A LAND USE PLANNING APPLICATION OF THE WETLAND EVALUATION TECHNIQUE (WET) TO JACKSON/FRAZIER WETLAND, BENTON COUNTY, OREGON

by

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A LAND USE PLANNING APPLICATION OF THE WETLAND EVALUATION TECHNIQUE (WET) TO JACKSON/FRAZIER WETLAND, BENTON COUNTY, OREGON

ABSTRACT: Along with the increased attention in the past two decades on the values of wetlands and the documentation of great losses of wetland acreage has been a growing need for a comprehensive assessment method for analyzing the functions of a wetland. Detailed site-specific study has been the traditional method for assessing wetland functions. However, because of the large number of wetlands and because decisions regarding many wetlands are made by regulatory or planning agencies with neither the time, finances, nor expertise to do field investigations, a rapid assessment method is needed. The Wetland Evaluation Technique (WET), developed for the Corps of Engineers, is one such method and perhaps the most well known.

This research paper: 1) provides background on wetland assessment methods, 2) applies the WET methodology to Jackson/Frazier Wetland, and 3) critiques the method relative to its applicability to Oregon's statewide land use planning requirements.

This study found that the first and second level assessments of the WET technique can be completed in a relatively short period of time. Using this technique, the Jackson/Frazier Wetland received "high" ratings for four of 11 social/ecological functions. At the second level of assessment, the Wetland received "high" ratings for seven of 11 functions. The method is considered useful in situations where a limited number of wetlands need to be compared, evaluated, and prioritized. However, with respect to a county wetland inventory/ management plan, as is mandated in Oregon, the WET method requires too much data and time input to be applied efficiently to jurisdictions where wetlands may number in the hundreds or thousands.

INTRODUCTION TO AND BACKGROUND OF WETLAND ASSESSMENT

Interest in wetland ecology and conservation has increased manyfold over the past three decades, primarily due to perceived ecological functions and values to society. Estimates of between 300,000 and 450,000 acres of wetlands lost annually (Hirsch 1988) have also contributed to the great concern over wetlands. In the past 20 years, wetland ecology has developed from a field in which there were virtually no specialists to a field which has many multidisciplinary scientists interested in a holistic view of wetland systems.

Along with an increased attention toward wetland ecology and wetlands losses and trends (Tiner 1984) has come increased efforts in wetland regulation. In the United States, federal regulation of wetlands draws its full basis from the Clean Water Act (Public Law 92-500) (Dugan 1988). Section 404 of the Clean Water Act requires those who propose to dredge or fill material in the waters of the U.S. to obtain a permit from the Army Corps of Engineers (COE). The Environmental Protection Agency has the authority to override a COE decision if considered necessary. Wetlands are considered to be the landward limit of "waters" of the U.S. Other federal legislation designed to protect the wetlands resource include the so-called "swampbuster" provision of the "farm bill," the Food Security Act of 1985. Its goal is to remove federal agricultural incentives that a landowner could receive as a result of bringing wetlands into agricultural production. It would accomplish this by making any person who produces an agricultural commodity on wetlands converted into cropland after December 23, 1985 ineligible for certain loans, disaster payments, or price supports. Other existing laws that may form a national policy on wetlands are the Migratory Bird

Treaty Act, Wetlands Loan Act, and Emergency Wetlands Loan Act which would provide up to $100 million per year for 10 years for wetlands acquisition.

In addition to federal regulation, many states have their own system of wetland protection. All coastal states have regulations concerning the alteration of coastal wetlands and as of 1985 the following states require permits for the alteration or development of inland wetlands: Connecticut, Florida, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New York, Oregon, Rhode Island, and Wisconsin (Kuzler 1985). At a lower level yet, 4,000 local governments have wetland protection ordinances. In Oregon, each county and city is required to address the wetlands issue in its comprehensive plan. Of the 19 statewide planning goals that apply to each local jurisdiction, Goal 5 involves the conservation of open space and the protection of natural and scenic resources (Oregon Administrative Rule 660-16-000). Under this goal, wetlands and other natural resources must be inventoried based on their location, quality, and quantity. Those wetlands that are considered to have little or no importance may be omitted from the inventory. Those inventoried wetlands which are not protected must have conflicting uses identified. If none exist, the area is managed for preservation. If conflicting uses are identified, an economic, social, environmental, and energy analysis (ESEE) must be completed to form a planning program to satisfy the goal requirements.

Thus, one purpose of this paper is to examine whether the WET technique can be used to determine the quality of wetlands in the context of Oregon's statewide land use planning goal requirements. Potentially, this would require the method to be applied to hundreds of wetlands. Whether the method will be efficient and whether enough data on most wetlands exist to answer the questions in WET are issues that need to be examined. Another purpose of this paper is to contrast

the WET technique with a previous assessment of Jackson/Frazier Wetland and discuss any differences and similarities. A final purpose is to implement the WET method to assess the social values and ecological functions of the Jackson/ Frazier Wetland.

Need for Assessment Methods

With the abundance of regulations pertaining to wetlands, there exists a need to analyze the functions and values a wetland provides to society. In the future wetlands will be lost to development. It would be prudent, however, to steer development away from those wetlands that are of highest value. An Office of Technological Assessment report recommended a national classification system based on combined importance of ecological services and intrinsic values (Hirsch 1988). Regulations and management practices would then be adjusted to address wetlands having different values. Assessment and ranking of wetlands by conservation agencies is also needed to form a priority wetlands acquisition list.

By the 1980s, the formulation of several comprehensive assessment methods was completed. Many problems were noted among assessment methods, however. Kuzler and Riexinger (1985) summarized them as follows:

1. The scientific base and efforts to assimilate existing studies are still inadequate with regard to hydrology (groundwater, flood control), pollution control, and global values.
2. Assessment approaches vary in sophistication and adequacy (wildlife evaluation has been paid much more attention than cultural values).
3. Rapid assessment methods are poorly understood by regulators, resulting in unnecessary opposition or the misconception that these methods will or can replace detailed on-the-ground testing.

4. Assessment approaches are not tailored to the needs of major users including: acquisition and management agencies, developers, and construction agencies.
5. Those involved with wetland evaluation often lack expertise in the full range of disciplines needed.
6. Those undertaking the assessment often lack sufficient time, data, funding, and analytical capability to undertake the necessary evaluation.
7. Raw data needed for assessment of one or more key wetland functions is often missing, such as groundwater-wetland relationships, and can often be generated only at great expense.
8. Techniques for assessing cumulative impact are poorly developed.
9. Wetland evaluation methods often fail to place wetlands in their broader ecosystem or "values" context.

Wetland assessments can be done at three levels (Kuzler 1985):

1. Broadbrush Assessment--At this level, work is done in the office through examination of wetland maps, air photos, resources atlases, etc. This work can indicate general values, general hydrologic relationships, soils, access to wetland, and "red flags" to key functions or values such as rare or endangered species.
2. Limited Field Assessment--Even when brief, a limited field assessment can yield much information on soils, vegetation, and cultural features.
3. Detailed Assessment--This most precise level of analysis is the ideal situation but may take weeks, months, or even years of topographic mapping, hydrologic analysis, water sampling, wildlife counts, etc.

Because many decisions are made by regulatory and planning agencies with limited time frames, a rapid assessment method is needed. Precision is

sacrificed and decisions may be based on limited data, but as one wetland expert stated, "However imperfect generalizations may be, they are essential as long as decisions must be made in short time frames with limited budgets." (Kuzler 1985)

Assessment Methods

Among the earliest methods for assessing wetlands involved analysis of the habitat which they provide to waterfowl and other birds. The U.S. Fish and Wildlife Service (USFWS) Habitat Evaluation Procedure (HEP) (1980) is perhaps the best example. Another method using birds to rate wetland habitat is based on species diversity and uniqueness of species found at a site (Cable, Brack, and Holmes 1989). In this case, bird species are assigned base values as a function of how many of them are counted at a site. Total species points are then divided by an area factor to consider island biogeography theory.

Some political jurisdictions have their own systems for evaluating wetlands, such as Michigan (Michigan Department of Natural Resources 1982) and Ontario, Canada (Glooschenko 1983). Other assessment models concern themselves with visual resource values (Marble and Gross 1984; Smardon 1975), flood mitigation values (Ogawa 1982), and economic impacts (Batie and Shabman 1982). The wealth of literature on wetland assessment is evidenced by the recent publication of an annotated bibliography on assessment methods containing 561 citations (Leitch and Ekstrom 1989).

In the Pacific Northwest assessment of wetlands ranges from unsophisticated site surveys to the use of comprehensive assessment methods. A field data sheet from Albany, Oregon (City of Albany 1989) describes the information collected by interns on wetlands (Figure 1). Municipalities such as Beaverton (City of Beaverton 1988) and Eugene (Lane Council of Governments 1989) base their wetland

Figure 1. City of Albany Goal 5 Study Natural Areas Inventory Field Notes

LOCATION: North of the sewage disposal plant OBSERVER: Linda & Brett

DATE: April 5, 1988

MAP REFERENCE CL-2: PEM1A = Palustrine-Emergent/Persistent-Temporary

ASSESSORS PARCEL MAP:

COMPREHENSIVE PLAN DESIGNATION: Public Facilities ZONING: Open Space

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WEATHER:

* Precipitation (yes, no, type) - No
* Wind - Slight westerly
* Temperature - 55° F

PHYSICAL PARAMETERS:

* General topography - Gently rolling with fill along southern portion of site
* Degree and orientation of slope - 3-5%
* Water features (pond, lake, stream, stagnant, etc.) - Palustrine, areas of past inundation sighted
* Percent of site inundated by water - 0%
* Major structures, roads - Site adjacent to industrial water tanks

VEGETATION:

* Description of vegetation types including species list, communities, percent canopy closure (tree, shrub, herb), number and size of snags, seral stage, general health and vitality, percent open water/percent emergent vegetation at inundated areas.

  Soils wet but not soaked. Seasonal flooding apparent with emergent vegetative types around areas of past inundation. Open grassy areas are predominant on the higher portions of the site with lower areas scattered with willows and poplars. Northwest portion of site bordered by dense blackberry stand.

WILDLIFE:

* Species Observed (herps, fish, birds, mammals) - Many small bird species evident in the area and would presume the area to be a habitat for many small mammals due to the type of vegetative cover and the distance from human activities.

* Species Not Observed, but Known to be Present, and Source of Information -

* General Description of Habitat Function (food sources, roosting, perching, nesting, etc.) - The area is adjacent to the Willamette River and provides

diverse habitat for species that can utilize the riverine environment as well as a palustrine environment. By maintaining this area as a natural extension of the Willamette River corridor, a more diverse wildlife community can be supported.

HUMAN USE:

* List Human Uses and Use by Domestic Animals Including Proximity to Residential Area (discuss compatibility and conflicts with natural resources and interspersion with other natural areas).

A bike trail traverses the site, and there is scattered litter and trash. Stacks of large concrete pipe have been dumped in the middle of the site, and oil has been dumped on the ground. There has also been illegal fill activities over portions of the site.

Adjacent to the site on the west is an open space area, the City wastewater treatment plant is visible from along the southeasterly border of the site, and to the south of the site is a residence and light industrial use.

MANAGEMENT/POTENTIAL:

* A Brief Statement on Enhancement, Maintenance, or Compatible Uses and Development.

This is City-owned property, and the area could be better managed to preserve wetlands values. The site is part of the Willamette Greenway, which is a continuous open space area that provides unique development regulations for the area along the banks of the Willamette River. The area should be preserved for its wetland values as well as its location within the Willamette Greenway corridor.

ADDITIONAL COMMENTS:

* Unique Features, Rare/Threatened Species

Illegal dumping activities have taken place. The area should be cleaned up and restored to enhance the wetland characteristics of the site.

inventory and conservation plans on ratings that are wildlife oriented (Figure 2). King County, Washington (King County Planning Division 1986) uses a comprehensive method to assess all inventoried wetlands and assigns ratings based on specified criteria given to the hydrologic, biologic, visual, economic, and cultural values of a particular wetland. This method is a modified version of the Larson Method (Larson 1976), perhaps the earliest comprehensive assessment approach. The Larson model consists of four submodels which rank wetland wildlife habitat, visual-cultural values, groundwater potential, and economic value. A modified version of this model was applied to Jackson/Frazier Wetland (Marshall 1985). It resulted in ranking the site as "high priority" under four of 11 red-flag criteria (rare plants, visually prominent plants, availability of information, and rare habitat). Using this model, Jackson/Frazier Wetland received a good to excellent wildlife habitat score, moderately good visual-cultural score (dampened by a lack of recreational opportunities), and a moderate flood mitigation potential score. The economic rating resulted in a preservation value for Jackson/Frazier Wetland of $2,022 per acre.

The WET Method

Although all rating systems are vulnerable to weaknesses, the WET method has been cited as being the most popular due to its perceived comprehensiveness and foundation in the scientific literature (Leitch and Shabman 1988). The WET method is considered the best known and is gradually being acknowledged by a broad range of agencies and states as providing a common denominator framework for wetland evaluation (Kuzler 1985).

The author of WET, Paul Adamus, was not satisfied with existing assessment methodologies when he began working on a comprehensive methodology. In his opinion, wetlands have more importance than just serving as habitat for fish and

Figure 2. **Wildlife Habitat Assessment**

Unit No. _____ Location _____ Sq. Ft. _____ Score * _____ **

Comments _____

	COMPONENT	DEGREE	SCORE *	SCORE **	COMMENTS
WATER	Quantity & Seasonality	None Seasonal Perennial 0.....4.....8			
	Quantity	Stagnant Seasonally Flushed Continually Flushed 0.....3.....6			
	Proximity to Cover	None Nearby Immediately Adjacent 0.....4.....8			
	Diversity	One Present Two Present Three Present 2.....4.....8			
FOOD	Variety	Low Medium High 0.....4.....8			
	Quantity & Seasonality	None Limited Year Around 0.....4.....8			
	Proximity to Cover	None Nearby Immediately Adjacent 0.....4.....8			
COVER	Structural Diversity	None Seasonal Perennial 0.....4.....8			
	Variety	Stagnant Seasonally Flushed Continually Flushed 0.....3.....6			
	Nesting	None Nearby Immediately Adjacent 0.....4.....8			
	Nesting	None Nearby Immediately Adjacent 0.....4.....8			
	Seasonality	One Present Two Present Three Present 2.....4.....8			

*Existing ** Enhancement Potential

ADDITIONAL VALUE					
Disturbance	Physical	Permanent Temporary Undisturbed 0.....2.....4			
	Human	High Medium Low 0.....2.....4			
Interspersion		High Medium Low 0.....3.....6			
Unique Features 0 - 4		Wildlife ____ Rarity of Habitat Flora ____ Type ____ Scenic ____ Educational Potential			

(City of Beaverton 1989)

wildlife. His objective was to improve the scope, objectivity, and replicability of existing wetlands regulatory decisions. An earlier assessment method of his was adopted by the Federal Highway Administration (Adamus 1983). Cable et al. (1989) reported this technique involved significant effort in training field personnel and the field work was labor intensive. With more literature being produced yearly on wetland functions, Adamus produced a revised version of the assessment called the Wetland Evaluation Technique (WET). Wetlands assessment for the state of Maine (Adamus 1986) and for the City of Juneau, Alaska (Adamus 1987c) helped refine the current version. The WET method has been adopted by the Corps of Engineers for use in aiding administration of Section 404 of the Clean Water Act. The WET method was chosen because it: 1) considers all known wetland functions, 2) is based on technical literature, and 3) can be used to assess any wetland type in an objective manner (Kelsey 1985).

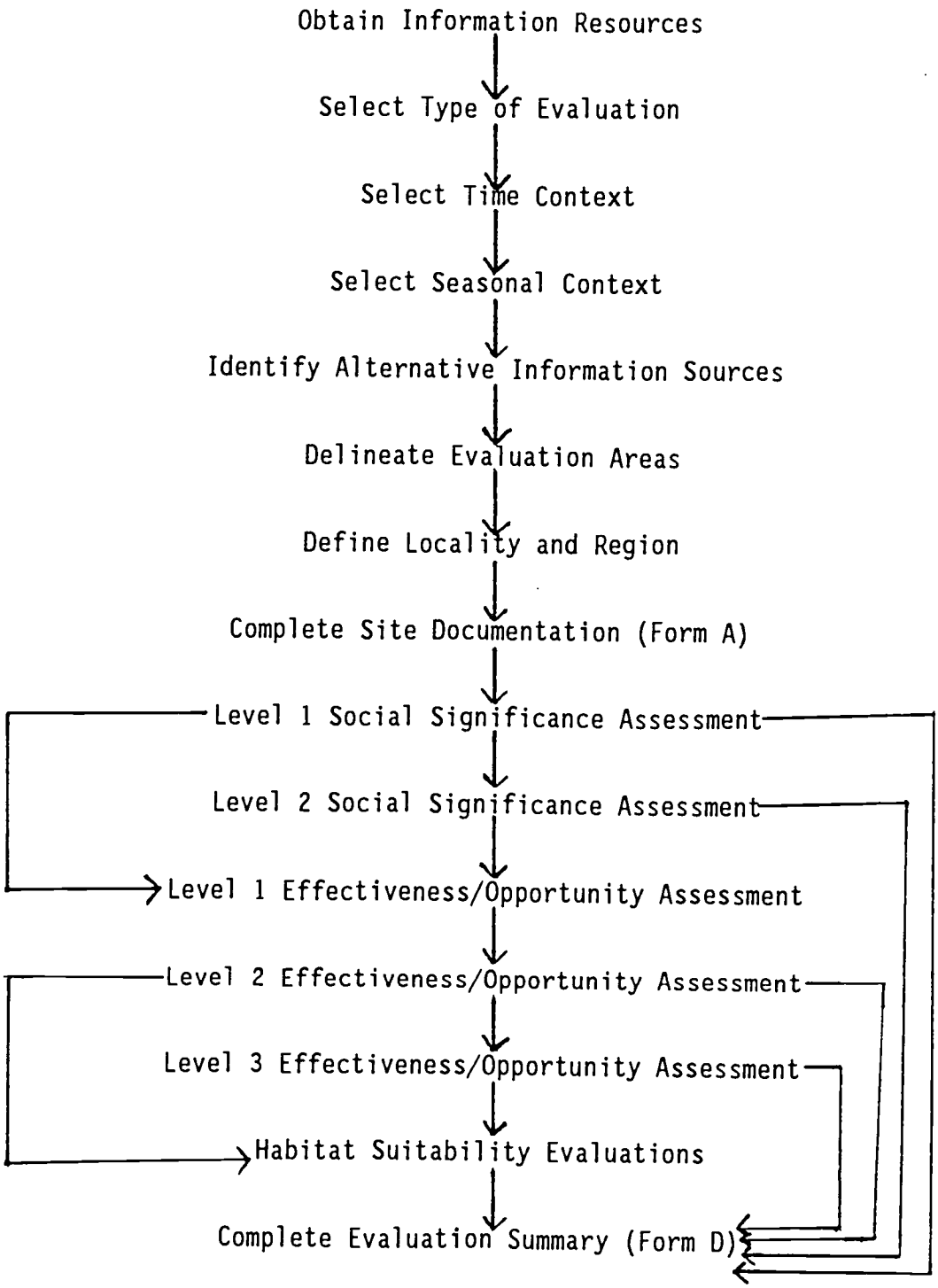
Basically, WET is an "expert system," consisting of a series of questions about a wetland. It evaluates functions and values with regard to social significance, effectiveness, and opportunity. Social significance refers to a wetland's special designations, economic value, and strategic location. Effectiveness refers to the ability of a wetland to perform a function based on its physical, chemical, or biological properties. Opportunity refers to the opportunity that a wetland has to perform up to its level of ability. WET can be performed at three levels of detail. The first level can be done in the office using maps, air photos, etc. The second level requires a brief site visit. The third level requires detailed and, in some cases, long-term field assessment. Figure 3 provides a flow chart for WET. In this report, the first level for social significance and the first and second levels for effectiveness/ opportunity are completed.

The second level for social significance rates uniqueness of a wetland in a regional context and requires that a count and acreage of the different types of wetlands in a county, ecoregion, state, etc. be calculated. Benton County does not have complete coverage of National Wetlands Inventory maps, and the financial resources of this author were inadequate to purchase such maps. In addition, the uniqueness of Jackson/Frazier Wetland has been well-documented. Therefore, this level is not addressed in this paper.

