Field Work
Field collections were made in July 2009, in the Bighorn Basin, Wyoming, by graduate student Rosemary Bush. This work piggy-backed onto on-going NSF-funded research (McInerney PI) in the area. Collections included 162 plant macrofossil, tuff, and preserved soil/substrate samples from Maastrichtian age sediments (~71.8 million years ago) from Big Cedar Ridge (BCR) and 46 plant macrofossils and paleosols from the Paleocene-Eocene Thermal Maximum (PETM; ~55.8 million years ago) in the Cabin Fork area of the basin. All samples were identified, labeled, and wrapped on site in the field. The rock and fossil collections were brought back to the McInerney laboratory on NU campus for further sampling and analysis. After preparation and lipid extraction in the lab, substrate and tuff samples from BCR have yielded well-preserved n-alkane profiles. These n-alkanes can be used as biomarkers for terrestrial plants, and they may also serve as proxies for vegetational type and climate.

Undergraduate Training
Field and laboratory assistance were provided by NU undergraduate John Kapnick, whose work has developed into his own research project and senior honors thesis comparing biomarker lipids in modern ferns, collected from the Chicago Botanic Garden, with preserved lipids extracted from BCR substrates.

In addition, Rosemary Bush worked with NU undergraduates via the Science Engineering Research and Teaching Synthesis (SERTS) workshop program where she shared information about her research funded through this proposal with four non-science majors.

Proposals
Rosemary Bush submitted two graduate fellowship applications, one for DOE Office of Science Graduate Fellowship and the other for EPA Science to Achieve Results (STAR) Graduate Fellowship. Both fellowships are 3 years tuition, stipend and research funds. Although official notification is pending, and she has been asked not to share the results just yet, she has been awarded one of these prestigious fellowships. Both proposals are attached.

Conference presentation
Research on related work on modern plants formed the basis of an abstract and oral presentation at the Annual Meeting of the American Geophysical Union (December 2009, San Francisco). Work on modern plants is integral to interpreting ancient lipid signatures. Abstract and presentation are attached.

Advancing research in Energy and Sustainability
Collections supported by this grant are providing essential information on the response of past ecosystems to elevated greenhouse gases. Specifically, these samples enable assessment of the shifting importance of evergreen and deciduous species in response to past climate change. These empirical results will inform decision-making regarding mitigation of ecological impacts of modern climate change.