Michigan Department of Transportation
Rideshare/Non-Motorized Unit
Bureau of Transportation Planning

Bicycle Facility Map Prototype & Feasibility Study

Mapping the future of bicycle navigation in Michigan

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Executive Summary

Project Goal

The Michigan Department of Transportation (MDOT) has a legal obligation to educate the public on non-motorized transportation and encourage it as a mode of transportation. This project addresses that obligation; its goal is to define the replacement of the existing out-of-date county-based bicycle maps and the most practical way to implement and maintain this new standard. In developing the prototype the project considered:

- The logistical and financial issues of producing, promoting, distributing and maintaining the eventual product(s).
- Input from individuals with different perspectives on bicycling.
- Research into bicycle map programs from around the country.
- The feasibility of having the bicycle map program handled wholly, or in part, by the private sector.

Purpose of this report

This report documents the research and process that led to the proposed solution. This report provides the basis for the Michigan Department of Transportation's (MDOT) decision on the most appropriate and cost effective way to supply bicycling maps to the cycling community. Currently, MDOT staff provides bicycle maps for sale on a county-by-county basis; a complete set of all 83 counties (96 maps) costs $38.00. Not only does this activity take up valuable staff time; the information is incomplete, out of date, and not user friendly. In addition, there is no way to track the costs and income of this effort.

Through development of a prototype map, market estimate, and financial projections, the department can rationally determine the best manner in which to provide this information to the bicycling public. Beyond documenting this work for MDOT, and the bicycling community in the State of Michigan, this information is available for use by other states creating or refining their own bicycle map program.

Approach

The recommended solution came from a process that considered existing bicycle map programs, MDOT staff input, and input from a number of individuals with different perspectives on bicycling. The following outlines the steps that led towards the final recommendation:

1. Inventory and cursory analysis of the content of numerous bicycle maps from around the country.
2. Input from MDOT staff and focus groups on what information should be included in the map.

3. Case Studies of seven bicycle map programs (including Michigan) that encompass a number of approaches and styles.

4. Development of a few prototypes based on research, focus group input and direction of MDOT staff.

5. Development of the final prototype and financial projections based on focus group input and direction of MDOT staff.

Recommended Model

The proposed bicycle map will set the standards for the country in quality and content providing a useful guide for bicyclist in the state. The recommended model calls for 10 maps covering the state of Michigan. The map coverage is based on MDOT regions with two maps for the "North" Region and three maps covering the "Superior" Region. The primary map will be presented at a scale of 1" = 3 Miles, with selected urban are enlargements at 1" = 1 ½ Miles. The information presented on the maps is based on recent research regarding the most significant factors affecting the bicyclist comfort when using an on-road facility.

For the Primary Road system estimated peak-hour curb lane volume and known wide shoulders will presented. Context information includes place names keyed with available support facilities, residential areas, commercial/industrial areas, wooded areas, major parks, limited access highways, local roads, railroads, and 10' contour lines. All main roads will be labeled as will major points of interest. In addition, enlargements of selected bicycle and shared use trails will be presented along with special bicycling destinations such as Mackinaw Island.

The maps will be utilized to educate the general public on bicycle safety and laws. Map panels will discuss, where it is appropriate and legal to bike; tips and laws on riding prepared; and suggestions and laws on bicycle safety. There will also be information on organizations and governmental programs related to bicycling as well as general tourist, regional and weather information.

The target price for the maps is $6.95 each. The pricing of the maps is such that the program will become self sufficient and able to support frequent updates. Map production will be handled by MDOT and/or The Michigan Information Center with potential contracted assistance. The proposed distribution will be typical commercial channels so that the maps are readily available in numerous venues and MDOT staff is relieved of map distribution chores.

The data necessary to establish these maps, although limited, is still not available uniformly on a statewide basis. Proceeding with implementing the map program will be encouraged on a regional basis with remaining regions (if any) undertaken in four years with all of the necessary data becomes available.

The maps have a substantial secondary benefit in that the information collected to establish the maps is much the same as required to do bicycle facility planning. As there is are a number of regions currently considering regional bicycle planning efforts, those efforts could coincide with the bicycle map as the first tangible outcome of those planning studies.

Resource Inventory and Analysis

The purpose of this step was to gain an understanding of how other states have dealt with providing information to the bicycling community. In addition, this step looked at what resources are currently available in Michigan to produce, maintain, and distribute a bicycle map.

Inventory of State Bicycle Maps

A letter requesting a copy of the current state bicycle map or maps was sent to all state bicycle coordinators in the United States. Through this request of information, and from MDOT and The Greenway Collaborative, Inc. previous collections of maps, 22 official state bicycle maps were collected. In addition, numerous bicycle maps from other countries, private companies, and non-profit organizations were collected. Beyond these bicycle maps, many other road and trail maps were consulted. Lists of the bicycle maps collected are included in the Appendix.

The following features were inventoried on all of the official state bicycle maps:

- Developing agency/organization
- Price of the map or maps
- Format (i.e. state, quadrant, regional, county, strip/corridor map)
- Number of maps per state
- Size of the map
- Scale
- If there were map insets for urban or other special areas
- Presentation of road information
- Other features

Figure 1., Maps Inventoried, indicates which states responded to the request for information and the nature of the information that we have on hand for those states. Figure 2., Bicycle Map Formats, shows what states used which map format and the number of maps or route sets for each state. Table 1., is a summary of the survey work. Rather than list all features on every map only the "unique" or noteworthy features are included.

Comparative Analysis

The value of a state-by-state comparative analysis is limited due to major differences in such things as size, geography, and political structure. Still, with providing information to the bicyclist as the common element, the following narrative shares observations culled from an examination of the state maps collected.

Developing agency/organization – The vast majority of state bicycle maps are developed by the state's Department of Transportation. Exceptions are North Dakota (the Department of Parks and Recreation) and Missouri (Department of Natural Resources). For Wisconsin, the Division of Tourism took the lead, although the Department of Transportation was the other major player. For Colorado, the Department of Transportation cooperated with the University of Colorado. Like Wisconsin and Colorado, many of the state maps are the result of some level of collaboration, whether interdepartmental or with some outside educational or private organization.

Maps Inventoried

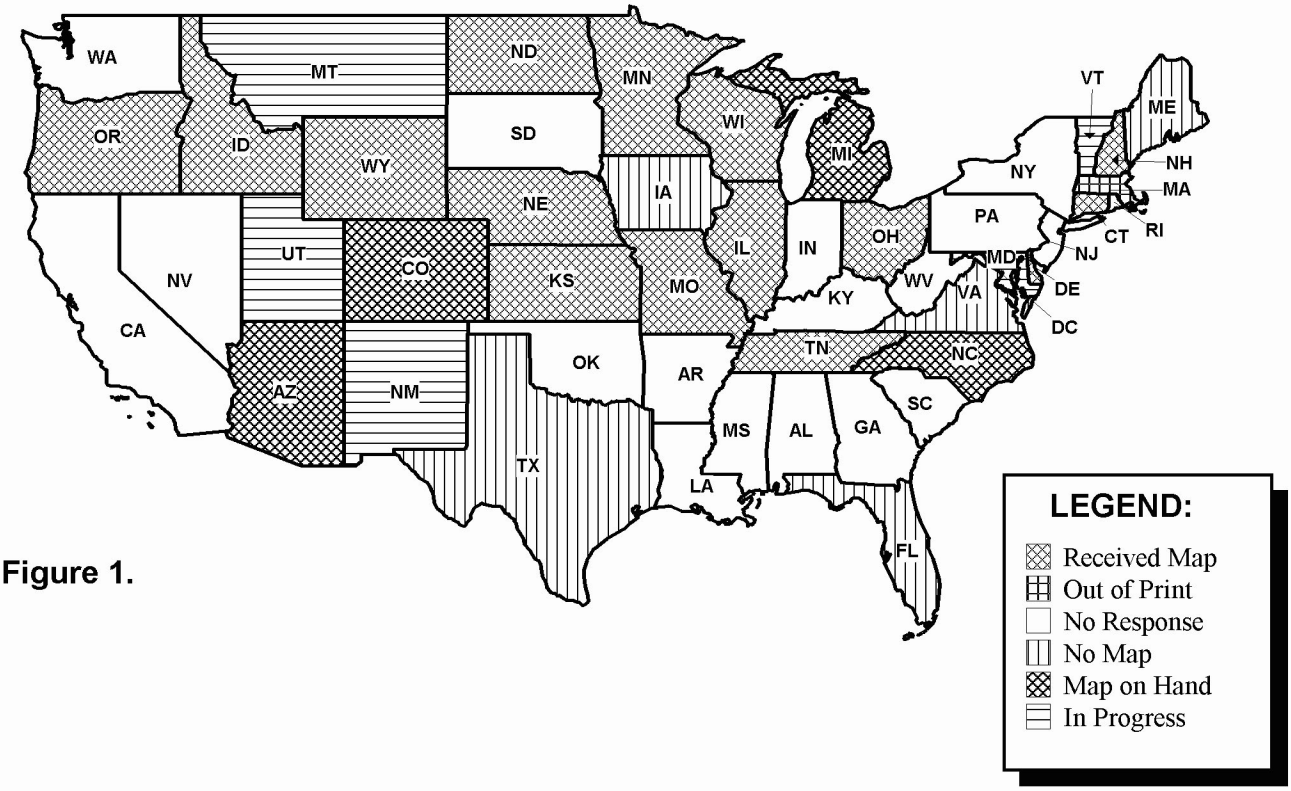


Figure 1.

Bike Map Formats

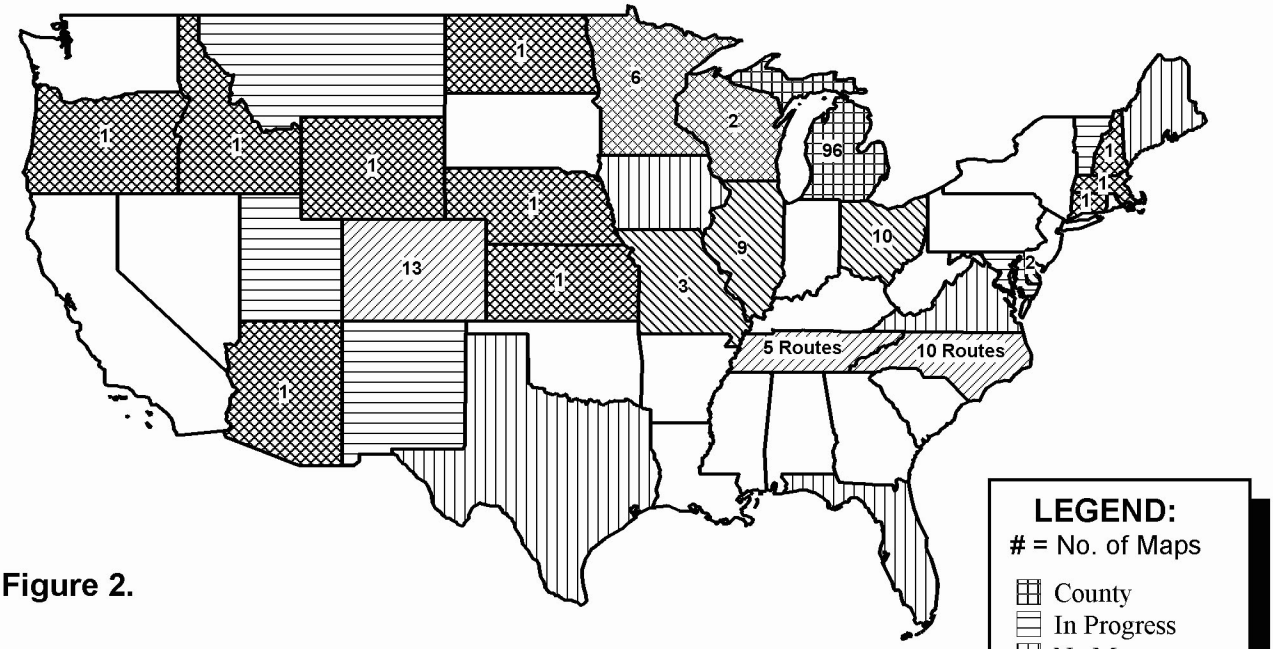


Figure 2.

Table 1
Map Inventory Summary

State	Agency	Response	Price	Format	Maps	Size	Scale	Insets	Road Info
AK		No Response		No Response				F	
AL		No Response		No Response				F	
AR		No Response		No Response				F	
AZ	ADOT/Task	Map on Hand	Free?	State	1	20" x 30"	1" = 19 Mi.	T	Suitability
CA		No Response		No Response				F	
CO	CDOT/Uof C	Map on Hand	$19.95	Strip	13	8" x 17"	1" = 4 Mi.	T	Routes
CT	CDOT	Received Map	Free	State	1	24" x 36"	1" = 3.5 Mi.	T	Routes
DC		No Response		No Response				F	
DE	DDOT	Received Map	Free	Region	2	23"x31"	1" = 2 Mi.	T	Suitability
FL	FDOT	No Map	Free	No Map				F	
GA		No Response		No Response				F	
HI	HDOT	Received Map	Free	Region	1	18" x 24"	1" = 2.25 Mi.	T	Routes
IA	IDOT	No Map		No Map				F	
ID	IDOT	Received Map	Free?	State	1	17" x 22"	1" = 25 Mi.	F	Suitability
IL	IDOT	Received Map	Free	Region	9	26" x 35"	1" = 3.5 Mi.	F	Suitability
IN		No Response		No Response				F	
KS	KDOT	Received Map	Free	State	1	9 " x 19"	1" = 28 Mi.	F	Factual
KY		No Response		No Response				F	
LA		No Response		No Response				F	
MA	MDOT	Out of Print		State	1			F	
MD	MDOT	In Progress		In Progress				F	
ME	MDOT	No Map		No Map				F	
MI	MDOT	Map on Hand	$38.00	County	96	19" x 24"	1" = 2 Mi.	F	Suitability
MN	MDOT	Received Map	$16.00	Quadrant	6	24" x 32"	1" = 6 Mi.	T	Suitability
MO	MDNR	Received Map	$1.59	Region	3	17" x 22"	1" = 8 Mi.	F	Suitability
MS		No Response		No Response				F	
MT	MDOT	In Progress		In Progress				F	
NC	NCDOT	Map on Hand	Free	Strip	10 Routes	8" x 8.5"	1" = 4.5 Mi.	F	Route
ND	NDP&RD	Received Map	$1.00	State	1	17" x 24"	1" = 24 Mi.	F	Factual
NE	NDOR	Received Map	Free	State	1	11" x 17"	?	F	Factual
NH	NHDOT	Received Map	Free	State	1	22.5" x 37	?	F	Factual
NJ		No Response		No Response				F	
NM	NMDOT	In Progress		In Progress				F	
NV		No Response		No Response				F	
NY		No Response		No Response				F	
OH	ODOT	Received Map	Free?	Region	10	17" x 22"	1" = 3 Mi.	F	Suitability
OK		No Response		No Response				F	
OR	ODOT	Received Map	Free	State	1	22 " x 33	1" = 15 Mi.	T	Factual
PA		No Response		No Response				F	
RI		No Response		No Response				F	
SC		No Response		No Response				F	
SD		No Response		No Response				F	
TN	TDOT	Received Map	Free?	Strip	5 Routes	5" x 9"	1" = 4 Mi.	F	Route
TX	TDOT	No Map		No Map				F	
UT	UDOT	In Progress		In Progress				F	
VA	VDOT	No Map		No Map				F	
VT	VDOT	In Progress		In Progress				F	
WA		No Response		No Response				F	
WI	WDOT/Touri	Received Map	Free	Quadrant	2	27" x 33"	1" = 5 Mi.	F	Suitability
WV		No Response		No Response				F	
WY	WDOT	Received Map	Free?	State	1	22" x 28"	1" = 16 Mi.	F	Factual

State Name	Unique Features
Alaska	
Alabama	
Arkansas	
Arizona	Safety laws, mean temperature chart, annual bicycle events, tourist info/welcome centers, mileage chart, and city inde
California	
Colorado	Background on area, points of interest, camping/hostels, public transportation, route cross sections, and shaded relief
Connecticut	State park list w/ facilities, State Forests, scenic routes, State Police posts, bike touring/safety info., ferry & rail info.
District of Columbia	
Delaware	Safety tips, list of bicycle touring clubs, info. sources, mileage map, description of co., state park locations & facilities
Florida	Extensive "bicycle touring kit"of information with local maps and trail maps but no state map is available
Georgia	
Hawaii	Map of O'Ahu only, steep grade chevrons, shaded relief, top ten safety tips
Iowa	No state map available
Idaho	Works with hwy. map, mileage chart, photos, climate, rules, tips, grades, and info. sources
Illinois	Photos w/ tourism info., climate info, recreation areas, and area descriptions
Indiana	
Kansas	Bicycle safety, travel information
Kentucky	
Louisiana	
Massachusetts	State map out of date/print, Metro West (Boston) maps available from MPO, BikeMaps Mass. (private map) available
Maryland	Map still in production but will be ready at the end of this year
Maine	No state map available, but DeLorme (a private corp.) has a coastal and inland bike route map for sale
Michigan	Detailed road surface info., urban areas excluded
Minnesota	Detailed shoulder info., separate maps for Twin Cities area, park info, rest areas, campgrounds, and water sources
Missouri	Introduction and history, operating and safety tips, red used to highlight prime choices
Mississippi	
Montana	Currently producing basic state bicycle map and guide in-house
North Carolina	Roadway conditon, cultural features, bicycle shops, restaurants, campground, and recreation areas
North Dakota	List of bed & breakfasts/inns/vac. destinations, info. sources, mtn. biking areas, bike shops
Nebraska	
New Hampshire	Bike Map inset on backside of highway map, vacation info., scenic routes, state parks, nat. forest info.
New Jersey	
New Mexico	Map now being drafted using Oregon's map as a guide, include shoulders, adt's, but no co. road info., also topo
Nevada	
New York	
Ohio	Wind and windchill charts, ferries, cross-state bike routes, info. sources, safety tips, tour preparation, and hazards
Oklahoma	
Oregon	List of local area bike maps, mileage table, grade chevrons, state parks, and wind direction
Pennsylvania	
Rhode Island	
South Carolina	
South Dakota	
Tennessee	List of major annual events, monthly temperatures, safety tips, bicycling laws, info. sources, and points of interest
Texas	No state map available
Utah	No current map. One now in progress, will be completed in summer of 1997
Virginia	No map available, they have reviewed other state maps
Vermont	No current map, working in-house to produce a useful bike map
Washington	
Wisconsin	How to use map, planning your bike tour, mtn bike trails in State Parks and Forests, and extensive info. sources
West Virginia	
Wyoming	Towns with services distinguished, mtn. bike areas, camp sites, rest areas, and significant grades

Price – A high percentage of the maps inventoried are free. Notable exceptions are: Colorado, where a complete set of 13 full-color maps costs $19.95; Minnesota, where four full-color state quadrant maps and two full-color urban area maps costs $16.00; and Michigan where a set of 96 three-color maps costs $38.00.

Map Format – A variety of bicycle map formats exist, including statewide, quadrants of states, a variety of regions, county, and metropolitan area. Many maps are combinations of a statewide or region with enlargements of urban areas. A few maps had companion maps where a map of a large area would reference smaller detailed maps.

Number of Maps per State – As you would expect, the number of maps is directly related to the Map Format. Half of the states inventoried have one bicycle map. The states with the most maps are Michigan, with 96 county-based maps, and the three states that used the corridor or strip map format.

Size of Map -- There is a wide variety in map sizes, even within the same format types. Kansas squeezed its entire state on one 9" x 19" piece of paper while Oregon was twice that size. The quantity and clarity of information presented is directly impacted by the available space.

Scale – Not considering the detailed map insets, scales range from 1" = 2 Miles in Delaware's map to 1" = 28 Miles for Kansas' map.

Map Insets – A third of the maps inventoried had some detailed mapping of the urban areas or other special areas. These maps all tended to be statewide or comprised of large regions. The graphic approach sometimes changed dramatically in the detailed areas.

Presentations of Road Information – There are three general methods used to present roadway information. For the purpose of this discussion, we refer to them as "suitability", "factual", and "routes". The following is a brief description of the three approaches.

Suitability – This approach rates roads in a tiered manner as to their appropriateness to bicycle use. This rating is often the result of a calculation based on such factors as average daily traffic counts, shoulder width, road condition, and various other considerations. The suitability of the roads is then often displayed in a tiered "traffic light" theme, where the most appropriate bicycle routes are green, routes that require some caution are yellow, and routes to avoid are red. There are a number of variations on this approach including presenting the most appropriate routes in red. Almost half of the maps used a suitability approach.

Factual – This approach presents information that is relevant to a bicyclist in a minimally judgmental fashion. Even with this approach, average daily traffic counts are displayed in the "traffic light" approach. This method does allow bicyclists to choose their routes based on the factual information, related to traffic volumes and roadway conditions, given on the map. Some maps using this approach appear cluttered as they attempt to present all of the roadway information. A little over a quarter of the maps used a factual approach.

Routes – With this approach, selected roads are highlighted for bicycle use and so designated. There is no attempt to code the entire road network. The routes are not colored in the "traffic light" style. This results in a nice clean graphic appearance. Recommended routes between places are evident. What is lost is potential hazardous or undesirable portions of the route, unless highlighted in some other manner. Some Transportation Departments focus their bicycle facility improvements along these designated routes.

A concern that is often raised when discussing the various merits of the different systems is one of liability. Recently, there has been significant progress in the delineation of suitability. This work is documented in *The Bicycle Compatibility Index: A Level of Service Concept, Implementation Manual* (Pub. No. FHWA-RD-98-095, USDOT, FHA, 1998). Delaware is completing work on their state bicycle map that uses a similar system, a level of service rating, developed by Sprinkle Consulting Engineers, Inc. Both rating approaches are based on extensive research. In the case of Delaware, their Attorney General's office felt the system would be acceptable for the state's map.

Other Features – On many of the bicycle maps, there is a wealth of information not related to the suitability of a road for bicycle travel. The following highlights some of the other features found on the state maps:

Reference roads – These are roads not considered part of the bicycle route network, but included for orientation purposes. Interstates, closed to bicycles in most states, are a good example. Idaho does not show any other routes beyond the bicycle routes. The bicycle map directs bicyclists to consult the state highway map for the complete road system.

Special routes – Several state maps identify special routes. Illinois, color-codes these routes individually, while Minnesota provides separate map insets that highlight various bicycle touring routes.

Cities and villages – Most all maps indicated cities and villages in some manner. A few maps used symbols or type size to indicate population size. Wyoming used city symbols to show what types of services could be expected in a town.

Water, food and lodging – On some maps there is no reference to these "support" facilities. Others had detailed information on particular features. Minnesota's maps have detailed park information that includes the availability of water, picnic areas, and restrooms. Some maps confined their lodging information to public campgrounds.

Park and recreation facilities – Many of the maps indicated significant features, such as State Parks. Approaches included: a simple symbol on the map; the park area and name on the map; photographs and descriptions of facilities; and detailed chart of parks and facilities. Many states such as Wisconsin, Illinois, Minnesota, and Arizona use the map as a tourism marketing tool emphasizing the natural resources of their state.

Points of interest – Beyond such major features as state parks, a few states included information on a variety of natural, cultural, and historic points of interest.

Mileage – Miles between destinations are shown in a number of ways. Some maps showed mileage on the map between two points (road junctions). Others used a mileage chart on the side of the map.

Bicycle repair shops – Several maps, including North Carolina, North Dakota and Illinois included the location of bike shops.

