

An Examination of Local Ordinances for Wetland Protection



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1. Introduction

Wetlands provide important local ecosystem services but they have declined worldwide. To get a handle on wetland management, it's critical to understand their governance. Owens and Zimmerman (2013) argued the importance of local governance for wetlands decision making because of its local ecosystem services. In a subnational setting, Magyera and Genskow (2013) presented a framework for "assessing integration in wetland laws, policies and programs, and their linkages with watershed management and ecosystem protection initiatives" (122). Their focus on Wisconsin, a U.S. state that has about half of its 10 million acres of wetlands left, found a fragmented subnational or state system in place to address wetlands. Their analysis on state-level laws, policies, and programs, however, did not address those laws and rules that occur at a local level and impact wetlands and the services they provide. This report focuses on the following question: From a local perspective, what is the local governance for managing wetlands?

In Wisconsin, wetlands are protected through land use regulations. Local governments are required to establish shoreland/wetland zoning and follow minimum standards promulgated by the Wisconsin Department of Natural Resources. Wisconsin Administrative Code Chapter NR 115 establishes Wisconsin's Shoreland Protection Program. NR 115 requires counties to protect wetlands that are mapped on the Wisconsin Wetland Inventory and are located in the shoreland zone which is 1,000 feet from a lake and 300 feet from a river. NR 115 establishes minimum zoning standards such as lot sizes, building setbacks, shoreland setbacks, vegetative buffer requirements, permitted uses, prohibited uses and other zoning standards. Local governments may enact stricter standards than the minimum. This report summarizes Wisconsin's county-level wetland zoning ordinances. In addition, the report examines subdivision or land division regulations as these local level laws can address wetlands. Finally, the report looks at county comprehensive plans to understand the future importance of wetlands under county jurisdiction.

2. Methods

This report's findings were derived from examining zoning and subdivision ordinances, and comprehensive plans from every Wisconsin county. County ordinances and plans were found on each county's website with a few exceptions. In those exceptions, the county zoning and planning department was contacted and the specific documents were requested. In other instances, specific circumstances excluded certain counties from parts of this analysis. At the time of the inventory, Grant County was in the process of rewriting its zoning ordinance; therefore, Grant County was removed from the zoning ordinance analysis. Juneau County did not have a zoning ordinance or subdivision ordinance available electronically and was removed from the zoning and subdivision analysis. Milwaukee County is completely incorporated and does not have a county zoning or subdivision ordinance and was excluded from this analysis. In Ozaukee and Vernon counties, subdivision regulations are controlled at a town level so they were removed from the subdivision analysis. Comprehensive plans were available for all counties except Clark, Milwaukee, and Price, thus, these counties were left out of that portion of this analysis. Fond Du Lac County's comprehensive plan is represented by an average of four town plans. The four towns with the highest amount of mapped wetlands and a comprehensive plan available on the town's website were selected.

To complete the inventory, the authors created an evaluation tool to analyze the different types of documents. The authors started with questions created by the Wisconsin Wetland Association (WWA). WWA had conducted an analysis of 15 coastal counties and 30 non-coastal counties in 2010. The author of that study only examined zoning and subdivision ordinances. We added comprehensive plans to this analysis and created a set of questions to review plans. We revised WWA's evaluation tool so that we could score the ordinances and plans. A "yes" answer would receive a score of "1" and a "no" answer would receive a "0" score. Some questions included a second part where language strength was evaluated. Weak language received a value of "1" and strong language received a value of "2." Examples of weak language include encourage and discourage. Examples of strong language include require, shall comply, protect, prevent and will not. The individual scores could then be summed to create a total score. A high score translates to County ordinances and plans that are stronger in protecting wetlands.

The zoning ordinance evaluation tool contains 17 questions for a total of 23 possible points. The subdivision ordinance template contains 14 questions for a total of 23 possible points. Finally, the comprehensive plan ordinance template contains 11 questions for a total of 21 possible points.

After each county's documents were evaluated, total scores were computed. For each inventory, the raw total score was converted to a score out of 100. The zoning ordinance inventory had a raw total possible score of 23 points. The raw score was multiplied by 4.35 to be out of 100. For example, if a county scored a 10 out of 23 points, they would then score 43 out of 100. The same procedure was completed for the subdivision ordinance and comprehensive plan evaluations. Finally, the scores from the zoning ordinance, subdivision ordinance and comprehensive plan inventory were added together to create an overall score. The overall scores had a total possible score of 300 points.

3. Results

This section provides the results for the zoning and subdivision ordinances, and comprehensive plans.

3.1 Zoning Ordinance

For this part of the analysis, three counties, Grant, Juneau and Milwaukee were dropped because the ordinance was not available, was in the process of rewriting, or had no private county land base. Table 1 shows the questions we used to evaluate each zoning ordinance and the percent of counties that answered yes or no. We used four categories: general, protection/restoration, spatial, and dimensions/standards to examine the results. Four questions (1, 2, 3 and 8) are in the general category. Questions 1 and 2 have a 100 percent “yes” response. Every county defines a wetland (100 percent) and uses the state definition (100 percent). In Chapter 23.32 (1) of Wisconsin State Statutes “wetland” means an area where water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation and which has soils indicative of wet conditions.”¹ Columbia does not include a wetland definition within the definitions section of its code but it does fall back on the state definition. In addition, all of the counties have districts where “wetland” is either in the title or in the description of the

¹ Wisconsin State Legislature. Chapter 23. <http://docs.legis.wisconsin.gov/statutes/statutes/23/32/1> accessed March 3, 2015.

Table 1: Zoning Ordinance Evaluation Questions

Questions	Percent of Counties	
	Yes	No
1 Is the term wetland defined?	100.0	0
2 If yes, is the state definition used?	100.0	0
3 Does the purpose statement explicitly include wetlands?	43.5	56.5
4 Does the ordinance explicitly include wetland protection goals?	1.4	98.6
5 Does the ordinance explicitly include wetland restoration goals?	0	100.0
6 Does the ordinance include goals that can indirectly achieve wetland protection or restoration?	1.4	98.6
7 If wetlands are incorrectly mapped, does the ordinance allow for corrections to be made based on field conditions?	91.3	8.7
8 Does the ordinance include districts that recognize wetlands? (Wetland is stated in title or description)	100.0	0
9 Does the ordinance differentiate or recognize wetlands located outside of the shoreland district?	27.5	72.5
10 Are setbacks required from the edge of wetlands?	29.0	71.0
11 Are there requirements for a vegetative buffer that are more restrictive than the state standard of 35 feet from the OHWM?	21.7	78.3
12 Does the ordinance contain provisions for wetland restoration permit approvals?	4.3	95.7
13 Does the county have a water/lake classification system?	24.6	75.4
14 Are wetlands excluded when calculating the buildable area of a lot?	29.0	71.0
15 Do conditional use standards under general zoning include wetlands?	10.1	89.9
16 Do conditional use standards under specific districts include wetlands?	10.1	89.9
17 Does the ordinance include language about wetland mitigation?	50.7	49.3

Note: These percentages do not include Grant, Juneau and Milwaukee counties.

district. However, for question 3, only forty-three percent of the counties include a purpose statement that explicitly includes wetlands.

Seven questions (4, 5, 6, 11, 12, 13 and 17) address the protection/restoration category. Except for question 17 which addresses wetland mitigation, the percentage of counties focused on protection/restoration is quite low. Seventeen counties (24.6 percent) have a lake classification system. Some of the protections from a lake classification system include shoreland vegetation protection, shoreline setbacks, lot sizes, impervious surface coverage and mitigation requirements. About one-fifth of the counties have stronger requirements for a vegetative buffer than the state minimum standard. Only four percent, specifically Dane, Lincoln and Walworth, of the counties include wetland restoration provisions in the zoning ordinances. None of the counties included wetland restoration goals and only St. Croix County included wetland protection goals and goals that can be achieved indirectly through wetland protection or restoration.

Three questions (7, 9, 14) fall into the spatial category. Most of the counties (89.9 percent) allow for the correction of incorrectly mapped wetlands based on field conditions. Those that do not include language about incorrectly mapped wetlands include Calumet, Green Lake, Manitowoc, Pierce, Portage and Racine. Forty-three percent of the counties have a minimum mapping unit of two acres; the remaining counties have a minimum mapping

Table 2: Minimum Mapping Unit Per County

County	Minimum Mapping Unit						
Adams	2	Florence	2	Marathon	5	Rusk	5
Ashland	5	Fond du Lac	5	Marinette	2	St Croix	2
Barron	2	Forest	2	Marquette	5	Sauk	5
Bayfield	2	Grant	-	Menominee	5	Sawyer	5
Brown	2	Green	5	Milwaukee	-	Shawano	5
Buffalo	5	Green Lake	5	Monroe	2	Sheboygan	5
Burnett	5	Iowa	5	Oconto	2	Taylor	5
Calumet	2	Iron	2	Oneida	2	Trempealeau	5
Chippewa	2	Jackson	2	Outagamie	5	Vernon	5
Clark	5	Jefferson	2	Ozaukee	2	Vilas	5
Columbia	5	Juneau	-	Pepin	5	Walworth	2
Crawford	5	Kenosha	2	Pierce	5	Washburn	5
Dane	2	Kewaunee	5	Polk	5	Washington	2
Dodge	2	La Crosse	5	Portage	2	Waukesha	2
Door	2	Lafayette	5	Price	5	Waupaca	2
Douglas	5	Langlade	5	Racine	5	Waushara	2
Dunn	5	Lincoln	5	Richland	5	Winnebago	5
Eau Claire	5	Manitowoc	5	Rock	2	Wood	2

unit of five acres. Marinette County protects wetlands that are under the size of two acres that are shown on the Wisconsin Wetland Inventory map of 1989.² Just over one-quarter of the counties, nineteen of them, recognize and protect wetlands located outside of the shoreland district.

