3.5 NOISE

This section describes the existing noise setting in the areas along the Estuary margin where treatment may occur, and identifies potential sensitive receptors. It then evaluates the effects of the various treatment methods on sensitive human noise receptors, and identifies mitigation measures to minimize these impacts. Noise impacts to wildlife are addressed in Section 3.3, Biological Resources.

3.5.1 Environmental Setting

Terminology

Noise is defined as unwanted sound. Noise usually is objectionable because it is disturbing or annoying due to its pitch or loudness. Pitch is the height or depth of a tone or sound. Higher pitched signals sound louder to humans than sounds with a lower pitch. Loudness is intensity of sound waves combined with the reception characteristics of the ear.

A decibel (dB) is a unit of measurement that is used to indicate the relative amplitude of a sound. Sound levels in decibels are calculated on a logarithmic scale. Subjectively, each 10-decibel increase in sound level is generally perceived as approximately a doubling of loudness. Technical terms are defined in **Table 3.5-1**.

There are several methods of characterizing sound. The most common in California is the *A*-weighted sound level or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive. Representative outdoor and indoor noise levels in units of dBA are shown in **Table 3.5-2**. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

Since the sensitivity to noise increases during the evening and at night – because excessive noise interferes with the ability to sleep – 24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level (CNEL) is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 p.m. to 10:00 p.m.) and a 10 dB addition to nocturnal (10:00 p.m. to 7:00 a.m.) noise levels. The Day/Night Average Sound Level, L_{dn}, is essentially the same as CNEL, with the exception that the evening period is dropped and all occurrences during this three-hour period are grouped into the daytime period.

Effects of Noise

Hearing Loss. While physical damage to the ear from an intense noise impulse is rare, hearing loss can occur due to chronic exposure to excessive noise, but may be due to a single event such as an explosion. Natural hearing loss associated with aging may also be accelerated from chronic exposure to loud noise. The Occupational Safety and Health Administration (OSHA) has a noise exposure standard that is set at the noise threshold where hearing loss may occur from long-term exposures. The maximum allowable level is 90 dBA averaged over eight hours. If the noise is above 90 dBA, the allowable exposure time is correspondingly shorter.

Table 3.5-1. Technical Terms for Noise

Term	*Definitions*
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a sound level meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted, unless reported otherwise.
L_{01}, L_{10}, L_{50}, L_{90}	The A-weighted noise levels that are exceeded 1, 10, 50, and 90 percent of the time during the measurement period.
Equivalent Noise Level, L_{eq}	The average A-weighted noise level during the measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 5 decibels in the evening from 7:00 p.m. to 10:00 p.m. and after addition of 10 decibels to sound levels measured in the night between 10:00 p.m. and 7:00 a.m.
Day/Night Noise Level, L_{dn}	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10:00 p.m. and 7:00 a.m.
L_{max}, L_{min}	The maximum and minimum A-weighted noise level during the measurement period.
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Intrusive	That noise which intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.

Source: Illingworth & Rodkin, Inc., 2002

Table 3.5-2. Representative Outdoor and Indoor Noise Levels (in Units of dBA)

At a Given Distance from Noise Source	*A-Weighted Sound Level in Decibels*	*Noise Environments*	*Subjective Impression*
	140		
Civil Defense Siren (100')	130		
	120		Pain Threshold
Jet Takeoff (200')	110	Rock Music Concert	
	100		Very Loud
Diesel Pile Driver (100')	90	Boiler Room Printing Press Plant	
Freight Cars (50') Pneumatic Drill (50')	80	In Kitchen With Garbage	
Freeway (100') Vacuum Cleaner (10')	70	Disposal Running	Moderately Loud
	60	Data Processing Center	
	50	Department Store	
Light Traffic (100') Large Transformer (200')	40	Private Business Office	Quiet
	30	Quiet Bedroom	
Soft Whisper (5')	20	Recording Studio	
	10		Threshold of Hearing
	0		

Source: Illingworth & Rodkin, Inc., 2002

Sleep and Speech Interference. The thresholds for speech interference indoors are about 45 dBA if the noise is steady and above 55 dBA if the noise is fluctuating. Outdoors the thresholds are about 15 dBA higher. Steady noise of sufficient intensity (above 35 dBA) and fluctuating noise levels above about 45 dBA affect sleep.

