# *Seals and Sea Lions in the Columbia River:*

# *<u>An Evaluation and Summary of Research</u>*

By

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*Cover photo from http://www.salmonrecovery.gov/Files/Predator/sea_lion_fact_sheet_2012.pdf*

# I. Introduction and Methodology

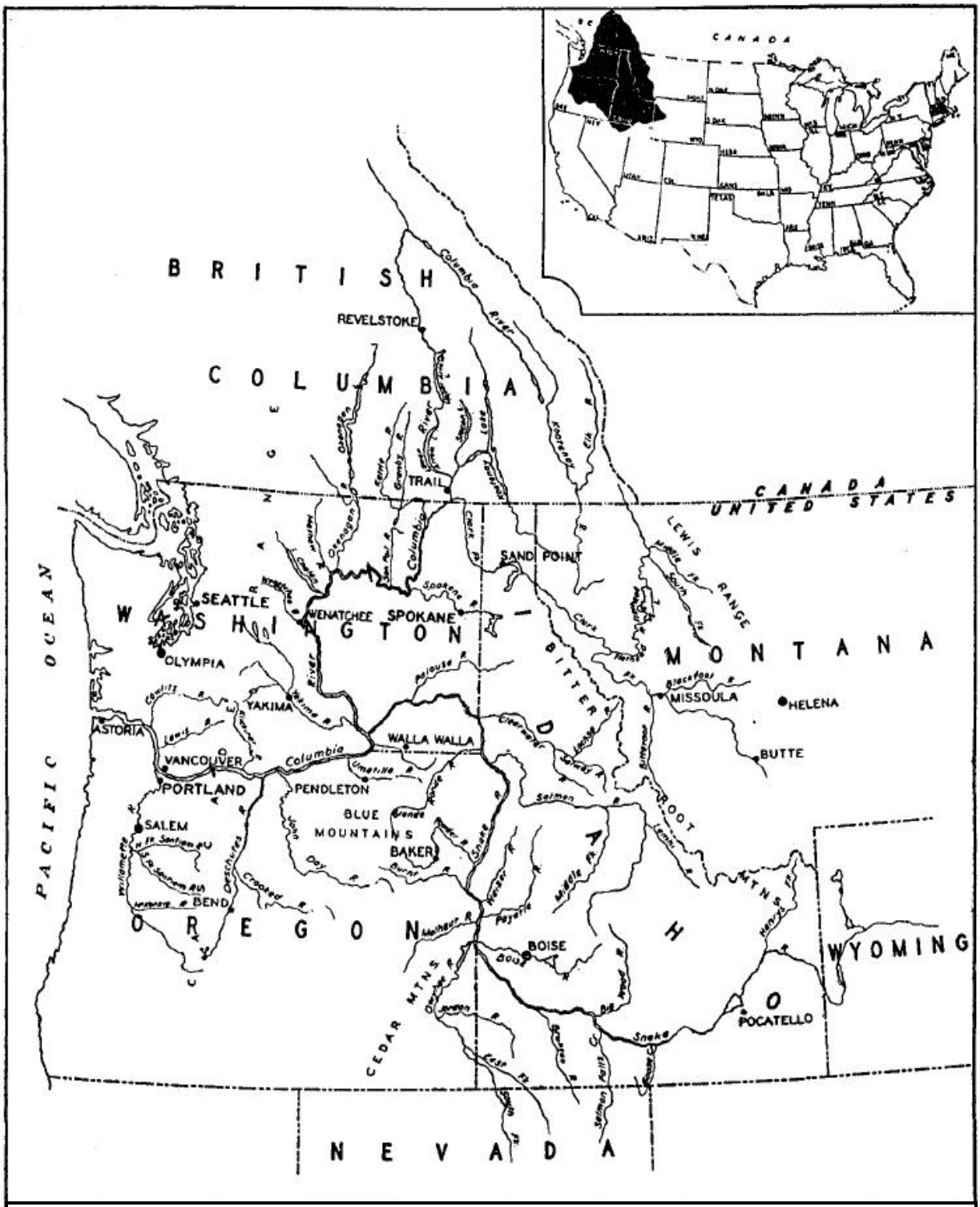
## A. Introduction

The member tribes of the Columbia River Inter-Tribal Fish Commission (CRITFC) rely heavily on fish runs. "The average fish consumption rate of Umatilla, Yakama, Nez Perce, and Warm Springs tribal members is approximately nine times greater than the average consumption rate estimated for the general US population (CRITFC 1994: 59). Members of these tribes harvest about 88 percent of their fish themselves or get it from "their families, friends, ceremonies, or tribal distributions" (CRITFC 1994: 62). The importance of fish, and especially the importance of salmon, to the tribes for subsistence, economic, and cultural purposes cannot be overstated: "the fishery resource is not only a major food source for tribal members, it is also an integral part of the tribes' cultural, economic, and spiritual well-being" (CRITFC 1994: 12-13). These tribes depend on salmon in the Columbia River.

The Columbia River system (Map 1) drains some 259,000 square miles in the United States and Canada. The basin includes eastern Washington, northern Idaho, and western Montana. Its tributaries include the Snake River, which drains western Wyoming, southern Idaho, eastern Oregon, southeastern Washington, and parts of Utah and Nevada. The Kootenai River is another main tributary, as is Clarks Fork (Craig and Hacker 1940: 136-137). Adult salmon and other migratory fish use the Columbia River to move "from the ocean to the smaller tributaries and upper reaches where they spawn" (Craig and Hacker 1940: 136). Along the Columbia and its tributaries are many traditional tribal fisheries (Map 2).

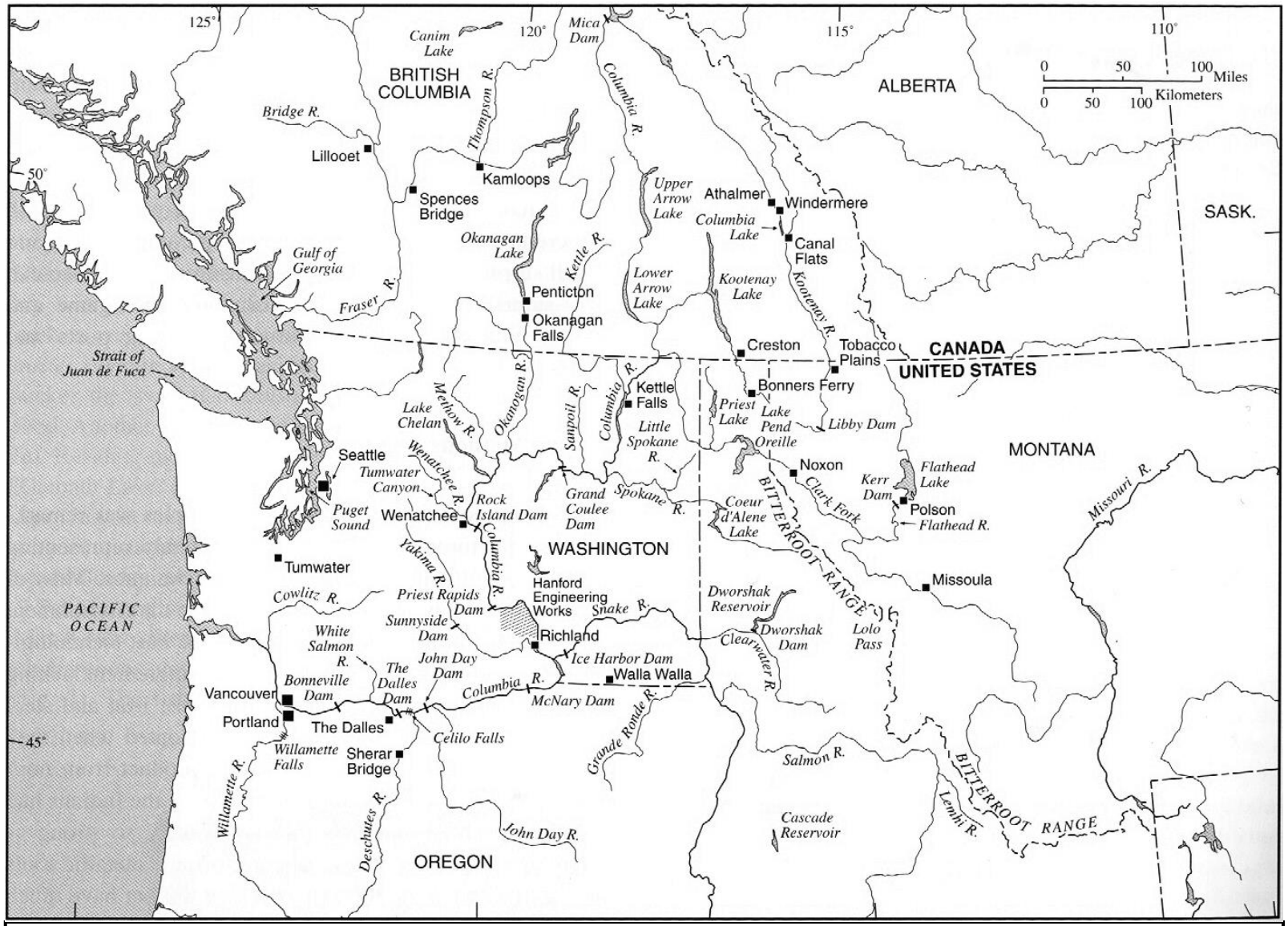
Salmonid predation at Bonneville Dam has increased from approximately zero in 2002 to more than 5,000 fish by 2010 (Brown et al 2011: 1). Between 2002 and 2007, observers noted an average of eighty-three pinnipeds at Bonneville Dam; between 2007 and 2010 that number increased to 124 (Stansell et al. 2010: iv). Between 2008 and 2010, pinnipeds took some 4,000 to 6,000 salmonids per year. In the 2010 January-to-May run alone, "an estimated 6,081 adult salmonids (2.2% of the run) were consumed." Stansell et al (2010: iii) note that between 2008 and 2010, pinnipeds took some 4,000 to 6,000 salmonids per year within a ¼ mile of Bonneville Dam. Salmonids are likely more vulnerable to pinniped predation near Bonneville Dam as a result of limited fish-ladder entrances that concentrate fish, making hunting easier; however, additional significant predation also occurs throughout the lower 145 miles of the Columbia River. In fact, Hatch (2012: 8, 9) estimated that from 2002 through 2012, California sea lion predation totaled approximately 33,030 salmon, which "averaged 10.6% of the ESA-listed component of the run and was as high as 18.4% of the listed spring Chinook salmon."

Other salmonids "were caught by pinnipeds but escaped and swam away with unknown injuries (3.3%, 2.3%, and 2.6% of total salmonid catch escaped in 2008, 2009, and 2010, respectively)" (Stansell et al 2010: iii). The seals and sea lions are also taking Pacific lamprey (*Lampetra tridentata*), white sturgeon (*Acipenser transmontanus*), and other fish on which the tribes have traditionally and continue to depend such as American shad (*Alosa sapidissima*), northern pikeminnow (*Ptychocheilus oregonensis*), and bass (*Centrarchidae*) (Stansell et al 2013: 4). Stansell et al (2010: iii-iv) note that "Lamprey comprised 1.4% of the total observed catch from 2008 to 2010, although lamprey catch is probably underestimated." Predation of white sturgeon, mostly by Steller sea lions, increased "every year since 2006, averaging 2.5% of observed catch before 2008 and 16.0% the last three years." Numbers of sturgeon taken increased from 315 in 2006 to 1,879 in 2010 (Stansell et al 2010: iv). In 2011 "Steller sea lion predation on white sturgeon in the waters below Bonneville Dam" was noted as increasing. Between January 7 through February 23, Steller sea lions were seen taking 1,136 white sturgeon,




**Map 1.** Columbia River system. Original in Craig and Hacker 1940: 135.

as compared to 1,100 during the entire winter-spring season of 2010 ("ESA-listed Steller sea lions" 1). This is in combination with a general decreasing of the white sturgeon population from averages of 131,400 during 1998-2007 to 91,100 during 2008-2010 to a projection of 77,000 in 2011. Five populations of salmonids preyed upon are protected under the ESA.




