Land Trusts are nonprofit organizations that work to conserve land through acquisition and stewardship (Ryan et al. 2013). Land acquired through purchases or donations are often managed as preserves (Ryan et al. 2013). They also use conservation easements to conserve privately owned lands (Braddock and Heinen 2017). In these situations, the land is still privately owned, but has permanent restrictions on its development in order to protect valued features (Ryan et al. 2013). These can be working lands; such as farms or forestlands (Williams et al. 2006). Land Trusts have been growing in number over the past few decades, and are considered an important tool for private land protection (Kazmierski et al. 2004). Although there have been doubts about the ecological value and conservation impacts of land trusts (Braddock and Heinen 2017), improved science based methods and education may increase support for these organizations (Braddock and Heinen 2017). This can begin with the utilization of tools, such as GIS and remote sensing. Being nonprofit organizations, many land trusts lack the funding and training required to make use of these technologies (Ryan et al. 2013). This is unfortunate because there are many useful applications in this field, that would help land trusts more efficiently and effectively carry out their goals (“Land Trust GIS”).

Some basic applications of GIS software include databases and maps. Property databases, created using official tax parcel data, are useful for land trusts to keep track of their properties (“Land Trust GIS”). With the properties in a database, maps can easily be made by adding publicly available data of features such as roads, topography, soils, conservation lands, and wetlands. Service area maps represent a land trust’s properties and their relationships to surrounding features (“Land Trust GIS”). Maps of service areas can be used for regional land assessments and planning (“Land Trust GIS”). Individual property maps show parcel lines, trails, and other relevant features and can be useful for preserve visitors, baseline documentation reports, and management planning (“Land Trust GIS”). Any of these products can be useful tools for communication and outreach. Maps of current or proposed lands can be useful in newsletters, grant proposals and donor communications (“Land Trust GIS”). The 1998 study of the Sterling Forest acquisition in New York, showed the effective use of GIS in presenting information on the impacts of a proposed development on a forest to decision makers (Lathrop and Bognar 1998). This information aided in negotiations over which portion of the land would be purchased for conservation, and which would be developed (Lathrop and Bognar 1998).

Traditionally, land trusts use an opportunistic approach to acquiring land (Ryan et al. 2013). Decisions on which properties to acquire may be based on availability, price, or site specific features, such as the presence of a particular species (Ryan et al. 2013). This method does not include many features that would aid in preserving biodiversity and ecosystem functions at a landscape scale (Ryan et al. 2013). The literature reviewed for this paper recommends scientifically based landscape-scale prioritization for land trust regions (Braddock and Heinen 2017; Kazmierski et al. 2004; Ryan et al. 2013). Priority maps can help land trusts create strategic conservation plans that can aid in “identifying, prioritizing, pursuing and protecting those specific tracts of land that will most effectively and efficiently achieve the land trust’s mission” (Amundsen 2011). Advanced spatial analysis, using GIS software, can
help land trusts make meaningful and efficient choices on which land parcels they will secure (Lathrop and Bognar 1998).

There are a variety of methods for creating priority maps, based on the conservation values and missions of each organization. They may combine environmental factors, such as soils and hydrology, with information on rare species, and important spatial variables (Kazmierski et al. 2004). Some organizations also recognize the importance of including social, economic, and historical factors (Braddock and Heinen 2017; Ryan et al. 2013). It is recommended that these parameters are advised by experts, and that statistical analysis is used to reduce highly correlated and redundant features (Weber et al. 2006). Once chosen, these features are scored and spatially represented using GIS software (Kazmierski et al. 2004; Weber et al. 2006) and data sources such as USFWS, USGS, satellite imagery, local counties, and conservation groups (Lathrop and Bognar 1998). By creating raster grids of this data and using overlay analysis, the areas of highest conservation value in a service area can be delineated (Kazmierski et al. 2004). From there, land parcels can be ranked to show which ones are the highest priority for conservation (Kazmierski et al. 2004). This method can also be used to map the environmental costs or development constraints of a proposed project in order to prioritize areas under the greatest threat (Lathrop and Bognar 1998). Development threat and conservation value maps can also be used together to further aid organizations in the planning process. (Weber et al. 2006, Kazmierski et al. 2004),

