NewHampshireView 2020 - 2021 Activities

Our High Impact Activity for this year was a pilot study to evaluate our ability to map riparian habitat with imagery of differing spatial resolutions. The challenge with using moderate resolution imagery has been that the spatial resolution is too coarse to adequately distinguish the relatively small riparian habitat from the upland habitat. Our study included an area in northern New Hampshire and included imagery from Landsat 8 (30 m pixels), Sentinel 2 (10 m pixels), and the National Aerial Imagery Program (NAIP) combined with field data sampling for use as the reference data. The map classes used were four upland classes: conifer forest, deciduous forest, mixed forest, and grass/shrubland; and four riparian classes: conifer forest, deciduous forest, mixed forest, and grass/shrubland. Four dates of imagery were acquired for both the Landsat 8 and Sentinel 2. These dates were early May (representing leaf-off conditions), mid-June (representing early leaf-on conditions), late August/early September (representing full leaf-on conditions), and October (representing senescence). Riparian boundaries were determined from a combination of USGS hydrography data and elevation data generated from lidar imagery (see figure 1). Each date of imagery was classified separately using an object-based image analysis approach. In addition, a multi-temporal analysis was performed to see if the accuracy of the resulting maps could be improved. Analysis was conducted both for the 8 map classes (4 upland and 4 riparian) as well as collapsing the 8 into 2 classes (upland vs. riparian.
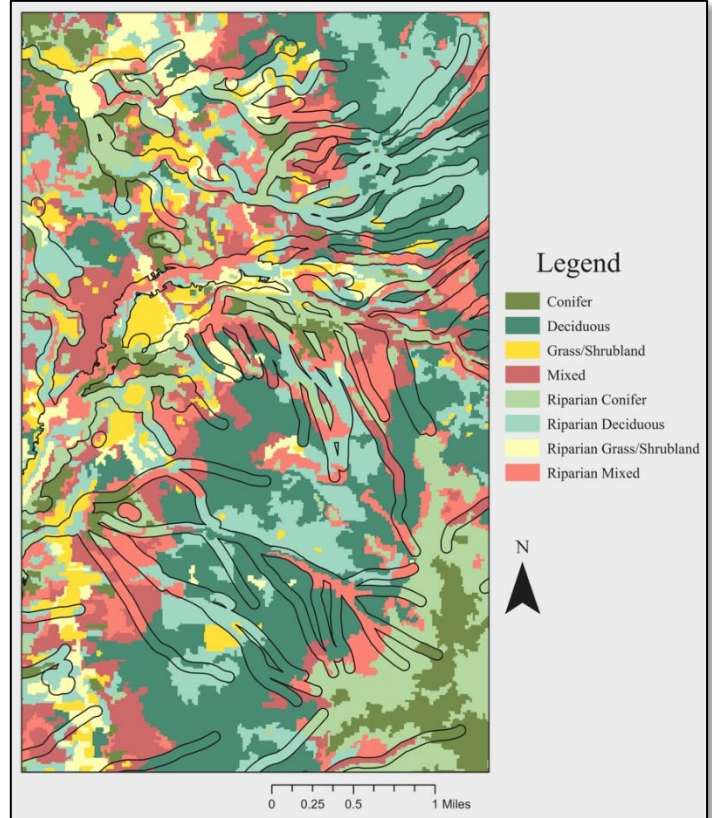

Figure 1. Thematic map of the multi-temporal Sentinel 2 analysis.

Results of this pilot study have shown:
- The higher spatial resolution imagery produces better results (higher thematic map accuracies).
- The best single dates for mapping all 8 classes are May (leaf off) and October (senescence).
- Neither spatial resolution (30 m or 10 m) produced very high accuracies (mostly ranging from 35 – 50%)
- Even collapsing the analysis to just upland vs. riparian map classes did not improve the accuracy all that much (see figure 2).
- Higher spatial resolutions need to be tested.

		REFERENCE		
		Riparian	Upland	Total
MAP	Riparian	**53**	47	100
	Upland	38	**62**	100
	Total	91	109	58%

Figure 2. Error matrix for the collapsed upland vs. riparian multi-temporal analysis for Sentinel 2 imagery.

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BENEFITS TO NHVIEW

- We completed our work evaluating the use of very high-resolution imagery for forest edge detection and were able to very effectively and efficiently monitor changes the forest landscape caused by landscape fragmentation that directly impact the ecology of the area. This technique will provide the means for natural resource managers, wildlife biologists, conservation planners, and others to make better decisions about their land.
- NHView continued the lead role in the University GeoSpatial Support Center (GSC) after the departure of the GeoScience librarian. This facility provides consulting and workshops on remote sensing and geospatial analysis to students, staff, and faculty. Most of the consulting and workshops was conducted virtually, but successfully.
- NHView funded an undergraduate intern to work in the Basic and Applied Spatial Analysis lab (BASAL) to aid our research resulting in a poster presented virtually at the UNH Undergraduate Research Conference in April 2021.

Undergraduate intern measuring the diameter of a large tree.

Field data collection is a necessary part of evaluating the results from any image analysis.

Very high spatial resolution image of riparian habitat in the fall (leaf color change)

NHVIEW CONSORTIUM MEMBERSHIP

- **Department of Natural Resources & the Environment, UNH**
  The Basic and Applied Spatial Analysis Lab (BASAL) conducts basic research on spatial data uncertainty/map accuracy and applied research applying the tools of remote sensing, GIS, and spatial data analysis to solve natural resource problems.
- **NH GLOBE Partnership, UNH**
  Carries out GLOBE teacher training in atmosphere, land cover, hydrology, soil and earth system science with a focus on land cover mapping and geospatial technologies.
- **EOS-EarthData, UNH**
  A digital library of Earth science data that serves scientists, educators and the public.
- **NH GRANIT GIS Repository, UNH**
  A cooperative project to create, maintain, and make available a statewide geographic data base serving the information needs of state, regional, and local decision-makers.
- **Diamond Library, UNH**
  The library maintains an extensive map and aerial photo collection for NH and houses the GeoSpatial Support Center.
- **Forest Watch, UNH**
  A New England environmental education activity using field, lab, and satellite data analysis methods for assessing the state-of-health of local forest stands.
- **Cooperative Extension, UNH**
  Offers short courses in geospatial technologies including GIS, GPS, and field mapping.
- **Dartmouth College**
- **NH Planning Commissions**

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