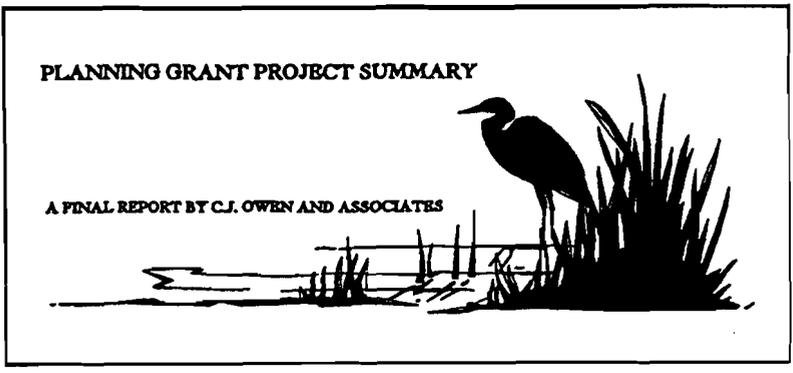


Handwritten notes:
The following contains
analysis for
the project

**PLANNING GRANT SUMMARY
FOR LAKE AMNICON AND
DOWLING 1994-1995**



March 8, 1995

Final Report

Report by:

C.J.Owen and Associate

Research Support:

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Funding by: Wisconsin DNR and The Lake Amnicon/Dowling Lake Management and Sanitary District

TABLE OF CONTENTS:

SECTION 1:

PHYSICAL/CHEMICAL CHARACTERIZATION:

- Dissolved Oxygen
- Temperature
- Chlorophyll
- Secchi
- Total Phosphorus
- Inorganic Nitrogen
- Water Chemistries

SECTION 2:

BIOLOGICAL and CONDUCTIVITY CHARACTERIZATION STUDY:

- Phytoplankton
- Bacteria
- Conductivity (Near-Shore Study)
- Periphyton Artificial Substrata-Colonization
- Macrophyte Survey and Outline for Integrated Macrophyte Control Program
- Soil Survey

SECTION 3:

AERIAL LAKESHORE ANALYSIS

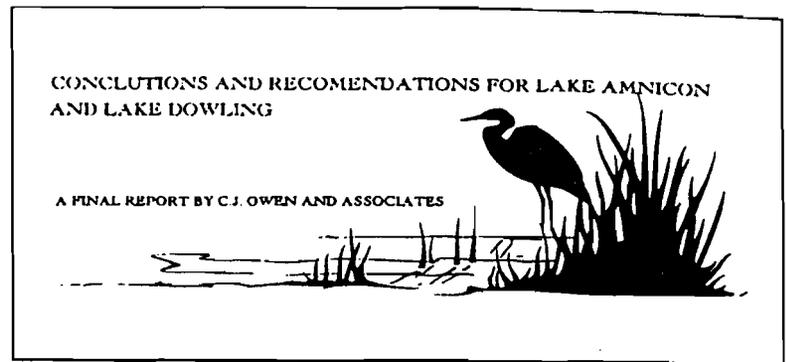
SECTION 4:

CONCLUSIONS AND RECOMMENDATIONS

SECTION 5:

BEST MANAGEMENT PRACTICES RESOURCES

CONCLUSIONS AND
RECOMMENDATIONS AS A RESULT
OF THE 1994 LAKE AMNICON/
DOWLING LAKE MANAGEMENT
PROJECT



Conclusions

Clearly, results from this study indicate the progressive eutrophication of both Lake Amnicon and Lake Dowling. Dramatic improvements in the manner in which lakeshore/watershed residences relate to the lakes needs to be addressed. The lack of sound shoreline best management practices (i.e. BMP's) has undoubtedly accelerated the process of eutrophication. As a result of water quality degradation, there was the early presence and persistence of blue-green algal blooms in both Lake Amnicon and Dowling, detracting from the recreational use of both lakes.

The high rate of production in these lakes has undoubtedly resulted in high organic loading and in turn, high rates of decomposition. This decomposition process utilizes dissolved oxygen, depleting its concentration in the water. However, because of the shallow nature of the lakes, results in weak thermal stratification, re-aeration due to wind mixing was evident. In contrast, during ice cover this decomposition continues without the advantage of the re-aeration process which may lead to fish stress or winter fish kills, if the winter anoxic layer continues to increase in depth for these lakes.

