# Combining Remotely Sensed Data and Machine Learning for Rapid and Repeatable Wetland Mapping and Assessment

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Understanding baseline conditions prior to design and monitoring post-construction success accurately and cost-efficiently are crucial components of ecosystem restoration. Quality data and assessment methods help guide adaptive management and provide quick feedback to guide restoration approaches for future projects. Current non-machine learning methods to evaluate the extent and type of wetlands rely on extensive field efforts or desktop analysis often based on outdated and low spatial resolution data, which can be a subjective and laborious process. Existing wetland machine learning models identify and map wetlands at regional scales, but their accuracy might be less effective for smaller restoration projects.

CDM Smith created a machine learning model to delineate wetland boundaries using high-resolution LiDAR and publicly available multispectral NAIP imagery for projects across multiple geographies. CDM Smith utilized several approaches to train the model on site-specific data to save time while increasing accuracy and developed multiple model iterations with different sites and combinations of data. Combing high-resolution spatial datasets and leveraging machine learning allows for rapid wetland identification and quantification in a repeatable manner, which allows for the tracking of changes over time. Overall, the machine learning model accuracy was high, ranging from 70 to 90 percent.

A machine learning model based on quality digital data provides a variety of benefits to restoration monitoring. The high volume of quality data can help reduce and eliminate the uncertainty of baseline conditions at a restoration site. The digital data utilized for the wetland machine learning model can be leveraged to aid in H&H design, mapping vegetative communities, and identifying sensitive habitats. This machine learning model can be applied to site-specific regions and ecosystem types and optimized using additional site-specific data. The model can then be reapplied over time and eliminates the subjectivity that can come from variable human-based assessments.

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