The third level of effectiveness/opportunity evaluation is also unaddressed here. This level requires information on water chemistry. Such data does not yet exist for Jackson/Frazier Wetland.

WET assesses functions and values for a wetland by analyzing its physical, chemical, and biological processes and attributes. This is done by identifying "predictors," which are variables that directly or indirectly measure the physical, chemical, and biological processes or attributes of a wetland and its surrounding area. Predictors are based upon the answers to the series of questions in WET. Responses are then analyzed by a set of interpretation keys that define the relationship between predictors and functions and values as defined by the scientific literature. The result is assignment of ratings of "high," "moderate," or "low" to functions and values.

Figure 3. Evaluation Sequence for the Wetland Evaluation Technique



(Adamus 1987)

WET has been field tested in all of the lower 48 states, and regional modifications have been developed for specific sites, such as the bottomland hardwoods of the southeastern U.S. (Adamus 1987b). The states of New Jersey and Wisconsin have had agencies that used WET and found it to be successful for their requirements (Polin and McColligan, Jr. 1985; Reed 1985). In Portland, Oregon WET was used in the Columbia South Shore Resource Management Plan (Portland Development Commission 1989) to evaluate 47 wetlands in an area of intense industrial development in order to provide a management plan and to remove uncertainty as to how development will take place. Planners considered the method to be a success because it involved examining sites on an objective, consistent basis. The resulting ratings can then be plainly shown for public scrutiny. In this case, however, a member of the Corps of Engineers and several professionals with strong backgrounds in wetland ecology aided the implementation of WET in the study.

APPLICATION OF WET METHODOLOGY TO JACKSON/FRAZIER WETLAND

Before answering any of the evaluation questions addressing Jackson/Frazier Wetland, the time context, seasonal context, and several boundary areas are defined. WET may be used to evaluate pre-impact or post-restoration wetlands if historical or predictive data are available. This investigation will evaluate the Wetland in its present state. However, conditions or activities known to be imminent will be considered.

At the Jackson/Frazier Wetland, variation in water levels from season to season may have an effect on its various functions. It is therefore necessary to define the seasonal context in which the wetland is being studied. In this report, the Jackson/Frazier Wetland was studied in late October/early November

and is considered to be in the "average" season condition (as opposed to being wet or dry). The hydrology at this time is intermediate between the average annual wettest and driest conditions.

The following areas are delineated in this study:

1. Assessment area (AA)
2. Input zone (IZ)
3. Watershed of the AA
4. Service areas of the AA
5. Watershed of the closest service area

The AA is the wetland area that is analyzed for its functions and values. It is possible for a large wetland area to be divided into several AAs if there are distinct and separate hydrologic interactions occurring within the site. The AA for the Jackson/Frazier Wetland was considered as an entire unit and was based on Marshall's (1985) delineation of the Wetland. Contact with the author of WET (Adamus 1989) confirmed that addressing Jackson/Frazier Wetland as one unit is appropriate.

The IZ is defined as an area surrounding the AA that may contribute sediments, nutrients, or contaminants to the wetland. The IZ includes the area 300 feet upslope from the boundary of the wetland. Along tributaries, this zone is extended 100 feet for each 10 feet of tributary width at its entrance to the AA. The width of Jackson/Frazier Creek was measured at 45 feet at the railroad bridge east of Highway 99, and therefore the IZ was extended 450 feet from the Wetland's northwest boundary (Figure 4). The watershed of the Jackson and Frazier Creeks of the Jackson/Frazier Wetland was delineated on a topographic map. The area was digitized with the AUTOCAD system and found to be 7.09 square miles (Table 1).

Figure 4. Map of Jackson/Frazier Wetland (next overleaf)

USGS topographic map delineating: Jackson/Frazier Watershed (blue)
Input Zone (dashed black)
Jackson/Frazier Wetland (dashed blue)

MCDONALD STATE FOREST

CORVALLIS

Vineyard Mtn Radio Tower

Lewisburg Saddle Gate

Quarry

Sulphur Springs Creek

Baker Creek Road

Patterson Road

Frazier Creek

Lewisburg Ave NW

Crescent Valley

Mountain View Sch

Locke Cem

Lewisburg

Pettibone Road

Frazier Creek

Trailer Park

Dimple Hill

Jackson Creek

Highland Drive

Pacific Highway Southern

Frazier Creek Ditch

Granger

WCTU Childrens Home

Oak Creek

Ponderosa Ave

Glen Ridge Dr

Spring

Water Tanks

Corporate Boundary

Walnut Blvd

Dixon Creek

Lutheran Cem

Radio Tower

Radio Tower (KCOV)

Beaver Sch

McKinley Dr

Jefferson Sch

Highland View Jr High Sch

Garfield Sch

Wilson Sch

Cheldelin Jr High Sch

Fairplay Sch

Stewart

Stewart Lake

Seavy Rd

Garden Rd

Circle Blvd

Elmwood Ave

Menard St

Gravel Pit

Indefinite Boundary

Willamette River

BM 282

BM 241

BM 230

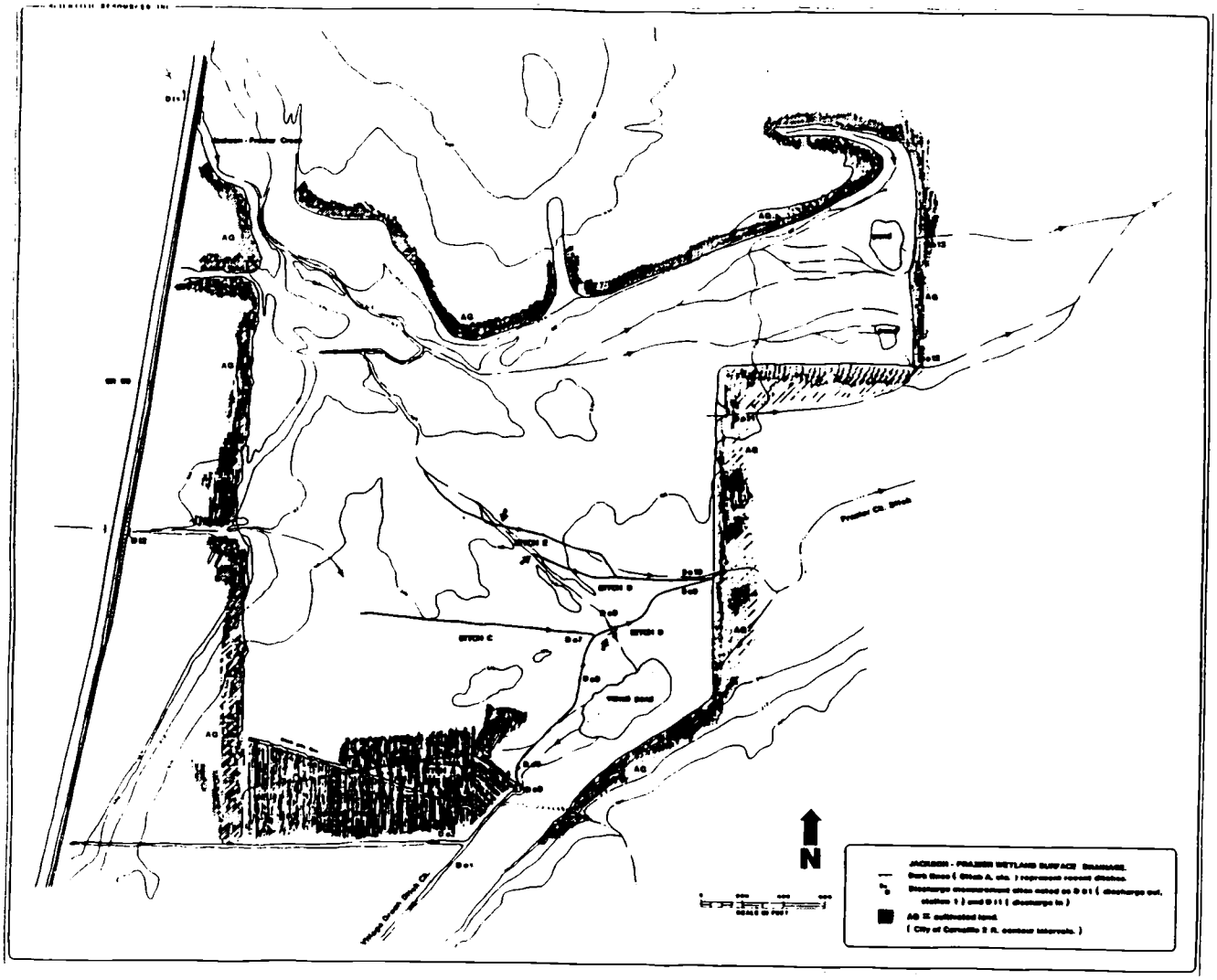
BM 229

BM 225

BM 224

BM 215

Figure 4A. Large-scale Map of Jackson/Frazier Wetland



(Scientific Resources, Inc. 1986)

Table 1. Jackson/Frazier Wetland Data

Site Location: Township 11W, Range 5S, Section 13, 24

Size of Wetland: 159 acres

- Forested: 66% (105.6 acres)
- Scrub-shrub: 9% (14.3 acres)
- Emergent: 21% (33.4 acres)
- Upland: 4% (5.7 acres)

Size of Jackson/Frazier Watershed: 4,433 acres (7.09 square miles)

- Forested area: 50.3% of watershed
- J/F Wetland: 3.6% of watershed
- Upstream wetlands: 1.6% of watershed

Size of Closest Service Area Watershed: 4,985 acres (7.97 square miles)

- Wetland: 231 acres
- Impermeable surface: 4.8%

Service areas are defined as points to which wetland functions or values are delivered. One example of a service area is a town downstream of a wetland which is the delivery point for the floodflow alteration function. Service areas for a watershed the size of Jackson/Frazier Wetland's are considered to be those areas within five miles downslope from the AA's outlet which possibly benefit from wetland services. Service areas identified for the Jackson/Frazier Wetland include:

1. The residential area in northeast Corvallis; service--floodflow alteration
2. Stewart Slough and Frazier Ditch/Creek; services--sediment/toxicant retention, nutrient retention
3. The oxbow lakes and Willamette River (just within the five-mile limit); service--water quality improvement.

The watershed for the northeast section of Corvallis drained by Stewart Slough has been delineated. This is the closest service area to the Wetland.

APPLICATION OF WET METHODOLOGY TO JACKSON/FRAZIER WETLAND

The Jackson/Frazier Wetland was selected as a study area primarily because of its close proximity and its previous assessment with a different technique, thus allowing comparison to the WET technique. Other pertinent reasons are those described by Marshall (1985): 1) a large body of site information on the area has been collected, 2) Jackson/Frazier Wetland contains typical wetland classes of the Willamette Valley, and 3) the site is relatively undisturbed by human activities.

The WET methodology was applied to Jackson/Frazier Wetland. No detailed field measurements are needed to complete WET at the first and second levels. Simple field reconnaissance consisted of measuring areas and depths of ponding, measuring and mapping a cross-section of an outlet ditch, and surveying of site characteristics such as presence of snags, tree diameters, presence of beavers, and presence of edge cover for wildlife. The answer to all the question given in the completed levels of the WET methodology are shown in Appendix A and yielded the following results. The results pertain to a wetland condition intermediate between the wet and dry seasons.

Level 1 Social Significance Assessment

The Level 1 answers were interpreted using the keys provided in the manual and yielded the following ratings of the values and functions provided by Jackson/Frazier Wetlands at an initial level. Ratings may be low, moderate, or high for any given function.

Groundwater Recharge: moderate
Groundwater Discharge: moderate
Floodflow Alteration: high
Sediment Stabilization: moderate
Sediment/Toxicant Retention: moderate
Nutrient Removal/Transformation: moderate
Wildlife Diversity/Abundance: high
Aquatic Diversity/Abundance: high
Recreation: low
Uniqueness/Heritage: high

Level 1 and 2 Effectiveness/Opportunity Assessment

Groundwater Recharge: uncertain
Groundwater Discharge: low
Floodflow Alteration Effectiveness: high
Floodflow Alteration Opportunity: high
Sediment Stabilization: high
Sediment/Toxicant Retention Effectiveness: high
Sediment/Toxicant Retention Opportunity: high
Nutrient Removal/Transformation Effectiveness: high
Production Export: moderate
Aquatic Diversity/Abundance: low
Wildlife Diversity/Abundance: high
Wildlife Diversity/Abundance for Migration and Wintering: high

DISCUSSION

The following is an explanation of the rationale behind the assigned ratings as supported by the literature-based WET method and selected literature. Possible sources of error in applying the WET methodology are also discussed.

Groundwater Functions

The relationship of groundwater to wetlands and the degree of impact is not understood well. Hydrology of wetlands in general is an area that needs much more research (Eilers 1987). Groundwater can heavily influence some wetlands, while it may have little impact at all on others. In Alaska, Siegel (1988) found blanket bogs to be recharge zones and forested wetlands to be discharge zones. His work also revealed that:

1. Gradients of the water table commonly reverse near wetland margins as water table mounds seasonally build up and decay.
2. Recharge-discharge depends more on the hydrologic setting than the wetland type classified by vegetation.
3. The volumes of recharge and discharge are small compared to volumes of groundwater in storage and surface water in streams.

Using the WET method in studying Jackson/Frazier Wetland, Level 1 significance ratings for recharge and discharge were both moderate. These turned out to be crude evaluations as Level 1 and 2 effectiveness/opportunity ratings were uncertain for recharge and low for discharge. Due to the impermeable nature of the clay soils, Jackson/Frazier is most likely not a recharge area. The low rating for groundwater discharge stems from the fact that the site is a nonpermanently flooded wetland that does not have two or more of the following characteristics: 1) occurring in a precipitation deficit region, 2) occurring

immediately below a dam, 3) occupying more than 200 acres, with a watershed less than five times the AA's area, 4) having a steeper gradient downstream of the outlet than upstream of the inlet, 5) lacking inlets but having outlets and not dominated by snowmelt, 6) having stability with regard to seasonal water level fluctuations, or 7) having springs and water quality or temperature anomalies. These items all suggest the presence of significant groundwater input. However, a previous report (Scientific Resources, Inc. 1986) suggested some groundwater discharge, due to the fact that input into the wetland was 29.2 cfs, while output from the wetland was 34.3 cfs. This discrepancy suggests more study should be directed to hydrogeology at the Jackson/Frazier Wetland.

Floodflow Alteration Effectiveness and Opportunity

A number of criteria are presented in WET that, when met, classify a wetland as effective for altering floodflows. The one criterion which Jackson/Frazier meets is the ability to expand its surface water area at least 25% for 20 days each year. Other factors which lead to its "high" rating include: the area is inundated by sheetflow and leaves through constricted channels, and the site is greater than 40 acres and is comprised of primarily Zone A vegetation (which acts to obstruct floodflow) (see Figure 9 for wetland zone definitions).

There is some degree of personal interpretation in answering these questions. Although water that floods the Wetland enters via channel flow, the floodwaters inundate the Wetland via sheetflow. Perhaps some evaluators may have considered the floodwaters as originating from channel flow. Another problem is evident because the Jackson/Frazier Wetland may have little effect on downstream flooding in major flood events. The area of Stewart Slough is flooded primarily by the "backwater effect" of the flooded Willamette River, not by overflow from Jackson/Frazier Creek (City of Corvallis 1981). In fact, both the

City of Corvallis (1981) and the second flood desynchronization assessment of Marshall (1985) determined that the Wetland has only moderate flood storage and desynchronization capabilities.

The opportunity for floodflow alteration is rated "high" due to the presence of a large watershed relative to wetland size and to the fact that nearby soils are relatively impervious and provide high runoff, thus providing the opportunity for the Wetland to modify this runoff.

Sediment Stabilization

This category refers to areas which are more effective for binding soil and dissipating erosive forces. It is more applicable to coastal wetlands than to an area such as Jackson/Frazier Wetland, where the level topography allows for little erosive action. The site was rated high because of the presence of ditches which act to confine water. This is the only criterion needed for a "high" rating for sediment stabilization, and if the evaluator determined that ditches did not appreciably affect this wetland, the site would receive a "moderate" rating. On the Jackson/Frazier Wetland, ditches are not on the site; they begin at the edges of the Wetland. Thus, different interpretations and different answers to this question are possible.

Sediment/Toxicant Retention Effectiveness and Opportunity

The primary factor responsible for the "high" rating for sediment/toxicant retention is the fact that Jackson/Frazier Wetland contains erect vegetation wider than 20 feet in a basically depositional environment. Additional factors to support this rating are the presence of a constricted outlet and slow-velocity flow. The Jackson/Frazier site is rated "high" for opportunity for sediment/ toxicant retention because of the presence of nearby fields where ground is bare for a short time and pesticides may be applied. These situations should be

investigated more thoroughly for greater confidence in the rating.

Nutrient Removal/Transformation

WET defines "high" effectiveness for this category as areas which retain or transform phosphorus and/or nitrogen into their organic forms. Again, the fact that flooding stems from sheet flow determined the "high" rating. Other factors include: presence of significant vegetation (which assimilates nutrients) and high plant diversity. Opportunity is "high" in this category because of the presence of adjacent grass seed farms which involve field burning and fertilization with nitrogen and phosphorus.

Production Export

This involves removal of large amounts of organic plant material (specifically net annual primary production) from the AA into downslope waters. In order to receive a "high" rating, the AA must have a permanent outlet. Jackson/Frazier Wetland has only intermittent outlets. Even in winter flood conditions, the site would not be rated "high" as another requirement for that rating is a fringe or island situation, which does not occur at the site.

Aquatic Diversity

Jackson/Frazier Wetland received a "low" rating in this category because standing water does not exist at the site throughout the entire year.

Wildlife Diversity/Abundance

A rating of "high" was given to Jackson/Frazier Wetland in this category. Basically, certain types of wetlands have a high probability of supporting high diversity of birds. Among these are bottomland hardwoods, other floodplain wetlands, large and vegetatively diverse wetlands, and moderately sized wetlands that are oases or complexes and have at least minimal interspersion (Adamus 1987). These types all occur at the Jackson/Frazier Wetland.

APPLICATION OF WET BY PLANNING AGENCIES

The Level 1 and Level 2 assessments of WET can be done without extensive field work and in a reasonable time period. For this report, the Level 1 assessment for social significance and the Levels 1 and 2 assessments for effectiveness/opportunity were completed in approximately 2.5 weeks. The work was not done on a full-time, "40-hour week" basis and was delayed by the wait for information. This took the form of waiting for return phone calls from agencies regarding, among other things, endangered species lists, well yield information, and water quality information. Gathering the necessary data involved a significant portion of the time to complete the assessment. Among the resources that facilitated completion of this assessment were much existing information on Jackson/Frazier Wetland including:

- detailed vegetation maps
- detailed surface water hydrology maps
- plant lists
- bird lists
- people intimate with the Wetland.

The question of whether WET can be used for application by planning agencies depends on the scope of the study. If the wetland has much background data, WET can be applied fairly easily. However, the majority of wetlands have little detailed information already written about them. To expect the staff of a planing agency to document the hydrology, possible endangered species, etc. is not realistic. The Oregon land use process at the county level provides an example which illustrates possible difficulties in the application of WET. Each county is required by law (Oregon PL-100) to inventory certain resources (including wetlands). Marion County (in western Oregon) has approximately 2,000

wetlands within its jurisdiction that need to be evaluated according to their location, quantity, and quality. Applying WET at the second level to each of these 2,000 wetlands is not a realistic goal. Among the requirements necessary in the Level 2 assessment are the following:

- determining the areal extent and depth of ponded areas (to determine ares of Zones A, B, and/or C)
- determining the density of vegetation (and whether it is sufficient to shade 80% of the area)
- determining whether vegetation provides sufficient shelter from wind (requires height of vegetation to be calculated)
- determining cross-sectional areas of outlets and inlets
- conducting water velocity determinations
- calculating the area of the wetland's watershed
- analyzing soil types within one mile of the wetland and determining the percentage of the area having soils with slow infiltration capacity.

