Northwest Fisheries Science Center
FRAMD, NMFS
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Cruise Report for the 2007 West Coast Groundfish Bottom Trawl Survey May 14 – Oct. 23, 2007

Chartered vessels:	F/V *Ms. Julie*	(2007 Pass 1)
	F/V *Noah's Ark*	(2007 Pass 1)
	F/V *Excalibur*	(2007 Pass 2)
	F/V *Raven*	(2007 Pass 2)

Summary

The Northwest Fisheries Science Center's (NWFSC) Fishery Resource Analysis and Monitoring Division (FRAM) conducted the tenth in a series of groundfish bottom trawl surveys along the west coast upper continental slope and shelf from May 14 to October 26, 2007. The survey targeted the commercial groundfish resources inhabiting depths of 55 to1,280 meter from the area off Cape Flattery, Washington (lat. 48°10'N) to the U.S.-Mexican border (lat. 32°30'N). The West Coast groundfish fishery includes about 80 commercially fished stocks off Washington, Oregon and California. The goal of the 2007 groundfish survey is to provide fishery-independent data used in the assessment of the status and trends of commercially important species. Four chartered West Coast bottom trawlers were selected to participate in the survey through a competitive bid process. Two vessels, the Fishing Vessel (F/V) *Noah's Ark* and the F/V *Ms. Julie*, were used during the first survey period, pass 1. Two additional vessels, the F/V *Excalibur* and the F/V *Raven*, were used during the second survey period, pass 2. All vessels progressed south along the coast, finishing the survey south of San Diego, CA.

In 2007, 771 stations were sampled with 722 successful tows. Catches were sorted to species, aggregate or other appropriate taxonomic level and then weighed using an electronic, motion compensated scale. A count of 635 distinct fish and invertebrate species were identified within the survey area. Biological sampling included determination of sex as well as collection of lengths, weights, otoliths, and stomachs. Summaries indicate that 26,417 individual weights and 106,399 length measurements were taken with 23,456 otolith samples collected. A total of 670 stomachs were collected from 3 species: Pacific hake, bocaccio and chilipepper rockfish.

New to the groundfish survey in 2007 were an inventory of marine debris and a study of fish distribution and abundance in an hypoxic area off Newport OR. Corals were subsampled (n = 255) for DNA analysis, collected whole (n = 77) or photographed (n = 173). Estimates of seabird abundance were made at the start of each tow, time permitting, with data intended to advance an understanding of the distribution of seabird species and their oceanic habitats.

Itinerary

The survey was conducted on board the chartered commercial trawlers F/V *Ms. Julie* and F/V *Noah's Ark* from May 14 through July 26, 2007 and the F/V *Excalibur* and the F/V *Raven* from August 13 until October 23, 2007. These vessels began the cruise at Cape Flattery, Washington and worked southward to the U.S.-Mexican border sampling in randomly predetermined areas and depths.

Objectives

The West Coast Groundfish Trawl Survey (WCGTS) is designed to provide information on distribution and abundance of demersal fish species, and other biological resource information. Although NWFSC assumed responsibility for the slope portion of the groundfish survey starting in 1998, the time series began as a West Coast continental slope survey conducted by the Alaska Fisheries Science Center (AFSC) in 1988. Since 1998, the NWFSC has conducted an annual coast-wide survey to establish an ongoing time series of groundfish catch, fishing effort, and individual fish measurement. Beginning in 2003, the NWFSC expanded the depth coverage of the slope survey (184 – 1,280 m) to incorporate the continental shelf (55 – 183 m). Consequently, in the current sampling configuration the WCGTS now also encompasses the area historically monitored by the continental shelf survey conducted triennially by the Alaska Fisheries Science Center (from 1977 through 2001). The NWFSC's groundfish survey currently provides not only an annual snapshot of fish stock status, but also provides an extension of two established, long-term time series from which informed management decisions can be made. Prior to 1998, surveys conducted by the AFSC were the principal source for fishery-independent data of groundfish resources along the upper continental slope and shelf of the U.S. West Coast. The AFSC conducted slope surveys, periodically from 1984 – 1987, and annually beginning in 1988 and shelf surveys triennially from 1977 – 2001. The AFSC slope surveys were conducted with the NOAA vessel *Miller Freeman* while the triennial survey used chartered Alaskan fishing vessels. Spatial coverage of the West Coast surveys varied among years due to constraints imposed by annual budget levels and availability of NOAA ship time.

The NWFSC groundfish survey was initially designed to cover the same depths and latitudes established with the AFSC slope survey. Beginning in 2003, the WCGTS was expanded to include the continental shelf and slope (range of depths 55 m to 1,280 m) along the entire area U.S. West Coast (U.S.-Canadian border to U.S.-Mexican border). Since inception in 1998, the NWFSC survey has utilized chartered fishing vessels from the West Coast commercial fishing industry. This feature capitalizes on the skills of fishing captains familiar with the challenges of fishing in the waters off the West Coast,

and fulfills the cooperative research provisions of the Magnuson-Stevens Sustainable Fisheries Act. The results of the surveys provide measures of the change in relative abundance, distribution, and condition of groundfish stocks over time, which is of interest to fisheries managers, fishers, and concerned citizens.

Chartered Vessels and Gear Specifications

The four vessels used in the 2007 charter ranged in length from 65 to 92 feet (19.8 to 28.0 m), with vessel horsepower ranging from 450-1,200. Each vessel was rigged as a stern trawler; with a rear gantry housing one or two net reels to set and retrieve trawl gear. Vessels were outfitted with split trawl winches and equipped with modern electronics including global positioning systems (GPS), multiple depth sounders, radars, and other navigational aids. Prior to the start of the survey, the NWFSC provided each vessel with two 5/8" steel core trawl cables, each 2,288 m (1,250 fm) in length. Cables were measured side-by-side and marked at 25 fm increments while being spooled onto the vessel's winches. The markings provided real-time verification of the release of equal warp length from both winches while setting a tow. An experienced captain, two crew members, and three scientists staffed each vessel (Table 1).

The FRAM division provided standardized fishing gear for the survey. An Aberdeen-style net, built and rigged to operate within strict specifications in compliance with NOAA protocols for bottom trawl surveys was used to sample fish biomass. The Aberdeen trawl is a four panel bottom trawl with a small-mesh (1 1/2" stretched measure or less) liner in the codend to retain small organisms. The Aberdeen trawls were fitted with 8" and 10" rubber disc footropes and spread with 1200 lb. 5' x 7' steel V-doors. A Simrad ITI trawl instrumentation package was employed on each net to monitor trawl performance and ensure that the gear's haul-to-haul catching performance was kept as constant as possible. Electronic net mensuration data, as well as global positioning system (DGPS) navigation data, bottom contact sensor data, and temperature data were obtained for each tow. Average vessel speed over ground and distance fished were calculated from the position, vessel speed, net-to-vessel range and bearing readings and actual bottom time of the trawl. All features of the trawl event (i.e. from commencement of net deployment to the completion of net retrieval) including net mensuration information, GPS data, trawl location, scope, vessel depth, trawl gear depth, and sea state conditions, were logged using customized software programs. Catches were sorted to species or other appropriate taxonomic levels and then weighed in aggregate using an electronic, motion-compensated scale. Sub samples of important management species were randomly selected for individual measurements (length and weights) and biological sampling (otoliths and sex determinations). Catch and individual species biological information were logged wirelessly into a rugged notebook computer using the Fisheries Scientific Computing System (FSCS) customized data integration system. Data were quality controlled while at sea using FRAM Division custom-built editing applications.

