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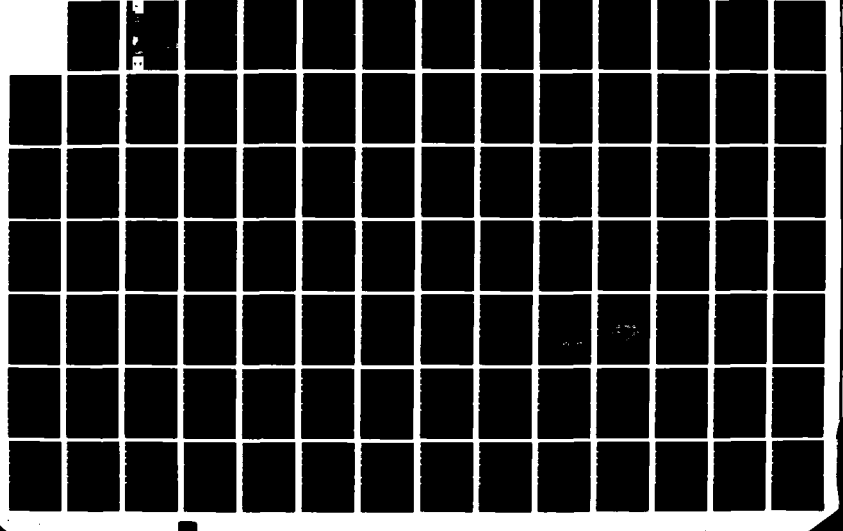

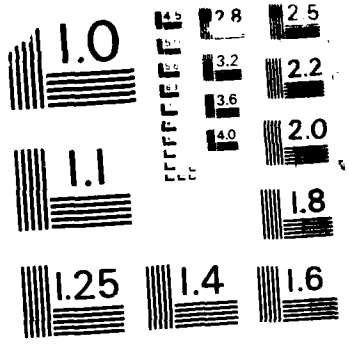

US Army Corps of Engineers

WETLANDS RESEARCH PROGRAM

WETLAND EVALUATION TECHNIQUE (WET)

Volume II: METHODOLOGY

by

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Abstract

This manual outlines a Wetland Evaluation Technique (WET) for the assessment of wetland functions and values. WET is a revision of the method developed for the Federal Highway Administration (FHWA) that has often been referred to as the "Federal Highway Method" or the "Adamus Method".

Wetland functions are the physical, chemical, and biological characteristics of a wetland. Wetland values are those characteristics that are beneficial to society. WET evaluates the following functions and values: ground water recharge, ground water discharge, floodflow alteration, sediment stabilization, sediment/toxicant retention, nutrient removal/transformation, production export, wildlife diversity/abundance, aquatic diversity/ abundance, uniqueness/heritage, and recreation. WET evaluates functions and values in terms of social significance, effectiveness, and opportunity. Social significance assesses the value of a wetland to society in terms of its special designations, potential economic value, and strategic location. Effectiveness assesses the capability of a wetland to perform a function because of its physical, chemical or biological characteristics. Opportunity assesses the opportunity of a wetland to perform a function to its level of capability.

WET evaluates functions and values by characterizing the wetland in terms of predictors. Predictors are simple, or integrated, variables that are believed to correlate with the physical, chemical, and biological characteristics of the wetland and its surroundings. Responses to questions concerning the predictors are analyzed in a series of interpretation keys that reflect the relationship between predictors and wetland functions or values as defined in the technical literature. Interpretation keys assign a qualitative probability rating of HIGH, MODERATE, or LOW to each function and value in terms of social significance, effectiveness, and opportunity.

WET also assesses the suitability of wetland habitat for 14 waterfowl species groups, 4 freshwater fish species groups, 120 species of wetland-dependent birds, 133 species of saltwater fish and invertebrates, and 90 species of freshwater fish. WET does not assess the suitability of wetland habitats for many important wildlife resources (e.g., furbearers, game mammals). Other methods must be used for these species.

WET was designed primarily for conducting an initial, rapid assessment of wetland functions and values. WET can also be applied in a variety of other situations including: (1) comparison of different wetlands, (2) selection of priorities for wetland acquisition or detailed, site-specific research, (3) selection of priority wetlands for Advanced Identification, (4) identification of options for conditioning of permits, (5) determination of the effects of preproject or postproject activities on wetland functions and values, and (6) comparison of created or restored wetlands with reference or preimpact wetlands for mitigation purposes.

WET has been printed as an Operational Draft for review and field testing. Announcements of revisions, modifications, and corrections will be provided in the following free publications:

Environmental Effects of Dredging Information Exchange Bulletin, ATTN: Dr. Robert M. Engler, US Army Engineer Waterways Experiment Station, PO Box 631, Vicksburg, MS 39180-0631

Wildlife Resource Notes, US Army Corps of Engineers Information Exchange Bulletin, ATTN: Mr. Chester O. Martin, US Army Engineer Waterways Experiment Station, PO Box 631, Vicksburg, MS 39180-0631

Review comments and recommendations should be provided to Mr. Ellis J. Clairain, Jr., at the US Army Engineer Waterways Experiment Station, CEWES-ER-W, PO Box 631, Vicksburg, MS 39180-0631.

Preface

The Wetland Evaluation Technique (WET) represents a revision of the Method for Wetland Functional Assessment, Volume II, authored by Mr. Paul R. Adamus under contract to the Federal Highway Administration (FHWA). The FHWA publication is hereafter referred to as Version 1.0. Revisions include modification of the organizational structure; incorporation of additional reference sources; incorporation of changes suggested by numerous reviewers; and development of a computer program for data analysis.

WET is a product of the Wetlands Research Program (WRP) of the Environmental Laboratory (EL), US Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss. WET was authored by Mr. Paul R. Adamus, formerly of Eco-Analysts, Inc., and ARA Inc., and presently at the Environmental Protection Agency (EPA) Corvallis Environmental Research Laboratory, and Messrs. Ellis J. Clairain, Jr., R. Daniel Smith, and Richard E. Young of the Wetlands and Terrestrial Habitat Group (WTHG), EL. The work was sponsored primarily by the Office, Chief of Engineers (OCE), US Army. Partial funding for development of this technique was also provided by the FHWA under Order No. DTFH 61-84-Y-30025. OCE Technical Monitors for the WRP were Dr. Robert J. Pierce and Mr. Phillip C. Pierce. Contracting Officer's Technical Representatives for the FHWA were Messrs. Douglas Smith and Charles DesJardins.

Many agencies, organizations, and individuals contributed to this revision. Soon after the FHWA published Version 1.0, the US Fish and Wildlife Service initiated a workshop sponsored by 17 Federal agencies to critique the method. An Interagency Wetland Values Assessment Coordinating Group (IAWVACG), representing those 17 participating Federal agencies, was formed to coordinate the workshop and provide recommendations. The IAWVACG continues to meet two to three times each year and has been instrumental in the development of WET. The National Wetlands Technical Council held four regional workshops to review Version 1.0 and recommend improvements. EPA sponsored three workshops on bottomland hardwood wetlands which provided valuable technical information relevant to the evaluation of those systems. The State of Washington Department of Ecology held a workshop to examine the state of understanding of wetland functions in the Northwest. A symposium held in Portland, Maine, by the Association of State Wetland Managers, Inc. provided recommendations which improved WET. Version 1.0 has been used in Corps of Engineers (CE) training during the last 2 years, and the students have been instrumental in influencing the development of WET.

In addition, the authors wish to thank the following people for their contributions to this effort: John Kittelson, Jon A. Kusler, Joseph S. Larson, Lyndon Lee, Thomas Muir, Wilma A. Mitchell, L. Jean O'Neil, Thomas H. Roberts, Dana R. Sanders, Sr., J. Henry Sather, Priscilla Slack, Hanley K. Smith, Lauren T. Stockwell, James S. Wakeley, and William O. Wilen.

WET has undergone considerable review and field testing prior to publication; however, it is expected that it will continue to evolve in response to further review, field use, and development of new information concerning wetland functions and values. Users are encouraged to submit their comments to Mr. Ellis J. Clairain, Jr., US Army Engineer Waterways Experiment Station, PO Box 631, Vicksburg, MS 39180-0631.

The work was monitored at WES under the direct supervision of Dr. Hanley K. Smith, Chief, WTHG, and under the general supervision of Dr. Conrad J. Kirby, Chief, Environmental Resources Division. Dr. Dana R. Sanders, Sr., Mr. Russell F. Theriot, and Dr. Robert M. Engler were Managers of the WRP. Dr. John Harrison was Chief, EL.

COL Dwayne G. Lee, CE, was Commander and Director of WES during the preparation of this report. Technical Director was Dr. Robert W. Whalin.

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1.0 INTRODUCTION

This volume of the Wetland Evaluation Technique (WET) outlines the procedure for conducting an assessment of the following wetland **functions*** and **values**:

Ground Water Recharge	Production Export
Ground Water Discharge	Wildlife Diversity/Abundance
Floodflow Alteration	Aquatic Diversity/Abundance
Sediment Stabilization	Recreation
Sediment/Toxicant Retention	Uniqueness/Heritage
Nutrient Removal/Transformation	

WET also assesses the suitability of wetland habitat for 14 waterfowl species groups, 4 freshwater fish species groups, 120 species of wetland-dependent birds, 133 species of saltwater fish and invertebrates, and 90 species of freshwater fish. WET does not evaluate many other important wildlife resources (e.g., game and furbearing mammals). Other evaluation methods must be used to evaluate these other wildlife resources.

1.1 Objective of WET

Traditional methods of assessing wetland functions and values rely on detailed, site-specific studies or, more commonly, on professional judgment. Detailed, site-specific studies can be expensive, time-consuming, and often impractical when time or budgetary constraints dictate the extent of information that can be gathered for the decision making process. Professional judgment is a viable approach, however, it is limited by available expertise, and may suffer from a lack of reproducibility. There is a recognized need in planning and regulatory arenas for an evaluation technique that strikes a balance between these two traditional approaches. The objective of WET is to provide an evaluation technique that: (1) assesses most of the recognized wetland functions and values, (2) is applicable to a wide variety of wetland types, (3) is reproducible and rapid (in the sense that the procedure can be completed in one day or less), and (4) has a sound technical basis in the scientific literature.

1.2 Conceptual Basis of WET

WET evaluates functions and values in terms of **social significance, effectiveness,** and **opportunity.** Social significance assesses the value of a wetland to society due to its special designations, potential economic value, and strategic location. Effectiveness assesses the capability of a wetland to perform a function due to its physical, chemical or biological characteristics. Opportunity assesses the opportunity of a wetland to perform a function to its level of capability.

As an example of social significance, effectiveness, and opportunity consider the wetland function of floodflow alteration. The capability of a wetland to alter floodflow is dependent on several characteristics such as floodwater storage capacity, outlet discharge, and water velocity reduction. As a result of these characteristics, there may be a reduction of flooding

* Throughout this manual bold faced terms are defined in the Glossary (Appendix A).

downstream from the wetland. The floodflow alteration function of a particular wetland will probably have social significance if there are features of social concern or economic value in the area downstream of the wetland that benefit from flood control. A wetland will probably be effective in terms of the floodflow alteration function if it has unrestricted physical space for floodwater expansion and/or physical obstructions that reduce water velocity (i.e., the presence of robust vegetation). A wetland will probably have the opportunity to perform the floodflow alteration function if it is in a watershed capable of producing flood conditions.

WET assesses functions and values by characterizing a wetland in terms of its physical, chemical, and biological processes and attributes. This characterization is accomplished by identifying threshold values for **predictors**. Predictors are simple, or integrated, variables that directly, or indirectly, measure the physical, chemical, and biological processes or attributes of a wetland and its surroundings. Threshold values for predictors are established by addressing a series of questions concerning each predictor. Responses to the questions are analyzed in a series of interpretation keys that define the relationship between predictors and wetland functions and values as defined in the technical literature. The interpretation results in the assignment of a qualitative **probability rating** of HIGH, MODERATE, or LOW to functions and values in terms of social significance, effectiveness, and opportunity.

1.3 Technical Assumptions of WET

The technical assumptions listed below should be understood prior to using WET.

(1) The probability ratings assigned by WET are based strictly on the interpretation of available technical literature concerning wetland functions and values. The technical literature base is deficient in some cases, and the probability ratings assigned by WET reflect this deficiency. WET has not been explicitly calibrated against detailed measures of wetland functions. Most wetlands that are described as being of high value in the literature will also be rated HIGH by WET, however, the converse is not necessarily true. Wetland functions and values rated HIGH by WET may not always be determined to actually be of high value.

(2) WET uses a large number of **predictors** to assign qualitative probability ratings of HIGH, MODERATE, or LOW to wetland functions and values in terms of social significance, effectiveness, and opportunity. Predictors were chosen purposefully for ease of measure or evaluation and vary greatly in terms of the directness and accuracy with which they measure the process or characteristic of the wetland (i.e., the relationship of any single predictor to a function or value may be strong and direct, or weak and circumstantial). Many predictors are redundant in the sense that they provide information that is similar to the information provided by other predictors. Redundant predictors allow for greater flexibility in terms of data availability. When data for preferred predictors are lacking, probability ratings are assigned based on the the cumulative weight of "fallback" predictors.

(3) The qualitative probability ratings assigned by WET are not direct estimates of the magnitude of a wetland function or value. Rather they are an estimate of the probability that a function or value will exist or occur in the wetland (to an unspecified magnitude). For example, WET may assign a HIGH probability rating to a wetland for the ground water recharge function. In reality, the importance of the wetland may be negligible in comparison to the total amount of water that reaches a ground water aquifer from other portions of the watershed.

(4) The development of WET required that criteria be established for the conditions that constituted a HIGH and LOW probability rating for each function and value in terms of effectiveness, opportunity, and social significance. In some cases it was possible to objectively define these criteria. For example, the criteria for a HIGH probability rating, in terms of effectiveness, for the sediment/toxicant retention function is that the wetland trap and retain more sediments and toxicants than it exports on an annual basis. For other functions and values, the selection of criteria for HIGH and LOW probability ratings was a more subjective process. For example, wildlife habitat is a wetland value provided to some degree by virtually all wetlands. What constitutes a HIGH and LOW probability rating, in terms of effectiveness, for wildlife diversity and abundance depends on many factors (e.g., geographic location, management strategy, etc.) and a subjective weighting of these factors.

(5) Interpretation keys are conservative and designed to be rigorous in terms of the criteria that must be met before a HIGH or LOW probability rating is assigned. Therefore, it is normal for an evaluation to have a large percentage of the functions and values being assigned a MODERATE probability rating. Probability ratings do not have quantitative basis. For example, a LOW probability rating does not mean that fewer than 10 percent of all wetlands meet the criteria for a LOW probability rating. However, probability ratings are not totally arbitrary. It is estimated that depending on the function or value, 60 to 80 percent of the wetlands that are described in the literature as performing or possessing a particular function or value would be assigned a rating of HIGH for that particular function or value by WET.

(6) WET is currently designed for use in the contiguous United States. It is not designed for use in Alaska, Hawaii, Puerto Rico, or the Virgin Islands. The authors recognize the desirability of regionalizing WET and recommend using regional versions of WET as they become available. EPA's version of WET for bottomland hardwoods is near completion, and other regional versions are in various stages of development.

(7) Users of WET should have, at a minimum, an undergraduate degree in biology, wildlife management, environmental science, a related field, or several years of experience in one of these areas. Users should also have a working knowledge of the FWS wetland classification system (Cowardin et al. 1979) and should be capable of delineating watershed boundaries using topographic maps. An interdisciplinary team is not required to use WET, however, confidence in the results of the evaluation may be improved if such a team is employed.

1.4 Guidelines for Using WET

WET was designed primarily for conducting an initial, rapid evaluation of wetland functions and values. However, subject to the suggestions below, WET can be applied in a variety of other situations or circumstances including: (1) comparison of different wetlands in terms of their functions and values, (2) selection of priorities for wetland acquisition or more detailed, site-specific research, (3) selection of priority wetlands for Advanced Identification, (4) identification of options for conditioning of permits, (5) determination of the effects of preproject and postproject activities on wetland functions and values, and (6) comparison of created or restored wetlands with reference, or preimpact, wetlands during mitigation,.

To curb potential misuse or misunderstanding of WET in administrative and technical contexts, the following suggestions for use are provided:

(1) WET vs. Professional Opinion.

WET is primarily intended for use by persons who do not have ready access to an interdisciplinary team of technical experts. It is not intended to replace professional opinion. WET lacks regional/site specificity and the "common sense" of an expert, but it is capable of tracking a wider range of functions and values than a single expert. When WET is used in conjunction with expert opinion, results should be compared, and discrepancies identified and resolved.

(2) WET vs. Quantitative Data or Methods.

WET is a "broad brush" approach to wetland evaluation and is not intended to substitute for quantitative data or evaluation methods, when time and manpower resources permit. WET is designed to alert regulators, planners, and other decision makers to the probability that a wetland performs specific functions or values, and does not give the definitive answers that more quantitative data or methods can provide. For example, if available water quality data clearly demonstrate that nutrient retention is occurring, or economic data shows that an area has high recreational value based on existing hunting leases, there would be no point in using WET to assess these functions and values. WET makes provision for using other sources of information for the evaluation of functions and values when appropriate data are available.

(3) Arbitration of Disputes.

Probability ratings resulting from WET provide one of many possible inputs of technical information to the decision-making process. Probability ratings resulting from WET should not be used as the final arbiter of disputes, unless a prior agreement by the parties involved exists. If differences of opinion arise concerning the value of a wetland, the technical basis for a probability rating assigned to a function or value by WET can be pinpointed. This opens the door for resolution of differences through more detailed investigation.

(4) Numerical Values and Overall Probability Ratings.

No satisfactory method exists to synthesize the probability ratings of the different functions and values into an overall probability rating for the wetland. It is inappropriate to assign numerical values to probability ratings and use these values to derive an overall probability rating for the wetland. Similarly, it is inappropriate to assign numerical values to probability ratings, multiply these values by acreage figures, and use these values to derive an overall probability rating for a wetland. Probability ratings assigned by WET do not measure magnitude and consequently the assignment of numerical values to probability ratings are inappropriate and misleading. For example, large wetlands which are rated LOW or MODERATE by WET might be just as important as small wetlands rated HIGH when viewed on a watershed scale.

(5) Full Disclosure.

Many decisions and assumptions must be made during the WET procedure. It is necessary that these decisions and assumptions be fully documented and made available as part of the evaluation results. Documentation must include a completed Form A: Site Documentation, Form B: Evaluation Answer Sheet (annotated to indicate source of information, or basis for response where applicable), Form C: Supplementary Observations (habitat suitability analysis only), and Form D: Evaluation Summary.

(6) Mitigation Decisions.

Under most circumstances WET should not be used to decide whether mitigation should be required. The purpose of WET is to provide one perspective on the level of mitigation effort that is justified after regulatory agencies have decided whether or not mitigation is required. This point is especially pertinent in regions that have experienced great wetland losses.

(7) Comparison With Past or Future Functions and Values.

WET can be used to compare probability ratings of an existing wetland to past or future conditions. Under these circumstances two important limitations must be understood:

(a) Assumptions concerning past or future physical, chemical and biological conditions must be accurate in order for predicted probability ratings to be accurate. For example, WET can be used to predict a probability rating for the sediment stabilization function based upon the assumption that a certain type of vegetation will dominate the wetland. If the vegetation type that actually dominates the wetland turns out to be different than predicted, the probability rating predicted by WET may be incorrect.

(b) WET is built upon correlated variables rather than causative ones; therefore, probability ratings for future conditions should be screened carefully. For example, estuarine wetlands are typically considered ineffective for flood storage. Evaluation of existing and future conditions using WET would key into the estuarine conditions and assign a low rating for both time frames. This does not mean that estuarine wetlands could be totally filled without flood conditions being aggravated. Some degree of "common sense" is required with regard to the type and intensity of impacts.

(8) Cumulative Effects.

WET cannot anticipate cumulative effects on functions and values. It does not necessarily follow that every local wetland rated low could be filled without some deleterious effect resulting from the cumulative loss. Wildlife habitat and floodflow alteration functions and values are lost in a manner that is disproportionate to the loss of wetland acreage. In addition, WET does not account for cumulative effects on certain global functions and values of wetlands (e.g., carbon cycling).

(9) Created Wetlands Performance Criteria.

Mitigation "in-kind" is sometimes prescribed for wetland loss. Normally this implies creation or restoration with wetlands of the same vegetation class. "In-kind" mitigation can also be based on functional equivalence (i.e., the created or restored wetland performs the same functions to a similar degree). WET can be used to help develop design criteria for functional equivalence in created or restored wetlands by identifying wetland characteristics that contribute to a high probability rating for a function or value. The created or restored wetlands should have probability ratings for effectiveness that are at least equivalent with the impact or reference wetland. Functional equivalence based on WET can be used as a yardstick to measure the extent to which a created wetland will mitigate the impacts of a project. In those cases where exact duplication of functions and values is desirable, it is probably best as a safety factor to guard against deficiencies or flaws in the technical literature, to design the created wetland to "look like" the original wetland.

2.0 PREPARATORY TASKS

Read the Introduction (Section 1.0) before conducting an evaluation. Begin the evaluation by completing the tasks outlined in this section (2.0). Continue with evaluation of social significance, effectiveness and opportunity, and habitat suitability. The evaluation sequence is summarized in Figure 1.

2.1 Task 1 - Obtain Information Resources

The first task is to obtain maps, aerial photographs, and other information resources for the wetland to be evaluated as well as the area within a 5 mile radius of the wetland. In addition, if the wetland occurs along a channel, obtain information resources for the area 20 miles downstream from the wetland.

Information resources of primary importance include:

(1) United States Geological Survey (USGS) topographic maps (7.5-minute and 15-minute series)
(2) County Soil Survey published by the Soil Conservation Service (SCS).
(3) Aerial photographs (color infrared is best for vegetation, and sequential years and various seasons are helpful)
(4) National Wetland Inventory (NWI) wetland classification maps from the US Fish and Wildlife Service (USFWS), and the companion publication "Classification of Wetlands and Deepwater Habitats of the United States" (Cowardin et al., 1979)

Additional information resources that may be helpful if available include:

(1) Flood Hazard Maps from the Federal Emergency Management Agency (FEMA) and USGS.
(2) Maps that indicate land use, surficial geology, erosion, fish and wildlife habitat, nonpoint pollution sources, and ground water.
(3) Stream gage or lake level data.
(4) Water quality monitoring or classification data.
(5) Land holdings of resource agencies and private conservation groups.
(6) Regional resource atlases.
(7) Locality listings of rare plants and animals.
(8) Recreational needs and usage inventories.
(9) Fish and wildlife surveys.
(10) Dredging locations.
(11) Natural critical area inventories.
(12) State or local recreational plans (SCORP's)

2.2 Task 2 - Select Type of Evaluation

The second task is to determine the type of evaluation that will be done. WET consists of three evaluation procedures. These include a procedure to evaluate social significance, effectiveness and opportunity, and habitat suitability for species and species groups. The three evaluation procedures are discussed below.

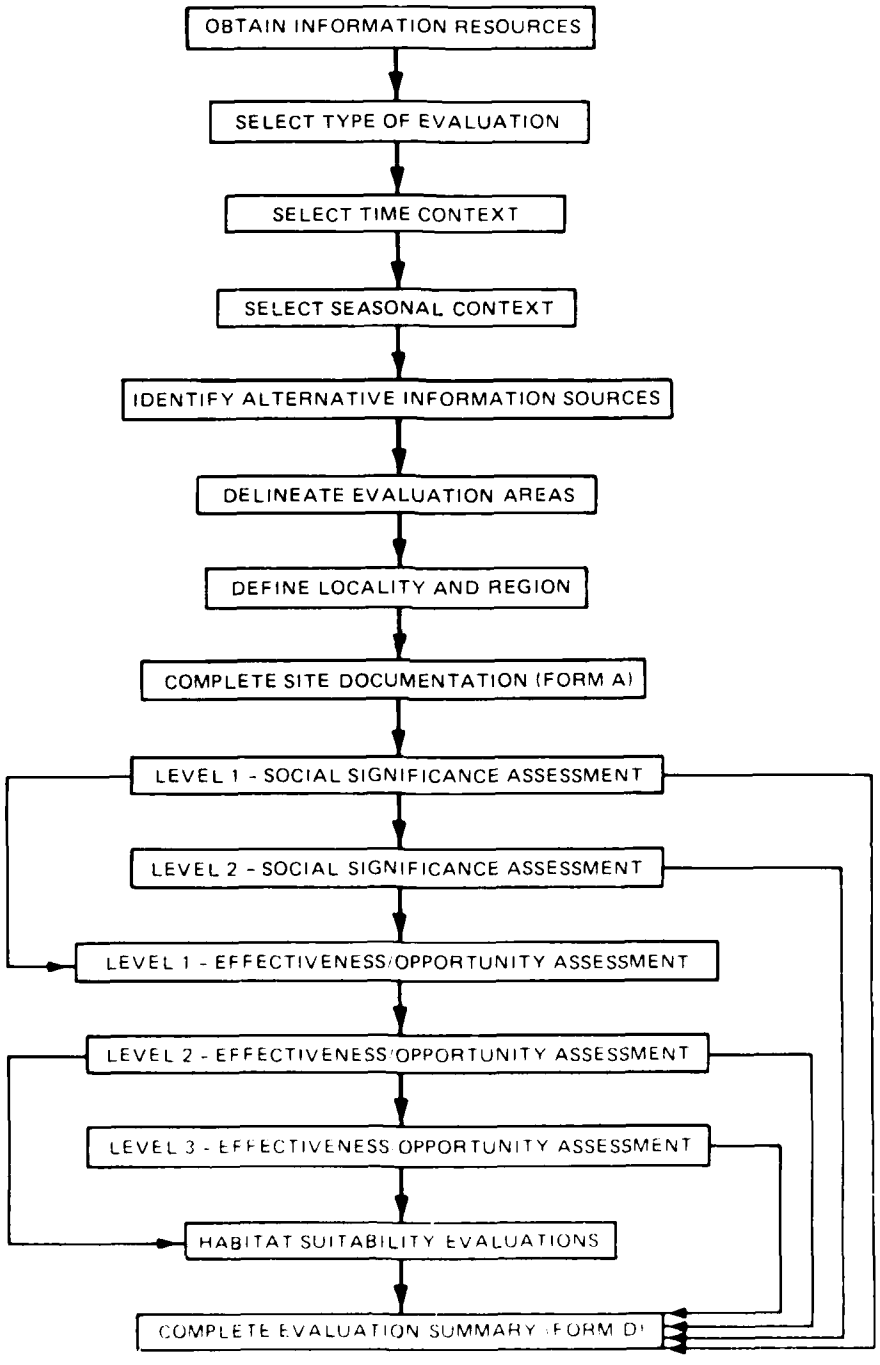


Figure 1. Evaluation Sequence for the Wetland Evaluation Technique

(1) Social Significance Evaluation

Social significance is a measure of the probability that a wetland is of value to society because of its natural features, economic value, official status, and strategic location. The evaluation consists of two levels of assessment. The first level consists of 31 questions designed to determine if the wetland is beneficial to society. Responses to these questions are analyzed in a series of interpretation keys that assign probability ratings of HIGH, MODERATE, or LOW to ten wetland functions and values for social significance. A Level 1 assessment can be completed in 1-2 hours* using the information resources described in Task 1.

The second level of the social significance evaluation refines the probability rating for the uniqueness/heritage value that was assigned during the Level 1 assessment. This refinement is based on the relationship of the evaluated wetland to all other wetlands in a selected area (**context region**). A Level 2 assessment will take several hours to several weeks to complete depending upon the availability of NWI or similar wetland classification maps.

(2) Effectiveness and Opportunity Evaluation

Effectiveness and opportunity measure the probability that a wetland has the capability and opportunity to perform a function. The evaluation has three levels of assessment. Each level consists of a series of questions designed to characterize the wetland and its surroundings in terms of physical, chemical, and biological attributes and processes. Successive levels of assessment build on previous levels to develop an increasingly detailed characterization of the wetland. Corresponding to the increasingly detailed characterization of the wetland is an increased **confidence** in the probability ratings resulting from the assessment. The level of assessment chosen depends on the time and information available, as well as the confidence desired. Experience has shown that the second level of assessment provides an acceptable balance between these three factors for most wetland evaluation situations.

The level 1 assessment can be conducted in the office using the information resources described in Task 1 and will take 1-2 hours to complete. The level 2 assessment requires visiting the wetland site for observation and data collection and will require approximately 1-3 hours to complete. The level 3 assessment requires a visit to the wetland site and, in addition, requires detailed (and in some cases long term) physical, chemical, and biological monitoring data from the wetland site. The time required for a level 3 assessment varies depending on the size and complexity of the wetland.

Responses to the questions in levels 1-3 are analyzed in a series of interpretation keys that assign probability ratings of HIGH, MODERATE, or LOW to eleven wetland functions in terms of effectiveness, and three wetland functions in terms of opportunity.

* Time estimates do not include collection of information resources or travel.

The interpretation keys that assign probability ratings for effectiveness and opportunity were constructed with the assumption that information gathered during the level 1 and 2 assessment would be available for analysis. The probability ratings that result from the interpretation keys when only the information gathered during a level 1 evaluation is used have not been validated to date; therefore, it is recommended that evaluations of effectiveness and opportunity be conducted at assessment level 2 or 3.

(3) Habitat Suitability Evaluation

This evaluation assesses the suitability of wetland habitat for groups of waterfowl species and fish species exhibiting similar habitat requirements as well as wetland dependent bird species, freshwater fish species, and saltwater fish and invertebrate species. The assessment relies on the characterization of the physical, chemical, and biological attributes of the wetland developed for the effectiveness and opportunity evaluation. Responses are analyzed in a series of interpretation keys which assign probability ratings of HIGH, MODERATE, or LOW to the species or species group being evaluated.

2.3 Task 3 - Select Time Context

The next task is to establish the time context of the evaluation. The majority of WET evaluations are conducted on wetlands as they presently exist. However, WET may be used to assign probability ratings to functions and values for preimpact or postrestoration wetlands if historical or predictive data are available. Probability ratings for past or future conditions are dependent entirely on the validity of the historical or predictive data used. Data that are poorly supported or documented will result in questionable probability ratings for functions and values.

2.4 Task 4 - Select Seasonal Context

Variation in water levels from season to season in some wetlands may have an effect on wetland functions, therefore, certain aspects of wetland functions should be assessed in terms of average, wet, and dry seasonal conditions. Average, wet, and dry conditions are defined differently depending upon the context. Definition of average, wet, and dry in different contexts are as follows:

(1) Average

(a) Hydrology: intermediate between average annual wettest and driest condition.
(b) Vegetation: maximum annual standing crop.
(c) Tidal: the average daily high tide condition.

(2) Wet

(a) Hydrology: wettest time of an average year.
(b) Vegetation: midpoint of the growing season
(c) Tidal: the average monthly high tide condition (spring tide).

(3) Dry:

(a) Hydrology: driest time of an average year.
(b) Vegetation: dormant time of the year.
(c) Tidal: the daily midtide condition.

It may be difficult to characterize a wetland in terms of average, wet, and dry conditions in regions of the country where precipitation conditions vary greatly from year to year (i.e., drought cycles) or where seasonal precipitation conditions are indistinct. If a wetland is located in a region where these conditions exist, the wetland should be evaluated in the context of an average annual condition only.

2.5 Task 5 - Identify Alternative Information Sources

In some cases it may be appropriate to assess a function or value using information from another source. Alternative sources of information for assessment could result from other evaluation methods such as the Habitat Evaluation Procedure (HEP), detailed field data (e.g., water quality analysis), analytical methods (e.g., physical or mathematical models), or a consistent consensus of opinion among professional specialists who have examined the wetland. When functions or values are assessed using information from alternative sources, the nature and origin of the information should be included with documentation of the WET evaluation.

2.6 Task 6 - Delineate Evaluation Areas

Delineate the following areas on a topographic or other suitable map.

(1) The **assessment area (AA)** and **impact area (IA)** (if applicable)
(2) The **input zone (IZ)**
(3) The **watershed** of the AA
(4) The **service area(s)** of the AA
(5) The watershed of the service area(s)

Guidelines for delineating the evaluation areas are provided in Sections 2.6.1-2.6.4. Follow the guidelines as closely as possible because the validity of the evaluation is linked to these standardized definitions and delineation procedures. Any deviation from these guidelines should be explained and included with documentation of the WET evaluation.

2.6.1 Delineation of the Assessment Area

The AA is the area that will be assessed for functions and values. The primary goal in delineating the AA is to identify an area that is characterized by a high degree of hydrologic interaction and interdependence (i.e., unconstricted movement and interchange of surface water).

Delineation of the AA is straightforward when a wetland is in a small, topographic depression where a high degree of hydrologic interaction occurs. In this situation, the AA simply includes all wetland and **deepwater** areas within the topographic depression. Delineation of the AA becomes more difficult as the size of the topographic depression increases and/or hydrologic interactions become more complex.

General guidelines for delineation of the AA are as follows. Identify the wetland area of interest. This may be the site of a proposed impact, a mitigation site, an advanced identification area, environmental assessment site, etc. Next, identify physical points of hydrologic change in the wetland and **deepwater** area surrounding the wetland area of interest. Physical points of hydrologic change include natural (geomorphic) or man made (e.g., road crossings) constrictions, points where gradient changes rapidly, points of significant inflow (e.g., tributaries), or places where other factors that limit hydrologic interaction. Finally, delineate the boundary of the AA to include the wetland area of interest and contiguous wetland/deepwater with a high degree of hydrologic interaction. When the wetland area of interest is large, several AA may have to be delineated in order to meet the criteria of hydrologic interaction. Each AA delineated within the area of interest must be evaluated separately.

Guidelines for delineating the AA in specific situations are outlined below (this information is presented in a hierarchical key in Appendix D):

(1) Detailed Field Measurements

If detailed field measurements indicate a high degree of hydrologic interaction between two wetland/deepwater areas include them in the same AA. If little or no evidence of hydrologic interaction is evident, delineate the wetland/deepwater areas as separate AA's.

(2) Wetlands Along a Channel

Wetlands along a channel can be classified as fringe or nonfringe based upon a ratio of wetland width to channel width. Fringe wetlands cumulatively occupy (both sides of the channel) less than three times the width of the channel on a line perpendicular to the flow. Nonfringe wetlands cumulatively occupy more than three times the width of the channel on a line perpendicular to flow.

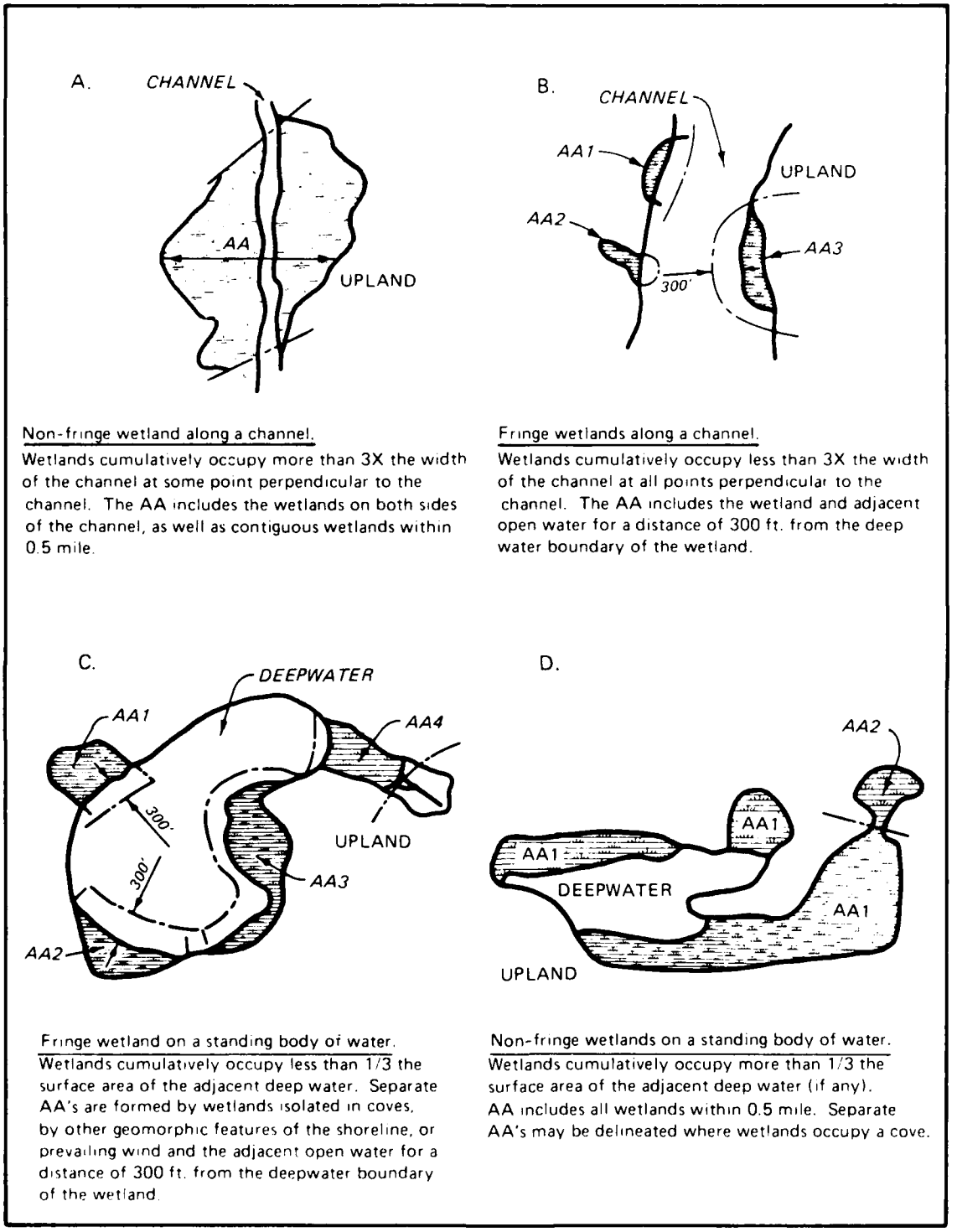
Constrictions are common points of hydrologic change on a channel, and are defined as a point where the channel/floodplain narrows to one-third, or less, the width of the widest upstream or downstream channel/floodplain.

(a) Fringe Wetlands on a Channel

If the area of interest is a fringe wetland (cumulatively less than three times the width of the channel), delineate the AA to include wetlands on one side of the channel as well as deepwater in the adjacent channel up to a distance of 300 ft past the 6.6 ft depth contour. Upstream and downstream boundaries of the AA should be drawn at points of hydrologic change (Figure 2B).

(b) Nonfringe Wetlands on a Channel

If the area of interest is a nonfringe wetland (cumulatively more than three times the width of the channel), delineate the AA to include wetlands on both sides of the channel as well as the channel itself. Upstream and downstream boundaries should be drawn at points of hydrologic change (Figure 2A).



Non-fringe wetland along a channel.
Wetlands cumulatively occupy more than 3X the width of the channel at some point perpendicular to the channel. The AA includes the wetlands on both sides of the channel, as well as contiguous wetlands within 0.5 mile.

Fringe wetlands along a channel.
Wetlands cumulatively occupy less than 3X the width of the channel at all points perpendicular to the channel. The AA includes the wetland and adjacent open water for a distance of 300 ft. from the deep water boundary of the wetland.

Fringe wetland on a standing body of water.
Wetlands cumulatively occupy less than 1/3 the surface area of the adjacent deep water. Separate AA's are formed by wetlands isolated in coves, by other geomorphic features of the shoreline, or prevailing wind and the adjacent open water for a distance of 300 ft. from the deepwater boundary of the wetland.

Non-fringe wetlands on a standing body of water.
Wetlands cumulatively occupy more than 1/3 the surface area of the adjacent deep water (if any). AA includes all wetlands within 0.5 mile. Separate AA's may be delineated where wetlands occupy a cove.

Figure 2. Delineating the assessment area of fringe and nonfringe wetlands

(3) Wetlands On a Standing Body of Water

Wetlands on a standing body of water (e.g., lakes, ponds, estuaries, etc.) can be classified as fringe and nonfringe based on the ratio of wetland to surface area of the body of water. Fringe wetlands cumulatively occupy less than one-third the surface area of the body of water. Nonfringe wetlands cumulatively occupy more than one-third the surface area of the body of water.

Constrictions on a standing body of water are defined as a point where the wetland/deepwater width is one-tenth, or less, of the widest, adjacent wetland/deepwater area.

(a) Fringe Wetlands on a Standing Body of Water

Fringe wetlands on a body of water may be separated from other fringe wetlands by constrictions, peninsulas, or other conditions such as prevailing winds. In this situation, identify the fringe wetland that contains the area of interest. Delineate the AA to include the fringe wetland and the adjacent deepwater areas up to a distance of 300 ft. past the 6.6 ft. depth contour (Figure 2C).

(b) Nonfringe Wetlands on a Standing Body of Water

If the area of interest is in a nonfringe wetland, delineate the AA to include all wetlands and contiguous deepwater areas on the standing body of water. If **coves** or constrictions are present, separate AA's may be delineated (Figure 2D).

(4) Large Wetlands

In areas of extensive wetland there may be no obvious point of hydrologic change within a practical distance. In this situation it may be desirable to evaluate a representative subsample of the AA. The following guidelines are suggested. For wetlands along a channel, draw upstream and downstream boundaries of the AA to include **contiguous** wetland/deepwater areas within 1/2 mile of the area of interest. Draw lateral boundaries to include contiguous wetland/deepwater areas within 1/2 mile of the channel. For wetlands on a standing body of water, draw the AA boundary to include wetland/deepwater areas within 1/2 mile of the area of interest.

(5) Impact Area

In certain situations it may be desirable to evaluate a small portion of an AA. This may be the case when a localized impact is proposed, or a mitigation project has been implemented. Under these circumstances the following procedure should be followed. First, delineate an AA as outlined above, and conduct an evaluation for the AA. Second, delineate an **impact area (IA)** within the AA and conduct an evaluation for the IA. Delineate the IA by identifying the area that will (or already has in the case of a mitigation site) undergo significantly different impacts than the rest of the AA. Results of the evaluations for both the AA and IA should always be presented together. It should

be noted that evaluating a portion of the AA may violate the assumption of hydrologic interaction and interdependence on which delineation of the AA is based. Consequently, the probability ratings that result from the evaluation of an IA are likely to be less accurate than probability ratings that result from the evaluation of the AA.

2.6.2 Delineation of the Input Zone

The **input zone** is an area surrounding the AA that may have significant impact on the AA in terms of sediments, nutrient, or contaminant input. The input zone includes the area 300 ft upslope from the AA boundary. On tributaries, extend the boundary of the input zone 100 ft (upstream) for each 10 ft of tributary width at its entry point to the AA and include the areas on both sides of tributary channels (permanent and intermittent) for a distance of 300 ft upslope.

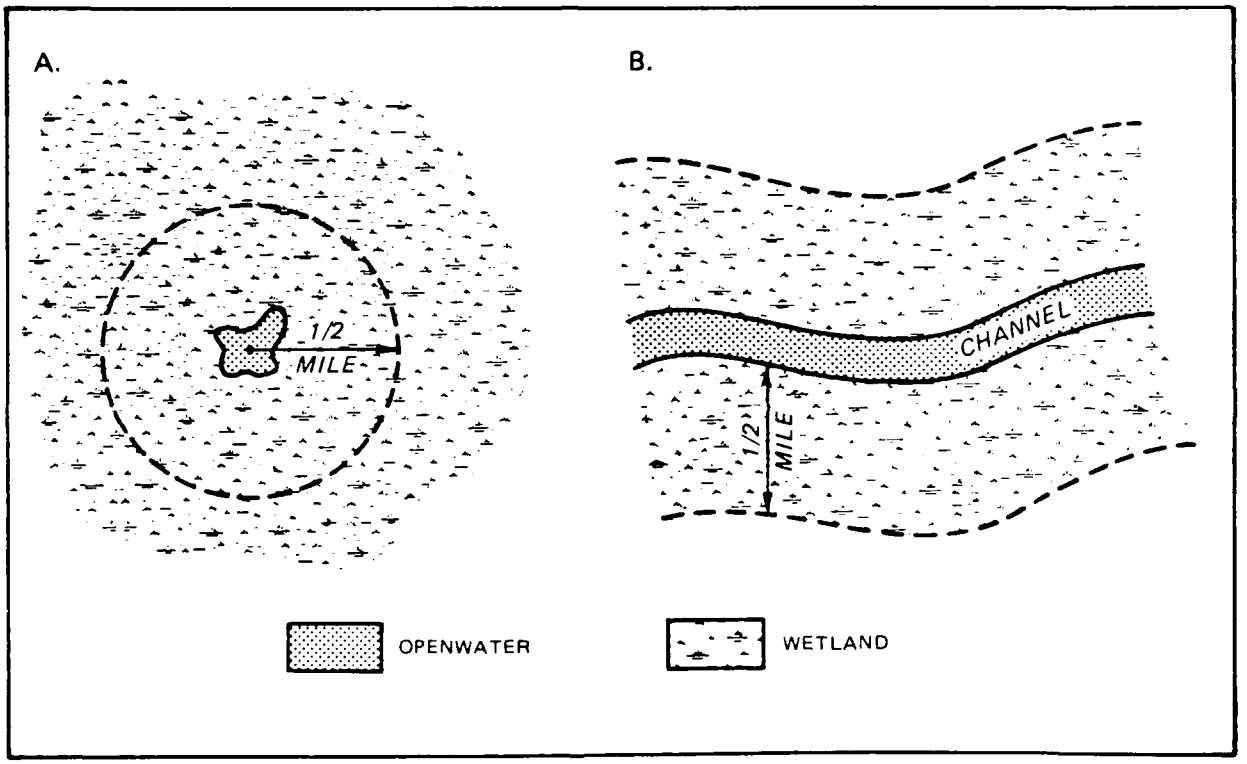


Figure 3. Delineation of the assessment area in large wetlands

2.6.3 Delineation of the Watershed

Guidelines for delineating the watershed for fringe and nonfringe wetlands are as follows:

(1) The watershed of tidal fringe wetlands and nontidal fringe wetlands on large lakes (e.g., greater than 10 sq. mi.), includes the area **upslope** of the AA from which water flows into the AA, or until a dam is reached. It does not include the watershed of **contiguous** wetland/deepwater areas.

(2) The watershed of nontidal fringe wetlands and all nonfringe wetlands includes the area upslope of the AA from which water flows into the AA, or until a dam is reached. In addition, the watershed of the AA includes the watershed of contiguous wetland/deepwater areas if water from these areas enter the AA (e.g., flooding).

For practical purposes it is not necessary to actually delineate the watershed of the AA on a map for a distance greater than 5 miles upstream. It will be necessary to estimate the estimate the size of the total watershed in sq. mi. (i.e., less than 1 mile^2, 1-100 miles^2, 100-2,500 miles^2, or greater than 2,500 miles^2).

2.6.4 Identification of Service Area and Delineation of Service Area Watershed

Services are wetland functions or values which have a fairly well defined, off-site delivery point. The **service area** is the point to which the service is delivered. For example, the delivery point for the floodflow alteration function may be a town downstream from the wetland. Similarly, the delivery point for the sediment/toxicant retention function may be a dredged channel downstream from the wetland. The potential exists for any number of service areas to occur downstream from the AA. It is also possible that there is no identifiable service area downstream.

The ability of a wetland to provide services diminishes with increasing distance downstream from the wetland. The following guidelines, derived in part from the simulation study of Ogawa and Male (1983), have been developed to gauge this diminished effect.

(1) If the wetland is nontidal and:

(a) the **watershed** of the AA covers less than 20 square miles, consider service areas within 5 miles downslope from the AA's outlet (or until a dam is reached) to potentially benefit from wetland services.

(b) the watershed of the AA covers more than 20 square miles, then consider service areas within 10 miles downslope of the AA's outlet (or until a dam is reached) to potentially benefit from wetland services.

(2) If the wetland is tidal and:

(a) the AA is 100 acres or less, consider service areas within 1000 ft of the AA to be potential beneficiaries of wetland services.

(b) the AA is larger than 100 acres, consider service areas within 2 miles of the AA to be potential beneficiaries of wetland services.

The watershed of each service area includes the entire source area for waters that reach the service area as surface runoff or channel flow. The watershed of each service area will be different; that is, each successive downslope service area will include the watershed of the previous service area(s) as well as any new watershed area whose contributions enter below the closest upstream service area.

2.7 Task 7 - Define Locality and Region

In some instances during the evaluatio it is necessary to assess the wetland in the context of a larger surrounding area. Two areas are defined for this purpose. **Locality** is a relativley small political or hydrologic area (e.g., township, county, section, watershed, or similar hydrologic division). **Region** is a larger political, ecological, hydrologic, or jurisdictional area (e.g., state, ecoregion, flyway, Corps District, EPA Region, hydrologic unit) which is relatively homogeneous in terms of topography and landscape pattern.

Ideally, the selection of locality and region will be based on the availability of quantitative data concerning wetland types and their loss rates for a locality or region. However, this type of quantitative data is often unavailable. If quantitative data is unavailable, select the most geographically restricted area as the locality, and favor the use of hydrologic criteria over geopolitical criteria. Similarly, in selecting region, use the most geographically restricted area that is larger than locality, and favor the use of hydrologic criteria over geopolitical criteria.

2.8 Task 8 - Complete Form A: Site Documentation

Form A documents general information about the wetland being evaluated. It serves as a useful reference throughout the evaluation procedure and as documentation of the evaluation following its completion. Turn to Form A (Appendix A) and complete Part 1.

Complete Part 2 of Form A by sketching a map, or attaching a copy of the topographic map. Include in the sketch, or on the map (if it is not already indicated), the additional information itemized in Part 2 of Form A. In addition, determine the size of each of the following areas and record your answers in Part 2 of Form A.

(1) The AA acreage
(2) The IA acreage (if applicable)
(3) The watershed acreage of the AA
(4) The wetland acreage within the AA (AA acreage minus deepwater acreage)
(5) The wetland acreage within the watershed of the closest service area (watershed acreage minus upland and deepwater acreage)
(6) The wetland/deepwater acreage within the watershed of the closest service area

This completes the preparatory tasks. Begin the evaluation for social significance on the next page.

3.0 SOCIAL SIGNIFICANCE EVALUATION

Social significance assess a wetland in terms of its special designations, potential economic value, and strategic location. The evaluation consists of two levels of assessment. The first level consists of 31 questions designed to determine if the wetland has specific characteristics that indirectly indicate it may be performing functions and values beneficial to society. Responses to these questions are analyzed in a series of interpretation keys that assign probability ratings of HIGH, MODERATE, or LOW to ten wetland functions and values for social significance. A Level 1 assessment can be completed in 1-2 hours using the information resources described in Task 1.

Read the instructions for Form B (page B-4) before starting the social significance evaluation. Record your answers to the following questions in the appropriate section of Form B.

3.1 Social Significance Evaluation - Level 1 Assessment

3.1.1 "Red Flags"

1. Are any Federal or State endangered or threatened species (including officially designated "candidate" species) known to use the AA regularly? (uniqueness/heritage)**

2. Is the AA/IA part of an area owned by an organized conservation group or public agency for the primary purpose of preservation, ecological enhancement, or low-intensity recreation? For example, a park, refuge, scenic route, water bank or conservation easement, historic site, marine or estuarine sanctuary, wilderness or primitive area, landmark area, public recreation area, or research natural area. (uniqueness/heritage)

3. Is the AA/IA included in a statewide listing of historical or archaeological sites? (uniqueness/heritage)

4. Is the AA/IA known to have ecological or geological features consistently considered by regional scientists to be unusual or rare for wetlands in the **region**? (Answer "N" if the type is merely sensitive or threatened, answer "Y" only if the AA is indeed rare among regional wetland types.) Examples include:

   (a) Peat bogs in southern New England.
   (b) Fens in some parts of the Midwest.
   (c) Cypress swamps in northern states.
   (d) Spring communities in various regions.
   (e) Wild rice producing wetlands in the north-central U.S.
   (uniqueness/heritage)

* The AA/IA designation indicates the question should be answered for the AA or IA whichever is appropriate for the evaluation. See page 22 for discussion and delineation of the IA.

** The parenthetical phrase following each question indicates which function or value the question addresses.

5. Does the AA/IA represent most or all of this **wetland system** (e.g., estuarine, palustrine, lacustrine, etc.) in this **locality**? (all functions)

6. Have substantial public or private expenditures been made to create, restore, protect, or ecologically manage the AA/IA? Examples include, costs to resource agencies for conservation purchase, seeding, fencing, maintenance, water quality improvements, installation of fishways or impoundments, and improved accessibility. (uniqueness/heritage)

3.1.2 On-Site Wetland Social Significance

7. (Answer "I" if the AA is tidal.) Are there biological communities in the AA that are stressed by saline springs or abnormally high salinities, or are there wetlands **contiguous** with the AA where this situation exists? (ground water discharge)

8. (Answer "I" if AA is tidal.) Are there point sources of pollution (e.g., hazardous waste sites) or other features of social or economic value (e.g., buildings in incorporated areas, industrial developments, etc.) within or adjacent to the AA that might be inundated by flooding of the AA? (floodflow alteration)

3.1.3 Off-Site Wetland Social Significance

For Questions 9-14, consider the "area specified" to be the same downstream area used during the identification of service areas (see page 24).

9. (Answer "I" if tidal.) Are there features of social or economic value within the 100 year floodplain of the area specified or has a dam, with the primary purpose of flood control, been proposed within 5 miles upstream or downstream of the AA? (floodflow alteration)

10. Are any of the following features present within the area specified?

    (a) Harbors, channels, stormwater detention ponds, or reservoirs that are dredged or cleaned regularly.
    (b) Artificial recharge pits.
    (c) Fish spawning areas that are known to be sensitive to siltation.
    (d) Commercial shellfish beds.
    (e) Areas known to be in violation of Section 401 of the Clean Water Act water quality standards due to suspended solid or toxicant levels. (sediment/toxicant retention)

11. Are there bodies of water, within the area specified, that have been targeted by government agencies as "priority areas" for construction of wastewater treatment facilities or other water quality improvement projects because they violate official water quality standards (e.g., Section 401) for metals, organics, suspended solids, nitrogen, or phosphorous? (nutrient removal/transformation, sediment/toxicant retention)

12. Is there **surface water** within the AA or the area specified that is a major source of drinking water? (nutrient removal/transformation, sediment/toxicant retention)

13. Are either of the following conditions present in the area specified?

(a) Bodies of water known to be especially nutrient-sensitive or subject to regular blooms of algae, aquatic fungi, or oxygen-related fish kills.

(b) Bodies of water known to be in violation of Section 401 water quality standards due to nutrient levels (e.g., nitrogen, phosphorous). (nutrient removal/transformation)

14. Are there swimming/bathing areas that are used frequently in the area specified? (nutrient removal/transformation)

If any of Questions 9-14 were answered "Y," refine your answers using the following procedure:[1]

(a) Determine if condition (1) or (2) below is true. If either of these conditions is true, do not change the original "Y" answer(s) in Questions 9-14 and continue with Question 15. If neither condition (1) or (2) below is true go to (b).

(1) The land cover of the watershed of the service area closest to the AA is covered by more than 10% **impervious surface.**

(2) Wetlands and open water (excluding the AA) comprise less than 7% of the watershed of the service area closest to the AA.

(b) Determine if either of the conditions (1) or (2) above is true for the remaining service areas that were identified. If <u>either</u> of the conditions is true for <u>any</u> of the remaining service areas, do not change the original "Y" answer(s) to Questions 9-14 and continue with Question 15. If <u>neither</u> of the conditions is true for <u>any</u> of the remaining service areas, change all original "Y" answers in Questions 9-14 to "N", then continue with Question 15.

<u>Guidelines</u>:

[1] The rational for this refinement is as follows. Wetlands within a service area watershed with extensive areas of impervious surface, and/or few wetland/deepwater areas, are of greater relative importance in terms of providing functions and values than wetlands within a service area watershed with an insignificant area of impervious surface, and/or extensive wetland/deepwater areas

For Questions 15-18, consider the "area specified" to be the area within 2 miles of the AA's perimeter <u>and</u> within the same watershed.

15. (Answer "I" if tidal.) Does a threatened or endangered species that is **wetland-dependent** regularly inhabit the area specified? (ground water discharge)

16. (Answer "I" if tidal.) Are any of the following features present in the area specified?

(a) Sites designated by US Environmental Protection Agency (USEPA) as Sole Source Aquifers or Class II (Special) Ground Waters.

(b) Wells that serve at least 2,500 people (people using the well may be living outside the area specified).

(c) Actively used wells with yields that are greater than the yields shown for this region on the map in Figure 4.

(d) Wells that are within a major alluvial valley (i.e., watershed area of at least 100 square miles) and have yields exceeding 2,500 gallons per minute. (ground water recharge, ground water discharge)

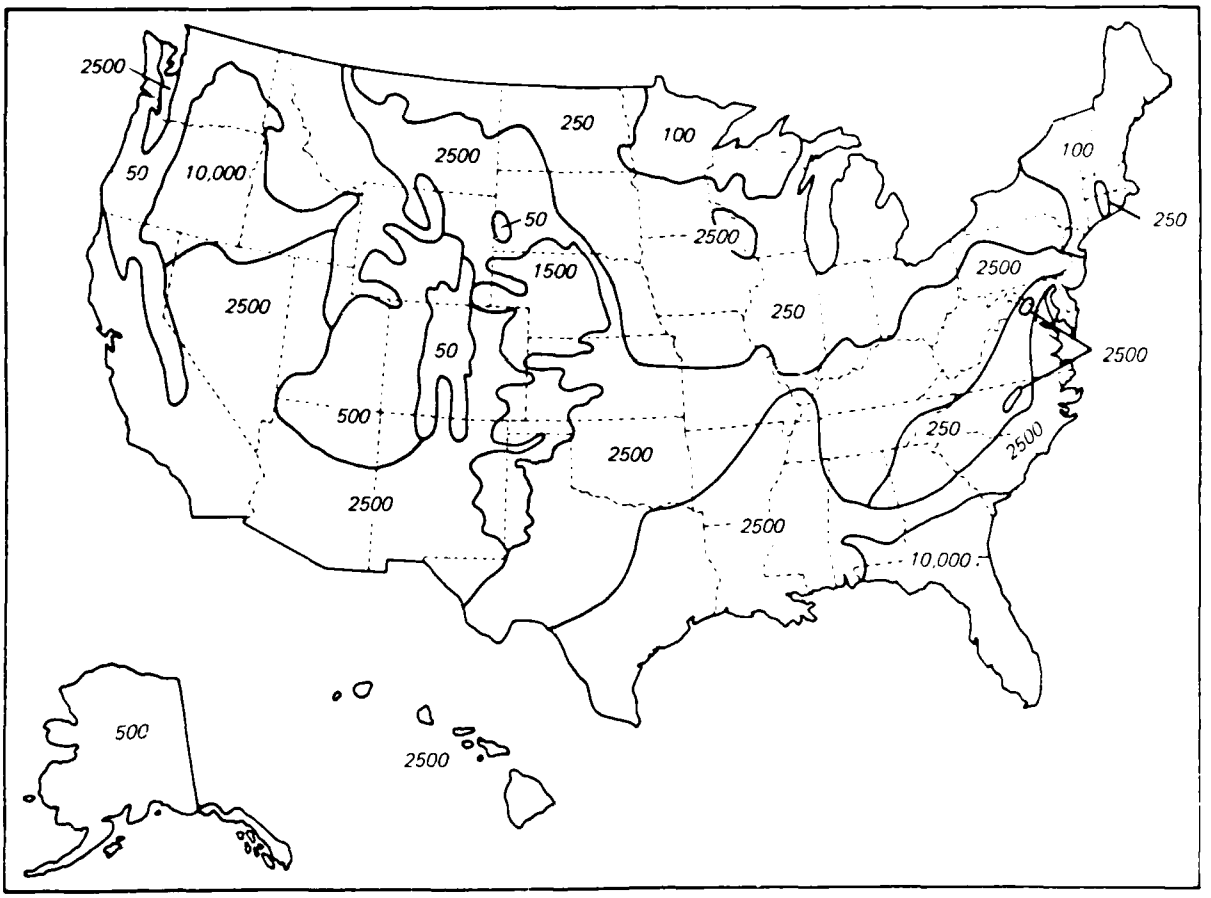


Figure 4. Ground water regions of the United States with exceptional well yields in gallons per min (USGS, 1970)

17. (Answer "I" if tidal.) Do well yields in the area specified surpass the criteria described in Question 16(c) or does the AA empty into an area (within 2 miles) where fish or wildlife use has been critically limited by excessively low water flow or low water level during dry years? (ground water recharge, ground water discharge)

18. (Answer "I" if none of Questions 9-17 were answered "Y.") Is either of the following conditions true for any of Questions 9-17 that were answered yes?

    (a) The AA is the only AA in the watershed of the closest service area.

    (b) The AA is closer to the service area where the service identified in the question is delivered, than any other AA (that could be delineated if desired) in the watershed of the closest downstream service area. For example, in Question 12, the AA is closer to the service area to which drinking water is being supplied than any other AA in the watershed of the closest service area. (all functions)

19. Does the AA/IA act as a buffer to features of social or economic value that are situated in erosion-prone or wave-vulnerable areas? (sediment stabilization)

20. Is any of the following true?

    (a) The AA/IA supports at least one fish species that is on USFWS National Species of Special Emphasis List (Table 1) and is rare or declining in the **region.**

    (b) The AA/IA has a State or Federal special designation relating to its recognized fishery value.

    (c) There is commercial fishing or shellfishing with the AA/IA. (aquatic diversity/abundance)

21. Is any of the following true?

    (a) The AA/IA supports at least one wildlife species that is on USFWS National Species of Special Emphasis List (Table 1) and is rare or declining in the **region.**

    (b) The AA/IA has a State or Federal special designation relating to its recognized wildlife value.

    (c) A fee is charged at the AA/IA for consumptive (hunting) or nonconsumptive (observation) use of wildlife. (wildlife diversity/abundance)

22. (Answer "I" if less than 1 acre of open water is present in the AA.) Is the AA in a waterfowl use region of major concern as defined by FWS (Figure 5) or has it received a priority rating in state waterfowl management concept plans? (wildlife diversity/abundance)

Table 1. National Species of Special Emphasis (Source: USFWS, unpubl. data)

MAMMALS:
- Grizzly Bear
- Polar Bear
- Black-Footed Ferret
- Sea Otter:
  - Southern
  - Alaskan Population
- Gray Wolf:
  - Eastern
  - Rocky Mountain
  - Mexican
- Pacific Walrus
- West Indian Manatee

BIRDS:
- Brown Pelican:
  - Eastern
  - California
- Tundra Swan:
  - Eastern Population
  - Western Population
- Trumpeter Swan:
  - Interior Population
  - Pacific Coast Population
  - Rocky Mountain Population
- Greater White-Fronted Goose:
  - Eastern Mid-Continent Population
  - Western Mid-Continent Population
  - Tule
  - Pacific Flyway Population
- Snow Goose:
  - Greater,
    Atlantic Flyway Population
  - Lesser,
    Mid-Continent
  - Western Central Flyway Population
  - Western Canadian Arctic Population
  - Wrangel Island Population
- Brant:
  - Atlantic Population
  - Pacific Population
- Canada Goose:
  - Atlantic Flyway Population
  - Tennessee Valley Population
  - Mississippi Valley Population
  - Eastern Prairie Population
  - Great Plains Population
  - Tall Grass Prairie Population
  - Hi-Line Population
  - Short Grass Prairie Population
  - Western Prairie Population
  - Rocky Mountain Population
  - Pacific Population
- Canada Goose (cont.)
  - Lesser (Pacific Flyway Population)
    - Vancouver
    - Dusky
    - Cackling
    - Aleutian
- Northern Pintail
- Wood Duck
- Black Duck
- Mallard
- Canvasback:
  - Eastern Population
  - Western Population
- Ring-Necked Duck
- Redhead
- California Condor
- Osprey
- Bald Eagle:
  - Southeastern Population
  - Chesapeake Bay Population
  - Northern Population
  - Southwestern Population
  - Pacific State Population
  - Alaskan Population
- Golden Eagle:
  - Western Population
- Peregrine Falcon:
  - Eastern Population
  - Rocky Mountain Population
  - Southwestern Population
  - Pacific Coast Population
  - Alaskan Population (Arctic, American and Peal's)
- Attwater's Greater Prairie Chicken
- Masked Bobwhite
- Clapper Rail:
  - Yuma
  - Light-Footed
- Sandhill Crane:
  - Eastern Population-Greater
  - Mid-Continent Population-Lesser
  - Canadian-Greater
  - Rocky Mountain Population-Greater
  - Lower Colorado Population-Greater
  - Central Valley Population greater
  - Pacific Flyway Population-Greater
- Whooping Crane
- American Woodcock
- Piping Plover

(Continued)

Table 1. (Concluded)

BIRDS
- Least Tern:
  - Interior
  - Eastern
  - California
- Roseate Tern
- White-Winged Dove
- Spotted Owl (Northern)
- Red-Cockaded Woodpecker
- Kirtland's Warbler

REPTILES AND AMPHIBIANS:
- American Alligator

FISH:
- Sockeye Salmon (Alaskan)
- Coho Salmon:
  - Non-Alaskan U.S. Stock
  - Alaskan Stock
- Chinook Salmon
- Cutthroat Trout (Western United States)
- Steelhead Trout
- Atlantic Salmon
- Lake Trout (Great Lakes)
- Striped Bass
- Cui-ui

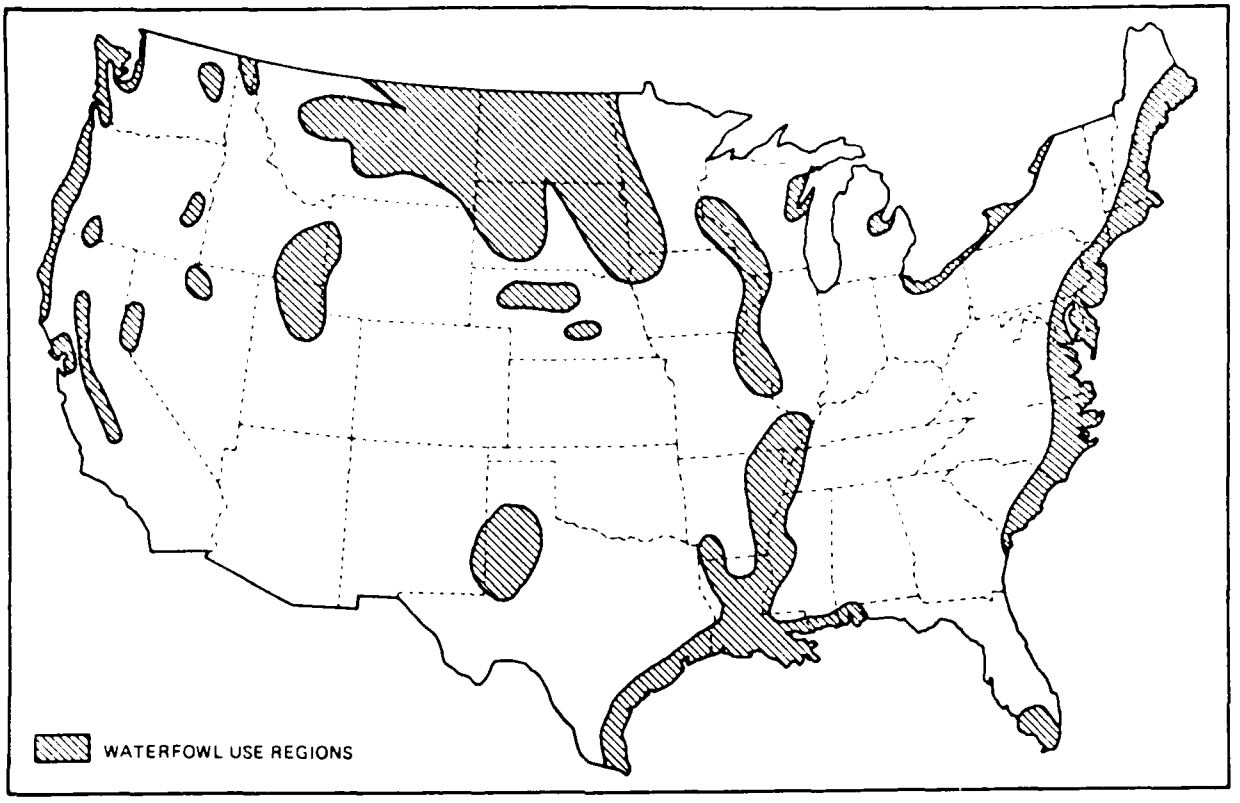


Figure 5. Waterfowl use regions of major concern (Source: USFWS, unpubl. data)

23. Does this AA/IA support plant or animal species with exceptionally narrow habitat requirements or of extremely limited occurrence in this **region** (e.g., desert pupfish)?[1] (wildlife diversity/ abundance, aquatic diversity/abundance, uniqueness/heritage)

Guidelines:

[1] Species for which less than 1% of the other wetlands in the same **class** (e.g., **emergent, forested, scrub/scrub**) provide acceptable habitat.

