

Elkhorn Slough Tidal Marsh Restoration Project
Phase III
Post Construction Marine Mammal Monitoring Report
10/2023

Contents

List of Tables	2
List of Figures	2
List of acronyms and abbreviations	2
Executive summary.....	2
Introduction.....	3
Methods.....	4
Monitoring protocol	4
Daily Protocol	9
Methods Review	10
Results.....	10
a. Environmental conditions	10
b. Summarized behaviors of Harbor Seals.....	11
c. Mitigation measures implemented.....	13
d. Observation results.....	13
Discussion	19
Recommendations.....	19
References.....	19

List of Tables

Table 1. Abundance of harbor seals by construction activity	Error! Bookmark not defined.
Table 2. Otter change in behaviors due to various stimuli.	147
Table 3. Abundance of otters by construction activity..	178

List of Figures

Figure 1. Regional setting	4
Figure 2. Observation posts	9
Figure 3. Seal counts, before construction starts, throughout the day, after construction ends....	12
Figure 4. Average seal abundance throughout the day, during time of construction.	122
Figure 5. Maximum daily Harbor seal observations by month.	133
Figure 6. Otter counts, before construction starts, throughout the day, after construction ends	166
Figure 7. Average otter abundance throughout the day during construction time.....	167
Figure 8. Maximum daily otter counts by month	177

List of acronyms and abbreviations

ESF – Elkhorn Slough Foundation

ESNERR – Elkhorn Slough National Estuarine Research Reserve

IHA - Incidental Harassment Agreement

Executive summary

The Elkhorn Slough Tidal Marsh Restoration was a large-scale estuarine restoration project undertaken in Elkhorn Slough, Monterey County, central California. The project was a 147-acre (60 ha) restoration of an integrated coastal landscape, ranging from tidal creeks to salt marsh to adjacent grassland. Phase I was implemented in 2018 and included 61 acres (24 ha) of tidal marsh and 5 acres (2 ha) of coastal grassland. Phase II was completed in the fall of 2021 and includes an additional 29 acres (12 ha) of tidal marsh and 5 acres (2 ha) of coastal grassland. Phase III was initiated in February 2023. Phase III includes a final 29 acres (12 ha) of tidal marsh and 3 acres (1.2 ha) of coastal grassland. This report covers the marine mammal monitoring activities associated with the initial Incidental Harassment (IHA) permit September 16, 2022, through September 15, 2023. No Level A takes were observed and no Level B takes were observed for harbor seals.

Introduction

Phase III of the Elkhorn Slough Tidal Marsh Restoration project will restore a final 29 acres of subsided marsh and tidal channels within a larger project restoring a total of 147 acres of integrated coastal landscape, ranging from tidal creeks to salt marsh to adjacent grassland. (Figure 1).

CDFW was granted an Incidental Harassment Agreement (IHA) on September 16, 2022, for the project by the National Oceanic and Atmospheric Administration (NOAA). The IHA was valid until September 15, 2023. NOAA granted Level B harassment of 1920 harbor seals. The take for this project was based upon stock assessments completed by Elkhorn Slough National Estuarine Research Reserve. Work at the Seal Bend Restoration Area began in February 2023 but stopped after 3 days due to weather. It restarted in June 2023. Between February 2023 and September 15, 2023 (an approximate 9-month period, during which construction occurred for 6 months), the construction contractor worked a total of 55 days and approximately 550 hours. Marine mammal monitoring was required on 30 days and implemented on 55 of the 55 construction days. Additional monitoring days were added for training and when in water work was conducted. See the monitoring protocol (methods section) for details on monitoring locations.

Goals

1. Ensure that marine mammals are not subject to injury under the Marine Mammal Protection Act and the Federal Endangered Species Act.
2. Collect field data about the movement and activity of marine mammals during construction monitoring, which will inform NMFS and USFWS on marine mammal sensitivity to disturbance and provide reference for future construction projects.

Objectives

1. Ensure that construction activity is halted when there is a reasonable possibility that marine mammals will enter the exclusion zone in order to avoid any potential for physical injury.
2. Ensure that presence, distribution, movement and behavior of harbor seals and sea otters within the project area and surrounding vicinity is recorded when there is a reasonable possibility that marine mammals will experience behavioral harassment.

The above objectives were met through following the marine mammal monitoring protocols developed in conjunction with NMFS and USFW. Other project goals and objectives related to the restoration and the details on how they were met can be found in the annual monitoring report (Fountain et al 2024).



Figure 1. Regional setting

Methods

Monitoring protocol

The following outlines the methods used to monitor marine mammals during the project.

Observation locations (Figure 2)

Monitoring during construction occurred from the best vantage point, at a safe distance from moving equipment. It was accessed by foot and provided a vantage point of the entire construction area and main channel of Elkhorn slough. This

includes the entire area within which harbor seals might be expected to experience disturbance due to construction activities.

