Russian River Estuary Management Project

Marine Mammal Protection Act Incidental Harassment Authorization
Report of Activities and Monitoring Results – January 1 to December 31, 2013

Prepared for
Office of Protected Resources and
Southwest Regional Administrator
National Marine Fisheries Service

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Table of Contents

EXECUTIVE SUMMARY i

INTRODUCTION 1

BACKGROUND 1

Biological Opinion and the Estuary 3

METHODS 4

Baseline (Jenner Haul-out Use) 6

Water Level Management Activities 7

Biological and Physical Monitoring 7

Monitoring During Pupping Season 7

Additional Training 8

RESULTS 8

Baseline (Jenner Haul-out Use) 8

Water Level Management Activities 9

Artificial Breaching Events 10

Influence of Barrier Beach Condition on Seal Abundance 13

Biological and Physical Monitoring 13

Disturbance of Seals at Russian River Mouth 16

Peripheral Haul-out Use 17

Photo identification 19

CONCLUSIONS 20

ACKNOWLEDGEMENTS 21

REFERENCES 22

TABLE OF TABLES

Table 1. Levels of pinniped response to disturbance used for Russian River Estuary Management Project pinniped monitoring. For permitting purposes a "take" or Level B harassment would include only moving or flight responses. 6
Table 2. Summary of barrier beach closed conditions occurring in 2013 at the Russian River mouth (Goat Rock State Beach). Peak water level during the event was measured at the gauge located at the Sonoma Coast State Park Visitors Center in Jenner, Ca. Gauge data is missing or incomplete for dates: Oct. 6 –17; Oct. 26 – Nov. 3; Nov. 29 – Dec. 2; Dec. 11 –18 and Dec. 22 – 27. 12
Table 3. Number of disturbances of pinnipeds during Russian River Estuary Management and Monitoring Activities for 2013 that resulted in incidental take by harassment. Disturbances reported here are pinnipeds moving on or flushing from their haul-out, number of disturbed seals that flushed from their haul-out is denoted by (#). 16
Table 4. Mean number of harbor seals by month hauled out at peripheral sites as observed during all monitoring surveys conducted in 2013. Shaded areas represent time of pupping (Mar-May) and molting (Jul-Aug). 18

TABLE OF FIGURES

Figure 1. Russian River Estuary 2
Figure 2. Pinniped haul-outs at the Russian River Estuary and surrounds. 5
Figure 3. Mean number of harbor seals hauled out at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) as counted during baseline surveys for each year (July 2009 – December 2013) categorized by month. Error bars represent standard error and sample size used to calculate means are presented inside the bars. Numbers in brackets under month indicate the number of days the barrier beach was closed for the month in the year 2013. 9
Figure 4. Maximum number of harbor seals counted during all pinniped surveys at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) since surveys began in 2009. Open diamonds represent counts in bar open conditions, black filled diamonds represent counts during bar closed conditions and grey diamonds represent counts during naturally perched conditions. Dashed line represents linear trend for harbor seal counts in bar open conditions and solid line represents linear trend for harbor seal counts in bar closed conditions. 14
Figure 5. Maximum number of people counted during all pinniped surveys at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) since surveys began in 2009. Open diamonds represent counts in bar open conditions, black filled diamonds represent counts during bar closed conditions and grey diamonds represent counts during naturally perched conditions. Dashed line represents linear trend for people during bar open conditions and the solid line represents linear trend for people during bar closed conditions. In order to better illustrate trends, there were 7 survey days removed from analysis where the maximum single count of people exceeded 50. 15
Figure 6. Percent of all pinniped surveys (excluding water level management activities) where disturbances occurred by disturbance source. Data presented is cumulative since surveys began in 2009. For this figure disturbances were defined as only movement or flushes, not head alerts. 17

Figure 7. Average seal abundance at peripheral haul-outs as observed during pre-breaching, breaching and post-breaching surveys. For comparison the baseline averages for seal abundance during bar closed (blue) and bar open (yellow) conditions are also represented. 19

TABLE OF APPENDICES

Appendix A. Summary of pinniped monitoring activities at the Jenner haul-out (Goat Rock State Beach, Sonoma County) conducted by the Sonoma County Water Agency and Stewards of the Coast and Redwoods from January – December 2013 for the Russian River Estuary Management Project, including summary of pinniped abundance and Estuary water level.

Appendix B. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Monitoring Protocols for Jenner.

Appendix C. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Russian River Pinniped Surveys: 2009-2012.

Appendix D. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Marine Mammal Protection Act.

Appendix E. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Identification of pinnipeds of California.

EXECUTIVE SUMMARY

The purpose of this report of activities and monitoring results is to comply with the requirements of the Incidental Harassment Authorization (IHA) issued pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C 1361 et seq.) to take small numbers of marine mammals, by Level B harassment, incidental to the Sonoma County Water Agency's (Water Agency) Russian River Estuary Water Level Management Activities (issued April 16, 2013, original authorization dated March 30, 2010, NMFS IHA).

The Water Agency applied in 2009 to the National Marine Fisheries Service (NMFS) Office of Protected Resources for an IHA under the Marine Mammal Protection Act (MMPA) for activities associated with water level management activities in the Russian River Estuary (Estuary). NMFS issued an original IHA to the Water Agency on March 30, 2010 and subsequently on April 20, 2011 and April 17, 2012. In January 2013 the Water Agency requested that NMFS issue a new IHA for similar activities and additional activities related to the Jetty Study Plan (ESA PWA 2011) and a subsequent IHA was issued on April 16, 2013. This report provides the results of all baseline monitoring and water level management activities for the 2013 calendar year, and additional summary information for all related activities.

The Estuary may close throughout the year as a result of a barrier beach forming across the mouth of the Russian River. Closures result in formation of a lagoon behind the barrier beach and, as water surface levels rise in the Estuary, flooding may occur. The Water Agency's artificial breaching activities are conducted in accordance with the Russian River Estuary Management Plan recommended in the Heckel (1994) study. The purpose of artificially breaching the barrier beach is to alleviate potential flooding of low-lying properties along the Estuary. The Water Agency and the U.S. Army Corps of Engineers (Corps) consulted with the NMFS under Section 7 of the Endangered Species Act (ESA) regarding the potential effects of their operations and maintenance activities, including the Water Agency's estuary management program, on federally-listed steelhead (*Oncorhynchus mykiss*), coho salmon (*O. kisutch*), and Chinook salmon (*O. tshawytscha*). As a result of this consultation, the NMFS issued the Russian River Biological Opinion (NMFS 2008) finding that artificially elevated inflows to the Russian River estuary during the low flow season (May through October) and historic artificial breaching practices have significant adverse effects on the Russian River's estuarine rearing habitat primarily for steelhead. The historic method of artificial sandbar breaching, which is done in response to rising water levels behind the barrier beach, adversely affects the Estuary's water quality and freshwater depths.

The Biological Opinion (NMFS 2008) concludes that the combination of high inflows and breaching practices impact rearing habitat because they interfere with natural processes that cause a freshwater lagoon to form behind the barrier beach. Fresh or brackish water lagoons at the mouths of many streams in central and southern California often provide depths and water quality that are highly favorable to the survival of rearing salmon and steelhead.

The Biological Opinion's Reasonable and Prudent Alternative (RPA) 2 (NMFS 2008) requires the Water Agency to collaborate with NMFS and to modify estuary water level management in order to reduce marine influence (high salinity and tidal inflow) and promote a higher water surface elevation in the estuary (formation of a fresh or brackish lagoon) for purposes of enhancing the quality of rearing habitat for juvenile (age 0+ and 1+) steelhead from May 15 to October 15 (referred to hereafter as the lagoon management period). A program of potential, incremental steps are prescribed to accomplish this, including adaptive management of a lagoon outlet channel on the barrier beach.

The Biological Opinion also requires the Water Agency to study the potential influences of an existing jetty at the mouth of the Russian River on water surface elevations in the Estuary. In accordance with the Biological Opinion's RPA 2 the Water Agency commissioned a draft study plan to analyze the effects and role of the existing, remnant Goat Rock State Beach jetty on beach permeability, seasonal sand storage and transport, seasonal flood risk, and seasonal water surface elevations in the Russian River estuary (ESA PWA 2011). Implementation of this study plan was scheduled to begin in 2013, but was delayed. The study should begin implementation in 2014 and includes the installation and maintenance of monitoring wells and geophysical surveys.

Harbor seals (*Phoca vitulina richardsi*) regularly haul out at the mouth of the Russian River (Jenner haul-out). California sea lions (*Zalophus californianus*) and northern elephant seals (*Mirounga angustirostris*) are occasionally observed at the haul-out. There are also several known river haul-outs at logs and rock piles in the Russian River Estuary. The Water Agency applied for an IHA under the MMPA for activities associated with Russian River Estuary management activities, which occur in the vicinity of these haul-outs, including:

- excavation and maintenance of a lagoon outlet channel that would facilitate management of a barrier beach (closed sandbar) at the mouth of the Russian River and creation of a summer lagoon to improve rearing habitat for listed steelhead as required by the Russian River Biological Opinion (NMFS 2008)
- artificially breaching the barrier beach to minimize the potential for flooding of low-lying properties along the Estuary
- biological and geophysical monitoring activities associated with the management actions described above
- construction and maintenance of monitoring wells on the barrier beach south of the jetty
- geophysical surveys conducted at the barrier beach

Pinniped monitoring was performed in accordance with the requirements of NMFS IHA issued April 16, 2013, and the Russian River Estuary Management Activities Pinniped Monitoring Plan (Sonoma County Water Agency and Stewards of the Coast and Redwoods 2011).

