Appendix IV
How to Use the Streams and Lakes Tables

HOW TO USE THE STREAM TABLES

The stream tables are provided for each subwatershed with the information listed on 4 separate pages. Each page has a descriptor identifying if it is page 1, 2, 3, or 4 (of the 4) listed in the upper right hand corner of the table.

Name of Stream: All named streams and some unnamed streams are listed. Stream names are those found on U.S. Geological Survey (USGS) quadrangle maps unless the Wisconsin Geographic Names Council has established a different name.

Length: Stream length is either the total length of the stream, or the starting and ending mile of the portion of the stream described, based on data from a fish distribution study conducted by the Bureau of Research (Fago, 1984). The stream mile at the stream mouth is zero ("0") and increases as one moves upstream.

Existing Use: This column indicates the existing biological use supported by the stream as defined in NR 102(04)(3) under fish and aquatic life uses. The word "unknown," or a blank space, indicates the existing use is unassessed. The following abbreviations for stream uses are used in the tables:

COLD; Cold Water Community; includes surface waters capable of supporting a community of cold water fish and other aquatic life, or serving as a spawning area for cold water fish species.

WWSF; Warm Water Sport Fish Communities; includes surface waters capable of supporting a community of warm water sport fish, or serving as a spawning area for warm water sport fish.

WWFF; Warm Water Forage Fish Communities; includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

LFF; Limited Forage Fishery (intermediate surface waters); includes surface waters of limited capacity because of low flow, naturally poor water quality or poor habitat. These surface waters are capable of supporting only a limited community of forage fish and aquatic life.

LAL; Limited Aquatic Life (marginal surface waters); includes surface waters severely limited because of very low or intermittent flow and naturally poor water quality or poor habitat. These surface waters are capable of supporting only a limited community of aquatic life.

DEF; Fish and Aquatic Life; All streams not formally classified are assumed to meet the Federal Clean Water Act goals of supporting recreation and aquatic life uses and are identified here a DEF (default).

GLC; Great Lakes Communities; includes Lake Superior, Lake Michigan and Green Bay, including all bays, arms and inlets thereof and including those tributaries that serve as spawning areas for anadromous fish species. Many of the streams and rivers in the Twin-Door-Kewaunee Basin fall under the GLC classification. Chapter NR 102(04)(3), Wis. Adm. Code, is being revised. Since specific water bodies are not listed in this code, streams in this basin are not formally classified as GLC. Updates of this plan will include the GLC classification according to the updated code.

The table also includes "classes" of trout streams, based on "Wisconsin Trout Streams" [WDNR Publ. 6-3600(80)]. The approximate length or portion of stream meeting each of the use classes is indicated.

Class I streams are high-quality streams where populations are sustained by natural reproduction.
Class II streams have some natural reproduction but need stocking to maintain a desirable fishery.
Class III streams sustain no natural reproduction and require annual stocking of legal-size fish for sport fishing.

Potential Use: This column indicates the biological use and trout stream class a stream or stream segment could achieve if it was well managed and pollution sources were controlled. In many cases, potential use is the same as the existing use classification. In other streams, potential use may be higher than the existing use. Abbreviations are the same as those used in the existing use columns. The sources of information are indicated by footnotes. (Not all footnotes defined below the tables may be represented.) The classification for trout streams came from "Wisconsin Trout Streams" (Kmiotek, 1980), Chapters NR 102.10 and NR 102.11, Wis. Adm. Code, and the professional judgments of area fish managers. The word "unknown," or a blank space, indicates that the potential biological use is unassessed.

Supporting Assessment Category: This column indicates whether a stream or parts of a stream are threatened, or are fully, partially or not meeting potential biological use. If use support is unknown, the word "unknown," or a blank space indicates it is unassessed.

Assessment Data / Monitored or Evaluated: If the potential use decision was based upon site-specific data, then "M," for monitored, is entered. If site-specific data was unavailable and a biologist or fish manager was familiar enough with the resource to provide a reasonable assesment based on best professional judgment then "E," for evaluated, is entered.