24. (Answer "N" if the AA is less than 5 acres in size.) Is the AA/IA the closest wetland to any nature center, school, camp, college, or similar educational facility, and is it within 2,000 ft of a public road where parking is allowed? (uniqueness/heritage)

25. Is the AA/IA part of, and essential to, an ongoing, long-term environmental research or monitoring program? (uniqueness/heritage)

26. Is the AA and its **watershed** a "pristine" natural area, in the sense of having no lasting, direct or indirect, human alteration? (uniqueness/heritage)

27. Is the AA/IA used regularly for recreational or consumptive activities, for which opportunities are otherwise locally deficient as recognized by a local or state recreational plan (e.g., SCORP)? (recreation)

28. Is the AA/IA a major public access point to a recreational waterway? (recreation)

29. Is the AA located in an **urban area**? (all functions)

For Questions 30 and 31, if data for a more restricted region or geographic area are available, substitute it for the state data shown in Table 2.

30. Is the AA located in a state that is losing wetlands at a rate greater than, or equal to, the national annual average of 0.42%/year (Table 2)? (all functions)

31. Is the AA's wetland acreage (expressed as a percent of the acreage of wetlands in the watershed of the closest service area) greater than the annual percentage loss rate of wetlands for the state (Table 2)? For example, if the watershed of the closest service area has 200 acres of wetland and the AA comprises 20 of these acres, then 20/200 = 0.1 and 0.1 x 100 = 10%. The corresponding statewide loss rate (for Alabama) from Table 2 is 0.67%. Therefore, the answer to Question 31 for this example is "Y" since the calculated loss rate is greater than the state loss rate shown in Table 2.[1] (all functions)

Guidelines:

[1] The rational for Question 31 is as follows. This question serves a weighting mechanism in several of the social significance keys. If the wetlands in the AA represent an amount equal to, or lower than, the average state wetland loss per acre then Question 31 has no effect in the social significance keys. However, if the wetlands in the AA represent an amount greater than the average state wetland loss per acre the probability ratings for several functions are elevated.

This completes the first assessment level of the social significance evaluation. Interpret the responses to these questions using the interpretation keys in Section 3.2. or, alternatively, interpret the responses using the computer program described in Appendix E.

When the interpretation is completed three options are possible:

(1) Continue with the second assessment level of the social significance evaluation (page 41), or

(2) Begin the first assessment level of the effectiveness and opportunity evaluation in Section 4.0.

(3) Stop the evaluation at this point and complete Form D: Evaluation Summary.

Table 2. Acreage Criteria for Oases (OA) and Clusters (CL) for Emergent (EM), Scrub-Shrub (SS), and Forested (FO) Vegetation Classes, and Wetland Loss Rates. (Source: USFWS unpubl. data.)

STATE	PALUSTRINE (acres/mile^2)				ESTUARINE (acres/mile shoreline)				LOSS RATE
	EM		SS/FO		EM		SS/FO		(%/year)
	OA	CL	OA	CL	OA	CL	OA	CL	
AL	0.4	2.3	11.1	66.5	7.6	45.6	ND		0.67**
AZ	0.2	1.3	1.2	7.0	----------				0.42***
AR	0.9	5.6	9.1	54.6	----------				1.80
CA	0.3	1.6	0.2	1.0	6.1	36.8	ND		0.42***
CO	0.6	3.7	0.5	2.7	----------				0.42***
CT	0.5	2.9	7.8	47.0	5.9	35.3	1	1	0.35**
DE	0.6	3.8	9.6	57.7	47.1	282.7	1	1	0.81
FL	11.3	67.8	21.7	129.9	27.8	166.5	13	78	0.57
GA	0.7	4.2	15.6	93.6	29.3	175.7	1	1	0.35**
ID	0.2	1.4	0.6	3.8	----------				0.42***
IL	0.2	1.1	2.2	13.0	----------				0.84
IN	0.4	2.6	0.8	5.0	----------				0.67**
IA	1.3	7.6	1.6	9.7	----------				0.67**
KS	0.3	1.9	0.2	0.9	----------				0.42***
KY	0.2	1.1	0.4	2.3	----------				0.67**
LA	5.3	31.8	21.4	128.6	48.8	292.9	ND		0.84
ME	1.6	9.9	8.6	51.7	4.6	27.6	ND		0.35**
MD	0.3	2.0	3.8	22.6	10.3	62.0	1	1	0.35**
MA	1.5	9.1	10.8	64.5	3.0	18.2	1	1	0.35**
MI	3.2	19.2	9.7	58.1	----------				0.67**
MN	8.8	53.0	9.9	59.6	----------				0.67**
MS	1.3	7.9	14.7	88.3	4.8	28.7	ND		1.48
MO	0.2	1.4	1.3	7.7	----------				0.67**
MT	0.8	4.6	0.4	2.3	----------				0.42***
NE	3.5	21.1	1.0	5.9	----------				0.42***
NV	0.2	1.0*	0.1	0.1*	----------				0.42***
NH	0.6	3.6	3.0	17.8	4.3	25.6			0.35**
NJ	0.7	4.1	13.6	81.8	----------				0.35**
NM	0.6	3.7	0.1*	0.1*	----------				0.42***
NY	1.1	6.7	2.7	16.0	6.6	39.9	ND		0.35**
NC	1.7	10.2	19.0	113.9	10.4	62.5	ND		0.65
ND	7.1	42.7	0.5	3.1	----------				0.42***
OH	0.7	4.4	1.2	6.9	----------				0.67**
OK	0.4	2.6	2.5	15.1	----------				0.42***
OR	1.6	9.7	0.8	4.6	8.7	51.9	ND		0.42***
PA	0.3	1.8	1.6	9.4	----------				0.35**
RI	0.5	3.0	7.9	47.1	16.5	99.3	ND		0.35**
SC	1.3	7.8	25.1	150.8	32.4	194.3	1	1	0.35**
SD	3.2	18.9	0.2	1.1	----------				0.42***
TN	0.4	2.3	2.9	17.4	----------				0.67**
TX	1.1	6.4	1.0	6.1	32.9	197.6	ND		0.42***
UT	0.9	5.6	0.4	2.3	----------				0.42***
VT	0.7	4.2	4.1	24.5	----------				0.35**
VA	0.3	1.8	3.3	19.6	14.25	85.5	ND		0.35**

(Continued)

Table 2 (Concluded)

STATE	PALUSTRINE (acres/mile^2)				ESTUARINE (acres/mile shoreline)				LOSS RATE (%/year)
	EM		SS/FO		EM		SS/FO		
	OA	CL	OA	CL	OA	CL	OA	CL	
WA	1.6	9.7	0.8	4.6	1.8	10.7			0.42***
WV	9.2	1.0	0.5	3.2	ND		ND		0.35**
WI	3.2	19.2	9.9	59.3	----------				0.67**
WY	0.7	4.2	0.4	2.3	----------				0.42***

* Wetland acreage estimates were not available for this state, so data from nearby states were used. More detailed or accurate data on wetland densities from state or local agencies may be substituted if available. The following formula should be applied to improve the definition of clusters and oases: Oasis = 0.2x; Cluster = x + 0.2x (where x = mean statewide density of wetlands in acres per square mile).

** State data were statistically insignificant, and figures represent regional (flyway) data. Substitute more detailed or accurate data if available.

*** State data were statistically insignificant, and figures represent the national loss rate (0.42%). Substitute more detailed or accurate data if available.

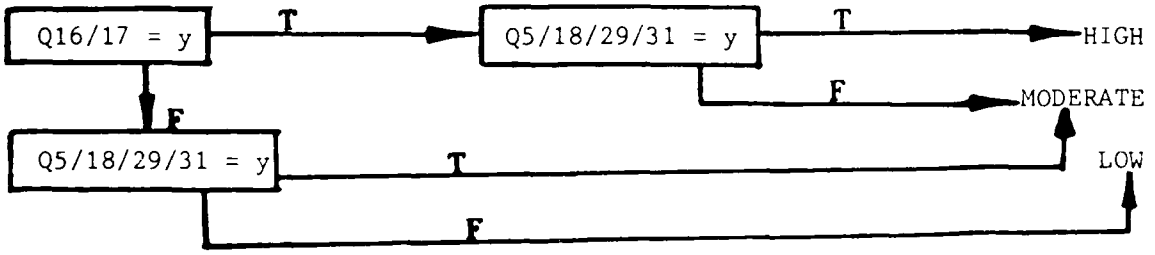
3.2 Social Significance Evaluation - Level 1 Interpretation

This section outlines the procedure for interpreting the responses to questions in the first level of the social significance evaluation and assigning probability ratings of HIGH, MODERATE, or LOW to functions and values in terms of social significance.

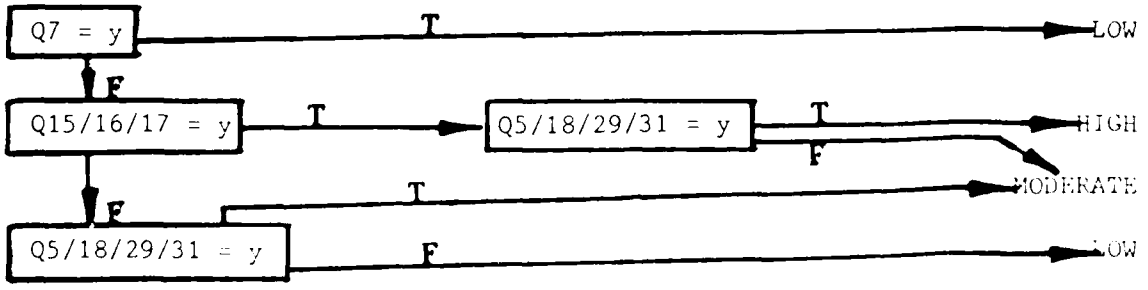
Place Form B and the Social Significance Keys in front of you. Note that there is an separate key for each of the functions and values to be evaluated. Each key consists of a series of boxes. Within each box are coded references to a single question, or group of questions from the Level 1 assessment. Each coded reference is followed by a specified answer of "y" (yes) or "n" (no). Within the boxes, "/" should be read as "or." For example, in the ground water recharge key the first box contains the statement "Q16/17 = y." This translates into, "Were Questions 16 or 17 answered yes?" A true (T) and false (F) arrow emerges from each box. Follow the true arrow if all questions within the box were answered as specified. Follow the false arrow if all questions were not answered as specified. Proceed through the key from box to box until a HIGH, MODERATE, LOW, or UNCERTAIN probability rating is specified. Then proceed to next key until all function and values have been assigned a probability rating for social significance. Record the probability ratings for each of the functions and values in the Social Significance column of Form D.

Social Significance Keys

Ground Water Recharge

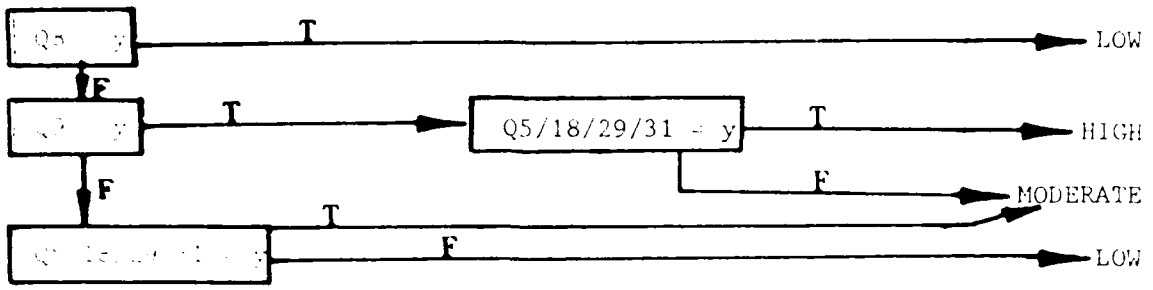


Ground Water Discharge

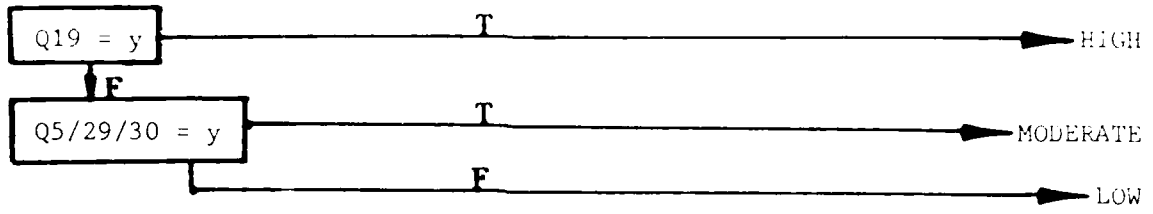


Social Significance Keys (Cont.)

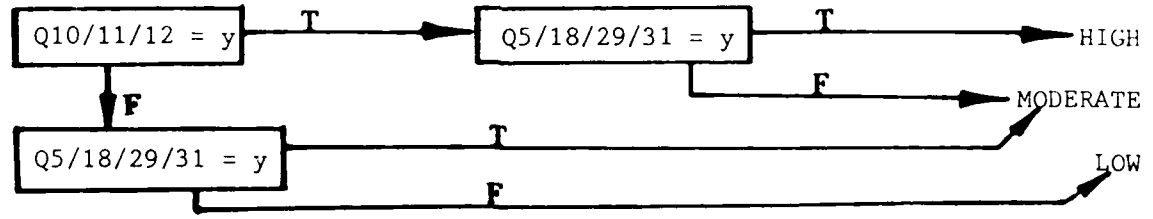
Floodflow Alteration



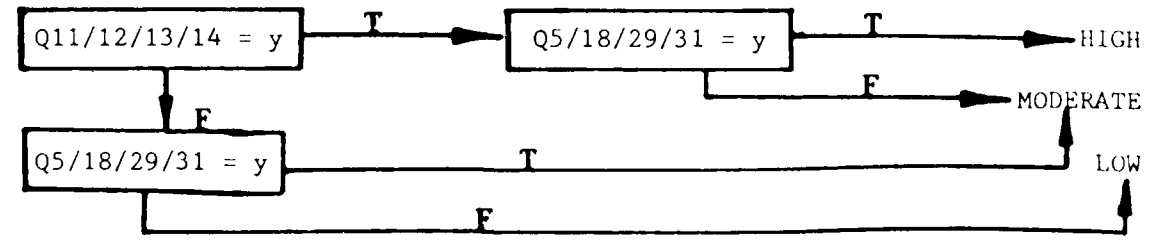
Sediment Stabilization



Sediment/Toxic Retention

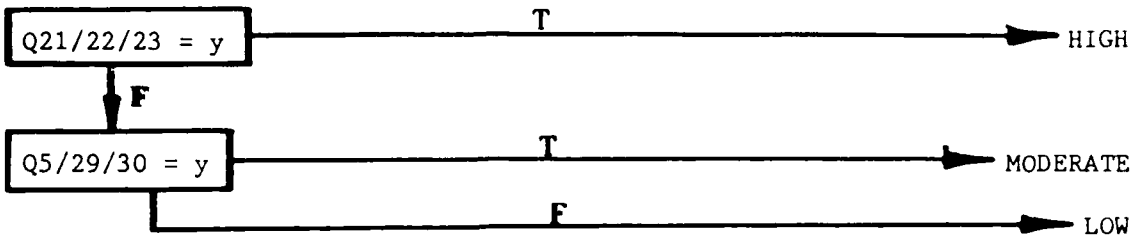


Nutrient Removal/Transformation

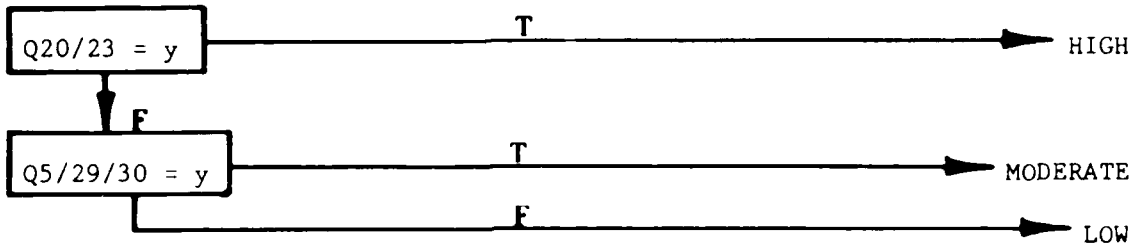


Social Significance Keys (Cont.)

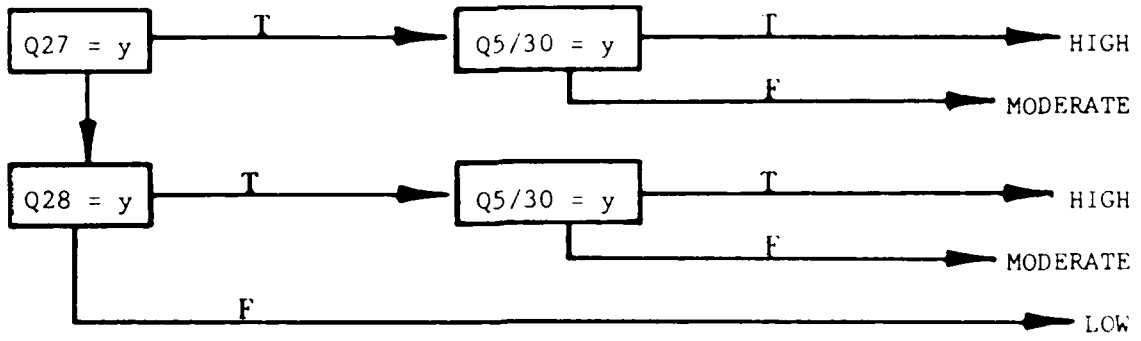
Wildlife Diversity/Abundance



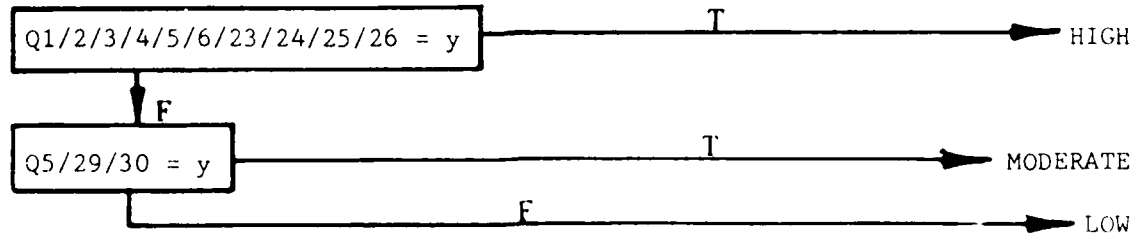
Aquatic Diversity/Abundance



Recreation



Uniqueness/Heritage



3.3 Social Significance Evaluation - Level 2 Assessment

Social significance level 2 assessment is an optional step to refine the probability rating for uniqueness/heritage. The probability rating for uniqueness/heritage assigned during Level 1 assessment is refined by considering how other wetlands in a selected area (**context region**) are related to the wetland being evaluated. The ideal approach for accomplishing this goal would be to assess uniqueness/heritage for all wetlands in the context region and then scale the probability rating for uniqueness/heritage for the wetland of interest accordingly. In the more realistic approach (in terms of effort) that follows, single-characteristic assessments are tallied for all wetlands in the context region to improve the uniqueness/heritage estimate.

3.3.1 Selection of Context Region

There are several options for choosing a context region. Select the context region that coincides with available manpower and project objectives. The smallest area you may wish to use as a context region is **locality.** A disadvantage in using locality is that difficult to compare wetland uniqueness/heritage in localities of greatly different size. Larger localities are more likely to have a greater number of wetlands, and thus more wetland types. Although this increases the probability of there being an especially rare or unique type, the relative value of each wetland may seem smaller.

Another option for the context region is to use a **standard density circle** (SDC). A standard density circle is a circle drawn to include a predetermined number of wetlands (typically 30). Within any two SDC's, the probability of encountering a rare type of wetland is greater. Thus, wetland comparisons based on scarcity and uniqueness have a statistical basis. A third option is to use the watershed of a service area or USGS hydrologic unit as the context region. Although such an option has little political relevance and makes comparisons statistically less reliable, it accounts for the potential interactions among wetlands and uniqueness/heritage values. Other options include evaluating wetlands in terms of their uniqueness/heritage in an ecoregion (see Bailey 1978) or within a local, state, or jurisdictional district. These options may require extensive effort to examine and classify wetlands. The result, however, would be a more realistic perspective on uniqueness/heritage of a particular wetland.

3.3.2 Assessment Procedure

Assess the uniqueness/heritage of the AA using the following steps:

(1) Select the context region.
(2) Obtain NWI wetland classification maps for the context region. If NWI maps are not available and no regional wetland classification maps are available, a classification of the wetlands within the context region must first be completed using aerial photography, field visits, etc.
(3) From the wetland classification map tally the number, and if convenient, the acreage of all wetlands according to wetland system and class, and if possible subclass and hydroperiod.
(4) Calculate percentages for the categories tallied in Step 3.

(5) Answer the four following questions:

(a) Is the wetland's class the rarest or most unique wetland class in the context region by number of acreage?

(b) Is the wetland's subclass the rarest or most unique wetland subclass in the context region by number of acreage?

(c) Is the wetland's hydroperiod the rarest or most unique wetland hydroperiod in the context region by number of acreage?

(d) Of all the wetland hydroperiods or subclasses that are present in this context region, does this wetland possess more than 30%

3.4 Social Significance Evaluation - Level 2 Interpretation

If none of the four questions above (a-d) was answered "Y" enter a LOW in the uniqueness/heritage row of the social significance column of Form D. If only one of the four questions above (a-d) was answered "Y," enter a MODERATE on Form D in the uniqueness/heritage row of the social significance column. If more than one of the four questions above (a-d) were answered "Y," place a rating of HIGH in the uniqueness/heritage row of the social significance column of Form D. If a higher probability rating has already been assigned to uniqueness/heritage as a result of the Level 1 assessment, do not replace it with a lower probability rating. Enter the appropriate code next to the uniqueness/heritage probability rating to indicate the type of Level 2 assessment that was done. For example:

Context Region	Wetlands Classification	Code
SDC	Hydroperiod	SDC-HP
Locality	Class, subclass	L-C,SC
Hydrounit	Class, hydroperiod	HU-C,HP

This completes the second level assessment of the social significance evaluation. Two options are now possible:

(1) Continue with the effectiveness and opportunity evaluation in Section 4.0.

(2) Stop the assessment at this point and complete the evaluation by filling in the appropriate portions of Form D.

4.0 EFFECTIVENESS AND OPPORTUNITY EVALUATION

The effectiveness and opportunity evaluation assesses the capability and opportunity of a wetland to perform functions. The evaluation consists of a series of questions designed to characterize the wetland and the surrounding area in terms of its physical, chemical and biological attributes. The evaluation has three levels of assessment. Each successive level of assessement adds to the information gathered during previous levels to build a more detailed characterization of the wetland and the surrounding area. Corresponding with the more detailed characterization of the wetland is an increased **confidence** in the probability ratings resulting from the assessment. The level of assessment chosen will depend upon time and information available, as well as the confidence desired. Experience has shown that the second level of assessment provides a reasonable balance between these three factors for most evaluation situations.

The first level of assessment can be conducted in the office using the information resources described in Task 1 and will take approximately 1 hour to complete. The second level of assessment requires visiting the wetland site for observation and data collection. This level will take approximately 1-3 hours to complete. The third level of assessment requires requires detailed (and in some cases long term) physical, chemical, and biological monitoring data from the wetland site. The time required for this level varies depending on the size and complexity of the wetland being evaluated.

An interpretation key specific to each function assigns probability ratings of HIGH, MODERATE, or LOW to eleven wetland functions in terms of effectiveness, and three wetland functions in terms of opportunity. The interpretation keys that assign probability ratings for effectiveness and opportunity were constructed with the assumption that responses from the questions in the first and second level of the effectiveness and opportunity evaluation would be available for interpretation. The only provision made for partially completed data sets (i.e., unknown answers) is in the case of a Level 3 assessment (Questions 51-64). If all Level 1 and 2 questions are not answered (unless specified in the question itself), the validity of the probability ratings is uncertain. Therefore, it is recommended that effectiveness and opportunity evaluations be conducted at Level 2 or 3.

4.1 Effectiveness and Opportunity Evaluation - Level 1 Assessment

1. CLIMATE

1.1 Is the AA located in one of the precipitation deficit region shown in Figure 6 or does local data indicate that on-site evaporation exceeds precipitation on an annual basis?

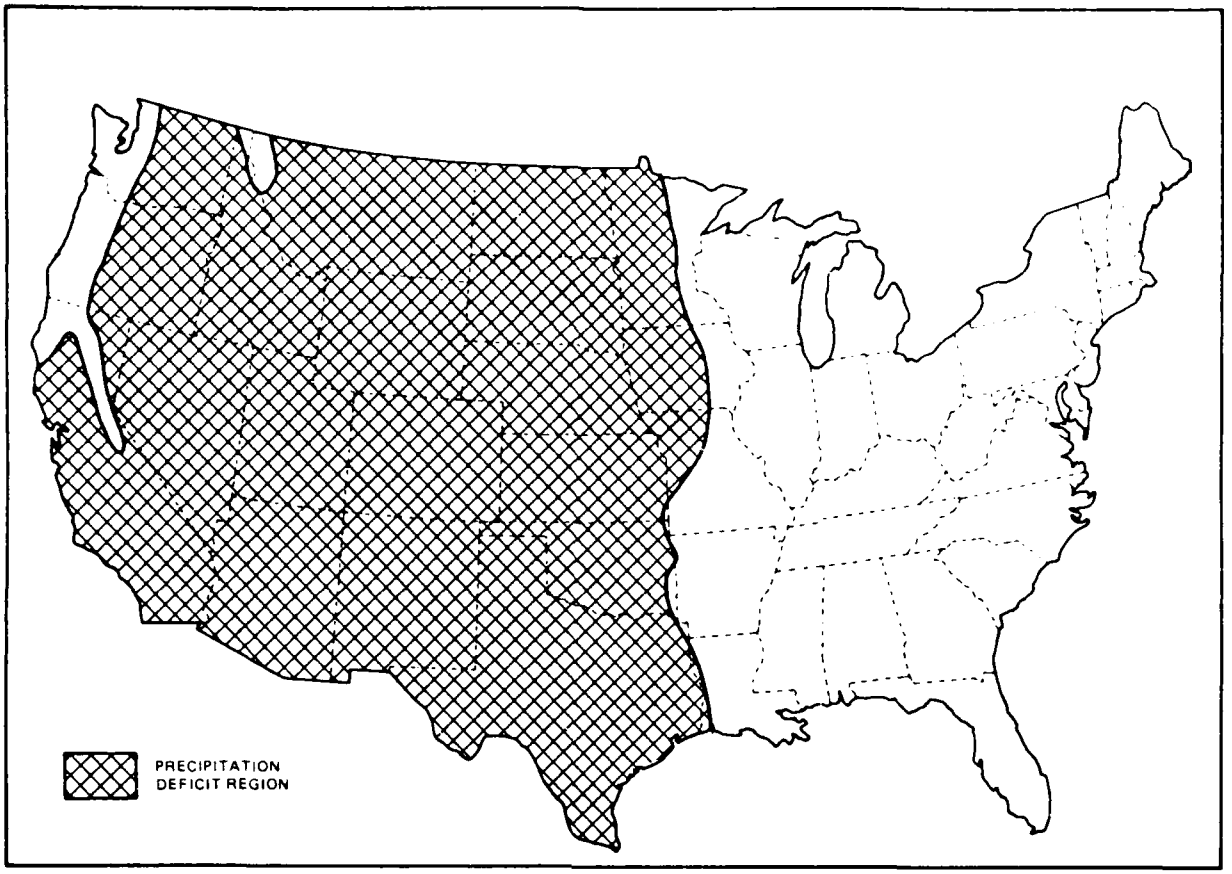


Figure 6. Precipitation deficit regions of the United States (Source: USGS 1970) (Note: Use local data if available, especially in the mountainous regions of the western United States.)

1.2 Is either of the following conditions true?

(a) The AA is located in one of the intense storm regions shown in Figure 7.

(b) The rainfall erosivity factor for the area is greater than 300[1] and if the AA is in a tidal area, tidal range is less than 3 ft?

Guidelines:

[1] This factor (EI_{30} in the Universal Soil Loss Equation) is available from your local Soil Conservation Service office.

1.3 Does the entire AA freeze over for more than 1 month during most winters? (If unknown, estimate based on climate, salinity, flow, depth, size, and presence of springs.)

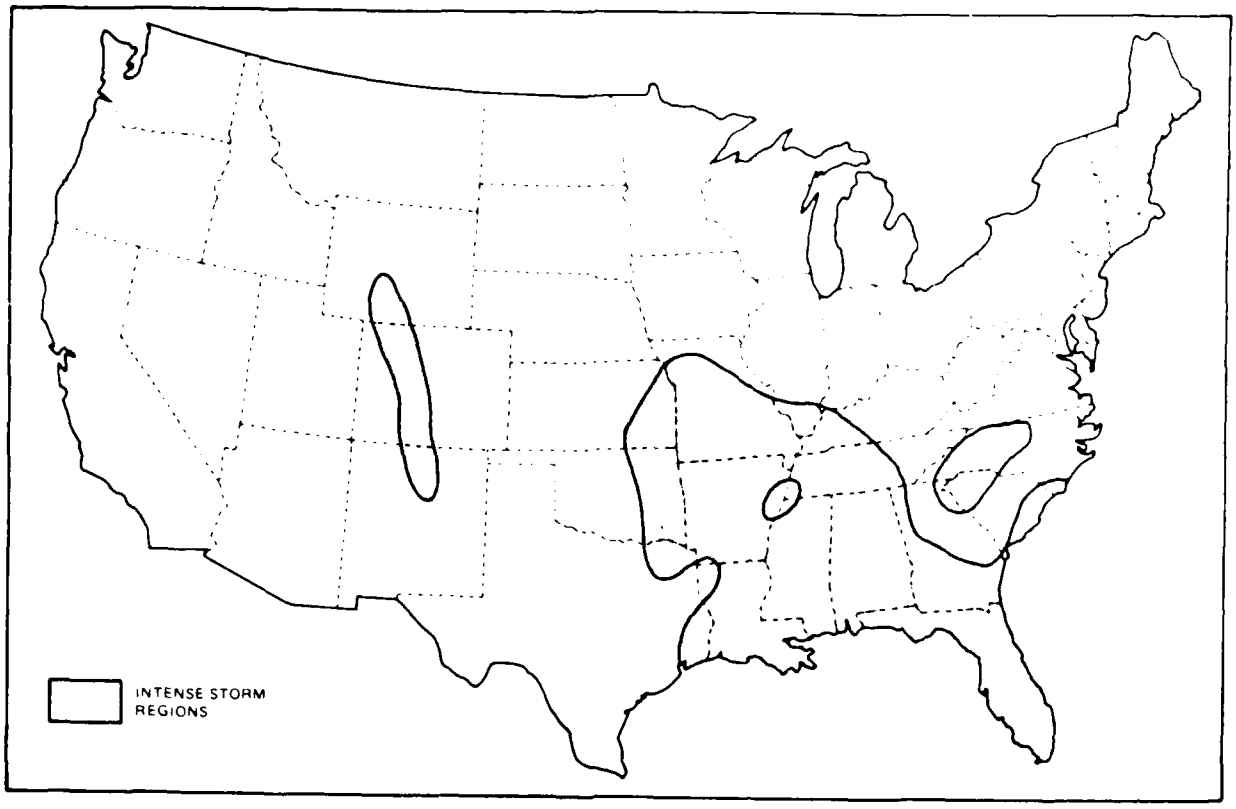


Figure 7. Intense storm regions of the United States

2. ACREAGE

2.1 Is the surface area of the AA/IA and any **accessible**[1] wetlands within 1 mile of the AA/IA:

2.1.1 Less than 5 acres?
2.1.2 Greater than 40 acres?
2.1.3 Greater than 200 acres?

Guidelines:

[1] Throughout this document, accessible refers to accessibility of an area to fish. See the Glossary for greater detail.

2.2 (Answer "I" if the AA/IA has no forest.) Is the forested area within the AA/IA and up to 1 mile away from the AA/IA:[1]

2.2.1 Less than 5 acres?
2.2.2 Greater than 40 acres?

Guidelines:

1 Include all forested within 1 mile of the AA/IA connected by an unbroken, forested corridor of at least 150 ft in width (Figure 8).

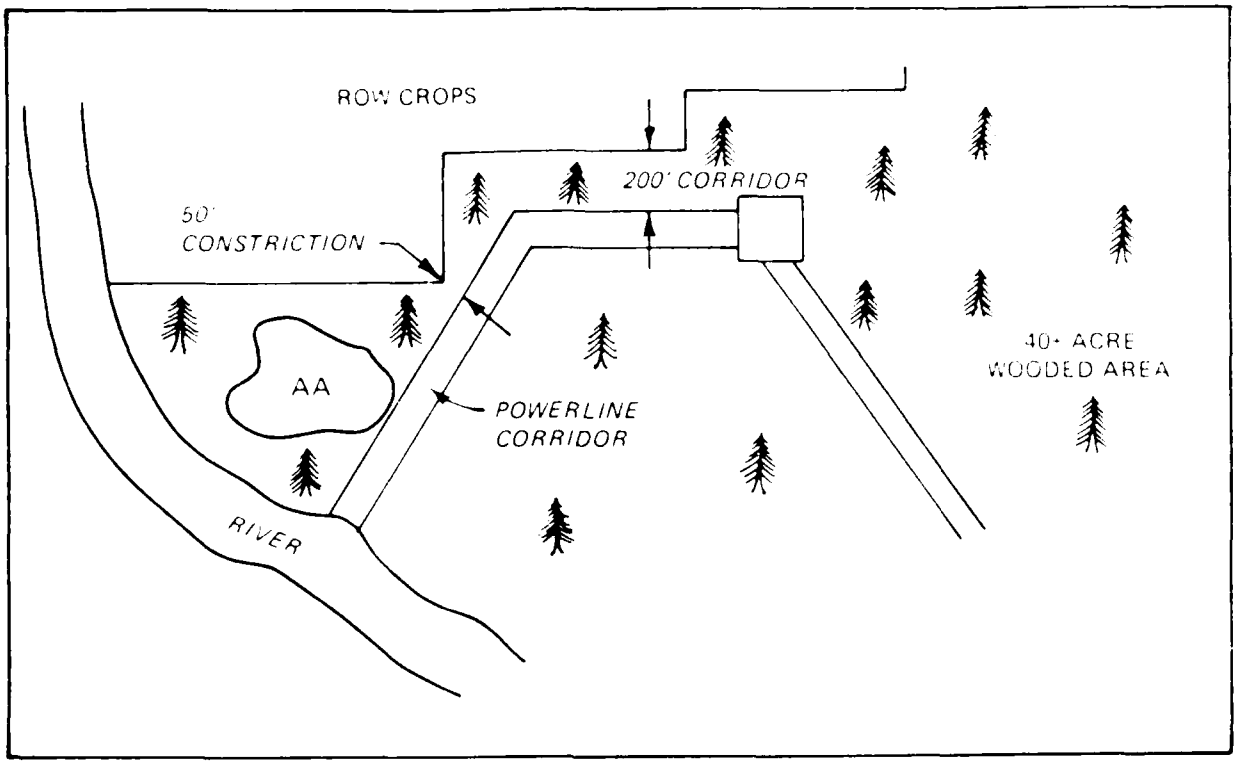


Figure 8. Example of a forested corridor connecting the AA/IA to adjacent forested areas (Note: In the figure, a 10-acre forested AA/IA is connected by a forested corridor to a 40-acre forest within 1 mile. However, the corridor has a constriction of less than 150 ft, therefore, Questions 2.2.1 and 2.2.2 would be answered "N.")

3. COMPLEX, CLUSTER, OASIS

3.1 Are there other wetlands within 1 mile of the AA?

3.2 Within 1,000 yd of the AA's center (or within 1 mile along the shoreline if the AA is tidal), is the acreage of emergent or scrub-shrub/forested wetland classes[1] greater than the criteria acreage shown for the corresponding type in the **"cluster"** columns of Table 2?

3.3 Within 1,000 yd of the AA's center (or within 1 mile along the shoreline if the AA is tidal), is the acreage of emergent or scrub-shrub/forested wetland classes[2] less than the criteria acreage shown for the corresponding type in the **"oasis"** columns of Table 2?

Guidelines:

[1] For Question 3.2 if both emergent and scrub-shrub/forested classes are present, use the class with the greater acreage.

[2] For Question 3.3 if both emergent and scrub-shrub/forested classes are present use the class with the lesser acreage.

4. LOCATION AND SIZE

4.1 Is the AA within 5 miles of tidal waters, the Great Lakes, or a river of at least 100 miles length?

4.2 The **watershed** of the AA is:

4.2A Less than 1 square mile?
4.2B 1-100 square miles?
4.2C 100-2,500 square miles?
4.2D greater than 2,500 square miles?

5. ASSESSMENT AREA/WATERSHED RATIO

5.1 What percentage of the AA **watershed** acreage[1] does the AA comprise?[2]

5.1.1 Less than 5% or less than 10% if region is dry.
5.1.2 More than 20% or more than 15% if region is dry.

Guidelines:

[1] If the AA is a subsample of a larger hydrologically interdependent AA (see page 22), use the acreage of the larger AA to answer this question.
[2] Using the acreages from Form A, Part 2, perform the following calculation: AA acreage/AA watershed acreage x 100.

5.2 Do upslope AA's comprise more than 5% of the total acreage of this AA watershed (Figure 9) or more than 3% if region is dry?

Guidelines:

[1] Determine acreage of all upslope AA's in watershed of AA and using the watershed acreage from Form A, Part 2, perform following calculation: upslope AA acreage/AA watershed acreage x 100.

6. LOCAL TOPOGRAPHY

6.1 Are any of the following conditions present?

(a) The AA is a **playa.**
(b) The drop in elevation from the downslope end of the AA to a point 2 miles downslope (or to the bottom of a valley, whichever comes first) is greater than the rise in elevation from the upslope end of the AA to a point 2 miles upslope (or to the top of a ridge, whichever comes first) (Figure 10).
(c) The AA is located within 2 miles of a topographic divide that separates two major watersheds[1] and is not at the toe of a slope of greater than 20% (Figure 11).

Guidelines:

[1] A major watershed contains a river channel of at least 100 ft width from bank to bank.

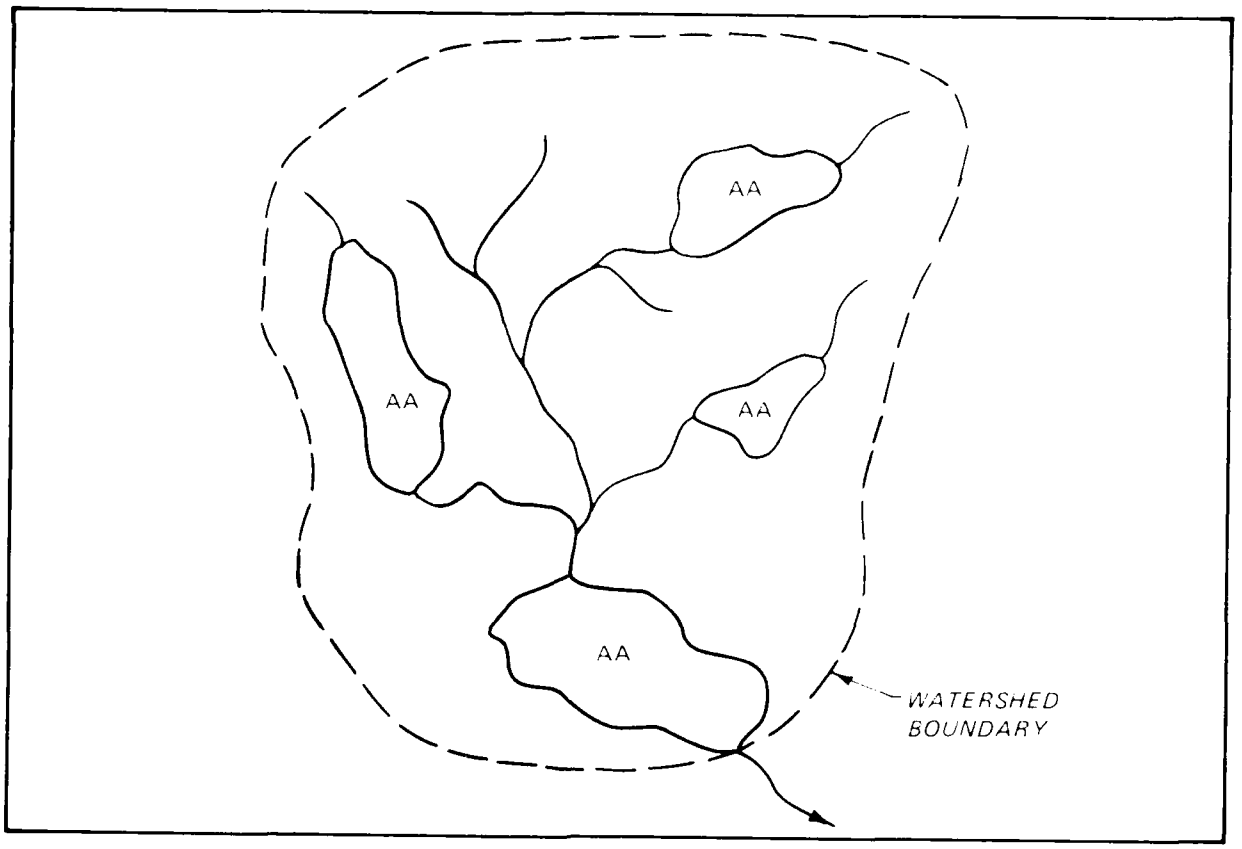


Figure 9. Upslope AA's in relation to the watershed (Note: In the figure, upslope AA's comprise more than 5 percent of the watershed area excluding the AA, therefore, Question 5.2 = "Y.")

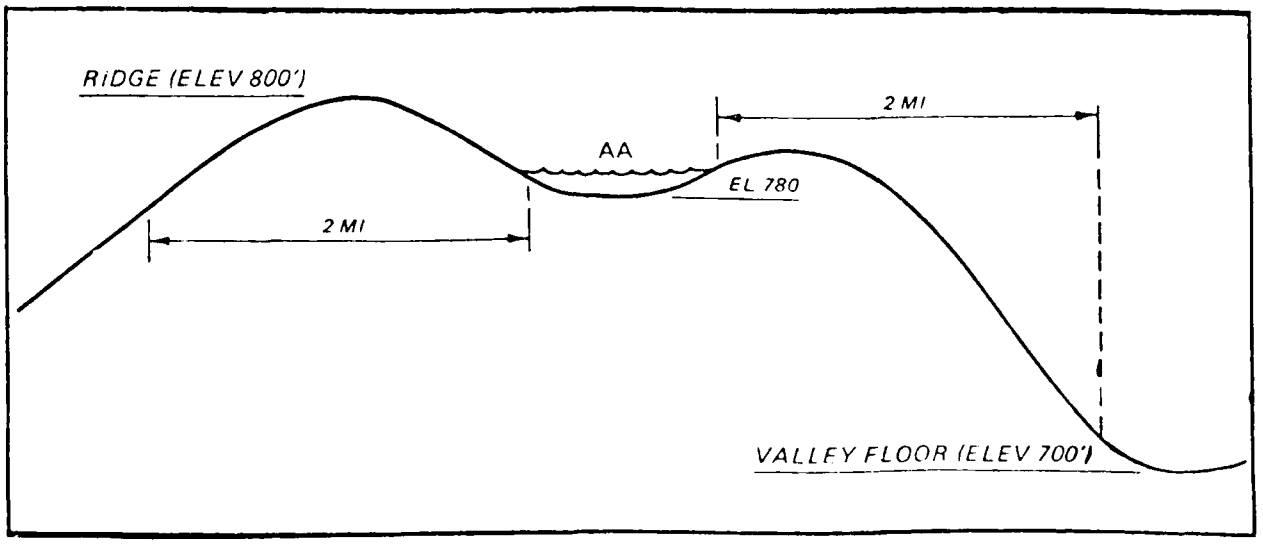


Figure 10. Elevational change upslope and downslope of the AA (Note: In the figure, the downslope elevational change of 80 ft is greater than the upslope elevational change of 20 ft; therefore, Question 6.1 would be answered "Y.")

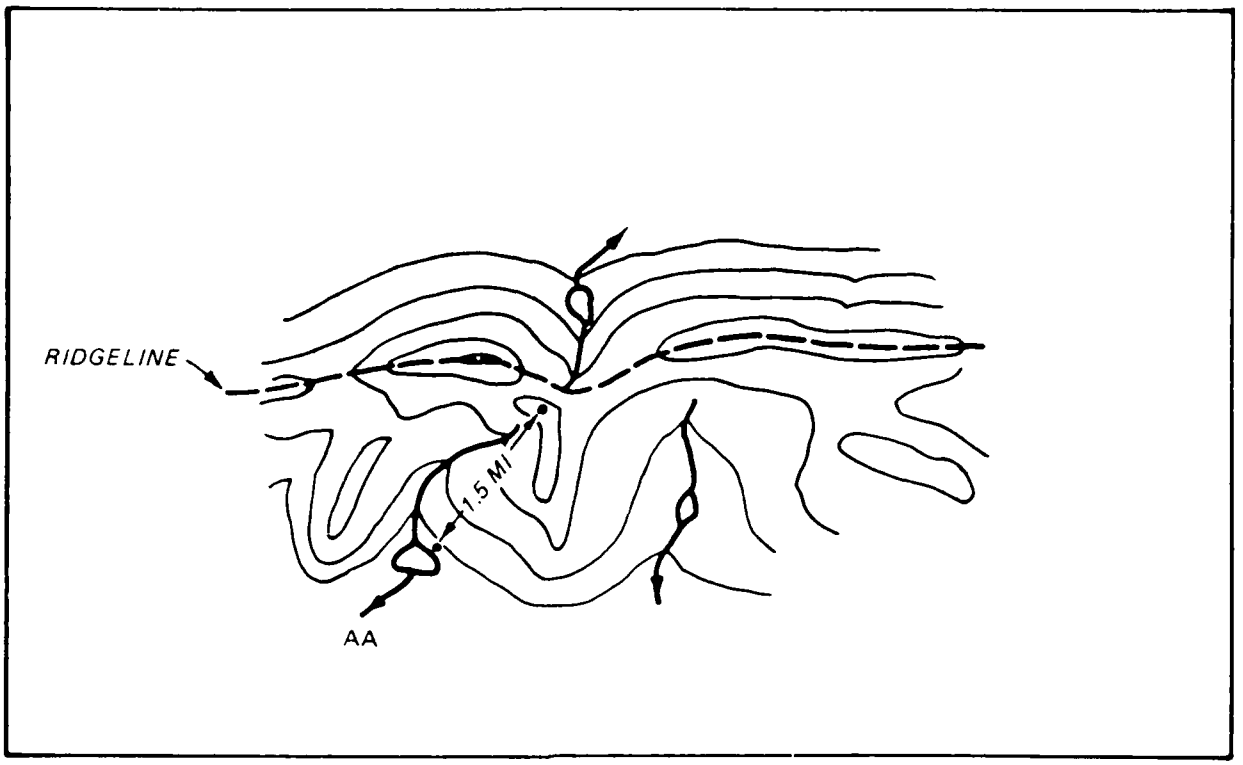


Figure 11. Example of a topographic feature dividing watersheds (Note: In the figure, a ridge line, within 2 miles, divides two watersheds; therefore, Question 6.1 would be answered "Y.")

6.2 Do soil maps, geologic maps, or field inspection indicate that any of the following is true?

(a) A geologic fault, oriented perpendicular to surface flow, is present within the AA.

(b) Within the AA's watershed the permeability of the soils decreases in a downslope direction toward the AA. If unknown, assume that decreased permeability[1] is represented by increased prevalence of marine clays or fine particled soils, shallower depth to bedrock, or decreased prevalence of talus or coarse alluvial sediments (such as occur at the mouths of canyons in glacial moraine areas or at the base of avalanche paths).

(c) The AA is at the base of a relatively steep regional slope.

Guidelines:

[1] Permeability can be thought of as the ease with which soil pores permit the movement of water. It is most directly related to soil structure and texture.

7. GRADIENT

(Answer "I" if Question 41 can and will be answered or if the AA/IA is tidal.) Is either of the following true?

(a) The AA/IA does not have a channel or the annual floodplain is wider than the channel.
(b) The channel **gradient** of the AA/IA is less than the corresponding gradient value shown in Table 3.[1]

Guidelines:

[1] Determine the AA/IA's gradient (see Figure 12) and compare the calculated gradient value to the gradient value shown in Table 3 for the selected roughness coefficient (columns) and depth (rows).

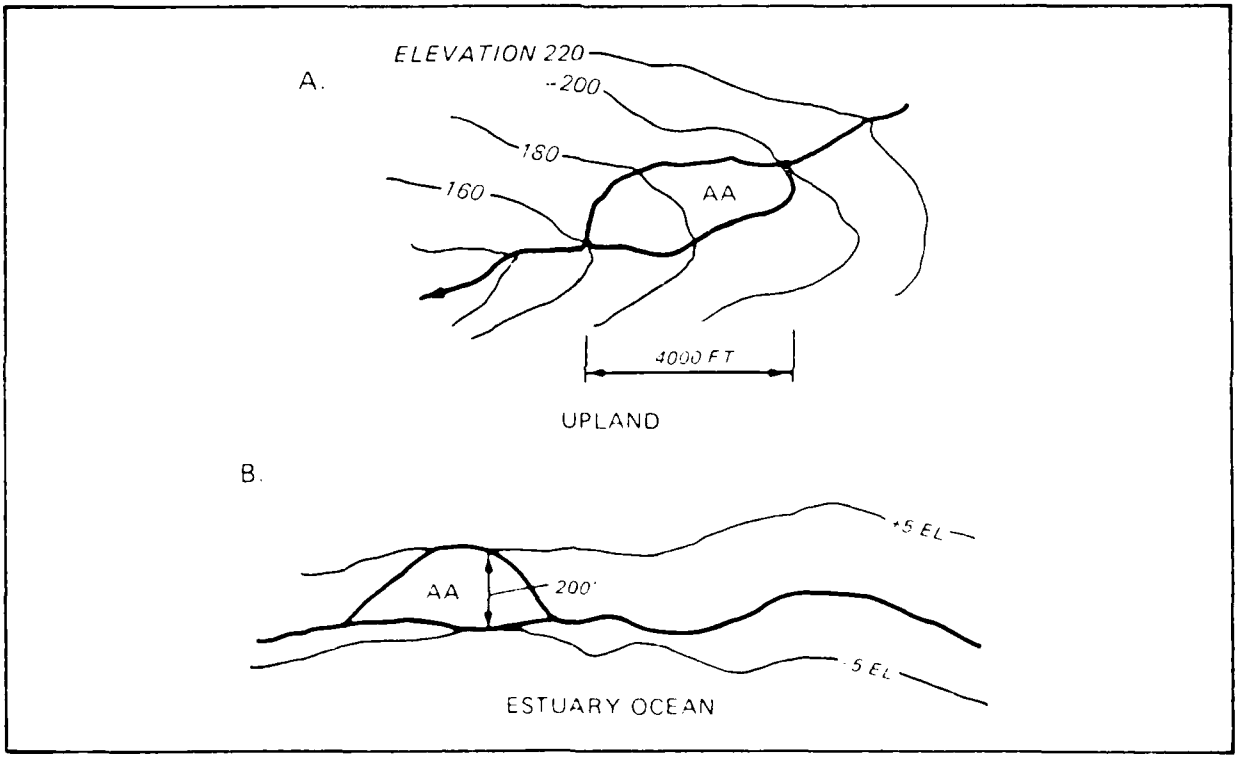


Figure 12. Determining gradient of the AA/IA using topographic maps. (Note: In Part A, the gradient of the AA/IA is 3.01 (200 minus 160 divided by 4000). In Part B, the gradient of the AA is 0.05 (15 minus 5 divided by 200).)

Table 3. Gradient Necessary to Create Depositional Velocity Conditions. (Interpreted from SCS curves for channel flow.)

Mean Depth (ft)	N ≥ 0.125[1]	N = 0.080[2]	N = 0.050[3]	N ≤ 0.035[4]
< 0.5	< 0.0250	< 0.0100	< 0.0038	< 0.0018
0.5-1	< 0.0150	< 0.0060	< 0.0023	< 0.0012
1-2	-----	< 0.0030	< 0.0012	< 0.0006
2-3	-----	< 0.0017	< 0.0006	< 0.0003
3-4[5]	-----	< 0.0013	< 0.0005	< 0.0002
4-6[5]	-----	< 0.0008	< 0.0003	< 0.0001
6-8[5]	-----	< 0.0006	< 0.0002	< 0.0001
8-10[5]	-----	< 0.0004	< 0.0002	-----
10-12[5]	-----	< 0.0003	< 0.0001	-----

1 Densely wooded floodplains ("N" is Manning's roughness coefficient).
2 Densely vegetated emergent wetlands not totally submerged by floodflow.
3 Moderately vegetated or totally submerged (by floodwater) emergent wetlands, or with boulders.
4 Unobstructed channels.
5 Assumes width, perpendicular to flow is <8 ft. If channel is 8-20 ft wide, the value in the row immediately below the value identified should be used. If channel is wider than 20 ft, answer "I."

8. INLETS, OUTLETS

Does **surface water** enter and/or exit the AA through an:[1]

8.1 Inlet with permanent flow?
8.2 Inlet with **intermittent** flow?
8.3 Outlet with permanent flow?
8.4 Outlet with **intermittent** flow?

Guidelines:

1 (a) Do not consider precipitation or sheetflow to be surface water.
(b) Consider fringe wetlands to have both a permanent inlet and outlet.
(c) Inlets and outlets regularly flooded by the tide are permanent.

9. CONSTRICTION

9.1 Is any of the following true?

(a) Channel flow is present, and the width of the AA/IA's outlet(s), at annual high water, is less than one-third the average width of the AA/IA perpendicular to flow (Figure 13A).
(b) Channel flow is present, and the cross-sectional area of the AA/IA's outlet(s) is less than the cross-sectional area of the inlet(s) (Figure 13A).
(c) Channel flow is not present (i.e., AA/IA has no gradient or is tidal), and the total width of the AA/IA's outlet(s) is less than one-tenth the **average width** of the AA/IA (Figure 13B).

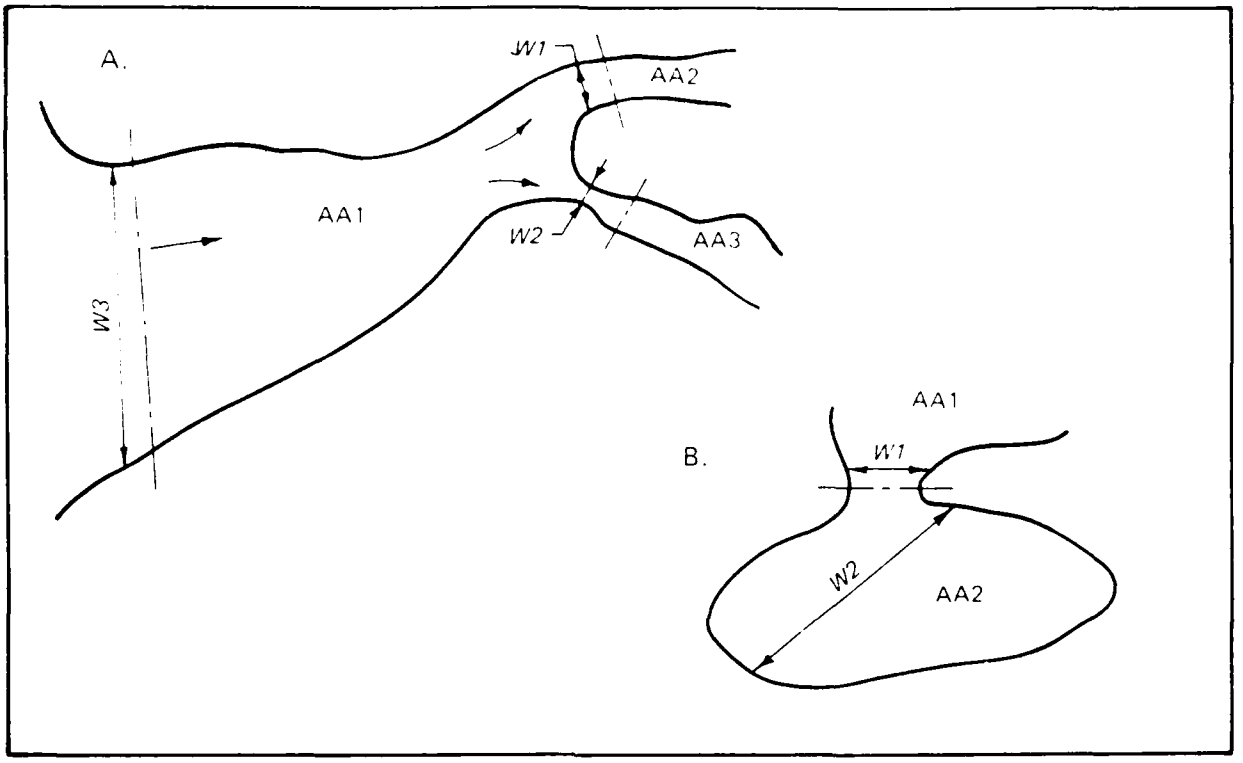


Figure 13. Examples of constricted outlets (Note: In Part A, the width and/or cross-sectional area of the outlets (W1 and W2) is less than 1/3 of the inlet (W3). In Part B, there is no channel flow, and the outlet (W1) is less than 1/10 the average width of the AA1 (not shown). In both cases the outlet is constricted.)

9.2 (Answer "I" if tidal.) Does sheetflow from a contiguous body of water inundate wetlands in the AA/IA at least once a year, and subsequently exit the wetland through a constricted outlet(s) or not exit the AA/IA wetland at all (Figure 14)?

9.3 (Answer "I" if the AA/IA has no outlet.) Does outflow (if any) from the AA/IA originate mostly from precipitation or snowmelt occurring within the AA/IA (i.e., AA/IA has little or no watershed)?

10. WETLAND SYSTEM

Which **wetland system** covers the greatest area in the AA/IA?

10.A Lacustrine (no woody or persistent emergent vegetation)
10.B Palustrine
10.C Riverine nontidal (no woody or persistent emergent vegetation)
10.D Riverine tidal (no woody or persistent emergent vegetation)
10.E Estuarine
10.F Marine (no erect vegetation)

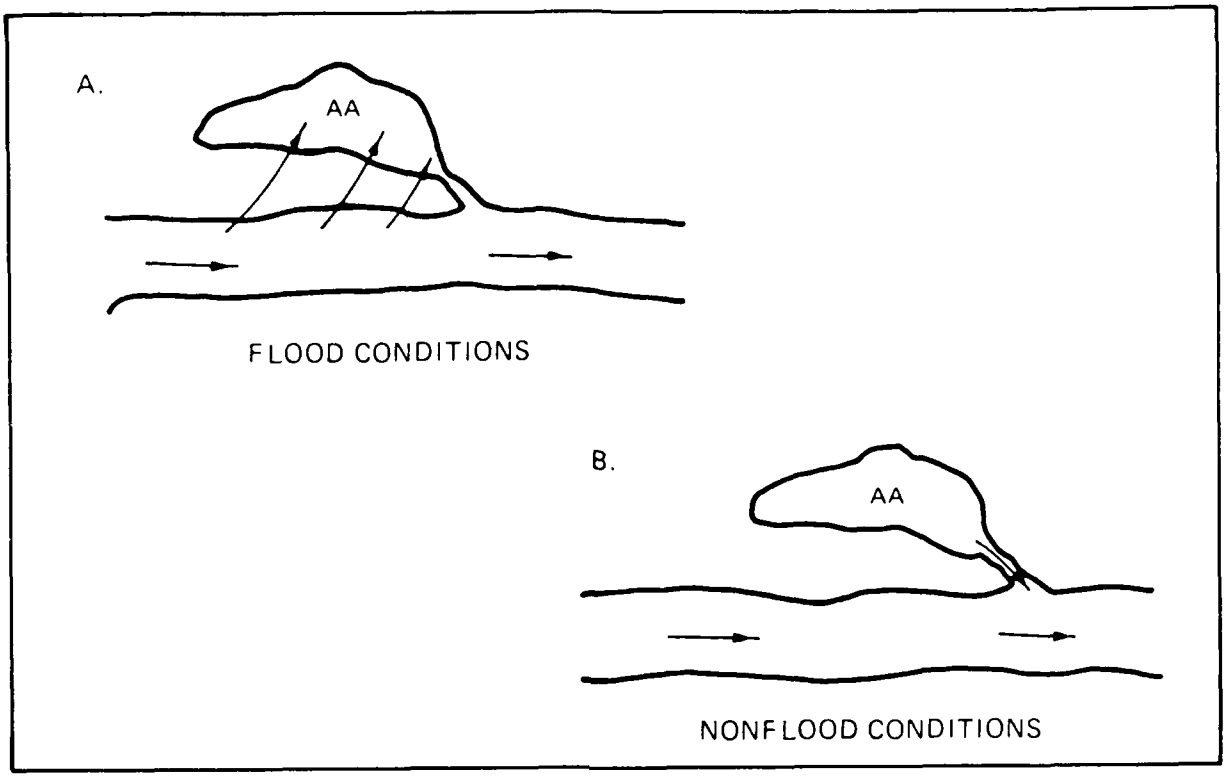


Figure 14. Example of a seasonally constricted outlet

11. FRINGE WETLAND OR ISLAND

Is the AA/IA part of a **fringe wetland** or an island or does the AA/IA comprise all, or most of, a **fringe wetland** or **island**?

12. VEGETATION CLASS/SUBCLASS (PRIMARY)

Select from the list below, the vegetation **class**[1] (e.g., forested, emergent, etc.) and **subclass** (e.g., needle-leaved evergreen, broad-leaved deciduous, etc.) that is:

(a) Dominant[1] in the AA/IA?

(b) Dominant at the edge of **open water** of Zones B and C (Figure 15). (Exclude the subclass rooted vascular, "12Cc".)

(c) In contact with water over the largest area of the AA/IA (i.e., roots and stems inundated).

Circle "Y" on the answer sheet for the classes and subclasses that were selected. Circle "N" for the classes and subclasses not selected.

12.A Forested?
- **Aa** and dead?
- **Ab** and needle-leaved evergreen?
- **Ac** and broad-leaved evergreen?
- **Ad** and needle-leaved deciduous?
- **Ae** and broad-leaved deciduous?

12.B Scrub-shrub?
- **Ba** and dead?
- **Bb** and needle-leaved evergreen?
- **Bc** and broad-leaved evergreen?
- **Bd** and needle-leaved deciduous?
- **Be** and broad-leaved deciduous?

12.C Aquatic bed?
- **Ca** and algal?
- **Cb** and floating vascular?
- **Cc** and rooted vascular?
- **Cd** and aquatic bryophyte (moss or liverwort)?

12.D Emergent?
- **Da** and persistent?
- **Db** and nonpersistent?

12.E Moss-lichen?

Guidelines:

[1] "Dominant" in this question means the class or subclass that covers the greatest area. However, if 12.A (forested) and 12.B (scrub/shrub) together or 12.C (aquatic bed) and 12.D (emergent) together cover a greater area than any other single class, answer "Y" to the larger of the two classes. Apply this procedure on a subclass level by grouping evergreens (all 4), deciduous (all 4), or dead (both). For example, if the four evergreen subclasses together cover a greater area than any other single subclass, answer "Y" to the largest of the four subclasses.

13. VEGETATION CLASS/SUBCLASS (SECONDARY)

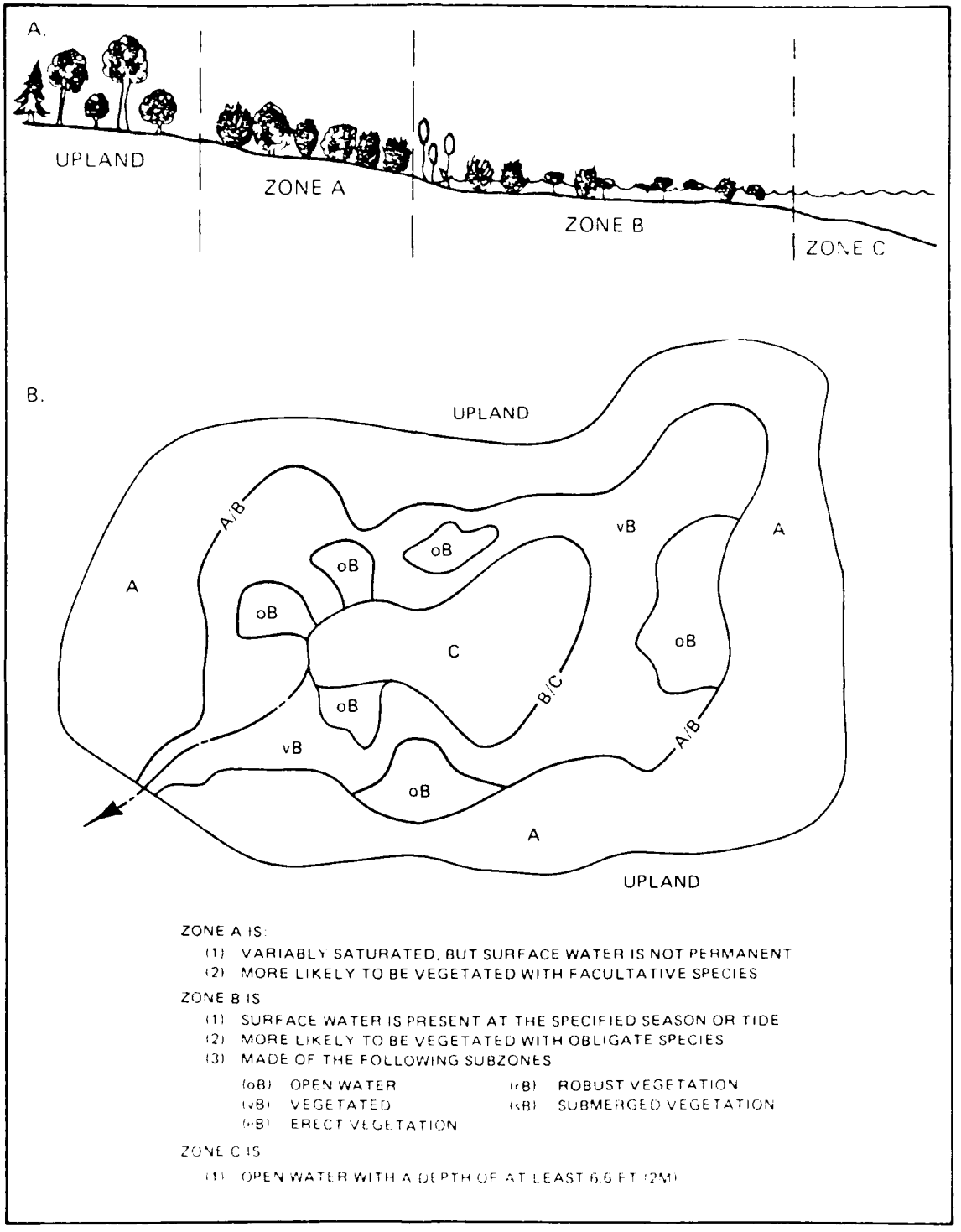
Select from the vegetation classes and subclasses listed in Question 12 those that comprise 10% of the AA/IA or at least 1 acre of the AA/IA?

14. ISLANDS

Is the AA/IA an **island** or does it contain part, or all, of an **island** that is:

14.1 At least 25 sq ft in size and at least 50 ft from the shoreline?

14.2 At least 2 acres in size, separated from the mainland by water at least 30 in. deep, and at least 2 miles offshore if the **wetland system** is **marine** or 0.5 mile offshore if the wetland system is not marine?



