Resource Assessment and
Watershed Level Plan for Agriculture in the
St. Albans Bay Watershed,
Franklin County, Vermont

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Background and Purpose of Plan

These watershed plans were developed by NRCS in Vermont to address the need for more effective practice implementation of conservation plans on agricultural lands in the Lake Champlain Basin. Past conservation practice implementation efforts have been broad in scope and have not resulted in any significant improvements in water quality. In response to the pending new phosphorus TMDL for Lake Champlain and due to the availability of increased NRCS funding for the next five years, NRCS in Vermont has decided to use a more strategic and focused process for conservation practice implementation. Under this new process NRCS will collaborate with the Vermont Department of Environmental Conservation (VTDEC) to contribute information to the agricultural sections of Tactical Basin Plans (TBP's). These agricultural watershed plans will provide a comprehensive inventory of land use and resource conditions in each of the targeted watersheds. This information will then be used by local NRCS staff and partners working in each watershed to identify and target specific farms and fields for further resource assessment and for the development of practice alternatives.

Local Watershed Teams will be initially established by NRCS in each watershed, but eventually they will be directed by an appropriate local partner to bring all agricultural partners together to work in a coordinated and strategic effort. The Local Watershed Teams will determine the length of the project for each watershed and what amount of phosphorus reduction they would like to achieve during that time period. These Teams will also identify objectives to meet their goals and a detailed action plan supporting these objectives. The timeline and amount of practice implementation may be determined to some extent by the amount of funds likely to be available and the staff available to implement the Local Watershed Team Action Plan.

These watershed plans will also include the results of an analysis to establish phosphorus reduction goals (in lbs/yr) for each of the targeted watersheds using existing EPA tools such as the EPA HUC-12 Tool for the Lake Champlain Basin. The percent reduction in phosphorus load identified by EPA for the larger HUC-8 watershed will be used to calculate the required phosphorus load reduction for each HUC-12 watershed. Currently, EPA has proposed phosphorus reduction goals for our four targeted watersheds that range from 35 to 83 percent, although at this time the TMDL is not finalized and these reduction goals could still change.

Based on the required reduction for each of the targeted watersheds, an example conservation practice scenario will be developed. This scenario will include a suite of individual practices, and systems of practices, that when implemented will reduce phosphorus loading from the agricultural lands by the required amount for each of the targeted watersheds. The new EPA Scenario Tool will be used to develop this example suite of practices that meet the TMDL goal for agriculture in each of the watersheds. The Local Watershed Teams will modify this list of selected practices and the amount applied based on their more detailed assessment of the watershed and their locally developed goals. The amount of estimated phosphorus reduction from implemented practices will be tracked on an annual basis. It is important to note that the phosphorus reduction amounts achieved by these specific practices are an estimate based on some fairly general modeling assumptions. These modeled loading reductions can be helpful in establishing goals for a watershed and for the tracking of progress. However, these numbers are not necessarily accurate in a way that they could be used for regulatory purposes.

Resource Inventories

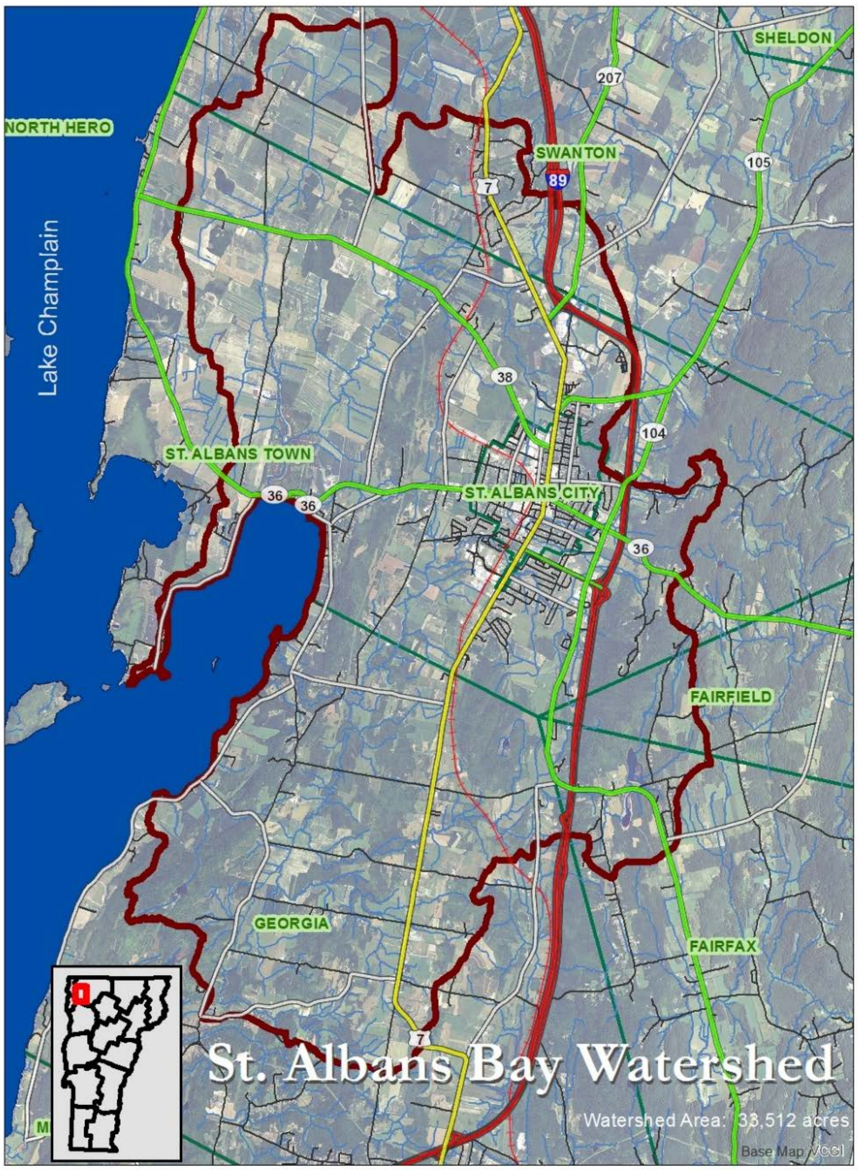
A variety of watershed land and farm assessments were undertaken in order to provide resource condition information on a watershed scale to the Local Watershed Teams, NRCS staff and partners. These various data layers can be used individually or in combination with each other to help the Local Watershed Teams and conservation planners to target areas for further on the ground assessment and then if appropriate, conservation practice implementation. Due to the large extent of information that could be potentially developed and the short time frame in which the data is needed, we have prioritized the development of the data layers to some extent based on feedback from local NRCS employees.

For each data layer a short narrative will describe the data set, briefly how it was generated, show a watershed wide map of the data, a more detailed example map, and some tabular or graphical summary data when appropriate. Suggestions will also be provided how a particular data layer might be used in conjunction with other data layers. All applicable NRCS offices will be provided GIS based electronic files of each data layer for them to use in their more detailed assessments.

Watershed Overview

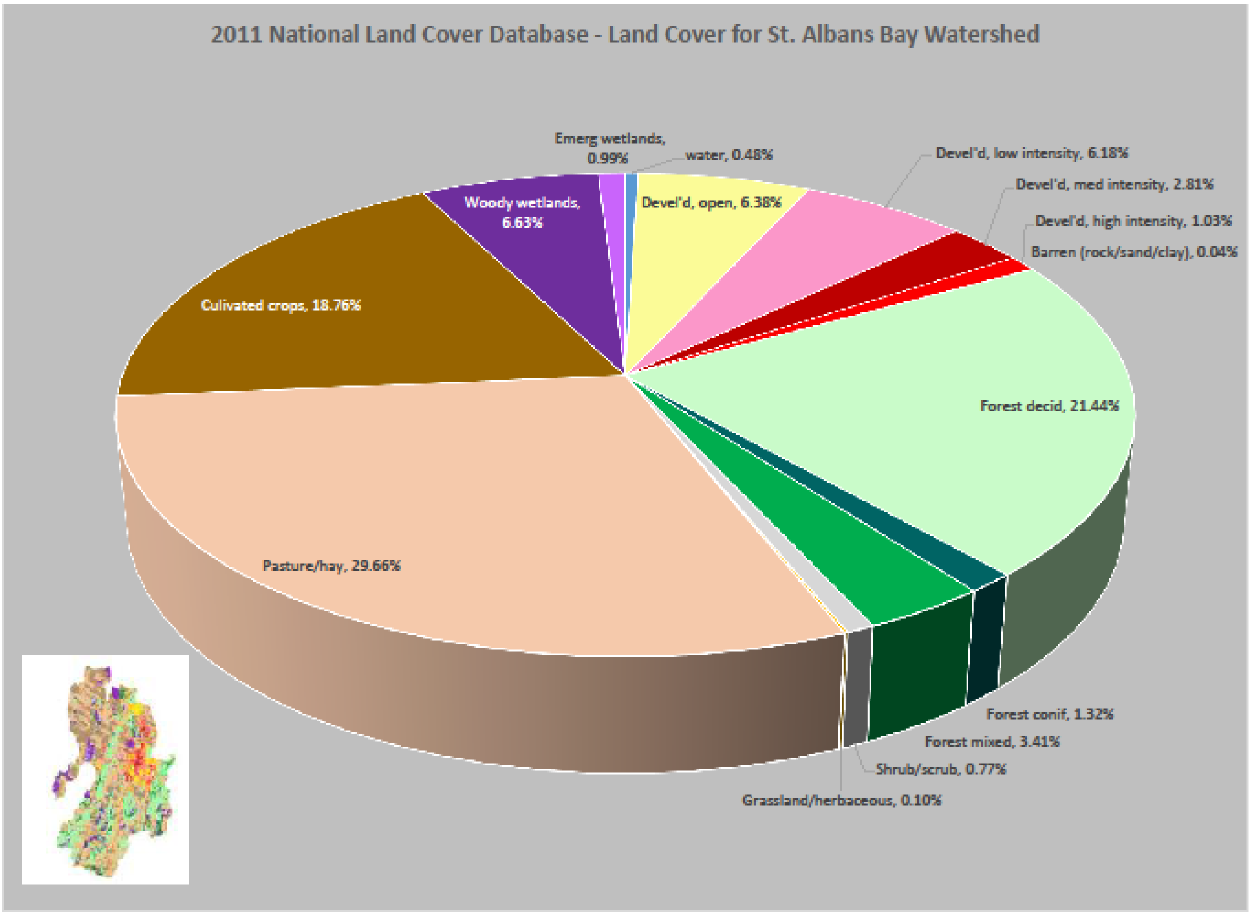
The St. Albans Bay watershed is located in western Franklin County Vermont. There are four major tributaries that drain into St. Albans Bay: Jewett Brook, Stevens Brook, Rugg Brook and the Mill River. The total watershed area is 34,260 acres. St. Albans Bay is subject to frequent, and sometimes severe, blue-green algae blooms during the late summer.

Figure 1 – Map of the St. Albans Bay Watershed



The St. Albans Bay Watershed is mostly rural with a significant amount of land in agriculture. It does include the city of St. Albans. Data from the National Land Cover Database (NLCD 2011, Figure 2) estimates that 19% of the watershed is in annual cropland and 30% is in pasture or hayland, for a total of 49% in agriculture. Approximately 25% of the watershed is in forest. Only about 10% of the watershed is in a developed use.

Figure 2 – Land Cover in the St. Albans Bay Watershed (NCD 2011)



Farmsteads

The Farmstead Map shows the location of each active farmstead within the St. Albans Watershed. The identification of farmsteads was conducted by visual interpretation of imagery from 2013 and 2014. Farmstead boundaries were based on the visual identification of structures and heavily disturbed ground surface. As can be seen in Figure 3, there were a total of 50 active farmsteads identified in the St. Albans Bay Watershed in 2014. The NRCS field staff assisted with verification of active farmstead locations in the watershed. There are 3 LFO's in the watershed, 3 of the farms are MFOs' and the remaining 44 farmsteads are small farms. These maps can be used to ensure that all farmsteads in the watershed are reviewed on the ground for potential waste management issues and to help identify farmsteads with potential resource concerns such as improperly constructed and/or maintained heavy use areas.

Figure 3 – Farmstead Locations in the St. Albans Bay Watershed

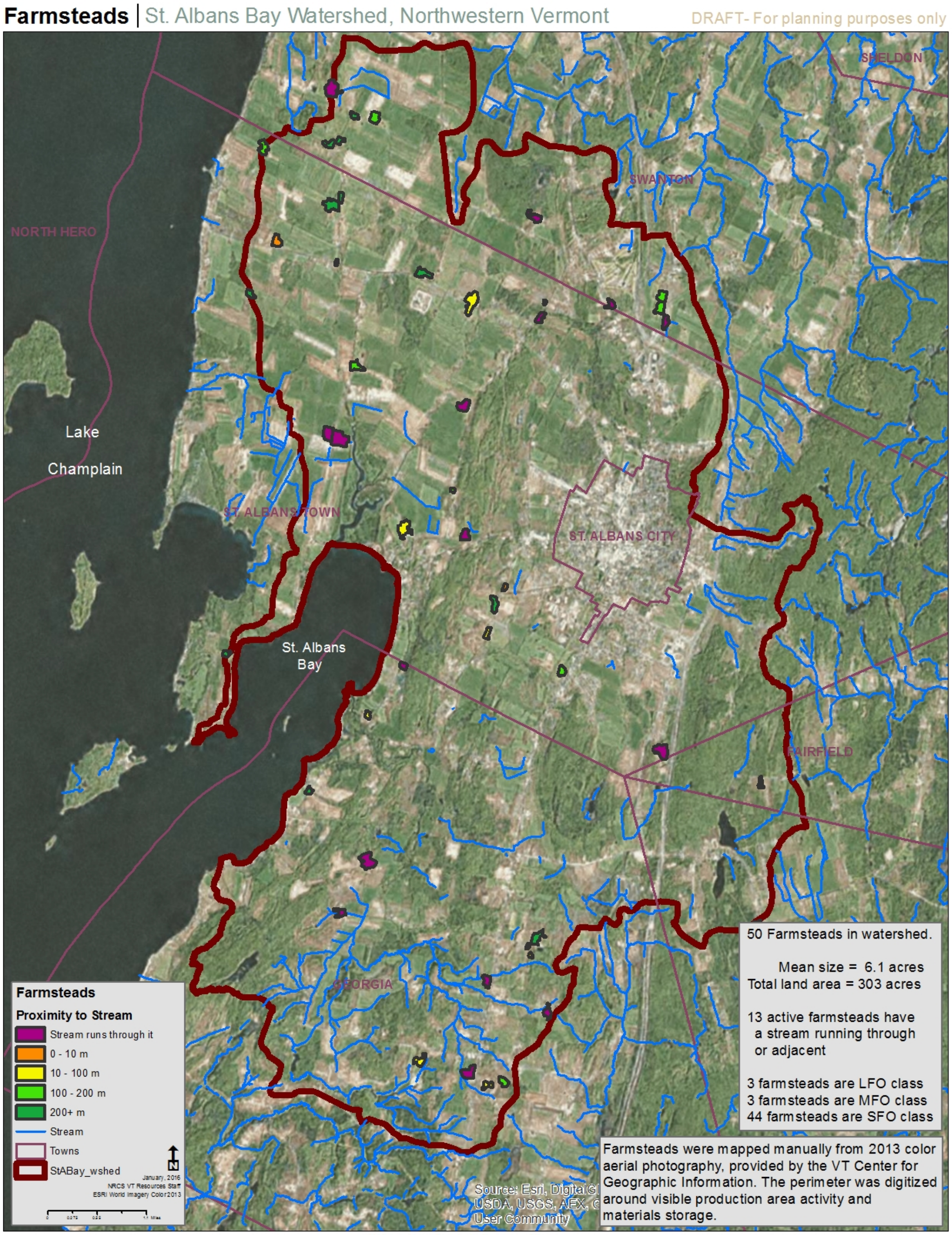
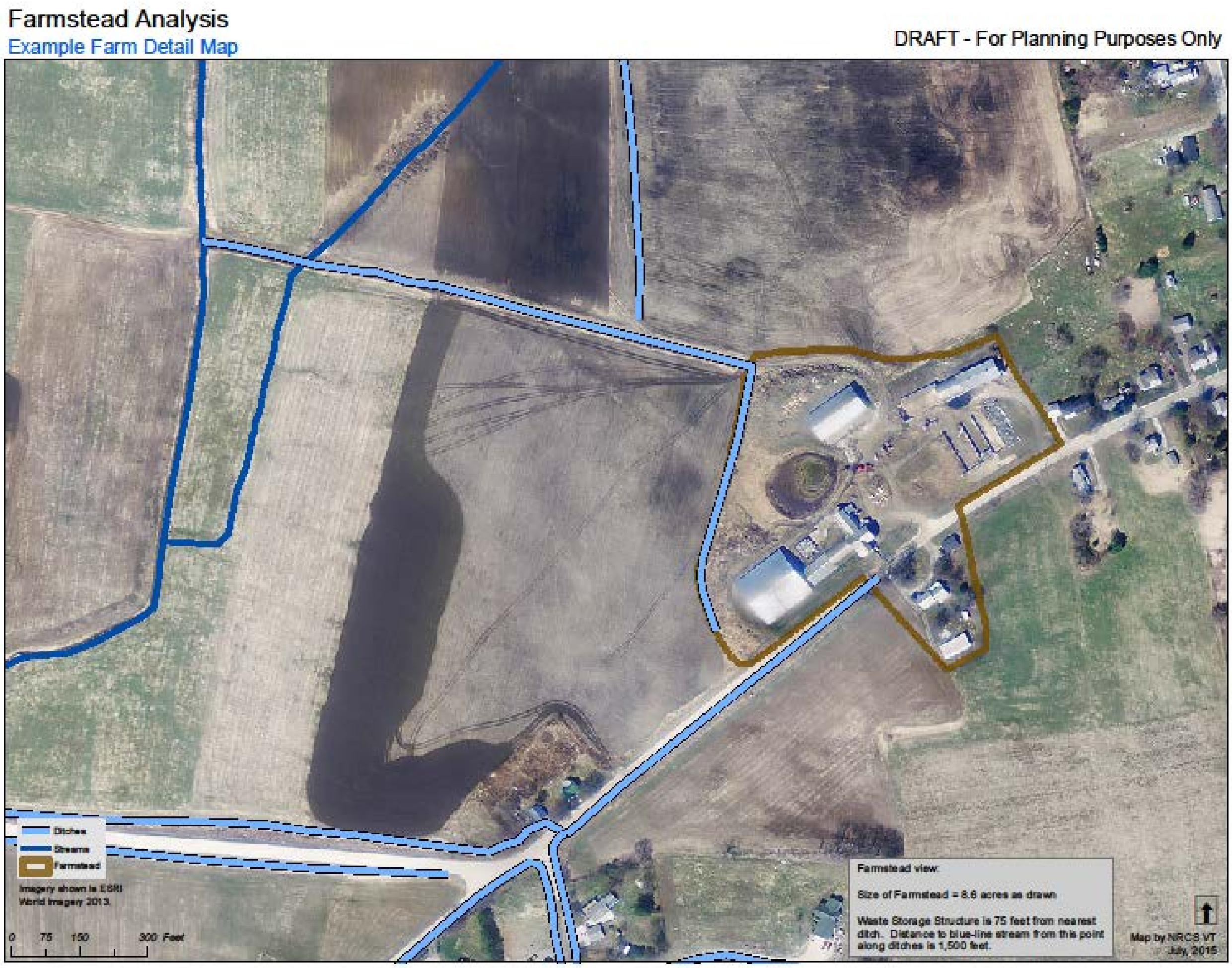


