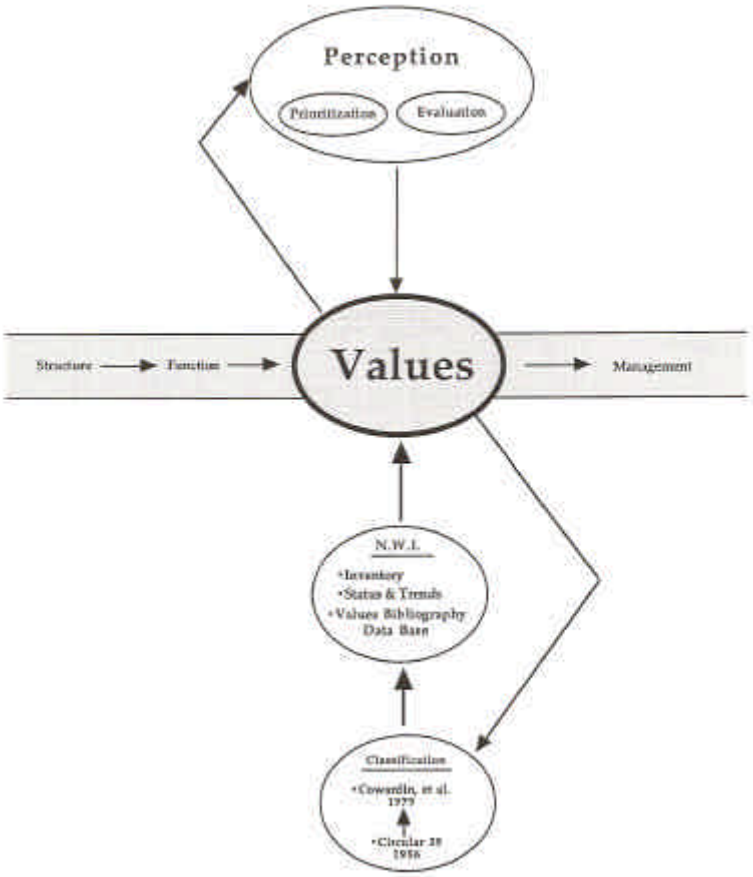
Perception of Wetland Values
in
South Central Minnesota



Professor Henry W. Quade

Contribution #151

Water Resources Center
Minnesota State University, Mankato
Mankato, Minnesota

May 2005

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

The author wishes to thank the following for their contributions to this paper.

The Comparison of The Minnesota Wetland Evaluation Methodology to Selected Recent North American Methodologies was the work of the wetlands class of 1990. Mr. John Wells, Chairperson of the Minnesota WEM Task Force (Water Planning Board) assisted with ideas and obtaining methodologies and Ms. Jean Spellacy of the MSU Water Resources Center prepared the numerous drafts and final document.

The model of the Context of Values in Wetland Policy and position statement was developed by six students from the 1998 wetlands class in a follow up project (Tory Christensen, Melanie Coners, Brett Ellanson, Jennifer Heymann, Rhonda Payonk, and Carrie Trytten).

The data for the chapter on media paradigms was collected by the wetlands class of 1992. Three of the students (Ben Green, Kathy Kleen, and Shari Pernu) followed up with the data analysis and draft report. Robin McCartney, a student in mass communications, did the literature review. David Bye, Joanna Skluzacek, and Jean Spellacy worked on revisions of drafts and data presentation.

The Perception of Wetland Values chapter involved the wetland classes of 1995 and 1996. The development of the survey was the direct result of the initiative of Rick Hanna and Julie Conrad, Blue Earth County Water Planners. Jane Starz, Brown County Water Planner, provided the survey distribution plan. Carrie Trytten, a biology graduate student, expanded the survey distribution to include state and county personnel as well as wetland class students. Gregg Asher, professor in the MSUM Department of Computer and Information Sciences provided the statistical analysis. Joanna Skuzacek and Jean Spellacy, Water Resources Center, provided the data formatting and draft reports. A special thank you to the 11 area high school biology teachers, students and parents as well as the regional state agency and county personnel who took their time to fill out the lengthy questionnaire.

All of the above provided the data and input which has made this paper possible. Throughout this extended project the county water planners of the South Central Minnesota Comprehensive Water Planning Project (SCMCCWPP) were partners providing input in the form of direction, requests, and ideas which gave this project its reason for being.

The Minnesota Board of Water and Soil Resources provided a 205j3 grant in 1992 to the 13 County Water Planning Joint Powers for a workshop on wetland values which I presented and which helped start this whole endeavor. Mankato State University, Department of Biological Sciences provided the resources for my Wetlands classes that were essential to this extended project.

Finally I wish to thank Cis Berg, acting director of the MSUM Water Resources Center, for her support of the project; Dr. Brad Cook, Professor of Biological Sciences, MSUM, and Chris Hughes, Minnesota Board of Water and Soil Resources for their review and editing of the draft document; Dr. Ann Quade, Professor of Computer and Information Science, for her retrieving of data from old files and editing; and Sunnie McCalla, an undergraduate Biological Sciences major, for her persistence and professionalism in putting this document into final form. The ten year pursuit of developing an understanding of the context and perception of wetland values has hopefully been a worthwhile endeavor and learning experience for all involved.

This research project report is available on the Minnesota River Basin Data Center: Water Resources Center, Minnesota State University Mankato.
http://mrbdc.mnsu.edu

INTRODUCTION

Webster's dictionary defines "value" as something intrinsically valuable or desirable and "valuable" as something of great use or service. "Perception" is defined as quick, acute, and intuitive cognition and "perceptive" as characterized by sympathetic understanding or insight. The two words are related but not synonymous. Further, the definitions indicate that these terms require a great amount of further clarification if and when specifically applied.

Values are fundamental to everything we do and leads to behavior and expectations from society. Milbrath (1989) stated that values are held strongly and are generalized to many situations whereas preferences are held weakly and are not generalized. He feels that valuing is a uniquely human activity as other animals have preferences only. Further, societies do not have values rather individuals hold and conceive values resulting in a consensus or silent majority (Milbrath, 1989).

Science plays a large role when dealing with facts, values and beliefs. Milbrath (1989) emphasized that the scientific method has become the honored way to observe and come to know facts. Facts are not absolutes; they are beliefs that we hold more or less strongly. Beliefs also relate to values in that we tend to believe things that we value and disbelieve things that we do not value. The scientific method facilitates agreement about physically based facts; therefore it is easier to agree about facts than to agree about values.

Within the context of wetlands it should be noted that structure and functions are fact based but values and management are value based. Further, if science attempts to be value free it will serve the values of those who rule the establishment

> "The term "value" imposes an anthropocentric (man centered) orientation on a discussion of wetlands. The term is often used in an ecological sense to refer to functional processes…..But in ordinary parlance, the word connotate something worthy, desirable, or useful to humans. The reasons that wetlands are legally protected have to do with their value to society, not with the abstruse ecological processes that occur in wetlands. Perceived values arise from the functional ecological processes….but are determined also by human perceptions, the location of a particular wetland, the human population pressures on it, and the extent of the resource."
> (Mitsch and Gosselink, 1993)

Evaluating the functions and values of wetlands is relatively new. Eugene Odum in his classic 1978 paper "The Value of Wetlands: A Hierarchical Approach" set the stage for the rest of the century. During the last 20 years of the 20th century, a considerable amount of research effort was directed at the development of methodologies for evaluating wetland functions and values. My wetlands class at

Mankato State University did a comparison of seven evaluation methodologies from the 1980's (Figure 1). The conclusions of this class study stated the following:

- Wetland evaluation methodologies are necessary. (There are critics of developing evaluation methodologies who note that many wetland functions and values are not well understood hence evaluations might not be reliable. Proponents argue that an evaluation methodology is vital to assure that wetland functions and values are considered in the decision-making process with the assumption that technical information will improve in the future).

- Present evaluation methodologies vary greatly.

- Local citizens and government should be involved in assigning values.

- A single composite functional numerical value for a wetland is not a meaningful method for determining either net loss or net gain.

- The emphasis should be on "no net loss of value" not just "no net loss of acres." (does "no net loss of function" = "no net loss of value"?)

- This concept should apply to mitigation, banking, restoration and conversions.

Section 404 of the Clean Water Act in its public interest review process has forced consideration of the value of wetland functions:

> "In 404, it is necessary to make a clear distinction between wetland functions and the value of wetland functions. This is because the public interest review process requires not only that the loss of wetland function be quantified, but that a value be assigned to those functions that are lost. The 404 permit decision is based on a "balancing" process that compares the value assigned to the benefits, goods, and services resulting from a proposed project to the value assigned to the wetland functions that are lost as a result of the proposed project. This assessment approach is designed to estimate the loss, or gain, of wetland function as a result of a proposed project. It was not designed to assign a value to that loss or gain of wetland function. *Assigning value requires the consideration of a variety of subjective factors beyond the ecosystem and landscape characteristics that are considered in assessing wetland functions.**
>
> Value is a term that can be defined or interpreted in several ways. For example, Brown (1984) considered value to be either "held" or "assigned." He characterized a held value as a precept, belief, or ideal of an individual or group, and an assigned value is the relative importance of something to an individual or group. Throughout this

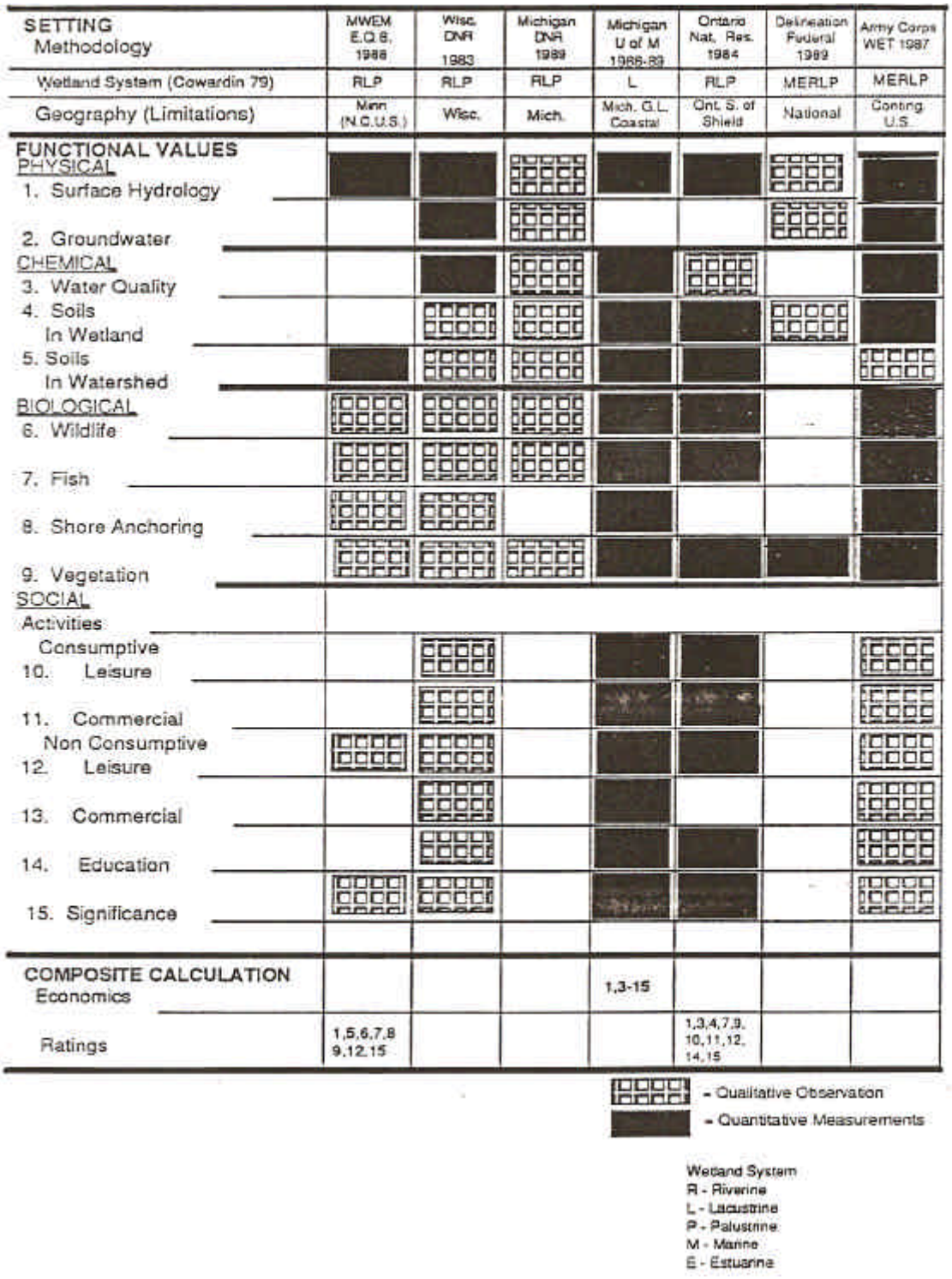


Figure 1. Composite matrix of selected wetlands evaluation methodologies

> assessment approach, the term value will be used in the latter sense of assigned value or a measure of the relative importance of a wetland function to an individual or group. Implicit in the concept of assigned value is the recognition that different individuals or groups may assign a different value to wetland functions.
>
> In the wetland literature, the term value has been used in association with wetland functions in at least two ways. Taylor, Cardamone, and Mitch (1990) use the term values to refer to the benefits, goods, and services that result from the functions performed by wetlands. This use is unnecessarily confusing. The benefits, goods, and services, resulting from wetland functions should simply be called benefits, goods, and service, not wetland values. Similarly, Ammann, Franzen, and Johnson (1986) and Ammann and Lindley-Stone (1991) use the term functional values to identify the functions performed by wetlands that are considered to be valuable to society. Again, this is unnecessarily confusing. The subset of wetland functions that are valuable to the public should be called valuable wetland functions, not functional values (R. Daniel Smith et. al., 1995)."
> **my emphasis*

Minnesota's Wetland Conservation Act of 1991 chose to amend the often used phrase of "no net loss" to "no net loss of values". In doing so we were led to examine the whole concept of values. Further, within the act and rules the phrase "at least equal public value" is often used. The question inherent here is who determines "public value" and what is it? This act put increased pressure on defining wetland values (the process of defining them) and set the stage for the work that follows and is reported herein.

What determines our perception of wetlands is controlled by different paradigms that are partially determined by the media. Are the various written media sources presenting one or multiple paradigms when it comes to wetland values? Are the public perceptions of values the same or different from academic, state agency and county technical personnel and what is the level of homogeneity between each of these categories to each other? Is management based on values from top down or bottom up? If media homogeneity doesn't exist this creates an educational and communication challenge to all four categories. Are we what we read and read what we are?

Obviously the above questions present a huge challenge that can not be answered or understood by a few studies. It requires a joint effort of wetland scientists, public policy-management experts and media-communication people. Utilizing students in my wetlands classes from 1990 thru 1999, I have attempted to take an initial look at the above challenge. In order to accomplish this goal the following tasks were conducted.

- A model of perception relating to wetland values, science and management was developed.

- An examination of wetland values perception in five written media categories was undertaken to document differences in order to determine if individual paradigms exist.

- A South Central Minnesota perception of wetland values survey of the public, utilizing high school students and their parents, was developed, beta tested, given, and assessed.

- The same regional perception of wetland values survey was given to academics, county technical personnel and regional state agency personnel.

The first chapter will present a model of the context of wetland values and the role of perception. The second chapter will look at the results of our perception in the written media paradigm study and the third will present the results of the perception-values surveys.