Survey Design and Methods

The survey followed a stratified random sampling scheme with 2 geographic strata (80% N and 20% S of Pt. Conception, CA) and 3 depth strata. The depth strata were: shallow (55-182 m), middle (183-549 m), and deep (550-1,280 m). The sample design consisted of 752 randomly selected sampling locations, within specified depth strata (minimum of 30 tows per strata). Each of the four vessels occupied a different subset of 188 cell sites. Table 2 includes the haul numbers and station locations (latitude, longitude) by vessel. Station location, as defined here, is a location central to the sampled survey grid cell that is computed as the mean latitude and mean longitude of the four defined grid cell trapezoid corner positions. Following post-season data processing the station location represent the "best" location as defined by a hierarchy of computational preferences that depend on data availability. These are: (1) the mean of the start (touchdown) and stop (liftoff) locations of the net along a tow track, or in absence of these data, any known single net position along the tow track (preferred and actual for most tows); (2) similar means based on the vessel location at the start and end of the tow, or in absence of these data, any know single vessel position along the vessel track (occasional); or (3) if no other information were available, the cell centroid as previously described for the station locations reported here (rare).

Target duration of each tow was 15 minutes. Captains attempted to maintain a constant speed (2.2±0.5 knots) throughout the tow. Bottom contact sensors (Scott McEntire, AFSC/RACE Division, Seattle WA) were placed on the footrope of the net and used to verify that the trawl was on the bottom. Tow duration was determined from the bottom contact sensors as the time from net touch down to net lift-off. Acoustic instruments attached to the net recorded various aspects of the net's mechanical performance (e.g. net height, net width, distance to bottom, etc.). Other data were collected on the operational conditions (e.g. depth, amount of towing cable deployed, towing speed, tow duration, and weather conditions).

Catches were sorted to species or other appropriate taxon, and then weighed. Samples were taken of the principal species for length-frequency determinations using an electronic measuring board or acquisition of other biological data. The data were logged using a data gathering system called Fisheries Scientific Computing System (FSCS, Dennis Shields, NOAA/OMAO Silver Springs, MD). Following this, marketable fish were placed in the hold of the vessel, iced and delivered to a shoreside processing facility within 5 days. Such fish were part of the vessel's compensation. All prohibited species and other marine organisms with no commercial value were returned to the sea.

Table 1. Scientific survey personnel participating in the 2007 WCGTS.

	Pass 1	**F/V** ***Ms. Julie***	**5/14/07 – 7/26/07**
Leg 1	Erica Fruh	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Brady Vanderpol	Fisheries Biologist	Volunteer
Leg 2	Erica Fruh	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Mariah Boyle	Fisheries Biologist	MLML
Leg 3	Dan Kamikawa	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Jasmine Frye	Fisheries Biologist	MLML
Leg 4	Keith Bosley	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Simon Brown	Fisheries Biologist	MLML
Leg 5	Keith Bosley	Chief Scientist	NMFS-NWFSC
	Victor Simon	Fisheries Biologist	NMFS-NWFSC
	Cathleen Vestfals	Fisheries Biologist	OSU
	Pass 1	**F/V** ***Noah's Ark***	**5/14/07 – 7/26/07**
Leg 1	John Buchanan	Chief Scientist	NMFS-NWFSC
	Dan Kamikawa	Fisheries Biologist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
Leg 2	John Buchanan	Chief Scientist	NMFS-NWFSC
	Dan Kamikawa	Fisheries Biologist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
Leg 3	Keith Bosley	Chief Scientist	NMFS-NWFSC
	John Buchanan	Fisheries Biologist	NMFS-NWFSC
	Jim Miller	Fisheries Biologist	NMFS-NWFSC
Leg 4	Dan Kamikawa	Chief Scientist	NMFS-NWFSC
	Erica Fruh	Fisheries Biologist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
Leg 5	Dan Kamikawa	Chief Scientist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
	Scott Malvitch	Fisheries Biologist	ODFW

NMFS-NWFSC	National Marine Fisheries Service, Northwest Fisheries Science Center
MLML	Moss Landing Marine Laboratory, Santa Cruz, CA
ODFW	Oregon Department of Fish and Wildlife
OSU	Oregon State University

Table 1 (continued). Scientific survey personnel participating in the 2007 WCGTS.

	Pass 2	**F/V *Excalibur***	**8/13/07 –10/23/07**
Leg 1	Dan Kamikawa	Chief Scientist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
	Grant Law	Fisheries Biologist	NMFS-NWFSC
Leg 2	Dan Kamikawa	Chief Scientist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
	Craig Good	Fisheries Biologist	ODFW
Leg 3	Erica Fruh	Chief Scientist	NMFS-NWFSC
	Dan Kamikawa	Fisheries Biologist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
Leg 4	John Buchanan	Chief Scientist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
	Brady Vanderpol	Fisheries Biologist	Volunteer
Leg 5	Victor Simon	Chief Scientist	NMFS-NWFSC
	Tristan Britt	Fisheries Biologist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Pass 2	**F/V *Raven***	**8/13/07 –10/23/07**
Leg 1	John Buchanan	Chief Scientist	NMFS-NWFSC
	Erica Fruh	Fisheries Biologist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
Leg 2	Keith Bosley	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Nick Wilsman	Fisheries Biologist	ODFW
Leg 3	Keith Bosley	Chief Scientist	NMFS-NWFSC
	Melanie Johnson	Fisheries Biologist	NMFS-NWFSC
	Shaara Ainsley	Fisheries Biologist	MLML
Leg 4	Erica Fruh	Chief Scientist	NMFS-NWFSC
	Phil Watson	Fisheries Biologist	NMFS-NWFSC
	Nick Wilsman	Fisheries Biologist	ODFW
Leg 5	Vanessa Tuttle	Chief Scientist	NMFS-NWFSC
	Aimee Keller	Fisheries Biologist	NMFS-NWFSC
	Keith Bosley	Fisheries Biologist	NMFS-NWFSC

NMFS-NWFSC	National Marine Fisheries Service, Northwest Fisheries Science Center
ODFW	Oregon Department of Fish and Wildlife
MLML	Moss Landing Marine Laboratory, Santa Cruz, CA

Table 2. Vessel, haul number, and station locations for the 2007 WCGTS.

Vessel	Haul	Latitude (N)	Longitude (W)
Excalibur	1	45° 14.34'	-124° 53.91'
Excalibur	2	45° 12.09'	-124° 28.33'
Excalibur	3	45° 14.00'	-124° 21.88'
Excalibur	4	45° 15.91'	-124° 15.42'
Excalibur	5	45° 27.74'	-124° 08.65'
Excalibur	6	45° 29.90'	-124° 21.46'
Excalibur	7	45° 41.69'	-124° 10.39'
Excalibur	8	45° 41.75'	-124° 14.69'
Excalibur	9	45° 49.76'	-124° 18.78'
Excalibur	10	45° 55.67'	-124° 14.30'
Excalibur	11	45° 57.83'	-124° 27.20'
Excalibur	12	46° 05.68'	-124° 18.35'
Excalibur	13	46° 07.67'	-124° 18.29'
Excalibur	14	45° 59.53'	-124° 05.54'
Excalibur	15	46° 09.82'	-124° 31.24'
Excalibur	16	46° 29.93'	-124° 50.37'
Excalibur	17	46° 37.56'	-124° 19.65'
Excalibur	18	46° 45.53'	-124° 19.44'
Excalibur	19	46° 49.63'	-124° 28.09'
Excalibur	20	46° 59.73'	-124° 41.02'
Excalibur	21	47° 11.66'	-124° 36.36'
Excalibur	22	47° 25.71'	-124° 44.88'
Excalibur	23	47° 31.79'	-124° 55.84'
Excalibur	24	47° 45.71'	-124° 48.92'
Excalibur	25	47° 51.78'	-124° 57.72'
Excalibur	26	48° 25.68'	-124° 45.88'
Excalibur	27	48° 23.75'	-124° 54.92'
Excalibur	28	48° 13.86'	-125° 10.79'
Excalibur	29	48° 05.95'	-125° 28.80'
Excalibur	30	48° 08.00'	-125° 44.45'
Excalibur	31	47° 59.97'	-125° 33.31'
Excalibur	32	47° 53.83'	-125° 04.37'
Excalibur	33	47° 45.93'	-125° 20.07'
Excalibur	34	47° 39.88'	-125° 09.03'
Excalibur	35	47° 15.75'	-124° 47.30'
Excalibur	36	46° 57.90'	-124° 58.63'
Excalibur	37	46° 51.92'	-124° 58.73'
Excalibur	38	46° 02.09'	-124° 55.22'
Excalibur	39	46° 01.99'	-124° 44.41'
Excalibur	40	45° 55.91'	-124° 33.73'
Excalibur	41	45° 55.94'	-124° 35.89'

