AB 492a pt 01

48

Vote Record

Assembly Committee on Environment

Date:

Moved by: Duff

Seconded by: Kedzie

AB: 492

Clearinghouse Rule:

AB: SB:

Appointment:

AJR: SJR:

Other:

A: SR:

(3) (A)/S Amdt: 1894/1

A/S Amdt: to A/S Amdt:

A/S Sub Amdt:

A/S Amdt: to A/S Sub Amdt:

A/S Amdt: to A/S Amdt: to A/S Sub Amdt:

Be recommended for:

- ☐ Passage
- ☐ Introduction
- ☑ Adoption
- ☐ Rejection

- ☐ Indefinite Postponement
- ☐ Tabling
- ☐ Concurrence
- ☐ Nonconcurrence
- ☐ Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☑	☐	☐	☐
Rep. Tim Hoven	☑	☐	☑	☐
Rep. DuWayne Johnsrud	☑	☐	☐	☐
Rep. Eugene Hahn	☑	☐	☐	☐
Rep. Lorraine Seratti	☑	☐	☐	☐
Rep. Neal Kedzie	☑	☐	☐	☐
Rep. Peter Bock	☑	☐	☐	☐
Rep. Judy Robson	☑	☐	☐	☐
Rep. Spencer Black	☑	☐	☐	☐
Rep. John La Fave	☑	☐	☐	☐

Totals: ____ ____ ____ ____

(1) Duff – Unan Consent Intro

AA 0534/2

(2) Duff Intro AA 1894/1895

☐ Motion Carried ☐ Motion Failed

Vote Record

Assembly Committee on Environment

Date: _____

Moved by: Duff

Seconded by: Kedzie

AB: 492

Clearinghouse Rule: _____

AB: _____ SB: _____

Appointment: _____

AJR: _____ SJR: _____

Other: _____

A: _____ SR: _____

A/S Amdt: 1895/1

A/S Amdt: _____ to A/S Amdt: _____

A/S Sub Amdt: _____

A/S Amdt: _____ to A/S Sub Amdt: _____

A/S Amdt: _____ to A/S Amdt: _____ to A/S Sub Amdt: _____

Be recommended for:

- ☐ Passage
- ☐ Introduction
- ☑ Adoption
- ☐ Rejection
- ☐ Indefinite Postponement
- ☐ Tabling
- ☐ Concurrence
- ☐ Nonconcurrence
- ☐ Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☑	☐	☐	☐
Rep. Tim Hoven	☑	☐	☑	☐
Rep. DuWayne Johnsrud	☑	☐	☐	☐
Rep. Eugene Hahn	☑	☐	☐	☐
Rep. Lorraine Seratti	☑	☐	☐	☐
Rep. Neal Kedzie	☑	☐	☐	☐
Rep. Peter Bock	☑	☐	☐	☐
Rep. Judy Robson	☑	☐	☐	☐
Rep. Spencer Black	☑	☐	☐	☐
Rep. John La Fave	☑	☐	☐	☐
Totals:	_____	_____	_____	_____

☐ Motion Carried ☐ Motion Failed

Vote Record

Assembly Committee on Environment

Date:
Moved by: Black
Seconded by: Bock
AB: 492
Clearinghouse Rule:
AB: SB:
Appointment:
AJR: SJR:
Other:
A: SR:

(5)

A/S Amdt: 1896/1
A/S Amdt: to A/S Amdt:
A/S Sub Amdt:
A/S Amdt: to A/S Sub Amdt:
A/S Amdt: to A/S Amdt: to A/S Sub Amdt:

Be recommended for:
- ☐ Passage
- ☒ Introduction
- ☐ Adoption
- ☐ Rejection

- ☐ Indefinite Postponement
- ☐ Tabling
- ☐ Concurrence
- ☐ Nonconcurrence
- ☐ Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☐	☑	☐	☐
Rep. Tim Hoven	☐	☐	☑	☐
Rep. DuWayne Johnsrud	☐	☑	☐	☐
Rep. Eugene Hahn	☐	☑	☐	☐
Rep. Lorraine Seratti	☐	☑	☐	☐
Rep. Neal Kedzie	☐	☑	☐	☐
Rep. Peter Bock	☑	☐	☐	☐
Rep. Judy Robson	☑	☐	☐	☐
Rep. Spencer Black	☑	☐	☐	☐
Rep. John La Fave	☑	☐	☐	☐
Totals:	4	5	1	

☐ Motion Carried ☒ Motion Failed

Vote Record

Assembly Committee on Environment

Date:
Moved by: Black
Seconded by: Bock
AB: 492
Clearinghouse Rule:
AB: SB: Appointment:
AJR: SJR: Other:
A: SR:

(6)

A/S Amdt: 1897/1
A/S Amdt: to A/S Amdt:
A/S Sub Amdt:
A/S Amdt: to A/S Sub Amdt:
A/S Amdt: to A/S Amdt: to A/S Sub Amdt:

Be recommended for:
- ☐ Passage
- ☒ Introduction
- ☐ Adoption
- ☐ Rejection
- ☐ Indefinite Postponement
- ☐ Tabling
- ☐ Concurrence
- ☐ Nonconcurrence
- ☐ Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☐	☑	☐	☐
Rep. Tim Hoven	☐	☐	☑	☐
Rep. DuWayne Johnsrud	☐	☑	☐	☐
Rep. Eugene Hahn	☐	☑	☐	☐
Rep. Lorraine Seratti	☐	☑	☐	☐
Rep. Neal Kedzie	☐	☑	☐	☐
Rep. Peter Bock	☑	☐	☐	☐
Rep. Judy Robson	☑	☐	☐	☐
Rep. Spencer Black	☑	☐	☐	☐
Rep. John La Fave	☑	☐	☐	☐
Totals:	4	5	1	

☐ Motion Carried ☒ Motion Failed

Vote Record

Assembly Committee on Environment

Date:
Moved by: Duff
Seconded by: Kedzie
AB: 492
Clearinghouse Rule:
AB: SB:
Appointment:
AJR: SJR:
Other:
A: SR:

(7)

A/S Amdt:
A/S Amdt: to A/S Amdt:
A/S Sub Amdt: 0534
A/S Amdt: to A/S Sub Amdt:
A/S Amdt: to A/S Amdt: to A/S Sub Amdt:

Be recommended for:

- ☐ Passage
- ☐ Introduction
- ☒ Adoption + Sub
- ☐ Rejection
- ☐ Indefinite Postponement
- ☐ Tabling
- ☐ Concurrence
- ☐ Nonconcurrence
- ☐ Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☑	☐	☐	☐
Rep. Tim Hoven	☐	☐	☑	☐
Rep. DuWayne Johnsrud	☑	☐	☐	☐
Rep. Eugene Hahn	☑	☐	☐	☐
Rep. Lorraine Seratti	☑	☐	☐	☐
Rep. Neal Kedzie	☑	☐	☐	☐
Rep. Peter Bock	☐	☑	☐	☐
Rep. Judy Robson	☐	☑	☐	☐
Rep. Spencer Black	☐	☑	☐	☐
Rep. John La Fave	☐	☑	☐	☐
Totals:	5	4		

☒ Motion Carried ☐ Motion Failed

Vote Record

Assembly Committee on Environment

Date: _____

Moved by: Duff

Seconded by: Kedzie

AB: 492

Clearinghouse Rule: _____

AB: _____ SB: _____

Appointment: _____

AJR: _____ SJR: _____

Other: _____

A: _____ SR: _____

8

A/S Amdt: _____

A/S Amdt: _____ to A/S Amdt: _____

A/S Sub Amdt: _____

A/S Amdt: _____ to A/S Sub Amdt: _____

A/S Amdt: _____ to A/S Amdt: _____ to A/S Sub Amdt: _____

Be recommended for:

- [x] Passage as amended
- [ ] Introduction
- [ ] Adoption
- [ ] Rejection
- [ ] Indefinite Postponement
- [ ] Tabling
- [ ] Concurrence
- [ ] Nonconcurrence
- [ ] Confirmation

Committee Member	Aye	No	Absent	Not Voting
Rep. Marc Duff, Chair	☑	☐	☐	☐
Rep. Tim Hoven	☐	☐	☑	☐
Rep. DuWayne Johnsrud	☑	☐	☐	☐
Rep. Eugene Hahn	☑	☐	☐	☐
Rep. Lorraine Seratti	☑	☐	☐	☐
Rep. Neal Kedzie	☑	☐	☐	☐
Rep. Peter Bock	☐	☑	☐	☐
Rep. Judy Robson	☐	☑	☐	☐
Rep. Spencer Black	☐	☑	☐	☐
Rep. John La Fave	☐	☑	☐	☐
Totals:	5	4		

☑ Motion Carried ☐ Motion Failed

Wisconsin Builders Association

September 22, 1998

Wetlands bill

Scott Hausmann
Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

RE: The role of mitigation in the wetland approval process

Dear Scott:

A recent wetland case has crossed my desk that clearly illustrates the importance of resolving the "where does it fit?" question. This case, Lake Country Pavilion (LCP), has brought to light clear and critical differences between the department and the Association. After reviewing the correspondence in this case, visiting the site, and discussing it with our leadership, we need to state that **the WBA will not support any legislative effort to allow mitigation unless situations such as those presented by LCP can be addressed through mitigation.**

I believe that you are aware of the LCP situation, so there is no need to restate the entire case here. I am enclosing a copy of the December 23, 1997 letter from Secretary Meyer to Attorney Kevin Delorey to help explain our position.

On page two of the letter, paragraph three begins with "In the instant case it is clear that avoidance of this 1.1 acre wetland was, and is, available." While it is true that the developer could essentially wrap the development around this area, the letter neglects to mention that the result of this "avoidance" is the loss of a large department store, with a direct economic impact of millions of dollars.

Since the store cannot be accommodated on this site (which is zoned commercial/industrial), it will be located somewhere else in the same area, but at a site which is likely to be less suitable from a local land use perspective. Such a site may also be much less desirable from an environmental perspective in terms of the potential loss of upland woods or prairies and more air pollution due to increased drive times. The current site is at the intersection of two major thoroughfares.

If this accurately represents the department's vision for how mitigation will (or will not) be applied in Wisconsin, mitigation is of negligible value to the development community. We have maintained throughout our discussions with the department that mitigation must offer a reasonable degree of flexibility as part of the sequencing process. This letter suggests that the department will not offer such flexibility.

The letter of denial makes much of the fact that the developer was aware of the department's position prior to acquiring the site. This is irrelevant, since the argument does nothing to support the merits of the department's position.

NAHB

4868 High Crossing Boulevard • Madison, Wisconsin 53704-7403
(608) 242-5151 • (800) 362-9066 • Fax (608) 242-5150

In the second paragraph on page two, which begins, "In your proposal..." the department again misconstrues the "..sequence established by federal law.." Our objection to the department using this as justification for sequencing in small projects is that federal law has already sequenced those wetlands, via the Nationwide Permit system. If Wisconsin truly wanted to "adhere to the sequence established by federal law," it would recognize the validity of Nationwide Permits. This site would be eligible for mitigation under the NWP system.

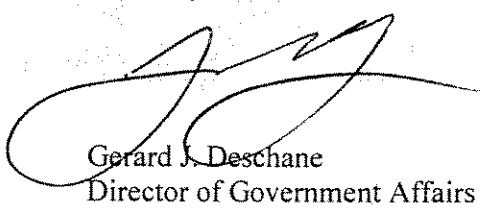
Also, we are concerned with the department's defense of rigid avoidance in the LCP case based upon "cumulative impacts" (last paragraph, page two and onto page three). Again, is the department suggesting that mitigation may never be allowed, since the department is "required" to "consider the cumulative impacts" of projects? We are greatly concerned that the nebulous concept of "cumulative impacts," which cannot be measured by objective criteria, is being used to deny mitigation in urbanizing areas. We submit that those areas are most in need of mitigation and are where mitigation is most appropriate.

The department and the legislature, working with interested parties, need to establish a clear set of criteria that includes flexibility within the sequencing process, and an acknowledgment that mitigation is the appropriate avenue if the lost acreage will be replaced with acreage of equal or higher value. The criteria should also recognize economic and land use impacts, which should be given appropriate weight in the decision.

In closing, we wish to point out that the Wisconsin Builders Association has worked long and hard and in good faith with the department, the legislature, and with other interested parties to find a way to make wetland mitigation a reality. We believe that mitigation is the only alternative that combines both environmental improvement with economic activity in the context of rational land use. To work, however, the department must be willing to apply mitigation in a fair, common-sense manner. If that is not assured, mitigation merely becomes another regulatory burden, which we will oppose.

Please let me know if you need additional information. I can be reached at (608) 242-5155, ext. 15; fax (608) 242-5150 or e-mail deschane@midplains.net.

Sincerely,



Gerard J. Deschane
Director of Government Affairs

cc: Governor Tommy G. Thompson
Secretary George Meyer
Representative Marc Duff
Representative Neal Kedzie
Senator Rob Cowles

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

Box 7921
101 South Webster Street
Madison, Wisconsin 53707-7921
TELEPHONE 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

IN REPLY REFER TO: 8300
M7875

December 23, 1997

Attorney Kevin Delorey
Quarles & Brady
P.O. Box 2113
Madison, WI 53701-2113

SUBJECT: Lake Country Pavilion, Village of Pewaukee, Waukesha County
Docket Number 3-SE-96-280

Kevin

Dear Mr. Delorey:

This letter is in response to your letter concerning the Lake Country Pavilion/Boulder Venture project in the Village of Pewaukee, Waukesha County. In your letter, you proposed a settlement of this case through mitigation of the wetland impacts at this site.

I have reviewed this matter with staff and legal counsel. I have had previous involvement with this project during the time the original decision was made to deny water quality certification for this project.

As you are aware, this project concerns a proposed commercial/retail development on a 128 acre parcel north of Capitol Drive in the Village of Pewaukee. Ninety eight acres of this site is developable uplands, the remainder is wetlands. The plans submitted to the Department show, in addition to the currently proposed development, an area of upland which is reserved for "Future Office/Warehouse Development".

