

# USING CONTENT ANALYSIS TO EXAMINE PRESENCE OF ECOSYSTEM SERVICES IN LOCAL PLANS



Photos: MDNR

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# ABSTRACT

Identifying and achieving landscape-scale conservation goals is a challenge without considering the role of local units of government. Local planning processes and plans signal the intent of local governments, and the inclusion of ecosystem services (ESs) that are traditional and broadly inclusive of recreation and culture are important for landscape-scale conservation and governance. Understanding how local community plans incorporate ESs can inform opportunities for state wildlife agencies and communities to work together to achieve conservation goals in new ways. For this study, we collected and reviewed community plans (n = 71) from within three Michigan regions: Saginaw Bay, Lake St. Clair, and Lake Erie. We sought to: (1) identify the extent of ESs content in the community documents; (2) explore how local communities incorporated natural resources, specifically wildlife management areas (WMAs), into their community documents; and (3) explore the relationship between community characteristics and local plan content. Though we detected some differences, most of the community plans included themes related to ESs concepts. Insights from this work suggest novel ways state wildlife agencies and communities can collaborate for landscape-scale conservation and governance through local planning and zoning processes.

Wildlife managers are increasingly interested in landscape-scale approaches, but face obstacles related to transboundary wildlife, local management actions, stakeholder participation, and private lands (Doyle-Capitman, et al. 2018). Local community planning and zoning has the potential to be a systems partner in landscape-scale wildlife conservation, like the systems thinking of conservation biology and landscape planning (Nassauer 2006).

State wildlife agencies (SWAs) have increasingly invested in staff who are wildlife planners for the purpose of supporting wildlife conservation. However, most local communities have limited staff expertise in wildlife or natural resources. Partnerships and collaborations between local communities and SWAs might be beneficial since local communities via planning documents and associated zoning decisions potentially have significant impacts on landscape-scale conservation goals. Conversely, desirable wildlife and natural resources may have positive ES benefits – culturally, economically, or socially – to communities. Our research examines the extent of how local communities include ESs, a broad reference to wildlife and natural resources, in their community documents as a signal of their policy interest in wildlife conservation and how it may be related to other community characteristics. The results from this research describe the status of how ESs, wildlife, and WMAs are incorporated into local community plans, yield insights into the potential for local planning to be an important partner in wildlife conservation, and how SWAs might effectively and efficiently develop or enhance partnerships.

## Ecosystem Services

ESs are benefits provided by the natural environment along a variety of dimensions, such as provisioning services, regulating services, habitat or supporting services, or cultural services and are often generated from undeveloped, or lightly developed land, like community parks, wetlands, and woodlands (Hansen et al. 2015). Historically, communities have included groundwater recharge, flood abatement, pollution mitigation, or recreation in their planning documents, which resulted in their increased acceptance and support ESs (Michigan Planning Enabling Act 2008; Adams et al. 2014; Annis et al. 2017). More recently, in urban communities, inclusion of ESs in community plans contributes to educating and engaging citizens in environmental stewardship (Rall et al. 2015; Cortinovis and Geneletti 2018), communicating environmental goals (Wilkinson et al. 2013; Rall et al. 2015), assessing impacts of planning decisions (Rall et al. 2015; Cortinovis and Geneletti 2018), assisting with mitigation of environmental impacts (Hansen et al. 2015); and improving urban resilience (Hansen et al. 2015). Previous research has examined the following ESs: habitat/biodiversity (Hansen et al. 2015; Nordin et al. 2017; Nilon et al. 2017); recreation (Wilkinson et al. 2013; Rall et al. 2015; Nordin et al. 2017; Cortinovis and Geneletti 2018); health (Nordin et al. 2017; Nilon et al. 2017); cultural (Hansen et al. 2015; Nilon et al. 2017); ecological regulatory services (Rall et al. 2015; Nilon et al. 2017; Cortinovis and Geneletti 2018); and aesthetic (Wilkinson et al. 2013; Rall et al. 2015).

# LOCAL PLANNING AND ZONING

In the United States, planning refers to a local master or comprehensive plan that is not legally enforceable (Norton 2008). When the master plan informs the legally enforceable land development management program, it becomes an integral element for guiding communities (Norton 2008). Increasingly, access to public funds to support development (e.g., Michigan Natural Resources Trust Fund) requires up-to-date master plans.

Michigan has 1,859 general purpose units of government, which include 262 villages and 273 cities, nested within 83 counties (Norton 2008). Michigan also has 1,241 townships, which are an additional unit of government between the city or village and the counties, and act with the planning and zoning functions conducted by counties in other states (Norton 2008). The Michigan Planning Enabling Act, Act 33 (2008), codified the master planning process for government bodies in Michigan. It requires communities to develop a master plan which is a comprehensive document that establishes the vision for the community's future, sets goals and objectives, and identifies the needs of the community. Master plans are the long-term framework for how a community will develop over the coming decades. They are the product of community planning commissions along with input from community members about their thoughts and priorities amalgamated into a coherent vision. The planning commission implements the plan, and is tasked with periodically updating it. Act 33 also directs community master plans to establish a Capital Improvements Program (CIP), which is a plan to direct future development within the community based on the annual budget, and requires community master plans to be updated every 5-6 years, and CIP to be reviewed annually with the budget (Michigan Planning Enabling Act 2008).

A zoning ordinance is the legal document that guides future development in a community based on the master plan. According to the Michigan Zoning Enabling Act, 110 of 2006, zoning ordinances should protect natural resources, the health, safety, and welfare of community members, as well as the social and economic well-being of the community as a whole. The zoning ordinance states what land uses (e.g. residential, commercial, recreation, etc.) are allowed in specific parts of the community, and how they are to be developed (building size, uses, architecture etc.). Drawing upon the communicative policy act frame, master plans describe local officials' focus (i.e., policy intentions) where local decision makers eventually act (i.e., decide) about local land management (Norton 2008).