The context of values in wetland policy continues to be an issue in the 21st century. Values must be defined, understood and supported by perception before proper and broadly accepted regulations can be implemented to manage wetland ecosystems. Incorporating perceptions into wetland policy is difficult because of the diversity of wetland values and because human perceptions are scale related. There are many wetland values, however a single wetland does not hold all of them. The values are often in the eye of the beholder (perception) that can differ from person to person and area to area. Further, as wetland science expands our knowledge of structure and function our perceptions and values will also change.

The purpose of the above is to address the extremely complex issue of wetland perception-values in South Central Minnesota. Like it or not, Pandora's Box has been opened with the Federal, Status and Trends component of the National Wetlands inventory and the Minnesota Wetlands Conservation Act, both of which emphasize and require values assigned to different wetland types.

MODEL OF PERCEPTION IN RELATION TO WETLAND VALUES, SCIENCE, AND MANAGEMENT

INTRODUCTION

Early in the 20th century, wetlands were seen as a common enemy and the result was massive drainage. Since that time, our understanding and perception of wetlands has changed and this has caused a corresponding reassessment in the way we value wetlands. The emphasis has shifted from drainage to wildlife habitat and continues to evolve.

Historically "value" has been incorporated in a linear sequence of steps leading to management:
Structure → Function → Values → Management.

> Eugene Odum, in his 1978 paper, "The Value of Wetlands: A Hierarchical Approach", noted that there are three levels of wetland values.
> 1. Population Values: those values specific to the needs of various biological populations (Fish and Wildlife).
> 2. Ecosystem Values: those values specific to the functioning of an ecosystem. (Hydrological and Productivity Values).
> 3. Global Values: those values that affect the functioning of the entire planet. (Waste Assimilation, Atmospheric, and Life Support).
>
> A wetland may function within one or any combination of these values at the same time.

Our understanding of structure and function of wetlands is based on science, but wetland values are not strictly science based. Wetland values are a product of science (function) and perceptions. Going from value to management is a policy-based step. Values must be defined before proper regulations can be implemented to manage wetland ecosystems. Wetland management policies are presently incomplete because perceptions, a part of defining wetland values, are not incorporated.

The entire process of valuing wetlands is dynamic. When scientific understanding of functions or public perceptions change, then Values and Management need to change accordingly. This paper presents an expansion of the linear model of:
Structure → Function → Values → Management.

PERCEPTION

The interactions and survival of our biocommunities are dependent on the environment and more importantly how we occupy it. Our society is the first to examine in detail the environmental resources base that will support that survival. The confrontation between societal values and ecological limits ultimately will

change our values. These values are fundamental to everything we do, the way we behave, and what we expect from society and government.

Our understanding of wetland structure and function (science) has changed the way we perceive wetlands by influencing the values we associate with them. Perceived values arise from functional ecological processes but are determined also by human perceptions, the location of a particular wetland, the human population pressures on it, and the extent of the resource (Mitsch, Gosselivk, 1993. pg. 508). Therefore the traditional linear concept of **Structure → Function → Values → Management** is inadequate, and should be revised to include perception as seen in Figure 2.

Perception of wetland values leads to prioritization based on how wetlands benefit society. Priorities can be used to construct an evaluation methodology that would reflect these perceptions. The inherent values of the developed evaluation methodology in turn influence wetland management policies. The policy should revolve both around the community perceptions and the function of the wetland. Perceptions are influenced by our knowledge of how wetlands benefit society and therefore education becomes an important part of wetland policy. If people do not know the benefits of wetlands, their perception will not reflect these benefits.

Additionally, incorporating perceptions into wetland policy is difficult because the diversity of wetland values and human perceptions are scale related. Local perceptions lead to prioritization of values based on how they benefit their community. Larger scale values, i.e. global air quality, are of increasing societal concern but difficult for the individual to relate to. Problems arise in the evaluation of values because a decision has to be made on whose priorities are to be utilized.

The current wetland classification system does not incorporate values based on perceptions of scale. Lack of a comprehensive evaluation methodology, based on both wetland function and perception, is not conducive to the formation of a wetland management policy which satisfies all scales from the local to the global level.

CLASSIFICATION

Most classification systems are established as a consequence of the values that are dictated by perception. The classification systems then in turn impact values. The way wetlands are classified dictates how a wetland is perceived and therefore how much value we place on it from that point onward, a self-fulfilling prophecy prevails. The classification is also used in education, which further solidifies how a particular wetland is perceived.

The first classification system, Circular 39, was established to determine the extent and quality of wetlands in relationship to waterfowl. This system had a narrow purpose and when the National Wetlands Inventory was initiated there was a need to develop a system with a broader scope. Cowardin, et al 1974, developed a system for the NWI which classifies all continental aquatic and semi-aquatic ecosystems.

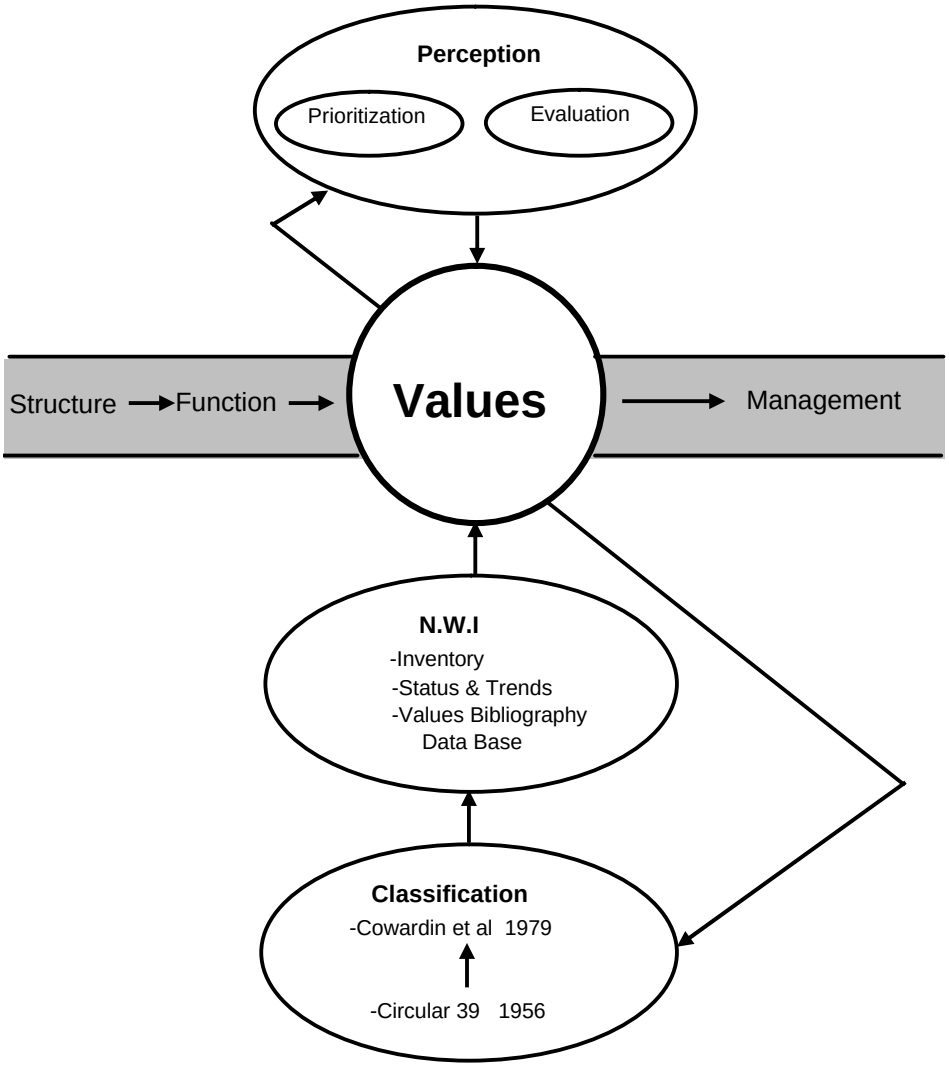


Figure 2. Context of values in wetland policy

Cowardin provided the basic mapping units for the NWI. Status and Trends reports documented the wetland gains, losses, and conversions with the third component being a Values Bibliography Data Base to catalog all of the "values" information.

As perception and/or our understanding of functions change, as it has in the past, values will also change and the classification system will need to be altered to reflect those changes (Figure 1). Future classification systems may include, for example, impacts wetlands have on the atmosphere which is a more global concern.

SUMMARY

- Historically wetland policy has been based on **Structure → Function → Values → Management** with "values" being strictly related to scientific function.
- Wetland management policies are presently incomplete because perceptions are not incorporated into values.
- Priorities should be used to construct an evaluation methodology that would reflect perception which would influence wetland management practices.
- Incorporating perceptions into wetland policy is difficult because of the diversity of wetland values and because human perceptions are scale related.
- As perception and/or our understanding of function change, as it has in the past, values will also change and the classification system will need to be altered to reflect those changes.
- We need to develop a comprehensive evaluation methodology, based on both wetland function and perception determining values which result in management policy that will satisfy all scales from the local to the global level. This will undoubtedly change again our classification system.

PERCEPTION OF WETLAND VALUES IN THE WRITTEN MEDIA

(You are what you read and read what you are)

INTRODUCTION

A contention in environmental issues is that groups follow different paradigms and these paradigms are determined, at least partially, by what they read. Are different values emphasized by different written media? If so, we are what we read and read what we are. Paradigms form the foundation for a society's belief and value system, and are the guiding force behind how we deal with ourselves, family, community, and even the environment. In a sense, they dictate what concerns us. Paradigms can be thought of as sets of cultural lenses, they provide the structure for social learning. When reality changes, as it does, those lenses distort some aspects of reality and may lead observers to completely ignore other aspects. As Americans, we are part of the social paradigm of the culture that makes us Americans and as in all societies we, as a people, join together with those who share our own view and build upon that view based on our view of how our world should be. It also influences how we act and react within the society group as well as what choices we make.

In lieu of this, three questions arise: 1.) Are these actions and reactions, influenced by the social paradigm, reinforced by what we read in the written media? Is what we read based on what paradigm our community as a social unit believes in? In turn, 2.) how is the written media a part of this and how are they, if so, shaped by the paradigm of the reader? If they are shaped, does this limit them and is the quality of content affected? Also, 3.) if we are what we read, and the media is influenced by the same paradigm that makes this so, does this limit the potential for changes in perception and values and thus limit environmental change?

Wetland values issues are the source of much debate and controversy at this time. The purpose of this study is to examine the values cited and how they are presented in five written media categories: (Academic, News, Agency, Trade and Environment) and determine the level of homogeneity or differences that exist.

LITERATURE REVIEW

Communication is shaped by the paradigm that dictates the society in which the communication is taking place. The written media, as a part of this communication process, creates a spiral of information from themselves to the reader which changes and evolves, but still holds the same paradigm theme of the community. This process is a repetitive activity that, along with the other goings on of daily living, maintains our society's state of equilibrium according to its particular paradigm (DeFleur, 1986).

In a sense what we read in the written media reinforces our own and our community's social paradigm. The media serving that community and being a part of it will mirror

those beliefs that the readers hold. An example of this close relationship between the media and the reader and the role of paradigm can be seen in the results of a study undertaken by Julia B. Corbett, in 1992, a doctoral student in communications at the University of Minnesota. She conducted a content analysis of wildlife stories during a nine week period in six Minnesota area newspapers. The goal of the study was to determine "to what extent the newspaper's portrayal of wildlife was a function of the type of community (rural or urban) in which it was reported." She found that the coverage of wildlife issues was written in a tone that reflected the prevailing concerns and values of the surrounding social environment in which the stories are read (Corbett, 1992). Each community perceived the issues according to how they affected such things as the local and dominant industries (Corbett, 1992). These issues were treated accordingly by the written media that served each individual community making it evident that they do play a role in reflecting the social paradigm of the readers. She concluded that perhaps we are what we read since it appears that the information reported to us by the written media is presented in a way that is acceptable to our beliefs.

Therefore, one could wonder, is the written media narrow in its reporting of information since it seems they are only writing what the reader wants to hear, instead of partaking in conveying all information in a scope that may even challenge the social beliefs of the reader. A key point of a paradigm is that input that seemingly goes against it is viewed negatively by the society. This in itself could lead to a narrowness on the part of the written media in reporting information.

What often occurs with new input that is rejected by a paradigm in place is that it is treated as conflictive by the media and conveyed to the reader in that sense. An example can be seen in the way environmental issues are handled in the United States. The Dominant Social Paradigm (DSP) is focused on economic growth and unlimited resources (Dunlap, 1984), but the environmental movement doesn't fit into these dimensions of the DSP. It is viewed as radical by many, or separate from the world of most people because in the media it is portrayed either as disruptive or in a vague content that gives "interesting facts" but doesn't go on to show its connection to improving life or solutions.

Conflictive reporting of environmental issues by the media mirrors the same alarm the public has to this "negative" input to the dominant belief system. It creates an "us against them" story line. One only has to look at this nation's newspapers and their headline of the spotted owl issue (Meadows, 1991) to see the media’s tendency to focus on conflict as well as the alarm that the media feels towards ideas that are contrary to DSP (Dunlap, 1984). Meadows (1991), notes that the newspapers ran headlines much like "An Owl Versus An Industry" that, in his view, accepted the industry's exaggerated view of the situation. He points out that jobs are not threatened by the owl but instead by the industry's own labor saving changes, by export policies, and by the over-harvesting of trees (Meadows, 1991). The true headline showing the actual conflict Meadows believes should be stated as "A Forest Versus Greed". This, however, would represent an attack on "the paradigm that pervades everything in the culture, including the media". Ultimately what is

occurring with the information is that the problems are being emphasized instead of solutions, and obstacles outweigh opportunities. The media "systematically unempowers themselves and their audience" (Meadows, 1991).

With all this in mind, what is happening to the environmental perception on the part of the reader who relies on the traditional newspaper as a source of information? We gain our perceptions of our world from daily contact with others and through what we read, among other things. Our perceptions reinforce our paradigm and vice versa. If you allow no alternative view, then little changes. The perception created by the media writing such headlines as "An Owl Versus An Industry" (Meadows, 1991) reinforces the community's view that it is an "us against them" problem with them being the environmental movement. As long as there is nothing else written that intelligently says otherwise, and offers solutions that are beneficial for all parties, then the current paradigm pervades.

One should also wonder if we, as the readers, are receiving quality and accurate information from our media sources with the social paradigm of the community and the nation playing such a pervasive role in setting the tone for what is written. In one study that looked at environmental risk reporting, it was found that the media used scientists and representatives from government and industry as their traditional news sources. These self-serving sources placed great importance in not alarming the public (Salomone, 1990). The tone they tried to set was to reassure the public. It was suggested, at the conclusion of the findings, that this desire to support the social paradigm of the reader is stronger than the journalist's wish to undermine it (Salomone, 1990). As for accuracy in the information reported, analyses show that the tendency to make it more interesting and acceptable "errors of omission, emphasis, or fact" occur in the media report (Singer, 1990). For most people, their source of information is the mass media. What the media chooses to emphasize, omit, or treat as fact when reporting on such issues as environmental risk becomes, once again, a key point in how public perception is shaped (Singer, 1990).

It is expected of journalists to present stories that are accurate, balanced, informative, as well as interesting (Salomone, 1990). Even though it is the goal of the journalist to do so when writing a story, studies like the two mentioned above clearly point out that this is not always so. Social paradigm is a strong reason for this since it appears the written media avoids challenging it. By following the belief system of the community it serves, some written media, in the area of environmental issues, falls short in presenting the issues in an accurate and balanced format. Only those issues that don't disrupt the daily lives of Americans are portrayed. Friedman (1991) makes the comment that today even though there are more stories in the written media on the environment, the quality of their content and coverage has not changed.