Bicycle safety/laws – The majority of maps had a section covering the state laws on bicycling, as well as "safety tips" for effective cycling. In a few maps, there were extensive effective cycling sections.

Bicycle resource information – A number of maps contained information that could be of interest to a cyclist, such as other bicycle maps, touring groups, and bicycle advocacy groups,

Latitude/longitude – The Illinois maps include this information. This might become a more important feature as more cyclists begin to use global positioning systems.

Bike Trails – Some maps indicated long distance wide-track trails, such as rails-to-trails conversions. A few others indicated the location of trailheads to mountain bike trails used primarily for recreation.

Ferry and bridge info – Information on location and fares was included on a few maps.

Area history/orientation – A few states, such as Illinois, prepared a detailed overview of a particular region.

Weather information – A number of states included information on such things as seasonal temperature ranges, wind keys, and prevailing winds in particular areas.

Topography – Two general approaches were used to indicate topography: shaded relief and chevrons pointing up hill. Shaded relief seems more appropriate for mid-western landscapes where there are a number of shorter up and down hills. The chevrons are useful in the western mountain states where there are notable long distance grades.

Special events – Tennessee and Illinois had information on special yearly events.

Existing Bicycle Map Resources for Michigan

There are many sources of digital data usable for the creation of bicycle maps. Fortunately much of the information is in the public domain. As such, it is less costly than purchasing it from private sources, or developing it from scratch. The following outlines some of the primary data sources.

Michigan Information System
The Michigan Information System, in the State Office of Management and Budget, is overseeing the creation of a single Geographic Information System (GIS) that will be utilized by a number of agencies. This system is working to bring together a number of GIS's such as the accident reporting system used by the State Police, TIGER files used by the Census Bureau, MIRIS, and the Transportation Management System being developed by MDOT.

Michigan Transportation Management System
A part of the mandate of the Intermodal Surface Transportation Efficiency Act (ISTEA) was the creation of six computerized management systems known as the Transportation Management System or TMS:

1. Bridge
2. Congestion
3. Intermodal
4. Pavement
5. Public Transit
6. Safety

In addition to these six systems, Michigan planned to create three additional systems

1. Real-estate
2. Maintenance
3. Strategic

These last three systems have not yet been implemented. The focus is to implement the six primary systems for the roadway first. In addition, the strategic system may not be implemented at all, as most of its components have been incorporated into the six primary systems.

At this point, the "framework" of the TMS is complete, and database is being populated. Information on all state trunk lines and national highway system roads are in the system. The Lansing tri-county area (Ingham, Clinton, and Eaton counties) is the prototype region. For this area, all county roads have been added to the system.

The essential management system for the creation of a bicycle map is the Intermodal Management System. Within the Intermodal Management System are two sub-sections that are specifically directed towards non-motorized transportation:

1. Shared Roadway Facility – this includes information on the road itself such as traffic volumes and shoulders.

2. Dedicated ROW – this includes information on facilities that would be parallel to the road within the ROW, or a separate corridor such as an abandoned railroad corridor converted to a bike path.

Please note that communities are not required to maintain data in all of the fields. The goal of this portion of the TMS is to set a framework so that communities who will use this information will organize it in a uniform manner. In addition, non-motorized information is a secondary priority and will most likely be addressed after all of the local roads are in the TMS.

The following is an outline of the previous two sub-systems:

Shared Roadway Facility:

- Roadway Type (state trunk line, county, local, etc.)
- Median Type (left turn lane, etc.)
- Truck Climbing Lane (yes or no)
- Commercial Average Daily Traffic (volume in trips per day)
- Regular Average Daily Traffic (volume in trips per day)
- Surface Rating (good, fair, or poor)
- Functional Class (collector, local collector, urban collector, etc., there is some overlap with roadway type listings but this field is aimed at naming federal classifications)
- Number of Lanes
- Lane Width
- Roadside Development (there is no data at this point, in the future this is intended for information on parks and rest areas at the side of the road)
- Speed Limit
- Base Rating (and engineering rating based on maximum design speed)
- Shoulder Type (unimproved, gravel, paved, etc., in the future there may be a difference indicated between concrete and asphalt pavement)

- Paved Shoulder Width Left
- Paved Shoulder Width Right
- Total Shoulder Width Left (and right)
- Total Shoulder Width Right (this would include the sum of paved and unpaved shoulders)
- Capacity Rating (what the roadway can handle in theory)

Dedicated ROW:

- ROW Width
- Horizontal Alignment Index (this is being developed and is currently blank, the intent is to indicate how "curvy" an alignment is)
- Vertical Alignment Index (this is being developed – in the future the intent is to indicate how "hilly" an alignment is)
- Shared Use (power lines, railroad tract, etc.)
- Former Use (abandoned railroad, etc.)
- Allowed Usage (bicycle, pedestrian)
- Non-road Surface Type (paved, crushed stone, etc.)
- Non-road Surface Width (improved for actual use)
- Non-road Shoulder Type (shoulder of the pathway, e.g. gravel, grass, etc.)
- Non-road Shoulder Width
- Lane Marking (lined, unimproved)
- Design Exceptions (this field is being developed – in future, the intent is to indicate areas that do not meet design standards)
- Year Built
- Year Last Improved
- Entity Responsible (for operations and maintenance)
- Users Permitted (this field is different than Allowed Usage)
- Volume of Use (based on spot checks)
- Open Hours or Seasons
- Deed Characteristics (owned, leased, etc.)
- Owner

Case Studies

From the maps inventoried, a few were selected for more detailed analysis. The selection criteria was based on:

- Overall quality of the map product
- User friendliness
- Diversity in map formats
- Approaches that may be adaptable to Michigan's situation

The following maps/states where chosen:

1. *Oregon Bicycling Guide* – A statewide map currently in final stages of development
2. *Explore Minnesota Bikeways* – A quadrant approach with separate urban area maps
3. Illinois Official Bicycle Map – A regional set of maps
4. *Chicagoland Bicycle Map* – A privately developed map of routes through Chicago
5. *North Carolina Bicycling Highways* – A set of strip maps of bicycle routes
6. *Colorado Bikeways* – 13 specialty touring maps on two corridors
7. Michigan County Maps – 96 Maps

Oregon Bicycling Guide

Oregon has one full-color bicycle map that covers the entire state. The map is free, and prepared by the Oregon Department of Transportation Bicycle and Pedestrian Program and Inventory & Mapping Unit in cooperation with the University of Oregon Department of Geography. The sheet size is 22 1/2" x 33 1/2"; the scale is 1" = 15 miles. One photograph is used for the cover panel.

The map is designed to serve touring bicyclists traveling in or through the state on long trips. All of the state highways (7,600-mi.) are included on the map, as are many important county roads. Some city streets are included on the reverse of the state map where more detailed city insets are provided. For local day trips, a list of local area bicycle maps is included, from which the bicyclist can obtain more detailed local information.

The Oregon Department of Transportation also publishes a route specific map for the Oregon Coast Bike Route. The intended audience is bicyclists on an extended tour along scenic U.S. Highway 101.

The roads found on the Oregon Bicycling Guide are coded to indicate traffic volumes, the presence of shoulders, and road grades. The coding is as follows:

Traffic Volumes

Green	Low Traffic Volume Paved Road	(<1000 ADT)
Yellow	Moderate Traffic Volume Paved Road	(1000-3000 ADT)
Orange	High Traffic Volume Paved Road	(>3000 ADT)
Red	Caution areas due to combinations of narrow roads, poor visibility, or high truck volumes.	
Double Black (bold)	Interstate Freeway (bicycles allowed)	
Double Purple (bold)	Interstate Freeway (bicycles not allowed)	
Black	Information Not Available (usually low traffic county roads)	
Gray	Gravel Road	

Shoulders

Double narrow black lines indicate shoulders four-foot or wider on both sides of a roadway.

Grades

1 Chevron	2-4% grade
2 Chevrons	4-6% grade
3 Chevrons	Over 6% grade

Additional Map Features
Other information found on the map includes distances, bicycle repair facilities, public campgrounds, prevailing summer wind directions, points of interest, bicycle caution areas, and separated paths shared with pedestrians. An index to Oregon's cities and towns is also included. This index is keyed to a grid of letters and numbers along the perimeter of the map that aid in finding the location of the various communities on the map. Another important feature to the map is that roads do not end at the state line. While not color-coded, roads are shown as they continue into the bordering states of Washington, Idaho, Nevada and California.

On the reverse of the map, in addition to the urban area insets and list of local area bicycle maps, is a map featuring the Willamette Valley. The legend for the Willamette Valley is the same as the state map. The legend for the urban areas is slightly different (blue is used to show streets with bicycle lanes or shoulders). The scales for the five insets on the back are all different. A mileage table is also provided.

In addition, on the back, the state is graphically divided into six distinct regions with accompanying text that briefly describes the weather, topography, and traffic conditions of each region. The road color coding system is explained, and information is provided on the rules of the road, and how to get other types of information.

The following disclaimer is printed on the map.

No warranty is made or intended as to the safety or fitness of the highways, roads or streets for bicycle travel. The State, counties, cities and their officers and employees disclaim responsibility and shall not be answerable or held accountable in any manner for loss, damage or injury that may be suffered by bicyclists who travel along highways, roads or streets in Oregon.

Oregon Bicycling Guide Telephone Interview

Phone interview with Michael Ronkin, Bicycle/Pedestrian Program Manager for Oregon Department of Transportation (4-23-97). Answers are italicized.

<u>Map Creation</u>
What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

Department of Transportation's Bicycle and Pedestrian Program. All of the Departments Districts were contacted as well as all counties and a select few bike clubs.

Was any of this work performed by a private consultant?

No, all done in-house except the printing.

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

New map is GIS based. Started from the highway map and eliminated a number of features that are not necessary for bicyclists. Things like unnamed streams, Indian Reservations, and Forest Service colorings. Than added coded ADT's, shoulders, grades, wind directions, and other features. Some added by hand.

How much did the development of the bicycle map information cost?

A guess would be about $20,000 not including staff time. Much time has been lost in

trying to get the GIS information in a compatible form for printing. Computer keeps crashing.

Map Maintenance

What entity is responsible for the ongoing maintenance of the map?

Department of Transportation's Bicycle and Pedestrian Program.

How often is this information to be updated? Who performs the update work?

Update the year after the first printing, then every three years after that. The Department's Bicycle and Pedestrian Program.

How much is budgeted for map maintenance?

Not a separate item, part of the job.

Map Printing and Distribution

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

Have $10,000 for new map. Asked printers how many they can print for that amount and then went with the printer that can print the greater quantity. Printing 20,000 for the first year. Unit cost is $.50.

How are the maps distributed? Who is in charge of the distribution process?

Department of Transportation serves as the central distributor. Have a special phone line for people to leave their name and address for single orders. These are processed once a week. Mass orders are sent to the various chambers of commerce, tourist offices, hotels, parks, and the Forest Service for further distribution.

How do you track your costs internally, is the bike map program self-sufficient?

Costs are not tracked internally. Maps are free. Grants are given to other governmental agencies for local bicycle map development.

How would you do things differently?

Make sure that the files are printable. Roads are coded based on ADT's and 4' shoulders, there is no classification given to roads as to the suitability for bicycling. Needed to have done a better job of outreach on the coding system so that all other governmental entities that are preparing maps use the same coding system.

Explore Minnesota Bikeways

Minnesota developed a series of six full-color maps covering the entire state. Dividing the state into quadrants, four maps comprise the statewide quadrant series, while another two maps specific to the Minneapolis-St. Paul Metro Area comprise the metro series. The statewide quadrant maps cost $3.00 each, and the metro series maps cost $2.00 each. Total cost for the complete set is $16.00, plus a $2.00 mailing charge per order. The Minnesota Department of Transportation prepared the map series. The sheet size for three of the four statewide quadrant maps is roughly 24" x 36", the fourth one is roughly 24" x 32", the scale for the statewide quadrant maps is 1" = 6 miles. The metro series sheet size is roughly 24" x 32", and the scale for the metro series maps is 3/4" = 1 mile.

The maps are geared for recreational and touring bicyclists and are intended as a guide to help in route selection. While no photographs are used the maps use artwork to convey a sense of what Minnesota is like. All state highways and county roads are included on the statewide quadrant maps. Local roads are included on the reverse of the state maps where more detailed insets of the larger cities are featured. One or more bicycle tour routes are also highlighted with each sheet.

The roads found on the statewide maps are rated to indicate suitability for bicycling based on average daily traffic and road characteristics such as speed of traffic, width of shoulder, and parking. The rating is as follows:

Roadway Suitability Ratings

Green	Good
Yellow	Fair
Red	Poor
Brown	Unsatisfactory
Double Red Lines (no color)	Bicycles Prohibited
Double Black Lines (no color)	Unrated Roads (usually unpaved)
Black Dots	Off Road Bikeway

Shoulders

Large Box Overlay	Paved Shoulders - 4' & greater
Small/Bold Box Overlay	Paved Shoulders - Less than 4'

Grades

No attempt is made to show topography.

Additional Map Features
Other information found on the maps includes distances along the trunk highways, public park facilities (showing availability of campgrounds, rest rooms, drinking water, and picnic areas), rest area facilities, special points of interest, and off road bikeways. While there is a grid of letters and numbers along the perimeter of the map, there is no accompanying index to Minnesota's communities. Roads also end at the state's border or at the edge of the quadrant map.

For the most part the urban area insets are on the reverse of the quadrant map (although three of the four quadrants use both sides of the sheet for total coverage), and include a coded list of parks for each community. Not all of the urban insets are at the same scale. There is no mileage table.

A small map inset accompanies each quadrant to show the location of that particular region to the rest of the state. There is no accompanying text describing any of the regions, although some descriptive text accompanies each of the highlighted bicycle tour routes. Each map contains a panel that provides tips on safe cycling and a panel that lists places a bicyclist can get additional information.

While a brief discussion of the computer generated roadway suitability ratings is located near the map legend, a good definition for the ratings is lacking. All that is mentioned is that the terms good, fair, poor and unsatisfactory are used to evaluate roadways for bicycling, based on the road design and the average daily motorized traffic.

The following disclaimer is printed on the maps.

The information shown is the most current available and may not, in all cases, reflect the status of the roadway environment.

Explore Minnesota Bikeways Telephone Interview

Phone interview with Charles Cadenhead, Jr., Bicycle Coordinator for Minnesota Department of Transportation (4-22-97). Answers are italicized.

<u>Map Creation</u>
What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

Department of Transportation by Legislative mandate.

Was any of this work performed by a private consultant?

Yes, hand drawing and printing

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

Hand drawn. Utilizes the road database.

How much did the development of the bicycle map information cost?

From 1979 to 1990, development cost roughly $130,000. Had one full time staff person during the development phase.

<u>Map Maintenance</u>
What entity is responsible for the ongoing maintenance of the map?

Department of Transportation

How often is this information to be updated? Who performs the update work?

No changes have been made to the maps since 1990-1991. Should be done yearly by the Sustainable Transportation Initiatives within the Department of Transportation.

How much is budgeted for map maintenance?

Nothing

Map Printing and Distribution

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

No budget for printing maps. Except for a reprint of 7,500 in 1994 for one quadrant, maps have not been reprinted.

How are the maps distributed? Who is in charge of the distribution process?

Department of Transportation Map Sales.

How do you track your costs internally, is the bike map program self-sufficient?

Costs not tracked internally.

How would you do things differently?

Convert to GIS database with information from road database.

Include the off-road trails.

Serve as a clearinghouse for other governmental agencies.

Create a public-private partnership. Department of Transportation would maintain the road information and contract out the work of making the map look good and the distribution. Hopefully this would be a profit-making venture. Department of Transportation wants to get out of having to do the distribution.

Currently have $10,000 front loaded for training and hardware and a 0.5 FTE to develop the GIS information and then hand it off to the private sector for completion and distribution.

Illinois Official Bicycle Map

Illinois divided their state into nine regions with a full-color bicycle map for each region. The maps are free and published by the Illinois Department of Transportation Division of Highways. The Department of Geography at Northern Illinois University does the cartographic production. The sheet size is roughly 26" x 35", the scale is 1.0 cm = 2.25 km or roughly 1" = 3.5 miles. In addition to the cover panel, many photographs are used on the reverse of the map to give a visual feel for the region covered by the map.

The maps are intended for utilitarian, commuting, or touring bicyclists with average or better experience and who are comfortable using the existing road system. The map is not intended as a guide for children.

All state highways and county roads are included but only a few municipal roads. Detailed city insets are not included with the map.

The roads found on the regional maps are rated to indicate suitability for bicycling based on traffic volumes (including truck traffic), outside lane widths, width of paved shoulders, and road surface type and condition. The rating is as follows:

Bike Routes

Green	Most Suitable for Bicycling
Yellow	Caution Advised
Red	Not Recommended for Bicycling
Gray	Use at Your Discretion (gravel- or earth-based road)
Double Black	Bicycles Prohibited

Special Routes

Purple	Bike Route
Purple and Red/Black Border	Bike Trail (paved)
Purple and Red/No Border	Bike Trail (other surface types)
Purple/Red	Bike Trail (mountain bikes only)
Brown	Historic Route

Shoulders

Double narrow black lines bordering a route indicates unpaved shoulders, while black dots within a route indicates paved shoulders.

Grades

No attempt is made to show topography.

Additional Map Features
Other information found on the map includes bicycle repair shops, food and lodging, public campgrounds, roadside facilities, Amtrak stations, and points of interest coded to a grid of letters and numbers along the perimeter of the map. The maps also have the latitude and longitude coordinates along the edge of the map. Also included are tables listing climatic conditions, services at recreation areas, and the locations of off-road bicycling and, for some regions, hiking trails. Roads are shown continuing into bordering states and regions, but no distances are provided between junctions.

The maps also include a small map inset that identifies the counties found in the region, and a panel that lists bicycle rules and safety tips. A detailed explanation of the computer generated rating system is provided but it fails to give a good definition for the ratings.

The reverse of the map gives a fairly detailed description of the region and highlights historic, recreation, and conservation sites. Color photographs give a sampling of the sites in the region, and a site locator map indicates their general location. A calendar of events is provided as is a list of places a bicyclist can get additional information. In order for total coverage, many of the regions are printed in part on both sides of the map sheet.

The following disclaimer is printed on the map.

This Map is published as an aid to bicyclists by IDOT and is not intended to be a substitute for a person's use of reasonable care. IDOT makes no express or implied warranty as to the safety or condition of the roads indicated to bicyclists for shared bicycle/motor vehicle use. The unpredictable change of traffic, road, and weather conditions will require the bicyclist to constantly review all routes for suitability. Thus bicyclists using this map ASSUME ALL RISKS AND RESPONSIBILITIES for their own safety when cycling on the routes indicated on this map.

Illinois Official Bicycle Map Telephone Interview

Phone interview with Craig Williams, Bikeway & Pedestrian Program Manager for Illinois Department of Transportation (5-21-97). Answers are italicized.

<u>Map Creation</u>
What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

Department of Transportation's Bikeway & Pedestrian Program. Contract with Northern Illinois University for the map work.

Was any of this work performed by a private consultant?

No.

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

Wanted to develop a methodology that provided a consistent rating for roads throughout the state without a biased rating from local bicyclists. The result is a computer decision program that provides a weighted suitability rating based on a number of bicycle-related factors. The information is extracted from the Illinois Roadway Information System. Database includes all paved roads in the state and is tied to the link nodes of the Information System.

Northern Illinois University scans the state's county maps, and then draws over them and assigns colors using Macromedia Freehand.

How much did the development of the bicycle map information cost?

Work all done in-house. A guess would be about $30,000.

Development of the first map was financed with NHTSA Section 402 funds through IDOT's traffic safety office. The remainder of the state is financed with FHWA Highway /Planning and Research Funds. This is the same source that funds the state highway map.

Map Maintenance

What entity is responsible for the ongoing maintenance of the map?

Department of Transportation's Bikeway & Pedestrian Program.

How often is this information to be updated? Who performs the update work?

To be updated every 2-3 years. The Department's Bikeway & Pedestrian Program with the Northern Illinois University.

How much is budgeted for map maintenance?

This year $10,000 is budgeted for revision work.

Map Printing and Distribution

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

The number of maps printed varies from region to region. The first map covering southern Illinois is a popular area for bicyclists. That region had 20,000 maps printed initially. Another 10,000 will be printed this year after revisions are completed.

For printing this year, $65,000 is budgeted. Costs $1.30 per map.

How are the maps distributed? Who is in charge of the distribution process?

Department's Map Sales office handles distribution. Since maps are free the Department controls distribution. Maps are provided to the Travel Bureaus and some to Visitor Centers. Travel Bureau's wish that they would print 500,000 maps. They use them for more then just bicycling.

How do you track your costs internally, is the bike map program self-sufficient?

Costs are not tracked internally. Maps are free. Maps are a source of pride within the Department and not questioned as to their expense.

How would you do things differently?

When project first began, GIS hadn't the capabilities that it does today. Would like to move to having the maps GIS based.

Northern Illinois University is working to have the information available to the county level and placed on Department's Web-site in the next several months.

Chicagoland Bicycle Map

The Chicagoland Bicycle Federation has produced a map of the greater Chicago Area. The maps cost $6.95 and have the same look as the Illinois Official Bicycle Maps. The Department of Geography at Northern Illinois University does the cartographic production. The sheet size is 24" x 33", the scale is 1" = approximately 1.6 miles. The maps use no photographs and have little text.

The map is designed to help cyclists in planning bicycle transportation and recreation, and recommends routes intended for bicycling from one area to another. The routes shown were proposed and evaluated by cyclists; using criteria that included traffic volumes, traffic speed, width of shoulders, width of outside lanes, intersection layouts, and pavement conditions. The map indicates that many of the routes are not ideal but they do represent the best in that particular area. The recommended routes are shown in red.

The maps include trails for mountain and road bikes, points of interest, parks, selected forest preserves, woodlands, universities and colleges, and the location of transit stations. The various levels of urban density are shown using different levels of shading. Not included is a street index, or a grid of letters and numbers along the perimeter of the map. The map does include an inset listing sources of information for the bicyclist.

The following disclaimer is printed on the map.

Conditions on roads vary depending on the time of day, the day of the week, and the season. Increased congestion during rush hours and construction may call for extra caution on these routes. Be prepared to make your own evaluation of traffic and road conditions, and plan routes appropriate to your riding skills. The user of this map bears full responsibility for his or her safety.

Chicagoland Bicycle Map Telephone Interview

Phone interview with Randy Neufeld, Director of the Chicagoland Bicycle Federation (4-28-97). Answers are italicized.

Map Creation

What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

The Chicagoland Bicycle Federation was in charge of initial development.

Was any of this work performed by a private consultant?

A volunteer worked halftime for 2-years on the development of the map.

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

Didn't want to do a suitability map since, particularly in an urban area, it is not reflective of where people are riding. Selected a dozen regions in the metro area, designated region leaders, and developed a form for use by volunteers to go out and check routes in each region. Hand-drawn initially moving toward having the maps on a GIS base with the next edition of the map. Trouble finding a suitable base that isn't too costly. May use some of the state's suitability data for the exurban areas.

How much did the development of the bicycle map information cost?

Hard to judge with all the volunteer time involved. Received a $4,000.00 grant that covered half of the cartography costs.

Map Maintenance

What entity is responsible for the ongoing maintenance of the map?

Chicagoland Bicycle Federation

How often is this information to be updated? Who performs the update work?

Normally every 2-3 years. Currently working on the 3rd edition which should be completed in 1998. The 4th edition will be available one year later. The 3rd edition is checking all routes, while the 4th edition is in anticipation of the completion of a number of ISTEA trail projects that will be added to the new GIS based map. Should be easier to update.