Figure 4 shows an example Farmstead Map for a location that has several barns, a manure storage facility and some heavy use areas, but shows no visible resource concerns. The close proximity of the manure pit to a surface ditch might warrant an onsite visual assessment of any potential resource concerns.

Figure 4 – Example Farm Scale Farmstead Map

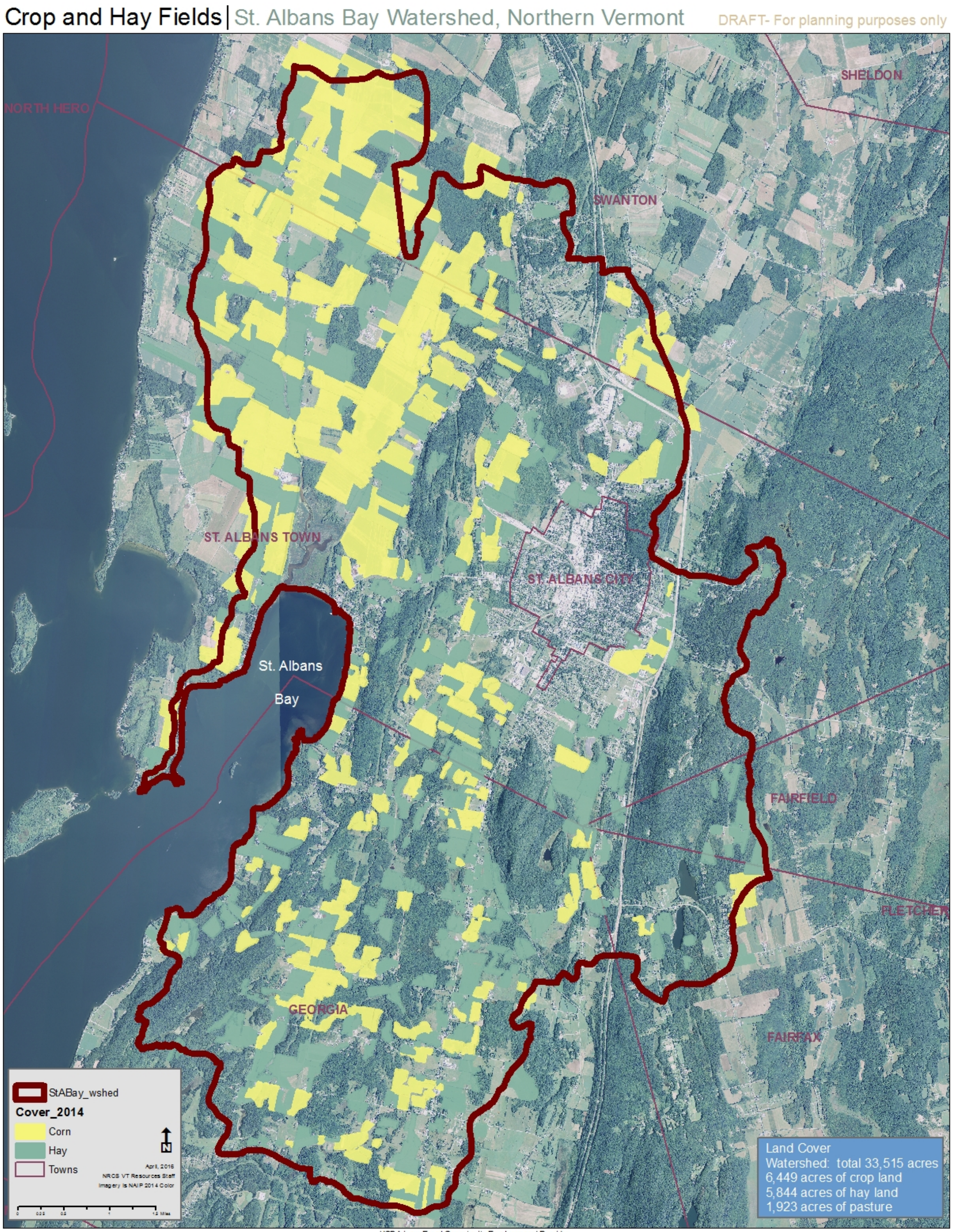


<u>Annual Cropland and Hayland Maps</u>

One of the basic pieces of information need for agricultural watershed planning is the extent and types of land cover in the watershed. Annual crop and hay fields were visually identified in the St. Albans Bay Watershed using 2014 NAIP imagery. As such the land cover is a “snapshot in time” since many crop and hay fields are rotated between annual crops, such as corn, and hay. In addition, multiple years of aerial photography were examined to identify fields that were planted continuously to annual crops.

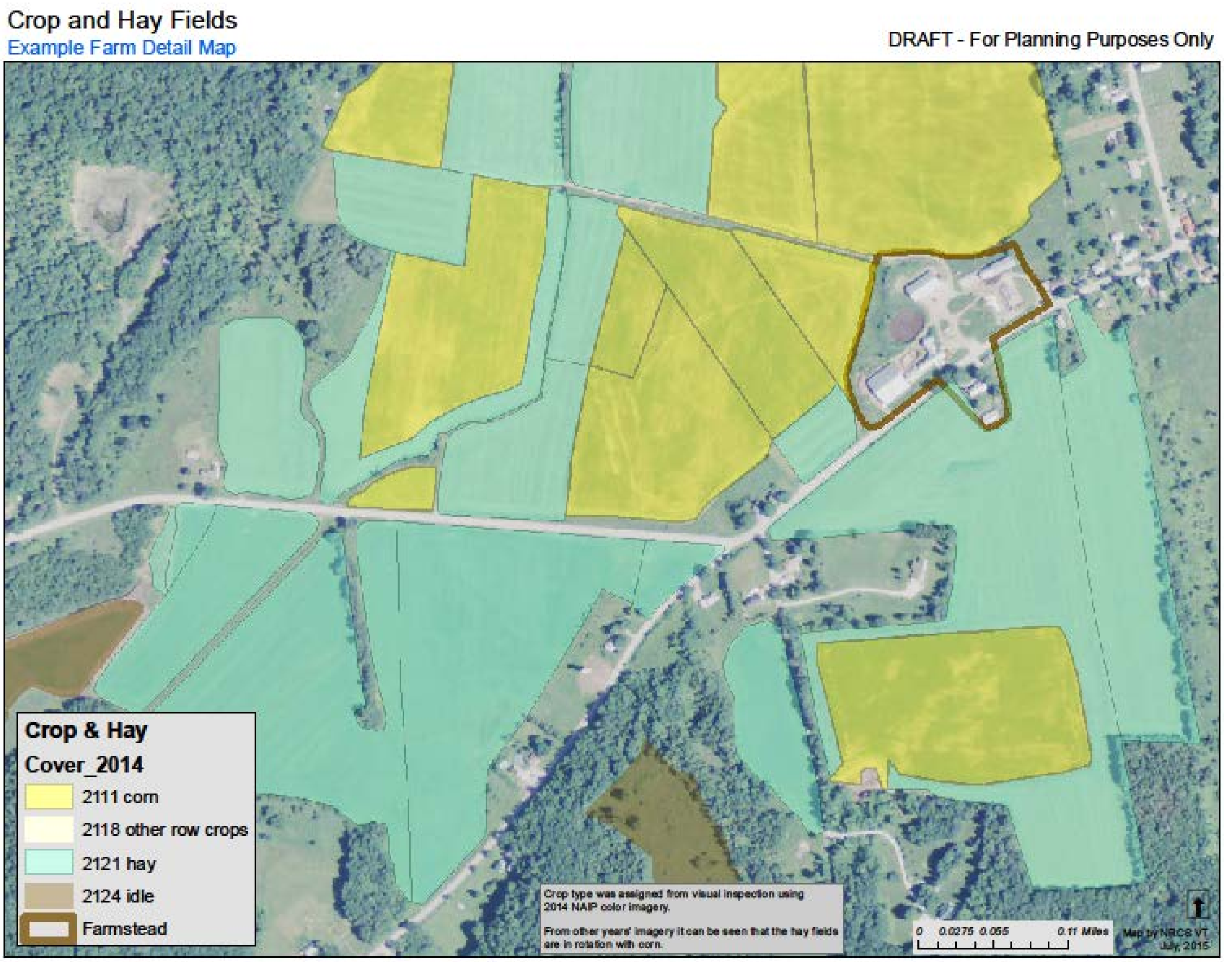
Figure 5 shows the location and extent of corn and hay fields in the St. Albans Bay Watershed as of 2014. This information was digitized using the 2014 National Agriculture Imagery Program (NAIP), and as such may differ slightly from the NCD data presented in Figure 2. According to the NAIP photography there was a total of 6,450 ac. of annual crops (mostly corn) and 5,844 ac. of hay in the St. Albans Bay Watershed in 2014. This comprises a total of 37% of the 33,515 ac. watershed. There was approximately 1,923 ac. of pasture in the watershed at this time.

Figure 5 – Location and Extent of Annual Cropland and Hayland in the St. Albans Bay Watershed



Field scale maps can be produced by conservation planners working in the Watershed. An example of a field scale map for annual cropland and hayland is shown in Figure 6. The Annual Cropland and Hayland Maps can be used alone or overlain with other several data layers such as the Erosion and Runoff Risk Potential Maps to evaluate specific fields for erosion and runoff risk. It is important to remember that these Annual Cropland and Hayland Maps represent land cover in 2014 and many of these fields may be in a corn/hay rotation.

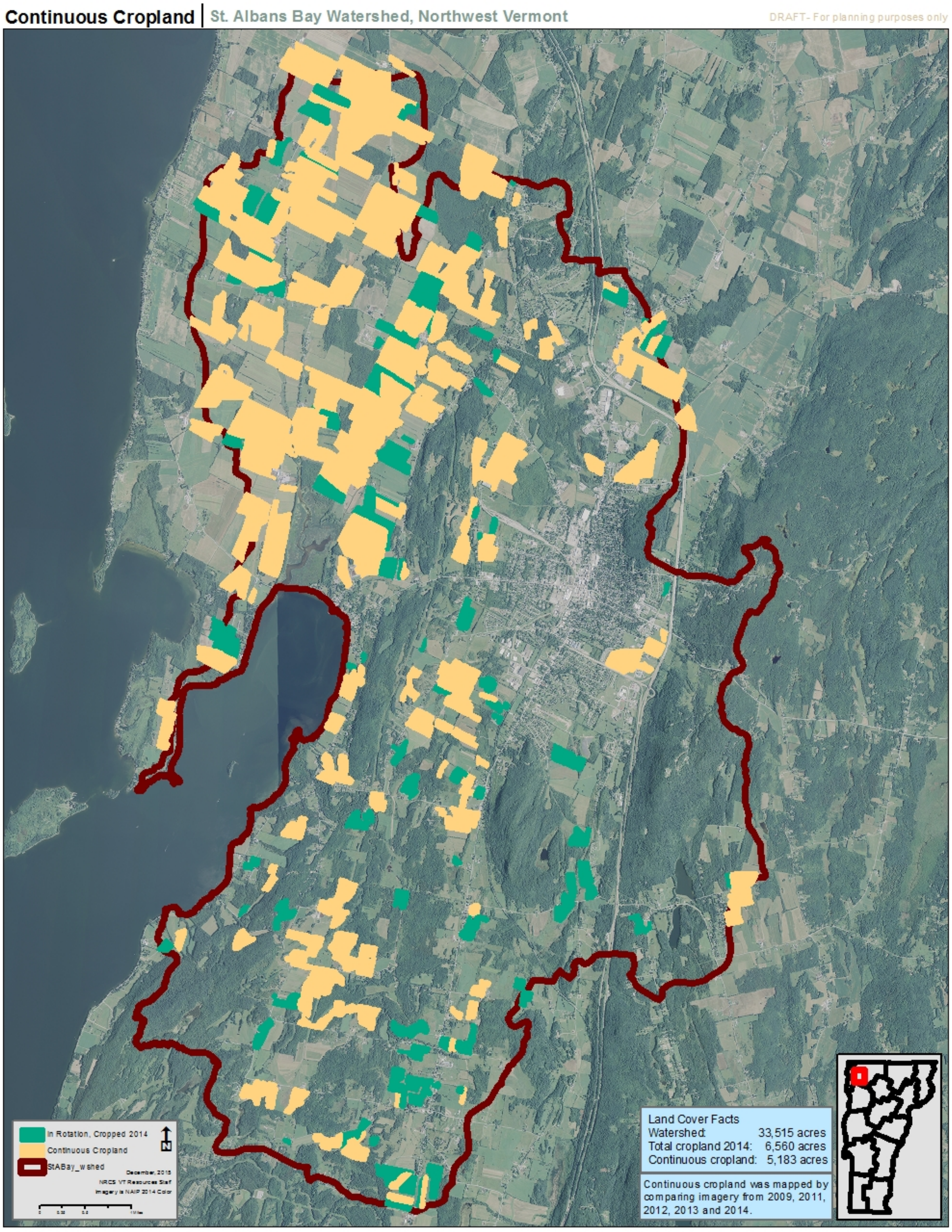
Figure 6 – Example Field Scale Map of Annual Cropland and Hayland



An additional analysis was performed to identify farm fields continuously planted to annual crops such as silage corn (Figure 7). These fields were visually identified using five years of aerial imagery (2009, 2011, 2013, and 2014). There is an estimated 5,183 ac. of continuous cropland identified in the St. Albans Bay Watershed (53% of total cropland). This represents 79% of the annual cropland in the watershed in 2014.

Fields in continuous annual crops are likely to exhibit a number of resource concerns. These fields may have higher erosion rates, depleted organic, and higher nutrient application rates, among other concerns. For this reason these fields should be prioritized for more detailed and onsite evaluations. Any fields identified as continuous cropland and have a high Erosion and Runoff Risk Potential should be considered as especially vulnerable to significant resource concerns.