Excalibur	42	45° 48.04'	-124° 42.53'
Excalibur	43	45° 52.09'	-124° 48.92'
Excalibur	44	45° 46.22'	-125° 01.96'
Excalibur	45	45° 42.12'	-124° 46.96'
Excalibur	46	45° 26.06'	-124° 32.27'
Excalibur	47	44° 59.86'	-124° 05.22'
Excalibur	48	44° 48.03'	-124° 11.94'
Excalibur	49	44° 54.31'	-124° 37.26'
Excalibur	50	44° 50.40'	-124° 43.71'
Excalibur	51	45° 02.32'	-124° 43.47'
Excalibur	52	44° 58.43'	-124° 52.06'
Excalibur	53	44° 54.49'	-124° 56.38'
Excalibur	54	44° 46.54'	-124° 56.51'
Excalibur	55	44° 30.73'	-125° 07.33'
Excalibur	56	44° 24.75'	-125° 03.20'
Excalibur	57	44° 22.73'	-124° 59.01'
Excalibur	58	44° 18.81'	-125° 05.39'
Excalibur	59	44° 06.81'	-124° 55.07'
Excalibur	60	44° 12.71'	-124° 48.66'
Excalibur	61	44° 08.66'	-124° 40.34'
Excalibur	62	44° 18.56'	-124° 38.03'
Excalibur	63	44° 20.57'	-124° 40.10'
Excalibur	64	44° 38.44'	-124° 39.72'
Excalibur	65	44° 40.33'	-124° 31.21'
Excalibur	66	44° 34.27'	-124° 22.90'
Excalibur	67	44° 18.34'	-124° 19.10'
Excalibur	68	44° 04.57'	-124° 29.94'
Excalibur	69	44° 04.55'	-124° 27.85'
Excalibur	70	43° 58.54'	-124° 23.80'
Excalibur	71	43° 52.45'	-124° 13.50'
Excalibur	72	43° 42.84'	-124° 38.79'
Excalibur	73	43° 36.87'	-124° 36.84'
Excalibur	74	43° 34.95'	-124° 43.12'
Excalibur	75	43° 34.95'	-124° 43.12'
Excalibur	76	43° 30.96'	-124° 41.12'
Excalibur	77	43° 34.84'	-124° 32.72'
Excalibur	78	43° 34.71'	-124° 22.32'
Excalibur	79	43° 27.13'	-124° 55.74'
Excalibur	80	43° 27.04'	-124° 45.35'
Excalibur	81	43° 26.99'	-124° 41.20'
Excalibur	82	43° 05.20'	-124° 43.71'
Excalibur	83	42° 41.48'	-124° 52.38'
Excalibur	84	42° 23.58'	-124° 46.56'
Excalibur	85	42° 21.60'	-124° 46.60'
Excalibur	86	42° 19.42'	-124° 28.27'
Excalibur	87	42° 15.75'	-124° 56.90'

Excalibur	88	42° 13.75'	-124° 54.89'
Excalibur	89	41° 59.71'	-124° 38.88'
Excalibur	90	41° 47.97'	-124° 53.29'
Excalibur	91	41° 46.04'	-124° 59.40'
Excalibur	92	41° 44.05'	-124° 59.43'
Excalibur	93	41° 42.04'	-124° 55.41'
Excalibur	94	41° 41.78'	-124° 31.16'
Excalibur	95	41° 41.63'	-124° 19.03'
Excalibur	96	41° 37.75'	-124° 25.19'
Excalibur	97	41° 29.89'	-124° 31.42'
Excalibur	98	41° 29.89'	-124° 31.42'
Excalibur	99	41° 31.88'	-124° 31.38'
Excalibur	100	41° 28.15'	-124° 53.62'
Excalibur	101	41° 14.26'	-124° 51.85'
Excalibur	102	41° 06.04'	-124° 25.94'
Excalibur	103	41° 02.10'	-124° 28.03'
Excalibur	104	40° 56.13'	-124° 26.17'
Excalibur	105	40° 52.06'	-124° 18.28'
Excalibur	106	40° 36.41'	-124° 34.59'
Excalibur	107	40° 34.48'	-124° 38.60'
Excalibur	108	40° 22.52'	-124° 32.90'
Excalibur	109	40° 22.44'	-124° 26.95'
Excalibur	110	40° 22.44'	-124° 26.95'
Excalibur	111	40° 16.47'	-124° 25.11'
Excalibur	112	40° 06.78'	-124° 43.11'
Excalibur	113	39° 52.37'	-124° 04.03'
Excalibur	114	39° 32.42'	-123° 56.76'
Excalibur	115	39° 26.61'	-124° 04.75'
Excalibur	116	39° 32.65'	-124° 10.46'
Excalibur	117	39° 18.83'	-124° 14.73'
Excalibur	118	39° 04.70'	-123° 59.53'
Excalibur	119	38° 48.60'	-123° 46.44'
Excalibur	120	38° 34.49'	-123° 35.30'
Excalibur	121	38° 32.50'	-123° 35.37'
Excalibur	122	38° 32.30'	-123° 25.73'
Excalibur	123	38° 22.71'	-123° 41.49'
Excalibur	124	38° 16.30'	-123° 20.55'
Excalibur	125	38° 14.00'	-123° 07.18'
Excalibur	126	38° 10.03'	-123° 07.35'
Excalibur	127	37° 27.87'	-122° 50.06'
Excalibur	128	37° 25.89'	-122° 50.15'
Excalibur	129	37° 20.04'	-122° 54.20'
Excalibur	130	37° 13.55'	-122° 35.54'
Excalibur	131	37° 06.09'	-122° 52.92'
Excalibur	132	37° 03.79'	-122° 41.68'
Excalibur	133	36° 59.54'	-122° 32.43'

Excalibur	134	36° 59.36'	-122° 26.78'
Excalibur	135	36° 55.39'	-122° 26.98'
Excalibur	136	36° 55.03'	-122° 15.67'
Excalibur	137	36° 42.41'	-121° 55.64'
Excalibur	138	36° 21.21'	-122° 15.56'
Excalibur	139	36° 13.14'	-122° 12.25'
Excalibur	140	35° 56.59'	-121° 54.50'
Excalibur	141	35° 52.48'	-121° 51.01'
Excalibur	142	35° 50.21'	-121° 43.71'
Excalibur	143	35° 48.23'	-121° 43.82'
Excalibur	144	35° 47.18'	-122° 09.89'
Excalibur	145	35° 38.70'	-121° 55.51'
Excalibur	146	35° 34.79'	-121° 57.58'
Excalibur	147	35° 28.42'	-121° 46.84'
Excalibur	148	35° 25.85'	-121° 32.19'
Excalibur	149	35° 33.04'	-121° 13.23'
Excalibur	150	35° 31.29'	-121° 18.90'
Excalibur	151	35° 23.18'	-121° 15.73'
Excalibur	152	35° 21.27'	-121° 17.70'
Excalibur	153	35° 13.70'	-121° 27.41'
Excalibur	154	35° 03.52'	-121° 22.52'
Excalibur	155	35° 05.04'	-121° 11.38'
Excalibur	156	35° 00.82'	-121° 06.14'
Excalibur	157	35° 02.65'	-121° 02.34'
Excalibur	158	35° 10.44'	-120° 58.12'
Excalibur	159	34° 33.86'	-120° 44.17'
Excalibur	160	34° 33.86'	-120° 44.17'
Excalibur	161	34° 21.47'	-120° 35.93'
Excalibur	162	34° 15.41'	-120° 34.56'
Excalibur	163	33° 54.94'	-120° 25.17'
Excalibur	164	34° 20.26'	-120° 12.32'
Excalibur	165	34° 17.98'	-120° 07.03'
Excalibur	166	34° 23.46'	-119° 57.47'
Excalibur	167	34° 19.38'	-119° 55.98'
Excalibur	168	34° 14.99'	-119° 49.06'
Excalibur	169	33° 51.72'	-119° 27.43'
Excalibur	170	33° 45.23'	-119° 53.34'
Excalibur	171	33° 45.63'	-120° 00.54'
Excalibur	172	33° 47.72'	-120° 02.18'
Excalibur	173	33° 39.45'	-119° 57.42'
Excalibur	174	33° 25.60'	-120° 00.34'
Excalibur	175	34° 02.09'	-119° 01.07'
Excalibur	176	33° 59.51'	-118° 52.23'
Excalibur	177	33° 58.92'	-118° 43.21'
Excalibur	178	33° 58.92'	-118° 43.21'
Excalibur	179	33° 58.43'	-118° 35.99'

