

Elkhorn Slough Tidal Marsh Restoration Project Phase II
Draft Post Construction Marine Mammal Monitoring
Report
8/2022

List of tables.....	1
List of figures.....	1
List of acronyms and abbreviations	2
Executive summary.....	2
Introduction.....	3
Methods.....	4
Monitoring protocol.....	4
Daily Protocol.....	9
Methods Review	11
Results.....	11
Discussion.....	20
Recommendations.....	21
References.....	21

List of tables

Table 1. Level B take events.....	15
Table 2. Abundance of harbor seals by construction activity.....	16
Table 3. Otter change in behaviors due to various stimuli.	19
Table 4. Abundance of otters by construction activity.	20

List of figures

Figure 1. Regional setting.....	4
Figure 2. Observation posts.	9
Figure 3. Average seal abundance around construction time.	13
Figure 4. Seal counts, before construction starts, throughout the day, after construction ends....	13
Figure 5. Maximum daily Harbor seal observations by month.	14
Figure 6. Cause and type of seal reactions by distance.....	16

Figure 7. Average seal abundance around construction time.	18
Figure 8. Otter counts, before construction starts, throughout the day, after construction ends. .	18
Figure 9. Otter counts by month.	19
Figure 10. Cause and type of otter reactions by distance.	20

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 is 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 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 Incidental Harassment (IHA) permit issued by NOAA. No Level A take was Observed and actual Level B take was well below take estimates in the IHA of 6755.

Introduction

Phase II of the Elkhorn Slough Tidal Marsh Restoration project is restoring 58 acres of subsided marsh and tidal channels, including 29.4 acres associated with the Minhoto-Hester Restoration Area and 28.6 acres associated with the Seal Bend Restoration Area (Figure 1). To date, earthwork at the Minhoto-Hester Restoration Area has been completed, including earthwork in subareas M4a, M4b and M5 and M6. Outstanding work includes the Seal Bend area.

CDFW was granted an Incidental Harassment Agreement (IHA) on June 30, 2021 for the project by the National Oceanic and Atmospheric Administration (NOAA). The IHA was valid from June 30, 2021 to May 31, 2022. NOAA grant Level B harassment of Harbor seals (2327 instances). The takes for this project were based upon stock assessments completed by Elkhorn Slough National Estuarine Research Reserve. Work at the Minhoto-Hester Restoration Area began in August 2021. Between August 2020 and May 2021 (an approximate 9-month period), the construction contractor worked a total of 126 days. Work stopped during the IHA renewal process and then commenced August 24, 2021 finishing October 20, 2021 for a total project work days of 162. Marine mammal monitoring was required on 87 days and implemented on 113 of the 162 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 objective related to the restoration and the details on how they were met can be found in the annual monitoring report (Fountain et al 2021).



Figure 1. Regional setting

Methods

Monitoring protocol

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

Observation location (Figure 2)

Monitoring during construction occurred primarily from one observation area near the barns. It is accessed by car or foot and provides a vantage point of the entire 300m observation area. This includes the entire area within which harbor seals and sea otters present might reasonably 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 will begin 0.5-hour before work begins and will continue until 0.5-hour after work is 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 was conducted 30 minutes prior to the beginning of construction on monitoring days, and again 30 minutes after the completion of construction activities. Data was 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)
- 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