ZONE A IS:

(1) VARIABLY SATURATED, BUT SURFACE WATER IS NOT PERMANENT
(2) MORE LIKELY TO BE VEGETATED WITH FACULTATIVE SPECIES

ZONE B IS

(1) SURFACE WATER IS PRESENT AT THE SPECIFIED SEASON OR TIDE
(2) MORE LIKELY TO BE VEGETATED WITH OBLIGATE SPECIES
(3) MADE OF THE FOLLOWING SUBZONES

(oB) OPEN WATER
(vB) VEGETATED
(eB) ERECT VEGETATION
(rB) ROBUST VEGETATION
(sB) SUBMERGED VEGETATION

ZONE C IS

(1) OPEN WATER WITH A DEPTH OF AT LEAST 6.6 FT (2M)

15. VEGETATION/WATER INTERSPERSION

(Answer "I" to all of 15.1 if the wetland system is riverine. Answer "Y" to 15.1A if surface water is absent.) Does the horizontal pattern of erect vegetation in **Zone B** (Figure 15) consist of:

15.1A Relatively few, continuous areas supporting vegetation with little r no **interspersion** with channels, pools, or flats (Figure 16)?

15.1B A condition intermediate between the conditions described in 15.1A and 15.1C.?

15.1C A mosaic of relatively small patches of vegetation (i.e., none smaller in diameter than two times the height of the prevailing vegetation) interspersed with pools, channels, or flats (Figure 16)?

15.2 (Answer "I" if channel or tidal flow never occurs in the AA/IA.) Is either of the following conditions present in that portion of the AA/IA having measurable flow?

(a) Vegetation in Zone B consists mainly of **persistent emergent** distributed in the mosaic pattern described in 15.1C.

(b) Under average flow conditions, water enters the AA/IA in a channel and then spreads out over a wide area.

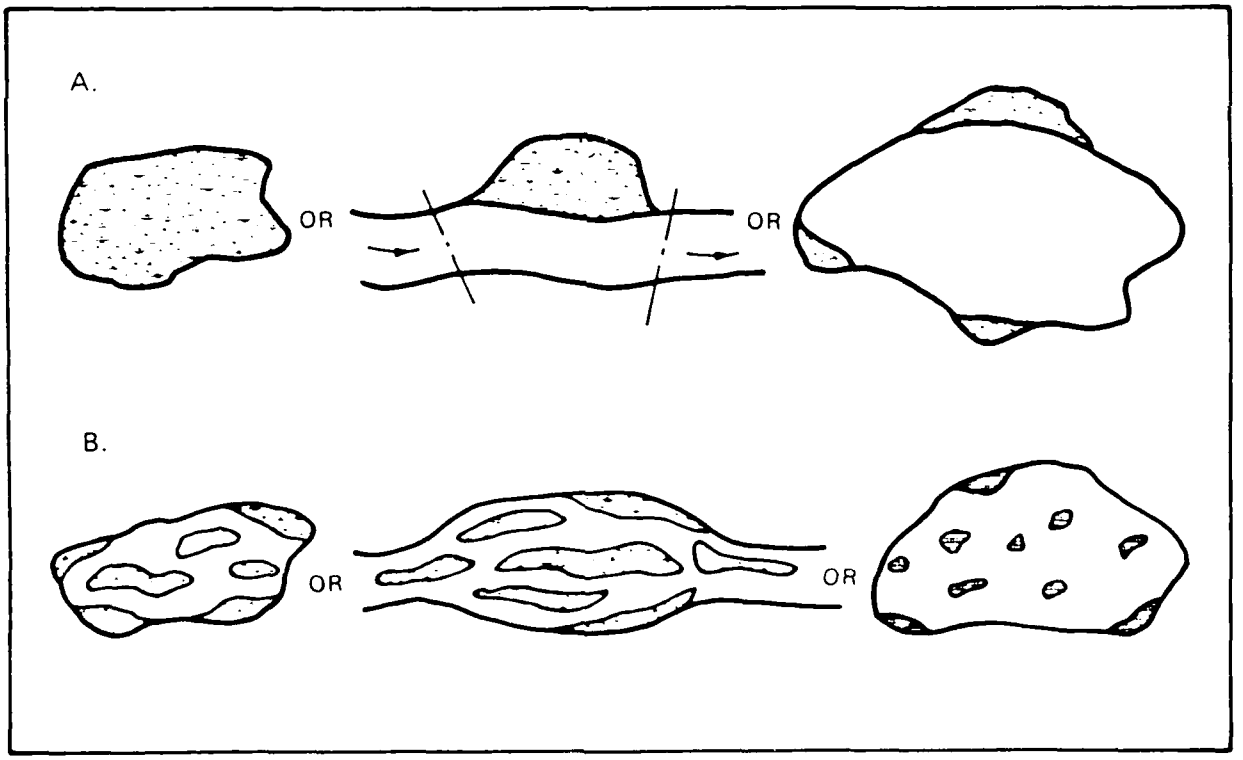


Figure 16. Examples of low and high vegetation/water interspersion (Note: In this figure, Part A exemplifies low vegetation/water interspersion (Question 15.1A = "Y"), and Part B exemplifies high vegetation water interspersion (Question 15.1C = "Y").)

16. VEGETATION CLASS INTERSPERSION

The horizontal pattern of vegetation classes (e.g., forested, aquatic bed, scrub-shrub) in the AA/IA consists of:

16.A Relatively homogeneous areas supporting a single vegetation class with little or no interspersion between these homogeneous areas (Figure 17)?

16.B A condition intermediate between the conditions described in 16.A and 16.C?

16.C A highly interspersed mosaic of relatively small areas (not less than 100 sq ft) which support different vegetation classes (Figure 17).

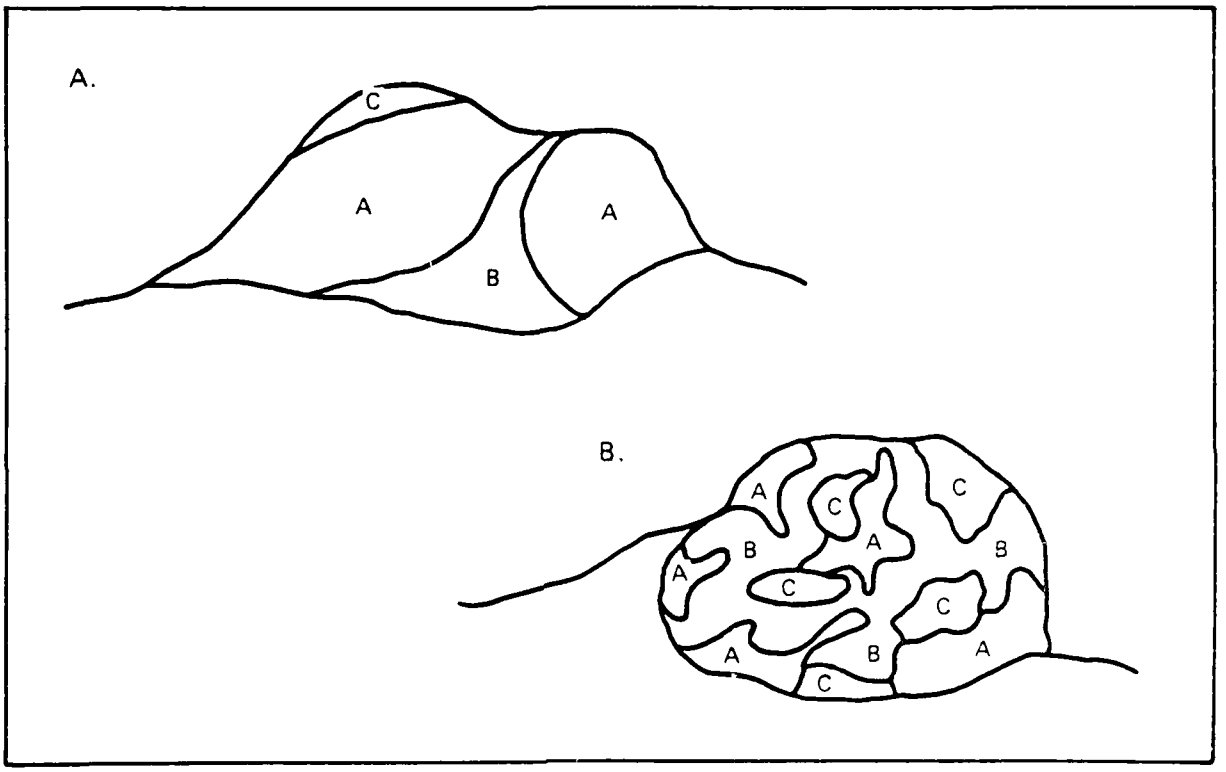


Figure 17. Examples of low and high vegetation class interspersion (Note: In the figure, Part A exemplifies low vegetation class interspersion (Question 16A = "Y"), and Part B exemplifies high vegetation class interspersion (Question 16C = "Y").)

17. VEGETATION FORM RICHNESS

Are any of the following statements true?

(a) The AA/IA is 1-10 acres and supports at least three vegetation classes (none of which comprises more than 70% of the AA/IA's vegetation) or at least four vegetation subclasses.

(b) The AA/IA is 10-100 acres and supports at least three vegetation classes (none of which comprises more than 70% of the AA/IA's vegetation) or at least six vegetation subclasses.

(c) The AA/IA is 100 or more acres and has 4 or more vegetation classes (none of which comprises more than 70% of the AA/IA's vegetation) or at least 8 vegetation subclasses.

18. SHAPE OF UPLAND/WETLAND EDGE

(Answer "I" if the AA/IA is longer than 10 miles or if there is no adjacent upland.) Is the boundary between the upland and the AA/IA irregular (Figure 18)?

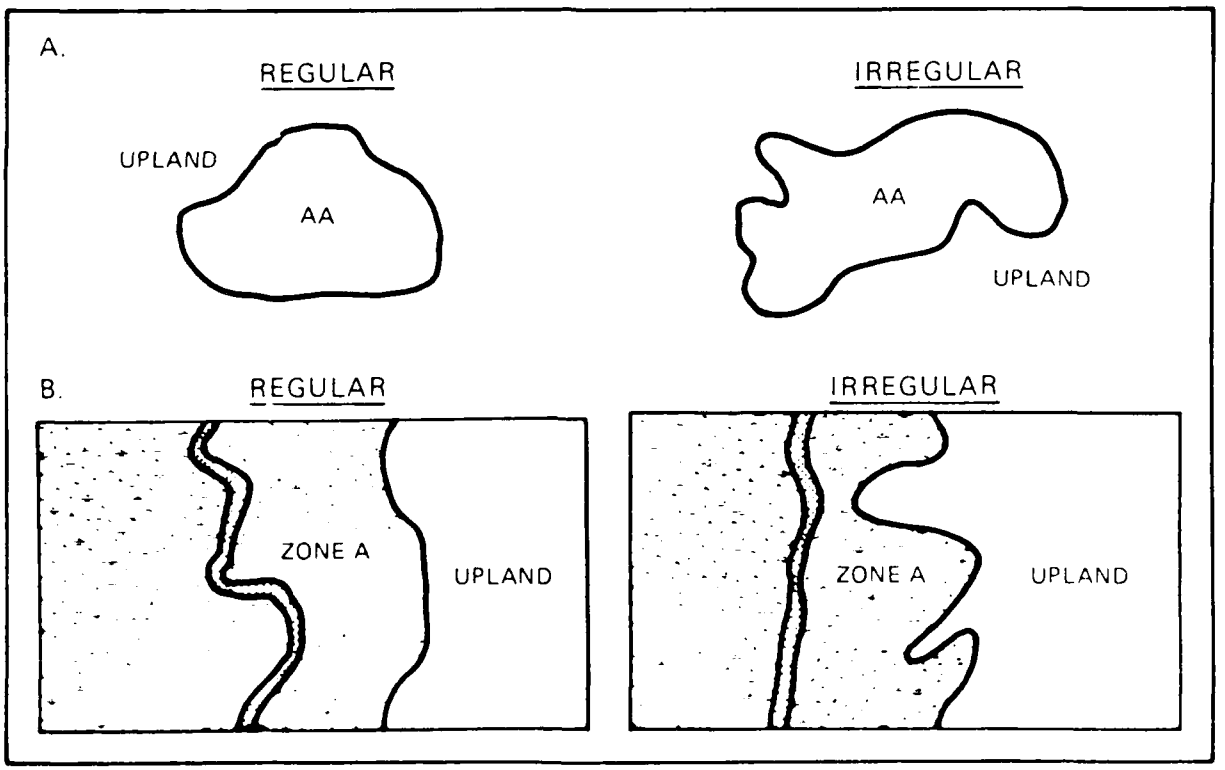


Figure 18. Regular and irregular boundaries between wetland and upland

19. FETCH/EXPOSURE

19.1A (Answer "I" if the AA/IA is composed primarily of **Zone A.**) Is either of the following true?

(a) Adjacent vegetation or topographic relief is sufficient[1] to shelter at least 1 acre of open water in Zones B or C from wind.

(b) Open water **fetch** is less than 100 ft (Figure 19)?

19.1B (Answer "I" if the AA/IA is mostly a riverine wetland system and narrower than 100 ft.) Is either of the following true?

(a) Vegetation or topographic relief adjacent to the AA/IA is insufficient[1] to shelter at least 1 acre of open water in **Zone B** or **Zone C** from wind and fetch is greater than 2 miles.

(b) Vegetation at the deepwater edge of **Zone B** is exposed to waves taller than 1 ft?

Guidelines:

[1] "Sufficient" is defined as the height of vegetation or relief multiplied by length of vegetation or relief (parallel to shore) is greater than 2,000 sq ft.

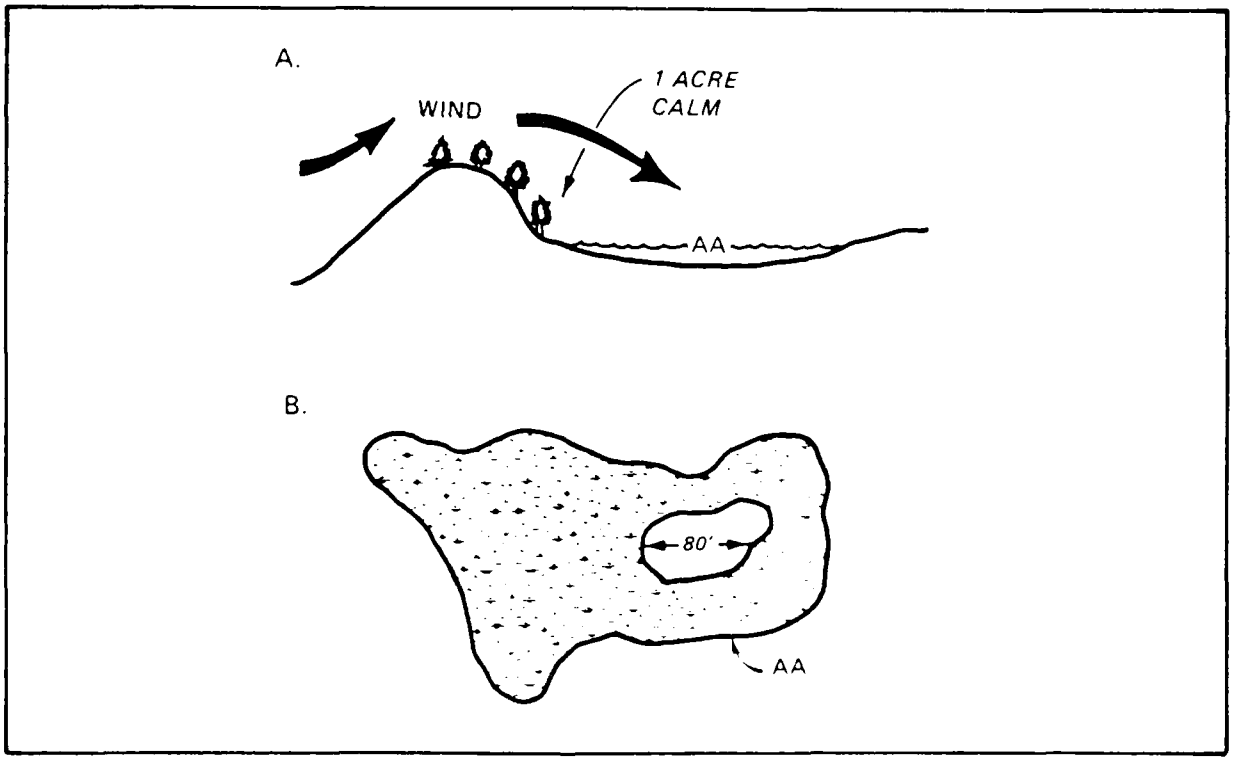


Figure 19. Examples of sheltered open water in the AA/IA (Note: In Part A of this figure, vegetation and topographic relief shelter open water in the AA/IA. In Part B of this figure, the maximum unobstructed distance is <100 ft.)

19.2 Is the AA/IA, or a portion of the AA/IA, an island, delta, bar, or peninsula that intercepts waves and thereby protects other nearby shores (Figure 20)?

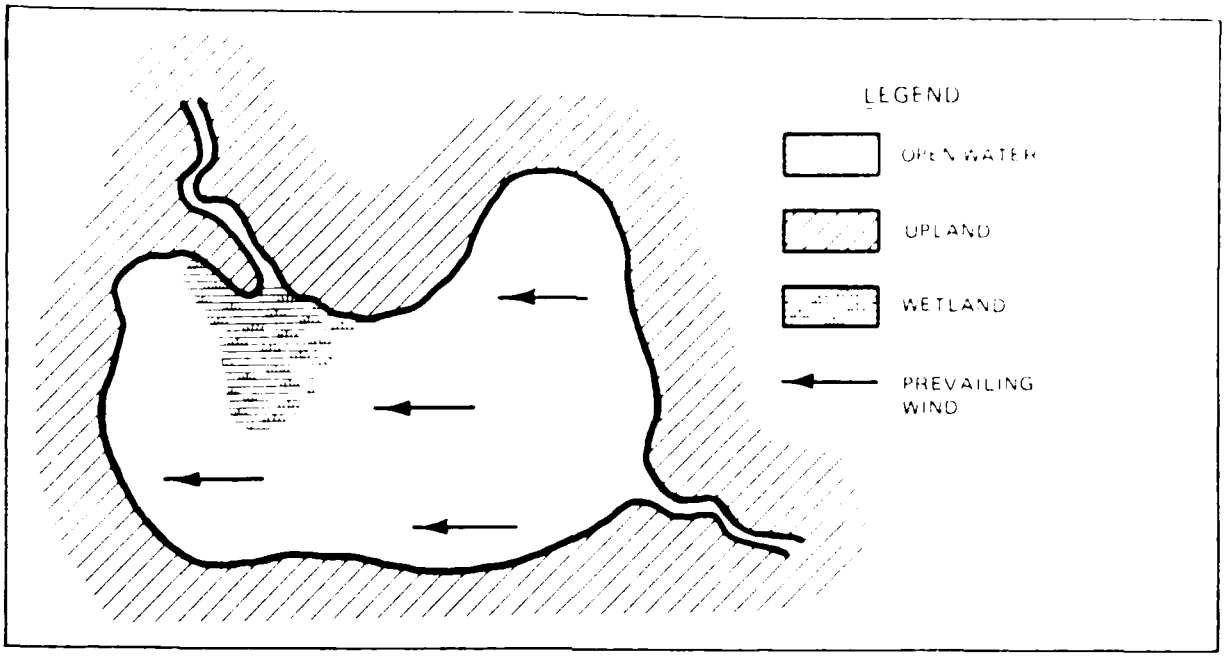


Figure 20. Example of a wetland-protected shoreline

19.3 (Answer "I" if there is no woody vegetation in AA/IA.) Does woody vegetation within the AA/IA shelter adjacent, otherwise unsheltered, uplands from wind (Figure 21)?

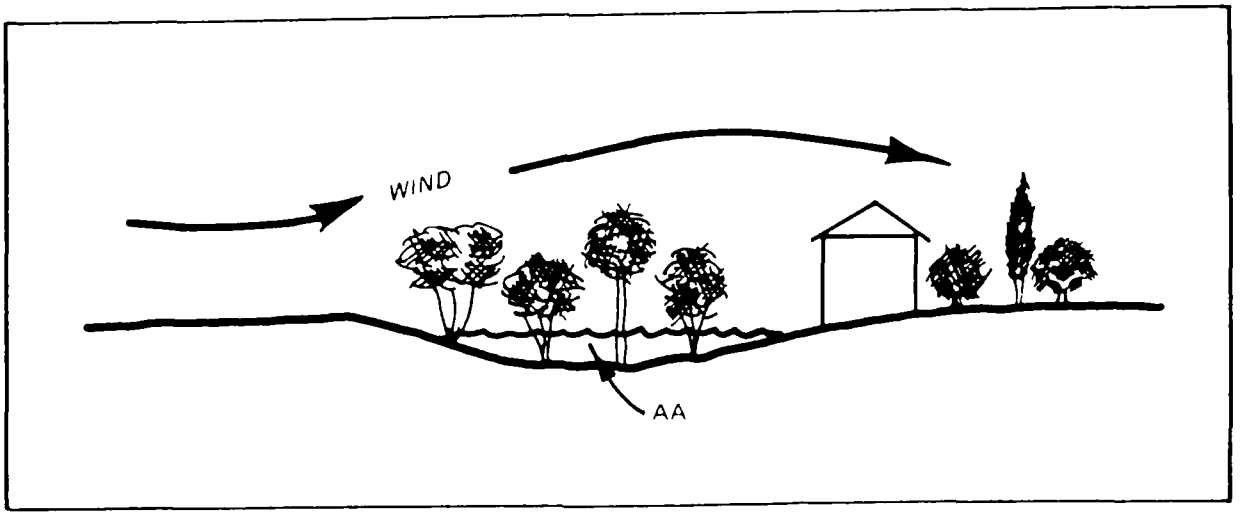


Figure 21. Example of vegetation within the wetland sheltering adjacent upland

20. VEGETATIVE CANOPY

(Answer "I" to 20.1 and 20.2 if there is no **channel** within the AA, or the AA is tidal.)

20.1 Is there sufficient vegetative canopy or topographic relief in and around the AA to shade at least 80% of Zone B at midday?

20.2 Is there a balanced **interspersion** of shaded and unshaded area **in** the **input zone,** Zone A, and Zone B (Figure 22)?

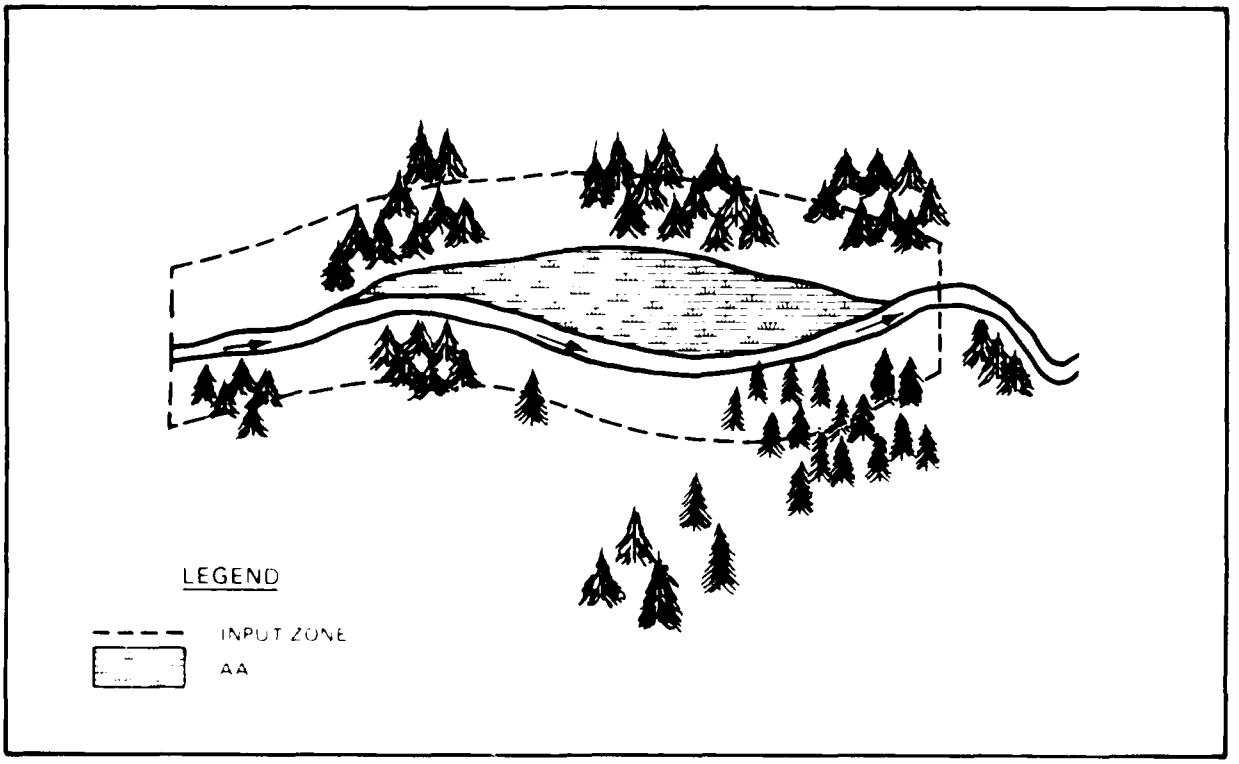


Figure 22. Example of balanced interspersion of shaded and unshaded areas in the input zone and AA

21. LAND COVER OF THE WATERSHED

The majority of the AA's **watershed** (excluding the AA) land cover is:[1]

21.A Forest and scrub-shrub.
21.B **Impervious surfaces** (urban or suburban areas, etc.).[2]
21.C Row crops, orchards, or vineyards.
21.D Nonurban pasture, hayland, perennial forbs, or grassland?
21.E Recently revegetated areas, landfills, surface mines, or other areas of exposed soil?

Guidelines:

[1] If 21B, 21C, and 21E together comprise a greater percentage than any other type, answer "Y" to the largest of these three land cover types.

[2] Impervious surfaces occur in developed areas where asphalt, concrete, etc., are extensive and where average lot size is less than 1/4 acre (10,000 sq ft).

22. FLOW, GRADIENT, DEPOSITION

22.1.1 Is any of the following true?

(a) The AA/IA contains a **channel.**

(b) The AA/IA has an outlet and an inlet.

(c) The AA/IA is tidal.

(d) The AA/IA has seasonal flow as suggested by gage data, scour lines, sediment deposition on vegetation, etc.

22.1.2 (Answer "I" if the AA/IA does not contain a channel.) Is the channel at least mildly sinuous with a **meander ratio**[1] exceeding 1.2?

22.2 Does the AA/IA include, or is it part of, an actively accreting delta (Figure 23)?

22.3 Do aerial photos or other sources of information indicate long-term erosion of the AA/IA?

Guidelines:

[1] Meander ratio is the distance from one point on a river to another point on the river via the channel, divided by the straight line distance between the same two points.

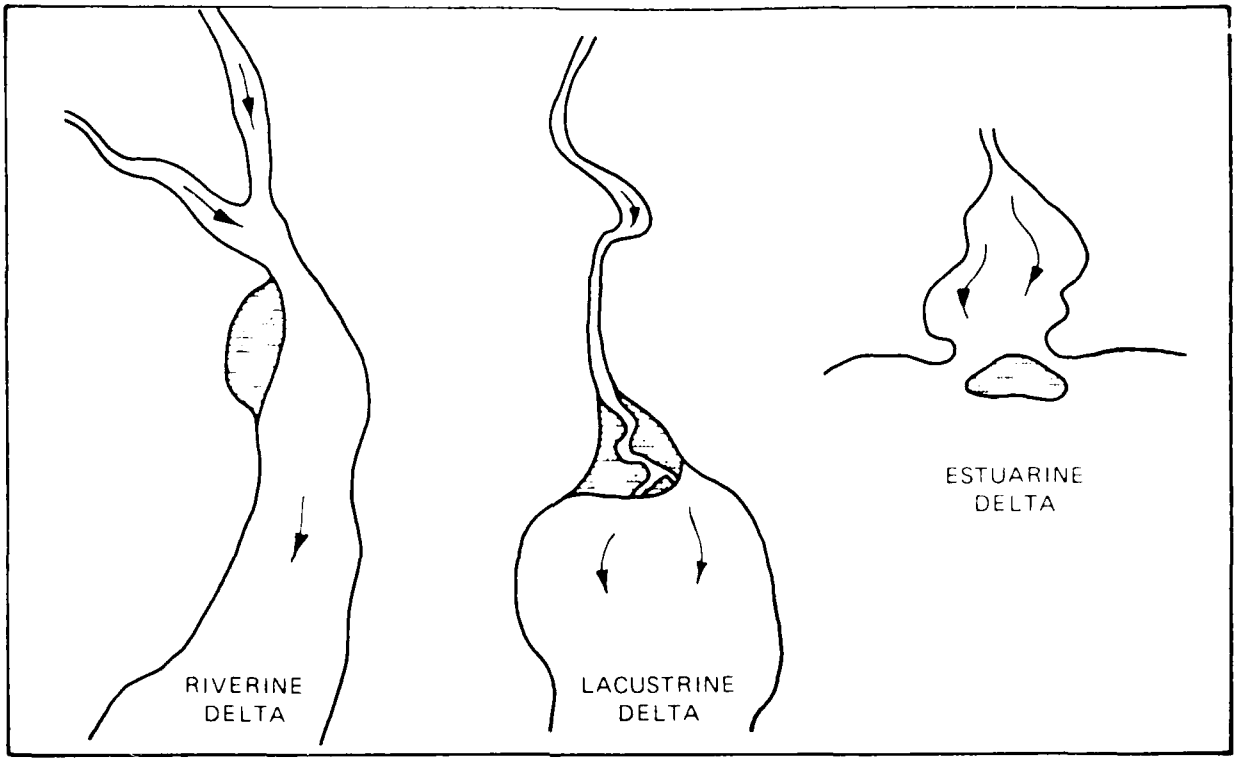


Figure 23. Examples of actively accreting deltas

23. DITCHES/CANALS/CHANNELIZATION/LEVEES

Do functioning ditches, canals, levees, or similar artificial features cause surface water to leave the AA/IA at a faster rate than it would if these features were not present?

24. SOILS

24.1 (Answer "I" if unknown.) Does analysis indicate that the soil types present in the AA/IA contain more than 4,000 mg/kg (dry weight) of amorphous extractable aluminum in the upper 8 in.?

24.2 (Answer "I" if Question 24.1 was answered "Y" or "N".) Are both of the following true?

(a) Soil maps or a site visit indicate the dominance of alluvial (e.g., fluvaquent), alfisol, ferric, clay, or other primarily fine mineral soils in the AA/IA.

(b) The map in Figure 24 shows the soils of this region to normally have elevated concentrations of aluminum (>6%) or iron, or analysis indicates there is less than 20% organic matter by weight in the upper 3 in. of sediment?

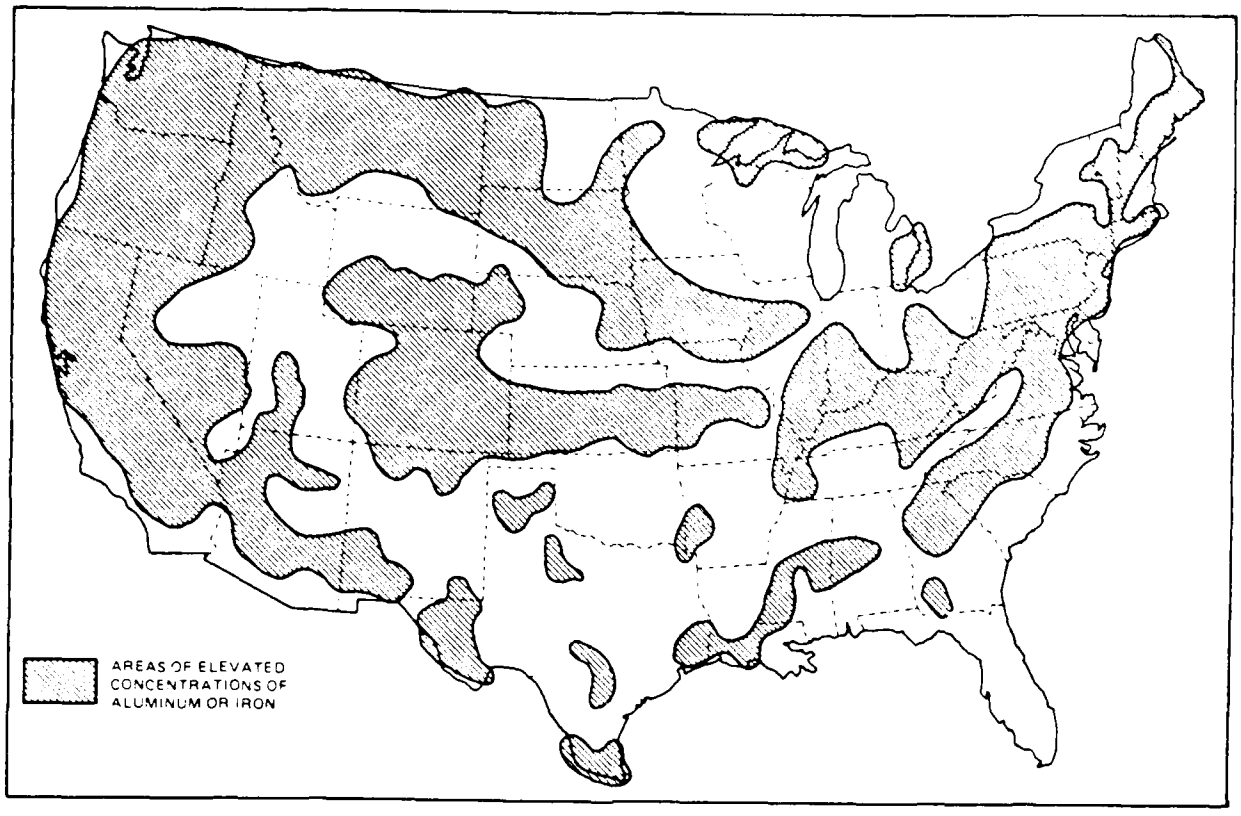


Figure 24. Geographic areas with elevated concentrations of aluminum or iron (interpreted from USGS 1984)

24.3 (Answer "I" if tidal or if unknown.) Do soil surveys indicate that soils in the AA/IA have exceptionally slow infiltration rates due to presence of impeding layers (fragipan, duripan, claypan) or very shallow depth to unfractured bedrock?

24.4 (Answer "I" if unknown.) Do soil surveys indicate that soils in the watershed (up to 1 mile away) have mostly slow infiltration rates, or are these soils impermeable due to fine texture, impeding layers, high water table, shallow depth to unfractured bedrock, or frozen condition during the usual time of greatest flooding?

24.5 Is the AA/IA in a karst (limestone) region?

25. SEDIMENT SOURCES

25.1 Are there a sediment sources that contribute inorganic sediment to the AA? Sources to consider include stormwater outfalls, irrigation return waters, surface mines, or areas[1] containing any of the following: exposed soils associated with agriculture, lands cleared within the last 2 years, soil-slope conditions classified by SCS as eroding or erosion hazard (e.g., subclass "e" in the SCS Land Classification Codes), gullies, sand or gravel pits, or severely eroding stream or road banks.

25.2A (Answer "I" if 25.1 = "N.") Is overland runoff the primary source of the sediment entering the AA?

25.2B (Answer "I" if 25.1 = "N.") Is channel flow the primary source of the sediment entering the AA?

25.3 Is <u>any</u> of the following true?

(a) Erosion within the AA is caused by drastic fluctuation in water levels due to artificial manipulation or extensive urban runoff.
(b) Slopes immediately adjacent to the AA are steeper than 10% (or steeper than 1% if alluvial clays prevail) <u>and</u> are unstable.
(c) Boating activity causes frequent wakes that impinge on the deepwater fringes of the AA.
(d) Tributaries immediately upstream of the AA have been channelized.

<u>Guidelines</u>:

[1] To be considered, an area must comprise 1 acre, 2% of the **input zone**, or an area within 0.5 mile at least as large as the AA's wetland acreage.

26. NUTRIENT SOURCES

26.1 Is there evidence of high nutrient concentration in the AA (algal blooms or actual measurement of high concentration) <u>or</u> do any of the following sources contributenutrients to the AA?

(a) Sewage outfalls, phosphate mines, tile drains, canals, or other nutrient-rich sources.
(b) Areas[1] containing any of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, or soils tilled, burned, or cleared within the last 2 years.
(c) Areas where the acreage of the AA divided by the number of houses with septic systems within the input zone is less than eight.
(d) Areas where the acreage of the AA divided by the number of people living within the input zone (including those beyond the input zone if their wastes are carried to the input zone, or AA, by a collector-outfall system) is less than 25.

26.2 (Answer "I" if 26.1 = "N.") Is overland sheetflow the primary source of the nutrients entering the AA?

26.3 (Answer "I" if 26.1 = "N.") Is channel flow the primary source of the nutrients entering the AA?

Guidelines:

[1] To be considered, an area must comprise 1 acre, 2% of the **input zone**, or an area within 0.5 mile at least as large as the AA's wetland acreage.

27. CONTAMINANT SOURCES

27.1 Is there evidence of waterborn contaminants (e.g., fish kills or actual measurements of hazardous concentrations) or is there a source that contributes waterborn contaminants (in concentrations hazardous to aquatic life) to the AA? Consider industrial and sewage outfalls, mines, landfills, leaking subsurface tanks, salt/brine seepage, pesticide-treated areas, contaminated aquifers, severe oil runoff, irrigation return water, heavily traveled highways, or water inputs significantly contaminated by the above farther upstream.

27.2 (If 27.1 is "N," circle "I" for 27.2.) Is sheetflow the primary source of the waterborn contaminants described above?

27.3 (If 27.1 is "N," circle "I" for 27.3.) Is channel flow the primary source of the waterborn contaminants described above?

Continue with Level 2 assessment on the next page.

4.2 Effectiveness and Opportunity Evaluation - Level 2 Assessment

The second level of assessment requires a field visit to the AA. Plan to spend 1 - 3 hours at the site. During the field visit, review your responses to the questions in social significance evaluation and the first level of assessment. Revise responses in light of field observations if necessary.

Take the following items with you to the field:

(a) Volume II of WET
(b) Data forms A, B, and C
(c) Topographic maps, aerial photos, and soil survey
(d) Measuring stick/depth meter, salinometer, pH meter, and sediment grab.
(e) Binoculars

If habitat suitability is to be evaluated, review Form C (Appendix B) for the types of fish and wildlife species and recreational activities to watch for during the field visit. In addition, complete Form C before you leave the field site.

28. DIRECT ALTERATION

Is either of the following conditions true?

(a) Most of the AA/IA has been tilled, filled, or excavated at least once in the past 3 years.

(b) An outlet has recently been added to the AA/IA where none previously existed, or an inlet has recently been blocked off and an outlet is still present.

29. WETLAND/UPLAND EDGE

29.1 Does the boundary between the wetland and upland support adequate understory vegetation (e.g., shrubs less than 3 ft tall, dense grasses, etc.) to serve as cover for vertebrates using the wetland?

29.2 Are **slopes** in most of the **input zone** less than 5%?

30. DISTURBANCE

Are both of the following conditions true?

(a) The AA/IA, or areas adjacent and visible to the AA/IA, are visited by people on foot, boat, or off-road vehicle at least three times daily.

(b) Surface water in the AA/IA is mostly less than 3 ft deep and less than 1,000 ft from the usual places of human activity or greater than 3 ft deep and less than 600 ft from the usual places of human activity.

31. WATER/VEGETATION PROPORTIONS

Considering the entire AA:

31.1 Are **Zones A and B** combined greater than **Zone C** (Figure 15)?

31.2 Is Zone B at least 10% of the AA?

31.3 Is Zone B larger than Zone A?

31.4 (Answer "I" if submerged vegetation is absent in Zone B.) Is the area of submerged vegetation in **Zone B (sB)** larger than the unvegetated areas of **Zones B (oB)** and C?

31.5 Is the area of Zone A at least 10% the area of Zones B and C?

31.6 (Answer "Y" to 31.6E if Zone B is absent.) What percent of Zone B and Zone C together are dominated by emergent vegetation (eB)?

31.6A 0
31.6B 1-30
31.6C 31-60
31.6D 61-99
31.6E 100

32. HYDROPERIOD (SPATIALLY DOMINANT)

The dominant[1] flooding regime of the AA/IA is (Figure 25):

32.A Permanently flooded nontidal.
32.B Intermittently exposed nontidal.[2]
32.C Semipermanently flooded nontidal.
32.D Seasonally flooded nontidal.
32.E Saturated (no standing water) nontidal.
32.F Temporarily flooded nontidal.
32.G Intermittently flooded nontidal.[2]
32.H Artificially flooded nontidal.[3]
32.I Regularly flooded tidal.
32.J Irregularly exposed tidal or subtidal.
32.K Irregularly flooded tidal.

Guidelines:

[1] "Dominant" is defined as the largest percentage of the AA. However, if 32.A and 32.B together comprise a greater percentage than any other type, answer affirmatively for the larger of the two types. Similarly, if any of the nonpermanent types (32.C-32.G) in combination comprise a greater percentage than any permanent type(s), answer "Y" to the largest of the nonpermanent types.

[2] Distinctions between 32.B and 32.G are usually not critical unless wildlife will be analyzed at the group or species level.

[3] If 32.H is "Y," also answer "Y" to the second most dominant hydroperiod.

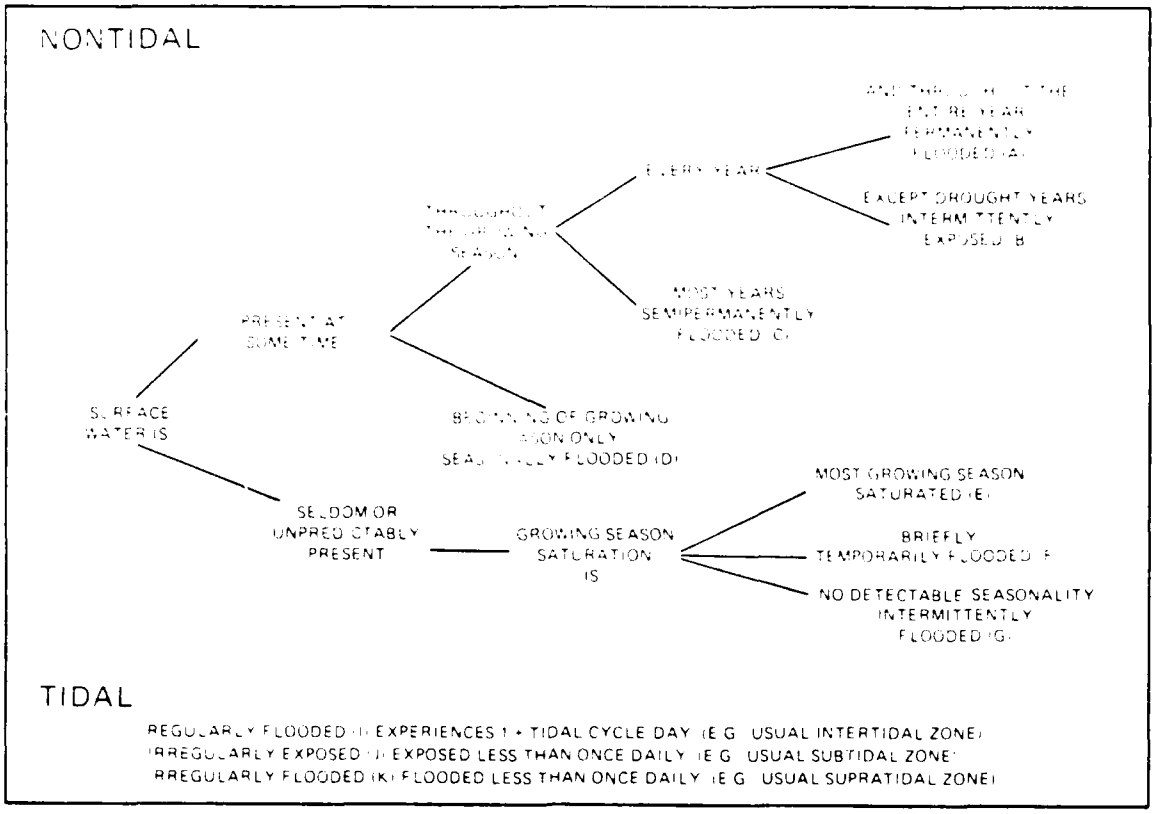


Figure 25. Key for determination of hydroperiod

33. MOST PERMANENT HYDROPERIOD

Which hydroperiod listed in Question 32 best describes the portion of the AA, or the contiguous deepwater, that is inundated or saturated for the longest part of the year and comprises at least 1 acre or 10% of the AA?[1]

Guidelines:

[1] If 32.H is "Y," answer "Y" to the second most descriptive hydroperiod.

34. WATER LEVEL CONTROL

34.1 Is the AA/IA's existence dependent on upstream or downstream artificial control structures (other than those designed specifically for fish and wildlife management) built within the last 20 years?

34.2 Is the AA/IA located less than 2 miles downslope from a large impoundment (higher than 20 ft at outlet) or is the AA/IA's water table influenced by any other type of upstream impoundment?

34.3.1 Is any part of the AA/IA flooded (even seasonally) due to permanent or temporary ponding created by a dam or dike or is the AA/IA actively managed for stormwater or floodwater detention?

34.3.2 (Answer "I" if 34.3.1 is "N.") Is flooding in the AA/IA a result of beaver activity?

35. FLOODING EXTENT AND DURATION

35.1 (Answer "I" if tidal.) Does flooding cause surface water to expand to more than 3 times (200%) its extent under average conditions for more than 25 days during an average year (Figure 26) or is the relationship between extent and duration above the curve shown in Figure 27? [1]

Guidelines:

[1] Hydroperiod/flooding regime information can be determined using the following sources of information and/or guidelines:

(a) The best sources for flooding information include: gaging stations, direct observation, air photos, HUD/FEMA flood maps, local knowledge, and flood models of the Hydrologic Engineering Center and SCS (e.g., HEC and TR-20).

(b) Extent of flooding may also be determined in the field by observation of the following: water marks, drift lines, scour marks, absence of litter, beaver sign, sediment on leaves and stems, and the presence of flood-intolerant vegetation.

(c) If the information in (a) and (b) is unavailable, answer Question 35.1 "Y" if the wetland is low in the watershed and has a large Zone A that is devoid of upland plants. Answer Question 35.1 "N" if the wetland's Zone B has a sharp transition to upland.

35.2 (Answer "I" if tidal or if channel flow is absent.) Is any of the following conditions true?

(a) Base flow typically fills less than 60% of the **channel** volume.

(b) **Surface water** is absent 5 days after a mean monthly 24-hr storm, and the **watershed** is larger than 10 square miles (100 square miles in dry regions).

(c) The ratio of the high flow (measured in cubic feet per second) that is reached or exceeded 10% of the year, versus the typical low flow that is exceeded 90% of the year, is greater than 1.5.[1]

Guidelines:

[1] This analysis requires at least two complete years of daily streamflow records and a summarization of these according to the "percent exceedance" parameter. These data may be available for some streams with dams.

36. VEGETATED WIDTH

36.1 Is the average width[1] of the area dominated by emergent, scrub/shrub, or forest vegetation in Zones A and/or Zone B:

36.1.1 Less than 20 ft?

36.1.2 Greater than 500 ft, or the AA/IA is **constricted** and the vegetation is present throughout.

Guidelines:

[1] Average width should be measured perpendicular to flow. If average width cannot be determined using this method, calculate average width by dividing the area of vegetation by twice its length parallel to open water (or, if no open water, by its maximum dimension) (Figure 28).

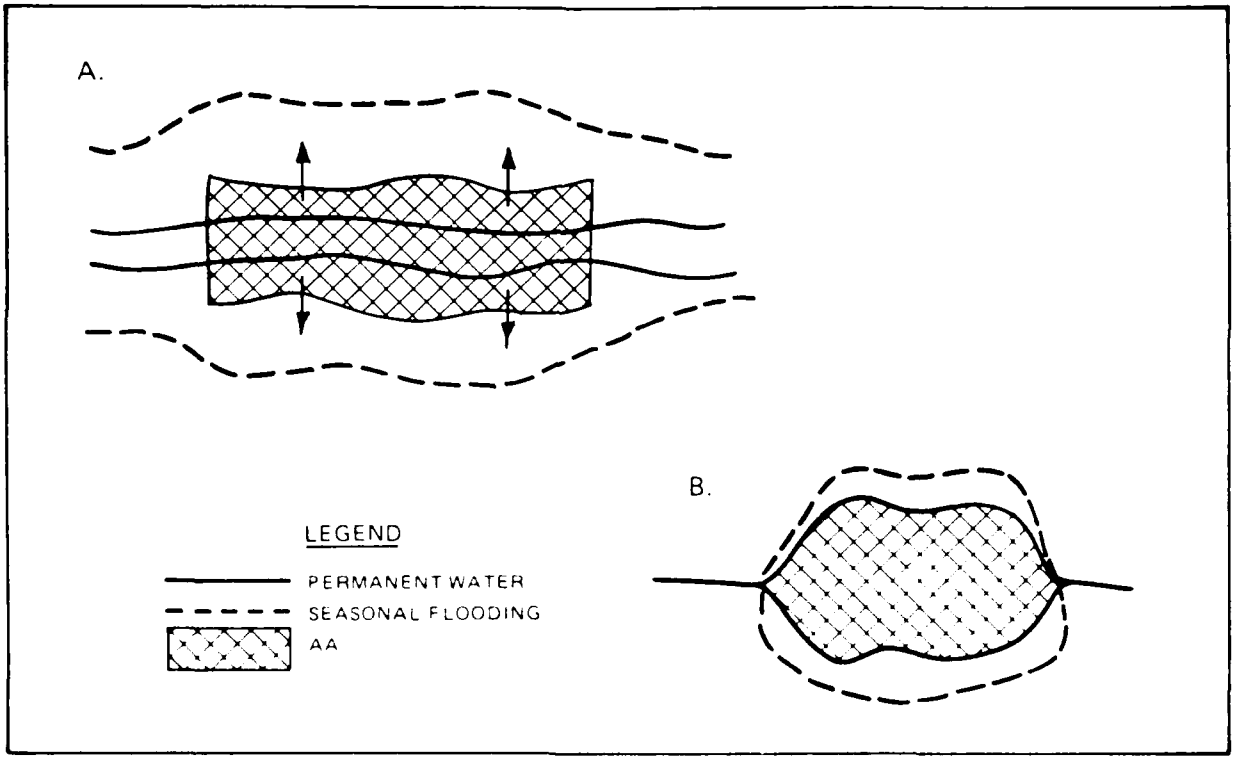


Figure 26. Examples of surface water expansion during flooding (Note: In Figure 26, Part A, surface water expands 400% for 20 days, therefore, Question 35.1 = "Y." In Part B, surface water expands 200% for 22 days, therefore, Question 35.1 = "N.")

36.2 (Answer "N" to 36.2.1, 36.2.2, and 36.2.3 if Zone B is absent.) Is the average width[1] of the area in Zone B that supports emergent vegetation and where depth seldom exceeds 50% plant height:

36.2.1 Less than 20 ft?

36.2.2 Less than 20 ft, and mainly persistent emergent vegetation?

36.2.3 Greater than 500 ft, or alternatively, the AA/IA is constricted, emergent vegetation is present throughout, and stem density is approximately 50 stems per meter^2 or greater?

Guidelines:

[1] Average width should be measured perpendicular to flow. If average width cannot be determined using this method, calculate average width by dividing the area of erect vegetation by twice its length parallel to open water (or, if no open water, by its maximum dimension) (Figure 28).

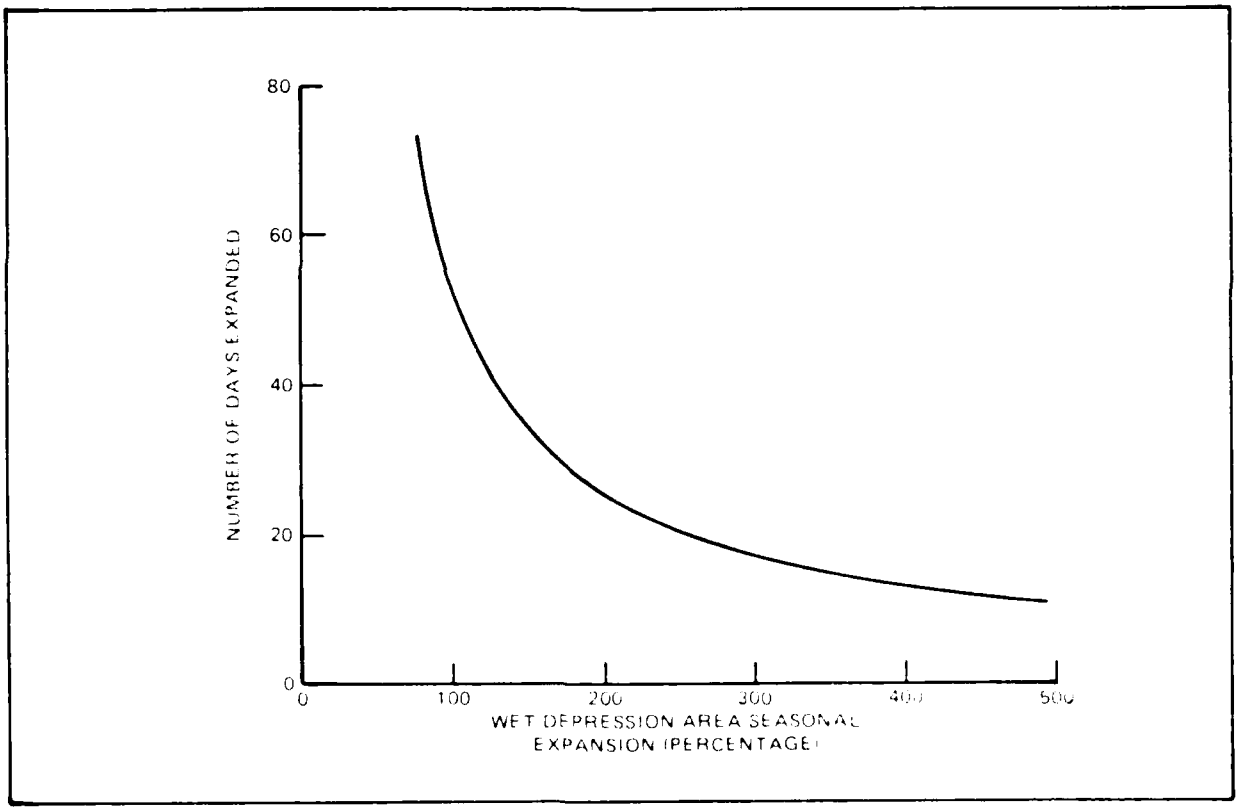


Figure 27. Seasonal expansion of surface water (Adapted from U.S. Army Corps of Engineers 1980) (Note: In the figure, if a point lies above the curve in the graph, Question 35.1 = "Y." If a point lies below the curve in the graph, Question 35.1 = "N.")

37. OPEN WATER WIDTH

Is there an area of **open water** in the AA/IA that meets all of the following conditions?

(a) Mostly devoid of aquatic bed vegetation.

(b) Depth exceeding 2 ft.

(c) Width greater than 6 ft.

(d) Length at least 1,000 ft (including **accessible** areas) or an area serving to connect two large water bodies.

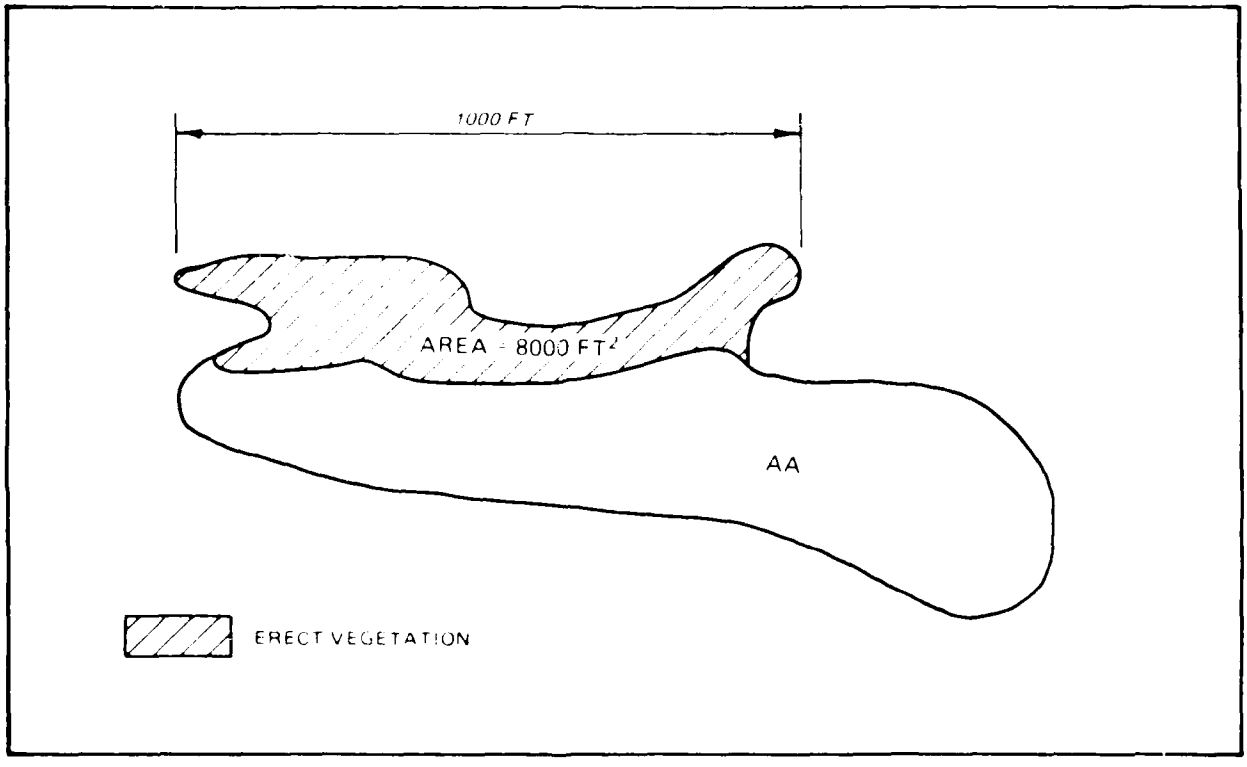


Figure 28. Example of average width calculation for erect vegetation in Zone B (eb). (Note: In the figure, the average width is 8 ft (8,000 ft²/1,000 ft x 2).)

38. TYPE COMBINATIONS

38.1 The AA/IA is primarily:

(a) Permanently flooded, tidally or
(b) Seasonally flooded, tidally or

and within 1 mile of the AA/IA there is appropriate AA/IA which is primarily artificial or natural in origin and is seasonally flooded, tidally or [illegible] then enter "E." If no AA/IA is present within this specified distance, enter "N."

38.2 The AA/IA:

(a) Is predominantly nontidal with erect vegetation or rooted vascular floating-leaved vegetation in Zone B or
(b) Contains at least one acre of hardwoods (less than 6 in. diameter at breast height) with greater than 25% canopy closure.

and within 0.5 mile of the AA/IA there is a separate AA where the other situation described in (a) or (b) is predominant.

38.3 The AA/IA is predominantly:

(a) Estuarine or marine or
(b) Freshwater palustrine or lacustrine, or on a coastal island.

and within 5 miles of the AA/IA there is a separate AA/IA where the other situation described in (a) or (b) is predominant.

38.4 The AA/IA is predominantly:

(a) Mudflat or
(b) Tidal scrub-shrub.

and adjacent to the AA/IA there is a separate AA/IA where the other situation described in (a) or (b) is predominant.

38.5 The AA/IA contains:

(a) At least 5 acres of mudflat or
(b) At least 5 acres of emergent vegetation.

and adjacent to this area of at least 5 acres there is a separate area where the other situation described in (a) or (b) exists.

38.6 The AA/IA:

(a) Is predominantly agricultural or is predominantly early successional stage vegetation or contains at least 5 acres of emergent vegetation in Zone A or
(b) Contains at least 10 acres of evergreen forest.

and within 0.5 mile of the AA/IA there is a separate AA/IA where the other situation described in (a) or (b) exists.

38.7 The AA/IA is predominantly:

(a) Semipermanently flooded or
(b) Seasonally flooded or
(c) Permanently flooded, nontidal, intermittently exposed, or artificially flooded and managed for wildlife.

and within 1 mile of the AA/IA there are separate AA/IA where the other situations described in (a), (b), and (c) are predominant (not less than 1 acre of the AA/IA.

38.8 (Answer only if the AA/IA is located in a Southwestern riparian wetland. If not located in a Southwestern riparian wetland answer ".".) The AA/IA is predominantly:

(a) Cottonwood-willow stands (greater than 1 acre).
(b) Honey mesquite (greater than 1 acre).

and within the same AA/IA, or the adjoining upland, the other situation described in (a) or (b) occurs.

39. SPECIAL HABITAT FEATURES

Is either of the following conditions true?

(a) The AA/IA is less than 100 acres and two of the features listed below are present in the AA/IA or buffer zone at some time during the year.

(b) The AA/IA is more than 100 acres and three or more of the features listed below are present.

- standing snags with cavities larger than 2 in.
- trees with diameter exceeding 10 in.
- plants bearing fleshy fruit (e.g., cherry, persimmon)
- mast bearing hardwoods (e.g., oak, beech, hickory)
- cone-bearing trees or shrubs
- tilled land with waste grains
- evergreen tree stands with over 80% canopy closure
- native prairie
- exposed bars (e.g., unconsolidated gravel, mudflat

40. BOTTOM WATER TEMPERATURE

(Answer "." if estimation is not possible. The average daily minimum summer water temperature at the deepest part of the AA/IA is usually:

40.1 Less than 50° F.
40.2 Greater than 69° F.

41. VELOCITY (SPATIALLY DOMINANT)

Answer "." if mild and mild if question 7 was answered 1 if the AA/IA [illegible] during peak, annual flow in the vast majority of the AA/IA:

41.1 [illegible]
41.2 [illegible]

42. VELOCITY (SECONDARY)

42.1 (Answer "1" if the AA/IA is tidal.) Which velocity categories reflect seasonal flows that occur in at least 1 acre or 10% of the AA/IA.

42.1.1 0-1 ft/sec
42.1.2 1-3.3 ft/sec
42.1.3 3.3+ ft/sec

42.2 (Answer "1" if the AA/IA is tidal.) Which velocity categories reflect seasonal flows (wet and dry) that occur in other AA/IA's within 1 mile of the AA/IA and are **accessible** to fish for at least 20 days a year?

42.2.1 0-1 ft/sec
42.2.2 1-3.3 ft/sec
42.2.3 3.3+ ft/sec

43. WATER DEPTH (SPATIALLY DOMINANT)

Which depth category covers the greatest portion of the AA/IA?[1]

43.A Less than 1 in.
43.B 1-4 in.
43.C 5-8 in.
43.D 9-20 in.
43.E 21-39 in.
43.F 40-59 in.
43.G 5-6.5 ft
43.H 6.6-26 ft
43.I Greater than 26 ft

Guidelines:

[1] A precise answer is required only for habitat suitability evaluations.

44. WATER DEPTH (SECONDARY)

Which water depth categories cover at least 1 acre or 10% of the AA/IA or other AA/IA's within 1 mile that are **accessible** to fish from this AA/IA during at least 20 days of the year.[1]

44.1 Less than 1 in.
44.2 1-4 in.
44.3 5-8 in.
44.4 9-20 in.
44.5 21-39 in.
44.6 40-59 in.
44.7 5-6.5 ft
44.8 6.6-26 ft
44.9 Greater than 26 ft

Guidelines:

[1] A precise answer is required only for habitat suitability evaluations.

45. SUBSTRATE TYPE (SPATIALLY DOMINANT)

Is the surface substrate (upper 3 in) in the AA [illegible] predominantly:

45.A Mineral soil? or mud?
45.B Muck (nonporous organic)?
45.C Peat (porous organic)?
45.D Sand?
45.E Cobble-gravel?
45.F Rubble?
45.G Bedrock?

Guidelines:

[illegible] material is defined as the the largest percentage [illegible]. However, if "A", "B", and "C" [illegible] comprise a greater percentage than any other type [illegible], or if "D" is the largest of these three. Similarly, if "E", "F", "G", or "H" [illegible] comprise a greater percentage than any other type [illegible], or if "I" is the largest of these four.

[illegible] substrates with at least [illegible] organic material. [illegible] material if [illegible] not easy.

[illegible] types [illegible] by [illegible] major physical [illegible], [illegible] the [illegible] may be helpful:

a. Assume sediments with wide [illegible], stems, etc., are peat, and sediments with [illegible] are muck.
b. Assume that sediments with a "bitter [illegible]" odor are muck.
c. Assume that areas with sphagnum moss are peat.
d. Assume that sediments in Zone A, [illegible] water unvegetated [illegible] Zone B, and Zone C are not muck or peat but verify in [illegible] water.
e. Assume that streams or rivers with a channel gradient greater than [illegible] have cobble-gravel or coarser material, while those with a lesser gradient have sand or finer material.

46. PHYSICAL HABITAT INTERSPERSION

Answer 46.A "Y" and 46.F and 46.G "N" if Zone B and C are absent. Within Zones B and C are substrate types, velocity and depth categories [illegible]:

46.A [illegible] with [illegible] substrate types, velocities and depth [illegible] of the AA [illegible].

46.B [illegible]

46.C [illegible]

47. pH

(Answer 47.A "Y" if AA/IA is tidal.) Is pH of the water in the AA/IA:

47.A 6.0-8.5 (neutral)

47.B Below 6.0 (generally acidic)?

47.C Above 8.5 (generally alkaline)?

48. SALINITY AND CONDUCTIVITY

(Answer "I" if unknown and reasonable estimation is impossible, but see question guidelines[1].) Is the AA/IA's salinity/halinity or conductivity:

	Salinity/ Halinity (ppt)	Approximate Conductivity	Estuarine/ Marine	Riverine/Lacustrine Palustrine
48.A	<0.5	<800	fresh	fresh
48.B	0.5-5.0	800-8,000	oligohaline	mixosaline
48.C	5.0-18.0	8,000-30,000	mesohaline	mixosaline
48.D	18.0-30.0	30,000-45,000	polyhaline	mixosaline
48.E	30.0-40.0	45,000-60,000	euhaline	eusaline
48.F	>40.0	>60,000	hyperhaline	hypersaline

Guidelines:

[1] If salinity/halinity or conductivity cannot be measured, the presence of the plant species shown in Table 4 may serve as an indicator of nonfresh conditions.

Table 4. Wetland Plants Indicating Saline (Nonfresh) Conditions* (Sources: Millar 1976, Stewart and Kantrud 1972)

Suaeda depressa	*Atriplex patula*
Scirpus nevadensis	*Polygonum pacificum*
Scirpus paludosus	*Lactuca scariola*
Ruppia occidentalis	*Triglochin maritima*
Cannichellia palustris	*Muhlenbergia asperifolia*
Ruppia maritima	*Spartina* spp.
Potamogeton vaginatus	*Ranunculus cymbalaria*
Chenopodium salinum	*Spergularia marina*
Aster brachyactis	*Heliotropium curvassavicum*
Distichlis spicata	*Alisma gramineum*
Plantago eriopoda	*Puccinellia nuttalliana*
Potentilla anserina	*Salicornia virginica*

* Supplement this plant species list with local information if available.

49. AQUATIC HABITAT FEATURES

(Answer "1" if a tidal channel with a **gradient** of more than 0.01 is present.)

49.1.1 Does the AA include, or is it included in, a permanently flooded stream reach[1] comprised of 20-80% pools, backwaters, or similar slow-water areas?[2]

49.1.2 (Answer "N" if 49.1.1 is "N.") Does the AA include, or is it included in a stream reach with a cobble-gravel substrate and riffles[3] spaced at intervals of five to seven times the average stream width?

Guidelines:

[1] Stream reach is defined as the distance between tributaries, or a distance of 1 mile, whichever is greater.

[2] Slow-water areas include pools, backwaters, side channels, and other areas where flow velocity at the surface is generally less than 0.6 ft/sec.

[3] Riffles are naturally shallow areas with coarser substrate (generally cobble-gravel) and faster current.

49.2 Does the AA have fish cover[1] available for at least 20 days annually in at least 20% of **Zone B** or is fish cover available in other AA's that are within 1 mile and **accessible** to fish from this AA?

Guidelines:

[1] Fish cover is defined as moderately dense aquatic vegetation, submersed logs and stumps, tree roots, boulders, overhanging vegetation, crevices, undercut banks, etc.

49.3 Are carp prevalent in the AA?

50. PLANTS: WATERFOWL VALUE

(Answer "N" if AA/IA is unvegetated.) Does any plant or combination of plants listed in Table 5 comprise more than 10% or 1 acre of the AA/1A?