The written media portrays and interprets reality that is internalized by the reader, thereby shaping their personal and social behavior (DeFleur, 1986). The way in which the information is interpreted by the media seems to be controlled by the prevailing social paradigm and the resulting attitude towards the information. What we read reflects who we are from an individual level, to a community level,

ultimately to a national level. If the major source of information comes from the traditional media, it is likely the Dominant Social Paradigm (Dunlap, 1984), as discussed earlier, plays a key role in setting the tone for what is written. The traditional media write accordingly so as not to disrupt the prevailing attitudes of the reader who, in turn, receives information that is in line with his or her beliefs creating in a sense a "we are what we read" reality.

METHODS

This study represents a survey written and developed by the Mankato State University Wetlands Class of 1992 on the issue of written media perception of wetland values. It is based on the written media only. Eighteen students reviewed three articles involving wetlands from each of five media categories: (Academic, News, Agency, Trade and Environment) for cited values. Articles were limited to those dealing with the upper Midwest. Value categories used were obtained from the User's handbook for Wetland Values Database. The handbook was created for the U.S. Department of the Interior, Fish and Wildlife Service, National Wetlands Inventory and grouped values into 11 different categories (Stuben, 1984). The class found 1789 values mentioned in 271 printed articles. A descriptive breakdown of the data set was developed to determine the similarities of the parameters related to the written values. Data was then broken down by value for each media category using Microsoft Excel.

RESULTS

Comparison of Descriptive Parameter Sets to Media Categories

Prior to examining differences in media category values, we looked at the breakdown of descriptive parameters utilized in our survey to determine those that could influence our wetland values interpretation (Table I). In reviewing related parameters it is important to realize that the comparisons are not within the media categories but within sets. Differences between the first three geographic sets for different media categories could greatly influence interpretation of different media categories (i.e. pothole vs. lake vs. river location). The last four parameter sets represent emphases, approaches and methods.

When looking at the Cowardin Classification and wetland type there is uniformity for each of the five media categories. The news paradigm stands out within the Location Set with one third of their articles citing urban wetlands.

Within the information source set the academic paradigm shows that 47 percent of the articles are referenced, much higher than the average of 17 percent. Within the news category there is a higher non-referenced, 63 percent, compared to the average of 39 percent, and a lower original and referenced 5 percent for both sets compared to an average of about 15 percent. The agency paradigm fits the norm for the source set. The trade and environment paradigms were quite similar with a higher percentage for the implied, 39 percent compared the 29 percent average, and a lower percent for referenced, 3 compared to 17 percent average. For the environment paradigm there

Table I. Breakdown of descriptive parameters sets related to wetland values by written media

Media Category	Number of Articles Reviewed	Total Values Cited	Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
			Palustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Replacement	Scaling & Weighing	Common Denominator	Other	Legislation	Regulation	Management
1. Academic	60	186	47	24	29	88	5	7	9	91	16	23	47	15	41	59	14	19	22	45	31	20	49
2. News	49	120	45	27	28	77	16	7	35	65	27	5	5	63	82	18	20	0	20	60	40	43	17
3. Agency	62	197	42	28	29	78	8	14	13	87	27	17	14	42	52	48	20	14	16	49	27	16	57
4. Trade	53	142	43	26	31	67	10	23	18	82	39	16	3	42	85	15	18	0	35	47	42	25	33
5. Environment	47	144	47	24	29	78	12	10	25	75	40	9	6	45	72	28	13	7	30	50	32	19	49
Total # Breakdown	**271**	789	668	393	437	698	85	112	148	633	280	145	166	380	256	156	45	27	64	129	149	111	178
Total % by Set			45	26	29	78	9	13	19	81	29	15	17	39	62	38	17	10	24	48	34	25	41
Total # by Set					1498			895		781				971		412				269			438

was again a higher percent in the implied about 40, compared to an average of 29 percent and lower original and referenced sets.

There is a lack of homogeneity in the determination set (qualitative vs. quantitative) among the five paradigms. Academic and agency were both high and news and trade were low for quantification.

When looking at the model utilized set once again there was no uniformity. The common denominator was highest in trade and environment with replacement highest in agency.

The replacement model involves the cost of replacing the various services performed by a wetland. This is a conventional economist's model. The shortcoming is that it is difficult putting a value on many services.

Scaling and weighting models involves making a list of all values that apply to a wetland in question and then assigning a value of "1" to each. This is followed by factoring in multipliers of the relationship of the individual values to their maximum of 1. For example, potential versus actual ducks/acre. Then weigh each factor in proportion to its relative importance, i.e. value 2 is 10 times more important than value 1, then multiply value 2 by 10. This process is similar to the Environmental Impact Statement matrix approach.

The Common Denominator Model is a strict economic approach of net willingness to pay. This approach to monetize wetland values generally emphasizes commercial aspects (fish, waterfowl, recreation) but ignore global level life support functions.

Finally, when looking at the policy addressed set there is once again a lack of homogeneity. Highest percentages are seen in management for agency, academic, and environment paradigms with news paradigm highest in regulation and trade highest in legislation.

The overall data population shows a fair degree of homogeneity for the classification, type, and location sets, with the only exception being the larger emphasis on urban within the news paradigm. These three sets represent the critical sets for assuring us that we are comparing similar wetlands by our five media categories. The last four sets represent differences in emphases, approaches, and methods, which need to be examined and support the hypothesis that the written media has different paradigms when it comes to wetlands.

Academic Category

In the academic media 186 values were cited from 60 articles (Table I). The academic media emphasized four major values (Figure 3). Use, habitat, water quality, and hydrologic values were all mentioned in approximately one-half of the

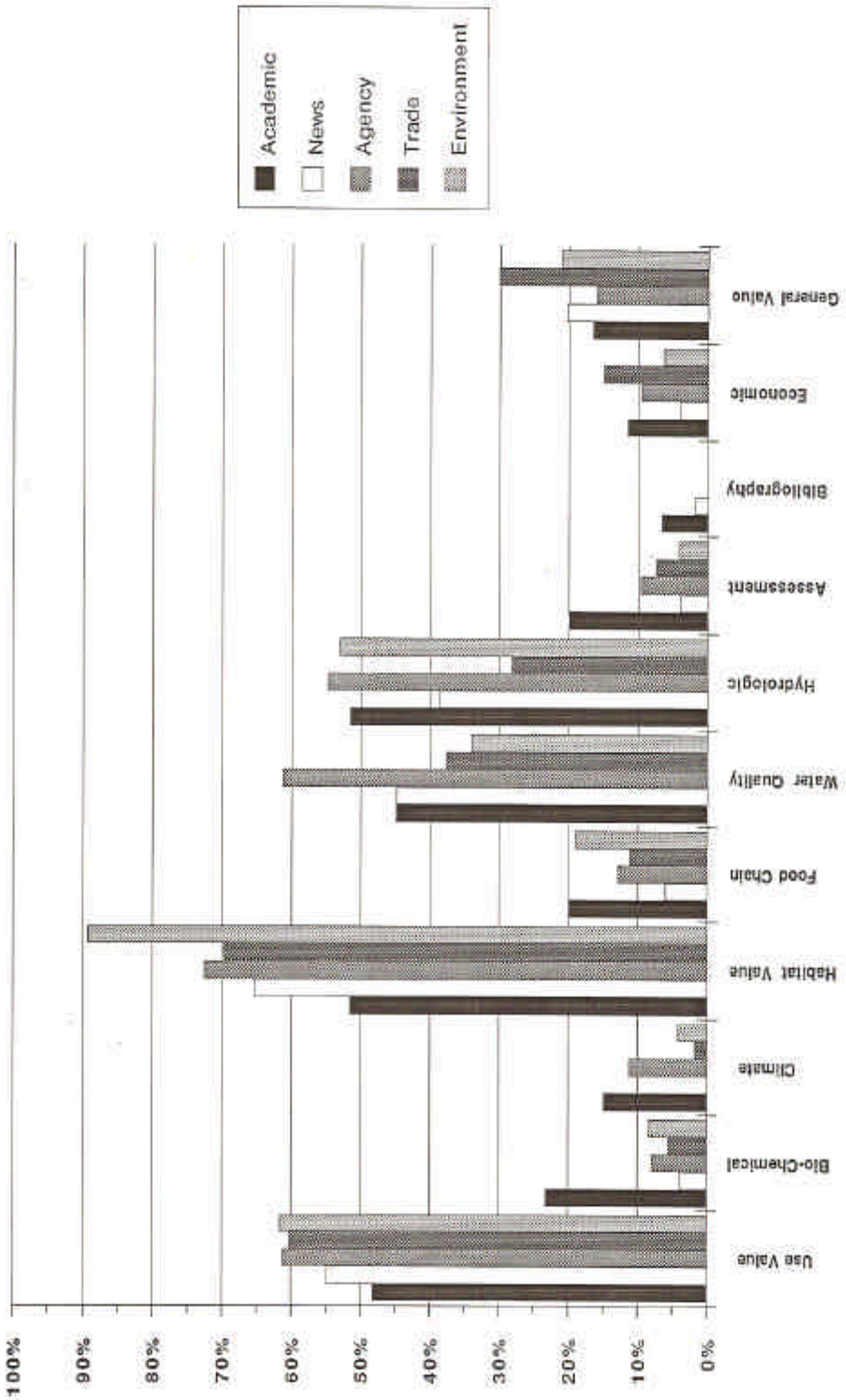


Figure 3. Percent of articles citing specific values by media category

60 academic articles reviewed. The five academic media value categories of biochemical processes, climate, food chain, assessment techniques, and bibliography had the highest percentages of value citations per article of all five media categories.

The values use, habitat and hydrologic each represent over 15 percent of the values cited by the academic category (Figure 4).

The natural, rural, palustrine wetlands were the dominant wetlands cited (Table I). Within the academic media there is a large amount of value citation (186), second only to the agency category. The sources of information for the articles reviewed for the academic media were referenced 47 percent of the time. Forty one percent were qualitative and 59 percent were quantitative. The common denominator was the most frequently cited specific type in the modeling set although all modeling methods were quite evenly distributed. Policy focused on management of wetlands one-half of the time.

When looking at the specific values within the parameter sets the following key relationships are seen (Table II):

- Referenced citations are highest in all 11 value category
- Quantitative determination is dominant in all but food chain and hydrologic values.
- Common denominator is the dominant model used, although models are seldom sited (69).
- Within the policy parameter set management is the dominant policy type sited in all but water quality and hydrology. Further, policy represents the least sited of all 11 parameter sets (54).

News Category

In the news media 49 papers were reviewed with 120 values cited (Table I). Use and habitat values were cited in over 50 percent of the 49 papers (Figure 3). Habitat value represented over 25 percent, use over 20 percent, and water quality and hydrologic each represented over 15 percent of the values cited by the news category (Figure 4).

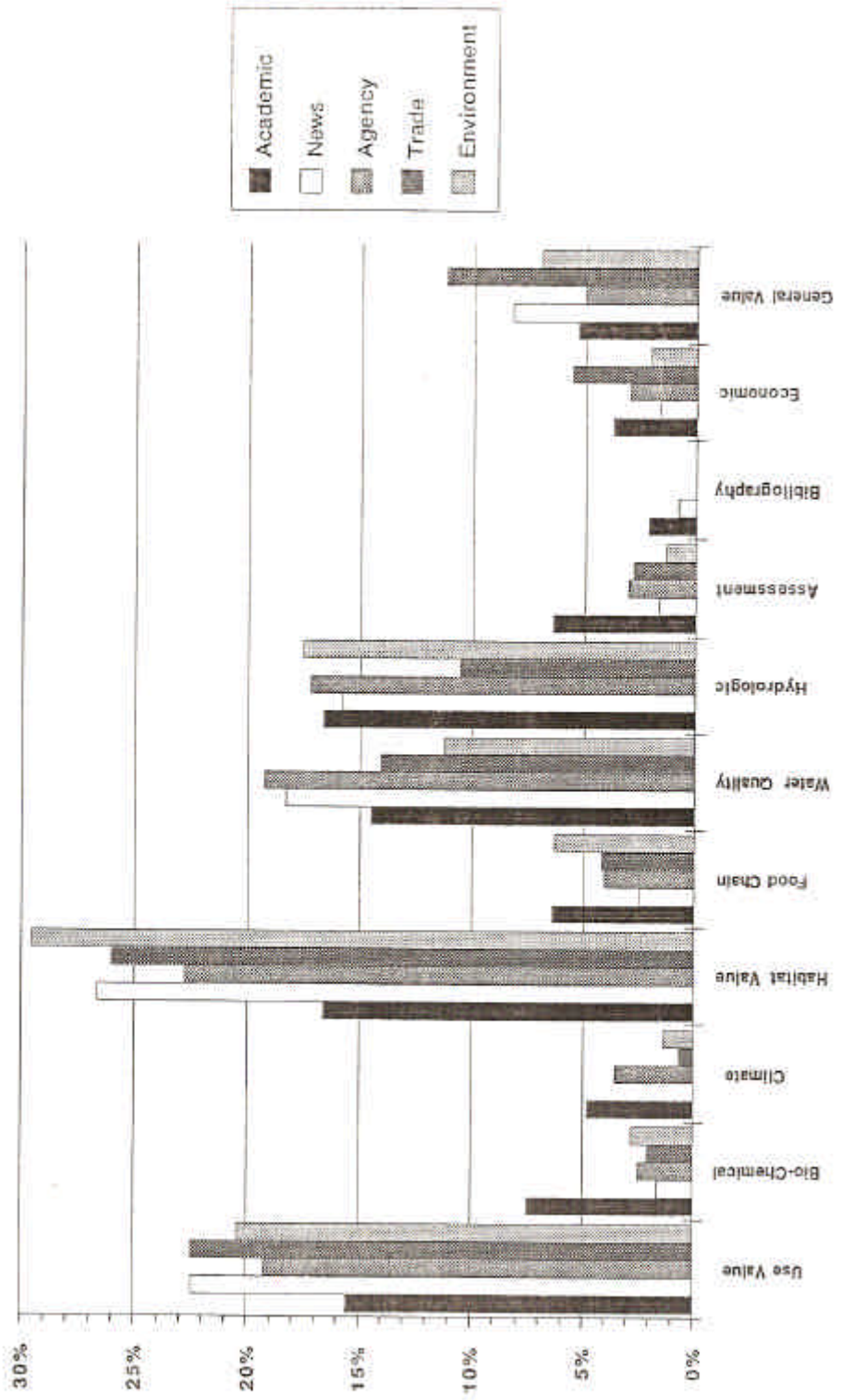


Figure 4. Percent of values cited by media category

Table II. Academic media breakdown of values citations by descriptive parameter sets

Values	Values Cited	Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
		Palustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Other	Scaling & Weighing	Common Denominator	Replacement	Legislation	Regulation	Management
1. Use Value	29	24	16	16	27	2	4	7	23	13	8	17	6	5	11	8	4	2	--	4	4	9
2. Biochemical Processes	14	13	5	6	13	1	--	--	9	2	2	12	--	5	5	--	--	--	--	--	--	2
3. Climate	9	7	5	5	8	--	1	1	7	2	4	4	--	2	4	2	--	--	1	--	--	1
4. Habitat Value	31	24	11	13	29	1	1	1	28	5	9	16	10	7	13	7	2	3	2	3	2	5
5. Food Chain	12	9	4	5	11	1	--	--	11	3	3	8	2	5	2	1	1	1	--	--	--	3
6. Water Quality	27	19	10	15	25	2	1	3	24	1	8	15	6	10	11	3	2	2	3	3	--	2
7. Hydrologic Values	31	28	13	15	29	1	3	2	25	6	9	16	7	9	8	2		2	2	4	3	--
8. Assessment Techniques	12	11	3	3	10	--	2	--	12	1	6	9	1	--	8	1	2	--	--	--	--	1
9. Bibliography	4	4	1	1	3	--	1	--	4	--	--	4	--	1	1	--	--	--	--	--	--	--
10. Economic Models	7	4	4	5	7	--	--	--	6	--	4	7	--	1	2	4	1	3	1	--	1	2
11. General Value	10	6	6	8	10	1	1	2	7	4	1	4	3	1	2	3	1	2	1	3	1	1
Total # Breakdown	186	149	78	92	172	9	14	16	156	37	54	112	35	46	67	31	13	15	10	17	11	26
Total % by Set	--	47	24	29	88	5	7	9	41	16	23	47	15	41	59	45	19	22	14	31	20	49
Total # by Set				319			195		172				238		113				69			54

The dominant type of wetland cited was the palustrine and natural type with a rural location (Table I). Sources were non-referenced in 63 percent of the papers reviewed, and implied sources were cited in one-fourth of the papers. Original and referenced sources were only cited 5 percent of the time. Wetland value determination was primarily qualitative (82 percent). In the model category the common denominator model and replacement model types are each seen in one-fifth of the cases, however their overall numbers are very small. Legislation and regulation were both cited equally in the policy set at about 40 percent of the articles (Table I).