In an attempt to understand possible relationships between use of the Jenner haul-out and nearby coastal and river (peripheral) haul-outs, several other haul-outs on the coast and in the Russian River Estuary were monitored. These haul-outs include North Jenner and Odin Cove to the north, Pocked Rock, Kabemali, and Rock Point to the south, and Penny Logs, Paddy's Rock, and Chalanchawi in the Russian River Estuary.

Two types of monitoring were performed: baseline and water level management activities. Baseline monitoring was performed to gather additional information about the population of harbor seals utilizing the Jenner haul-out including population trends, patterns in seasonal abundance and the influence of barrier beach condition on harbor seal abundance. Pinniped monitoring was also conducted in relation to Water Agency water level management events (lagoon outlet channel implementation and artificial breaching). Each of the peripheral haul-outs was monitored concurrent with Jenner baseline monitoring and monitoring of water level management activities.

A barrier beach was formed eleven times during 2013, but only during five of these closure events did the Water Agency artificially breach the sand bar (the fifth breaching event occurred in 2014 and will not be included in this report). The Russian River outlet was closed to the ocean for a total of 104 days (or 28%) in 2013. In January 2012 the barrier beach was artificially breached after two days of breaching activity. There were also several periods over the course of the year where the barrier beach closed or became naturally perched and then subsequently breached naturally (SCWA 2013). In 2011 no water level management activities occurred (SCWA 2012). In 2010 one lagoon management event and two artificial breaching events occurred (SCWA 2011). Pinniped monitoring occurred no more than 3 days before, the day of, and the day after each water level management activity.

The Water Agency's Estuary biological and geophysical monitoring activities are included in the NMFS IHA. The Water Agency surveys the sandbar (or barrier beach) monthly to collect a topographic map of the beach, as required by the Russian River Biological Opinion. A monitor is present during these surveys to record any disturbances of the Jenner haul-out during the survey. Additionally, Water Agency field staff conducting biological and physical monitoring in the Estuary recorded any pinnipeds they encountered hauled out and recorded any disturbance to pinnipeds associated with their activities.

The Russian River Estuary Management and Monitoring Activities in 2013 resulted in incidental harassment (Level B harassment) of 1,351 harbor seals, well under the total 3,130 allowed by NMFS IHA. The Russian River Estuary Management activities in 2012, 2011 and 2010 resulted in incidental harassment (Level B harassment) of 208, 42 and 290 marine mammals respectively. No other marine mammal species were harassed by Water Agency activities during the current or any previous years.

INTRODUCTION

The purpose of this report of activities and monitoring results is to comply with the requirements of the Incidental Harassment Authorization (IHA) issued pursuant to Section 101(a)(5)(D) of the Marine Mammal Protection Act (16 U.S.C 1361 et seq.) to take small numbers of marine mammals, by Level B harassment, incidental to the Sonoma County Water Agency's (Water Agency) Russian River Estuary Water Level Management Activities (issued April 16, 2013, original authorization dated March 30, 2010, NMFS IHA).

The Water Agency applied in 2009 to the National Marine Fisheries Service (NMFS) Office of Protected Resources for an IHA under the Marine Mammal Protection Act (MMPA) for activities associated with water level management activities in the Russian River estuary (Estuary). NMFS issued an original IHA to the Water Agency on March 30, 2010 and subsequently on April 20, 2011 and April 17, 2012. In January 2013 the Water Agency requested that NMFS issue a new IHA for similar activities and additional activities related to the Jetty Study Plan (ESA PWA 2011) and a subsequent IHA was issued on April 16, 2013. This report provides the results of all baseline monitoring and water level management activities for the 2013 calendar year and additional summary information for all related activities.

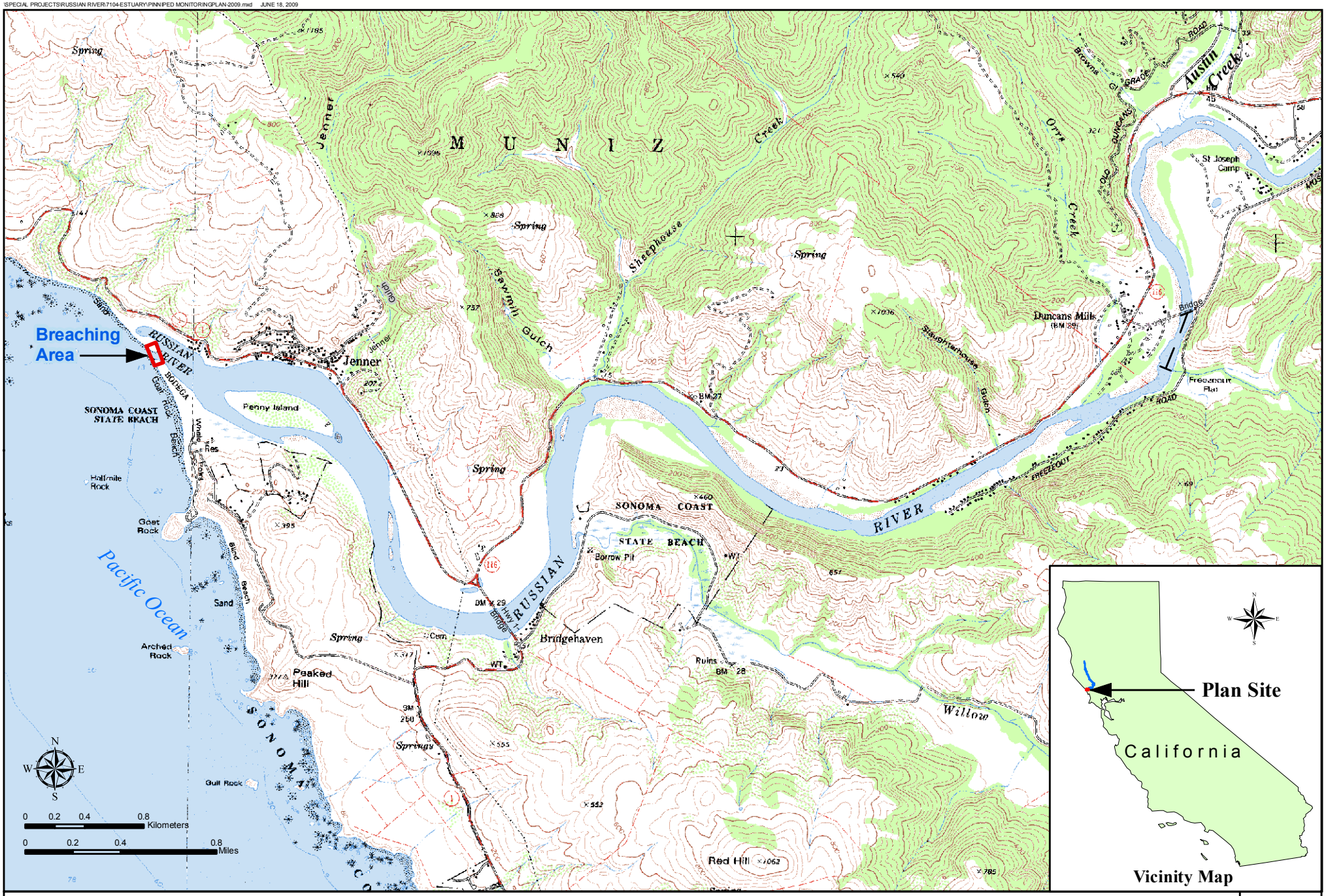
BACKGROUND

The Russian River estuary (Estuary) is located about 97 kilometers (km; 60 miles) northwest of San Francisco in Jenner, Sonoma County, California (Figure 1). The Russian River watershed encompasses 3,847 square kilometers (km) (1,485 square miles) in Sonoma, Mendocino, and Lake Counties. The Estuary extends from the mouth of the Russian River upstream approximately 10 to 11 km (6 to 7 miles) between Austin Creek and the community of Duncans Mills (Heckel 1994).

The Estuary may close throughout the year as a result of a barrier beach forming across the mouth of the Russian River. The mouth is located at Goat Rock State Beach (California Department of Parks and Recreation). Closures result in formation of a lagoon behind the barrier beach and, as water surface levels rise in the Estuary, flooding may occur. Natural breaching events occur when Estuary water surface levels exceed the capability of the barrier beach to impound water, causing localized erosion of the barrier beach and creation of a tidal channel that reconnects the Russian River to the Pacific Ocean.

The barrier beach has also been artificially breached for decades; first by local citizens, then the County of Sonoma Public Works Department, and, since 1995, by the Water Agency. The Water Agency's artificial breaching activities are conducted in accordance with the Russian River Estuary Management Plan recommended in the Heckel (1994) study. The purpose of artificially breaching the barrier beach is to alleviate potential flooding of low-lying properties along the Estuary.

\SPECIAL PROJECTS\RUSSIAN RIVER\7104-ESTUARY\PINNIPED MONITORINGPLAN-2009.mxd JUNE 18, 2009



RRIFR
Russian River Instream Flow and Restoration

Russian River Estuary

This Map is for general reference only.

Figure 1

Biological Opinion and the Estuary

The Water Agency and the U.S. Army Corps of Engineers (Corps) consulted with the NMFS under Section 7 of the Endangered Species Act (ESA) regarding the potential effects of their operations and maintenance activities, including the Water Agency's Estuary Management Program, on federally-listed steelhead (*Oncorhynchus mykiss*), coho salmon (*O. kisutch*), and Chinook salmon (*O. tshawytscha*). As a result of this consultation, the NMFS issued the Russian River Biological Opinion (NMFS 2008) finding that artificially elevated inflows to the Russian River Estuary during the low flow season (May through October) and historic artificial breaching practices have significant adverse effects on the Russian River's estuarine rearing habitat primarily for steelhead. The historic method of artificial sandbar breaching, which is done in response to rising water levels behind the barrier beach, adversely affects the Estuary's water quality and freshwater depths.

