



Flooded Forests: ecosystem at risk

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Executive Summary

In 2007, old growth riparian Acadian forest remnants were discovered along the Annapolis River. Riparian community type and associated rare plants were identified at these sites. In August of 2010 recommendations were made by Xing Chen of the University of Saskatchewan on how to develop conservation strategies for these endangered ecosystems within the Annapolis watershed. The recommendations included establishing nature reserves, conservation easements, stewardship agreements and riparian buffers in areas of high ecological value on the Annapolis River. The strategies suggested were developed in the current project.

The purpose of the current project was to develop a conservation plan for 34 sites discovered in 2007 by the Atlantic Canada Conservation Data Centre within the Annapolis River watershed consisting of riparian Acadian forest remnants and populations of rare plant species. Field surveys were conducted during October of 2010 to assess the impacts and threats to properties and to gather other characteristics of the sites. The data was used to develop this conservation plan.

This conservation plan includes one conservation option per site and is based on the biological priority for each site. The criteria used to assign biological priority were: presence of rare or endangered flora, habitat type, current land use, disturbance, and surrounding land/ development pressures/restoration potential. For sites with a low biological priority a stewardship agreement option was assigned. Those with a medium biological priority had a conservation easement option assigned; and those with a high biological priority had a purchase option assigned. This plan will be used as a guideline to provide the best possible option for each site in question. This plan also prioritized each site to determine which properties to pursue for conservation first.

The number of sites selected for each conservation option is as follows:

Stewardship agreement: 14

Conservation easement: 9

Purchase: 10

Below, the number of sites organized by biological priority:

Low: 11

Low-Medium: 3

Medium: 5

Medium-High: 21

High: 10

Low-High: 3

Background

Riparian areas provide multiple ecological functions to maintain the health of the river. As transitional lands between aquatic and terrestrial ecosystems, riparian areas flood often, providing a diversity of plant and wildlife communities. These zones help to improve water quality, water absorption and storage and protect the streambanks from erosion (Harris, year unknown). One of the ways water quality is affected is by water temperature, maintained by canopy cover of vegetation in riparian areas. In the summer, canopies reduce the water temperature and increase the temperature in the winter, crucial for fish and other organisms inhabiting the river. Vegetation in riparian areas also maintains water quality by slowing upland run off and filtering sediments and pollutants that would otherwise run into the river. The root system of riparian areas allows increased organic material and soil porosity, therefore increasing water absorption and holding capacity for groundwater recharge. Root systems also help to stabilize the bank, holding soil in place to reduce erosion. By altering riparian vegetation, the aforementioned functions would be degraded and the health of the river would be compromised. The Annapolis River is an example of a river threatened by riparian damage.

Old growth riparian Acadian forests are essential components to maintain and restore the ecological health of the Annapolis River. The Annapolis River is one of the few regions where remnants of these forests are presently located. Acadian forests can be recognized by tree species such as red spruce, balsam fir, eastern hemlock, eastern white pine, yellow birch, sugar maple, and American beech. These riparian remnants are among the most endangered ecosystems in eastern Canada and are a high priority to conserve.

Threats to old growth riparian Acadian forests in the Annapolis Valley include agriculture and development. Nearly 400 years of agricultural practices in the Annapolis Valley have made negative impacts on these sites, destroying much of the riparian areas and the river's ecological integrity. Livestock that graze near the stream compact the soil and vegetation increasing runoff and erosion (Meehan, 1991). The stability of the streambank is decreased and canopy cover is lost rendering a wider, nutrient rich stream. The riparian area will no longer be able to filter runoff effectively from agricultural practices, instead running directly into the stream. Development along the river destroys the root systems of trees and compacts soils; therefore facilitating erosion and degrading soil porosity (Meehan, 1991). To offset future impacts to the threatened ecosystems, land conservation is the next step facilitated through the Environmental Goals and Sustainable Prosperity Act.

