A GUIDE TO CONDUCTING WETLANDS INVENTORIES

WASHINGTON STATE DEPARTMENT OF ECOLOGY

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A GUIDE TO CONDUCTING WETLANDS INVENTORIES

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PREFACE

Since colonial times, over fifty percent of the nation's 215 million acres of wetlands have been destroyed, and between 300,000 and 450,000 acres of wetlands continue to be lost each year (Feieraben and Zelazny, 1987). Similar trends occur in the state of Washington. Many of the state's great estuaries have experienced enormous losses: Sammish - 96.4%, Skagit - 58.6%, Snohomish - 74.4%, Duwamish - 99.2%, and the Puyallup - 100% (Bortleson, 1980).

This continuing loss of wetlands with their functions and values is no longer acceptable on a national or state level. In 1988, the National Wetlands Policy Forum, created to address major policy concerns about the protection and management of wetlands, recommended "the nation establish a national wetlands protection policy to achieve no overall net loss of the nation's remaining wetlands base (as defined by acreage and function) and to restore and create wetlands, where feasible, to increase the quality and quantity of the nation's wetlands resource base" (The Conservation Foundation, 1988). This goal has been adopted by the Puget Sound Water Quality Authority in the 1989 management plan, and has been endorsed by both Governor Booth Gardner and President George Bush.

Effective development, implementation and enforcement of wetland management strategies is critical, especially at the local level. To succeed in protection efforts, each jurisdiction must be able to assess the extent and nature of its wetlands. This is accomplished through wetland inventories.

This book has been written to provide guidance and direction for local wetland inventories and to encourage a minimum level of consistency in the inventory process statewide. It is intended primarily for use by local governments and is written with that audience in mind. However, it can be useful to other parties, such as watershed committees and other citizen groups, interested in wetland inventories. The guide is one of a number of tools that may be used in the responsible management and protection of Washington's wetlands.

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APPENDICES

HOW TO USE THE GUIDEBOOK

In the guidebook, we discuss both planning and conducting a wetland inventory. The inventory process incorporates the use of existing wetland information, maps, and other pre-inventory information with data obtained through field observation.

Written as a "how to" book, the guide is organized in a question and answer format. Each of seven sections covers a question, with the seventh section defining inventory phases and steps. The eighth section details these phases and steps and is arranged to allow easy reference to a specific part of the process. This is especially helpful if you need to reference the guidebook frequently or are using an alternative inventory process.

Because of the need for flexibility in local inventory design, the guide employs a "cook book" approach. You can elect to use multiple options and examples described while incorporating the necessary minimum specifications, which are enclosed in boxes.

The text can be placed in a three-ringed binder so that you can add information pertinent to your particular inventory project.

NOTE: To plan and conduct a wetland inventory, it is important to understand what wetlands are (definition) and why they are important (functions and values). These and other important subjects are not covered in the main body of the guidebook, but please refer to Appendices A-C for brief discussions of these topics.

Acknowledgements

I would like to extend a warm thank you to all of the kind souls that assisted me on this project: Christine Brodmerkel for working so hard on the working draft; Chris Maynard for collecting local inventory cost information; Jane Frost, Brian Lynn, Sue Mauermann, and Mary Burg for reviewing and editing both the working and final draft; Melanie Palmer for providing art work and graphics. An extra big thanks to Mikel McCormick and Shawn Ultican who worked dilegently for many hours on completing layout and design of the final guide.

I would also like to thank the local government representatives that gave me feedback on the "working draft", as well as comments on general inventory issues. Their viewpoints were invaluable.

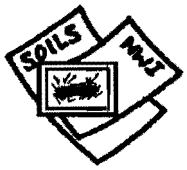
I. WHAT IS A WETLAND INVENTORY?

A wetland inventory is a research effort to collect data about wetlands. Inventories are designed to provide information about the presence, extent, and often, the characteristics of wetlands within a geographic area. In some cases, inventories include data about wetland functions and values or adjacent upland areas.

The Inventory Process

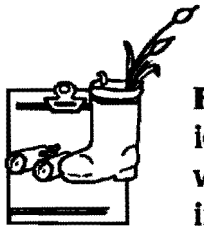
For the purposes of this guide, the inventory process has been divided into five phases:

Phase One. Inventory Planning - clarifying the purpose, goals and scope of the inventory;



Phase Two. Paper Inventory - identifying areas that have been determined through existing information to have a high likelihood of being wetlands; these areas will be placed on field "reconnaissance" maps;

Phase Three. Field Work Preparation - preparing for the field inventory;



Phase Four. Field Inventory - determining if the areas identified during the paper inventory are indeed wetlands, what their boundaries are, and collecting other necessary information; and

Phase Five. Final Products - putting collected wetland information into a useable form.

Each phase has numerous steps, which are outlined in Section VII, "How is an inventory planned and conducted?"

The information gathered during a wetland inventory is organized and presented as inventory products, such as wetland maps. These products are essential tools to help you assess, protect, and manage wetlands. Ideally, the inventory information and products help you to understand an area's wetland resources and minimize impacts to these sensitive lands.

Inventory products range from simple unbound maps to computerized mapping systems with data bases. They include:

- Field data forms and data summaries;
- Final wetland maps - zoning overlays, digitized mapping systems atlases, inventory notebooks, map folios, loose map collections;
- Photo documentation;
- Qualitative and quantitative assessments of wetland characteristics, values, and functions;
- Computerized data bases and mapping systems;
- Statistical analyses of the information gathered; and,
- Inventory reports describing methods and results.

Minimally, inventory products must include final wetland maps illustrating wetland locations and approximate wetland boundaries.

II. HOW ARE WETLAND INVENTORIES USED?

The information gathered and products produced during a wetland inventory can be used in both regulatory and non-regulatory applications by local governments, and interested private entities. In addition, federal and state agencies use inventory information in long range planning and review of site specific impacts to wetlands under their purview.

Non-regulatory Applications of Inventory Information Include:

1. Targeting wetlands for preservation and acquisition, for example, designation as sanctuaries and preserves, education centers, etc.

2. Educating community decision makers, landowners, environmental groups, developers and other interested groups about the wetland resources in their community;

3. Conducting wetland research;

4. Assessing specific functions or values of interest or concern;

5. Alerting investors of land use restrictions affecting sensitive properties; and,

6. Assessing effectiveness of management goals, such as "no net loss."

Regulatory Applications of Inventory Information Include:

1. Developing comprehensive resource management plans;

2. Developing wetland protection strategies including wetland ordinances with rating systems (See Appendix D for a brief description of rating systems);

3. Alerting permit and environmental review staff to projects that may impact wetland resources;

4. Providing information to landowners with sensitive wetland property that may be regulated;

5. Enabling negotiation to avoid wetland impacts early in the project planning process to avoid project revision costs;

6. Responding to violations by providing site-specific predisturbance data on which to base compensation; and,

7. Determining whether the goals of a wetland management program are being met.

III. WHY ARE WETLAND INVENTORIES IMPORTANT?

Wetland inventories and the resulting products, such as wetland maps, are critical to wetland protection efforts. They are a basis for informed decisions about wetlands - both in long range land-use planning and in permit or design review.

Inventories are especially important in a regulatory context. In fact, their most common application is in implementing and enforcing wetland laws. When correlated with property boundaries, inventory maps provide a mechanism by which permit review, environmental review, and resource planning staff are alerted to projects that may impact wetlands.

The necessity of wetland inventories is clearly stated in the pamphlet *Illinois Wetlands Management Program:* "The need for an inventory became apparent when four efforts at wetland protection failed in a 15 year period because too little was known about Illinois' wetlands resources...You can't manage a resource until you know where it is and of what it consists!" (Illinois Department of Conservation.)

Without inventory information, a local jurisdiction enforcing protective regulations is forced to rely on non-professionals to identify wetlands and report illegal activities. Unfortunately these sources are not always reliable:

- O The general citizenry, developer, or in some cases, local government staff are not skilled in identifying wetlands and may not be aware that the project site contains a wetland;
- O A developer or citizen may choose to conceal the presence of a wetland in order to avoid altering the size or scope of the project;
- O Local governments are commonly understaffed, making it impossible to conduct field visits to determine the presence of wetlands at the sites of all projects requiring permits; and,
- O Witnesses to violations do not commonly recognize illegal activities and/or may not be willing to report the violation.

Effective implementation and enforcement of wetland laws can not be accomplished without a basic knowledge of the location and extent of the wetland resource. Without inventory information wetland losses will inevitably continue, despite regulation.

IV. WHO SPONSORS AND CONDUCTS WETLAND INVENTORIES?

Most commonly, wetland inventories are sponsored by federal, state, or local governments. Regional planning entities, such as Hood Canal Coordinating Council and Thurston Regional Planning Council, have also initiated wetland inventories.

On the local level, planning departments usually take the lead in inventory planning, although other departments are often involved. Planning department staff, with the assistance of other involved departments and both state and federal agencies, oversee the entire inventory process, from the conceptual stages to product completion. They work with technical staff to plan field data gathering procedures, and may participate in the actual field work.

Cartographers usually complete the paper inventory, and produce field maps and the final wetland maps. Having specialized skills, they can produce these essential materials both efficiently and accurately.

Technical staff with expertise in biological sciences, especially botany or ecology, soils science and hydrology, conduct the field inventory. Team members develop the field assessment approach, document it in an inventory methodology, and design field data forms. The leader of the field team should be a technical staff member.

Consultants with wetland expertise are sometimes hired to conduct the inventory and/or package the final products.

State and federal agencies provide advice and assistance throughout the inventory process. The Wetlands Section of Ecology's Shorelands and Coastal Zone Management Program offers inventory training sessions as well. Refer to Appendix D for wetland inventory resource contacts.

V. HAVE ANY WETLAND INVENTORIES BEEN COMPLETED IN WASHINGTON STATE?

Federal

Washington's wetlands have been inventoried by the United States Fish and Wildlife Service (FWS) as a part of the National Wetland Inventory Project (NWI). The NWI, initiated in 1979, provides the only wetlands information with a national scope. NWI maps depict locations, approximate boundaries, and classification by wetland type on 1:24,000 (1"= 2,000') USGS topographic quadrangles. (NOTE: The USFWS classification scheme is not a rating system!)

To produce NWI maps, contractors delineate and classify wetland areas by interpreting vegetation, visible hydrology, and geology from high-altitude (1:80,000) color infrared aerial photographs. USFWS conducts limited field studies to confirm their interpretation of particular tones and textures on the photographs. (See Appendix I for more information on NWI)

State

The State of Washington has not conducted a wetlands inventory. However, the Department of Natural Resources, assisted by Ecology, is in the process of designing an inventory in which NWI and other selected data will be placed in a geographic information system (GIS)

Local

Six Washington governments have completed or are conducting wetland inventories in large partions of their jurisdiction. All include field verification of wetlands identified during a paper inventory. These are shown on the top of the next page.

1. King County

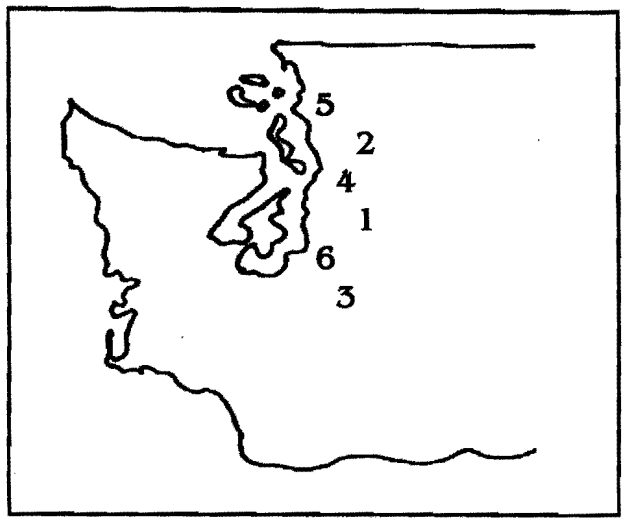
2. Snohomish County

3. Pierce County

4. City of Bellevue

5. City of Bellingham

6. City of Auburn



In addition, inventories covering limited areas or specific wetlands have been conducted in Clallam and Jefferson counties and the City of Renton. The Thurston County Regional Planning Council completed a paper inventory and a limited accuracy study incorporating field analysis for the county. They also completed a paper inventory for the city of Olympia.

Jefferson County and the Hood Canal Coordinating Council organized an inventory in 1988/89 to cover selected watersheds. These are demonstration projects that will be used as a template for future projects in Jefferson, Mason and Kitsap counties.

The amount of area covered in these inventories varies. Few, with the exception of some municipalities, have covered their entire jurisdiction.

Table I "Select Washington Wetland Inventories - At a Glance" provides information about selected inventory efforts. Refer to Appendix E for more detailed descriptions. (Jefferson Co. & HCCC pilot projects are not included in Appendix.) Also, a discussion of inventories conducted by selected states and local governments in Washington is presented in "Wetland Inventories: An Overview" (Granger, 1989.)

We support and encourage these local efforts. They provide products that are: more appropriate for local government use, that can be mapped in relation to property lines, and are usually more accurate than the smaller scale NWI maps.

Table 1 - Selected Washington Wetlands Inventories - At A Glance

	KING	*BELLEVUE*	*SNOHOMISH*	*PIERCE*	*BELLINGHAM*	*AUBURN*
Date	1981 (expanded inventory planned)	1983	1985-ongoing	1987-89	1988	1988-ongoing
Types	P, E	P, L	P, E, R	P	P, E	P
Minimum Sizes (acres)	1.0	.17	.5	.25	.25	unk
Boundary determination	V	V	C	C	V/O	V/M
Data gathered	D	D	I-wetlands D-streams	I	L	D
Collection Process	L	L	I	B	I	L
Completion time (months)	18	unk	36	10	6	3
Area covered (sections) (% of total County/City including federal land)	800 (38%)	30 (100%)	275 (13%)	572 (34%)	19 (82%)	7.3 (37%)
Products	N, M, DB, P, R	S, M, AM/DB	M, DB, SI, P	M	N, M, DB	AM/DB, M
Staff Resources (FTE'S)	9	1	2.5 (staff also responsible for some non-inventory tasks)	1.8	.15	1

CODES:
unk = Unknown

Types: P - palustrine; E - estuarine; R - riverine; L - lacustrine

Data Gathered: D - detailed; I - intermediate; L - limited

Boundary Determination: V/M verified using 3 parameters; V - verified; C - combination verified and unverified; V/O - verified using obligate plants

Collection Process: L - lengthy visit primarily quantitative; I - intermediate quant/qualitative; B - brief visit primarily qualitative

Products: N - notebook; M - maps; R - rating; DB - database (computerized); SI - stream inventory; P - photos; S - summary in sensitive areas notebook; AM - automated mapping

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VI. WHAT ARE SOME OF THE MAJOR ISSUES OF CONCERN?

In planning and conducting a wetland inventory, certain topics must be given special consideration, especially in the context of a regulatory program.

When to Conduct an Inventory

Local governments must decide when to conduct an inventory in relation to the development and implementation of a wetland management program. Should it precede or follow strategy development?

Some jurisdictions in Washington have conducted wetland inventories prior to establishing wetland management programs. Doing an inventory *before* the development of a program plan allows for a management approach based on knowledge of the resource. For example, a small municipality that is developing a wetland management program may not be aware of the location, size, and types of all the wetlands in it's jurisdiction. If a size threshold for exclusion from regulation is being considered; city officials would benefit from knowing approximately what percent of the wetland resource would be excluded from a size limited regulation.

If a management program is already in place, the inventory can be designed to produce the information and products needed to implement it. In this way, jurisdictions are protected from collecting too little or inappropriate information, resulting in products that are not useful. For example, if a jurisdiction has developed a wetland rating system, the inventory could be based on objective data collection methods, enabling inventory information to be used to reliably categorize wetlands by the established rating criteria. Likewise, if a jurisdiction is primarily concerned with protecting a particular wetland value, function, or characteristic (such as hydrology or wildlife habitat) the inventory could focus on collecting information necessary to evaluate that function.

Those jurisdictions without an established program can develop a concept paper or draft outline for a wetland protection strategy acceptable to local decision makers. This concept or outline can be used to guide inventory design and ensure, as much as possible, useable products. Modifications to the strategy, based on inventory results, can be made before it is submitted for final approval.

Appropriate Season for Field Inventory

The time of year to conduct a field inventory is an important consideration. The data collected during the inventory will be influenced by the season in which observations are made. There are optimal seasons for evaluating particular wetland characteristics, functions, and values. For example, the hydrological parameters are best measured in the winter because of the high rainfall, whereas wetland vegetation identification is optimal during the summer season. It is important to be aware of the seasonal limitations of the data collected.

In addition, funding cycles often conflict with optimal field season. Refer to Phase 1, Step 10 for a discussion of time line development.

Scale

Scale is a key factor in the accuracy of any map, including final wetland maps. Scale determines how closely a map depicts the location of features as they appear on the ground. The more area covered by a particular map (small scale), the less detail it can contain. Large scale wetland maps can depict boundaries more realistically, especially in relation to features such as property lines, and are more effective in implementing wetland laws.

According to John Kusler in *Our National Wetland Heritage* (1983), "the argument is often made that wetlands should be mapped in urban areas at scale of 1" = 200' to provide certainty to landowners". 1:12,000 (1"=1,000') and 1:24,000 (1"=2,000') scale maps have limited application for regulatory purposes. Most of the local governments in Washington produce final wetland maps at a large-scale, 1:2,400 (1" = 200') or 1:4,800 (1" = 400'). See Appendix H for a description of the concept of scale.

NOTE: Scale enlargements do not cure basic inaccuracies. In fact, inaccuracies can be compounded during the transfer procedures.

Inclusion and Precision

Because local wetland inventory maps are used during the permitting process to alert staff of projects which impact wetlands, it is critical that they are as inclusive and precise as possible.

Ideally, an inventory should account for all of the wetlands in a geographic area. The more inclusive and precise the maps are, the more effective and credible a regulatory program will be. However, due to the constraints of limited time and resources, 100% inclusion and precision is not practical. Wetland boundaries, as determined during an inventory, are approximate because exact boundary determinations are extremely time consuming. Also, wetlands are dynamic by nature and boundaries may change over time. An inventory will indicate the presence and approximate extent of a wetland on the site, but specific boundary delineation will require further investigations at the project proposal stage. The boundary location should be identified and mapped with enough precision that all properties on which it occurs can be identified.

The inclusiveness and precision of the final wetland maps are dependent upon:

1. The scale and accuracy of information sources used for the paper inventory;

2. The scale of the reconnaissance map used in the field to determine and record boundary lines;

3. Boundary delineation methods and amount of field investigation;

4. The difference in scale between the field maps and final wetland maps;

5. The transfer technique used; and,

6. The accuracy of the base map used for the final wetland maps.

Some Things to Keep In Mind...

- Be aware of gaps in paper inventory information;

- Use large scales to do field mapping;

- Field verify the existence all wetlands and use accepted wetland determination methods;

- Provide enough time to delineate the approximate boundary for the entire wetland;
- Use field maps that are close to the scale of the final wetland maps;
- Use the most accurate transfer technique possible; and,
- Use the most accurate large scale base map possible.

Limitations

The limitations of wetland maps - inclusiveness, boundary precision, limited data collection and others - must be clearly understood by all users of inventory products. Final wetland maps must express a disclaimer as to the possible exclusion of wetlands and the approximate nature of the boundaries. Any data about the characteristics, functions, and values of wetlands must be viewed in the context of the thoroughness of the methods used during the inventory.

Revisions

Because wetlands are dynamic systems and inventory products are approximate, it is important to establish a procedure to incorporate revisions to inventory data. Maps and other inventory products can be revised by incorporating the results of more detailed and accurate site specific project studies. These studies may be completed in response to permit applications or challenges to mapped boundaries.

It is also advisable to re-inventory on a periodic basis. A re-inventory schedule will be dependent on the rate of development in the area and the financial resources of the jurisdiction. Comparisons between original data and updates can provide information on wetland trends.

Consistency Within the Wetland Inventory

To provide accuracy and credibility, inventory staff must evaluate wetlands and interpret wetland features in a consistent manner. To increase consistency and allow reproduction of results, the methods used to conduct the inventory should be documented in a methodology. This inventory methodology can be used for reference during staff training and while conducting the field inventory; at the conclusion of the inventory it can be used to reproduce the data and justify results, if necessary. To further increase consistency in the field inventory, the field team should also learn to judge features in a similar manner by working together for a short time at the beginning of the field inventory.

Funding and Cost

Inventories, especially those which include quantitative assessments of values and functions, can be costly; most local governments cannot afford to fund them independently. Creative funding schemes are usually necessary.

Costs vary with each inventory depending on the geographic area covered, the resources of the local government, the scope of the inventory, and the number of technical staff required. Funds are needed for the salary of existing staff involvement, field team members, and cartographic assistance.

Funds are also needed for materials and equipment, including:

1. Aerial photos;
2. Maps;
3. Bluelines for field maps;
4. Transportation; and,
5. Training.

Overhead expenses such as office space, clerical assistance, computer purchase and use, as well as data base development and data entry, must be financed.

If finances limit the inventory's geographic coverage, you should first inventory wetlands in areas that are under greater development pressure. See Phase One, Steps 3 and 9 for a discussion of funding.

VII. HOW IS AN INVENTORY PLANNED AND CONDUCTED?

Insightful and comprehensive planning is one of the most important components for a successful inventory. The decisions you make at the outset will ultimately determine whether the final products will meet the needs of the jurisdiction and be useful.

The end results should be considered at the beginning of the planning effort. For example consider:

- Wetland information needed to implement your wetland protection strategy;
- How it will be used;
- What inventory products would be most appropriate; and,
- What forms the products should take (for example, maps in the form of a wetland atlas, zoning overlays, or computer mapping?).

The following outline provides the recommended basis for an inventory plan. Some of the steps are dependent upon each other, while others can be completed at the same time. (Each step is discussed in more detail in Section VIII.)

The inventory plan is described as a continuum from the initial planning phase to project completion. However, as a result of limited resources or specific information needs, some jurisdictions may find it necessary to use an alternative, incremental approach. For example, one alternative may involve ending the effort prior to the field work phase and using the resulting products as an interim "working" inventory until more funding can be obtained. In this scenario, the local government must recognize that accuracy and comprehensiveness may be significantly reduced by postponing the field phase. Another example may be completing the inventory over multiple years, prioritizing rapidly developing areas to be inventoried first.

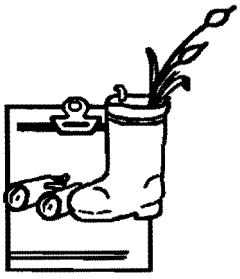
If an alternative approach is chosen, eventual goals should include a field inventory.

Phases of a Successful Inventory

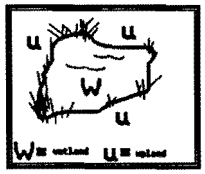
I. Planning

II. Paper Inventory

III. Field Work Preparation



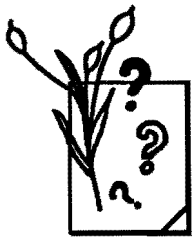
IV. Field Work



V. Final Products

NOTE : This plan does not address inventorying stream corridors, although knowledge of stream resources is also important.

PHASE ONE - INVENTORY PLANNING



Step 1 - Determine the need and solicit support for the inventory.

Step 2 - Designate a project lead.

Step 3 - Research funding options.

Step 4 - Identify information needs of the jurisdiction and decide on products.

Step 5 - Define the purpose and goal(s) of the inventory.

Step 6 - Determine the inventory scope.

Step 7 - Approximate the cost of conducting the inventory.

Step 8 - Obtain funding.

Step 9 - Adjust the scope according to the funding obtained.

Step 10 - Identify time limitations and develop a time line.

Step 11 - Hire a skeleton technical staff to assist with planning the paper and field inventory.

Step 12 - Begin public outreach and education campaign to obtain support and cooperation, and to solicit information about locations of wetlands.

PHASE TWO - PAPER INVENTORY COMPLETION

Step 1 - Determine and collect materials and equipment needed.

Step 2 - Complete paper inventory and produce reconnaissance maps.

PHASE THREE - FIELD WORK PREPARATION

Step 1 - Clarify and document a methodology for conducting field inventory.

Step 2 - Develop and produce field data forms.

Step 3 - Determine your policy for accessing private property.

Step 4 - Determine and collect materials and equipment necessary for field inventory.

Step 5 - Hire the rest of the technical staff needed to conduct field inventory.

Step 6 - Orient and train the technical staff.

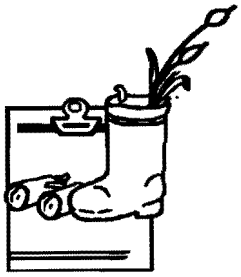
Step 7 - Organize logistics and strategies to cover inventory area.

Step 8 - Divide a large field inventory team into crews and determine the division of labor.

Step 9 - Fill out office section of field data forms.

PHASE FOUR - FIELD INVENTORY COMPLETION

Step 1 - Plan daily work load, review information for planned site visits, and collect necessary maps.



Step 2 - Make observations while enroute to probable wetland sites.

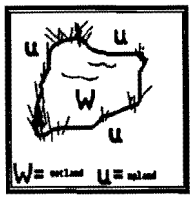
Step 3 - Organize division of work at the wetland site.

Step 4 - Make the appropriate field observations and assessments, recording them on the field data form.

Step 5 - Enter collected information into computer data base, if applicable.

Step 6 - Update public and appropriate agencies of inventory progress.

PHASE FIVE - FINAL PRODUCTS PRODUCTION



Step 1 - Finalize the form and content of the inventory products.

Step 2 - Produce the final products.

Step 3 - Get official approval.

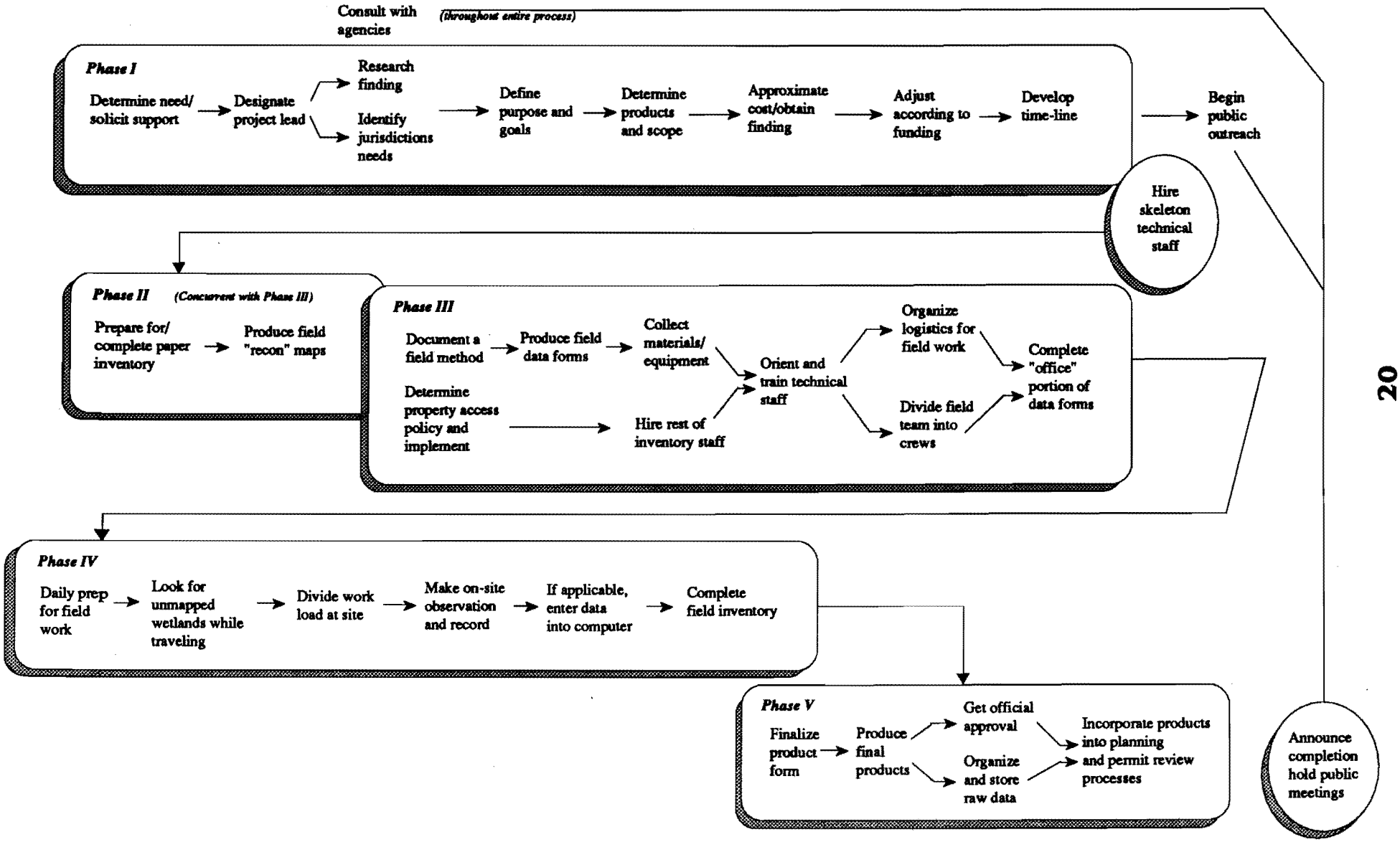
Step 4 - Organize and store raw data.

Step 5 - Announce completion of the inventory and conduct public information meetings.

Step 6 - Incorporate use of the inventory data in the planning process.

NOTE: Table 2 graphically illustrates how these steps can be completed. By inserting dates, this flow chart could be transformed into a time line.

Table 2 - Wetland Inventories: A Phased Approach



VIII. PLANNING AND CONDUCTING AN INVENTORY: THE DETAILS

PHASE ONE - INVENTORY PLANNING

Step 1 - Determine the need for an inventory and solicit support

The necessity of a wetlands inventory to a jurisdiction must be established and solid support for its completion must be obtained before any planning steps are carried out.

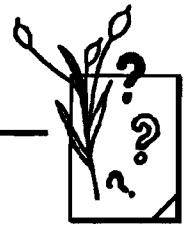
In determining the need and gaining support, it is important to call on interested and affected parties. Support from commissioners and council members is critical; they authorize the project and make key decisions during the initial planning stages. Public support is a must to reinforce the commitment of the governing body. Decision makers and staff from other departments can offer invaluable assistance and guidance in the planning process. It is also beneficial to include federal and state agencies during the introductory and planning phases to create a rapport and get feedback on inventory concepts.

From the outset of the planning process, presentations to these groups can set the stage for the understanding, interest, and support necessary for a successful program. Presentations should cover the importance, purpose, use and limitations of wetland inventories, as well as overview how they can be conducted. This education effort also serves to increase awareness about wetlands and wetland issues and can help staff lay the ground work for future wetland protection efforts.

Local government staff, state and federal agencies and the public should be updated throughout the inventory process.

Step 2 - Designate a project lead

As with any project, it is beneficial to designate one individual to lead the inventory effort. Even if a committee is formed to discuss inventory-related issues, a designated coordinator is essential. Some of the project lead's responsibilities include:



1. Guiding the planning and implementation process;

2. Serving as spokesperson to the local government, with the media, and citizenry;

3. Supervising technical staff, contractors, and any government staff involved in the project; and,

4. Dealing with budgetary responsibilities.

Step 3 - Research funding options

It is important to identify and investigate probable funding sources for the inventory before continuing the planning process. Identify inherent restrictions in monetary resources before defining the goal(s) and scope of the inventory and modify them accordingly.

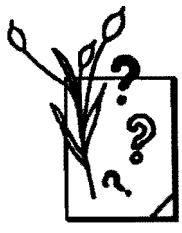
Step 4 - Identify information needs of the jurisdiction and decide on product(s)

In order to design an inventory, you must first identify the information needed to protect wetlands in the jurisdiction. Review the existing wetland protection strategy or design a proposal to identify potential needs. If you don't identify or anticipate these needs, key pieces of information may not be collected and the final products may not be useful.

Also, determine what products should result from the inventory. Data collected during an inventory is often not as useful to local government when in its raw form. It must be organized and presented as a useable product. For example, zoning overlay maps, functions/values summary sheets, or a computer data base may be necessary.

Step 5 - Define the purpose and goals of the inventory

The purpose and goals are the foundation on which the entire inventory is built. Use the information and product needs identified in the previous step to help define them.



The purpose can be limited, (eg. collecting information about specific values and functions that the jurisdiction is interested in protecting), comprehensive, (e.g. collecting detailed site-specific information on all values, functions and characteristics), or something in between.

At a minimum, the purpose should include identification and illustration of the locations and approximate boundaries of wetlands on maps for a defined area.

Some goals the inventory may include:

- O To map as many wetlands as possible in the jurisdiction in a short time;
- O To inventory the entire jurisdiction in phases over several years;
- O To inventory areas of the jurisdiction where wetlands are under more threat;
- O To inventory select areas;
- O To inventory select areas as demonstration projects for a future comprehensive inventory; and/or
- O To use objective (vs. subjective) data collection methods.

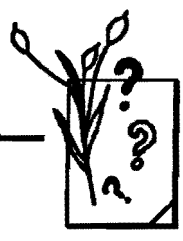
Step 6 - Determine the inventory's scope

The scope of the inventory must be consistent with the purpose and goal(s) and should include:

1. Geographic area to be covered - For example: all areas under the jurisdiction of the local government except remote forested areas and Native American lands, incorporated areas, military facilities.

2. Types of wetlands to be inventoried - For example: All wetland systems except riverine will be inventoried. (Refer to Appendix I for definitions of wetland systems.)

3. Minimum size to be inventoried - For example: any wetland that is equal to or larger than 1/4 acre.



4. General concept of the method for data collection - For example: detailed quantitative data on all functions and values will be collected using a prescribed methodology.

5. Specifics on final products - For example: final maps will consist of approximate wetland boundaries that will be illustrated on assessors maps at 1" = 200'.

6. Strategy for completion - For example: inventory will be completed incrementally, with the rapidly developing areas covered first.

We encourage inventory of all wetland systems without size limitations whenever possible.

Justification for limitations specified in the scope should be documented and included in a final report.

A Case History: the Pierce County Planning Department began conducting a wetland inventory in 1987. The purpose of the inventory was to locate and roughly determine the boundaries of palustrine wetlands. Completed in phases over several months in two consecutive years, the inventory covered a large portion of the unincorporated county. The time frame was relatively short and the resources were limited.

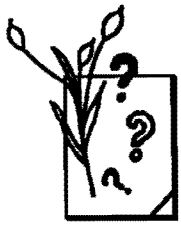
The inventory produced maps that could be used in an overlay system during permit application review, drawing the attention of staff to properties containing wetlands. The scope of this project included:

1. Coverage of a large geographic area, excluding incorporated areas, reservations, and military land;

2. The inclusion of wetlands a quarter acre and larger that were classified as palustrine under the USFWS classification system (riverine if part of a palustrine system);

3. Brief site visits with short qualitative descriptions of site characteristics;

4. Determination of rough wetland boundaries; and,



5. The production of wetland maps, consisting of assessor's maps onto which wetland boundaries were drawn.

In contrast, an inventory by the City of Auburn:

1. Covered a small geographic area;

2. Included a more accurate delineation of wetland boundaries mapping them using both the USFWS and Clean Water Act definition and the standard delineation methodology;

3. Conducted longer site visits using primarily quantitative measures;

4. Produced maps using a computerized mapping system;

5. Collected plant specimens for an herbarium, with samples of dominant plants from inventoried sites; and,

6. Produced a detailed inventory methodology report.

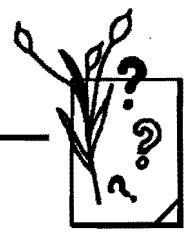
Step 7 - Approximate the cost of conducting the inventory

After you finalize the scope, approximate the cost of the inventory you designed. The cost of conducting an inventory is dependent upon:

1. The scope of the inventory - For example: geographic area included, the number of biologists required, overhead expenses, computer use and development of a data base, type of final product(s), and the time frame involved.

2. The method used to collect information - For example: it takes more time to collect detailed quantitative data and make objective assessments than make qualitative observations and assessments based on best professional judgement.

3. The resources available within the local government - For example: access to aerial photographs on mylar, computers, vehicles for field work, cartographers, maps, and staffing.



Because each inventory varies in scope and products, as well as available resources, making generalizations about cost is difficult. Refer to descriptions of local government inventories in Appendix E for examples of costs.

One way of reducing costs is to recruit qualified interns, work study students, or qualified volunteers to partially staff the inventory team. For example, Washington Conservation Corps personnel participated on the Snohomish County wetland inventory team. Keep in mind that the training and supervision needed for non-professionals can be time consuming. Turn to page 43 for further discussion of the inventory team.

NOTE: Careful exploration of material and equipment resources available in the various local government departments can eliminate unnecessary costs.

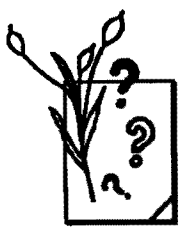
Step 8 - Obtain funding

This is probably the most fundamental step in the inventory process. Options are somewhat limited, and you may have to devise some creative funding combinations to pay for the inventory. Grants, which usually must be supplemented and/or matched by local monies, have been a primary funding source.

The Coastal Zone Management (CZM) grant program, administered by Ecology's Shorelands and Coastal Zone Management Program, has provided funds for most of the inventories in Washington's coastal zone. CZM grants require a funding match from the grantee; the anticipated match for 1990 is 50 percent. The deadline for yearly application is in March.

The Centennial Clean Water Fund (CCWF), also administered by Ecology through the Water Quality Financial Assistance Program, is available to all public entities for water quality related projects. In some cases, wetland inventories may be eligible. The categories most appropriate to wetland projects, Nonpoint and Discretionary, generally require a 25% match. Applications are accepted yearly in January and February. (Refer to Appendix G for Ecology contacts for CZM and CCWF grant applications.)

NOTE: The federal and state grant cycles may not work well with the local government fiscal calendar, in which case, local matching funds must be obtained during two different fiscal years.



Step 9 - Adjust scope according to funding obtained

Once you obtain funding, you may need to modify your goals and/or scope so that inventory costs meet your budget. Be certain that your plan remains true to the purpose and goals after necessary adjustments have been made.

Step 10 - Identify time limitations and develop a time line

Work out a schedule and timeline for completing all of the inventory steps and their associated tasks. A time line illustrates the inventory process, and helps prepare for upcoming steps in a timely manner, as well as keep the project on track.

General factors influencing the schedule and time line include:

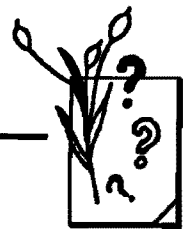
1. Funding calendar;
2. Seasonal restrictions for field work;
3. Scope of the inventory; and,
4. Geographic coverage.

The time line for some funding cycles may conflict with the optimum time to observe plant and animal life (late spring to late fall). It is sometimes possible to extend the time line over the course of multiple grant periods, and apply for grants accordingly.

The time line should be as detailed as possible and indicate when each inventory step will be completed. Factors to consider are:

1. Time needed to solicit support and guidance from local decision-makers and conduct community outreach;
2. Number of staff members involved in organizing the inventory;
3. Number of inventory team members that will be hired;
4. Size of geographic area covered during inventory;
5. Amount and detail of information to be collected;
6. Projected time for data collection in the field;
7. Final preparation of inventory products;
8. Development of computer data base and data entry, if appropriate;
9. Time for official approval and public hearings.

Refer to: "Wetland Inventories: A Phased Approach", on pg.20 for an illustration of the completion sequence of inventory steps.



Step 11 - Hire a skeleton technical staff to assist with planning both the paper and field inventories

At this point, you will benefit by employing technical staff, such as a cartographer and a wetlands ecologist, to help you prepare for the paper and field inventories. Their technical skills can be invaluable in planning and preparation efforts. Having completed field preparation tasks such as developing the field data sheets, the wetlands ecologist can then function as the field inventory team leader.

Step 12 - Begin public outreach and education to obtain support and cooperation from the community

It is important to inform property owners, environmental groups, developers, and other interested parties about the purpose of the inventory and to explain the presence and function of the field team. Identify the jurisdications educational goals and the audience needs and design a strategy to accomodate them. Continue working with state and federal agencies to maintain a working rapport and receive advice.

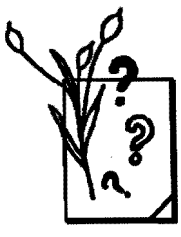
In addition to informing the public about the inventory, you may want to:

1. Enlist public support for the inventory;
2. Educate community members about the characteristics, values, and functions of wetlands as well as their importance;
3. Stimulate interest in wetlands and wetland issues;
4. Develop support for any proposed or existing wetlands protection efforts; and,
5. Use the opportunity to get tips about the location of wetlands on private properties.

Most importantly, an education and outreach effort will make the public more receptive to the inventory team as they become familiar with their activities.

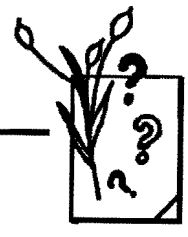
Education efforts can include:

1. Informative talks to local groups and organizations:
2. Newspaper articles and press releases;
3. Advertisements;
4. Open houses and public workshops;
5. Appearances on radio and television talk shows; and,
6. Public involvement activities.



For example, the City of Auburn held more than thirty formal meetings and countless informal ones with agencies, developers, property owners, environmental groups, special interest groups, interested parties and individuals. They developed a mailing list of nearly 600 interested parties which were sent public presentations and hearings notices. Two formal open houses were conducted by staff.

NOTE: The outreach and education effort should continue throughout the inventory process and beyond.



PHASE TWO - PAPER INVENTORY COMPLETION

Step 1 - Determine and collect the materials and equipment needed.

Paper inventories result in reconnaissance maps that guide the field teams. It is important to understand what they are in order to collect the information, materials, and equipment that are needed.

The Paper Inventory

A paper inventory is a compilation of probable wetland locations and boundaries from existing maps and other available information sources. It is completed in the office.

The paper inventory gives direction to the field investigation by identifying areas that have a high probability of being wetlands. Ideally, all land area in a jurisdiction should be investigated for the presence of wetlands, but as mentioned earlier, this approach is cost and resource intensive, and therefore prohibitive. The paper inventory will help focus on areas that are most likely to be wetlands.

The limitations of a paper inventory must be clearly understood. Restricting the field inventory to those areas identified in the paper inventory is cost effective, but wetland areas will be missed. The field inventory team should make every effort during their travels to investigate other areas that appear to have wetland characteristics. For example, the Snohomish County team has discovered numerous wetlands not included in the paper inventory by walking streams. (They are completing a stream inventory in conjunction with the wetland inventory.)

The primary sources for the paper inventory are:

1. Topographic maps;
2. Soils maps indicating hydric (saturated) soils;
3. National Wetlands Inventory (NWI) maps;
4. Stereoscopic interpretation of aerial photographs;
5. Flood hazard maps; and,
6. Data from other studies that may have been completed in your jurisdiction.

(See Appendix J for examples of the maps and photographs listed above.)

Minimally, soils maps (hydric soils) and NWI maps should be used as information sources for the paper inventory.

The hydric soils on soils maps and wetlands on NWI maps are the most reliable sources of information for locating potential wetlands. Hydric soils maps cover the most surface area and are potentially the most inclusive of wetland sites. NWI maps are the most comprehensive data available on wetland resources, both nationally and in the state of Washington.

Reconnaissance Maps

The primary product of the paper inventory is a series of reconnaissance maps. These are base maps on which office wetland information has been compiled. They are carried by the field inventory team and are used to locate wetlands and their boundaries. The field team also uses them to record negations, confirmations, and changes to the existing information according to on-site observations.

To produce reconnaissance maps, a staff person, preferably a cartographer, draws a composite of the wetland boundaries from source maps and stereoscopic interpretation onto a base map. Each wetland boundary should be drawn in a different color, allowing easy distinction between them. For example, the boundary of hydric soils may be drawn as yellow, whereas the NWI boundary may be red. The map maker should also label the names of roads, streams, railroads, and other prominent landmarks on the reconnaissance maps for easier navigation in the field. Refer to Appendix L for an example of a reconnaissance map.

You should choose the largest scale feasible for the base map, making features easier to identify in the field. (Refer to Appendix H for scale.) Wetland boundaries can be drawn more accurately, and the maps will be close in scale to final wetland maps. Refer to Phase 5, Step 1 for a discussion of final wetland maps; the base map used for reconnaissance and the final wetland maps is different.

Blueline reproduction of aerial photographs or orthophotographic maps (Refer to Appendix J) work best as the base for reconnaissance maps. Being photographs, these base maps illustrate features that are identifiable on the ground; they are good for locating wetland areas, navigating to and within them, delineating boundaries, and evaluating wetland characteristics, values, and functions.

There are, however, disadvantages to using either bluelines or orthophotographs. The following factors must be considered when choosing a base map:

1. Orthophotos more accurately represent the location of features as they appear on the ground, because distortions and relief displacements have been optically removed. Bluelines are not corrected;
2. Orthophotos are not usually available at the largest scales, whereas the photos used to produce bluelines often are; and,
3. In order to produce bluelines, you must have access to a diazo printer and mylar copies of aerial photographs.

Some jurisdictions have found it helpful to use two reconnaissance maps:

- A blueline or orthophoto base showing wetlands as indicated on flood hazard maps, topographic maps, and aerial photos; and,
- A NWI map as a base with hydric soils illustrated.

By using two reconnaissance maps, you can reduce the amount of information transfer required for one reconnaissance map. Soils maps are at the same scale as the NWI maps, and transferring wetland boundaries from the soils map onto the NWI is quick and easy. Using two reconnaissance maps in the field, however, can be cumbersome.

The material and equipment needed for a paper inventory and the production of reconnaissance maps includes:

1. NWI maps covering the geographic scope of the inventory;
2. Soils maps covering the geographic scope of the inventory;
3. Orthophotographic maps or blueline copies of aerial photographs covering the geographic scope of the inventory;
4. Topographic maps covering the geographic scope of the inventory;
5. All other wetland information sources, such as Federal Flood Insurance Rate Maps and storm drainage utility maps;

6. Road maps for the inventory area;
7. Colored pencils;
8. Electric eraser for those big errors;
9. Aerial photographs suitable for use as stereo pairs; and,
10. Stereoscope, to see photos in 3-D.

(Appendix J gives a brief description of aerial photographs and stereoscopic photographic interpretation.)

If bluelines are used for reconnaissance maps:

11. Diazo printer;
12. Map paper; and,
13. Mylar prints of large-scale aerial photographs. (Bluelines copies of aerial photos are not available through a state agency.)

Step 2 - Complete paper inventory and produce reconnaissance maps

Once you have determined what is needed to conduct the paper inventory and have collected the materials and equipment, the compilation process can begin. As mentioned earlier, this process is most easily and efficiently completed by a cartographer due to their specialized skills. If hiring a cartographer is not possible, some field staff, trained in photographic interpretation and other procedures, may be hired early to conduct the paper inventory.

To produce a reconnaissance map:

1. Compare the area covered on one blueline or orthophoto map with the same area on each of the information sources that is being used for the paper inventory. If there are wetlands indicated on a source, draw their outlines as close to scale as possible on the reconnaissance map. Use the color that will be coded with that source, e.g. NWI = red. Do the same for all of the sources.

2. Mark the type of soil occurring in the potential wetland, using the code that has been designated on the soils maps.

3. Label roads, streams, and other important landmarks.

4. If two or more staff are involved, each should initial the reconnaissance maps for reference, in case there is a question about a particular map during the field verification.

5. Attach a second clean blueline/orthophoto. The field team can use this clean copy to trace the wetland boundary as originally drawn on the reconnaissance map. This redrawn boundary will provide a clear illustration for transfer to the final wetland maps.

Optimally, staff should complete the reconnaissance maps before field work begins. If that is not possible, they should certainly keep reconnaissance map-production well ahead of the progress of the field team.

PHASE THREE - FIELD WORK PREPARATION

Step 1 - Clarify and document a methodology for conducting the field inventory

A wetland field inventory methodology documents the materials, equipment, and methods used to:

1. Identify the existence of a wetland;
2. Determine approximate wetland boundaries;
3. Evaluate various wetland features, characteristics, classification, and values and functions that have been determined to be of interest; and,
4. Identify priorities when time is limited.

A methodology can be simple guidelines used consistently by team members or it can involve quantitative and technical procedures. (Appendix M includes examples of three methodologies.)

Minimally, the local wetland inventory methodology must describe how the presence of a wetland and the location of its boundary are determined during the inventory.

The methodology is used for reference both during and after the inventory. During, it is used by each field team members to make observations and collect wetland information in a consistent manner. After inventory completion, it provides the background information necessary for interested parties and inventory product users to understand the process used for data collection and any limitations of the data.

Because of their expertise in methods of field data collection, the ecologist hired at the end of Phase 1 should have primary responsibility for developing the methodology. Ecology and other state and federal agencies can provide valuable assistance in the development of a methodology.

Design the methodology prior to starting field work and, if necessary, revise it during the first week or so of field testing. To ensure consistency from beginning to end, limit modifications to the early stages of the field inventory.

Wetland Identification and Delineation Methodology

You should use the Fish and Wildlife Service (FWS) definition of wetlands for inventory purposes and base your wetland determination methodology on the Federal Manual for Identification and Delineation of Jurisdictional Wetlands (Ferderal Interagency Committee for Wetland Determination, 1989)

The FWS definition was developed for the National Wetlands Inventory and includes both vegetated and unvegetated wetlands whereas other definitions used for jurisdictional purposes require the presence of vegetation under normal circumstnaces. See Appendix A for a discussion of definitions.

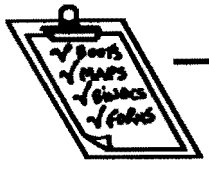
The FWS has not published a wetland determination methodology for inventories. However, the FWS, Soil Conservation Service (SCS), Army Corps of Engineers (CE), and the Environmental Protection Agency (EPA) have negotiated a unified methodology for identifying and delineating vegetated wetlands for regualtory purposes. You should build your field inventory methodology around this approach.

The purpose of the Federal method is to provide users with mandatory technical criteria, field indicators and other information to determine if an area is a jurisdictional wetland, and to delineate it's upper boundary.

It provides a logical, technical, and easily defensible basis for wetland determinations. The method examines the presence of three parameters for wetland determinations - hydric soils, hydrophytic (water tolerant) vegetation, and wetland hydrology, placing a heavy emphasis on hydric soils and wetland hydrology. A series of steps determines the presence of these parameters and ultimately leads to a wetland determination.

The methodology employs three levels of evaluation, depending upon wetland size and the complexity of the area or project being planned: routine, intermediate, and complex. The "routine" level is the simplest application; the evaluator identifies plant communities and assesses each for the presence of the wetland parameters.

In the "broad brush approach" to wetland inventories, even the routine process is fairly time consuming (it includes digging soil pits in each area with distinct plant communities). For inventory purposes, the methodology can be modified and simplified somewhat while retaining it's basic approach, although any modifications should be reviewed by Ecology or another



appropriate state or federal agency. In areas that are confusing or questionable, the 'routine' federal method should be used to make the wetland determination.

Some jurisdictions, such as municipalities, may chose to apply the federal methodology in its standard form. For example, the City of Auburn delineated approximate wetland boundaries using a three parameter approach. In this case, the field team should use the "routine" level of evaluation.

NOTE: For regulatory determinations and project review, wetlands should be evaluated using the unmodified federal methodology.

Wetland Plant List

The federal methodology uses the list of wetland plant species compiled for the National Wetlands Inventory to determine whether a plant is hydrophytic vegetation. The list categorizes various plant species according to their frequency of occurrence in wetlands, i.e. their indicator status. It should be used as the standard reference in determining the presence of hydrophytic vegetation. Refer to Appendix N for a list of the indicator status categories and a sample page from the *1986 Wetland Plant List Northwest Region,* (Reed et al. 1986).

Wetland Classification System

If the inventory scope includes wetland classification, you should use the U.S. Fish and Wildlife Service (USFWS) system (Cowardin, et. al. 1979) in the inventory methodology. The USFWS classification scheme is used to characterize wetlands by federal agencies, including the USFWS National Wetland Inventory (NWI) Project, state and local governments, and the private sector.

This classification describes ecological taxa of wetlands, arranged in a system useful for mapping, and provides uniformity on a nationwide basis. It divides wetlands into a hierarchy of wetland habitats (see Appendix I). The highest level in the hierarchy includes the following systems: 1) marine 2) estuarine 3) riverine 4) lacustrine and 5) palustrine.

The classification further divides these systems into ten subsystems. For example, lacustrine is divided into limnetic and littoral subsystems. Within the subsystems are classes based on vegetation, substrate, and flooding regime. Examples of classes include forested wetland, emergent wetland, and rocky shore. The lowest level in the hierarchy is subclass/dominance type, which is named for the dominant plant or animal forms.

Different modifying terms may also be applied to the classes and subclasses in the USFWS system, but are not necessary for a basic classification of a wetland.

The standard application of the USFWS classification system by all local inventories will ensure that the data gathered during the inventory can be used by all levels of government and the private sector, and in conjunction with NWI project information.

Step 2 - Develop and produce field data form(s)

Field data forms should be designed so that the field team can record wetland data in a standardized manner. Field data forms increase consistency in collecting and recording information - an important requirement in conducting an inventory. The forms must be concise and logical, cover all the information that will be collected, and be easy to use in the field, as well as to decipher in the office. It should be organized into at least two sections:

1. Office data - information that can be determined in the office such as wetland size, soils, and location; and,

2. Field data - information to be gathered in the field.

The data form can also include categories related to specific features such as wildlife habitat, hydrology features, vegetation, classification, soils, human impacts, surrounding upland, etc. To simplify completion and save time, these categories need to be clearly labeled and displayed as checklists, schematic illustrations, and/or circling options. The designer should minimize the amount of information recorded in long hand.

Because of their expertise, the field inventory team leader should be primarily responsible for data form design. He/she should complete the design prior to formation of the field inventory team, enabling its use during orientation and training exercises.

A field data form can include the following:

General information:
* date
* time begin/end
* name of observer/team
* weather
* size

Wetland identification:
* a unique identifying number for each wetland and corresponding map
* local name if appropriate
* location (include section/township/range, street name)
* names and phone numbers of land owner(s)
* access point

Wetland Characterization:
* classification
* soils
* hydrologic characteristics
* checklist of plant and animal species
* habitat features
* rare or endangered species
* cultural and aesthetic features
* environmental problems and human manipulations
* dominant vegetation/plant communities or associations
* surrounding upland characteristics
* wetland shape
* comments

Sketch:
* grid for drawing to scale
* physical features such as buildings, beaver dams, snags, islands, water impoundment areas, and human impacts
* wetland boundaries

Summary Paragraph:
* short narrative characterization of the wetland

Minimally, include the following on a data form:
1) Location of the wetland;
2) A unique identifying wetland/map number;
3) The day and time of the field visit;
4) The members of the verification team; and,
5) A list of the indicators used to identify the wetland and determine the boundary.