After parcels have been selected and acquired, the task of efficiently and effectively monitoring these lands begins (Levitt 2006). Monitoring is crucial in order to verify that conservation easement terms are satisfied, and to keep track of the site’s overall ecological health (Williams et al. 2006). Remote sensing in particular is very useful for the monitoring of large land parcels (Williams et al. 2006). On large tracts of land, traditional ground-based monitoring can be inefficient and costly (Williams et al. 2006). By incorporating satellite imagery, land trusts can create cost effective and science based methods for large easement monitoring (Williams et al. 2006). An example of this is the methods developed by the University of Maine and New England Forestry Foundation to monitor the Pingree Forest, a 762,192-acre working forestland conservation easement in Maine (Levitt 2006). These methods have also been applied to the Connecticut Lakes easement in New Hampshire and the Hancock easement in Vermont (Williams et al. 2006). First baseline documentation occurred, incorporating manually entered GPS point locations and publicly available databases to obtain easement boundaries, township boundaries, water bodies, hydrologic features, roads, digital elevation models, land cover, and digital orthophoto quadrangles (DOQ) (Williams et al. 2006). The monitoring is a three tiered system. First they annually survey the land using medium spatial resolution satellite imagery, such as Landsat Thematic Mapper to detect canopy disturbance (Williams et al. 2006). They can also obtain information on forest diversity, fragmentation, stand age, and structure through landscape metric analysis in GIS (Williams et al. 2006). If there is a disturbance that requires further investigation, they can obtain high resolution satellite imagery or aerial photography, from Ikonos and Quickbird satellites and DOQ (Williams et al. 2006). Since site visits are expensive, they are well planned out and only used in high priority situations (Williams et al. 2006). This method can allow land trusts to accurately monitor changes in the landscape in an efficient and cost effective way (Levitt 2006).

Overall, the use of GIS and remote sensing technologies can be beneficial to land trusts. Maps created with this technology can aid in communication and fundraising, and help land trusts to make resource efficient decisions (Lathrop and Bognar 1998; Kazmierski et al. 2004). With these services,
organizations can more effectively carry out their missions by basing their decisions on ecologically important factors and creating strategic plans for their service areas (Kazmierski et al. 2004; Braddock and Heinen 2017). Like several of the land trusts cited in this paper, by collaborating with other organizations, such as the Land Trust Alliance, government agencies, and universities, even small land trusts can have access to these valuable services (Braddock and Heinen 2017; Kazmierski et al. 2004; Lathrop and Bognar 1998; Williams et al. 2006). Collaborations also create important opportunities for ongoing research to be conducted on the best strategies for land conservation through land trusts (Braddock and Heinen 2017; Williams et al. 2006). This research can give land trusts more credit in the conservation community and help them to better accomplish their goals (Braddock and Heinen 2017).
Annotated Bibliography

This is a publication of the Land Trust Alliance that provides users with the process and tools to identify, prioritize, pursue and protect the land that will most effectively and efficiently achieve conservation missions. I primarily used it to learn more about what strategic conservation plans are, since some of the other papers mentioned them.

This paper provided an overview of the structure and function of present day land trusts. It used the case study of a small land trust in Michigan, the Little Traverse Conservancy to show examples of accomplishments and challenges that land trusts face. It outlined traditional land trust methods, such as the use of conservation easements to prevent development on private lands. It also provided suggestions to improve strategies. For example, they discussed the need for more research and collaboration with other organizations to improve the quality of a land trust’s work for the benefit of conservation and local communities. These collaborations can give land trusts access to tools such as habitat suitability models, land administration domain models, remote sensing, and GIS technology, that can aid them with planning and monitoring properties. With increased monitoring and data, as well as outreach, land trusts may be able to increase the support they receive from the community. This paper also recommended that land trusts set clear goals, focused on the ecological functions of their land and community goals.

This website is meant to be a resource to land trusts. It gives an overview of the ways land trusts can utilize GIS and remote sensing technologies. It provides many examples of different types of maps, as well as links to land trusts that actively use these technologies.