The Environmental Goals and Sustainable Prosperity Act, requires the province to protect 12% of Nova Scotia's landmass by 2015 (Office of Legislative Counsel, Nova Scotia House of Assembly, 2007). As most crown land possibilities have been exhausted, the need to protect private land is essential to achieve the 12% goal.

Private land conservation through land trusts plays an important role in minimizing the threats and impacts to ecologically important areas. As a majority of remnants from the old growth riparian Acadian forest remain on private land in the Annapolis Valley, these biodiversity hotspots are a high priority to acquire. Land trusts such as the Nova Scotia Nature Trust and the Nature Conservancy specialize in acquiring private lands for conservation through purchase, stewardship agreement and conservation easement. These non-governmental organizations give landowners the opportunity to protect land that they regard as ecologically significant. In cooperation with these organizations, strategies can be organized to protect old growth riparian Acadian forest among other natural areas in the Annapolis Valley.

Goal

The goal of this project is to create a conservation plan to identify priority old growth riparian Acadian forest sites and associated rare flora for conservation. The plan recommends stewardship, conservation easement or purchase as a best option for each site.

Methods

Site Selection

Sean Basquill, of the Atlantic Canada Conservation Data Centre, selected sites in 2007 within the Annapolis River Watershed between Middleton and Aylesford. The preliminary survey conducted identified undisturbed flooded forests and some rare flora. Thirty-three of the 34 sites described were also used for the current survey, as one (site 006) was not accessible by boat or by foot. Figure 1 shows an overview of the sites visited.

Field Evaluation

A field survey was conducted to assess 15 variables at each site. Data was collected between September 16 and October 20, 2010. Variables assessed can be seen in Table 1 below. Preferred habitat was described as preferred tree and shrub species present, including willows, maples, poplars, birches, conifers, alders, hazelnut, pin cherry, chokeberry, cranberry, honeysuckle, dogwood, blackberry and raspberry.

Table 1: Variables assessed during field surveys at each site

	Variables
Property variables	UTM coordinates Property use Buildings or structures on the property Land use of surrounding properties
Habitat variables	Main tree and shrub species present Percent of dead wood standing/fallen Percent preferred habitat Threatened species present
Soil variables	Percent of coarse fragments Texture of the A horizon Description of the LFH horizon
Threats and Impacts	Threats/impacts identified as anthropogenic or natural Are streambanks altered by human activity Are threats immediate

