

PUGET TROUGH FRESHWATER WETLANDS

A Summary of Biologically Significant Sites

Phase I: Northern Puget Trough Impounded Wetlands

by

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ABSTRACT

This study identifies high quality native wetlands which occur in the northern portion of the Puget Trough region. It focuses on impounded freshwater wetlands which have rooted vascular plant vegetation. The report includes:

1. A list of relatively pristine native wetlands,
2. A list of wetlands which have been disturbed but may be possible to restore,
3. Descriptions of each of the wetland sites listed in 1 and 2 above,
4. A classification of native vegetated wetlands, and
5. Descriptions of wetland communities.

ACKNOWLEDGMENTS

Thank you to all of the private land owners who allowed me to work on their land and shared what they knew of the history of the areas. A special note of thanks to those who offered me their hospitality.

Also thank you to Mark Sheehan who edited this report, Rex Crawford for his assistance and perspective on the classification, and Nancy Sprague for producing the report maps.

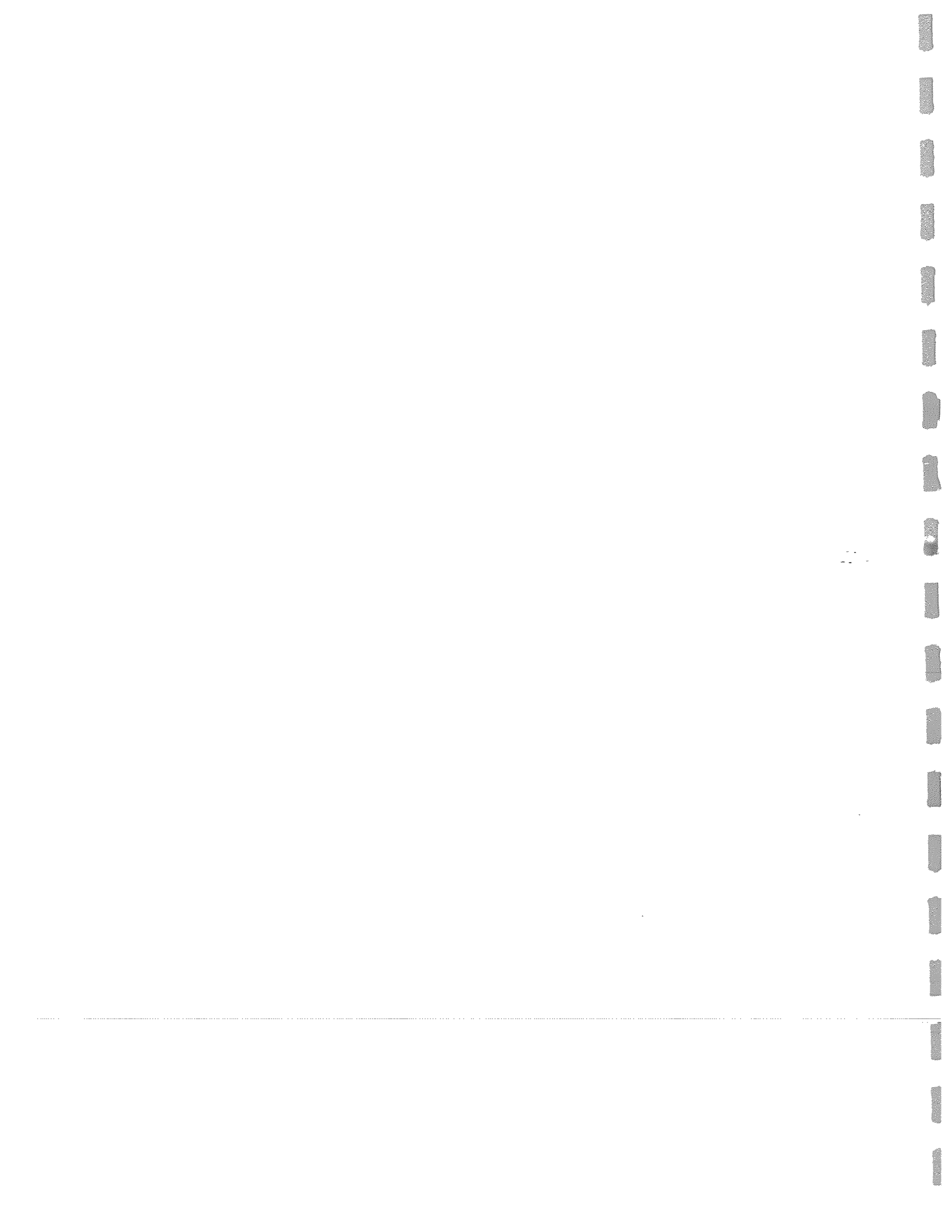
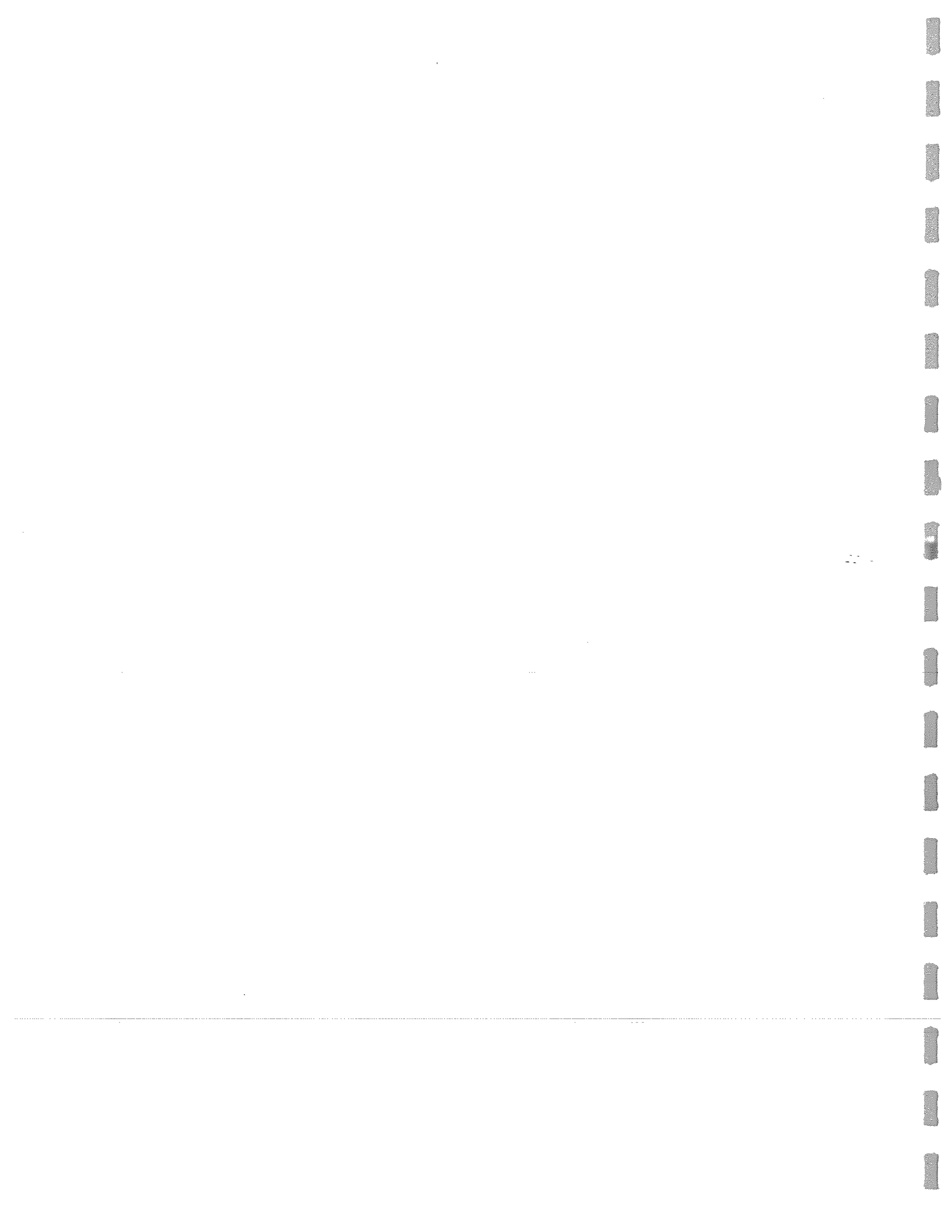
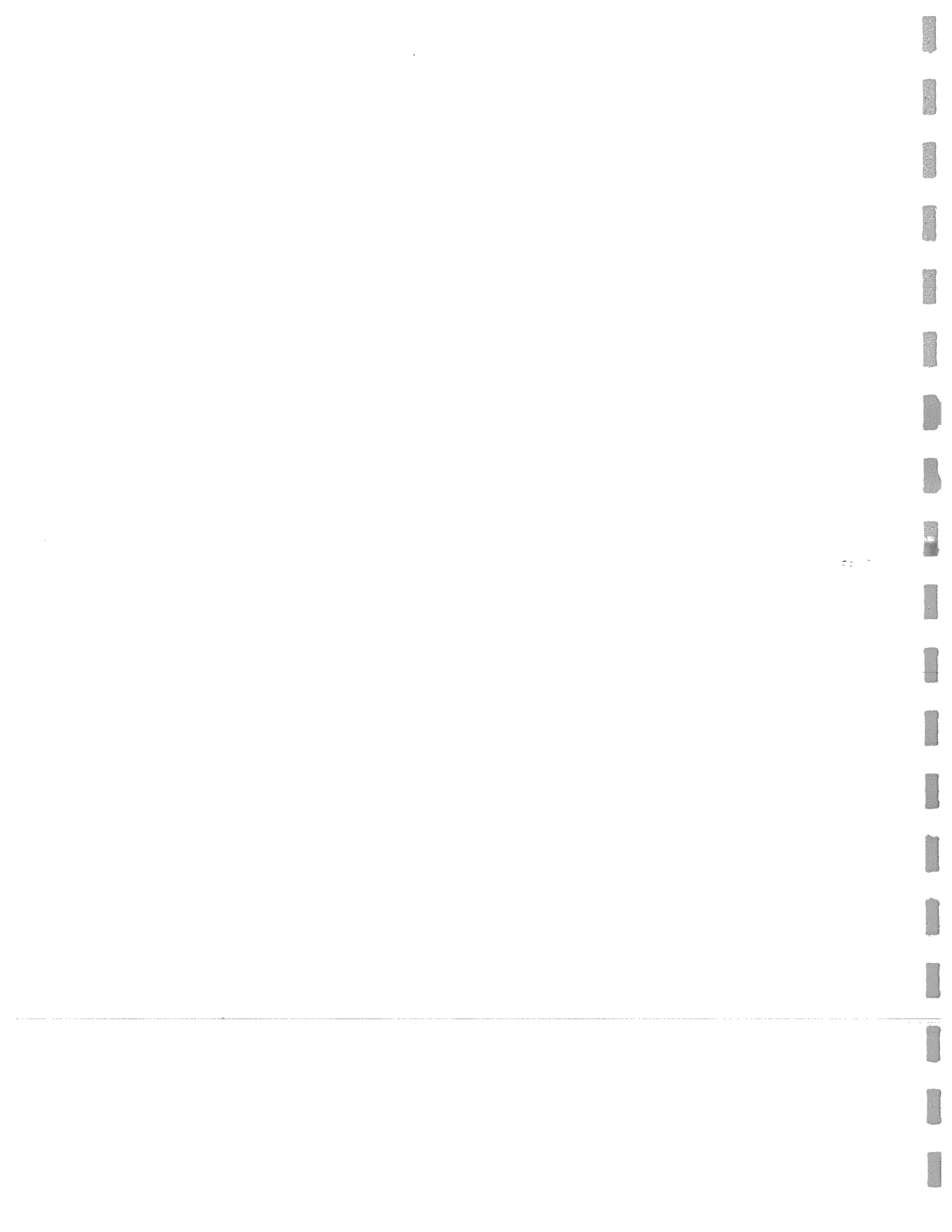


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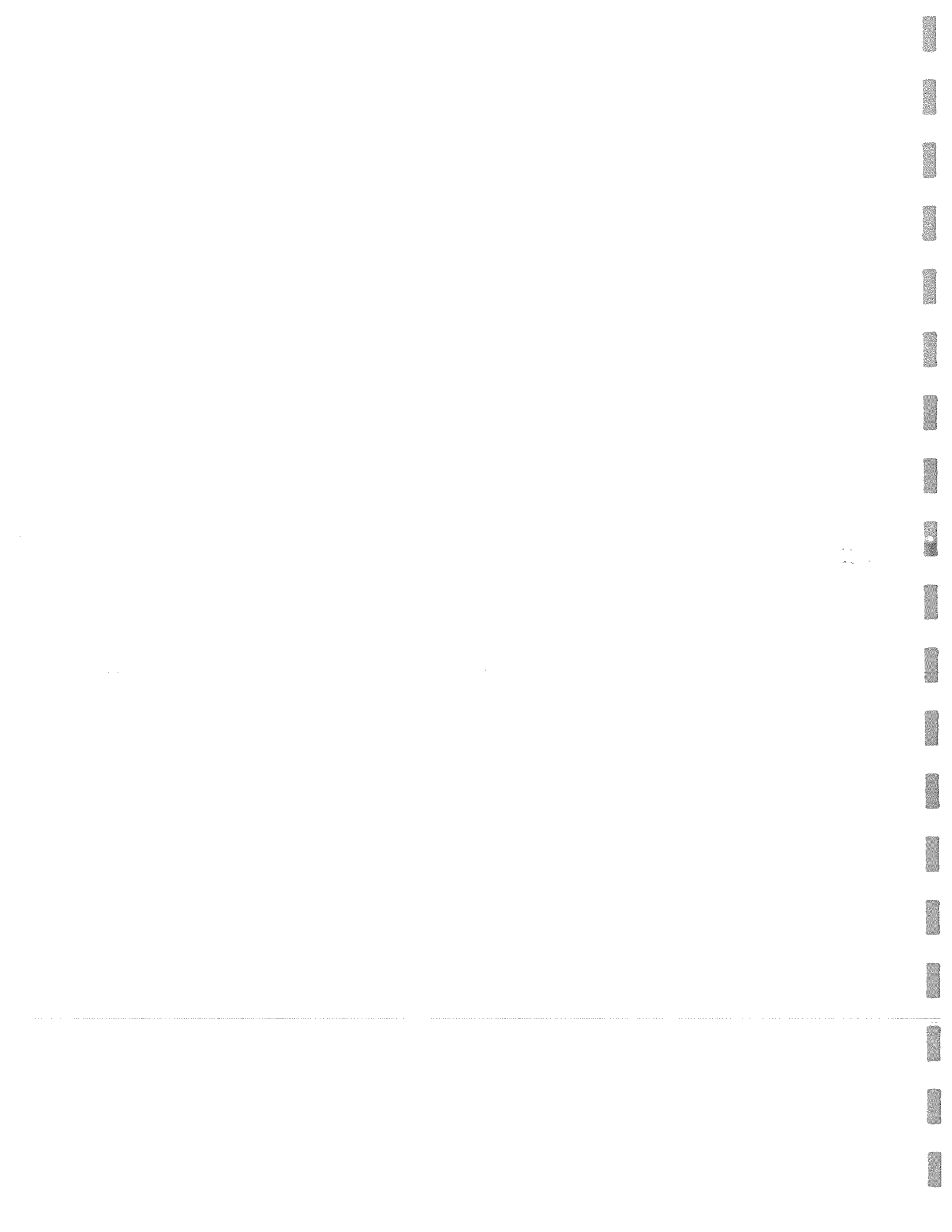


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INTRODUCTION

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 within the lowlands of the northern Puget Trough region.

Specifically, the study included native, impounded, freshwater wetlands which were vegetated by rooted vascular plants. It did not include wetlands associated with flowing water, nor did it include those wetlands vegetated exclusively with nonvascular or floating aquatic vegetation.

This report provides the following information.

1. A list of "pristine" native wetlands (first tier).
2. A list of wetlands which have been disturbed but may be able to be restored (second tier).
3. Descriptions of each of the sites listed in numbers 1 and 2.
4. A classification of native, vegetated wetlands.

Although a large percentage of the vegetated wetlands located in the lowlands of the northern Puget Trough region were reviewed, not all could be included in this study. With further work, it is probable that a few more sites could be added to the list of high quality sites identified here.

STUDY AREA

The study area includes the lowlands of the northern Puget Trough region, that is, lands below 2,000 feet in Whatcom, Skagit, Snohomish, King, San Juan, Island, northern Kitsap, and eastern Jefferson counties (figure 1).

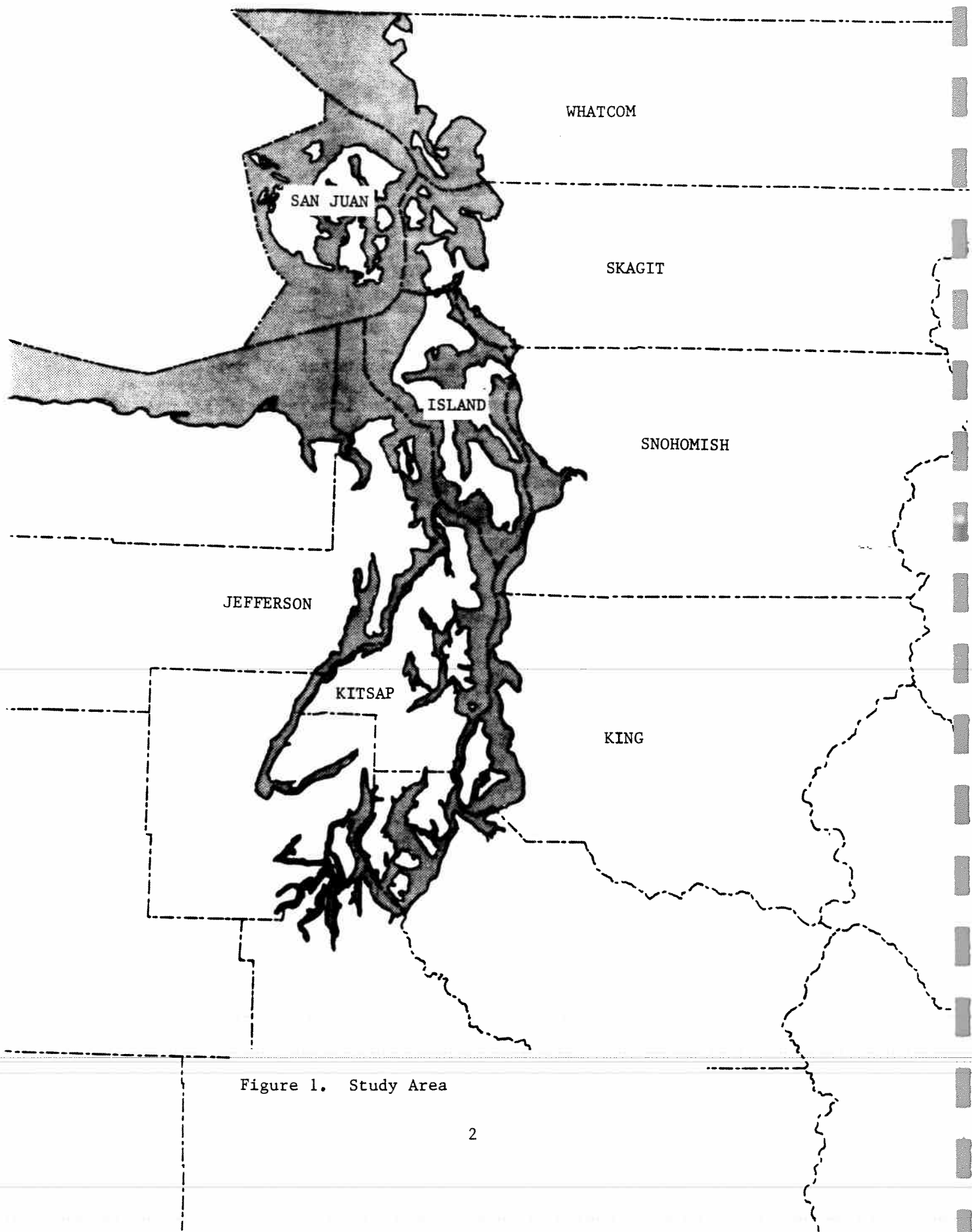


Figure 1. Study Area

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; and 3) by a retrieval of data already contained within the Natural Heritage Database.

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, mining of the substrate, or inclusion within a sludge disposal area. 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 right-of-way, 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:

Field surveys were conducted during the summer of 1985. Existing data from the Natural Heritage Database were collected in 1984 and 1983 using the same methodology employed during the 1985 field survey.

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, along with the criteria for initial site selection outlined above.

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 and means of impoundment, and wetland configuration. Data on hydrology included water depth, apparent water level fluctuation, drainage patterns within the wetland's basin, and water source.

Soils generally were classed as: sphagnum peat, sedge peat, woody peat, organic muck, silts, sands, or glacial till. Soils data were also gathered from the U.S. Soil Conservation Service, Washington Department of Natural Resources Geology and Earth Resources Division, and soil surveys conducted for private land owners.

Adjacent land use and historic uses were determined through site observation, talking with owners of a site and adjacent areas, county assessor's office staff, and historical records.

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. 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 or threatened in Washington.

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, alteration of the wetland topography,
2. No alteration of the hydrology of the wetland, or else the wetland appeared to have recovered from 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. The wetland system could be degraded, but, if so, it 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. Cache Pond
2. Cannery Lake
3. Cypress Island Basin *NA*
4. Devils Lake *gwa*
5. First Lake
6. Killebrew Lake *NA*
7. Kings Lake Bog *NA*
8. Lake Desire Forest Bog
9. Mosquito Lake
10. Snoqualmie Bog *NA*
11. Tony's Bog

SECOND TIER SITES:

12. Blueberry Lake *NC*
13. Cranberry Creek *1500' in bog (at 200')*
14. Cranberry Lake *NC*
15. Elwell Creek Headwaters *NC*
16. Horseshoe Lake *NC*
17. Johnson Creek Island Bog *smallest wet bog*
18. Kellogg Lake *NC*
19. Klaus, Boyle, and Bridges Lakes *NC*
20. Lake Elsie *NC*
21. Lake Martha *W/In/PA*
22. Lily Lake *NC*
23. Lost Lake Two *NC*
24. Maud Lake *NC*
25. McLeod Lake *NC*
26. Mooney Swamp
27. Mt. Constitution Wetlands *NC*
28. Robe Bog *✓*
29. Second Lake *NC*
30. Sleeper Bog *NC*
31. Summer Lake *at 100' in bog*
32. Summit Lake *NC*
33. Tulloch Road Bog *NC*
34. Walsh Lake *WOCO*
35. West Hylebos Creek Forest Bog *NC*
36. Woods Lake *incubated heavily - close to SE*
37. Woods Lake Key *NC*

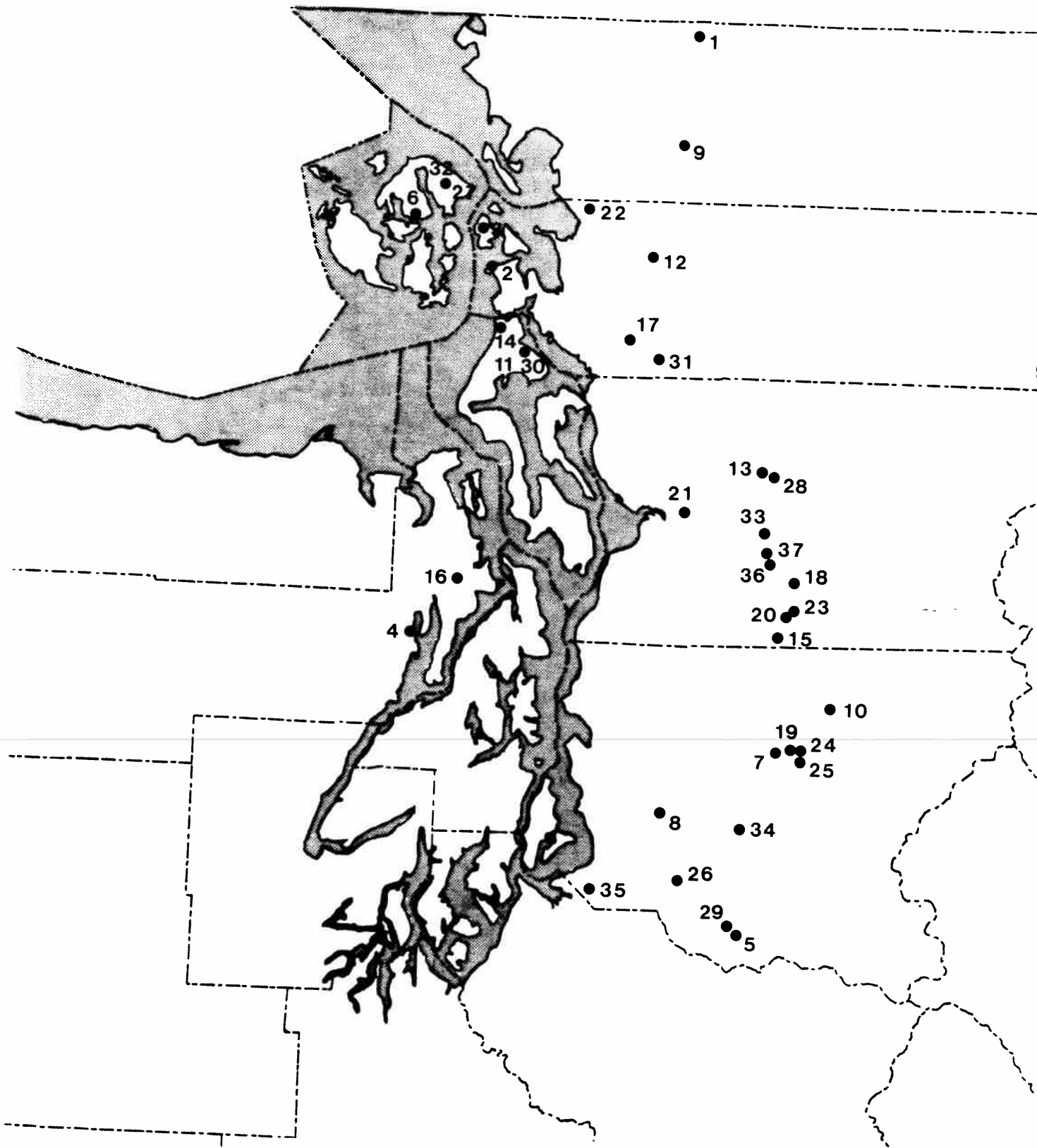
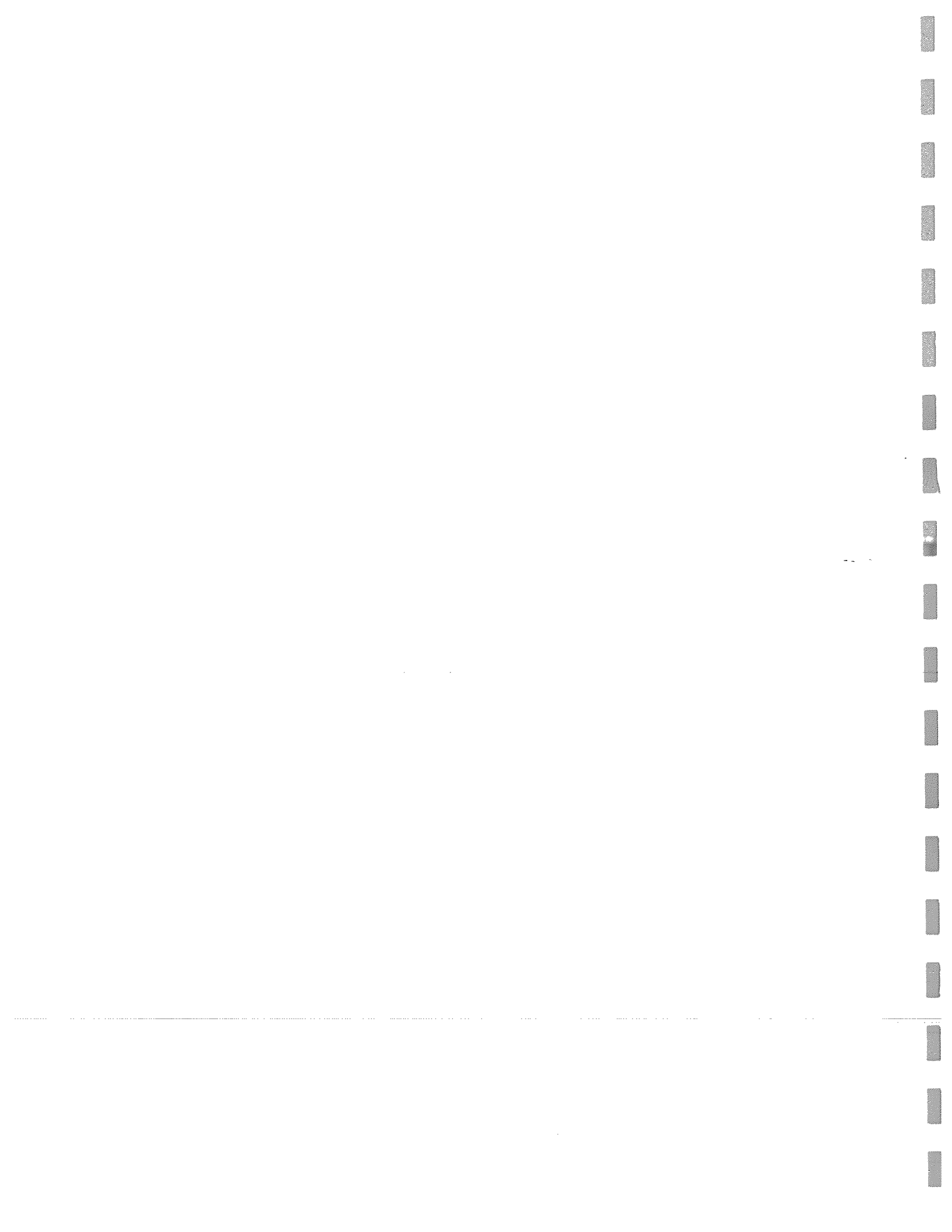


Figure 2. Location of First and Second Tier Sites



FIRST TIER SITE DESCRIPTIONS

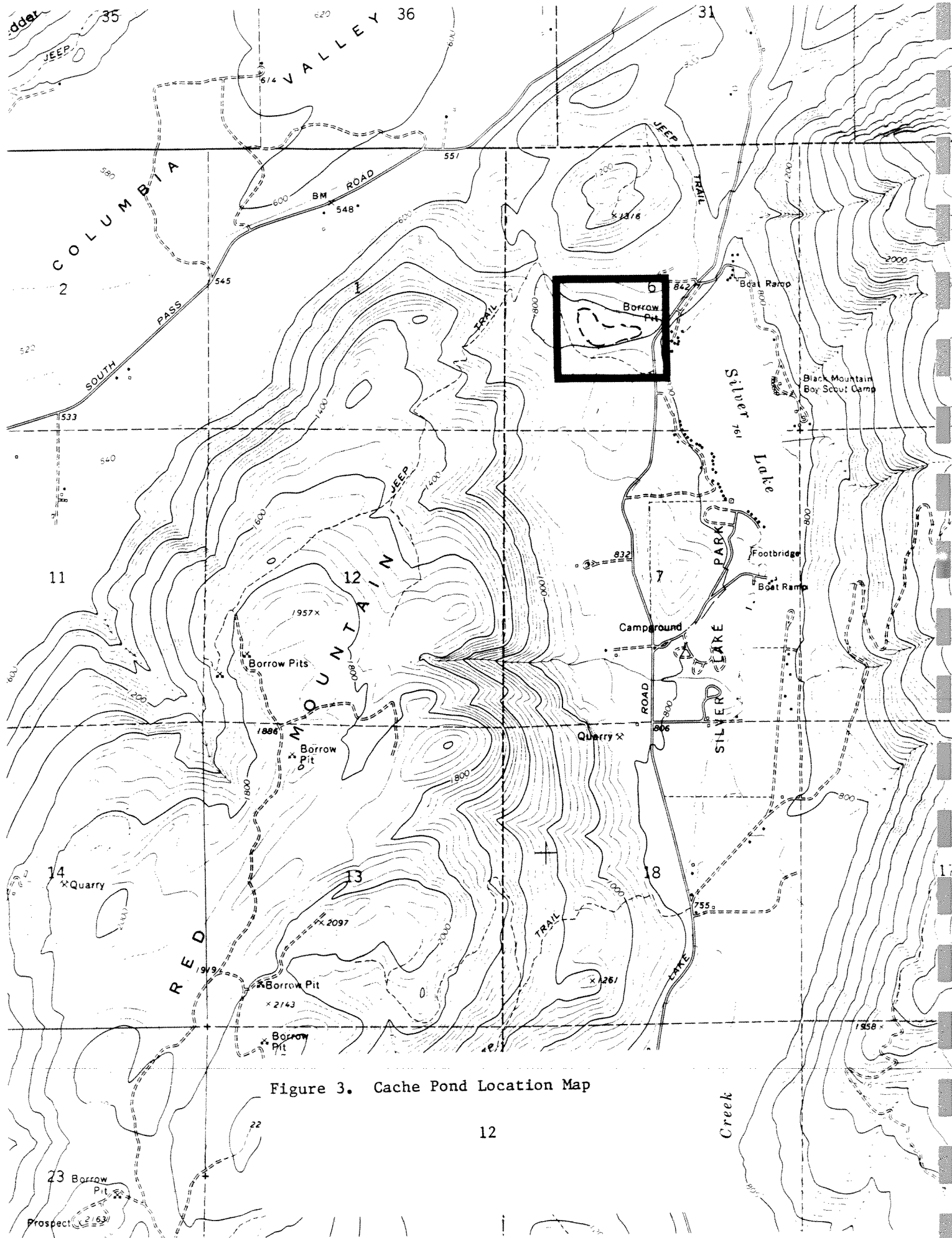


Figure 3. Cache Pond Location Map

CACHE POND

LOCATION: Whatcom County; Section 6, Township 40 North, Range 6 East, Willamette Meridian.

SIGNIFICANCE: Cache Pond is a first tier site. It is a high quality kettle wetland which consists of 4 freshwater wetland communities.

FEATURES: Freshwater Wetland:

1. Nuphar polysepalum community
2. Carex rostrata community
3. Eleocharis palustris-Sium suave community
4. Spiraea douglasii community

DESCRIPTION:

Physical: Cache Pond is a 6 acre kettle wetland located at an elevation of 800 feet. The wetland basin has steep sides. It has no outflow and is fed from surface run-off. There is a large annual water level fluctuation. Most of the wetland is seasonally flooded, though an area is permanently ponded.

The soils range from organic muck in the areas which are permanently flooded, to glacial till with very little organic matter in the seasonally flooded areas.

Biological: There are very sharp transitions between the four wetland communities. Nuphar polysepalum occurs in the permanently ponded areas. The Carex vesicaria community occupies the ecotone between permanently and seasonally flooded areas. The Eleocharis palustris-Sium suave community occurs on the steep slopes in the seasonally flooded areas, and the Spiraea douglasii community occurs along the wetland margin adjacent to the upland.

CONDITION: The wetland appears to be in excellent condition. The uplands were logged many years ago. An equestrian trail is primarily located in the uplands but reaches the wetland margin.

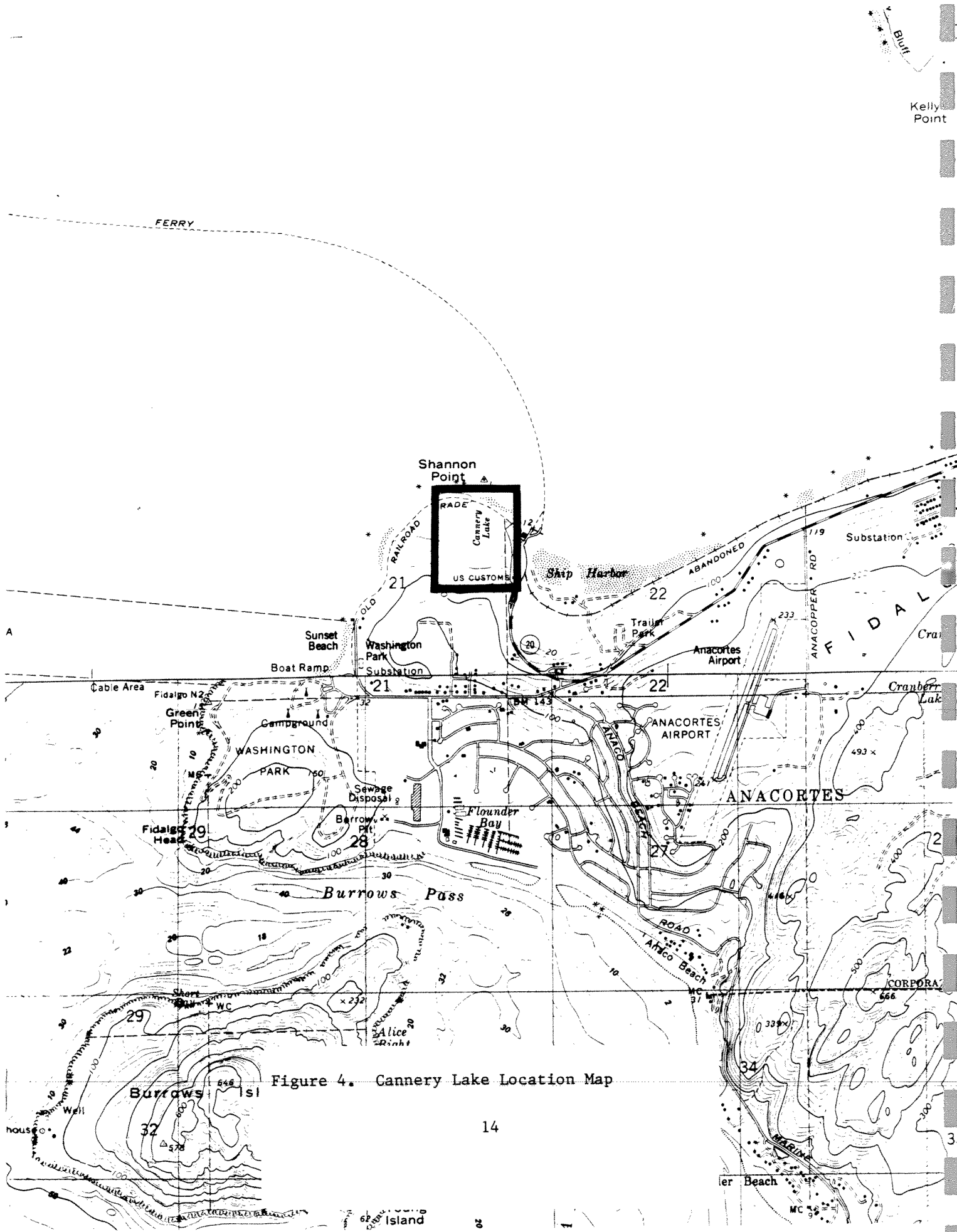


Figure 4. Cannery Lake Location Map

CANNERY LAKE

LOCATION: Skagit County; Section 21, Township 35 North, Range 1 East, Willamette Meridian.

