Overview of Water Classification For Shoreland Management

Lakes and streams in Oconto County are changing. The development pressures of new homes, conversion of older cottages to year round homes, and other shoreland development activities are adversely affecting water quality, wildlife habitat and natural scenic beauty. In turn, this degradation affects all who utilize Oconto County waters. Understanding and wisely managing the impacts of shoreland development can help protect this vital ecological and economic resource for Oconto County.

A water classification approach to shoreland management allows Oconto County to tailor management tools (such as education, technical and financial assistance and shoreland zoning) to a particular water body. Water classification projects are supported by state investment, university extension resources and private organizations. Projects are further supported though diverse public participation.

Oconto County Water Classification contains five main components:

1. Classification system - Lakes and streams are placed in management groups based on their sensitivity to development activities/resulting pollutants and their current level of development.

2. Management objectives – Water quality, habitat, public use/recreation and compatible shoreland development goals are identified for each management class.

3. Management strategies and tools - General management strategies and specific management tools are investigated and selected based on effectiveness, community capacity to implement them and water class objectives.

Management Strategies

Land use regulations, community planning, incentives, educational programs and new technologies are considered.

Management Tools

Specific management tools are selected for each general strategy. Most communities have recognized the importance of land use controls and have

investigated some or all of the following issues in selecting development standards appropriate for water class objectives:

o development density (lot size)
o development patterns (cluster & keyhole development)
o shoreline buffers & setbacks
o erosion control
o stormwater runoff management (detention/infiltration areas and impervious surfaces)
o protection of sensitive areas (wetlands, special habitat or scenic areas)
o expansion/development of substandard structures and lots.

4. Implementation – Selected management strategies and tools are implemented.

5. Performance monitoring - Progress toward water class objectives are measured and policy corrections implemented.

How lakes are classified

Choosing variables for lake classification

The variables Lake Hydrologic Type, Shoreline Development Rating, Percent Erodible Soils, and Percent Shoreline Development were used to classify the lakes. ArcView and the DNR's Surface Water Resources were the primary data sources.

Lake Hydrologic Type

Lake Hydrologic Type is a hydrologic designation. Four lake designations have been used by the Wisconsin Department of Natural Resources. The designations are:

Seepage - No inlets and no outlets; landlocked. Intermittent outlet may be present. Water level maintained by groundwater table and basin seal. Seepage lakes have small watersheds and very low flushing rates, making them the most sensitive to shoreland-derived pollutants.

Drained - Natural lake whose main water source is dependent on the groundwater table, basin seal and seepage from adjoining wetlands. Seldom has an inlet but will have an outlet of very little flow. Characteristics similar to that of the seepage lake except for the outlet. Drained lakes generally have small watersheds and low flushing rates, making them relatively sensitive to shoreland-derived pollutants.

Spring - Seldom has an inlet, but always has an outlet of substantial flow. Water supply dependent upon groundwater rather than surface drainage. Spring lakes have high flushing rates, making them relatively insensitive to shoreland-derived pollutants.

Drainage - Impoundments and natural lakes whose main water source is from stream drainage. Drainage lakes have at least one inlet and an outlet. Drainage lakes have large watersheds and high flushing rates, making them generally the least sensitive to shoreland derived pollutants.

Shoreline Development Factor (SDF) (lake shape)

Shoreline Development Factor is a ratio of shoreline length to the circumference of a circle with the same area. The higher the SDF number, the more irregularly shaped the lake is. Lakes with high irregularity have a greater amount of shoreline available for development and a greater susceptibility to development impacts on water quality and shoreland habitat.

% Erodible Soils

% Erodible Soils indicate the potential for shoreland development to cause erosion and impact water quality. The amounts and types of all soils, including erodible soils, within 1000 feet of the lake shoreline were calculated. The higher the Percentage of Erodible Soils in a surrounding 1000 foot zone of the lake, the higher the susceptibility for erosion and nutrient loading to the lake.

% Shoreline Development

% Shoreline Development calculates the amount of developed land on lake shorelines. Aerial photographs and GIS parcel layers were used to estimate the percentage of shoreline in a developed condition.

Use of % Shoreline Development, % Erodible Soils, and SDF to classify lakes

Using all lakes greater than 20 acres, a graph for each variable was produced. Each variable graph was used to establish rankings of 1, 2, 3, or 4 for each lake. A ranking of 1 represents a high sensitivity to development, while a ranking of 4 represents a low sensitivity to development. Table 1 shows how lakes were ranked by variable.

Table 1 Lake rankings by variable.

Ranking	% Development	% Erodible Soils	SDF	Lake Hydrology
1	0 – 10	51 - 100	2.51 +	Seepage
2	11 – 35	26 - 50	2.01 - 2.50	Drained
3	36 – 60	11 - 25	1.51 - 2.00	Spring
4	61 - 100	0 - 10	1.00 - 1.50	Drainage

The rankings for variables Percent Erodible Soils, SDF, and Lake Hydrology were averaged. The average is the sensitivity score. The sensitivity score and Percent Shoreline Development ranking were then used in a Lake Classification Matrix.

Lake Classification Matrix

This matrix is used to determine a lake's classification. The sensitivity score and the Percent Shoreline Development ranking are used in the matrix. Lakes can either be Class 1, Class 2, or Class 3 lakes. Class 1 lakes are most sensitive to development and Class 3 lakes are least sensitive to development.