How much is budgeted for map maintenance?

$5,000.00 per year.

Map Printing and Distribution

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

Have sold 15,000 copies of the first printing and anticipate selling all 15,000 copies of the 2nd edition by the end of this year. Budgeted $5.000 for 10,000 copies. Fifty cents/copy

How are the maps distributed? Who is in charge of the distribution process?

American Bike Trails handles the wholesale distribution.

How do you track your costs internally, is the bike map program self-sufficient?

Don't track costs carefully. The map was developed for advocacy work not intended to be a money generator. Has proven very profitable.

How would you do things differently?

Needed more staff to maintain the volunteer base of information between editions.

Moving toward GIS based system. Would have done this initially but the technology wasn't available yet.

Best map would contain every street and street name with some reference to the house numbering system. Made compromise, to keep the number of maps down to the one double-sided map, by showing every street but not giving all the street names.

North Carolina Bicycling Highways

North Carolina has created a system of *Bicycling Highways*. Ten different routes have been developed along 3,000 miles of lightly traveled back roads (the state maintains 77,000 miles of highway). The routes have been selected according to criteria based on the safety needs of cyclists; however, the criteria are not defined on the map-sets. The routes generally parallel major highways. There is no attempt to show the condition of the roadway for bicycling, the location of road shoulders, or topography. The maps are free, formatted as strip maps, and prepared by the Department of Transportation Bicycle Program.

Using the 700-mile *Mountains to Sea* route as an example; it takes sixteen sheets to provide coverage for the route. Each sheet is 8" x 8 1/2" and is folded in half to 4" x 8 1/2". The strip map is on the inside of the fold and covers half of the folded sheet. The scale is roughly 1" = 4.75 miles. Each map covers a road riding distance of thirty-six to fifty-five miles. The sixteen folded sheets are black and white with the route highlighted with color. The maps are housed in a heavy grade paper that serves as a cover and map-holder. This sheet is 8 1/2" x 11" and is tri-folded to hold the folded strip maps.

The map-sets are geared for people taking an extended tour along one of the *Bicycling Highways* routes; they are not intended as a guide for children. While the map-sets use no photographs, narrative information is provided for each map segment that provides a general description of the terrain, hazardous areas, roadway conditions, services along the route or within reasonable biking distance, and identified points of interest. This information is located on the other half of the folded page under the strip map.

Special illustrated symbols are used to mark the location of bicycle shops, campgrounds, recreation areas, historic sites, and other points of interest. Additional symbols, printed in color, mark the location of country markets, full service towns, hazardous areas, and sections of the map that have been enlarged. These enlarged insets are located within the strip map to provide clarity for particularly confusing or difficult to follow portions of the route. Also in color are match lines that show how the various segments of the route fit together, with colored dashed lines indicating where another *Bicycling Highways* route intersects the one you are following.

In addition to serving as the cover and map-holder, the tri-folded sheet provides information on the *Bicycling Highways* system, the route you are traveling, how to use the maps, bicycle laws and safety tips, weather information, and sources for additional information. Also enclosed with the strip maps is a campground directory that is specific to that route.

The *Bicycling Highways* routes are signed with AASHTO approved bicycle route signs, and a state approved share the road sign designed by the Department of Transportation. The Department also works with local government in the development of local mapped systems. The result is a statewide grid of cross-state and regional routes that are enhanced as more detailed local mapped systems are developed.

The following disclaimer is printed on the map-holder.

This guide is published by the Department of Transportation as an aid to bicyclists. The Department of Transportation in no manner warrants the safety of the highways indicated on these maps for use by bicyclists. These roads are suggested only as more suitable than others for use by bicyclists as connecting routes. All roads suggested are regular roads of the highway system used by automobiles and trucks, with no special lanes provided for bicycles. As no

separate lanes are provided for bicycles and therefore are dangerous for use by bicyclists, the bicyclist assumes the risk for his own safety when using the routes indicated on these maps.

North Carolina Bicycling Highways Telephone Interview

Phone interview with Mary Meletiou, Office of Bicycle & Pedestrian Transportation (4-28-97). Answers are italicized.

Map Creation

What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

The Bicycle Program within NCDOT.

Was any of this work performed by a private consultant?

Yes, but not in the development.

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

Up to 5-6 years ago, all hand-drawn. Now redrawing onto Macs. Over time may move toward GIS based map.

How much did the development of the bicycle map information cost?

Staff Time. Hard to track actual costs.

Map Maintenance

What entity is responsible for the ongoing maintenance of the map?

Bicycle Program does all maintenance.

How often is this information to be updated? Who performs the update work?

Ideally every three years, but now having difficulty keeping up with work load.

How much is budgeted for map maintenance?

None for maintenance, have $10,000 to $15,000 budgeted for updates and reprinting.

Map Printing and Distribution

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

Print about 10,000 maps in-house for Bicycling Highways. Print anywhere from 5,000 to 20,000 maps per local map project. Distribute 15,000 to 16,000 maps per year through Bicycle Program, and another 15,000 or more through local governments who have completed a local map project. The Bicycling Highways maps print at 25 to 50 cents per unit, except the Mountains to Sea map-set which is closer to $1.00 per set. County maps print at 35 cents per unit. Urban maps print at 78 cents per map.

How are the maps distributed? Who is in charge of the distribution process?

The Bicycle Program distributes the Bicycling Highways maps.
The county maps and other local maps are distributed in bulk to the local entities for distribution.

How do you track your costs internally, is the bike map program self-sufficient?

Not tracked. All maps are free

How would you do things differently?

Nothing specific.

Colorado Bikeways

Colorado has completed 13 specialty-touring maps that provide route descriptions for two corridors. One corridor crosses the state east to west (the I-70/I-76 corridor) while the second runs north to south (the I-25 corridor). The Colorado Department of Transportation Bicycle/Pedestrian Program created the maps with the University of Colorado Geography Department's Cartographic Lab. Bicycle Colorado distributes the maps through a public-private partnership with the Department of Transportation. The maps cost $1.95 each, or $10.95 for the I-25 corridor (6 maps), $13.95 for the I-70/I-76 corridor (8 maps) or $19.95 for both corridors (13 maps). Each map sheet is 8" x 17" folded down to 8" x 3 1/2".

The maps are designed in an attempt to maximize the level of detail needed to travel the road system yet keeping the number of maps to a minimum and small enough to easily use and carry. The corridor design also attempts to show as much of the route as possible resulting in north not always being at the top of the map. The scale is 1" = 4 miles. Each 4-color map covers a road riding distance of fifty to ninety miles, providing recommended and alternate routes with loop ride possibilities. The routes are on paved roads with a few dirt roads included where they form links for bicycling. While there is no explanation on how the routes were selected, attempts are made to indicate road hazards including areas with high traffic volumes and narrow roads.

While no photographs are used, the color relief of the map, and the riding cross section that shows distances and elevation gains, and the regional narrative (on the reverse of the map) provide a feel for the history and topography of the area and route. Other information found on the map includes distances, bike repair, camping with level of service, level of service for cities and towns, contact numbers for information, hostels, points of interest, elevations, water stops, telephones, off road mountain biking, hiking and pedestrian routes, Amtrak stations, safety notes, and emergency medical service. Map insets provide enlargements of the route where more detailed information is required.

In addition to the riding cross section and regional narrative discussed above, the reverse of the map contains additional narrative information. This includes text on the identified primary, alternate and connecting bike routes, points of interest, caution areas, mountain bike options, camping, hostels, and options for public transportation. General weather information is also provided.

The corridors are marked by a black and green *Colorado Bikeways* sign that is similar to the black and red logo used on the front of each map. The sign is replacing the standard green and white AASHTO approved bicycle route signs used throughout the state.

No disclaimer is printed on the maps.

Colorado Bikeways Telephone Interview

Phone interview with Nancy Cifelli, Bicycle & Pedestrian Coordinator for Colorado Department of Transportation (5-6-97). Answers are italicized.

Map Creation

What entity was in charge of the development of the bicycle map information? If more than one entity was involved please list each and what role they played in the development process.

Department of Transportation's Bicycle Program and the University of Colorado Department of Geography's Cartographic Lab.

Was any of this work performed by a private consultant?

Yes, the onsite checks and judgement calls were sub-contracted out by the Cartographic Lab.

How was your bicycle map information assembled? Is it GIS based? Digital-cartography based? Hand-drawn? Or, assembled in some other manner? Is it tied to the road referencing system?

Used the old statewide suitability maps as a base of information (ADT's, shoulder widths). Maps use an Elevation Tinted Shaded Relief base. Only the two major cross-state corridors have been completed. Other corridors will be completed, as money becomes available. Still plan to do a statewide suitability map.

How much did the development of the bicycle map information cost?

Cost $100,000 to produce. Budgeted as part of Bicycle Program.

<u>Map Maintenance</u>

What entity is responsible for the ongoing maintenance of the map?

Department of Transportation's Bicycle Program in conjunction with the University of Colorado's Cartographic Lab.

How often is this information to be updated? Who performs the update work?

Maps have been out for less than two years. No maintenance has yet been performed. Money has been budgeted for this activity. Will utilize a student at $15/hour.

How much is budgeted for map maintenance?

Rough guess is $2,000 to $3,000 but no more than $5,000. This will include rework on selected maps and printing those sheets that needed an update.

<u>Map Printing and Distribution</u>

How many maps do you print? What is budgeted for printing? Do you have a per unit cost?

Printed 1,000 copies of all maps for each corridor at a cost of about $5,000 to $6,000.

How are the maps distributed? Who is in charge of the distribution process?

Bicycle Colorado does the map distribution for CDOT. Individual maps cost $1.95. CDOT gets .50 of that and pays the shipping costs, and a set amount, per packet sent out by Bicycle Colorado.

How do you track your costs internally, is the bike map program self-sufficient?

Have not really tracked costs but it could be tracked by looking at old budgets. The reason they decided to sell the maps was to attempt to recoup enough of the costs to fund reprinting.

<u>How would you do things differently?</u>

If distributing maps were the goal, likely would have sold maps to a distributor. It was important to help in the development of the advocacy group, but they may not be the best at distributing the maps. Still have plenty of maps left from the initial printing.

Work closely with locals and make sure they agree on routes etc. The east-west corridor does not include the section west of Grand Junction. This was recommended highly by the locals but not followed-up on. That area is now becoming very popular for Mountain Biking and doesn't show on the map.

Corridor concept is limiting. Creates many maps and gets expensive. Limiting factor on the amount of information on the maps was computer memory. Also was difficult to piece the various corridor maps together.

Have an enhancement grant to place green and black Colorado Bikeways signs along the routes (red was deemed inappropriate-red means stop). Colorado A.G. thought that signing a bike route was similar to signing a truck route (as for moving hazardous waste). Still Commission will not let them sign a stretch of one route where there is no shoulder at the present time.

The hope is that the Colorado Bikeway signs will serve as share the road signs.

Michigan - County Maps

It takes ninety-six maps to cover all of Michigan's eighty-three counties. The maps cost $1.00 for one county map, $3.50 for five, $6.00 for ten, $12.00 for the Upper Peninsula, $26.00 for the Lower Peninsula, and $38.00 for the whole set. The Michigan Department of Transportation prepares the maps, with recreational information supplied by the Department of Natural Resources. The sheet size is 18" x 24", the scale is 1" = 2 miles. The maps print one side only and have no text or photographs.

The bicycling information is highlighted in color over a black and white county map. No information is provided for urban areas, and bicyclists are urged to contact the appropriate urban area for local bicycle touring information.

The roads highlighted on the maps are coded to show rural roads with low traffic volumes, and rural roads with paved shoulders. The coding is as follows:

Traffic Volumes

Green	Paved Roads with Low ADT's (County Primary and State Trunk Line only)
Pale Red	Higher Volume Roads
Bright Red	Bicycle Travel Prohibited

Shoulders

Dark Blue	Paved Shoulder
Pale Blue	Designated Bicycle Routes

Grades

No attempt is made to show topography.

The following disclaimer is printed on each map.

This map is published to provide general bicycle touring information only, and does not reflect roadway conditions.

State Bicycle Maps Visioning and Input Summary

Methodology

To solicit input from the public, four small focus group meetings were scheduled in different regions of the state. An attempt was made to invite individuals with different perspectives on bicycling. This included representatives from transportation, recreation, government, and private citizens. Touring cyclists, commuting cyclists, recreational riders, and mountain bikers represented the bicycling community. Twenty-seven people took part in these meetings. Following a brief presentation on the ingredients of a number of state bicycle maps, each of the four focus groups was asked a series of six questions (the sixth question was added after the first meeting). The intent of the questions was to get opinions on what features and formats individuals thought desirable for a new bicycle map or maps for the state. The participants had 10-15 minutes to write out their answers. In a round table manner, each then had an opportunity to give their top 2-4 responses to each question. These responses were recorded on a flip chart or chalkboard. After everyone had an opportunity to provide their responses, each person went to the chalkboard or flip chart to select items under each category that they thought most important.

Focus Group Visioning Questions:

The following is an overview of all those items that got at least one vote during the prioritization process. The individual meeting responses can be found in the appendix.

Below (in bold), are the six questions that each of the focus groups were asked. *Italicized* under each of the questions are all of the prioritized responses collected at each focus group meeting. In parentheses is the total number of focus groups that selected a particular response. Responses that were similar have been grouped under a common heading and indented. This heading is not a prioritized response, and the bracketed number represents the total number of responses listed below it.

You've just gotten your ideal Michigan bicycling map, or maps.

1) **How did you get your map, or maps?**
Bike shops, Chambers of Commerce, Tourism Offices, and various Governmental and Transportation Departments were among the top selections for where people got their maps. Other locations included Bookstores, the Internet, and from Advocacy Groups such as the League of Michigan Bicyclists.

Government/Welcome Centers: [total of 5]
State Government/Welcome Centers (1)
Governmental Offices (1)
DNR Regional Offices (1)
Local Government (1)
Visitor Centers (1)
Bike Shop (4)
Chamber/Tourism (4)
Transportation Departments [3]
Departments of Transportation both Urban & State (1)

MDOT (2)
Book Stores (2)
Internet (2)
Advocacy Groups [2]
Advocacy Groups (1)
League of Michigan Bicyclists (1)
USGS Stockers (1)
Software (such as DeLorme) (1)

2) How much did it cost?

The majority felt that the map should be free, or at least reasonably priced. The most interesting response was the one for having the information available on CD-ROM, and that they were willing to pay more. Still no one suggested anything near what is the current sum of $38.00 for a complete set of Michigan bicycle maps.

Inexpensive to Free [8]
Inexpensive/Free (1)
Free (2)
Free to $4.00 (1)
Free to $5.00 (1)
$2.00/unit (1)
$2.00 to $3.00/sheet (1)
$3.00/sheet (1)
$5.00 [4]
$5.00 (1)
$5.00/unit (2)
<$5.00/unit (7 maps) (1)
$5.00/set (1)
$10.00/set (1)
<$10.00 (1)
$8.00 to $10.00 (1)
$10.00/map (1)
$20.00 CD-ROM (1)

3) How is it formatted (number of maps covering what type of area)?

Clearly, the people at the focus group meetings prefer some type of regional map format.

Some Regional Approach [14]
Region/Multi-County (that can be linked) (1)
Naturally Demarcated Identifiable Regions (1)
3/8" = 1 Mile (Same as Universal Regional Map) (1)
3 Regions (1-U.P. - 1- northern L.P. - 1- southern L.P.) (1)
4 Regions (2-U.P. - 2-L.P.) (1)
4 Regions (1-U.P. - 3-L.P.) (1)
5 Regions (2)
6 to 8 Regions (2)
7 Regions (1)
9 MDOT Regions (1)
10 Regions (2-U.P.include cities) (1)
14 Regions (Cog's & MPO's) (1)
Strip Maps (2)

Tiered (State-Region-Topic) (1)
State Map (U.P. on one side L.P. on other)
Readable from Handle Bar (1)
Urban (1)
Flexible Based on Customer Request (1)
CD-ROM (1)

4) What features are most helpful or important for you in planning your trip (choose 2-4 as most important)?

The distinction between questions #4 and #5 was not clear to all participants. As a result one focus group might put something under #4 that shows up under #5 in another focus group. This reflects the way information is displayed on maps. It can show up as both a feature on the map or as information that accompanies the map. Since the lines are blurred between the two questions, several responses were moved from one question to the other in an attempt to combine like responses.

Responses indicate that it is important to indicate road suitability or road conditions for bicycling. Also important to show are safety hazards, distances, off-road bicycle facilities, and on-road bicycle routes.

Routes [5]
- *Suggested Routes (1)*
- *Routes Evaluated by Cyclists (1)*
- *Existing Bike Routes Through State (1)*
- *Direct Routes (1)*
- *Top Cycling Routes with Mileage Options and Highlighted with Text (1)*

Suitability [4]
- *Road Suitability (2)*
- *Standard Color Coding for Roads/Green Most Suitable (1)*
- *Unsuitable Roads (1)*

Off Road Facilities [4]
- *Off Road Trails (1)*
- *Trailhead Icon for Mountain Bike Trails (1)*
- *Bike Paths (1)*
- *Path Surface (separate or shoulder) (1)*

Safety [3]
- *Safety Hazards (1)*
- *Restricted Areas (1)*
- *Barriers (bad bridge etc) (1)*

Road Surface (paved/dirt) (2)
Distances (2)
Width of Shoulders (1)
Traffic Volumes (1)
Bike Facilities/Intermodal Issues (1)

5) What other types of information are most helpful or important for you in planning your trip (choose 2-4 as most important)?

Other types of information that the groups felt were important included various points of interest, overnight accommodations, topography, mileage chart, bike shop locations, food availability, additional sources of information for the bicyclist, detailed urban areas, restrooms, and printing on a durable or waterproof paper.

Points of Interest [9]
- *Points of Interest (1)*
- *Natural (1)*
- *Man-made (1)*
- *Scenic Locations (1)*
- *Scenic Views and Tourist Spots (1)*
- *Non-Traditional Tourism Information (1)*
- *Text for Travel Features Coded to Map (1)*
- *Wildlife by Region/Season (insects) (1)*
- *Events/Cultural (1)*

Overnight Accommodations [6]
- *Lodging (2)*
- *Lodging/Campgrounds (1)*
- *Campgrounds (2)*
- *Bed & Breakfasts (1)*

Topography (3)
Waterproof Paper (2)
Mileage Chart (2)
Bike Shop Location [2]
- *Bike Shops (1)*
- *Towns with Bike Shops (1)*

Food (2)
Parks - Local, State, National (1)
Reference other Maps and Information (1)
Contacts for Bicycling Information (1)
Emergency Contacts (1)
Weather Information Including Extremes (1)
GPS Information (1)
Rules of the Road for Bicyclists (1)
Detailed Urban Areas (1)
Towns & Cities (1)
Hospitality/Urban Amenities (1)
Restrooms (1)

6) Bicyclists are a diverse group, who, beside yourself, would find this map or maps helpful?
Tourists and other recreation minded individuals were the top responses of the three focus groups that were ask this question.

Tourists (3)
Hikers (2)
Long Distance Cyclists (1)
Bike Clubs (1)
Recreational Day-riders (1)
Bike Tour Planners (1)
Families (1)
Scout Groups (1)
Cross-Country Skiers (1)
In-Line Skaters (other wheeled sports) (1)
Hotels/Motels (1)
Gas Stations (1)

Alternatives

Having explored how other states have dealt with providing road information to the bicycling community, several conceptual versions of a bicycle map were developed for Michigan. In the development of the alternatives a number of variations in the presentation of road information and additional support information were explored that lead to the final recommendations in the next section.

Selection of Alternatives

A decision to pursue the development of three alternatives, using two different mediums, was set at a meeting with MDOT staff following review of the following items:

- The inventory and cursory analysis of the content of the bicycle maps collected from across the country.
- The input collected from the four focus group meetings addressing the types of information that should be included in the map.
- The detailed analysis of the six maps chosen as case studies.
- Discussion regarding what type of information is appropriate to include on an official MDOT map and what are some of the legal implications.
- Status of the road referencing system.

It was further determined that Washtenaw County would serve as the area of coverage for development of the three alternatives. This was so that the prototype could take advantage of the work done to date on the Southeast Michigan Greenways Project, the relatively complete road information available through UATS, the mix of urban and rural land uses, and the consultants familiarity with the cycling conditions of the roads.

Alternative One – Large Regions

Examples of this approach are Minnesota and Wisconsin. These states have been divided into four regions with map scales of 1" = 6 miles, and 1" = 5 miles respectively.

Because of Michigan's unique shape, it was determined that three large regions worked better than the four regions used by Minnesota and Wisconsin. A scale of 1" = 7 miles was selected since it allowed for each of the three regions to fit on a sheet size of 26" x 35”.

In attempting to divide the state into three regions, the state's shape again caused some unique problems. It was determined that the usual approach of dividing the Lower Peninsula into two halves and using the Upper Peninsula as the third region was not going to work. The resulting

southern Lower Peninsula region extends north from the Indiana and Ohio borders to a line running roughly from Pentwater to Saginaw Bay and includes the thumb. The remaining northern tier of the Lower Peninsula combines with the eastern third of the Upper Peninsula to create a Central (or Northern) Michigan region. The remaining western Upper Peninsula becomes the third region (see Figure 3).

The scale of the large regions dictated that only the primary roads could be labeled and that labeling would be crowded at that. The scale also limited the information that could be displayed on support facilities and points of interest. On the back of the maps, detail maps of urban area would be provided but the space available would restrict the scale to approximately 1" = 3 Miles. This approach was generally considered unsatisfactory with the product having very limited appeal to the cycling public.

Alternative Two

Small Regions (Multi-County Approach)
An example of this approach is Illinois. The state has been divided into nine regions (IDOT Regions) along county lines. The map scale is 1" = 3.75 miles.

For this alternative a scale of 1" = 3 miles was selected. This scale allows significantly more information to be presented than under Alternative One. The simple inch to mile ratio also makes determining distances easier using a typical ruler. The scale lies between the scale identified by a bicycle map task force of the League of Michigan Bicyclists as their preferred scale (3/8" = 1 mile), and the scale used by Illinois for their regional maps (1" = 3.75 miles).

Two approaches to displaying road-based information were explored within Alternative Two. The factual based system presented average daily traffic volumes, and the location of shoulders and bicycle lanes four feet and over and those less than four feet. A subjective system was explored based on the research by Alex Sorton on road suitability ratings. While it was felt that the suitability approach presented a good snapshot of the road conditions there were concerns over the use of a subjective system on an official map.

On the maps many options were explored including briefs on counties histories, details on points of interest, etc. Concerns were discussed on how this information would be obtained and verified, as well as how pertinent this information was to the primary focus of the bike map program.

In grouping counties together as regions, several existing examples were examined including the State Planning and Development Regions and MDOT Regions. It was determined that utilizing MDOT Regions would be appropriate as the maps are MDOT products. It was also seen as beneficial to utilize the MDOT regions for both map production and integration and use by MDOT staff at the regional level.

Alternative Three

Digital (Distribution on Computer Disk, CD-ROM or via the Internet)
This format would make bicycling information available by computer. The information could be multi-tiered. It would allow for an economical means of providing information based on the

particular needs of a bicyclist. While this was seen as an economical choice from MDOT's standpoint there were concerns on the elitist nature of an official bicycle map being available only to those possessing the technology and financial resources to obtain the map through the use of a personal computer and potentially the Internet. While public institutions are more and more providing computers and Internet access to the public there were still concerns with this being the primary means of conveying the map.