When looking at the specific values sited within the parameter sets the following key relationships are seen (Table III):

- Non-referenced sources are the highest or tied with implied in all value categories (93 out of 146) with implied adding 40 for a total of 90%).
- Qualitative determination is dominant and often the only determination in all values (51 of 62 or 82 percent).
- Model citations are rare.
- Within the policy parameter set, legislation and regulation each account for approximately two-fifths of the values sited.

Agency Category

In the agency media 62 papers were reviewed with 197 values cited (Table I). Over one-half of the articles cited use value, habitat, water quality, and hydrologic values (at 61, 72, 61, and 55 percent respectively (Figure 3). Together these values represent over three-fourths of the total values cited (Figure 4). Water quality and hydrology values were higher than the other four categories in percent of articles citing these values. Within the water quality value category the agency media had the largest percent of total values for all five categories, but was followed closely by news (Figure 4).

Agency media categories had the largest number of value citations of all 5 categories (Table I). Palustrine, natural, and rural were the dominant wetlands types cited, which was similar to the other media categories. The sources of information in the articles reviewed were non-referenced (42 percent) and implied (27 percent). There was an almost even split between qualitative and quantitative in the determination set which was unique among the media paradigms. Replacement was uniquely the predominant model used. Management was very dominant in the policy set at 57 percent followed by legislation at 27 percent.

Table III. News media breakdown of value citations by descriptive parameter sets

		Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
Values	Values Cited	Palustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Other	Scaling & Weighing	Common Denominator	Replacement	Legislation	Regulation	Management
1. Use Value	27	22	13	14	27	5	3	12	19	14	3	1	18	10	2	3	1	1	1	10	12	5
2. Biochemical Processes	2	2	1	1	2	--	--	--	--	1	--	--	1	2	--	--	--	--	--	1	1	--
3. Climate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4. Habitat Value	32	29	15	14	29	3	3	10	22	8	1	1	27	12	4	3	--	--	2	8	8	4
5. Food Chain	3	3	2	2	2	--	1	1	2	--	1	1	2	2	--	--	--	--	--	1	1	--
6. Water Quality	22	20	13	13	21	2	1	6	17	5	1	3	17	10	2	1	--	1	--	7	9	4
7. Hydrologic Values	19	17	12	14	19	1	--	6	12	4	--	--	17	8	3	1	--	--	1	7	8	2
8. Assessment Techniques	2	2	1	1	2	1	--	1	1	1	--	--	2	2	--	1	--	1	--	2	--	1
9. Bibliography	1	1	1	1	1	--	--	1	1	1	--	--	1	1	--	1	--	--	1	1	--	--
10. Economic Models	2	2	1	1	2	--	--	1	1	2	--	--	2	2	--	2	--	1	--	1	1	--
11. General Value	10	8	5	6	6	11	3	6	5	4	1	1	6	2	--	1	--	1	--	4	6	2
Total # Breakdown	**120**	**106**	**64**	**67**	**111**	**23**	**11**	**44**	**80**	**40**	**7**	**6**	**93**	**51**	**11**	13	**0**	**4**	**5**	**42**	**46**	**18**
Total % by Set		45	27	28	77	16	7	35	65	27	5	5	63	82	18	60	0	20	20	40	43	17
Total # by Set				237			145		124				146		62				22			106

When looking at the specific values within the parameter sets the following key relationships are seen (Table IV):

- Non-referenced citations are highest in all except climate biochemical processes and assessment techniques. Non-referenced and implied account for two-thirds of the citations.

- Qualitative determination is dominant in six of the value types, but only by a minimal difference.

- The three modeling types are evenly distributed and as a parameter set are the lowest cited.

- Within the policy set management is highest, often significantly, in all but economic models.

Trade Category

The trade media cited 142 values in 53 articles (Table I). Use and habitat values were mentioned in over 60 percent of the trade articles (Figure 3). The values of use and habitat each represent over 20 percent of the total values cited by the trade category (Figure 4). Water quality, hydrologic, and general were each cited in approximately 30 percent of the articles (Figure 3). Further, these three values represent nearly 40 percent of all values cited in trade media (Figure 4). Both Figures 3 and 4 show that the trade media has the highest percentage of values in the economic and general category, more than any other media.

Forty three percent of the wetland citations were palustrial, 67 percent natural and 80 percent rural. However, the trade media category had the highest restored wetland coverage of all media categories (Table I). Approximately four-fifths of the values were provided through implied or non referenced sources. Eighty-five percent of the values were determined by qualitative rather than quantitative measurements. Models were predominantly the common denominator type. Legislative policy was mentioned more frequently than regulation or management, the only media category where this was the case (Table I).

When looking at specific values within the parameter sets, the following key relationships were seen (Table V):

- Non-reference or implied were highest in most value categories, with the exception of economic models and assessment techniques.

Table IV. Agency media breakdown of value citations by descriptive parameter sets

Values	Total Values Cited	Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
		Paulustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Other	Scaling & Weighing	Common Denominator	Replacement	Legislation	Regulation	Management
1. Use Value	38	35	24	25	35	4	7	7	30	14	8	6	22	12	10	6	4	2	1	9	9	19
2. Biochemical Processes	5	5	1	1	3	1	1	---	4	2	1	1	1	2	1	2	---	---	1	1	---	1
3. Climate	7	7	6	6	7	---	---	---	4	4	1	1	2	1	1	---	---	---	---	1	---	1
4. Habitat Value	45	42	25	26	37	4	11	2	42	14	8	7	23	12	7	5	2	2	4	8	3	18
5. Food Chain	8	8	5	5	7	1	3	---	6	2	2	1	3	2	1	2	---	1	---	---	---	1
6. Water Quality	38	35	22	23	33	4	5	5	31	14	9	6	17	11	9	6	2	2	3	3	3	14
7. Hydrologic Values	34	30	21	22	32	---	3	5	28	9	4	6	21	8	7	6	1	2	2	6	4	11
8. Assessment Techniques	6	6	6	6	6	1	1	1	4	1	2	2	1	---	2	1	1	---	---	---	---	3
9. Bibliography	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10. Economic Models	6	5	4	5	5	1	1	---	5	2	3	1	4	---	5	3	---	2	1	3	---	2
11. General Value	10	10	9	9	10	1	1	4	7	2	2	1	5	2	3	2	---	---	2	3	2	3
Total # Breakdown	**197**	**183**	**123**	**128**	**175**	**17**	**33**	**24**	**161**	**64**	**40**	**32**	**99**	**50**	**46**	**34**	**10**	**11**	**14**	**34**	**21**	**73**
Total % by Set		42	28	29	78	8	14	13	87	27	17	14	42	52	48	49	14	16	20	27	16	57
Total # by Set				434			225		185				235		96				69			128

Table V. Trade media breakdown of value citations by descriptive parameter sets

		Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
Values	Values Cited	Paulustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Other	Scaling & Weighing	Common Denominator	Replacement	Legislation	Regulation	Management
1. Use Value	32	26	14	13	25	2	9	4	30	14	8	1	19	9	1	7		4	3	10	9	9
2. Biochemical Processes	3	2	---	1	2	1	---	2	2	2	1	1	---	1	---	---	---	---	---	---	---	---
3. Climate	1	---	---	1	1	---	---	---	1	1	---	---	1	1	---	---	---	---	---	---	---	---
4. Habitat Value	37	29	15	18	24	6	11	7	32	13	10	1	18	15	2	4	---	2	3	8	3	9
5. Food Chain	6	4	3	3	6	---	---	1	5	5	---	---	2	3	---	1	---	1	---	---	---	---
6. Water Quality	20	15	10	14	12	3	6	4	15	11	1	1	10	6	1	3	---	3	---	2	1	1
7. Hydrologic Values	15	11	7	10	12	1	4	3	13	9	---	---	6	3	1	1	---	1	---	2	---	2
8. Assessment Techniques	4	4	3	3	4	---	---	2	4	1	---	2	2	1	2	---	---	---	---	2	---	---
9. Bibliography	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10. Economic Models	8	4	---	1	7	1	5	1	8	2	5	---	5	1	2	5	---	4	2	4	3	3
11. General Value	16	8	11	9	12	2	1	2	11	9	2	1	9	10	1	2	---	2	1	6	4	3
Total # Breakdown	**142**	**103**	**63**	**73**	**105**	**16**	**36**	**26**	**121**	**67**	**27**	**6**	**72**	**50**	**9**	**23**	**0**	**17**	**9**	**34**	**20**	**27**
Total % by Set		43	26	31	67	10	23	18	82	39	16	3	42	85	15	47	0	35	18	42	25	33
Total # by Set				239			157		147				172		59				49			81

- Qualitative determination was highest in all value categories, except economic models and assessment techniques. Further, the qualitative determinations were usually significantly higher.

- Common denominator was the most cited model but there were minimal models cited overall.

- Within the policy parameter, legislation was most cited in all but habitat value. However, the distribution of citations within the three policy parameters was fairly uniform.

Environmental Category

In the environment media, 144 values were cited in 47 articles reviewed (Table I). Environmental media showed a significant emphasis in habitat value with inclusion in almost 90 percent of the articles (Figure 3). Further, habitat represented 29 percent of the total values cited (Figure 4). Use and hydrologic values were each cited in over one half of the articles (Figure 3). These two values contained 38 percent of all the values mentioned in this media (Figure 4). Within the environment category habitat and hydrologic percent of values cited were the highest for all the media categories.

Approximately one half of the value addressed palustrine while three fourths addressed natural and rural wetlands (Table I). Of the 144 values, cited only 6 percent were referenced forty five percent of the values were from non referenced sources and 40 percent from implied. Qualitative determination of wetlands occurred in 72 percent of the articles. Modeling was the least cited with common denominator significantly higher than replacement or scaling and weighting. Nearly one half of the policies section focused on management practices with legislation at 32 percent and regulation at 19 (Table I).

When looking at the specific values within the parameter sets the following key relationships are seen (Table VI):

- Non-referenced citations were highest in the use, habitat, and water quality values. Implied citations were highest in climate, food chain, hydrologic, and general. Together the non-referenced and implied accounted for 85 percent of the citations.

- Qualitative determinations were highest in all but economic models and were usually significantly higher.

- Common denominator was the predominant model used. However, modeling was minimally cited in the environmental articles.

Table VI. Environmental media breakdown of value citations by descriptive parameter sets

Values	Values Cited	Cowardin Classification			Wetland Type			Location		Source				Determination		Model				Policy		
		Palustrine	Lacustrine	Riverine	Natural	Constructed	Restored	Urban	Rural	Implied	Original	Referenced	Non Referenced	Qualitative	Quantitative	Other	Scaling & Weighing	Common Denominator	Replacement	Legislation	Regulation	Management
1. Use Value	29	26	13	17	26	5	4	9	23	15	3	2	20	13	3	7	1	5	1	7	6	9
2. Biochemical Processes	4	4	2	1	3	1	---	2	3	2	---	1	2	2	2	2	1	1	---	---	---	2
3. Climate	2	1	---	---	2	---	---	1	1	1	---	---	---	---	---	---	---	---	---	---	---	---
4. Habitat Value	42	39	18	21	37	6	4	9	32	19	8	1	27	18	8	6	2	3	1	8	4	11
5. Food Chain	9	8	3	4	9	---	1	1	8	8	---	---	3	5	2	1	---	1	---	1	1	---
6. Water Quality	16	15	9	9	14	1	2	5	14	8	1	2	10	4	1	3	---	3	---	1	---	5
7. Hydrologic Values	25	20	13	16	32	2	3	4	21	15	3	1	14	9	4	4	---	4	---	2	2	6
8. Assessment Techniques	4	2	1	1	2	2	2	2	2	---	1	1	---	2	---	1	---	---	1	---	---	---
9. Bibliography	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10. Economic Models	3	3	1	2	2	2	1	3	2	---	1	2	---	1	2	2	---	---	2	---	---	---
11. General Value	10	9	5	6	8	1	1	2	9	6	---	---	5	5	1	2	---	---	2	3	---	1
Total# Breakdown	**144**	**127**	**65**	**77**	**135**	**20**	**18**	**38**	**115**	**72**	**17**	**10**	**81**	**59**	**23**	**28**	**4**	**17**	**7**	**22**	**13**	**34**
Total % by Set		47	24	29	78	12	10	25	75	40	9	6	45	72	28	50	7	30	13	32	19	49
Total # by Set				269			173		152				180		82				56			69

- Within the policy parameter set management was dominant in five out of seven value categories cited (use, biochemical processes, habitat, water quality, and hydrologic). Regulation was not dominant in any of the value categories.

Comparison of Values: Numbers and Co-Occurrence

Number of values cited per article

Only 57 (21) percent of the 271 articles reviewed cited a single value (Figures 5 and 6). The largest number of articles cited two values (24 percent) with an almost linear drop off to a maximum of eight values cited. Further, the two values cited category had a very even distribution among all five media categories. The academic and agency media categories increased relatively in percentage with increasing number of values cited (Figure 6). News dropped out the earliest but is dominant in the three value cited category.

Matrix of co-occurring value comparisons

Certain values were found to co-occur at higher levels than others and the co-occurrence fell into three groups (Figure 7). Co-occurrence among hydrologic, habitat, use, and water quality ranged from 43 to 30 percent of total percent of articles. The second group, ranging from 13 to 3 percent of the total articles, involved biochemical, food chain, general values, climate, economic, and assessment. Finally the second group against itself with the addition of bibliography formed a third group and ranged from 0 to 3 percent of total articles.

The percentage of articles by individual media category generally follows the percent of total articles. Group 1 (total articles ranging from 43 to 30 percent) range from 62 to 19 percent in the breakdown. Group 2 (total articles 13 to 3 percent) ranges from 19 to 0 percent in the breakdown. Group 3 (total articles range from 6 to 0 percent) ranges from 8 to 0 percent in the breakdown. It is also clear that there is a relation, in the matrix, to the number of specific values cited.

SUMMARY

Two overall questions were addressed in this section:

- Are there differences in descriptive parameters utilized relating to different written media categories? If this is the case then the written media represents multiple paradigms rather than a single one. Further, does this involve different types of wetlands emphasized by media types and/or differences in approach, emphasis, and methods utilized?