Prior to designing the field data sheet, determine whether a computer data base will be used to store the data. If so, the data base design should be in place so that the field data form can be formatted with the computer data base in mind.

Ideally, the data form should fit on 8 1/2 x 11 or 8 1/2 x 14 sheets of paper, which can be carried into the field on a clipboard and be easily reproduced. If you print the data sheet on water proof paper, it will be more durable in the field, but it will be much more costly.

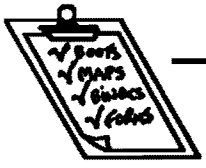
Some jurisdictions have developed numerous sheets for different situations. For example, if an area was determined not to be a wetland, justification was recorded on a short form. Refer to Appendix O for examples of field data forms.

If the data form is extensive, the field team may need a significant amount of time to complete it. In some cases, depending on the size, accessibility, and complexity of the wetland, filling out the data form may take as much as twice the time it takes to make the observations.

In order to provide consistency throughout the inventory, any changes in the field form should be completed in the first few weeks of the field verification.

Step 3 - Determine your policy for accessing private property

Field team members must have access to private property to make observations. A policy must be established well in advance of the work. You may want legal assistance concerning this issue.



When the policy requires landowners' permission, access to private property can be obtained by:

- O Mailing notifications to all property owners in inventory areas;
- O Mailing notifications exclusively to owners of property(s) the inventory team will need to access; and/or,
- O Requesting permission on-site.

NOTE : When requesting permission on-site, courtesy is paramount.

In all cases provide the phone number of a local government contact who will be available to answer questions and record denials to trespass. If you plan on requesting permission in advance, contact property owners early to allow adequate response time.

Each member of the field verification team should carry an official form of identification into the field, as well as a letter signed by the supervisor explaining the inventory and its purpose. (See Appendix P for an example of an identification letter.) The letter should provide the landowner with a name and phone number of a contact person they can call for more information.

Step 4 - Determine and collect necessary materials and equipment for field inventory

Specific materials and pieces of equipment will be necessary to conduct the field portion of the inventory. Collect them well in advance of the inventory team's arrival so you can eliminate delays due to inadequate supplies.

Office and transportation needs include:

1. Office space;
2. Access to copy equipment;
3. Transportation to and from the field;
4. Access to or payment system for fuel;
5. Planimeter or dot grid (used to measure wetland acreage);
6. Key to flora of the Pacific Northwest;
7. Rulers/scale;
8. Refrigerator space (for preservation of plants for keying); and,
9. If a data base will be used, a computer.

When in the field, each team member should carry items in the personal equipment list. Members should distribute the collective equipment between them.

Personal Equipment:

Compass
Walking staff
Hand lens
USGS topographic maps (copy)
Pencils (mechanical .7mm lead)
Data forms
Blank waterproof paper for notes
Plant sample bags
Binoculars
Pocket knife
Watch
Water/food
Fluorescent vest
Personal identification

Collective Equipment:

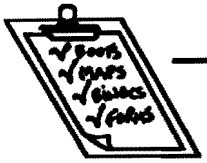
Plant ID books
Bird field guide
Reconnaissance maps
Road maps
Clipboard with plastic covering
Camera, film
100' tape measure
First aid kit per team
Spare vehicle key
Map scale
First aid/bee sting kit
Guide to mammals & tracks
Road maps
Letter of identification
Munsel Soil Color Chart
Soil shovel

Individual team members must provide some of the items such as a pocket knife and watch; the local government must provide many of the others. Each member should carry a backpack with personal items, food and water for the day.

Team members must be prepared for inclement weather by wearing appropriate clothing (using the layer method), and rain gear. Even though wetlands will rarely be in remote areas, team members should carry emergency equipment such as a first-aid kit, sun block, spare vehicle key, matches, and flashlights. They should consider comfort and safety, and take sunglasses, bug repellant, dry socks, fluorescent vests, and walking staffs into the field. (If the walking staff is marked in inches, it can be used to measure, as well as a probe for secure footing).

Appropriate Clothing:

Hat
Rain gear
Quick drying layered clothing (wool during cool weather)
Hip boots/rubber boots
Bandana
Extra socks



Step 5 - Hire the rest of the technical staff needed to conduct the field inventory

To allow adequate time for orientation and training, hire the technical staff that will make up the field team in advance of initiating the field inventory.

During the field inventory, the field team will be responsible for:

1. Locating wetlands identified and mapped on reconnaissance maps during the paper inventory;
2. Confirming the area as either wetland or upland;
3. Determining the approximate boundary;
4. Drawing the boundary on the reconnaissance map;
5. Collecting any other information and making wetland evaluations according to the inventory scope and methodology; and,
6. Recording observations on the field data form.

Because of the nature of the data gathered during the field inventory, the team should consist of professionals with strong backgrounds in environmental or biological sciences, preferably wetland ecology or botany. A working knowledge of soils and hydrology and experience in conducting field surveys is desirable. They should have good observation and recording skills, be familiar with identification of Northwest plant and animal species, and be able to read maps.

The size of the team will vary depending on the financial resources of the project, the extent of the area to be inventoried, the detail of information gathered, and the time frame involved. Due to safety precautions, no team member should ever go into the field alone.

You may benefit from including one or more members of the planning (or other) department staff on the field team; their expertise in assessing cultural values can enhance the evaluation, and membership on the team will familiarize them with wetland evaluation techniques for future project review.

Although the field team should be staffed primarily by professionals, you can supplement it with qualified volunteers, interns, work study students, or other non-professionals. With the biologists in leadership roles, these individuals can assist with on-site observations.

At least one inventory biologist must be present at each site evaluation.

Recruit non-professionals from the ranks of:

- Environmental, biology, zoology, geology and similar programs at local colleges and universities;
- Environmental groups such as Audubon societies, Sierra Club chapters, and Native Plant societies whose membership have expertise in biological sciences; and/or,
- Non-affiliated individuals in the community that have expertise in the biological sciences.

You should carefully examine both the benefits and detriments of enlisting volunteers from the general public. The benefits include controlling costs, providing valuable education, and encouraging community involvement which may well result in a base of understanding and support for wetland protection efforts. The detriments involve limited availability, extensive coordination, logistical problems, credibility, volunteer burnout, dependability and liability issues, and in many cases, the need for and investment in extensive training for non-staff members.

Step 6 - Orient and Train the Technical Staff

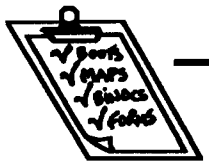
Orientation and training sessions are critical to making wetland determinations. They elevate the accuracy of data gathering and consistency of response among the field team members.

Orientation

You should conduct a general orientation to the project, describing it's purpose, goal and scope. If a technical staff member(s) was hired earlier in the inventory process, staff organizers may want to involve or relinquish responsibility for conducting the orientation to the technical lead.

We suggest you include the following topics in the field team orientation:

1. The purpose of the inventory;
2. The scope, goals and expectations;
3. Important procedures and policies;
4. The time line;



5. Roles of project coordinator and other staff;
6. Who is available to address problems, questions, and advice;
7. Methods, materials, and field data forms;
8. Conduct in the field; and,
9. Safety and first aid.

Although it may be safe to presume that the field team members will use common courtesy when encountering citizens in the field, we suggest you set up conduct guidelines. The field team should apply these guidelines in the occasional situations where they deal with skeptical property owners. Maintaining favorable relations with the public is dependent on courteous conduct. (See Appendix Q for an example of a Code of Conduct.)

In addition, training in basic first aid and cardiopulmonary resuscitation (CPR) procedures is critical and ensures that the team is prepared for life threatening emergences. The Red Cross and local fire departments will conduct private CPR/first aid classes.

Technical Training in Wetland Evaluation

Under it's technical assistance program, Ecology offers workshops for local governments on how to conduct wetland inventories, make wetland determinations, and evaluate wetlands. Ecology also offers guidance in organizing orientation sessions.

Ecology workshops are between 2-4 days in length, depending on the scope of the inventory, the methodology developed, and the skills of the participants. Workshops are tailored to meet the needs of the inventory and inventory team when necessary.

During the typical workshop, Ecology staff, and when possible, staff from other agencies who are skilled in wetland assessment, cover the following topics:

1. Wetland identification and boundary delineation;
2. Wetland value and functions assessment;
3. Aerial photographic interpretation;
4. Endangered species recognition;
5. Plant identification; and,
6. Wetland classification.

They supplement classroom presentations and lab exercises with opportunities to practice these skills in the field. Both professionals and non-professionals assisting with the inventory should attend the technical training sessions.

Other state and federal agencies sometimes offer assistance and training in wetland determination and evaluation. See Appendix G for a list of resource contacts.

In order to apply wetland identification and evaluation techniques accurately and consistently in the field, the team must become proficient at them. To complete their training, the team should visit a few wetland sites together before the field verification officially begins. During the first week, the team should work together to further tackle any application problems and calibrate their observation techniques to ensure consistency when working separately. Refinements of the field data sheet are best addressed during this time.

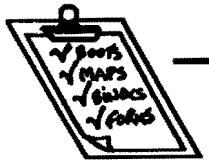
STEP 7 - Organize logistics and strategies to cover inventory area

A systematic approach to the field inventory is necessary to ensure that all wetlands in the targeted areas are investigated and that transportation logistics are simplified. The field team should divide the geographic area to be inventoried into manageable units. A commonly used unit is the stream drainage basin. We recommend the basin/sub-basin because it is a topographical, hydrological, and an ecological unit.

It is not practical to use common grid systems as inventory units. Section boundaries, for example, are artificial lines on a map that assist legal determinations, but have no relation to the natural systems on the ground.

These lines often divide wetlands into parts, with each part appearing in a different section. If field crews are assigned to areas on the basis of section lines, portions of the same wetland system may be evaluated by different crews. Assigning crews by drainage basin ensures each wetland system will be inventoried as an intact unit.

You may want to consider adopting the same geographic units used during other field surveys that have been conducted by the jurisdiction to allow for easy integration of information.



Inventory units should be prioritized to ensure that areas of most concern, such as high threat areas, are covered first.

Inventory units located in rapidly developing areas should be top priority because of the high rate of wetland degradation that occurs in these areas.

In addition to designing a systematic approach, the movements of the team members must be discussed and planned on a daily basis.

STEP 8 - Divide the field inventory team into crews and determine the division of labor

If the field inventory team is composed of four or more individuals, it should be divided into crews that work independently. Independent crews can cover larger portions of the inventory area in a shorter period of time than one large team.

A coordinator or crew leader can be designated for each crew. Although most decisions in the field can be made by consensus, one member of the team should have the authority to make final decisions and be ultimately responsible for:

1. Talking with property owners on the site;
2. Completing inventory tasks;
3. Monitoring quality control; and,
4. Ensuring consistency in application of the methodology and field interpretation.

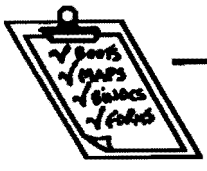
They should be available for consultation on field observations, and be on the look-out for of potential safety hazards. The crew leader must be one of the inventory team biologists.

STEP 9 - Fill out office section of field data forms

The "office" portion of the data sheet can be filled out before the team leaves for the field. If the information needed is substantial, office staff should be responsible for completing this portion of the data sheet. Specifics, such as wetland location, are usually available from existing maps and other accumulated data.

Wetland size is usually a part of the "office" portion, being determined by the use of a planimeter or dot grid. It should not, however, be permanently recorded on the data form until **after** the field crew has confirmed the approximate boundary.

This section can be completed on a daily or weekly basis during the field inventory.



PHASE FOUR - FIELD INVENTORY COMPLETION

STEP 1 - Plan daily work load, review information for planned site visits, and collect necessary maps

Begin each field day with a brief team discussion concerning the division of the work load, questions or problems that may have arisen during the previous field day, and comparing notes on wetland assessment. Depleted supplies should be replaced on a regular basis.

Divide workloads between crews according to roads and creeks within basins/sub-basins. These are easily identified landmarks on both maps and the ground, and many wetlands (not all) are located near creeks and streams.

Do not divide the workload so that a wetland is split between two crews.

The field team should collect reconnaissance maps, road maps, and/or photos of the areas to be inventoried on that day and review them. They should note any significant features, identify logistical problems, and locate potential access points. A scan of the entire targeted area for the day can decrease frustrating logistical problems in the field. During this exercise, the crews can also identify wetlands that extend onto numerous maps and ensure that specific wetlands are inventoried as units, not in parts.

Once the equipment and maps have been collected, the information reviewed, and a plan made, the crews are ready for data collection at wetland sites.

NOTE: It is best to intersperse field days with occassional days in the office to catch up on paperwork, identify plants, collect supplies, and deal with unanticipated problems.

STEP 2 - Make observations while enroute to wetland sites

While driving the roads, following the drainages, and confirming the existence of paper-inventoried wetlands, the field crews should scan the landscape to identify and investigate any probable wetland areas that weren't identified during the paper inventory. The field crews should add these "new" wetlands to the inventory. Filling in gaps in existing information is an important function of the inventory effort.

STEP 3 - Organize division of work at the wetland site

Field work at the wetland site must be organized efficiently, considering the nature of the wetland and the abilities of the crew. Wetland evaluation tasks can be divided between crew members in a number of different ways:

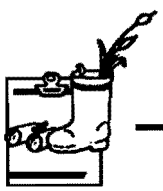
1. The field crew could make all observations and conclusions as a team, using their combined expertise;

2. Each member could specialize in specific areas (e.g. botany) or in particular procedures, (e.g. making assessments of wetland boundary, wildlife habitat, and hydrology), and be responsible for evaluating that specialty for all wetlands visited; and,

3. If the wetland is large, the crew could divide it up into segments, each crew member evaluating their segment for all information needed.

Regardless of the number of members in each crew, it is often helpful to have one person record and organize raw data as field notes, while the other members make observations and verbally relay them. The notes can then be used to complete the field data form. If the crew consists of two individuals, these roles can be rotated site-by-site.

Crew members should stay at least within shouting distance of each other for safety and communication purposes. When the crew is visually separated, landmarks that are distinguishable on aerial photos, such as prominent trees or clearings, should be established as rendezvous points. These points will also serve for general orientation in the wetland.



STEP 4 - Make the appropriate field observations and assessments

On-site, the crew must make the observations and collect data as required in the scope, described in the methodology, and detailed on the field data form. If the crews split up, each member will need a reconnaissance map and field data forms.

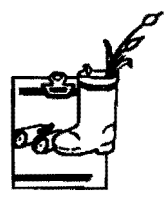
The minimal observations that must be made and recorded are the indicators used to identify the area as a wetland and determine its boundary.

Although data collection techniques vary somewhat between field biologists, crew members can record their observations concerning wetland characteristics and features (such as species, human disturbances, adjacent land uses, hydrology, and buffer widths) in the form of running field notes jotted and/or sketched on the reconnaissance map. The crew members should make notes on the map in close proximity to the area being described or draw a line from the notes to the appropriate section. The reconnaissance maps can then be used as future reference if any questions arise.

The field crews may have to budget field time. If a wetland is too large to survey completely in the time available, they may be able to traverse the center to characterize it. They could use photo interpretation in the field to assist in assessing inaccessible portions. Establish priorities so that the crew has a solid basis for decisions about how to spend their time.

You should make wetland identification and boundary delineation top priority.

We recommend that, if at all possible, the field crews determine the classification of the wetland. This characterization is an important tool in policy decisions. "What kind is it?" is one of the first questions asked about a wetland.



Although the federal methodology for making wetland determinations has been discussed briefly on pages 36 and 37, this guide is not intended to describe these methods in detail. This subject, as well as technique in evaluating wetland functions, values, and characteristics are discussed during Ecology sponsored workshops, as well in a number of references. (See Bibliography.)

Following the completion of the wetland evaluation, crew members should record their observations on a single data form. We recommend they redraw the wetland boundary, as confirmed on site, on the attached clean blueline/ orthophoto. In some cases the confirmed boundary will not be very different from the boundary found on existing maps, while in others it will be significantly different.

The field crew should complete the data form and redraw the final approximate boundary at the site or soon after leaving - while memories are fresh.

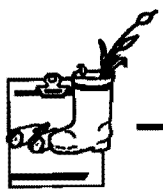
The wetland, its corresponding data form, and reconnaissance map should be given an identification number if one was not already assigned.

Time required

Don't underestimate the time it takes to make wetland determinations and assessments, complete the field data form, and sketch the boundaries on the maps. The crew may spend from 20 minutes to several days evaluating a single wetland and completing paper work. The amount of time spent on each wetland site will vary on the basis of the inventory scope, such as the type and detail of information being collected, the size, complexity, and accessibility of individual wetlands, and the time available to the crew for field evaluation.

Impacts to the wetland by crews

It is important to minimize impacts to the wetland while inventorying it. Crews should be as quiet as possible in order to decrease wildlife disturbance. They should also be mindful that many wetland plants are fragile and may die if severely trampled.



Plant collection

The field crews should not collect plant specimens unless:

1. A species must be identified using detailed keys which are too cumbersome for field work;
2. An herbarium is planned as permanent evidence in defense of wetland determinations;
3. There is an abundance of the species in question; and
4. The plant is not an endangered, threatened, or sensitive species.

Every attempt should be made to identify species in the field, so that wetland vegetation is not destroyed. If specimens do have to be collected, the entire plant should be removed and placed in an inflated plastic zip-lock sample bag. Two specimens may be needed if it is necessary to consult a university herbarium. A label noting the collector, habitat description, site, name and number of the wetland, and date should be attached. (Refer to Appendix R for a sample label.) Some wetland plants can be stored under refrigeration for short periods of time while awaiting identification.

Safety hazards

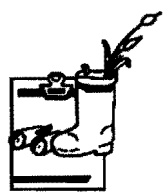
Although injury in the field is uncommon, it is important to recognize safety hazards and prepare for and avoid them whenever possible. There are four primary ways to deal with safety issues:

1. Carry an adequate first aid kit;
2. Be prepared for the weather;
3. Be alert; and,
4. Use common sense.

Some of the hazards that may be encountered include:

Overexposure to the sun - Severe sunburn, eye strain, and heat exhaustion could result if precautions such as wearing sun block, sun glasses, and a brimmed hat are not taken.

Insect bites - The outdoors provides habitat for many species of biting and stinging insects. Team members may choose to wear insect repellent, especially if they are sensitive to insect bites. Stinging insects such as



hornets and yellow jackets live in vegetation and downed logs. Each team member should look for signs of activity and avoid those areas. Team members with allergies to stings should carry a bee sting kit at all times.

Unsure footing - Dense vegetation often grows in mats, tussocks, and dense stands. Thin spots and holes in the mat, areas between tussocks, and tangled vegetation make walking precarious. Mishaps can result in twisted ankles and wet clothing. Field crews can use a walking stick to probe vegetation to help determine secure footing.

Poor visibility - Wetland vegetation often makes it difficult to see obstacles and distinguish shapes and forms, especially from a distance. Wearing a fluorescent vest ensures visibility.

Hypothermia - The combination of wet conditions and cool temperatures can result in hypothermia. Prevent hypothermia by wearing layers of clothing (wool in the spring and fall) and being aware of the symptoms. Know the appropriate actions to take in the event that hypothermia occurs.

Injury from falls - Wearing a hard hat can prevent head injuries resulting from falls.

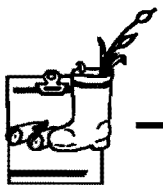
Scratches and abrasions - The dense woody vegetation and thorny plants often associated with wetlands or their surrounding uplands can cause painful scratches on exposed arms. Wearing long sleeves and long pants is advisable under these conditions.

STEP 5 - Enter data in the computer

If the data collected during the inventory will be computerized, it can be entered as it is completed by the field inventory team. Coordinating data entry and field work will prevent a work load build-up at the end of the field inventory. In addition, the inventory team will still be available for questions about the data.

STEP 6 - Update the public, local government personnel and decision makers, and appropriate agencies

At the completion of the field inventory portion of the project, update key groups and agencies on the progress of the inventory effort.



PHASE FIVE - PRODUCE FINAL PRODUCTS

STEP 1 - Finalize the form and content of final inventory products

Before you can produce inventory products, you must finalize the form and content of each. The form is important because it determines:

1. How much information will be available;
2. How easily the information can be interpreted;
3. How much the final products will cost; and,
4. How easily they can be used in the daily business conducted by the local government.

When making decisions about the design and content of inventory products, you must consider the specific uses and users. Staff from departments other than the planning office (eg. public works, the assessor's office) will refer to the wetland inventory products for different purposes. Try to accommodate their needs as well.

If the products, such as maps and/or summaries, are difficult to interpret and use on an everyday basis they may not be referred to as often as needed.

Wetland summary sheets

The raw data recorded on the field data forms is most useful for office application when summarized on a separate form. The type of information, amount of detail, and layout on the form should reflect what will be needed in the office.

Items that have been included on summary sheets are:

1. Individual wetland number (same as the number corresponding to the field data sheet and reconnaissance map for that wetland);
2. Location;
3. Acreage;
4. Classification;
5. Written description/summary of the wetland and it values and functions;
6. A list of plant and animal species observed on site; and,
7. Wetland rating.

(Examples of office summary sheets are included in Appendix S.)

Computerized summaries are an option if a data base is being used.

Computer data base

Storing data on field data forms or summary sheets can be cumbersome on a daily basis - which may discourage its use. A computer data base provides easy access to large amounts of information. It is very useful for compiling and analyzing statistics such as total number of wetland acreage, abundance and scarcity of wetland types, threatened areas, monitoring wetland losses, and can be organized by the legal descriptions of section, township, and range. Therefore, we recommend placing the site information in a user-friendly data base. Data bases commonly in use for inventory purposes are the Statistical Analysis System (SAS), Geographic Information System (GIS), and R-Base.

As mentioned earlier, you should address the issue of computer data bases and designs early in the inventory development process and in conjunction with the design of field data sheets.

Final wetland maps

The wetland boundaries determined in the field must be transferred to base maps in order to produce the final wetland maps. The type of base needed for the final maps is usually different from the one used for reconnaissance maps. Some local governments find it beneficial to transfer wetland boundaries onto a map that indicates property boundaries, such as assessor's maps. The wetland maps can then easily be used to identify property ownership of specific parcels.

The type of map and the scale selected for the final map base is often the same used for other large-scale local government maps, such as zoning maps. Others have incorporated their wetland maps into a transparent overlay system with other resource maps. They use the overlay system for quick identification of sensitive areas and parcels which contain features regulated under local regulations. Other jurisdictions have digitized mapping systems.

We recommend using the large-scale maps commonly used by local governments such as 1:4,800 (1" = 400') or 1:2,400 (1" = 200'). For regulatory purposes, large-scale maps are imperative because they are usually more accurate than small scales.

Maps must have:
- **A legend with directional coordinates;**
- **Sectional lines;**
- **Date of delineation;**
- **Wetland name;**
- **An identification number; and,**
- **A disclaimer.**

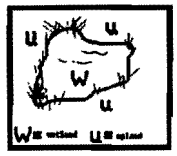
(See Appendix T for examples of final wetland maps.)

In addition to the large-scale maps, it is useful to compile an area-wide wetland map in order to have a general overview of wetlands in the jurisdiction.

Final Report

The final report provides inventory information that can be distributed to interested citizens and groups, other local governments, and state and federal agencies. Inventory results, analyses, and conclusions should be presented, as well as the organization and implementation of the inventory, and the methods and materials used. Suggested topics include:

1. Rationale for the inventory;
2. History and development of the inventory;
3. Justification for planning decisions:
4. The inventory team;
5. The training process;
6. Methodology used;
7. Map showing areas surveyed;
8. Record of acreage inventoried and percent of jurisdiction covered;
9. Sample field data sheets, maps, office data forms, and final wet land maps;
10. Results and conclusions; and
11. Breakdown of costs for each phase.



STEP 2 - Produce the final products

Local government staff or contractors usually produce the final products planned during the initial inventory phase. Of the all the inventory products, it is imperative that the wetland maps be produced by professionals and be as accurate as possible. Map accuracy is not only dependent upon field work, but also on the accuracy of the base map itself and the process and precision of boundary delineation on the base map. Therefore, it is important to carefully consider how the transfer will be made and who will execute it.

Map Transfer process

You can use a variety of processes to transfer boundaries from one map to another, as well as from one scale to another. Appendix T briefly describes some transfer techniques. Using a zoom transfer scope is the most accurate. However, few local governments have access to this expensive piece of equipment. The pantograph method is relatively crude but is generally more accurate than other options described in the Appendix.

Map Transfer Execution

Whether completed in house or through a consultant, we highly recommend enlisting a cartographer to draft the final wetland maps. A professional cartographer will usually provide higher accuracy and increased efficiency.

Allow for adequate time for map production; it may take up to 6 months or more.

Other products

The project lead or inventory team leader should write the final report. Anyone with the appropriate skills can produce the other inventory products (e.g. setting up the computer data base requires specific skills whereas data entry can be completed any staff person).

STEP 3 - Get official approval

Official adoption of the final wetland maps by the appropriate local governing body (such as the city council or county commissioners) is required before they can be used in an official capacity. This process will require a public review period and public hearings, which can be time consuming.

STEP 4 - Organize and store raw data

Organize and store the original data recorded on field data forms and reconnaissance maps so that they are easy to access (e.g. filed according to section, township, and range).

STEP 5 - Announce completion of inventory and conduct information meetings

At the conclusion of the inventory process, you should announce its completion through press releases, as well as open houses or workshops to display the products, discuss results, and thank property owners and the public for their cooperation during the inventory.

STEP 6 - Incorporate use of inventory products in the planning and permit review process

Wetland inventory products are only of benefit to a jurisdiction if they are actively used in the planning and permit review process. In order to facilitate their use, staff should become familiar with the products and have them easily accessible. A system or procedure should be established to incorporate consistent review of the products during development review. Access to this information should be made readily available to the public, especially interested landowners.

ACRONYMS and ABBREVIATIONS

Acronym or Abbreviation	Agency or other
COE	Army Corps of Engineers
CPR	Cardiopulmonary Resuscitation
CZM	Coastal Zone Management
DNR	Washington State Department of Natural Resources
WDW	Washington State Department of Wildlife
ECOLOGY	Washington State Department of Ecology
EPA	Environmental Protection Agency
NWI	National Wetland Inventory
PSWQA	Puget Sound Water Quality Authority
PSWQMP	Puget Sound Water Quality Management Plan
SCS	Soil Conservation Service
SMA	Shoreline Management Act
topo	topographic map
USFWS	United States Fish and Wildlife Service
USGS	United State Geological Service
WCC	Washington Conservation Corps

Glossary of Terms

base map - a map on which map information, such as boundaries, is superimposed, transferred, or compiled. For example, a USGS topographic map is the base map for the NWI maps.

blueline - blue tone copies of aerial photographs made from aerial photographs on transparent mylar using a diazo printer.

boundary delineation - to draw a line around; in the case of a wetland, to determine the boundary.

buffer - a vegetated area established or managed to protect wetlands from human impacts.

data base - a set of information stored in computer memory.

determination - the act of making or arriving at a decision; in the case of wetlands boundaries, making a decision about the location of the boundary.

diazo printer - equipment used to reproduce drawings or maps prepared on transparent media using exposure of light-sensitive paper to ultraviolet light and ammonia vapors. They appear as positive images on a white background with dark lines (blue, black, or brown).

drainage basin - a topographically defined area which includes all the land area which drains into a body of water. In other words, rain falling inside the boundary of the drainage area will drain toward the body of water.

ecological taxa - classification according to ecological principles.

emergent - a plant that grows rooted in shallow water the bulk of which emerges from the water and stands vertically. Usually applied to non-woody vegetation.

emergent wetland - in USFWS classification system (Cowardin, et al. 1979), a wetland characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens.

field data form - in the case of wetland inventories, a form used to record site-specific wetland information, most of which is collected at a wetland site.

field inventory - the process of locating, identifying, and evaluating wetlands in the field, including delineating their boundaries, guided by information gathered from existing information sources.

field verification - verifying the presence of a wetland and its boundary on site.

forested wetland - in USFWS classification system (Cowardin, et al. 1979), a welted characterized by woody vegetation that is 6 m tall or taller.

hand lens - hand-held magnifying device used to observe small features such as flower parts.

herbaceous - with the characteristics of an herb; a plant with no persistent woody stem above ground.

herbarium - a collection of dried plants mounted and labeled for use in scientific examination.

hydric soil - a soil that in its undrained condition is saturated, flooded, or ponded long enough during growing season to develop an anaerobic conditions that favor the growth and regeneration of hydrophytic (wetland) vegetation.

hydrology - the properties, distribution and circulation of water. Wetland hydrology is the total of all wetness characteristics in areas that are inundated or have saturated soils for a sufficient duration to support hydrophytic vegetation.

hydrophyte - any plant growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

hydrophytic vegetation - see hydrophyte.

hypothermia - abnormally low body temperature.

in association - in the case of wetlands, to have influence or be influenced by in terms of water flow and other functions and values of wetlands.

indicator - in "1986 Wetland Plant List" (Reed, et al. 1986), the frequency of occurrence in wetland versus nonwetland across the entire distribution of the species, or in the case of a regional indicator, the frequency of occurrence in wetlands versus nonwetlands in the region.

lacustrine - in USFWS classification system (Cowardin, et al. 1979), freshwater (< 0.5 parts per thousand ocean derived salts) area with all of the following characteristics: (1) situated in a topographic depression or a dammed river channel; (2) has less than 30% coverage of trees, shrubs, persistent emergents, mosses or lichens; and (3) total area exceeds 20 acres. For areas less than 20 acres, an area is considered lacustrine if it has an active wave-formed or bedrock shoreline or is deeper than 6.6 feet in the deepest part.

marine - in USFWS classification system (Cowardin, et al. 1979), system consisting of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 parts per thousand, with little or no dilution except outside the mouths of estuaries. Shallow coastal indentations or bays without appreciable freshwater inflow, and coasts with exposed rocky islands that provide the mainland with little or no shelter form wind and waves, are also considered part of the marine system because they generally support typical marine biota.

methodology - a system of procedures followed to accomplish a given task, e.g. identify wetlands, delineate boundaries, and assess wetland characteristics.

mitigation - avoiding, reducing, moderating, an/or compensating for the environmental impacts of an action.

orthophoto - a photo reproduction that has been corrected for tilt, topographic displacement, and sometimes camera lens distortion.

palustrine - in USFWS classification system (Cowardin, et al. 1979), freshwater (,0.5 parts per thousand ocean derived salts) area dominated by trees, shrubs, persistent emergents, mosses or lichens. They can be non-tidal or tidal. Palustrine also includes wetlands lacking this vegetation, but has the following characteristics: (1) area less than 8 ha (20 acres); (2) no active wave-formed or bedrock shoreline; (3) water depth in the deepest part is less than 6.6 ft. at low water.

pantograph - a mechanical device used to transfer scale. It is relatively cumbersome and slow.

paper inventory - the process of identifying and locating wetlands and their boundaries in the office using existing maps and information.

persistent emergents - emergents which remain standing at least until the beginning of the next growing season.

plant indicator categories - indicators used in the National List of Plant Species that Occur in Wetlands: 1988 Washington to reflect the range of estimated probabilities (expressed as a frequency of occurrence) of a species occurring in wetland versus nonwetlands in the region. Indicator categories include:

- obligate wetland (obl) - occur almost always (estimated probability >99%) under natural conditions in wetlands.
- facultative wetland (FACW) - usually occur in wetlands (estimated probability 67%-99%), but occasionally found in nonwetlands.
- facultative (FAC) - equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%).
- facultative upland (FACU) - usually occur in nonwetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).
- obligate upland (UPL) - occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the region specified. If a species does no occur in wetlands in any region, it is not on the National List.

reconnaissance maps - maps on which wetland information gathered during the paper inventory is compiled. They are used by the field inventory team to locate and evaluate a wetland in the field.

riverine - in USFWS classification system (Cowardin et al. 1979), freshwater (<0.5 parts per thousand ocean derived salts) areas that are contained within a channel and which are not dominated by trees, shrubs, and persistent emergents, for example rivers and streams.

scale - an expression of a distance on the map to distance on the earth ratio with the distance on the map always expressed as unity.

stereopairs - a pair of aerial photographs consisting of two adjacent, overlapping photos in the same flight line. The stereoscopic view is seen only in the portion of the photos which overlaps. A minimum of 50 percent overlap is necessary for complete stereoscopic viewing.

stereoscope - binocular optical instrument that helps us view two properly oriented photographs to obtain the mental impression of a three-dimensional model.

stereoscopy - use of binocular vision to achieve three-dimensional effects. Stereoscopic vision enables us to view an object simultaneously from two different perspectives to obtain the mental impression of a three-dimensional model.

upland - an area characterized by plants which do not tolerate saturated or inundated soil conditions during a significant period of the growing season. Examples of upland plants include Douglas fir, ponderosa pine, blackberry, snowberry, sword fern, and velvet grass.

watershed - drainage basin.

wetland - transitional lands between terrestrial and aquatic systems, where the water table is usually at or near the surface or the land is covered by shallow water...Wetlands must have one or more of the following attributes:

1. at least periodically, the land supports predominantly hydrophytes,
2. the substrate is predominantly undrained hydric soil, and
3. the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year.

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Wetland Definitions

Several wetland definitions have been used by federal and state agencies for various laws, regulations, and programs. The following are the primary definitions that are applied in Washington State:

Section 404 of the CLEAN WATER ACT - "The term `wetlands' means 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. Wetland generally include swamps, marshes, bogs and similar areas."

Food Security Act of 1985 - "Wetlands are defined as areas that have a predominance of hydric soils and that are inundated or saturated by surface or ground water at a frrequency and duration sufficient to support, and under normal circumstances do support, a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions, except lands in Alaska identified as haveing a high potential for agricultural development and a predominance of premafrost soils."

USFWS - "Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water...Wetlands must have one or more of the following attributes: (1) at least periodically, the land supports predominantly hydrophytes, (2) the substrate is predominantly undrained hydric soil, and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

SHORELINE MANAGEMENT ACT - "Wetlands" or "wetland areas" means those lands extending landward for two hundred feet in all directions as measured on a horizontal plane from the ordinary high water mark; floodways and contiguous floodplain areas landward two hundred feet from such floodways; and all marshes, bogs, swamps, and river deltas associated with the streams, lakes, and tidal waters which are subject to the provisions of this chapter; the same to be designated as to location by the Department of Ecology; Provided, that any county or city may determine that portion of a one-hundred-year-floodplain to be included in its master program as long as such

portion includes, as a minimum, the floodway and the adjacent land extending landward two hundred feet therefrom."

The Clean Water Act definition is the regualtory definition used by Environmental Protection Agency and Corps Of Army Engineers. It emphasizes hydrology, vegetation, and saturated soils. This definition of wetlands does not cover non-vegetated wetands, such as mufiats, coral reefs, etc. which are treated as special aquatic sites under Section 404. The Food and Security Act's definition is used by the Soil Conservation Service in assessing farmer eligibility for benefits under "Swampbuster's". It specifies hydrology, hydrophytic vegetation, and hydric soils, using hydric soils criteria to determine if an area has a predominance of hydric soils. The Fish and Wildlife Service developed their definition in a wetland classification system for conducting the National Wetland Inventory. It includes both vegetated and nonvegetated wetlands, e.g. mud fiats, sand bars, etc. The classification system also defines deep water habitats such as estuarine and marine aquatic beds. In the State of Washington, the USFWS definition has been incorporated into the regulations which implement the Washington State Shorline Management Act of 1971, which protects certain shorelines of the state and their associated wetlands.

The primary difference between the definitions is that the USFWS is inclusive of vegetated and nonvegetated areas while the other three federal agency definitions include only areas that are vegetated under normal circumstances. Except for the exclusion of nonvegetated wetlands and the SCS exemption for Alaska, by including three basic elements for identifying wetlands - hydrology, vegetation, and soils - all of these definitions are conceptually the same.

For the purpose of conducting a wetland inventory, all wetland inventories in the State of Washington should use the USFWS definition. All areas that function as a wetland should be mapped, even if they aren't regulated. Local governments must know the location of the entire resource, not a portion of it. Also, the standard use of the USFWS definition for wetland inventories will provide consistency between all local inventories, as well as the NWI.

NOTE: Use of the USFWS definition for an inventory does not preclude the use of other definitions in the management and regulation of wetlands.

Wetland Values and Functions

It is important that those involved in wetland regulation and management understand their functions and values. Knowledge of these roles can be a key factor in the design and implementation of wetland inventories. Not all wetlands provide each function or value nor do they provide them to the same degree. Variations occur because of wetland type and characteristics, as well as regional and local influences. Some local governments try to distinquish how functions and values relate to their community and region. There are numerous detailed descriptions of functions and values available (see Selected Bibliography). The following is a brief summary:

Water Supply

With the growth of urban centers and dwindling water supplies, wetlands are increasingly important as a source of surface and ground water. They can function as recharge areas where water soaks into the soils, replenishing ground water supplies. Wetlands are also areas where ground water moves to the surface through springs and seepage, often collecting in pools and ponds, and supplying critical reserves during periods of drought.

Flood Control

Wetlands are valuable in reducing the impact of flooding. They have the ability to store and slow the flow of water from upland run-off. If a wetland is associated with a river in a flat valley, the wetland and its vegetation reduces the height and velocity of flood peaks. Some wetland soils can store large amounts of floodwater and gradually release them downstream. Construction in flood plain wetlands causes increased flood heights and rates, and an associated increase in flood damage.

Erosion Control

Vegetated wetlands serve as natural buffers from the effects of tides, waves, wind and river currents. They dissipate the energy of these erosive forces. The fibrous root systems of wetland plants bind and stabilize banks,

protecting the shoreline from erosion. On the coast, they can limit wave generation, slow and absorb the impacts of wave energy, and thereby protect inland areas from storm damage. Construction of bulkheads, rip-rap, and other bank hardening stabilization techniques simply transfer the erosive energy to neighboring areas.

Pollution and Sediment Control

Wetlands protect and improve the quality of surface and ground waters by removing sediments, nutrients, heavy metals, and hazardous chemicals. Wetland vegetation filters particulate matter from the water. When moving water comes into contact with vegetation, its flow is slowed and sediment falls out of suspension. The root systems trap the sediment, reducing siltation in downstream water bodies. Substances such as nutrients, pathogens, and many chemicals are often bound to the surface of sediment particles. Thus, sedimentation reduces both organic and inorganic pollutants. These pollutants may be released when wetland soils are disturbed. Wetland vascular plants and algae also absorb nutrients and chemicals. The micro-organisms utilize dissolved nutrients and break down organic matter. Research is underway to determine the feasibility of utilizing wetlands for stormwater treatment and to determine the impacts of utilizing wetlands as tertiary waste treatment facilities.

Wildlife Habitat

Wetlands, the interface between land and water, are among the richest wildlife habitats in the world. They provide the conditions essential for the breeding, nesting, feeding, and protection for many species of waterfowl, mammals, reptiles, and amphibians. These conditions include abundant water, diverse and rich vegetation, and adequate cover. Many of these species are "obligates" or dependent upon the wetland for their survival. Some such as the beaver spend their entire lifetimes in the wetland environment. Others like the salmon inhabit it for shorter, but critical, parts of their lifecycle. Numerous species (such as deer and raccoon) depend on wetlands as a source of drinking water, food, and winter cover. Wetlands are as critical to the needs of these species as they are to those that depend solely on wetland habitat. Though many waterfowl nest primarily in northern freshwater wetlands, they use wetlands through out the country while migrating and for over-wintering. Birds such as herons, egrets, rails and harriers depend upon wetlands for their survival.

Both salt and freshwater wetlands are important spawning, nursery, feeding, and wintering areas for sport and commercial fish and shellfish.

Wetlands also support many endangered plant and animal species. Although wetlands constitute only 5 per cent of the nation's lands, close to 35 per cent of all rare and endangered animal species are dependent upon them. (McMillan, A. 1986)

Food Web Productivity

Wetlands play an important part in the food web. Coastal wetlands are among the most productive areas in the world. Solar energy is utilized by wetland plants to produce hundreds of pounds of nutrients per acre of salt marsh annually. The vegetation dies, decays, and is broken down to form a nutrient-rich "soup" called detritus. This rich food source is converted by micro-organisms into basic nutrients and elements for use by vascular plants and phytoplankton (minute floating plant life). The phytoplankton are consumed by zooplankton (minute floating animal life). The detritus and planktons are carried into tidal creeks, and bays and are consumed by invertebrates such as oysters, shrimp and crabs. They in turn are preyed upon by other animals including humans. It has been estimated that 90 per cent of the important commercial marine species either spend their entire lives in estuarine wetlands or require estuaries as nursery grounds (Kusler, J. 1983). Freshwater wetlands also provide food, habitat, and spawning grounds for many other species of fish.

Education and Research

Coastal and inland wetlands provide unique opportunities for education and scientific research. Due to the land-water interface, diversity of vegetation, topography, and the resulting varied habitats, wetlands are ideal for studying plant and animal life. Because ecological relationships are easily observed, they are excellent locations for teaching environmental science. The complex ecological relationships of wetland systems make them valuable areas for scientific research as well.

Recreation and Aesthetic Values

Wetlands are areas not only of great diversity but also of great beauty. They provide open space and contrast for both visual and recreational enjoyment, especially valuable in urban areas. Visitors include photographers, bird watchers, hikers, boaters, hunters, fishers and natural history enthusiasts. Appreciation and use of wetlands as a recreational resource is steadily increasing on both a national and state-wide basis. Nationally, wetland-dependant waterfowl are hunted by over 2 million hunters. Nisqually National Wildlife Refuge, near Olympia, Washington has had a 300 per cent increase in visitor use since 1977. (McMillan, A. 1986)

Wetland Protection Efforts

Federal, state, and local governments have instituted policies, management plans, and laws to regulate activities associated with wetlands in an effort to minimize harmful impacts.

On the federal level: Wetlands are regulated through the permit and certification processes of Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and the Coastal Zone Management Act.

In the state of Washington: there is no comprehensive protection for wetlands. However, the Shoreline Management Act (SMA - Chapter 90.58 RCW) specifically identifies wetlands as natural resources requiring special protection, thereby recognizing their fragile nature. The Act was designed to prohibit piecemeal development of shorelines and their associated wetlands. In addition, the State Environmental Policies Act (Chapter 43.21 C RCW) allows local and state agencies to require and review environmental impact statements for projects involving wetland areas. The State Hydraulic Code (RCW 75.20.100), administered by the departments of Wildlife and Fisheries, also has jurisdiction over wetlands important to fish life.

A detailed description of the federal and state laws that address wetland protection are provided in Department of Ecology publication number 88-5, "Wetland Regulations Guidebook".

In Puget Sound Basin: The Puget Sound Water Quality Authority has addressed wetland protection as one of the elements necessary for clean up and pollution prevention in the Sound. In the 1989 Puget Sound Water Quality Management Plan, the Authority directs the State of Washington's departments of Ecology and Natural Resources (DNR), with the assistance of other state agencies, to implement wetland protection in the Puget Sound Basin through a preservation and a regulatory management program.

In these programs, Ecology will identify the "most important" wetlands in Puget Sound Basin and place them on a preservation list. DNR will secure these sites for preservation in perpetuity as funds allow. In the regulatory

element, Ecology will provide local governments with guidelines to develop and implement wetland protection programs.

At the local level, a few municipal and county governments have already adopted sensitive areas ordinances and zoning ordinances which address wetland protection. However, many local governments don't have actual wetland laws. Some municipal and county governments regulate wetlands indirectly through various ordinances dealing with activities such as grading and clearing, sewage treatment, and flood plain management.

WETLAND RATING SYSTEMS

Wetlands perform a number of functions and have values that are of benefit to society. However, wetlands vary widely in character as well as in their ability to perform those functions. When used in a regulatory scheme, wetland rating systems attempt to differentiate wetlands and apply varying degrees of protection based on specific characteristics or functions.

DEFINITION:
A wetland management strategy that differentiates wetlands by assigning a degree of importance to a wetland based on specific characteristics or functions.

PURPOSE:
To apply levels of protection to a wetland based on its value or sensitivity (e.g. variable standards for permitted uses, buffers, and mitigation)

EXAMPLES OF RATING SYSTEMS IN WASHINGTON:

City of Bellevue Natural Determinants Ordinance

Type A - All wetlands related by surface hydrology to a Type A or B riparian corridor;
Type B - Wetlands with an area exceeding 7200 sq ft which have no hydrological relationship to a Type A or B riparian corridor;
Type C - Wetlands with an area of less than 7200 sq ft which have no hydrologic relationship to a Type A or B riparian corridor.

A wetland is considered to be related to surface hydrology of a riparian corridor if the stream passes through the wetland or if there is a surface flow path evident between the stream and the wetland. A stream is also related to the wetland if the wetland serves as a source for sustaining the base flow in the stream.

A Type A riparian corridor has an established flood plain on FEMA maps or is a reach which scores 40 or less on the city's watercourse inventory. It includes the most significant streams in Bellevue and the corridors are measured from the top of each stream bank and extend away from the stream on

each side for fifty feet. Type B riparian corridors are the rest of the streams and they are measured from the top of each stream bank and extend away from the stream on each side a distance of 25 feet.

Island County Zoning Ordinance

Category A:

1. The wetland is not a Category C wetland, is not regulated by the Shoreline Management Act, and is one-fourth of an acre or greater in size and meets the following:
2. Presence of a protected species or of an outstanding potential habitat for a protected species; or
3. Adjacent to an anadromous fish-bearing stream; or
4. Exhibits near equal proportions of open water to vegetated cover in interspersed patches in combination with 5 or more wetland sub-classes*; or
5. Wetlands that can be shown by a preponderance of evidence to contribute to groundwater recharge; or
6. Any sphagnum bog.

*please refer to Appendix G for further explanation of the USFWS classification system (Cowardin et. al.)

Category B:

1. The wetland does not meet the criteria for Category A or Category C and is one acre or greater in size; or
2. The wetland is a marsh, bog or swamp subject to the provisions of the Shoreline Management Act.

Category C:

1. Artificial wetlands intentionally created from non- wetland areas, including ponds created for agricultural or aquacultural uses, except for wetlands created for mitigation.

King County Sensitive Areas Ordinance

Number 1 or Unique/Outstanding #1:

1. Presence of species recognized by the federal government or State of Washington as endangered, threatened, or sensitive or outstanding potential habitat for those species;

2. Wetlands greater than 5 acres in size and having 40% to 60% open water at any time with 2 or more subclasses of vegetation in a dispersed pattern;
3. Wetlands greater than 10 acres in size and having 3 or more wetland classes, one of which is open water; or
4. The presence of plant associations of infrequent occurrence. These include estuaries and bogs.

Number 2 or Significant #2:
1. Wetlands greater than 1 acre in size and having 2 or more wetland classes;
2. Wetlands less than or equal to 1 acre in size and having 3 or more wetland classes;
3. Wetlands greater than 2 acres in size and having only 1 wetland class; or
4. Presence of species recognized by the state as important.

Number 3 or Low Concern #3:
1. Wetlands 1 acre or less in size with 2 or less wetland classes; or
2. Wetlands less than or equal to 2 acres in size and having only 1 wetland class.

EXAMPLES OF RATING SYSTEMS IN OTHER STATES:

<u>New Jersey Freshwater Wetlands Protection Act of 1987</u>

Exceptional resource value wetlands:
1. Those which discharge into FW-1 waters and FW-2 trout production (TP) waters and their tributaries; or
2. Those which are present habitats for threatened or endangered species, or those which are documented habitats for threatened or endangered species which remain suitable for breeding, resting, or feeding by these species during the normal period these species would use the habitat.

Intermediate resource value wetlands:
1. Those which are not included as extraordinary or ordinary resource value wetlands.

Ordinary resource value wetlands:
1. Those which do not exhibit the characteristics of an extraordinary resource value wetland, and which are certain isolated wetlands, man-made drainage ditches, swales, or detention ponds

New York 1975 Freshwater Wetlands Act

The act requires the commissioner to classify wetlands in a manner that recognizes that not all wetlands are of equal value. They have been ranked into four regulatory categories (Class I-IV) depending on vegetative cover, ecological associations, special features, hydrological and pollution control features, and distribution and location. The rules contain more specific information on the classification system.

Selected Inventories

STATES WITH WETLAND INVENTORIES
A SUMMARY**

NOTE: The standard categories of information are listed below, if a category is not listed under a given state, no information for it was available at the time of writing.

- O INVENTORY EXISTING OR PROPOSED?:
- O IS IT REQUIRED BY LEGISLATION?
- O LEGISLATION MANDATING INVENTORY:
- O SCALE:
- O INVENTORY CONDUCTED BY?:
- O SIZE THRESHOLD FOR MAPPED WETLANDS:
- O WETLANDS WERE CLASSIFIED?:
- O INVENTORY IS ADOPTED BY?:
- O NOTES:

California

INVENTORY EXISTING OR PROPOSED?:
No adopted inventory

NOTES:
Wetlands have been mapped at a rough scale by the California Coastal Commission using aerial photography.

New Hampshire

INVENTORY EXISTING OR PROPOSED?:
No, however, local governments may designate, map and document prime wetlands.

**This summary of wetland inventories is an appendix included in a report called "Wetland Inventories: An Overview" (Granger, 1989). Refer to the report, listed in the selected bibliography, for a discussion of this information.

SCALE:
Same as municipal tax map (tax and assessors maps are usually small scale maps eg. 1:2,400 (1" = 200')

INVENTORY CONDUCTED BY?:
Local communities

INVENTORY IS ADOPTED BY?:
Cities or towns following public hearings

Connecticut

INVENTORY EXISTING OR PROPOSED?:
Yes - freshwater, yes - tidal, yes - smaller regional area

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATION MANDATING INVENTORY:
Connecticut Inland Wetland and Watercourses Act (1972) requires the commissioner to inventory wetlands and water courses to meet the intent of the legislation and specifies inclusion of pictorial representations.

Connecticut Tidal Wetlands Act requires the commissioner to map wetlands and establish them by order following a public hearing and record to all property owners.

SCALE:
Inland wetlands inventory - initially identified on 1:80,000 aerial photos (1" = 6,666'), final maps at 1:24,000 (1" = 2,000)

tidal wetland inventory - 1:12,000 (1" = 1,000) aerial photos used to determine tidal wetland boundaries, final wetland maps 1" = 200'

INVENTORY CONDUCTED BY?:
Connecticut Department of Environmental Protection (DEP) and USFWS.

SIZE THRESHOLD FOR MAPPED WETLANDS:
Wetlands 1 acre or larger

WETLANDS WERE CLASSIFIED?:
Yes, using USFWS (see notes)

INVENTORY IS ADOPTED BY?:
Inland wetlands inventory - local government agencies or the commissioner

Coastal wetlands inventory - commissioner

OTHER INVENTORIES:
North Central Connecticut Inventory produced preliminary land use/ land cover maps on which all wetlands and water bodies larger than 5 acres were mapped and classified.

NOTES:
Some agencies will not regulate wetlands not on the local inventory although the maps may not be inclusive of all wetlands meeting the statutory definition.

Connecticut completed wetland mapping in cooperation with the USFWS. The purpose was to influence type, quality and accuracy of wetland mapping in Connecticut. DEP felt information on existing NWI maps could be improved through a detailed review of natural resources information supplemented by extensive field review.

For the inland wetland inventory, DEP used black and white photographic transparencies taken in the spring season. They delineated and classified wetlands based on vegetative cover, visible hydrology and geography. Prior to delineation, wetlands were also identified on 1:12,000 (1" = 1,000') black and white photos.

DEP submitted each quadrangle for review by the regional office of USFWS. All questionable areas were field checked and resubmitted to USFWS.

Although air photo interpretation was the primary method for mapping wetlands, volumes of additional information was reviewed prior to delineating difficult or confusing boundaries/types. Information sources used: topographic maps, soil survey, Coastal Resource Boundary maps, manuscripts, personal observations, field investigations.

DEP noted that a small number of wetland plant communities could be consistently identified on aerial photo's. Additional wetland types were identified and mapped with collateral information and regularly scheduled field checks.

DEP is considering mapping on orthophoto quadrangles base maps to ensure the accuracy of spatial location for computerized geographic information survey (GIS).

For the coastal wetlands and shoreline features mapping project, DEP used 1:12,000 tide-coordinated, false-color infrared transparencies producing a set of photo overlays showing tidal wetland boundaries and types and selected shoreline features.

Delaware

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATION MANDATING INVENTORY:
Delaware Wetland Act of 1973 requires that the Secretary inventory all wetlands and prepare maps. Prior to adopting the wetland designations, hearings must be held. Maps are filed with the Secretary of State.

SCALE:
1:2,400 (1" = 200')

INVENTORY IS ADOPTED BY?:
Secretary of State

NOTES:
Wetlands not appearing on the maps are not regulated.
Staff opinion - mapping should be included in a regulatory program to establish whether a violation has taken place and measure its extent.

Maine

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATION MANDATING INVENTORY:
The Freshwater Wetlands Statute of Maine, 1985, required that all wetlands meeting specific criteria be identified and mapped.

SCALE:
Initially identified on 1:40,000 black and white aerial photos. Scales were then adjusted and boundaries were transferred to 1:50,000 topographic maps.

INVENTORY IS ADOPTED BY?:
Commissioner under the Maine Administrative Procedures Act with prior notice to owners of record.

INVENTORY CONDUCTED BY:
Maine Geological Survey, Department of Environmental Protection had primary responsibility

SIZE THRESHOLD FOR MAPPED WETLANDS:
10 acres

WETLANDS WERE CLASSIFIED?:

NOTES:
The primary purposes of the law were to determine how many wetlands were not included in existing regulatory programs and provide a single set of maps for their location and extent. A paper inventory was produced using aerial photos, 1970's wetland habitat by the Maine Department of Inland Fish and Wildlife, NWI, and county soil surveys. They were compiled into a matrix keyed to each wetland.

The inventory involved 6 person-months of aerial photo interpretation, 4 person-months of cross checking, and several person-months for cartography and key preparation.

Draft maps were sent to municipalities for review for 6 months before submittal to the legislature. Public eduction was conducted by the Maine Association of Conservation Commissions during workshops to explain the maps, their preparation, implications and review. The public review process was considered an effective screen when volunteer government responded responsibly. An approx. 10-15% revision to the maps occurred in areas that responded.

Criteria for areas to be included in the inventory were:

1. Wetland vegetation that grow in "generally water-logged or water-covered areas" (excluding marketable trees)

2. consisting of a minimum size of 10 acres, corresponding with the existing "Great Ponds" Act

3. Currently unprotected.

It proved difficult to limit the inventory to these criteria.

Maryland

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATION MANDATING INVENTORY:
Maryland Wetlands Act of 1970 requires the Secretary of the Department of Natural Resources to delineate the landward boundaries of any wetlands in the state on maps or aerial photographs.

