Ecology (GRSLE) project in the Shoshone National Forest have begun to develop baseline data on archaeological evidence of long-term human use and begun to evaluate approaches for monitoring how contemporary recreational and management practices impact this unique contemporary record of past human/landscape interactions. Research that investigates human actions as significant factors in landscape development and that bridges traditional social and natural science disciplinary boundaries are described.



Figure 2. As intensity of prehistoric human use of high elevation, montane Wilderness settings is revealed, the need to integrate "natural" and "cultural" resource research strategies and management policy becomes clear. Traditional disciplinary divides must make way for transdisciplinary approaches to landscape scale processes.

Legislation in the United States has created nearly 428,000 km² of Wilderness Areas that are to be protected in "their natural condition" and in which humans are "a visitor who does not remain" (Public Law 88-577, 1964). By extension of this mandate, the more general perception of Wilderness Areas as being pristine landscapes in which the long-term, natural condition has always been limited use and therefore limited humanly produced impacts and with little evidence of human presence. This notion that wilderness is marginal to human actions today has had an unintended consequence of fostering concepts and promoting policy that stresses a dichotomy between "natural" and "cultural" landscape processes. The research reported here clearly highlights that today's wilderness area are the result of long-term interactions of cultural, biological, and physical processes and that each contributes to wilderness landscapes.