The developer here was apprised by Department staff in the fall of 1996, before they had purchased the property in question, that, with the amount of developable upland available at this site, the Department was of the opinion that this project could be designed in a manner which would avoid the 1.1 acre wetland which is the subject of the current review. In a letter dated November 11, 1996, Marty Johnson of our staff advised Mr. De Michele that the "Department believes that there are alternatives to filling the 1.1 acres of wetland on site". He further advised that "we are skeptical that any further information will change our current stance." (Emphasis in the original.) After being advised of the Department's position relative to the availability of alternatives in November, 1996, your client purchased the property in April, 1997.

As you recognize in your letter, there is currently no mitigation program for these types of projects in Wisconsin, and "the Department has introduced legislation to clarify its legal authority in this area." The Recommendation for a Wetland Compensatory Mitigation Program that you cite in your

letter are staff recommendations which discuss a range of potential mitigation alternatives. There is currently no legal basis on which the Department can consider mitigation for this project. There must be both statutory and rule changes adopted before such mitigation could be considered. While the Department has made a commitment to pursue a mitigation program, the adoption of statutes and rules for such a program will be vigorously debated and final adoption of a program is not likely to occur for some time.

In your proposal for settlement, you suggest this is "precisely the type of project for which the Department's proposed mitigation program is designed". We respectfully disagree. We believe this case raises significant land use and wetland protection issues, and demonstrates why it is imperative that the State of Wisconsin, in any mitigation program, retain a strong requirement that "the program maintain the 'sequence' established by federal law in which wetlands are first avoided, next minimized, and then compensated." The Department staff's Recommendations further provide that the purpose for retaining the "sequencing" of project analysis "is to continue to promote applicant planning to reduce wetland impacts rather than 'making a deal' in order to get a permit."

In the instant case it is clear that avoidance of this 1.1 acre wetland was, and is, available. There are 98 acres of upland available for development at this site. The developer purchased the property after being made aware of the presence of this wetland by the Army Corps of Engineers and after being advised by the Department that it did not appear the project design they were proposing would be approvable under Wisconsin's wetland water quality standards contained in NR 103.

As you are undoubtedly aware, the Wisconsin Supreme Court recognized over 25 years ago, in Just v. Marinette County, 56 Wis 2d 7(1972), that the State of Wisconsin has an "active public trust duty" to protect the waters and associated wetlands of the State of Wisconsin. The Court in Just asked the rhetorical question "Is the ownership of a parcel of land so absolute that man can change its nature to suit any of his purposes?" The Court then went on to state that "An owner of land has no absolute and unlimited right to change the essential natural character of his land so as to use it for a purpose for which it was unsuited in its natural state and which injures the rights of others....".

These same concepts have been reaffirmed on numerous occasions by the Wisconsin Supreme Court. The most recent enunciation of these principles is contained in Zealy v. City of Waukesha, 201 Wis 2d 365(1996), where the Court affirmed the status of its decision in Just, supra, stating:

> Wisconsin has a long history of protecting its water resources, its lakes, rivers and streams, which depend on wetlands for their proper survival. As stated in Just, at 17:
>
> > Swamps and wetlands were once considered wasteland, undesirable and not picturesque. But as people became more sophisticated, an appreciation was acquired that swamps and wetlands serve a vital role in nature, are part of the balance of nature, and are essential to the purity of water in our lakes and streams. Swamps and wetlands are a necessary part of the ecological creation and now, even to the uninitiated, possess their own beauty in nature.

We would hope that this matter can be resolved without litigation concerning the filling of the 1.1 acre wetland parcel involved in this water quality certification. We do not agree this wetland is without value, especially when you consider its connection to the larger wetland parcel which it is contiguous to. We are required, under our rules and under our public trust mandate, to consider the cumulative impacts of projects which affect Wisconsin's waters and wetlands. When you look at the developments

that are occurring in the Southeast part of our State, the cumulative impacts issues and land use issues relative to our remaining wetlands and water resources are brought into clear focus.

We have been involved with many projects such as this one in the Southeast part of the State. We have consistently required that where, as here, there is a large area of developable land on a project site, the project be revised to avoid the wetlands. We have encouraged proponents of projects such as this to incorporate existing wetlands into their projects as an amenity and to work to design the projects to route clean water into the wetlands to preserve the quality of the wetlands.

I sincerely hope that your client will be willing to work with us to develop a plan which avoids the filling of this wetland and which preserves and improves it's value. If it remains the position of your client that such alternatives do not exist, the matter will be scheduled for hearing.

Please make future contacts relative to this matter with Attorney Michael Cain, who is the legal counsel assigned to this case.

Sincerely,

George

George E. Meyer
Secretary

cc: Michael Cain-L/5
Gloria McCutcheon-SER
Susan Sylvester-AD/5
Michael Staggs-F/4
Greg Pilarski-SER
Mary Ellen Vollbrecht-F/6
Scott Hausmann-F/6

Becky Wadewitz 7-2-97

XXXX is created to read:

-------- Authority to consider compensatory mitigation of wetlands. The department may consider a compensation step in current and future wetland permitting or water quality certification decisions. The department is authorized to promulgate and implement rules governing the compensatory mitigation of wetlands. Such rules shall, at a minimum, meet federal standards for wetland compensatory mitigation.

7-30 check status Mary Gibson Glas returning Aug 6 WRB 3667/3

DEWITT ROSS & STEVENS S.C.
LAW FIRM

Marc - I saw the DNR revision of my amendment this morning. I would like to discuss this with you tomorrow if you have time.
Thanks
Ron Kuehn

MEMORANDUM

To: Representative Neal Kedzie
Representative Marc Duff
Representative Scott Jensen
Representative John Gard

From: Ron Kuehn

Date: March 19, 1998

Re: Amendment to AB 492—Compensatory Wetland Mitigation

I have reviewed LRBa2162/1 which was drafted last evening. This is a proposed Assembly Amendment to Assembly Substitute Amendment 1 to AB 492.

For the cranberry growers to support this bill, we need an improvement on that amendment. I am enclosing two redrafts of the Assembly Amendment for your consideration. We would support passage of this legislation if either of the enclosed were adopted instead of LRBa2162/1.

Amendment #1

The recommended amendment is similar to the LRB draft, but differs in the following ways:

1. I had recommended yesterday that a definition of federal wetland mitigation be included in the bill. That request has not been accepted. Therefore, the language in the amendment that refers to federal mitigation must be adjusted to strike the word "compensatory" and just refer to "wetland mitigation" (see enclosed). The federal government, to the best of my knowledge, has no definition of "wetland compensatory mitigation" (the reason I sought a definition expansion yesterday), but they most certainly use the term "wetland mitigation". If we are not going to include a definition, then we at least must include a term that the federal government uses.

2. The insertion at page 2, line 13 has been adjusted to provide that the rules may not require "or allow" double mitigation to occur. Since this is a voluntary wetland compensatory mitigation program, the Department of Natural Resources may never "require" mitigation. However, the DNR will certainly "allow" mitigation upon the "request" of an applicant.

   Therefore, the prohibition against the adoption of rules which could result in a double mitigation requirement, must contain a prohibition not only on the DNR requiring such mitigation, but also even "allowing" it. The language has been adjusted accordingly.

3. The amendment I suggested yesterday at the end of page 2, line 8 does not appear in the proposed LRB amendment. I believe it is absolutely essential that the enclosed language be inserted at that point. Without it, the rulemaking section in (3) will be inconsistent with section (2) (i.e., the Department is allowed to honor any "request" for wetland compensatory mitigation under section (2)—even one that would result in double mitigation). However, the rulemaking then prohibits the DNR from honoring such requests. The two sections absolutely must be made consistent for this statute to make any sense.

Alternative #2

In the alternative, if someone insists it is redundant to have the prohibition against double mitigation appear in two places in the legislation, then the place that it must appear is at the end on line 8 on page 2. The rules, of course, have to be consistent with the statute. I therefore offer a second alternative amendment, which is enclosed. Either Alternative #1 or #2 is acceptable to us.

Thank you very much for considering my thoughts on this subject.

WISCONSIN WETLANDS ASSOCIATION
222 South Hamilton Street · Suite #1 · Madison, Wisconsin 53703 · (608) 250-9971

Do no dishonor to the earth, lest you dishonor the spirit of its people. For the gifts of life are the earth's, and they are given to all.

30 September 1997

Dear State Representative Duff

On behalf of the Wisconsin Wetlands Association, I'm pleased to be able to provide you with a summary of the excellent presentations made at our recent *Wetland Restoration and Compensatory Mitigation* forum. We are also providing as background material a reprint from one of our previous newsletter articles, *A Primer on Compensatory Mitigation.*

We held the forum in order to contribute in a positive way to the policy debates that will arise as the legislature considers the Duff bill and as the Department of Natural Resources develops proposals for a compensatory mitigation program at the state level. We think it is important for you to hear from those who are practicing and studying the art and science of wetland restoration on a daily basis. We invited four of Wisconsin's most experienced wetland restorationists and wetland scientists to share their views on developing successful wetland restorations for compensatory mitigation.

The Forum was very thought-provoking, sparking a long and wide-ranging discussion. The enclosed Summary of Presentations captures and distills the major points made by the speakers. Several major themes emerged from the evening.

- Good site selection is absolutely essential for successful restoration.
- An adequate understanding of, and sufficient control over, the physical and biological influences on a restoration site is also critical to the long term success of any restoration.
- Successful restorations require a major and long term commitment of time and expertise — and an ability to learn from mistakes.

The Wisconsin Wetlands Association has not yet taken a definite position relative to the work of the DNR's Compensatory Mitigation Advisory Committee or on the Duff bill. We feel that Wisconsin is in a position to learn from and avoid many of the mistakes of past compensatory mitigation programs. One of our top concerns is that adequate oversight be provided to maximize the chances for successful restorations to compensate for unavoidable wetland losses.

Thank you for your consideration of this material. We hope to continue to provide you with sound scientific information on which to base wetland policy decisions. If you have any questions, please call me at (608) 250-9971.

Sincerely yours,

Tom Boswell

Tom Boswell,
Wisconsin Wetlands Association

Thanks for taking the interest to send your staff person to the Forum. We feel we have a lot to offer.

Forum on Wetland Restoration and Compensatory Mitigation "Possibilities and Pitfalls" Sponsored by Wisconsin Wetlands Association September 18, 1997

Summary of Presentations

Note: These summaries are based on notes taken at the forum.

Introduction

Wetland mitigation and mitigation banking are hot topics these days. The Wisconsin DNR is currently working with an advisory committee to draft guidelines for how compensatory mitigation should operate in Wisconsin. Many questions and tough issues are being worked out. Permitting of wetland losses is one side of the "no net loss" equation, adequate compensation through wetland restoration is the other. The Wisconsin Wetlands Association is sponsoring this forum to address some of the key issues related to the "adequate compensation" side of the equation. **How do we insure, or at least maximize the probability, that the restorations done for a wetland compensatory mitigation program are successful and sustainable on a long-term basis?**

We have assembled a panel of 4 speakers, each with a great deal of "hands on" experience and expertise, and each coming to wetland restoration from a slightly different angle.

John Jackson - Provides the perspective of a state agency required to do compensatory mitigation. As an environmental scientist with the Wisconsin Department of Transportation John has directed WisDOT's statewide wetland compensatory mitigation program. As such, he has overseen the restoration or creation of over 2700 acres of wetland across the state, including 30 mitigation bank sites.

Jeff Nania - Provides the perspective of a private non-profit organization working primarily with private landowners voluntarily restoring wetlands on their property. Jeff is the Project Director for the Wisconsin Waterfowl Association, which restores about 600 acres of wetland a year, mostly in central, south central and Lake Michigan coastal counties. Jeff is currently developing the first privately owned mitigation bank in Wisconsin, just northeast of Portage.

Steve Apfelbaum - Provides the perspective of a consulting ecologist (Applied Ecological Services) working on required compensatory mitigation projects for clients, as well as designing projects that avoid and minimize ecological impacts, and utilize the natural features on a site as natural amenities that are positive "selling points" for the property. Steve has also developed the first permitted private mitigation bank in the country (Otter Creek Wetland Bank in northern Illinois).

Randy Hunt - Provides the perspective of a top research scientist studying the hydrological aspects of wetland restoration. Randy is a Research Hydrologist, with the United States Geological Survey (USGS), who has closely monitored 3 restoration and creation project sites over a 5 to 8 year period, studying the water sources and the water quality of the resulting wetlands.

Summary of Presentations

John Jackson - Wisconsin Dept of Transportation

- Site Selection is the key to success for any restoration.

- John introduced the concept of the "**hydrogeomorphic** setting" (from **hydro** - water sources and flows, and **geomorphic** - the shape of the landscape resulting from the underlying geology and soil). In other words the landscape setting and climate combine to control the flow of water in and out of the site.

- It is essential to understand the hydrogeomorphic setting of the area to be restored and its contributing watershed in order to develop a good restoration design. Since 1990 DOT has considered the geomorphic setting in choosing a site, using a variety of maps. Natural Resources Conservation Service (NRCS) wetland inventory maps of agricultural lands are helpful in identifying drained and partially drained wetland areas having good potential for restoration.

- In practice ease of acquisition becomes the top priority and driving force behind site selection. Control of the site and adjacent parcels that affect the site (through purchase or lease agreements) is the first step in the restoration process.

- Restorations usually fail or involve expensive mid-term corrections and maintenance when poor sites are selected. Although the initial cost of the land might be lower on a poor site, the long-term costs will likely be higher because of the need for maintenance or the possibility of failure.

- The best mitigation is to avoid impacting wetlands in the first place. DOT does try to do this, but it is very difficult to do with a linear feature like a highway.

- DOT closely monitors their developing restoration sites to see what type of hydrology is developing, the nature of the plant and animal communities colonizing the site and identify threats to the wetland.