Figure 7 – Map of Cropland in Continuous Annual Tillage

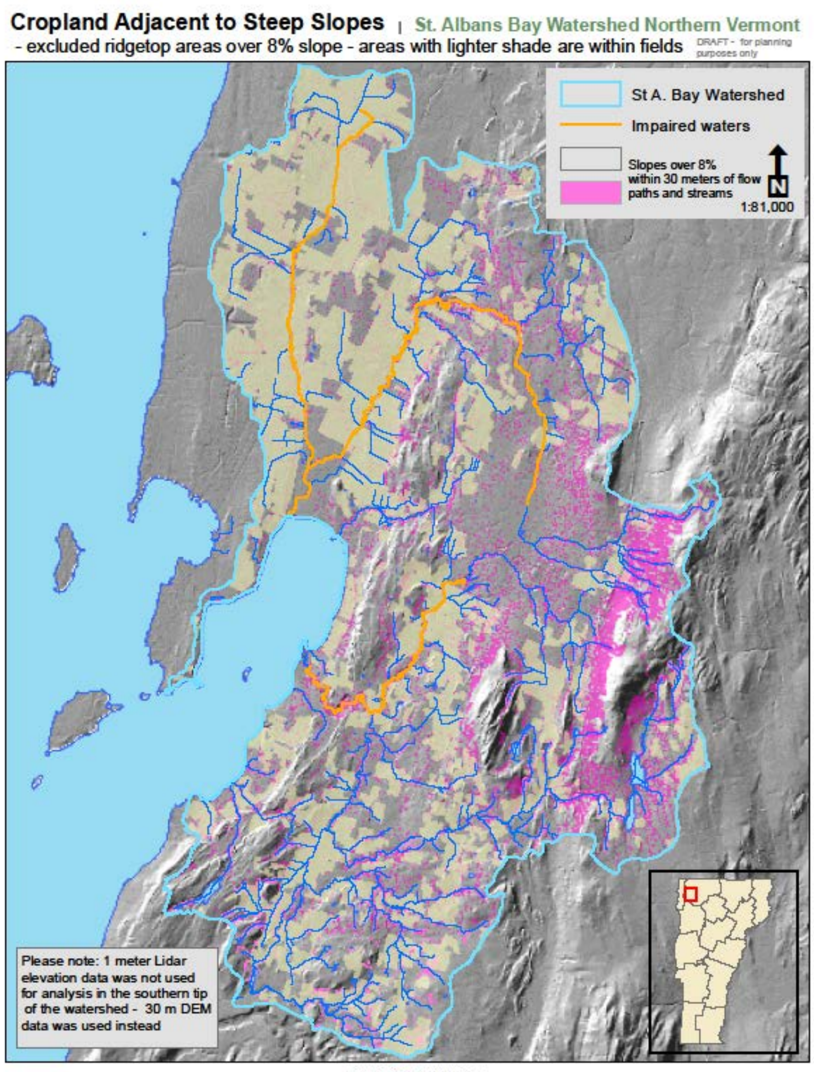


Cropland and Steep Slope Adjacency

The streams and rivers in the St. Albans Bay watershed are not as deeply incised as some other watersheds. However, there are still some steep slopes along the waterways up to the edges of adjacent fields. These areas are prone to the development of gully erosion due to the steep slopes and the erosive nature of the soils in the watershed. These gullies often first form in the woods or on non-ag land adjacent to fields and then with time head cut into the crop fields.

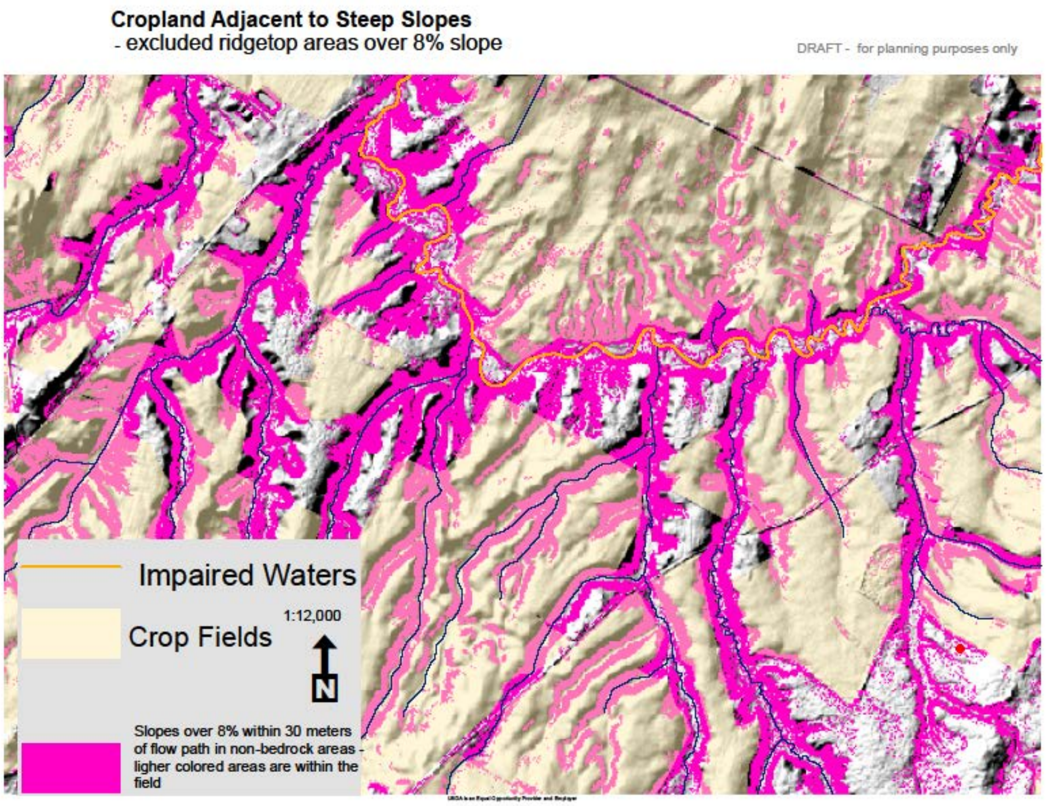
This GIS analysis highlights areas of steep slopes over 8% grade that are adjacent to fields. It is important to identify the location of potential gullies as they can be direct conduits of nutrients and sediment into receiving waters. With the advent of widespread availability of highly detailed LiDAR elevation data, it becomes much easier to locate these potential erosion areas. A flow accumulation model was used to identify steep areas within 30 meters of a flow pathway that are adjacent to crop and hay fields. The analysis used 1 meter LiDAR data. The results of the analysis for the St. Albans Bay Watershed are shown in Figure 8.

Figure 8 – Steep Slopes Adjacent to Cropland in the St. Albans Bay Watershed



Individual field scale maps such as the one shown in Figure 9 can be developed to target in-field resource assessments. As part of the field assessment these areas should be visually checked to identify any areas with significant gully erosion. The maps in Figures 8 and 9 also show (in tan) those streams and rivers that are listed as Impaired by the State of Vermont (VDEC 303d List).

Figure 9 – Field Scale Map of Steep Slopes Adjacent to Cropland



Wetland Restoration

The Restorable Wetland data layer was developed by a variety of government agencies and private consultants in 2007. The main data input layers were: hydric soils, land-use / land-cover data from 2002 showing open land, slopes under 5%, and National Wetland Inventory data showing disturbed wetlands. Once appropriate restoration sites had been delineated using GIS analysis, these areas were then run through a prioritization model that ranked the sites based their potential to retain phosphorus. Four prioritization categories for restoration were chosen: highest, high, moderate, and low. For further details on how the data layer was developed refer to the "Lake Champlain Wetland Restoration Plan" report.

Since this data is now 9 years old, land use changes have occurred over this time period. The data was edited to remove sites that contained house sites. The e911 "esites" data for 2015 was used to remove those areas that now show homes within the restorable wetlands. Additionally, State Land was also excluded from the data layer, since it is not eligible for NRCS restoration programs. The extent and location of potentially restorable wetland areas is shown in Figure 10. These areas are located on private land and may have historic drainage and other modifications. These areas would only be available for restoration under a voluntary restoration program such as the Wetland Reserve Easement program. Using field scale maps such as in Figure 11, it will be necessary for on-site investigation to insure that they are eligible and capable of being restored to natural wetland conditions.

Figure 10 - Watershed Scale Map of Potentially Restorable Wetlands

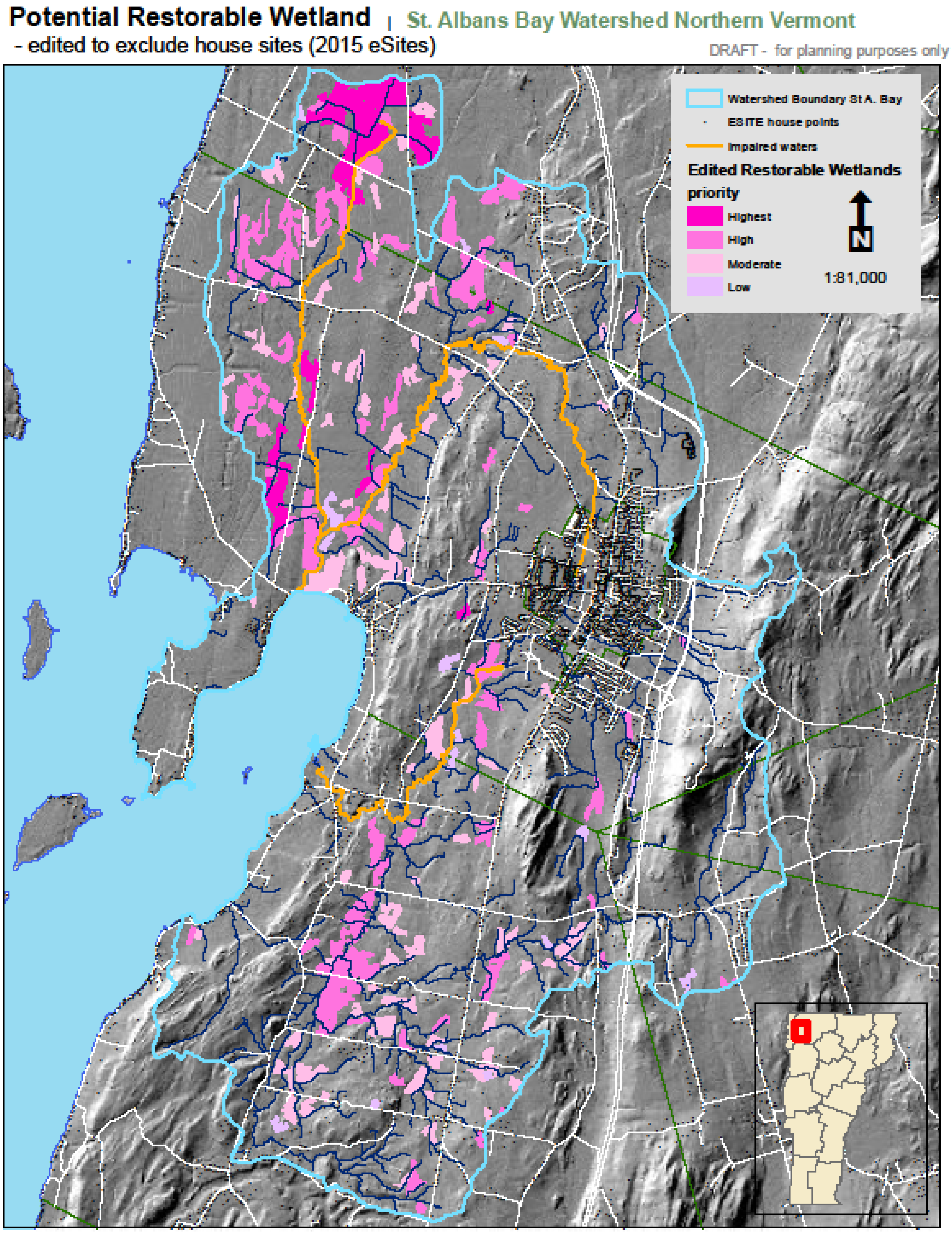
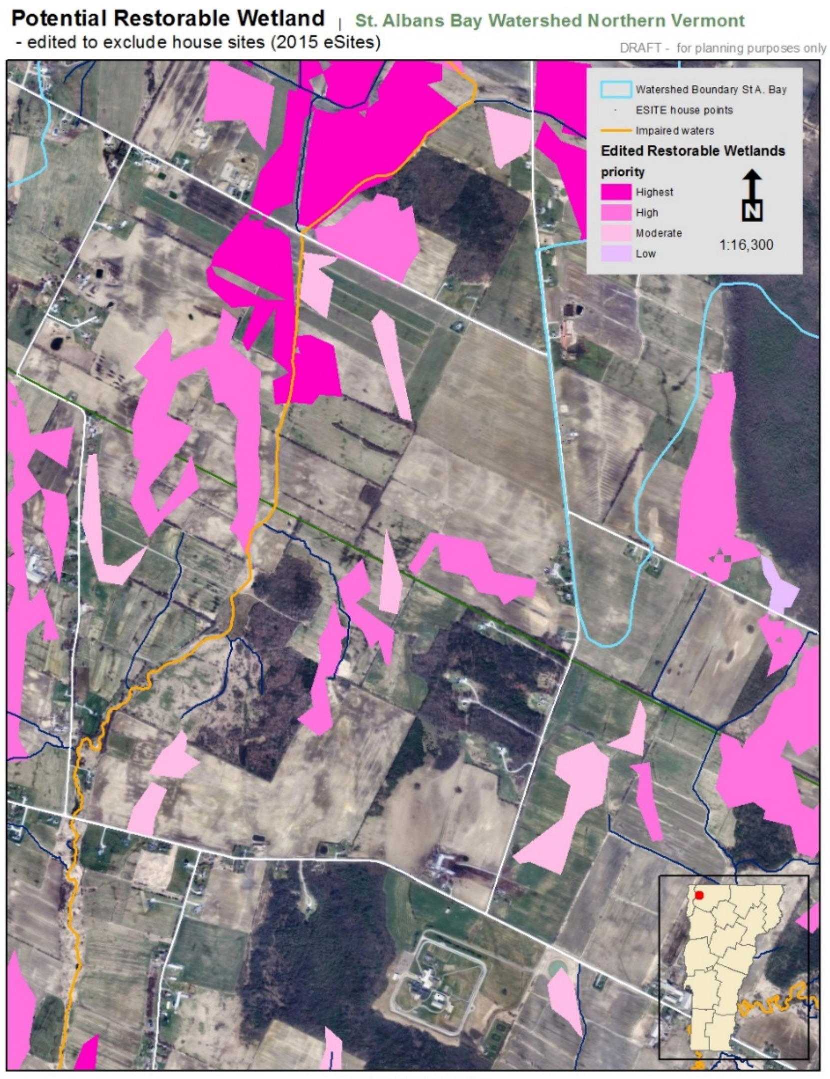
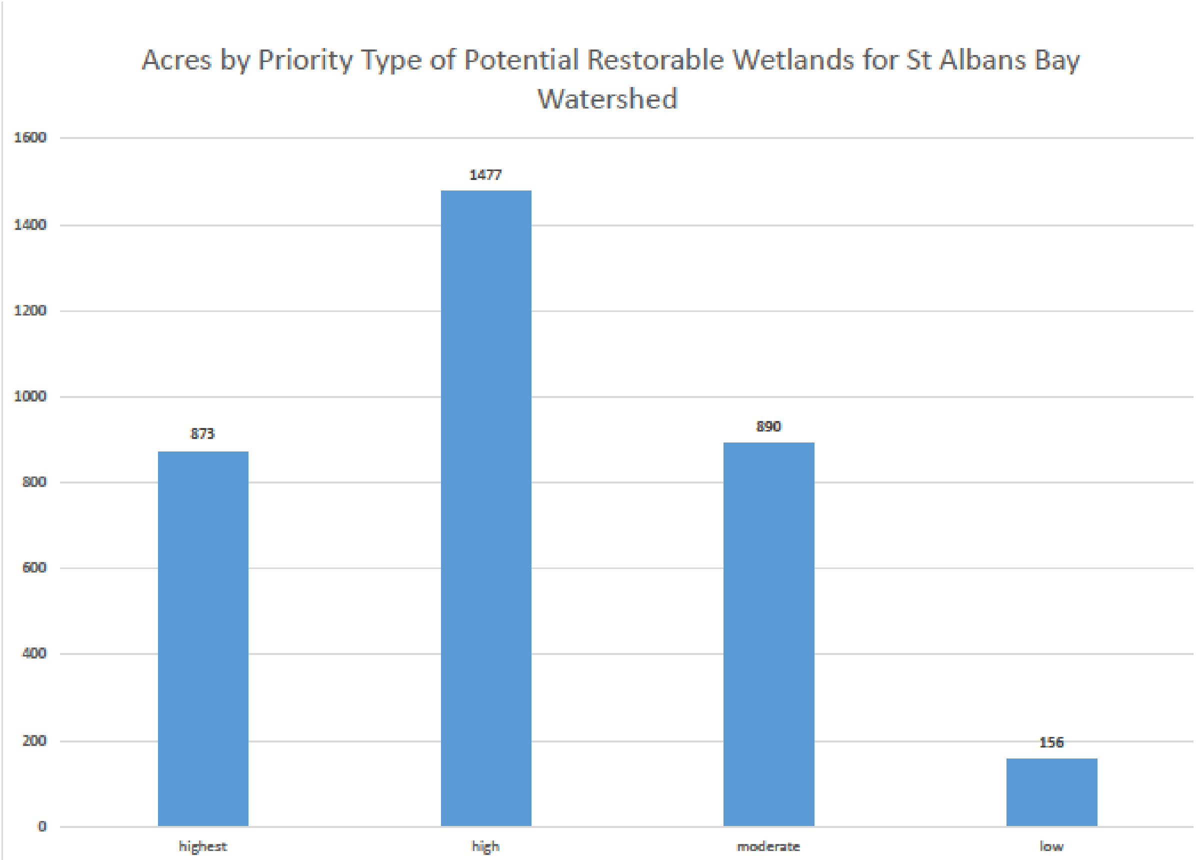


Figure 11 - Example Field Scale map of Potentially Restorable Wetlands



The map in Figure 10 identifies over 3,402 ac. of potentially restorable wetland in the St. Albans Bay Watershed. As can be seen in Figure 12 over half of this area (2,345 acres) is categorized as having high or very high restoration potential.