Three questions (10, 15, 16) address dimensions and/or standards. Over one-quarter of the counties enforce a building setback from wetlands. Ten percent of the counties within the general zoning ordinance include wetlands in the conditional use standards. Ten percent of the counties identify specific districts with conditional use standards that include wetland language. For example, Columbia County provides the following language as part

² NR 115 protects wetlands identified on Wisconsin Wetland Inventory (WWI) maps which have a minimum mapping unit of five acres. This means the WWI will only identify wetlands greater than five acres, however, some counties have a minimum mapping unit of two acres allowing them to identify wetlands larger than two acres.

Table 3: Language Strength in Ordinance for Applicable Questions

Question	Strong Language
Does the purpose statement explicitly include wetlands? (43.5%) If yes, what is the language strength?	93.1
Do conditional use standards under general zoning include wetlands? (10.1%) If yes, what is the language strength?	85.7
Do conditional use standards under specific districts include wetlands? (10.1%) If yes, what is the language strength?	62.5

Note: Percent is based on only counties who received a yes answer to the question.

Table 4: Wetland District Names, Excluding Shoreland Wetland Districts

County	Distict Name
Adams	Wetland Conservation Overlay District
Ashland	Wetland District
Barron	Wetland Conservancy
Burnett	Resource Conservation
Calumet	Wetland, Exclusive Agricultural Wetland, Natural Area
Dane	Inland-Wetland
Door	Wetland
Dunn	Conservancy
Florence	Natural Resource Preservation
Green Lake	Natural Resource Conservancy
Kenosha	Lowland Resource Conservancy
Langlade	Conservancy
Lincoln	Wetland Overlay
Marathon	Conservancy
Marinette	Conservancy
Marquette	Resource Protection District
Monroe	Wetland
Oconto	Conservancy
Ozaukee	Lowland Conservancy Overlay (County Owned)
Portage	Conservancy
Price	Conservancy
Richland	Conservancy
St Croix	Conservancy, Inland-Wetland Overlay
Trempealeau	Exclusive Agriculture, Exclusive Agriculture-2, Environmental Significance
Walworth	Lowland Resource Conservation
Washburn	Resource Conservation District
Waukesha	Conservancy
Waupaca	Resource Protection Overlay

of a conditional use standard: “A 35 foot wide vegetative buffer strip shall be provided and maintained between (a) a navigable waterway or wetland and (b) any area used for the keeping, feeding, or pasturing of farm animals.”³

Language: Another set of questions focused on the strength of the language. The underlying thought here is that if more definitive language is used, such as shall or must, enforcement is easier and perhaps less of a grey area than the use of less definitive language, such as encourage. For this set of questions, only the counties that had previously answered yes were assessed. Of the 43.5 percent of counties that included wetlands in their purpose statement, 90 percent used definitive language. Of the ten percent of counties that included conditional use standards under general zoning or in specific districts, 85.7 percent of the counties included strong language in general zoning and almost 2/3 used strong language in reference to specific districts. Words that were used include: protect, conserve, limit, and preserve.

Zoning Districts: While all of the counties include districts that recognize wetlands, about 60 percent of the counties have only one district that include wetlands and 40 percent have more than one district that protects wetlands. Table 4 shows the different names of the districts that protect wetlands throughout the state.

Setbacks: Most counties follow the state standard 75 foot building setback from the ordinary high water mark (OHWM). Menominee and Portage County extend the setback to 100 feet from the OHWM. Clark County has a 75 foot setback from the OHWM and also requires the building to be two feet higher in elevation than the OHWM. Table 5 shows the counties that enforce a setback from wetlands specifically and counties that enforce a vegetative buffer that is stricter than the Wisconsin state standard of 35 feet from the OHWM. Dane, Marquette and Outagamie counties enforce a wetland setback of 75 feet – the most of all the counties. Winnebago County enforces a wetland setback based on the type of residence. Fourteen counties enforce a vegetative buffer that is more restrictive than the state standard. St. Croix and Vilas County implement a 75 foot vegetative buffer from the OHWM.

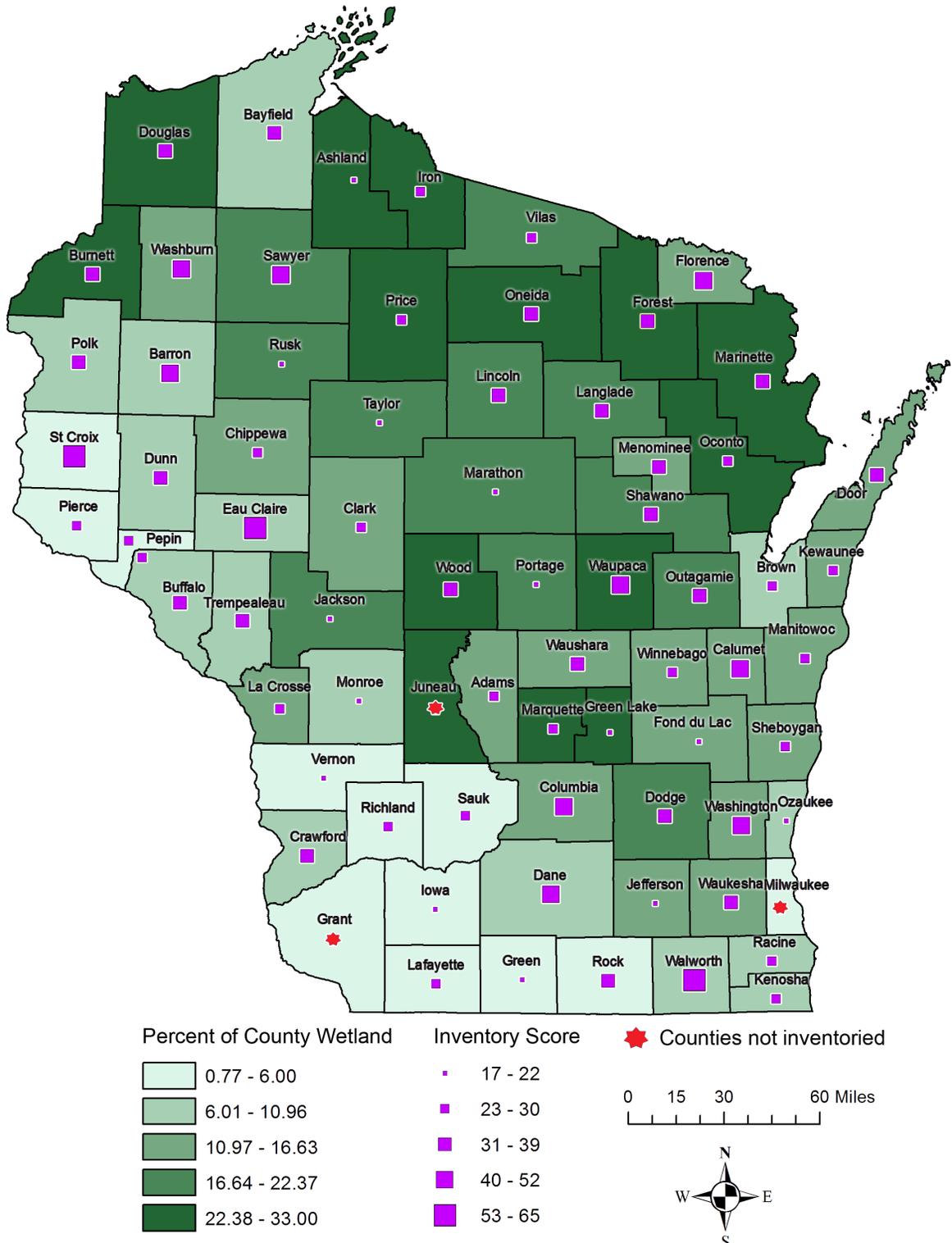
³ Columbia County Zoning Code. 2014. Title 16 Chapter 100. Columbia County Board of Supervisors. <http://www.co.columbia.wi.us/columbiacounty/Portals/3/New%20Ordinance/May2014Draft.pdf> Accessed May 8, 2015.

Table 5: Setbacks from Wetlands and Vegetative Buffer Length Requirements

<i>County</i>	<i>Setbacks from Edge of Wetlands Distance (ft)</i>	<i>Vegetative Buffer More Restrictive than 35 (ft) Distance (ft)</i>
Bayfield	25	OHWM setback minus 25
Burnett	40	OHWM setback minus 25, at least 35
Calumet	50	Half of shoreland setback
Dane	75	-
Door	35 or 10 depending on district	-
Florence	20	-
Kenosha	35	-
Langlade	25	OHWM setback minus 25
Marinette	-	50 from OWHM
Marquette	75	-
Outagamie	75	50 from OWHM
Polk	25	-
St Croix	50	75 from OWHM
Sawyer	40	-
Vilas	-	75 from OWHM
Washburn	25	OHWM setback minus 25
Washington	25	Based on Lake Classification
Waupaca	25	Shoreland setback minus 25, no less than 35
Waushara	50	Half of shoreland setback
Winnebago	30 - Single Family Residence 50 - Two or More Family Residence	Half of shoreland setback