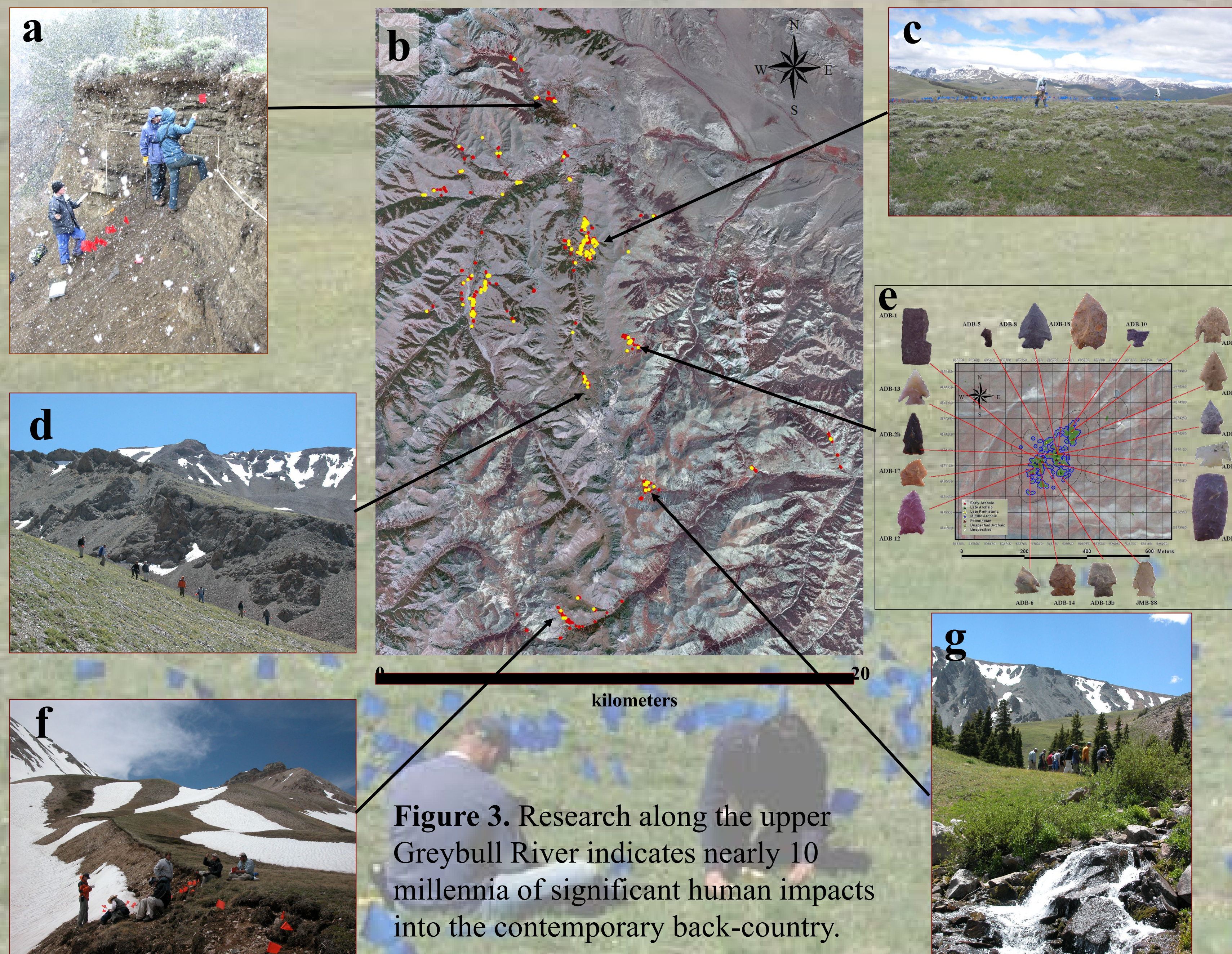


Figure 3. Research along the upper Greybull River indicates nearly 10 millennia of significant human impacts into the contemporary back-country.

Since 2002, archaeology field survey in the Washakie Wilderness, Shoshone National Forest (Figure 1) has recorded nearly 200 prehistoric sites with over 40,000 individual stone artifacts documented. These sites, which range in age from nearly 9000 to less than 500 years in age, provide unambiguous evidence that prior to Euro-American expansion, these remote mountains of northwestern Wyoming were used, and often apparently extensively, as part of widespread cultural landscapes. Results presented here focus on: 1) the need for systematic inventory of wilderness settings to provide basic information on prehistoric and contemporary landuse; 2) the necessity for developing effective methods for monitoring the cultural component of landscapes; and 3) integration of the results of scientific research into both adaptive management and public education programs.

WILDERNESS INVENTORY

Summary data on archaeological observations documented since 2002 are presented in Figure 3 and Table 1. Inventory of approximately 1.5% of the area shown in Figure 3b indicates an average surface density of prehistoric artifacts of 37/ha. This project represents the first systematic, multi-phase survey (Figure 3d, 3g) in the Washakie Wilderness. Before this project, lack of inventory data supported a notion of limited human use of these remote areas in the past that seemed to support a viewpoint that human actions had never been a significant component of landscape processes here. Artifacts have been recorded most often at elevations between 2700 and 2800 m, we also have evidence of use of the area at elevations over 3300 m. In addition to the nearly 1000 ha surveyed as part of block surveys (Figure 3d), we have examined almost another 50 ha as part of back county pack trail corridor survey (10m transect along 48 km of Forest Service trails). Diagnostic artifacts range in age from Late Paleoindian (terminal Pleistocene/early Holocene) to Late Prehistoric (Late Holocene). Evidence of human involvement in areas today seen as Wilderness is both ubiquitous and includes both surface (Figure 3e) and subsurface (Figure 3a) manifestations. Uses of the high country ranges from specialized hunting features and lithic raw material procurement locations (Figure 3f) to large-scale residential occupation sites, several of which seem to have been repeatedly visited for thousands of years (Figure 3e; site 48PA2874 at an elevation of 3100 m).

Table 1. Summary of 2002-2005 Survey Areas

SURVEY BLOCK	MEAN ELEVATION	AREA (ha)	CHIPPED STONE	ART/HA
Dollar Mountain	3250	90	2609	29
Gold Reef	3200	115	234	2
Haymaker Flats	2580	310	10686	34
Jack Creek Flats	2875	185	17887	97
Meadow Creek Basin	3100	90	1069	12
Piney Creek	2540	90	1178	13
Upper Francis Fork	3075	100	2629	26
TOTAL		980	36292	37

Recognition of the abundance of archaeological traces of prehistoric landuse generates a set of issues often not associated management of Wilderness setting – preservation of evidence of human presence. While there are a number of biological and physical process that are act as part of the natural, taphonomic modification processes that impact archaeological sites, since these are the uncontrolled aspect of a wilderness setting, they are of much less immediate concern than the immanent threat to heritage resources posed by either inadvertent (e.g., camping or trail erosion) or direct (e.g., artifact collection or excavations) threats. Along the Greybull River drainage, this potential for both indirect and indirect recreational impacts has been low through the 20th century. National and regional trends in backcountry use suggest that this limited recreational use is of limited duration. Therefore, we have begun to consider that recreational impacts on archaeological materials (heritage resources) require consideration in wilderness management decisions and as such are arguably should be considered under the general rubric of Recreation Ecology.