Figure 12 - Summary of Potentially Restorable Wetland Classes



Erosion and Runoff Risk Potential

A GIS model was constructed to estimate the risk of erosion and runoff from farm fields based on four factors. These factors included the K factor (erodibility), hydrologic soil group and flooding potential of the soil map unit, as well as the slope, based on Digital Elevation Model (DEM) data. The categories in the Erosion and Runoff Potential Maps are meant to represent the relative risk of sheet and rill erosion, and runoff occurring from specific fields or portions of fields. As can be seen in Figure 13 a moderate portion of the fields in the St. Albans Bay Watershed have been identified having a high or very high risk for erosion and runoff. Figure 14 provides an example of the type of field level maps that can be produced from this data. It is important to note that in many situations it is only a portion of a field that is identified as having high or very high risk. The analysis does not consider cropping systems or conservation practices currently used on the field.

Figure 13 - Watershed Scale Map of Erosion and Runoff Risk Potential

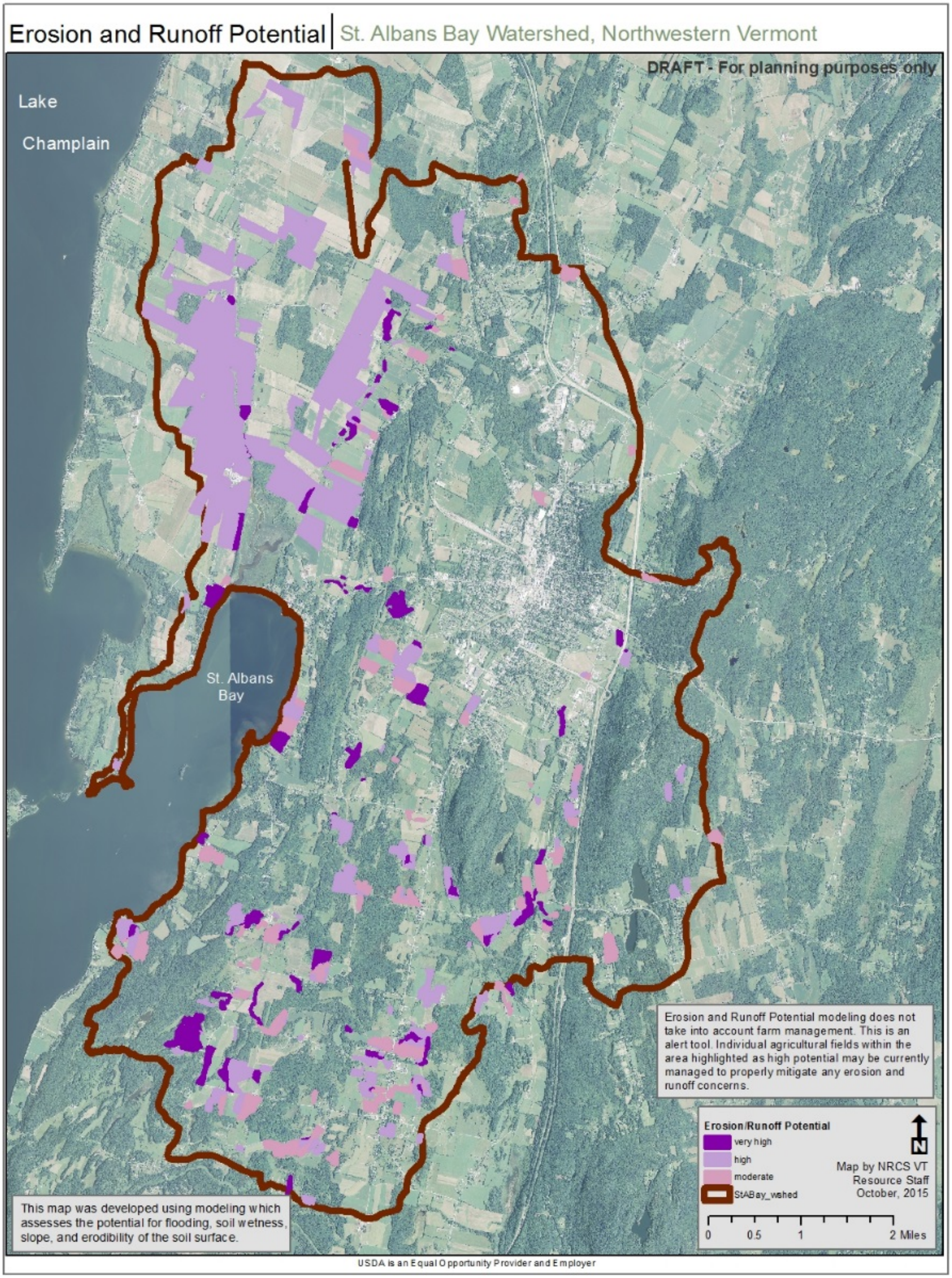
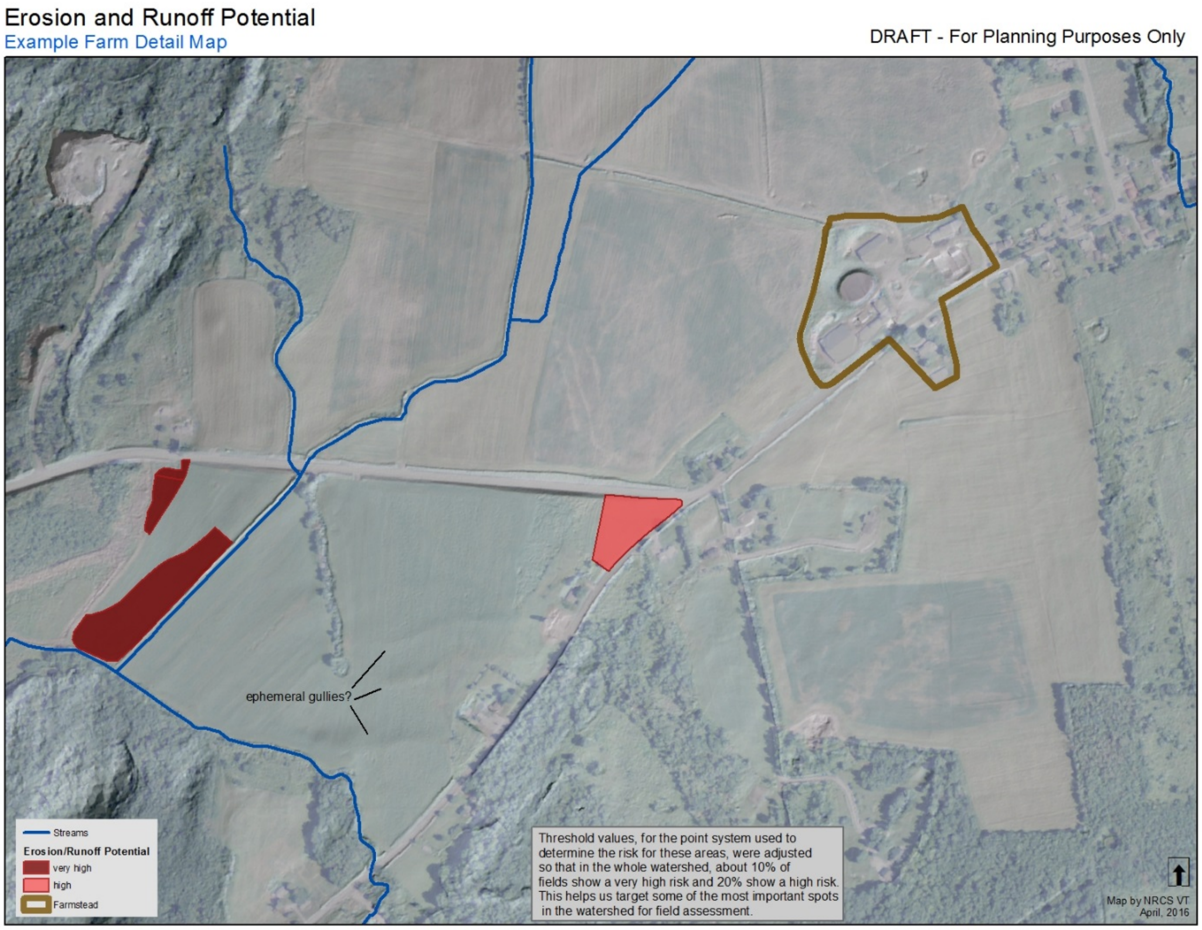


Figure 14 - Example Field Scale Erosion and Runoff Risk Potential Map



<u>Farm Ditches</u>

Field ditches are common on agricultural land throughout the Lake Champlain Basin in Vermont. These waterways have the potential to readily transport both sediment and nutrients to streams and rivers. Under the new Required Agricultural Practices recently passed by the State Legislature all ditches will likely be required to have a 10 ft. wide vegetated buffer adjacent to them. As such it will become important to know the location of these ditches to ensure that the farmer has opportunities to install buffers. Figure 15 shows the location of ditches and other drainage features in the St. Albans Bay Watershed. These drainage features were identified through visual interpretation of orthophotos and LiDAR data and as such **do not represent a completely accurate and complete depiction of drainage features in the watershed. These maps should be used for planning purposes only.** There were a total of 180 miles of field and roadside ditches identified in the St. Albans Bay Watershed. Field scale maps can also be developed as shown in Figure 16 where the ditch locations are overlain with crop field and farmstead location data.

Figure 15 – Drainage Network in the St. Albans Bay Watershed

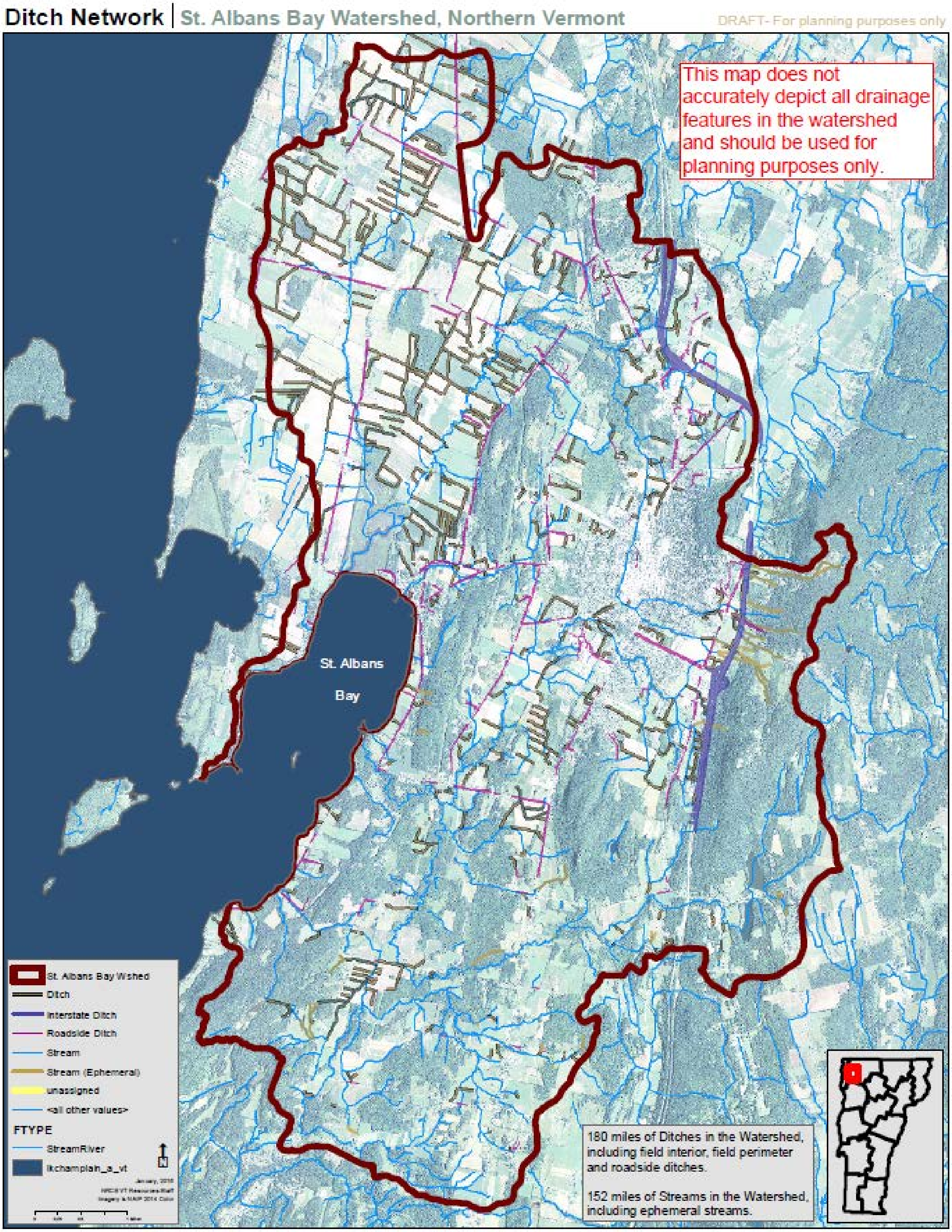
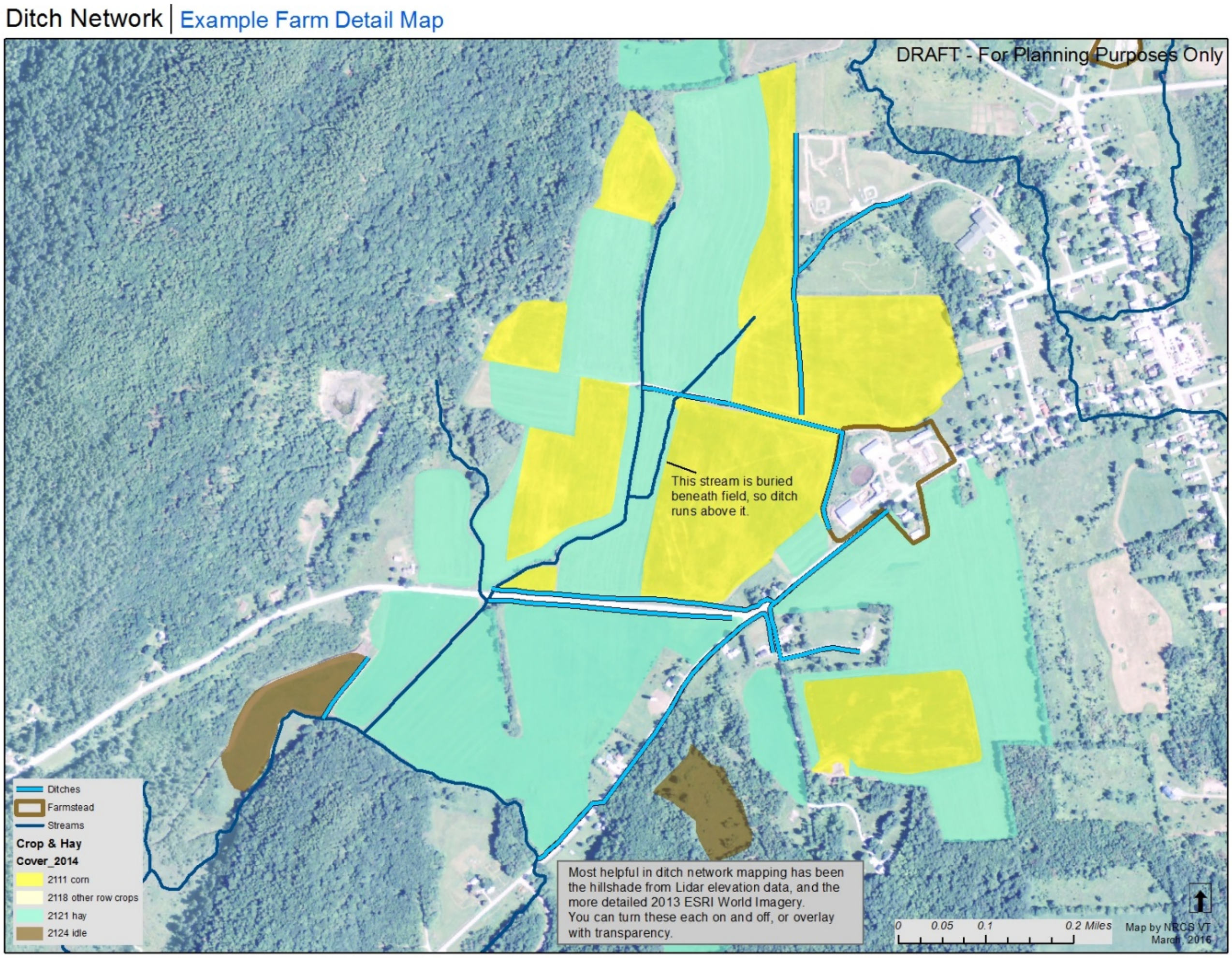