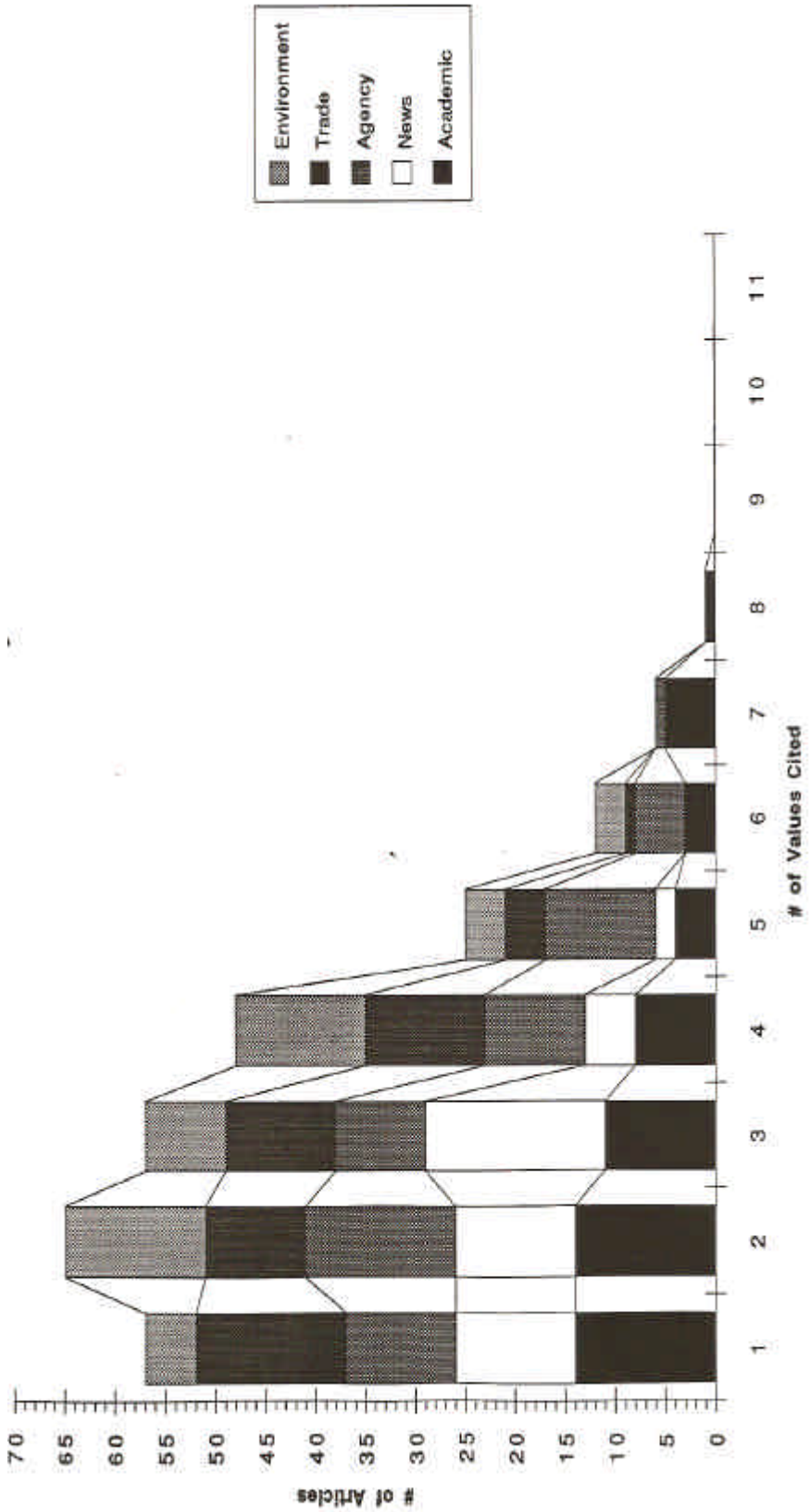


Figure 5. Number of values cited by article

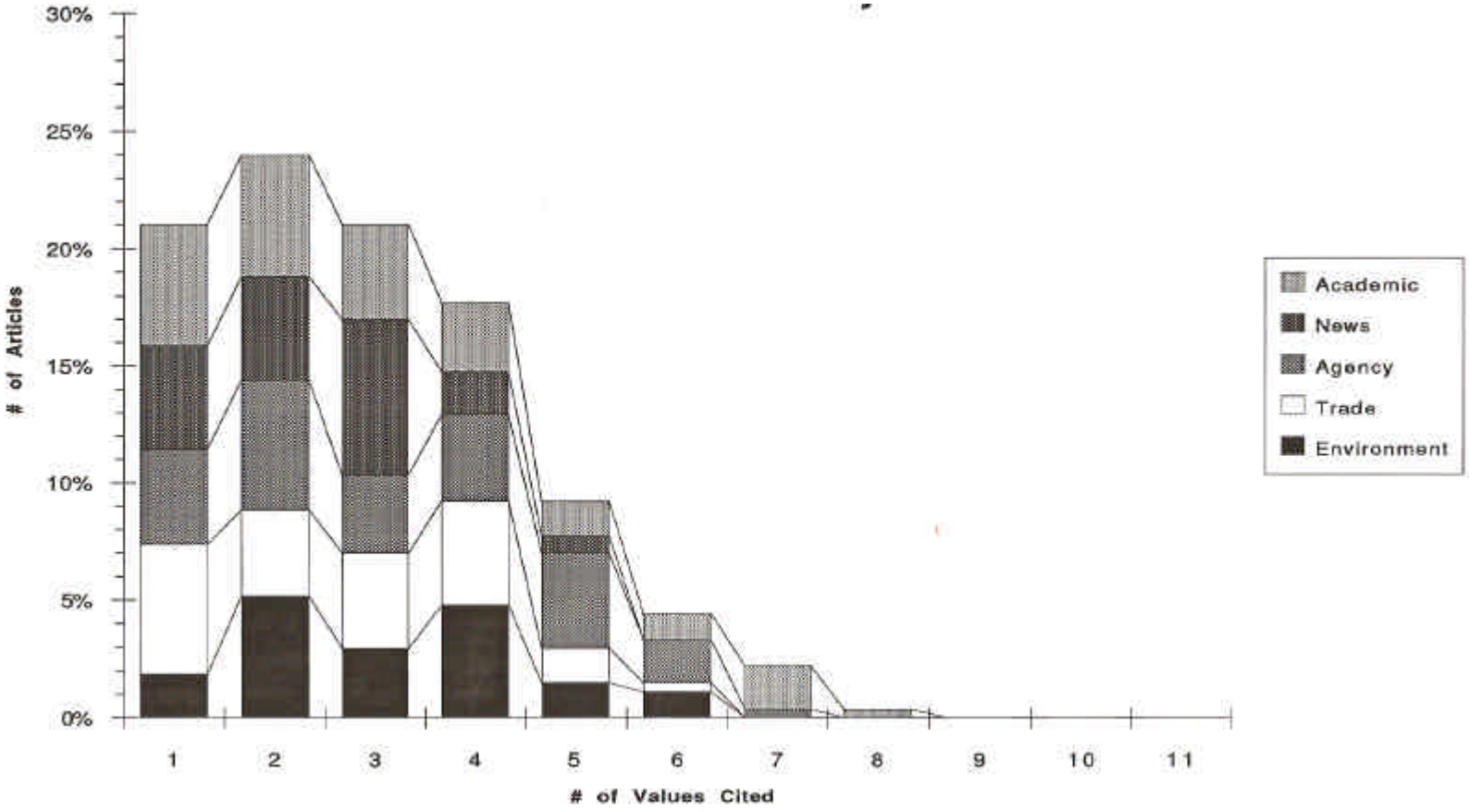


Figure 6. Percent of values cited by article

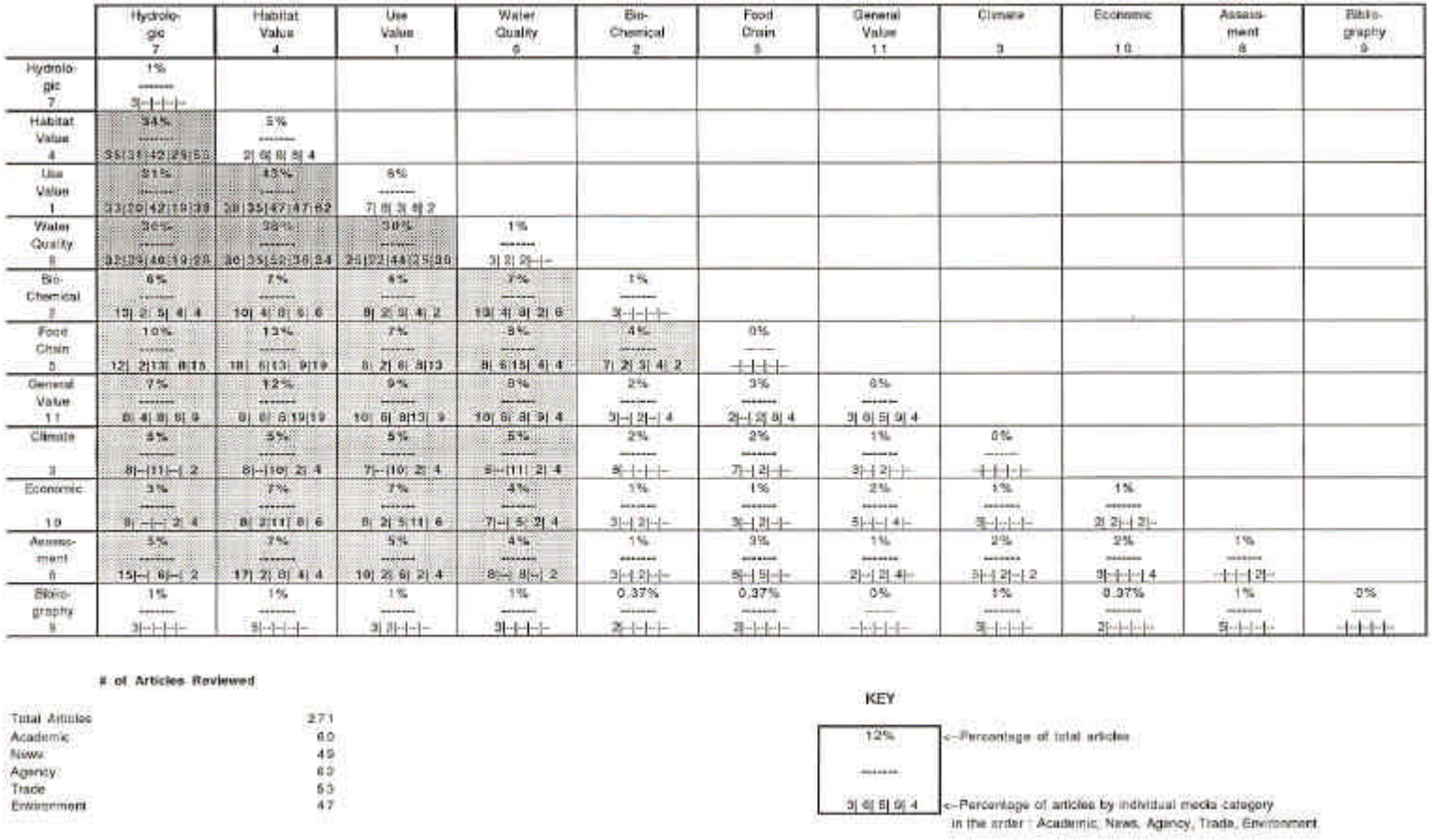


Figure 7. Percent Value to Value Comparison by Total and Media Comparison

- Are different values for wetlands emphasized by different written media categories? If this is the case than the written media represents multiple paradigms rather than a single one.

The answer to the first question, from the context of our study, indicates that we are exposed, in the written media, to different approaches, emphases, and methods regarding wetlands. It should be noted that our data indicates that the written media categories are homogeneous in their emphasis on the geographically controlled parameter sets of Cowardin classification, wetland type, and location (Table I). This is an important first cut in that it eliminates type and location as a basis for creating separate paradigms.

However, the last four descriptive parameter sets examined deal more with approach, emphasis, and methods used in examining wetland values by the written media. Under the source parameter set, academic stands out with 47 percent referenced and 23 percent original for a total of a 70 percent. All four other media categories are dominated by combined non-referenced and implied (ranging from 90 to 69 percent). Within the determination parameter set academic at 59 percent and agency at 48 percent are at the high end of the quantified spectrum while trade (15 percent) and news (18 percent) are at the low end. Within the use of models, agency media is unique with its emphasis on replacement whereas the other four emphasize common denominator. The policy parameter breakdown has academic, agency, and environment, all emphasizing management, trade emphasizing legislation, and news emphasizing regulation and legislation.

It is seen in this survey that there are differences in emphasis, approach, and methods utilized by the media categories. These differences impact the credibility (source, determination, model) as well as the emphasis (policy) of each media category and therefore constitute media paradigms based on these differences.

The second question asks whether different values for wetlands are emphasized by different media categories. Addressing this question by percent of articles citing specific values by media category (Figure 3), the academic media is dominant in biochemical, climate, food chain, assessment, and bibliography; all of which are minor values when looking at the total of 787 values cited. The news category shows no dominance in any of the 11 categories; agency is dominant in water quality, hydrologic, and use value (tied with environment); trade is dominant in economic and general value; environment is dominant in habitat value (the overall dominant value) and use value (tied with agency). These findings also support the media categories being classified as paradigms.

The answers to the above two questions have resulted in the conclusion that the written media, in regard to wetland values, does fall into definable paradigms. It is important to understand that these are not statistically generated and are subjective.

- Academic Paradigm

  The academic paradigm can be characterized by a dominant level of referenced and original sources and use of quantitative procedures in determining values (unique to the five media categories). This paradigm is almost identical to the environmental paradigm regarding policy legislation 31 percent, regulation 20 percent, management 49 percent. Further, this paradigm had the highest value citations per article of the value categories bio-chemical processes, climate, food chain, assessment techniques, and bibliography, none of which were cited often.

- News Paradigm

  The news paradigm can be characterized as having the most non referenced and combined non referenced and implied citations in regard to source. Eighty two percent of the citations were qualitative. The news paradigm was the only one to emphasize regulation (43 percent) from the policy perspective. In relation to values cited, this paradigm was not dominant for any of the values and generally fell in the middle range.

- Agency Paradigm

  The agency paradigm is characterized by non-referenced and implied regarding source citation, evenly split between qualitative and quantitative, unique in being dominant in the use of the replacement model, and emphasized and was dominant for all paradigms in management for the policy set (57 percent). Water quality and hydrology were higher than the other four paradigms in percent of articles citing these values and within the water quality value category it had the largest percent of total values followed closely by news.

- Trade Paradigm

  The trade paradigm had the highest restored wetland coverage of all media paradigms. Eighty one percent of the sources cited were non-referenced or implied and 85 percent of the values were determined by qualitative means. Legislative policy was cited more frequently than regulation or management, the only paradigm where this was the case. This paradigm had the highest percentage of values in the economic and general value categories of all five.

- Environmental Paradigm

  The environment paradigm had 85 percent of its citations non-referenced or implied for sources and they were predominantly qualitative (72 percent). It was similar to academic and agency in emphasizing management. This paradigm

showed a significant emphasis on habitat value with almost 90 percent of the articles citing habitat value. From the perspective of values cited by media category, both habitat and hydrologic were highest in the environment paradigm for all media paradigms.