The historic artificial breaching practices create a tidal marine environment with shallow freshwater depths and high salinity. Salinity stratification contributes to low dissolved oxygen at the bottom in some areas. The Biological Opinion (NMFS 2008) concludes that the combination of high inflows and breaching practices impact rearing habitat because they interfere with natural processes that cause a freshwater lagoon to form behind the barrier beach. Fresh or brackish water lagoons at the mouths of many streams in central and southern California often provide depths and water quality that are highly favorable to the survival of rearing salmon and steelhead.

The Biological Opinion's Reasonable and Prudent Alternative (RPA) 2 (NMFS 2008) requires the Water Agency to collaborate with NMFS and to modify Estuary water level management in order to reduce marine influence (high salinity and tidal inflow) and promote a higher water surface elevation in the Estuary (formation of a fresh or brackish lagoon) for purposes of enhancing the quality of rearing habitat for juvenile (age 0+ and 1+) steelhead from May 15 to October 15 (referred to hereafter as the lagoon management period). A program of potential, incremental steps are prescribed to accomplish this, including adaptive management of a lagoon outlet channel on the barrier beach.

In accordance with the Biological Opinion's RPA 2 the Water Agency commissioned a draft study plan to analyze the effects and role of the existing, remnant Goat Rock State Beach jetty on beach permeability, seasonal sand storage and transport, seasonal flood risk, and seasonal water surface elevations in the Russian River Estuary (ESA PWA 2011). Implementation of this study plan was scheduled to begin in 2012, then again in 2013, but has continued to be delayed. The study should begin implementation in 2014 and includes the installation and maintenance of monitoring wells and geophysical surveys.

Harbor seals (*Phoca vitulina richardsi*) regularly haul out at the mouth of the Russian River (Jenner haul-out) (Figure 2). California sea lions (*Zalophus californianus*) and northern elephant seals (*Mirounga angustirostris*) are occasionally observed at the haul-out. There are also several known river haul-outs at logs and rock piles in the Russian River Estuary (Figure 2). The Water Agency applied for an IHA under the MMPA for activities associated with Russian River estuary management activities, including:

- excavation and maintenance of a lagoon outlet channel that would facilitate management of a barrier beach (closed sandbar) at the mouth of the Russian River and creation of a summer lagoon to improve rearing habitat for listed steelhead as mandated by the Russian River Biological Opinion (NMFS 2008)
- artificially breaching the barrier beach to minimize the potential for flooding of low-lying properties along the Estuary

- biological and geophysical monitoring activities associated with the management actions described above
- construction and maintenance of monitoring wells on the barrier beach south of the jetty
- geophysical surveys conducted at the barrier beach south of the jetty

METHODS

Monitoring was performed in accordance with the requirements of NMFS IHA issued April 16, 2013, and the Russian River Estuary Management Project Pinniped Monitoring Plan (Sonoma County Water Agency and Stewards of the Coast and Redwoods 2011).

Water Agency biologists and Stewards of the Coast and Redwoods (Stewards) volunteers and staff monitored pinnipeds at the Jenner and peripheral haul-outs. The Stewards provide annual training for all volunteers; trainings occurred on March 10, 2010, January 10, 2011, February 14, 2012 and February 14, 2013. The training session was also attended by Water Agency biologists participating in the monitoring program. The training agenda covered:

- the Marine Mammal Protection Act
- anticipated IHA monitoring requirements
- the Russian River Estuary Management Activities Pinniped Monitoring Plan and monitoring methods therein, including completion of data sheets
- field identification of pinnipeds of the California coast, including harbor seals, California sea lions, Steller sea lions, northern elephant seals, northern fur seals and Guadalupe fur seals
- field identification of neonates (pups less than 1 week old)
- care and use of field equipment (e.g. cameras, spotting scopes, binoculars)
- field visits to each haul-out monitoring location

In an attempt to understand possible relationships between use of the Jenner haul-out and nearby coastal and river (peripheral) haul-outs, several other haul-outs on the coast and in the Russian River Estuary were monitored (Figure 2). These haul-outs include North Jenner and Odin Cove to the north; Pocked Rock, Kabemali, and Rock Point to the south; Penny Logs, Paddy's Rock, and Chalanchawi in the Russian River Estuary. These are known harbor seal haul-outs that have been monitored by Joe Mortenson for over 25 years.

Two types of monitoring were performed: baseline and water level management activities. Baseline monitoring of the Jenner haul-out was shared by Water Agency biologists and Stewards volunteers (each group monitored once a month), with volunteers monitoring the peripheral haul-outs for all baseline monitoring. The water level management activity monitoring at the Jenner haul-out was also shared, but Water Agency biologists monitored artificial breaching activities on the day of the event (no lagoon outlet channel activities occurred). Pre- and post-management activity monitoring was shared by the organizations depending on the availability of volunteers and Water Agency staff.

SPECIAL PROJECTS/RUSSIAN RIVER/7104-ESTUARY/HARBOR SEAL-2009-JENNER FEBRUARY 10,2011

Pinniped Haulouts at the Russian River Estuary and Surrounds

Figure 2

Baseline (Jenner Haul-out Use)

Baseline monitoring was performed to gather additional information about the population of harbor seals utilizing the Jenner haul-out including population trends, patterns in seasonal abundance and the influence of barrier beach condition on harbor seal abundance. Baseline monitoring of the peripheral haul-outs was completed concurrently with the monitoring of the Jenner haul-out. Baseline counts were scheduled for two days out of each month with the intention of capturing a low and high tide each in the morning and afternoon.

Pinnipeds at the Jenner and peripheral haul-outs were surveyed twice monthly. This census began at local dawn and continued for 8 hours. At Jenner all pinnipeds hauled out on the beach were counted every 30 minutes from the overlook on the bluff along Highway 1 adjacent to the haul-out using binoculars or a high-powered spotting scope. Depending on time of year and how the sandbar is formed, harbor seals may haul out in multiple groups at the Jenner haul-out. At each 30-minute count, the observer would indicate where groups of seals are hauled out on the sandbar (e.g. Site A, Site B mapped on datasheet) and provide a total count for each group. Adults and pups were counted separately through June, after which it became difficult to differentiate between age classes. All neonates were also recorded and were identified using one or more of the following characteristics: less than 1 week old, less than 15 kg, thin for their body length, an umbilicus or natal pelage present, wrinkled skin, or awkward or "jerky" movement.

The peripheral haul-outs were visited for 10 minute counts four times during each baseline monitoring day. All pinnipeds hauled out during the 10 minutes were counted from the same vantage points at each haul-out using a high-powered spotting scope or binoculars.

In addition to the census data, disturbances of the haul-outs were recorded. The methods for recording disturbances followed those in Mortenson (1996). Disturbances were recorded on a three-point scale that represents an increasing seal response to the disturbance (Table 1). The time, source, and duration of the disturbance, as well as an estimated distance between the source and haul-out, were recorded.

Table 1. Levels of pinniped response to disturbance used for Russian River Estuary Management Project pinniped monitoring. For permitting purposes a "take" or Level B harassment would include only moving or flight responses.

Level	Type of Response	Definition
1	Alert	Seal head orientation in response to disturbance. This may include turning head towards the disturbance, craning head and neck while holding the body rigid in a u-shaped position, or changing from a lying to a sitting position.
2	Moving	Movements away from the source of disturbance, ranging from short withdrawals over short distances to hurried retreats many meters in length.
3	Flight	All retreats (flushes) to the water, another group of seals, or over the beach.
SOURCE: Mortenson, J. 1996. Human interference with harbor seals at Jenner, California, 1994-1995. Prepared for Stewards of Slavianka and Sonoma Coast State Beaches, Russian River/Mendocino Park District. July 11. 1996.		

Weather conditions were recorded at the beginning of each census. These included temperature, visibility, ocean conditions and wind speed (Beaufort scale). Tide levels and Estuary water surface elevations were correlated to each monitoring day.

Water Level Management Activities

Pinniped use of haul-outs was also monitored in relation to Water Agency water level management events (lagoon outlet channel implementation and artificial breaching). Each of the peripheral haul-outs was monitored concurrently with monitoring of water level management activities in the vicinity of the Jenner haul-out. This provided an opportunity to investigate if there was any correlation to water level management activities and the number of seals using these nearby coastal haul-outs. As the exact movements of individual seals are not tracked, the number of seals displaced from the Jenner haul-out to the peripheral haul-outs cannot be quantified; however, potential trends may be observed. The methods for monitoring water levels management activities are as follows. A one-day, pre-event survey was made within 1 to 3 days prior to all water level management events. On the day of the management event, pinniped monitoring began at least one hour prior to the crew and equipment accessing the beach work area and continued during the duration of the event until at least one hour after the crew and equipment left the beach. Monitoring continued on the day following each water level management event to document the number of seals utilizing the haul-outs. Methods followed the census and disturbance monitoring protocols described in the "Baseline (Jenner Haul-out Use)" section above.

Biological and Physical Monitoring

The NMFS IHA also provides incidental take for Level B harassment of pinnipeds that may result from monitoring of biological resources and physical processes in the Estuary. Water Agency field staff record the presence of pinnipeds hauled out in the Estuary in the vicinity of their activities and record any resulting disturbances. The Russian River Biological Opinion also requires monthly topographic surveys of the sandbar at the mouth of the Russian River. A Water Agency biologist was present during topographic surveys to provide guidance to the survey crews on minimizing disturbance of the haul-out and to observe pinniped response to the survey work in the vicinity of the Jenner haul-out. Once survey crews approached a seal haul-out the Water Agency monitor would notify the survey crew as soon as the seals became alert to their presence via radio, in an effort to minimize any disturbance. Beginning on May 30, 2013 the methods for conducting the monthly topographic surveys of the barrier beach changed. Due to the frequent and prolonged river mouth closures there was an increased need to gather complete information about the topography and sand elevation of the beach to best inform water level management activities. This necessitated the survey crew to access the entire beach, including any area where seals were hauled out. Provided that no neonates or nursing pups were on the haul-out, the survey crew approached the haul-out slowly on foot and allowed for the seals to gradually vacate the beach before the survey proceeded. A pinniped monitor was present for all of these surveys and carefully documented the seals' response and total number of animals disturbed.