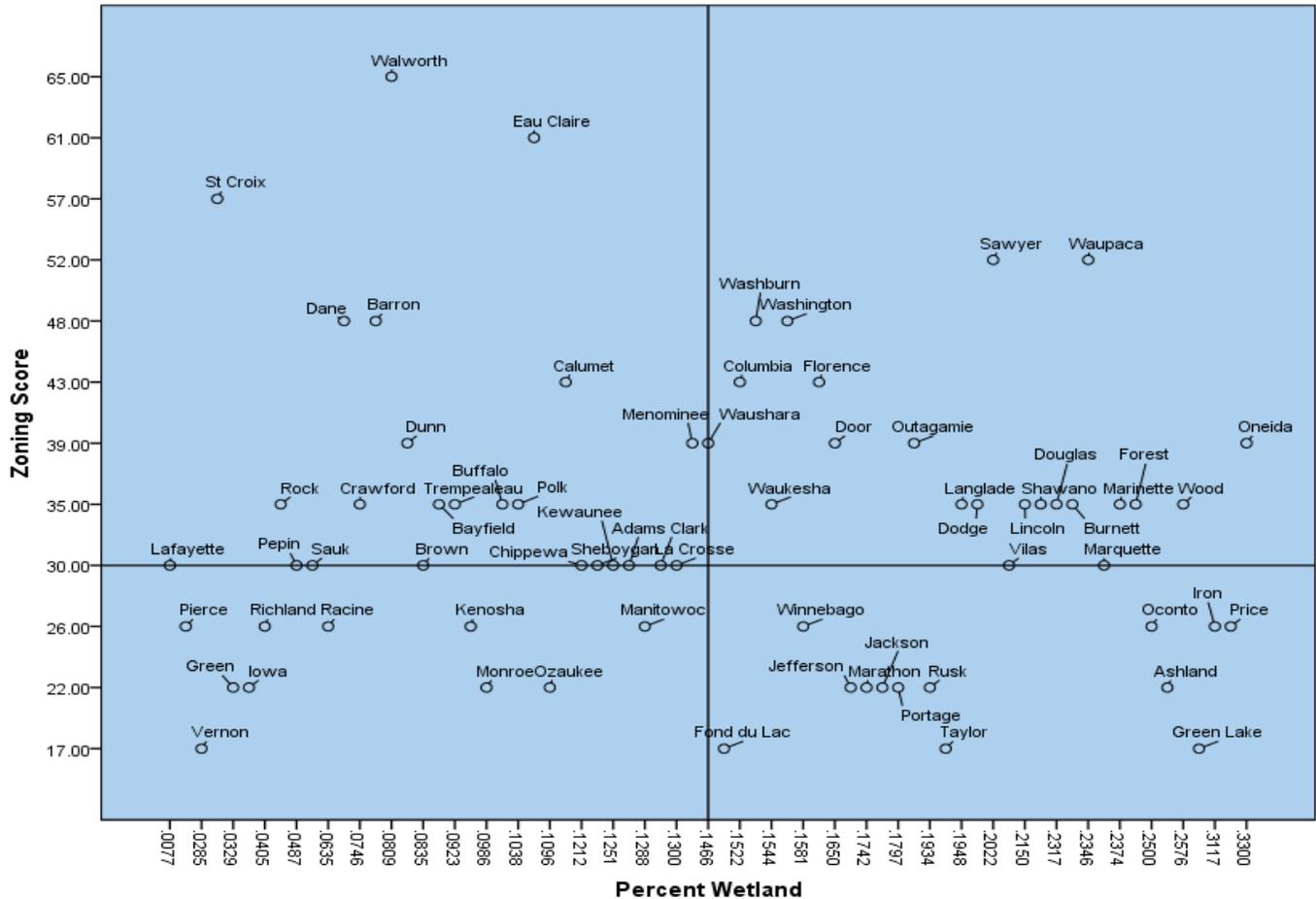
Score: The zoning ordinance inventory had a total possible score of 100. Total scores ranged from 17 to 65 with an average of 33. Total scores were compared with the county's percent of acres mapped as wetland. By comparing the total scores to the percent of the county mapped as wetland, counties with a high score and large amounts of wetlands could be identified. Figure 1 illustrates the county's zoning inventory score and the percent wetland of each county. A larger wetland symbol represents a higher score on the zoning ordinance inventory. The shades of green represent the percentage of wetlands within a county. Generally, there are less wetlands in southeastern Wisconsin and generally more wetlands in northwestern Wisconsin. Figure 2 displays the same information but in a scatterplot and shows each county's score and wetland percent and if it is above or below the median. St. Croix,

Figure 1: Zoning Ordinance Inventory Score Map



Walworth and Eau Claire scored the highest in the inventory and are below the median percent wetland. Waupaca and Oneida County scored above the median in the inventory and have a high percentage of wetlands in the county. Green Lake, Taylor and Fond du Lac County scored low on the inventory and above the median percent of wetland. Also, we wanted to see if the scores correlated with wetland acres. We found there was no correlation between the zoning ordinance scores and the percent wetland ($r= 0.0123$).

Figure 2: Scatterplot of County Wetland and Zoning Ordinance Inventory Score



Note: Vertical and Horizontal lines indicate the median values. Grant, Juneau and Milwaukee are included but do not have available zoning ordinances

3.2 Subdivision Ordinance

For this section, the questions used to evaluate subdivision ordinances are similar to the ones used for zoning (see Table 6). Four counties (Juneau, Milwaukee, Ozaukee, Vernon) were dropped from this analysis due to no electronic copy, no land to subdivide, or subdivisions occur at the town level. Like the analysis for zoning, we used four categories: general, protection/restoration, quality, and development standards to examine the results. Three questions (1, 2 and 3) are in the general category. Out of 68 counties in this analysis, 21 counties (30.8 percent) define the term wetland in their subdivision ordinance and 19 (90.5 percent) of those use the state wetland definition. Only 14.7 percent of the inventoried counties have a purpose statement that explicitly includes wetlands.

Three questions (4, 5 and 6) address the protection/restoration category. Only 1.5 percent of the counties include wetland protection goals, and 1.5 percent of the counties include goals that can indirectly achieve wetland protection or restoration. None of the counties include wetland restoration goals.

For the quality category, four questions (8, 9, 10 and 11) address various aspects of wetland quality. Forty-five counties (66.2 percent) require the location of a wetland to be identified prior to a land division while two counties (2.9 percent) require the size of a wetland to be identified prior to a land division. Forty-four percent

Table 6: Subdivision Ordinance Inventory Questions

Questions	Percent of Counties	
	Yes	No
1 Is the term wetland defined?	30.8	69.2
2 If yes, is the state definition used? *	90.5	9.5
3 Does the purpose statement explicitly include wetlands?	14.7	85.3
4 Does the ordinance explicitly include wetland protection goals?	1.5	98.5
5 Does the ordinance explicitly include wetland restoration goals?	0	100
6 Does the ordinance include goals that can indirectly achieve wetland protection or restoration?	1.5	98.5
7 Are wetlands explicitly mentioned as an unsuitable development and/or land division site?	10.3	89.7
8 Are wetland characteristics mentioned as unsuitable locations?	44.1	55.9
9 Are there requirements to identify the size of wetlands prior to the approval of a land division?	2.9	97.1
10 Are there requirements to identify the location of wetlands prior to the approval of a land division?	66.2	33.8
11 Are there requirements to identify the quality of wetlands prior to the approval of a land division?	0	100
12 Does the ordinance require developers to avoid wetlands in the design of land divisions and/or development?	14.7	85.3
13 Does the ordinance require developers to minimize wetland impacts in the design of land divisions and/or development?	14.7	85.3
14 Are there requirements to dedicate wetlands?	8.8	91.2
15 Are there requirements that landowners preserve wetlands?	11.7	88.3
16 Are there options for conservation or cluster subdivisions?	77.9	22.1

* percent is based on only counties who defined a wetland in the ordinance

mention wetland characteristics, such as hydric soils, as unsuitable locations for development or land division but do not explicitly mention wetlands. Only 10.3 percent of the counties explicitly mention wetlands as unsuitable for development or land division. None of the counties require the quality of a wetland to be identified prior to a land division.

Finally, questions 12 through 16 are in the development standards category. While over three-quarters of the counties (78 percent) allow for conservation or cluster subdivisions, only six counties (8.8 percent) require the dedication of wetlands. Only ten counties (14.7 percent) require developers to avoid wetlands in the design of land divisions or developments, and ten counties (14.7 percent) require developers to minimize wetland impacts in the design of land divisions or developments. Five counties overlap and do both. Eight counties (11.7 percent) require that landowners preserve wetlands.

Language: Table 7 indicates the language strength found within the subdivision ordinance for three of the inventory questions. Of the ten counties that explicitly included wetlands within the purpose statement, six of them (60 percent) used strong language while four of them used weak language. One-third of the counties that require wetlands to be dedicated, use strong language while 5 of the 8 counties that require landowners to preserve wetlands use strong language.