SCALE:
1:2,400 (1" - 200')

INVENTORY IS ADOPTED BY?:
Adopted by order and filed among land records following public hearings. Each affected property owner was notified.

OTHER WETLAND INVENTORIES:
Chesapeake Bay Critical Area - an inventory of the first 1000feet inland using the National Wetlands Inventory

Michigan

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATION MANDATING INVENTORY:
Michigan's Goemaere-Anderson Wetland Protection Act requires the state to complete an inventory and file it with county clerks. Owners of record as identified on tax role must be notified.

SCALE:
1:24,000 (1"= 2,000')

INVENTORY CONDUCTED BY?:
Department of Natural Resources

SIZE THRESHOLD FOR MAPPED WETLANDS:
regulated wetlands greater or equal to 10 acres

INVENTORY IS ADOPTED BY?:
Filed with the agricultural extension, register of dees and county clerks

NOTES:
Michigan has been involved with the inventory of the state since 1979. Coordinating with the USFWS, Michigan's DNR interpreted black and white 1:80,000 scale aerial photos provided by USFWS. Subsequently, USFWS provided color infrared photos at 1:58,000. DNR field checks a portion of the maps and if satisfactory, the maps are sent to the regional USFWS office where they are reviewed by photo interpreters. The contractor that produces the wetland maps enlarges them to 1:24,000 (1' = 2,000). The draft maps are reviewed, staff field check them for accuracy, and any errors are corrected.

New York

INVENTORY EXISTING OR PROPOSED?:
Tidal wetlands - yes
Freshwater wetlands - yes

IS IT REQUIRED BY LEGISLATION?:
Tidal wetlands - yes
Freshwater wetlands - yes

LEGISLATIONS MANDATING INVENTORY:
Both the Freshwater Wetlands Act and the Tidal Wetlands Act required that maps be produced by the Department of Environmental Conservation on which regulated wetlands and waters are delineated.

The New York 1975 Freshwater Wetlands Act required the commissioner to identify and map freshwater wetlands. The owner of record on tax assessment must be notified of hearings.

SCALE:
Tidal wetland maps - photo interpreted at 1:12,000 (1" = 1,000'), enlarged to 1:2,400 (1" = 200')

freshwater wetland maps - 1:24,000 (1' = 2,000')

INVENTORY CONDUCTED BY?:
Department of Environmental Conservation

SIZE THRESHOLD FOR MAPPED WETLANDS:
tidal wetlands - 1 acre or larger

freshwater wetlands - 12.4 acres or smaller wetlands of unusual local importance

WETLANDS WERE CLASSIFIED?:
Yes, using NY's own classification system used in wetland regulation.

INVENTORY IS ADOPTED BY?:
Filed with the local government

NOTES:
Tidal wetlands inventory - Field checking was conducted to establish consistency of boundary delineation following interpretation of color infrared transparencies.

Freshwater wetlands inventory - Freshwater maps show the approximate location of the actual boundaries. More precise boundary delineations are made by request for field determinations.

The base map used is a planimetric map (which shows everything a topographic map does without the contour lines) on mylar. NY contends that enough detail if provided on the base maps for identification of specific parcels and a wetlands relationship to them.

All available information sources, such as NWI, soil survey, field work, other inventories were overlain, compiled and delineations made. Site inspections were made when inconsistencies existed.

Wetlands were classified according to New York's classification system, which was developed to categorize (rate) wetlands for regulatory purposes.
There is a provision in the law that allows for corrections, deletions, or additions to the wetlands maps.

OTHER INVENTORIES:

Biological Freshwater Wetlands Inventory - the Department of Environmental Conservation's Division of Fish and Wildlife and Cornell University conducted an inventory to evaluate the fish and wildlife habitat for management and acquisition purposes. They used spring season
black and white photo's at a scale of 1:24,000 (1' = 2,000'). The wetland maps produced were overlays with
parcels of wetland delineated by vegetative structural type. It was determined that this inventory was not adequate for regulatory purposes.

NYS Adirondack Park - The Adirondack Park Agency conducted an inventory using NWI with additional field work as required by the Agency Program. Using the NWI proved to be problematic for mapping forested (coniferous) wetlands due to scale and difficulty with photo interpretation of this cover type.

New Jersey

INVENTORY EXISTING OR PROPOSED?:

Tidal wetlands - yes
Freshwater wetlands - yes

IS IT REQUIRED BY LEGISLATION?:
Tidal wetlands - yes
Freshwater wetlands - yes

LEGISLATIONS MANDATING INVENTORY:
New Jersey Coastal Wetlands Act of 1970 requires an inventory to be filed with the county clerk and mailed to owner of record of affected lands.

New Jersey Freshwater Wetlands Protection Act of 1987 requires the department to develop a functional complete, and up to date composite inventory and map of freshwater wetlands using most recent available data.

NOTES:
As stated in the statute, the NWI maps are not considered accurate for the purposes of locating the actual wetlands boundary, therefore the department is required to prepare more reliable maps.

Minnesota

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATIONS MANDATING INVENTORY:
Laws of Minnesota 1979, Chapter 199, required the Minnesota Department of Natural Resources to cooperate with each county in preparing the first complete inventory of protected waters and wetlands.

SCALE:
.5" = 1 mile

INVENTORY CONDUCTED BY?:
DNR

SIZE THRESHOLD FOR MAPPED WETLANDS:
10 acres for rural areas, 2.5 acres for municipalities

WETLANDS WERE CLASSIFIED?:
USFWS classifiction

INVENTORY IS ADOPTED BY?:
state and counties

NOTES:
In the original 1976 "Public Waters Inventory" process, an inventory was not mandatory for any county and no deadlines were suggested. With a change in title to "Protected Waters Inventory", in 1979, inventories were made mandatory for DNR and the 87 counties in Minnesota with a deadline for DNR to complete a stateside inventory. A procedure for public review and hearings concerning wetland maps produced was also required.

The purpose of the inventory was to prepare maps showing the general location, size, and configuration of protected waters. The maps are used to draw attention to existence and location of wetlands but not delineate actual property or regulatory boundaries.

The Minnesota inventory used statewide general highway maps as base maps which included transportation, drainage, structural, navigational, and land use information for each county. They received complaints that the base maps did not show property and legal boundaries.

DNR provided local county boards with preliminary maps and lists derived from historical data from 1975-1978. The board conducted public information meetings and supervised local review of the maps. Recommendations on disagreements were presented to DNR. Draft lists and maps were published in the county newspaper with a notice of opportunity to challenge the maps through the petition process.

The state provided grant monies ($1,746) to assist the counties with conducting the public meetings.

Wisconsin

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATIONS MANDATING INVENTORY:
Wisconsin's Shoreland Management Program and Shoreland Wetland Zoning. A 1983 amendment to the legislation requires the preparation of maps that identify wetlands which have an area of 5 or more acres, based upon soil surveys, aerial photographs and existing wetland surveys. The statute states that the maps may be supplemented by onsite surveys.

SCALE:
Interpreted from 1:20,000 black and white aerial photos. Final wetland maps are at 1:24,000

SIZE THRESHOLD FOR MAPPED WETLANDS:
5 of more acres were required for local ordinances. Initially half of the state was mapped at 2 acres or greater but the minimum size was later increased to 5 acres due to time constraints.

WETLANDS WERE CLASSIFIED?:
Yes using USFWS classification

INVENTORY IS ADOPTED BY?:
Counties

NOTES:
Presently there is an ongoing inventory update to inventory all the state's wetlands 2 acres or greater every 20 years. THree to four counties are update each year. The inventory was adopted by USFWS for NWI maps.

Virginia

INVENTORY EXISTING OR PROPOSED?:
Yes

IS IT REQUIRED BY LEGISLATION?:
Yes

LEGISLATIONS MANDATING INVENTORY:
Virginia Wetland Act requires the Marine Resources Commission to maintain a continuing inventory of vegetated wetlands.

Illinois

SCALE:
Initially identified from 1:58,000 infrared photos 1:24,000 (1" = 2,000')

INVENTORY CONDUCTED BY?:
Department of Conservation

SIZE THRESHOLD FOR MAPPED WETLANDS:
One-half acre or larger

WETLANDS WERE CLASSIFIED?:
Yes using USFWS classification

NOTES:
The Department of Conservation has been conducting a statewide wetland inventory since 1984. The "high tech" inventory is used to develop a state wetlands management program. After four wetland protection efforts failed in 15 years, the need for an inventory was clear. "Too little was known about Illinois' wetlands resources. You can't manage a resource until you know where it is and of what it consists!"

The state inventory will become part of the NWI maps and is therefore being partially funded by the federal government.

The Illinios NWI maps are produced from infrared photo interpretation, soil and topographic maps, and field visits. They undergo an extensive review process.

Final maps are produced are Diazo copies form clear mylar overlays.

*WASHINGTON JURISDICTIONS WITH WETLAND INVENTORIES A SUMMARY**

NOTE: The categories used to present inventory information are listed below. If a jurisdiction does not have a category listed, that information was not available at the time of writing.

Jurisdiction
DATE COMPLETED
BASE AND SCALE FOR PAPER OR FIELD INVENTORY
INVENTORY PRODUCTS
BASE AND SCALE FOR FINAL WETLAND MAPS
GEOGRAPHIC AREA COVERED
PAPER INVENTORY CONDUCTED?
FIELD VERIFICATION CONDUCTED?
UNITS USED FOR FIELD VERIFICATION
CLASSIFICATION SYSTEM USED
WETLAND TYPES INVENTORIED
SIZE THRESHOLD FOR MAPPED WETLANDS
METHOD OF WETLAND ASSESSMENT
PHOTO DOCUMENTATION?
INFORMATION COLLECTED
COST
PERSON HOURS SPENT
HOW WILL/IS THE INVENTORY BEING USED?
NOTES

* This is not an all inclusive listing. For example, pilot studies conducted recently by Hood Canal Coordinating Council and Jefferson Co. are not included.

WASHINGTON COUNTIES

PAPER INVENTORY ONLY

San Juan County

DATE COMPLETED:
1987

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
1:24,000 (1' = 2,000') NWI

INVENTORY PRODUCTS:
Hydric soils superimposed onto NWI maps

SCALE FOR FINAL WETLAND MAPS:
No final map product

GEOGRAPHIC AREA COVERED:
Entire county

PAPER INVENTORY CONDUCTED?:
Yes - used Soil Conservation Service (SCS) Soils Survey and NWI

FIELD VERIFICATION CONDUCTED?:
No

COST:
One week salary (approx. $495)

PERSON HOURS SPENT:
One planner for one week to transfer boundaries of hydric soils onto NWI maps. (40 hours)

HOW WILL/IS THE INVENTORY BEING USED?:
Not being used by county staff.

NOTES:
Paper inventory was conducted in preparation for a field inventory of wetlands. The field verified wetland inventory was intended to alert

staff to projects which may impact wetlands. It was to be used during the permit review process. Confirmation of wetland location and extent in the field has not been made.

A planner would not necessarily be required to compile NWI and SCS maps.

PAPER INVENTORY WITH PARTIAL VERIFICATION

Thurston County

DATE COMPLETED:
Paper inventory - 1984
Partial field verification - 1986

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
Paper - 1:24,000 (1' = 2,000')
Field - 1:4,800 (1' = 400') blueline aerial photo

INVENTORY PRODUCTS:
Wetland maps

BASE AND SCALE FOR FINAL WETLAND MAPS:
1:2,400 (1' = 200') assessor's maps

GEOGRAPHIC AREA COVERED:
Unincorporated Thurston County - excluded Capital Forest, Fort Lewis Military Reservation, Nisqually Indian Reservation, the Chehalis Indian Reservation and the City of Olympia.

PAPER INVENTORY CONDUCTED?:
Yes - using SCS Soils Survey, habitat studies by Department of Game, and NWI.

FIELD VERIFICATION CONDUCTED?:
A partial field verification was conducted in order to determine the accuracy of the paper inventory. Locations and exact boundaries of 67 wetlands in the Stormwater Management Utility boundaries in Northern Thurston County were determined by 1 team of 4 biologists (interns) during site visits. 396 townships were used in the study. Wetlands

included in the field verification were chosen because of ease of access and the ability to determine wetland boundary in 2-3 hours. 4-5 wetlands in each township were verified. No additional information was collected.

SIZE THRESHOLD FOR MAPPED WETLANDS:
1 acre

CLASSIFICATION SYSTEM USED:
None

WETLAND TYPES INVENTORIED:
All except intertidal

METHOD OF WETLAND ASSESSMENT:
None

PHOTO DOCUMENTATION?:
None

INFORMATION COLLECTED:
Location and extent of wetlands

COST:
Research - $1,500
Preparation of maps - $3,600
Field work - wages only $6,400
Paper inventory - staff only $6,000

PERSON HOURS SPENT:
Paper inventory and preparation for field work - 1 FTE for 50 days or .14 FTE's
Field verification - 2 FTE's for 4 months or .66 FTE

HOW WILL/IS THE INVENTORY BEING USED?:
Wetland maps are used as reference at the planning counter to alert staff to projects which may impact wetlands. If a parcel for which development is proposed contains a wetland according to the maps, it is determined whether the project is under the jurisdiction of the Sensitive Areas Ordinance and further investigation is conducted.

NOTES:

Partial field verification of the paper inventory showed that 59% of the wetlands were mapped inaccurately. Despite the fact that the biologists were restricted to visiting specific wetlands, two unmapped wetlands were discovered in the course of the study. County staff concluded that the accuracy of the maps was adequate for the regulatory purposes of the County and provides a "good starting point".

INVENTORIES

Clallam County

DATE COMPLETED:

1985

INVENTORY PRODUCTS:

A report containing field report of observations, computer plotted wetland maps, mylar maps on a section-by-section basis for overlays to assessor's maps, and photographic record.

BASE AND SCALE FOR FINAL WETLAND MAPS:

1:2,400 (1" = 200') overlay on assessor's maps

GEOGRAPHIC AREA COVERED:

Mouth of Salt Creek near Crescent Bay and the coastal shoreline from the mouth of the Dungeness River east to the Jefferson County line. Approx. 1,800 to 2,00 acres (30-31 lineal miles of shoreline)

PAPER INVENTORY CONDUCTED?:

Yes - using aerial photographs, USGS quadrangle maps, ortho photos.

FIELD VERIFICATION CONDUCTED?:

Yes - conducted by a botanist from North West Cartography.

UNITS USED FOR FIELD VERIFICATION:

Section-by-section

SIZE THRESHOLD FOR MAPPED WETLANDS:

None

CLASSIFICATION SYSTEM USED:

Land cover/land use classification system (adapted from Coastal Zone Atlas and the Land use Mapping Project in Grays Harbor and Pacific County) modified to coincide with United States Fish and Wildlife Service (USFWS) "Classification of Wetlands and Deep Water Wetland Habitats in the United States".

WETLAND TYPES INVENTORIED:

Those that met WAC definitions

METHOD OF WETLAND ASSESSMENT:

Qualitative observations recorded in narrative form in field notes.

PHOTO DOCUMENTATION?:

Of representative types and photos to record current site conditions.

INFORMATION COLLECTED:

-accurate location and boundaries
-associated wetlands
-beach substrate
-upland developments
-stability
-areas of concern
-wetland type
-land cover/landuse

COST:

Contract with Northwest Cartography Inc. was $15,000 included production of maps. County staff pointed out that the consultant already had information about the area collected prior to conducting the inventory, without which the cost would have been higher. Estimate - $25,000

The County will need to adjust map scale because the assessor's maps are not of uniform scale. Cost estimate is $2,000.

PERSON HOURS SPENT:

Consulting staff - 3 FTE's for 5 months or 1.25 FTE's per year
County staff - 1 FTE for 2 months or .16 FTE's

HOW WILL/IS THE INVENTORY BEING USED?:

The overlays are used as reference by planning staff for project permit review to determine if proposed projects fall within the jurisdiction of the Shoreline Management Act as well as providing information about parcels to interested parties.

Jefferson County

DATE COMPLETED: June, 1975

NOTE: Jefferson Countyrecently completed a pilot inventory in selected watersheds. Information on this pilot will be included in guidebook update.

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
1:2,400 (1"=200') no base map

INVENTORY PRODUCTS:
90 page report containing 21 maps of tidal wetlands

BASE AND SCALE FOR FINAL WETLAND MAPS:
1:4,800 (1"=400')

GEOGRAPHIC AREA COVERED:
21 select tidal marshes totaling 145 acres. The study did not include two large marshes (double the acreage inventoried).

CLASSIFICATION SYSTEM USED:
Vegetation characterized by North West Environmental Consultants.

WETLAND TYPES INVENTORIED:
Salt water wetlands

FIELD VERIFICATION CONDUCTED?:
Yes

METHOD OF WETLAND ASSESSMENT:
Unknown, but used harvest method to measure primary productivity

INFORMATION COLLECTED:

-Boundaries
-Ownership
-Physical characteristics
-Vegetational Marsh Types
-Vegetation
-Upland use
-Marsh land use
-Nearby marine resources

HOW WILL/IS THE INVENTORY BEING USED?:
Intended to provide County with general information and site specific data on tidal marshes to aid in decision-making process created by SMA.

NOTES:
Maps delineate approximate boundaries by wetland type.

INVENTORIES WITH FIELD EVALUATIONS

King County

DATE COMPLETED:
1981

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
USFWS quadrangles divided into nine field maps and enlarged to 1:12,000 (1" = 1,000')

INVENTORY PRODUCTS:
Map folio of "Sensitive Areas - Wetlands Supplement", "King County Wetlands Inventory Notebook", "Wetland Plants of King County and the Puget Sound Lowlands", computerized data base of information collected, slide catalog of photos of most of the wetlands visited during the inventory, an automated 10 minute slide show - "Earth, Air and Water, Understanding our Puget Sound Wetlands", and "Methodology for the Inventory and Evaluation of Wetland Habitat in King County" which includes a rating and ranking system.

In the King County Wetlands Inventory Notebook, the information that was gathered during the inventory is summarized for each wetland. The summary sheets contain an aerial photo of the wetland and its boundary and contains summaries of the information about each wetland that was gathered during the site visits. In addition, the wetland's status in King County's rating and ranking systems is listed.

BASE AND SCALE FOR FINAL WETLAND MAPS:
Map Folio 1:24,000 (1" = 2,000'). Wetlands Inventory Notebook contains aerial photos on which wetland boundaries are drawn. The scale for the photos vary from 1:1,200 (1" = 100') to 1:63,360 (1" = 1 mile) in order to illustrate the extent of a entire wetland in a approx. 7" x 5" space.

GEOGRAPHIC AREA COVERED:
Western half of King County including Vashon Island - approx. 330,000 acres or 509 sections.

PAPER INVENTORY CONDUCTED?:

Yes - using NWI, Sensitive Areas Map Folio, SCS Soils Survey

FIELD VERIFICATION CONDUCTED?:

Yes - three field teams of two or three members: a planner, a biologist and a volunteer or staff person from other Wetlands Task Force agencies.

UNITS USED FOR FIELD VERIFICATION:

Stream basins

CLASSIFICATION SYSTEM USED:

USFWS wetland classification and Amherst wetland classification system

WETLAND TYPES INVENTORIED:

Palustrine and estuarine

SIZE THRESHOLD FOR MAPPED WETLANDS:

1 acre (some were less)

METHOD OF WETLAND ASSESSMENT:

It incorporated components of existing wetland assessment methods as well as creating new evaluation tasks. A methodology for wetland assessment was developed by a Wetlands Task Force to determine wetland values, functions, features and characteristics. The assessment was relatively objective and comprehensive using both quantitative and qualitative measurements. 582 items were included in the resultant data base. The field verification included a wetlands location and boundaries as well as wetland assessment. The field team walked the perimeter of most wetlands in order to locate any inlets/ outlets as well as delineate approximate boundaries. Information was recorded on field data sheets and entered into a computer data base.

The methodology assigned scores for the evaluation tasks. The scores were used in the rating and ranking of wetlands.

PHOTO DOCUMENTATION?:

Yes

INFORMATION COLLECTED:

location and boundaries
flora
fauna - signs and observations
special habitat features
wetland classifications
hydrology
endangered species - known and potential
cultural values - economic
aesthetic
education
agricultural use

COST:

Planner	$77,500
Biologists	15,830
Graphics	30,600
Clerical	3,300
Equipment	6,220
Printing	11,000
Total	$145,440

PERSON HOURS SPENT:

Field inventory - 18 staff months or 6 FTE's for 1 1/2 yrs.

HOW WILL/IS THE INVENTORY BEING USED?:

The wetlands information is used in the screening process primarily in the development review system. Staff for all areas of the Bureau of Land Development use the folio. It is used during a more detailed review by the sensitive areas planner in assessing a particular development project. The notebook's are also used by the community as a wetlands information resource. Numerous developers purchased copies of the notebook.

Pierce County

DATE COMPLETED:

Phase 1 and 2 - 1987
Phase 3 - 1988

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:

1:1,400 (1" = 400') blueline copies of aerial photos

INVENTORY PRODUCTS:

File of field data sheets containing site specific wetland information collected during inventory and a wetland atlas. Computer data base designed following inventory completion.

BASE AND SCALE FOR FINAL WETLAND MAPS:

1:2,400 (1" = 200') on assessor's maps

GEOGRAPHIC AREA COVERED:

Western half of the County or 498 sections excluding incorporated areas, Muckleshoot Indian Reservations, Fort Lewis Military Reservation, McChord Air Force Base.

PAPER INVENTORY CONDUCTED?:

Yes - using NWI, SCS Soils Survey, National Flood Insurance Rate Maps (FIRM), aerial photo interpretation.

FIELD VERIFICATION CONDUCTED?:

Yes - by one to three teams of two biologists each (depending on the phase)

UNITS USED FOR FIELD VERIFICATION:

Inventory was conducted on a section-by-section basis

CLASSIFICATION SYSTEM USED:

USFWS wetland classification

WETLAND TYPES INVENTORIED:

Palustrine (Lacustrine were included in the atlas but were not field verified.)

SIZE THRESHOLD FOR MAPPED WETLANDS:

1/4 acre unless very unique

METHOD OF WETLAND ASSESSMENT:

The inventory was conducted in phases. The first phase focused on the urbanizing areas. The purpose of the inventory was to determine the approximate location and boundaries of wetlands. Information on the values, functions, features and characteristics of wetlands visited

were noted as time allowed and was a qualitative assessment. Guidelines for minimum observations were established. Information was recorded on a field data sheet. In the case of large wetlands or those difficult to access, the wetland was observed from one or two vantage points. The boundaries were recorded as confirmed (verified) where directly observed and unverified when interpreted by distant observations ie. using binoculars and photo interpretation.

PHOTO DOCUMENTATION?:
No

INFORMATION COLLECTED:
Location and boundaries (verified and unverified)
flora
fauna
special habitat features
wetland classification
hydrology (qualitative only)
endangered species
cultural values
adjacent land use
character of the buffer
human impacts

COST:
For phases 1 & 2 was $55,719, or $112 per section

PERSON HOURS SPENT:
For phases 1 & 2 4500 hours or 2 FTE's

HOW WILL/IS THE INVENTORY BEING USED?:
The wetland inventory is being used in the development of a wetland management strategy. The wetland atlas is intended to be used at the development counter to alert staff of projects that may impact wetlands. It is also being used by the Department of Public Works to assist in determining if a project falls under the jurisdiction of the Grading Filling and Clearing Ordinance. The atlas and data sheets are used by the Department of Natural Resources and Planning staff in environmental review and in reviewing development permits. The information is used by the community including environmentalists, developers and consultants.

Snohomish County

DATE COMPLETED:
On going

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
1:4,800 (1" = 400') aerial photos

INVENTORY PRODUCTS:
Wetland Atlas, computerized data base of inventory information, Stream Survey, proposed - mylar overlays for zoning map photo docmentation.

BASE AND SCALE FOR FINAL WETLAND MAPS:
1:4,800 (1" = 400') aerial photos

GEOGRAPHIC AREA COVERED:
To date - 272 sections or approx. 31% of area under the jurisdiction of the county ie. excluding federal land. 14% of all land included within the boundaries of the County. Included incorporated as well as unincorporated areas.

PAPER INVENTORY CONDUCTED?:
Yes - for the wetland inventory using NWI, SCS Soils Survey, color stereo photos. Yes - for the stream inventory using DNR water typing maps, and Water Resources Inventory Areas Catalogue.

FIELD VERIFICATION CONDUCTED?:
Yes - by 3 field teams consisting of a biologist, a technician and three members of the Washington Conservation Corps trained in wetland assessment.

UNITS USED FOR FIELD VERIFICATION:
Stream basins

CLASSIFICATION SYSTEM USED:
USFWS wetland classification

WETLAND TYPES INVENTORIED:
Palustrine, some estuarine, riverine in the Stream Survey

SIZE THRESHOLD FOR MAPPED WETLANDS:
1/2 acre

METHOD OF WETLAND ASSESSMENT:

The Snohomish County wetland inventory is ongoing since 1986. During this time, the method by which wetlands are evaluated has evolved. During Phase I in 1986, detailed assessments of the physical and biological characteristics were made in addition to the location and approximate boundaries of wetlands. The information collected was a qualitative and quantitative assessment of values, functions and features eg. the volume capacities of 50% of the wetlands were measured. Detailed information was recorded on a field data sheet and wetland maps. Currently, the information gathered has been reduced to basic information on location, boundaries, classification, and a description of beneficial values summarized in a paragraph, without an assessment of values and functions. The functions as well as unique characteristics and cultural values are determined on a case-by-case basis by the biologists when a project is proposed within 200 feet of a wetland.

In the near future, the assessment method will be revised. Although not as detailed as the first phase of the inventory, the wetland data collected will be more detailed than that which is currently recorded. The purpose of the revision is to provide staff with reliable information with which they can make some preliminary conclusions about wetland values and potential impacts of projects on them.

Concurrent with the wetland inventory, Snohomish County is conducting a stream survey. Therefore, in the course of the Snohomish inventory, field teams walk all streams noting their characteristics and observing wetlands in association with them, in addition to verifying wetlands that were identified during the paper inventory. Consequently, they are able to discover a greater than usual number of wetlands not on the paper inventory. Information on streams is recorded on separate data sheets.

PHOTO DOCUMENTATION?:

Yes

INFORMATION COLLECTED:

location and boundaries
flora
fauna
special habitat features
wetland classification

hydrology (some quantitative measurement)
endangered species

PERSON HOURS SPENT:
For the first phase - 15 full time biologists, technicians, and Corps members for 6 months or 7.5 FTE's.

HOW WILL/IS THE INVENTORY BEING USED?:
The wetland information is being used to establish a wetland protection program. The wetland atlas is used in the Department of Public Works, Comprehensive Planning, and Community Development for review of development projects and their relation to County ordinances and laws. The inventory information is used by the community, environmentalists as well as developers/consultants. The inventory is occasionally used for research projects, most recently to select sites for a stormwater/wetlands research project.

NOTES:
In addition to usual training, staff received additional training in USFWS Habitat Evaluations Procedure (HEP), andWetland Evaluation Training (WET).

WASHINGTON CITIES

City of Renton

DATE COMPLETED:
1981

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
1:12,000 (1" = 1,000') aerial photos

INVENTORY PRODUCTS:
"City of Renton Wetlands Study: A Reconnaissance Study of Selected Wetlands in the City of Renton", which included the inventory methods, wetland maps, wetland ranking, a discussion of and recommendations for wetland protection policies, and field notes.

BASE AND SCALE FOR FINAL WETLAND MAPS:
1:4,800 (1" = 400') maps showing some cultural features

GEOGRAPHIC AREA COVERED:
Green River Valley and one wetland along Cedar River

PAPER INVENTORY CONDUCTED?:
No - only used aerial photo's

FIELD VERIFICATION CONDUCTED?:
Yes - conducted by a staff member from the City of Renton and from Northwest Environmental Consultants.

CLASSIFICATION SYSTEM USED:
USFWS with an additional class for transitional areas

WETLAND TYPES INVENTORIED:
Selected wetlands were inventoried, all were palustrine

SIZE THRESHOLD FOR MAPPED WETLANDS:
5 acres

METHOD OF WETLAND ASSESSMENT:
The team conducted a reconnaissance during which they mapped the location of wetlands and their extent and made qualitative observation of wetland characteristics. The observations were recorded in the form of narrative field notes.

PHOTO DOCUMENTATION?:
Yes

INFORMATION COLLECTED:
-location and approximate boundaries
-flora
-fauna
-special wildlife features
-Comprehensive Plan Designation
-wetland classification
-hydrologic
-cultural values
-ownership
-zoning

COST:
Approx. $20,000 for contract with consultant.
Cost of staff contribution to preparation and field work is not known.

HOW WILL/IS THE INVENTORY BEING USED?:
The wetlands study including the inventory was intended to provide wildlife, vegetation and hydrologic assessment to aid public decision-making and provide the Council and Planning commission with policy direction regarding wetlands in the City of Renton. The inventory is not

being actively used by City staff. The report is occasionally used of a resource document by interested parties and groups. The information is considered out of date.

NOTES:
Seasonally flooded fields and pastures were not included. Wetlands were also evaluated using eight criteria and ranked for wildlife value.

City of Bellingham

DATE COMPLETED:
1988

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
1:2,400 (1" = 200') contour maps

INVENTORY PRODUCTS:
2 notebooks containing wetland maps and field data sheets with index map. Wetland locations will be matched with property ownership in a computer data base. Worksheets are currently computerized.

BASE AND SCALE FOR FINAL WETLAND MAPS:
1:2,400 (1" = 200') real estate atlas

GEOGRAPHIC AREA COVERED:
City limits

PAPER INVENTORY CONDUCTED?:
Yes - using contour maps, orthophotos (1"=200'), past observations of parks department staff

FIELD VERIFICATION CONDUCTED?:
Yes - conducted by parks department staff and an intern.

UNITS USED FOR FIELD VERIFICATION:
Section-by-section

CLASSIFICATION SYSTEM USED:
USFWS classifications are not currently recorded but will be added to the data base.

WETLAND TYPES INVENTORIED:

Palustrine and estuarine, major streams. Lakes are included on the wetland maps but were not field inventoried.

SIZE THRESHOLD FOR MAPPED WETLANDS:

None

METHOD OF WETLAND ASSESSMENT:

Wetland boundaries were ascertained by walking the circumference of wetlands, assessing the presence of obligate wetland vegetation and measuring the distance from recognizable landmarks. The measured boundary was drawn on field maps. Qualitative observations were made and recorded when significant features were noted. The field team routinely recorded inlet/outlet and occurrence of any fill material.

PHOTO DOCUMENTATION?:

No

INFORMATION COLLECTED:

-location and boundaries	-ownership
-flora	-fauna when possible
-special habitat features	-size
-wetland classifications	-hydrology

COST:

Approx. $5,000

Paper Inventory -		Final Maps -	
Staff	$2,311	Staff	$462
Printing and Supplies	375	Map Costs	216
Subtotal	$2,686	Subtotal	$678

Field Inventory -	
Staff	$1,386
Transportation	50
Materials	200
Subtotal	$1,636

NOTE: Base maps for final maps were obtained at no cost. Included college intern on field staff.

PERSON HOURS SPENT:

approx. 320 hours or .15 FTE

HOW WILL/IS THE INVENTORY BEING USED?:

The wetland inventory will be used in the environmental review process to flag projects that fall under the jurisdiction of federal and state wetland laws. It will also play an important role in the development of City policies regarding wetland protection. The City will encourage their use as an information resource.

City of Bellevue

DATE COMPLETED:

1983

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:

1:4,800 (1" = 400') blueline copies of aerial photos

INVENTORY PRODUCTS:

Wetland maps, summary of wetland information collected during the inventory included in a "Sensitive Areas Notebook", automated mapping system. A separate stream inventory was also conducted.

BASE AND SCALE FOR FINAL WETLAND MAPS:

1:4,8000 (1" = 400') assessor's maps

GEOGRAPHIC AREA COVERED:

City limits and sphere of influence

PAPER INVENTORY CONDUCTED?:

Yes - using SCS Soils Survey, contour maps, aerial photos.

FIELD VERIFICATION CONDUCTED?:

Yes - conducted by one biologist who also conducted the stream inventory.

CLASSIFICATION SYSTEM USED:

USFWS and a classification system established by the City. The classification system differentiates between the biological and surface hydrologic characteristics of wetlands.

WETLAND TYPES INVENTORIED:

All wetland types except esturaine (no estuarine wetlands in Bellevue). Streams were inventoried during a serparate inventory

SIZE THRESHOLD FOR MAPPED WETLANDS:
7200 sq. ft.

METHOD OF WETLAND ASSESSMENT:
A modified King County method (described above) was used. Wetland information gathered was recorded on field data sheets. Qualitative and quantitative observations were made.

PHOTO DOCUMENTATION?:
No

INFORMATION COLLECTED:
location and boundary
flora
fauna
special habitat features
wetland classification
hydrology
endangered species
cultural values
adjacent landuse and use in the wetland
location in the sub-basin
distribution of vegetation types
associated water bodies

COST: Total $34,860

Inventory prep -		Final maps and Report -	
Staff	3,500	Digitizing	$7,000
Subtotal	$3,500	Printing	13,000
		Subtotal	$20,000
Paper and Field inventories -			
Printing	100		
Staff (contracted)	11,260		
Subtotal	$11,360		

PERSON HOURS SPENT:
1 FTE for paper and field inventory only.

HOW WILL/IS THE INVENTORY BEING USED?:
The wetland maps are used to indicate the location and boundary of a wetland in order to flag projects which involve wetlands. Prior to review of development proposals or actions involving wetlands, site specific wetland analysis is prepared by an approved biologist hired by the

project proponent. The information collected is used to assist with categorizing wetlands according to Bellevue's classification system. The maps are also used to flag projects requiring review fees.

City of Auburn

DATE COMPLETED:
Phase 1, Nov. 1989

BASE AND SCALE FOR PAPER OR FIELD INVENTORY:
Blueline section maps at 1:2,400 (1"=200')

INVENTORY PRODUCTS:
Digitized maps, field data forms, final report

BASE AND SCALE FOR FINAL WETLAND MAPS:
Maps were digitized and entered in a Geographical Information System which can produce maps at various scales.

GEOGRAPHIC AREA COVERED:
7.5 square miles - Mill Creek drainage basin

CLASSIFICATION SYSTEM USED:
USFWS Classification

WETLAND TYPES INVENTORIED:
Palustrine

SIZE THRESHOLD FOR MAPPED WETLANDS:
No minimum

PAPER INVENTORY CONDUCTED?:
Yes, using aerial photos, SCS soils maps, FEMA floodplain maps, NWI maps, and storm drainage maps.

FIELD VERIFICATION CONDUCTED?:
Yes

METHOD OF WETLAND ASSESSMENT:
Wetlands were identified and approximate boundaries delineated using both the Clean Water Act and USFWS definition. A minimum of two biologists walked each site in its entirety, noting wetland hydrology,

vegetation, soils (digging soil pits), biological function, and visual/ cultural function.

INFORMATION COLLECTED:

-location and boundary
-Hydrological features
-flora
-fauna
-surrounding habitat
-water quality
-special wildlife features
-adjacent land uses
-soil characteristics
-agricultural use
-wetland type
-cultural values

COST:

Total $32,733

Inventory Prep	$2,248
Paper Inventory -	
Supervisory	1,442
Staff	10,500
Supplies	100
Printing	100
Subtotal	$12,142
Field Inventory -	
Supervisory	1,442
Staff	10,500
Supplies	100
Transportation	600
Subtotal	$12,642
Final Maps -	
Digitizing	750
Equipment	owned by Co.
Subtotal	$27,782
Final report -	
Staff	5,501
Printing	200
Subtotal	$5,701

PERSON HOURS SPENT:

2,614 hours or approx. 1.25 FTE's

HOW WILL/IS THE INVENTORY BEING USED?:

The inventory will be used to assist the ciyt develop a wetlands protection program and update Auburn's Comprehensive Plan.

NOTES:

Maps show areas that are wetlands according to USFWS/CWA definitions, CWA definitions, and non-inventoried areas (hydric soils currently being cultivated). Some areas were inconclusive because of the lack of hydrological indicators in dry summer months.

Auburn is planning to continue their inventory effort in 1989/90.

SELECTED WETLAND STUDIES IN THE STATE OF WASHINGTON

PUGET SOUND BASIN

Burrell, G. 1978. SNOHOMISH ESTUARY WETLANDS STUDY - CLASSIFICATION AND MAPPING, Volume III. U.S. Army Corps of Engineers, Seattle, Washington. (Classification, Maps, Inventory, Snohomish River and Estuary, Snohomish County)

Critical biological areas and habitat types were identified, classified, and mapped in the Snohomish River basin.

Ellman, N. S., and J.P. Schuett-Hames. 1981. WETLANDS OF LAKE WASHINGTON, U.S. FISH AND WILDLIFE SERVICE, ECOLOGICAL SERVICES, Olympia, Washington, August, pp. 47. (Inventory, Historic Changes, Fish and Wildlife, Lake Washington, King County)

From this study and using data gathered by others: 84 plant species, 105 bird species, and 7 mammal species have been observed in the wetlands of Lake Washington.

The wetlands of Lake Washington have suffered large acreage losses, and they are still being encroached upon. We estimate approximately 1,063 acres of wetland associated with Lake Washington remain in 7 of the 9 areas studied. Two areas previously in wetland had been filled by the time of our field surveys, and only remnants of the past vegetation remained.

The U.S. Fish and Wildlife Service believes the remaining wetlands should be preserved, and therefore, will not support activities adversely impacting natural and beneficial fish and wildlife values of wetlands.

Jeffrey, R., R.C. Parker, and P.M. Henry. 1977. WETLANDS SURVEY - NORTHWESTERN WASHINGTON. Washington State Department of Game, Olympia, Washington. (Inventory, Snohomish, Skagit, Island, San Juan and Whatcom Counties)

* From: Boule, M.E., R.D. Kranz, T. Miller. 1985. DRAFT ANNOTATED WETLAND BIBLIOGRAPHY OF THE STATE OF WASHINGTON. Seattle District, U.S. Army Corps of Engineers, Seattle, Washington.

This report developed a method for comparing wetlands on the basis of their value for wildlife and other natural resources contributing to outdoor recreation. The region inventoried was that part of Snohomish County north of U.S. Highway 2 and Skagit, Island, San Juan, and Whatcom Counties. Generally, areas of less than 20 acres were not included. In all, 56 wetland tracts were evaluated for resources and habitat value. Padilla Bay, Lake Terrell, and Drayton Harbor had the highest habitat ratings.

Kunze, L.M. 1984. PUGET TROUGH COASTAL WETLANDS. A summary report of biologically significant sites; Washington Natural Heritage Program, Department of Natural Resources, Washington Department of Ecology, Olympia, Washington, January, pp. 154. (Inventory, Puget Sound)

This study was conducted to identify coastal wetlands throughout the Puget Trough region that might be appropriate candidates for inclusion within a statewide system of estuarine sanctuaries. The study was conducted employing a botanical and ecological perspective, supplemented with secondary source data on wildlife and land use history. The sites were evaluated in terms of the quality, representation, and the diversity of physical and biotic features present. Nineteen sites were recommended as being appropriate for possible inclusion with an estuarine sanctuary system. Individual reports are provided for each site.

Martel Laboratories, Inc. 1976. EXISTING STATE AND LOCAL WETLANDS SURVEYS (1965-1975). U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Volume II, Narrative, pp. 453. (Inventory, United States)

The Office of Biological Services directed Martel Laboratories, to conduct a survey of Regional, State, and local wetland surveys performed since 1965. This resulted from the realization that recent inventories can provide a partial data source from which to formulate and conduct a new National Wetlands Inventory. Such information may be useful also as an index to wetlands data for planners, conservation groups, and other organizations.

The results of the Martel survey are presented in two volumes. The material for each volume is arranged by State in alphabetical order within each of the appropriate USFWS Regions. Volume I is a map atlas showing each State at a common map scale (1:750,000), and

detailing the area covered by each inventory. The maps are cross-indexed by means of a legend-key to Volume II, which contains a profile of each inventory. Volume I includes a small-scale generalized map of the United States showing wetland inventories accomplished or work in progress.

Volume II is organized into chapters, each of which covers one State. Each chapter is divided into:

1. Inventory Section, summarizing all wetland inventories performed, and reporting for each survey the reasons, method, products, and key persons to contact;

2. Notes Section, serving as background information on relevant inventories conducted prior to 1965, inventories of small aerial extent, or studies whose primary purpose was not a wetland inventory, but which involved wetlands in a general manner; and

3. Legal Synopsis Section, describing State legislation that pertains to the management, protection, or identification of wetlands.

Maynard, C. 1979. INVENTORY OF VEGETATION COMMUNITIES AND ASSOCIATED WILDLIFE OF THE SKOOKUMCHUCK RIVER DRAINAGE. Washington State Department of Game, Olympia, Washington. (Inventory, Fish and Wildlife, Skookumchuck River)

Land cover types were classified and mapped for the Skookumchuck River drainage area, approximately 181 square miles on the west slope of the Cascade Mountains. To accompany the land-cover maps, narratives were written describing vegetative communities, successional stages, and fauna likely to be found in these areas.

Northwest Environmental Consultants. 1975. THE TIDAL MARSHES OF JEFFERSON COUNTY. Jefferson County Planning Department, Port Townsend, Washington. (Inventory, Maps, Tidal Datums, Jefferson County, Port Townsend)

This report examines 20 tidal marshes in the eastern portion of Jefferson County. A description and evaluation of each tidal marsh was completed. Marshes range in size from 1.5 acres to 32.8 acres.

The ratio of high marsh area to low marsh area suggests that much of the marsh had been present for many years before the county was settled and developed. There is a discussion of tidal marsh dynamics, the value of tidal marshes, and tidal marshes and shoreline development.

Puget Sound Regional Planning Council. Undated. PROJECT OPEN SPACE. Report Number 11: swamp, marsh, and bog areas in the Central Puget Sound Region. (Inventory, Map, Values, Puget Sound)

Approximately 80 square miles of land area in the region consist of swamp, marsh, and bog lands. These areas, characterized by poor drainage and organic peat, muck, or marsh soil types have, for the most part, either remained vacant or partially utilized for agricultural purposes. The impact of urban development on these areas has been minimal, and largely confined to intensive urban uses such as commercial, industrial or high-density residential land use types on sites with locational advantages. Cost disadvantages related to the provision of suitable structural support appears to be one of the primary factors precluding the use of these areas for extensive urban developments such as single-family residences. The existing and future availability of an adequate supply of developable land resources with normal site preparation costs, also tend to mitigate against the extensive use of these areas for residential purposes.

To date, these areas have tended to be self-preserving. However, as urbanization pressures intensify, it can be expected that conversion of these areas to their "highest and best" economic use will take place. Except for localized situations, swamp, marsh, and bog areas will likely continue to be generally open space land preservation objectives can best be accomplished through the continued maintenance of high standards in the administration and enforcement of "official controls" regulating the use and development of land. Fee or less than fee simple acquisitions would be justified and should be encouraged for areas having locational or natural qualities, and which would accommodate a specific open space objective, need or demand.

Raedeke, L.D., J.C. Garcia, and R.D. Taber. 1976. WETLANDS OF SKAGIT COUNTY, LOCATIONS, CHARACTERISTICS, AND WILDLIFE VALUES. College of Forest Resources, University of Washington, Seattle, Washington. (Boundary Delineation, Classification, Fish and Wildlife, Inventory, Maps, Preservation, Shoreline Management, Vegetation, Skagit County)

A total of 35,865 acres of inland standing water and coastal wetlands were inventoried. Coastal wetlands comprised 68% of that total (sounds and bays, 56%; regularly flooded salt marsh, 6%; coastal deep marsh, 4%; and Coastal salt meadow,1%), and the remaining 32% fell in inland standing water wetland classes (Inland open freshwater, 23%; Seasonally flooded basins or flats, 4%; Shrub swamps, 2%; Inland deep freshwater marsh, 1%; Inland shallow freshwater marsh, 1%; and Wooded swamps and Bogs combined, 1%). In addition, over 391 miles of streams were inventoried.

Ownership percentage breakdown showed 52% of the standing water wetlands to be under private, municipal, or county ownership. Land use percentage breakdown showed 33% of the wetlands to be under agriculture, 19% under conservancy, 18% idle, 16% under forestry, 10% developed, and 4% under recreational land use.

Over 92% of Skagit County wetlands are of high wildlife value, and over 86% are of high value to waterfowl. Over half of the wetlands of high wildlife and waterfowl value are privately owned, about 41% are state owned, and the balance are federally owned. Again, only a small fraction are municipally or county owned.

About 75% of all wetlands are protected under the Shorelines Management Act of 1971.

Shapiro and Associates, Inc. 1978. INVENTORY OF WETLANDS LOWER SKAGIT RIVER. U.S. Army Corps of Engineers, Seattle, Washington. (Boundary Delineation, Classification, Fish and Wildlife, Inventory, Maps, Values, Vegetation, Skagit River, Skagit County)

This study identified, classified, and mapped wetlands lying within the proposed Skagit River Levee and Channel Improvement Project. The study area extends along the Skagit River from Sedro Woolley, Washington to the mouth. The relative biological importance of these wetland habitats were evaluated, and a priority rating of the various wetland habitat types with respect to their fish and wildlife value were recommended.

Shapiro and Associates, Inc. 1981. INVENTORY OF WETLANDS GREEN-DUWAMISH RIVER VALLEY. U.S. Army Corps of Engineers, Seattle, Washington. (Classification, Inventory, Maps, Value, Vegetation, Green River, Duwamish River, Pierce County)

This report is the result of an inventory conducted to identify, classify, and map wetland and terrestrial vegetation in the Green River Valley within King County, Washington, including the cities of Auburn, Kent, and Renton. Relative biological importance of wetland habitats within the study area were evaluated. Approximately 152 acres of small and large open water ponds, 494 acres of river habitat types, 829 acres of emergent marsh, and 227 acres of forested wetland occur in the study area.

Shapiro and Associates, Inc. 1981. WETLANDS STUDY OF COMMENCEMENT BAY. U.S. Army Corps of Engineers, Seattle, Washington. (Classification, Fish and Wildlife, Inventory, Maps, Vegetation, Puget Sound, Commencement Bay)

All wetlands in the Commencement Bay study area have been inventoried and mapped.. Within the study area there are about 327 acres of wetlands, including about 131 acres of open water and ponds, 91 acres of intertidal flats, 11 acres of salt marshes, and 86 acres of freshwater marshes; swamps and brackish marsh cover less than 5 acres.

Almost 75% of the freshwater marshes are seasonal, their occurrence being dependent upon winter rains which flood or saturate these areas. In dryer summer months, surface water evaporates, the water table drops, and these wetlands dry up.

The wetlands within the study area, although not numerous or expansive, appear to be of value to a diverse avian population. Waterfowl rely upon the wetlands for wintering, feeding, cover, and nesting. Great blue heron and other wading birds were frequently observed, as well as numerous shorebirds and passerines.

Our studies have revealed some potential sites in Commencement Bay for rehabilitation and/or creation of wetland habitat, either by increasing the flow of water to isolated seasonal marshes or, alternatively, by selective deposition of fill on intertidal flats and shallow marine areas to raise the elevation such that salt marsh habitat may be created.

Unauthored. Undated. JEFFERSON COUNTY SHORELINE INVENTORY. (Inventory, Shoreline Management, Jefferson County)

Inventory of wetlands throughout Jefferson County described by residential and commercial uses, general welfare and community services, parks and recreation, circulation network, utilities available, agricultural and commercial forest uses, undeveloped land, and water uses. Descriptions are discussed by U.S. Geological Survey topographic quadrangles to include quadrangles: Brinnon, Center, Gardiner, Hansville, Holley, Lofall, Mt. Walker, Nordland, Port Ludlow, Port Townsend north, Port Townsend south, Quilcene, Seabeck, Uncas, and West End.

U.S. Army Corps of Engineers. 1975. PUGET SOUND AND ADJACENT WATERS, WASHINGTON. Authorization report for channel improvements for navigation in the Blair and Sitcum Waterways, Tacoma Harbor, Washington, August. (Inventory, Navigational Improvement, Management, Tacoma Harbor)

Report discusses purpose, authority, scope of project, and other related studies. Specifically, it describes the resources and economy of the study area including the environmental setting, human resources, and development plans. Problems and needs are identified to aid in formulating and selecting a plan. Plan responsibilities are divided into federal and non-federal roles.

U.S. Army Corps of Engineers. 1980. INVENTORY OF WETLANDS WILLAPA RIVER AT RAYMOND. Environmental Resources Section, Seattle, Washington, January. (Classification, Environmental Assessment/ Impacts, Inventory, Maps, Willapa River, Raymond, Pacific County)

The Seattle District of the Corps of Engineers has planned a flood damage reduction project on the Willapa River. The Seattle District has conducted a wetlands inventory, and prepared an environmental impact statement. The report identifies, classifies, and illustrates by maps those wetlands lying within the project area. A bibliography of references appropriate to the Raymond area is also included.

OTHER AREAS IN THE NORTHWEST

Ball, I.J., J.W. Connelly, D.W. Fletcher, G.L. Oakerman, and L.M. Sams. 1976. WETLANDS OF GRANT COUNTY - LOCATION, CHARACTERISTICS, AND WILDLIFE VALUES. Department of Zoology, Washington State University, Pullman, Washington. (Inventory, Fish and Wildlife, Grant County)

Over 5,600 wetland areas with a total area of 88,426 acres were inventoried. Lakes and impoundments accounted for 67,433 acres, leaving a non-lake wetland total of 20,993 acres. The former are referred to as "lakes" and the latter as "wetlands". Inland Deep Fresh Marsh comprised 36.9% of wetland acreage. Other common wetland types were Seasonally Flooded Basins and Flats (21.6%), Inland Open Fresh Water (13.3%), Inland Fresh Meadow (10.6%), Inland Open Saline Water (8.0%), and Inland Shallow Fresh Marsh (7.9%).

Because of federal ownership of a relatively few very large lakes and impoundments, lake and wetland ownership vary markedly. On an acreage basis, lakes wee 12.2% private, 3.9% state, and 83.9% federal. Wetland acreage was 44.6% private, 23.2% state, and 32.2% federal. Considering both lakes and wetlands, 83.4% of the acreage was judged as high in waterfowl value for either breeding or wintering, 13.7% as moderate, and 2.9% as low.

Clallam County Planning Department. 1972. A SHORELINES INVENTORY REPORT FOR CLALLAM COUNTY, WASHINGTON, ELEMENT A: SURVEY OF NATURAL CHARACTERISTICS, AUGUST 28. (Inventory, Clallam County)

Inventory survey sheets of rivers and creeks discussed by physical and human factors.

Fies, T.T. 1971. SURVEY OF SOME SLOUGHS OF THE LOWER COLUMBIA RIVER. Oregon State Game Commission, pp. 58. (Inventory, Columbia River)

A survey to gather physical, biological, and chemical information from major slough areas.

Oregon, State of, Department of Fish and Wildlife. 1979. HABITAT CLASSIFICATION AND INVENTORY METHODS FOR THE MANAGEMENT OF OREGON ESTUARIES. Prepared for Oregon Land Conservation and Development Commission by the Research and Development Section, June, pp. 109. (Classification, Inventory, Vegetation, Oregon)

Report begins with a physical classification of Oregon estuaries by physiographic province, geomorphology and drainage areas. Estuaries are classified into subsystems and habitat classes. Resource inventories for estuary planning and management are then presented by physical and biological characteristics.

Shapiro and Associates, Inc. 1979. QUILLAYUTE RIVER NAVIGATION PROJECT AND WETLANDS MAPPING AND WILDLIFE LITERATURE REVIEW. U. S. Army Corps of Engineers, Seattle, Washington. (Annotated Bibliographies, Boundary Delineations, Classification, Inventory, Maps, Navigational Improvements, Vegetation, Quillayute River, Clallam County)

A field investigation of the wetland habitat types and upland areas in the vicinity of La Push, Washington, was performed. Habitat types were mapped, and wetlands were classified according to Macomber's (1978) system, and cross referenced with U. S. Fish and Wildlife's National Wetland Inventory classification.

The Washington Coastal Zone Atlas (Washington Department of Game, 1979) classification system was used for identification of upland habitat types and land uses.

Twelve wetland and nine upland habitat types were identified and mapped within the study area. The major wetland types included wet meadows, overflow forest, low tide shoes, and low tide bars and flats. The most abundant habitat types were estuarine zones, mixed forest, commercial/service/industrial regions, and residential areas. A brief description of all habitat types found in the study area is provided, and their aerial extent is listed and mapped as noted in the field.

An annotated bibliography of publications relating to wildlife resources on or near the Quilayute Indian Reservation is included.An annotated bibliography of publications relating to wildlife resources on or near the Quilayute Indian Reservation is included.

Thomas, D.W. 1982. SIGNIFICANT SHORELAND AND WETLAND HABITATS IN THE CLATSOP PLAINS AND THE COLUMBIA FLOODPLAIN OF CLATSOP COUNTY, OREGON. Unpublished Report, pp. 62. (Classification, Inventory, Maps, Shoreline Management, Values, Clatsop County, Columbia River)

A report to Clatsop Tillamook Intergovernment Council and Columbia River Estuary Study Taskforce to identify wetlands, shorelands, and riparian values, and describing the significant sites in the Clatsop Plains and the Columbia Rive Floodplain.

U.S. Department of the Interior, Fish and Wildlife Service. 1970. NATIONAL ESTUARY STUDY III: WILLAPA BAY, WASHINGTON. Management studies in specific estuaries, U.S. Bureau of Sport Fisheries, U.S. Bureau of Commercial Fisheries, pp. 213-248. (Dredge Materials, Fish and Wildlife, Inventory, Management, Values, Willapa Bay, Pacific County)

This report discusses fish and wildlife resources of Willapa Bay. Factors affecting fish and wildlife values and uses of Willapa Bay include destruction of tidelands and marshlands, dredging activities, construction of shoreline facilities, contamination of aquatic life, and sedimentation. Discusses the need for a coordinated and integrated use management plan, and the need for a complete inventory of the resources.

Resource Contacts

FEDERAL AGENCIES AND PROGRAMS

Soil Conservation Service
Consult your phone book for the address and phone for the SCS office in your county.

Army Corps of Engineers
Contact: Karen Northrup. Biologist/Environmental Analyst

P.O. Box C-3755
4735 E. Marginal Way S.
Seattle, Wa 98124-2255

(206) 764-3455

Environmental Protection Agency
Contact: William Riley, Chief, Water Resources Assessment Section

Can provide: technical assistance in federal delineation methodology

1200 Sixth Avenue
Seattle, WA 98101

(206) 442-1412

U.S. Fish and Wildlife Service

Olympia
Contact: John Cooper, Fish and Wildlife Biologist

Division of Ecological Services
7625 Parkmont Lane SW
Building B
Olympia, WA 98502

(206) 753-9440

Portland

Contact: Dennis Peters, Assistant Regional Wetlands Coordinator, National Wetlands Inventory

Can provide: Information and instruction in NWI, USFWS Classification, and aerial photo interpretation.