Conclusions

Based on a review of the two paper map alternatives, it was determined to pursue the development of the Small Regions (Multi-County Approach). The primary reasons were the clarity of information at that scale and the benefit of using the MDOT regions. The road information should be presented in a factual manner and the map should not try to incorporate detailed history and point of interest information on the map as that strays from the core purpose of the bicycle map program and is best undertaken on other maps.

A significant concern that caused considerable delays in the project and much discussion was the availability of information necessary to portray either the basic factual information, let alone the date required to prepare a suitability rating. While MDOT has substantial data on the State Trunk Line System, in the Transportation Management System, the data for remainder of the Federal Aid (or Primary Road) system was sparse and inconsistent. At this point there is not a mandate to utilize the Transportation Management System for non-Trunk Line Federal Aid roads.

One of the most important omissions in available data is the presence and width or bicycle lanes and wide shoulders. This is seen as one of the most significant factors in a bicyclist choice of a potential route. The Average Annual Daily Traffic counts are also not uniformly available. Some if this information is available in paper formats in some jurisdictions.

A number of options to collect this data were discussed including the enlisting the help of bicycle clubs and the League of Michigan Bicyclists to assist with data collection. A significant concern was the incorporation of unverified data collected by volunteers on an official map and the liability that MDOT would incur if that data proved to be false.

Another concern discussed was the ability of a consultant or other third party to obtain data from the Michigan Information Center, Metropolitan Planning Authorities, Transportation Study Organizations, and Road Commissions. The Greenway Collaborative, Inc. experienced a significant hesitation and reluctance from numerous organizations to provide any data for use in this study. Only The Ann Arbor Area Urban Area Transportation Study was forthcoming with data and supportive of the efforts. Other organizations, even though this was clearly a MDOT project, cited incompleteness of information, fear of misrepresentation, and various other reasons for their unwillingness to share the information. Also there were considerable bureaucratic obstacles presented often resulting in circular directions to what organization the data really should be obtained from. It became clear that whatever organization was to ultimately prepare the maps, there would have to be either a strong institutional buy-in to the program and/or an official mandate to provide the information.

Recommendations

The final recommendations for the bicycle map program are grouped into the following interrelated topics:

- **Proposed Product** – What should the map look like and what information should be on the map.
- **Estimated Market Demand** - How many copies of each map are expected to sell/distribute and what are people willing to pay for the product.
- **Financial Projections** – What will the maps cost to produce and maintain and can the program be self-sufficient or profitable.
- **Implementation** – Based on known and projected conditions how should the bicycle map program proceed.

Proposed Product

The product is defined by the following elements:

- Scale of the maps
- Geographic coverage of the maps
- The size of the individual maps
- Road based information
- Additional map features

The following describes in detail the proposal for the previous map elements:

Scale of the Maps
The scale of the main map should be 1" = 3 Miles. This scale provides sufficient space to label the main roads, both Primary Roads, and significant local roads. It also allows for the labeling of key features such as Universities and major parks and the inclusion of important context information that influences bicycle route choices. As mentioned earlier the simple inch to mile ratio facilitates convenient distance measurements.

Geographic Coverage of the Maps
MDOT Regions are the bases for the map coverages. Due to disparity in size of the regions, some regions require more than one map. The North Region will be comprised of two maps and the Superior Region (the upper peninsula) will be comprised of three maps.

The Size of the Individual Maps
Based on the scale and the geographic coverage the resulting map size is 27" x 36". The orientation is primarily landscape with the one side of two maps having a portrait orientation. The maps will be folded in 4" x 9" portrait oriented panels. The main maps, enlargement maps, and additional map elements have been sized and positioned so they work neatly with the folds.

Road-Based Information
The presentation of the road-based information is based on the research documented in *The Bicycle Compatibility Index: A Level of Service Concept* (Pub. No. FHWA-RD-98-095, USDOT, Federal Highway Administration, December 1998). While that document proposes a level of service rating, or a subjective approach as discussed earlier, the key variables from that research are what is proposed be presented in a factual bases. This approach recognizes the limitations of the data available and the concerns regarding liability with a level of service system.

A significant benefit to this approach is the potential use the information collected for the bicycle maps in bicycle system planning. The Bicycle Compatibility Index (BCI), and other level of service approaches using similar data sets, are often being compared with the Latent Demand for a facility as a cornerstone for bicycle system planning. As there is significant interest in bicycle system planning in some of the MDOT regions the two efforts could be undertaken simultaneously, with the bicycle map being the first tangible outcome of the process.

The key variables presented are estimated peak-hour curb lane volume and known shoulder and bicycle lane locations. The following outlines how the key variables may be derived:

<u>Peak-hour curb lane volume</u>
The peak-hour curb lane volume *(CLV)* is based on the following calculations:

$CLV = PHV / N$

where:

PHV = peak-hour directional volume

N = number of through lanes in one direction.
If this variable is unavailable directly it may be deduced from the number of lanes and the directional factor assuming that 3 and 5 lane roads include a turning lane.

$PHV = AADT \times K \times D$

where:

AADT = average annual daily traffic (vehicles per day)

K = peak-hour factor (the proportion of vehicles traveling during the peak hour, expressed as a decimal), the default value is .10

D = Directional split factor (the proportion of vehicles traveling in the peak direction during the peak hour, expressed as a decimal), the default value is .55

The peak-hour curb lane volume is then grouped into 4 ranges 0 to 100, 100 to 200, 200 to 300, and over 300. The information is presented without any subjective description but in a color code system that goes from green at the lowest volumes to red at the highest volumes. By using the worst case volume scenario and expressing it in a hourly figure the cyclist can get a fair idea of how many times they will be overtaken by an automobile during a given period of time. Recognizing that there will be many road segments where missing variables make a calculation impossible a separate gray color code will indicate that information is unavailable.

Bicycle Lane/Wide Curb Lane/Wide Shoulder

The presence of a bicycle lane, a wide curb lane or a wide shoulder is seen as the other key variable in cyclist choice of a cycling route. These three variables have been grouped for the practical purposes of simplifying the graphic representation on the map and simplifying the data collection on an already poorly documented variable. While there may not be any specific data on the presence of a bicycle lane or a shoulder width, there may be information on the number of lanes and total pavement width. In these cases the curb lane width can be calculated for two lane roads. This grouping is also justified as the difference between the three types of facilities in cyclist preferences and safety is not significant. This approach can be verified in both the BCI report and *A Comparative Analysis of Bicycle Lanes Versus Wide Curb Lanes* (Pub. No. FHWA-RD-99-034, October 1999).

It is recommended that the following standards be followed when including a facility on the map:

- Bicycle Lane ≥ 1.2 m (approximately 4 feet)
- Paved shoulder ≥ 1.2 m (approximately 4 feet)
- Wide Curb Lane ≥ 4.2 m (approximately 14 feet)

The recommendations are based on *The Guide for the Development of Bicycle Facilities* (AASHTO, 1999) and the guide should be referred to for special circumstances such as the presence of parking. The legend should clearly indicate that the lines only show "known" situations. It is expected that in the first rendition of a regional map many cases may be overlooked. Reports from cyclists, verified by the responsible agency, can be incorporated in subsequent generations of the map.

Included roads and data required

This information is calculated for only for the paved primary road system, excluding limited access highways. In essence, the minimum data required to portray the road based information is the average annual daily traffic, the number of lanes, the directional factor, functional classification, and whether the road is paved or not. Additional information improves the accuracy of the equation but the default values should be suitable for the purposes of the map.

Additional Map Elements

Beyond the road information substantial additional information further defines the usefulness of the map product. This information can be grouped into map route context information, urban area map insets, separate bicycle facilities, and supplemental information.

Route context information

Supporting the road-based information many other layers of information enhance a cyclist understanding of what they can expect along a particular route. The selection of the route context information is based on the focus group input and secondary variables in found the Bicycle

Compatibility Index research. Adjacent land use is seen as an important variable. Knowing where commercial and industrial lands are provides a cyclist with some nominal understanding of what type of turning movements to expect. Residential land uses are generally viewed by cyclists as positively impacting a route. Major parklands were included both for land use context and as major destinations. Forested areas were included primarily to provide some idea of the visual quality of the rural landscapes along a route that may influence recreational riding.

Limited access highways were included orientation and for the impact that interchanges may have on route selection. Interchanges are indicated because of the high speed and high number of turning movements at interchanges may influence route choice. Local major roads, such as unpaved mile roads, are included because they offer a viable alternative to the paved primary roads, especially to cyclists with mountain bikes. Minor residential and local roads, are also included because they also offer a viable alternative to the primary roads as well as they provide an excellent context.

Place name labels were utilized for both context and to indicate available facilities. Many large communities have all of the support facilities desired by a cyclist. To utilize icons for all of these towns would clutter the map and be of little use. Instead, communities with a complete set of support facilities are indicated in all capitals. Communities with limited facilities are indicated in lower case type and are further annotated with international icons that illustrate what facilities a cyclist would expect to find in that town.

Water features, railroads, and 10-foot contour lines round out the map context features. The contours lines are not labeled and only occasional high point and low points will be indicated. Their main purpose is to illustrate the general steepness of the grade.

The context data comes from a number of sources. The Michigan Resource Information System (MIRIS) data will be used as the foundation for land use, water features and place names. USGS digital elevation models will be used to generate the contour lines. Major park lands can be compiled from MIRIS data, Commercial GIS data, and local GIS and paper sources.

Urban Area Map Insets

The main map scale of 1" = 3 Miles, is sufficient to label all of the main roads in a rural area but only selected roads in an urban area. Also, as the main roads tend to become closer together in an urban areas the main maps tend to crowd the road information. To remedy this, urban areas will be displayed in map insets at twice the scale. This allows for more roads and points of interest to be labeled. The same map look will be used for uniformity and clarity.

Separate Bicycle Facilities and Special Bicycle Areas

Beyond the road conditions separate bicycle and shared use facilities constitute important resources for cyclist, especially novice and young cyclists. These facilities are indicated on the main map and the urban area inset maps. For selected facilities, separate detail maps will be provided. In addition for selected areas, such a Mackinaw Island, that are unique places for bicyclists, will have their own separate more detailed map.

These separate inset maps can provide information on staging areas, rest rooms, and points of interest, etc. These maps may be done with special effects such as 3-D modeling or in some other artistic manner. In addition, photos of the area and miscellaneous facility information can be included in these map insets. The goal of granting such importance to these facilities is two fold. First, there is a demand for these types of maps, and their inclusion on the bicycle map will increase sales. Second, the bicycle map may be used as a tool to encourage bicycling beyond off-

road facilities as a mode of transportation. The maps, as detailed in the following section, will provide important information on safe and responsible cycling to a group of cyclists who may not be familiar with much of this information.

Supplemental Information
As indicated the bicycle map is seen as advocacy tool for safe and responsible bicycling as well as a guide to potential routes. To this end a number of map panels (4" x 9" rectangles) are devoted to a variety of safety topics. "Where to Bike" indicates the general rules regarding different Federal and State facilities. "Ride Prepared" and "Bicycle Safety" mix important tips with Law regarding bicycling in Michigan. "Bicycle Resources" presents governmental and nonprofit organizations that are important to bicycling in the state.

Other supplemental information includes tourist information, information on the sponsor(s) of the map (assumed to be MDOT), and a disclaimer.

Estimated Market Demand

Numerous factors were considered in attempting to determine the demand for the new bicycle maps. In this section the following factors were considered:

- Number of maps in a complete set (Format)
- Analysis of MDOT's past bicycle map sales and pricing
- Map Quality
- Marketing and Distribution
- Retail Price Target

Number of Maps in a Complete Set (Format)
The proposed format calls for ten maps to cover the entire state. It is unlikely that each of the regions will be of equal importance to all bicyclists. With limited dollars available for producing bicycle maps, it therefore becomes increasingly important to determine the potential demand for each of the regional maps as best as possible. With the likelihood that the development of the maps will be phased in over a three-year time frame, it could hurt the long-term viability of the mapping program if the potential demand of the first maps is set unrealistically high.

MDOT's Past Bicycle Map Sales
While records of MDOT map sales are not complete, they do provide a reference point from which to gage future map sales. The most complete set of records exists for the three-year period from 1989 through 1991 (see Table 2). During that period there were 4,385 map orders, and 88,557 maps sold. An average of 20 maps sold with each order.

During that time, several options were available from which maps could be selected. They could be ordered individually, in-groups of five or ten, or, one could order maps for the entire Upper Peninsula, the eastern or western halves of the Lower Peninsula, the entire Lower Peninsula, or the entire state. Discounts were offered for quantity purchases. Fortunately, sales records were

Table 2
MDOT Bicycle Map Sales 1989 - 1991

Order Type	1989 Number of Maps	1989 Cost Per Set	1989 Sets Ordered	1989 Maps Sold	1989 Total Sales	1990 Sets Ordered	1990 Maps Sold	1990 Total Sales
Individual County	1	$1	353	353	$353	845	845	$845
Individual Counties	5	$3	296	1,480	$888	285	1,425	$855
Individual Counties	10	$5	245	2,450	$1,225	248	2,480	$1,240
Upper Peninsula	15	$11	70	1,050	$770	80	1,200	$880
W. Lower Peninsula	34	$11	97	3,298	$1,067	161	5,474	$1,771
E. Lower Peninsula	34	$11	78	2,652	$858	74	2,516	$814
Lower Peninsula	68	$22	70	4,760	$1,540	93	6,324	$2,046
All 83 Counties	83	$32	146	12,118	$4,672	203	16,849	$6,496
Totals			**1,355**	**28,161**	**$11,373**	**1,989**	**37,113**	**$14,947**

Table 2 Continued

Order Type	1989 Number of Maps	1989 Cost Per Set	1991 Sets Ordered	1991 Maps Sold	1991 Total Sales	Yearly Avg. Sets Ordered	Yearly Avg. Maps Sold	Yearly Avg. Total Sales
Individual County	1	$1	309	309	$309	**502**	502	$502
Individual Counties	5	$3	179	895	$537	**253**	1,267	$760
Individual Counties	10	$5	168	1,680	$840	**220**	2,203	$1,102
Upper Peninsula	15	$11	56	840	$616	**69**	1,030	$755
W. Lower Peninsula	34	$11	89	3,026	$979	**116**	3,933	$1,272
E. Lower Peninsula	34	$11	48	1,632	$528	**67**	2,267	$733
Lower Peninsula	68	$22	69	4,692	$1,518	**77**	5,259	$1,701
All 83 Counties	83	$32	123	10,209	$3,936	**157**	13,059	$5,035
Totals			**1,041**	**23,283**	**$9,263**	**1,462**	**29,519**	**$11,861**

kept for each of these options allowing for an approximate conversion of the information to the new MDOT Regions (see Table 3).

The numbers in Table 3 are all generated from the column in Table 2, labeled "Yearly Avg. Sets Ordered." With 157 sets sold of the complete state, that number of maps is credited to each of the new MDOT Regions in Table 3. Since 77 sets were sold of the Lower Peninsula that number gets credited to the new MDOT Regions located in the Lower Peninsula. The 67 sets of maps sold of the eastern Lower Peninsula get credited to the four regions located in the eastern half of the state. The 116 sets of maps sold of the western Lower Peninsula get credited to the two regions located in the western half of the Lower Peninsula, and the 69 sets of maps sold of the Upper Peninsula get credited to the three maps that cover the Upper Peninsula.

To allocate the individual county orders they first were multiplied by the number of maps in the order set, either one, five or ten, and then the totals divided by 8.3, the average number of counties in each map, and were portioned out amongst the new MDOT Regions based on the 2000 Estimated Populations for each region. This information was then used in Table 4 as a baseline for estimated sales. The estimated increase in sales in based on the following.

Map Quality

One of the major objectives of this project is to produce a map of high quality. It is important to have a product that not only looks good but is also useful, something that a bicyclist will want to have. The prototype is an attractive color map with a great amount of detailed road information, urban area and trail insets, photographs, and other information useful to bicyclists. When produced it will be one of the outstanding bicycle maps in the country. The map is expected to appeal not only to avid bicyclists but novice bicyclists. It also may be used by "armchair adventures" that may purchase the maps to explore area they may never bicycle. It can be also be marketed as an attractive and useful gift.

Marketing and Distribution

As the target audience has gone well beyond the avid cyclist the manner in which the map is marketed and distributed should change as well. Before a bicyclist would have only known about the availability of the bicycle maps if they participated in a major event where MDOT bicycling information was handed out, were apart of the bicycling club or organization that provided this information in their correspondence or websites, found the non-motorized section of the MDOT website, etc. The chance of an average recreational bicyclist even knowing about the availability of these maps was slim.

To reach a broader audience the map distribution needs to go to a typical broad based distribution channels. Contracting with an organization such as Universal Map, who is the largest map distributor in the country would be an appropriate approach. Such an organization could market the map to book stores, specialty shops, oversee restocking operations, and provide many new outlets for the map. In particular, it would be would be wise to target the large bookstore chains. The growth of these venues in the past number of years has been tremendous and most of the stores feature a large travel section.

In addition, gas stations, an important venue for traditional road maps is an important target. When vacationing, people who are looking for additional information on an area they are visiting often turn to the gas station/convenience store map rack is a resource. Bicycle destinations, such as separate bicycle facilities, would be a point of interest for many travelers who may even have bicycles strapped to their car.

Table 3
Average 1989 - 1991 Map Sales Reallocated to Proposed Maps

Proposed Map Regions	2000 Estimated Population	Percent of State Population	Orders for Complete State	Orders fo Lower Peninsula	Orders for E. Lower Peninsula	Orders for W. Lower Peninsula	Orders for Upper Peninsula	* Orders for a Single County	* Orders for a Set of 5 Counties	*Orders for a Set of 10 Counties	Total Allocation	% of Total
Superior, W	78,000	1%	157				69	0	1	2	230	7%
Superior, C	179,100	2%	157				69	1	3	5	235	7%
Superior, E	61,400	1%	157				69	0	1	2	229	7%
North, W	262,700	3%	157	77		116		2	4	7	363	11%
North, E	274,700	3%	157	77	67			2	4	7	314	9%
Grand	1,180,700	12%	157	77		116		7	18	32	408	12%
Bay	1,242,000	13%	157	77	67			8	19	34	362	11%
Southwest	930,200	10%	157	77		116		6	15	25	395	12%
University	1,419,400	15%	157	77	67			9	22	38	370	11%
Metro	4,148,600	42%	157	77	67			26	65	112	504	15%
Totals	*9,776,800*	*100%*	***1,570***	***539***	***268***	***348***	***207***	***60***	***152***	***265***	***3,410***	***100%***

* County map data distributed based on the average number of counties in a typical map (8.3) and a regional percent of the state's population

Table 4
Estimated Map Sales

Proposed Map Regions	Historic Data (Table 2, Total Allocation)	Estimated Increase in Sales	Est. Avg No. of Maps to be Sold/Yr.	Projected Map Life	Estimated Sales in Map Life	Estimated No. of Maps to Print	Est. 2000 Population in Map Region	Est. Map Sales as a Percent of Reg. Pop.	
Superior, W	230	200%	689	3	2,068	2,300	78,000	2.65%	Tourist area
Superior, C	235	200%	704	3	2,113	2,400	179,100	1.18%	Tourist area
Superior, E	229	200%	687	3	2,061	2,300	61,400	3.36%	Significant tourist area
North, W	363	200%	1,089	3	3,266	3,600	262,700	1.24%	Tourist area
North, E	314	200%	943	3	2,830	3,200	274,700	1.03%	Tourist area
Grand	408	300%	1,631	3	4,893	5,400	1,180,700	0.41%	Lots of trail maps should spur sales
Bay	362	200%	1,085	3	3,255	3,600	1,242,000	0.26%	
Southwest	395	200%	1,186	3	3,559	4,000	930,200	0.38%	
University	370	250%	1,296	3	3,889	4,300	1,416,400	0.27%	
Metro	504	600%	3,527	3	10,580	11,700	4,148,600	0.26%	Poor map coverage in previous maps
Totals	***3,410***		**12,838**		**38,514**	**42,800**	9,773,800	0.39%	

Retail Price

If the maps are going to go through a traditional wholesale and retail distribution channels there must be some profit incentive. In addition, if a goal is to make the program self-sufficient there must be revenue stream. If the maps were to be distributed at no charge, MDOT probably couldn't print enough of them, plus MDOT would have to underwrite the distribution process. In Illinois, where the maps are free, the Chamber of Commerce wishes that the Department would print thousands more copies than they do.

The financial resources necessary to produce, print, distribute, and update the maps is substantial. The use of public tax dollars every year to provide the maps as a service to the cycling community would probability be a difficult sell. As the majority of the focus group seemed willing to pay some amount for the maps and that is the current practice in the state, it seems charging for the maps is an acceptable course. Also, as stated earlier, the maps must cost enough to engage the free market system that is seen as the most desirable distribution approach.

The question then is what to charge. It must be enough to make distribution and retailing the maps worthwhile to the private sector and provide some revenue stream to the map program. This must be balanced of course with what the market will bear. To determine what the market will bear we looked at historical map sales and similar specialized map products currently for sale.

Historical Bicycle Map Costs and Spending

The following calculations are based on the historical map sales, as indicated earlier, the most complete set of records exists for the three-year period from 1989 through 1991. If you take the total dollar amount from sales ($35,583.00) and divide it by the number of maps sold (88,557) you get the average spent per map (.40). Now divide the number of maps sold (88,557) by the number of orders (4,385) and you get the average number of maps per order (20). Multiply the two numbers together (20 x .40) and you get the average dollar amount of each order, $8.00, or about $10.47 in year 2000 dollars.

Now take the number of counties in the state (83) and divide it by the number of new maps to be produced (10) and you get the average number of counties per map (8.3). Since the average number of maps ordered was 20, and we have each of the new maps containing 8.3 counties, we could assume, that on average, each new order will be for 2.4 maps. Since the average dollar amount of each order is $8.00, than each map would cost $3.33 in '89-'91 dollars, or about $4.36 in year 2000 dollars.

Another way to figure the price to charge for a new map is to simply take the average spent per county map (.40) and multiply it by the average counties per new map (8.3). This gives you the cost of a new regional map based on the equivalent geographic area of the old county maps (8.3 x .40 = $3.32 in '89-'91 dollars, or $4.36 in year 2000 dollars).

Similar Map Products

Universal Map produces a series of regional maps of a similar scale and coverage to the proposed bicycle map series. Their map retails for $3.95, it has a black and white back and a multi-color front. Fen's Rim produces regional maps for northern Michigan at a similar scale to the bicycle map series. These maps are full color front and back and retail for $5 to $6 range depending on the quantity. The Chicagoland Bicycle Federation sells their maps for $6.95.

Conclusion

The specialized nature, and lack of competition, provides significant leeway in pricing. The Chicagoland experience indicates that a well-designed bicycle map has a viable market willing to

pay a premium over a typical map for the additional information. As the proposed map will be an official map of the state the price should be set at the minimum amount that still provides for production, printing, and distribution costs. The new maps will have a high development cost that can only be deferred over a limited sales do to its focused audience. This will in turn lead to a higher than desirable price. This figure based on Table 5, appears to be $6.95

Considering the higher quality of the new maps, the map sales experience of other states and areas, a pent-up demand for a bicycle map, and a better marketing and distribution plan, it is very likely that map sales will significantly exceed the previous bicycle map sales, even with higher price maps. We think it is realistic for sales to exceed the approximate numbers by an average of 200% for most regions. In the case of the Metro region, where the previous maps were of extremely limited value and sales were disproportionately low when compared with population, we expect this figure to be around 600%. This is based on population and the sales history of the Chicagoland bicycle map. Table 4, illustrates the project maps sales based on historic data and in comparison to a regions population.

