

WESTERN WASHINGTON FRESHWATER WETLANDS

Phase III: Southwestern Washington Wetlands

by

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ABSTRACT

This study identifies high quality native wetlands which occur in Grays Harbor, Pacific and Wahkiakum Counties, in southwestern Washington. It focuses on impounded and surge plain freshwater wetlands which have rooted vascular plant vegetation. The report includes:

1. A list and descriptions of relatively pristine native wetlands,
2. A list and descriptions of wetlands which have been disturbed but have or may be restored, and
3. A classification of native vegetated wetlands.

ACKNOWLEDGMENTS

I would like to thank the people who contributed to this report. First, the private landowners who allowed me to survey their lands. Second, the many researchers and interested persons who informed us of possible high quality wetlands, and added to our knowledge of the land use history and processes of some of the wetlands. Third, Bill Phillips and Josh Logan for providing information on the geology of the region. Fourth, Heritage staff members: Mark Sheehan who edited this report; Rex Crawford who assisted with the classification; and Nancy Sprague who produced the report maps.

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INTRODUCTION

Over the last few years, the public has become more aware of the values and functions of wetlands. At the same time, information has become available on the amount and rate of destruction of these systems. The result has been a heightened public concern about the protection and rehabilitation of wetland systems.

The Washington Department of Ecology determined a need for wetland studies which would classify and describe wetland types, identify high quality native systems, and identify wetlands which, though disturbed, have the potential to be restored.

To satisfy part of this need, the Department of Ecology contracted with the Department of Natural Resources, Natural Heritage Program to inventory wetlands located in the coastal counties of southwestern Washington.

Specifically, this study focuses on native, freshwater, impounded and surge plain wetlands which are vegetated by rooted vascular plants. It includes a few peat wetlands associated with slow moving, low gradient water.

Surge plain wetlands are areas in which the water rises and falls with the tides, but the water is less than 0.5 parts per thousand salt. They occur along the tidal reaches of rivers, upstream of or above saltwater influence. Tidal water flowing up river during high tides backs-up water flowing down the river. This causes freshwater, either up river of the salt water intrusion or floating over the denser saltwater, to flow over the wetlands.

This report provides the following information.

1. A list and descriptions of "pristine" native wetlands (first tier).
2. A list and descriptions of wetlands which have been disturbed but which have been, or may be able to be, restored (second tier).
3. A classification of native, vegetated wetlands.

Although a large percentage of the impounded and surge plain wetlands located in southwestern Washington were reviewed, not all could be surveyed in this study. With further work, it is probable that more sites could be added to this list of high quality sites.

STUDY AREA

The study area includes all of Pacific and Wahkiakum Counties, and lands below 2,000 feet in Grays Harbor County, with the exception of Indian and National Forest lands (figure 1).

The study area falls within the Coast Range, which is defined as occurring between the Strait of Juan de Fuca to the north, and the Klamath Mountains to

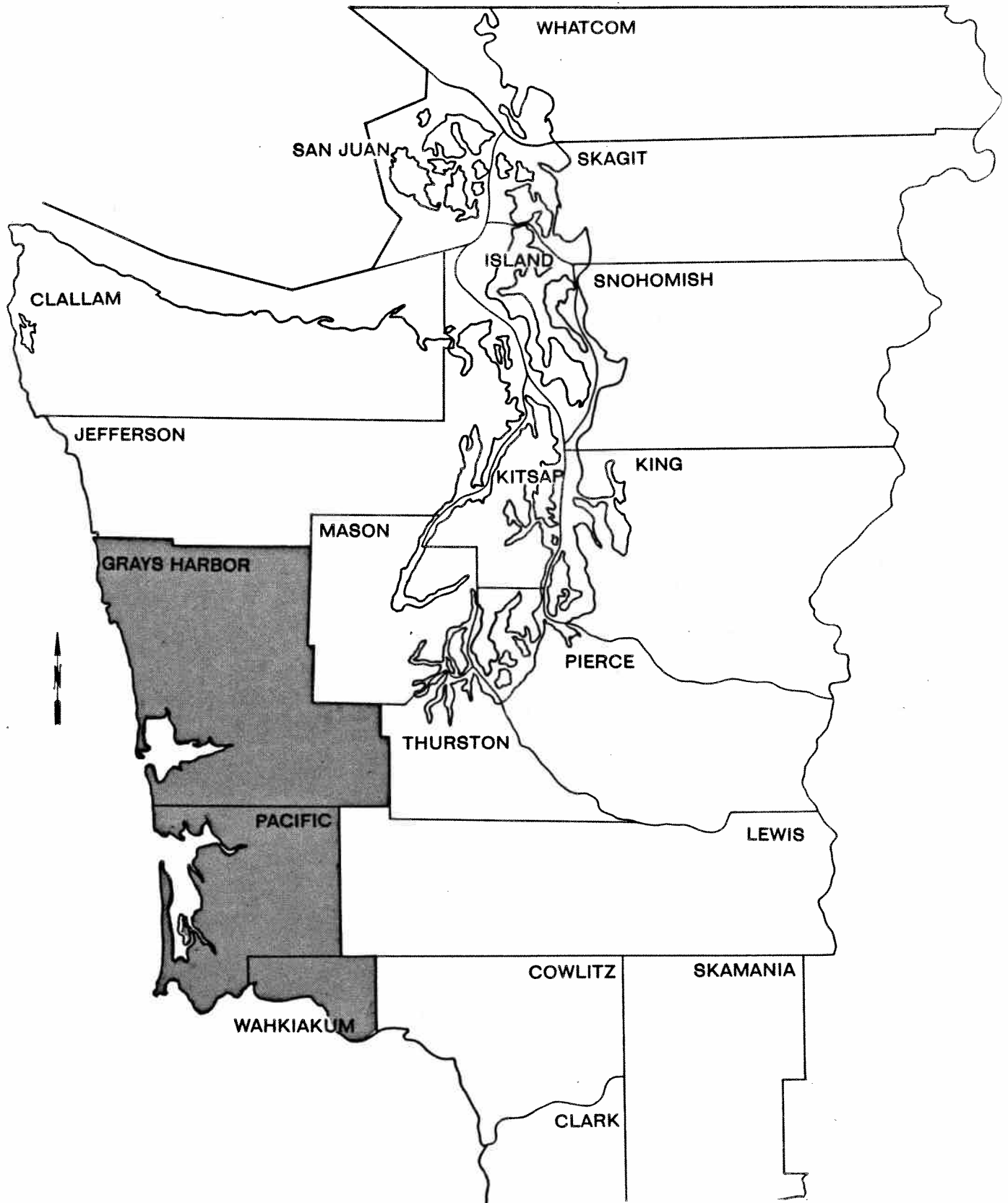


Figure 1. Study Area

the south, the Pacific Ocean to the west, and the Puget-Willamette Lowlands to the east (McKee, 1972). This portion of the Coast Range is divided into the Olympic Mountains, north of the Chehalis River, and the Willapa Hills, between the Chehalis and the Columbia Rivers. That portion of the study area north of the Chehalis River is primarily different aged marine sedimentary rock, differentiated and undifferentiated glacial outwash, and alluvium (Walsh et al., 1987). South of the Chehalis river, the study area is a mixture of basalt, marine sedimentary rock, terraced marine sediments, alluvium and beach sand.

Southwestern Washington has a mild marine climate. Winters are overcast and wet. Average winter temperatures are between 41 and 42 degrees F. Summers are cool and dry. Average summer temperatures are between 60 and 62 degrees F. Average annual precipitation ranges between 60 and 100 inches per year. Fog is common during the night and morning through the fall and winter. Fog also occurs along the coast during the summer.

METHODOLOGY

INITIAL SITE SELECTION:

Sites for initial study were selected: 1) by reviewing U.S.G.S. 7.5 and 15 minute quadrangle maps; 2) by reviewing the latest available aerial photographs printed at a scale of 1:12,000; 3) by a retrieval of data already contained within the Natural Heritage Database; and 4) by reviewing leads provided by researchers and knowledgeable landowners.

The criteria that were used in this initial site selection were:

1. The degree of human-related physical disturbances. These disturbances included: damming, diking, ditching, filling, draining, vegetation removal or mining of the substrate. The site continued to be considered for survey if the disturbance appeared to be relatively minor or isolated. Otherwise, the existence of any of these disturbances resulted in the elimination of a site from further consideration.
2. Adjacent land use. Some adjacent land uses are more disruptive of wetlands than are others. Adjacent land uses include: timber production, pasture, agriculture, industry, powerline and gasline right-of-ways, roads, railroads, recreational development, urban development, and rural development. If an adjacent land use was highly disruptive, the wetland may have been eliminated from further consideration.
3. The presence and quality of an upland buffer. Assessment of the quality of a buffer was based on 1) the width of the buffer in relationship to adjacent land uses, 2) the composition and age of the buffer, and 3) current uses within the buffer. If a buffer did not exist between a wetland and a disruptive adjacent land use, and the wetland appeared disturbed, then the site was usually eliminated

from further consideration for field survey. If, on the other hand, the site appeared undisturbed, it continued to be considered for field surveys, despite the absence of a buffer.

4. The minimum size for sites to be considered was arbitrarily set at two acres.

Sites selected through this process were then ranked according to their apparent quality, and scheduled for field surveys.

FIELD SURVEYS:

Most field surveys were conducted during the summer of 1987. Existing data from the Natural Heritage Database were collected in previous years.

Upon visiting a site, a preliminary determination was made to include or eliminate the site from further consideration. Site inclusion was based on the cover and frequency values of non-native plant species, apparent historical use of the wetland (for instance as pasture or for timber harvest), along with the criteria for initial site selection outlined above. Degraded sites were surveyed if they represented relatively better examples of wetland types that have been degraded throughout the region.

For all survey sites, data were collected on physical and biotic features, hydrology, soils, adjacent land use, and historic use. Physical features included topography, elevation, exposure, special climatic conditions, kind or means of impoundment, and wetland configuration. Data on hydrology included water depth, apparent water level fluctuation, tidal influence, drainage patterns within the wetland's basin, and water source.

Soils generally were classified in the field as: sphagnum peat, sedge peat, heath peat, woody peat, muck, clays, silts, sands, glacial till, or outwash. Soils data were also gathered from the U.S. Soil Conservation Service. Peat soil definitions follow Rigg (1958). Geologic data were obtained from the Washington Department of Natural Resources, Division of Geology and Earth Resources (Walsh et al., 1987; and Phillips and Logan, pers. comm.).

Adjacent land use and historic uses were determined through site observation, talking with owners of a site and adjacent areas, agency personnel, people involved with the timber industry, historical records, and aerial photographs.

The biologic evaluation of a site included a detailed description of the vegetation. Assemblages of native plant species were identified during a reconnaissance of each wetland. Lists of species and their percent cover values were recorded for each assemblage. Plant species nomenclature follows Hitchcock and Cronquist (1973). Wildlife species or their sign were noted.

CLASSIFICATION:

An initial classification of relatively undisturbed, native, wetland

vegetation was developed (Appendix A). It synthesized the data from the field surveys, the Natural Heritage Database, and the literature.

A matrix, of species cover values by stand, was developed. The matrix consisted of data collected from the field surveys and the Natural Heritage Database. The stands were the assemblages identified in the reconnaissance surveys.

From this matrix, wetland communities were identified in the following way. Stands (assemblages) were arrayed to reflect similarities in their species composition. If three or more stands had similar species composition and cover values, they were lumped to form a wetland community considered to be recurring in the landscape. A wetland community considered to not recur in the landscape was identified if 1) only two stands had similar species composition and cover values, 2) a stand had a species composition dissimilar from any other, or 3) two or more communities had similar dominant species but otherwise very different species composition and cover values. Communities identified in this way were compared with those described in the literature. Descriptions of these communities, and their average percent species cover values, are in Appendix B.

FINAL SITE SELECTION CRITERIA:

The following criteria were applied to "first tier" sites, that is, those sites which are the most pristine examples of native, undisturbed, wetland systems:

1. No evidence of human-caused topographic or hydrologic alteration of the wetland,
2. Exotic plant species occurred infrequently if at all,
3. Relatively little known or apparent human-caused disturbance of the native vegetation,
4. Existence of an adequate buffer at sites where adjacent land use was potentially degrading, and
5. No known major water quality problems.

If a site did not meet these criteria, it could still be listed as a "first tier" site if it was the highest quality known example of a community, or contained particularly important populations of plant or animal species listed as endangered, threatened or sensitive in Washington (Washington Natural Heritage Program, 1987 and Washington Department of Wildlife, Nongame Program, 1988).

The following criteria were applied to "second tier" sites, that is, those sites which were disturbed but have good potential for restoration:

1. No, or isolated, human alteration of the wetland topography,

2. No human caused alteration of the hydrology of the wetland, or else the wetland appeared to have recovered from the alteration,
3. Low cover and frequency of exotic plant species,
4. Relatively little human-related disturbance of the native vegetation, or excellent recovery from past disturbance,
5. If the wetland system was degraded, it still contained a viable and high quality example of a wetland community, and
6. No known major water quality problems.

SITE LISTS

FIRST TIER SITES:

1. Chehalis River Surge Plain
2. Cranberry Creek
3. Devils Elbow
4. Hogans Corner
5. New London Surge Plain
6. North Bay
7. Wilderness Marsh

SECOND TIER SITES:

8. Beaver Pond
9. Burg Creek Marsh
10. Carlisle Bog
11. Copalis Bog Forest
12. Copalis Headwater
13. Copalis Marsh
14. Donkey Creek Oxbow
15. East Fork Hoquiam River
16. Humptulips Willow Wetland
17. Loomis Lake
18. Moclips/Macafee Marsh
19. Moclips Marsh
20. Newman Creek
21. North Fork Moclips River
22. Salmon Creek Bog
23. Specter Marsh
24. Twin Harbors Dune Trough

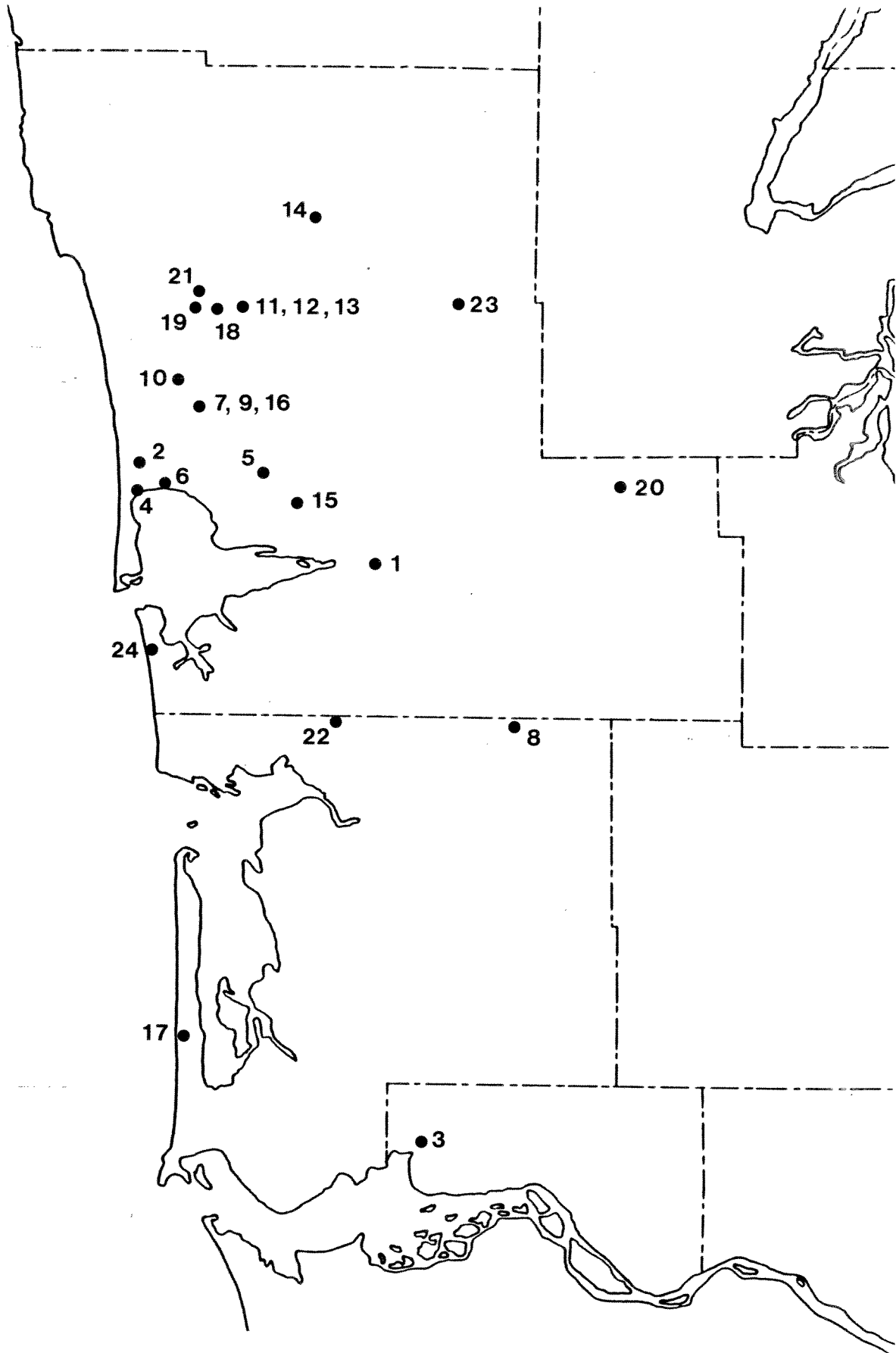


Figure 2. Location of First and Second Tier Sites

FIRST TIER SITES

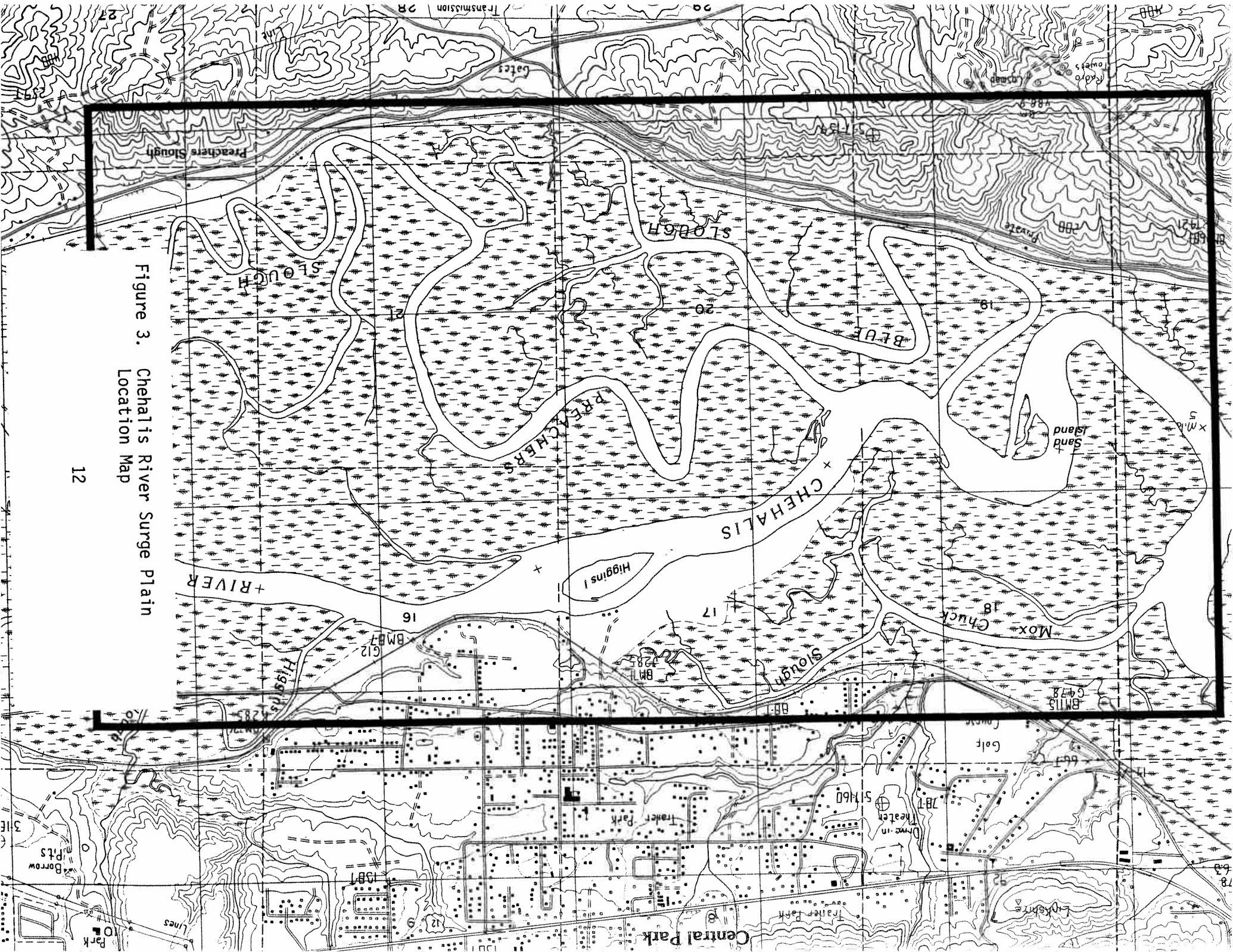


Figure 3. Chehalis River Surge Plain Location Map

CHEHALIS RIVER SURGE PLAIN

LOCATION: Grays Harbor County; Sections 15, 16, 17, 18, 19, 20, 21, 22, 28 and 29, Township 17 North, Range 8 West and Sections 13 and 24, Township 17 North, Range 9 West, Willamette Meridian.

SIGNIFICANCE: Chehalis River Surge Plain is a first tier site. It contains the largest and highest quality example of a coastal Sitka spruce surge plain wetland remaining in Washington. The surge plain wetland is composed of six communities.

FEATURES: Surge Plain Wetland:

1. Athyrium filix-femina community
2. Carex lyngbyei community
3. Typha latifolia community
4. Cornus stolonifera-Salix spp./Lysichitum americanum community
5. Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community
6. Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community

DESCRIPTION:

Physical: Chehalis River Surge Plain is an approximately 2,560 acre remnant of a once much larger wetland system along the Chehalis River between Aberdeen and Montesano. The wetland occurs mostly on islands cutoff from the mainland by tidal sloughs. It occurs below 10 feet in elevation on Quaternary alluvium and glacial outwash within the river flood plain. Soils are mostly clays, with varying amounts of silts, organic matter, and large woody debris.

Sloughs and the main river channel carry tidal water throughout the wetland during incoming tides. The frequency and duration of flooding to any given area is dependant upon: 1) the elevation, 2) the proximity to a channel or series of channels and 3) the amount of beaver activity (channels and dams). The herb or shrub dominated areas are either flooded at each high tide or permanently flooded. The tree dominated areas are flooded at most high tides.

Biological: The Carex lyngbyei community occurs along the margins of the Chehalis River channel, mostly on low terraces, and along sloughs intermixed with the Athyrium filix-femina community. Where it occurs along the main river channel, it may occasionally be inundated with brackish water. The community is nearly a monospecific stand along the Chehalis River channel, but is species rich within the Athyrium filix-femina community.

The Athyrium filix-femina community mostly occurs around Blue Slough. It is flooded with every high tide, but is drained at each low tide. It is species rich, and is a conglomeration of herb dominated communities. Various combinations of the following species may be dominant in any given area: Aster sp., Athyrium filix-femina, Oenanthe sarmentosa, Potentilla pacifica, Scirpus microcarpus and Scirpus validus. It intergrades with the

Cornus stolonifera-Salix spp./Lysichitum americanum and the Typha latifolia communities.

The Typha latifolia community occurs interspersed with the Athyrium filix-femina community but also covers large areas which may be either tidally or permanently flooded. The permanent flooding is due to beavers.

Large areas of the surge plain are covered with the Cornus stolonifera-Salix spp./Lysichitum americanum community. This community appears to occur in two different areas, those which are flooded permanently and seem to have black anoxic muck soils over alluvium, and areas which are flooded at most high tides and drain between tides. These areas are dominated by shrubs (Cornus stolonifera, Physocarpus capitatus, Salix spp. and Spiraea douglasii). The understory may be dominated by Athyrium filix-femina and Lysichitum americanum.

The Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community seems to be the precursor to the Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community. The latter is probably the climax surge plain wetland community. Both forested wetland communities have tidal channels throughout which fill at high tides. The degree to which the communities flood is variable.

CONDITION:

This area has been disturbed in the past, but continues to be in remarkably good condition. There are very few occurrences of exotic plant species, and the vegetation appears to have recovered well from past uses. Remnants of old logging railroad spurs extend from some of the wetland areas to log dumps along the larger sloughs. Individual Picea sitchensis probably were selectively removed along the main sloughs and river channel in the past, but there has been no logging activity during the last few decades. One wet meadow area along the main river channel was the site of intensive human activity at one time, and has high number and percent cover of exotic plant species. Pilings were set and logs rafted in the major sloughs.

Approximately one mile down river from the site is the up-river extent of the port, and timber storage and processing facilities of Grays Harbor. The town of Central Park is located on the uplands adjacent to the north shore of the site. Upstream of the site, the Chehalis River flood plain and the flood plains of its tributaries are used for pasture and agriculture. They are dotted with small towns, farms and single family residences. The hillsides within the drainage are mostly used for timber production.