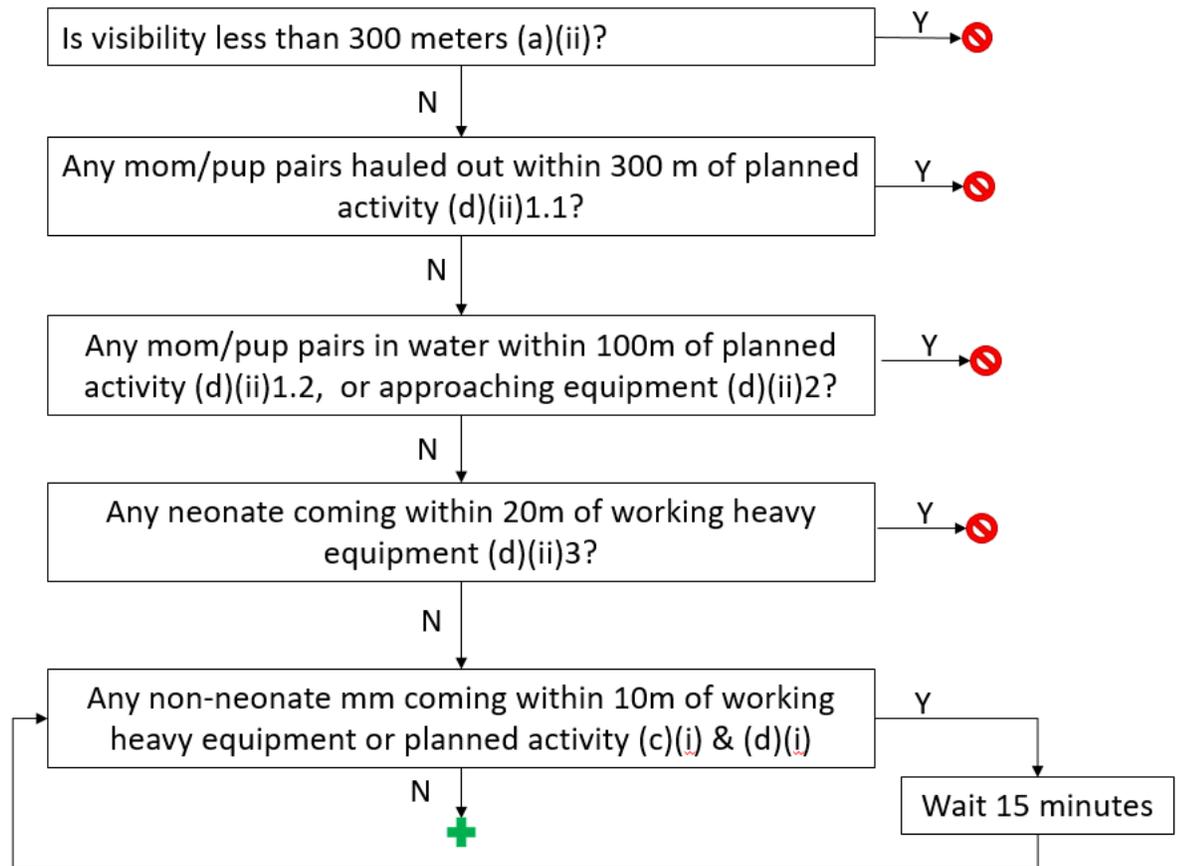
Code reactions:

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-

Level	Type of response	Definition
		<p>shaped position, changing from a lying to a sitting position, or brief movement of less than twice the animal's body length.</p>
2 *	Movement	<p>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.</p>
3 *	Flush	<p>All retreats (flushes) to the water.</p>

* 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 (use 1 blow from air horn if needed)
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
5. Record the time construction resumes

