CITIZENS COMMITTEE TO COMPLETE THE REFUGE

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December 5, 2018

Via email: marc.zeppetello@bcdc.ca.gov

Bay Conservation and Development Commission
455 Golden Gate Avenue, Suite 10600
San Francisco, CA 94102-7019

RE: Enforcement Committee's Recommended Enforcement Decision Regarding Westpoint Harbor; Proposed Settlement Agreement between the Commission and Westpoint Harbor

Dear Chair Wasserman and Commissioners,

We write in regards to Item 10 of the Commission's December 6, 2018 Agenda. We urge the Commission not to approve the enforcement decision, including proposed Permit Amendment Ten, for Westpoint Harbor.

Citizens Committee to Complete the Refuge ("Citizens") is dedicated to the protection of the environment, and is particularly concerned about impacts to the Don Edwards San Francisco Bay National Wildlife Refuge, its ecosystem and affected species.

Citizens provided written comments urging BCDC to bring Westpoint Harbor into compliance with Permit No. 2002.002,on March 10, 2017, May 18, 2017, May 19, 2017, October 26, 2017, November 2, 2017, November 3, 2017, January 15, 2018 and March 8, 2018. Citizens provided oral testimony to the Enforcement Committee on November 16, 2017 and January 18, 2018, and to the Commission on March 15, 2018 regarding BCDC's proposed enforcement action regarding Westpoint Harbor. Citizens provided written comments to the Enforcement Committee on November 7, 2018 and oral testimony at the hearing on November 8. A copy of our correspondence to the Enforcement Committee is attached. On December 3, 2018 Citizens and its attorney, Law Offices of Brian Gaffney, submitted further comments to the Commission.

Because of the dramatic changes to the Permit which the public first learned about after October 26, 2018, Citizens is convinced that Amendment Ten is NOT consistent with the San Francisco Bay Plan, the McAteer-Petris Act, the Commission's Regulations, the California Environmental Quality Act, and the Commission's Amended Management Program for the San Francisco Bay segment of the California coastal zone.

We write to bring additional important concerns and information to your attention that have surfaced since the Enforcement Committee met in November.

1) Proposed Authorization for a Helipad

Attached is a PDF of helipad locations at the harbor. BCDC's proposed November 16, 2017 Cease and Desist and Civil Penalty Order (CDO) required Westpoint Harbor to remove the unauthorized asphalt pad, restore the surface to grade level, and properly dispose of the asphalt debris. Now Amendment Ten proposes to reverse BCDC's own CDO, after the fact permitting an illegally installed helipad without any environmental review.

Without thorough environmental review, BCDC must not authorize any helipad at the harbor. Also, immediately, BCDC must require the removal of the unauthorized asphalt pad. Only this will ensure that BCDC is in compliance with its statutory duties and public trust obligation.

2) New Buoy Near Entrance to Westpoint Slough Fails to Identify the "No Wake" Zone

"No Wake" buoys and signs were part of the BCDC original Westpoint Harbor permit as a means to protect Westpoint Slough mudflats and endangered species tidal marsh habitat on Greco Island from erosion caused by boat wakes. This condition was also included in the Redwood City Mitigated Negative Declaration at the request of the U.S. Fish & Wildlife Service – the agency with enforcement authority under the federal Endangered Species Act.

Proposed Permit Amendment Ten adds new language to Special Condition H asserting that Westpoint Harbor's placement of three signs near the marina basin entrance "satisfy the requirement to identify Westpoint Channel as a 'no wake' zone.

Signage on a new buoy recently installed near the entrance to Westpoint Slough from Redwood Creek does not identify a "No Wake" zone because it also displays a 10 MPH speed limit.

The signage on the new buoy displays two conflicting messages to boaters: "Slow-No Wake", and a circle designating a speed limit of 10 MPH. Boats traveling at 10 MPH can generate large wake waves that could have significant impacts to the tidal marsh and endangered species on Greco Island, depending on the size and type of boat. The signage must only display "Slow - No Wake" wording to meet the permit requirement.

3) Enforcement Committee's Request for Additional Information on the Shorebird Roosting Habitat Mitigation

At the November 8 Enforcement Committee hearing, the Committee requested a report from Westpoint Harbor on whether the remaining portion of Cargill's Pond 10 was meeting the permit requirement for "replacement habitat of similar functions and benefits" for shorebirds.