Monitoring During Pupping Season

If any pup which was potentially abandoned was observed during monitoring, the Water Agency contacted the NMFS stranding response network (Marine Mammal Center in Sausalito, CA) immediately and also reported the incident to NMFS' Southwest Regional Office and NMFS Headquarters within 48 hours. Monitors were instructed not to approach or move the pup. Monitors used the following

potential indications that a pup may be abandoned: no observed contacts with adult seals, no movement of the pup, and the pup's attempts to nurse were rebuffed.

Additional Training

Prior to each breaching activity and beach topographic survey, the biologist monitoring the survey participated in the onsite tailgate safety meeting to discuss the location(s) of pinnipeds at the Jenner haul-out that day and methods of avoiding and minimizing disturbances to the haul-out as outlined in NMFS IHA.

RESULTS

The NMFS IHA (April 16, 2013) requires the following information be provided in this report:

(a) the number of seals taken, by species and age class (if possible)
(b) behavior prior to and during water level management events
(c) start and end time of activity
(d) estimated distances between source and seals when disturbance occurs
(e) weather conditions (e.g., temperature, wind, etc.)
(f) haul-out reoccupation time of any seals based on post activity monitoring
(g) tide levels and estuary water surface elevation
(h) seal census from bi-monthly and nearby haul-out monitoring
(i) specific conclusions that may be drawn from the data in relation to the four questions of interest in SCWA's Pinniped Monitoring Plan, if possible

Estuary water surface elevations are recorded at the Jenner gauge (operated by the Water Agency), located at the State Parks visitor center in the town of Jenner. Appendix A includes the Estuary water surface elevations associated with pinniped monitoring in 2013, including both baseline and water level management events.

Baseline (Jenner Haul-out Use)

Baseline monitoring of the Jenner and peripheral haul-outs was performed two days out of each month with the intention of capturing a low and high tide each in the morning and afternoon (SCWA 2011, 2012, 2013). In 2013 a total of 22 baseline surveys, 13 monthly beach topographic surveys, 4 breaching surveys, 8 pre-breaching, 4 post-breaching and 2 pre-lagoon outlet surveys were conducted (Appendix A).

Peak seal abundance, as determined by the single greatest count of harbor seals at the Jenner haul-out, was on July 11 (476 seals). Using the mean number of seals hauled out as a measure of average abundance, seal abundance at Jenner was greatest in July (mean = 411 ± 7.6 s.e.) greater than any of our previously reported monthly averages, by more than 100 seals (Figure 3.) This peak in abundance occurred during the summer molting period. Similar to previous years, seal abundance declined in the fall, and was particularly low in November, which could be in part due to the reduced number of surveys for the month (a breaching event took place on a day that had been scheduled for baseline monitoring). If all surveys conducted in November (including breaching, pre-breaching, post-breaching and monthly topographic surveys) were used to calculate the monthly average, it would increase to 87 seals: more comparable to previous years.

Pups are born at the Jenner haul-out beginning in March. In 2012 the earliest pup observation was on March 23, 2012 and observations of pups continued until May 23 (the last neonate was observed on May 2, 2012). (). However, in 2013 the first pups were not observed until April 18, with the latest observation of pups occurring on May 30, 2013 (the last neonate was observed on April 26). Pups are counted during surveys through June, after which time it becomes difficult to distinguish pups from sub-adult seals. No distressed or abandoned pups were reported by Water Agency or Stewards monitors in 2013. Pup production at the Jenner haul-out was 28.8% of total seals as calculated from the peak pup count recorded on April 26 and the number of adult harbor seals present at the same time. Pup production increased compared to last year when an unusually low number of 13.8% was reported, and is similar to previous years (29.3% on May 4, 2011). However, the average of pups observed (when pups were present) during April and May was down slightly for 2013: 12.9 pups compared to 15.4 pups in 2012 and 14.9 pups in 2011.

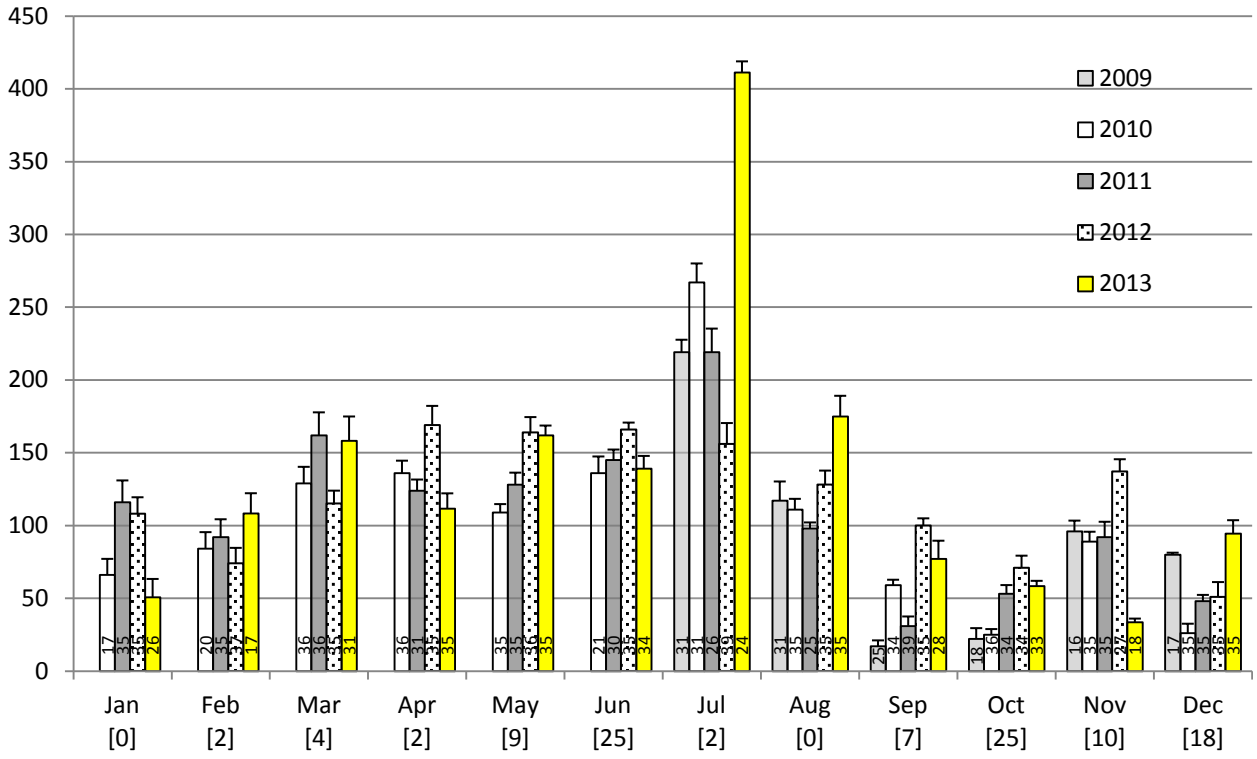


Figure 3. Mean number of harbor seals hauled out at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) as counted during baseline surveys for each year (July 2009 – December 2013) categorized by month. Error bars represent standard error and sample size used to calculate means are presented inside the bars. Numbers in brackets under month indicate the number of days the barrier beach was closed for the month in the year 2013.

Water Level Management Activities

The barrier beach was formed eleven times during 2013 (Table 2), but only during five of these closure events did the Water Agency artificially breach the sand bar (the fifth breaching event occurred in 2014 and will not be included in this report). The Russian River outlet was closed to the ocean for a total of

104 days (or 28%) in 2013, with 56 (or 54%) of these days occurring during the Lagoon Management Period.

Artificial Breaching Events

On February 19 the barrier beach formed after a period of steep ocean swells, depositing sand to close the outlet located in the far north end of the beach. During this closure event the Estuary water level peaked at 9.9ft NGVD, just before the barrier beach was breached on February 21. Prior to the breaching activities, there were 76 harbor seals hauled out at Jenner. Before excavation activities began Water Agency surveyors were on the barrier beach and seals alerted to their presence and one seal moved along the haul-out. At 10:50 one seal alerted, then moved on the haul-out in response to the excavator traveling north along the beach. The excavator began constructing a channel at 10:55 and completed the breach at 12:12. The excavated channel was located about 765 feet south of the seals that were hauled out on the Estuary side of the barrier beach. By 12:29 all equipment had departed the beach. During the excavation activities only a small number of seals were disturbed from their haul-out: 30 seals alerted, 12 moved and 8 flushed into the Estuary. Seals remained hauled out on the beach, at a distance of about 800 feet north of the excavation activities throughout the breach event. At the time that observations were finished for the day there were 93 harbor seals hauled out on the beach.

On September 24 a barrier beach was formed after a period of steep southerly swells. The river outlet remained closed for a period of 21 days before the water level in the lower river approached flood stage, necessitating the Water Agency to artificially breach the barrier beach on October 15. Breaching activities began at 8:47 when the excavator entered Goat Rock State Beach (GRSB). At this time there were 49 harbor seals hauled out on the ocean side of the beach. At 8:56 as the excavator and safety crew traveled north along the beach the 45 seals that were hauled out began to flush into the ocean. By 9:00 all seals had left the beach for the ocean. At 9:04 the excavator began constructing a channel at the north end of GRSB, about 600 feet north of the haul-out. Excavation of the channel was complete at 11:30 and all equipment was off the beach by 11:50. When observations were completed at 12:50 no harbor seals had returned to the beach. The following day when observation began at 7:00 there were 82 harbor seals hauled out.

