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FISH WEIRS AND AN INTERIOR SALMON FISHERY ON THE NAUTLEY RIVER, CENTRAL BRITISH COLUMBIA*

PAUL PRINCE
MacEwan University, Canada

ABSTRACT

Portions of wood stake salmon fishing weirs have been recorded in the Nautley River of central British Columbia dating from roughly the 13th to early 20th century A.D. The factors contributing to the preservation and detection of these features are considered, along with their spatial arrangement, and it is argued they are the remains of wood fence and basket trap weirs used to harvest sockeye salmon. The early dates and the fact that these features have survived at all have significant implications for interpretations of the development of the ethnographically described salmon focused cultures of this area, and the network of relationships they developed to compensate for cycles in sockeye abundance. It is argued here that weirs are not a result of recent diffusions, and that there is potential for the remains of similar features to be found in other streams of the region, such that long-term cultural adaptations can be better defined.

INTRODUCTION

Wood stake fishing weirs were widely employed by aboriginal peoples of the Pacific Northwest, including the Northwest Coast and the salmon bearing parts

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of the Interior culture area (Bernick, 1998a; Drucker, 1963; Stewart, 1982). They are best known in coastal streams and estuaries, where they were used to take a wide range of fish species, and have been recorded at many archaeological sites from Alaska to Oregon, as recently reviewed by Moss (2013). Very few weirs have been recorded archaeologically inland (Moss and Erlandson, 1998:183; Prince, 2005). This article presents evidence of wood stake weirs dating back to 660 ± 40 B.P. in the Nautley River of the Nechako watershed, in the Central Interior of British Columbia (Figure 1). The archaeological site registry of British Columbia lists only 15 other weir sites in the basin of the Nechako and other tributaries of the upper Fraser River—most notably the Blackwater, to the south of the study area, where eight sites are listed. None have been dated. Most entries provide no details on the configuration of these features, or what they are made of, but three are described as arrangements of cobbles suitable for blocking, or funneling suckers or kokanee during their spawning runs (Cranny, 1986:128; Traces, 2003:3). Given the locations of many of the other weirs on small streams beyond major salmon routes, they may also have served to capture non-anadromous species. Prior to surveys in the Nautley River though, no archaeological examples of wood weirs had been described in detail, dated, or studied in relation to a major salmon stream this far inland. This is significant because salmon were the most important fish in the Central Interior, providing the basis for a storage based, delayed-return economy, and wood stake weirs are known from ethnohistoric sources to have been a widely used and effective means of capturing them (Kew, 1992).

The Nautley River is a short channel that drains Fraser Lake into the Nechako River, which in turn feeds the Fraser River. It flows through Nautley Indian Reserve 1—the hub of the territory of the Nadleh Whut'en Carrier. This work is informed by ethnographic and historical details pertaining to the salmon fisheries of the Nadleh Whut'en and neighboring Carrier (Dakelh) groups of the Nechako watershed, as well as the related Wet'suwet'en of the Bulkley watershed and Babine Nation of the Babine watershed. For all of these Carrier peoples, salmon were the staple resource. There is abundant ethnographic evidence for the techniques used to catch, preserve, and store salmon, as well as the strategies employed to manage fisheries (Hudson, 1983; Morice, 1889, 1893; Tobey, 1981). Archaeological investigations of subsistence in the Nechako watershed are much sparser and have yielded relatively few salmon bones. These do not seem to have survived in very large quantities, even at locations known to have been important salmon fishing spots. Instead, small to medium sized terrestrial and semi-aquatic mammals dominate the identifiable portions of zooarchaeological assemblages (Cranny, 1986; Prince and McAvoy, 2012). The remains of fish weir facilities thus provide the best available evidence for a salmon fishery in the region geared toward taking large quantities of fish, extending back several centuries. This represents an earlier focus upon salmon than expected and has implications for long-held models of cultural development in the area.

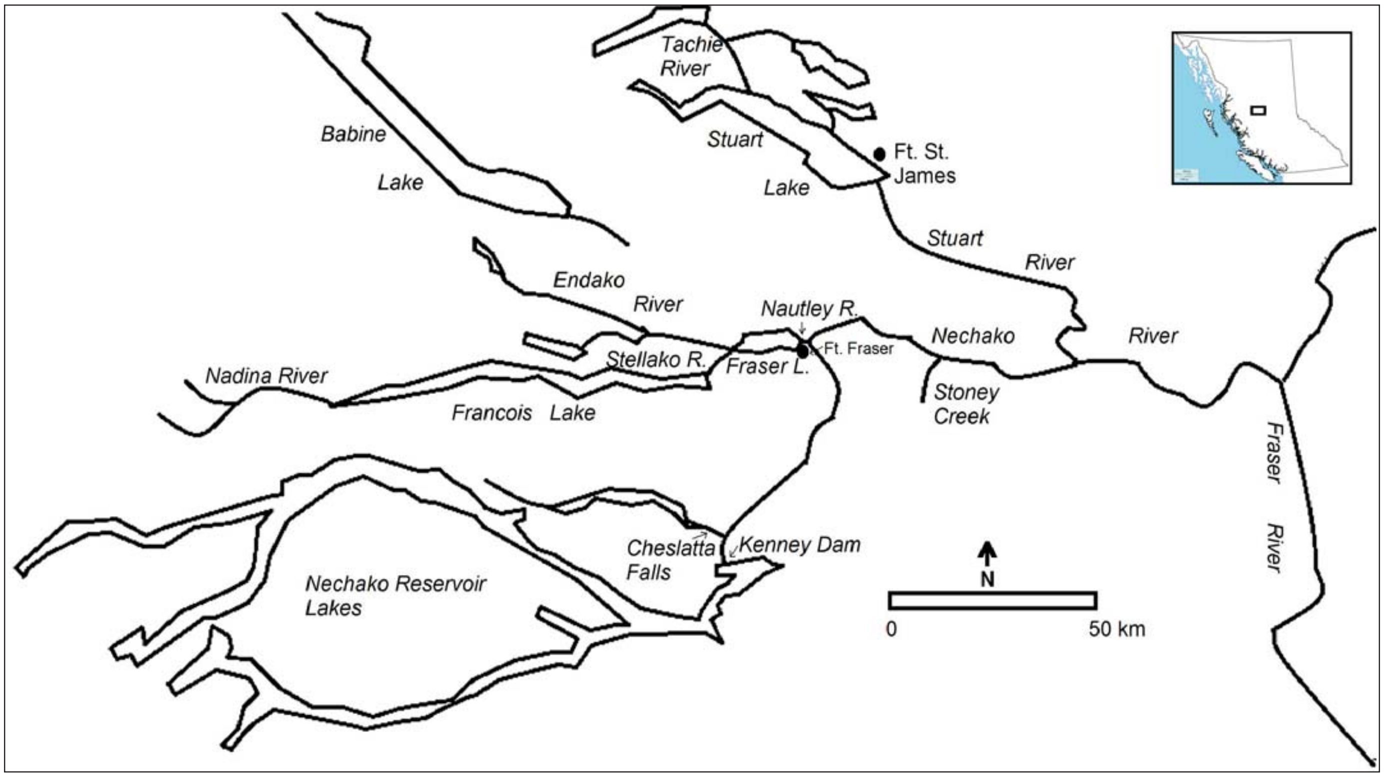

Figure 1. Map showing the location of the Nautley River in Central British Columbia, salmon spawning locations and fur trade posts discussed.