SIGNIFICANCE: Cannery Lake is a first tier site. It is a high quality shallow lake and wetland system in which the entire drainage is protected.

FEATURES: Freshwater Wetland:

1. pond/lake
2. Scirpus acutus community
3. Typha latifolia community
4. Carex cusickii community

DESCRIPTION:

Physical: Cannery Lake is located at the northwest end of Fidalgo Island at an elevation of 5 feet. The total wetland is approximately 12 acres, the pond is 9 acres, and the freshwater wetland is 3 acres.

Cannery Lake occurs within a small amphitheater shaped basin and is fed by surface run-off. It is separated from salt water influence by what is probably a natural berm. There is no outflow. Snags in the wetland indicate a historic change in water level, but the current water level appears stable. Soils are mostly sedge peat and muck.

Biological: The lake is rich with floating and rooted aquatic vegetation. The predominant plant species is Ceratophyllum demersum, but at least eight other vascular plant species have been observed.

The wetland vegetation is complex and occurs on and around floating sedge mats. The Carex cusickii community, with high cover values of Potentilla palustris, makes up the floating mats. Intermixed with and along the margins of the mats occurs an emergent Typha latifolia community. Small patches of the Scirpus acutus community, comprised of S. validus, are emergent throughout the lake.

CONDITION: Cannery Lake is in excellent condition. The whole drainage basin has been included in the Sundquist Marine Research Station and is managed as a preserve and research area by Western Washington University.

The area was disturbed at one time but it appears to have recovered. Cannery Lake was used to supply water to the cannery located in Ship Harbor to the east. A railroad grade was built along the berm at one time, probably using fill. The uplands were clearcut once.

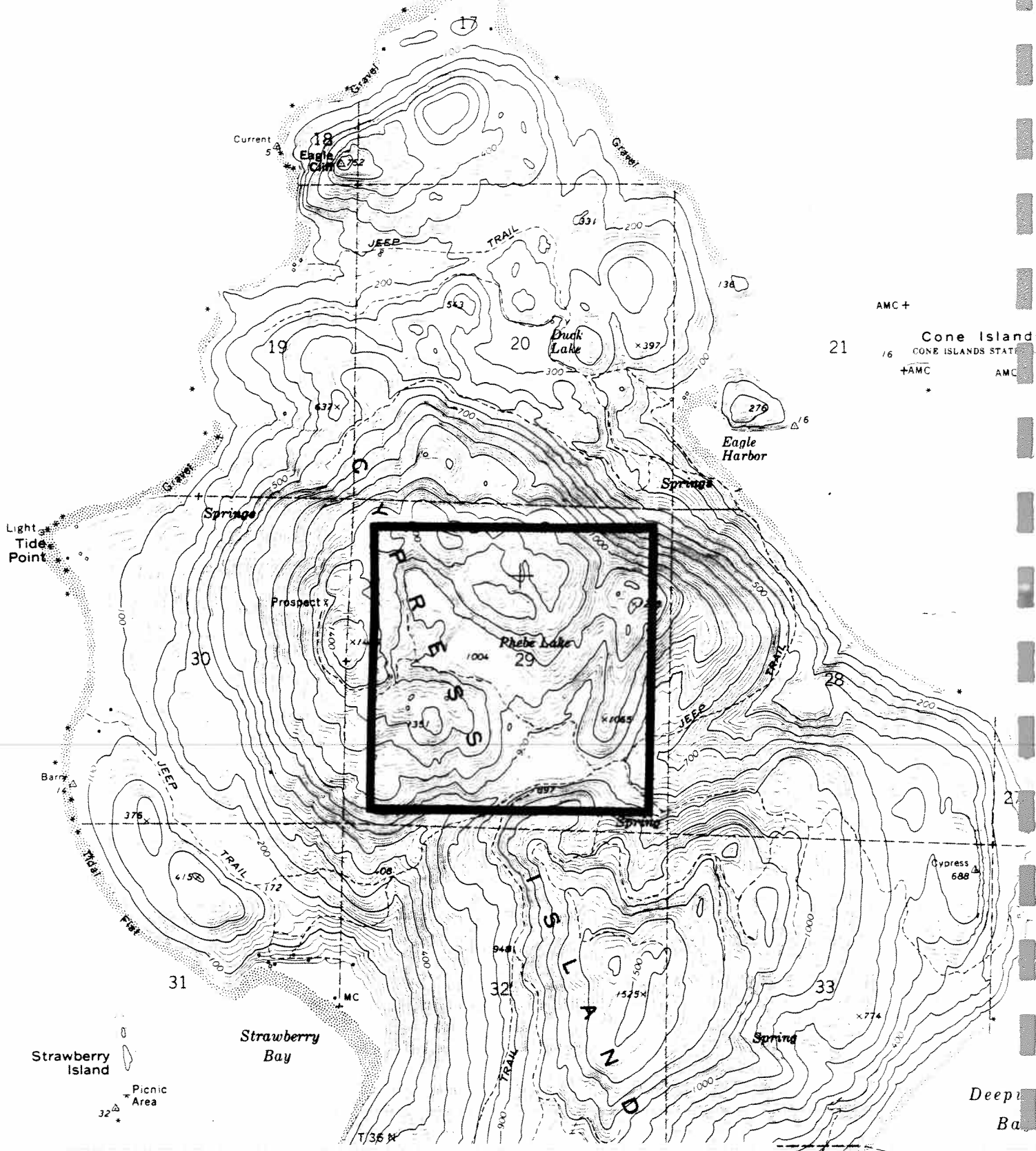
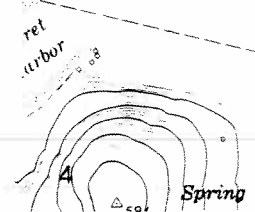


Figure 5. Cypress Island Basin Location Map



CYPRESS ISLAND BASIN

LOCATION: Skagit County; Section 29, Township 36 North, Range 1 East, Willamette Meridian.

SIGNIFICANCE: Cypress Island Basin is a first tier site. It is composed of 9 relatively undisturbed wetlands, lakes, and ponds. The wetlands contain both freshwater and sphagnum bog vegetation and may be influenced by serpentine.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. pond and lake
2. Nuphar polysepalum community
3. Juncus balticus community
4. Carex obnupta community
5. Carex rostrata community
6. Spiraea douglasii community

DESCRIPTION:

Physical: Cypress Island Basin is located on Cypress Island in the San Juan Archipelago. The wetlands occur in a basin at elevations ranging from 860 to 1,280 feet. The basin contains approximately 14 acres of ponds and lakes, 3 acres of sphagnum bogs, and 12 acres of freshwater wetlands.

The island was glaciated and the parent material is a combination of glacial till and serpentine. The wetland soils are a combination of alluvium, sedge peat, and sphagnum peat.

Biological: 3 of the 9 wetlands have sphagnum bogs. These all have Ledum groenlandicum/Sphagnum spp. communities, but they differ from the norm in having Festuca rubra as a component. F. rubra occurs as a codominant with L. groenlandicum in some areas. There are also small areas in which Carex cusickii or C. rostrata occur.

The ponds and lake are freshwater. The water is clear to slightly brown. The Nuphar polysepalum community occurs in all of the shallow but permanently flooded areas. Landward of this zone in shallower, but still permanently flooded areas, the Juncus balticus community occurs. In most cases, it occurs as a nearly monospecific community. However, an unusual community dominated by J. balticus, but including Triglochin maritimum and several Carex species, is found at Homestead Lake.

Carex obnupta, Spiraea douglasii, and occasionally C. rostrata communities occur in shallow permanently to seasonally flooded

areas. The former 2 communities typically occur as monospecific stands, while the later community forms small species rich swards.

CONDITION: Cypress Island Basin wetlands are in unusually good condition. The water level in one wetland was raised slightly near the turn of the century and has been kept at that level ever since. Another wetland has a logging road adjacent to it and received some fill from the roadbed. A portion of one wetland looks as if it may have been grazed. This could have been done several decades ago or may be currently done by deer.



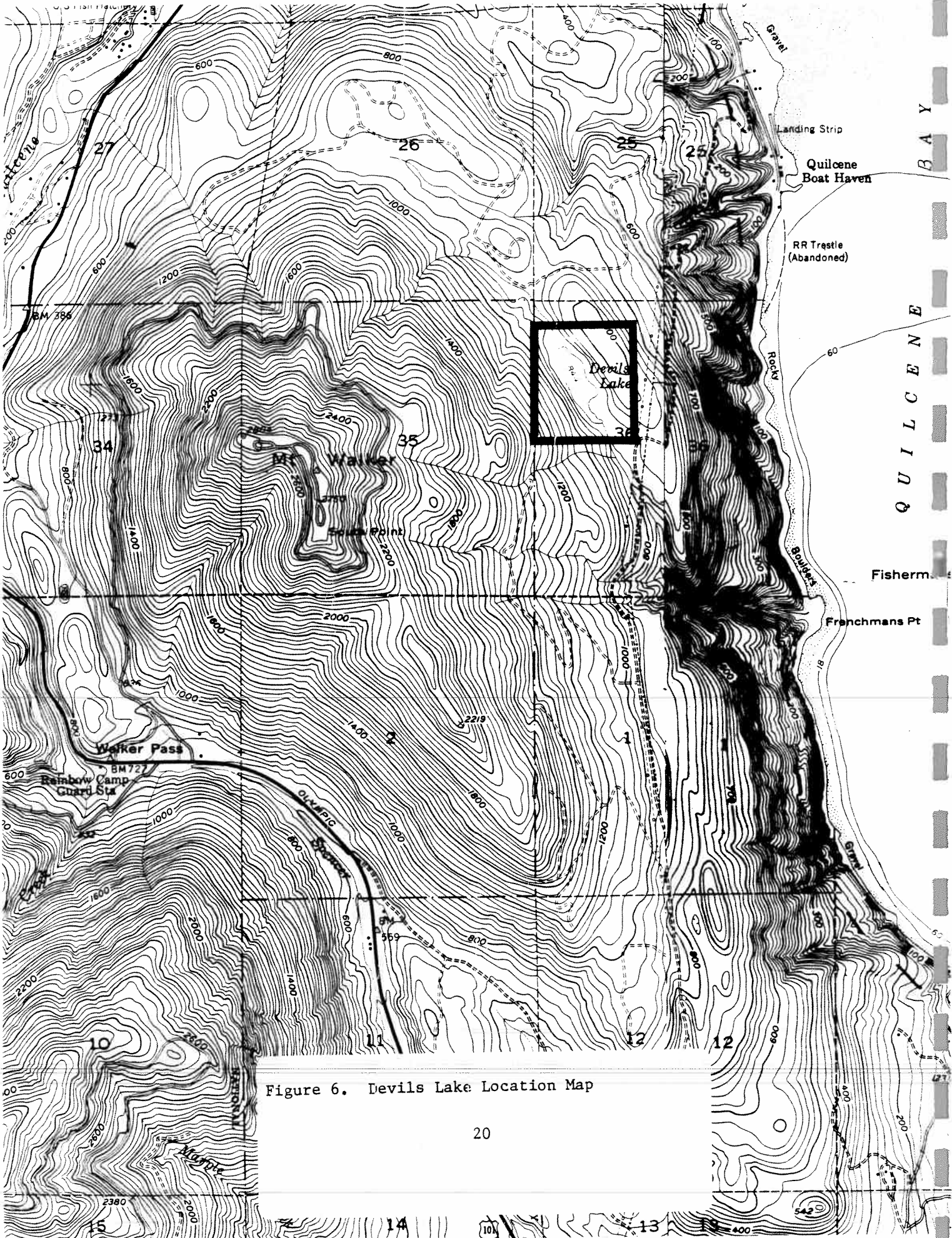


Figure 6. Devils Lake Location Map

DEVILS LAKE

LOCATION: Jefferson County; Section 36, Township 27 North, Range 2 West, Willamette Meridian.

SIGNIFICANCE: Devils Lake is a first tier site. It contains 2 freshwater wetland and 2 sphagnum bog communities, one of which is unusual.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. Carex sitchensis community
2. Spiraea douglasii community

DESCRIPTION:

Physical: Devils Lake is located in a saddle, on the west side of Mount Walker, at an elevation of 844 feet. The lake drains to either side of the saddle, both to the north and the south.

The wetlands consist of approximately 4 acres of sphagnum bog and 6 acres of freshwater wetlands. Wetlands have developed at the north and south ends of the 12 acre lake. Some of the soils are organic muck. Those associated with the bog areas are sphagnum peat probably with some woody material.

Biological: The bog at the south end of the lake contains a rich assemblage of plant species. The lake margins most closely resemble a Rhynchospora alba/Sphagnum spp. community. Inland, the bog vegetation quickly progresses to a mixture of a Kalmia occidentalis/Sphagnum spp. community and a Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. The T. heterophylla are short in stature and widely spaced. The understory resembles the short form of the L. groenlandicum/Sphagnum spp. community but also contains K. occidentalis and Rhododendron macrophyllum. Small Pinus monticola and Thuja plicata occur in the bog as well.

The wetland at the north end of the lake is mostly freshwater with a narrow band of sphagnum bog along the lake margin. The bog is classified as a Rhynchospora alba/Sphagnum spp. community. The freshwater wetland is complex. It contains a large number of snags and fallen logs, but no cut stumps were observed. The vegetation is best described as a species rich mosaic of a Spiraea douglasii community, and a Carex sitchensis community with conifer and Alnus rubra reproduction.

CONDITION: The bog at the south end of Devils Lake is in excellent condition. There is very little evidence of human

use. If the system was disturbed, it now appears to be recovering well.

The bog fringe at the north end of the lake is located near a hiking trail and is trampled. It will probably recover, given enough time, if it is left undisturbed and managed to eliminate exotic plant species and litter.

The snags in the freshwater wetland suggest that the wetland was disturbed at one time. This disturbance may be due to a change in the water level (either natural or human caused), fire, or insects. The amount of log debris may be natural or may be relictual from past logging of the adjacent uplands.



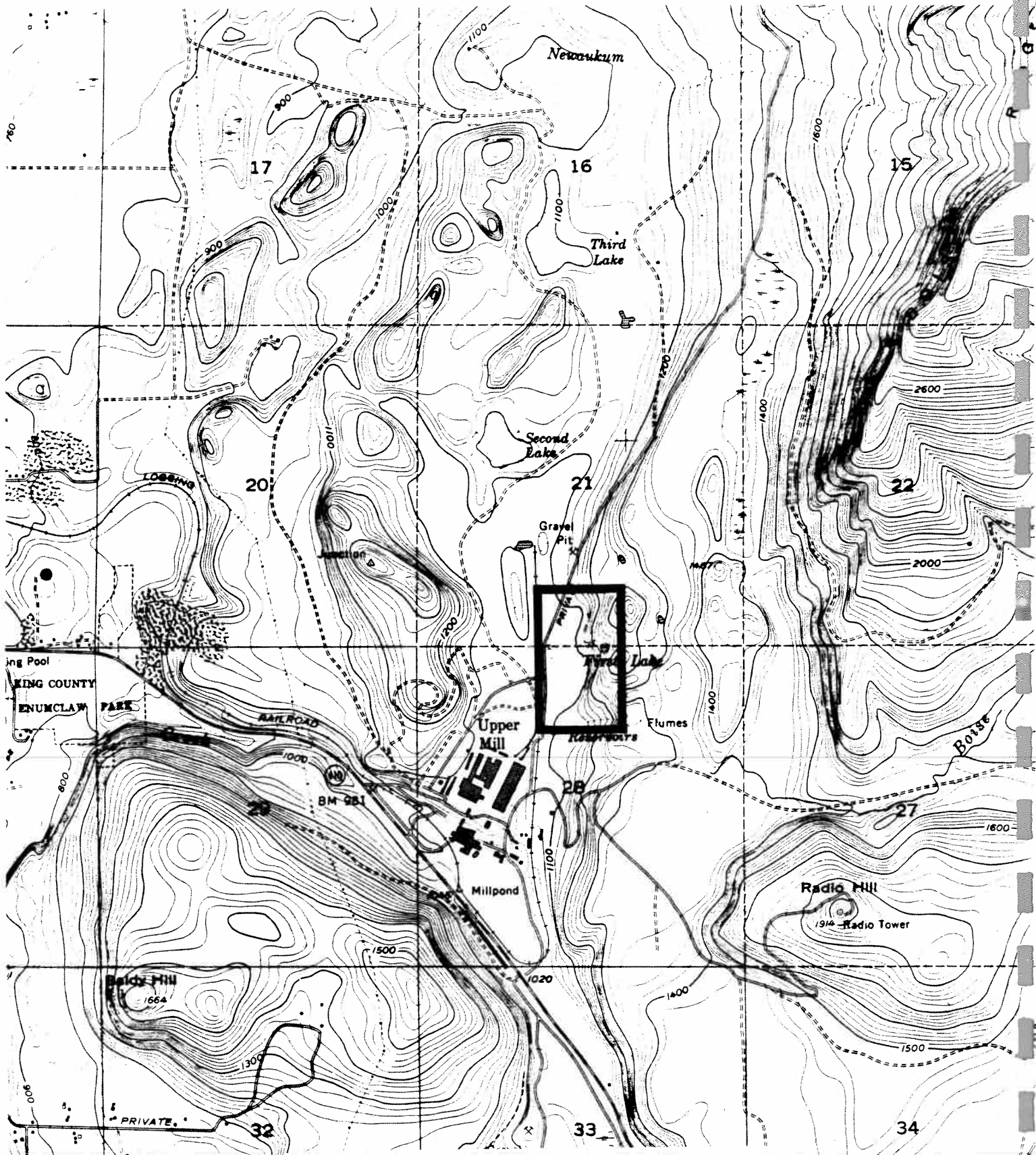


Figure 7. First Lake Location Map

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FIRST LAKE

LOCATION: King County; Sections 21 and 28, Township 20 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: First Lake is a first tier site. It is a high quality freshwater wetland which contains a pond and 2 communities.

FEATURES: Freshwater Wetland:

1. pond
2. Typha latifolia community
3. Spiraea douglasii community

DESCRIPTION:

Physical: First Lake is located at 1,100 feet in the foothills of the Cascade Mountains. The lake occurs at the base of a steep slope. The wetland appears to be fed from surface runoff. It then drains to the south via an intermittent stream.

The freshwater wetland is approximately 6 acres, and the pond is 2 acres. Wetland soils are probably organic muck. There is no apparent sphagnum peat, although there is a small amount of living Sphagnum moss.

Biological: First Lake has been set aside as a reservoir for the adjacent mill facility. As such, surveys of the wetland were restricted to the shore and are not as thorough as other wetland surveys.

The wetland is composed of a shallow pond surrounded by a relatively complex Typha latifolia community. Snags occur in this part of the wetland. On floating logs are small occurrences of the Carex cusickii/Sphagnum spp. community. To the north, the wetland vegetation shifts to a Spiraea douglasii community.

CONDITION: The wetland appears to have been undisturbed for a long period of time. Downed logs in the wetland indicate past logging effects. The uplands are now old second growth and probably will not be logged as long as the wetland is used as a reservoir.

The snags in the wetland indicate an increase in the water level. This may be due to beavers or past logging. In either case, the wetland vegetation appears to have adjusted to the change. The vegetation appears to be stable and is composed solely of native species.

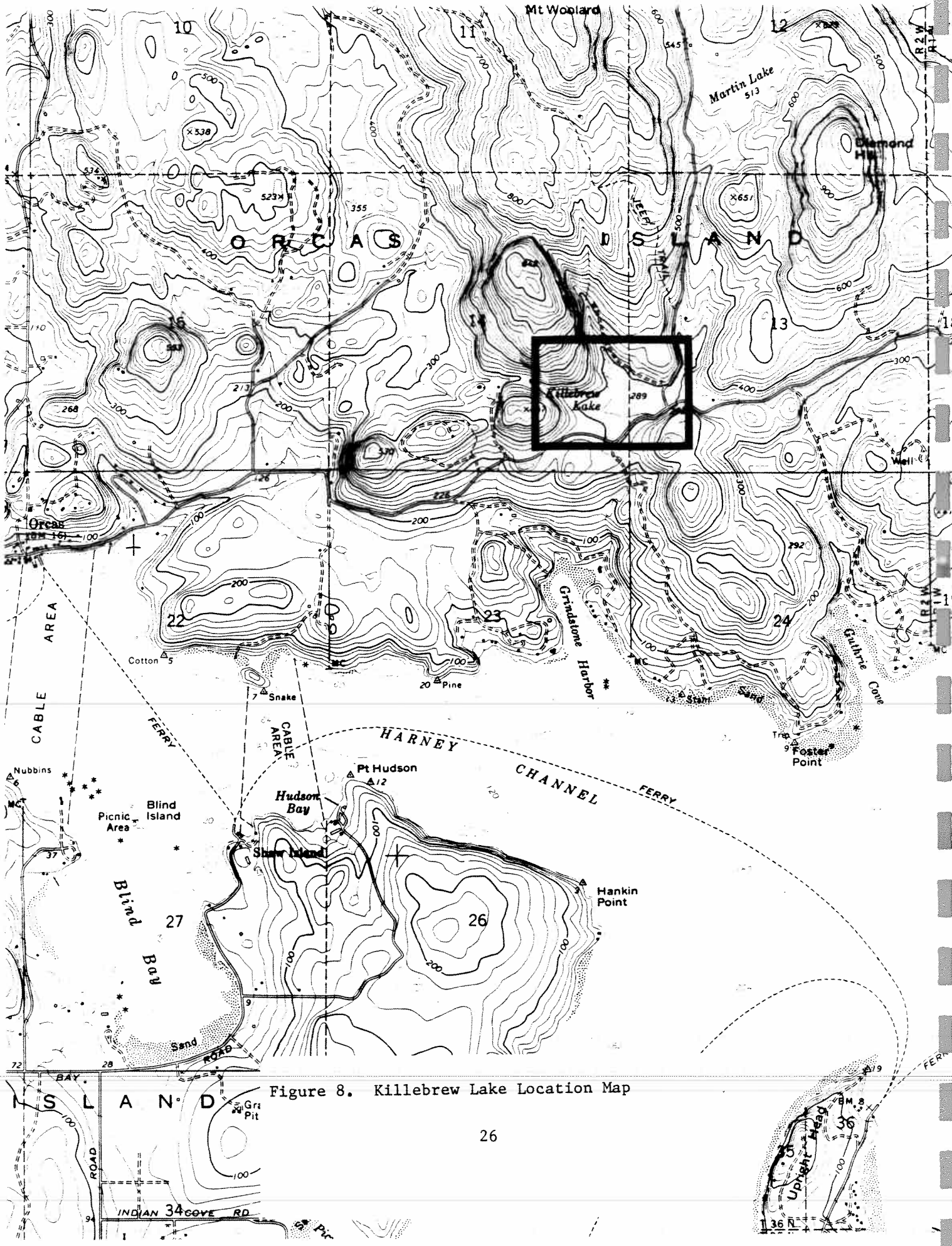


Figure 8. Killebrew Lake Location Map

KILLEBREW LAKE

LOCATION: San Juan County; Sections 13 and 14, Township 36 North, Range 2 West, Willamette Meridian.

SIGNIFICANCE: Killebrew Lake is a first tier site. It contains 2 sphagnum bog communities, 6 freshwater wetland communities, and 2 threatened and 1 sensitive plant species listed in Washington.

JUSTIFICATION: Sphagnum Bog:

1. Carex cusickii/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Hippuris vulgaris community
2. Nuphar polysepalum community
3. Scirpus acutus community
4. Carex lasiocarpa community
5. Carex sitchensis community
6. Spiraea douglasii community

DESCRIPTION:

Physical: Killebrew Lake is located on Orcas Island in the San Juan Archipelago, at an elevation of 293 feet. The wetland of interest is located on the west side of Killebrew Lake at the mouth of one of the three drainages which feed into the Lake. The area consists of a 1 acre sphagnum bog and an 8 acre freshwater wetland.

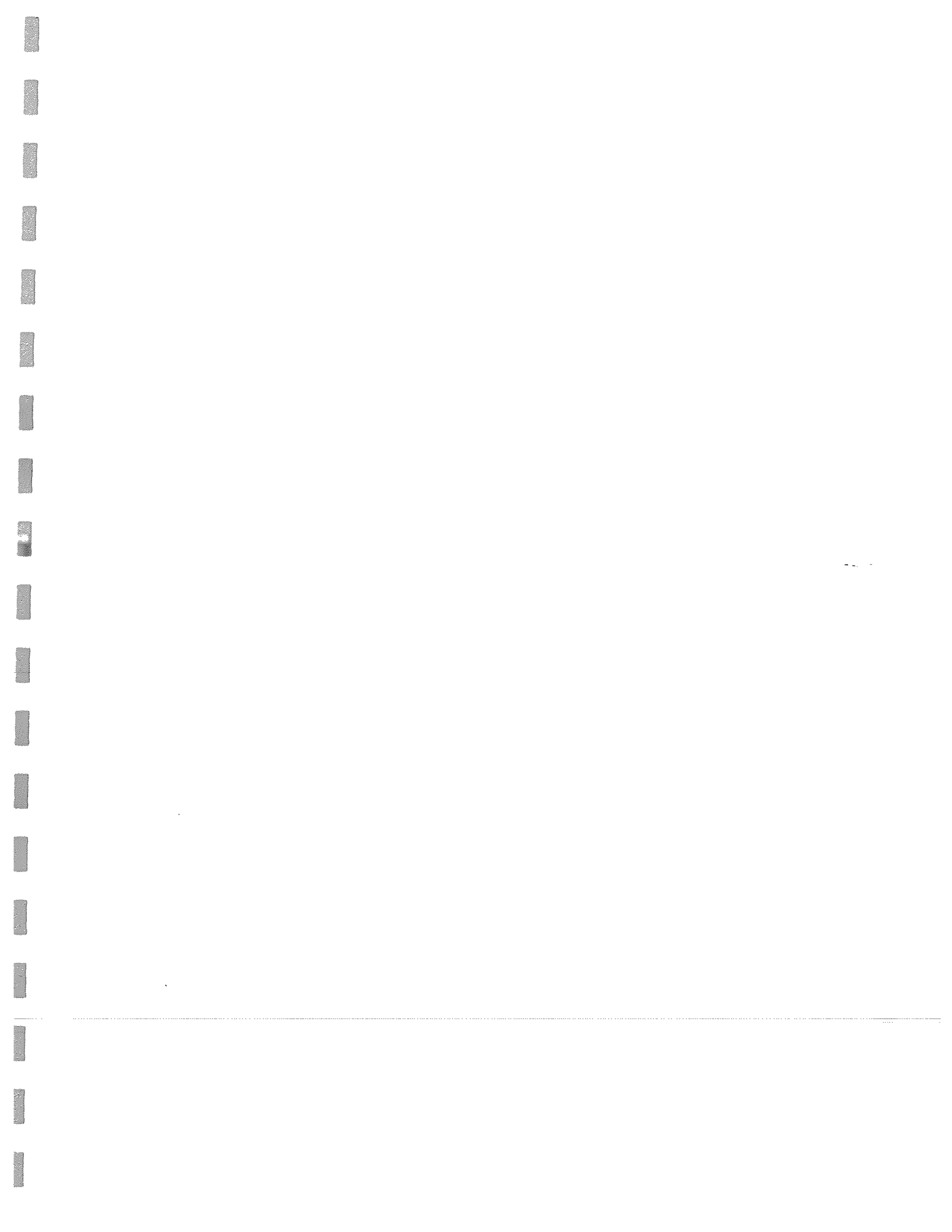
The wetland substrate is a mosaic of sedge and sphagnum peat, with areas of wood fiber and muck. Most of the wetland is quaking.

Biological: The sphagnum bog progresses from a hummocky Carex cusickii/Sphagnum spp. community near the lake edge, inland to a C. lasiocarpa freshwater wetland community and then to a Ledum groenlandicum/Sphagnum spp. community near the upland edge. Between the C. lasiocarpa and L. groenlandicum/Sphagnum spp. communities is a species rich assemblage codominated by C. leptalea and C. oederi, on a mixture of sedge and sphagnum peat.

The freshwater wetland communities progress from a Hippuris vulgaris community in permanently flooded areas adjacent to open water, to a Nuphar polysepalum community adjacent to the quaking wetland. On the edge of the quaking mat is the Scirpus acutus community. Remnants of this community occur inland where they appear to have been encircled by the sedge and sphagnum peat.

The Carex sitchensis community is found on a quaking sedge mat. Landward of this community, on a solid substrate, is the Spiraea douglasii community. As previously mentioned, there is a C. lasiocarpa community intermixed with the sphagnum bog communities.

CONDITION: According to historical records, this wetland at Killebrew Lake was grazed. If so, it has not been grazed since the Washington Department of Game acquired it 10 to 15 years ago. There are a few exotic plant species indicative of cattle grazing but for the most part the wetland vegetation has recovered well.



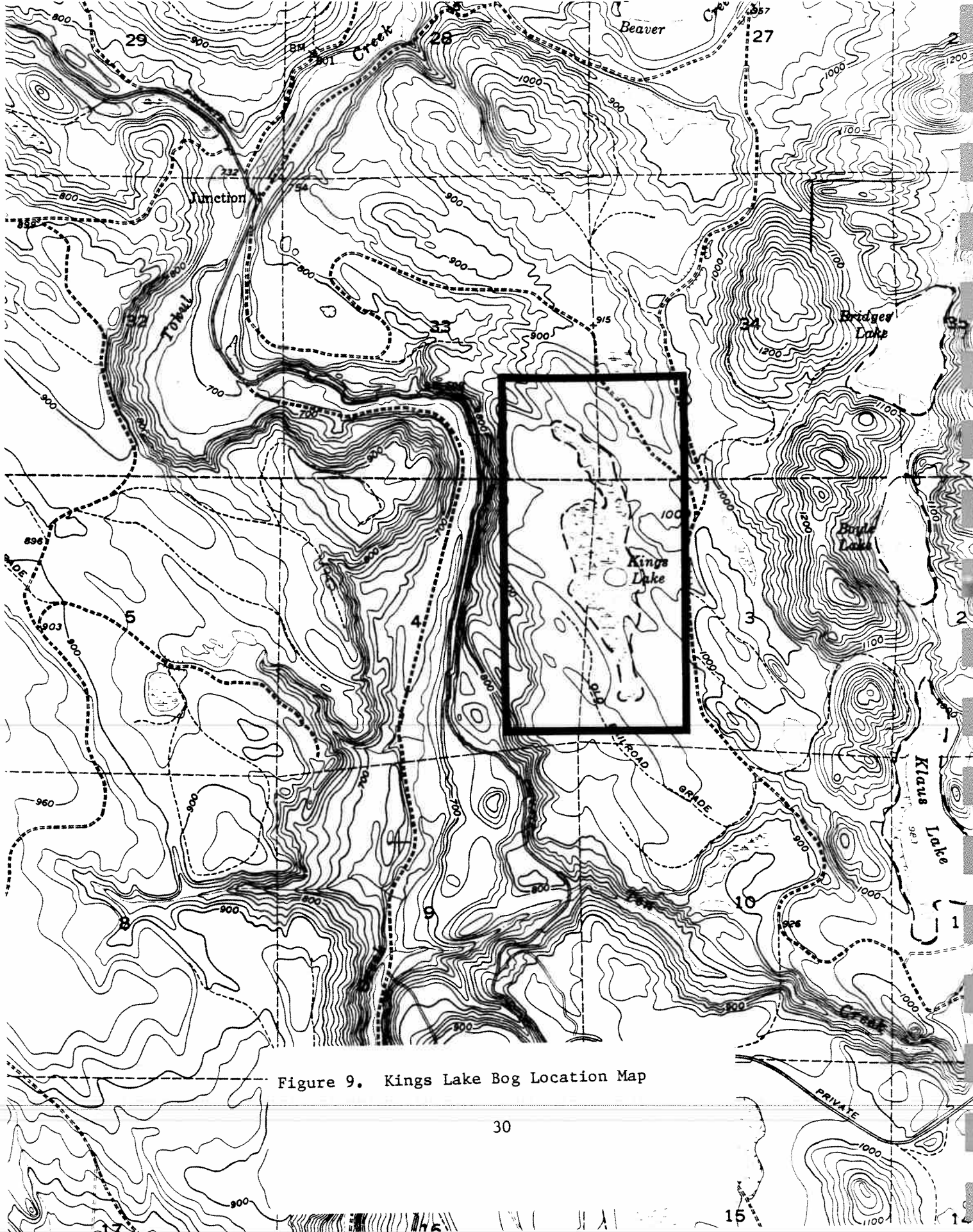


Figure 9. Kings Lake Bog Location Map

KINGS LAKE BOG

LOCATION: King County; Sections 3 and 4, Township 24 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Kings Lake Bog is a first tier site. It is an exceptionally high quality sphagnum bog. The site contains 3 bog communities, 1 bog pond, 2 freshwater wetland communities, 1 plant species listed as threatened and 2 animal species listed as sensitive in Washington.

FEATURES: Sphagnum bog:

1. bog pond
2. Rhynchospora alba/Sphagnum spp. community
3. Ledum groenlandicum/Sphagnum spp. community
4. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Sphagnum spp. community

Freshwater wetland:

1. Spiraea douglasii community
2. Tsuga heterophylla/Lysichitum americanum community

DESCRIPTION:

Physical: Kings Lake Bog is located on a small plateau at an elevation of 960 feet, approximately 300 feet above Tokul Creek. The site is composed of a 2 acre bog pond which is 15 feet deep, a 29 acre sphagnum bog, and a 9 acre freshwater wetland.

The pond is surrounded by a floating (quaking) mat of sphagnum peat. Landward, the quaking mat progresses to firm, relatively dry sphagnum peat. 3 wetland areas, which probably have soils composed of sedge peat and wood fiber, are located next to the uplands.

Kings Lake Bog is fed by a permanent stream, an intermittent stream, and surface run-off. The wetland drains to the north into Tokul Creek.

Biological: The Kings Lake Bog site contains a well-developed sphagnum bog. The wetland progresses from a Rhynchospora alba/Sphagnum spp. community on the quaking bog mat to a Ledum groenlandicum/Sphagnum spp. community on drier, firmer, sphagnum peat. The Carex rostrata phase of the L. groenlandicum/Sphagnum spp. community occurs in wet depressions near the quaking bog mat. Farther inland is a large occurrence of a Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community.

A freshwater Spiraea douglasii community occurs along the outlet to the north of the bog. This is a tall (>6 feet) nearly monospecific community, though it contains a little sphagnum moss, and other species on fallen logs and along the wetland margins.

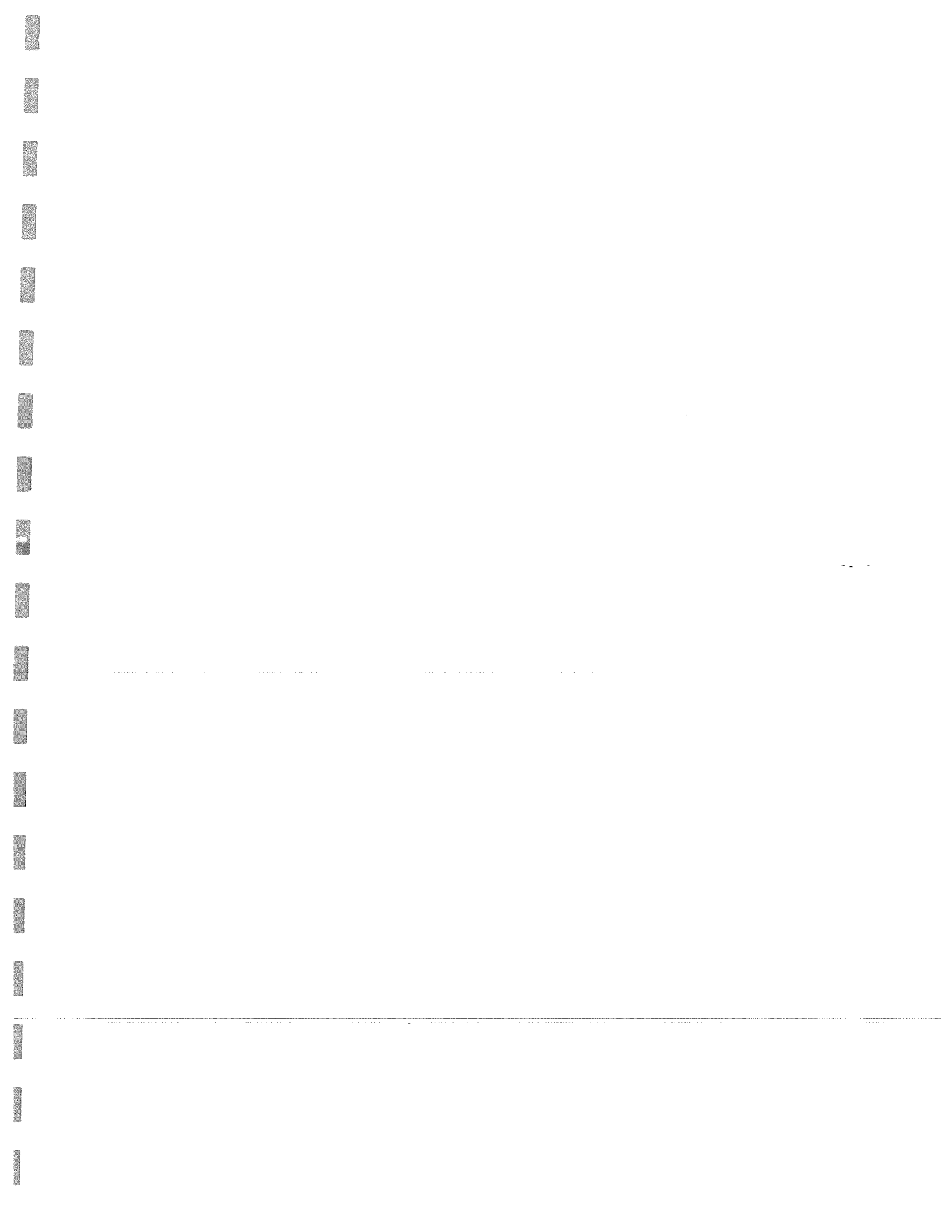
There are two wet-forest areas classified as a Tsuga heterophylla/Lysichitum americanum community. This is not a typical occurrence of this community, it has less L. americanum and more wet-site shrub species than is the normal case.

