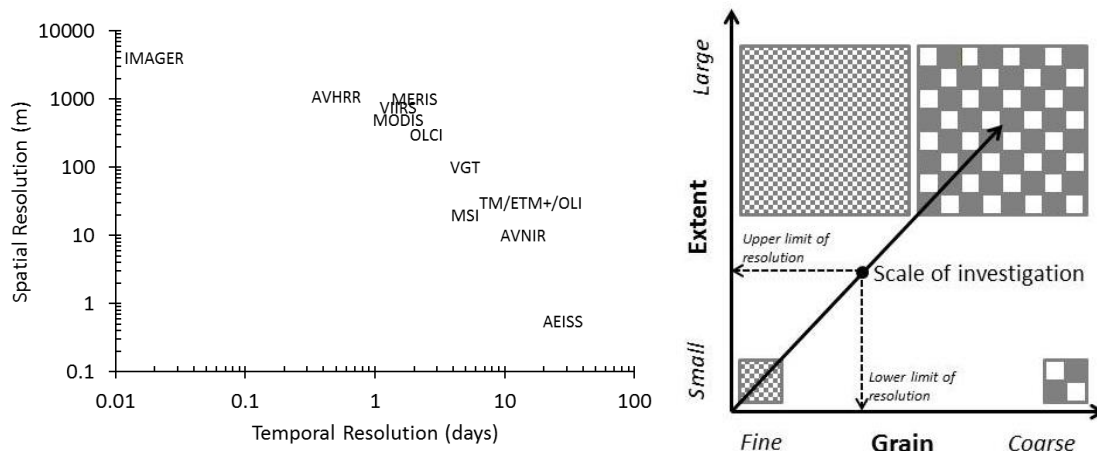


Box A2: Tradeoffs of resolution vs. frequency, and implications for appropriate scale

Aquatic systems, and ecological processes in general, function across various spatial and temporal scales (Frissell et al. 1986; Wiens 2002). As remote sensing data become available at higher spatial and temporal resolutions there will be more information available for use in conservation and management decisions, but there are often trade-offs when choosing among remote-sensing data products that differ in their spatial and temporal resolutions. Data with high temporal frequency often have reduced spatial resolution (left panel, Figure 1). For example, Landsat OLI and Aqua MODIS sensors both collect multispectral data used to develop snow cover data products. However, Landsat snow cover data are collected at a 30-m nadir resolution but only every 16-d for the same place on Earth, whereas Aqua MODIS snow cover data are available daily but only at a resolution of 500-m (left panel, Figure 1). This is analogous to the spatial grain and extent issue surrounding scaling in ecology (right panel, Figure 1). The resolution of imagery often decreases with increased swath (extent); that is, grain and extent are positively correlated due to logistical, technical, or cost constraints of the satellite and sensor system. Since information content is associated with grain, the grain and extent of data limit the types of ecological or management questions that can be asked of those data. Therefore, deciding which remote-sensing products may be appropriate for use is dependent upon both the spatial and temporal grain and extent of the ecological or management question at hand (Peterson and Dunham 2010).

Box A2: Figure 1.

The tradeoff typically observed in the spatial resolution (grain) and temporal frequency of data from different satellite sensors (left panel), and the relation between spatial grain and extent and how it limits data information and the scale of investigation (right panel).



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