Monitoring protocol

A Service- and NMFS- approved biological monitor will monitor for marine mammal disturbance. Monitoring will occur:

4.b (iii) When construction activities occur either, (1) in water or (2); within the boundaries of the two tidal restoration areas, Minhoto-Hester and Seal Bend identified in Figure 1, monitoring must occur every other day when work is occurring.

4.b.(iv) When construction activities occur near the "borrow" areas where marsh fill material is gathered, monitoring must occur every fifth day when work is occurring, unless the borrow area is more than 300 m from any area where marine mammals have been observed. Occurrence of marine mammals within the Level B harassment zone must be communicated to the construction lead to prepare for the potential shutdown when required.

The biological monitor had the authority to stop project activities if marine mammals approach or enter the exclusion zone. Biological monitoring began 0.5-hour before work began and continued until 0.5-hour after work was completed each day. Work will not commence if marine mammals are present in the exclusion zone.

Pre and post construction daily censuses - A census of marine mammals in the project area and the area surrounding the project will be conducted 30 minutes prior to the beginning of construction on monitoring days, and again 30 minutes after the completion of construction activities. Data were recorded on iPads.

Hourly counts - Conduct hourly counts of animals hauled out and in the water.

- Data collected will include:
 - Meta data including: date/time, monitor, monitoring location, visibility, construction activity
 - Numbers of each species spotted
 - Number of mom/pup pairs and neonates observed

- Zone (distance from equipment to mammal)
 - Status (in water or hauled out)
- Notes may include any of the following information to the extent it is feasible to record:
 - Age-class
 - Sex
 - Unusual activity or signs of stress
 - Any other information worth noting
 - Notable behaviors, including foraging, grooming, resting, aggression, mating activity, and others
 - Tag color and tag location (and tag number if possible)—for sea otters, note right or left flipper and location between digits (digits 1 and 2 are inside; digits 4 and 5 are outside)

Construction related reactions- Record reaction observed in relation to construction activities including:

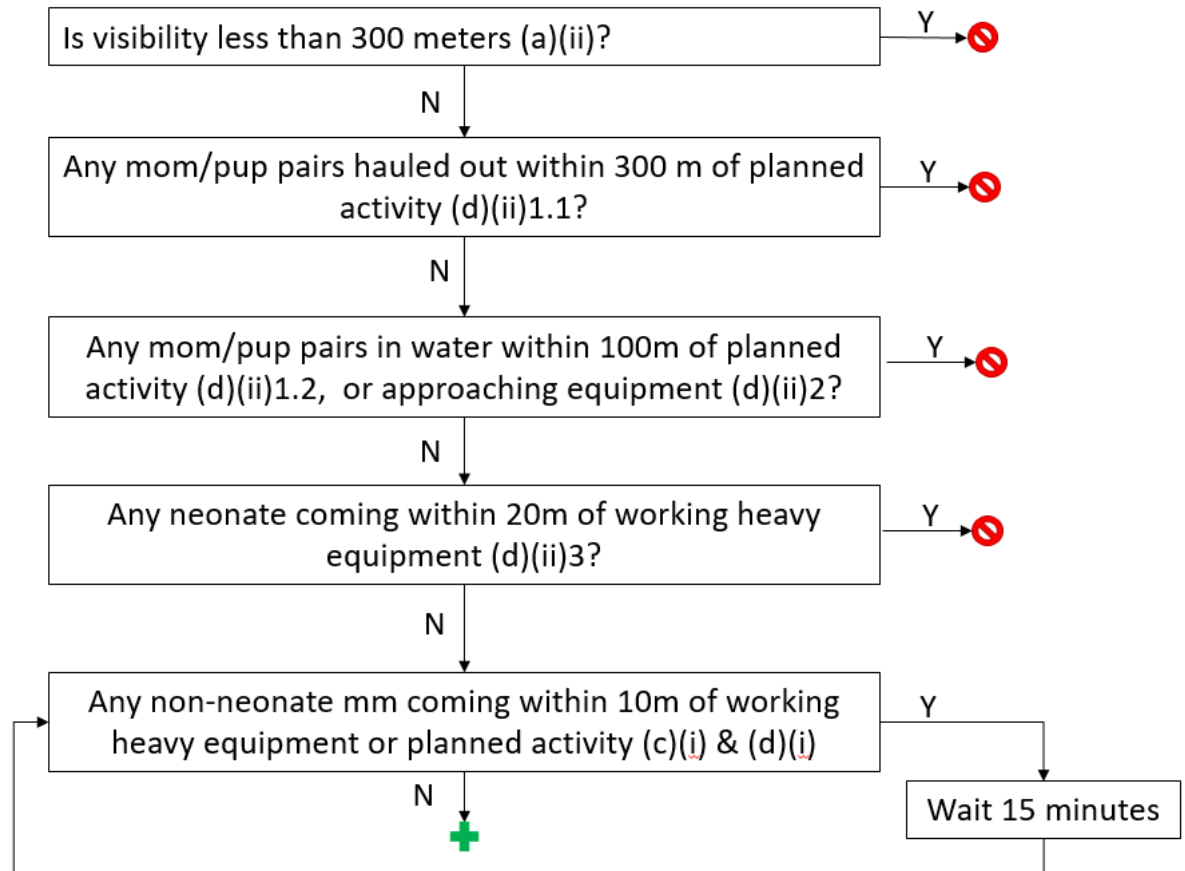
- Date/Time of reaction
- Concurrent construction activity
- Reaction code (see below)
- Distance from the noted disturbance.
- Activity before and after disturbance
- Status (in water or hauled out) before and after disturbance