Codified Classification (water quality standard designation): This column indicates the formal classification of a particular stream. Streams considered to be formally classified are those listed in Wisconsin Administrative Codes NR 102 and NR 104, all those referenced in Wisconsin Trout Streams, NR 102, and other formal stream classifications that will be added to the codes upon the next revision. A stream may also be classified as an Outstanding Resource Water (ORW) or an Exceptional Resource Water (ERW), as defined in NR 102.10 and NR 102.11:

Outstanding Resource Waters have the highest value as a resource, excellent water quality and high quality fisheries. They do not receive wastewater discharges and point source discharges will not be allowed in the future unless the quality of such a discharge meets or exceeds the quality in the receiving water. This classification includes national and state wild and scenic rivers and only the highest quality Class I trout streams in the state.

Exceptional Resource Waters have excellent water quality and valued fisheries but already receive wastewater discharges. Actions necessary to correct environmental or public health problems may also result in future discharges to these waters. This classification includes about 1,400 trout stream segments not classified as Outstanding Resource Waters.

All streams not formally classified are assumed to meet the Federal Clean Water Act goals of supporting recreation and aquatic life uses and are identified here as DEF (default).

HBI Water Quality Integrity Indicator: This Column provides a water quality rating based on the Hilsenhoff Biotic Index (HBI) which uses an average tolerance value for all macroinvertebrates present within the sample that have an assigned tolerance value (a tolerance value is associated with an individual organisms ability to tolerate decreased dissolved oxygen levels associated with organic enrichment). This index is an indirect measurement of the degree of organic enrichment which has proven to be a useful tool in assessing impacts form non-point source or runoff pollution. A corresponding water quality rating is provided after the index score and a date and season is also provided.

An incremental breakdown of the HBI water quality ratings based on the HBI score is as follows: a score of 0-3.50 indicates “Excellent” water quality, 3.51-4.50 indicates “Very Good” water quality, 4.51-5.50 indicates “Good” water quality, 5.51- 6.50 indicates “Fair” water quality, 6.51- 7.50 indicates “Fairly Poor” water quality, 7.51-8.5 indicates “Poor” water quality, and a score >8.5 indicates “Very Poor” water quality. HBI scores and HBI water quality ratings should be cautiously used; because, If the sample was not collected from a sampling site with ideal sampling conditions using the proper methodology the score may reflect environmental conditions other than water quality and could result in an inaccurate assessment of water quality.

Joe Ball Habitat: This column provides an index score based on a rapid assessment of in-stream habitat and the watershed factors affecting in-stream habitat. The index is based on a scale ranging from 0 – 254 with 0 representing excellent habitat and the watershed factors affecting habitat and scores as they approach 254 representing poor habitat and the associated watershed factors affecting habitat.

An incremental breakdown of the habitat quality ratings based on the score generated using the Joe Ball Habitat methodology is as follows: scores less than 70 represent “Excellent” habitat and the watershed factors affecting habitat, scores between 71 – 129 represent “Good”, scores between 130 – 200 are only “Fair”, and scores greater than 200 are “Poor”. The Joe Ball methodology for assessing stream habitat can produce a fairly effective assessment of habitat if the evaluator spent adequate time familiarizing themselves with the physical in-stream habitat and associated land use for the stream segment being evaluated. However, established procedures

for this methodology did not include clear instructions on what was adequate for orientation prior to rating the habitat. In the past, some of these surveys were done from bridge crossings with little or no walking of the stream to orient the evaluator to the overall condition of the segment being evaluated. For this reason the reader is cautioned against using this data to track trends or make management decisions without other supportive data.

Simonson et al. Habitat: This column is present in very few of the watershed stream tables; but, the data will be an increasingly important part of future surveys and an important tool to help make management decisions. This column, if present, represents a more detailed approach to direct measurements of instream habitat and the watershed factors affecting habitat insuring reproducible results and increasing the accuracy of assessments through time and the ability to detect change. Caution should also be used when interpreting these scores. This index is a product of many specific habitat variables and a stream is only as healthy as its most limiting factor. A good score can be achieved even if all of the spawning habitat is buried in sediment. For this reason the reader is encouraged to go back to original field sheets and look more closely at the individual variables that made up the final score. If critical variables are receiving scores of near zero, it is an indication that a serious problem exists and these items need to be addressed through specific management actions. An incremental breakdown of the habitat quality ratings based on the overall score is as follows: a score of 75-100 indicates “Excellent” habitat, 50 – 74 represents “Good” habitat, 25-49 is only “Fair” habitat, and scores less than 25 indicate “Poor” habitat (Simonson et al., 1993).