This completes level 2 assessment. At this point you may:

(1) Continue with level 3 assessment, or

(2) Interpret the responses to assessment levels 1 and 2 as outlined in Section 4.4.

Table 5. Wetland Food Plants Preferred by Waterfowl.* (Sources: Bagur 1977, Bellrose 1976, Kadlec and Wentz 1974, Martin et al. 1951.)

AQUATIC BED SPECIES	PART 1: Preference by Region					PART 2: Preference by Waterfowl Group and Season																
						1		2		3		4		5		6		7		8		
	NE	SE	PR	MT	PC	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	
Aneilema keisak		*					*															
Brasenia schreberi	*	*					*				*		*	*								
Ceratophyllum demersum	*	*	*	*	*						*		*									
Chara spp.		*	*	*	*		*						*									
Halodule spp.		*									*		*									
Lemna spp.	*	*	*	*	*				*		*											
Najas (except marina)	*	*					*				*											
Nuphar spp.	*	*			*					*												
Nymphaea spp.	*	*							*				*									
Polygonum spp.	*	*	*	*	*	*	*	*	*		*											
Potamogeton spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*					
Rorippa spp.	*	*					*										*					
Ruppia maritima	*	*	*	*	*	*	*						*	*		*	*					
Spirodela spp.	*	*	*	*	*				*		*											
Vallisneria spp.	*	*											*	*			*					
Wolffia spp.	*	*	*	*	*				*		*											
Zanichellia palustris		*	*	*		*	*						*	*								
Zostera marina	*				*						*		*				*	*				

EMERGENT SPECIES	PART 1: Preference by Region					PART 2: Preference by Waterfowl Group																
						1		2		3		4		5		6		7		8		
	NE	SE	PR	MT	PC	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	
Acnida cannabinus	*	*					*															
Atriplex patula		*	*				*															
Carex spp.	*	*	*	*	*	*	*			*	*											
Cladium jamaicense		*					*										*					
Distichlis spicata	*	*	*	*	*												*					
Echinochloa spp.		*	*		*		*															
Eleocharis spp.	*	*	*	*	*	*	*				*						*					
Equisetum spp.	*		*	*	*	*	*										*					
Juncus spp.	*	*	*	*	*	*																
Jussiaea spp.		*					*															

(Continued)

Table 5 (Cont.)

EMERGENT SPECIES	PART 1: Preference by Region					PART 2: Preference by Waterfowl Group														
						1		2		3		4		5		6		7		8	
	NE	SE	PR	MT	PC	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW	N	MW
Leersia oryzoides	*	*	*				*														
Leptochloa fasicularis	*	*	*				*														
Lophotocarpus calycinus	*	*	*				*														
Oryza		*				*	*						*		*		*			*	*
Panicum spp.	*	*	*			*	*														
Paspalum boscianum	*	*				*	*														
Peltandra virginica	*	*						*	*			*									
Sagittaria platyphylla		*					*														
Salicornia virginica	*	*	*	*	*												*				
Scirpus spp.	*	*	*	*	*	*	*		*	*	*	*	*								
Scolochloa festucacea		*	*				*														
Sesuvium portulascastrum		*	*																		
Setaria spp.	*		*				*														
Sparganium spp.	*		*	*	*	*	*		*								*				
Spartina spp.	*	*							*												
Triglochin maritima					*																
Zizania aquatica	*	*					*	*	*	*	*	*	*	*							

* All plants listed in Table 5 are of above average attractiveness to at least one waterfowl group in at least one region as indicated by the asterisks in the body of the table. Plants not listed are seldom preferred as food; nevertheless, they may sometimes be valuable as cover, nesting material, or as food when preferred plants are locally scarce. This table reflects the attractiveness of plants to waterfowl and not necessarily their nutritive value. Nuts, mast, and fruits of woody species may be important locally but are not considered here. It should be noted that the presence of adequate cover and dense concentrations of aquatic invertebrates may be at least as important as presence of preferred plants to some groups at some seasons. This is particularly true for groups 1 through 5 and group 8 during the breeding season. This fact is accounted for in the interpretation keys.

(Continued)

Table 5 (Concluded)

Part 1 of Table 5 indicates regions in which the plant is preferred (combining all waterfowl species and seasons). The regions are:

Northeast (NE): ME, NH, VT, MA, CT, RI, NJ, NY, PA, DE, MD, WV, OH, IN, MI, WI, KY, west NC, east TN, south IL, east MN, west VA.

Southeast (SE): SC, GA, FL, AL, MS, AK, LA, east OK, east TX, south MO, west TN, east NC, south VA.

Prairie (PR): IA, IL, KS, NE, SD, ND, east MT, east WY, east CO, east NM, west OK, west MN, north MO, central TX.

Mountains (MT): AZ, UT, NV, ID, west NM, west CO, west WY, west MT, east OR, east WA, southeast CA.

Pacific (PC): CA, west OR, west WA.

Part 2 of Table 5 indicates plants preferred by waterfowl species during particular periods of the year. The periods of the year are abbreviated: N = nesting and brood rearing; MW = migration and winter. The waterfowl groups are defined below.

Group 1: Prairie Dabblers
Group 2: Wood Duck and Black Duck
Group 3: Goldeneye and Bufflehead
Group 4: Canvasback, Redhead, Ruddy, and Ring-necked Duck
Group 5: Greater and Lesser Scaup
Group 6: Inland Geese and Swans
Group 7: Brant
Group 8: Whistling Ducks

4.3 Effectiveness and Opportunity Evaluation - Level 3 Assessment

51. PLANT PRODUCTIVITY

Is the net annual aboveground productivity[1] (or less desirably, end of season standing crop) of any species, or group of species (association), that predominates in more than 10% of the AA/IA:

51.1 Less than 500 g/m^2/year?

51.2 Greater than 1,500 g/m^2/year?

Guidelines:

[1] Measured as the spatial mean value within the portion of the AA/IA where it occurs. Procedures are described in Kibby et al. 1980.

52. FRESHWATER INVERTEBRATE DENSITY

(Answer "I" if tidal.) Does representative field sampling of the AA/IA's benthic and epiphytic macroinvertebrates indicate that during the growing season there are:

52.1 More than 500 individuals/ft^2 (excluding annelid worms)?

52.2 Less than 25 individuals/ft^2 ?

53. TIDAL FLAT INVERTEBRATE DENSITY/BIOMASS

(Answer "I" if the AA/IA does not include tidal flats.) Does representative field sampling of the AA/IA indicate that the relationship between density and biomass of macroscopic annelids, molluscs, or crustaceans is:

53.1 In the "H" portion of the graphs in Figure 29?

53.2 In the "L" portion of the graphs in Figure 29?

54. GROUND WATER MEASUREMENTS

If two wells are drilled next to each other in the AA, one to the depth of the water table and the other to the base of the organic layer, is the ground water level in the deeper well below the ground water level in the shallow well?

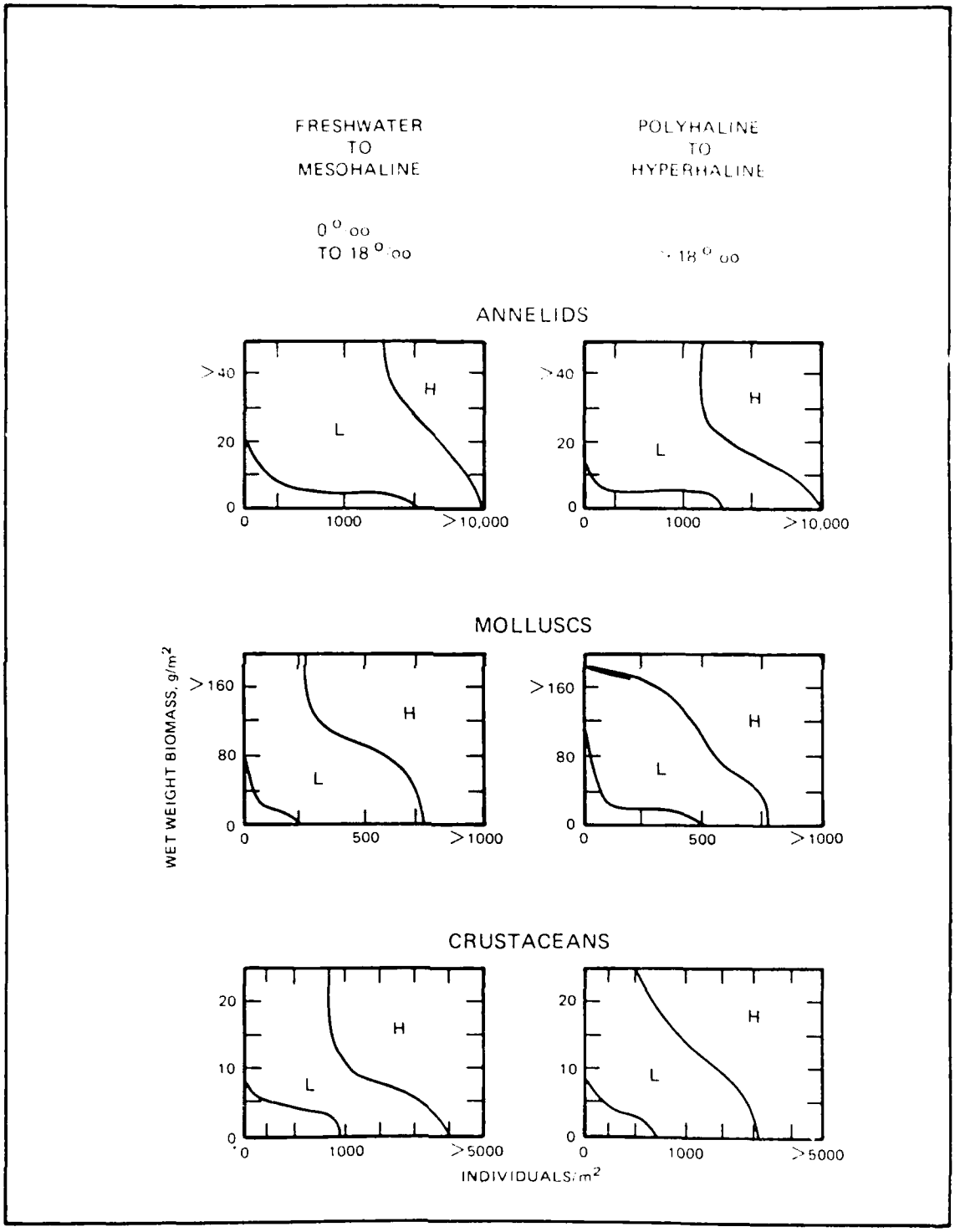


Figure 29. Benthic invertebrate populations of estuarine tidal flats (Source: Diaz 1982)

55. SUSPENDED SOLIDS

Does most runoff or surface water entering the AA [illegible] suspended solids (preferably inorganic suspended solids):

55.1 Almost always below 25 mg/l or a Secchi disc reading[1] consistently greater than 8 m (26.4 ft)?

55.2 Regularly exceeding 80 mg/l for prolonged periods, or exceeding 200 mg/l at least once annually, or a Secchi disc reading[1] consistently less than 2 m (6.6 ft).

55.3 Exceeding 1,200 mg/l at least once annually?

55.4 Exceeding 4,000 mg/l at least once annually?

Guidelines:

[1] Secchi disc is not a valid measure of suspended solids if waters are naturally turbid.

56. DISSOLVED SOLIDS OR ALKALINITY

(Answer "I" to 56.1 and 56.2 if AA is tidal or inaccessible to fish.)

56.1 Is alkalinity ($CaCO_3$) less than 20 mg/l?

56.2 Is the **morphedaphic index** less than 7 or greater than 35?

57. EUTROPHIC CONDITION

57.1 Within the AA, is any of the following conditions present in the upper 2 m (6.6 ft) of the water column during the growing season for a period of at least 1 day?

(a) The **wetland system** is palustrine or lacustrine and total phosphorus is less than 0.01 mg/l.

(b) Inorganic nitrogen is less than 0.05 mg/l.

(c) A Secchi disc is visible at greater than 8 m.[1]

(d) The wetland system is palustrine or lacustrine and chlorophyll *a* is less than 0.001 mg/l.

(e) The wetland system is estuarine and the relationship between chlorophyll *a* and light intensity at the sediment interface is in region "L" on the graph in Figure 30.

(f) The wetland system is not marine or estuarine and the relationship between phosphorus loading rate and flushing capacity is in region "L" on the graph in Figure 31.

57.2 Within the AA, is any of the following conditions present in the upper 2 m (6.6 ft) of the water column during the growing season for a period of at least 1 day?

(a) The wetland system is palustrine or lacustrine and total phosphorus is greater than 0.025 mg/l.

(b) Inorganic nitrogen is greater than 0.30 mg/l.

(c) A Secchi disc is not visible at greater than 1 m.[1]

(d) The wetland system is palustrine or lacustrine and chlorophyll a is greater than 0.020 mg/l.

(e) The wetland system is estuarine and the relationship between chlorophyll a and light intensity at the sediment interface is in region "H" on the graph in Figure 30.

(f) The wetland system is not marine or estuarine and the relationship between phosphorus loading rate and flushing capacity is in region "H" on the graph in Figure 31.

Guidelines:

[1] Secchi disc is not a valid measure of eutrophic condition if waters are tidal, well-mixed, silt-laden, or deeply colored.

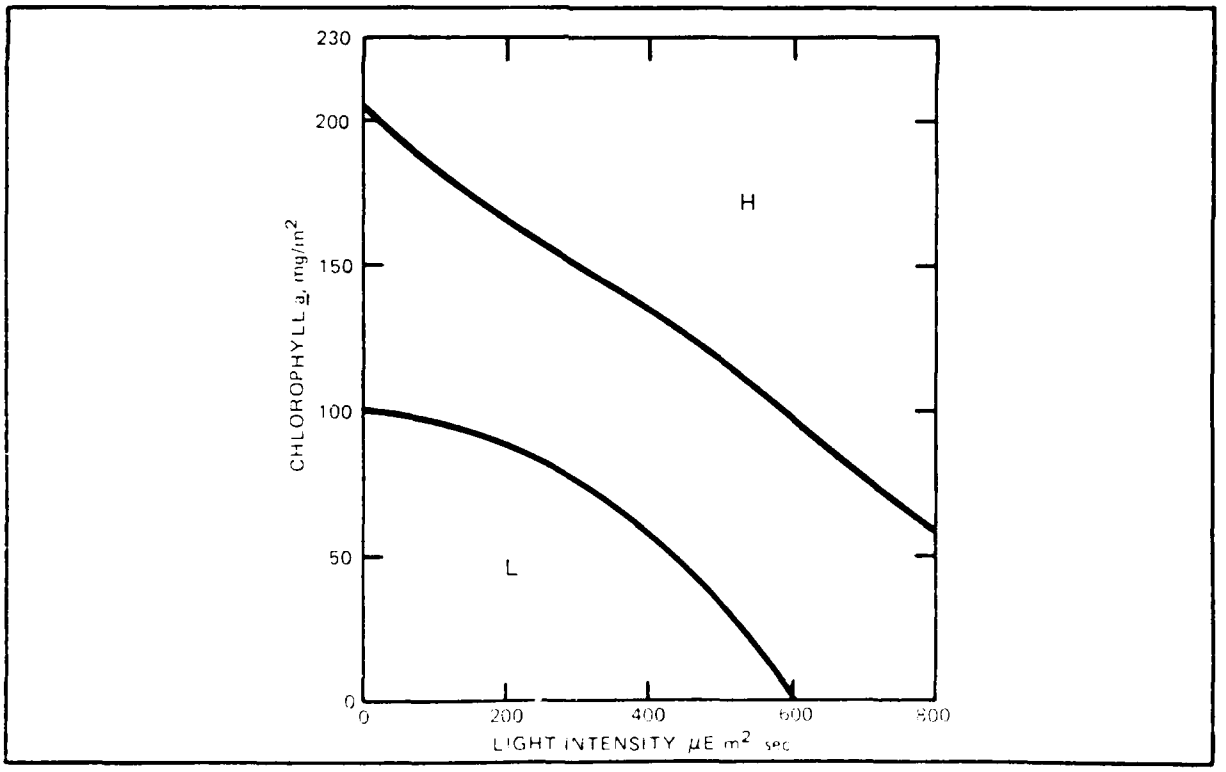


Figure 30. Chlorophyll a as a eutrophic indicator in estuaries (Source: Diaz 1982)

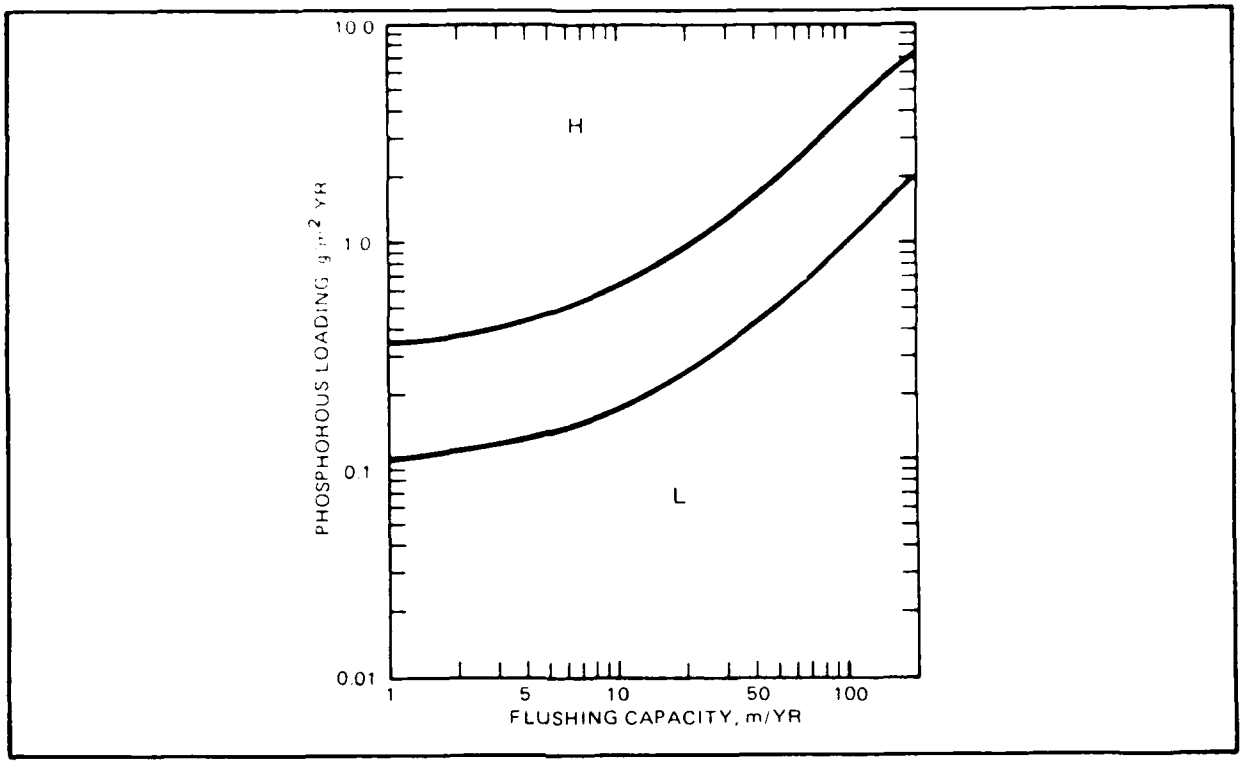


Figure 31. Phosphorus as a eutrophic indicator in freshwater (Source: Vollenweider 1974)

58. COLIFORM

Is the AA/IA classified by the state as unsuitable for swimming or shellfish harvesting, based on bacterial (coliform) counts or other health hazards.

59. WATER QUALITY ANOMALIES

59.1 (Answer "I" if tidal.) Do water samples from the AA/IA (preferably from drilled wells) exhibit elevated levels of magnesium, chloride, bicarbonate (and their ratio with calcium), alkalinity, hardness (both usually above 100 mg/l), specific conductance, halinity, total dissolved solids (especially greater than 1,500 mg/l), and possibly silica when compared to water samples collected in the rest of the AA/IA, or other nearby AA/IA's, thereby suggesting substantial ground water input/output?

59.2 (Answer "I" if tidal.) Do water samples from the AA/IA (preferably from drilled wells) exhibit reduced, and sometimes seasonally variable, levels of total dissolved solids (less than 500 mg/l), halinity, and alkalinity or hardness (both usually below 50 mg/l) with increased prevalence of sulfates or bicarbonates of calcium or magnesium when compared to water samples collected in the rest of the AA/IA, or other nearby AA's, thereby suggesting substantial ground water input/output?

60. WATER TEMPERATURE ANOMALIES

Are springs present within the AA/IA or are there localized, atypical thermal conditions[1] which might suggest substantial ground water input?

Guidelines:

[1] Evidence of atypical thermal conditions that might be attributed to ground water input include: locally cooler and less variable temperatures in summer and warmer or less variable temperatures in winter not attributable to local snowmelt, water depth, turbidity, differential solar absorption by sediments, water velocity, shading, or wind buffering.

61. DISSOLVED OXYGEN

(Answer "I" if AA/IA is not accessible to fish.) Is dissolved oxygen known to be limiting,[1] at least seasonally, to fish that could otherwise use this AA/IA?

Guidelines:

[1] Assume that concentrations of less than 4 mg/l and 60% saturation are limiting unless direct observation indicates regular presence and/or successful reproduction of fish.

62. UNDERLYING STRATA

Do geologic maps indicate that any part of the AA is underlain by at least 10 ft of predominantly porous materials or well-fractured rock?

63. DISCHARGE DIFFERENTIAL

63.1 (Answer "I" if tidal.) Do inlet hydrographs exhibit higher flood peaks than outlet hydrographs, based on data from more than one storm?

63.2 (Answer "I" if tidal.) Do surface water inflows exceed simultaneously measured surface water outflows after accounting for losses due to evapotranspiration? (Evapotranspiration loss can be accounted for by making measurements at night.)

64. TOTAL SUSPENDED SOLIDS (TSS) DIFFERENTIAL

(Answer "I" if the AA lacks a **constricted** outlet or inlet.) Are levels of total suspended inorganic solids, measured at the AA's inlet (especially during intense storms), greater than those measured simultaneously at the outlet or is **detention time** (as determined by tracer dyes or morphometric measurements) at least 3 days in summer and 15 days in winter?

This completes level 3 assessment. Interpret the responses according the the guidelines in Section 4.4.

4.4 Effectiveness and Opportunity Interpretation

This procedure interprets the responses to the questions in effectiveness and opportunity assessment levels 1-3, and assigns probability ratings of HIGH, MODERATE, or LOW using function specific interpretation keys. There are effectiveness interpretation keys for ten functions and opportunity interpretation keys for three of the functions.

It is important to reiterate that the effectiveness and opportunity interpretation keys assume that all questions in effectiveness and opportunity levels 1 and 2 are answered. The only provision made for partially completed data sets (i.e., unknown answers) is in the case of a level 3 assessment (Questions 51-64). If all level 1 and 2 questions are not answered (unless specified in the question itself), the validity of the probability ratings is uncertain.

Interpretation keys for evaluating effectiveness and opportunity of each function are contained in sections 4.4.1 - 4.4.11. Each section begins with a brief introductory discussion of the function, followed by a working definition of the function, a rationale for HIGH and LOW probability ratings, a statement of general sensitivity of the interpretation key, and the interpretation key itself. Three of the functions (floodflow alteration, sediment/toxicant retention, nutrient removal/transformation) have two interpretation keys one for effectiveness and one for opportunity.

Interpretation of effectiveness and opportunity can be done manually, or using the computer program described in Appendix E. To do a manual interpretation, place Form B and the interpretation key for the function of interest in front of you. Each key contains a series of boxes which contain a question or group of questions and specified answers. Within the boxes, a "/" should be interpreted as an "or", and a "+" should be interpreted as an "and". A true (T) and false (F) arrow emerge from each box. Follow the true arrow if the question, or group of questions, have all been answered as specified. Follow the false arrow if the single question, or group of questions, have not all been answered as specified. In some cases a third arrow designated partial data (PD) is available. This occurs when responses to level 3 questions are requested. The PD arrow should be taken when level 3 responses are unavailable and therefore all questions were not answered as specified. Begin with the first box of each interpretation key and proceed through the key until a HIGH, MODERATE, LOW, or UNCERTAIN probability rating is assigned to all functions. Record the rating on Form D.

4.4.1 Ground Water Recharge

Definition - For purposes of this method, recharge AA's or wetlands are considered to be those where: (a) recharge to underlying materials or ground water (deep or shallow) exceeds ground water discharge to the wet depression on a net annual basis, and/or (b) the rate of recharge typically exceeds the rate of recharge from terrestrial environments.

Rationale (HIGH) - There are three general sets of conditions which indicate a wetland which has a high probability of recharging ground water on a net annual basis. The first set of conditions consists of direct evidence of recharge through the use of groundwater wells or piezometer tubes at various seasons. Specific evidence consists of measurements

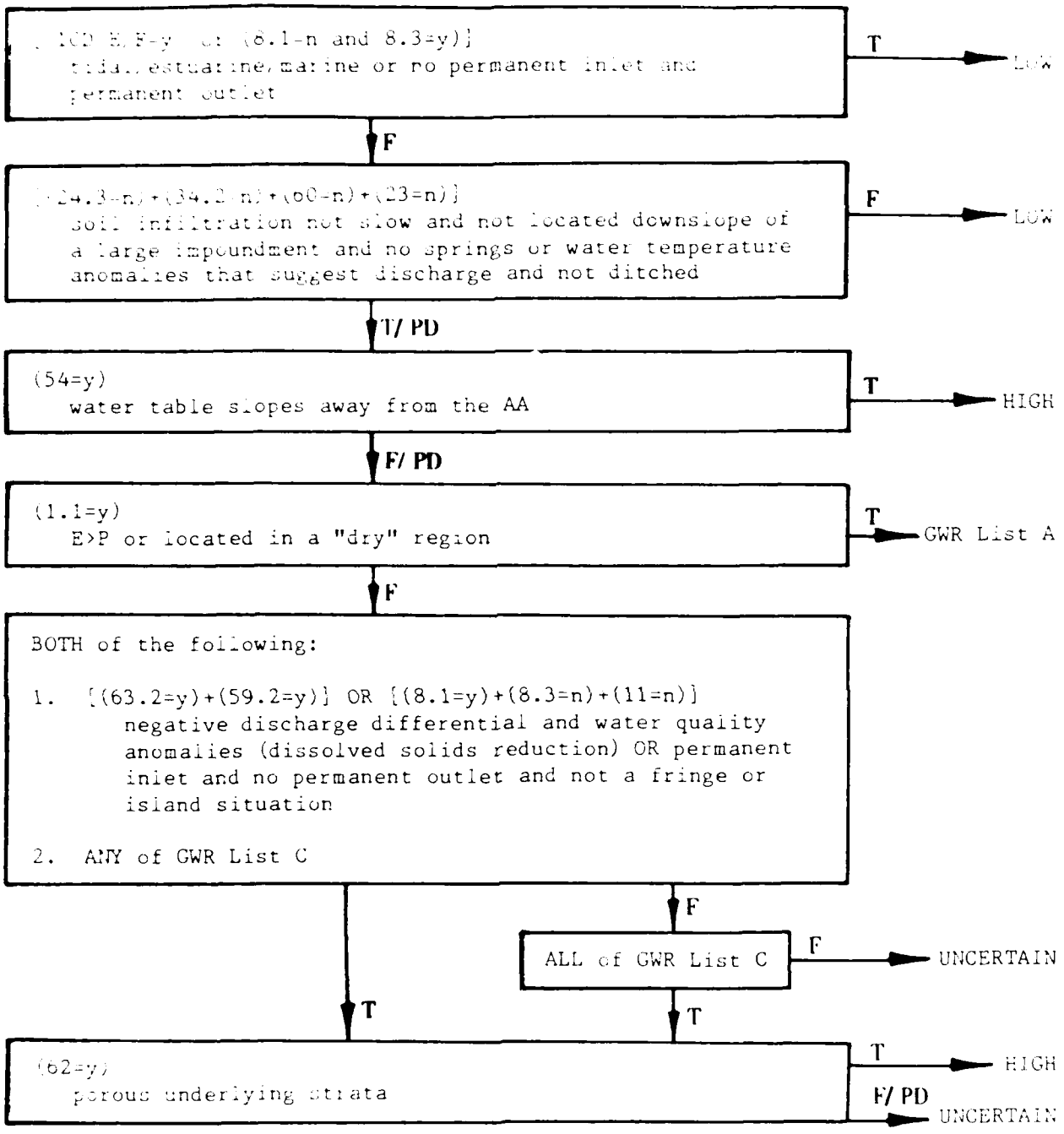
showing that the water table slopes away from the AA on all sides, with no downslope water table divide occurring in the intervening [illegible], and/or where the depth to water is progressively deeper in successive piezometers drilled at the same location but to different depths. A second set of conditions exists for wetlands in a precipitation deficit region. These wetlands must be not permanently flooded, have a negative discharge differential, or have an inlet but no outlet and not be a fringe wetland. In addition, one of the following conditions must be true: topography is favorable, watershed soils have a slow infiltration rate, watershed is impervious, wetland is located upslope from a dam or dike, or water quality anomalies exist. The third set of conditions are for wetlands not in precipitation deficit regions. These wetlands must have a negative discharge differential and water quality anomalies or have a permanent inlet but no permanent outlet and be a fringe or island wetland. In addition, the wetland must have one of the following conditions: not be permanently flooded, have favorable topography, impervious watershed, soils of slow infiltration, located upslope of a dam, having fine mineral soils or be in a karst region, or having expansive flooding or unstable flows.

Rationale (LOW) - Several wetland types are considered to have low probabilities of net annual recharge, regardless of any circumstantial evidence of high recharge as described above. Such low-recharge wetlands include: (a) all marine and estuarine wetlands (where recharge, if it occurs, is economically detrimental), (b) all wetlands with impervious underlying strata, (c) all nonfringe AA's that have outlets only, (d) other wetlands that do not have all of the following: coarse underlying strata, not below a dam, and no indicators of ground water discharge.

General Sensitivity - Relatively few eastern wetlands will be rated HIGH for recharge. Most will receive a rating of *UNCERTAIN*, and probably more will be rated LOW than HIGH. Relatively more western wetlands will receive HIGH ratings. Collection of piezometric data or knowledge of the area's surficial geology can have a pivotal effect on the ratings, which otherwise are strongly affected by the hydroperiod, precipitation balance, **contiguity**, and system predictors.

Interpretation Key - For the Ground Water Recharge Key use the answer in the "X" column of Form B.

Ground Water Recharge (GWR) Effectiveness Key



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GWR Key (Cont.)

GWR List A

ANY of the following:

1. (33A=n)
   not permanently flooded
2. (63.2=y)
   negative discharge differential
3. [(8.1=y)+(8.3=n)+(11=n)]
   permanent inlet and no permanent outlet and not fringe or islandsituation

T → GWR List B

F → UNCERTAIN

GWR List B

ANY of the following:

1. (6.1=y)
   local topography looks favorable
2. (24.4=y)
   watershed soils have slow infiltration rate
3. (21B=y)
   watershed impervious
4. (34.3.1=y)
   located upslope of a dam or dike
5. (59.2=y)
   water quality anomalies

T →

F →

GWR List C

1. (32A=n)
   not permanently flooded
2. (6.1=y)
   local topography favorable
3. [(21B=y) or (24.4=y) or (34.3.1=y
   watershed impervious or water
   infiltration or located
4. (24.2=y or 24.5=y)
   fine mineral
5. (35.1=y or 35.
   expansive

AD-A189 968 WETLANDS RESEARCH PROGRAM WETLAND EVALUATION TECHNIQUE (WET) VOLUME 2 METHODOLOGY(U) ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS ENVIR... 2/3

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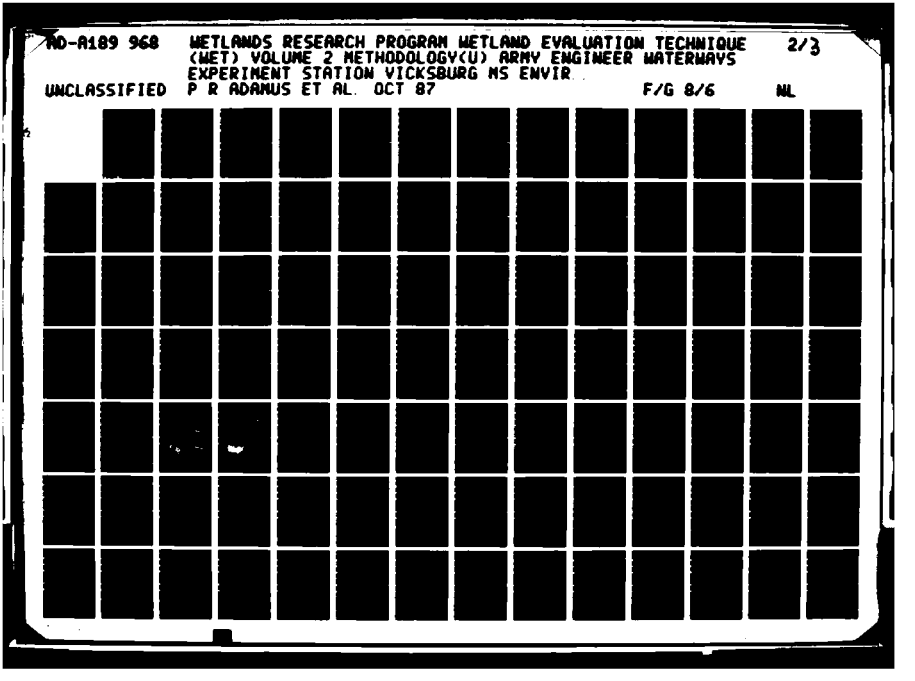
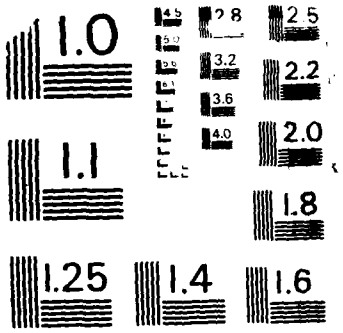




4.4.2 Ground Water Discharge

Definition - For purposes of this method, ground water discharge areas are those where the rate of discharge from ground water (deep or shallow) into the wetland exceeds the rate of recharge to underlying ground water from the wetland on a net annual basis.

Rationale (HIGH) - There are many sets of conditions under which wetlands will have a high probability of discharging groundwater on a net annual basis. These include most permanently flooded or saturated wetlands that are: (a) in precipitation deficit regions, (b) immediately below dams, (c) larger than 200 acres, with a watershed less than 5 times the area of the assessment area, (d) larger than 200 acres and not surrounded by paved land, (e) steeper gradient downstream of the outlet than upstream of the inlet, (f) lacking inlets but having outlets, and not dominated by snowmelt (nonfringe wetlands only), (g) stable with regard to seasonal water-level fluctuations, or (h) characterized by springs, water quality, or temperature anomalies that suggest discharge. If the wetland is not permanently flooded or saturated, a rating of HIGH may still be assigned if at least two of the above are met.

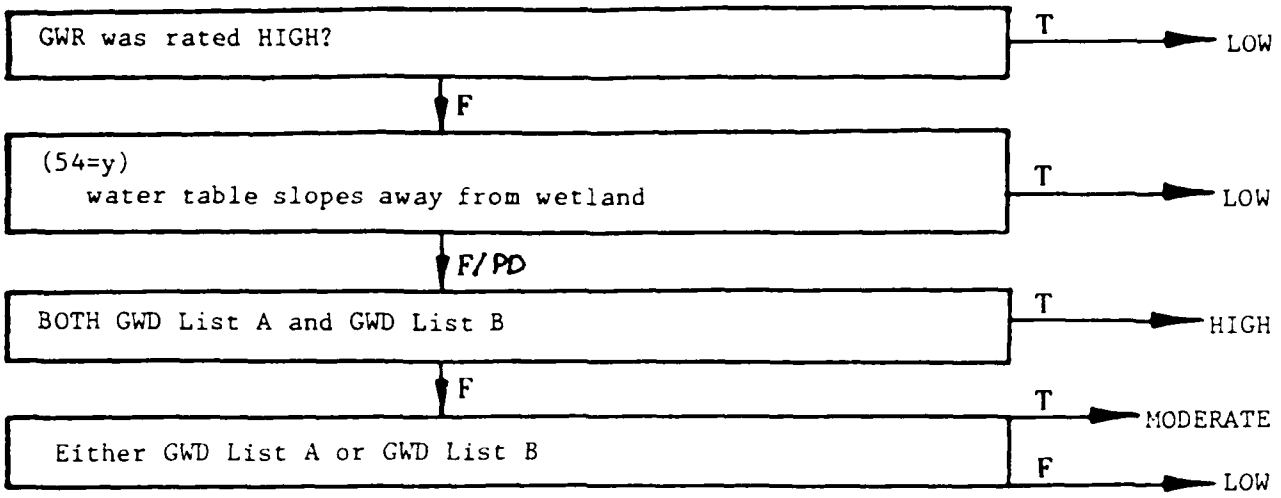
Rationale (LOW) - The only wetlands believed to have a LOW probability for ground water discharge are those: (a) rated HIGH for ground water recharge, or (b) nonpermanently flooded wetlands that do not have at least two of the characteristics described above.

General Sensitivity - A majority of wetlands nationwide will probably attain ratings of HIGH for ground water discharge, particularly if they are permanently flooded. Fewer wetlands will be rated UNCERTAIN and the fewest, although probably a significant percent, will be rated LOW. Tidal wetlands will most often be rated UNCERTAIN and can never attain a rating of HIGH. This does not deny the occurrence of ground water discharge in tidal wetlands, but rather highlights the difficulty in predicting its presence. It is not possible for a permanently flooded nontidal wetland to be rated LOW for discharge, unless recharge has been indicated by the recharge key.

The most pivotal predictors in the Ground Water Discharge Key are those discussed in the previous section on ground water recharge (Section 4.4.1).

Interpretation Key - For the Ground Water Discharge Key use the answer in the "X" column of Form B.

Ground Water Discharge (GWD) Effectiveness Key



GWD List A

ANY of the following:

1. [(1.1=y)+(5.1.1=n)+(21B=n)+(32A/B/E/H/I/J=y)+(59.2=n)+(63.2=n)+(23=n]
   E>P and depression >5% of watershed area and watershed not impervious and longstanding water and no water chemistry anomalies suggesting recharge and not a "losing stream" and not ditched
2. [(1.1=n)+(5.1.2=y)+(21B=n)+(32A/B/E/H/I/J=y)+(63.2=n)+(59.2=n)+(23=n)]
   E<P and depression >20% of watershed area and watershed not impervious and longstanding water and no chemical anomalies which suggest recharge and not a "losing stream" and not ditched
3. (35.1=n and 35.2=n)
   no expansive flooding and stable flow
4. Two of the conditions in GWR List B

-- Continued --

GWD Key (Cont.)

GWD List B

ANY of the following:

1. (34.2=y)
   AA water table influenced by upstream impoundment
2. (59.1=y)
   water quality anomalies (elevated dissolved solids)
3. (12Cd=y)
   aquatic moss
4. [(6.1=n)+(6.2=y)]
   local topography not favorable for recharge but favors discharge
5. (60=y)
   water temperature anomalies
6. [(8.1=n)+(8.2=n)+(8.3=y)+(11=n)+(9.3=n)]
   no inlet and permanent outlet and not fringe or island situation and internal snowmelt is not the sole source of water

-- End --

4.4.3 Floodflow Alteration

A number of quantitative methods are available for determining the floodflow alteration capacity of AA along a channel. Qualitative methods for determining floodflow alteration capacity have been presented by Reppert et al. (1979) and Wolverton (1980). Few of these quantitative or qualitative methods specifically examine the contribution of the wetland portion of the AA to floodflow alteration.

Definition - For purposes of WET, floodflow alteration occurs in those areas where surface water is stored or its velocity is attenuated to a greater degree than typically occurs in terrestrial environments. No judgment is made as to the value of such flow alteration, in fact, there may be situations in which reduction of flow velocity causes increased flooding due to flow synchronization.

1. Floodflow Alteration Effectiveness

Rationale (HIGH) - There are five types of AA's that most clearly are effective for altering floodflows. These include AA's which : (a) have regulated outflows (reservoirs, dams), (b) have outflows that are measured as being less than inflows, (c) have neither an outlet nor an inlet, (d) expand their surface area by at least 25 percent for 20 days of the year and are larger than 5 acres, or (e) are larger than 200 acres and are either in a precipitation deficit region or (if flowing water is present) are at least 70% covered with juxtaposed woody vegetation. Additionally, they must not be tidal. Thus, the simple presence of vegetation which adds to channel roughness is considered insufficient to result in a rating of HIGH; the wet depression must remove (through evapotranspiration) or store water as well as create a lag (desynchronized) effect.

Rationale (LOW) - Wetlands with LOW probabilities of altering floodflows are assumed to be those which have all the following characteristics: (a) the spatially dominant hydroperiod is "permanent," (b) the AA is less than 200 acres, (c) no potential for ponding of stormflows is apparent (e.g., fringe wetland or others with unconstricted outlets), (d) if precipitation is greater than evaporation, and the AA is smaller than 5 acres, and (e) if flow is present, channels are neither sinuous nor contain ample woody vegetation to intercept surface flows. Also, all tidal wetlands are rated LOW, as they are a buffer against floodflows only if mild storm surges occur at low tide.

General Sensitivity - Most western and prairie wetlands will be rated HIGH, as will large flowing wetlands elsewhere with extensive woody vegetation. LOW ratings will be assigned to most small, unconstricted, permanently flooded wetlands in the East, especially if they lack low-gradient channels and woody vegetation. The MODERATE rating will be the most common rating in many regions.

These ratings do not reflect the quantity (e.g., acre-feet) of flood storage--only the probability that storage or loss will occur or lag time will be measurably increased. The position of the wetland in the watershed and its position relative to floodable properties have been ignored in this portion of the key due to the difficulty of predicting whether increased lag time will synchronize or desynchronize floodflows at a particular point of interest.

The pivotal predictors are wetland system type, region, contiguity, size, and vegetation form. A very few wetlands might meet the criteria for both HIGH and LOW, e.g., a small unconstricted, unvegetated, permanently flooded Eastern wetland (LOW) which has great natural fluctuations in water level (HIGH). In such cases, the logic flowchart and computer program produce a message of UNCERTAIN (U).

2. Floodflow Alteration Opportunity

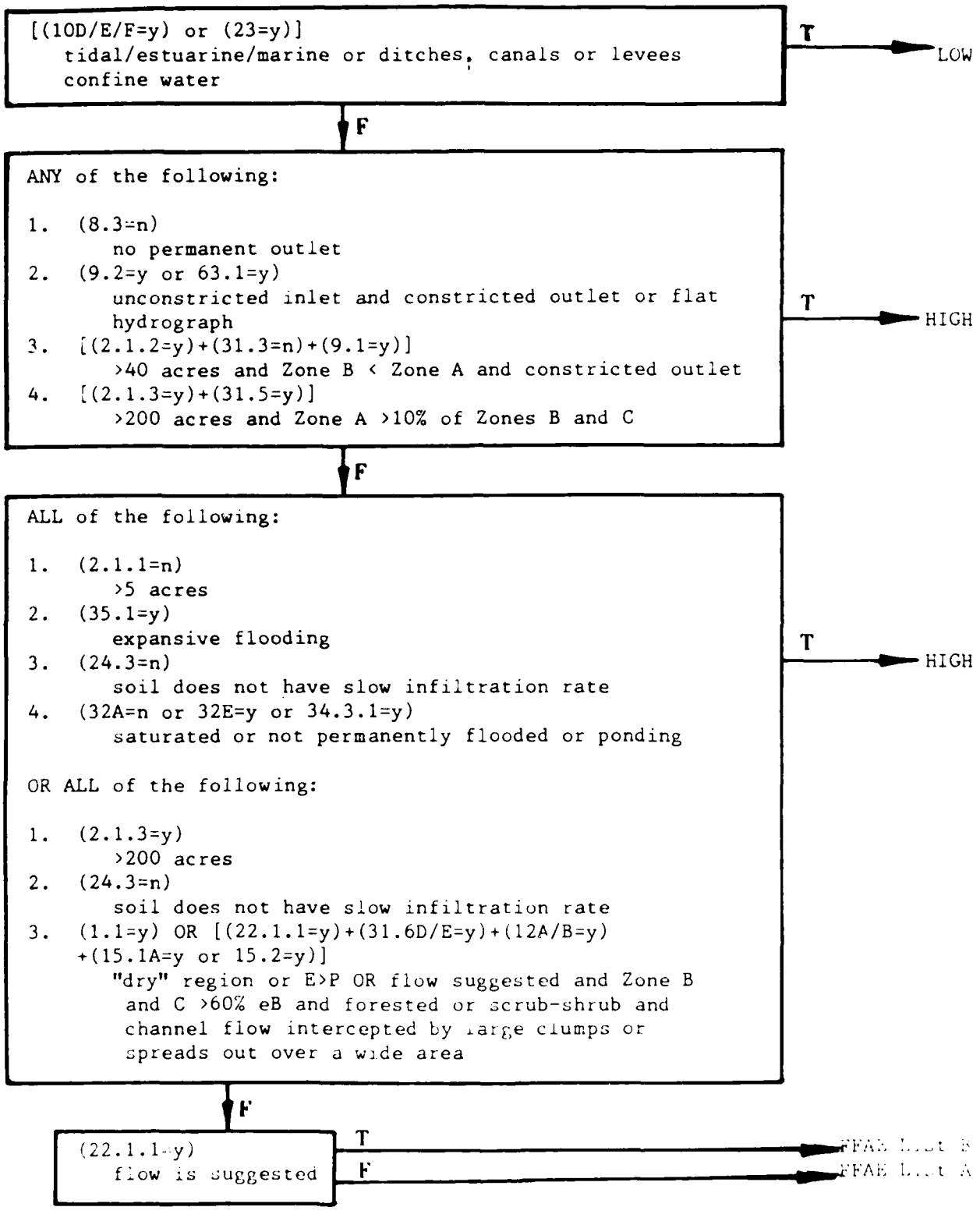
Wetlands low in a watershed may have greater opportunity for intercepting floodflows; however if they are lower in the watershed than most floodable properties, their social significance will be slight and, in some cases, their effectiveness may also be less (i.e., as compared to "headwater reservoir" type wetland).

Wetlands considered to have the highest opportunity for floodflow alteration are those which are not tidal but which have a large watershed relative to their size, or whose watersheds are predominantly urban or relatively impervious/frozen soils, with few other storage areas upstream.

Wetlands are rated LOW for floodflow opportunity if they have not met the criteria for HIGH opportunity and have a small watershed relative to wetland size, predominantly forested land cover in the watershed, upstream storage areas, or if they are tidal.

Interpretation Keys - For the Floodflow Alteration Effectiveness and Opportunity Keys use the answer in the "W" column of Form B. If this is unavailable use the answer in the "X" column.

Floodflow Alteration Effectiveness (FFAE) Key



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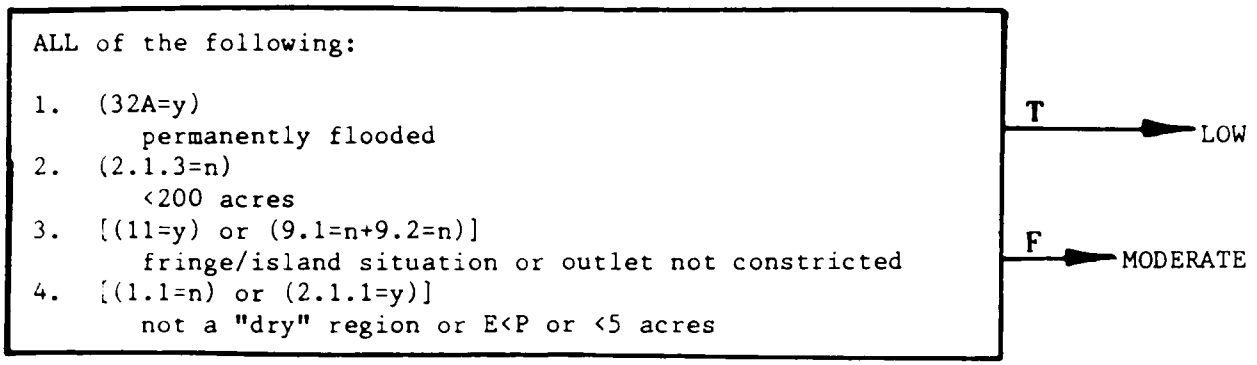
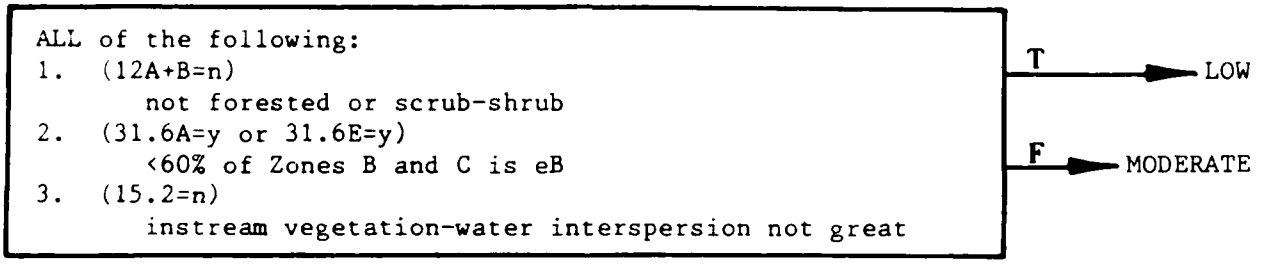
FFAE Key (Cont.)

FFAE List A



FFAE List B



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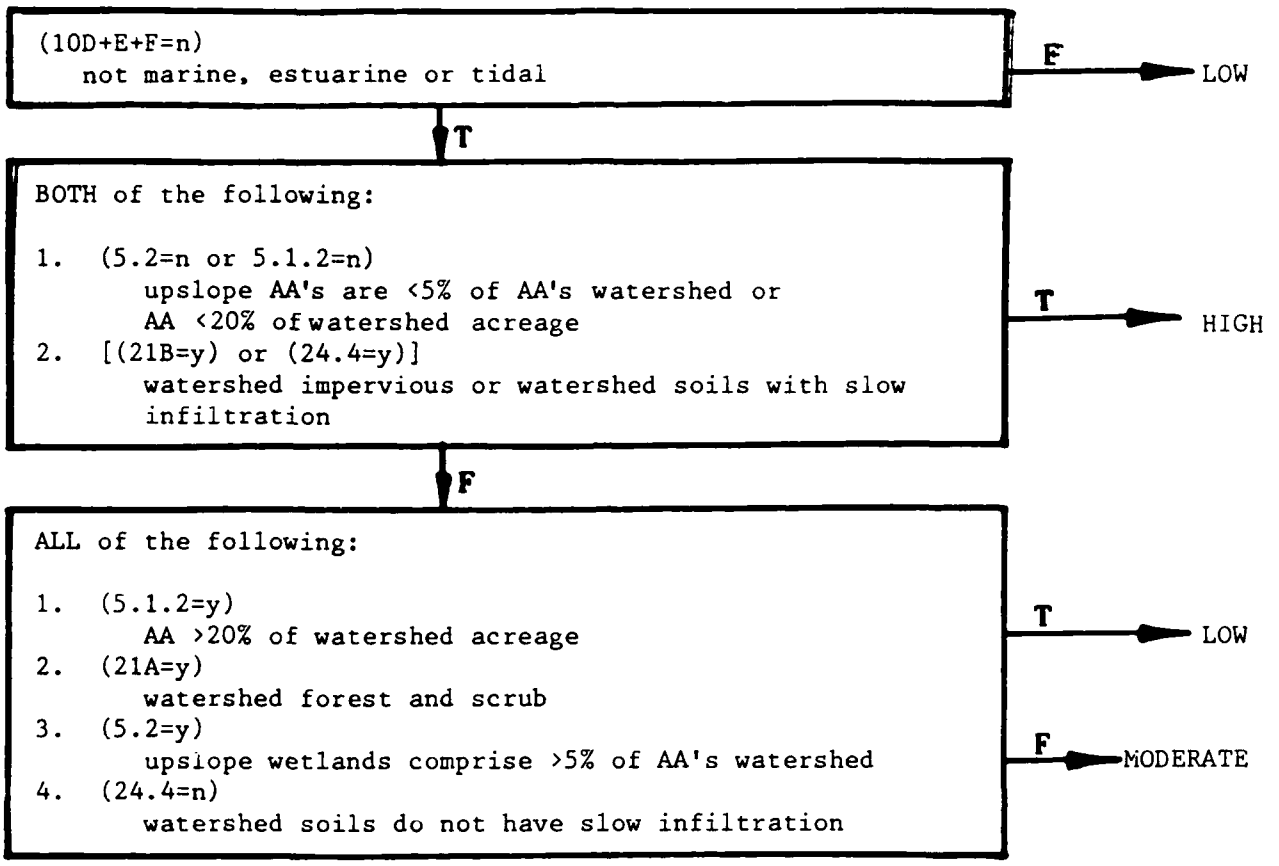
Floodflow Alteration Opportunity (FFAO) Key



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4.4.4 Sediment Stabilization

Quantitative models for evaluating the wave dissipation ability of vegetation are presented by Camfield (1977) and Wayne (1976). Several quantitative models are available for evaluating the frictional resistance of terrestrial vegetation to runoff in temporarily flooded grassed waterways, but few, if any, for aquatic vegetation. Quantitative models for evaluating depositional-erosional dynamics and wave decay are available for wetland systems, but do not always include a component easily attributable to "wetland influence." No formal qualitative procedures exist for evaluating this function in all wetland types, although informal guidelines are given by Silberhorn et al. (1974). A formal procedure by Pfaunkuch (1975) is applicable to riverine depressions, and a procedure by Knutson et al. (1981) is applicable to tidal emergent areas.

Definition - For purposes of this method, HIGH sediment stabilization areas are those which are more effective for binding soil and dissipating erosive forces than are typical upland environments.

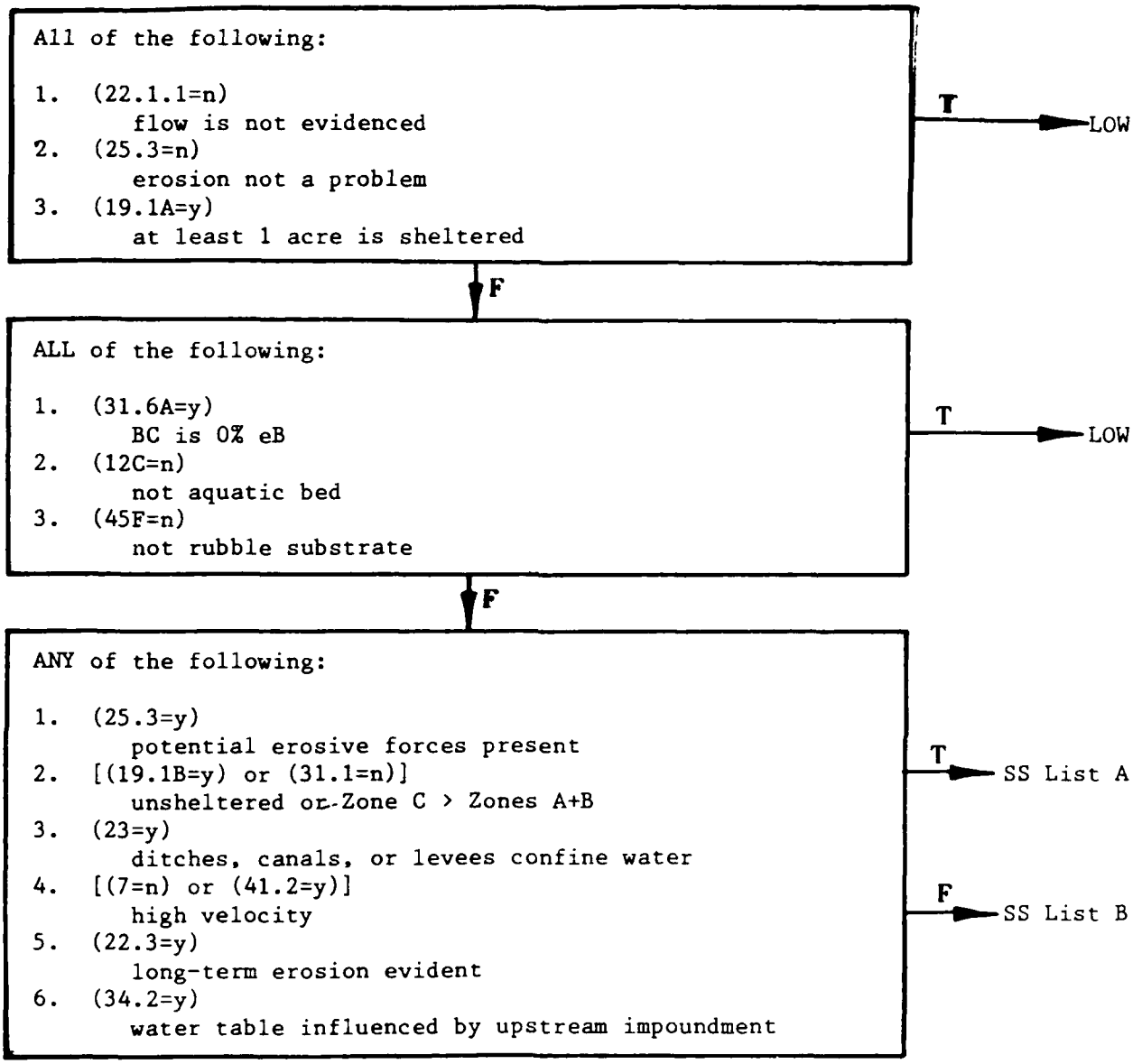
Rationale (HIGH) - Wetlands rated HIGH for this function must be characterized by one of the following characteristics: potential erosive forces present, unsheltered or Zone C greater than Zones A and B, ditches, canals, or levees are present that confine water, high water velocity, evidence of long-term erosion, or a water table influenced by an upstream impoundment. In addition, one of the following characteristics must also be present: rubble substrate, protective of nearby shorelines, greater than 20 ft width of erect vegetation, presence of forest of scrub-shrub, or good water and vegetation interspersion.

Rationale (LOW) - The only type of wetland considered capable of being rated LOW is one in which there is no flowing water, no boat wakes, no open water wider than 100 ft, and no eroding areas abutting the wetland, as well as having no vegetation (erect or submerged) or rubble.

General Sensitivity - Marine, estuarine, riverine, and contiguous palustrine wetlands will never be rated LOW by these criteria. Most vegetated estuarine and palustrine wetlands with some open water will be rated HIGH, as will most rocky seacoasts and islands. The most pivotal characteristics for this function are those dealing with contiguity, flow, fetch, and vegetation zone width.

Interpretation Key - For the Sediment Stabilization Key use the answer in the "W" column of Form B. If this is unavailable use the answer in the "X" column.

Sediment Stabilization (SS) Effectiveness Key



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SS Key (Cont.)

SS List A

ANY of the following:

1. (45F=y)
   rubble substrate
2. (19.2=y)
   island or peninsula intercepts waves
3. (36.1.1=n)
   erect vegetation in Zones A and B >20 ft
4. (12A/B=y)
   forested or scrub-shrub
5. (15.2=y)
   instream water-vegetation interspersion good

T → HIGH

F → SS List B

SS List B

ALL of the following:

1. (45F=n)
   substrate not rubble
2. (19.2=n)
   no island or peninsula to intercept waves
3. (36.1.1=y)
   erect vegetation in Zones A and B <20 ft
4. (12A+B=n)
   not forest or scrub-shrub
5. (15.2=n)
   poor instream water-vegetation interspersion

F → MODERATE

T → LOW

-- End --

4.4.5 Sediment/Toxicant Retention

Quantitative models for evaluating the sediment and toxicant retention capabilities of wetlands are few. As previously noted, quantitative models of varying usefulness exist for predicting sediment routing and deposition rates in all systems, but few include an identifiable shallow-water component. An exception is the study by Hickok et al. (1977). Qualitative models for sediment and toxicant retention are presented in procedures by Reppert et al. (1979) and Wolverton (1980).

Definition - For purposes of this method, HIGH sediment/toxicant retention areas are those which physically (or chemically in the case of toxicants) trap and retain on a net annual basis the inorganic sediments and/or chemical substances generally toxic to aquatic life.

Rationale (HIGH for Effectiveness) - Wetlands considered by the method to have high effectiveness for sediment trapping include ones with no outlets; ones that are impounded (though it can be argued that the dam, not the wetland, is the factor causing sedimentation); ones where water sampling (especially during storms) directly indicates that outlet waters have less inorganic particulate matter than nontidal inlet waters; ones that are vegetated with erect, persistent vegetation and comprise all of a clearly defined delta, island, bar, or peninsula; ones where there is direct evidence of accretion from historic photographic evidence or field sampling; ones in basically depositional environments with erect vegetation wider than 20 ft; persistent emergent estuarine wetlands wider than 20 ft in depositional environments; mollusk bed/reef wetlands; or estuarine rooted vascular aquatic bed wetlands. Wetlands fulfilling any of these descriptions must also be free of artificial channelization and soil tillage.

Other wetlands qualifying for a rating of HIGH are those having <u>most</u> of the following conditions: constricted outlet; no flow or slow-velocity flow; brackish salinity; riverine with good pool-riffle ratio (if cobble-gravel sediment) or adequate pools and instream debris; short fetch; great depth (or shallower depths with shorter fetches); relatively long duration and extent of seasonal flooding; and estuarine emergent in a high-intensity storm region. In addition, such wetlands also must be free of artificial channelization and soil tillage, as well as having erect vegetation in a zone at least 20 ft wide, or in the case of tidal wetlands, having aquatic bed vegetation under brackish (flocculating) conditions.

Rationale (LOW for Effectiveness) - Wetlands that have not met the criteria for HIGH are next screened for LOW effectiveness. Wetlands considered to have a LOW probability of being effective for sediment trapping are one of five basic types: (a) wetlands with tilled (farmed) soils and having a permanent outlet, (b) wetlands with cobble-gravel, rubble, or bedrock substrates and no vegetation, instream debris, or pools; (c) wetlands fringing the channel immediately downstream from an impoundment; (d) wetlands where measured nontidal outputs of inorganic particulates are greater than inputs (especially during storms); (e) wetlands where prevailing current velocities are sometimes greater than the suspension thresholds of the prevailing sediment types; or (f) wetlands having most of the following characteristics: exposed to boat wakes or channelized; unconstricted outlet; tilled soil; not in a depositional gradient or not

being in an AA that expands greatly when flooded; shallow depths with large fetch (and minimal aquatic bed vegetation); and minimal fringe vegetation if sediment enters as overland flow (or minimal vegetation interspersion if sediment enters as channel flow).

Wetlands meeting any of the criteria in the above paragraph must also (if such data are available) show no evidence of accretion, based on historic photographic or field coring data.

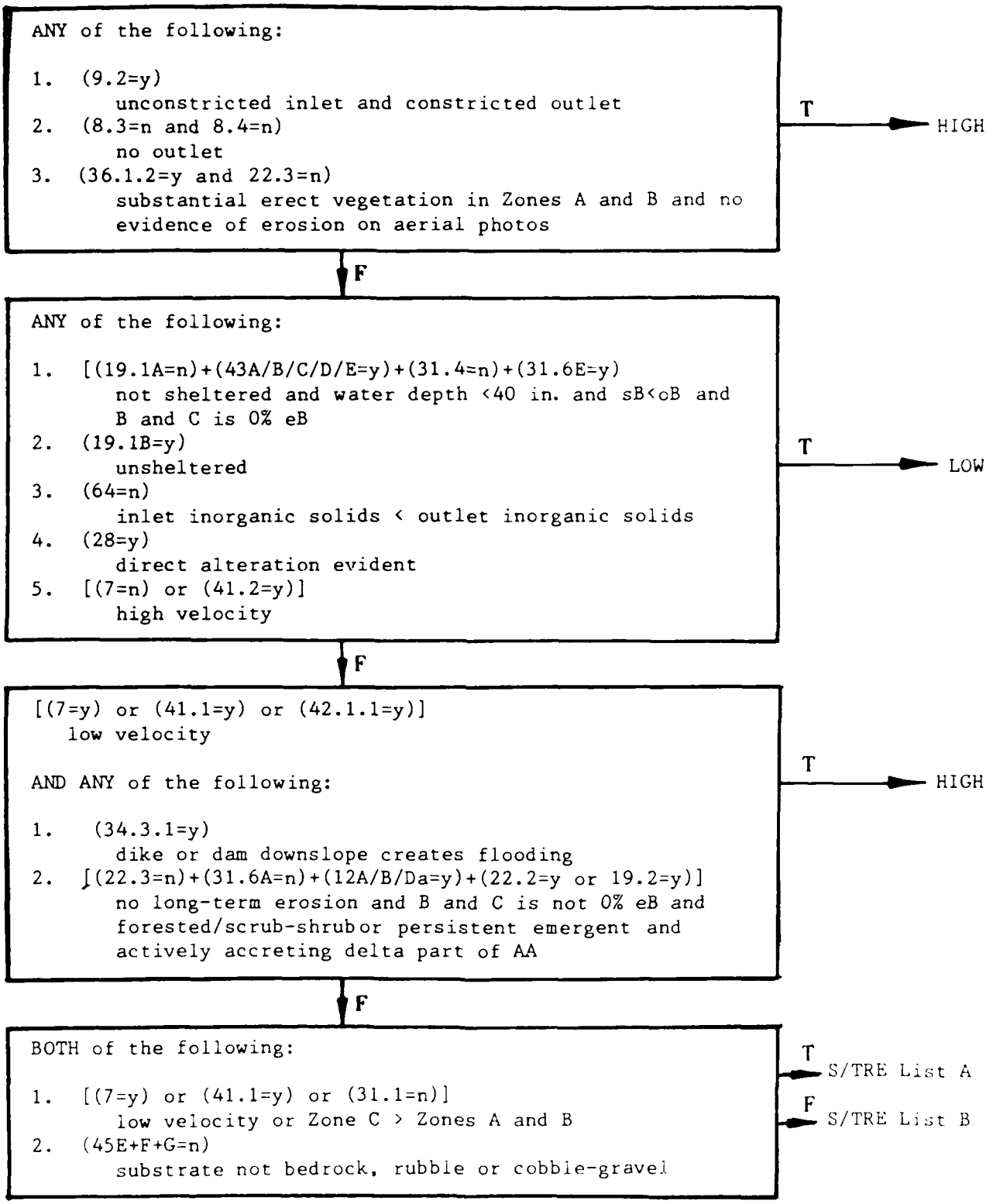
General Sensitivity - A majority of prairie pothole wetlands will be rated HIGH, and in some regions probably a majority of wetlands will be rated MODERATE. Wetlands most likely to be rated LOW will be marine and riverine types. The most pivotal characteristics are vegetation zone width, contiguity, velocity, and sediment type.

Rationale (HIGH for Opportunity) - Wetlands with a HIGH opportunity for sediment trapping are those with any of several potential nonpoint or point sources of sediment or toxicants named in the method (e.g., row crops, soil-slope conditions enhancing erosion, dumps, fields where pesticides are applied).

Rationale (LOW for Opportunity) - LOW opportunity for sediment and toxicant retention results from absence of potential sediment sources, combined with a forested watershed of a size not larger than five times the wetland's area and at least 5% of the upslope watershed being occupied by wetlands (or a reservoir being present).

Interpretation Keys - For the Sediment/Toxicant Retention Opportunity and Effectiveness Keys use the answer in the "X" column of Form B.

Sediment/Toxicant Retention Effectiveness (S/TRE) Key



-- Continued --

S/TRE Key (Cont.)