- Sometimes a restoration will not develop the plant community you had planned, but will still provide valuable wetland functions. In a sense you can say, "The plan may have failed but the wetland was a success."

- A problem with having many small sites is they can be forgotten after initial restoration work is complete. Those that are turned over to responsible groups or agencies have a better chance of being well cared-for.

Jeff Nania - Wisconsin Waterfowl Association (the other WWA)

- "On-site, in-kind" is not always the best option for compensatory mitigation, because the conditions at the site may not make it possible to do a successful restoration. It makes no sense for regulators to force an on-site mitigation, if it is going to fail.

- The guiding principle for compensatory mitigation should be to choose restoration sites with the greatest chance of success - "anything less is a betrayal of the public's trust."

- Jeff does **sustainable historic restorations** - by restoring the site to the conditions that existed prior to disturbance to the extent possible. This means restoring the original drainage pattern, removing the washed-in sediment to expose the original wetland soil and seed bank.

- If the site and enough of the surrounding landscape cannot be restored to pre-disturbance conditions the restoration will not be sustainable. It will become degraded over time and not provide the wildlife, water quality and other values hoped for. This means you must design for more that just the wetland area itself and you have to be able to purchase or reach management agreements for the larger area.

- To find a sustainable site you must evaluate the "threat level" to the site. Many restorable sites in southeast Wisconsin are not available, or an adequate buffer from existing or future surrounding development cannot provided. In farming areas neighbors are concerned about having their land flooded, so you end up having to install dikes and levees that "disconnect" the restoration from the surrounding landscape.

- WWA selects sites that will be used by people and can teach people the value of wetlands. They provide educational programs and tours for nearby school districts to some of their projects.

- WWA tries to get a perpetual easement or a strong commitment from the landowner to maintain the restored wetland.

- If it is to be environmentally positive, a compensatory mitigation program must uphold the highest standards for judging success, the restorations must be permanently protected, and should be accessible for the enjoyment and education of people in a way that doesn't damage their plant and animal communities.

- Currently we are losing wetlands of less than two acres **without any compensation**. We need a state compensatory mitigation program emphasizing banking to provide a means of successfully compensating for those losses.

- The Bottom Line - "There is nothing more fulfilling than bringing life back to the land. When I die I'm going to leave sustainable, protected wetlands behind."

Steve Apfelbaum - Applied Ecological Services

- People need to think about the landscape context of the urbanizing areas in which we are losing wetlands as well as the land use surrounding restoration sites.

- There's more than one way to kill a wetland. In some urban areas the wetlands that are left are severely degraded by the effects of surrounding development: polluted stormwater, siltation from construction erosion, delivery of pesticides and nutrients from neighboring lawns. They lose their buffer and are cut off from other natural areas offering suitable wildlife habitat. Existing Clean Water Act wetland regulations can only address the direct impacts of filling, there is no control over the type of secondary impacts that can destroy a wetland's value just as surely as filling will.

- We need to look at these urban areas and at urban-fringe areas in terms of planning for the enhancement of the natural areas that are left. Compensatory mitigation banking can be used as a conservation tool to accomplish this if it is done right. A high quality restoration should be considered as a trade-off for the loss of severely degraded wetlands.

- We also need to be realistic about what it takes to produce a high quality restoration. For instance, Steve looks at about 70 different criteria in selecting a site. Wetland restorations don't happen by magic and they don't happen overnight, but the science and art of restoration have advanced to the point where we can develop "reasonable facsimiles of natural systems."

- Mitigation banking is the best way to foster good compensatory restorations by making the bank developer responsible for the success of the project. A team of professionals with a variety of expertise is needed to find the right site, plan and construct the restoration, provide for its monitoring and maintenance, and educate and involve the public throughout the process.

- Mitigation bank sites should involve more than wetland restoration. The restoration should be planned within a landscape ecology framework. Opportunities to enhance river corridors and restore woodlands, savannas, and prairies should be included as appropriate for the site. Mitigation banks can become links in a greenway system with trails, educational signs and parking all part of the plan.

- Adequate performance criteria need to be provided within the legal framework surrounding mitigation banking. Criteria should be both quantitative and qualitative, reflecting the goals of the project.

- No one can create a fully functioning natural system right from the start. It takes time for a restoration to develop into the desired condition. Success should be judged by whether the restoration is moving in the right ecological direction. Annual incremental standards work best so that an annual increase in performance criteria is required.

- A bank site should have a plan for perpetual monitoring and stewardship.

Randy Hunt - United States Geological Survey

- There is widespread agreement that "Hydrology is the most important aspect of wetland restoration." However most restoration design does not take into account the real-world complexities of wetland hydrology.

- The traditional, commonly used hydrological methods (such as "Darcy's Law) do not work well in many organic wetland soils, such as peat and muck. Calculations can easily be off by factors of 10 to 100.

- A lot is happening chemically at the interface of soil and water. Soil and water chemistry can change drastically within a matter of inches. This complexity is totally missed by traditional water table measurements. In order to accurately evaluate wetland water quality functions and site conditions related to water and soil chemistry, sampling methods need to be improved.

- Wetland science is a young science. As yet there is no "cookbook" for in kind replacement of a wetland.

- Wetland restorations are more successful than wetland creations. Deep and shallow marshes are easier to restore than other wetland types.

- Some wetland types, such as sedge meadows, calcareous fens, bogs, and other peatlands are difficult or impossible to successfully replace. Emphasizing avoidance is the best way to preserve their functions.

- Wetland construction should be encouraged to replace the wetlands we have lost over the last 150 years, but should not be considered adequate to compensate for future wetland loss.

- Randy also presented some of the misconceptions or "Wetland Myths" that hamper people's understanding of wetland issues and offered clarifications. (These were originally outlined by the late professor Jim Zimmerman, a student of Aldo Leopold who became a pioneer in the study of wetland ecology.) His clarifications touched on many of the points made by the other three speakers.

Myth 1. "All wetlands are alike." - There are over 100 different wetland types across the country, and 14 different wetland types in Wisconsin. Different wetland types possess different types of wetland functions.

Myth 2. "Wetlands can stand alone." - Wetlands are shaped by their surrounding watershed. Impacts to their watershed greatly affect wetlands. You can't pave right up to edge of a wetland without jeopardizing its health.

Myth 3. "Wetlands are static over time." - Wetlands are very dynamic in nature. Water levels move up and down both over the course of a year and over cycles of several years. Wetland plant communities can also change from year to year, especially in restorations.

Myth 4. "As long as the wetland remains all functions remain regardless of impact." - Wetlands can lose important functions through changes in the quantity and quality of the water they receive, such as receiving an increase in polluted stormwater runoff.

What does mitigation really mean?

DAVE SIEBERT
WDNR Ecologist

As the topic of wetland mitigation is debated and discussed, it may be useful to have someone background and terms under your belt. A great deal has been written in the science literature and the news media on the subject. I'll try to cover the basics for you here.

What is "wetland mitigation"?

The word "mitigation" is defined by Webster's Dictionary as: "to lessen, to soften, to make less harsh, to alleviate." This term is not new to wetlands regulations as it has been used in several environmental regulations dating back to 1934.

Under the federal "404(b)(1) Guidelines," mitigation is defined as a *sequence* of avoid, minimize, rectify, reduce, and compensate.

1. *Avoid* the impact by not taking a certain action or parts of an action.
2. *Minimize* the impacts by altering the project.
3. Rectify the impact by repairing, "rehabbing", or restoring.
4. Reducing or eliminating the impact over time by preservation and maintenance.
5. *Compensation* for the impact by replacing or supplying a substitute.

For wetland permitting programs, the term "compensatory mitigation" is more accurate than just "mitigation." The above sequence is often simplified to Avoid-Minimize-Compensate. It is really the "compensation" factor that is the topic of the current debate.

What is involved in Compensatory Mitigation?

Under the federal Clean Water Act 404 program, in order to receive permit approval, an applicant must show that there is no practicable alternative to the proposed action, that the environmental impacts are not significantly adverse, and that he/she has avoided and minimized impacts as much as possible. This process is mirrored by the state's decision sequence under NR 103, Wis. Adm. Code.

The Corps of Engineers may require the applicant to compensate for unavoidable losses. Compensatory Mitigation may involve:

- *Restoration-* the re-establishment of wetland conditions that historically existed (for example blocking ditches, breaking tiles, re-planting or allowing seed bank regeneration)
- *Creation-* building a wetland in an area that was not wetland in the recent past (200 years)
- *Enhancement-* management techniques to increase a given function or functions
- *Preservation-* setting aside of existing wetlands, usually a site that is in some sort of real jeopardy
- *Other-* monetary contribution for programs that preserve wetland resources

For a successful restoration/creation, a great deal of up-front site analysis and planning is needed before design can occur. Often finding willing sellers for appropriate sites is a major difficulty. Supervision of construction personnel is critical to ensure the project is built according to plans and specifications, especially site grading and planting and that any mid-course corrections in construction are made to account for site variability.

Most compensatory mitigation programs establish replacement ratios that consider the type of project offered, whether the replacement area is a change in wetland type or function, the proximity of the replacement site to the location of wetland loss, and the riskiness (i.e. how sure are we that wetland conditions will develop and be maintained) in the replacement site development. Generally, replacement is required at a ratio greater than 1 acre for 1 acre, with ratios of 1.5 to 1 and 2

Wisconsin Wetlands Association Newsletter

Winter 1997

Wisconsin Wetlands Association
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OFFICE MANAGER

Newsletter ISSN# 1083-7841

to 1 commonplace. These ratios above 1 to 1, are used to provide some level of insurance that replacement will be successful.

Compensatory mitigation sites are supposed to be protected as wetlands in perpetuity. Though this requirement is part of the current guidelines, the Corps has allowed filling of compensatory mitigation sites. The applicant is also required to monitor the site to ensure success, usually providing annual reports to the Corps for at least 5 years. Enforcement of the permit conditions, including the specific mitigation requirements, is covered by Corps field staff.

What compensatory mitigation is occurring in Wisconsin today?

1. Federal Section 404

Per a February 1990 Memorandum of Agreement between COE and EPA ("Army/EPA MOA Concerning the Determination of Mitigation under the Section 404(b)(1) Guidelines"), any entity receiving a s. 404 permit from the Corps, may be required to compensate for unavoidable losses. The MOA calls for the Corps to consider resource agency input in deciding what is "appropriate and practicable measures" to offset unavoidable impacts. Some projects that are approved under nationwide or regional general permits may not have compensatory mitigation requirements attached to the permit by the Corps.

2. DOT Mitigation

Section 30.12(4), Wis. Stats., provides an exemption to DOT for permitting of certain activities affecting waters of the state. A comprehensive environmental review liaison process was established and set forth in a cooperative agreement between the agencies. This agreement recognizes the linear nature of transportation projects and the mutually important goals of the two agencies—maintaining a quality environment and maintaining a safe transportation system.

Update: What's Happening with NR 103?

The comment period closed on August 30 for DNR proposed changes to NR 103 state wetland water quality standards (see summer 96 issue of *Wisconsin Wetlands* for a discussion of the changes and issues). Seven hearings were held around the state with fairly limited attendance. According to DNR records, 106 individuals attended the hearings, but the DNR did receive over 800 written responses to the rule change proposal.

A brief summary of the comments shows that the WWA/Sierra Club letter writing campaign was a strong one. The public overwhelmingly support strengthening the rule. The comment tally shows strong support for the proposal to allow a simpler review process for projects that will have minimal impacts (i.e. for impacts to less than 0.1 acres of wetland the DNR can consider quality in determining the scope of the alternatives analysis) as the comments were 803 in support to 61 against. It should also be noted that the comments were 617 to 226 in opposition to increasing the 0.1 acre figure *any* more. The public comments were 602 to 5 in support of increasing enforcement authority. The proposal to change public notice requirements received much concern as the comments went 617 to 239 against.

DNR staff are now in the process of addressing the specific comments to the proposal for eventual presentation to the Natural Resources Board early in 1997. Stay tuned!

Wetland mitigation and banking are the primary focus of a 1990 amendment to the cooperative agreement, which establishes the procedures for DOT compensation for all unavoidable wetland losses.

DOT projects may require federal permits under s. 404. For many of these projects, compensatory mitigation is required, thus the mitigation efforts conducted to meet the cooperative agreement also serve to meet s. 404 permit conditions. The completion of the liaison review process is used by the Department for water quality certification determinations under s. 404.

3. State

It is important to remember that there is no state wetland regulatory law in Wisconsin. The wetland water quality standards (NR 103), by which the Department assesses wetland impacts under existing state permitting authorities, is not a permitting authority in and of itself. "DNR does not *recognize* mitigation", means that there is no legal (statutory) authority for the Department to consider compensation as a way of offsetting the wetland loss.

Under Section 401 of the Clean Water Act, which establishes the requirement for state water quality certification of s. 404 permits, DNR has review authority over projects that must receive s. 404 permits from the Corps. Under ch. NR 299, DNR must assure that a project meets certain criteria (including the NR 103 wetland water quality standards) in order to provide Water Quality Certification to the Corps. Many applicants will provide compensation proposals to meet Corps requirements, but state water quality certification decisions do not consider these compensatory mitiga-

(continued on page 7)

(Continued from page 3)

tion proposals in the decision-making process.

What is Mitigation Banking ?

Banking has been defined in recent federal guidance as ". . . wetland restoration, creation, enhancement . . . undertaken expressly for the purpose of compensating unavoidable wetland losses in advance of development actions, when such compensation cannot be achieved at the development site or would not be as environmentally beneficial." Typically banking involves the development of larger sites to consolidate small, fragmented wetland losses. Established wetland "credits" can be debited when an applicant has unavoidable wetland losses.

