

INTRODUCTION

This Monitoring Plan for the Southern California Range Complex (SOCAL) has been developed to provide marine mammal and sea turtle monitoring as required under the Marine Mammal Protection Act (MMPA) of 1972 and the Endangered Species Act (ESA).

In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a) (5) (a) of the MMPA states that National Marine Fisheries Service (NOAA/NMFS) must set forth “requirements pertaining to the monitoring and reporting of such taking”. The MMPA implementing regulations at 50 CFR Section 216.104 (a) (13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present (NOAA/NMFS, 2005).

While the Endangered Species Act does not have specific monitoring requirements, recent Biological Opinions issued by NOAA have included terms and conditions requiring the Navy to develop a monitoring program.

Navy-wide Monitoring:

A number of monitoring plans are currently being developed for protected marine species (primarily marine mammals and sea turtles) as part of the environmental planning and regulatory compliance process associated with a variety of training actions and range complexes. The purpose of these monitoring plans is to assess the effects of training activities on marine species. The primary focus of these monitoring plans will be on effects to individuals but data may also support investigation of potential population-level trends in marine species distribution, abundance, and habitat use in various range complexes and geographic locations where Navy training occurs.

The Chief of Naval Operations (CNO) Environmental Readiness Division and the Office of Naval Research have developed a coordinated Science & Technology and Research & Development program focused on marine mammals and sound (Figure 1). Total investment in this program for FY07-FY09 is \$18 million, and continued funding is foreseen in subsequent years. The program:

- Comprises four interrelated areas: determining marine mammal demographics; establishing accepted criteria and thresholds to measure the effects of naval activities; developing effective protective methods to lessen those effects; and further understanding the effects of man-made sound fields on marine life.
- Provides better biological data and tools to enable the Fleet to train prior to deployments at a minimal risk to marine mammals.
- Seeks to make monitoring and mitigation as compatible as possible with Fleet sensors, data displays and personnel training.

The SOCAL monitoring plan will integrate elements of this broader Navy marine mammal research into the exercise and regional monitoring and data analysis proposed in this plan as these new technologies and techniques become available.

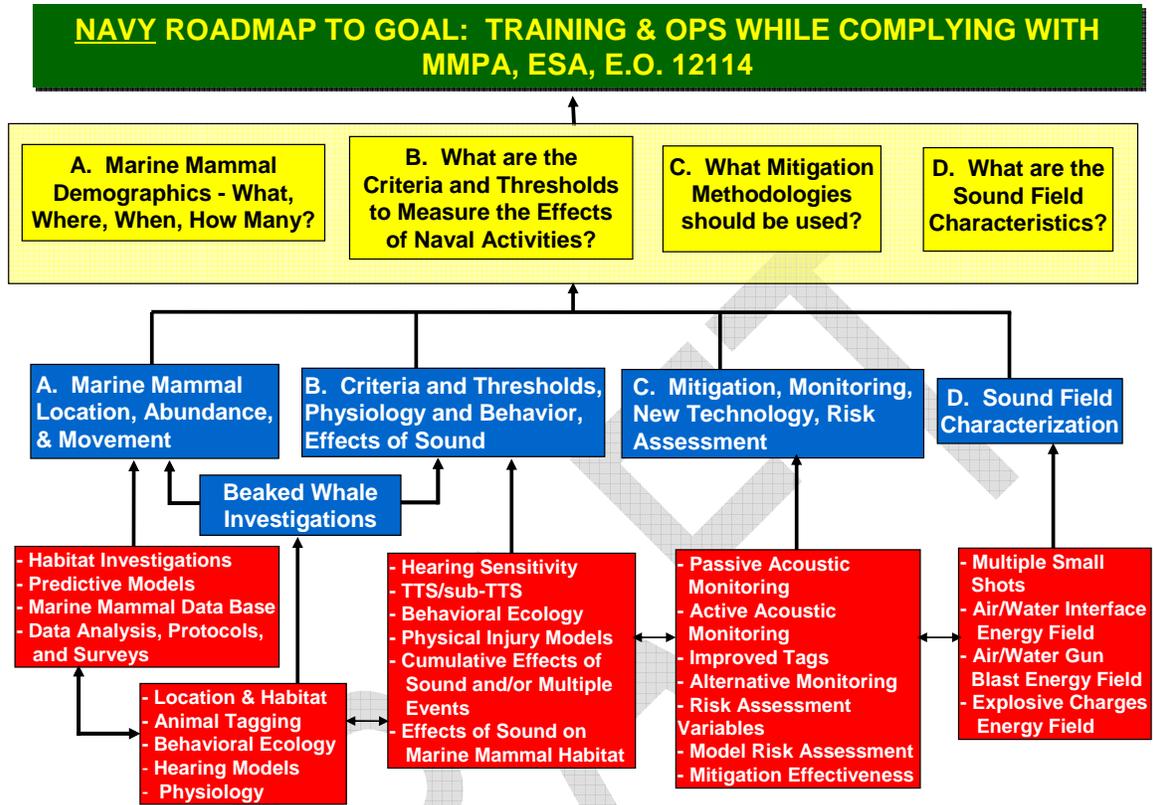


Figure 1. CNO and ONR funded marine mammal science thrust areas whose results could be incorporated into SOCAL marine mammal monitoring program.