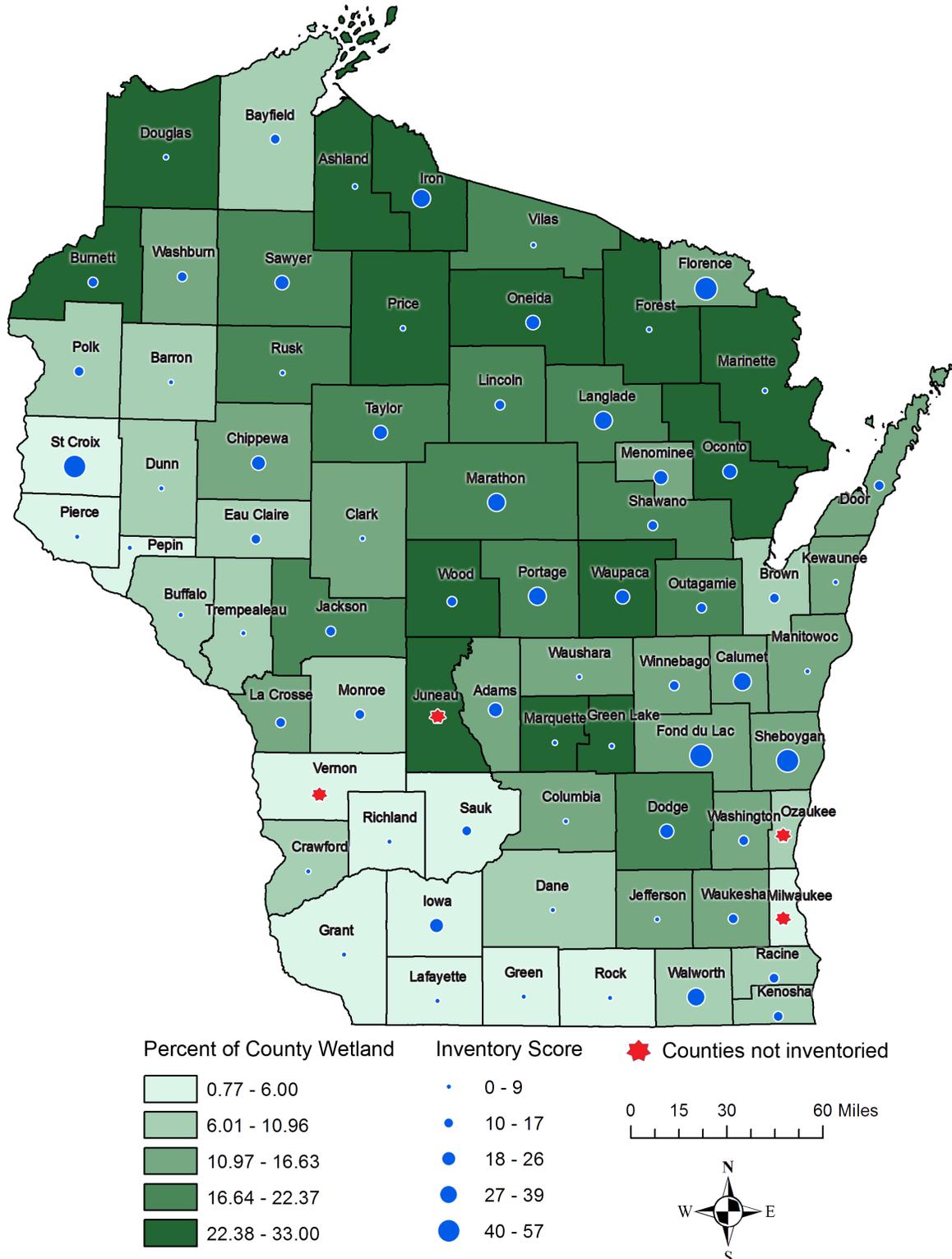
Score: The subdivision ordinance inventory had a total possible score of 100. Total scores ranged from zero to 57 with an average of 16. St. Croix was the highest scoring county with 57, followed by Florence, Fond du Lac and Sheboygan counties with a score of 40. Figure 3 illustrates the subdivision ordinance inventory scores and the percent of each county that is mapped wetland. It is interesting to note that the counties along the western border of

Table 7: Language Strength in Ordinance for Applicable Questions

Question	Strong Language
Does the purpose statement explicitly include wetlands? If yes, what is the language strength?	60
Are there requirements to dedicate wetlands? If yes, what is the language strength?	33.3
Are there requirements that landowners preserve wetlands? If yes, what is the language strength?	71.4

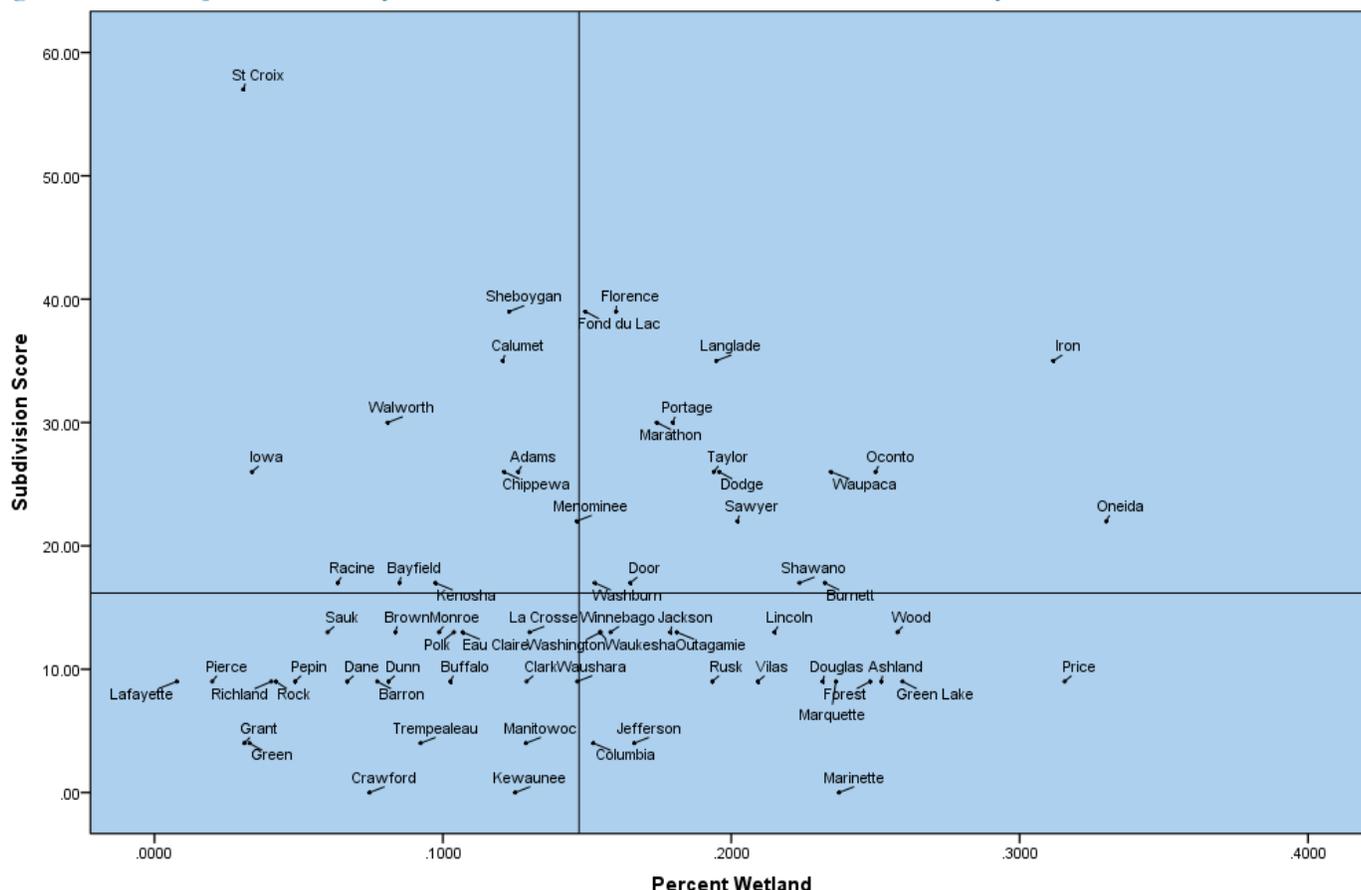
Note: Percent is based on only counties who received a yes answer to the question.

Figure 3: Subdivision Ordinance Inventory Score Map



Wisconsin and the counties in the southwestern corner generally scored low in the inventory. However, there was no correlation found between the subdivision ordinance score and the percent of each county mapped wetland ($r=0.11$). Figure 4 shows a scatterplot of each county's subdivision ordinance score along with percent wetland. St. Croix County scored the highest and has one of the lowest percentages of wetlands. Iron and Oneida County have a high percentage of wetlands and scored above the median in the inventory. Price County scored below the median in the

Figure 4: Scatterplot of County Wetland and Subdivision Ordinance Inventory Score



Note: Vertical and Horizontal lines indicate the median values. Juneau, Marinette, Milwaukee, Ozaukee, and Vernon counties are included but do not have available subdivision regulations.

inventory and has a high percentage of wetlands.

3.3 Comprehensive Plan

Twelve questions were used in this portion of the inventory. Again, we used four categories to analyze the inventory data, including: general, protection/restoration, quality and action. Three counties (Clark, Milwaukee, and Price) were dropped from this analysis due to no comprehensive plan. Three questions (1, 2 and 3) are in the general category. Out of 69 counties in this analysis, about half of the counties, (54.4 percent) define a wetland and over two-thirds of those counties use the state definition of a wetland. Sixty-one counties (89.7 percent) discuss the importance of wetlands within the plan.

Two questions (4, and 9) address protection/restoration with about half of the counties (54.4 percent) explicitly including wetland protection goals and 38 counties (55.8 percent) explicitly including wetland protection objectives. Only 24 counties (35.3 percent) identified wetland priority areas for preservation. Questions 7 and 8 address quality of wetlands. Almost 80 percent of the plans include a map that identifies the location of wetlands while only about one-third recognize different types of wetlands.

The last category addresses action with four questions (6, 10, 11, and 12). Forty-seven counties (70.5 percent) include wetland policies or programs within the plan. While only 14.7 percent of counties identified partnership opportunities other than regulatory agencies within their plan, 41.2 percent of them identify specific funding sources.

Table 8: Comprehensive Plan Inventory Questions and Results

Questions	Percent of Counties	
	Yes	No
1 Is the term wetland defined?	54.4	45.6
2 If yes, is the state definition used? *	67.6	32.4
3 Is the importance of wetlands discussed within the Plan?	89.7	10.3
4 Does the Plan explicitly include wetland protection goals?	54.4	45.6
5 Does the Plan explicitly include wetland protection objectives?	55.8	44.2
6 Does the Plan include wetland Policy or Programs?	70.5	29.5
7 Does the Plan include a map identifying the location of wetlands within the county?	79.4	20.6
8 Does the plan recognize different types of wetlands?	35.3	64.7
9 Does the Plan identify wetland priority areas for preservation?	35.3	64.7
10 Does the Plan identify specific funding sources?	41.2	58.8
11 Does the Plan identify partnership opportunities other than regulatory agencies?	14.7	85.3
12 Does the plan include implementation actions for wetland activities?	25	75

* percent is based on only counties who defined a wetland in the ordinance

One-quarter include implementation actions for wetland activities within their plan.

