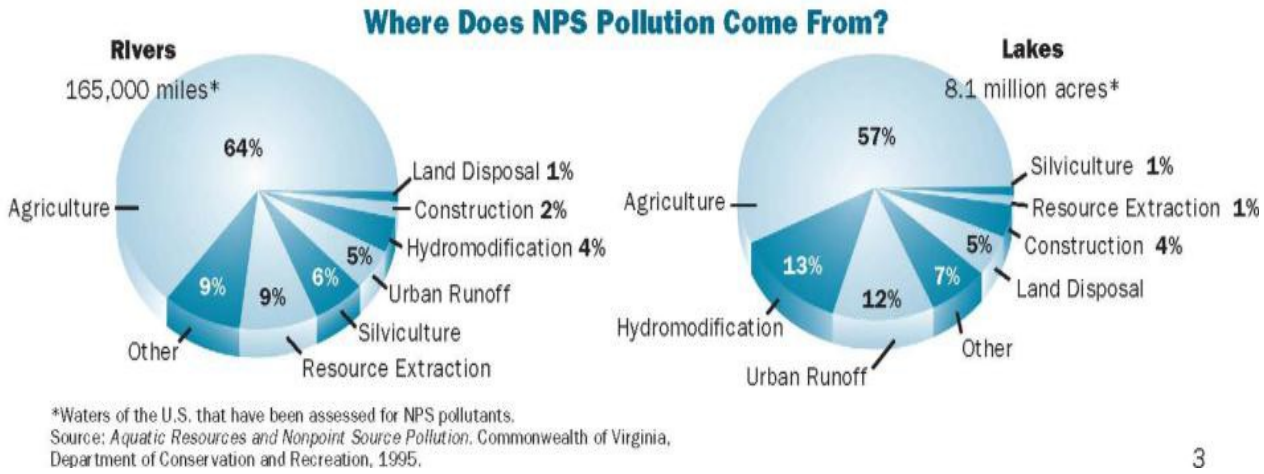
2.4 Land Use

Land use for the watershed is predominantly agricultural with over 84% of it being covered by agricultural vegetation. Developed and forested lands each account for a little over 6% of the total watershed area. A complete list of land uses in the Upper Iroquois Watershed can be found in Table 15 Land Use/Land Cover (Tetra Tech, 2009). In general, there are isolated pockets of urban and forested/wetland land use with a corridor of forested vegetation adjacent to the Iroquois River (Banning Engineering, P.C., 2010).

The impact of agricultural practices on water quality is of concern to the stakeholders. As can be seen in Figure 18 Where Does NPS Come From?, agricultural land use is generally responsible for 64% of non-point pollution, which would be the nutrients, sediments, and E.coli stakeholder concerns. Specifically, the volume of exposed soil entering adjacent water bodies, the prevalence of tiled fields and thus the transport of chemicals into water bodies, the use of agricultural chemicals, and the volume of manure applied via small animal farms and confined animal feeding operations are possible sources of non-point pollution in the watershed (WREC, 2010). Cultivated areas can be seen in Figure 19 below.

Figure 18 Where Does NPS Come From?



The amount of impervious surface within a watershed is important. Surfaces such as pavement, sidewalks, roof tops, and compacted earth (lawns and some agricultural ground) prevent natural infiltration of water into the ground and disrupt the natural water cycle which helps maintain adequate levels of clean water in the watershed. It is well documented that with a greater percent of impervious surfaces higher loads of pollutants such as excess nutrients, chemicals, sediment, and waste via stormwater run-off enter watershed streams. Normally, this wouldn't occur as filtration and infiltration would prevent the pollutants from reaching streams. A direct relationship between the amount of impervious surface in a watershed and the quality and quantity of water exists. Generally, where less than 10% of a watershed is covered in impervious surfaces, the streams are generally protected; where 11-25% is impervious, the streams are most likely impacted;