A dominant anthropological view has been that the Carrier peoples adopted various aspects of Northwest Coast culture in the 1700s or later as a package which included: matrilineal kinship, hereditary resource rights, social ranking, the potlatch, art and architecture traditions, and a residential focus upon villages at salmon streams where weirs were erected (Bishop, 1987; Cranny, 1986; Goldman, 1941; Kobrinsky, 1977; Steward, 1977). Syntheses of prehistoric cultural development in the Central Interior which do not concern themselves with the issue of historic period cultural diffusion assume that the Carrier settlement focus upon prime salmon fishing locations was a late and sudden occurrence, perhaps around 1000-1200 years ago (Fladmark, 2009:597; Matson and Magne, 2007:150). In a still broader sense, there continues to be debate over whether Northwest Coast and Interior cultures established intensive salmon fishing economies, which employed technologies of mass captures such as weirs, after a long period of settling in (Ames and Maschner, 1999; Matson and Coupland, 1995; Prentiss and Kuijt, 2004; Rousseau, 2004), or if there was a more immediate focus upon salmon (Cannon and Yang, 2006; Moss and Cannon, 2011a; Prince, 2011). Even when the issue of the development of salmon based culture is not addressed, the potential for detecting fishing features in the Central Interior is under-appreciated. Wood weirs are acknowledged in regional overview assessments and predictive models as potentially identifiable features (Carlson, 1996; Ecofor, 2004; Millennia, 1998), and have been occasionally recorded, as described above. However, they have not been routinely searched for and there seems to have been a tacit expectation that prehistoric wood weirs are not likely to be preserved (Rahemtulla, 2012:11; Traces, 2003:4), although this is now being tested. The dates on weirs reported here suggest that assumptions that there was a delay in orientation of settlement and subsistence toward salmon harvesting sites, that weir fishing diffused to the Central Interior as part of a constellation of proto-historic Northwest Coast cultural traits, and that preserved wood weirs are a rarity, all need to be reconsidered.

FISH WEIRS IN THE NORTHWEST COAST AND INTERIOR CULTURE AREAS

The term weir has been used somewhat inconsistently in the literature on aboriginal fishing technology to refer to a wide range of stone or wood stake features built in intertidal or stream environments to trap fish or direct them toward traps (Bernick, 1998a:178). This article is concerned with wood stake arrangements, which occur in many forms. They usually appear as short nubs of what used to be longer poles protruding above the mud. In intertidal and estuarine environments stakes could be arranged as a simple near shore impoundment that fish swam over at high tide and were stranded within when the tide receded (Byram, 1998:210; Moss and Erlandson, 1998:192; Tveskov and Erlandson, 2003:1025). Many very large and complex arrangements of weir stakes have also been found in estuaries forming lead lines or funnels that directed fish toward holding pens or portable basket traps (Byram, 1998:211; Caldwell, 2011; Greene, 2010).

The weirs described ethnohistorically in the Central Interior were most often fences of wooden stakes that spanned a river with lattice filling the intervening spaces to at least partially bar the passage of fish migrating to their spawning grounds. Throughout the greater Pacific Northwest weir fences functioned in a variety of ways, as reviewed in Prince (2005:73) and Moss (2013:325). Variations included: simply using a tight fence as an obstruction and netting the fish that swam up against it from a platform or canoe; building parallel rows of fences which forced fish to jump a downstream weir and become impounded between it and a taller upstream fence; arranging basketry traps at openings in a fence into which the fish swam; or as described in more detail below, positioning basketry traps on the downstream side of a weir fence so that tired salmon would be swept or directed into it by fishermen (Drucker, 1963:36; Emmons, 1991:105; Ksan, 1980:30; Morice 1893:85-87; Stewart 1982:99-111).

Weir Fishing by the Carrier

Wood stake weirs were one of several techniques the Carrier employed for mass capturing salmon and other fish as they schooled or made their way through constricted waterways on their way to spawn (Cranny, 1986:26). These included several kinds of fixed basket traps set to stakes in the water, or hung above cascades, as well as manually dipping nets or gaff hooks into pools and eddies from rocky ledges in canyons (Kew, 1992:204; Morice, 1889:129, 1893:89-90; Wet’suwet’en, 2011). The most effective salmon fishing methods, though, employed wooden stake fences and basketry or lattice work traps. Where waters were wide, deep, and turbid, partial “wing fences” were sometimes built near shore leading to traps (Kew, 1992:204; Swannell, 1923), but fences which could completely span shallow rivers were the most productive facilities. Within the Nechako watershed there are historical or traditional accounts of such weirs on the Nautley, Stuart, Endako, and Nadina rivers, as well as Stony Creek and one part of the Nechako River (Figure 1) (Carrier-Sekani Tribal Council [CSTC], 2007:16; Harmon, 2006; McLean, 1849; Traces, 2003:4; Wet’suwet’en, 2011:36). Hudson (1983:57) suggested they were much more common, though, with each Carrier local group maintaining a weir at its main village. The missionary Father A. G. Morice provided thick descriptions of wood fence weirs based upon first-hand observations in the late 19th century (Morice, 1893) (Figure 2). According to him, heavy vertical posts were driven into the riverbed at intervals of 12 to 15 meters, and slanting posts were set against them as braces to counter the current (Morice, 1893:84). Heavy horizontal poles were placed in the crook between the upright posts and braces at the waterline to make a top rail upon which people could walk. The intervals between the upright posts were filled in by poles driven into the bed of the river on the upstream side of the top rail (Morice, 1893:84). In Morice's (1893:85) account, "hurdles" were constructed of slats along the fence at intervals and projected downstream. Basket traps were placed into "corrals" formed by these hurdles, and consisted of two parts: a funnel-like basket called a *nazret*, and a narrow terminal basket called a *kes* (Morice, 1893:85) (Figure 2). These traps were very large: the *nazret* being 4.5 meters long and 1.8 to 2.5 meters wide, and the *kes* being 3 to 4.8 meters long and .15 meters wide (Morice, 1893:86). According to the fur trader Harmon (2006:126) basket traps could hold 400 to 500 salmon each. In Morice's description, fish swam upstream to the fence and, seeking a way past the barricade, entered an opening in the side of the corral. They then went into the funnel basket and terminal basket from which they could not escape (Morice, 1893:86). Photographs taken in 1909 of a weir in the Nautley River (Figures 3 and 4) match the general description of these constructions, with people standing on the top rail. There are structures projecting a short distance downstream which must be the corrals that held the basket traps. Lattice sheets project diagonally out of the water on the upstream side of the fence. These may have been gates to close openings in the fence when the corrals and traps were set on the downstream side.

There are several early 19th century fur trade accounts of full barricade fence weirs used by the Carrier which pre-date Morice's descriptions and differ in some regards (Anderson, n.d.; Fraser, 2007; Harmon, 2006; McLean, 1849). In particular, there is some variation in the sketchy details concerning the spacing of posts and positions of traps and lattices, which have bearing on what may be expected archaeologically. Fraser (2007:146-147), Harmon (2006:126), and McLean (1849:251-252) all indicated that basket traps were fitted into gaps left between posts in the fence, rather than in corrals on the downstream side. McLean (1849:251) said the stakes of the weir fence were driven six inches apart, except for these gaps, and both he and Fraser indicated lattice work was placed against the upstream side to further prevent fish from passing. Descriptions of weirs in 1904 on the Babine River by a fisheries officer named Helgesen suggest a wide spacing of posts (1.8 to 2.5 meters) could be used when the fence was backed with lattice (Harris, 2001:96).