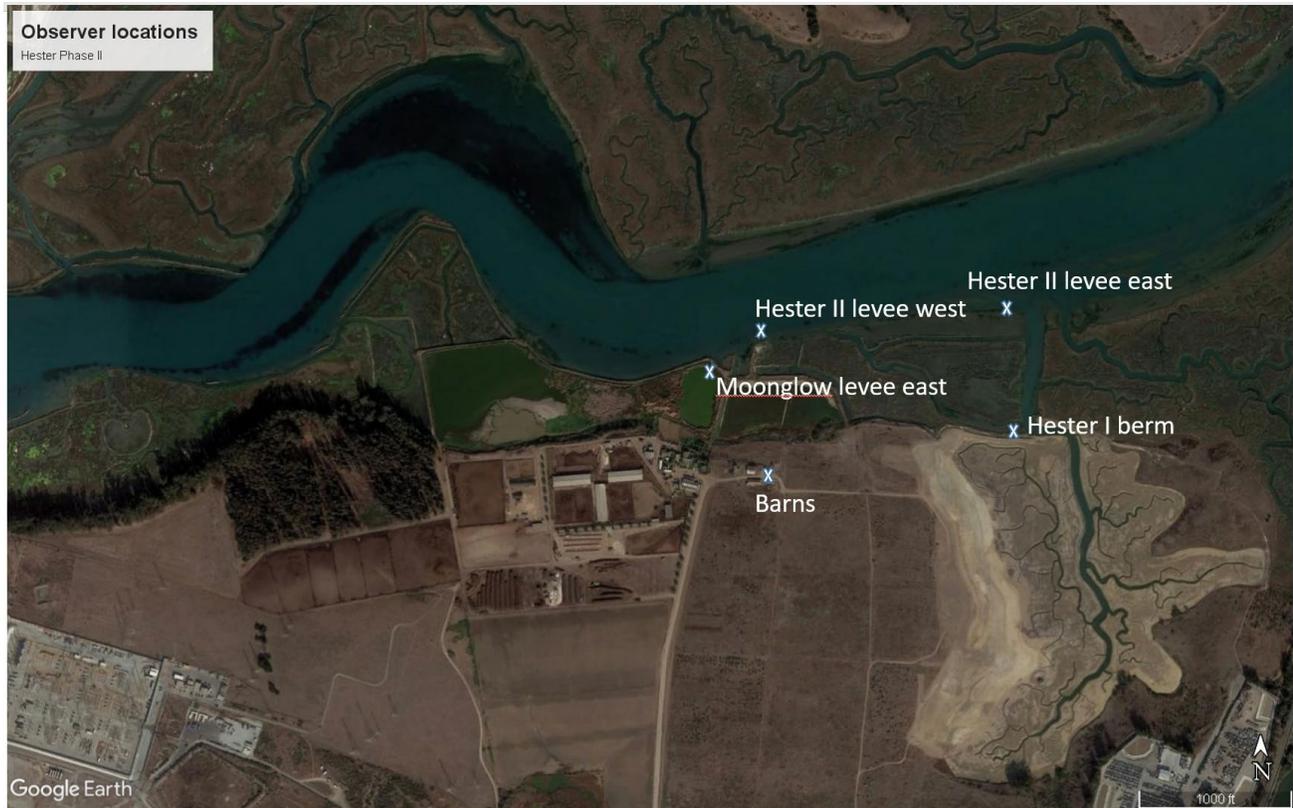


Figure 2. Observation posts.

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 ESNERR about 45 minutes before on-site shift starts
2. Pick up the iPad and check that you have the equipment you need in the field [equipment list]
3. Download the most recent HanDBase data bases from drop box [iPad sync instructions]
 - there are two different databases, the mmData.PDB for hourly counts and the incident log named disturbance.PDB
4. Go to field site

5. By the green gate, please wipe your feet on the brush to remove any seeds from your footwear
6. If the gate is locked, the combo is xxxx, this is also the combo for the porta-potty
When you get to the field site and have arrived at the green box:
7. Put on a high visibility vest
8. Put up red flag
9. Note the time and conduct the pre count
10. Text contractor xxx-xxx-xxxx that construction is OK to start (7:30am)
11. Put up the green flag
12. Get your scope or binoculars ready for the first hourly observation

For the hourly observations:

13. Count all areas from near the green box on top of the hill unless you must be elsewhere
14. Record data on iPad
15. Rinse and repeat ☺

For incidents/disturbances:

16. From your hourly count, you'll 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)
17. Leave site when PM shift arrives but first
 - Hand off iPad to next observer
 - give brief report of anything next observer should know
18. If the afternoon person doesn't show up, 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. Get iPad and equipment from AM observer
3. Be ready to collect marine mammal data according to protocol at shift start time
4. Follow marine mammal protocol for monitoring
5. Text contractor 30 mins before sunset, if equipment is still moving, and ask them to please stop construction.
6. Put up the red flag at this time
7. Conduct your post count 0.5 hrs after construction ended
8. Put the flags, tripod, scope, chair etc. in the green box
9. Take the iPad(s) with you and
10. Lock the green gate behind you
8. Go to ESNERR
9. Synchronize HanDBase TWO databases with Drop Box [iPad sync instructions]
10. Plug in iPad(s) for charging

Methods Review

Since this was essentially the third time we have followed this monitoring protocol there were no aspects that were not completed. Complications continue to include monitors being responsible for about a third of disturbances through checking areas during low tides, 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. 96% of the time visibility was over 300m from the top observation post. When visibility declined due to fog, monitors move to the location of the equipment 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 (6AM - 6PM) ranged from 0 to 118 individuals within 300 m of construction activity in the project area and from 0 to 250 individuals in the entire observation area. The average number of seals per hourly count, within 300 m of construction activity in the project area was 7 seals/hr and 20 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 tags individuals were observed.

Fewer seals were observed during the pre and post counts compared to the hourly counts during construction (Figure 3).

The number of individuals observed within 300 m of construction activity varied throughout the day. An average count of seals per hour shows the general trend that seals moved into the area throughout the morning peaking around 10-11am and then slowly moved out of the area in the evening, repeating the pattern each day (Figure 4).

Since this phase of the project spanned most months of the year we were able to look at average numbers of seals present within 300m of construction by month and see the general pattern of seals in the area. The maximum average number of seals recorded was in April (Figure 5).