Two Variable Lake Classification Matrix					
Sensitivity Score	4	Class I	Class II	Class III	Class III
	3	Class I	Class II	Class II	Class III
	2	Class I	Class II	Class II	Class III
	1	Class I	Class I	Class II	Class III
	0	1	2	3	4
	% Shoreline Development Ranking				

Lake Classification Results

Lakes less than 20 acres are Class 1. Lakes greater than 20 acres are classified using the variable rankings and the classification matrix. Table 2 lists the results of the classification.

Table 2 Classified lakes ≥20 acres.

Lake name according to DNR Surface Water Resources	Location T-R-S	Lake classification using % Erodible Soils, SDF, and Lake Hydrology as sensitivity variables
Anderson	T30N R17E S03	3
Archibald	T32N R15E S02	2
Balcom	T28N R19E S17	1
Barnes	T32N R15E S16	1
Bass	T32N R15E S09	3
Bear	T33N R16E S21	2
Bear Paw	T31N R17E S08	1
Berry	T28N R17E S19	3
Big Gillett (Gillett)	T32N R16E S18	2
Big Island	T32N R15E S24	2
Binder	T33N R16E S19	2
Boot	T32N R15E S09	2
Boulder	T31N R15E S21	2
Boundary	T32N R17E S12	3
Camp Four	T32N R16E S19	1
Cave	T32N R15E S15	1
Chain	T33N R16E S31	2
Chicken Crop	T32N R15E S15	1
Chicken Foot	T32N R15E S15	1
Christie	T28N R18E S19	1
Chute	T31N R16E S36	3
Cooley	T29N R18E S02	1
Crooked	T32N R17E S22	3
Deadman	T32N R15E S22	2
Deer	T30N R18E S26	1
Dell	T32N R17E S12	1
Explosion	T33N R15E S29	3
Flower	T32N R17E S13	2
French	T32N R15E S13	2

Funk	T30N R18E S23	1
Glockie	T33N R15E S24	1
Green	T31N R16E S13	3
Grignon	T29N R17E S7	1
Grindle	T32N R17E S21	3
Hagen	T32N R16E S20	1
Halfmoon	T31N R18E S1	3
Hidden	T33N R16E S08	1
Horn	T33N R15E S21	2
Impassible	T30N R18E S23	1
John	T33N R16E S16	3
Kathleen	T32N R15E S21	1
Kelly	T29N R19E S06	3
Klaus	T28N R18E S4	1
Ledge (Pine)	T32N R17E S01	1
Leigh Flowage	T30N R19E S30	3
Little Archibald	T33N R15E S36	2
Little Horn	T33N R15E S28	3
Little Maiden	T32N R16E S07	2
Little Pickerel	T33N R15E S11	2
Long	T30N R19E S31	2
Machickanee Flowage	T28N R20E S34	3
Maiden	T32N R16E S07	3
Munger	T33N R16E S21	2
Neligan	T32N R17E S27	2
Oconto Falls Pond	T28N R19E S26	2
Paya	T32N R16E S10	3
Pickerel	T31N R18E S01	2
Pickerel	T33N R15E S11	3
Pine Ridge	T33N R16E S23	2
Plantation	T33N R15E S13	1
Porcupine	T29N R19E S12	1

Quill	T32N R15E S13	1
Ranch	T31N R18E S12	2
Reservoir	T33N R15E S28	2
Rost	T30N R19E S24	3
Round	T30 R19E S31	2
Shadow	T32 R15E S35	1
Shay (Brazeau)	T31N R18E S18	3
Shay (Doty)	T32N R15E S17	2
Smoke	T33N R15E S14	2
Squaw	T30N R18E S24	1
Star	T32N R15E S26	3
Sunrise	T32N R17E S29	3
Surprise	T33N R15E S10	3
Townsend Flowage	T33N R15E S26	3
Trout	T32N R15E S21	1
Ucil	T30N R18E S13	2
Underwood	T30N R19E S30	3
Wapato Lower	T33N R15E S32	2
Wapato Upper	T33N R15E S31	2
Waubee	T33N R16E S13	3
Waupee	T31N R17E S03	1
Waupee Flowage	T32N R17E S21	1
Wescott	T30N R18E S24	2
Westphall	T31N R17E S21	1
Wheeler	T33N R16E S22	3
White	T30N R18E S36	2
White Potato	T31N R18E S23	3
Winslow	T32N R16E S08	2
Wiscobee	T29N R17E S05	1

How Streams and Rivers are Classified

Data Source for Streams and Rivers

The primary source of data came from Wisconsin Administrative Chapter NR 102 "Water Quality for Wisconsin Surface Waters" and Wisconsin Trout Streams publication 6-3600 (80). NR 102 and Wisconsin Trout Streams designate outstanding and exceptional resource waters and Trout Class Streams 1, 2, and 3 for Wisconsin, respectively. Outstanding and exceptional resource waters and Trout Class 1 waters were classified as Water Classification Class 1 waters. All other streams and rivers were classified as Water Classification Class 2 waters.

Please see these documents for the names and locations of streams and rivers in Oconto County.