Perth Natural Heritage Systems Study:

2019 Update Report based on 2015 Aerial Photography

(Includes City of Stratford and Town of St. Marys)

Perth County
Cultivating Opportunity

Prepared by:
Upper Thames River Conservation Authority
In cooperation with Perth County Conservation Authorities

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Oblique aerial photography of rural Perth County. Photo by UTRCA.

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Project Study Team – Upper Thames River Conservation Authority

Cathy Quinlan	Report author and technical expertise
Terry Chapman	GIS modeling and technical expertise
Tracey Haycock	GIS vegetation mapping
Tracy Annett	Project management, policy and implementation
Chris Harrington	Project oversight

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Thanks go to Mark Swallow, Manager of Planning, and other staff at the County of Perth for their direction and guidance of the study.

Thanks to the County of Perth and the UTRCA for the financial support of this study.

Executive Summary

This report provides an update to the vegetation mapping and modeling of the natural heritage system using the 2015 photography. It serves as an update to the full 2018 Perth Natural Heritage Systems Study (PNHSS) which was based on 2010 photography. This update report accompanies the 2018 PNHSS document, so it does not contain the full methodology and detailed results of the PNHSS. The key findings and changes seen in the vegetation cover over this five-year span are listed below.

Vegetation Changes, 2010 to 2015

- There was an increase in over 200 ha of woodland that succeeded from thicket and meadow types, notably along the North Thames River where conifer plantations matured.
- Approximately 30 ha of newly defined water bodies/watercourses were mapped, largely a reflection of more aggregate pit ponds and improved mapping.
- The area of wetland cover (evaluated and unevaluated wetlands) changed from 9,284 ha to 10,930 ha (2010 to 2015 data) owing to the completion of unevaluated wetland mapping in the Maitland Valley watershed area since the initial PNHSS study. This is not new wetland cover, but a re-assignment of upland vegetation types to wetland vegetation types (e.g., no net gain in vegetation cover).

Forest Loss and Gain, 2010 to 2015

- Approximately 123 ha of woodland were lost (removed and converted to other landuses) between 2010 and 2015. In addition, 326 ha of meadow and 21 ha of thicket were also cleared/removed in these five years.
- Over 300 ha of new meadows and thickets were mapped, attributed to the creation of new habitats from tree planting, naturalization or land retirement projects since 2010. Some of these areas may succeed into woodlands in time.

The results of the landscape criteria modelling based on the updated 2015 vegetation mapping showed that:

- 91.5% of vegetation patches met at least one criterion for ecological importance. The 2010 data was similar (91.9% met at least one criterion).
- 11.09% of Perth County is in ecologically important vegetation cover, similar to the 11.06% reported in the 2010 data.
- 10.20% of the Perth Study Area is in significant ecologically important woodland cover.

Maps showing the results are included in the appendices. The digital vegetation mapping and model results, has been provided to the County of Perth.

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1.0 Purpose of the Update Report

In 2017 the County of Perth contracted the Upper Thames River Conservation Authority (UTRCA) to complete a Perth Natural Heritage Systems Study (PNHSS). The PNHSS, completed in 2018, identified the natural heritage systems in the county using 2010 aerial photography from SWOOP (South Western Ontario Ortho-imagery Project).

In 2018 the County of Perth contracted the UTRCA to update the GIS data for natural heritage features and vegetation in the county reflecting the 2015 SWOOP ortho-imagery.

In 2019 the County contracted the UTRCA to re-run the PNHSS model using the updated vegetation data from the 2015 imagery, and to write an Update Report to summarize the results. The UTRCA cost-shared this report as it helps to serve the goals of the UTRCA strategic plan, specifically action related to natural heritage restoration and protection (http://thamesriver.on.ca/wp-content/uploads//Targets/EnvironmentalTargets-June2016.pdf).

This Update Report accompanies the 2018 PNHSS document, so it does not contain the full methodology and detailed results of the PNHSS. The Update Report serves to identify and summarize the natural heritage features and system as of 2015 and to summarize changes since 2010 without completely regenerating the entire 2018 PNHSS report.

2.0 Mapping Updates

2.1 2015 SWOOP Photography

This Update Report uses the 2015 SWOOP (South Western Ontario Ortho-imagery Project) digital aerial photography, flown in early spring of 2015 prior to leaf-out. The vegetation mapping methods used in this study followed those of the full PNHSS (2018) that used 2010 photography. Both the 2010 and 2015 SWOOP photography are full colour with very good resolution. Each set of photography is unique as they are flown at slightly different dates and times of day, providing different benefits for mapping clarity. For example, the 2010 photography was flown slightly later in spring, so some crop greenup is visible, where the 2015 imagery was flown earlier and no greenup is visible, but there are less shadows owing to the time of day.

2.2 Additional Wetland Mapping

The 2018 PNHSS included data for both evaluated and unevaluated wetlands in Perth County, except unevaluated wetlands were not available for the Maitland Valley watershed portion. Since then, the Maitland Valley Conservation Authority (MVCA) completed mapping of unevaluated wetlands for their watershed using 2015 aerial photography. The methodology that was used is consistent with the UTRCA's methods used in the original study. This wetland data layer was shared with the UTRCA and incorporated into this update study.

2.3 Mapping and Tracking Vegetation Changes

This update report includes new information about vegetation change from 2010 to 2015. By updating the vegetation community mapping with every new set of aerial photography, changes in the natural heritage system can be tracked and evaluated. There are two types of vegetation changes:

- real gains and losses in vegetation cover, and
- successional changes from one vegetation community type to another.

2.3.1 Real gains (newly defined) and losses (absent) in vegetation cover

The following categories are tagged or attributed to vegetation polygons that have changed from the 2010 to the 2015 photography.

"Newly defined" vegetation polygons are natural vegetation communities that were not present or not visible on the 2010 photography but show up on the 2015 photography and so represent a gain in natural vegetation cover in the County. Examples include land that was cropland but subsequently planted with young trees (i.e., now recognized as a thicket or meadow), or pasture land that has gone fallow to become a new meadow. It can also include some corrections to the area of a feature, now better seen with the 2015 photography (e.g., vegetation that was likely present in 2010, just not accurately seen).

"Absent" vegetation polygons are natural vegetation communities that were present in 2010 but are not present on the 2015 photography and so represent a loss in natural vegetation cover in the County. Examples include woodlands or meadows that have been cleared to become farmland, urban development, aggregate pits or other non-natural landuses. Absent vegetation may involve the loss of part of a natural feature (e.g., a corner of a woodland) or the entire feature (e.g., an entire meadow community).

