Appendix B: WATER RESOURCES OVERVIEW AND RECOMMENDATIONS FOR SAN JUAN ISLAND NATIONAL HISTORICAL PARK

Description and Overview of Water Resources

San Juan Island National Historical Park (SAJH) consists of two separate units on San Juan Island, one of many islands between Vancouver Island (Canada) and the State of Washington mainland. The British Camp Unit consists of 529 acres located on Garrison Bay and Westcott Bay along the northwestern shore of San Juan Island. The American Camp Unit contains 1,223 acres spanning the peninsula between Griffin Bay and the Haro Strait near the southeastern tip of the island. Though some streams exist on San Juan Island, water resources inside the park are limited to groundwater and wells, small springs, lagoons and other shoreline features. These features support important historic, natural, and scientific resources within the National Historical Park.

Precipitation is remarkably variable on San Juan Island, which is only 10 miles in diameter. This variability is caused by rain shadow effects of the Olympic Mountains located just across the Strait of Juan de Fuca. The southern tip of the island, including American Camp, is the driest, averaging about 17 inches of precipitation annually. The higher elevations in the northern portion of the island average approximately 32 inches of precipitation a year. British Camp, located in the northwestern portion of the island, receives approximately 26-28 inches of precipitation each year. The winter months are significantly wetter than the summer months, though rainfall may occur during any time of the year. Winter precipitation occurs primarily as soaking rains, though a small amount of snow may fall each year. While a small percentage of the precipitation percolates into the groundwater table, the greatest percentage of precipitation is lost to runoff, evaporation, and evapotranspiration.

While surface freshwater resources are very limited, a few small springs do occur along the southern slopes in American Camp. Riparian vegetation around these springs indicates their location clearly on areal photographs. This vegetation, consisting of dense thickets of a broadleaf willow, made it impossible for us to reach the actual spring site and observe or measure surface flow. Flow apparently surfaced here historically, as the location of these springs was one factor in locating the original American Camp. The only other fresh surface water we know of at American Camp is a small shallow pond/wetland on the wooded north slope of Mt. Finlayson.

The only possible surface freshwater feature at British Camp is the parade ground, which was probably once a wetland. Saturated soils are a problem here during the wet months, which includes part of the growing season. It is not known if the soils are hydric, and the vegetation does not provide any indication because it consists of lawn grasses with a few old shade trees.

Marine and shore features are more varied. The north shore of American Camp, along Griffin Bay, is a long beach of fine gravel with three tidal lagoons, Old Town Lagoon, Jakles Lagoon, and Third Lagoon. Temperate marine lagoons such as these are uncommon along the Pacific coast of the northwestern United States and are considered to be valuable resources. Jakles Lagoon is the largest and apparently the most hydrologically and biologically productive of these lagoons. It has regular circulation with the bay, and salinity data indicate the possibility of groundwater inflow from the slopes of Mt. Finlayson. The southern shore of American Camp along the Strait of Juan de Fuca, has rock outcrops and gravel beach. Swimming occurs on both the northern and southern beaches of the unit, even though the water is cool.

The shore of British Camp lies in the low-energy, protected waters of Garrison Bay and Westcott Bay. As such, much of the intertidal zone consists of a productive mudflat (Hoffman, 1966), and recreational shellfishing is popular where it is allowed (north of the ferry dock and into Westcott Bay).

American Camp was originally a prairie and retains the appearance of a prairie today. It was overgrazed for many years and the timber surrounding the prairie was harvested. Livestock eliminated the perennial grasses and introduced rabbits appear to be at least partly responsible for keeping native bunchgrasses out of the prairie. Vegetation now consists of annuals and perennial exotics, with numerous bald spots that have been cleared by the rabbits. The park has plans to restore some of the native vegetation. This will include reforestation of about 30 acres and planting native grasses elsewhere. Some natural tree regeneration is occurring, but tree establishment and growth has been very slow, possibly due to the rabbits, soil compaction, past erosion, or harsh micro-climates caused by the timber harvesting. Eagles reside and nest in the area and occasionally feed on the rabbits.

From a hydrologic perspective, the disturbed vegetation at American Camp has probably increased runoff over natural conditions, but sheet erosion and gullying do not appear to be problems. Evapotranspiration has probably been reduced due to the loss of forest canopy and perennial grasses. Whether groundwater recharge differs from natural conditions is not clear at this level of examination.

With the exception of the parade ground, and the forests being second or third growth, the vegetation and hydrology at British Camp is probably much as it was 1859.