On October 21 a barrier beach was formed, and the river outlet remained closed for 17 days before the water level in the lower river approached flood stage, necessitating the Water Agency to artificially breach the barrier beach on November 7. Breaching activities began at 10:20 when the excavator entered GRSB. At this time there were 64 harbor seals hauled out on the ocean side of the beach. At 10:27 as the excavator and safety crew travelling on foot continued north along the beach seals began to flush into the ocean. By 10:31 all seals had left the beach for the ocean. At 10:37 the excavator began constructing a channel at the north end of GRSB, about 600 feet north of where the seals were hauled out. Excavation of the channel was complete at 12:51 and all equipment was off the beach by 13:09. When observations were completed at 15:23 no harbor seals had returned to the beach. The following day when observations began at 7:20 there were 253 harbor seals hauled out on the estuary side of the beach.

On November 27 a barrier beach formed when the narrow outlet channel located at the north end of the beach closed, and remained closed for eight days until the Water Agency artificially breached the barrier beach on December 5. Breaching activities began at 11:21 when the crew and excavator left the GRSB parking lot and travelled north along the beach. At this time there were 76 harbor seals hauled out on the ocean side of the beach. At 11:26 the harbor seals alerted to the noise of the excavator and

the presence of the safety crew as they travel north over the jetty wall. At 11:36 the excavator began digging on the estuary side of the barrier beach, about 150 feet south of the haul-out and 48 seals flushed into the ocean. At 12:47 10 seals moved and 3 flushed into the ocean as the excavator moved closer to the ocean side of the barrier beach, 21 seals remained on the haul-out. At 13:55 the excavator completed work and the river began to flow out to the ocean, 16 seals remained on the haul-out. When observations had completed for the day at 16:04, there were no harbor seals hauled out. The remaining seals had been flushed from the haul-out by a beach visitor with a dog at 14:46.

The estimated take by incidental harassment (Level B), as defined by the Marine Mammal Protection Act, of harbor seals during artificial breaching activities in 2013 was 192 harbor seals (168 flushed and 24 moved). Disturbance information for each event is provided in Table 3.

Table 2. Summary of barrier beach closed conditions occurring in 2013 at the Russian River mouth (Goat Rock State Beach). Peak water level during the event was measured at the gauge located at the Sonoma Coast State Park Visitors Center in Jenner, Ca. Gauge data is missing or incomplete for dates: Oct. 6 –17; Oct. 26 – Nov. 3; Nov. 29 – Dec. 2; Dec. 11 –18 and Dec. 22 – 27.

Date	Mouth condition	Peak Jenner gauge height (ft NGVD)	Date mouth opened
February 19-20	closed	9.9	February 21[a]
March 3-4	closed	7.6	March 5
March 6-7	closed	8.8	March 7
April 7-8	closed	9.3	April 9
May 23 – June 2	closed	6.6	June 3
June 8 – July 2	closed	7.7	July 3
September 24 – October 14	closed	7.4[b]	October 15[a]
October 21 – November 6	closed	7.4[b]	November 7[a]
November 27 – December 4	closed	7.4[b]	December 5[a]
December 16-21	closed	5.5	December 21
December 24	closed	7.4[b]	Jan 2, 2014[a,c]

[a] *river mouth was artificially breached*
[b] *river level height is from day of breaching event*
[c] *breaching event not included in 2013 totals*

Influence of Barrier Beach Condition on Seal Abundance

Pinniped monitoring in 2013 provided another opportunity to increase our observations of seals at Jenner during bar closed conditions. While it is not possible to separate the effect of barrier beach condition (closed versus open) from time of year, observations from this year provide further evidence that fewer seals are present during bar closed conditions (Figure 4). However, it is important to note that during this year of prolonged and frequent bar closures, the overall trend was an increase in seal abundance compared to earlier years. An analysis of the maximum number of people observed near the Jenner haul-out shows that their numbers increase during bar closed conditions (Figure 5). When comparing the linear trend for people abundance during open versus closed conditions it is apparent that there is an increasing trend for people abundance during bar closed conditions only (Figure 5). Observations during bar closed conditions in the fall and winter of 2013 also indicate that seals may prefer to haul out on the ocean side of the beach when the river mouth is closed. Seals hauled out on the ocean side of the beach are subjected to wave over-wash and inundation from rising tides. This trend was new to observations in 2013 and will be monitored in the future in an effort to analyze any possible trends.

Biological and Physical Monitoring

The NMFS IHA (2013) provides incidental take for Level B harassment of pinnipeds that may result from monitoring of biological resources and physical processes in the Russian River Estuary. The number of incidental takes in 2013 was calculated based on the number of animals that responded to disturbance by either moving on their haul-out or flushing from their haul-out. Alerts were also recorded by monitors, but are not included in the number of incidental takes reported. At haul-out sites within the Estuary (excluding the barrier beach, Figure 2) disturbances were rare compared to the total number of monitoring events that occurred, with only two of 28 monitoring events in the upper Estuary resulting in a seal disturbance (Table 3). Most often, when seals were present on the Estuary haul-outs they either had no reaction or most often raised their heads in alert as the boat passed. The most seals hauled out in the Estuary as observed by Water Agency field staff were five at Chalanchawi (middle reach) and five at Penny Logs (lower reach). Other disturbances resulting from monitoring of the biological resources and physical processes in the Estuary occurred at the Jenner haul-out. Only one of 26 water quality monitoring events near Jenner resulted in a disturbance to harbor seals.

The Russian River Biological Opinion requires monthly topographic surveys of the barrier beach at the mouth of the Russian River. A Water Agency biologist was present during topographic surveys to monitor the seal response to the survey crew. Prior to the change in survey techniques on May 30, there were no seals disturbed during the monthly topographic surveys. Once the survey crew began mapping the entire barrier beach between 53% and 100% of seals were flushed from their haul-out during the monthly mapping activities (Table 3).

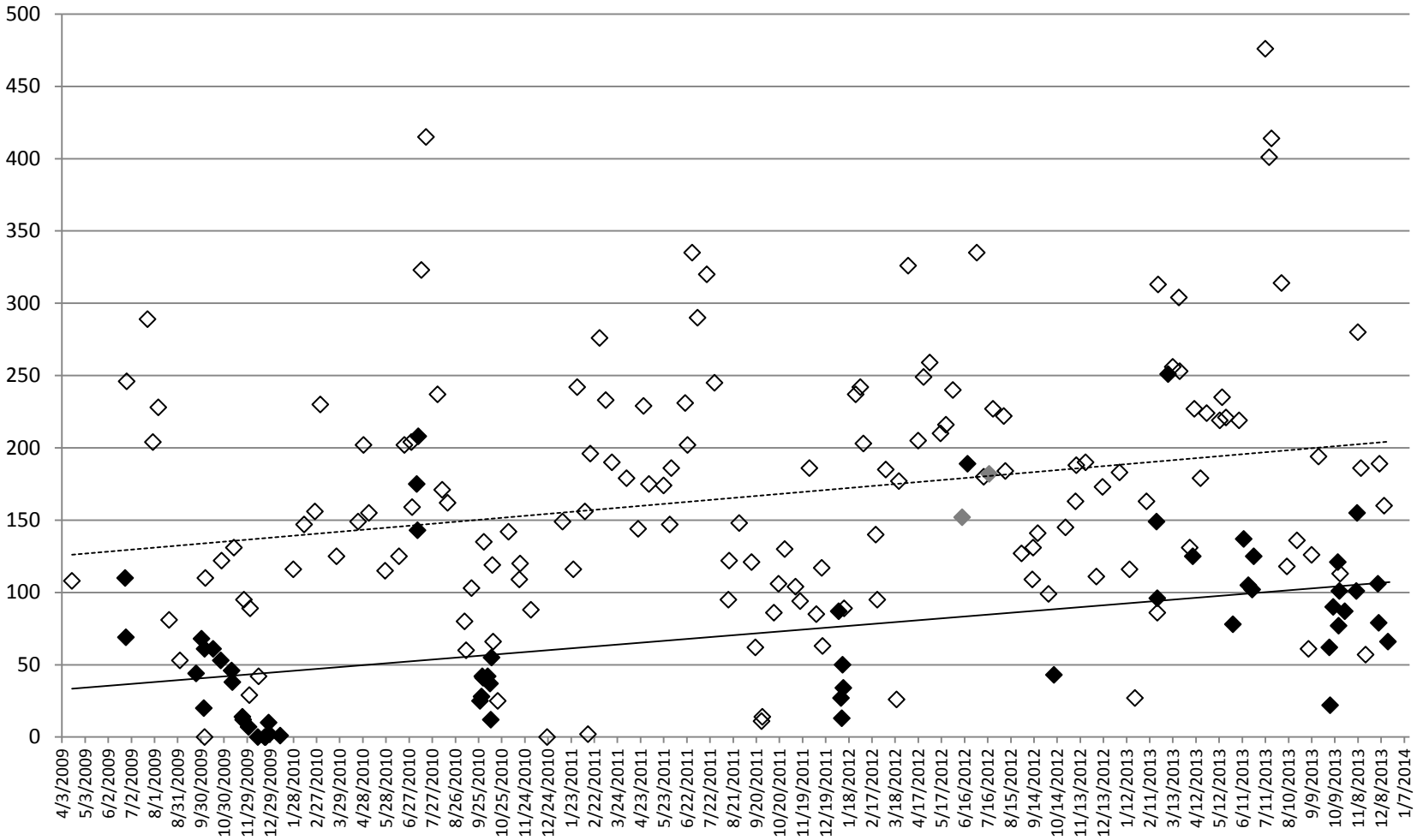


Figure 4. Maximum number of harbor seals counted during all pinniped surveys at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) since surveys began in 2009. Open diamonds represent counts in bar open conditions, black filled diamonds represent counts during bar closed conditions and grey diamonds represent counts during naturally perched conditions. Dashed line represents linear trend for harbor seal counts in bar open conditions and solid line represents linear trend for harbor seal counts in bar closed conditions.