Code reactions:

Level	Type of response	Definition
1	Alert	Seal head orientation or brief movement in response to disturbance, which may include turning head towards the disturbance, craning head and neck while holding the body rigid in a u-shaped position, changing from a lying to a sitting position, or brief movement of less than twice the animal's body length.
2 *	Movement	Movements in response to the source of disturbance, ranging from short withdrawals at least twice the animal's body length to longer retreats over the beach, or if already moving a change of direction of greater than 90 degrees.
3 *	Flush	All retreats (flushes) to the water.

* Only Levels 2 and 3 are considered take, whereas Level 1 is not.

Construction shutdown decision tree



-  = Construction may start or continue
 = Construction shutdown or may NOT start

Steps for shutting down and resuming construction

1. Alert construction foreman of animal via text or phone call
2. Record the construction activity and the time of shutdown
3. Record the reaction and location of the animal
4. Give clearance for construction activities to resume with a text or phone call
5. Record the time construction resumes



Figure 2. Observation posts

Note: Some areas within the marshes cannot be seen at low tides which necessitated observers moving throughout the project area.

Daily Protocol

AM shift

1. Arrive at observer location about 15 minutes before on-site shift starts
2. Note the time and conduct the pre count
3. Get your scope or binoculars ready for the first hourly observation

For the hourly observations:

4. Every hour, record number of seals and otters, hauled out and in-water, in the distance categories specified in HanDBase on the iPad.

For incidents/disturbances:

5. From your hourly count, you will know which animals are were. When construction begins in the morning, or resumes after lunch, or after a break, watch the

animals to see if they are disturbed by the change in construction equipment activity (disturbance = head lift, flush, etc. see Key for definitions)

6. If the afternoon person does not show up, check Slack and contact the person or call Monique xxx-xxx-xxxx or Rikke xxx-xxx-xxxx

PM shift

1. Arrive at field site about 10-15 minutes before shift starts
2. Be ready to collect marine mammal data according to protocol at shift start time
3. Follow marine mammal protocol for monitoring
4. Conduct your post count 0.5 hrs. after construction ended
5. Synchronize HanDBase TWO databases (Hourly and Disturbance) with Drop Box [iPad sync instructions]

Methods Review

There were no aspects of the monitoring protocol that were not completed. Monitors were responsible for disturbances in 1 instance for harbor seals and 3 instances for otters) while checking areas during low tides, pre-construction, triangulating distance from marine mammals to construction equipment and shifting the observers from looking at distance rather than zone. We had monitors in the highest and best location for visibility but they were not always exactly where the equipment was making it difficult to triangulate distance. This was mitigated with a map and a calibrated set of rings printed on a transparent material which allow for quick and accurate triangulation.

Results

a. Environmental conditions

Cloud cover ranged from zero to 100% throughout the project. Fog occasionally occurred in the early mornings when the least number of seals were present. 91% of the time visibility was over 300m from the observation posts. When visibility declined due to fog, monitors moved to a better location where they could see the equipment and mammals for observation. This likely reduced hourly counts but ensured disturbance events were recorded. There were several rain events that shut construction down for days or weeks depending on how long it took for the soil to dry enough to be manipulated.

b. Summarized behaviors of Harbor Seals

Hourly counts

Harbor seal counts during the daytime (7AM - 6PM) ranged from 0 to 213 individuals within 300 m of construction activity in the project area and from 0 to 376 individuals in the entire observation area (1000 m) for the full day. Harbor seal individuals during the hourly counts ranged from 0 to 38 individuals per hour within 300m of the construction activity and from 0 to 48 per hour in the entire observation area. The average number of seals per hourly count, within 300 m of construction activity in the project area was 1 seal/hr. and 11 seals/hr. for the entire observation area. Pre- and post- construction counts had lower average and maximum numbers of seals, than regular hourly counts (Figure 3). No tagged individuals were observed.