Banking involves a sponsor or banker who establishes the bank site to develop "approved" credits that can be sold to others or used by the banker to offset his/her own unavoidable wetland losses. It is important to understand that the term "bank" refers to the administrative system for accounting and managing. A wetland mitigation bank could involve one or more "bank sites". The bank is the process and administration, while the bank sites are the actual restored or created wetland systems.

In Wisconsin, the only banking currently approved by the federal agencies is for DOT projects. Banking was set forth in the cooperative agreement (as discussed above) and formalized for federal agencies in a July 1993 WDOT Wetland Mitigation Banking Technical Guideline. From 1991-1995, the DOT has established 20 bank sites to compensate for nearly 775 acres of wetland loss. Nearly 500 lost acres have been compensated for at "consolidation sites" or on-site. The bank sites have been established throughout the state after much coordination between DNR and DOT staff for each project. Debits from a bank site are allowed after it is determined that the required sequence— avoid; minimize; compensate on-site; compensate near-site; compensate at bank site— has been exhausted. Debit ratios are based on whether the wetland type is being replaced in kind and whether the bank site is in the same watershed and floristic province as the loss.

Federal wetland banking has been supported by the Bush and Clinton Administrations for widespread use. Federal guidance on the establishment of banks was released in December 1995. The St. Paul District of the Corps has prepared draft regional guidance for private banking in this state, based on the new federal guidance. The guidance addresses the technical and administrative requirements needed to develop a bank or bank site(s). At least one proposal to start a private bank in Wisconsin has been submitted to the Corps for approval.

Why is there so much debate?

The issues with compensatory mitigation fall into two main camps— the administrative/policy questions and uncertainties about the science of ecological restorations and creations. As you read about the issues, try to separate the science-based questions about the human ability to re-create ecosystems and those concerns over things like who should be required to compensate, when should compensation be allowed, what financial assurance are needed, who will enforce the requirements, etc. Many feel that the regulatory path would be easier to navigate if the state had the option to consider mitigation to replace what was being lost. Others see mitigation as a means of allowing more permits and thus more loss of natural wetlands. Some question whether we really have the knowledge to restore or create functioning habitat. All these questions are important and will need to be addressed as Wisconsin develops a program. ■

Our Trip to Sheboygan Marsh

Mrs. Leannah's 5th Grade Class, Sheridan Elementary School, Sheboygan

We went out into the marsh and on our way we saw a turkey vulture, wood frogs, toads, a painted turtle, damsel flies, crayfish, bullheads, cattails, weeping willows, lily pads, water bugs, and leopard frogs. We also saw cans and a lot of garbage in the waters of the Sheboygan Marsh.

At first we (except our teacher) thought the marsh was nothing important. But now we know that the marsh is the most important thing to keep our water clean. We've thought about it every day since we visited the marsh and we'll continue to think about it until we're old.

We are working hard at doing everything we can to save our beautiful marsh. ■

Rep. Dutf

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

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December 16, 1997
Representative Neal Kedzie, Chair
Assembly Subcommittee on Wetland Policy
State Capitol
307 North
Madison, Wisconsin 53707

SUBJECT: Compensatory Mitigation for Wetlands

Dear Rep. ~~Kedzie~~ Neal:

Thank you for asking some of my staff to present information to your subcommittee on wetland policy.

As you know, the subject of compensatory mitigation has been debated for a number of years and most recently has been the focus of the work of an advisory committee. This advisory committee represents a diverse group of interests and was established to help staff develop a compensatory mitigation program as directed by the Natural Resources Board (NRB) at their June 1996 meeting.

Department staff have developed a draft recommendation for presentation to the NRB at the February 24-25, 1998 meeting. The Advisory Committee has endorsed the general concepts in these recommendations. Staff are currently working on a briefing package to the NRB that will outline the recommendations.

I look forward to working with you and your subcommittee in the near future on wetland policy issues. Please contact the Department's Wetlands Team Leader, P. Scott Hausmann at 266-7360 for immediate assistance.

Sincerely yours,

George

George E. Meyer
Secretary

Copy: Assembly Subcommittee on Wetland Policy
Wetland Compensatory Mitigation Advisory Committee

AMENDED

December 16, 1997

Assembly Environment Committee
Subcommittee on Wetlands Policy

List of Interest Groups

Technical Assistance

DATCP
DOT
DNR
Southeast Regional Planning Commission (SEWRPC) – Don Reed
U.S. Army Corps of Engineers
U.S. Department of Agriculture, Natural Resources Conservation Service
UW Resources – Fish and Wildlife – Cal DeWitt

Advocacy Groups

Wally Arts, Quarles and Brady
Ron Kuehn, DeWitt Ross and Stevens (Cranberry Growers)
Consolidated Papers
Muck Farmers
Murn Environmental Inc.
River Alliance
Sierra Club
Trout Unlimited
Wisconsin Builders Association
Wisconsin Farm Bureau
Wisconsin Land and Water Conservation Association, Inc.
Wisconsin Manufacturers and Commerce
Wisconsin Paper Council
Wisconsin Realtors Association
Wisconsin Utilities Association, Inc.
Wisconsin Waterfowl Association, Inc.
Wisconsin Wetlands Association

WISCONSIN WETLANDS ASSOCIATION
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File

Do no dishonor to the earth, lest you dishonor the spirit of its people. For the gifts of life are the earth's, and they are given to all.

22 December 1997

Rep. Marc Duff
Assembly Environment Committee
Subcommittee on Wetlands Policy
State Capitol, P.O. Box 8952
Madison WI 53708

Dear Representative Duff:

Thank you for the invitation to address the Subcommittee on Wetlands Policy on behalf of the Wisconsin Wetlands Association and to address some of our concerns and hopes for a compensatory mitigation program for the State of Wisconsin.

With the exception of Department of Transportation projects, the Wisconsin DNR has never allowed compensatory mitigation as part of the decision-making equation in the NR103 process. Indeed, the DNR feels that, at least till now, it has lacked the statutory authority to do so. Environmental groups, at least till now, have been relieved that the DNR has steered clear of these treacherous rocks and shoals, i.e. the failures and abuses of compensatory mitigation programs elsewhere in the country.

In exercising its "veto power" over Army Corps fill permits, the DNR does not consider offers from a developer to compensate for proposed wetland impacts by restoring or creating wetlands elsewhere. However, now the nature of the debate has shifted from whether or not Wisconsin will have a compensatory mitigation program to **when** and **how** it will function within the regulatory process. This might *not necessarily* be a bad thing.

Compensatory mitigation, and even mitigation banking, offers some limited promise, but also many potential problems and pitfalls. We can't afford to sacrifice any more of our natural wetlands for a promise without adequate safeguards and assurances that the promise will be fulfilled.

The dictionary says that *mitigate* means "to make less severe or less painful; to moderate. In terms of the wetland regulatory process, *mitigation* actually refers to a three-step process: **1)** ***to avoid*** wetland loss; (the practicable

alternatives analysis process, a key issue in the current cranberry controversy); **2) *to minimize*** effects of wetland loss; and **3) to *compensate*** for unavoidable wetland loss. This is known as the ***sequencing*** process. When people refer to mitigation, they commonly focus on the third step, but the first two are also crucial!

Our over-riding concern is that a mitigation program for the State of Wisconsin actually make future wetland impacts *less painful* by compensating wetland losses in quantity, in quality, in kind, in function, and in location. The only way it can do that is if it is a program that assures *no net loss* of wetland acres and functions!

It is imperative that the sequencing process be preserved, and it is equally imperative that any wetland restoration for mitigation purposes (to compensate for lost wetland acres and functions) be high quality!

Some of the problems, potential pitfalls, and challenges to be aware of when considering wetland mitigation policy are:

- Wetland restoration science is in its **infancy**, most professionals agree.
- We lack basic wetland **research techniques** to adequately assess:

    1) **functions** occurring in wetlands
    2) **role** that destroyed wetlands played in greater watershed/ecosystem health
    3) **extent** to which replacement wetlands actually compensate for lost wetland systems

- Measuring the loss and replacement of wetland functions is far from an exact science. There's no reliable method to compare the *apples* of lost wetland acres and functions with the *oranges* of replacement wetlands.

There's an old adage: *If you get the hydrology right, everything else will follow*. But, first of all, it's not always that easy to get the water right, and second, it's not necessarily true that the rest will automatically follow.

When we talk about *net loss* we are not just talking about loss of acres, but loss of *function* and loss of *types* of wetland habitat. A successful compensation program would insure no net loss of wetland functions — such as flood control or recharge capacity, for instance — and no net loss of habitat types.

A compensatory mitigation program, and mitigation banking, offers promise when it contributes to larger ecosystem restoration efforts and when it offsets the

cumulative effects of many small, isolated wetland losses that we have experienced through our current regulatory programs. [The DNR estimates that this is now approximately 75 acres/year.] A compensatory mitigation program should be authorized as one tool for adding demonstrable net ecological value within our watersheds, not as an invitation to developers to trade wetlands like stocks on the market or to shuffle wetlands around willy-nilly on the landscape.

More than a third of our endangered species (nationwide) are associated with wetlands, even though wetlands comprise less than five percent of the landscape. We've lost close to 50 percent of our pre-settlement wetlands here in Wisconsin. What these figures suggest is that certain **types** of wetlands could be crucial — not just for protection from floods or protecting our water quality — but as habitat for endangered plant and animal life.

As an aside, this is one reason the environmental community and the public at-large has expressed so much concern over the current attempt to provide regulatory concessions for the cranberry industry. Replacing natural wetlands with reservoirs — pretty holding tanks with ducks, if you will — may at first glance seem like a fair trade. But if it results in the elimination of a whole class or classes of wetlands in a particular region, such as sedge meadows, for instance, it may represent a significant habitat loss and jeopardize the existence of certain species in that region which depend on that habitat.

If a compensatory mitigation program takes the attitude that *a wetland is a wetland*, the state and its residents stand to be severely short-changed in terms of quality and diversity of wetland habitats.

This is not a hypothetical argument. There have been instances where the Corps has allowed cranberry growers to count their reservoirs as compensation for wetlands filled for cranberry beds. Now we understand that the NRCS has been contemplating using wetlands previously restored through government programs, with taxpayer funds, as mitigation for future wetland impacts.

A study last year by National Audubon of wetland mitigation in Ohio required by the Army Corps found that, (of wetland impacts where mitigation was actually required) over 60 percent were replaced with deeper water wetlands or ponds. In other words, the unique role played by small, shallow wetlands in flood control, amphibian habitat and water quality improvement seemed to be overlooked by the government regulators, which, in Ohio, happened to include four district offices of the Corps.

We need to develop a program here in Wisconsin which avoids this sort of *cattailization* of our landscape. We need to develop a program we can be proud of.

We need to make sure that authorized mitigation legitimately compensates for lost wetland systems: in quantity, in quality, in kind, in location, and in function.

We must be careful not to lose wetlands we may not be able to replace. A compensatory mitigation program, at least for the foreseeable future, should concentrate on ***restoring*** sites where a wetland once functioned, and ***enhancing*** wetlands that are degraded. Wetland ***creation*** is a risky venture, at best, and should be avoided.

The cost of **restoring** a wetland is one fifteenth that of **creating** a wetland. The implementation time is far shorter, and the likelihood of success is far greater.

It is imperative that rigorous monitoring and enforcement components be built into a compensatory mitigation program. This will necessitate additional staff to do the monitoring and enforcement.

Finally, we'd like to encourage the Subcommittee on Wetlands Policy to listen to and work with the Mitigation Advisory Committee that has been addressing all these issues for more than a year. It has been a frustrating experience, at times, for everyone involved with this committee, but now the committee appears to have reached a break-through. They've reached consensus on the broad issues and the basic goals and parameters of a program. There is also consensus that *the devil is in the details*, and those devilish details remain to be worked out.

WWA wants to continue to be involved in the process of developing the rules and guidelines for a program that will fulfill the promise of compensatory mitigation and avoid the myriad pitfalls that lie on the path. We look forward to working with your committee to help implement a program that Wisconsin residents can be proud of.

Sincerely,

Tom Boswell

Tom Boswell, for the
Wisconsin Wetlands Association

WETLAND PROTECTION PROGRAMS IN WISCONSIN

SECTION 404 OF THE CLEAN WATER ACT (CWA)

The primary goal of the Clean Water Act (CWA) is to "restore and maintain the chemical, physical and biological integrity of the Nation's waters". Section 404 of the CWA regulates the disposal of dredged or fill material into U.S. waters, including wetlands. This is the **primary federal** law that regulates the filling and draining of wetlands. Some activities that destroy or degrade wetlands, but are not regulated by Section 404, include timber harvesting and certain agricultural activities. Clearing and land-leveling operations by mechanized equipment, such as a bulldozer, are regulated under Section 404.

WHO ADMINISTERS SECTION 404?

Section 404 is administered by the U.S. Army Corps of Engineers (Corps), with guidance and oversight by the U.S. Environmental Protection Agency (EPA). As authorized under Section 404, the Corps may issue or deny permits for fill activities in "waters of the United States", which is defined as waters that support interstate or foreign commerce, including wetlands. The Corps may take legal action through the federal courts to issue fines and/or require restoration.

EPA developed guidelines for the Corps to use in assessing the environmental impacts of proposed projects, as directed by Section 404(b)(1) of the Clean Water Act, (33 U.S.C. 1344). The guidelines are designed to discourage the placement of dredge or fill material into the aquatic ecosystem unless it can be shown that it will not have an "unacceptable adverse impact on restoring and maintaining the chemical, physical, and biological integrity of the waters in the United States".

Section 404 of the Clean Water Act, (33 U.S.C. 1344) gives EPA veto authority over the Corps issuance of a permit if the EPA finds the project will cause "unacceptable adverse impacts on municipal water supplies, fish and wildlife habitat and recreational uses". Also, the EPA is authorized to bring enforcement actions for unauthorized activities. In 1987, the Water Quality Act expanded EPA's enforcement authority to include the power to levy administrative penalties and increase the monetary amount of potential civil and criminal penalties.