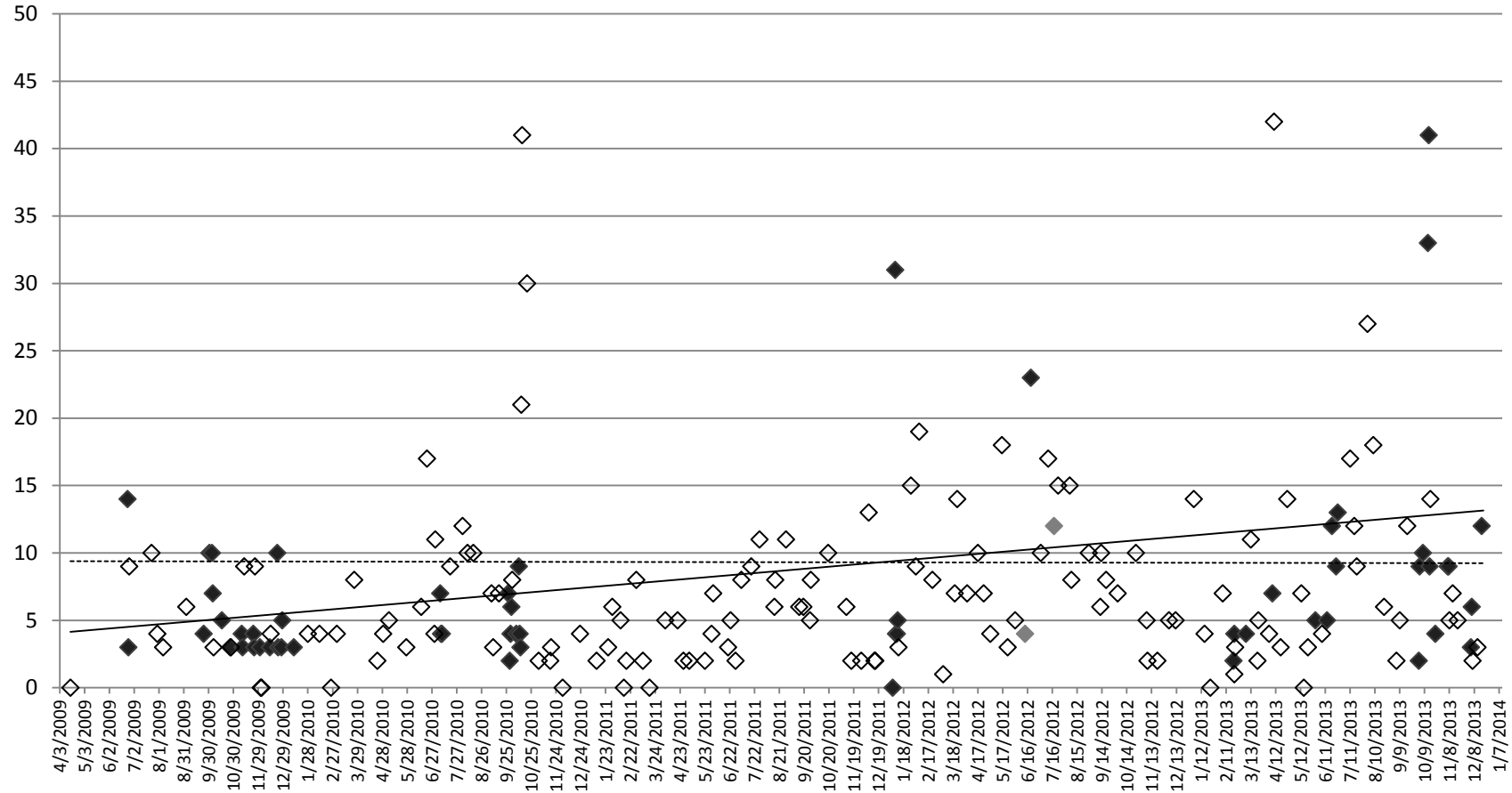


Figure 5. Maximum number of people counted during all pinniped surveys at the Jenner haul-out (Russian River mouth at Goat Rock State Beach) since surveys began in 2009. Open diamonds represent counts in bar open conditions, black filled diamonds represent counts during bar closed conditions and grey diamonds represent counts during naturally perched conditions. Dashed line represents linear trend for people during bar open conditions and the solid line represents linear trend for people during bar closed conditions. In order to better illustrate trends, there were 7 survey days removed from analysis where the maximum single count of people exceeded 50.

Table 3. Number of disturbances of pinnipeds during Russian River Estuary Management and Monitoring Activities for 2013 that resulted in incidental take by harassment. Disturbances reported here are pinnipeds moving on or flushing from their haul-out, number of disturbed seals that flushed from their haul-out is denoted by (#).

Date	Event Type	Estimated Disturbance			
		Species	Age Class	Number	Max % total seals flushed[a]
21 Feb	breaching	harbor seal	adult	22(8)	11%
15 May	water quality	harbor seal	adult	1(1)	20%
30 May	topo survey	harbor seal	adult	80(75)	99%
30 May	topo survey	harbor seal	pup	2(2)	100%
13 June	topo survey	harbor seal	adult	156(151)	53%
16 July	topo survey	harbor seal	adult	295(295)	65%
8 August	topo survey	harbor seal	adult	107(107)	91%
5 September	topo survey	harbor seal	adult	40(34)	100%
15 October	breaching	harbor seal	adult	45(45)	100%
7 November	breaching	harbor seal	adult	64(64)	100%
12 November	topo survey	harbor seal	adult	325(217)	70%
13 November	water quality	harbor seal	adult	10(10)	12%
4 December	pre-breaching[b]	harbor seal	adult	25(25)	24%
5 December	breaching	harbor seal	adult	61(51)	53%
12 December	topo survey	harbor seal	adult	118(90)	100%
	2013 total	**harbor seal**	**adult**	**1,349(1,173)**	
			pup	**2(2)**	

[a] *Due to the fact that multiple disturbance episodes are represented by the total number of seals disturbed for a given day, the number reported for the percent of seals on the haul out that were flushed is the maximum value recorded for that day*
[b] *Disturbance was caused by Water Agency personnel posting warning signs on beach, prior to breaching activities.*

Disturbance of Seals at Russian River Mouth

In addition to the recording of disturbances to seals that occur during Water Agency water level management and biological and physical monitoring activities, other sources of disturbance are recorded during monitoring surveys. In an effort to compare the impact of Water Agency caused disturbances to those seals encounter from other sources at and around the Jenner haul-out a summary of disturbance observations is reported here. Disturbance sources were separated into 9 categories: aircraft, bird, dog, kayak, other boat, people, SCWA (Water Agency personnel), unknown and vehicle. For the purpose of comparison, monitoring surveys that occurred during a breaching or lagoon outlet channel implementation were excluded since these do not represent typical activity that seals would encounter, and the seals are usually vacant from the haul out once water level management activities have begun. Monthly beach topographic surveys of Goat Rock State Beach, conducted by Water Agency personnel are included. Also, only seal movement or flushing responses were considered a disturbance since that is the criterion for a take under our permit. Given that there is some evidence that seal abundance on the haul-out may be depressed during bar closed (including naturally perched) conditions we also compare the frequency of disturbances by barrier beach condition.

Harbor seals were most frequently disturbed by people on foot (53% of surveys), with a small increase in frequency of disturbances during mouth closed conditions (Figure 6). People in kayaks were the next most frequent source of disturbance overall (24.3%) with an increase during mouth closed conditions (27.8%). Water Agency personnel and birds were the next most frequent source of disturbance with 14.9% and 13.3% respectively.

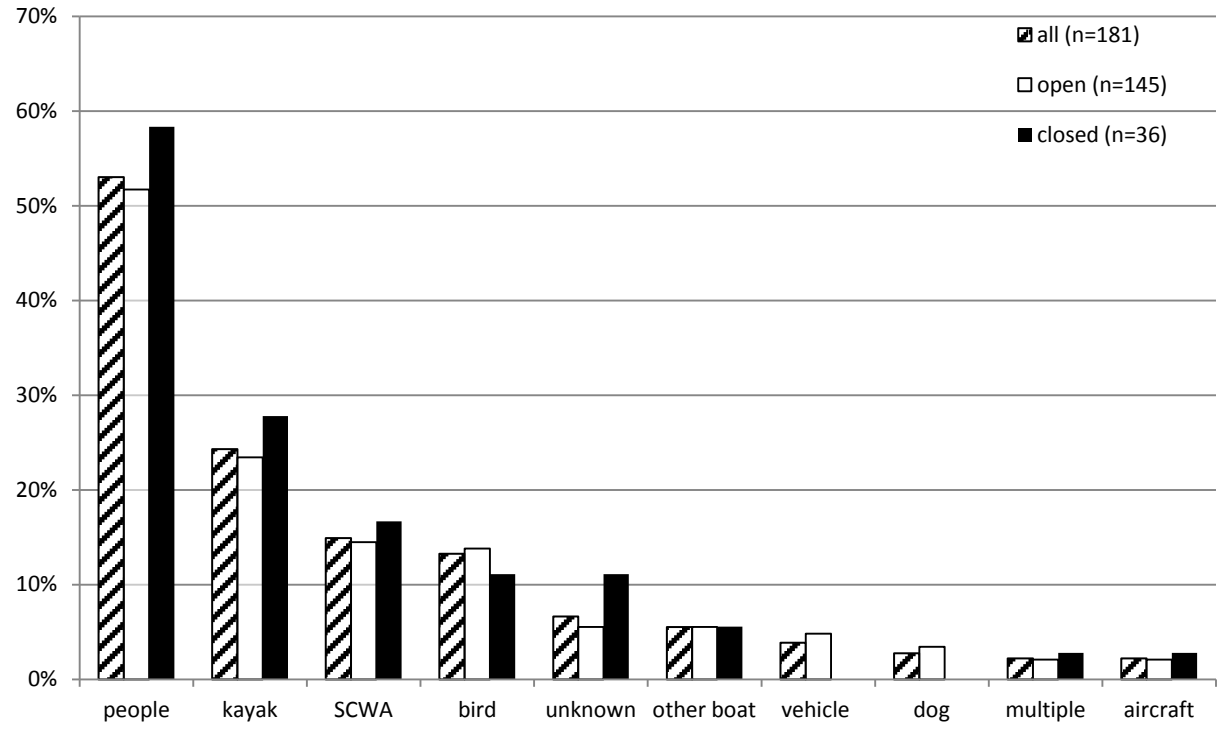


Figure 6. Percent of all pinniped surveys (excluding water level management activities) where disturbances occurred by disturbance source. Data presented is cumulative since surveys began in 2009. For this figure disturbances were defined as only movement or flushes, not head alerts.