From the view that plans signal policy intent, assessment of community plans for how ESs are incorporated yields insights into the value and priorities of local natural resources, including wildlife and WMAs. While local zoning ordinances are the legal framework for community decision-making around land development, the ordinances or associated land use maps were not included in this study. The study objectives were to:

1. Identify the extent of ESs content in the planning documents;
2. Explore how local communities incorporated natural resources, and specifically WMAs, into their community documents; and
3. Explore the relationship between community characteristics and its content.

# METHODS

This study focused on community plans proximate to six WMAs in Southeast Michigan, USA. They were: Nayanquing Point State Wildlife Area, Fish Point State Wildlife Area, Shiawassee River State Game Area, St. Clair Flats State Wildlife Area – Harsens Island Unit, Pointe Mouillee State Game Area, and the U.S. Fish and Wildlife Service Shiawassee National Wildlife Refuge (Figure 1). These sites were selected because of their continuity along a rural to urban gradient with the Lake St. Clair and Lake Erie WMAs more urban than the more rural Lake Huron Saginaw Bay WMAs, and were used in other aspects of the overall research project (e.g., Avers 2022). Seventy-one community plans were retrieved from October 2020 and June 2021 from the six counties (Bay, Monroe, Saginaw, St. Clair, Tuscola, and Wayne) containing the WMAs. Of the 71 plans, 55 were master plans, 13 were parks and recreation plans, one was a water trail plan, one was an economic development plan, and one was a resiliency plan. Appendix A lists the communities included in this project.

Figure 1. Study location figure, Southeast Michigan, 2020.



The analysis was completed using Dedoose version 8.3 (2020) and included three steps. The first step involved application of codes for eight ESs based upon Hansen (2015) (Table 1). The second step involved reading through 10 plans to identify and define emergent themes, and then code all plans with these themes (Table 2). The third step was to code plans according to community characteristics of: proximity to WMA (nearest vs. not nearest); age of plan (< 10 years vs.  $\geq 10$  years); whether they were completed by a professional author or by the community; region they came from: Saginaw Bay (Lake Huron), Lake St. Clair, or Lake Erie; and community population size: <2500, 2501-5000, 5001-10,000, 10,001-20,000, or > 20,001 (excluding county plans). The coding was completed by one individual.

Table 1. Hansen et al. 2015 ecosystem services.

<b>Erosion control</b>	<b>Recreation potential</b>
<b>Air pollution mitigation</b>	<b>Flood control</b>
<b>Water pollution mitigation</b>	<b>Groundwater recharge</b>
<b>Noise pollution mitigation</b>	<b>Wildlife habitat</b>

Table 2. Emergent themes.

<b>Preserving access to parks/open space</b>	<b>Using land efficiently or mixed land uses</b>
<b>Preserving history and character</b>	<b>Bringing in more visitors/tourists</b>
<b>Increasing or enhancing multi-use trails</b>	<b>Using green energy or technology</b>
<b>Preserving native environment</b>	<b>Providing amenities via state or federal lands</b>
<b>Increasing access to or use of waterways</b>	<b>Providing hunting or fishing opportunities</b>
<b>Creating or maintaining wildlife habitat</b>	<b>Providing wildlife watching opportunities</b>

## Data Analysis

Welch's t-tests were used to determine differences between proximity, age, and authorship. Analysis of variance (ANOVA) was used to examine differences based upon region as well as community population size.

# RESULTS

The top ES themes present in the community plans were for wildlife habitat (59%; n = 42), followed by recreation potential (45%; n = 32) and flood control (45%; n = 32). Other ES themes found in the plans were mitigating water pollution (34%; n = 24), controlling erosion (25%; n = 18), mitigating air pollution (24%; n = 17), addressing groundwater recharge (23%; n = 16), and mitigating noise pollution (17%; n = 12).

Of the emergent themes, 89% of plans (n = 63) referenced preserving access to parks/open space. The following other emergent themes were observed in the plans:

- 79% (n = 56) included reference to preserving history and character.
- 77% (n = 55) included increasing or enhancing multi-use trails.
- 75% (n = 53) referenced preserving native environment/open space.
- 65% (n = 46) included increasing access to or use of waterways.
- 51% (n = 36) referenced creating or maintaining wildlife habitat.
- 51% (n = 36) referenced providing hunting or fishing opportunities.
- 46% (n = 33) referenced using land efficiently or mixed land uses.
- 39% (n = 28) included reference to bringing in more visitors/tourists.
- 32% (n = 23) included reference to providing amenities via state or federal lands.
- 31% (n = 22) included reference to providing wildlife watching opportunities.
- 25% (n = 18) referenced using green energy or technology.

## Proximity to WMAs

Plans from 16 communities were identified and coded as adjacent to a WMA and 55 plans were from communities not immediately adjacent to a WMA. We detected no significant differences ( $p < 0.05$ ) in presence of ES concepts in plans when comparing plans from communities near vs. non-near WMAs (Table 3). For emergent themes, we only detected a difference ( $p < 0.05$ ) in plan content from communities not near the WMA as they had more content about creating and maintaining habitat than plans from communities nearer WMAs (Table 4).

Table 3. Proximity to WMAs and presence of ESs (Hansen et al. 2015)

	NEAR WMA	NOT-NEAR WMA		
Variable	Mean <sup>1</sup> (Variance)	Mean <sup>1</sup> (Variance)	Statistical test	P-value
Erosion control	0.38 (0.78)	0.42 (0.69)	t23= -0.17	0.86
Air pollution	0.25 (0.33)	0.31 (0.33)	t24= -0.36	0.72
Water pollution	0.44 (0.53)	0.65 (1.12)	t35= -0.94	0.35
Noise pollution	0.13 (0.25)	0.27 (0.35)	t28= -1.00	0.33
Recreational potential	1.38 (2.92)	0.58 (0.84)	t18= 1.78	0.09
Flood control	0.94 (1.66)	0.85 (1.42)	t23= 0.23	0.82
Groundwater recharge	0.19 (0.30)	0.42 (0.66)	t36= -1.32	0.19
Wildlife habitat	1.13 (1.98)	1.49 (8.18)	t52= -0.70	0.49

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

Table 4. Proximity to WMAs and emergent themes.