Surveying 2,000 wetlands for these data alone would constitute an enormous effort and may not be feasible for small planning agencies with staffs of approximately 10 people. In this study, time spent on field visits to Jackson/Frazier Wetland totalled five hours. The site visits consisted of basic site reconnaissance and measurement of several variables as previously noted. This may have been a relatively large amount of time spent to complete these tasks. The WET manual suggests one to three hours will be spent at each site in completing the Level 2 analysis. Even so, if this is applied to western Oregon counties which may have up to 5,000 wetlands within each one, up to 10,000 man-hours may be spent on each project. Planning agencies with small staffs may not be able to allocate this kind of staff time to WET assessment duties. For most planning agencies,

applying the Level 3 analysis would not be feasible because it requires even more time to complete and more data on water chemistry. Acquiring such data for a large number of wetlands would be prohibitively expensive.

A crude, "first cut" screening system is needed to remove the least valuable wetlands. Simply using the Level 1 social significance assessment as a screening device may yield less than accurate ratings. For Jackson/Frazier Wetland, of the eight values/functions contained in both the social significance Level 1 assessment and the Levels 1 and 2 effectiveness/opportunity assessment, six ratings were modified by the more detailed assessment. If WET were to be used in the Oregon land use system, perhaps the Level 1 assessment could be refined with the addition of a few more pertinent questions in order to yield more accurate ratings and to allow utilization as a "first cut" screening device. The Level 1 social significance assessment merely determines whether there are features of social value in the area which may be affected by the wetland. For instance, if there are features of social value in the downstream area which may be affected by flooding, the floodflow alteration rating would be "high," even though the wetland may not actually suppress flood peaks as determined by more intensive study. Thus, if only the Level 1 social significance evaluation were to be used, the resulting ratings would be based on whether there are features of value which may derive benefits from the wetland and not on the actual ecological services the wetland provides. However, an argument can be made that any wetland which is surrounded by features of social value deserves further study.

The difference in hydrology for areas with a distinct dry season may pose a problem for planners. In the assessment of Jackson/Frazier Wetland, Zone B varies with the season and the definition of Zone B has particular impact on the

floodflow alteration, sediment/toxicant retention, and wildlife habitat ratings. In areas with distinct dry seasons, it appears a full year of study is needed to understand the value and functional status of a wetland throughout its hydrologic cycle.

Although no specialty in wetland ecology is needed to use WET, it appears to at least require a training course or short course in wetland ecology in order to apply good judgement in questions that leave room for interpretation.

Goal 5 of Oregon's statewide planning goals has created great difficulty for county planning agencies which are required to inventory all wetlands and create conservation plans for them. Due to the sheer number of wetlands, WET or any other wetland evaluation system may not be feasible tools because of the time involved and the large number of other land use actions to which county planning agencies must attend. The possibility of transferring wetland inventory/conservation duties from the counties to the state exists. At least one county planner believes this to be a reasonable course of action and suggests that other county planners have the same opinion (Nebon, personal communication, 1989). This situation of transferring resource planning duties occurred in the 1970s with forest resources. The burden of regulating forestry practices proved too great for the counties, so those duties were transferred to the state by the Oregon Forestry Practices Act of 1976. Oregon Senate Bill 3, passed in 1989, mandates greater state involvement in wetland regulation and may result in the transference of wetland regulation from the counties to the state.

COMPARISON WITH PREVIOUS ASSESSMENT

The assessment of Jackson/Frazier Wetland by Marshall (1985) yielded ratings in the following areas:

- qualification as a high priority site under four of 11 red-flag criteria (rare plants, visually prominent plants, availability of information, and rare habitat types)
- good to excellent wildlife habitat score
- moderate visual-cultural score
- two flood mitigation scores--high and moderate (with moderate being considered more accurate).

Jackson/Frazier Wetland qualifies for four of 11 red-flag criteria using Marshall's evaluation; using the WET method, the Wetland qualifies as a high priority site in two of six red-flag situations.

Marshall's assessment, using the modified Larson model, involved more detailed work including the preparation of extensive vegetation maps of the site. Characteristics considered in Marshall's assessment are: number of wetland classes, size, dominant class, cover/water interspersion, and vegetation interspersion. The WET method also considers these characteristics. One area considered in the modified Larson model and lacking in WET is that of visual resource value. Marshall also included an economic assessment of Jackson/ Frazier Wetland. WET does not determine economic value but considers several other values which the modified Larson model does not assess such as sediment stabilization, nutrient transformation, production export, and sediment/toxicant retention. The WET method provides a more comprehensive assessment of a wetland's functional vlaues in a shorter period of time. However, the detail and level of precision is not as sharp.

SUMMARY AND CONCLUSION

The Wetland Evaluation Technique (WET) developed for the Corps of Engineers is used to assign ratings to the values and functions of Jackson/Frazier Wetland. The model consists of two levels of social significance evaluation and three levels for effectiveness/opportunity evaluation. In this paper, the first level for social significance and the first and second levels for effectiveness/opportunity are completed. Given the data available on most wetlands, this represents the highest level to which most planning agencies can analyze a moderate number of wetlands. The time involved in such a project may be the limiting factor. The WET method attempts to compromise between the demands of detailed analysis for scientific accuracy and the staff, time, and financial limitations of regulatory agencies.

The Level 1 social significance assessment yielded "moderate" ratings to the following functions: groundwater recharge, groundwater discharge, sediment stabilization, sediment/toxicant retention, and nutrient removal/transformation. "High" ratings were assigned to the following functions: floodflow alteration, wildlife diversity/abundance, aquatic diversity/abundance, and uniqueness/heritage. Only one category, recreation, received a rating of "low."

The first and second level effectiveness/opportunity assessments resulted in modification of the ratings of several functions. The changes included: groundwater recharge, uncertain; groundwater discharge, low; sediment stabilization, high; sediment/toxicant retention, high; nutrient transformation/removal, low; and aquatic diversity/abundance, low. Two additional ratings at this level are: production export, moderate; and wildlife habitat for migration/wintering waterfowl, high.

The WET method results in a comprehensive assessment of wetland functions and values. In the case of Jackson/Frazier Wetland, this methodology revealed it to be a complex wetland with healthy ecological functions which provide a high degree of social values. The present study reveals several ares of research on which work need to be completed pertaining to Jackson/Frazier Wetland. Among these are: 1) entomologic studies, 2) mammalian use of the Wetland, 3) hydrogeologic studies, 4) fish use of the Wetland, and 5) water chemistry studies. In addition, this study shows the need for development of a quick "first cut" screening device to "weed out" less significant wetlands. Refinements to the Level 1 social significance assessment may prove useful in attaining this goal.

In the context of Oregon's land use system, the use of anything beyond the first level assessment will be too cumbersome, expensive, and time-consuming to evaluate the "quality" of hundreds of wetlands as required by the statewide planning goals. The lack of moderately detailed information on many unstudied wetlands will invoke limitations on the use of WET in Oregon. If refinements to the first level analysis result in more accurate ratings, then this level may be used as a "first cut" screening tool to eliminate the need for assessment of the least valuable wetlands. The WET method appears to work best when the number of wetlands to be analyzed by each jurisdiction is manageable (perhaps, less than 100). The proper time to complete the WET methodology at the higher levels can then be allocated. Given the fact that decisions must be made by regulatory agencies without wetlands experts, WET is a satisfactory, objective method for comparing the functional values of the wetlands in Oregon. Whether the counties can handle wetland inventories or whether the state of Oregon assumes responsibility for this is an issue which will be resolved in the near future.

REFERENCES

Adamus, Paul. 1989. Wetlands Scientist, NSI, Inc. Personal communication, October.

Adamus, P., et al. 1987a. Wetland evaluation technique (WET), Volume II: methodology. Operational Draft Technical Report. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

Adamus, P. 1987b. *Wetland evaluation technique for bottomland hardwood functions.* Washington, DC: Office of Protection, U.S. Environmental Protection Agency.

_____. 1987c. *Juneau wetlands: an analysis of functions and values.* Juneau, AK: Department of Community Development.

_____. 1986. *The cumulative impacts of development in southern Maine: Wetlands: their locations, functions, and values.* Maine State Planning Office, 69 pp.

_____. 1983. *A method for wetland functional assessment, Volume 1.* Washington, DC: U.S. Department of Transportation, Federal Highway Administration, 176 pp.

Batie, S. and L. Shabman. 1982. Estimating the economic value of wetlands: principles, methods, and limitations. *Coastal Zone Management Journal* 10(3):255-275.

Benton County. 1986. *A revised economic, social, environmental, and energy analysis for Jackson-Frazier wetland.* Corvallis, OR: Benton County.

Buffkin-Drost, M. 1985. A preliminary investigation into the hydrology of the Jackson/Frazier wetland, Oregon. Unpublished manuscript. Department of Geography, Oregon State University, Corvallis.

Cable, T., V. Brack, and V. Holmes. 1989. Simplified method for wetland habitat assessment. *Environmental Management* 13(2):207-213.

Chambers, K. 1986. Cited in report on Benton County ESEE assessment. Corvallis, OR.

Chambers, K. and R. Halse. 1980. Corvallis wetland prairie, Jackson and Frazier Creeks, north of Village Green, plant species list. On file at Department of Botany, Oregon State University, Corvallis, OR.

City of Albany. 1988. Representative field data sheet, City of Albany, OR wetlands study for comprehensive plan. Albany, OR.

City of Beaverton. 1989. Example of field data sheet from wetland study for City of Beaverton, OR comprehensive plan. Beaverton, OR.

City of Corvallis. 1989. Floodplain maps for City of Corvallis, OR. On file at Department of Economic Development, Corvallis, OR.

_____. 1981. Corvallis drainage master plan: technical supplement. 65 pp.

Condit, Jeff. 1989. Benton County Legal Counsel. Personal communication. October.

Cowardin, L., V. Carter, F. Golet, and E. LaRoe. 1979. *Classification of wetlands and deepwater habitats of the United States*. Washington, DC: U.S. Fish and Wildlife Service, 103 pp.

Dugan, P. 1988. The importance of rural communities in wetlands conservation and development. In *The Ecology and Management of Wetlands, Volume 2: Management of Wetland*, ed. D.D. Hook, pp. 3-15. Portland, OR: Timber Press.

Eilers, P. 1987. Strategies and direction for wetlands: scientific research. *Proceedings*, Northwest Wetlands Conference, University of Washington, Seattle, WA, pp. 239-254.

Ervin, Roger. 1989. Civil engineer, Benton County Department of Public Works. Personal communication. October.

Frenkel, Robert. 1989. Professor of Geography, Oregon State University. Personal communication. October.

_____. 1982. Analysis of the significance of Jackson/Frazier wetland. Report prepared for Benton County Planning Department, Corvallis, OR, 15 pp.

Glooschenko, V. 1983. Development of an evaluation system for wetlands in southern Ontario. *Wetlands* 3:192-200.

Hall, James D. 1989. Professor of Fisheries and Wildlife, Oregon State University. Personal communication. October.

Hirsh, A. 1988. Wetlands ranking - an innovative approach to wetland regulation? In *The Ecology and Management of Wetlands, Vol. 2: Management of Wetlands*, ed. D.D. Hook, pp. 373-381. Portland, OR: Timber Press.

Jarvis, R. 1978. Jackson/Frazier wetland birds, a list of birds typically found in Willamette Valley wetland habitats. On file at the Department of Fisheries and Wildlife, Oregon State University, Corvallis, OR.

Kelsey, R. 1985. Corps of Engineers perspective of wetland assessment. *Proceedings* of the National Wetlands Assessment Symposium, June 17-20, Portland, ME, 329 pp.

King County Planning Division. 1986. Methodology for the inventory and evaluation of wetland habitat in King County. Seattle, WA: Resource Planning Section, King County, 77 pp.

Kuzler, J. 1985. Introduction, wetland assessment: the regulator's perspective. *Proceedings*, National Wetlands Symposium, June 17-20, Portland, ME, pp. 2-8.

Kuzler, J. and P. Riexinger. 1985. Conclusions, recommendations, and research needs. *Proceedings*, National Wetlands Symposium, June 17-20, Portland, ME, pp. VI-X.

Lane Council of Governments. 1988. Goal 5 wetlands inventory for west Eugene. Prepared by Esther Lev. 9 pp.

Larson, R. 1989. Biology teacher, Crescent Valley High School, Corvallis, OR. Personal communication. October.

Larson, J., ed. 1976. Models for evaluation of freshwater wetlands, Publication No. 32, Completion Report FY-76-5. Amerherst, MA: Water Resources Research Center, University of Massachusetts, 91 pp.

Leitch, J. and B. Ekstrom. 1989. *Wetland economics and assessment: an annotated bibliography*. New York, NY: Garland Publishing, 194 pp.

Lightcap, Brian. 1989. Wetlands Manager, Corps of Engineers, Portland, OR. Personal communication. October.

Marble, A.D. and M. Gross. 1984. A method for assessing weland characteristics and values. *Landscape Planning* 11(1):1-17.

Marshall, John. 1989. Wetlands Scientist, Oregon Division of State Lands. Personal communication. October.

_____. 1985. *Value assessment of Jackson/Frazier wetland, Benton County, Oregon: a case study. M.S. thesis, Department of Geography, Oregon State University, Corvallis, OR, 147 pp.*

Michigan Department of Natural Resources. 1982. Division of Land Resource Program, Lansing, MI, 47 pp.

Mitchell, G. 1989. Current status recent trends of palustrine wetland of the Tualatin Valley, OR. *Unpublished report*. Department of Geography, Oregon State University, Corvallis, OR, 28 pp.

Mosgar, Herb. 1989. Benton County Water Master, Oregon Department of Water Resources. Personal communication. October.

Nebon, Russ. 1989. Marion County Chief Planner, Salem, OR. Personal communication. August.

Norgren, J.A. 1984. Comments on the stratigraphy of the Jackson-Frazier wetlands area. *Unpublished report*. Benton County Soil Conservation Service. Available from R. Frenkel, Department of Geosciences, Oregon State University, Corvallis, OR, 2 pp.

Ogawa, H. 1982. Evaluation methodologies for the flood mitigation potential of inland wetlands. Ph.D. dissertation. Amherst, MA: University of Massachusetts.

Peters, Dennis. 1989. Regional Wetlands Coordinator, U.S. Fish and Wildlife Service, Portland, OR. Personal communication. October.

Poling, D. and E. McColligan, Jr. 1985. The use of FHWA's wetland functional assessment methodology in New Jersey. *Proceedings*, National Wetlands Assessment Symposium, June 17-20, Portland, ME, pp. 104-107.

Portland Development Commission. 1989. Columbia South Shore Natural Resource Management Plan, City of Portland, OR, 142 pp.

Rackham, Robert. 1989. Benton County/Oregon State University Extension Service agent. Personal communication. October.

Reed, R. 1985. Alternate methodologies: the Wisconsin experience in modification of the FHWA's (Adamus) methodology. *Proceedings*, National Wetlands Assessment Symposium, June 17-20, Portland, ME, pp. 96-97.

Schreck, D. and D. Hall. 1989. Professors of Fisheries and Wildlife, Oregon State University, Corvallis, OR. Personal communications. October.

Scientific Resources, Inc. 1986. *Jackson/Frazier Creek wetland impact analysis.* Prepared for Oregon Division of State Lands, 23 pp.

Siegel, D. 1988. The recharge-discharge function of wetlands near Juneau, Alaska, part I: hydrogeological investigations. *Groundwater* 26(4):427-434.

Smardon, R. 1975. Assessing visual-cultural values of inland wetlands in Massachusetts. M.S. thesis. Amherst, MA: University of Massachusetts, 309 pp.

Tiner, R. 1984. *Wetlands of the United States: current status and recent trends.* Washington, DC: U.S. Government Printing Office, 59 pp.

U.S. Fish and Wildlife Service. 1980. *Habitat procedure manual.* Washington, DC: U.S. Government Printing Office.

U.S. Fish and Wildlife Service. Maps from National Wetlands Inventory series. St. Petersburg, FL.

APPENDICES

SOCIAL SIGNIFICANCE EVALUATION

Level 1 Assessment

1. **Are any federal or state endangered or threatened species (including officially designated "candidate" species) known to use the AA regularly?**

   Yes. A survey of the plant list by Chambers and Halse (1980) (Appendix B) reveals that one federal and state endangered species, Lomatiium bradshawii (Bradshaw's desert parsley), occurs on Jackson/Frazier Wetland. In fact, this species is found in the second largest concentration in the state (Benton County 1986). Sidalcea nelsoniana (Nelson's checker mallow) is on the Oregon threatened plant species list (Appendix C) and had been observed at the site in the late 1970s but has not been observed since 1981 (Chambers 1986). A vegetation map of the area shows Lomatiium to be in the southern section of the Wetland.

2. **Is the AA part of an area owned by an organized conservation group or public agency for the primary purpose of preservation, ecological enhancement, or low-intensity recreation?**

   Yes. Although the site is not currently owned for these purposes, it appears that it will be highly likely in the near future. The property was foreclosed on in 1988 due to failure of the owner to pay back taxes. There is a two-year grace period to pay the taxes; however, it is unlikely that this will occur because the amount of back taxes to be paid is $28,000 while the property is worth only $12,000. Benton County will most likely sell the land to the Nature Conservancy or deed the property to Oregon State University to be managed as a wetland. (Condit, personal communication, 1989)

3. **Is the AA included in a statewide listing of historical or archaeological sites?**

   No. (Frenkel, personal communication, 1989)

4. **Is the AA known to have ecological or geological features consistently considered by regional scientists to be unusual or rare for wetlands in the region?**

   No. The instructions for this question state to answer no if the type is merely sensitive or threatened. Many scientists have stated that Jackson/Frazier Wetland is among the last natural wet prairie wetlands of this size in the Willamette Valley. However, it does not fit the definition of rare for this question. Rare or unusual types are, for example, peat bogs in southern New England, cypress swamps in northern states, rice-producing wetlands in the north-central U.S., etc.

5. **Does the AA represent most or all of this wetland type in this locality?**

No. Maps from the National Wetlands Inventory of the USFWS show many other palustrine wetlands in Benton County.

6. **Have substantial public or private expenditures been made to create, restore, protect, or ecologically manage the AA?**

No. While much money and staff time have been expended on legal matters involving use and development of Jackson/Frazier Wetland, no physical enhancements, with the exception of installed piezometers, have been made.

7. **Are there biological communities in the AA that are stressed by saline springs or abnormally high salinities, or are there wetlands contiguous with the AA where this situation exists?**

No. Neither topographic maps nor observations of an investigator who wrote a thesis on the Wetland suggest saline springs. (Marshall, personal communication, 1989)

8. **Are there point sources of pollution or other features of social or economic value within or adjacent to the AA that might be inundated by flooding of the AA?**

No. The Wetland has no structures within it.

9. **Are there features of social or economic value within the 100-year floodplain of the area specified or has a dam, with the primary purpose of flood control, been proposed within five miles upstream or downstream of the AA?**

Yes. A residential area is within the 100-year floodplain as shown on floodplain maps of the City of Corvallis (Figure 5).