Peripheral Haul-out Use

In addition to monitoring harbor seal abundance at the Jenner haul-out, eight coastal and Estuary haul-outs were monitored. Similar to previous years, most of these peripheral haul-outs had very low seal abundance with two sites averaging less than one seal as observed during baseline surveys (Penny Logs = 0.1, Paddy's Rock = 0.3) and four sites averaging less than 3 seals as observed during baseline surveys (North Jenner = 1.0, Odin Cove = 2.1, Chalanchawi = 1.5 and Pocked Rock = 2.2) The two southernmost rocky haul-outs included in our monitoring surveys, Kabemali and Rock Point, had the highest abundance of seals with a baseline average of 3.1 and 6.3 respectively. Seasonal increases in seal abundance were most apparent at the Rock Point haul-out, and also at North Jenner and Odin cove, where seal abundance peaks during the summer molt period (July) (Table 4).

Table 4. Mean number of harbor seals by month hauled out at peripheral sites as observed during all monitoring surveys conducted in 2013. Shaded areas represent time of pupping (Mar-May) and molting (Jul-Aug).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North Jenner	0.1	0.0	0.0	1.1	0.4	2.6	**3.6**	2.6	0.5	2.7	0.5	0.0
Odin Cove	1.0	1.1	1.5	1.3	1.7	0.5	**8.3**	1.6	1.6	3.0	3.9	2.5
Penny Logs	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.4	1.0	0.2	0.1
Paddy's Rock	0.0	0.2	**1.7**	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.7
Chalanchawi	1.2	1.2	**2.1**	1.1	1.5	**1.9**	1.1	**1.8**	1.2	0.8	1.2	0.9
Pocked Rock	0.9	2.1	2.6	1.9	**4.9**	**5.0**	1.9	3.1	1.8	0.7	1.1	0.8
Kabemali	2.5	3.3	3.9	1.8	**4.5**	2.3	1.5	3.5	2.2	**4.3**	**4.6**	3.7
Rock Point	4.0	1.3	2.4	1.7	3.8	7.6	**16.9**	**12.9**	6.7	4.9	6.8	8.1

In order to evaluate whether or not beach management activities cause harbor seals to leave the Jenner haul-out for near-by peripheral sites we compared average seal abundance for each peripheral site before, during and after breaching activities for 2013 (Figure 7). At North Jenner and Odin Cove more seals were present during pre-breaching surveys compared to post breaching surveys. At Chalanchawi the most seals were present during post-breaching surveys. Chalanchawi is a collection of logs located in the middle reach of the Estuary that become submerged as river water elevation rises, as during bar closed conditions. Kabemali and Rock Point are notable in the fact that seals were most abundant during the breaching surveys, compare to any other surveys.

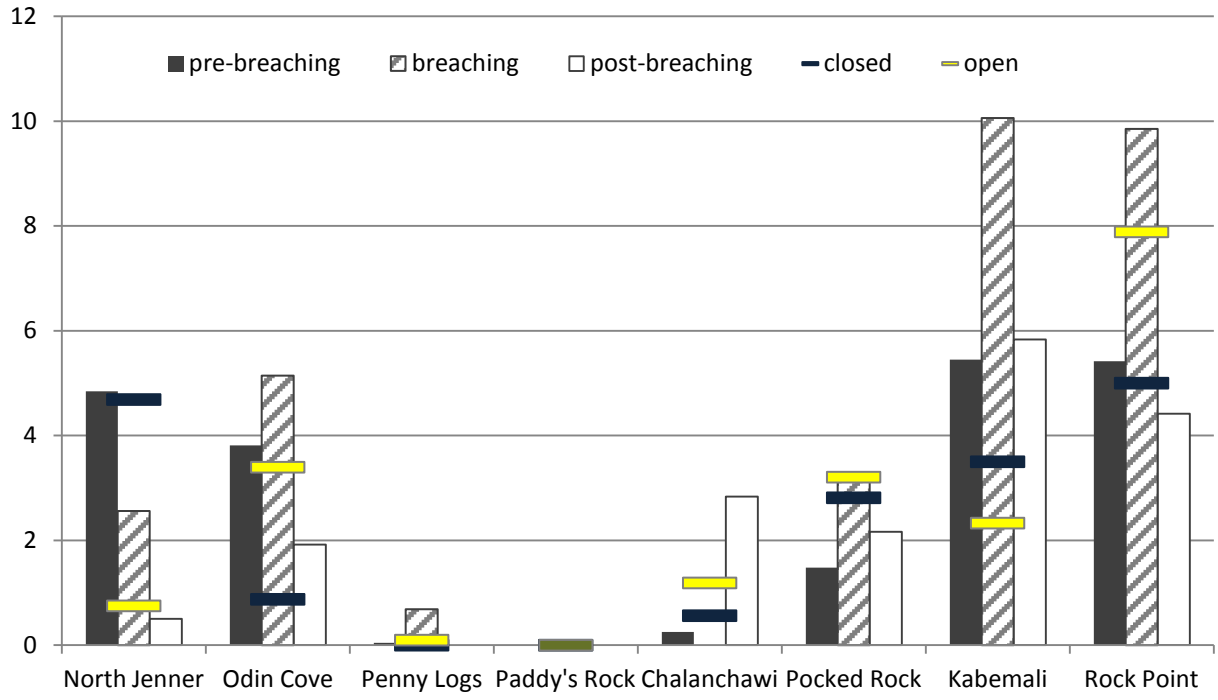


Figure 7. Average seal abundance at peripheral haul-outs as observed during pre-breaching, breaching and post-breaching surveys. For comparison the baseline averages for seal abundance during bar closed (blue) and bar open (yellow) conditions are also represented.

Photo identification

A pilot study on the use of photo identification to passively track the movements and haul out patterns of individual harbor seals was initiated in the summer of 2013. Between June 11 and December 17 a total of 18 surveys were made at the Jenner, North Jenner, Odin Cove, Kabemali and Rock Point haul-outs. Most of these surveys were concurrent with previously scheduled pinniped monitoring surveys. It was determined that the current Highway 1 overlook monitoring location is adequate for collecting identification photos provided that the seals are hauled out on the estuary side of the barrier beach. Distance, wind and poor lighting conditions make the collection of adequate photos from the North Jenner and Odin Cove haul-outs challenging. While the close proximity of the observer to the Kabemali and Rock Point haul-outs provide easy collection of identification photos. To date a total of 137 seals have been photographed (124 from Jenner, 9 from Kabemali, 3 from North Jenner and 1 from Rock Point). While only 17 photographs have been evaluated for matches, one confirmed match was made of an adult male harbor seal located at Jenner, initially sighted on September 11 and re-sighted two months later on November 12.

CONCLUSIONS

The water level management activities and biological and geophysical monitoring activities conducted by the Water Agency in 2013 resulted in incidental harassment (Level B harassment) of 1,351 harbor seals, well under the total allowed by NMFS IHA (2013).

The purpose of the Russian River Estuary Management Project Pinniped Monitoring Plan (Sonoma County Water Agency and Stewards of the Coast and Redwoods 2011) is to detect the response of pinnipeds to Estuary management activities at the Russian River Estuary. Specifically, the following questions are of interest:

1. Under what conditions do pinnipeds haul out at the Russian River Estuary mouth at Jenner?

2. How do seals at the Jenner haul-out respond to activities associated with the construction and maintenance of the lagoon outlet channel and artificial breaching activities?

3. Does the number of seals at the Jenner haul-out significantly differ from historic averages with formation of a summer (May 15th to October 15th) lagoon in the Russian River Estuary?

4. Are seals at the Jenner haul-out displaced to nearby river and coastal haul-outs when the mouth remains closed in the summer?

A summary of baseline pinniped monitoring concluded that time of year, tidal state and time of day influenced harbor seal abundance at the Jenner haul-out (SCWA 2012). Harbor seals were most abundant on the haul-out in July during their annual molt. Seasonal variation in the abundance of harbor seals at their haul-out locations is commonly observed throughout their range (Allen et al. 1989, Stewart and Yochem 1994, Gemmer 2002). The variation in their abundance can mostly be explained by changes in their biological and physiological requirements throughout the year. Peak seal abundance occurring in July during their molting season is likely a result of seals spending more time on land in order to help facilitate the molting process. This annual peak is typically followed by a decline in seal abundance which is likely a result of individual seals decreasing the amount of time on the haul-out post-molt to spend more time foraging and also coincides with the time that young seals may temporarily disperse from their natal haul-out (Stewart and Yochem, 1994, Thompson et al. 1994, Small et al. 2005). Harbor seal abundance at Jenner was also influenced by barrier beach condition. Daily average abundance of seals was lower during bar closed conditions compared to bar open conditions. This effect is likely due to a combination of factors including: increased human disturbance, reduced access to the ocean from the estuary side of the barrier beach, and the increased disturbance from wave action when seals utilize the ocean side of the barrier beach.