CONDITION: Kings Lake Bog is in unusually good condition for a low elevation bog. The uplands have all been logged, most have been recently logged for the second time, but there have been no intrusions into the bog or freshwater wetlands. There also appears to have been no alteration of the hydrology of the system.

The quaking bog margin around the bog pond has been badly trampled but will probably recover if it is no longer trampled.

The pond was stocked with eastern brook trout in the 1950s, and Tokul Creek cutthroat trout in the 1970s. It is not known whether these populations are self-sustaining.

NOTE: Kings Lake Bog has been acquired by The Nature Conservancy as a Natural Area Preserve. It will eventually be transferred to the Department of Natural Resources for inclusion in the Natural Area Preserve System.



LAKE DESIRE FOREST BOG

LOCATION: King County; Section 25, Township 23 North, Range 5 East, Willamette Meridian.

SIGNIFICANCE: Lake Desire Forest Bog is a first tier site. It is an example of a rare bog community.

FEATURES: Sphagnum Bog:

1. Tsuga heterophylla/Sphagnum spp. community

DESCRIPTION:

Physical: Lake Desire Forest Bog is located along the drainage into Lake Desire at an elevation of 500 feet. The site consists of an 8 acre sphagnum bog, which occurs over deep sphagnum peat with some woody material. The water table is near the surface.

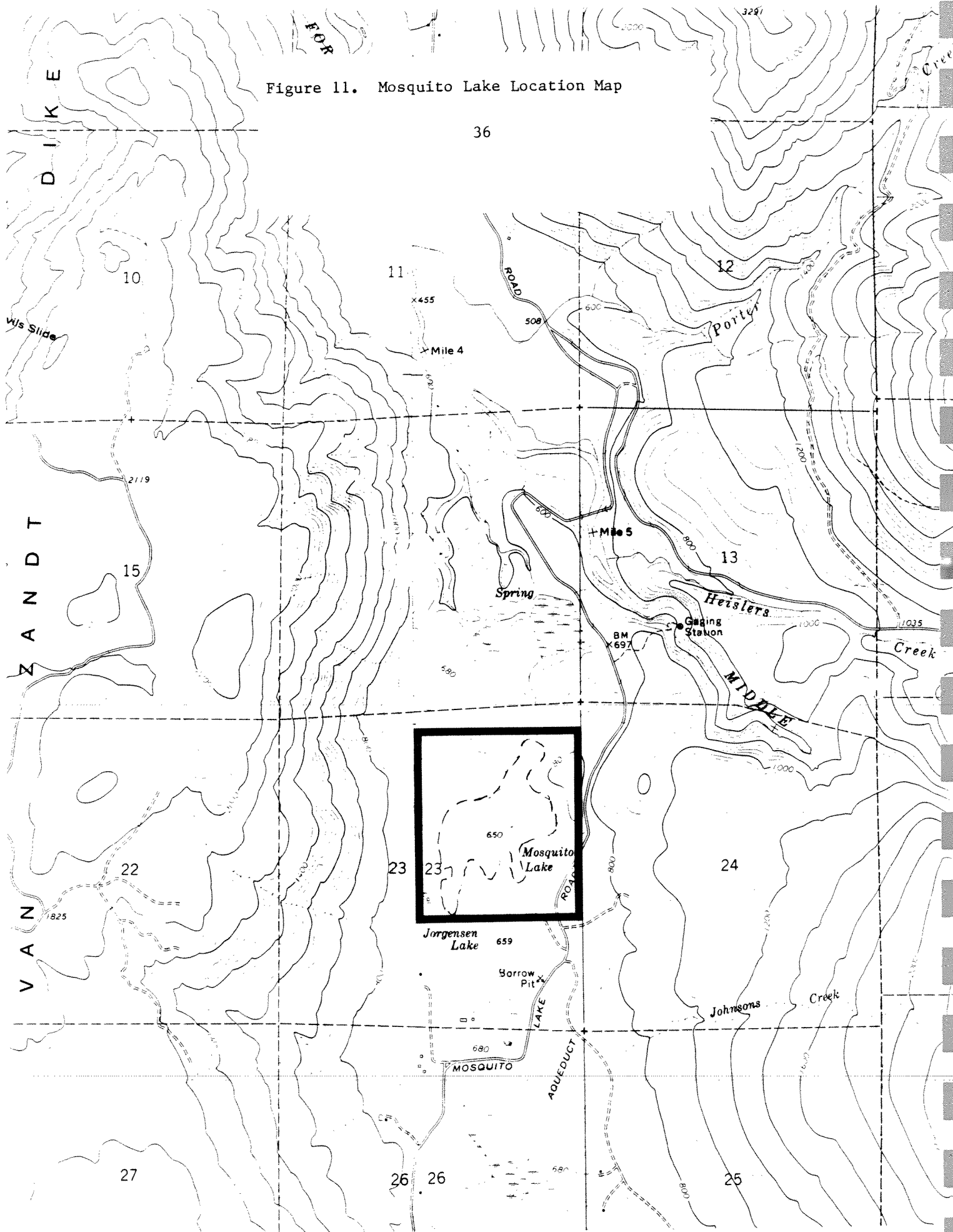
Biological: This is a typical example of a Tsuga heterophylla/Sphagnum spp. community. The canopy is closed throughout most of the area. The only understory occurs where there is a break in the canopy. Here are found examples of the Ledum groenlandicum/Sphagnum spp. community. T. heterophylla is reproducing. Thuja plicata occurs around the margins where the bog shifts to a freshwater wetland.

CONDITION: The bog forest is in relatively good condition. An old railroad grade is located on the uplands along the northwest side of the bog and has had no apparent effect on the bog.

A family, which partially owns the site, uses the area for picnics and backyard camping. They have had a minimal impact on the community.

The greatest threat to the area is development. The lake is developed, and a small subdivision is planned adjacent to the bog.

Figure 11. Mosquito Lake Location Map



MOSQUITO LAKE

LOCATION: Whatcom County; Section 23, Township 38 North, Range 5 East, Willamette Meridian.

SIGNIFICANCE: Mosquito Lake is a first tier site. It is comprised of a series of small lakes and their associated wetlands which are of unusually high quality.

FEATURES: Freshwater Wetland:

1. ponds
2. Nuphar polysepalum community
3. Carex vesicaria community
4. Dulichium arundinaceum community
5. Spiraea douglasii community

DESCRIPTION:

Physical: The Mosquito Lake site is located at an elevation of 650 feet on a past glaciated river terrace near the Middle Fork Nooksack River. Mosquito Lake consists of three ponds covering about 5 acres, and their associated wetlands covering about 34 acres. The ponds are shallow, and the water is transparent with a slight brown cast. They have formed in depressions within the glacial terrace and are interdigitated with low upland ridges.

Mosquito Lake is fed from surface run-off and a seasonal stream. The stream flows north into Mosquito Lake from Jorgenson Lake. Mosquito Lake is drained to the north into another ponded system and then into the Nooksack River.

The soils in the wetlands have developed out of glacial outwash and fluvial materials. In places a relatively deep layer of organic matter has accumulated, but in other areas very little has accumulated and the wetlands overlay coarse textured glacial materials. This lack of organic matter is unusual.

Biological: The freshwater wetland vegetation is unusual in that there are 4 predominant species, each forming an extensive, nearly monospecific community. Nuphar polysepalum occurs in the rooted aquatic zone in water approximately 3 feet deep. Carex vesicaria occurs in water 2 to 3 feet deep. Dulichium arundinaceum forms continuous mats in water 10 inches to 1.5 feet deep. Spiraea douglasii forms a dense shrub community in water up to 1 foot deep. The lines of demarcation between these communities are sharp.

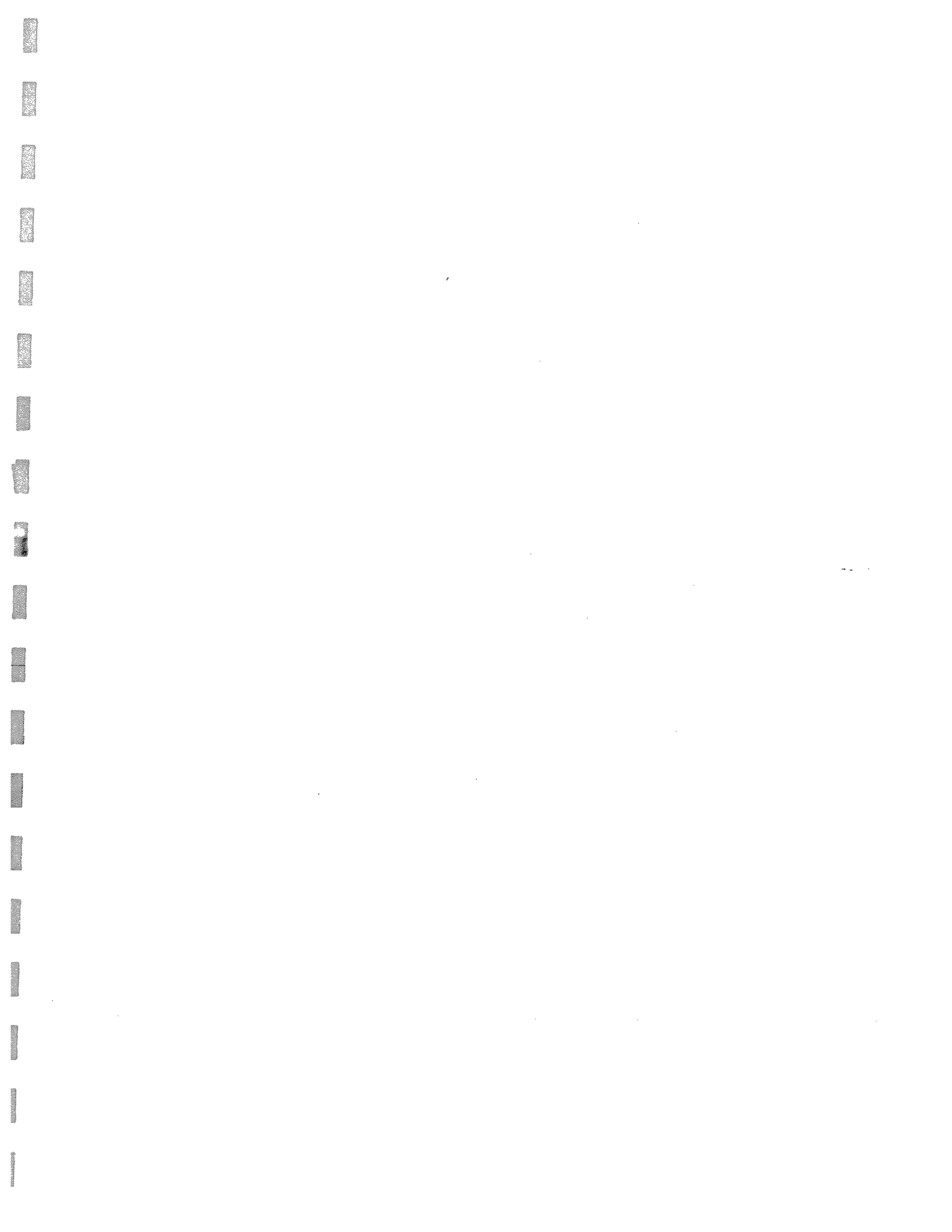
Forested wetlands occur along the upland margin, particularly to the southeast of Mosquito Lake. Their major components are Pyrus fusca, Populus trichocarpa, Betula sp., and Alnus rubra.

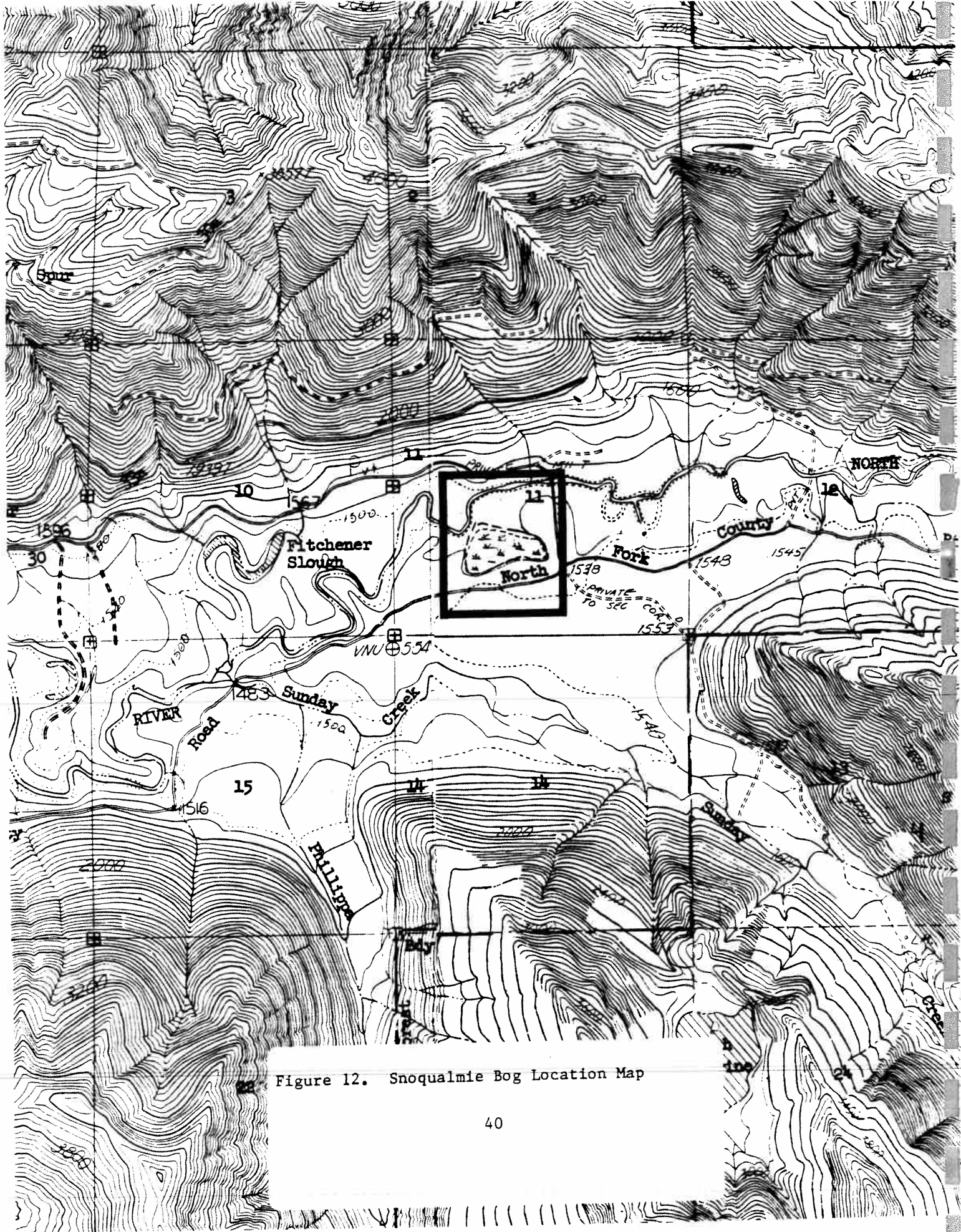
CONDITION: The wetlands and ponds at Mosquito Lake appear to be in good condition. They receive relatively little use. Local residents hike in the area, and some anglers and hunters use the area. Boats dragged across a portion of the vegetated wetland has created a path to the lake edge.

The wetlands appear to have recovered well from old logging activities. A logging railroad was built through the area. It follows ridges for the most part, but also crosses part of the wetlands. The railroad has deteriorated making it difficult to tell all of its impact on the area. It was built on a piling supported bridge across part of the wetlands, of which only a few pilings remain. Fill, used to improve the railroad bed, probably spilled into the margin of Mosquito Lake.

An old road extends west from Mosquito Lake Road to the margin of Mosquito Lake. Where it bounds or crosses a portion of the wetland, the road is built on fill. This road is deteriorating, reducing access to foot traffic.

Phalaris arundinacea, an exotic plant species, has become established, but is restricted to a few areas.





22 Figure 12. Snoqualmie Bog Location Map

SNOQUALMIE BOG

LOCATION: King County; Section 11, Township 25 North, Range 9 East, Willamette Meridian.

SIGNIFICANCE: Snoqualmie Bog is a first tier site. It is an unusually high quality wetland system which contains 2 bog ponds, 3 bog communities, 5 freshwater wetland communities, 1 threatened plant species and 1 sensitive animal species listed in Washington.

FEATURES: Sphagnum Bog:

1. Carex sitchensis/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/

Sphagnum spp. community

Freshwater Wetland:

1. Carex lasiocarpa community
2. Carex livida community
3. Carex sitchensis community
4. Rhynchospora alba community
5. Tsuga heterophylla/Lysichitum americanum community

DESCRIPTION:

Physical: Snoqualmie Bog is located at 1,500 feet in an oxbow of the North Fork Snoqualmie River. The wetland area is approximately 25 acres: 1 acre of ponds, 12 acres of sphagnum bog, and 12 acres of freshwater wetlands.

The wetland is contained within a small drainage basin (about 80 acres). The wetland is fed from surface flow, seeps, and groundwater flow. No streams flow into the system.

The 2 bog ponds are the remnants of the old oxbow channel. The pond water is brown.

The wetland soils have developed over volcanic ash and alluvium. The freshwater wetland soils are mostly sedge peat, with a little sphagnum intermixed. The forested wetland soils also contain woody material. The sphagnum bog areas are predominantly sphagnum peat, with some sedge and woody peat intermixed.

Biological: The bog ponds are small. Nuphar polysepalum occurs throughout one pond and along the margins of the second. The sphagnum bog mat around each quakes and supports a very small area of Rhynchospora alba/Sphagnum spp. community.

Most of the sphagnum bog is covered with a Tsuga heterophylla/
Ledum groenlandicum/Sphagnum spp. community. There are areas
without conifers which are covered by the Ledum groenlandicum/
Sphagnum spp. community. The Carex rostrata phase of this
community occurs where the ground water is near or at the
surface and the sphagnum is wet. There is one area of Carex
sitchensis/Sphagnum spp. community where the water table is
above the surface.

The freshwater wetland is species rich and dominated by sedges.
The sedge communities which comprise the area are: Carex
lasiocarpa, C. livida (which is a highly unusual community), C.
sitchensis (which intergrades with the previous community), and
an unusual community on sedge peat, Rhynchospora alba. All of
these communities occur along a seep, with water at or just
above the surface.

There is a forested wetland community at this site, Tsuga
heterophylla/Lysichitum americanum. This occurrence is typical
of the community.

CONDITION: The wetland is in unusually good condition though it
has sustained some impacts. A portion of the bog was logged.
This area appears to be recovering well and is dominated by
native plant species.

Some of the old growth cedar have recently been high graded
from the forested wetland. Relatively little damage was done
by this operation.

Helicopters at one time landed in the freshwater wetland,
gouging out areas. A slightly raised ridge and a shallow ditch
were created through much of the freshwater wetland, apparently
to provide a dry path when the wetland is flooded.



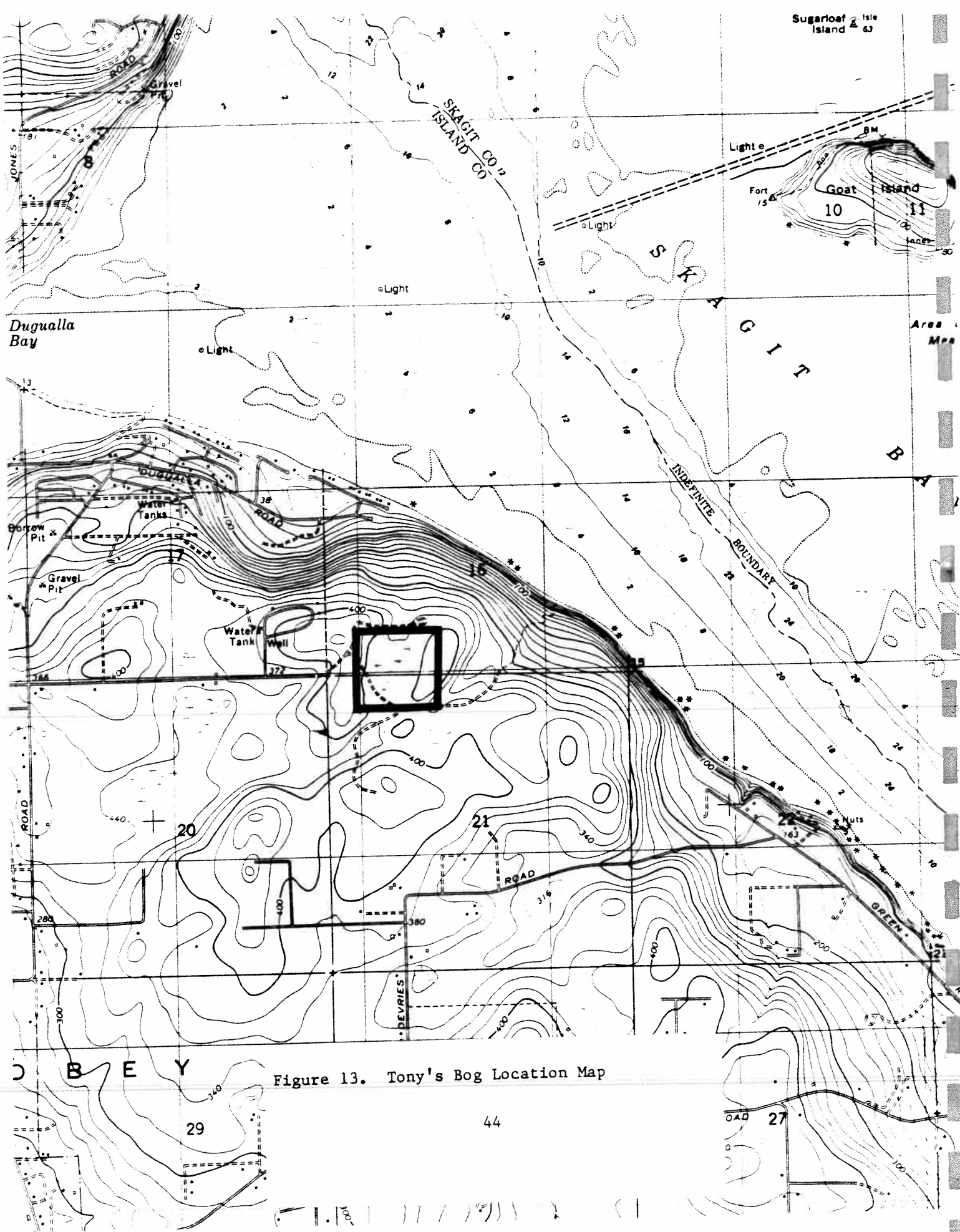


Figure 13. Tony's Bog Location Map

TONY'S BOG

LOCATION: Island County; Sections 16 and 21, Township 33 North, Range 2 East, Willamette Meridian.

SIGNIFICANCE: Tony's Bog is a first tier site. It is of high quality and consists of 3 bog communities.

FEATURES: Sphagnum Bog:

1. Kalmia occidentalis/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community

DESCRIPTION:

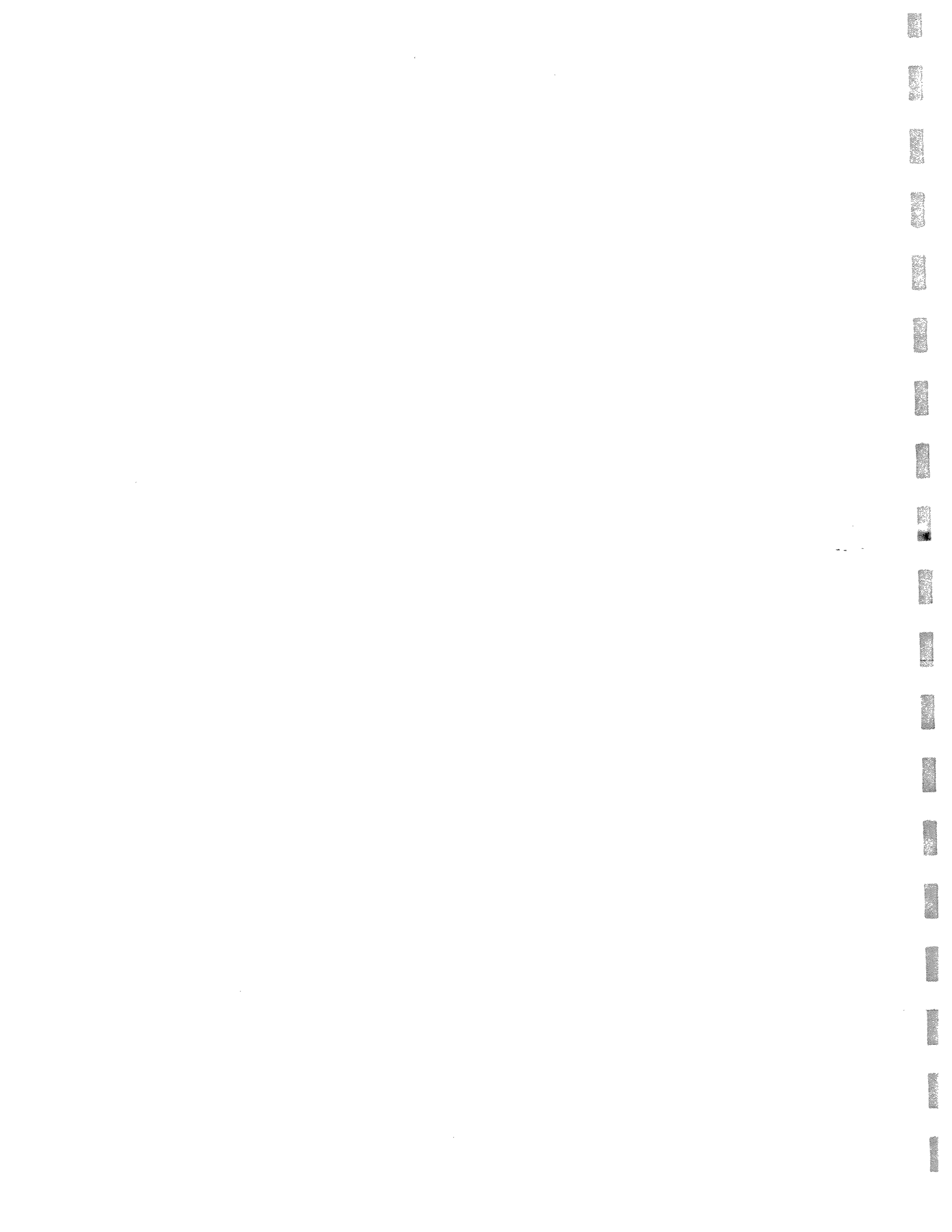
Physical: Tony's Bog is located on Whidbey Island at an elevation of 390 feet. It is a 7 acre pocket wetland on glacial till. It has no apparent inlet or outflow. Sphagnum peat occurs through out the bog.

The bog is relatively dry. There is a trough of shallow standing water around its margin and one seasonally flooded area within the bog.

Biological: Most of the bog is composed of Pinus contorta/Ledum groenlandicum/Sphagnum spp. and Ledum groenlandicum/Sphagnum spp. communities. In both communities, the L. groenlandicum occurs in its tall form with few other species, but with a high cover value of Pteridium aquilinum.

Towards the center and southern portion of the bog occurs the Kalmia occidentalis/Sphagnum spp. community. This bog community has a short, open, growth form. The seasonally flooded area occurs here with vegetation similar to the Rhynchospora alba/Sphagnum spp. community.

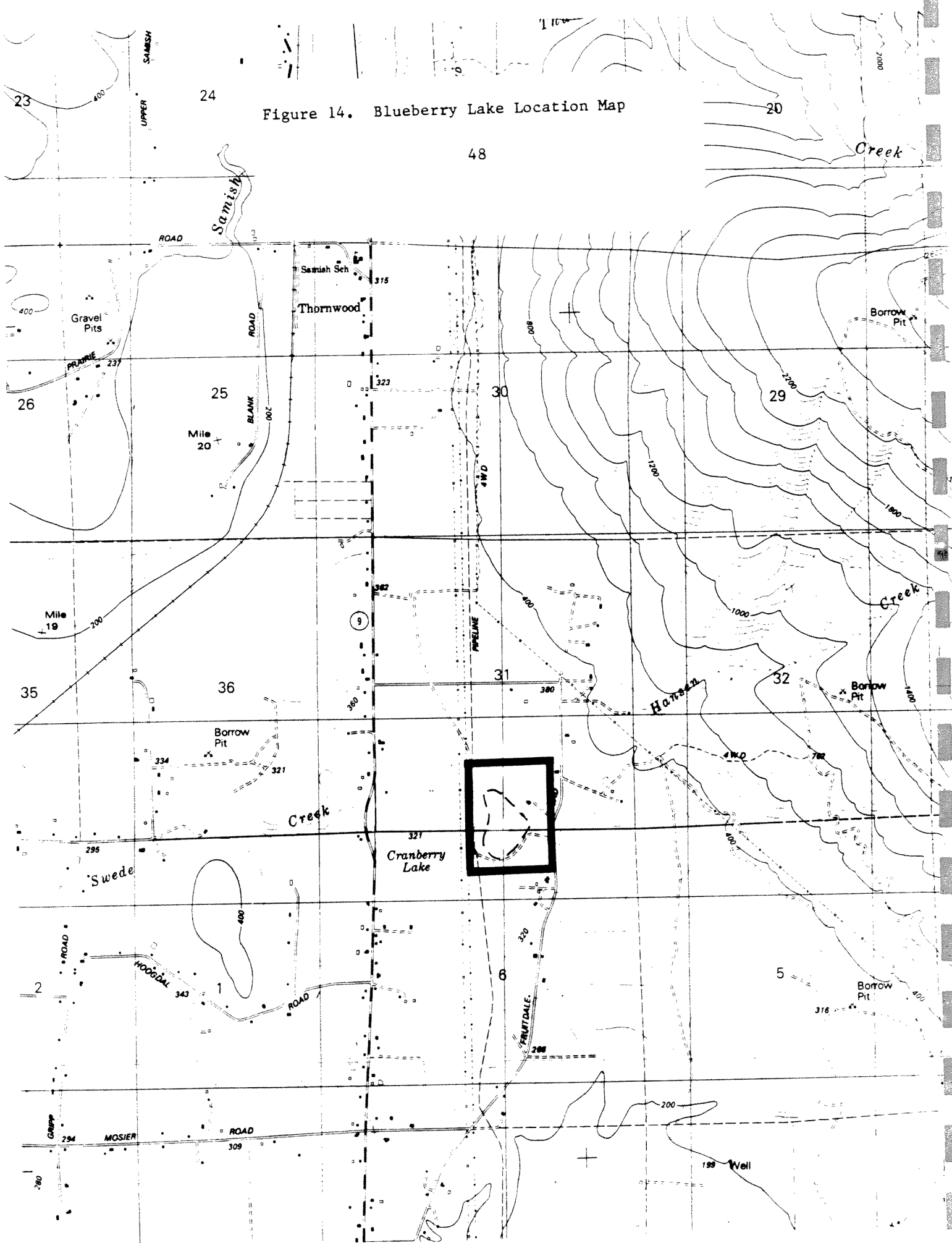
CONDITION: The wetland is in good condition with very little sign of disturbance. The bog receives a lot of human use, but a boardwalk has been built from which people tend not to stray. The uplands are managed for timber production.



SECOND TIER SITE DESCRIPTIONS

Figure 14. Blueberry Lake Location Map

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BLUEBERRY LAKE

LOCATION: Skagit County; Section 6, Township 35 North, Range 5 East, and Section 31, Township 36 North, Range 5 East, Willamette Meridian.

SIGNIFICANCE: Blueberry Lake is a second tier site. It is a small, but relatively high quality sphagnum bog containing a bog pond and 3 bog communities.

FEATURES: Sphagnum Bog:

1. pond
2. Rhynchospora alba/Sphagnum spp. community
3. Ledum groenlandicum/Sphagnum spp. community
4. Tsuga heterophylla/Ledum groenlandicum/

Sphagnum spp. community

DESCRIPTION:

Physical: Blueberry Lake is located on an old floodplain. It is adjacent to the foothills of the Cascade Mountains, at an elevation of 350 feet. The wetland is a total of 14 acres, with a 1 acre pond, 12 acre sphagnum bog, and a .5 acre blueberry patch.

There is no apparent inflow or outlet to the system. The water level appears to be stable. The pond is surrounded by peat and the water is brown in color. The substrate is sphagnum and woody peat.

Biological: On a quaking mat around the pond margin is the Rhynchospora alba/Sphagnum spp. community. Inland of that community is a combination of the tall form of the Ledum groenlandicum/Sphagnum spp. community and some Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. Within this area there is an abundance of Betula papyrifera, otherwise the communities are typical.

CONDITION: Blueberry Lake appears to be in excellent condition except for a small fenced area which has been converted to blueberry cultivation. Except for wildlife trails, there is no sign of trampling. A weedy plant species, Juncus effusus, has become established along the wildlife trails.

There is an upland buffer between the wetland and adjacent land uses. The adjacent lands are used for forestry, grazing and agriculture. A road is located to the south of the bog.

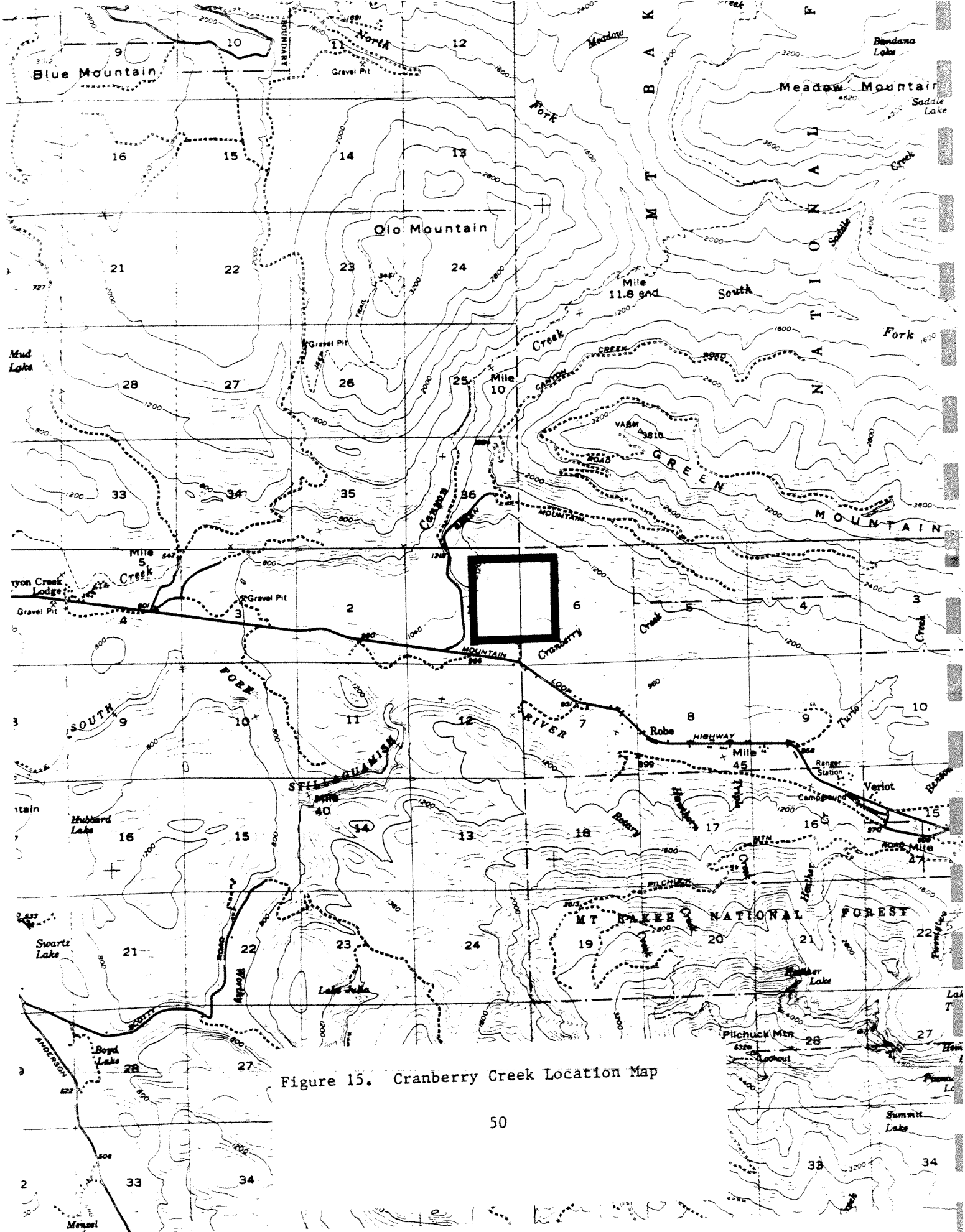


Figure 15. Cranberry Creek Location Map

CRANBERRY CREEK

LOCATION: Snohomish County; Section 1, Township 30 North, Range 7 East; Section 6, Township 30 North, Range 8 East; Section 36, Township 31 North, Range 7 East; Section 31, Township 31 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Cranberry Creek is a second tier site. The wetland includes 2 wet forest communities which are rare in Washington. The wetland as a whole is diverse and, though it has been disturbed, it has good potential for recovery.