Figure 4. Cranberry Creek Location Map

CRANBERRY CREEK

LOCATION: Grays Harbor County; Sections 2, 3, 10 and 11, Township 18 North, Range 12 West, Willamette Meridian.

SIGNIFICANCE: Cranberry Creek is a first tier site. It is an excellent example of a limnogenous bog and contains examples of three freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Myrica gale/Lysichitum americanum community
2. Spiraea douglasii community
3. Picea sitchensis/Gaultheria shallon/Lysichitum americanum community

DESCRIPTION:

Physical: Cranberry Creek includes approximately 110 acres of wetlands along the middle reaches of Cranberry Creek (approximately 2 miles), and the lowest reach of Connor Creek (approximately 0.4 miles). The wetlands occur at an elevation of about 15 feet along the nearly still reaches of the two creeks. Deep sedge, heath and woody peat overlay Quaternary alluvial deposits.

Cranberry Creek wetland is a limnogenous or marsh swamp bog (Damman, 1986). The stream channel cuts part way through a peat deposit, such that the stream bed is composed of peat. The water is red-brown in color. The wetland on either side of the stream channel is fed by precipitation, surface flow over the adjacent uplands, and surface overflow from the stream. The wetland is seasonally flooded, and the remainder of the time, the water table is at the soil surface.

Biological: There are three wetland plant communities at Cranberry Creek, and broad ecotonal zones where these communities overlap. In general, the wetland vegetation nearest the stream is dominated by a species rich example of the Myrica gale/Lysichitum americanum community which has high percent cover of Salix sp. There are other areas which are dominated by a species rich example of a Spiraea douglasii community in which Gaultheria shallon, Carex obnupta and Lysichitum americanum are subdominant.

Landward, both of these communities shift to the Picea sitchensis/Gaultheria shallon/Lysichitum americanum community. This community has several variations at Cranberry Creek. The wettest areas have no Gaultheria shallon. Instead, Salix sp. and Carex obnupta are codominant with Picea sitchensis. Pyrus fusca, Lysichitum americanum and Athyrium filix-femina are subdominant. In drier areas, the Salix sp. is replaced with Gaultheria shallon growing on ridges of soil and fallen trees. Thuja plicata is subdominant in some areas.

CONDITION:

The wetland area of interest is in excellent condition except along portions of the upland/wetland margin where logging has recently taken place. In

these areas, some trees have been felled within, and slash has been pushed into the wetland. The upstream extent of the wetland along Connor Creek is coincident with an old bridge. Wetland forests with large Thuja plicata may be threatened with future logging.

The Cranberry and Connor Creek drainages are used almost exclusively for timber production. At one time, there was a house, or group of a few houses, on a rise near the junction of the two creeks.

DEVILS ELBOW

LOCATION: Wahkiakum County; Sections 28 and 33, Township 10 North, Range 8 West, Willamette Meridian.

SIGNIFICANCE: Devils Elbow is a first tier site. It is one of the few remaining high quality examples of a Sitka spruce surge plain wetland and contains a high quality example of one surge plain wetland community.

FEATURES: Surge Plain Wetland:

1. Picea sitchensis-Alnus rubra-Rubus spectabilis/Carex obnupta community

DESCRIPTION:

Physical: Devils Elbow is a 61 acre surge plain wetland within the flood plain of the Grays River. It occurs at an elevation of about 10 feet on Quaternary alluvium. Soils are mostly silty clay with some organic matter and large woody debris.

The site is an island, bounded to the west by a tidal ditch and elsewhere by the Grays River. There are sloughs and beaver channels which carry tidal water throughout the site, flooding much of it at high tide. Most of the site drains at low tide, but the water table remains near the soil surface.

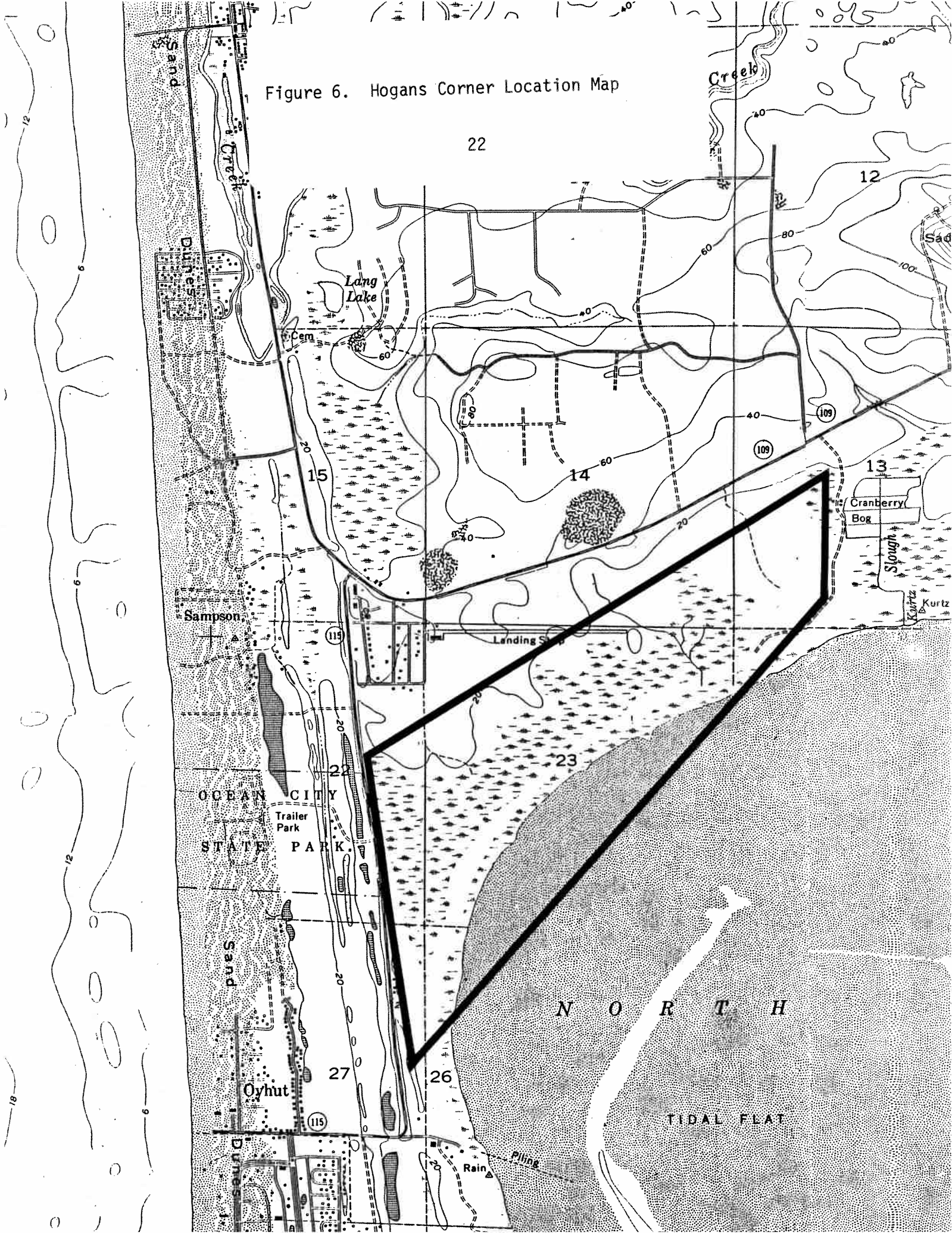
Biological: Devils Elbow consists of a diverse example of the Picea sitchensis-Alnus rubra-Rubus spectabilis/Carex obnupta community. For the most part, the understory is a shrub thicket dominated by Cornus stolonifera, Acer circinatum and Gaultheria shallon, and high percent cover of Rubus spectabilis, Physocarpus capitatus, Pyrus fusca and Salix spp. There also are relatively open patches which have a diverse herb layer dominated by Carex obnupta, Athyrium filix-femina, Impatiens sp. and Lysichitum americanum. Small permanently flooded areas around channels and in depressions left from up-ended tree root-wads have high cover of Glyceria elata, Callitriche sp., Oenanthe sarmentosa and other typical wet site species.

CONDITION:

Devils Elbow appears to be in excellent condition although there is evidence of some past disturbance. It is a fragment of a once larger wetland, much of which was converted to pasture. It is isolated from adjacent land use and cattle by a ditch. A few cut Thuja plicata stumps are located within the wetland along the main river channel. A 3 foot dbh Picea sitchensis was cored and found to be greater than 320 years old. Very few exotic plant species were found in the wetland, and those that were found occur together in one small opening. No other signs of disturbance were evident, but the wetland is scheduled to be logged in 1988 or 1989.

Devils Elbow is located about one mile upstream from the mouth of Grays River. It lies within a large drainage basin, most of which drains lands used for timber production. The flood plain along the lower reaches of the river are used for pasture and contain scattered homes and two small towns.

Figure 6. Hogans Corner Location Map



HOGANS CORNER

LOCATION: Grays Harbor County; Sections 22, 23, 26 and 27, Township 18 North, Range 12 West, Willamette Meridian.

SIGNIFICANCE: Hogans Corner is a first tier site. It is a large, nearly undisturbed wetland which contains high quality examples of three freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Myrica gale/Lysichitum americanum community
2. Picea sitchensis/Gaultheria shallon/Lysichitum americanum community

DESCRIPTION:

Physical: Hogans Corner is an approximately 215 acre, triangularly shaped wetland along the North Bay of Grays Harbor. It occurs at an elevation of about 20 feet, landward of a natural berm. The wetland is fed from precipitation, springs and surface flow. Most of the wetland is shallowly but permanently flooded. The wetland drains into the bay via several small sloughs and seepage through the berm.

The wetland overlays Quaternary alluvial sediments. Soils are most likely Damon silts intermixed with sedge, heath and woody peat. There is very little sphagnum at this site.

Biological: The central area of Hogans Corner wetland is dominated by tall dense Myrica gale. There is uniformly high cover of Lysichitum americanum, and patchy cover of Typha latifolia.

Landward (both towards the uplands and the berm), the vegetation makes a gradual transition to a typical example of the Picea sitchensis/Gaultheria shallon/Lysichitum americanum community. In a zone apparently transitional between the two communities, the tree species appear stunted, and the water level is higher than in the Myrica gale/Lysichitum americanum community.

CONDITION:

Hogans Corner appears to be in excellent condition. The past disturbances to the wetland are small and localized, leaving most of the wetland in excellent condition. However, the area is threatened with future filling and changes in nutrient levels from adjacent land development.

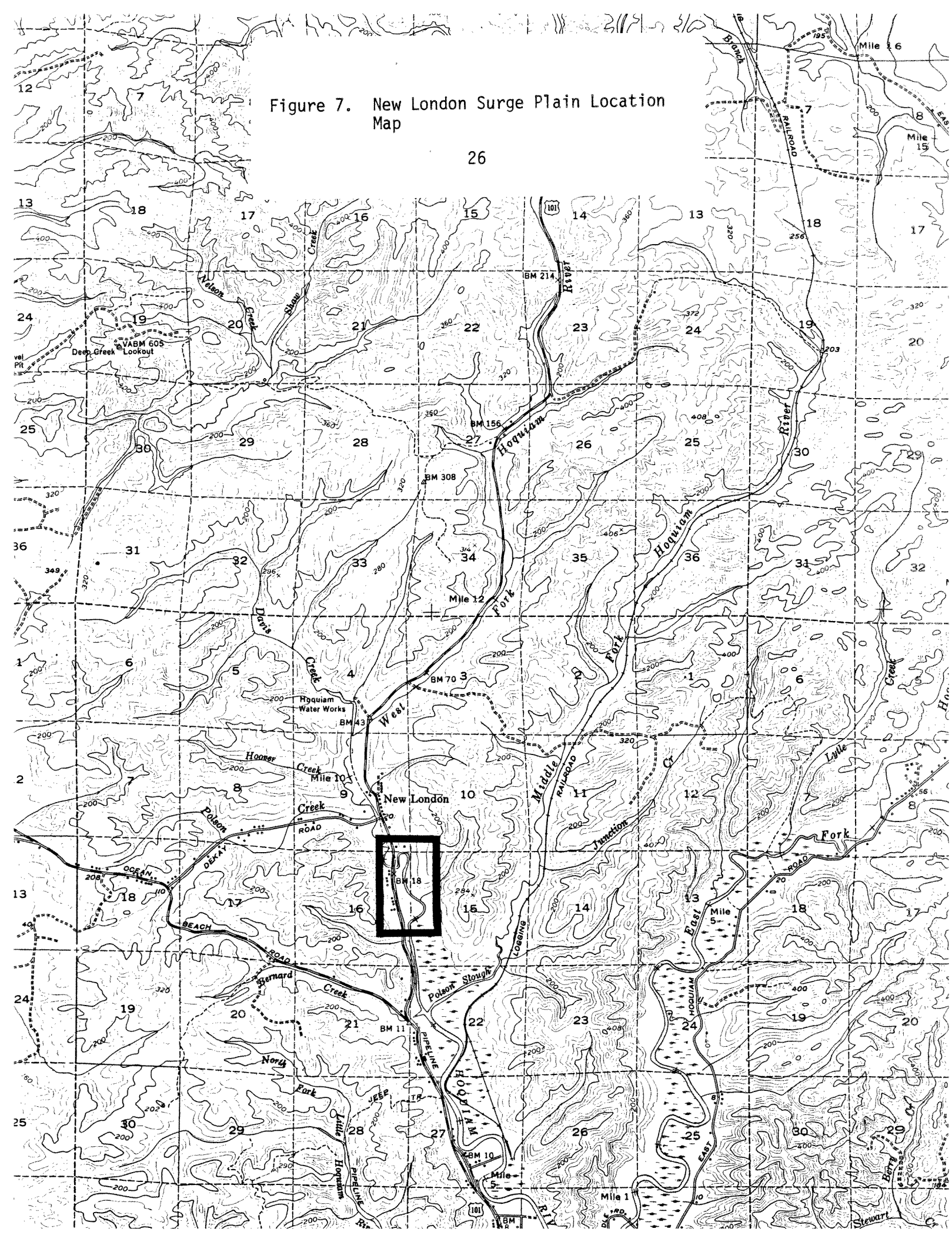
There is a logging spur road that extends a short distance into the wetland on road-fill. A few trees were removed from the forested wetland in a few places adjacent to uplands. The western boundary of the wetland is formed by a coastal dune ridge. Highway 115 was built along the ridge, and road-fill, graded soils and vegetation were pushed into the wetland margin. Exotic plant species extend a few feet into the wetland along the highway, and a recent grass seeding along a portion of the highway may introduce more exotic plant species into the wetland. Treated sewage sludge was also sprayed along the highway, and the wetland edge. This could alter the

nutrient levels and plant species composition of a small portion of the wetland. A few houses have been built on fill in the southwest corner of the wetland area in what was once forested wetland. Several more tracts are for sale in that portion of the wetland.

The wetland is located at the bottom of a small watershed. The northeast corner of the watershed supports a small housing development which may be extended south towards the wetland margin. There are a few houses on fill along the southwest edge of the wetland. The north and west watershed boundaries are coincident with highways, and a private airstrip is oriented east-west between one highway and the wetland. The remainder of the surface watershed is used for timber production.

Figure 7. New London Surge Plain Location Map

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NEW LONDON SURGE PLAIN

LOCATION: Grays Harbor County; Sections 15 and 16, Township 18 North, Range 10 West, Willamette Meridian.

SIGNIFICANCE: New London Surge Plain is a first tier site. It is one of the few remaining high quality examples of a Sitka spruce surge plain wetland, and contains examples of six communities.

FEATURES: Surge Plain Wetland:

1. Athyrium filix-femina community
2. Caltha sp.-Lysichitum americanum community
3. Carex lyngbyei community
4. Lilaeopsis occidentalis-Oenanthe sarmentosa community
5. Cornus stolonifera-Salix spp./Lysichitum americanum community
6. Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community

DESCRIPTION:

Physical: New London Surge Plain is a 36 acre wetland along the West Fork Hoquiam River. It occurs at less than 20 feet elevation within a tidally influenced portion of the flood plain. The anoxic silty clay soils have developed in Quaternary alluvium.

Sloughs carry tidal water from the river throughout the wetland at most high tides. Small drainages carry freshwater from the upland into portions of the wetland. Tidal water is mostly fresh, although brackish water may occasionally inundate portions of the wetland adjacent to the sloughs. Beavers have dammed some freshwater streams and tidal channels creating areas which are permanently flooded.

Biological: The wetland vegetation appears to be distributed along an elevation gradient. The Lilaeopsis occidentalis-Oenanthe sarmentosa community occurs in tidal channels at the lowest elevations dominated by macrophytes. The Caltha sp.-Lysichitum americanum community occurs in the tidal channels just above the Lilaeopsis occidentalis-Oenanthe sarmentosa community. The Carex lyngbyei community is located along the upper portion of the tidal channels, and along the banks of the river channel. These tidal channel communities are inundated with each high tide, and occasionally may be flooded with brackish water.

The Athyrium filix-femina community occurs in low areas on the river terraces. Sloughs carry tidal water into these areas at each high tide. Some portions of these areas are permanently flooded due to beaver dams. In places at this site, the community is codominated by Carex obnupta.

The Cornus stolonifera-Salix spp./Lysichitum americanum and Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta communities occur at the highest elevations within the wetland, but are interlaced with sloughs which fill with every high tide. The communities may not flood at every high tide. The former is dominated by Physocarpus capitatus, Salix spp. and

Athyrium filix-femina. The later is dominated by Picea sitchensis, Salix spp., Athyrium filix-femina and Carex obovata with high percent cover of Physocarpus capitatus, Gaultheria shallon and Pyrus fusca.

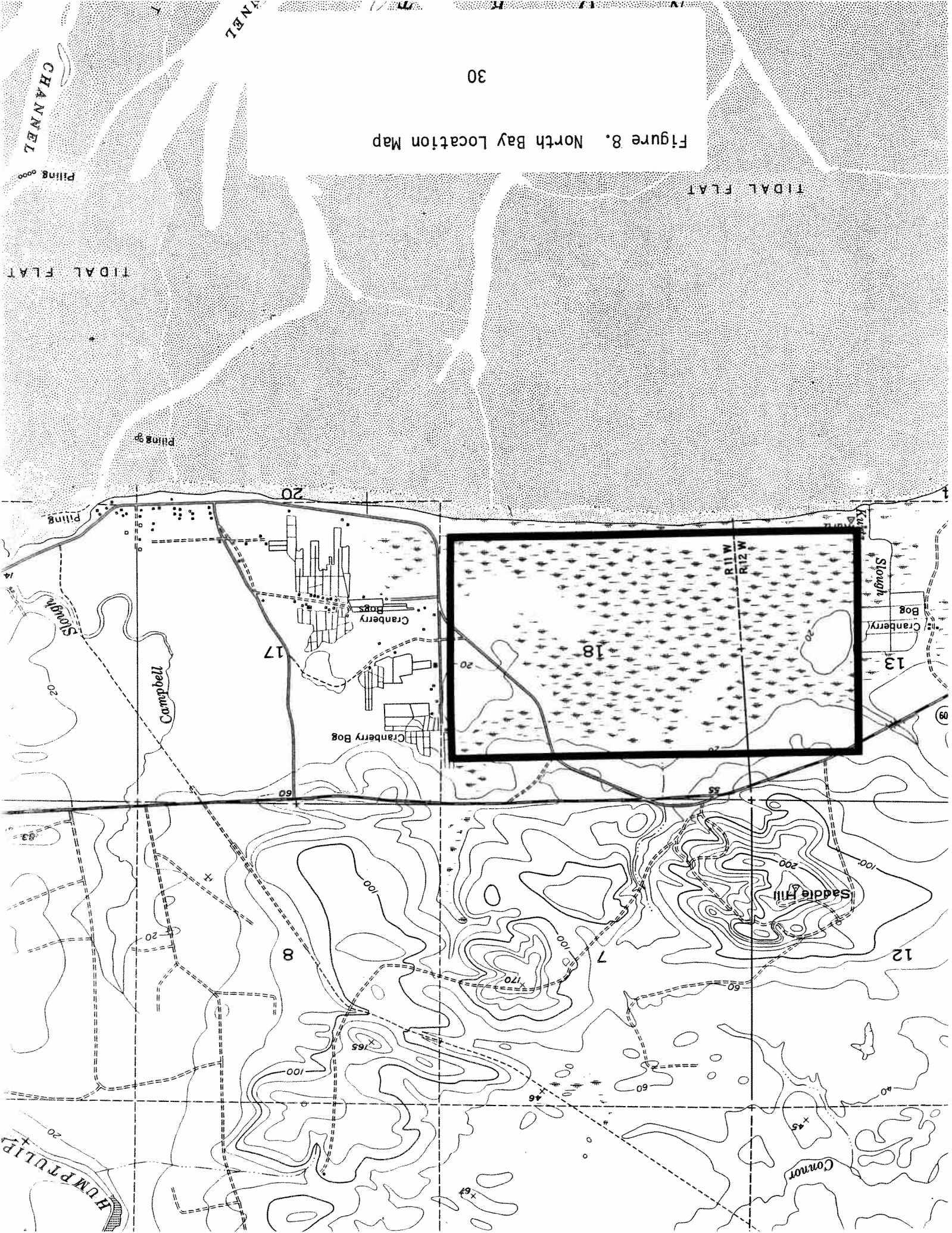
CONDITION:

The site appears in excellent condition except for a small wet meadow which contains several exotic plant species. Picea sitchensis were probably selectively removed from the site several decades ago, but no cut stumps or other evidence of logging was observed.

The West Fork Hoquiam River is parallel to, and often crossed by, Highway 101. Homes and small communities are located along, and up-river of, the site, but most of the upstream drainage is used for timber production.

Figure 8. North Bay Location Map

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NORTH BAY

LOCATION: Grays Harbor County; Section 18, Township 18 North, Range 11 West and Section 13, Township 18 North, Range 12 West, Willamette Meridian.

SIGNIFICANCE: North Bay is a first tier site. It is a large wetland area which contains four sphagnum bog and three freshwater wetland communities, all in virtually pristine condition.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Myrica gale/Carex sitchensis-Sanguisorba officinalis/Sphagnum spp. community
4. Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. Myrica gale/Carex sitchensis-Sanguisorba officinalis community
2. Salix spp.-Spiraea douglasii/Carex obnupta community
3. Thuja plicata/Lysichitum americanum community

DESCRIPTION:

Physical: North Bay is an approximately 275 acre wetland along the North Bay of Grays Harbor, landward of a natural berm. It occurs at an elevation of about 20 feet. The wetland is located in a groundwater discharge area and is fed by numerous springs as well as three small streams. Water levels within the wetland range from slightly above to slightly below ground level, and appear to fluctuate very little throughout the year. Tiny pockets of water and stream channels lace most of the area. The wetland drains through two human enhanced sloughs and subsurface seepage through the berm and into Grays Harbor.

The wetland soils are composed of sedge, heath, woody and sphagnum peat intermixed with Damon silt. They overlay Pleistocene continental sediments (weathered gravel and sand), originating from the Olympic Mountains, and transported by the Humptulips River.

Biological: Forested wetland communities are predominant at North Bay, but there are also large areas dominated by shrub communities. Sphagnum and non-sphagnum communities are interspersed throughout the wetland area, with sphagnum bog occupying about 70 acres.

The Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community here is very wet. There are numerous springs and some surface flow which maintain the water level just above the soil surface. The trees are stunted, averaging 20-40 feet tall, yet are often 100-200 years old. Tsuga heterophylla are only occasionally found. Myrica gale dominates the shrub layer in most areas. In slightly higher and drier areas, Ledum groenlandicum and Kalmia occidentalis may codominate. Lysichitum americanum has about 10% cover throughout.

The shrub sphagnum areas are mostly a typical example of the Myrica gale/Carex sitchensis-Sanguisorba officinalis/Sphagnum spp. community. The water level is at, to slightly above, the soil surface. In a few areas there are small examples of the Ledum groenlandicum/Sphagnum spp. community.

The Rhynchospora alba community covers small areas of supersaturated Sphagnum spp. around pockets of open water, and in depressions within the forested wetland communities.

The freshwater wetland covers about 205 acres. The forested wetland is an example of the Thuja plicata/Lysichitum americanum community. It is codominated by Thuja plicata and Tsuga heterophylla. The understory shifts from Myrica gale or Carex obnupta in wetter areas, to Gaultheria shallon on slightly higher and drier areas of soil or fallen logs.

The shrub freshwater wetlands are mostly the Myrica gale/Carex sitchensis-Sanguisorba officinalis community, with one area of Salix spp.-Spiraea douglasii/Carex obnupta community. The freshwater Myrica gale community forms dense stands up to 8 feet tall. The water level is at, to slightly above, the soil surface.

CONDITION: Branches of North Bay wetland to the east and west have been converted to agriculture and soil mining. However, none of these disturbed areas drain into the wetland area described above. This main area appears virtually undisturbed by humans.

The drainage basin is mostly used for timber production. A hill north of the wetland has been platted for a long time, but none of the tracts have sold. Highway 109 and a county road both cross drainages into, and upstream of, the site.