Morice (1893:87) also described a variation on weir construction employed at the outlet of Stuart Lake where a partial weir was erected immediately downstream from a full weir (Figure 2). The partial "*kuntzai*" weir was a fence of posts extending from shore into the stream channel with a corral of lattice work extending back upstream and holding large cylindrical baskets (Morice, 1893:87-88). Salmon blocked by the full weir were directed by people in canoes into the *kuntzai* traps of the partial weir (Morice, 1893:88).

Ethnohistoric accounts indicate that weir fishing locations were regarded as the property of lineage groups, or clans; and the construction of the facilities, and the harvest, were managed by chiefs. A chief would direct construction of a weir after monitoring the beginning of a run to ensure that enough salmon had passed to their spawning locations (Harris, 2001:84). Individual families held rights

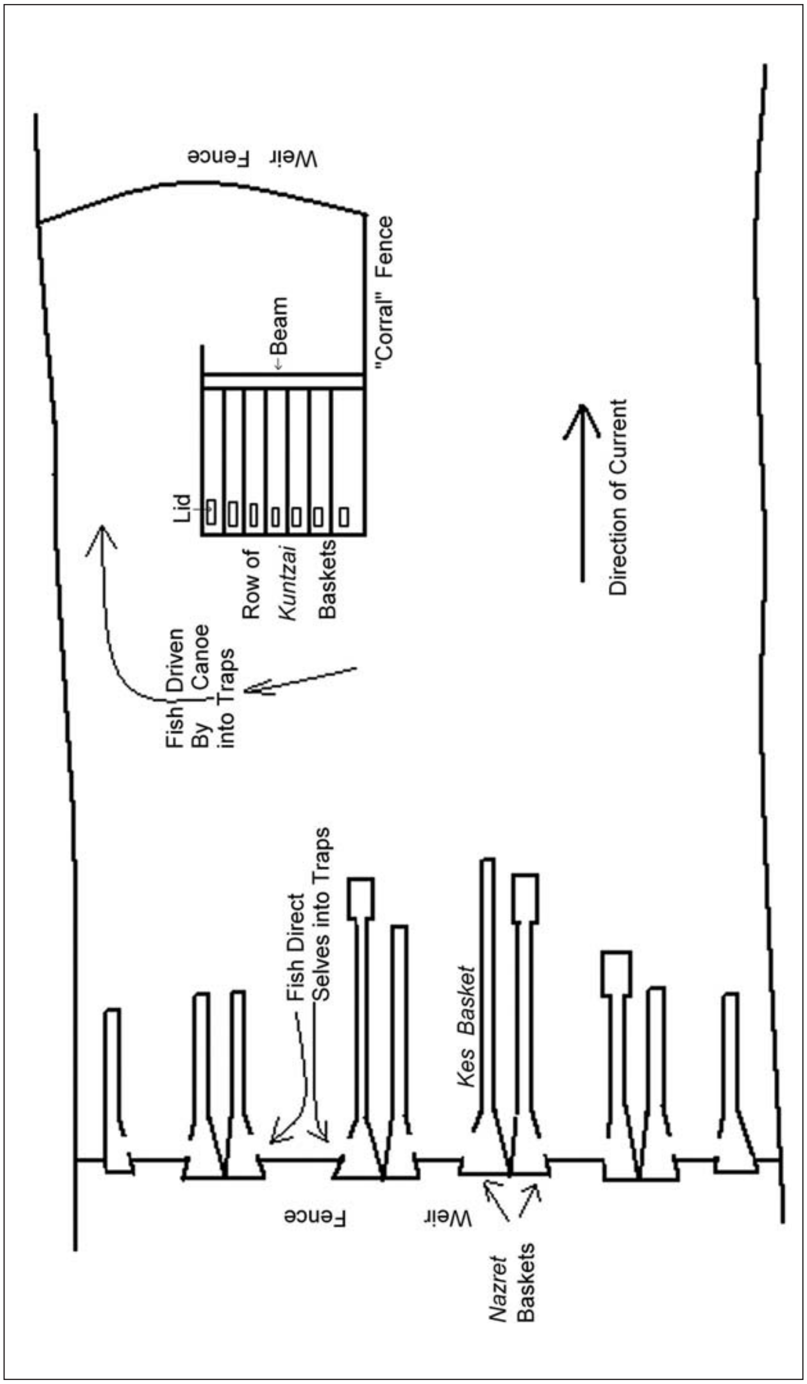

Figure 2. Diagram of weir operation. No scale provided. (Adapted from Morice, 1898:88).

Figure 3. Photograph of weir in Nautley River in 1909 looking toward the north bank. (Photograph by Frank Swannell, Courtesy Royal British Columbia Museum, BC Archives, G-03743.)

Figure 4. Photograph of weir in Nautley River in 1909 looking toward the south bank. (Photograph by Frank Swannell, Courtesy Royal British Columbia Museum, BC Archives, G-03876.)

which determined where they could set traps on the weir and for how long (Harris, 2001:84; Morice, 1889:130). The stocks themselves were managed by not only timing the setting of traps and regulating their placement, but the kind of weir construction also played a role in managing escapements. Anderson (n.d.:57) stated the Nautley and Stuart River weirs purposefully did not bar all fish from passing, but Helgesen claimed the Babine River weirs were so tight "not a single fish could get through" (Harris, 2001:96). It should be noted, however, that Helgesen was writing to justify a government ban on weir fishing. A further conservation strategy of importance for understanding site taphonomy is the dismantling of weirs. Harris (2001:23) and Losey (2010) have reviewed a common Pacific Northwest practice of dismantling weirs before salmon runs finished as an act of reciprocity and thanks for the fish and consideration for one's neighbors upstream. In some cases, a framework of stakes was left to rebuild on the next year (Losey 2010; Prince 2005:73; Stewart, 1982:99). Among the Carrier, the chiefs closed the fishery each season, and ordered the traps removed and the weirs dismantled. McLean (1849:252) stated "all the materials [were] removed," while Indian Agent Loring observed on the Babine River "only here and there a post [left] standing" (Harris, 2001:84). It would appear from the photographic and archaeological evidence at the Nautley River, however, that not all stakes were completely removed (Figure 4). The result is a palimpsest of stakes left from several weirs built in the same location, similar to what has been noted in other studies of weirs (Tveskov and Erlandson, 2003:1026).

WEIR SURVEY IN THE NAUTLEY RIVER

History of Investigation and Disturbance Factors

The presence of a weir in the Nautley River in the 19th and early 20th centuries is well documented, as shown in Figures 3 and 4. Remnants of other weirs, but not their exact locations, were remembered by several Nadleh Whut'en community members I spoke to. There was a general assumption that material evidence at most locations would not be preserved due to several modern disturbance factors, in addition to natural processes that cause weir stakes to be dislodged, worn, decayed, or buried. Such natural processes include: ice scour, seasonal and long-term fluctuations in water levels and velocity, variations in rates of sedimentation, exposure to cycles of wet and dry, and the activity of beavers (Prince, 2005:77; Tveskov and Erlandson, 2003:1024). Human disturbance factors in the Nautley River include the construction of a pile supported bridge, and livestock grazing, but the most radical change has been the dumping of fill along the north side of the middle stretch of the river to create a small island and alter the flow of the river (Figure 5). This occurred in the early 1950s, following the damming of the Nechako River headwaters at Nechako Canyon, as an effort to regulate the relative heights of the Nautley and Nechako rivers (Boudreau,