2.3.2 Changes in vegetation community type through succession or alteration

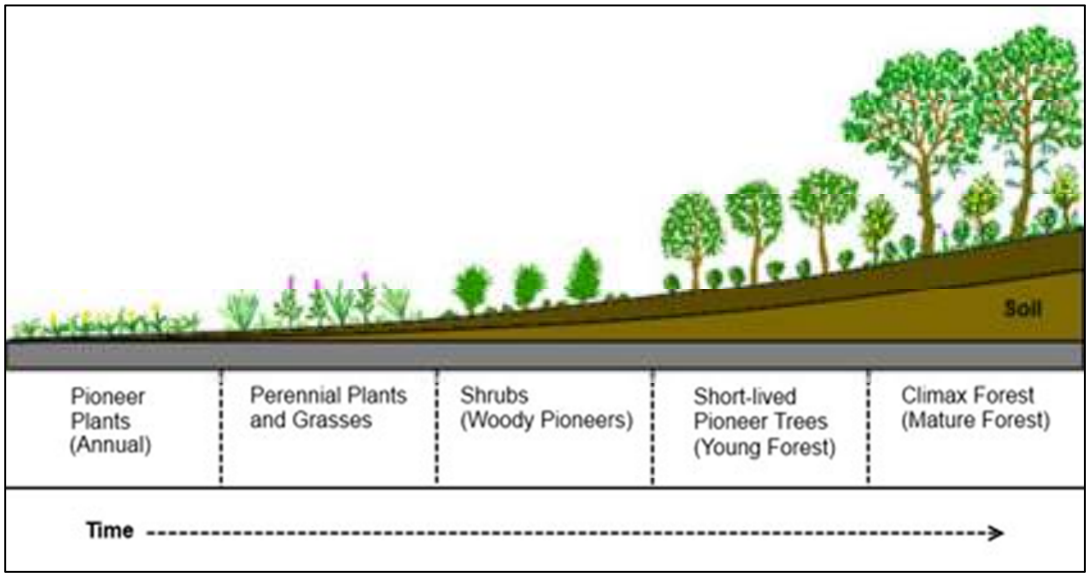
The proportion of the different vegetation communities (e.g., woodland vs. thicket vs. meadow) in a region will change over time through the process of succession. Ecological succession is the gradual process by which ecosystems change and develop over time, as illustrated in Figure 1. The process is also called Forest Succession as an empty field left undisturbed for long enough will turn into a forest (with some exceptions such as arid regions).

Recently disturbed land is first colonized by meadow species (i.e., pioneer/annual and perennial plants and grasses), then shrubland (thicket), then a young forest (i.e., pioneer tree species), and finally, climax/mature forest. Each vegetation community improves the soil for the next vegetation community and provides increasing amounts of shade. Succession from open land to forest can take 25 to 50 years or longer depending on moisture, soil and other conditions.

Succession is directional and predictable but can be set-back if there are alterations or disturbances such and tree clearing or fire, in which case the process starts again with meadow.

In this update report, vegetation communities that succeeded or altered to another vegetation community were tracked and tabulated. By comparing the total area of each vegetation group in the 2010 photography to the 2015 photography, the changes over the 5 years can be seen, especially the maturation of thickets and young plantations into mature woodland.

Figure 1. Stages of Forest Succession



Source: deepgreenpermaculture.com.

3.0 Results of Mapping the Vegetation Layers

Table 1 shows the number of vegetation communities, groups and patches that were identified on the 2015 photography compared with the 2010 photography. The changes in numbers are due to improved mapping (e.g., corrections), real gains and losses, and successional changes. All of these changes alter the way groups and patches are assembled. More wetland groups are present in the 2015 photography due to the updated wetland mapping carried out by the MVCA since the 2018 PNHSS was completed (see Section 2.2).

Table 1. Number of vegetation communities, groups and patches in the Perth study area, 2010 vs. 2015

Vegetation Layers	Number (2010)	Number (2015)
Communities	7,067	8,003
Groups	2,943 (809 Wetlands**)	2,738 (960 Wetlands**)
Patches	2,371	2,402

Notes:

- The Study Area is the area of geographic Perth County (222,233 ha) plus a 1 km buffer around the perimeter (total 247,323 ha) to capture natural heritage features that are located on both sides of the boundary and need to be modeled based on their full size.
- **Wetland Groups are part of other Vegetation Groups (e.g., Deciduous Swamp is part of a Wetland Group and a Woodland Group), so it is double counting to add them in.

3.1 Vegetation Community Types

Table 2 lists the number and area of the 17 vegetation community types in the Perth Study Area sorted by like types. Table 3 shows the same data, sorted by area. Seventy-five percent of the total vegetation cover is made up of: deciduous woodland (37.5%), deciduous swamp (27.4%), and upland meadow (10.6%).

Table 2. Number and Area of the 17 vegetation community types in the Perth study area (2015 SWOOP data)

Vegetation Community (sorted by like types)	Number of Vegetation Communities	Area of Vegetation Communities (ha)	% Area of all Vegetation Communities (30,507 ha)	% of Perth Study Area (247,323 ha)
Deciduous Woodland	2,400	11,446	37.5%	4.63%
Mixed Woodland	407	1,870	6.1%	0.76%
Coniferous Woodland	350	714	2.3%	0.29%
Mature Plantation	237	829	2.7%	0.34%
Deciduous Swamp	1,527	8,355	27.4%	3.38%
Mixed Swamp	180	1,848	6.1%	0.75%
Coniferous Swamp	42	161	0.5%	0.07%
Plantation Swamp	8	167	0.5%	0.07%
Upland Thicket	283	421	1.4%	0.17%
Wetland Thicket	62	113	0.4%	0.05%
Young Plantation	121	197	0.6%	0.08%
Young Plantation Swamp	1	1	<0.1%	0.00%
Upland Meadow	1,789	3,226	10.6%	1.30%
Marsh Meadow	194	242	0.8%	0.10%
Water Body	282	355	1.2%	0.14%
Major Watercourse	89	538	1.8%	0.22%
Connected Veg Feature	31	24	0.1%	0.01%
Total	**8,003**	**30,507**	**100%**	**12.33%**

Table 3. Vegetation community types sorted by area (2015 SWOOP photography)

Vegetation Community (sorted by area)	Number of Vegetation Communities	Area of Vegetation Communities (ha)	% Area of all Vegetation Communities (30,507 ha)	% of Perth Study Area (247,323 ha)
Deciduous Woodland	2,400	11,446	37.5%	4.63%
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Young Plantation Swamp	1	1	<0.1%	0.00%
Total	**8,003**	**30,507**	**100%**	**12.33%**

3.2 Vegetation Group Results

Table 4 shows the area of each vegetation group as a percentage of the vegetation cover and as a percentage of the Perth Study Area, based on the 2015 photography. Woodland is the dominant vegetation group type, representing 83.4% of all the total vegetation area, and 10.25% of the Perth Study Area. Wetlands represent 4.42% of the Perth Study Area.

