Webinar Brief for Resource Managers

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The Incredible Diversity of Sagebrush Chemistry and its Potential Value in Restoration

Presented on 15 March 2016 by Justin Runyon, Research Entomologist, USDA Forest Service Rocky Mountain Research Station, Bozeman, MT

Project Summary:
Sagebrushes are champion chemists and famous for their abundant and complex volatile bouquets. The chemical make-up of sagebrush plays important roles in plant fitness and is an unseen but fundamental component of sagebrush habitats. In this webinar, we discuss sagebrush chemical diversity and the potential use of sagebrush volatiles to identify plants for restoration.

Management Implications

- Sagebrushes (*Artemisia*) produce a diversity of chemical compounds that play important roles in plant defense and habitat adaptation
- We collected and analyzed odors from five sagebrush species and subspecies to see if plant volatiles could be used to identify taxa
- Sagebrushes, including big sagebrush subspecies, could be accurately identified using smell alone and could potentially be used to identify plants for restoration

Abstract:
Chemistry, including volatile organic compounds (VOCs), play important roles for plants. We review the types of secondary chemicals produced by sagebrushes (*Artemisia*) and some of the functions of these chemicals including allelopathy, defense against herbivores, and plant-plant communication. We collected and analyzed VOCs from five sagebrush taxa growing in two common gardens to see if VOCs differ among *Artemisia nova* (black sagebrush), *A. arbuscula* (low sagebrush), and three subspecies of *A. tridentata* (big sagebrush): *tridentata, vaseyana, wyomingensis*. Of the 74 total VOCs emitted, only 15 were needed to identify sagebrush taxa using Random Forest analysis (a classification algorithm) with a low error of 4%. VOCs can discriminate closely related species and subspecies of *Artemisia*, which are difficult to identify using morphology or DNA, and this could allow confident identification of taxa for restoration. Moreover, it appears changes in VOCs either lead the way or follow closely behind speciation in this group.

We also discovered a surprising amount of chemical diversity, even within subspecies. Chemical diversity could be important in restoration because sagebrush chemistry is known to affect the feeding and nesting choices of sage-grouse, deer, pronghorn, pygmy rabbits, and many different insect species. Thus, the chemical diversity (or lack of) of the plants used in restoration has the potential to influence the occurrence and abundance of these animals. However, more research is needed to understand sagebrush chemical diversity and the role it plays in habitat health.

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