The number of individuals observed within 300 m of construction activity varied throughout the day. An average count of seals per hour shows seals moving into the area throughout the morning and peaking around 10am. The highest average number of seals for the day occurs at 6pm (Figure 4).

Although this phase of the project spanned only part of the year we assessed average numbers of seals present within 300m of construction by month. The maximum average number of seals recorded was in August (Figure 5).

Highest number of seals throughout the day, during active construction

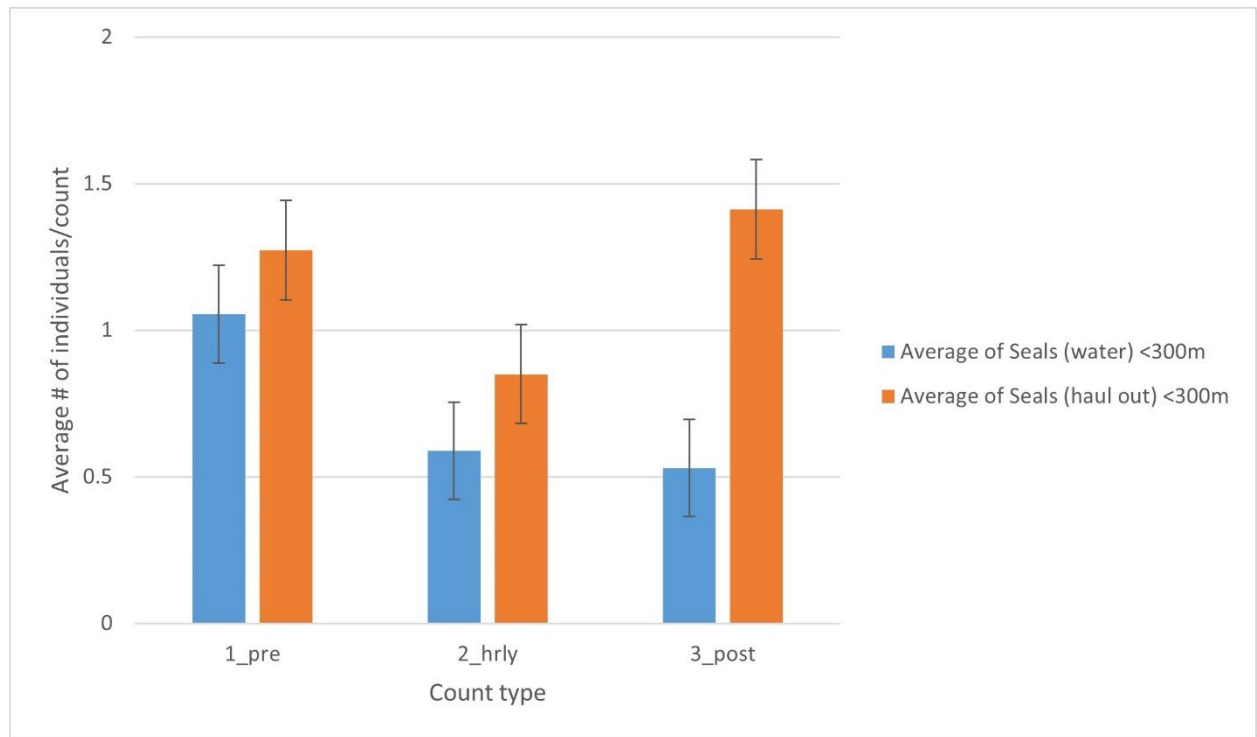


Figure 3. Seal counts, before construction starts, throughout the day, after construction ends