Excalibur	180	33° 58.30'	-118° 34.18'
Excalibur	181	33° 51.96'	-118° 29.38'
Excalibur	182	33° 27.58'	-118° 24.61'
Excalibur	183	33° 18.59'	-118° 11.11'
Excalibur	184	33° 15.13'	-118° 18.67'
Excalibur	185	33° 09.28'	-118° 21.06'
Excalibur	186	33° 24.10'	-118° 32.17'
Excalibur	187	33° 08.05'	-120° 08.92'
Excalibur	188	33° 12.52'	-120° 17.55'
Excalibur	189	33° 12.52'	-120° 17.55'
Excalibur	190	33° 06.63'	-120° 19.79'
Excalibur	191	33° 00.92'	-120° 25.59'
Excalibur	192	32° 57.78'	-120° 04.34'
Excalibur	193	32° 47.80'	-120° 05.13'
Excalibur	194	32° 46.68'	-119° 45.57'
Excalibur	195	32° 34.29'	-119° 39.46'
Excalibur	196	32° 34.29'	-119° 39.46'
Excalibur	197	32° 36.39'	-118° 38.66'
Excalibur	198	32° 52.22'	-118° 35.32'
Excalibur	199	32° 41.51'	-118° 25.66'
Excalibur	200	32° 41.51'	-118° 25.66'
Excalibur	201	32° 56.81'	-118° 15.16'
Excalibur	202	32° 42.33'	-117° 17.64'
Excalibur	203	32° 40.49'	-117° 19.64'
Excalibur	204	32° 34.66'	-117° 22.10'
Ms. Julie	1	45° 00.58'	-125° 15.43'
Ms. Julie	2	45° 00.57'	-125° 13.30'
Ms. Julie	3	44° 56.51'	-125° 00.59'
Ms. Julie	4	44° 56.38'	-124° 45.72'
Ms. Julie	5	44° 58.26'	-124° 35.05'
Ms. Julie	6	46° 05.91'	-124° 37.83'
Ms. Julie	7	46° 07.94'	-124° 42.12'
Ms. Julie	8	46° 07.94'	-124° 42.12'
Ms. Julie	9	46° 13.82'	-124° 33.32'
Ms. Julie	10	46° 19.64'	-124° 20.14'
Ms. Julie	11	46° 38.00'	-125° 03.33'
Ms. Julie	12	46° 57.70'	-124° 36.67'
Ms. Julie	13	46° 59.67'	-124° 34.43'
Ms. Julie	14	46° 49.57'	-124° 23.71'
Ms. Julie	15	46° 49.57'	-124° 23.71'
Ms. Julie	16	47° 17.66'	-124° 38.43'
Ms. Julie	17	47° 27.62'	-124° 35.99'
Ms. Julie	18	48° 17.75'	-124° 55.02'
Ms. Julie	19	48° 15.77'	-124° 57.30'
Ms. Julie	20	48° 13.80'	-125° 01.82'
Ms. Julie	21	48° 13.85'	-125° 08.55'

Ms. Julie	22	48° 09.90'	-125° 17.56'
Ms. Julie	23	48° 07.93'	-125° 24.30'
Ms. Julie	24	47° 59.95'	-125° 26.61'
Ms. Julie	25	48° 07.96'	-125° 31.02'
Ms. Julie	26	47° 59.98'	-125° 35.55'
Ms. Julie	27	47° 57.97'	-125° 33.33'
Ms. Julie	28	47° 51.99'	-125° 35.60'
Ms. Julie	29	47° 51.99'	-125° 35.60'
Ms. Julie	30	47° 41.97'	-125° 26.78'
Ms. Julie	31	47° 43.94'	-125° 22.31'
Ms. Julie	32	47° 49.89'	-125° 13.34'
Ms. Julie	33	47° 53.86'	-125° 08.83'
Ms. Julie	34	47° 45.84'	-125° 04.49'
Ms. Julie	35	47° 37.80'	-124° 57.96'
Ms. Julie	36	47° 31.81'	-124° 58.06'
Ms. Julie	37	47° 23.93'	-125° 13.67'
Ms. Julie	38	47° 23.71'	-124° 44.93'
Ms. Julie	39	46° 29.62'	-124° 22.05'
Ms. Julie	40	46° 29.73'	-124° 30.76'
Ms. Julie	41	46° 09.74'	-124° 24.74'
Ms. Julie	42	45° 57.88'	-124° 31.53'
Ms. Julie	43	45° 53.59'	-124° 07.88'
Ms. Julie	44	45° 43.74'	-124° 14.64'
Ms. Julie	45	44° 48.06'	-124° 14.06'
Ms. Julie	46	44° 46.16'	-124° 20.48'
Ms. Julie	47	44° 40.23'	-124° 22.75'
Ms. Julie	48	44° 32.20'	-124° 16.62'
Ms. Julie	49	44° 28.23'	-124° 16.72'
Ms. Julie	50	44° 32.44'	-124° 35.62'
Ms. Julie	51	44° 38.48'	-124° 43.95'
Ms. Julie	52	45° 50.08'	-124° 46.80'
Ms. Julie	53	45° 46.03'	-124° 40.42'
Ms. Julie	54	45° 33.98'	-124° 29.94'
Ms. Julie	55	45° 30.10'	-124° 38.61'
Ms. Julie	56	45° 17.92'	-124° 17.50'
Ms. Julie	57	45° 17.86'	-124° 13.22'
Ms. Julie	58	45° 10.03'	-124° 21.98'
Ms. Julie	59	45° 06.08'	-124° 24.21'
Ms. Julie	60	45° 01.91'	-124° 09.42'
Ms. Julie	62	44° 52.34'	-124° 39.42'
Ms. Julie	63	44° 52.34'	-124° 39.42'
Ms. Julie	64	44° 52.45'	-124° 50.04'
Ms. Julie	65	44° 52.48'	-124° 54.29'
Ms. Julie	66	44° 48.49'	-124° 52.23'
Ms. Julie	67	44° 40.53'	-124° 50.26'
Ms. Julie	68	44° 20.81'	-125° 07.47'