Prior to beginning any work authorized under Phase Two, the permittee was required to provide mitigation for the 2.3 acres of shorebird roost habitat lost as a result of the Westpoint Marina project. BCDC's required mitigation was for the permittee to provide approximately 3.0 acres of replacement habitat with similar functions and benefits for shorebirds. The habitat creation plans were to be reviewed and approved by BCDC after consultation with the U.S. Fish and Wildlife

Service and the California Department of Fish and Wildlife. Permit No. 2-02, Section II. F and Findings III.A.2 and III.F.

The August 17, 2001 LSA Biotic Resources Report prepared for the Westpoint Marina project stated that during a March, 2001 site inspection over 1,000 birds were observed roosting on the high ground in the southwest corner of the site and that shorebird use of the salt ponds had been documented since late 1980. The 3.0 acres of roost habitat was to be recreated on the south side of the levee separating the marina from the remaining bittern pond. The recreated roost habitat was to be high ground remaining exposed year-round, provide isolation and limited disturbance, and serve as an island, surrounded by open water, to provide shorebirds and other waterfowl with a protected roost.

Three acres of replacement shorebird roost habitat **with similar functions and benefits** has not been provided on the south side of the levee separating the marina from the remaining bittern pond, or in an alternate location. The “replacement” habitat which has been provided - without consultation with the resource agencies – does not have similar functions and benefits as the original habitat. This is in part because the required consultation and approval of habitat plans never occurred. Also, the permittee’s “replacement habitat” is at a lower elevation than the original habitat. During the winter as water levels rise the acreage of the replacement habitat shrinks and at certain times of year there is zero roosting habitat. For example, in 2017 as winter rains filled the former bittern pond lying south of the project site, by early spring roosting shorebirds were limited to the levee along the southern edge of Westpoint Marina. By mid-spring, during peak migration, shorebirds had abandoned this now-submerged pond altogether because of the absence of roosting habitat. Thus, neither the levee, nor the submerged pond, provide 3.0 acres of replacement habitat with similar functions and benefits for shorebirds as neither serve as an island of high ground remaining exposed year-round.

The Commission is not restricted from modifying the terms of the proposed settlement agreement. Even the Settlement Agreement negotiated behind closed doors provides that if the Commission makes recommendations to be incorporated into the permit, the Executive Director and Westpoint Harbor agree to address such recommendations.

In conclusion, we urge the Commission not to approve the currently proposed Westpoint Harbor enforcement decision. Instead, we urge the Commission to protect critically important Bay habitats and uphold the permit conditions which could protect these resources.

Thank you for giving these additional concerns your careful consideration.

Sincerely,

Gail Raabe Carin High

Gail Raabe Carin High
Co-Chairs
Citizens Committee to Complete the Refuge

Attachments

CITIZENS COMMITTEE TO COMPLETE THE REFUGE

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December 3, 2018

Commissioner R. Zachary Wasserman, Chair
Larry Goldzband, Executive Director
Attn: Marc Zeppetello
San Francisco Bay Conservation and Development Commission
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San Francisco, CA 94102-7019
marc.zeppetello@bcdc.ca.gov

RE: Item 10, December 6, 2018 BCDC Agenda
Permit Amendment Ten & Enforcement Committee's Recommended Enforcement Decision Regarding Westpoint Harbor

Citizens Committee to Complete the Refuge ("Citizens") submits the following comments regarding the location of Westpoint Harbor and regarding the failure of BCDC to comply with CEQA in Permit Amendment Ten and the Executive Director's Recommended Enforcement Decision dated October 26, 2018. A CEQA Categorical Exemption is improper for Permit Amendment Ten given the location of the Westpoint Harbor.

Westpoint Harbor: Unique and Important Site Information

Westpoint Harbor is surrounded by several sensitive San Francisco Bay aquatic habitats. To the north and east of the harbor are the subtidal, intertidal mudflat, and emergent salt marsh habitats of Westpoint Slough. Across Westpoint Slough to the north lies Greco Island, part of the Don Edwards San Francisco Bay National Wildlife Refuge. The southern boundary of the harbor is contiguous with a former salt pond used by roosting shorebirds during high tides. Protection of these habitats is critical for the preservation of several endangered, threatened and sensitive animal species in the vicinity of Westpoint Harbor, including the Ridgway's Rail (formerly California clapper rail, state and federally endangered), salt marsh harvest mouse (state and federally endangered), California least tern (state and federally endangered), western snowy plover (federally threatened), and harbor seals (federally protected). Greco Island also provides suitable habitat for the state-threatened black rail.