	NEAR WMA	NOT-NEAR WMA		
Variable	Mean <sup>1</sup> (Variance)	Mean <sup>1</sup> (Variance)	Statistical test	P-value
Bringing in more visitors/tourists	1.88 (8.12)	0.69 (1.62)	t17= 1.62	0.12
Increasing or enhancing multi-use trails	6.56 (46.80)	5.31 (34.48)	t22= 0.67	0.51
Increasing access to or use of waterways	2.69 (8.50)	2.51 (14.62)	t32= 0.20	0.84
Using green energy or technology	0.50 (0.80)	0.65 (1.86)	t37= -0.54	0.60
Providing amenities via state or federal lands	1.31 (2.36)	0.53 (1.66)	t22= 1.86	0.08
Providing hunting or fishing opportunities	1.19 (2.03)	1.75 (13.53)	t63= -0.19	0.36
Providing wildlife watching opportunities	0.56 (0.66)	0.45 (0.92)	t28= 0.45	0.66
Preserving access to parks/open space	4.75 (17.00)	6.11 (38.54)	t37= -1.02	0.31
Preserving history and character	5.50 (40.93)	3.84 (12.55)	t18= 1.00	0.33
Preserving native environment	3.00 (15.20)	2.62 (7.13)	t19= 0.38	0.72
Creating or maintaining wildlife habitat	0.13 (0.12)	0.47 (1.22)	t69= -2.03	0.05
Using land efficiently or mixed land uses	3.81 (23.63)	2.02 (9.46)	t19= 1.40	0.18

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

## Age of Plans

Twenty of the plans were published prior to 2010 and 51 plans were from 2010 or later. Plans completed prior to 2010 had more ( $p < 0.05$ ) content related to erosion control, air pollution, water pollution, noise pollution, flood control, and groundwater recharge than those completed 2010 or later (Table 5). Plans produced 2010 or later had more ( $p < 0.05$ ) content related to bringing in more visitors/tourists, increasing or enhancing multi-use trails, increasing access to or use of waterways, using green energy or technology, providing amenities via state or federal lands, providing hunting or fishing opportunities, providing wildlife watching opportunities, and creating or maintaining wildlife habitat (Table 6).

Table 5. Age of plans and ESs (Hansen et al. 2015).

	BEFORE 2010	2010 OR LATER		
Variable	Mean <sup>1</sup> (Variance)	Mean <sup>1</sup> (Variance)	Statistical test	P-value
Erosion control	0.91 (1.42)	0.19 (0.25)	t24= 2.71	0.012
Air pollution	0.55 (0.55)	0.19 (0.20)	t29= 2.08	0.047
Water pollution	1.09 (1.52)	0.40 (0.64)	t30= 2.39	0.023
Noise pollution	0.59 (0.63)	0.09 (0.12)	t25= 2.85	0.009
Recreational potential	0.86 (1.65)	0.74 (1.32)	t37= 0.37	0.713
Flood control	1.59 (2.25)	0.57 (0.81)	t28= 2.94	0.007
Groundwater recharge	0.73 (0.97)	0.21 (0.35)	t28= 2.27	0.031
Wildlife habitat	2.32 (17.27)	1.04 (1.78)	t23= 1.41	0.173

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

Table 6. Age of Plans and emergent themes.

	<b>BEFORE 2010</b>	<b>2010 OR LATER</b>		
<b>Variable</b>	<b>Mean<sup>1</sup> (Variance)</b>	<b>Mean<sup>1</sup> (Variance)</b>	<b>Statistical test</b>	<b>P-value</b>
Bringing in more visitors/tourists	0.36 (0.34)	1.19 (4.33)	t59= -2.52	0.014
Increasing or enhancing multi-use trails	3.73 (13.16)	6.53 (47.30)	t66= -2.22	0.030
Increasing access to or use of waterways	1.50 (4.26)	3.09 (17.04)	t67= -2.13	0.037
Using green energy or technology	0.23 (0.56)	0.79 (2.04)	t66= -2.13	0.037
Providing amenities via state or federal lands	0.27 (0.30)	0.94 (2.58)	t63= -2.53	0.014
Providing hunting or fishing opportunities	0.77 (1.23)	2.09 (15.38)	t59= -2.12	0.038
Providing wildlife watching opportunities	0.23 (0.18)	0.62 (1.15)	t66= -2.15	0.035
Preserving access to parks/open space	4.27 (12.40)	6.47 (42.91)	t66= -1.81	0.075
Preserving history and character	5.45 (14.83)	3.74 (20.67)	t48= 1.62	0.112
Preserving native environment	3.45 (5.69)	2.47 (10.12)	t54= 1.43	0.158
Creating or maintaining wildlife habitat	0.23 (0.18)	0.62 (1.15)	t66= -2.15	0.035
Using land efficiently or mixed land uses	1.55 (5.69)	2.77 (16.10)	t63= -1.57	0.120

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

## Authorship of Plans

Fifty-seven communities (80%) consulted with professionals for the preparation of their plans, while 14 communities (20%) appeared to have no evidence of professional assistance with plan development. Overall, we detected differences ( $p < 0.05$ ) on the presence of three ESs (erosion control, air pollution mitigation, and noise pollution mitigation) where professional assistance was involved with plan development compared to those without professional assistance (Table 7). No differences ( $p < 0.05$ ) in emergent themes existed by author (Table 8).

Table 7. Authorship of plans and ESs (Hansen et al. 2015).