Figure 16 - Example Field Scale Ditch Map

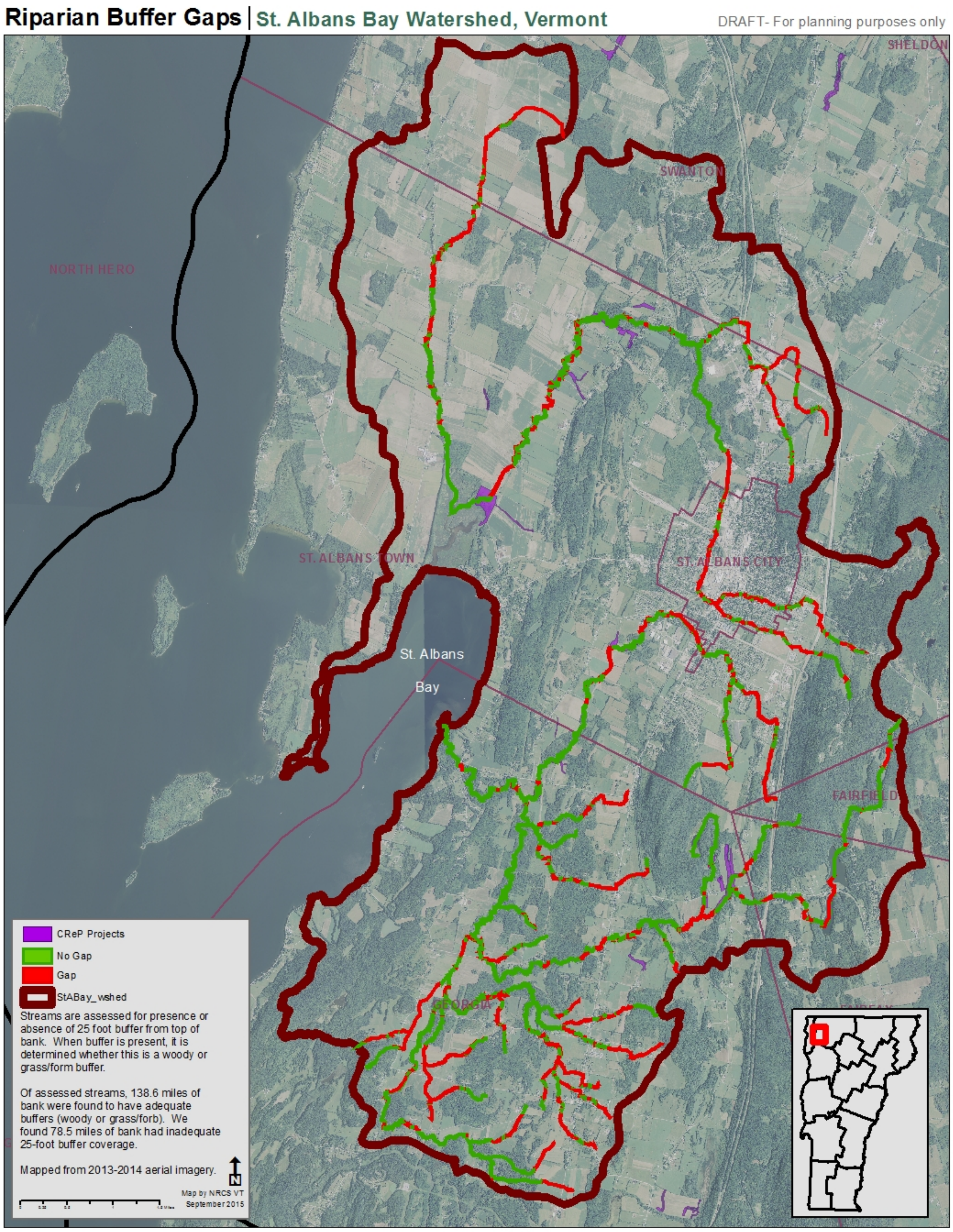


Riparian Buffer Gaps

Riparian corridors were evaluated in the St. Albans Bay Watershed to determine locations where adequate riparian buffers were lacking. The identification of these riparian buffer gaps was based on visual interpretation of 2014 aerial imagery and channel width information from the Vermont Department of Environmental Conservation (VTDEC) Rivers Program database. Riparian zones were evaluated to determine if at least a 25 foot wide vegetated buffer was present, either herbaceous or woody. Twenty-five feet was used as the minimum requirement since the NRCS practice standard for Filter Strip requires a minimum of 25 ft and the practice standard for Riparian Forest Buffer requires a minimum of 35 ft.

A total of 217 miles of streambank (both sides of the stream) were evaluated. It was estimated that 78.5 miles of streambank in the St. Albans Bay Watershed do not have an adequately vegetated riparian buffer. It may be useful to overlay the Riparian Buffer Map data with continuous cropland and/or erosion and runoff risk potential data. These areas may exhibit greater rates of erosion and runoff and would be a priority for well vegetated riparian buffers.

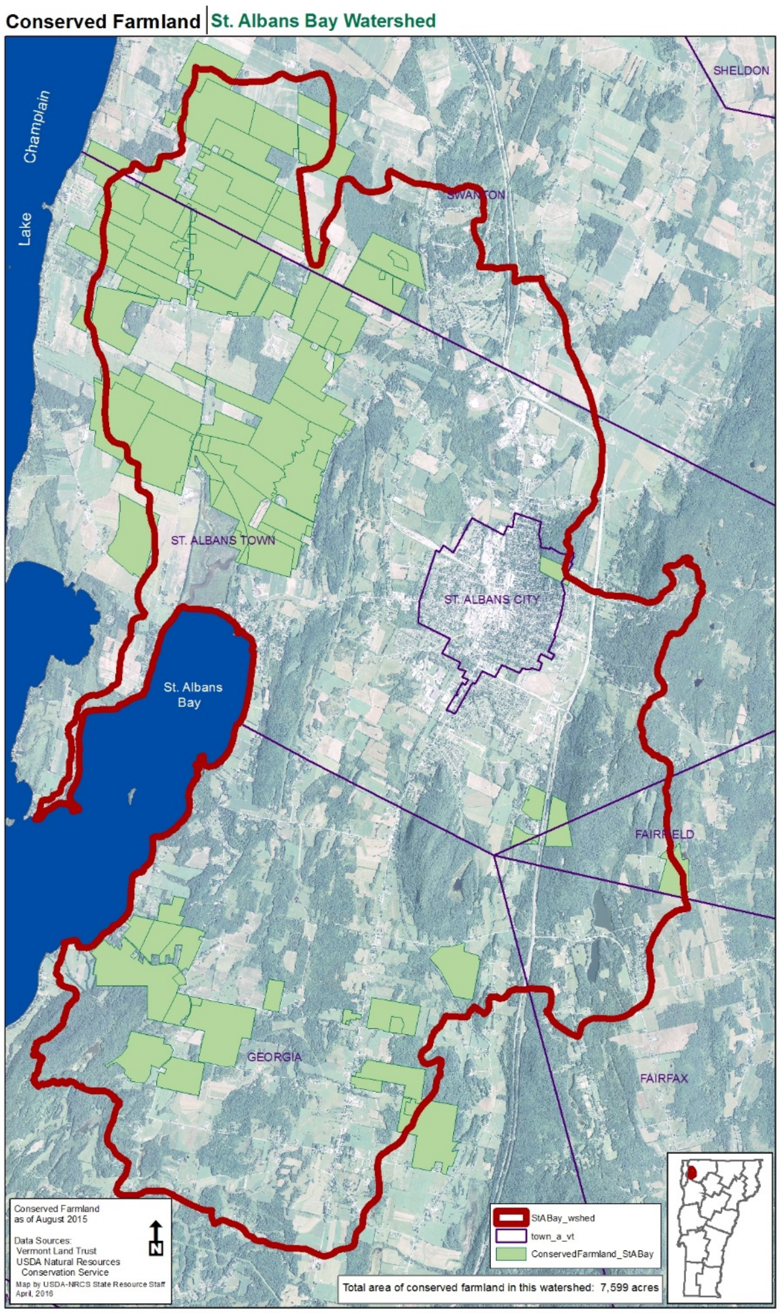
Figure 17 – Map of Riparian Buffer Gaps



Conserved Farmland

In partnership with other groups such as the Vermont Land Trust, the Vermont Housing and Conservation Board has operated a farmland conservation program in Vermont since 1987. NRCS has contributed significant funds to this program over the years through what is now the Agricultural Conservation Easement Program. In some areas large, contiguous blocks of conserved farmland are forming. The map in Figure 18 shows conserved farmland in the St. Albans Bay Watershed. A total of 7,599 ac. of farmland have been conserved to date in this watershed. Conserved farmland maps can help direct funds and efforts of programs such as the Regional Conservation Partnership Program (RCPP) and other water quality initiatives.

Figure 18 – Conserved Farmland in the St. Albans Bay Watershed



Watershed Phosphorus Reduction and Practice Implementation Goals and Projected Costs

EPA has proposed phosphorus reduction goals for all the HUC-8 watersheds or lake segments in the Lake Champlain Basin. The current overall phosphorus reduction goal for the St. Albans Bay Watershed is 24% for all land uses. Since the TMDL is not finalized at this point there is a chance the reduction goal could still change. EPA then allocated different reduction goals for each sector within the watershed, agriculture is one of these sectors. The phosphorus reduction goal for agriculture in the watershed is 35%.

NRCS has attempted to use the TMDL goals and EPA developed tools to estimate phosphorus loads and reductions to the extent possible. This includes use of the new EPA HUC-12 Tool and the EPA Scenario Tool. All costs are based on NRCS payment schedules, except for a couple of situations where estimated practice costs were developed (ex. average farmstead wide practice costs).

<u>Watershed Phosphorus Reduction Goals for Agriculture</u>

Watershed phosphorus reduction goals for agriculture were estimated using the EPA HUC-12 Tool. This tool provides an estimate of phosphorus loading for each land cover type at the HUC-12 level. Phosphorus loading from continuous corn, crop/hay rotation, continuous hay, pasture and farmland were totaled from the HUC-12 Tool to determine the total estimated phosphorus loading from agriculture. The needed amount of phosphorus reduction in lbs/yr was then estimated by multiplying the total agricultural load by the percentage reduction determined by EPA to be necessary for agriculture in the watershed. Table 1 provides the necessary load reductions for the four targeted watersheds. For the St. Albans Bay Watershed the total agricultural loading was estimated to be 19,248 lbs/yr. The reduction goal at this time was set to be 35%, and **the resulting agricultural phosphorus reduction goal for the St. Albans Watershed was estimated to be 8,066 lbs/yr.** The St. Albans Bay Watershed has the second lowest estimated phosphorus load reduction of the four targeted watersheds.

Table 1 – Agricultural Phosphorus Reduction Goals for the Four Targeted Watersheds

2016 Priority Watershed Estimated Ag Phosphorus Loadings and Targeted Reductions August, 2015 - Draft				
Watershed Name	**Watershed Area (acres)**	**Total Estimated Ag P Loading (lbs /yr)**	**TMDL Reduction Goal**	**Ag P Reduction Goal (lbs /yr)**
Rock River	22,743	19,248	83%**	15,976
Pike River	25,088	9,599	83%**	7,967

St. Albans Bay	33,515	23,047	35%	8,066
McKenzie Brook	21,222	43,276*	60%	25,965
*Total loading reduced 25% to remove loading from East Creek (included in the BMP Scenario Tool)				
** The Rock River and Pike River are part of the Missisquoi Direct watershed in the BMP Scenario Tool.				

Individual Practice and Practice System Efficiencies

The EPA Scenario Tool is a spreadsheet tool based on SWAT modelling of watersheds in the Lake Champlain Basin. It was developed by a private consultant under contract by EPA Region I. Early on in the model development EPA convened a workgroup of local experts to help develop reduction efficiencies for conservation practices that are included in the SWAT model. These efficiencies and ones adjusted or produced by the model were then incorporated into the EPA Scenario Tool. As such the EPA Scenario Tool is subject to the same limitations of the SWAT model. Certain agricultural practices cannot be easily included in the SWAT model, including many farmstead related practices. Based on the SWAT modelling, efficiencies for a conservation practice vary based on factors such as cropping system, soil hydrologic group and slope.

Table 2 lists the agricultural conservation practices and systems of practices that are included in the EPA Scenario Tool and provides example efficiencies for each practice. It is important to consider multiple practices that are applied to the same field as a system since the individual efficiency of each practice will decrease as additional practices are added to the same field. These efficiencies will be adjusted as better information becomes available, such as the Edge of Field Monitoring Project data.

Table 2 - List of Available Ag Practice and Practice Systems in the EPA Scenario Tool and Example Practice Efficiencies*

1. Change in crop rotation	25%
2. Change in crop rotation and conservation tillage	63%
3. Change in crop rotation, grassed waterway, ditch buffer and riparian buffer**	84%
4. Change in crop rotation, grassed waterway riparian buffer	67%
5. Change in crop rotation and riparian buffer	56%
6. Conservation tillage	50%
7. Cover crop	28%
8. Cover crop, conservation tillage, grassed waterway, ditch buffer and riparian buffer	92%
9. Cover crop, conservation tillage and manure injection	64%
10. Cover crop and manure injection	28%
11. Ditch buffer	51%

12.	Grassed waterway	25%
13.	Grassed waterway and riparian buffer	56%
14.	Manure injection and reduced manure P applied	5%
15.	Reduced manure P applied	5%
16.	Reduced manure P applied and grassed waterway	29%
17.	Annual cropland to permanent grass	92%
18.	Riparian buffer	41%
19.	Livestock exclusion/fencing/grazing system	73%
20.	Farmstead practices	85%

*BMP efficiencies vary with cropping system, soil type and slope
**Riparian forest buffers and grassed filter strips are both considered as riparian buffers
Note: These practice efficiencies should only be used for planning purposes and will change as better practice efficiency data is developed.

Existing Practice Implementation and Loading Reduction Estimates

NRCS has been working with farmers in The St. Albans Bay Watershed for an extended period of time. During this period farmers have signed contracts with NRCS to implement a variety of conservation practices. Over time many of the early contracts expired and some of the practices were either discontinued or not maintained. Table 3 provides the number of a list of practices that were installed in the St. Albans Bay Watershed with NRCS support over the 5 year period from 2010 – 2014. During this period practices were tracked to determine which specific years during that time period they were implemented. It cannot be determined which practices were continued after the contracted period.

The practices that were implemented to the greatest extent included nutrient management (2,193 ac.), waste recycling (manure injection = 740 ac.), cover crops (318 ac.), and a number of grazing system practices. Table 3 also shows estimated phosphorus reductions as a result of the implementation of these practices. The largest phosphorus reductions resulted from cover crop (378 lbs/yr), filter strip (320 lbs/yr) and prescribed grazing (319 lbs/yr). The total annual average reduction in phosphorus reduction which resulted in the implementation of these practices was 1,985 lbs/yr. It is important to note that this is 25% of the total reduction (8,066 lbs/yr) that will be required by EPA under the TMDL.

Table 3 – NRCS Practices Implemented in the St. Albans Bay, 2010- 2014

NRCS Practices Implemented in the St. Albans Bay Watershed, 2010 - 2014									
Practice Group	practice code	practice name	Count of Practices Applied	Total Applied Amount	units	Estimated P Loading by Landcover* (lbs/ac/yr)	Total P Load from Untreated Acres (lb/yr)	Annual P Reduction from Treated Acres (lb/yr)	Estimated Cumulative P Reduced (lbs)
Farmstead	313	Waste Storage Facility	1	1	no	3.35	23	20	199
	558	Roof Runoff Structure	1	1	no				
	560	Access Road	7	2765	ft				
	561	Heavy Use Area Protection	5	0.7	sq ft				
	606	Subsurface Drain	1	460	ft				
	629	Waste Treatment	2	2	no				
	634	Waste Transfer	5	5	no				
Agronomic (Crop & Hay Fields)	328	Conservation Crop Rotation	13	169.4	ac	2.23	378	94	283
	340	Cover Crop	16	317.6	ac	2.23	708	354	1,062
	345	Residue and Tillage Management, Reduced Till	8	214.8	ac	2.23	479	268	805
	382	Fence	8	13695	ft	NA			
	391	Riparian Forest Buffer	1	10.4	ac	2.23	464	190	1,902
	393	Filter Strip	21	17.5	ac	2.23	781	320	3,200
	512	Forage and Biomass Planting	3	51.9	ac	2.23	116	93	278
	578	Stream Crossing	5	6	no	NA			
	590	Nutrient Management	162	2192.7	ac	2.23	4,890	244	733
	620	Underground Outlet	5	1515	ft	NA			
	633	Waste Recycling	48	739.6	ac	2.23	1,649	82	247
	655	Forest Trails and Landings	2	0.3	ft	NA			
Grazing (Pasture)	528	Prescribed Grazing	29	320	ac	2.49	797	319	3,187
	516	Livestock Pipeline	16	10685	ft				
	575	Trails and Walkways	4	1725	ft				
	614	Watering Facility	21	22	no				
*Land Use & P Load data from EPA HUC-12 Tool						Totals		1,985	11,897
**Used 3 years of practice implementation for agronomic, 10 years for structural and buffer practices									
***Assumed that buffer practices treated 20 acres for every acre of buffer									

Contracts with farmers written during this period also include practices that are still planned for implementation. These planned practices are summarized in Table 4. This includes a lot of grazing related practices such as prescribed grazing (299 ac.), fence (16,125 ft.) and pipelines (2,030 ft.). It also includes a significant amount of access roads, reduced tillage, waste recycling (manure injection) and cover crops. These recently implemented and planned practices should be considered when establishing practice implementation goals for the watershed.

