FINGERPRINTING

NATIVE AND NON-NATIVE BIODIVERSITY

IN THE UNITED STATES

PHASE I – THE WESTERN US

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Abstract

There currently exists no coherent scientific or technological frame for rapidly assessing – or "fingerprinting" – biodiversity and invasive species hotspots on a continental-scale. We propose to create such a capability by posing a heretofore intractable but scientifically and economically important "Grand Challenge Problem" that can be used as a context to advance the science and technology of biological fingerprinting. In this work, we will focus on the Western United States and will attempt to comprehensively map the top priority invasive species of Federal and state land managers of this region. This interdisciplinary work will incorporate the following elements: (1) data from several remote sensing satellites (Landsat, MODIS, IKONOS); (2) synthesis of biodiversity field data sets from the Department of Interior (USGS, BLM, NPS, BOR), Department of Agriculture (USFS, APHIS, ARS), non-government organizations (The Nature Conservancy, NatureServe), and universities (Colorado State University); (3) new multi-scale spatial modeling algorithms; and (4) high-performance computing capabilities to document, map, and predict the distributions and abundances of native and non-native plants, animals, and diseases. This work builds upon established geostatistical modeling approaches that have proven successful at local and landscape scales. However, the work provides significant extensions since few if any research efforts have yet attempted to quantify, overlay, and predict hotspots of native plant diversity, areas of unique (endemic/rare) species assemblages, and patterns of non-native species seamlessly from local to national scales. Because habitat loss and invasive non-native species represent some of the most important threats to native biodiversity, they are a major driver of how life on Earth is rapidly changing and thus a particular focus for science and technology investment by both the USGS and NASA.