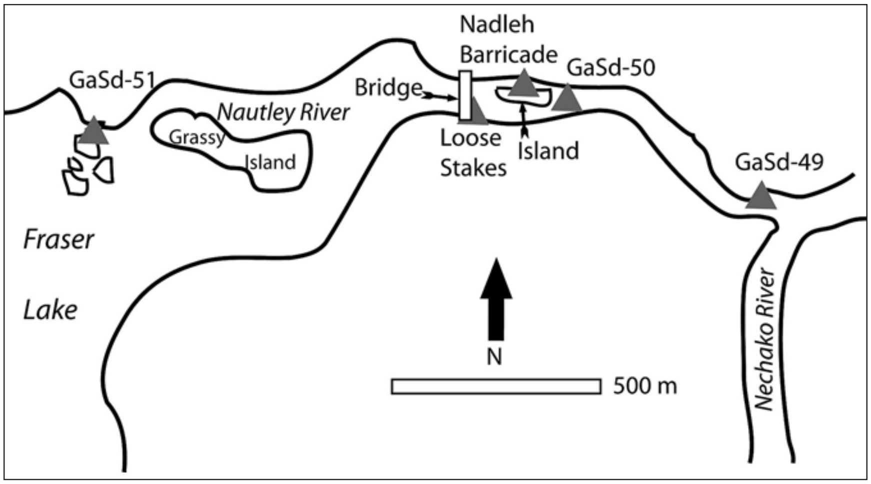

Figure 5. Map of the Nautley River showing weir sites and modern features referred to in the text.

2005:10; Bradford, 1994:965; Shrimpton and Heath, 2003:2573). The artificial island constricts the Nautley River channel, increasing the velocity of flow toward the Nechako and the amount of erosion in the riverbed. It also has caused the Nautley to change course, undercutting the terraces and bluffs on its south side and exposing sections of riverbed on the north side. There continues to be problems with regulating water balances between the Nechako and Nautley Rivers, producing radical fluctuations in water levels in the Nautley, and further exposing weir stakes to cycles of wet and dryness.

During an episode of extreme low water conditions in the Nautley River in the fall of 2003, the nubs of a large number of wood weir stakes were exposed in a small channel that runs along the north side of the artificial island. Recognizing that these were important features to document, the Nadleh Whut'en band contracted Traces Archaeological Research and Consulting to survey the channel (Traces, 2003). The survey recorded a cluster of 243 stakes, referred to as the Nadleh Barricade site and believed to include remnants of the weir shown in Figures 3 and 4. I conducted additional surveys for weir stakes along the near shore edge and portions of the river bed in 2009 and 2010. In 2009 an area along the south side of the river immediately west of the bridge, where people from the Nadleh community reported seeing stakes 25 years ago, was surveyed by snorkeling. Four dislodged stakes were found in a tangle of debris on the river bottom at the bridge. A second area inspected was along the north shore of the

Nautley near its confluence with the Nechako. This area was selected because it currently is the narrowest part of the river. We recorded a cluster of stakes here designated site GaSd-49.

In 2010 a more systematic survey was conducted. Particular attention was given to areas judged to have high potential for stake preservation and detection. This included narrow stretches of river with stable banks, near shore gravel shoals on the inside curves of river meanders, and a channel between four rocky islets and the north shore at the outlet of Fraser Lake. The Nadleh Barricade site was also visited to collect a sample from a stake for radiocarbon dating. Other areas were given less attention because of erosion or difficulties in seeing the riverbed. This included most of the mid-channel where the water is deep and swift, the broadest parts of the inlet to the Nautley River, and the bases of steep, undercut bluffs. Water levels in 2010 were lower than usual. In many areas a one- to two-meter wide gravel beach that is normally submerged river bed was exposed. Pedestrian surface survey was employed along the beaches. Slow moving waters that were knee to hip deep with a firm bottom were surveyed by wading. The south shore near the bridge is deeper and had been surveyed in 2009 by snorkeling. Snorkeling was also employed to survey the waters around the rocky islets at the outlet of Fraser Lake, and in the main channel of the Nautley River near the artificial island. Most of the area around a large grassy island near the entrance to the river was inspected from canoe, as the river bottom is too soft for wading. The river bottom was clearly visible from the canoe, but much of it is coated in weed growth. If weir features existed around this island their remains would be very difficult to detect.

Clusters of stakes were designated as sites and their locations were plotted with a hand-held GPS unit. Weir stakes and shoreline features at each site were mapped by cross-tape triangulation relative to a baseline of survey stakes established on shore. Isolated sticks protruding from the river bed or exposed shoals were temporarily removed to inspect their tip for evidence of deliberate shaping. Several partially buried tree branches were eliminated from further consideration in this manner. Our surveys detected three previously unknown weir or trap locations and several isolated stakes which had been dislodged from unknown positions. Portions of stakes from two of the new sites and the Nadleh Barricade were removed for radiocarbon dating by AMS. At the first two sites, stakes were selected from clusters in separate parts of the weir. In each case, care was taken to collect wood from near the outer rings of the stake to avoid dating old wood, but not the outermost ring which was usually coated in algae.

GaSd-49

Site GaSd-49 is on the north side of the Nautley River near to its confluence with the Nechako (Figure 5). There is a high terrace north of the site upon which the remnants of a village site are located. The river ran against the base of this terrace at some point, but has been migrating southward and is undercutting a bluff on the south shore. As a result of the southward movement of the river channel, a broad grassy floodplain has been exposed along the north shore, which is currently used as pasture for cattle. This increases the chances that stakes will be dislodged or trampled. Site GaSd-49 was discovered in 2009 during average water-level conditions, at which time 19 stakes were visible protruding from the riverbed, dislodged on shore, or protruding from the mud of the floodplain (Figure 6). The latter stakes indicate the river was positioned closer to the base of the terrace during the weir's operation. During the low water conditions in 2010 an additional 12 stakes were found. The stakes range in circumference from 5-20 cm, with an average of 12 cm. The smallest stakes are severely weathered and worn from river action. Figure 6 shows small clusters of in-situ stakes, with dislodged stakes more widely scattered.

The radiocarbon dates from GaSd-49 represent at least three prehistoric weir building episodes when the overlap in calibrated age ranges is considered (Table 1). The earliest date is from stake 10. It could be from the late 13th century A.D., or from the 14th century, as its age range overlaps with stake 13 and they are reasonably in line spatially. Stake 24 is close in age, but a considerable distance downstream in a different spatial cluster. Stakes 24 and 28 also are close together in age, but not aligned in a direction for a weir spanning the river, and may be parts of different features. Stakes 19 and 32 are both estimated to be historic in age, based on the presence of broad, even, slightly concave, faceted scars on their

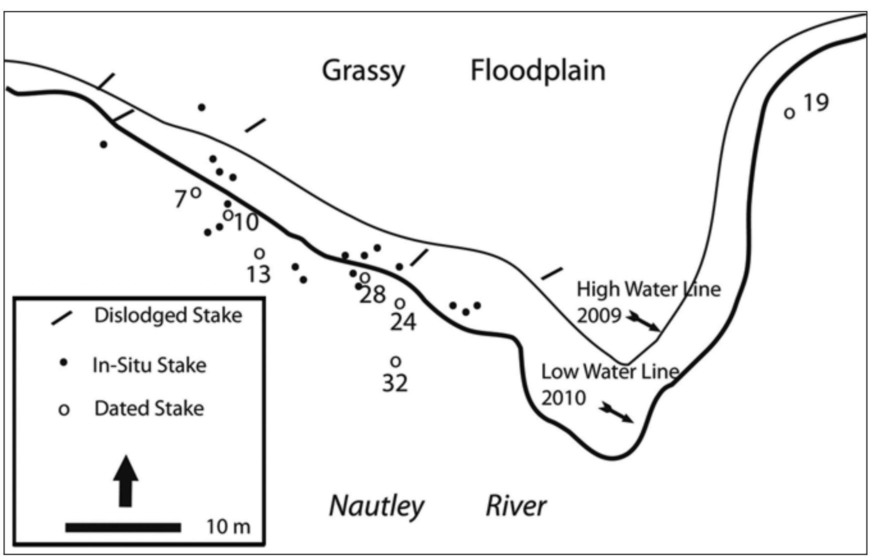

Figure 6. Map of site GaSd-49 showing dated stakes with numbers.