**Map 2:** Traditional fishing sites of the Plateau. SOURCE: Hewes 1998: 621.

**B. Methodology**

Between 1964 and 2015, Walker Research Group, Ltd. has been engaged in long-term investigations of tribal fishing in the Columbia River, its many tributaries and riverine and lacustrine systems in western North America. This research has addressed questions of traditional, pre-contact, recent, and contemporary tribal exploitation of aquatic resources, including fish, shellfish, large and small mammals (including seals and sea lions), and has also supported the reserved, ongoing fishing rights of various tribes. Such research can be found in the following papers and reports:

- "Comparison of Contemporary and Heritage Fish Consumption Rates in the Columbia River Basin." With Barbara L. Harper. *Human Ecology* 43(2): 225-236.
- "Columbia Basin Heritage Fish Consumption Rates." With Barbara L. Harper. *Human Ecology* 43(2): 237-245.
- "Shoshone-Paiute Reliance on Fish and Other Riparian Resources." For the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation. Technical report. 2014-2015.
- "Tulalip Fishing Sites." For the Tulalip Tribes. Technical report. 2014-2015.
- "Yakama Hunting, Fishing, and Gathering in the Lower Snake River Intertribal Resource Area." For the Yakama Nation. Technical Report. 2011.
- "Traditional Fishing Practices among the Northern Shoshone, Northern Paiute, and Bannock of the Duck Valley Indian Reservation: A Progress Report." *Northwest Anthropological Research Notes* 44(1): 53-62. 2010.
- "CTUIR Fishing Below Bonneville Dam: A Preliminary Summary of Research and Interviews." For the Confederated Tribes of the Umatilla Indian Reservation. Technical report. 2009.
- "The Yakama Nation and the Wenatshapam Fishery: A Report Prepared for the Yakama Indian Nation." Technical report. 2008.
- "The Confederated Salish-Kootenai Tribes of the Flathead Indian Reservation, Montana, and Fishing and Water Rights." For the Confederated Salish-Kootenai Tribes of the Flathead Indian Reservation. Technical report. 2008.
- "The Klamath Treaty of 1864 and the Klamath Indian Fisheries and Water Resources. For the Klamath Tribe." Technical report. 2005.
- "Literature Review of the Significance of Fishing to the Klamath Indian Tribe, Oregon and California." For the Native American Rights Fund. Technical report. 2004.
- "Study of the Nez Perce Snake River Basin Fishery." Prepared for the Nez Perce Tribe. Technical report. 1997.
- "Lemhi Shoshone-Bannock Reliance on Anadromous and Other Fish Resources." *Northwest Anthropological Research Notes* 27(2). 1993.
- *State of Idaho v. Bruce Baldwin, Rulon March, and Stanley Baldwin.* Investigation of Shoshone-Bannock fishing in the Rapid River Region of Idaho. Case Nos. CR3171, CR3172, and CR3173. (Expert Witness). 1992-1994.
- "Productivity of Tribal Dipnet Fishermen at Celilo Falls: Analysis of the Joe Pinkham Fish Buying Records." *Northwest Anthropological Research Notes*. 26(2):123-135. 1992.
- *The State of Idaho v. Dianne C. (David) Coffee.* In the District Court of the First Judicial District of the State of Idaho, in and for the County of Boundary, Magistrate Division, CV M-2941. Conducted research and offered testimony on behalf of Coffee concerning

Kutenai traditional and contemporary hunting, fishing, and gathering practices in Northern Idaho and adjacent areas. (Expert Witness). 1973.

- "The 1968 Seattle Session on Indian Hunting and Fishing Rights, American Anthropological Association Annual Meeting." *Northwest Anthropological Research Notes* 2(2): 1-43. 1968.
- "Mutual Cross-Utilization of Economic Resources in the Plateau: An Example from Aboriginal Nez Perce Fishing Practices." *Washington State University, Laboratory of Anthropology, Report of Investigations* No. 41, 70 pp. 1967.
- *The State of Oregon v. Jesse Greene.* In the Circuit Court of the State of Oregon, in and for the County of Sherman, Case No. 3350. Conducted research and offered testimony on behalf of Jesse Greene and the Nez Perce tribe concerning Nez Perce traditional fishing, acculturation, and contemporary fishing on the mid-Columbia River (Preachers Eddy). (Expert Witness). 1967.

Research methods have included reviews of comparative, historical, and ethnohistorical data, direct observation, and in-depth interviews of tribal fishermen and other tribal cultural experts. The first goal of this research has been to determine the fishing, hunting, and related practices in place at the time of the 1855 treaties and subsequent to 1855. Routine questions have been explored with tribal respondents concerning these practices that included the following topics:

- Locations of usual and accustomed (U&A) fisheries;
- Techniques of catching and processing catch
- Tribal groups using U&A fisheries
- Types of fish species taken
- Seasons for various species taken
- Numbers taken of various species
- Distribution of catch
- Sale of catch
- Hunting, gathering, and pasturing livestock when fishing and other activities at U&A sites of various types.
- Intertribal cross-utilization of fisheries
- Causes of salmon decline
- Effects of state and federal regulation on fishing

This research has been conducted as a basic investigation as well as for several tribes and agencies. I have been assisted by elders and cultural resource personnel from various tribes in the Columbia Basin, especially those in the four mid-Columbia tribes: Nez Perce, CTUIR, Yakama, and Warm Springs. Table 1 lists the names and tribal affiliations of the tribal members who have been aware of and described to me pinniped hunting on the Columbia River and its tributaries.

In cooperation with tribal members, our ethnographic research focuses on three topics:

Topic 1: Traditional tribal uses of aquatic species focusing primarily on pinnipeds of the Celilo/Cascade Forks part of the Columbia River;

Topic 2: Traditional tribal procurement techniques for marine mammals and their subsistence and cultural significance based on oral histories provided by contemporary Columbia River tribal members from the four CRITFC tribes;

Topic 3: Ethnohistorical, ethnographic, and archaeological research concerning the impacts of pinnipeds on salmon and other aquatic resources of the Columbia River.

In this report we summarize and provide an analysis and interpretation of selected published sources of information on pinnipeds and traditional tribal relationships with and uses of them. in addition to tribal interviews between 1964 and 2015 we rely on existing literature and research to demonstrate traditional Columbia River tribal hunting of pinnipeds.

**Table 1: Interviewees Who Noted Seals and Sea Lions during Columbia Basin fishing interviews, 1964-2015**

| Name | Tribe | Name | Tribe |
|---|---|---|---|
| Alec Williams | Nez Perce | Sam Cash Cash | Umatilla/Nez Perce (Cayuse) |
| Allen Slickpoo | Nez Perce | William Burke | Umatilla/Nez Perce (Cayuse) |
| Caleb Carter | Nez Perce | Alphonse (Frenchy) Halfmoon | Umatilla/Nez Perce (Cayuse) |
| Charlie Williams | Nez Perce | Ron Halfmoon | Umatilla/Nez Perce (Cayuse) |
| Corbett Lawyer | Nez Perce | Charlie Jackson | Umatilla/Nez Perce (Cayuse) |
| David Jackson | Nez Perce | Harold Culpas | Warm Springs |
| Elizabeth Wilson | Nez Perce | Nelson Walulahtum | Warm Springs |
| Harrison Lott | Nez Perce | Verne Jackson | Warm Springs |
| James Miles | Nez Perce | Wilson Meanus | Warm Springs |
| Jesse Greene | Nez Perce | Alec Saluskin | Warm Springs |
| Jim Green | Nez Perce | Eagle Selatse | Yakama |
| Jim Reynolds | Nez Perce | Joe Meninick | Yakama |
| Johnny Woods | Nez Perce | Roger Jim | Yakama |
| Joseph Pinkham | Nez Perce | Robert Jim | Yakama |
| Samuel Slickpoo | Nez Perce | Virginia Beavert | Yakama |
| Samuel Watters | Nez Perce | Henry Thompson | Yakama |
| Saul Webb | Nez Perce | Louie Sohappy | Yakama |
| Alice Barnhart | Umatilla/Nez Perce (Cayuse) | Levi George | Yakama |
| Antone Minthorn | Umatilla/Nez Perce (Cayuse) | Jim Alexander | Yakama |
| Clarence Burke | Umatilla/Nez Perce (Cayuse) | James Selam | Yakama |
| Gilbert Conner | Umatilla/Nez Perce (Cayuse) | Joe Jay Pinkham | Yakama |
| Ike Patrick | Umatilla/Nez Perce (Cayuse) | Abe Showay | Yakama |
| Jay Minthorn | Umatilla/Nez Perce (Cayuse) | Samuel Sturgis | Yakama |
| Percy Brigham | | | |

## II. Pinniped Predation

### A. Pinniped Ranges

Stanley et al (1996: 368) describe harbor seal (*Phoca vitulina*) distribution as "one of the broadest geographic distributions of any pinniped, stretching from the east Baltic, west across the Atlantic and Pacific Oceans to southern Japan." While some may travel great distances to feed on annual migrations, "harbor seals are generally believed to be philopatric" at least to several hundred kilometers, "returning to the same areas each year to breed." Stanley et al's research suggests that harbor seals in the Atlantic and Pacific may "have been colonized from west to east with the European populations showing the most recent common ancestry."

The Steller sea lion (*Eumetopias jubata)* ranges from "the central California coast to the Bering Sea, the Kamchatka Peninsula in the Soviet· Union, the Kurile and Commander Islands, and the western Pacific waters as far south as Hokkaido and Northern Honshu in Japan (Haynes and Mishler 1991: 2). In 1996, within this range, lay "approximately 27 rural communities with a 1985 population of about 67,000 (many of whom are of Alaska Native ancestry)." Some of these communities continue to make traditional use of sea lions "for subsistence food and raw materials"; other communities do not, "although they have done so in the past" (Haynes and Mishler 1996: 2-3).

California sea lions (*Zalophus californianus*) "are the most abundant pinniped, and have the broadest distribution of any pinniped in Mexico. . . . California sea lions range throughout temperate and subtropical waters off the western coast of North America, from southern Canada to the south of Mexico, including the Gulf of California. They utilize three breeding areas along the Pacific Coast: 1) the U.S. from Canada to the U.S.-Mexico border; 2) western Baja California from the U.S.-Mexico border to the tip of Baja California; and 3) the Gulf of California. The animals from each breeding area are considered to be different stock. In 1983 there were 145,000 animals; in 2002 the U.S. population alone was estimated at 237,000 to 244,000 animals, a growth of 5.4% to 6.1% per year (Szteren, Aurioles, and Gerber 2006: 370). The U.S. population of California sea lions has been increasing over the last 15 years (Szteren, Aurioles, and Gerber 2006: 369).

### B. Pinniped Increases

McKechnie and Wigen (2011: 133) point out that until 1970, the Canada Department of Fisheries and Oceans supported "population control" programs to reduce pinniped (especially harbor seals, which were seen as competing with humans for salmon, and Steller sea lions) populations. These programs ceased in the early 1970s with the advent of marine mammal protections. Braje and Rick (2011b: 297-298) point out that before 1973, when the Marine Mammal Protection and Endangered Species Act was passed, marine mammals were also managed for commercial harvest. Since 1980, however, commercial hunting of marine mammals has been discontinued and "direct threats to the populations in U.S. waters have been largely eliminated," with management focusing on reducing hunting of marine mammals as well as accidental catching by commercial fishing. Without the decimation of commercial hunting, sea lion numbers have exploded: "North Pacific seal and sea lion populations now number in the hundreds of thousands" (Braje and Rick 2011b: 298). Since 1970, harbor seal populations alone have increased from 10,000 animals to 105,000 animals (Moss and Losey 2011: 133). This is an

increase of roughly 2,300 animals per year.[1] Braje and Rick assume that, with an adequate food supply, most pinnipeds are repopulating along the Pacific Coast, "establishing rookeries and, perhaps, recovering to 'prehistoric levels'" (2011b: 298). Moss and Losey (2011: 167) also note that "recent biological studies demonstrate range expansion of some species subsequent to the Marine Mammal Protection Act of 1972." For example, California sea lions do not seem to breed in the Oregon area, but they do winter there, as well as in Washington and British Columbia. They arrive in August, "with numbers peaking in September and October" (Moss and Losey 2011: 171). According to Scordino (2010: i),

> assessments indicated the Washington and Oregon harbor seal populations were at their optimum sustainable population (OSP) levels. Population assessments initially demonstrated that California sea lions had reached OSP, but continued exponential growth indicated from the 2006 to 2008 pup counts suggest the population is not yet at OSP. Additional surveys are needed to affirm California harbor seal status.

The numbers of pinnipeds such as California sea lions (*Zalophus californianus*), Steller sea lions (*Eumetopias jubatus*), and harbor seals (*Phoca vitulina*) in the Columbia River are increasing and are now negatively impacting the salmon runs in the Columbia River on which tribes depend. For example, Lyman[2] (2011: 24) notes that "California sea lions have been observed for the past decade or so preying upon salmon and steelhead – two economically valued fish – below Bonneville Dam on the Columbia River." Increasing numbers of California sea lions are being found up rivers "as they congregate during salmon runs and herring and smelt spawning" (Moss and Losey 2011: 171). "During the 1980s and 1990s, one to two California sea lions (*Zalophus californianus*) were reported annually at the dam during fishway inspections" (Brown et al 2011: 1); since the turn of the [21st] century an increasing number of California sea lions have been "assembling to feed on spring chinook salmon and steelhead headed upstream to spawn" ("2013 Pinniped Predation"; see also Stansell et al 2013: 17, 23). In 2001, there were "six California sea lions observed at one time, and by 2002 the U.S. Army Corps of Engineers (USACE) estimated that thirty California sea lions were foraging at the dam for salmonids (*Onchorynchus* spp.), many of which are listed under the Endangered Species Act (ESA)" (Brown et al 2011: 1).