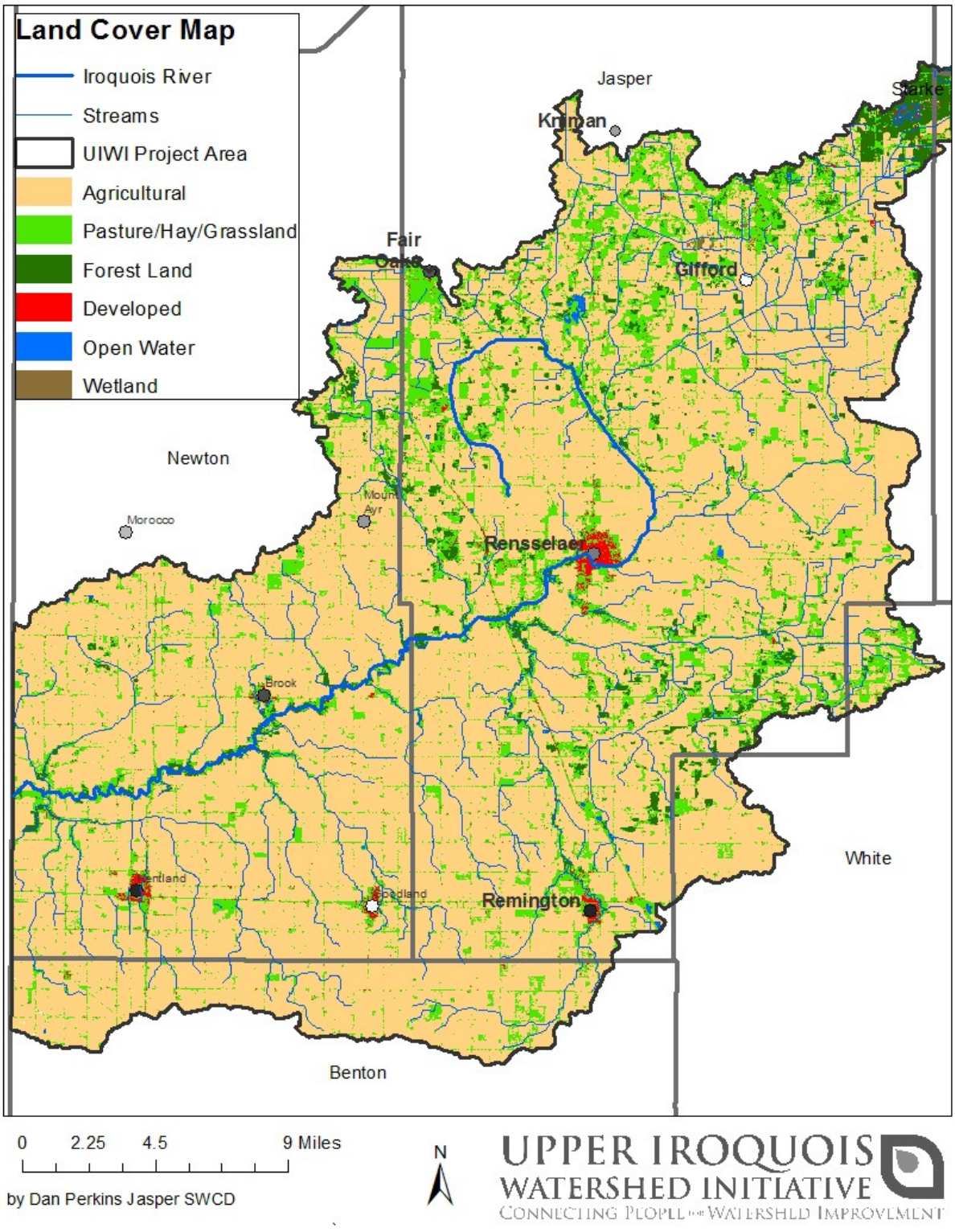
where more than 25% is impervious, the streams are most likely degraded. Development across the Iroquois watershed has not reached these levels, but as development increases and we further focus on areas of concentrated growth such as Rensselaer, Remington, Brook, Kentland then we must weigh the impact on local streams in those particular watersheds.

Continual development within the Iroquois Watershed is likely to increase impervious surfaces and therefore further degradation of streams unless conscious efforts are made to plan and develop with water resources in mind.

Table 15 Land Use/Land Cover

Land Use/Land Cover	**Watershed**		
	Area		**Percent**
	Acres	**Square Miles**	
Agricultural Land	368,676	576.06	84.11
Forested Land	27,192	42.49	6.20
Developed Land	26,680	41.69	6.09
Pasture/Hay	10,636	16.62	2.43
Grassland and Shrubs	2,344	3.66	0.53
Wetland	1,722	2.69	0.39
Open Water	1,082	1.69	0.25
Total	438,332	684.90	100.00

Figure 19 Land Use



2.4.1 Unsewered Areas

Unsewered areas that operate without modern treatment systems can have significant impacts on water quality and be a significant source of non-point pollution. A number of communities within the watershed are unsewered (Figure 21 Unsewered Areas with Significant Populations. This map also includes subdivisions that have 50+ homes on septic as these could be a possible source of pollutants if systems are failing. It needs to be determined if these areas are operating on old and outdated septic systems or even a "no-fail" system (i.e. a system with no absorption field and the septic tank piped directly to an open waterway or a subsurface drainage tile that discharges into an open waterway). Many of these concerns can be addressed with the creation of regional sewer districts such as the district serving the area around State Road 114/I-65 Interchange and the Yeomen Ditch, which has shown significant impairment based on high E-coli levels.