Table 1. Radiocarbon Dating Age Estimates for Wood Stakes Discussed in the Study

Site	Stake #	^{14}C Age (B.P.)	2 Sigma cal range[a]	Lab #
GaSd-49	10	660 ± 40	A.D. 1268-1395	Beta-262635
GaSd-49	13	510 ± 40	A.D. 1316-1448	Beta-262636
GaSd-49	24	520 ± 20	A.D. 1398-1440	ULA-1896
GaSd-49	28	385 ± 20	A.D. 1445-1620	ULA-1895
GaSd-49	7	340 ± 40	A.D. 1462-1642	Beta-262634
GaSd-50	4	325 ± 20	A.D. 1490-1642	ULA-1894
GaSd-50	12	95 ± 20	A.D. 1691-1923	ULA-1897
Barricade		65 ± 25	A.D. 1694-1919	ULA-1893

[a]Calibrated using INTCAL 09 (Reimer, 2009).

tips—traits typical of shaping wood with metal axes (Sands, 1997:10). The potential age range of axed stakes is between A.D. 1806, when fur traders entered the area, and 1911, when the Fort Fraser Barricade Treaty banned weir fishing (Traces, 2003:7). While these two stakes may be close in age, they are distant from one another spatially, and must represent two other constructions.

Although the sample of dated stakes is small, it is apparent that some stakes with potentially close dates are situated in different spans of the river, and were unlikely to have been contemporaneous, even if a weir had features at right angles to its main fence. Other stakes are close together, but have widely separated dates, so must also represent different constructions. There was thus a succession of weirs built and repaired or remodeled at GaSd-49 over a potential time span of more than 600 years (A.D. 1268-1911), although no stakes are represented from the 1700s.

GaSd-50

Site GaSd-50 is situated immediately downstream from the small channel that runs along the north side of the artificial island. Thirty stakes were found here on the north side of the river (Figure 7). Most are on a gravely prominence which was exposed by low waters (Figure 8). The weirs that spanned the river here can be projected to have followed a riffle to the south side of the river toward what is now the base of a steep bluff. Historical photographs indicate that a low terrace to the east extended upstream along what is now the base of the bluff when the weir was present. On the north side, inland from the rocky prominence, is a broad boulder and gravel plain covered in dense willow growth. A single stake was found protruding from the mud of a dried puddle, indicating this area was

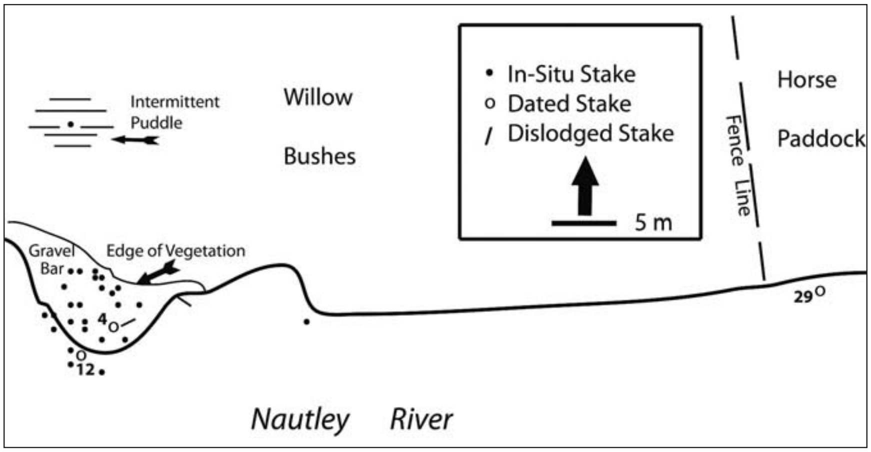

Figure 7. Map of site GaSd-50 showing dated stakes with numbers.

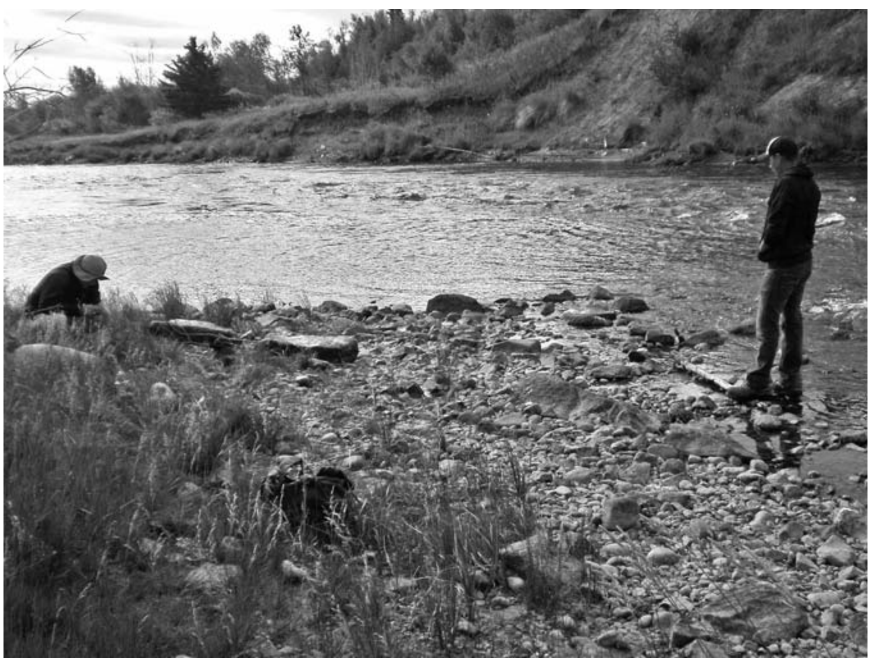

Figure 8. Flagging stakes with ribbon on gravel beach exposed at GaSd-50, looking southwest.

once riverbed. In addition to the dense cluster of stakes on the prominence, two isolated in-situ stakes were found down-river, representing two other weir locations. The stakes at GaSd-50 range in circumference from 5-17 cm, with a mean of 10.9 cm, and vary in condition depending on age, exposure to current, and cycles of drying. One of the isolated stakes (#29) was temporarily removed and was found to have a faceted tip indicative of axe sharpening in the Historic Period.

The dates from GaSd-50 do not extend back as far as those from GaSd-49, but there is some degree of overlap between the two sites. The calibrated age range of the oldest stake, number 4, falls mostly in the 16th to early 17th century A.D. The sample from stake 12 returned a very large calibrated range and may be historic in age. Stake 29, which is morphologically judged to be historic in age, is isolated a significant distance downstream, and unlikely to have functioned with any of the others. The spatial and chronological data thus represent parts of at least four separate weirs over a potential span of roughly 400 years (A.D. 1490-1911). Given the possibility that stake 12 belongs in the latter half of its two sigma age range, the 1700s may not be represented in the sample from this site either. However, at both GaSd-49 and GaSd-50 this is more likely a factor of preservation and sampling than an indication of a hiatus in weir fishing.