Recreation Ecology's 5th Dimension

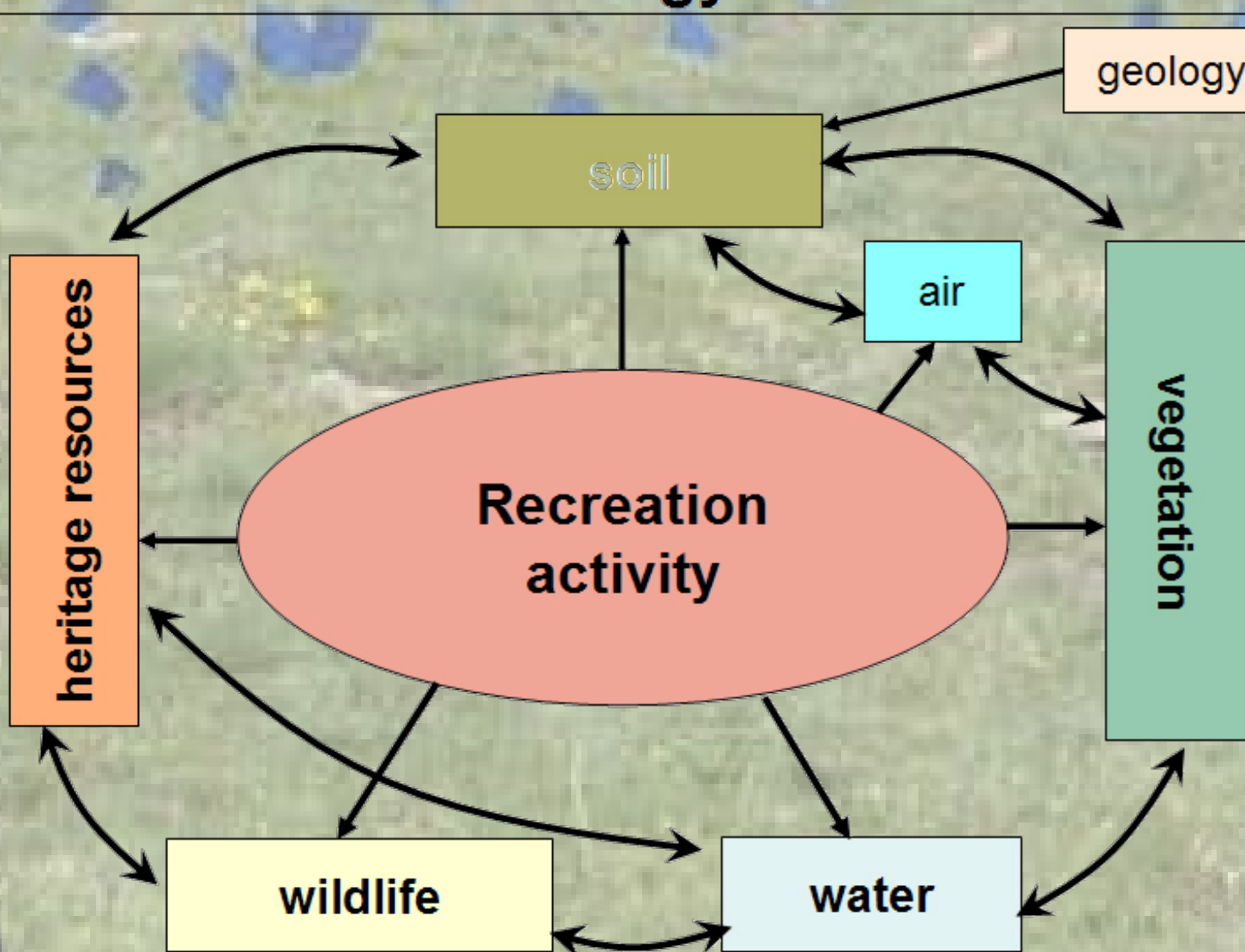


Figure 4. An initial step to integration of natural and social sciences is recognition that prehistoric human actions represent key components of landscapes.