Financial Projections

Financial projections are based on the following:

- Analysis of other state's development and maintenance expense
- Production and distribution estimates from potential map producers

To get a handle on the expense to develop and produce a set of ten bicycle maps, a number of assumptions were made to address certain variables. These assumptions were then built into Table 5. The table is actually a working spreadsheet that was used to consider many different scenarios before arriving at the one presented. Please recognize that the figures in the tables have been developed to get a handle on potential income and expenses and should be used with care. There are any number of factors that might come in to play to increase or decrease the expense for the development, production or distribution of a set of nine bicycle maps.

The variables addressed here relate to the following key components:

- Development Expense
- Printing Expense
- Maintenance Expense
- Distribution Expense
- Income from map sales

Development Expense
A key variable in the development expense is the availability of information. The numbers

provided do not include any fieldwork to determine information such as bicycle lane locations. There is an allowance for digitizing parks, and bicycle or shared use trails that are not readily available through other sources. Beyond those items the development expense includes data collecting, calculations to obtain the road statistics, placing labels, trail and special map area creation, sheet layout, and prepress activities. Development costs are expected to be around $17,500 per map. The first few maps will be at somewhat of a premium while the bugs in the process are worked out.

Printing Expense
The printing expense for each map is likely cost in the neighborhood of $1.00 for each map. This is based on discussions with printers and the experience of other states. It is based on a map printed on a standard paper for maps. It should be noted that using a waterproof paper would increase the cost of printing by a factor of two or three.

Maintenance Expense
This is an important element often overlooked when bicycle maps are first developed. Since this series of maps is intended to be geographic information system (GIS) based, it should be easier to perform updates and to make corrections than has been the case with the current set of maps. It is our feeling that this will also help to keep overall maintenance expense down.

By periodically producing updated maps, it should make it easier to sustain long-term interest in the maps. This may result in a higher or more consistent level of map sales than if the maps are allowed to become outdated like the current set of bicycle maps.

Not figured into the tables are expenses associated with collecting the road data, or keeping the TMS current. These are activities that will generally be conducted by MDOT, or other road agencies, whether or not new bicycle maps ever get produced. A case in which this could be a problem is where specific data needed for the road portion of the map is not collected. No allowance has been made in the tables for additional funds to support an effort to collect that information.

Distribution Expense
The distribution expense is born by the distributor who receives a discount of 50% to 60% from the retail price. The distributors discount is not a fixed percentage and will depend on the product, sales volumes, and scope of their efforts in marketing and stocking the product. Due to the high production to retail price ratio, a 50% distributor discount is seen as the maximum that can be offered. The distributor will intern sell the product to a retailer who typically will look for a 30 to 40% discount.

Income from Map Sales
It is assumed that that in the three years of a maps life that the first year will account for 50% of all sales, the second year will account for 30%, and the third year will account for 20%. This assumption is made based on the desire of the consumer to obtain the most up-to-date product. This cycle then repeats itself as each region's maps are updated and reprinted. As the maps will be sold through a retail outlet, any discounts for purchasing multiple maps will be provided from their margin.

Table 5

Projected Expenses and Income for Proposed Maps

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Totals
Expenses											
Development											
Superior, W				$17,500							$17,500
Superior, C				$17,500							$17,500
Superior, E				$17,500							$17,500
North, W				$17,500							$17,500
North, E				$17,500							$17,500
Grand			$17,500								$17,500
Bay			$17,500								$17,500
Southwest			$17,500								$17,500
University		$20,000									$20,000
Metro		$20,000									$20,000
Sub-Total		**$40,000**	**$52,500**	**$87,500**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$180,000**
Printing	**$ 1.10**	**Per Map**									
No. to Print											
Superior, W	2,300			$2,530			$2,530			$2,530	$7,590
Superior, C	2,400			$2,640			$2,640			$2,640	$7,920
Superior, E	2,300			$2,530			$2,530			$2,530	$7,590
North, W	3,600			$3,960			$3,960			$3,960	$11,880
North, E	3,200			$3,520			$3,520			$3,520	$10,560
Grand	5,400		$5,940			$5,940			$5,940		$17,820
Bay	3,600		$3,960			$3,960			$3,960		$11,880
Southwest	4,000		$4,400			$4,400			$4,400		$13,200
University	4,300	$4,730			$4,730			$4,730			$14,190
Metro	11,700	$12,870			$12,870			$12,870			$38,610
Sub-Total	**42,800**	**$17,600**	**$14,300**	**$15,180**	**$17,600**	**$14,300**	**$15,180**	**$17,600**	**$14,300**	**$15,180**	**$141,240**
Maintenance											
Superior, W							$2,500			$2,500	$5,000
Superior, C							$2,500			$2,500	$5,000
Superior, E							$2,500			$2,500	$5,000
North, W							$2,500			$2,500	$5,000
North, E							$2,500			$2,500	$5,000
Grand						$2,500			$2,500		$5,000
Bay						$2,500			$2,500		$5,000
Southwest						$2,500			$2,500		$5,000
University					$2,500			$2,500			$5,000
Metro					$2,500			$2,500			$5,000
Sub-Total		**$0**	**$0**	**$0**	**$5,000**	**$7,500**	**$12,500**	**$5,000**	**$7,500**	**$12,500**	**$50,000**
Total		**$57,600**	**$66,800**	**$102,680**	**$22,600**	**$21,800**	**$27,680**	**$22,600**	**$21,800**	**$27,680**	**$371,240**
Income											
Retail Price	**$ 6.95**										
Wholesale Discount	**30%**	**Wholesale Cost**		**$ 4.87**							
Distributors Discount	**50%**	**Distributors Cost**		**$ 3.48**							
3 Yr. Target Sales											
Superior, W	2,068			$ 3,593	$ 2,156	$ 1,437	$ 3,593	$ 2,156	$ 1,437	$ 3,593	$ 17,966
Superior, C	2,113			$ 3,671	$ 2,203	$ 1,469	$ 3,671	$ 2,203	$ 1,469	$ 3,671	$ 18,357
Superior, E	2,061			$ 3,581	$ 2,149	$ 1,432	$ 3,581	$ 2,149	$ 1,432	$ 3,581	$ 17,905
North, W	3,266			$ 5,675	$ 3,405	$ 2,270	$ 5,675	$ 3,405	$ 2,270	$ 5,675	$ 28,373
North, E	2,830			$ 4,917	$ 2,950	$ 1,967	$ 4,917	$ 2,950	$ 1,967	$ 4,917	$ 24,586
Grand	4,893		$ 8,502	$ 5,101	$ 3,401	$ 8,502	$ 5,101	$ 3,401	$ 8,502	$ 5,101	$ 47,609
Bay	3,255		$ 5,656	$ 3,393	$ 2,262	$ 5,656	$ 3,393	$ 2,262	$ 5,656	$ 3,393	$ 31,671
Southwest	3,559		$ 6,184	$ 3,710	$ 2,474	$ 6,184	$ 3,710	$ 2,474	$ 6,184	$ 3,710	$ 34,629
University	3,889	$ 6,757	$ 4,054	$ 2,703	$ 6,757	$ 4,054	$ 2,703	$ 6,757	$ 4,054	$ 2,703	$ 40,543
Metro	10,580	$ 18,383	$ 11,030	$ 7,353	$ 18,383	$ 11,030	$ 7,353	$ 18,383	$ 11,030	$ 7,353	$ 110,297
Total	**38,514**	**$ 25,140**	**$ 35,425**	**$ 43,698**	**$ 46,139**	**$ 44,000**	**$ 43,698**	**$ 46,139**	**$ 44,000**	**$ 43,698**	**$ 371,935**
Net		***$ (32,460)***	***$ (31,375)***	***$ (58,982)***	***$ 23,539***	***$ 22,200***	***$ 16,018***	***$ 23,539***	***$ 22,200***	***$ 16,018***	***$ 695***
Total No. of Units	**128,400**										
Total Cost	**$371,240**										
Cost per Unit	**$ 2.89**										
Cost to Retail Ratio	**42%**										

Implementation

That there is significant need and demand for the new bicycle maps is not in question. The real question is how the program can be implemented given the lack of uniform data necessary to create the maps. If these maps are to be official MDOT publications, then the information presented should come from, or be verified by, official transportation agencies such as MPO's, Road Commissions, Transportation Study agencies, etc. As the inclusion of the necessary information in MDOT's Transportation Management System is approximately three years out, a centralized approach to data creation cannot be undertaken at this time.

As stated earlier, obtaining the necessary information from the individual entities, when it is not a priority of theirs, is an exceedingly difficult, time consuming, and expensive task. The best approach is to encourage, and support, a voluntary undertaking of the map creation on a region-by-region basis. As a number of regions are looking at bicycle planning issues this approach seems to make sense. Perhaps even a healthy competition can be generated to see which region generates the first map. To support this effort special training sessions could be offered to the regions and local governments on how to create and publish a map on their own based on the findings and recommendations within this report.

Interim Distribution
As the map production is phased in on a regional basis, it may not be realistic to go with a full-scale commercial distribution approach. If that were the case, sales could be handled through the use of a website and/or a 1-800 number. Perhaps this task could be contracted out to an advocacy organization such as League of Michigan Bicyclists. Of course sales projections would have to be lowered accordinaly.

Establishing a Supporting Fund
As stated earlier, while the program is targeted to be eventually self-sustaining, it will require substantial financial backing in the initial stages. In order to track the financial success of the project, a separate account should be established for all activities undertaken related to the production of the map. The account could be initially funded through the TEA-21 enhancement funds or general funds. If, after a period of time, the initial investment is returned through revenue, those funds could be returned to their source and the program could continue on its own revenue stream.

In Conclusion
While it may be frustrating to have gone through the prototype and feasibility effort only to find that the minimal data necessary to establish a statewide map program is not available, there are ways to proceed. The study outlines a logical and attractive replacement for the current bicycle map program and is designed to reach a wide constituency by bringing bicycle maps into the main stream. It also provides for the long-term financial stability in the program as well as making allowances for frequent map updates to keep the program effective and attractive in the long run. The new program can be a model for public/private partnerships and self-sustaining government led initiatives that respond to needs of the public.

Appendix

Proposed Map Cover

Proposed Map Legend

Proposed Main Map Sample

Proposed Enlargement Map Sample

Where to Bike Map Panel

Ride Prepared Map Panel

Bicycle Safety Map Panel

Bicycle Resources Map Panel

Tourism Map Panel

Sponsor Information Map Panel

Overview of Regions and Map Layout

¼ Scale Mock-up of the 10 Regional Maps

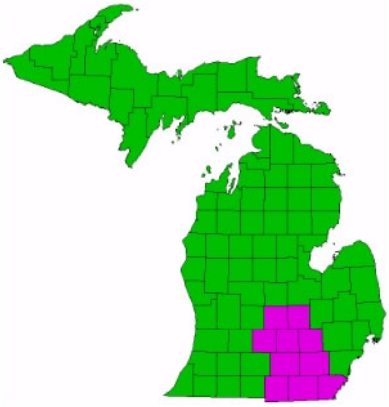
Map Front Cover

University Region

Road and Trail

Bicycling Guide

Including Clinton, Eaton, Ingham,
Hillsdale, Jackson, Lenawee,
Livingston, Monroe, Shiawassee,
and Washtenaw Counties



MDOT
Michigan Department of Transportation

Legend for Main Map

Legend

Roadway Conditions:

The color codes indicate the estimated vehicles per hour in the outside lane during the busiest hour of the day.

The purple edge indicates a known bicycle lane, wide shoulder, or wide curb lane.

0 to 100

100 to 200

200 to 300

Over 300

Unknown

Gravel or Unpaved Road

Local Road

Two Track

Interchange

Expressway - No Bicycle Traffic Allowd

Bicycle and Shared Use Trails:

Asphalt or Concrete Path

Crushed Fines Path

Unpaved Path

Additional Information:

CHELSEA A city or village that has lodging, food, restrooms, and water

Dexter A city or village that has the facilities listed

Lodging

Food

Public Restroom

Water

Hospital

Bicycle Shop

Campground

Park H.Q.

Picnic Area

Commercial or Industrial Area

Forested Area

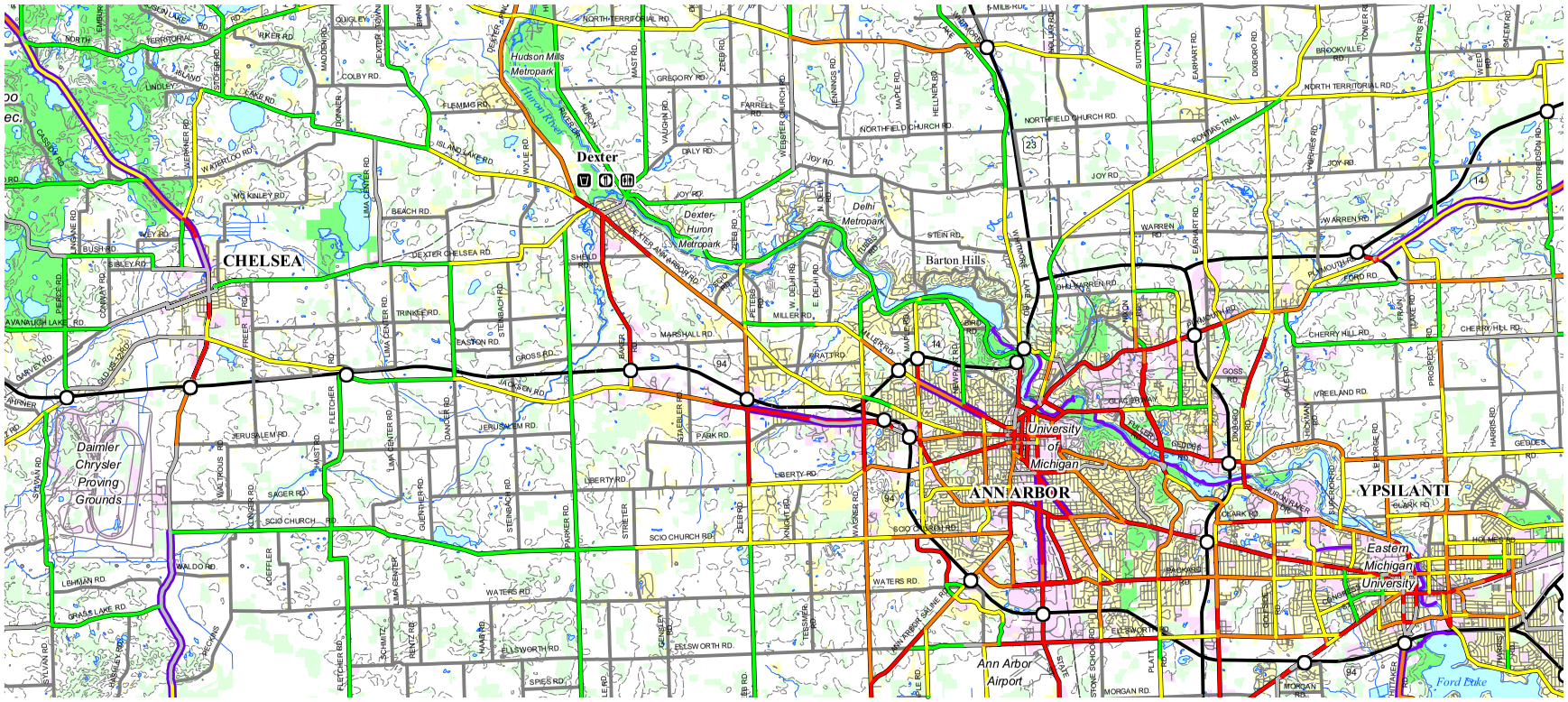
Residential Area

Park or Recreation Area

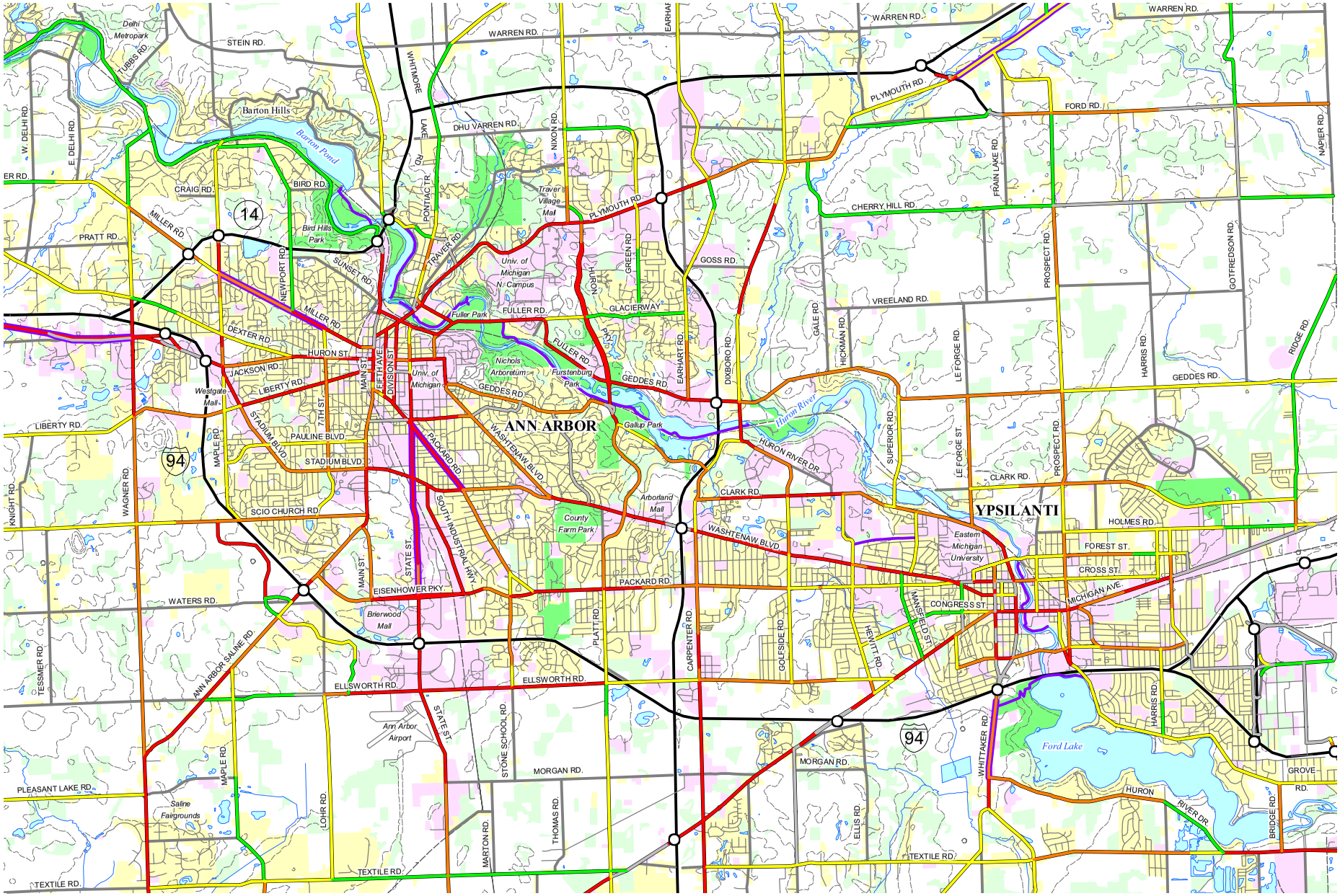
Railroad

10' Countour Line

Main Map - Typical Panel



Urban Detail Map



Where to Bike

On the Road

Bicycles are permitted on all Michigan highways and roads, EXCEPT limited access freeways or unless otherwise posted. Bicycles are allowed on all road systems including those in State Forests, State Parks, National Forests, and National Parks.

State Park Trails

Bicycles are currently allowed on trails in 31 State Parks and Recreation Areas. This includes six State Park Trails, which were developed with bicyclists in mind. Call the individual park or the Michigan Department of Natural Resources, Parks Division, 517-373-1270 for maps of trails and further information.

State Forest Trails

Bicycles are allowed on most State Forest Trails. For more information and a map contact the Michigan Department of Natural Resources, Forest Management Division, P.O. Box 30452, Lansing, MI 48909-7952, 517-373-1275.

National Forest Trails

Bicycles are allowed on National Forest Trails except where posted. Prohibited trails include the following: Nine Mile Creek - Manistee National Forest, Hoist Foot Trail and Reed Lake Trail - Huron National Forest, and portions of the North Country National Scenic Trail - Ottawa and Hiawatha National Forest. Bicycles are also prohibited in congressionally designated wilderness areas. National Forest maps are available at each Forest Service office. For further information call the respective Forest Service. Huron-Manistee National Forest, 1-800-999-7677; Ottawa National Forest, 1-800-552-1201; Hiawatha National Forest, 906-786-4062.

Local Trails

Many local communities have developed their own trail systems. Rules and regulations vary by each community and trail.

Ride Prepared

Ride Prepared

Fitted and Adjusted Bike

Be sure your bicycle is adjusted to fit your properly. Check tires, chains, brakes, and other moving parts. Your bicycle must be equipped with a brake, which will enable you to skid on dry, level, clean pavement.

Helmet

Most fatalities and serious injuries to cyclists are the result of head injuries. A Snell or ANSI approved helmet can reduce the severity of many head injuries. Some areas require the use of helmets, check with local authorities.

Bells and Horns

A bicycle must be equipped with a bell or other device capable of giving a signal audible form a distance of at least 100 feet.

Lights and Reflectors

When operating a bicycle at night, it must be equipped with a lamp on the front, which shall emit a white light visible from a distance of at least 500 feet, and with a red reflector on the rear, which shall be visible from up to 600 feet in the headlights of an automobile.

Clothing

Light and bright colored clothing and safety vests help to make a bicyclist more visible, especially at dusk or at night. Added reflective material on your clothing and bicycle is recommended when night riding is required.

Racks, Packs and Trailers

If you plan on carrying any packages, bundles or any articles you must be able to keep both hands on the handlebars. A variety of racks, packs, and trailers can be fitted on your bicycle to transport goods.

Safety Accessories

Water bottles, tire repair kits, mirrors, locks, and first aid kits help make each trip safer and the cyclist more self sufficient.

Bicycle Safety

Bicycle Safety

Rights and Responsibilities

Bicyclists are granted all of the rights and are subject to all of the duties applicable to the driver of an automobile except as noted.

Riding

Ride as near to the right side of the road as practical. Make left turns as a motorist would or stay to the right and cross as a pedestrian would. Exercise due care when passing a standing vehicle or one proceeding in the same direction. Signal all of your turns. Do not ride more than two abreast except when on a path or a designated part of the roadway. Do not carry more persons on a bicycle at a time than the number for which it is designed and equipped.

Trails and Sidewalks

When operating on a shared use trail or sidewalk bicyclist must yield the right of way to pedestrians and shall give an audible signal before overtaking and passing a pedestrian.

Common Crashes

The following are common crashes for bicyclist riding in cities. Stay alert and ride defensively. Try to anticipate a motorist move, and always assume that he or she does not see you.

Left turning motorist hits oncoming cyclist
Motorist makes a left turn and hits an oncoming bicyclist. When approaching an intersection, slow down, cover your brakes, and watch other traffic.

Right turning motorist turns into cyclist
Motorist makes a right turn and hits a bicyclist riding along side. Check for overtaking vehicles as you approach an intersection and stay away from a motorist blind spot.

Cyclist gets hit while riding against traffic
Motorist pulls out of a cross street, driveway, or alley and hits a bicyclist riding the wrong way or on the sidewalk or crosswalk

Motorist hits cyclist in intersection
Motorist pulls away from a stop sign and hits a bicyclist riding in a cross street. Make eye contact with the motorist, cover your brakes, and anticipate the vehicle's movement.