Table 5 shows the area of the vegetation groups that changed as a result of succession or alteration (no net habitat gain or loss). Out of 30,393 ha of vegetation cover, 494 ha changed type. The most notable change is 258 ha of thicket and meadow succeeded to woodland since 2010. Much of this change is the result of young plantations along the North Thames River near Fullarton (most are UTRCA lands) maturing to the woodland category.

Table 4. Area of vegetation groups as a percent of the study area, 2015 photography

Vegetation Group	Area (ha)	% of Total Veg Group Area (30,393 ha)	% of Perth Study Area (247,323 ha)
Woodland	25,357	83.4%	10.25%
Thicket	729	2.4%	0.29%
Meadow	3,415	11.2%	1.38%
Water body/course	871	2.9%	0.35%
Connected Veg Feature	21	0.1%	0.01%
Total	**30,393**	**100%**	**12.29%**
Wetland	10,930	36.0%	4.42%

*The Perth Study Area includes a 1000m buffer around the outside of the county.

- The total area of vegetation groups is slightly smaller than the total area of vegetation communities shown in Table 2 (30,507 vs 30,393) because of boundary overlaps being created and dissolved.

Table 5. Vegetation type change through succession or alteration, 2010 to 2015

Vegetation Group	Difference (ha)
Woodland	258
Thicket	-122
Meadow	-135
Water body	-1
Connected Veg Feature	0
Total	**0**

Note: A total of 494 ha changed group type. Only those vegetation polygons that were present in both the 2010 and 2015 photography are included in this table (i.e., no net change in vegetation cover, just internal changes in type).

3.3 Vegetation Group Gain (Newly Defined) and Loss (Absent)

Table 6 shows the gains (newly defined) and losses (absent) in the various vegetation groups between 2010 and 2015. See section 2.3.1 for definitions.

Gain: The large area of newly defined meadows (284 ha) and thickets (57 ha) are attributed to the creation of new habitats from recent tree planting and naturalization projects or land going fallow since 2010, as well as improved mapping picking up more area of these communities. The small area of newly defined woodlands (24 ha) is also attributed to improved mapping (i.e., area adjustments on existing woodlands, not new woodlands that developed in the last 5 years). The 30 ha of newly defined water body/course is largely a reflection of more aggregate pit ponds and improved mapping.

Loss: Approximately 123 ha of woodland was lost and converted to other human landuses such as agriculture or urban/rural development between 2010 and 2015. This woodland loss occurs a little here and a little there, not necessarily in large blocks. Often, there is a nibbling away of woodland edges. Some 30 ha of wetland were lost, and this includes swamps, thickets and meadows already shown in the other categories. The loss (absence) of large areas of meadow (326 ha) and some thicket (21 ha) is also the result of land conversion to agricultural or urban/aggregate uses.

Overall, there is a net loss in total vegetation cover of 84 ha over the five year interval (2010 to 2015).

Table 6. Vegetation group gain (newly defined) and loss (absent) in the study area, 2010 to 2015

Vegetation Group	Gain (Newly Defined) (ha)	Loss (Absent) (ha)	Difference (Gain minus Loss) (ha)
Woodland	24	123	-99
Thicket	57	21	36
Meadow	284	326	-42
Water body/course	30	9	21
Connected Veg Feature	0	0	0
Total	**395**	**479**	**-84**
Wetland	**0**	30	-30

4.0 Results of Running the Ecologically Important Criteria Model

The landscape model was re-run using the updated 2015 vegetation mapping. Vegetation patches that meet one or more criteria are considered Ecologically Important in Perth County. Table 7 below shows that only 8.5% of the patches met no criteria, while the remaining 91.5% did meet one or more. Over 65% of patches met two or more criteria. The results are similar percentage wise from the 2010 data.

Table 7. Number of Vegetation patches vs. the Number of Criteria Met in the Study Area

	2010 data		2015 data	
# of Criteria met	**# Vegetation Patches**	**% of Patches (2,402)**	**# Vegetation Patches**	**% of Patches (2,402)**
0	192	8.1%	205	8.5%
1	640	27.0%	644	26.8%
2	537	22.6%	528	22.0%
3	229	9.7%	351	14.6%
4	222	9.4%	297	12.4%
5	235	9.9%	190	7.9%
6	153	6.5%	108	4.5%
7	83	3.5%	47	2.0%
8	52	2.2%	22	0.9%
9	18	0.8%	10	0.4%
10	10	0.4%	0	0.0%
Total	**2,371**	**100.0%**	**2,402**	**100.0%**

Table 8 shows the number of vegetation patches that are ecologically important by municipality and county. Overall, 91.0% of patches in Perth County meet one or more criteria and are ecologically important.

Table 9 shows the area of vegetation patches that are ecologically important by municipality and county. Overall, 99.3% of patch area is ecologically important and that correlates to 11.09% of the county. The results are similar for each municipality, with over 99% of patch area being ecologically important, except in Stratford where the result is 95.8%. The maps in Appendix B illustrate the above results. Table 10 shows a comparison of these results from the 2010 to 2015 data sets. Only slight changes in the figures area seen, with the percentage of the county that is ecologically important changing from 11.06% to 11.09%.

Table 8. Number of vegetation patches that are Ecologically Important by municipality, 2015 data

Municipality	# Patches	# Patches that are ecologically important	% of patches that are ecologically important
Stratford	54	45	83.3%
North Perth	492	451	91.7%
West Perth	480	437	91.0%
St. Marys	21	20	95.2%
Perth East	736	670	91.0%
Perth South	357	324	90.8%
Perth County*	2,140	1,947	91.0%

Note: Perth County figures may not exactly equal the sum of the columns due to overlaps along boundary lines.