Nadleh Barricade Site

This site was visited to select a sample for dating (Figure 9). Thirty-five of the 243 stakes recorded at this site had been measured and reported to have circumferences from 5.96 to 21.3 cm (Traces, 2003:11). Several specimens were

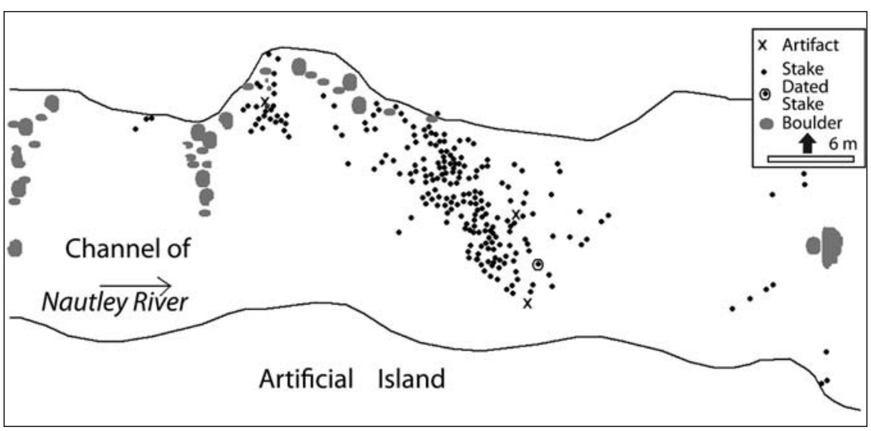

Figure 9. Map of Nadleh Barricade Site showing location of dated stake. (Adapted from Traces, 2003.)

temporarily removed during the initial survey and judged to have tool marks typical of a metal axe (Traces, 2003:11). However, three stone tools were also mapped amongst the stakes, leading to speculation that the location may have been used as a weir earlier (Traces, 2003:16). The stake chosen for dating was between two stone tools. The radiocarbon date from the Barricade Site also has a large calibrated range and strong likelihood of being recent in age. The vast majority of the stakes at this site likely relate to the position of weirs historically documented. Our survey in the main channel of the Nautley River detected seven stakes protruding from the river bed opposite the east end of the artificial island. These form a rough line that can be projected to join the Barricade Site (Figure 10).

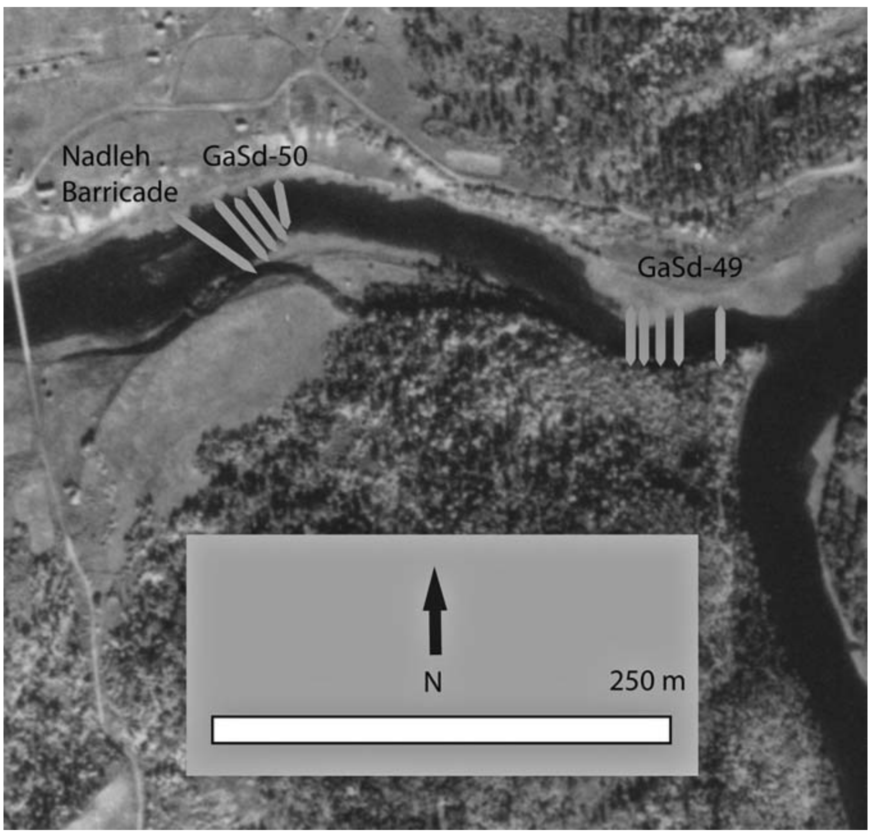

Figure 10. Aerial photograph of the middle and eastern sections of the Nautley River in 1928 before creation of the artificial island and the erosion of the lower terraces. The positions of archaeological weirs is projected between the shorelines.

The stakes of the main cluster are found in a southeast trending linear arrangement, which would have been much closer to being perpendicular to the river course during their use. The breadth of the main cluster of stakes suggests the replacement or repair of a weir in the same general location over a period of decades or more. The few widely outlying stakes to the northwest and southeast likely represent other weir locations, rather than support features or funnels, both of which would be downstream from and perpendicular to the main fence.

Isolated Stakes

In the area between the Nadleh Barricade Site and site GaSd-50, several isolated stakes were found washed up on shore. These may have originated upstream at the Nadleh Barricade site. On the south side of the Nautley River, the four dislodged stakes found on the river bed immediately below the bridge must have originated from some unknown weir location upstream. They all lacked clear indications of metal tool working and could be prehistoric in age. None of the dislodged stakes were submitted for dating.

GaSd-51

At site GaSd-51, a single wooden stake was found 8 m offshore from the north islet at the outlet of the lake (Figure 11) in a shallow channel. The river bottom at this point is very silty, and it is possible that other stakes may be buried. The area has also been disturbed by livestock coming to water at a small beach along the north shore of the mainland, accelerating erosion and exposing a scatter on lithics on the beach and in the water. The single stake detected was likely part of a larger feature used to capture fish migrating through this channel. It would obviously not block fish from reaching the lake by going around the south side of the islets, but as noted, not all weirs used by the Carrier required barricading an entire stream. The single stake is of unknown age, small in circumference (10.5 cm), and has narrow and shallow tool facets at its tip which were not likely made with a metal axe. The nearby lithics cannot be used to date the stake, because none are diagnostic of age or unequivocally associated with the stake. Much more evidence is required to reach detailed conclusions about what facility may have existed here.

Operation of Weir Sites

The most immediate conclusion to be drawn from the dates of the stakes in the Nautley River is that weir technology is much older in this area than expected. Since weirs were noted by the first fur traders, it has been long understood that they were an indigenous technology, and historically important weir locations were suspected to have been used in the Late Prehistoric or the Protohistoric

Figure 11. View looking southward of the channel at outlet of Fraser Lake where site GaSd-51 is located. The wood stake was recovered between the beach in the foreground and the island.

Period (i.e., late A.D. 1700s to 1806) (Cranny, 1986:89; Kew, 1992:204-205; Traces, 2003:3, 15). Parts of sites GaSd-49 and GaSd-50 are much older. The dates derived from this study also indicate the same general areas of the river were used repeatedly, and weirs may have stood in more than one part of the river at the same time. Understanding these possibilities requires further consideration of how the weir fishery worked.

Although the ethnographic record indicates weirs were dismantled at the end of each fishing season, obviously not all of the stakes were removed. Many stakes can be seen protruding from the water downstream from the operational weir in Figure 4, and sparse scatters of stakes can be seen in other photographs of the Nautley River taken in the late 19th and early 20th centuries. Perhaps some stakes were too firmly fixed to the river bottom to be pulled out, or, as discussed earlier, the framework of the most substantial posts was purposefully left in place to reestablish the weir the next season. Over time, weirs were likely rebuilt in the same general location, so not all stakes found at a site reflect a weir functioning at a single moment in time. When a weir was set up in a completely different reach of river, some stakes obviously remained.