Table 4 also summarizes the expected phosphorus reductions associated with the implementation of these practices over the lifespan of the practices. If implemented as planned the reduced tillage would provide the greatest reduction (425 lbs/yr), then cover crop (302 lbs/yr) and prescribed grazing (298 lbs/yr). It is important to note that the total reduction provided by the planned and implemented practices is 3,142 lbs/yr. This represents 39% of the required load reduction under the TMDL for agriculture in the St. Albans Bay Watershed.

Table 4 – NRCS Practices Planned for Implementation in the St. Albans Bay Watershed

NRCS Practices Planned for the St. Albans Bay Watershed, as of February 2015									
Practice Group	Practice Code	Practice Name	Number of Planned Practices	Total Planned Amount	Units	Estimated P Loading by Landcover* (lbs/ac/yr)	Total P Load from Untreated Acres (lb/yr)	Annual P Reduction from Treated Acres (lb/yr)	Cumulative P Reduced Over Life of Practice** (lbs)
Farmstead	313	Waste Storage Facility	2	2.0	no	3.35	47	40	399
	533	Pumping Plant	1	1.0	no				
	558	Roof Runoff Structure	2	2.0	no				
	560	Access Road	3	920.0	ft				
	561	Heavy Use Area Protection	7	0.9	sq ft				
	634	Waste Transfer	2	2.0	no				
Agronomic (Crop & Hay Fields)	104	Nutrient Management Plan - Written	2	2.0	no	NA			
	340	Cover Crop	24	271.3	ac	2.23	605	302	907
	345	Residue and Tillage Management, Reduced Till	18	340.7	ac	2.23	760	425	1,276
	382	Fence	8	16,125.0	ft	NA			
	512	Forage and Biomass Planting	1	23.1	ac	2.23	52	41	124
	578	Stream Crossing	4	4.0	no	NA			
	590	Nutrient Management	8	77.0	ac	2.23	172	9	26
	620	Underground Outlet	2	942.0	ft	NA			
	633	Waste Recycling	21	376.0	ac	2.23	838	42	126
Grazing (Pasture)	528	Prescribed Grazing	19	299.0	ac	2.49	745	298	2,978
	516	Livestock Pipeline	4	2,030.0	ft				
	614	Watering Facility	6	20.0	no				
*Land Use & P Load data from EPA HUC-12 Tool						Totals		1,157	5,835.7
**Used lifespan of 10 years for constructed practices and prescribed grazing, used 3 years for agronomic practices									
***Assumed that buffer practices treated 20 acres for every acre of buffer									

<u>Potential Phosphorus Load Reductions Associated with One Practice Scenario</u>

A suite of individual practices and practice systems was developed as an example scenario that meets the required phosphorus reductions for agriculture in the St. Albans Bay Watershed. This example practice scenario was developed to provide additional guidance to the Local Watershed Team and is intended as an example for planning purposes only. The actual amount and type of practices identified and implemented by the Local Watershed Team will be different than the example provided here. The example does provide several pieces of useful information, it indicates the magnitude of the work that needs to be accomplished in order to meet the reduction goal, it provides a comparison of the effectiveness of different practices or practice systems, it provides information on the extent of available land area for different practices or practice systems and it provides one cost estimate of the necessary practices.

Table 3 provides summary information on land use in the St. Albans Bay Watershed, an example conservation practice scenario list, estimated extent of practice application, estimated phosphorus reductions by conservation practice and estimated costs. Some of the underlying assumptions built into this scenario include:

- This level of conservation practice implementation is reasonable for the watershed,
- 80% of the land in corn in 2014 was continuous corn,
- 10% of the land in hay in 2014 was continuous hay,
- that 90% of the annually tilled cropland will planted to cover crops,
- overall, a little over 30% of the land in corn would use a conservation tillage-manure injection-cover crop system,
- the average cost of a grazing that includes livestock exclusion is $50,000,
- the average cost of improvements necessary on a farmstead is $200,000.

It appears that the watershed phosphorus reduction goal of 8,066 lbs/yr would be achievable using the level of practice implementation specified in Table 5. **This level of practice implementation would result in approximately a 38% reduction in phosphorus loading in the watershed (going above the required reduction).** The cost of implementing this combination of practices to the extent identified would be approximately $9,120,000.

From Table 5 you can also see that the greatest reductions in phosphorus loading are achieved with a reduced tillage system (2,546 lb/yr), cover crops (2,216 lb/yr) and buffers on ditches (1,982 lbs/yr). This is largely a result of the large acreage available for implementation of these practices.

Table 5 – Example Practice Scenario with Phosphorus Reductions and Costs

St. Albans Bay - Practice Scenario to Meet TMDL Goal March, 2016							
		Based on a Reduction Goal for Agriculture of 35%					
Cropping System		**No. of Acres**					
Corn in 2014		**6,327**					
Hay in 2014		**5,838**					
Pasture in 2014		**2,947**					
Farmstead in 2014		**303**	**50 HQ's**				
Cont. Corn*		**5,813**	*** From data estimated 80% of corn in 2014 was continuous corn**				
Cont. Hay**		**1,168**	****Assumed 20% of the hay in 2014 was continuous hay**				
Corn-Hay Rotation***		**5,184**	***** Acres of corn/hay rotation equals the remainder from above**				
Scenario Components	**Selected BMP**	**Available Acres**	**Acres Applied**	**% of Total Acres**	**TP Load Reduction (lbs/yr)**	**Practice Cost**	**Cost (Maxium Payment Period)**
Cont. Corn	Cover Crop-Conservation Tillage-Manure Injection	5,813	1,720	30	1,445	$164	846,240
Corn/Hay	Cover Crop-Conservation Tillage-Manure Injection	5,184	1,550	30	1,101	$164	$762,600
Cont. corn	Cover Crop	5,813	2,350	40	1,293	$79	$928,250
Corn/Hay	Cover Crop	5,184	2,050	40	923	$79	$485,850
Cont. Corn	Crop Rotation	5,813	1,150	20	552	$16	$55,200
Corn/Hay	Crop Rotation	5,184	1,050	20	378	$16	$50,400
Cont. Corn	Riparian Buffer	75	37	49	144	$750	$27,750
Corn/Hay	Riparian Buffer	53	26	49	85	$750	$19,500
Cropland	Grassed Waterays	46	11	24	53	$5,000	$55,000
Cont. Corn	Reduced Manure P (Nutrient Management and CAP)	5,813	1,480	25	252	$19	$335,741
Corn/Hay	Reduced Manure P (Nutrient Management and CAP)	5,184	1,300	25	130	$19	$335,088
Cont. Corn	Ditch Buffer	180	135	75	878	$550	$0
Corn/Hay	Ditch Buffer	147	110	75	462	$550	$0
Hay	Reduced P inputs and Injection	5,838	2,919	50	292	$70	$204,330
Pasture	Livestock Exclusion	1,923	490	25	225	$50,000 ea.	$245,000
Pasture	Livestock Exclusion and Riparian Buffer (CREP)	1,923	490	25	304	N/A	$0
Farmstead	Waste Management Improvements	50	20	40	200	$200,000	$3,800,000
Total Estimated Reduction					**8,714**	38% of Total Load	
Watershed Target					**8,066**	35% of Total Load	
Total Ag Load					**23,027**		
Total Cost							**$8,150,949**

Estimated Costs of P Reduction by Practice and System and Costs per lb of Phosphorus

Important information for the Local Watershed Teams will include the cost of practice implementation. This information will be needed for the Teams to establish reasonable reduction goals for their local project and the timeline necessary to implement the project. The costs presented in Table 6 are the NRCS payments (based on 2015 payment schedules) provided to farmers to implement these practices, and as such represent an average of 75% of the total cost. The greatest costs are for implementing conservation tillage-manure injection-cover crops ($1,608,000), cover crops alone ($1,414,000) and for farmstead practices ($3,800,000). The high cost for conservation tillage systems and for cover crops is because of the large acreage available for implementation, and because NRCS can now pay up to 5 years of cover crops. Farmstead costs are high because of the high cost of structural practices.

The total cost of using the practices in this scenario to meet the phosphorus reduction goals for agriculture is $8,150,000. This does not include any cost inflation factor if the implementation of practices is extended over a long time period. Another concern not addressed in this scenario is the relatively short time period for which NRCS can financially support annual practices such as cover crops. This scenario assumes only 5 years of financial support. It is unclear who will support the farmers to continue cover cropping after their NRCS contract expires, and whether they will continue to implement these annual practices without the government's financial support.

One way to reduce the total cost of a project such as this one in the St. Albans Bay Watershed is to focus on implementing those practices where you get the greatest reduction of phosphorus per dollar. Table 6 also shows the phosphorus reduction efficiency of the different practices based on cost per pound of phosphorus. According to these calculations ditch buffers and crop rotations are the most cost effective practices in reducing phosphorus losses ($2 and $35/lb of P), while the farmstead practices are the least cost effective at over $5,000 per lb of P.

However, there may not be much flexibility in the St. Albans Bay Watershed to maximize phosphorus reduction based on cost because the underlying assumption with this scenario was that it represented all reasonable practices that could be implemented by farmers.

Table 6 – Cost Efficiency of Available Conservation Practices

Agricultural Conservation Practice Efficiency in Cost Per Pound of Phosphorus Reduced			
Conservation Practice	NRCS Payment	Total Practice Cost	Practice Cost Efficiencey ($/lb P reduction)*
1. Change in crop rotation	$16	$21	$130
2. Change in crop rotation and conservation tillage	$51	$68	NA
3. Change in crop rotation, grassed waterway, ditch buffer and riparian buffer**	$50	$67	NA
4. Change in crop rotation, grassed waterway riparian buffer	$5,766	$7,688	NA
5. Change in crop rotation and riparian buffer	$769	$1,025	NA
6. Conservation tillage	$34	$45	NA
7. Cover crop	$79	$105	$550
8. Manure injection	$51	$68	NA
9. Cover crop, conservation tillage, grassed waterway, ditch buffer and riparian buffer	$6,413	$8,550	NA
10. Cover crop, conservation tillage and manure injection	$164	$219	$680
11. Cover crop and manure injection	$110	$147	NA
12. Annual crop to permanent hay	$209	$279	NA
13. Ditch buffer	$550	$733	$7**
14. Grassed waterway	$5,000	$6,666	$525
15. Grassed waterway and riparian buffer	$5,750	$7,666	NA
16. Manure injection and reduced manure P applied	$70	$93	NA***
17. Reduced manure P applied	$19	$25	$1,200
18. Reduced manure P applied and grassed waterway	$5,019	$6,692	NA
19. Riparian buffer	$750	$1,000	$39
20. Livestock Exclusion /Grazing system (estimated average)	$50,000	$66,666	$223
21. Farmstead practices (estimated average)	$200,000	$266,666	$20,771
*Based on the total NRCS cost			
**Ditch buffer efficiency currently set very high			
***Error in Model			

NEPA Concerns and Compliance

The National Environmental Policy Act of 1964 requires all federal agencies to conduct an environmental review of all federal actions. This requirement also applies to area-wide or watershed planning activities. As part of these plans the responsible federal agency is required to evaluate the individual and cumulative effects of the actions being proposed. Any project that has significant environmental impacts must be evaluated with an Environmental Assessment (EA) or Environmental Impact Statement (EIS) unless the activities are eligible under a categorical exclusion or are covered by an existing EA or EIS.

NRCS utilizes a planning process that incorporates an evaluation of potential environmental impacts using an Environmental Evaluation checklist. NRCS also has categorical exemptions for a number of different activities that include many of our conservation practices. These categorical exemptions include conservation practices that reduce soil erosion, involve the planting of vegetation and/or to restore areas to natural ecological systems.

The watershed plan for the St. Albans Bay Watershed Plan calls for the accelerated implementation of conservation practices that have been used in the region for a number of years. These practices include a number of erosion control, field based practices that are covered by categorical exclusions, and a range of structural practices that are used to address waste management issues on the farmstead. A list of practices that are likely to be used to implement the plan are included in Table 7.

Table 7 - List of Practices and Practice Systems Likely to be Used to Implement the St. Albans Bay Watershed Plan
(CE = categorically excluded, EA = included in exiting environmental assessment)

1) Change in crop rotation	CE
2) Change in crop rotation and conservation tillage	CE
3) Change in crop rotation, grassed waterway, ditch buffer and riparian buffer**	CE
4) Change in crop rotation, grassed waterway riparian buffer	CE
5) Change in crop rotation and riparian buffer	CE
6) Conservation tillage	CE
7) Cover crop	CE
8) Cover crop, conservation tillage, grassed waterway, ditch buffer and riparian buffer	CE
9) Cover crop, conservation tillage and manure injection	CE
10) Cover crop and manure injection	CE
11) Annual crop to permanent hay	CE
12) Ditch buffer	CE
13) Grassed waterway	CE
14) Grassed waterway and riparian buffer	CE
15) Manure injection and reduced manure P applied	CE
16) Reduced manure P applied	CE
17) Reduced manure P applied and grassed waterway	CE
18) Annual cropland to permanent grass	CE
19) Riparian buffer	CE
20) Livestock exclusion/fencing/grazing system	CE
21) Farmstead practices	EA

As mentioned above, as part of the planning process each planned practice will be evaluated individually and in combination with other planned practices to ensure it meets the criteria of the categorical exclusions and any existing Environmental Assessments. Any significant negative practice impacts, either individually or cumulatively, will first try to be avoided, then minimized and/or mitigated to the extent possible, or eliminated from the individual farm plan if necessary. It is not expected that the practices planned for implementation in the St. Albans Bay Watershed will necessitate an Environmental Assessment or an Environmental Impact Statement.

Local Watershed Team Actions and Outcomes

The St. Albans Bay Watershed Plan will be provided to the local NRCS office(s) working with farmers in the watershed. The Watershed Plan is not considered confidential and will be made available to all partners and the public. The Local Watershed Team also developed a number of products to guide and coordinate their conservation practice implementation in the watershed.

Field Scale Land Cover and Resource Maps

These maps will be developed by the local NRCS office based on the spatial data layers provided to them and described in the Watershed Plan. The data layers may be used alone or overlain with layers as suggested in the Watershed Plan or as deemed necessary by the conservation planners. These maps will generally contain Personally Protected Information and will be considered confidential.

Local Watershed Team Products

The Action Plan was developed by the Local Watershed Team. The Team was composed primarily of representatives of NRCS, FSA, UVM-Extension, VDEC and VAAFM and representatives of local watershed groups including the St. Albans Area Watershed Association and FNLC. There were several farmer representatives on the Local Watershed Team.

The planning group started the process by establishing 4 Key Strategies for successfully working with farmers to meet water quality goals. The four key strategies are farmer engaged conservation, outreach to farmers, technical assistance to farmers, and financial assistance to farmers.

Logic diagrams were developed to capture watershed outcomes and actions needed for each of the key strategies (see Figures 19 – 22). Then an Action Plan for the watershed project was developed that identified responsibility for each action and a timeline to complete the action as shown in Figure 23.

The Local Watershed Team also developed a five year practice implementation plan for the watershed. **As part of this plan the Team identified a phosphorus reduction goal that meets 87% of the TMDL goal for the watershed (7,000 lbs/yr).** Using information from the watershed plan the group identified a suite of practices that could potentially meet this goal over a five year period (Table 7). Practice implementation was distributed over a five year period and included high rates of implementation for practices such as conservation tillage systems, cover crops, crop rotations and ditch buffers. Annual costs of practices contracted ranged from $798,000 to $1,715,000 and totaled to over $7,450,000 for the five year period.

From Tables 3 and 4 it was estimated that conservation practices implemented or planned since 2010 would result in an estimated reduction of 3,142 lbs/year of phosphorus from the St. Albans Bay Watershed. The cumulative reduction in loading from the Watershed would include some portion of this phosphorus reduction in addition to any reductions achieved during the 5 year project. As local planners work with farmers in the watershed they will verify that these practices have been maintained and that phosphorus loading reductions should be applied.