S/TRE List A

BOTH of the following:

1. (13A/B/Da=y)
   part forested, scrub-shrub or persistent emergent
2. [(36.1.1=n)+(25.2A=y)] OR [(36.2.1=n)+(25.2B=y)+(7=y)+(9.1/9.2=y)]
   erect vegetation in Zones A+B <20 ft wide and sediment sourceis overland flow OR Zone eB usually <20 ft wide and sediment source is channel flow and low velocity and constrictedoutlet

T → MODERATE

OR ALL of the following:

1. (9.1=y)
   constricted outlet
2. (10D/E=y)
   tidal riverine or estuarine
3. (48B=y) or [(1.2=y)+(13A/B/Da=y)]
   salinity=0.5-5.0 ppt or high rain-erosivity factor and forested,scrub-shrub or persistent emergent

F → S/TRE List B

S/TRE List B

ALL of the following:

1. (31.4=y)
   Zone sB > Zones oB and C
2. (10D/E/F=y)
   marine, estuarine or tidal riverine
3. (48B=y)
   salinity = 0.5-5.0 ppt

T → MODERATE

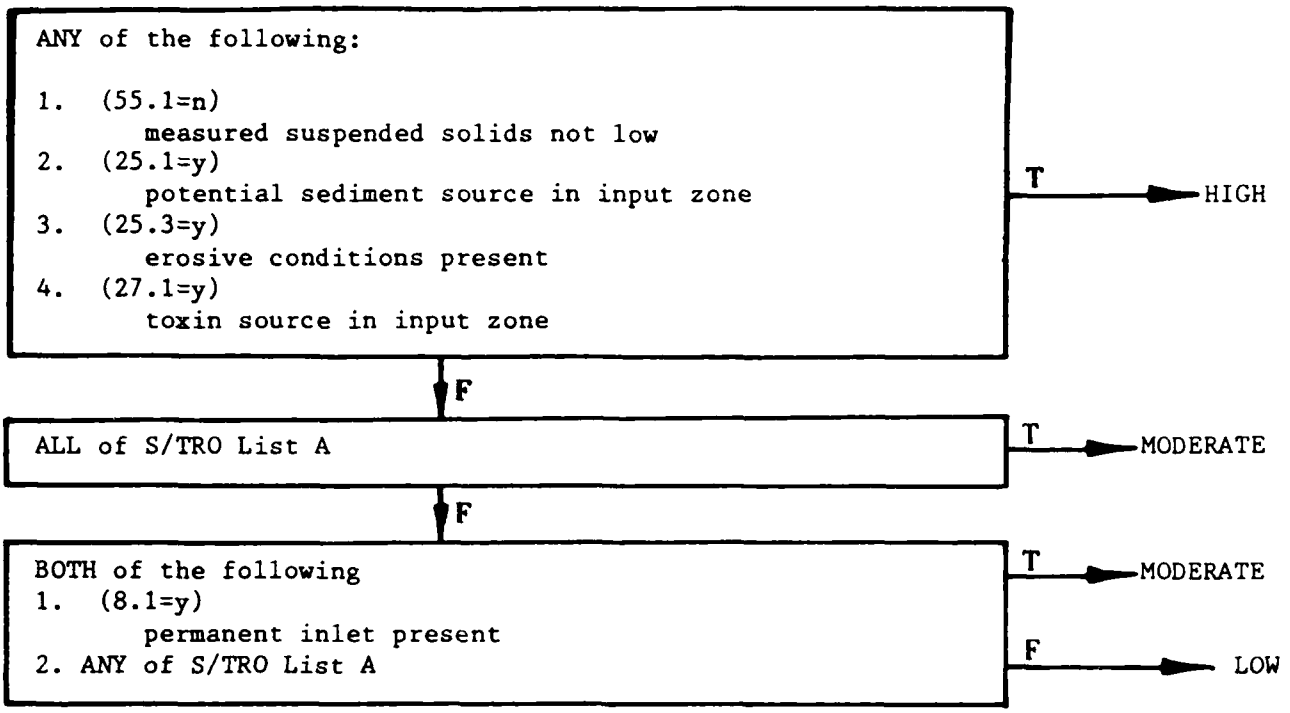
OR ALL of the following:

1. (10C/D=y)
   riverine
2. (35.1=y or 35.2=y)
   expanded flooding or flow
3. [(15.2=y) or (31.4=y)]
   good interspersion or Zone sB > Zones oB and C
4. (9.1=y) or (9.2=y) or (31.1=n) or [(49.1.2=y)+(49.1.1=y)]
   constricted outlet or Zones A+B>C or pools/riffles

F → LOW

-- End --

Sediment/Toxicant Retention Opportunity (S/TRO) Key



S/TRO List A

1. [(21A=n) or (1.2=y)]
   watershed not forest and scrub or high rainfall-erosivity factor
2. (5.1.1=y)
   wetland comprises <5% of watershed
3. [(5.2=n)+(34.2=n)]
   upslope wetlands comprise <5% of watershed and water table not influenced by upslope impoundment

-- End --

4.4.6 Nutrient Removal/Transformation

Few quantitative models exist for evaluating the nutrient retention and removal capabilities of wetlands. Qualitative models include informal guidelines by Kibby (1979) and more formal procedures by Reppert et al. (1979) and Wolverton (1980).

Definition - For purposes of this method, HIGH nutrient removal/transformation areas are those which retain or transform inorganic phosphorus and/or nitrogen into their organic forms or transform (remove) nitrogen into its gaseous form, on either a net annual basis or during the growing season, and which are generally more effective at doing so than typical upland environments.

Rationale (HIGH for Effectiveness) - Sediment retention is often (but not always) accompanied by nutrient retention; nutrient retention is often (but not always) accompanied by sediment retention. For this method, conditions conducive to sediment trapping such as the presence of inlets with constricted or no outlets indicate a high probability for nutrient removal/transformation. Alternatively, the presence of most of the following conditions indicate a high probability of nutrient removal/transformation: low water velocity or presence of significant vegetation, fine mineral soils and alkalinity greater than 20 mg/l, high plant diversity with no dead forested or scrub-shrub areas or structures to confine water, significant vegetation and nutrient sources, and hydroperiod permanently flooded, saturated, or irregularly exposed/flooded tidal.

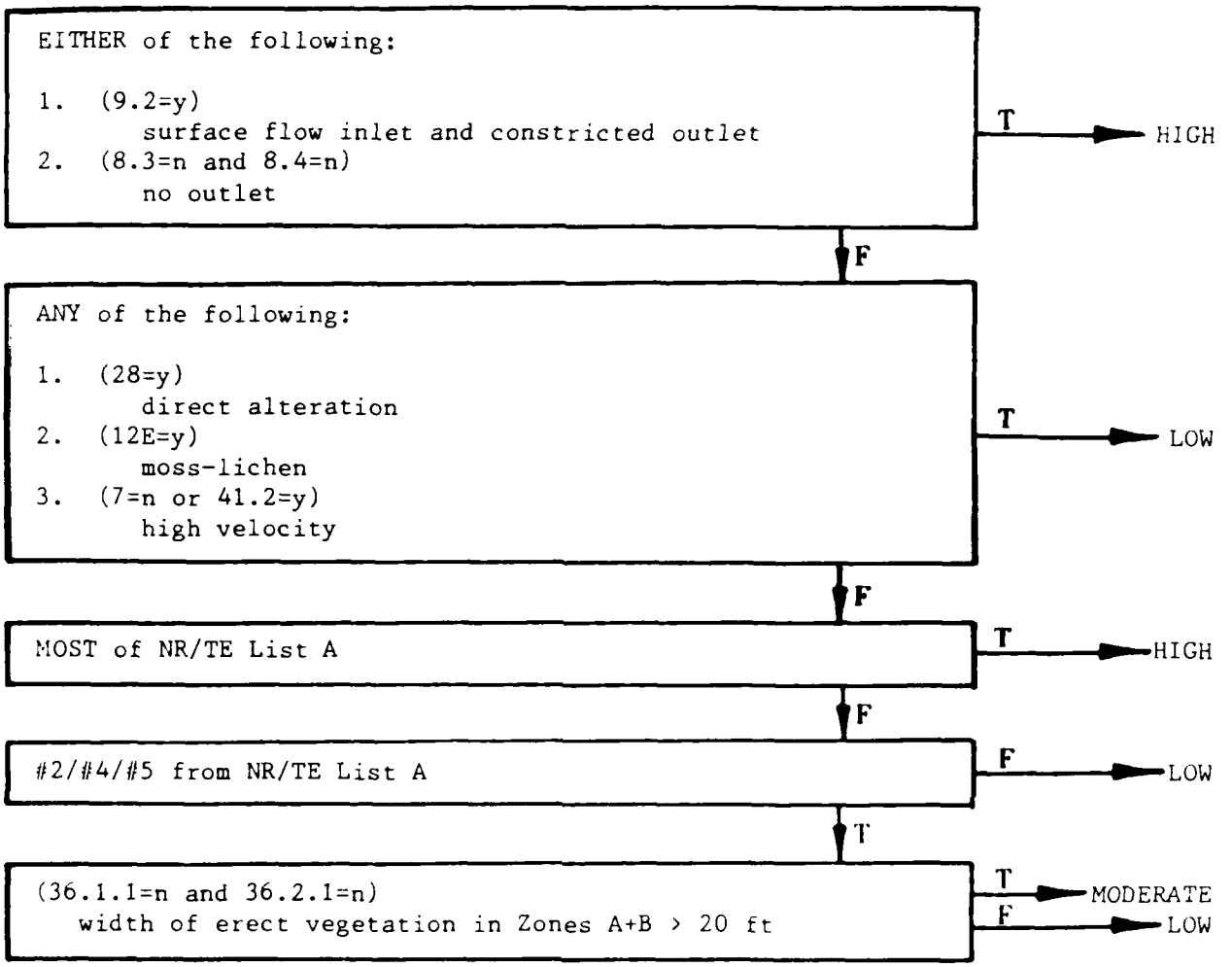
Rationale (LOW for Effectiveness) - Wetlands are rated LOW for nutrient removal if they are also rated LOW for sediment trapping, plus have primarily peat sediments, anoxic water column conditions, and no woody or floating-leaved vegetation, or if they are marine.

Rationale (Opportunity) - Wetlands with a HIGH opportunity for nutrient retention are those with any of several potential point or nonpoint sources of nutrients named in the method (e.g., septic systems, feed lots). LOW opportunity results from absence of potential nutrient sources, combined with a forested watershed or with a watershed less than five times larger than the wetland's area and having relatively permeable soils.

General Sensitivity - (See sediment/toxicant retention Section 4.4.5.) If the wetland is contiguous, analysis for extractable aluminum and measurement of actual retention times will considerably improve the validity. By the method's criteria, prairie potholes and many bottomland/riparian wetlands will rate HIGH for effectiveness, but only a minority of other wetlands will. In most regions, a majority of wetlands will be rated MODERATE. Tidal wetlands, unless brackish, may tend to have slightly lower ratings due to usually greater flushing action and organic sediments. The clay soils and long growing seasons in southern wetlands may result in somewhat higher ratings.

Interpretation Keys - For the Nutrient Removal/Transformation Effectiveness and Opportunity Keys use the answer in the "X" column of Form B.

Nutrient Removal/Transformation Effectiveness (NR/TE) Key



--Continued --

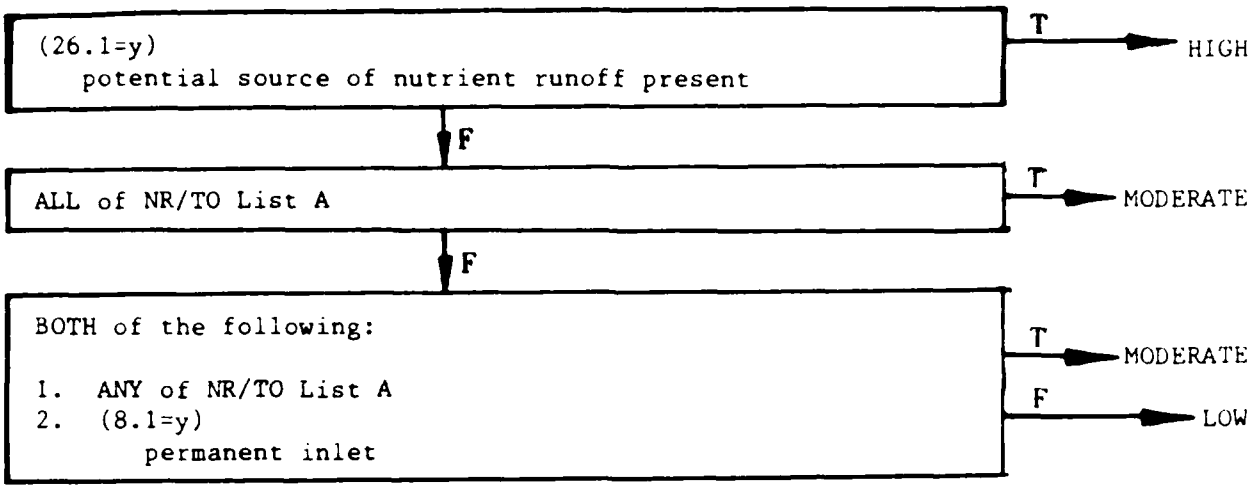
NR/TE Key (Cont.)

NR/TE List A

1. [(7=y) or (41.1=y) or (12A/B/Cb/Da=y)]
   low velocity throughout or forested/scrub-shrub, floating vascularaquatic bed or persistent emergent
2. [(24.1=y or 24.2=y) and (56.1=n)]
   fine mineral soils present and alkalinity not low
3. [(12Aa+Ba=n) and (23=n) and (17=y)]
   no dead forest and scrub-shrub and no ditches, levees, or channels toconfine water and high plant diversity
4. [(36.1.2=y)+(26.2=y)] OR
   [(36.2.3=y)+(26.3=y)+(9.1=y or 9.2=y)+(7=y or 41.1=y)]
   extensive erect vegetation in Zones A and B and sheet-flow is majornutrient source OR extensive eB width in shallow water and channel flowis major nutrient source and constricted outlet and low velocity
5. (33A/E/J/K=y)
   most permanent hydroperiod is permanently flooded, saturated, orirregularly exposed/flooded tidal

--End --

Nutrient Removal/Transformation Opportunity (NR/TO) Key



NR/TO List A

1. [(1.2=y) or (21A=n)]
   high rainfall-erosivity factor or not forest and scrub watershed
2. [(5.1.2=n) and (4.2C/D=y)]
   AA comprises <20% of watershed or riverine watershed >100 square miles
3. (5.2=n)
   upslope wetlands comprise <5% of watershed acreage

-- End --

4.4.7 Production Export

Previous attempts to develop a research-based wetlands evaluation procedure for production export (e.g., Oviatt et al. 1977) have been unsuccessful, at least in terms of the usual statistical tests. A procedure for using field measurements of chlorophyll a and benthic populations to characterize productivity of tidal mudflats has been developed by Diaz (1982), but the results of this procedure are not specifically and directly related to production export potential for commercial and sport fisheries beyond the wetland. Production export was also one focus of the procedure by Reppert et al. (1979), who required that some flushing exist.

Various quantitative models have been developed site-specifically to address production export, but none is broadly applicable. On a very crude basis, one can determine the nutrient and/or caloric contents of wetland plants (published values are given in Tilton et al. 1978) or animals and estimate from this the numbers or biomass of higher organisms that can be supported. For example, menhaden consume 6 to 9 percent of the phytoplankton in estuaries they inhabit, or the equivalent daily production of 0.8 g/sq m (Peters and Schaaf 1981). Daily macroinvertebrate drift available as food to fish in freshwater streams may represent the equivalent standing crop from up to 100 sq m of benthic habitat. However, decomposition rates, depression flushing rates, and feeding rates must also be known before the support function can be realistically estimated.

Definition - For purposes of this method, HIGH production export is the flushing of relatively large amounts of organic plant material (specifically, net annual primary production) from the AA into downslope waters. No judgment is made as to the value of such export; indeed, there may be instances where such export represents a nutrient loss to the exporting system or where such exported material causes water quality problems downslope.

Rationale (HIGH) - To attain a rating of HIGH, the assessment area must have conditions favoring primary productivity (relative to similar wetland types within the same region) of wetland plants, as well as having a permanent outlet. Specifically, if the wetland system is marine, primary productivity must not be low or potentially eutrophic conditions are present. If the wetland system is riverine the following conditions must be present: or all of the following conditions must be present: potentially eutrophic conditions present, watershed greater than 100 square miles, significant areas of erect or submerged vegetation present. If the wetland system is estuarine the following conditions must be present: significant areas of erect vegetation must be present, should be wider than 20 ft and flooded vegetation, high plant productivity, erosion potential is high, Zone B must cover at least 10% of the AA, and potential eutrophic conditions. If the wetland system is lacustrine the following conditions must be present: significant areas of erect vegetation exist, aquatic or emergent vegetation dominate the AA, plant productivity high, pH not acidic, potential for eutrophic conditions or existing high level of dissolved solids, high erosion potential, and watershed not small. If the wetland system is palustrine the following conditions must be present: significant areas of erect vegetation, potential erosive conditions, Zone B greater than 10% of AA, potential for expansive flooding, potential for eutrophic conditions or high levels of dissolved solids, high plant productivity, and fringe or

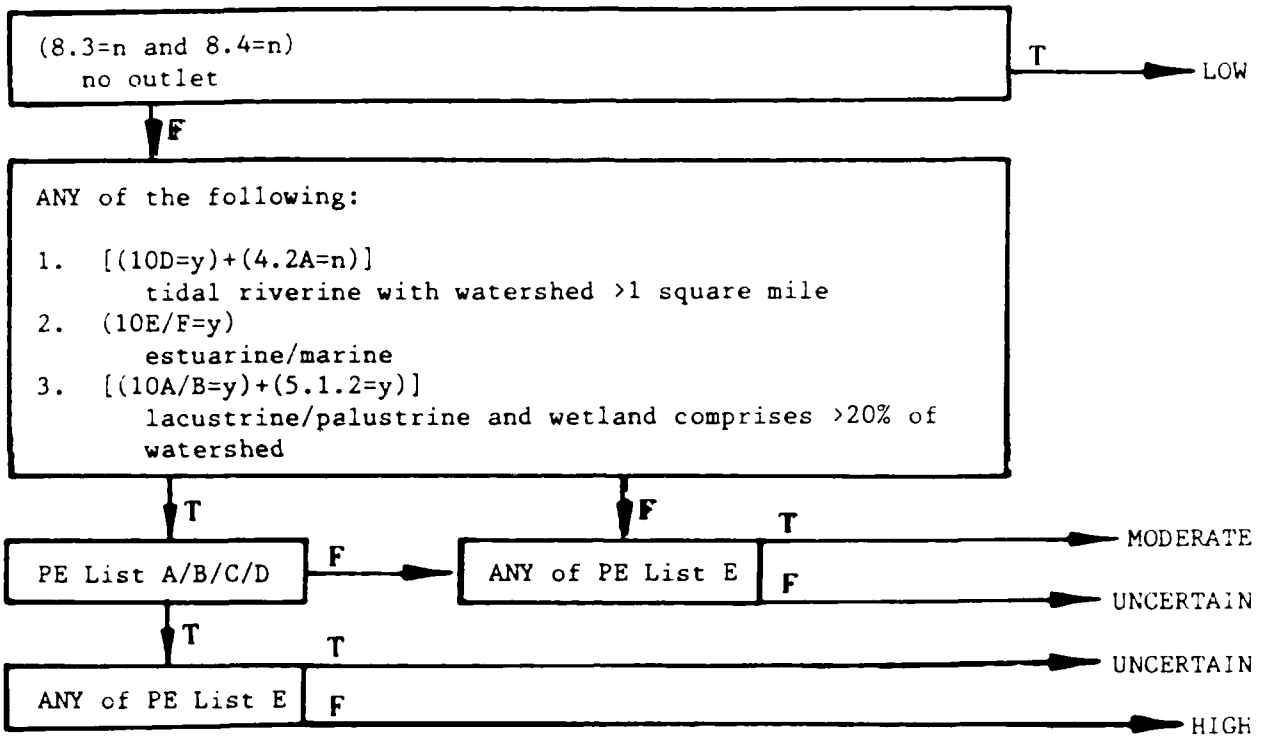
island situation. In addition, for all wetland systems, one of the following conditions must not be present: moss-lichen class extensive, sandy substrate, water velocity high or AA unsheltered, low water/vegetation interspersion, presence of direct alteration, artificially manipulated water levels, small watershed, or low levels of suspended solids.

Rationale (LOW) - To attain a rating of LOW, the AA must have no permanent or intermittent outlets regardless of the levels of productivity present. This is not to deny the productivity or importance of noncontiguous (e.g., Prairie pothole) wetlands; it means only that their relative probability of exporting organic nutrients is low. Additionally, some wetlands with outlets may be rated LOW if reduced **macrophyte** productivity is suggested by hypersaline or very acidic conditions, sand bottom dominating in a flowing-water situation with very little stable instream substrates, occurrence of recent soil disturbance, headwater situation without emergent or aquatic bed vegetation, scouring conditions of current or fetch with no offsetting influence of aquatic vegetation, or excessive turbidity in an aquatic bed dominated wetland.

General Sensitivity - Noncontiguous wetlands and nontidal riverine wetlands (excluding some fringe types, such as bottomland hardwoods) will generally get lower ratings for this function. Most marine and estuarine wetlands will probably be rated HIGH, as will many contiguous palustrine wetlands. The most pivotal characteristics appear to be contiguity, system type, fringe situation, and velocity.

Interpretation Key - For the Production Export Key use the answer in the "W" column of Form B. If this is unavailable use the answer in the "X" column.

Production Export (PE) Key



PE List A

(10F=y) and [(57.2=y) or (51.1=n)]
marine and probable eutrophic condition or plant productivity not low

OR ALL of the following:

1. (10C/D=y)
riverine
2. [(31.4=y) or (36.1.1=n)]
Zone sB > Zones oB and C or erect vegetation in Zones A and B > 20 ft.
3. (4.2A+B=n)
watershed >100 square miles
4. (57.1=n)
potential eutrophic condition

-- Continued --

PE Key (Cont.)

PE List B

ALL of the following:

1. (10E/F=y)
   estuarine/marine
2. (36.1.1=n)
   width of erect vegetation in Zones A and B > 20 ft
3. [(31.2=y) or (1.2=y)]
   high rain-erosivity factor or Zone B >10% of the AA
4. (57.1=n)
   potential eutrophic condition
5. (51.2=y)
   high plant productivity

PE List C

ALL of the following:

1. (10A=y)
   lacustrine
2. (36.1.1=n)
   erect vegetation in Zones A and B > 20 ft
3. [(31.2=y) or (1.2=y) or (35.1=y and 2.1.1=n)]
   Zone B >10% of the AA or high rainfall-erosivity factor or expansive flooding and not very small
4. [(57.1=n) or (56.1=n or 56.2=y)]
   potential eutrophic condition or high dissolved solids
5. (51.2=y)
   high plant productivity
6. (47B=n)
   pH > 6.0
7. (12A+B=n)
   forest and scrub-shrub

-- Continued --

PE Key (Cont.)

PE List D

ALL of the following:

1. (10B=y)
   palustrine
2. (36.1.1=n)
   erect vegetation in Zones A and B > 20 ft
3. [(31.2=y) or (1.2=y) or (35.1=y)]
   Zone B >10% of the AA or high rainfall-erosivity factor or expansive flooding
4. [(57.1=n) or (56.1=n)]
   potential eutrophic condition or not low dissolved solids
5. (51.2=y)
   high plant productivity
6. [(11=y) or (22.1.1=y)]
   fringe or island situation or flow is suggested

PE List E

1. [(12E=y) or (47B=y) or (45D=y)
   moss-lichen or pH <6.0 or substrate is sand
2. [(7=n or 41.2=y) or (19.1B=y)]
   high velocity or unsheltered
3. [(15.2=n) or (28=y) or (4.2A=y)]
   instream water/vegetation interspersion not high or direct alterationor riverine watershed <1 sq. mile
4. [(12C=y) or (13C+D=y)]
   mostly aquatic bed or partially aquatic bed and emergent
5. (55.2=n)
   low suspended solids
6. (34.1=y)
   water levels artificially manipulated

-- End --

4.4.8 Aquatic Diversity/Abundance

Definition - For purposes of this method, a HIGH rating for an area means that, at least seasonally, the AA supports a notably great on-site diversity of fish or invertebrates (i.e., most trophic groups of secondary consumers with complex food webs). Other aquatic animals (e.g., waterfowl) are covered under other functions.

Rationale (LOW) - Before being eligible for a HIGH rating, the wetland must not be rated LOW. Estuarine and riverine wetlands cannot have a bedrock or rubble substrate without substantial macroalgae, nor have potentially toxic inputs into an AA that lacks an outlet and is less than 40 acres. Lacustrine and palustrine wetlands also must lack these conditions, and in addition must not be farmed (soil tilled), must have some surface water present (i.e., not merely saturated), and must not have an excessively acidic condition (e.g., many sphagnum bogs).

Rationale (HIGH) - If the wetland does not meet the conditions necessary to receive a LOW probability rating, a majority (not all) of several conditions must be present for a HIGH probability rating to be achieved.

If marine, the hydroperiod must be "regularly flooded" or "intermittently exposed" (intertidal or subtidal). Such areas must comprise at least 10% of the AA, must not be dominantly sand, and must have a diversity of depths and current velocities.

If riverine, in addition to the conditions required of marine wetlands, wetlands must not be channelized, leveed, or have the seasonal timing of their flows altered. Natural flooding must expand the AA to a significant extent and seasonal duration if they are in southern regions, while in northern regions there should be minimal natural variation in flow (suggesting ground water inputs). In both regions, streambanks should be neither completely forested nor totally unshaded, and adequate instream cover, dissolved oxygen, and (in headwater or intermittent streams) adequate pools should be present.

If estuarine, "great storm intensity/frequency" is substituted for the seasonal flood index used for riverine systems. It implies increased access to (and use of) supratidal areas. In addition to the other above-named requirements, estuarine wetlands should have a freshwater inlet or a watershed that is at least 5% freshwater wetlands (diversity of estuarine salinity conditions) and moderate amounts of adequately interspersed erect vegetation.

If lacustrine, the AA: (a) should have an inlet and outlet; (b) should be larger than 200 acres or, if smaller and in an ice-hazard region, should have a large watershed; (c) should not be dominated by sand bottom; (d) should be permanently flooded (at least in part); (e) should have a shallow area with diverse cover and vegetation that covers at least 10% of the area of the deepwater; (f) should have a diversity of depth categories and adequate dissolved oxygen; (g) should not be leveed or ditched; (h) should expand substantially with natural seasonal flooding; and (i) should not be oligotrophic or should have suitable values for the morphedaphic index.

If palustrine, in addition to characteristics in the above paragraph, the wetland: (a) should have moderate amounts of erect vegetation well juxtaposed with open water; (b) if forested, should have some flow present throughout; and (c) should not have its water levels subject to artificial manipulation (except for intentional ecological management).

General Sensitivity - A probable minority of wetlands nationally will be assigned a LOW for this function. Palustrine wetlands may be slightly less likely than lacustrine ones to attain a rating of HIGH, depending in part on the region. The most pivotal characteristics are substrate, hydroperiod, and presence of potential toxicants.

Interpretation Key - For the Aquatic Diversity/Abundance Key use the answer in the "D" column of Form B. If this is unavailable use the answer in the "X" column.

Aquatic Diversity/Abundance (AD/A) Key

ANY of the following:

1. [((21B=y or 27.1=y)+(2.1.2=n)+(8.3=n or 61=y)) OR (48E/F=y) OR (56.1=y) (57.1=y)]watershed impervious or toxic source present and <40 acres and no permanent outlet or D.O. is limiting OR salinity >30 ppt OR alkalinity low OR oligotrophic condition
2. [(10E/F=y)+(12C=n)+(45F/G=y)] estuarine/marine and not aquatic bed and substrate is bedrock orrubble
3. [(10A/B/C=y)+(13C=n)+(31.6A/E=y)+(33A+B=n)] lacustrine/palustrine/riverine and no aquatic bed class and Zone B and C is 0 or 100% eB and never permanently flooded or intermittently exposed
4. [(10A/B=y) AND ((23=y) or (28=y) or (47B=y) or (25.3=y) or (48C/D/E/F=y))] lacustrine/palustrine AND canals, ditches or levees confine water or direct alteration or pH <6.0 or potential sediment sources or salinity >5 ppt
5. [(10E=y)+(31.6E=y)+(32K=y)] estuarine and BC is 100% eB and tidal irreg. flooded

F → AD/A List A/B/C/D/E

T → (53.2=n) tidal flat invert density not low

MODERATE

LOW

-- Continued --

AD/A Key (Cont.)

AD/A List A

(10A=y)
lacustrine

AND MOST of the following:

1. [((8.1=y and 8.3=y)) OR (11=Y)]
   permanent inlet an outlet OR fringe or island situation
2. [(2.1.2=y) AND ((1.3=n) or (4.2C/D=y and 35.1=y))]
   >40 acres AND does not freeze >1 month/year or watershed >100 square miles and fluctuates naturally
3. [(13C=y) or (45D=n) or (49.2=y)]
   partially aquatic bed or substrate not sand or fish cover present
4. (33A/B/H=y)
   at least permanently flooded, intermittently exposed or artificiallyflooded
5. [(31.2=y) AND ((17=y) or (46C=y))]
   Zone B > 10% of AA AND high plant form richness or mosaic habitatinterspersion
6. [(40.1=n) AND ((56.2=y) or (57.1=n))]
   temperature >50° F AND dissolved solids <7 or >35mg/l/mor oligotrophic condition
7. (34.1=n)+(61=n)
   no artificial control structures and D.O. is not limiting

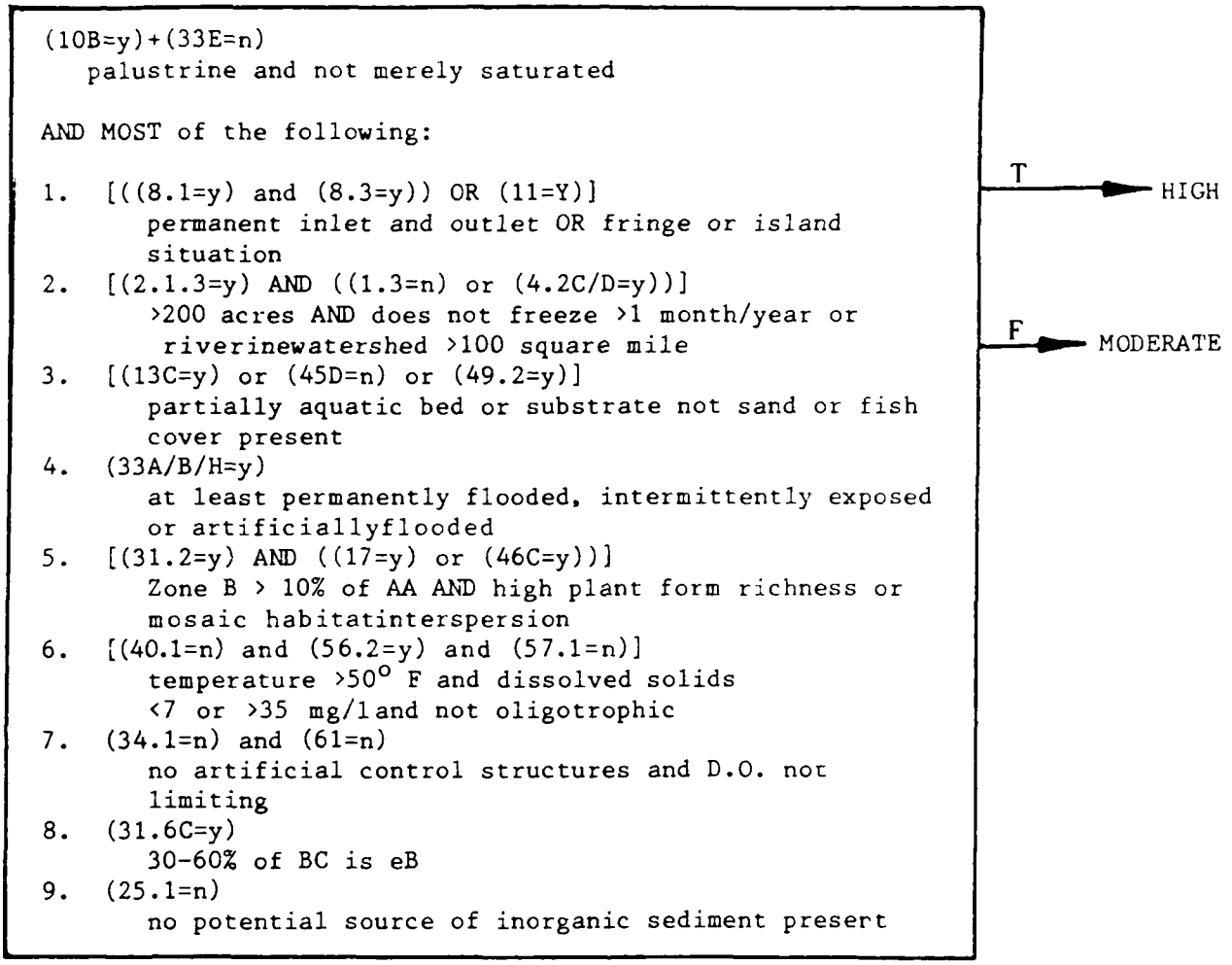
T → HIGH

F → MODERATE

-- Continued --

AD/A Key (Cont.)

AD/A List B



-- Continued --

AD/A Key (Cont.)

AD/A List C

(10E=y)
estuarine

AND MOST of the following:

1. (31.6C=y)
   30-60% of BC is eB
2. [(1.2=y) or (5.2=y)
   rainfall-erosivity factor high or
   upslope wetlands present
3. [(15.1C or 15.2=y) or (16B/C=y)]
   good vegetation interspersion or good
   vegetation/water interspersion
4. (34.1=n)+(33K=n)+(61=n)
   no artificial control structures and not exclusively
   supratidal and D.O. not limiting
5. (57.1=n)
   not oligotrophic condition

T → HIGH

F → MODERATE

AD/A List D

ALL of the following:

1. (10F=y)
   marine
2. (32K=n)
   not irregularly flooded tidal
3. [(31.2=y) and(46C=y)]
   Zone B >10% of the AA or mosaic habitat interspersion
4. (45D=n)
   not sand substrate

T → HIGH

F → MODERATE

-- Continued --

AD/A Key (Cont.)

AD/A List E

ALL of the following

1. (10C=y)
   riverine
2. (23=n)
   no ditches, canals or levees to confine water
3. [(7=y) or (41.2=n)]
   low water velocity
4. [((34.1=n) or ((35.1=y)+(33A=y)+(32D=y)+(40.2=y))) OR ((35.2=n)+(40.2=n)+(31.2=y))]
   no water control structures or expansive flooding and at least permanently flooded and predominantly seasonally flooded and summerwater temperatures >69 F OR stable water levels and summer temperatures <69° F and Zone B >10% of the AA

AND MOST of the following:

1. (20.1=y)
   80% of Zone B shaded at midday
2. [(15.2=y) or (13C=y) or (49.2=y)]
   good instream interspersion or partially aquatic bed or fish cover present
3. [(4.2A+B=n) or (49.1.1=y)]
   riverine watershed >100 square miles or 20%-80% pools
4. [(52.1=y) or (49.1.2=y)]
   high freshwater invertebrate density or good riffles
5. [(25.1=n) or (55.2=n)]
   no potential source of organic sediment or measured suspended solidsnot high

T → HIGH

F → MODERATE

-- End--

4.4.9 Wildlife Diversity/Abundance for Breeding

Definition - For purposes of this method, a HIGH rating for a wetland means that during the breeding season the wetland normally supports a notably great on-site diversity and/or abundance of wetland-dependent birds. This definition does not take into account the contribution of the AA to off-site (regional) faunal richness or the uniqueness/rarity of the species. Those factors are addressed in the "Red Flag" portion of Section 3.1.

Rationale (Level 2 - HIGH) - There are six types of wetlands that have a high probability of supporting an exceptional diversity of breeding birds. Certain individual wetlands within the following types may be rated HIGH:

1. Non-wooded prairie potholes.
2. Western riparian zones.
3. Bottomland hardwoods.
4. Other floodplain wetlands.
5. Large and vegetationally diverse wetlands.
6. Moderate-size wetlands that are oases or complexes and have at least minimal interspersion.

Accuracy in the use of this key depends on reliable estimation of the following characteristics: surrounding land use, potential sources of toxic material, location in a precipitation deficit area, interspersion, size, and vegetation class.

Rationale (Level 2 - LOW) - There are seven types of wetlands which, in a natural context, have a LOW probability of supporting exceptional diversity of breeding birds. Certain individual wetlands within the following seven types may be rated LOW if they are in a precipitation surplus region:

1. Upper riverine, forested, shrub, or moss wetlands unconnected to adjoining forests by vegetated corridors, and smaller than 40 acres.
2. Small wetlands with potential toxic inputs.
3. Estuarine/marine wetlands that are either:
   (a) small and exposed to large waves, or
   (b) contain little vegetation.
4. Palustrine/lacustrine wetlands that either:
   (a) are predominantly moss (peat bogs) and have low vegetation class diversity and no open water, or
   (b) are small, surrounded by urban development, and if forested have no connecting corridors, or
   (c) are small and have low vegetation class diversity, low edge irregularity, no open water, and are not part of an oasis/cluster.

Accuracy in the use of this key depends on reliable estimation of the following characteristics: location in a precipitation surplus area, size, potential sources of toxic material, and wetland classification.

Rationale (Level 3 - HIGH and LOW) - This level improves the estimates from Level 2 by calling for determination (usually, in the field) of the wetland's dominant hydroperiod, the hydroperiods of nearby wetlands (if available), general salinity, presence or absence of certain alterations of hydrology and soils, and flow velocity. "Disturbance" is substituted for "urban watershed,"

as it more directly measures stress to wildlife. In addition to the requirements of Level 2, to achieve a HIGH rating a nontidal wetland must have:

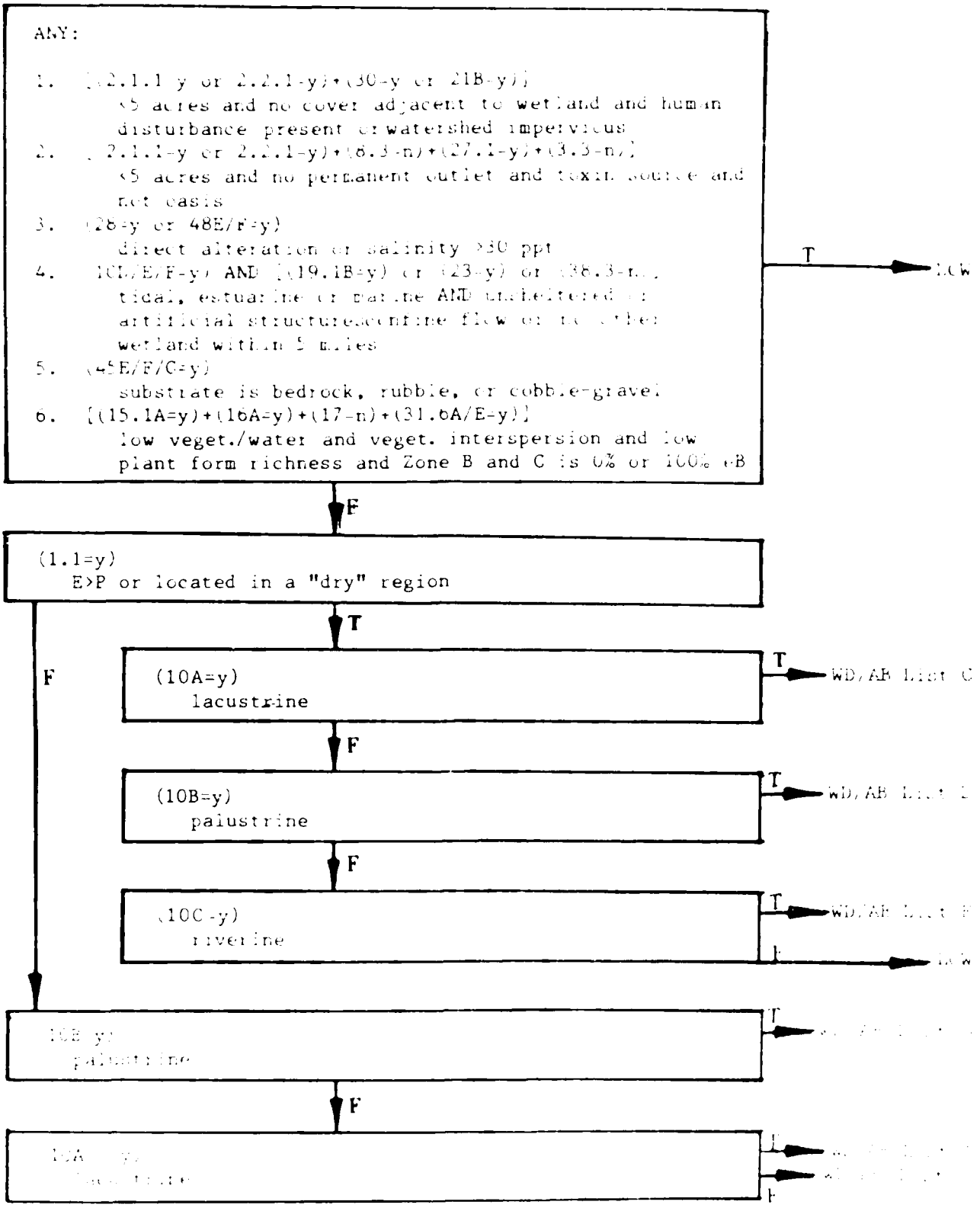
1. A hydroperiod that is not "saturated" or "intermittently flooded" unless evapotranspiration is more than twice precipitation.
2. Salinity <30 ppt.
3. Velocity, if riverine, <30 cm/sec.
4. Hydric soils that have not been tilled, nor any type of detrimental hydrologic alterations made.

In addition, if the wetland is in a moderate precipitation deficit region, a requirement for regional hydroperiod diversity is added (i.e., at least one other wetland with a different hydroperiod type should be present within 1 mile). In addition to the six basic types that (in Level 2) can attain a HIGH rating in Level 3, a seventh type, wetlands artificially flooded for wildlife management, is added.

To attain a "LOW" rating under Level 3, the converse of the above must be true. Also, excessive salinity is added as a limiting condition for estuarine/marine wetlands, pH is added as a "backup" predictor for moss wetlands, and a requirement is added that in wetlands smaller than 5 acres, Zone A must be larger than Zone B.

Interpretation Key - For the Wildlife Diversity/Abundance Breeding Key use the answer in the "X" column of Form B.

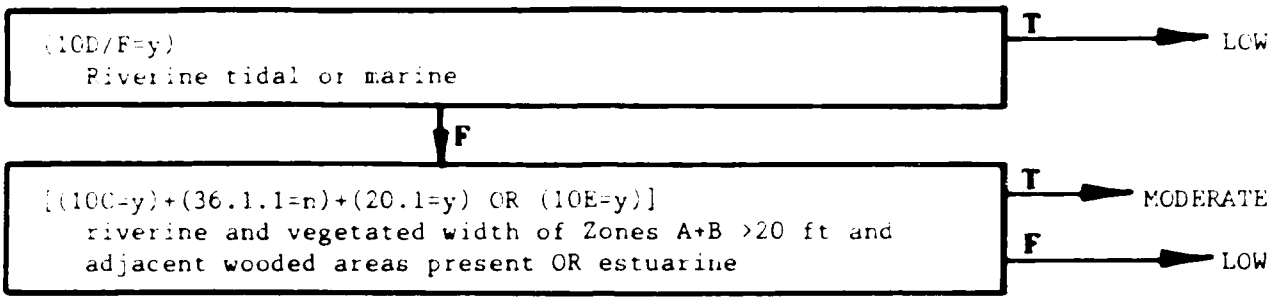
Wildlife Diversity/Abundance for Breeding (WD/AB) Key



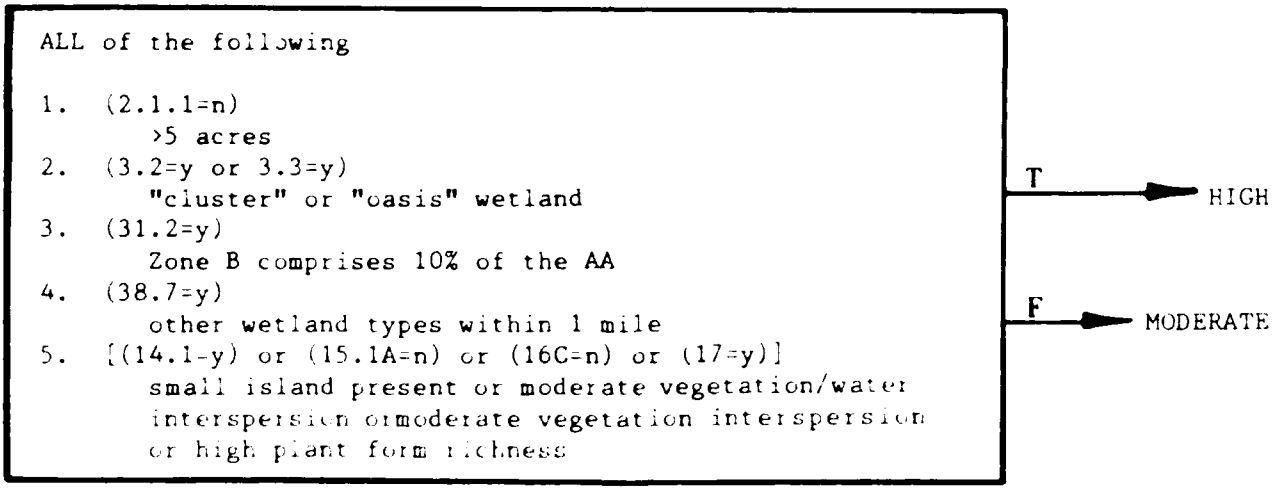
WD/AB Key (Cont.)

WD/AB List A

WD/AB List B



WD/AB List C



-- Continued --

WD/AB Key (Cont.)

WD/AB LIST D

ALL of the following

1. (2.1.1=n)
   >5 acres
2. (31.6E=n)
   Zone B and C is not 100% eB
3. [(33A/B=y) or (38.7=y)]
   partially permanently flooded or intermittently exposed or otherwetland types within 1 mile
4. [(15.1C=y) or (16C=y) or (17=y)]
   great vegetation/water interspersion or great vegetationinterspersion or high plant form richness
5. [(20.1=y) or (36.1.1=n) or (38.8=y)]
   connected or adjacent wooded areas or vegetation width >20 ft

T → HIGH

F → MODERATE

WD/AB LIST E

ALL of the following

1. (2.1.1=n)
   >5 acres
2. (4.2A=n)
   riverine watershed > 1 square mile
3. (31.1=y)
   Zones A+B>C
4. [(14.1=y) or (15.1A=n) or (16C=n) or (17=y)]
   small island present or moderate vegetation/water interspersion ormoderate vegetation interspersion or high plant form richness
5. (20.1=y or 38.8=y)
   adjacent or connected wooded areas
6. (7=y or 41.2=n)
   low water velocity

T → HIGH

F → MODERATE

-- Continued --

WD/AB Key (Cont.)

WD/AB LIST F

1. [(15.1C=y) or (16C=y)]
   great vegetation/water interspersion or great vegetationinterspersion
2. (17=y)
   good plant form richness
3. (18=y)
   irregular upland/Zone A edge
4. (3.2=y or 3.3=y)
   "cluster" or "oasis" wetland
5. (39=y)
   special habitat features present

WD/AB List G

ANY of the following

1. (2.1.1=n)+(MOST of WD/AB List F)
   >5 acres
2. (2.1.1=y or 2.2.1=y)+(ALL of WD/AB List F)
   <5 acres
3. (2.1.2=y or 2.2.2=y)+(ANY of WD/AB List F)
   >40 acres

T → HIGH

F → MODERATE

-- End --

4.4.10 Wildlife Diversity/Abundance for Migration and Wintering

Definition - For purposes of this method, a HIGH rating for a wetland means that during migration or winter, the wetland normally supports a notably great on-site diversity and/or abundance of wetland-dependent birds.

Rationale (Migration/Wintering - HIGH) - This key recognizes three general types of wetlands which, in a national context, have a HIGH probability of supporting an exceptional diversity of wildlife during migration. Certain individual wetlands within the following types may be rated HIGH:

1. West coast freshwater wetlands located within 5 miles of estuarine wetlands larger than 5 acres (or vice versa).
2. Moderate or large-sized mudflats with good visibility and adjoined by emergent marsh.
3. Wetlands with good vegetational diversity and interspersion, generally large and in agricultural areas or along river valleys or coastlines.

Wetlands potentially rated HIGH for wintering wildlife include 1 and 2 above and also 3 above if the wetland is unfrozen.

Use of Level 3 may add another high-probability category for both migration and wintering: Wetlands managed for wildlife or rice cultivation. Level 3 also improves the accuracy of (3) above by making the criteria slightly more stringent. It does so by adding requirements for lack of channelization or alteration (Eastern wetlands) and presence of waterfowl food plants.

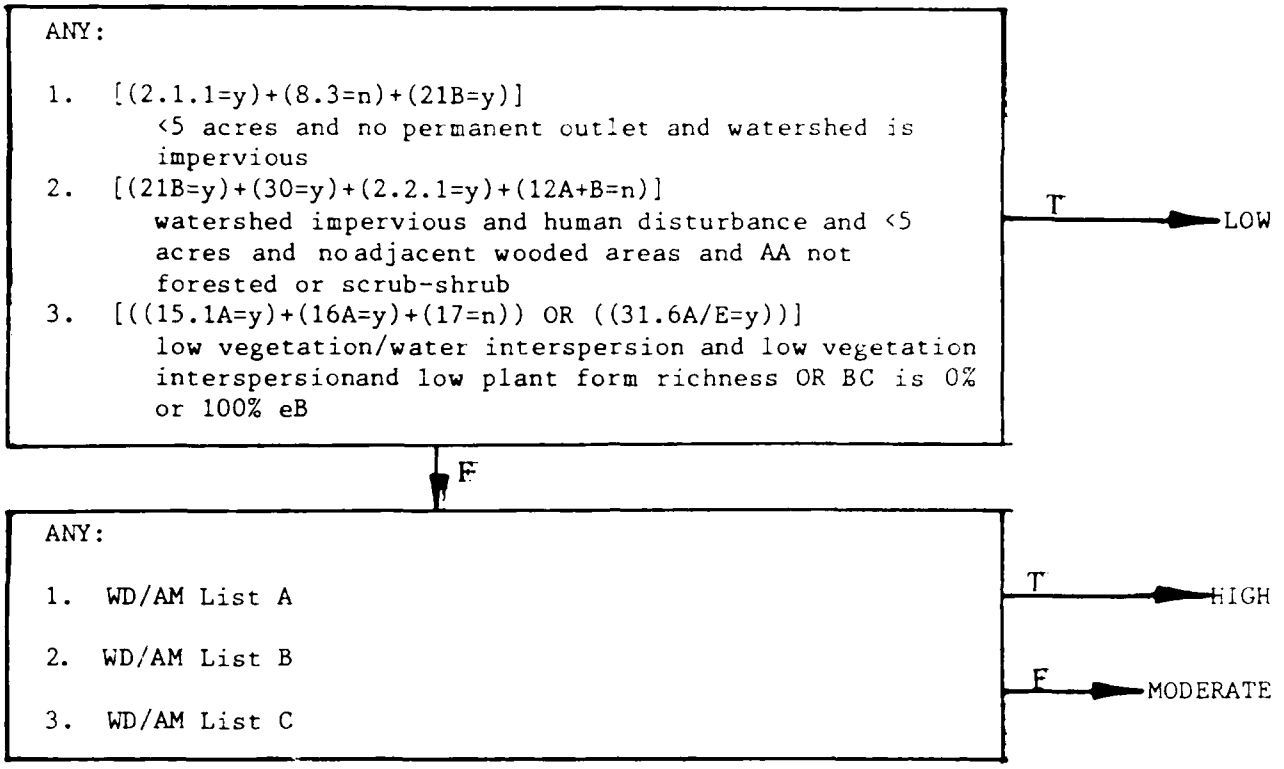
Rationale (Migration/Wintering - LOW) - The key recognizes three general types of wetlands which, in a national context, usually have a LOW probability of supporting an exceptional diversity of wildlife during migration. These, plus a fourth type, are assigned a LOW rating for wintering wildlife as well. Certain individual wetlands within the following may be assigned a LOW rating:

1. Wetlands with toxic inputs, and having no outlet or being smaller than 5 acres.
2. Moss-lichen wetlands (bogs) with no open water.
3. Small, urban wetlands without woody vegetation.
4. Wetlands frozen over at least 1 month of the year.

Accuracy in these two keys depends on reliable estimation of the following characteristics: size, presence of toxic materials, vegetation type and diversity, and presence of ice cover.

Interpretation Keys - For the Wildlife Diversity/Abundance Migration Key use the answers in the "X" column of Form B. For the Wildlife Diversity/Abundance Wintering Key use the answers in the "D" column of Form B. If this is unavailable, use the answers in the "W" column. If this is unavailable, use the answers in the "X" column.

Wildlife Diversity/Abundance for Migration (WD/AM) Key



WD/AM LIST A

ALL of the following

1. (38.5=y)
   emergent vegetation or mudflat adjoin each other
2. (2.1.1=n)
   >5 acres
3. [(3.2=y) or (3.3=y) or (4.1=y)]
   wetland is part of a "cluster" or "oasis" or within 5 miles of the Great Lakes, a major river, or tidal waters

-- Continued --

WD/AM Key (Cont.)

WD/AM LIST B

ALL of the following

1. (1.1=n)
   not located in a "dry" region
2. (2.1.1=n and 2.2.1=n)
   >5 acres
3. [(38.3=y) or (32H=y) or (4.1=y) or (12A/B=y)]
   within 5 miles of a wetland of different system type or artificially flooded or within 5 miles of the Great Lakes, a major river, or tidal water or wooded

WD/AM LIST C

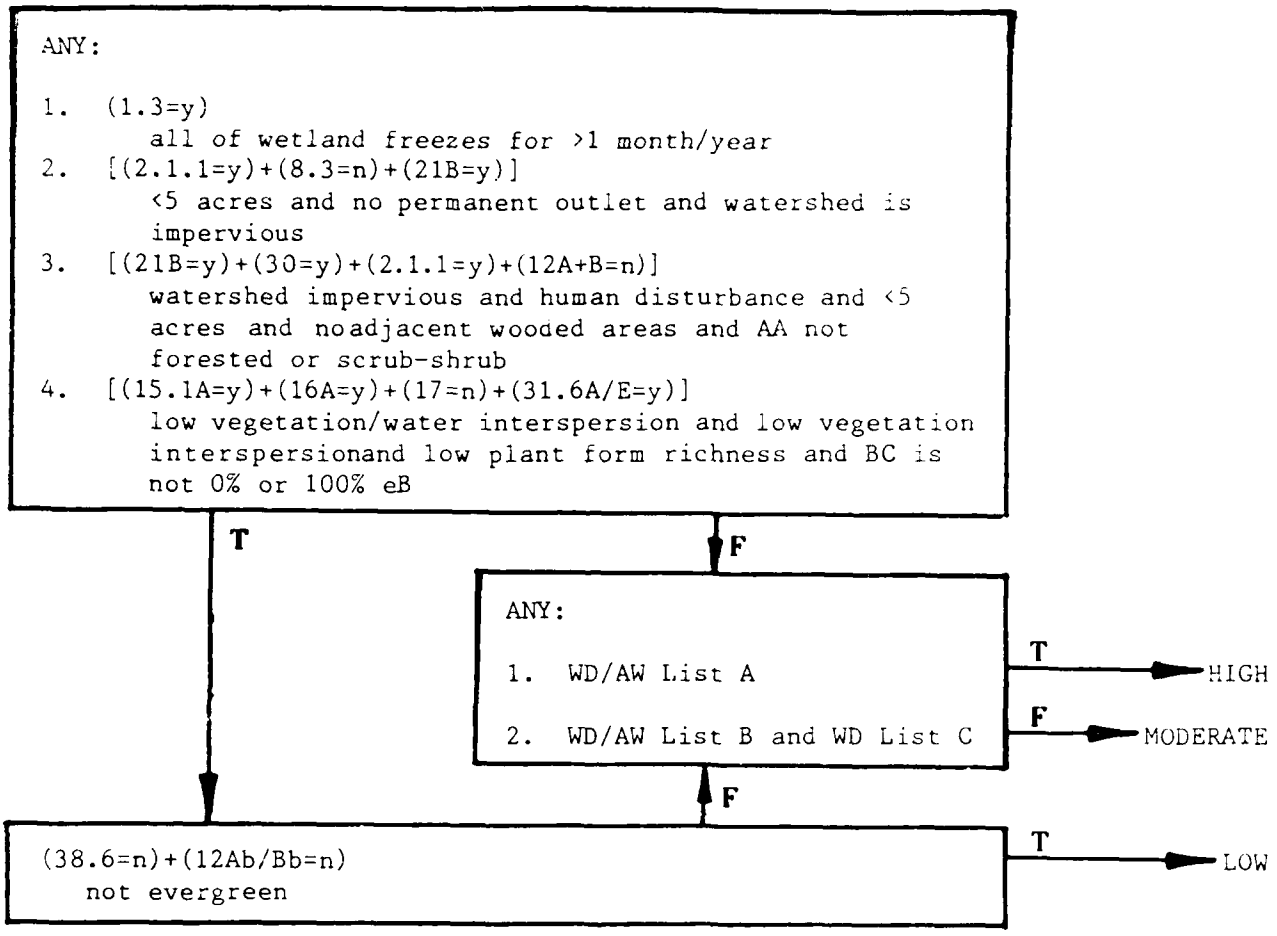
[(2.1.1=n) or (3.2=y) or (3.3=y) or (4.1=y)]
   >5 acres or part of a "cluster" or "oasis" or within 5 miles of the Great Lakes, a major river, or tidal waters

AND MOST of the following:

1. (31.6C=Y)
   30%-60% of Zones B and C is eB
2. [(21C=y) or (50=y) or (39=y)]
   cultivated agricultural watershed or waterfowl food plants presentor special habitat features present
3. (17=y)
   high plant form richness
4. [16C=y) or (18=y) or (15.1C/15.2=y)]
   great vegetation interspersion or irregular upland/Zone A edge orgreat vegetation/water interspersion
5. [(28=n)+(23=n)+(34.1=n)]
   no direct alteration and no structures to confine or control water
6. (30=n)
   no human disturbance
7. (2.3=y)
   >200 acres
8. (47B=n)
   pH >6.0
9. (45E+F+G=n)
   substrate is not bedrock, rubble, or cobble-gravel

-- End --

Wildlife Diversity/Abundance for Wintering (WD/AW) Key



WD/AW LIST A

ALL of the following

1. (1.1=n)
   not located in a "dry" region
2. (2.1.1=n and 2.2.1=n)
   >5 acres
3. [(38.3=y) or (32H=y) or (4.1=y) or (12A/B=y)]
   within 5 miles of a wetland of different system type or artificially flooded or within 5 miles of the Great Lakes, a major river, or tidal water or wooded

-- Continued --

WD/AW Key (Cont.)

WD/AW LIST B

[(2.1.1=n) or (3.2=y) or (3.3=y) or (4.1=y)]
>5 acres or part of a "cluster" or "oasis" or within 5 miles of the Great Lakes, a major river, or tidal waters

AND MOST of the following:

1. (31.6C=Y)
   30%-60% of BC is eB
2. [(21C=y) or (50=y) or (39=y)]
   cultivated agricultural watershed or waterfowl food plants presentor special habitat features present
3. (17=y)
   high plant form richness
4. [16C=y) or (18=y) or (15.1C/15.2=y)]
   great vegetation interspersion or irregular upland/Zone A edge orgreat vegetation/water interspersion
5. [(28=n)+(23=n)+(34.1=n)]
   no direct alteration and no structures to confine or control water
6. (30=n)
   no human disturbance
7. (2.3=y)
   >200 acres
8. (47B=n)
   pH >6.0
9. (45E+F+G=n)
   substrate is not bedrock, rubble, or cobble-gravel

WD/AW LIST C

ANY of the following

1. (19.1A=y)
   at least 1 acre is sheltered
2. (38.6=y)
   agricultural, evergreen, or regenerating vegetation within 0.5 mile
3. (32H=y)
   artificially flooded
4. (12Bc=y)
   scrub-shrub and broad-leaved evergreen

-- End --

4.4.11 Recreation and Uniqueness/Heritage

No interpretation keys are presented for assessing opportunity and effectiveness of these values because no scientific basis exists for an objective assessment without considerable site-specific data collection.

Few traditional wetland evaluation techniques have addressed recreational potential, probably because of the manner in which "wetlands" were defined, and/or because recreation was viewed as an incompatible use. An exception is a key developed for Massachusetts localities by the USDA Soil Conservation Service (1978). Quantitative procedures for recreational assessment are provided by the U.S. Water Resources Council's Principles and Guidelines. Also, several evaluation techniques exist for qualitative recreational assessments of lakes and rivers.

Procedures for evaluation of aesthetic aspects of wetlands, rivers, and shorelines (Smardon and Fabos 1976) rely primarily on landscape diversity, vividness, scarcity, unity, and freedom from eyesores. Although society respects, to some degree, the judgments of "authorities" on questions of artistic merit, this respect has not, to date, been routinely vested in professionals working with the aesthetic analysis of landscapes. This is partly because perception of the landscape, which may be encountered everyday or once in a lifetime, tends to be more strongly shaped by sociological factors.

Systematic procedures exist for incorporation of scientific data into policy decisions regarding management, avoidance, or protection of natural areas or species. For example, numerous procedures exist for ranking rare animals (Adamus and Clough 1978, Sparrowe and Wight 1975), rare plants (DuMond 1973, Peterken 1974), and natural areas (Spellerberg 1981, Tans 1974, and Wright 1977).

5.0 Habitat Suitability Evaluation

WET evaluates Fish and Wildlife Habitat for Social Significance, and Aquatic Diversity/Abundance and Wildlife Diversity/Abundance for effectiveness. These evaluations provide a general measure of the diversity and abundance of wetland-dependent birds in the AA. They do not evaluate wildlife species in terms of their dependence on the wetland habitat, duration of stay, ecological or social importance. Fish and wildlife species have highly individualistic requirements for food, cover, water quality, and other habitat factors, and therefore, the evaluation of fish and wildlife habitat, in general terms, must be viewed with caution. Ideally, wildlife habitat should be evaluated at the species-specific level.

For this reason WET provides a procedure to evaluate fish and wildlife habitat at the species group and individual species level. Specifically, WET evaluates habitat suitability of a wetland for 14 waterfowl species groups, 4 freshwater fish species groups, 120 species of wetland-dependent birds, and 133 species of saltwater fish and invertebrates. These evaluations are restricted to avian, fish, and invertebrate species that reside in the 48 contiguous states and are wetland-dependent throughout most of their range. WET does not evaluate for wetland-dependent furbearers and other mammals, reptiles, and amphibians (e.g., beaver, crayfish, alligator, etc.). Habitat suitability for these wetland-dependent species can be assessed by other procedures such as the Habitat Evaluation Procedures (HEP) of the USFWS or in the south-central United States, the Habitat Evaluation System (HES) of the US Army Corps of Engineers. The habitat suitability interpretation keys and the supporting data in Volume I represent a rich source of detailed habitat preference information for wetlands. They can be used to supplement more precise and detailed wildlife evaluation procedures (HEP and HES).

The habitat suitability ratings cannot be combined to give an overall probability ratings of habitat suitability for the wetland. This would require weighting of species, which is both a social, and a biological, judgment. For those users who wish to pursue this further, guidelines are provided by Adamus and Clough (1978), Sparrowe and Wight (1975), and US Fish and Wildlife Service (1980a).

5.1 Procedure for Habitat Suitability Evaluation

The habitat suitability evaluation is based on answers to the questions in assessment levels 1,2 and 3 of the effectiveness and opportunity evaluation. Therefore, in order to assess the habitat suitability of a species or species group these questions must be answered.

Introductory information, instructions, and interpretation keys for freshwater fish species groups and waterfowl species groups are in Sections 5.2 and 5.3 respectively. These two sections follow the same format used in Levels 1, 2, and 3 of the effectiveness and opportunity evaluation. Introductory information, instructions, and interpretation for freshwater fish species, saltwater fish and invertebrates, and wetland-dependent birds are in Section 5.4, 5.5. and 5.6 respectively. The interpretation keys in these three sections are in a table format.

The habitat suitability assessments for the species and species groups are done independently. An assessment can be done for one or many species or species groups. Begin the habitat suitability evaluation by selecting the species or species groups to be assessed. Turn to the appropriate section and read the introductory material and then follow the instructions for using the interpretation keys.

5.2 Freshwater Fish Species Groups

Definition - For the purposes of WET, a high probability rating means that the wetland normally supports a high level of productivity for sport or commercial freshwater members of the fish species group.

Rationale (General Fish Key) - At least 1 acre of permanently flooded wetland is assumed necessary if the depression is never contiguous. There must be at least 1 acre of water at least 4 in. deep for most fish. If the depression is in an ice-hazard region and is never contiguous, it should also be larger than 5 acres and have a water depth of at least 15 ft to somewhat reduce island biogeography effects and the threat of winter-kill of fish. Evidence of fish kills must be lacking. Secondarily, the site should (a) not be extremely acidic (pH less than 6); (b) be contiguous and accessible, at least intermittently, to other aquatic areas; (c) lack excessive aquatic plant cover that would restrict fish movement; (d) lack excessive water level fluctuations that do not mimic natural fluctuations; (e) lack potential sources of toxins; and (f) not be hypersaline. Some sites may lack two of these secondary characteristics yet have fish present.

Rationale (Warmwater Fish Key) - To support warmwater riverine fish, the area must receive a MODERATE OR HIGH probability rating from the General Fish Key and must meet three of the following criteria: (a) a sinuous main channel; (b) large natural (seasonal) fluctuations; (c) a wooded floodplain; (d) a gently sloping (perpendicular to thalweg) floodplain; and (e) an intermediate or large stream order. Some sites may lack two of these five, yet have an appreciable warmwater fishery.

Rationale (Coldwater Fish Key) - To support any coldwater fish, the AA must receive a MODERATE OR HIGH probability rating by the General Fish Key and must provide suitable cover, temperature, and dissolved oxygen. Secondarily, it should have: (a) acceptably low turbidity; (b) ground water input, as implied by springs or relatively stable water levels; and (c) at least 1 acre of coarse sediments. Some sites may lack one of these three, yet have coldwater fish present.

Rationale (Coldwater Riverine Key) - To support coldwater riverine fish, the AA must receive a MODERATE or HIGH probability rating from the General Fish Key, must receive a MODERATE or HIGH probability rating from the Coldwater Fish Key, and must meet most of the following criteria: (a) intermediate stream order; (b) gravel-rubble sediments (not merely coarse); (c) a good pool-riffle ratio; (d) moderate shade; and (e) lack of <u>potential</u> sediment sources. Some sites may lack two of these five, yet have coldwater riverine fish present.

Rationale (Northern Lake Fish Key) - To support a northern, lacustrine, centrarchid-Esox (largemouth bass - Northern pike) complex of species, the lake must receive a MODERATE or HIGH probability rating from the General Fish Key and must be contiguous with other AA's in a watershed of at least 208 square miles or have a winter dissolved oxygen (DO) content of at least 4.0 mg/l (Rahel 1984).

Instructions for Fish Species Group Keys - Begin with the General Fish Key. If a LOW probability rating is assigned by the General Fish Key, all fish groups also receive a LOW probability rating. If a MODERATE or HIGH probability rating results, proceed to the Warmwater, Coldwater, or Northern Lake fish species group key. To proceed to the Coldwater Riverine Group a MODERATE or HIGH probability rating must result from the the Coldwater Group Key. For example, to evaluate the Coldwater Riverine Group, begin with the General Fish Key. If a LOW probability rating is assigned, then assign a LOW probability to the Coldwater Riverine Group also. However, if a HIGH or MODERATE probability rating results, proceed to the Coldwater Group Key. If a LOW probability rating results, assign a LOW probability rating to the Coldwater Riverine Group also. However, if a HIGH or MODERATE probability rating results, proceed to the Coldwater Riverine Group Key. Assign the resulting probability rating to the Coldwater Riverine Group.

Interpretation Key - For the General Fish Key and all the fish group keys use the answer in the "D" column of Form B. If this is unavailable use the answer in the "X" column.

General Fish (GF) Key

[(33A/I/J=y) AND (44.3/.4/.5/.6/.7/.8=y)]
permanently flooded, regularly flooded tidal or irregularly exposed tidal AND at least 1 acre or 10% of wetland is 5 in. deep

F → GF List A

T

[(1.3=y) and (8.1+8.2+8.3+8.4=n)]
all of AA freezes for >1 month and no inlet or outlet

F → GF List C

T

ALL:

1. (2.1.1=n)
   >5 acres
2. (44.9=y)
   acre or 10% of water is 26 ft deep
3. (61=n)
   D.O. not limiting
4. (49.3=n)
   Carp not prevalent

T → GF List C

F → GF List B

GF List A

ACTUALLY PRESENT *

F → LOW

T → MODERATE

GF List B

ANY:

1. (2.1.1=n)
   >5 acres
2. (44I=y)
   1 acre or 10% of water is 26 ft deep
3. (61=n)
   D.O. not limiting

T → MODERATE

F → GF List A

Proceed to Species Key if desired

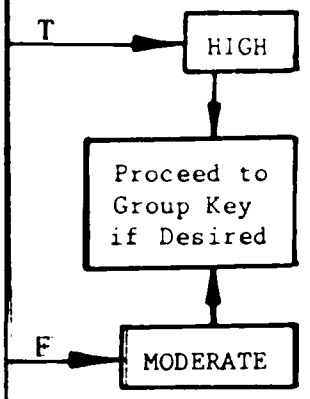
-- Continued --

GF Key (Cont.)