The number of Steller sea lions seen at the dam has also been steadily increasing, from zero in 2002 to three in 2003 and 2004; four in 2005; eleven in 2006; nine in 2007; thirty-nine in 2008; twenty-six in 2009, and doubling to seventy-five in 2010 ("ESA-listed Steller sea lions" 2). In 2012 more Steller sea lions than California sea lions were seen at Bonneville Dam; Steller sea lions also consumed more salmonids than California sea lions for the first time since observation began. In fact, in 2012, "Steller sea lion predation on both salmonid and sturgeon was higher than for any previous year" ("For First Time"), and Steller sea lion consumption of both salmon and steelhead "continued its upward trend during the late winter-spring of 2013" ("2013 Pinniped Predation"; see also Stansell et al 2013: 17, 23).

At the turn of the 21st century, workers at Bonneville Dam[3] also began noticing an increase of California sea lions ascending the Columbia to feed on the salmon searching for the fish ladders below the dam ("ESA-listed Steller sea lions" 1, 2). A fish ladder is a series of pools

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[1] 105,000-10,000 = 95,000. 2011-1970 = 41. 95,000/41 = 2,317.

[2] R. Lee Lyman is a Professor and Chair of the Department of Anthropology at the University of Missouri, Columbia.

[3] "Bonneville Dam is the first dam upstream from the mouth of the Columbia River at river kilometer (rkm) 235" (Stansell et al 2010: 2).

designed to allow fish to ascend from one to another upriver, as they would normally make their way through rapids. However, fish ladders create "a traffic jam for the migrating fish, which often spend hours or even days at the base of the dam searching for the fish ladder to get upstream" (Schneider 2013: 150). The fish are particularly vulnerable to seals and sea lions at the fish ladder entrances.

Some argue that seals and sea lions are taking unnatural "advantage of the artificial structure of the dam"; Fidelia Andy, former chairwoman of CRITFC and vice-chairwoman of the Yakama Nation's Fish and Wildlife Committee, pointed out that "Sea lions patrol the entrance to, and even inside, the Bonneville fish ladder, thereby eliminating any normative predator/prey relationship" (in Schneider 2013: 152). Possibly supporting Andy's observation, in 2010 Stansell et al recorded one California sea lion, number C287, taking "the most fish in one day at Bonneville Dam since we began observing in 2002": twelve Chinook. Using an average Chinook weight of 6.6 kg per fish (about 14.5 pounds), twelve Chinook comes to about seventy-nine kg or roughly 175 lbs of salmon in one day. Hewes (1973: 134) points out that one pound of salmon equals about 1,000 calories, so calorie-wise, using Hewes' 1,000 calories/lb, this resulted in C287 ingesting 175,000 calories: again, in one day. Using Hewes' numbers of 2,000 calories per capita, this means that in one day C287 ate enough to feed eighty-seven people. Over the next month C287 took 195 Chinook, of which he kept 162; he also took three steelhead and four unknown fish, of which he kept four (the others were stolen by Steller sea lions). "This averages out to about 6.7 kg of fish per day taken, or 5.5 kg per day consumed" (Stansell et al 2010: 30). Again, using Hewes' numbers, C287 ate enough each day to feed sixty people per day on nothing but fish. If fish accounts for only half of a person's diet, this number doubles to 120 people. The amount eaten by C287 is also about triple what an average male California sea lion in captivity eats. Stansell et al (2010: 30) note that while not every California sea lion eats this many fish, "it does give us an indication of how unusual a situation pinniped predation at Bonneville Dam has become when compared to natural or captive consumption studies, and what some CSL are capable of consuming."

However, McMillan notes that seals and sea lions may have historically

> eaten somewhere between 5-15 million salmon and steelhead annually (depending on how many fish they consumed or lethally injured per day), and yet there remained enough salmon and steelhead to supply the tribal fisheries throughout the Columbia Basin[4] as well as the abundant populations of bears (grizzly and black), wolves, coyotes, cougars, bobcats, lynx, ospreys, eagles, mergansers, American dippers, cormorants, terns, loons, herons, and on and on, that all subsisted in part on differing life histories of salmon and steelhead within the Columbia Basin.

Historical periods, however, did not include commercial and sport fishing that have, at the very least, laid a heavy toll on salmon and other fish resources of the tribes. Historically, as well, the tribes hunted seals and sea lions that were present at their fisheries, whether as a means to reduce competition, as an additional subsistence resource, or for both these and possibly other reasons.

Since 2002, not only have sea lion numbers in the Bonneville Dam tailrace increased steadily, they have arrived "at the dam progressively earlier in the year" (Keefer et al 2012:

[4] Fisheries were traditionally maintained "on the mainstem and all of the principal tributaries, including the Deschutes, John Day, Umatilla, Walla Walla, Snake, Clearwater, Salmon, Yakima, Wenatchee, Methow, Okanogan, Sanpoil, Spokane, Pend Oreille and Kootenai Rivers" (Scholz et al 1985: 10).

1237) and staying later (Brown et al 2011: 1). For example, between 2003 and 2007, Wright et al (2010: 63) "tracked the movements of 14 river-type sea lions from as early as 14 November to as late as 9 August." Based on a 9-year study, Keefer et al (2012: 1240-1241) note that "Pinnipeds were observed progressively earlier in the year through time." Brown et al (2011: 1) also note that since 2002 the "minimum number of California sea lions has ranged from approximately 50 to 100 animals, with animals generally arriving earlier and occurring over a longer period each year."

Early-arrival fish may be more at risk for predation. Keefer et al (2012: 1237) note that predation rates were "substantially higher for early-timed than for late-timed salmon populations. The most at-risk group included Snake River and upper Columbia River Chinook salmon listed as endangered under the U.S. Endangered Species Act." Steller sea lions have discovered the "all-you-can-eat banquet" of thousands of white sturgeon that have recently begun overwintering below the dam ("ESA-listed Steller sea lions" 1, 2). During winter months, more salmon may be consumed by seals and sea lions than are passing the dam: "Numbers of salmonids observed to be consumed exceeded the number of salmonids counted passing Bonneville Dam in nine of fifty-nine (15%) winter observation weeks" (Keefer et al 2012: 1244). Schneider points out that while sea lions may consume some 4 percent of the total run of salmon each year, "their impact on spring runs is significantly higher. If a run is wiped out, it is gone forever—which is exactly what happened to the Spring Chinook run on Lake Washington: sea lions hanging out at the fish ladder on Ballard Locks effectively wiped out the entire run" (2013: 152).

It must be noted that the foregoing numbers are just the animals that have been observed from the face of the dam, not the animals that may actually be at Bonneville or consuming salmon further downstream in the Columbia River out of sight of the dam and observers. Stansell et al (2013: 1) point out that the U.S. Army Corps of Engineers (USACE) uses surface observations "to evaluate the seasonal presence, abundance, and predation activities of pinnipeds." However, it must be noted that while surface observations are useful, seals and sea lions "can consume smaller prey underwater, so all consumption estimates and associated impacts . . . should be considered minimum estimates" (Stansell et al 2013: 2). Further, observations are mostly carried out in daylight; only occasional night observation activities are practiced because "nighttime predation is very difficult to observe and therefore is still largely an unknown factor that we most likely are underestimating" (Stansell et al 2013: 4). In 2013 some twenty-nine hours of nighttime observations were made over nine nights using night-vision binoculars. However, glare "from dam lighting, power tower lighting, highway lights, and poor weather conditions all combined to make viewing at night difficult. Predation by SSL [Steller sea lion] tends to be fast, quiet, and typically farther downstream than CSL [California sea lion] predation, so we could be missing more nighttime predation than in the past" (Stansell et al 2013: 16). In 2013, some "3,247 hours of daytime observations" were conducted between January 4 and May 31; in this period pinnipeds caught and ate some 2,275 fish of several species (Stansell et al 2013: 6). Before 2013, observations were made between January and the end of May, "to focus on the spring Chinook salmon passage season," but, as noted, in recent years Steller sea lions have been seen at Bonneville Dam as early as August, so a program of observations in the fall and early winter was begun, which supplied more information on Steller sea lion predation on white sturgeon and other fish (Stansell et al 2013: 2).

Furthermore, the Columbia is not the only river in which seals and sea lions prey on salmon (Table 2). Virtually any river on the Pacific Coast that hosts a salmon run may be a viable area

for seals and sea lions. Scordino[5] (2010: i, 3) noted that "salmonids are a common prey species for Pacific harbor seals and California sea lions in many west coast rivers/estuaries and even in open marine waters." Roffe and Mate (1984) describe the feeding habits of California sea lions, Steller (or Northern) sea lions, and Pacific harbor seals in the Rogue River in Oregon. Lyman (1989: 70-71) discusses the presence of pinniped remains at the Umpqua River, the Pistol River, and the Mattole River, all in Oregon. Giwargis (2014) and Yancey (2014) note a sea lion pup some 1½ miles from the San Joaquin River in California. Another sea lion was seen in Old Sacramento along the Sacramento River in 2010 (News10 Staff, KXTV). Yet another was spotted, again in 2012, at the confluence of the Sacramento and American Rivers in Sacramento (Editor 2012).

**Table 2. Some Rivers and Creeks with Documented Pinniped Predation**
**SOURCE: Scordino 2010**

| | |
|---|---|
| Alsea River | Pistol River |
| Carmel River | Quilcene River |
| Columbia River | Rogue River |
| Dosewallips River | Sacramento River |
| Duckabush River | San Joaquin River |
| Duwamish River | San Lorenzo River |
| Eel River | Scott Creek |
| Hamma Hamma River | Skokomish River |
| Klamath River | Smith River |
| Mad River | Snohomish River |
| Mattole River | Umpqua River |
| Ozette River | |

Scordino investigated pinniped predation on salmonids in several rivers, including "rivers draining into Hood Canal [including the Quilcene, Dosewallips, Duckabush, Hamma Hamma and Skokomish Rivers], Ozette River, Columbia River, Alsea River, Rogue River, Klamath River, Mad River, and San Lorenzo River; and at Bonneville Dam, Willamette Falls," and several marine areas. Salmon predation was observed at all river mouths as well as about "0.5 kilometers upriver in the Duckabush River" (2010: 5). On the Duwamish River at Seattle, Washington, observations were conducted at the river mouth and upstream. California sea lions and harbor seals were both observed, but only the California sea lions were seen taking salmon (Scordino 2010: 9). On the Snohomish River, haul-out sites were seen "at Smith Island in the lower Snohomish River area and . . . on log booms at the Everett Naval Base" (Scordino 2010: 9-10). Between late February and early June 2001, one California sea lion was seen in the mainstem lower Snohomish River, and harbor seals were observed both in the mainstem river and the sloughs. They were not then observed taking salmonids (Scordino 2010: 10).

Harbor seals have been reported upstream on the Ozette River on the Olympic Peninsula. Scats from harbor seals, California sea lions, and Steller sea lions were found "within about six kilometers of the mouth of the Ozette River" (Scordino 2010: 12). An underwater camera at an upriver weir near Lake Ozette "also provided information on pinniped-scarred fish, predation on sockeye by harbor seals and river otters, and movements of seals in and out of Lake Ozette." In

[5] At the time of his writing, Scordino was retired from the NOAA/National Marine Fisheries Service - Northwest Region.

1998, the camera at the weir showed harbor seals "passing through the weir at least eight times and on one occasion with a sockeye in its mouth" (Scordino 2010: 14).

At Willamette Falls, "206 kilometers upriver from the mouth of the Columbia River at Oregon City, Oregon," California sea lions have been observed since April 1975 "when two sea lions were reported taking salmon and hindering fish passage at the fish ladder" (Scordino 2010: 23). The next sightings were in the late 1980s; sea lions were sporadically sighted near the falls "until 1995 when California sea lions began occurring almost daily from February through late May." In 1995 a California sea lion reportedly first entered one of the fish ladders to eat spring Chinook salmon (Scordino 2010: 23). Between 1997 and 2003 three to ten sea lions were seen at the falls in any given year (Scordino 2010: 23-25).