	<b>PROFESSIONAL ASSISTANCE</b>	<b>NO EVIDENCE OF PROFESSIONAL ASSISTANCE</b>		
<b>Variable</b>	<b>Mean<sup>1</sup> (Variance)</b>	<b>Mean<sup>1</sup> (Variance)</b>	<b>Statistical test</b>	<b>P-value</b>
Erosion control	0.50 (0.84)	0.08 (0.08)	t62= 2.93	0.005
Air pollution mitigation	0.38 (0.38)	0.00 (0.001)	t55= 3.61	0.000
Water pollution mitigation	0.70 (1.12)	0.31 (0.40)	t30= 1.73	0.094
Noise pollution mitigation	0.30 (0.40)	0.00 (0.001)	t55= 3.61	0.000
Recreational potential	0.70 (0.91)	1.15 (3.64)	t13= -0.84	0.416
Flood control	0.88 (1.42)	1.00 (1.83)	t17= -0.31	0.763
Groundwater recharge	0.38 (0.53)	0.38 (0.92)	t15= -0.04	0.973
Wildlife habitat	1.45 (7.67)	1.38 (4.09)	t24= 0.09	0.927

<sup>1</sup> = mean number of times the concept was mentioned in the plan.



Table 8. Authorship of plans and emergent themes.

	PROFESSIONAL ASSISTANCE	NO EVIDENCE OF PROFESSIONAL ASSISTANCE		
Variable	Mean <sup>1</sup> (Variance)	Mean <sup>1</sup> (Variance)	Statistical test	P-value
Bringing in more visitors/tourists	0.73 (2.49)	1.69 (5.90)	t14= -1.36	0.195
Increasing or enhancing multi-use trails	5.25 (36.15)	7.46 (42.60)	t17= -1.12	0.280
Increasing access to or use of waterways	2.36 (13.43)	3.69 (12.56)	t18= -1.22	0.240
Using green energy or technology	0.55 (1.67)	1.00 (1.50)	t19= -1.17	0.256
Providing amenities via state or federal lands	0.73 (2.02)	0.69 (1.73)	t19= 0.10	0.924
Providing hunting or fishing opportunities	1.70 (12.14)	1.46 (7.77)	t22= 0.26	0.797
Providing wildlife watching opportunities	0.46 (0.91)	0.62 (0.76)	t19= -0.55	0.586
Preserving access to parks/open space	5.45 (23.12)	8.08 (80.41)	t14= -1.02	0.323
Preserving history and character	4.29 (18.83)	3.85 (23.64)	t17= 0.30	0.768
Preserving native environment	2.71 (7.77)	2.92 (14.91)	t15= -0.18	0.856
Creating or maintaining wildlife habitat	0.39 (1.12)	0.46 (0.60)	t24= -0.27	0.792
Using land efficiently or mixed land uses	2.45 (12.80)	2.62 (16.09)	t17= -0.14	0.891

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

## Resident Population Size

Nineteen plans came from communities with a population size of <2,500; 18 plans from communities with populations size of 2,501 – 5,000; 11 plans from communities with population size of 5,001 – 10,000; seven plans from communities with population size of 10,001 – 20,000; and 10 plans from communities with population size of >20,001. Of the ESs, we detected differences ( $p<0.05$ ) between community resident population sizes for erosion control and groundwater recharge (Table 9). Of the emergent themes, we detected differences ( $p<0.05$ ) for increasing or enhancing multi-use trails, preserving access to parks/open space, and creating or maintaining wildlife habitat (Table 10).

Table 9. ESs per community resident population sizes (Hansen et al. 2015).

Variable	≤2500	2501-5000	5001-10000	10001-20000	≥20001		
	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	F4=	P-value
Erosion control	0.16 (0.83)	0.83 (0.97)	0.00 (0.00)	0.29 (0.24)	0.30 (0.46)	3.56	0.011
Air pollution mitigation	0.00 (0.00)	0.11 (0.10)	0.00 (0.00)	0.00 (0.00)	0.10 (0.10)	1.03	0.400
Water pollution mitigation	0.58 (0.92)	0.94 (1.70)	0.36 (0.45)	0.71 (1.57)	0.30 (0.46)	0.88	0.481
Noise pollution mitigation	0.32 (0.34)	0.33 (0.59)	0.00 (0.00)	0.43 (0.29)	0.20 (0.40)	0.79	0.534
Recreational potential	0.58 (0.59)	0.94 (2.41)	0.45 (0.47)	1.14 (3.48)	0.70 (0.90)	0.58	0.679
Flood control	0.63 (0.80)	1.28 (1.86)	0.36 (0.45)	1.43 (3.29)	0.80 (1.73)	1.59	0.188
Groundwater recharge	0.16 (0.25)	0.83 (0.97)	0.00 (0.00)	0.29 (0.24)	0.30 (0.46)	3.56	0.011
Wildlife habitat	0.84 (0.58)	0.94 (1.35)	0.73 (0.82)	3.57 (47.62)	1.10 (3.43)	1.91	0.121

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

Table 10. Emergent themes per community population sizes.

VARIABLE	≤2500	2501-5000	5001-10000	10001-20000	≥20001		
	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	F4=	P-value
Bringing in more visitors/ tourists	0.79 (1.18)	0.72 (2.80)	1.18 (8.76)	0.86 (2.48)	0.60 (2.49)	0.16	0.956
Increasing or enhancing multi- use trails	2.32 (7.34)	4.61 (32.02)	5.73 (29.02)	5.29 (13.24)	10.60 (54.71)	4.47	0.003
Increasing access to or use of waterways	1.42 (1.37)	1.61 (6.84)	3.18 (8.16)	2.29 (7.24)	2.10 (6.54)	1.05	0.390
Using green energy or technology	0.68 (1.56)	0.28 (0.68)	0.64 (1.05)	0.00 (0.00)	0.70 (0.90)	1.00	0.416
Providing amenities via state or federal lands	0.58 (0.59)	0.56 (1.08)	1.00 (2.20)	0.29 (0.24)	0.90 (1.66)	1.01	0.410
Providing hunting or fishing opportunities	0.79 (1.51)	0.61 (0.96)	0.82 (0.96)	2.00 (5.33)	0.40 (1.60)	1.78	0.144
Providing wildlife watching opportunities	0.37 (0.69)	0.17 (0.15)	0.36 (0.25)	0.71 (0.57)	0.20 (0.18)	1.15	0.343
Preserving access to parks/open space	5.43 (34.81)	3.94 (4.88)	2.73 (9.62)	11.29 (87.57)	8.60 (42.93)	3.99	0.006
Preserving history and character	4.47 (22.82)	5.61 (23.19)	2.00 (4.40)	4.14 (19.14)	5.10 (20.10)	1.25	0.301
Preserving native environment	1.84 (3.03)	3.28 (13.39)	2.27 (6.62)	4.29 (17.24)	3.80 (9.96)	1.38	0.253
Creating or maintaining wildlife habitat	0.26 (0.32)	0.17 (0.26)	0.00 (0.00)	1.00 (2.33)	0.20 (0.18)	2.77	0.035
Using land efficiently or mixed land uses	1.74 (13.87)	2.44 (12.38)	2.73 (18.02)	1.43 (1.43)	5.50 (10.06)	2.14	0.087