Since surface waters are so limited, the park and most island residents must rely on groundwater as the source of domestic water supply. Like most island aquifers, the fresh water on San Juan Island is floating on salt water. If the fresh water is pumped faster than it is recharged, salt water moves in to take its place. Once the aquifer is contaminated by saltwater, recovery as a water supply is a slow process. Preventing saltwater intrusion is, therefore, an important ongoing concern both for park management and for island residents. This is particularly true in areas on San Juan Island where some wells have already been affected.

Water quality in the domestic supply well at American Camp is a problem. When it was first drilled in 1970 it produced water of acceptable quality for domestic use. Analysis in 1981, and thereafter (including this year), have found the water to exceed drinking water standards for manganese, chloride and dissolved solids. High levels of chloride could indicate the influence of salt water intrusion.

There are residential developments around both units that rely on groundwater for their domestic supply. Residential development has been occurring east and west of American Camp for several years. The residents, state, and National Park Service officials are concerned about the adequacy of groundwater resources in this area.

1- Groundwater and Water Rights

Obtaining a water supply has always been an important concern at American Camp, and water rights have more recently become the focus of attention. Czarnowski (1988) explored this issue in depth and prepared a report entitled Hydrologic Characterization and Inventory of Water Rights, Uses and Requirements at American Camp Unit, San Juan Island National Historical Park.

This report offers an excellent overview of the hydrologic conditions, provides a history and status of water rights, and proposes alternatives for future management of this important resource. We will not restate the contents of this report here. Instead, we provide a brief summary, and a discussion of some areas we think should be included in the ongoing efforts by the Water Rights Branch of the NPS Water Resources Division.

There are three basic water rights issues at American Camp; water rights for the use of water for administration of the site, water rights for the protection of park resources, and responding to requests to export water to adjacent developments from wells within the park. The park has a certified water right for the well at the current temporary visitor center for 3.5 gpm, or 5,000 gpd (1.5 acre feet per year). This quantity is sufficient to meet current visitor needs, but may have to be increased to support a planned permanent visitor center.

The National Historical Park may also have, as yet unquantified, water rights for the water necessary to protect the natural and cultural features for which the park was established. It is fortunate that most of the resources dependent on fresh water are located along South Beach, relatively distant from water supply wells adjacent to the eastern boundary of American Camp. A possible exception to this, however, may be Jakles Lagoon and Third Lagoon. In reviewing the literature available on Jakles Lagoon, we found reports of fluctuations in salinity (Horch, 1966; Hardy, 1973; Landry, 1978), possibly indicating subsurface fresh water inflow into the lagoon. Since there are no active or intermittent surface channels flowing into the lagoon, any freshwater input into the lagoon is dependent upon direct precipitation, intermittent runoff, or groundwater discharge. While yet unproven, the possibility that groundwater is entering the lagoons via aquifer interception cannot be dismissed. If significant amounts of groundwater are regularly flowing into Jakles Lagoon and Third Lagoon, then that flow and the ecological integrity of the lagoon could possibly be impacted by pumping in the vicinity. Additional studies may be required to address this issue.

There have been requests by landowners outside the park to take water from presently unused wells inside the park. We agree with Czarnowski's recommendation to deny any such requests.

Water supply has been less of a concern at British Camp because of the greater precipitation in the area, the relatively greater distance to developments at Roche Harbor, and since National Park Service use of this water is very limited. This unit has one maintained well and two inoperative historic wells. The park does not provide drinking water for visitors and relies on vault toilets for sanitary purposes. Presently, there are no park residences utilized on site. The only current water uses are for maintenance of the structures and grounds, supporting a maintenance facility, and for fire protection. Water consumption may increase in the future if employee housing or more extensive facilities are needed. One on-site building, the Crook House is currently being considered for possible renovation and for use as employee housing, which is a continuing problem at SAJH because property values are extremely high.

Even though current water use is limited, there are several issues at British Camp that should be included in water rights investigations for San Juan Island National Historical Park. The operating well at British Camp was purchased along with state land. The status of water rights for this well are presently unknown. During our visit the park staff observed a notice posted requesting a zoning change in order to subdivide ranch lands immediately south of British Camp. Successful subdivision will almost certainly result in increased needs for groundwater withdrawals.

The British Camp Unit also contains an historic orchard that, in spite of suffering years of neglect, has several surviving trees of historic cultivars. The park is interested in returning the orchard to its historic appearance and providing for its interpretation. This may require water and a water right for irrigation.

Representatives from the Water Rights Division visited the park earlier this year. One of the results of that visit will be the development of an action plan for addressing the water rights issues at SAJH. We have discussed our observations with Paul Christensen and Alice Johns of the Water Rights Branch, and suggested that the action plan also include water rights issues at British Camp, and an assessment of the value of possible fresh groundwater inflows into Jakles and Third Lagoon.