The state also has veto power over Corps permits, as explained in Section 401 CWA and NR 299 Water Quality Certification.

The Fish and Wildlife Coordination Act requires the U.S. Fish & Wildlife Service (USFWS), the National Marine Fishery Service (NMFS) and state fish and wildlife agencies to be involved in the Section 404 program. These agencies are authorized to: a) review and comment on permit applications and b) provide technical assistance to protect and mitigate fish and wildlife resources. Note however that the Corps is only required to give "full consideration" to the recommendations, but they are not required to adopt them.

WHAT ARE 404 PERMITS?

The Corps issues one of the following permits under the CWA: nationwide permit, general permit, letter of permission or individual permit. If the proposed project exceeds the conditions of a nationwide or general permit, an application for an individual permit may be required.

The Corps will process the application using the simplest or lowest level of permitting. The levels of permitting (from simplest to most complex) are: nationwide permit, general permit, letter of permission, and individual permit.

- **Nationwide Permits (NWP)** -- Currently the Corps has 40 nationwide permits (1 is vacant or "reserved"). The Corps District Engineer can take discretionary authority on a NWP and require individual applications for that activity based on concern for the aquatic environment. This discretionary authority can only occur on an individual case basis.

- **General Permits (GP)** -- Under Section 404 (e) (1), the Corps has authority to issue general permits on a nationwide, regional and statewide basis for categories of activities similar in nature that will cause only minimal individual and cumulative adverse environmental impacts.

Typical projects covered under general permits include: navigational markers, utility structures, minor dredge and fill projects, and boat docks.

- **Letter of Permission (LOP)** -- LOP's are used in cases that are only subject to Section 10 of the Rivers and Harbors Act of 1899 (navigable waters of the United States), excluding filling, and that, in the opinion of the Corps District Engineer, will be a minor project, will not result in significant individual or cumulative impacts on environmental values and should not encounter "appreciable opposition". A written application is required. Department of Natural Resources (DNR) and USFWS concurrence, as required by the Fish and Wildlife Coordination Act, is achieved usually through telephone contact by the Corps. No published public notice is required for a LOP.

- **Individual Permits** -- An individual permit is required where the proposed project or activity is not authorized by either a nationwide permit or other general permit.

The Corps evaluates individual permit applications based on two standards: a) the EPA Section 404(b)(1) guidelines and b) the public interest factors. In addition, under the National Environmental Policy Act (NEPA), the Corps prepares an environmental assessment.

The Corps must determine whether the proposed project complies with the 404(b)(1) guidelines. The guidelines state that "no discharge of dredge or fill material shall be

permitted if there is a practical alternative to the discharge which would have less adverse impacts on the aquatic ecosystem". Also under the guidelines, the project must be water dependent -- that is, it must require access or proximity to the water to fulfill its basic purpose. If the project is not water dependent, it is assumed that other workable options exist (unless proven otherwise by the applicant) and the permit must be denied.

In the public interest review process, the Corps uses three general review criteria to determine if the project is "contrary to the public interest". The criteria include: 1) the public and private needs, 2) the availability and practicality of alternative sites and methods and 3) the extent and permanence of beneficial and detrimental effects (both private and public) of the project. The following public interest factors are considered: economics, aesthetics, environmental quality, historical value, fish and wildlife values, flood hazards, land use, wetlands, shore erosion, mineral needs, property ownership, navigation, recreation, water supply, water quality, energy needs, food production, and the needs and welfare of the people and safety.

The Corps is required to publish a public notice for actions requiring an individual permit. The Corps is not required to hold a public hearing but **may** do so if requested or if it believes a hearing would result in the gathering of important new information.

ENVIRONMENTAL IMPACT

Under NEPA, the Corps must consider the impacts of proposed projects on the human and natural environment. NEPA requires that an environmental impact statement be prepared for any major federal action, including the issuance of the Section 404 permit, if it would have a significant affect on the quality of the human environment. In most instances, "a finding of no significant impact" (FONSI) is issued by the Corps after preparation of an environmental assessment or if a project is categorically excluded from requiring either an environmental assessment or an environmental impact statement.

WHAT OTHER LAWS AFFECT SECTION 404 ACTIVITIES?

SECTION 401 OF THE CLEAN WATER ACT

Section 401 of the CWA requires proposed federal actions or permits to comply with state water quality standards. The state must either grant, grant with conditions, waive or deny water quality certification. Corps permit decisions are only valid if the state grants or waives water quality certification, except on tribal lands, where EPA has certification authority. Section 401 and NR 299 are the Department's main mechanism for wetland protection.

CHAPTER NR 299 - WATER QUALITY CERTIFICATION

Chapter NR 299, "Water Quality Certification", of the Wisconsin Administrative Code (Wis. Adm. Code), establishes the procedures and criteria for the application, processing and review of state water quality certifications required by provisions of the federal CWA. NR 299 certifications pertain to all federal permits or licenses in which discharges to waters of the state are involved. This state law sets the criteria and process to follow in determining whether the state must grant, grant with conditions, waive or deny water quality certification.

The code sets forth time requirements for review and decisions on each application (Department must review within 60 business days of receipt of a **complete** application and must notify the applicant of it's decision to grant, conditionally grant, waive or deny water quality certification within 120 days of receipt of a complete application).

CHAPTER NR 102 - WATER QUALITY STANDARD FOR SURFACE WATERS

Chapter NR 102, "Water Quality Standards For Surface Waters", Wis. Adm. Code, establishes water quality standards for surface waters pursuant to Section 281.15, Wis. Stats. NR 102 identifies the designated use categories for such waters and the water quality criteria (ie. water pH, clarity and temperature) necessary to support those uses. These standards are intended to protect public rights and interest, public health and welfare, and the present and prospective uses of all waters of the state for public and private water supplies, propagation of fish and other aquatic life and wild and domestic animals, preservation of natural flora and fauna, domestic and recreational uses, and agricultural, commercial, industrial and other uses. These standards must be met for all Corps regulated activities that are located in surface waters of the state including but not limited to dredging, filling, discharges regulated under the Wisconsin Pollution Discharge Elimination System (WPDES) permit program and any other applicable activity under NR 299, Wis. Adm. Code.

CHAPTER NR 103 - WATER QUALITY STANDARDS FOR WETLANDS

Chapter NR 103, "Water Quality Standards For Wetlands", Wis. Adm. Code, became effective on August 1, 1991, establishing water quality standards for wetlands. In accordance with Section 281.15, Wis. Stats and NR 103.01(2), "water quality standards are intended to protect public rights and interest, public health and welfare and the present and prospective uses of all waters of the state for public and private water supplies, propagation of fish and other aquatic life and wild and domestic animals, preservation of natural flora and fauna, domestic and recreational uses, and agricultural, commercial, industrial and other uses". These water quality standards are applicable to most Department regulatory, planning, resource and financial aid determinations that may impact the quality and uses of wetlands. The standards do not apply to shoreland-wetland zoning decisions, activities specifically exempted from state and federal regulations, and activities where more specific legislative direction has been given to the Department on how wetlands should be protected, such as metallic mining activities. The wetland water quality standards are carefully geared to mesh with the Corps 404 program in a

qualitative sense by incorporating the concepts of wetland dependency, practicable alternatives and significant adverse impact to the functional value of wetlands under NR 299, Wis. Adm. Code.

COASTAL CONSISTENCY

Through the Federal Coastal Zone Management Act (CZMA) the Corps cannot issue a permit if the state determines that the proposed discharge would be inconsistent with the state's federally approved coastal zone management plan. In Wisconsin, coastal consistency determinations are generally deemed to be met if state water quality certification is granted. However, the Coastal Management Program (through the Department of Administration) may on their own grant or deny coastal consistency for any federal activity affecting any coastal county (counties adjacent to Lake Superior and Lake Michigan).

NR 1.95 - WETLANDS PRESERVATION, PROTECTION AND MANAGEMENT

Section NR 1.95, Wis. Adm. Code, was promulgated in 1978 to establish the Department's policy on "wetlands preservation, protection and management". The rule sets forth the **policy** of the Natural Resources Board that "wetlands shall be preserved, protected, and managed to maintain, enhance or restore their values in the human environment" and requires that impacts to wetlands be considered in all Department regulatory and management actions. NR 1.95 also includes a listing of wetland functions and values. Because, NR 1.95 is only a policy statement, it does not have the force of law.

NR 103 states that "whenever the procedures [of NR 103] are applicable to an activity, it shall supersede the provisions of NR 1.95". NR 103 is very similar to NR 1.95, but creates minimum standards and a specified process for decision making. NR 1.95 is still applicable to DNR decisions where no formal NR 103 decision is required. The older rule is still used as a reference for the Department's policy on protecting wetland functional values.

OTHER FEDERAL WETLAND PROTECTION PROGRAMS

SWAMPBUSTER

The Swampbuster provision of the Food, Agriculture, Conservation and Trade Act is administered by USDA's Natural Resource Conservation Service (NRCS), formerly Soil Conservation Service (SCS), and Consolidated Farm Service Agency (CFSA), formerly Agricultural Stabilization and Conservation Service (ASCS). Swampbuster discourages the conversion of wetlands by draining, dredging or leveling. It is based upon two premises: the need to reduce agricultural production, and recognition of the need to protect wetlands for their water quality and wildlife benefits.

CONSERVATION RESERVE PROGRAM (CRP)

The Conservation Reserve Program (CRP) was authorized under the Food Security Act. CRP allows the federal government to enter into contracts with agricultural producers to remove highly erodible cropland and cropped wetlands from production in return for annual rental payments. This program is administered by CFSA with assistance from NRCS, WDNR, and USFWS.

WETLAND RESERVE PROGRAM (WRP)

The Wetland Reserve Program (WRP), originally authorized by the 1990 Farm Bill, is a voluntary program offering landowners the opportunity to receive payments for restoring and protecting wetlands on their property. WRP provides cost share payments for wetland restorations in combination with conservation easements. This program is administered by NRCS and USFWS with assistance from WDNR.

OTHER STATE WETLAND PROTECTION PROGRAMS

SHORELAND - WETLAND ZONING: NR 115, NR 117

Wis. Adm. Codes NR 115 and NR 117 require counties, cities and villages to establish shoreland-wetland zoning districts. All wetlands or portions of wetlands ≥ 5 acres that are within 1,000 feet of a navigable water way (ie. lake, pond or flowage) or within 300 feet of a floodplain of a navigable river or stream, whichever is greater, are subject to this protective zoning. Some communities have chosen to zone additional wetlands. Zoning ordinances enacted under NR 115 and NR 117 generally prohibit any drainage, dredging, filling or flooding of wetlands. Wetland zoning allows a variety of uses including recreation, limited road and utility construction, some agricultural activities and maintenance of existing drainage systems.

An area cannot be rezoned (changed to a non-wetland zoning district) if it would result in significant harm to wetland functional values. The functional values specified in NR 115 and NR 117 are: a) storm and floodwater capacity, b) maintenance of dry season stream flow, the discharge of groundwater to a wetland, the recharge of groundwater from a wetland to another area or the flow of groundwater through a wetland, c) filtering or storage of sediments, nutrients, heavy metals or organic compounds that would otherwise drain into navigable water, d) shoreline protection against soil erosion, e) fish spawning, breeding, nursery or feeding grounds, f) wildlife habitat, and g) areas of special recreational, scenic or scientific interest, including scarce wetlands types. Public notice and hearing are required for rezoning petitions prior to action by the municipal governing body. The DNR reviews rezoning decisions to make sure state standards are met and has the authority to override municipal shoreland wetland rezoning approvals if they would result in significant harm to wetland functional values.

Revised: December 11, 1997 (coednr3.def)

CITY OF NEW BERLIN
City Living
with a Touch of Country

3805 S. Casper Drive
New Berlin, Wisconsin 53151-5510
414/786-8610

Project—

January 22, 1993

MEMO TO: T. Michael Schober, City Attorney

MEMO FROM: Steven K. Hoese AICP, Director of Planning SKH

MEMO RE: Wetland Regulations

Dear Mike,

The Staff feels in somewhat of a dilemma. We have a Shoreland/Wetland Ordinance and related maps which require regulation of Wetlands five acres or greater that are within a specified distance from a navigable waterway.

We are also aware the DNR, Army Corp, EPA may have additional regulations that may regulate Wetlands less than five acres in size. We have no copies of these administrative rules, or maps to indicate where these areas may be.

I had offered to refer all Building Permits to the DNR to insure they could be reviewed for compliance with State and Federal rules. The DNR officials declined that offer. After conversations with the State's Attorney General, we now hand out information/ literature which encourages owners, applicants, or builders to seek assistance from these other agencies regarding wetlands.

The City Staff concern on liability is as follows: If we deny a Building Permit or prevent reasonable development of land because we suspect it may violate a law other than our own, or attempt to litigate or get an injunction on the basis of a law not our own, we would be at fault for denying the owner reasonable use of his land if found to be wrong; thus we do not attempt to enforce laws other than those that are our Municipal Ordinances.

The Godfrey & Kahn Report suggests that if we issue a Building Permit and it is later found the construction encroaches on an area that has State or Federal significance but legal per our Code, we could still be held liable.

It seems we are wrong no matter what we do.

Can you advise how we should proceed in administering Wetland regulations?

SKH:jg
c: Marc Duff

How Much Are Wetlands Worth?

In the ever-shifting world of land use law, a New Jersey state tax court decision has just added its voice to the confusing din.

The court recently decided that a 240-acre tract near the Meadowlands sports complex in East Rutherford was vastly overvalued, at $20 million, because of restrictions placed on development by state and federal wetlands regulations. The assessment was kicked down a whopping $19 million. Instead of paying East Rutherford $300,000 a year in taxes, the landowner will now pay only $17,000.

While the implications of the ruling outside of New Jersey are unclear, at least one aspect of it should be disturbing to localities everywhere, says East Rutherford's attorney, Ken Porro: The court in this case shifted the burden of proof of a property's value squarely onto the locality. "It assumes you're starting at zero value and that the municipality has to prove the land is developable."