Annoyance. Attitude surveys determined that the causes for annoyance include interference with speech, radio and television, house vibrations, and interference with sleep and rest. People appear to respond relatively adversely to aircraft noise. When the L_{dn} is 60 dBA, approximately 10 percent of the population is believed to be highly annoyed. Each decibel increase to 70 dBA adds about two percentage points to the number of people highly annoyed. Above 70 dBA, each decibel increase results in about a three percent increase in the percentage of the population highly annoyed.

Existing Noise Levels

The ambient noise levels near potential cordgrass treatment sites varies depending on the adjacent land uses. Vehicular traffic is the predominant source of noise throughout the San Francisco Bay Area. Aircraft traffic over the Bay from San Francisco, Oakland, and San Jose International Airports, as well as smaller airports, also contributes to the noise exposure. Railroad train traffic along the railroad corridors on either side of the Bay is an intermittent source of noise. The ambient noise level at a particular location depends upon proximity to major or minor noise sources. Typical daytime noise levels in the areas surrounding the Estuary vary from about 45 dBA up to about 75 dBA in close proximity to the freeways or airports.

Noise Monitoring Survey. A noise monitoring survey was conducted to provide examples of different noise exposures in the study area. Four sites were selected for the noise monitoring survey.

Creekside Park, Marin County. The noise environment at Creekside Park is created primarily from vehicular traffic on the local street network. The park is surrounded on three sides by residential land uses. Marin General Hospital is to the east across Bon Air Avenue from the park. Noise levels were monitored during the morning of May 21, 2001 for a 10-minute interval beginning at 10:35 a.m. The L_{eq} during the measurement was 48 dBA. Noise levels ranged from a low of 44 dBA to a high of 59 dBA.

Bair Island, San Mateo County. Bair Island is across a channel from the Redwood Shores residential area. Noise sources affecting the environment in the area include regular aircraft activity, distant traffic on the Bayshore Freeway and local traffic. Ambient noise levels were monitored on the levee near Waterside Circle in the Redwood Shores Development during the same morning between 11:50 a.m. and noon. The L_{eq} during the measurement was 55 dBA. Noise levels during the monitoring survey ranged from a low of 50 dBA in the absence of all identifiable noise sources to a high of 61 dBA during an aircraft over-flight. Distant traffic generated a steady noise level of 50 to 54 dBA.

Alameda Creek Flood Control Channel, Hayward. Noise levels were not monitored at this site due to high winds. Residential receptors are in new subdivisions located along Whipple Road and Seaport Drive. Ambient noise levels at this location would be expected to be similar to the Bair Island Area with noise from aircraft and distant traffic and local traffic all contributing to ambient noise levels in the area.

Crown Beach, Alameda. The noise environment at this shoreline park in Alameda results from vehicular traffic on the street network and jet aircraft departing Oakland International Airport. Noise levels were monitored on Monday, May 21, 2001 for a 10-minute period beginning at 4:00 p.m. The average noise level during the measurement was an L_{eq} of 55 dBA. Noise levels during the monitoring survey ranged from a minimum level of 47 dBA to a maximum level of 71 dBA resulting from a jet aircraft departing Oakland International Airport.

3.5.2 Analysis of Potential Effects

The key potential noise impact associated with the eradication of non-native cordgrass is the disturbance resulting from noise generated by equipment and machinery used in the eradication process. Because of the wide variability in ambient noise levels at sensitive receptors (e.g., residences, schools, hospitals, etc.), and distances between potential treatment sites and sensitive receptors, it is not possible to quantitatively predict and evaluate the effects of noise at specific

locations. Guidelines are presented in the impact assessment to evaluate the appropriateness of treatment control methods in certain settings. Potential impacts and mitigation measures are summarized in **Table 3.5-3** and **Table 3.5-4**, respectively.