In 2000, in the Alsea River, which enters the Pacific Ocean at Waldport, Oregon, ODFW marked 62 harbor seals; 23% were sighted at least once in the river. In 2002, 59 harbor seals were caught and marked. Twenty-three seals were found in the Alsea River at least once; "these 23 seals made 593 trips upriver totaling 5,067 hours. . . . seven of the seals accounted for 94% of the total hours. Seventy-three percent of the total hours spent upriver occurred at night" (Scordino 2010: 30). The 23 marked seals spent most of their time in the river and were there far more at night than in the day (Scordino 2010: 30).

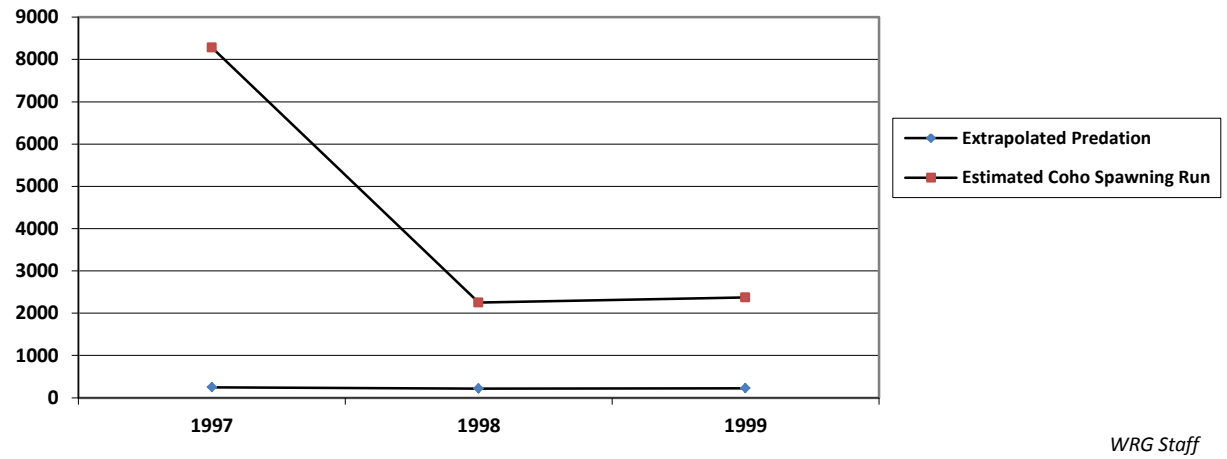
The Umpqua River has been examined for cutthroat trout as well as salmonid predation (Scordino 2010: 31). In 1997 a harbor seal was seen at Half Moon Bay, about 1.5 kilometers upriver from the mouth of the Umpqua River, "diving and surfacing repeatedly while consuming a coho salmon" (Scordino 2010: 31). Harbor seals were also seen at River Mile 14 (Brady Bar), and River Miles 16 and 18. Interestingly, there was a lack of cutthroat trout remains in harbor seal scats from Half Moon Bay and Windy Cove, the two upriver haul-out sites, although observations were limited to only one year (Scordino 2010: 32).

On the Rogue River in southern Oregon, California sea lions can be found in the river from fall through spring. There is a Steller sea lion rookery at Rogue Reef (about four kilometers upriver from the mouth of the Rogue River); "Steller sea lions occurred in the Rogue River in the spring, summer and fall" (Scordino 2010: 32). In 1996 "California sea lions, harbor seals and Steller sea lions were observed foraging in the Rogue River" (Scordino 2010: 33). In 1997 two upriver surveys "starting at RM 35 and ending at the mouth" found most of the pinnipeds in the lower 16 kilometers of the river, "except for a single harbor seal at River Mile 24 on one occasion" (Scordino 2010: 33). In 1998 "Most of the predation events were in the lower three kilometers of river" (Scordino 2010: 33). It is not known how many of the salmonids taken were ESA-listed coho salmon. As can be seen in Figure 1, pertaining to the Rogue River, Scordino's numbers show that predation on salmon by pinnipeds remains relatively constant no matter what the run may be. This will have a great impact especially on years in which there are smaller runs: such as was the case in 1998 and 1999.

On the Smith River in northern California, observations were conducted in the lower 1 to 1.5 kilometers of the river in 1999 and 2001. Harbor seal predation on pinnipeds was observed during both years (Scordino 2010: 35).

In the Klamath River, the Yurok Tribal Fisheries Program (YTFP) "conducted investigations on pinniped predation on fall-run Chinook salmon" in the lower 3 kilometers of the Klamath River from 1997 to 1999. In 2,813 hours of surface observations, "YTFP observed a total of 1,366 salmonid predation events." In 1997 California sea lions were the primary pinniped predator, but harbor seals and Steller sea lions were also seen (Scordino 2010: 37). Although upriver predation was not investigated, Scordino (2010: 38) did conclude that the YTFP study "confirmed that salmonids were common prey of both harbor seals and California sea lions in the Klamath River."

**Figure 1: Extrapolated Salmonid Predation by Pinnipeds, Rogue River, 1997-1999**
**SOURCE: Scordino 2010: 33-34**




Salmonid predation by pinnipeds was also seen at the mouths and lower portions of the Mad River, Eel River, Scott Creek, the San Lorenzo River, and the Carmel River (all in California) (Scordino 2010: 39, 40, 42, 43, 47). It is important to note that these water courses were all studied within 2 km of their mouths. There may be undocumented pinniped predation on salmonids and other fish farther upriver.

### C. Mitigation Efforts at Bonneville Dam

Mitigation efforts such as sea lion exclusion devices (SLEDs), floating orifice gates (FOGs), harassment of seals and sea lions from land and boats, acoustic devices, and capture and permanent removal of specific returning sea lions have proven somewhat effective or ineffective in keeping sea lions out of the fishways, depending upon the goal. For example, Brown et al (2011: 7) note that below Bonneville Dam, "Overall, the 2011 field season was successful from a research standpoint but unsuccessful from a management standpoint." While the "GPS-phone tags and river-wide pinniped surveys provided an unprecedented level of information on pinniped abundance, distribution, and foraging behavior in the Columbia River," being unable to remove the animals and a lack of effective non-lethal deterrent methods meant that management was severely hampered.

Stansell et al (2010: 22) also noted that "hazing activity temporarily moved some sea lions out of tailrace areas, but the animals typically returned and resumed foraging shortly after hazers left the area." Brown et al (2011: 7) also found that boat-based deterrents "only cause a short-term disruption in foraging behavior and fail to deter the majority of sea lions from the dam." Over a period of nine years, Keefer et al (2012: 1245) also found that "Harassment efforts, begun in full in 2006, did not substantially slow the trend of increasing total sea lion presence, although the California sea lion removals did probably reduce abundance of this species temporarily." In 2013 Stansell et al again noted that hazing from boats "temporarily moved some sea lions out of tailrace areas, but the animals typically returned and resumed foraging shortly after hazers left the area" (2013: 21).

Haul-out traps were useful in marking and tagging sea lions, "but lack of removal authority for most of the [2011] season required the release of numerous (ten to fifteen) California sea

lions eligible for removal," which proved to be a major setback. Telemetry, GPS, and surveys were good research tools but did nothing to deter sea lions (Brown 2011: 8). Acoustic deterrent devices (ADDs) also seem not to have the desired effect on the mammals: ADDs were installed at most fishway entrances in 2010 but, as "in all previous years, pinnipeds were observed swimming and eating fish within 20 ft. of some of the ADDs" (Stansell et al 2010: 22). The ADDs have little deterrent effect; happily, they also do not seem to adversely affect the fish, either (Stansell et al 2010: 22). In fact, in 2010 Stansell et al (2010: 31) recommended that their use be discontinued.

GPS, ADDs, and Critter Cam applications on California sea lions continued in 2013; two Steller sea lions were also fitted with Critter-Cams and tracking devices, but this proved ineffective. "One Critter-Cam was recovered off the coast of southern Washington and the other never found," and both sea lions abandoned the Bonneville area immediately after release for the ocean. "Little useful footage of relevance to the Bonneville studies was seen" from Steller sea lions (Stansell et al 2013: 21).

On the other hand, Stansell et al (2010: 21) note that "In 2010, SLEDs and FOGs were installed at all operating main fishway entrances . . . There were no sea lions observed inside the fishways, nor did any observers note any sea lions attempting to get through the SLEDs or FOG barriers in 2010 despite significant predation activity near dam structures" In 2013 SLEDs and FOGs were re-deployed at various locations around Bonneville Dam Powerhouse I and Powerhouse II between January 31 and March 18 and were effective: "no pinnipeds were observed entering the fishways during the 2013 season" (Stansell et al 2013: 4). Again, observers saw no "sea lions attempting to get through the SLEDs or FOG barriers in 2013 despite significant predation activity near dam structures" (Stansell et al 2013: 20). Furthermore, hundreds of concrete blocks were deployed in 2010 "along the PH2 tailrace Cascades Island west end shoreline concrete apron in 2010 (where the pinnipeds prefer to haul out) in an attempt to prevent the pinnipeds from hauling out and getting comfortable staying near the dam" (Stansell et al 2010: 21). Almost no pinnipeds hauled out onto the concrete apron in 2010. In 2013 "no pinnipeds hauled out on the PH2 tailrace concrete apron along Cascades Island . . . (barring a few single short-term events), preferring instead to rest in pods near the shoreline of Tower Island or near the traps." The blocks on the aprons seem to have encouraged the seals and sea lions to use Tower Island instead of Cascade Island (Stansell et al 2013: 20).

Stansell et al (2010: 25) note that from 2008-2010, thirty-eight California sea lions were removed from "the population of 'Bonneville' animals." While this removal "failed to reduce the overall salmonid consumption estimate," the animals removed did account for "34% (3,118 of 9,275) of all the salmonid catch events attributed to specific individuals (and 42% of those individuals on the removal list)" (Stansell et al 2010: 27).[6] In other words, those thirty-eight California sea lions were at Bonneville for more days and ate more salmon than the rest of the identified California sea lions. "Consumption estimates and presence metrics for 2008, 2009, and 2010 undoubtedly would have been higher if these select sea lions had they not been removed . . . perhaps by as much as 1,000 or more over the past two years" (Stansell et al 2010: 27, 28). Further, "We know from observations of branded CSL seen at Bonneville Dam over the years, that if they do not return in consecutive years, they are unlikely to return at all" (Stansell et al 2010: 27).

Conversely, Keefer et al (2012: 1247) noted that all the California sea lions that had been

[6] These rates are complicated by "the increasing presence and salmon predation by [Steller sea lions] at Bonneville Dam" (Stansell et al 2010: 28).

tagged with satellite transmitters in the lower Columbia River and trapped at or previously observed at the dam subsequently revisited it." In fact, Keefer et al noted "repeat visits by many individual animals." For example, an average of 56% of easily identifiable California sea lions "was present in consecutive years and others were recorded in as many as eight years" (2012: 1247). Further, these repeat-visit California sea lions "captured disproportionately high numbers of salmonids at Bonneville Dam in most years." These mammals were present for longer and "probably developed selective foraging behaviors," which was demonstrated by the sheer size of two California sea lions that weighed in at 660 and 522 kg[7] when captured, "the largest California sea lions ever recorded (typical adult males weigh 200–400 kg[8])" (Keefer et al 2012: 1247).

From 2003 to 2007, Wright et al (2010: 60) fitted transmitters onto fourteen male California sea lions that have consumed fish at Bonneville Dam or Willamette Falls in order to compare their movements with twelve animals "of unknown foraging history" in the river. They found that all fourteen California sea lions that had utilized Bonneville or Willamette Falls returned to those areas, whereas none of the twelve did. Travel between the mouth of the Columbia River and Bonneville Dam, some 130 miles, took the sea lions between 1 and 1.9 days. They stayed at the dam between 2 and 43 days. Their results showed "that not all California sea lions in the Columbia River prey on salmonids at Bonneville Dam or Willamette Falls," although "factors influencing recruitment into the upriver salmonid-foraging subpopulation are unknown."

Schneider (2013: 152) notes that "Proponents of the sea lion removal (including tribal and state representatives) point out that the overall sea lion population is at an historic high, and has actually exploded in recent years" to what the Washington Department of Fish and Wildlife (WDFW) biologists consider to be carrying capacity. From the early 2000s, when the sea lions were first seen at Bonneville, to 2009, "there has been a 382 percent increase in the number of salmon being eaten by sea lions."

Even if it works, removal does not preclude new animals from taking old animals' places. For example, even though forty sea lions were removed from Bonneville Dam in 2008-2010, this effort lost ground in 2011: "Tangible gains made in 2008-2010 were potentially reversed by allowing the pool of experienced, predatory sea lions to increase unchecked in 2011" ("States, Tribes Sea Lion Report"). Stansell et al (2010: 28) had expected to see a decline of California sea lions (and thus salmon predation) in 2010 because of the removals:

> However, this was not the case, as many new CSL ventured up to Bonneville Dam this year, if only briefly. It may be that removing 11 to 15 animals each year is not enough to prevent substantial recruitment of new individuals and increased predation, and that it would take more additional measures (e.g. the removal of about 30 individuals) each year to see and document a significant reduction in CSL numbers and salmonid predation.