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

## Region

Thirty-two plans were from communities near Lake Huron's Saginaw Bay, 24 plans were from communities near Lake Erie, and 15 plans were from communities near Lake St. Clair. We detected differences ( $p < 0.05$ ) among regions for erosion control, water pollution mitigation, noise pollution mitigation, flood control, and groundwater recharge (Table 11). When examining the emergent themes, we found differences ( $p < 0.05$ ) among regions for providing amenities via state or federal lands, providing wildlife watching opportunities, preserving access to parks/open space, and creating or maintaining wildlife habitat (Table 12).

Table 11. ES themes per region (Hansen et al. 2015).

VARIABLE	SAGINAW BAY	LAKE ST. CLAIR	LAKE ERIE		
	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	F2=	P-value
Erosion control	0.50 (1.13)	0.80 (0.89)	0.16 (0.20)	3.46	0.037
Air pollution mitigation	0.21 (0.26)	0.53 (0.70)	0.25 (0.19)	1.72	0.187
Water pollution mitigation	0.63 (0.77)	1.20 (1.89)	0.31 (0.54)	4.50	0.015
Noise pollution mitigation	0.13 (0.20)	0.73 (0.78)	0.09 (0.09)	8.65	0.000
Recreational potential	0.96 (2.39)	0.93 (1.64)	0.53 (0.52)	1.11	0.335
Flood control	1.13 (2.03)	1.47 (1.84)	0.41 (0.51)	5.32	0.007
Groundwater recharge	0.58 (0.78)	0.53 (0.70)	0.13 (0.31)	3.13	0.050
Wildlife habitat	2.33 (16.75)	1.13 (1.12)	0.84 (1.30)	2.46	0.093

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

Table 12. Emergent themes per region.

VARIABLE	SAGINAW BAY	LAKE ST. CLAIR	LAKE ERIE		
	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	Mean <sup>1</sup> (Var)	F2=	P-value
Bringing in more visitors/tourists	0.88 (1.77)	1.87 (10.12)	0.59 (0.89)	2.72	0.073
Increasing or enhancing multi-use trails	7.29 (33.35)	6.27 (55.64)	4.00 (28.39)	2.20	0.118
Increasing access to or use of waterways	3.29 (20.91)	3.07 (11.64)	1.75 (7.61)	1.46	0.240
Using green energy or technology	0.75 (2.72)	0.47 (0.70)	0.59 (1.28)	0.24	0.790
Providing amenities via state or federal lands	1.25 (3.67)	0.07 (0.07)	0.28 (0.40)	3.65	0.031
Providing hunting or fishing opportunities	2.50 (21.65)	1.27 (5.35)	1.13 (5.27)	1.31	0.277
Providing wildlife watching opportunities	0.88 (1.59)	0.47 (0.70)	0.19 (0.22)	4.14	0.020
Preserving access to parks/open space	9.17 (56.58)	4.67 (10.38)	3.81 (15.96)	7.31	0.001
Preserving history and character	5.25 (28.28)	4.20 (9.03)	3.44 (16.25)	1.20	0.309
Preserving native environment	3.17 (12.58)	3.47 (5.27)	2.00 (7.16)	1.73	0.185
Creating or maintaining wildlife habitat	0.79 (2.17)	0.19 (0.29)	0.20 (0.31)	3.08	0.053
Using land efficiently or mixed land uses	3.25 (14.80)	1.87 (8.41)	2.06 (13.61)	0.97	0.383

<sup>1</sup> = mean number of times the concept was mentioned in the plan.

## DISCUSSION

Communities include content related to ESs, albeit modestly. Additional efforts to include content related to natural resources, wildlife, or WMAs could result in enhancing any benefits to landscape-scale conservation. Communities nearer to WMAs could enhance their inclusion of ESs or emergent themes related to natural resources and provide corridors to connect with lands in communities further from the WMA that had greater focus on creating or maintaining wildlife habitat.

Statewide policy mechanisms, such as the Michigan Natural Resources Trust (MNRT) Fund that requires local communities to have up-to-date master plans, appear to have positive effects on the presence of recreation-related content in local community plans. Our analysis demonstrated that over 75% of community plans included aspects such as access to parks, open space, history and character, and multi-use trails, and differences in content were observed in plans produced 2010 or later. WMAs might explore additional ways to connect landscape-scale conservation goals that could be achievable through inclusion of ES concepts, wildlife, or WMAs in local plans required to access MNRT funds or other appropriate funds. A policy systems approach could enable communities to identify their wildlife values with intentions and acquire funds to help achieve desired land uses that contribute to landscape-scale conservation. These effective approaches could be used to develop or enhance partnerships for effective governance to benefit landscape-scale conservation.