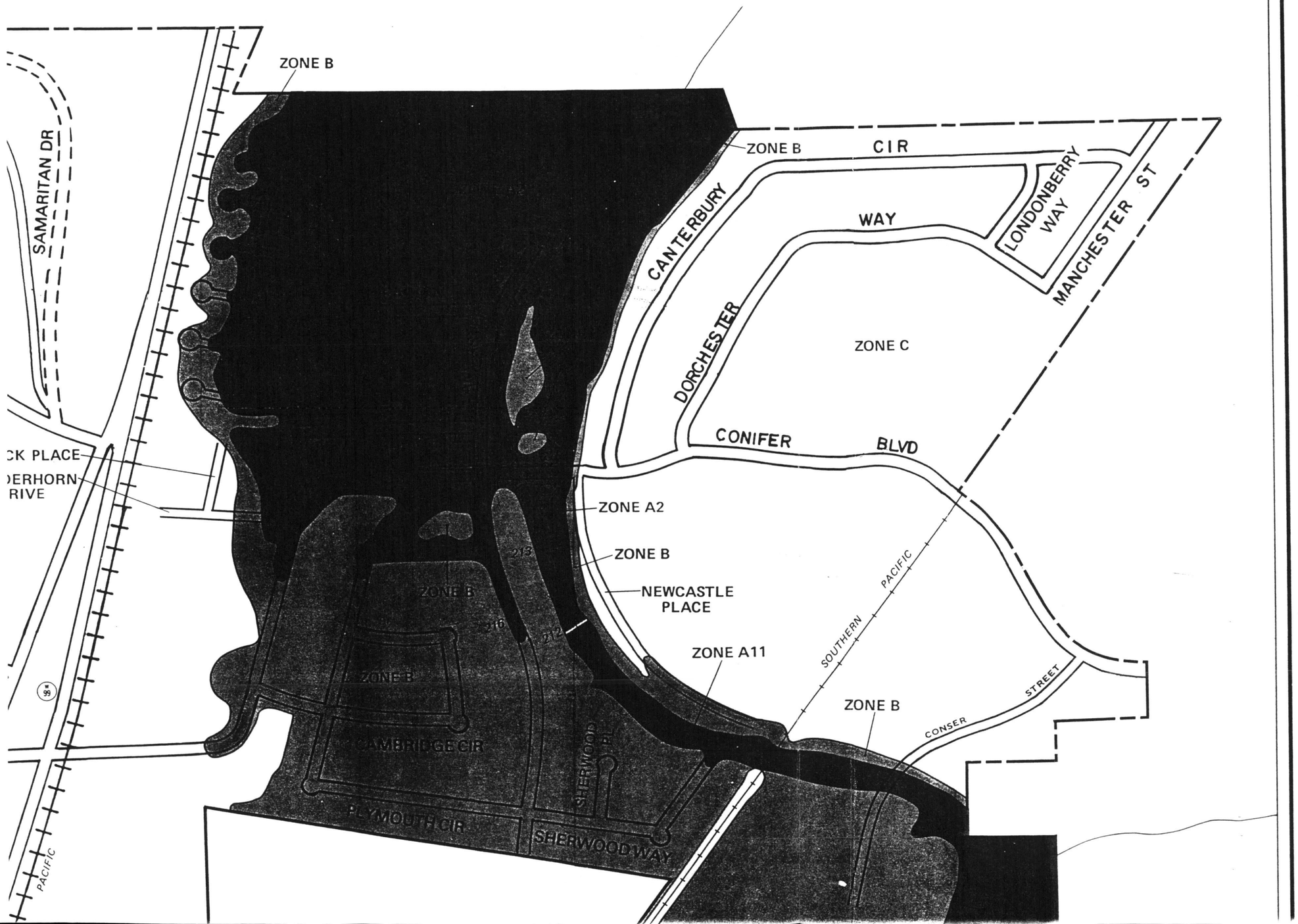
10. **Are any of the following features present within the area specified? Harbors, channels, ponds, or reservoirs that are dredged or cleaned regularly; artificial recharge pits; fish spawning areas; commercial shellfish beds; or areas known to be in violation of Section 401 of the Clean Water Act?**

No. Contacts were made with the Public Works offices of the City of Corvallis and of Benton County, the Department of Water Resources, Oregon Department of Fish and Wildlife, Oregon Department of Environmental Quality (DEQ), and the Environmental Protection Agency (EPA) Portland office to confirm the absence of these features.

11. **Are there bodies of water, within the area specified, that have been targeted by government agencies as "priority" areas for construction of wastewater treatment facilities or other water quality improvement projects because they violate official water quality standards.**

No. contacts were made with DEQ and Benton County Public Works to confirm this.

Figure 5. Floodplain Map of Northeast Corvallis (next overleaf)



KEY TO MAP

500-Year Flood Boundary	
100-Year Flood Boundary	
Zone Designations	ZONE B / ZONE B
100-Year Flood Boundary	
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JUNE 14, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS:
DECEMBER 26, 1975
DECEMBER 27, 1977

12. **Is there surface water within the AA or the area specified that is a major source of drinking water?**

    No. Contact with Benton County Public Works confirms this. (Ervin, personal communication, 1989)

13. **Are either of the following conditions present in the area specified? a) Bodies of water known to be especially nutrient-sensitive or subject to regular blooms of algae, aquatic fungi, or oxygen-related fish kills. b) Bodies of water known to be in violation of Section 401 water quality standards due to nutrient levels.**

    No. contact with DEQ, EPA, and John Marshall (personal communication, 1989) support this.

14. **Are there swimming/bathing areas that are used frequently in the area specified?**

    No. Due to a lack of large open water bodies and being situated on private land, swimming at the Wetland is not a use in the area.

A refinement of Questions 9-14 is as follows. If either condition (1) or (2) below is true the "Yes" answers remain the same. If neither is true, a "Yes" answer may be changed to "No."

(1) The land cover of the watershed of the service area closest to the AA is covered by more than 10% impervious surface. This condition is not true. The land cover of the closest service area (considered to be the section of developed area of northeast Corvallis) watershed was digitized and found to have 4.8% impermeable surface.

(2) Wetlands and open water comprise less than 5% of the watershed of the service area closest to the AA. This condition is true. Wetlands comprise only 4.6% of the closest service area watershed.

Therefore, the "Yes" answer to Question 9 remains the same.

15. **Does a threatened or endangered species that is wetland dependent regularly inhabit the area specified?**

    Yes. Lomatiium bradshawii is classified as a facultative wetland species, occurring in wetlands 67%-99% of the time.

16. **Are any of the following features present in the area specified? a) Sites designated by the EPA as sole source aquifers or Class II (Special) groundwaters. b) Wells that serve at least 2,500 people (people using the well may be living outside the area specified). c) Actively used maps with water yields that are greater than the yields shown for this region on the map in the manual. The map in the manual shows the specified yield for the Willamette Valley as 2,500 gallons per minute (gpm). d) Wells that are within a major alluvial valley and have yields exceeding 2,500 gpm.**

No. Contacts were made with EPA to confirm lack of special groundwater status of the area. The Benton County Public Works Department reports no wells that serve 2,500 or more people (Ervin, personal communication, 1989). The Water Master for Benton County at the Department of Water Resources reports the following representative well yields of larger wells in the area downstream of Jackson/Frazier Wetland and includes the following Sections in Township 11, Range 4:

Sec. 7	50-400 gpm
Sec. 8	48-400 gpm
Sec. 9	85-400 gpm
Sec. 16	75-700 gpm
Sec. 18	60-500 gpm
Sec. 19	50-825 gpm
Sec. 20	50-600 gpm

The Water Master characterized these well yields as good and stated the aquifer allowed heavy production (Mosgar, personal communication, 1989).

17. **Do well yields in the area specified surpass the criteria described in Question 16. c) or does the AA empty into an area (within two miles) where fish or wildlife use has been critically limited by excessively low water flow or low water level during dry years?**

No. See Question 16. c) for well yield information. In regard to fish or wildlife use being critically limited by low water flow or low water level during dry years, the slough is normally dry due to the natural summer drought period of Oregon, and the Wetland is not considered to impact upon these oxbow lakes downstream in the summertime.

18. **Is either of the following conditions true for any of Questions 9-17 that were answered "Yes"? a) The AA is the only AA in the watershed of the closest service area. b) The AA is closer to the service area where the service identified in the question is delivered than any other AA in the watershed of the closest downstream service area.**

Yes. The Wetland is the closest wetland to the residential area of northeast Corvallis.

19. **Does the AA act as a buffer to features of social or economic value that are situated in erosion-prone or wave vulnerable area?**

No. The level portions of the Willamette Valley floodplain are not considered erosion-prone.

20. **Is any of the following true? a) The AA supports at least one fish species that is on the USFWS National Species of Special Emphasis List and is rare or declining in the region. b) The AA has a state or federal special designation relating to its recognized fishery value. c) There is commercial fishing or shellfishing within the AA/IZ.**

No. There is no large-scale fishing activity in the Wetland, but the question of whether any fish use Jackson/Frazier Wetland is not definitely answered. The site is generally dry in the summer, but there can be over five feet of water in the incoming Jackson/Frazier Creek in wintertime. Consultation with fisheries biologists (Shreck and Hall, personal communications, 1989) reveals uncertainty about the fish population. They state the possibility of cutthroat trout being in the upstream portion of the creeks. Native minnows are likely to use the Jackson/Frazier Wetland. In the mid-1980s, there was a program at Crescent Valley High School involving the stocking of Jackson Creek with silver salmon and steelhead trout. The salmon would have to travel through Jackson/Frazier Wetland to reach the Willamette River. No return of the salmon has been noted (Larson, personal communication, 1989). Cutthroat trout is on the USFWS National Species of Special Emphasis List (Appendix D) and has been observed in Jackson Creek; whether it uses the sluggish water of the Wetland is dubious. Regardless, cutthroat trout is not considered rare or declining in the region.

21. **Is any of the following true? a) The AA supports at least one wildlife species that is on the USFWS National Species of Special Emphasis List (Appendix C) and is rare or declining in the region. b) The AA has a state or federal special designation relating to its recognized wildlife value. c) A fee is charged at the AA for consumptive or nonconsumptive use of wildlife.**

No. Comparison of the Jackson/Frazier bird list (Jarvis 1978) (Appendix E) and the USFWS Special Emphasis List (Appendix D) shows three species in common: 1) Canada Goose (Pacific Flyway population), 2) Wood duck, and 3) Mallard. These species are not rare or declining in the region (Jarvis, personal communication, 1989).

22. **Is the AA in a waterfowl use region of major concern as defined by the USFWS or has it received a priority rating in state waterfowl concept plans?**

I (used for incomplete data or when question does not apply). The instructions for this question state to answer "I" if there is less than one acre of open water at the site. Field inspection of the site in October showed only minor patches of open water. In winter, more than one acre of open water exists and the answer would be "Yes," as the Willamette Valley is considered a waterfowl use region of major concern (Peters, personal communication, 1989).

23. **Does this AA support plant or animal species with exceptionally narrow habitat requirements or of extremely limited occurrence in this region?**

Yes. Rare species indicate rare habitat types (Marshall 1985). Lomatiium bradshawii and its associated Deschampsia caespitosa wet prairie are a severely diminished resource in the Willamette Valley (Marshall 1985).

24. **Is the AA the closest wetland to any nature center, school, camp, college, or similar education facility, and is it within 2,000 feet of a public road where parking is allowed?**

Yes. Cheldelin Middle School in northeast Corvallis is located approximately 1,500 feet south of Jackson/Frazier Wetland. The next closest wetland is a small riparian forested wetland along Stewart Slough, which is approximately 2,000 feet from Jackson/Frazier Wetland.

25. **Is the AA part of, and essential to, an ongoing long-term environmental research or monitoring program?**

Yes. Although no formal long-term program exists at the present time, a "Yes" answer is justified due to abundant scientific documentation and interest in the area. An extensive bird list (Jarvis 1978) and plant list (Halse and Chambers 1980) are available. Detailed vegetation studies have been contributed by EPA (Boss 1979) and a Master's thesis (Marshall 1985) on the Wetland has been completed. Other studies have involved hydrology (Buffkin-Drost 1985) and the effects of recent ditching on hydrology, vegetation, and groundwater (Scientific Resources, Inc. 1986).

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

No. The watershed has forestry, agricultural, and rural residential activities within it.

27. **Is the AA used regularly for recreational or consumptive activities, for which opportunities are otherwise locally deficient as recognized by a local or state recreational plan?**

No. Opportunities for hiking, bird-watching, etc. exist at McDonald State Forest and Finley National Wildlife Refuge in Benton County and Willamette and Siuslaw National Forests in the nearby Coast and Cascade Ranges.

28. **Is the AA a major access point to a recreational waterway?**

No.

29. **Is the AA located in an urban area?**

No. According to the criteria given in the manual, the AA does not meet urban area standards (Appendix F).

30. **Is the AA located in a state that is losing wetlands at a rate greater than, or equal to, the national average of 0.42% per year?**

Yes. For Oregon, the WET manual provides no true data, so the national average of 0.42% per year is given. It is likely that the figure may be higher in the agricultural Willamette Valley (Frenkel 1982). Mitchell (1989) reports a 10% decrease in non-riparian wetlands in the Tualatin

Valley. However, the data given in the manual was used in answering this question.

31. **Is the AA's wetland acreage (expressed as a percentage of the acreage of the wetlands in the watershed of the closest service area, greater than the annual percentage loss rate of wetlands for the state?**

Yes. See Table 1 (4.6%).

SOCIAL SIGNIFICANCE EVALUATION

Level 1 Assessment

The level 1 answers were interpreted using the keys provided in the manual (Appendix G) and yielded the following evaluations of the values and functions provided by Jackson/Frazier wetland at an initial level. Ratings may be low, moderate, or high for any given function.

Groundwater Recharge: moderate
Groundwater Discharge: moderate
Floodflow Alteration: high
Sediment Stabilization: moderate
Sediment/Toxicant Retention: moderate
Nutrient Removal/Transformation: moderate
Wildlife Diversity/Abundance: high
Aquatic Diversity/Abundance: high
Recreation: low
Uniqueness/Heritage: high

EFFECTIVENESS AND OPPORTUNITY EVALUATION

Level 1 Assessment

1. Climate

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

No. The Willamette Valley is in a humid, temperate region and is not shown on the manual's map of precipitation deficit regions.

1.2 **Is either of the following conditions true? a) The AA is located in one of the intense storm regions located on the map. b) The rainfall erosivity factor for the area is greater than 300 and if the AA is in a tidal area, tidal range is less than three feet.**

No. No portion of Oregon is shown on the manual's map of intense storm regions. The erosivity factor for western Oregon is 70 (a variable given

by the Soil Conservation Service (SCS) for use in the Universal Soil Loss Equation).

1.3 **Does the entire AA freeze over for more than one month during most winters?**

No. Analysis of climate data for Corvallis shows mean daily lows in the coldest month, January, to be in the mid-30s (degrees Fahrenheit).

2. Acreage

2.1 **Is the surface area of the AA and any accessible (to fish) wetlands within one mile of the AA: a) less than five acres? b) greater than 40 acres? c) greater than 200 acres?**

The surface area is greater than 40 acres. The size of 159 acres is based on Marshall (1985). The fish population of the area is unknown. However, most of the upstream wetlands are riparian wetlands and water is contained only in the channel. The forested area is only moist to saturated and therefore these areas are not considered accessible at this time. There is a riparian wetland along Stewart Slough approximately one mile downstream of the Wetland; however, the Slough is dry at the time of this report (late October-early November).

2.2 **Is the forested area within the AA and up to one mile away from the AA: a) less than five acres? b) greater than 40 acres?**

The forested area is greater than 40 acres. The area was digitized based on Marshall's (1985) vegetation map (Figure 6) and found to be 105 acres (66%) of the site (see Table 1). No forested corridors extend from the area.

3. Complex, Cluster Oasis

3.1 **Are there other wetlands within one mile of the AA?**

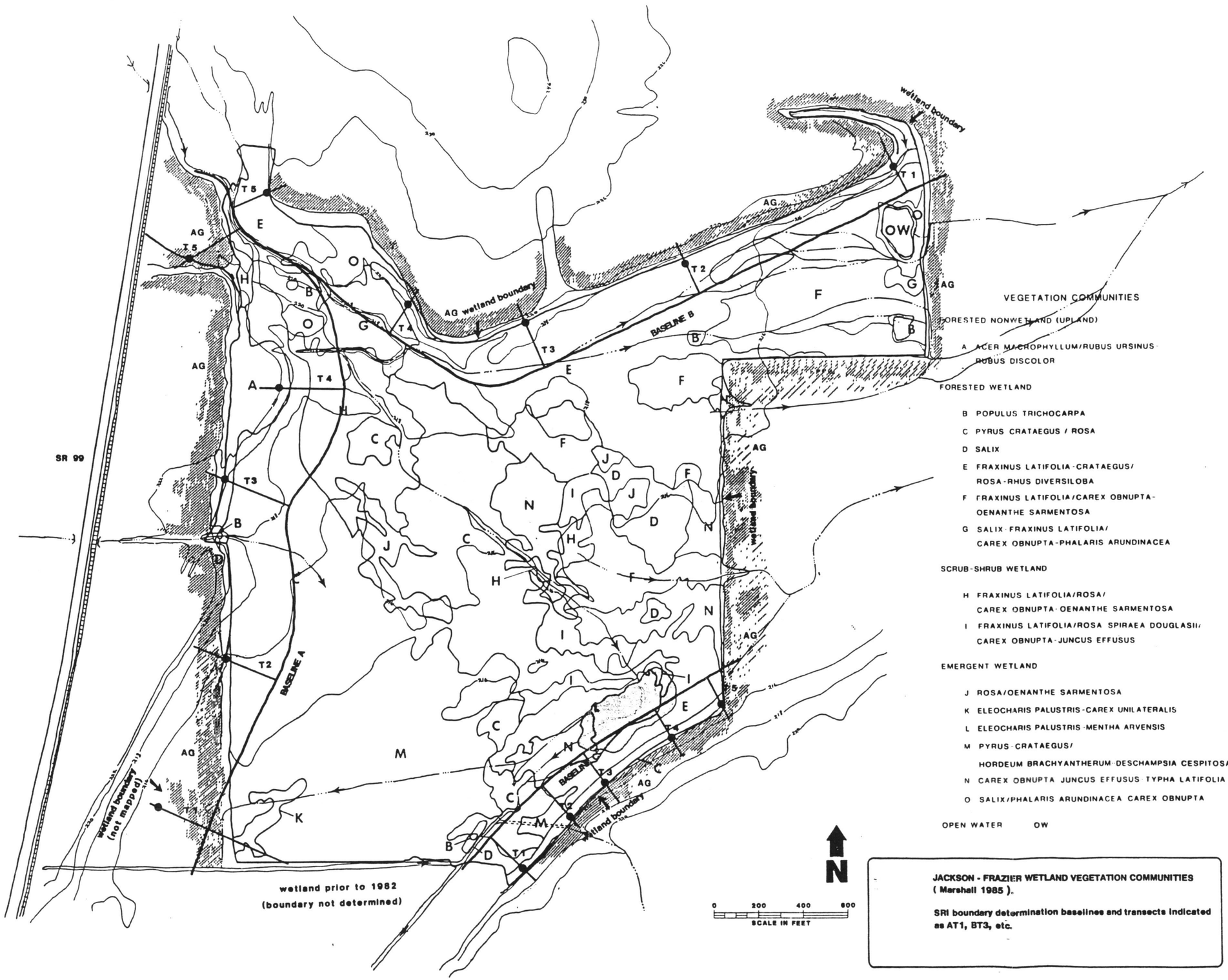
Yes. National Wetlands Inventory Maps show eight other wetlands within one mile of Jackson/Frazier totalling approximately 81 acres.

3.2 **Within 1,000 yards of the AA's center, is the acreage of emergent scrub-shrub/forested wetland classes greater than the criteria acreage shown for the corresponding type in the "cluster" columns shown in the manual?**

Yes. There are 105 acres of forested area. The criteria acreage for Oregon given in the manual is 4.6 acres.

3.3 **Within 1,000 yards of the AA's center is the acreage of emergent or scrub-shrub/forested wetland classes less than the criteria acreage shown in the manual for the corresponding type in the "oasis" column?**

Figure 6. Jackson/Frazier Vegetation Map (from Marshall 1985) (next overleaf)



VEGETATION COMMUNITIES

FORESTED NONWETLAND (UPLAND)

A ACER MACROPHYLLUM/RUBUS URSINUS-RUBUS DISCOLOR

FORESTED WETLAND

B POPULUS TRICHOCARPA

C PYRUS CRATAEGUS / ROSA

D SALIX

E FRAXINUS LATIFOLIA-CRATAEGUS/ROSA-RHUS DIVERSILOBA

F FRAXINUS LATIFOLIA/CAREX OBNUPTA-OENANTHE SARMENTOSA

G SALIX-FRAXINUS LATIFOLIA/CAREX OBNUPTA-PHALARIS ARUNDINACEA

SCRUB-SHRUB WETLAND

H FRAXINUS LATIFOLIA/ROSA/CAREX OBNUPTA-OENANTHE SARMENTOSA

I FRAXINUS LATIFOLIA/ROSA SPIRAEA DOUGLASII/CAREX OBNUPTA-JUNCUS EFFUSUS

EMERGENT WETLAND

J ROSA/OENANTHE SARMENTOSA

K ELEOCHARIS PALUSTRIS-CAREX UNILATERALIS

L ELEOCHARIS PALUSTRIS-MENTHA ARVENSIS

M PYRUS-CRATAEGUS/HORDEUM BRACHYANTHERUM-DESCHAMPSIA CESPITOSA

N CAREX OBNUPTA JUNCUS EFFUSUS-TYPHA LATIFOLIA

O SALIX/PHALARIS ARUNDINACEA CAREX OBNUPTA

OPEN WATER OW

JACKSON - FRAZIER WETLAND VEGETATION COMMUNITIES (Marshall 1985).

SRI boundary determination baselines and transects indicated as AT1, BT3, etc.