FEATURES: Sphagnum Bog:

1. Tsuga heterophylla/Sphagnum spp. community

Freshwater Wetland:

1. ponds
2. Salix spp. community
3. Spiraea douglasii community
4. Tsuga heterophylla/Lysichitum americanum community

DESCRIPTION:

Physical: Cranberry Creek wetland is located in the South Fork Stillaguamish River Valley at an elevation of 960 to 1,040 feet. The area of interest is approximately 87 acres. It is the headwaters for the west fork of Cranberry Creek. The wetland area includes riparian areas, a ponded area, and wet forests with a mixture of sphagnum and non-sphagnum soils. Two beaver ponds have been excluded because of past disturbance and high cover of weedy and exotic plant species.

Biological: The Tsuga heterophylla/Sphagnum spp. community has more of an understory component than is typical. The understory is dominated by Vaccinium alaskaense. Living Sphagnum moss occurs in depressions in the deep organic soils.

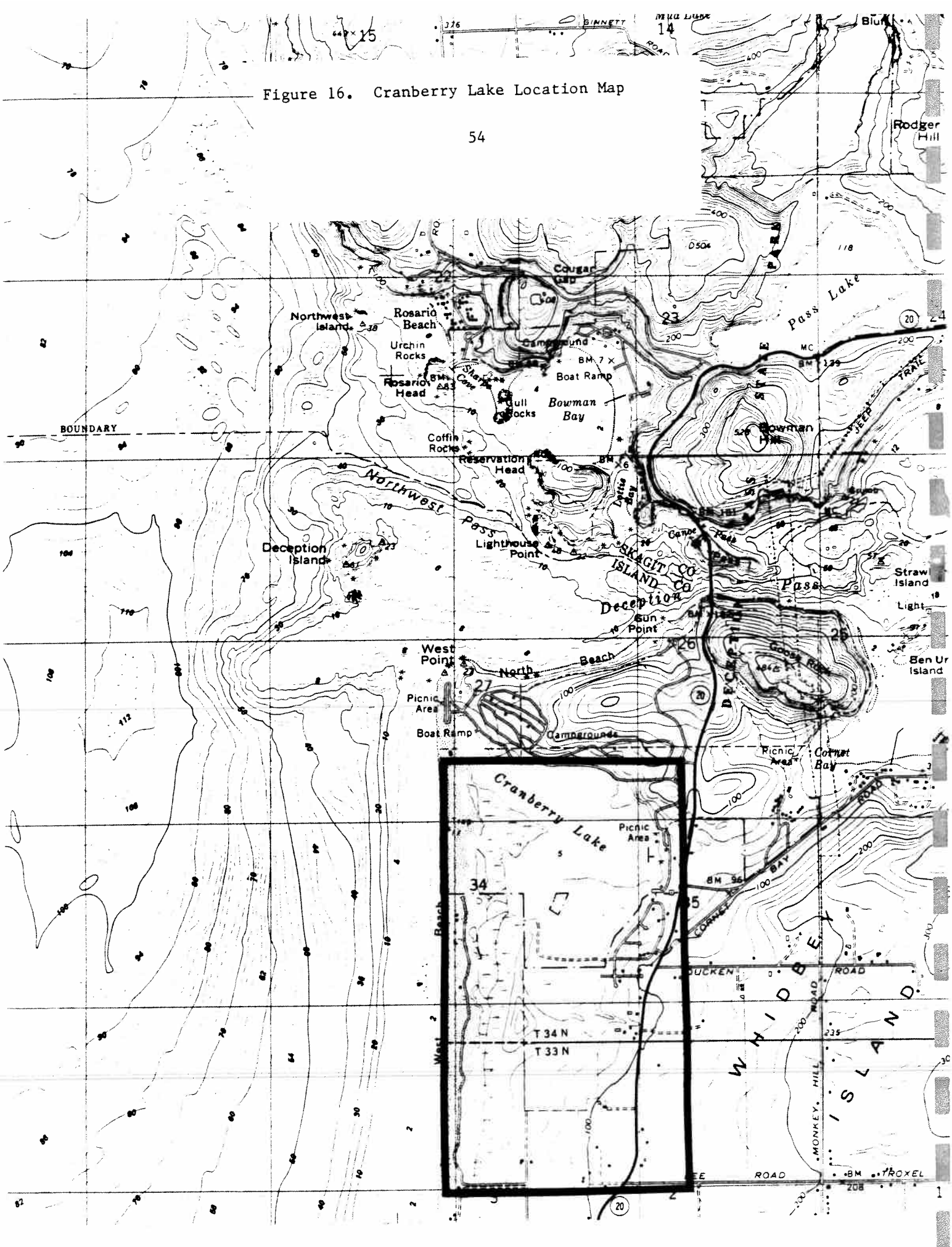
One area of the Tsuga heterophylla/Lysichitum americanum community differs from a typical stand in having deeper surface water and higher cover of shrub species such as Lonicera involucrata, Cornus stolonifera, and Rhamnus purshiana. Another area is more representative of a typical stand.

An approximately eleven acre shrub wetland occurs in a permanently flooded area. It consists of a mixture of Salix spp. and Spiraea douglasii communities. Conifers are beginning to be established in this area.

CONDITION: The wetland has been disturbed. The wetland communities described above have all been selectively logged, mostly for cedar. The logging appears to have taken place a long time ago and the communities seem to be recovering.



Figure 16. Cranberry Lake Location Map



CRANBERRY LAKE

LOCATION: Island County; Section 3, Township 33 North, Range 1 East; and Sections 34 and 35, Township 34 North, Range 1 East, Willamette Meridian.

SIGNIFICANCE: Cranberry Lake is a second tier site. It includes a large and diverse wetland which has 1 sphagnum bog community and 7 freshwater wetland communities.

FEATURES: Sphagnum Bog:

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

Freshwater Wetland:

1. Hippuris vulgaris community
2. Nuphar polysepalum community
3. Juncus balticus community
4. Typha latifolia community
5. Salix spp. community
6. Spiraea douglasii community
7. Pinus contorta/Lysichitum americanum community

DESCRIPTION:

Physical: Cranberry Lake is located just south of Deception Pass, on the west side of Whidbey Island, at an elevation of 5 to 10 feet. It is separated from salt water influence by a sand berm.

The bog area is 16 acres, and occurs on a firm but floating sphagnum mat. The freshwater wetlands of interest cover 92 acres. They occur mostly in shallow standing water with organic muck soils overlaying sand. Some of the forested wetlands occur in areas with perched water tables, probably over glacial till and some impermeable material.

Biological: The sphagnum bog area is a diverse example of a Pinus contorta/Ledum groenlandicum/Sphagnum spp. community. It occupies a large area and progresses from a quaking mat with the low growth form of L. groenlandicum and short P. contorta, to areas on firm substrates with the tall form of L. groenlandicum and relatively tall P. contorta. The latter area is nearly impenetrable and consists almost exclusively of these two species.

The freshwater wetland is a mosaic of emergent and shrub vegetation. The emergent vegetation appears to be composed of single species patches, some of which are not found as such at any other site. Along with the communities listed above under

"Features", occur patches of Menyanthes trifoliata and Sparganium emersum.

A dense tangle of vegetation dominated by Salix spp. fills a narrow arm of the wetland. It is virtually impenetrable which makes vegetation surveys difficult. The vegetation appears to be a seral stage of a Tsuga heterophylla/Lysichitum americanum community.

A Pinus contorta/Lysichitum americanum community occurs on a bench above the sphagnum bog. There is a perched water table, with the water near to slightly above the surface. This wetland has very few known analogues in Washington.

CONDITION: In general, the wetland is in excellent condition. The tree dominated freshwater wetland forests have been logged in the past, some selectively, but are recovering well. The wetland once extended much farther to the south. This area has been converted to housing and agriculture. The effects of this conversion and land use are unknown.



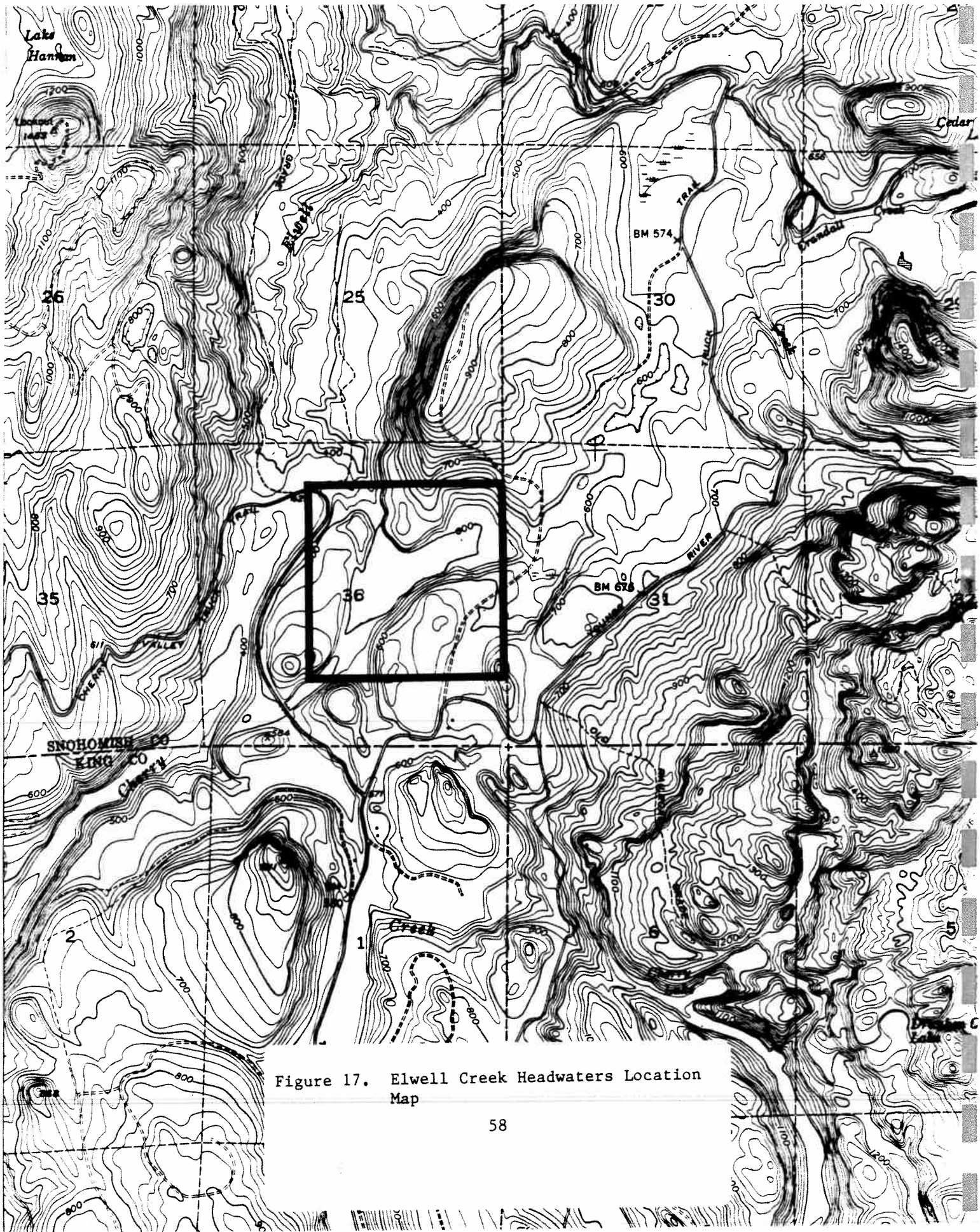


Figure 17. Elwell Creek Headwaters Location Map

ELWELL CREEK HEADWATERS

LOCATION: Snohomish County; Section 36, Township 27 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: Elwell Creek Headwaters is a second tier site. The headwater area of Elwell Creek has unusually diverse vegetation and contains examples of a forested wetland not frequently found in Washington.

FEATURES: Sphagnum Bog:

1. pond
2. Carex cusickii/Sphagnum spp. community
3. Rhynchospora alba/Sphagnum spp. community
4. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community
2. Calamagrostis canadensis community
3. Spiraea douglasii community
4. Salix spp. community
5. Alnus rubra/Lysichitum americanum community
6. Alnus rubra/Rubus spectabilis community
7. Tsuga heterophylla/Lysichitum americanum community

DESCRIPTION:

Physical: The headwaters of Elwell Creek are located in the foothills of the Cascade Mountains at an elevation of 500 feet. The area contains approximately a 1 acre pond, 4 acres of sphagnum bog, and 34 acres of freshwater wetlands.

The pond is surrounded by the sphagnum bog. The soils in the area of the bog and pond are sphagnum peat. The soils underlying the freshwater wetland are organic muck, possibly with some sedge and woody peat.

The wetland is fed from surface run-off and springs. The system drains to the north, forming Elwell Creek.

Biological: Adjacent to the bog pond, on the quaking sphagnum mat, is a Rhynchospora alba/Sphagnum spp. community. Inland from this zone and to the south and west of the pond the bog vegetation progresses from the short to the tall form of the Ledum groenlandicum/Sphagnum spp. community. Near the landward edge of this community, the vegetation begins to change to a Tsuga heterophylla/L. groenlandicum/Sphagnum spp. community. Along the pond edge, and to the south and east, the Carex cusickii/Sphagnum spp. community occurs in a narrow zone.

To the north and east of the pond occurs a Calamagrostis canadensis community which is floating on a thin grass and sedge peat mat. To the north, this community ends with the beginning of the creek channel. To the east, the C. calamagrostis community forms a mosaic with Typha latifolia and Spiraea douglasii communities. East of this mosaic, the vegetation is dominated by Salix spp.

The eastern boundary of the Salix spp. community is formed by a beaver dam. West of the beaver dam, the wetland is permanently flooded. East of the dam, the wetlands are seasonally to permanently flooded.

West of the beaver dam occurs a Tsuga heterophylla/Lysichitum americanum community. This is not a typical example of this community, as it has more standing water, less sphagnum moss, and slightly different plant cover values.

Farther to the west, Spiraea douglasii is the predominant community. A disturbed, sedge dominated meadow occurs within the S. douglasii community. Along the upland margins of the wetland are Alnus rubra/Lysichitum americanum, A. rubra/Rubus spectabilis, and Pyrus fusca communities. These all occur in areas where the water table is near to slightly above the surface.

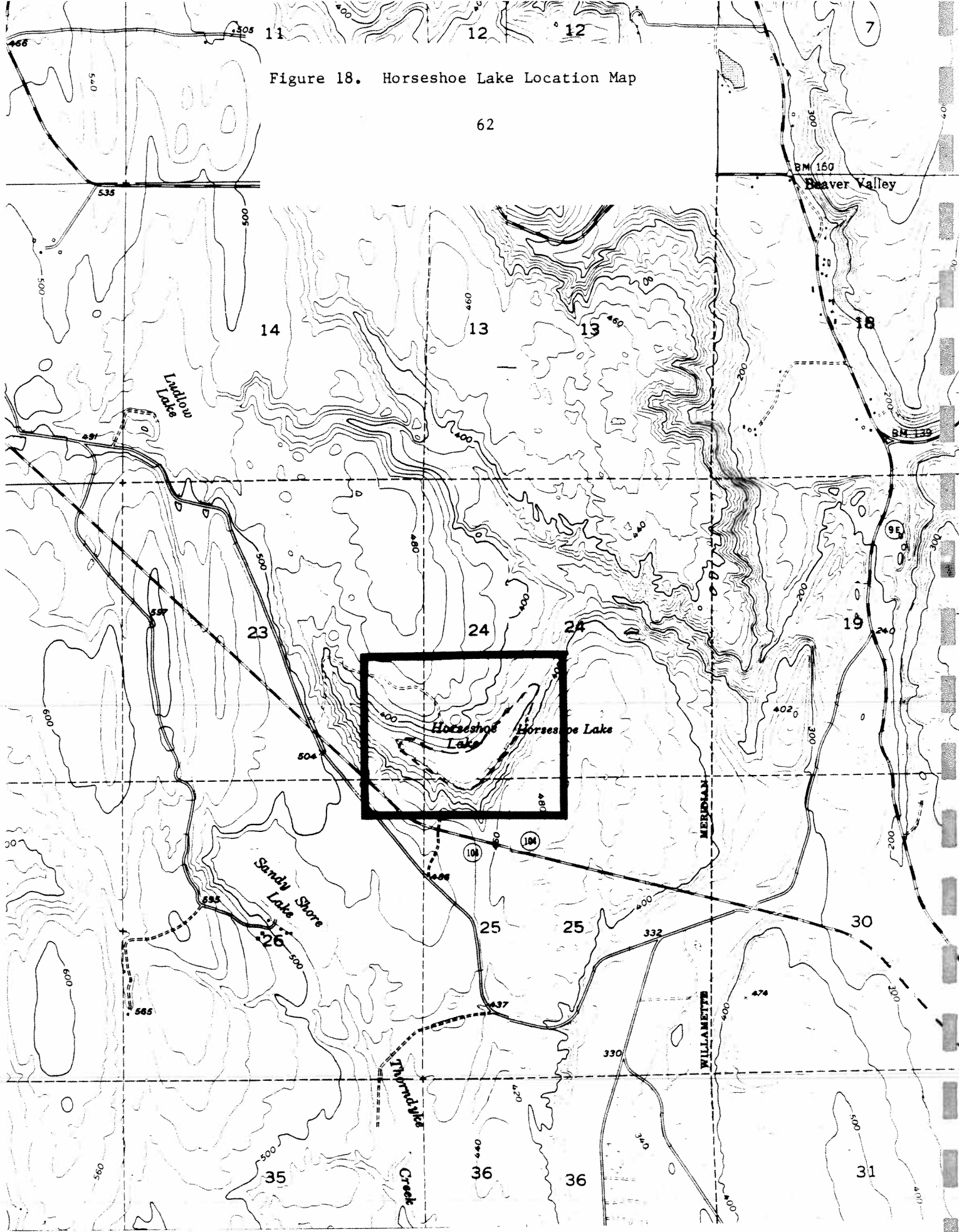
CONDITION: The headwaters of Elwell Creek are in relatively good condition. The bog mat adjacent to the pond has been trampled, probably by anglers. The forest adjacent to the bog has been recently cut without retaining an upland buffer for the bog. In a few cases, trees were felled into the wetland.

The wet sedge meadow in the eastern part of the wetland has stumps in it as well as some exotic plant species.



Figure 18. Horseshoe Lake Location Map

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HORSESHOE LAKE

LOCATION: Jefferson County; Sections 23, 24, and 25, Township 28 North, Range 1 West, Willamette Meridian.

SIGNIFICANCE: Horseshoe Lake is a second tier site. It consists of a relatively high quality freshwater lake and wetland system which includes 3 plant communities. It also contains a small sphagnum bog.

FEATURES: Sphagnum Bog:

1. Kalmia occidentalis/Sphagnum spp. community

Freshwater Wetland:

1. pond/lake
2. Typha latifolia community
3. Carex obnupta community
4. Spiraea douglasii community

DESCRIPTION:

Physical: Horseshoe Lake, on the east side of the Olympic Mountains, is at an elevation of 320 feet. It consists of an approximately 9 acre lake, a 9 acre freshwater wetland, and a .5 acre sphagnum bog.

Horseshoe Lake apparently has no outlet. There is inflow at either end of the wetland and from surface run-off. There appears to be a large annual water level fluctuation.

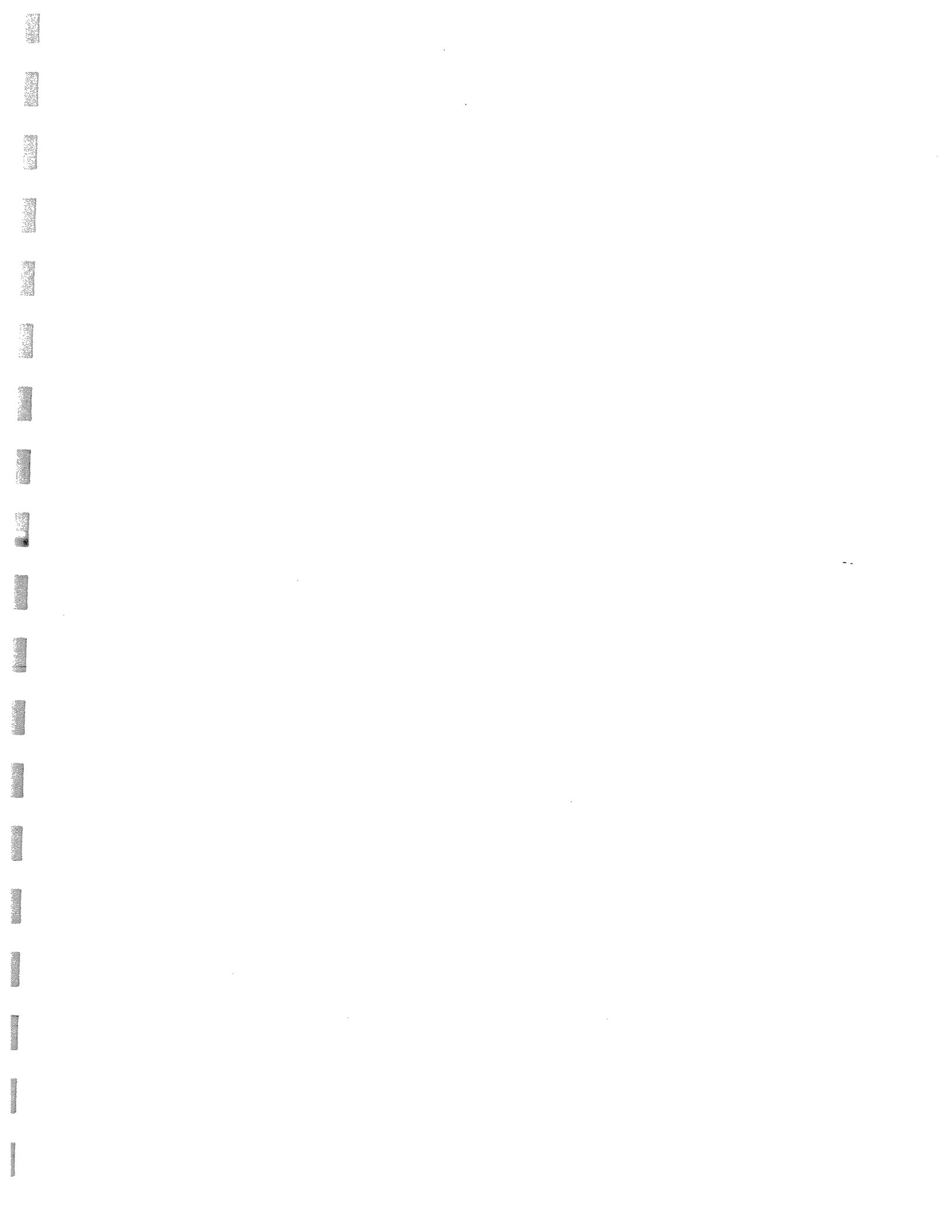
The wetlands occur on terraces above the lake surface. These terraces are composed primarily of sedge and woody peat, with at least one area of sphagnum peat. The wetlands are seasonally to permanently flooded.

Biological: The wetland is primarily an example of a Spiraea douglasii community and has open areas dominated by Carex obnupta and Sparganium emersum. Around the lake margin the S. douglasii is interspersed with Typha latifolia. Cedar snags are prevalent in part of the Spiraea douglasii community.

The bog area is a small quaking sphagnum mat along part of the lake shore. It is primarily a Kalmia occidentalis/Sphagnum spp. community.

CONDITION: Horseshoe Lake is in good condition. The annual water level fluctuation is probably natural. It is typical of wetlands which have no outlet and are fed from surface run-off. The snags indicate some major past alteration of the water level. This may have been related to past logging.

The uplands are managed for timber production and the only apparent use of the wetland and lake is by hunters. The sphagnum bog shows signs of some trampling and a few trails have been trampled along the lake shore. Access to the site is partially blocked by a locked gate.



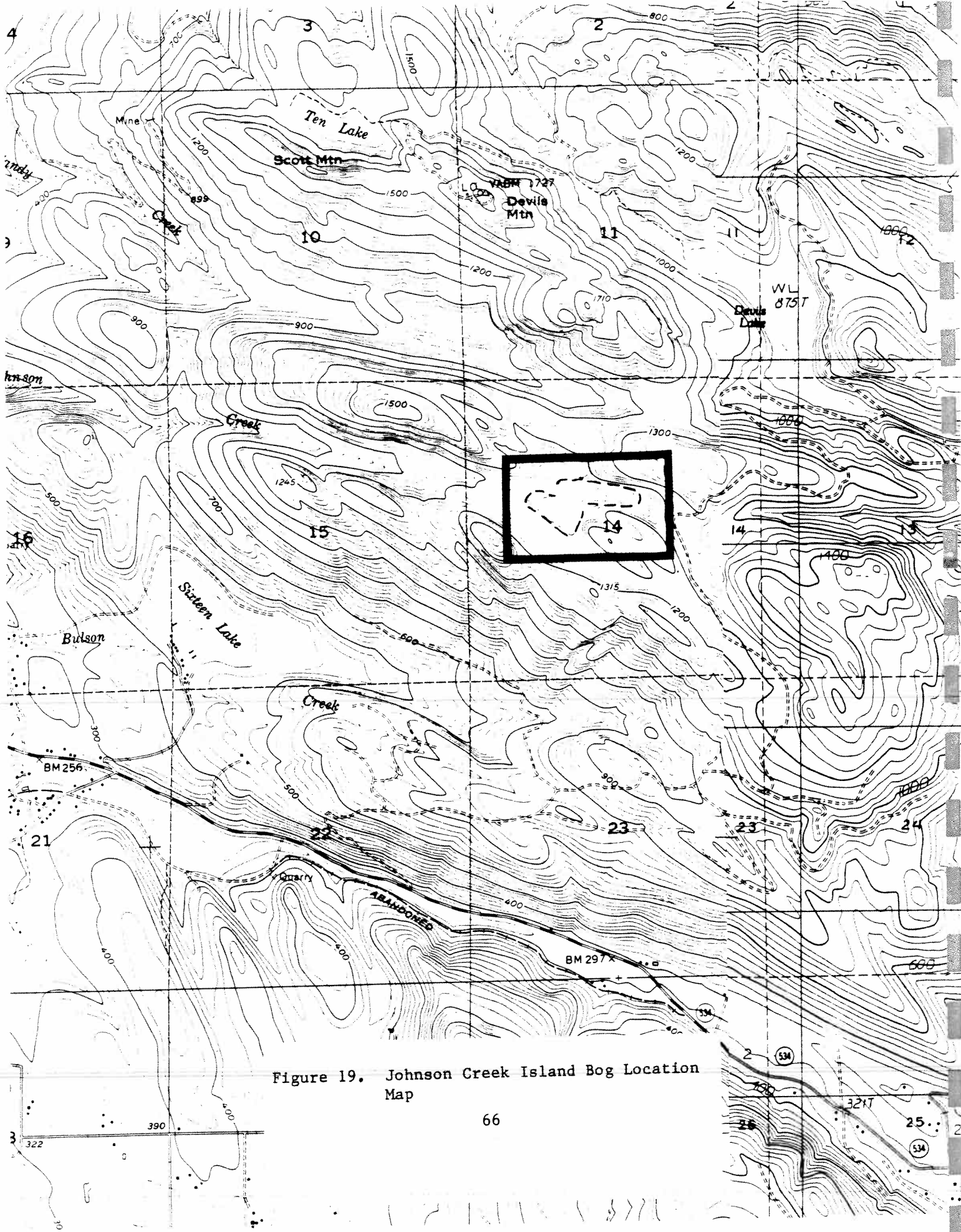


Figure 19. Johnson Creek Island Bog Location Map

JOHNSON CREEK ISLAND BOG

LOCATION: Skagit County; Section 14, Township 33 North, Range 4 East, Willamette Meridian.

SIGNIFICANCE: Johnson Creek Island Bog is a second tier site. It is a high quality occurrence of a sphagnum bog which consists of 2 plant communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community
2. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

DESCRIPTION:

Physical: Johnson Creek Island Bog is located at the headwaters of Johnson Creek at an elevation of 1,135 feet. The bog is a 4 acre island and is probably floating. The substrate is sphagnum peat with woody material.

Biological: The island margins quake and are predominantly an example of the short form of the Ledum groenlandicum/Sphagnum spp. community. The center of the island is predominantly an example of a Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. The T. heterophylla are short in stature and the understory resembles the short form of L. groenlandicum/Sphagnum spp. community, and has a high cover value of Gaultheria shallon. The substrate is relatively dry and is firm where this community occurs.

CONDITION: The bog is in excellent condition, probably because it is an island and the surrounding water acts as a buffer. Access to the bog is difficult, either over logs or by boat, and the roads leading to the area all are blocked by locked gates.

The adjacent uplands are used for timber production. Historically buffers have not been left around the lake, and the wetlands which adjoin the uplands have been heavily disturbed.

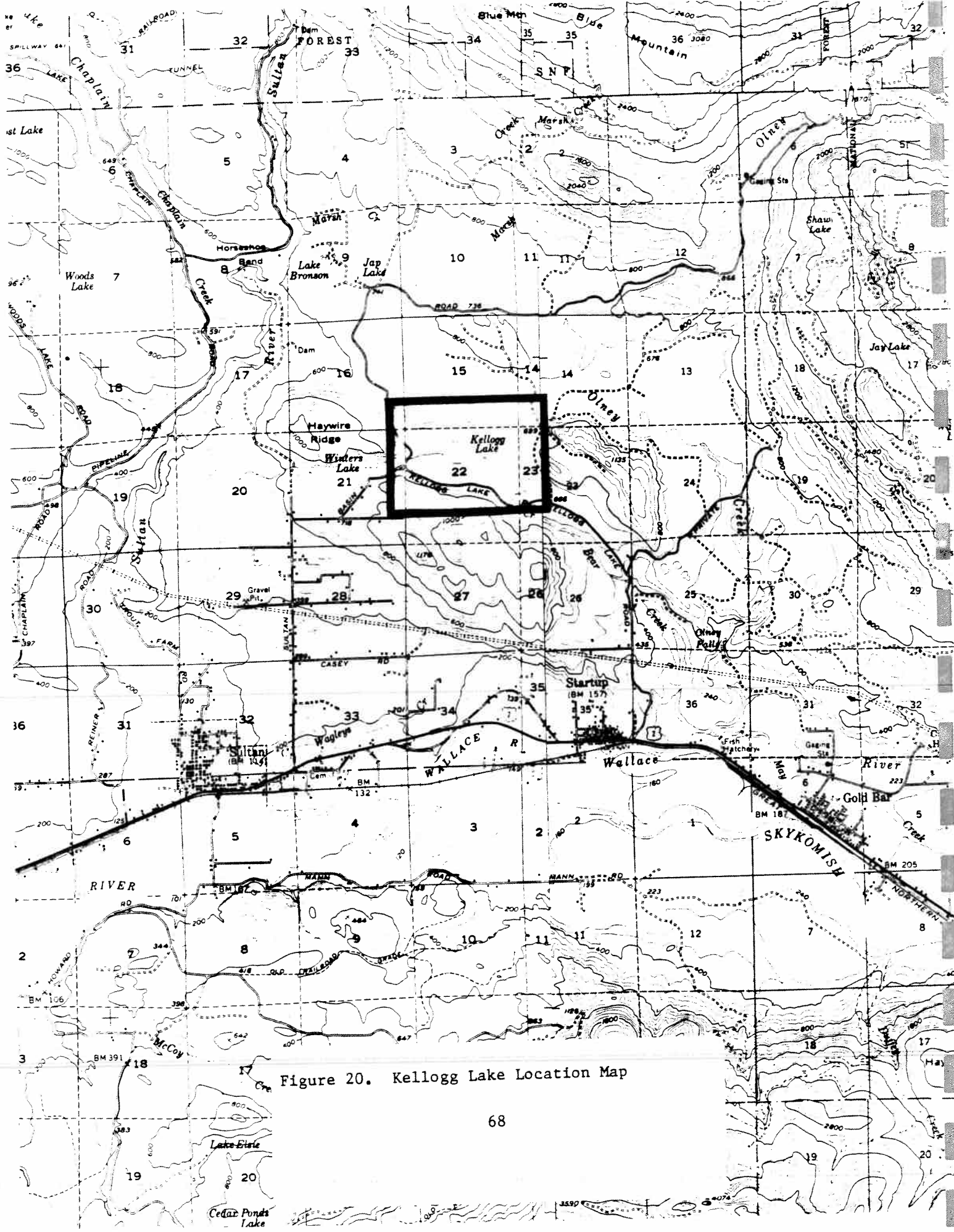


Figure 20. Kellogg Lake Location Map

KELLOGG LAKE

LOCATION: Snohomish County; Sections 22 and 23, Township 28 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Kellogg Lake is a second tier site. It contains a large, diverse wetland which is recovering well from past disturbance. The wetland consists of 3 sphagnum bog communities and 3 freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community
2. Myrica gale/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Dulichium arundinaceum-Scirpus subterminalis community
2. Spiraea douglasii community
3. Tsuga heterophylla/Lysichitum americanum community

DESCRIPTION:

Physical: Kellogg Lake is a large, shallow, and diverse wetland system which occurs at an elevation of 680 feet. The wetland is permanently to seasonally flooded and has a large annual water level fluctuation. Kellogg Lake drains into the Sultan River.

Kellogg Lake contains approximately 28 acres of sphagnum bog and 56 acres of freshwater wetlands. The soils in the bog areas are sphagnum peat with woody material. The freshwater wetland areas are organic muck with large woody debris.

Biological: The areas of Myrica gale/Sphagnum spp. bog are small and raised above the elevation of the adjacent freshwater wetland. These areas are frequently only comprised of these two species.

The major areas of bog development are also raised above the freshwater wetland. They grade from the short form of Ledum groenlandicum/Sphagnum spp. community landward to the Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. Wet areas of the bog support the Carex rostrata phase of the L. groenlandicum/Sphagnum spp. community.

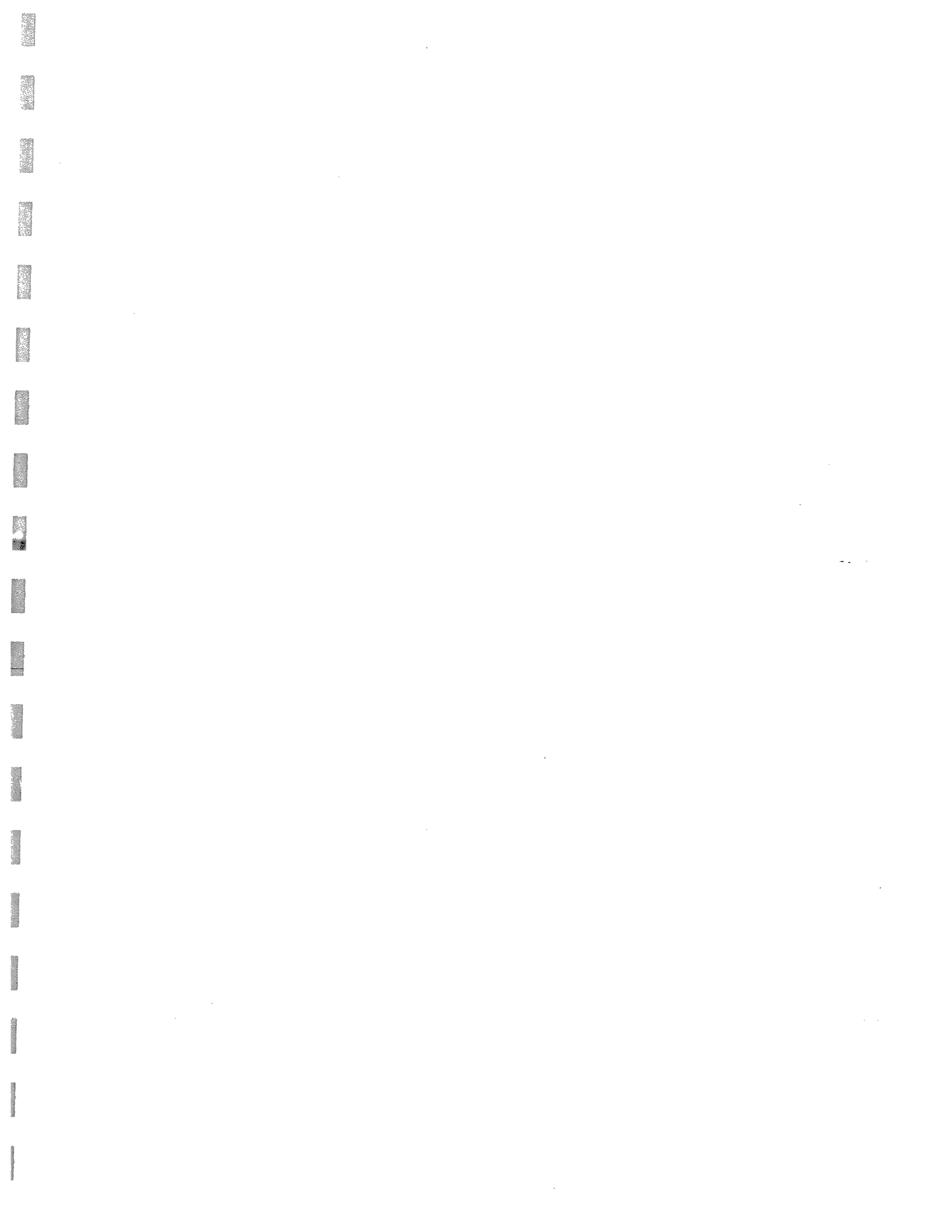
The freshwater wetland margin and a small basin are dominated by the Spiraea douglasii community. Typha latifolia and Salix spp. are intermixed in areas of the S. douglasii community.

