Available online at www.sciencedirect.com
ScienceDirect
Applied Geochemistry 22 (2007) 2225–2239
Applied Geochemistry
www.elsevier.com/locate/apgeochem

Lessons learned in remediation and restoration in the Oklahoma prairie: A review

Kerry L. Sublette [a,*], J. Bryan Tapp [a], J. Berton Fisher [a], Eleanor Jennings [a], Kathleen Duncan [b], Greg Thoma [c], Josh Brokaw [d], Tim Todd [e]

[a] *Center for Applied Biogeosciences, University of Tulsa, 600 S. College Avenue, Tulsa, OK 74104, United States*
[b] *Department of Botany and Microbiology, University of Oklahoma, 770 Van Vleet Oval, Norman, OK 73019, United States*
[c] *Department of Chemical Engineering, University of Tulsa, 3202 Bell Engineering Center, Fayetteville, AR 72701, United States*
[d] *School of Biological Sciences, Washington State University, Pullman, WA 99164, United States*
[e] *Department of Plant Pathology, Kansas State University, 4024 Throckmorton Plant Sciences Center Manhattan, KS 66506, United States*

Available online 22 May 2007

Abstract

For almost a decade the Tallgrass Prairie Preserve in Oklahoma has been used as a field laboratory for the investigation of aspects of the remediation and restoration of oil and brine spills. Objectives of this work have included: (1) simplification of the remediation process and lowering the cost of remediation; (2) the development of methods to accelerate or jump-start the restoration process; and (3) determining appropriate metrics for assessing the status of soil ecosystem recovery. This research has resulted in a number of lessons learned that will be presented here which can be exported to other exploration and production sites, especially sites located in sensitive ecosystems. Key observations have included the role of a fertilizer amendment in linking the remediation and restoration process at an oil-impacted site, the use of nematodes as ecological indicators in the restoration of oil- and brine-impacted sites, and the development of a two-stage process for remediation of brine impacted sites that does not include significant use of gypsum.
© 2007 Elsevier Ltd. All rights reserved.

1. Introduction

Since 1997, the authors have been engaged in a variety of projects in remediation and restoration of crude oil and brine spills in the Tallgrass Prairie Preserve (The Nature Conservancy) in northeastern Oklahoma (Fig. 1). The tallgrass prairie ecosystem in this area has never been plowed and has been used only for grazing and ranching purposes. As a result very few exotic plant species have been introduced in comparison to the other tallgrass prairie ecosystems in North America. Historically, grazing by bison and periodic fire have shaped and sustained the growth of these native grasses and prevented the encroachment of trees. Today, The Nature Conservancy (TNC) employs bison and cattle grazing as well as random burning to recreate a pre-settlement-type Great Plains prairie landscape in the preserve.

Located in a historic oil-producing area of Osage County, the Preserve is also home to over 100 producing oil wells that are operated through leases

* Corresponding author.
E-mail address: kerry-sublette@utulsa.edu (K.L. Sublette).

0883-2927/$ - see front matter © 2007 Elsevier Ltd. All rights reserved.
doi:10.1016/j.apgeochem.2007.04.011

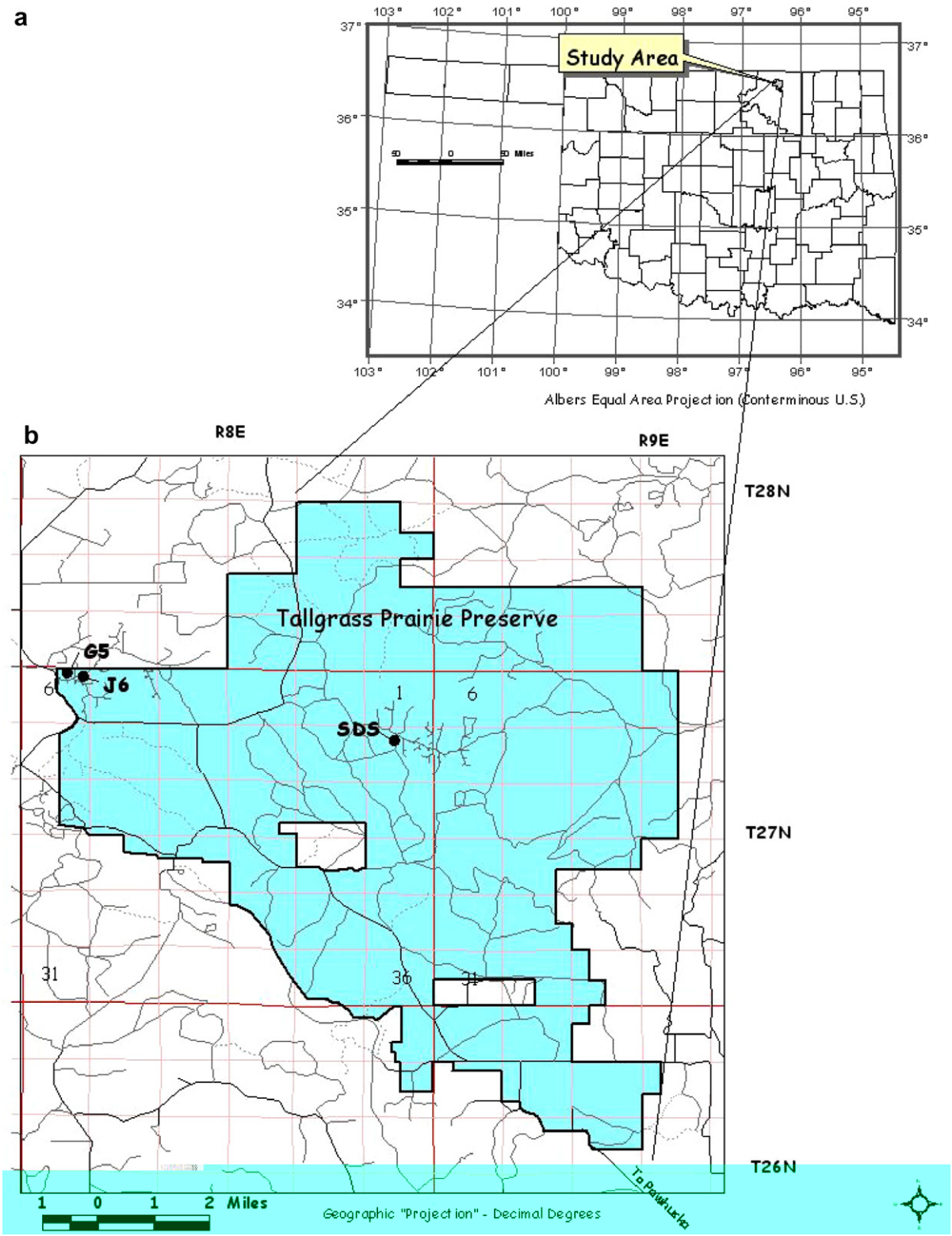

Fig. 1. (a) Tallgrass Prairie Preserve location in northeastern Oklahoma and (b) a map of the preserve showing detail and locations of study sites. Numbers indicate sections at corners of townships.