Methods for Early Detection of Invasive Plant Species: A Case Study of Hueston Woods State Nature Preserve

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Abstract : Invasive Plant Species (IPS) are an important component of effective preservation and conservation of natural lands management. IPS are non-native plants which can aggressively encroach upon native species and pose a significant threat to the ecology, public health, and social welfare of a community. The presence of IPS in U.S. nature preserves has caused economic costs, which has estimated to exceed $26 billion a year. While different methods have been identified to control IPS, few methods have been recognized for early detection of IPS. This study examined identified methods for early detection of IPS in Hueston Woods State Nature Preserve. Mixed methods research design was adopted in this four-phased study. The first phase entailed data gathering, the phase described the characteristics and qualities of IPS and the importance of early detection (ED). The second phase explored ED methods, Geographic Information Systems (GIS) and Citizen Science were discovered as ED methods for IPS. The third phase of the study involved the creation of hotspot maps to identify likely areas for IPS growth. While the fourth phase involved testing and evaluating mobile applications that can support the efforts of citizen scientists in IPS detection. Literature reviews were conducted on IPS and ED methods, and four regional experts from ODNR and Miami University were interviewed. A questionnaire was used to gather information about ED methods used across the state. The findings revealed that geospatial methods, including Unmanned Aerial Vehicles (UAVs), Multispectral Satellites (MSS), and Normalized Difference Vegetation Index (NDVI), are not feasible for early detection of IPS, as they require GIS expertise, are still an emerging technology, and are not suitable for every habitat for the ED of IPS. Therefore, Other ED methods options were explored, which include predicting areas where IPS will grow, which can be done through monitoring areas that are like the species' native habitat. Through literature review and interviews, IPS are known to grow in frequently disturbed areas such as along trails, shorelines, and streambanks. The research team called these areas "hotspots" and created maps of these hotspots specifically for HW NP to support and narrow the efforts of citizen scientists and staff in the ED of IPS. The results further showed that utilizing citizen scientists in the ED of IPS is feasible, especially through single day events or passive monitoring challenges. The study concluded that the creation of hotspot maps to direct the efforts of citizen scientists are effective for the early detection of IPS. Several recommendations were made, among which is the creation of hotspot maps to narrow the ED efforts as citizen scientists continues to work in the preserves and utilize citizen science volunteers to identify and record emerging IPS.

Keywords : early detection, hueston woods state nature preserve, invasive plant species, hotspots
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