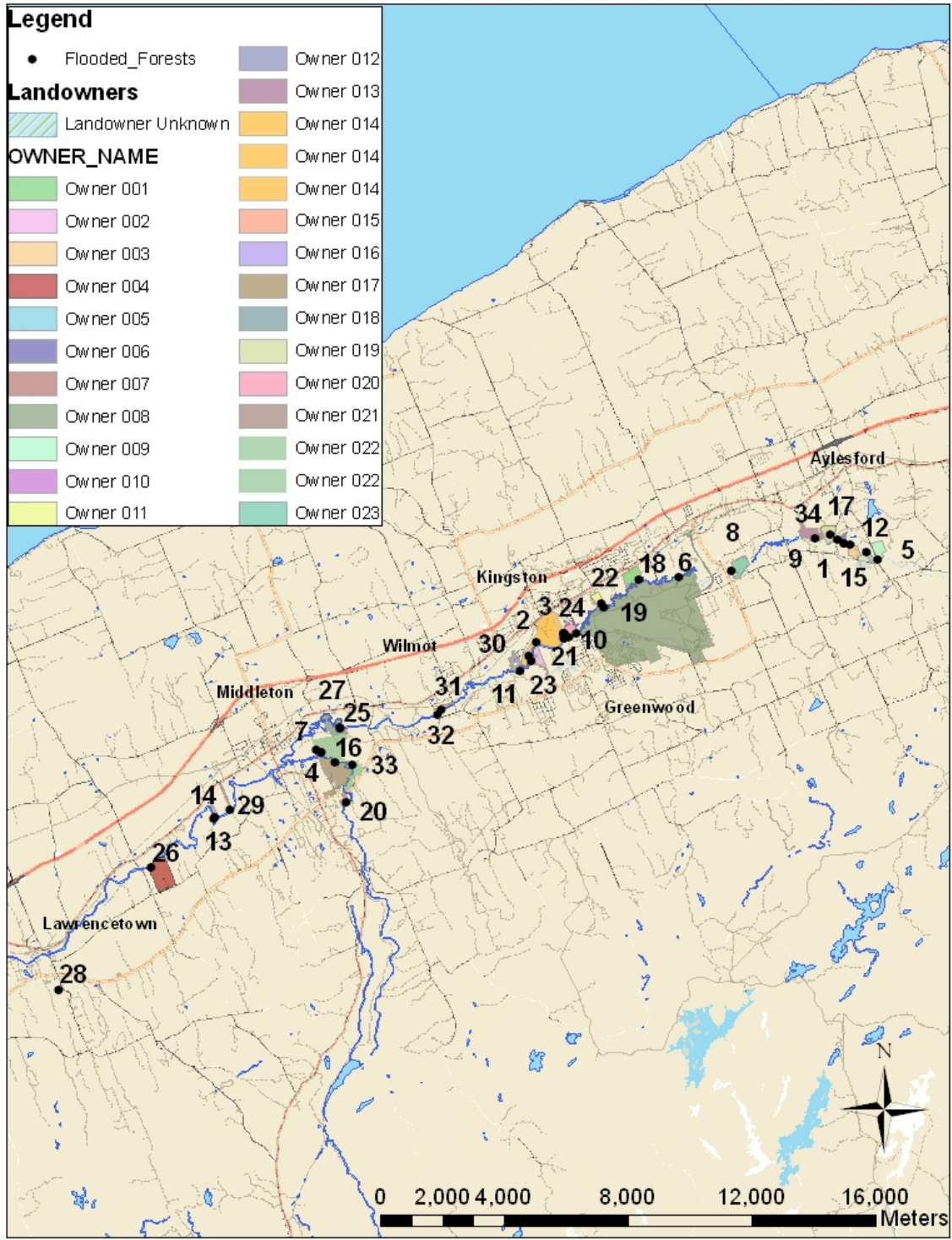


Figure 1: Overview of the Flooded Forests sites 1 through 34 located between Lawrencetown and Aylesford and the associated landowners codes

GIS Analysis

ArcGIS was used to gather information on property owners, property sizes (acres) and potential impacts on the sites. Layers were provided by the Centre of Geographic Sciences, Lawrencetown. Maps were created to illustrate the land use within the properties containing flooded forest sites. Understanding the land use surrounding each site was important in creating a conservation plan; what is next to the proposed site has an influence on the level of protection determined for it.

Criteria for Biological Priority

The biological priority of a site defines its importance when being considered for conservation. For each site, a low, medium or high biological priority was chosen to represent which sites have the greatest potential for conservation. In the event that sites were evenly weighted between two biological priorities they were placed into one of these three categories: Low-Medium, Medium-High or Low-High. Five evenly weighed factors were considered to describe biological priority for each site. Each site's biological priority was determined by tallying the total of factors in each priority level.

Presence of rare/endangered flora

This category defined whether the site contained flora considered uncommon, rare or extremely rare by the Atlantic Canada Conservation Data Centre's species status rank.

Habitat type

Habitat was defined as: pasture, perennial or annual cropland, developed, mixed wood (open or dense), coniferous (open or dense), shrub-low, grassland and marsh. Some sites had a mixture of habitats and some were isolated from civilization. Isolation of a site put more weight towards a high biological priority, as placing protection on the site would be easier.

Current land use

Current land use depicted how the property was being used and affected the type of conservation option placed on it. Land uses included: developed, agricultural use, forested/unused and occasional use.

Disturbance

Disturbance defined how much the property had been impacted by human activity or natural occurrences. A high amount of disturbance was given a low biological priority, where a small amount of disturbance was given a high biological priority.