SURVEY OF PERCEPTIONS OF WETLAND VALUES IN SOUTH CENTRAL MINNESOTA

INTRODUCTION

County water planners in South Central Minnesota faced a problem. Where do they locate constructed and restored wetlands to make the best use of limited funds? The limited funds factor required prioritization and prioritization required evaluation. One of the components in the decision making process was the publics perception of wetland values and their preferred locations. In response to this need, the Mankato State University wetlands classes of 1995 developed a prototype questionnaire, followed by the 1996 class which reformatted, beta tested, refined, distributed, and analyzed the results.

The basis of this study was applied rather than esoteric. However, it did provide for an indirect approach to gauge the values the public places on wetlands in general and on preferred wetland locations.

A second question arose once we had determined the public's perception of wetland values. That question was: Are the regional state agency personnel, county environmental technical personnel, and academics on the same page as the public? If they are, the populations are homogeneous. If they aren't, the populations may well represent different paradigms and education between these paradigms becomes important. Further, who leads in this education effort and should they lead from in front or behind?

The purpose of this perception-value study was to determine the public's perception-values of wetlands and to see if it varies from and among agency, county, and academic technical personnel.

METHODS

The Mankato State University wetlands class of 1995 developed an initial survey on perception-values of wetlands for our region. The 1996 class reworked the questionnaire, beta tested it at Mankato East High School, refined it, distributed and analyzed the results. The questionnaire is seen in Figure 8. Jane Starz, Brown County water planner, provided the idea of using high school students, from general biology classes (required of all students) and their parents as our "public" population. Of the 22 students in class, 11 came from regional high schools. We divided the class into 11 teams to survey these schools. Each team was headed by the particular school's graduate, who knew the respective general biology teacher. The students in the respective high school classes were instructed by our teams on the questionnaire during their class time with the support of their teachers. Additionally, questionnaires were sent home for their parents to fill out and returned via their student to school. The process worked very well considering it was

DEPARTMENT OF BIOLOGICAL SCIENCES

WETLAND SITE CONSTRUCTION SURVEY

County Water Planning

by MSU - Wetlands Class, 1996

County Water Planners face a problem: Where do they locate new wetlands to make the best use of limited funds. **This survey has been drafted to gather your opinions for assisting in this decision making process.**

A priority system to determine wetland site selection is needed. Guidelines for this system will be established based on the values received from you. This survey contains a list of factors to consider when selecting future wetland sites. **Your rating of each factor will help determine its relative importance in these decisions.**

In order to usefully evaluate your responses, it is important to receive information on who you are. Please complete the questions below:

1. School _____

2. What township do you live in? _____

3. What county do you live in? _____

4. You are: (circle one)

   a. High school student
   b. Parent / Guardian
   c. Other (please specify)_____

5. Your home is : (circle one)

   a. Rural (farm)
   b. Rural (non-farm, hobby farm)
   c. Urban (population less than 5,000)
   d. Urban (population greater than 5,000)

Figure 8. Survey of perception of wetland values in South Central Minnesota by site selection

A SURVEY TO ASSESS LOCAL VALUES FOR PRIORITIZING POTENTIAL SITES FOR WETLAND CONSTRUCTION/RESTORATION

On a scale of 0 to 10, 0 being a low wetland construction priority site and 10 being the highest wetland construction priority site, rate the parameters below by circling a number:

WATER QUALITY/QUANTITY

How important is it to you to build a new wetland near (river, lake, drainage ditch) in order to improve the water quality of that (river, lake, drainage ditch)?

1. **a river**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

2. **a lake**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

3. **a drainage ditch**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

How important is it to you to build a wetland near (river, lake, drainage ditch) in order to moderate the water level during a flood or drought?

4. **a river**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

5. **a lake**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

6. **a drainage ditch**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

DOWNSLOPE OF POTENTIAL POLLUTION SOURCES

How valuable to you would a wetland be to a lake or river if it was placed in between each of the following possible sources of pollution and that lake or river?

7. **erosion - loss of soil due to water and wind**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

8. urban runoff - runoff from urban storm drains and lawns

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

9. hazardous point source - hazardous chemicals as defined by the EPA originating from a single site or location

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

10. non-hazardous point source - non-hazardous chemicals including organic waste - chemical storage facilities, septic sewer systems, livestock barns - originating from a single site or location

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

WILDLIFE HABITAT AND RECREATION

Wildlife Habitat

How valuable to you would it be to build a wetland next to each of the following wildlife habitat types?

11. river

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

12. lake

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

13. woodland

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

14. wetlands

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

15. grassland

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

Recreation

How valuable to you would it be to build a wetland next to each of the following recreational areas?

16. trails (scenic value)

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

17. roads (scenic value)

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

18. homes (scenic value)

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

19. areas used for hunting, trapping, etc.

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

20. areas used for bird & nature observation, etc.

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

COUNTY LAND USE ZONES

How valuable to you would a wetland be if it were constructed within:

21. conservation zone - the management of resources including wetlands, both natural and man made so as to use them economically and preserve the environment

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

22. heavy industry zone - industry that involves bulky raw materials with large end products: Examples are ethanol refineries, chemical and agricultural plants

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

23. light industry zone - industrial property which does not produce the noise, odors, and pollution characteristics of heavy industry

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

24. rural township zone - low density area where municipal utilities are available: population density less than 100 per acre

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

25. city zone - a developed community

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

26. prime agriculture zone - highly desirable agricultural land expected to produce consistently high yields

not important 0 1 2 3 4 5 6 7 8 9 10 very important — don't know

27. limited agriculture zone - moderately desirable agricultural land with medium yields received: supports only limited variety of crops

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

28. general business zone - retail, service, and general commercial businesses in the rural area

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

Systems

How valuable to you would a wetland be if it were one of the following types of systems?

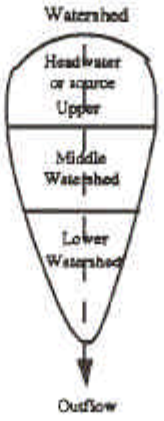
29. a wetland that has little movement of water across its boundaries.

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

30. a wetland that has an abundant exchange of water across its boundaries (flow through).

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

Watersheds



How valuable to you would a wetland be if it were constructed within each of the following areas?

31. upper watersheds - headwaters

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

32. middle watersheds

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

33. lower watersheds

not important 0 1 2 3 4 5 6 7 8 9 10 very important don't know

A SURVEY TO ASSESS LOCAL VALUES FOR PRIORITIZING POTENTIAL SITES FOR WETLAND CONSTRUCTION/RESTORATION BASED ON BROAD CATEGORIES

On a scale of "0-10", "0" being non-important and "10" being most important, what value would you place on each of the following broad categories for prioritizing wetland construction. Please determine your rating value for each by circling a number.

1. **Water Quality Proximity to Water Body (Lake, Stream, Ditch, Wetland)**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

2. **Water Quantity Proximity to Water Body (Lake, Stream, Ditch, Wetland)**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

3. **Downslope of Potential Sources of Pollution**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

4. **Proximity to Wildlife Habitat**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

5. **Proximity to Recreation Sites**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

6. **County Land Use Zones**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

7. **Closed (depressional) Open (flow thru) System**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

8. **Watershed Location**

not important 0 1 2 3 4 5 6 7 8 9 very important 10 don't know

a time consuming endeavor for the students and parents. A list of participating schools and number of respondents is seen in Table VII.

In all there were 637 usable surveys received from students and 388 surveys received from parents. In additions to separating the group into age categories (students and parents), the individuals were also asked to select a residence category. The four residence category selections were: rural farm (191), rural non-farm or hobby farm (242), urban with a population less than 5000 (351), and urban with a population greater than 5000 (241). The parentheses indicate the number of surveys received in each category.

The survey was set up on a 0-10 scaling, with 0 corresponding to not important and 10 corresponding to very important. There was also a "don't know" selection available. There were 41 questions total in 9 different sections. A total of 33 questions were specific and fell into 8 categories: water quality, water quantity, downslope of potential pollution sources, adjacent to wildlife habitats, adjacent to recreational areas, county land use zones, type of wetland system, and placement in watershed. The ninth category was a section where the individuals were asked to rate these 8 broad categories for importance, therefore this section consisted of 8 questions. The data was placed into File Maker Pro 2.0v, a Macintosh database, and the averages calculated.

Following the survey of the public's perception-values survey of wetlands, Carrie Trytton, a graduate student, used the same survey instrument on other select groups. These included: regional staff of state agencies (Board of Water and Soil Resources, BWSR; Minnesota Pollution Control Agency, MPCA; and Minnesota Department of Natural Resources, MDNR); county technical water planning personnel (13 County South Central Minnesota Comprehensive County Water Planning Project staff planners; and Soil and Water Conservation District staff); and academics (1998 and 1999 Mankato State University, upper division and graduate student wetlands classes). These groups represent wetland specialists and were compared to the "public" responses as well as between and amongst themselves. A statistical computer program, SPSS, was used for descriptive statistics and testing of significant differences of the means at the .05 significance level using the Tukey HSD test. Since the numbers of respondents in some groups were low several categories were lumped together.

RESULTS

Public Perception of Wetland Values

The results of the 33 specific questions (shown in Table VIII), and the results of the broad categories (shown on Table IX) were used to examine several different questions. The first step was to look for population homogeneity. Second, if homogeneity was found, was it related to all questions or just certain questions? Last, the results

Table VII. South Central Minnesota participating high schools and numbers of respondents

High School	Students	Parents
Madelia	54	35
Mankato East	65	51
Mankato West	50	30
Blue Earth Area	79	44
LeCenter	22	5
Nicollet	44	31
St. Clair	71	34
Lake Crystal Welcome Memorial (LCWM)	38	26
LeSueur Henderson	31	30
Janesville, Waldorf, Pemberton (JWP)	90	58
Waseca	98	50
Total Returned	642	394
Total Utilized*	637	388

Table VIII. Results of the specific questions by student versus parent and by location (each question based on a maximum of 10 points)

Category	Question	Averages		Rural Farm	Rural Nonfarm	Urban Less 5000	Urban More 5000
		Student	Parent				
Water Quality	River	6.9	6.7	6.1	7.0	7.1	7.0
	Lake	7.3	7.1	6.2*	7.3	7.5	7.7
	Drainage Ditch	5.5	5.6	4.7	5.7	5.6	6.0
Water Quantity	River	7.0	6.6	6.1	6.7	7.2	7.1
	Lake	6.5	6.4	5.7	6.6	6.8	6.5
	Drainage Ditch	6.0	5.7	5.1	5.9	6.1	6.1
Downslope of Pollution Sources	Erosion	6.5	6.6	6.1	6.6	6.8	6.6
	Urban Runoff	6.3	6.9	6.4	6.4	6.7	6.6
	Hazardous Point Source	7.1	7.7	7.3	7.4	7.4	7.2
	Non-Hazardous Point Source	6.6	6.8	6.0	6.9	6.8	6.6
Adjacent to Wildlife Habitats	River	6.9	6.7	6.0	6.9	7.1	7.0
	Lake	7.2	6.9	6.2*	7.2	7.3	7.2
	Woodland	7.6	7.0	6.5*	7.7	7.6	7.7
	Wetland	6.5	6.3	5.7	6.5	6.6	6.8
	Grassland	6.9	6.4	6.0	6.8	7.0	6.9
Adjacent to Recreational Areas	Trails (Scenic)	6.3	6.1	5.2*	6.6	6.4	6.5
	Roads (Scenic)	5.1	5.0	4.1*	5.2	5.4	5.2
	Homes (Scenic)	5.2	4.8	4.2*	5.2	5.3	5.2
	Hunting	6.7	6.3	6.1	7.0	6.6	6.2
	Nature Observation	7.3	7.1	6.2*	7.4	7.4	7.5
Constructed Within County Landuse Zones	Conservation Zone	7.2	7.2	6.4*	7.5	7.4	7.4
	Heavy Industry Zone	4.5	4.8	4.5	4.6	4.6	4.7
	Light Industry Zone	5.6	5.2	5.0	5.6	5.6	5.5
	Rural Township Zone	6.3	5.7	5.3	6.4	6.2	6.2
	City Zone	5.3	5.0	4.8	5.0	5.3	5.4
	Prime Agriculture Zone	5.8*	4.4*	4.0*	5.5	5.5	5.7
	Limited Agriculture Zone	5.9	5.3	4.8*	5.9	5.9	6.0
	General Business Zone	4.6	4.3	3.9	4.4	4.8	4.5
Type of Wetland System	Closed System	5.9	5.3	5.0	5.9	5.8	6.0
	Open System	6.8	6.5	5.8*	6.9	6.8	6.9
Placement in Watershed	Upper Watershed	6.0	5.8	5.4	6.0	6.2	6.1
	Middle Watershed	6.2	5.9	5.5	6.3	6.2	6.2
	Lower Watershed	6.0	6.1	5.7	6.1	6.2	6.3

Table IX. Results of the broad category questions by student versus parent and by location (each question based on a maximum of 10 points)

	Averages					
CATEGORY	Student	Parent	Rural Farm	Rural Nonfarm	Urban Less 5000	Urban More 5000
Water Quality	7.4	7.3	6.8	7.5	7.5	7.6
Water Quantity	6.9	6.6	6.2	6.9	6.9	6.9
Downslope Pollution Sources	6.7	7.1	6.6	6.8	7.0	7.0
Wildlife Habitat	8.0	7.5	7.1	8.0	8.0	7.9
Recreational Areas	6.9	6.3	5.8*	6.8	6.8	6.9
County Land Use Zones	6.1	5.9	5.5	6.4	6.1	6.0
Type of Wetland System	6.5	6.1	5.7	6.5	6.5	6.4
Placement in Watershed	6.6	6.8	6.4	6.7	6.8	6.7

***** indicates a difference of 1.0 or greater

were used to see if, as a whole, wetlands are valued by any or all populations and which wetland functions are valued the most and the least.

Age Categories: Students vs. Parents

The first comparison was the age categories, students vs. parents. There were differences in averages greater than 0.5 in 7 of the 33 questions, and in 25 of the 33 questions the students' averages were higher than that of the parents. The difference in averages exceeded 1.0 (shown by the asterisk on Table VIII) in only one question, which asked the value of a wetland constructed within a counties prime agriculture zone.

Residence Categories: Rural Farm vs. Rural Non-farm vs. Urban Less Than 5000 vs. Urban Greater Than 5000

In 31 of the 33 questions the rural farm category response averages were lower than the rural non-farm, urban less than 5000, and urban greater than 5000. When comparing the rural farm averages to the next lowest average, within the residence categories, the rural farm average was lower by 0.5 or more in 27 of the 33 questions, with 11 being lower by a difference of 1.0 or more (Table VIII).

Rural non-farm, urban less than 5000, and urban greater than 5000 categories showed more uniformity in their response, with no tendency for any category to be higher or lower consistently and only small differences between averages.

Broad Categories

There was also a section in the questionnaire in which all the 33 questions were condensed into their eighth respective broad categories (Table IX).

The averages show the broad categories follow the same pattern as the 33 specific questions. The students' and parents' averages were fairly close, with the greatest differences seen in the recreational areas category (0.6), and the wildlife habitats category (0.5).

Looking at the residence comparisons, we again see that rural farm averages were lower in all categories, the greatest difference, as with the student and parent averages, being in the recreational areas category (1.0). The other three categories (rural non-farm, urban less than 5000, and urban greater than 5000) again showed more homogeneity in their averages with no differences exceeding 0.4.

In the broad categories, land use zones were ranked as the least important by all groups (age and residence). Wildlife habitat was ranked highest by all groups, and also achieved the top average of 8.0 by three groups (students, rural non-farm, and urban less than 5000).

