

Popular summary

Every year, millions of migratory shorebirds stop along the Yellow Sea coast during their long journeys between breeding and wintering grounds. These coastal wetlands provide food and resting areas that are essential for their survival. However, many of these habitats have been threatened by an invasive plant, *Spartina alterniflora*.

Over the past few decades, *Spartina alterniflora* has spread rapidly along the Chinese coast. It forms dense stands that replace open mudflats, making it harder for shorebirds to find food. To restore coastal ecosystems, China launched a nationwide campaign to remove the species between 2022 and 2025. Yet it remains unclear how successful these efforts have been in individual protected areas.

This study examined the situation in Dafeng Milu National Nature Reserve in Jiangsu Province, a UNESCO World Natural Heritage site that supports many migratory bird species. Because the tidal flats are large and difficult to access, satellite images were used instead of traditional field surveys.

Using freely available Sentinel-2 imagery, I mapped the distribution of *Spartina alterniflora* before and after the main control period. By combining machine learning techniques with a simple vegetation index, I was able to identify where the plant remained and measure how much had been removed.

The results show that the control program was highly successful. In 2022, *Spartina alterniflora* covered more than 3,100 hectares of the reserve's intertidal zone. By 2025, only about 23 hectares remained. This means that more than 99% of the invasion had been removed. The few remaining patches were concentrated in three small areas near major tidal channels, making future monitoring and management more targeted and efficient.

The recovery of over 3,000 hectares of open tidal flats is good news for migratory shorebirds. These habitats are important feeding grounds during migration and winter. The study also shows how satellite imagery can provide a fast and cost-effective way to track invasive species and evaluate large-scale conservation projects.

This thesis can help managers understand where progress has been made and where further action is still needed.

Keywords: Geographical Information Science, Remote Sensing, *Spartina alterniflora*, invasive species control, Sentinel-2, coastal wetlands, Random Forest