Significance Criteria

Noise impacts would be considered significant if the project would:

- Expose persons to or generate noise levels in excess of standards established in a local general plan, noise ordinance, or applicable standards of other agencies;
- Expose persons to or generate excessive ground-borne vibration or ground-borne noise levels;
- Cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; and/or
- Cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

ALTERNATIVE 1: Proposed Action/Proposed Project. Regional Eradication Using All Available Control Methods

Impacts

Treatment methods that would involve the use of clippers, knives, shovels, trowels, bags, wheelbarrows, hand carts, sleds, and trucks for transport of removed material are not expected to generate noise over ambient levels at any location. The only source of noise associated with these activities would be from the trucks that would support the work crew. The noise generated by the occasional movement of trucks would be less than significant anywhere in the Bay Area.

The use of crews and application of fuel, such as propane, to ignite stems and leaves is not expected to generate noise. Although fire department personnel and equipment would be present at the treatment site during this method, fire suppression activities are also not expected to generate noise above ambient levels. It is not anticipated that the use of sirens or fire department equipment would be necessary unless there were an accident. This treatment method would result in less than significant noise increases at any sensitive receptors regardless of their proximity to the eradication site.

Physically covering cut plants or small clones would require transporting approximately two to five persons by truck to place the covers. This activity would not generate significant noise and the limited scale and duration of this work would result in less than significant impacts.

Other potential noise impacts are described below.

IMPACT N-1: Disturbance of Sensitive Receptors

Use of gas-powered or other mechanized equipment may generate noise and affect residences or other sensitive receptors. However, these impacts would be temporary and less than significant with mitigation due to the limited scale and duration of periodic treatment at sites.

The use of water-filled dams or temporary dikes to enclose stands of non-native cordgrass and prevent tidal action would require construction equipment such as trucks, cranes, generators, and pumps. The engines and motors associated with the trucks, crane, generators, and pumps would temporarily elevate noise levels in close proximity to the site where the dam was being inflated. Such construction equipment typically generates maximum A-weighted noise levels of 80 to 85

dBA at a distance of 50 feet. Assuming compliance with local noise ordinance restrictions (including timing of construction activities) the noise generated by this activity would not cause a significant impact because of the limited duration necessary to install or remove the dam.

Mowing infestations with mechanical hand-held weed eaters has the capacity to generate noise. Noise generation would be similar to a residential gas-powered lawn mower, and noise levels would be elevated in close proximity to the work for the several hours or days necessary to treat infested sites. This treatment method would not cause a significant noise impact in excess of established standards on sensitive receptors, regardless of their proximity to the eradication area if the activity occurs during the daytime (7:00 a.m. to 7:00 p.m.), as typically required by local noise ordinances.

Mechanical smothering, ripping, and shredding machines are small, amphibious vehicles with tracks. It is anticipated that one to two amphibious vehicles per site would be used, depending on the size of the infestation. Noise data is not available for the small amphibious tracked vehicles. However, it is anticipated that the noise from these types of equipment would be similar to a small tractor or bulldozer. Such equipment generates a maximum noise level of about 80 dBA at a distance of 50 feet. Noise levels could be temporarily elevated at a sensitive receptor depending upon the ambient noise environment and proximity to the treatment site where the equipment is being operated. This eradication method would be appropriate in any setting regardless of the proximity of the noise-sensitive receptors, if the activity occurs only during daytime hours (7:00 a.m. to 7:00 p.m.) as typically required by local noise ordinances. The impact of this method would be less than significant because of the short duration (approximately one to two weeks to treat a large site) of the activity at any particular sensitive receptor location.

Ground-based application of herbicide by crews on foot, from trucks or other land-based vehicles or from boats would also be used to eradicate non-native cordgrass infestations. Typically, from one to three trucks or combination of trucks and boats for a large infestation would be expected. Noise resulting from crews, vehicles, air boats, or hover crafts could disturb adjacent residents located within approximately 500 feet of the activity. Because of the short duration (one to two weeks to treat a large site) of the noise exposure, the noise impact would be less than significant with mitigation.