Bicycle Resources

Michigan Department of Natural Resources

MDNR promotes the development of trail systems throughout the state. They will work with local agencies in trail development, planning and design, and administer a number of funding programs. Contact the Michigan Department of Natural Resources, Recreation Division, Recreation Services Branch, P.O. Box 30028, Lansing, MI 48909; 517-374-9483; Website: http://www.dnr.state.mi.us

League of Michigan Bicyclists

LMB is a nonprofit membership organization, which promotes bicycling for recreation and transportation in Michigan. The LMB organizes annual Shoreline Bicycle Tours, publishes an annual poster calendar of cycling events statewide, distributes general cycling information and educates children and adults on safe cycling. The LMB also publishes a quarterly magazine to inform members of local, state and national bicycling news. The LMB works with Michigan Department of Transportation and other state and local agencies to improve conditions for bicycling in Michigan. For a free brochure listing membership benefits and services contact The League of Michigan Bicyclists, P.O. Box 16201, Lansing, MI 48901-6201; 517-FYI-BIKE or 1-888-MI-BIKES; Website: http://www.lmb.org

Michigan Mountain Biking Association

MMBA promotes responsible mountain biking and works towards the goals of common land access and natural resource protection through interaction with policy makers, the cycling industry, race promoters, mountain bikers and other trail users. For information write to Michigan Mountain Biking Association, 4217 Highland Rd. #268, Waterford, MI 48328-2165; 616-785-0120; FAX: 616-785-1940 Website: http://www.mmba.org

Rails-to-Trails Conservancy, Mich. Field Office

RTC is a national, nonprofit organization working with local recreations and conservation agencies to preserve rail corridors for conservation and recreational uses. This organization promotes the conversion of abandoned railroad rights-of-way to recreational trails through public education, advocacy, and technical assistance to grassroots organizations. For more information write to Rails-to-Trails Conservancy of Michigan, 913 West Holmes Street, Suite 145,Lansing, MI 48909; 517-393-6022; Email: rtcmichigan@transact.org; Website: http://www.railtrails.org

Tourist Information

Tourism

Vacation and accommodation information can be obtained from the following organizations. The same information can be obtained at the Michigan's 13 Welcome Centers, located on major highways throughout Michigan.

Travel Michigan
Michigan Jobs Commission
Lansing, MI 48909
888-78-GREAT (TDD: 800-722-8191)

West Michigan Tourist Association
136 Fulton, E.
Grand Rapids, MI 49503
616-456-8557

Upper Peninsula Travel & Recreation Association
P.O. Box 400
Iron Mountain, MI 49801
906-774-5480 or 1-800-562-7134 (in-state only)

Metropolitan Detroit CVC
100 Renaissance Center
Suite 1950
Detroit, MI 48243
313-259-4333

Huron-Clinton Metropark Guide
Huron-Clinton Metropolitan Authority, P.O. Box 2001, Brighton, MI 48116800 R 248-227-2757, 1-800-47-PARKS; free map of Metroparks; shows location, facilities, activities and bike paths.

Sponsor Information

MDOT
Michigan Department of Transportation

The Michigan Department of Transportation provides information and planning assistance for nonmotorized transportation facilities. Facilities for nonmotorized transportation may be established in conjunction with existing highways or may be established when a highway is being constructed or reconstructed. For further information or for any comments, suggestions, or corrections regarding this map please contact:

Michigan Department of Transportation,
Transportation Planning Services Division,
P.O. Box 30050, Lansing, MI 48909
Phone: 517-335-2823 or 517-373-9049 Fax: 517-373-9255

Also for information on state road projects specific to this region please contact:

MDOT University Region Office
301 E. Louis Glick Hwy.
Jackson, MI 49201
Phone: 517-780-7500 Fax: 517-780-7825

MICHIGAN TRANSPORTATION ENHANCEMENT PROGRAM

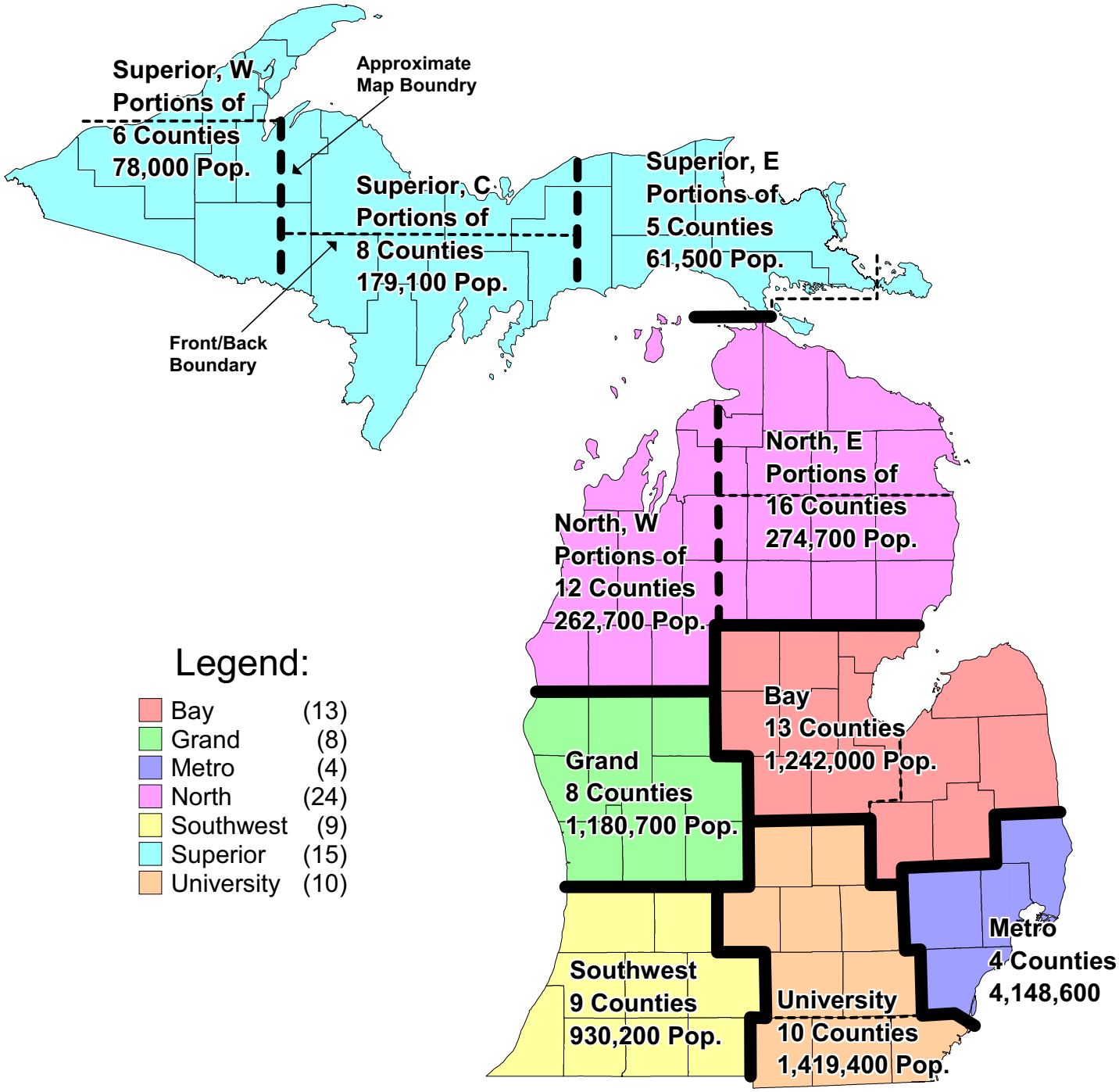
The development and printing of this map is made possible through funding from the Michigan Transportation Enhancement Program.

A portion of the funds generated from sales go towards updates of this and other bicycle maps.

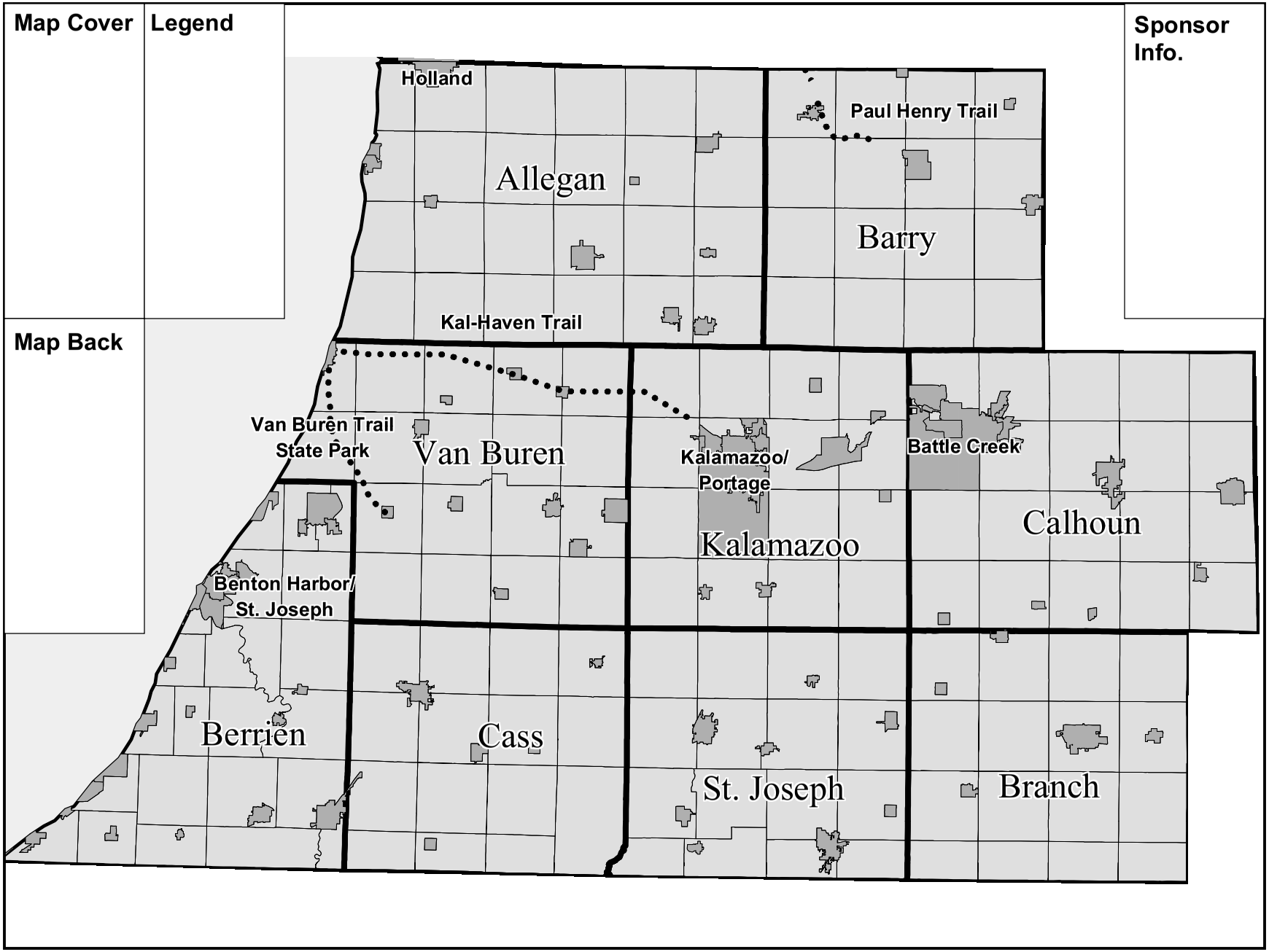
Use of This Map

This guide is published by the Michigan Department of Transportation (MDOT) as an aid to bicyclists and is not intended to be a substitute for a person's use of reasonable care. MDOT makes no express or implied warranty as to the safety or condition of the roads indicated; the user of this map bears full responsibility for his or her safety. Conditions indicated on the map are subject to change, be prepared to make your own evaluation of traffic and road, and plan routes appropriate to your riding skills. All public and private entities and persons involved in the creation of this map disclaim responsibility and shall not be answerable or held accountable in any manner for loss, damage or injury that may be suffered as the result of the use of this map.

Overview of Regions and Map Layout



Southwest Region - Front Side 1/4 Scale Mock-up



Southwest Region - Back Side 1/4 Scale Mock-up

<table>
<tr><td>Where to Bike</td><td>Ride Prepared</td><td>Bicycle Safety</td><td>Holland Detail</td><td>Benton Harbor/St. Joseph Detail</td></tr>
<tr><td>Bicycle Resources</td><td>Tourist Info.</td><td>Regional Overview and Climate Chart</td><td>Kalamazoo Detail</td><td>Battle Creek Detail</td></tr>
<tr><td colspan="3">Kal-Haven Trail Detail/Photos</td><td>Paul Henry Trail Detail/Photos</td><td>Van Buren Trail Detail/Photos</td></tr>
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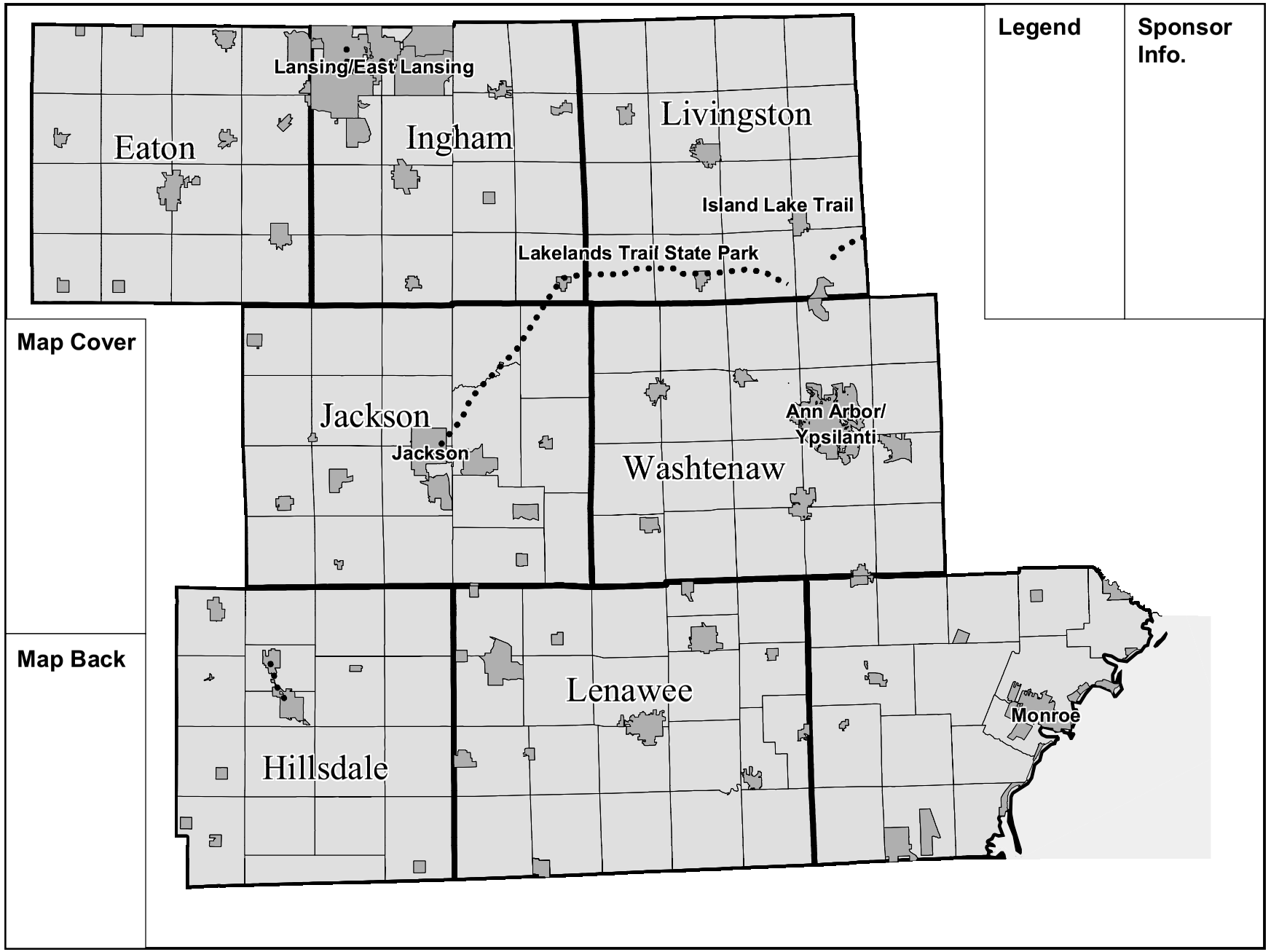
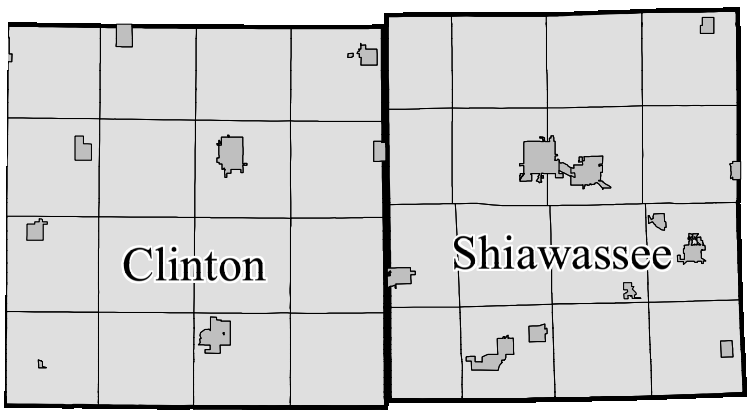
27"

36"

University Region - Front Side 1/4 Scale Mock-up



University Region - Back Side 1/4 Scale Mock-up

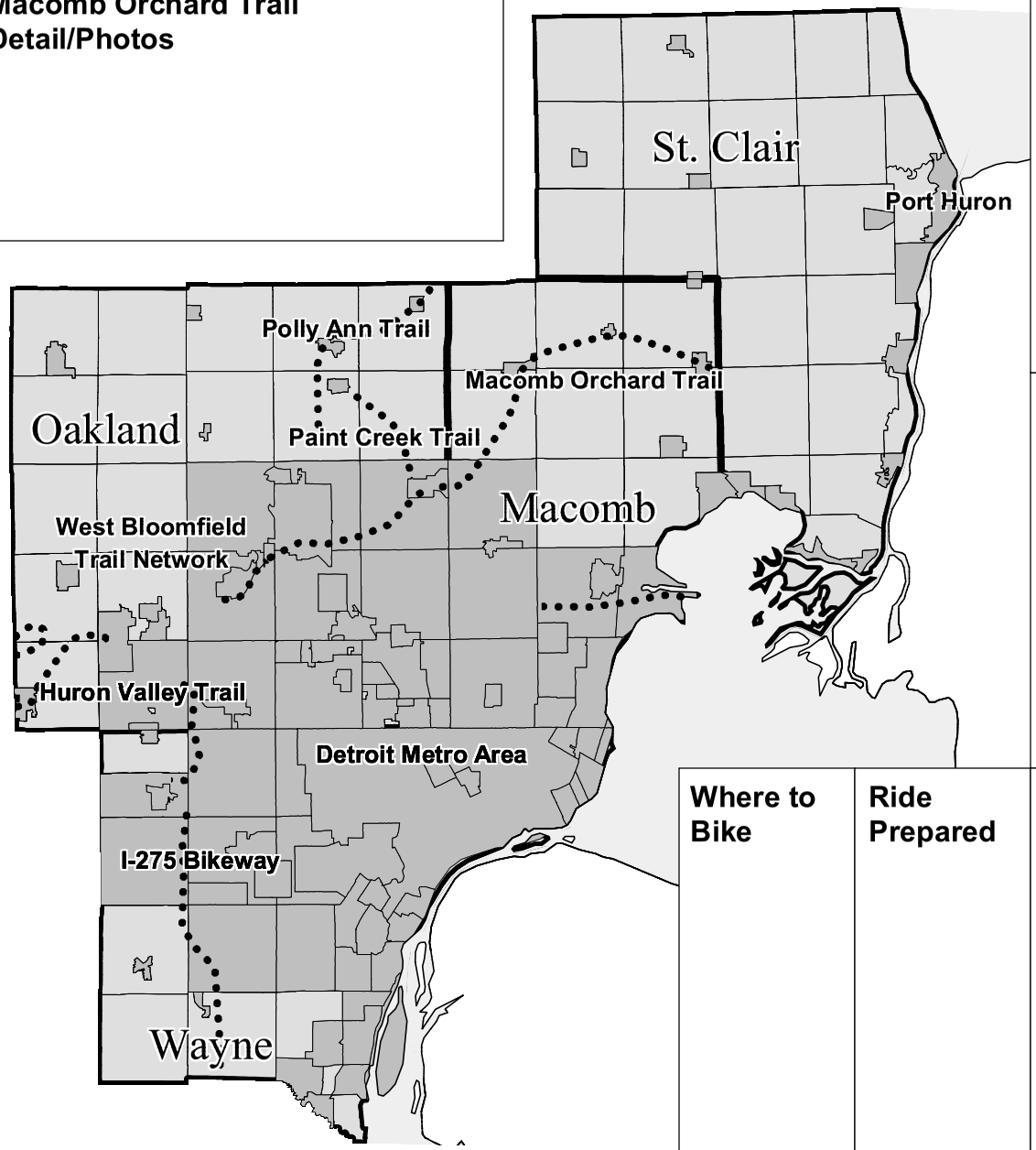
Where to Bike	Ride Prepared	Bicycle Safety	Lakelands Trail Detail/Photos	Lansing/East Lansing Detail
Bicycle Resources	Tourist Info.	Regional Overview and Climate Chart	Island Lake Trail Detail/Photos	Ann Arbor/Ypsilanti Detail
			Legend	Monroe Detail

27"

36"

Metro Region - Front Side 1/4 Scale Mock-up

Map Cover	Macomb Orchard Trail Detail/Photos		Port Huron Detail	Sponsor Info.
Map Back			Tourist Info.	Regional Overview and Climate Chart
Legend		Where to Bike / Ride Prepared	Bicycle Safety	Bicycle Resources