Lloyd Five Hundred Bldg.
500 N.E. Multnomah Street
Portland, Oregon 97232

(503) 231-6154

STATE AGENCIES

Department of Natural Resources

Resource Mapping Section
Contact: State Resident Cartographer

Can provide: contacts for inquiries about cartographic products and technical assistance.

Resource Mapping Section
Department of Natural Resources
Mail Stop AW-11
Olympia, WA 98504

(206) 753-5340

Natural Heritage Program
Contact: Mark Sheehan, Assistant Manager

Can provide: information about the Natural Heritage Program and endangered, threatened, and sensitive vascular plants of Washington.

Division of Land And Water Conservation
Department of Natural Resources
Mail Stop EK-12
120 East Union
Olympia, WA 98504

(206) 234-2449

Department of Ecology

Wetlands Section
Contact: Mary Burg, Section Head

Can provide: wetland inventory training and technical assistance in wetland evaluation, regulation, and other wetland related issues.

Shorelands and Coastal Zone Management Program
Wetlands Section
Department of Ecology
Mail Stop PV-11
Olympia, WA 98504

(206) 459-6790

Cartographic Section
Contact: Joan Velikanje, Cartographer

Can provide: NWI maps

Department Of Ecology
Mail Stop PV-11
Olympia, Wa 98504

(206) 459-6201

Washington Conservation Corps
Contact: Linda Bradford, Washington Conservation Corps Program Director

Can provide: youth work crews (ages 18-25).

Department of Ecology
Mail Stop PV-11
Olympia, WA 98504

(206) 459-6131

Coastal Zone Management Program
Contact: Steve Craig, Administrator, Coastal Zone Management (CZM) grants to local governments in coastal counties.

Department Of Ecology
Shorelands and Coastal Zone Management Program
Mail Stop PV-11
Olympia, Wa 98504

(206) 459-6779

Water Quality Financial Assistance Program
Contact : Steve Carley, Program Management Unit Leader

Department of Ecology
Policy and Planning Section
Water Quality Financial Assistance Program
Mail Stop PV-11
Olympia, Wa 98504

(206) 459-6104

Department of Fisheries
Contact: Mary Lou Mills, Fisheries Biologist

Can provide: general and site specific fisheries information.

Department of Fisheries
Room 115
General Administration Bldg.
Olympia, WA 98445

(206) 753-0576

Department of Wildlife

Habitat Management
Contact: Bob Zeigler, Wetland Biologist

Can provide: training on fish and wildlife values of wetlands and wetland buffers.

Department of Wildlife
MS GJ-11
Olympia, WA 98504

(206) 753-3188

LOCAL GOVERNMENTS THAT HAVE OR ARE CONDUCTING INVENTORIES

City of Auburn
Contact: Greg Fewins, Associate Planner

City of Auburn
Planning and Community Development Department
25 West Main St.
Auburn, WA 98001

(206) 931-3090

City of Bellevue
Contact: Toni Cramer, Environmental Coordinator

Design and Development Department
Administration Division
City of Bellevue
PO Box 90012
Bellevue, WA 98009-9013

(206) 453-2971

City of Bellingham
Contact: Vicki Matheson, Development Planner

Bellingham Planning and Economic Development
210 Lottie St.
Bellingham, WA 98225

(206) 676-6982

Jefferson County
Contact: Jim Pearson, Assistant Planner

Jefferson County Courthouse
Port Townsend, WA 98368

(206) 385-2140

King County
Contact: Eric Stockdale, King County Planning and Community Development

Room 770
Dexter-Horton Bldg.
710 Second Ave.
Seattle, WA 98104

(206) 344-2544

Kitsap County
Contact: Rick Kimball, SEPA Coordinator

Kitsap County Planning Department
614 Division
Port Orchard, WA 98366

(206) 876-7152

Hood Canal Coordinating Council
Contact: Clyde Strikland, Division Planning Head

Kitsap County Planning Department
614 Division
Port Orchard, WA 98366

(206) 876-7154

Pierce County
Contact: Mike Cooley, Senior Planner

Pierce County
Department of Planning and Natural Resources
2401 South 35th Street
Tacoma, WA 98409-7487

(206) 591-7361

Thurston County
Contact: Neil Aaland or Steve Morrison, Senior Planners

Thurston Regional Planning Council
2000 Lakeridge Drive SW
Olympia, WA 98502

(206) 786-5480

Snohomish County
Contact: Tom Murdoch, Water Resources Coordinator

Snohomish County
Department of Public Works
County Administration Bldg.
300 Rockerfeller
Everett, WA 98201

(206) 259-9488

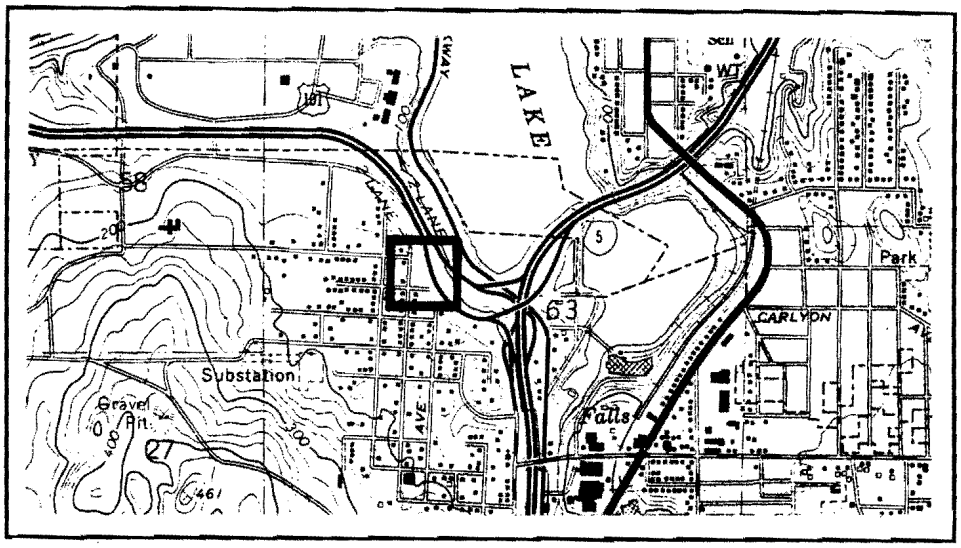
Understanding Scale

Scale is defined as a ratio of distances between corresponding points on a map (or photo) and on the ground. It is usually expressed as a representative fraction, such as 1/24,000. This means that one unit on the map is equivalent to 24,000 of the same units on the ground. For example, with a scale of 1:24,000, each inch on the map equals 24,000 inches on the ground. This can also be expressed as 1" = 2,000' (24,000" divided by 12" to change units to feet). Each inch on the map equals 2,000 feet on the ground. A small scale map (1" = 2,000') covers the greatest geographical area while a large scale map (1" = 200') covers the smallest geographical area. As the scale gets larger the detail per acre is greater.

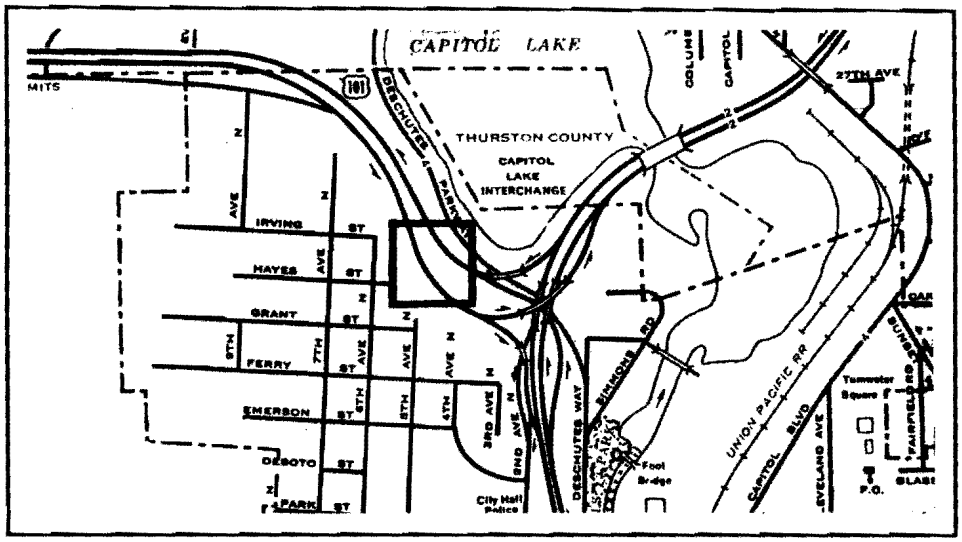
Common Scales

Large scale	1:1,200	1"=100'
	1:2,400	1"=200'
	1:7,200	1"=600'
	1:24,000	1"=2000'
	1:62,500	1"=almost 1 mile
Small scale	1:250,000	1"=almost 4 miles

The outlined area on each map below represents one acre.



USGS Topographic Map scale 1" = 2000'



City Map scale 1" = 1275'

Aerial Photograph scale 1" = 500'

Smaller Scale

Larger Scale

*Wetland and Deepwater Systems in USFWS Classification**

Marine System consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides. Salinities exceed 30 0/00, with little or no dilution except outside the mouths of estuaries. Shallow coastal indentations or bays without appreciable freshwater inflow, and coasts with exposed rock islands that provide the mainland with little or no shelter form wind and waves, are also considered part of the Marine System because they generally support typical marine biota.

Estuaries System consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land. The salinity may be periodically increased above that of the open ocean by evaporation.

Riverine System includes all wetlands and deepwater habitats contained within a channel, with two exceptions: 1) wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens, and 2) habitats with water containing ocean-derived salts in excess of 0.5 0/00. A channel is "an open conduit either naturally or artificially created which periodically or continuously contains moving water, or which forms a connecting link between two bodies of standing water".

Lacustrine System includes wetlands and deepwater habitats with all of the following characteristics: 1) situated in a topographic depression or a dammed river channel; 2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30% aeral coverage; and 3) total area exceeds 8 ha (20 acres). Similar wetland and deepwater habitats totaling less than 8 ha are also included in Lacustrine System if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 2 m (6.6 feet) at low water. Lacustrine waters may be tidal or nontidal, but ocean-derived salinity is always less than 0.5 0/00.

Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 0/00. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: 1) area less than 8 ha; 2) active wave-formed or bedrock shoreline features lacking; 3) water depth in the deepest part of basin less than 2m at low water; 4) salinity due to ocean-derived salts less than 0.5 0/00.

*Cowardin. et. al., *Clasification of Wetlands and Deepwater Habitiats of the United States* U.S. Fish and Wildlife Service, Washington, DC, 1979.

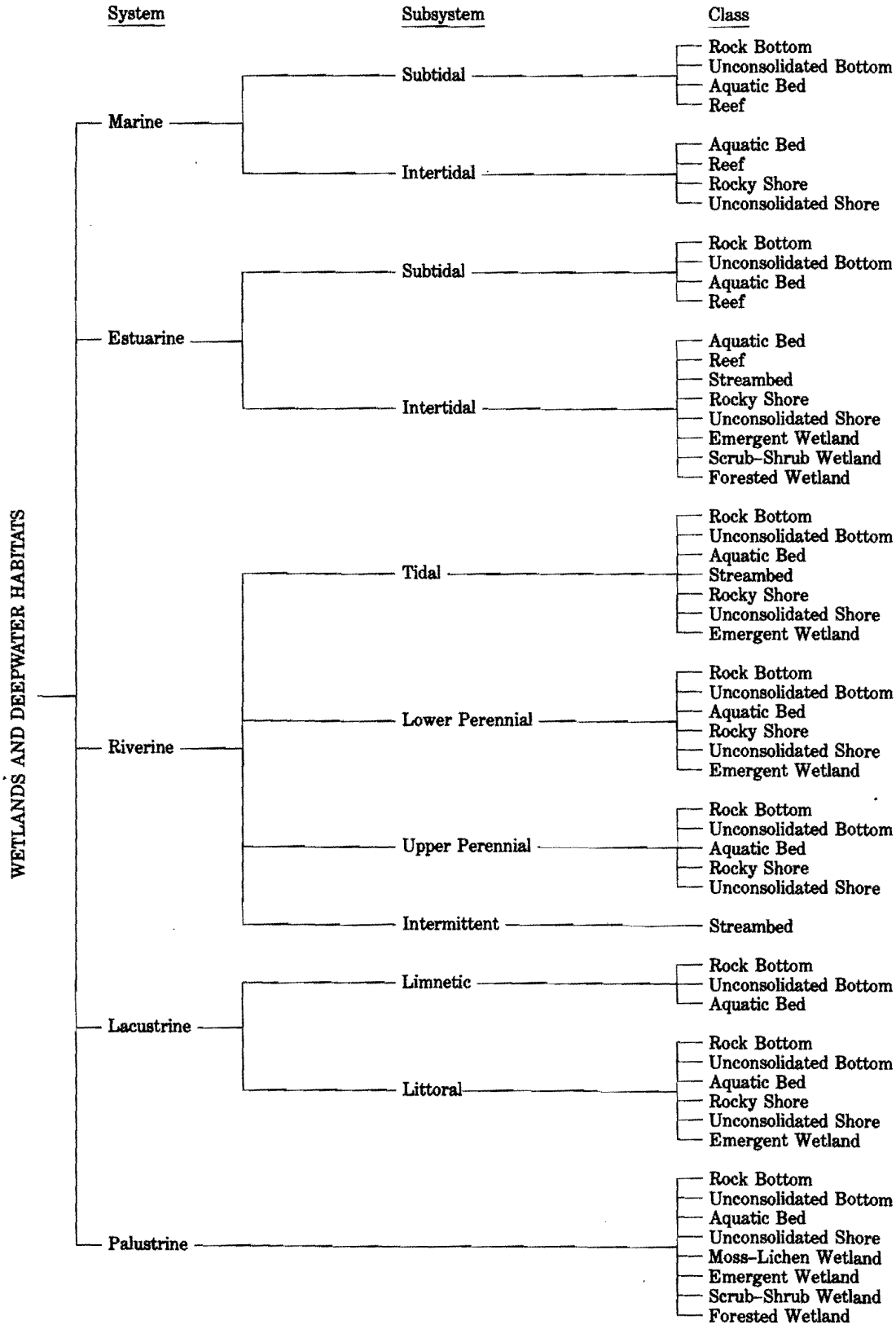


Fig. 1 Classification hierarchy of wetlands and deepwater habitats, showing Systems, Subsystems, and Classes. The Palustrine System does not include deepwater habitats. (Cowardin, 1979)

DESCRIPTIONS AND EXAMPLES OF BASE AND SOURCE MAPS USED DURING PAPER INVENTORY

RECOMMENDED BASE MAPS FOR RECONNAISSANCE MAPS

Orthophoto maps are continuous-tone photographic images prepared from high resolution black and white photographs. They depict topographic relief true to scale. Distortions and relief displacements have been optically removed. They show all the detail that appears on the original aerial photograph. They often include section lines, road names, property and political boundaries. In Eastern Washington, they are available at a scale of 1:24,000 covering an entire quadrangle. In Western Washington, they can be obtained at both the 1:24,000 and 1:12,000 covering a quarter quadrangle per map. Orthophoto maps can be reproduced using diazo printer if you have access to the mylar originals. Since they disintegrate when wet, they should be placed in plastic covering for protection when taken in the field.

Bluelines are blue tone reproductions of aerial photos made from photos on transparent mylar using a diazo printer. Although they are not optically corrected and some features can be difficult to interpret, depending on their darkness, they show the detail of the original aerial photo. Most importantly, they are often at large scales, e.g.1:4,800 (1" = 400').

Local governments sometimes have the necessary materials and equipment to produce bluelines for their jurisdiction. If the local jurisdiction has access to the mylars, they can produce them rather inexpensively. Bluelines are not available through any state agency. They also disintegrate when wet.

PRIMARY INFORMATION SOURCES FOR PAPER INVENTORY

National Wetlands Inventory Maps are the primary information sources used in conducting a paper inventory. They are a product of a national wetlands inventory initiated in 1979 by the United States Fish and Wildlife Service (USFWS). NWI maps are available primarily in 7.5 minute or a 1:24,000 scale.

To produce the maps, the National Wetlands Inventory teams interpret the location of wetlands, their boundaries, and classifications from aerial photographs. This information is superimposed on United States Geological Society (USGS) topographic quadrangle base maps. The wetland classification, according to Cowardin et al. 1979, is designated on the topographic map by a system of codes. Random ground truthing is used to confirm the accuracy of the photographic interpretation.

Although the NWI maps are the most accurate national & statewide inventory to date discrepancies (both in wetland number and size) have been found between the maps and observations on site. This is due to the scale of the photographs used and interpreting wetlands in areas with continuous forest cover (forested wetlands are often difficult to identify when surrounded by the same type forest cover). The majority of maps for Washington have been updated using photographs from the 1980's. Because larger scaled (1:80,000 vs. 1:130,000) and better quality photographs were used, the new maps should be more accurate.

Soils maps are important in conducting the paper inventory because they indicate the location of different soil types including saturated wetland soils (hydric soils). They sometimes depict potential wetland areas which may not be identified on the NWI maps.

Soils survey maps are available through the Soil Conservation Service (SCS) and Department of Natural Resources (DNR). The SCS maps are superimposed on half-tone aerial photography and are at a 1:24,000 scale (same scale as NWI). The maps and accompanying soil descriptions are available in soil survey books organized by county. The SCS also has a listing of the hydric soils found in various regions in the state of Washington. Since the information is updated periodically, it is important to acquire the most current maps available.

State soils maps cover an entire township at a scale of 1:24,000 (same scale as NWI). They are available on paper or transparent overlays. The mylar overlays make it easy to transfer information between maps of the same scale. Because DNR maps were designed for use in forested areas, their availability may be limited.

Aerial photographs are interpreted during the paper inventory to identify any wetlands that do not appear on NWI or soils maps. Differences in the tone, texture, topography, vegetation, drainage and other features on these photographs are analyzed by local inventory staff to determine probable location of wetlands.

Stereoscopy is the most useful way to interpret aerial photography. With stereoscopy, you use binocular vision (stereoscope) to view pairs of photos to achieve three-dimensional effects. Stereoscopic vision enables you to view an object simultaneously from two different perspectives to obtain the mental impression of a three-dimensional model.

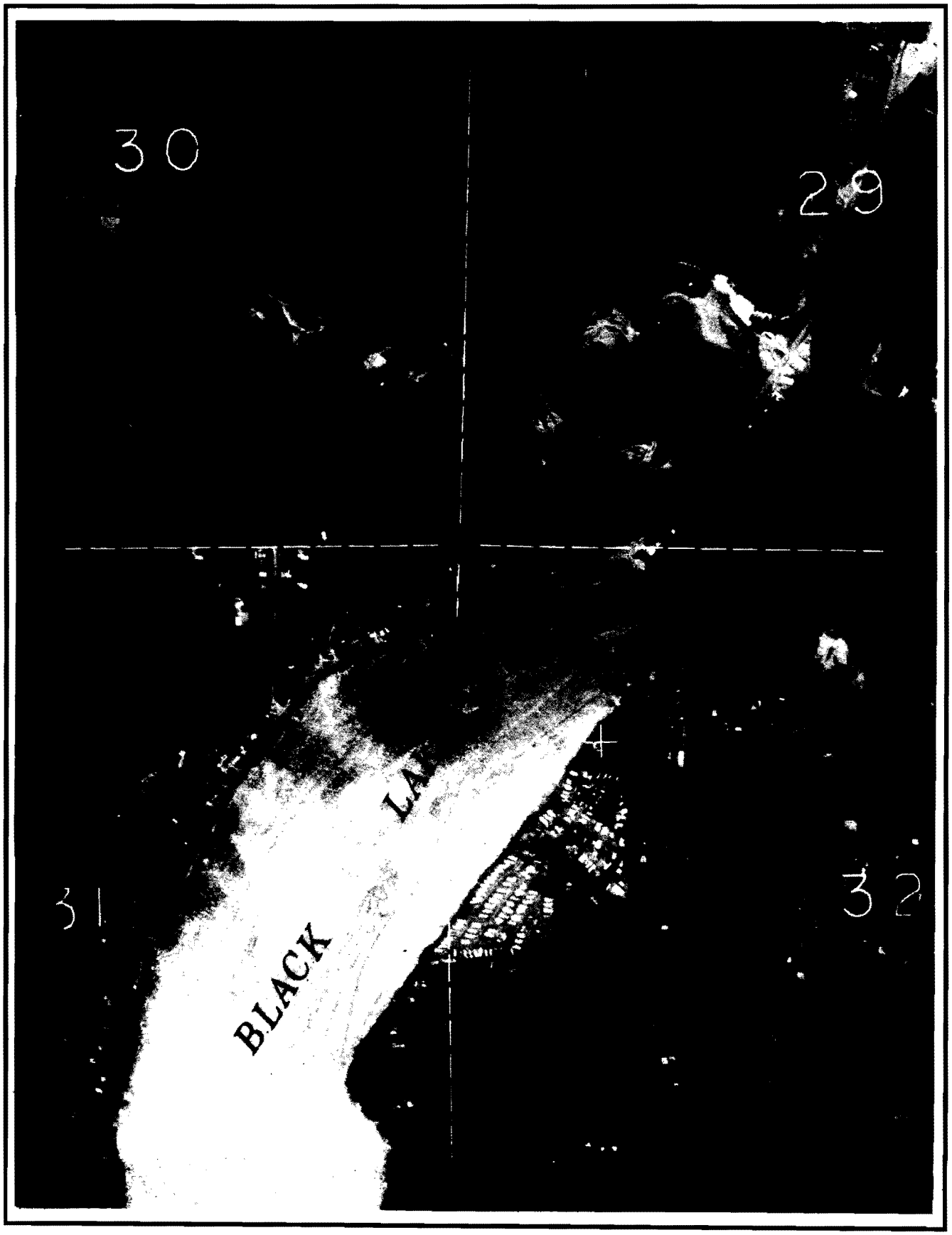
The accuracy of photo interpretation is dependant on the skill and experience of the interpreter, the quality and scale of the photograph, and the type of vegetation cover. With practice, accuracy can be high.

It is optimal to have aerial photos that were taken during the winter with leaves off the deciduous trees and when water levels are high. However, frequent cover of clouds during the winter season in Washington makes good aerial photography difficult.

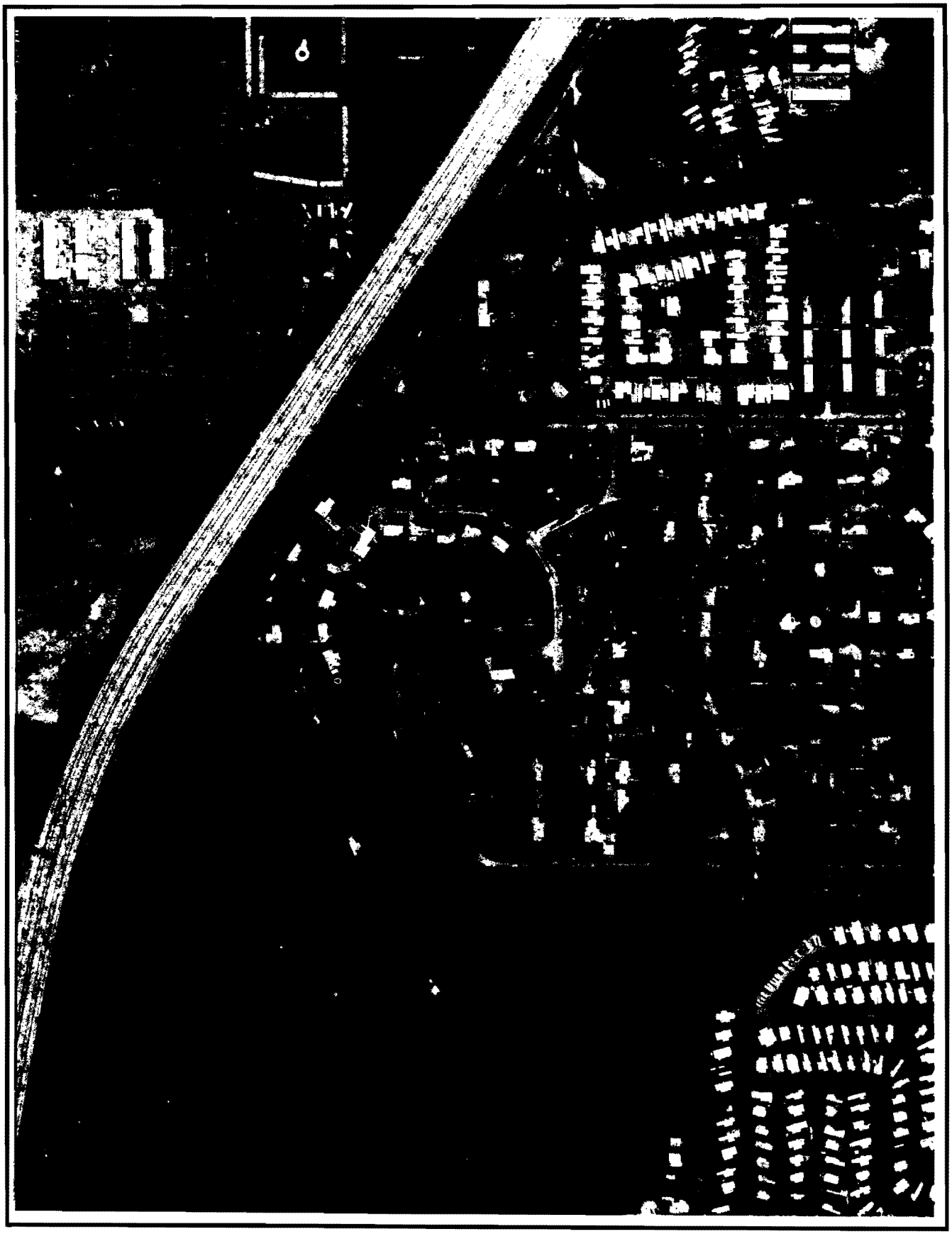
Aerial photographs are taken from an aircraft along flight lines that usually run north-south. They are produced in color, black and white, and infra red. Infra-red photos are taken using film that is sensitive to a different part of the color spectrum than conventional color film. Therefore, it is more useful in distinguishing wetland vegetation. Black and white photographs, however, are the least expensive, most easily accessible, and therefore most commonly used. Aerial photographs are available in a varitey of scales ranging from very large to small scales.

D.N.R. offers a "participator" program in which interested agencies or local governments finance part of a photographic flight. In exchange, the "participator" can purchase aerial photographs from the flight at a reduced price. Call DNR map and photo sales department for more information.

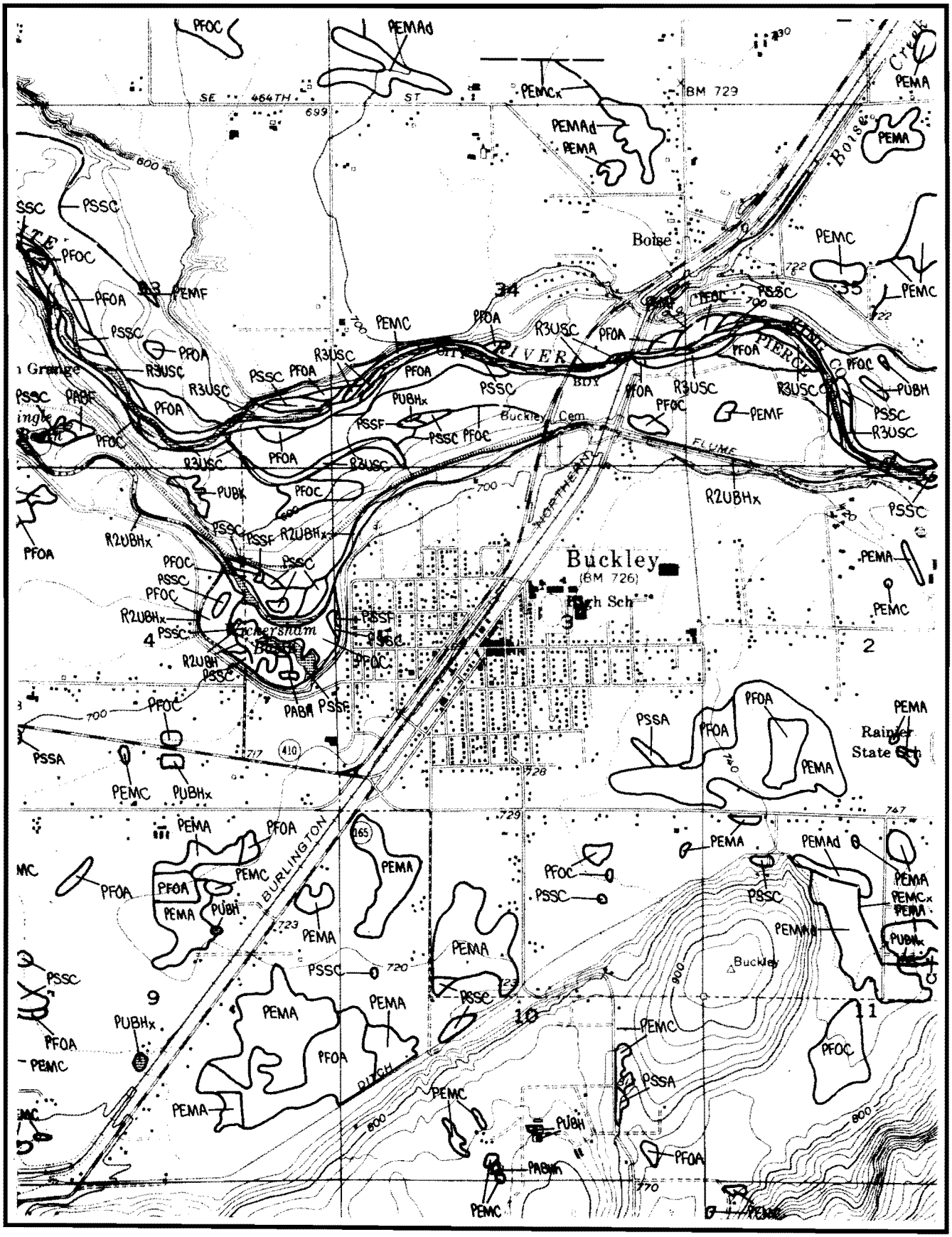
EXAMPLES: MAPS AND PHOTOGRAPHS



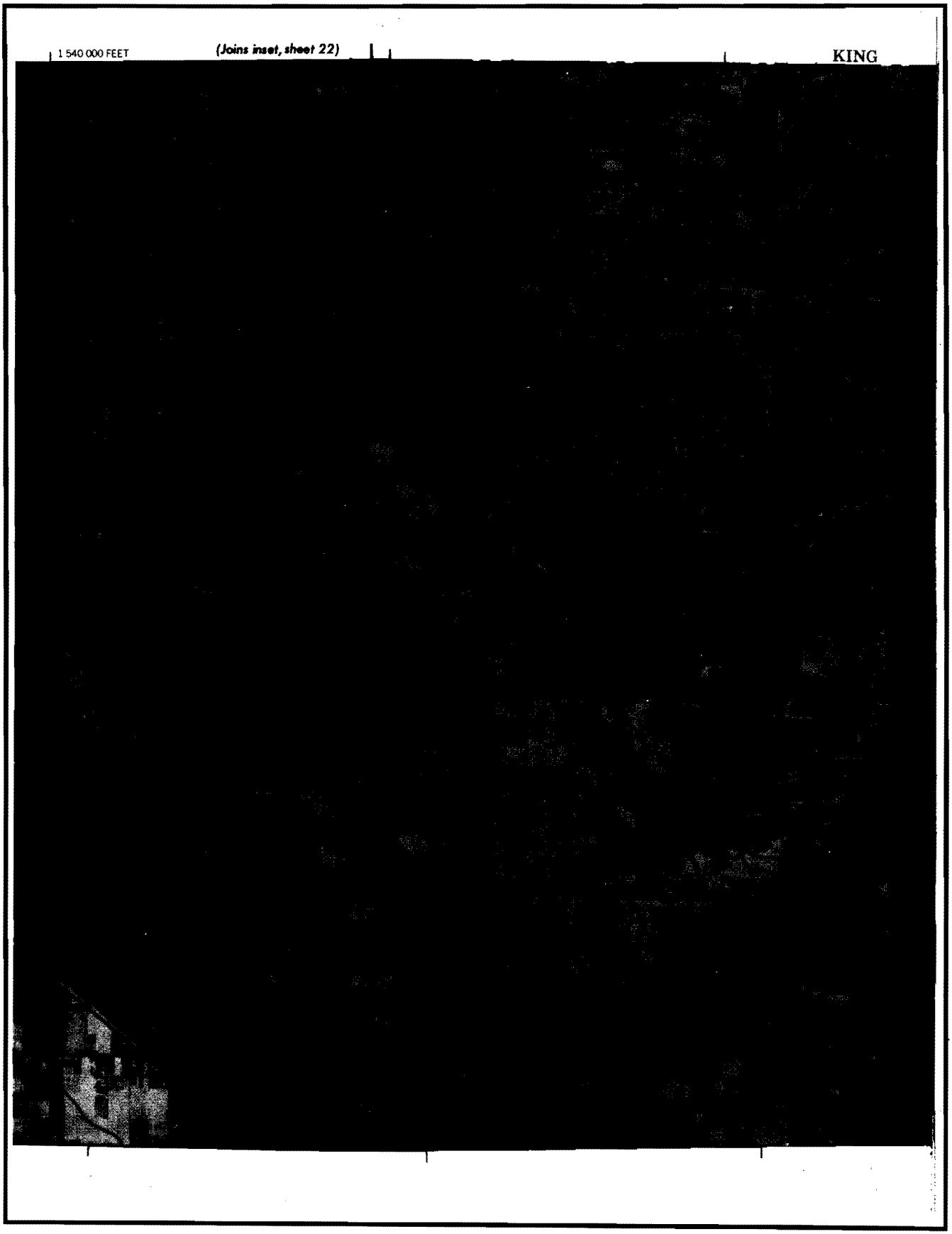
Orthophoto Map



Blueline Map

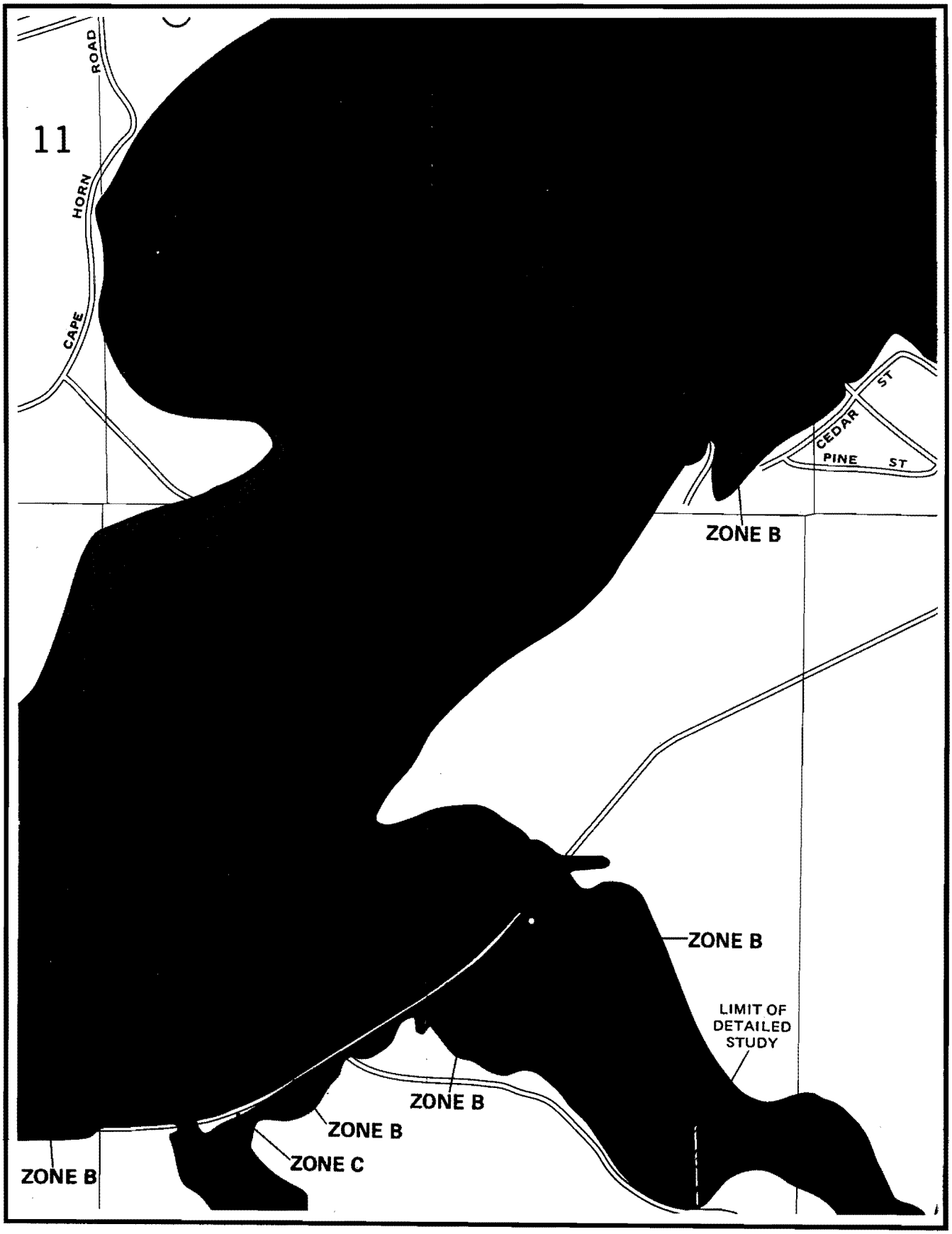


National Wetlands Inventory (NWI) Map
U.S. Fish and Wildlife Service



Soil Survey Map
Soil Conservation Service

Aerial Photograph



Flood Insurance Rate Map (FIRM)
National Flood Insurance Program

MAP, PHOTO, AND EQUIPMENT SOURCES

The following is a list of resources that can be used in conducting paper inventories and producing reconnaissance maps. Selected field equipment is included. Prices are subject to change and reflect 1989 information.

Note: many local governments have maps and photos on hand. Contact them for further information.

Photography

Aerial Photography

Scale: Varies from 1:12,000 to 1:80,000.
Enlargements usually can be made.
Coverage: Entire state through various agencies
Available from: 1. Department of Natural Resources
Division of Engineering AW-11
1065 S. Capital Way
Olympia, WA 98504-8411
Photo and Map Sales Unit: 206-753-5338
Call for an Index of available photos.

Price: Black and white $7.00
Color $7.00 + $10.00 (for color balance) for each roll in order.

2. Department of Transportation
Geographic Services QM-11
1655 South 2nd Avenue
Tumwater, WA. 98504
206-753-2162
Generally cover highway corridors and metropolitan areas.
Call to see if your area is covered.

Price: Black and white $7.00
Color $7.00 for 1, 2-25 $8.00 each + $30.00 (for color balance) per each order.

USF&WS National Wetlands Inventory Maps (NWI)

Scale: 1:24,000
Depicts: Wetland boundaries and coded USF&WS classification descriptions of individual wetlands superimposed on United States Geological Service topographic maps (black and white) or on mylar film. Wetland information also available without topographic map.
Coverage: Entire state
Available from: 1. Department of Ecology
Cartography Section
Mail Stop PV-11
Olympia, WA 98504
Black and white with topographic base

Price: $1.00 for each map plus tax, plus postage and handling for 1 to 10 maps $9.25, and for up to 10 maps thereafter an additional $9.25.

2. National Cartographic Information Center
U.S. Geological Survey
507 national center
Reston, VA 22092
703-860-6045

Overlay (wetlands maps) and composites (wetlands and topographic maps) come in 7.5 and 15' and 30'x 60' on mylar film or on paper.

Price: Mylar film maps $3.50, paper $1.75 plus $6.50 per order shipping and handling charge.

Soil Conservation Service County Soil Survey Reports

Scale: 1:24,000
Depicts: Detailed soil map units on aerial photographs; soil map unit descriptions and maps together in bound book format.

Coverage: Books, by counties, cover almost all of private lands, but not all are current.
Available from: 1. County Soil Conservation Service offices. Contact your local office
2. Washington State Library has all counties in reference section
Price: Free or on loan

State Soil Survey Maps

Scale: 1:24,000
Depicts: Soil units for townships, printed on white background.
Coverage: About half of state
Available from: Department of Natural Resources (see above)
Price: $5.00

Flood Plain Study Area and Flood Insurance Rate Map(FIRM)

Scale: Varies
Depicts: 100 year floodplain; maps are accompanied by a study area report which explains the information on the maps.
Coverage: Most floodprone communities have studies and maps.
Available from: National Flood Insurance Program (NFIP)
For maps call 1-800-333-1363
Price: Free
For community map numbers contact:
Federal Emergency Management Agency (FEMA)
Natural and Technological Hazards
Regions X, Federal Regional Center
Bothell, WA 98021
206-487-4685

Note: For detailed map interpretation use: Floodplain Management Handbook for Local Administrators
Available from: Department of Ecology
Floodplain Section PV-11
Olympia, WA. 98504
206-459-6796

United State Geological Service Topographic Quadrangle Maps

Scale: 1:24,000 (7 min); 1:62,500 (30 min)
Depicts: Topography through contour lines, major highways, towns and cities, water bodies, buidlings such as schools
Coverage: Entire state with a few exceptions
Available from: Department of Natural Resources
Price: $3.25

Orthophoto maps

Scale: 1:24,000 in eastern Washington
1:12,000 in western Washington
Depicts: High resolution photographs with distortion eliminated, with some section lines and geographic names
Coverage: Most of state, in quarter townships for western Washington, and townships for eastern Washington
Available from: Department of Natural Resources (see above)
Price: $5.00 each

Public lands quadrangles

Scale: 1:100,000
Depicts: State and federal ownership including national parks, national forests, military reservations, Indian reservations, state owned trust lands and State Parks
Available from: Department of Natural Resources (See above)
Price: $5.00 each

Speciality topographic maps

Scale: 1:24,000 and 1:12,000
Depicts: Five major water type classifications defined by Washington Forest Practice Rules and Regulations
Coverage: Most of western Washington and portions of eastern Washington
Available from: Department of Natural Resources (see above)
Price: $2.00 each

Water Resources Inventory Areas (WRIA)

Scale: 1:125,000
Depicts: drainage basins
Coverage: all 62 drainage basins in the state
Available from: Department of Ecology
Cartography Section
Mail Stop PV-11
Olympia, WA 98504-8711
206-459-6201
Price: $1.00 for each map plus tax, plus postage and handling for 1 to 10 maps $9.25, and for up to 10 maps thereafter an additional $9.25.

Assessors/ Tax maps/ Property Ownership Maps

Scale: varies
Depicts: property outlines and roadways, varies
Coverage: entire county
Available from: county planning or cartography departments. Contact your local office.
Price: varies

Munsell Soil Color Chart

Obtain: Standard seven chart book plus gley chart
Available from: Munsell Color
Macbeth a division of
Kollmorgen Corporation
2441 North Calvert Street
Baltimore, Maryland 21218

Price: Chart book - $49.50
Gley chart - $ 8.50
$58.00

Steroscope

Available from: Any civil engineering catalog
Price: pocket $3.50 - 62.50
mirrored $315.00 - 800.00

Soil Shovel

Available from: Any natrual resources or forestry catalog
Price: $18.00

Appendix L

Reconnaisance Map Example

Reconnaissance Map

Appendix M

Wetland Inventory Methodology Examples

METHODOLOGY

Introduction

Attitudes towards wetlands have evolved slowly from seeing them as wastelands, to realizing their value as critical natural resources. These attitude changes have in turn lead to various regulations governing the use of wetlands. Different agencies within the federal and state governments developed their own definitions as the need arose, and there is still no single nationally accepted definition for wetlands.

Section 404 of the Clean Water Act established a regulatory definition of the "waters of the United States" which is the basis for the U.S. Army Corps of Engineers (Corps) jurisdiction over filling of wetlands. Under normal circumstances, the Corps' definition of wetlands requires a positive finding for three parameters: hydrology, hydrophytic vegetation, and hydric soils. The wetlands delineation methodology is designed to determine exactly where on any given site, the Corps' Section 404 jurisdiction begins and ends relative to wetland fill proposals. The Corps' wetland definition refers only to vegetated wetlands, and excludes tidal and mud flats, which the Corps regulates as other special aquatic sites under Section 404 of the Clean Water Act.

The U.S. Environmental Protection Agency (EPA) has advisory and review authority over the Corps' filling permits and has developed their own field methodology for delineation purposes. Although their authority comes from Section 404 of the Clean Water Act, their regulatory mandate for environmental protection comes from other legislation as well, and is not restricted to Section 404's specific language. In 1980, EPA issued interim guidance for identification and delineation of wetlands, which is the rationale for their methodology.

The U.S. Fish and Wildlife Service (F&WS), through wildlife habitat research and the compilation of a National Wetlands Inventory, developed an ecological or functional definition. This definition is supported by a fairly complex classification scheme which carries specific information about each wetland. The F&WS maps are derived from high altitude infrared aerial photographs. Information from this National Inventory comprises a National Wetlands Data Base, which can be accessed throughout the country.

The F&WS definition and the EPA's methodology differ from the Corps' in that they define ecologically functioning areas and include tidal flats, mud flats, and other unvegetated areas as wetlands. The F&WS's definition is a broader and more inclusive definition than the Corps', and is used extensively for inventories and surveys. While being similar to the Corps' in that data on hydrology, soils and vegetation characteristics are evaluated, positive findings for only two of the three parameters are required under the EPA's methodology. Wetland hydrology must be present, and presence of either hydric soils or hydrophytic vegetation on a site indicates a functioning wetland. Although the Corps, EPA, F&WS and the Soil Conservation Service (SCS) are currently working to develop a single methodology which will be used in regulatory delineations, problems exist for local and state jurisdictions in deciding which definition and methodology is appropriate to apply in mapping and regulating wetlands.

In compliance with the Washington Department of Ecology's (Ecology) Coastal Zone Management grant, Auburn's inventory mapped wetlands meeting the F&WS definition, as well as those meeting the Corps' definition. By mapping wetlands according to F&WS criteria, Auburn's inventory will be consistent with the National Data Base compiled by the F&WS, and can be used in national trends studies. Mapping Corps-defined wetlands will provide regulatory information to property owners in Auburn, and serve as a data base for the cooperative Special Area Management Permit (SAMP) process. The Puget Sound Water Quality Authority and other state agencies have adopted the use of F&WS's definition, and should any expansion of the Corps' methodology occur, these wetland areas will already be mapped. Since F&WS wetlands tend to be larger than Corps wetlands, the maps will provide valuable information on possible mitigation sites, and approximate direction of water movement. If these F&WS extensions of Corps areas are filled, it is possible that additional water will move onto the Corps-defined sites. Mapped information on wetter and drier property will also help stormwater utility planning by Auburn's Public Works Department.

Parameters Defined

As explained above, both methodologies utilize three parameters to separate a wetland from surrounding uplands. These are: wetland hydrology, presence of hydric soils, and presence of hydrophytic vegetation.

Parameter 1: Wetland Hydrology. Wetland hydrology simply means the presence of water on a particular site for a significant portion of the growing season. Soils must be inundated or saturated for a sufficient length of time to develop hydric soils and hydrophytic vegetation. A rule of thumb used in the field is saturation to within 12" of the soil surface for at least one week during the growing season. The growing season is defined by the U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) as that period of time when the ground is above "biological zero," or five degrees centigrade. In the Auburn valley, the growing season extends at least from February to November.

This is the most critical parameter for wetlands delineation, and is often the most difficult to establish. The onset of the growing season varies from region to region, and collaboration with various agencies such as Agricultural Extension offices is essential to determine the appropriate time to examine each site, if no positive field evidence can be found.

The Corps and EPA use similar methods to determine the presence of this parameter, and look at hydrology during the same time periods. Field evidence of inundation or soil saturation at the appropriate time, and historical records are considered to be positive indicators of wetland hydrology. The amount of time water is on a site determines the extent to which the other two parameters will be present. Water causes formation of hydric soils, and the types of plants which can survive in flooded conditions are limited.

Parameter 2: Hydric Soils. Hydric soils are defined by the SCS as soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation. Hydric soils may be either organic or mineral in origin. Organic soils,

which contain high levels of peat, are formed in bogs at the rate of about 1" per 100 years. Mineral soils are often formed from stream depositions, or sediments dropping out of flood waters.

When a soil is flooded or saturated, water fills the air spaces in the soil, and drives the air out, which reduces the amount of oxygen in the soil. The lack of oxygen causes changes in the iron and manganese in the soil, and characteristic colors develop which can be identified using a Soil Color Chart. A soil sample is compared to paint chips whose color can indicate the degree to which oxygen has been removed from the soil. The Corps, EPA and F&WS use the same color indicators to define when a soil is considered hydric.

Bright orange mottles or splotches in the soil column indicate a fluctuating water table, and the presence of gleying is also an indication of flooding. Gleyed soils in Auburn are bluish-grey in color, and most have a sticky, clay-like texture. This particular color change is found in mineral soils, and must be within the plant root zone to indicate the presence of a hydric soil.

Parameter 3: Hydrophytic Vegetation. Hydrophytic vegetation consists of plants which are typically adapted to life in saturated, low oxygen or anaerobic, conditions. All plant roots require oxygen in order to carry out cell division and growth, and to take up water for the above-ground stems and leaves. Hydrophytic and aquatic plants are capable of carrying out these tasks in flooded (low oxygen) conditions, and get oxygen either through structural changes in their roots which make oxygen from the surface available to them, or through internal chemical processes which allow them to function in low oxygen environments. Hydrophytic plants are capable of not only existing in these conditions, but maturing and successfully reproducing in them.

The Corps, EPA and F&WS require a predominance of hydrophytic vegetation to be present on a site for a positive finding of this parameter. The F&WS produces the National List of Plant Species That Occur in Wetlands, which gives the likelihood of a plant being found in a wetland. This probability is reflected by an indicator, which is specific to geographical regions. The indicator categories range from "Obligate Wetland," a plant almost always occurring in saturated conditions, to "Obligate Upland," a plant which rarely occurs in wetlands, and is killed by exposure to flooding conditions for extensive amounts of time. The "Facultative" indicator implies a plant found in wetlands, but not restricted to wetlands, and is divided into three subcategories. All agencies working with wetland delineations refer to this same list of plants. The list is periodically reviewed and updated by wetland specialists in federal, state, and academic organizations.

The five basic indicator categories, abbreviations and the respective probabilities of a plant's occurring in a wetland are:

Obligate Wetland	OBL	>99%
Facultative Wet (+/-)	FACW	67% - 99%
Facultative (+/-)	FAC	34% - 66%
Facultative Upland (+/-)	FACU	67% - 99%
Obligate Upland	UPL	<1%

Pluses and minuses may be added to each category to indicate those plants that may be at either end of the range of that category. A plant that occurs throughout the country could have a different indicator status in each of the nine geographic regions.

Although all of the agencies who administer programs involving wetland delineations refer to the same list, they do not all interpret the list in the same manner. The Corps defines hydrophytic plants as those with an indicator of Facultative or wetter, excluding FAC-, FACU and UPL plants. The F&WS and EPA include plants down to FACU- that may be functioning as hydrophytes in saturated conditions and hydric soils. The F&WS and EPA methodologies expand the list of possible hydrophytes, and in some cases can expand the areas delineated as wetlands considerably.

Within an agency, different districts may view the list as a guideline and a flexible tool, while other districts may use the list as a literal and fixed reference not open to interpretation. The constant revisions and updating of the list, while necessary to maintain current information, require that changes to the list be accepted and can add confusion as to the exact status of any one species. The determination of the presence of hydrophytic vegetation proved to be the area where the greatest differences existed between the Corps and F&WS delineations.

When the final delineations were mapped, many of the Corps wetlands had a fringe, or extension of area that would be included under the F&WS method. Some wetlands were the same size using both definitions, but were mapped as Corps with the understanding that if an area qualified under the Corps' definition and methodology, then it also met F&WS's requirements.

Inventory Planning Process

Inventory Crew. Three wetland biologists were hired to conduct the field survey as employees of the City through the Environmental Internship Program (EIP). The EIP program provides temporary specialists to agencies and firms for projects requiring scientific or environmental expertise. Recommendations for inventory personnel were also provided to EIP by Ecology. The crew included biologists with extensive botanical backgrounds in plant identification, particularly grasses. In addition, team members had knowledge of soils, hydrology, surveying, and wildlife habitat analysis. These individual skills were enhanced through an intensive training session developed by Ecology on wetland delineation and field methodologies.

In August, personnel from Ecology's Wetlands Section of the Shorelands Division conducted a three day training session for the inventory team that would be doing the field delineations. Ecology arranged for a representative of the F&WS regional office in Portland to present a workshop on the Cowardin System of Wetlands Classification, and staff from the Corps attended the session as well. Participants dug soil pits, examined soil colors, mottling, gleying, and discussed problems likely to be encountered when applying methodology, and where the two methodologies might differ. Three sites which were fairly representative of the inventory area's vacant land were visited, two which were not disturbed, and one which had been partially filled. Both Ecology and Corps personnel were available for advice throughout the inventory, and return visits for site inspections and data sheet reviews were made by both agencies.

Existing Sources. A number of different sources were consulted initially for information that had already been compiled and might affect the delineation of wet areas. The information came from various agencies, as well as Auburn's Public Works and Planning departments.

Blue Line Section Maps. Section maps of the city, which were transferred to mylar sheets, were available to the inventory team. Blue line prints made from the mylars were the working maps for the inventory. Each wetland was drawn on the appropriate blue line(s), as either Corps or F&WS. The wetlands were numbered chronologically, and according to their proximity to Mill Creek. Those directly associated with the creek had the prefix 1. attached to their number to identify which wetlands were associated with Mill Creek.

Aerial Photographs. In addition to the blue lines, 1":200' scale black and white photos of quarter sections were available to the inventory team. Although the black and white film does not have as much information on vegetation as high altitude infrared film, the greater detail was extremely helpful, and the photos were the size of the regular section maps. Infrared photos are more expensive to produce, and are usually printed on 1'x1' sheets. The black and white photos were on a 3'x3' sheet, and vegetation patterns were easy to see.

SCS Maps. Much of the Green River valley is mapped as hydric or urban (fill) soil. The soils consist primarily of alluvial deposits, with sandy streams threaded throughout. The 1973 King County Soil Survey maps were used to determine the approximate location of different soil types. The soil information was then transferred to the blue line section maps. Although the SCS map scale is much larger (1":24,000') than the section maps (1":200'), the boundaries were used as guidelines, and many of the soil pit samples agreed with the soil descriptions and locations given on the SCS maps.