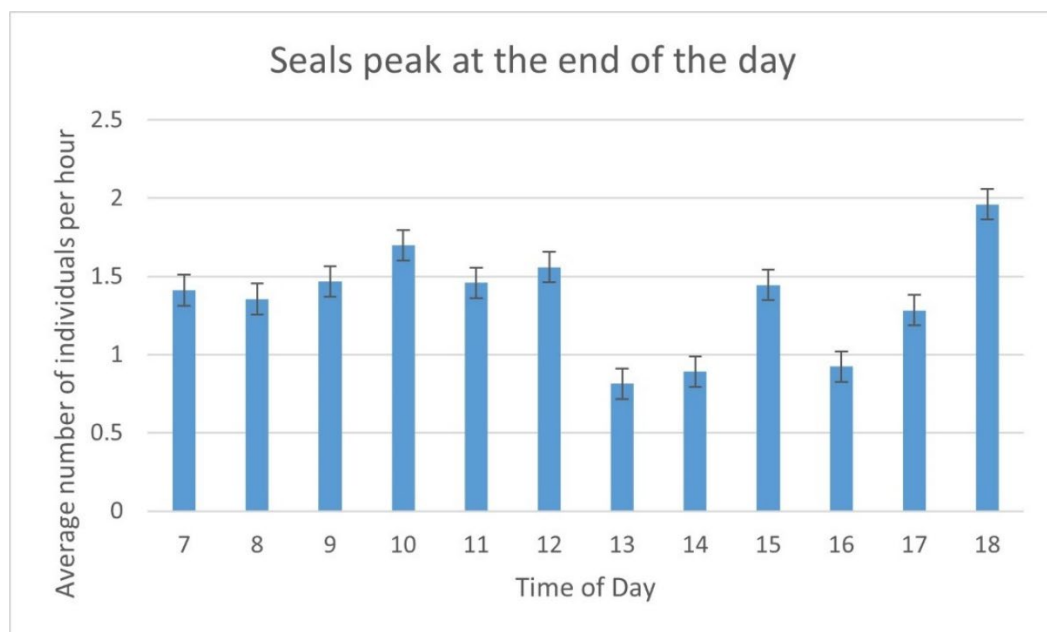


Figure 4. Average seal abundance throughout the day, during time of construction.

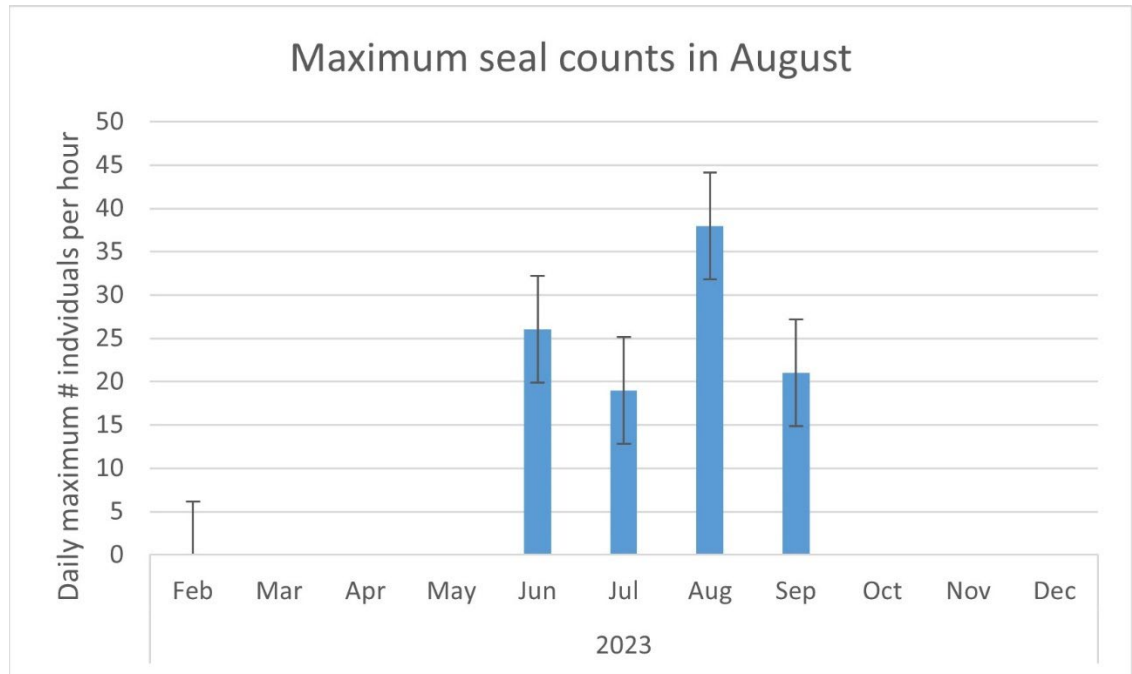


Figure 5. Maximum daily Harbor seal observations by month.

c. Mitigation measures implemented

All mitigation measures outlined in the IHA were implemented. This included:

Timing: work only during daylight hours and when shutdown area is visible

Visual monitoring: by qualified and NOAA and USFW approved monitors on the days required.

Pre-construction clearance and ramp up: as outlined in the IHA

Shutdown: All shutdown requirements were adhered to.

Construction activities: Environmental training and all construction initiation precautions were adhered to.

d. Observation results

i) *Mortalities*

There were no mortalities observed during the project.

ii) *Level A takes for authorized stocks*

(1) *Observed takes*

There were no Level A takes observed during the project.

(2) *Extrapolated takes*

With no Level A takes observed the extrapolated value is also zero.

iii) *Level B takes for authorized stocks*

(1) *Observed takes*

Zero incidents of Level B harassment of harbor seals (flushing or movement) due to construction or marine mammal observer were recorded by the monitors. Zero incidents of Responses of Level 1 (alert) were observed

We looked at the abundance of seals within 300m of construction during distinct types of activities and found that 65% of seals counted occurred during excavating and filling activities (Table 1)

We also recorded Level B harassment due to kayakers or other recreationalists. We recorded 3 incidents involving a total of 32 seals moving or flushing due to recreationalist. The biggest incident was 16 seals flushed at once by two stand-up paddle boarders.