Further Analysis of Rural Farm: Rural Farm Student vs. Rural Farm Parent

Since the rural farm category showed some differences to the other residence categories, a further analysis was performed to determine the source of these differences. The rural farm category was further broken down into students and parents.

The result of this breakdown, Figure 9, shows the results of the rural farm student vs. rural farm parent for the 33 specific questions, while the results of the broad category questions are shown in Figure 10. The box plot shows the range of data trimming off the top and bottom ten percentile in an effort to exclude outliers and shows the middle fifty percent of responses including the mean (average) and median. The parents' averages are lower in every question except for the two questions concerning urban runoff, and hazardous point sources (Figure 10). In 23 of the 33 specific questions and in 5 of the 8 broad questions the difference was at least 1.0.

Public Perception of Wetland Values Compared to Select Groups

The participant groups being compared were: high school students and parents (representing the public); BWSR, MDNR, and MPCA (representing regional offices of state agencies); county technical staff (13 county water planners and SWCD staff); and academics (1998 and 1999 advanced students in upper division wetlands classes). Water quality and quantity were combined as well as wildlife habitat and recreation. The number of responses as well as means in percent by respondent group and value category are given in Table X. It should be noted that we did receive 22 responses from the MDNR but they were received too late for statistical analysis, however, they are included in the descriptive data. The total frequency of responses ranged from 57.7 for high school students to 0.2 percent for BWSR. The frequency inequities were taken into consideration by the statistics used.

The first test ran each of the six value categories against the seven participant groups. A total of 16 comparisons out of 42 (38 percent) had mean differences that were significant at the .05 level (Table XI). One of the sixteen was between parents and students with the other 15 all between technical participant groups verses the students or parents (public). In all these 15 cases of significant differences the public had the lower mean. Watershed location, type of system, and down slope of pollution sources contained 15 of 16 significant differences.

The same type of analysis was then run combining the 7 participant groups into 4 categories: public (student and parents), county (water planners and SWCD staff), state agency regional personnel (BWSR and MPCA), and academics (university wetlands students). The grouping resulted in 10 comparisons out of 24 (42 percent) having a mean difference that was significant at the .05 level (Table XII). In all 10 cases of significance the differences were to the public category which always had a lower mean. The value

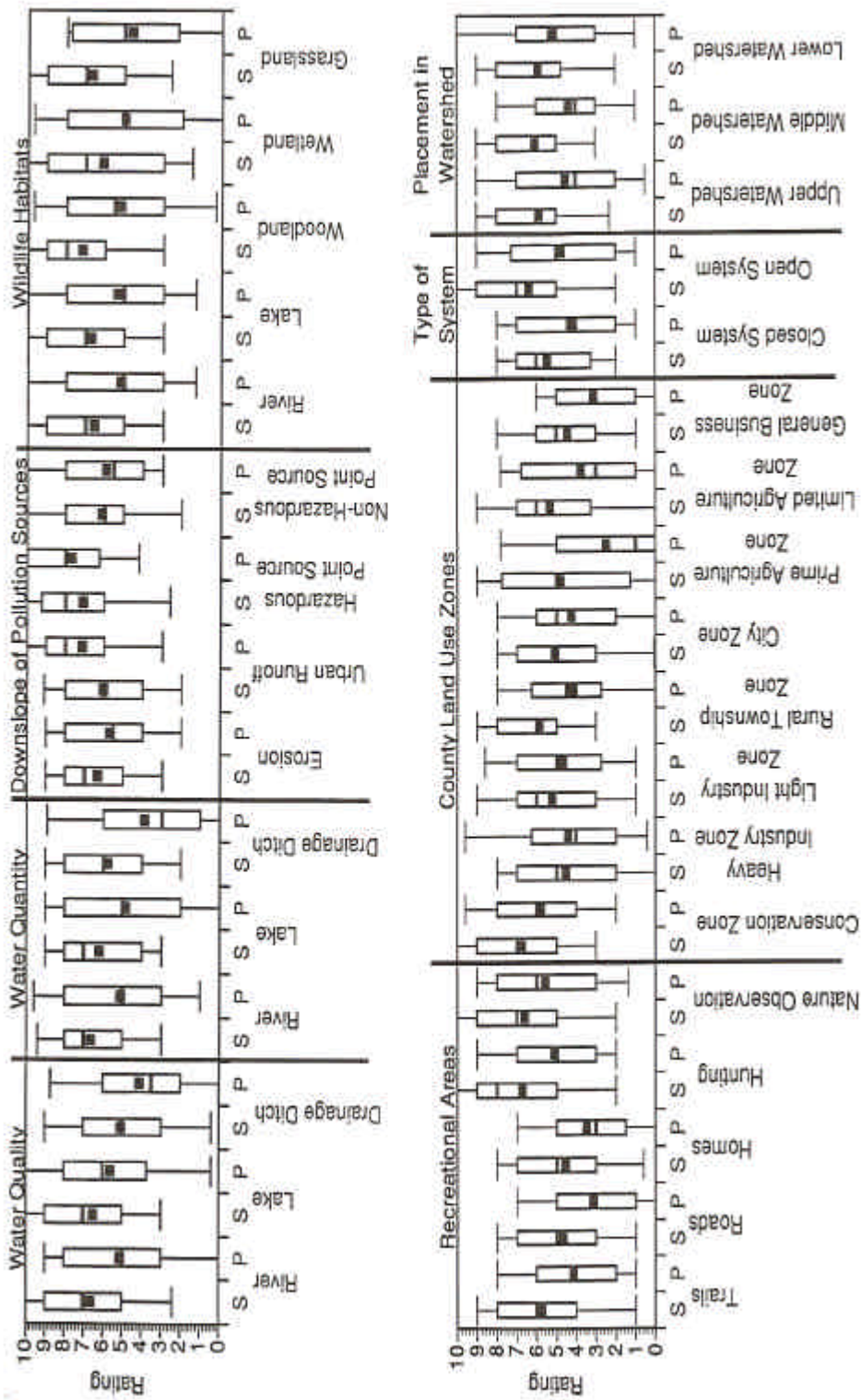


Figure 9. Rural farm student (S) vs. rural farm parent (P) specific questions. See Figure 10 for key.

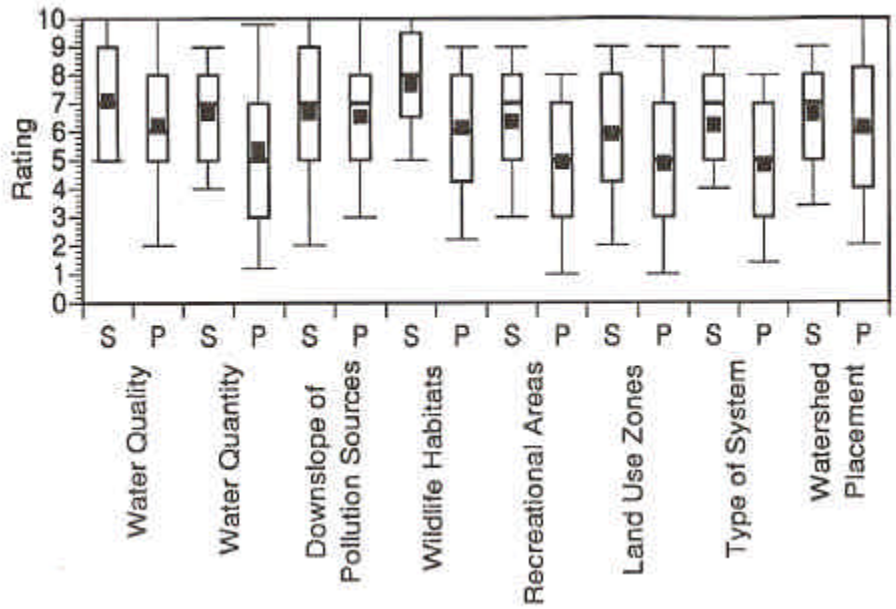
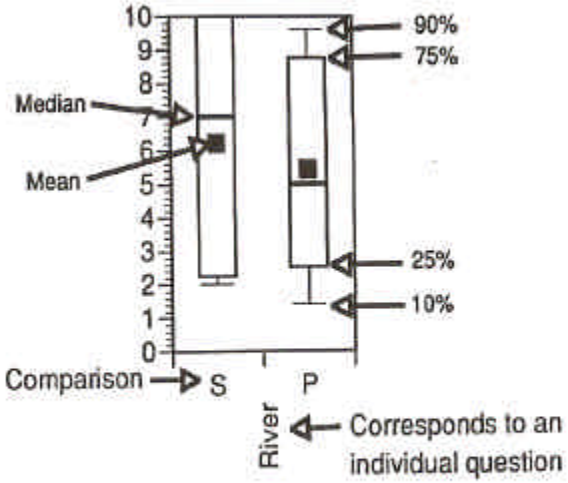


Figure 10. Rural farm student (S) vs. rural farm parent (P) broad category questions



Box plot key for Figures 9 and 10

Table X. Number of responses and means by respondent groups and value categories

	Water Quality/Quantity (60)	Downslope of Potential Pollution Sources (40)	Wildlife Habitat and Recreation (100)	County Land Use Zones (80)	Type of Systems (20)	Watershed Location (30)
High School Students	627 38.3	612 25.0	634 64.7	618 43.4	596 12.5	540 18.2
Parents	384 37.2	381 27.4	386 61.0	382 41.0	349 11.7	318 17.7
BWSR	3 46.0	3 34.0	3 41.3	3 44.3	3 18.7	3 27.0
MPCA	6 44.5	6 25.3	6 67.2	6 56.7	6 17.8	6 26.6
MDNR	22 50.7	18 31.5	22 78.9	21 51.4	21 14.4	21 22.7
13 County Water Planners	15 46.0	15 33.8	15 73.6	15 50.5	14 14.3	15 23.3
SWCD	7 49.0	7 32.3	7 62.6	7 54.3	6 13.5	7 23.0
Wetland Classes 98-99	48 42.0	48 31.7	48 66.6	48 49.3	46 14.8	47 23.2

Table XI. Significant mean difference at the .05 level for comparisons of all participant groups

Dependent Variable	Participant Group 1	Participant Group 2	Significant Mean Difference
Water Quality/Quantity (60)*	---	---	---
Downslope of Potential Pollution Sources (40)	Parents (27.4)	High School Students (25.0)	2.44
	13 Counrty Water Planners (31.7)	High School Students (25.0)	8.83
	MSU Wetland Classes (31.7)	High School Students (25.0)	6.68
	MSU Wetland Classes (31.7)	Parents (27.4)	4.23
Wildlife Habitats & Recreation (100)	---	---	---
County Land Use Zone (80)	MSU Wetlands Class (49.3)	Parents (41)	8.77
Type of System (20)	MSU Wetland Classes (14.8)	High School Students (12.5)	2.31
	MSU Wetland Classes (14.8)	Parents (11.7)	3.11
	MPCA (17.8)	High School Students (12.5)	5.32
	MPCA (17.8)	Parents (11.7)	6.11
	BWSR (18.7)	Parents (11.7)	6.95
Watershed Location (30)	MPCA (26.6)	High School Students (18.2)	8.34
	MPCA (26.6)	Parents (17.7)	8.82
	13 Co. Water Planners (23.3)	High School Students (18.2)	5.17
	13 Co. Water Planners (23.3)	Parents (17.7)	5.66
	MSU Wetland Classes (23.2)	High School Students (18.2)	4.99
	MSU Wetland Classes (23.1)	Parents (17.7)	5.47

*(X) is maximum possible

Table XII. Significant mean difference at the .05 level for comparisons of the four lumped participant groups to value categories

Dependent Variable	Participant Group 1	Participant Group 2	Significant Mean Difference at 0.05
Water Quality/Quantity (60)*	13 Co. SWCD (46.9)	High School Students and Parents (37.9)	9.07
Downslope of Potential Pollutions Sources (40)	13 Co. Water Planners & SWCD (33.3)	High School Students & Parents (25.9)	7.41
	Wetland Classes (31.6)	High School Students and Parents (25.9)	5.74
Wildlife Habitat & Recreation (100)	---	---	---
County Land Use Zones (80)	13 Co. Water Planners & SWCD (51.7)	High School Students and Parents (42.5)	9.23
	Wetland Classes (49.73)	High School Students and Parents (42.5)	7.23
Type of System (20)	Wetland Classes (14.8)	High School Students and Parents (12.2)	2.6
	BWSR & MPCA (18.11)	High School Students and Parents (12.2)	5.89
Watershed Location (30)	13 Co. Water Planners and SWCD (23.2)	High School Students and Parents (18.0)	5.24
	Wetland Classes (23.1)	High School Students and Parents (18.0)	5.17
	BWSR & MPCA (26.7)	High School Students and Parents (18.0)	8.68

* (x) is maximum possible

category of wildlife habitat/recreation revealed no significant differences in means while the other 5 ranged from 3 to 1.

Again one needs to ask why the non public responses were higher than the public in all 42 percent of the significant comparisons.

A final analysis was run to look for differences among the technical categories of water professionals. This comparison resulted in 3 out of 18 significant differences (17 percent) (Table XIII).

The three differences were in the type of system and watershed location questions. In all three cases the regional state agency staff had higher means. No differences were found between county technical staff and the academic category.

DISCUSSION/SUMMARY

Public Perception of Wetland Values

The students' and parents' averages define these groups as being homogenous populations, with one notable exception. The two groups differ on the value of a wetland constructed within a prime agriculture zone, with students placing a higher value on this question (a difference of 1.4).

Although the same homogeneity didn't follow in the residence categories, it was limited to the rural farm differing from the other 3 categories (rural non-farm, urban less than 5000, and urban greater than 5000). The group was lower in almost all questions, but there were two questions where they had the highest means (the questions pertaining to wetlands constructed downslope of urban runoff, and downslope of hazardous point sources). The other three location categories rural non-farm, urban less than 5000, and urban greater than 5000) showed no differences.

Through further breakdown of the rural farm category into students and parents, it was seen that the rural farm parents' averages were driving the rural farm category averages lower. The rural farm students' averages were only slightly lower than the rural non-farm, urban less than 5000, and urban greater than 5000. A similar breakdown was run on the other residence categories and the results did not show differences between the students and parents except in the question concerning the placement of a wetland within a prime agriculture zone, but this difference was limited to the rural non-farm and urban less than 5000. This leads to the conclusion that it is not necessarily the rural farm category that disrupts the homogeneity, but it is the rural farm parent category that is different.

Table XIII. Significant mean difference at the .05 level for comparisons of the grouped technical water professionals to value categories

Dependent Variable	Participant Group 1	Participant Group 2	Significant Mean Difference at 0.05
Water Quallity/Quantity (60)	---	---	---
Downslope of Potential Pollution Sources (40)	---	---	---
Wildlife Habitat and Recreation (100)	---	---	---
County Land Use (80)	---	---	---
Type of System(20)	BWSR/MPCA (18.1)	13 Co./ SWCD (14.0)	4.1
	BWSR/MPCA (18.1)	Wetland Classes (14.8)	3.3
Watershed-Location (30)	BWSR/MPCA (26.7)	Wetland Classes (23.2)	3.5

Key: Regional State Personel=BWSR, MPCA
County Personel= 13 County Water Planners & SWCD
Academic=Wetlands Classes

Almost all questions' averages fell within the range of 5.0-7.5 indicating that wetlands are overall valued by the general population. As the broad and specific questions show, wetlands are most highly valued as habitat for wildlife, but not in areas of agriculture.