Federal Emergency Management Agency (FEMA). FEMA has developed maps showing floodplains and floodways which are used to determine flood insurance rates. Development within floodways and floodplains is restricted, and insurance cannot be obtained for buildings that violate these restrictions. These maps were used by the inventory team to help identify which areas adjacent to Mill Creek were likely to experience sufficient flooding to produce a positive finding for the hydrology parameter.

F&WS National Wetlands Inventory Maps. These national inventory maps are produced by the F&WS to show wetland locations. Wetlands are delineated through the use of high altitude infrared aerial photography, in conjunction with the Cowardin classification system. Although these maps are excellent starting points for a local inventory, they are produced at such a large scale (1":24,000') that the detail required for parcel specific work is not provided. F&WS provided the latest draft version of the Auburn quadrangle map, dated August, 1988, for the inventory team's use.

Storm Drainage Maps. The storm drainage maps produced by Auburn's Public Works department were used to locate drainage pipes and ditches which might affect the hydrology in a wetland.

Data Sheet Development. Because of the scale of the inventory, the intensive methodologies for Corps and EPA delineations were not possible to follow. Each requires that transect lines be established, and numerous plots sampled. After reviewing the shorter delineation methods of each, a composite was developed which added greater detail to the Corps' "routine" method, and decreased the amount of computation required by the EPA's "simple" method. This composite method was discussed with Ecology and the Seattle District Corps, to assure that all delineation requirements would be met.

The data sheets used by the inventory team in the field were designed to be compatible with a spreadsheet program. Multiple choice questions were used to format needed information, with spaces included for comments and notes. (See Appendix A.) Ideas for questions came from Corps, F&WS, Ecology, King County and City of Bellevue data collection sheets, and from the specific needs of the City of Auburn.

The completed data sheets were nine pages long, with additional pages added for more complex plant communities. The data collected on each site included observations on hydrology, soils, vegetation, biological factors such as presence of wildlife and habitat opportunities, cultural values, and proximity of the wetland to city parks, trails, schools and urban development. In addition to the data sheet, field notes were taken on a daily basis, and a copy of these notes are on file with the data sheets.

Delineation Procedure

Wetland Hydrology. Field determination of the presence of wetland hydrology requires documentation of positive signs of soil saturation during the growing season, a process which is the same for any methodology. Evidence of water marks, floodlines, debris deposited from flooding and other field indicators were searched for, and filling of soil pits by water was noted.

Hydric Soils. In order to assess the character of the soils on any given site, soil pits were dug, and the colors and characteristics of the soil documented. Mottling in the soil column was looked for, as was gleying. Mottling was usually orange in color, although some soils produce light tan or black mottles. Gleying, development of a bluish-grey color, was usually found in a layer which had a clay-like texture. Mottling was often found in gley layers, as well.

After the presence of mottling or gleying was established, a sample of soil taken from at least 10" below the surface was soaked with water, then compared with paint chips in a Munsell Soil Color Chart. These chips are organized according to the amount of blue, yellow or red in a color, then according to the amount of grey or white in a color.

Soils within a series fall within a certain range of colors, and those in the inventory area were usually a dark brown, with more yellow than red in the brown. The greyer the soil color is, the less oxygen is present. A value of 2 for chroma (large amount of grey), with mottling present in the soil, indicated a hydric soil. Soils lacking mottling, but with chromas of 1 (very grey) are also considered to be hydric.

Soil pits were dug at obvious points of change in vegetation types, (i.e. from pasture grasses to sedges and reed-like plants), or where vegetation associations become dominated by a different Indicator status. The soil pits were critical in determining the edges of the wetlands, and in deciding whether a specific community would be included in the delineated wetland. When the vegetation began to change to a "drier" condition, a soil pit would often indicate that the soil was no longer hydric.

Hydrophytic Vegetation. When the inventory team reached a site, the primary task was to walk the entire site, keeping a list of species, and estimations of coverage for each species found on the site. As plant communities and associations changed, new percentages for each species were recorded. Each site was walked by a minimum of two team members, and most of the inventory area was covered by all three.

By process of discussion, the different vegetation units or communities were established, and a complete list of species seen in each community was compiled with percent areal cover for each species. When estimating areal coverage, the object is to quantify the amount of ground a plant shades or covers. Thus, if plant communities have several canopy layers, or smaller plants are intertwined with larger, the percentage totals can and usually do exceed 100%. Vegetation changes, from communities largely comprised of hydrophytic plants to larger numbers of upland plants, were usually the easiest and most obvious indication that the conditions on a site had changed from wetland to upland.

Habitat Information. Observations were made at each site to determine the value of each wetland to wildlife. Habitat includes everything a creature requires or utilizes for its existence and/or well being. Animals require, at least to some extent, food, water, breeding and nesting sites, protection from predators, and shelter from the weather. Virtually any open space can provide habitat for some type of bird or animal, but certain characteristics combine to provide higher quality habitats to larger numbers of wildlife species.

The type of vegetation on a site determines to a great extent the amount and type of food that is available. Berries, fruit, and grains are obvious supplies of food, as well as mixtures of grasses, shrubs and herbs for birds that eat seeds or animals that graze on foliage. Shrubs and trees provide cover for nesting and perching birds, and protection for smaller animals from predators. A site with a variety of vegetation types will support more types of wildlife than one with a single, or monotypic composition. A variety of vegetation types will also provide more shelter from weather extremes. The presence of shelter, protection and food not only tends to increase the number of smaller birds and animals on a site, but also increases the number of predators due to an increased prey base.

The overall condition and age of the vegetation influences the benefits provided. A young stand of alders may provide some shelter and food, while an older stand would provide more nesting sites but not as much food. A snag would no longer provide food, but might have cavity-nesting birds such as woodpeckers or owls. Likewise, a mowed meadow provides grazing and loafing opportunities for waterfowl, but an unmowed meadow provides much more shelter and nesting sites for rodents and other birds.

Presence of water bodies provides food and habitat for fish and predators, such as blue heron who depend on aquatic animals for food. All animals require water for metabolic processes, although the presence of open water tends to increase the numbers of some species, and decrease others. Many animals such as waterfowl, beavers, muskrats escape predators by taking to the water and diving for long periods of time. The condition of the water body, whether or not it is subject to polluted runoff water from dairy operations or industrial sources, and the amount of algae and other plants growing in it, whether it is ponded or free flowing, will affect the type of animal supported.

The actual physical shape or contour of the land surface can affect the types of wildlife found on any site. Open, flat sites are better for flocking waterfowl, as well as predators such as Northern Harriers who cruise over open fields looking for field mice. The size of a particular site can determine the value of that site to wildlife. Larger sites tend to have a wider variety of habitats available to animals, and may provide more types of food, thereby increasing the variety of animals found on the site.

Inconclusive Areas. Since the inventory was begun in August, after an unusually dry two-year period, many of the sites visited in the beginning of the study were extremely dry. Hydrology is very difficult to positively determine in August and September due to seasonal fluctuations. Soon after the prolonged summer drought, Auburn began receiving significant amounts of rain, which is usual for the fall in the Pacific Northwest. Many sites, because of impermeability of summer dried soils were suddenly flooded with inches of rain and runoff water. Because of this drastic fluctuation, some sites were nearly impossible to designate as possessing positive hydrology. Because of this circumstance, the inventory team recommended that an area with reasonable indications of meeting the other two parameters be checked during the appropriate time of year for positive signs of hydrology. These areas were included on the final maps, as either F&WS or Corps, depending on which criteria they appeared to meet, but will be removed should they fail to meet the hydrology parameter.

Non-Inventoried Areas. Certain areas within Auburn have been cultivated and in agricultural use for a considerable amount of time. The presence of hydric soils, and indications of wetlands hydrology on some of these sites suggest that if cultivation was discontinued, these areas might revert to hydrophytic vegetation. If so, they could be considered wetlands under the Corps' special circumstances conditions. Such areas were mapped as non-inventoried to identify that future site specific studies would be required.

Final Mapping. After each blue line Section map was completely inventoried, the blue line was digitized by an Engineering Technician. Information on each wetland boundary was incorporated into the City's GIS (Geographic Information System) computer mapping program, and was plotted with an overlay of property lines. At the end of the inventory, the sections comprising the study area were merged into a composite map which can be plotted at various scale levels.

METHODOLOGY FOR THE INVENTORY AND EVALUATION OF WETLAND HABITAT IN KING COUNTY

King County Planning Division

Resource Planning Section

Department of Planning and Community Development

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CONTENTS

INTRODUCTION

Background

Wetlands are a valuable natural resource in King County. They are among the most productive biological systems, providing habitat for fish and wildlife. They serve as outdoor classrooms and laboratories for scientific study. Wetlands provide recreational activities such as hiking, hunting, fishing, boating or observing wildlife. In certain cases, they support agricultural uses and provide rearing habitat vital to commercial and sport fisheries. Wetlands offer unique scenic value which has only recently been recognized. They protect water quality by trapping sediments and absorbing pollutants as nutrients. In many cases, wetlands help recharge groundwater supplies and maintain stream flows. Finally, wetlands control runoff and store flood waters, thereby reducing potential damage from flooding and erosion in downstream areas.

Wetlands in King County also face many problems. One long-standing problem has been the image of wetlands. Traditionally, wetlands have been regarded as lands of little or no value, unfit for productive use, unsightly, a nuisance or a hazard. Unfortunately, this attitude has led to the more serious problems facing wetlands. The most common are the dredging, draining and filling of wetlands for urban development. When this occurs, valuable fish and wildlife habitat is lost. Because the wetland's capacity to store flood waters is removed, stream flows increase and cause erosion, flooding and related damage downstream.

New development on top of filled wetlands also faces problems of unstable foundations, shifting, settling or inadequate drainage. Logging compacts soils, destroys plants and habitat and increases runoff and sedimentation in wetlands. Too many pollutants from streets and urban development can change the chemistry of the water in wetlands, causing damage to wetland plants. This, in turn affects the animals which depend on those plants for food and cover. Finally, wetlands are too often used as a convenient place to dump garbage or toxic wastes.

King County recognized the value of wetlands and the problems they face by taking actions to protect them. The values and functions of wetlands were first recognized in 1973 through an amendment to the King County Comprehensive Plan (Ord. 1838). More recently, King County's Surface Water Policy (Ord. 2281, as amended) recognized the inherent flood storage value of wetlands and their ability to moderate flows in downstream areas. The King County Sewerage General Plan (1979) contains a provision which prohibits the extension of sewer service within a designated wetland. However, the most encompassing action to protect wetlands taken by King County is the Sensitive Areas Ordinance (Ord. 4365). It prohibits development in wetlands unless special studies can show that either (1) the wetland does not serve any of a number of specific functions or (2) the proposed development would preserve or enhance those functions.

In combination, these actions comprise a substantial body of policy designed to protect wetlands. However, for some time there has been a need for more effective measures to help carry out those policies. Since King County wetland policies were first adopted, the development

review process for wetlands has been characterized by a number of recurring questions and issues. These include whether a site is, in fact, a wetland, the location of the wetland's edge, identification of wetland plants, the values of one wetland versus another, the impact of new development on wetlands, and the specific measures which can be taken to protect them. Improved mapping, definitive classification, supporting data, a method for evaluating wetland values and functions and uniform guidelines for new development were considered essential for resolving these questions and improving the process for carrying out wetland policies.

An important impetus for a wetlands inventory came in 1980. During its review of the King County Sewerage General Plan, the METRO Council added an amendment restricting the extension of sewer service within wetlands, floodways and agricultural lands. As a condition of its approval Metro requested King County to provide maps delineating designated wetlands. Although wetland maps had been published in the Sensitive Areas Map Folio, they were not based on field inventories or systematic classification and were generally considered to be inadequate. As a result, the wetlands inventory was scheduled by the King County Planning Division for 1981.

The Wetlands Inventory

The wetlands inventory was intended to accomplish a number of objectives. First, it was to locate and systematically classify wetlands in western King County. Second, it was to collect data for evaluation in five categories corresponding to significant wetland values and functions: hydrology, biology, visual, cultural and economic. Third, it would store and publish the inventory data and evaluations in a variety of ways which would make them easily accessible and useful to staff of King County and other agencies in their review of development proposals affecting wetlands. Finally, it would recommend uniform regulations for new development adjacent to wetlands for use by regulatory staff in the development review process.

Inventory Products

The results of King County's wetlands program are summarized in a number of publications and products. In combination, they are the measures intended to more effectively carry out King County wetland policies. The handbook titled Wetland Plants of King County and the Puget Sound Lowlands contains illustrations and descriptions of common wetland plants, plant associations and wetland types in King County. It is designed to be used in the field by lay persons to identify wetlands. The map folio titled Sensitive Areas-Wetlands Supplement shows the location of wetlands mapped in the inventory and identifies each with a two-digit number which links it to collected data. The original field data are on file in the King County Building and Land Development Division and have also been computerized for easy access, computation of wetland values and preparation of special reports. A slide catalog contains photos of most of the wetlands visited during the inventory. An automated 10 minute slide show, titled "Earth, Air and Water, Understanding our Puget Sound Wetlands," reviews wetland

values and problems, describes the different types of wetlands and presents King County's wetlands program. Amendments to the Sensitive Areas Ordinance for new development in or adjacent to wetlands have also been proposed. Finally, this present report contains a detailed description of the process used to design and carry out the wetlands inventory.

INVENTORY METHODOLOGY

Wetlands Task Force

To develop a successful methodology for the wetlands inventory, King County considered essential the participation of wetland specialists from other agencies and groups. Late in 1980, staff of the Planning Division's Resource Planning Section contacted a number of agencies and individuals active in wetland management in an effort to assemble a technical advisory group which would guide the development of the inventory methodology. The resulting group was named the Wetlands Task Force and represented a number of agencies, private groups and institutions including the U.S. Geological Survey, Washington Department of Game, Seattle University, Pacific Science Center and the Audubon Society. Other King County agencies included the Department of Public Works' Surface Water Management Division. A complete list of the Wetlands Task Force members appears in Appendix 1.

The Wetlands Task Force first met in January of 1981 and continued to meet bi-weekly until June 1, when the field inventory began. With the coordination of Resource Planning Section staff, the Task Force reviewed relevant literature, developed the scope of the methodology and designed many of the inventory tasks and evaluations. The results of the Task Force's efforts are documented in this report.

Inventory Mapping

The wetlands inventory focused on western King County within an area covered by the thirteen composites of U.S.G.S. quadrangles used in the Sensitive Areas Map Folio (Appendix 2). Those quadrangles were also the basis for the field maps used in the inventory. Each "quad" was divided into nine field maps which were enlarged to 18"x22" in size at a scale of 1":1000'. In addition to topography and other features, the field maps contained wetlands identified on draft U.S. Fish & Wildlife Service National Wetlands Inventory maps, wetlands identified by the Sensitive Areas Map Folio, the location of hydric soils identified by the U.S.D.A. Soil Conservation Service for the purpose of identifying other potential wetland sites (Appendix 3) and river and stream basin boundaries. A sample field map appears in Appendix 4.

The basic unit for conducting the inventory was the stream basin. King County contains all or a portion of four major river basins as well as direct drainages to Puget Sound and major lakes. These, in turn, are divided into 67 stream basins (Appendix 5). Stream basins were selected as the inventory units because they are an established framework for the collection of data currently used in the County's basin planning program. They also provided a means of determining the order in which wetlands would be inventoried. The stream basins were prioritized based on the number of platted lots and building permit activity in 1980. This assured that those stream basins where the impact of new development on wetlands was potentially the greatest would receive early attention. Finally, the stream basin is a self-contained unit within which a wetland may play a key hydrologic role within the drainage system. A wetland's hydrologic role relative to other wetlands could best be measured within the boundaries of the stream basin.

Field Teams

The inventory was conducted between June 1 and September 14, 1981 by three field teams consisting of two or three members. The team leader was a full-time planner from the Resource Planning Section. In addition to coordinating the activities of the field team, the team leader performed the Hydrologic, and usually the Visual/ Cultural/Economic portions of the inventory. The second team member was a qualified biologist hired during the summer specifically to conduct the Biology portion of the inventory. Occasionally, a third member joined the field team. This person was either a volunteer or staff person from other Wetlands Task Force agencies who conducted the Visual/Cultural/Economic portion of the inventory.

In most instances, the inventory required field teams to enter private property in order to observe a wetland and collect the necessary data. Because it was not possible to give advance notice of the inventory to the numerous owners of property where wetlands are or might be located, field teams had to exercise caution and good judgment when entering private property. To meet this need, a set of guidelines for the conduct of field teams was prepared (Appendix 6).

Inventory Forms

Format

An inventory form was completed for each identified wetland. The form was divided into three parts: 1) hydrology, 2) biology and 3) visual/ cultural/economic (Appendix 7). Each part was further divided into "field" and "non-field" tasks. Non-field tasks were those which could be completed using data available in the Resource Planning Section or Building and Land Development Division. To the extent possible, the non-field tasks were to be completed prior to the field portion of the inventory, although this was often not possible due to scheduling or the fact that some wetlands were discovered in the course of the inventory of other sites.

Each of the three inventory parts was designed to be carried out by a specific member of the inventory team. The separate parts allowed each member to work on and become proficient in one or two specific aspects of the inventory (biological, hydrologic, and/or visual/cultural/economic), to work independently and to complete the tasks in a minimum acceptable period of time.

Each of the inventory parts was also designed for easy coding of inventory data by a key punch operator. In order to store, organize, analyze and retrieve inventory data, the Resource Planning Section utilized the Statistical Analysis System (SAS). Because of the large amount of wetlands data to be recorded, the inventory forms were designed so that most responses could be given by use of easy-to-read alpha-numeric codes or by circling a letter or number. The resulting format not only speeded inventory work in the field, but helped minimize costs for data entry.

General Information

At the top of each of the three inventory parts was a space reserved for data on the general location of the wetland in King County. This space was completed as a part of the non-field tasks. The stream basin name was indicated in the space provided. If the wetland had a commonly used name, it was noted. The wetland number consisted of space for four digits. The first two spaces were for a one or two-digit stream basin number. The number was derived from an alphabetized list of the 67 sub-basins in the County. The second two spaces were for a one or two-digit wetland number. Within each stream basin, wetlands were numbered consecutively and labeled on the field maps. The map number had space for three digits. The first two contained a one or two digit number corresponding to one of the 13 King County quads. The third space contained a letter corresponding to the map itself.

The Hydrology form contained a special section at the top which was to be completed by the team leader at the beginning of the inventory. It called for basic information about the site which was critical for record-keeping and later reference. The full names of all team members were listed. Access to the site was described in as much detail as possible using street names, physical features, estimated distances, easements, trails etc. A space was also provided to note the name, address and phone number of the property owner or resident so that a later contact could be made if access was not permitted or if (s)he provided information about the wetland which assisted or supplemented the inventory.

Areas for sketches were included at the end of all three parts of the inventory. A ¼-inch grid was printed in the space for the purpose of drawing to scale. The sketch served many purposes. Among these were identifying a) new wetland edges or revising existing edges, b) the location and size of outlets, c) potential impoundments or retention areas, d) significant habitat features and e) points of access. The sketch was also used to record the number and direction of each photograph taken of the wetland.

Geographic Locators

Also at the top of the Hydrology inventory form were two lines on which section-township-range data were listed. Together, they described the wetland's location in a format compatible with King County's existing computerized Land Development Information System (LDIS). Two lines were provided for large wetlands covering more than one section. Each line was designed to accommodate a ¼-¼, ¼, ½ or full section listing. Following are the criteria for making the listings.

The smallest portion of a section in which all or a majority of the wetland was located was listed. If the wetland was contained in a ¼-¼ section, the first four spaces were filled in along with the section-township-range; the fifth space was left blank (e.g., SE NW __ 15 23 5). If the wetland was contained in a ¼ section, the first two spaces were left blank and the ¼ section listed in the second two spaces (e.g., __ __ NW __ 15 23 5). When the wetland occupied a half section, the

first four spaces were left blank and the notation made in the space for ½ section, either N, S, E, or W depending on in which half the wetland was contained (e.g., __ __ __ __ W 15 23 5). If the wetland occupied a full section, the first five spaces were left blank and only the full section noted (e.g., __ __ __ __ W 15 23 5). Depending on the size and configuration of the wetland, the listing may have been extended to the second line.

To the right of these two lines was a space with a y/n below it. The y stood for "yes"; the n stood for "no". If the section-township-range information on the two lines contained the entire wetland, a "y" was placed in the space above; if the information did not contain the entire wetland, an "n" was placed in the space above. This is a signal to persons who refer to the data in the future that they must look outside that geographic area to find the rest of the wetland.

PIERCE COUNTY MANAGEMENT STUDY

WETLAND INVENTORY AND ATLAS METHODOLOGY

DECEMBER, 1987

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METHODOLOGY

Pierce County Wetlands Inventory

December, 1987

Inventory Objectives

The Pierce County Department of Planning and Development is in the process of developing a strategy for the management of wetlands within the County. Consequently, a wetlands inventory was conducted in Pierce County during the spring, summer, and fall of 1987 in order to provide information that would assist with the design and implementation of this strategy. The purpose of the inventory was to produce maps on which wetland locations and boundaries could be specified in relation to property lines. The maps, which were subsequently organized into an atlas, will be used to alert Planning staff of wetlands that may be affected by land use activities. The wetland boundaries that were determined in the field are approximate and are intended only to provide an indication of the presence of wetlands.

Pierce County's wetlands inventory was also designed to create a base of general information on the classifications, functions and values, human impacts, and other features for each wetland inventoried. This information, in conjunction with the wetland maps, will be available for use by Pierce County personnel, as well as state and federal agencies, developers, landowners, and other county residents.

Geographic Scope

The wetland inventory was composed of two phases; Phase I was conducted for 10 weeks between March and July; and Phase II was conducted for 17 weeks between mid-July and mid-November. The geographic boundaries of the study were organized around U.S. Geological Survey Quadrangle maps. Approximately two-thirds of the county was covered during the inventory. During Phase I, the rapidly urbanizing areas in northwestern Pierce County were inventoried. The area covered included Tacoma North, Tacoma South, Steilacoom, Puyallup, and Spanaway Quadrangles, as well as portions of Frederickson and Gig Harbor Quadrangles. Phase II covered the more rural areas of the County and included the remainder of Frederickson and Gig Harbor Quadrangles, in addition to Sumner, Buckley, Harts Lake, Tanwax Lake, Fox Island, and some sections of Orting, McKenna, Bald Hill, Kapowsin NW, Eatonville, Burley, Auburn, Poverty Bay, and Olalla Quadrangles. Incorporated areas, Fort Lewis, McChord Air Force Base, and the Muckleshoot Indian Reservation, are not under Pierce County jurisdiction, and therefore were excluded from the study (Figure 1). The remaining sections of the County, most of which are heavily forested, are under less development pressure, and therefore were considered a lower priority. They were excluded from the inventory because of time limitations.

Wetlands Inventory

The study was limited to an inventory of palustrine wetlands, as defined by the U.S. Fish and Wildlife Service classification system, that were one-quarter acre or larger in size. A wetland is defined as

> "lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year."

Palustrine refers to

> "all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.05 o/oo (parts per thousand). It also includes wetlands lacking such vegetation, but with all of the following four characteristics: 1. area less than 8 ha (hectares) (20 acres); 2. active wave-formed or bedrock shoreline features lacking; 3. water depth in the deepest part of basin less than two meters at low water; and 4. salinity due to ocean-derived salts less than 0.5 o/oo (parts per thousand)." (Cowardin, et al. 1979).

Lacustrine systems were not included in the field inventory, but were included in the wetlands atlas. Riverine wetlands were not included in the inventory or atlas unless they formed an integral part of the palustrine wetland; no estuarine wetlands were inventoried or mapped. The decision not to include these classifications in the field inventory was based on time limitations and a prioritization of Pierce County's needs. The location of riverine and estuarine wetlands are included in the Coastal Zone Atlas, the National Wetland Inventory Maps, or Pierce County Floodplain maps.

Brief site evaluations consisted of verification of the presence of a wetland, delineation of its approximate boundary, classification to the level of class (Cowardin, et al. 1979), and identification of dominant plant species. Assessments were also made regarding wildlife habitat, stormwater detention capabilities, adjacent land use, height differences between wetland and upland vegetation, water quality maintenance, buffers, human impacts within the wetland, open space, and any other unique features. A sample of the data collected in the field is included in Appendix E.

The inventory team for Phase I consisted of a project lead, project planner, and two field biologists. A cartographer and two more field biologists were added to the team for Phase II. Field personnel were trained in wetland plant identification, the use of the U.S. Fish and Wildlife Service classification system, boundary delineation, and aerial photographic interpretation by experts from the Washington Department of Ecology and the U.S. Fish and Wildlife Service. Field inventories were conducted by teams of two persons.

Paper Inventory

Potential wetland sites in Pierce County were identified during a paper inventory. The paper inventory consisted of a compilation of information from four sources:

1. U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) Maps (1973-1981) at a scale of 1:24,000;
2. hydric soils determined from the Soil Conservation Service (SCS) Soil Survey for Pierce County Area (1979) at a scale of 1:24,000 (see Table 1 for list of hydric soils found in Pierce County);
3. flood plains determined from National Flood Insurance Rate Maps (FIRM) (1987) and National Flood Insurance Program Preliminary Floodway Maps (1986); and
4. aerial photographic interpretation using 1:12,000 black and white aerial photographs (Department of Natural Resources, 1985) and stereoscopes.

Each source was assigned a color code (e.g., NWI - red, SCS - orange, FIRM - violet, aerial - green, areas not included in study - blue). Potential wetland areas identified from these sources were drawn freehand using the appropriate color code on 1:4800 (1" = 400") blueline prints of aerial photographs, which were used as field maps. SCS alphanumeric codes for hydric soils were also noted on the blueline prints. A sample field map is included in Appendix A.

Field Inventory

Using the field maps, developed from the paper inventory and organized by quadrangles, the field teams verified the existence and the approximate boundaries of wetlands on a section by section basis. The potential wetland areas were located in the field by using road maps and identifying landmarks on the field maps. Because field time was limited, evaluations were definitive, but relatively brief. The time spent at each wetland site varied from approximately ten minutes to two hours, depending on accessibility, size, and complexity.

In many cases, an entire wetland could not be surveyed on foot. For example, private property was not accessed without permission. When a "no trespassing" sign, an obvious barricade to entry (such as a locked gate), or a residence or business was present on the site, permission to enter private property was requested. The inventory team carried a letter and photo identification cards to present to landowners when they requested permission. Appendix B contains a copy of the identification letter. When permission could not be obtained because of denial or time limitations, the wetland was assessed, if possible, from the roadside.

TABLE 1

Hydric Soils Found in Pierce County*

Soil Name	Map Symbol	Soil Material
Bellingham	4A	silty clay loam
Briscot	6A	loam
Buckley	8A	loam
DuPont	12A	muck
Hydraquents	17A	---
McKenna	22A	gravelly loam
Norma	26A	fine sandy loam
Puget	30A	silty clay loam
Reed	33A	silty clay
Semiahmoo	37A	muck
Shalcar	38A	muck
Snohomish	39A	silty clay loam
Tacoma	43A	silt loam
Tanwax	44A	muck
Tisch	45A	silt

* As identified by Ron Shavlik, Soil Conservation Service, personal communication, May 1987

The field team occasionally discovered wetlands that had not been indicated on any of the sources used in the paper inventory. These were inventoried and included on the field maps.

Field site assessment began with a determination of the existence of a wetland. The presence of hydrophytic vegetation (versus hydric soils, e.g.) was used as the primary indicator that the site contained a wetland. The site was considered a wetland if 50% of the aerial cover consisted of plants that were listed as facultative, facultative wet or obligate in Reed, et al. (1976). Appendix C defines these descriptors and lists some of the common wetland indicator plant species in Pierce County and their status. The percent aerial cover was estimated visually. In some cases, the composition of the understory vegetation was used to confirm the determination (for example, in the case of a forested wetland dominated by a facultative species). Indications of wetland hydrology (such as water marks, algae mats, and debris lines) and plant adaptations to wet conditions (such as swollen trunk bases, shallow root systems, and adventitious roots) were also noted and considered in the verification.

Following verification of the existence of a wetland, approximate boundaries were determined, also using the percentage of hydrophytic species present. As described above in the geographic scope section, wetland boundaries were intended only to provide an indication of the presence of wetlands and were not mapped as absolute. Approximate boundaries were drawn on the field maps using a solid pencil line. In many cases, portions of a wetland were inaccessible or boundaries were difficult to determine from the team's vantage. In these cases, boundaries were estimated using aerial photographic interpretation or other information, and designated as unverified. They were drawn on the field maps with a hatched line. In some cases, a potential wetland site was inaccessible and the entire wetland boundary was estimated and drawn as unverified.

Each inventory team recorded the hydrophytic plant species observed as well as the presence of animal species or signs of their presence. Various field guides were used to assist with plant and animal identification (King County 1981, Weinman, et al. 1984, Reed, et al. 1986, Clark 1974, Robbins, et al. 1983, Knobel 1977). Unknown plant specimens were identified using a key written by Hitchcock and Cronquist (1973). The field team also classified wetland types by "class" as described by Cowardin, et al. (1979). Wetland classes are described in Appendix D - "Field Sheet Instructions." Dominant plant species for each class were noted. In addition, the field team briefly assessed and recorded other wetland characteristics: storage capacity (inlet/outlet); special habitat features (for example, snags and islands); impacts within the wetland (for example, filling and use as pasture), the surrounding habitat, the height difference between wetland and upland vegetation, open space, water quality maintenance, buffers, wildlife habitat, human impacts, and any other unique features. These assessments were based on a visual evaluation and aerial photo interpretation with little quantification. Appendix D describes the factors considered in the assessments.

Five different field data forms were used during the wetland inventory. The long form was a modification of a field survey data form from the Snohomish County wetlands inventory. It was used for the majority of wetlands inventoried. When a wetland was minimal in size and lacked diversity, or could be succinctly described in a paragraph, a short form called the "Field Information Survey" form was used. Some small palustrine wetlands that were almost exclusively open water were not visited. These sites and wetlands that were inaccessible, but were obviously wetland areas as determined from aerial photographs were briefly described on a second short form - the "Aerial Interpretation" form. A third short form was used to document areas that also were inaccessible, but were strongly suggestive of, but not definitively interpreted as, wetlands on aerial photographs. They were recorded as potential wetlands on an "unverified wetlands" form. No field information was available for unverified wetlands or wetlands identified solely by aerial photo interpretation.

Occasionally, areas that were indicated as wetlands on the National Wetland Inventory Maps were determined not to be wetlands based on field site visits. Documentation of these sites and the basis for their exclusion was described on a separate form labeled "Not a Wetland."

All field survey data forms indicate the location of the site described according to section, township, range, and quarter-quarter section. Appendix E includes samples of the field survey data forms. Explanations of how data was recorded are given in Appendix D.

Wetland boundaries determined in the field were transferred onto a clean blueline print of an aerial photograph. Verified boundaries were drawn in pink, unverified in black. After the field verification was completed, the wetlands were mapped onto assessor's maps, as described below in the cartographic methodology section.

CARTOGRAPHIC METHODOLOGY

The cartographer for the Pierce County Wetland Inventory was assigned two general tasks: prepare the field maps for the field teams, and compile a Pierce County Wetlands Atlas. The procedure used to prepare the field maps is discussed on page 4 of this methodology, under "Paper Inventory." The procedure for the creation of the atlas follows.

For each 1/4-section of the inventory that contained at least one wetland, one copy of the County Assessor's map was made. Printed onto 18" square sheets of mylar, these copies are at a scale of 1:2,400.

Wetland boundaries, as drawn on the blueprint field maps, were transferred to the appropriate 1/4-section Assessor's maps. The boundary transfer and scale conversion was completed manually with a pantograph. Boundaries were inked onto the mylars by hand using a #2 (0.6mm) drafting pen. A solid line was drawn to indicate field-vertified boundaries, while unverified boundaries were depicted with a dashed line consisting of a repeating pattern of a 1/6" line, a 1/12" space, a 1/6" line, a 1/12" space, a 2/5" line, and a 1/12" space.

Text on each mylar sheet consisted of letters indicating the location of wetland and upland, as well as a map legend and brief explanatory text. Within each wetland, an italicized "WL" was lettered onto the mylar, using a Leroy lettering set with size 240C template and #2 drafting pen. Onto upland islands within wetlands, a "U" was drafted, using the same lettering system. The legend and explanatory text were inked onto the bottom of each sheet using rubber stamps; their imprint is as follows:

PIERCE COUNTY WETLANDS INVENTORY - 1987
Pierce County Assessor's basemap - 1987
_____ verified boundary
_ _ _ _ _ unverified boundary

Wetland boundaries are approximate and are intended only to provide an indication of the presence of wetlands. Further evaluation may be necessary to determine exact wetland boundaries.

Copies of each wetland mylar sheet were run off on 18" x 18-1/2" sheets of diazo paper. These sheets were pre-drilled to accommodate screw posts, used later to bind the loose map sheets.

To aid users of the Wetlands Atlas, a title page and index to inventory coverage were included. The text of the title page states the minimum wetland size included in the atlas (1/4-acre), lists the sources used in preparing the field maps in the paper inventory (the National Wetland Inventory, Soil Conservation Service Soil Survey, National Flood Insurance Rate Maps and aerial photo interpretation), gives the U.S. Fish and Wildlife definition of a wetland, briefly explains the manner in which wetland boundaries were delineated, and acknowledges the source of financial aid which facilitated the completion of the inventory and atlas (Coastal Zone Management grant through the Washington Department of Ecology). A wetland boundary legend was also included on the title page.

Once all original mylar sheets were copied to the pre-drilled paper, the Atlas was assembled between hard covers, bound by screw posts. Maps were arranged by section within each township and range. Copies of the title page and index preceded the maps.

Examples from the Wetlands Atlas are given in Appendix F.

CRP:cart

APPENDIX D

Field Sheet Instructions

FIELD SHEET INSTRUCTIONS

1. Section, Township, Range and quarter-quarter section:

2. N/A

3. FWS Wetland Type

   A. Palustrine:

   - non-tidal wetlands dominated by trees, shrubs, persistent emergents, persistent mosses or lichens.
   - non-vegetated wetlands where:
     (1) the area is less than 20 acres; and
     (2) water depth in the deepest part of the basin is less than 6' at low water.

   Classes: If vegetation (except pioneer species) covers 30% or more of the wetland, the class is based on the uppermost layer of vegetation that possesses an aerial coverage of 30% or greater.

   - When trees or shrubs alone cover less than 30% of an area, but in combination cover 30% or more, the wetland is assigned the class scrub-shrub.
   - When trees and shrubs cover less than 30% of the area, but the total cover of vegetation (except pioneer species) is 30% or greater, the wetland is assigned to the appropriate class for the predominant life form below the shrub layer.

   Class Types*:

   FO (forested) - characterized by woody vegetation that is 20 feet (6 m) tall or taller. Normally, this class possesses an overstory of trees, an understory of young trees or shrubs, and a herbaceous layer.

   SS (scrub-shrub) - includes areas dominated by woody vegetation less than 20 feet (6 m) tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.

   EM (emergent) - characterized by erect, rooted, herbaceous hydrophytes, including mosses and lichens. This non-woody vegetation is present for most of the growing season in most years. Emergent wetlands, known as marshes, fens, wet meadows, and sloughs, are usually dominated by perennial plants.

OW (open water) - includes area of non-vegetated open water and water that is dominated by plants that grow on or below the surface of the water for most of the growing season in most years. The plants are either attached to the substrate or float freely in the water above the bottom or on the surface. The vegetation types include algal beds, aquatic mosses, rooted vascular and floating vascular.

B. Lacustrine:

- situated in a topographic depression or dammed river channel.
- vegetative cover less than 30% aerial coverage.
- total area exceeds 20 acres or the water depth in the deepest part of the basin exceeds 6.6 feet at low water.

Subsystem types*:

limnetic - all deepwater habitats.

littoral - wetland habitat extending from shoreward boundary to a depth of 6.6 feet (2 m) or to the maximum depth of nonpersistent emergents, if these grow at depths greater than 2 m.

C. Riverine:

- Rivers, creeks, and streams are not surveyed as separate units in this inventory. When they are an integral part of a palustrine wetland, only that section of the river, creek, or stream within the palustrine wetland is mapped and surveyed.

Subsystem types*:

Lower perennial - the gradient is low and water velocity is slow, with some water flowing throughout the year. The substrate consists mostly of sand and mud.

Upper perennial - the gradient is high and velocity is fast, with some water flowing throughout the year. The substrate consists of rock, cobbles, or gravel with occasional patches of sand.

Intermittent - the channel contains flowing water for only part of the year. When the water is not flowing, it may remain in isolated pools or surface water may be absent.

* Under each class and/or subsystem type, list the three most dominant plant species that pertain to that particular class and/or subsystem.

For each system, a set of modifiers can be used when the wetland is artificially made or when natural ones have been modified to some degree by the activities of humans or beavers. The modifiers can be used singly or in combination where applicable:

EX (Excavated) - Lies within a basin or channel excavated by man.

IM (Impounded) - Created or modified by a barrier or dam which purposefully or unintentionally obstructs the outflow of water. Both artificial dams and beaver dams are included.

D (Diked) - Created or modified by an artificial barrier or dike designed to obstruct the inflow of water.

PD (Partly Drained) - The water level has been artificially lowered, but the area is still classified as wetland because soil moisture is sufficient to support hydrophytes. Drained areas are not considered wetland if they can no longer support hydrophytes.

F (Farmed) - The soil surface has been mechanically or physically altered for production of crops, but hydrophytes will become reestablished if farming is discontinued.

A (Artificial) - Refers to substrates that were emplaced by humans, using either natural materials such as dredge spoil or synthetic materials such as discarded automobiles, tires, or concrete.

4. N/A

5. Storage Capacity

A. Type of Outlet:

a. none - applicable if the entire wetland perimeter has been walked and it is known with certainty that no outlet exists.

b. overland - water running above-ground:

1. constricted - water is contained within a natural channel.

2. unconstricted - water flows over the ground in a diffused pattern.

c. open channel - refers to an outflow of water contained within an artificial channel.

d. pipe - water flowing through a pipe of any material: concrete, plastic, metal, etc.

e. other - describe.

f. unknown - applicable when an outlet is not observed, whether or not the wetland perimeter has been walked, and it is uncertain whether an outlet exists.

B. Type of Inlet:

a. no visible inlet - applicable where the entire wetland perimeter has been walked and no outlet has been observed.

b. seep - when water contained below-ground oozes slowly to the surface over a diffused area.

c. spring - where water contained below-ground comes to the surface in a small stream.

d. wetland (via culvert) - where water from a wetland flows through a relatively short pipe.

e. stream or river

f. stormwater drainage pipe - the inlet is a pipe or culvert that deposits stormwater runoff into the wetland.

g. other - describe

h. unknown - applicable when the wetland perimeter has not been walked and an inlet is not observed.

C. Soils - list the code and name of the soil type(s) from the Soil Survey of Pierce County, Washington (Soil Conservation Service)

6. Special Habitat Features

Circle all of the special habitat features that apply. Use the Cover Abundance Class symbols (+,a,b,c,d) to indicate percentage of aerial coverage of the features present. If an observed special habitat feature is not listed in the field sheet, describe it under (g) Other.

7. Describe the Impacts Within the Wetland

Describe impacts that have altered and/or degraded the wetland. Circle all of the applicable impacts. When pollution, sedimentation, or erosion are observed, describe those impacts. If an observed impact is not listed on the field sheet, describe it under (f) Other.

8. Surrounding Habitat

Briefly describe the land use within 200 feet of the wetland in each cardinal direction. Use descriptive words, such as residential, industrial, natural, disturbed natural, roadway, pasture, agricultural. Descriptive words can be used singly, or in combination where applicable.

9. Wetland -Upland Vegetation

Circle the appropriate illustration(s) which describe the height differences between the wetland vegetation and the upland vegetation. Note: This does not compare the vegetation within the wetland. It does compare the vegetation along the border of the wetland between the wetland and upland. Where the vegetation height is different, be sure to circle (a) or (b) to indicate which height level is wetland and which is upland. For all of the observed height differences, estimate the percentage of the border that these height differences encompass.

10. Summary Paragraph

Open space: circle the appropriate description and describe. Factors to consider:
- What is the wetland classification?
- What are the specific eye-catching/pleasing features of the wetland, if any?
- What dominates the wetland?
- Does this area act as a buffer between land uses?
- Does this wetland offer visual diversity to the area?
- Does the wetland have potential for passive recreation and/or educational uses?

Biofiltration: circle the appropriate description and describe. Factors to consider:
- Does water flow slowly through the wetland to allow more time for biofiltration?
- Is there a diversity of plant spp. present to bioassimilate a greater variety of pollutants?
- Is there a large percentage of emergent vegetation present (better assimilation than scrub-shrub and/or forested)?
- How much vegetation is there (the more dense the vegetation, the more the velocity of the water is slowed and there is more vegetative surface area for pollutants to adhere to)?

Buffers: circle the appropriate description and describe. Factors to consider:
- What type of vegetation borders the wetland?
- How wide are the buffers?
- How much of an impact does land-use abutting the wetland have on the wetland?

Wildlife Habitat: circle the appropriate description and describe. Factors to consider:
- Is the shape of the wetland convoluted, giving it a lot of edge?
- Does it have vegetative cover for animals?
- Does it contain a variety of habitat types?
- Is the wetland isolated from humans and pets?
- Is it now used as or does it have the capability to be a migration corridor?
- What animals or signs of animals are present?
- Is this a large wetland (the larger the area, the more individuals it can support and the greater the possibility of isolation in the inner regions)?
- What, if any, are the special habitat features here?
- Is it, or could it potentially be, used as over-wintering grounds or as a stopover during migration?

Stormwater Detention: describe from the viewpoint of both natural and artificial stormwater detention; factors to consider:

- What is topography of the wetland; is it in a depression, and how deep is it?
- Is there evidence that this wetland can retain water?
- Does it have an inlet?
- Does it have an easily dammed outlet?
- Is this a large wetland?
- Is this wetland in an urbanized area making it valuable for stormwater retention?

Human Impacts: describe the impacts to the wetland as outlined in question #7.

Unique Features: describe the special habitat features as outlines in question #6. Also include any unique characteristics of the wetland (example: uncommon/rare plant or animal species, especially good habitat value, etc.) not indicated in any other category in question #10.

Note: It is important to initial the top of question #10, and to initial and date the "Field data compiled by" line at the end of the field sheet. Also, remember to initial and date the sectional field maps upon completion of the field inventory and mapping of that particular section.

CRP:Wetfield

APPENDIX E

Field Survey Data Forms

*Plant Indicator Catagories**

Obligate Wetland (OBL) - Occur almost always (estimated probability >99%) under natural conditions in wetlands.

Facultative Wetland (FACW) - Usually occur in wetlands (estimated probability 67%-99%), but occasionally found in nonwetlands.

Facultative (FAC) - Equally likely to occur in wetlands or nonwetlands (estimated probability 34%-66%).

Facultative Upland (FACU) - Usually occur in nonwetlands (estimated probability 67%-99%), but occasionally found in wetlands (estimated probability 1%-33%).

Obligate Upland (UPL) - Occur in wetlands in another region, but occur almost always (estimated probability >99%) under natural conditions in nonwetlands in the region specified. If a species does not occur in wetlands in any region, it is not on the National List.

* Reed, P.B., 1988, *Wetland Plant List - Northwest Region.* USFWS, Washington , D.C.

Sample Pages From

The National List of Plant Species That Occur In Wetlands - 1988 Washington

by Porter B. Reed, Jr.

for

The National Wetlands Inventory
U.S. Fish and Wildlife Service

NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WASHINGTON

SCI-NAME	AUTHOR	COMMON-NAME	R9IND	NAT-IND	HABIT
ABIES AMABILIS	(DOUGL.) FORBES	FIR,PACIFIC SILVER	FACU	UPL,FACU	NT
ABIES LASIOCARPA	(HOOK.) NUTT.	FIR,SUBALPINE	FACU	UPL,FAC	NT
ACER CIRCINATUM	PURSH	MAPLE,VINE	FACU+	FACU+,FAC	NT
ACER GLABRUM	TORR.	MAPLE,ROCKY MOUNTAIN	FAC	FACU,FAC	NT
ACER MACROPHYLLUM	PURSH	MAPLE,BIG LEAF	FACU	FACU,FAC	NT
ACER NEGUNDO	L.	BOX-ELDER	FAC+	FAC,FACW	NT
ACHILLEA MILLEFOLIUM	L.	YARROW,COMMON	FACU	FACU-	PNF
ACONITUM COLUMBIANUM	NUTT.	MONKSHOOD,COLUMBIA	FACW	FACW	PNF
ACORUS CALAMUS	L.	SWEETFLAG	OBL	OBL	PIEF
ADIANTUM PEDATUM	L.	FERN,NORTHERN MAIDEN-HAIR	FAC	FACU,FAC	PNF3
AGOSERIS AURANTIACA	(HOOK.) GREENE	FALSE-DANDELION,ORANGE-FLOWER	FAC	FACU,FAC	PNF
AGOSERIS ELATA	(NUTT.) GREENE	FALSE-DANDELION,TALL	FAC	FACU,FAC	PNF
AGOSERIS GLAUCA	(PURSH) D. DIETR.	FALSE-DANDELION,PALE	FAC	FACU,FAC	PNF
AGRIMONIA GRYPOSEPALA	WALLR.	GROOVEBUR,TALL HAIRY	NI	FACU,FACW-	PNF
AGROHORDEUM X MACOUNII	(VASEY) LEPAGE	WILDRYE,MACOUN	FACU	FACU,FAC	PNG
AGROPYRON CANINUM	BEAUV.	WHEATGRASS,CUTTING	FAC-	FACU,FAC	PIG
AGROPYRON DASYSTACHYUM	(HOOK.) SCRIBN.	WHEATGRASS,THICK-SPIKE	FACU-	UPL,FAC	PNG
AGROPYRON REPENS	(L.) BEAUV.	QUACKGRASS	FACU	UPL,FAC	PIG
AGROPYRON SMITHII	RYDB.	WHEATGRASS,WESTERN	FACU	UPL,FAC-	PNG
AGROPYRON SPICATUM	(PURSH) SCRIBN. & J.G. SMITH	WHEATGRASS,BLUE-BUNCH	FACU-	UPL,FACU	PNG
AGROPYRON TRACHYCAULUM	(LINK) MALTE EX H.F. LEWIS	WHEATGRASS,SLENDER	FAC	FACU,FAC	PNG
AGROSTIS ALBA	L.	REDTOP	FACW	FACW,OBL	PIG
AGROSTIS BOREALIS	HARTM.	BENTGRASS,NORTHERN	FACU	FACU	PNG
AGROSTIS CLAVATA	TRIN.	BENTGRASS	NI	OBL	PNG
AGROSTIS EXARATA	TRIN.	BENTGRASS,SPIKE	FACW	FACW	PNG
AGROSTIS GIGANTEA	ROTH	BENTGRASS,BLACK	NI	FAC?	PNG
AGROSTIS HYEMALIS	(WALTER) B.S.P.	BENTGRASS,WINTER	FAC	FACU,FACW	PNG
AGROSTIS IDAHOENSIS	NASH	BENTGRASS,IDAHO	FAC+	FAC,FACW	PNG
AGROSTIS MICROPHYLLA	STEUD.	BENTGRASS,SMALL-LEAF	FACW	FACW	ANG
AGROSTIS OREGONENSIS	VASEY	BENTGRASS,OREGON	FAC	FAC,OBL	PNG
AGROSTIS SCABRA	WILLD.	BENTGRASS,ROUGH	FAC	FAC,FAC+	PNG
AGROSTIS SEMIVERTICILLATA	(FORSK.) C. CHR.	BENTGRASS,WATER	FACW	FACW,OBL	PIG
AGROSTIS STOLONIFERA	L.	BENTGRASS,SPREADING	FAC+	FAC+,FACW	PNG
AILANTHUS ALTISSIMA	(MILL.) SWINGLE	TREE-OF-HEAVEN	NI	FACU	IT
ALISMA GRAMINEUM	GMEL.	WATER-PLANTAIN,NARROW-LEAF	OBL	OBL	PNEF
ALISMA PLANTAGO-AQUATICA	L.	WATER-PLANTAIN,BROAD-LEAF	OBL	OBL	PNEF
ALLIUM DOUGLASII	HOOK.	ONION,DOUGLAS'	FAC+	FAC+	PNF
ALLIUM GEYERI	S. WATS.	ONION,GEYER	FACU	FACU	PNF
ALLIUM SCHOENOPRASUM	L.	CHIVES	FACW+	FACU,FACW+	PNF
ALLIUM VALIDUM	S. WATS.	ONION,TALL SWAMP	OBL	OBL	PNF
ALNUS INCANA	(L.) MOENCH	ALDER,SPECKLED	FACW	FACU,FACW	NS
ALNUS RHOMBIFOLIA	NUTT.	ALDER,WHITE	FACW	FACW	NT
ALNUS RUBRA	BONG.	ALDER,RED	FAC	FAC,FACW	NT
ALNUS RUGOSA	(DU ROI) SPRENG.	ALDER,SPECKLED	OBL	FAC,OBL	NT
ALNUS SINUATA	(REG.) RYDB.	ALDER,SITKA	FACW	FAC,FACW	NT
ALNUS TENUIFOLIA	NUTT.	ALDER,THIN-LEAF	FACW	FAC,FACW	NT
ALOPECURUS AEQUALIS	SOBOL.	FOXTAIL,SHORT-AWN	OBL	OBL	PNG
ALOPECURUS ALPINUS	J.E. SMITH	FOXTAIL,MOUNTAIN	FACW	FACW	PNG
ALOPECURUS CAROLINIANUS	WALTER	FOXTAIL,TUFTED	FAC+	FAC+,FACW	ANG
ALOPECURUS GENICULATUS	L.	FOXTAIL,MEADOW	FACW+	FACW+,OBL	PNG
ALOPECURUS MYOSUROIDES	HUDS.	FOXTAIL,MOUSE	FACW	FACW-,FACW	AIG
ALOPECURUS PRATENSIS	L.	FOXTAIL,MEADOW	FACW	FAC,FACW	PIG

ABIES AMABILIS

ALOPECURUS PRATENSIS

NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WASHINGTON

SCI-NAME	AUTHOR	COMMON-NAME	R9IND	NAT-IND	HABIT
ALOPECURUS SACCATUS	VASEY	FOXTAIL,PACIFIC	FACW+	FACW+,OBL	ANG
AMARANTHUS ALBUS	L.	AMARANTH,WHITE	FACU	FACU-,FACU	ANF
AMARANTHUS BLITOIDES	S. WATS.	AMARANTH,PROSTRATE	FACW	FACU,FACW	AIF
AMARANTHUS CALIFORNICUS	(MOQ.) S. WATS.	AMARANTH,CALIFORNIA	FACW	FACW	ANF
AMARANTHUS RETROFLEXUS	L.	AMARANTH,RED-ROOT	FACU+	FACU-,FAC-	ANF
AMBROSIA ARTEMISIIFOLIA	L.	RAGWEED,ANNUAL	FACU+	FACU-,FACU+	ANF
AMBROSIA PSILOSTACHYA	DC.	RAGWEED,NAKED-SPIKE	FACU+	FACU-,FAC	PNF
AMBROSIA TRIFIDA	L.	RAGWEED,GREAT	FAC	FAC,FACW	ANF
AMELANCHIER ALNIFOLIA	(NUTT.) NUTT.	SERVICE-BERRY,SASKATOON	FACU	UPL,FAC-	NS
AMMANNIA COCCINEA	ROTTB.	AMMANNIA,PURPLE	OBL	FACW+,OBL	ANF
AMMOPHILA ARENARIA	(L.) LINK	BEACHGRASS,EUROPEAN	FACU	FACU-,FACU	PIG
AMSINCKIA SPECTABILIS	FISCH. & C.A. MEYER	FIDDLE-NECK,SEASIDE	FACU	FACU	ANF
ANAGALLIS ARVENSIS	L.	PIMPERNEL,SCARLET	FAC	UPL,FACW-	AIF
ANDROMEDA POLIFOLIA	L.	ROSEMARY,BOG	OBL	OBL	NS
ANDROSACE FILIFORMIS	RETZ.	ROCK-JASMINE,SLENDER	FACW	UPL,OBL	ANF
ANDROSACE SEPTENTRIONALIS	L.	ROCK-JASMINE,PYGMY-FLOWER	FAC-	UPL,FAC-	ANF
ANEMONE OREGANA	GRAY	THIMBLE-WEED,OREGON	FACU	FACU,OBL	PNF
ANEMONE PARVIFLORA	MICHX.	THIMBLE-WEED,SMALL-FLOWER	FACW-	FACU,FACW-	PNF
ANEMONE PIPERI	BRITTON	THIMBLE-WEED,PIPER'S	FACU-	FACU-	PNF
ANGELICA ARGUTA	NUTT.	ANGELICA,LYALL'S	FACW	FACW	PNF
ANGELICA GENUFLEXA	NUTT.	ANGELICA,KNEELING	FACW	FACW	PNF
ANGELICA LUCIDA	L.	ANGELICA,SEAWATCH	FAC	FACU,FAC	PNF
ANTENNARIA CORYMBOSA	E. NELS.	PUSSY-TOES,FLAT-TOP	FAC	FAC-,FACW	PNF
ANTENNARIA PULCHERRIMA	(HOOK.) GREENE	PUSSY-TOES,SHOWY	FACU	FACU,FAC	PNF
ANTENNARIA UMBRINELLA	RYDB.	PUSSY-TOES,BROWN	FACU	FACU-,FACU	PNF
ANTHEMIS COTULA	L.	MAYWEED	FACU	UPL,FACU+	AIF
ANTHOXANTHUM ODORATUM	L.	GRASS,SWEET VERNAL	FACU	UPL,FACU	PIG
APARGIDIUM BOREALE	(BONG.) TORR. AND GRAY	APARGIDIUM,COMMON	OBL	OBL	PIF
APOCYNUM CANNABINUM	L.	DOGBANE,CLASPING-LEAF	FAC+	FACU,FAC+	PNF
APOCYNUM SIBIRICUM	JACQ.	DOGBANE,PRAIRIE	FAC-	FAC-,FAC+	PNF
AQUILEGIA FORMOSA	FISCH.	COLUMBINE,CRIMSON	FAC	FACU,FAC	PNF
ARABIS CRUCISETOSA	CONSTANCE & ROLLINS	ROCKCRESS,CROSS-HAIR	FAC	FAC	PNF
ARABIS DIVARICARPA	A. NELS.	ROCKCRESS,LIMESTONE	FACU	FACU	BNF
ARABIS DRUMMONDII	GRAY	ROCKCRESS,DRUMMOND'S	FACU	FACU	BNF
ARABIS HIRSUTA	(L.) SCOP.	ROCKCRESS,HAIRY	FACU	FACU	PNF
ARABIS HOLBOELLII	HORNEM.	ROCKCRESS,HOLBOELL'S	FACU-	UPL,FACU	BNF
ARABIS LEMMONII	S. WATS.	ROCKCRESS,LEMMON'S	FACU-	UPL,FACU-	PNF
ARABIS LYRATA	L.	ROCKCRESS,LYRE-LEAF	FACU	FACU-,FACU	BNF
ARALIA NUDICAULIS	L.	SARSAPARILLA,WILD	FACU	FACU,FAC	PNF
ARCTOSTAPHYLOS UVA-URSI	(L.) SPRENG.	BEARBERRY	FACU-	UPL,FACU	NS
ARENARIA PALUDICOLA	ROB.	SANDWORT,SWAMP	OBL	OBL	PNF
ARENARIA SERPYLLIFOLIA	L.	SANDWORT,THYME-LEAF	FACU	FACU,FAC	AIF
ARMERIA MARITIMA	WILLD.	THRIFT,WESTERN	FACU	FACU	PNF
ARMORACIA RUSTICANA	P. GAERTN., B. MEYER & SCHERB.	HORSERADISH	NI	FAC	PIEF
ARNICA AMPLEXICAULIS	NUTT.	ARNICA,STREAMBANK	FACW	FAC,FACW	PNF
ARNICA CHAMISSONIS	LESS.	ARNICA,LEAFY	FACW	FACW	PNF
ARNICA DIVERSIFOLIA	GREENE	ARNICA,STICKY-LEAF	FACW	FACU,FACW	PNF
ARNICA LATIFOLIA	BONG.	ARNICA,MOUNTAIN	FAC-	FACU,FAC	PNF
ARNICA LONGIFOLIA	D.C. EAT.	ARNICA,SEEP SPRING	FACW	FAC,FACW	PNF
ARNICA MOLLIS	HOOK.	ARNICA,HAIRY	FAC	FAC,FACW	PNF
ARTEMISIA BIENNIS	WILLD.	WORMWOOD,BIENNIAL	FACW	FACU-,FACW	AIF
ARTEMISIA CANA	PURSH	SAGEBRUSH,SILVER	FAC	FACU,FACW	NS