Table 9. Area of vegetation patches that are Ecologically Important by municipality, 2015 data

Municipality	Municipal Area (ha)	Area of all patches (ha)	% of municipality in patch cover	Area of patches that are ecologically important	% of patch area that is ecologically important	% of municipality that is ecologically important
Stratford	2,845	213	7.49%	204	95.8%	7.17%
North Perth	49,349	5,420	10.98%	5,383	99.3%	10.91%
West Perth	57,963	5,287	9.12%	5,250	99.3%	9.06%
St. Marys	1,303	228	17.5%	228	99.8%	17.46%
Perth East	71,289	8,449	11.85%	8,396	99.4%	11.78%
Perth South	39,516	5,213	13.19%	5,170	99.4%	13.11%
Perth County	222,233	24,810	11.16%	24,640	99.3%	11.09%

Table 10. Area of ecologically important patches, 2010 vs 2015

Municipality	Area of all Patches (ha)		Area of patches that are ecologically important (ha)		% of municipality that is ecologically important (ha)	
	2010	2015	2010	2015	2010	2015
Stratford	206	213	194	204	6.82%	7.17%
North Perth	5,455	5,420	5,414	5,383	10.97%	10.91%
West Perth	5,295	5,287	5,262	5,250	9.08%	9.06%
St. Marys	215	228	214	228	16.42%	17.46%
Perth East	8,409	8,449	8,358	8,396	11.72%	11.78%
Perth South	5,155	5,213	5,135	5,170	12.99%	13.11%
Perth County	24,731	24,810	24,572	24,640	11.06%	11.09%

Table 11 shows the three woodland categories used in this study. Over 99% of woodlands in Perth are in the Significant Ecologically Important category, meaning they meet the definition of significant as per the Provincial Policy Statement (PPS).

- Significant ecologically important woodlands
  - *Definition:* woodland groups that meet group level criteria within the PNHSS
  - Establishes significance for woodlands consistent with the PPS
  - Thus the woodlands are significant as per the PPS and ecologically important as per the PNHSS

- Non-significant ecologically important woodlands
  - *Definition:* woodland communities or groups within a patch that meet patch level criteria but no group level criteria within the PNHSS
  - Some woodlands that do not meet group level criteria, maybe be part of a larger patch made up of other vegetation groups such as thicket, meadow, or water features, that does meet a patch level criteria.
  - Thus the woodlands are ecologically important and part of the Perth Natural Heritage System, though not Significant as per the PPS.

- Other / Non-ecologically important woodlands
  - *Definition*: woodland groups and patches containing woodlands that do not meet any group or patch level criteria within the PNHSS
  - Although non-ecologically important based on mapped PNHSS criteria, these woodlands could still be considered "candidate sites" until an EIS determines that no unmapped criteria are present (i.e., when a change in landuse is proposed)

The map in Appendix A shows the results in map form.

Table 11. Woodland category results for the Perth Study Area, 2015 data

Woodland Category	Number of Woodland Groups	% of Total Number of Woodland Groups	Area (ha)	% of Total Woodland Group Area	% of Perth Study Area (247,324 ha)
Significant Ecologically Important	2,337	93%	25,225	99.5%	10.20%
Non-significant Ecologically Important	58	2%	43	0.2%	0.02%
Other (non-ecologically important)	129	5%	89	0.3%	0.04%
Total	**2,524**	**100%**	**25,357**	**100.0%**	**10.25%**

5.0 Summary

This report provides an update to the vegetation mapping and modeling of the 2018 Perth Natural Heritage Systems Study (that was based on 2010 photography), using the 2015 aerial photography. The key findings and changes seen in the vegetation cover over this five-year span are listed below.

Vegetation Changes, 2010 to 2015

- There was an increase in over 200 ha of woodland that succeeded from thicket and meadow types, notably along the North Thames River where conifer plantations matured.
- Approximately 30 ha of newly defined water bodies/watercourses were mapped, largely a reflection of more aggregate pit ponds and improved mapping.
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Forest Loss and Gain, 2010 to 2015

- Approximately 123 ha of woodland were lost (removed and converted to other landuses) between 2010 and 2015. In addition, 326 ha of meadow and 21 ha of thicket were also cleared/removed in these five years.
- Over 300 ha of new meadows and thickets were mapped, attributed to the creation of new habitats from tree planting, naturalization or land retirement projects since 2010. Some of these areas may succeed into woodlands in time.

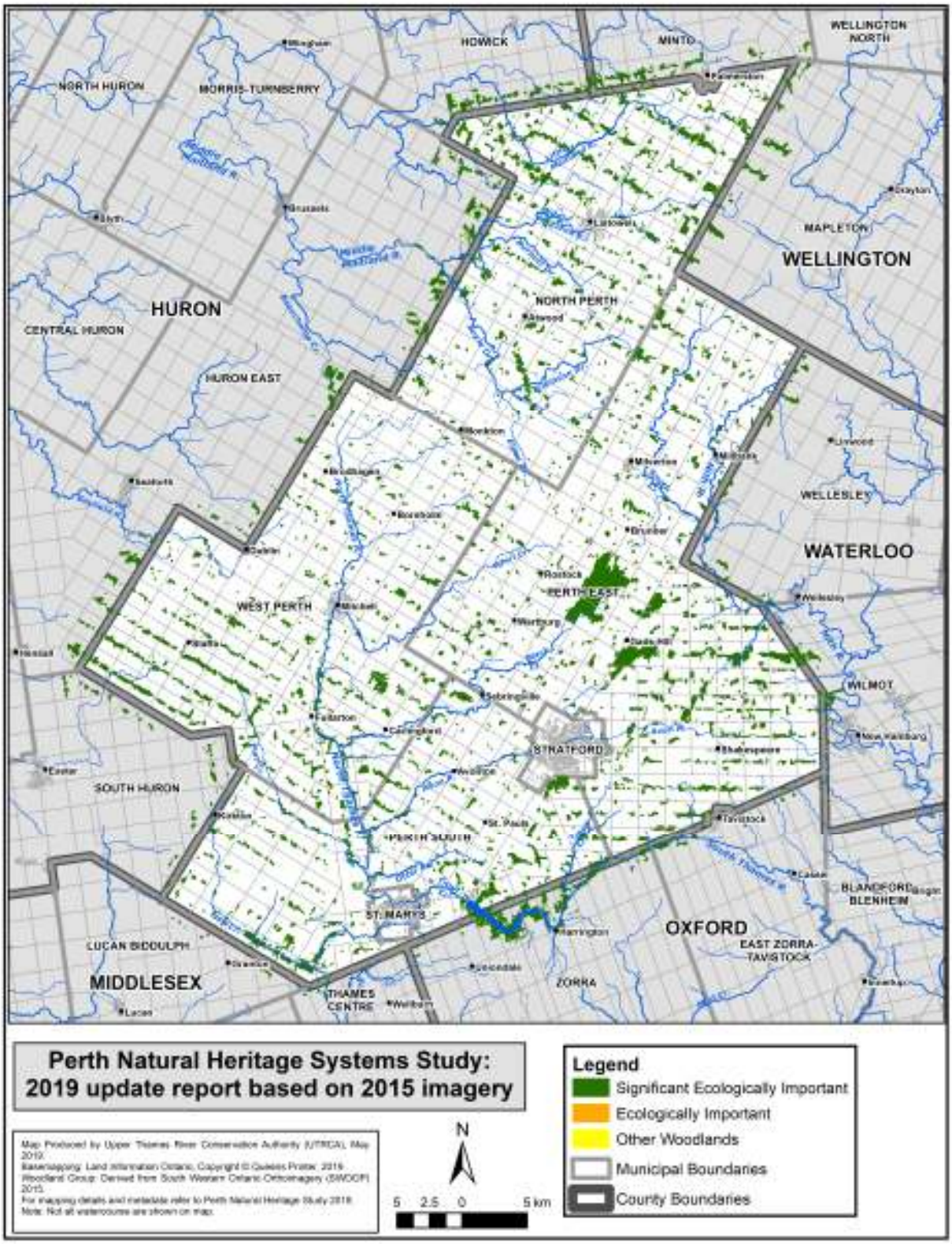
The results of the landscape criteria modelling based on the updated 2015 vegetation mapping showed that:

- 91.5% of vegetation patches met at least one criterion for ecological importance. The 2010 data was similar (91.9% met at least one criterion).
- 11.09% of Perth County is in ecologically important vegetation cover, similar to the 11.06% reported in the 2010 data.
- 10.20% of the Perth Study Area is in significant ecologically important woodland cover.

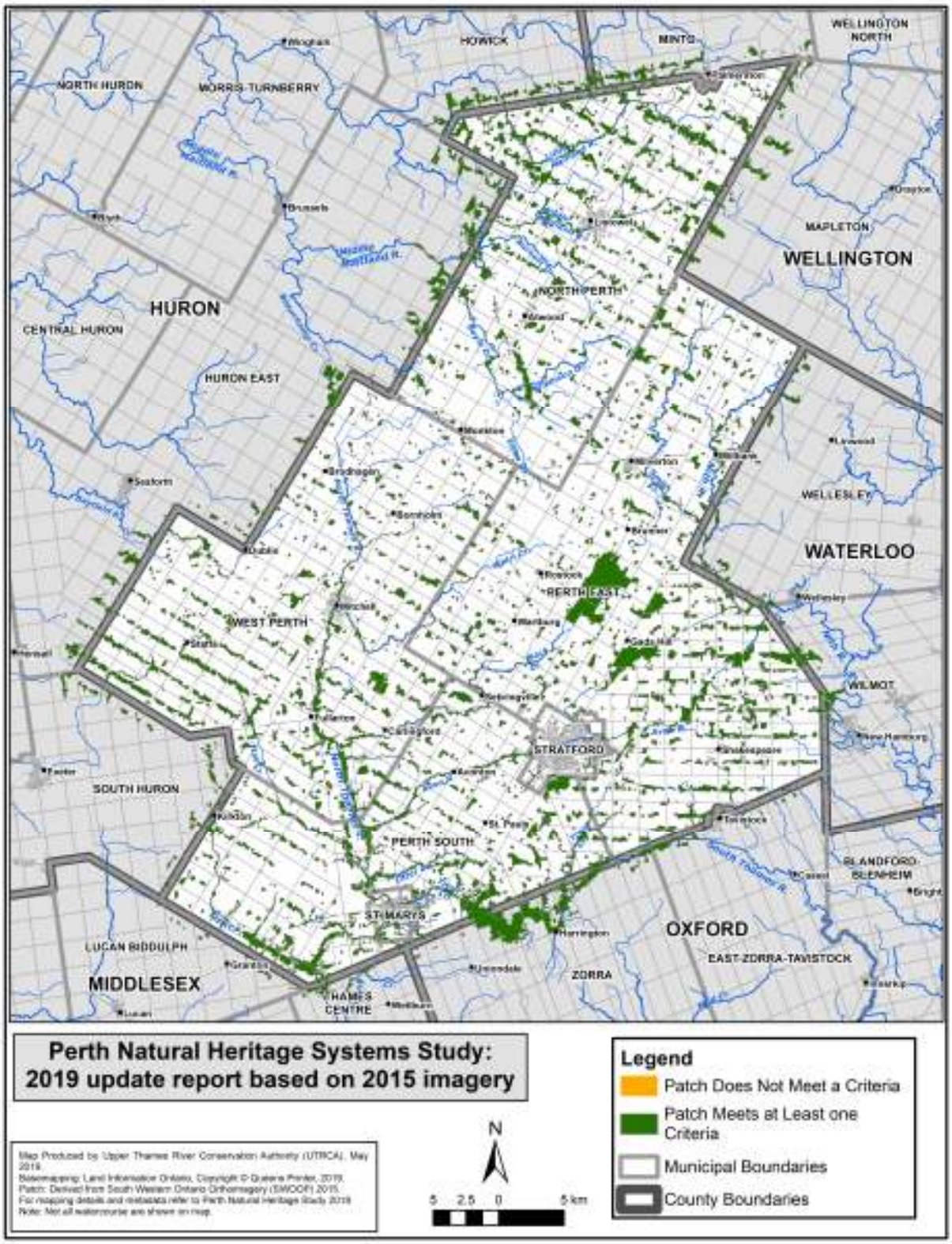
Maps showing the results are included in the appendices. The digital vegetation mapping and model results, has been provided to the County of Perth.