As illustrated in Liddle's *Recreation Ecology* (1997) and as commonly practiced in the field, the impacts of contemporary human recreational use of managed natural areas usually entails concerns with four primary domains: vegetation, wildlife, soils, and water. However, as it becomes clear that human actions have played important roles in the long-terms ecological processes, it also becomes clear that the evidences if these past human actions represent a 5th dimension to be considered in the study of recreational impacts on a landscape (Figure 4). Within the context assessing contemporary human impacts on a range of Wilderness properties, archaeological field methods are also applied to the documentation of the material evidence of recreational activities. In addition to prehistoric materials, this project also records items such as trash scattered along trails, fire hearth locations at backcountry campsites, and other modifications to the biological and physical landscapes resulting from recent human activities (Figure 5).

INTEGRATED MONITORING

As the inventory process is completed, condition of resources require systematic monitoring. While this is common practice in the natural sciences, effective approaches for monitoring non-architectural archaeological resources are less well developed. An approach we have found useful is to examine heritage resources using sample plots similar to those used to monitor a variety of other landscape attributes (Figure 6a; Burger et al. 2002). Application of a nested sampling framework has been especially useful in providing baseline data on factors that influence archaeological site condition such as herbivore trampling (Figure 6b), where pellet counts are used as a proxy for trampling intensity) or vegetation cover in relation to archaeological artifact visibility (Figure 6c). A more focused approach to site monitoring relies on a program to assess the degree that artifacts most prone to removal (projectile points; Figure 3e) persist on the ground surface in relation to less "collectable" classes of prehistoric chipped stone debris (Burke et al. 2006). Removal of artifacts from prehistoric archaeological sites is arguably one of the most intensive forms of damage to heritage resources.