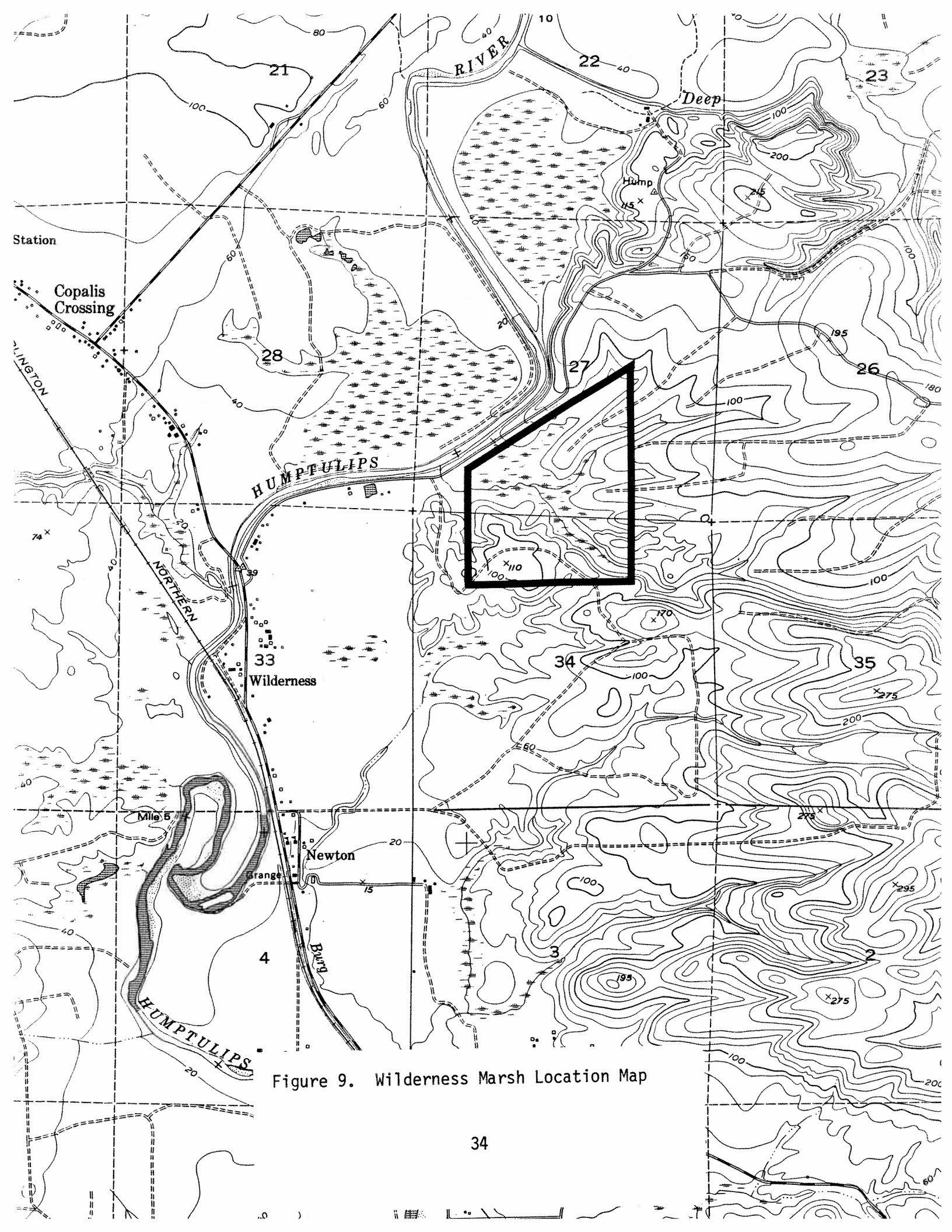


Figure 9. Wilderness Marsh Location Map

WILDERNESS MARSH

LOCATION: Grays Harbor County; Sections 27 and 34, Township 19 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Wilderness Marsh is a first tier site. It is an unusually high quality beaver controlled wetland which contains three freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Carex rostrata-Carex sitchensis community
2. Salix spp.-Spiraea douglasii community
3. Spiraea douglasii community

DESCRIPTION:

Physical: Wilderness Marsh is a 35 acre wetland formed around a small impounded tributary of the Humptulips River, at an elevation of 30-40 feet. The tributary is short, cutting through Quaternary and Pliocene alluvial sediments. Soils within the wetland are sedge and heath peat, and muck. Beavers have impounded the wetland, keeping it permanently flooded. The wetland is vegetated throughout except for a few channels which appear to be dredged by beavers.

Biological: There is a vegetation gradient from downstream to upstream. The downstream area is a mosaic of Carex rostrata-Carex sitchensis and Spiraea douglasii communities. Myrica gale is intermixed with these communities along the north arm of the wetland. Upstream, this mosaic shifts to a Salix spp.-Spiraea douglasii community. Farther upstream, Alnus rubra becomes progressively more abundant.

CONDITION:

Wilderness Marsh appears to be in excellent condition. The only exotic plant species observed occurs on road-fill adjacent to Humptulips River Valley Road. Impoundment of the wetland appears to be natural, accomplished by beavers, and to be a stable and long term feature. Although nearly all of the adjacent uplands have been recently logged, care was taken not to drop trees into the wetland, and a few large trees were left standing around the wetland margin.

Wilderness Marsh is part of a small drainage basin used entirely for timber production.

SECOND TIER SITES

BEAVER POND

LOCATION: Pacific County; Sections 14 and 15, Township 15 North, Range 7 West, Willamette Meridian.

SIGNIFICANCE: Beaver Pond is a second tier site. It is a beaver created and controlled wetland that currently contains examples of two freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Spiraea douglasii community
2. Carex rostrata-Sparganium emersum community

DESCRIPTION:

Physical: Beaver Pond is an approximately 13 acre beaver pond and associated wetland. It occurs at an elevation of about 160 feet on a river terrace adjacent to North River. The soils are organic muck over fine grained alluvium and possibly Miocene marine sedimentary rock. Woody debris and soil mounds provide some microtopographic relief within the wetland.

The wetland lies upstream of two beaver dams on a tributary of Archer Creek. At least one of the dams is located where a dam existed when the area was first surveyed in 1891. The water level and vegetation are controlled by the beavers and fluctuate over time. Recently the wetland has been extended into the margin of the adjacent forest by increasing the height of the primary dam. Most of the wetland is permanently flooded, although the margins are more often seasonally flooded. The wetland is fed by surface run-off and precipitation, there is no stream inflow.

Biological: The vegetation is chaotic. The interior of the primary beaver wetland is a Spiraea douglasii community. However, many of the shrubs are recently dead, and there are several highly decayed snags. Typha latifolia is established in this area, and may be replacing areas of now dead Spiraea douglasii.

The primary wetland margin is classified as a Carex rostrata-Sparganium emersum community. It is a dynamic, species rich area with high percent cover of Carex rostrata, Sparganium sp., Oenanthe sarmentosa, Ludwigia palustris and Marchantia sp. A few typically upland species are distributed over fallen trees in the wetland.

The wetland between the primary and secondary dams is dominated by Spiraea douglasii but also contains several species typical of the Carex rostrata-Sparganium emersum community.

CONDITION:

For a beaver controlled freshwater wetland, Beaver Pond is in good condition. Although there are several exotic plant species within the wetland, they have low percent cover. There are cut stumps throughout the wetland, but mostly in the recently flooded wetland margin. In the past,

beavers were regularly trapped out of the wetland, but the current land owner no longer allows trapping.

The area which drains into Beaver Pond is quite small and is used for timber production.

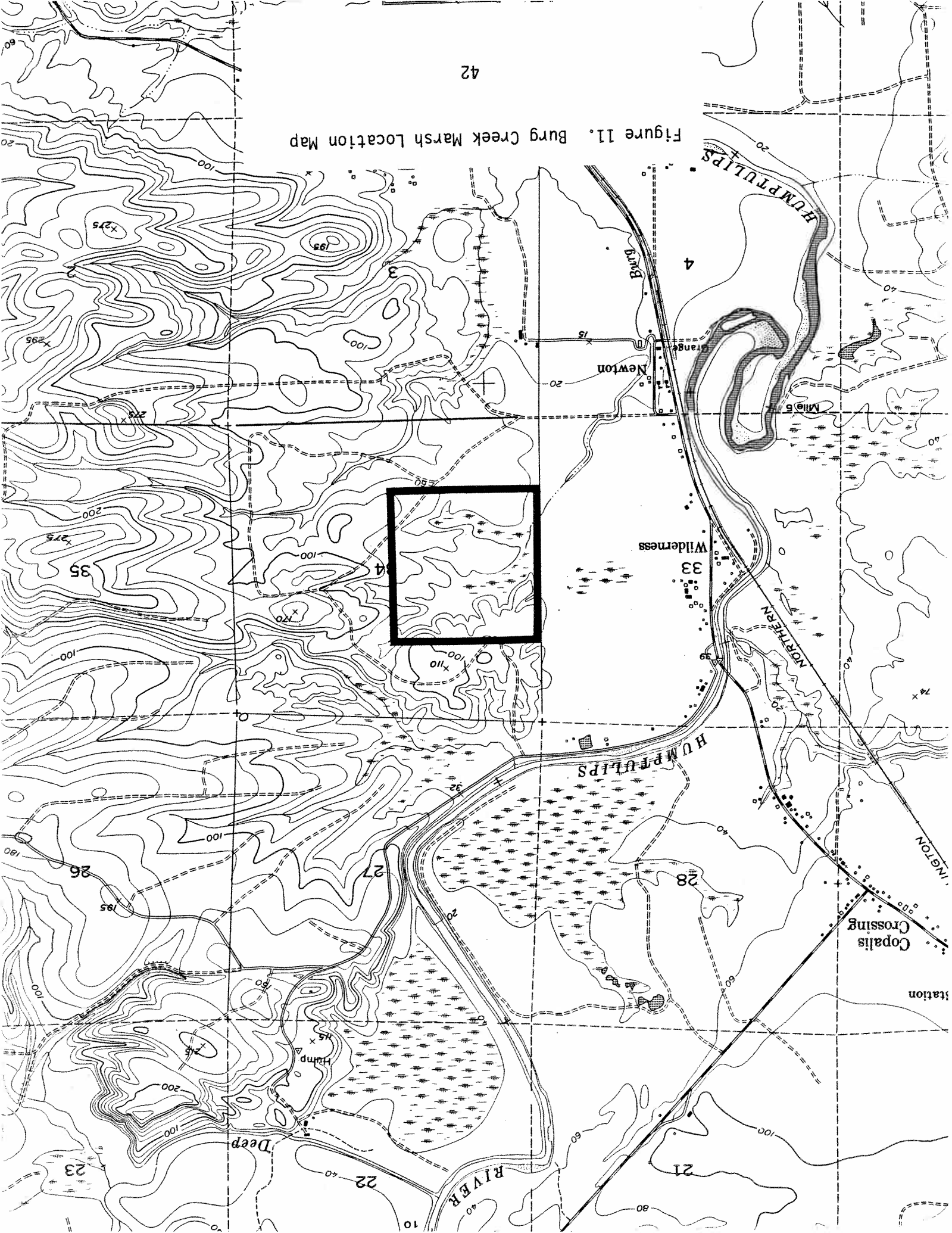


Figure 11. Bury Creek Marsh Location Map

BURG CREEK MARSH

LOCATION: Grays Harbor County; Section 34, Township 19 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Burg Creek Marsh is a second tier site. It is in relatively good condition, but some trees have been harvested from it and some wood waste has been deposited in it. The site contains examples of three freshwater wetland communities.

FEATURES: Freshwater Wetland:
Carex rostrata-Carex sitchensis community
Carex rostrata-Sparganium emersum community
Salix spp.-Spiraea douglasii community

DESCRIPTION:

Physical: Burg Creek Marsh includes 23 acres of beaver controlled wetlands along two branches of Burg Creek. The wetland is located at an elevation of 40 feet, on Quaternary alluvial sediments, above the Humptulips River flood plain.

The northern branch of Burg Creek is impounded by a single beaver dam. Snags and stumps in the wetland, indicate periodic water level fluctuations. Currently, the wetland is flooded year round. Soils are sedge, heath and woody peat, and muck. There may be some sphagnum peat.

The southern branch of Burg Creek is crossed by a series of beaver dams. The eastern most (upstream) dam is in disrepair and the wetland area behind it is relatively dry. Downstream from this dam the water level is progressively higher until the western most (downstream) dam is reached. There are areas of open water near the western dam, and seasonally flooded wetlands just west of the eastern dam. Soils are sedge, heath and woody peat, and muck.

Biological: The northern branch of Burg Creek is a species rich assemblage of plant species dominated by Carex rostrata and Carex sitchensis. Fallen trees and soil hummocks provide habitat for upland and drier site wetland plant species. Shallow water areas provide habitat for emergent shrub and herbaceous species.

The eastern most portion of the southern branch of Burg Creek is dominated by Carex sitchensis. It is being invaded by Salix spp. and Spiraea douglasii. Once the Salix spp. are well established and the beavers need them for food, the beaver dam will probably be repaired and this area re-flooded. Downstream of the dam currently in disrepair, the vegetation is dominated by Salix spp. and Spiraea douglasii. In seasonally flooded areas, the vegetation is composed of several species. With increased water depth and duration, the vegetation becomes simpler, primarily composed of the two shrub species with minor occurrence of a few herbaceous species.

CONDITION:

Burg Creek Marsh is in relatively good condition. No exotic plant species were observed which is unusual given the degree and frequency of natural (beaver caused) disturbance. A few cut stumps are located in the wetland, and recently, Thuja plicata along the wetland margin have been cut and salvaged for cedar shake and shingle bolts. Some of those trees and residue from the salvage operations are in the wetland.

The Burg Creek drainage basin is small. Upstream of the site, the land is used for timber production. Houses, pasture and agricultural use downstream have no apparent effect on the wetland.

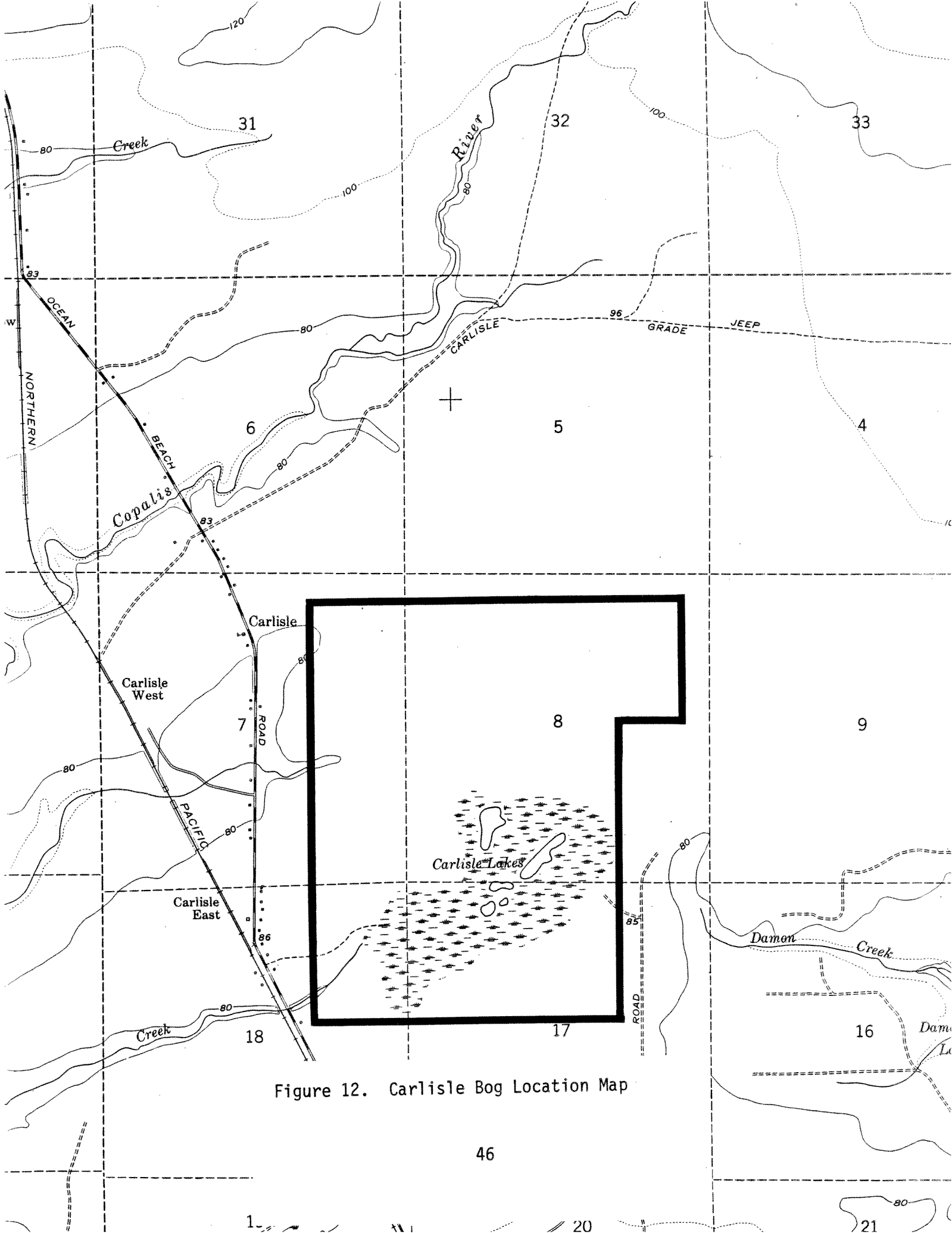


Figure 12. Carlisle Bog Location Map

CARLISLE BOG

LOCATION: Grays Harbor County; Sections 7, 8, 17 and 18, Township 19 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Carlisle bog is a second tier site. It is a large and diverse wetland composed of six sphagnum bog communities and five freshwater wetland communities. Some of the examples of native wetland communities are of high quality, but most appear to be recovering well from past disturbance.

FEATURES: Sphagnum Bog:

1. bog pond
2. Carex rostrata-Carex sitchensis/Sphagnum spp. community
3. Rhynchospora alba/Sphagnum spp. community
4. Myrica gale/Carex rostrata/Sphagnum spp. community
5. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community
6. Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. Brasenia schreberi community
2. Scirpus subterminalis community
3. Carex rostrata-Carex sitchensis community
4. Myrica gale/Carex rostrata community
5. Pinus contorta-Thuja plicata-Tsuga heterophylla community

DESCRIPTION:

Physical: Carlisle Bog is located at 85-90 feet elevation in a large depression over glacial outwash and alluvium. The area of interest is about 290 acres. There is an additional 165 acres to the north which have been converted to other uses but which may be recoverable. Soils are deep sphagnum and sedge peat and muck, with areas of heath peat and woody material.

The wetland is fed by precipitation, surface flow and probably groundwater. It drains via Cedar Creek to the southwest and possibly a second unnamed stream to the southeast. There are several shallow, permanent and seasonal ponds. Beavers frequently dam the outflow to Cedar Creek further impounding water in the bog.

The 165 acres to the north forms a tributary of the Copalis River draining to the west. It is not clear whether there is a hydrologic link between this area and the primary wetland area to the south.

Biological: Some of the ponds have high percent cover of aquatic macrophytes; Brasenia schreberi, Nuphar polysepalum, Scirpus subterminalis and Dulichium arundinaceum are the primary species. In a narrow band, adjacent to some ponds, on quaking sphagnum mats, are small examples of the Rhynchospora alba/Sphagnum spp. community.

The vegetation progresses to the Pinus contorta/Ledum groenlandicum/Sphagnum spp. community on dry, firm substrates. At Carlisle Bog, this community has unusually high cover of Empetrum nigrum in places.

Pinus contorta, Thuja plicata and Tsuga heterophylla codominate in areas that are wetter than the Pinus contorta/Ledum groenlandicum/Sphagnum spp. community. In some areas, Sphagnum spp. are dominant in the understory, and in others it is a minor component or absent. Its presence or absence has a major effect on the understory species composition.

The Carex rostrata-Carex sitchensis/Sphagnum spp. and Myrica gale/Carex rostrata/Sphagnum spp. communities are intermixed in seasonally flooded areas. The Carex rostrata-Carex sitchensis and Myrica gale/Carex rostrata communities grow intermixed in seasonally and permanently flooded areas along the Cedar Creek drainage. The location of the two sets of communities differ first in the degree and frequency of flooding, and probably second in the levels of available nutrients. The sphagnum communities are drier and occur away from surface drainage. They are mostly fed by precipitation which is lower nutrient water than surface water.

CONDITION:

The primary wetland area has received agricultural and forestry use in the past, some of which continues today. Large areas of sedge and shrub dominated communities were mown for hay or used for pasture. Some were ditched in an attempt to drain them for pasture and hay. Most of the ditching efforts failed because, 1) there was too little relief, and 2) beavers repeatedly dammed the ditches. Those areas in which these practices have been abandoned appear to be recovering, although there may be a greater predominance of some species than there was prior to the manipulations, and there is probably fewer acres of sphagnum bog communities.

Most of the forested wetlands have been at least selectively logged in the past, and some were clear-cut. One landowner continues to selectively log his lands. There may have been Thuja plicata/Lysichitum americanum wet forests at one time. It is unclear if the clear-cut forests will recover.

Carlisle Bog is located on a large coastal plain. Most of the area within the drainage basin is used for timber production, but some is used for agriculture, mostly pasture and hay. Use of the 165 acre wetland north of the primary area is of concern. It continues to be mown for hay and occasionally ditched and drained for pasture and hay.

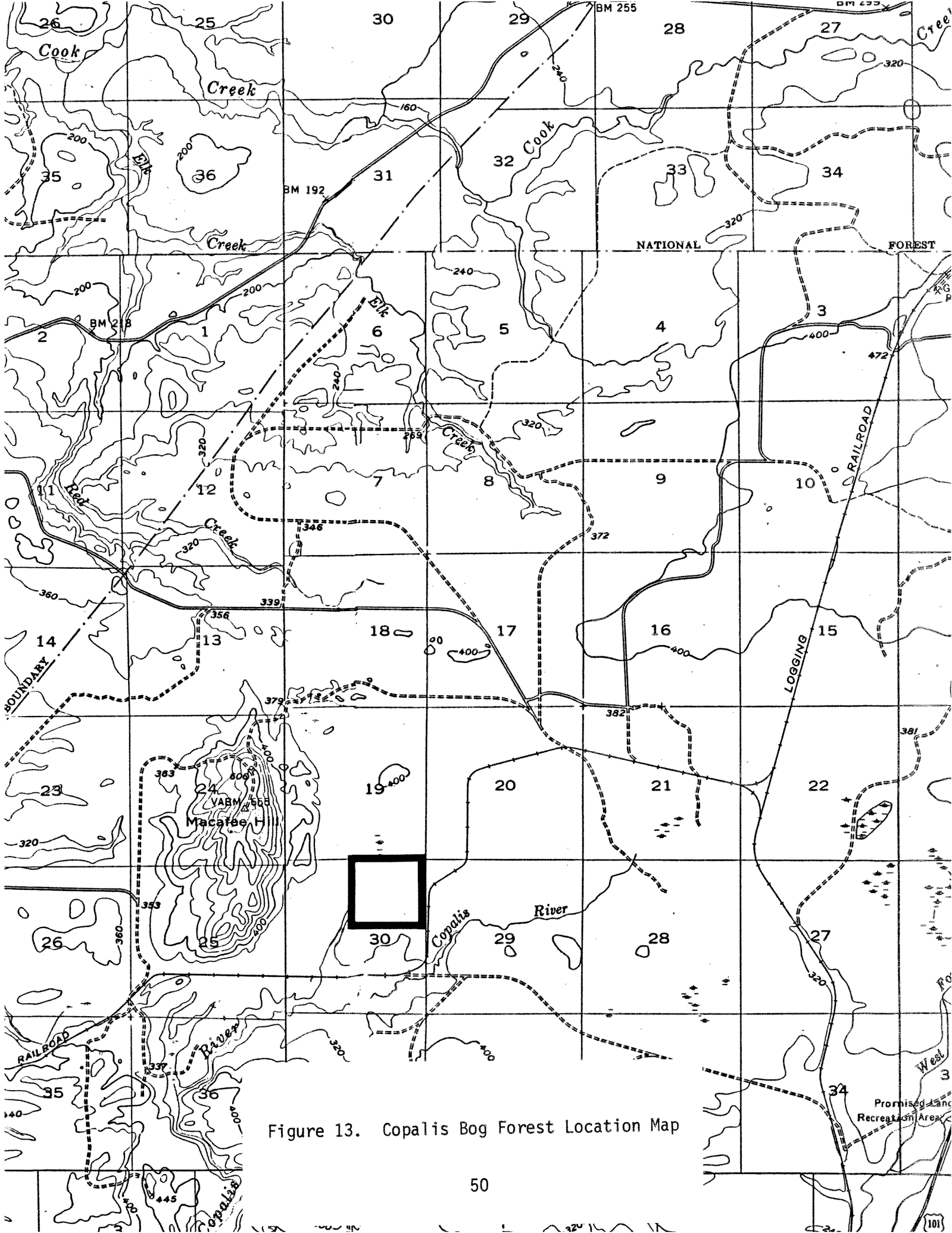


Figure 13. Copalis Bog Forest Location Map

COPALIS BOG FOREST

LOCATION: Grays Harbor County; Section 30, Township 21 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Copalis Bog Forest is a marginal second tier site. It is a small remnant of a community which was once abundant but is now rare in this area.

FEATURES: Freshwater Wetland:
Thuja plicata/Lysichitum americanum community

DESCRIPTION:

Physical: Copalis Bog Forest is a 15 acre remnant bog forest located at an elevation of about 380 feet, near the headwaters of the Copalis River. The site occurs in a glacial outwash plain in glaciolacustrine sediments. Soils are mapped as Halbert muck.