Table 1. Abundance of harbor seals by construction activity

Construction activity	Observed seals <300m	Observed seals [%]
Excavating	0	0
Excavating and filling	35	3
Filling	649	62
Other	1	0
People only	358	34
Total	1043	100

(2) *Extrapolated takes*

With no Level B takes observed the extrapolated value is also zero.

iv) *Shutdowns*

While both the construction crew and monitors were always in constant communication and ready to shut construction down, no shutdowns occurred. During the short initial stage when the containment berm went in, heavy equipment was close enough to the water that seals might have moved into the exclusion zone at high tide. The rest of the time work was far enough away so that seals could not physically get

near enough unless they crossed a mudflat or climbed onto the berms, which they never did.

v) *Changes in behavior of other stocks*

Sea Otters, counts

Under the MMPA, Level B harassment is the potential to disturb through changes in patterns of behavior. Determining at what temporal scale a pattern is defined and when it has been disrupted is within agency discretion and USFW has directed us to report our monitoring results in terms of changes in behavior or reaction of sea otters but that this does not constitute take (Table 2).

Sea otter counts during the daytime (7AM - 6PM) ranged from 0 to 221 individuals within 300 m of construction activity in the project area and from 25 to 424 individuals in the entire observation area for the full day. Sea otter individuals during the hourly counts ranged from 0 to 44 individuals within 300 m of the construction activity and from 0 to 77 in the entire observation area.

The average number of otters per hourly count, within 300 m of construction activity in the project area was 5 otters/hr. and 23 otters/hr. for the entire observation area. Post- construction counts had the lowest average and maximum numbers of otters, relative to regular hourly counts (Figure 6) and pre-construction counts were the highest. The average number of otters were calculated within 300 m for time of day (Figure 7) and by month (Figure 8). November had the highest average of otters.

Over 568 hourly counts we observed a total of 43 otter change in behavior events (Table 2). None were caused by construction, three were most likely caused by construction monitoring and 40 events were caused by recreational-, kayak-, or boat users of Elkhorn Slough.

We looked at the abundance of otters within 300m of construction during distinct types of activities and found that 77 % of otters counted occurred during excavating and filling activities (Table 3).

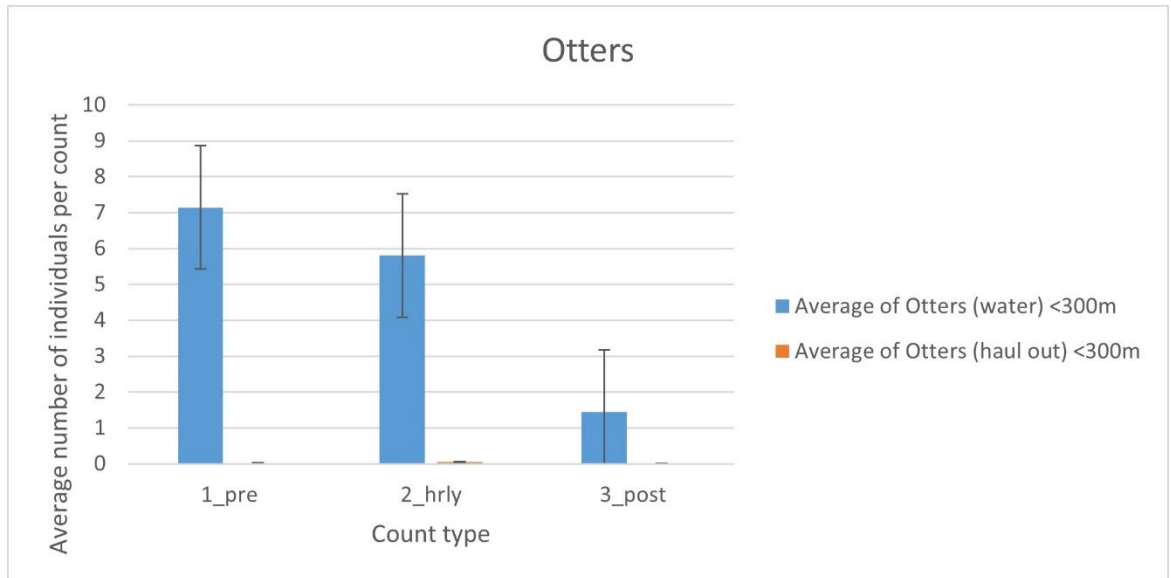


Figure 6. Otter counts, before construction starts, throughout the day, after construction ends