This paper provided an example of priority mapping. The University of Michigan worked with the Grand Traverse Regional Land Conservancy to create a method for identifying land of high conservation value and ranking private land parcels associated with these areas in order to prioritize land for acquisition. The authors gave detailed information on their methods for each of their goals. Using raster grids and overlay analysis, they were able to create a map showing the priority levels of privately owned land parcels. They also mapped potential threats for reference. They discussed the value of having a landscape ecology based approach to land acquisition. They emphasized the need for land trusts to have access to similar processes. They proposed that their method is feasible for small trusts, and that it can be altered to fit the specific needs of an organization.

This study is another example of using priority mapping with a landscape ecology focus to prioritize land for conservation. In this case, two land trusts decided to buy a portion of a forested plot that was threatened by development. In order to decide which portion would be
the highest priority for conservation, and which would be best suited for development, they enlisted the GIS services of Rutgers University. They used an overlay analysis to determine the environmental costs and development constraints of the plot. They successfully used this information to negotiate with the land owners about where the development should be placed. This paper gave detailed information about what data sources they used. I also found it interesting how they highlighted that their GIS work led to effective communications with decision makers.


This is a case study of the monitoring of the Pingree Forest easement using remote sensing and GIS technologies. Levitt outlined the methods used to monitor the 762,192-acre working forest conservation easement. Using remote sensing technologies, the University of Maine and the New England Forestry Foundation created a cost effective and scientifically based method to monitor large easements. This three tiered process begins with annual monitoring using medium resolution satellite imagery to detect changes in the forest canopy. If a disturbance requires further investigation, they obtain high resolution satellite imagery or aerial photos. As a last resort, they conduct well planned site visits to further investigate the disturbances. Levitt discussed the accomplishments of this peer reviewed method and its application to other easements in New England. He pointed out that this success was made possible by adequate funding and collaborations.


This paper surveyed land trusts in Alberta Canada to find out how they prioritize land for conservation. They interviewed twelve land trusts in order to find out how they are making their decisions and justifying their accomplishments. They found that the land trusts were using individualistic, parcel level approaches to land acquisition. These decisions did not consider many factors that lead to biodiversity and ecosystem function on a landscape level. They also recognized the challenges facing the land trust community such as the lack of funding and communication. Key elements that were missing from the land trusts’ prioritizing process were identified as scale, parcel shape, leveraging effects, modeling, historical, and social changes. The authors recommended that more research be focused on the decision making processes of land trusts, that landscape-scale prioritization processes should be developed for land trusts, and that there should be increased communication and collaboration between land trusts and other organizations.


This paper highlighted another method for land prioritization, Maryland’s Green Infrastructure Assessment. This method was developed by the Maryland Department of Natural Resources to identify and rank the state’s areas of high ecological importance and those that have the highest risk of development. They also identified corridors that link these priority areas. They identified features of conservation value such as sensitive species, unfragmented stretches of forest, wetlands, streams, and rivers. They decided on 27 parameters to use in the analysis. These
parameters were advised by biologists, and had statistical analysis performed on them to minimize highly correlated and redundant parameters. They weighted and ranked priority areas and corridors based on relative risk of development and ecological importance. This method has been used in Maryland’s state conservation planning, as well as on a regional scale. They also highlighted how this method can be used for a number of organizations including land trusts.


The authors presented how to apply remote sensing technologies to large forest conservation easement monitoring. They used the methods developed for the Pingree Forest on two easements in New Hampshire and Vermont. They discussed the importance of easement monitoring to uphold easement terms and to detect any problems with the land. They acknowledged that many land trusts lack the training to utilize available GIS and remote sensing technologies. Along with a description of the methods, they also highlighted the importance of baseline documentation and publicly available sources of data. They discussed the use of GPS for creating point locations on the properties using cost effective devices. They also discussed the costs of varying satellite imagery and aerial photos. By showing cost effective technologies and outlining methods, this paper is a good resource for land trusts, however, an update on the technologies to use would be necessary considering that this paper is over a decade old.