In April 2014, "Stansell noted that less than ten percent of the California sea lions observed at Astoria this year are branded, while the past couple years it has been around thirty-fifty percent" ("Strong Smelt Returns"). However, twice the usual number of sea lions were seen at Astoria in 2014, indicating that while removed animals are not returning, "there are a lot of new recruits to the Astoria basin, likely brought in by the strong smelt run up the Columbia River this year" ("Strong Smelt Return").

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[7] 1,455 and 1,150 lbs respectively.
[8] 440 and 881 lbs respectively.

In 2010 Stansell et al suggested the use of more traps, since the traps currently being used are often full of mostly Steller sea lions, leaving little room for California sea lions; loosening the criteria of needing to document seeing a California sea lion take a salmonid and/or seeing it at Bonneville for 5 days; putting a California sea lion on the list to be removed sooner; or examining other methods of removal (28).

It is also important to note that seals and sea lions are being seen upstream of Bonneville Dam. Stansell et al (2010: 29-30) noted that observations were also conducted "in the forebay of Bonneville Dam when we knew pinnipeds were upstream of the dam." Other sightings were made by Army Corps of Engineers' "employees and biologists between Bonneville and The Dalles dam" at river mark 308. One California sea lion was "observed using the navigation lock to pass upstream into the forebay on May 16, 2009"; he stayed there until he was caught nearly 10 months later. In addition, several other sightings were made "from the tailrace of The Dalles Dam, Drano Lake (rkm 261), the mouth of the Wind River (rkm 249),[9] and the forebay (especially near the fishway exits) of Bonneville Dam." Portland State University students also observed California sea lions at Willamette Falls Locks in 2009 and 2010 (Stansell et al 2010: 30). Other upstream sightings were made at the boat ramp at Stevenson, Washington, and Eagle Creek and the Bridge of the Gods near Cascade Locks, Oregon (Stansell et al 2010: 45).

### D. Effects of Pinneped Predation on Tribes

The increasing level of predation on salmonids needs to be examined for its effects on the tribes who rely on salmonids as a resource. As Schneider (2013: 156) points out, salmon between the mouth of the Columbia and Bonneville Dam "are mostly caught by sports fishermen and smaller commercial operations." Tribal fisheries are generally restricted to areas upstream of Bonneville (see also U.S. v. Oregon 2008-2017 Management Agreement), so those fisheries most impacted by the increase of pinniped predation are those of the tribes. "The groups working to end the sea lion program often fail to mention that the sea lions have the greatest impact on the tribal fisheries" (Schneider 2013: 156).

This paper will next investigate tribal hunting of pinnipeds and reliance on them as a traditional resource, a right reserved to the tribes in several treaties. We examine this through a review of historical documents as well as through interviews of tribal members, especially tribal fishermen, and other cultural experts.

[9] Near Home Valley, Washington.

## III. Traditional Tribal Uses of Seals and Sea Lions

Rights of hunting and fishing at usual and accustomed places are reserved in the Treaty with the Wallawalla, Cayuse, Etc., 1855, to the Umatilla:

> That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians, and at all other usual and accustomed stations in common with citizens of the United States, and of erecting suitable buildings for curing the same; the privilege of hunting,[10] gathering roots and berries and pasturing their stock on unclaimed lands in common with citizens, is also secured to them. (Kappler 1904: 694-695)

The Treaty with the Yakima, 1855, reserves the same rights to the fourteen bands and tribes that make up the Yakama Nation

> The exclusive right of taking fish in all the streams, where running through or bordering said reservation, is further secured to said confederated tribes and bands of Indians, as also the right of taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary buildings for curing them; together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land. (Kappler 1904: 699)

This treaty language is the foundation of the recent enactment by the Yakama tribe of a regulation allowing tribal take of California sea lions in Zone 6 of the Columbia River, if necessary, to defend Yakama tribal members' fishing gear or catch. This regulation clearly indicates the tribe's traditional understanding that marine mammal hunting is reserved in the treaties.

In the Treaty with the Nez Percés, 1855, similar language is used to reflect the Nez Perces' reserved rights:

> The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land. (Kappler 1904: 703)

Finally, the Treaty with the Tribes of Middle Oregon, 1855, reserved to the groups now known as the Warm Springs Tribe the rights to hunt and fish at all usual and accustomed places using virtually the same language as that found in the Umatilla, Nez Perce, and Yakama treaties:

> That the exclusive right of taking fish in the streams running through and bordering said reservation is hereby secured to said Indians; and at all other usual and accustomed stations, in common with citizens, of the United States, and of erecting suitable houses for curing the same; also the privilege of hunting, gathering roots and berries, and pasturing their stock on unclaimed lands, in common with citizens, is secured to them. (Kappler 1904: 715)

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[10] The Court in *State of Idaho v Tinno* determined that "to hunt" also meant "to fish."

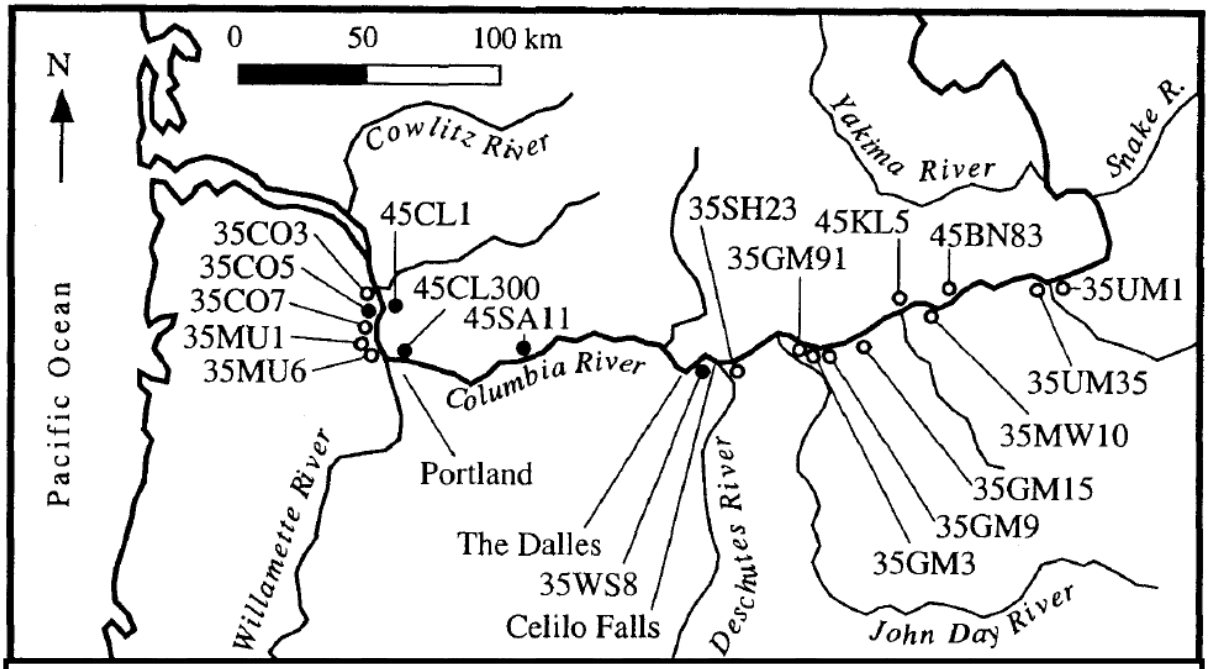
## A. The Traditional Presence of Seals and Sea Lions in the Columbia River

The presence of seals and sea lions in the Columbia River is not a 21st-century phenomenon. Lyman et al. have established the ancient presence of seals and sea lions in the Columbia River before the time of contact with Euroamericans by examining archaeological collections from sites downstream of Celilo Falls that contain bones and teeth of seals and sea lions: "These remains represent pinnipeds procured from the Columbia River rather than ones traded inland from the coast" (2002: 1). They state specifically that "Harbor seals were in the lower Columbia River between about 10,000 and 6,000 yr ago, and also after 1,000 yr ago" (2002: 1). Lyman et al (2002: 1, 2) reviewed published and unpublished sources and data on faunal remains recovered from archaeological sites along the Lower Columbia River from near the confluence with the Snake River in Washington State to the mouth of the Columbia (Map 3), and based on the location of 19 sampled sites (9 sites downstream and 10 sites upstream of Celilo), the number of sea mammal remains identified, and the age of the remains, they conclude that seals and sea lions "did not occur upriver farther than Celilo Falls." However, our review of the present evidence inclines us to disagree with this statement from Lyman. It must be noted that Lyman et al. did not consider post-impoundment presence of sea lions or speak with the tribes on this issue. There are tribal memories who suggest that there were seals and sea lions above Celilo Falls[11]. One Nez Perce fisherman claimed a sighting of sea lions above the John Day and The Dalles dams, but we have not been able to locate other examples of such sightings. Further, because Lyman did not find evidence of pinnipeds in the Columbia River above Celilo does not mean there is no evidence to be found. If seals and sea lions were hunted in their capacity of competing with the tribes for salmon resources, the tribes may not have used them at all but simply discarded them after they were killed, leaving no remains to be found. It is also possible that remains could have been washed away by floods, or that the seals and sea lions were processed at locations other than those Lyman et al explored. For our purposes, Lyman et al did find that pinnipeds are still found "significant distances upstream of salt water" (2002: 4). Their results clearly show a traditional presence of seals and sea lions in the Columbia River.

During my graduate research with him, Luther Cressman identified 6 bones he considered to be from phocids at sites WS-1 and WS-4 near Fivemile Rapids, about five miles east of The Dalles[12] (1960: 15-16). Cressman et al (1960: 71) note that "at Fivemile Rapids they took not only fish for food but land animals and marine mammals from the river." In fact, the earliest use of the Five Mile site at The Dalles, "and this is probably true for the whole stretch of the river, was not for fishing but for hunting. The animals hunted were fox, a member of the cat family, muskrat, beaver, marmot cervid (elk or deer), a canid (probably coyote), and seal" Cressman (1977: 134). At Fivemile Rapids one bone was in Feature 25, Level 30, along with stone, bone, and antler artifacts and about 40 grams of ochre (Cressman 1960: 63). The others were found in the roadcut of WS-4 between levels 20 and 36. These represented about 7% of the total, but within their specific levels, they represented between 16.7 and 33.2% of the totals. Similar representations were made by beaver and canid bones (Cressman 1960: 77). The 3 strata containing the phocid remains were deposited between 9800 and 6000-7500 yr ago; these remains "represent the oldest remains of sea mammals on the Columbia River known to us [and] establish that phocids were in the river during the first 4,000 yrs of the Holocene epoch that began 10,000 yr ago" (Lyman et al 2002: 2) and are "the farthest upstream of any pinniped

[11] Celilo Falls was inundated by The Dalles Dam in 1957.
[12] This is about 200 miles up the Columbia River from its mouth (McMillan).

remains yet reported from an archaeological context" (Lyman et al 2002: 3). Other sites reveal pinniped remains from as recently as 1300-1800 AD to 1900 AD (Lyman et al 2002: 2).




**Map 3:** Lyman et al. study area. Approximate locations of archaeological sites and modern cities. Open circles represent sites with no pinniped remains; filled circles represent sites containing pinniped remains.

In the journals of the Corps of Discovery, on October 22, 1805, John Ordway noted seeing "a number of large Sea otter [actually seals] below the falls in the whorl pools and eddys" (The Journal . . .). In fact, on October 23, 1805, Clark took a shot[13] at a harbor seal, which he mistook for a sea otter, at Celilo. He noted there were "Great Numbers [of them] about those rapids" (The Journal . . .). On October 24, 1805, near what is now Horsethief Lake, Patrick Gass also noted the presence of harbor seals (which he also mistook for sea otters): "In our way down to day we saw a great many sea otters swimming in the river, and killed some, but could not get them as they sunk to the bottom" (The Journal . . .). On October 25, 1805, at Rock Fort at The Dalles, Clark again noted "Great numbers" of seals "about those narrows and both below and above" (The Journal . . . ). On November 1, 1805, Clark again noted "great numbers" of seals, this time below the Cascades (The Journal . . .). Lewis and Clark also named a rock in the Columbia River "Phoca Rock" for the abundant harbor seals that frequented it (see November 2, 1805, and footnote in The Journal . . .). Phoca Rock is some 100 miles up the Columbia River from the ocean.