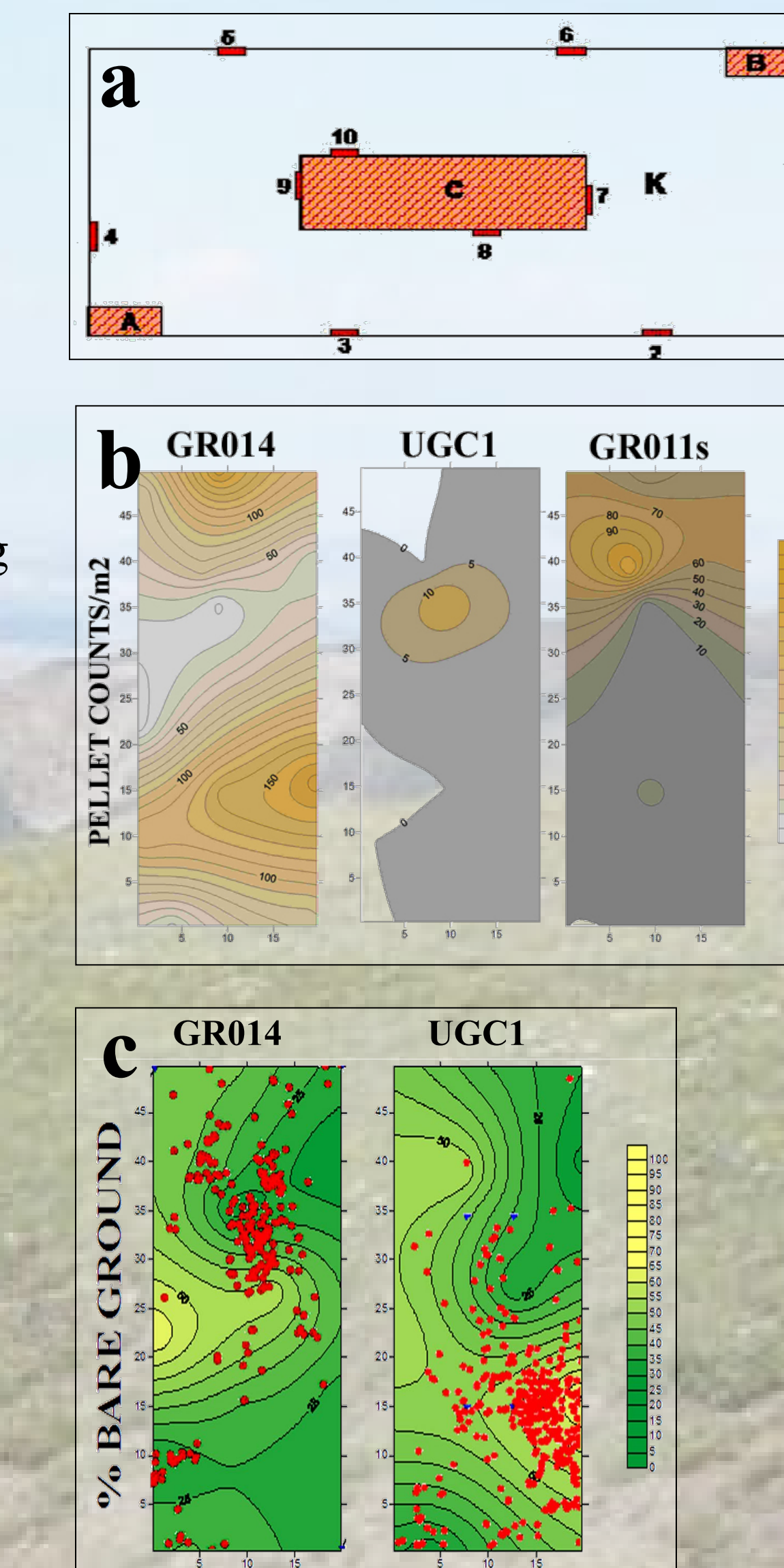


Figure 6. Use of Modified-Whittaker sample plots (a) to monitor a variety of conditions that influence archaeological site condition such as trampling (b) and vegetation cover (c).

TRANSDISCIPLINARY ADAPTIVE MANAGEMENT

Archaeological monitoring of contemporary human impacts to heritage resources using the integrated multi-disciplinary approach outlined above, has to potential to contribute data useful for helping monitor a number of other bio-physical processes (Figure 7). Perhaps an equally important consideration for adaptive management is that being able to monitor impacts of human use of wildernesses such as artifact collection, allows a more direct indicator of backcountry visitor attitudes that standard social science interview techniques. We suggest that documenting recreational artifact collection (or other modifications) represents direct indicators an "extractive" perspective on a wilderness experience which is fundamentally not compatible with an "experiential," leave-no-trace wilderness preservation approach. Degradation of heritage

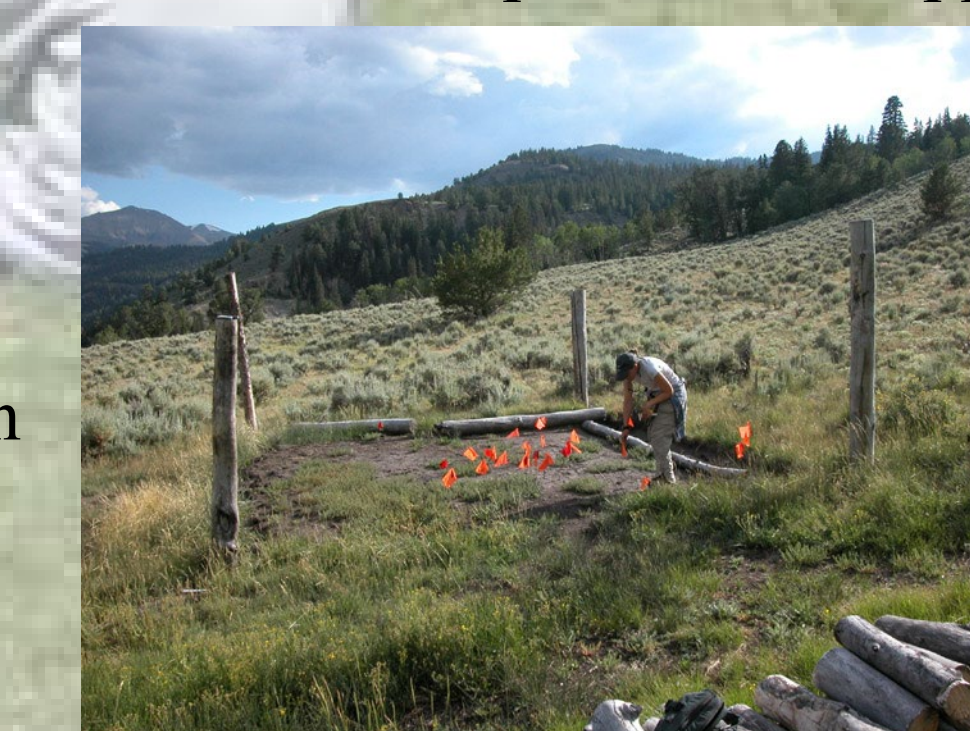


Figure 5. Archaeological documentation of recent landscape modifications to a Wilderness setting.

resources as a by product of recreational use of Wilderness areas can be one line of assessment that educational programs on ecological processes and preservation are in need of modification.