Professionals who assist with processes and preparation of local plans are a key audience for education about important ES, wildlife, or WMA concepts as plans are more likely to include these concepts when a professional assists with the preparation of the plan. Michigan State University Extension, Michigan Sea Grant, Michigan Natural Features Inventory, or local planning associations may be key partners in offering professional learning opportunities to these professionals. General non-formal education programs for locally elected or appointed leaders, (e.g., planning or zoning commissioners) could focus on planning and zoning, conservation, or landscape conservation. And, these may be an effective way to build local leadership. Professional planners or elected or appointed local officials, could all work towards envisioning how conservation and community benefits from landscape-scale planning, identifying their role with the tools they have, making data and decision-support tools available more broadly, or empowering them to use their local planning and zoning tools to achieve common goals. This could be especially important as the need to incorporate projections of changing climate or socioeconomics increases – all opportunities to continue integrating natural resources into community life. Individually, local communities do not generally have their own natural resources professionals, so any assistance provided or offered from regional or statewide efforts or through partnerships may be the best approach. Appendices B, C, and D offer examples of how communities might do this.

Future research could examine community codes to determine if policy intentions in support of ESs actually make it into legal codes or zoning maps, and how the zoning maps align with unique ecosystems. Additional research could explore needs assessments and efficacy evaluation of either professional learning opportunities or leadership development/training programs focusing on ESs, wildlife, or WMAs. Hedonic pricing analysis to examine the effects of WMAs on proximate property values is one promising economic research approach, among the numerous available.

## MANAGEMENT IMPLICATIONS

Local community plans can include relevant ESs concepts, both traditional and those more broadly related to recreational and cultural uses. However, it may involve a few changes to consider: (1) what are the tools and approaches local communities use to shape their communities?; (2) how could these be scaled-up for landscape-level conservation?; (3) what is the role of WMAs or partner organizations in outreach, education, and engagement with local communities to co-develop a vision, and their roles in implementing actions to achieve collective action benefits?

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## Appendix A. List of communities

COUNTY	COMMUNITY	PLAN TYPE
Bay	Charter Township of Bangor	Master Plan
Bay	Essexville	Master Plan
Bay	Beaver Township	Master Plan
Bay	Hampton Township	Master Plan
Bay	Monitor Township	Master Plan
Bay	Frankenlust	Master Plan
Bay	Bay County	Parks and Recreation Plan
Bay	Pinconning City	Development Plan
Huron	Sebawaing	Parks and Recreation Plan
Monroe	Summerfield Township	Master Plan
Monroe	Whiteford Township	Master Plan
Monroe	Erie Township	Master Plan

Monroe	Monroe County	Water Trail
Monroe	Berling	Master Plan
Monroe	Dundee	Master Plan
Monroe	Bedford	Master Plan
Monroe	Monroe Township	Master Plan
Monroe	Luna Pier	Master Plan
Monroe	Frenchtown	Master Plan
Monroe	LaSalle	Master Plan
Monroe	City of Monroe	Parks and Recreation Plan
Monroe	Village of South Rockwood	Parks and Recreation Plan
Monroe	Resilient Monroe	n/a
Monroe	Monroe Comprehensive plan	Master Plan
Saginaw	Birch Run Township	Master Plan
Saginaw	Village of St. Charles	Master Plan
Saginaw	James Township	Master Plan
Saginaw	Kochville Township	Master Plan
Saginaw	Richland Township	Master Plan
Saginaw	Saginaw Township	Master Plan
Saginaw	Thomas Township	Master Plan
Saginaw	Tittabawassee Township	Master Plan
Saginaw	St. Charles Township	Master Plan
Saginaw	Bridgeport Township	Parks and Recreation Plan
Saginaw	Saginaw County	Parks and Recreation Plan
Saginaw	City of Zilwaukee	Parks and Recreation Plan
Saginaw	City of Saginaw	Master Plan
St. Clair	Lynn	Master Plan
St. Clair	East China	Master Plan
St. Clair	Emmett Township	Master Plan
St. Clair	Greenwood	Master Plan
St. Clair	Burtchville	Master Plan

St. Clair	China Township	Master Plan
St. Clair	St. Clair Township	Master Plan
St. Clair	Grant Township	Master Plan
St. Clair	Mussey Township	Master Plan
St. Clair	Algonac	Master Plan
St. Clair	Ira	Parks and Recreation Plan
St. Clair	Clyde Township	Parks and Recreation Plan
St. Clair	Port Huron	Master Plan
St. Clair	Clay Township	Master Plan
St. Clair	St. Clair County	Parks and Recreation Plan
Tuscola	Akron	Master Plan
Tuscola	Vassar Township	Master Plan
Tuscola	Denmark Township	Master Plan
Tuscola	Columbia Township	Master Plan
Tuscola	Gilford Township	Master Plan
Tuscola	Tuscola Township	Master Plan
Tuscola	Novesta	Master Plan
Tuscola	Wisner Township	Master Plan
Tuscola	Fremont Township	Master Plan
Tuscola	Fairgrove Township	Master Plan
Wayne	Grosse Ile	Master Plan
Wayne	Gibraltar	Master Plan
Wayne	Brownstown Township	Master Plan
Wayne	Wayne City	Parks and Recreation Plan
Wayne	Ecorse	Master Plan
Wayne	Canton	Master Plan
Wayne	Trenton City	Parks and Recreation Plan
Wayne	VanBuren Township	Master Plan
Wayne	Wayne County	Parks and Recreation Plan



## **Appendix B. Community planning examples near Nayanquing Point State Wildlife Area**

### Bay County Area Recreation Plan

Nayanquing Point Wildlife Area – Approximately 1,040 acres in Fraser Township. Nayanquing Point is a collection of farm fields, diked pools, mud flats and Saginaw Bay marshland. It is known as an important bird area by the Audubon Society. It includes an observation tower and waterfowl hunting areas. An additional 130 acres is located to the north in Pinconning Township. (page 23); Water trail overview (page 22); Non-motorized trails (page 23).

### Eastern Michigan Council of Government's Comprehensive Economic Development Strategy

Page 19 - Discusses plans to continue investing in outdoor amenities and placemaking.

### Bay City Master Plan

Page 127 - Bay City Recreation Amenities does not include Nayanquing Point.