Surrounding land/ Development pressures/ Restoration potential

The land use surrounding the property in question may have direct or indirect impacts affecting restoration potential. Development pressures may also impact the restoration potential of the site. Surrounding land that is heavily used may have little conservation potential and may increase the development pressures on a site. A site with these conditions would be most appropriately given a low biological priority. However, unused surrounding land would allow for the greatest conservation potential and would be most appropriately given a high biological priority.

Conservation Options

The conservation options were designated according to the biological priority for each site. Three conservation options were available: stewardship agreement, conservation easement and purchase. Stewardship agreement was given to sites with low or low-medium biological priority. A conservation easement was given to sites with medium or medium-high biological priority and purchase was given to sites with high biological priority. In the case where a site was evenly weighted between low and high biological priorities, a conservation easement was recommended as a middle ground.

Conservation Plan

Biological Priority

A conservation plan was created for each of the 33 sites using the five criteria discussed, shown in Table 2. Eleven sites were found to have a low biological priority according to these criteria, while five sites were placed into a medium biological priority category and the high priority category had ten sites. Four sites were equally weighted between the low and medium biological priority, therefore were placed in to a low-medium category. One site was equally weighted between medium and high priority. This site was placed into a medium-high category. Three sites were equally weighted between low priority and high priority, so were placed into a low-high category. The biological priority chosen for each site can be seen in Table 3. A summary of each site’s conditions used to select a biological priority is available in Appendix B.

Table 2: General criteria used to classify stewardship agreement, conservation easement or purchase to 33 sites

Conservation criteria	Biological Priority		
	Low	Medium	High
Presence of rare/endangered flora	No rare/endangered species	Some uncommon/ rare species	Rare/endangered species present may be listed provincially/federally
Habitat type	Pasture/cropland/industrialized	Grassland/forest/wetland and/or agriculture	Minimally impacted grassland/wetland/forest
Current land use	Developed/agricultural use	Some forest/Land may be used occasionally	Forested/Land is used
Disturbance	High	Medium	Low
Surrounding land/ development pressures/ restoration potential	Surrounding land heavily used	Surrounding land used occasionally/selective cutting	Surrounding land unused

Table 3: Site numbers organized by biological priority.

Biological priority	Site number
Low	1, 12, 15, 18, 20, 24, 28, 31, 32, 33, 34
Low-Medium	5, 17, 26
Medium	2, 4, 7, 11, 16,
Medium-High	21
High	3, 8, 13, 14, 19, 22, 23, 25, 27, 29
Low-High	9, 10, 30

Conservation Options

Stewardship Agreement

A stewardship agreement is a non-binding contract between the landowner and a land trust organization. The intent of the informal agreement is to protect the natural values of all or parts of the property for landowners who do not want more legally binding protection for their land. This said, the degree of protection is limited and will not carry over into the following ownership. Stewardship agreements do not provide income or property tax breaks.

Conservation Easement

A conservation easement is a conservation tool placed on an entire property or a section of it to help permanently protect its natural value. As this applies to the property deed, future owners must obey the easement restrictions. The restrictions are created and tailored by the landowner and the authorized land trust. Limitations may be as exclusive as restricting all development or as inclusive as allowing some commercial use. Conservation easements may provide landowners with income tax breaks as well as property tax breaks.

Purchase

Purchasing a property from a landowner requires more funds and time than other conservation options. The Nova Scotia Nature Trust does, however, purchase land at fair market value.

Recommendations

As discussed, the conservation options were recommended according to which biological priority was designated for each site. Fourteen sites were designated as Low or Low-Medium and were recommended as a stewardship agreement. Six sites from the Medium, Medium-High categories were recommended as a Conservation easement. The three sites from Low-High were weighted evenly between low priority and high priority. These sites were recommended for a conservation easement, as there was not enough weight towards a purchase or a stewardship agreement. Ten sites from the high priority category were recommended for Purchase. A summary of the sites by conservation option is in Table 4.