Tracking Database

An interim database will be developed to track practice implementation and estimated phosphorus reductions. This database will be updated at least annually and the results will be shared among partners and watershed farmers. This interim database will eventually be replaced by the "partner database" that is currently under development by the VAAFM and their consultant. Factsheets and media releases will be used to communicate progress in meeting the project goals to a wider audience.

Figure 19 – Conservation Actions and Outcomes

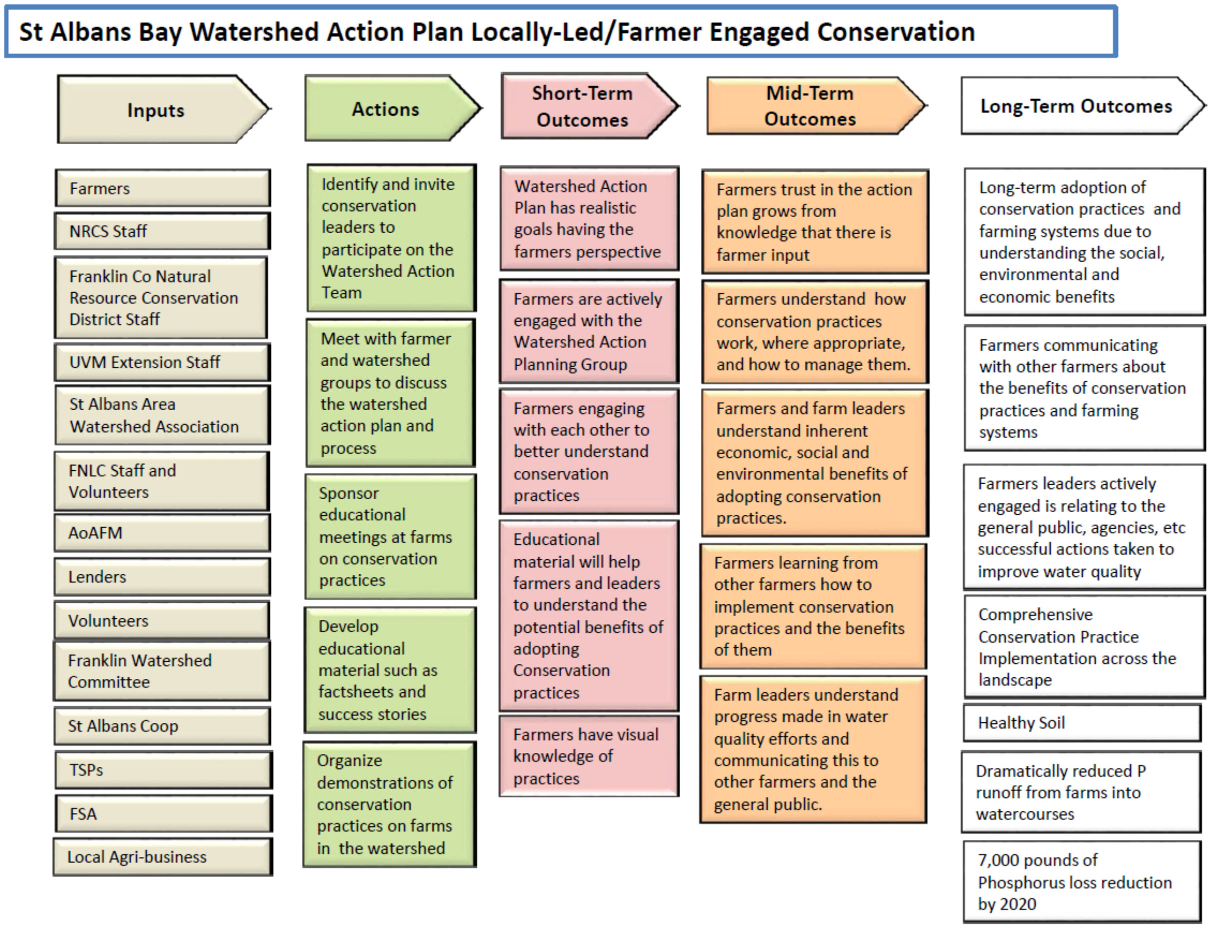


Figure 19 (continued)

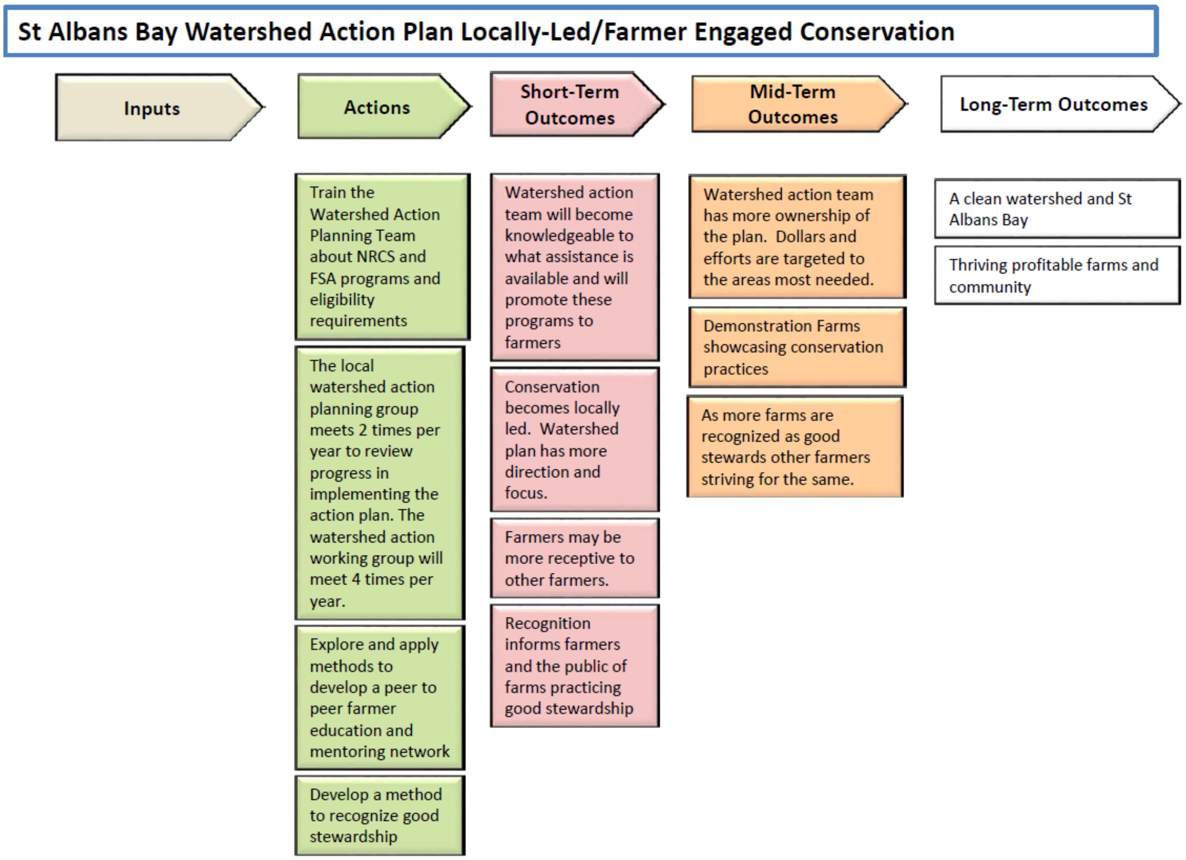
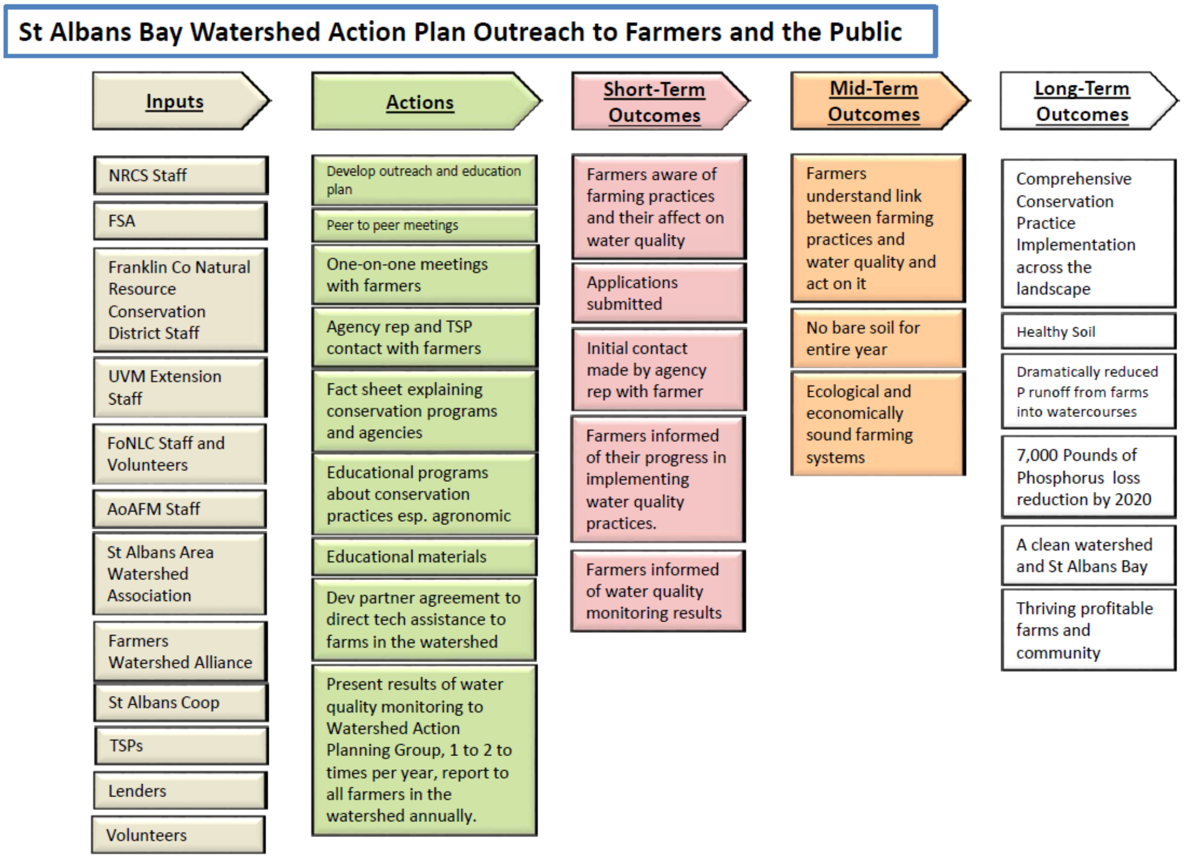


Figure 20 – Outreach Actions and Outcomes



<u>Figure 21 – Technical Assistance Actions and Outcomes</u>

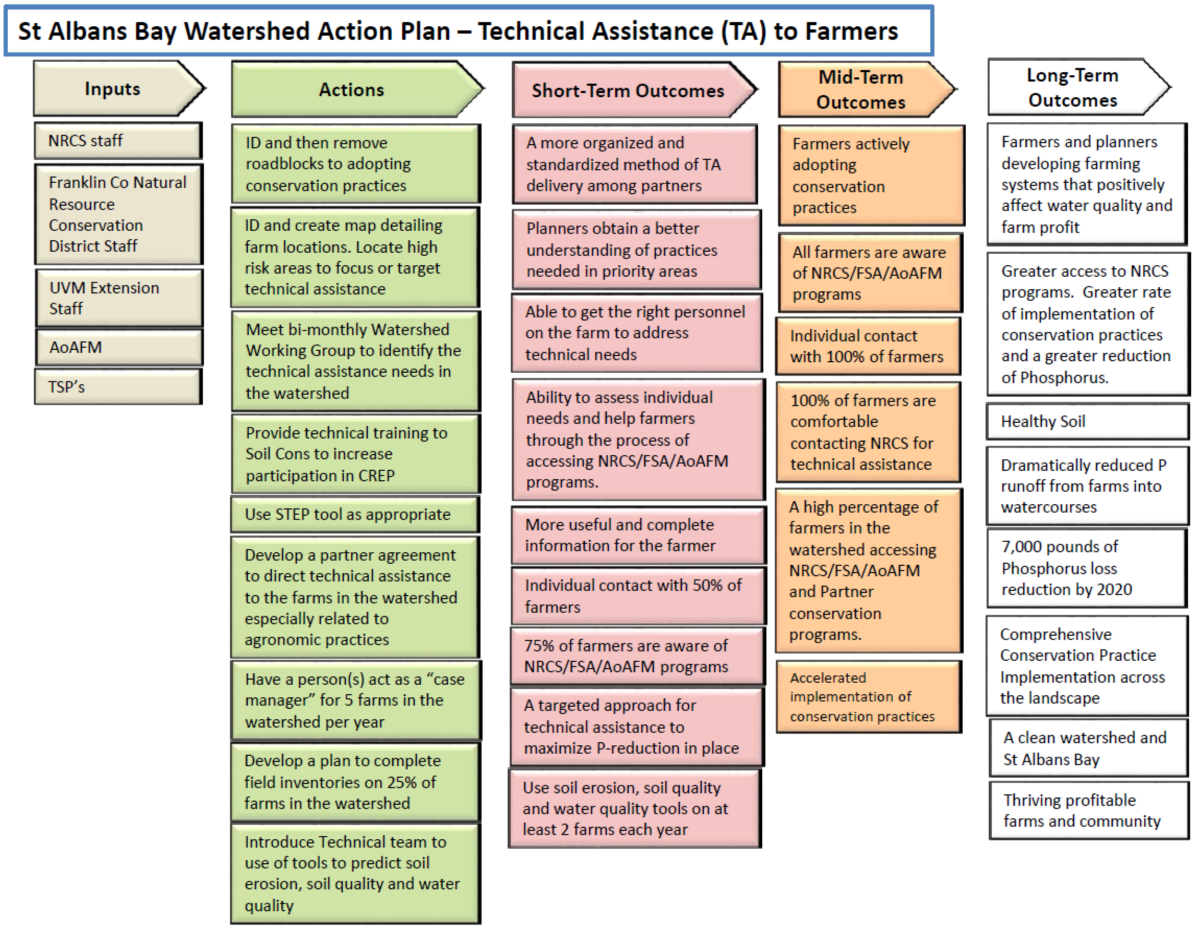


Figure 22 – Financial Assistance Actions and Outcomes

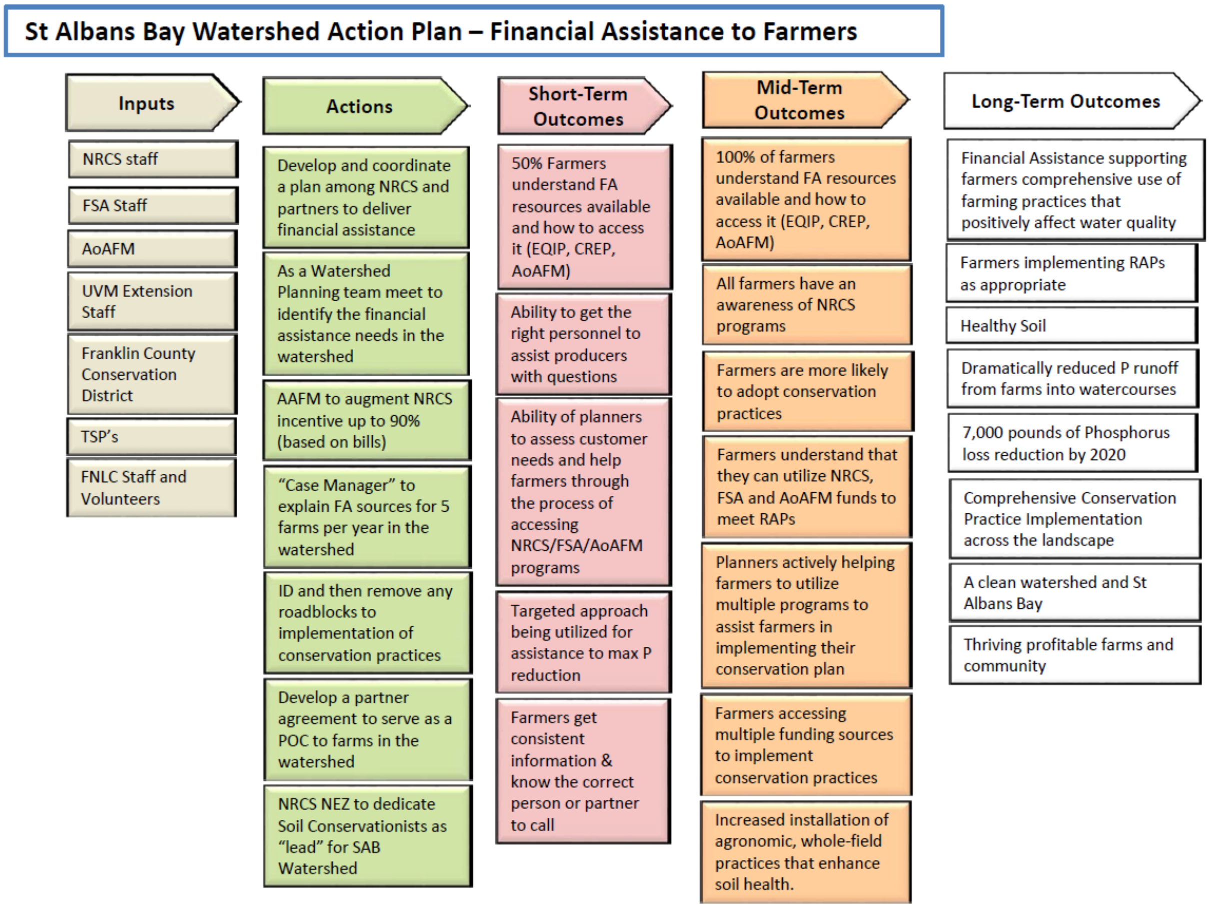


Figure 23 – Action Item Responsibility and Timeline

St Albans Bay Watershed

Action Planning Template **04/26/16**

Strategy I_ Locally-Led/Farmer Engaged Conservation				
Actions:	Description	Who is responsible?	When Begin	When End
Identify and invite conservation leaders to participate on the Watershed Action Team	Invite and actively involve leaders on the Watershed Action Planning Team, goal is to involve at least 2 farmers and 1 interest group member	NRCS & UVM	04/01/16	12/31/17
Meet with farmer and watershed groups to discuss the watershed action plan and process	Meet with groups provide updates, get feedback for improvement and to request their support and assistance- on-going	NRCS & UVM	09/30/16	12/31/17
Sponsor Educational meetings at farms on conservation practices	See Outreach and Education Below			
Develop educational material such as factsheets and success stories	See Outreach and Education Below			
Organize demonstrations of conservation practices on farms in the watershed	See Outreach and Education Below			