Language: Table 9 identifies the language strength for three inventory questions. Of the 54 percent of the counties that had wetland protection goals, 81 percent of them used strong language. In terms of wetland protection objectives, of the 56 percent that had objectives, 40 percent used strong language. In terms of actions related to policies or programs, of the 70 percent of counties that included policies, less than half of them (45.8 percent) used strong language

Wetland Types: Table 10 shows twenty-five counties that identified types of wetlands in their comprehensive plans. Counties recognized from three to 14 different types of wetlands. Some counties only recognize one type of wetland, for example, coastal wetlands in Ashland and isolated wetlands in Marinette. Examples of the types of wetlands identified include emergent wet meadows, marshes, potholes, bogs, shrub-carr, southern sedge meadow, aquatic bed, flat, filled/drained, lowland scrub and woodlands.

Wetland Functions: Table 11 shows the percent of counties that included wetland functions. We specifically looked for three types of functions: ecosystem services, habitat, and biodiversity. Nine counties (14.8 percent) included all three functions. Forty-two counties (68.8 percent) included two of the three functions. Ten counties (16.4 percent) identified only one function. Other functions identified included scenic open areas, recreational opportunities, educational opportunities, natural buffers for shorelines and stabilization of stream banks.

Score: The comprehensive plan inventory had a total possible score of 100. Scores ranged from five to 90 with an average of 48. Ozaukee County scored the highest with 90, followed by Dodge County with 85 and Burnett County with 81. Figure 5 shows the final comprehensive plan inventory scores and percent wetland. Unlike the previous figures, the counties on the western border of the state and the southwestern corner of the state generally do not have low scores. There was no correlation found between the comprehensive plan inventory score and the percent

Table 9: Language Strength in Ordinance for Applicable Questions

Question	Strong Language
Does the Plan explicitly include wetland protection goals? If yes, what is the language strength?	81
Does the Plan explicitly include wetland protection objectives? If yes, what is the language strength?	39.5
Does the Plan include wetland Policy or Programs? If yes, what it the language strength?	45.8

Note: Percent is based on only counties who received a yes answer to the question.

Table 10: Types of Wetlands Recognized in the Comprehensive Plans

County	Number Recognized	Types of Wetlands
Adams	6	emergent wet meadows, marshes, potholes, bogs, sloughs, swamps
Ashland	1	Coastal wetlands
Burnett	3	emergent/wet to shrub to deciduous to coniferous forested
Douglas	3	forested, emergent, lowland shrub
Dunn	5	Marshes, sedge, wet meadows, shrub/scrub, forested
Florence	3	forested, shrub, emergent
Forest	2	forest, shrub
Grant	6	marshes, swamps, fens, bogs, Shrub-Carr, Southern Sedge Meadow
Green Lake	4	swamps, marshes, bogs, sedge meadows
Iron	5	Aquatic bed, marshes, sedge or wet meadow, scrub/shrub, forested
Juneau	3	forested, emergent, lowland shrub
Lincoln	4	forested, lowland shrub, bogs, swamps
Manitowoc	14	Open bog, emergent marsh, hardwood swamp, hard bog, soft bog, floodplain forest, clay seepage bluff, interdunal wetland, northern wet forest, northern sedge meadow, southern sedge meadow, lake, northern wet-mesic forest, Great Lakes ridge and swale
Marathon	5	Aquatic bed, marshes, sedge or wet meadow, scrub/shrub, forested
Marinette	2	Shoreland/coastal only
Oconto	4	upland, lowland woodlands, coastal
Outagamie	5	On map: emergent/wet meadow, forested, scrub/shrub, open water, filled/draind
Ozaukee	1	isolated wetlands
Portage	3	forested, scrub, emergent/wet meadow
Sawyer	6	aquatic bed, emergent, filled/draind, flats, forested, scrub
Taylor	3	emergent, shrub, forest
Trempealeau	8	aquatic beds, emergent/wet meadow, scrub/shrub, forested, bogs, swamps, marsh
Vilas	3	emergent/wet meadow, scrub, forested
Washburn	8	mixed deciduous/coniferous, coniferous, broad-leaved deciduous, lowland shrub-needle leaved, broad-leaved evergreen, broad-leaved deciduous, lowland shrub, emergent/wet meadow
Winnebago	3	emergent, scrub-shrub, forested

Table 11: Number of Wetland Functions Identified in the Plan

Number of functions identified including ecosystem services, habitat and biodiversity	Percent of Counties
3	14.8
2	68.8
1	16.4

Other types of functions identified, recreation, opens space, aesthetics, shoreline erosion, stabilize stream banks, research, education

Figure 5: Comprehensive Plan Inventory Score Map

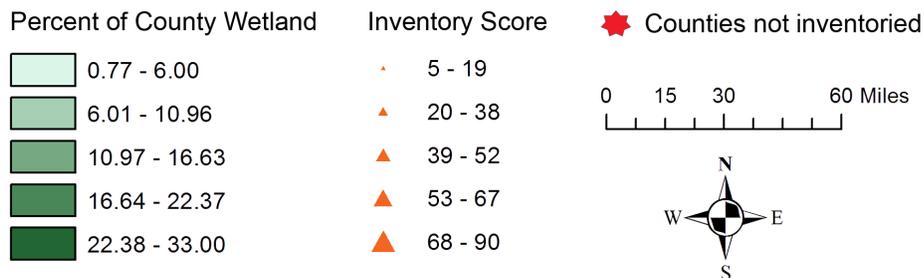
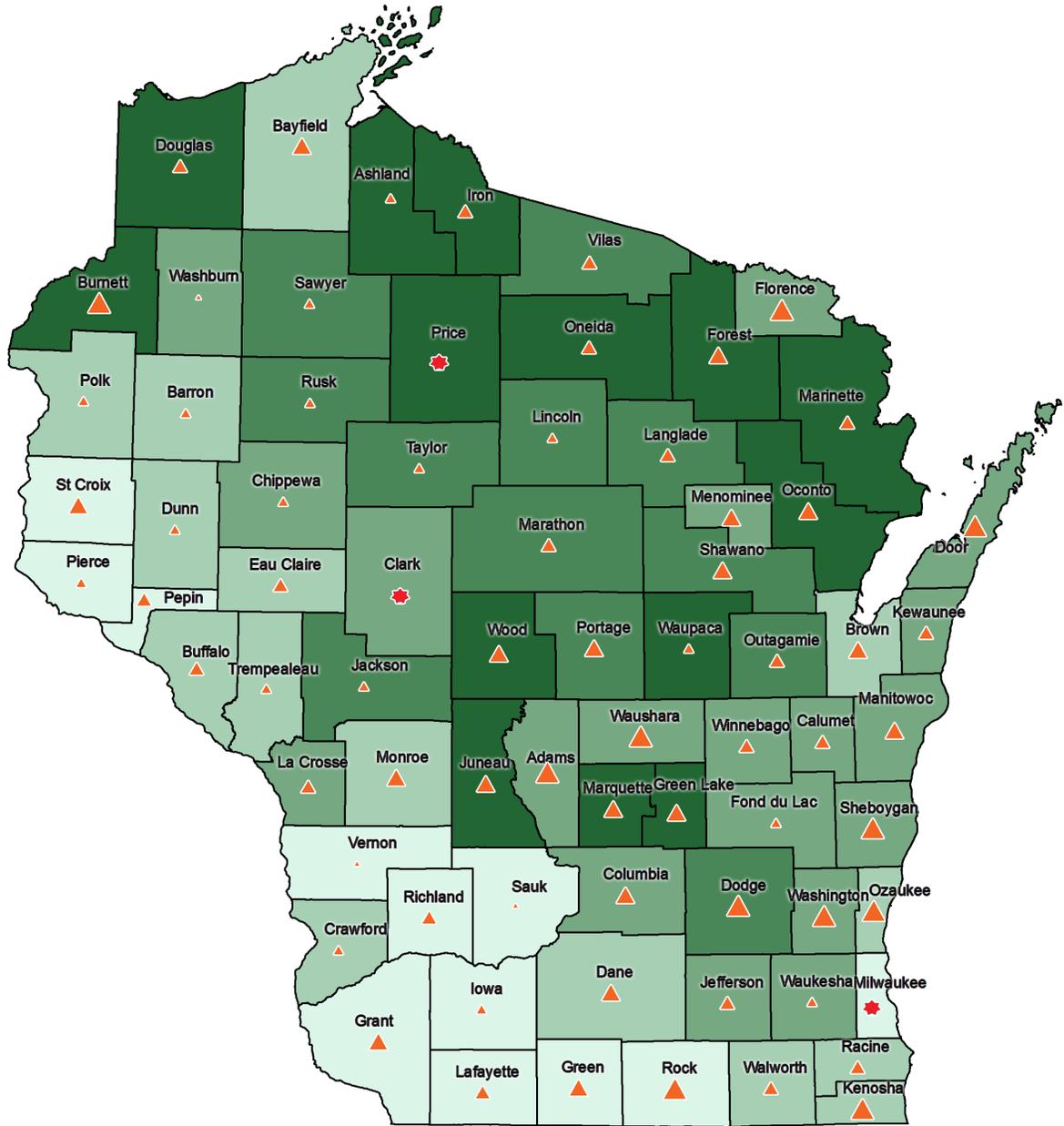
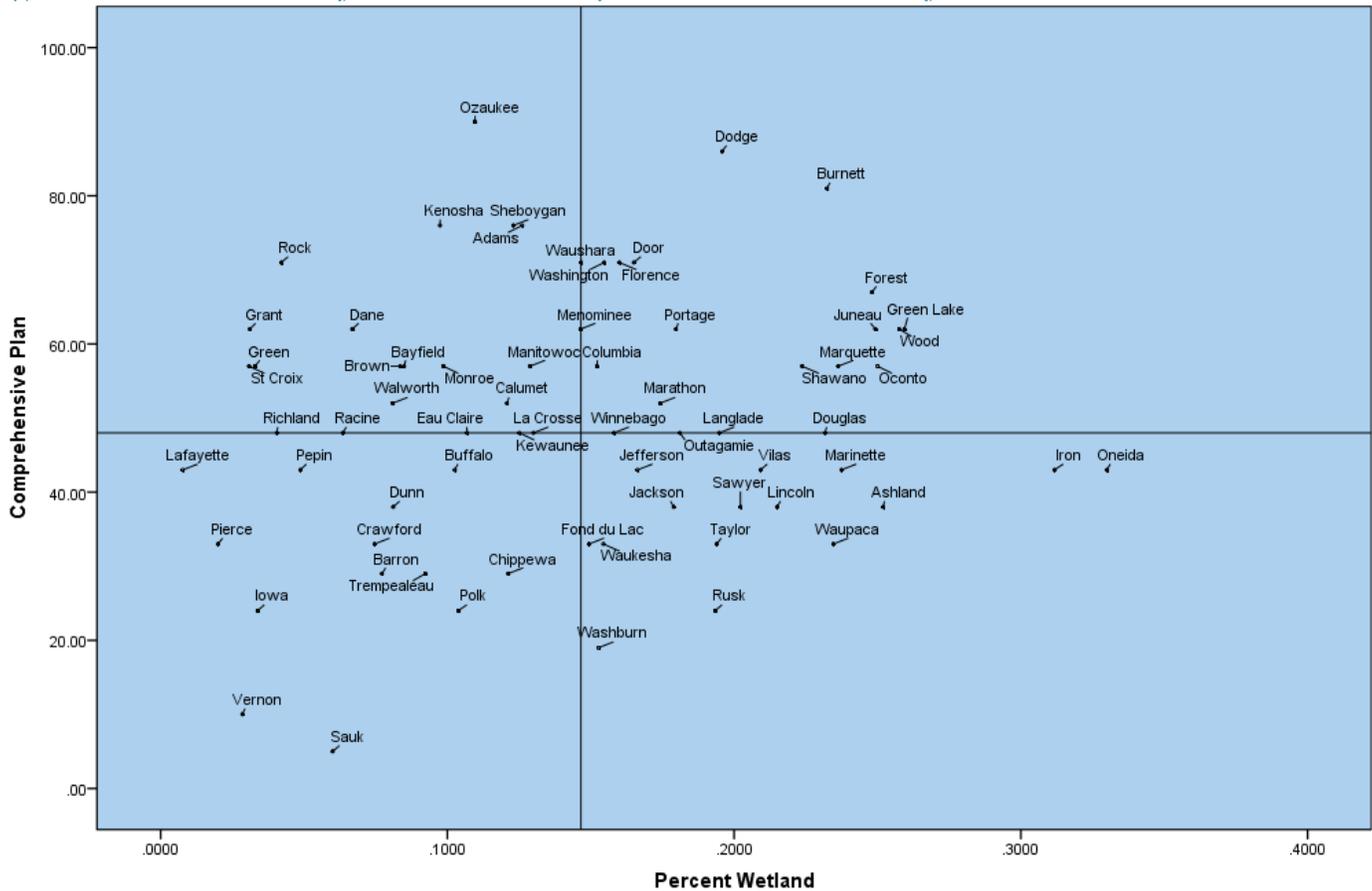