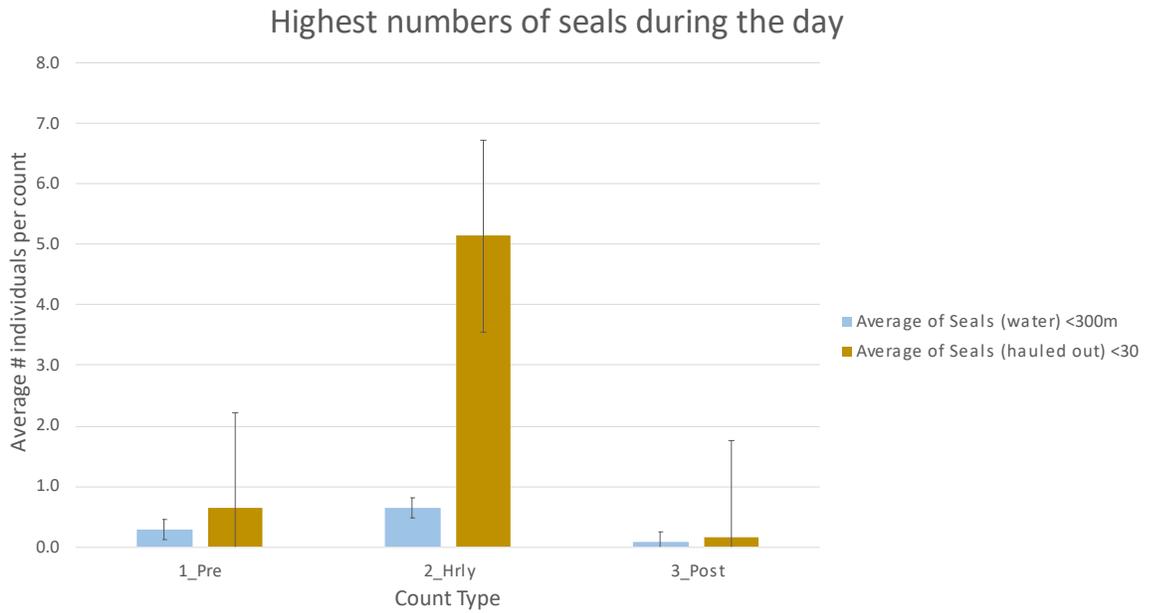


Figure 3. Average seal abundance around construction time.

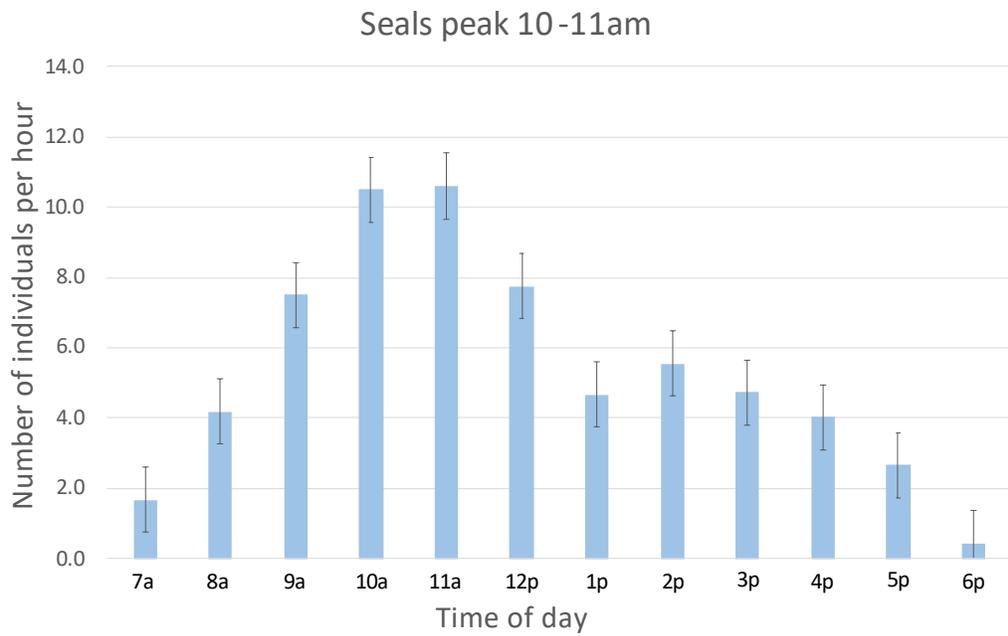


Figure 4. Seal counts, before construction starts, throughout the day, after construction ends.