The response of harbor seals at the Jenner haul-out to water level management activities in 2013 (Question 2 above) was similar to the responses observed in previous years of monitoring (Merritt Smith Consulting 1997, 1998, 1999, 2000; Sonoma County Water Agency and Merritt Smith Consulting 2001; SCWA 2011, 2012 and 2013). Harbor seals alerted to the sound of equipment on the beach and left the haul-out as the crew and equipment approached closer on the beach. When breaching activities were conducted south of the haul-out location seals often remained on the beach during all or some of the

breaching activity. This indicates that seals are less disturbed by activities when equipment and crew do not pass directly past their haul-out.

Since the beginning of the modified estuary water level management procedures as a result of the NMFS 2008 Biological Opinion a summer lagoon has only been implemented once (July 2010). However, since the Water Agency began implementing the lagoon outlet channel adaptive management plan a barrier beach has formed during the lagoon management period twelve times, the longest incidence lasting 25 days, with an average duration of nine days. With the additional sustained river outlet closures observed in 2013 during the lagoon management period it is possible to make better informed conclusions about the abundance of seals during the formation of a summer lagoon (Question 3 above). While seal abundance was lower during bar closed conditions, there was also a record high in seal abundance recorded this year. These results indicate that while seal abundance may exhibit a short term decline during bar closed conditions, overall the number of seals utilizing the Jenner haul-out continues to increase. We conclude that the effect of barrier beach condition on seal abundance represents only a short term response, and is not an indication that seals are less likely to choose Jenner as a haul-out overall. Coupling seal abundance data with human abundance data and disturbance observations leads us to conclude that the increased frequency of disturbances during bar closed conditions is the underlying cause for the short term decline in seal abundance.

Harbor seals are generalists in many ways: including diet, resting locations and activity patterns. They are able to find refuge on sandy beaches, tidal mud flats and rocky shores (Allen et al. 1989, Gemmer 2002, Small et el. 2005). Seals exploit a wide range of locally abundant prey (Gemmer 2002, Hanson 1993, Tollit et al. 1997): they may forage during the day and come ashore at night, or forage at night and come ashore during the day, or even spend multiple days at sea (Small et al. 2005, Suryan and Harvey 1998, Yochem et al. 1987). Given that harbor seals exhibit this range of behaviors our ability to understand temporal changes in seal behavior and population abundance is limited by the use of periodic count data. In order to better understand the underling behaviors that influence the population trends for harbor seals located at Jenner, we propose to conduct a photo-identification study as a means to observe individual seals over time. This year we began a pilot study, and determined that our current observation locations allow us to capture detailed images of seals that can be used to identify individuals based on spot patterns. Analysis of the photographs collected in 2013 is still underway and more identification photographs continue to be collected when possible during scheduled pinniped surveys.

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Appendix A. Summary of pinniped monitoring activities at the Jenner haul-out (Goat Rock State Beach, Sonoma County) conducted by the Sonoma County Water Agency and Stewards of the Coast and Redwoods from January – December 2013 for the Russian River Estuary Management Project, including summary of pinniped abundance and Estuary water level.

			HASE adults			HASE neonates			HASE pups					
Date	**Activity**	**Estuary water level[a,b] (ft)**	**max**	**mean**	**s.e.**	**max**	**mean**	**s.e.**	**max**	**mean**	**s.e.**	**n**	**CASL present[c]**	**NES present**
1/3/2013	baseline	0.87	183	129.7	14.82							9		
1/16/2013	topo survey	0.31	116	74.6	9.50							10		
1/23/2013	baseline	3.73	27	8.8	2.00							17		
2/7/2013	baseline	4.88	163	108.3	13.83							17		
2/20/2013	pre-breaching	8.33	149	133.9	3.00							11		
2/21/2013	breaching/ topo survey	9.89	96	64.1	7.70							14		
2/22/2013	post-breaching	1.16	313	201.9	23.74							17		
3/7/2013	pre-breaching[d]	6.84	251	224.3	6.71							8		
3/13/2013	baseline	--	256	198.8	12.03							13		
3/21/2013	topo survey	1.27	304	182.2	32.73							9		
3/22/2013	baseline	1.62	253	128.8	25.54							18	Y	
4/4/2013	baseline	2.00	131	62.4	10.08							17		
4/8/2013	pre-breaching	8.69	125	79.9	10.11							17		
4/10/2013	post-breaching[d]	2.55	227	146.6	19.97							9		
4/18/2013	topo survey	0.68	167	143.2	10.82	12	9.6	0.87	1	0.4	0.24	5		
4/26/2013	baseline	1.74	189	138.2	6.83	1	0.1	0.06	38	19.7	2.71	18		
5/13/2013	baseline	2.72	207	143.6	8.69	0	0.0	0.00	19	10.2	1.06	18		
5/16/2013	topo survey	--	207	164.5	16.04	0	0.0	0.00	28	23.5	2.10	4		
5/21/2013	baseline	2.17	209	158.8	9.76	0	0.0	0.00	19	11.5	0.81	17		
5/30/2013	topo survey	5.81	75	50.8	8.00	0	0.0	0.00	4	2.0	0.46	8		
6/7/2013	baseline	1.74	219	187.7	3.83							17		

Appendix A. Summary of pinniped monitoring activities at the Jenner haul-out (Goat Rock State Beach, Sonoma County) conducted by the Sonoma County Water Agency and Stewards of the Coast and Redwoods from January – December 2013 for the Russian River Estuary Management Project, including summary of pinniped abundance and Estuary water level.

			HASE adults			HASE neonates			HASE pups					
	Activity	Estuary water level[a,b] (ft)	max	mean	s.e.	max	mean	s.e.	max	mean	s.e.	n	CASL present[c]	NES present
6/13/2013	topo survey	4.31	137	77.4	14.23							8		
6/19/2013	baseline	4.93	105	90.3	2.38							17		
6/24/2013	pre-lagoon outlet[d]	5.38	102	50.5	9.87							11		
6/26/2013	pre-lagoon outlet[d]	6.39	125	96.3	8.27							8		
7/11/2013	baseline	1.21	476	429.8	5.83							15		
7/16/2013	topo survey	1.22	401	310.6	25.30							9		
7/19/2013	baseline	1.79	414	380.4	12.20							9		
8/1/2013	baseline	1.25	314	249.4	13.50							17		Y
8/8/2013	topo survey	1.04	118	90.5	9.39							10		
8/21/2013	baseline	1.37	136	104.3	5.35							18		
9/5/2013	topo survey	1.11	61	22.2	7.04							10		
9/9/2013	baseline	1.40	126	34.5	14.42							11		
9/18/2013	baseline	1.21	194	104.6	14.91							17		
10/2/2013	baseline	6.33	62	43.1	2.62							18		
10/3/2013	topo survey	6.46	22	4.6	2.83							8		
10/7/2013	pre-breaching[d]	--	90	28.3	10.55							15		
10/13/2013	pre-breaching	--	121	16.7	9.41							17		
10/14/2013	pre-breaching	--	77	12.4	6.20							17		
10/15/2013	breaching	7.40[e]	101	24.4	11.37							12		
10/16/2013	post-breaching	2.10[e]	113	71.6	7.70							18		
10/22/2013	baseline	3.19	87	76.9	2.53							15		
11/6/2013	pre-breaching	7.03	101	52.8	9.50							18		
11/7/2013	breaching	5.86[f]	155	26.7	12.15							14		

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			HASE adults			HASE neonates			HASE pups					
	Activity	**Estuary water level[a,b] (ft)**	**max**	**mean**	**s.e.**	**max**	**mean**	**s.e.**	**max**	**mean**	**s.e.**	**n**	**CASL present[c]**	**NES present**
11/8/2013	post-breaching	1.46	280	209.5	12.30							17		
11/12/2013	topo survey	1.75	186	114.7	15.07							11		
11/18/2013	baseline	2.29	57	33.6	2.38							18		
12/4/2013	pre-breaching	7.06	106	76.5	8.13							17		
12/5/2013	breaching	7.40	79	32.3	6.05							18		
12/6/2013	baseline/post-breaching	1.23	189	142.3	6.41							18		
12/12/2013	topo-survey	--	160	74.8	18.64							13		
12/17/2013	baseline	--	66	43.6	3.24							17	Y	

[a] *For breaching events Estuary water level from time of breaching*

[b] *For all other events Estuary water level is average height for the day*

[c] *Only counts for sea lions on land, does not include sea lions observed in the water*

[d] *No water level management occurred during closure, barrier beach breached naturally*

[e] *Remote link to Jenner river gauge not working, data was recorded from gauge at beginning of pinniped monitoring*

[f] *Some data is missing for the day, including at time of breach, data reported is average of gauge height available for the day*

-- missing data

Appendix B. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Monitoring Protocols for Jenner. (online at www.stewardsofthecoastandredwoods.org)

Appendix C. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Russian River Pinniped Surveys: 2009-2012. (online at www.stewardsofthecoastandredwoods.org)

Appendix D. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Marine Mammal Protection Act. (online at www.stewardsofthecoastandredwoods.org)

Appendix E. Power Point presentation for Stewards of the Coast and Redwoods Pinniped Monitors, February 14, 2013: Identification of pinnipeds of California. (online at www.stewardsofthecoastandredwoods.org)