Figure 6: Percent of County Wetland and Comprehensive Plan Inventory Score



Note: Vertical and Horizontal lines indicate the median values. Juneau, Marinette, Milwaukee, Ozaukee, and Vernon counties are included but do not have available subdivision regulations.

wetland (r=0.100).

Figure 6 shows a scatterplot of score and wetlands by county. Unlike the other scatterplots, the median score is higher. Dodge and Burnett counties scored high in the inventory and placed in the upper quartile of percent wetland. Iron and Oneida counties placed below the median in the inventory and have the highest percent of wetlands in the state.

3.4 Combined Score:

Combined scores ranged from four to 170 and had an average of 94. St. Croix County scored the highest with a total of 170, followed by Florence County (154), Dodge County (147), and Sheboygan County (146). Figure 7 (page 17) represents the score along with percent wetland.⁴ The combined scores and percent of each county wetland were examined for a correlation. There was no correlation between these two variables (r = 0.11).

3.5 Regional Planning Commission

Throughout Wisconsin there are nine Regional Planning Commissions (RPC). Counties were divided into their respective RPC for further analysis. Since Sauk, Columbia, Dodge, Jefferson and Rock County are not part of an RPC, they were combined with Dane County to make up the Capital Area RPC.

Figures 8, 9 and 10 illustrate average inventory

Table 12: Correlation Values for Average Regional Planning Commission Scores

	Average Zoning Score	Average Subdivision Score	Average Comprehensive Plan Score
Percent Wetland	0.12	0.64	0.26

⁴ Note that Grant and Juneau were not part of the zoning inventory; Juneau, Ozaukee, and Vernon were not part of the subdivision inventory; Clark and Price were not part of the comprehensive plan inventory. Milwaukee was the only county not included in any of the inventories.

scores for each RPC.

Table 12 illustrates the correlation values for scores and percent wetland within an RPC. There was a low correlation for zoning and comprehensive plan. This low correlation means there is little relationship between the score and the percent wetland. In contrast, the correlation for the subdivision score and percent wetland ($r = 0.64$) shows sign of a positive relationship – the higher the percent of wetlands in an RPC, the higher the subdivision score.

3.6 County Type

Each inventory was examined to identify the counties that appeared in the same quadrant or type over all three inventories. Four types were identified: Type 1 – high inventory score and low percent wetland, Type 2 – high inventory score and high percent wetland, Type 3 – low inventory score and high percent wetland, and Type 4 – low inventory score and low percent wetland.

Type 1 and Type 2 have strong ordinances and plans in place to protect wetlands. These counties are leading the state in wetland protection. Type 3 consistently placed below the median score on the inventories. These counties have a high percent of wetlands and have poor wetland protection through these three county tools. Type 4 counties have consistently low scores and have a low percentage of wetlands.

Figure 11: Types of Counties

<i>Type 1: High Inventory Score and Low Percent Wetland</i>	<i>Type 2: High Inventory Score and High Percent Wetland</i>
Bayfield	Burnett
Calumet	Door
Eau Claire	Florence
Sheboygan	Shawano
St. Croix	Washington
Walworth	Wood
<i>Type 4: Low Inventory Score and Low Percent Wetland</i>	<i>Type 3: Low Inventory Score and High Percent Wetland</i>
Pierce	Ashland
Richland	Jackson
Vernon	Jefferson
	Rusk

Figure 7: Combined Scores Map

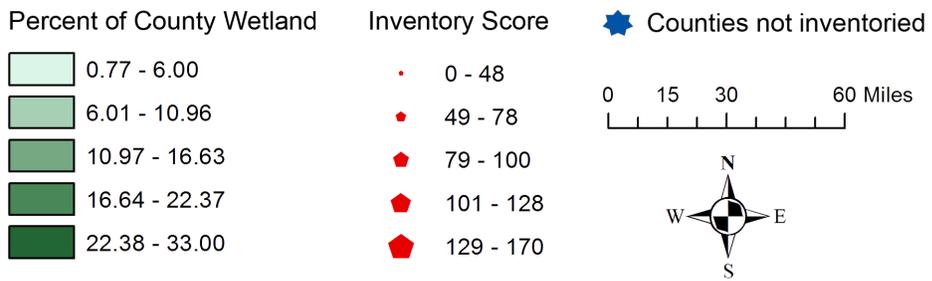
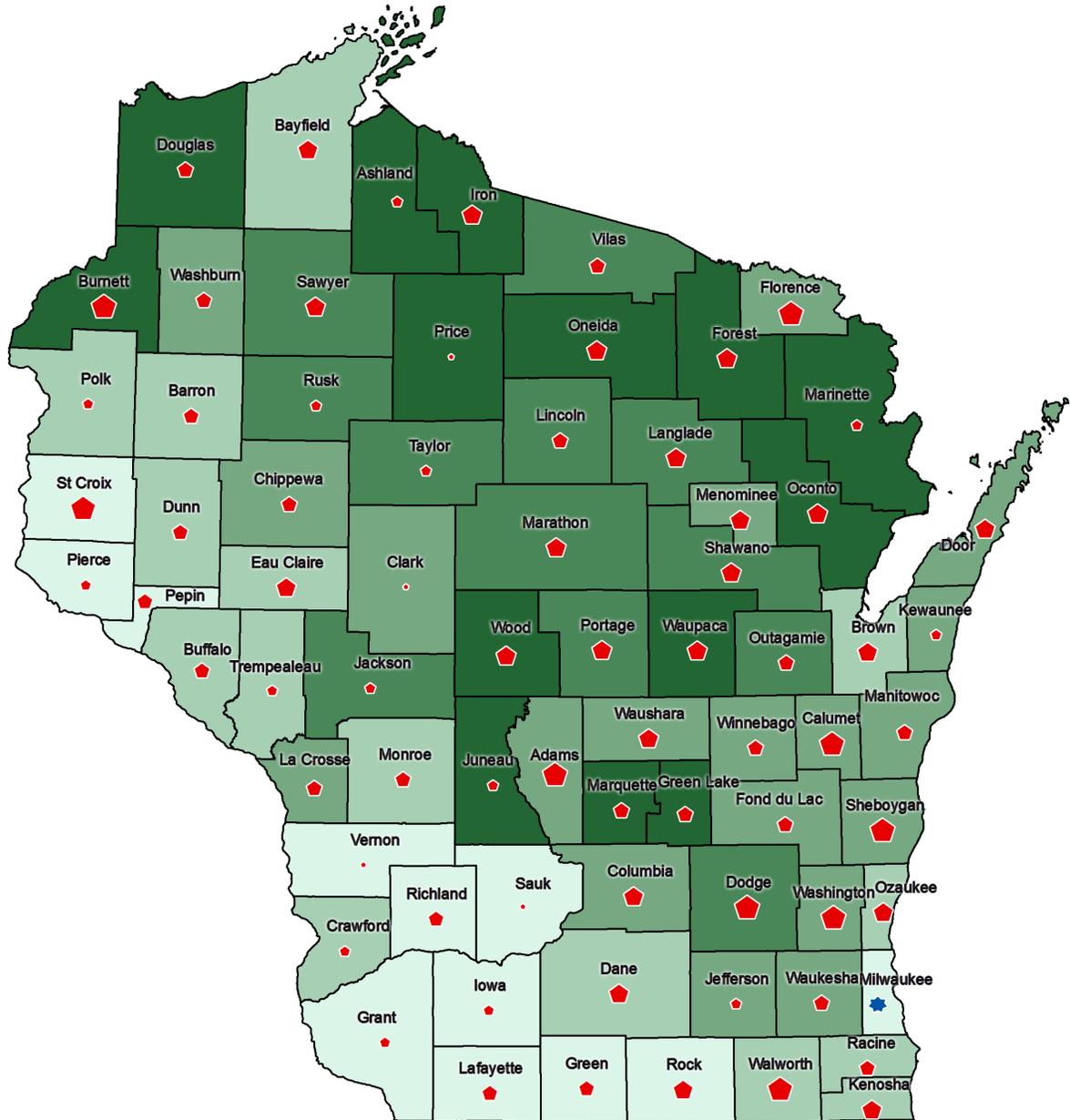