Given the amount of disturbance to the Nautley River through the creation of the bridge and island, alterations to its discharge and course, and grazing along its banks, it is remarkable that weir stakes are preserved. Figure 10 depicts the locations of weir features in relation to the positions of the river banks in 1928, prior to creation of the island and the resulting erosion and alterations in the river's course. At GaSd-49 and GaSd-50 what was detected is unfortunately too fragmentary spatially to be certain which stakes worked together. The dates are also broadly scattered and not precise enough to determine which stakes belong together in time, but they do help to determine which stakes do not. Given their positions extending into mid-channel relative to where the north river bank was during their use, these two sites likely represent remnants of several full-river barricades.

The Nadleh Barricade Site is ironically the best-preserved site, having been protected by the reduced water flow through the small channel created by the artificial island, although most of the feature has been destroyed by infilling for the island and increasing the velocity of flow in the main channel of the river. At present there is no firm evidence of this site predating the A.D. 1800s. There is also some potential overlap of dates within the historic period between sites GaSd-49, GaSd-50, and the Barricade Site, and during the A.D. 1400s to1600s between sites GaSd-49 and GaSd-50. It is conceivable that weirs stood at both the outlet and middle stretches of the Nautley River at the same time. Late 19th and early 20th century records indicate three weir locations in proximity to one another on the Babine River, with two situated only 800 meters apart being worked simultaneously (Harris, 2001:85-87, 94). For two or more weirs to operate at the same time there would clearly have to be some physical mechanisms and social agreements to allow fish to pass to the upper weir (Losey, 2010). While this is an intriguing possibility, absolute dates recorded for the Nautley River sites lack the precision to confirm it.

There is also not sufficient evidence to comment on the function of weir facilities represented by the loose stakes by the bridge, except that the site must have been upriver. The facility represented by the single stake at GaSd-51 could have been part of a weir fence across the channel from the island to the north shore, or part of a smaller fixed trap or netting station. The visibility and preservation of other stakes here is likely affected by siltation, weed growth, and trampling of the north bank and near shore by livestock.

SALMON OF THE NECHAKO RIVER AND THE HISTORIC CARRIER FISHERY

To further understand why there were weirs in the Nautley River, and their significance in the development of the regional political-economy, it is worth considering the nature of salmon stocks and drainage patterns in the Nechako watershed. Fraser Lake is fed by two large catchments to the west: the

Nadina River-Francois Lake-Stellako River system, and the Burns Lake-Endako River system (Figure 1). The main stem of the Nechako River formerly forked at the Cheslatta River, with the Cheslatta entering the Nechako via Cheslatta Falls, and the other branch draining a network of lakes through Nechako Canyon. Construction of the dam across the head of Nechako Canyon made the Cheslatta and an artificial spillway the main sources of the Nechako River and created problems in regulating flow. This alteration has consequences for the condition of the weir sites downriver, as discussed, and for our understanding of salmon habitat.

Currently, three species of Pacific salmon migrate as far as the Nautley River: coho (*Oncorhynchus kisutch*), chinook (*O. tshawytscha*), and sockeye (*O. nerka*). The modern populations of coho and chinook are either endangered or functionally extinct, and their historical distribution and numbers in the area are not well known because detailed fisheries studies were not undertaken prior to their habitat being altered by the dam. The current distribution of coho in the Nechako extends to several spawning creeks above the Nautley River confluence, but they are not reported to migrate through the Nautley River (Department of Fisheries and Oceans Canada [DFO], 2002:1). Two small populations of chinook migrate through the Nautley River: one proceeding through Fraser Lake, the Stellako River, and Francois Lake to the Nadina River; the other proceeding up the Endako River (CSTC, 2011; Schell, 2003:23). A third group of chinook formerly proceeded through the Nautley River to Ormond Creek on the north side of Fraser Lake (DFO, 2007; MacDonald et al., 1995:48).

Sockeye are by far the most abundant and readily available salmon at the Nautley River. The Fraser River supports the world's second largest runs of sockeye, of which 23% are estimated to originate in the Nechako Watershed (Schubert, 2000:1). The main populations of Nechako sockeye are early and late summer runs heading either to the Stuart or Stellako rivers (Ricker, 1997; Schubert, 2000). The Stellako runs pass through the Nautley River, while the Stuart runs branch off downstream. The early Stellako run is small and arrives mid-July to August (Schubert, 2000:3). The late Stellako run is much larger and arrives late August to September (Ricker, 1997:959; Schubert, 2000:3). There were also, until recently, remnants of two other distinct sockeye populations that migrated through the Nautley River and Fraser Lake: one going to the Endako River, and the other to Ormond Creek (MacDonald et al., 1995:48; Schubert, 2000:3; Wet'suwet'en, 2011:42). There were thus up to four sockeye populations that passed through the Nautley River.

While sockeye were, and still are, the most abundant resource of the upper Nechako, their numbers are notoriously unstable due to the structure of their populations. The Fraser River sockeye salmon have a four-year life cycle with each population divided into four lines of descent. Within the main populations one of the lines that return at four-year intervals is much larger than the others and is called dominant. In such populations, the off-years have a subdominant line

10-25% as large, and two weak lines less than 1% the size of the dominant line (Ricker, 1997:950). Historically most of the large sockeye populations going up the Fraser River to the Nechako, including the Stuart River runs, peaked on the "1901 line" (Ricker, 1997). Discussions of the Fraser sockeye cycle sometimes include the largest runs through the Nautley River—the late Stellako runs—in the group peaking on the 1901 line (Kew, 1992:184, 213; Schubert, 2000:3), but in the mid-20th century they peaked at different four-year intervals (Ricker, 1997:954, 960). The dominant lines are known to be sensitive to disruption in modern times and cannot be assumed to extend into distant prehistory unchanged (Kew, 1992:184; Ricker, 1997:960), but a cyclical pattern of abundance and failure does extend back at least as far as the earliest European records (Fraser, 2007). These cycles were commented on frequently by fur traders at Fort St. James on Stuart Lake and Fort Fraser at the outlet of Fraser Lake, as they were dependent upon the Native salmon fishery for provisions, and it is apparent that the failure of runs to Stuart Lake was not always coincident at Fraser Lake (Fraser, 2007:258-262; Harmon, 2006:119-120, 138). The decision to establish both of these posts was motivated by a need to secure access to alternate dominant lines of sockeye going through Stuart and Fraser lakes (Fraser, 2007:255, 262). Even though the peak years at the two lakes may have differed, because each sockeye population has two consecutive weak lines, crashes in separate runs were still synchronized on a roughly four-year cycle (McLean, 1849:251; Morice, 1978:95; Rudland, 1988:15-22). McLean (1849:251), writing at Fort St. James, lamented "they fail this quarter [the entire upper Fraser and Nechako watershed] every fourth year." For the purposes of this article, the exact timing of the cycles in sockeye abundance is less important than the fact that extreme fluctuations in abundance were a long-term phenomenon, as it leads to questions about how the fishery worked.

To place the sites in the Nautley River into the context of this discussion of salmon stocks, shoreward settlements were well situated to fish salmon in both the Nechako and Nautley Rivers. Coho could only be caught in the Nechako River, while chinook could be taken in both. While their status is hard to determine, the chinook and coho runs may never have been large enough to serve as staples, and historically tended to be taken by methods other than weirs, such as spearing and gaffing (Morice, 1889:129). The focal point for residence and fishing was thus the sockeye which were taken in the Nautley River by the tens of thousands in peak years (Rudland, 1988:15), even though they periodically crashed.