### Charter Township of Bangor Master Plan

Page 16 - highlights outdoor activities around the county and does not include Nayanquing Point.

### Tuscola County Parks and Recreation Plan

Mentions other state game areas.

## **Appendix C. Community planning examples near Pointe Mouillee State Game Area.**

### Brownstown Township Draft 5-year Parks and Recreation Plan

Pages 35-36 highlight Natural Resource areas and Downriver Linked Greenways; Michigan State Parks provide opportunities to residents of Brownstown and the region. These state facilities provide a variety of activities including camping, picnicking, swimming, hunting, fishing, snowmobiling, hiking, cross country skiing, mountain biking, and horseback riding.

A list of Michigan State Parks:

- Island Lake Recreation Area (Brighton)
- Maybury State Park (Northville)
- Proud Lake Recreation Area (Wixom)
- Sterling (Monroe)
- Tri-Centennial State Park and Harbor (Detroit)

In addition, Pointe Mouillee State Game Area is a 4,000-acre park located partially in Brownstown Township. While the headquarters, fishing piers, boat docks and hunting areas are located in the Township, much of the park is in Berlin Township to the south. Pointe Mouillee, one of the largest freshwater marsh restoration projects in the world, provides opportunities for boating, fishing, hunting, hiking, and bird watching (page 40).

## Berlin Township Parks and Recreation Master Plan

Berlin Township is situated in an area abundant in natural resources. These include Lake Erie, the Huron River, Swan Creek, the Pointe Mouillee State Game Area and agriculturally productive soils. These resources are fragile and can be easily damaged through pollution, erosion, and uncontrolled development. It is important to understand the hazards that could befall these resources, and to address measures to manage and protect the frail equilibrium between people and nature. (page 19); DLG Initiative explanation (page 23); Pointe Mouillee Recreational Area represents the largest recreational / open space area in the Township containing approximately 2,000 acres. It takes up the entire eastern shore line or Township boundary and juts out into Lake Erie, near the mouth of the Huron River due to dredging deposits. According to the Michigan Department of Natural Resources, Pointe Mouille is one of the largest freshwater marsh restoration projects in the world consisting of wetlands, diked marshes, and river bayous. Waterfowl, shorebirds, and other wetland wildlife, as well as bald eagles are the primary attractions at this site. Visitors can walk or hike along the water control dikes for a good look at muskrats, waterfowl, shorebirds, wading birds, and birds of prey. This recreational area provides some of the best shorebird viewing in the state especially in late summer and early fall. Most of the Pointe Mouillee State Game Area is open to public hunting during appropriate seasons. Restrooms are available at the area headquarters. A boat ramp and fishing are also available at this site (page 28).

### Specific goals and objectives

1. Improve the functionality of Pointe Mouille.
  - a. Discuss developing activities and facilities to serve a broader range of users. New activities/facilities could include canoe/kayak rental, interpretive foot/water trails and an educational interceptive center.
  - b. Improve poorly maintained existing facilities at recreation areas such as roads, boat launches, fishing piers, and parking areas.
  - c. Discuss development of a public marina at the east shore of the park.
  - d. Provide better amenities such as public restrooms, signs, trails, and observation areas (page 48).

## Village of South Rockwood Parks and Recreation Plan

“Other Nearby Public Facilities”: Pronounced “Point Moo-yay,” the State Game Area is one of the largest freshwater marsh restoration projects in the world. Hiking trails within the Game Area offer scenic views and the opportunity to observe wildlife. Hunting is permitted in much of the park. (page 30); Formulate and implement a community-wide trail plan that focuses on trails within the Village that can link Labo Park and other South Rockwood amenities with community trail systems in Wayne County such as Flat Rock, Rockwood, and other communities, including connections to the Downriver Linked Greenways: with priority being trails within the Village (page 45).

## Monroe County Trail and Bicycle Plan

In Monroe County, the Great Lakes Way supports both the green and blue way connections from Lake Erie Marsh in Erie Township to Pointe Mouillee State Game Area in Berlin Township, connecting the landmarks of Sterling State Park and the River Raisin National Battlefield Park, as well as the water trail connections from Lake Erie inland along the River Raisin, Swan Creek, and the Huron River (page 20).

## Appendix D. Example Master Plan from Clay Township (2021) proximate to Harsens Island at St. Clair Flats State Wildlife Area.

Please see pages 64-69 using the following link: [https://cms2.revize.com/revize/claytownship/20210420/ClayTownshipMasterPlan\\_FINALDRAFT.pdf](https://cms2.revize.com/revize/claytownship/20210420/ClayTownshipMasterPlan_FINALDRAFT.pdf).

St. Clair Flats State Wildlife Area - Harsens Island Unit is proximate to Clay Township, Michigan. In 2021, Clay Township adopted its current master plan and includes four goals and objectives relevant for conservation and community development. They are:

- 1) Residential character.
- 2) Resilient outdoor lifestyle.
- 3) Open and efficient transportation access and circulation.
- 4) Prosperous local economy.

Goal: To maintain, support, enhance and protect the character of residential areas.

Why?

- The established residential character provides a sense of community and belonging for residents.
- Ensure sufficient equitable housing for lower income residents.
- Attractive neighborhoods with access to walkable destinations appeals to younger residents and families.

Where? Throughout residential neighborhoods.

Potential obstacles/related considerations?

- Difficulty enforcing code compliance and effectiveness.
- Outdated zoning ordinance standards may not have the desired regulatory effect.
- Zoning regulations should support housing types desired by current and future residents.

Housing Objectives:

1. Improve residential code compliance and enforcement awareness through educational materials.
2. Provide support for residents to maintain and update homes and properties.
3. Establish a program to engage with residents in the individual residential areas in the township in order to better understand the needs and desires of each area and pursue capital improvements or assistance based on identified need.