Chemical and physical data collected for Lake Amnicon and Dowling further support the eutrophic classification of these lakes. TSI's based on chlorophyll, secchi and TP all indicate a system eutrophic in nature. Further, TP:DIN ratios suggest systems co-limited by nitrogen and phosphorus, indicating systems sensitive to inputs of both nitrogen and phosphorus from septic systems and run-off.

Although limited by economic constraints (i.e. number of samples was limited), near-shore bacteria sampling did indicate areas of elevated Fecal Coliform, Fecal Streptococcus and E. Coli. These data however were inconclusive and only suggest areas of possible septic input.

Near-shore conductivity did show areas of elevated ion input, these areas being associated with heavy development and proximity to roads. These elevations are most likely due to increased ion-loading from residential properties to ground water and/or surface run-off.

The periphyton artificial substrata colonization survey was most successful on Lake Amnicon for identifying spatial differences in colonization rates. Greatest biomass accumulation was associated with highly developed areas of shoreline and proximity to roads. This method was less successful in Dowling Lake, presumably due to the highly colored nature of the water, which limits light penetration.

Areal lakeshore analysis of Amnicon and Dowling provided convincing circumstantial evidence to district members as to the high occurrence rate of possible septic, run-off, point source and toxic influences on the lakes. Although estimates of the percent of lots exhibiting these influences may be overstated by A.W. Research, the obvious influences can not be refuted. The data evaluation performed by A.W. Research on possible septic influences on the lakes is sound in its assumptions and conclusions (i.e. number of shoreline feet per lot, number of structures producing waste per lot and the presence of second tier development).

Conclusions drawn by A.W. Research as to the sensitivity of the lakes to hydrologic nutrient inputs is further supported by the soil characterization survey performed by the US Department of Agriculture in 1969. This survey suggests poor soil types for treatment of human waste by drainfield type systems. Recommendations by A.W. Research for the establishment of watershed BMP's and the need for more control over zoning ordinances is supported by C.J. Owen and Associates.

Results from the macrophyte synoptic surveys for Lake Amnicon and Dowling indicate a healthy, diverse community. Any control strategies for the lakes should be limited in its scope and should follow the development of an integrated macrophyte management plan, as outlined by C.J. Owen and Associates.

Re-evaluation of the soil survey conducted in 1969 by the US Department of Agriculture, further supports the conclusion that nutrient loading from lakeshore/watershed residential properties are most likely, impacting the water quality of both lakes. Soil types in general were not appropriate for the use of drainfield type systems.

Recommendations

The following recommendations are made by C.J. Owen and Associates as a result of the 1994 Lake Amnicon and Dowling lake management project:

1. A concerted effort must be made to explore alternative waste management alternatives for Lake Amnicon and Dowling, including, but not limited to, centralized waste treatment systems and holding tank technology. This effort must be carried out with all due haste, with full disclosure to members of the district and effected parties.
2. Closer ties must be made and consultation must be established between the Amnicon/Dowling Lake Management and Sanitary District and the local agency responsible for zoning ordinances so that a critical review of any expansion and/or development could be reviewed by the commissioners prior to construction.
3. A stronger Lakes Management Organization must be established with discreet objectives related to watershed and in-lake management issues, thereby freeing sanitary district member to address the waste treatment needs of the district members (this may mean establishment of a sub-committee for with oversight by the commissioners of the Lake Management and Sanitary District).
4. Establish a steering committee to direct the lake-wide implementation of watershed BMP's for Lake Amnicon and Lake Dowling.
5. Establish a steering committee to follow-up on the recommendations for the establishment of a integrated macrophyte management plan.
6. Work to implement recommendations as a result of the Areal Lakeshore Analysis, performed by A.W. Research.

Recommended Timeline for Future Lake Management Requirements

Spring 1995:

- ◆ Strengthen Lakes Management Organization by establishing various steering committees.
- ◆ Investigate alternative waste treatment systems for Lake Amnicon and Dowling and explore funding and management alternatives (in particular cooperative efforts with local power co-op's).
- ◆ Hold meetings with local WI-DNR and legislators to discuss results of Lake Management projects and directions for implementation of BMP's and waste treatment options.
- ◆ Set framework for dissemination of lake study results and recommendations to district members.