Leveraging of Academic, National Marine Fisheries (NMFS), and Navy funded Regional Monitoring

Where possible, collaboration will be sought with SOCAL academic researchers, scientists at Southwest Fisheries Science Center (SWFSC NMFS), and Navy funded regional science efforts to contribute additional broad area information on marine mammal distributions within SOCAL. While not being proposed for funding under this particular Navy monitoring plan, basic biological information from these other sources can contribute to the understanding of regional marine mammal populations. For instance, cetacean survey data from the California Cooperative Oceanic Fisheries Investigation (CalCOFI) cruises conducted in southern California has been funded by the Navy R&D program. These cruises have been conducted consistently on the same transect lines over the past 60 years and provide one of the longest and most extensive time series of physical and biological oceanographic data in the world. Approximately four years ago, Scripps Institution of Oceanography was awarded a contract to add visual and acoustic surveys of cetaceans to the CalCOFI cruises. Four seasonal cruises were conducted annually. A towed hydrophone is used to detect vocalizing cetaceans. Sonobuoys were deployed and acoustic signals recorded when the ship was stopped for oceanographic observations. The goals of the cetacean surveys are to determine the temporal and spatial patterns of cetacean distribution, to compare

visual and acoustic survey methods and results, to quantify differences in vocalizations between cetacean species, and to make seasonal estimates of cetacean density and abundance within the study area. The surveys have been successful in achieving broad coverage (Figure 2). The greatest strength of this survey is its broad seasonal and geographic coverage within southern California. Sample sizes (numbers of sightings) are comparable or greater than the total number of SWFSC sightings from the same area. The weakness of the CalCOFI surveys are that, due to time constraints, the vessel cannot alter course during the survey to estimate group sizes or determine species identifications. A comparison of visual and acoustic detections has shown that most groups are detected by both methods. Very few groups are detected only by visual methods. CalCOFI cetacean surveys are planned to continue for at least the next two years. To date, no estimates of cetacean density or abundance have been made from the CalCOFI surveys, but both are planned in the future. Plans also exist to model cetacean density as a function of habitat models using these survey data.

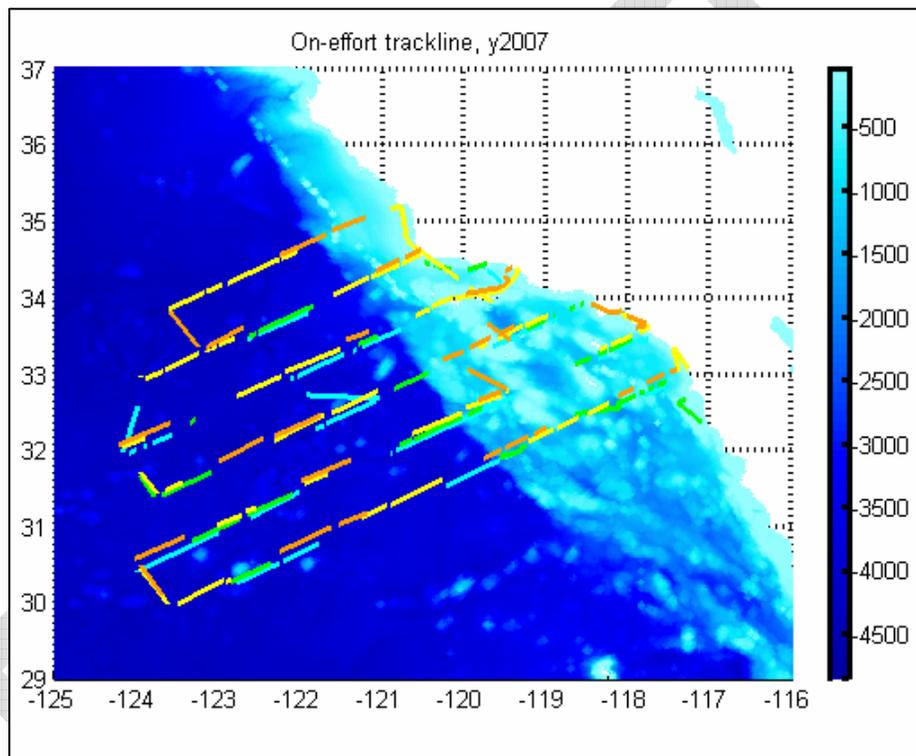


Figure 2. CalCOFI cetacean survey transects completed in 2007. Different colors represent cruises in 4 different season. Shading indicates water depth (from SIO, John Hildebrand).

SOCAL Monitoring Plan:

The SOCAL Monitoring Plan is one component of the overall Navy monitoring effort. The SOCAL Monitoring Plan has been designed as a collection of focused “studies” to gather data that will allow us to attempt to address the following questions which are described fully in the following sections:

1. Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS’ criteria for behavioral harassment, TTS, or PTS)? If so, at what levels are they exposed?
2. If marine mammals and sea turtles are exposed to MFAS in SOCAL, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?
3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?
4. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?
5. Is the Navy’s suite of mitigation measures for MFAS and explosives (e.g., PMAP, major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Marine Species within the SOCAL study area:

There are 41 marine mammal species or separate stocks with possible or confirmed occurrence in the marine waters off Southern California and within the SOCAL Range Complex. There are 34 cetacean species (whales, dolphins, and porpoises), six pinnipeds (sea lions, fur seals and true seals) and one sea otter species. Barlow and Forney (2007) contain the latest cetacean density estimates for multiple species within California.

This monitoring plan has been designed to attempt to gather data on all species of marine mammals and sea turtles that are observed in the SOCAL study area. The Plan recognizes that deep diving and cryptic species of marine mammals such as beaked whales, sperm whales and minke whales, have low probability of visual detection (Barlow and Gisiner, 2006). Therefore, methods will be utilized to attempt to address this issue (e.g., passive acoustic monitoring).

Beaked whales will be given particular attention during monitoring in the SOCAL study area in the form of focal follows when observed and passive acoustic monitoring when possible; although monitoring methods will be the same for all species.