On January 10, 1806, at Fort Clatsop, Ordway noted "Several villages along the coast of different tribes which lived mostly on whail [sic] meat, and fish, Some Seals" (The Journal . . .). On February 23, 1806, still at Fort Clatsop, Lewis wrote that he had "reason to believe . . . that there are several species of the seal on this coast and in the river" and described some of them:

[13]"Like for Audubon, this was the primary means for collection of animals from which to make detailed descriptions, which was another primary purpose of the expedition -- to collect and describe the flora and fauna" (McMillan).

"the skins of such as I have seen are covered with a short coarse stiff and glossy hair of a reddish bey [sic] brown color" or sometimes spotted black and white (The Journals . . .). Clark's description for February 23, 1806, is roughly similar, noting the presence of *Phosia*, or seals, "from the Great Falls of the Columbia to the mouth." Clark adds that "the flesh of this animal is highly prized by the natives who Swinge [sic] the hair off and then roast the flesh on Sticks before the fire" (The Journal . . .). Also on February 23, 1806, Lewis noted that harbor seals are "found here in great numbers, and as far up the Columbia river as the great falls [Celilo] above which there are none." On March 25, 1806, Lewis noted a "party of Cathlahmahs about 10 in number who had established a temporary residence for the purpose of fishing and taking seal. They had taken a fine parcel of sturgeon and some seal. They gave us some of the flesh of the seal which I found a great improvement to the poor Elk" (The Journal . . .).

David Thompson also mentions seals in his journal. For example, on July 12, 1811, he was at the "head of The Dalles" and noted that at a small, sandy bay near "the carrying place" of The Dalles they had "the pleasure of seeing many grey-colored Seals [possibly *Phoca richardi* Gray, or Richard's Harbor Seal], they were apparently in chase of the Salmon, we fired several shots at them to no purpose" (Tyrell 1916: 497). On July 14, at the Cascades of the Columbia, Thompson again writes that they were "amused with the Seals playing in the River" (Tyrell 1916: 500). Tyrell notes that Thompson's "portage was on the north side of the river, and he must have re-embarked in very swift water. His camp for the night was nearly opposite Cape Horn" (500), which is near Phoca Rock.

John Townsend (1839: 252-253) also noted the presence of seals on the Columbia:

> We see great numbers of seals as we pass along. Immediately below The Dalles[14] they are particularly abundant, being attracted thither by the vast shoals of salmon which seek the turbulent water of the river. We occasionally shoot one of them as he raises his dog-like head above the surface, but we make no use of them; they are only valuable for the large quantity of oil which they yield.

Lyman et al also note that seals, particularly harbor seals "were observed in the Columbia River from its mouth to Celilo Falls, 324 km upstream [about 200 miles], during the 19th and early 20th centuries" (2002: 1). George Brown Goode also writes that harbor seals ascended "all the larger rivers, often to a considerable distance above tide-water," such as the Saint Lawrence (on the east coast of the US), from which they reach the Great Lakes. Harbor seals were also seen in Lake Champlain and in Lake Ontario near Cape Vincent." They are "also known to ascend the Columbia River as far as The Dalles (above the Cascades[15] and about two hundred miles from the sea), as well as the smaller rivers of the Pacific coast, nearly to their sources." In fact, the "Dog River,[16] a tributary of the Columbia, takes its name from a dog-like animal, probably a Seal, being seen in the lake whence the stream rises" (Brown, in Goode 1886-1887: 57). Ray (1938: 113) also notes that the "hair seal (*Phoca richardii richardii*) was . . . found far up the Columbia." Nelson Wallulatum of the Wasco tribe noted on a journey up the Columbia that "Just upstream from The Dalles Dam, at river mile 197, was the island where seals had pups[17]" (Ulrich 1999: 181).

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[14] "He is describing here the area downstream of Celilo about 10 miles" (McMillan).
[15] Today's Cascade Locks.
[16] Possibly the Hood River.
[17] Rookeries.

Moss and Losey (2011: 170) note that harbor seals "are the most abundant and geographically widespread pinniped in Oregon today." Goode (1886-1887, 1:57) describes harbor seals as ranging from "Southern California northward to Bering's Strait," where they were abundant. Harbor seals do not migrate and do not have designated rookeries as they "reproduce everywhere they occur" (Brown, in Moss and Losey 2011: 170). Even though the animals are skittish of humans, 101 haul-out sites have been identified in Oregon in "pocket beaches and rocks" near the coast but also "on sandspits within bays and river mouths." Moss and Losey contend that harbor seals may be more optimal to hunt than other sea mammals because they prefer waters in bays and estuaries that are safer for them to travel than the open ocean; because they are smaller, making them easier to transport and butcher; and because they are abundant (171).

Other scholars also discuss the presence of other seals in the Columbia and its tributaries:

> Weed (1936) reported a male Steller sea lion was found on a stem of the Willamette River 150 km upstream of the Columbia River mouth in the 1930s. Scheffer and Sperry (1931) collected a harbor seal 25 km upstream of the mouth in the late 1920s and Bailey (1936, p 335) reported that harbor seals were observed "by many travelers in the Columbia River up to The Dalles" (308 km from the mouth) after the Corps of Discovery expedition. (Lyman et al 2002: 1)

McMillan notes that

> At Celilo Falls, The Dalles, at the Cascades of the Columbia (today's Cascade Locks), and at the entry of the Washougal River [Lewis and Clark] saw particularly large concentrations of these mixed species [seals and sea otters] of seal-like animals that undoubtedly included both California and Stellar's [sic] sea lions along with harbor seals, and very likely some northern fur seals as well whose historic distribution is now known to be much further south than once considered (to California).
>
> For Lewis and Clark to be impressed by the abundance of an animal, which was remarked numerous times regarding the "seals" they saw (particularly so at Celilo Falls), it would have meant animals in the thousands.

It is important to note that other scholars disagree with McMillan's estimation of "animals in the thousands." For example, Lyman (in Wright 2011) points out that the McMillan paper was not peer-reviewed. Further, according to Lyman, McMillan has no empirical basis on which to "estimate that these men meant '100 [pinnipeds] per mile with concentrations of 1000s' at places where salmon congregate." Certainly McMillan provides none in his paper. Lyman also notes that, based on the relative scarcity of "pinniped remains (regardless of species) in Columbia River archaeological sites," pinnipeds were not abundant, and certainly not as abundant as McMillan suggests, in the Columbia River:

> But given that prehistoric people would have been in direct competition with pinnipeds for the salmon at Celilo and other prime fishing spots, I strongly believe we should find lots more pinniped remains than we have to this point in time if pinnipeds were as abundant as McMillan suggests they were. (Lyman in Wright 2011)

However, Lyman (in Wright 2011) also notes that

> to estimate total abundance of pinnipeds for the lower Columbia based on 100 individuals per mile over 200 river miles seems to me to be exceptionally ecologically naïve. No organism, plant or animal, has such a uniform density across such a large area. A couple thousand pinnipeds seems to me a reasonable guess, and I emphasize that it is at best an archaeologically and ecologically informed guess.

That Steller sea lions can ascend fish ladders was recorded in February 1936 during a sighting of a sea lion in the Willamette River, nearly 100 miles from the ocean. For several days the animal stayed in the Oregon City area, catching fish, before ascending the fish ladder:

> At Oregon City there is a large falls harnessed to run paper mills. The strange marine visitor was found at the foot of this natural barricade the next morning. Crowds gathered to watch the sea-lion coast on the top of the murky water, gaze curiously at his audience, and then slip noiselessly from sight. Soon he would reappear with a fish in his cavernous mouth.
>
> But, on the twenty-first, "Sergeant Finnegan" discovered the 200-foot fish ladder at the side of the falls. Like the good explorer he was, he started to climb in order to find what the upper river was like. It took him a half hour to surmount the watery cataract. Reaching the upper river, the sea-lion headed upstream toward the state capital. (Weed 1).

Two days later a farmer found the sea lion in his field. The sea lion had swum up the Pudding River and then taken to land. "When found, the sea lion had progressed nearly two miles. In the course of his wanderings he had flattened three hog-tight fences with his 1,200-pound bulk" (Weed 1-2). Eventually, after much sight-seeing by locals, the Fish and Game Commission was called. They hauled the animal in a truck the hundred miles back to the Pacific, where the sea lion was released (Weed 2). Weed's account included a photograph of the sea lion (Figure 2).

Another sea lion, a California sea lion pup that was named Hoppie, was found in April 2014 by ranch hands in the San Joaquin Valley: "the sea lion pup had hopped close to a mile from the San Joaquin River before he was discovered at Mape's Ranch, about eight miles west of Modesto -- near the boundary of the San Joaquin River National Wildlife Refuge" (Giwargis 2014). Yancey (2014) notes that "Hoppie likely travelled through a side channel of the San Joaquin River, moved overland through riparian forest on the San Joaquin River [National Wildlife Refuge], along the edge of a refuge crop field, and finally along a dirt road bordering an orchard where he was rescued," ending up about 1½ miles from the river and about 100 miles from the Pacific Ocean. "Sea lions are quite mobile on land compared to seals" (Yancey 2014). Hoppie is not the only sea lion to be found that far from the sea: "In February 2004, a 321-pound sea lion named Chippy was found lounging on a police cruiser and rescued by California Highway Patrol officers" in the same area (Giwargis 2014). In 2012 another sea lion was spotted in Old Sacramento after having swum up the Sacramento River in California: "Sea lions are frequent visitors to Old Sacramento, swimming up the Sacramento River from the San Francisco Bay and feasting on fish and other delicacies along the way" (News 10 Staff, KXTV 2012).

Pearson (1969: 2) points out that from 1924 to 1933 bounties were paid on both harbor seals and sea lions in Oregon. "The records of these payments . . . indicated that harbor seals were present in every major estuary from Brookings to Astoria. However, the major concentration apparently was in the Columbia River estuary":

> Oregon State Game Commission "Resume of control activities and observations on harbor

seals" for 1956 through 1965" (unpublished), Alsea, Winchester, and Tillamook Bays were listed as problem areas. At various times the Oregon State Game Commission had received complaints of "excessive numbers of seals and possible predation on fish" in these bays.

**Figure 2:** "Sergeant Finnegan," a sea lion. SOURCE: Weed 1.

The bounty on seals in Oregon was discontinued in 1933 but another bounty system began in 1935. The Oregon Fish Commission used the seal fund to hunt, kill, or catch seals in the Columbia River. Bounties ranged from $5 in the late 1930s to $25 in the 1960s. Numbers of seals killed presented for bounty ranged from more than 300 per year for 1941-42 to 14 in 1967 (Pearson 1969: 4, 7). This is not indicative of all seals killed, however. Using Imler and Sarber (1947), who estimate that some 40% of seals shot will sink, Pearson (1969: 7) assumes that "the number of seals presented for bounty represents only 60% of the seals actually killed. This would imply that the number of seals killed in the Columbia River ranged from over 500 in 1941-42 to a low of 23 in 1967." The decrease between the 1940s and 1960s also indicates that lethal methods do, in fact, deter sea lions from utilizing the areas in which they are hunted.

### B. Tribal Use of Seals and Sea Lions

Tribal use of seals and sea lions by Columbia River tribes is long-standing. As discussed, archaeological sites downstream of Celilo Falls have revealed the bones and teeth of harbor seals and other phocids and pinnipeds "procured from the Columbia River rather than ones traded inland from the coast" (Lyman et al 2002: 1).

Haynes and Mishler (1991: 11-12) describe historic uses of Steller sea lions in the Aleutian Islands, including how they were butchered. The Columbia River tribes and other Pacific Coast

tribes traditionally butchered seals and sea lions in similar ways and put them to similar uses:

1. Kill and bring in the sea lion. Split open the belly and lay back the ribs. The first step is to remove all the intestines. Be careful not to cut useful parts and ruin them.
2. Carefully cut the skin up the length of the bottom of a boot from the head to the shoulder. This will be used for making boots. This thickest part of the skin (about 1 inch thick) will be used and dried for soles.[18]
3. Take off the remaining skin, cutting around the flippers and feet. This will be used for the outside covering of bidarkies [kayaks].
4. Take feet and flippers off. Save all skin on these for using on the soles of boots. The rubbery part of the flipper makes a gripping surface.
5. Remove the arm with the shoulder. Use this for dried meat. This part of the sea lion is the heaviest and contains the most meat of any part.
6. The breast and ribs are salted down for food.
7. The back part of the ribs is cut along the spine. All leg parts are removed with these and used in cooking. If killed in May, the blubber is 4 inches thick.
8. The blubber is salted down for eating with dry fish. It is also melted for oil. Blubber is taken from the meat. Each chunk of meat is given to a family with the blubber attached since the hide is peeled away without the blubber.
9. Save the stomach. Clean and remove any meat. Turn the stomach inside out, wash, and after returning to original shape, dry it. This is used for storage of oil or other liquids.
10. Cut out the throat clear up to the stomach and remove. This is dried and used for the leg part of the boots.
11. Save all the gut. Clean and dry. This is used for the rain coat. One sea lion will make two average-sized coats. The gut opens up to about l 1/4-inch width and the strips are sewn together with sinew to make the coat.
12. Long ago when sea lions were being butchered, the first thing to be removed was the thin tissue covering of the heart. This was removed very carefully so as not to tear it. It was rinsed in salt water and stretched over the peak of the wooden hat. While the rest of the sea lion was butchered, this tissue dried sufficiently to be lined with cloth. It was used as a carrying traveling. It was used to hold tea because it was waterproof and pliable bag.
13. Eat the heart after soaking it in salt water. It may be baked, boiled, or eaten raw.
14. Eat the liver from a young sea lion. The liver of big sea lions is bitter to the taste.
15. Save the bladder. This is dried and used for a halibut hook buoy as a float.
16. Sea lion whiskers were used to decorate wooden hunting hats. They were also used for pipe cleaners by modern tobacco smokers.