A large portion of the wetland is vegetated mud flats. This area is codominated by several herbaceous species: Dulichium arundinaceum, Carex oederi, Scirpus subterminalis, and an exotic species, Juncus supinus. Along the lake margin of these flats, on firmer sedge peat, occurs a Carex rostrata community.

In one large area is a Tsuga heterophylla/Lysichitum americanum community. This community is typical except that it has a greater proportion of flooded land and, in one area, Thuja plicata is predominant instead of T. heterophylla.

CONDITION: The lake has been disturbed. Pilings and an abundance of sawn logs suggest that the lake may have been used as a mill pond at one time. The water level appears to have been altered at least once. The vegetation seems to be recovering well from these past disturbances although J. supinus has become widespread.

Currently, the wetland receives use from anglers and hunters. A crude boat access has been developed. The surrounding lands are managed for timber production. There is some illegal dumping of garbage.



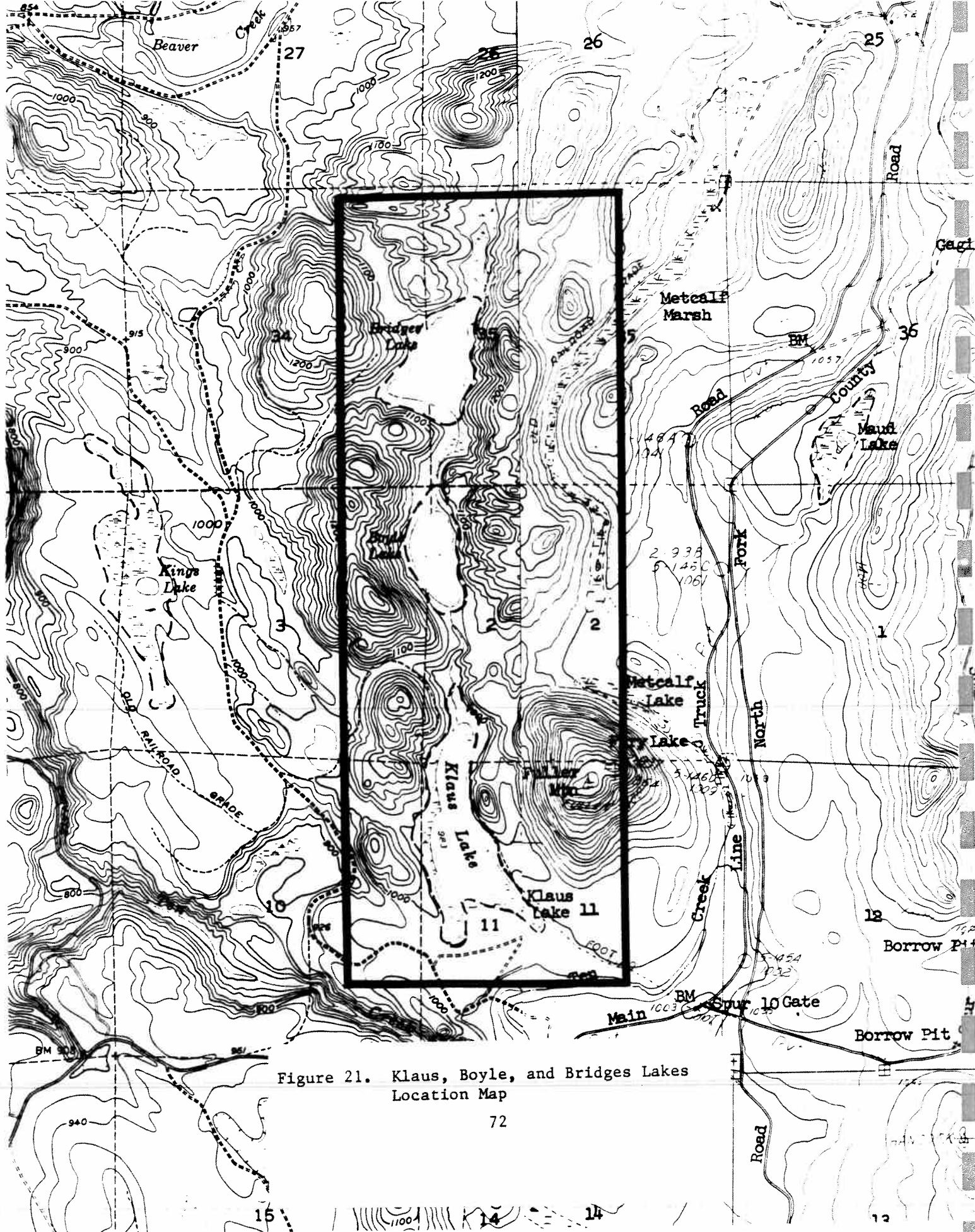


Figure 21. Klaus, Boyle, and Bridges Lakes Location Map

KLAUS, BOYLE, AND BRIDGES LAKES

LOCATION: King County; Sections 2, 3, 10, and 11, Township 24 North, Range 8 East, and Sections 34 and 35, Township 25 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Klaus, Boyle, and Bridges Lakes are a second tier site. This series of three lakes and their associated wetlands are relatively undisturbed. There are 3 sphagnum bog and 4 freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Kalmia occidentalis/Sphagnum spp. community
2. Myrica gale/Sphagnum spp. community
3. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland;

1. Typha latifolia community
2. Carex sitchensis community
3. Spiraea douglasii community
4. Alnus rubra/Rubus spectabilis community

DESCRIPTION:

Physical: Klaus, Boyle, and Bridges Lakes are located in a narrow north-south oriented valley in the foothills of the Cascade Mountains. Water drains from Bridges Lake (elevation 1,055 feet), to Boyle Lake (elevation 1,034 feet), to Klaus Lake (elevation 983 feet). From there it drains into Ten Creek.

There is a total of 7 acres of sphagnum bog and 43 acres of freshwater wetlands associated with the lakes. Soils are mostly organic muck, with terraces of sedge, sphagnum, and woody peat.

Biological: Some sphagnum bog occurs in each of the three lakes. It is most extensive in Klaus Lake where it occurs on terraces at the south end and along the western margin of the lake. The Myrica gale/Sphagnum spp. community occurs nearest the lake edge. The community is composed of nearly pure tall stands of M. gale. The Ledum groenlandicum/Sphagnum spp. and Kalmia occidentalis/Sphagnum spp. communities are intermixed and occur at the south end of the lake inland of the M. gale/Sphagnum spp. community. This area also has relatively high cover values of Pinus monticola, Tsuga heterophylla, and Gaultheria shallon.

Boyle Lake has only a small area of bog vegetation. It occurs at the north end of the lake, adjacent to the water's edge and ringed by a Spiraea douglasii community. The bog was surveyed

with binoculars due to access problems. It probably consists of a Kalmia occidentalis/Sphagnum spp. community. Bridges Lake has small floating islands of sphagnum bog located along the waterward edge of the freshwater wetland. These islands are composed of the K. occidentalis/Sphagnum spp. community.

All three lakes have a Spiraea douglasii community. The largest occurrences are at the inflow and outflow for each lake, but it also occurs in a band around each of their perimeters. Inland, the freshwater wetland shifts to an Alnus rubra/Rubus spectabilis community. This community also occurs along the stream channels between the lakes, and is seasonally flooded.

All three lakes have some representation of the Typha latifolia community. It is emergent along the waterward edge of the sphagnum bog and freshwater wetlands. Only Bridges Lake has a Carex sitchensis community. This occurs as a floating band waterward of the S. douglasii community.

CONDITION: All three lakes and their wetlands are in relatively good condition. Trails have been developed through some of the wetlands, mostly by hunters and anglers. Few exotic plant species were observed. The lakes have all been stocked with exotic fish species. Their hydrology is unaltered.

The uplands have all been logged, and the second cutting will soon begin. No buffers were left with the first cutting and the Alnus rubra/Rubus spectabilis community was at least selectively logged. Logging railroads were built adjacent to, and some times within, the Alnus rubra/Rubus spectabilis wetlands. The railroads and the one bridge have deteriorated though the beds are still apparent.



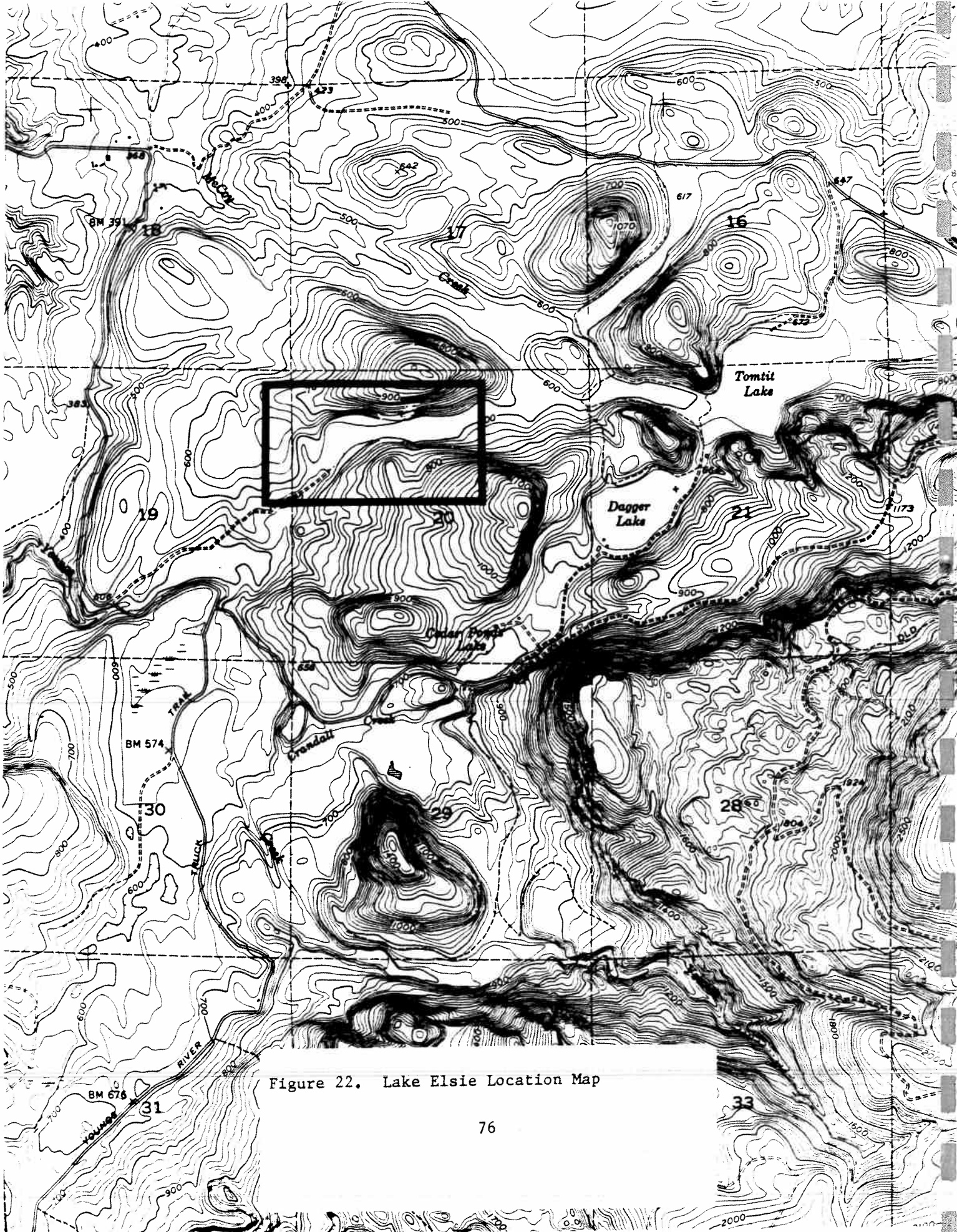


Figure 22. Lake Elsie Location Map

LAKE ELSIE

LOCATION: Snohomish County; Section 20, Township 27 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Lake Elsie is a second tier site. It is a disturbed wetland which is still dominated by native plant species and communities. The wetland consists of 3 sphagnum bog communities, 5 freshwater wetland communities, and 1 plant species listed as sensitive in Washington.

FEATURES: Sphagnum Bog:

1. Carex sitchensis/Sphagnum spp. community
2. Kalmia occidentalis/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community
2. Carex cusickii community
3. Carex sitchensis community
4. Salix spp. community
5. Spiraea douglasii community

DESCRIPTION:

Physical: Lake Elsie is located in a narrow, east-west oriented valley, at an elevation of 570 feet. The wetland consists of approximately 2 acres of sphagnum bog, and 8 acres of freshwater wetland. It is associated with a 1 acre pond.

The wetland drains to the southwest into Youngs Creek. The west end of the wetland is a shallow pond with floating sphagnum and sedge peat mats, and emergent vegetation. To the east, the water becomes shallower with areas that are seasonally flooded. The soils are a mixture of sphagnum peat, sedge peat, and muck.

Biological: There are two areas of sphagnum bog, both with quaking to supersaturated soils. The vegetation progresses from a Carex sitchensis/Sphagnum spp. community along the bog margin, to a Kalmia occidentalis/Sphagnum spp. community on a firm quaking mat, to a Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community on slightly firmer, higher, and drier microsites. The C. sitchensis/Sphagnum spp. community intergrades with some of the adjacent freshwater wetland communities, particularly the Typha latifolia community. The Tsuga heterophylla have a stunted growth form.

The Typha latifolia community is emergent in the ponded area. Potentilla palustris is codominant. The Carex cusickii and C.

sitchensis communities in the ponded area are intermixed on a thin layer of quaking sedge peat. To the east, C. cusickii intergrades with the Spiraea douglasii community on permanently to seasonally flooded soils. The S. douglasii community occurs intermixed with the Salix spp. community and by itself as well. The Salix spp. community occurs in permanently flooded areas.

CONDITION: Lake Elsie is a disturbed system though the results of some of the most recent disturbances will not be apparent until some time in the future. Currently it is still in relatively good condition, and is still dominated by native plant species and communities.

At one time, the outlet stream was dammed and the water level in Lake Elsie was raised. The system appears to have recovered from this event. There probably was a homestead near the dam, but, with the exception of the road which leads to the site, there is no readily visible evidence of it or its impacts.

Recent (and probably future) degradation of the site has been caused by logging activities. No buffer was left between the wetland and a steep bluff that rises up from the wetland to the south. The bluff was logged. Some trees which fell into the wetland were removed, while others were left. Marks in the wetland indicate that a tractor was driven into it. This kind of disturbance has some immediate effect on the wetland, but also introduces and provides habitat for weedy plant species. It is not clear how much the bluff will erode and what subsequent effect that will have on the hydrology and rate of siltation of the wetland.

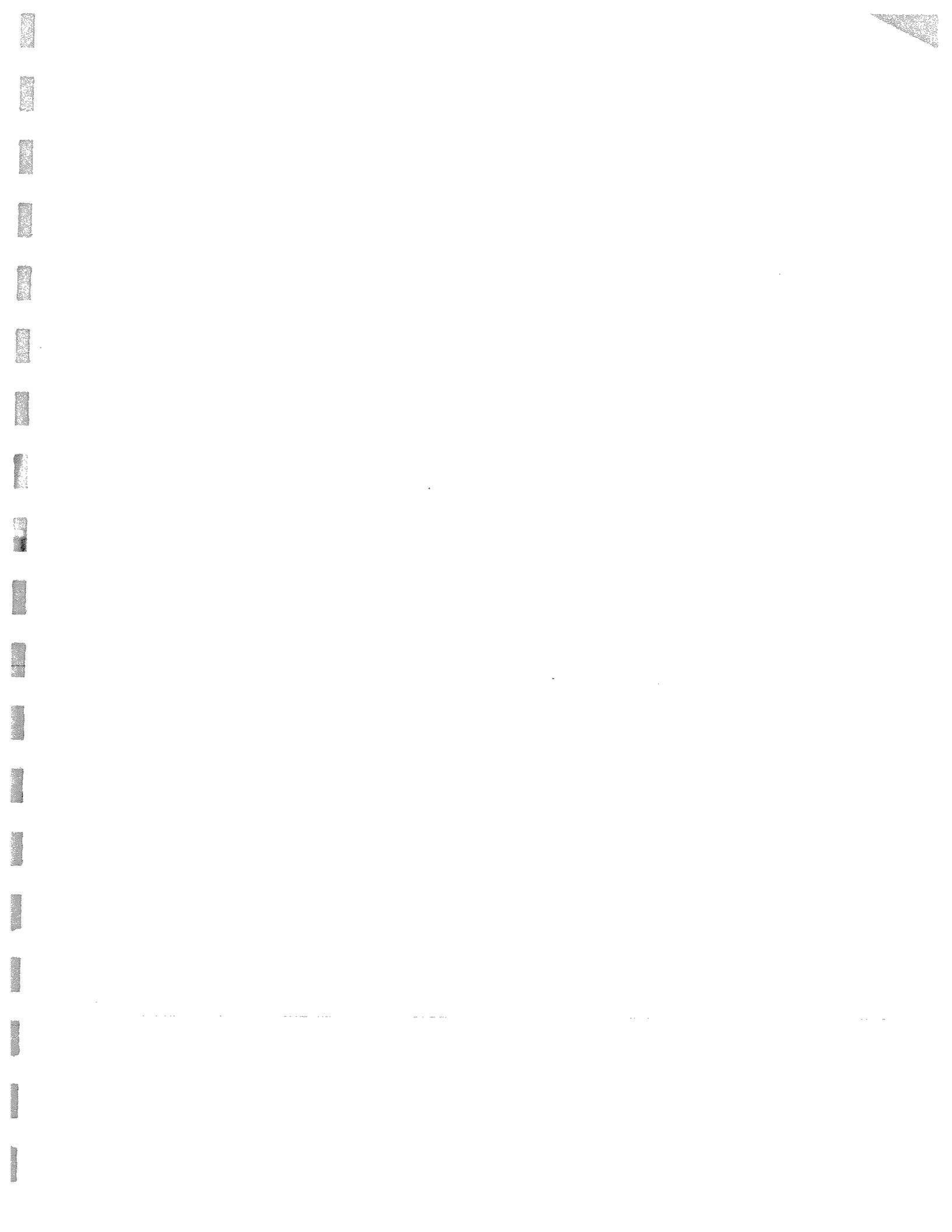
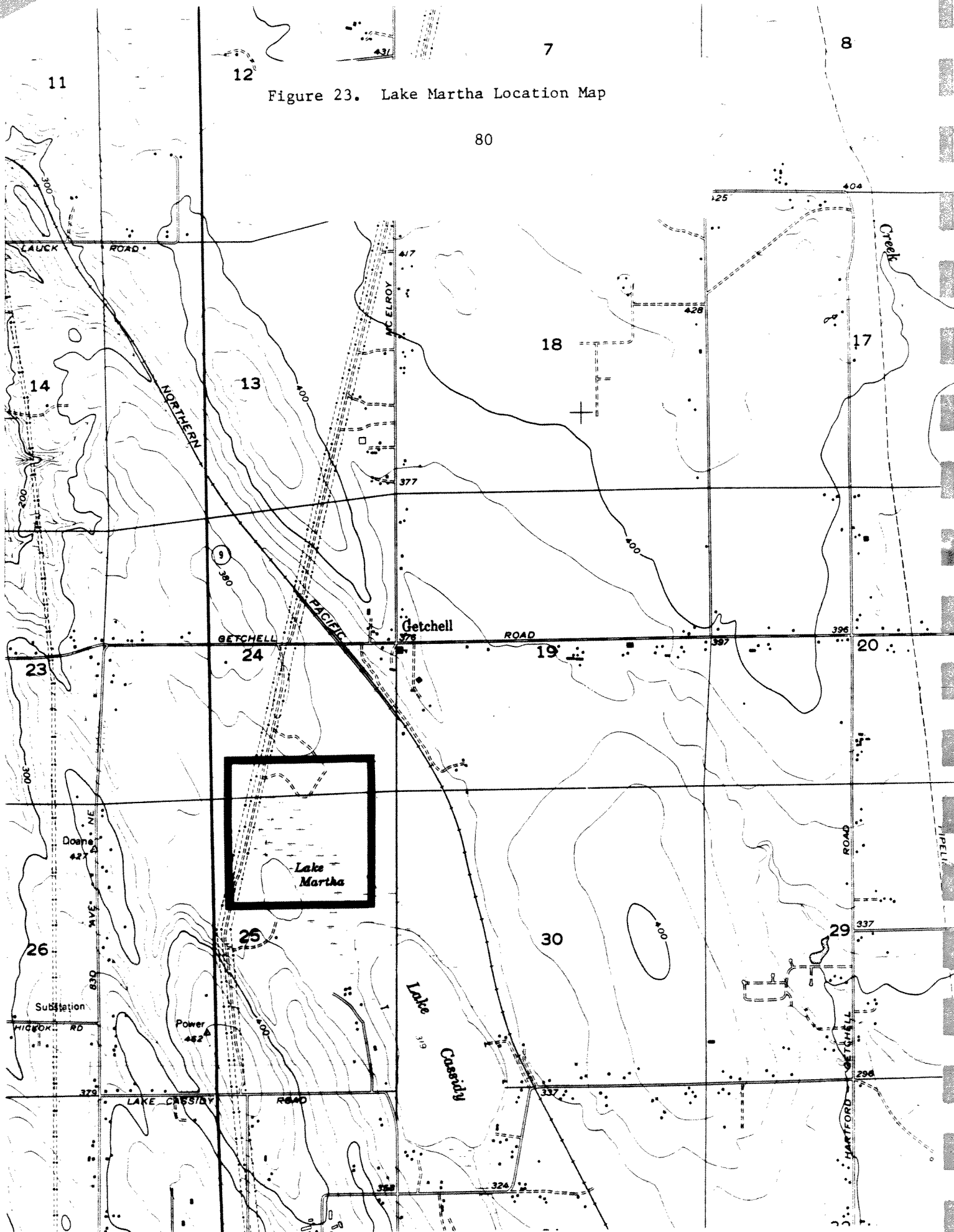


Figure 23. Lake Martha Location Map



LAKE MARTHA

LOCATION: Snohomish County; Sections 24 and 25, Township 30 North, Range 5 East, Willamette Meridian.

SIGNIFICANCE: Lake Martha is a second tier site. The bog is in relatively good condition. It consists of 3 communities and contains a population of a state threatened plant species.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community

DESCRIPTION:

Physical: Lake Martha is located at an elevation of 340 feet. It is contiguous with, and drains into, Lake Cassidy. An approximately 8 acre bog is located at the north end of the 13 acre lake. The bog soils are a mixture of sphagnum and woody peat. The waterward edge of the bog is quaking.

Biological: The Rhynchospora alba/Sphagnum spp. community occurs on the quaking mat near the lake edge. Inland, the vegetation progresses to the tall form of Ledum groenlandicum/Sphagnum spp. community and then to a Pinus contorta/Ledum groenlandicum/Sphagnum spp. community.

CONDITION: The bog has been disturbed. Trails are located through the bog. The Rhynchospora alba/Sphagnum spp. zone has been particularly trampled. A powerline corridor cuts through the northwest side of the wetland. In addition to disturbing the native wetland vegetation, the corridor provides access to the wetland.

The adjacent forested freshwater wetland has been logged and is used for recreation. The uplands are currently used for recreation and timber production. This general area is beginning to be developed for suburban homes.

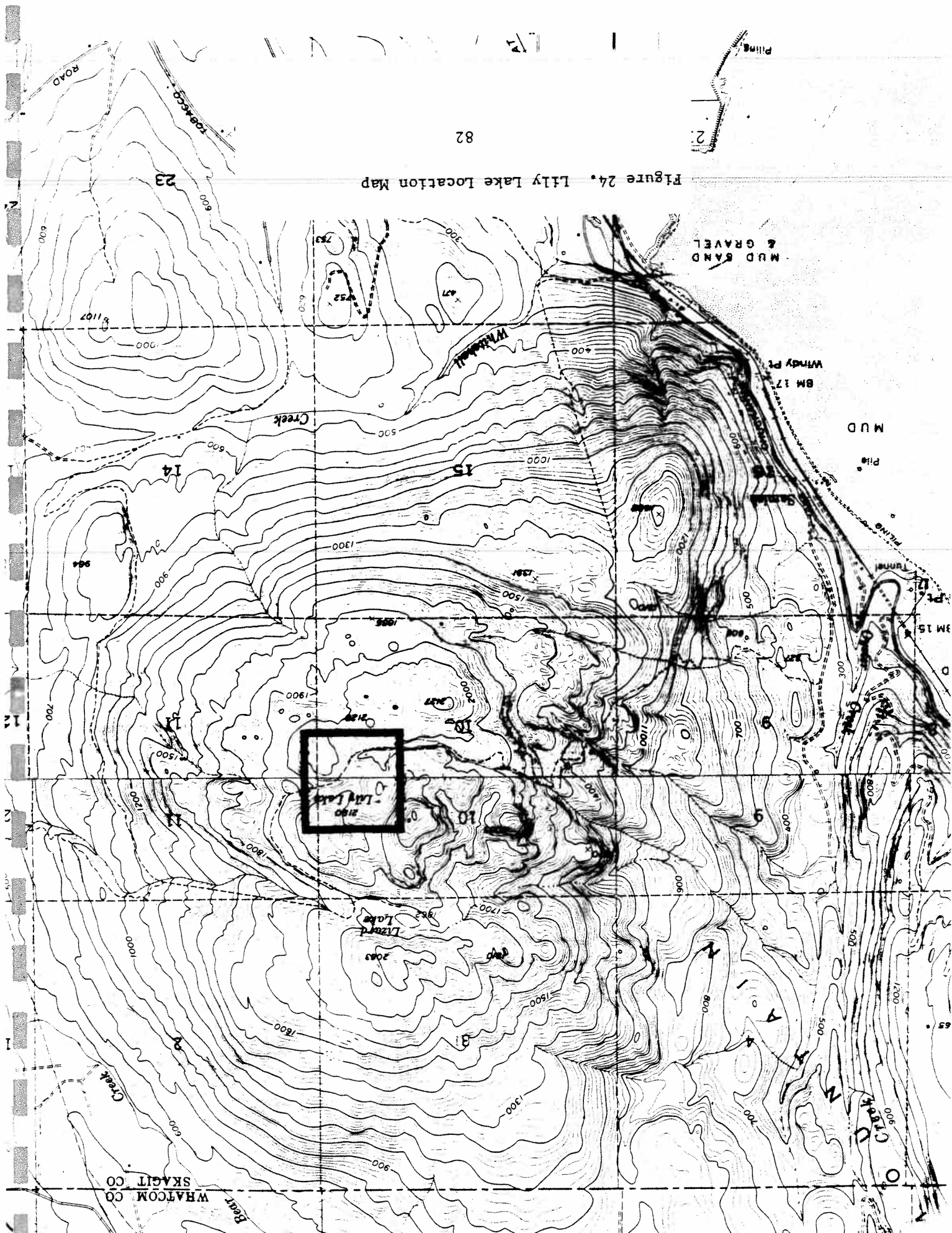


Figure 24. Lily Lake Location Map

MUD SAND & GRAVEL

MUD

WHATCOM CO
SKAGIT CO

LILY LAKE

LOCATION: Skagit County; Section 10, Township 36 North, Range 3 East, Willamette Meridian.

SIGNIFICANCE: Lily Lake is a second tier site. It is a small, relatively good quality sphagnum bog with 2 bog communities.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community

DESCRIPTION:

Physical: Lily Lake is located on Chuckanut Mountain at an elevation of 2,190 feet. The sphagnum bog is approximately 4 acres and encircles a 1 acre pond. The lake and wetland are the headwaters for one of the many streams that feed into Oyster Creek.

The sphagnum bog substrate is sphagnum peat, some of which is quaking.

Biological: The bog is a mosaic of the Rhynchospora alba/Sphagnum spp. and Ledum groenlandicum/Sphagnum spp. communities. In general, the former community occurs nearer the water's edge than does the latter.

CONDITION: The wetland is in relatively good condition. The bog receives recreational use and has some damage from trampling. Sometime in the past, a few trees were cut in the bog. There are a few exotic plant species.

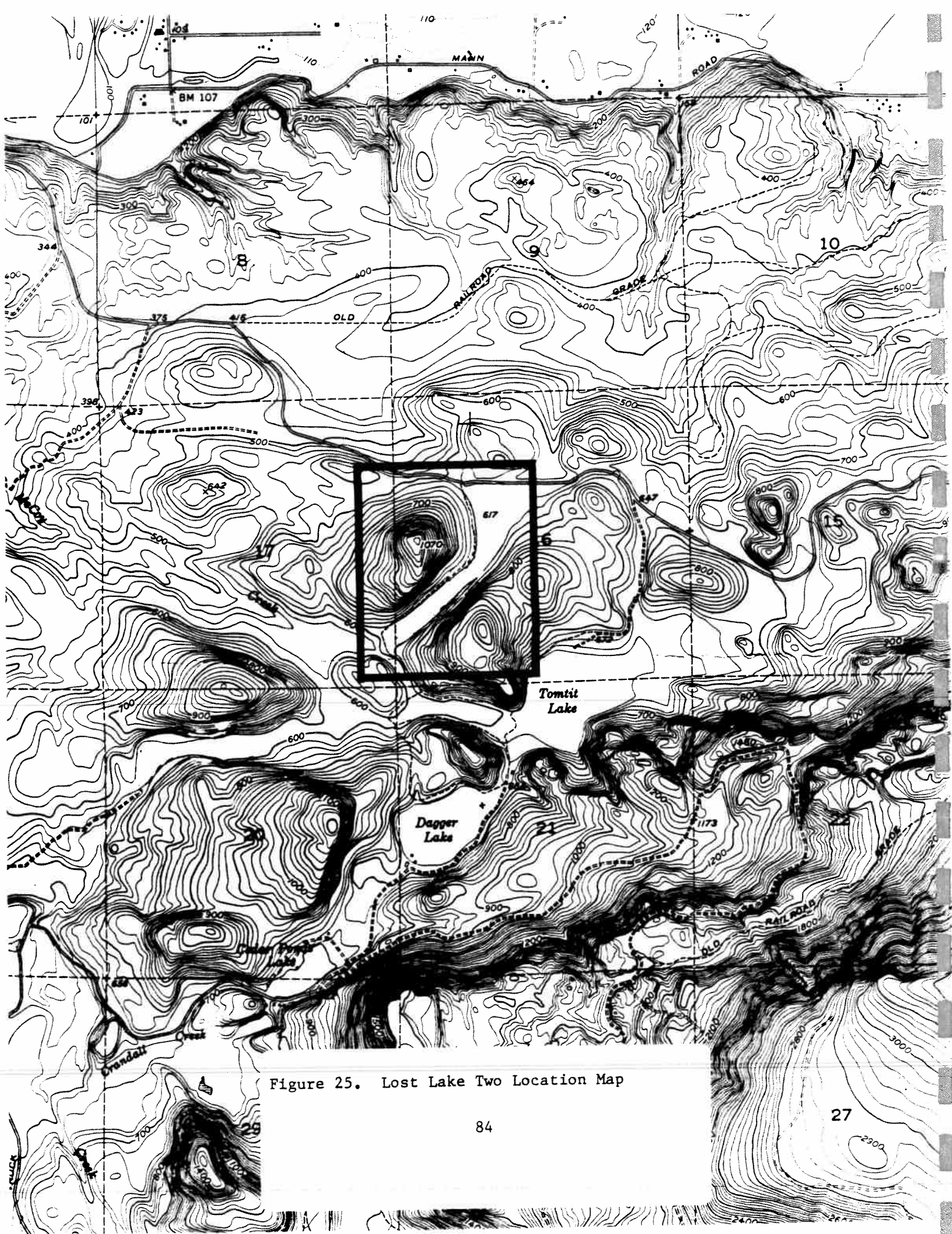


Figure 25. Lost Lake Two Location Map

LOST LAKE TWO

LOCATION: Snohomish County; Sections 16 and 17, Township 27 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Lost Lake Two is a second tier site. It is a relatively high quality wetland which is comprised of 3 sphagnum bog communities, 2 freshwater wetland communities, and 1 plant species listed as sensitive in Washington.

FEATURES: Sphagnum Bog:

1. Carex cusickii/Sphagnum spp. community
2. Rhynchospora alba/Sphagnum spp. community
3. Kalmia occidentalis/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community
2. Spiraea douglasii community

DESCRIPTION:

Physical: Lost Lake Two nearly fills a small narrow valley at an elevation of 620 feet. The 9 acre lake is located at the north end of the valley and is 30 feet deep. The south end of the lake is formed by a beaver dam. South of the dam is a long shallow wetland crossed by other dams. The lake drains through this wetland and finally underground into McCoy Creek.

There are 7 acres of sphagnum bog and 21 acres of freshwater wetlands. The wetland soils are muck, sedge peat, and sphagnum peat.

Biological: The sphagnum bog communities mostly occur around the perimeter of the lake proper, over floating logs and sphagnum mats. The Rhynchospora alba/Sphagnum spp. community occurs along the margin of a floating mat at the north end of the lake. The Kalmia occidentalis/Sphagnum spp. community occurs landward, on a quaking mat covering logs. The K. occidentalis/Sphagnum spp. community extends along the western shore of the lake. At the south end of the lake is a large floating Carex cusickii/Sphagnum spp. community. It occurs on a combination of sedge and sphagnum peat.

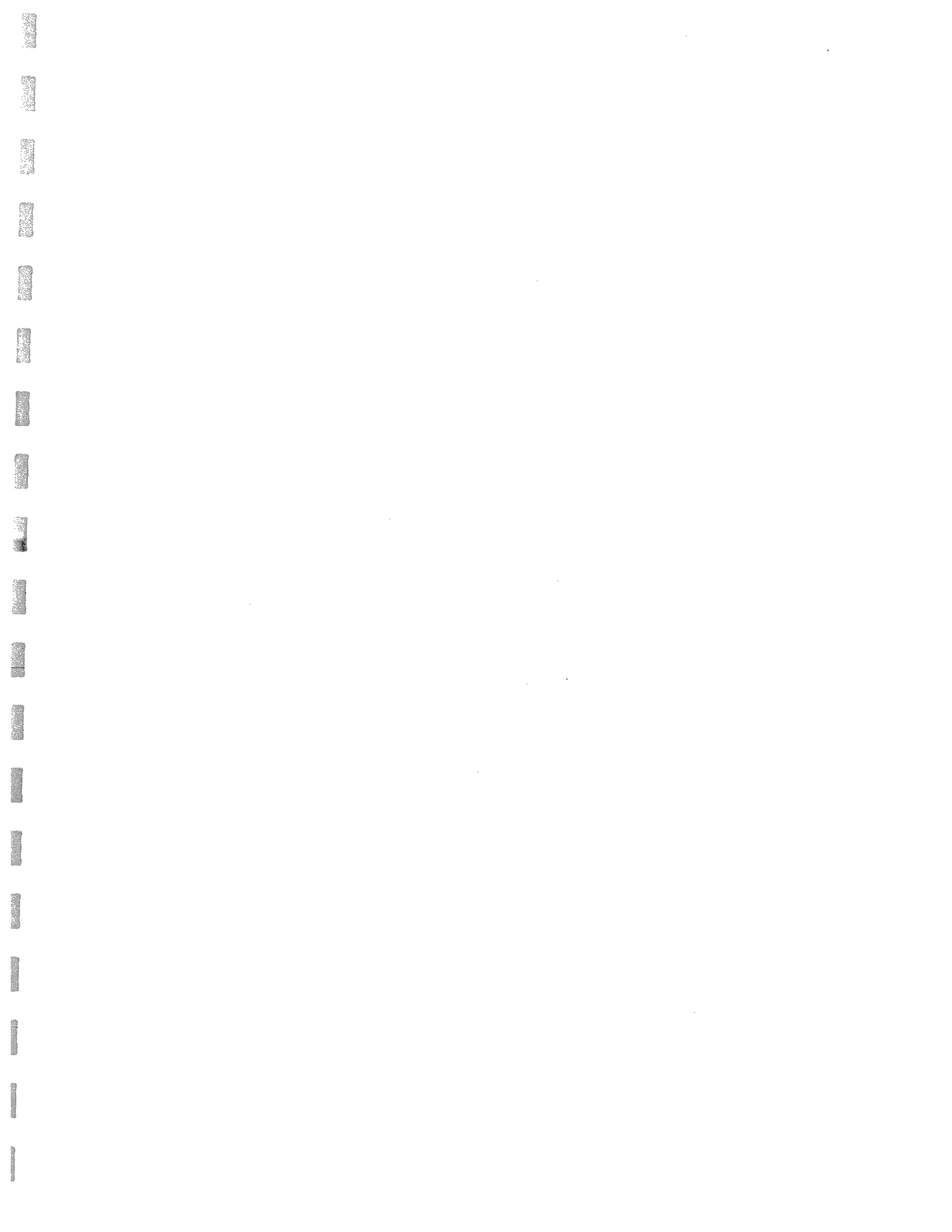
The freshwater wetland communities occur mostly along the shallow wetland south of the beaver dam. The exception is a patch of Typha latifolia which occurs at the far north end of the lake.

The wetland south of the beaver dam is a rich mosaic of plant species generally dominated by Spiraea douglasii, but with a large complement of sedge, grass, and herb species. The

vegetation is an excellent example of a partially impounded riparian wetland.

CONDITION: A main logging road is located along the northern shore of the lake. The road bed has altered some of the drainage into the lake and filled a small part of the lake. The road also provides access to the lake for hunters, anglers, and recreationists. These users have caused some impact on the wetland by trampling and littering. A serious threat to the wetland is the potential damage of the beaver dams or the beaver population.

