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Comparison of Different Analytical Strategies for Classifying Invasive Wetland Vegetation in Imagery from Unpiloted Aerial Systems (UAS)

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摘要 Detecting newly established invasive plants is key to prevent further spread. Traditional field surveys are challenging and often insufficient to identify the presence and extent of invasions. This is particularly true for wetland ecosystems because of difficult access, and because floating and submergent plants may go undetected in the understory of emergent plants. Unpiloted aerial systems (UAS) have the potential to revolutionize how we monitor invasive vegetation in wetlands, but key components of the data collection and analysis workflow have not been defined. In this study, we conducted a rigorous comparison of different methodologies for mapping invasive Emergent (*Typha x glauca* (cattail)), Floating (*Hydrocharis morsus-ranae* (European frogbit)), and Submergent species (*Chara* spp. and *Elodea canadensis*) using the machine learning classifier, random forest, in a Great Lakes wetland. We compared accuracies using (a) different spatial resolutions (11 cm pixels vs. 3 cm pixels), (b) two classification approaches (pixel- vs. object-based), and (c) including structural measurements (e.g., surface/canopy height models and rugosity as textural metrics). Surprisingly, the coarser resolution (11 cm) data yielded the highest overall accuracy (OA) of 81.4%, 2.5% higher than the best performing model of the finer (3 cm) resolution data. Similarly, the Mean Area Under the Receiving Operations Characteristics Curve (AUROC) and F1 Score from the 11 cm data yielded 15.2%, and 6.5% higher scores, respectively, than those in the 3 cm data. At each spatial resolution, the top performing models were from pixel-based approaches and included surface model data over those with canopy height or multispectral data alone. Overall, high-resolution maps generated from UAS classifications will enable early detection and control of invasive plants. Our

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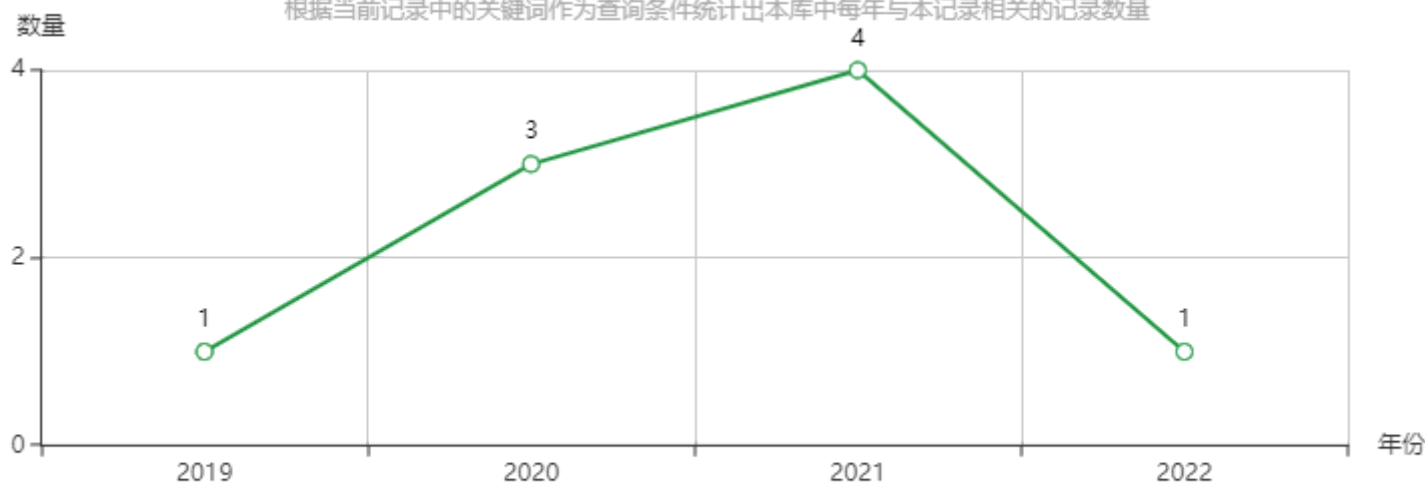
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