Ms. Julie	69	44° 24.70'	-124° 56.87'
Ms. Julie	70	44° 26.65'	-124° 52.62'
Ms. Julie	71	44° 26.63'	-124° 50.51'
Ms. Julie	72	44° 18.65'	-124° 46.45'
Ms. Julie	73	44° 18.65'	-124° 46.45'
Ms. Julie	74	44° 16.68'	-124° 48.59'
Ms. Julie	75	44° 04.73'	-124° 44.62'
Ms. Julie	76	44° 00.65'	-124° 34.22'
Ms. Julie	77	44° 06.40'	-124° 17.31'
Ms. Julie	78	44° 06.40'	-124° 17.31'
Ms. Julie	79	42° 41.55'	-125° 00.59'
Ms. Julie	80	42° 37.50'	-124° 50.40'
Ms. Julie	81	42° 51.38'	-124° 50.15'
Ms. Julie	82	42° 55.33'	-124° 48.02'
Ms. Julie	83	42° 57.38'	-124° 56.23'
Ms. Julie	84	42° 57.38'	-124° 56.23'
Ms. Julie	85	43° 01.31'	-124° 52.04'
Ms. Julie	86	43° 01.17'	-124° 37.60'
Ms. Julie	87	43° 09.14'	-124° 41.56'
Ms. Julie	88	43° 34.74'	-124° 24.40'
Ms. Julie	89	43° 44.76'	-124° 32.49'
Ms. Julie	90	43° 11.26'	-124° 56.00'
Ms. Julie	91	43° 18.99'	-124° 35.15'
Ms. Julie	92	42° 41.43'	-124° 46.22'
Ms. Julie	93	42° 39.36'	-124° 38.06'
Ms. Julie	94	42° 37.26'	-124° 27.85'
Ms. Julie	95	42° 25.41'	-124° 32.22'
Ms. Julie	96	42° 17.70'	-124° 52.79'
Ms. Julie	97	42° 09.67'	-124° 42.75'
Ms. Julie	98	42° 07.62'	-124° 36.68'
Ms. Julie	99	42° 05.54'	-124° 28.59'
Ms. Julie	100	42° 03.53'	-124° 26.60'
Ms. Julie	101	41° 49.89'	-124° 47.18'
Ms. Julie	102	41° 31.95'	-124° 37.43'
Ms. Julie	103	41° 22.02'	-124° 35.62'
Ms. Julie	104	41° 23.87'	-124° 25.52'
Ms. Julie	105	41° 29.77'	-124° 21.35'
Ms. Julie	106	41° 19.74'	-124° 13.55'
Ms. Julie	107	41° 07.97'	-124° 21.88'
Ms. Julie	108	41° 04.01'	-124° 21.98'
Ms. Julie	109	41° 00.12'	-124° 28.08'
Ms. Julie	110	41° 04.25'	-124° 42.00'
Ms. Julie	111	40° 52.34'	-124° 40.24'
Ms. Julie	112	40° 34.50'	-124° 40.59'
Ms. Julie	113	40° 18.82'	-124° 58.72'
Ms. Julie	114	40° 18.53'	-124° 31.00'

Ms. Julie	115	40° 06.51'	-124° 21.39'
Ms. Julie	116	39° 58.35'	-124° 05.83'
Ms. Julie	117	39° 56.55'	-124° 17.70'
Ms. Julie	118	39° 54.82'	-124° 37.43'
Ms. Julie	119	39° 00.77'	-124° 01.59'
Ms. Julie	120	38° 44.44'	-123° 36.89'
Ms. Julie	121	38° 12.06'	-123° 09.19'
Ms. Julie	122	38° 06.11'	-123° 09.43'
Ms. Julie	123	38° 02.10'	-123° 07.67'
Ms. Julie	124	37° 57.89'	-122° 58.27'
Ms. Julie	125	37° 50.10'	-123° 04.34'
Ms. Julie	126	37° 21.71'	-122° 42.74'
Ms. Julie	127	36° 55.68'	-122° 36.40'
Ms. Julie	128	36° 55.28'	-122° 23.21'
Ms. Julie	129	36° 43.06'	-122° 14.42'
Ms. Julie	130	36° 22.95'	-122° 07.98'
Ms. Julie	131	36° 18.65'	-121° 58.86'
Ms. Julie	132	35° 48.30'	-121° 45.68'
Ms. Julie	133	35° 38.00'	-121° 37.01'
Ms. Julie	134	35° 33.12'	-121° 15.08'
Ms. Julie	135	35° 24.85'	-121° 08.22'
Ms. Julie	136	35° 18.12'	-121° 38.21'
Ms. Julie	137	35° 14.14'	-121° 38.44'
Ms. Julie	138	35° 14.14'	-121° 38.44'
Ms. Julie	139	35° 07.19'	-121° 14.92'
Ms. Julie	140	34° 52.95'	-121° 08.50'
Ms. Julie	141	34° 56.01'	-120° 48.09'
Ms. Julie	142	34° 54.19'	-120° 51.89'
Ms. Julie	143	34° 46.40'	-120° 56.10'
Ms. Julie	144	34° 46.81'	-121° 05.24'
Ms. Julie	145	34° 45.22'	-121° 14.51'
Ms. Julie	146	34° 44.24'	-120° 52.59'
Ms. Julie	147	34° 42.59'	-121° 00.03'
Ms. Julie	148	34° 32.80'	-121° 04.35'
Ms. Julie	149	34° 14.63'	-121° 00.10'
Ms. Julie	150	34° 25.63'	-120° 39.28'
Ms. Julie	151	34° 25.09'	-120° 28.37'
Ms. Julie	152	34° 27.26'	-120° 31.86'
Ms. Julie	153	34° 19.48'	-120° 36.08'
Ms. Julie	154	34° 20.83'	-120° 23.22'
Ms. Julie	155	34° 20.55'	-120° 17.77'
Ms. Julie	156	34° 14.48'	-120° 16.42'
Ms. Julie	157	34° 16.19'	-120° 10.82'
Ms. Julie	158	33° 43.44'	-119° 57.10'
Ms. Julie	159	33° 42.93'	-119° 48.10'
Ms. Julie	160	34° 13.31'	-119° 54.66'

Ms. Julie	161	34° 12.90'	-119° 47.41'
Ms. Julie	162	34° 14.89'	-119° 47.25'
Ms. Julie	163	34° 16.14'	-119° 34.38'
Ms. Julie	164	34° 18.56'	-119° 41.47'
Ms. Julie	165	33° 59.87'	-118° 57.65'
Ms. Julie	166	33° 59.75'	-118° 55.84'
Ms. Julie	167	33° 59.40'	-118° 50.43'
Ms. Julie	168	33° 56.56'	-118° 37.99'
Ms. Julie	169	33° 50.10'	-118° 31.38'
Ms. Julie	170	33° 39.27'	-118° 19.80'
Ms. Julie	171	33° 39.27'	-118° 19.80'
Ms. Julie	172	33° 30.54'	-118° 09.86'
Ms. Julie	173	33° 30.01'	-118° 02.69'
Ms. Julie	174	33° 31.74'	-117° 58.89'
Ms. Julie	175	33° 05.16'	-118° 48.41'
Ms. Julie	176	33° 17.50'	-118° 23.83'
Ms. Julie	177	33° 32.56'	-118° 38.55'
Ms. Julie	178	33° 32.06'	-118° 31.38'
Ms. Julie	179	32° 55.99'	-117° 37.59'
Ms. Julie	180	32° 56.42'	-117° 17.81'
Ms. Julie	181	32° 50.59'	-117° 20.27'
Ms. Julie	182	32° 44.47'	-118° 11.06'
Ms. Julie	183	32° 42.46'	-117° 44.45'
Ms. Julie	184	32° 36.93'	-117° 25.41'
Ms. Julie	185	32° 39.21'	-117° 28.73'
Ms. Julie	186	32° 42.48'	-117° 19.41'
Ms. Julie	187	32° 42.91'	-117° 24.73'
Noah’s Ark	1	45° 30.36'	-125° 08.64'
Noah’s Ark	2	45° 29.98'	-124° 27.89'
Noah’s Ark	3	45° 32.09'	-124° 38.57'
Noah’s Ark	4	45° 36.11'	-124° 42.78'
Noah’s Ark	5	45° 56.10'	-124° 53.17'
Noah’s Ark	6	45° 58.05'	-124° 48.81'
Noah’s Ark	7	46° 10.07'	-124° 57.25'
Noah’s Ark	8	46° 12.06'	-124° 57.22'
Noah’s Ark	9	46° 17.98'	-124° 50.60'
Noah’s Ark	10	46° 17.98'	-124° 50.60'
Noah’s Ark	11	46° 22.03'	-124° 59.22'
Noah’s Ark	12	46° 27.81'	-124° 37.34'
Noah’s Ark	13	46° 33.74'	-124° 32.85'
Noah’s Ark	14	46° 35.78'	-124° 37.17'
Noah’s Ark	15	46° 37.79'	-124° 39.31'
Noah’s Ark	16	46° 43.93'	-124° 56.67'
Noah’s Ark	17	46° 47.98'	-125° 05.36'
Noah’s Ark	18	46° 48.03'	-125° 14.12'
Noah’s Ark	19	47° 29.99'	-125° 26.89'