Contracted third party data collection will be collected by qualified, professional marine mammal and sea turtle biologists that are experts in their field. Researchers will provide annual reports to the Navy, however, this is expected to be an ongoing process with data collected, analyzed and interpreted over many years. It is not likely that firm conclusions can be drawn on most questions within a single year of monitoring effort due to the difficulty in achieving sufficient sample sizes for statistical analysis. The Navy will provide annual reports to NMFS HQ in fulfillment of the MMPA Letter of Authorization (LOA) requirements. The report will provide information on the amount and spatial/temporal distribution of monitoring effort as well as summaries of data collected and any preliminary results that may be available from analysis.

MONITORING PLAN

The monitoring methods proposed for use during training events in the SOCAL include a combination of individual elements designed to allow a comprehensive assessment to be conducted. These elements include:

- Contracted vessel and aerial surveys
- Passive acoustic monitoring
- Marine mammal observers on Navy ships
- Marine mammal tagging

Periodicity And Compliance

Based upon the Sonar Positional Reporting System (SPORTS) and knowledge of training events in the SOCAL study area, Navy operators determined that three types of training events are appropriate for exercise monitoring within SOCAL. These include Integrated ASW Course (IAC), portions of COMPTUEX or JTFEX when appropriate, and unit level training (ULT). ULT offers the best opportunity for multiple study collaboration without significant impacts to larger scale events, as well as easier schedule adjustments. The goal of this monitoring plan is to select from the best representative exercise in which to schedule the most appropriate monitoring, with the understanding that major exercise undergo significant schedule changes base on real-world commitments which may or may not therefore limit the availability of monitoring within these major exercises.

While the monitoring described in this plan represent the best estimate of availability, there may be instances within any given year where exercise schedules shift, survey crew availability becomes limited, or extreme weather precludes effective sampling. In case of monitoring delay based on these conditions, monitoring effort will be re-scheduled at the next available opportunity. In the event that a particular target exercise is not available within the remainder of a particular year, monitoring may have to be made up in a following year.

The proposed hour goal for conducting SOCAL monitoring is shown in Table 1. The hours shown are actual study hours when active sonar is being used (e.g., aerial survey in conjunction with training event if possible), with darkness and non-ASW hours removed.

Visual Surveys

Due to the number and spatial extent of vessels and aircraft involved, major exercises such as Composite Training Unit Exercises (COMPTUEXs) and Joint Task Force Exercises (JTFEXs) are not always the most appropriate option for the simultaneous use of commercial aircraft or vessels for marine mammal monitoring. However, the requirements to conduct this study are: 1) one or more surface combatants conducting ASW during a regularly scheduled training event; 2) the ability to conduct aerial or shipboard surveys close to the Navy vessel (for Study 1); and 3) training events that occur close enough to shore that re-fueling does not become an issue with the aerial survey team. The Navy has identified three types of training events that will meet the requirements of the following studies and also provide the highest likelihood of success.

Passive Acoustic Monitoring

Passive acoustic monitoring from the existing Navy fixed underwater range at SOAR and deployable acoustic recording devices will also be employed. Passive acoustic monitoring allows detection of marine mammal vocalizations from animals that may not be readily apparent from visual surveys. Species specific results, however, have to be viewed in context of the individual species since not all animals within a given population may vocalize, or may only vocalize under

certain conditions (Mellinger, 2007; ONR, 2007) Mellinger et al. (2007) contains a detailed discussion on the benefits and limitations to passive acoustic monitoring.

Marine Mammal Observer on Navy ships

Field experienced marine mammal observers (MMO) will be placed alongside existing Navy ship lookouts aboard select platforms and for a certain sub-set of training events. Presence of MMOs allows for verification of Navy lookout sighting efficiency, allows for more detailed species identification of marine mammal sightings, and provides an opportunity for an experienced biologist to make qualified observations on potential marine mammal behavior at the time of sighting.

Marine Mammal Tagging

Effort will also be given to coordinate with ongoing marine mammal tagging efforts in the SOCAL study area for baleen whale species (i.e., [Tagging of Pacific Predators](http://www.topp.org) available at: <http://www.topp.org>). Tagging of Pacific Predators began in 2000 as one of 17 projects of the Census of Marine Life, a 10-year, 80-nation endeavor to assess and explain the diversity and abundance of life in the oceans. NOAA's Pacific Fisheries Ecosystems Lab, Stanford's Hopkins Marine Lab, and University of California, Santa Cruz's Long Marine Laboratory manage the program. The Navy's ONR already provides funding for marine mammal tag development and improvement. If an opportunity arises, Navy is open to providing further assistance to SOCAL efforts that attempt to tag baleen whale species in and around SOCAL training areas in context of the TOPP program.

In addition to baleen whale tagging, the Navy will directly fund academic researchers in a program to tag beaked whales and certain substitute deep diving surrogate species recommended by these researchers within SOCAL. This program is in an initial planning phase and will be integrated as the SOCAL monitoring plan matures (Table 1). Depending on results and timing for NMFS permitting require prior to conducting marine mammal tagging research, one of the goals of the SOCAL tagging program will be to place one of two types of tags on beaked whales or surrogate species: a retrievable Digital Acoustic Recording Tag (DTAG) which is a short-term tag (hours-to-days) that can record short term animal movement (diving profiles, swimming speed, depth), exposure to underwater sound, and potential behavioral reactions; or one of a series of satellite position tags that can provide longer term indication of animal movement. One example of these longer term tags, discussed on the TOPP web site, is the Smart Position or Temperature Transmitting Tag (SPOT) which has a potential lifespan of two years. Species will be tagged opportunistically; however the focus will be on cryptic and deep diving species such as beaked, or sperm whales that have the lowest rates of detectability in visual surveys (Barlow and Gisiner, 2006). Results from tagging will be examined annually to assess the effectiveness of this technique.