Public Perception of Wetland Values Compared to Select Groups

The groups being compared were students and parents (representing the public), BWSR, MDNR, and MPCA (representing regional offices of state agencies), county technical staff (13 county S C Minnesota water planners and SWCD's), and academics (1998 and 1999 advanced students in upper division wetland classes). Converting Table X, which shows the number responding and mean points for each value category, into percentages is shown in Table XIV and gives a simplified summary of the data.

The following summary points are noted:

- For all 6 value categories parents (60 percent) and students (62 percent) were lowest with MPCA and MDNR (76 percent), 13 county water planners (75 percent), BWSR (74 percent), and SWCD (73 percent) all at the high end for overall mean. It should be noted that all were above 50 percent which indicated a positive view of the overall value of wetlands.

- Within the six value categories downslope of potential pollution sources and watershed location (76 percent), and water quality/water quantity and type of system (74 percent) were highest with land use zoning lowest (61 percent) when comparing the mean of all groups against value categories.

- Within each comparison of individual respondent groups to value categories, 4 of the 6 lows were found within the parent group with the other 2 in the state regional offices group. All 6 of the highs were found within the regional state offices (BWSR 3, MDNR 2, and MPCA 1).

- There was a 38 percent difference in means, significant at the .05 level, when comparing the 7 respondent groups to the 6 value categories (Table XI). No significant differences were found between the participant groups and water quality/ water quantity or wildlife habitat/ recreation. In all significant cases, it was the parents or students who were lower.

- When combining the responses into four categories (public, regional state offices, county water technicians, and academics) there was a significant difference in 42 percent of the comparisons (Table XII). In all significant comparisons the public had the lower means. There were no significant differences in wildlife/recreation.

Table XIV. Summary respondents versus value categories by percent of possible

Participant (Mean %) Group	Water Quality Water Quantity	Downslope of Pollution	Habitat and Recreation	Land Use	Systems	Watershed Location
Students (62)	64	63	65	54	63	61
Parents (60)	62	69	61	51	59	59
BWSR (74)	77	85	41	55	94	90
MDNR (76)	85	80	79	64	70	77
MPCA (76)	74	63	67	71	89	89
County Water Planners (75)	77	85	74	63	72	78
SWCD (73)	82	81	63	68	68	77
Wetlands Class (72)	70	79	67	62	74	77
Mean of Values	74	76	65	61	74	76

- When comparing just the technical groups to each other only 17 percent of the comparisons were significant (Table XIII). The significant comparisons were only found in the type of system and watershed location. Within the significant comparisons the state regional offices were always higher than county technical or academic.

In summary the comparisons, that included all participant categories, found the public (students and parents) were always lower, with regional state offices, county technical and academic much higher. This probably reflects the education, training, and career emphasis on wetlands inherent within the latter groups and perhaps indicates that more public education and awareness of wetland values is needed.

Within the non public, technical groups, the regional state agencies are significantly higher than the county technical and academic in only 2 of 6 value categories (these numbers would have undoubtedly been higher if MDNR had been included in the statistical analysis). In general the technical groups are homogeneous.

CONCLUSIONS

COMPARISON OF EVALUATION METHODOLOGIES

- In an era of limited resources, evaluation methodologies are needed because not all wetlands can be saved nor are they all equal.

- Different wetlands have different values and the determination of values is often based on the perception of those constructing the evaluation tool. Therefore, evaluation methodologies vary greatly.

- The purpose of evaluation methodologies should be "no net loss of function and value", not just "no net loss of acres".

MODEL OF PERCEPTION

- We need to develop a comprehensive evaluation methodology, based on both wetland function and perception, that will result in management policy that will satisfy all scales from the local to the global scale.

- Historically, wetland policy has been based on the model of Structure –Function--Values—Management with values being strictly related to scientific function. Wetland values should be determined not just by function (science), but also by human perceptions.

- Incorporating perceptions into wetland policy is difficult because of the diversity of wetland values and because human perceptions are related to scale, location, and an individuals paradigm. Further, classification systems reflect value paradigms.

- The model we developed places "values" as the central focal point for wetland policy.

PERCEPTION OF WETLAND VALUES IN THE WRITTEN MEDIA

- Our study indicates that there are differences in descriptive parameters utilized by the written media categories. The type and location of wetlands are similar but those parameter sets dealing with approach, emphasis, and methods used in examining wetland values differ. These differences impact the credibility (source,

determination, and model) as well as emphasis (policy) of each media category and therefore constitute individual paradigms.

- Our study indicates that different wetland values are emphasized by different media categories, supporting the contention that they are individual paradigms. It is important to understand, however, that these are not statistically generated and are subjective.

Academic Paradigm

The academic paradigm can be characterized by a dominance of referenced and original sources and the use of quantitative procedures in determining values (unique to the five media categories).This paradigm has the highest value citations per article of the value categories biochemical processes, climate, food chain, assessment techniques, and bibliography.

News Paradigm

The news paradigm can be characterized as having the most non-referenced and combined non-referenced/ implied citations in regard to source. This paradigm was the only one of the five to emphasize regulation from the policy perspective.

Agency Paradigm

The agency paradigm is unique in being dominant in the use of the replacement model and was the dominant in all of the paradigms in emphasis of management in the policy set. Water quality and hydrology were higher than the other four paradigms in percent of articles citing these values.

Trade Paradigm

The trade paradigm had the highest restored wetland coverage of all media types. Legislative policy was cited more frequently than regulation or management, the only paradigm where this was the case. This paradigm had the highest percentage of values in the economic and general value categories.

Environmental Paradigm

The environmental paradigm had 85 percent of its citations non referenced or implied for sources and they were predominantly qualitative. Both habitat and hydrologic were the highest for all media categories in values cited.

SURVEY OF PERCEPTIONS OF WETLAND VALUES IN SOUTH CENTRAL MINNESOTA

Comparison of Public Perception of Wetland Values

A comparison of regional high school students and their parents on their perceptions of wetland values, based on selection of potential construction sites, revealed the following:

- The students' and parents' averages define these groups as being a homogeneous population with the single exception being that of constructing a wetland in a prime agricultural zone.

- The same data, when examined by residence category, showed the rural farm differing from the rural non-farm, urban less than 5000 and urban greater than 5000. The rural farm group was lower in almost all value categories except questions pertaining to wetlands constructed downslope of urban runoff and downslope of hazardous point sources. Through further breakdown of the rural farm category into students and parents, it was seen that the rural farm parents' averages were driving the rural farm category averages down.

Almost all questions averages fell within the range of 5.0 to 7.5, on a 10 point scale, indicating that the general public values wetlands. As the broad and specific questions show, wetlands are most highly valued as habitat for wildlife by the public.

Comparison of Public Perception of Wetland Values to Professional,Technical Select Groups

A comparison of public perception of wetland values (high school students and parents) to regional offices of state agencies (BWSR, MDNR, MPCA), county technical staff (13 county S C Minnesota county water planners and SWCD's), and academics (1998 and 1999 students in upper division wetlands classes) revealed the following:

- For all 6 value categories, parents (60 percent) and students (62 percent) had the lowest means with MPCA and MDNR (76 percent), BSWR (74 percent), and SWCD (73 percent) all at the high end.

- Within each comparison of individual respondent groups to value categories 4 of the 6 lows were found within the parent group. All 6 of the highs were found within the regional state offices.

All Participant Groups: (Table XI):

- When comparing the 7 respondent groups to the 6 value categories, thirty eight percent of the means showed a significant difference at the .05 level.

- No significant differences were found between participant groups and water quality/quantity or wildlife habitat/recreation.

- In all significant cases it was the parents or students who were lower.

Combining Participant Groups: (Table XII):

- When combining the responses into four categories (public, regional state offices, county water technicians and planners, and academics) there were significant differences in 42 percent of the comparisons.

- In all significant comparisons the public had the lower means.

- There were no significant differences in wildlife/recreation.

Within Professional/Technical Respondent Groups: (Table XIII):

- When comparing just the technical groups to each other, only 17 percent of the comparisons were significant.

- The significant comparisons were only found in the type of system and watershed location.

In summary, the comparisons that included all participant categories found the public was always lower with regional state offices, county technical, and academic much higher. This probably reflects the education, training, and career emphasis on wetlands inherent within the latter groups and perhaps indicates that more public education and awareness of wetland values is needed. Within the non-public, technical groups, the regional state agencies are significantly higher than the county technical and academic in only 2 of 6 value categories. In general, the technical groups are homogeneous.

OVERALL CONCLUSION

As stated in the introduction, my purpose in this 10 year endeavor was to address the extremely complex issue of wetland perception and values with emphasis on South Central Minnesota. This was deemed critical because both federal and state wetland legislation were for the first time emphasizing no net loss of value, not just acres and this

put an added burden on county and state technical personnel. The science of wetlands, structure and function, was far advanced over the process of establishing value, and remains so today. The relationship of perception to values as applied to wetland evaluation was almost non-existent. A great deal of credit however should be given to Eugene Odum whose 1978 paper really opened up the dialog on wetland values.

With the students in my wetlands classes, we accomplished the three major goals set out in the introduction. A new model of wetland values was developed which includes perception and classification feedback loops. The model also puts "values" as the central focus.

A study of wetland values and perception in five major written media categories was completed and it was concluded that written media paradigms do exist in regards to wetland values.

A South Central Minnesota perception and values survey was developed, given and assessed as to perception of wetland values. The survey was given to and analyzed for similarity and differences among the general public, county technical personnel, regional state agency personnel, and academics. The public in general valued wetlands lower, often significantly, than the other three groups. However, it should be noted that all four groups placed high values on wetlands, with differences being relative.

It is my concluding thought that the public needs more education on the hierarchy of wetland values and the professional/technical wetlands scientists need more education on the broader, not just scientific, aspects of values and perception.

LITERATURE CITED

Adamus, et al. 1987. Wetland Evaluation Techniques (WET). Volume II: Methodology, Department of the Army and U.S. Department of Transportation. 206 pp. & appendices & computer program.

Amacher, et al. 1988. An Interdisciplinary Approach to Valuation of Michigan Coastal Wetlands. The University of Michigan, School of Natural Resources. 61 pp. & figures and appendices.

Amacher, et al. 1989. Application of Wetland Valuation Techniques; Examples from Great Lakes Coastal Wetlands, School of Natural Resources, The University of Michigan and Institue of Water Research, Michigan State University. 30 pp. & appendices.

Anderson, et al. 1989. An Evaluation of the Minnesota Wetland Evaluation Methodology for the North Central United States, Mankato State University Water Resources Center, Mankato, Minnesota. 105 pp. & appendices.

Association State Wetland Managers, Inc. 1985. Proceedings: National Wetland Assessment Symposium. Ed. Jon Kusler & Patricia Riexinger, Portland, Maine, 331 pp.

Board of Water and Soil Resources, 1992, Proposed Permanent Rules Relating to Wetland Conservation, Chapter 8420, Office of the Reviser of Statutes, 86 pp.

Corbett, Julia B. 1992. Rural and Urban Newspaper Coverage of Wildlife: Conflict, Community and Bureaucracy. *Journalism Quarterly*, Vol. 69, No. 4, Winter 1992. pp 929-937.

Corps of Engineers and The Minnesota Environmental Quality Board, 1988. The Minnesota Wetland Evaluation Methodology for the North Central United States, Minnesota Environmental Quality Board, 97 pp. & appendices and computer program.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T.LaRoe, 1979, Classification of Wetlands and Deepwater Habitats of the United States, U.S. Fish and Wildlife Service Pub. FWS/OBS-79/31, Washington, D.C., 103 pp.

Dahl, T.E. and C.E. Johnson. 1991. Status and Trend of Wetlands in the Conterminous United States, Mid-1970's to Mid-1980's. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. 25 pp.

Defleur, Melvin L. and Sandra J. Ball-Rokeach. 1986. *Theories of Mass Communication.* Sage Publications, Inc., Beverly Hills, CA.

Dunlap, Riley E., and Kent d. VanLiere. 1984. Commitment to the Dominant Social paradigm and Concern for Environmental Quality. *Social Science Quarterly,* Vol. 63, pp. 1013-1028.

Friedman, Sharon M. 1991. Two Decade of the Environmental Beat. *Media and the Environment.* Craig L. LaMay and Everette E. Davis (ed.) The Freedom Forum Media Studies Center Island Press, Washington, D.C. pp. 17-28

Meadows, Donelia H. 1991. Changing the World Through the Information Sphere. Media and the Environment. Craig L. Lamay and Everette E. Davis (ed.). The Freedom Forum Media Studies Center. Island Press, Washington D.C. pp. 67-80.

Michigan Department of Natural Resources. 1989. The Michigan Department of Natural Resources Wetland Determination Manual for Field Testing. Vol. 1 prepared by Johnson, Johnson and Roy, Inc., 47 pp. & appendices.

Milbrath, Lester W., 1989, Envisioning A Sustainable Society, Learning Our Way Out, State University of New York Press, Albany, 403 pp.

Minnesota Wetland Conservation Act, 1991, Chapter No. 354, H.F. No. 1.

Mitsch, William J. and James G. Gosselink, 1993, Wetlands, Second Edition, Van Wostrand Reinhold, New York, 732 pp.

Odum, E.O., 1978, The Value of Wetlands; A Hierarchical Approach, in Wetland Functions and Values: The State of Our Understanding, P.E. Greeson, J.R. Clark and J. E. Clark, eds., American Water Resources Assoc., Bethesda, Md., p. 16-25.

Ontario Ministry of Natural Resources and Canadian Wildlife Service. 1984. An Evaluation System for Wetlands of Ontario South of the Precambrian Shield, 169 pp.

Salamone, Kandice L., Michael R. Greenberg, Peter M. Sandman and David B., Sachsman. 1990. A Question of Quality: How Journalists and News Sources Evaluate Coverage of Environmental Risk. *Journal of Communication*. Vol. 40, No. 4, Autumn 1990. pp117-129.

Salvensen, David. 1990. Wetlands, Mitigating and Regulating Development Impacts. The Urban Land Institute, Washington, D.C., 175 pp.

Sather, J.H. and P.J.R. Stuber, tech. coords. 1984. Proceedings of the National Wetlands Values Assessment Workshop. U.S. Fish and Wildlife Service, Western Energy and Land Use Team. FWS/OBS-84/12, 100pp.

Shaw, S.P. and C.G. Fredine, 1956, Wetlands of the United States. U.S. Fish Wildlife Service, Circular 39-67 pp.

Singer,. 1990. A Question of Accuracy: How Journalists and Scientists Report Research on Hazards. *Journal of Communication.* Vol. 40, no., 4, Autumn 1990. pp. 102-116.

Smith, R.D., A. Ammann, C. Bartoldus and M.M. Brinson. 1995. An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices. Wetlands Research Program Technical Report WRP-DE-9, U.S. Army Corps of Engineers, Waterways Experiment Station. P. 25-26.

Stuber, P.J.R., 1984. Users Handbook for the Wetland Data Base. 1984 up date. U.S. Fish Wildlife Service, WELUT 84/W01. 52 pp.

Tiner, R.W. 1984, Wetlands of the United States; Current Status and Recent Trends, National Wetlands Inventory, Fish and Wildlife Service, U.S. Department of Interior, Washington, D.C., 58pp.

U.S. Army Corps of Engineers. 1989. Federal Manual for identifying and Delineating Jurisdictional Wetlands. An Interagency Cooperative Publication. 76pp and appendices.

U.S. EPA Region V. 1984. Literature Review of Wetland Evaluation Methodologies, PB85- 186922, 120 pp. & appendices.

Wisconsin Department of Natural Resources. 1983. Wetland Evaluation Methodology. 63 pp. and appendices.