Huron River Watershed Council

Protecting the river since 1965

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Bioreserve Method

Following is a breakdown of the scoring for each criterion:

- **Size**. Natural areas were sorted according to their size and divided into five categories using natural breaks. The largest areas received 100 points and the smallest parcels received zero. Field: "Acres."
- **Core size.** Core area is defined as "size" (see above) minus a 300-foot wide buffer measured inward from the edge of the site. Core area is different from total area of the site because it takes into account the shape of the site. Typically, round shapes contain a larger core area relative to the total site than long narrow shapes. The largest core areas received 100 points and the smallest parcels received zero. Field: "Core Size."
- **Presence of waterway or lake.** Natural areas containing rivers or streams received 100 points, natural areas without waterways received zero. Field: "WATER."
- **Areas containing wetlands and uplands.** Natural areas containing any wetlands present received 100 points while natural areas without wetlands received 0. Field: "WETLANDS."
- **Potential for groundwater recharge.** The movement of groundwater through soils and into surface waters can be illuminated by applying Darcy's Law, an equation that describes water flow in soils. A map illustrating how Darcy's law applies to groundwater flow has been created for the entire lower peninsula of Michigan (Baker, M.E., M. J. Wiley, and P.W. Seelbach. 2001). It indicates areas where soil types are more likely to allow infiltration leading to groundwater discharge. Natural areas were converted from vector to raster format to match the data of the Darcy map, and Darcy values within each natural area were averaged. The average Darcy value for all the cells in a natural area was generated. These averages were ranked into five classes using natural breaks. Natural areas with a higher potential for groundwater infiltration received 100 points while areas with the lowest potential received zero. Field: "Groundwater."
- **Presence in the 1800's of conifer swamp, lowland hardwood, oak opening, central hardwood, or emergent wetland.** Natural areas were analyzed to see if they had formerly contained any of these presettlement vegetation types. The number of types of presettlement ecosystems present in each natural area was tallied, and natural areas that intersected areas where any of the presettlement vegetation occurred were ranked higher than those without. Sites with the highest number of these ("remnant") ecosystems received 100 points while areas with none received zero. Field: "Remnant Ecosystems Count."

- **Glacial variation.** Natural areas were intersected with glacial variation data to determine the number of glacial landforms within each natural area. A higher diversity of glacial landforms in a particular natural area resulted in that area scoring higher points. Sites with the highest number of glacial landscapes received 100 points while areas with only one received zero. Field: "Glacial_co."
- **Topographical variation.** The number of slopes and aspects in a natural area is an indicator of ecosystem diversity. For instance, northeast slopes tend to be cooler and moister, while southwest aspects tend to be warmer and drier. Slope and aspect were identified using a digital elevation model (DEM) of the Watershed to create a triangulated irregular network (TIN) for the Huron River Watershed. A TIN identifies slope and direction between centroid points of the raster DEM data, creating a triangle for each piece of land with consistent slope and aspect. The number of triangles within each natural area was summarized, providing an indication of the roughness or topographic diversity of the site. The number of TINs was divided into five categories using natural breaks. Those sites with highest topographical diversity received 100 points, those with the least received zero. Field: "Topographic Count."
- **Connectedness.** Natural areas closer to other natural areas have the potential to be corridors for wildlife and provide for more contiguous natural areas. The proximity of the site to other bioreserve sites was measured by building a 100 foot buffer around each site and counting the other bioreserve sites in that buffer. Sites with the highest number of bioreserve sites within their buffers received 100 points while areas with only one received zero. Field: "Connectedness Count."
- **Connectedness.** Another measure of connectedness is the percent of a ¼ mile buffer around the natural area that remains undeveloped. The sites with the largest percentages of undeveloped area in their buffers received 100 points and those with the smallest percentages received zero. Field: % of Buffer Bioreserve
- **Unchanged Vegetation: by Percentage**. A vegetation change map comparing the 2000 vegetation to the circa 1800 vegetation was created. The resulting potential unchanged vegetation can then act as an indicator of vegetation quality. Calculating the percentage of the site that contains potentially unchanged vegetation allows small sites with a high percentage of potentially unchanged vegetation to score points. Sites with the highest percentage of unchanged vegetation received 100 points; those with the lower received zero. Field: "%Potentially Unchanged."
- **Unchanged Vegetation**: **by Area**. Calculating the area of potentially unchanged vegetation that falls within each bioreserve site balances the bias of small sites with high percentage of potentially unchanged vegetation by awarding points based on actual area covered. Sites with the largest area of unchanged vegetation received 100 points; those with lower areas received zero. Field: "Area Potentially Unchanged."
- **Restorability**. We measured the percentage of undeveloped l ands within a ¼ mile buffer area. Sites with the largest percentage of undeveloped lands within their buffer received 100 points; those with lower percentages received zero. Field: "% of Buffer Undeveloped."