Data collection will begin after January 2009, after the SOCAL LOA is issued and the monitoring plan is finalized (See Table 1 for year by year implementation schedule). Data collected from the SOCAL monitoring plan will be added to a Navy wide analysis of monitoring from other permitted Navy range complexes. Data in this analysis will be collected from the U.S. East Coast Atlantic Fleet Active Sonar Training (AFAST) and Hawaii Range Complex monitoring plans, and compiled in order to compare and analyze data from all the individual Navy monitoring efforts. All available data will be included in Navy's annual report for SOCAL to NMFS including an evaluation of the effectiveness of any given element within the SOCAL monitoring program. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

STUDY 1

Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS)? If so, at what levels are they exposed?

In order to address this question, there is a need to detect marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. Shipboard surveys, either from Navy vessels or contracted research vessels, will not enable the observers to see animals much below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial surveys and marine mammal observers aboard Navy vessels will be used.

Methods

A combination of aerial surveys and marine mammal observers will be used, in conjunction with regularly scheduled Naval training events. Aerial surveys are preferred for this type of monitoring as they provide the ability to observe animals that are below the surface (Slooten et al., 2004). This is particularly true in sea states of Beaufort 3 or less where water conditions are relatively calm therefore, should training schedules allow, the Navy will make every effort to conduct monitoring in sea states of Beaufort 3 or less.

Aerial survey:

Due to the large amount of air traffic off of Southern California, controlled airspace may prove to be a problem with this type of surveying. However, Navy will make every effort to coordinate and schedule this proposed monitoring. An aerial survey team will fly pre-determined zigzag transects relative to a Navy surface combatant which is transmitting MFA sonar. The Navy will collect detailed ship track, speed and sonar use data for comparison with the survey data. The aerial survey team will collect both visual sightings (to be used to help calculate densities) and behavioral observations. These transects will allow for the gathering of movement relative to ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all aerial surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative data of densities and behaviors, which will complement the hours shown in Table 1.

The aerial survey team will attempt to collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles including date; 4) time and visual conditions associated; 5) direction of travel relative to Navy vessel; and 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to estimate received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Marine mammal observers on Navy vessels:

When available and consistent with scheduled Navy training field experienced marine mammal observers (MMO) will be placed alongside existing Navy ship lookouts aboard select platforms and for a certain sub-set of training events. Presence of MMOs allows for verification of Navy lookout sighting efficiency, allows for more detailed species identification of marine mammal sightings, and provides an opportunity for an experienced biologist to make qualified observations on potential marine mammal behavior at the time of sighting.

Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels and cannot have a conflict of interest in working for the Navy. MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. The events selected for MMO participation will take into account safety, logistics, and operational concerns.

MMOs will observe from the same height above water as the lookouts. Of note, these MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP). The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Beaked whale or surrogate species animal tagging

Attempts to tag suitable animals will be conducted prior to a given Navy event, allowing animals the opportunity to distribute naturally prior to any potential immediate exposure to training activities. Tags shall be applied in a geographical area within SOCAL that is likely to be transited by Navy vessels during the training event. If DTAGs are deployed, then direct measures of potential acoustic exposures by individual animals can be determined along with any behavioral reactions, or lack of reactions. It should be cautioned that finding, approaching, and tagging these rather cryptic species is a very difficult process, and successful tag attachment can not be guaranteed.

STUDY 2

If marine mammals and sea turtles are exposed to MFAS in the SOCAL study area, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?

Line-transect shipboard surveys are regularly conducted by NOAA/NMFS in the SOCAL study area to assess long-term trends in abundance (e.g., Forney, 2007; ORCAWALE, 2008). While funding dependent, it is assumed that data collection will continue. These NOAA surveys are partially funded by the Navy and serve to address this question on longer term trends in abundance. However, those surveys will not detect short term shifts in distribution, therefore, detection of redistribution on the order of days will be addressed by Study 2.

When feasible, marine mammal densities will be calculated from aerial survey data conducted immediately before and after training events. Additionally, autonomous recording devices will be used to gather additional data on movements of animals through the SOCAL study area, providing a baseline and data on animals not detected by the aerial survey.

Methods

Aerial surveys:

Systematic line-transect aerial surveys will be conducted on the two days before and a variation of 1-5 days after a Navy training exercise to collect relative density data in the exercise area for marine mammals in the area. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to active sonar. When monitoring is associated with training that takes place near the Channel Islands, one survey day after the training event will be devoted to flying the coastline of the islands closest to the training event to look for potential strandings. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, and decayed) will be immediately reported for appropriate action (e.g., notification of the NMFS Regional Stranding Coordinator).

Standard distance sampling methodology and techniques, as described in Buckland et al. (2001) and Kinsey et al. (2002) shall be used. Surveys will be conducted from a twin-engine aircraft, with two experienced NOAA trained or certified observers.

The survey will be flown at a speed of 100 knots and an altitude of 800 ft (244m). Two observers will spot marine mammals during the surveys and report data to a recorder. Information recorded will include species sighted, numbers of individuals, presence, or absence of a calf, behavior, angle to the sighting and any apparent reaction to the aircraft. It is important to note any unusual behavior or species associations. Additionally, GPS locations and altitude will be automatically recorded at 30-sec intervals, as well as manually whenever a sighting is made. Environmental data (sea-state, glare and visibility) will be manually recorded at the start of each transect leg and whenever conditions change. When appropriate, the aircraft may go off effort (off the trackline) for behavioral observations or for species identification. Digital photographs or possible video will be taken as conditions permit. In the event that a given flight date is canceled, due to weather conditions, safety concerns, or mechanical problems, the survey will be flown when the safety or mechanical issue is resolved, next available good weather date, or if prolonged next available training event. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1. In the event of monitoring delay and conflicting exercise schedules, NMFS has agreed that efforts missed in one given year can be made up in the subsequent year.