The water table is near the soil surface. A tributary of the Copalis River bisects the forest.

Biological: The forested wetland community is codominated by Picea sitchensis, Thuja plicata and Tsuga heterophylla. Higher microsites are dominated by Gaultheria shallon and Pteridium aquilinum. Wet depressions are dominated by Carex obnupta and Carex rostrata and often have some Sphagnum spp.

CONDITION:

This is a small remnant of a much larger wetland system which includes several sphagnum and non-sphagnum wetland communities. This fragment was selectively logged in the past, but continues to have the character and species composition of an undisturbed stand. It is a museum piece, important mostly if no examples exist farther to the north in western Jefferson and Clallam counties.

Copalis Bog Forest is located near the head of a drainage. That portion of the drainage upstream of it is used for timber production. The stream is crossed by road-fill and a logging spur immediately upstream of the site. If there are culverts, they are inadequate and the water flows over the road. Upstream bog forest has been recently logged.

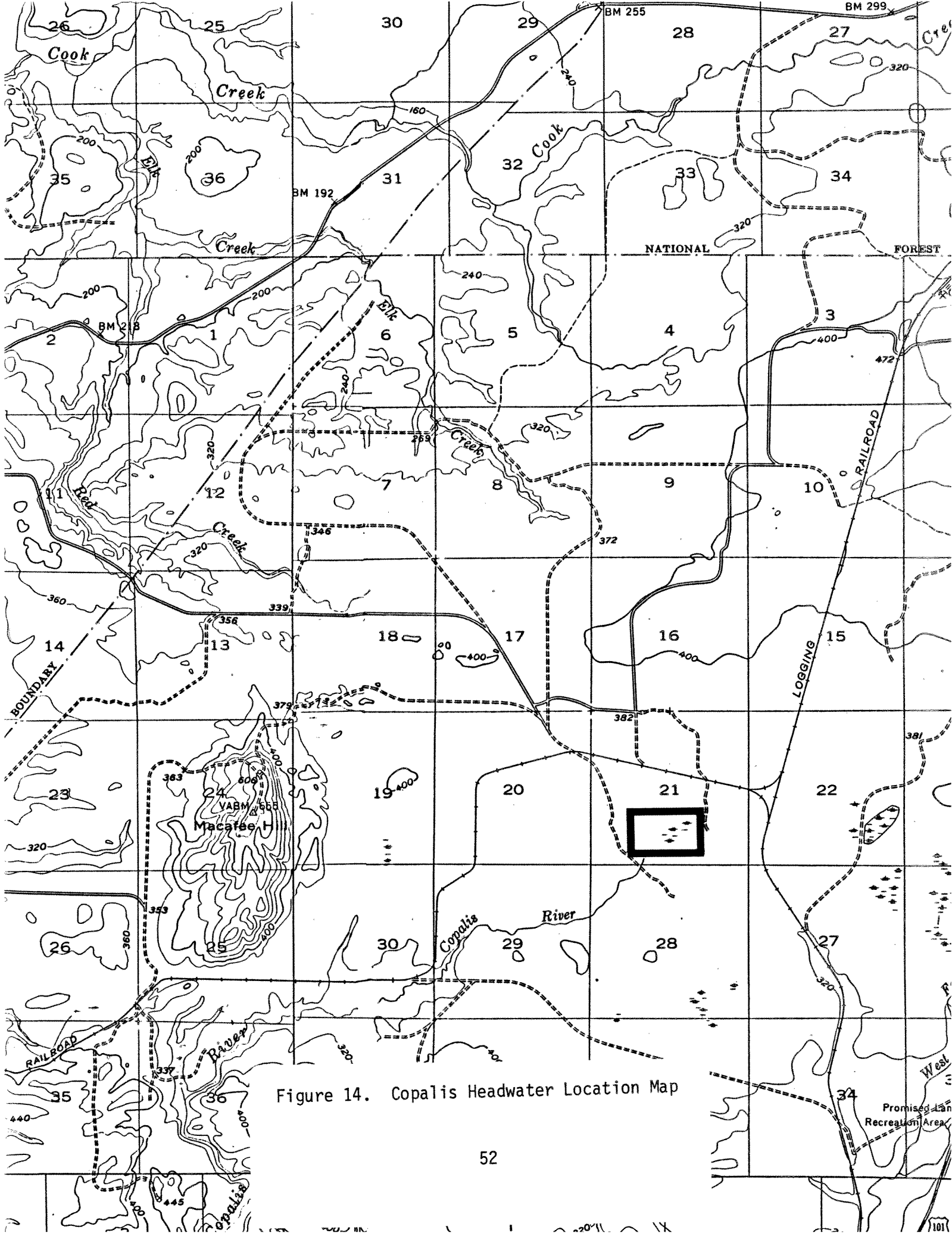


Figure 14. Copalis Headwater Location Map

COPALIS HEADWATER

LOCATION: Grays Harbor County; Section 21, Township 21 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Copalis Headwater is a marginal second tier site. It appears to be recovering from past disturbance. The wetland is composed of one freshwater wetland community.

FEATURES: Freshwater Wetland:
Myrica gale/Carex rostrata community

DESCRIPTION:

Physical: Copalis Headwater is a 16 acre wetland, located at an elevation of 380 feet, which forms the headwater marsh of the Copalis River. It occurs on a glacial outwash plain. Soils are a mixture of sedge, heath and woody peat. The area is seasonally to permanently flooded. A braided stream channel winds its way through the wetland. Beavers have built small dams across some of the channels. Some of the channels have peat bottoms, but the primary channel cuts down to mineral soil.

Biological: The site is dominated by Myrica gale 5 feet or greater tall. There are small areas, where the Myrica gale is shorter and less dense, that are species rich, but most of the wetland is composed of a few species. To the north, Rhamnus purshiana is codominant with the Myrica gale.

CONDITION:

The Copalis Headwater wetland appears to be recovering from past disturbance. The adjacent forested wetland was clear-cut in the past, including an area which is now shrub wetland. There is evidence that a logging spur once crossed the wetland, but it is no longer evident in the field. A small population of a weedy plant species, Juncus effusus, is in the wetland.

The drainage basin upstream of this site is used for timber production. Old logging railroad and road beds occur in the drainage on fill.

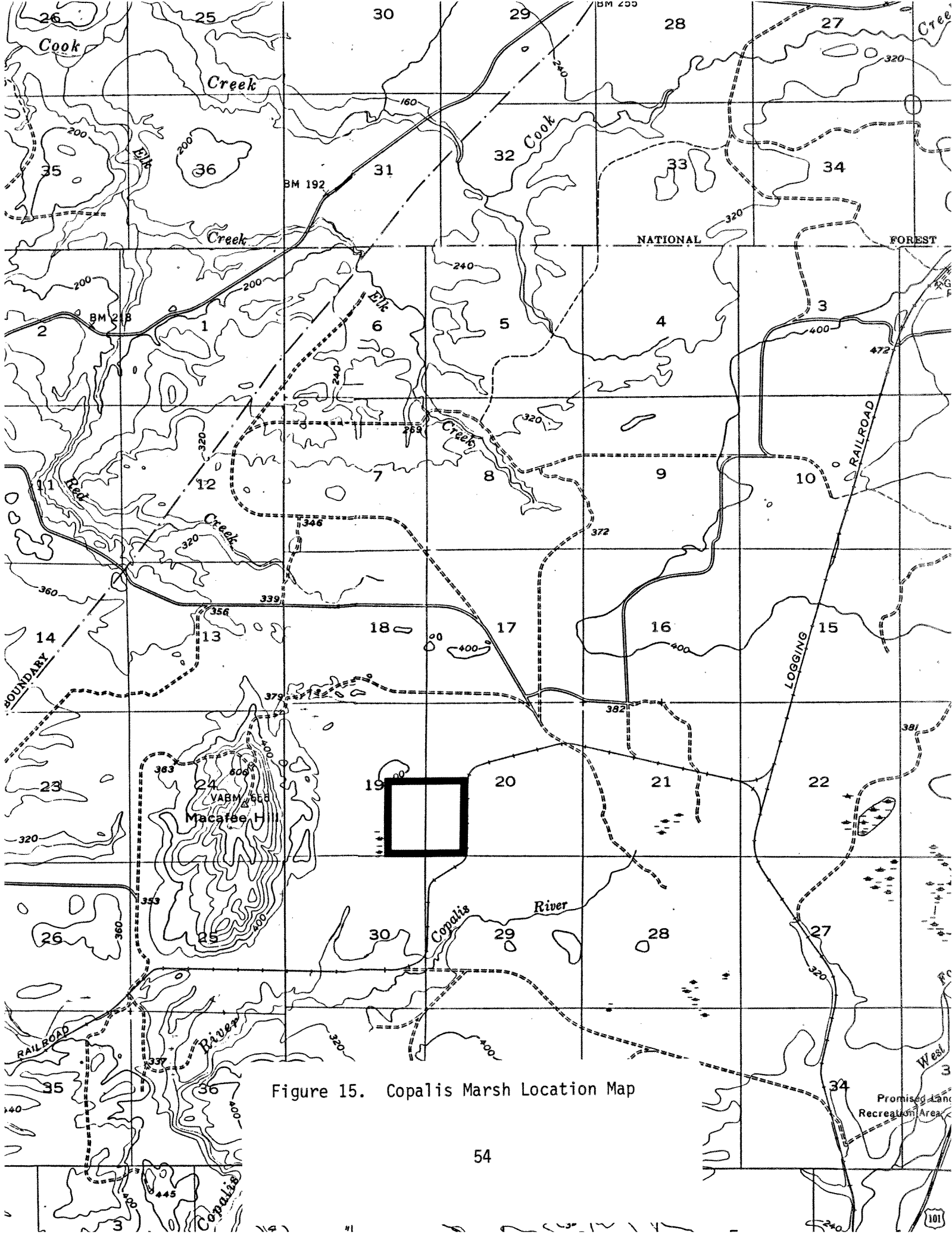


Figure 15. Copalis Marsh Location Map

COPALIS MARSH

LOCATION: Grays Harbor County; Sections 19 and 20, Township 21 North, Range 10 West, Willamette Meridian.

SIGNIFICANCE: Copalis Marsh is a second tier site. It was disturbed in the past, but still contains examples of three sphagnum bog and one freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community
2. Myrica gale/Carex rostrata/Sphagnum spp. community
3. Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. Myrica gale/Carex rostrata community

DESCRIPTION:

Physical: Copalis Marsh is an approximately 70 acre wetland system which is located at an elevation of 380 feet near the headwaters of the Copalis River. It occurs on a glacial outwash plain. Soils are a mixture of sphagnum, sedge, heath and woody peat, and muck.

The area may be a groundwater discharge area and also has inflow via a small stream and precipitation. Most of the site is permanently flooded, including the forested wetland areas. There is a slightly higher and drier sphagnum area which is only flooded seasonally if at all.

Biological: The forested wetland area was only partially surveyed. Most of it is permanently flooded and has deep anoxic muck soils and a tangle of shrubby vegetation which makes it very difficult to traverse. Pinus contorta and Thuja plicata are the dominant tree species. The understory is a mosaic of Myrica gale, Ledum groenlandicum, Gaultheria shallon and Pyrus fusca.

Most of the shrub dominated wetland is permanently flooded, by inflow stream water and springs. It is an example of the Myrica gale/Carex rostrata community in which the Myrica gale reaches 8 or more feet tall.

The raised, relatively dry sphagnum area is a mixture of the Ledum groenlandicum/Sphagnum spp. and Myrica gale/Carex rostrata/Sphagnum spp. communities. The shrubs tend to be low growing, up to 4 feet tall. One area is also dominated by Pyrus fusca, and has high percent cover of Rhamnus purshiana and Gaultheria shallon.

CONDITION:

Copalis Marsh is a fragment of a larger wetland system. The site has been disturbed in the past, and is bounded to the south and west by recently logged wetlands and a logging spur road built on fill. A road cuts through the eastern portion of the wet forest. There is an odd ridge which bisects

the length of the site, separating the permanently flooded from the relatively dry shrub wetland communities. This ridge may have been an old railroad grade, left over from the original logging of this area. Some of the forested wetland areas are second growth.

Only a small portion of the Copalis River drainage basin occurs upstream of this site. All of that upstream drainage is used for timber production. Old logging railroads and roads on fill cut across the drainage to the north and east, altering drainage into the site.

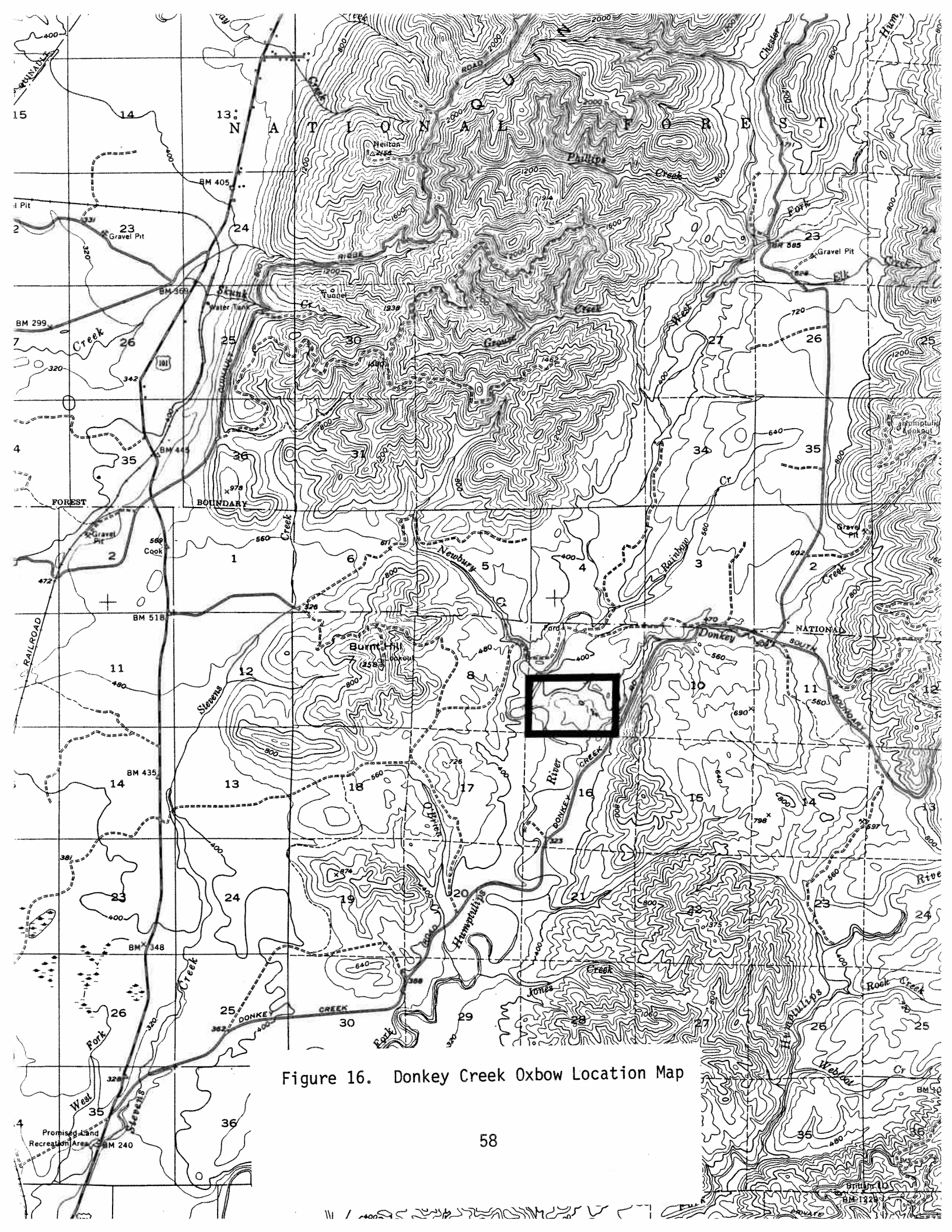


Figure 16. Donkey Creek Oxbow Location Map

DONKEY CREEK OXBOW

LOCATION: Grays Harbor County; Section 9, Township 21 North, Range 9 West, Willamette Meridian.

SIGNIFICANCE: Donkey Creek Oxbow is a second tier site. The wetland is an oxbow composed of examples of two freshwater wetland communities.

FEATURES: Freshwater Wetland:
Carex obnupta community
Carex rostrata community

DESCRIPTION:

Physical: Donkey Creek Oxbow is an 8-9 acre wetland formed in an old oxbow of the West Fork Humptulips River. The wetland is located at an elevation of 320 feet. Shallow sedge peat soils overlay alluvium. There is a cobble-gravel delta where a seasonal stream enters the wetland.

Donkey Creek Oxbow appears to drain to the southwest into the Humptulips River, and to the southeast into Donkey Creek. There is a braided stream channel which follows the length of the oxbow. Beavers have dammed the stream channel at both ends in the past, flooding some areas of the wetland year round. At the time of the survey all of the dams were in disrepair, and the wetland was mostly seasonally flooded.

Biological: The eastern half of the wetland is dominated by Carex rostrata. It is highly diverse, with a small beaver pond, depressions that are flooded year round, higher areas that are seasonally flooded, and small areas with sphagnum bog species. Lycopus uniflorus, Viola sp., Hypericum anagalloides, Carex obnupta and Carex sitchensis have high percent cover in areas. There are old remnants of small trees and shrubs suggesting that the water level in this part of the wetland fluctuates periodically, probably controlled by the beavers. Alnus rubra are currently encroaching on the wetland.

The western half of the wetland is dominated by Carex obnupta. The vegetation is composed of relatively few species, and the Carex obnupta is tall and lush. Spiraea douglasii and Alnus rubra are established in the wetland.

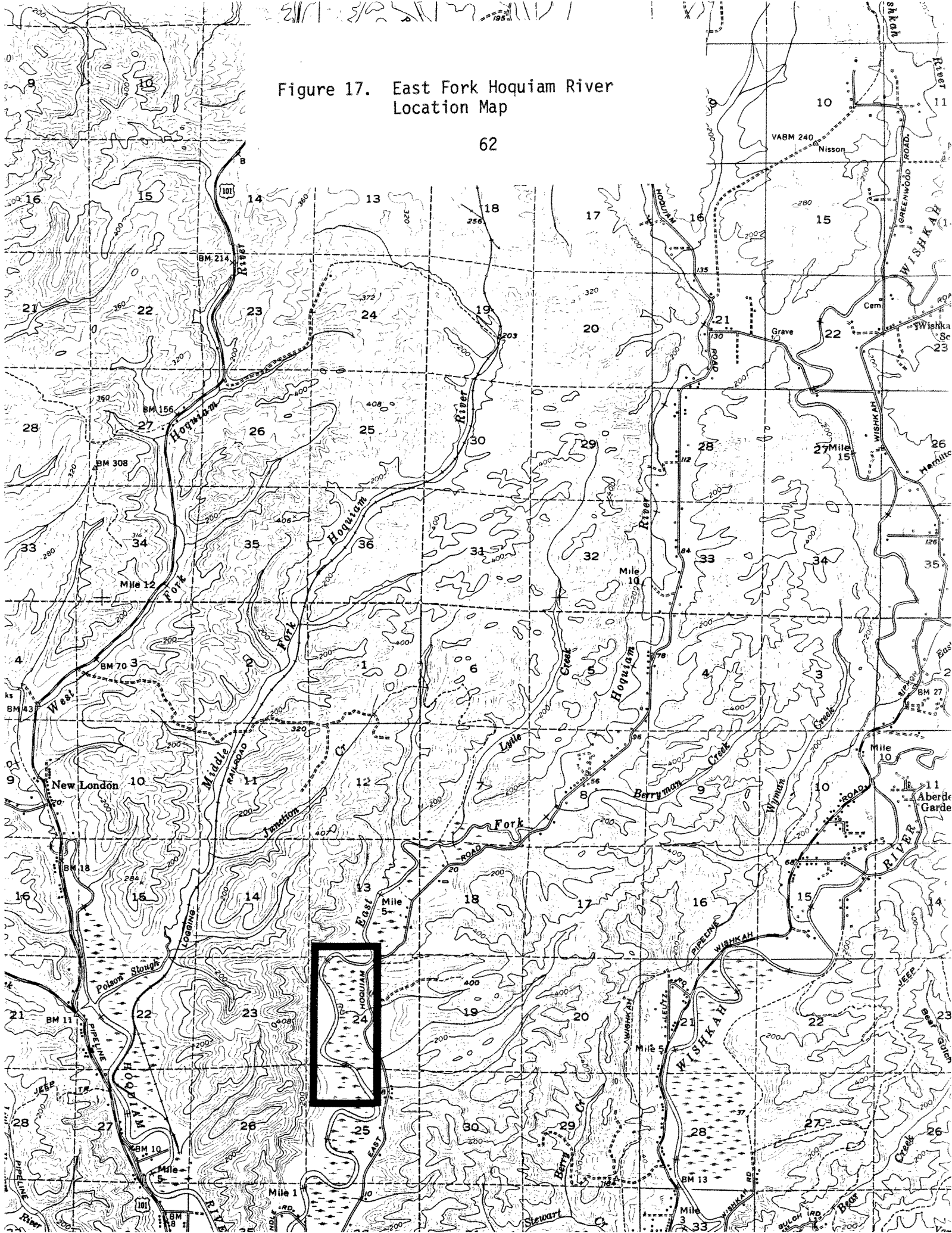
CONDITION:

Half of the wetland appears to be in good condition while the other half may have been disturbed. The eastern half of the wetland has several exotic plant species, three of which have high percent cover. Most of the exotic species occur on and around the delta, suggesting that seeds and plants may have washed down from the adjacent uplands. It is also possible that the wetland was used for pasture in the past. The lack of exotic species in the western half of the wetland favors the former hypothesis. The future extent of these exotic plant species in the wetland is not known.

Although it occurs within the West Fork Humptulips River flood plain, Donkey Creek Oxbow has a very small drainage basin. The drainage basin is used for timber production.

Figure 17. East Fork Hoquiam River Location Map

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EAST FORK HOQUIAM RIVER

LOCATION: Grays Harbor County; Sections 24 and 25, Township 18 North, Range 10 West, Willamette Meridian.

SIGNIFICANCE: East Fork Hoquiam River is a second tier site. It contains examples of four surge plain wetland communities in relatively good condition.

FEATURES: Surge Plain Wetland:

1. Athyrium filix-femina community
2. Typha latifolia community
3. Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community
4. Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community

DESCRIPTION:

Physical: East Fork Hoquiam River is a 140 acre surge plain wetland which occurs at about 10 feet in elevation within the flood plain of the East Fork Hoquiam River. The wetland has developed over Quaternary alluvium which in turn may overlay Miocene sedimentary rock. Soils are a mixture of silts and clays with some non-sphagnum peat, woody material and muck.

The wetland is interlaced with sloughs which carry tidal freshwater throughout the site during high tides. Occurrence of salt tolerant plant species right along the sloughs suggest that there may be some brackish water influence. The meadow wetland areas are flooded at each high tide, and some areas are permanently flooded due to beaver dams. The forested wetland areas have wet soils, but may not be flooded with each high tide.

Biological: There are two meadow communities. The Athyrium filix-femina community occurs in areas that are flooded at high tide. The Typha latifolia community occurs in areas that are permanently flooded. The former is dominated by Athyrium filix-femina and has high cover of Scirpus microcarpus and/or Calamagrostis nutkaensis. The later is codominated by Typha latifolia and Carex obnupta, and has high percent cover of Athyrium filix-femina.

One area of the Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community occurrence is unusual and may be in transition from an Athyrium filix-femina community to a more typical Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community. The area is codominated by Alnus rubra, Salix spp., Athyrium filix-femina, Carex obnupta and Scirpus microcarpus. The Alnus rubra are all small and probably even aged suggesting a recent and sudden change initiating the stand development.

Other areas of this community are more typical, and are dominated by Alnus rubra, Pyrus fusca and Polystichum munitum. These areas are often drier than the following community.

The Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community is the predominant wetland plant community at this site. There is a lot of microtopographic diversity in this community as reflected in the understory species composition.

CONDITION:

This site was disturbed in the past, but it is in good condition relative to what is left of this community in Washington. The forested wetland areas appear to be recovering well. It is unclear if the meadow areas will recover of their own accord.

An old logging railroad is still visible across the north end of the site, and a straight line bisecting the center of the site is visible in 1985 aerial photographs, although it was not apparent on the ground. This line leads to the odd Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community. Several exotic and weedy plant species occur in the wet meadow areas, suggesting past use. Picea sitchensis were selectively removed in the past.

The East Fork Hoquiam River drainage basin upstream of the site is large. Most of the basin is used for timber production. The East Hoquiam Road is located adjacent, and parallel, to the river. Homes are scattered along the road.