2- Management of Jakles Lagoon, Old Town Lagoon, and Third Lagoon

The three lagoons (Jakles Lagoon, Old Town Lagoon, and Third Lagoon) located along the northern shore of the American Camp adjacent to Griffin Bay represent the only three temperate marine lagoons found on San Juan Island. While little is known about Old Town Lagoon and Third Lagoon, extensive research has been undertaken by the University of Washington on the ecological aspects of various marine organisms in Jakles Lagoon. Past studies have included Hardy (1973), who studied the ecology of the phytoneuston, (microscopic planktonic organisms found in the surface micro-layer (upper 0.4 cm)); Shuman (1974) and Landry (1978) who reported upon the population dynamics, grazing patterns, and production of Acartia clausii (an important planktonic marine copepod); and Bollens and Frost (1989a, 1989b, 1991), Bollens and Stearns (1992), and Bollens et al. (1992), who studied the effects of zooplanktivorous fish upon the feeding cycles and diel vertical migration of zooplankton within the lagoon. In addition, the lagoon has, over the years, been an important source of marine organisms for researchers conducting physiological and other research studies (see Strathmann, 1973; Landry 1975a, 1975b; and Chaffee and Strathmann, 1984) and has served as an excellent field laboratory for students taking summer courses at the Friday Harbor Laboratories (see Horch, 1966; Lambert, 1967; Banse and Postel, 1970; Postel, 1970; and Shuman, 1974).

Jakles Lagoon is the largest of the three lagoons found at American Camp. It is separated from Griffin Bay on the north by a bar composed of gravel and driftwood, which is bisected by a narrow tidal channel allowing saltwater exchange during high tides. The hydrography and bathymetry of Jakles Lagoon are briefly reviewed in Landry (1978). He reports that the lagoon is separated into two basins, a "main" lagoon with a surface area of approximately 6.5 acres, a maximum depth (at high tide) of 13.2 feet (4 meters) and a mean depth of approximately 8 feet (2.4 meters), and a smaller "side" lagoon with surface area of 1.2 acres (0.5 hectares) and a maximum depth of approximately 6 feet (1.8 meters). Landry (1978) further reports that the "side" lagoon becomes separated from the "main" lagoon during the summer and is periodically anoxic.

The heavily forested hills of Mount Finlayson help to protect Jakles Lagoon from heavy winds and turbulent mixing (Hardy, 1973). Except for periodic runoff, there is no evidence of surface freshwater flow into Jakles Lagoon, though salinities lower than might otherwise be expected led Horch (1966) to postulate a possible groundwater inflow. The presence of a groundwater recharge zone on Mount Finlayson is probable, as evidenced by a growing number of water supply wells just outside the eastern boundary of the unit. Inflow from this shallow aquifer into both Jakles Lagoon and Third Lagoon, while not documented, is also a distinct possibility, and its ecological significance (if it exists) is unknown.

Water temperature and salinity data for Jakles Lagoon are available from Horch (1966), Banse and Postel (1970), Hardy (1973), and Landry (1978). As might be expected, water temperature and salinity display a greater range of variability within the lagoon than in the adjacent waters of Griffin Bay. Landry (1978) reported that surface water temperatures in the "main" lagoon ranged from a low of 4°C (Centigrade) in January to a high of 20-21°C in late summer. By comparison, surface water temperatures in Griffin Bay rarely exceed 14-15°C. Thus, during the late spring and summer, the cooler water from Griffin Bay is denser than the surface water within Jakles Lagoon and flows to the bottom of the lagoon (Landry, 1978).

Hardy (1973) reported surface water salinities ranged from 22.6-31.8 parts per thousand (o/oo) in the "main" lagoon as compared to a more narrow range of 30.2-31.3 o/oo in Griffin Bay waters. Similarly, Landry (1978) found that surface water salinity within the "main" lagoon ranged from 25-34 o/oo during his study. The reasons for the increased variability within the lagoon could include the effects of direct precipitation, runoff, and evaporation, and the possible influence of groundwater interception.

Horch (1966) and Lambert (1967) provide faunal lists of organisms found in Jakles Lagoon. In addition, a large number important studies focusing upon the population dynamics and ecological interactions of various planktonic organisms have been completed in Jakles Lagoon establishing the importance of the lagoon as a long term research site.

The current San Juan National Historical Park's Draft Resource Management Plan (National Park Service, 1992) recommends the continued management of Jakles Lagoon as a research area. The Resource Management Plan further identifies (Project Statement SAJH-N-004) the need for the development of a Jakles Lagoon Management Plan.

The Water Resources Division is impressed with the long history of rewarding research that has been undertaken in this system. Not only has the research conducted within this system been well received by the scientific community, but information gained from these studies provide valuable background information both for assessing the integrity of this resource and for planning for its future management.