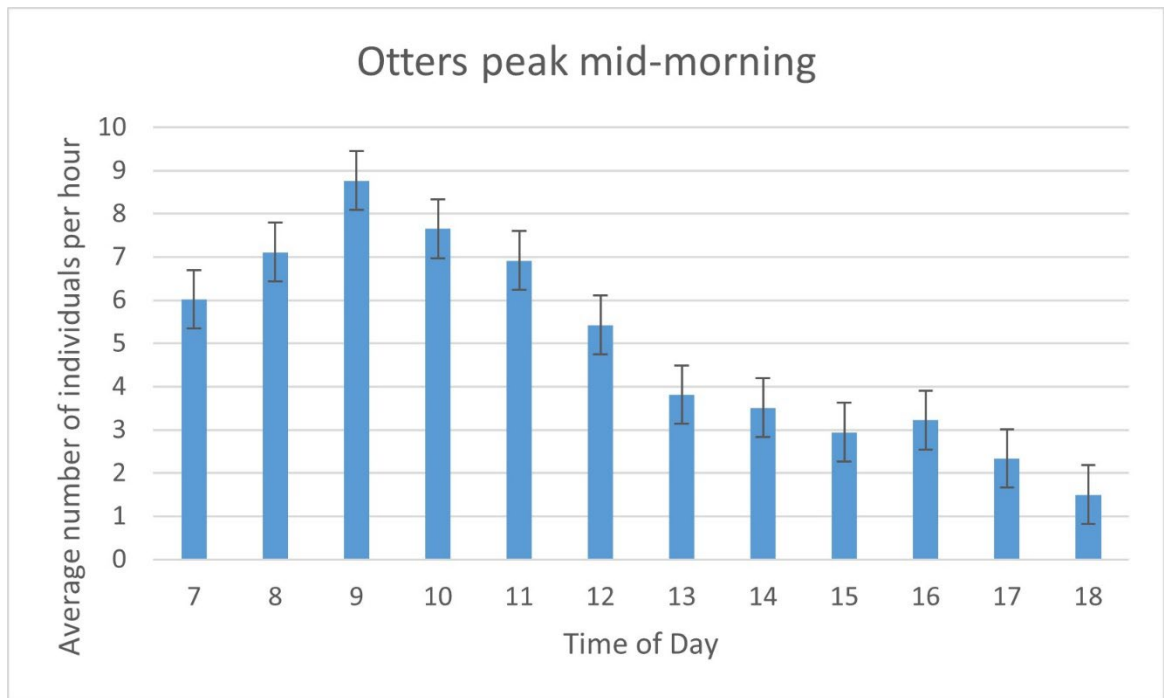


Figure 7. Average otter abundance throughout the day during construction time

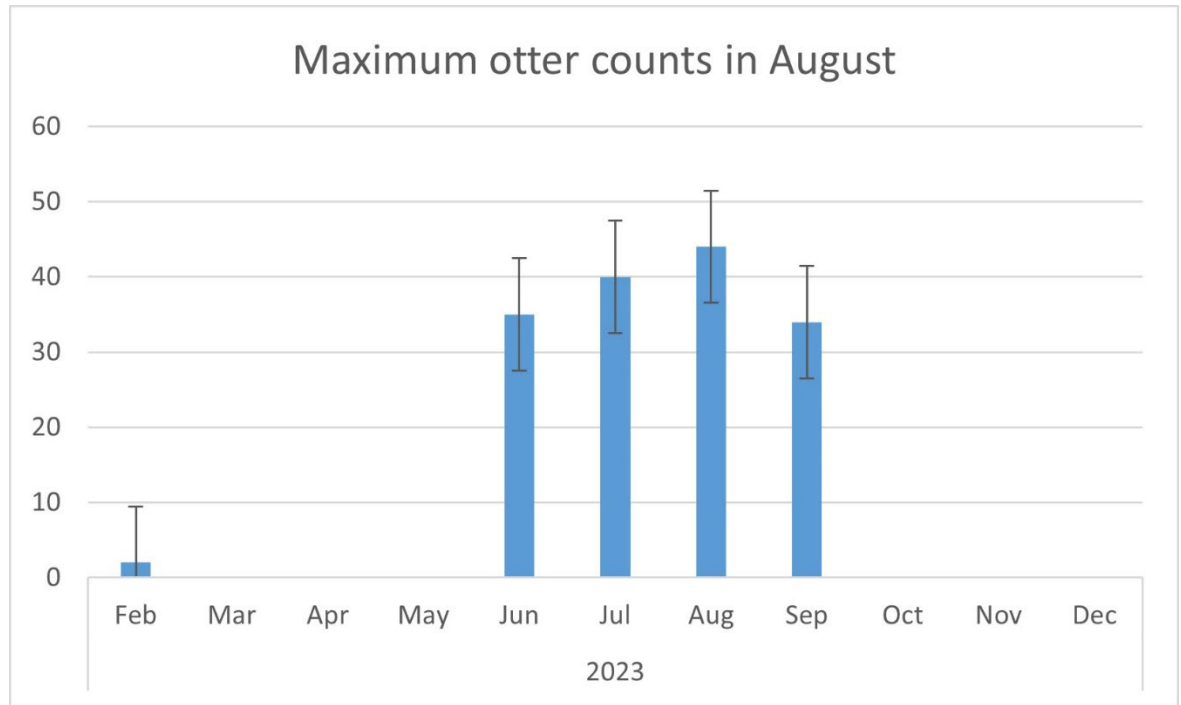


Figure 8. Maximum daily otter counts by month

Table 2. Otter change in behaviors due to various stimuli.