Figure 8: Zoning Score by Regional Planning Commission

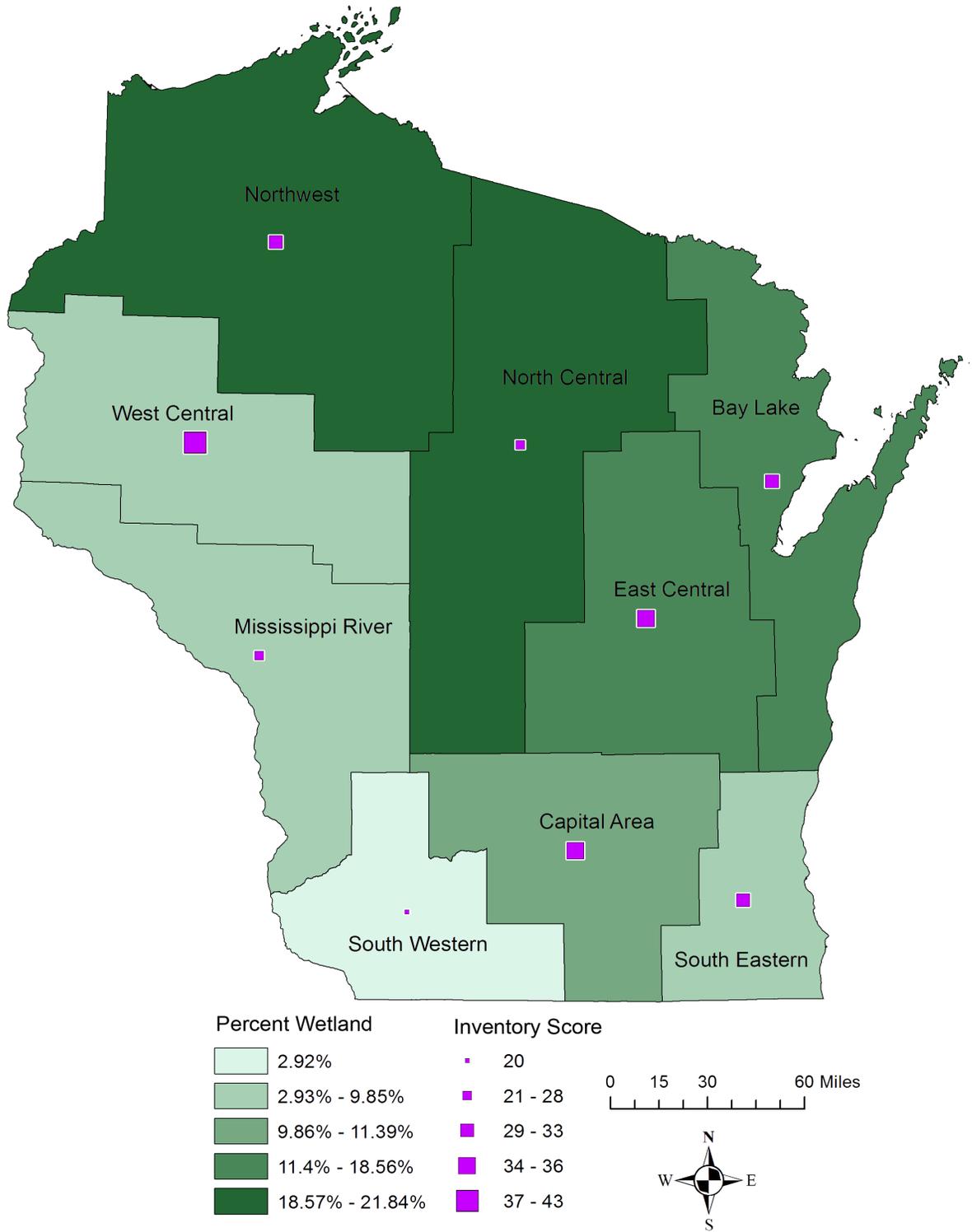


Figure 9: Subdivision Score by Regional Planning Commission

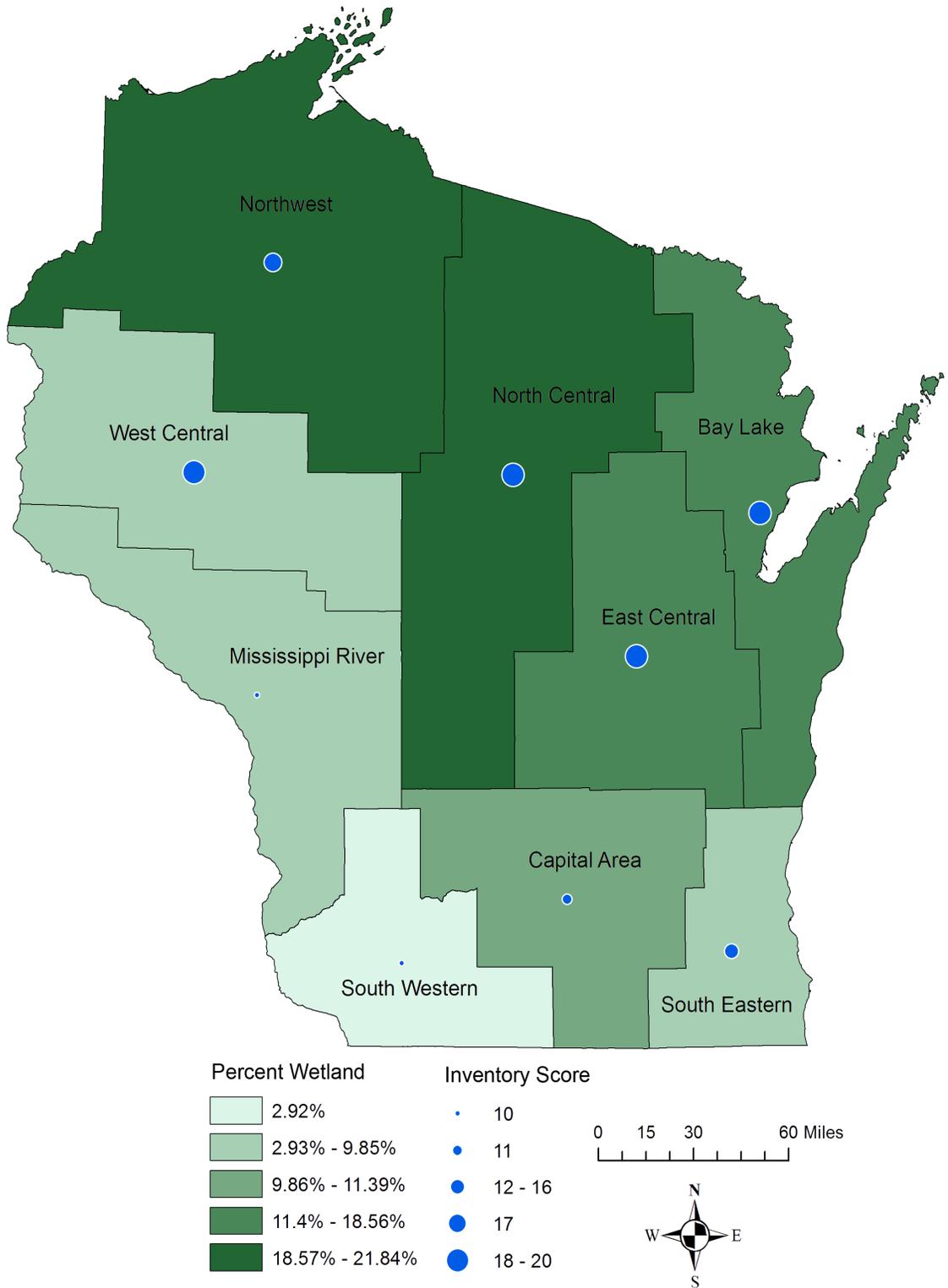
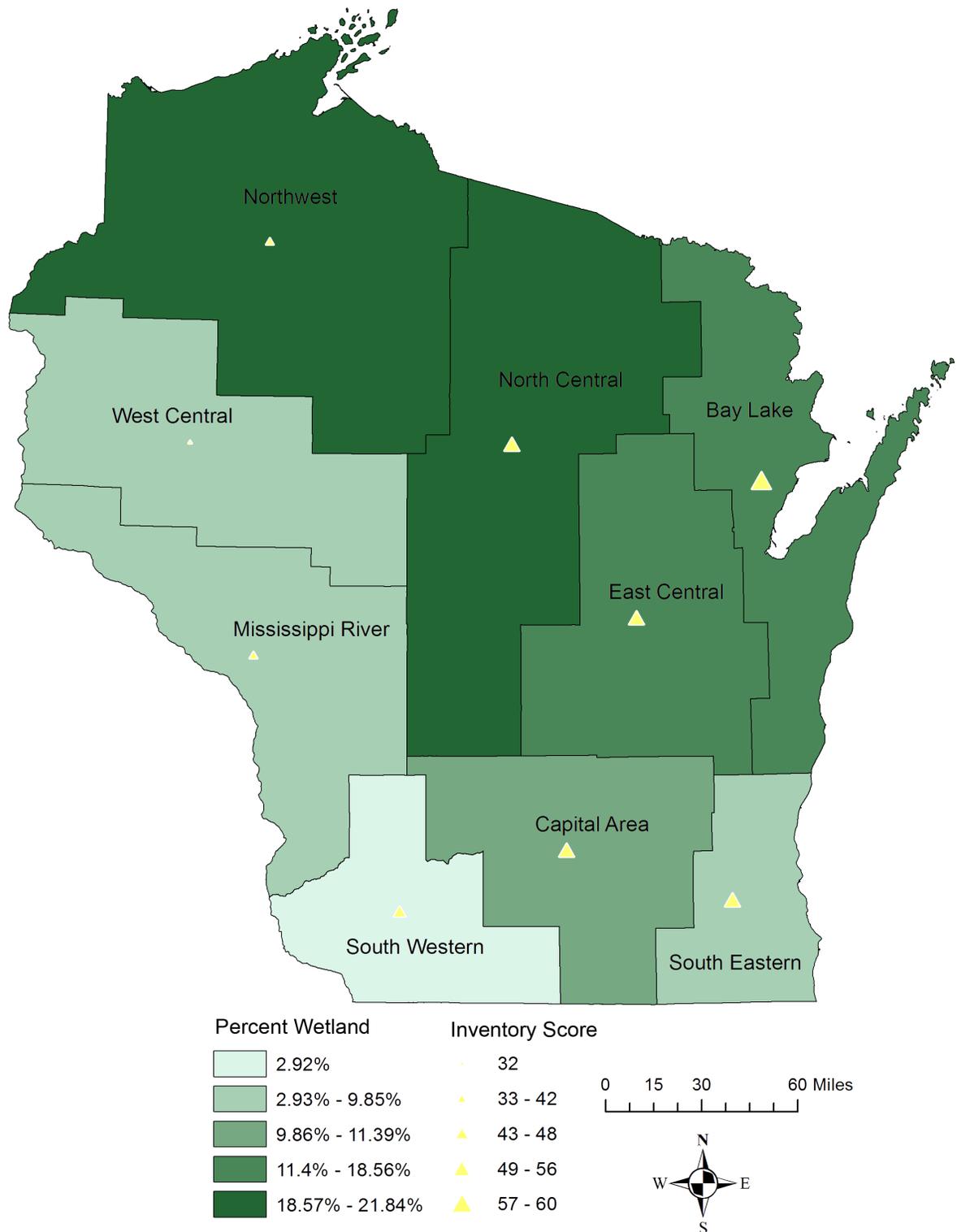