The fishery of the Nautley River cannot be understood in isolation though: the role of individual salmon fisheries in the broader regional political economy must also be considered (Hudson, 1983). It is evident from the fur traders' accounts that when a village experienced a failure in its fishery, or a shortage occurred in winter stores of salmon, they sought assistance from a neighboring community where the catch may have been better (Fraser, 2007:271; Harmon, 2006:155). When the failure of sockeye runs synchronized throughout the Nechako watershed, widespread shortages occurred. At such times, trade with Carrier groups in the Skeena watershed (the Wet'suwet'en and Babines) and the Dean River watershed—where the salmon cycles differed—was crucial (Goldman, 1941:401; Hudson, 1983:68-71; Rudland, 1988:18-19). The challenges inherent in adapting to the salmon cycles locally and regionally have impacted the way ethnologists and archaeologists have viewed cultural development in the area, as discussed below.

DISCUSSION

The last two decades have seen a great deal of archaeological research on fishing weirs of all types in the neighboring Northwest Coast culture area, with at least 1300 recorded thus far, and the oldest being 5500 cal B.P. in age (Moss, 2013:327, 332). Interpretations of these features have been context dependent, but there are several identifiable themes. The themes include: tracing the origins of weirs in different regions; examining changes in stream courses and sea levels; inferring details of weir operation; assessing targeted fish stocks; inferring the amount of logistical organization and degree of specialization in the fishery; theorizing the ontological relationship between fish and people; describing the conditions contributing to the preservation of wood stake remains; and simply inferring the existence of a fishery where faunal preservation is poor (see examples in Bernick, 1998b; Losey, 2010; Moss, 2013; Moss and Cannon, 2011b). In the case presented here, I emphasize the importance of weirs as evidence that is much older than sometimes expected for a major focus on salmon fishing in the Central Interior, and the implications for the long-term understanding of the regional political economy.

At present, it is not known when weir fishing may have begun in the Central Interior, but some tacit and some explicit expectations have been offered. Kew (1992:203-204) did not venture to offer a date for the Carrier's weirs, but suggested their partial wing fence and trap features were an independent innovation upon the more widespread and ancient full river fences and traps of the Northwest Coast, Interior Plateau, and Western Subarctic culture areas. Fladmark (2009:597-598) suggested that the Carrier, and other Athapaskans, did not have a "deep rooted" salmon-oriented culture at all, but they adapted to the salmon area of the upper Fraser and Nechako watershed sometime after 1100-1200 B.P. Similarly, Matson and Magne (2007:150) argued that Athapaskans migrating into the area around this time brought with them a flexible, but primarily boreal forest adaptation that included fishing freshwater lake species. By contrast, Donahue (1977) argued for long-term continuity in settlement and cultural orientation in the Central Interior, extending back 4500 years. I have argued elsewhere (Prince, 2011) that a salmon-based economy is evident at Moricetown Canyon, on the Bulkley River to the west of the study area, at least by 3500 B.P., to judge from continuity in occupation at this excellent dip netting and gaffing location, and the abundance of bifacial tools suitable for fish processing recovered there. To the northwest, Rahemtulla's research on the Babine River indicates village settlement in the vicinity of the historic weir fishing locations extends back to at least 1300 B.P. (Rahemtulla, 2012), and one would expect it was supported at that time by the fishery.

By the time of the earliest European contacts, the Carrier of central British Columbia certainly had a sophisticated adaptation to salmon resources that were cyclically abundant, and this included technologies (weirs) for the mass capture of tens of thousands of fish, storage of the resulting surpluses, and mechanisms of exchange between areas of shortage and abundance. Anthropologists have long noted the network of relationships between Carrier groups that allowed them to compensate for local resource shortfalls, caused not just by the unequal distribution of salmon habitats, but also the cycles in sockeye abundance (Duff, n.d.; Hudson, 1983). Hudson (1983:57, 68, 72) emphasized the importance for local groups to maintain villages at, and control over, weirs at productive sockeye fisheries, and that the cyclical crashes also made kin ties and the ritual potlatch exchange network with neighboring groups crucial. Extending the earlier diffusion models of Goldman (1941), Steward (1977), and Kobrinsky (1977), Cranny (1986:91, 142) hypothesized that the network of relationships between communities and fisheries did not exist before the A.D. 1700s, when it diffused to the Interior with other aspects of Northwest Coast culture including weir technology and its capacity to produce food surpluses.

The dates derived from weirs in the Nautley River extending back to at least the A.D. 1300s are certainly contrary to Cranny's model, and challenge the notion that intensive salmon fishing, and storage of the surplus catch produced, is a protohistoric introduction. The patterns of trade between watersheds described historically as crucial to subsistence upon the unstable sockeye fishery may also extend back as much as one thousand years, as obsidian from both Anaheim Peak to the south and Mount Edziza to the north are present in deposits dating back that far on the Nautley River, and would have connected the area economically and socially to the Skeena and Dean watersheds (Prince et al., 2010). Thus, Hudson's argument that cycles in the sockeye fishery required compensation with strong regional and extra-regional networks of exchange may also have great time depth. However, neither the presence of harvesting and storage of salmon, nor networks of trade, necessarily means that aspects of social complexity like potlatches, ranked titles, and resource ownership can be directly inferred (Cannon and Yang, 2006). Until more thorough and varied settlement and artifactual data are available for the area, the suggestion that such traits of cultural complexity are recent introductions from the Northwest Coast cannot be discounted, but weir fishing clearly was not part of a recently diffused package. Also at the regional scale, the dates on weirs in the Nautley River thus far do not directly contradict Fladmark's model, but we cannot argue that salmon oriented adaptations in this area are not deeply rooted. As more wood weir features are documented and dated in the Central Interior, and more terrestrial components are excavated, multiple lines of evidence are likely to emerge for deeply rooted salmon fisheries and networks of exchange between them.

At the local scale, the broad dates derived from stakes in the Nautley River suggest there could have been more than one weir in operation at a time, with stakes at the Barricade Site, GaSd-50 and GaSd-49, for instance, dating to the 19th century, and other overlaps in dates occurring between GaSd-49 and GaSd-50. Current dates lack the precision, however, to support a claim that more than one weir operated in a given year. It is equally probable that only one weir was erected for any given run and that its position fluctuated over time. While historically the Babine people had social mechanisms for regulating the use of more than one weir at a time, the chronological resolution from the Nautley River sites can only be considered suggestive, at most, of such a possibility.

CONCLUSION

Wooden weir stakes are durable features if kept continually waterlogged, even if exposed to dry air during short tidal ebbs, as evidenced from their widespread occurrence in coastal environments. Wooden stakes in the Nautley River have been subjected to several human and natural disturbance agents resulting in their gradual removal, burial beneath fill, and destruction, making interpretation of the configuration and operation of the weirs difficult. It is promising, however, that evidence of the weirs survives, as it provides important clues to late prehistoric to historic period fishing, and raises the possibility that other weirs may be preserved in the archaeological record of the Central Interior of British Columbia. As more of these sites are studied, we will gain further understanding of cultural development in the area, the regional political economy, the structure of prehistoric salmon stocks, and a sounder basis for evaluating extant models of settlement, migration, exchange, and diffusion.

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Direct reprint requests to:

Paul Prince
Anthropology Program
MacEwan University
10700-104 Ave.
Edmonton, AB, Canada T5J 4S2
e-mail: prince@macewan.ca