Table 4: Site numbers organized by recommended conservation option

Conservation option	Site number
Stewardship agreement	1, 5, 12, 15, 17, 18, 20, 24, 26, 28, 31, 32, 33, 34
Conservation easement	2, 4, 7, 9, 10, 11, 16, 21, 30
Purchase	3, 8, 13, 14, 19, 22, 23, 25, 27, 29

Landowner Contact Strategy

Strategy

Approaching landowners on sensitive issues such as discussing the idea of protecting their land should be approached with caution and respect for the landowner. Therefore a strategy was developed in preparation for contact with the landowners. Landowners should be contacted initially with a letter, a follow-up phone call and, if the landowner is interested, a site visit. Objectives were developed below for each stage of landowner contact:

Letter

The objective of the letter is to inform the landowner of the organization and the purpose of writing the letter (ie. to discuss the uniqueness and value of the landowner’s property). The final objective is to communicate the service being offered (sharing information on private land stewardship options).

Phone call

The phone call is a follow-up after the letter with the intentions of discussing old growth riparian Acadian forest remnants on the landowner’s property. The objective is to build interest in the significance of their land and share the variety of options available to protect their land.

Site visit

The site visit gives the opportunity to provide the landowner with further information and outreach material on stewardship options. The objective of the visit is to leave the landowner with the tools to make an informed decision.

During the phone call and site visit it is important to remain patient, find out what the landowner knows about his/her property, how they use the land and what they want to know. Also ask how they envision their property in the future. Secondly, providing information to educate the landowner of ecological values, methods of integrating human and wildlife needs and information about conservation options. It is important not to give them a speech, rather, engage the person in the conversation. Lastly, conveying the message of land conservation and management options in a manner that is specific to the project’s needs is important. The message from the Flooded Forests project would be to help maintain and restore old growth riparian Acadian forests and associated rare species.

Motivations for Landowners

Landowners may be hesitant to get involved with the project for multiple reasons. Using persuasive measures such as the advantages to learning more about their property and the positive impacts of conservation may help (Duynstee, 1997). Motivations will be unique for every landowner offering their land for protection. Personal values, economic status and family history have great influences on the decision (Rilla and Sokolow, 2000). In Northern California, a survey was conducted to review motivations for farmers who had conservation easements placed on their properties. Among the feedback for the survey, preserving land, family needs and cash were the three general responses given. Within these categories included motivations such as preserving land for farming or protection from development, facilitating the purchase of the farm by younger generations and cash for expansion of the farm or retirement funds (Rilla et al., 2000). As the majority of the sites for the current project are agricultural, these interview responses may be consistent with the motivations of landowners in the Annapolis Valley.

Landowner Contact

The Flooded Forests sites, grouped within their conservation options, were prioritized for contact. The prioritized list is in Table 5. It was decided that four sites may not be suitable for conservation and are therefore not included in the prioritized list. These sites were all located in heavily developed areas and the habitats were highly disturbed. Site 31 was included in this list, as it has no conservation value. Restoration of the site and controlling human traffic on the sites would be difficult. The list of sites that may not be suitable for conservation is in Table 6.

Table 5: Flooded forests sites organized by conservation options and prioritized from highest to lowest priority for contact.

Priority	Stewardship agreement	Conservation easement	Purchase
Highest	26	21	3
	5	7	27
	34	2	25
	18	4	23
	12	16	22
	15	30	13
	17	9	14
	1	10	29
	20	11	19
Lowest	-	-	8

Table 6: Sites that may not be suitable for conservation

	Sites
May not be suitable for conservation	33, 32, 28, 24, 31

Conclusion

Old growth riparian Acadian forest remnants are ecologically significant habitats within the Annapolis River watershed. Through data collection and research, a conservation plan was developed. Furthermore, a strategy for contacting landowners was developed.

The next phase for this project should use the prioritized conservation plan to decide which properties to pursue first and to implement the landowner contact strategy.