- **Area of MNFI Community**. The Michigan Natural Features Inventory has a database of known boundaries of high quality plant communities. Sites with larger areas of "MNFI Communities" received 100 points; those with no areas received zero. Field: "Area of MNFI Community"
- **Biorarity**. MNFI has created a grid by section of what it calls "biorarity," a score reflecting their database of high quality plant communities, occurrences of threatened and endangered plants and animals, and other measures of potential ecological quality. This grid was overlaid onto the Bioreserve Site layer. Sites with a higher average biorarity score received 100 points; those with a lower score received zero. Field: "Average Biorarity."

Ranking breakdown by category

Category and units	*Highest ranking*				*Lowest ranking*	*Breaks*	*Method*
Size Acres	100 Highest acreage	75	50	25 Lowest acreage	0	5	Natural Breaks
Core Size Acres	100 Highest acreage	75	50	25 Lowest acreage	0	5	Natural Breaks
Waterways	100 Rivers present			Rivers absent	0	2	Presence Absence
Wetlands	100 Wetlands present			Wetlands absent	0	2	Presence Absence
Groundwater recharge Average of standard deviations per unit	100 Highest infiltration	75	50 Lowest infiltration	25	0	5	Natural Breaks
Remnant ecosystems Number of rare presettlement vegetation types	100 4	75 3	50 2	25 1	0 0	5	Numeric
Glacial variation Number of different landforms	100 4	66 3	33 2	0 1		4	Numeric
Topographic variation TINs	100 Max. Number of TINs	75	50	25 Min. number of TINs	0	5	Natural Breaks
Connectedness Number of bioreserve sites w/in 100 ft. buffer	100 8 – 11	66 4 – 7	33 2 – 3	0 1		4 4	Numeric
Connectedness Percent of ¼ mile buffer that is a Bioreserve Site	100 Highest percentage	7550	25 Lowest percentage	0		5	Natural Breaks

	100	75	50	25	0		
Unchanged Vegetation	100	75	50	25	0	5	Natural
Percent of Bioreserve Site that remain unchanged	Highest percentage			Lowest percentage			Breaks
Unchanged Vegetation	100	75	50	25	0	5	Natural
Area of Bioreserve Site that remains unchanged	Highest area			Lowest area			Breaks
Restorability	100	75	50	25	0	5	Natural
Percent of buffer that is undeveloped	Highest percentage			Lowest percentage			Breaks
Area of MNFI Community Area of Site that is MNFI Community	100 Highest acreage	75	50	25 Lowest acreage	0	5	Natural Breaks
Biorarity Average Biorarity score for Site	100 Highest score	75	50	25 Lowest score	0	5	Natural Breaks

To obtain final rank, create the field "final rank," and calculate it as the sum of all the ranks.

We have displayed the final ranking with three classes from lowest to highest priority, with the final ranking classified in 3 categories with natural breaks. 0 – 158, 158 – 591, and 591 – 1224.