GF List C

ALL:

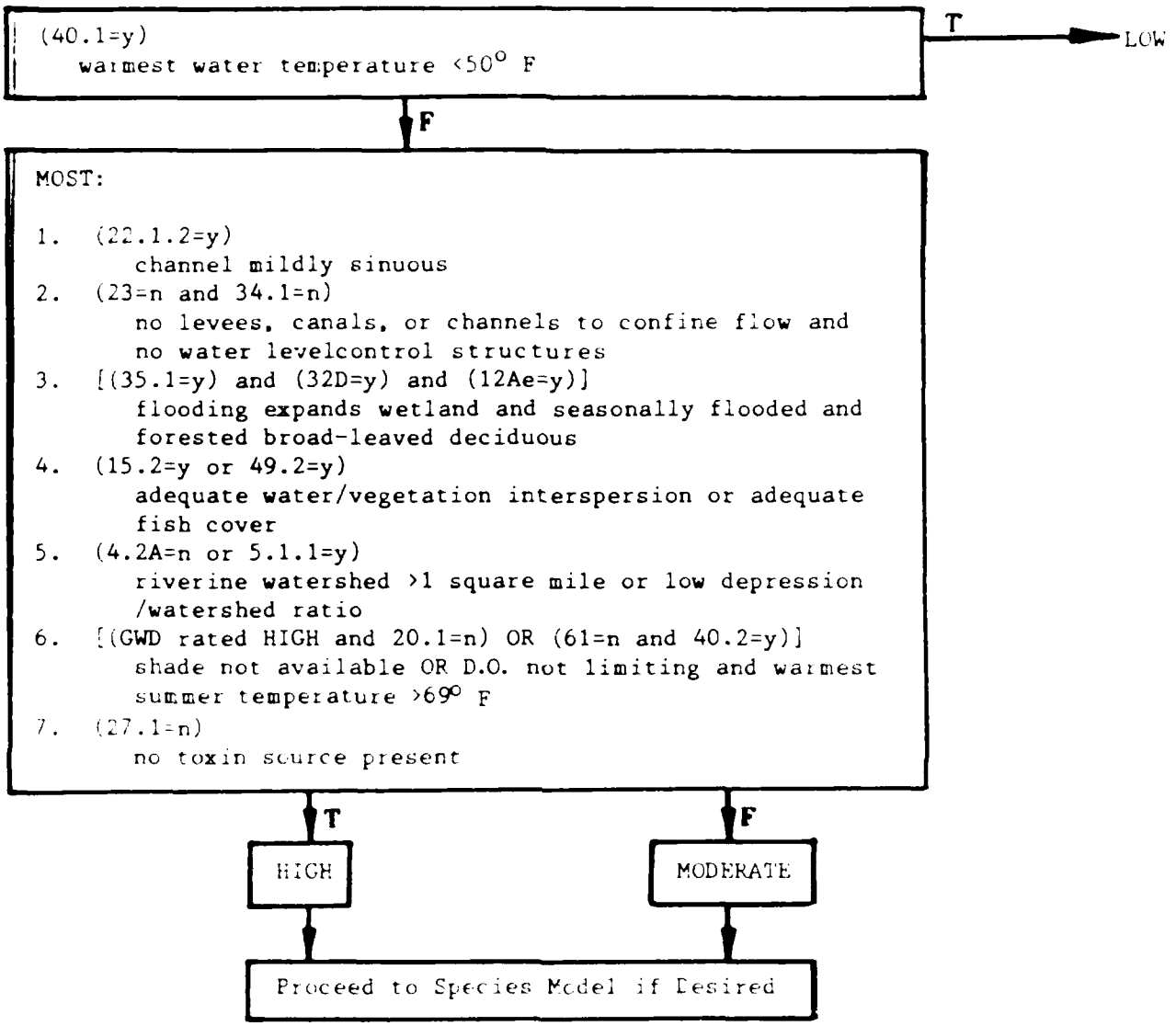
1. (47B=n)
   pH >6.0
2. (8.1/8.2/8.3/8.4=y)
   inlet or outlet present
3. (61=n)
   D.O. not limiting
4. (34.1=n)
   no water level control structures
5. (31.6E=n)
   BC is not 100% eB
6. (27.1=n)
   no toxin source
7. (48F=n)
   salinity <40 ppt



-- End --

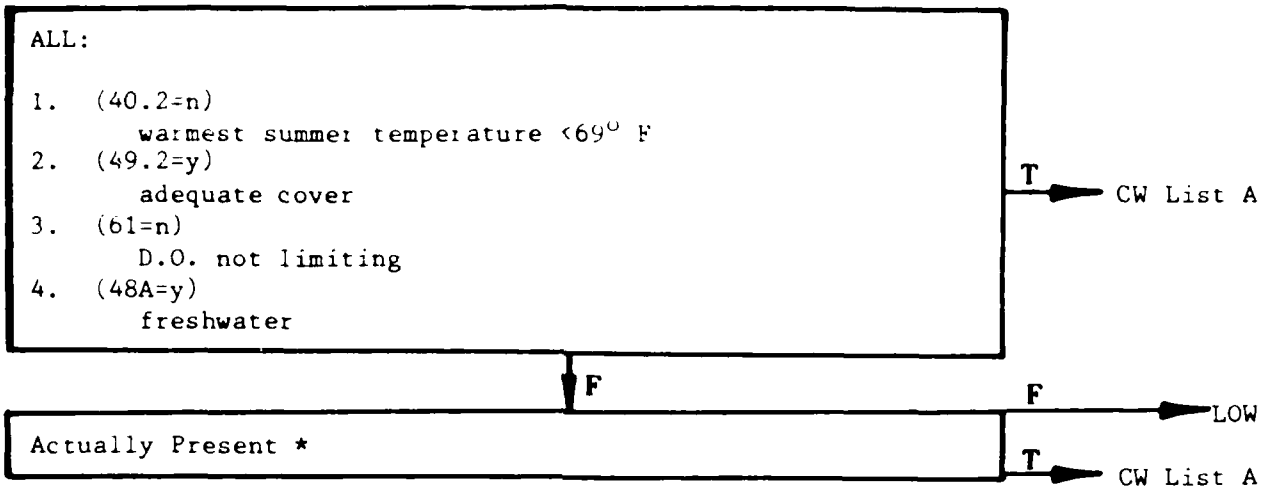
* Skip this criterion if a future condition is being assessed. Assign a LOW value since the future presence/absence of the fish in the area is not known.

Warmwater Fish (WW) Group Key

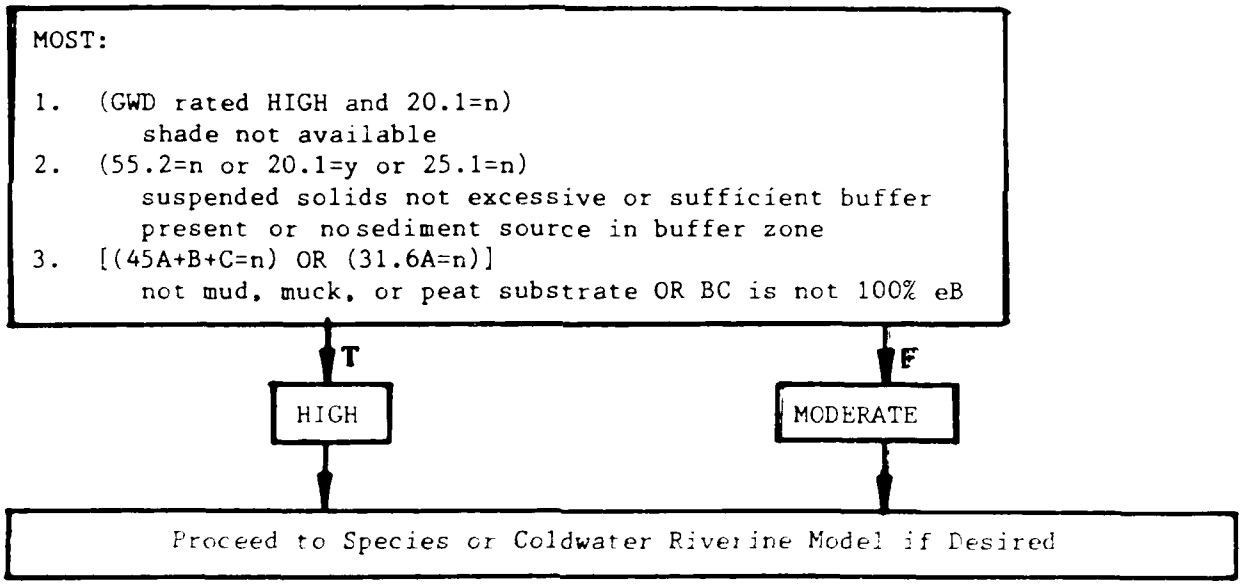


-- End --

Coldwater Fish (CW) Group Key



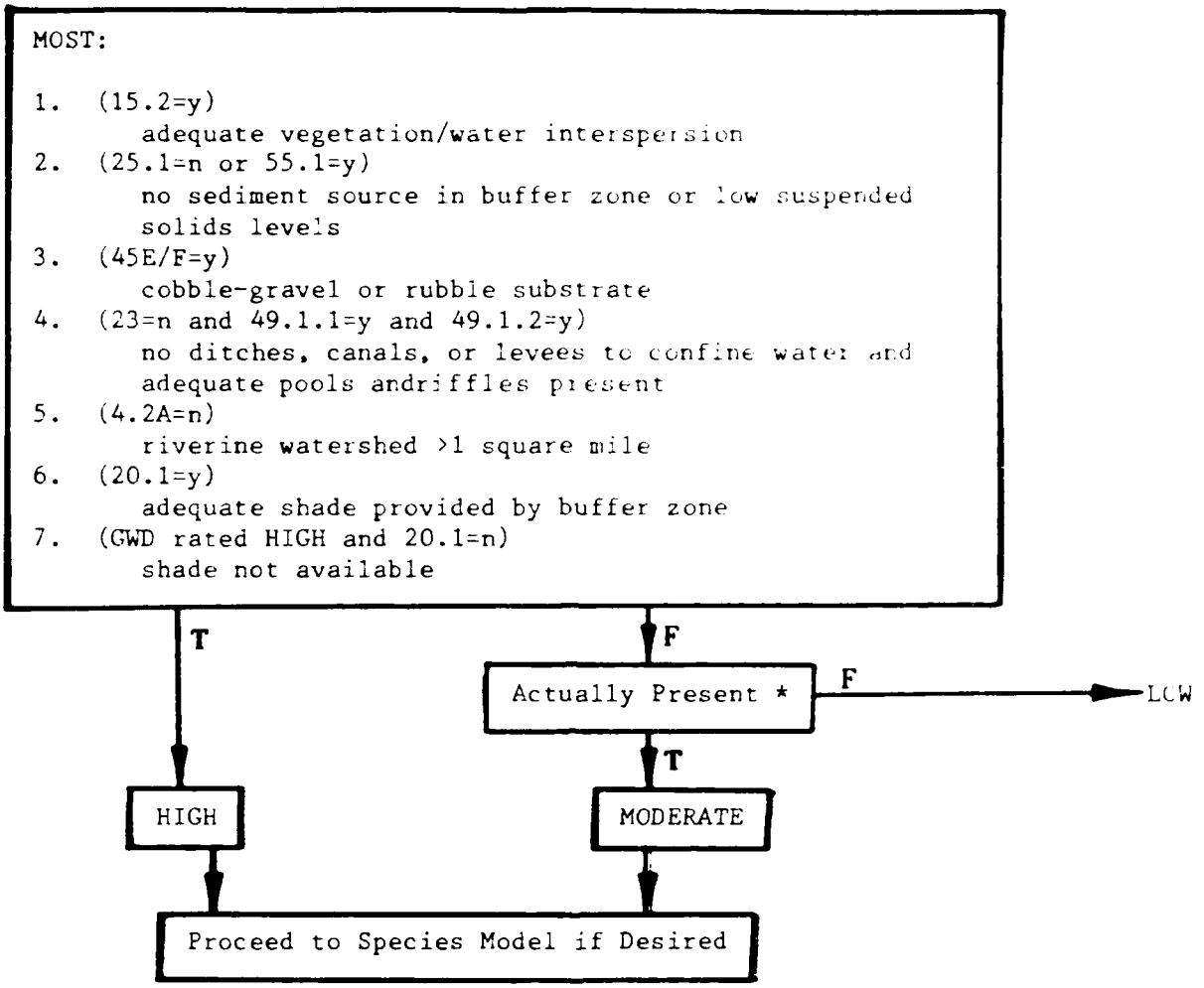
CW List A



-- End --

* Skip this criterion if a future condition is being assessed. Assign a LOW value since the future presence/absence of the fish in the area is not known.

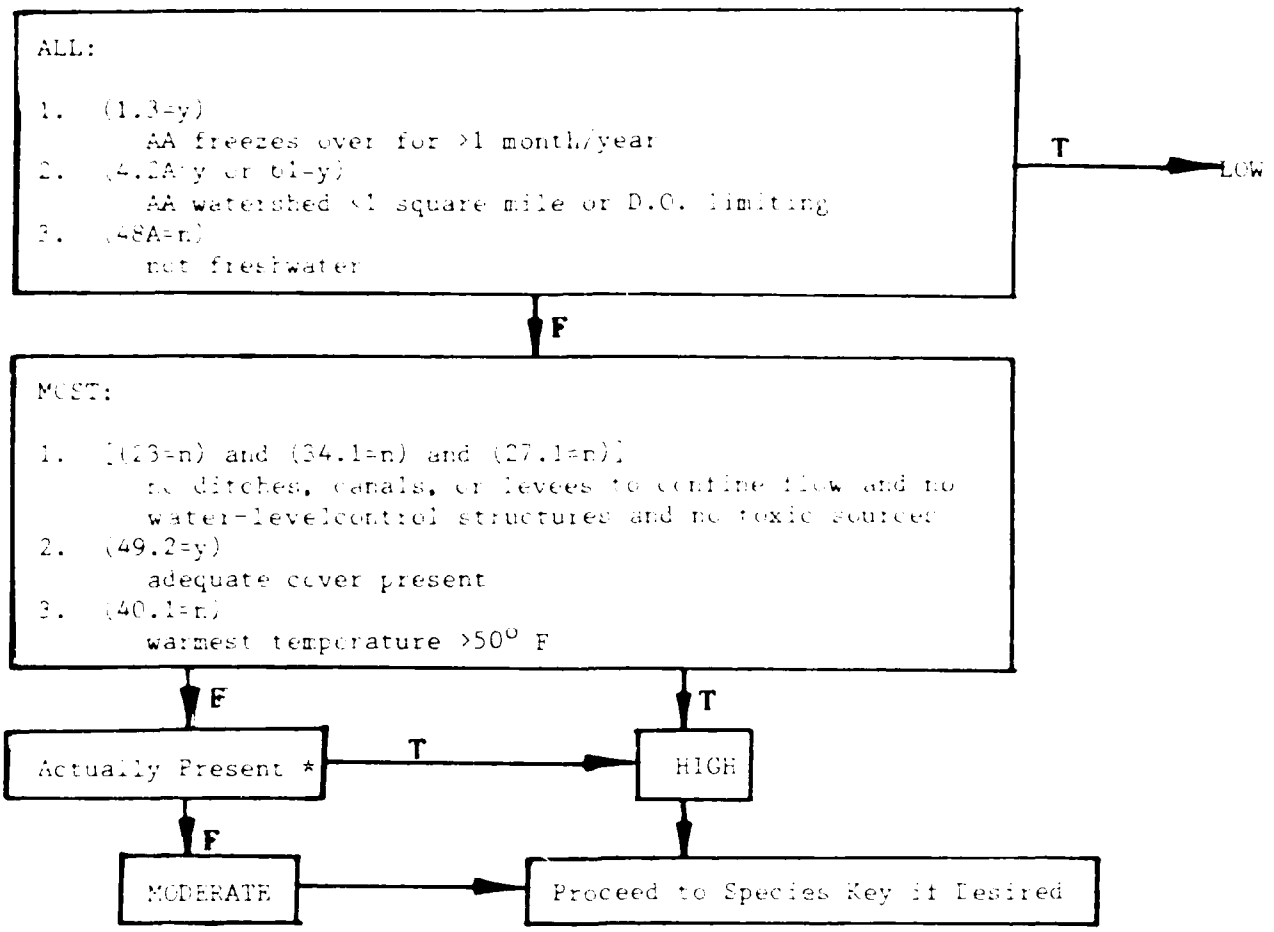
Coldwater Riverine Fish (CWR) Group Key



-- End --

* Skip this criterion if a future condition is being assessed. Assign a LOW value since the future presence/absence of the fish in the area is not known.

Northern Lake Fish (NL) Group Key



-- End --

* Keep this criterion if a future condition is being assessed. Assign a "MODERATE" value since the future presence/absence of the fish in the area is unknown.

5.3 Harvested Waterfowl Species Groups

Waterfowl have been assigned to 14 groups based on the normal requirements of adult males. Summering habitat affinities are weighted more heavily than wintering habitat affinities, although, some species do not summer in the 48 contiguous states. Table 6 lists the 14 waterfowl groups and describes the species included in each group (e.g., the prairie dabblers group includes mallard, mottled duck, pintail, etc.).

Breeding - The harvested waterfowl keys probably have greater validity for the early summer period (nesting) than late summer. They also probably have greater validity for regions where extreme year-to-year precipitation fluctuations do not exist.

The following species may be expected to show the greatest deviation from the general habitat criteria specified in the breeding keys:

1. Gadwall, Mottled Duck, and Mexican Duck - all tolerate higher salinities.

2. Red-breasted Mergansers - can nest in estuarine/marine systems, and may use emergent wetlands.

Wintering and Migration - The prediction of habitat value for wintering waterfowl has rarely been attempted. A procedure based mostly on winter food habits of coastal waterfowl was published by Allan (1956), and a classification based mostly on vegetation, sediment type, water depth, and shelter was developed for coastal Maine by Adamus (1978).

Instructions for Harvested Waterfowl Keys - Begin by selecting one or more of the waterfowl species whose geographic range during breeding, migration or wintering coincides with the wetland being evaluated. The maps in Figures 32-34 will assist in making appropriate selections. Interpret the habitat suitability of the wetland for a specific season using the key(s) specified in Table 6. For example, to interpret for Prairie Dabbler breeding, turn to Harvested Waterfowl Key 4. Work through the key using the same procedure used with the interpretation keys for effectiveness/opportunity. Interpretation for the migration season requires the use of two keys. For example, to interpret for Prairie Dabbler migration, begin with Key 1. If a LOW probability rating results, assign a LOW probability rating to the Prairie Dabblers (Group 1) for migration. If a HIGH or MODERATE probability rating results proceed to work through Key 12 and assign the resulting probability rating to the Prairie Dabblers.

Interpretation Key - For waterfowl habitat suitability evaluation during the breeding season use the answers in the "W" column of the answer sheet sheet (Form B). If this is lacking, use the answers in the "X" column. For waterfowl habitat suitability evaluation during the migration and wintering seasons use the answers in the "X" column of the answer sheet.

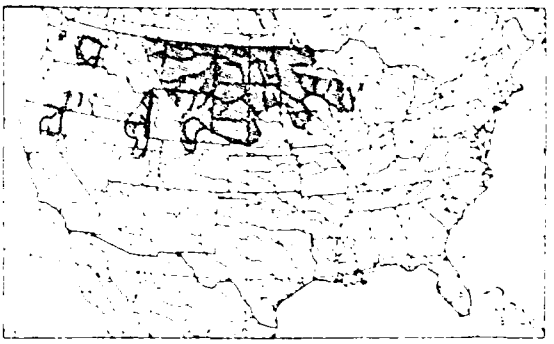
Table 6. Harvested Waterfowl Species Groups and Keys for Interpreting Habitat Suitability for Breeding, Migration, and Wintering

Group	Species Description	Keys for Breeding	Keys for Migration	Keys for Wintering
1	Prairie Dabblers[1]	4	1 then 12	2
2	Black Duck	5	1 then 13	2
3	Wood Duck	6	1 then 14	2
4	Common/ Red-Breasted Mergansers	7	1 then 15	2
5	Hooded Merganser	6	1 then 16	2
6	Canvasback, Redhead, Ruddy Duck	8	1 then 17	2
7	Ring-necked Duck	8	1 then 18	2
8	Scaup (Greater and Lesser)	8	1 then 19	2
9	Common Goldeneye	9	1 then 20	2
10	Bufflehead	9	1 then 20	2
11	Whistling Ducks[2]	11	11	11
12	Inland Geese[3]	10	1 then 21	3
13	Tundra Swan	10	1 then 22	2
14	Brant	10	1 then 23	3

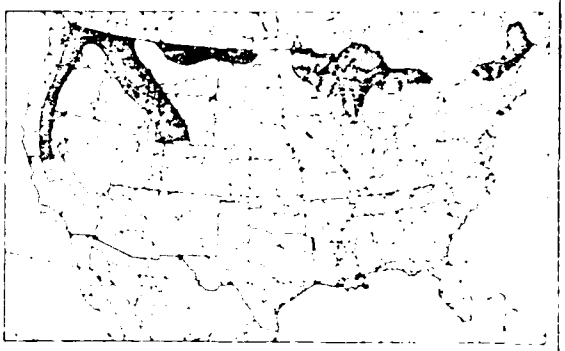
[1] Mallard, mottled duck, pintail, gadwall, widgeon, shoveler, blue-winged teal, green-winged teal, cinnamon teal

[2] Fulvous and Black-bellied

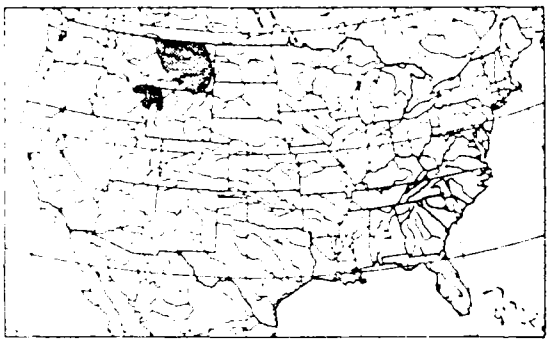
[3] Canada, White-fronted, Snow and Ross' goose



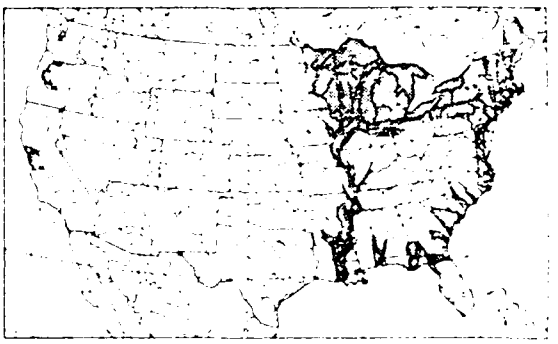
PRAIRIE DABBLERS/N



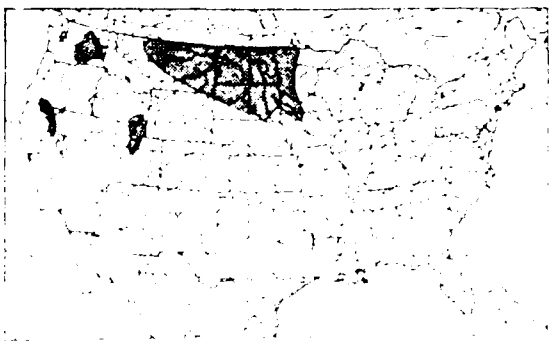
GOLDENEYE, BUFFLEHEAD/N



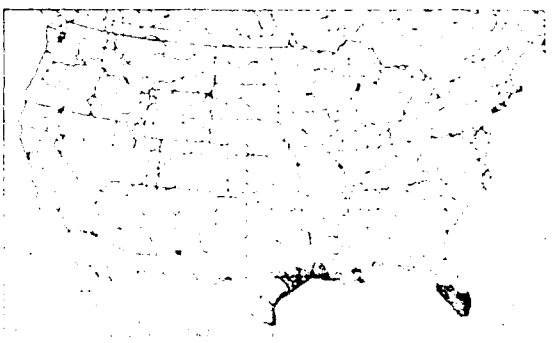
INLAND SWANS AND GEESE/N



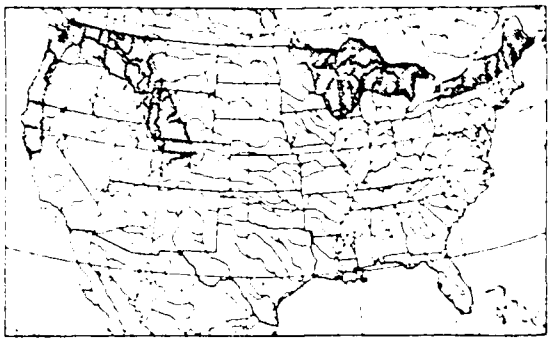
BLACK DUCK, WOOD DUCK/N



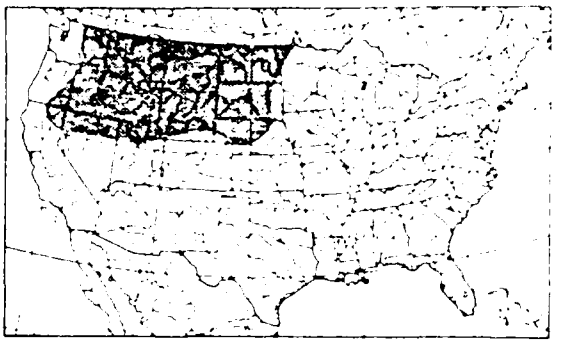
CANVASBACK, REDHEAD, RUDDY
RING NECKED/N



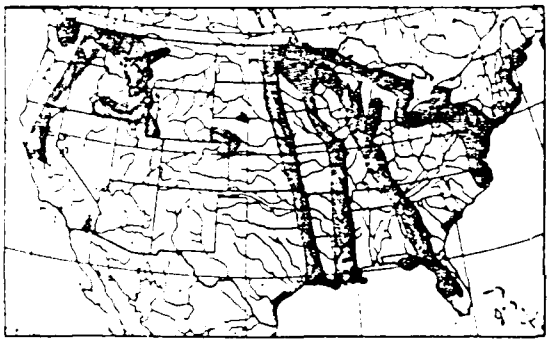
WHISTLING SWANS/N



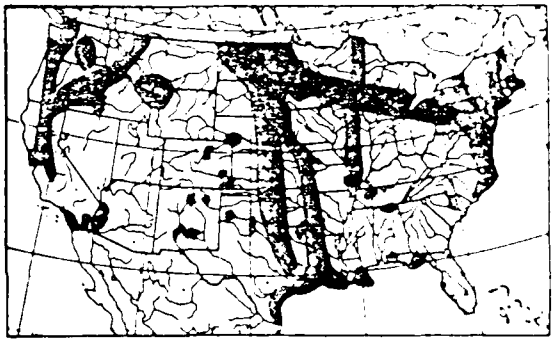
MERGANERS/N



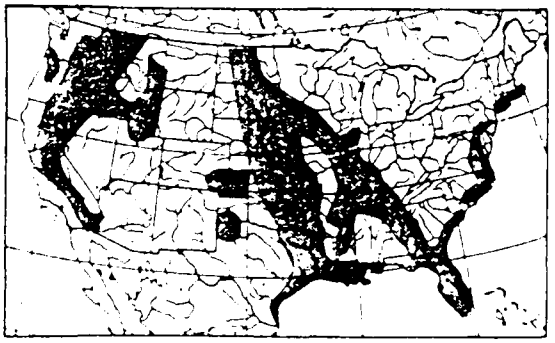
SCAUP/N



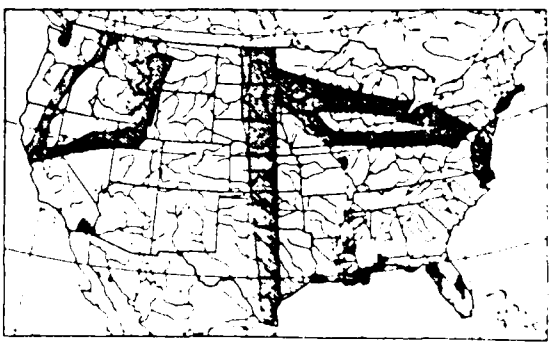
GOLDENEYE, BUFFLEHEAD/NW



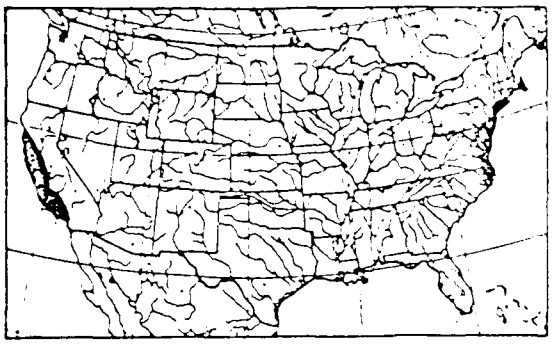
INLAND SWANS AND GEESE/MW



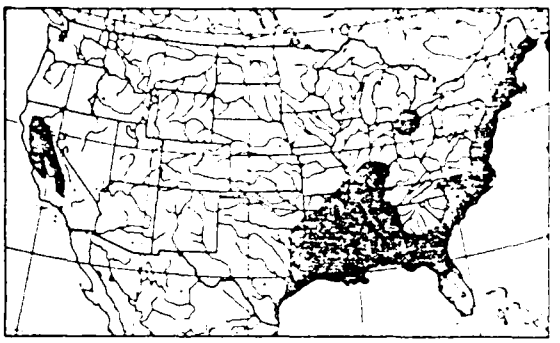
PRAIRIE DABBLERS/MW



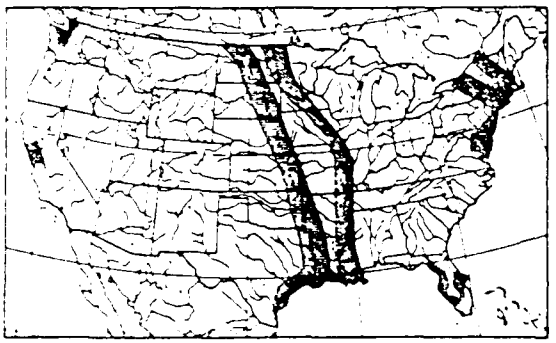
CANVASBACK, REDHEAD, RUDDY, RING-NECKED/MW



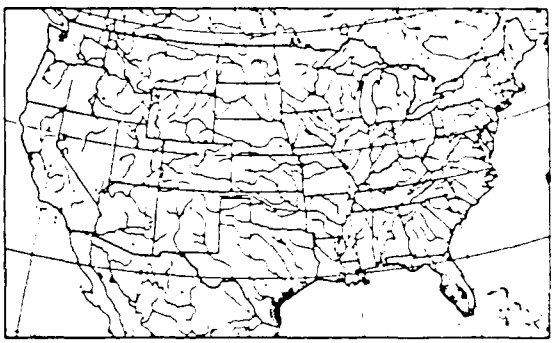
BRANT/MW



BLACK DUCK, WOOD DUCK/MW



SCAUP/MW

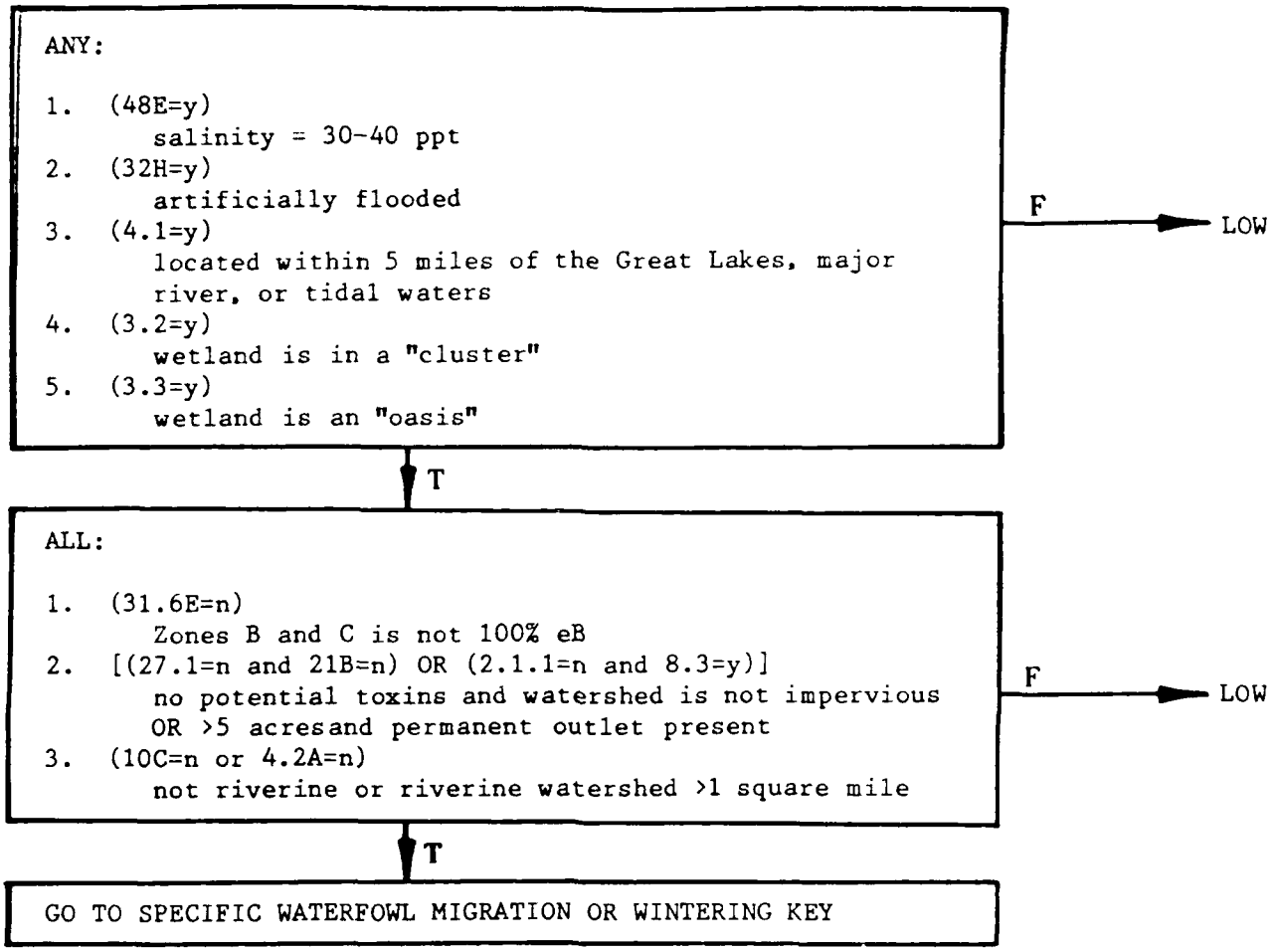


WHISTLING DUCKS/MW

MERGANERS/MW

Harvested Waterfowl Interpretation Keys

Key 1: General Waterfowl Migration (GWM) Key



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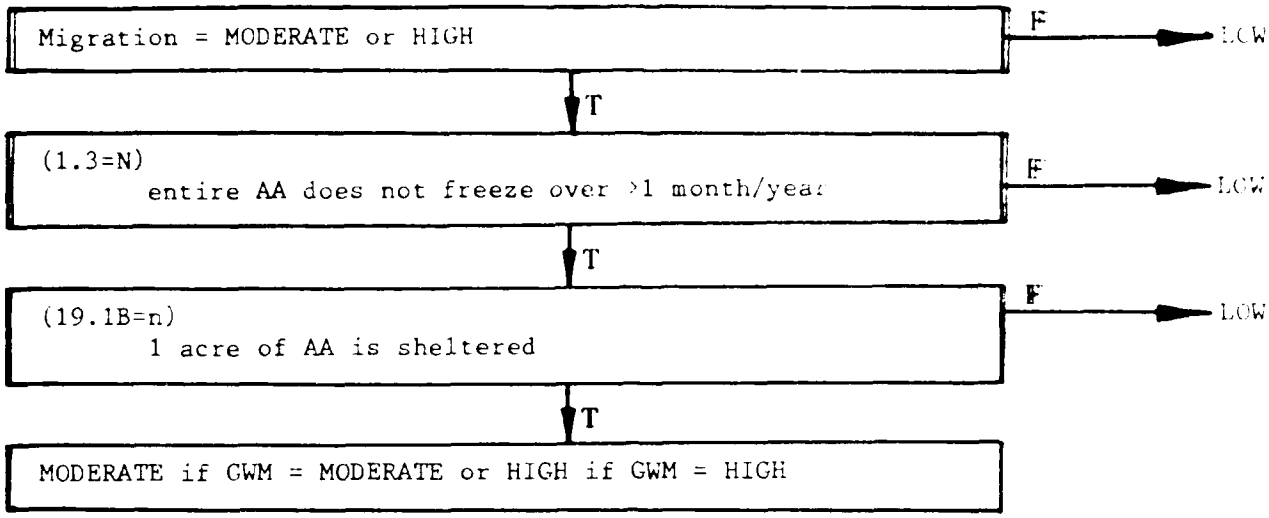
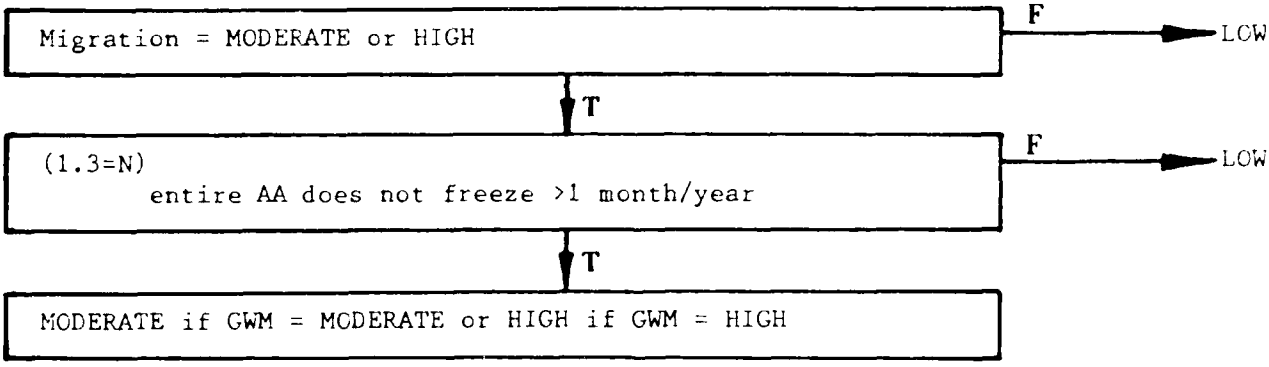
HW Keys (Cont.)

Key 2: Wintering for Keys 12-20, 22



Key 3: Wintering for Keys 21 and 23



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HW Keys (Cont.)

Key 4: Prairie Dabblers Breeding (PDB)

ANY:

1. [(2.1.1=y and 8.3=n and (27.1=n or 21B=y)]
   <5 acres and no permanent outlet and toxin source or watershed mostly impervious
2. (12A=y)
   forested
3. (36.1.1=y and 29.1=n)
   width of eB in Zone A and B <20 ft and no cover for wetland animals
4. (31.6E=y)
   100% of Zones B and C is eB
5. (41.2=y or 7=n)
   high water velocity
6. (48A+B=n)
   salinity >5 ppt
7. (19.1B=y)
   unsheltered

T → LOW

F

MOST:

1. (14.1=y or 15.1C=y or 15.2=y)
   island or good veget./water interspersion
2. (31.6C=y)
   30%-60% of Zones B and C is eB
3. (21A=n)
   watershed not forested and scrub
4. (33A=n)
   most permanent hydroperiod is permanently flooded nontidal
5. (38.7=y)
   permanent water within 1 mile
6. (12D=y)
   emergent
7. (10B=y and 19.1A=y)
   palustrine and at least 1 acre sheltered
8. (48A=Y)
   freshwater
9. (23=n and 34.1=n)
   no ditches, canals, or levees and no great water level fluctuations

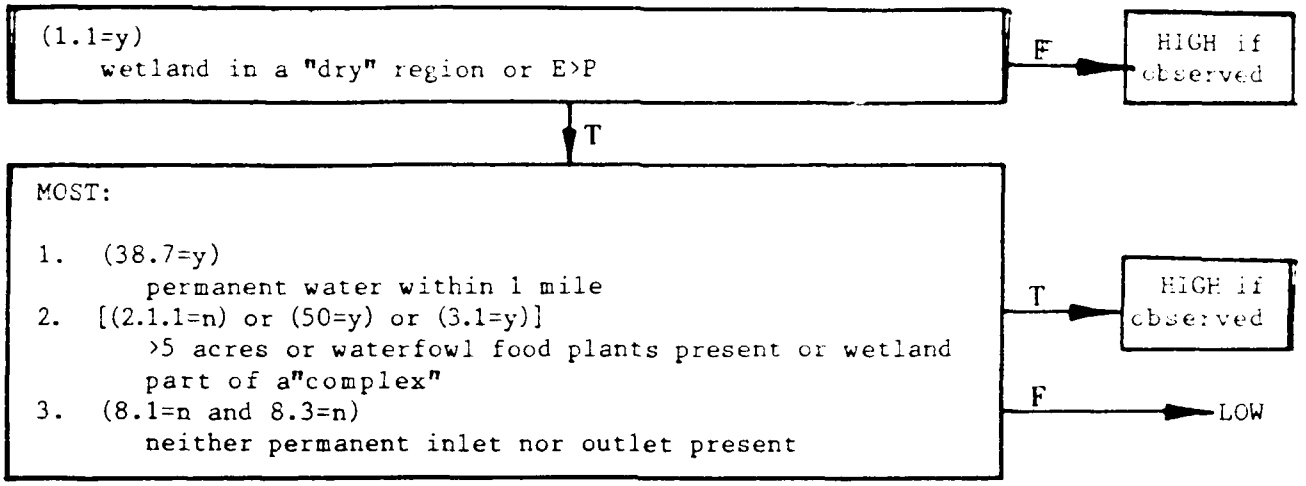
T → PDB List A

F → LOW

-- Continued --

HW Key Cont.

PDB List A



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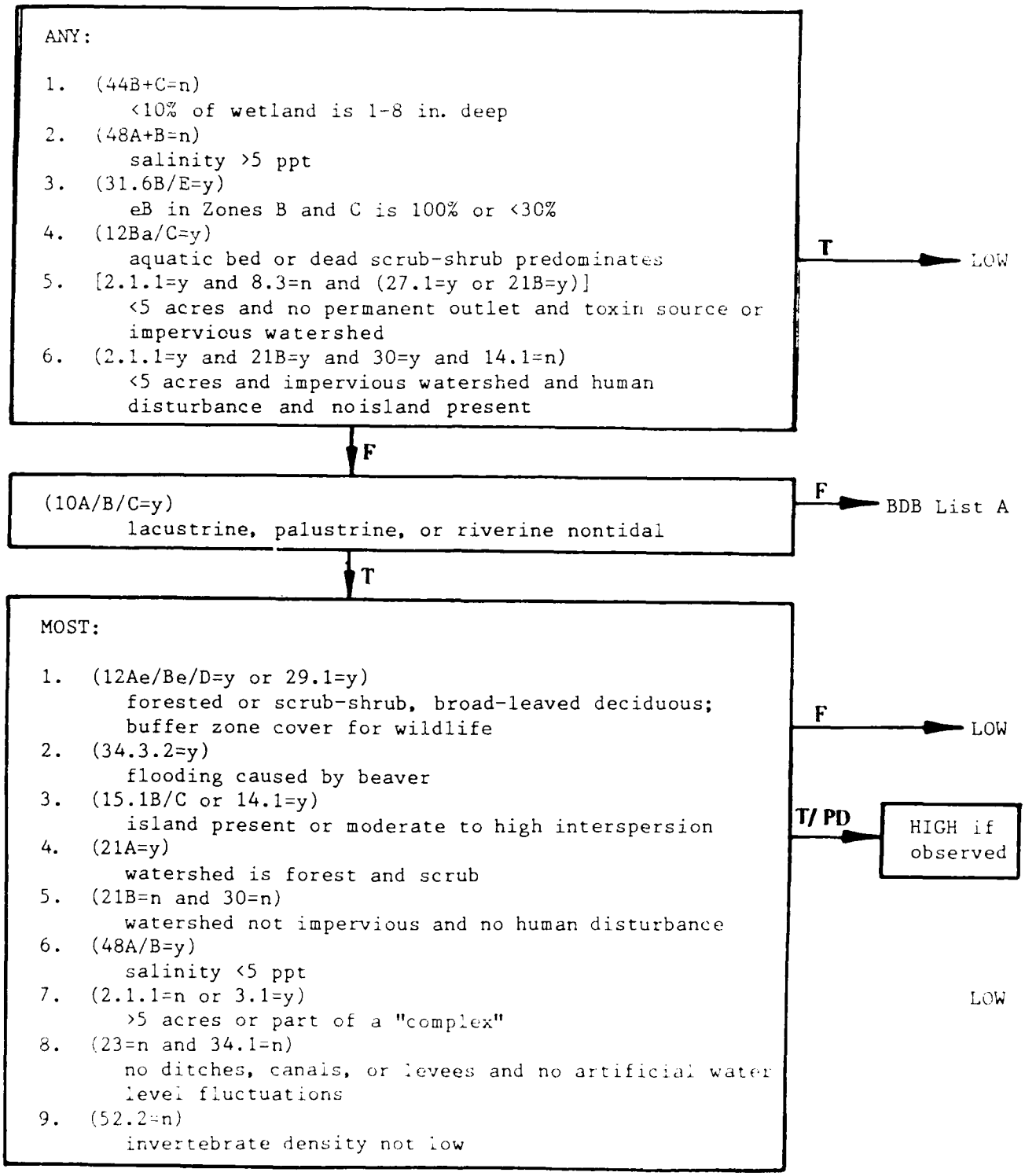
HW Keys (Cont.)

Key 5: Black Duck Breeding (BDB)



-- Continued --

HW Keys (Cont.)

BDB List A

ALL:

1. (38.3=y)
   freshwater palustrine system within 5 miles
2. (21A=y)
   watershed forest and scrub
3. (2.1.1=n and 30=n)
   >5 acres and no human disturbance
4. (41.2=n or 7=y)
   velocity not high

T → HIGH if observed

F → LOW

Key 6: Wood Duck Breeding

ALL:

1. (44B/C=y)
   at least 10% of AA is 1-8 in. deep
2. (10E+F=n)
   not marine or estuarine
3. [(2.1.1=n) OR (2.2.1=n and 3.1=y)]
   >5 acres or part of a "complex"
4. (31.6E=n)
   Zone B and C is not 100% eB
5. (12C/E=n)
   not aquatic bed or lichen-moss
6. (48A=y)
   freshwater
7. (21A=y or 13A=y)
   watershed is forest and scrub or 10% of AA is forested
8. (52.2=n)
   invertebrates not scarce

F → LOW

T/ PD

HIGH if actually observed or MODERATE if not observed

-- Continued

HW Keys (Cont.)

Key 7: Common and Red-Breasted Merganser Breeding

ALL:

1. [(2.1.2=y) OR (2.2.1=n and 3.1=y)]
   >40 acres or >5 acres and part of a "complex"
2. (44E/F/G=y)
   at least 10% of water is 21 in. to 6.5 ft deep
3. (21A=y)
   watershed is forest and scrub
4. (33A/B=y)
   at least partially permanently flooded or intermittently exposed
5. (31.6A/B=y)
   0-30% of Zones B and C is eB
6. (48A=y)
   freshwater
7. (4.2A=n)
   riverine watershed > 1 square mile
8. [10A/B=y OR (10C=y and (41.1=n or 7=n))]
   lacustrine/palustrine OR riverine with high velocity

F → LOW

T

MOST:

1. (4.1=y or 5.1.1=y)
   within 5 miles of the Great Lakes, major river, tidal water or lowdepression/watershed ratio
2. (14.2=y)
   contains part of a large island
3. (30=n)
   no human disturbance
4. (45E/F/G=y)
   substrate is cobble-gravel, bedrock or rubble
5. (47B=n)
   pH >6.0
6. (10A=y)
   lacustrine
7. (11=y)
   fringe or island wetland

F → LOW

T

HIGH if actually observed or MODERATE if not observed

-- Continued --

HW Keys (Cont.)

Key 8: Prairie Divers Breeding (PDIB)

ALL:

1. (3c.1.1=n or 29.1=y)
   eB in Zone A and B is >20 ft wide or buffer zone wide enough to provide wildlifecover
2. (12A=n)
   not forested
3. [(27.1=n and 21B=n) OR (2.1.1=n and 8.3=y)]
   no toxic source and watershed not impervious OR >5 acres withpermanent outlet
4. (31.6E=n)
   Zone B and C is not 100% eB
5. [10C=n OR ((41.2=n or 7=y) and 4.2A=y)]
   not riverine OR if riverine, low velocity and small watershed
6. (44E/F=y)
   at least 10% of AA is 21-59 in. deep
7. (13Cc/D=y)
   10% of AA is emergent or rooted vascular
8. (1.1=n or 38.7=y)
   not in "dry" region or else permanent water nearby
9. (28=n)
   no direct alteration

T → PDIB List A

F → LOW

-- Continued --

HW Keys (Cont.)

PDIB List A

MUST:

1. (23=n and 34.1=n)
   no ditches, channels, or levees and no artificial waterlevel fluctuation
2. [(2.1.1=n) or (2.2.1=n and 3.1=y)]
   >5 acres or part of a "complex"
3. (8.1=n and 8.2=n)
   no inlet
4. (15.1C=y or 14.1=y)
   great veget./water interspersion or island
5. (31.6C=y)
   Zone B and C is 30-60% eB
6. (12C/D=y)
   aquatic bed or emergent
7. (50=y and 52.2=n)
   waterfowl food plants present and invertebrate density not low
8. (48A/B/C=y)
   salinity <18 ppt
9. (10A/B=y and 19.1B=n)
   lacustrine/palustrine and partially sheltered
10. (33C=y)
    at least semipermanently flooded
11. (21A=n)
    watershed not forest and scrub

F → LOW

T/ PD

HIGH if actually observed or MODERATE if not observed

-- Continued --

HW Keys (Cont.)

Key 9: Common Goldeneye Breeding

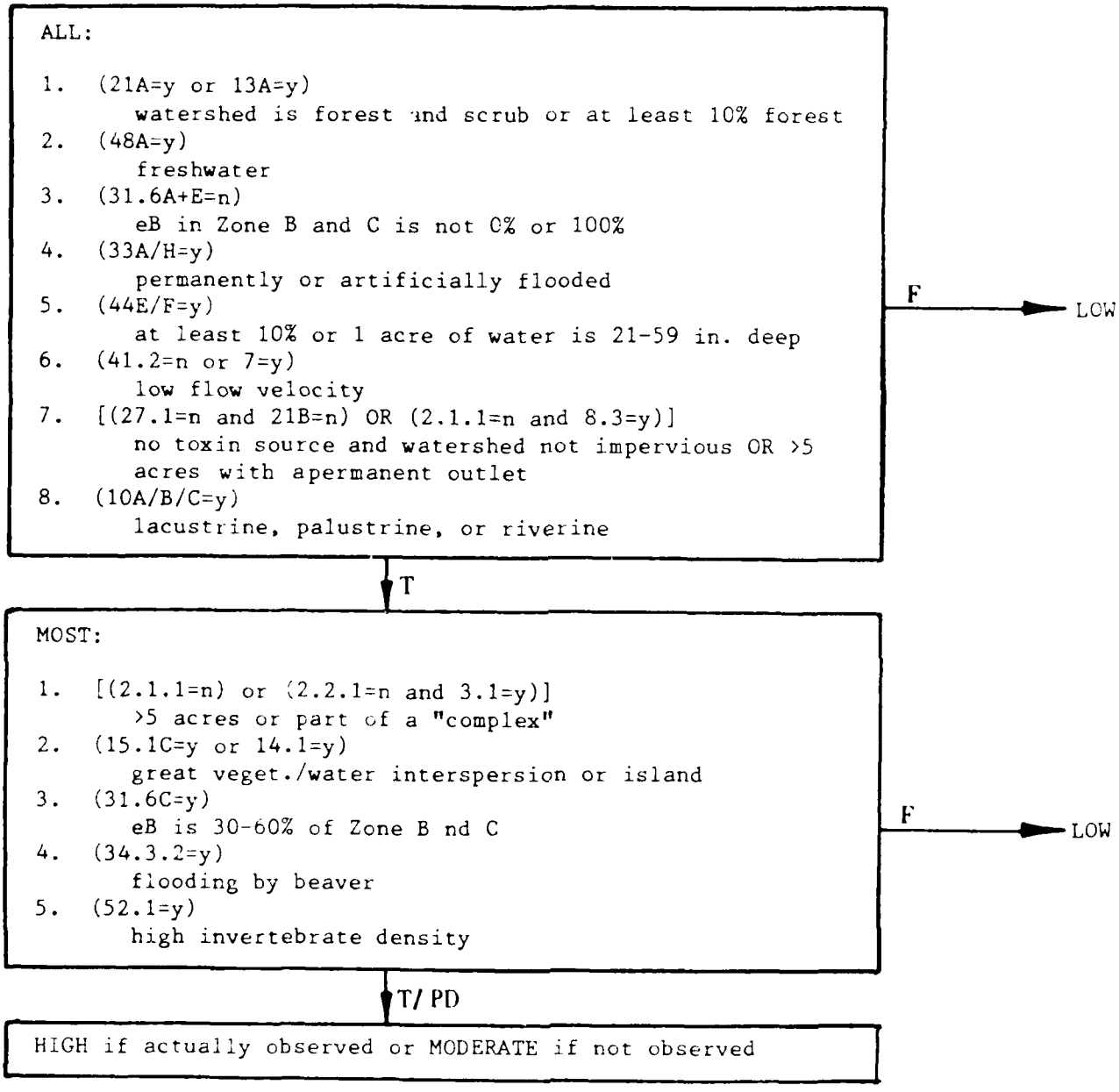


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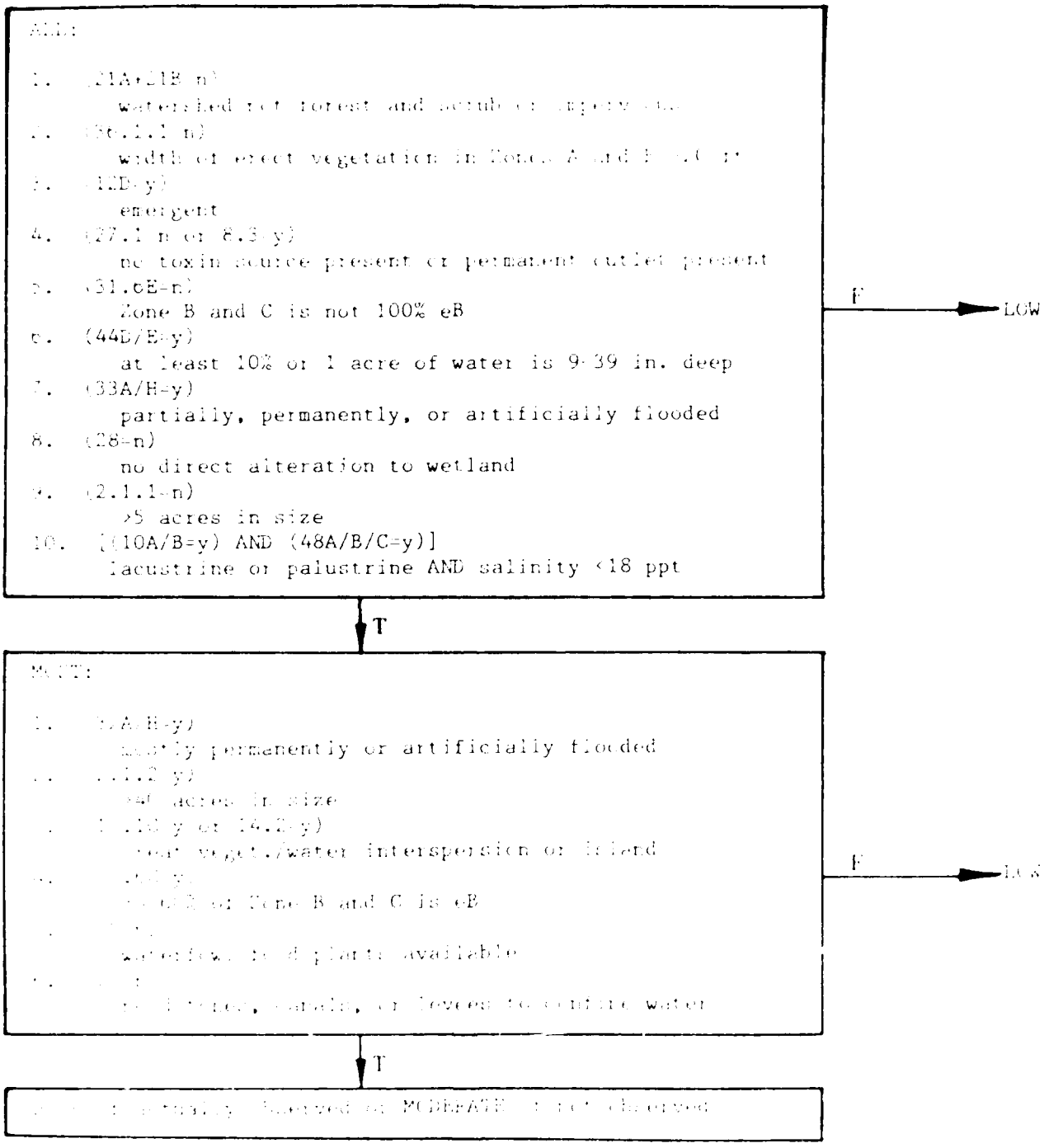
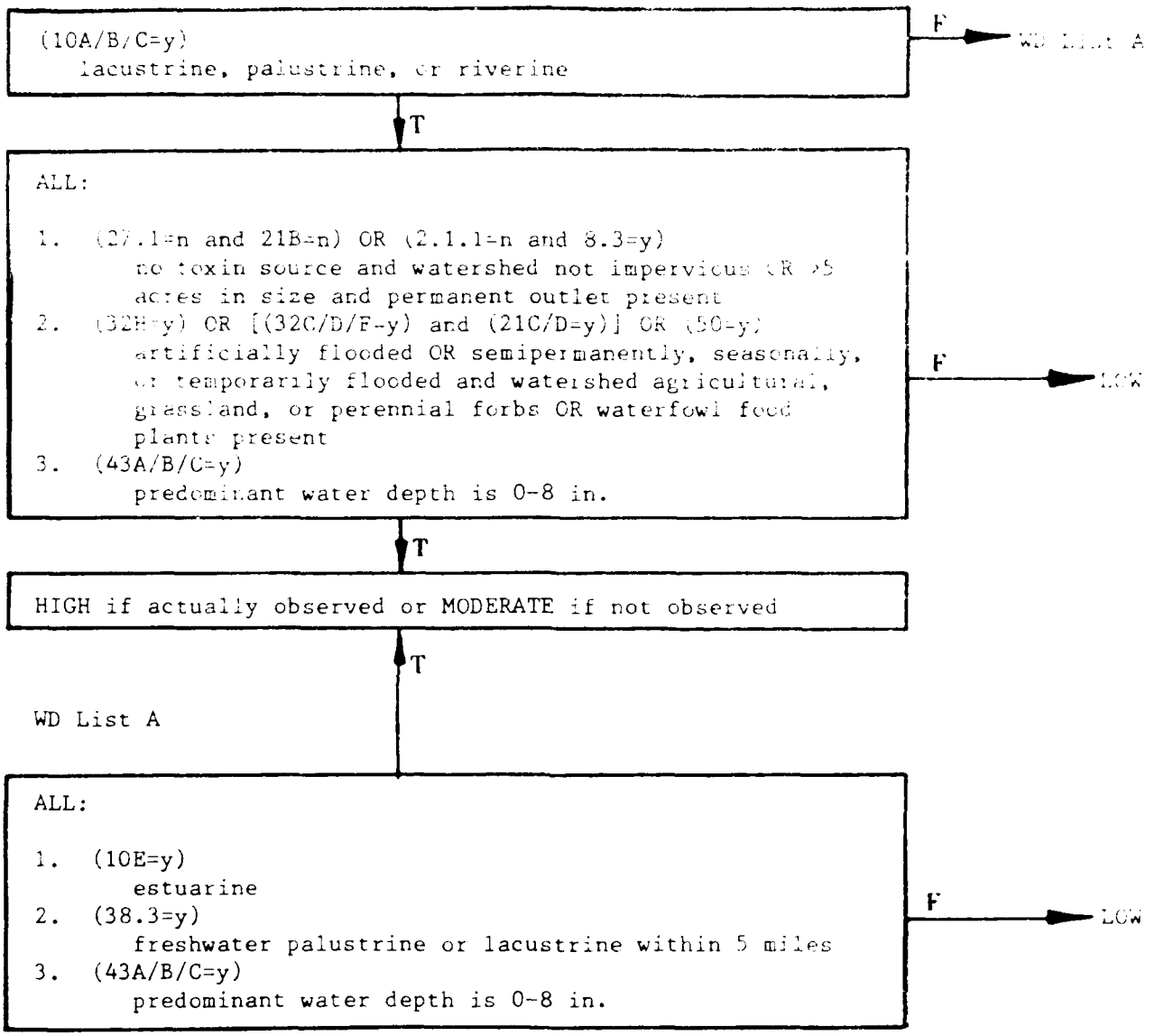
Fig. 11: Inland Geese, Tundra Swan and Brant Breeding



HW Keys (Cont.)

Key 11: Whistling ucks (WD)



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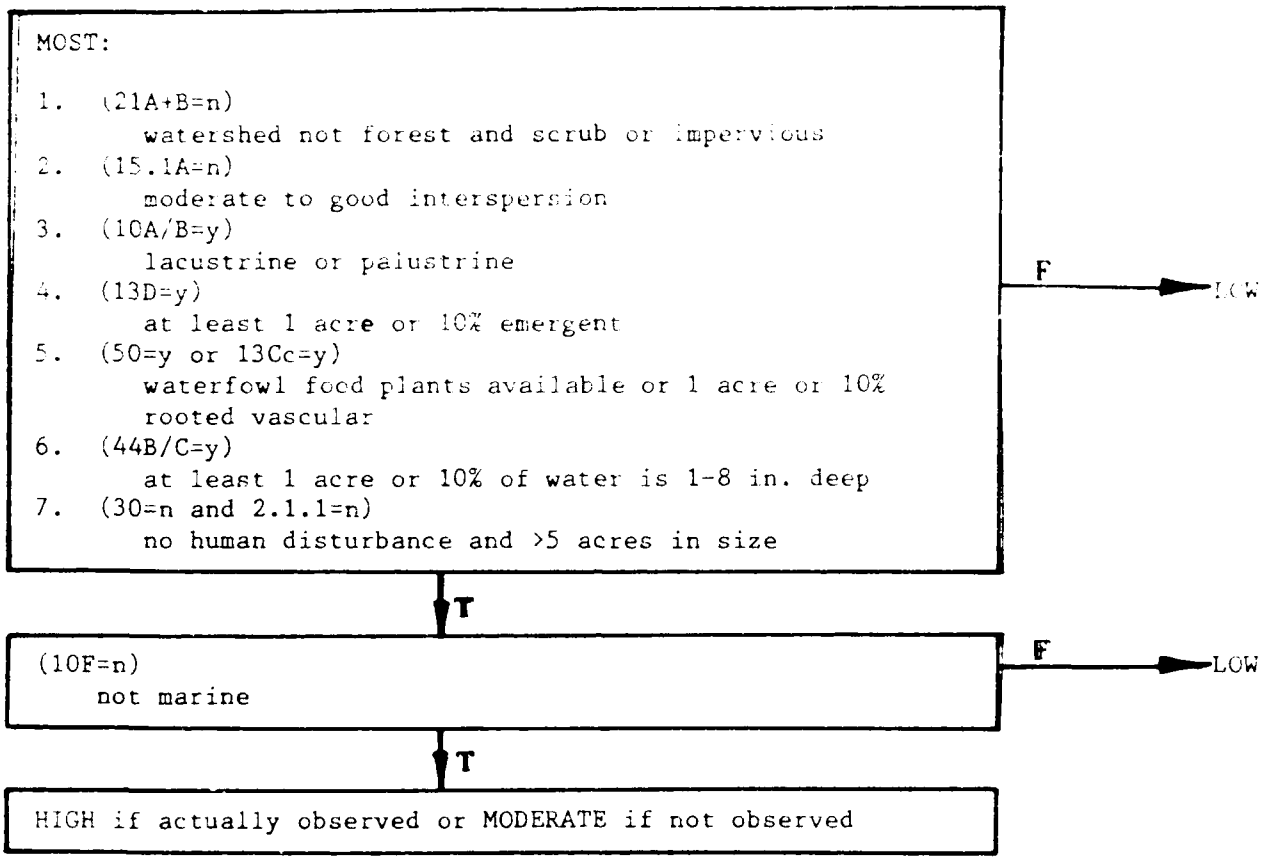
HW Keys (Cont.)

Key 12: Puddle Ducks Migration



-- Continued --

Key 13: Black Duck Migration

MOST:

1. (50=y or 53.2=n)
   food plants available or tidal flat invertebrate density >25 individuals/sq ft
2. (12C/D=y)
   aquatic bed or emergent predominates
3. (44B/C=y)
   at least 1 acre or 10% of water is 1-6 in. deep
4. (15.1A=n)
   moderate to high veget./water interspersion
5. (38.5=y)
   5-acre mudflat or emergent vegetation directly adjacent
6. (2.1.1=n)
   >5 acres in size
7. (30=n)
   no human disturbance

F → LOW

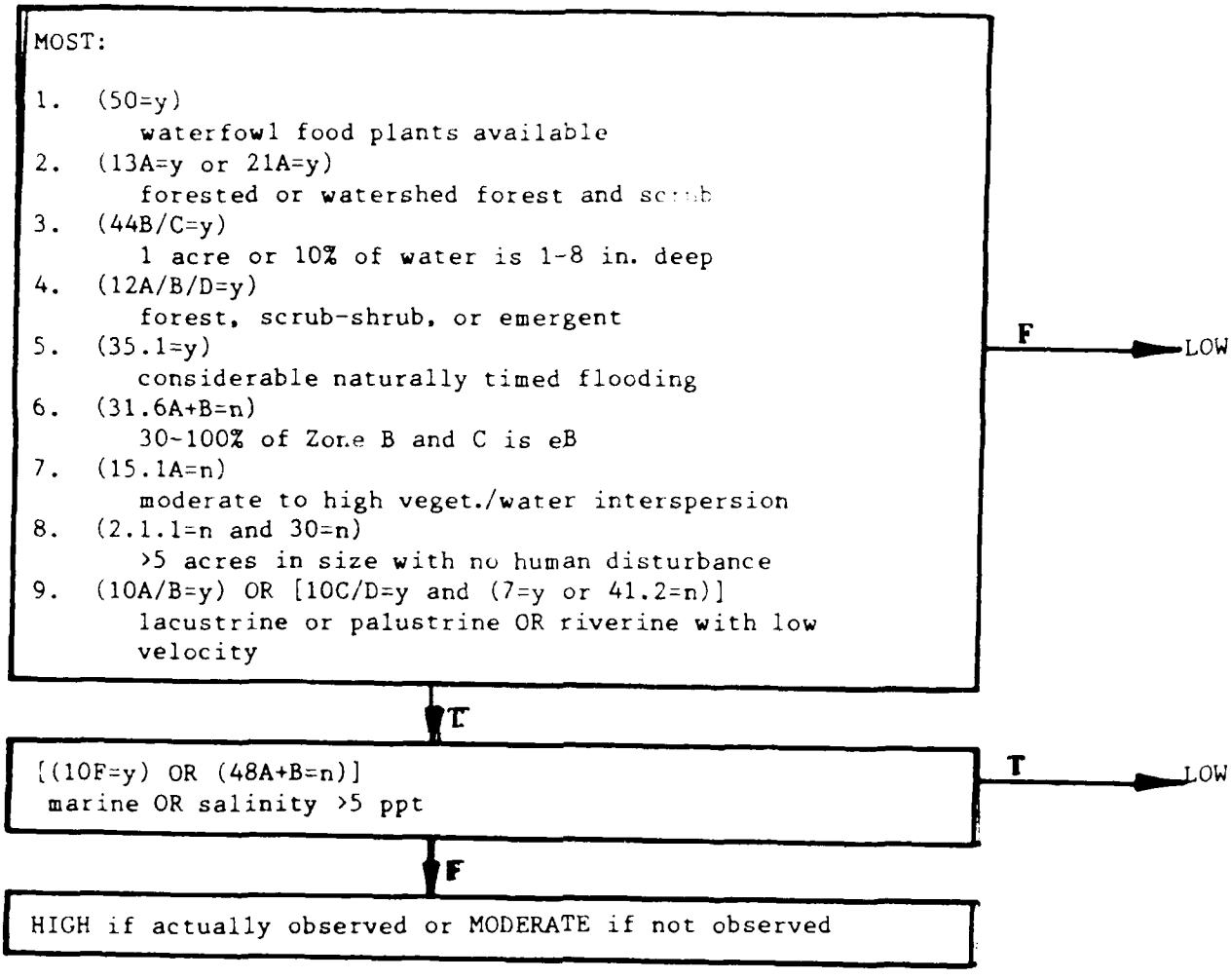
T/ PD

HIGH if actually observed or MODERATE if not observed

-- Continued --

HW Keys (Cont.)