In traditional land use and land value disputes, it is the landowner who has to prove that the government has done something to reduce a property's value or that it has inflated an assessment.

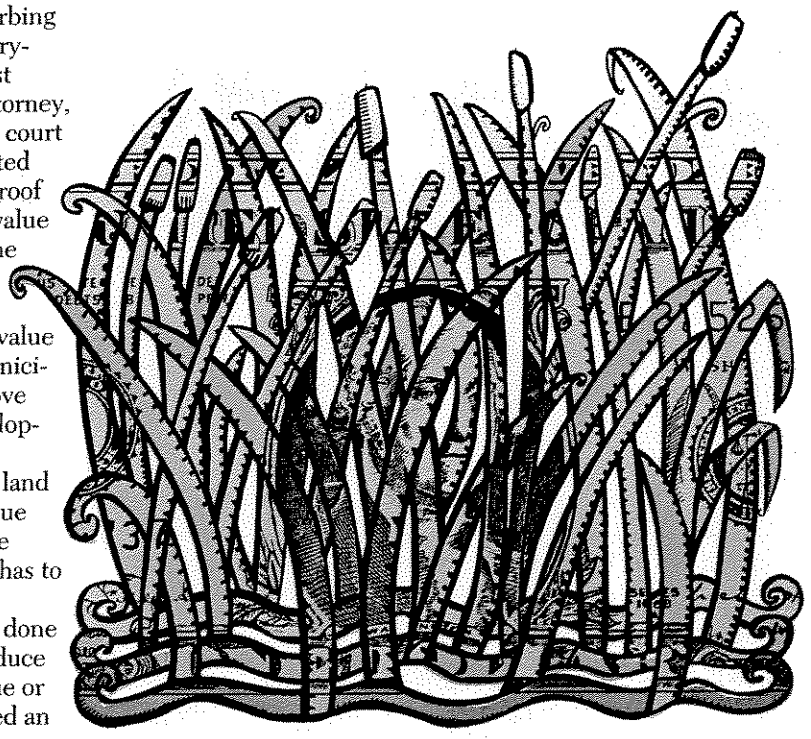
The decision has clear ramifications for thousands of acres of wetlands within the borders of New Jersey, says John Moran of the state's League of Municipalities. "You're seeing an increase in property tax appeals generally," he says. "When things get tough like this, folks look for ways to cut their expenses. If word of this gets around, I think you're going to see a domino effect."

All the usual players have lined up on either side of the decision. The Pacific Legal Foundation, a landowner rights organization based in Sacramento, has hailed it as another significant step in the fight against over-burdensome government land use regulation. Members of the environmental community are calling it an isolated and wrong-headed decision that ignores the facts of the case.

East Rutherford, however, may still prove to be the big winner in the case. According to expert testimony by local zoning officials, 40 percent of the 240-acre tract is indeed developable. So confident are East Rutherford officials of the property's actual value, in fact, that they have made an offer to buy the land for twice its new assessment. "We think we can easily turn it over for $20 million," says Porro.

If the landowner refuses to sell, then the town will appeal the tax court decision and the $1 million assessment.

—Jonathan Walters



Ellen Prochnik illustra

ON THE RECORD

Joseph Perone, deputy director of the New Jersey Division of Building and Construction, explaining how easy it is for the state to have work done at low cost during a real-estate recession:

"If I threw a rope out here, the contractors would climb the side of the building to get in."

A Lesson For Police In 'Gay Bashing'

In many gay communities, police are seen as the adversary, more intent on harassing than protecting people who already feel under siege. In Houston, police officers posing as gays in an undercover operation learned firsthand what "gay bashing" is and earned new respect from that community.

In the first 15 days of Operation Vice Versa, police made 137 arrests—five of them for assault on undercover cops. Two received facial lacerations. One officer was hit in the mouth and another was assaulted with a tree branch. "It opened our eyes," says Assistant Police Chief Frank Yorek. "A person can suffer harassment, even death, just by virtue of standing around on the street."

The undercover operation grew out of a

THE BUCKS STOP HERE: Studies showed that poor cash-handling practices by employees were costing the city of Seattle $100,000 a year. So the treasurer's office came up with a four-hour training and certification program: Better Understanding of Cash Kontrol Systems. More than 1,000 city workers—from lifeguards to building inspectors—are learning the importance of money management through lectures, videos and role-playing. Losses dropped to $20,000 the first year of the program. Copies of the training manual are available for $15. Contact: Chris Coy, Special Assistant, City Treasurer's Office, Municipal Building, Room 103, Seattle, WA 98104. Phone 206-684-5215.

TRAFFIC VIOLATIONS, not felony crimes, are the main reasons for high-speed police chases, says a study sponsored by the AAA Foundation for Traffic Safety. *Police Pursuit in Pursuit of a Policy* also reports that one in four persons injured or killed in a car chase is an innocent motorist or pedestrian. The study, conducted by the Illinois State University Department of Criminal Justice Sciences with the help of the Illinois state police, recommends that law enforcement agencies have well-defined, highly restrictive policies and procedures for such chases. Copies may be requested from the AAA Foundation for Traffic Safety, 1730 M St. N.W., Suite 401, Washington, DC 20036. Phone 202-775-1456.

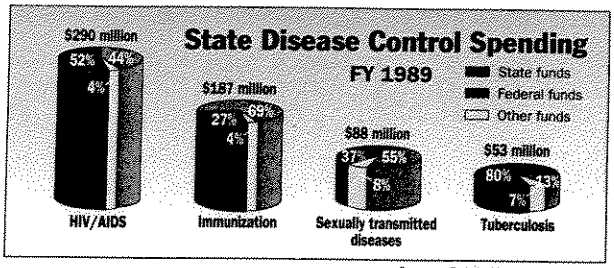
CLEAN-FOOD PROGRAMS traditionally emphasize inspection scores and strict enforcement of regulations on the food service industry. Boulder County, Colorado, has received a national consumer protection award for taking a more scientific and less confrontational approach to ensuring public health and safety. The agency, working in cooperation with restaurants, grocery stores, nursing homes and food banks to develop educational workshops on food handling and sanitation, has achieved a high level of voluntary compliance. Contact: Kay Forward, Food Protection Program, Boulder County Health Department, 3450 Broadway, Boulder, CO 80304. Phone 303-441-1187.

RECYCLING CAN CREATE JOBS and economic development opportunities, according to a new resource guide, *Capturing the Local Economic Benefit of Recycling*. The 144-page book, put together by the Local Government Commission in California, describes 43 programs nationwide for attracting recycled product manufacturers and generating demand and markets for recycled goods. Contact: Michele Kelso, Local Government Commission, 909 12th St., Suite 205, Sacramento, CA 95914. Phone 916-448-1198. The cost of $27.50 includes a 16-page policy-makers summary.

'SWIMSUIT OPTIONAL,' read the signs once posted at beaches in the San Diego area. Nude bathing is illegal now, but the signs are the top-sellers at San Diego's City Store, which offers salvaged items such as street signs, parking meters and old jail locks, in addition to new T-shirts and tote bags displaying the city's logo. The original store is located in the Municipal Building; a second outlet has opened in a downtown shopping mall. Operated as a public-private partnership, the pilot project has already turned a profit since opening last November. Contact: Don Telford, Project Manager, City of San Diego, 202 C St., #57, San Diego, CA 92101. Phone 619-236-6500.

MAIL CALL: Residents of Macon, Georgia, created such a traffic congestion problem around the water authority's downtown office and drive-up window that it led to an incentive to keep folks away. A monthly sweepstakes drawing is now being held for customers who mail, rather than hand-deliver, their monthly water bills. A $50 prize will be awarded every month to a customer in each of the city's seven billing districts. Contact: Gene Holcomb, Executive Director, Macon Water and Sewer Authority, P.O. Box 108, Macon, GA 31298. Phone 912-741-9143.

PUBLIC HEALTH DEPARTMENTS first learned of the AIDS virus in the early 1980s. By the end of the decade, state health agencies' spending on AIDS alone surpassed total expenditures for both chronic and communicable diseases. The data comes from the *1991 Public Health Chartbook*. To obtain a copy, contact: Joeratta Bennett, Public Health Foundation, 1220 L St. N.W., Washington, DC 20005. Phone 202-898-5600. Cost is $10; free to state and local health departments.



Source: Public Health Foundation

CITY OF NEW BERLIN
City Living
with a Touch of Country

3805 S. Casper Drive
New Berlin, Wisconsin 53151-5510
414/786-8610

October 25, 1991

Marc Duff
1811 S. Elm Grove Road
New Berlin, Wisconsin 53151

Dear Assemblyman Duff:

Thank you for your support for the underground wiring agreement. The Common Council has committed to its share of the project with the Electric Company.

On the issue of wetlands, I offer the following quick comments:

I value and support the preservation of wetlands for the following reasons: Storm water detention, waterfowl preservation, hunting and fishing opportunities, shoreland protection of natural streams, groundwater recharge.

However, my experience has observed over zealous field personnel declaring private property as wetlands that exhibit none of the above characteristics. These lands do not recharge groundwater, protect streams or have significant water fowl habitat.

In addition, the scare tactics used in the field administration of well meaning legislation on wetlands has caused a push to developing of prime farmland, woodlands and forested areas. The preservation of wetlands SHOULD NOT be to the detriment of other more important environmental areas. Farmland and woodlands have a more direct benefit to human beings than do wetlands.

Thus, I support what ever efforts you can to narrow the focus on wetland preservation to those areas that were originally intended for protection.

i.e. Wetlands that are wet, navigable streams that are truly natural and passable, Wetlands that are good or prime, not a parcel that exhibits partial characteristics of a wetland.

I have read the recent proposal from the compromise of the proposed revisions to the federal manual for delineating wetlands. I agree and support this action.

Supporting these more acceptable definitions of wetlands is not being anti-wetland. I truly believe that without a more balanced interpretation of wetland preservation and private property rights that we would be dangerously close to losing all ability to publicly restrict private property use of wetland areas. I am referring to waning tolerance by various courts around the land to the extreme interpretations field personnel are inflicting on private land owners.

Implementing more reasonable legislation in regards to wetlands will also serve to ease pressure on farmland and woodlands. Which is being pro-environment.

I am not quite sure how wetlands became center stage with national attention over other more important environmental issues. But a more reasonable and fair approach to wetlands will lay favorable groundwork for other environmental legislation.

To allow an unreasonable approach to continue with wetlands will lead to more resistance from Middle America (environmental groups will always support these items) and greater chance for big loss from the courts.

Your position is difficult, environmentalists are trying to label anyone with a moderate position as anti-wetland, which isn't true. However, we must balance everyones rights and the wetland laws as administered in the field went too far.

Sincerely,

Steven K. Hoese AICP
Director of Planning

SKH:dg

CITY OF NEW BERLIN
City Living
with a Touch of Country

3805 S. Casper Drive
New Berlin, Wisconsin 53151-5510
414/786-8610

January 9, 1992

Thomas J. Dawson
Wisconsin Public Intervenor
123 West Washington Avenue
P. O. Box 7857
Madison, WI 53707-7857

Dear Mr. Dawson,

Thank you for your assistance. We are modifying the Jefferson County handout to reflect the correct local phone numbers for the New Berlin area, etc. I have also contacted Katie Kazan about getting copies of the Building Near Wetlands handout. She will be sending me a supply for hand out at our counter.

I am distressed with a comment in your letter that people don't want or need to know if they are in or out of wetlands; all they want to know is the "existence of the programs, and who to contact to find out".

It doesn't make sense for you to request local officials hand out information about Federal Wetland Programs, and then these handouts recommend that local officials make determinations on wetlands locations and procedures, but then also tell local officials we don't need maps or information on these Federal programs.

I called the local Army Corp office and the southeastern district DNR office as you suggested. Both indicated they do not have the people, time or ability to review all our permits for compliance with wetland requirements. Yet your office indicates that we should send all our people there? We are required to issue a permit in 10 working days or a reason why not.

The way the administration of the wetland protection procedure operates (or doesn't) has created many difficulties. Your letter suggesting this was the fault of local officials concerned me, and offering that we are to do this without maps and information is disturbing.

A citizen who simply desires to purchase a lot and build a building should not be required to visit local, State, and numerous Federal agencies for signoff on a permit. This is especially troublesome when the State and Federal offices are not staffed sufficiently to respond in a reasonable time frame and with any certainty.

The administration of the Floodplain requirements are much more efficient than the wetland procedures. 1. Floodplain MAPS are created and distributed to all officials. 2. Floodplain procedures and regulations are similiar or identical between State and Federal government and made known to all. 3. Administration of the Floodplain regulations is at the local level, where with one stop you will get your permit.

In the case of floodplain administration, the DNR is available for technical assistance to local officials, and to review any variances or deviations. The Federal level is over-seen by FEMA handling map amendments and insurance rate mapping. But you do not need to visit all these offices just to check on your permit as you must do to adequately protect yourself in this Wetland administrative process.

Wetlands and the fact that they are regulated by both State and Federal government is commonly known by local officials and citizens I deal with. Our problem is no one knows for certain if their land is or isn't a regulated wetland. And if you attempt to find out, you fall into a regulatory morass with no set timetable, and no reasonable assurance you will get a straight answer in a timely fashion that someone will stand behind.

We need to change the administration of the wetland protections with accurate and reasonable definitions of a wetland with good mapping, along with uniform, simple to follow regulations administered by local permit officials.

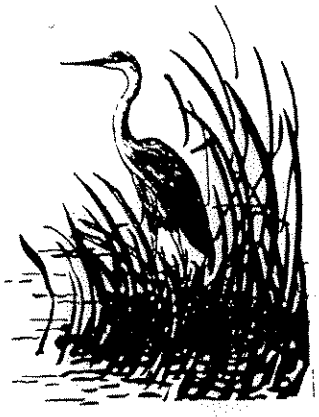
Thank you for reading my concerns and your assistance thus far.