4. Review and, if necessary, update the zoning ordinance to address buffering and separation in areas of conflict between residential and non-residential areas.
5. Protect established residential areas from potentially negative impacts of other uses and development, including studying the potential addition of sewer and water utilities to Harsens Island.
6. Support and plan for housing that is attainable for the majority of township residents.
7. Encourage missing middle housing types and accessory dwelling units in appropriate locations.
8. Expand senior living housing options in areas near amenities, services and transit.

Zoning Action Items:

- 4. Assess site design standards and update as needed to ensure adequate provisions exist that protect residential development from the negative impacts of non-residential development, including noise, traffic, waste management, light trespass, privacy, and poor property maintenance.
- 7. Consider ordinance changes to permit smaller single-family homes and expanded opportunities for attached single-family homes.

Advocacy Action Items:

- 2. Develop resource packet for homeowners that identifies available home improvement financing tools, guides for home maintenance, and a directory of local tradespeople.
- 6. Develop policies and programs to facilitate the development of new public and private senior housing facilities to meet the needs of the township's expanding aging population.
- 8. Pursue strategies to make Clay Township an "Age-Friendly Community."

Other Action Items:

- 1. Create a development review guide or similar tool that will help residents, staff and code enforcement understand the intent of ordinances.
- 3. Establish a Capital Improvement Program and encourage residents to participate in the development of the plan.
- 5. Budget for a feasibility study to determine the cost-benefit analysis of adding sewer and upgrading utilities on Harsens Island.

Goal: To protect and enhance natural resources within the township, and to withstand and emerge from environmental threats and challenges.

## Why?

- Protecting natural resources enhances the quality of life and livability and viability of the township.
- Providing outdoor recreation opportunities benefits public health and the local economy.
- Having an established mitigation plan for natural occurrences saves lives and resources.

Where? Throughout the township.

Potential obstacles/related considerations?

- Coordination of state and private lands.

Resilient Outdoor Lifestyle Objectives:

1. Coordinate and support the management of state-owned or regulated natural resources.
2. Pursue aquatic-based amenities and access that support the township as a regional recreation destination.
3. Promote and increase observational and educational benefits of the township's natural resources.
4. Discourage the use of transient housing types that negatively affect established residential areas.
5. Support and promote the benefits of the township's proximity to natural resources on the local tourism and other industries.
6. Monitor changes and expert forecasts related climate and Great Lakes water levels, and take action to improve the township's overall resiliency.
7. Monitor and promote the mitigation of hazardous materials that may pose a threat to residents and resources in the township.
8. Support and promote community events, especially those that focus on local community.
9. Pursue neighborhood-scale revitalization projects that increase recreational opportunities for residents.
10. Expand upon the place-making and walkability opportunities in the Pearl Beach, East End and San Souci areas.

Zoning Action Items:

- 4. Review zoning standards and consider updating the design standards to ensure future development meets expected area standards.
- 10. Adopt zoning standards that will allow for flexible uses while preserving the historical and existing character of these areas.

Advocacy Action Items:

2. Develop resource packet for visitors to navigate and understand the destinations within the township.
- 3 + 8. Consider centralizing and disseminating useful (non-essential) township community events and information into a monthly or quarterly publication to keep township residents informed of opportunities.
5. Market the township as a vacation destination and seek developers to build overnight lodging to support weekend tourism.

Other Action Items:

1. Identify contacts that manage state owned lands and 3. Establish a Capital Improvement Program and encourage residents to participate in the development of the plan.
6. Publish water levels as on a consistent basis and consider establishing a resiliency plan based on observed water levels.
7. Ensure hazardous waste material disposal guidelines are easily accessible, including a contact list of local facilities that are equipped to deal with such materials.
9. Identify areas that have high potential and consider acquiring land when a public benefit should be preserved or enhanced.

Goal: Policies that strengthen existing business and promote new development.

Why?

- To help provide meaningful, well-paying jobs for residents.
- To help provide entry-level jobs for younger residents.
- To offer access to local goods and services for residents.

Where? Throughout non-residential and mixed-use districts.

Potential obstacles/related considerations?

- Difficulty enforcing code compliance and effectiveness.
- Outdated zoning ordinance standards may not have the desired regulatory effect.
- Zoning regulations should support housing types desired by current and future residents.

Local Economy Objectives:

1. Strengthen Pearl Beach, East End and Sans Souci as distinct mixed-used nodes.
2. Identify pilot projects for placemaking in targeted areas near businesses.
3. Support and plan for the appropriate continued use of historic industrial uses and essential services, including coordination with the City of Algonac.

4. Increase opportunities for employment of township residents within the township.
5. Promote opportunities for pop-up shops and temporary retailers that can serve as incubators for local entrepreneurs.
6. Support the Downtown Development Authority.
7. Promote high-quality, aesthetically appealing development including attractive context-based signage that provides messaging in an uncluttered fashion and is sized to respect and not overwhelm the building or site upon which it is placed. Provide support for business façade and signage improvement programs.
8. Encourage businesses to tap into the market potential associated with non-motorized travel, which could include healthy food, recreational clothing and equipment, and also delivery services for those shopping by bicycle and on foot.

Zoning Action Items:

- 2. Review the Zoning Map to ensure that intense non-residential development is concentrated in areas served by utilities and infrastructure.
- 5. Review the zoning ordinance to ensure temporary uses regulation is flexible while still providing necessary oversight during approval.

Advocacy Action Items:

- 1. Market Pearl Beach, East End District and San Souci as unique waterfront development opportunities.
- 3. Direct new and growing industrial businesses to desired township locations.
- 8. Work with local businesses to encourage non- motorized travel. This may include offering delivery services for shoppers who make purchases and are traveling on foot and by bicycle.

Other Action Items:

- 6. Schedule annual check-ins with the DDA to facilitate discussion and align goals with available funding.
- 7. Explore a range of tools to assist with the rehabilitation, reuse and/or redevelopment of blighted and polluted commercial and industrial properties through possible creation of a brownfield redevelopment authority or through coordination with the existing DDA.
- Develop an illustrated guidebook that property owners can use as an idea resource for placemaking improvements on private property.

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