One combined sewer overflow (CSO) community does exist within the watershed and is possibly a significant source of water quality pollutants. The city of Rensselaer has nine (9) CSOs that discharge directly into the Iroquois River. Figure 20 Combined Sewer Outfalls (CSO) and Delineated Drainage Areas shows the location of each outfall and the approximate contributing drainage area for each outfall. These should be addressed to improve water quality.

Figure 20 Combined Sewer Outfalls (CSO) and Delineated Drainage Areas

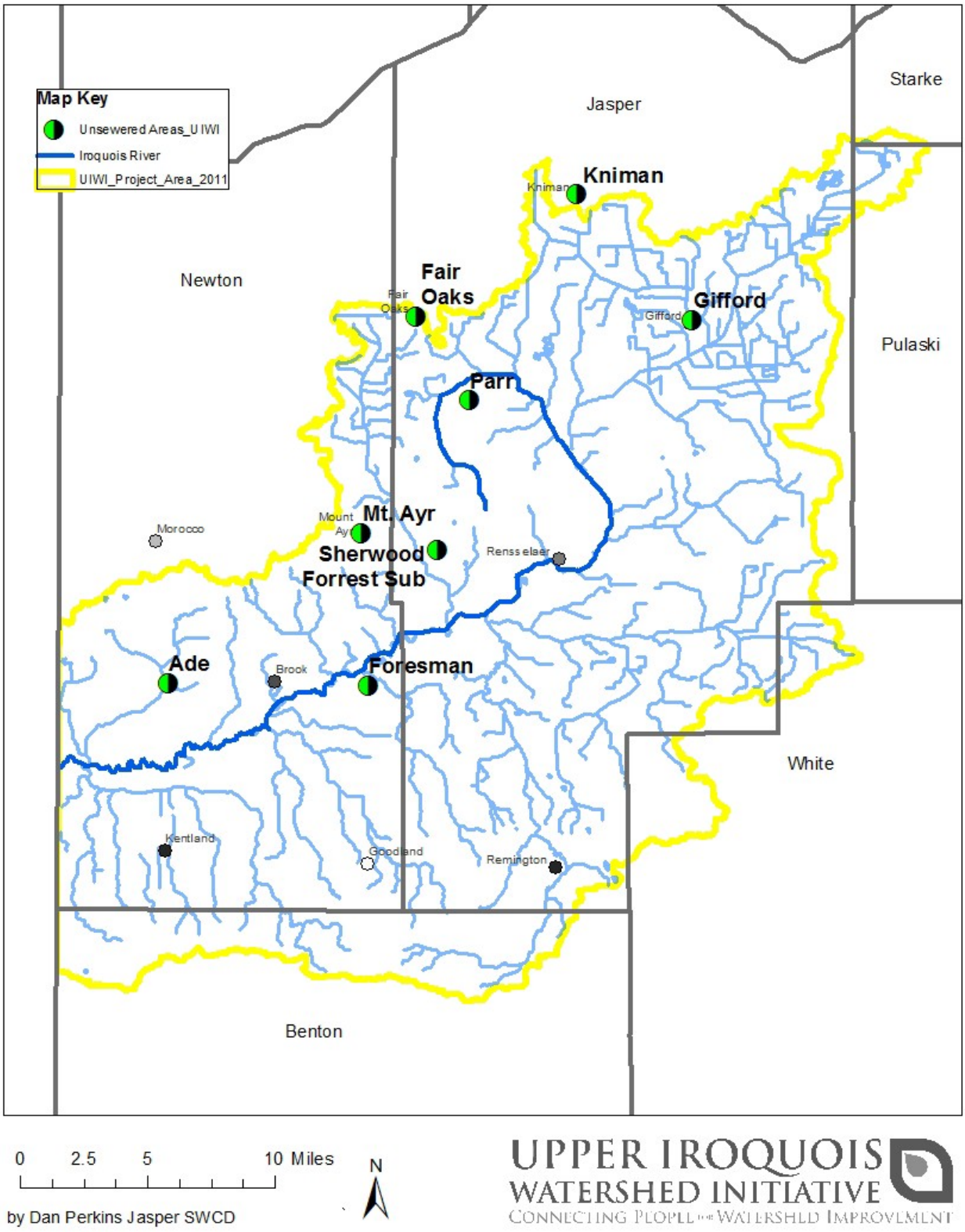


Figure 21 Unsewered Areas with Significant Populations

2.4.2 Tillage Transect

The largest land use in the watershed is agriculture at 84% of the acreage and therefore has the most potential to negatively or positively impact water quality. Four of the six stakeholder concerns- flashiness of river, too much sediment, too much nutrients, and high E.coli levels can be associated with agricultural land use.