Noah’s Ark	20	47° 33.98'	-125° 26.85'
Noah’s Ark	21	47° 41.84'	-125° 04.56'
Noah’s Ark	22	47° 41.84'	-125° 04.56'
Noah’s Ark	23	47° 43.77'	-124° 55.63'
Noah’s Ark	24	47° 45.73'	-124° 51.15'
Noah’s Ark	25	47° 55.81'	-125° 02.11'
Noah’s Ark	26	48° 12.00'	-125° 46.67'
Noah’s Ark	27	48° 03.97'	-125° 33.29'
Noah’s Ark	28	48° 03.93'	-125° 22.11'
Noah’s Ark	29	48° 05.92'	-125° 22.08'
Noah’s Ark	30	48° 05.92'	-125° 22.08'
Noah’s Ark	31	48° 05.80'	-125° 01.95'
Noah’s Ark	32	47° 59.87'	-125° 10.98'
Noah’s Ark	33	47° 51.91'	-125° 17.77'
Noah’s Ark	34	47° 39.64'	-124° 40.15'
Noah’s Ark	35	47° 23.60'	-124° 33.87'
Noah’s Ark	36	47° 23.63'	-124° 36.08'
Noah’s Ark	37	47° 23.81'	-124° 55.98'
Noah’s Ark	38	47° 11.70'	-124° 40.76'
Noah’s Ark	39	47° 03.79'	-124° 47.53'
Noah’s Ark	40	46° 57.86'	-124° 54.24'
Noah’s Ark	41	46° 51.80'	-124° 45.58'
Noah’s Ark	42	46° 47.86'	-124° 50.04'
Noah’s Ark	43	46° 43.70'	-124° 32.61'
Noah’s Ark	44	46° 25.61'	-124° 19.98'
Noah’s Ark	45	46° 21.76'	-124° 30.96'
Noah’s Ark	46	46° 01.55'	-124° 07.64'
Noah’s Ark	47	45° 57.51'	-124° 03.44'
Noah’s Ark	48	45° 49.65'	-124° 10.16'
Noah’s Ark	49	45° 49.68'	-124° 12.31'
Noah’s Ark	50	45° 49.68'	-124° 12.31'
Noah’s Ark	51	45° 45.81'	-124° 21.04'
Noah’s Ark	52	46° 17.70'	-124° 24.54'
Noah’s Ark	53	46° 11.62'	-124° 16.02'
Noah’s Ark	54	45° 39.64'	-124° 06.15'
Noah’s Ark	55	45° 37.59'	-124° 01.91'
Noah’s Ark	56	45° 41.78'	-124° 16.84'
Noah’s Ark	57	45° 35.84'	-124° 19.16'
Noah’s Ark	58	45° 37.91'	-124° 25.55'
Noah’s Ark	59	45° 36.11'	-124° 42.78'
Noah’s Ark	60	45° 36.09'	-124° 40.63'
Noah’s Ark	61	45° 17.95'	-124° 19.63'
Noah’s Ark	62	45° 13.97'	-124° 19.74'
Noah’s Ark	63	45° 16.04'	-124° 26.10'
Noah’s Ark	64	45° 10.20'	-124° 36.91'
Noah’s Ark	65	45° 10.08'	-124° 26.24'

Noah’s Ark	66	45° 01.88'	-124° 07.29'
Noah’s Ark	67	45° 01.97'	-124° 13.67'
Noah’s Ark	68	44° 56.27'	-124° 35.09'
Noah’s Ark	69	44° 48.41'	-124° 43.75'
Noah’s Ark	70	44° 34.59'	-124° 52.48'
Noah’s Ark	71	44° 32.34'	-124° 27.17'
Noah’s Ark	72	44° 32.39'	-124° 31.40'
Noah’s Ark	73	44° 36.38'	-124° 33.42'
Noah’s Ark	74	44° 34.68'	-125° 03.05'
Noah’s Ark	75	44° 24.78'	-125° 07.41'
Noah’s Ark	76	44° 22.60'	-124° 44.27'
Noah’s Ark	77	44° 16.72'	-124° 52.80'
Noah’s Ark	78	44° 16.76'	-124° 57.00'
Noah’s Ark	79	44° 20.78'	-125° 03.26'
Noah’s Ark	80	44° 08.85'	-125° 01.33'
Noah’s Ark	81	44° 04.67'	-124° 38.33'
Noah’s Ark	82	43° 54.89'	-124° 53.18'
Noah’s Ark	83	43° 46.76'	-124° 34.53'
Noah’s Ark	84	43° 46.74'	-124° 32.45'
Noah’s Ark	85	43° 44.71'	-124° 28.32'
Noah’s Ark	86	43° 50.58'	-124° 21.91'
Noah’s Ark	87	43° 38.62'	-124° 18.05'
Noah’s Ark	88	43° 38.68'	-124° 22.22'
Noah’s Ark	89	43° 38.80'	-124° 32.63'
Noah’s Ark	90	43° 38.83'	-124° 34.71'
Noah’s Ark	91	43° 29.10'	-124° 53.62'
Noah’s Ark	92	43° 07.24'	-124° 49.87'
Noah’s Ark	93	43° 03.31'	-124° 54.06'
Noah’s Ark	94	42° 59.35'	-124° 54.13'
Noah’s Ark	95	42° 59.16'	-124° 35.58'
Noah’s Ark	96	43° 03.13'	-124° 35.49'
Noah’s Ark	97	42° 57.43'	-125° 02.41'
Noah’s Ark	98	42° 41.34'	-124° 38.02'
Noah’s Ark	99	42° 39.54'	-124° 56.52'
Noah’s Ark	100	42° 35.59'	-124° 58.63'
Noah’s Ark	101	42° 29.42'	-124° 36.22'
Noah’s Ark	102	42° 09.71'	-124° 46.82'
Noah’s Ark	103	42° 03.76'	-124° 46.93'
Noah’s Ark	104	42° 09.71'	-124° 46.82'
Noah’s Ark	105	42° 01.84'	-124° 53.06'
Noah’s Ark	106	41° 51.74'	-124° 34.99'
Noah’s Ark	107	41° 47.85'	-124° 41.15'
Noah’s Ark	108	41° 34.09'	-124° 53.53'
Noah’s Ark	109	41° 27.89'	-124° 29.45'
Noah’s Ark	110	41° 17.95'	-124° 27.67'
Noah’s Ark	111	40° 48.26'	-124° 30.34'