Summer 1995:

- ◆ Implement BMP educational programs.
- ◆ Continue baseline monitoring program for Lake Amnicon and Dowling.
- ◆ Explore future funding for continued work on Lake Amnicon and Dowling.
- ◆ Truth high priority sites, as indicated by the Areal Lakeshore Analysis results.

Summer/Fall 1995:

- ◆ Interview engineering firms and consultants ideas for alternative waste treatment systems.
- ◆ Secure funds for 1996 lake management program.

A reasonable time frame for full implementation of BMP's would be summer of 1997. Waste treatment alternatives should be fully implemented with full district compliance by the year 2000.

Future Research Needs

Future research needs include, groundwater monitor placement and analysis for ground water development of a nutrient budget for lake Amnicon and Dowling, development of a water budget for both lakes; continued chemical and physical monitoring to track stability of the lake systems.

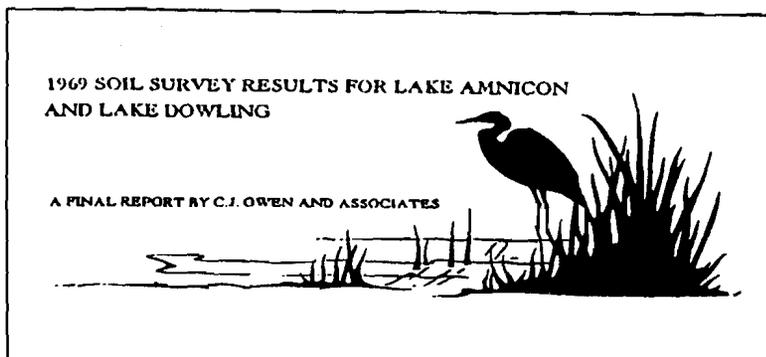
- 6). Balancing Enhancement of Beneficial Uses with Environmental Protection
 - a). What are the projected short-term and long-term impacts?
 - b). Is there a risk that control for the sake of maximizing human use could seriously jeopardize an important segment of the native aquatic plant or animal community?
- 7). Possible Mitigation Techniques and Costs, Including Replacement of Untargeted Plants That Are Removed
- 8). Local, County, State or Federal Permits Required

◆ **Develop Action Programs**

The final step takes information from the preceding steps to formulate a long-term action plan for management of the aquatic plant community in the lake.

It is important to note that special care must be taken when developing and executing an aquatic macrophyte program to ensure that the risk of possible environmental harm is minimized.

NORTHWESTERN
WISCONSIN REGIONAL
PLANNING AND
DEVELOPMENT
COMMISSION SOIL
SURVEY RESULTS



Soil Map Survey Results-1994 Application

As a result of public interest in the on-going Amnicon/Dowling lake management project, conducted by C.J. Owen and Associates, soil survey map results (previously unknown to district members) were brought to the attention of the lake management consultant. This map, produced in 1969 by the Northwestern Wisconsin Planning and Development Commission in cooperation with Davy Engineering and funded by the US Department of Agriculture, evaluated soil types adjacent to Lake Amnicon and Dowling. Soil characterizations were described in terminology most commonly used in this era, but conclusions drawn as to limitations for use of septic-filter fields are still applicable. It is most likely that soil types have not changed since this survey and that population density adjacent to the lakes, and the number of septic systems, has dramatically increased since the survey.

Most soil characterizations made on land adjacent to the lakes indicate soils of a sandy loam, loam or peat character. These soil types were classified as having moderate to high limitations for septic-filter field type systems. It should be noted that a large percentage of areas currently having significant development, were classified as having severe limitations for these types of systems.

It should also be noted that current management sectors 6-16, 18-28, 30, 32-40 for Lake Amnicon and 1-5, 10-12, 15, 20-23 for Dowling Lake have been characterized as having severe limitations and are currently areas of heavy residential development.

The results of this survey further support the data gathered by C.J. Owen and Associates, showing that major influences on lake eutrophication are human derived, driven by poor shoreline best management practices and likely influenced by the reliance on filter-field type treatment systems that are inappropriate for the soil types adjacent to Lake Amnicon and Lake Dowling.