

Sagebrush Establishment on Mined Lands: Ecology and Research

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Editors



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Preface

The Wyoming Abandoned Coal Mine Land Research Program (WACMLRP) funded by the Wyoming Department of Environmental Quality, Abandoned Mine Land Division and administered by the Office of Research, University of Wyoming supports applied research to address key issues confronting the mining industry and State agencies that are responsible for reclamation and associated environmental aspects of mining. This program was initiated in 1991 and during the ensuing years one of the key issues that confronted the mining industry and the Land Quality Division, Department of Environmental Quality was the need to better understand native shrub ecology and develop technology that would enable establishment of native shrubs on rangelands disturbed by mining. In the period from 1991 through 1998 the WACMLRP funded five research projects that dealt with the study of sagebrush ecology, seed ecology, and the development of cultural practices to enhance sagebrush re-establishment from seed on reclaimed mined lands. These research projects have greatly expanded our knowledge of sagebrush community dynamics, seed ecology, the effects of cultural practices such as mulching, topsoil management, and competition on sagebrush seedling establishment, and have allowed for assessing the effectiveness of historic revegetation practices on sagebrush establishment on pre-1985 reclamation sites. To further assess the state-of-the-art knowledge base of sagebrush establishment on mined lands the Steering Committee of the WACMLRP concluded that a symposium be organized and the research investigators of the these five projects be invited to report on their findings and conclusions. To develop a more thorough and comprehensive symposium program other sagebrush researchers and industry representatives were invited. The symposium was held as part of the 2000 Billings Land Reclamation Symposium (March 20-24, 2000 Billings, MT) on March 20. Attendance was excellent, exceeding 100 during most of the symposium and discussion periods were effective and fully utilized. The attendance and discussion at the symposium are indicators of the interest in this topic and the need to ensure that these research results are readily available to the industry and regulatory agencies.

The symposium was composed of nine presentations and opened with a presentation on the general topic of sagebrush ecology and sagebrush restoration potential. This presentation gave an excellent background on the ecology of big sagebrush communities and reviewed the historic literature relating to its restoration potential on rangelands in the western U.S. Wyoming's post-mine shrub density regulation and its interpretation was also presented. During the discussion period questions arose as to how the shrub density evaluations should be monitored and how these measurements would be interpreted to meet the regulations. Seed factors (viability, germination, processing, and dormancy), cultural practices (mulches, topsoil management, arbuscular mycorrhiza, and competition) to aid establishment, and the effects of grass competition and sagebrush seeding rates on sagebrush establishment were discussed in three separate presentations. Using nursery grown sagebrush transplants to develop seed production plots and facilitation beds to enhance natural recruitment of sagebrush was proposed and discussed as a method of re-establishing big sagebrush on reclaimed mined lands. Studies on the demographic characteristics of big sagebrush communities has shown that Wyoming and mountain big sagebrush stand ages are older than those for basin big sagebrush. Research also showed that mean recruitment intervals (years) were shorter for basin than for Wyoming and mountain big sagebrush. A review of historic sagebrush

establishment practices by mines in the Powder River Basin covering the past 20 years was presented. This chronology showed that the mining industry has been quick to implement new research findings into their reclamation practices to aid them in establishing big sagebrush. Significant advances in establishing big sagebrush has occurred and is reflected in sagebrush seedling densities in the early phases of reclamation but concern exists as to the longevity of these seedlings and severe wildlife browse. The symposium was concluded with a presentation that reviewed the chronology of sagebrush research conducted under the WACMLRP and summarized the significant findings from this research. This last presentation also identified additional research needs and highlighted the fact that the research and technology developed must keep in mind the economics of shrub re-establishment because of the very competitive coal market.

This collection of presentations/papers identified the importance of big sagebrush in reclaimed rangeland ecosystems and discussed a significant pool of recent research that greatly aids our understanding of the many factors affecting its re-establishment. These research findings ranged from understanding the demographic characteristics of native sagebrush stands and the influence of climate on that demographics; to research on seed quality and on the many cultural practices that have aided re-establishment as noted in the constantly improving re-establishment success demonstrated by the mining industry in the Powder River Basin. The symposium also pointed out that economics of new technology developed for re-establishment of big sagebrush must be a major consideration. The question was also raised as to whether additional cultural practices should be evaluated such as using livestock to aid establishment and whether soil physical and nutrient characteristics influence big sagebrush establishment.

The consensus of those in attendance at the symposium was that it was an excellent technology transfer mechanism and that much new knowledge exists. However, it was also clearly stated that additional advances could and must be made to make shrub establishment success a more consistent occurrence realizing that climatic conditions cannot be controlled, but our knowledge of precipitation patterns and other climatic variable be used in developing future technology and recommendations for big sagebrush establishment. A primary example of this is the fact that several researchers and the mining companies themselves have noted that seed viability in the field is longer than previously thought and this fact can be used to develop seeding recommendations that will greatly enhance the probabilities of successful re-establishment of big sagebrush considering the benefits received from other cultural practices.

The Editors