Noah’s Ark	112	40° 44.29'	-124° 30.43'
Noah’s Ark	113	40° 44.29'	-124° 30.43'
Noah’s Ark	114	40° 36.44'	-124° 36.57'
Noah’s Ark	115	40° 28.46'	-124° 32.77'
Noah’s Ark	116	40° 14.64'	-124° 37.02'
Noah’s Ark	117	40° 14.68'	-124° 40.98'
Noah’s Ark	118	40° 14.93'	-125° 08.67'
Noah’s Ark	119	40° 04.77'	-124° 41.17'
Noah’s Ark	120	40° 06.43'	-124° 15.47'
Noah’s Ark	121	39° 30.37'	-123° 52.91'
Noah’s Ark	122	39° 20.53'	-123° 57.11'
Noah’s Ark	123	38° 56.81'	-124° 01.70'
Noah’s Ark	124	38° 52.49'	-123° 42.43'
Noah’s Ark	125	38° 44.70'	-123° 50.43'
Noah’s Ark	126	38° 24.65'	-123° 39.50'
Noah’s Ark	127	38° 26.31'	-123° 24.02'
Noah’s Ark	128	38° 20.27'	-123° 20.40'
Noah’s Ark	129	38° 16.35'	-123° 22.47'
Noah’s Ark	130	37° 52.04'	-123° 02.35'
Noah’s Ark	131	37° 31.79'	-122° 47.98'
Noah’s Ark	132	37° 17.52'	-122° 35.35'
Noah’s Ark	133	37° 13.71'	-122° 41.22'
Noah’s Ark	134	37° 04.31'	-123° 00.56'
Noah’s Ark	135	37° 06.14'	-122° 54.81'
Noah’s Ark	136	36° 57.26'	-122° 23.11'
Noah’s Ark	137	36° 53.05'	-122° 15.78'
Noah’s Ark	138	35° 48.64'	-121° 54.95'
Noah’s Ark	139	35° 40.76'	-121° 57.25'
Noah’s Ark	140	35° 34.10'	-121° 39.10'
Noah’s Ark	141	35° 35.18'	-121° 16.79'
Noah’s Ark	142	35° 32.96'	-121° 11.38'
Noah’s Ark	143	35° 24.93'	-121° 10.06'
Noah’s Ark	144	35° 15.84'	-121° 30.96'
Noah’s Ark	145	35° 18.26'	-121° 41.89'
Noah’s Ark	146	34° 59.99'	-121° 33.77'
Noah’s Ark	147	35° 12.84'	-121° 07.18'
Noah’s Ark	148	35° 12.51'	-120° 59.82'
Noah’s Ark	149	35° 10.35'	-120° 56.28'
Noah’s Ark	150	35° 08.53'	-121° 00.10'
Noah’s Ark	151	35° 02.73'	-121° 04.17'
Noah’s Ark	152	35° 02.89'	-121° 07.84'
Noah’s Ark	153	34° 58.83'	-121° 06.27'
Noah’s Ark	154	35° 00.33'	-120° 55.14'
Noah’s Ark	155	34° 49.28'	-121° 16.08'
Noah’s Ark	156	34° 36.37'	-120° 54.96'
Noah’s Ark	157	34° 23.28'	-120° 32.15'

Noah’s Ark	158	34° 22.73'	-120° 21.25'
Noah’s Ark	159	34° 14.86'	-120° 23.67'
Noah’s Ark	160	33° 54.85'	-120° 23.37'
Noah’s Ark	161	34° 22.16'	-120° 10.35'
Noah’s Ark	162	34° 18.66'	-119° 43.28'
Noah’s Ark	163	34° 12.59'	-119° 41.98'
Noah’s Ark	164	33° 49.41'	-119° 56.62'
Noah’s Ark	165	33° 47.01'	-119° 49.57'
Noah’s Ark	166	33° 47.01'	-119° 49.57'
Noah’s Ark	167	33° 41.24'	-119° 53.66'
Noah’s Ark	168	33° 26.48'	-120° 16.49'
Noah’s Ark	169	33° 20.97'	-120° 25.90'
Noah’s Ark	170	33° 11.74'	-120° 03.24'
Noah’s Ark	171	33° 02.26'	-120° 12.95'
Noah’s Ark	172	33° 01.37'	-119° 56.90'
Noah’s Ark	173	33° 01.47'	-119° 58.68'
Noah’s Ark	174	32° 48.68'	-119° 45.40'
Noah’s Ark	175	32° 32.50'	-119° 43.17'
Noah’s Ark	176	32° 16.21'	-119° 39.19'
Noah’s Ark	177	32° 27.67'	-118° 28.82'
Noah’s Ark	178	32° 37.52'	-118° 26.05'
Noah’s Ark	179	32° 50.23'	-118° 35.52'
Noah’s Ark	180	32° 58.69'	-118° 41.86'
Noah’s Ark	181	33° 07.03'	-118° 46.44'
Noah’s Ark	182	33° 34.52'	-118° 09.44'
Noah’s Ark	183	33° 32.40'	-118° 07.86'
Noah’s Ark	184	33° 32.27'	-118° 06.06'
Noah’s Ark	185	33° 34.12'	-118° 04.06'
Noah’s Ark	186	33° 21.52'	-117° 56.38'
Noah’s Ark	187	33° 21.12'	-117° 51.01'
Noah’s Ark	188	33° 09.36'	-117° 28.91'
Noah’s Ark	189	33° 09.65'	-117° 32.47'
Noah’s Ark	190	33° 02.93'	-117° 49.39'
Raven	1	44° 38.65'	-125° 02.99'
Raven	2	44° 38.65'	-125° 02.99'
Raven	3	44° 46.49'	-124° 50.15'
Raven	4	44° 56.40'	-124° 47.84'
Raven	5	45° 06.16'	-124° 30.60'
Raven	6	46° 12.01'	-124° 50.71'
Raven	7	46° 16.06'	-124° 59.32'
Raven	8	46° 21.94'	-124° 48.35'
Raven	9	46° 27.87'	-124° 43.88'
Raven	10	46° 42.05'	-125° 14.20'
Raven	11	46° 41.97'	-125° 01.08'
Raven	12	47° 13.91'	-125° 07.18'
Raven	13	47° 15.86'	-125° 00.53'

Raven	14	48° 08.01'	-125° 48.92'
Raven	15	48° 13.91'	-125° 19.76'
Raven	16	48° 13.91'	-125° 19.76'
Raven	17	48° 15.90'	-125° 17.49'
Raven	18	48° 15.83'	-125° 06.28'
Raven	19	48° 09.88'	-125° 13.08'
Raven	20	48° 03.85'	-125° 08.69'
Raven	21	47° 47.96'	-125° 26.72'
Raven	22	47° 47.86'	-125° 08.92'
Raven	23	47° 43.84'	-125° 04.52'
Raven	24	47° 41.87'	-125° 09.00'
Raven	25	47° 39.89'	-125° 11.25'
Raven	26	47° 33.86'	-125° 04.68'
Raven	27	47° 35.69'	-124° 44.68'
Raven	28	47° 35.65'	-124° 40.24'
Raven	29	47° 15.62'	-124° 34.06'
Raven	30	47° 07.69'	-124° 38.65'
Raven	31	47° 05.76'	-124° 45.29'
Raven	32	47° 01.68'	-124° 36.58'
Raven	33	46° 31.62'	-124° 22.00'
Raven	34	46° 35.63'	-124° 24.07'
Raven	35	46° 33.71'	-124° 30.67'
Raven	36	46° 29.78'	-124° 35.12'
Raven	37	46° 27.74'	-124° 30.81'
Raven	38	46° 15.74'	-124° 26.76'
Raven	39	45° 57.72'	-124° 18.56'
Raven	40	45° 47.85'	-124° 25.30'
Raven	41	45° 45.84'	-124° 23.19'
Raven	42	45° 41.66'	-124° 08.24'
Raven	43	45° 33.64'	-124° 04.19'
Raven	44	45° 37.80'	-124° 16.95'
Raven	45	45° 20.23'	-124° 45.25'
Raven	46	45° 06.03'	-124° 19.95'
Raven	47	45° 02.08'	-124° 22.19'
Raven	48	44° 52.22'	-124° 28.81'
Raven	49	44° 49.99'	-124° 09.76'
Raven	50	44° 40.06'	-124° 10.05'
Raven	51	44° 42.07'	-124° 12.11'
Raven	52	44° 40.26'	-124° 24.86'
Raven	53	44° 34.47'	-124° 39.80'
Raven	54	44° 30.50'	-124° 39.89'
Raven	55	44° 22.58'	-124° 42.16'
Raven	56	44° 18.69'	-124° 50.66'
Raven	57	44° 10.62'	-124° 38.20'
Raven	58	44° 14.31'	-124° 15.00'
Raven	59	44° 10.31'	-124° 13.01'