Passive Acoustics:

The Navy already has an existing fixed passive acoustic array at the Southern California ASW Range (SOAR) mounted on the bottom of San Nicholas basin west of San Clemente Island, as well as a proposal for extending this array as part of the SOCAL EIS/OEIS. This system was originally designed to record underwater sounds and provide tracking capability for Navy training events. The hydrophones on this fixed system are not currently capable of recording vocalization from all marine mammal species, especially low frequency specialist such as some baleen whales (in particular, blue and fin whales). Planned updates and refurbishment of this passive array are funded and design work in progress which will allow for greater frequency range once newer hydrophones are installed.

The Navy also plans on future integration of the Marine Mammal Monitoring on Navy Ranges (M3R) project within the SOAR underwater range (Tiemann et al. 2006). The main objective of the M3R project is to develop a toolset for passive detection, localization, and tracking of marine mammals using existing Navy undersea range infrastructure. The project by the Naval Undersea Warfare Center (NUWC) was originally funded by the ONR and now continuous under CNO funding. A necessary first step in this effort is the creation of a baseline of acoustic classification and behavior that requires long-term monitoring of marine mammals. As part of an overall comprehensive compliance program, M3R is working to develop new tools for tracking marine mammals. It should be noted, however, that M3R passive acoustics, especially real-time detection, is an emerging field that does need continued research especially as applied to classification, localization, and density estimation. Data from the M3R system tests on the fixed passive acoustic range at SOAR will be used opportunistically as available. The system is still in development and undergoing periodic field tests of marine mammal species identification based on passive detections. There has been recent success in particular with Cuvier's beaked whales, although similar results for all cetacean species are still distant. Prototype real-time classifiers for beaked whales are tentatively scheduled for deployment at SOAR by spring of 2009.

In addition to working with the passive acoustic detection capabilities of the Navy's SOCAL fixed range, the Navy also commits to deploying at least two autonomous acoustic recording buoys (e.g., HARP, EAR or similar buoy; see Newcomb et al., 2002; Wiggins and Clark, 2007; Lammers et al., 2008) in the SOCAL study area in order to detect, locate and track vocalizing marine mammals. The exact number of buoys above two needed to adequately characterize an area is under review and will be promulgated as a separate study plan. If Navy funding is available and additional buoys deemed necessary, then potentially up to 3 additional buoys may be considered. Pop-up buoys (or similar buoys) may also be used to monitor specific areas for periods of time before, during and after training events in conjunction with other monitoring efforts when possible. The buoys will be distributed in an array to facilitate data collection on geographical movements, however, the exact placement of the buoys each year will be determined using operational guidance to maximize the likelihood of capturing data during training events. These buoys will be left in place for a long enough duration that data are collected both during and outside of training events. All passive acoustic recording packages will be set on a duty cycle to provide appropriate sampling coverage and maximize battery power and data storage space. Buoys will be retrieved as required for maintenance and downloading of data. Autonomous acoustic recording buoys will provide long term, daily information on the presence and absence of marine mammals in each area and their movements through the area. These systems will also provide information on the species present and their movements when an exercise occurs in that area (Mellinger and Barlow, 2003; Oswald et al., 2003; Mellinger et al., 2007). Acoustic data will be collected according to standard and accepted passive acoustic monitoring protocols (NMFS 2008 Passive Acoustic guidelines).

One goal for deployment of these temporary buoys is to select potential sub-area or areas used for Navy training events not previously covered by either fixed arrays such as the San Nicolas basin or previous deployable areas. Alternatively, larger buoys such as HARP may be used to compliment the low-frequency monitoring adjacent to the existing underwater fixed range until range hydrophone refurbishments are complete.

Beaked whale or surrogate species animal tagging

Attempts to tag suitable animals will be conducted prior to a given Navy event, allowing animals the opportunity to distribute naturally prior to any potential immediate exposure to training activities. Tags shall be applied in a geographical area within SOCAL that is likely to be transited by Navy vessels during the training event. The goal of the tagging effort is to examine spatial distribution of animals before, during and after a training event; as well as potential long-term habitat associations and distributions independent of Navy training events. It should be cautioned that finding, approaching, and tagging these rather cryptic species is a very difficult process, and successful tag attachment can not be guaranteed.

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STUDY 3

If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?

Note: the methods used in Study 3 are the same as those used for Study 1, with the addition of vessel surveys. Vessel surveys are used here specifically for their ability to collect behavioral data and focal follows.

Documenting known at-sea behavioral reactions of marine mammal to military sonar is complicated by lack of information and direct observations of cause-and-effects. Any particular reaction is likely to be conditional on the species in question, and a host of other factors such as feeding status, breeding status, time of day, overall health, and other issues. In order to address this question, there is a need to assess whether marine mammals and sea turtles are not only at the surface, but in the water column where they could be potentially exposed to sonar. If animals are not present, then there would be no exposure and no possibility of behavioral reaction, or lack of reaction. Observers aboard either Navy vessels or contracted research vessels will have difficulty observing animals below the surface. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the surface as do aerial surveys. Therefore, a combination of aerial surveys, vessel surveys, marine mammal observers aboard Navy vessels, and opportunistic passive acoustic monitoring within SOAR (M3R) will be used for this study.

Methods

A combination of aerial surveys, vessel surveys and marine mammal observers will be used in conjunction with training events. Aerial surveys are preferred for this type of monitoring as they provide the ability to observe animals that are below the surface. This is particularly true in sea states of Beaufort 3 or less.

Aerial survey:

During specified training events, an aerial survey team will fly pre-determined zigzag transects relative to a Navy warship which is transmitting sonar. The aerial survey team will collect both visual sightings (to be used for densities) and behavioral observations from observed animals. These transects will allow for gathering information regarding movement of a species relative to the ship and behavioral responses of marine mammals at different received levels. The same altitude above water will be used for all surveys. The surveys will be conducted both during and outside of sonar transmissions to allow for comparative densities and behaviors.