Lyman et al (2002: 3-4) are unsure how the tribes in The Dalles area used pinnipeds. It is not clear if they intentionally or opportunistically hunted seals, although they do note that the traps, harpoons, and nets used to catch salmon could have also caught seals. However, Rick, Braje, and DeLong (2011a: 1) note that humans have hunted and scavenged seals and sea lions "for much of the Holocene or earlier" due to the "large amounts of meat, oil, ivory, and other important raw material and dietary resources" that seals and sea lions provide. Faunal remains at archaeological

[18]Sources from Warm Springs and Yakama also note the use of sea lion skins as burial robes, especially for infants. However, we have been unable to document this use in the available literature, even though there are many more traditional uses that may require ethnographic research.

sites also suggest that even earlier use was substantial (Rick, Braje, and DeLong 2011a: 2). Scott (1941: 208) notes that seals and sea lions are one of 8 main classes of food and alludes to their being taken at The Dalles and Cascades:

> Salmon pemmican, made mostly at The Dalles and Cascades by women, packed in rush baskets lined with salmon skin, and weighing some 90 pounds, was an article of large commerce. Smelt, in a net strainer before a fire, yielded oil. Eels they caught in traps. Sardines they caught with rakes. Flounder they caught with the feet and hands, when wading. Seals they speared by stratagem; also sea lions. The meat, blood and liver they prized. (Scott 1941: 217)

Hewes (1973: 134) includes sea mammals in his estimation of Pacific Northwest tribal food consumption. He bases his estimations on a figure of 2,000 calories per day per capita, noting that "The satisfaction of this demand must have been largely up to the fisheries (including sea-mammal hunting), since other natural foods available in the area in quantity are notoriously low in fuel value." This includes "nearly all the vegetable items" available for use in diets. Aside from acorns and pine nuts, which are really only available in the southern and southeastern portions of the Plateau, bulbs and tubers "such as wapato, bitterroot, camas, clover root, etc., are low in calories, while berries and miscellaneous greens, so necessary for vitamins and trace elements, are negligible sources of fuel" (Hewes 1973: 151). It must also be noted that many of these vegetable items require a good deal of labor to process, whereas salmon and sea mammals, while requiring effort to acquire, are relatively easy to process for consumption. Hewes also notes that the "caloric value of the flesh and blubber of sea-mammals . . . is at least equivalent to fat beef, and is probably much higher" (Hewes 1973: 134), although he does not mention which sea mammals. He does note that, as well as being a good source of protein, the "organs, flesh, and blubber of seals are an excellent source of vitamins A and C" (Hewes 1947: 38).

Moss and Losey (2011) also look at the uses of seals and sea lions by American Indians along the Oregon and Washington coasts at the Netarts, Palmrose, Par-Tee, and Minard sites. While these areas are obviously not along the Columbia River, the uses the tribes put seals and sea lions there may be extrapolated for the CRITFC tribes. At the Netarts site, some 2.5% of the vertebrate remains were marine mammals including, in order of representation, sea otters (380), Steller sea lions (166), harbor seals (124), northern fur seals (31), Guadalupe fur seals (3), and California sea lions (2) (Moss and Losey 2011: 175-176). Even though the representation is small within the whole vertebrate remains, Moss and Losey state that "pinnipeds and sea otters were clearly part of a meat diet that included a wide array of species" (176). (It is interesting to contrast these numbers with those of Cressman, who found that phocids represented 7% of the assemblage.) Tools include three-piece toggle harpoon assemblages dating within the last 1,000 years as well as "contracting-stem, narrow-necked chipped-stone projectile points" indicating use of the bow and arrow (Moss and Losey 2011: 177).

The Palmrose site, some 15 km from the mouth of the Columbia, and also very near the Par-Tee site, was first occupied around 4,000 BP and abandoned around 800 BP possibly because the estuary filled in (Moss and Losey 2011: 178). The site was excavated in the mid-1960s and again in 1988. In the mid-1960s, of the total vertebrate remains, some 29% were of marine mammals, including, in order of representation, sea otters (196), Steller sea lions (179), northern fur seals (105), harbor seals (30), and California sea lions (15). From the 1988 excavation, some 3% of the vertebrate remains were from marine mammals: sea otters, Steller sea lions, northern fur seals, harbor seals, and California sea lions. Other bones indicated that the most abundant fish species were salmonids. Tools included both unilaterally and bilaterally barbed harpoons as well as

toggling harpoon valves (Moss and Losey 2011: 178).

The nearby Par-Tee site is one of the most extensively excavated sites, with 2,344 units being dug over 10 years. Occupation occurred between 2000 and 1000 BP, with some use being as late as 1800 CE. Marine mammals represented about 34% of the total remains, including sea otters (422), harbor seals (85), Steller sea lions (57), and California sea lions (5) (Moss and Losey 2011: 178-179). Tools included bilaterally and unilaterally barbed harpoon heads dating from roughly between 3000 and 1000 BP, single-piece harpoon heads, and toggling harpoons "similar to those used historically for taking salmon, seals, sea lions, and sea otters" (Moss and Losey 2011: 179).

The Minard site, located about 1 km from the Pacific, revealed some 20,000 remains, of which about 11% were marine mammal bones: mostly sea otters (780), with harbor seals (256), northern fur seals (255) Steller sea lions (234) and California sea lions (7) also being represented (Moss and Losey 2011: 180). Of the fish remains, more than 80% were salmon and flatfish (Moss and Losey 2011: 181). Toggling harpoon valves were also recovered as well as points that could be from arrows, spears, or harpoon blades (Moss and Losey 2011: 182).

**Table 3: Marine Mammal Remains from Sites Along the Oregon and Washington Coasts**
**(Moss and Losey 2011: 177)**

| Species | Latin name | Minard site | Palmrose site | Par-Tee site | Netarts site |
|---|---|---|---|---|---|
| Sea otter | *Enhydra lutris* | 780 | 196 | 422 | 380 |
| Guadalupe fur seal | *Arctocephalus townsendii* | | | | 3 |
| Northern fur seal | *Callorhinus ursinus* | 255 | 105 | 32 | 31 |
| Steller sea lion | *Eumetopias jubatus* | 234 | 179 | 57 | 166 |
| Harbor seal | *Phoca vitulina* | 256 | 30 | 85 | 124 |
| California sea lion | *Zalophus californianus* | 7 | 15 | 5 | 2 |

From these findings, Moss and Losey conclude that northern fur seals were far more abundant off the Oregon coast in the late Holocene than they are presently. California fur seals, however, were not as abundant as they are now; coupled with the presently "increasing numbers of California sea lions in coastal bays and up rivers," it is possible that "today this species occupies a niche that belonged to one or more other pinnipeds in the past" (Moss and Losey 2011: 184). Perhaps this species is the northern fur seal. Steller sea lions seem as present today as in the past. Ray (1938: 113) notes that "The huge Steller's sea lion (*Eumetopias jubata*) appeared not only on the rocks of the coast but also in the Columbia river for the entire length of Lower Chinook territory," which he places as far upriver as Oak Point (Ray 1938: 38), some 50 miles from the mouth of the river.

### C. Hunting Techniques

Cressman notes that the harpoon was in use at The Dalles possibly as early as 9,000 years ago (1977: 109): "Various kinds of weapons, including presumably the harpoon, were in use at The Dalles . . . well before 9,000 years ago and perhaps at the Fraser Canyon site of comparable age . . . Both sites were used for taking salmon, and at The Dalles seals were also killed." In fact, "The major difference between the harpoons used for sea mammal hunting and fishing largely a matter of size and arming. The principles are the same – detachable head held by a retrieving line" (Cressman 1977: 115). It is also possible that leisters were used to hunt seals:

> the leister is represented by some of the small pieces of bone and antler from the Early Level at the Five Mile Rapids site at The Dalles. . . The specimen occurs at about the time the first seal appears in the fill, and fish were also being taken. It obviously could have been either a part of a leister or the point of a harpoon. (Cressman 1977: 115).

Cressman notes that the harpoon replaced the fish spear because the retrieval line made the harpoon more efficient in holding fish as well as sea mammals. Further, the harpoon's detachable head not only keeps the line attached to the prey, it maintains the injury given to the animal (1977: 115). "Smaller unilaterally or bilaterally barbed harpoons . . . were used interchangeably for small sea mammals [such as harbor seals] or salmon" (Cressman 1977: 116). Hewes (1998: 625; 1947: 106-107) notes that "the Tenino, and probably other tribes of the Columbia River living below The Dalles" would sometimes harvest a harbor seal (*Phoca vitulina*) during salmon runs and describes how harbor seals were hunted utilizing a detachable-head harpoon:

> The seals were taken from shore, and after the detachable harpoon head was embedded in the animal the line was fastened to a nearby post or tree, to be hauled in when the seal was exhausted. According to . . . informants, these seals formerly congregated on an island in the river from which they could prey on the passing salmon. Seals, and possibly sea lions, were probably fairly common visitors in the lower courses of all the larger rivers of the Pacific coast before the era of intensive commercial sealing and the spread of firearms.

Other scholars discuss the use of the spear to hunt sea mammals (although they may be referring to what Cressman would consider to be a harpoon). For example, Alexander Henry (in Henry, Thompson, and Cous 1857: 857) described how the tribes used spears or harpoons to hunt sea lions at Oak Point[19]:

> The natives at Oak point, during the time Mr. Keith was there, killed five very large sea lions. Two canoes being lashed together, they approach very softly and throw their spears, which, are fastened by a long, strong cord, with a barb so fixed in a socket that, when it strikes the animal and pierces the flesh, it is detached from the shaft of the spear, but remains fastened to the cord. This is instantly made fast between the canoes; the animal dives and swims down the river, dragging the canoes with such velocity that they may be in danger of filling, and require great skill in steering. In this manner they are carried down some miles before the animal becomes exhausted with loss of blood, makes for the shore, and lies on the beach, where they dispatch and cut it up.
>
> Mr. Keith bought the flesh of one of these animals, and we had some roasted; it resembles bear's meat. The hair is like that of a horse, in summer of a chestnut color.[20]

Spears were also used widely to capture salmon. The slip-point spear in particular could also have been used to harvest seals and sea lions:

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[19] Meany (1920: 288) notes that Oak Point, also known as Oakpoint, is "a town on the Columbia River in the southwestern part of Cowlitz County" first mentioned by explorers in 1792. It's about 50 miles from the mouth of the Columbia.

[20] Cous, the editor of this work, comments that "This is an exceptionally important passage. I hardly know where else to find positive indication of the former occurrence of Steller's sea lion on the Columbia" (1857: 857). The chestnut color identifies the sea lions as Steller sea lions.

> As originally constructed by the Indians, [the slip point spear] consisted of a straight piece of elk or deer horn, about 7 inches long, pointed, and mounted on the end of a long willow pole. A small piece of bone was then fashioned into a very sharp point with either one or two barbs. This small point was hollowed and fitted snugly over the long piece of horn fitted to the pole. A cord was then made fast to the small point and secured firmly to the pole about 2 or 3 feet back from the head. Enough slack was left in the cord so that the small point could be removed without difficulty. When ready for use, the small point was mounted on the longer piece of horn. When a salmon was struck the small point was usually forced completely through the fish. The point would then become dislodged from the rest of the spear and turn sidewise with the result that it could not be pulled out through the wound. Since the point was attached to the wooden shaft of the spear by a cord, the salmon could then be played and landed with the short line and stiff pole. Such an implement has a considerable advantage over a spear with the head attached immovably to the shaft, since a large fish[21] is apt to either tear away from the spear or break the shaft when one of that type is used. (Craig and Hacker 1940: 144)

After contact with Europeans and Euroamericans, iron was substituted for the bone materials used to make the spear's head. While it seems unlikely that a seal or sea lion could be "played and landed with the short line and stiff pole" (Craig and Hacker 1940: 144) from a spear, it is likely that the wound caused by the head would eventually kill the animal which could then be pulled out of the river and harvested.