Appendices

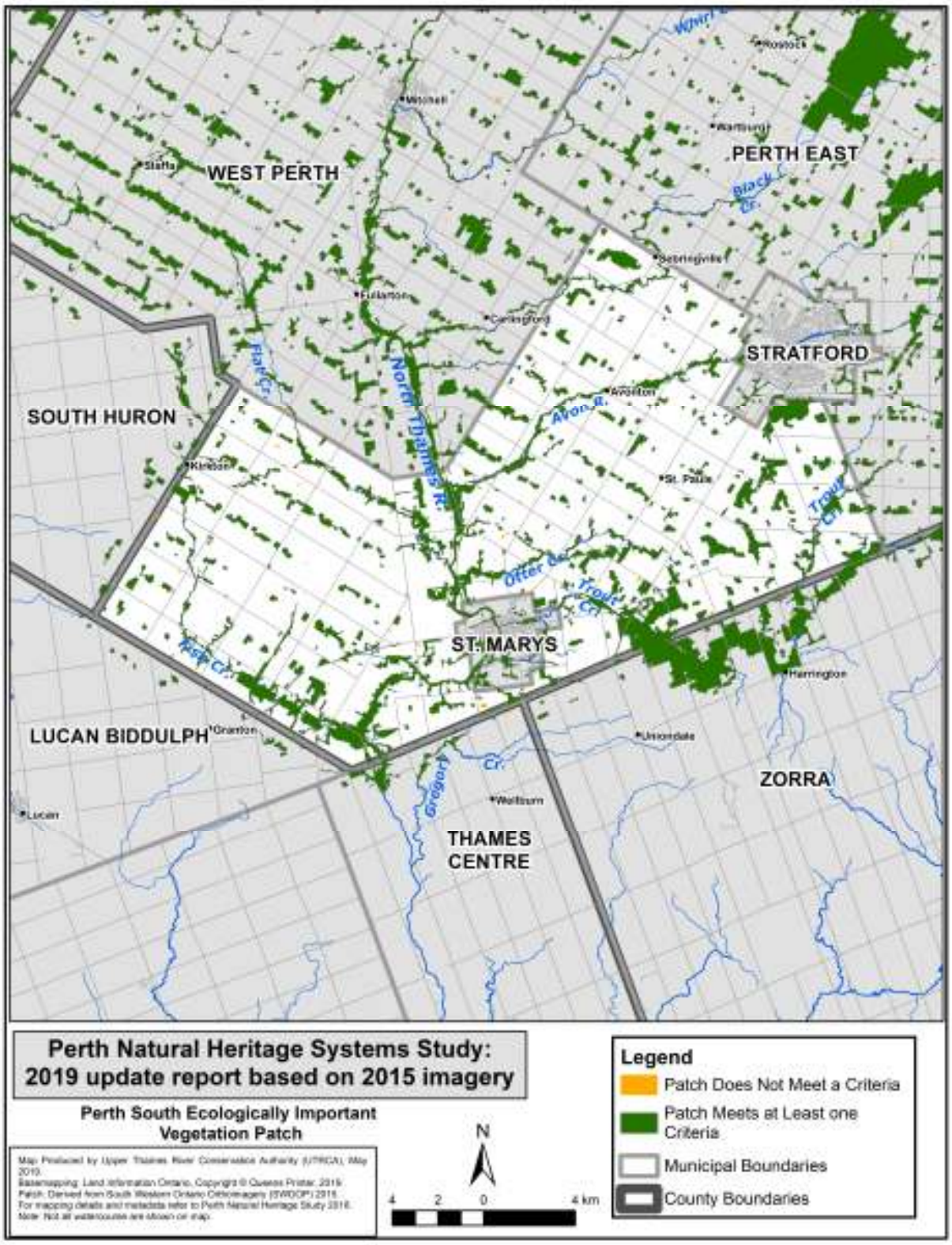
Appendix A. Woodland categories: Significant, Ecologically Important and Other in Perth County



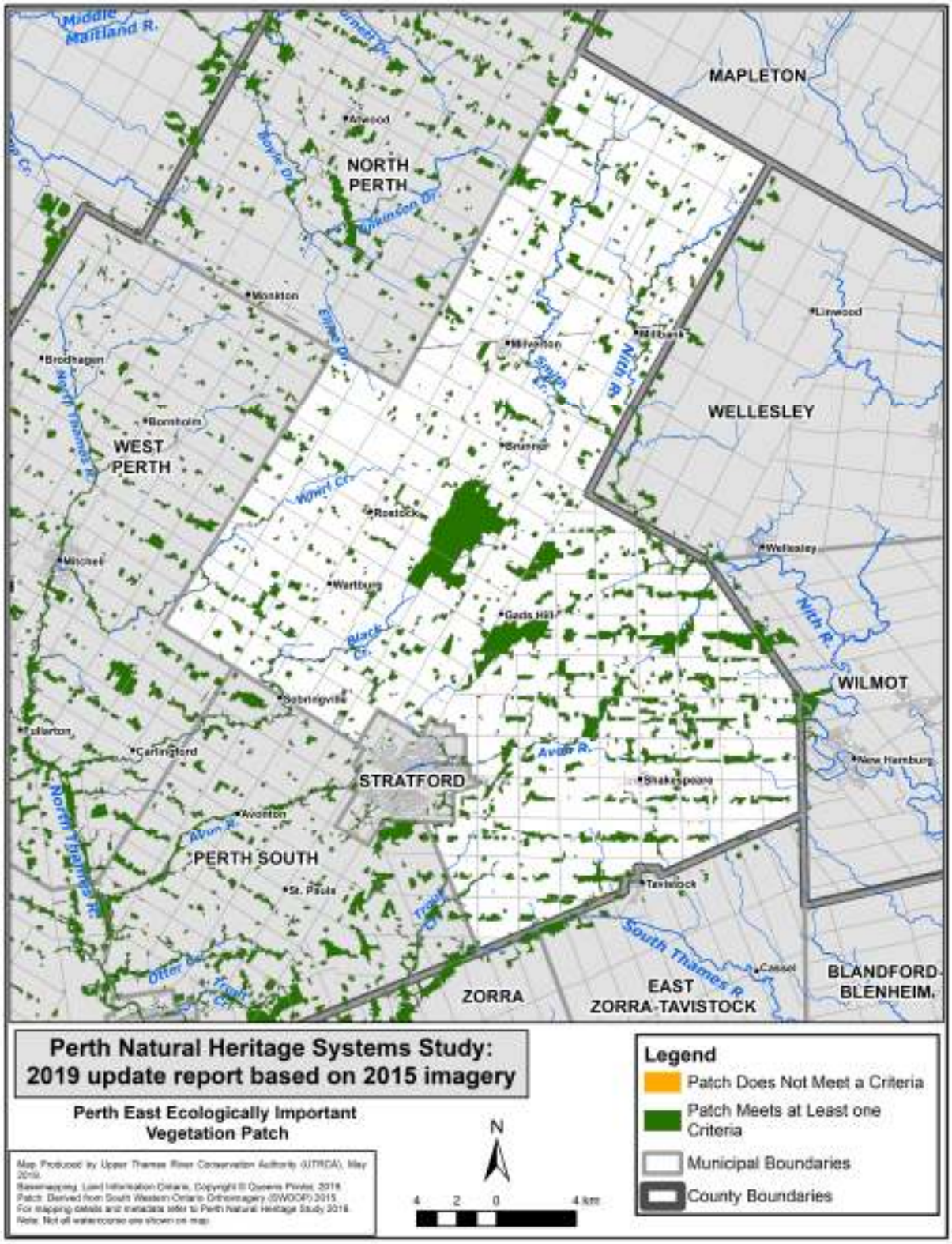
Appendix B-1. Patches that meet Ecologically Important Criteria in Perth County