Key 14: Wood Duck Migration



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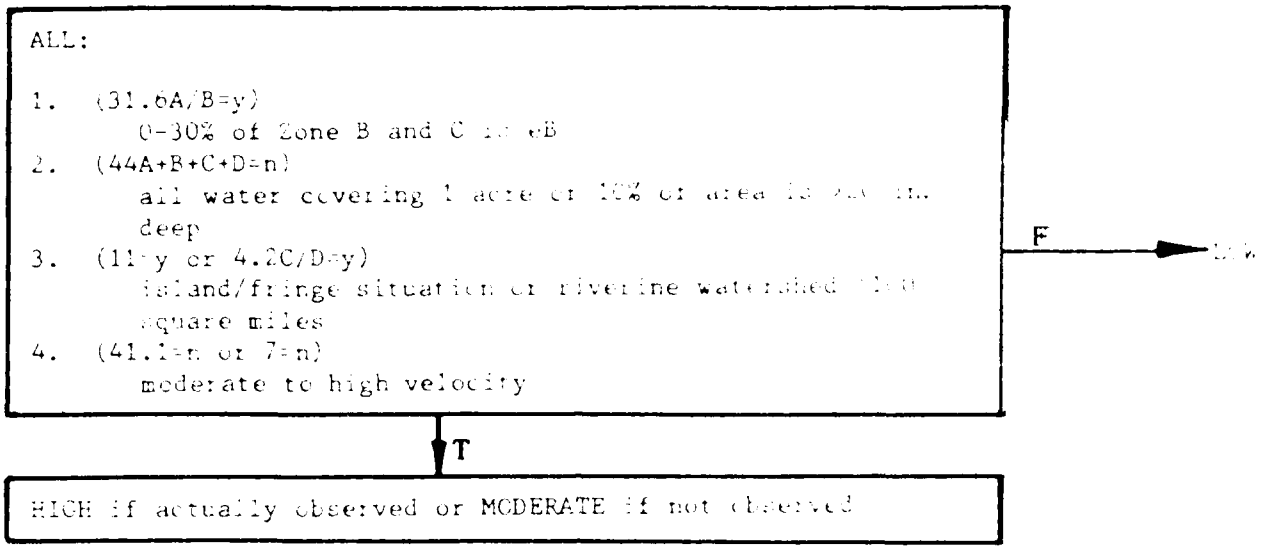
HW Keys (Cont.)

Key 15: Common and Red Breasted Merganser Migration



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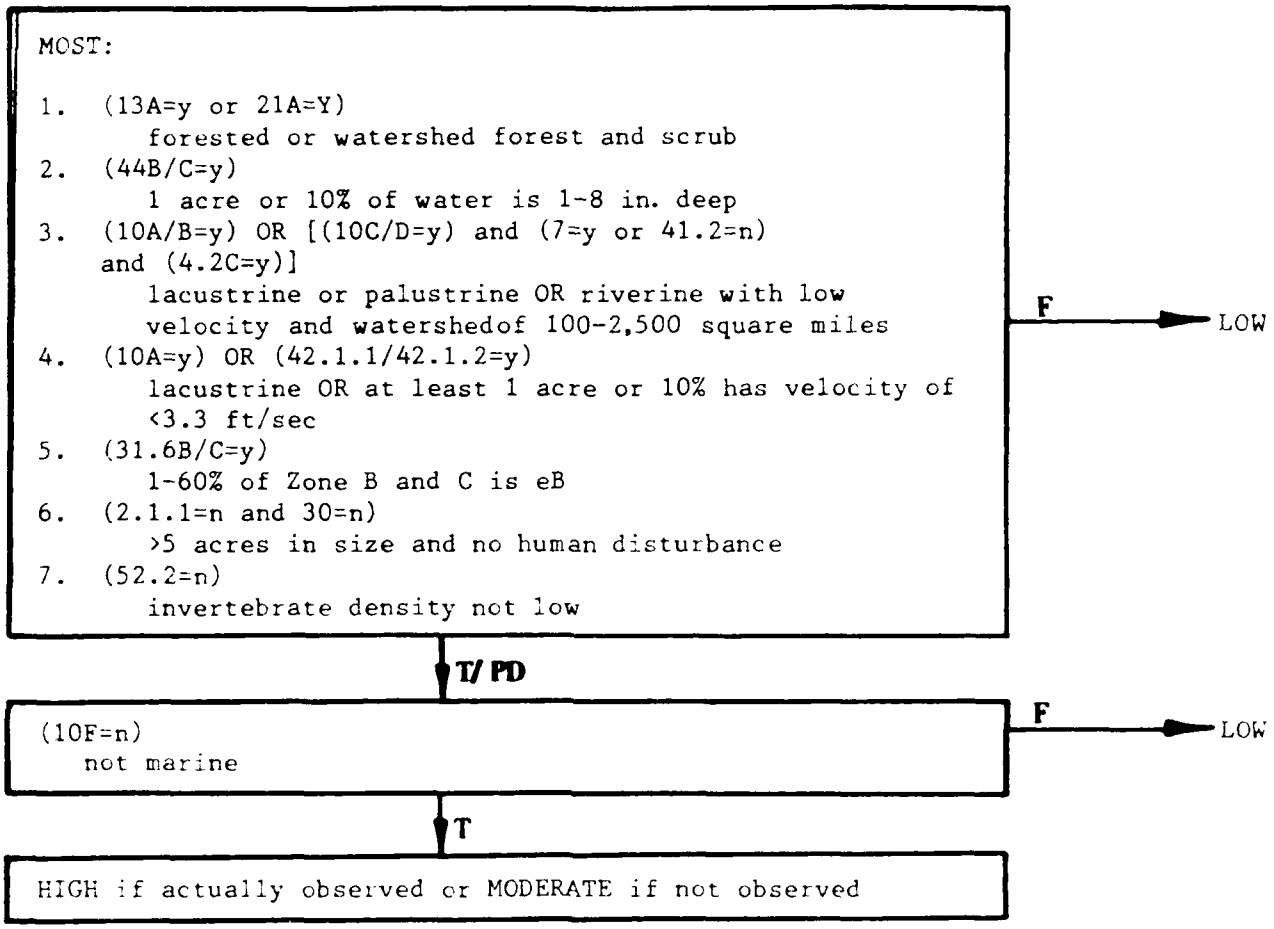
HW Keys (Cont.)

Key 16: Hooded Merganser Migration



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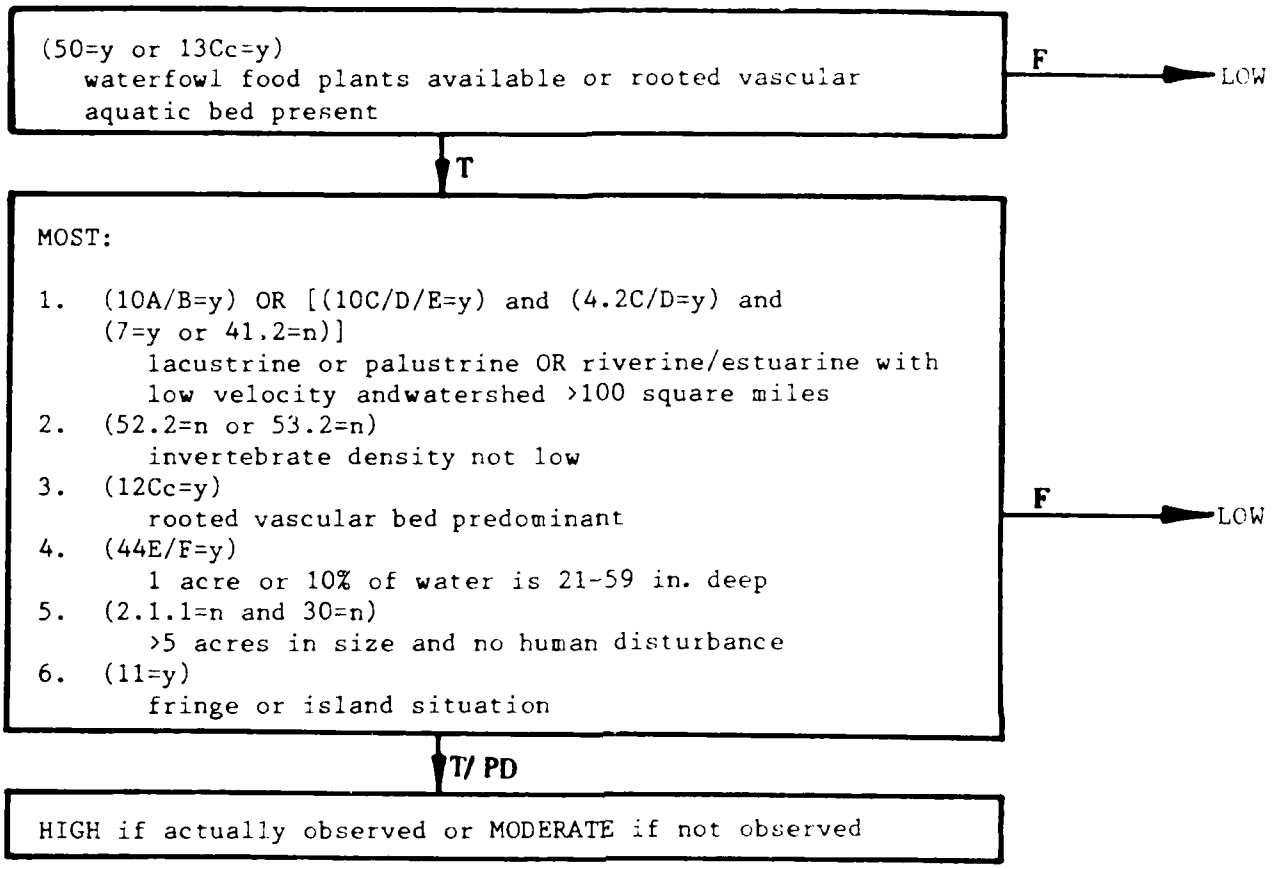
HW Keys cont.

Key 17: Canvasback, Redhead, Ruddy Migration



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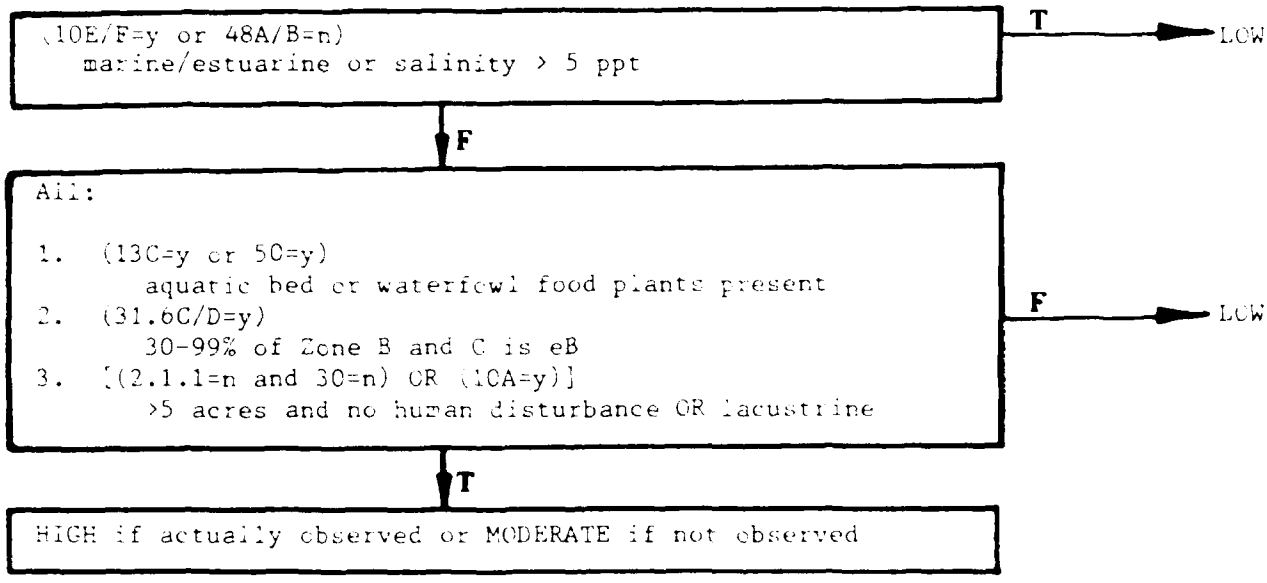
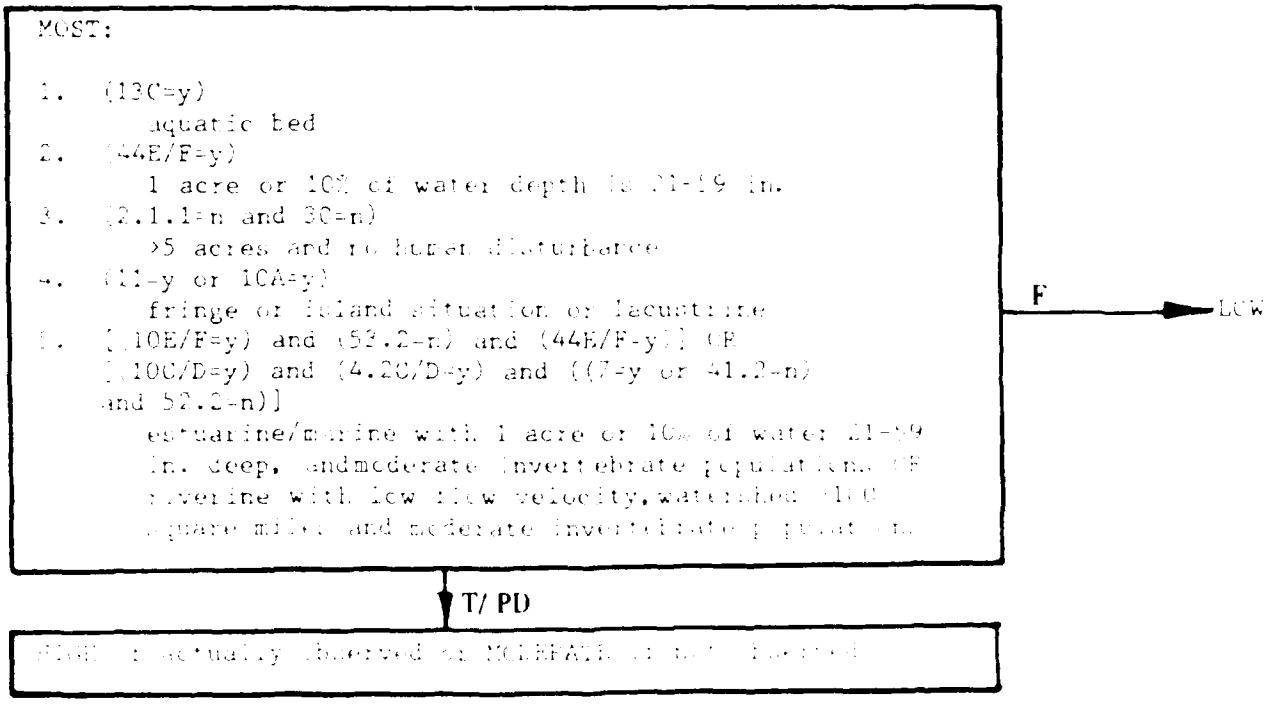
HW Keys (Cont.)

Key 18: Ring-Necked Duck Migration



Key 19: Scaup Migration



HW Keys (Cont.)

Key 20: Bufflehead and Goldeneye Migration

[(10E/F=y) and (43E/F=y) and (52.2=n or 53.2=n)]
estuarine/marine with abundant invertebrates and predominant depth of 21-59 in.

OR

MOST:
1. (11=y)
   fringe or island situation
2. (44E/F=y)
   1 acre or 10% of water is 21-59 in. deep
3. (52.2=n or 53.2=n)
   abundant invertebrates
4. (7=y or 41.1=y)
   slow water velocity
5. (2.1.1=n and 30=n)
   >5 acres in size and no human disturbance

F → LOW

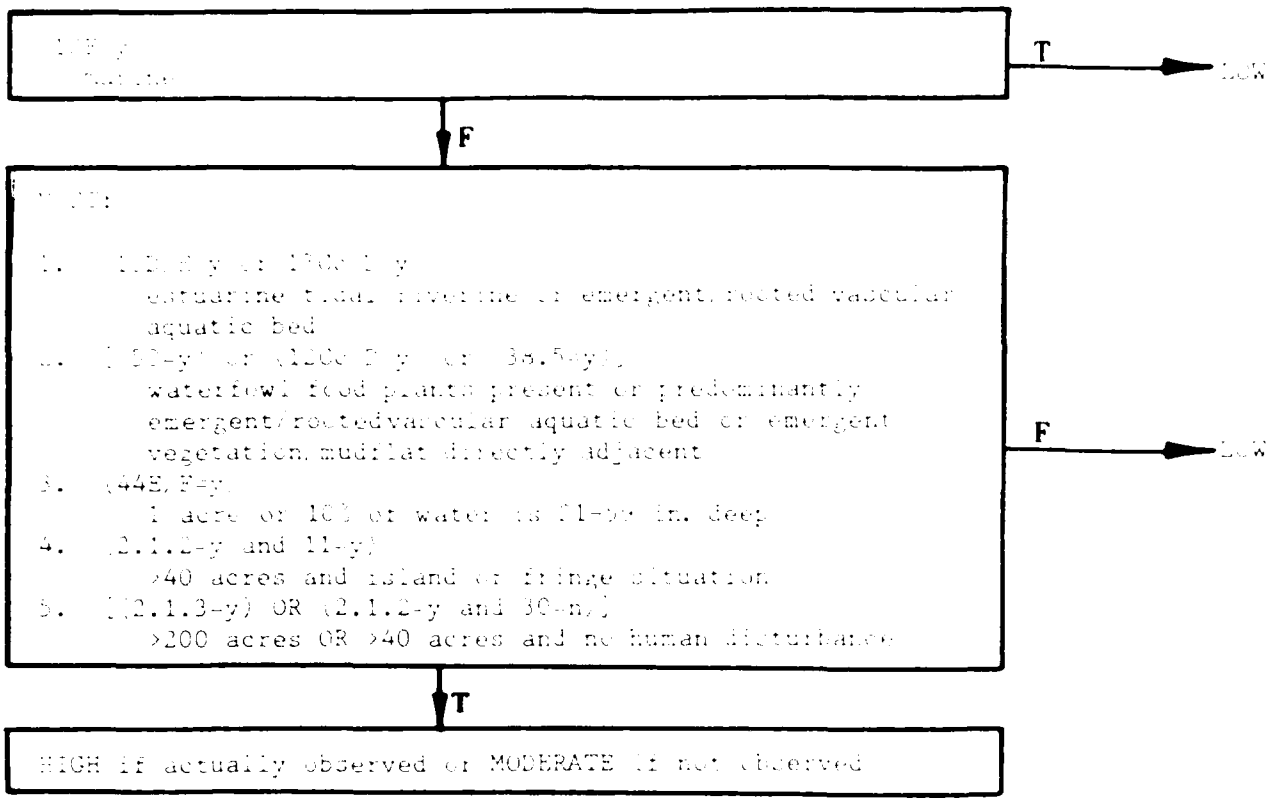
T/PD

HIGH if actually observed or MODERATE if not observed

-- Continued --

[illegible]

Key 21: Inland Goose Migration



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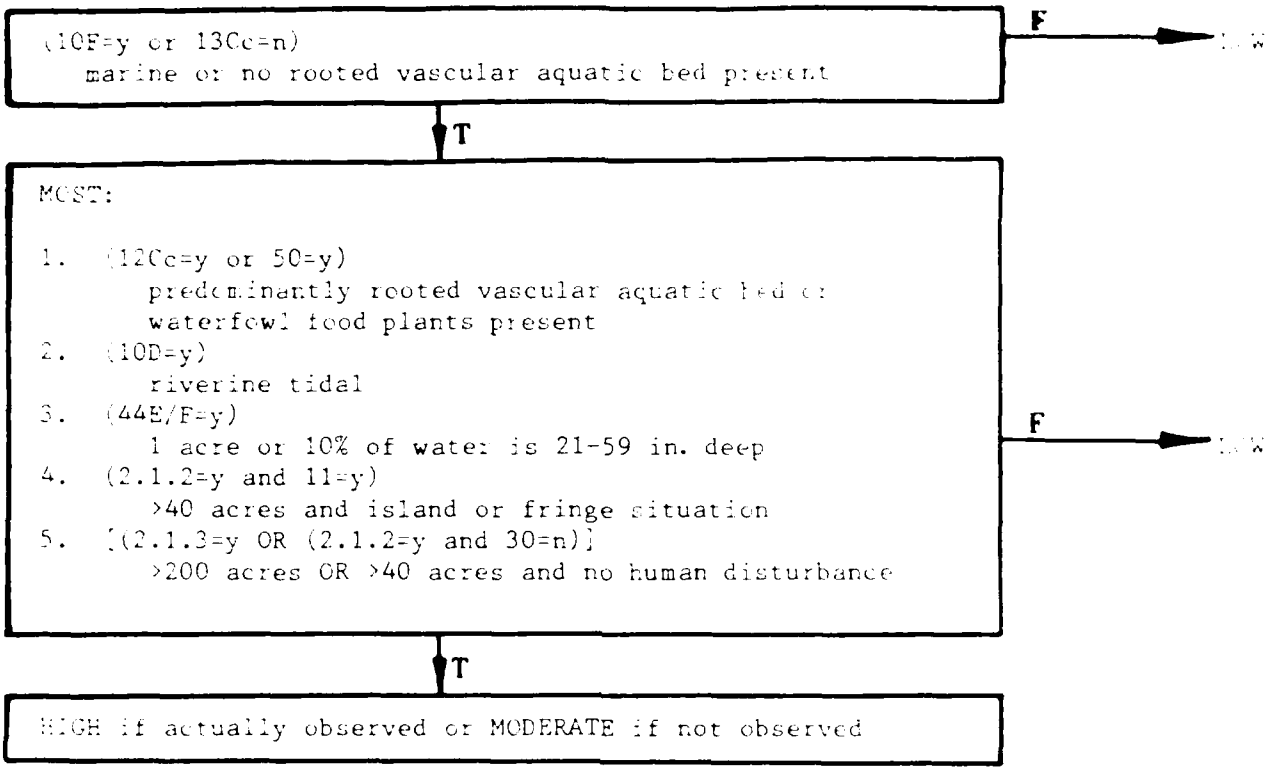
HW Keys (Cont.)

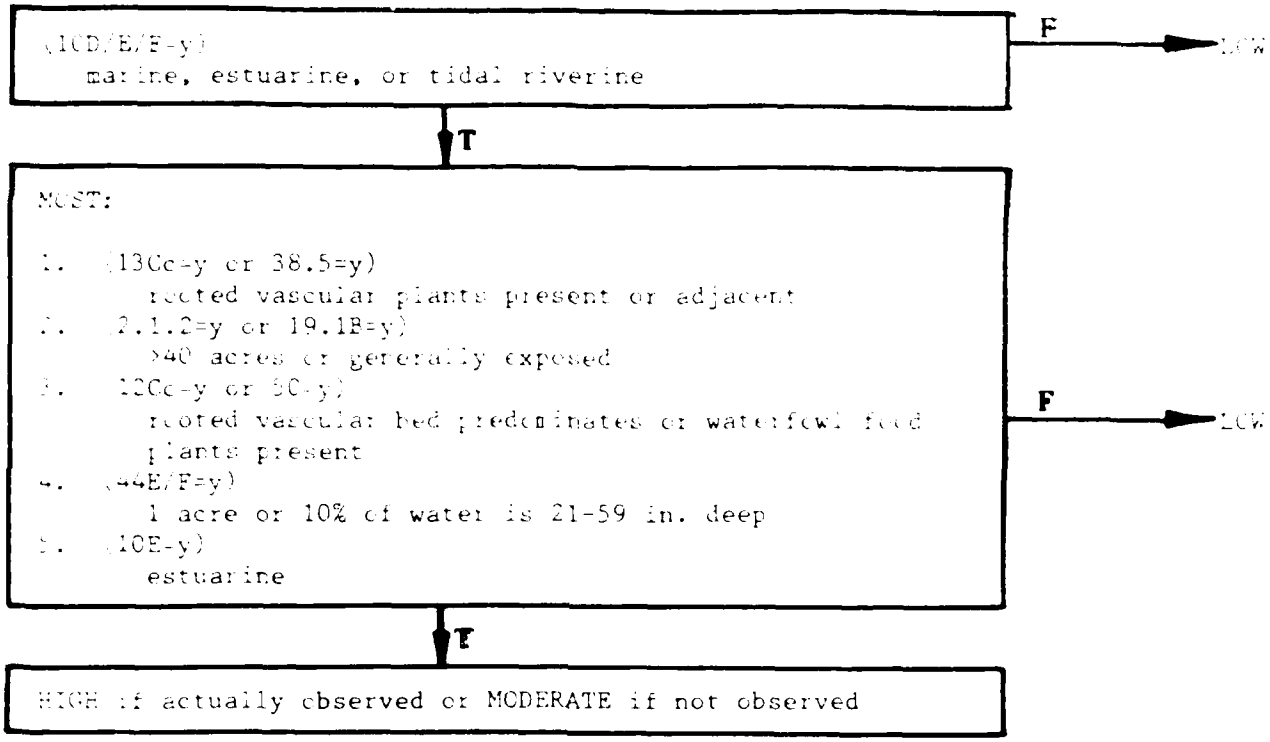
Key 22: Tundra Swan Migration



-- Continued --

HW Keys (Cont.)

Key 23: Brant Migration



-- End --

5.4 Freshwater Fish Species

Definition

Instructions for Freshwater Fish Species Keys

appended "N" refers only to Q42.1. In the case of "Depth" the appended "N" refers only to Q43. For example, if Largemouth Bass are being evaluated, in order to meet the criteria of the "Velocity" predictor, Q42.1.1 and Q42.2.1 must be answered "Y" and Q42.1.2 must be answered "N". In order to meet the criteria of the "Depth" predictor for Rock Bass, Q43.E or Q43.F and Q44.E or Q44.F must be answered "Y" and Q43.G must be answered "N."

(7) For the species keys in Table 7, use the answer in the "D" column of Form B. If this is lacking, use the answer in the "X" column. If this is lacking, use the answer in the "W" column.

(8) The habitat suitability of the AA for the selected species is potentially HIGH if both (a) and (b) below are true, potentially MODERATE if (a) or (b) below are true or use of the AA by the species is known to occur, potentially LOW if (a) and (b) are false and use of the AA by the species is not known to occur.

(a) All of the criteria for the predictors listed in Table 7 are met.

(b) Probability ratings resulting from the keys shown in the last column of Table 7 are HIGH or MODERATE.

Table 7. Freshwater Fish Species Keys

SPECIES	WATERSHED (Q4.2)	SYSTEM (Q21)	VELOCITY (Q42.1&42.2)	DEPTH (Q43&44)	SUBSTRATE (45)	SALINITY (Q48)	COVER (Q49)	TSS (Q55)	FISH KEY*
Bass,									
Largemouth		.A-.D	.1-.2N	.E-.H	.A-.E	.A-.B	.2		G,W,NL
Rock		.A-.C	.1-.2N	.E-.GN	.A-.F	.A	.2	.1	G,W
Smallmouth		.A-.C	.1-.2N	.D-.IN	.D-.F	.A	.2		G,W
White		.A-.E			.E-.F	.A-.C		.1	G,W
Yellow	.B-.C	.A-.D		.E-.GN	.E	.A-.D			G
Bluegill		.A-.D	.1	.E-.IN	.A-.D	.A-.C	.2		G,W,NL
Catfish									
Blue	.D	.A-.D	.1-.3N			.A-.C			G
Channel	.C	.A-.D	.1-.3N	.D-.GN	.D-.E	.A-.C	.2	.2	G
Flathead	.D	.A-.D			.E	.A-.C			G
White		.A-.C				.A-.B			G
Crappie,									
Black		.A-.D	.1	.D-.HN	.A-.D	.A-.C	.2	.2	G,W
White		.A-.D	.1	.D-.HN	.A-.D	.A-.C			G,W
Drum,									
Freshwater		.A-.D	.1-.3N		.A-.G	.A-.C	.2	.2	
Flier	.D	.A-.D				.A-.B	.2		
Grayling,									
Arctic	.B-.C	.A-.C		.C	.A-.E	.A-.E		.1	G,C
Muskellunge		.A-.C			.A-.F	.A	.2		G,W
Perch,									
White						.A-.C			G,W
Yellow		.A-.E	.1	.C-.IN	.A-.D	.A-.C	.2		G,W
Pickerel,									
Chain		.A-.D				.A			G,W
Redfin		.A-.C				.A	.2		G,W
Pike,									
Northern		.A-.C	.1	.E-.IN	.A-.D	.A	.2		G,W,NL
Pumpkinseed		.A-.B	.1	.E-.IN		.A	.2	.1	G,W

(Continued)

Table 7 (Concluded)

SPECIES	WATERSHED (Q4.2)	SYSTEM (Q21)	VELOCITY (Q42.1&42.2)	DEPTH (Q43&44)	SUBSTRATE (45)	SALINITY (Q48)	COVER (Q49)	TSS (Q55)	FISH KEY*
Salmon,									
Atlantic					.E-.F	.A-.E			G,C,CR
Chinook			.1-.3N	.C-.GN	.E-.F	.A-.E			G,C,CR
Coho			.1-.3N	.D-.GN	.E-.F	.A-.E			G,C
Pink			.1-.3N	.C-.EN	.E-.F	.A-.E			G,C
Sockeye			.1-.3N	.B-.EN	.E	.A-.E			G,C
Sauger		.A-.C	.1-.3N	.H	.A-.F	.A		.2	G
Sturgeon,									
Atlantic	.D	.C-.F				.A-.E			G
Green	.D	.C-.F				.A-.E			G
Shortnose	.D	.C-.F	.2-.3N		.D-.F	.A-.E			G
Shovelnose	.D	.C-.D	.2-.3N			.A		.2	G
White	.D	.C-.F				.A-.E			G
Sunfish,									
Blackbanded	.C	.A-.C	.1			.A	.2		G
Green		.A-.C	.1	.E		.A-.B		.2	G
Redbreast		.A-.C	.1			.A			G
Redear		.A-.D	.1			.A-.C	.2	.1	G
Spotted		.A-.C	.1		.A-.B	.A	.2	.2	G
Trout,									
Brook		.A-.E	.1-.3N	.B-.FN	.D-.F	.A-.E			G,C,CR
Brown		.A-.E	.1-.3N	.C-.GN	.E-.F	.A-.E			G,C,CR
Cutthroat	.B-.C		.1-.3N	.B-.GN		.A-.E			G,C,CR
Dolly Varden		.A-.C	.1-.3N	.D		.A-.E			G,CR
Rainbow	.B-.C		.1-.3N	.C-.GN		.A-.E			G,C,CR
Walleye		.A-.C	.1-.3N	.H	.A-.F	.A	.2		G
Warmouth		.A-.D				.A-.C	.2		G
Whitefish,									
Lake	.D	.A-.C			.E-.F	.A			G,C
Mountain		.A-.C		.C	.A-.E	.A			G,C

* Fisheries Keys are abbreviated as follows: Fisheries Productivity Key = F, Warmwater Fish Group Key = W, Coldwater Fish Group Key = C, Coldwater Riverine Fish Group Key = CR, Northern Lake Fish Group Key = NL.

5.5 Saltwater Fish and Invertebrate Species

Definition - Our ability to predict the spatial occurrence of saltwater species is very weak. Thus, the criteria are more reflective of the species' minimum requirements than their optimal needs. Within the ranges specified, a narrower subset of conditions may be used for spawning, another subset for nursery areas, another by adults.

Rationale (HIGH) - The keys assume that salinity data are available and can be used in combination with geographic data as a general indicator of the probability of regular occurrence of most wetland-related saltwater fishes. For species which have been studied more extensively, the keys incorporate data on substrate preference and presence/absence of vegetation.

General Sensitivity - These species keys may be expected to be most reliable for the more abundant, commercially important Atlantic and Gulf Coast species and least reliable for Pacific Coast and rarer species of sporting value. Also, it may be expected to be more reliable where salinity transitions are relatively abrupt and not extremely variable by tide or season, and where wetlands comprise a relatively small percentage of the total shoreline (thus possibly focusing fishes on whatever wetlands are present).

Information for these keys was derived primarily from the following sources and the principal authors' personal experience: Baughman 1941; Darnell 1959, 1981; Dawson 1958; Eleuterius 1977; Fontenot and Rogillio 1970; Gunter 1945, 1956a, 1956b, 1957, 1961, 1965; Gunter and Hall 1963; Gunter et al. 1964; Hildebrand 1954; Jannke 1971; Johnson et al. 1974; Linder and Anderson 1956; Loesch 1976; Martin 1979; Martin and Drewry 1978; Miles 1950; Parker 1970; Phillips and Springer 1960; Reid 1954; Roessler 1970; Simmons 1957; Springer and Woodburn 1960; Tabb 1966; Tabb et al. 1962; Tagatz and Dudley 1961; Thayer et al. 1978; and Weinstein 1979.

Instructions for Saltwater Fish and Invertebrate Species Keys

(1) Select one or more species from Table 8 based on their social or ecological value. Contact the local experts most likely to know the fisheries of the wetland and find out if the selected species actually occur in the AA (population estimates are not needed).

(2) If local experts have no experience with the AA, sample the wetland's fish using qualitative sampling techniques. If neither of these sources of information is available, an assessment may still be done, however, be aware that the method may cause a shift to a lower rating (MODERATE will be the highest possible probability rating). Proceed to (3) below.

(3) If two or more wetlands will be compared, it is essential that the level of information acquired in (2) and (3) above be comparable for both wetlands (i.e., do not compare a wetland for which qualitative sampling data are available with another wetland for which no qualitative sampling data are available).

(4) To evaluate a species, determine if the criteria for the predictors listed Table 8 are met. The numbering of the predictors in Table 8 corresponds to Form B. A "Y" answer is implied unless the predictor is followed by an "N". For example, in the case of the Bay Anchovy, in order to meet the criteria of the "Salinity" predictor the answer to Q48 on Form B must be "Y" for Q48.C, Q48.D, or Q48.E.

(5) For the species keys in Table 8, use the answer in the "D" column of Form B. If this is lacking, use the answer in the "X" column. If this is lacking, use the answer in the "W" column.

(8) The habitat suitability of the AA for the selected species is potentially HIGH if both (a) and (b) below are true, potentially MODERATE if (a) or (b) below are true, and potentially LOW if (a) and (b) are false.

(a) The species has been recently recorded from the area at least once.

(b) All of the predictor criteria in Table 8 are met for the selected species.

Table 8. Saltwater Fish and Invertebrate Species Keys

FISH SPECIES	LIFE STAGE* S	N	A	VEGETATION (Q13)	SUBSTRATE (Q45)	SALINITY (Q48)
Anchovy, Bay		X	X	.D		
Bass, Black Sea		X		.C		.C-.E
Bass, Striped	X	X		.D		.A-.E
Cod, Atlantic			X	.C	.D-.G	.A-.E
Croaker, Atlantic		X	X	.D	.A-.D	
Cunner		X	X	.C	.D-.G	.D-.F
Drum, Red	X	X	X	.B/.C		
Flounder, Gulf		X			.A-.D	.C-.F
Flounder, Southern		X			.A-.D	
Flounder, Starry	X	X	X	.C		.A-.E
Flounder, Summer				.D	.A-.D	.C-.F
Greenling, Kelp		X	X	.C	.D-.G	.A-.E
Grunt, White		X		.C		.D-.E
Halibut, California		X	X		.D	.E
Herring, Pacific	X			.C	.D-.G	.A-.E
Menhaden, Atlantic		X		.D		.A-.E
Menhaden, Yellowfin		X			.A-.C	.B-.E
Mojarra, Spotfin		X	X	.C		.A-.E
Mullet, Striped		X	X	.C/.D	.A-.C	
Mullet, White		X			.A-.C	.A-.E
Needlefish, Atlantic	X	X	X	.B	.A-.D	.A-.E
Opaleye		X	X	.C	.E-.G	.E
Perch, Silver		X	X	.C/.D		
Perch, White				.D		
Pompano, Pacific			X		.A-.D	.A-.E
Rockfish, Brown	X	X	X		.E-.G	.E
Rockfish, Copper	X	X	X		.E-.G	.E
Sargo			X	.C	.D-.G	.E
Seatrout, Sand		X	X	.D		.A-.E
Seatrout, Spotted	X	X	X	.B/.C		
Shark, Bull		X		.B		.C-.E
Sheepshead		X	X	.B/.C		.A-.E
Snapper, Gray		X		.B/.C		.A-.E
Snook		X		.B		.A-.E
Sole, English		X		.C		.A-.E
Surfperch, Barred			X		.D	.E
Surfperch, Black	X	X	X	.C	.F-.G	.E
Surfperch, Silver	X	X	X		.D	.A-.E
Surfperch, Walleye	X	X	X		.D-.G	.C-.E
Surfperch, White	X	X	X		.D-.G	.A-.E
Surfsmelt			X	.C	.D-.G	.C-.E
Tarpon		X		.B		.A-.E
Tomcod, Atlantic	X	X	X	.C/.D		.A-.E
Tomcod, Pacific	X			.C	.D-.G	.A-.E
Topsmelt	X		X	.C		.E
Weakfish	X	X		.D		.B-.E

Table 8 (Cont.)

INVERTEBRATE SPECIES	LIFE STAGE S	N	A	VEGETATION (Q13)	SUBSTRATE (Q45)	SALINITY (Q48)
Abalone, Green	X	X	X	.C	.F-.G	.E
Abalone, Red	X	X	X	.C	.F-.G	.E
Clam, Little-neck	X	X	X		.A-.E	.E
Clam, Washington	X	X	X		.A-.D	.B-.F
Crab, Blue		X	X	.C		
Crab, Dungeness		X			.A-.D	.E
Mussel, Ribbed	X	X	X	.D	.A-.D	.C-.E
Oyster, American	X	X	X	.C		.C-.E
Oyster, Western	X	X	X		.D-.G	.B-.E
Shrimp, Brown		X		.D		.C-.E
Shrimp, Pink		X		.C		.C-.F
Shrimp, White		X		.D		.B-.D

* Abbreviations for Life Stages are S = spawning, N = nursery, A = adult.

5.6 Wetland-Dependent Bird Species

Definition - The wetland-dependent bird keys include species known to depend on wetlands for food and/or cover throughout most of their range in the United States. For the purposes of WET, a high rating for a wetland means that the wetland normally supports a high level of productivity for the selected species of wetland dependent bird.

Instructions for Wetland-Dependent Bird Species Keys

These keys are similar in format and execution to the keys for freshwater and saltwater fisheries.

(1) Begin by selecting one or more species known to occur in the region. Species selection should be based on their indicator value, social importance, or other considerations described in the narrative of HEP (US Fish and Wildlife Service 1980a) or by Roberts and O'Neil (1985).

(2) If two or more wetlands will be compared, it is essential that the level of information acquired in (1) above be comparable for both wetlands (i.e., do not compare a wetland for which qualitative sampling data are available with another wetland for which no qualitative sampling data are available).

(3) When using the key, examine only the rows describing the expected use in your region (N=nesting season, M=migration, W=wintering, A=all year, C=coastal, and I=inland) for the selected species.

(4) To complete the evaluation of a species, determine if the criteria for the predictors listed Table 9 are met. The numbering of the predictors in Table 9 corresponds to Form B. A "Y" answer is implied unless the predictor is followed by an "N". For example, in Table 9, in the column "System (Q10)" the .D next to Dipper means that Q10.D on Form B was answered "Y". A range of values (e.g., .1-.5 or .A-.D) indicates that <u>any</u> "Y" response within this range meets the criteria. When an "N" is appended (e.g., .A-.DN), this indicates that the answer to .D must be "N" <u>as well as</u> .A, .B, or .C being "Y." An exception to this general rule concerning appended "N's" exists in the case of the "Depth" predictor. In the case of "Depth" the appended "N" refers only to Q43. For example, if Dipper is being evaluated, in order to meet the "H" criteria of the "Depth" predictor for Dipper, one of Q44.A through Q44.F must be answered "Y" and one of Q43.A-Q43E must be answered "Y", but Q43.F must be answered "N."

(5) If the "Use" code in the key is A or M, use the "X" column from the response sheet (Form B); if the "Use" code is W, use the "D" column response (or "X," if "D" is not available); if the "Use" code is a combination of uses, choose the more important expected use.

(6) The habitat suitability of the AA for the selected species is potentially HIGH if all the criteria in the "H" row in Table 9 have been met, potentially MODERATE if the species is known to occur in the area <u>and</u> all of the criteria in the "M" row of Table 9 have been met, and potentially LOW if it is neither HIGH or MODERATE.

Table 9. Wetland-Dependent Bird Keys

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Avocet, American	...SEE SHOREBIRDS, GROUP 1...									
Cormorant, Olivaceous	A	H	.A-.D	.A-.D		.D		.A-.E	31.6EN	(60,73)
		M	.A-.E			.D			31.6EN	
Crane, Sandhill	N	H	.A-.B	.D	.D-.F				2.1.2	(47,61)
		M	.A-.B	.B-.E					2.1.1N	
	MW	H	.A-.D	.B-.E					2.1.2	
		M	.A-.E	.B-.E					2.1.1N	
Dipper	A	H	.C		.A	.A-.EN	.F			(11)
		M	.G		.A	.A-.FN	.D-.G			
Dowitcher, Long-billed Short-billed	...SEE SHOREBIRDS, GROUP 2...									
Dunlin	...SEE SHOREBIRDS, GROUP 3...									
Egret, Great	A	H	.A-.E	.C-.D		.C-.EN	.A-.D		31.6EN	(21,22,54, 73,90,100)
		M	.A-.E							
Egret, Reddish	A	H	.D-.F	.Bc/.D		.A-.EN			31.6EN	(55,60,73, 90)
Egret, Snowy	A	H	.A-.E	.C-.D		.A-.DN	.A-.D		31.6EN	(21,22,65, 73,90,100)
		M	.A-.E							
Flycatcher, Alder Willow	A	H	.B	.A-.B						(10,23)
		M	.A-.D	.A-.C						

(Continued)

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (45)	SALINITY (Q48)	OTHER	REFERENCES
Gallinule, Common	A	H	.B	.Cc/.D	.A-.B	.D-.FN	.A-.C		31.6EN	(7,92,98)
		M	.A-.E	.B-.D	.A-.E	.A-.FN	.A-.D			
Gallinule, Purple	A	H	.B	.Cc/.D	.A-.B	.D-.FN	.A-.C			(7,44)
		M	.A-.E	.B-.D	.A-.E	.A-.FN	.A-.D			
Godwit, Hudsonian, Marbled	...SEE SHOREBIRDS, GROUP 6...									
Grackle, Boat-tailed	A	H	.E-.F	.B/.D	.I/.K	.A-.B			31.6EN	(13)
		M		.B/.D	.D/.I/.K					
Grebe, Horned Western	N	H	.A-.B	.C-.E	.A-.B	.F	.A-.D		31.6EN	(4,72,73)
		M	.A-.B	.C-.E	.A-.D	.E	.A-.D		31.6EN	
Grebe, Pied-billed	A	H	.A-.B	.C-.D	.A-.C	.F	.A-.D		31.6EN	(4,72,73,
		M	.A-.E	.C-.D		.E			31.6EN	85)
Gull, Group A California Herring	A	H		.C-.E					21.B/.C/.E	(5,17,45,
		M		.C-.E						52,71,84)
Gull, Group B Heerman`s Laughing Western	A	H	.D-.F	.C-.E				.B-.F	21.B/.C/.E	(5,17,97)
		M	.D-.F	.C-.E					21.B/.C/.E	
Gull, Group C Bonaparte's	N	H	.A-.B	.C-.E					21.B/.C/.E	(5,72,97)
		M	.A-.B	.C-.E						
Franklin's	MW	H	.A/.B/.D-.F	.C-.E					21.B/.C/.E	
		M		.C-.E					21.B/.C/.E	

(Continued)

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Gull,	N	H	.A-.B	.C-.E					21.B/.C/.E	(5,71,84,
Ring-billed		M	.A-.B	.C-.E						97)
Hawk,	A	H	.A-.E	.B-.C	.E/.K					(8,63,72)
Marsh		M		.B-.E						
Hawk,	A	H	.B	.Ac/.Ad/.Bc/.Bd						(8)
Short-tailed		M	.A-.E	.A-.D						
Heron,										
Blk-crowned Night	A	H	.A-.E		.A-.D,.I-.J	.A-.EN			31.6EN	(21,35,54,
Yellow-crowned Night		M	.A-.E							60,73,90)
Heron,	A	H	.A-.E		.A-.D,.I-.J	.A-.FN			31.6EN	(41,49,54,
Great Blue										73,88,100)
Heron,	A	H	.A-.C	.A-.D	.A-.B	.A-.EN			31.6EN	(35,46,49,
Green		M	.A-.E							55,73)
Heron,	A	H	.A-.B	.C-.D	.A-.D	.A-.DN				(21,22,54,
Little Blue		M	.A-.E							60,88,100)
Heron,	A	H	.D-.E	.Bc/.D	.A-.D,.I-.J	.A-.DN	.A-.D		31.6EN	(21,60,65,
Louisiana		M	.A-.E							80,90,100)
Ibis, Group A	A	H	.A-.E	.Bc/.D		.A-.EN	.A-.D		31.6EN	(21,22,53,
Glossy		M	.A-.E							56,57,58)
White										
White-faced										
Ibis,	A	H	.A-.E		.A-.D,.I-.J	.A-.EN	.A-.D		31.6EN	(60,73,90)
Wood		M	.A-.E							

(Continued)

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Kingfisher, Belted	A	H	.A-.E		.A-.B	.C			31.6EN	(25,72)
		M				.C				
Kingfisher, Green Ringed	A	H	.C		.A-.B	.C			31.6EN	(9,59)
		M	.A-.E			.C				
Kite, Mississippi	NM	H	.A-.C	.A-.D						(8,74)
		M		.A-.D						
Kite, Swallow-tailed	NM	H	.A-.E	.Ac/.Ad/.Bc/.Bd						.(8,87)
		M	.A-.E	.A-.D						
Knot, Red	...SEE SHOREBIRDS, GROUP 3...									
Limpkin	A	H	.A-.B	.A-.B	.A-.D	.A-.EN	.A-.D		31.6EN	(7,47)
		M	.A-.D	.A-.B,.D		.A-.FN				
Loon, Common	MW	H	.A/.B/.E/.F	.C-.E		.F			31.6EN,30N	
		M		.C-.E		.E			31.6EN,30N	
Oystercatcher, American	A	H	.E-.F	.Ca	.I	.C		.C-.E	2.1.2	(18,19)
		M	.D-.F	.Ca/.D		.C		.C-.E	31.6EN	
Oystercatcher, Black	A	H	.F	.Ca	.I	.C	.H		2.1.2	(39,40,78)
		M	.E-.F	.Ca	.I-.K	.C	.D-.F			
Pelican, Brown	N	H	.B/.E-.F		.A-.D,.I-.J	.D			31.6EN,2.1.2	(1,6,16,
		M				.D			31.6EN,2.1.1N	(73,101)
	MW	H	.B/.E-.F	.C		.D			31.6EN,2.1.2	
		M				.D			31.6EN,2.1.1N	

(Continued)

Table 9 (Cont.)

SPECIES	USE	SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Pelican, White	N	H .A-.B		.A-.D,.I-.J	.D			31.6EN,2.1.2	(62,71,
	M	.A-.B			.D			31.6EN,2.1.1N	73,83)
	MW	H .A-.B/.E			.D			31.6EN,2.1.2	
	M	.A-.E			.D			31.6EN,2.1.1N	
Phalarope, Northern	M	H .A/.F	.C-.D		.C		.E-.F	31.6EN	(97)
	M	.A-.B,.E-.F	.C-.D		.C		.D-.F	31.6EN	
Phalarope, Wilson's	NM	H .A-.B/.E	.C-.D	.C-.D,.I-.K	.C	.A-.D		31.6EN	(46,50,78)
	M	.A-.B/.E	.C-.D		.C	.A-.D		31.6EN	
Plover, Black-bellied Semipalmated	...SEE SHOREBIRDS, GROUP 3...								
Plover, Piping	A	H .E-.F		.I/.K	.A-.C	.D			(15,18,20,
	M				.A-.C	.A-.E			29)
Plover, Snowy	A	H .A-.B			.C	.A-.D	.E-.F		(26,49,70,
	M	.A-.B,.E-.F			.C				77)
Rail, Black	A	H .B/.E	.D	.E/.K	.A-.CN	.A-.C			(60,79,95)
	M	.B/.E-.F	.D	.D-.F,.I,.K	.A-.CN	.A-.D			
Rail, Clapper	A	H .E	.D	.I/.K	.A-.DN		.C-.E		(7,49,64,
	M		.Bc/.D	.A-.I,.K	.A-.EN				81)
Rail, King	A	H .B	.D	.A-.E,.I,.K	.A-.CN	.A-.C			(3,7,67,
	M	.A-.E	.A/.D	.A-.F,.I,.K	.A-.DN	.A-.D			98)
Rail, Sora	A	H .B	.D	.A-.I,.K	.A-.DN	.A-.C			(7,36,75,
	M	.A-.E	.D	.A-.I,.K	.A-.EN	.A-.E			69)

(Continued)

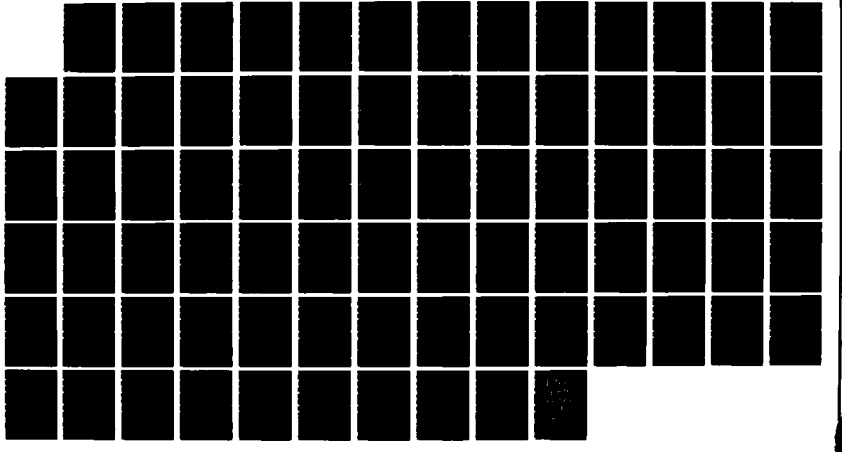
Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Rail, Virginia	A	H	.A/.E	.D	.A-.B	.A-.DN	.A-.C			(7,36,49,
		M	.A-.C,.E		A-.E	.A-.EN	.B-.D			82,102)
Rail, Yellow	A	H	.A/.E	.D	.E	.A-.DN	.A-.C			(2,7)
		M	.A-.B,.E	.D	.E-.G	.A-.DN	.A-.D			
Sanderling	(C)MW	H	.F		.I/.K	.A-.C	.D			(15,18,29,
		M	.E-.F			.A-.C				49,68,78)
	(I)M	H	.A-.B		.A-.D	.A-.C	.A-.E			
		M	.A-.C			.A-.C	.A-.D			
Sandpiper, Spotted	A	H			.A-.D	.C			31.6EN,15.2	(15,29,72,
		M				.C			31.6EN	82,93)
Sandpiper, Stilt	...SEE SHOREBIRDS, GROUP 2...									
Sandpiper, Purple	...SEE SHOREBIRDS, GROUP 4...									
Sandpiper, Least, Semipalmated, Western, White-rumped	...SEE SHOREBIRDS, GROUP 5...									
Sandpiper, Baird's, Buff-breasted, Pectoral, Solitary	...SEE SHOREBIRDS, GROUP 7...									
[illegible]	A	H	.E	.C	.I-.J	.A-.DN	.A-.E		31.6EN	(5,17,27)
[illegible]		M	.A/.D-.E	.C-.D	.I-.K		.A-.E		31.6EN	

(Continued)

AD-A189 968 WETLANDS RESEARCH PROGRAM WETLAND EVALUATION TECHNIQUE (WET) VOLUME 2 METHODOLOGY(U) ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MS ENVIR... 3/3

UNCLASSIFIED P R ADAMUS ET AL OCT 87 F/G 8/6 NL



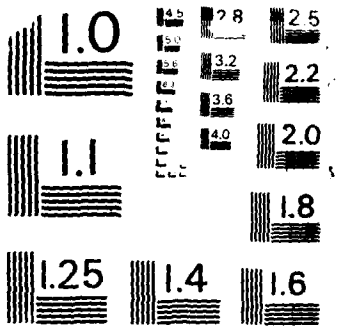


Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Snipe,	A	H	.B	.D	.E-.G	.A-.B	.A-.D			
Common		M		.D		.A-.B				
Sparrow,	N	H	.A-.B	.D	.C-.E				21.D	(14,59)
Leconte's		M		.D						
	MW	H	.A-.B/.E	.B/.D					21.D	
		M		.B/.D						
Sparrow,	A	H	.E	.D	.1				31.6EN	(14,47,76,
Seaside		M	.A/.E	.B/.D	.1/.K					99)
Sparrow,	A	H	.A/.E	.D		.C-.EN				(14,47,72)
Sharp-tailed		M	.A-.B/.E	.B/.D						
Sparrow,	A	H	.A-.B	.B/.D		.A-.DN				(14,72)
Swamp		M		.B/.D						
Spoonbill,	A	H	.A-.E	.A-.B/.D	.D/.I-.J	.A-.EN			31.6EN,2.1.2	(60,73,90)
Roseate		M	.A-.E			.A-.FN			2.1.1N	
Stilt,										
Black-necked				...SEE SHOREBIRDS, GROUP 1...						
Surfbird				...SEE SHOREBIRDS, GROUP 4...						
Swallow,	A	H	.A-.D	.C-.D			.A-.E			(10,34,72)
Rough-winged		M	.A-.E	.B-.E						
Swallow,	A	H	.A-.D	.Aa						(10)
Tree		M	.A-.E							
Tattler,										
Wandering				...SEE SHOREBIRDS, GROUP 4...						

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Tern,	N	H	.A-.B	.C-.D	.A-.B					(5,75,84)
Black		M	.A-.C	.B-.E						
	MW	H	.A-.C	.C-.D					31.6EN	
		M		.C-.D						
Tern,	(C)A	H	.D-.F	.D		.E		.B-.F	31.6EN	(5,75,84)
Caspian		M	.D-.F	.C-.D		.E		.B-.F	31.6EN	
	(I)NM	H	.A/.C	.C-.D		.E			31.6EN	
		M	.A-.C	.C-.D		.E			31.6EN	
Tern,	(C)A	H	.D-.E	.C-.D				.B-.F	31.6EN	(5,17,28,
Common		M	.D-.E	.C-.D				.B-.F	31.6EN	71,89)
	(I)NM	H	.B	.C-.D		.C			31.6EN	
		M	.A-.C	.C-.D		.C			31.6EN	
Tern,	(C)A	H	.D-.F	.D			.A-.D	.B-.F	31.6EN	(5,75,84)
Forster's		M	.D-.F	.C-.D			.A-.D	.B-.F		
	(I)NM	H	.A-.B	.C-.D	.A-.B		.A-.D		31.6EN	
		M	.A-.C	.C-.D			.A-.D			
Tern,	A	H	.E	.D		.A-.FN	.A-.D		31.6EN	(5,17,28,
Gull-billed		M	.D-.E	.C-.D			.A-.D			66,86)
Tern,	(C)A	H	.E-.F				.D			(5,24,28,
Least		M	.D-.F							30,66,89)
	(I)NM	H	.B-.C			.C	.D			
		M	.A-.C			.C				
Turnstone,										
Black										
Ruddy				...SEE SHOREBIRDS, GROUP 4...						

(Continued)

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Vireo,	N	H	.A/.C	.Be						(12,42)
Bell's		M	.A/.C	.Ae/.Be						
Warbler,	N	H	.A-.B	.Bb/.Bc/.E	.E					(23,72)
Palm		M	.A-.B	.A-.B,.E						
Warbler,	N	H	.A-.C	.Ac/.Ad/.Bc/.Bd	.A-.D					
Prothonotary		M	.A-.E							
Warbler,	N	H	.A-.B	.A-.B,.Da						
Swainson's		M	.A-.C	.A-.B,.Da						
Waterthrush	N	H	.A-.C	.A-.B	.A					
Northern		M	.A-.D	.A-.B						
Louisiana										
Whimbrel			...SEE SHOREBIRDS, GROUP 6...							
Willet	A	H	.E-.F	.C-.D		.C	.A-.C			(29,78,91)
		M	.A-.B,.E-.F	.C-.D		.C	.A-.D			
Wren,	A	H	.A-.B,.E	.B/.D	.A-.C,.K					(11,51,72,
Long-billed		M	.A-.B,.E	.A-.B,.D						98)
Wren,	A	H	.A-.B	.B/.D	.C-.G					(11,98)
Short-billed		M		.B/.D						
Yellowthroat	A	H	.A-.C	.B/.D						(49)
		M		.A-.B,.D						
Yellowlegs,										
Greater			...SEE SHOREBIRDS, GROUP 6...							

(Continued)

Table 9 (Cont.)

SPECIES	USE		SYSTEM (Q10)	VEGETATION (Q13)	HYDROPERIOD (Q32)	DEPTH (Q43&44)	SUBSTRATE (Q45)	SALINITY (Q48)	OTHER	REFERENCES
Yellowlegs, Lesser	...SEE SHOREBIRDS, GROUP 2...									
Shorebirds, Group 1	A	H	.A/.E	.D	.C-.G,.I-.K	.C	.A-.D		31.6EN	(31,32,33,
		M	.A-.B,.E-.F	.D		.C	.A-.E			38,43,78)
Shorebirds, Group 2	(C)MW	H	.E	.D		.C	.A-.D		31.6EN	(15,18,29,
		M	.D-.F	.Ca/.D		.C				93)
	(I)M	H	.A-.B	.D	.A-.D	.C	.A-.D		2.1.1N,31.6EN	
		M	.A-.C	.D		.C				
Shorebirds, Group 3	(C)MW	H	.E	.D		.C	.A-.E		31.6EN	(15,18,25,
		M	.D-.F			.C				29,49,93)
	(I)M	H	.A-.C	.D	.A-.D	.C	.A-.E		2.1.1N,31.6EN	
		M				.C				
Shorebirds, Group 4	MW	H	.F	.Ca		.C	.D-.F			(15,18,29,
		M	.E-.F	.Ca		.C	.D-.F			37,78,97)
Shorebirds, Group 5	(C)MW	H	.E	.D		.C	.A-.D			(15,18,29,
		M	.D-.F	.Ca/.D		.C				78,93)
	(I)M	H	.A-.B	.D	.A-.D	.C	.A-.D		31.6EN	
		M	.A-.C	.D		.C				
Shorebirds, Group 6	(C)MW	H	.E	.D		.C	.A-.D		31.6EN	(15,18,29,
		M	.D-.F	.Ca/.D		.C	.A-.E			49,82,93)
	(I)M	H	.A-.B	.D	.A-.D	.C	.A-.D		31.6EN	
		M	.A-.C	.D		.C				
Shorebirds, Group 7	M	H	.A-.C	.D	.C-.E	.A-.B	.A-.C		31.6EN	(15,49,78,
		M		.Ca/.D		.A-.B	.A-.E			82,93)

(Continued)

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APPENDIX A: GLOSSARY

Glossary*

Accessible (to fish) - Connected by waters at least 4 inches deep that are free of waterfalls, debris jams and other obstructions, or water velocities which block fish movement. Specifically, obstructions higher than 1.25 times the adjacent pools greatest depth, or velocities greater than 2-4 fish body lengths/second, or slightly lesser velocities over longer distances.

Aquatic Bed - Wetland and deepwater habitats dominated by plants that grow principally on or below the surface of the water during most of the growing season in most years.

Assessment Area (AA) - The area for which functions and values are being assessed. The AA is characterized by a high degree of hydrologic interaction.

Channel - A watercourse shown on a 1:24,000 scale topographic map with at least seasonal flow.

Channel Flow - Observable movement of surface water (due to gradient currents) in a confined, concentrated zone. Includes intermittent channels.

Class - The taxonomic unit used in the FWS wetland classification system (Cowardin et al. 1979) that describes the general appearance of the habitat in terms of dominant vegetation or some other feature.

Cluster - Wetlands situated so that there is a large number of wetland acres per total square miles. Clustered wetlands are not necessarily contiguous.

Cobble-gravel - A mixture of rock fragments ranging from 2 mm (0.08 inches) to 25.4 cm (10 inches) in diameter.

Confidence - An assurance of accuracy. As used within the context of WET it is not used to reflect a statistical level of assurance but rather only a qualitative indication of accuracy.

Constricted Outlet - A surface outlet on a channel less than one-third the maximum width of the AA or larger adjoining AA, or a surface outlet on a standing body of water less than one-tenth the width of the AA or larger adjoining AA.

Constriction - A physical point where a wetland and/or deepwater narrows to a degree which may obstruct hydrologic interaction. Constrictions in channels are physical points where the wetland and/or open deepwater are less than one-third the maximum width of the adjacent wetland and/or open deepwater. Constrictions on standing bodies of water are points where the wetlands and/or open deepwater are less than one-tenth of the adjacent wetland and/or open deepwater areas.

Context Region - The area used during a Level 2 social significance assessment. During this process the uniqueness/heritage value is assessed in the context of other wetlands in the area.

* These definitions are not purported to have legal or regulatory status

Contiguous - Abutting, adjacent, or in close proximity and being connected by surface water.

Cove - A cove is an area of wetland/deepwater that, in its annually flooded condition, is surrounded by upland on more than two-thirds of its perimeter.

Detention time - The length of time a molecule of a substance is physically detained within a specified area.

Deepwater - Surface water deeper than 6.6 feet and lacking vegetation.

Downslope - In the direction of a lower elevation. In areas of very flat relief, "downslope" shall mean in the direction of the nearest AA (contiguous or not) which is both permanently (or tidally) flooded and is larger than the AA.

Effectiveness - Effectiveness assess the capability of a wetland to perform a function due to its physical, chemical, and biological attributes. Effectiveness does not estimate the magnitude at which a function is performed, only the probability that a wetland will perform the function.

Emergent Vegetation - Erect, rooted, herbaceous vegetation excluding mosses and lichens.

Estuarine - Tidal wetlands usually semienclosed by land but with partly obstructed or sporadic access to the open ocean. Salinities are usually greater than 0.5 parts per thousand.

Fetch - The maximum open water distance unimpeded by intersecting islands, erect vegetation, or other obstructions.

Forested - A wetland class characterized by vegetation that is 6 m or taller.

Fringe Wetland - Fringe wetlands along a channel (i.e., river, stream, etc.)are those wetlands which cumulatively (both sides of the channel) occupy less than 3 times the width of the adjacent channel on any line perpendicular to flow. Fringe wetlands on a standing body of water (i.e., lake, estuary, etc.) are those wetlands which cumulatively occupy less than one-third the surface area of the standing body of water at the time of highest annual water.

Functions - The physical, chemical, and biological processes or attributes of a wetland without regard to their importance to society.

Gradient - The elevation at the inlet (highest) minus the elevation at the outlet (lowest) divided by the straight line distance separating the inlet and outlet.

Hydroperiod - A term used to indicate the seasonal occurrence of flooding and/or saturated soil conditions.

Impact Area - A portion of the AA where an impact with localized effect is proposed, or has already taken place, (e.g., fill, dredging, wetland creation, etc.).

Impervious surface - Surfaces where water infiltration is impeded by impermeable materials on top of the soil (e.g., concrete, asphalt).

Inlet - The point at which surface water enters the AA via a channel.

Input Zone - The upland area, located in the AA's watershed, extending 300 ft upslope from the upland/wetland boundary of the AA. This includes uplands in a 300-foot wide corridor on each side of all tributaries (permanent or intermittent) that enter the AA, extending a distance of 100 feet up the tributary for each 10 feet of tributary channel width at its entry point to the AA.

Intermittent (flooding) - Flooding from an adjoining body of water or channel for at least ten consecutive days at least once every ten years, and dry for at least ten consecutive days every growing season.

Intermittent (flow) - Surface water flow for at least ten consecutive days at least once every ten years, and dry for at least ten consecutive days every growing season.

Interspersion - The degree of intermingling of different cover types, regardless of the number of types or their relative proportions.

Island - An area of land that is, at least, seasonally exposed, not connected to the mainland by any bridge, and uninhabited by humans.

Lacustrine - Nonflowing, usually nontidal waters in an AA larger than 20 acres, or in a smaller AA with (a) erect persistent vegetation comprising less than 30% of the area or (b) with a depth greater than 6.6 feet.

Locality - A small political division (e.g., town, county section, etc.), or a ideally, a functional watershed or similar hydrologic division, for which quantitative data are compiled and available for types of wetlands and their loss rates.

Macrophyte - Any nonmicroscopic leafy plant.

Marine - Tidal, with salinities greater than 30 parts per thousand and erect vegetation absent.

Meander Ratio - The length of a river or stream channel from an upstream point to a downstream point divided by the straight line distance between the same two points.

Morphedaphic Index - An index which estimates the productivity of a lake by taking the ratio of total dissolved solids (mg/l) to mean depth of the lake.

Moss-Lichen - The wetland class in which mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30% of the areal coverage.

Nonpersistent Emergent Vegetation - Emergent vegetation that falls to the surface of the substrate, or below the surface of the water at the end of the growing season, so that at certain seasons of the year there is no sign of emergent vegetation.

Oasis - One or more wetlands situated so that they are isolated or comprise a small number of acres per total square miles.

oB - Open water portions of Zone B.

Open Water - Water of any depth with at least 7 linear feet and 49 sq. ft. of surface area with no erect vegetation. If adjacent vegetation is mostly woody, the surface area requirement increases to 200 linear feet and 2,000 square feet. Includes channels, deepwater, and wetland areas with submerged vegetation.

Opportunity - Opportunity assesses the chance or opportunity a wetland has to perform a function. For example, a wetland may possess the physical attributes required to perform floodflow alteration, but unless the wetland is positioned in the watershed where it will receive floodflows it will not have the opportunity to perform the floodflow alteration function.

Outlet - The point at which surface water exits the AA.

Palustrine - Nontidal wetlands dominated by trees, shrubs, persistent emergents, or emergent mosses and lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt.

Playa - Relatively small, mostly noncontiguous lakes located primarily in the Texas high plains.

Persistent Emergent Vegetation - Persistent emergents are vegetation species that normally remain standing until the beginning of the next growing season.

Predictor - Simple, or integrated variables that directly, or indirectly, measure the physical, chemical, and biological processes of characteristics of the wetland.

Probability Rating - A measure of the potential of a wetland to perform a function. A probability rating is not a direct estimate of magnitude of a function or value, rather it is an estimate of the probability that a function or value will exist or occur in a wetland to an unspecified degree.

Region - An area (e.g. Corps District, river basin, state, EPA region, advance identification region, flyway) for which quantitative data are compiled and available for types of wetlands and their loss rates. Ideally, the area will be of relatively homogenous topography usually with a single landscape pattern. Choose the most geographically restricted area available that is larger than **"locality"**, and favor the use of hydrologic criteria over geopolitical criteria.