Tillage transects are county level windshield surveys that collect data on current crop use, tillage practice and various soil loss factors. Data from these yearly to biannual surveys provide valuable information on trends in crop use and acceptance of conservation practices such as conservation tillage and cover crops.

Common tillage types include no-till, strip-till, ridge-till, mulch-till, reduced-till, and conventional-till. According to the Indiana State Department of Agriculture (ISDA) by definition no-till is any direct seeding system, including site preparation, with minimal soil disturbance (includes strip and ridge till). Mulch-till is any tillage system leaving 30%-75% residue cover after planting, excluding no-till. Reduced-till is any tillage system leaving 16%-30% residue cover after planting and conventional-till is any tillage system leaving less than 15% residue cover after planting. No-till, ridge-till, strip-till, and mulch-till are all examples of conservation tillage. The purpose of conservation tillage is to reduce sheet and rill erosion, maintain or improve soil organic matter content, conserve soil moisture, increase available moisture, reduce plant damage, and provide habitat and cover for wildlife. The remaining crop residue helps reduce soil erosion and run-off volume **(WREC, 2010)**. Conservation tillage positively impacts water quality for these reasons. The more conservation tillage acres we have the better protected the soil surface is from erosion, which should result in local water quality improvements**.** Appendix 1 lists the acres used for bean and corn production in 2009 versus 2011 for each tillage practice according to the ISDA Conservation Tillage Summary Reports.

Key observations 2009-2011:

1. Decreasing reduced till acres to more mulch till acres for both corn and soybeans = more residue on soil, a positive for water quality
2. Decreasing no-till acres for soybeans = less residue on the surface, a negative for water quality.

Table 16 Tillage Practices in UIWI Area

County	Total Acres	No Till		Mulch Till		Reduced Till		Conventional Till	
		Percent	Acres	Percent	Acres	Percent	Acres	Percent	Acres
Corn									
asper	156,000	12%	18,700	31%	48,400	16%	2,500	40%	62,400
ewton	118,000	7%	8,300	49%	57,800	15%	17,700	29%	34,200
enton	156,000	12%	18,700	31%	48,400	16%	25,000	40%	62,400
ulaski	106,000	29%	30,700	21%	22,300	32%	33,900	19%	20,100
White	150,000	7%	10,500	42%	63,000	21%	31,500	30%	4,500
Totals									
Soybean									
asper	99,900	38%	38,000	41%	41,000	8%	8,000	13%	13,000
ewton	673,000	59%	39,700	27%	18,200	6%	4,000	9%	6,100
enton	100,500	68%	68,300	27%	27,100	3%	3,000	2%	2,000
ulaski	77,300	64%	49,500	16%	12,400	15%	11,600	5%	3,900
White	95,700	46%	44,000	40%	38,300	9%	8,600	5%	4,800

A historic view of tillage transects data for Jasper and Newton was conducted and is summarized in Table 17 Historic Tillage Transect No Till Acres in Jasper and Newton. It appears no-till acres for corn reached an all-time high in 1996, and for soybeans in 2007. Again the downward trend in no-till acres is not positive for water quality protection.

Table 17 Historic Tillage Transect No Till Acres in Jasper and Newton

Historic Tillage Transect for No-till Corn and Soybean Acres				
No-Till Year	Jasper No till Corn (% of Corn)	Newton No till Corn (% of Corn)	Jasper No till Soybeans(% of Soybeans)	Newton No till Soybeans(% of Soybean Acres)
1990	16%	15%	10%	15%
1996	26%	17%	47%	45%
2000	20%	No Data	41%	No Data
2002	13%	23%	48%	55%
2004	9%	17%	35%	67%
2007	17%	20%	54%	74%
2009	8%	14%	52%	71%
2011	12%	7%	38%	59%
Summary Data	**Jasper Corn**	**Newton Corn**	**Jasper Soybean**	**Newton Soybea**
Recorded High	26%	23%	54%	74
2011	12%	7%	38%	59
Loss (High to current)	14%	16%	16%	15

2.4.3 Fertilizer Use on Urban and Suburban Land

Fertilizers are commonly applied to urban and suburban land in Indiana. These chemicals can be carried into adjacent water bodies through surface run-off and via storm water drainage systems. This is especially an issue if a storm occurs prior to the chemicals being broken down and used. Given that 6% of the land area is developed and would be considered urban/suburban land use, the overall impact on water quality and concerns of stakeholders would be minimal. However, given that several of the towns have significant streams flowing directly through them more study is needed to determine if this is an issue in these areas. This is especially true in the City of Rensselaer since most of their CSOs discharge directly into the Iroquois River and currently the city offers grass clipping pickup so piles of grass clippings are often piled on the street and can leach nutrients directly into the sewer system.