The aerial survey team will collect: 1) species identification and group size; 2) location and relative distance from the Navy ship(s); 3) the behavior of marine mammals and sea turtles including date; 4) time and associated sighting conditions; 5) direction of travel relative to Navy vessel (s); and, 6) duration of the observation.

Animal sightings and relative distance from the ship will be used post-survey to determine received levels for active transmission periods. This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels and their corresponding behavior. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Vessel surveys:

The primary purpose of the survey will be to document and monitor potential effects of the planned exercise on marine mammals and sea turtles. As such, parameters to be monitored for potential effects are changes in the occurrence, distribution, numbers, surface behavior, and/or disposition (injured or dead) of marine mammal and sea turtle species before, during and after the

training event. While challenging, the vessel surveys will attempt to conduct focal follows on animals with Navy vessels in view. Particular attention will be given to obtaining focal follows on beaked whales.

The vessel will conduct systematic line transect surveys in a survey box designated by the Navy (based upon training event distribution), to assess marine mammal distribution and abundance. Behavioral data will also be collected from all species. Specifically, the survey should deviate from transect protocol to collect behavioral data if a Navy vessel is visible on the horizon or closer. At this point, they will approach within three nautical miles of the vessel(s), if weather and conditions allow, and will work in “Focal Follow Mode” (e.g., collect behavioral data using the big eyes, and observe the behavior of any animals that are seen). The team will go off effort for photo-id, video and close approach “Focal Animal Follows” as feasible, and when marine animal encounters occur in proximity to the vessel. While in Focal Follow Mode, observers will gather detailed behavioral data from the animals, for as long as the animal allows. Analysis of behavioral observations will be made after the exercise or training activity (Altman, 1974; Martin and Bateson, 1993). While the Navy vessels are within view, attempts will be made to position the dedicated survey vessel in the best possible way to obtain focal follow data in the presence of the Navy exercise. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Data will be logged using NOLDUS software, which is specifically designed to facilitate collection of behavioral data. This program will be specifically tailored to the needs of the SOCAL Monitoring Plan and the Navy’s overall monitoring efforts throughout all the range complexes.

Marine mammal observers on Navy vessels:

When available and consistent with scheduled Navy training field experienced marine mammal observers (MMO) will be placed alongside existing Navy ship lookouts aboard select platforms and for a certain sub-set of training events. Presence of MMOs allows for verification of Navy lookout sighting efficiency, allows for more detailed species identification of marine mammal sightings, and provides an opportunity for an experienced biologist to make qualified observations on potential marine mammal behavior at the time of sighting.

Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels and cannot have a conflict of interest in working for the Navy. MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. The events selected for MMO participation will take into account safety, logistics, and operational concerns.

MMOs will observe from the same height above water as the lookouts. Of note, these MMOs will not be part of the Navy’s formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting effort will be conducted according to a standard operating procedure (SOP) to allow for consolidation of data amongst all the range complex monitoring programs. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Passive Acoustic Monitoring

Opportunistic data collected as part of the M3R effort at SOAR (described in Study 2) may offer insights to animal vocalization rates, potential dive pattern, and possible movement in relation to exercise events. This field is still new and the M3R technology still being developed. When available, information derived from M3R monitoring in relation to animal behavior response, or lack of response may be incorporated.

Beaked whale or surrogate species animal tagging

Attempts to tag suitable animals will be conducted prior to a given Navy event, allowing animals the opportunity to distribute naturally prior to any potential immediate exposure to training activities. Tags shall be applied in a geographical area within SOCAL that is likely to be transited by Navy vessels during the training event. If DTAGs are deployed, then direct measures of potential acoustic exposures by individual animals can be determined along with any behavioral reactions, or lack of reactions. It should be cautioned that finding, approaching, and tagging these rather cryptic species is a very difficult process, and successful tag attachment can not be guaranteed.

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STUDY 4

What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives?

Documenting known at-sea behavioral reactions of marine mammal to underwater explosion that occur on relatively short time scales is complicated by lack of information and direct observations of cause-and-effects. Any particular reaction is likely to be conditional on the species in question, and a host of other factors such as feeding status, breeding status, time of day, overall health, and other issues. In order to address this question, there is a need to assess whether marine mammals and sea turtles are not only at the surface, but in the water column where they could be potentially exposed to underwater explosions. If animals are not present, then there would be no exposure and no possibility of behavioral reaction, or lack of reaction. In order to address this question, there is a need to observe marine mammals and sea turtles not only at the surface, but to the extent possible in the water column. While shipboard surveys are preferable in many ways (slow speed, offshore survey ability and duration, close approaches), they do not allow for observation of animals that are below the ocean surface as do aerial surveys. Therefore, for this study, a combination of aerial and vessel surveys may be used. Current mitigation measures by Navy exercise participants include monitoring the exclusion zone (size depends on the type and size of the explosives being used) beginning 30 minutes prior to detonation and for 30 minutes post detonation.

Methods

For specified training events, aerial or vessel surveys will be used 1-2 days prior to, during if safely possible, and 1-5 days post detonation. The variation in the number of days after allows for the detection of animals that gradually return to an area, if they indeed do change their distribution in response to underwater detonation events.

Surveys will include any specified exclusion zone around a particular detonation point plus 2000 yards beyond the exclusion zone but in no circumstances will aerial and vessels enter the safety designated for participants which may exceed the exclusion zone and additional 2,000 yard buffer. Safety of personnel is paramount at all times. For vessel based surveys a passive acoustic system (hydrophone or towed array) could be used to determine if marine mammals are in the area before and after a detonation event. Depending on animals sighted, it may be possible to conduct focal surveys of animals outside of the exclusion zone (detonations could be delayed if marine mammals or sea turtles are observed within the exclusion zone) to record behavioral responses to the detonations

The primary goal will be to survey detonation events with multiple detonations and larger live ordnance (5/54 guns shells, SM-2 missiles, MK80 series aerial bombs). This includes SINKEX, Surface-to-Surface Gunnery Exercise (GUNEX specifically with platforms using 5/54 shells), Surface-to-Surface Missile Exercise (MISSILEX), or Bombing Exercise (BOMBEX). Given that there may significant annual variability in which events occur more frequently within SOCAL, the Navy will not agree to survey a minimum number of per year.