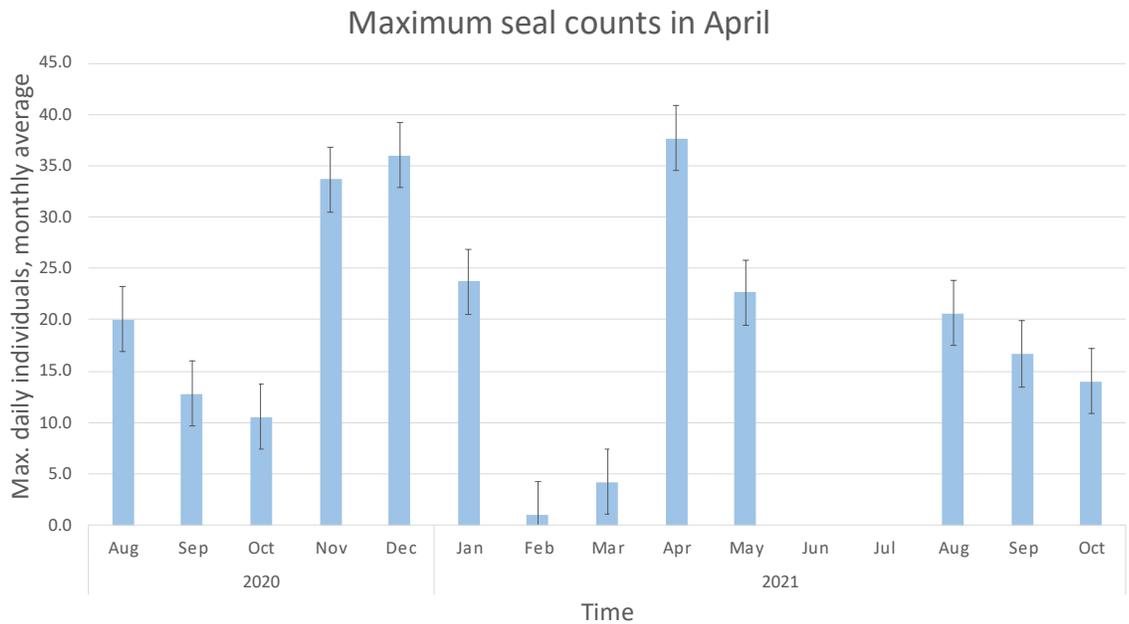


Figure 5. Maximum daily Harbor seal observations by month.

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 course of the project.

ii) *Level A takes for authorized stocks*

(1) *Observed takes*

There were no Level A takes observed during the course of 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*

Thirteen (13) incidents of Level B harassment of harbor seals (flushing or movement) were recorded by the monitors (Table 1). Of these, 7 incidents representing harassment of 15 individual seals were attributed to construction activities; the remaining 6 incidents representing harassment of 20 seals were attributed to marine mammal monitoring activities.

We looked at the abundance of seals during different types of activities and found that 84% of seals counted occurred during excavating and filling activities (Table 2).

We also looked at the cause of seal disturbance by distance and reaction (including alerts and found that recreationists and PSO (human activity) caused disturbance in closer proximity than equipment (Figure 6 & 10).

Table 1. Level B take events

Incident #	Date	Reaction	Trigger	Construction activity	Distance (m)	Total Seals in Vicinity	Total Seals Reacted	Total Seals within 300m*
1	09/21/2020	Flush	Construction (Sound and Visual)	Excavating & filling	60m	4	2	35
2	11/09/2020	Movement	Construction (Sound)	Tractors starting	300m	3	1	3
3	03/17/2021	Movement	Construction (Sound)	Equipment moving	200m	5	5	5
4	03/24/2021	Flush	Construction (Sound and Visual)	Equipment moving	60m	1	1	1
5	03/24/2021	Flush	Construction (Sound and Visual)	Equipment moving	60m	1	1	4
6	04/14/2021	Flush	Construction (Sound and Visual)	Equipment moving	80m	2	2	45
7	05/17/2021	Flush	Construction (Sound and Visual)	Equipment moving	100m	6	3	7
			subtotal Construction			22	15	100
8	09/03/2020	Flush	Observer (Visual)		20m	1	1	6
9	09/08/2020	Flush	Observer (Visual)		80m	8	8	8
10	10/19/2020	Flush	Observer (Visual)		40m	2	2	2
11	12/03/2020	Flush	Observer (Visual)		80m	1	1	1
12	12/16/2020	Flush	Observer (Visual)		60m	7	7	10
13	05/19/2021	Flush	Observer (Visual)		10m	1	1	
			subtotal Observers			20	20	27
Total						42	35	127

* Based on hourly counts to the nearest hour as seals were unlikely to move entirely out of the observation area.

Table 2. Abundance of harbor seals by construction activity

Construction Activity	Count
Excavating	140
Excavating and Filling	7101
Filling	203
Other	676
People only	309
Grand Total	8429