No. Instructions state to use the lesser amount if both emergent and forested classes exist. The amount of emergent vegetation is approximately 33 acres. The "oasis" listing is 0.8 acres.

4. Location and Size

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

Yes. Jackson/Frazier Wetland is approximately two miles from the Willamette River at its nearest point.

4.2 **The watershed of the AA is: a) less than one square mile? b) 1-100 square miles? c) 100-2,500 square miles? d) greater than 2,500 square miles?**

The watershed is within the 1-100 square miles category; it is approximately 7.09 square miles (see Table 1).

5. Assessment Area/Watershed Ratio

5.1 **What percentage of the AA watershed acreage does the AA comprise? a) less than 5% (or 10% if region is dry). b) more than 20% (or 15% if region is dry).**

The AA of Jackson/Frazier comprises less than 5% of the watershed acreage; the percent coverage is 3.59%.

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

No. Upslope AAs comprise 1.6% of the watershed.

6. Local Topography

6.1 **Are any of the following conditions present? a) The AA is a playa. b) The drop in elevation from the downslope end of the AA to a point two miles downslope (or to the bottom of a valley, whichever comes first) is greater than the rise in elevation from the upslope end of the AA to a point two miles upslope (or to the top of a ridge, whichever comes first). c) The AA is located within two miles of a topographic divide that separates two major watersheds and is not at the toe of a slope greater than 20%.**

No. Conditions a) and c) are not present based on observation of a topographic map. Concerning b), the drop in elevation from the AA's exit to a point two miles downslope is 30 feet (216 feet - 186 feet); from the upslope end to the nearest ridge top (in the northeast corner of the basin) the elevation differential is 84 feet (314 feet - 230 feet).

6.2 **Do soil maps, geologic maps, or field inspection indicate that any of the following is true? a) A geologic fault, oriented perpendicular to surface flow, is present within the AA. b) Within the AA's watershed, the**

permeability of the soils decreases in a downslope direction toward the AA. c) The AA is at the base of a relatively steep regional slope.

No. Analysis of geologic maps and comments on the stratigraphy of Jackson/ Frazier Wetland (Norgren 1984) reveal no faults beneath the wetland. Typical soils in the upper watershed are the Dixonville and Price series which have slow to moderately slow permeability. Typical downstream watershed soils are Hazelair silt loam and Willamette silt loam which have permeabilities ranging from moderate to very slow. No trend toward a significant decrease in permeability is noted. The AA is approximately two miles from the hills of the Coast Range and is not considered to be at the base of a relatively steep regional slope.

7. Gradient

Is either of the following true? a) The AA does not have a channel or the annual floodplain is wider than the channel. b) The channel gradient of the AA is less than the corresponding gradient value shown in the table.

I. The instructions state to answer this question "I" (incomplete) if Question 41, concerning water velocity, can and will be answered.

8. Inlets, Outlets

Does the surface water enter and/or exit the AA through an: a) inlet with permanent flow? b) inlet with intermittent flow? c) Outlet with permanent flow? d) Outlet with intermittent flow?

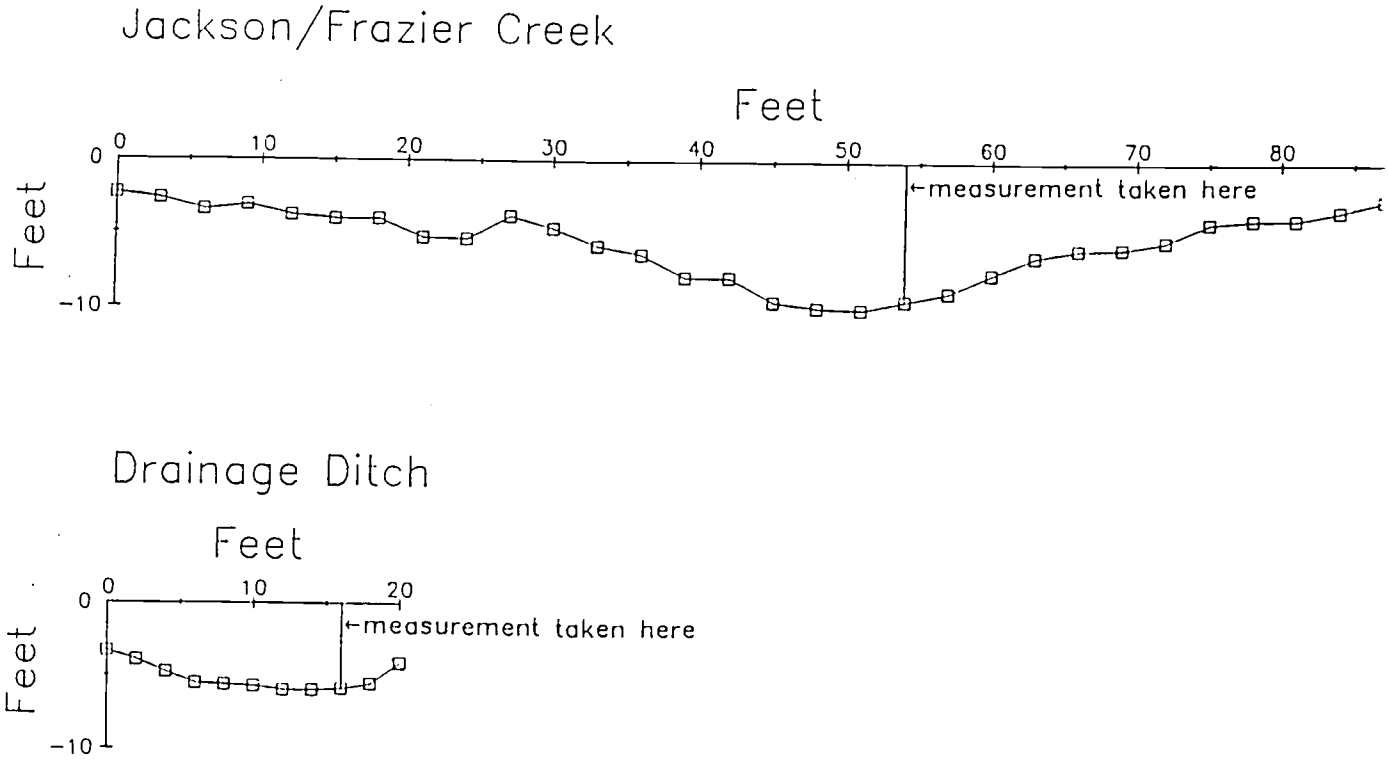
The AA has an inlet with intermittent flow, based on U.S. Geological Survey (USGS) topographic maps and Buffkin-Drost's work (1985) which showed inflow to range from 0 to 190 cubic feet per second (cfs). All outlets have intermittent flow.

9. Constriction

9.1 **Is any of the following true? a) Channel flow is present, and the width of the AA's outlet(s) at annual high water, is less than 1/3 the average width of the AA perpendicular to flow. b) Channel flow is present, and the cross-sectional area of the AA's outlet(s) is less than the cross-sectional area of the inlet(s). c) Channel flow is not present, and the total width of the AA's outlet(s) is less than 1/10 the average width of the AA.**

Yes. Cross-sections of Jackson/Frazier Creek and Stewart Slough drainage ditch from Buffkin-Drost (1985) are used (Figure 7). In addition, the Frazier Creek bankfull cross-section was measured (Figure 8). Other drainages leaving the Wetland are estimated to have a discharge of less than 5 cfs (Buffkin-Drost 1985) and are considered insignificant. For a), the combined width of the outlet channels is 34 feet, while the average width of the AA perpendicular to flow is greater than 500 feet. To determine if b) was true, the three cross-sections were digitized to

Figure 7. Stream Cross Sections (from Buffkin-Drost 1985)



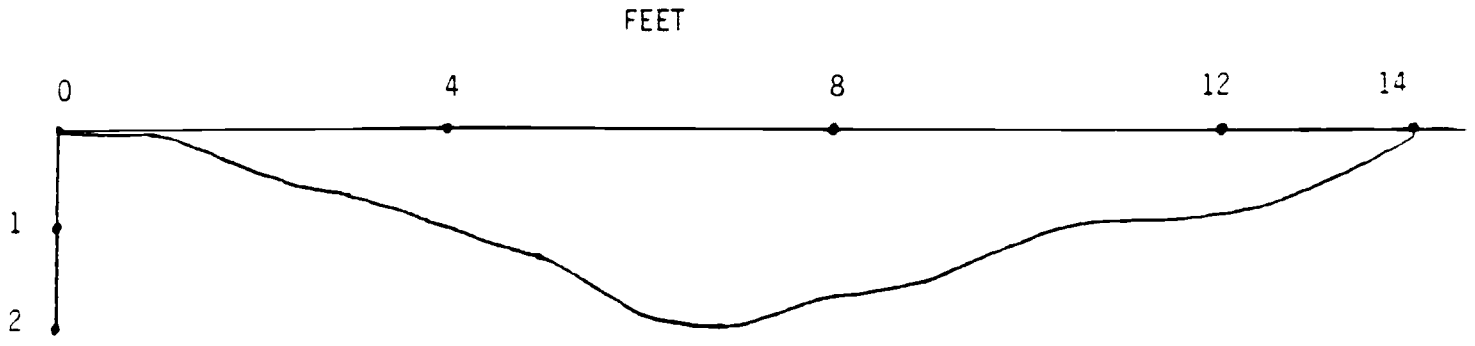


Figure 8. Cross-section of Frazier Creek Ditch

calculate areas. The area of Jackson/Frazier Creek is 514.2 square feet, while the area of Frazier Creek Ditch (bankfull) is 57 square feet and the area of Stewart Slough Ditch is 103.5 square feet, making a combined total of 160.5 square feet and thus providing the wetland with a constricted outlet.

9.2 **Does sheetflow from a contiguous body of water inundate wetlands in the AA at least once a year and subsequently exit the wetland through a constricted outlet or not exit the AA wetland at all?**

Yes. Although most water enters the wetland via Jackson/Frazier Creek channel, when flooding of the Wetland occurs, it results from overflow from the channel and sheetflow across the Wetland. The water will later exit through a constricted outlet as determined from Question 9.1 above.

9.3 **Does outflow from the AA originate mostly from precipitation or snowmelt occurring within the AA?**

No. This refers to wetlands with little or no watersheds. Most of the outflow from Jackson/Frazier Wetland results from drainage from the watershed.

10. Wetland System

Which wetland system covers the greatest area in the AA?

Palustrine. This is the only system in the Jackson/Frazier Wetland, based on the USFWS classification system (Cowardin, et al. 1979).

11. Fringe Wetland or Island

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

No. Fringe wetlands are wetlands along a moderate to large channel and which occupy less than three times the width of the adjacent channel. This is not the case for Jackson/Frazier Wetland.

12. Primary Vegetation Class/Subclass

Select the vegetation class and subclass that is: a) dominant in the AA. b) dominant at the edge of open water of Zones B and C. c) in contact with water over the largest area of the AA (i.e., roots and stems inundated).

The dominant vegetation class is forested (see Table 1) with the dominant subclass being broad-leafed deciduous (primarily Fraxinus latifolia).

The definition of Zone B requires explanation. As shown in Figure 9, zone B is the wetland portion of the AA which has visible, standing surface water. This can include channels, which would make definition of dominant vegetation in Zone B at Jackson/Frazier very difficult. However, contact

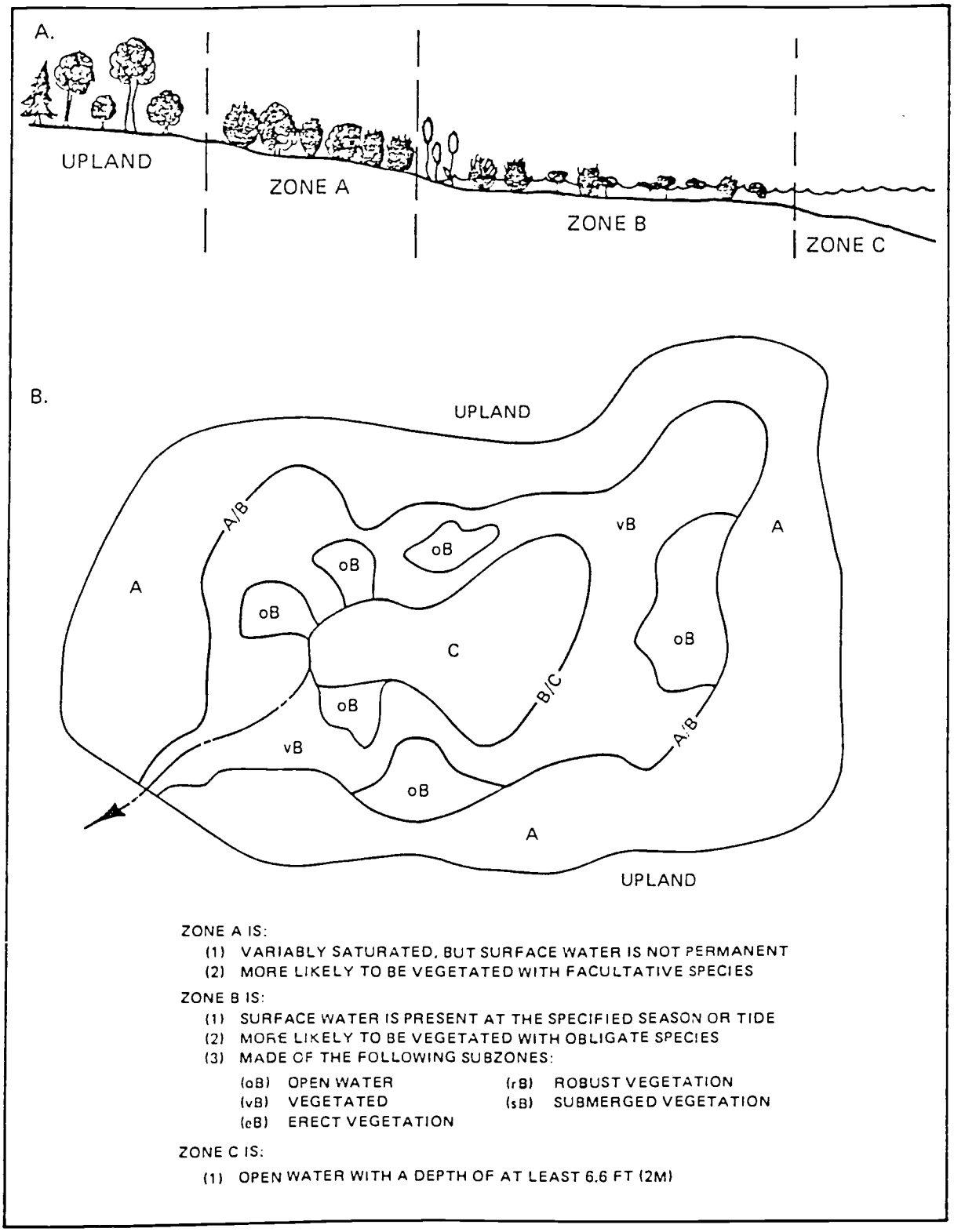


Figure 9. Wetland Zone Definitions (from Adamus 1987)

with the author of WET (Adamus, personal communication, 1989) revealed that Zone B generally has vegetation emerging from the water. At the present time, the stream channels through the ash swamp areas do not have any vegetation emerging from them. In the winter flood period, the ash forests along the channels may be inundated and there may be water standing at the base of the trees. At that time, the ash forest would be considered Zone B. Thus, Zone B can differ from season to season. At the time of this study (intermediate between the wettest and driest times), field inspection showed standing water in only small areas around the vernal pond and the ponds in the northeast corner These areas are considered Zone B in this report. The dominant vegetation class here is emergent, with the dominant subclass being persistent.

The dominant area in contact with water over the largest area of the AA is the same area mentioned in b) above--emergent, persistent vegetation. This is answered in terms of average hydrologic conditions.

13. Secondary Vegetation Class/Subclass

Select the vegetation classes and subclasses that comprise 10% of the AA or at least one acre of the AA.

Jackson/Frazier Wetland contains forested, broad-leafed deciduous; scrub-shrub, broad-leafed deciduous (Pyrus, Craetaegus, Salix); and emergent, persistent vegetation.

14. Island

Is the AA an island or does it contain part, or all, of an island that is: a) at least 25 square feet in size and at least 50 feet from the shoreline? b) at least two acres in size, separated from the mainland by water at least 30 inches deep and at least two miles offshore if the wetland system is marine or 0.5 mile offshore if the wetland system is not marine?

No. No islands exist at Jackson/Frazier Wetland.

15. Vegetation/Water Interspersion

15.1 **Does the horizontal pattern of erect vegetation in Zone B consist of: a) relatively few continuous areas supporting vegetation with little or no interspersion with channels, pools, or flats (see Figure 10)? or b) a condition intermediate between a) and c)? or c) A mosaic of relatively small patches of vegetation (i.e., none smaller in diameter than two times the height of the prevailing vegetation) interspersed with pools, channels, or flats?**

The photo shown as Figure 11 displays some patches of vegetation occurring within the open water area. In addition, there are some ponded areas within the forested and scrub-shrub areas within the Wetland.

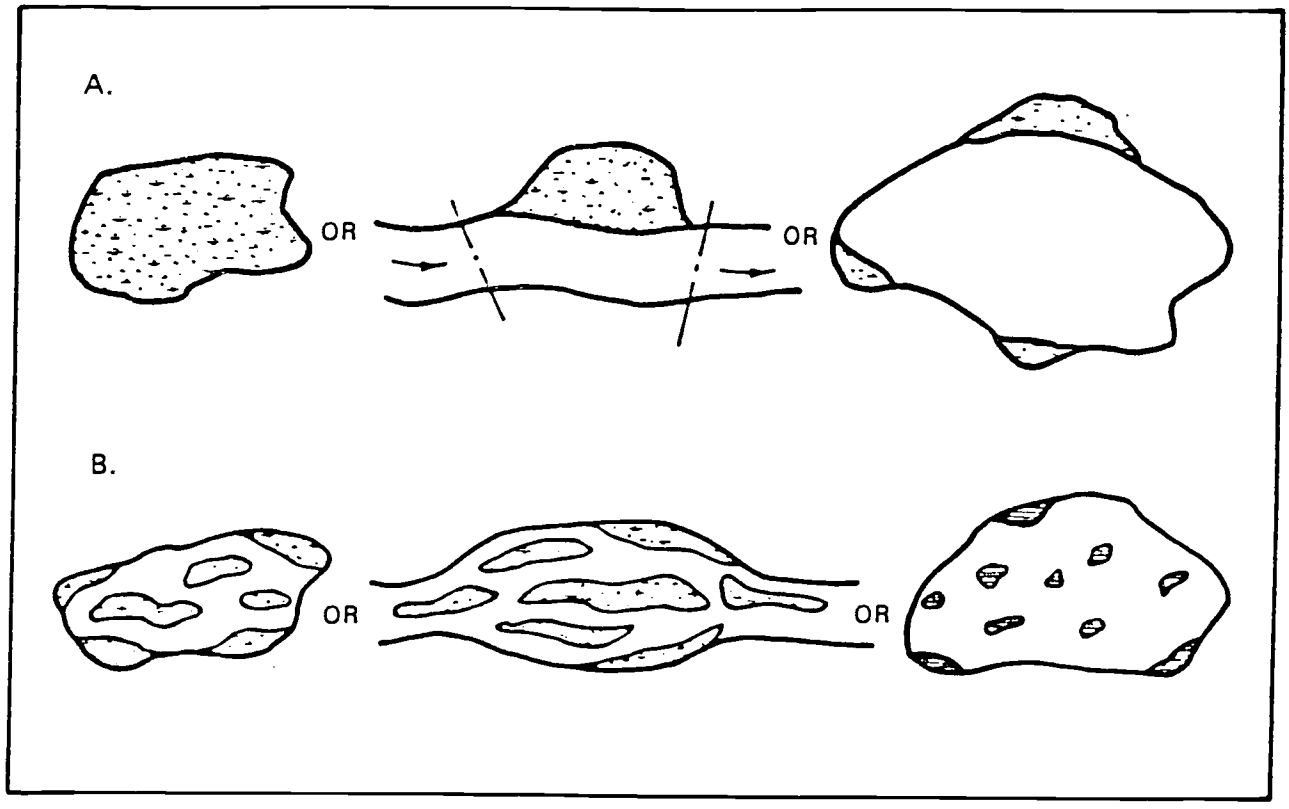


Figure 10. Examples of low and high vegetation/water interspersion. Note: In this figure, Part A exemplifies low vegeation/water interspersion (Question 15.1A = "Y"), and Part B exemplifies high vegetation/ water interspersion (Question 15.1C = "Y"). (from Adamus 1987)

Figure 11. Ponded area showing water interspersion with emergent vegetation.