Lyon’s IBI Water Quality Integrity Indicator: This column is present in very few of the watershed stream tables; but, the data will be an increasingly important part of future surveys and an important tool to help make management decisions. This column, if present, provides a water quality rating based on the fish community structure and generates a corresponding Index of Biotic Integrity (IBI) score. This index was initially developed by Karr (Karr 1981, Karr et al., 1986) and modified for warmwater and cold water streams in Wisconsin by John Lyons (Lyons 1992, and Lyons 1995 respectively). John is also working on developing a cool water IBI which should greatly enhance our ability to assess streams that the warm water and cold water IBI couldn’t effectively do.

Environmental Problems, Source / Impact: These two columns list the probable sources of pollution and the types of water quality impacts or problems they present. Some streams listed as fully meeting their potential may still have a use problem. This may mean the problem cannot be managed or that there is a threat to the potential use. These situations are explained in the narrative or may be listed in the references column for that stream. Following is a key to the abbreviations which may be used if the full descriptor would not fit in a given column:

Source (cause of problem)

DRDG - Dredging
HM - Hydrologic modification
LF - Landfill leaching
NPS - Unspecified nonpoint sources
BY - Barnyard or exercise lot runoff

CL - Cropland erosion
CON - Construction site erosion
PSB - Stream bank pasturing
PWL - Woodlot pasturing
RS - Roadside erosion
SB - Stream bank erosion
URB - Urban stormwater runoff
WD - Wind erosion
PSM - Point source, municipal treatment plant discharge
PSI - Point source, industrial discharge
SS - Storm sewer

Impact (effect or impact of source on a stream)

BAC - Bacteriological contamination
DO - Low dissolved oxygen levels
FCA - Fish consumption advisory
FLOW - Stream flow fluctuations caused by unnatural conditions
HAB - Habitat degradation (lack of cover, sedimentation, scouring, etc.)
HM - Heavy metal toxicity
MIG - Fish migration interference
NUT - Nutrient enrichment
ORG - Organic chemical toxicity or bioaccumulation
PCB - PCB bioaccumulation
SED - Sedimentation
TOX - General toxicity problems
TURB - Turbidity

References: This column lists the written references and personal communications used to fill in the information for different columns within the watershed tables. These references are listed at the back end of this report in the “reference list”.

Trend: This column lists if there is a known trend in increasing or decreasing water quality. In most situations adequate data to assess this parameter is lacking and unknown will appear in this column.

Data reliability: This column lists the reliability and volume of supporting data used to determine if a stream is meeting its current potential and if there was an increasing or decreasing trend in water quality. Data that was more then 5-10 years old was considered less reliable in assessing current conditions. A scale of 1 to 4 was used to provide a crude indication of the reliability of the data to assess current conditions within a given stream or stream segment. A score of 1 represents a stream or stream segment that had very little in the way of monitoring information or the data was more than ten years old. Scores approaching 4 represent a stream or stream segment that had current data reflecting habitat, IBI, HBI, and water chemistry data adequate to assess the portion of stream listed.

NPS Ranking: This column lists how a give stream or stream segment should be considered based on current impacts or the threat of impacts from NPS runoff pollution and how it should be viewed on a priority scale ranging from low to high for conservation program funding.

Additional Comments: This column provides additional information qualifying the information provided in the previous columns. (The narratives and recommendations are on the pages preceding the watershed tables.)

HOW TO USE THE LAKE TABLES

The lakes tables are presented by subwatersheds and broken down into three parts to fit the information on a standard landscape print format. The table includes general information (e.g. lake name, location, size) and a summary of lake management activities, monitoring, recommendations and references, with a summarization of lake trophic state information (e.g. phosphorus sensitivity). Each part will be labeled in the upper right hand corner of the sub-table as part 1 of 3, part 2 of 3, ...