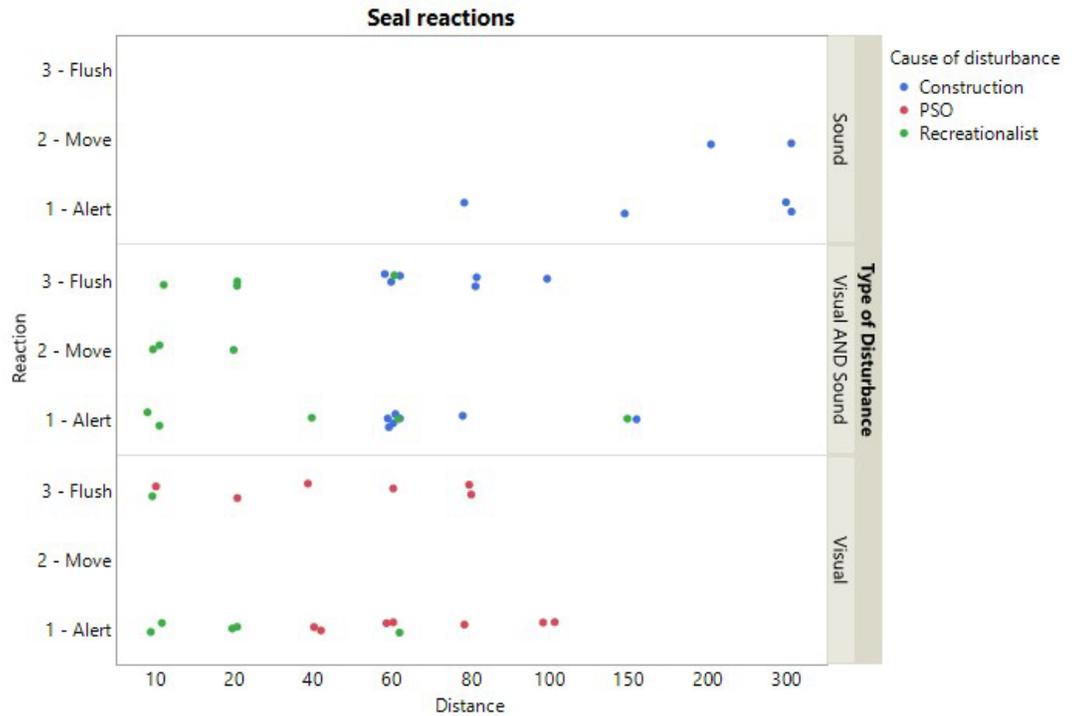


Figure 6. Cause and type of seal reactions by distance.

(2) Extrapolated takes

It is estimated that project construction has resulted in the take of 35 seals in 113 monitoring days, or less than 1 (0.31) seal per day. If an estimate of take of 0.31 seals per day is applied to the 49 construction days when monitoring did not occur (i.e., 0.31×49), an additional 15 seals may also have been subject to Level B harassment, for a total take to date of 64 seals.

iv) Shutdowns

While both the construction crew and monitors were in constant communication and ready at all times 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 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 3).

Sea otter counts during the daytime (6AM - 6PM) ranged from 0 to 36 individuals within 300 m of construction activity in the project area and from 0 to 111 individuals in the entire observation area. The average number of otters per hourly count, within 300 m of construction activity in the project area was 4 otters/hr and 14 otters/hr for the entire observation area. Pre- and post- construction counts had lower average and maximum numbers of otters, than regular hourly counts (Figure 7). The average number of otters were calculated within 300m for time of day (Figure 8) and by month (Figure 9). August had the highest average of otters.

Over about a thousand hourly counts (1186) we observed a total of 20 otter change in behavior events. 12 were most likely caused by construction or construction monitoring, 8 events were caused by recreational- or boat users of Elkhorn Slough.

We looked at the abundance of otters during different types of activities and found that 84% of disturbances occurred during excavating and filling activities (Table xx).

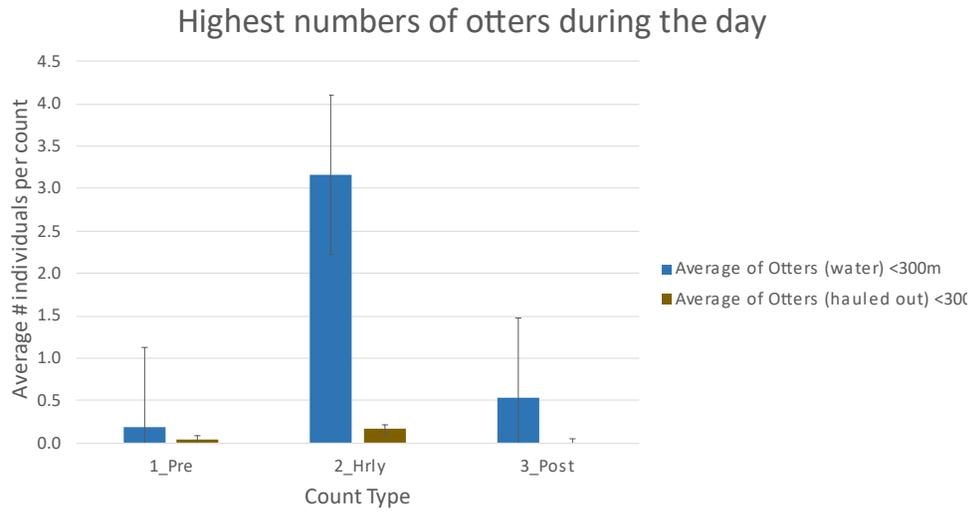


Figure 7. Average seal abundance around construction time.