15.2 **Is either of the following conditions present in that portion of the AA having measurable flow? a) In channel situations, vegetation in Zone B consists mainly of persistent emergent distributed in the mosaic pattern described in Figure 10). b) Under average flow conditions, water enters the AA in a channel and then spreads out over a wide area.**

Yes. Condition b) is considered true. The hydrologic map shown in Figure 12 shows several distributary channels leaving the main channel and spreading over a large portion of the AA.

16. Vegetation Class Interspersion

The horizontal pattern of vegetation classes in the AA consists of: a) relatively homogeneous areas supporting a single vegetation class with little or no interspersion between these homogeneous areas? or b) a condition intermittent between a) and c)? or c) a highly interspersed mosaic of relatively small areas (not less than 100 square feet) which support different vegetation classes?

Jackson/Frazier Wetland is considered to have a highly complex vegetation interspersion pattern (see Figure 6 and Marshall 1985).

17. Vegetation Class Composition

Are any of the following statements true? a) The AA is 1-10 acres and supports at least three vegetation classes (none of which comprises more than 70% of the AA's vegetation) or at least four vegetation subclasses. b) The AA is 10-100 acres and supports at least three vegetation classes (none of which comprises more than 70% of the AA's vegetation) or at least six vegetation subclasses. c) The AA is 100 or more acres and has four or more vegetation classes (none of which comprises more than 70% of the AA's vegetation) or at least eight vegetation subclasses.

Jackson/Frazier Wetland is 159 acres with the following vegetation classes present: forested, scrub-shrub, and emergent. In addition, duckweed, which is aquatic bed vegetation, was observed growing in sluggish portions of the channel and in some ponded areas.

18. Shape of Upland/Wetland Edge

Is the boundary between the upland and the AA irregular?

No. In Marshall's (1985) assessment of visual resources, the Jackson/Frazier Wetland is given a score of 3 out of a possible 15 for wetland edge complexity. Figure 13 shows a regular boundary as a result of agricultural fields being juxtaposed to the wetland.

19. Fetch/Exposure

19.1 **1. Is either of the following true (Answer "I" if the AA is composed primarily of Zone A.)? a) Adjacent vegetation or topographic relief is**

Figure 12. Hydrologic Map of Jackson/Frazier Wetland (from Scientific Resources, Inc. 1986) (next overleaf)

SCIENTIFIC RESOURCES, INC.

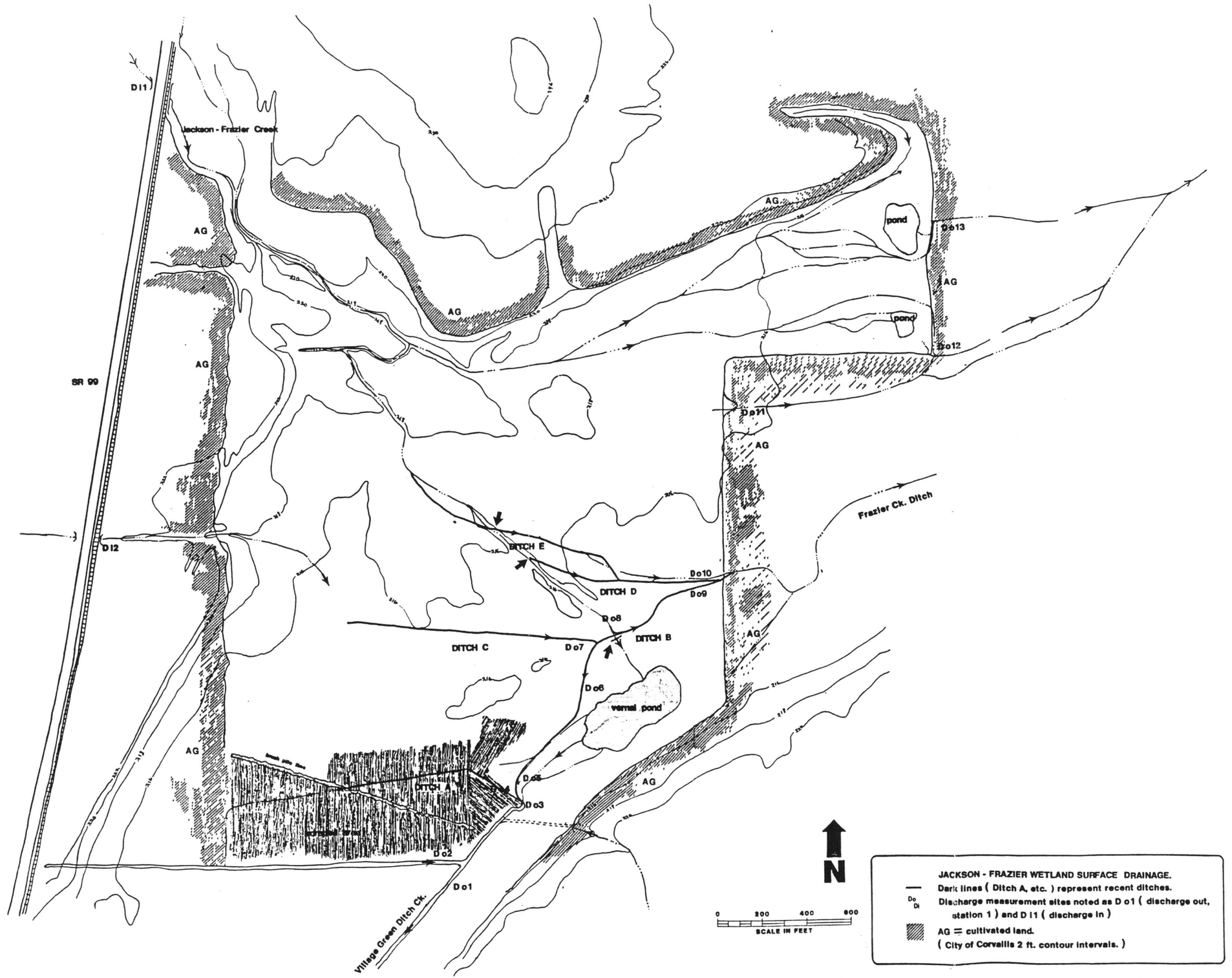


Figure 13. Photo showing the "regular" boundary of the Wetland's eastern edge.

sufficient to shelter from wind at least one acre of open water in Zones B or C. b) Open water fetch is less than 100 feet.

I. At this season, surface water areas are very small and the site is considered composed primarily of Zone A. In the winter flood period, there may be close to one acre of water in the vernal pool.

2. Is either of the following true? a) Vegetation or topographic relief adjacent to the AA is insufficient to shelter from wind at least one acre of open water in Zone B or Zone C and fetch is greater than two miles. b) Vegetation at the deepwater edge of Zone B is exposed to waves taller than one foot.

No.

19.2 **Is the AA, or a portion of the AA, an island, delta, bar, or peninsula that intercepts waves and thereby protects other nearby shores?**

No.

19.3 **Does woody vegetation within the AA shelter from wind adjacent, otherwise unsheltered uplands?**

Yes. Adjacent upland on the east (leeward) side of the Wetland is bare; however, no sensitive buildings or other items are there, as wind erosion and wind in general is not considered a local problem.

20. Vegetative Canopy

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

Yes. The density of vegetation as show in Figure 14 is sufficient to shade most of Zone B.

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

No. The input zone is composed predominantly of agricultural fields; no shading exists there.

21. Land Cover of the Watershed

The majority of the AA's watershed land cover is: a) forest and scrub-shrub? b) impervious surfaces? c) row crops, orchards, or vineyards? d) nonurban pasture, hayland, perennial forbs, or grassland? e) recently revegetated areas, landfills, surface mines, or other areas of exposed soils?

The majority of land cover is forest and scrub-shrub. After digitizing a U.S. Geological Service map, the forested area was found to be 50.3%

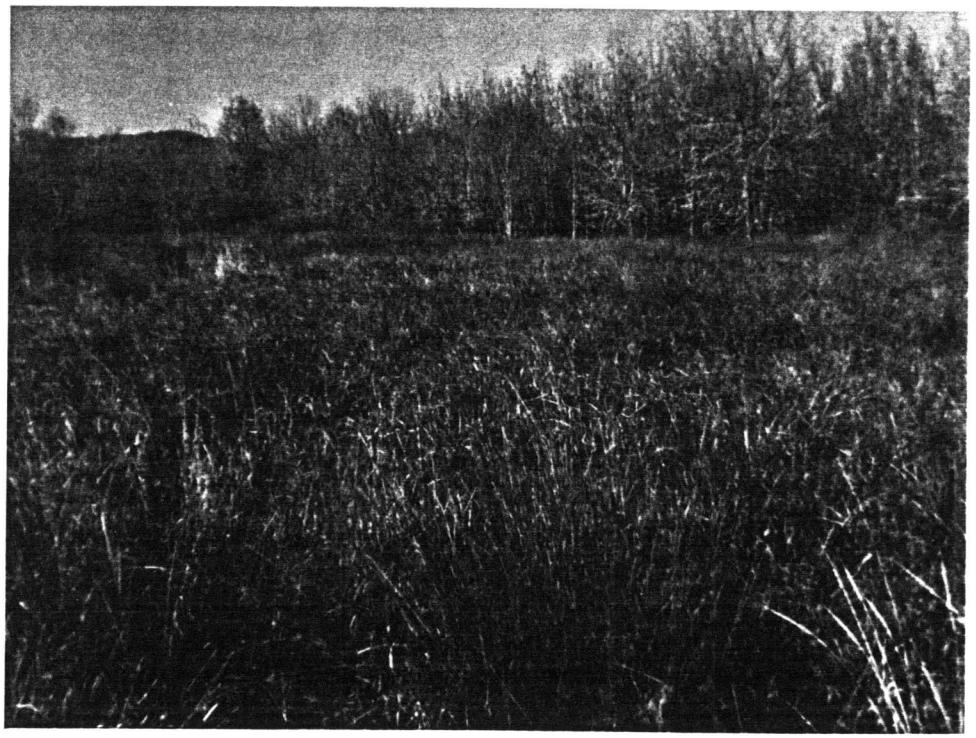


Figure 14. Photo showing sufficient density of emergent vegetation to shade the small ponded areas lying underneath.

(Table 1). If areas of scrub-shrub in residential areas that are not shown as forest land on the map are included the percentage would be higher.

22. Flow, Gradient, Deposition

22.1 **1. Is any of the following true? a) The AA contains a channel. b) The AA has an outlet and an inlet. c) The AA is tidal. d) The AA has seasonal flow as suggested by gage data, scour lines, sediment deposition on vegetation, etc.**

Yes. Conditions a), b), and d) above are all true.

2. Is the channel at least mildly sinuous with a meander ratio exceeding 1.2?

Yes. The ratio of the straight distance from the channel's entrance to its exit at Stewart Slough was measured with an engineer's scale along with the channel distance; the meander ratio is 1.47.

22.2 **Does the AA include, or is it part of, an actively accreting delta?**

No.

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

No. Although there is erosion within the channels (Frenkel, personal communication, 1989), the AA as a whole is not being eroded; in fact, sediments are accumulating within the AA (Norgren 1984).

23. Ditches, Canals, Channelization, Levees

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

Yes. The two major outlets of the Wetland, Stewart Slough and Frazier Creek Ditch, are both ditches and most likely accelerate water removal from the Wetland.

24. Soils

24.1 **Does analysis indicate that the soil type present in the AA contain more than 4,000 mg/kg of amorphous extractable aluminum in the upper eight inches?**

I. No data set on soil chemistry for Jackson/Frazier Wetland exists.

24.2 **Are both of the following true? a) Soil maps or a site visit indicate the dominance of alluvial, alfisol, ferric, clay, or other primarily fine**

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

Yes. The site is within the Willamette Valley floodplain and alluvium has been accumulating for thousands of years. A soil map (Figure 15) shows the site to be composed primarily of Waldo silty clay loam and Bashaw clay. The site is also in an area of elevated concentrations of iron (Figure 16).

24.3 **Do soil surveys indicate that soils in the AA have exceptionally slow infiltration rates due to presence of impeding layers (fragipan, duripan, claypan) or very shallow depth to unfractured bedrock?**

Yes. Most of Jackson/Frazier Wetland is composed of Bashaw and Waldo soil types which have permeabilities of slow to very slow (Benton County Soil Survey 1979). The site is also considered to have a claypan (Frenkel, personal communication, 1989).

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

Yes. An area one mile from the Wetland was digitized from the Benton County Soil Survey. Soil types were divided into moderate to moderately slow permeabilities and slow to very slow permeabilities. The results yielded the area of the slow to very slow permeability-type soils to be 61% of the total area.

24.5 **Is the AA in a karst region?**

No.

25. Sediment Sources

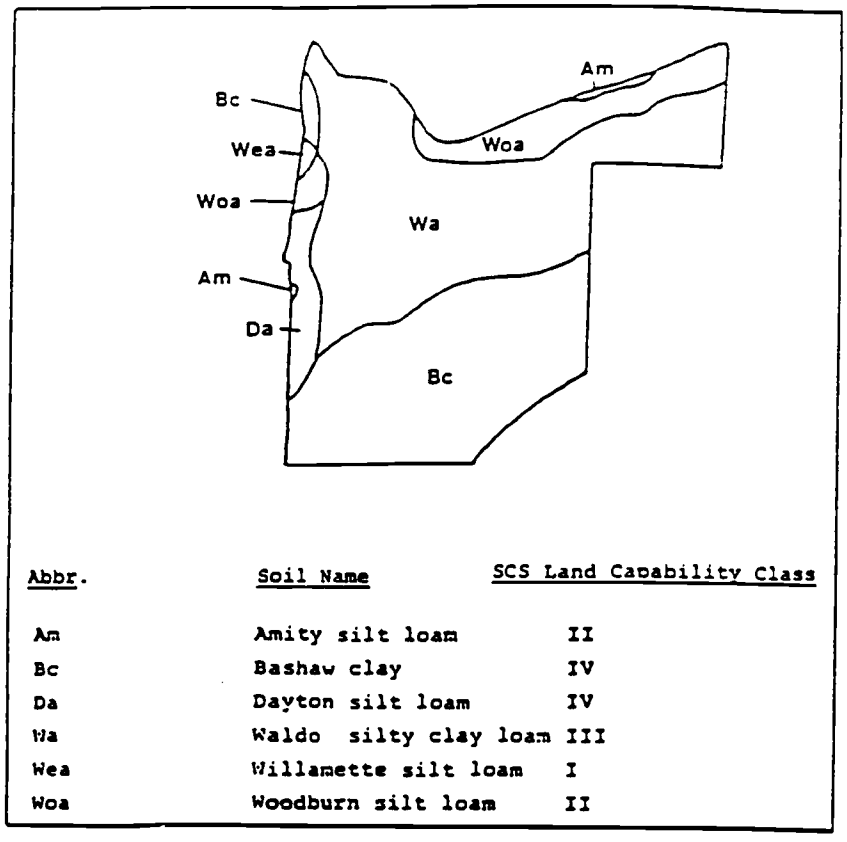
25.1 **Are there sediment sources that contribute inorganic sediment to the AA (To be considered, an area must comprise one acre, 2% of the input zone, or an area within 0.5 mile at least as large as the AA's wetland acreage)?**

Yes. The input zone is composed primarily of grass seed fields. Although throughout most of the year ground cover exists, there is a short time when bare ground exists.

25.2 **1. Is overland runoff the primary source of sediment entering the AA?**

Yes. The agricultural fields adjacent to the Wetland have little slope and no significant channels.

2. Is channel flow the primary source of the sediment entering the AA?



Abbr.	Soil Name	SCS Land Capability Class
Am	Amity silt loam	II
Bc	Bashaw clay	IV
Da	Dayton silt loam	IV
Wa	Waldo silty clay loam	III
Wea	Willamette silt loam	I
Woa	Woodburn silt loam	II

Figure 15. Jackson/Frazier Wetland soils (ESEE Analysis, Benton County Planning Department, p. 6)

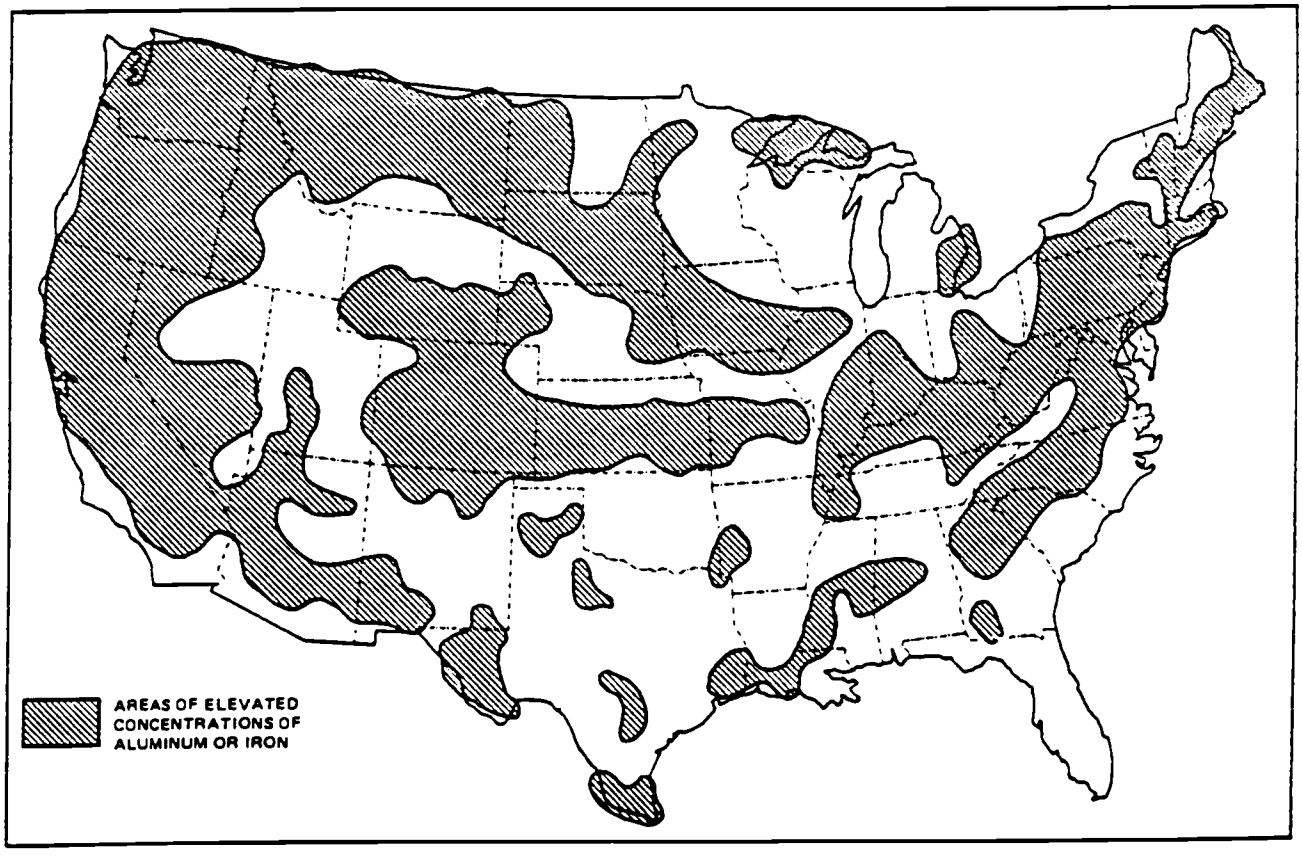


Figure 16. Geographic areas with elevated concentrations of aluminum or iron (Adamus 1987).

No. The input zone has little slope and no significant channels.

25.3 **Do any of the following conditions result in significantly elevated levels of suspended solids in a major portion of the AA? a) Erosion within the AA is caused by drastic fluctuation in water levels due to artificial manipulation or extensive urban runoff. b) Slopes immediately adjacent to the AA are steeper than 10% (or steeper than 1% if alluvial clays prevail) and are unstable. c) Boating activity causes frequent wakes that impinge on the deepwater fringes of the AA.**

No. Only b) is a possibly true conditions, but slopes in the input zone were calculated to be less than 1%. Regardless, these areas are considered to be stable.