Aerial application of herbicide would include the use of a helicopter fitted with a boom or spray ball. Helicopter noise is common in the Bay regions. If helicopters are maintained at a distance of at least 1,500 feet from residences, helicopter noise would not cause a substantial increase in noise levels or cause a significant disturbance because of the short duration (less than one day to treat a large site) expected to be necessary at any particular eradication area. Normally, helicopters do not operate within approximately 1,500 feet of residences, however if operations are closer than this distance, significant helicopter noise impacts may occur.

Mitigation N-1: Disturbance of Sensitive Receptors. The following measures shall be implemented to reduce project noise impacts:

N1-A. The use of equipment and machinery shall comply with all applicable local noise ordinances and policies. At a minimum, use of equipment and machinery in cordgrass removal shall be limited to weekdays (Monday to Friday) between the hours of 7:00 a.m. to 7:00 p.m. within 500 feet of sensitive receptors.

N1-B. Helicopters shall not be used within 1,500 feet of sensitive receptors.

ALTERNATIVE 2: Regional Eradication Using Only Non-Chemical Control Methods

Impacts

Alternative 2 would result in manual or mechanical methods being applied more frequently to compensate for those areas that might otherwise have been treated chemically. Short-term mechanical/vehicular noise impacts could result on a more frequent basis than described above under Alternative 1. However, there would not be any helicopter noise associated with this alternative. Impacts would be temporary and less than significant with mitigation due to the limited scale and duration of periodic treatment at sites.

Mitigation Measures

Mitigation N-1A would apply under this alternative. Mitigation N-1B would not apply because this alternative does not include aerial spraying.

ALTERNATIVE 3: No Action – Continued Limited, Regionally Uncoordinated Treatment

Impacts

Under Alternative 3, there would be an uncoordinated effort to eradicate non-native cordgrass throughout the Bay. Continued limited uncoordinated treatment could incorporate the use of any or all of the treatment methods included in Alternative 1, but the area of treatment could be reduced. Impacts would be temporary and less than significant with mitigation due to the limited scale and duration of periodic treatment at sites.

Mitigation Measures

Same as for Alternative 1.

Table 3.5-3: Summary of Potential Noise Effects

Impact	*Manual Removal (Hand pulling and manual excavation)*	*Mechanical Removal (Excavation, dredging, and shredding)*	*Pruning, Hand-mowing, and Smothering*	*Flooding (Diking, drowning, and salinity variation)*	*Burning*	*Herbicide Application*	*Beneficial Effects*
N-1: Disturbance of Sensitive Receptors.	All Alternatives: Minor noise during treatment activities.	All Alternatives: Potentially significant equipment noise during treatment activities.	All Alternatives: Minor noise during treatment activities.	All Alternatives: Potentially significant equipment noise during treatment activities.	All Alternatives: Minor noise during treatment activities.	Alternatives 1, 3: Minor noise during hand, all-terrain vehicle, or boat application activities. Potentially significant helicopter noise during aerial spraying. Alternative 2: No impact.	N/A

Table 3.5-4: Summary of Mitigation Measures for Noise

Mitigation	*Manual Removal (Hand pulling and manual excavation)*	*Mechanical Removal (Excavation, dredging, and shredding)*	*Pruning, Hand-mowing, and Smothering*	*Flooding (Diking, drowning, and salinity variation)*	*Burning*	*Herbicide Application*
Mitigation N-1: Disturbance of sensitive receptors. N-1A. The use of equipment and machinery shall comply with all applicable local noise ordinances and policies. At a minimum, the use of equipment and machinery in cordgrass removal shall be limited to weekdays (Monday-Friday) between the hours of 7:00 a.m. to 7:00 p.m. within 500 feet of sensitive receptors. N-1B. Helicopters shall not be used within 1,500 feet of sensitive receptors.	Not Applicable	Applicable (N-1A only)	Applicable (N-1A only)	Applicable (N-1A only)	Not Applicable	Applicable (Alts 1 & 3 only)

Note: Due to summarization, there may be textual differences between the measures in this summary table and the text in the section. The actual mitigation measure is in the text.

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