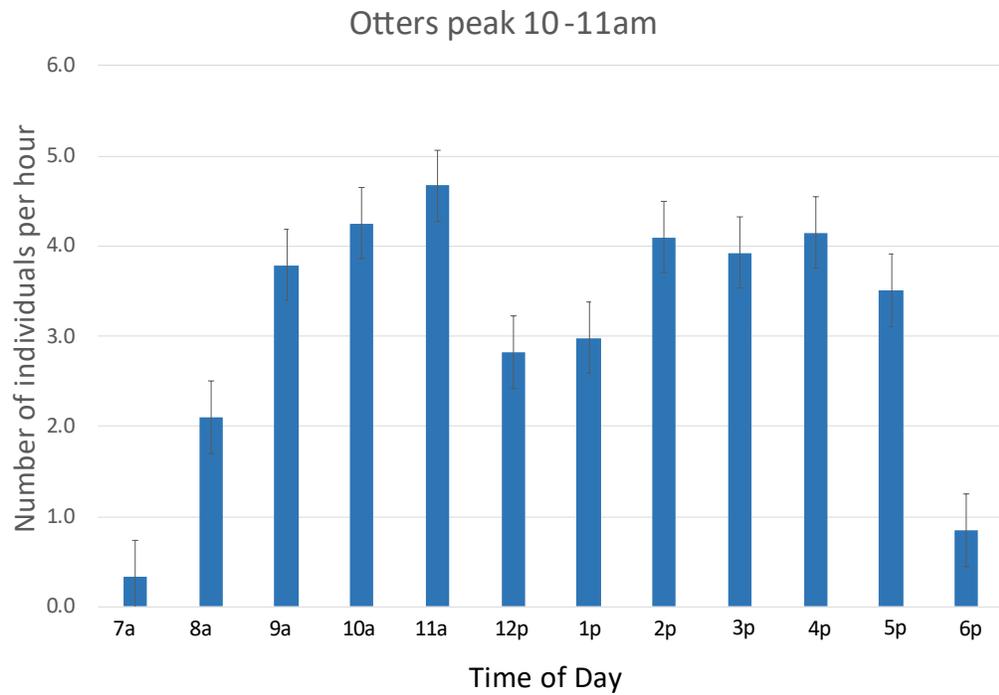


Figure 8. Otter counts, before construction starts, throughout the day, after construction ends.

Maximum otter counts in August

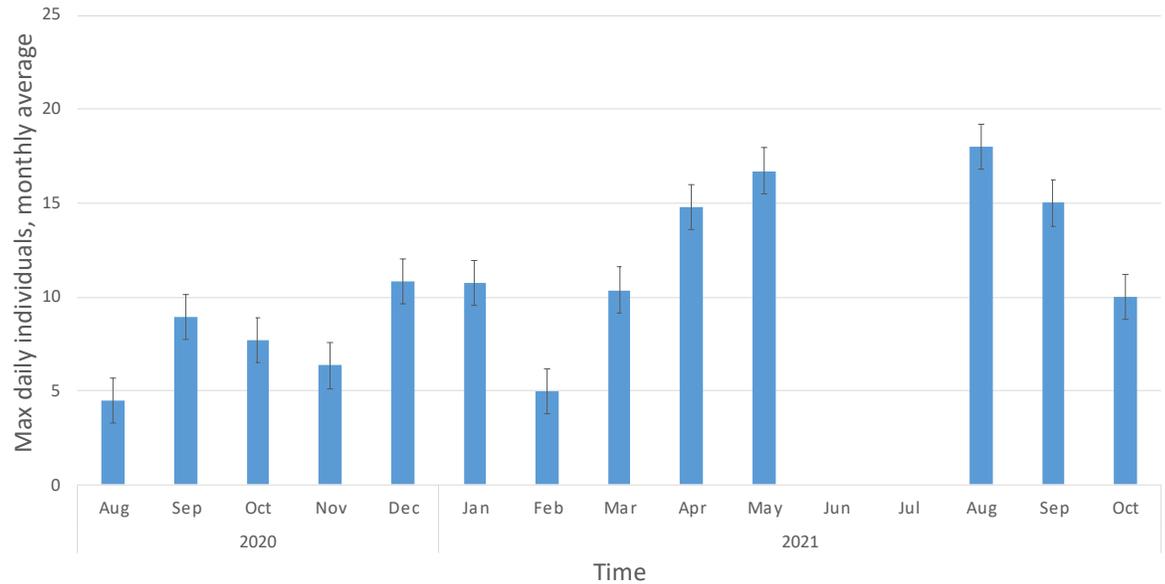


Figure 9. Otter counts by month.