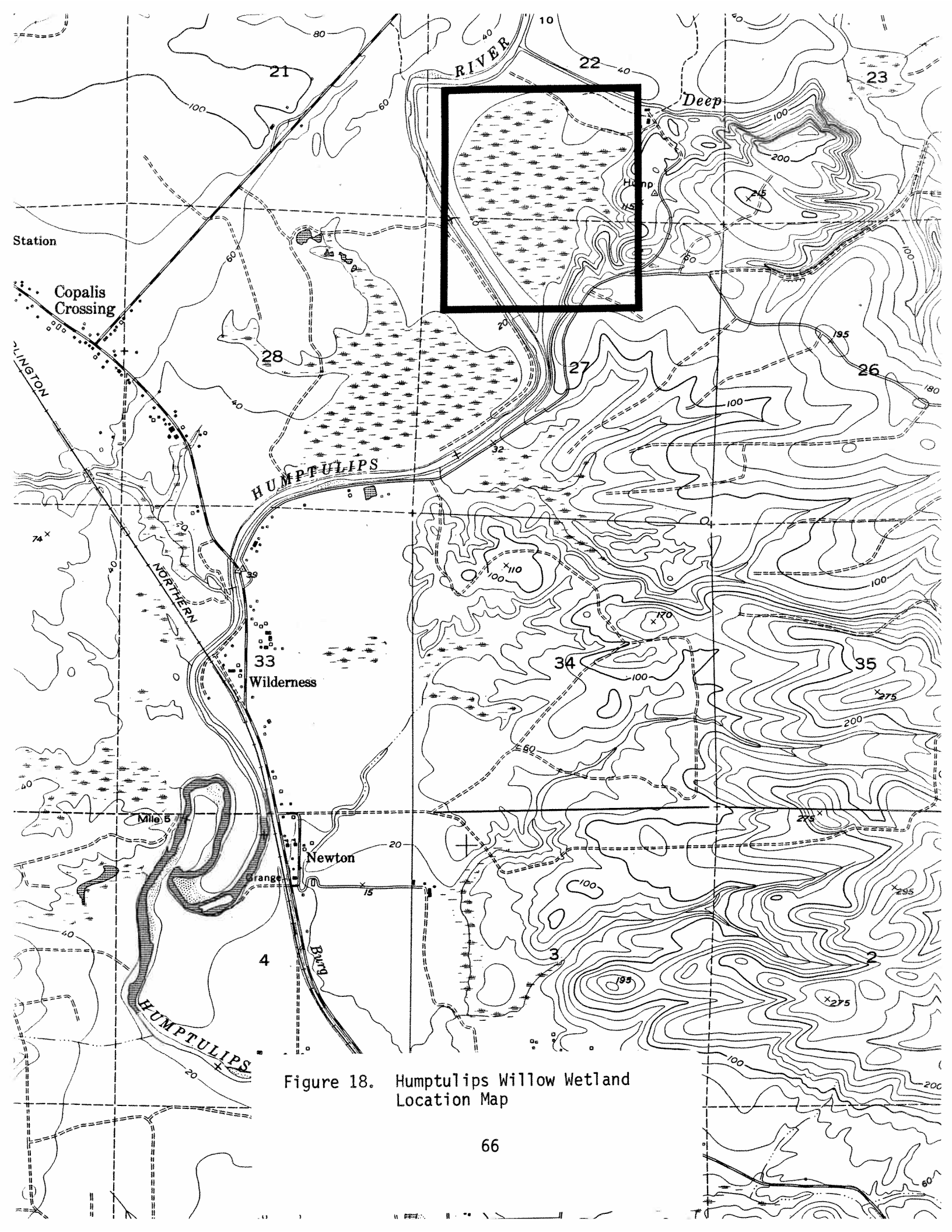


Figure 18. Humptulips Willow Wetland Location Map

HUMPTULIPS WILLOW WETLAND

LOCATION: Grays Harbor County; Sections 22 and 27, Township 19 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Humptulips Willow Wetland is a second tier site. It has been disturbed by diversion of its primary inflow stream, but it continues to be a relatively high quality example of a generally degraded wetland type containing one freshwater wetland community.

FEATURES: Freshwater Wetland:

1. Salix spp.-Spiraea douglasii/Carex obnupta community

DESCRIPTION:

Physical: Humptulips Willow Wetland is a 130 acre isolated portion of the Humptulips River flood plain separated from the river by a natural levee. It occurs at an elevation of 40 feet on a river terrace composed of Quaternary alluvium. Soils are deep sedge, heath and woody peat, and muck. There are only traces of Sphagnum spp.

The wetland is mostly shallowly and permanently flooded. It receives water from several small streams, most of which are seasonal. In the past, it received water from a large perennial stream, Deep Creek, but that stream has been diverted and now flows north of the wetland into the Humptulips River. A deep outflow channel is located through the southern end of the berm.

Beavers live throughout the wetland. They appear to move their primary area of activity from time to time: excavating channels, constructing and maintaining small dams, and harvesting the willows. They cause additional flooding in these areas.

Biological: The wetland vegetation and hydrology appear to be controlled by the beavers. Beavers have created an intricate system of small channels and dams which they maintain in some areas and don't in others. The channels are usually flooded, and in primary activity areas, all but hummocks around Salix spp. are flooded. Plant species distributions are related to microtopography and water level. They are also effected by beavers which harvest vegetation, most noticeably Salix spp. in their primary activity areas. The result is a dynamic patchwork of wetland vegetation, with varying densities and sizes of Salix spp., depending on when the beavers were last active in a given patch.

The Salix spp.-Spiraea douglasii/Carex obnupta community is dominated by at least three species of Salix, Spiraea douglasii and Carex obnupta. In places, there is also high percent cover of Cornus stolonifera, Ledum groenlandicum, Carex cusickii, Potentilla palustris and Menyanthes trifoliata.

CONDITION:

Currently, the wetland vegetation appears in excellent condition. No exotic plant species were observed, which is very unusual in a freshwater wetland. However, the system has been altered by diversion of Deep Creek. Also, cattle have access to the northwestern corner of the wetland, with unknown effects.

With diversion of Deep Creek, the drainage basin for the Humptulips Willow Wetland is small, less than twice the size of the wetland. Most of the adjacent uplands are used for timber production. The northeast portion of the drainage contains a residence and small logging facility. The northern portion of the basin, between the wetland and the Deep Creek canal, appears to be pasture.

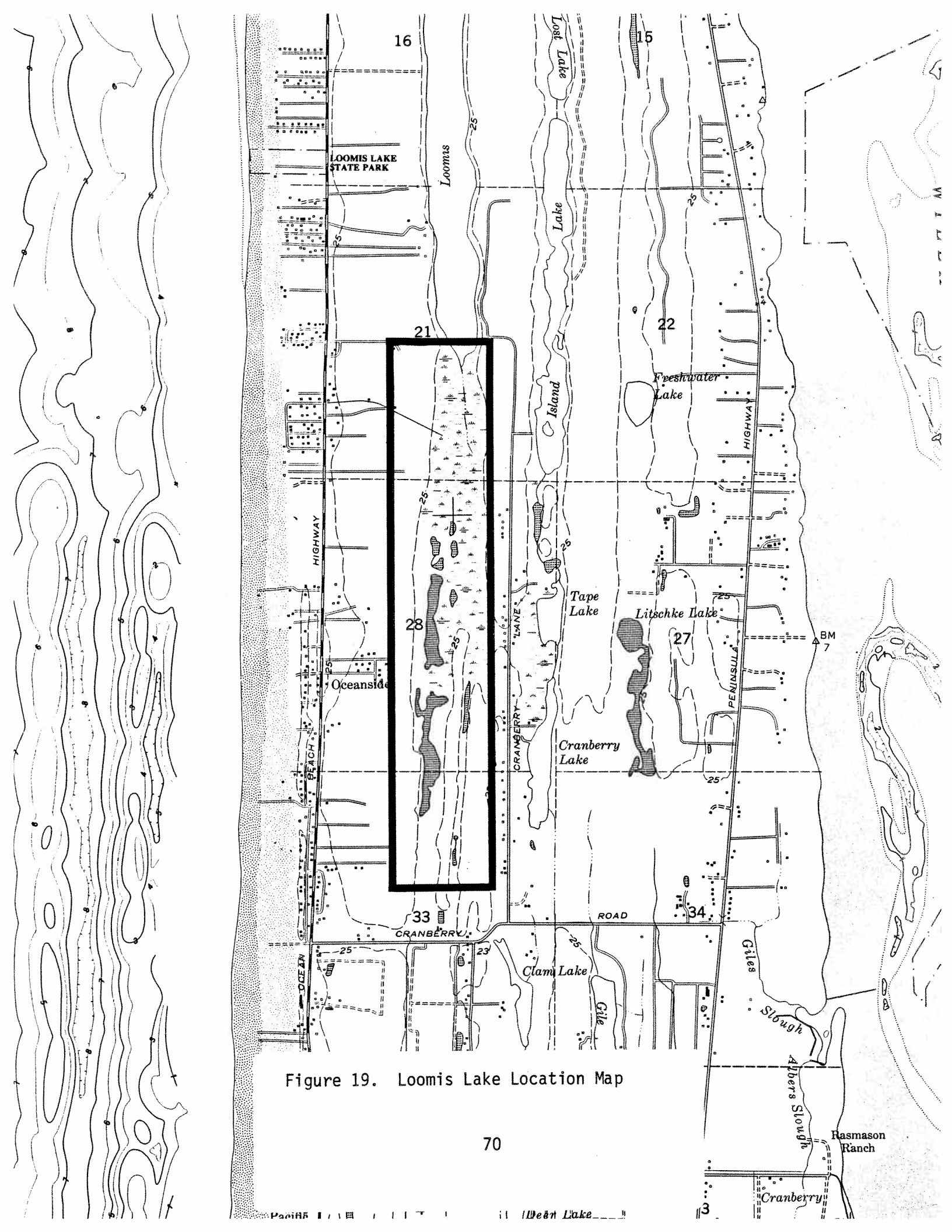


Figure 19. Loomis Lake Location Map

LOOMIS LAKE

LOCATION: Pacific County; Sections 21, 28 and 33, Township 11 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Loomis Lake is a second tier site. It is a relatively undisturbed and recovered fragment of a dune trough wetland which contains examples of 2 sphagnum bog and 7 freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community
2. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Nuphar polysepalum community
2. Carex rostrata-Carex sitchensis community
3. Myrica gale/Carex sitchensis-Sanguisorba officinalis community
4. Salix hookeriana community
5. Spiraea douglasii community
6. Pinus contorta-Thuja plicata-Tsuga heterophylla community
7. Pyrus fusca community

DESCRIPTION:

Physical: Loomis Lake is a 315 acre portion of a dune trough wetland which extends south from Loomis Lake to an old road bed north of Cranberry Road on the Long Beach Peninsula. It occurs below 25 feet elevation over Columbia River sands. Soils are a mixture of sphagnum, sedge, heath and woody peat, and muck.

The wetland is fed by groundwater, precipitation and surface water flow. Currently it drains to the south. There is a short channel leading south from Loomis Lake into the wetland, but the remainder of the wetland has no channels.

The water level in the wetland is partially controlled by humans and beavers. The cranberry growers to the south regulate water levels in their fields which in turn affects water levels in the wetland. Most of the wetland appears to be seasonally flooded. Ponds and some of the Spiraea douglasii dominated areas are permanently flooded. Slightly raised islands and ridges within the site may never be flooded, but the water table is near the soil surface.

Biological: Most of the wetland is a mosaic of sedge meadows and shrub thickets. The sedge meadows are all dominated by Carex sitchensis. Oenanthe sarmentosa and Potentilla palustris often co-dominate with Carex sitchensis.

Most of the shrub thickets are composed of Myrica gale, Salix hookeriana or Spiraea douglasii. A few are dominated by Pyrus fusca, Spiraea douglasii and Carex obnupta.

In and around the ponds the vegetation is dominated by Nuphar polysepalum, Potamogeton sp. and Potentilla palustris. Carex rostrata and Carex vesicaria may have high percent cover around the pond margins.

Both sphagnum bog communities (Ledum groenlandicum/Sphagnum spp. community and Pinus contorta/Ledum groenlandicum/Sphagnum spp. community), and the Pinus contorta-Thuja plicata-Tsuga heterophylla community occur on raised islands or ridges within the wetland. In the sphagnum bog communities, Kalmia occidentalis is codominant. The percent cover of Vaccinium oxycoccos decreases, and the percent cover of Gaultheria shallon and Pteridium aquilinum increase with increase in cover and size of Pinus contorta.

CONDITION:

This site is a portion of a much larger dune trough wetland. There is no evidence that this portion of the wetland has been used for cranberry growing in the past although an adjacent land owner thought it had been in the early 1900s. There are old fence posts and barbed wire still visible in the wetland which suggests that at least a portion of the wetland was grazed at one time. The cranberry growers to the south regulate the drainage from Loomis Lake through their cranberry fields at times. Flooding their fields could also back-up water on to this portion of the wetland. Beavers constantly attempt to dam the drainage system, but the cranberry growers try to keep the system free of beaver dams.

Some upland owners along the west side of the wetland have dug drainage ditches into the wetland to help drain the uplands. One owner dug a channel through the vegetated wetlands to one of the ponds, presumably to gain access for hunting. One hunting blind was found along the margin of a pond.

The wetland is threatened by conversion to cranberry growing, filling, dredging and development of adjacent lands (including the lake margin) which could change the nutrient levels and/or hydrology of the wetland. The groundwater is threatened with draw-down from wells, and pollution.

The drainage basin is used for recreational and rural housing development, agriculture (mostly cranberry and blueberry growing) and timber production.

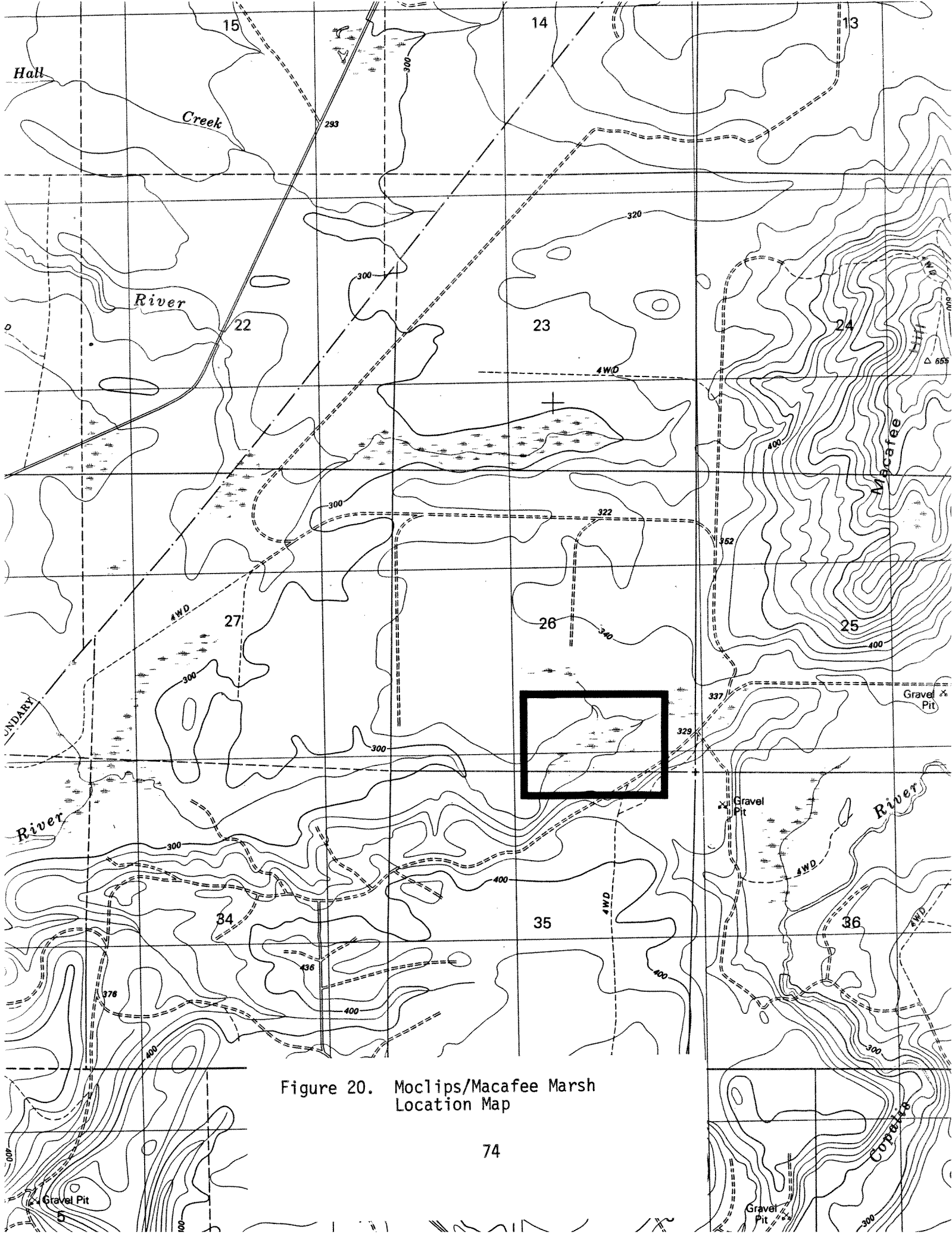


Figure 20. Moclips/Macafee Marsh Location Map

MOCLIPS/MACAFAEE MARSH

LOCATION: Grays Harbor County; Section 26, Township 21 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Moclips/Macafee Marsh is a second tier site. It is a fragment of a larger wetland system and contains examples of one sphagnum bog and two freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Myrica gale/Carex rostrata/Sphagnum spp. community

Freshwater Wetland:

1. Carex rostrata community
2. Myrica gale/Carex rostrata community

DESCRIPTION:

Physical: Moclips/Macafee Marsh is the 10 acre headwater wetland of the middle fork of the Moclips River. It occurs at an elevation of 320 feet over glacial outwash. The soils are a mixture of sphagnum, sedge and heath peat.

The wetland has four arms and drains from east to west. The eastern arm of the wetland is a raised, relatively dry sphagnum bog. It may be seasonally flooded. The northeastern and northern arms are permanently to seasonally flooded, each containing a small stream channel. The outflow follows the western arm and appears to shift from seasonally to permanently flooded from east to west. The water level in part is controlled by beavers.

Biological: The eastern arm of the wetland contains a species rich Myrica gale/Carex rostrata/Sphagnum spp. community. The vegetation is low growing, shrubs not exceeding 3 feet tall. There is high percent cover of small Thuja plicata, Kalmia occidentalis, Rhynchospora alba, Sanguisorba officinalis, Carex livida, Carex interior and Nephrophyllidium crista-galli.

The rest of the wetland is a mosaic of the Myrica gale/Carex rostrata/Sphagnum spp., Carex rostrata and Myrica gale/Carex rostrata communities. This mosaic is composed of very few plant species, and the shrub layer is between 4 and 7 feet tall. The water level in this part of the wetland fluctuates periodically, depending on beaver activity.

CONDITION:

The portion of the wetland described is in excellent condition. However, it is small and surrounded by wet forest communities which were logged in the past. Very little of the Copalis River drainage lies upstream of this wetland, and all that does is used for timber production. There are roads and old logging railroads within this portion of the drainage.

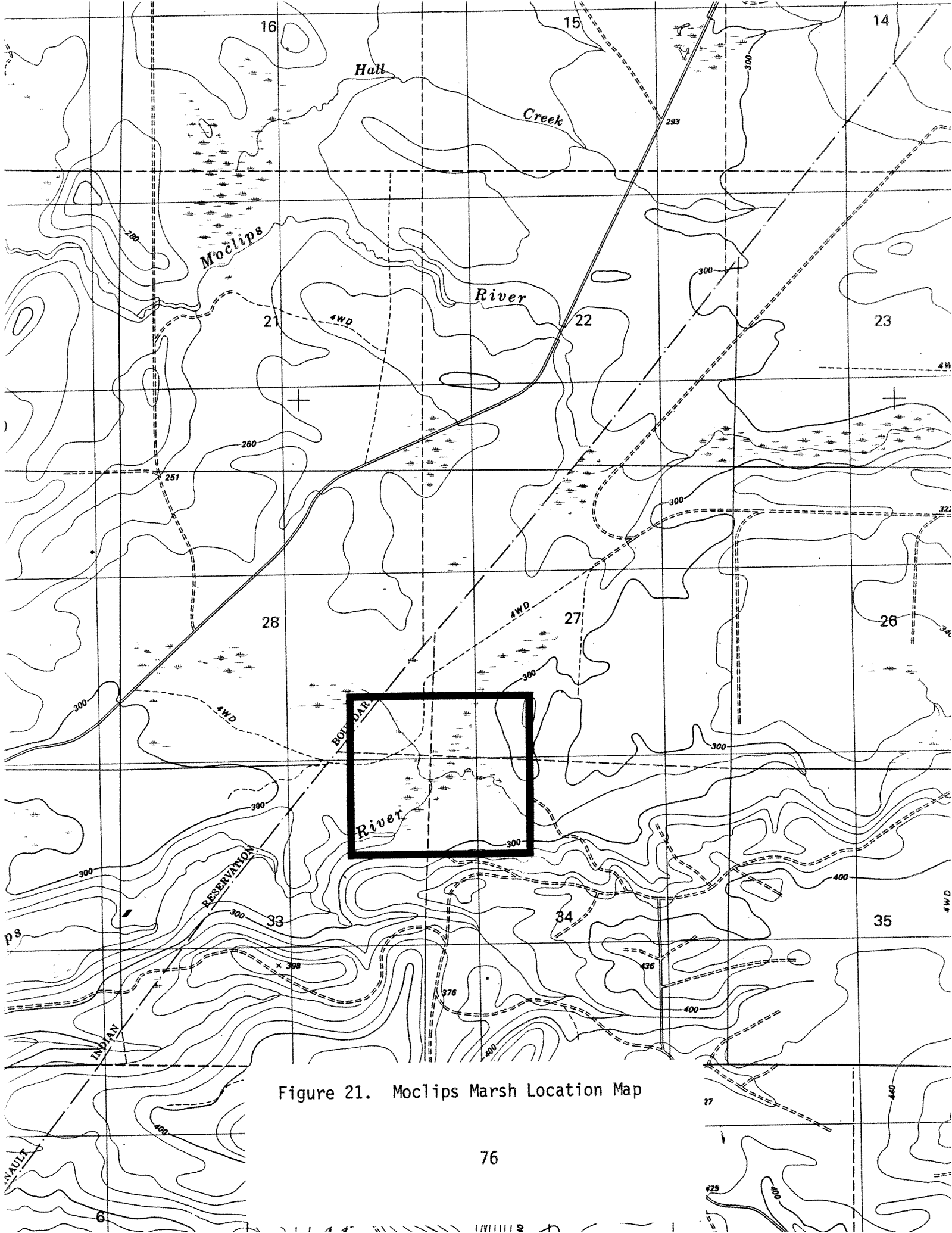


Figure 21. Moclips Marsh Location Map

MOCLIPS MARSH

LOCATION: Grays Harbor County; Sections 27, 28, 33 and 34, Township 21 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Moclips Marsh is a second tier site. It is a high quality fragment of a larger wetland system, much of which has been logged recently. It contains examples of three sphagnum bog and four freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/sphagnum spp. community
2. Myrica gale/Carex rostrata/Sphagnum spp. community
3. Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. Carex rostrata community
2. Myrica gale/Carex rostrata community
3. Pinus contorta-Thuja plicata-Tsuga heterophylla community
4. Thuja plicata/Lysichitum americanum community

DESCRIPTION:

Physical: Moclips Marsh includes approximately 46 acres of wetlands along an upper reach of the Moclips River. The wetlands occur at an elevation of about 300 feet over glacial outwash. The soils are a mixture of sphagnum, sedge and heath peat, and muck.

Moclips Marsh is a limnogenous or marsh swamp bog (Damman, 1986). The main stream channel cuts part way through the peat deposit, such that the stream bed is composed of peat. The water is red-brown in color and flows very slowly. The wetland on either side of the stream channel is fed by precipitation, surface overflow from the stream, and surface and subsurface seepage from two small drainages which also flow into the wetland. The water table is high, at, to slightly above, the surface over most of the wetland, and slightly below the surface in some of the forested wetlands.

Biological: The sphagnum and non-sphagnum communities are interspersed throughout the wetland. In general, the Carex rostrata and Myrica gale/Carex rostrata communities occur in the wettest areas (those permanently to seasonally flooded), and the Myrica gale/Carex rostrata/Sphagnum spp. community tends to occur on slightly raised areas that are seasonally flooded or perpetually supersaturated.

The Ledum groenlandicum/Sphagnum spp. community occurs along the eastern side of the wetland (the up-slope side) on supersaturated peat that is slightly higher and drier than the previously described communities.

The forested wetland communities are relatively dry, with the water table slightly below the surface. The Thuja plicata/Lysichitum americanum community has high cover of Gaultheria shallon on fallen trees and slightly

raised areas of soil. Depressions are numerous and dominated by Carex obnupta. There is up to 50% cover of Sphagnum spp.

Drier forested wetland areas that are dominated by Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. or Pinus contorta-Thuja plicata-Tsuga heterophylla communities have been selectively logged. These communities probably occur over shallower peat soils.

CONDITION:

A portion of this wetland is in excellent condition. However, most of the forested wetland areas have been logged, some clear-cut and some selectively. There is a Pyrus fusca thicket along the northern drainage which contains a large number of recently dead stems, suggesting some perturbation, natural or otherwise. There is a vehicle trail over a small portion of the wetland.

The portion of the Moclips River drainage upstream from this wetland is all used for timber production. Recently, a large area of wet forest, along the primary inflow stream to the wetland, was logged. An old railroad grade crossing a small inflow stream is deteriorating, the fill eroding into the wetland.