Raven	60	43° 48.67'	-124° 28.23'
Raven	61	43° 50.71'	-124° 32.36'
Raven	62	43° 52.83'	-124° 44.85'
Raven	63	43° 48.88'	-124° 47.02'
Raven	64	43° 37.10'	-125° 01.82'
Raven	65	43° 17.18'	-124° 51.76'
Raven	66	43° 15.11'	-124° 43.51'
Raven	67	43° 01.14'	-124° 35.54'
Raven	68	42° 45.47'	-124° 54.37'
Raven	69	42° 47.31'	-124° 39.95'
Raven	70	42° 37.33'	-124° 34.00'
Raven	71	42° 19.62'	-124° 46.63'
Raven	72	42° 05.75'	-124° 46.89'
Raven	73	42° 07.71'	-124° 44.82'
Raven	74	42° 11.61'	-124° 38.63'
Raven	75	42° 15.50'	-124° 32.44'
Raven	76	42° 03.58'	-124° 30.67'
Raven	77	41° 59.60'	-124° 28.73'
Raven	78	41° 59.69'	-124° 36.85'
Raven	79	41° 53.65'	-124° 28.86'
Raven	80	41° 35.84'	-124° 31.29'
Raven	81	41° 31.80'	-124° 25.33'
Raven	82	41° 28.07'	-124° 45.57'
Raven	83	41° 14.24'	-124° 49.84'
Raven	84	41° 10.17'	-124° 39.88'
Raven	85	41° 17.93'	-124° 25.66'
Raven	86	40° 46.22'	-124° 26.40'
Raven	87	41° 02.02'	-124° 22.03'
Raven	88	40° 58.28'	-124° 40.12'
Raven	89	40° 32.43'	-124° 32.68'
Raven	90	40° 32.38'	-124° 28.71'
Raven	91	40° 30.47'	-124° 34.71'
Raven	92	40° 12.94'	-125° 06.72'
Raven	93	40° 06.89'	-124° 54.95'
Raven	95	39° 58.76'	-124° 35.38'
Raven	96	39° 52.44'	-124° 07.96'
Raven	97	39° 52.44'	-124° 07.96'
Raven	98	39° 18.61'	-124° 01.07'
Raven	99	39° 12.63'	-123° 59.30'
Raven	100	39° 06.84'	-124° 09.20'
Raven	101	38° 54.72'	-123° 55.94'
Raven	102	38° 38.65'	-123° 44.82'
Raven	103	38° 18.62'	-123° 35.85'
Raven	104	38° 18.50'	-123° 30.08'
Raven	105	38° 28.25'	-123° 22.02'
Raven	106	38° 24.19'	-123° 18.32'

Raven	107	38° 18.01'	-123° 08.94'
Raven	108	38° 16.03'	-123° 09.02'
Raven	109	38° 09.89'	-123° 01.59'
Raven	110	38° 04.04'	-123° 05.68'
Raven	111	38° 10.27'	-123° 16.94'
Raven	112	37° 58.41'	-123° 19.31'
Raven	113	37° 50.52'	-123° 21.53'
Raven	114	37° 50.43'	-123° 17.71'
Raven	115	37° 52.50'	-123° 21.45'
Raven	116	38° 10.65'	-123° 34.21'
Raven	117	37° 50.29'	-123° 11.98'
Raven	118	37° 51.94'	-122° 58.53'
Raven	119	37° 47.97'	-122° 58.70'
Raven	120	37° 21.37'	-122° 31.37'
Raven	121	37° 33.67'	-122° 44.09'
Raven	122	36° 55.51'	-122° 30.74'
Raven	123	37° 01.17'	-122° 21.02'
Raven	124	36° 57.14'	-122° 19.34'
Raven	125	36° 48.83'	-122° 08.46'
Raven	126	36° 18.85'	-122° 04.46'
Raven	127	36° 21.40'	-122° 21.17'
Raven	128	36° 15.13'	-122° 12.14'
Raven	129	36° 14.94'	-122° 06.54'
Raven	130	36° 12.89'	-122° 04.78'
Raven	131	36° 02.42'	-121° 50.44'
Raven	132	35° 54.05'	-121° 39.76'
Raven	133	35° 55.89'	-121° 35.92'
Raven	134	35° 57.73'	-121° 32.08'
Raven	135	35° 51.77'	-121° 32.45'
Raven	136	35° 44.67'	-121° 55.17'
Raven	137	35° 39.92'	-121° 35.04'
Raven	138	35° 39.92'	-121° 35.04'
Raven	139	35° 39.39'	-121° 22.09'
Raven	140	35° 26.84'	-121° 08.09'
Raven	141	35° 20.11'	-121° 38.09'
Raven	142	35° 16.20'	-121° 40.17'
Raven	143	35° 14.21'	-121° 40.28'
Raven	144	35° 08.10'	-121° 36.96'
Raven	145	35° 09.41'	-121° 20.30'
Raven	146	34° 39.72'	-121° 25.85'
Raven	147	34° 39.17'	-121° 13.07'
Raven	148	34° 41.09'	-121° 11.12'
Raven	149	34° 43.16'	-121° 12.81'
Raven	150	34° 48.88'	-121° 06.94'
Raven	151	34° 56.51'	-120° 59.08'
Raven	152	35° 06.54'	-121° 00.23'

Raven	153	35° 04.64'	-121° 02.20'
Raven	154	35° 16.57'	-121° 01.39'
Raven	155	35° 14.33'	-120° 56.01'
Raven	156	34° 49.87'	-120° 44.86'
Raven	157	34° 43.81'	-120° 43.46'
Raven	158	34° 24.50'	-120° 57.61'
Raven	159	34° 08.49'	-120° 56.88'
Raven	160	34° 26.33'	-120° 13.67'
Raven	161	34° 25.94'	-120° 06.40'
Raven	162	34° 16.67'	-119° 43.45'
Raven	163	34° 14.47'	-119° 39.99'
Raven	164	34° 12.38'	-119° 38.35'
Raven	165	34° 10.17'	-119° 34.90'
Raven	166	33° 47.42'	-119° 56.78'
Raven	167	33° 43.13'	-119° 51.70'
Raven	168	33° 41.14'	-119° 51.86'
Raven	169	33° 41.34'	-119° 55.46'
Raven	170	33° 04.67'	-118° 41.28'
Raven	171	33° 14.74'	-118° 13.31'
Raven	172	33° 12.75'	-118° 13.51'
Raven	173	33° 19.87'	-118° 28.99'
Raven	174	33° 28.58'	-118° 38.94'
Raven	175	33° 28.70'	-118° 40.74'
Raven	176	33° 32.44'	-118° 36.76'
Raven	177	33° 34.91'	-118° 14.82'
Raven	178	33° 32.13'	-118° 04.27'
Raven	179	33° 13.63'	-117° 32.02'
Raven	180	33° 08.94'	-117° 23.56'
Raven	181	33° 00.97'	-117° 24.47'
Raven	182	32° 54.41'	-117° 43.14'
Raven	183	32° 46.72'	-117° 47.57'
Raven	184	32° 44.86'	-117° 49.56'
Raven	185	32° 43.01'	-117° 51.55'
Raven	188	32° 17.62'	-118° 01.37'
Raven	189	32° 38.48'	-117° 44.89'
Raven	190	32° 38.48'	-117° 44.89'
Raven	191	32° 46.99'	-117° 51.12'
Raven	192	33° 00.83'	-117° 22.69'
Raven	193	32° 52.72'	-117° 21.82'