Sincerely,

Steven K. Hoese AICP
Director of Planning and
Community Development

SKH:mlf
c: State Senator Huelsman
State Senator Adelman
State Representative Duff

What's a Wetland Worth?



Wetlands Key to a Healthy Economy

America's wetlands provide something for everyone — they protect our communities from flooding, filter dangerous pollutants from our drinking water and provide life-sustaining habitat to fish and wildlife. The benefits of wetlands are incalculable, both for our economy and our environment, yet more than 120,000 acres of wetlands continue to be destroyed every year. (U.S. Fish and Wildlife Service, Wetland Status and Trends Report, 1997.) More than half of the wetlands in the lower 48 states that were present when European settlers arrived have already been lost.

Wetlands Protect Our Families from Floods

Wetlands can be the first line of defense against flooding. Just ask Louisville, Ky., schoolteacher Doris Wilson, who hadn't been flooded after 20 years in her home — until last year. The summer after a neighboring developer destroyed a nearby wetland, her yard flooded, even though it wasn't raining. When it did rain, three feet of water forced her from her home for two months.

Like sponges, wetlands soak up rain and store excess flood water runoff, then slowly release the water back into streams, lakes and groundwater.

One acre of wetlands stores up to 1.5 million gallons of flood water. Those states that have lost 80 percent or more of their original wetlands — Ohio, Kentucky, California and Missouri — have experienced the most severe flooding over the past four years.

Wetlands Purify Water

Wetlands come in many forms — swamps, bogs, estuaries, prairie potholes — but all clean our water.

People living near South Carolina's Congaree Bottomland Swamp don't take that for granted. Without the wetland, which acts as a natural filter removing sediment and toxic substances, the community would have to build a 5-million-dollar water treatment facility.

And relying on chemicals and treatment plants to clean our water doesn't always work. In 1995, the largest waterborne disease outbreak in modern U.S. history sickened more than 900,000 people in Milwaukee and killed 104. Less than a year later, the same disease killed 19 people in Las Vegas.

One solution? Preserve more wetlands to shield our drinking water sources.

Wetlands Provide Habitat for Fish, Shellfish and Wildlife

Many fish and waterfowl species are born in wetlands. The U.S. Fish and Wildlife Service estimates that up to 43 percent of America's threatened and endangered species need wetlands for their survival. For many animals, such as the wood duck, alligator and heron, wetlands are primary habitat. For others, they provide habitat for part of the year.

The destruction of wetlands threatens the viability of America's 45-billion-dollar commercial fishing industry. National Marine Fisheries Service scientists estimate that nearly 70 percent of the annual commercial fish catch depends upon inshore-wetland habitats.

Wetlands Provide a Wealth of Recreational Opportunities

According to the EPA, poor water quality threatens America's 380-billion-dollar recreation and tourism industry. Beaches, lakes and rivers are the most popular destinations.

Americans count on wetlands for popular activities such as fishing, hunting, boating, hiking, birdwatching and wildlife viewing. A 1995 EPA study found that 50 million people spend $10 billion each year observing and photographing wetlands-dependent birds. And roughly 3 million waterfowl hunters spend over $600 million annually in pursuit of wetlands-dependent birds.

Wetlands Are Worth More Protected Than Destroyed

Currently, our laws offer limited protection for wetlands under the Clean Water Act. We must strengthen wetlands protections to safeguard these precious places.

The benefits of wetlands are incalculable, yet every year, more than 120,000 acres of wetlands are destroyed.

Sierra Club

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Clean Water Act at 25: A Victory in Progress

When Ohio's Cuyahoga River burst into flames in 1969, Americans were shocked by the vision of a waterway so polluted it could foster an inferno. From the ashes came the Clean Water Act, passed by Congress in 1972. Its goal: All water bodies should be safe for fishing and swimming by 1983, there should be no more direct discharge of pollutants into navigable water by 1985 and there should be no toxic pollutants released in toxic amounts.

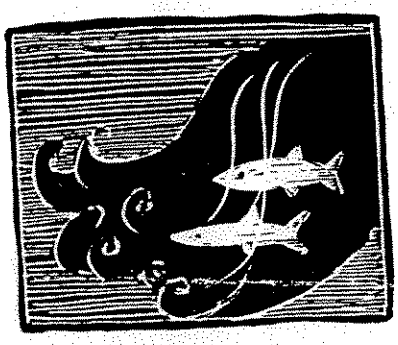
Now, 25 years later, our nation's water is cleaner — the National Wildlife Agency estimates that the Clean Water Act prevents more than 900 million pounds of sewage and 1 billion pounds of toxic chemicals from entering our waterways every year — but we still have not met the act's goals. In 1972, two-thirds of our water bodies were unfit for swimming or fishing. Today one-third of our rivers and one-half of our lakes are still considered unsafe, according to the Environmental Protection Agency.

While direct discharge from factories has been practically eliminated, our water continues to be poisoned by more insidious culprits like agricultural and urban runoff. For example, in Louisiana's Gulf Coast, an area roughly the size of Massachusetts, fish and wildlife can no longer survive. Runoff containing sewage, fertilizers and animal waste — coming down the Mississippi River basin — is killing the gulf. Shrimp harvests are crashing and one fish processing plant has already closed its doors.

The waste from corporate hog farms in Missouri, North Carolina and other states has killed thousands of fish, both through spills into rivers and runoff. Other threats to our waterways include poor wastewater treatment, overuse of lawn and garden fertilizers, even air pollution.

The Great Lakes once swallowed untreated industrial waste and sewage until one of them, Lake Erie, was pronounced dead. Today they are free from such direct discharge, but they are threatened by air pollution that rains from above and toxic sediments that release poison from below. Pollution levels in Lake Michigan fish have dropped 90 percent in the past 10 years, but they're still 150 times too high for human consumption. A 1997 Sierra Club report, "Something's Fishy," found that one-third of the 5 million Great Lakes fishing families are not aware of the health risk from eating contaminated fish.

Nationwide, more than 2,000 beaches were closed in 1994 to protect the public from harmful bacteria and other pollutants



found in the water, according to the EPA. Advisories or bans have been issued for more than 1,500 bodies of water to protect the public from eating contaminated fish.

Moving Ahead: Strengthen Enforcement, Add Runoff Protections

Dead lakes and burning rivers are remnants of the past, but our nation's water pollution problems persist.

We have many of the tools we need, mainly the Clean Water Act, but it must be enforced. Many states have failed to abide by it. The Sierra Club has filed lawsuits to force the EPA to enforce the law in Minnesota, Mississippi, Louisiana, Kansas, Georgia, Delaware and California.

We also need a national system that provides better access to information about water quality, including fishing advisories. We need consistent standards, monitoring of dangerous waters and posting of results.

We must also strengthen our water protection laws so they address polluted runoff.

We have made great progress in cleaning our water, but one-third of our rivers and one-half of our lakes are still unfit for swimming or fishing.

Sierra Club

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U.S. Department of the Interior—U.S. Geological Survey
Fact Sheet FS-246-96

Do Created Wetlands Replace the Wetlands that are Destroyed?

by Randall J. Hunt

Introduction

Wetlands, once perceived as worthless land, are now recognized as a necessary component of a vital landscape. However, due to draining and filling we have lost many of our wetlands. The loss of wetlands can have undesirable effects on the landscape, such as erosion, flooding, habitat loss and deterioration of water quality. While natural wetland systems are being destroyed nationwide, the wetlands restored or created to compensate for these losses are commonly not evaluated or contain large percentages of non-wetland acreage. At the present time we do not have established methodology that can uniformly evaluate a wetland's function, or that is useful for providing guidelines that enhance wetland restoration/creation success.

Why should we care about wetland loss?

Wetlands are often considered "kidneys of the landscape" because of their role in filtering the effects of surrounding land use, and have widely recognized functions that include storm/flood water retention, shoreline protection, water-quality improvement, and wildlife habitat. In fact, more than one-third of our endangered species are associated with wetlands even though wetlands comprise less than five percent of the landscape! We have lost vast areas of the pre-settlement wetland acreage—more than 50 percent nationally and more than 95 percent in some states. Increasing population, development, farming and landowner's rights have resulted in increasing amounts of our wetland resource being destroyed and have increased the pressure on the wetlands that remain. As demonstrated by the floods of 1993, the loss of wetland functions is becoming increasingly recognized. The effects of wetland loss, however, are poorly understood and wetland research is still considered to be immature.

What is wetland mitigation?

In the broadest sense, mitigation is a process that focuses on: 1) avoiding wetland loss, 2) minimizing the effect of wetland loss, and 3) compensating for unavoidable wetland loss. In general usage, however, mitigation has become synonymous with number 3 and now refers to replacing the function and structure of a destroyed wetland by creating, restoring or enhancing a wetland somewhere else. This mitigation of wetland loss has been mandated by federal law, and there have been numerous large and small wetland mitigation projects in every part of the nation.

What are the challenges associated with wetland mitigation?

Wetland ecosystems span a large environmental gradient—between occasionally wet uplands to shallow lakes. As might be expected over such a large range, no "universal truths" apply to all wetlands, or to wetland mitigation projects. It has become apparent that we are lacking basic wetland research techniques that can easily assess: 1) the functions occurring within the wetlands, 2) the role that destroyed wetlands played in the greater watershed/ecosystem health, and 3) the extent to which mitigation wetlands compensate for lost wetland systems. In the midst of the pursuit to create and restore, wetland scientists are becoming aware that the many unknowns make it virtually impossible to provide definitive guidelines for successful wetland assessment and design.

Wetlands have many uses, including that as an outdoor classroom.

What are some of the issues surrounding wetland mitigation?

It is not widely accepted that mitigation projects are successful. Although the current wetland permit programs assume that wetland loss is being ameliorated, no long-term, interdisciplinary research shows unequivocally that a created wetland has fully replaced the lost function resulting from a wetland's destruction. Secondly, there is a concern that created wetlands do not provide in-kind compensation. That is, many hard-to-create wetland types (such as fens, bogs and sedge meadows) are being replaced with common, easy-to-create wetland types (cattail marsh), or the "quality" of the resulting mitigation wetland is not equal to the wetland that was destroyed. A third concern is that placing mitigation projects in areas distant from the destroyed wetland will result in the wetland functions being replaced in areas away from where they are needed and/or in areas that are not wetland deficient. Finally, there is great interest in mitigation "banks"—large wetland

Wetland studies require intensive instrumentation and labor to properly characterize the hydrology, soils and vegetation.

Wetlands span a large range of "wetness"—from occasionally wet meadows and prairies to shallow lakes.

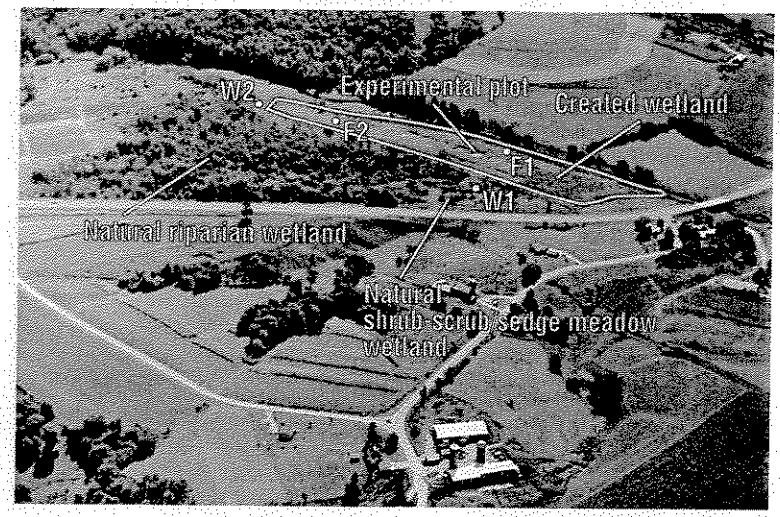


Figure 1. Aerial view of the Wisconsin Department of Transportation/U.S. Geological Survey wetland creation site near Wilton, Wisconsin one year after construction. Within the created wetland are experimental plots where design parameters (for example, depth to ground water) were varied. The locations of intensively instrumented sites in the natural and created wetland are also shown.

Site description: *The site is located in the unglaciated region of Wisconsin that is characterized by steep slopes and narrow valleys that promote localized ground-water discharge and the formation of river bottom wetlands (fig.1). The natural wetland consists of a natural shrub-scrub/sedge meadow wetland dominated by sedges, willow and alder and a riparian wetland dominated by alder, american elm and black ash. During the summer of 1991, an adjoining upland agricultural field was excavated to compensate for a wetland being filled by a road construction project. A sedge meadow was the target for the wetland creation, and the field was excavated to depths that were specified on the basis of pre-construction water levels in 72 wells on the site. Salvaged marsh surface (wetland topsoil from a destroyed wetland) was obtained from the on-site project and from a highway project off-site. During the growing season, the ground-water level is generally 0.5 to 1.5 feet below ground surface. As a result of their landscape setting, surface water is not important to either the natural or constructed wetlands.*

restoration or creation projects that can serve as compensation credit for wetland losses elsewhere in a given region. While many people agree that large, intact wetland acreage is desirable, there is some concern that mitigation banking projects will not provide meaningful mitigation of the cumulative effects of widely distributed, small-acreage wetland loss.

Evaluation of Wetland Creation: A case study

The U.S. Geological Survey and the Wisconsin Department of Transportation have cooperatively funded an eight-year study that has focused on both evaluation and design of wetland creation projects. Our work focused on 1) the appropriateness of traditional techniques in wetland investigations, and 2) interdisciplinary evaluations of how the constructed wetland compares to the adjacent natural analogue.

1) Do traditional techniques for investigating hydrologic problems work in wetlands?

Scientists commonly investigate hydrologic questions by determining how much water is moving through a system, and what that water is carrying. This understanding is then used to characterize how the system functions, and how it interacts with the surrounding landscape. Our work focused on evaluating how well these traditional methods work in wetland investigations.