Riverine - Flowing fresh waters (salinity less than 0.5 ppt) with less than 30% persistent vegetation cover.

Scrub-shrub - The wetland class dominated by woody vegetation less than 6 m.

Services - Services are benefits that accrue to society as a result of the processes or attributes of wetlands. Services have a well-defined, off-site delivery point.

Service Area - The service area is a well-defined point to which a wetland service is delivered (e.g., downstream developed area, dredged channel, water supply reservoir, etc.)

Sheetflow - Observable movement of surface water not confined to a channel.

Shoreline - The interface between open water and erect vegetation or unvegetated flats or banks as visible at a map scale of 1:63,500.

Slope - Vertical distance (elevational) separating two points divided by the horizontal distance between the same two points.

Social Significance - A nonstatistical measure of the importance society (locally or nationally) may attach to a wetland due to the official recognition of its natural features, economic value attributable to the wetland, strategic location of the wetland, or other factors.

Standard Density Circle - A circular area that encompasses a predetermined density of objects (wetlands in the case of WET).

Subclass - A subdivision of a class as used in the Cowardin et al. (1979) wetland classification system. Classes are based on substrate material and flooding regime, or on vegetative life form.

Tidal Flow - Water movement due to tides.

Surface Water - Water above the surface of the ground that is visible to the unaided eye, whether in channels, diffuse flow, or standing. Not necessarily permanent.

Tributary - Any small channel (e.g., stream or river), entering a larger channel.

Unconstricted Outlet - A surface outlet on a channel greater than one-third the maximum width of the AA or larger adjoining AA, or a surface outlet on a standing body of water greater than one-tenth the width of the AA or larger adjoining AA.

Upslope - In the direction of higher elevation. In areas with very flat relief, "upslope" means in a direction away from the nearest AA (contiguous or not) which is both permanently, or tidally, inundated.

Urban Area - An area having a residential density of at least 1,000 residences/square mile over 4 contiguous square miles, or a central city having a population of 50,000 or more and including, surrounding, closely settled areas if these surrounding areas are (a) incorporated places of 2,500 inhabitants or more; or (b) incorporated places with fewer than 2500 persons, provided that each place has a closely settled area of 100 permanent residences or more; or (c) small land parcels normally less than one square mile in area, having a population density of 1,000 inhabitants or more per square mile; or (d) other similar small areas in unincorporated territory with lower population density when these areas serve to complete urban-suburban community boundaries.

Values - Wetland processes or attributes that are valuable or beneficial to society.

Watershed - The upslope area from which surface waters (overland runoff and channel flow) enter the AA at least seasonally. The watersheds is measured from the AA outlet (or, if the AA is a fringe situation, from the outlet or closest downstream constriction of immediately contiguous deeper waters). The watershed for specific types of wetlands are defined as follows: (1) The watershed of tidal fringe wetlands (or nontidal fringe wetlands on lakes larger than 10 sq. mi) begins at the outlet, or closest downstream constriction of the contiguous deepwater, and includes the area upslope of the AA from which water drains directly into the AA. It does not include the watershed of contiguous wetlands and deepwater, (2) The watershed of nontidal fringe wetlands begins at the outlet of the AA, or closest downstream constriction of the contiguous deepwater, and includes the areas upslope of the AA from which water drains directly into the AA, and, in addition, includes the areas upslope of contiguous areas of wetland or deepwater that flood the AA.

Wetland - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wetland-dependent - A term for species that may use nonwetland habitats, but occur in wetlands a preponderance of the year, or which have critical life requirements met by wetlands that are not provided by nonwetlands.

Wetland System - This refers to a category wetlands that share the influence of similar hydrologic, geomorphologic, chemical, or biological factors. Wetland systems recognized in the FWS wetland classification system (Cowardin et al. 1979) include: Marine, Estuarine, Riverine, Lacustrine, and Palustrine.

Zone A. The wetland portion of the AA with no visible, standing, surface water. It may include contiguous areas with soils saturated only seasonally.

Zone B. The wetland portion of the AA which has visible, standing, surface water.

Zone C. The deepwater portion of the AA (i.e., deeper than 6.6 feet and lacking vegetation.

APPENDIX B: DATA FORMS

INSTRUCTIONS FOR FORM A: SITE DOCUMENTATION

Form A must be completed for all evaluations. Form A documents general information about the wetland being evaluated. It serves as a useful reference throughout the evaluation procedure and as documentation of the evaluation following its completion. It is suggested that Form A be completed as one of the preparatory tasks (see Section 2.8). Instructions for completing Form A are as follows:

Complete Part 1 of Form A by filling in each of the blanks with the requested information.

Complete Part 2 of Form A by sketching a map, or attaching a copy of the topographic map. Include in the sketch, or on the map (if it is not already indicated), the additional information itemized in Part 2 of Form A.

In addition, determine the size of each of the following areas and record your answers in Part 2 of Form A.

(1) The AA acreage
(2) The IA acreage (if applicable)
(3) The watershed acreage of the AA
(4) The wetland acreage within the AA (AA acreage minus deepwater acreage)
(5) The wetland acreage within the watershed of the closest service area (watershed acreage minus upland and deepwater acreage)
(6) The wetland/deepwater acreage within the watershed of the closest service area

FORM A: SITE DOCUMENTATION (Page 1 of 2)

Part 1 - Background Information

Evaluation Site: _____ Date: _____

Site Location (Section, Range, and Township): _____

Has the evaluator taken a training course in WET Version 2.0? _____

Agencies/Experts Contacted: _____

Circle the assessment levels to be completed? SS-1 SS-2 E/O-1&2 E/O-3 HS

Is the wetland tidal or nontidal? If the wetland is nontidal, indicate the month(s) that represent wet, dry, and average conditions, or if only average annual condition will be used, give rationale. Also, indicate if the previous 12 months of precipitation has been above, below, or near normal.

_____

_____

Is this evaluation an estimate of past conditions or a prediction of future conditions? (If answer is yes, explain nature and source of predictive data.)

_____

_____

Will alternative ratings be used to evaluate any of the functions or values (if yes, explain)? _____

_____

_____

Part 2 - Identification and Delineation of Evaluation Areas

Sketch a map on the following page, or attach a suitable map (photocopy of topgraphic map) that shows the following information:

-- Boundaries of the AA, IA, and IZ, and the location of service areas.
-- Watershed boundaries of AA, and service areas.
-- Extent of surface water in the AA during the wet and dry seasons.
-- Open water (channels and pools) within and adjacent to the AA.
-- Normal direction of channel or tidal flow
-- Normal direction of wind-driven waves or current.
-- Impact area(s).
-- Scale of distance and north compass direction.

Explain the procedures used to identify or delineate the AA, IA, IZ, service areas, and the watersheds of these areas if they differed from the guidelines outlined in Section 2.7. _____

_____

_____

-- Continued --

FORM A: SITE DOCUMENTATION (Page 2 of 2)

Part 2 (Cont.)

Estimate the extent of the following areas:

Assessment Area = _____ acres
Impact Area = _____ acres (only if applicable)
Watershed of AA = _____ acres/_____ miles^2 (acres x 0.0016 = miles^2)
Wetlands in AA = _____ acres
Wetlands in the watershed of closest service area = _____ acres
Wetlands and deepwater in the watershed of closest service area = _____ acres

How were locality and region defined for this evaluation? _____
_____
_____
_____
_____

Sketch of Evaluation Areas (or attach map):

INSTRUCTIONS FOR FORM B

Record your answers to the social significance and effectiveness and opportunity questions on Form B. There are four possible answers on this form. They include the letters "Y" for a "yes" answer, "N" for a "no" answer, "U" for an "unknown" answer, and "I" if the question is inappropriate to a particular situation (i.e., a question dealing with tide is inappropriate when evaluating nontidal wetlands).

In all cases, Form B indicates the appropriate answer options for each question. For instance, appropriate answers for a level 1 assesment of social significance (Questions 1-31) are "Y," "N," "U," and, in some cases, "I." On Form B note that the "I" is only given as an option when it is appropriate. For effectiveness and opportunity assessment level 1 (Questions 1-27), "U" is never an appropriate answer; therefore, it never appears on Form B as an option. Answers to each question must be selected from the options shown on Form B.

During the effectiveness and opportunity evaluation certain questions must be answered for the three seasonal contexts addressed by WET. For these questions, three subcolumns with headings of "X," "W," and "D" are provided for answering the question in terms of seasonal context. Unless it was determined in Task 4 to use the average annual condition for the evaluation, answer questions for all three seasonal conditions using the following guidelines:

(1) Average ($\bar{X}$):

- (a) Hydrology: intermediate between average annual wettest and driest condition.
- (b) Vegetation: maximum annual standing crop.
- (c) Tidal: the average daily high tide condition.

(2) Wet (W):

- (a) Hydrology: wettest time of an average year.
- (b) Vegetation: midpoint of the growing season
- (c) Tidal: the average monthly high tide condition (spring tide).

(3) Dry (D):

- (a) Hydrology: driest time of an average years.
- (b) Vegetation: dormant time of the year.
- (c) Tidal: the daily midtide condition.

Some effectiveness and opportunity questions are broken into two or more alphabetic and/or numeric subsections. Alphabetic subsections are designed to have a single "Y" answer. For example, in Question 10 only one of the choices (10A-10F) will be answered "Y" while the remaining choices should be answered "N." Numeric subsections, on the other hand, are designed so that more that one "Y" answer is possible. For example, in Question 42.1 one or more of the choices (42.1.1-42.1.3) may have a "Y" answer.

FORM B: EVALUATION ANSWER SHEET

Evaluation Site: _____

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 1

3.1.1 "Red Flags"

				Comments/Assumptions
s1.	Y	N	U	
s2.	Y	N	U	
s3.	Y	N	U	
s4.	Y	N	U	
s5.	Y	N	U	
s6.	Y	N	U	

3.1.2 On-site Social Significance

					Comments/Assumptions
s7.	Y	N	U	I	
s8.	Y	N	U	I	

3.1.3 Off-site Social Significance

					Comments					Comments
s9.	Y	N	U	I		s21.	Y	N	U	
s10.	Y	N	U			s22.	Y	N	U	I
s11.	Y	N	U			s23.	Y	N	U	
s12.	Y	N	U			s24.	Y	N	U	
s13.	Y	N	U			s25.	Y	N	U	
s14.	Y	N	U			s26.	Y	N	U	
s15.	Y	N	U	I		s27.	Y	N	U	
s16.	Y	N	U	I		s28.	Y	N	U	
s17.	Y	N	U	I		s29.	Y	N	U	
s18.	Y	N	U	I		s30.	Y	N	U	
s19.	Y	N	U			s31.	Y	N	U	
s20.	Y	N	U							

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 2

Context Region (Circle one)

Standard Density Circle
Locality
Hydrologic Unit

Question #

			Comments/Assumptions
1	Y	N	
2	Y	N	
3	Y	N	
4	Y	N	

FORM B (Cont.)

Evaluation Site: _____

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 1 (OFFICE)

Q.#	WETLAND CONDITION $\bar{X}$	W	D	COMMENTS/ASSUMPTIONS
1.1	Y N			
1.2	Y N			
1.3	Y N			
2.1.1	Y N			
2.1.2	Y N			
2.1.3	Y N			
2.2.1	Y N I			
2.2.2	Y N I			
3.1	Y N			
3.2	Y N			
3.3	Y N			
4.1	Y N			
4.2A	Y N			
4.2B	Y N			
4.2C	Y N			
4.2D	Y N			
5.1.1		Y N		
5.1.2		Y N		
5.2		Y N		
6.1	Y N			
6.2	Y N			
7	Y N I			
8.1	Y N			
8.2	Y N			
8.3	Y N			
8.4	Y N			
9.1		Y N		
9.2		Y N I		
9.3		Y N I		
10A	Y N			
10B	Y N			
10C	Y N			
10D	Y N			
10E	Y N			
10F	Y N			

FORM B (Cont.)

Evaluation Site: _____

Q.#	WETLAND CONDITION $\bar{X}$		W		D		COMMENTS/ASSUMPTIONS
11	Y	N	Y	N	Y	N	
12A	Y	N	Y	N	Y	N	
12Aa	Y	N	Y	N	Y	N	
12Ab	Y	N	Y	N	Y	N	
12Ac	Y	N	Y	N	Y	N	
12Ad	Y	N	Y	N	Y	N	
12Ae	Y	N	Y	N	Y	N	
12B	Y	N	Y	N	Y	N	
12Ba	Y	N	Y	N	Y	N	
12Bb	Y	N	Y	N	Y	N	
12Bc	Y	N	Y	N	Y	N	
12Bd	Y	N	Y	N	Y	N	
12Be	Y	N	Y	N	Y	N	
12C	Y	N	Y	N	Y	N	
12Ca	Y	N	Y	N	Y	N	
12Cb	Y	N	Y	N	Y	N	
12Cc	Y	N	Y	N	Y	N	
12Cd	Y	N	Y	N	Y	N	
12D	Y	N	Y	N	Y	N	
12Da	Y	N	Y	N	Y	N	
12Db	Y	N	Y	N	Y	N	
12E	Y	N	Y	N	Y	N	
13A	Y	N	Y	N	Y	N	
13Aa	Y	N	Y	N	Y	N	
13Ab	Y	N	Y	N	Y	N	
13Ac	Y	N	Y	N	Y	N	
13Ad	Y	N	Y	N	Y	N	
13Ae	Y	N	Y	N	Y	N	
13B	Y	N	Y	N	Y	N	
13Ba	Y	N	Y	N	Y	N	
13Bb	Y	N	Y	N	Y	N	
13Bc	Y	N	Y	N	Y	N	
13Bd	Y	N	Y	N	Y	N	
13Be	Y	N	Y	N	Y	N	
13C	Y	N	Y	N	Y	N	
13Ca	Y	N	Y	N	Y	N	
13Cb	Y	N	Y	N	Y	N	
13Cc	Y	N	Y	N	Y	N	
13Cd	Y	N	Y	N	Y	N	
13D	Y	N	Y	N	Y	N	
13Da	Y	N	Y	N	Y	N	
13Db	Y	N	Y	N	Y	N	
13E	Y	N	Y	N	Y	N	

Evaluation Site: _____

WETLAND CONDITION

Q.#	X			W			I		
14.1	Y	N		Y	N		Y	N	
14.2	Y	N		Y	N		Y	N	
15.1A	Y	N	I						
15.1B	Y	N	I						
15.1C	Y	N	I						
15.2	Y	N	I						
16A	Y	N		Y	N		Y	N	
16B	Y	N		Y	N		Y	N	
16C	Y	N		Y	N		Y	N	
17	Y	N							
18	Y	N	I						
19.1A	Y	N	I						
19.1B	Y	N	I						
19.2	Y	N	I						
19.3	Y	N	I						
20.1	Y	N	I						
20.2	Y	N	I						
21A	Y	N							
21B	Y	N							
21C	Y	N							
21D	Y	N							
21E	Y	N							
22.1.1	Y	N							
22.1.2	Y	N	I						
22.2	Y	N							
22.3	Y	N	I						
23	Y	N							
24.1	Y	N	I						
24.2	Y	N	I						
24.3	Y	N	I						
24.4	Y	N	I						
24.5	Y	N							
25.1	Y	N							
25.2A	Y	N	I						
25.2B	Y	N	I						
25.3	Y	N							

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#		$\bar{X}$			W			D		
26.1	Y	N								
26.2	Y	N	I							
26.3	Y	N	I							
27.1	Y	N								
27.2	Y	N	I							
27.3	Y	N	I							

EFFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 2 (FIELD)

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#		$\bar{X}$			W			D		
28	Y	N								
29.1	Y	N								
29.2	Y	N								
30.	Y	N		Y	N		Y	N		
31.1	Y	N		Y	N		Y	N		
31.2	Y	N		Y	N		Y	N		
31.3	Y	N		Y	N		Y	N		
31.4	Y	N	I	Y	N	I	Y	N	I	
31.5	Y	N		Y	N		Y	N		
31.6A	Y	N		Y	N		Y	N		
31.6B	Y	N		Y	N		Y	N		
31.6C	Y	N		Y	N		Y	N		
31.6D	Y	N		Y	N		Y	N		
31.6E	Y	N		Y	N		Y	N		
32A	Y	N								
32B	Y	N								
32C	Y	N								
32D	Y	N								
32E	Y	N								
32F	Y	N								
32G	Y	N								
32H	Y	N								
32I	Y	N								
32J	Y	N								
32K	Y	N								

FORM B (Cont.)

Evaluation Site: _____

Q.#	WETLAND CONDITION $\bar{X}$			W			D			COMMENTS/ASSUMPTIONS
33A	Y	N								
33B	Y	N								
33C	Y	N								
33D	Y	N								
33E	Y	N								
33F	Y	N								
33G	Y	N								
33H	Y	N								
33I	Y	N								
33J	Y	N								
33K	Y	N								
34.1	Y	N								
34.2	Y	N								
34.3.1	Y	N								
34.3.2	Y	N	I							
35.1	Y	N	I							
35.2	Y	N	I							
36.1.1	Y	N		Y	N		Y	N		
36.1.2	Y	N		Y	N		Y	N		
36.2.1	Y	N		Y	N		Y	N		
36.2.2	Y	N		Y	N		Y	N		
36.2.3	Y	N		Y	N		Y	N		
37	Y	N								
38.1	Y	N								
38.2	Y	N								
38.3	Y	N								
38.4	Y	N								
38.5	Y	N								
38.6	Y	N								
38.7	Y	N								
38.8	Y	N	I							
39	Y	N								
40.1	Y	N	I							
40.2	Y	N	I							
41.1				Y	N	I				
41.2				Y	N	I				

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#		$\bar{X}$			W			D		
42.1.1	Y	N	I	Y	N	I	Y	N	I	
42.1.2	Y	N	I	Y	N	I	Y	N	I	
42.1.3	Y	N	I	Y	N	I	Y	N	I	
42.2.1	Y	N	I	Y	N	I	Y	N	I	
42.2.2	Y	N	I	Y	N	I	Y	N	I	
42.2.3	Y	N	I	Y	N	I	Y	N	I	
43A	Y	N		Y	N		Y	N		
43B	Y	N		Y	N		Y	N		
43C	Y	N		Y	N		Y	N		
43D	Y	N		Y	N		Y	N		
43E	Y	N		Y	N		Y	N		
43F	Y	N		Y	N		Y	N		
43G	Y	N		Y	N		Y	N		
43H	Y	N		Y	N		Y	N		
43I	Y	N		Y	N		Y	N		
44.1	Y	N		Y	N		Y	N		
44.2	Y	N		Y	N		Y	N		
44.3	Y	N		Y	N		Y	N		
44.4	Y	N		Y	N		Y	N		
44.5	Y	N		Y	N		Y	N		
44.6	Y	N		Y	N		Y	N		
44.7	Y	N		Y	N		Y	N		
44.8	Y	N		Y	N		Y	N		
44.9	Y	N		Y	N		Y	N		
45A	Y	N								
45B	Y	N								
45C	Y	N								
45D	Y	N								
45E	Y	N								
45F	Y	N								
45G	Y	N								
46A	Y	N		Y	N		Y	N		
46B	Y	N		Y	N		Y	N		
46C	Y	N		Y	N		Y	N		
47A	Y	N								
47B	Y	N								
47C	Y	N								

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#	$\bar{X}$			W			D			
48A	Y	N	I	Y	N	I	Y	N	I	
48B	Y	N	I	Y	N	I	Y	N	I	
48C	Y	N	I	Y	N	I	Y	N	I	
48D	Y	N	I	Y	N	I	Y	N	I	
48E	Y	N	I	Y	N	I	Y	N	I	
48F	Y	N	I	Y	N	I	Y	N	I	
49.1.1	Y	N	I	Y	N	I	Y	N	I	
49.1.2	Y	N	I	Y	N	I	Y	N	I	
49.2	Y	N	I	Y	N	I	Y	N	I	
49.3	Y	N	I	Y	N	I	Y	N	I	
50.	Y	N		Y	N		Y	N		

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 3 (DETAILED DATA)

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#	$\bar{X}$			W			D			
51.1	Y	N	U							
51.2	Y	N	U							
52.1	Y	N	I	U						
52.2	Y	N	I	U						
53.1	Y	N	I	U						
53.2	Y	N	I	U						
54	Y	N	U		Y	N	U		Y	N U
55.1	Y	N	U							
55.2	Y	N	U							
55.3	Y	N	U							
55.4	Y	N	U							
56.1	Y	N	I	U						
56.2	Y	N	I	U						
57.1	Y	N	U							
57.2	Y	N	U							
58.	Y	N	U							

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION						COMMENTS/ASSUMPTIONS
Q.#		$\bar{X}$			W	D	
59.1	Y	N	I	U			
59.2	Y	N	I	U			
60	Y	N	U				
61	Y	N	I	U			
62	Y	N	U				
63.1	Y	N	I	U			
63.2	Y	N	I	U			
64					Y	N I U	

INSTRUCTIONS FOR FORM C: SUPPLEMENTARY OBSERVATIONS

Form C is used to document the observation of fish and wildlife species by the evaluator(s) during the field visit to the AA site. The observations documented in Form C are only used during the habitat suitability evaluation procedure, therefore, it is not necessary to fill out Form C unless habitat suitability evaluations are anticipated.

Record observations of fish and waterfowl species groups, as well as individual fish and bird species while at the AA site. In addition, record observations of recreational and consumptive activities occurring at the AA site.

FORM C: SUPPLEMENTARY OBSERVATIONS

Evaluation Site: _____

Indicate the species, species groups, and activities that are actually observed, reliably reported, or known to occur at the AA on a regular basis.

FISH SPECIES GROUPS*	OBSERVED/REPORTED
1. Warmwater Group	Y or N
2. Coldwater Group	Y or N
3. Northern Lake Group	Y or N
4. Coldwater Riverine Group	Y or N

FISH SPECIES	OBSERVED/REPORTED
_____	Y or N
_____	Y or N
_____	Y or N

WATERFOWL SPECIES GROUPS**	OBSERVED/REPORTED		
	NESTING	MIGRATING	WINTERING
1. Prairie Dabblers	Y or N	Y or N	Y or N
2. Black Duck	Y or N	Y or N	Y or N
3. Wood Duck	Y or N	Y or N	Y or N
4. Common and Red-Breasted Mergansers	Y or N	Y or N	Y or N
5. Hooded Merganser	Y or N	Y or N	Y or N
6. Canvasback, Redhead, Ruddy Duck	Y or N	Y or N	Y or N
7. Ring-necked Duck	Y or N	Y or N	Y or N
8. Greater and Lesser Scaup	Y or N	Y or N	Y or N
9. Common Goldeneye	Y or N	Y or N	Y or N
10. Bufflehead	Y or N	Y or N	Y or N
11. Whistling Ducks	Y or N	Y or N	Y or N
12. Inland Geese	Y or N	Y or N	Y or N
13. Tundra Swan	Y or N	Y or N	Y or N
14. Brant	Y or N	Y or N	Y or N

BIRD SPECIES	OBSERVED/REPORTED
_____	Y or N
_____	Y or N
_____	Y or N

RECREATIONAL ACTIVITIES

Hiking	Sailing	Snowmobiling	Research
Birdwatching	Power Boating	Skiing	Educational Fieldtrips
Photography	Canoeing	Ice Boating	Horseback Riding
Swimming	Kayaking	Ice Fishing	

CONSUMPTIVE ACTIVITIES

Agriculture	Fur Harvesting	Commercial Use of Plants	Peat Harvesting
Hunting	Timber Harvest	Natural Resource Extraction	Water Supply

* Fish species groups are explained on page 10.
** Waterfowl species groups are explained on page 10.

INSTRUCTIONS FOR FORM D: EVALUATION SUMMARY SHEET

Form D summarizes the results of the evaluation. Record probability ratings for functions in terms of social significance and/or effectiveness and opportunity evaluations in the appropriate row and column. An "*" on Form D indicates that WET does not evaluate the function in terms of social significance, effectiveness and opportunity.

Record probability ratings for any habitat suitability evaluations that were completed in the appropriate row and column.

At the bottom of the form indicate:

1. The level of assessment completed for the evaluation
2. Whether this form is for an AA or IA
3. Identify discrepancies suggesting contrary probablity ratings
4. Identify alternative sources of information used to assign a probability rating
5. If possible identify wetland loss rates for the locality or region in terms of wetland type, acreage, and time frame.

FORM D: EVALUATION SUMMARY SHEET

Evaluation Site: _____

Wetland Functions and Values

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge			*
Ground Water Discharge			*
Floodflow Alteration			
Sediment Stabilization			*
Sediment/Toxicant Retention			
Nutrient Removal/Transform.			
Production Export	*		*
Wildlife Diversity/Abundance**		*	*
Breeding	*		*
Migration	*		*
Wintering	*		*
Aquatic Diversity/Abundance			*
Uniqueness/Heritage		*	*
Recreation		*	*

Habitat Suitability Evaluation

Fish Species Groups:

_____ Group ___ _____ Group ___ _____ Group ___

Waterfowl Species Groups:

	Breeding	Migration	Wintering
Group _____	___	___	___
Group _____	___	___	___
Group _____	___	___	___
Group _____	___	___	___

Fish, Invertebrate, and Bird Species:

_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___

Levels of assessment completed: S-1 S-2 E/O-1 E/O-2 E/O-3 HS
Evaluation is for the: AA IA (Note: if the evaluation is for an IA, documentation of the AA evaluation must be presented with this evaluation).
Is there any evidence that suggests ratings contrary to the above (explain)?

_____

Were alternative sources used for any of the ratings above (explain)? _____

_____

The loss rate for _____ (identify locality/region) between 19__ and 19__ for _____ (identify wetland type) was _____ (acres/year or % loss).

* WET does not evaluate this function or value in these terms.
** Wildlife Diversity/Abundance assesses only wetland-dependent birds. Other wildlife (e.g., game mammals) should be evaluated using other methods.

APPENDIX C: IMPORTANT CONSIDERATIONS NOT ADDRESSED BY WET

Important Considerations not Addressed by WET

The foregoing analysis is intended to synthesize technical information into a format useful for decision makers. However, wetland decisions rely on more than technical information. This appendix provides a partial list of other considerations. There are no "correct" or "incorrect" answers to the following questions, and it is not possible to generate ratings from responses. Responses and interpretations are understood to be subjective. They should be arrived at through the combined input of the public, policy staff, and technical personnel, and used appropriately according to the mandate of each agency.

1. Regardless of the project action, is the Social Significance or Opportunity of any of the AA's functions likely to increase or decrease in the next twenty years, due to natural or human factors? (Consider: regional development trends and patterns of their associated ground water depletion, eutrophication, runoff volume increase, soil loss, harvest, drainage, habitat fragmentation, exotic species introduction, open space loss, and microclimate effects; as well as natural successional trends and patterns including beaver activity, insect and disease factors, competition, predation, and climatic events).

2. Regardless of the project action, is the Effectiveness of any of the AA's functions likely to increase or decrease in the next twenty years, due to the above?

3. Assuming that nearby or upslope wetlands were to become degraded over the next twenty years, do you believe this will increase or decrease the "value" of this wetland? Similarly, do you believe it is more important to preserve the biological and hydrological conditions now present (allowing only for changes caused by natural events), or (assuming a choice is required) to manage or use the wetland to improve downstream water quality or other values?

4. Which of the following contexts should be used to determine the Uniqueness/Heritage ratings of a wetland: watershed, township, state, ecoregion, country, or entire world? (If all, then should all contexts be weighted equally?)

5. If any of the wetland's functions were to be impaired, are there alternatives which are (a) economically practical, (b) politically realistic, (c) equally effective, and (d) environmentally sound, and which might substitute for the local performance of the function?

Consider the following potential substitutes:

-Ground Water Recharge: artificial recharge pits, induced recharge, sediment flushing to increase recharge.

-Ground Water Discharge: well construction, transfer of water from surplus areas, reservoir construction, increased implementation of water conservation programs.

--Floodflow Alteration: dams, floodways, dikes, levees, floodwalls, diversions, zoning, relocation of property, tax policies, land acquisition, flood proofing, flood forecasting, detention depressions, reservoirs, land treatment measures.

--Sediment Stabilization: riprap, bulkheads, jetties, stream restoration, regulation of boat traffic, zoning of erosion-hazard areas, relocation of property, tax policies, land acquisition.

--Sediment/Toxic Retention: sedimentation depressions, land treatment measures, dilutional flushing, buffer strip policies, zoning, tax policies, water treatment facilities, dredged removal of contaminants.

--Nutrient Removal/Transformation: same as Sediment/Toxic Retention, plus chemical treatment, aeration/circulation.

--Fishery Habitat, Aquatic Diversity: creation of replacement habitat, diversion of fishing effort to nonimpacted species or non-fishing industries or recreational activities, improvement of habitat (e.g., stream restoration, placement of artificial shelters), stocking, predator management, modification of harvest restrictions, regulation of other limiting factors (e.g., pollutants).

--Wildlife Habitat, General Diversity: similar to Fisheries, above.

--Active Recreation: diversion of activities to alternate sites, construction of new sites (e.g., reservoirs, swimming pools), diversion to less water-dependent activities, improved access.

6. Are there alternative sites for the proposed activity which would be economically feasible (not necessarily the MOST feasible) and would cause less impact on wetlands and other sensitive natural features?

7. Are the benefits of the proposed activity likely to be felt by the general public (rather than solely by the landowner)?

8. Are any of the proposed impacting activities expected to trigger other impacts (e.g., from induced economic growth) of equal or greater magnitude?

9. Do the types of alternatives associated with the proposed activity mimic alterations caused by local natural events, in their magnitude, duration, frequency, and seasonal pattern?

10. Of the following impact categories (arranged in decreasing order of severity), which is the most severe one likely to result from the proposed activity?

--First order. Immediate, total, and essentially irreversible (although confined) wetland conversion by filling or excavation, or long-term wetland displacement by flooding or draining and clearing, which may be technically but not economically feasible to reverse.

--Second order. Permanent, often far-reaching, and practically irreversible adverse change to the hydrologic regime, primarily in wetland water levels, temperature, salinity, velocity, circulation, flushing, and fluctuation, resulting in the loss of wetland vegetation and wet or dry cycles.

-Third order. Enduring, often economically irreversible, but gradual and relatively confined changes to wetland soils and substrate from erosion, sedimentation, and chemical contamination.

-Fourth order. Chronic, sometimes persistent and wide-spread, but usually low-level water-quality deterioration from nutrient over enrichment, organics with low biodegradability, and trace elements that are potentially toxic.

-Fifth order. Temporary, usually localized damage to soils, water quality, vegetation, and other environmental features from effects such as high turbidity, oil or chemical spills, defoliation, noise, and similar phenomena.

NOTE: Numerous procedures, both quantitative and qualitative, are available for estimating impacts to wetlands, as well as impacts of wetland loss.

These include the following:
Hydrologic effects: Ogawa and Male (1983), HEC models (Corps of Engineers, Davis, CA), TR-20 (USDA Soil Conservation Service), HSPF (EPA).

Sediment, Nutrient Loading: SWMM model (EPA), CREAMS model (EPA) Universal Soil Loss Equation (USDA Soil Conservation Service).

Hydrologic-Biological Interactions: Instream Flow, Reservoir, HSI models for HEP (USFWS-NEC, Fort Collins, CO).

Ground Water Sensitivity: DRASTIC model (EPA).

Sediment Stabilization: Corps of Engineers (Vicksburg, MS).

11. Is this AA likely to be especially sensitive to the proposed activity because of any of the characteristics shown in Table A1?

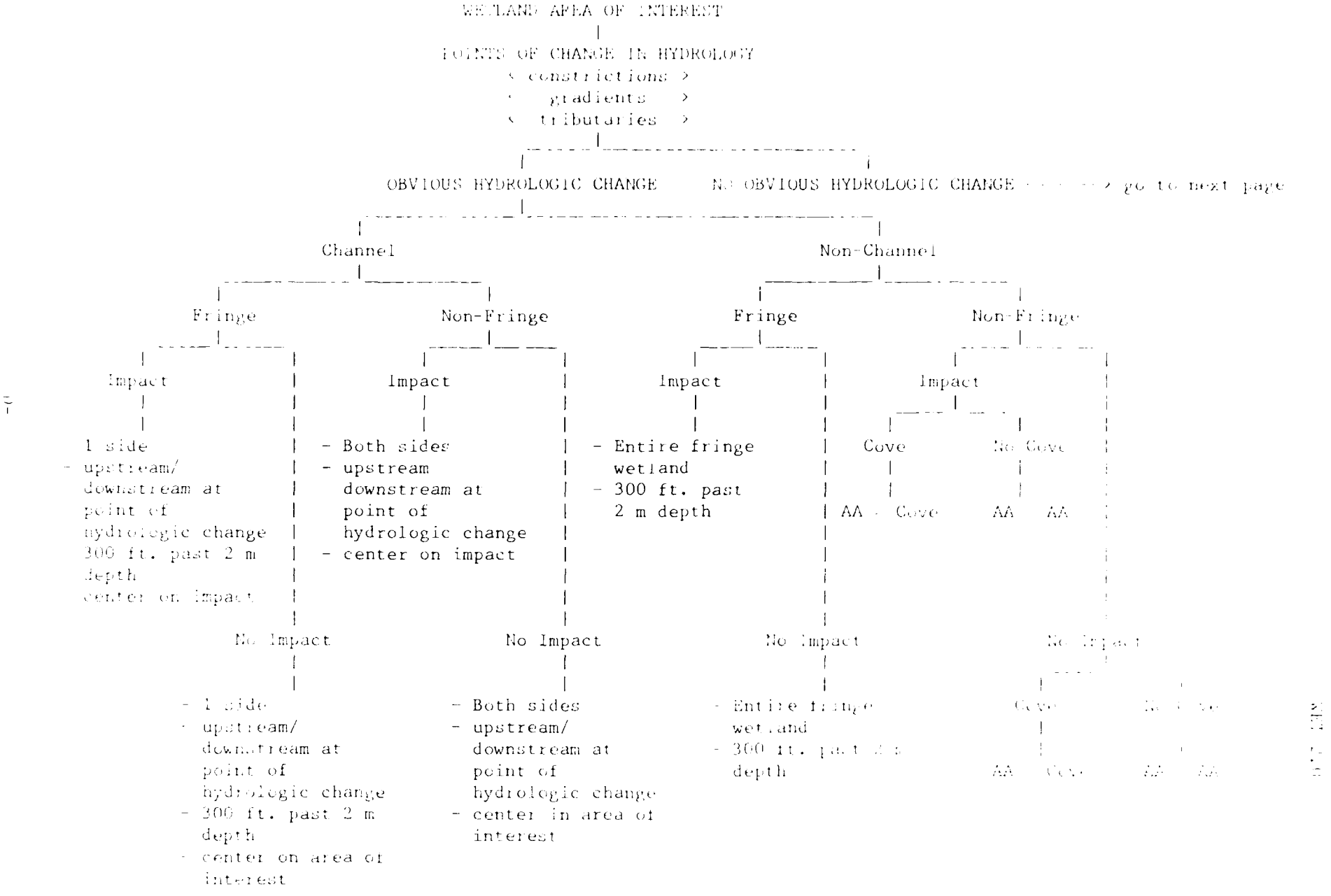
12. Are there other largely compatible functions which could not be objectively assessed or comparatively ranked by this method, but which may be present in the AA and add to its value? For example, certain types of: forestry, agriculture, mining, peat harvesting, grazing, haying, aquaculture, fur harvest, cranberry cultivation, hunting, fishing, ice skating, hiking, skiing, photography, nature study, off-road vehicle use, open space/aesthetic amenities, contributions to global carbon sink, climatological amelioration.

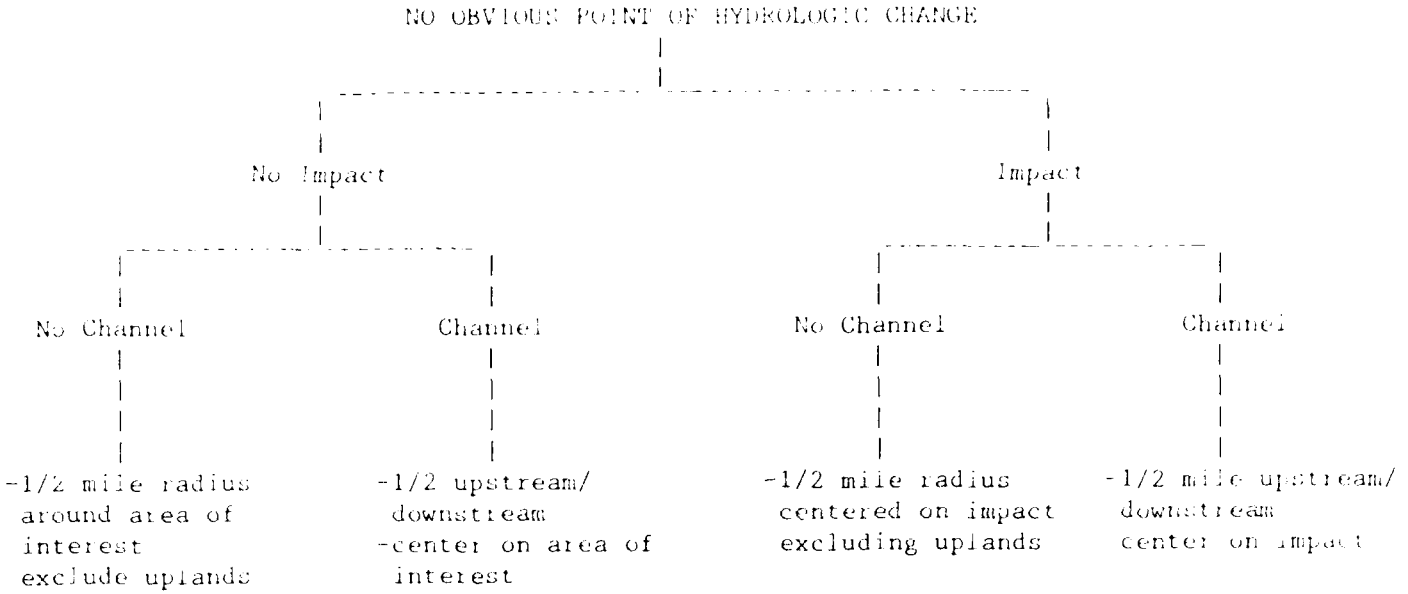
Table C1. Especially Sensitive Wetland Types

Sensitive Type	Rationale/Type of Critical Impact
1. Small size	lack of seed source, lack of refugia, lack of dilution
2. Noncontiguous islands/oases	(same as above)
3. Headwater area	(same as above)
4. Mainstream area	flood storage loss impacts farther off-site
5. % slope x $\sqrt[4]{\text{flow(cfs)}}$ =0.17-1.0	unstable/transitional channels
6. Borderline eutrophic	septic systems, land clearing
7. Borderline hypersaline	groundwater alteration, runoff
8. Borderline brackish (salinity near 5 ppt)	sediment runoff flocculates easily
9. Borderline acidity (bogs)	sedimentation, heavy metals
10. Submerged aquatic	turbidity from runoff
11. Forested, disjunct or narrow	species loss from further fragmentation
12. River-fed estuary	runoff or flow alteration
13. Pristine	community not adapted to stress
14. Colonial or large animals inhabit wetland	most sensitive to cumulative impacts
15. Nearby water table is near surface	increased pollution hazard
16. Nearby water table is deep	wetland water balance precarious
17. Wetlands in rapid wetland-loss region	loss of habitat
18. Freshwater wetlands along coast	groundwater withdrawal nearby

NOTE: With additional field data collection, some of these wetland "types" could be considered as social significance "Red Flags."

APPENDIX D: KEY TO DELINEATION OF THE ASSESSMENT AREA


WETLAND AREA OF INTEREST
POINTS OF CHANGE IN HYDROLOGY
< constrictions >
< gradients >
< tributaries >
OBVIOUS HYDROLOGIC CHANGE
NO OBVIOUS HYDROLOGIC CHANGE
go to next page
Channel
Non-Channel
Fringe
Non-Fringe
Fringe
Non-Fringe
Impact
Impact
Impact
Impact
1 side
- upstream/ downstream at point of hydrologic change 300 ft. past 2 m depth center on impact
- Both sides
- upstream downstream at point of hydrologic change
- center on impact
- Entire fringe wetland
- 300 ft. past 2 m depth
Cove
No Cove
AA - Cove
AA
AA
No Impact
No Impact
No Impact
No Impact
- 1 side
- upstream/ downstream at point of hydrologic change
- 300 ft. past 2 m depth
- center on area of interest
- Both sides
- upstream/ downstream at point of hydrologic change
- center in area of interest
- Entire fringe wetland
- 300 ft. past 2 m depth
Cove
No Cove
AA
Cove
AA
AA


NO OBVIOUS POINT OF HYDROLOGIC CHANGE
No Impact
Impact
No Channel
Channel
No Channel
Channel
-1/2 mile radius around area of interest exclude uplands
-1/2 upstream/ downstream -center on area of interest
-1/2 mile radius centered on impact excluding uplands
-1/2 mile upstream/ downstream center on impact

APPENDIX E: USERS GUIDE TO THE WET COMPUTER PROGRAM

Users Guide to the WET Computer Program

This program is designed to be used [illegible] manual:

> Adamus, P.R., Clairain, E.J., Smith, R.D., [illegible]
> "Wetland Evaluation Technique (WET) - Volume [illegible]," [illegible]
> 87-__, US Army Engineer Waterways Experiment Station, [illegible].

The program is not compatible with earlier versions of the Wetland Evaluation Technique (Adamus, 1983).

System Requirements

The WET program will run on any IBM, or true compatible computer, preferably under MS-DOS 2.0 or later. The program will run from a floppy or hard drive.

Running the WET Program

Hard disk users should make a subdirectory (MD WET) and copy the program file (WET.EXE) to that subdirectory. Floppy disk drive users can simply insert the program disk into any drive. At the DOS prompt, type "wet". After several introductory screens, the Main Menu will appear. From this point on the program is interactive with the user being prompted to enter commands that direct program flow. The Main Menu offers seven options. Each of these options is discussed below.

Option 1 - Data Input

This option allows the storage of an answer dataset resulting from a wetland evaluation in a file in the current directory. The user is asked to supply a name for the file containing the answer dataset. During the input procedure, the user is prompted to enter an answer for each of the questions answered during the wetland evaluation.

Option 2 - Data Modification

This option allows for the editing of existing answer datasets. The user is prompted for the question to change, and is then prompted for the new answer. Format of the questions follows the Answer Sheet (Form B).

Option 3 - Data Interpretation: Functions and Values

This option allows the user to run the interpretation keys for functions and values. The user is prompted through the different levels of assessment. Probability ratings resulting from the interpretation are stored in a file with the same name as the answer dataset, but with an extension of "val".

Option 4 - Data Interpretation: Habitat Suitability

This option allows the user to run the interpretation keys for habitat suitability. The user is prompted through the different species groups and individual species options. Probability ratings resulting from the interpretation are stored in a file with the same name as the answer dataset, but with an extension of "val".

Option 5 - Display/Print Form D

This option allows the user to display on the screen, or print a hardcopy of, Form D (WET evaluation summary for a particular dataset).

Option 6 - Display/Print Answer Summary

This option allows the user to display on the screen, or print a hardcopy of, Form B (answer sheet) for a particular dataset.

Option 7 - Exit the Wet Program

This option returns the user to DOS.

APPENDIX F: USE OF PREDICTORS IN INTERPRETATION KEYS

Use of Predictors in Interpretation Keys

Below is a list of predictors and the interpretation keys each predictor is used in. Interpretation key codes are given at the end of the list.

1. CLIMATE.
   GWR,GWD,FFAE,S/TRE,S/TRO,NR/TO,PE,AD/A,WD/AB,WD/AM,F,W

2. ACREAGE.
   FFAE,AD/A,WD/AB,WD/AM,F,W,B

3. COMPLEX, CLUSTER, OASIS.
   WD/AB,WD/AM,W

4. LOCATION AND SIZE.
   NR/TO,PE,AD/A,WD/AB,WD/AM,F,W

5. ASSESMENT AREA/WATERSHED RATIO.
   GWD,FFAO,S/TRo,NR/TO,PE,AD/A,F,W

6. LOCAL TOPOGRAPHY.
   GWR,GWD

7. GRADIENT
   SS,S/TRE,NR/TE,PE,AD/A,WD/AB,W

8. INLETS/OUTLETS.
   GWR,GWD,FFAE,S/TRE,S/TRo,NR/TE,NR/TO,PE,AD/A,WD/AB,WD/AM,F,W

9. CONSTRICTION.
   FFAE,S/TRE,NR/TE

10. WETLAND SYSTEM
    GWR,FFAE,FFAO,S/TRe,PE,AD/A,WD/AB,W,B

11. FRINGE WETLAND OR ISLAND
    GWR,GWD,FFAE,PE,AD/A,W

12. VEGETATION CLASS/SUBCLASS (PRIMARY)
    GWD,FFAE,SS,S/TRE,NR/TE,PE,AD/A,WD/AM,F,W

13. VEGETATION CLASS/SUBCLASS (SECONDARY).
    S/TRE,PE,AD/A,W,B

14. ISLANDS.
    WD/AB,W

15. VEGETATION/WATER INTERSPERSION.
    FFAE,SS,S/TRE,PE,AD/A,WD/AB,WD/AM,F,W,B

16. VEGETATION CLASS INTERSPERSION.
    AD/A,WD/AB,WD/AM

17. VEGETAION FORM RICHNESS.
AD/A,WD/AB,WD/AM

18. SHAPE OF UPLAND/WETLAND EDGE.
FFAE,WD/AB,WD/AM,F

19. FETCH/EXPOSURE.
SS,S/TRE,PE,WD/AB,WD/AM,W

20. VEGETATIVE CANOPY.
AD/A,WD/AB,WD/AM,F

21. LAND COVER OF THE WATERSHED.
GWR,GWD,FFAO,S/TRo,NR/TO,AD/A,WD/AB,WD/AM,F,W,B

22. FLOW, GRADIENT, DEPOSITION.
FFAE,SS,S/TRE,PE,F

23. DITCHES/CANALS/CHANNELIZATION/LEVEES.
FFAE,SS,NR/TE,AD/A,WD/AB,WD/AM,F,W

24. SOILS.
GWR,FFAE,FFAO,NR/TE

25. SEDIMENT SOURCES.
SS,S/TRE,S/TRo,AD/A,F

26. NUTRIENT SOURCES.
NR/TE,NR/TO

27. CONTAMINANT SOURCES.
S/TRo,AD/A,WD/AB,F,W

28. DIRECT ALTERATION.
S/TRE,NR/TE,PE,AD/A,WD/AB,WD/AM,W

29. WETLAND/UPLAND EDGE
W

30. DISTURBANCE.
WD/AB,WD/AM,W

31. WATER/VEGETATION PROPORTIONS.
FFAE,SS,S/TRE,PE,AD/A,WD/AB,WD/AM,F,W,B

32. HYDROPERIOD (SPATIALLY DOMINANT).
GWR,GWD,FFAE,AD/A,WD/AM,F,W,B

33. MOST PERMANENT HYDROPERIOD.
GWR,NR/TE,AD/A,WD/AB,F,W

34. WATER LEVEL CONTROL.
GWR,GWD,SS,S/TRE,S/TRo,AD/A,WD/AM,F,W

35. FLOODING EXTENT AND DURATION.
GWR,GWD,FFAE,S/TRE,PE,AD/A,F,W

36. VEGETATED WIDTH.
SS,S/TRE,NR/TE,PE,WD/AB,W

37. OPEN WATER WIDTH.

38. TYPE COMBINATIONS.
WD/AB,WD/AM,W

39. SPECIAL HABITAT FEATURES.
WD/AB,WD/AM

40. BOTTOM WATER TEMPERATURE.
AD/A,F

41. VELOCITY (SPATIALLY DOMINANT).
SS,S/TRE,NR/TE,PE,AD/A,WD/AB,W

42. VELOCITY (SECONDARY)
S/TRE,NR/TE,F,W

43. WATER DEPTH (SPATIALLY DOMINANT).
S/TRE,W

44. WATER DEPTH (SECONDARY).
F,W,B

45. SUBSTRATE TYPE (SPATIALLY DOMINANT).
SS,S/TRE,PE,AD/A,WD/AB,WD/AM,F,W,B

46. PHYSICAL HABITAT INTERSPERSION.
AD/A,W

47. pH.
PE,AD/A,WD/AM,F,W

48. SALINITY AND CONDUCTIVITY.
S/TRE,NR/TE,PE,AD/A,WD/AB,F,W,B

49. AQUATIC HABITAT FEATURES
S/TRE,AD/A,F

50. PLANTS: WATERFOWL VALUE.
WD/AM,W

51. PLANTS: PRODUCTIVITY.
PE

52. FRESHWATER INVERTEBRATE DENSITY.
AD/A,W

53. TIDAL FLAT INVERTEBRATE DENSITY.
AD/A,W,B

54. GROUND WATER MEASUREMENTS.
GWR,GWD

55. SUSPENDED SOLIDS.
S/TRo,PE,AD/A,F

56. DISSOLVED SOLIDS OR ALKALINITY.
PE,AD/A

57. EUTROPHIC CONDITION.
PE,AD/A

58. COLIFORM.

59. WATER QUALITY ANOMALIES.
GWR,GWD

60. WATER TEMPERATURE ANOMALIES.
GWR,GWD

61. DISSOLVED OXYGEN.
F

62. UNDERLYING STRATA.
GWR

63. DISCHARGE DIFFERENTIAL.
GWR

64. SUSPENDED SOLIDS (TSS) DIFFERENTIAL.
S/TRE

GWR = GROUND WATER RECHARGE
GWD = GROUND WATER DISCHARGE
FFAE = FLOODFLOW ALTERATION (effectiveness)
FFAO = FLOODFLOW ALTERATION (opportunity)
SS = SEDIMENT STABILIZATION
S/TRE = SEDIMENT/TOXICANT RETENTION (effectiveness)
S/TRE = SEDIMENT/TOXICANT RETENTION (opportunity)
NR/TE = NUTRIENT REMOVAL/TRANSFORMATION (effectiveness)
NR/TO = NUTRIENT REMOVAL/TRANSFORMATION (opportunity)
PE = PRODUCTION EXPORT
ADA = AD/AUATIC DIVERSITY/ABUNDANCE
WD/AB = WILDLIFE DIVERSITY/ABUNDANCE (BREEDING)
WD/AM = WILDLIFE DIVERSITY/ABUNDANCE (MIGRATION)
WD/AW = WILDLIFE DIVERSITY/ABUNDANCE (WINTERING)
F = FISH SPECIES AND SPECIES GROUPS
W = WATERFOWL SPECIES GROUPS
B = WETLAND-DEPENDENT BIRDS

APPENDIX G: EXTRA DATA FORMS

FORM A: SITE DOCUMENTATION (Page 1 of 2)

Part 1 - Background Information

Evaluation Site: _____ Date: _____

Site Location (Section, Range, and Township): _____

Has the evaluator taken a training course in WET Version 2.0? _____

Agencies/Experts Contacted: _____

Circle the assessment levels to be completed? SS-1 SS-2 E/O-1&2 E/O-3 HS

Is the wetland tidal or nontidal? If the wetland is nontidal, indicate the month(s) that represent wet, dry, and average conditions, or if only average annual condition will be used, give rationale. Also, indicate if the previous 12 months of precipitation has been above, below, or near normal.

_____

_____

Is this evaluation an estimate of past conditions or a prediction of future conditions? (If answer is yes, explain nature and source of predictive data.)

_____

_____

Will alternative ratings be used to evaluate any of the functions or values (if yes, explain)? _____

_____

_____

Part 2 - Identification and Delineation of Evaluation Areas

Sketch a map on the following page, or attach a suitable map (photocopy of topographic map) that shows the following information:

-- Boundaries of the AA, IA, and IZ, and the location of service areas.
-- Watershed boundaries of AA, and service areas.
-- Extent of surface water in the AA during the wet and dry seasons.
-- Open water (channels and pools) within and adjacent to the AA.
-- Normal direction of channel or tidal flow
-- Normal direction of wind-driven waves or current.
-- Impact area(s).
-- Scale of distance and north compass direction.

Explain the procedures used to identify or delineate the AA, IA, IZ, service areas, and the watersheds (if these areas or they differed in the guidelines outlined in Section 2.2).

_____

_____

_____

(continued)

FORM A: SITE DOCUMENTATION (Page 2 of 2)

Part 2 (Cont.)

Estimate the extent of the following areas:

Assessment Area = _____ acres
Impact Area = _____ acres (only if applicable)
Watershed of AA = _____ acres/_____ $miles^2$ (acres x 0.0016 = miles)
Wetlands in AA = _____ acres
Wetlands in the watershed of closest service area = _____ acres
Wetlands and deepwater in the watershed of closest service area =_____ acres

How were locality and region defined for this evaluation? _____
_____
_____
_____
_____

Sketch of Evaluation Areas (or attach map):

FORM B: EVALUATION ANSWER SHEET

Evaluation Site: _____

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 1

3.1.1 "Red Flags"

				Comments/Assumptions
s1.	Y	N	U	
s2.	Y	N	U	
s3.	Y	N	U	
s4.	Y	N	U	
s5.	Y	N	U	
s6.	Y	N	U	

3.1.2 On-site Social Significance

					Comments/Assumptions
s7.	Y	N	U	I	
s8.	Y	N	U	I	

3.1.3 Off-site Social Significance

					Comments					Comments
s9.	Y	N	U	I		s21.	Y	N	U	
s10.	Y	N	U			s22.	Y	N	U	I
s11.	Y	N	U			s23.	Y	N	U	
s12.	Y	N	U			s24.	Y	N	U	
s13.	Y	N	U			s25.	Y	N	U	
s14.	Y	N	U			s26.	Y	N	U	
s15.	Y	N	U	I		s27.	Y	N	U	
s16.	Y	N	U	I		s28.	Y	N	U	
s17.	Y	N	U	I		s29.	Y	N	U	
s18.	Y	N	U	I		s30.	Y	N	U	
s19.	Y	N	U			s31.	Y	N	U	
s20.	Y	N	U							

SOCIAL SIGNIFICANCE EVALUATION - LEVEL 2

Context Region (Circle one)

Standard Density Circle
Locality
Hydrologic Unit

Question #			Comments/Assumptions
1	Y	N	
2	Y	N	
3	Y	N	
4	Y	N	

FORM B (Cont.)

Evaluation Site: _____

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 1 (OFFICE)

	WETLAND CONDITION								COMMENTS/ASSUMPTIONS
Q.#		$\overline{X}$			W			D	
1.1	Y	N							
1.2	Y	N							
1.3	Y	N							
2.1.1	Y	N							
2.1.2	Y	N							
2.1.3	Y	N							
2.2.1	Y	N	I						
2.2.2	Y	N	I						
3.1	Y	N							
3.2	Y	N							
3.3	Y	N							
4.1	Y	N							
4.2A	Y	N							
4.2B	Y	N							
4.2C	Y	N							
4.2D	Y	N							
5.1.1				Y	N				
5.1.2				Y	N				
5.2				Y	N				
6.1	Y	N							
6.2	Y	N							
7	Y	N	I						
8.1	Y	N							
8.2	Y	N							
8.3	Y	N							
8.4	Y	N							
9.1				Y	N				
9.2				Y	N	I			
9.3				Y	N	I			
10A	Y	N							
10B	Y	N							
10C	Y	N							
10D	Y	N							
10E	Y	N							
10F	Y	N							

FORM B (Cont.)

Evaluation Site: _____

Q.#	WETLAND CONDITION $\bar{X}$		W		D		COMMENTS/ASSUMPTIONS
11	Y	N	Y	N	Y	N	
12A	Y	N	Y	N	Y	N	
12Aa	Y	N	Y	N	Y	N	
12Ab	Y	N	Y	N	Y	N	
12Ac	Y	N	Y	N	Y	N	
12Ad	Y	N	Y	N	Y	N	
12Ae	Y	N	Y	N	Y	N	
12B	Y	N	Y	N	Y	N	
12Ba	Y	N	Y	N	Y	N	
12Bb	Y	N	Y	N	Y	N	
12Bc	Y	N	Y	N	Y	N	
12Bd	Y	N	Y	N	Y	N	
12Be	Y	N	Y	N	Y	N	
12C	Y	N	Y	N	Y	N	
12Ca	Y	N	Y	N	Y	N	
12Cb	Y	N	Y	N	Y	N	
12Cc	Y	N	Y	N	Y	N	
12Cd	Y	N	Y	N	Y	N	
12D	Y	N	Y	N	Y	N	
12Da	Y	N	Y	N	Y	N	
12Db	Y	N	Y	N	Y	N	
12E	Y	N	Y	N	Y	N	
13A	Y	N	Y	N	Y	N	
13Aa	Y	N	Y	N	Y	N	
13Ab	Y	N	Y	N	Y	N	
13Ac	Y	N	Y	N	Y	N	
13Ad	Y	N	Y	N	Y	N	
13Ae	Y	N	Y	N	Y	N	
13B	Y	N	Y	N	Y	N	
13Ba	Y	N	Y	N	Y	N	
13Bb	Y	N	Y	N	Y	N	
13Bc	Y	N	Y	N	Y	N	
13Bd	Y	N	Y	N	Y	N	
13Be	Y	N	Y	N	Y	N	
13C	Y	N	Y	N	Y	N	
13Ca	Y	N	Y	N	Y	N	
13Cb	Y	N	Y	N	Y	N	
13Cc	Y	N	Y	N	Y	N	
13Cd	Y	N	Y	N	Y	N	
13D	Y	N	Y	N	Y	N	
13Da	Y	N	Y	N	Y	N	
13Db	Y	N	Y	N	Y	N	
13E	Y	N	Y	N	Y	N	

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#			$\bar{X}$			W			D	
14.1	Y	N		Y	N		Y	N		
14.2	Y	N		Y	N		Y	N		
15.1A	Y	N	I							
15.1B	Y	N	I							
15.1C	Y	N	I							
15.2	Y	N	I							
16A	Y	N		Y	N		Y	N		
16B	Y	N		Y	N		Y	N		
16C	Y	N		Y	N		Y	N		
17	Y	N								
18	Y	N	I							
19.1A	Y	N	I							
19.1B	Y	N	I							
19.2	Y	N	I							
19.3	Y	N	I							
20.1	Y	N	I							
20.2	Y	N	I							
21A	Y	N								
21B	Y	N								
21C	Y	N								
21D	Y	N								
21E	Y	N								
22.1.1	Y	N								
22.1.2	Y	N	I							
22.2	Y	N								
22.3	Y	N	I							
23	Y	N								
24.1	Y	N	I							
24.2	Y	N	I							
24.3	Y	N	I							
24.4	Y	N	I							
24.5	Y	N								
25.1	Y	N								
25.2A	Y	N	I							
25.2B	Y	N	I							
25.3	Y	N								

FORM B (Cont.)

Evaluation Site: _____

Q.#	WETLAND CONDITION $\bar{X}$			W			D			COMMENTS/ASSUMPTIONS
26.1	Y	N								
26.2	Y	N	I							
26.3	Y	N	I							
27.1	Y	N								
27.2	Y	N	I							
27.3	Y	N	I							

EFFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 2 (FIELD)

Q.#	WETLAND CONDITION $\bar{X}$			W			D			COMMENTS/ASSUMPTIONS
28	Y	N								
29.1	Y	N								
29.2	Y	N								
30.	Y	N		Y	N		Y	N		
31.1	Y	N		Y	N		Y	N		
31.2	Y	N		Y	N		Y	N		
31.3	Y	N		Y	N		Y	N		
31.4	Y	N	I	Y	N	I	Y	N	I	
31.5	Y	N		Y	N		Y	N		
31.6A	Y	N		Y	N		Y	N		
31.6B	Y	N		Y	N		Y	N		
31.6C	Y	N		Y	N		Y	N		
31.6D	Y	N		Y	N		Y	N		
31.6E	Y	N		Y	N		Y	N		
32A	Y	N								
32B	Y	N								
32C	Y	N								
32D	Y	N								
32E	Y	N								
32F	Y	N								
32G	Y	N								
32H	Y	N								
32I	Y	N								
32J	Y	N								
32K	Y	N								

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#		$\bar{X}$			W			D		
33A	Y	N								
33B	Y	N								
33C	Y	N								
33D	Y	N								
33E	Y	N								
33F	Y	N								
33G	Y	N								
33H	Y	N								
33I	Y	N								
33J	Y	N								
33K	Y	N								
34.1	Y	N								
34.2	Y	N								
34.3.1	Y	N								
34.3.2	Y	N	I							
35.1	Y	N	I							
35.2	Y	N	I							
36.1.1	Y	N		Y	N		Y	N		
36.1.2	Y	N		Y	N		Y	N		
36.2.1	Y	N		Y	N		Y	N		
36.2.2	Y	N		Y	N		Y	N		
36.2.3	Y	N		Y	N		Y	N		
37	Y	N								
38.1	Y	N								
38.2	Y	N								
38.3	Y	N								
38.4	Y	N								
38.5	Y	N								
38.6	Y	N								
38.7	Y	N								
38.8	Y	N	I							
39	Y	N								
40.1	Y	N	I							
40.2	Y	N	I							
41.1				Y	N	I				
41.2				Y	N	I				

FORM B (Cont.)

Evaluation Site:

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#	X			W			D			
42.1.1	Y	N	I	Y	N	I	Y	N	I	
42.1.2	Y	N	I	Y	N	I	Y	N	I	
42.1.3	Y	N	I	Y	N	I	Y	N	I	
42.2.1	Y	N	I	Y	N	I	Y	N	I	
42.2.2	Y	N	I	Y	N	I	Y	N	I	
42.2.3	Y	N	I	Y	N	I	Y	N	I	
43A	Y	N		Y	N		Y	N		
43B	Y	N		Y	N		Y	N		
43C	Y	N		Y	N		Y	N		
43D	Y	N		Y	N		Y	N		
43E	Y	N		Y	N		Y	N		
43F	Y	N		Y	N		Y	N		
43G	Y	N		Y	N		Y	N		
43H	Y	N		Y	N		Y	N		
43I	Y	N		Y	N		Y	N		
44.1	Y	N		Y	N		Y	N		
44.2	Y	N		Y	N		Y	N		
44.3	Y	N		Y	N		Y	N		
44.4	Y	N		Y	N		Y	N		
44.5	Y	N		Y	N		Y	N		
44.6	Y	N		Y	N		Y	N		
44.7	Y	N		Y	N		Y	N		
44.8	Y	N		Y	N		Y	N		
44.9	Y	N		Y	N		Y	N		
45A	Y	N								
45B	Y	N								
45C	Y	N								
45D	Y	N								
45E	Y	N								
45F	Y	N								
45G	Y	N								
46A	Y	N		Y	N		Y	N		
46B	Y	N		Y	N		Y	N		
46C	Y	N		Y	N		Y	N		
47A	Y	N								
47B	Y	N								
47C	Y	N								

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#	$\bar{X}$			W			D			
48A	Y	N	I	Y	N	I	Y	N	I	
48B	Y	N	I	Y	N	I	Y	N	I	
48C	Y	N	I	Y	N	I	Y	N	I	
48D	Y	N	I	Y	N	I	Y	N	I	
48E	Y	N	I	Y	N	I	Y	N	I	
48F	Y	N	I	Y	N	I	Y	N	I	
49.1.1	Y	N	I	Y	N	I	Y	N	I	
49.1.2	Y	N	I	Y	N	I	Y	N	I	
49.2	Y	N	I	Y	N	I	Y	N	I	
49.3	Y	N	I	Y	N	I	Y	N	I	
50.	Y	N		Y	N		Y	N		

EFFECTIVENESS/OPPORTUNITY EVALUATION - LEVEL 3 (DETAILED DATA)

	WETLAND CONDITION									COMMENTS/ASSUMPTIONS
Q.#	$\bar{X}$			W			D			
51.1	Y	N	U							
51.2	Y	N	U							
52.1	Y	N	I	U						
52.2	Y	N	I	U						
53.1	Y	N	I	U						
53.2	Y	N	I	U						
54	Y	N	U	Y	N	U	Y	N	U	
55.1	Y	N	U							
55.2	Y	N	U							
55.3	Y	N	U							
55.4	Y	N	U							
56.1	Y	N	I	U						
56.2	Y	N	I	U						
57.1	Y	N	U							
57.2	Y	N	U							
58.	Y	N	U							

FORM B (Cont.)

Evaluation Site: _____

	WETLAND CONDITION								COMMENTS/ASSUMPTIONS
Q.#	$\bar{X}$				W			D	
59.1	Y	N	I	U					
59.2	Y	N	I	U					
60	Y	N	U						
61	Y	N	I	U					
62	Y	N	U						
63.1	Y	N	I	U					
63.2	Y	N	I	U					
64					Y	N	I	U	

FORM C: SUPPLEMENTARY OBSERVATIONS

Evaluation Site: _____

Indicate the species, species groups, and activities that are actually observed, reliably reported, or known to occur at the AA on a regular basis.

FISH SPECIES GROUPS*	OBSERVED/REPORTED
1. Warmwater Group	Y or N
2. Coldwater Group	Y or N
3. Northern Lake Group	Y or N
4. Coldwater Riverine Group	Y or N

FISH SPECIES	OBSERVED/REPORTED
_____	Y or N
_____	Y or N
_____	Y or N

WATERFOWL SPECIES GROUPS**	OBSERVED/REPORTED		
	NESTING	MIGRATING	WINTERING
1. Prairie Dabblers	Y or N	Y or N	Y or N
2. Black Duck	Y or N	Y or N	Y or N
3. Wood Duck	Y or N	Y or N	Y or N
4. Common and Red-Breasted Mergansers	Y or N	Y or N	Y or N
5. Hooded Merganser	Y or N	Y or N	Y or N
6. Canvasback, Redhead, Ruddy Duck	Y or N	Y or N	Y or N
7. Ring-necked Duck	Y or N	Y or N	Y or N
8. Greater and Lesser Scaup	Y or N	Y or N	Y or N
9. Common Goldeneye	Y or N	Y or N	Y or N
10. Buffiehead	Y or N	Y or N	Y or N
11. Whistling Ducks	Y or N	Y or N	Y or N
12. Inland Geese	Y or N	Y or N	Y or N
13. Tundra Swan	Y or N	Y or N	Y or N
14. Brant	Y or N	Y or N	Y or N

BIRD SPECIES	OBSERVED/REPORTED
_____	Y or N
_____	Y or N
_____	Y or N

RECREATIONAL ACTIVITIES

Hiking	Sailing	Snowmobiling	Research
Birdwatching	Power Boating	Skiing	Educational Fieldtrips
Photography	Canoeing	Snowshoeing	Horseback Riding
Swimming	Kayaking	Ice Skating	

CONSUMPTIVE ACTIVITIES

Agriculture	Fur Harvesting	Commercial/Sport Fishing	Peat Harvesting
Hunting	Timber Harvest	Natural Food Gathering	Water Supply

* Fish species groups are explained on page 5.
** Waterfowl species groups are explained on page 5.

FORM D: EVALUATION SUMMARY SHEET

Evaluation Site: _____

Wetland Functions and Values

	Social Significance	Effectiveness	Opportunity
Ground Water Recharge			*
Ground Water Discharge			*
Floodflow Alteration			
Sediment Stabilization			*
Sediment/Toxicant Retention			
Nutrient Removal/Transform.			
Production Export	*		*
Wildlife Diversity/Abundance**		*	*
Breeding	*		*
Migration	*		*
Wintering	*		*
Aquatic Diversity/Abundance			*
Uniqueness/Heritage		*	*
Recreation		*	*

Habitat Suitability Evaluation

Fish Species Groups:

_____ Group ___ _____ Group ___ _____ Group ____

Waterfowl Species Groups:

	Breeding	Migration	Wintering
Group _____	___	___	___
Group _____	___	___	___
Group _____	___	___	___
Group _____	___	___	___

Fish, Invertebrate, and Bird Species:

_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___
_____ ___ _____ ___ _____ ___

Levels of assessment completed: S-1 S-2 E/O-1 E/O-2 E/O-3 HS
Evaluation is for the: AA IA (Note: if the evaluation is for an IA, documentation of the AA evaluation must be presented with this evaluation).
Is there any evidence that suggests ratings contrary to the above (explain)?

_____

Were alternative sources used for any of the ratings above (explain)? _____

_____

The loss rate for _____ (identify locality/region) between 19__ and 19__ for _____ (identify wetland type) was _____ (acres/year or % loss).

* WET does not evaluate this function or value in these terms.
** Wildlife Diversity/Abundance assesses only wetland dependent birds. Other wildlife (e.g., game mammals) should be evaluated using other methods.

END

DATE

FILMED

DTIC

4/88