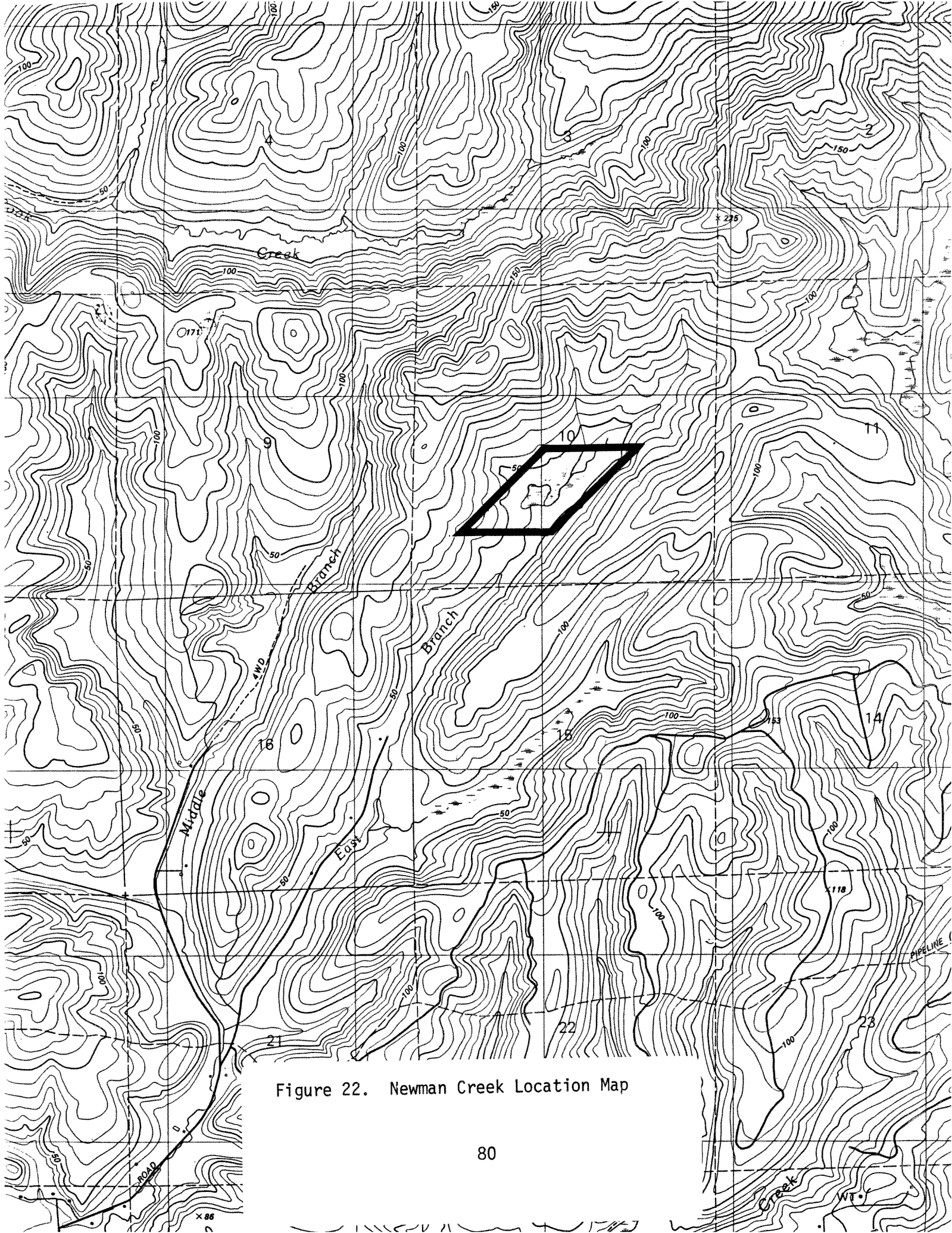


Figure 22. Newman Creek Location Map

NEWMAN CREEK

LOCATION: Grays Harbor County; Section 10, Township 18 North, Range 6 West, Willamette Meridian.

SIGNIFICANCE: Newman Creek is a marginal second tier site. It is included because there are so few freshwater wetlands, particularly beaver controlled wetlands, which are known to be in good condition. It contains a diverse example of one freshwater wetland community.

FEATURES: Freshwater Wetland:
Glyceria elata community

DESCRIPTION:

Physical: Newman Creek is an 11 acre beaver created and maintained wetland along the upper reaches of East Branch Newman Creek. The wetland is located at an elevation of about 150 feet. The wetland occurs over a Miocene, marine, sedimentary, rock formation, in sandy loam alluvium. The organic soils are black anoxic muck.

The water level is controlled by beavers. There are two main dams across the creek drainage, plus many small dams across small channels. Currently, both dams are being maintained. Most of the wetland behind the downstream dam is permanently flooded at this time. The wetland behind the upstream dam is a mixture of seasonally and permanently flooded areas. The soils in seasonally flooded areas are supersaturated at all times.

Biological: The vegetation is a chaotic mosaic of species, typical of highly dynamic beaver wetlands. Glyceria elata seems to have high abundance throughout the wetland. Typha latifolia, Carex sp. and Scirpus microcarpus are dominant in portions of the downstream wetland. The upstream wetland has high cover of small Salix sp. and Alnus rubra appears to be invading the margins.

CONDITION:

Newman Creek is a marginal wetland site. Burned snags and stumps are visible within the wetland indicating past logging of the now wetland area. The uplands are being logged for the second time, including the wetland forested margin. No buffers are being left along the wetland margins or along drainages into the wetland, and slash has been piled on the margins. The adjacent upland slopes are steep and erodible. Currently there are surprisingly few exotic plant species in the wetland. However, newly logged lands on adjacent slopes and along drainages are dominated by aggressive exotic plant species.

All of the East Branch Newman Creek drainage basin upstream of the wetland is used for timber production. It is a steep, erodible drainage. Roads are restricted to ridge tops.

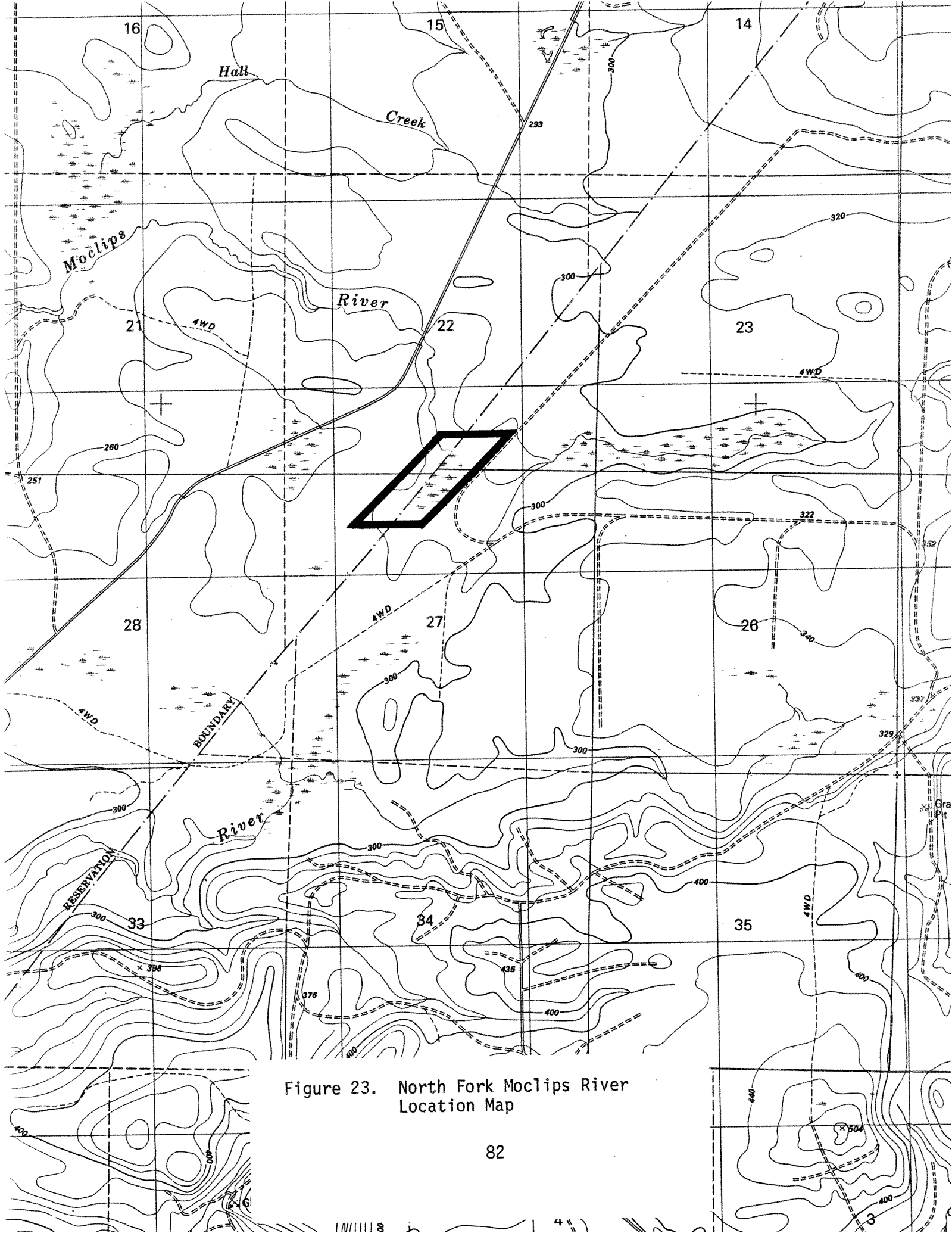


Figure 23. North Fork Moclips River Location Map

NORTH FORK MOCLIPS RIVER

LOCATION: Grays Harbor County; Sections 22 and 27, Township 21 North, Range 11 West, Willamette River.

SIGNIFICANCE: North Fork Moclips River is a second tier site. It is a high quality fragment of a larger wetland system and contains examples of two freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Carex rostrata community
2. Myrica gale/Carex rostrata community

DESCRIPTION:

Physical: North Fork Moclips River is a 14 acre wetland near the headwaters of the north fork of the Moclips River. It is located at an elevation of 250 feet over glacial outwash. The soils are a mixture of sedge and heath peat, and may have some sphagnum peat.

The wetland is seasonally flooded. There is a small stream channel through the wetland. The wetland is fed by surface water overflow from the stream and precipitation.

Biological: The wetland vegetation is a mosaic of the Carex rostrata and the Myrica gale/Carex rostrata communities. The Carex rostrata community is codominated by Carex rostrata, Nephrophyllidium crista-galli and Sanguisorba officinalis. The Myrica gale/Carex rostrata community also has high percent cover of Sanguisorba officinalis, and ranges from 0-25 percent cover of Sphagnum spp.

CONDITION:

North Fork Moclips River is in relatively good condition. It is a fragment of a larger wetland area which includes some impounded and forested wetlands. An old railroad grade cuts through a portion of the wetland, crossing an inflow channel and altering the hydrology of at least one area. There is an odd discontinuous shallow ditch through the wetland. This could be the result of deer and elk use, or a remnant of an old drainage ditch.

North Fork Moclips River is located near the river headwaters. That portion of the north fork Moclips River drainage basin upstream of this site is used entirely for timber production.

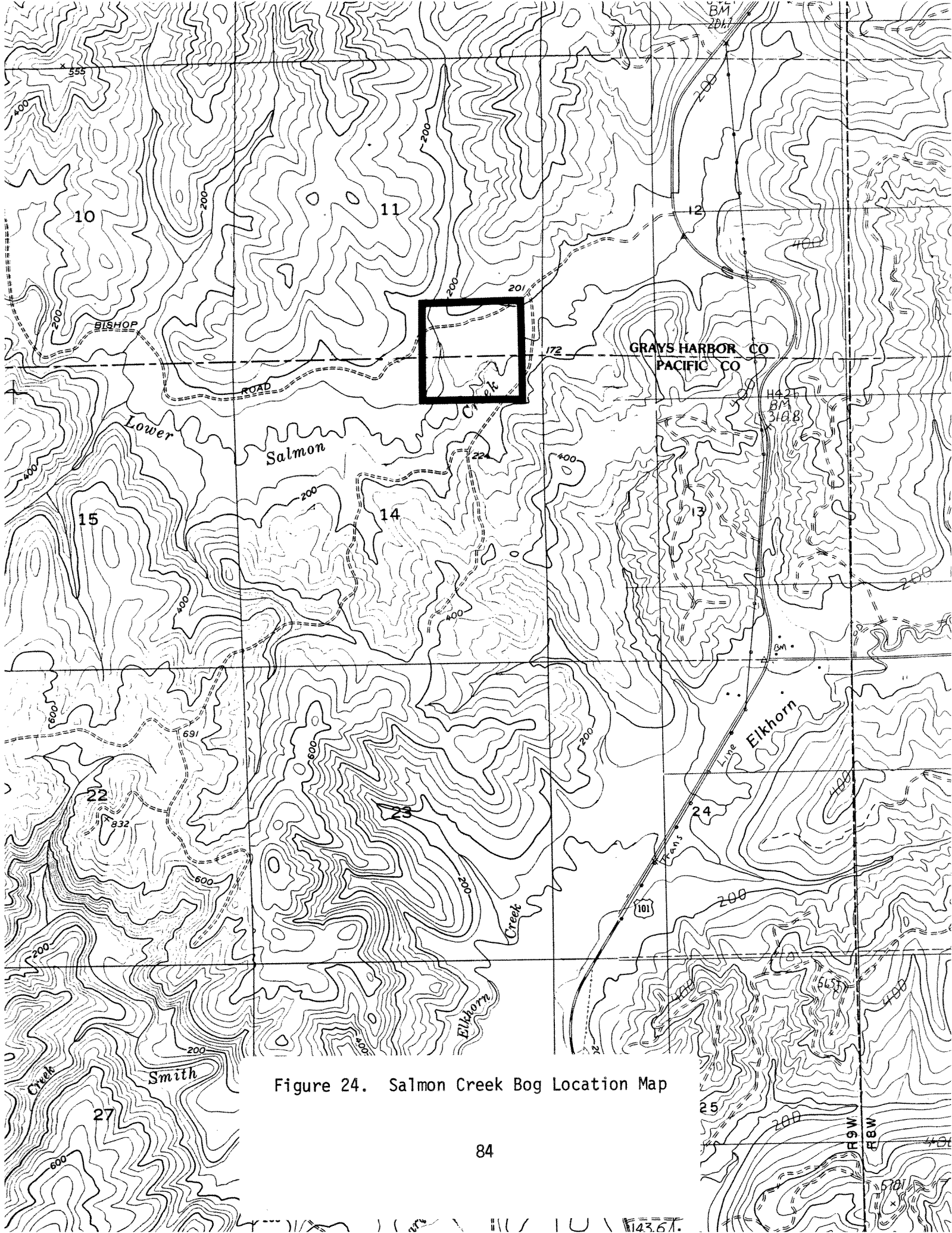


Figure 24. Salmon Creek Bog Location Map

SALMON CREEK BOG

LOCATION: Grays Harbor and Pacific Counties; Sections 11 and 14, Township 15 North, Range 9 West, Willamette Meridian.

SIGNIFICANCE: Salmon Creek Bog is a second tier site. It is in excellent condition, but is very small. It contains an example of one unusual sphagnum bog community.

FEATURES: Sphagnum Bog:
Carex obnupta/Sphagnum spp. community

DESCRIPTION:

Physical: Salmon Creek Bog is a 4 acre, oval bog. It is located at an elevation of 160 feet in the Willapa Hills over a fault. The wetland has developed in the floodplain of Lower Salmon Creek, over sandstone and siltstone alluvium, overlaying Oligocene and Eocene marine sedimentary rock. The soils are a mixture of sphagnum, sedge, heath and woody peat.

The wetland occurs near the junction of Lower Salmon Creek and a large perennial tributary. However, no streams run through the wetland. The bog is seasonally flooded.

Biological: It is unusual to find a sphagnum bog that is dominated by Carex obnupta as Salmon Creek Bog is. There are very few typical sphagnum bog species at this site, most are freshwater wetland species. Thuja plicata, Tsuga heterophylla, Salix spp. and Gaultheria shallon have high percent covers. There are several large Thuja plicata snags in the bog, one 5 foot dbh snag that had been cut was over 435 years old when it died.

CONDITION:

Salmon Creek Bog is in good condition. Only two exotic plants were observed, and both were removed. Two big old Thuja plicata snags had been cut and the butt of one cut into shake bolts, most of which had been removed from the site.

The upstream drainage basins for both the tributary and Lower Salmon Creek are used for timber production. Both stream channels have gravel roads running along portions of them, and Lower Salmon Creek is crossed by Highway 101.

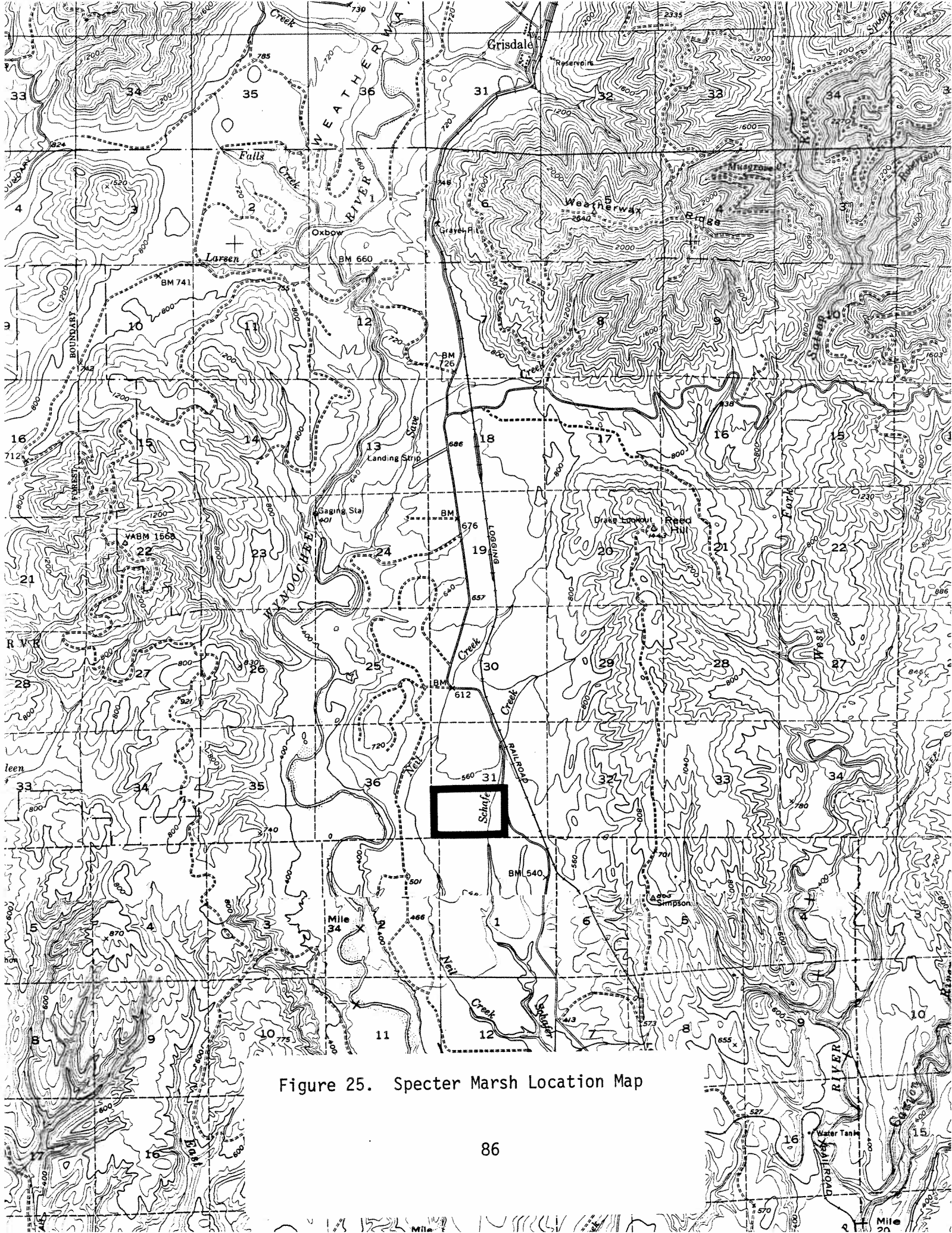


Figure 25. Specter Marsh Location Map

SPECTER MARSH

LOCATION: Grays Harbor County; Section 31, Township 21 North, Range 7 West, Willamette Meridian.

SIGNIFICANCE: Specter Marsh is a second tier site. It was logged in the past, but is still a relatively good example of a beaver controlled wetland.

FEATURES: Freshwater Wetland:

1. Salix spp.-Spiraea douglasii/Carex obnupta community

DESCRIPTION:

Physical: Specter Marsh is a 16 acre area along a tributary of Schafer Creek. It is located at an elevation of about 500 feet on a terrace composed of glacial drift. Soils are organic muck and decomposing peat.

The wetland hydrology is controlled by a series of beaver dams. Currently, the beaver dams are in disrepair and the wetland area is seasonally flooded at most. When the dams are being maintained, the entire wetland area can be permanently flooded.

Biological: The vegetation in Specter Marsh is dynamic. Currently Juncus supiniformis, Eleocharis sp. and Menyanthes trifoliata are the primary species in the lowest wettest areas. Carex obnupta is the dominant species in the next to lowest areas, particularly along stream channels. Spiraea douglasii, Cornus stolonifera, Pyrus fusca and Salix spp. dominate the upper elevations of the wetland basin. Once Salix spp. are abundant again, beaver will probably return to the area and begin repairing dams and re-flooding the wetland, which will change the distribution of plant species.

CONDITION:

Specter Marsh is a good example of a beaver controlled wetland. It has very few exotic plant species and those are not widely distributed. However, the wetland area contains several cut and burned stumps. Although the wetland is composed mostly of native plant species, it has been altered from what it would have been if the trees had never been cut.

Most of the drainage basin upstream of the site is used for timber production.

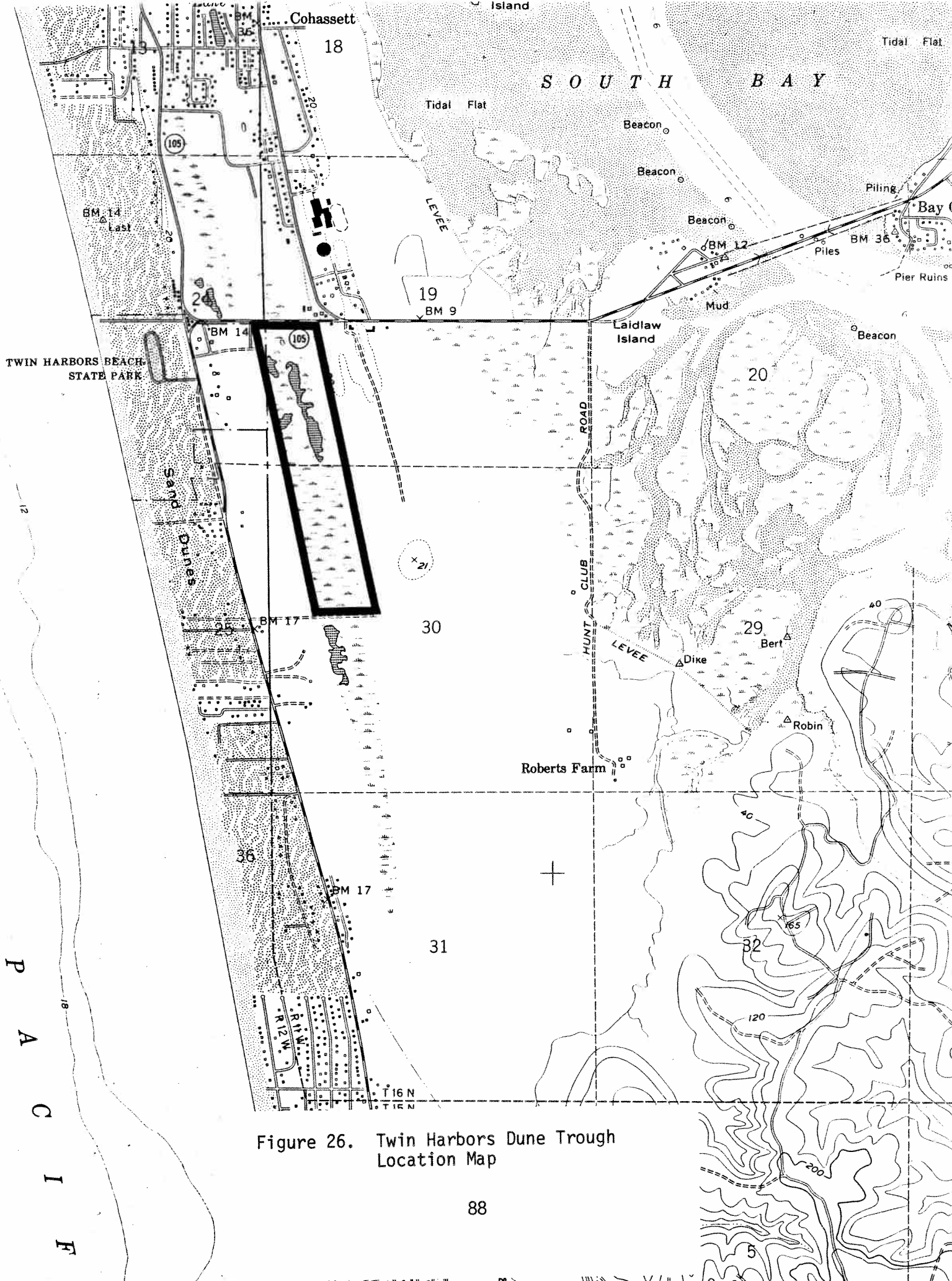


Figure 26. Twin Harbors Dune Trough Location Map

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TWIN HARBORS DUNE TROUGH

LOCATION: Grays Harbor County; Sections 19 and 30, Township 16 North, Range 11 West, Willamette Meridian.