ALOPECURUS SACCATUS

ARTEMISIA CANA

NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WASHINGTON

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ARTEMISIA DOUGLASIANA	BESSER	WORMWOOD,DOUGLAS'	FACW	FAC,FACW	PNF
ARTEMISIA LINDLEYANA	BESSER	WORMWOOD,COLUMBIA RIVER	OBL	OBL	NHS
ARUNCUS DIOICUS	(WALTER) FERNALD	GOATSBEARD,HAIRY	FACU+	UPL,FACW	PNF
ASCLEPIAS FASCICULARIS	DECNE.	MILKWEED,NARROW-LEAF	FAC-	FAC-,FAC	PNF
ASCLEPIAS SPECIOSA	TORR.	MILKWEED,SHOWY	FAC+	FAC,FACW	PNF
ASPARAGUS OFFICINALIS	L.	ASPARAGUS-FERN,GARDEN	FACU	FACU-,FACU	PIF
ASPLENIUM TRICHOMANES-RAMOSUM	L.	SPLEENWORT,GREEN	FACU	UPL,FACU	PNF3
ASTER BRACHYACTIS	BLAKE	ASTER,RAYLESS ALKALI	FACW	FAC,FACW	ANF
ASTER CHILENSIS	NEES	ASTER,COMMON CALIFORNIA	FAC	FACU,FACW-	PNF
ASTER EATONII	(GRAY) T. HOWELL	ASTER,EATON	FAC+	FAC,FAC+	PNF
ASTER FALCATUS	LINDL.	ASTER,WHITE PRAIRIE	FACU-	FACU-,FAC	PNF
ASTER FOLIACEUS	LINDL.	ASTER,LEAFY-BRACTED	FACW-	FACU,FACW	PNF
ASTER FRONDOSUS	(NUTT.) TORR. & GRAY	ASTER,LEAFY	FACW+	FACW+,OBL	ANF
ASTER JUNCIFORMIS	RYDB.	ASTER,RUSH	OBL	OBL	PNF
ASTER MODESTUS	LINDL.	ASTER,GREAT NORTHERN	FAC+	FAC,FAC+	PNF
ASTER OCCIDENTALIS	(NUTT.) TORR. & GRAY	ASTER,WESTERN MOUNTAIN	FAC	FAC	PNF
ASTER PANSUS	(BLAKE) CRONQ.	ASTER,MANY-FLOWERED	FAC+	FACU,FAC+	PNF
ASTER SIBIRICUS	L.	ASTER,SIBERIAN	NI	FAC	PNF
ASTER SUBSPICATUS	NEES	ASTER,DOUGLAS'	FACW	FAC,FACW	PNF
ASTRAGALUS AGRESTIS	DOUGL.	MILKVETCH,FIELD	FACW-	FACU,FACW-	PNF
ASTRAGALUS ALPINUS	L.	MILKVETCH,ALPINE	FAC-	FACU,FAC	PNF
ASTRAGALUS CANADENSIS	L.	MILKVETCH,CANADA	FACW-	FACU,FACW	PNF
ASTRAGALUS DIAPHANUS	DOUGL. EX HOOK.	MILKVETCH,TRANSPARENT	FACU+	FACU+	ANF
ASTRAGALUS LEMMONII	GRAY	MILKVETCH,LEMMON'S	FACW	FACW	PNF
ASTRAGALUS ROBBINSII	(OAKES) GRAY	MILKVETCH,ROBBINS	FAC+	UPL,FAC+	PNF
ATHYRIUM DISTENTIFOLIUM	TAUSCH	FERN,ALPINE LADY	FAC	FACU,FAC	PNF3
ATHYRIUM FILIX-FEMINA	(L.) ROTH	FERN,SUBARCTIC LADY	FAC	FAC,FAC+	PNF3
ATRIPLEX ARGENTEA	NUTT.	SALTBUSH,SILVER-SCALE	FAC-	FACU,FAC	ANF
ATRIPLEX GMELINII	C.A. MEYER	SALTBUSH,GMELIN'S	NI	FACW	ANF
ATRIPLEX PATULA	L.	SALTBUSH,HALBERD-LEAF	FACW	FAC,FACW	ANF
ATRIPLEX ROSEA	L.	ORACHE,TUMBLING	FACU-	FACU-,FACU+	AIF
ATRIPLEX TRUNCATA	(TORR. EX S. WATS.) GRAY	ORACHE,WEDGE-LEAF	FACU+	FACU+,FAC	ANF
AZOLLA FILICULOIDES	LAM.	FERN,FERN-LIKE MOSQUITO	OBL	OBL	PN/W
AZOLLA MEXICANA	SCHLECHT. & CHAM. EX K. PRESL	FERN,MEXICAN MOSQUITO	OBL	OBL	PN/W
BARBAREA ORTHOCERAS	LEDEB.	WINTER-CRESS,AMERICAN	FACW+	FACW,OBL	BNEF
BARBAREA VULGARIS	R. BR.	ROCKET,YELLOW	FAC-	FACU,FACW	BIF
BASSIA HYSSOPIFOLIA	(PALLAS) KUNTZE	SMOTHER-WEED,FIVE-HORN	FACW	FAC,FACW	AIF
BECKMANNIA ERUCIFORMIS	(L.) HOST	GRASS,BECKMANN'S	NI	OBL	G
BECKMANNIA SYZIGACHNE	(STEUD.) FERNALD	SLOUGHGRASS,AMERICAN	OBL	OBL	ANG
BERGIA TEXANA	(HOOK.) SEUBERT	BERGIA,TEXAS	OBL	OBL	ANF
BERULA ERECTA	(HUDS.) COV.	PARSNIP,CUT-LEAF WATER	OBL	OBL	PIF
BETULA GLANDULOSA	MICHX.	BIRCH,TUNDRA DWARF	OBL	FAC,OBL	NS
BETULA OCCIDENTALIS	HOOK.	BIRCH,SPRING	FACW	FAC,FACW	NT
BETULA PAPYRIFERA	MARSHALL	BIRCH,PAPER	FACU	FACU,FACU+	NT
BIDENS CERNUA	L.	BEGGAR-TICKS,NODDING	FACW+	FACW+,OBL	AIF
BIDENS FRONDOSA	L.	BEGGAR-TICKS,DEVIL'S	FACW+	FACW,FACW+	ANF
BIDENS TRIPARTITA	L.	BEGGAR-TICKS,THREE-LOBE	FACW	FACW,OBL	AIF
BIDENS X AMPLISSIMA	GREENE		FACW+	FACW+	ANF
BLECHNUM SPICANT	(L.) ROTH	FERN,DEER	FAC+	FAC,FAC+	PNF3
BOISDUVALIA DENSIFLORA	(LINDL.) S. WATS.	SPIKE-PRIMROSE,DENSE-FLOWER	FACW-	FACW-,OBL	ANF
BOISDUVALIA GLABELLA	(NUTT.) WALP.	SPIKE-PRIMROSE,SMOOTH	FACW+	FACW,OBL	ANF
BOISDUVALIA STRICTA	(GRAY) GREENE	SPIKE-PRIMROSE,BROOK	FACW	FACW	ANF

ARTEMISIA DOUGLASIANA

BOISDUVALIA STRICTA

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SCI-NAME	AUTHOR	COMMON-NAME	REGION	NAT-IND	HABIT
BOLANDRA OREGANA	S. WATS.	BOLANDRA,NORTHERN	FACW	FACW	PNF
BOTRYCHIUM BOREALE	MILDE	GRAPEFERN,NORTHERN	FAC	FACU-,FAC	PNF3
BOTRYCHIUM LANCEOLATUM	(S.G. GMEL.) RUPR.	MOONWORT,TRIANGLE	FACW	FAC,FACW	PNF3
BOTRYCHIUM LUNARIA	(L.) SWARTZ	MOONWORT	FAC	FAC,FACW	PNF3
BOTRYCHIUM MATRICARIIFOLIUM	A. BRAUN	MOONWORT,DAISY-LEAF	FACU	FACU	PNF3
BOTRYCHIUM MULTIFIDUM	(J.F. GMEL.) RUPR.	GRAPEFERN,LEATHERY	FAC	FACU,FAC	PNF3
BOTRYCHIUM SIMPLEX	E. HITCHC.	GRAPEFERN,LEAST	FACU	FACU,FAC	PNF3
BOTRYCHIUM VIRGINIANUM	(L.) SWARTZ	FERN,RATTLESNAKE	FACU	FACU	PNF3
BOYKINIA ELATA	(NUTT.) GREENE	BROOKFOAM,SANTA LUCIA	FACW	FACW	PNF
BOYKINIA MAJOR	GRAY	BROOKFOAM,MOUNTAIN	FACW	FACW	PNF
BRASENIA SCHREBERI	J.F. GMEL.	WATERSHIELD	OBL	OBL	PNZF
BROMUS CILIATUS	L.	BROME,FRINGED	FAC+	FACU,FACW	PNG
BROMUS JAPONICUS	THUNB.	BROME,JAPANESE	FACU	UPL,FACU	AIG
BROMUS RUBENS	L.	BROME,RIPGUT	NI	FACU?	AIG
BROMUS VULGARIS	(HOOK.) SHEAR	BROME,COLUMBIA	FACU-	FACU-,FACU	PNG
CAKILE EDENTULA	(BIGEL.) HOOK.	SEAROCKET,AMERICAN	FACU	FACU	ANSF
CAKILE MARITIMA	SCOP.	SEAROCKET,EUROPEAN	FACU	FACU,FACW	AISF
CALAMAGROSTIS CANADENSIS	(MICHX.) BEAUV.	REEDGRASS,BLUE-JOINT	FACW+	FAC,OBL	PNG
CALAMAGROSTIS CRASSIGLUMIS	THURB.	SMALL-REEDGRASS,THURBER'S	OBL	OBL	PNG
CALAMAGROSTIS INEXPANSA	A. GRAY	SMALL-REEDGRASS,NARROW-SPIKE	FACW	FACW,FACW+	PNG
CALAMAGROSTIS NEGLECTA	(EHRH.) P. GARTN., B. MEYER & SCHERB.	REEDGRASS,SLIMSTEM	FACW	FACW,OBL	PNG
CALAMAGROSTIS NUTKAENSIS	(J. PRESL) J. PRESL EX STEUD.	SMALL-REEDGRASS,PACIFIC	FACW	FAC,FACW	PNG
CALAMAGROSTIS SCRIBNERI	W.J. BEAL	SMALL-REEDGRASS,SCRIBNER'S	FACW	FACW,OBL	PNG
CALANDRINA CILIATA	(RUIZ & PAVON) DC.	MAIDS,RED	NI	FACU	ANSF
CALLITRICHE ANCEPS	FERNALD	WATER-STARWORT,TWO-EDGE	OBL	OBL	ANZF
CALLITRICHE HERMAPHRODITICA	L.	WATER-STARWORT,AUTUMNAL	OBL	OBL	PNZF
CALLITRICHE HETEROPHYLLA	PURSH	WATER-STARWORT,LARGER	OBL	OBL	PIZ/F
CALLITRICHE STAGNALIS	SCOP.	WATER-STARWORT,POND	OBL	OBL	PNZF
CALLITRICHE VERNA	L.	WATER-STARWORT,SPINY	OBL	OBL	PNZ/F
CALTHA LEPTOSEPALA	DC.	MARSH-MARIGOLD,SLENDER-SEPAL	OBL	OBL	PNEF
CALTHA PALUSTRIS	L.	MARSH-MARIGOLD,COMMON	OBL	OBL	PNF
CALYPSO BULBOSA	(L.) OAKES	SLIPPER,FAIRY	FAC+	FACU,FACW	PNF
CALYSTEGIA SEPIUM	(L.) R. BR.	BINDWEED,HEDGE	FAC	FACU,OBL	PIF
CAMASSIA LEICHTLINII	(BAKER) S. WATS.	CAMASSIA,LEICHTLIN'S	FACW-	FACW-,FACW	PNF
CAMASSIA QUAMASH	(PURSH) GREENE	CAMASSIA,COMMON	FACW	FACW	PNF
CAMELINA SATIVA	(L.) CRANTZ	FALSE-FLAX,LARGE-SEED	FAC-	UPL,FAC	AIF
CAMISSONIA SUBACAULIS	(PURSH) RAVEN	SUNCUP,LONG-LEAF	FACW-	FAC,FACW	PNF
CAMPANULA LASIOCARPA	CHAM.	BELLFLOWER,COMMON ALASKA	FACU	UPL,FACU	PNF
CAMPANULA PARRYI	GRAY	BELLFLOWER,PARRY NORTHERN	FAC	FACU,FAC	PNF
CAMPANULA ROTUNDIFOLIA	L.	BELLFLOWER,SCOTCH	FACU+	UPL,FAC	PNF
CANNABIS SATIVA	L.	MARIJUANA	FACU	FACU-,FAC	AIF
CAPSELLA BURSA-PASTORIS	(L.) MEDIC.	PURSE,COMMON SHEPHERD'S	FAC-	FACU,FAC	AIF
CARDAMINE ANGULATA	HOOK.	BITTER-CRESS,SEASIDE	FACW	FACW	PNF
CARDAMINE BELLIDIFOLIA	L.	BITTER-CRESS,ALPINE	NI	FAC,FACW	PNF
CARDAMINE BREWERI	S. WATS.	BITTER-CRESS,BREWER'S	FACW+	FAC,OBL	PNF
CARDAMINE CORDIFOLIA	GRAY	BITTER-CRESS,HEART-LEAF	FACW	FACW,OBL	PNF
CARDAMINE LYALLII	S. WATS.	BITTER-CRESS,LYALL'S	FACW	FACW	PNF
CARDAMINE OCCIDENTALIS	(S. WATS.) T. HOWELL	BITTER-CRESS,WESTERN	FACW+	FACW+	PNF
CARDAMINE OLIGOSPERMA	NUTT.	BITTER-CRESS,FEW-SEED	FACW	FACW	ANF
CARDAMINE PENSYLVANICA	MUHL. EX WILLD.	BITTER-CRESS,PENNSYLVANIA	FACW	FACW,OBL	ANF
CAREX AENAE	FERNALD	SEDGE,BRONZE	NI	FACW?	PNGL
CAREX ALBONIGRA	MACKENZ.	SEDGE,BLACK-AND-WHITE-SCALE	FACU	UPL,FACU	PNGL

BOLANDRA OREGANA

CAREX ALBONIGRA

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SCI-NAME	AUTHOR	COMMON-NAME	R9IND	NAT-IND	HABIT
CAREX AMPLIFOLIA	BOOTT	SEDGE,BIG-LEAF	FACW+	FACW+,OBL	PNGL
CAREX APERTA	BOOTT	SEDGE,COLUMBIA	FACW	FACW	PNGL
CAREX AQUATILIS	WAHLENB.	SEDGE,WATER	OBL	OBL	PNEGI
CAREX ARCTA	BOOTT	SEDGE,NORTHERN CLUSTERED	FACW+	FACW+,OBL	PNGL
CAREX ATHERODES	SPRENG.	SEDGE,SLOUGH	OBL	OBL	PNEGL
CAREX ATHROSTACHYA	OLNEY	SEDGE,SLENDER-BEAK	FACW	FAC,FACW	PNGL
CAREX ATRATA	L.	SEDGE,BLACK-SCALE	FAC	FACU,FAC	PNGL
CAREX ATROSQUAMA	MACKENZ.	SEDGE,BLACK-SCALE	NI	FACU,FACW	PNGL
CAREX AUREA	NUTT.	SEDGE,GOLDEN-FRUIT	FACW+	FACW,OBL	PNGL
CAREX BEBBII	(L.H. BAILEY) OLNEY EX FERNALD	SEDGE,BEBB'S	OBL	OBL	PNGL
CAREX BOLANDERI	OLNEY	SEDGE,BOLANDER'S	FAC	FAC,FACW	PNGL
CAREX BONANZENSIS	BRITTON	SEDGE,YUKON	NI	FACW	PNGL
CAREX BREVIOR	(DEWEY) MACKENZ. EX LUNELL	SEDGE,SHORT-BEAK	OBL	UPL,OBL	PNEGL
CAREX BRUNNESCENS	(PERS.) POIR.	SEDGE,BROWNISH	OBL	FAC,OBL	PNGL
CAREX BUXBAUMII	WAHLENB.	SEDGE,BROWN BOG	OBL	FACW,OBL	PNEGL
CAREX CALIFORNICA	L.H. BAILEY	SEDGE,CALIFORNIA	OBL	FAC,OBL	PNGL
CAREX CAMPYLOCARPA	TH. HOLM	SEDGE,CRATER LAKE	FACW	FACW	PNGL
CAREX CANESCENS	L.	SEDGE,HOARY	FACW+	FACW+,OBL	PNGL
CAREX CAPITATA	L.	SEDGE,CAPITATE	FAC	FAC,FACW	PNGL
CAREX COMOSA	BOOTT	SEDGE,BEARDED	OBL	OBL	PNEGL
CAREX CRAWEI	DEWEY	SEDGE,CRAWE'S	FACW	FACW,OBL	PNGL
CAREX CRAWFORDII	FERNALD	SEDGE,CRAWFORD'S	FACU	FACU,FAC+	PNGL
CAREX CUSICKII	MACKENZ. EX PIPER & BEATTIE	SEDGE,CUSICK'S	OBL	OBL	PNGL
CAREX DENSA	(L.H. BAILEY) L.H. BAILEY	SEDGE,DENSE	OBL	OBL	PNGL
CAREX DEWEYANA	SCHWEINITZ	SEDGE,SHORT-SCALE	FAC+	UPL,FACW	PNGL
CAREX DIANDRA	SCHRANK	SEDGE,LESSER PANICLED	OBL	OBL	PNGL
CAREX DISPERMA	DEWEY	SEDGE,SOFT-LEAF	FACW	FACW,OBL	PNGL
CAREX DOUGLASII	BOOTT	SEDGE,DOUGLAS'	FAC-	FACU,FAC	PNGL
CAREX ECHINATA	MURRAY	SEDGE,LITTLE PRICKLY	NI	OBL	PNGL
CAREX EURYCARPA	TH. HOLM	SEDGE,WIDE-FRUIT	FACW+	FACW,FACW+	PNGL
CAREX EXSICCATA	L.H. BAILEY	SEDGE,BEAKED	OBL	OBL	PNGL
CAREX FESTUCACEA	SCHKUHR EX WILLD.	SEDGE,FESCUE	NI	FAC,FACW	PNGL
CAREX FETA	L.H. BAILEY	SEDGE,GREEN-SHEATH	FACW	FACW,OBL	PNGL
CAREX FLAVA	L.	SEDGE,YELLOW	OBL	OBL	PNGL
CAREX FOENEA	WILLD.	SEDGE,DRY-SPIKE	NI	FAC+?	PNGL
CAREX GARBERI	FERNALD	SEDGE,ELK	FACW-	FACW-,FACW	PNGL
CAREX HASSEI	L.H. BAILEY	SEDGE,HASSE'S	FACW	FACW	PNGL
CAREX HAYDENIANA	OLNEY	SEDGE,HAYDEN'S	FAC-	FAC-,FACW	PNGL
CAREX HENDERSONII	L.H. BAILEY	SEDGE,HENDERSON'S	NI	FAC?	PNGL
CAREX HETERONEURA	W. BOOTT	SEDGE,DIFFERENT-NERVED	FAC	FAC,FACW	PNGL
CAREX HINDSII	C.B. CLARKE	SEDGE,HINDS'	OBL	OBL	PNEGL
CAREX HOODII	BOOTT	SEDGE,HOOD'S	NI	FAC?	PNGL
CAREX HYSTERICINA	MUHL. EX WILLD.	SEDGE,PORCUPINE	OBL	OBL	PNEGL
CAREX ILLOTA	L.H. BAILEY	SEDGE,SMALL-HEAD	FAC	FAC,OBL	PNGL
CAREX INTERIOR	L.H. BAILEY	SEDGE,INLAND	FACW-	FACW-,OBL	PNGL
CAREX INTERRUPTA	BOECK.	SEDGE,GREEN-FRUIT	OBL	OBL	PGL
CAREX JONESII	L.H. BAILEY	SEDGE,JONES'	FACW+	FACW,FACW+	PNGL
CAREX KELLOGGII	W. BOOTT	SEDGE,KELLOGG'S	FACW+	FACW+,OBL	PNGL
CAREX LAEVICULMIS	MEINSH.	SEDGE,SMOOTH-STEM	FACW	FACW	PNGL
CAREX LANUGINOSA	MICHX.	SEDGE,WOOLY	OBL	OBL	PNGL
CAREX LAPPONICA	O. LANG	SEDGE,LAPLAND	NI	OBL	PNGL
CAREX LASIOCARPA	EHRH.	SEDGE,WOOLLY-FRUIT	OBL	OBL	PNEGL

CAREX AMPLIFOLIA

CAREX LASIOCARPA

NATIONAL LIST OF PLANT SPECIES THAT OCCUR IN WETLANDS: 1988--WASHINGTON

SCI-NAME	AUTHOR	COMMON-NAME	Ry IND	NAT-IND	HABIT
CAREX LENTICULARIS	MICHX.	SEDGE,SHORE	FACW+	FACW+,OBL	PNGL
CAREX LEPORINA	L.	SEDGE,HARE'S-FOOT	FAC	FAC,OBL	PNGL
CAREX LEPTALEA	WAHLENB.	SEDGE,BRISTLY-STALK	OBL	OBL	PNGL
CAREX LEPTOPODA	MACKENZ.	SEDGE,SHORT SCALE	FAC	FAC,FACW	PNGL
CAREX LIMNOPHILA	F.J. HERM.	SEDGE,APPRESSED	FACW	FACW,OBL	PNGL
CAREX LIMOSA	L.	SEDGE,MUD	OBL	OBL	PNGL
CAREX LIVIDA	(WAHLENB.) WILLD.	SEDGE,LIVID	OBL	OBL	PNGL
CAREX LUZULINA	OLNEY	SEDGE,WOOD-RUSH	OBL	OBL	PNGL
CAREX LYNGBYEI	HORNEM.	SEDGE,LYNGBYE'S	OBL	OBL	PNGL
CAREX MACROCEPHALA	WILLD.	SEDGE,BIG-HEAD	FAC-	FAC-,FAC	PNGL
CAREX MACROCHAETA	C.A. MEYER	SEDGE,ALASKA LONG-AWN	FACW-	FACW-,FACW	PNGL
CAREX MEDIA	R. BR.	SEDGE,INTERMEDIATE	FACW	FACW	PNGL
CAREX MERTENSII	PRESCOTT	SEDGE,MERTEN'S	FACW	FAC,FACW	PNGL
CAREX MICROPTERA	MACKENZ.	SEDGE,SMALL-WING	FAC	FAC,FACW	PNGL
CAREX MISERABILIS	MACKENZ.	SEDGE,STARVED	FACW	FACW	PNGL
CAREX NARDINA	FR.	SEDGE,NARD	FACU	UPL,FACU	PNGL
CAREX NEBRASCENSIS	DEWEY	SEDGE,NEBRASKA	OBL	OBL	PNGL
CAREX NERVINA	L.H. BAILEY	SEDGE,SIERRA	FACW-	FAC,FACW-	PNGL
CAREX NEUROPHORA	MACKENZ.	SEDGE,ALPINE-NERVE	FACW	FACW	PNGL
CAREX NIGRA	(L.) REICHARD	SEDGE,BLACK	NI	FACW+	PNGL
CAREX NIGRICANS	C.A. MEYER	SEDGE,BLACK ALPINE	FACW	FACW	PNGL
CAREX NORVEGICA	RETZ.	SEDGE,SCANDINAVIAN	FACW	FACW	PNGL
CAREX NUDATA	W. BOOTT	SEDGE,TORRENT	FACW	FACW	PNGL
CAREX OBNUPTA	L.H. BAILEY	SEDGE,SLOUGH	OBL	OBL	PNGL
CAREX PACHYSTACHYA	CHAM. EX STEUD.	SEDGE,THICK-HEAD	FAC	FACU,FACW	PNGL
CAREX PANSA	L.H. BAILEY	SEDGE,SAND-DUNE	FACU	FACU	PNGL
CAREX PAUCIFLORA	LIGHTF.	SEDGE,FEW-FLOWER	OBL	OBL	PNGL
CAREX PAUPERCULA	MICHX.	SEDGE,POOR	OBL	OBL	PNEGL
CAREX PHAEOCEPHALA	PIPER	SEDGE,MOUNTAIN HARE	FACU	UPL,FAC	PNGL
CAREX PHYLLOMANICA	W. BOOTT	SEDGE,COASTAL STELLATE	OBL	OBL	PNGL
CAREX PLURIFLORA	HULTEN	SEDGE,SEVERAL FLOWERED	OBL	OBL	PNGL
CAREX POLYMORPHA	MUHL.	SEDGE,VARIABLE	NI	FACU	PNGL
CAREX PRAECEPTORUM	MACKENZ.	SEDGE,EARLY	FACW+	FACW+,OBL	PNGL
CAREX PRAEGRACILIS	W. BOOTT	SEDGE,CLUSTERED FIELD	FACW	FACW-,FACW+	PNGL
CAREX PRATICOLA	RYDB.	SEDGE,NORTHERN MEADOW	FACW	FACU,FACW	PNGL
CAREX PRESLII	STEUD.	SEDGE,PRESL'S	FACU	FACU	PNGL
CAREX PRIONOPHYLLA	TH. HOLM	SEDGE,SAW-LEAF	FACW	FACW	PNGL
CAREX PSEUDOSCIRPOIDEA	RYDB.	SEDGE,WESTERN SINGLE-SPIKE	FACU	FACU	PNGL
CAREX PYRENAICA	WAHLENB	SEDGE,PYRENAEAN	FAC	FAC,FACW	PNGL
CAREX RAYNOLDSII	DEWEY	SEDGE,RAYNOLDS'	FACU	FACU,FAC	PNGL
CAREX RETRORSA	SCHWEINITZ	SEDGE,RETRORSE	FAC	FAC,OBL	PNGL
CAREX RICHARDSONII	R. BR.	SEDGE,RICHARDSON'S	NI	UPL,FAC-	PNGL
CAREX ROSTRATA	J. STOKES	SEDGE,BEAKED	OBL	OBL	PNEGL
CAREX SAXATILIS	L.	SEDGE,RUSSET	FACW+	FACW,OBL	PNGL
CAREX SCIRPOIDEA	MICHX.	SEDGE,CANADIAN SINGLE-SPIKE	FACU+	FACU,FACU+	PNGL
CAREX SCOPARIA	SCHKUHR EX WILLD.	SEDGE,POINTED BROOM	FACW	FACW	PNGL
CAREX SCOPULORUM	TH. HOLM	SEDGE,HOLM'S ROCKY MOUNTAIN	FACW	FACW	PNGL
CAREX SHELDONII	MACKENZ.	SEDGE,SHELDON'S	OBL	OBL	PNGL
CAREX SIMULATA	MACKENZ.	SEDGE,SHORT-BEAK	OBL	FACW,OBL	PNGL
CAREX SITCHENSIS	PRESCOTT	SEDGE,SITKA	OBL	OBL	PNEGL
CAREX SPECTABILIS	DEWEY	SEDGE,SHOWY	FACW	FACW	PNGL
CAREX STYLOSA	C.A. MEYER	SEDGE,LONG-STYLE	FACW+	FACW,FACW+	PNGL

CAREX LENTICULARIS

CAREX STYLOSA

Appendix O

Wetland Inventory
Data Form Examples

City of Auburn

Wetland Inventory Data Forms

APPENDIX A

WETLAND INVENTORY DATA FORM

Wetland No.:_____ Map No.:_____
1/4__ 1/4__ S__ T__ R__ 1/4__ 1/4__ S__ T__ R__
1/4__ 1/4__ S__ T__ R__ 1/4__ 1/4__ S__ T__ R__
Location:_____
_____
Parcel No(s).:_____
_____
Date Inventoried:_____ Zoning:____ Plan Map:____
Weather Conditions:_____
_____

==========

A. HYDROLOGIC/SOIL FUNCTION

1. General wetland type or characteristic:

A. River_____
B. Stream_____
C. Marsh/Swamp/Bog
D. Drainage Channel/Ditch
E. Wet Pasture
F. Pond/Lake_____
G. Other_____

2. Types of water bodies associated with the wetland (Inlet (I); Outlet (O); Undetermined (U)):

A. River_____ I/O/U
B. Stream_____ I/O/U
C. Drainage Channel/Ditch I/O/U
D. Drainage Pipe I/O/U
E. Pond/Lake_____ I/O/U
F. None (Groundwater Exchange) I/O/U

3. Distance to nearest drainage facility:

A. 0-100'
B. 100'-500'
C. 500'-1000'
D. >1000'

N S E W NE SE NW SW

4. Evidence of water movement through the wetland:

A. No outlet.
B. Outlet with standing water/water below outlet.
C. No visible water movement (but water moving from outlet).
D. Visible movement of water through wetland.
E. None.

Comment:_____.

5. Extent of pollutant discharge into the wetland.

A. No known discharge.
B. Probable discharge.
C. Visible discharge.

Source:_____

6. The substrate is saturated with water or covered by shallow water at some time during the growing season of each year:

No Yes (Probable) Yes (Confirmed) ___ Inconclusive

7. Is there visible surface water?

No____ Yes____

8. Field evidence of inundation or saturation (i.e. water marks, drift lines, algal mats):_____

---

9. The substrate is predominantly undrained hydric soil:

No Yes __ Field Inventory (See below)
__ Soil Conservation Service Maps

Test Pit #: ____

Series/Phase:_____
Is the soil on the hydric soil list?_____
Is the soil:
Mottled? No___ Yes___ Matrix Color_____
Gleyed? No___ Yes___ Gley Color_____
Saturated? No___ Yes___ Sulfer smell? No___ Yes___
Entisol with Mottling? No___ Yes___
Chroma____ Hue____ Value____

Test Pit #: ____

Series/Phase:_____
Is the soil on the hydric soil list?_____
Is the soil:
Mottled? No___ Yes___ Matrix Color_____
Gleyed? No___ Yes___ Gley Color_____
Saturated? No___ Yes___ Sulfer smell? No___ Yes___
Entisol with Mottling? No___ Yes___
Chroma____ Hue____ Value____

==========

NOTES:

B. BIOLOGICAL FUNCTION

Wetland No.____ Map No.____

1. At least periodically, the land supports predominantly hydrophytes:

No Yes* (Probable) Yes* (Confirmed) ___Inconclusive*

*See attached worksheets.

2. Degree of hydrophytic vegetation cover on the wetland (See attached worksheets):

A. >75% B. 50-75% C. 25-50% D. 0-25%

3. Agricultural use is present within the wetland:

No

Yes (Extent of Coverage): A. 0-25% B. 25-50%
C. 50-75% D. >75%

4. Quality of wetland for breeding/spawning, wintering/transit or habitat for anadromous fish, trout, game fish, game birds or other mammals of significant commercial or recreational value (see attached plant list):

A. Breeding Area	No	Yes(Probable)	Yes(Confirmed)
B. Spawning Area	No	Yes(Probable)	Yes(Confirmed)
C. Wintering/Transit	No	Yes(Probable)	Yes(Confirmed)
D. Habitat	No	Yes(Probable)	Yes(Confirmed)
E. Rare/Endangered Species*	No	Yes(Probable)	Yes(Confirmed)

*Based on U.S. Department of Interior Fish and Wildlife Service and the Washington State Departments of Wildlife, and Natural Resources reporting.

Observation:

5. Surrounding habitat:

A. Open Water:	N	S	E	W	NE	SE	NW	SW
B. Agricultural	N	S	E	W	NE	SE	NW	SW
C. Grass:	N	S	E	W	NE	SE	NW	SW
D. Wooded:	N	S	E	W	NE	SE	NW	SW
E. Brush/shrub:	N	S	E	W	NE	SE	NW	SW
F. Developed/Urban:	N	S	E	W	NE	SE	NW	SW
G. Filled/unvegetated:	N	S	E	W	NE	SE	NW	SW
H. Freeway/Railroad:	N	S	E	W	NE	SE	NW	SW

6. Special habitat features:

A. Snags >25' high
B. Snags <25' high
C. Rock outcrop
D. Perches
E. Logs
F. Canopy cover
G. Other_____
H. None.

7. Animals observed on the wetland site:

Birds

_____
_____
_____
_____
_____

Fish/Amphibians/Reptiles

_____
_____
_____
_____
_____

Mammals

_____
_____
_____
_____
_____

Other Species

_____
_____
_____
_____
_____

==========

NOTES:

C. VISUAL/CULTURAL FUNCTION

Wetland No.____ Map No.____

1. Size of wetland:

   Average Width: _____ feet. N/S E/W
   Average Length: _____ feet. N/S E/W
   Estimated Area: _____acres

2. Distance in miles to nearest school:

   A. 0-.5 miles: N S E W NE SE NW SW
   B. .5-1 miles: N S E W NE SE NW SW
   C. 1-2 miles: N S E W NE SE NW SW
   D. >2 miles: N S E W NE SE NW SW

3. Distance in miles to nearest park:

   A. 0-.5 miles: N S E W NE SE NW SW
   B. .5-1 miles: N S E W NE SE NW SW
   C. 1-2 miles: N S E W NE SE NW SW
   D. >2 miles: N S E W NE SE NW SW

4. Types of access to the wetland:

   A. Pedestrian Trail: N S E W NE SE NW SW
   B. Bicycle Trail: N S E W NE SE NW SW
   C. Road: N S E W NE SE NW SW
   D. Boatable Watercourse: N S E W NE SE NW SW
   E. None.

5. Types of access within the wetland:

   A. Pedestrian Trail
   B. Bicycle Trail
   C. Road
   D. Boatable Watercourse
   E. None.

6. Surrounding land uses:

   A. Vacant: N S E W NE SE NW SW
   B. Agricultural : N S E W NE SE NW SW
   C. Industrial/commercial: N S E W NE SE NW SW
   D. Residential: N S E W NE SE NW SW
   E. Park Land: N S E W NE SE NW SW
   F. Freeway/Railroad R/W: N S E W NE SE NW SW

==========

NOTES:

D. FISH AND WILDLIFE SERVICE CLASSIFICATION

Wetland No.____ Map No.____

I. System_____
Subsystem_____
1. Class_____ % Cover_____
Subclass_____
Subclass_____
Subclass_____
Modifier_____
2. Class_____ % Cover_____
Subclass_____
Subclass_____
Subclass_____
Modifier_____
3. Class_____ % Cover_____
Subclass_____
Subclass_____
Subclass_____
Modifier_____
4. Class_____ % Cover_____
Subclass_____
Subclass_____
Subclass_____
Modifier_____
5. Class_____ % Cover_____
Subclass_____
Subclass_____
Subclass_____
Modifier_____

==========

NOTES:

E. SUMMARY

Wetland No.____ Map No.____

1. Is wetland hydrology present?

___No ___Yes (Probable) ___Yes (Confirmed) ___Inconclusive

2. Is hydric soil present?

___No ___Yes

3. Is a predominance of wetland vegetation present?

___No ___Yes (Probable) ___Yes (Confirmed) ___Inconclusive

4. The wetland is classified as:

___ Non-wetland
___ Fish and Wildlife Service
___ U.S. Army Corps of Engineers

==========

NOTES:

F. WETLAND SURVEY

The following map indicates such features as the general wetland shape, location of survey transects, wetland dimensions, public access, and the location of specific survey information (i.e. soil test pits; inlets; outlets; habitat features; etc.):

VEGETATION UNIT WORKSHEET

Wetland No._____ Map No._____

VEGETATIVE UNIT	SPECIES	INDSTAT	%COVER	COVER STATUS

Vegetation unit community indicator status:_____

Proportion of vegetation unit to the entire wetland:_____%

Do the dominant species indicate that the vegetation unit supports hydrophytic vegetation? No___ Yes___ Inconclusive__

WETLAND INVENTORY DATA SHEET

Wetland Name _____ Date _____ Time _____

Wetland Location _____

¼ ½ S T R

__ _____ _____ _____ _____

Weather _____

Field Person _____

Access _____

Sub-basin _____

Non-Field Data

1. Estimate: A. width _____
   B. length _____
   C. area _____ acres

2. The outflow of the wetland enters:
   A. River or stream
   B. Wetland
   C. Lake
   D. Pipe

3. Location of wetland within the sub-basin:
   A. Upper
   B. Upper middle
   C. Middle
   D. Lower middle
   E. Lower

4. Distance in miles
   A. _____ nearest elementary/ high school
   B. _____ nearest college

5. Indicate site type
   A. 1. Upland
      2. Bottomland
   B. 1. Isolated
      2. Lakeside
      3. Streamside
      4. Deltaic

6. Distance in miles:
   A. _____ nearest upstream tributary, waterbody
   B. _____ nearest downstream tributary, waterbody

7. List any anadromous fish, trout or game fish, gamebirds, or mammals of significant commercial or recreational value. Also list any rare, endangered, or threatened plants and/or animals. For each, note the number of species observed and whether the wetland serves as any of the following:

species (code)

A. Breeding/spawning area ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

B. Wintering/transit ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

C. Potential Habitat ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

For rare/endangered species note if they are:

D. Recorded/confirmed ___ ___ ___ ___ ___

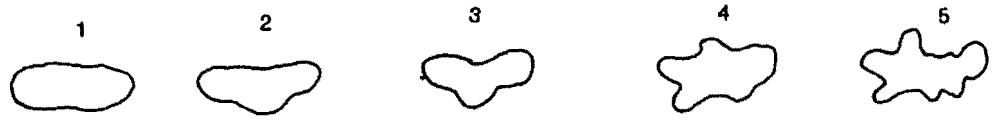
E. Recorded/unconfirmed ___ ___ ___ ___ ___

(above information based on data from Dept. of Fisheries and Game reports)

Field Data

1. Which of the following figures best represents the number and distribution of vegetative types surrounding the wetland?

2. Which of the following figures best represents the shape of the wetland edge?



3. Which of the following figures best represents the difference in height between the wetland vegetation and surrounding vegetation?

4. Indicate the different types of water bodies associated with the wetland.

	NO	YES
A. Lake		
B. Reservoir		
C. Pond		
D. River		
E. Stream		

5. Indicate different types of access to the wetland.

	NO	YES
A. Trail		
B. Road		
C. Boat on associated lake		

6. Indicate the different types of access on the wetland.

	NO	YES
A. Trail		
B. Road		
C. Boat		

7. Indicate and describe types of environmental problems observed on or near the wetland.

	NO	YES	
A. Visual			_____
B. Air			_____
C. Noise			_____
D. Water			_____

8. A. Is agricultural use present on the wetland?

NO	YES

B. If yes, determine the extent of its coverage over the wetland.

1	2	3	4
0-25%	25-50%	50-75%	75-100%

9. A. Is the extraction of peat/organic soil occurring on the wetland?

NO	YES

B. If yes, determine the extent of its coverage over the wetland.

1	2	3	4
0-25%	25-50%	50-75%	75-100%

10. Determine type of outlet, its size and condition:

A. Type — Size

1. None
2. Overland
   a. Defined
   b. Undefined
3. Open channel _____
4. Pipe _____

B. Condition

1. Open
2. Partially blocked
3. Totally blocked

C. The outflow from the wetland enters:

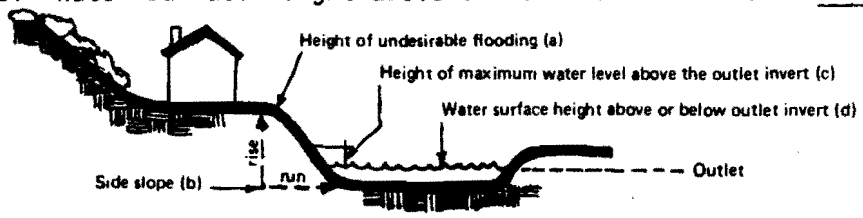
1. Stream
2. River
3. Lake
4. Wetland
5. Pipe

11. A. Height above outlet invert to point of undesirable flooding of improved property: _____ feet.

B. Average side slope (rise/run) from minimum storage level to elevation of undesirable flooding. _____ feet/ _____ feet.

C. Height of maximum water level under existing conditions above the outlet invert _____ feet.

D. Water surface height above or below outlet invert. _____ feet.



12. Determine the degree of water movement through the wetland:

A. No outlet/outlet with standing water/water below outlet invert

B. No visible movement (but water moving from outlet)

C. Visible movement of water through wetland

13. Water quality: determine the extent of pollutant discharge into the wetland:

A. No known discharge

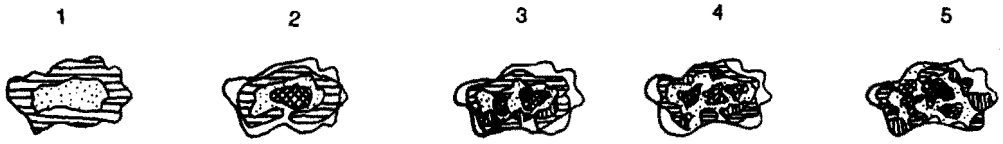
B. Probable discharge _____

C. Visible discharge _____

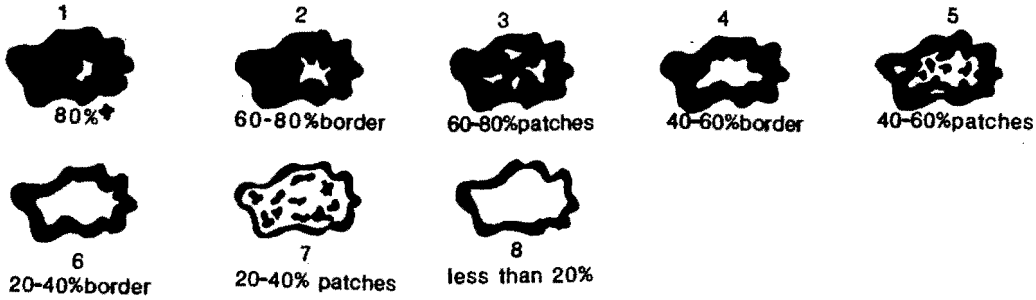
14. Indicate FWS wetland classification

A. System _____	B. System _____
1. Subsystem _____	1. Subsystem _____
2. Class (FWS/Amherst) ___/___	2. Class (FWS/Amherst) ___/___
B-1 Subclass _____	B-1 Subclass _____
B-2 Subclass _____	B-2 Subclass _____
B-3 Subclass _____	B-3 Subclass _____
3. Class (FWS/Amherst) ___/___	3. Class (FWS/Amherst) ___/___
C-1 Subclass _____	C-1 Subclass _____
C-2 Subclass _____	C-2 Subclass _____
C-3 Subclass _____	C-3 Subclass _____
4. Class (FWS/Amherst) ___/___	4. Class (FWS/Amherst) ___/___
D-1 Subclass _____	D-1 Subclass _____
D-2 Subclass _____	D-2 Subclass _____
D-3 Subclass _____	D-3 Subclass _____

15. Which of the following figures best represents the number and distribution of subclasses within the wetland?



16. Which of the following figures best represents the degree of vegetative cover on the wetland?



17. Note surrounding habitat/land uses, their % of the total surrounding, and if buffer, % of edge and approximate width.

Surrounding habitat/land use	% of total surroundings within 1000 ft.	If buffer, % of edge	If buffer, approx. width (1 - 100')
A. water	_____	_____	_____
B. grass	_____	_____	_____
C. woods	_____	_____	_____
D. brush/shrub	_____	_____	_____
E. agriculture	_____		
F. urban high den	_____		
G. urban low den	_____		

18. Special Habitat Features — number

A. Snags more than 18' dia.
   1. less than 25' high _____
   2. greater than 25' high _____

B. Snags less than 18' dia.
   1. less than 25' high _____
   2. greater than 25' high _____

C. Rock out crop _____

D. Perches _____

E. Logs _____

F. Beaver muskrat lodge _____

G. Other _____

Trees

Alnus rubra (Red Alder) (Ar)
Fraxinus latifolia (Oregon Ash) (Fl)
Populus trichocarpa (Black Cottonwood) (Pt)
Populus tremuloides(Trembling Aspen) (Pq)
Tsuga heterophylla (Hemlock) (Ts)
Thuja plicata (W. Red Cedar) (Tp)

Herbs

Geum macrophyllum (Lrg Lvd Geum Yellow) (Gm)
Iris pseudocarpus (Yellow Iris) (Ip)
Lysichitum americanum (Skunk cabbage) (La)
Maianthemum uniflorum (Wld Lily of Valley) (Mu)
Nuphar polysepalum (Yellow Pond Lily) (Np)
Nymphaea odorata (White Pond Lily) (No)
Oenanthe sarmentosa (Water Parsley) (Os)
Polygonum hydropiper (Marsh Pepper) (Ph)
Potentilla paulustris (Potentilla) (Pp)
Prunella vulgaris (Self-heal) (Pv)
Ranunculus aquatilis (Water Crowfoot) (Ra)
Ranunculus orthorhynchus (Aquatic Buttercup) (Ro)
Ranunculus repans (Rr)
Sium suave (Water Parsnip) (Ss)
Solanum dulcamara (Bittersweet Nightshade) (Sd)
Trientalis arctica (Bog Starflower) (Ta)
Typha latifolia (Cattail) (Tl)
Utricularia Minor (Bladder wort) (Um)
Veronica americana (Am. Brooklime) (Va)
Veronica scuttellata (Marsh Speedwell) (Vs)
Viola paulustris (Marsh Violet) (Vp)

Shrubs

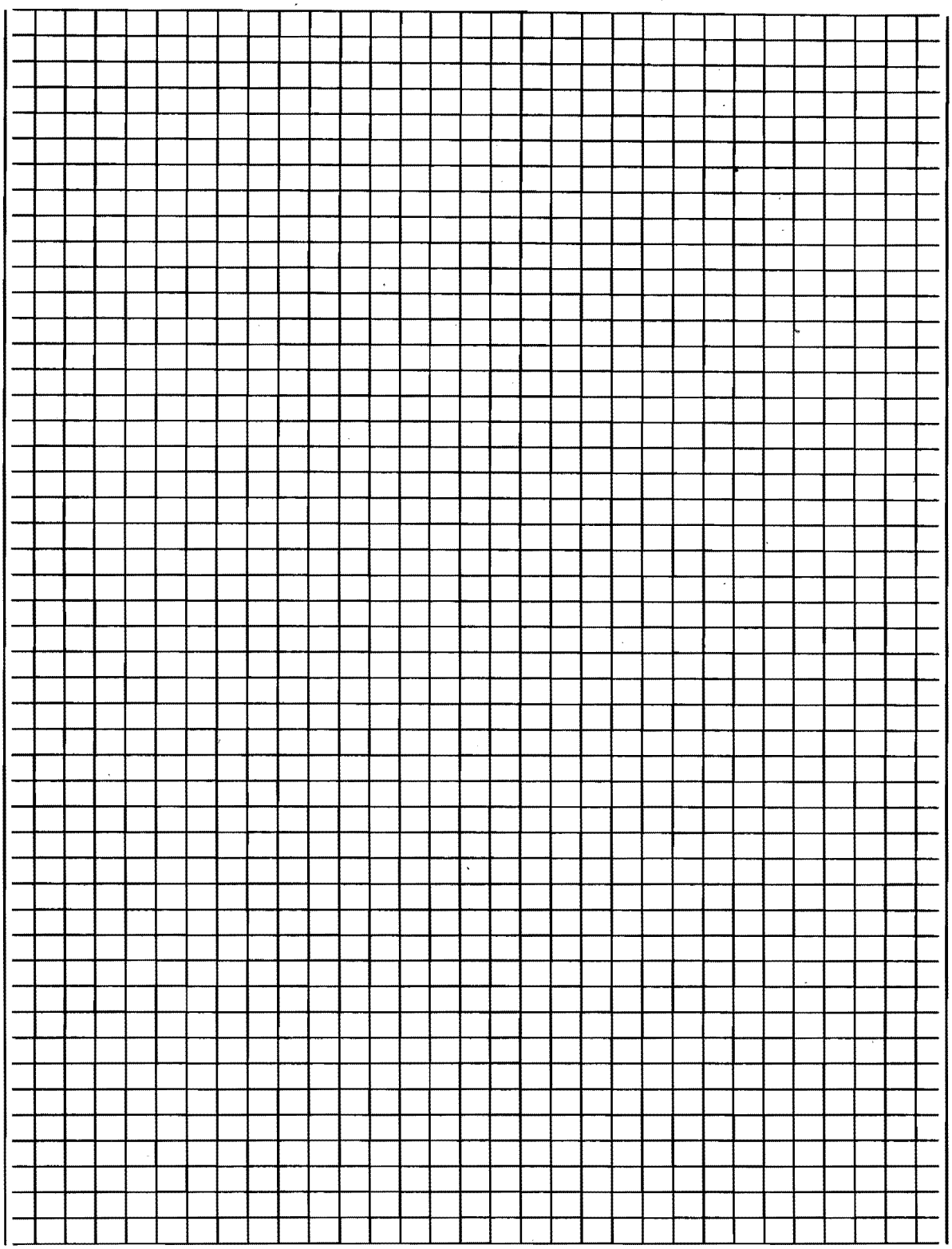
Acer circinatum (Vine Maple) (Ac)
Cornus stolenifera (Red os. Dogwood) (Cs)
Gaultheria shallon (Salal) (Gs)
Kalmia occidentalis (Swamp Laurel) (Ko)
Ledum groenlandicu (Lab. Tea) (Ll)
Lonicera involucrata (Twinberry) (Li)
Malus diversifolia (Crabapple) (Md)
Rhamnus purshiana (Cascara) (Rp)
Rubus spectabilis (Salmonberry) (Rs)
Salix sp. (Willow) (Sx)
Spirea douglassii (Hardhack) (Sd)
Vaccinium oxycoccus (Cranberry) (Vo)
Vaccinium parvifolium (Red Huckleberry) (Vp)

Sedges/Rushes/Grasses/Ferns

Alopecuros sp. (Foxtail Grass) (Ax)
Athyrium felix-femina (Lady Fern) (Af)
Carex aquatilis (Water Sedge drk/lg) (Ca)
Carex sp. (Cx)
Carex obnupta (Slough Sedge male/female) (Co)
Dulichium arundinaceum (Da)
Eleocharis sp. (Ex)
Juncus effusus (Rush, sm. infl.) (Je)
Juncus sp. (Jx)
Juncus tennuis (Rush, lrg. infl.) (Jt)
Lemma minor (Duckweed) (Lm)
Phalaris arundinacea (Reed Canary) (Pa)
Ricciocarpus natans (Liverwort) (Rn)
Scirpus fluviatilis (River Bulrush) (Sf)
Scirpus validus (Soft-stemmed Bulrush) (Sv)
Scirpus Sp. (Sx)
Sphagnum sp. (Px)
Ulva spp.

Birds

Great Blue Heron (GB)
Green Heron (GH)
Canada Goose (CG)
Mallard (MA)
Marsh Hawk (MH)
Red-tailed Hawk (RH)
Ruffed Grouse (RG)
California Quail (CQ)
Common Coot (CO)
Virginia Rail (VR)
Spotted Sandpiper (SP)
Killdeer (KD)
Rufous Hummingbird (RH)
Violet-green Swallow (VS)
Tree Swallow (TS)
Barn Swallow (BS)
Redwinged Blackbird (RB)
Am. Robin (AR)
Swainsons Thrush (ST)
Marsh Wren(MW)
Cowbird (CO)
Song Sparrow (SS)
Yellow Throat (YT)
Yellow Warbler (YW)
Willsons' Warbler (WW)
Goldfinch (GF)
Rufous-sided towhee (RS)



PROVIDE DETAILED FIELD INVENTORY HERE

Mileage: Starting _____ Ending _____

Wetland Location _____ Wetland No. _____
Quad Name _____ Series _____
County _____
¼_____ ¼_____ ¼_____ S_____ T_____ R_____
Soil Type: Name and No. _____

****

1. Contact Person _____ Phone _____
   Access _____ Date _____
2. Contact Person _____ Phone _____
   Access _____ Date _____
3. Contact Person _____ Phone _____
   Access _____ Date _____

Crew Members Date/Time

_____
_____
_____
_____
_____

Weather Conditions (Temp./Precip./% Cloud Cover)

_____
_____
_____
_____
_____

****

1. Indicate FWS Wetland Classification

1. System _____ Subsystem _____
   Water Regime(s) _____
   A. Class _____ Common Name _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   B. Class _____ Common Name _____
   Water Regime(s) _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   C. Class _____ Common Name _____
   Water Regime(s) _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   Special Modifiers _____

2. System _____ Subsystem _____
   Water Regime(s) _____
   A. Class _____ Common Name _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   B. Class _____ Common Name _____
   Water Regime(s) _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   C. Class _____ Common Name _____
   Water Regime(s) _____
      1. Subclass _____ Dominance Types _____
      2. Subclass _____ Dominance Types _____
      3. Subclass _____ Dominance Types _____

   Special Modifiers _____

3. System _____ Subsystem _____
Water Regime(s) _____
A. Class _____ Common Name _____
1. Subclass _____ Dominance Types _____
2. Subclass _____ Dominance Types _____
3. Subclass _____ Dominance Types _____

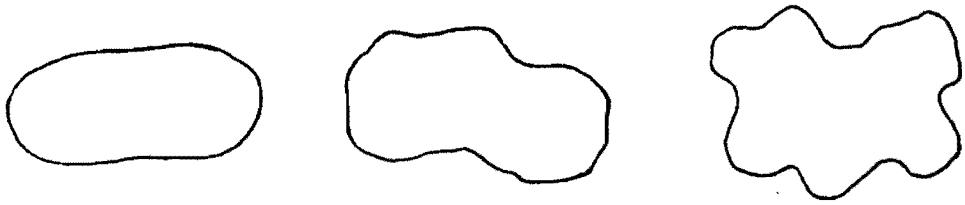
B. Class _____ Common Name _____
Water Regime(s) _____
1. Subclass _____ Dominance Types _____
2. Subclass _____ Dominance Types _____
3. Subclass _____ Dominance Types _____

C. Class _____ Common Name _____
Water Regime(s) _____
1. Subclass _____ Dominance Types _____
2. Subclass _____ Dominance Types _____
3. Subclass _____ Dominance Types _____

Special Modifiers _____

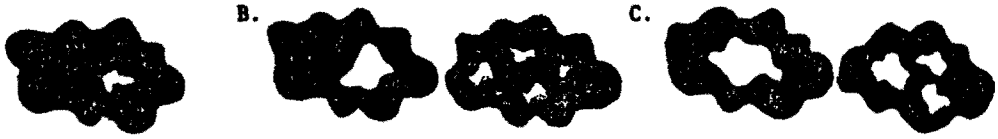
2. Which of the following figures best represents the shape of the wetland?