Brief aerial or vessel based surveys of the detonation area taking into account local oceanographic currents will be conducted for stranded animals over a two day period post detonation event. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported immediately for appropriate action (notification to NMFS Regional Stranding Coordinator). When conducting a particular survey, the survey team will collect: 1) species identification and group size; 2) location and relative distance from the detonation site; 3) the behavior of marine mammals and sea turtles including standard environmental and oceanographic parameters; 4) date, time and visual conditions associated with each observation; 5) direction of travel relative to the detonation

site; and 6) duration of the observation. For safety considerations aerial surveys will only be conducted before and after detonation events. Animal sightings and relative distance from a particular detonation site will be used post-survey to determine potential received energy and pressure (dB re 1 micro Pa-sec and pounds per square inch). This data will be used, post-survey, to estimate the number of marine mammals and sea turtles exposed to different received levels (energy and pressure based on distance to the source, bathymetry, oceanographic conditions and the type and size of detonation) and their corresponding behavior.

All available data will be provided to be included in Navy's annual report to NMFS. All subsequent analysis shall be completed in time for Navy's five year report to NMFS.

DRAFT

STUDY 5

Is the Navy's suite of mitigation measures effective at avoiding injury and mortality of marine mammals and sea turtles?

It is the Navy's position that the suites of mitigation measures for sonar and explosives are effective at avoiding exposures of marine mammals to levels of energy or pressure from sonar or explosives that would result in harm or mortality of marine mammals. Through several methods, this study will provide the scientific data needed to support that position. The Navy will: 1) conduct aerial surveys before and after two major exercises per year (at least one of which includes multiple explosive detonations) to determine whether animals have been injured in the exercise area; and 2) conduct a comparison of professional marine mammal observers and Navy lookouts.

Methods

Lookout comparison:

Navy lookouts are provided with extensive training to detect anything in the water 360 degrees around Navy vessels. This includes marine mammals. The Navy feels strongly that despite the fact that lookouts are not biologists trained to identify marine animals to species, that Navy lookouts have the skills to reasonably detect all marine mammals and sea turtles that are visible at the surface. In order to provide the scientific data to support this position, the Navy will initiate a side-by-side comparison of Navy lookouts ability to detect marine mammals at sea with sightings made by professional marine mammal observers. It is assumed that the abilities of Navy lookouts and professional marine mammal observers will vary; therefore, it is important that data be collected from many locations, in many environmental conditions, with many different lookouts and MMOs. Therefore, as part of the overall Navy monitoring effort, some of the data will be collected within the SOCAL study area.

Marine mammal observers (MMOs) will be placed on Navy vessels during regularly scheduled training events in the SOCAL study area. MMOs qualifications must include expertise in species identification of regional marine mammal and sea turtle species and experience collecting behavioral data. Experience as a NMFS marine mammal observer is preferred, but not required. Navy biologists and contracted biologists will be used; contracted MMOs must have appropriate security clearance to board Navy vessels. As noted above, MMOs will not be placed aboard Navy vessels for every Navy training event or major exercise, but during specifically identified opportunities deemed appropriate for data collection efforts. Additionally, the events selected for MMO participation will take into account safety, logistics, and operational concerns associated with such an endeavor. Navy lookouts will not be specially chosen.

Marine mammal observers will observe from the same height above water as the lookouts. Navy lookouts will officially be on duty and have the same responsibilities that they always do on duty (no more, no less). MMOs will not be part of the Navy's formal reporting chain of command during their data collection efforts; Navy lookouts will continue to serve as the primary reporting means within the Navy chain of command for marine mammal sightings. The only exception is that if an animal is observed within the shutdown zone that has not been observed by the lookout, the MMO will inform the lookout of the sighting for the lookout to take the appropriate action through the chain of command.

To the extent practicable, the MMO and lookouts will avoid cueing each other when they observe a marine mammal. The MMOs will collect species identification, behavior, direction of travel relative to Navy vessel, and distance first observed. All MMO sighting will be conducted according to a standard operating procedure (SOP) to allow for consolidation among data from all

range complex monitoring plans. Two marine mammal observers will be aboard, and work on rotating two hour shifts to avoid fatigue.

Comparisons of the following will be made between experienced observers and the lookouts 1) Rate of detection: Comparison of the number of animals sighted per hour (or other appropriate sighting period), 2) Distance of sighting: Comparison of the distance where the sighting was first made, 3) Distance estimation: Consistency of sighting distance estimates, 4) Animal size estimation: Comparison of animal size estimation (either by actual length or by grouping – small or dolphin size, medium and large), 5) Direction of travel relative to the ship or by compass bearing, 6) Behavior categorization: Comparison of the categorized behaviors. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

Aerial surveys:

A contracted team will conduct pre and post aerial surveys, taking local oceanographic currents into account, of the exercise area as well as a shoreline survey of San Clemente Island and possibly San Nicolas Island. Species composition of at sea and on land marine animals will be reported. If any distressed, injured or stranded animals are observed, an assessment of the animal's disposition (alive, injured, dead, or degree of decomposition) will be reported immediately to CPF and Commander, Third Fleet for appropriate action (notification to NMFS Regional Stranding Coordinator).

These aerial surveys will be the same as those conducted for other SOCAL monitoring studies. However, for this study in particular, survey data will include identification of any distressed, injured or stranded animals both in the training event area and adjacent island coastlines. The types of exercises and level of effort that are proposed for this type of monitoring are outlined in Table 1.