General Lake Information Tables

Lake Name: All named and unnamed lakes in the basin greater than ten acres in size are listed in the lake tables. Lake names are those found on U.S. Geological Survey quadrangle maps unless the Wisconsin Geographic Names Council has established a different name. Some lakes are known locally by other names. Where available, those names have been listed along with the lake's official name. Master waterbody numbers, if available, are also listed.

County: This column lists the county the lake occurs in.

WBIC: This column provides the Water Body Identification Code (WBIC) which is a unique number for every named and most unamed lakes and streams within the state. This insures that waterbodies with the same or similar names can be differentiated in reports and data base systems.

Twn-Rng-Sec): This column provides each lakes specific location based on township, range, and section number.

Surface Area: The surface area is the size of the lake, in acres, as listed on WDNR Master Waterbody File.

Maximum Depth: Maximum depths given in feet are those listed in *Wisconsin Lakes*, published by WDNR.

Lake Type: Each lake type displays unique limnological characteristics based on physical and chemical properties. Production of plant and animal life generally varies in accordance with lake type. Basic classifications are:

drainage lake--impoundments and natural lakes whose main water source is from stream drainage. Has at least one inlet and one outlet. Generally, drainage lakes have large watersheds.

drained lake--natural lake whose main water source is dependent on the groundwater table and seepage from adjoining wetlands. Seldom has an inlet but will have an outlet of very little flow (similar to the seepage lake except for outlet).

seepage lake--landlocked. Water level is maintained by groundwater table and basin seal. An intermittent outlet may be present.

spring lake--seldom has an inlet, but always has an outlet of substantial flow. Water supply dependent upon groundwater rather than surface drainage.

The abbreviation "imp" following any lake name denotes that an impounding structure (dam) is located on that lake. Shallow impoundments commonly exhibit problems such as sedimentation, turbidity, excess vegetation and algae, low dissolved oxygen levels, rough fish and water level fluctuations.

History of Winterkill: Because many small, shallow lakes experience oxygen depletion, they are vulnerable to dieoffs of existing fish populations during the winter. This column has been marked "yes" if there have been any known incidents of winterkill.

Access: This column provides information on the availability and type of public access.

Self Help: This column provides information about existing Self Help monitoring and provides recommendations for implementing it on lakes where it is needed to fill gaps in the current database.

Mercury Fish Consumption Advisory: This column lists existing mercury fish consumption advisories. Not all fish species and size groups have been tested for all lakes occurring within the Lakeshore Basin. A new, more conservative, mercury fish consumption advisory was developed for all waters of the State in February of 2001. This is a general advisory and does not affect the specific advisories issued for state waters.

Eurasion Water Milfoil: This column lists lakes where Eurasion Water Milfoil has been documented by a qualified aquatic plant taxonomist.

Lake Management Organization: This column lists all qualified lake management organizations associated with a specific lake.

Planning or Protection Grants: This column lists all past and current lake management planning or protection grants.

Lake Trophic State Information: This super-heading includes four sub-heading columns related too characterization of a lakes fertility or trophic state.

Trophic State Information

TSI numbers are general indicators of a lake's trophic class. There are three types of TSIs. TSI (TP) is an indicator based on the total amount of phosphorus available in the lake as indicated by lake monitoring. Phosphorus is an indicator of the amount of nutrients available for algae growth. TSI (CHL) is an indicator based on the amount of chlorophyll a (a measure of the amount of algae present) and TSI (SD) is a measure based on the Secchi depth (an indicator of water clarity).

To calculate TSIs, lake data were retrieved from STORET. Self-Help Lake Monitoring Secchi depth data, Office of Inland Lake Renewal (OILR) feasibility studies and WDNR Bureau of Research data were also utilized. *Wisconsin's Lakes: A Trophic Assessment* by Martin, *et al.* (1983) was reviewed for additional trophic state information.

TSIs were calculated only for those lakes for which WDNR had at least three data points taken from May-September. For TSI(TP), spring overturn phosphorus values were also a requirement. Data points were averaged before being applied to the TSI equation.