Logging has had an impact on the system, many of the logs in the lake are cut. It is probable that logging practices have had an effect on the hydrology of the system. However, the wetland appears to have recovered from past effects.



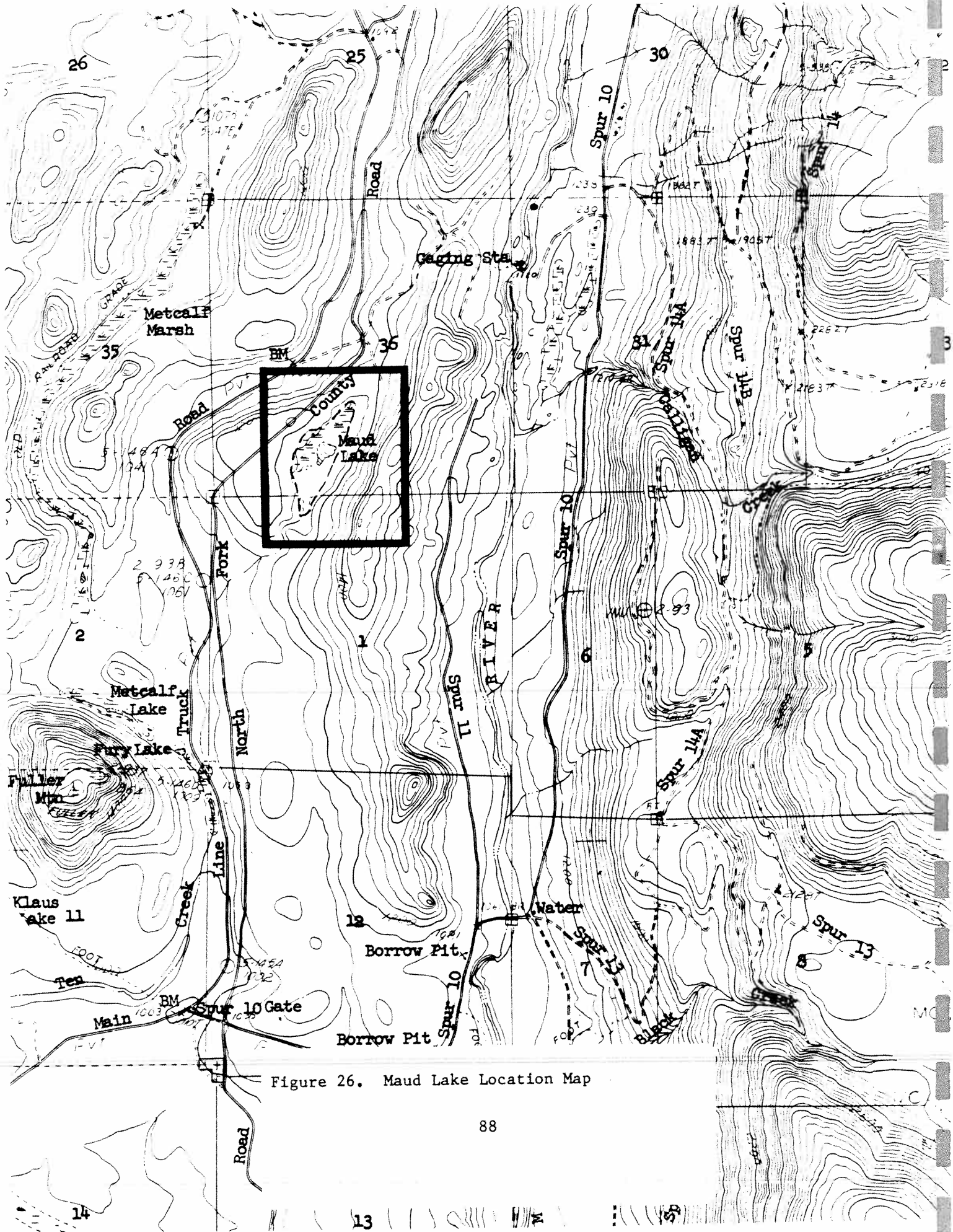


Figure 26. Maud Lake Location Map

MAUD LAKE

LOCATION: King County; Section 1, Township 24 North, Range 8 East, and Section 36, Township 25 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Maud Lake is a second tier site. It contains a floating sphagnum bog island with 4 high quality bog communities.

FEATURES: Sphagnum Bog:

1. Carex cusickii/Sphagnum spp. community
2. Rhynchospora alba/Sphagnum spp. community
3. Kalmia occidentalis/Sphagnum spp. community
4. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community

DESCRIPTION:

Physical: Maud Lake is located in the foothills of the Cascade Mountains at an elevation of 1,160 feet. It is fed by surface run-off and drains to the southwest into Ten Creek. Currently there appears to be very little annual water level fluctuation, although historically there has been a major change in water level.

There is a 2 acre, floating, bog island which is composed of sphagnum peat. There are also 2 acres of freshwater wetlands located on soils which are probably a mixture of organic muck and woody material.

Biological: Changes in the bog mat vegetation appear to be correlated with microtopographic differences. Along one edge of the mat is a Carex cusickii/Sphagnum spp. community which intergrades in places with a Typha latifolia freshwater wetland community. Inland from this community occurs a Rhynchospora alba/Sphagnum spp. community with very high cover of Vaccinium oxycoccos. The Kalmia occidentalis/Sphagnum spp. and short growth form of the Ledum groenlandicum/Sphagnum spp. communities occur on slight mounds. Stunted Tsuga heterophylla occur with the L. groenlandicum. Pure stands of Eriophorum chamissonis occur on portions of the mat with a very thin sphagnum layer.

CONDITION: Maud Lake has been severely altered. The lake is filled with Thuja plicata stumps and log debris, and the water level is much higher than it once was.

The sphagnum bog has been relatively unaffected by the disturbance to the lake. The bog mat occurs adjacent to, but not

within, the logged wetland area and it seems to have floated with the increase in water level. As a floating island, access to the bog is very difficult. This may explain the lack of trampling by humans.



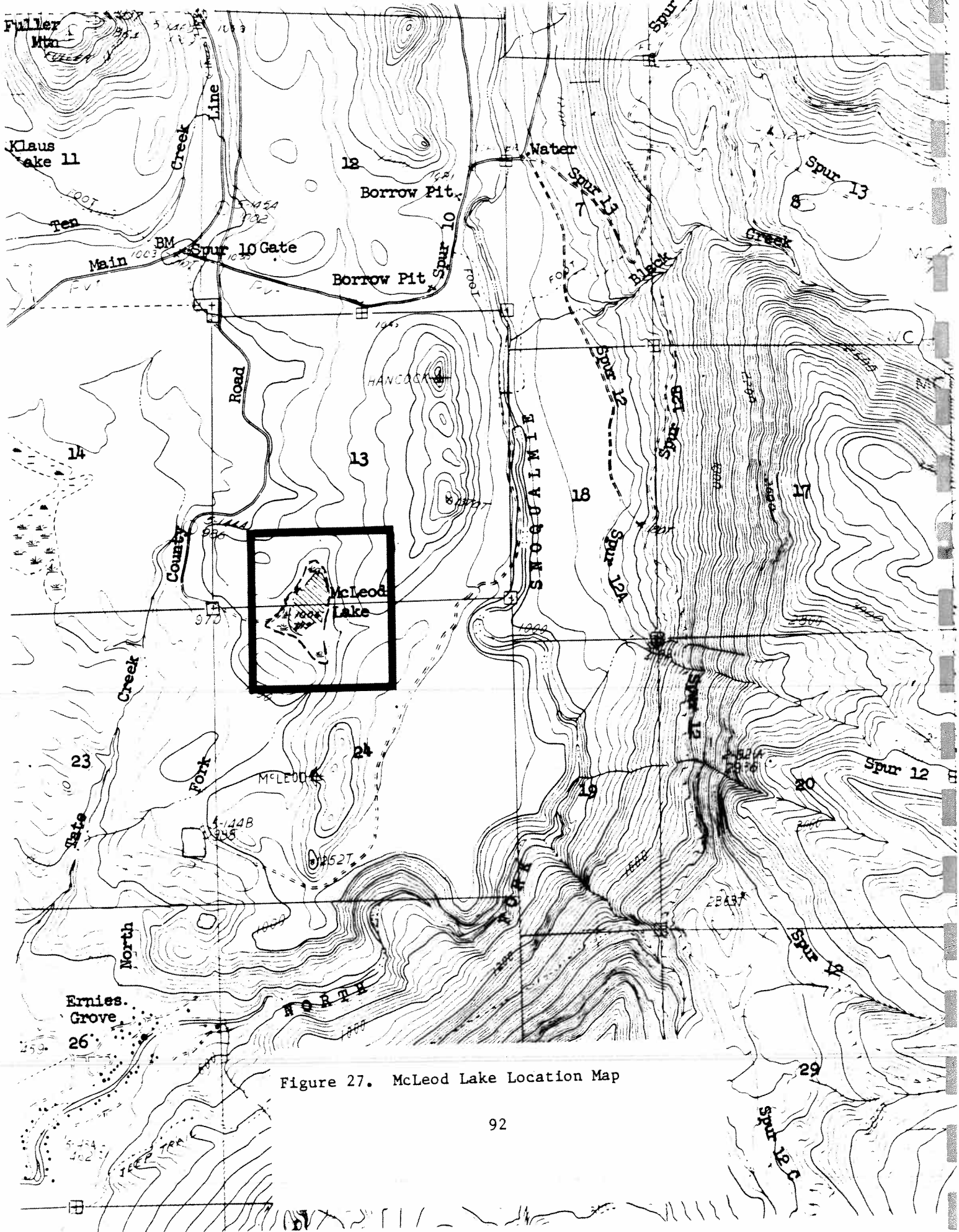


Figure 27. McLeod Lake Location Map

MCLEOD LAKE

LOCATION: King County; Sections 13 and 24, Township 24 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: McLeod Lake is a second tier site. It consists of a relatively undisturbed lake, freshwater wetland, and sphagnum bog.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Carex rostrata community
2. Carex sitchensis community
3. Spiraea douglasii community
4. Alnus rubra/Rubus spectabilis community

DESCRIPTION:

Physical: McLeod Lake is located in the foothills of the Cascade Mountains at an elevation of 1,006 feet. The site consists of a 1 acre sphagnum bog, and a 5 acre freshwater wetland, associated with a 9 acre lake.

McLeod Lake is fed by surface run-off and drains to the southwest into Tate Creek. The water level appears to be stable. Freshwater wetland soils are mostly sedge and woody peat, and muck. The bog soils are sphagnum peat.

Biological: The sphagnum bog vegetation is primarily composed of a Ledum groenlandicum/Sphagnum spp. community. The community shifts from the low growth form near the lake margin, to the tall form near the uplands. Tsuga heterophylla and Thuja plicata have become established towards the upland.

The freshwater wetland progresses from a Carex cusickii community along the lake margin, to a mixture of C. rostrata, C. sitchensis, and Spiraea douglasii communities. The vegetation forms a dense sward which is seasonally to permanently flooded. Inland the vegetation shifts to an Alnus rubra/Rubus spectabilis forested wetland. This community encircles the lake and is adjacent to the uplands.

CONDITION: The wetlands around McLeod Lake are in relatively good condition. The area is used primarily by hunters and anglers. A few trails have been made through them, including a boat access. The adjacent uplands are managed for timber production and buffers around the wetland have not been maintained.

The lake is of unknown quality. Fish and wild rice have been introduced into it.



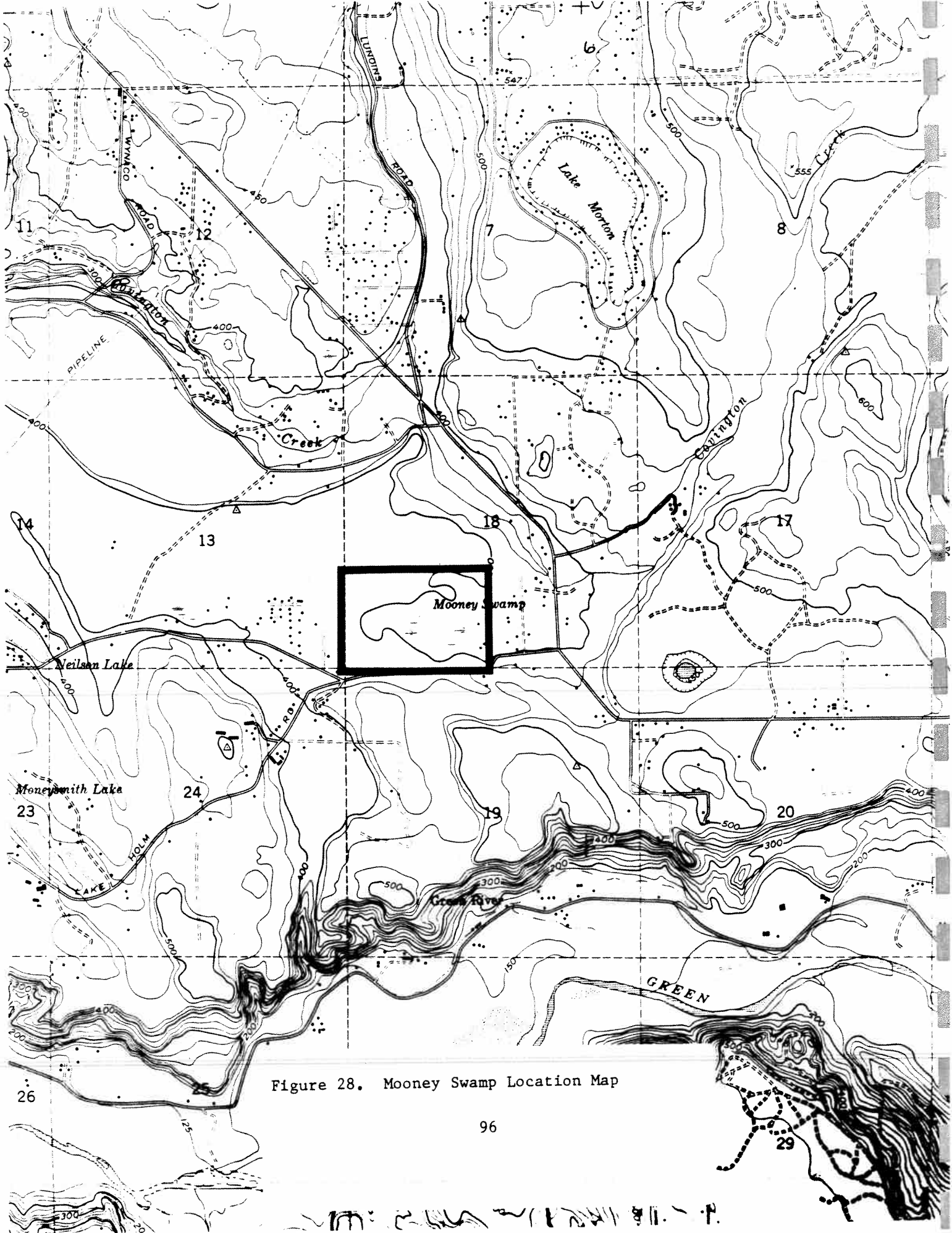


Figure 28. Mooney Swamp Location Map

MOONEY SWAMP

LOCATION: King County; Section 18, Township 21 North, Range 6 East, Willamette Meridian.

SIGNIFICANCE: Mooney Swamp is a second tier site. It is a shallow, seasonally flooded wetland with 2 fresh-water wetland communities in relatively good condition.

FEATURES: Freshwater Wetland:

1. Dulichium arundinaceum community
2. Spiraea douglasii community

DESCRIPTION:

Physical: Mooney Swamp is located in a 26 acre depression at an elevation of 400 feet. It is probably a kettle wetland and has no apparent inflow or outflow. It may receive some overflow water from Covington Creek, but otherwise is fed by surface flow. It has a large annual water level fluctuation and is seasonally flooded. Soils are organic muck.

Biological: The wetland is a mosaic of the Dulichium arundinaceum and Spiraea douglasii communities. Each community is composed almost solely of its dominant species. There is some Carex vesicaria and Nuphar polysepalum, but otherwise no other species were observed.

CONDITION: The wetland appears to be in good condition. There was a set of vehicle tracks through the wetland. The uplands have been logged recently and virtually no buffer was left. A wet forest community, codominated by Fraxinus latifolia and Salix spp., was logged. There is some housing development in the area which may threaten the quality of the wetland.

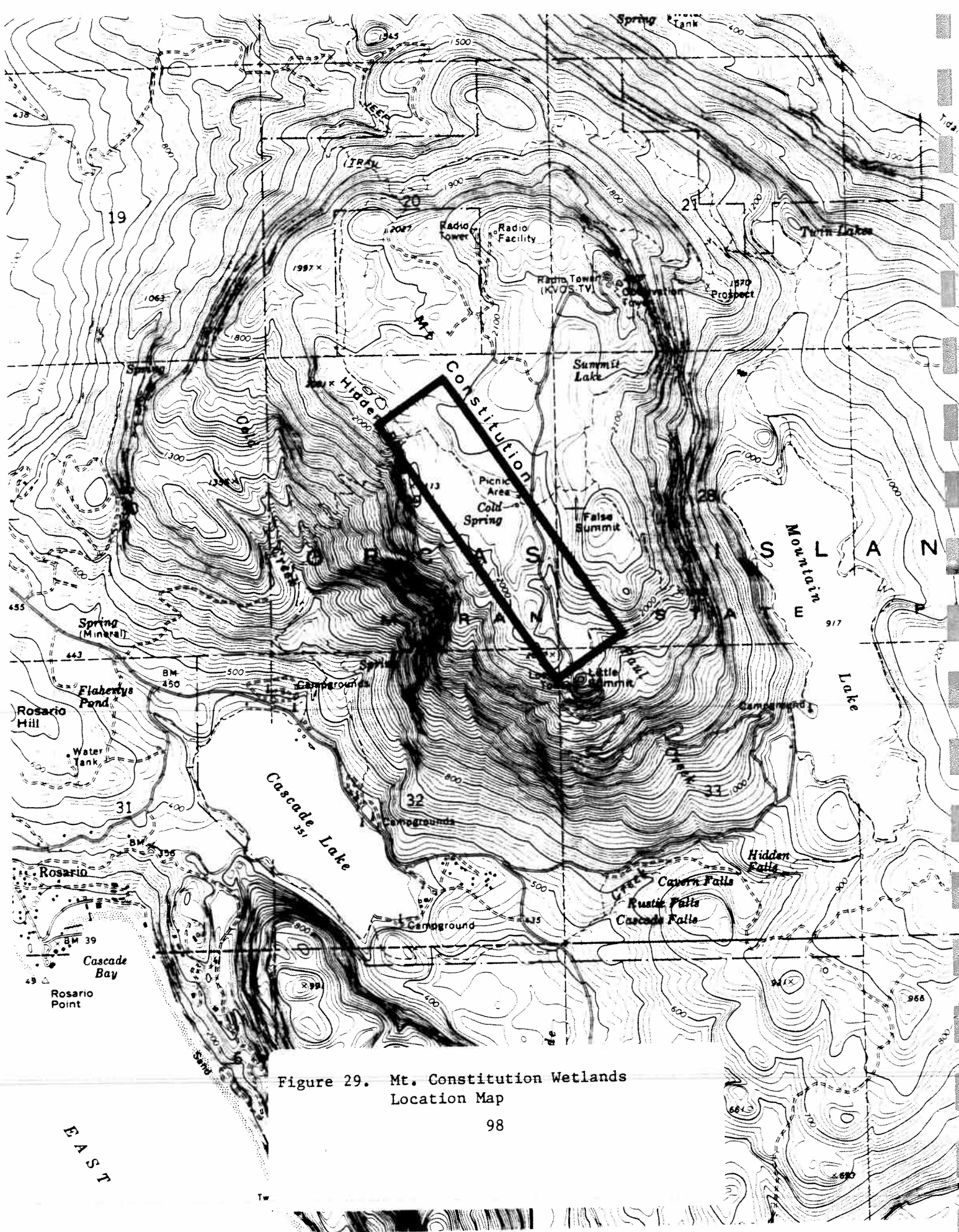


Figure 29. Mt. Constitution Wetlands Location Map

MT. CONSTITUTION WETLANDS

LOCATION: San Juan County; Sections 28, 29, and 33, Township 37 North, Range 1 West, Willamette Meridian.

SIGNIFICANCE: The Mt. Constitution Wetlands are a second tier site. It is a set of relatively high quality wetlands which have recovered well from past disturbances. The wetlands include 1 sphagnum bog community and 7 freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Calamagrostis canadensis community
2. Carex cusickii community
3. Carex obnupta community
4. Carex rostrata community
5. Carex sitchensis community
6. Juncus balticus community
7. Spiraea douglasii community

DESCRIPTION:

Physical: The Mt. Constitution Wetlands are located in two adjacent drainages on the southwest side of Mt. Constitution, between 1,980 and 2,040 feet. The wetlands cover approximately 11 acres, occurring in shallow depressions along the two stream drainages. Both are cold drainages, one is fed by cold springs and the other from Summit Lake. All of the wetlands are permanently, but shallowly flooded. The water is cold and clear. Soils are primarily sedge peats, but there is some sphagnum intermixed.

Biological: Though sphagnum moss is found scattered throughout the wetlands, it is the primary substrate only in part of one of the wetlands. In this area, the predominant community is Ledum groenlandicum/Sphagnum spp. Calamagrostis canadensis and Pinus contorta have relatively high cover values in this area.

The Calamagrostis canadensis, Carex cusickii, Carex rostrata, and Carex sitchensis communities occur intermixed and are the predominant vegetation. Where the water is deeper than average, Carex obnupta and Juncus balticus communities are predominant. This is usually in troughs around the margins of some of the wetlands, and in shallow "ponds". The Spiraea douglasii community is most frequently found along the upland wetland margin.

CONDITION: The Mt. Constitution Wetlands have sustained two disturbance events. The first was the original logging of the

area, during which livestock were grazed in the wet meadows. The second event was the building of the road to the summit of Mt. Constitution. The road was built across a portion of two wetlands and some areas were filled.

Despite these disturbances, these wetlands are in relatively good condition, apparently having recovered well. The wetlands are mostly composed of native plant species and communities. Exotic plant species are not abundant.



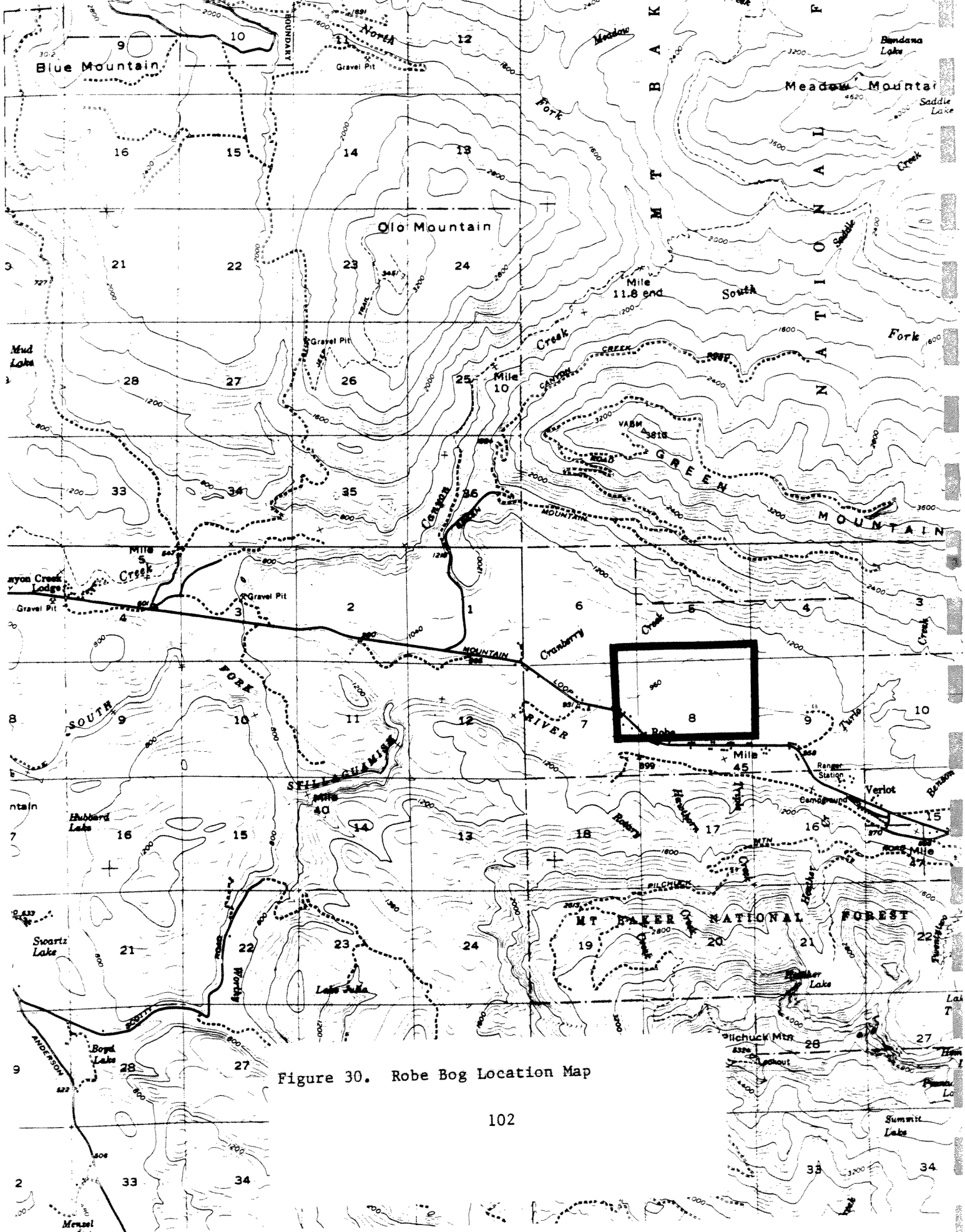


Figure 30. Robe Bog Location Map

ROBE BOG

LOCATION: Snohomish County; Section 8, Township 30 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Robe Bog is a second tier site. It is a diverse bog and wetland system which is ecotonal between a midmontane and a low elevation wetland. The site contains 3 sphagnum bog communities, 4 freshwater wetland communities, and 1 plant species listed as threatened in Washington.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/

Sphagnum spp. community

Freshwater Wetland:

1. Carex rostrata community
2. Salix spp. community
3. Spiraea douglasii community
4. Thuja plicata community

DESCRIPTION:

Physical: Robe Bog is located within the South Fork Stillaguamish River Valley at an elevation of 960 feet, about 80 feet above the river. The wetland is located on a slope, on and between two short streams. One of the streams flows along the northwest and west side and the second along the east side of the wetland.

The site consists of about 35 acres of sphagnum bog and 25 acres of freshwater wetlands. The bog communities occur on sphagnum peat that is relatively dry. The freshwater wetland communities occur on a variety of soils, most of which are permanently flooded.

Biology: The sphagnum bog communities progress from a small area of quaking bog with a Rhynchospora alba/Sphagnum spp. community, to a drier area with the short form of Ledum groenlandicum/Sphagnum spp. community, to a landward area with a Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. Along the southern and western margins of the bog, the L. groenlandicum/Sphagnum spp. community intergrades with two freshwater wetland communities, the Carex rostrata community and the Typha latifolia community. The latter two areas are seasonally flooded to permanently saturated.

The freshwater wetland communities surround the bog and follow the two stream drainages. The communities typically grade from

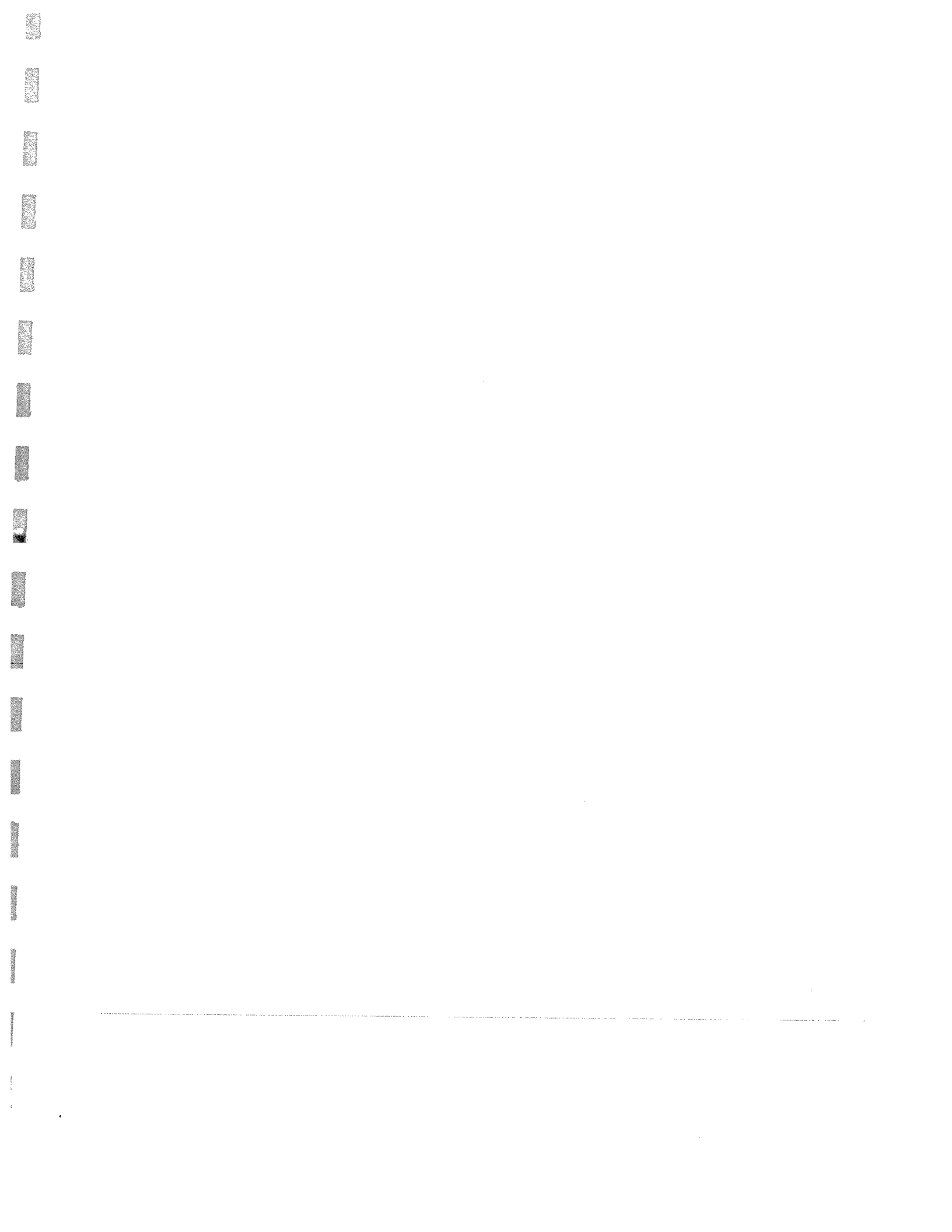
Carex rostrata to Spiraea douglasii to Salix spp., but there is intermixing. The Typha latifolia community occurs mostly on the southwest side of the bog, but is also intermixed with the S. douglasii and Salix spp. communities. These communities are all located in permanently flooded areas.

There is a small Thuja plicata forest in an area where the water table is slightly below the soil surface.

CONDITION: There has been some selective logging in the Thuja plicata community. This appears to have occurred a long time ago, and the area seems to be recovering well.

A wet meadow area within the wetland appears to have been grazed at one time. This is indicated by the presence of a few exotic plant species and a few fence posts. The vegetation appears to be recovering.

A large recreational property park, located adjacent to and to the east of the wetland, may be having an effect on the water quality of the wetland. One of the streams running through the wetland also runs through the park and several recreational sites abut it. Water quality may be affected from septic systems, and biocides and fertilizers used in management of the park. A few children find their way into the wetland, but the access is difficult and seems to deter most people.



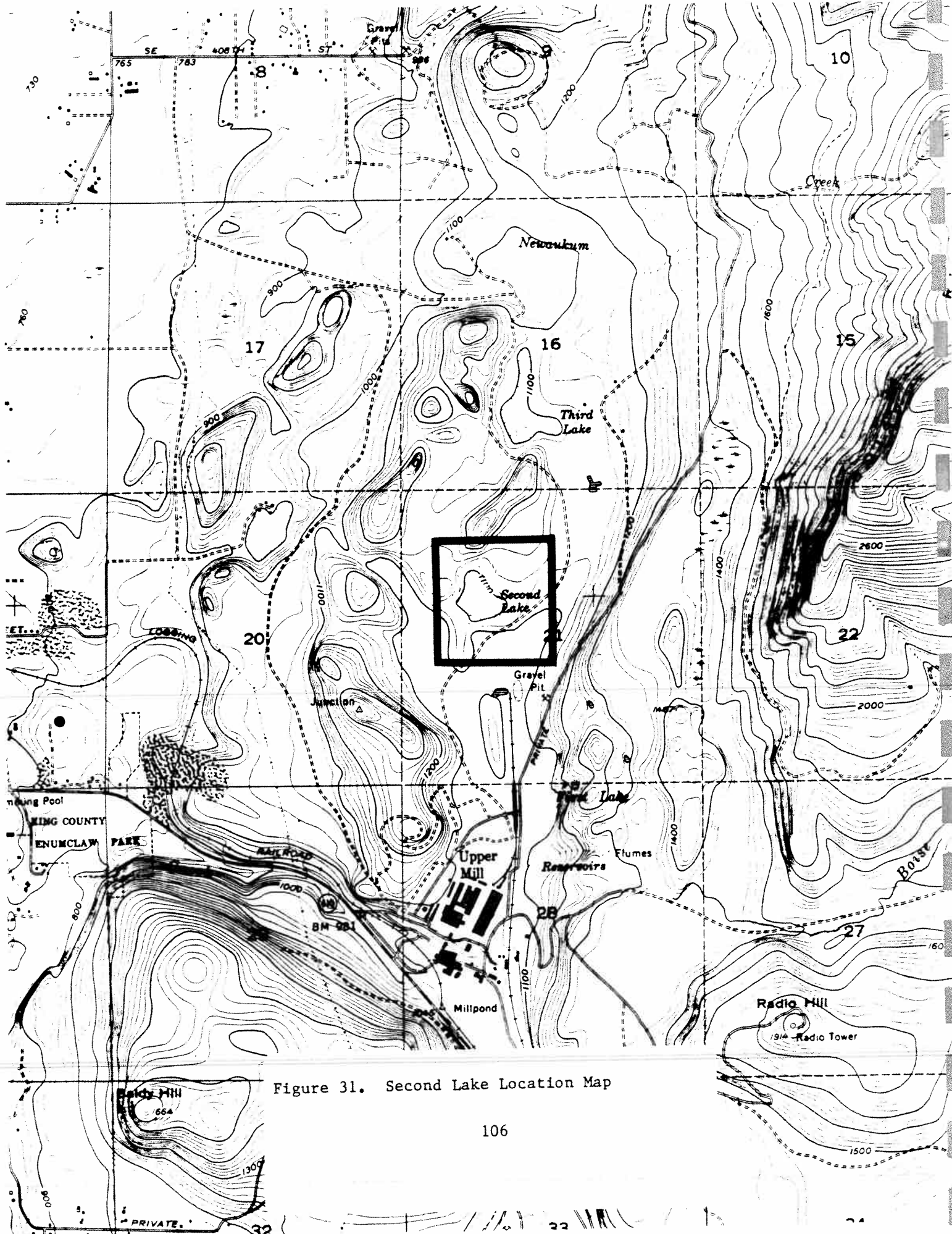


Figure 31. Second Lake Location Map

SECOND LAKE

LOCATION: King County; Section 21, Township 20 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: Second Lake is a second tier site. It is a small, but relatively high quality sphagnum bog which contains a bog pond and 2 bog communities.

FEATURES: Sphagnum Bog:

1. bog pond
2. Rhynchospora alba/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

DESCRIPTION:

Physical: Second Lake is located at the foot of the Cascade Mountains at an elevation of 1,100 feet. It apparently has no outlet and is fed by surface run-off.

The bog pond is 2 acres and is bounded to the north by a 6 acre sphagnum bog. The pond water is brown. The bog substrate is composed of sphagnum peat and woody material.

Biological: The Rhynchospora alba/Sphagnum spp. community is relatively large and is located along the lake margin of the bog mat. The majority of the bog is comprised of the Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. The community progresses from a mixture of the short form L. groenlandicum/Sphagnum spp. community and Kalmia occidentalis/Sphagnum spp. community with short T. heterophylla, to a more typical T. heterophylla/L. groenlandicum/Sphagnum spp. community.

CONDITION: The bog at Second Lake is in relatively good condition. An area near the bog pond appears to have been cleared at one time, but it is recovering. Hunters and/or anglers have trampled a trail along the bog margin through the Rhynchospora alba/Sphagnum spp. community. Some exotic plant species have become established in the trampled area. With management, the bog will probably recover.

The bog pond is of unknown condition. It has been stocked, and a boat ramp has been developed to its shore.