A. B. C.



3. Which of the following best represents the degree of vegetative cover (blackened area) on the wetland?

A. B. C.



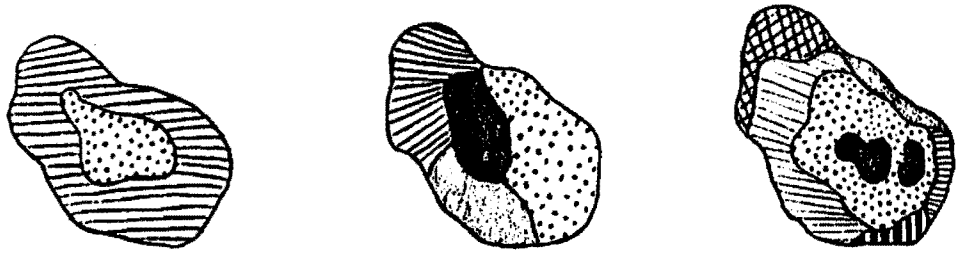
80%+ 60-80% border/patches 40-60% border/patches

D. E.

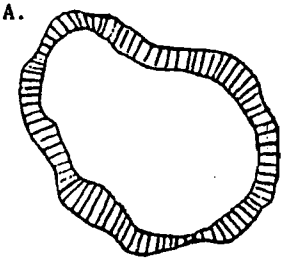
20-40% border/patches less than 20%

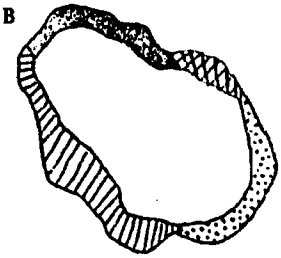
4. Which of the following figures best represents the variation in vegetation types within the wetland?

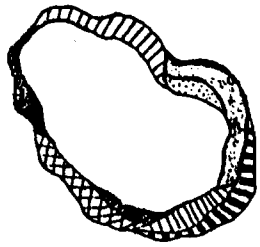
A. B. C.



5. Which of the following figures best represent the variation in UPLAND vegetation types bordering the wetland?

A. 

B 

C. 

6. Which of the following figures best represents the difference in height between the wetland vegetation and the bordering upland vegetation?

Different

A. 

a. Wetland | Upland
b. Upland | Wetland

B. 

a. Wetland | Upland
b. Upland | Wetland

C. 

a. Wetland | Upland
b. Upland | Wetland

Similar

D. 

Wetland | Upland

E. 

Wetland | Upland

F. 

Wetland | Upland

7. Indicate and describe the types of activities observed within the wetland site.

A. Residential _____
B. Commercial _____
C. Industrial _____
D. Recreational _____
E. Transportation _____

8. Indicate the different types of water bodies associated with the wetland (identify on sketch).

A. Lake
B. Reservoir
C. Pond
D. River
E. Stream
F. Ditch
G. Estuary
H. Open ocean

9. Describe surrounding habitat/land uses, their % of the total surroundings, % of edge, and distance from wetland edge.

Habitat/Land Use	% of Total surroundings within 1000 ft.	% of Edge	"Extent" from wetland edge (0-1000')
A. Water			
B. Grass			
C. Brush/Shrub			
D. Woods			
E. Agriculture			
F. Residential			
G. Commercial			
H. Industrial			
I. Recreational			
J. Transport. Corridor(s)			

Describe activities associated with land uses E-J above.

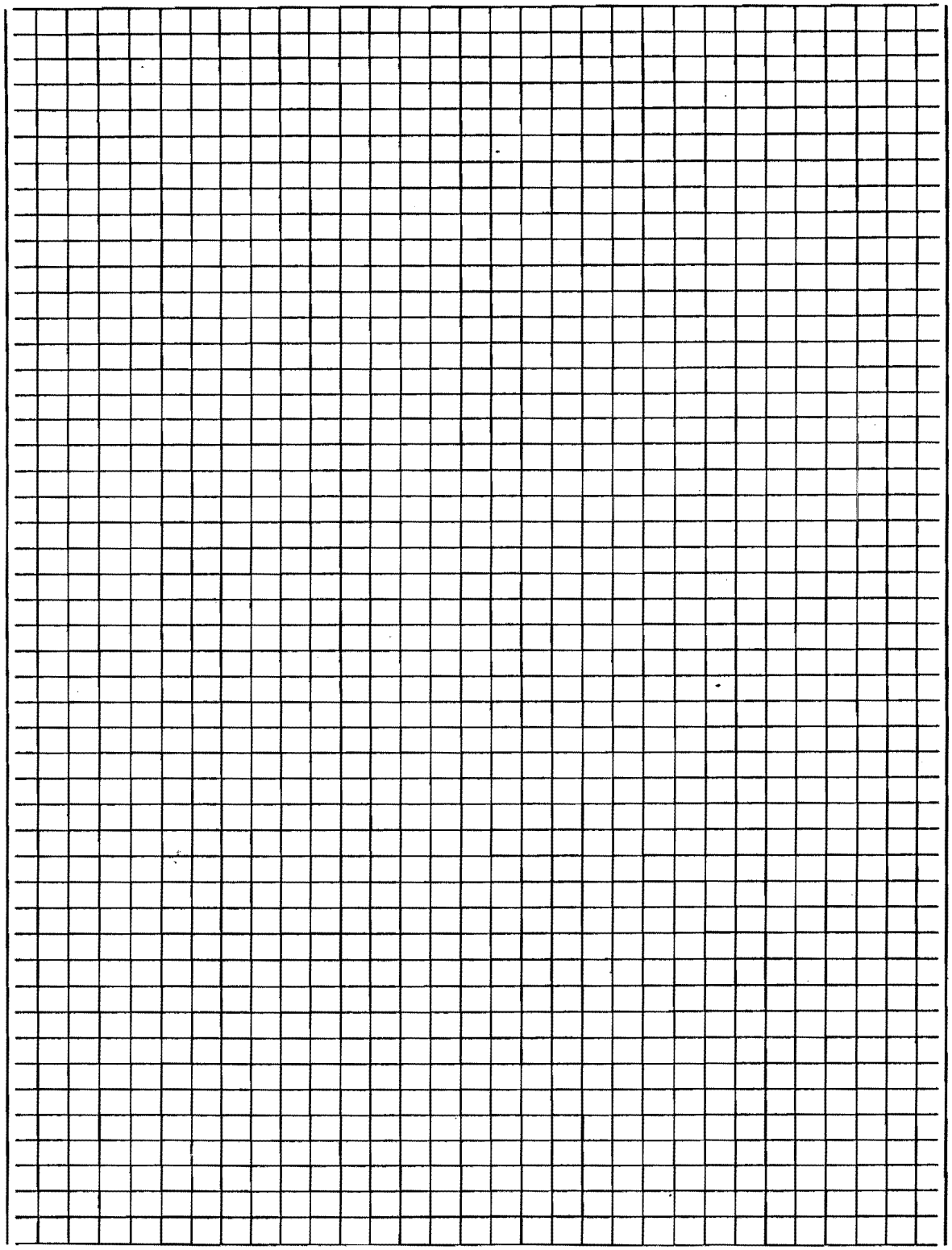
10. Indicate the different types of land forms bordering or adjacent to the wetland site (identify on sketch).

A. Cliff or Bluff
B. Mountain(s) or Ridge
C. Hill or Hilly Area
D. Valley
E. Canyon
F. Flat, Level Plain
G. Other _____

11. Describe habitat features within the wetland.

A. Snags - more than 18" dia. _____
   1. Less than 25' high _____
   2. Greater than 25' high _____
B. Snags - less than 18" dia. _____
   1. Less than 25' high _____
   2. Greater than 25' high _____
C. Rock outcrops _____
D. Perches _____
E. Logs - Floating _____ Embedded _____
F. Beaver Muskrat Lodge _____
G. Artificial Structures _____
H. Canopy Cover _____
I. Other _____

12. Wetland sketch. Identify scale and indicate photo direction and numbers.



13. List or describe flora or fauna observed on wetland site.

Trees

Shrubs

Herbs

Sedges/Rushes/Grasses/Ferns

Birds

Mammals

Fish/Amphibians/Reptiles

Other Species

King County Wetlands Inventory Data Form

HYDROLOGY

Wetland No. _ _ _ _ Map No. _ _ _
Wetland Name ____________________
Sub-basin ____________________

¼	¼	½	S	T	R	
__	__	__	__	__	__	__
__	__	__	__	__	__	y/n

Team ____________________ Date ____________________
Weather Conditions ____________________
Time ____________ Access ____________
Contact Person/Phone ____________________

NON-FIELD DATA

1. Estimate:
   - A. width ________
   - B. length ________
   - C. area ________ acres

2. The outflow of the wetland enters:
   - A. River or stream/DNR watertype ____
   - B. Wetland
   - C. Lake or Puget Sound
   - D. Pipe

3. Indicate the location of the wetland within the sub-basin
   - A. upper
   - B. upper middle
   - C. middle
   - D. lower middle
   - E. lower

4. Measure area of tributary drainage ________ acres

5. Indicate the presence of critical or sensitive areas in or adjacent to the downstream water body (measure to the closest river or lake) and the approximate extent of its linear coverage (%) along the water body edge:

	Area	No	Yes	Coverage
A.	critical	0	1	___.___
B.	landslide	0	1	___.___
C.	seismic	0	1	___.___
D.	erosion	0	1	___.___
E.	wetland	0	1	___.___
F.	anadromous fish	0	1	___.___
G.	floodplain	0	1	___.___
H.	coal mine	0	1	___.___

		No	Yes	
6.	King County Shoreline designation (if any):	0	1	________________
7.	King County Sewer Service Area?	0	1	

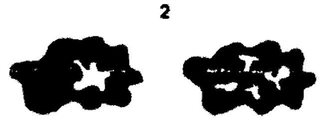
FIELD DATA

8. Which of the following best represents the degree of vegetative cover on the wetland?

1

80%+

2

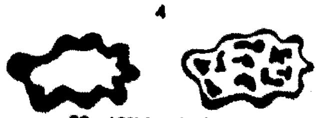


60 - 80% border/patches

3

40 - 60% border/patches

4



20 - 40% border/patches

5

less than 20%

King County Wetlands Inventory Data Form

9. Determine type of outlet, its size and condition:

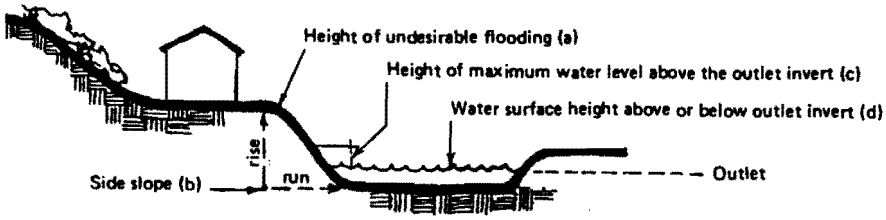
   A. Type — Size
      1. none
      2. overland
         a. defined
         b. undefined
      3. open channel _____
      4. pipe _____
   B. Condition
      1. open
      2. partially blocked
      3. totally blocked
   C. The outflow from the wetland enters:
      1. stream
      2. river
      3. lake
      4. wetland
      5. Puget Sound
      6. pipe

10. A. Height above outlet invert to point of undesirable flooding of improved property. _____ ft.

    B. Average side slope (rise/run) from minimum storage level to elevation of undesirable flooding. _____ ft./_____ft.

    C. Height of maximum water level under existing conditions above the outlet invert. _____ ft.

    D. Water surface height above or below outlet invert. _____ ft.



(Note on the sketch below the location of potential impoundments for retention areas within the wetland.)

11. Determine the degree of water movement through the wetland:

    A. No outlet/outlet with standing water/water below outlet invert.
    B. no visible movement (but water moving from outlet)
    C. visible movement of water through wetland

12. Water quality: determine the extent of pollutant discharge into the wetland:

    A. no known discharges
    B. probable discharge _____
    C. visible discharge _____

Wetland sketch (identify scale and indicate photo direction and numbers).

King County Wetlands Inventory Data Form

VISUAL/CULTURAL/ECONOMIC

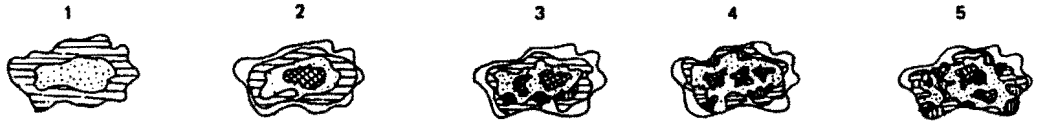
Wetland No. _ _ _ _ Wetland Name _____ Sub-Basin _____
Team Member _____ Date _____

NON-FIELD DATA

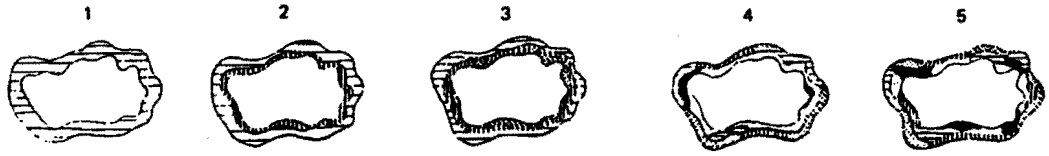
1. Distance in miles
   A. _____ nearest elementary/high school
   B. _____ nearest college
2. Size in acres
   _____ associated lake, pond, reservoir
3. Distance in miles
   A. _____ nearest upstream tributary, waterbody, wetland
   B. _____ nearest downstream tributary, waterbody, wetland

FIELD DATA

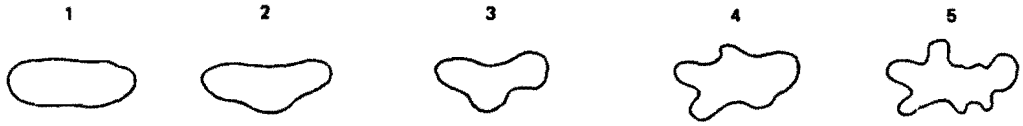
4. Which of the following figures best represents the number and distribution of vegetative types within the wetland?



5. Which of the following figures best represents the number and distribution of vegetative types surrounding the wetland?



6. Which of the following figures best represents the shape of the wetland edge?



7. Which of the following figures best represents the difference in height between the wetland vegetation and surrounding vegetation?

8. From two points on the wetland edge, measure angle from horizon to top of most distant landform on the four points of the compass (note on sketch).

		N	S	E	W
A.	Point 1	____	____	____	____
B.	Point 2	____	____	____	____

9. Indicate the different types of land form adjacent or surrounding the wetland (note on sketch)

		No	Yes
A.	cliff or bluff	0	1
B.	mountain(s) or ridge	0	1
C.	hill or hilly area	0	1
D.	valley	0	1
E.	canyon	0	1
F.	flat, level plain	0	1
G.	other _____	0	1

10. Indicate the different types of water bodies associated with the wetland

		No	Yes
A.	lake	0	1
B.	reservoir	0	1
C.	pond	0	1
D.	river	0	1
E.	stream	0	1

King County Wetlands Inventory Data Form

11. Indicate different types of access to the wetland

		No	Yes
A.	trail	0	1
B.	road	0	1
C.	boat on asso. river/stream	0	1
D.	boat on asso. lake/reservoir	0	1

12. Indicate different types of access on the wetland

		No	Yes
A.	trail	0	1
B.	road	0	1
C.	boat	0	1

13. Indicate and describe types of environmental problems observed on or near the wetland.

		No	Yes	
A.	visual	0	1	_____
B.	air	0	1	_____
C.	noise	0	1	_____
D.	water	0	1	_____

14. A. Is agricultural use present on the wetland?

No	Yes
0	1

B. If yes, determine the extent of its coverage over the wetland.

1	2	3	4
0 - 25%	25 - 50%	50 - 75%	75 - 100%

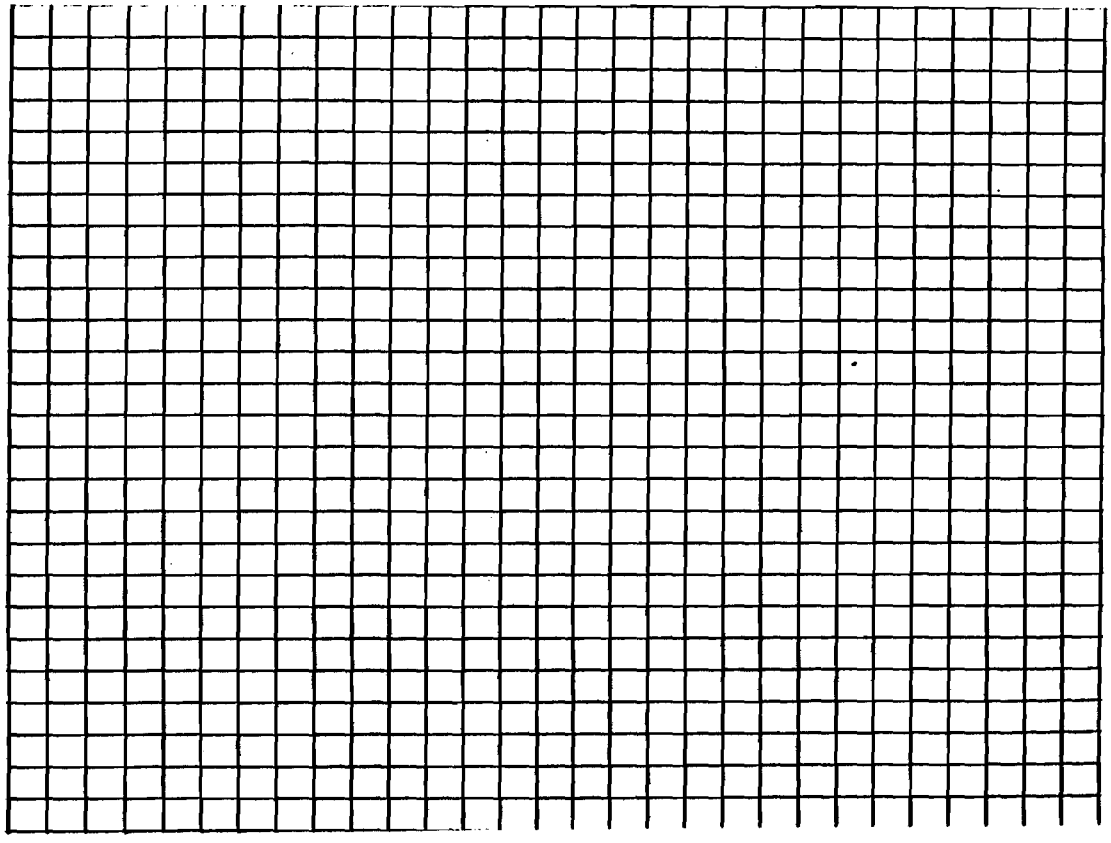
15. A. Is the extraction of peat/organic soil occurring on the wetland?

No	Yes
0	1

B. If yes, determine the extent of its coverage over the wetland.

1	2	3	4
0 - 25%	25 - 50%	50 - 75%	75 - 100%

Wetland sketch (identify scale and indicate photo direction and numbers)



King County Wetlands Inventory Data Form

WILDLIFE

Wetland No. ____ Wetland Name _____ Sub-basin _____
Team Member _____ Date _____

NON FIELD DATA

1. Indicate site type

   A. 1. Upland
      2. Bottomland
   B. 1. Isolated
      2. Lakeside
      3. Streamside
      4. Deltaic

2. List/describe any anadromous fish, trout or game fish, game birds or other mammals of significant commercial value. For each, note the number of species observed and whether the wetland serves as a) breeding/spawning, b) wintering/transit or c) potential habitat. List species at the right using code from species checklist.

		Number	Species (code)
A.	Breeding/spawning area	_____	
B.	Wintering/Transit	_____	
C.	Potential Habitat	_____	

3. List/describe any anadromous fish, trout or game fish, game birds or other mammals of significant recreational value. For each, note the number of species observed and whether the wetland serves as a) breeding/spawning, b) wintering/transit or c) potential habitat. List species at the right using code from species checklist.

		Number	Species (code)
A.	Breeding/Spawning Area	_____	
B.	Wintering/Transit	_____	
C.	Potential Habitat	_____	

4. List/describe any rare, endangered or threatened plants and animals. For each, note the number of species observed, whether it is Recorded/Confirmed or Recorded/Unconfirmed and whether the wetland serves as potential a) breeding/spawning, b) wintering/transit or c) habitat. List species at the right using code from species checklist.

		Number	Species (code)
A.	Recorded/Confirmed	_____	
B.	Recorded/Unconfirmed	_____	
C.	Potential Breeding/ Spawning	_____	
D.	Potential Wintering/ Transit	_____	
E.	Potential Habitat	_____	

FIELD DATA

5. Indicate FWS wetland classification

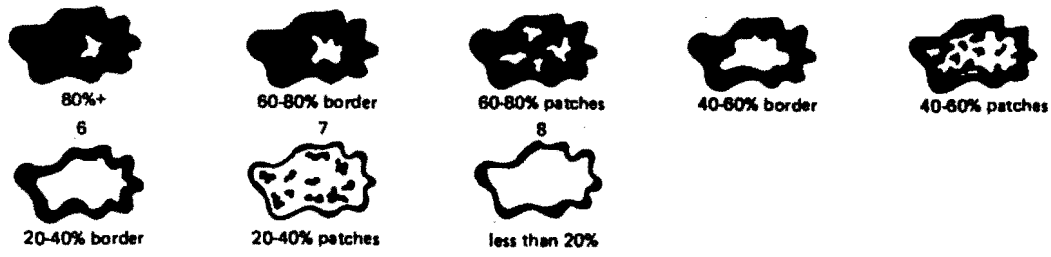
1. System _____	2. System _____	3. System _____
A. Subsystem _____	A. Subsystem _____	A. Subsystem _____
B. Class (FWS/Amherst) ___/___	B. Class (FWS/Amherst) ___/___	B. Class (FWS/Amherst) ___/___
B-1 Subclass _____	B-1 Subclass _____	B-1 Subclass _____
B-2 Subclass _____	B-2 Subclass _____	B-2 Subclass _____
B-3 Subclass _____	B-3 Subclass _____	B-3 Subclass _____
C. Class (FWS/Amherst) ___/___	C. Class (FWS/Amherst) ___/___	C. Class (FWS/Amherst) ___/___
C-1 Subclass _____	C-1 Subclass _____	C-1 Subclass _____
C-2 Subclass _____	C-2 Subclass _____	C-2 Subclass _____
C-3 Subclass _____	C-3 Subclass _____	C-3 Subclass _____
D. Class (FWS/Amherst) ___/___	D. Class (FWS/Amherst) ___/___	D. Class (FWS/Amherst) ___/___
D-1 Subclass _____	D-1 Subclass _____	D-1 Subclass _____
D-2 Subclass _____	D-2 Subclass _____	D-2 Subclass _____
D-3 Subclass _____	D-3 Subclass _____	D-3 Subclass _____

King County Wetlands Inventory Data Form

6. Which of the following figures best represents the number and distribution of subclasses within the wetland?

1 2 3 4 5

7. Which of the following figures best represents the degree of vegetative cover on the wetland?



8. Note surrounding habitat/land uses, their % of the total surroundings, and if buffer, % of edge and approximate width:

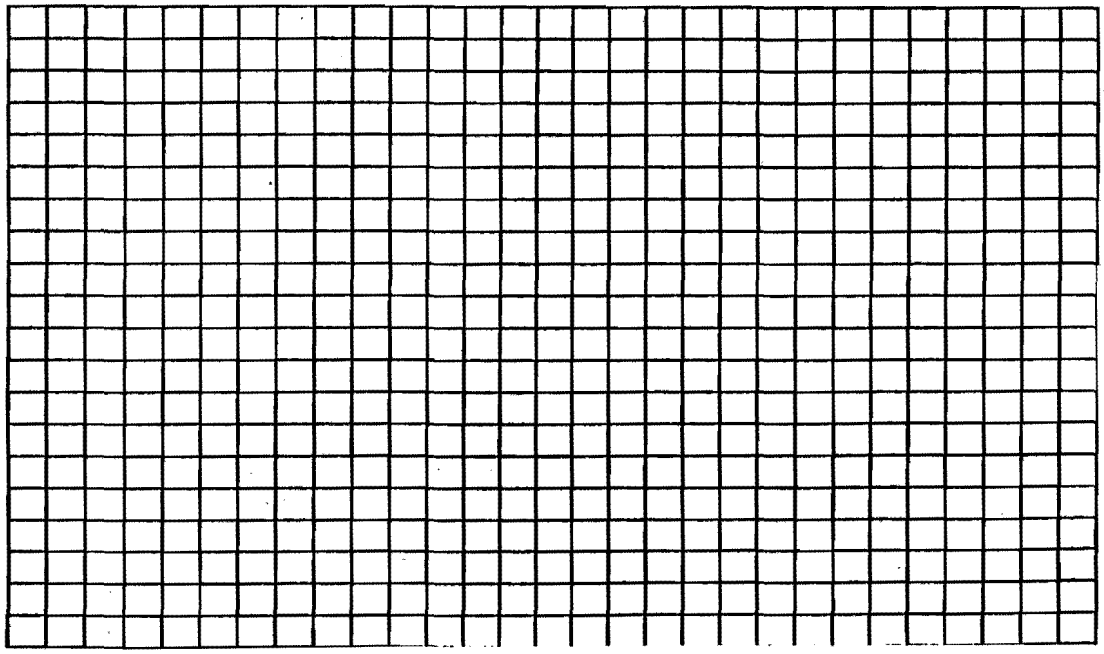
Surrounding habitat/land use	% of total surroundings within 1000 ft.	If buffer, % of edge	If buffer, approx. width (0 - 100')
A. water			
B. grass			
C. woods			
D. brush/shrub			
E. agriculture			
F. urban high den			
G. urban low den			

9. Special Habitat Features — number

A. Snags more than 18" dia.
   1. less than 25' high _____
   2. greater than 25' high _____
B. Snags less than 18" dia.
   1. less than 25' high _____
   2. greater than 25' high _____
C. Rock out crop _____
D. Parches _____
E. Logs _____
F. Beaver muskrat lodge _____
G. Other _____

10. List or describe flora or fauna observed on attached checklist.

Wetland sketch (identify scale and indicate photo direction and numbers).



King County Wetlands Inventory Data Form

SPECIES CHECKLIST

Trees

- Alnus rubra (Red Alder) (Ar)
- Fraxinus latifolia (Oregon Ash) (Fl)
- Populus trichocarpa (Black Cottonwood) (Pt)
- Populus tremuloides (Trembling Aspen) (Pq)
- Tsuga heterophylla (Hemlock) (Ts)
- Thuja plicata (W. Red Cedar) (Tp)

Herbs

- Geum macrophyllum (Lrg Lvd Geum Yellow) (Gm)
- Iris pseudocarpus (Yellow Iris) (Ip)
- Lysichitum americanum (Skunk cabbage) (La)
- Maianthemum uniflorum (Wld Lily of Valley) (Mu)
- Nuphar polysepalum (Yellow Pond Lily) (Np)
- Nymphaea odorata (White Pond Lily) (No)
- Oenanthe sarmentosa (Water Parsley) (Os)
- Polygonum hydropiper (Marsh Pepper) (Ph)
- Potentilla paulustris (Potentilla) (Pp)
- Prunella vulgaris (Self-heal) (Pv)
- Ranunculus aquatilis (Water Crowfoot (Ra)
- Ranunculus orthorhynchus (Aquatic Buttercup) (Ro)
- Ranunculus repens (Rr)
- Sium suave (Water Parsnip) (Ss)
- Solanum dulcamara (Bittersweet Nightshade) (Sd)
- Trientalis arctica (Bog Starflower) (Ta)
- Typha latifolia (Cattail) (Tl)
- Utricularia Minor (Bladder wort) (Um)
- Veronica americana (Am. Brooklime) (Va)
- Veronica scutellata (Marsh Speedwell) (Vs)
- Viola paulustris (Marsh Violet) (Vp)

Shrubs

- Acer circinatum (Vine Maple) (Ac)
- Cornus stolenifera (Red os. Dogwood) (Cs)
- Gaultheria shallon (Salal) (Gs)
- Kalmia occidentalis (Swamp Laurel) (Ko)
- Ledum groenlandicum (Lab. Tea) (Lt)
- Lonicera involucrata (Twinberry) (Li)
- Malus diversifolia (Crabapple) (Md)
- Rhamnus purshiana (Cascara) (Rp)
- Rubus spectabilis (Salmon berry) (Rs)
- Salix sp. (Willow) (Sx)
- Spirea douglassii (Hardhack) (Sd)
- Vaccinium oxycoccus (Cranberry) (Vo)
- Vaccinium parvifolium (Red Huckleberry) (Vp)

Sedges/Rushes/Grass/Fern

- Alopecaros sp. (Foxtail) (Ax)
- Athyrium felix-femina (Lady fern) (Af)
- Carex aquatalis (Water Sedge drk/lg) (Ca)
- Carex sp. (Cx)
- Carex obnupta (Slough Sedge male/female) (Co)
- Dulichium arundinaceum (De)
- Eleocharis sp. (Ex)
- Juncus effusus (Rush, sm. infl.) (Je)
- Juncus sp. (Jx)
- Juncus tennuis (Rush, lrg. infl.) (Jt)
- Lemna minor (Duckweed) (Lm)
- Phalaris arundinacea (Reed Canary) (Pa)
- Ricciocarpus natans (Liverwort) (Rn)
- Scirpus fluviatilis (River Bulrush) (Sf)
- Scirpus validus (Soft-stemmed Bulrush) (Sv)
- Scirpus Sp. (Sx)
- Sphagnum sp. (Px)

Birds

- Great Blue Heron (GB)
- Green Heron (GH)
- Canada Goose (CG)
- Mallard (MA)
- Marsh Hawk (MH)
- Red-tailed Hawk (RH)
- Ruffed Grouse (RG)
- Calif. Quail (CQ)
- Common Coot (CO)
- Virginia Rail (VR)
- Spottec Sandpiper (SP)
- Killdeer (KD)
- Rufous Hummingbird (RH)
- Violet-green Swallow (VS)
- Tree Swallow (TS)
- Barn Swallow (BS)
- Redwinged Blackbird (RB)
- Am. Robin (AR)
- Sweinsons Thrush (ST)
- Marsh Wren (MW)
- Cowbird (CO)
- Song Sperrow (SS)
- Yellow Throat (YT)
- Yellow Warbler (YW)
- Willsons' Warbler (WW)
- Goldfinch (GF)
- Rufous-sided towhee (RS)

NWI _____ Soils _____ Flood Plain _____ Aerial _____ Field Survey _____

PIERCE COUNTY WETLAND FIELD SURVEY DATA FORM*

1. Identification: 1/4 1/4 1/2 S T R

Wetland No. _____ ___ ___ ___ ___ ___ ___

Wetland Name _____ ___ ___ ___ ___ ___ ___

2. Investigation: ___ ___ ___ ___ ___ ___

Team _____ ___ ___ ___ ___ ___ ___

Date ___/___/___ Time Begin _____ Time End _____

Access Point _____

Landowner _____ Phone _____

Weather _____

3. FWS Wetland Type:

A. System PALUSTRINE

1. Class _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl. Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

2. Class _____
   - B-1 Subcl./Dom. _____
   - B-2 Subcl./Dom. _____
   - B-3 Subcl. Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

3. Class _____
   - C-1 Subcl./Dom. _____
   - C-2 Subcl./Dom. _____
   - C-3 Subcl. Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

4. Class _____
   - D-1 Subcl./Dom. _____
   - D-2 Subcl./Dom. _____
   - D-3 Subcl./Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

B. System LACUSTRINE

1. Subsyst./Cl. _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl./Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

2. Subsyst./Cl. _____
   - B-1 Subcl./Dom. _____
   - B-2 Subcl./Dom. _____
   - B-3 Subcl./Dom. _____
   - Special Modifier _____
   - Codes _____ Cl%

C. System RIVERINE

1. Subsyst./Cl. _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl./Dom. _____
   - Special Modifier _____
   - Codes _____ Sys%

Additional plant species:

Animal species:

*These Field data takes precedence over office/laboratory non-field data.

Wetland No. _____ Wetland ID _____ Date _____

4. Indicate the location of the wetland within the sub-basin:

1 upper 2 upper middle 3 middle 4 lower middle 5 lower

5. Storage Capacities:

A. TYPE OF OUTLET: CONDITION:

a. none:

b. overland: 1. constricted 2. unconstricted

c. open channel (artificial): _____, channel width _____, depth _____

not measured _____

d. pipe: type _____, diameter _____

not measured _____

e. other: _____

f. unknown

B. TYPE OF INLET:

a. no visible inlet:

b. seep:

c. spring:

d. wetland (via culvert):

e. stream or river:

f. storm water drainage pipe:

g. other: _____

h. unknown:

C. Soils (soil survey data) _____

Impoundment Capability:

1. Flat wetland with impoundment capability (describe) _____

2. Flat wetland without impoundment capability (describe) _____

3. Sloped wetland without impoundment capability (describe) _____

6. SPECIAL HABITAT FEATURES:

A. snags

B. rock outcrops

C. perches

D. logs

E. island

F. cliffs

G. other (list)

H. None

COVER ABUNDANCE CLASS FOR SPECIAL HABITAT FEATURES

+) 1%
a) 1-5%
b) 5-25%
c) 25-50%
d) 50%

7. DESCRIBE THE IMPACTS WITHIN THE WETLAND:

A. HUMAN: filling, clearing, grading, garbage dump, trails

B. AGRICULTURAL: pasture, cultivated field

C. COMMERCIAL: peat mining

D. POLLUTION: (type and extent) _____

_____

E. SEDIMENTATION; EROSION: (describe) _____

_____

F. OTHER: _____

_____

Wetland No. _____ Wetland ID _____ Date _____

8. SURROUNDING HABITAT (LAND USE WITHIN 200') IN EACH CARDINAL DIRECTION:

N

S

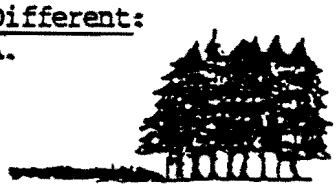
E

W

9. Which of the following figures best represents the differences in height between the wetland vegetation and the bordering upland vegetation?

Different:

A.



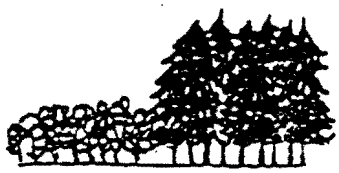
a. site | upland

or

b. upland | site

% _____

B.



a. site | upland

or

b. upland | site

% _____

C.

a. site | upland

or

b. upland | site

% _____

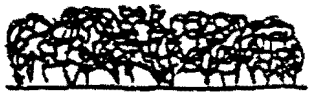
Similar:

D.

site | upland

% _____

E.



site | upland

% _____

F.

site | upland

% _____

Wetland No. _____ Wetland ID _____ Date _____

10. Summary Paragraph (by _____).

Open Space: poor moderate good excellent

Water Quality Maintenance: unknown poor moderate good excellent

Buffers: none poor moderate good excellent

Wildlife Habitat: none poor moderate good excellent

Storm Water Detention:

Human Impacts:

Unique Features:

Additional Comments:

Field data completed by _____ Date _____

Completed form checked by _____ Date _____

EEW:wetland

SNHOMISH COUNTY SURVEY DATA FORMS

LONG AND SHORT FORMS

Attachment C

LONG FORM

Sub-basin name & number

SNOHOMISH COUNTY WETLAND SURVEY DATA FORM

1. Identification:

¼	¼	¼	½	S	T	R

Wetland No. _/_/_/_._/_._/_._/_._/_/_/

Wetland ID (nearest trib.) _____

Sub-basin _____

Wetland Name _____

2. Investigation:

Team _____

Date __/__/__ Time Begin ____ Time End ____

Access Point _____

Landowner _____ Phone _____

Weather _____

3. FWS Wetland Type:

A. System PALUSTRINE

1. Class _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

2. Class _____
   - B-1 Subcl./Dom. _____
   - B-2 Subcl./Dom. _____
   - B-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

3. Class _____
   - C-1 Subcl./Dom. _____
   - C-2 Subcl./Dom. _____
   - C-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

4. Class _____
   - D-1 Subcl./Dom. _____
   - D-2 Subcl./Dom. _____
   - D-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

5. Class _____
   - E-1 Subcl./Dom. _____
   - E-2 Subcl./Dom. _____
   - E-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

6. Class _____
   - F-1 Subcl./Dom. _____
   - F-2 Subcl./Dom. _____
   - F-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

B. System LACUSTRINE

1. Subsyst./Cl. _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

2. Subsyst./Cl. _____
   - B-1 Subcl./Dom. _____
   - B-2 Subcl./Dom. _____
   - B-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

3. Subsyst./Cl. _____
   - C-1 Subcl./Dom. _____
   - C-2 Subcl./Dom. _____
   - C-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Cl%

C. System RIVERINE

1. Subsyst./Cl. _____
   - A-1 Subcl./Dom. _____
   - A-2 Subcl./Dom. _____
   - A-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____ Sys%

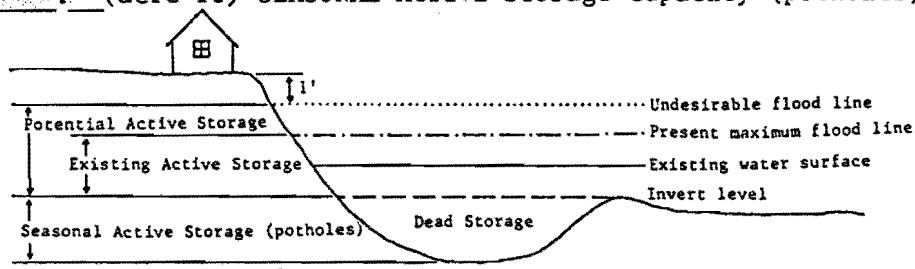
2. Subsyst./Cl. _____
   - B-1 Subcl./Dom. _____
   - B-2 Subcl./Dom. _____
   - B-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____

3. Subsyst./Cl. _____
   - C-1 Subcl./Dom. _____
   - C-2 Subcl./Dom. _____
   - C-3 Subcl./Dom. _____
   - Modifier _____
   - Codes _____

4. Indicate the location of the wetland within the sub-basin:
   1 upper 2 upper middle 3 middle 4 lower middle 5 lower

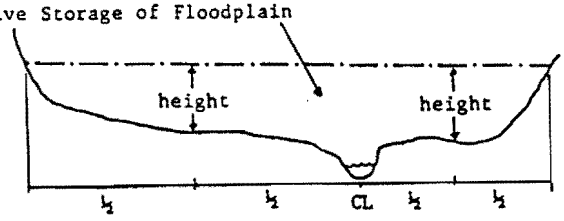
Wetland No._____ Wetland ID_____ Date _____

5. Storage Capacities:
   A. Soils_____ Avail. Water Cap._____
   B. Impoundment Capability:
      1. Flat wetland with impoundment capability (describe)_____
      2. Flat wetland without impoundment capability (describe)_____
      3. Sloped wetland without impoundment capability (describe)_____
         Angle of slope - rise:run (average or range)_____
   C. Measurements:
      1. Type of measurement: a. Transit b. Sight level c. Estimate
      2. Area:
         a. _____.__(acre) WETLAND area, width_____(ft) x length_____(ft)
         b. _____.__(acre) INVERT area, width_____(ft) x length_____(ft)
         c. _____.__(acre) EXISTING STORAGE area (MAXIMUM flood level), width_____(ft) x length_____(ft)
         d. _____.__(acre) POTENTIAL STORAGE area (level of UNDESIRABLE flooding), width_____(ft) x length_____(ft)
      3. Height:
         a. _____(ft) Height from outlet invert to level of MAXIMUM flooding (existing flood line)
         b. _____(ft) Height from outlet invert to level of UNDESIRABLE flooding (to level of improved property, yards, pastures)
         c. _____(ft) Height from outlet invert to EXISTING WATER SURFACE at time of survey, above (+) or below (-) invert
         d. _____(ft) Rise - Average side slope from EXISTING WATER SURFACE at time
            _____(ft) Run of survey to level of UNDESIRABLE flooding, rise:run
      4. Volume:
         a. Type of calculation: 1) Average areas 2) Side slopes
         b. _____.__(acre-ft) EXISTING ACTIVE storage capacity
         c. _____.__(acre-ft) POTENTIAL ACTIVE storage capacity
         d. _____.__(acre-ft) SEASONAL ACTIVE storage capacity (potholes)



      5. Floodplain storage calculations:
         a. _____.__(acre) FLOODPLAIN area, width_____(ft) x length_____(ft)
         b. _____(ft) Average height from level of floodplain to level of MAXIMUM flooding
         c. _____.__(acre-ft) FLOODPLAIN EXISTING ACTIVE storage capacity

Existing Active Storage of Floodplain



6. Type of outlet from wetland: Condition
   A. none
   B. overland: 1. constricted 2. unconstricted
   C. open channel: _____.__(ft) channel width, _____(ft) depth
   D. pipe: _____.__(ft) diameter, type _____

Wetland No._____ Wetland ID_____ Date_____

7. Type of inlet (circle all that apply):
   A. No visible inlet (groundwater or surface water fed)
   B. Seep
   C. Spring
   D. Wetland (via culvert)
   E. Stream or river, DNR water type _____
   F. Storm water pipe: _____.__(ft) diameter

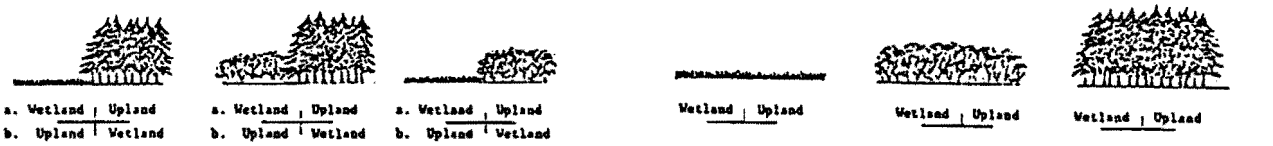
8. Describe habitat features within the wetland (also note in summary and sketch):

   A. Snags_____
   B. Rock outcrops_____
   C. Perches_____
   D. Logs_____
   E. Islands_____
   F. Other_____

9. Describe the impacts within the wetland (circle all that apply, note in summary/sketch):
   A. Human - filling, clearing, grading, garbage dumping, trails, other_____
   B. Agricultural - pasture, cultivated field, other_____
   C. Commercial - peat mining, other_____
   D. Pollution (type and extent) -_____
   E. Sedimentation, erosion (describe) -_____
   F. Other_____

10. Which of the following best represents the difference in height between the wetland and the surrounding upland? (note location, type, quality in summary)

Different A. B. C. Similar D. E. F.



%_____ %_____ %_____ %_____ %_____ %_____

Note location and type of buffers_____

NOTES

Wetland No. _____ Wetland ID _____ Date _____

11. Species Checklist

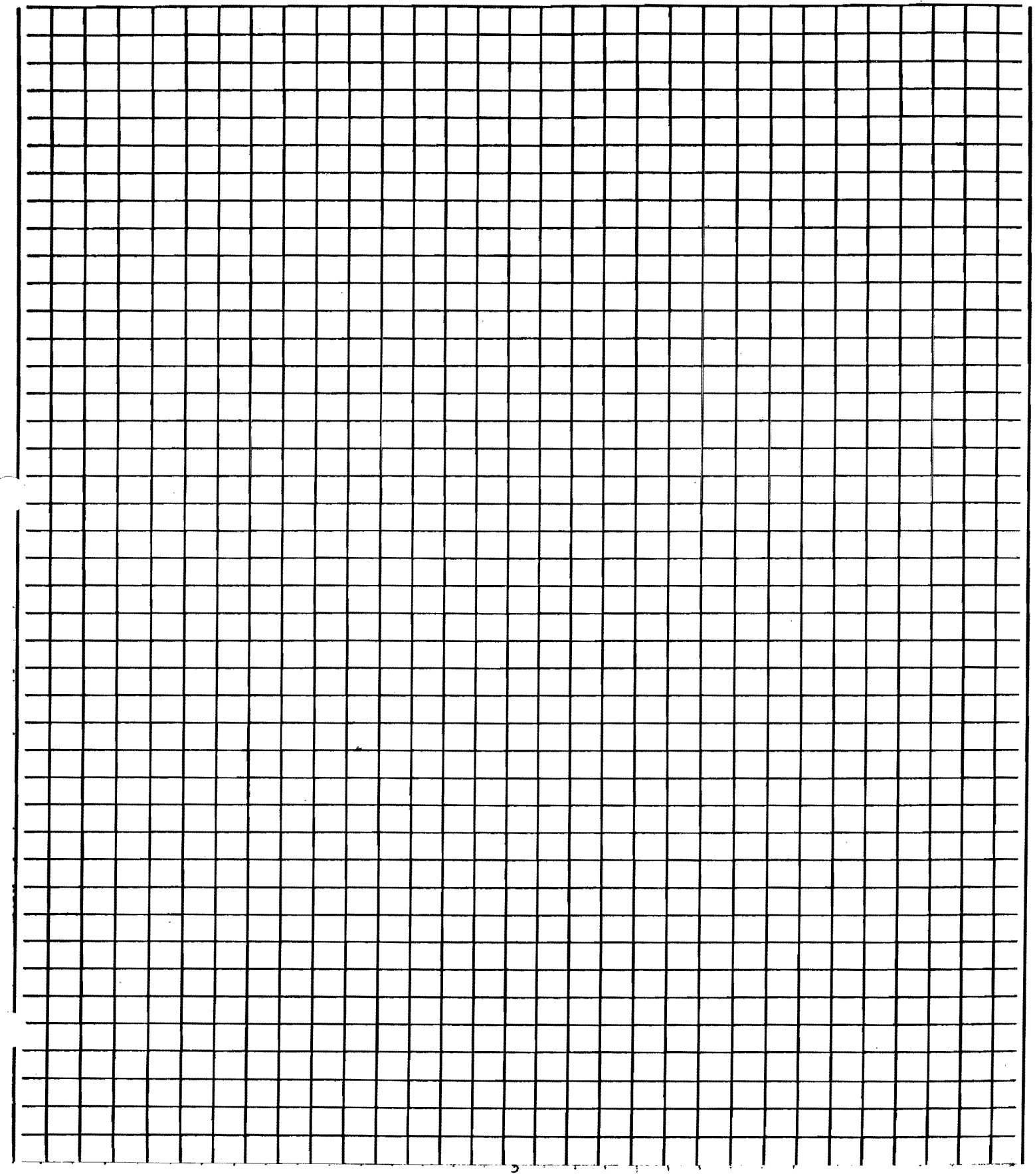
D	S	P	FSID	Common Name (Scientific Name)	N	I
				Labrador tea (Ledum groenlandicum)		OBLIGATE
				Swamp laurel (Kalmia occidentalis)		
				Wild cranberry (Vaccinium oxycoccos)		
				American skunk cabbage (Lysichitum americanum)		
				American three square (Scirpus americanus)		
				Baltic rush (Juncus balticus)		
				Common cattail (Typha latifolia)		
				Common duckweed (Lemna minor)		
				Common water-parsnip (Sium suave)		
				Hardstem bulrush (Scirpus acutus)		
				Pondweed (Potamogeton spp.)		
				Purple loosestrife (Lythrum salicaria)		
				Small-fruited bulrush (Scirpus microcarpus)		
				Water milfoil (Myriophyllum spp.)		
				Water parsley (Oenanthe sarmentosa)		
				White water-buttercup (Ranunculus aquatilis)		
				White water-cress (Rorippa nasturtium-aquaticum)		
				White water-lily (Nymphaea odorata)		
				Yellow monkey flower (Mimulus guttatus)		
				Yellow pond lily (Nuphar polysepalum)		
				Yellow water iris (Iris pseudacorus)		
				Peat moss (Sphagnum spp.)		
				Crabapple (Pyrus fusca)		FAC. WETLAND
				Hardhack (Spirea douglasii)		
				Red-osier dogwood (Cornus stolonifera)		
				Willow (Salix spp.)		
				False hellebore (Veratrum californicum)		
				Mint (Mentha spp.)		
				Smartweed (Polygonum spp.)		
				Sedge (Carex spp.)		
				Black cottonwood (Populus trichocarpa)		FACULTATIVE
				Oregon ash (Fraxinus latifolia)		
				Quaking aspen (Populus tremuloides)		
				Red alder (Alnus rubra)		
				Sitka spruce (Picea sitchensis)		
				Vine maple (Acer circinatum)		
				Cascara (Rhamnus purshiana)		
				Devil's club (Oplopanax horridus)		
				Pacific ninebark (Physocarpus capitatus)		
				Bittersweet nightshade (Solanum dulcamara)		
				Buttercup (Ranunculus spp.)		
				Cow-parsnip (Heracleum lanatum)		
				Forget-me-not (Myosotis spp.)		
				Reed canary grass (Phalaris arundinacea)		
				Rush (Juncus spp.)		
				Lady fern (Athyrium filix-femina)		
				Western hemlock (Tsuga heterophylla)		FACULTATIVE UPLAND
				Western red cedar (Thuja plicata)		
				Red elderberry (Sambucus racemosa)		
				Salmonberry (Rubus spectabilis)		
				Twinberry (Lonicera involucrata)		
				Bedstraw (Galium spp.)		
				Dock (Rumex spp.)		
				Fireweed (Epilobium angustifolium)		
				Foam flower (Tiarella trifoliata)		
				Swamp hedgenettle (Stachys palustris)		
				Wild lily-of-the-valley (Maianthemum dilatatum)		
				Common horsetail (Equisetum arvense)		
				Deer fern (Blechnum spicant)		
				Big leaf maple (Acer macrophyllum)		UPLAND
				Douglas fir (Pseudotsuga menziesii)		
				Red huckleberry (Vaccinium parvifolium)		
				Salal (Gaultheria shallon)		
				Common sword fern (Polystichum munitum)		

X	ID	Common Name (Scientific Name)	N	T
				INVERTS
		Chinook salmon (Oncorhynchus tshawytscha)		PISCES
		Chum salmon (Oncorhynchus keta)		
		Coho salmon (Oncorhynchus kisutch)		
		Cutthroat trout (Salmo clarki)		
		Dolly varden (Salvelinus malma)		
		Pink salmon (Oncorhynchus gorbuscha)		
		Rainbow trout (Salmo gairdneri)		
		Sockeye salmon (Oncorhynchus nerka)		
		Steelhead (Salmo gairdneri)		
		Stickleback (Gasterosteus spp.)		
				HERPS
		American bittern		AVES
		American robin		
		Band-tailed pigeon		
		Barn swallow		
		Bay ducks		
		Belted kingfisher		
		California quail		
		Canada goose		
		Cedar waxwing		
		Common coot		
		Cowbird		
		Dabbling ducks		
		Dipper		
		Egret		
		Goldfinch		
		Great blue heron	M	
		Green heron		
		Killdeer		
		Mallard		
		Marsh hawk		
		Marsh wren		
		Pileated woodpecker	M	
		Red-tailed hawk		
		Red-winged blackbird		
		Ruby-crowned kinglet		
		Ruffed grouse		
		Rufous hummingbird		
		Rufous-sided towhee		
		Song sparrow		
		Spotted sandpiper		
		Swainsons thrush		
		Tree swallow		
		Violet-green swallow		
		Virginia rail		
		Wilsons warbler		
		Yellow throat		
		Yellow warbler		
		Beaver		MAMMALIA
		Black bear		
		Black-tail deer		
		Coyote		
		Mountain beaver		
		Muskrat		
		Raccoon		

Wetland No. _____ Wetland ID _____ Date _____

12. Wetland sketch - indicate inlet (I), outlet (O), open water bodies (OW), upland border (U), plant communities (FWS code), potential (PI)/existing (EI) impoundment sites, major human impacts, important habitat features, photo direction/number, and other pertinent information:

Scale = North



Wetland No. _____ Wetland ID _____ Date _____

13. Summary Paragraph (by _____) mention beneficial functions such as open space, storm water detention, biofiltration; note major human impacts, vegetation types, buffers, important habitat features, unique features/plants/animals, etc.