Measuring water flows: Traditionally, a relation called Darcy's law has been successfully applied to ground-water problems in non-wetland areas. Darcy's law relates the flow of ground-water to the strength of the pressure driving the system (the gradient) and how easily the water can flow through the material (the material's hydraulic conductivity). Our work has demonstrated that in many cases this simple relation underestimates the amount of ground-water flow in wetlands (fig. 2) because of the uncertainty in characterizing the hydraulic conductivity

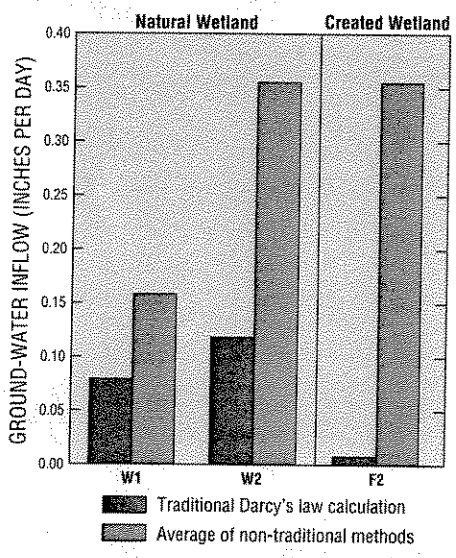


Figure 2. The blue bars represent the values of ground-water flow estimated by using traditional Darcy's law calculations. The green bars represent the inflow measured by innovative methods and demonstrate that traditional approaches can significantly underestimate inflow to wetlands.

of the sediments. The innovative techniques used in our work included an isotope mass balance, a model of heat and water flow, and a numerical water balance model; these techniques are described in the article referenced at the end of this fact sheet. This level of understanding will likely be needed elsewhere, especially to answer those questions that require knowledge of ground-water-wetland interaction.

Measuring wetland water quality: A wetland's ability to retain and transform potential contaminants is often cited as an important wetland function to preserve. In most studies, a well with a 1- to 3-foot long open interval is dug into the wetland and pumped to obtain a water sample. We compared traditional sampling from such a well to *in-situ* sampling profiles that divided the well's 3-foot long open interval into 6-inch and 0.6-inch intervals

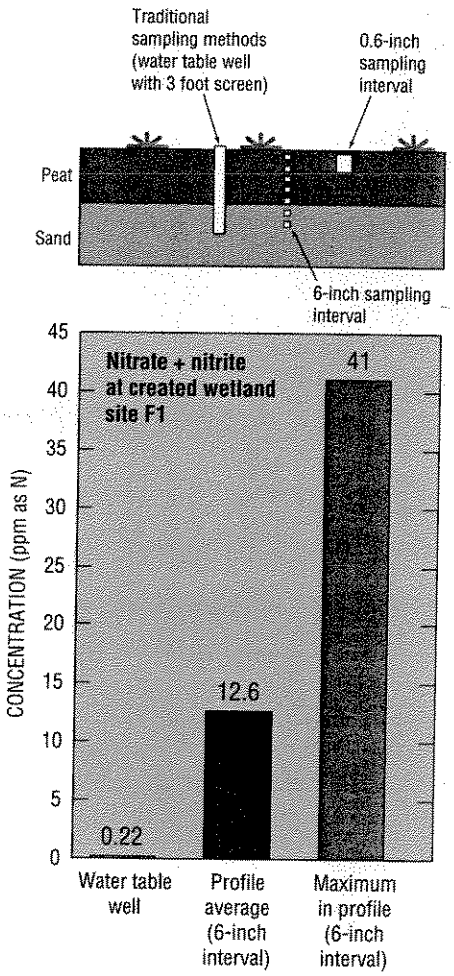


Figure 3. Three different sampling scales used to investigate water quality in the natural and created wetlands showed that very large differences in constituent concentration can be measured depending on the amount of the subsurface sampled. Again, traditional methods appropriate in other hydrologic investigations may not be appropriate for work in wetlands.

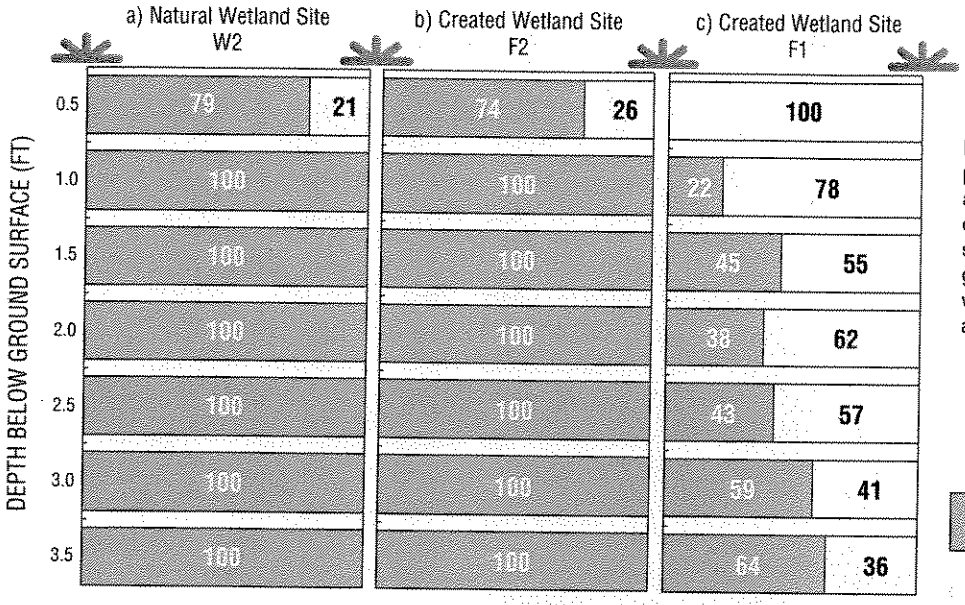


Figure 4. Assessing whether you've created the appropriate hydrology at a created wetland can be difficult. By analyzing the water molecule we can identify the sources of water at different depths in the wetlands. This approach shows that areas of the created wetland have the same ground-water source (a and b). Other areas of the created wetland (c) depend on rain water to maintain water levels and are expected to be drier in times of drought.

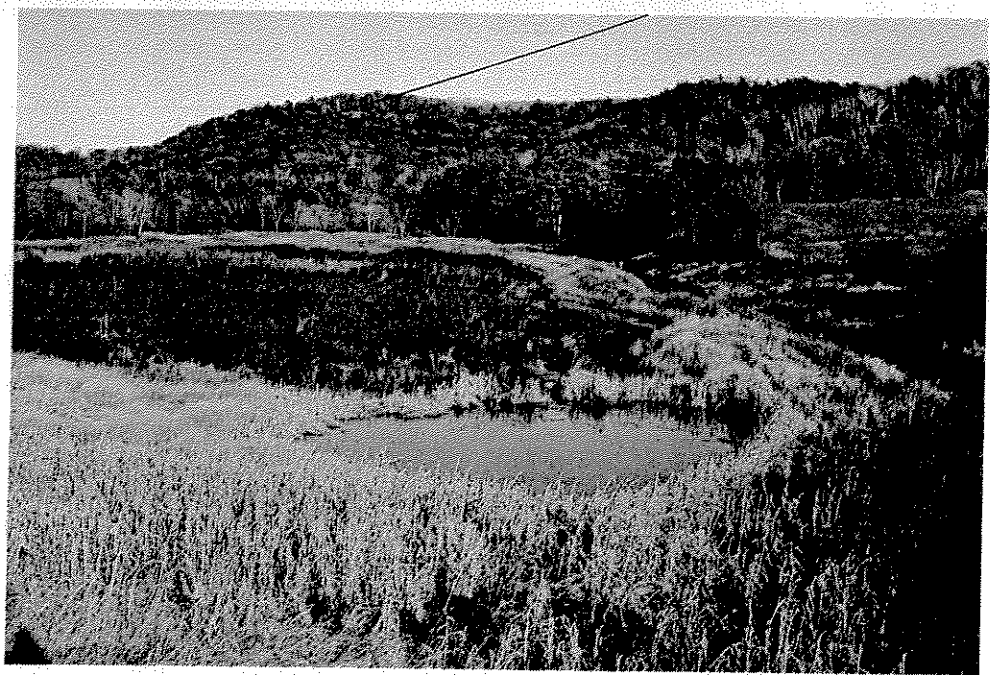
(fig.3). As shown in Figure 3, concentrations of dissolved chemical constituents (in this case nitrate + nitrite) measured in the samples from a water table well can be more than 50 times lower than the average concentration present in the subsurface. This difference is a result of water entering the well from preferential flow zones rather than uniformly from the entire interval sampled by the well's screen. The 0.6-inch sampling interval also showed dramatic geochemical changes vertically—concentrations of some constituents in the root-zone soil water differed by a factor of more than 1000 in water samples collected just 3 inches apart. Variability was present to some degree in each of the constituents measured. Clearly, our evaluations of wetlands—be they for wetland function analysis or assessing the effectiveness of wetlands for wastewater treatment—would be fundamentally flawed if this small-scale variability is ignored.

Salvage marsh surface (SMS) is excavated from the wetland that is to be filled and is stockpiled for application over the created wetland. SMS is a critical element for providing the appropriate hydrological and chemical environment for wetland plant establishment.

2) Is the created wetland similar to the natural wetland next to it?

The simple answer is "in some ways yes, but in other ways no". We looked at the system from the perspective of the essential components of wetlands—the water, the soils, and the vegetation.

Water: We used water tracers (naturally occurring stable isotopes of water) to identify sources of water to the wetlands. In the natural wetland (fig. 4a) and in some areas of the created wetland (fig. 4b), ground water is the predominant source of water; this represents a successful creation of the natural wetland hydrology at the site. In other areas of the created wetland, however, the major source of water is rain (fig. 4c). Because the timing and availability of these two water sources is very different, we can expect that the two areas in the created wetland will respond differently to environmental stresses such as drought. This difference in water source also indicates that wetland hydrology can vary significantly over small distances, and that the hydrology may be as variable as the associated vegetation community. Finally, the hydrologic results of this study demonstrate that even a high density network



While aesthetically pleasing, significant differences remain between the created wetland and the adjacent natural wetland five years after construction.

Wetland creation involves costly earth moving, making it a more expensive alternative than wetland restoration.

Figure 5. The type of wetland targeted for a creation or restoration can have a large effect on the success of the project. The Wisconsin Department of Transportation/U.S. Geological Survey restoration site targeted a shallow-water marsh (a relatively easy wetland type to restore). This resulted in a higher wetland success rate at the restoration site than at the creation site when evaluated as percent of site acreage.

How does the wetland creation compare to wetland restoration?

We also investigated how wetland restoration (restoring a wetland that was once drained or filled so that it once again functions as a wetland) compares to wetland creation in this same area of Wisconsin. The wetland restoration consisted of converting a drained corn field to shallow water marsh (fig. 5) and wet meadow—the types of wetlands found in the area. Shallow water marshes are considered easier to construct than the sedge meadow attempted at the created wetland site. This fact notwithstanding, the main conclusions of our comparison show that:

1) The construction cost for the restored site was one-fifteenth the cost of the created wetland. The high cost of earth moving required to create a wetland where one has never existed makes it likely that the costs of wetland creation will always be higher than wetland restoration.

2) Restoration implementation time was much shorter (two weeks) than wetland creation (six months) due primarily to the larger scope of work required for wetland creation.

3) In a 1993 delineation of the wetland creation and restoration sites, 60% of the created site would have been delineated as wetland and 100% of the restored site was wetland.

of wells and long-term pre- and post-construction monitoring cannot guarantee that we will have sufficient understanding of the system to create a hydrologic regime needed for a sedge meadow wetland. This difficult-to-obtain hydrologic knowledge is crucial for developing in-kind compensation, and needs to be considered when assessing the appropriate mitigation strategy for destruction of hard-to-replace wetland types.

Soils: The organic salvaged marsh surface (SMS) was only thinly spread on top of the created wetland mineral soil, therefore the soils on the created wetland are more mineral (therefore more dense) than those in the natural wetlands. This difference resulted in a 4° C increase in the root-zone temperatures of the created wetland. This has large implications for wetland seed germination and survival of certain wetland plants. The addition of off-site SMS also caused large deviations from water chemistry seen elsewhere on the site. These deviations demonstrate that SMS provides a suitable chemical substrate for wetland seed germination and survival, as well as a moist physical substrate. Areas that contain the off-site salvaged marsh surface, however, may never have the same wetland plant composition as the on-site natural wetlands due to these large differences in soil water chemistry.

Vegetation: After five years, it appears that the vegetation communities present in the created wetland are not any more similar to the natural wetlands than those observed initially after wetland construction. The areas of the created wetland where on-site salvaged marsh surface was applied were distinctly different not only from the natural wetland, but also from the areas of the created wetland that had salvaged marsh surface obtained from off-site. Recently, the two areas of the created wetland have become more compositionally similar, but are still very different from the natural wetland. These results demonstrate that the adage "get the water right and the wetland will follow" may not always hold, and that many factors may come into play in wetland development and persistence.

Study Schedule, Products and Future Work

This study was initiated in 1989 and is planned for completion in September 1997. One scientific journal article detailing the use of innovative methods for investigating natural and constructed wetland hydrology has been published and two others are planned as this fact sheet goes to press. Additional work focusing on quantifying evapotranspiration and trace metal cycling in wetlands are ongoing.

Published Article:

Hunt, R.J., D.P. Krabbenhoft, and M.P. Anderson. (1996). "Groundwater inflow measurements in wetland systems." Water Resources Research. 32(3): 495–507.

Titles of Planned Articles:

"Using stable isotopes of water and strontium to investigate a natural and a constructed wetland"

"Assessing hydrogeochemical heterogeneity in natural and constructed wetlands"

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