Incident #	Date	Reaction	Trigger	Distance (m)	Total Otters in Vicinity	Total Otters Reacted
1	7/26/2023	Movement	Observer (Visual)	60m	1	1
2	8/23/2023	Flush	Observer (Visual)	10m	1	1
3	8/23/2023	Flush	Observer (Sound + Visual)	10m	1	1
			Subtotal Observers		3	3
4	6/12/2023	Flush	kayak	10m	34	5
5	6/15/2023	Flush	kayak	1000m	14	14
6	6/19/2023	Flush	kayak	10m	6	6
7	6/19/2023	Movement	kayak	10m	22	10
8	6/19/2023	Movement	kayak	20m	12	3
9	6/20/2023	Flush	kayak	20m	11	1
10	6/21/2023	Flush	recreationalist	10m	4	3
11	6/22/2023	Movement	kayak	20m	12	12
12	7/12/2023	Flush	kayak	10m	20	20
13	7/12/2023	Movement	kayak	20m	18	5
14	7/12/2023	Flush	kayak	10m	9	4
15	7/17/2023	Flush	kayak	20m	6	6
16	7/17/2023	Flush	kayak	20m	6	6
17	7/18/2023	Flush	boat	20m	5	5

18	7/19/2023	Flush	kayak	10m	14	14
19	7/24/2023	Flush	kayak	10m	19	29
20	7/24/2023	Flush	kayak	10m	2	4
21	7/25/2023	Flush	kayak	60m	23	46
22	7/25/2023	Movement	kayak	80m	24	15
23	8/1/2023	Movement	kayak	60m	16	16
24	8/2/2023	Movement	kayak	10m	19	19
25	8/7/2023	Flush	kayak	10m	20	20
26	8/7/2023	Movement	kayak	10m	17	17
27	8/8/2023	Movement	boat	20m	17	17
28	8/8/2023	Movement	kayak	10m	15	15
29	8/9/2023	Flush	kayak	10m	8	16
30	8/10/2023	Movement	kayak	10m	15	6
31	8/10/2023	Flush	kayak	10m	9	9
32	8/16/2023	Flush	kayak	0m	3	2
33	8/16/2023	Flush	recreationalist	10m	2	2
34	8/22/2023	Movement	boat	10m	23	23
35	8/22/2023	Flush	recreationalist	20m	28	28
36	8/22/2023	Flush	kayak	10m	7	7
37	8/28/2023	Flush	kayak	10m	0	1
38	8/28/2023	Flush	boat	10m	2	2
39	8/28/2023	Flush	kayak	10m	1	1
40	8/29/2023	Flush	kayak	10m	9	9
41	9/5/2023	Flush	boat	10m	1	2
42	9/11/2023	Flush	kayak	10m	1	1
43	9/14/2023	Flush	kayak	10m	11	11
			Subtotal Other		485	432
Total					488	435

Table 2 Abundance of otters by construction activity

Construction activity	Observed otters <300m	Observed otters [%]
Excavating	0	0
Excavating and filling	223	6
Filling	2685	71
Other	35	1
People only	854	22
Total	3797	100

Discussion

Impacts of activities on pinnipeds

It appears that the impacts on pinnipeds was much less than originally estimated. Pinnipeds continued their regular activities. For example, harbor seals continued to move out into the bay to forage at night and haul out in the vicinity to rest during the day, regardless of construction activity. These findings are consistent with other marine mammal monitoring within Elkhorn Slough.

As mentioned above there were no shutdowns implemented. This is likely due to that fact the marine mammals in Elkhorn Slough appear to be habituated to noise and movement consistent with construction activities.

Recommendations

The Elkhorn Slough National Estuarine Research reserve implemented a robust and thorough monitoring program for monitoring marine mammal behavior during construction. It appears that takes estimate were extremely over estimated and it is our recommendation that future take estimates for construction projects in Elkhorn Slough be based on the data provided by these recent projects.

References

Fountain, M., Jeppesen, R., Endris, C., Woolfolk, A., Watson, E., Aiello, I., Fork, S., Haskins, J., Beheshti, K., Wasson, K. Hester Marsh Restoration. Annual Report 2024. Elkhorn Slough National Estuarine Research Reserve. Available from https://s3.us-west-1.amazonaws.com/craft-elkhorn/uploads/Hester_Report_2024.pdf