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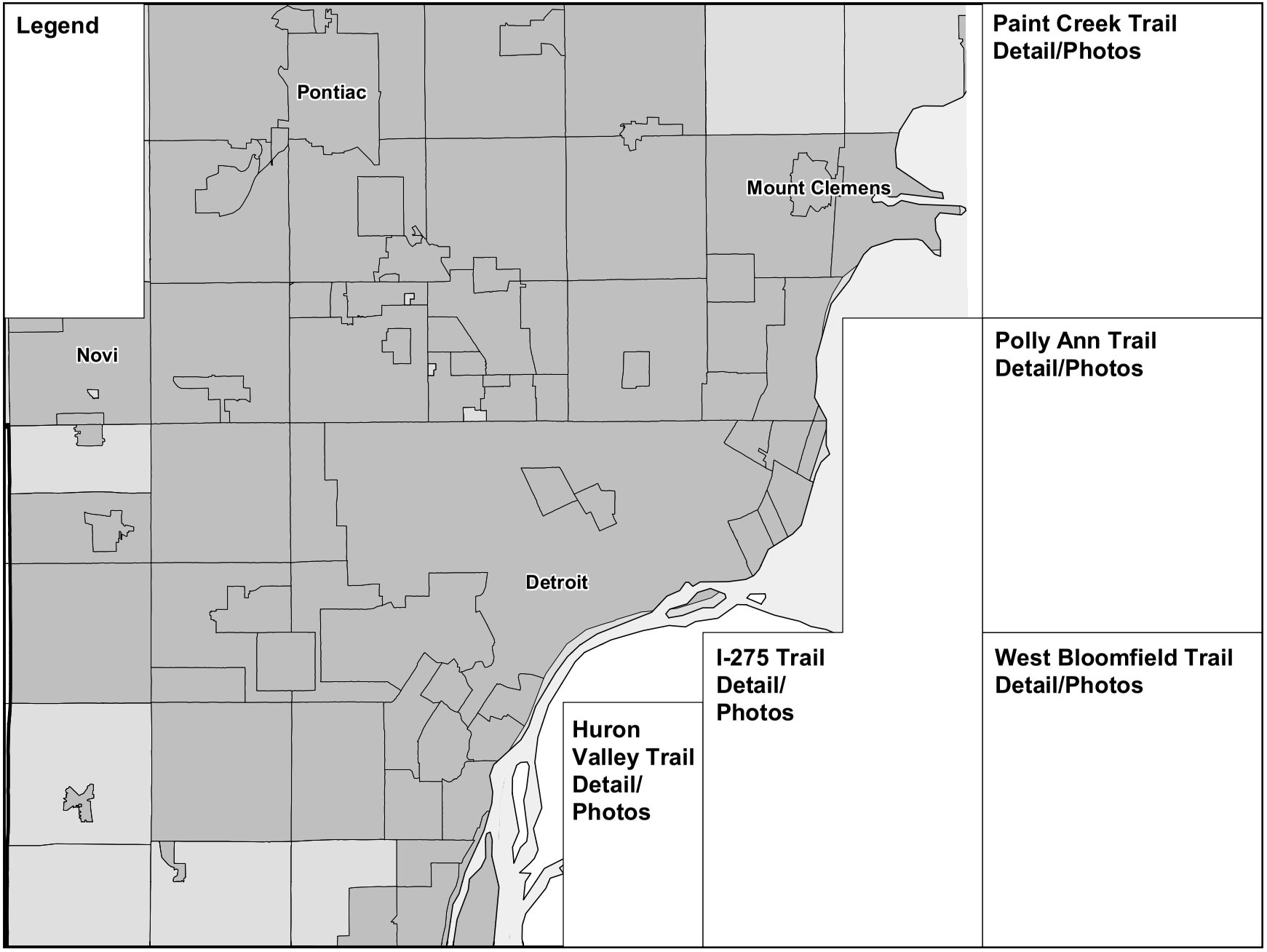
Metro Region - Back Side 1/4 Scale Mock-up



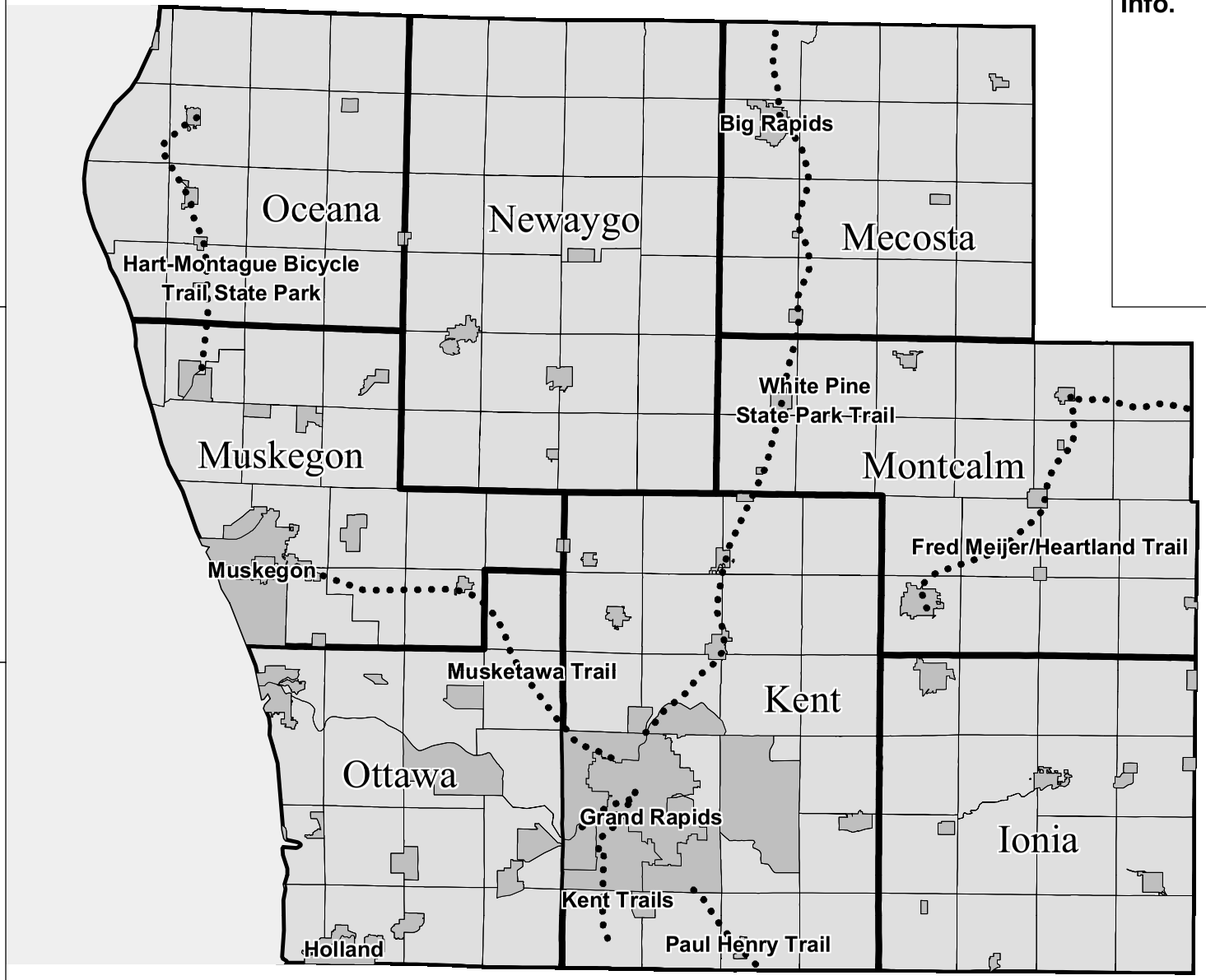
Grand Region - Front Side 1/4 Scale Mock-up

Map Cover

Map Back

Legend

Sponsor Info.



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Grand Region - Back Side 1/4 Scale Mock-up

<table>
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<tr><td>Bicycle Resources</td><td>Tourist Info.</td><td>Regional Overview and Climate Chart</td><td>Hart-Montague Bicycle Trail State Park Detail/Photos</td><td>White Pine Trail State Park Photos/Detail</td></tr>
<tr><td colspan="3">Musketawa Trail Detail/Photos</td><td>Kent Trails Detail/Photos</td><td>Fred Meijer/Heartland Trail/Detail</td></tr>
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36"

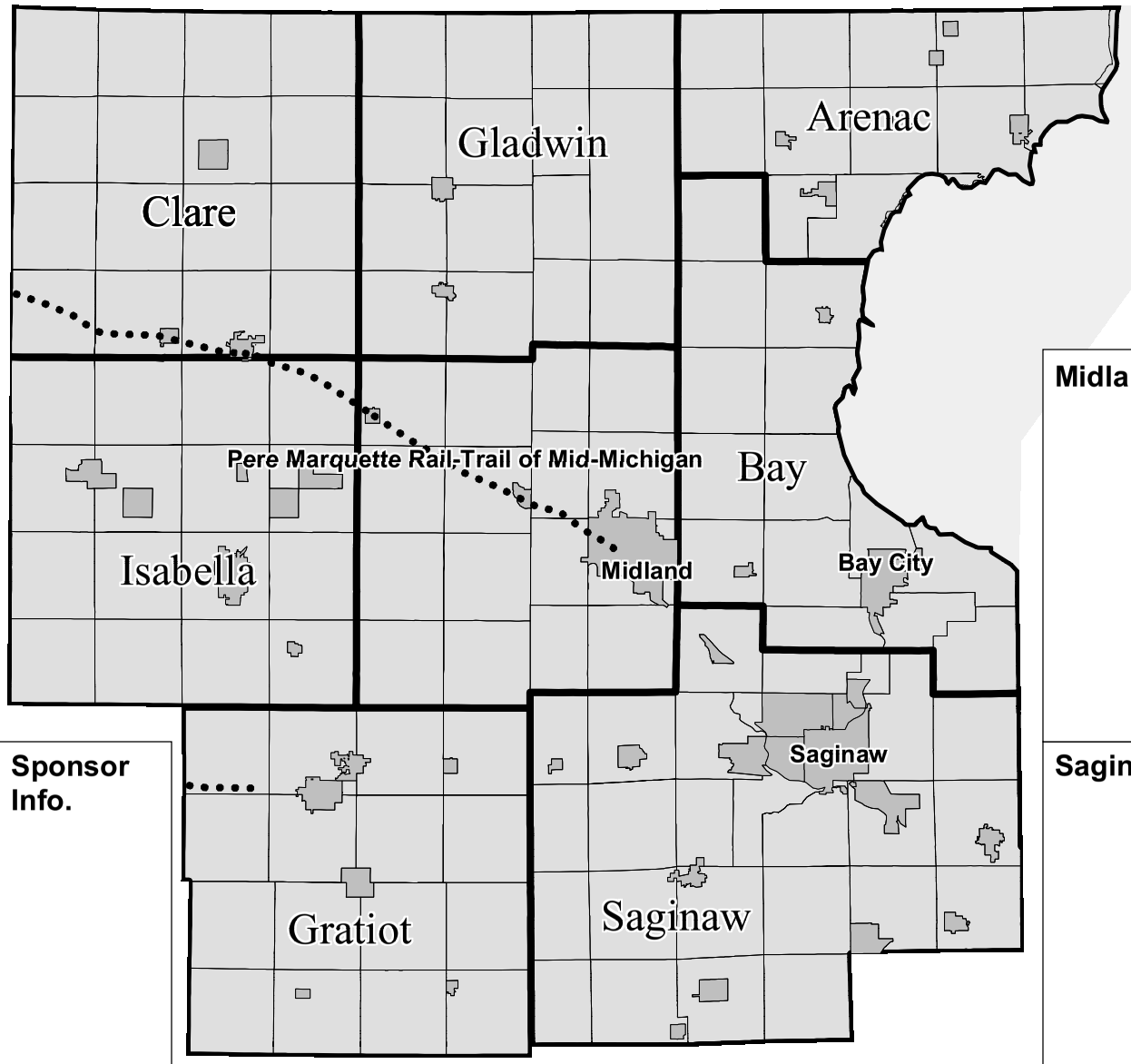
Bay Region - Front Side 1/4 Scale Mock-up

Map Cover

Map Back

Legend

Sponsor Info.



Bay City Detail

Midland Detail

Saginaw Detail

27"

36"

Bay Region - Back Side 1/4 Scale Mock-up

Where to Bike

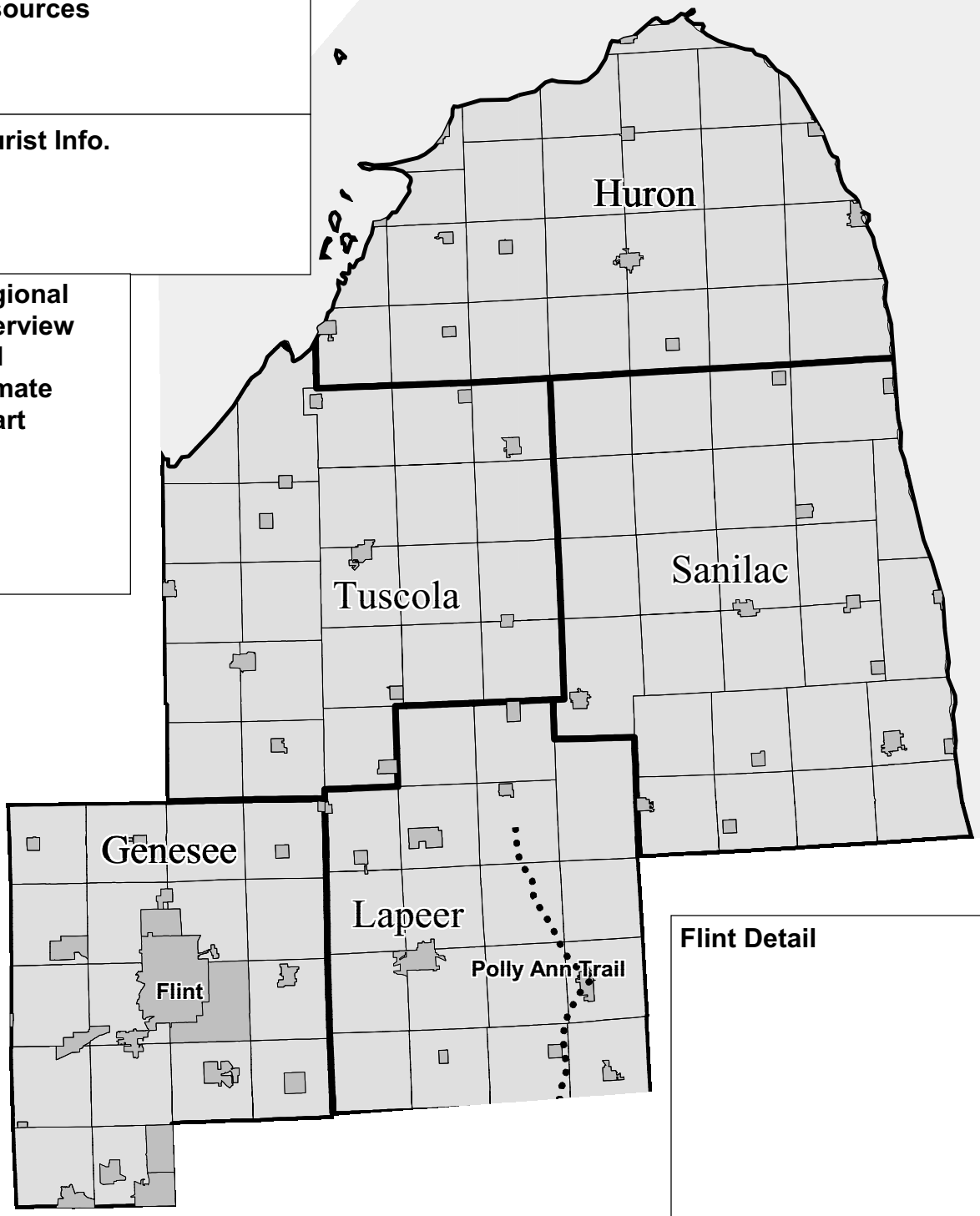
Ride Prepared

Bicycle Safety

Bicycle Resources

Tourist Info.

Regional Overview and Climate Chart



Flint Detail

36"

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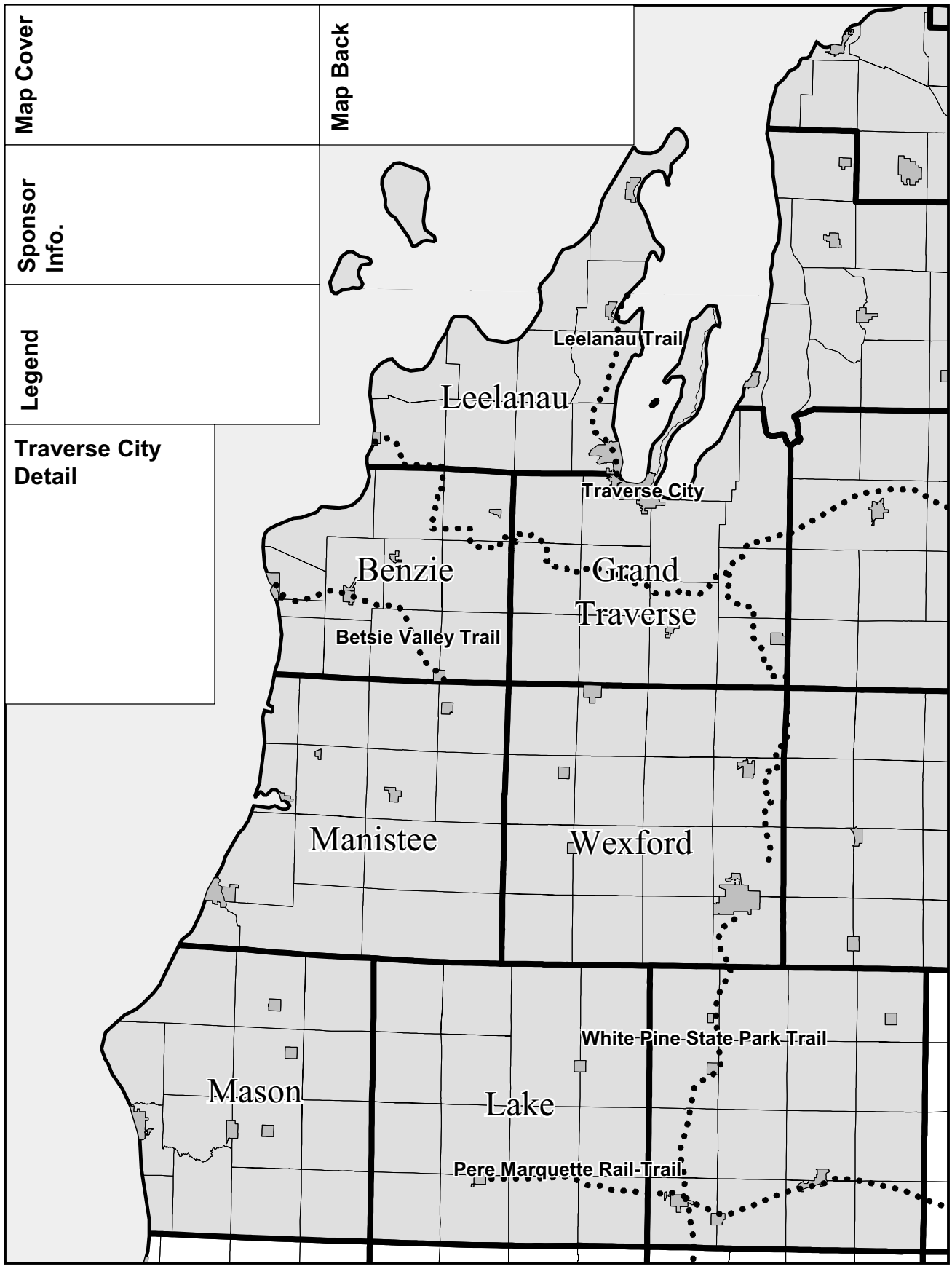
North Region, West Part - Front Side 1/4 Scale Mock-up



North Region, West Part - Back Side 1/4 Scale Mock-up

<table>
<tr><td>Where to Bike</td><td>Ride Prepared</td><td>Bicycle Safety</td><td>White Pine State Park
Trail Detail/Photos</td><td>Pere Marquette Rail-Trail
Detail/Photos</td></tr>
<tr><td>Bicycle Resources</td><td>Tourist Info.</td><td>Regional Overview and Climate Chart</td><td>Betsie Valley Trail
Detail/Photos</td><td>Leelanau/Tart Trail
Detail/Photos</td></tr>
<tr><td colspan="3">Mackinaw-Hawks
Trail Detail/Photos</td><td>Mackinaw-Alanson
Trail Detail/Photos</td><td>Cheboygan-Gaylord
Trail Detail/Photos</td></tr>
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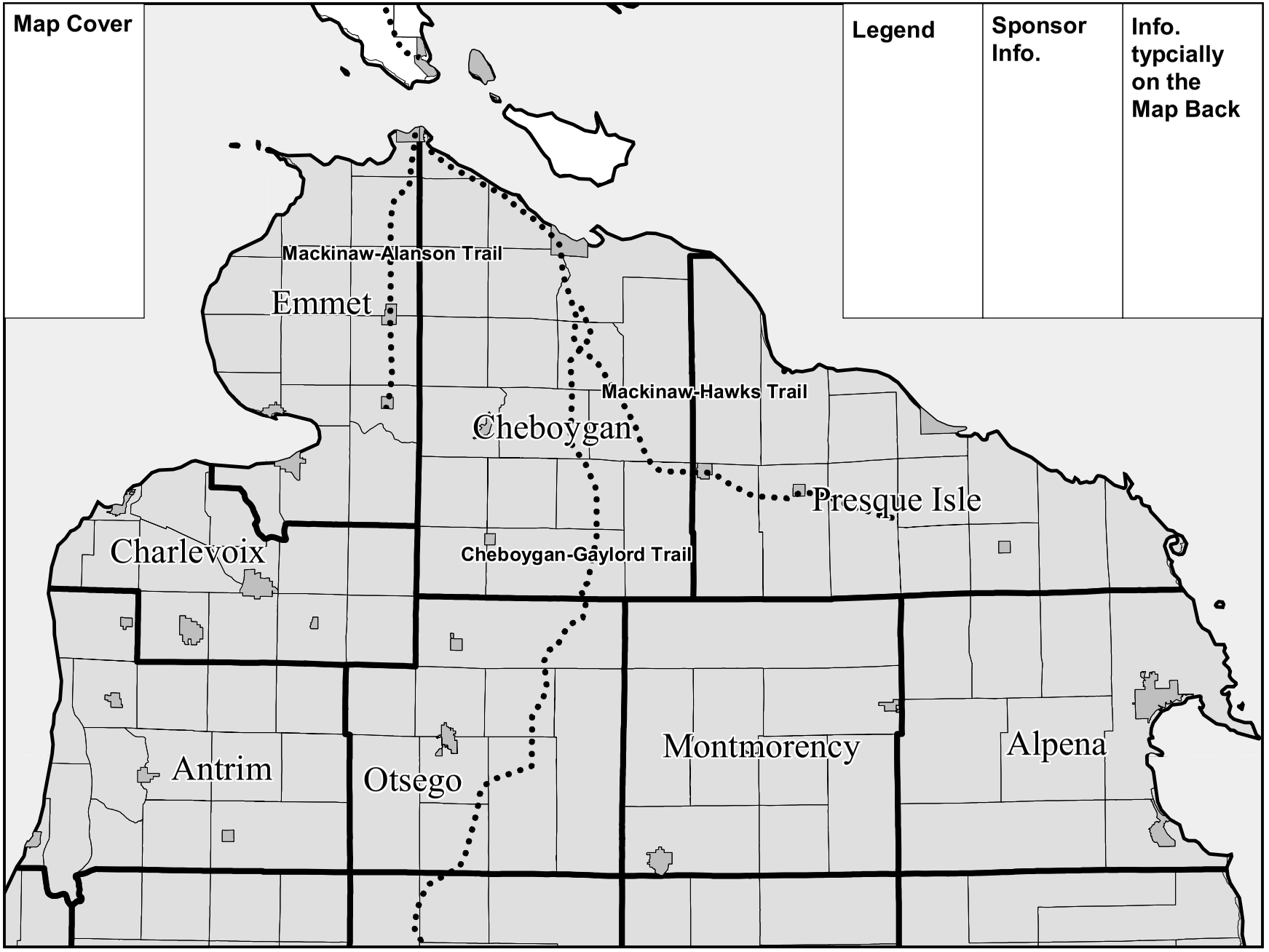
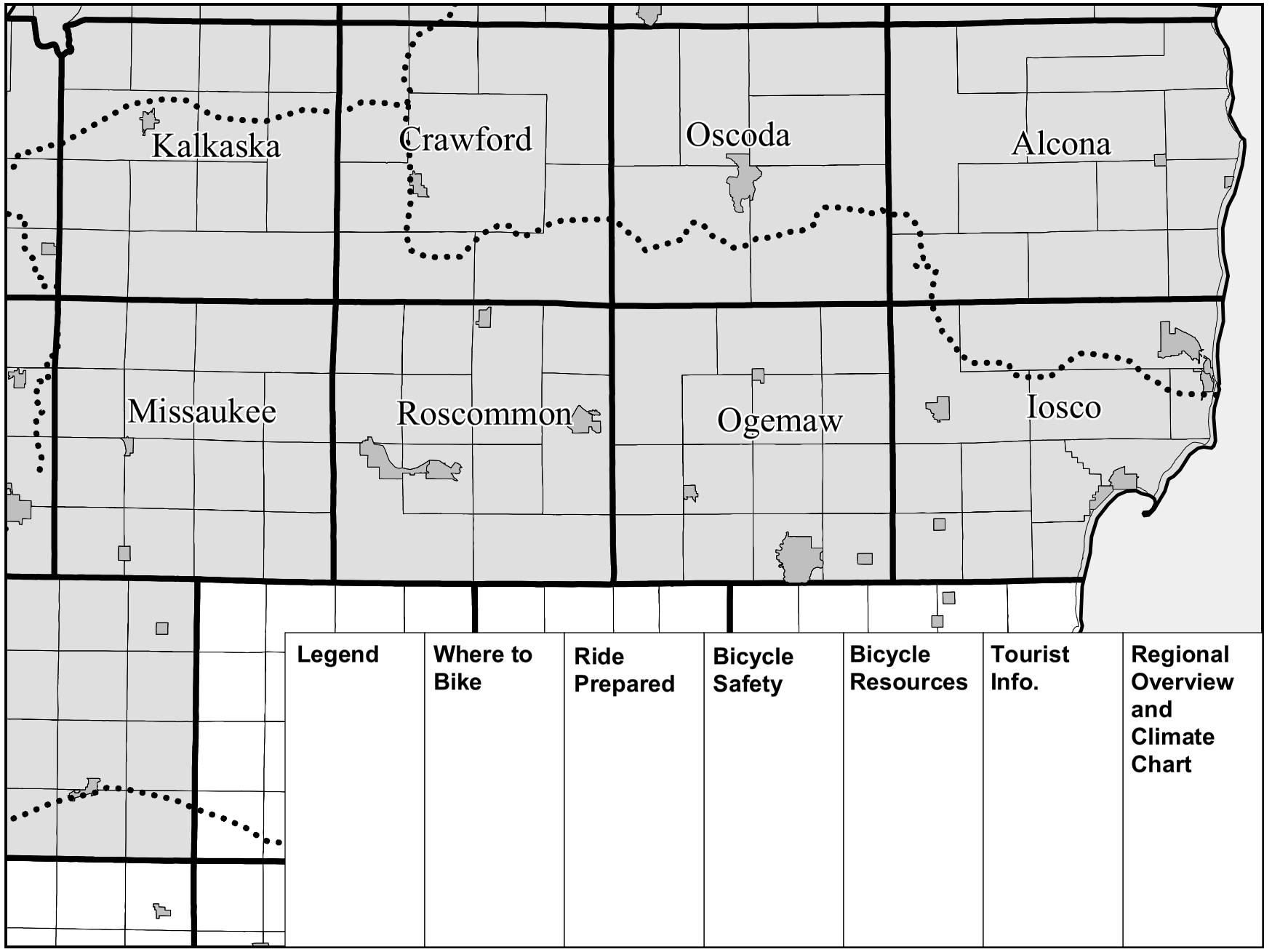
North Region, East Part - Front Side 1/4 Scale Mock-up