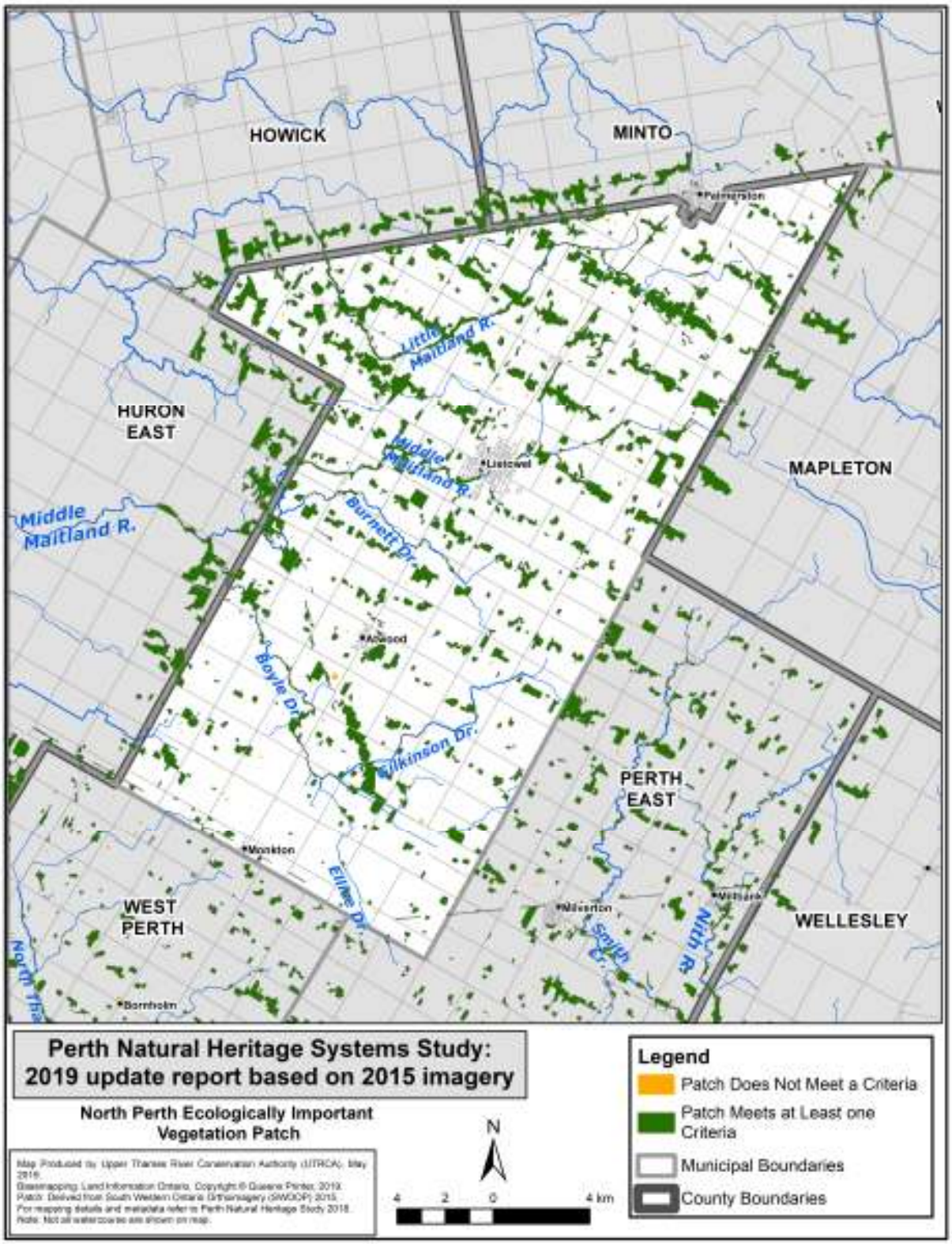
Appendix B-2. Patches that meet Ecologically Important Criteria in Perth South