Figure 10: Comprehensive Plan Score by Regional Planning Commission



4. Discussion, Conclusions and Recommendations

The results of this inventory show the diversity of local wetland governance throughout Wisconsin. Through these three common types of local tools, zoning ordinances, subdivision ordinances and comprehensive plans, we found plenty of variation across the counties for wetland protection. This inventory allows for the differences in each document to be highlighted and allows for the identification of specific counties which enact stricter regulation over wetlands. It is important to recognize the county's percent wetland when interpreting the county's inventory scores.

- Allow for local variation in local ordinances and plans

Each county adopts ordinances and plans and no two counties enact the same regulations. This variation reflects local culture, politics, and perhaps importance of wetlands to the county's economy and natural resource base. County zoning ordinances differ widely on how wetlands are regulated. Some counties enact stricter regulations than the DNR's minimum regulations.

- Identify types of wetlands in the county using DNR's identified types within Wisconsin:
<http://dnr.wi.gov/topic/EndangeredResources/Communities.asp?mode=group&Type=Wetland>

Major differences occurred in the types of wetlands the ordinance protects. Some counties only protect wetlands within the DNR specified shoreland district, while other counties chose to protect many types and sizes of wetlands. In examining the types of wetlands identified, there was no consistency.

- Include wetland language as Columbia County has done (page 4) as a part of conditional use standards.

Conditional use standards are important aspects of zoning ordinances. The plan commission or zoning committee can use these standards to help understand whether or not a particular land use in a particular location is appropriate.

- Strengthen the language within subdivision ordinances to protect wetlands. For example, by including language about identifying the size, location and quality of wetlands prior to approval of a major land division in particular.

The subdivision ordinance inventory average score (17) was much lower than the zoning inventory average score (33). St. Croix County has a high score in the inventory. Four counties (Fond du Lac, Florence, Langlade and Iron counties) scored high in the inventory and have a high percent of wetlands. Jefferson and Columbia counties scored low in the inventory and fell above the median percent of wetland.

- Define and identify types and locations of wetlands on maps and in text. Include wetland protection goals, objectives and policies within the Comprehensive Plan.

Comprehensive plans scored an average of 48 which was much higher than the average score for subdivision ordinances (17) and higher than the average zoning ordinance score (33). Instead of controlling the current conditions in a county, comprehensive plans represent a future picture for the county and identify the pathways and goals for the county in 15 to 20 years. So, the plans set the stage. However, plans can be meaningless if not implemented through zoning, subdivision ordinances, or other tools. Local officials must prioritize and have political will to strengthen ordinances following plan adoption. Examining comprehensive plans, as in this study, can help to identify the future status of wetlands by county. A higher average score for comprehensive plans can indicate that counties are accounting for the future of wetlands. It is interesting to note that almost 90 percent of the counties discuss the importance of wetlands for the community and for the county. Plans discussed a wide range of important functions that wetlands perform for the community, county and state. Although the average score is higher than the other two inventories, there is still room for improvement for planning of wetlands in comprehensive plans.

It is important to note that individual counties may be enforcing additional regulations than this inventory identified and examined. This inventory was based solely on the language found in each ordinance or plan. There is a need for more research to seek any other regulations that may protect wetlands and how those regulations affect wetland

governance. For example, stormwater regulations are a tool that some counties may use to address wetland protection.

It is interesting that some counties despite a low percentage of wetlands are working hard to protect them, while others with a high percentage of wetlands don't reflect wetland protection through the three regulatory and planning tools. One additional avenue of research includes: to understand why counties with a low percent of wetlands have stronger wetland protection in place than other counties. Likewise, what is happening in counties with a lot of wetlands and low scores?

Appendix

Table 1: Total Scores by County

County	Zoning	Subdivision	Comprehensive Plan	Combined Score	Percent Wetland
Adams	30	26	76	133	12.61
Ashland	22	9	38	69	25.20
Barron	48	9	29	85	7.72
Bayfield	35	17	57	109	8.49
Brown	30	13	57	101	8.35
Buffalo	35	9	43	86	10.26
Burnett	35	17	81	129	23.24
Calument	43	35	52	131	12.08
Chippewa	30	26	29	85	12.12
Clark	30	9		39	12.90
Columbia	43	4	57	96	15.22
Crawford	35	0	33	68	7.46
Dane	48	9	62	118	6.38
Dodge	35	26	86	147	19.58
Door	39	17	71	128	16.50
Douglas	35	9	48	100	23.17
Dunn	39	9	38	86	8.11
Eau Claire	61	13	48	122	10.69
Florence	43	39	71	154	16.00
Fond du Lac	17	39	33	90	14.94
Forest	35	9	67	106	24.81
Grant		4	62	66	3.11
Green	22	4	57	83	3.29
Green Lake	17	9	62	88	25.94
Iowa	22	26	24	72	3.38
Iron	26	35	43	99	31.17
Jackson	22	13	38	73	17.89
Jefferson	22	4	43	69	16.63
Juneau			62	62	24.93
Kenosha	26	17	76	120	9.74
Kewaunee	30	0	48	78	12.51
La Crosse	30	13	48	91	13.00
Lafayette	30	9	43	82	0.77
Langlade	35	35	48	117	19.48
Lincoln	35	13	38	86	21.50
Manitowoc	26	4	57	88	12.88
Marathon	22	30	52	105	17.42
Marinette	35	0	43	78	23.74
Marquette	30	9	57	96	23.63

Menominee	39	22	62	118	14.64
Milwaukee					2.89
Monroe	22	13	57	92	9.86
Oconto	26	26	57	109	25.00
Oneida	39	22	43	104	33.00
Outagamie	39	13	48	100	18.11
Ozaukee	22		90	112	10.96
Pepin	30	9	43	82	4.87
Pierce	26	9	33	68	2.00
Polk	35	13	24	67	10.38
Portage	22	30	62	114	17.97
Price	26	9		35	31.56
Racine	26	17	48	91	6.35
Richland	26	9	48	82	4.05
Rock	35	9	71	115	4.21
Rusk	22	9	24	54	19.34
St. Croix	57	57	57	170	3.08
Sauk	30	13	5	48	6.00
Sawyer	52	22	38	103	20.22
Shawano	35	17	57	109	22.37
Sheboygan	30	39	76	146	12.30
Taylor	17	26	33	77	19.39
Trempealeau	35	4	29	68	9.23
Vernon	17		10	27	2.85
Vilas	30	9	43	82	20.92
Walworth	65	30	52	139	8.09
Washburn	48	17	19	80	15.27
Washington	48	13	71	132	15.47
Waukesha	35	13	33	68	15.44
Waupaca	52	26	33	112	23.46
Waushara	39	9	71	119	14.66
Winnebago	26	13	48	87	15.81
Wood	35	13	62	110	25.76

Note: A blank space indicates that the county was not inventoried

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