Table 3. Otter change in behaviors due to various stimuli.

Incident #	Date	Reaction	Trigger	Activity	Distance (m)	Total Otters in Vicinity	Total Otters Reacted	Total Otters within 1000m
1	9/17/2020	Move	Construction (Visual)	Other	80	1	1	9
2	9/21/2020	Alert	Construction (Sound and Visual)	Excavating and filling	80	1	1	13
3	10/1/2020	Move	Construction (Visual)	Equipment moving closer	40	2	2	2
4	3/17/2021	Flush	Construction (Sound)	Tractors starting	300	1	1	4
			subtotal Construction			5	5	28
5	8/27/2020	Movement	Observer (Sound and Visual)	People only	100	1	1	4
6	8/27/2020	Flush	Observer (Sound and Visual)	People only	20	1	1	5
7	8/27/2020	Flush	Observer (Visual)	People only	20	1	1	5
8	9/22/2020	Movement	Observer (Visual)	Other	40	1	1	1
9	10/6/2020	Movement	Observer (Visual)	Excavating and filling	10	2	1	6
10	3/31/2021	Movement	Observer (Visual)	People only	80	2	2	2
11	4/13/2021	Flush	Observer (Visual)	Excavating and filling	20	1	1	1
12	5/11/2021	Movement	Observer (Visual)	People only	20	2	2	2
			subtotal Observers			11	10	26
13	9/22/2020	Movement	Visual	Tour boat	40	1	1	6
14	10/5/2020	Flush	Visual AND Sound	Kayak	20	1	1	3
15	10/21/2020	Movement	Visual AND Sound	Tour boat	10	1	1	4
16	10/22/2020	Flush	Visual AND Sound	Tour boat	10	2	2	9
17	11/23/2020	Flush	Visual	Kayak	20	2	2	3
18	5/10/2021	Flush	Visual	Kayak	1	1	1	7
19	5/20/2021	Movement	Visual AND Sound	Hydro bike	40	19	19	19
20	5/24/2021	Alert	Visual AND Sound	Paddle boarder	40	1	1	12
21	9/10/2021	Movement	Visual	Kayak	10	5	3	3
			subtotal Recreation			33	31	66
Total						49	46	120

Table 4. Abundance of otters by construction activity.

Construction Activity	Count
Excavating	77
Excavating and Filling	4230
Filling	256
Other	158
People only	118
Grand Total	4839

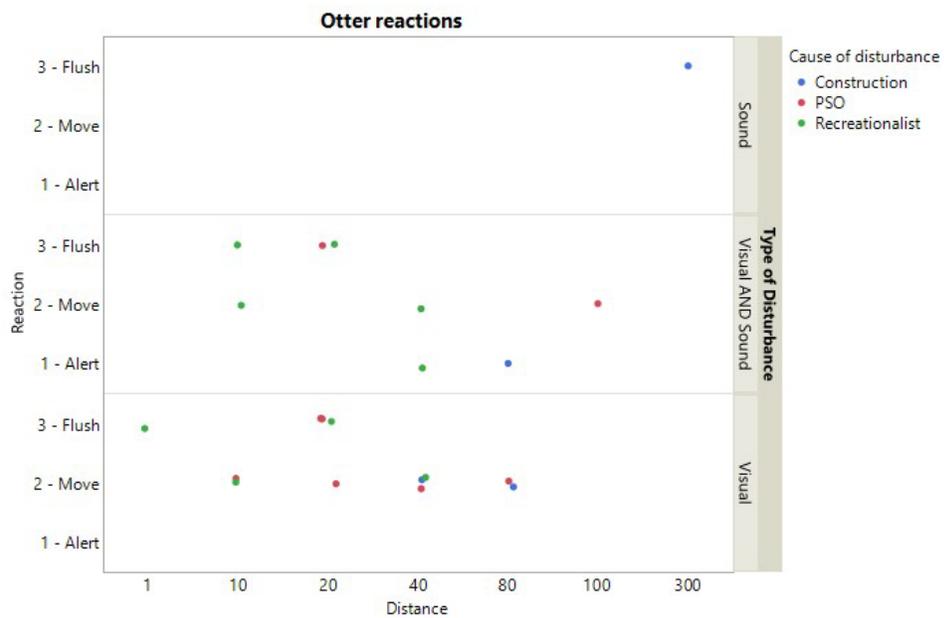


Figure 10. Cause and type of otter reactions by distance.

Discussion

Impacts of activities on pinnipeds

It appears that the impacts on pinnipeds was much less than originally estimated. They continued their regular activities. For example, harbor seal 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 take estimates 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 2021. Elkhorn Slough National Estuarine Research Reserve. Available from <https://www.elkhornslough.org/tidal-wetland-program/>.