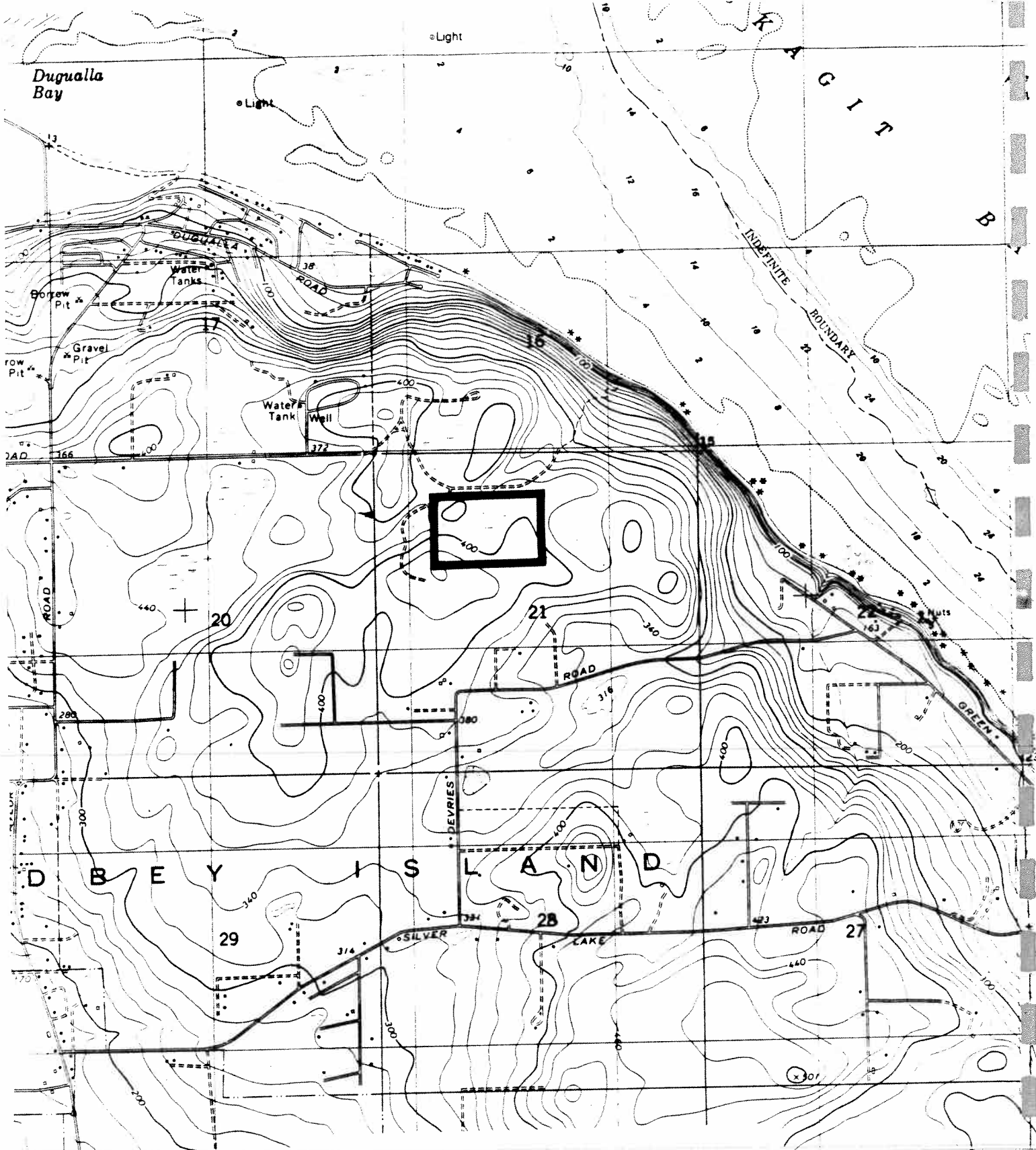
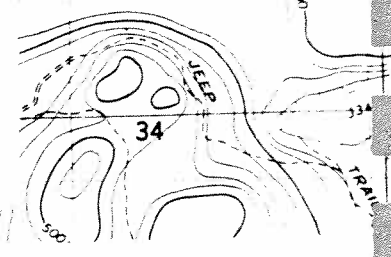
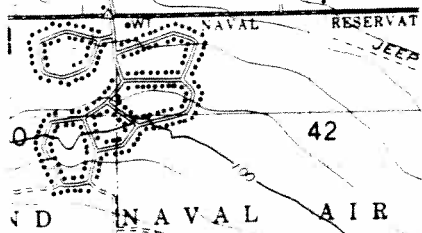


Figure 32. Sleeper Bog Location Map



SLEEPER BOG

LOCATION: Island County; Section 21, Township 33 North, Range 2 East, Willamette Meridian.

SIGNIFICANCE: Sleeper Bog is a second tier site. It is small, but relatively undisturbed. It is a sphagnum bog with an occurrence of 1 bog community and 1 freshwater wetland community.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Spiraea douglasii community

DESCRIPTION:

Physical: Sleeper Bog is located on Whidbey Island at an elevation of 400 feet. The wetland is approximately 4 acres; 3 acres of sphagnum bog and 1 acre of freshwater wetland.

The wetland may drain to the east into Skagit Bay. There is no ponded water in the bog proper, but it is ringed by a freshwater wetland which is permanently to seasonally flooded.

The soils are mostly sphagnum peat with woody material.

Biological: The center of the bog is a fairly typical Ledum groenlandicum/Sphagnum spp. community, with high cover of Gaultheria shallon. At either end of the bog, the vegetation becomes more diverse, with several upland and freshwater wetland species such as Vaccinium parvifolium, Carex obnupta, and Spiraea douglasii. Pinus contorta is the most abundant conifer species.

The freshwater wetland community is a dense Spiraea douglasii thicket. It primarily occurs at the northeast end of the wetland but also encircles the bog.

CONDITION: The bog appears to be undisturbed or has recovered well from the effects of past logging of the adjacent uplands. A buffer was left between the bog and recently logged uplands. The wetland is listed as a second tier site primarily because of its size and related edge effect which make it difficult to defend from adjacent land uses.

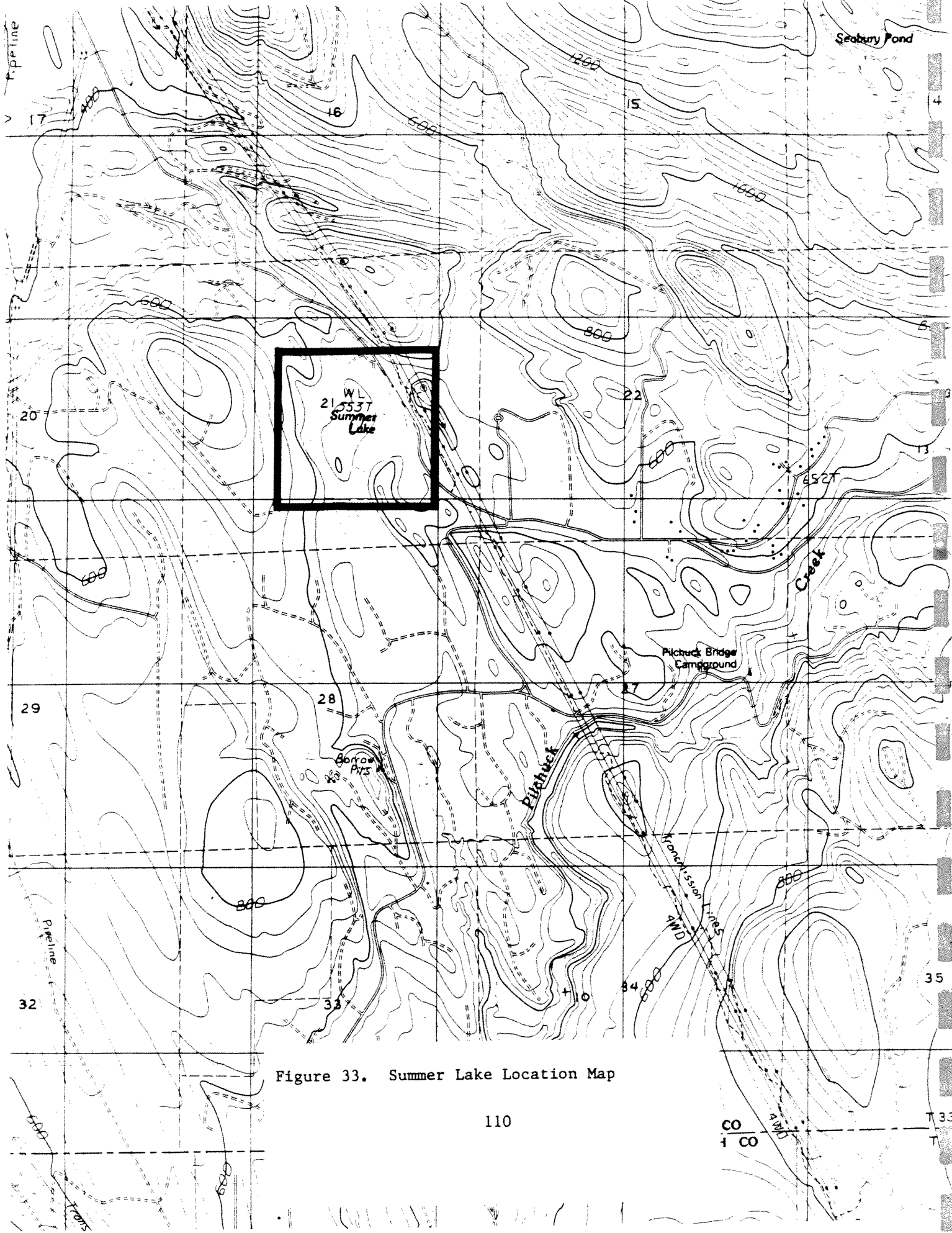


Figure 33. Summer Lake Location Map

SUMMER LAKE

LOCATION: Skagit County; Section 21, Township 33 North, Range 5 East, Willamette Meridian.

SIGNIFICANCE: Summer Lake is a second tier site. Within the wetland system is an island bog and adjacent freshwater wetland which are of high quality. The rest of the wetland has been disturbed. The high quality portion includes 3 sphagnum bog communities and 2 freshwater wetland communities.

FEATURES: Sphagnum Bog:

1. Rhynchospora alba/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community
2. Spiraea douglasii community

DESCRIPTION:

Physical: The wetland is located at an elevation of 522 feet and has no apparent outlet. The bog is 2 acres and is composed of sphagnum peat and large woody debris. The freshwater wetland is 7 acres, is permanently flooded, and has organic muck soils.

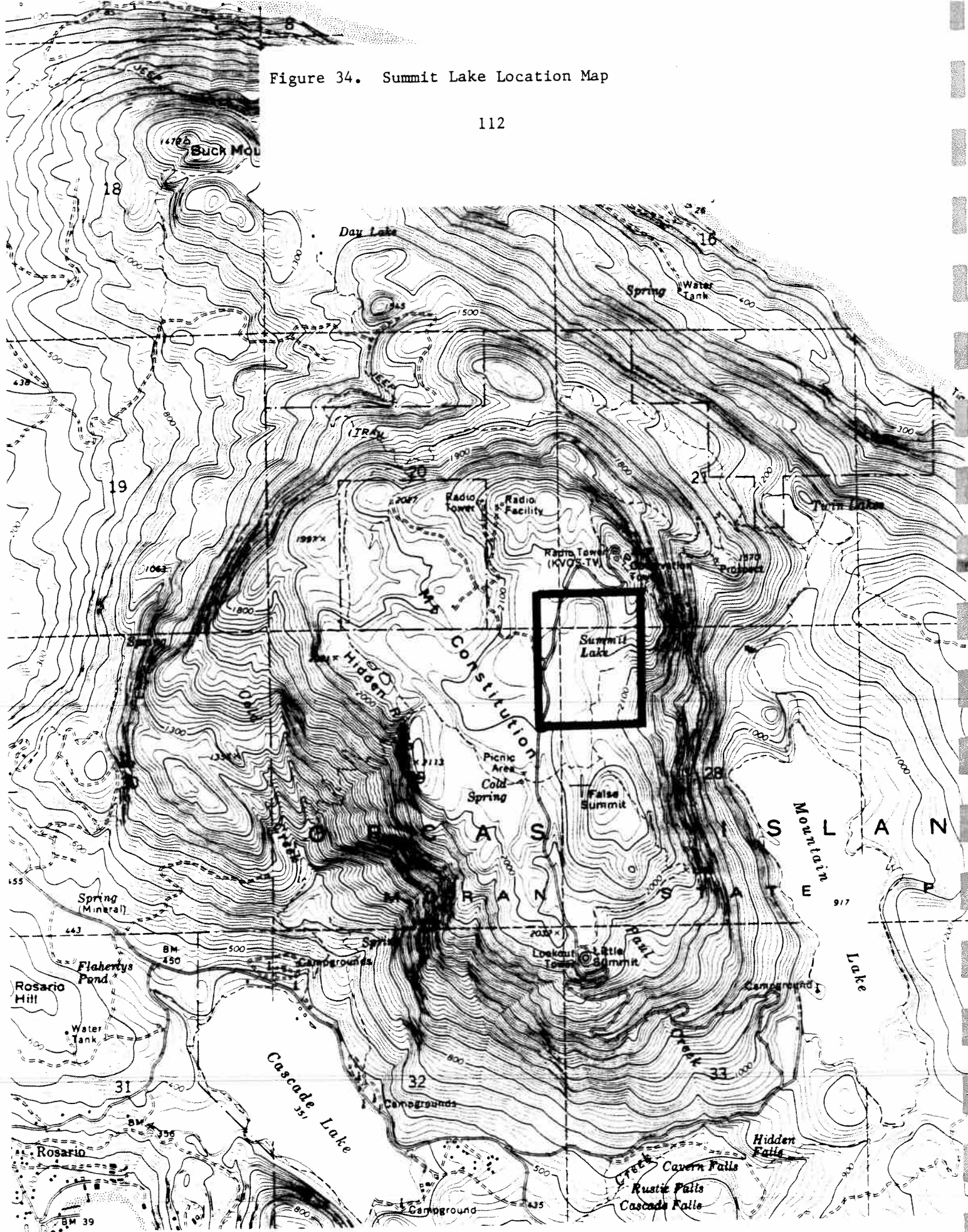
Biological: At the northeast end and southeast side of the bog island is a quaking mat with a Rhynchospora alba/Sphagnum spp. community. The remainder, and majority, of the island is a mixture of the short form of the Ledum groenlandicum/Sphagnum spp. community and the Pinus contorta/Ledum groenlandicum/Sphagnum spp. community.

The freshwater wetland is a mixture of the Spiraea douglasii and Typha latifolia communities. A large number of plant species co-occur in this area.

CONDITION: The sphagnum bog island and adjacent freshwater wetland are in good condition. There has been some trampling of the Rhynchospora alba/Sphagnum spp. zone but access to the island is difficult and this has protected it from human impact.

The rest of the wetland has been disturbed by logging activities and road building. Some areas have large populations of exotic plant species.

Figure 34. Summit Lake Location Map



SUMMIT LAKE

LOCATION: San Juan County; Sections 21, 28, and 29, Township 37 North, Range 1 West, Willamette Meridian.

SIGNIFICANCE: Summit Lake is a second tier site. The lake system is altered, but still represents a relatively high quality lake and wetland. It contains 2 sphagnum bog and 5 freshwater wetland communities, and has a population of a plant species listed as threatened in Washington.

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 cusickii community
3. Carex obnupta community
4. Carex rostrata community
5. Carex sitchensis community

DESCRIPTION:

Physical: Summit Lake is located on the south side of Mt. Constitution at an elevation of 2,140 feet. It is the headwaters for Paul Creek. The current water level is relatively stable and the water is brown in color.

The wetlands occur around the margin of the lake and as floating islands. There are approximately 2 acres of sphagnum bog and 5 acres of freshwater wetlands. The wetland substrates are a mixture of sedge and sphagnum peat.

Biological: The primary area of sphagnum bog vegetation is an island located in the southcentral portion of the lake. Elsewhere, the sphagnum and sedge vegetation are intermixed.

The bog vegetation appears to be primarily the short form of the Ledum groenlandicum/Sphagnum spp. community. On the large bog island, there is also an example of the Pinus contorta/Ledum groenlandicum/Sphagnum spp. community.

The aquatic vegetation is species rich. Nuphar polysepalum is a dominant species, but Potamogeton natans also has a high cover value.

The emergent and floating freshwater wetland vegetation is a mixture of sedge communities: Carex cusickii, C. obnupta, C.

rostrata, and C. sitchensis. This mixture is very similar to that of the Mt. Constitution Wetlands.

CONDITION: Summit Lake has always been a wetland, however the current water level is artificially high. The outlet stream was dammed to provide water to the radio facility at the summit of Mt. Constitution. The vegetation which developed since the dam was built, resembles a native system, it is composed of native plant species and communities, and has very few exotic species.



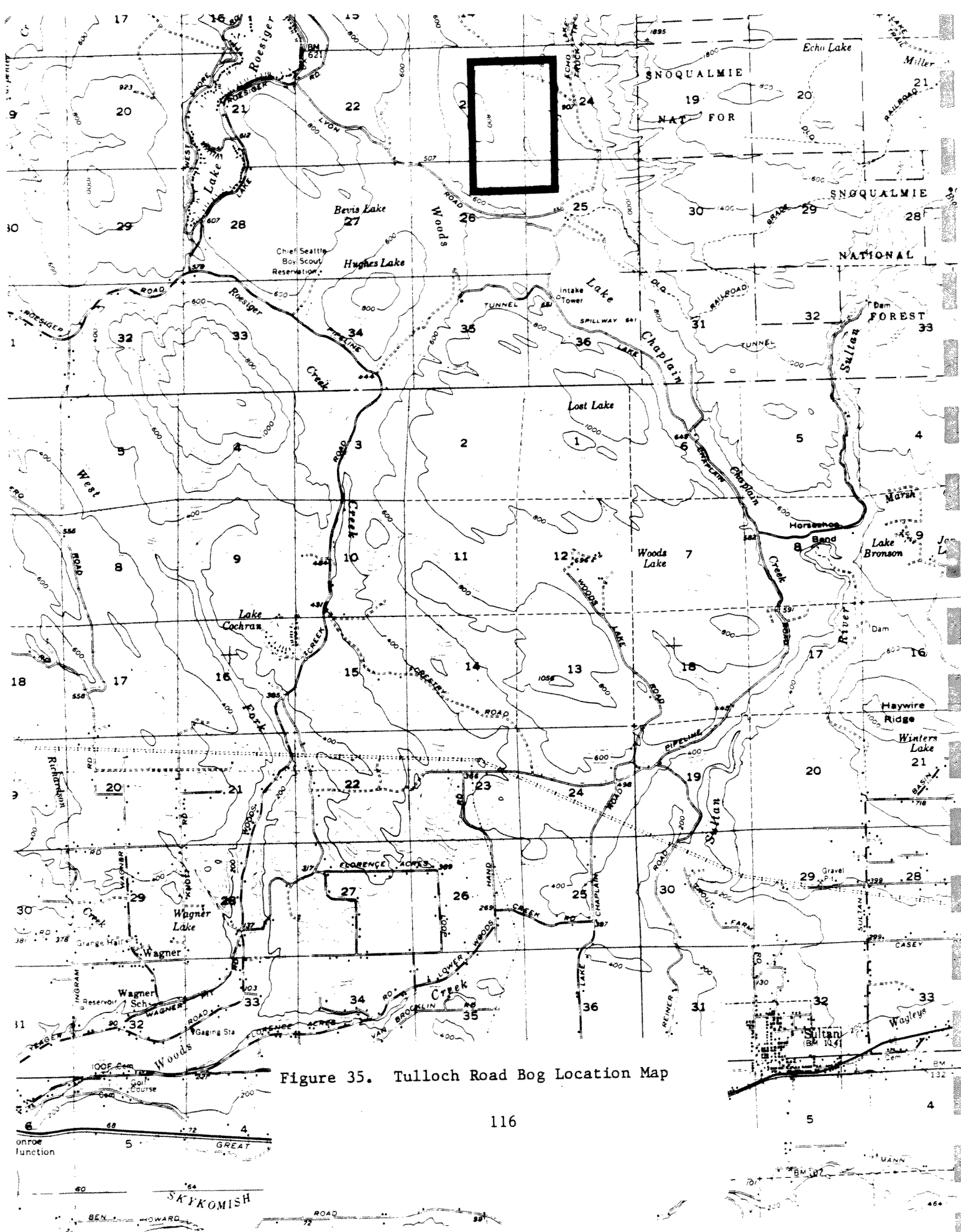


Figure 35. Tulloch Road Bog Location Map

TULLOCH ROAD BOG

LOCATION: Snohomish County; Section 23, Township 29 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: Tulloch Road Bog is a second tier site. It is in relatively good condition, although it is recovering from logging. It consists of a freshwater wetland and a sphagnum bog, each containing one community.

FEATURES: Sphagnum Bog:

1. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Spiraea douglasii community

DESCRIPTION:

Physical: Tulloch Road Bog occurs at an elevation of 760 feet and drains into Woods Creek. The sphagnum bog is 9 acres and the freshwater wetland is 6 acres. The freshwater wetland is permanently to seasonally flooded and has organic muck soils. The bog area is composed of relatively dry sphagnum peat.

Biological: The bog area is predominantly the tall form Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community with small Thuja plicata and high cover of Pteridium aquilinum.

The freshwater wetland progresses from a dense Spiraea douglasii community in a permanently flooded area, to a seasonally flooded wetland with a species-rich vegetation dominated by Spiraea douglasii. Conifers are becoming established in the wetland. There are signs of beaver activity.

CONDITION: The Tulloch Road Wetland has been disturbed. Thuja plicata stumps occur throughout the sphagnum bog and freshwater wetlands. However, the disturbance appears to have occurred a long time ago and the system is recovering well. The vegetation is composed primarily of native species and the plant communities are well developed.

The adjacent lands are used for timber production.

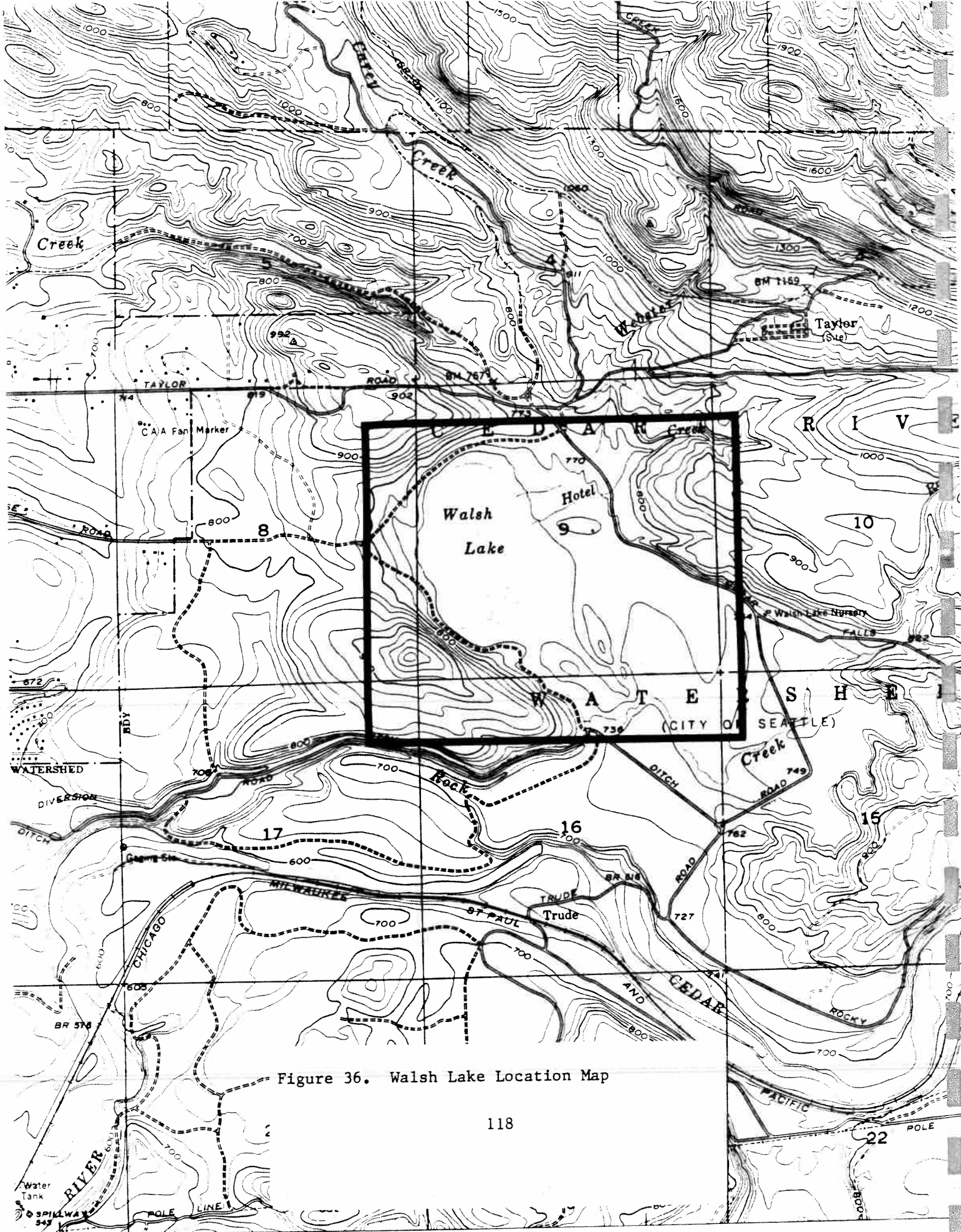


Figure 36. Walsh Lake Location Map

WALSH LAKE

LOCATION: King County; Section 9, Township 22 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: Walsh Lake is a second tier site. It was disturbed, but is recovering well. There is an extensive freshwater wetland comprised of 4 communities, and sphagnum bog areas containing 2 communities.

FEATURES: Sphagnum Bog:

1. Ledum groenlandicum/Sphagnum spp. community
2. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Freshwater Wetland:

1. Typha latifolia community
2. Salix spp. community
3. Pyrus fusca community
4. Alnus rubra/Rubus spectabilis community

DESCRIPTION:

Physical: Walsh Lake is located within the Cedar River Watershed at an elevation of 725 feet. It is fed by two streams and drains into the Walsh Lake Diversion and then into the Cedar River. It is a 75 acre lake with approximately 45 acres of relatively high quality wetlands. About 19 acres are sphagnum bog, and 26 acres are freshwater wetlands.

Soils are sphagnum peat in some areas and alluvium with some organic matter in other areas. Most of the wetlands are seasonally flooded.

Biological: Most of the sphagnum bog areas are a mosaic of the short form of Ledum groenlandicum/Sphagnum spp. and Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. communities. There is one area of new bog development, located on a thin quaking sphagnum and sedge peat mat, which has a mixture of sphagnum bog and freshwater wetland vegetation.

The freshwater wetland is located around the lake margin, and most of it appears to have developed since the 1940s. It appears to be composed primarily of the Salix spp. community with Typha latifolia along the waterward edge. Inland, the vegetation makes a sharp transition to an Alnus rubra/Rubus spectabilis community. The latter is predominant in the low, wet, forest areas within the drainage. Around the sphagnum bogs, in the freshwater wetland zone, is located the Pyrus fusca community.

CONDITION: Since the Cedar River Watershed was established, the lake and wetlands have been protected. Prior to that time, the area was used for recreation and logging. There was a resort and several vacation homes located around the lake margin. The uplands were all logged, and no buffer was maintained. Logging roads were built through some of the wetlands. The area burned in 1910-1911. The area continues to be logged, but care is taken to minimize impacts to the lake and wetlands.

A comparison of photographs taken in the 1940s with those taken in 1985 shows that much of the Salix spp. wetlands around the lake margin are newly developed.



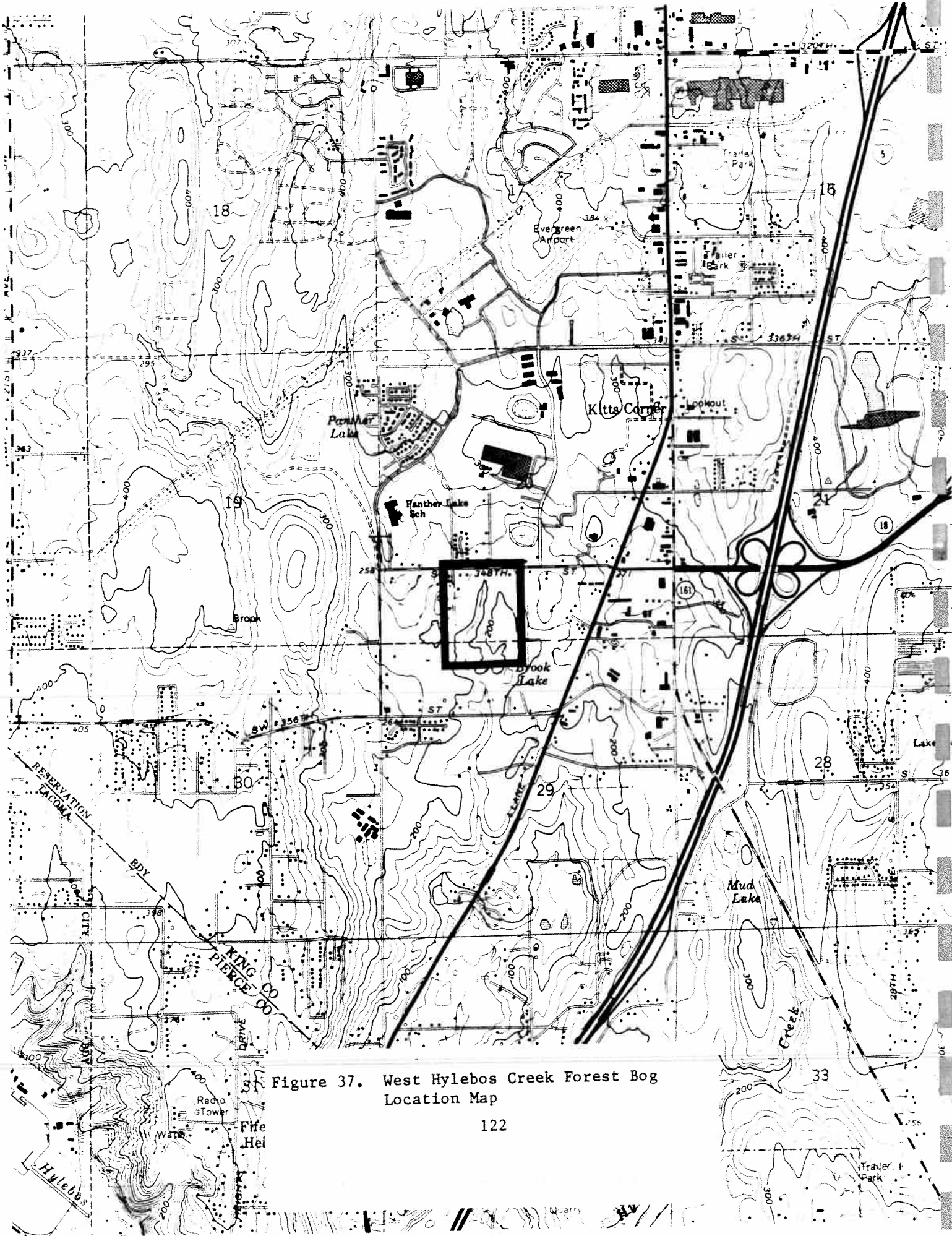


Figure 37. West Hylebos Creek Forest Bog Location Map

WEST HYLEBOS CREEK

LOCATION: King County; Sections 20 and 29, Township 21 North, Range 4 East, Willamette Meridian.

SIGNIFICANCE: West Hylebos Creek is a second tier site. It contains a Tsuga heterophylla/Sphagnum spp. bog community known from very few sites in Washington.

FEATURES: Sphagnum Bog:

1. Tsuga heterophylla/Sphagnum spp. community

DESCRIPTION:

Physical: This site is located at the headwaters of West Hylebos Creek. It occurs at an elevation of 200 feet. It is located in an urban area. Though the wetland area is much larger, the Tsuga heterophylla/Sphagnum spp. community is approximately 5 acres.

The bog community occurs over a mixture of sphagnum and woody peat soils. The water table is within one foot of the soil surface.

Biological: West Hylebos Creek contains a typical example of the Tsuga heterophylla/Sphagnum spp. community. There is virtually no understory, the trees forming a nearly closed canopy. In the few openings, mostly around the stand margin, occurs a Ledum groenlandicum/Sphagnum spp. community. Living sphagnum moss is found in the canopy openings and where the water table is at the surface. Tsuga heterophylla is reproducing.

CONDITION: Most of the headwater area has had very little use in recent history. An illegal still was set-up and run on the site at one time. Adjacent lands were logged and farmed, and have slowly been developed into an urban area. Through all of this the Tsuga heterophylla/Sphagnum spp. community seems to have survived relatively intact. Changes in the hydrology and possibly water quality due to development in the water shed may be threats to the community.

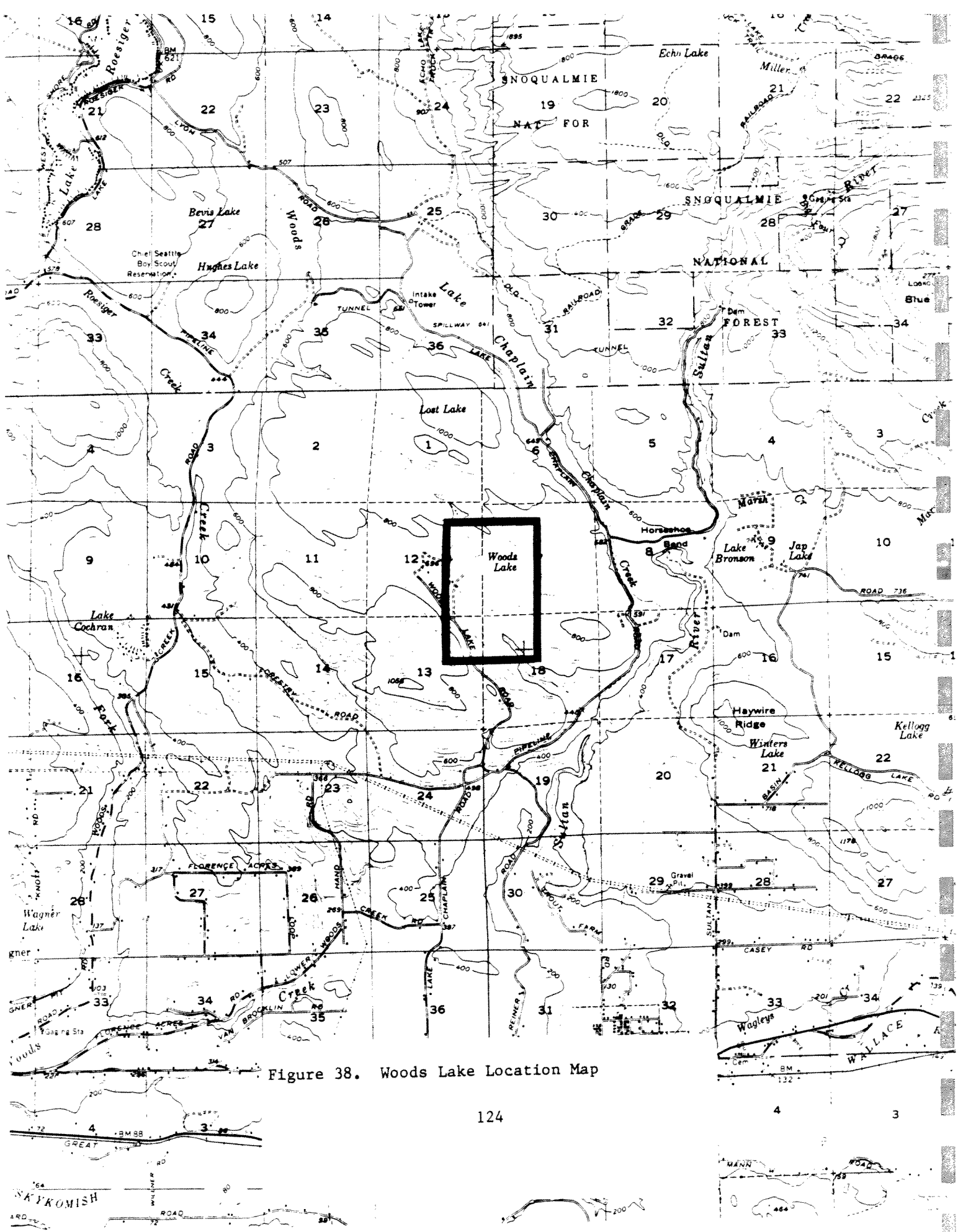


Figure 38. Woods Lake Location Map

WOODS LAKE

LOCATION: Snohomish County; Section 12, Township 28 North, Range 7 East, and Sections 7 and 8, Township 28 North, Range 8 East, Willamette Meridian.

SIGNIFICANCE: Woods Lake is a second tier site. It is a large and diverse wetland system which, though disturbed, is recovering well. It contains 2 sphagnum bog communities and 3 freshwater wetland communities.

FEATURES: Sphagnum Bog:

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

Freshwater Wetland:

1. Salix spp. community
2. Spiraea douglasii community
3. Alnus rubra/Rubus spectabilis community

DESCRIPTION:

Physical: Woods Lake is located at an elevation of 600-640 feet. Woods Lake and its associated wetlands are approximately 91. The bog is about 17 acres and the freshwater wetlands are about 54 acres in size.

Most of the lake system is permanently flooded, although some of the freshwater wetlands are only seasonally flooded. The lake drains to the south into the Sultan River.

The bog soils are sphagnum peat with woody material. The freshwater wetland soils are a mixture of sedge peat, woody peat, and muck.

Biology: The sphagnum bog is a mosaic of Ledum groenlandicum/Sphagnum spp. and Pinus contorta/Ledum groenlandicum/Sphagnum spp. communities. The L. groenlandicum/Sphagnum spp. community mostly occurs in its tall form. The Carex rostrata phase occurs in depressions. Along the lake margin occur minor examples of the Carex cusickii/Sphagnum spp. and Rhynchospora alba/Sphagnum spp. communities.

The freshwater wetland shifts from a mixture of Spiraea douglasii and Salix spp. communities near the lake margin, to Alnus rubra/Rubus spectabilis community inland. Both communities are seasonally flooded. The former community is species-rich and has high cover values of Lysichitum americanum and Glyceria elata as well as several shrub species.

The wetland along the outlet stream appears to be a Spiraea douglasii community.