SIGNIFICANCE: Twin Harbors Dune Trough is a second tier site. It is a portion of a larger wetland system which is still in relatively good condition. It contains two freshwater wetland communities.

FEATURES: Freshwater Wetland:
Nuphar polysepalum community
Salix spp.-Spiraea douglasii/Carex obnupta community

DESCRIPTION:

Physical: Twin Harbors Dune Trough is an 84 acre wetland in a secondary dune trough south of Grays Harbor. It occurs at an elevation below 20 feet over Columbia River sands. Soils are muck probably with some sedge, heath and woody peat.

Most of the wetland is permanently flooded. There may be some slightly raised and drier islands within the area. The wetland is mostly fed by groundwater and precipitation.

Biological: The wetland is a mosaic of small open water areas, Nuphar polysepalum dominated vegetation, and Salix spp., Spiraea douglasii and Carex obnupta dominated vegetation. All of these areas are permanently flooded.

Some of the islands may be forested wetlands, but they were not accessible. They appear dominated by Picea sitchensis and Tsuga heterophylla. One upland island had an understory dominated by Gaultheria shallon, Vaccinium ovatum and Carex obnupta.

CONDITION:

Twin Harbors Dune Trough is a fragment of a much larger dune trough wetland which extends from Westport nearly to Grayland. Highway 105 crosses the northern portion of the wetland on road-fill. Culverts allow some water movement through the highway. A private gravel road forms the southern boundary of the fragment. This road is built on road-fill and probably has culverts through it.

Fill has been pushed into the northwest portion of the wetland fragment, including some garbage. Just south of the fill in the wetland are lengths of concrete pipe, like sewer pipe, 10-gallon cans and treated pilings. Still visible are vehicle tracks which leave Highway 105, travel through a dry island and extend out into the wetland. These tracks suggest that the water level was reduced at one time.

The wetland is located within a drainage that is being increasingly developed. It is threatened by development on the ridges which bound it to

the east and west, filling, and conversion to recreational and agricultural uses. It is also threatened with groundwater draw-down and pollution.

GLOSSARY

Dominant - a plant species which covers at least 20 percent of an area.

Exotic - a non-native species.

Fibrous Peat - peat composed of the remains of herbaceous plants, mostly sedges. It contains little if any Sphagnum spp.

Freshwater - water with less than 0.5 parts per thousand marine derived salt.

Heath Peat - peat composed of the remains of shrubby plants.

Impounded - backed-up or accumulated behind an obstruction. An impounded wetland is one in which water has back-up or accumulated behind an obstruction such as a beaver dam.

Limnogenous - a peat wetland with a stream channel running through it, which is fed by precipitation and overflow from the stream.

Minor Occurrence - a plant species which covers less than 5 percent of a given area.

Muck - peat decomposed to such a degree that plant parts can not be distinguished.

Native - indigenous to, or originating naturally in, Washington; remaining or growing in an unaltered natural condition.

Peat - the remains of plants which have accumulated in water or in wet places.

Pristine - having never been disturbed or altered from the native condition.

Slough - a channel, usually associated with tidal water flow.

Sphagnum Bog - a wetland with a well developed Sphagnum moss or peat layer and resultant distinctive flora.

Sphagnum Peat - peat composed primarily of Sphagnum spp.

Subdominant - a plant species which covers between 5 and 20 percent of an area.

Surge Plain - areas along stream and river reaches which are inundated by freshwater due to tidal influence. Marine derived salinity is less than 0.5 parts per thousand.

Woody Peat - peat composed of particles of partially decomposed wood.

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APPENDIX A
PRELIMINARY CLASSIFICATION
OF
SOUTHWESTERN WASHINGTON FRESHWATER WETLANDS

This is an initial classification of native vegetation in impounded freshwater and surge plain wetlands located in southwestern Washington: Grays Harbor, Pacific and Wahkiakum Counties.

The classification is intended to assist in the characterization and comparison of native wetlands in southwestern Washington. It was developed following a review of the literature and one year of reconnaissance level field surveys of relatively undisturbed wetlands. It should be treated as a preliminary classification, ready for quantitative field testing.

During field surveys, each site was characterized by describing its apparent physical characteristics and plant communities. The communities were identified by: 1) dominant species, 2) presence or absence of key indicator species, and 3) observable differences in environmental conditions, such as soil characteristics or hydrology. A range of percent cover was recorded for all observed species in relatively undisturbed and accessible wetlands.

Wetland plant communities are difficult to define. Discrete communities are not typical. Instead, continua and mosaics of species appear to be the norm. Some of the recognized communities recur throughout the inventory area. Others were variable, but tended towards recurring communities. Yet others did not recur or were not consistent in their associated species or environmental characteristics.

The classification below has been divided into two parts. The first includes recurring communities, that is those for which at least three examples were found. The second includes communities observed to occur two or fewer times, or which occurred more frequently but were highly variable in their associated species composition.

The classification is similar to that used for the May, 1986 Northwest Wetlands Technical Conference convened by the Washington Department of Ecology in Port Townsend, Washington. The classification differs from that used at the conference in that it does not include information on soils. It also provides one finer level of resolution than did the conference classification; the plant community level. The classification is compatible with Cowardin et al., 1979.

CLASSIFICATION OF RECURRING COMMUNITIES:

I. Low Elevation Sphagnum Bog

- A. Non-macrophyte
 - 1. bog pond
- B. Herb Dominated
 - 1. Carex rostrata/Carex sitchensis/Sphagnum spp. community
 - 2. Rhynchospora alba/Sphagnum spp. community
- C. Shrub Dominated
 - 1. Ledum groenlandicum/Sphagnum spp. community
 - 2. Myrica gale/Carex rostrata/Sphagnum spp. community
 - 3. Myrica gale/Carex sitchensis-Sanguisorba officinalis/Sphagnum spp. community
- D. Tree Dominated
 - 1. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community
 - 2. Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community

II. Low Elevation Freshwater Wetland

- A. Permanently Flooded
 - 1. Non-macrophyte
 - a. pond/lake
 - 2. Macrophyte
 - a. Nuphar polysepalum community
- B. Saturated Soils or Seasonally Flooded
 - 1. Herb Dominated
 - a. Carex obnupta community
 - b. Carex rostrata community
 - c. Carex rostrata-Carex sitchensis community
 - 2. Shrub Dominated
 - a. Myrica gale/Carex rostrata community
 - b. Myrica gale/Carex sitchensis-Sanguisorba officinalis community
 - c. Myrica gale/Lysichitum americanum community
 - d. Salix hookeriana community
 - e. Salix spp.-Spiraea douglasii/Carex obnupta community
 - f. Spiraea douglasii community
 - 3. Tree Dominated
 - a. Picea sitchensis/Gaultheria shallon/Lysichitum americanum community
 - b. Pinus contorta-Thuja plicata-Tsuga heterophylla community
 - c. Thuja plicata/Lysichitum americanum community

III. Surge Plain Wetland

- A. Herb Dominated
 - 1. Athyrium filix-femina community
 - 2. Caltha sp.-Lysichitum americanum community
 - 3. Carex lyngbyei community
 - 4. Lilaeopsis occidentalis-Oenanthe sarmentosa community
 - 5. Typha latifolia community
- B. Shrub Dominated
 - 1. Cornus stolonifera-Salix spp./Lysichitum americanum community
- C. Tree Dominated
 - 1. Alnus rubra/Rubus spectabilis/Carex obnupta-Lysichitum americanum community
 - 2. Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obnupta community

CLASSIFICATION OF NON-RECURRING COMMUNITIES

I. Low Elevation Sphagnum Bog

- A. Non-macrophyte
 - none
- B. Herb Dominated
 - 1. Carex obnupta/Sphagnum spp. community
 - 2. Deschampsia caespitosa-Sanguisorba officinalis/Sphagnum spp. community
- C. Shrub Dominated
 - 1. Spiraea douglasii/Sphagnum spp. community
- D. Tree Dominated
 - none

II. Low Elevation Freshwater Wetland

- A. Permanently Flooded
 - 1. Non-macrophyte
 - none
 - 2. Macrophyte
 - a. Brasenia schreberi community
 - b. Glyceria elata community
 - c. Scirpus subterminalis community
- B. Saturated Soils or Seasonally Flooded
 - 1. Herb Dominated
 - a. Carex rostrata-Sparganium emersum community

2. Shrub Dominated
 - a. Pyrus fusca community
 - b. Rhamnus purshiana community
3. Tree Dominated
 - none

APPENDIX B

SOUTHWESTERN WASHINGTON FRESHWATER WETLAND COMMUNITY DESCRIPTIONS

Described below are those wetland communities which are known to occur within the study area. The descriptions provide information on physical and floristic characteristics of each community. Included are species lists which distinguish between the dominant or characteristic species ("Typical Species"), and those which were minor or uncharacteristic ("Other Species"). Average percent cover is given for the "typical species".

The community descriptions are presented in two major groups, the first includes those communities which were observed to recur in the landscape, while the second includes those which were not observed to recur. Within each of these major categories are three subheadings: sphagnum bog, freshwater (non-sphagnum) and surge plain wetland communities.

RECURRING COMMUNITIES

LOW ELEVATION SPHAGNUM BOG COMMUNITIES

A sphagnum bog is characterized by the presence of sphagnum moss species (Sphagnum spp.) and sphagnum peat. Bogs have low pH and low nutrient availability. They typically are fed by low nutrient water, either precipitation or ground water. This set of conditions give rise to an unusual flora, many species of which are unique to sphagnum bogs.

Bog Pond: Typically these are small bodies of water bounded on at least one side by sphagnum peat. The pH of the water is 5.5 or less. The water is usually brown to red brown in color. Often these ponds are surrounded by mats of sphagnum which slowly extend out over the water's surface and finally fill the basin. These ponds frequently overlay sedge, heath, woody, and sphagnum peat.

Carex rostrata-Carex sitchensis/Sphagnum spp. community: This is a typical coastal sphagnum bog community. Carex rostrata and Carex sitchensis usually co-occur, but occasionally C. rostrata occurs by itself. Soils are a mixture of sphagnum and sedge peat, and are seasonally flooded.

Typical Species:

Carex rostrata 10-75%
Carex sitchensis 10-30%
Sanguisorba officinalis 2-50%
Sphagnum spp. 25-100%

Other Species:

Carex obnupta	Juncus balticus
Deschampsia caespitosa	Nephrophyllidium crista-galli
Drosera rotundifolia	Trientalis arctica
Eriophorum chamissonis	Vaccinium oxycoccos
Gentiana sceptrum	

Rhynchospora alba/Sphagnum spp. community: This community occurs on supersaturated sphagnum peat. It is typically found in a band along the quaking margin of a sphagnum mat adjacent to open water or in small wet depressions intermixed with typically drier Sphagnum spp. communities. Rhynchospora alba and Vaccinium oxycoccos are the most characteristic plant species. Shrub species, when found in this community, have a short growth form, usually not exceeding 2 feet. Frequently there are no living Sphagnum spp.

Typical Species:

Rhynchospora alba 1-60%
Vaccinium oxycoccos 5-10%

Other species:

Drosera rotundifolia	Kalmia occidentalis
Eriophorum chamissonis	Nuphar polysepalum

Ledum groenlandicum/Sphagnum spp. community: This community occurs frequently but covers small areas in southwestern Washington bogs. The areas it occupies are seasonally dry, usually at slightly higher elevations than Myrica gale/Sphagnum spp. communities. Soils are sphagnum, heath and woody peat.

Typical species:

Carex rostrata 0-45%
Kalmia occidentalis 0-35%
Ledum groenlandicum 25-75%
Sphagnum spp. 25-100%

Other species:

Blechnum spicant	Pinus contorta
Carex sitchensis	Pinus monticola
Cladina rangiferina	Pteridium aquilinum
Cornus canadensis	Pyrus fusca
Drosera rotundifolia	Rhamnus purshiana
Eriophorum chamissonis	Rubus pedatus
Gaultheria shallon	Sanguisorba officinalis
Gentiana sceptrum	Spiraea douglasii
Linnaea borealis	Trientalis arctica
Maianthemum dilatatum	Tsuga heterophylla
Myrica gale	Vaccinium oxycoccos
Picea sitchensis	

Myrica gale/Carex rostrata/Sphagnum spp. community: Most Myrica gale bogs are composed of this community. The community is seasonally flooded. Soils are a mixture of sedge, heath and sphagnum peat. The Myrica gale is typically less than 4 feet tall. Sanguisorba officinalis and Nephrophyllidium crista-galli are common and abundant species.

Typical Species:

Carex rostrata 1-35%
Myrica gale 35-95%
Nephrophyllidium crista-galli 0-15%
Sanguisorba officinalis 0-30%
Sphagnum spp. 25-100%

Other Species:

Agrostis scabra	Pinus monticola
Agrostis sp.	Pteridium aquilinum
Carex interior complex	Pyrus fusca
Carex livida	Rhamnus purshiana
Deschampsia caespitosa	Rhynchospora alba
Drosera rotundifolia	Rubus pedatus
Gaultheria shallon	Spiraea douglasii
Gentiana sceptrum	Thuja plicata
Hypericum anagalloides	Trientalis arctica
Juncus ensifolius	Tsuga heterophylla
Kalmia occidentalis	Vaccinium ovatum
Ledum groenlandicum	Vaccinium oxycoccos
Picea sitchensis	Viola sp.
Pinus contorta	

Myrica gale/Carex sitchensis-Sanguisorba officinalis/Sphagnum spp. community: This community is permanently flooded. Soils are a mixture of sedge, heath and sphagnum peat. Myrica gale is typically less than 4 feet tall. Kalmia occidentalis and Ledum groenlandicum may be codominant.

Typical Species:

Carex sitchensis 15-30%
Myrica gale 25-50%
Sanguisorba officinalis 3-10%
Sphagnum spp. 40-60%

Other Species:

Agrostis aequivalvis	Maianthemum dilatatum
Blechnum spicant	Menyanthes trifoliata
Carex interior complex	Nuphar polysepalum
Deschampsia caespitosa	Picea sitchensis
Drosera rotundifolia	Pinus contorta
Eriophorum chamissonis	Rhynchospora alba
Hypericum anagalloides	Senecio triangularis
Juncus ensifolius	Thuja plicata
Kalmia occidentalis	Trientalis arctica
Ledum groenlandicum	Tsuga heterophylla
Lysichitum americanum	Vaccinium oxycoccos

Pinus contorta/Ledum groenlandicum/Sphagnum spp. community: This community grades from open shrublands with low growing Kalmia occidentalis and Ledum groenlandicum, and scattered Pinus contorta, to very dense stands of P. contorta with Ledum groenlandicum and Gaultheria shallon. It occurs on dry firm sphagnum peat, slightly raised above the adjacent shrub wetlands.

Typical species:

Gaultheria shallon 5-60%
Kalmia occidentalis 1-30%
Ledum groenlandicum 10-40%
Pinus contorta 25-50%
Pteridium aquilinum 10-35%
Sphagnum spp. 20-85%

Other species:

Blechnum spicant	Myrica gale
Carex obnupta	Picea sitchensis
Cladina rangiferina	Rhamnus purshiana
Drosera rotundifolia	Salix sp.
Linnaea borealis	Spiraea douglasii
Maianthemum dilatatum	Thuja plicata
Myrica californica	Tsuga heterophylla

Pinus contorta-Thuja plicata-Tsuga heterophylla/Sphagnum spp. community: This community may be ecotonal between the Pinus contorta/Ledum groenlandicum/Sphagnum spp. and the Thuja plicata-Tsuga heterophylla/Gaultheria shallon/Lysichitum americanum communities. The water table is from slightly below to slightly above the soil surface. Soils are organic, a mixture of sedge, heath, woody and sphagnum peat. The understory is dominated by either Myrica gale or Kalmia occidentalis, Ledum groenlandicum and Gaultheria shallon.

Typical Species:

Gaultheria shallon 0-40%
Kalmia occidentalis 0-35%
Ledum occidentale 1-40%
Myrica gale 0-70%
Pinus contorta 1-35%
Sphagnum spp. 25-90%
Thuja plicata 1-30%
Tsuga heterophylla 0-40%

Other Species:

Blechnum spicant	Maianthemum dilatatum
Calamagrostis nutkaensis	Menyanthes trifoliata
Carex interior complex	Picea sitchensis
Carex leptalea	Pteridium aquilinum
Carex obnupta	Pyrus fusca
Carex rostrata	Rhynchospora alba
Carex sitchensis	Rubus pedatus
Cladina rangiferina	Sanguisorba officinalis

<i>Cornus canadensis</i>	<i>Senecio triangularis</i>
<i>Drosera rotundifolia</i>	<i>Trientalis arctica</i>
<i>Empetrum nigrum</i>	<i>Vaccinium ovalifolium</i>
<i>Eriophorum chamissonis</i>	<i>Vaccinium ovatum</i>
<i>Hypericum anagalloides</i>	<i>Vaccinium oxycoccos</i>
<i>Juncus ensifolius</i>	<i>Vaccinium parvifolium</i>
<i>Lysichitum americanum</i>	

FRESHWATER WETLAND COMMUNITIES

Freshwater wetlands are those which have no marine derived salts, and very little sphagnum, either living or in the soil. The pH is greater than 5.5, either circumneutral or basic. They may be high or low nutrient systems.

Nuphar polysepalum community: This is one of the most common communities in shallow, permanently flooded areas. It usually occurs in the rooted aquatic zone but extends into the emergent zone, and is found in both sphagnum and non-sphagnum wetlands. It may be monospecific or composed of several aquatic plant species.

Typical species:

Nuphar polysepalum 40-60%

Other species:

Equisetum sp.

Potentilla palustris

Potamogeton sp.

Sparganium emersum

Carex obnupta community: This is a commonly occurring community along the forested margins of wetlands and in dune trough wetlands. It is typically seasonally flooded, but may be permanently flooded. Substrates may be sedge peat (often with woody material), sands, or muck.

Typical species:

Carex obnupta 60-90%

Other species:

Carex cusickii

Ledum groenlandicum

Nuphar polysepalum

Oenanthe sarmentosa

Spiraea douglasii

Carex rostrata community: This is a species rich community which may be found in either seasonally or permanently flooded areas. Substrates are typically sedge peat, but may contain some sphagnum (< 10%).

Typical species:

Carex rostrata 50-80%

Other species:

Angelica genuflexa	Glyceria elata
Calamagrostis canadensis	Mimulus guttatus
Carex cusickii	Myosotis laxa
Carex sitchensis	Oenanthe sarmentosa
Cicuta douglasii	Potentilla palustris
Epilobium sp.	Puccinellia pauciflora
Galium spp.	

Carex rostrata-Carex sitchensis community: Non-sphagnum communities dominated by either or both Carex rostrata and Carex sitchensis are grouped together. There appear to be two subgroups, one which is pauperate and one which is species rich. Soils are mostly sedge peat, but may have some sphagnum peat as well. They are seasonally flooded.

Typical Species:

Carex rostrata 0-75%
Carex sitchensis 0-90%

Other Species in Pauperate Occurrences:

Carex obnupta	Nephrophyllidium crista-galli
Gentiana sceptrum	Sanguisorba officinalis
Juncus balticus	Sphagnum spp.
Myrica gale	

Other Species in Species Rich Occurrences:

Agrostis scabra	Nuphar polysepalum
Alnus sp.	Oenanthe sarmentosa
Athyrium filix-femina	Potentilla palustris
Bidens sp.	Picea sitchensis
Blechnum spicant	Polygonum hydropiperoides
Carex canescens	Puccinellia palustris
Carex cusickii	Pyrus fusca
Carex obnupta	Ranunculus flammula
Eleocharis ovata	Rhamnus purshiana
Epilobium watsonii	Scirpus microcarpus
Galium trifidum	Sparganium sp.
Gaultheria shallon	Sphagnum spp.
Glyceria elata	Spiraea douglasii
Hypericum anagalloides	Thuja plicata
Juncus ensifolius	Tsuga heterophylla
Lycopus uniflorus	Typha latifolia
Lysichitum americanum	Veronica scutellata
Menziesia ferruginea	Viola sp.
Myosotis laxa	

Myrica gale/Carex rostrata community: This community is seasonally to permanently flooded. Soils are a mixture of sedge, heath and sphagnum peat. Usually Sphagnum spp. occur with up to 5% cover. Carex rostrata is a significant component of the community in most cases. Myrica gale is typically 5-7 feet tall.

Typical Species:

Carex rostrata 0-25%
Myrica gale 50-95%
Sphagnum spp. 0-5%

Other Species:

Calamagrostis canadensis	Pinus contorta
Deschampsia caespitosa	Pyrus fusca
Gentiana sceptrum	Rhamnus purshiana
Hypericum anagalloides	Rhynchospora alba
Juncus ensifolius	Rubus pedatus
Kalmia occidentalis	Sanguisorba officinalis
Ledum groenlandicum	Spiraea douglasii
Picea sitchensis	Viola sp.

Myrica gale/Carex sitchensis-Sanguisorba officinalis community: This community is seasonally flooded. The soils are a mixture of sedge, heath and sphagnum peat. There is usually some sphagnum within the community, and the community usually occurs adjacent to a sphagnum bog community. Myrica gale is typically 4-6 feet tall.

Typical Species:

Carex sitchensis 15-50%
Myrica gale 35-80%
Sanguisorba officinalis 10-30%

Other Species:

Kalmia occidentalis	Sphagnum spp.
Ledum groenlandicum	Spiraea douglasii
Lysichitum americanum	Thuja plicata
Pinus contorta	Tsuga heterophylla

Myrica gale/Lysichitum americanum community: This community is seasonally to permanently flooded. Soils are a mixture of sedge and heath peat. There is no sphagnum in this community. Picea sitchensis and Pyrus fusca are common components but have low cover values. The Myrica gale is 6-8 feet tall.

Typical Species:

Lysichitum americanum 25-60%
Myrica gale 50-90%
Spiraea douglasii 10-40%

Other Species:

Blechnum spicant	Picea sitchensis
Carex obrupta	Potentilla palustris
Carex sitchensis	Pyrus fusca
Cornus stolonifera	Rhamnus purshiana
Dryopteris austriaca	Rubus ursinus
Epilobium sp.	Salix sp.
Gaultheria shallon	Thuja plicata

Ledum groenlandicum
Lonicera involucrata
Menziesia ferruginea
Oenanthe sarmentosa
Physocarpus capitatus

Tsuga heterophylla
Typha latifolia
Vaccinium ovatum
Vaccinium parvifolium

Salix hookeriana community: This is a coastal willow community, often found in coastal dune trough wetlands, but also along bay shores where there is freshwater influence. It may occur as nearly monospecific stands of Salix hookeriana, or more commonly includes several understory herbaceous species with Carex obnupta dominant. Soils are typically anoxic muck overlaying sand. The community is usually permanently, but if seasonally flooded, the water table is near the soil surface year round.

Typical Species:

Carex obnupta
Salix hookeriana

Other Species:

Alnus rubra
Galium sp.
Luzula sp.
Oenanthe sarmentosa
Rubus spectabilis
Scirpus microcarpus

Salix spp.-Spiraea douglasii/Carex obnupta community: This community is permanently flooded. The canopy is more open than in the Spiraea douglasii community, resulting in a species rich understory. Soils are organic; they may be anoxic black organic muck, or relatively firm sedge and woody peat.

Typical Species:

Carex obnupta 5-50%
Salix spp. 20-75%
Spiraea douglasii 10-60%

Other Species:

Agrostis scabra
Alnus rubra
Athyrium filix-femina
Carex cusickii
Cornus stolonifera
Equisetum fluviatile
Galium cymosum
Gaultheria shallon
Ledum groenlandicum
Lonicera involucrata
Lycopus uniflorus
Lysichitum americanum
Menyanthes trifoliata
Oenanthe sarmentosa
Picea sitchensis
Physocarpus capitatus
Polypodium glycyrrhiza
Potentilla palustris
Pyrus fusca
Rhamnus purshiana
Sparganium sp.
Sphagnum spp.
Thuja plicata
Vaccinium sp.
Veronica scutellata
Viola sp.

Spiraea douglasii community: This community can be either seasonally or permanently flooded. Spiraea douglasii typically forms dense nearly monospecific stands, 6-10 feet tall. Soils are organic muck or sedge and heath peat.

Typical species:

Spiraea douglasii 50-80%

Other species:

Carex obnupta

Pyrus fusca

Carex rostrata

Rhamnus purshiana

Oenanthe sarmentosa

Salix spp.

Picea sitchensis

Picea sitchensis/Gaultheria shallon/Lysichitum americanum community: This community may be ecotonal between wetlands and uplands. Microtopographic differences are correlated with differences in hydrology and plant species composition: Depressions are usually permanently flooded and dominated by Carex obnupta. Seasonally flooded areas are usually have high percent cover of Pyrus fusca, Rubus spectabilis, Lonicera involucrata, Salix spp. and Carex obnupta. Dry microsites are dominated by Gaultheria shallon. This community lacks Pinus contorta and Sphagnum spp.

Typical Species:

Gaultheria shallon 0-70%

Lysichitum americanum 10-30%

Picea sitchensis 10-35%

Pyrus fusca 0-15%

Other Species:

Acer circinatum

Oenanthe sarmentosa

Alnus rubra

Physocarpus capitatus

Athyrium filix-femina

Rhamnus purshiana

Blechnum spicant

Rubus spectabilis

Carex obnupta

Rubus ursinus

Cornus stolonifera

Salix spp.