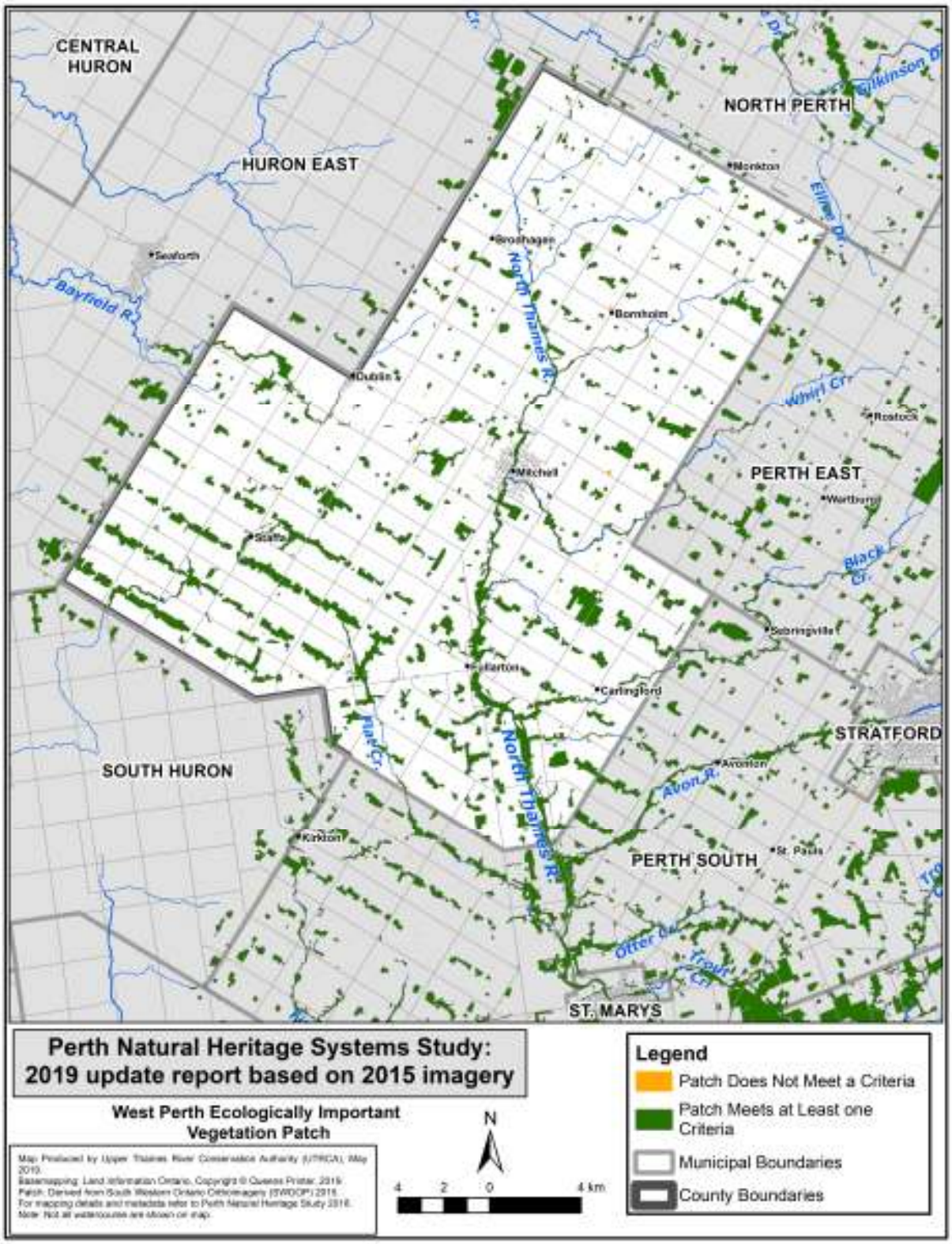
Appendix B-3. Patches that meet Ecologically Important Criteria in Perth East



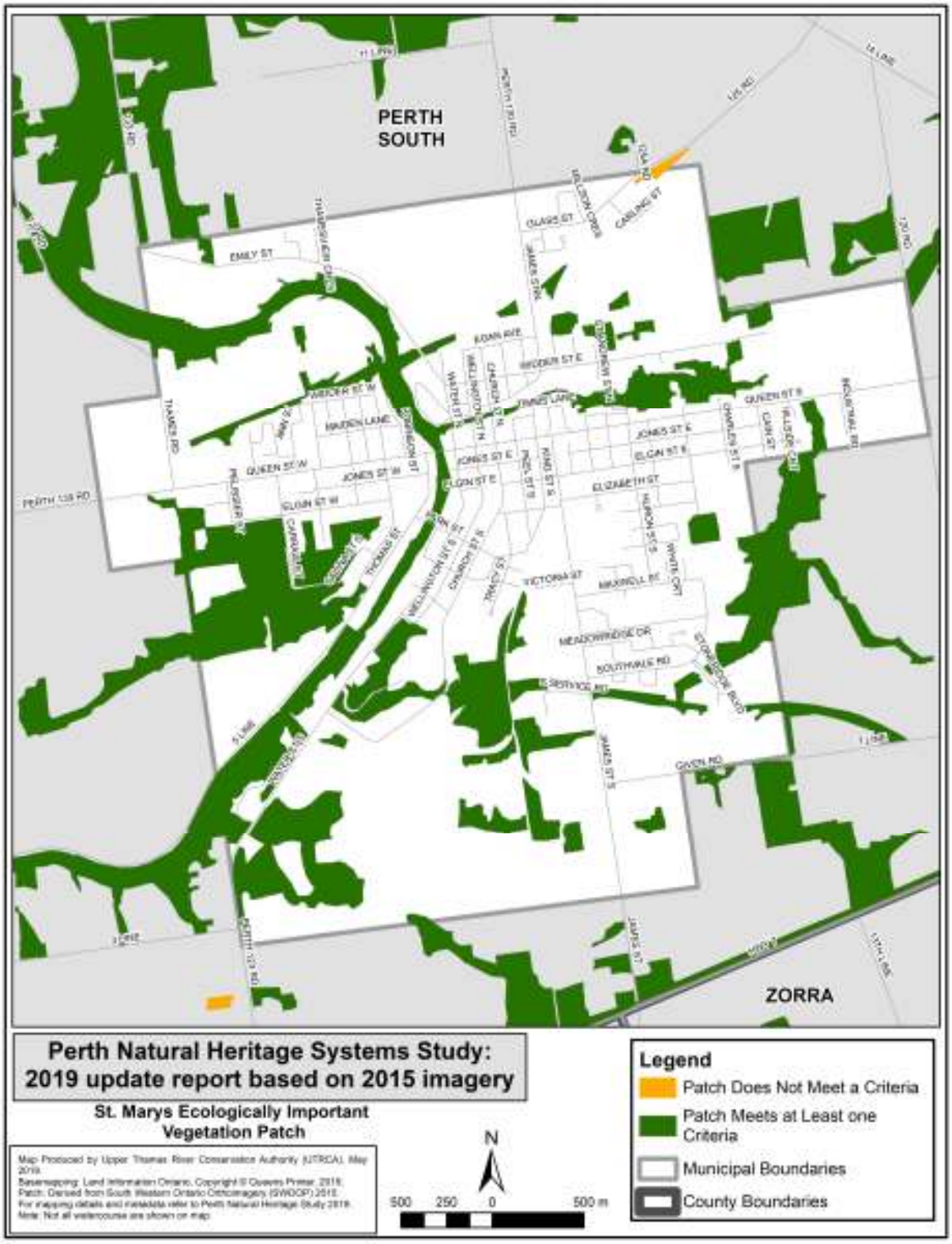
Appendix B-4. Patches that meet Ecologically Important Criteria in North Perth



Appendix B-5. Patches that meet Ecologically Important Criteria in West Perth



Appendix B-6. Patches that meet Ecologically Important Criteria in St. Marys



Appendix B-7. Patches that meet Ecologically Important Criteria in Stratford