In his work on the Chinook, Ray (1938: 113-114) relies on Swan's (1857: 83-84) description, during his 3 years at Shoalwater Bay, in Chinook territory, of hunting hair seals (*Phoca richardii richardii*), which the Chinook also accomplished using spears. The upriver tribes likely observed seal hunting by the Chinook during trade. Not only did "Coastwise travel from both the north and the south" center in Chinook territory, but "traders from the interior" used the Columbia River to reach Chinook territory, "where the riches of the coast might be obtained" (Ray 1938: 99). The Chinook eventually focused their culture on trade, and Chinook Jargon became the language of trade in the Northwest.

### D. Use of Weirs to Take Salmon and Sea Lions

Boxberger (2000: 13) notes the presence of sea mammals in Lummi subsistence; while salmon "were by far the most important food source to the Lummi people," sea mammals were also hunted. The Lummi employed both weir fishing and reef netting, and although "weir fishing was secondary to reef netting," Lummi weirs "were very complex undertakings, stretching across an entire river and including walkways and several traps" (Boxberger 2000: 14). As Moss and Losey (2011: 186) suggest, sea mammals could easily have been hunted at such weirs.

Campbell and Butler (2010: 7) comment that the efficiency of tribal weirs "is reflected by the fact that Euroamericans modeled much of their gear after aboriginal designs; indeed, some of the Euroamerican versions were so effective they were banned." Craig and Hacker (1940: 142) describe weirs as being "a singularly effective method for taking salmon and other fish in small tributary streams." However, David Lavender notes the use of weirs at the confluence of the Snake and Columbia Rivers: hardly "small tributary streams":

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[21] McDonald (in Scholz et al 1985: 34) note that "Salmon as heavy as one hundred pounds have been caught in [Kettle Falls]."

When the Corps of Discovery reached the confluence [of the Snake and Columbia Rivers], the last of that year's migration was ending. Though myriads of fish still undulated in transparent water fifteen to twenty feet below the boats, an even greater number lay dead in putrefying windrows along the banks or floated on the surface of the streams. The Indians, too, were leaving. Many of their settlements, frequently located where salmon congregated at the bottoms of the rapids, were empty. But, like the living salmon, many still remained, the men busy with spears, nets, and weirs, while the women dexterously slit in half and disemboweled, one by one, the fish brought to them and then laid the pieces on wooden scaffolds to dry. Amazed by the number of the structures, Clark tried to find out how far the people had rafted the timbers used in their building, but his gestured questions, turned into words by Twisted Hair, were not understood. (“OpenJurist”)

## IV. Predator Suppression

Scholz et al (1985: 10) note that

> Historical and ethnographic sources indicate that salmon and steelhead were the principal means of subsistence for nearly all of the tribes in the Columbia River drainage, from The Dalles and Celilo Falls to Kettle Falls and even to the source of the Columbia at Columbia and Windermere Lakes in British Columbia.

Such an important resource would not have gone unprotected. Any influx of competing seals and/or sea lions would have been dealt with in order to secure the continuance of fish for the people.

It seems obvious that seals and sea lions enter the Columbia to prey on salmon and other fish. Lyman et al (2002: 4) draw connections between the presence of seals in the Columbia and the presence of salmon and lamprey. Keefer et al (2012: 1240-1241) also note that sea lion arrival coincides with fish presence:

> Seasonal timing differences among sea lion species coincided in part with availability of their primary prey species. . . Peak pinniped abundance was in April or early May in all years, and typically preceded peak Chinook salmon passage at Bonneville Dam by several days.

Moss and Losey (2011: 186) surmise that "Intensive human competition for prey surely affected pinniped behavior" since the animals most likely congregated during runs of chum salmon, other salmon species, herring, and smelt spawning. McMillan estimates "that seals and sea lions in mixed presence [gathered] at those points where salmon and steelhead were particularly concentrated": that is, "between The Dalles and Celilo Falls, which of course, is where the fish were most concentrated." While being "described in great numbers in October, November, February, March, April, July and September," McMillan considers that seals and sea lions "were in the Columbia River virtually year around" and that until commercial fishing began being practiced on the Columbia in the 1860s, "the seals and sea lions were largely eradicated as competitors."

During April of 2014, "A host of spawning spring Chinook salmon arriving at the lower Columbia River's Bonneville Dam . . . coincided with a rush of sea lions eager for a feast." Numbers of Chinook salmon increased to 79,874, while steelhead increased to 3,867, "about average for the past 10 years." The single-day high was on April 30, when 17,972 salmonids passed through: "the third highest one-day total seen since 2002." This included 17,409 adult Chinook salmon, 519 chinook jacks, and 43 steelhead. Not surprisingly, seal and sea lion predation "really increased" over those two weeks as well. "Things really picked up the past couple of weeks" as the spring chinook run increased. "About 60 California sea lions (*Zalophus californianus* – CSL) have been seen at Bonneville so far this year, and 24 of those are returning individuals." Steller sea lion numbers also increased over the two-week period but averaged fewer than in 2010-2013. The maximum number seen in a day was 41, although some 50 different SSLs had been documented visiting the dam to that date. Thirty-three were returning individuals ("18,000 Spring Chinook").

Such congregations would traditionally have created competition between the tribes and the mammals; hunting the seals and sea lions in the Columbia may have been both a means to gain another subsistence resource and a way to lessen said competition. "Since pinnipeds and sea

otters feed on salmon, herring, hake, smelt, and other fish known to have been important to Native Americans, we suggest that they were vulnerable to hunting when these prey taxa aggregate" (Moss and Losey 2011: 186). In the 1820s George Simpson noted that "when sea lions entered the Columbia, natives would kill them" (in Ruby and Brown 1988: 14).

However, while Campbell and Butler (2010: 10) note that "Native peoples in the Northwest preyed on carnivores known to pursue salmon, such as *phocid* and *otariid* seals," they question that the tribes reduced seal populations to the point of actually improving salmon populations. Campbell and Butler examined the frequency of *Phocidae* and/or *Otariidae* remains in 9 sites on the lower (300-km) section of the Columbia River below The Dalles. Only a small amount of seal bones was found; of some 18,000 mammal specimens, only about 100 bones and teeth from harbor seals and other species were present. Campbell and Butler concluded from these findings that seal hunting was more opportunistic than focused and did not affect the resilience of the salmon fisheries (2010: 11).

However, this is not to propose that the tribes hunted seals and/or sea lions solely to suppress their predation on salmon and other fish. As we have shown, the tribes had many uses for seals and sea lions, not the least of which would have been as another subsistence resource. Some scholars suggest that seals and sea lions were hunted opportunistically in concert with other activities. For example, Moss and Losey suggest that hunting of marine mammals was part of common travel through the estuaries "to fish, to gather clams, crabs, and fuel wood, to hunt waterfowl, and to meet and trade with neighboring groups" (2011: 191); certainly Columbia River tribes would also have hunted sea mammals while fishing, gathering, and performing other labors. Moss and Losey propose that during runs and spawning times, American Indians traditionally pursued not only the fish, but the marine mammals that fed on the fish: "Pinnipeds and sea otters were probably also taken at places where fish were artificially concentrated, such as at the fish weirs and traps"; further, "Native Americans built these weirs not only to attract a variety of fish, but also to attract their mammalian . . . predators" (186). While Moss and Losey focus on estuaries of northern Oregon and southern Washington, it is possible that tribal fisherpeople farther up the Columbia River and its tributaries also traditionally utilized weirs and traps not only to gather fish, but to capture and utilize marine mammals as well. For example, and as noted previously, Cressman considers the Fivemile Rapids site to mainly be a hunting site for mammals including seals and sea lions.

Some scholars believe that tribal hunting of sea mammals may have even resulted in the animals' extirpation from certain areas. Lyman (2011: 26-27) suggested that pre-contact hunters may have wiped out species of California sea lions on the coast between 800 and 200 years ago although, importantly, such losses may also be due to shifts in climate. Lyman (2011: 26-27) also implied that this decimation of species was due to the tribes' suppression of seals and sea lions specifically as predators. However, this is a reversal of his 1988 opinion in which he "believed that precontact marine mammal hunting had not adversely affected local pinnipeds" (Ross and Losey 2011: 168). McMillan, however, disagrees with Lyman's implication of tribal overhunting in his discussion of historic numbers of seals and sea lions, instead associating seal and sea lion numbers with salmon populations:

> We could only wish there were still 20,000 seals and sea lions in the Columbia. It would tell us that we once again had historic run sizes of salmon and steelhead (likely between 35-50 million, not 11-15 million) that human procreation and agricultural/industrial civilization, not animal predation, will never allow us to recover.

Lyman hoped that "identifying a human cause of extinctions will not become evidence used for political purposes as it has for the overkill hypothesis regarding Pleistocene extinctions," and certainly some archaeologists "argue that prehistoric hunters drove many populations toward extinction," (Lyman 2011: 26, 27), suggesting at least that the tribes traditionally hunted the mammals. "Available data suggest that central and southern California populations of fur seals and sea lions were extirpated 800 or more years ago whereas more northern populations of these taxa were extirpated only in the last 200 or so years" (Lyman 2011: 26), although their losses may also be attributed to climate change. Other scholars, such as Whitaker and Hildebrandt (in Braje and Rick 2011b: 300) note that the tribes maintained a sustainable fur-seal harvesting practice for some 1,500 years before the arrival of Europeans. They argue "for a case of long-term continuity in marine mammal populations, despite human hunting and natural climatic oscillations." Braje and Rick (2011b: 301) conclude that "the degree of human forcing on North Pacific marine mammal populations has ranged from significant to superficial." Campbell and Butler (2010: 1, 2) even suggest that predator suppression was not a major factor in fishery resilience; in other words, the tribes did not kill enough seals and/or sea lions to affect the number of salmon. That number remained consistent more because of social institutions surrounding fishing.

## V. Conclusions

Pinniped predation on salmonids and other aquatic species on which the tribes depend has prompted this ethnographic research to document tribal hunting of pinnipeds along the Columbia River. Several published sources describe traditional tribal hunting of pinnipeds in the Columbia River, but more extensive ethnographic research with contemporary tribal members has provided a clearer, accurate, factual foundation for federal, state, and tribal management of the pinnipeds in the Columbia River. Our ethnographic and ethnohistoric research expands previous research findings concerning the pinniped predation in the Columbia River by addressing the tribal history of pinniped hunting, traditional uses of pinnipeds, and the contemporary impact they are having on tribal harvests.

Braje and Rick (2011b: 304-305) argue for establishing a "baseline for effective conservation management" of sea mammals based on traditional practices, although identifying this baseline is not without its difficulties as sea mammals have been influenced by humans since at least the Pleistocene. Certainly, "The most significant human impacts occurred with historic commercial overhunting beginning in the 17th century." What Braje and Rick fail to mention is that the tribes also suffered significant impacts from these same Euroamericans who overhunted the marine mammals.

Tribal hunting of seals and sea lions also occurred independently of fishing activities, according to some tribal elders. Among the conclusions we have drawn from our research at this time are the following:

1. The four reservation tribal populations each possess words for sea lions and seals. They are recognized as part of their traditional culture.
2. Members of each of the four reservation tribal populations traditionally traveled to customary seal/sea lion locations in the Columbia basin where they took seals/sea lions in association with fishing activities.
3. Tribal harvesting of seals/sea lions coincided with fishing activities during fish runs. Tribal fishermen traveled to locations such as Cascade Locks and Celilo to fish, and seals/sea lions were harvested not only for their meat and hides but likely also because they interfered with tribal fishermen who sometimes disposed of them primarily because of their depredations on the fish runs on which the tribes depended. but also because the seals/sea lions congregate at these locations in order to intercept fish runs.
4. Establishment of reservations and restrictions on tribal off-reservation travel and hunting/fishing began in the mid-nineteenth century, as did heavy non-Indian predation on both fish and seals/sea lions in the Columbia Basin.
5. The impact of new fishing technologies, extensive and largely unregulated non-Indian fishing, and increased settlement of non-Indians in the middle Columbia served to quickly reduce both fish runs and sea mammal population.
6. Construction of dams on the Columbia River and its tributaries limited fish populations.
7. Tribal opportunity to hunt for seals/sea lions had also been reduced by construction of dams and restrictions by State-imposed fish and game laws limiting tribal access to these resources.
8. The possibility that there were permanent populations of seals and sea lions on the Columbia River has not been adequately investigated at this time such that the effect of the elimination of seal/sea lion habitat and rookeries by real estate and related development has not been determined. We are informed that sea lions were hunted on the land and, we presume, largely in rookeries during the 19th and early 20th centuries.

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