Hydrocotyle ranunculoides

Spiraea douglasii

Lathyrus palustris

Thuja plicata

Lonicera involucrata

Tsuga heterophylla

Menziesia ferruginea

Vaccinium ovatum

Myrica gale

Vaccinium parvifolium

Pinus contorta-Thuja plicata-Tsuga heterophylla community: This community is widely distributed in southwestern Washington, but it is poorly defined. With more research it may prove to be composed of several communities. This communities common plant species are Pinus contorta, Thuja plicata and Tsuga heterophylla. If Sphagnum spp. are present, their total cover is less than 15%. The water table is from slightly below to slightly above the surface. Soils are a mixture of heath and woody peat. The plant species composition is variable.

Typical Species:

Gaultheria shallon 0-70%
Pinus contorta 5-40%
Thuja plicata 0-50%
Tsuga heterophylla 0-60%

Other Species:

Agrostis exarata	Pinus monticola
Blechnum spicant	Pteridium aquilinum
Calamagrostis nutkaensis	Pyrus fusca
Carex interior complex	Rhamnus purshiana
Carex obnupta	Rubus pedatus
Carex rostrata	Sanguisorba officinalis
Cornus canadensis	Sphagnum spp.
Kalmia occidentalis	Spiraea douglasii
Ledum groenlandicum	Trientalis arctica
Lysichitum americanum	Vaccinium ovalifolium
Maianthemum dilatatum	Vaccinium ovatum
Myrica gale	Vaccinium parvifolium
Oenanthe sarmentosa	Veronica scutellata
Picea sitchensis	

Thuja plicata/Lysichitum americanum community: This community occurs on organic soils, where the water table is slightly above to slightly below the surface. It occurs in groundwater discharge areas, headwater areas and adjacent to nearly still streams. Microtopographic differences are correlated with differences in hydrology and plant species composition: Depressions are usually permanently flooded and have high percent cover of Lysichitum americanum. Raised ground, or fallen logs have high percent cover of Gaultheria shallon. The community contains relatively large candelabra Thuja plicata. The percent cover of Tsuga heterophylla is variable. Pinus contorta is usually not present. Sphagnum spp. may be present but seldom exceed 15% cover.

Typical Species:

Gaultheria shallon 10-90%
Lysichitum americanum 5-40%
Thuja plicata 10-35%
Tsuga heterophylla 1-20%

Other Species:

Agrostis aequivalvis	Oenanthe sarmentosa
Athyrium filix-femina	Picea sitchensis
Blechnum spicant	Pyrus fusca
Calamagrostis nutkaensis	Rhamnus purshiana
Carex interior complex	Rubus spectabilis
Carex obnupta	Rubus ursinus
Cornus canadensis	Sphagnum spp.
Ledum groenlandicum	Spiraea douglasii
Maianthemum dilatatum	Vaccinium ovatum
Menziesia ferruginea	Vaccinium parvifolium
Myrica gale	

SURGE PLAIN WETLAND COMMUNITIES

Athyrium filix-femina community: This is a catch-all community for all herbaceous surge plain meadows except those dominated by Typha latifolia. Most of the meadows are dominated by Athyrium filix-femina. There are other areas which are dominated by Carex obnupta, Aster sp., Scirpus microcarpus and/or Scirpus validus. This community forms meadows on surge plain terraces. The meadows are inundated with freshwater at most high tides. They are dissected by sloughs, which are often dammed by beavers, creating areas that are permanently flooded. Soils are a mixture of clay, silt and organic matter. Carex obnupta and Typha latifolia may codominate.

Typical Species:

Athyrium filix-femina 15-80%

Other Species:

<u>Agrostis exarata</u>	<u>Mentha arvensis</u>
<u>Alnus rubra</u>	<u>Menyanthes trifoliata</u>
<u>Angelica genuflexa</u>	<u>Myosotis laxa</u>
<u>Aster</u> sp.	<u>Oenanthe sarmentosa</u>
<u>Calamagrostis canadensis</u>	<u>Physocarpus capitatus</u>
<u>Calamagrostis nutkaensis</u>	<u>Picea sitchensis</u>
<u>Caltha</u> sp.	<u>Platanthera dilatata</u>
<u>Carex lyngbyei</u>	<u>Poa palustris</u>
<u>Carex obnupta</u>	<u>Potentilla pacifica</u>
<u>Carex stipata</u>	<u>Pyrus fusca</u>
<u>Deschampsia caespitosa</u>	<u>Rubus spectabilis</u>
<u>Eleocharis palustris</u>	<u>Rubus ursinus</u>
<u>Epilobium</u> sp.	<u>Rumex occidentalis</u>
<u>Equisetum</u> sp.	<u>Salix</u> spp.
<u>Galium aparine</u>	<u>Scirpus microcarpus</u>
<u>Galium cymosum</u>	<u>Scirpus validus</u>
<u>Heracleum lanatum</u>	<u>Sidalcea hendersonii</u>
<u>Impatiens</u> sp.	<u>Spiraea douglasii</u>
<u>Lathyrus palustris</u>	<u>Thuja plicata</u>
<u>Lonicera involucrata</u>	<u>Typha latifolia</u>
<u>Lysichitum americanum</u>	<u>Veratrum californicum</u>

Caltha sp.-Lysichitum americanum community: This community occurs in surge plain sloughs. It occupies the second to the lowest intertidal zone dominated by macrophytic vegetation, and is inundated at every high tide. It occurs on slopes of anoxic clay soils. Tidal water may be brackish on occasion, but is typically fresh.

Typical Species:

Caltha sp. 5-10%
Lysichitum americanum 5-20%

Other Species:

<u>Bidens cernua</u>	<u>Sium suave</u>
<u>Glyceria grandis</u>	

Carex lyngbyei community: This community occurs in surge plains along main river channels and sloughs. It is the most extensive of the surge plain slough communities. It is often monospecific, but intergrades with communities found higher and lower in the intertidal. It is inundated at every high tide, with both brackish and freshwater. It occurs on silts, clays and gravel outwash.

Typical Species:

Carex lyngbyei 35-90%

Other Species:

Carex stipata

Deschampsia caespitosa

Galium cymosum

Mimulus guttatus

Oenanthe sarmentosa

Poa palustris

Platanthera dilatata

Rumex occidentalis

Sidalcea hendersonii

Sparganium sp.

Lilaeopsis occidentalis-Oenanthe sarmentosa community: This community occurs in surge plain sloughs. It occupies the lowest intertidal zone dominated by macrophytic vegetation, and is inundated at every high tide. It occurs on slopes of anoxic clay soils. Tidal water may be brackish on occasion.

Typical Species:

Lilaeopsis occidentalis 10-15%

Oenanthe sarmentosa 10-25%

Other Species:

Alisma plantago-aquatica

Callitriche sp.

Typha latifolia community: This community covers large areas of surge plain meadow, but is difficult to access. A few surveys conducted around the margins of the community were used to compile the following species list. Portions of the areas covered by this community are permanently flooded. Sloughs carry freshwater to the areas at each high tide. Beavers have dammed some of the sloughs, permanently flooding some areas.

Typical Species:

Typha latifolia 10-50%

Other Species:

Alnus rubra

Angelica genuflexa

Aster sp.

Athyrium filix-femina

Calamagrostis nutkaensis

Caltha sp.

Carex obnupta

Heracleum lanatum

Impatiens sp.

Lathyrus palustris

Mentha arvensis

Oenanthe sarmentosa

Picea sitchensis

Potentilla pacifica

Pyrus fusca

Rubus spectabilis

Salix spp.

Scirpus microcarpus

Scirpus validus

Spiraea douglasii

Lonicera involucrata
Lysichitum americanum

Veratrum californicum

Salix spp./Lysichitum americanum community: This is a shrub dominated community found throughout freshwater surge plains. It is flooded with freshwater at most high tides via sloughs. Beavers have dammed some of the sloughs, creating areas which are permanently flooded. Soils are a mixture of clay, silt and organic matter.

Typical Species:

Athyrium filix-femina 0-75%
Cornus stolonifera 0-60%
Lysichitum americanum 3-25%
Physocarpus capitatus <1-20%
Salix spp. 25-45%
Spiraea douglasii 0-40%

Other Species:

Alnus rubra	Polystichum munitum
Carex obruata	Pyrus fusca
Gaultheria shallon	Rosa sp.
Lathyrus palustris	Rubus parviflorus
Lonicera involucrata	Rubus spectabilis
Picea sitchensis	

Alnus rubra/Rubus spectabilis/Carex obruata-Lysichitum americanum community: This is a relatively dry surge plain community. Sloughs are widely spaced and only some areas are flooded at high tides. The community is flooded seasonally. Soils are a mixture of clay, silt and organic matter, with more organic matter than in the shrub or herb dominated surge plain communities. There are microtopographic differences within the community correlated with differences in hydrology and understory plant species composition. Depressions have high cover of Carex obruata and elevated areas have a higher cover of Rubus spectabilis.

Typical Species:

Alnus rubra 20-80%
Carex obruata 0-60%
Lysichitum americanum 0-60%
Rubus spectabilis 1-80%

Other Species:

Acer circinatum	Puccinellia pauciflora
Athyrium filix-femina	Pyrus fusca
Calamagrostis nutkaensis	Rhamnus purshiana
Epilobium sp.	Rubus ursinus
Equisetum sp.	Salix spp.
Gaultheria shallon	Sambucus sp.
Glyceria grandis	Scirpus microcarpus
Impatiens sp.	Spiraea douglasii

Lonicera involucrata
Maianthemum dilatatum
Oenanthe sarmentosa
Picea sitchensis
Polystichum munitum

Thuja plicata
Tolmiea menziesii
Tsuga heterophylla
Typha latifolia
Vaccinium parvifolium

Picea sitchensis-Alnus rubra/Rubus spectabilis/Carex obrupta community: This appears to be the climax surge plain wetland community. It varies from depressions and slough margins which flood with every high tide, to areas which flood with most high tides, to ridges and fallen logs which flood seasonally. Understory dominance shifts with the microtopography. Soils are a mixture of clay, silt and organic matter, including large woody debris. This community is frequently located along major river and slough channels, as if on natural levees. Although the climax community, it is flooded more frequently than the Alnus rubra community which usually is located landward of the Picea sitchensis community.

Typical Species:

Alnus rubra <1-50%
Carex obrupta 0-50%
Gaultheria shallon 0-20%
Lysichitum americanum <1-35%
Picea sitchensis 10-70%
Rubus spectabilis <1-40%

Other Species:

Acer circinatum
Adiantum pedatum
Athyrium filix-femina
Betula glandulosa
Cornus stolonifera
Fraxinus latifolia
Galium sp.
Gaultheria shallon
Glyceria sp.
Heracleum lanatum
Impatiens sp.
Lathyrus palustris
Lonicera involucrata
Maianthemum dilatatum
Myosotis laxa
Oenanthe sarmentosa
Physocarpus capitatus

Polystichum munitum
Pseudotsuga menziesia
Pyrus fusca
Rhamnus purshiana
Rosa sp.
Rubus parviflorus
Rubus ursinus
Salix spp.
Sambucus sp.
Scirpus microcarpus
Spiraea douglasii
Thuja plicata
Tiarella trifoliata
Tsuga heterophylla
Vaccinium parvifolium
Vaccinium sp.

NON-RECURRING COMMUNITIES

LOW ELEVATION SPHAGNUM BOG COMMUNITIES

Carex obnupta/Sphagnum spp. community: This community was observed at one small site in the Willapa Hills, Salmon Creek Bog. It has no purely sphagnum bog species, suggesting that the substrate is not very acidic. Soils are a mixture of sphagnum, sedge, heath and woody peat, overlaying alluvium. The wetland soils are supersaturated, and may be seasonally flooded.

Typical Species:

Carex obnupta 30-90%
Sphagnum spp. 80%
Thuja plicata 7-8%
Tsuga heterophylla 5-7%

Other Species:

Agrostis scabra	Picea sitchensis
Agrostis sp.	Poa sp.
Athyrium filix-femina	Pteridium aquilinum
Blechnum spicant	Rhamnus purshiana
Galium trifidum	Rubus ursinus
Gaultheria shallon	Salix spp.
Lysichitum americanum	Scirpus microcarpus
Maianthemum dilatatum	Viola sp.
Mentha arvensis	

Deschampsia caespitosa-Sanguisorba officinalis/Sphagnum spp. community: This community was observed at two sites. It occupies small areas, up to 10 square meters, and looks as if it may be a result of deer or elk bedding. The areas are seasonally flooded. Soils are a mixture of sedge, heath and sphagnum peat.

Typical Species:

Carex livida 3-5%
Deschampsia caespitosa 20-25%
Sanguisorba officinalis 15-20%
Sphagnum spp. 15-50%

Other Species:

Agrostis scabra	Kalmia occidentalis
Carex rostrata	Myrica gale
Gentiana sceptrum	Nephrophyllidium crista-galli
Juncus ensifolius	Rhynchospora alba

Spiraea douglasii/Sphagnum spp. community: This community, although common in the southern Puget Trough, is rarely found in southwestern Washington. It was observed at one site which has a history of past disturbance. The site is

seasonally flooded and then dry. A thin soil layer composed of sedge, heath and sphagnum peat, overlays cobble-gravel substrates.

Typical Species:

Carex obnupta 15-60%
Gentiana sceptrum 10-15%
Sphagnum spp. 50-100%

Other Species:

Blechnum spicant	Ledum groenlandicum
Carex canescens	Pinus contorta
Gaultheria shallon	Pyrus fusca
Kalmia occidentalis	Salix spp.
Spiraea douglasii 15-60%	

LOW ELEVATION FRESHWATER WETLAND COMMUNITIES

Brasenia schreberi community: Brasenia schreberi is known to be the dominant aquatic macrophytic plant species in a series of ponds within a single wetland system. The ponds are shallow, seasonally to permanently flooded, and overlay deep sphagnum and non-sphagnum peat soils.

Typical species:

Brasenia schreberi 20%

Other species:

Dulichium arundinaceum	Scirpus subterminalis
Nuphar polysepalum	

Glyceria elata community: Glyceria elata is a common component of freshwater wetlands, but it is seldom the dominant species over a large area. It occurs in greatest abundance in beaver impounded wetlands, that is wetlands which have fluctuating water levels and natural disturbance. These wetlands tend to have a high diversity of wetland plant species. Soils are anoxic organic muck. The water levels fluctuate seasonally and annually.

Typical species:

Glyceria elata 30-50%
Salix sp. 10-15%
Scirpus microcarpus 20%

Other species:

Alnus rubra	Lysichitum americanum
Athyrium filix-femina	Oenanthe sarmentosa
Angelica genuflexa	Pyrus fusca
Bidens sp.	Rhamnus purshiana
Carex rostrata	Sparganium sp.
Galium sp.	Typha latifolia

Scirpus subterminalis community: Although a common aquatic plant community in the Puget Trough region, Scirpus subterminalis is seldom observed in southwestern Washington. The community occurs in a series of ponds within a single wetland. The ponds are shallow, seasonally to permanently flooded, and overlay deep sphagnum and non-sphagnum peat soils. Scirpus subterminalis forms nearly monospecific stands.

Typical Species:

Scirpus subterminalis 20%

Other Species:

Nuphar polysepalum

Carex rostrata-Sparganium sp. community: This is a chaotic mixture of different wetland plant communities which occur in beaver ponds. The water level is controlled by beavers and fluctuates seasonally and periodically. Plant species dominance, and sometimes composition, changes with periodic water level changes. There is woody debris which provides habitat for typically upland plant species.

Typical Species:

Carex rostrata 15-20%
Gaultheria shallon 5-15%
Ludwigia palustris 2-10%
Marchantia sp. 10-25%
Sparganium sp. 10-35%

Other Species:

<i>Athyrium filix-femina</i>	<i>Nuphar polysepalum</i>
<i>Bidens</i> sp.	<i>Oenanthe sarmentosa</i>
<i>Carex canescens</i>	<i>Picea sitchensis</i>
<i>Carex obnupta</i>	<i>Pyrus fusca</i>
<i>Epilobium</i> sp.	<i>Rhamnus purshiana</i>
<i>Glyceria elata</i>	<i>Rubus ursinus</i>
<i>Hypericum anagalloides</i>	<i>Salix</i> spp.
<i>Lonicera involucrata</i>	<i>Sphagnum</i> sp.
<i>Lycopus uniflorus</i>	<i>Spiraea douglasii</i>
<i>Lysichitum americanum</i>	<i>Typha latifolia</i>
<i>Maianthemum dilatatum</i>	<i>Vaccinium parvifolium</i>

Pyrus fusca community: This is a poorly described but often observed type. It occurs as a spiny thicket, either as islands in a larger wetland system, or forming a wetland-upland boundary. In some cases the community may be an artifact of past grazing or agriculture. It occurs in both sphagnum and non-sphagnum wetlands. The soils are organic and vary from seasonally flooded to saturated. The islands are usually slightly raised above the surrounding wetland. The community occurrences are often used by deer, which trample and forage on the understory.

Typical Species:

Pyrus fusca 40-60%

Other Species:

Blechnum spicant
Calamagrostis sp.
Carex obnupta
Gaultheria shallon
Ledum groenlandicum
Lonicera involucrata
Luzula sp.
Lysichitum americanum

Maianthemum dilatatum
Picea sitchensis
Pteridium aquilinum
Rhamnus purshiana
Sphagnum spp.
Spiraea douglasii
Trientalis arctica

Rhamnus purshiana community: This community is ecotonal between sphagnum bogs and uplands. It is seasonally flooded. Soils are a mixture of sphagnum, non-sphagnum and woody peat. They receive a lot of wildlife use and usually contain trails and bedding areas.

Typical Species:

Gaultheria shallon 40-90% check
Rhamnus purshiana 15-50%

Other Species:

Blechnum spicata
Carex obnupta
Cornus canadensis
Ledum groenlandicum
Luzula sp.
Maianthemum dilatatum

Picea sitchensis
Pteridium aquilinum
Rubus spectabilis
Spiraea douglasii
Trientalis arctic
Vaccinium parvifolium

APPENDIX C

PLANT SPECIES SCIENTIFIC AND COMMON NAMES

<u>Scientific Name</u>	<u>Common Name</u>
<i>Acer circinatum</i>	vine maple
<i>Adiantum pedatum</i>	northern maidenhair
<i>Agrostis aequivalvis</i>	Alaska bentgrass
<i>Agrostis exarata</i>	spike bentgrass
<i>Agrostis scabra</i>	winter bentgrass
<i>Agrostis</i> sp.	bentgrass
<i>Alisma plantago-aquatica</i>	American waterplantain
<i>Alnus rubra</i>	red alder
<i>Angelica genuflexa</i>	kneeling angelica
<i>Aster</i> sp.	aster
<i>Athyrium filix-femina</i>	lady-fern
<i>Betula glandulosa</i>	bog birch
<i>Bidens cernua</i>	nodding beggars-tick
<i>Bidens</i> sp.	beggars-tick
<i>Blechnum spicant</i>	deer-fern
<i>Brasenia schreberi</i>	water-shield
<i>Calamagrostis canadensis</i>	bluejoint reedgrass
<i>Calamagrostis nutkaensis</i>	Pacific reedgrass
<i>Calamagrostis</i> sp.	reedgrass
<i>Callitriche</i> sp.	water starwort
<i>Caltha</i> sp.	marshmarigold
<i>Carex canescens</i>	gray sedge
<i>Carex cusickii</i>	Cusick's sedge
<i>Carex interior</i> complex	inland sedge
<i>Carex leptalea</i>	bristle-stalked sedge
<i>Carex livida</i>	pale sedge
<i>Carex lyngbyei</i>	Lyngby's sedge
<i>Carex obnupta</i>	slough sedge
<i>Carex rostrata</i>	beaked sedge
<i>Carex sitchensis</i>	Sitka sedge
<i>Carex stipata</i>	sawbeak sedge
<i>Carex vesicaria</i>	inflated sedge
<i>Cicuta douglasii</i>	Douglas' water-hemlock
<i>Cladina rangiferina</i>	reindeer lichen
<i>Cornus canadensis</i>	bunchberry
<i>Cornus stolonifera</i>	red-osier dogwood
<i>Deschampsia caespitosa</i>	tufted hairgrass
<i>Drosera rotundifolia</i>	sundew
<i>Dryopteris austriaca</i>	mountain wood-fern
<i>Dulichium arundinaceum</i>	dulichium
<i>Eleocharis ovata</i>	ovoid spike-rush
<i>Eleocharis palustris</i>	creeping spike-rush
<i>Empetrum nigrum</i>	crowberry
<i>Epilobium</i> sp.	willow-herb
<i>Epilobium watsonii</i>	Watson's willow-herb

<i>Equisetum fluviatile</i>	water horsetail
<i>Equisetum</i> sp.	horsetail
<i>Eriophorum chamissonis</i>	Chamisso's cotton-grass
<i>Fraxinus latifolia</i>	Oregon ash
<i>Galium aparine</i>	goose-grass
<i>Galium cymosum</i>	Pacific bedstraw
<i>Galium</i> sp.	bedstraw
<i>Galium trifidum</i>	small bedstraw
<i>Gaultheria shallon</i>	salal
<i>Gentiana sceptrum</i>	king's gentian
<i>Glyceria elata</i>	tall mannagrass
<i>Glyceria grandis</i>	American mannagrass
<i>Glyceria</i> sp.	mannagrass
<i>Heracleum lanatum</i>	cow-parsnip
<i>Hydrocotyle ranunculoides</i>	floating marsh-pennywort
<i>Hypericum anagalloides</i>	bog St. John's-wort
<i>Impatiens</i> sp.	jewelweed
<i>Juncus balticus</i>	Baltic rush
<i>Juncus ensifolius</i>	dagger-leaf rush
<i>Juncus supiniformis</i>	spreading rush
<i>Kalmia occidentalis</i>	western bog laurel
<i>Lathyrus palustris</i>	marsh pea
<i>Ledum groenlandicum</i>	Labrador-tea
<i>Lilaeopsis occidentalis</i>	lilaeopsis
<i>Linnaea borealis</i>	western twinflower
<i>Lonicera involucrata</i>	black twin-berry
<i>Ludwigia palustris</i>	water-purslane
<i>Luzula</i> sp.	woodrush
<i>Lycopus uniflorus</i>	northern bugleweed
<i>Lysichitum americanum</i>	skunk cabbage
<i>Maianthemum dilatatum</i>	beadruby
<i>Marchantia</i> sp.	liverwort
<i>Mentha arvensis</i>	corn mint
<i>Menyanthes trifoliata</i>	buckbean
<i>Menziesia ferruginea</i>	fool's huckleberry
<i>Mimulus guttatus</i>	yellow monkey-flower
<i>Myosotis laxa</i>	small-flowered forget-me-not
<i>Myrica californica</i>	Pacific wax-myrtle
<i>Myrica gale</i>	sweet gale
<i>Nephrophyllidium crista-galli</i>	deer-cabbage
<i>Nuphar polysepalum</i>	Indian pond lily
<i>Oenanthe sarmentosa</i>	Pacific water-parsley
<i>Physocarpus capitatus</i>	Pacific ninebark
<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta</i>	lodgepole pine
<i>Pinus monticola</i>	western white pine
<i>Platanthera dilatata</i>	bog-candle
<i>Poa palustris</i>	fowl bluegrass
<i>Poa</i> sp.	bluegrass
<i>Polygonum hydropiperoides</i>	waterpepper
<i>Polystichum munitum</i>	sword-fern
<i>Polypodium glycyrrhiza</i>	licorice-fern

Potamogeton sp.	pondweed
Potentilla pacifica	Pacific silverweed
Potentilla palustris	purple cinquefoil
Pseudotsuga menziesii	Douglas fir
Pteridium aquilinum	bracken
Puccinellia pauciflora	weak alkaligrass
Pyrus fusca	western crabapple
Ranunculus flammula	creeping buttercup
Rhamnus purshiana	casacara
Rhynchospora alba	white beakrush
Rosa sp.	rose
Rubus parviflorus	thimbleberry
Rubus pedatus	five-leaved bramble
Rubus spectabilis	salmonberry
Rubus ursinus	Pacific blackberry
Rumex occidentalis	western dock
Salix hookeriana	Hooker willow
Salix sp.	willow
Sambucus sp.	elderberry
Sanguisorba officinalis	garden burnet
Scirpus microcarpus	small-fruit bulrush
Scirpus subterminalis	water clubrush
Scirpus validus	softstem bulrush
Senecio triangularis	arrowleaf groundsel
Sidalcea hendersonii	Henderson's checker-mallow
Sium suave	hemlock water-parsnip
Sparganium emersum	simplestem bur-reed
Sparganium sp.	bur-reed
Sphagnum spp.	sphagnum
Spiraea douglasii	spirea
Thuja plicata	western red cedar
Tiarella trifoliata	foamflower
Tolmiea menziesii	youth-on-age
Trientalis arctica	northern starflower
Tsuga heterophylla	western hemlock
Typha latifolia	cat-tail
Vaccinium ovalifolium	early blueberry
Vaccinium ovatum	evergreen blueberry
Vaccinium oxycoccos	wild cranberry
Vaccinium parvifolium	red bilberry
Vaccinium sp.	blueberry
Veratrum californicum	California false hellebore
Veronica scutellata	marsh speedwell
Viola sp.	violet