The following TSI equations were used:

$TSI(TP) = 60 - 33.2 \log_{10}(40.5/TP)$

$TSI(CHL) = 36.25 + 15.5 \log_{10} Chl$

$TSI(SD) = 60 - (33.2 \log_{10} SD)$

Trophic Status Index (TSI) Class: Lakes can be divided into three categories based on trophic state: **oligotrophic**, **mesotrophic** and **eutrophic**. These categories are a general indicator of nutrient levels and observed water clarity in a lake. Oligotrophic lakes are generally clear, cold and free of many rooted aquatic plants or large blooms of algae. Because they are low in nutrients, oligotrophic lakes generally do not support large fish populations. However, they often have an efficient food chain with a very desirable fishery of large predator fish. Eutrophic lakes are high in nutrients. They are likely to be either weedy or experience algae blooms, sometimes both. They often support large fish populations, but are also susceptible to oxygen depletion. Small, shallow lakes are especially vulnerable to "winterkill," which can reduce the number and types of fish. Mesotrophic lakes are in an intermediate stage between oligotrophic and eutrophic. The bottoms of these lakes are often devoid of oxygen in late summer months, limiting cold water fish and resulting in phosphorus cycling from sediments. Lakes with a TSI $\leq$ 39 are generally considered oligotrophic, those with a TSI of 40-49 are considered mesotrophic, and those with a TSI $\geq$ 50 are generally considered eutrophic.

All lakes naturally age, or progress from being oligotrophic to eutrophic. In many places, people have accelerated this process by allowing nutrients from agriculture, lawn fertilizers, streets, septic systems, and urban storm drainage to enter lakes. All these activities have affected lakes in the Twin-Door-Kewaunee basin.

TSI Total Phos: This column lists a TSI score based on average total phosphorus concentrations present during the normal summer growing season or a Growing Season Mean (GSM). Phosphorus is an indicator of the amount of nutrients available for algae growth.

TSI Secchi Depth: This column lists a TSI score based on average Secchi depth readings during the normal summer growing season or a Growing Season Mean (GSM). Secchi depth readings provide a measurement of water clarity. In most situations algae are the principle factor limiting water clarity; so, Secchi readings provide an indirect measurment of algae production.

TSI Chl A: This column lists a TSI score based on average Chlorophyll A concentrations during the normal summer growing season or a Growing Season Mean (GSM). Chlorophyll A concentrations provide an indirect measurment of algal production; since, it is the primary pigment responsible for photosynthesis within most algae.

Phosphorus Sensitivity: The purpose of this analysis is to classify lakes according to their relative sensitivity to phosphorus loading and existing trophic condition. The screening identifies high-quality lakes that should receive highest priority for nutrient control management. The analysis first separates lakes into two major categories; lakes that are sensitive to increased phosphorus loading (Class I) and lakes less responsive to changes in phosphorus loading (Class II). Lakes in each general classification are then subdivided into management groups based on data needs or existing water quality conditions. These classification groups are used to establish appropriate management recommendations and priorities.

Class I:
- A = Existing water quality fair to excellent (TSI $\leq$ 54); potentially most sensitive to increased phosphorus loading.
- B = Existing water quality poor to very poor (TSI > 54); less sensitive to increased phosphorus loading than Group A.
- C = Data inadequate or insufficient to assess trophic condition; classification monitoring recommended.
- D = Stained, dystrophic lake, or aquatic plant-dominated lakes.

Class II:
- A = Existing water quality fair to excellent (TSI $\leq$ 54); may not be as sensitive to phosphorus loading as Class I lakes.
- B = Existing water quality poor to very poor (TSI > 54); low sensitivity to increased phosphorus loading.
- C = Data inadequate or insufficient to assess trophic condition.
- D = Stained, dystrophic lake, or aquatic plant-dominated lakes.

Comments: Additional information that was available for the lakes has been included in the comments column. Abbreviations were used to conserve space where necessary:

FCA = Fish Consumption Advisory currently in effect (as of October 1992)
LMO = Lake management organization exists for this lake (as of December 1991)
LM = Lake map available for this lake
Mig Birds = Significant use/stop for waterfowl and migratory water birds
N = See the narrative section for this county for a more detailed description
NPS = Nonpoint source water pollution impacts
Rec = High-quality recreational experience for listed activities: (eg. Rec: S, F, CA)

S - Swimming
C - Canoeing
W - Waterfowl hunting
CA - Camping
B - Boating
H - Hunting
F - Fishing