IMPLEMENTATION

For all field monitoring conducted in support of this plan, it will be the responsibility of the contracted researchers to obtain and maintain the appropriate permits.

Table 1 provides detail on how the SOCAL Monitoring Plan will be implemented from fiscal year 2008 to fiscal year 2013. The implementation of this monitoring plan will not officially commence until January 2009, after the issuance of the Letter of Authorization. However, the Navy plans to continue methods used in 2008 (pre and post aerial surveys, vessel surveys) as funding is available.

The monitoring plan will be implemented gradually in FY09, with full ramp up in 2010 as contracts are issued, Standard Operating Procedures (SOPs) are developed, and statisticians are consulted for input on sample size and analysis.

ANALYSIS and REPORTING

The Navy is currently working on the overarching structure and coordination that will, over time, compile data from both range-specific monitoring plans (e.g., SOCAL monitoring plan) as well as Navy funded research and development (R&D) studies. The analysis protocols are still in development phase at this time. However, data collection methods will be standardized to allow for comparison from ranges in different geographic locations. The sampling scheme for the program will be developed so that the results are scientifically defensible. For example, since all data will be collected using a behavioral program like NOLDUS, data collection will be standardized between the different geographical regions. A data management system will be developed to assure standardized, quality data are collected towards meeting of the goals. The data management plan shall provide standard marine species sighting forms for Navy lookouts and biologists to use to standardize data collection. Annual reports summarizing effort, analysis and results will be compiled and submitted to NMFS. These reports will allow the Navy and NMFS to assess and adaptively manage the Navy's monitoring effort to more effectively answer the questions outlined above.

All data is pre-decisional throughout at least the five year period of the Final Rule. While data will be prepared and analyzed over the course of the five years of the Final Rule, under no circumstances will the data be represented for conclusions before the end of the five year period without the written consent by the Director of NOAA and Secretary of the Navy or their designees. Final conclusions cannot be published or used for any take authorizations or enforcement action without the written consent of both the Director of NOAA and the Secretary of the Navy. Neither organization will release the information to any person or entity outside without the written consent of both the Director of NOAA and the Secretary of the Navy or their designee.

Table 1. Summary of studies planned each year and anticipated survey goals within SOCAL.

STUDY 1,3, 4 (exposures and behavioral responses)					
	FY09	FY10	FY11	FY12	FY13
Aerial surveys	Award monitoring contract, develop SOP, obtain permits; Portions of COMPTUEX/JTFEX, IACs, and ULT, including offshore detonation event- goal of 48 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 48 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 48 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT and including offshore detonation event - goal of 48 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 48 hours
Marine Mammal Observers	Opportunistic as staff and SOP developed; minimum IAC or ULT - goal of 20 hours	IAC or ULT - goal of 40 hours	IAC or ULT - goal of 40 hours	IAC or ULT - goal of 40 hours	IAC or ULT - goal of 40 hours
Vessel surveys (study 3 and 4 only)	Award monitoring contract, develop SOP, obtain permits; Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation events - goal of 40 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event- goal of 60 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 60 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 60 hours	Portions of COMPTUEX/JTFEX, IACs, and ULT including offshore detonation event - goal of 60 hours
Marine Mammal Tagging (study 1, and 3 only)	Award monitoring contract, develop SOP (Studies 1,2,3)	Conduct opportunistic marine mammal tagging	Conduct opportunistic marine mammal tagging	Conduct opportunistic marine mammal tagging	
STUDY 2 (geographic redistribution)					
	FY09	FY10	FY11	FY12	FY13
Aerial surveys before and after training events	Award monitoring contract, develop SOP, obtain permits; Portions of COMPTUEX and/or JTFEX, IACs, or ULT- goal of 50 hours	Portions of COMPTUEX and/or JTFEX, IACs, or ULT- goal of 50 hours	Portions of COMPTUEX and/or JTFEX, IACs, or ULT- goal of 50 hours	Portions of COMPTUEX and/or JTFEX, IACs, or ULT- goal of 50 hours	Portions of COMPTUEX and/or JTFEX, IACs, or ULT- goal of 50 hours
Passive Acoustics	Award monitoring contract, develop SOP, obtain permits Order devices and determine best location; integrate SOAR M3R classification data (beaked whales)	Install minimum 2 autonomous devices in the SOCAL study area and begin recording; integrate SOAR M3R classification data (beaked whales)	Continue recording from devices; Begin data analysis; integrate SOAR M3R classification data (beaked whales)	Continue recording from devices and data analysis; integrate SOAR M3R classification data (beaked whales)	Data Analysis and continue recording from devices and data analysis; integrate SOAR M3R classification data (beaked whales)
Marine Mammal Tagging	Award monitoring contract, develop SOP, obtain permits	Conduct opportunistic marine mammal tagging	Conduct opportunistic marine mammal tagging	Conduct opportunistic marine mammal tagging	
STUDY 5 (mitigation effectiveness)					
	FY09	FY10	FY11	FY12	FY13
Marine mammal observers/look out comparison	Opportunistic as staff and SOP developed; minimum IAC or ULT - 20 goal of hours	IAC or ULT- goal of 40 hours	IAC or ULT- goal of 40 hours	IAC or ULT- goal of 40 hours	SEASWITI or ULT- goal of 40 hours
Aerial surveys before and after training events	Portions of COMPTUEX and/or JTFEX - goal of 50 hours	Portions of COMPTUEX and/or JTFEX - goal of 50 hours	Portions of COMPTUEX and/or JTFEX - goal of 50 hours	Portions of COMPTUEX and/or JTFEX - goal of 50 hours	Portions of COMPTUEX and/or JTFEX - goal of 50 hours

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