References

Duynstee, T. 1997. *Landowner Contact Guide for British Columbia*. Ministry of Environment, Lands and Parks. 1-72

Meehan, W. R. 1991. Introduction and Overview. In W. Meehan (ed. 1), *Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats (1-15)*. American Fisheries Society Special Publication 19:Maryland

Office of Legislative Counsel, Nova Scotia House of Assembly. 2007. *Bill No. 146, Environmental Goals and Sustainable Prosperity Act*. Accessed on October 28, 2010. Available from: http://nslegislature.ca/legc/bills/60th_1st/1st_read/b146.htm

Rilla, E. & Sokolow, A.D. 2000. *California Farmers and Conservation Easements: motivations, experiences and perceptions in three counties*. University of California Agricultural issues Center. 1-56

Appendices

Appendix A- Site Criteria

Table 7: Specific site conditions used to recommend biological priority for sites 1 to 8

Site	Criteria
1	No threatened species Annual cropland Agricultural use Medium Surrounding land heavily used
2	Extremely rare species Mixed wood-dense Golf course/ unused forested area Medium Land adjacent to forest used heavily for golf course
3	Extremely rare species Mixed wood-dense (minimally impacted) Land unused Low Surrounding land unused
4	Rare species Mixed wood-dense/ Marsh Some logging in the past Medium Surrounding land used occasionally (ATV trails)
5	Uncommon species Perennial cropland and pasture Land unused Medium Surrounding land heavily used
7	Extremely rare species Mixed wood-dense Forested/ATV trails Medium Surrounding land used occasionally
8	No threatened species Mixed wood- dense (minimally impacted) Land unused Low Surrounding land unused

Table 8: Specific site conditions used to recommend biological priority for sites 9 to 16

9	No threatened species Coniferous open Land unused Low Surrounding land residential
10	No threatened species Mixed wood-dense Land unused Low Surrounding land residential
11	Uncommon species Mixed wood-open Land unused Medium Surrounding land unused
12	No threatened species Perennial cropland and pasture Agriculture Medium Surrounding land- agriculture
13	No threatened species Mixed wood-dense (minimally impacted) Land unused Low Surrounding land unused
14	No threatened species Mixed wood-dense (minimally impacted) Land unused Low Surrounding land unused
15	No threatened species Mixed wood-open and cropland Land use agriculture Medium Surrounding land use- agriculture
16	Extremely rare species Mixed wood- open Land used occasionally Medium Surrounding land use agriculture

Table 9: Specific site conditions used to recommend biological priority for sites 17 to 24

17	No threatened species Mixed wood-open Land used occasionally Low Surrounding land agriculture
18	No threatened species Perennial cropland and pasture Agriculture Medium Surrounding land agriculture
19	No threatened species Mixed wood- dense Land unused Low Surrounding land unused
20	Rare species Annual cropland Land used occasionally High Surrounding land agricultural/ forested
21	Extremely rare species Mixed wood- dense Land used occasionally for camping Low Surrounding land developed
22	Uncommon species Mixed wood dense (minimally impacted) Land unused Low Surrounding land unused
23	Uncommon species Mixed wood- dense (minimally impacted) Land unused Low Surrounding land unused
24	Fairly common species Developed Land used for boat launch High Surrounding land developed

Table 10: Specific site conditions used to recommend biological priority for sites 25 to 32

25	Extremely rare or rare Coniferous dense and annual cropland Land unused Low Surrounding land agriculture
26	Extremely rare or rare Coniferous dense and annual cropland Land use residential Medium Surrounding land residential/ developed
27	Extremely rare or rare Coniferous dense Land unused Low Surrounding land agriculture
28	Extremely rare or rare Developed Land heavily used in summer (community pool) High Surrounding land developed
29	No threatened species Mixed wood- dense Land unused Low Surrounding land unused
30	No threatened species Grassland and mixed wood-open Land unused Low Surrounding land residential
31	Exotic species Developed Land use agriculture Medium Surrounding land developed
32	Rare/uncommon and exotic species Developed Land used heavily High Surrounding land used heavily

Table 11: Specific site conditions used to recommend biological priority for sites 33 to 34

33	Extremely rare species Annual cropland and pasture and swamp Land used heavily High Surrounding land forested
34	No threatened species Annual cropland Land used heavily for agriculture Medium Surrounding land agriculture and forested