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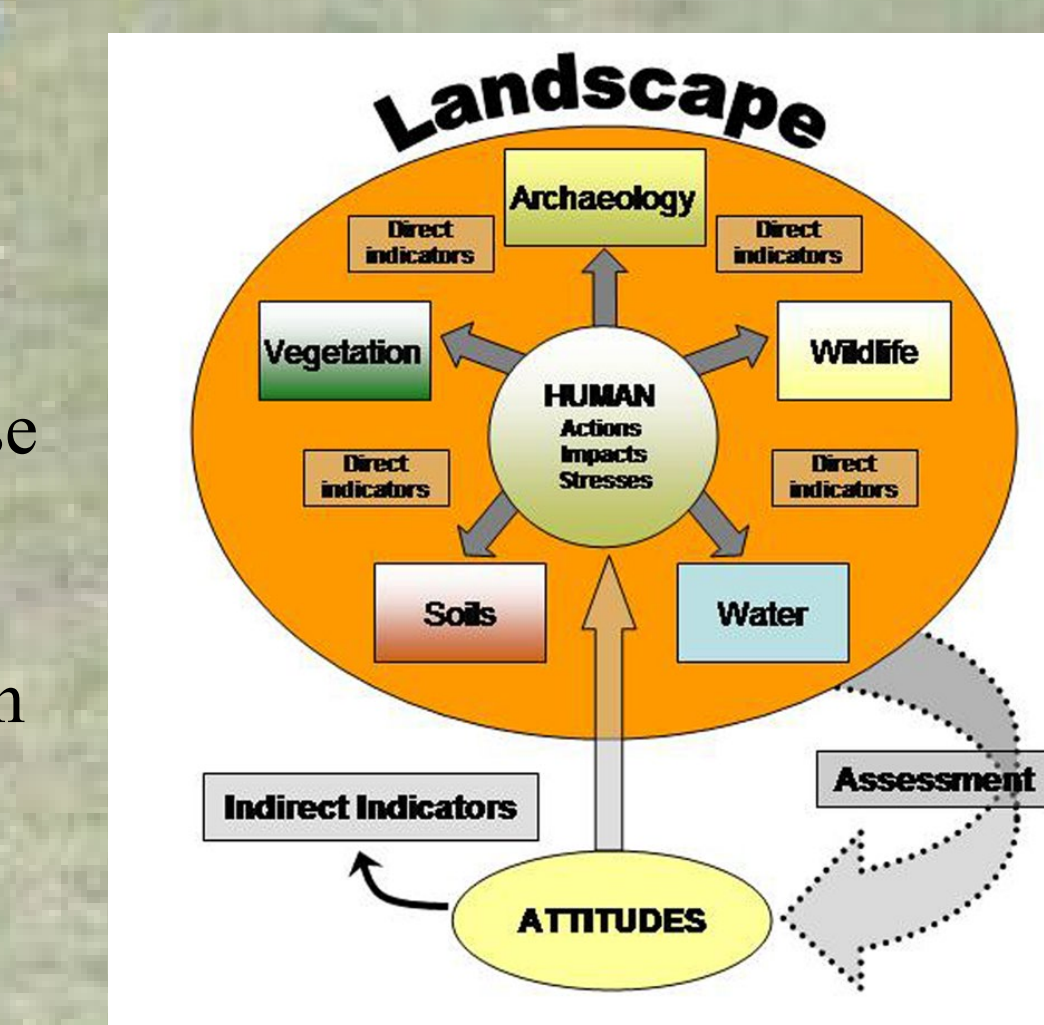


Figure 7. Integrated monitoring of archaeological resources can provide data on other landscape processes and social attitudes.