26. Nutrient Sources

26.1 **Is there evidence of high nutrient concentration in the AA, or do any of the following sources contribute nutrients to the AA: a) sewage outfalls, phosphate mines, tile drains, canals, or other nutrient-rich sources? b) areas containing any of the following: feedlots, active pastureland, landfills, septic fields, fertilized soils, or soils tilled, burned, or cleared within the last two years? c) areas where the acreage of the AA divided by the number of houses with septic systems within the input zones is less than eight? d) areas where the acreage of the AA divided by the number of people living within the input zone is less than 25?**

Yes. Fertilizer application and field burning are associated with the adjacent grass seed farms. Typical fertilizer applications on grass seed farms consist of 30 pounds/acre of phosphorous and potassium and 70-80 pound/acre of nitrogen (Rackham, personal communication, 1989).

26.2 **Is overland sheetflow the primary source of the nutrients entering the AA?**

Yes. See Question 25.2.1.

26.3 **Is channel flow the primary source of the nutrients entering the AA?**

No.

27. Contaminant Sources

27.1 **Is there evidence of waterborne contaminants (in concentrations hazardous to aquatic life), or is there a source that contributes waterborne contaminants (in concentrations hazardous to aquatic life) to the AA?**

I. The runoff from Highway 99 is not considered significant enough to be hazardous to aquatic life. Pesticides are used, but not regularly; only if there are diseased or insect-ridden crops are pesticides used. Leachate from a lumber mill on the northwest corner of the Wetland may contribute tannins and other material to the wetland. Whether the concentrations of these materials are hazardous to aquatic life is unknown.

27.2 **Is sheetflow the primary source of the waterborne contaminants described above?**

I (not applicable).

27.3 **Is channel flow the primary source of the waterborne contaminants described above?**

I (not applicable).

EFFECTIVENESS AND OPPORTUNITY EVALUATION

Level 2 Assessment

28. Direct Alteration

Is either of the following conditions true? a) Most of the AA has been tilled, filled, or excavated at least once in the past three years. b) An outlet has recently been added to the AA where none previously existed.

No. In 1985, several new ditches had been created in the Wetland; however, these ditches drained into already existing outlets (Scientific Resources, Inc. 1986). Also, the ditches were filled during the next year.

29. Wetland/Upland Edge

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

Yes. Field inspection shows dense understory vegetation at the boundary throughout most of the Wetland's perimeter. Vegetation typical at the edge are the Rosa, Rhus, and Craetaegus genera and on the east side, areas of dense emergent vegetation occur on the boundaries (Figure 14).

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

Yes. Slopes were calculated and are less than 1% in the input zone.

30. Disturbance

Are both of the following conditions true? a) The AA, or areas adjacent and visible to the AA, are visited by people on foot, boat, or off-road vehicle at least three times daily. b) Surface water in the AA is mostly less than three feet deep and less than 1,000 feet from the usual places of human activity or greater than three feet deep and less than 600 feet from the usual places of human activity.

No. At the present time, the Wetland is still privately owned. Of the several times the site was visited, no other persons were seen and it is assumed that less than three people per day visit the site. No easy access or trails exist at the Wetland.

31. Water/Vegetation Proportions

31.1 **Are Zones A and B combined greater than Zone C?**

Yes. No Zone C (open water at least two meters deep) exists at the site.

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

No. At this time, the amount of standing water, a requirement for Zone B definition, was very small and does not constitute 15 acres (10%) of the Wetland. During winter flooding, this condition is mostly likely true.

31.3 **Is Zone B larger than Zone A?**

No. During average hydrologic conditions, Jackson/Frazier Wetland is composed primarily of Zone A.

31.4 **Is the area of submerged vegetation in Zone B larger than the unvegetated areas of Zones B and C?**

Yes. No portion of Zone B on the site has an unvegetated bottom, except for the channels.

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

Yes. The site is composed dominantly of Zone A (see Figure 9).

31.6 **What percent of Zone B and Zone C together are dominated by emergent vegetation? a) 0. b) 1-3. c) 31-60. d) 61-99. e) 100.**

Emergent vegetation dominates in all areas but small portions of the open water area of Zone B.

32. Hydroperiod

What is the dominant flood regime of the AA?

Seasonally flooded nontidal is the dominant regime. The seasonal period of flooding in this wetland is from late autumn through spring.

33. Most Permanent Hydroperiod

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

Saturated non-tidal is the best description. National Wetlands Inventory maps show the vernal pool area to be classified in this hydrologic regime. This area was flooded until mid-April in 1980 and flooded in small channels in the pond bottom until July 1 that year (Scientific Resources, Inc. 1980).

34. Water Level Control

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

No. Jackson/Frazier Wetland is the result of naturally occurring processes (Norgren 1984).

34.2 **Is the AA located less than two miles downslope from a large impoundment (higher than 20 feet at its outlet), or is the AA's water table influenced by any other type of upstream impoundment?**

No. No impoundments exist upslope of the site.

34.3 **1. Is any part of the AA flooded (even seasonally) due to permanent or temporary ponding created by a dam or dike, or is the AA actively managed for stormwater or floodwater detention?**

No. No dams exist within the AA, and it is not actively managed for stormwater detention.

2. Is flooding in the AA a result of beaver activity?

Yes. A beaver has been noted by Marshall (1985) and Frenkel (personal communication, 1989). A site reconnaissance revealed a beaver dam in the north-central portion of the Wetland.

35. Flooding Extent and Duration

35.1 **Does flooding cause surface water to expand to more than three times (200%) its extent under average conditions for more than 25 days during and average year?**

Yes. Under average conditions, only small ponded areas of open water and channel water exist. Under flood conditions, the entire site can be flooded (Marshall; Lightcap, personal communications, 1989).

35.2 **Is any of the following conditions true? a) Base flow typically fills less than 60% of channel volume. b) Surface water is absent five days after a mean monthly 24-hour storm, and the watershed is larger than 10 square miles. c) The ratio of the high flow (measured in cfs) that is reached or exceeded 10% of the year, versus the typical low flow that is exceeded 90% of the year, is greater than 1.5.**

Yes. Considering the fact that in summer the channels are dry, base flow is assumed to be minimal or nonexistent. Considering Buffkin-Drost's measurements (1985) of high and low flow, which range from 0 to 190 cfs, the ratio of typical high flow to typical low flow is definitely greater than 1.5.

36. Vegetated Width

36.1 **Is the average width of the area dominated by emergent, scrub-shrub, or forest vegetation in Zone A and/or Zone B: a) less than 20 feet? b) greater than 500 feet, or the AA is constricted and the vegetation is present throughout?**

The average width is greater than 500 feet. Maximum width measured from the central channel is over 1,200 feet. Only in the southeast corner does the width drop to approximately 225 feet.

36.2 **Is the average width of the area in Zone B that supports emergent vegetation and where depth seldom exceeds 50% plant height: a) less than 20 feet? b) Less than 20 feet and mainly persistent emergent vegetation? c) Greater than 500 feet, or alternatively, the AA is constricted, emergent vegetation is present throughout, and stem density is approximately 50 stems per square meter or greater?**

None of the above are true. The duck ponds in the northeast corner had surface water which was greater than 20 feet wide. Even if the entire emergent vegetation areas are considered Zone B (as shown on the vegetation maps), they would not have an average width of 500 feet.

37. Open Water Width

Is there an area of open water in the AA that meets all of the following conditions? a) Mostly devoid of aquatic bed vegetation. b) Depth exceeding two feet. c) Width greater than six feet. d) Length at least 1,000 feet or an area serving to connect two large water bodies.

Yes. The Jackson/Frazier Creek meets these criteria. Depth at some points is greater than four feet, and width ranges from 45 feet down to six feet, at a point in the north-central portion of the Wetland where it begins to diminish in discharge.

38. Type Combinations (National Wetlands Inventory maps were used to answer the following questions.)

38.1 **The AA is predominantly: a) permanently flood, nontidal or b) seasonally flooded, forested, and/or scrub-shrub <u>and</u> within one mile of the AA there is a separate AA where the other situation described is predominant? In addition, to answer this question "Yes," both AA's must be accessible to the same fish population for at least 20 days of the year.**

No. The AA is predominantly seasonally flooded, but the situation in a) is not met within one mile of the AA.

38.2 **The AA: a) is predominantly nontidal with erect vegetation or rooted, vascular floating-leafed vegetation in Zone B or b) contains at least one acre of hardwoods (less than six inches in diameter at breast height (dbh)) with greater than 25% canopy closure, and within 0.5 mile of the AA there is a separate AA where the other situation described is predominant?**

Yes. Condition a) is true. Regarding b), there is a 25-acre riparian zone wetland northwest of the Jackson/Frazier. Typical Oregon riparian wetlands contain small red alder, Oregon ash, etc.

38.3 **The AA is predominantly: a) estuarine or marine or b) freshwater palustrine or lacustrine, or on a coastal island, and within five miles of the AA there is a separate AA where the other situation described is predominant?**

No. No estuarine or marine systems exist within five miles of Jackson/ Frazier.

38.4 **The AA is predominantly: a) mudflat or b) tidally scrub-shrub, and adjacent to the AA there is a separate AA where the other situation described is predominant?**

No. Neither of these types exist in the area.

38.5 **The AA contains: a) at least five acres of mudflat or b) at least five acres of emergent vegetation, and adjacent to this area of at least five acres there is a separate area where the other situation described exists?**

No. No mudflat areas exist in the area.

38.6 **The AA: a) is predominantly agricultural, or is predominantly early successional stage vegetation, or contains at least five acres of emergent vegetation in Zone A or b) contains at least 10 acres of evergreen forest, and within 0.5 mile of the AA there is a separate AA where the other situation described exists?**

No. A small portion of evergreen forest exists to the west of Highway 99, but it is not a wetland.

38.7 **The AA is predominantly: a) semipermanently flooded or b) seasonally flooded or c) permanently flooded, nontidal, intermittently exposed, or artificially flooded and managed for wildlife, and within one mile of the AA there are separate AAs where the other situations described are predominant in at least one acre of the AA?**

No. The hydrologic regimes in a) and c) do not exist within one mile of Jackson/Frazier Wetland.

38.8 **The AA is predominantly: a) cottonwood-willow stands (greater than one acre)? b) honey mesquite (greater than one acre)?**

I. This question applies only to Southwestern riparian wetlands.

39. Special Habitat Features

Is either of the following conditions true? a) The AA is less than 100 acres and two of the features listed below are present. b) The AA is more than 100 acres and three or more of the features listed below are present.
- **standing snags with cavities larger than two inches**
- **trees with diameter exceeding 10 inches**
- **plants bearing fleshy fruit (e.g., cherry, persimmon)**
- **mast-bearing hardwoods (e.g., oak, beech, hickory)**
- **cone bearing trees or shrubs**
- **tilled land with waste grains**
- **evergreen tree stands with over 80% canopy closure**
- **native prairie**
- **exposed bars**

Yes. The site is 159 acres. At least three and possibly four of the above features are present at the site. Frenkel (personal communication, 1989) reports standing snags at the site. A survey of trees revealed several Oregon ash trees ranging in dbh up to 24 inches. The native Deschampsia caespitosa wet prairie exists on the site. Also, the following trees from Marshall's vegetation list (1985) is a partial listing of species which have fleshy fruit: hawthorne, apple, cherry, pear, Oregon grape, snowberry, cascara, and rose.

40. Bottom Water Temperature

The average daily minimum summer water temperature at the deepest part of the AA is usually: a) less than 50° F? b) greater than 69° F?

If there is water in Jackson/Frazier Creek in summertime it would most likely fit neither category, since average daily minimum air temperature in summer is less than 69° F.

41. Spatially Dominant Velocity

During peak annual flow, is the velocity throughout most of the AA: a) less than 0.3 feet/second, or if unknown, most of the AA flooded for less than five days annually? b) greater than 1.5 feet/second, or greater than 3.3 feet/second and substrate is cobble-gravel?

Based on Buffkin-Drost's discharge measurements (1985), velocity at peak flow at Jackson/Frazier Creek was .64 feet/second, while the velocity at the drainage ditch (Stewart Slough) was 1.07 feet/second. Therefore, neither condition is true. The substrate of the channels is not cobble-gravel, but rather mud.

42. Secondary Velocity

42.1 **Which velocity categories reflect seasonal flows that occur in at least one acre or 10% of the AA? a) 0-1 foot/second. b) 1-3.3 feet/second. c) more than 3.3 feet/second.**

0-1 foot/second is the category that most likely fits, given the data of Buffkin-Drost (1985).

42.2 **Which velocity categories reflect seasonal flows (wet and dry) that occur in other AAs within one mile of the AA and are accessible to fish for at least 20 days each year? a) 0-1 foot/second. b) 1-3.3 feet/second. c) more than 3.3 feet/second.**

Given that upstream AAs contain a smaller channel, it is likely that flows of 0-1 foot/second (dry season) and 1-3.3 feet/second occur (wet season).

43. Spatially Dominant Water Depth

Which depth category covers the greatest portion of the AA? a) Less than one inch. b) 1-4 inches. c) 5-8 inches. d) 9-20 inches. e) 21-39 inches. f) 40-59 inches. g) 5-6.5 feet. h) 6.6-26 feet. i) greater than 26 feet.

At the current time, less than one inch of water covers most of the area.

44. Secondary Water Depth

Which water depth categories cover at least one acre or 10% of the AA or other AAs within one mile that are accessible to fish from this AA during at least 20 days of the year?

From knowledge of others who have done field work in Jackson/Frazier Wetland (Marshall; Lightcap, personal communication, 1989), categories a)-e) above are most likely present in areas of at least one acre during the flooding period.

45. Spatially Dominant Substrate Type

Is the surface substrate (upper three inches) in the AA predominantly: a) mineral soil or mud? b) muck? c) peat? d) sand? e) cobble-gravel? f) pebble? g) bedrock?

The soil is considered to be mineral (Frenkel, personal communication, 1989).

46. Physical Habitat Interspersion

Within Zones B and C are substrate types, velocity, and depth categories distributed: a) uniformly with similar substrate types, velocity, and

depth through the AA? b) in intermediate conditions? c) in a mosaic of substrate types, velocities, and depth?

Although substrate types are similar, there may be muck in the saturated emergent areas. Also, different depths of water exist in areas of Zone B.

47. Water Chemistry

Is the pH of the water in the AA: a) 6.0-8.5 (neutral)? b) below 6.0 (generally acidic)? c) above 8.5 (generally alkaline)?

The pH of water in the ponds was measured to be circumneutral (Frenkel, 1982).

48. Salinity and Conductivity

What is the AA's salinity or conductivity?

The water is completely fresh.

49. Aquatic Habitat Features

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

No. No permanently flooded stream reaches occur on the site.

49.1 **2. Does the AA include, or is it included in a stream reach with a cobble-gravel substrate and riffles spaced at intervals of five to seven times the average stream width?**

No.

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

Yes. Submerged logs, stumps, tree roots, and crevices occur in Jackson/ Frazier Creek at the entrance to the Wetland.

49.3 **Are carp prevalent in the AA?**

No. Carp are not prevalent in this portion of the Willamette Valley (Hall, personal communication, 1989).

50. Plant Populations

Does any plant or combination of plants listed in the manual comprise more than 10% or one acre of the AA?

Yes. Among the wetland food plants preferred by waterfowl listed in the manual and found at Jackson/Frazier Wetland are: Carex, Juncus, and Eleocharis.

The evaluation of Jackson/Frazier Wetland as determined on the second level using the interpretation keys yielded the following ratings:

Groundwater Recharge: Uncertain
Groundwater Discharge: Low
Floodflow Alteration Effectiveness: High
Floodflow Alteration Opportunity: High
Sediment Stabilization: High
Sediment/Toxicant Retention Effectiveness: High
Sediment/Toxicant Retention Opportunity: High
Nutrient Removal/Transformation Effectiveness: High
Production Export: Moderate
Aquatic Diversity/Abundance: Low
Wildlife Diversity/Abundance: High
Wildlife Diversity/Abundance for Migration and Wintering: High

Jackson/Frazier Wetland Vascular Plants

(Prepared by Richard Halse and Kenton Chambers, 1978-1980)

ALISMACEAE
- Alisma plantago-aquatica

ANACARDIACEAE
- Rhus diversiloba

ASCLEPIADACEAE
- Asclepias fascicularis

BERBERIDACEAE
- Berberis aquifolium

BETULACEAE
- Corylus cornuta

BORAGINACEAE
- Myosotis discolor
- Myosotis laxa
- Plagiobothrys figuratus
- Plagiobothrys scouleri

CALLITRICHACEAE
- Callitriche palustris

CAMPANULACEAE
- Downingia yina

CAPRIFOLIACEAE
- Lonicera involucrata
- Symphoricarpos albus

CARYOPHYLLACEAE
- Cerastium viscosum*
- Stellaria calycantha
- Stellaria media*

COMPOSITAE
- Achillea millefolium
- Agoseris grandiflora
- Anthemis cotula*
- Aster hallii
- Aster subspicatus
- Bidens cernua
- Bidens frondosa*
- Chrysanthemum leucanthemum*
- Cirsium vulgara*
- Crepis setosa*
- Eriophyllum lanatum var. achillaeoies
- Gnaphalium palustre
- Grindelia integrifolia
- Hypochaeris radicata*
- Lactuca serriola*
- Leontodon nudicaulis*
- Madia glomerata
- Madia sativa
- Microseris laciniata
- Senecio jacobaea*
- Senecio vulgaris*
- Sonchus asper*
- Tanacetum vulgare*
- Taraxacum officinale*
- Wyethia angustifolia

CORNACEAE
- Cornus stolonifera

CRUCIFERAE
- Barbarea orthoceras*
- Cardamine oligosperma
- Roripa curvisiliqua

CYPERACEAE
- Carex densa
- Carex lanuginosa
- Carex leporina
- Carex obnupta
- Carex stipata
- Carex unilateralis
- Eleocharis palustris

DIPSACACEAE
- Dipsacus sylvestris*

GENTIANACEAE
- Centaurium umbellatum*

* Introduced species, not native.