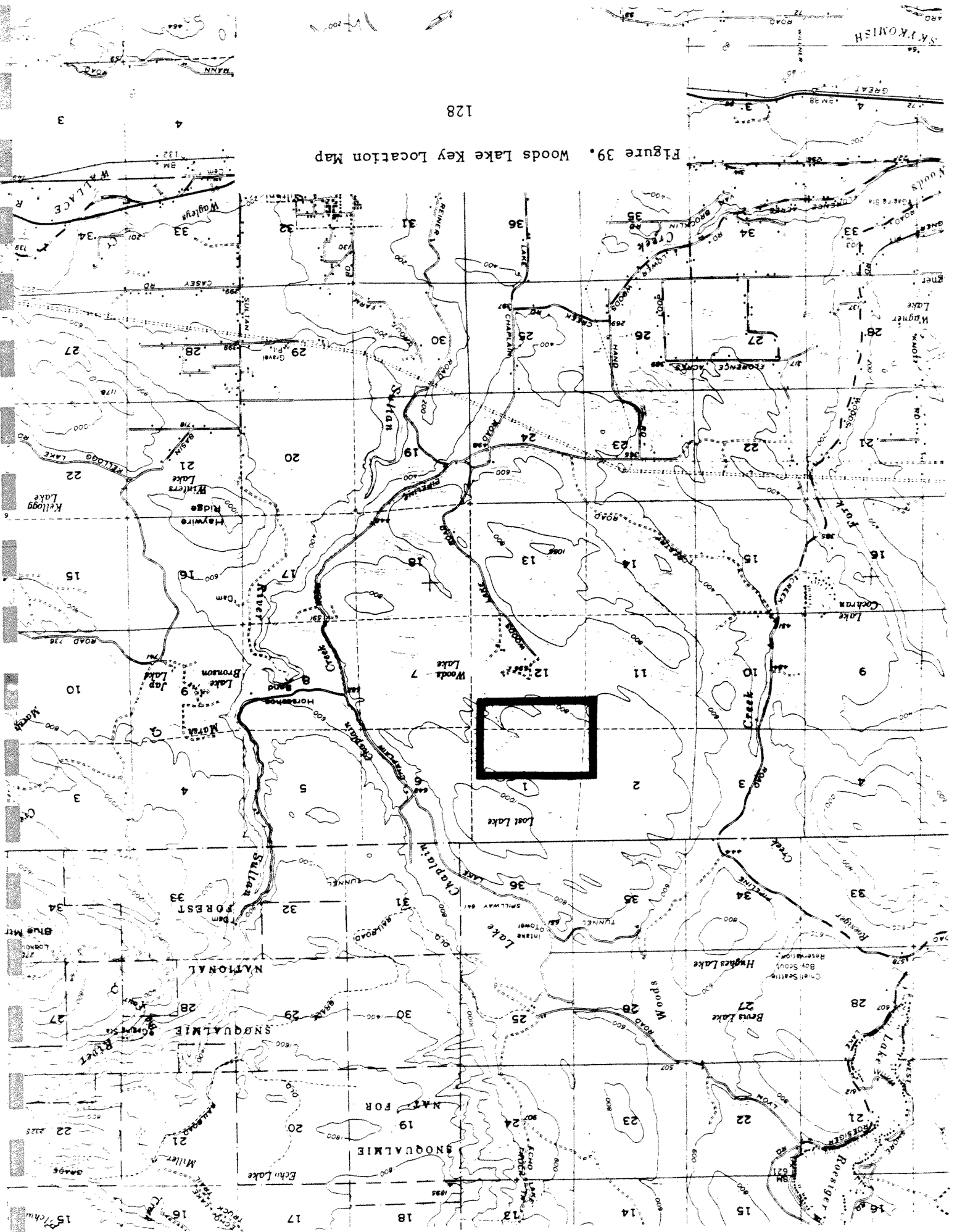
CONDITION: The lake and freshwater wetland have been disturbed, but the bog appears to have had very little use. A resort was once located on the lake, as well as a large area which served as vacation property for a family. Docks and boat access were built across the wetlands.

The uplands and the Alnus rubra/Rubus spectabilis community were logged. Some of the uplands are still used for timber production, but this is giving way to housing development.



Figure 39. Woods Lake Key Location Map

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WOODS LAKE KEY

LOCATION: Snohomish County; Section 1, Township 28 North, Range 7 East, Willamette Meridian.

SIGNIFICANCE: Woods Lake Key is a second tier site. It is a small but high quality wetland which contains a bog pond, 3 sphagnum bog communities, and 1 freshwater wetland community.

FEATURES: Sphagnum Bog:

1. pond
2. Rhynchospora alba/Sphagnum spp. community
3. Ledum groenlandicum/Sphagnum spp. community
4. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

Sphagnum spp. community

Freshwater Wetland:

1. Spiraea douglasii community

DESCRIPTION:

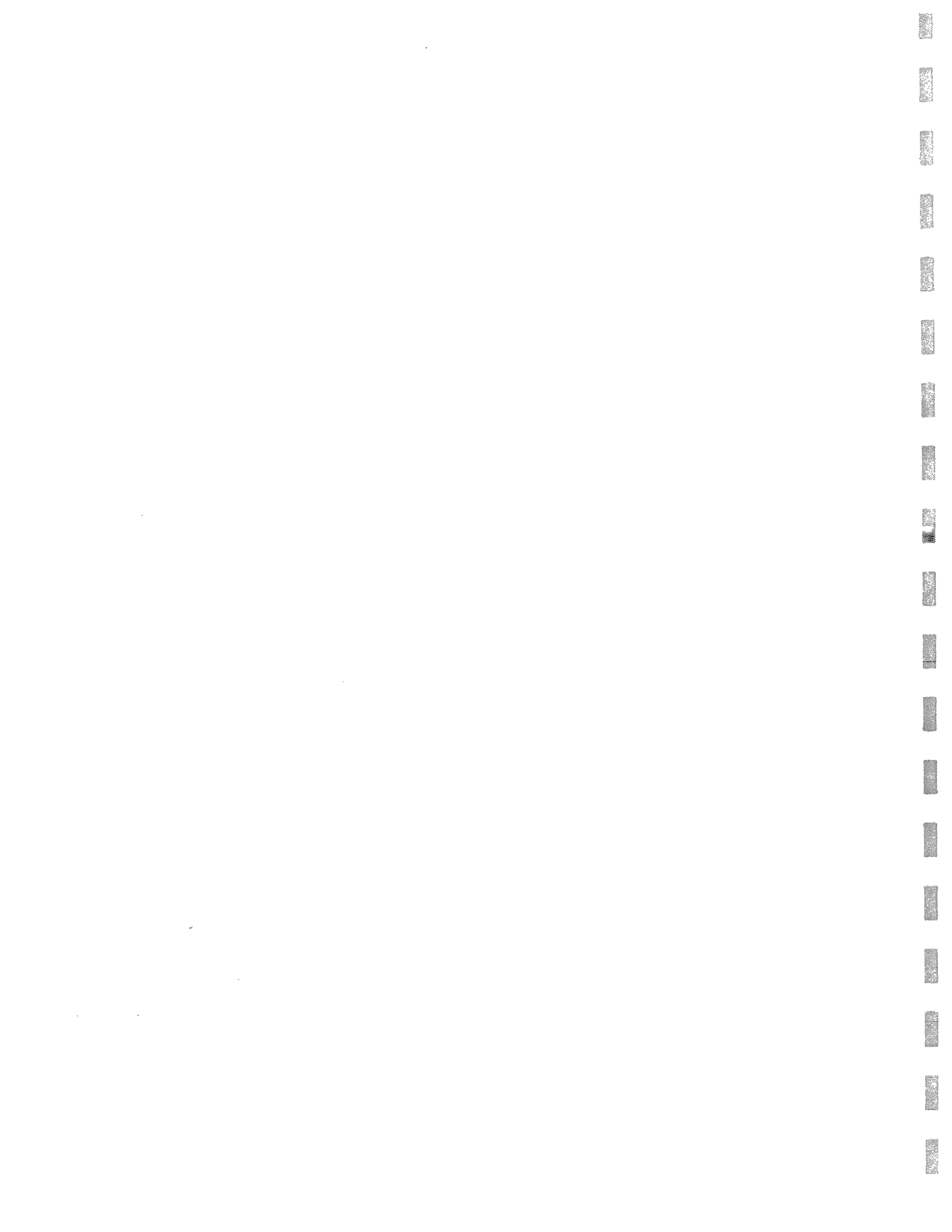
Physical: Woods Lake Key is located at 760 feet and drains into Woods Lake. The area is approximately 13 acres and includes a half-acre pond, an 8 acre sphagnum bog, and a 4 acre freshwater wetland.

The bog pond is completely surrounded by sphagnum and its water is brown in color. The bog area soils are composed of sphagnum peat, some of which are quaking. The freshwater wetland soils are probably a combination of muck, and sedge and woody peat. Portions of the freshwater wetland are permanently flooded.

Biological: The bog pond is ringed by a Rhynchospora alba/Sphagnum spp. community on a quaking sphagnum mat. The majority of the bog is a mixture of the low form of Ledum groenlandicum/Sphagnum spp. community, and the Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community. There are Thuja plicata snags and seedlings throughout the bog.

The freshwater wetland is a dense shrub wetland with Spiraea douglasii, Pyrus fusca, Lonicera involucrata, Rhamnus purshiana, and Alnus rubra. There are Thuja plicata snags in this portion of the wetland as well.

CONDITION: The wetland appears to be in good condition, though the presence of Thuja plicata snags suggests a past change in the water level. The uplands are used for timber production and buffers have not been left around the bog margin.



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APPENDIX A
PRELIMINARY CLASSIFICATION
OF
PUGET TROUGH FRESHWATER IMPOUNDED WETLANDS

This is an initial classification of native vegetation in impounded freshwater wetlands located in the Puget Trough.

The classification is intended to assist in the characterization and comparison of native wetlands in the Puget Trough region. It was developed following a review of the literature and four years 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 communities of plant species. 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. During the reconnaissance, a range of percent cover was recorded for each of the dominant species and often for all observed species. The amount and detail of information varied depending upon the accessibility of the site.

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

The classification below has been divided into two parts. The first includes reoccurring 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 cusickii/Sphagnum spp. community
2. Rhynchospora alba/Sphagnum spp. community

C. Shrub Dominated

1. Kalmia occidentalis/Sphagnum spp. community
2. Ledum groenlandicum/Sphagnum spp. community
3. Spiraea douglasii/Sphagnum spp. community

D. Tree Dominated

1. Pinus contorta/Ledum groenlandicum/Sphagnum spp. community
2. Tsuga heterophylla/Sphagnum spp. community
3. Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community

II. Low Elevation Freshwater Wetland

A. Permanently Flooded

1. Non-macrophyte
 - a. pond/lake
2. Macrophyte
 - a. Hippuris vulgaris community
 - b. Nuphar polysepalum community
 - d. Juncus balticus community
 - e. Scirpus acutus community
 - f. Scirpus subterminalis community
 - g. Typha latifolia community

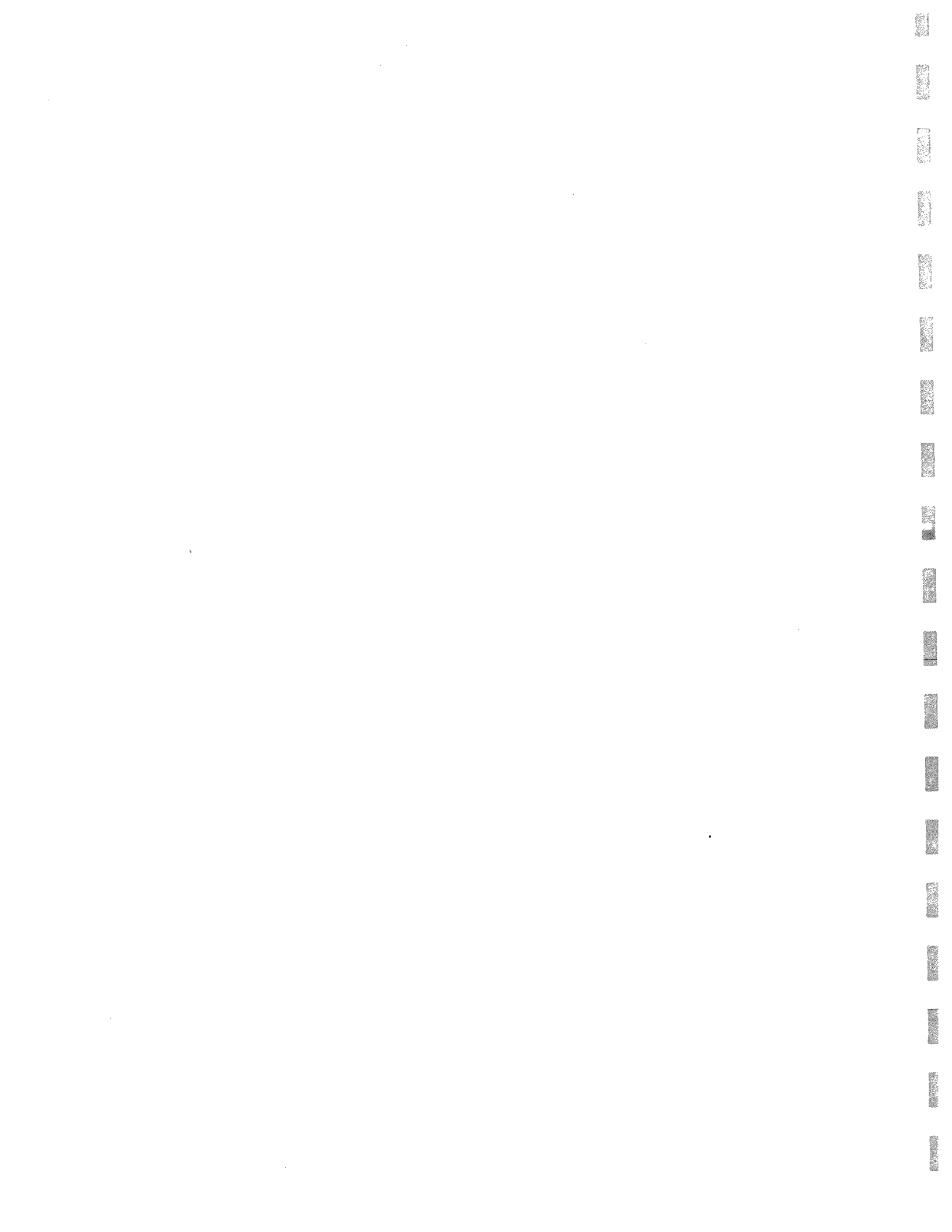
B. Saturated Soils or Seasonally Flooded

1. Herb Dominated
 - a. Calamagrostis canadensis community
 - b. Carex cusickii community
 - c. Carex obnupta community
 - d. Carex rostrata community
 - e. Carex sitchensis community
 - f. Carex vesicaria community
 - g. Dulichium arundinaceum community
2. Shrub Dominated
 - a. Spiraea douglasii community
3. Tree Dominated
 - a. Alnus rubra/Rubus spectabilis community

- b. Alnus rubra/Lysichitum americanum community
- c. Fraxinus latifolia/Salix spp. community
- d. Pyrus fusca community
- e. Tsuga heterophylla/Lysichitum americanum community

CLASSIFICATION OF NON-RECURRING COMMUNITIES:

- I. Low Elevation Sphagnum Bog
 - A. Non-macrophyte
 - none
 - B. Herb Dominated
 - 1. Carex lasiocarpa/Sphagnum spp. community
 - 2. Carex sitchensis/Sphagnum spp. community
 - C. Shrub Dominated
 - none
 - D. Tree Dominated
 - 1. Pinus monticola/Ledum groenlandicum/Sphagnum spp. community
- II. Low Elevation Freshwater Wetland
 - A. Permanently Flooded
 - 1. Non-macrophyte
 - none
 - 2. Macrophyte
 - a. Potamogeton spp. community
 - B. Saturated Soils or Seasonally Flooded
 - 1. Herb Dominated
 - a. Carex lasiocarpa community
 - b. Carex livida community
 - 2. Shrub Dominated
 - a. Alnus incana community
 - b. Salix spp. community
 - 3. Tree Dominated
 - a. Thuja plicata community



APPENDIX B

NORTHERN PUGET TROUGH FRESHWATER IMPOUNDED WETLAND COMMUNITY DESCRIPTIONS

Described below are those wetland communities which are known to occur within the study area. The descriptions provide information on the 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 reoccur in the landscape, while the second includes those which were not observed to reoccur. Within each of these major categories are two subheadings: sphagnum bog communities, and freshwater (non-sphagnum) communities. The community descriptions are listed below these subheadings in the order in which they appear in the classifications above.

RECURRING COMMUNITIES

LOW ELEVATION SPHAGNUM BOG COMMUNITIES

A sphagnum bog is characterized by the presence of sphagnum moss species (Sphagnum spp.) and a preponderance of sphagnum peat. Bogs have low pH and, as a result, have low nutrient availability. They typically develop in cold drainage basins. 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-in the basin. These ponds frequently overlay sedge, woody, and sphagnum peat.

Carex cusickii/Sphagnum spp. community: This community occurs on sphagnum peat or a combination of sphagnum and sedge peat which are supersaturated. It appears to be one of the bog communities which colonizes open water. It is most frequently found along the edge of the sphagnum mat adjacent to open water, but may also form large floating mats.

Typical species:

Carex cusickii 25-45%
Potentilla palustris 2-20%
Agrostis scabra
Hypericum anagalloides
Menyanthes trifoliata

Other species:

Carex interior complex
Carex leptalea
Carex rostrata
Carex sitchensis
Drosera rotundifolia
Eriophorum chamissonis
Galium trifidum
Kalmia occidentalis

Ledum groenlandicum
Mentha arvensis
Rhynchospora alba
Scirpus acutus
Spiraea douglasii
Typha latifolia
Vaccinium oxycoccos
Viola cf palustris

Rhynchospora alba/Sphagnum spp. community: This community occurs on supersaturated sphagnum peat and moss. It is typically found in a band along the quaking margin of a sphagnum mat adjacent to open water or just inland of the Carex cusickii community. Rhynchospora alba is the most characteristic plant species, though a large number of species may occur in the community. Shrub species, when found in this community, have a short growth form.

This community also includes small areas dominated by Eriophorum chamissonis. These areas typically have very thin layers of floating peat and few other species associated with them.

Typical Species:

Rhynchospora alba 15-60%
Vaccinium oxycoccos 1-35%
Drosera rotundifolia 5-15%
Kalmia occidentalis 1-10%
Cladina rangiferina 1-5%

Other species:

Carex leptalea
Carex rostrata
Eriophorum chamissonis
Ledum groenlandicum

Lycopus uniflorus
Lysichitum americanum
Menyanthes trifoliata
Tofieldia glutinosa

Kalmia occidentalis/Sphagnum spp. community: The K. occidentalis/Sphagnum spp. community may be predominant over large areas or, more frequently, it forms a mosaic with the short form of the Ledum groenlandicum/Sphagnum spp. community. It forms a low growing, open shrub bog over firm, relatively dry, sphagnum peat, but also extends onto the supersaturated portion of the quaking bog mat.

Typical species:

Kalmia occidentalis 25-45%
Ledum groenlandicum 1-25%
Vaccinium oxycoccos 2-25%
Drosera rotundifolia 1-5%

Other species:

<i>Carex canescens</i>	<i>Potentilla palustris</i>
<i>Carex cusickii</i>	<i>Pteridium aquilinum</i>
<i>Carex sitchensis</i>	<i>Rhamnus purshiana</i>
<i>Cladina rangiferina</i>	<i>Rhynchospora alba</i>
<i>Eriophorum chamissonis</i>	<i>Spiraea douglasii</i>
<i>Gaultheria shallon</i>	<i>Trientalis arctica</i>
<i>Lysichitum americanum</i>	<i>Tsuga heterophylla</i>
<i>Menyanthes trifoliata</i>	<i>Typha latifolia</i>
<i>Pinus contorta</i>	<i>Viola palustris</i>
<i>Pinus monticola</i>	

Ledum groenlandicum/Sphagnum spp. community: This community typically occurs on firm, at least seasonally dry sphagnum and woody peat. It has two forms. The first has a low growth form (2-4 feet tall), has about 60% cover of *L. groenlandicum*, and has a large number of associated species. The second has a tall growth form, (6-10 feet tall), has about 100% cover of *L. groenlandicum*.

Included within this community is a *L. groenlandicum*/Carex rostrata phase which occurs in wet pockets and in the transition zone between non-sphagnum and sphagnum wetlands.

Typical species:

Ledum groenlandicum 50-90%
Gaultheria shallon 1-50%
Carex rostrata 0-25%
Kalmia occidentalis 0-10%

Other species:

<i>Carex canescens</i>	<i>Pinus monticola</i>
<i>Carex interior complex</i>	<i>Pteridium aquilinum</i>
<i>Carex leptalea</i>	<i>Pyrus fusca</i>
<i>Cladina rangiferina</i>	<i>Spiraea douglasii</i>
<i>Drosera rotundifolia</i>	<i>Thuja plicata</i>
<i>Empetrum nigrum</i>	<i>Tsuga heterophylla</i>
<i>Eriophorum chamissonis</i>	<i>Vaccinium oxycoccos</i>
<i>Picea sitchensis</i>	<i>Vaccinium parvifolium</i>
<i>Pinus contorta</i>	

Spiraea douglasii/Sphagnum spp. community: This community occurs on terraces composed of a mixture of sphagnum, sedge, and woody peat. *Spiraea douglasii* has a short growth form (2-4 feet tall).

The terraces are typically elevated above a pond and are probably seasonally flooded. A large number of plant species co-occur with the S. douglasii. Gentiana sceptrum is an indicator species.

Typical species:

Spiraea douglasii 50-90%
Carex sitchensis 5-10%
Carex obnupta 1-10%
Gentiana sceptrum 1-5%

Other species:

Carex rostrata	Menyanthes trifoliata
Carex vesicaria	Nuphar polysepalum
Dulichium arundinaceum	Pyrus fusca
Kalmia occidentalis	Salix spp.
Ledum groenlandicum	Trientalis arctica

Pinus contorta/Ledum groenlandicum/Sphagnum spp. community: This community grades from open shrublands with the low growth form of L. groenlandicum and scattered P. contorta, to very dense stands of P. contorta and the tall growth form of L. groenlandicum. It occurs on dry firm sphagnum substrates to quaking bog mats.

Typical species:

Pinus contorta 20-50%
Ledum groenlandicum 30-75%
Gaultheria shallon 2-20%

Other species:

Cladina rangiferina	Pyrus fusca
Drosera rotundifolia	Spiraea douglasii
Empetrum nigrum	Thuja plicata
Eriophorum chamissonis	Trientalis arctica
Kalmia occidentalis	Tsuga heterophylla
Lysichitum americanum	Vaccinium oxycoccos
Pteridium aquilinum	Vaccinium parvifolium

Tsuga heterophylla/Sphagnum spp. community: This community is a later successional stage for Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. bogs. It occurs on deep sphagnum peat with the water table about one foot below the surface. The canopy is nearly closed. There is almost no understory except where there are breaks in the canopy. Trees that are 12-14 inches in diameter at breast height (DBH) may be over 300 years old.

Typical species:

Tsuga heterophylla 80%
Ledum groenlandicum 2-5%
Gaultheria shallon 2-5%

Other species:

Kalmia occidentalis
Maianthemum dilatatum
Trientalis arctica

Vaccinium parvifolium
Vaccinium oxycoccos

Tsuga heterophylla/Ledum groenlandicum/Sphagnum spp. community: This is a common sphagnum bog community which occurs on relatively dry sphagnum peat. It resembles the L. groenlandicum/Sphagnum spp. community except for the percent cover of T. heterophylla. The T. heterophylla is usually quite short near open water, increasing in height inland. Height is not necessarily correlated with age.

Typical species:

Tsuga heterophylla 15-20%
Ledum groenlandicum 30-60%
Gaultheria shallon 15%

Other species:

Carex canescens
Cladina rangiferina
Cornus canadensis
Kalmia occidentalis
Lysichitum americanum
Maianthemum dilatatum
Menziesia ferruginea

Picea sitchensis
Pinus monticola
Pteridium aquilinum
Spiraea douglasii
Thuja plicata
Trientalis arctica
Vaccinium oxycoccos

FRESHWATER WETLAND COMMUNITIES

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

Hippuris vulgaris community: This is a commonly occurring community found in shallow, permanently flooded areas. The community often appears to be monospecific, but detailed surveys have not been done.

Typical species:

Hippuris vulgaris 50%

Other species:

Nuphar polysepalum

Sparganium emersum

Juncus balticus community: This community occurs in shallow water over silts. It is usually monospecific. It contains several species in one wetland which has serpentine influence.

Typical species:

Juncus balticus 20%

Other species:

Carex cusickii
Carex obnupta
Carex oederi
Festuca rubra

Nuphar polysepalum
Potentilla pacifica
Triglochin maritimum

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. It may be monospecific or composed of several aquatic plant species.

Typical species:

Nuphar polysepalum 10-90%

Other species:

Equisetum fluviatile
Hippuris vulgaris
Juncus balticus
Potamogeton natans

Scirpus subterminalis
Sparganium emersum
Utricularia vulgaris

Scirpus acutus community: This is a very common emergent community, though it may occupy small areas. It is found in shallow water, on very soft silts and organic muck. It occurs as almost pure stands of either *S. acutus* or *S. validus*. The two species are very similar morphologically, and, because of the difficulty in walking on the substrates where they occur, *S. acutus* is used for both unless specified.

Typical species:

Scirpus acutus or *S. validus* 10-40%

Other species:

Nuphar polysepalum
Potentilla palustris

Spiraea douglasii

Scirpus subterminalis community: This community is found in very shallow permanent ponds over organic soils. It occupies the first zone waterward of seasonally flooded areas, most frequently in wetlands with large annual water level fluctuation. It is typically found associated with *Spiraea douglasii* sphagnum bogs, and may occur on muck, sedge peat, or a mixture of sedge and sphagnum peat.

Typical species:

Scirpus subterminalis 20-60%

Other species:

Nuphar polysepalum

Utricularia vulgaris

Typha latifolia community: This is a commonly occurring community, though it is difficult to distinguish between native and disturbance generated examples. It typically occurs in shallow permanently flooded areas with organic soils. Occasionally it also occurs in seasonally flooded areas. Typha latifolia usually forms monospecific stands in permanently flooded areas. In seasonally flooded areas it may occur with a large number of other species. The community is frequently located adjacent to other communities with which it merges, often forming complex ecotonal assemblages.

Typical species:

Typha latifolia 20-75%

Other species:

Alnus rubra

Carex cusickii

Carex obnupta

Carex rostrata

Carex sitchensis

Carex vesicaria

Galium trifidum

Lemna minor

Lonicera involucrata

Mimulus guttatus

Myosotis laxa

Oenanthe sarmentosa

Potamogeton natans

Potentilla palustris

Puccinellia palustris

Sparganium emersum

Spiraea douglasii

Veronica scutellata

Calamagrostis canadensis community: The C. canadensis community rarely occurs at low elevations. Where found at low elevations, it forms floating sedge mats which often intergrade with sphagnum mats.

The community is more common at elevations approaching mid-montane. At mid-elevations it occurs in seasonally flooded cold drainages with Carex rostrata and C. sitchensis communities, and some sphagnum bog vegetation.

Typical species:

Calamagrostis canadensis 75-95%

Other species:

Carex rostrata

Carex sitchensis

Potentilla palustris

Salix spp.

Spiraea douglasii

Typha latifolia

Carex cusickii community: This community occurs on floating mats, usually around lake margins. It is species rich and often contains some sphagnum moss (< 6% cover) and sphagnum associated plant species.

Typical species:

Carex cusickii 40-45%

Other species:

Agrostis scabra
Alnus rubra
Carex interior complex
Carex sitchensis
Cicuta douglasii
Drosera rotundifolia
Epilobium sp.
Galium spp.
Juncus balticus

Mentha arvensis
Menyanthes trifoliata
Mimulus guttatus
Myosotis laxa
Oenanthe sarmentosa
Potentilla palustris
Spiraea douglasii
Typha latifolia
Veronica americanum

Carex obnupta community: This is a commonly occurring community along the forested margins of 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
Calamagrostis canadensis
Carex cusickii
Carex sitchensis
Cicuta douglasii
Epilobium sp.
Galium spp.

Glyceria elata
Mimulus guttatus
Myosotis laxa
Oenanthe sarmentosa
Potentilla palustris
Puccinellia palustris

Carex sitchensis community: This community occurs in seasonally to permanently flooded areas on sedge peat. It may occur as a monospecific sward or intermixed with several other freshwater wetland communities: C. rostrata, C. cusickii, Calamagrostis canadensis and Spiraea douglasii.

Typical species:
Carex sitchensis 30-70%

Other species:
Carex cusickii
Carex rostrata
Juncus balticus

Nuphar polysepalum
Potentilla palustris

Carex vesicaria community: This community occurs over glacial till which has very little organic matter. It usually occupies a zone just landward of permanently flooded areas, though occasionally it occurs in areas permanently flooded with shallow water. It is typically a monospecific community.

Typical species:
Carex vesicaria 25-65%

Other species:
Dulichium arundinaceum
Eleocharis palustris
Nuphar polysepalum
Potamogeton spp.

Puccinellia palustris
Ranunculus flammula
Sium suave
Sparganium spp.

Dulichium arundinaceum community: This community occurs over glacial till which has very little organic matter. It occupies either the permanently flooded, shallow water areas or seasonally flooded areas. It is nearly monospecific.

Typical species:
Dulichium arundinaceum 50-75%

Other species:
Carex vesicaria
Eleocharis palustris
Menyanthes trifoliata

Nuphar polysepalum
Potentilla palustris

Spiraea douglasii community: This community can be either seasonally or permanently flooded. Spiraea douglasii typically forms dense, nearly monospecific stands, 6-10 feet tall. Along the margins of these stands, and in less dense stands, may be found a large number of associated species. Soils are usually organic muck.

Typical species:
Spiraea douglasii 20-100%

Other species:
Carex cusickii
Carex obnupta

Myosotis laxa
Oenanthe sarmentosa

Carex rostrata
Carex sitchensis
Cicuta douglasii
Cornus stolonifera
Glyceria elata

Potentilla palustris
Salix spp.
Sparganium spp.
Viola palustris

Alnus rubra/Lysichitum americanum community: This community occurs near the wetland margin where soils are usually super-saturated and may be seasonally flooded. Soils are organic, usually overlying sands.

Typical species:

Alnus rubra 80%
Lysichitum americanum 35-60
Athyrium filix-femina 8-10%
Rubus spectabilis 5%

Other species:

Carex obnupta
Cornus stolonifera
Blechnum spicant
Impatiens capensis
Lonicera involucrata
Maianthemum dilatatum
Oenanthe sarmentosa
Picea sitchensis

Pteridium aquilinum
Pyrus fusca
Thuja plicata
Tiarella trifoliata
Tolmiea menziesii
Tsuga heterophylla
Vaccinium parvifolium

Alnus rubra/Rubus spectabilis community: This community is commonly occurring, though it is unusual to find examples which have not been disturbed by humans. It typically occurs along the upland margin of wetlands. Soils are organic, and are usually saturated year round. They may be flooded seasonally. Alnus rubra forms a closed canopy. Rubus spectabilis may be the only species in the understory.

Typical species:

Alnus rubra 40-80%
Rubus spectabilis 30-60%

Other species:

Athyrium filix-femina
Equisetum hyemale
Galium trifidum
Lonicera involucrata
Lysichitum americanum
Thuja plicata

Tiarella trifoliata
Tolmiea menziesii
Tsuga heterophylla
Ribes sp.
Rubus ursinus
Sambucus racemosa

Fraxinus latifolia/Salix spp. community: This community occurs around the margins of wetlands. Soils may be thin over glacial

till or may have a relatively deep organic layer. These wetlands are usually seasonally flooded.

Typical species:

Fraxinus latifolia
Salix spp.

Other species:

Acer circinatum
Ainus rubra
Carex obnupta
Cornus stolonifera
Maianthemum dilatatum
Populus trichocarpa

Physocarpus capitatus
Pyrus fusca
Rhamnus purshiana
Rosa nutkana
Rubus spectabilis
Symphoricarpos alba

Pyrus fusca community: This community often encircles sphagnum bogs and kettle wetlands. It appears to occur over well drained glacial till with a thin organic layer. It has almost no under-story.

Typical species:

Pyrus fusca 30-80%

Other species:

Ainus rubra
Carex obnupta
Lysichitum americanum
Maianthemum dilatatum

Rhamnus purshiana
Salix spp.
Spiraea douglasii

Tsuga heterophylla/Lysichitum americanum community: This community occurs on organic soils, where the water table is at or slightly below the surface. It occurs in cold drainages. Conifer species form an open canopy. Gaultheria shallon and Vaccinium alaskense are dominant over fallen logs and occasional mounds of soil. Lysichitum americanum is the dominant species between logs, where soils are permanently or seasonally flooded. Some Sphagnum moss is usually present.

Typical species:

Tsuga heterophylla 10-20%
Lysichitum americanum 20-30%
Gaultheria shallon 25-30%
Thuja plicata 5-10%
Sphagnum spp. 5%

Other species:

Carex canescens
Carex leptalea
Carex rostrata
Cornus canadensis

Lonicera involucrata
Maianthemum dilatatum
Menziesia ferruginea
Picea sitchensis

Blechnum spicant
Galium spp.
Glyceria elata
Ledum groenlandicum
Lonicera involucrata

Rhamnus purshiana
Sparganium spp.
Vaccinium alaskaense
Vaccinium parvifolium

NON-RECURRING COMMUNITIES

LOW ELEVATION SPHAGNUM BOG COMMUNITIES

Carex sitchensis/Sphagnum spp. community: This community occupies very small areas and may be ecotonal. It typically occurs on firm substrates, but also may be found on quaking mats. It either forms dense monospecific stands or species rich swards. It is usually found intermixed, or in a mosaic, with the Carex cusickii or Spiraea douglasii bog communities. Soils are a mixture of sedge and sphagnum peat, and are seasonally flooded.

Typical species:

Carex sitchensis 30-70%
Carex cusickii 15-20%
Potentilla palustris 5-30%

Other species:

Equisetum fluviatile
Galium sp.
Kalmia occidentalis
Ledum groenlandicum
Lysichitum americanum
Mentha arvensis

Menyanthes trifoliata
Nuphar polysepalum
Spiraea douglasii
Vaccinium oxycoccos
Viola palustris

Pinus monticola/Ledum groenlandicum/Sphagnum spp. community: This is a very rare community although it once may have been more common. It has been nearly eradicated through disease, timber harvest, and manipulation of its habitat. Remnant examples have scattered P. monticola and a tall, but open, shrub layer. This community occurs mostly in the southern Puget Trough region.

Typical species:

Pinus monticola 10-15%
Ledum groenlandicum 50-80%
Spiraea douglasii 5-10%

Other species:

Carex canescens
Eriophorum chamissonis
Gaultheria shallon
Kalmia occidentalis
Lysichitum americanum
Pinus contorta

Pseudotsuga menziesii
Pteridium aquilinum
Tsuga heterophylla
Vaccinium oxycoccos
Vaccinium parvifolium

LOW ELEVATION FRESHWATER WETLAND COMMUNITIES

Carex lasiocarpa community: This community can be monospecific. It is found in areas where it is seasonally flooded, on firm substrates or on quaking mats. The substrate is typically either sedge peat or a mixture of sedge and sphagnum peat.

Typical species:

Carex lasiocarpa 30-60%

Other species:

<i>Carex sitchensis</i>	<i>Lysichitum americanum</i>
<i>Drosera rotundifolia</i>	<i>Nuphar polysepalum</i>
<i>Dulichium arundinaceum</i>	<i>Potentilla palustris</i>
<i>Hypericum anagalloides</i>	<i>Viola palustris</i>

Carex livida community: This is a rare community. It is species rich and may include sphagnum moss. It occurs on sedge peat or a mixture of sedge and sphagnum peat.

Typical species:

Carex livida 35-75%

Other species:

<i>Carex oederi</i>	<i>Juncus supiniformis</i>
<i>Carex sitchensis</i>	<i>Rhynchospora alba</i>
<i>Drosera rotundifolia</i>	<i>Tofieldia glutinosa</i>
<i>Equisetum fluviatile</i>	<i>Trientalis arctica</i>
<i>Juncus ensifolius</i>	<i>Viola palustris</i>

Alnus incana community: This community is very difficult to inventory, and has been insufficiently surveyed and characterized. With further work, it may be defined as one or more reoccurring communities.

This community occurs as dense shrub thickets, usually permanently flooded. Soils are organic muck. It usually has a large complement of shrubby species.

Typical species:

Alnus incana 30-60%
Salix spp. 10-30%
Spiraea douglasii 10-30%
Lysichitum americanum
Oenanthe sarmentosa

Other species:

<i>Alnus</i> spp.	<i>Picea sitchensis</i>
<i>Gaultheria shallon</i>	<i>Pyrus fusca</i>
<i>Glyceria elata</i>	<i>Thuja plicata</i>

Lonicera involucrata
Physocarpus capitatus

Tsuga heterophylla

Salix spp. community: All Salix dominated wetlands have been lumped into this one community because of the difficulties in species identification and site surveys. With further work, it will probably be divided into one or more reoccurring communities.

These wetlands are either permanently or seasonally flooded and occur on organic muck. The vegetation usually consists of several shrubby species forming a dense stand. There are several understory microenvironments related to water depth and substrate within the stand. These microhabitats support different plant species.

Typical species:

Salix spp. 20-60%
Spiraea douglasii 5-60%

Other species:

Alnus spp.
Athyrium filix-femina
Carex obnupta
Carex rostrata
Carex sitchensis
Cornus stolonifera
Glyceria elata
Lonicera involucrata
Lysichitum americanum

Maianthemum dilatatum
Oenanthe sarmentosa
Physocarpus capitatus
Potentilla palustris
Rhamnus purshiana
Sparganium spp.
Veronica scutellaria
Viola palustris