Strategy 2: Technical Assistance to Farmers				
Actions:	Description	Who is responsible?	When Begin	When End
Develop a partner agreement to direct technical assistance to the farms in the watershed especially related to agronomic practices	Partner agreement between NRCS and UVM Extension whereby Ext will provide outreach and technical assistance to farms in support of watershed goals.	NRCS & UVM	06/01/15	Complete
Develop Watershed Action Plan	Develop Action plan to implement the 4 key strategies through 12/31/2017	NRCS & UVM	01/12/16	04/21/16
Develop a plan for the delivery of technical assistance.	Develop a plan for the delivery of technical assistance to farmers in the SAB Watershed, plan to include farms to be serviced and tasks.	NRCS & UVM	01/12/16	05/31/16
Case management for 5 farms- 2016	Serve as case manager for farmers regarding their NRCS EQIP contract application (including assisting them with completing the application form and associated documents necessary to be considered eligible for NRCS program benefits) especially related to agronomic practices (assist the participant in identifying fields	UVM	01/12/16	09/30/16

	for the application of cover crops, no-till, nutrient management plans and other practices). Assist NRCS with the certification of conservation practices including cover crops, no-till, and cropland buffers.			
Case management for 5 farms- 2017	Same as above	UVM	10/01/16	12/31/17
Track Practices contracted and implemented	Track practice contracting and implementation of farmers in the SAB watershed especially as it relates to EQIP contracts, but should include practices farmers implement on their own.	NRCS & UVM	10/01/16	12/31/17
ID and then remove roadblocks to adopting conservation practices	Meet as a Watershed Agricultural Working Group to discuss the adoption of conservation practices of the lack thereof, and create plans to address roadblocks, on-going as progress is monitored	NRCS & UVM	01/01/16	12/31/17
ID and create map detailing farm locations	Develop GIS map identifying farmsteads and identify producers needing assistance.	NRCS, UVM and VT DEC	01/01/16	95% complete

Meet bi-monthly Watershed Working Group to identify the technical assistance needs in the watershed	This group will consist of agencies part of the MOU that can share PII	Agency representatives	01/01/16	12/31/17
Provide technical training to Soil Cons to increase participation in CREP	Increase ability of NRCS soil cons to promote and write CREP plans	NRCS, FSA & VAAFM	01/01/16	07/31/17
Use STEP tool as appropriate	This is an intensive tool to estimate the resource benefits of conservation practice adoption. This tool will be used if it is deemed to provide beneficial information.	NRCS	01/01/16	12/31/17
Develop a plan to complete field inventories on 25% of farms in the watershed	Inventory farms not already visited or who haven't actively participated in conservation programs in recent years.	NRCS & UVM	01/12/16	05/31/16
Introduce Technical team to use of tools to predict soil erosion, soil quality and water quality	Provide hands on training for NRCS' soil quality tools such as rainfall simulator or slake demonstration. Encourage these tools to be borrowed as appropriate. Use soil erosion, soil quality and water quality tools on at least 2 farms each year	NRCS & UVM	06/30/16	09/30/16

Locate high risk areas to focus or target technical assistance.	Arc-GIS maps provided by NRCS. This will provide farmers, watershed teams and those providing technical assistance direction on the most effective locations for conservation efforts.	NRCS & UVM	01/01/16	12/31/17
Strategy 3: Financial Assistance to Farmers				
Actions:	Description	Who is responsible?	When Begin	When End
Develop and coordinate a plan among NRCS and partners to deliver financial assistance	Assure funding amounts, screening rules, and deadlines are clearly communicated amongst partners.	NRCS & VAAFM	11/31/2015	12/31/17
As a Watershed Planning team meet to identify the financial assistance needs in the watershed	Meet annually to determine conservation practices needed to be implemented and associated funding needed.	NRCS, UVM & the Watershed Action Planning Team	11/01/16	11/15/16
As a Watershed Planning team meet to identify the financial assistance needs in the watershed	Meet annually to determine conservation practices needed to be implemented and associated funding needed.	NRCS, UVM & the Watershed Action Planning Team	11/01/17	11/15/17

AAFM to augment NRCS incentive up to 90% (based on bills)	Confirm details, exclusions and total funds available for this funding offered by AAFM.	NRCS & VAAFM	02/03/16	05/03/16
"Case Manager" to explain FA sources for 5 farms per year in the watershed	Serve as case manager for farmers regarding their NRCS EQIP contract application and explain financial resources available to them.	UVM	01/12/16	09/30/16
"Case Manager" to explain FA sources for 5 farms per year in the watershed	Same as above	UVM	10/01/16	12/31/17
ID and then remove any roadblocks to implementation of conservation practices due to financial constraints	Watershed action planning team to review progress and financial constraints to practice adoption (payments rates too low, lack of incentives for practices.	NRCS, UVM & the Watershed Action Planning Team	11/01/16	11/15/16
ID and then remove any roadblocks to implementation of conservation practices due to financial constraints	Watershed action planning team to review progress and financial constraints to practice adoption (payments rates too low, lack of incentives for practices.	NRCS, UVM & the Watershed Action Planning Team	11/01/17	11/15/17
Develop a partner agreement to serve as a POC to farms in the watershed	The POC is the go to person for farmers to contact when they need someone to help them work through the available funding sources as they relate to the farmers situation. Partner agreement completed.	UVM	01/12/16	12/31/17

NRCS NEZ to dedicate Soil Conservationists as "lead" for SAB Watershed	The NRCS lead will be the primary provider of conservation planner and will involve other professionals such as LTP planners, NRCS engineers, and others as needed.	NRCS	01/12/16	12/31/17
Strategy 4: Outreach and Education				
Actions:	Description	Who is responsible?	When Begin	When End
Develop and Implement SAB Outreach and Education plan	NRCS and UVM Extension are to develop and track a St. Albans Bay watershed outreach and education plan to include target audiences, key messages, expected outcomes, and timeline with goal of ensuring that 95% of farmers in watershed are contacted regarding the EQIP program.	NRCS & UVM	01/12/16	03/31/16
One-on One Contact with farmers.	Initiate individual contact with 25% or farmers in the watershed to explain the water quality	UVM	01/12/16	12/31/16

	issues in the SAB watershed and the goals of the watershed planning group as it relates to the EPA TMDL.			
One-on One Contact with farmers.	Same as above	UVM	01/01/17	12/31/17
Collaborate with the Farmers Watershed Alliance	Collaborate with the Farmers Watershed Alliance to provide peer-to-peer farmer education and networking opportunities.	UVM, NRCS & FNLC	01/12/16	04/30/16
Farm Success Story 1	Identify and contact one St. Albans Bay watershed farmer who is willing to be profiled in published success stories with the intent of motivating other farmers to adopt conservation practices. Coordinate with the NRCS Public Affairs Specialist to develop outreach press release to the general public.	UVM & NRCS Assistance	08/01/16	12/31/16
Farm Success Story 2	Same as above	UVM & NRCS Assistance	01/01/17	09/30/17
Establish one demonstration farm	Establish one demonstration farm by the end of the first year of the contract that has shown success in implementing NRCS conservation practices that may	UVM	01/12/16	01/12/17

	include farmstead, agronomic, buffer or other practices.			
Develop a list of all farms in the SAB watershed.	1) UVM will provide UVM with current list of known farms in St. Albans Bay watershed including CLU field locations and current crop as identified for watershed action plan. 2) NRCS will develop list of known farms in the SAB watershed. 3) A total list of farms will be finalized.	UVM & NRCS	01/12/16	06/30/16
Fact Sheet-1	1) A fact Sheet explaining the SAB Watershed Action Plan will be developed.	NRCS	01/01/16	1- 2/29/2016
Fact Sheet-2	2) A Fact Sheet explaining conservation programs offered by different agencies and technical assistance available will be developed.	NRCS, UVM, VAAFM	04/01/16	06/30/16
In-Field Signs	In-Field Signs pointing attention to conservation practices will be designed, purchased and provided to farmers that have implemented practices.	NRCS design, placing signs NRCS & UVM	02/01/16	10/30/16

In-Field Signs	In-Field Signs pointing attention to conservation practices will be designed, purchased and provided to farmers that have implemented practices.	NRCS design, placing signs NRCS & UVM	02/01/17	10/30/17
Educational Programs relating to water quality issues and conservation practices	Educational Programs relating to water quality issues and conservation practices to be held in the watershed or surrounding area. In the field focusing on no-till, interseeded cover crops, One per year.	UVM with assistance from NRCS	08/30/16	10/30/16
Articles- Press Releases	Articles targeted to the general public related to watershed activities/successes (aggregated) to be written and distributed to the press. (St Albans Messenger). One or two per year.	Amy with assistance from UVM	06/30/16	12/31/17
Farmer to Farmer Meetings	Two kitchen/shop meetings will be held with small groups of farmers to encourage EQIP applications.	UVM with assistance of NRCS	06/30/16	12/31/17
Farmer to farmer Meetings	Farmer to farmer meetings to discuss 1) how to successfully implement conservation practices, 2) FSAs CREP	UVM, NRCS & FSA	06/30/16	12/31/17

	Program, 3) prescribed grazing, 4) Feed Management Plans			
Encourage Feed Management Practice	Check the excretion rate of P from dairy cattle in the SAB. This will be done by looking at manure pit samples. Work to have 2 farmers apply for Feed Management plans.	UVM	09/30/16	03/31/17
Updates to Watershed Action Planning Group and farmers regarding practice implementation by way of a "newsletter" from the Watershed Action Planning Group.	Prepare annual update of progress for farmers and the general public in the watershed, inform the Watershed Action Planning Group at least twice annually and prepare and distribute newsletter to watershed farmers annually.	NRCS & UVM	11/31/2016	03/31/16
Updates to Watershed Action Planning Group and farmers regarding practice implementation by way of a "newsletter" from the Watershed Action Planning Group.	Prepare annual update of progress for farmers and the general public in the watershed, inform the Watershed Action Planning Group at least twice annually and prepare and distribute newsletter to watershed farmers annually.	NRCS & UVM	11/31/2017	03/31/17
Updates to Watershed Action Planning Group and farmers on monitoring results by way of a "newsletter" from the Watershed Action Planning Group.	Present results of water quality chemical, biological and physical to the Watershed Action Planning Group. Prepare and	VT-DEC, NRCS & UVM	11/31/2016	03/31/16

	distribute as part of a newsletter to watershed farmers annually.			
Updates to Watershed Action Planning Group and farmers on monitoring results by way of a "newsletter" from the Watershed Action Planning Group.	Present results of water quality chemical, biological and physical to the Watershed Action Planning Group. Prepare and distribute as part of a newsletter to watershed farmers annually.	VT-DEC, NRCS & UVM	11/31/2017	03/31/17
Breakfast on the Farm- Public Outreach Event	If this is to be done a volunteer to organize and conduct the event needs to be identified			

Table 7 – Five Year Implementation Goals and Cost for the St. Albans Bay Watershed

St. Albans Bay - Practice Scenario to Meet TMDL Goal
March, 2016

Based on a Reduction Goal for Agriculture of 35%

Cropping System		No. of Acres	
Corn in 2014		**6,327**	
Hay in 2014		**5,838**	
Pasture in 2014		**2,947**	
Farmstead in 2014		**303**	**50 HQ's**
Cont. Corn*		**5,813**	*** From data estimated 80% of corn in 2014 was continuous corn**
Cont. Hay**		**1,168**	****Assumed 20% of the hay in 2014 was continuous hay**
Corn-Hay Rotation***		**5,184**	***** Acres of corn/hay rotation equals the remainder from above**

Scenario Components	Selected BMP	Available Acres	2016	2017	2018	2019	2020	Acres Applied	% of Total Acres	TP Load Reduction	Practice Cost	Cost (Maxium Payment Period)	2016	2017	2018	2019	2020	Total
Cont. Corn	Cover Crop-Conservation Tillage-Manure Injection	5,813	300	300	300	300	280	1,480	25	1,243	$164	728,160	$147,600	$147,600	$147,600	$147,600	$137,760	$728,160
Corn/Hay	Cover Crop-Conservation Tillage-Manure Injection	5,184	300	250	250	250	250	1,300	25	923	$164	$639,600.00	$147,600	$123,000	$123,000	$123,000	$123,000	$639,600
Cont. corn	Cover Crop	5,813	400	400	320	300	300	1,720	30	946	$79	$679,400	$158,000	$158,000	$126,400	$118,500	$118,500	$679,400
Corn/Hay	Cover Crop	5,184	320	320	300	300	300	1,540	30	693	$79	$364,980	$75,840	$75,840	$71,100	$71,100	$71,100	$364,980
Cont. Corn	Crop Rotation	5,813	250	250	250	200	200	1,150	20	552	$16	$55,200	$12,000	$12,000	$12,000	$9,600	$9,600	$55,200
Corn/Hay	Crop Rotation	5,184	250	200	200	200	200	1,050	20	378	$16	$50,400	$12,000	$9,600	$9,600	$9,600	$9,600	$50,400
Cont. Corn	Riparian Buffer	75	5	5	4	4	4	22	29	86	$750	$16,500	$3,750	$3,750	$3,000	$3,000	$3,000	$16,500
Corn/Hay	Riparian Buffer	53	4	3	3	3	3	16	30	52	$750	$12,000	$3,000	$2,250	$2,250	$2,250	$2,250	$12,000
Cropland	Grassed Waterays	46	3	2	2	2	2	11	24	53	$5,000	$55,000	$15,000	$10,000	$10,000	$10,000	$10,000	$55,000
Cont. Corn	Reduced Manure P (Nutrient Management and CAP)	5,813	300	300	300	300	280	1,480	25	252	$19	$335,741	$68,056	$68,056	$68,056	$68,056	$63,519	$335,741
Corn/Hay	Reduced Manure P (Nutrient Management and CAP)	5,184	300	300	300	300	100	1,300	25	130	$19	$335,088	$77,328	$77,328	$77,328	$77,328	$25,776	$335,088
Cont. Corn	Ditch Buffer	180	0	50	20	10	10	90	50	585	$550	$0	$0	$0	$0	$0	$0	$0
Corn/Hay	Ditch Buffer	147	0	40	20	10	5	75	51	315	$550	$0	$0	$0	$0	$0	$0	$0
Hay	Reduced P inputs and Injection	5,838	400	400	400	400	300	1,900	33	190	$70	$133,000	$28,000	$28,000	$28,000	$28,000	$21,000	$133,000
Pasture	Livestock Exclusion	1,923	100	100	100	100	90	490	25	225	$50,000 ea.	$245,000	$50,000	$50,000	$50,000	$50,000	$45,000	$245,000
Pasture	Livestock Exclusion and Riparian Buffer (CREP)	1,923	100	100	100	100	90	490	25	304	N/A	$0	$0	$0	$0	$0	$0	$0
Farmstead	Waste Management Improvements	50	0	2	2	2	2	8	16	80	$200,000	$3,800,000	$0	$950,000	$950,000	$950,000	$950,000	$3,800,000
													$798,174	$1,715,424	$1,678,334	$1,668,034	$1,590,105	$7,450,069
Total Estimated Reduction										**7,007**	**Project Goal 7000 lbs/yr**							
TMDL Ag Target										**8,066**	35% of Total Load							$7,450,069
Total Ag Load										**23,027**								
Total Cost												**$7,450,069**						