The Water Resources Division strongly endorses the continued use of Jakles Lagoon as a research area and recommends the timely development of management plan for this important resource. In addition, SAJH should view Jakles Lagoon as a valuable interpretive resource both as a natural system (temperate marine lagoon) system and for its value to the scientific community. The Water Resources Division would be pleased to assist SAJH's interpretive staff in developing an interpretive program focusing upon the important scientific studies that have been completed in this system.

3- Oil Spill Contingency Inventory and Monitoring Requirements

The location of San Juan Island National Historical Park on the heavily transitted Strait of Juan De Fuca, Haro Strait, and San Juan Channel makes this unit particularly vulnerable oil and other hazardous substance spills and their associated environmental impacts. Because of this, SAJH is encouraged to take part in the U.S. Coast Guard's Spill Contingency Planning Area Committee and to develop a Spill Contingency Plan.

Representation on the U.S. Coast Guard's Spill Contingency Planning Area Committee is presently the best opportunity by which the National Park

Service can let its resource concerns be known when planning for a major spill. Information on Area Committee representation can be provided by the Environmental Quality Division (WASO) or the U.S. Coast Guard's Marine Safety Officer (Seattle).

The development of a Spill Contingency Plan is being recommended for all units of the National Park Service located in areas exhibiting a moderate-high probability of being affected by an oil or hazardous material spill. While federal activities in response to a major spill in the vicinity of SAJH would be coordinated by the U.S. Coast Guard, the National Historical Park is encouraged to develop a Spill Contingency Plan outlining Standard Operating Procedures detailing actions to be undertaken from the time a spill is discovered until appropriate spill response authorities arrive on the scene. In addition the Spill Contingency Plan should identify (on a seasonal basis) natural resources of particular concern in order that this information may be available to the Regional Response Team in the event of a spill. Examples of well written Spill Response Plans for Cape Cod National Seashore, Laguna Atascosa National Wildlife Refuge, and a "generic" plan prepared for Alaskan units of the National Park Service have been forwarded under separate cover.

In addition, the Water Resources Division recommends the initiation of spill-related inventory and monitoring activities within the intertidal zone for both units as part of the National Historical Park's spill contingency planning efforts. During our visit, we had the opportunity to meet with Dr. Megan Dethier of the Friday Harbor Laboratories, who proposed the establishment of seven permanent transects for the periodic monitoring of intertidal biological communities often impacted by oil spills. Dr. Dethier is well versed in this work and presented the Superintendent with a well formulated, and reasonably-priced proposal to initiate this work. While recommending the initiation of this study the Water Resources Division would further suggest the analysis of expanded polycyclic aromatic hydrocarbons (PAHs) which includes the alkylated PAHs, for both water and sediment (reported both as wet weight and dry weight) at selected transect sites. Because of the high cost associated with these chemical analyses (approximately $400-$500 per site), this work would be limited to select sites (perhaps 3) every other year. These chemical analyses would, however, provide invaluable background information in the event of a spill. Information on laboratories qualified to perform this type of analyses is available from Dr. Roy Irwin, Water Operations Branch, Water Resources Division [303-221-8328].

One final point to be made is that the monitoring efforts recommended above need to be repeated both seasonally and over a number of years. Information on funding sources to support these on-going monitoring requirements may be available from John Donahue (Environmental Quality Division (WASO) [202-208-4274].

4- Jurisdiction and Ownership of the Shoreline

Ownership of the tidal zone and the jurisdiction for its management have become an issue at British Camp. Recreational clamming is permitted north of the dingy dock, where it is thought that the state of Washington, Department of Wildlife has jurisdiction. It is not permitted south of the dock where NPS has jurisdiction. Neither the park or regional staff were certain as to the legal status of these tidelands. It is not clear if there is in fact a change in jurisdiction, and if there is, that the taking of natural resources from the park should be allowed. The park recognizes the clams as an important component of the mudflat ecosystem and worthy of protection. It might be that we are unaware of previous investigations of this issue that have resulted in the current practices. If it has not already been done, we suggest further

research into this issue in the regional office, Lands Division, and, if necessary, with the Solicitor's Office.

Recommendations

The present Resources Management Plan for San Juan Islands National Historical Park is both current and well-written. With the exception of the oil spill contingency planning issue, the water resources-related issues are well documented and appropriate project statements have been written. In addition, park staff has been coordinating with the WRD's Water Rights Branch in developing a strategy for addressing the most pressing water resource issue - water rights and groundwater withdrawals. Thus, we do not feel that the completion of a Water Resources Scoping Report is necessary at this time. We do however, encourage the continued cooperation between the park and the Water Resources Division and suggest the completion of an additional RMP project statement to address oil spill contingency planning activities.

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