Non-field data compiled by _____ Date _____

Field data completed by _____ Date _____

Completed form checked by _____ Date _____

Quality control check by _____ Date _____

Summary data entered by _____ Date _____

Summary data checked by _____ Date _____

Total data entered by _____ Date _____

Total data checked by _____ Date _____

SHORT FORM

Sub-basin name & number

SNOHOMISH COUNTY WETLAND ~~SURVEY~~ DATA FORM

¼	¼	¼	½	S	T	R

1. Identification:
   Wetland No. /_/_/_/./_/_/_/./_/_/_/
   Wetland ID (nearest trib.) _____
   Sub-basin _____
   Wetland Name _____

2. Investigation:
   Team _____
   Date _____/_____/_____ Time Begin _ _ _ _ Time End _ _ _ _
   Access Point _____
   Landowner _____ Phone _____
   Weather _____

3. FWS Wetland Type:

A. System PALUSTRINE
   1. Class
      A-1 Subcl./Dom.
      A-2 Subcl./Dom.
      A-3 Subcl./Dom.
      Modifier
      Codes Cl%
   2. Class
      B-1 Subcl./Dom.
      B-2 Subcl./Dom.
      B-3 Subcl./Dom.
      Modifier
      Codes Cl%
   3. Class
      C-1 Subcl./Dom.
      C-2 Subcl./Dom.
      C-3 Subcl./Dom.
      Modifier
      Codes Cl%
   4. Class
      D-1 Subcl./Dom.
      D-2 Subcl./Dom.
      D-3 Subcl./Dom.
      Modifier
      Codes Cl%
   5. Class
      E-1 Subcl./Dom.
      E-2 Subcl./Dom.
      E-3 Subcl./Dom.
      Modifier
      Codes Cl%
   6. Class
      F-1 Subcl./Dom.
      F-2 Subcl./Dom.
      F-3 Subcl./Dom.
      Modifier
      Codes Cl%

B. System LACUSTRINE
   1. Subsyst./Cl.
      A-1 Subcl./Dom.
      A-2 Subcl./Dom.
      A-3 Subcl./Dom.
      Modifier
      Codes Cl%
   2. Subsyst./Cl.
      B-1 Subcl./Dom.
      B-2 Subcl./Dom.
      B-3 Subcl./Dom.
      Modifier
      Codes Cl%
   3. Subsyst./Cl.
      C-1 Subcl./Dom.
      C-2 Subcl./Dom.
      C-3 Subcl./Dom.
      Modifier
      Codes Cl%

C. System RIVERINE
   1. Subsyst./Cl.
      A-1 Subcl./Dom.
      A-2 Subcl./Dom.
      A-3 Subcl./Dom.
      Modifier
      Codes Sys%
   2. Subsyst./Cl.
      B-1 Subcl./Dom.
      B-2 Subcl./Dom.
      B-3 Subcl./Dom.
      Modifier
      Codes
   3. Subsyst./Cl.
      C-1 Subcl./Dom.
      C-2 Subcl./Dom.
      C-3 Subcl./Dom.
      Modifier
      Codes

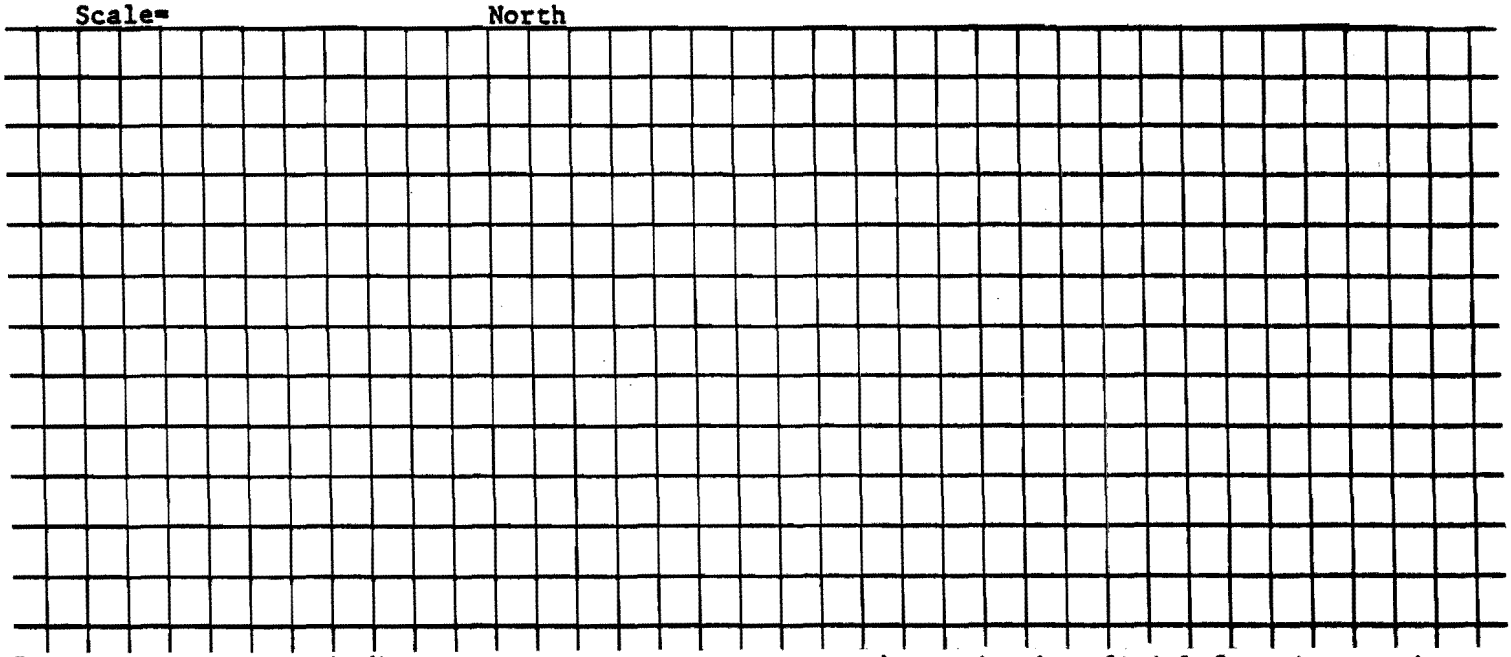
4. Indicate the location of the wetland within the sub-basin:
   1 upper 2 upper middle 3 middle 4 lower middle 5 lower

Wetlard No._____ Wetland ID_____ Date_____

5. Volume Storage Capacities:
   A. Type of calculation: 1. Average areas 2. Side slopes
   B. _____.__(acre-ft) EXISTING ACTIVE storage capacity
   C. _____.__(acre-ft) POTENTIAL ACTIVE storage capacity
   D. _____.__(acre-ft) SEASONAL ACTIVE storage capacity (potholes)
   E. _____.__(acre) WETLAND SURFACE AREA, width_____(ft) x length_____(ft)

6. Wetland sketch - indicate inlet (I), outlet (O), open water bodies (OW), upland border (U), plant communities (FWS code), potential (PI)/existing (EI) impoundment sites, major human impacts, important habitat features, photo direction/number, and other pertinent information:

Scale= North



7. Summary Paragraph (by_____) mention beneficial functions such as open space, storm water detention, biofiltration; note major human impacts, vegetation types, buffers, important habitat features, etc.

Completed form checked by _____ Date _____
Quality control check by _____ Date _____
Summary data entered by _____ Date _____
Summary data checked by _____ Date _____
Total data entered by _____ Date _____
Total data checked by _____ Date _____

COMMON NAME	SCIENTIFIC NAME	SYMBOL	WTIND	COMMENTS
PACIFIC NINEBARK	PHYSOCARPUS CAPITATUS	PHCA11	FAC+	
QUAKING ASPEN	POPULUS TREMULA	POTR10	FAC+	
DEER FERN	BLECHNUM SPICANT	BLSP	FAC+	
CRABAPPLE	MALUS FUSCA	MAFU	FAC+	
STINGING NETTLE	URTICA DIOICA	URDI	FAC+	
RED ALDER	ALNUS RUBRA	ALRU2	FAC	
SITKA SPRUCE	PICEA SITCHENSIS	PISI	FAC	
DEVIL'S CLUB	OPLOPANAX HORRIDUS	OPHO	FAC	
SCOULER WILLOW	SALIX SCOULERANA	SASC	FAC	OTHER SALIX Spp RANGE FACW TO OBL
COWPARSNIP	HERACLEUM LANATUM	HELA4	FAC	
BITTERSWEET NIGHTSHADE	SOLANUM DULCAMARA	SODU	FAC	
LADY FERN	ATHYRIUM FILIX-FEMINA	ATFI	FAC	
WESTERN RED CEDAR	THUJA PLICATA	THPL	FAC	
SALMONBERRY	RUBUS SPECTABILIS	RUSP	FAC	
TWINBERRY	LONICERA INVOLUCRATA	LOIN5	FAC	
FIELD HORSETAIL	EQUISETUM ARVENSE	EQAR	FAC	OTHER EQUISETUM SPP FAC,FACW,OBL
COLTSFOOT	PETASITES PALMATUS	PEPA31	FAC	
YOUTH-ON-AGE	TOLMIEA MENZIESII	TOME	FAC	
TWISTED STALK	STREPTOPUS AMPLEXIFOLIUS	STAM2	FAC-	
LODGEPOLE PINE	PINUS CONTORTA	PICO	FAC-	
FOAM FLOWER	TIARELLA TRIFOLIATA	TITR	FAC-	
FALSE SOLOMON'S SEAL	SMILACENA STELLATA	SMST	FAC-	
FIREWEED	EPILOBIUM ANGUSTIFOLIUM	EPAN2	FACU+	
EVERGREEN BLACKBERRY	RUBUS LACINIATUS	RULA	FACU+	
VINE MAPLE	ACER CIRCINATUM	ACCI	FACU+	
CANADA THISTLE	CIRSIUM ARVENSE	CIAR4	FACU+	
BULL THISTLE	CIRSIUM VULGARE	CIVU	FACU	COMMON LAWN,ROADSIDE WEED,BASAL LVS
CASCARA	RHAMNUS PURSHIANA	RHPU	FACU*	CURRENTLY NOT LISTED
CHOKECHERRY	PRUNUS VIRGINIA	PRVI	FACU	P. EMARGINATA IS UPL
RED ELDERBERRY	SAMBUCUS RACEMOSA	SARA2	FACU	
BEDSTRAW	GALLIUM Spp	GA**	FACU	GALIUM TRIFIDUM IS FACW+
BRACKEN FERN	PTERIDIUM AQUILINUM	PTAQ	FACU	
BIGLEAF MAPLE	ACER MACROPHYLLUM	ACMA3	FACU	
PEAFRUIT ROSE	ROSA PISOCARPUS	ROPI2	FACU	MAY BE FAC
WOOD'S ROSE	ROSA WOODSII	ROWO	FACU	MAY BE FAC
SNOWBERRY	SYMPHORICARPUS ALBUS	SYAL	FACU	
WESTERN HEMLOCK	TSUGA HETEROPHYLLA	TSHE	FACU-	
HIMALAYAN BLACKBERRY	RUBUS DISCOLOR	RUDI2	FACU-	
BLACK CAP	RUBUS LEUCODERMIS	RULE	UPL	
DEWBERRY,PAC.BLACKBERRY	RUBUS URSINUS	RUUR	UPL	OUR ONLY NATIVE BLACKBERRY
DOUGLAS FIR	PSEUDOTSUGA MENZIESII	PSME	UPL	
SALAL	GAULTHERIA SHALLON	GASH	UPL	
SWORD FERN	POLYSTICHUM MUNITUM	POMU	UPL	
EVERGREEN HUCKLEBERRY	VACCINIUM OVATUM	VAOV	UPL	ALSO CALLED BLUEBERRY
RED HUCKLEBERRY	VACCINIUM PARVIFOLIUM	VAPA	UPL	
TRILLIUM	TRILLIUM OVATUM	TROV	UPL	
NOOTKA ROSE	ROSA NUTKANA	RONU	UPL	MAY BE FACU TO FAC
WILD LILY-OF-THE-VALLEY	MAIANTHEMUM DILITATUM	MADI	UPL	
BLEEDING HEART	DICENTRA FORMOSA	DIFO	UPL	
BITTER CHERRY	PRUNUS EMARGINATA	PREM	UPL	P. VIRGININIA IS FACU
OREGON GRAPE	BERBERIS Spp	BE**	UPL	2 Spp HERE,AQUIFOLIUM & NERVOSA
HAZELNUT,FILBERT	CORYLUS CORNUTA	COCO	UPL	
INDIAN PLUM,OSOBERRY	OEMLARIA CERASIFORMIS	OECE	UPL	
OCEAN SPRAY	HOLODISCUS DISCOLOR	HODI	UPL	
VANILLA LEAF	ACHLYS TRIPHYLLA	ACTR	UPL	

PRESENCE D	S	P	COMMON NAME	SCIENTIFIC NAME	SYMBOL	WTIND	COMMENTS
			LABRADOR TEA	LEDUM GROENLANDICUM	LEGR	OBL	BOGS
			SUNDEWS	DROSERA Spp.	DR**	OBL	TWO Spp OUR AREA
			LAUREL,BOG	KALMIA POLIFOLIA	KAPO	OBL	BOGS
			CRANBERRY, SMALL	VACCINIUM OXYCOCCOS	VAOX	OBL	BOGS
			SKUNK CABBAGE	LYSICHITUM AMERICANUM	LYAM3	OBL	
			BULLRUSHES	SCIRPUS Spp	SC**	OBL	APPROX 9 SPP IN OUR AREA
			CATTAIL	TYPHA LATIFOLIA	TYLA	OBL	
			DUCKWEED.LESSER	LEMNA MINOR	LEMI3	OBL	
			PARSNIP,WATER	SIUM SUAVE	SISU2	OBL	
			PARSLEY,WATER	OENANTHE SARMENTOSA	OESA	OBL	
			PONDWEEDS	POTAMOGETON Spp	PO**	OBL	NUMEROUS SPP, OUR AREA
			LOOSESTRIFE,PURPLE	LYTHRUM SALICARIA	LYSA2	OBL	ALIEN SPECIES
			MARE'S TAIL	HIPPURUS VULGARIS	HIVU2	OBL	
			MILLFOILS,WATER	MYRIOPHYLLUM Spp	MY**	OBL	
			CRESSES,WATER	RORIPPA Spp	RO**	OBL	
			WATERLILY,WHITE	NYMPHAEA ODORATA	NYOD	OBL	
			MONKEY-FLOWER,YELLOW	MIMULUS GUTTATUS	MIGU	OBL	
			MONKEY FLOWERS	MIMULUS Spp	MI**	FACW TO OBL	
			POND LILY,YELLOW	NUPHAR LUTEUM	NULU	OBL	ALSO SPATTERDOCK; WAS N.POLYSEPALUM
			IRIS,YELLOW	IRIS PSEUDACORUS	****	OBL	NOT LISTED
			MOSS,PEAT	SPHAGNUM Spp	****	OBL	NON VASCULAR, SO NOT LISTED
			SEDGE,WATER	CAREX AQUATALIS	CAAQ	OBL	
			SEDGE,SLOUGH	CAREX OBNUPTA	CAOB3	OBL	
			SEDGES	CAREX Spp	CA**	FACW TO OBL	NUMEROUS SPP, OUR AREA
			SOFT RUSH	JUNCUS EFFUSUS	JUEF	FACW+	
			RUSHES	JUNCUS Spp	JU**	FACW TO OBL	NUMEROUS SPP, OUR AREA
			BUTTERCUPS	RANUNCULUS Spp	RA**	FACW TO OBL	NUMEROUS SPP, OUR AREA
			SMARTWEEDS(KNOTWEEDS)	POLYGONUM Spp	PO**	FACW TO OBL	NUMEROUS SPP, OUR AREA
			WILLOWS	SALIX Spp	SA**	FACW TO OBL	NUMEROUS SPP, OUR AREA
			PACIFIC WILLOW	SALIX LASIANDRA	SALA5	FACW+	
			HEDGENETTLE, WOUNDWORT	STACHYS Spp	ST**	FACW+	
			FALSE HELLEBORE	VERATRUM CALIFORNICUM	VECA2	FACW+	
			WATER FOXTAIL	ALEPOCURUS GENICULATIS	ALGE3	FACW+	
			CREEPING BUTTERCUP	RANUNCULUS REPENS	RARE3	FACW	
			CANDYFLOWER	CLAYTONIA SIBIRICA	CLSI2	FACW	ALSO, MONTIA SIBIRICA
			HARDHACK	SPIREA DOUGLASII	SPDO	FACW	
			RED OSIER DOGWOOD	CORNUS STOLONIFERA	COST4	FACW	
			REED CANARY GRASS	PHALARIS ARUNDINACEA	PHAR3	FACW	
			BLACK COTTONWOOD	POPULUS BALSAMIFERA	POBA2	FACW	FORMERLY P.TRICHOCARPA
			OREGON ASH	FRAXINUS LATIFOLIA	FRLA	FACW	
			MOUNTAIN WOODFERN	DRYOPTERUS DILATATA	DRDI2	FACW	
			TOUCH-ME-NOT	IMPATIENS NOLI-TANGERE	IMNO	FACW	
			THIMBLEBERRY	RUBUS PARVIFLORUS	RUPA	FACW*	LISTING HERE FROM NAT'L LIST
			CURLY DOCK	RUMEX CRISPUS	RUCR	FACW	SEVERAL OTHER Spp RANGE FAC TO FACW
			LARGE-LEAVED AVENS	GEUM MACROPHYLLUM	GEMA4	FACW	
			TRUE FORGET-ME-NOT	MYOSOTIS SCORPOIDES	MYSC	FACW	
			LITTLE BLUE FORGET-ME-NOT	MYOSOTIS DISCOLOR	MYDI	FACW	
			SCOURING RUSH	EQUISETUM HYEMALE	EQHY	FACW	
			STINK CURRANT	RIBES BRACTEOSUM	RIBR	FACW*	CURRENTLY NOT LISTED

Appendix P

Letter of Identification Example

PIERCE
COUNTY
DEPARTMENT OF PLANNING AND DEVELOPMENT
2401 South 35th Street, Room 2, Tacoma, Washington 98409-7490
Telephone: (206) 591-7210

JOSEPH A. SCORCIO
Acting Director

July 15, 1987

Dear Landowner:

The carrier of this letter is a Pierce County employee assigned to conduct an inventory of wetlands in your area. Your permission is requested for access to possible wetland sites on your property. Permission is strictly voluntary.

If you have further questions, please contact Mike Cooley, Senior Planner, at 591-7233.

Thank you for your cooperation.

Sincerely,

JOSEPH A. SCORCIO
Acting Director
Planning and Development Department

JAS:kb
CRP:jm,10
cc: Mike Cooley, Senior Planner

*Example Guidelines For Conduct**

1. Each field team shall have a team leader. The leader shall be an employee of King County or a person designated by the Director.

2. The field team leader shall be responsible for communicating with or responding to inquiries from property owners or residents concerning the wetlands inventory.

3. Whenever in the field, each team member shall wear a label or tag which identifies him/her as a participant in the wetlands inventory.

4. Field team members shall be courteous to property owners, residents and the general public at all times.

5. The inventory of each wetland shall be conducted in the shortest reasonable period of time. Activities of field team members shall be limited only to those necessary to carry out the wetlands inventory.

6. Field team members shall take every reasonable precaution in order to minimize invasion of the privacy of residents or damage to private property.

7. If access to a wetlands is blocked by a fence, wall or other barrier, or the property is posted with signs limiting access, the field team leader shall make a reasonable attempt to contact the property owner or resident and request permission to enter the property for the purpose of conducting the inventory.

8. If a property owner or resident refuses to allow access or requests the field team to leave the property, the field team shall leave immediately. If subsequent requests to gain access to the property are refused, the inventory for that wetland will be completed using the best available data.

* Taken from King County Inventory

Example: Plant Specimen Label

DATE: COLLECTOR:

LOCATION:

HABITAT:

ASSOCIATED SPECIES:

Appendix S

Wetland Summary Sheet Examples

WETLAND: #1-A Wilburton Interchange — SE 1/4 32-25-5, NE 1/4 5-24-5

LOCATION: East of 112th Avenue SE; north of SE 8th Street; west of U.S. 405; south of SE 6th Street. **MAPS:** 71, 79

DATE OF INVENTORY: 10/25/83 **TYPE:** A

DRAINAGE BASIN: Mercer Slough

CLASSIFICATION:	**Fish Wildlife Service Vegetation Code**	**Amherst (common) Name**
PSS1:	Palustrine, Scrub/Shrub Broad-leaved Deciduous, Spirea/Willow	Scrub-Shrub wetland
PF01:	Palustrine, Forested Broad-leaved Deciduous Ash/Crabapple/Alder	Forested wetland
PEM5:	Palustrine, Emergent Narrow-leaved Persistent Pharlaris/Cattails	Wet meadow/marsh

COMMON SPECIES:

Trees:

Alnus Rubra (Red Alder)
Populus trichocarpa (Black Cottonwood)
Pinus contorta (Lodgepole Pine)

Shrubs:

Malus diversifolia (Crabapple)
Acer circinatum (Vine Maple)
Cornus stolenifera (Red-osier Dogwood)
Rhamnus purshiana (Cascara)

Birds:

Great Blue Heron
Common Snipe
Stellars Jay
Bewicks Wren

Herbs:

Typha latifolia (Cattail)
Polyganum hydropiper (Marsh pepper)
Prunella vulgaris (Self-heel)
Rumex spp. (Dock)

Sedges/Rushes/Grass/Ferns:

Athyrium felix-femina (Lady Fern)
Juncus effusus (Rush)
Phalaris arundinecea (Reed Canary)
Scirpus validus (Soft-stemmed Bulrush)

DISCUSSION:

The area contains a mixture of vegetation types: in the southwest quarter is a wooded area containing Crabapple and Oregon Ash trees with an understory of Dogwood shrubs. The gravel fan area in this corner probably covers up a small remnant of bog as indicated by the Lodgepole Pine left protruding from the center of the fan.

Through the center and northern half of the site there is a patchwork of open water channels, Cattail stands, Hardhack and Willow scrub.

The patchwork effect of a variety of vegetative types provides excellent habitat for wildlife; nesting, feeding, and resting places are all provided. The openwater provides spots for waterfowl and feeding areas for predators such as the Great Blue Heron noted several times on the site.

The site is isolated from human interaction because of its location amongst well-traveled thoroughfares - this isolation provides a secure place for wildlife. Their activities are probably rarely intruded upon by casual by-passers.

The water flowing into this site from the north was noted to be silt laden, oil-slicked, and filled with floating garbage. The water flowing out the south end was quite "clean" in comparison.

King County Wetlands Inventory Notebook

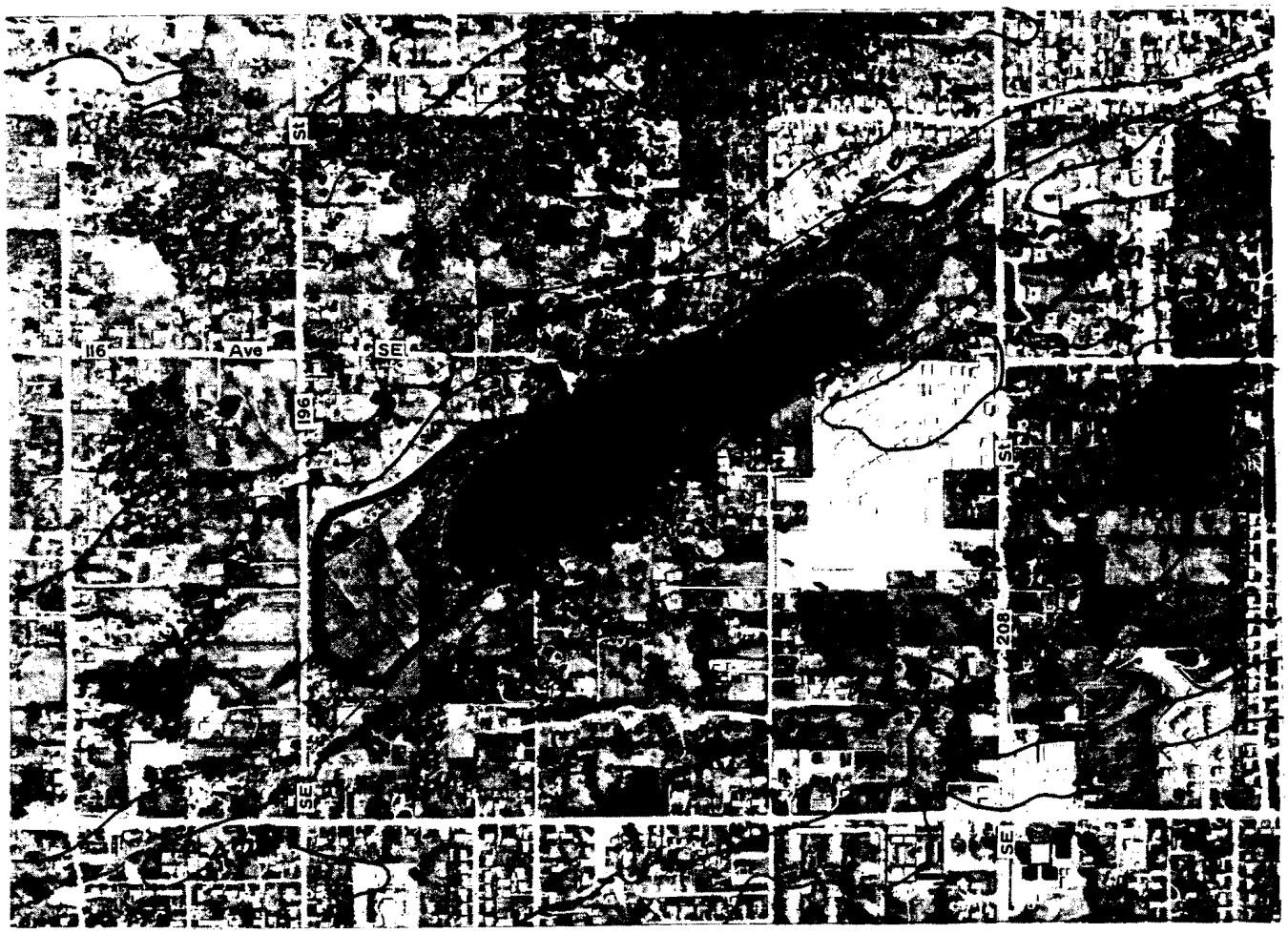


Photo Date: 5-80 North ◄ Approx. Scale: 1" = *1000'*

WETLAND: *Black River 6*
Panther Lake

LOCATION: *E 5-22-5*
SW 4-22-5

INVENTORY DATE: *7-22-81*

ACREAGE: *62.6*

COMMUNITY PLAN AREA: *Soos Creek*

BASIN OR DRAINAGE: *Green River*

CLASSIFICATION:	Fish and Wildlife Service	Common Name
L2AB4	*Lacustime, Littoral, Aquatic Bed, Floating leaved (Water-Shield/ White Pond Lily)*	*Open Water*
PSS1	*Palustrine, Scrub/Shrub, Broad-leaved Deciduous (Hardhack)*	*Scrub/Shrub*
PEM	*Palustrine, Emergent*	*Shallw Marsh*

NOTE: The wetland edge shown above is approximate. In marshes, ponds or lakes, the transition from standing water to uplands is usually clear. However, the edges of forested or scrub/shrub wetlands are less distinct. There, the change from wetland to upland often occurs over a broad area called the "transition zone". For a discussion, see Wetland Plants of King County and the Puget Sound Lowlands and "Guidelines for King County Wetlands."

OBSERVED SPECIES: (refer to list in Appendix 1)

Trees: AR
Herbs: BS, LA, NO, RR, TL, VS
Shrubs: MD, SD,
Sedges/Rushes/Grass/Fern: CX, EX, JE, JX, LM, SV
Birds: PG, GB, MA, CO, VS, BS, AR, ST, SS, YT
Mammals:
Fish:
Other:

RARE/ENDANGERED/THREATENED SPECIES: (refer to list in Appendix 2)

Recorded/Observed:
Potential:

SIGNIFICANT HABITAT FEATURES: Many snags in view of open water area.

OUTLET:

Type: Channel
Condition: Open
Outflow enters: Stream

POTENTIAL STORAGE:

Existing Active: 106 ac. ft.
Potential Active: 106 ac. ft.

GENERAL OBSERVATIONS: Although surrounded by residential development on most sides, the lake seems fairly uneffected by development except for liter.

WETLAND EVALUATION SUMMARY:

Data was collected in the five categories shown below. Within each category the data was evaluated to produce numerical values. Composite values for each category were produced in order to compare each wetland to other wetlands in its sub-basin and in King County. The result of that comparison was a percentile rank. The percentile is expressed on a scale of one hundred and indicates the percent of wetlands that scored equal to or below that particular site. For example, a percentile rank of 80 under sub-basin means that the wetland scored equal to or better than 80 percent of all sites within the sub-basin for that evaluation category. NOTE: The percentile ranks are valid only within the individual evaluation category and are intended solely for reference and comparison.

Evaluation Category		Rank (by percentile)	
		Sub-basin	County-wide
Hydrology:	runoff storage potential, water quality, potential for minimizing damage in downstream areas	100	91
Biology:	quality of habitat, abundance and diversity of plant and animal species	100	71
Visual:	diversity and contrast of wetland and surrounding vegetetion, surrounding landforms	100	95
Cultural:	types of access, proximity to schools/institutions, overall environmental quality	33	24
Economic:	presence of agriculture/peat extraction, anadromous or game fish, game birds or mammals of commercial value	33	31

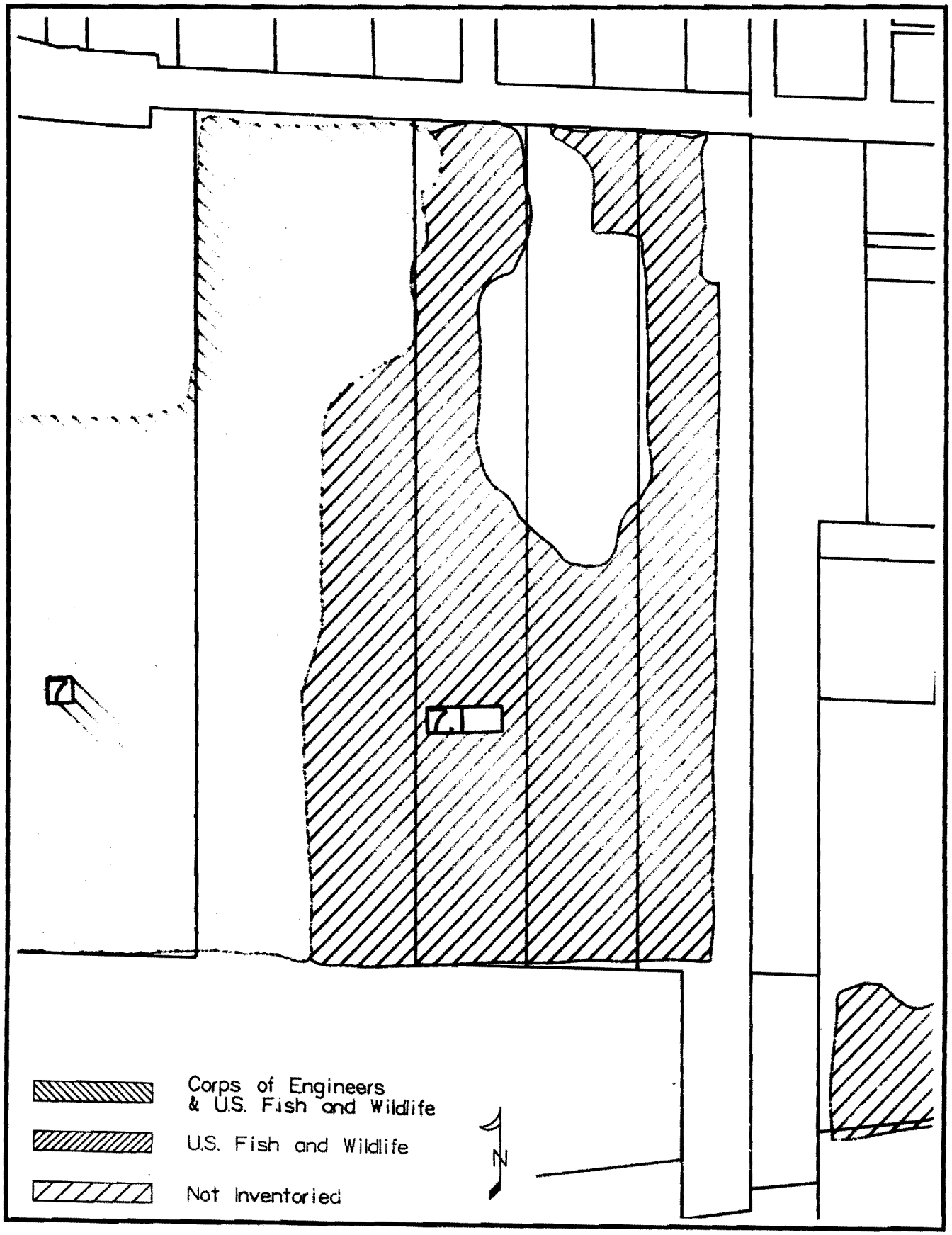
WETLAND RATING:

Each wetland was assigned one of three possible wetland ratings. The wetland ratings were determined by examining the scores of selected inventory tasks, specific data or percentile ranks for individual evaluation categories. The criteria used to assign the wetland ratings are described in the Introduction. For each rating a number of specific guidelines for new development in or adjacent to wetlands were prepared. The guidelines are intended to assist in carrying out King County's Sensitive Areas Ordinance and other wetland policies. They are included in a separate report titled "Guidelines for King County Wetlands".

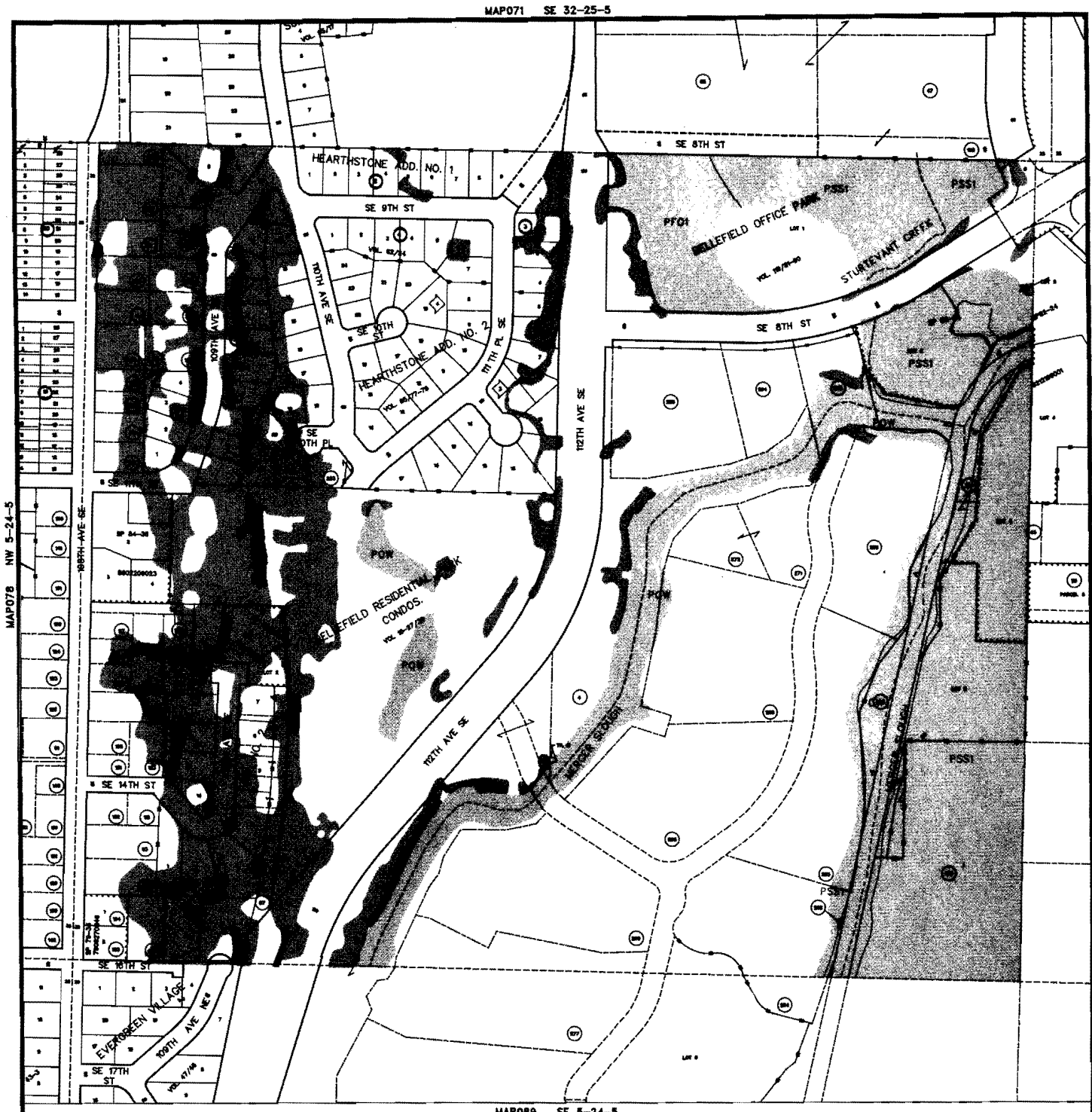
Wetland Rating: 1(c)

Appendix T

Final Wetland Map Examples



City of Auburn Wetlands Inventory
Mill Creek Drainage Basin



SLOPES

- 0%—15%
- 15%—40%
- 40% +

SEE SOILS/GEOLOGY REFERENCES SECTION 6

RIPARIAN CORRIDORS

- Type A
- Type B
- * STREAMSIDE WETLANDS

SEE REACH BOUNDARY DESCRIPTIONS IN SECTION 8A
SEE FEMA MAPS FOR FLOODPLAIN BOUNDARIES, SEC 8C

WETLANDS

WETLAND NUMBER

WETLAND AREA

PEM / PSS 1 — VEGETATION CLASSIFICATION ZONES

SEE WETLAND SUMMARIES SECTION 8B

SENSITIVE AREAS

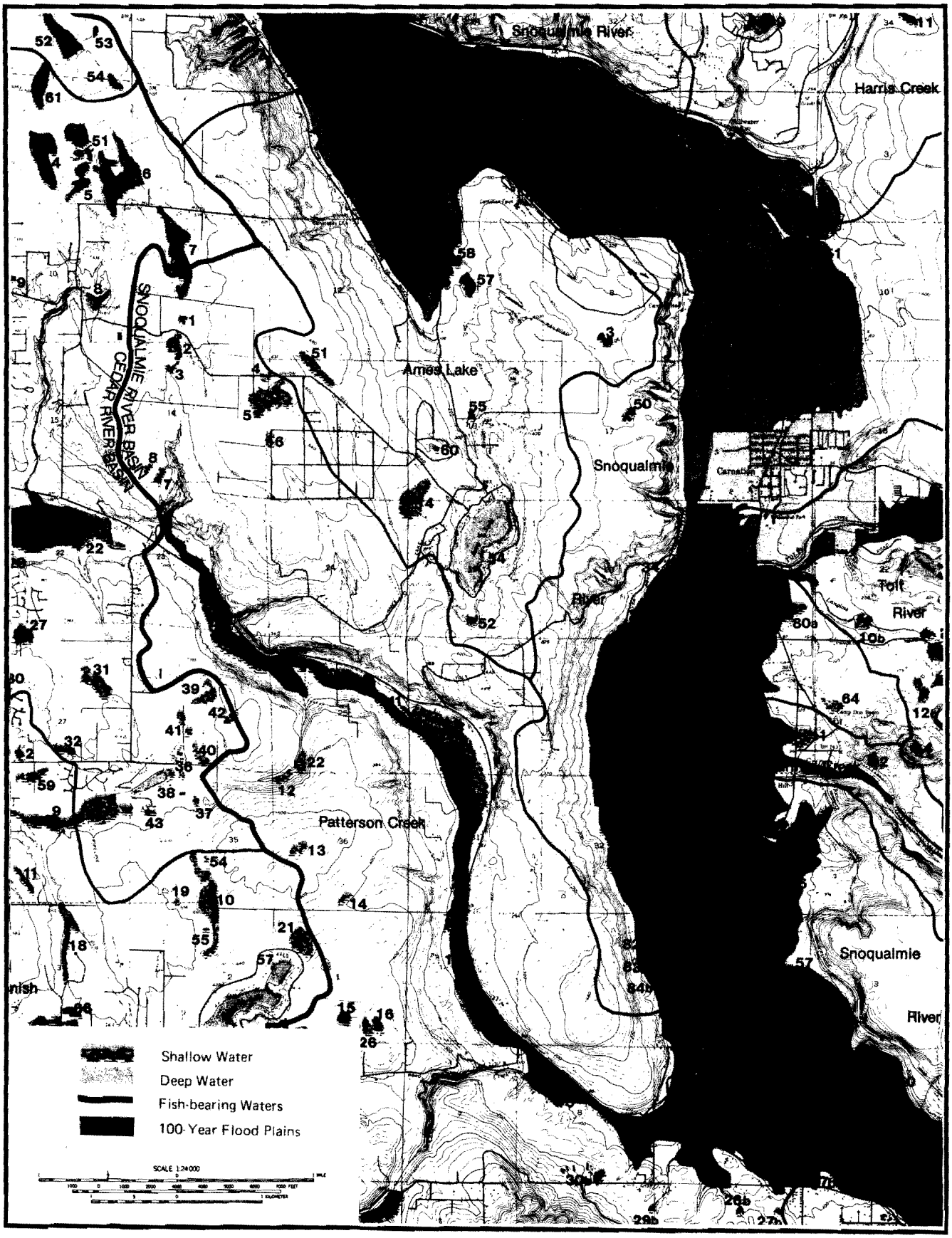
Information shown on this map is of a generalized nature. In all cases, actual field conditions determine location and extent of sensitive areas.

N

0 200

APRIL, 1987

CITY OF BELLEVUE WASHINGTON



King County Sensitive Areas Map Folio

King County Wetlands Inventory Notebook

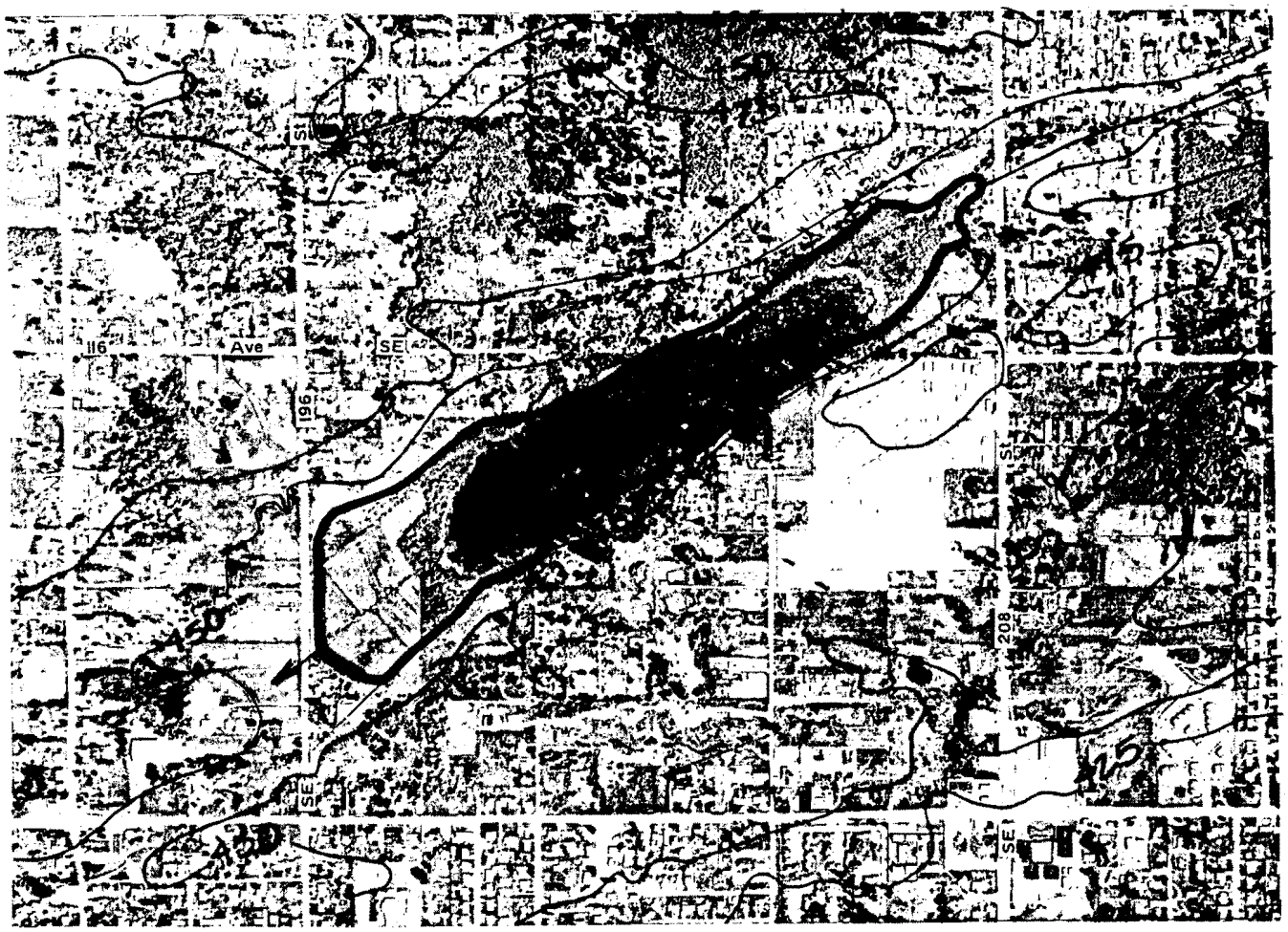


Photo Date: 5-80 North ◄ Approx. Scale: 1" = *1000'*

WETLAND: *Black River 6*
Panther Lake

COMMUNITY PLAN AREA: *Soos Creek*

LOCATION: *E 5-22-5*
SW 4-22-5

BASIN OR DRAINAGE: *Green River*

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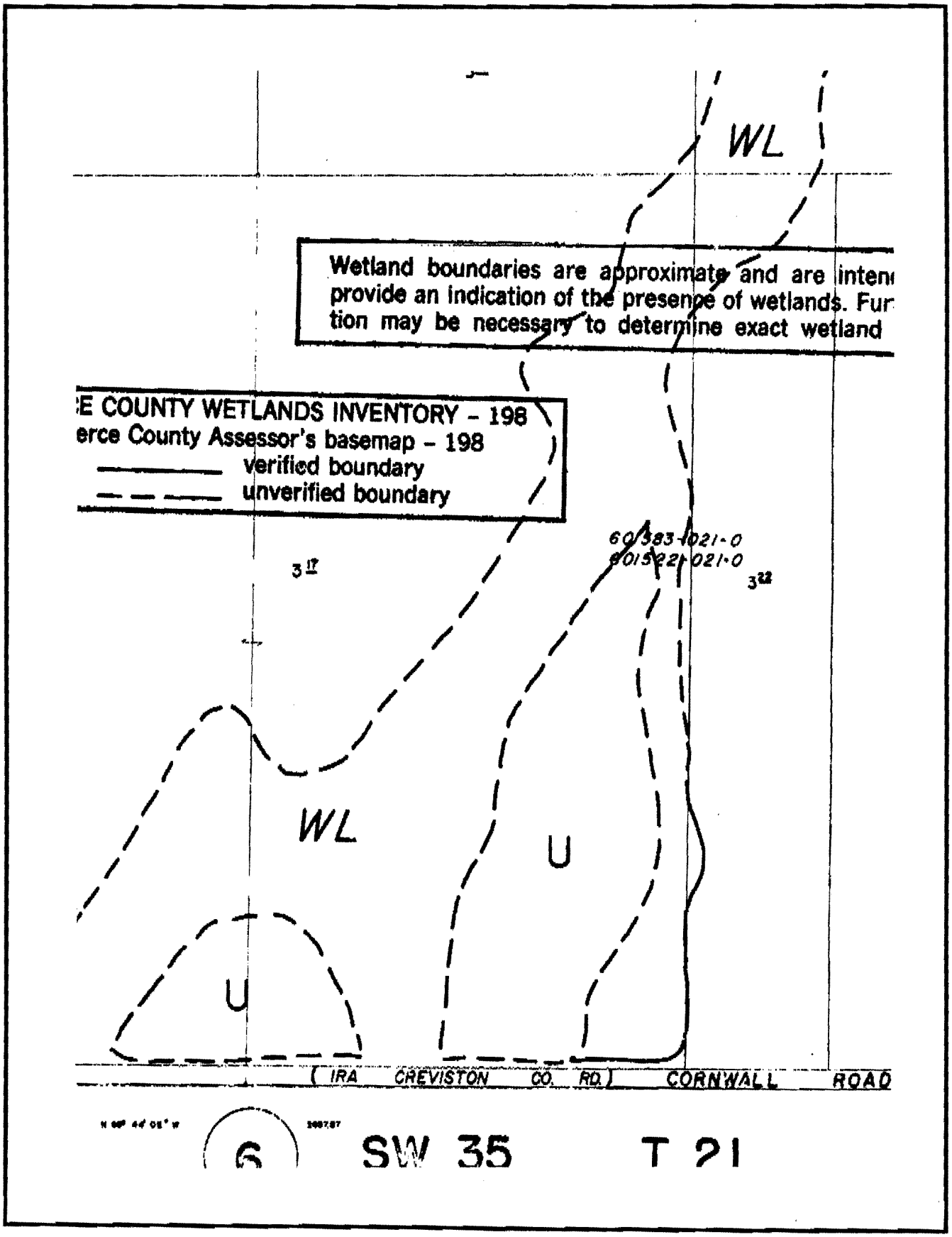
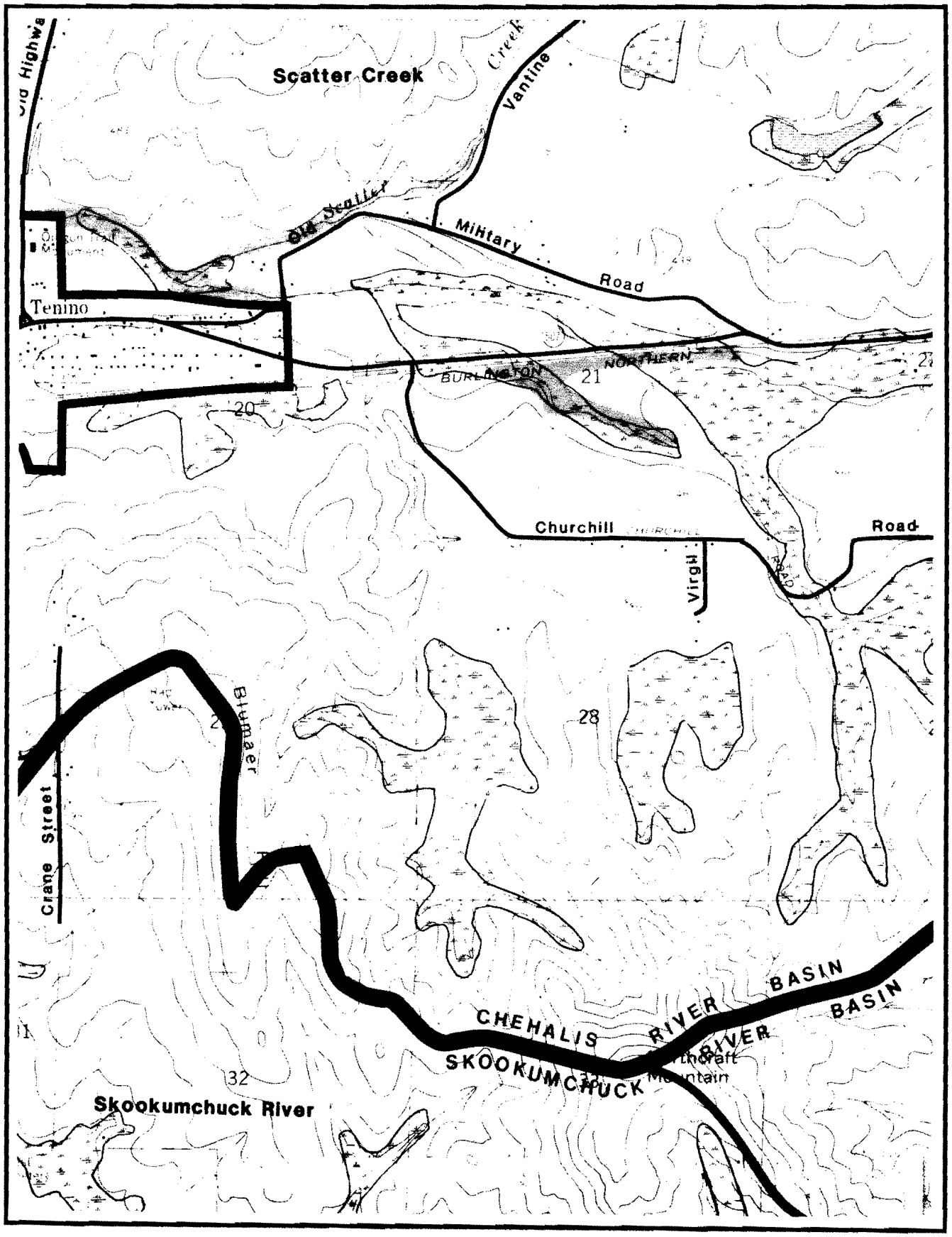
PSS1	*Palustrine, Scrub/Shrub, Broad-leaved Deciduous (Hardhack)*	*Scrub/Shrub*
PEM	*Palustrine, Emergent*	*Shallw Marsh*

NOTE: The wetland edge shown above is approximate. In marshes, ponds or lakes, the transition from standing water to uplands is usually clear. However, the edges of forested or scrub/shrub wetlands are less distinct. There, the change from wetland to upland often occurs over a broad area called the "transition zone". For a discussion, see Wetland Plants of King County and the Puget Sound Lowlands and "Guidelines for King County Wetlands."



Pierce County Wetland Atlas


162ND ST NE
156TH ST NE
S25-



Thurston County Wetlands, 100-Year Flood Plains

Transfer Tools and Techniques

Pantograph - The pantograph is a technical drafting device with two arms. One traces an area on the original map at one scale, while the other draws it on a second map at another scale. Accuracy depends on the calibration of the pantograph and the skill of the operator.

Opaque Projector - Although there is some lens distortion with this technique, scale adjustments can be made using an projector. The base map is secured to a wall. The map to be transferred is projected onto the base map and focused until the images coincide. The boundaries of the wetlands can then be traced onto the map. This method can be time consuming and, if the scales are extremely different, not very accurate. The equipment however is usually readily available through schools and libraries.

Photography - If a 35 mm camera and a copy stand is available, a slide can be taken of the source map. The slide can then be projected and the information traced onto the base map. The slide projector is more flexible than an opaque projector in adjusting scale. There is some lens distortion.

Grid - Graph paper can also be used to make scale adjustments. With the aid of a light table, the information to be transferred is traced onto the graph paper. Using the map's scales to compute the appropriate difference in the size of the squares, a graph can be constructed at the scale of the base map. The wetland information on the original graph paper can then be enlarged and drawn fresh on the second graph.

Best Fit - To transfer wetland boundaries from aerial photography to the base map, the scale of the base map is changed photographically to match that of the photos as closely as possible. The base map can then be reproduced on clear plastic. The boundaries are then drawn onto the base map laying the clear plastic base map over the photo. The best fit is accomplished by lining up recognizable features on both maps.

Zoom Transfer Scope - A zoom transfer scope provides stereo viewing of both two maps or photos, for example, the reconnaissance map and the base map for the final wetland map. Mechanical adjustments can be made to conform the photo image to control points on the map.