GERANIACEAE
- Geranium carolinianum*
- Geranium dissectum*
- Geranium oreganum

GRAMINEAE
- Agrostis exarata
- Aira caryophyllea*
- Aira elegans*
- Alopecurus geniculatus
- Alopecurus pratensis
- Arrhenathraum elatius*
- Beckmannia syzigachne
- Bromus carinatus
- Bromus japonicus*
- Bromus rigidus*
- Bromus secalinus*
- Cynosurus echinatus*
- Dactylis gomerata*
- Danthonia californica
- Deschampsia cespitosa
- Elymymus caput-medusae*
- Festuca arundinacea*
- Festuca microstachya
- Glyceria occidentalis
- Holcus lanatus*
- Hodeum brachiantherum
- Lolium multiflorum*
- Lolium perenne*
- Paspaulm distichum
- Phalaris arundinacea
- Phleum pratense*
- Poa nervosa
- Poa pratensis
- Poa scabrella

HYPERICACEAE
- Hypericum perforatum*

IRIDACEAE
- Iris tenax
- Sisyrinchium angustifolium

JUNCACEAE
- Juncus balticus
- Juncus bufonius*
- Juncus confusus
- Juncus effusus var. pacificus
- Juncus ensifolius
- Juncus oxymeris
- Juncus patens
- Luzula camestris

LABIATAE
- Mentha arvensis
- Mentha citrata*
- Mentha pulegium*
- Prunella vulgaris
- Stachys rigida

LEGUMINOSAE
- Lathyrus sphaericus*
- Lotus corniculatus*
- Lotus purshianus
- Lupinus micranthus
- Trifolium dubium*
- Trifolium pratense*
- Trifolium repens*
- Vicia hirsuta*
- Vicia sativa*
- Vicia villosa*

LILIACEAE
- Allium amplectens
- Brodiaea congesta
- Brodiaea hyacinthina
- Camassia quamash
- Zygadenus venenosus

MALVACEAE
- Sidalcea campestris
- Sidalcea nelsoniana

OLEACEAE
- Fraxinus latifolia

ONAGRACEAE
- Boisduvalia densiflora
- Clarkia amoena ssp. lindleyi
- Epilobium paniculatum
- Epilobium watsonii
- Ludwigia palustris

PLANTAGINACEAE
- Plantago lanceolata*

POLEMONIACEAE
- Liananthus bicolor
- Microsteris gracilis
- Navarretia intertexta
- Navarretia minima
- Navarretia squarrosa

PORTULACACEAE
- Montia fontana*
- Montia linearis
- Montia perfoliata

POLYGONACEAE
- Polygonum coccineum
- Polygonum douglasii
- Polygonum hydropiperoides
- Rumex acetosella*
- Rumex conglomeratus*
- Rumex crispus*
- Rumex salicifolius

RANUNCULACEAE
- Delphinium menziesii
- Myosurus minimus
- Ranunculus alismaefolius
- Ranunculus aquatilis
- Ranunculus lobbii
- Ranunculus occidentalis
- Ranunculus orthorhynchus
- Ranunculus uncinatus

RHAMNACEAE
- Rhamnus purshianus

ROSACEAE
- Amelanchier alnifolia
- Crataegus monogyna*
- Crataegus oxycantha*
- Fragaria virginiana
- Geum macrophyllum
- Oemleria cerasiformis
- Potentilla gracilis
- Prunus domestica*
- Pyrus communis*
- Pyrus malus*
- Rosa eglanteria*
- Rosa nutkana
- Rosa pisocarpa
- Rosa canina*
- Rubus procerus*
- Sanguisorba occidentalis
- Spiraea douglasii

RUBIACEAE
- Galium aparine
- Galium cymosum

SALICACEAE
- Populus trichocarpa
- Salix lasiandra
- Salix mackenziana
- Salix piperi
- Salix sessilifolia
- Salix sitchensis

SAXIFRAGACEAE
- Saxifraga oregana
- Tellima grandiflora

SCROPHULARIACEAE
- Gratiola ebracteata
- Orthocarpus braceteosus
- Orthocarpus hispidus
- Parentucellia viscosa*
- Veronica americana
- Veronica peregrina
- Veronica scutellata
- Veronica serpyllifolia

SOLANACEAE
- Solanum dulcamara*

TYPHACEAE
- Typha latifolia

UMBELLIFERAE
- Anthriscus scandicina*
- Cicuta douglasii
- Daucus carota*
- Eryngium petiolatum
- Heracleum lanatum
- Lomatium bradshawii
- Lomatium dissectum
- Lomatium nudicaule
- Oenanthe sarmentosa
- Perideridia oregana
- Sanicula crassicaulis

Oregon List of Endangered and Threatened Species

A. Endangered Plant Species

Abronia umbellata Sam. subsp breviflora (Stand.) Munz	pink sand verbena
Astragalus applegatei Peck	Applegate milk vetch
Calochortus umpquaensis Fredricks	Umpqua mariposa lily
Erigeron decumbens Nutt.	Willamette daisy
Haplopappus radiatus (Nutt.) Cronq.	Snake River goldenweed
Lilium occidentale Purdy	western lily
Lomatium bradshawii (Rose) Math. & Const.	Bradshaw's desert parsley
Lomatium cookii Kagan	Cook's desert parsley
Mirabilis macfarlanei Const. & Roll.	MacFarlane's four o'clock
Plagiobothrys hirtus (Greene) Johnst.	rough allocarya
Stephanomeria malheurensis Gottl.	Malheur wire-lettuce
Thelypodium howellii Wats. subsp. spectabilis (Peck) Al-Shehbaz	Howell's thelypody

B. Threatened Plant Species

Amsinckia carinata Nels. & Macbr.	Malheur Valley fiddleneck
Lomatium greenmanii Mathias	Greenman's desert parsley
Luina serpentina Cronq.	colonial luina
Mentzelia packardiae Glad	Packard's mentzelia
Pleuropogon oregonus Chase	Oregon semaphoregrass
Senecio ertterae Barkley	Ertter's senecio
Sidalcea nelsoniana Piper	Nelson's checker-mallow

National Species of Special Emphasis

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

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

- Greater Canadian
- Greater Rocky Mountain Pop.
- Greater Lower Colorado Pop.
- Greater Central Valley Pop.
- Greater Pacific Flyway Pop.
- Whooping Crane
- American Woodcock
- Piping Plover
- Least Tern
  - Interior
  - Eastern
  - California
- Roseate Tern
- White-Winged Dove
- Northern Spotted Owl
- Red-Cockaded Woodpecker
- Kirtland's Warbler

REPTILES AND AMPHIBIANS
- American Alligator

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

(USFWS, unpublished)

Birds Likely to Occur in Wetland-Prairie Area, North Corvallis

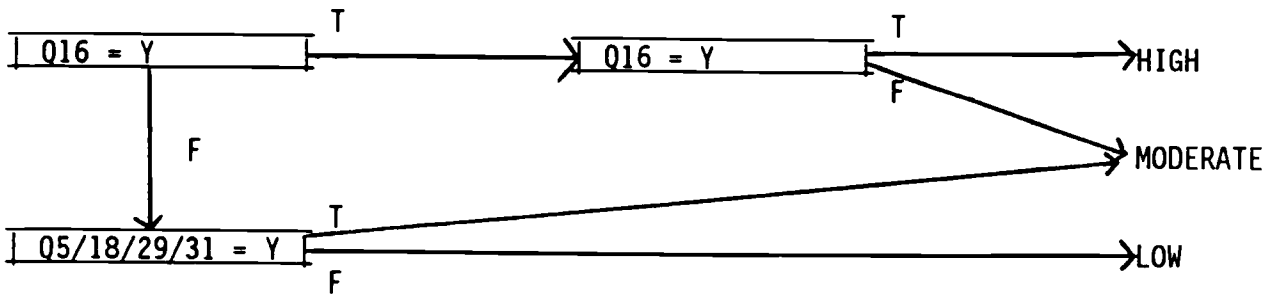
Canada geese
Mallard
Pintail
Gadwall
American Wigeon
Shoveler
Cinnamon teal
Green-winged teal
Wood duck
Turkey vulture
Cooper's hawk
Sharp-shinned hawk
Marsh hawk
Rough-legged hawk
Red-tailed hawk
Sparrow hawk
Ruffed grouse
California quail
Ring-necked pheasant
Great blue heron
Green heron
Sora
Virginia rail
Killdeer
Common snipe
Band-tailed pigeon
Mourning dove
Screech owl
Pygmy owl
Vaux's swift
Rufous hummingbird
Common flicker
Yellow-bellied sapsucker
Hairy woodpecker
Downy woodpecker
Alder flycatcher
Western flycatcher
Western wood pewee
Olive-sided flycatcher
Barn swallow
Violet-green swallow
Tree swallow
Scrub jay
Common crow
Black-capped chickadee
Common bushtit
White-breasted nuthatch
Red-breasted nuthatch
Brown creeper
House wren
Winter wren
Bewick's wren
Long-billed marsh wren
Robin
Varied thrush
Hermit thrush
Swainson's thrush
Golden-crowned kinglet
Ruby-crowned kinglet
Cedar waxwing
Starling
Solitary vireo
Hutton's vireo
Warbling vireo
Orange-crowned warbler
Yellow warbler
Yellow-rumped warbler
Towsend's warbler
Black-throated gray warbler
Yellow throat
Yellow-breasted chat
MacGillivray's warbler
Wilson's warbler
House sparrow
Western meadowlark
Red-winged blackbird
Brewer's blackbird
Brown-headed cowbird
Northern oriole
Western tanager
Black-headed grosbeak
Evening grosbeak
Lazuli bunting
Purple finch
House finch
Pine siskin
American goldfinch
Rufous-sided towhee
Savannah sparrow
Vesper sparrow
Dark-eyed junco
Chipping sparrow
White-crowned sparrow
Golden-crowned sparrow
Fox Sparrow
Song Sparrow

WET Definition of Urban Area

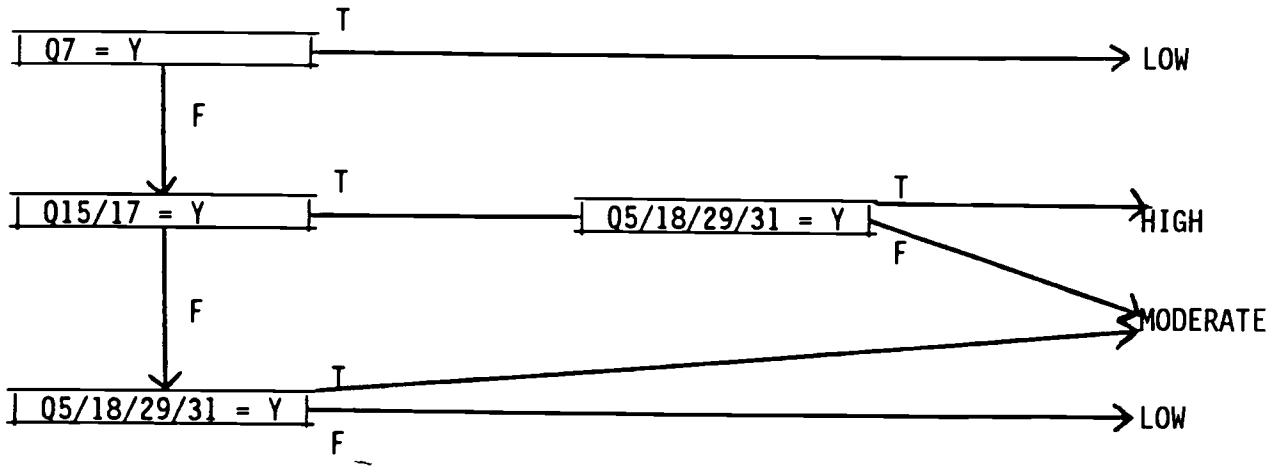
An area having a residential density of at least 1,000 residences/square mile over four contiguous miles, or a central city having a population of 50,000 or more and including surrounding, closely settled areas if these areas are (a) incorporated places of 2,500 inhabitants or more; or (b) incorporated places with fewer than 2,500 persons, provided that each place has a closely settled area of 100 permanent residences or more; or (c) small land parcels normally less than one square mile in area, having a population density of 1,000 inhabitants or more per square mile; or (d) other similar small areas in unincorporated territory with lower population density when these areas serve to complete urban-suburban community boundaries.

Evaluation Keys for Social Significance

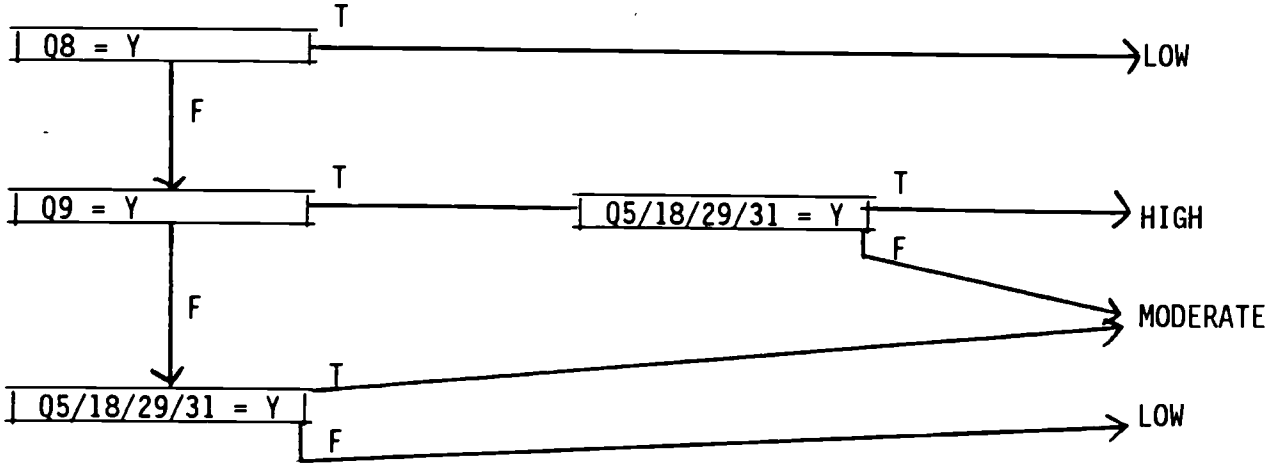
Groundwater Recharge



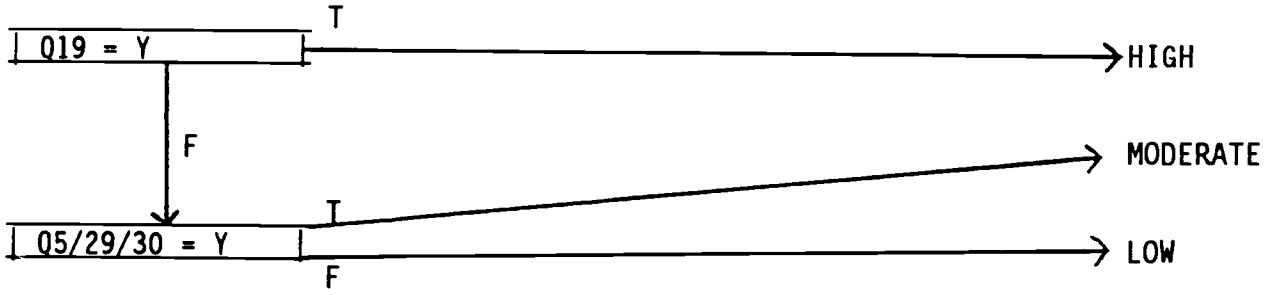
Groundwater Discharge



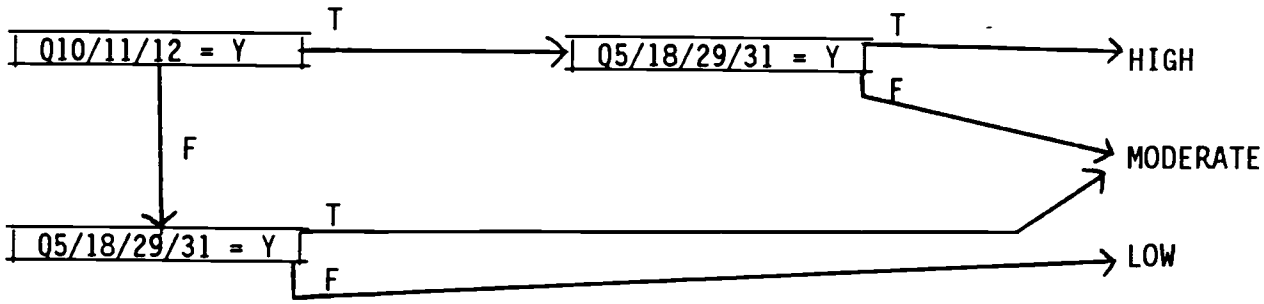
Floodflow Alteration



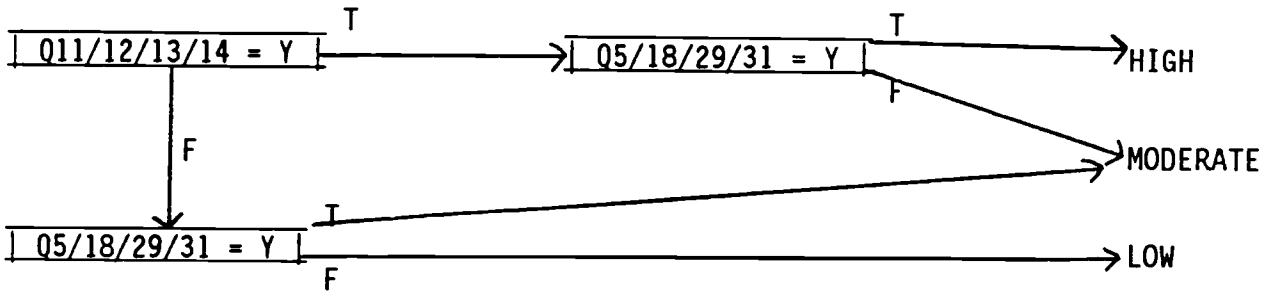
Sediment Stabilization



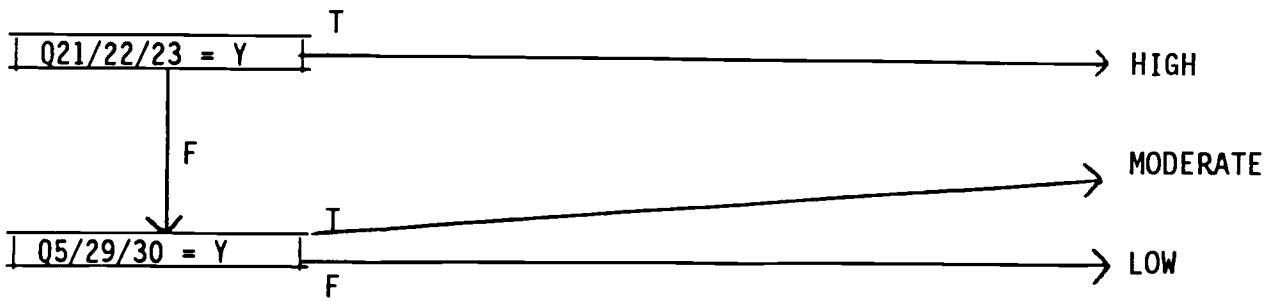
Sediment/Toxicant Retention



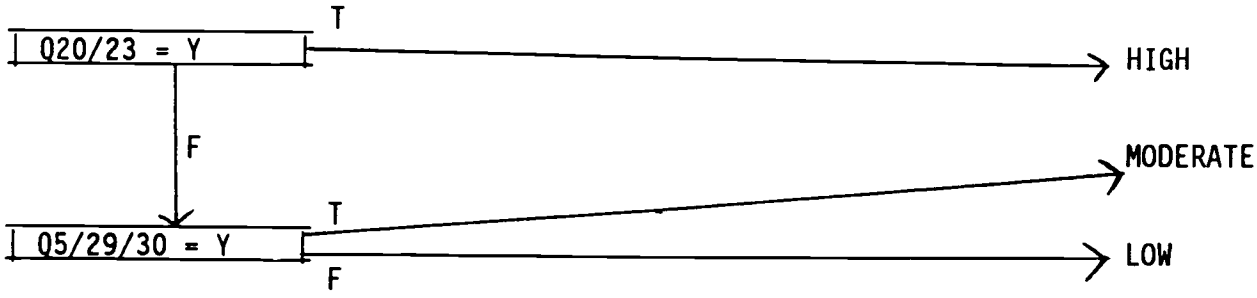
Nutrient Removal/Transformation



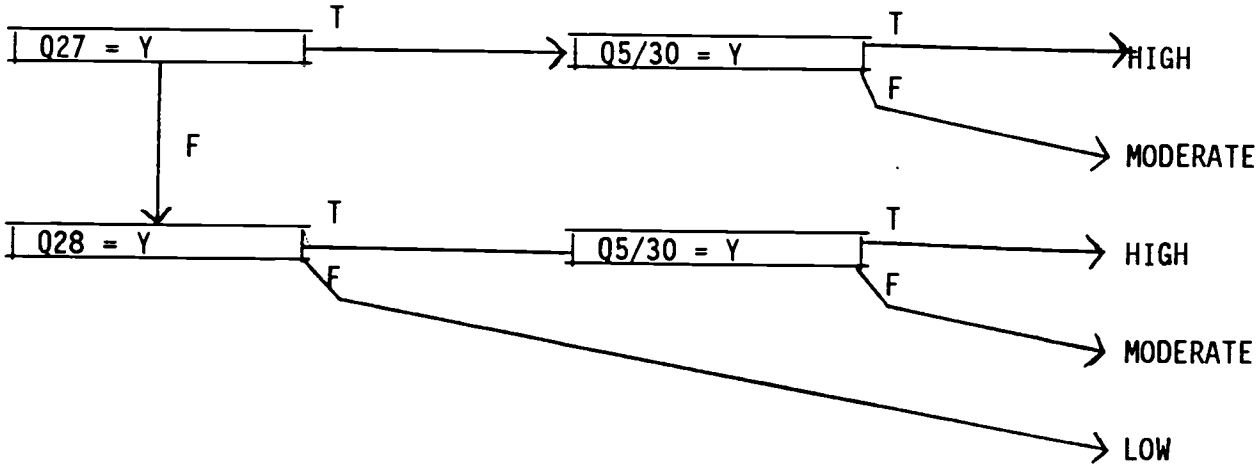
Wildlife Diversity/Abundance



Aquatic Diversity/Abundance



Recreation



Uniqueness/Heritage