North Region, East Part - Back Side 1/4 Scale Mock-up

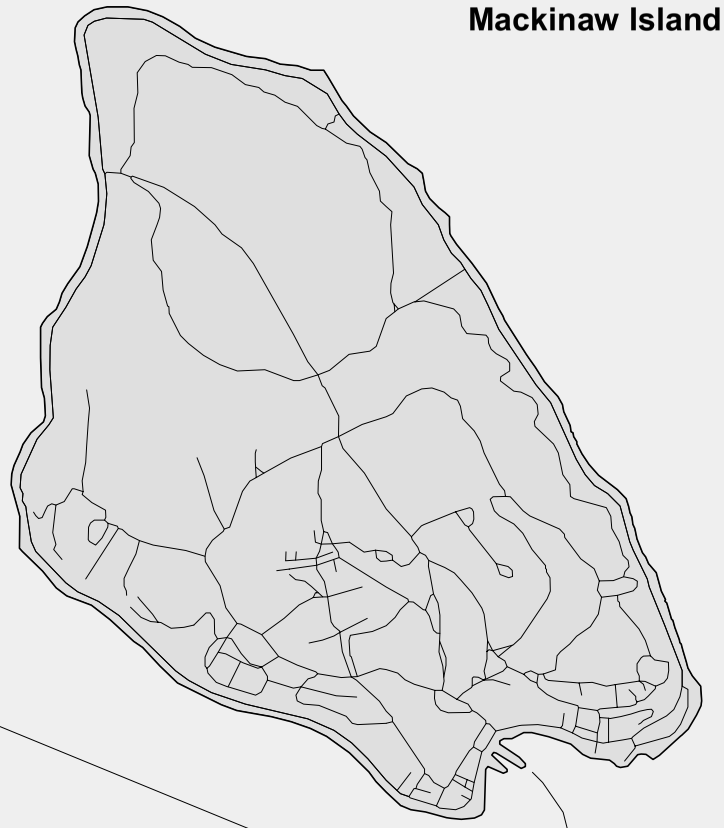


Superior Region, East - Front Side 1/4 Scale Mock-up

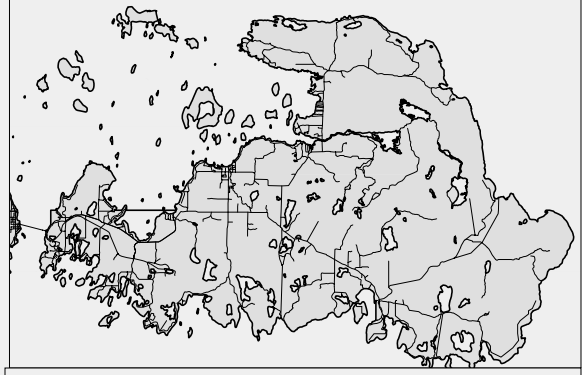
Map Cover

Map Back

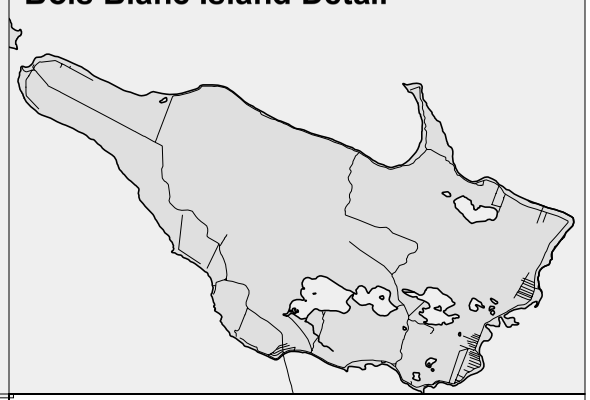
Mackinaw Island Detail



Drummond Island Detail



Bois Blanc Island Detail



Ride Prepared

Bike Safety

Bicycle Resources

Soo/Strongs Trail Detail/Photos

St. Ignace to Trout Lake Trail Detail/Photos

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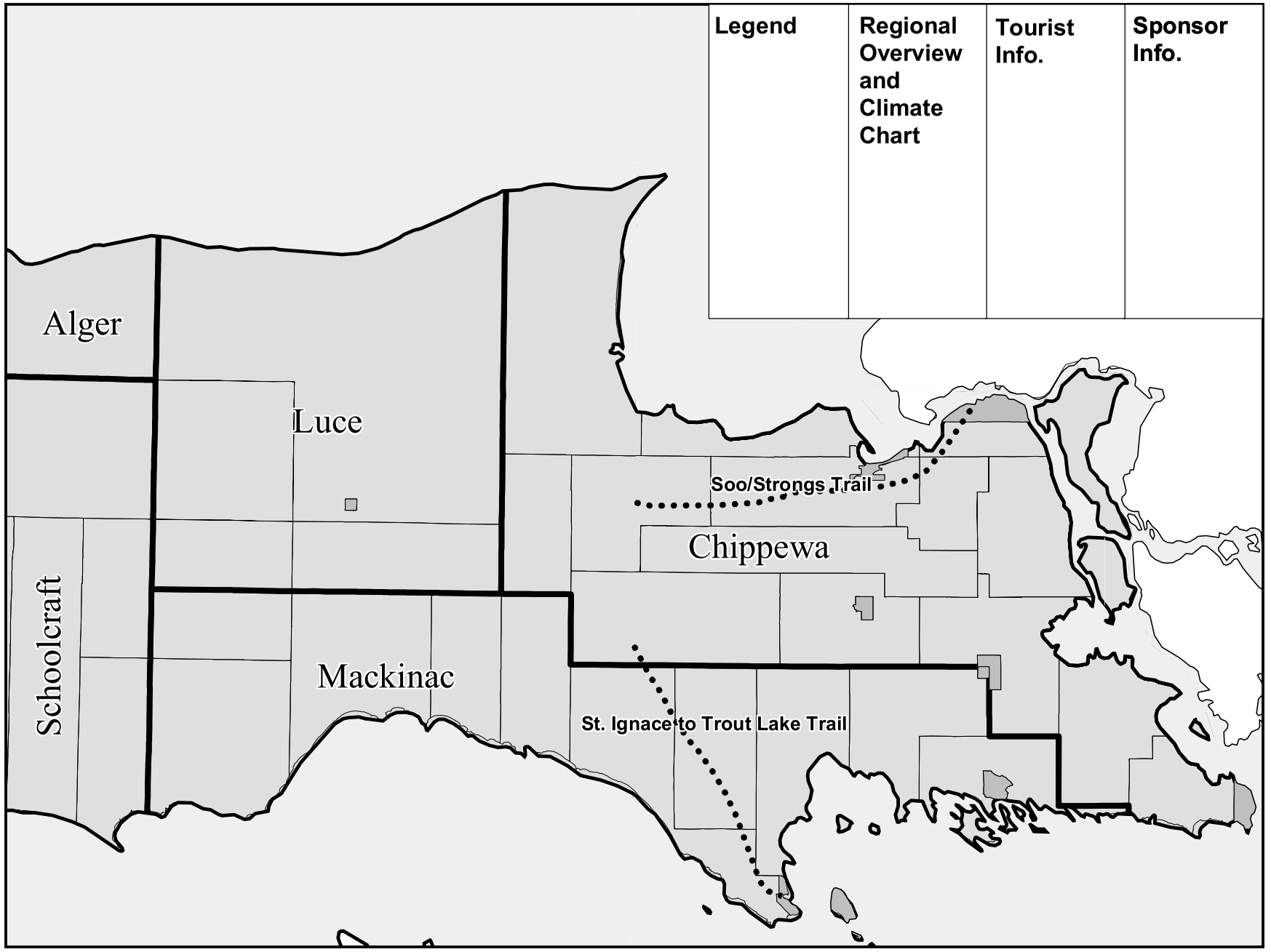
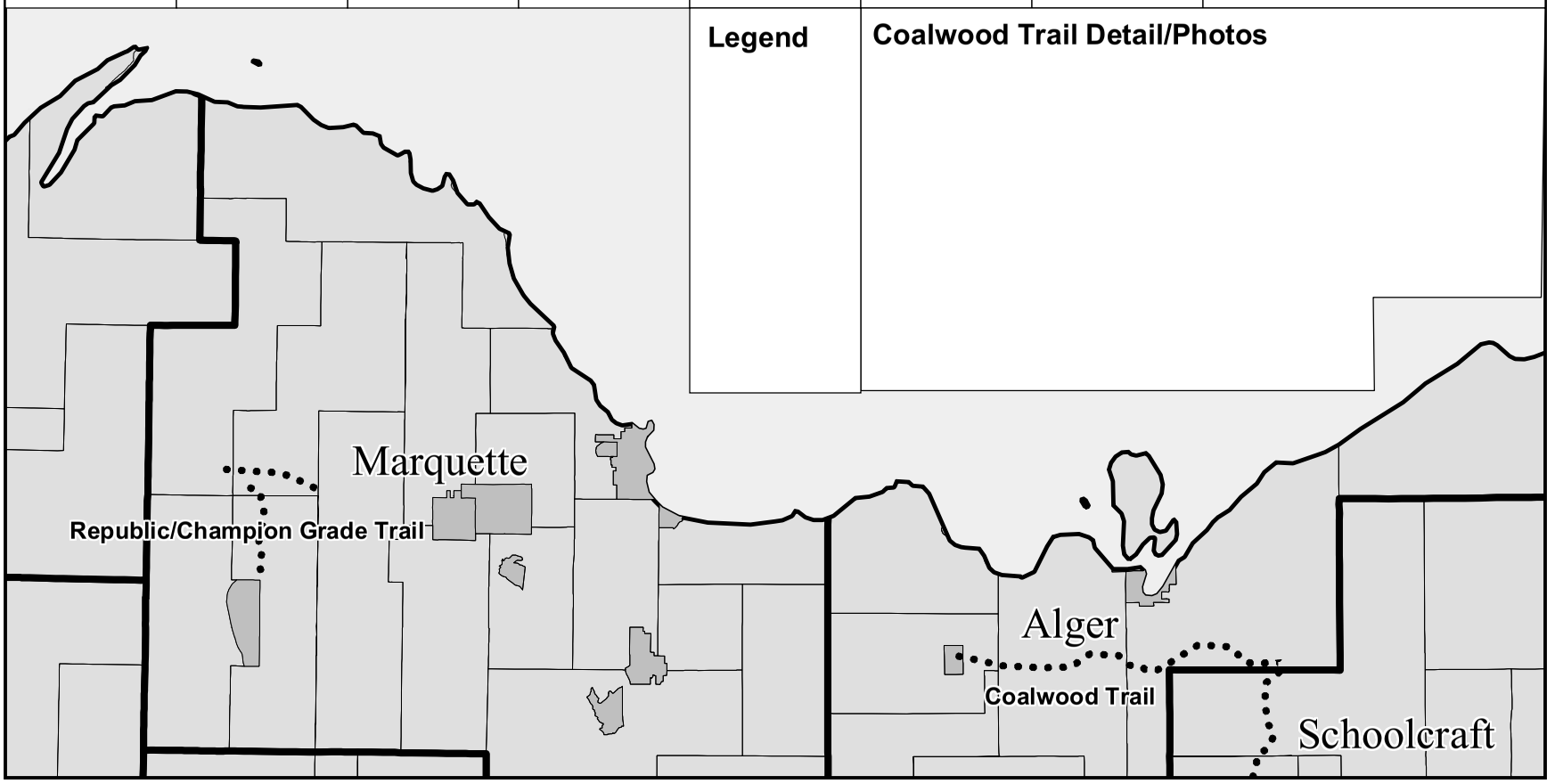
Superior Region, East Park - Back Side 1/4 Scale Mock-up



Superior Region, Central - Front Side 1/4 Scale Mock-up

Map Cover	Back Cover Info.	Ride Prepared	Bicycle Safety	Bicycle Resources	Tourist Info.	Regional Overview and Climate Chart	Republic/Champion Grade Trail Detail/Photos



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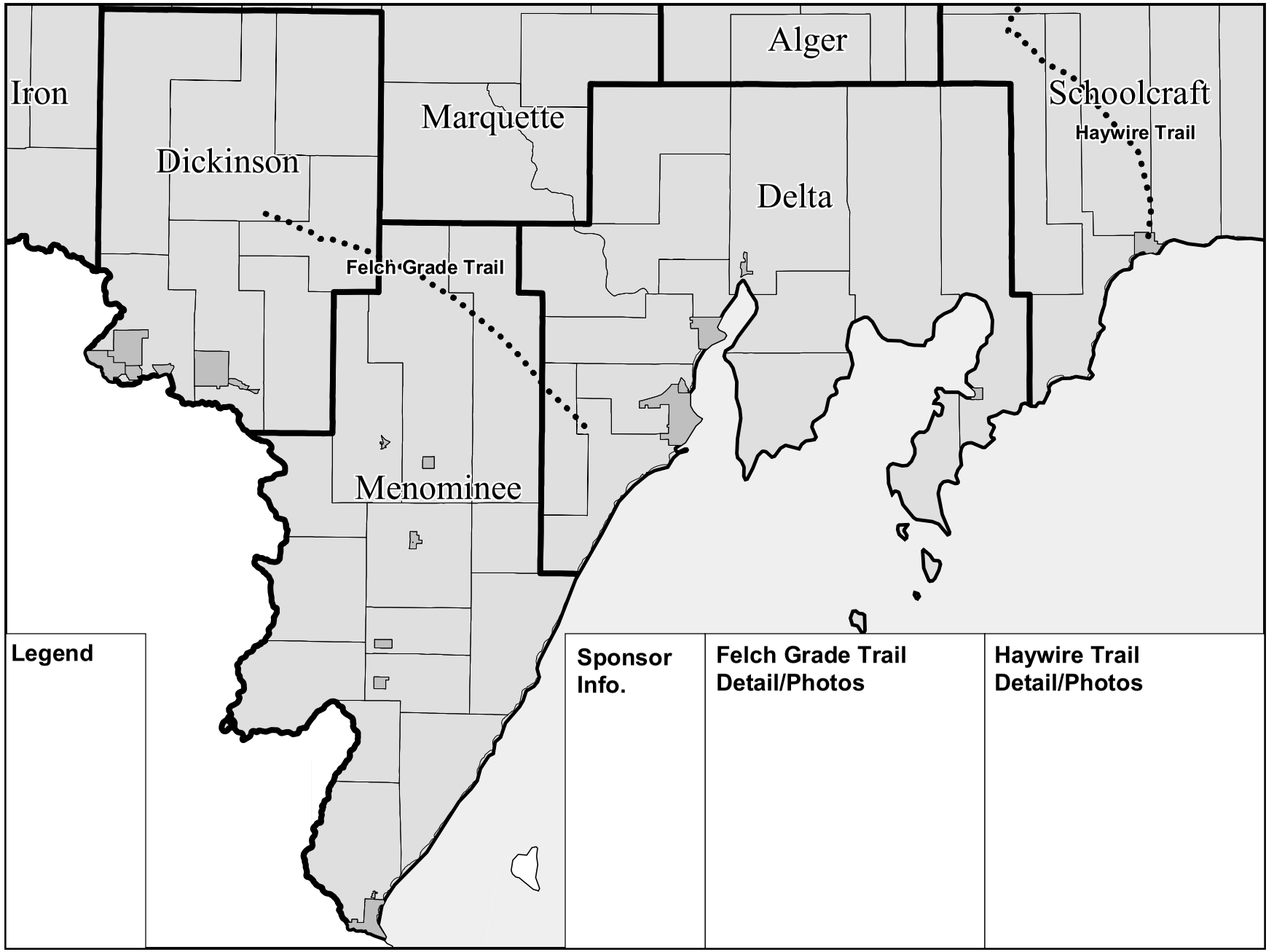
Superior Region, Central - Back Side 1/4 Scale Mock-up



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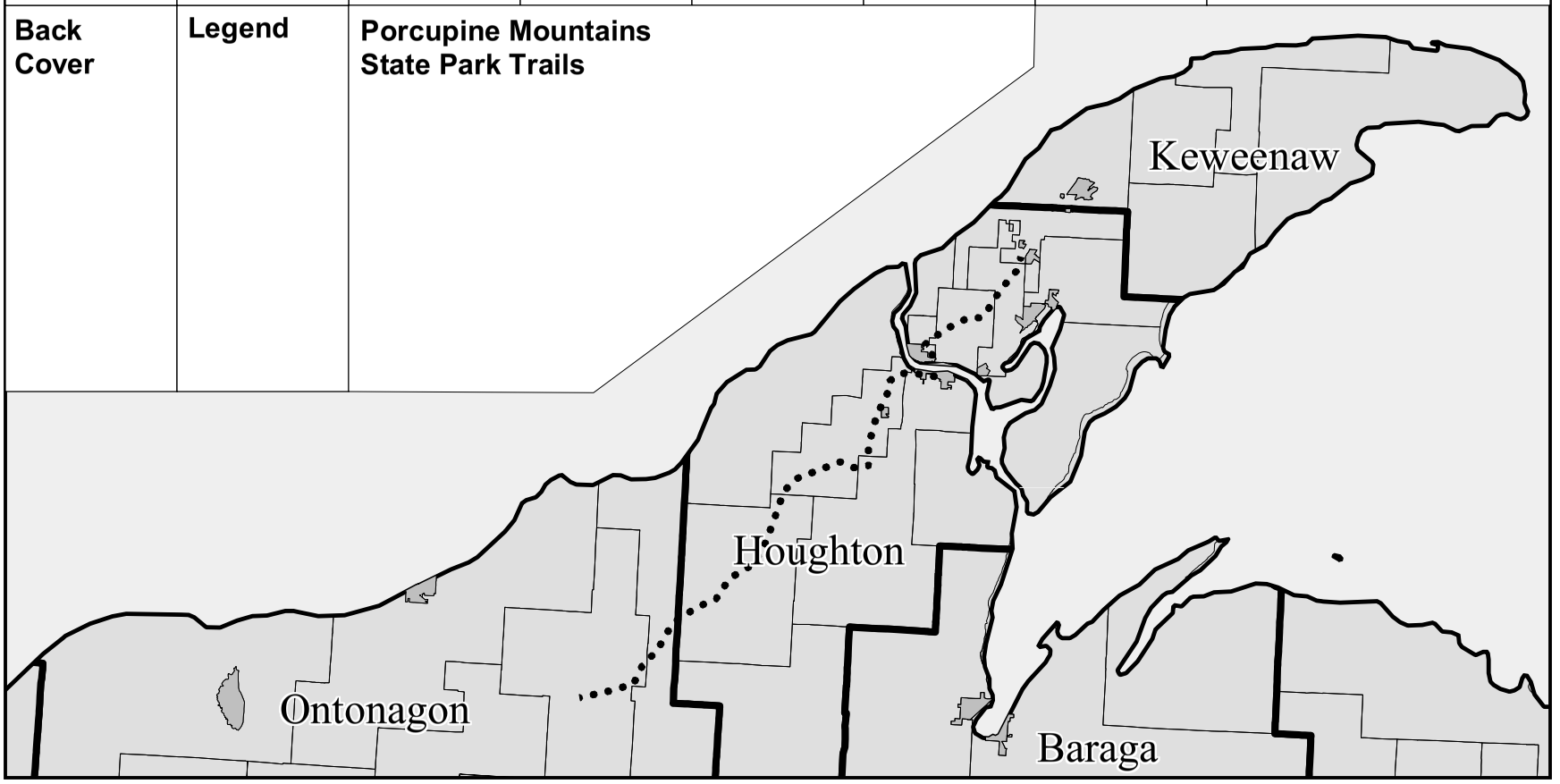
Superior Region, West - Front Side 1/4 Scale Mock-up

Map Cover	Back Cover Info.	Ride Prepared	Bicycle Safety	Bicycle Resources	Tourist Info.	Regional Overview and Climate Chart	Republic/Champion Grade Trail Detail/Photos
Back Cover	Legend	Porcupine Mountains State Park Trails					



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Superior Region, West - Back Side 1/4 Scale Mock-up