<u>General information</u>

In 1972 the National Wildlife Refuge in the South San Francisco Bay was established. As a testament to its importance, Greco Island in Redwood City was one of the four original units proposed for inclusion into the Refuge. In 1995, the Refuge was renamed the "Don Edwards San Francisco Bay National Wildlife Refuge.

The Refuge was established with three major purposes. The most important purpose of the Don Edwards San Francisco Bay Wildlife Refuge is to preserve the South Bay's natural resources. This includes the open water, mudflats and tidal marshes used by endangered species, harbor seals and migratory birds. Aiding in the recovery of two endangered species, the Ridgway's rail and salt marsh harvest mouse, is core to the Refuge's mission.

Within the South San Francisco Bay, Greco Island is Unique

In his September 18, 2001 letter to Redwood City, USFWS Clyde Morris described Greco Island as "one of the most valuable remaining salt water marshes in South San Francisco Bay" and one of the, "few remaining strongholds for the endangered California Clapper Rail and Salt Marsh Harvest Mouse as well as a great diversity of other wildlife." In its 2015 EIR for the Redwood City Harbor Navigation Improvement Integrated Feasibility Report, the US Army Corps of Engineers summarized two of the island's unique features: "Greco Island is the largest contiguous tidal marsh on the western side of the Bay and is relatively protected from human disturbance". It is no surprise then, that Greco Island has one of the largest populations of clapper rails in the west side of the south San Francisco Bay.

However, there are even more unique features of this island. Greco Island is a "remnant pre-historical tidal marsh" that contains "invaluable and irreplaceable information, preserving clues of the origin, development, structure, and composition of natural tidal marsh systems over several thousand years."(U.S. Fish & Wildlife Service 2013 Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California). In addition, remnant, pre-historic marshes like Greco Island are critical because they are species-rich and these remnant marshes are where most (>90%) of the state-threatened black rail live (San Francisco Bay Area Water Trail Plan Draft Revised EIR August 2010).

In her comments to Redwood City regarding the potential impacts of Westpoint Harbor to Greco Island, Jan Knight of the USFWS commented to Redwood City staff that Greco Island is, "…one of the few remaining large marshes left in South San Francisco Bay that support populations of the endangered southern subspecies of the harvest mouse. Greco Island also supports clapper rail. Although other marshes can be found in South San Francisco Bay, most are narrow, interrupted strips along sloughs and bayside dikes, or highly saline, diked-off marshes with areas of sparse pickleweed. … Much of the habitat value of Greco Island is due to its isolation, and care must be taken to insure that habitat values remain unaffected by this project.".

Threats to this unique island and its endangered inhabitants include dredging and boat wakes. These threats resulted in the USFWS voicing its concerns in a letter dated June 14, 2002 to the US Army Corps of Engineers regarding operations at Westpoint Harbor that, "Boating activity will likely contribute to erosion of existing marsh and mud-flats at Greco Island. The Service would therefore recommend a "no wake" policy be incorporated as a permanent part of any present or future operation of this site.", and that, "We also believe any future maintenance dredging of the Westpoint Slough channel would have serious effects on the Refuge and wildlife at Greco Island. We recommend that the applicant initiate a study on the effects of erosion and increased tidal flows that will result from the proposed dredging of the entrance to the marina."

Westpoint Slough and Greco Island Mudflats

The mudflats surrounding Greco Island provide feeding habitat for shorebirds. Because of the importance of these tidal mudflats to shorebirds, they, along with other habitats like the large areas of marsh habitat on Greco Island, have been included as part of the "Important Bird Area, San Francisco Bay – South" by the National Audubon Society.

The federally protected harbor seal forages in Westpoint Slough, and the mudflats of Greco Island are also used by harbor seals as a haul-out during low tides. Haul-out sites are critically important, especially during pupping season when disturbance to mother seals can seriously impact their pups. The north (bay side) of Greco Island is both a primary haul-out site and pupping site (San Francisco Bay Area Water Trail Site Description for Westpoint Harbor August 29, 2018) .

East End - Westpoint Slough Tidal Marsh

In addition to the marshes on Greco Island, the salt marshes on the outboard side of the Westpoint Harbor contain "excellent salt marsh habitat on the outboard side of the current salt pond levee on the Slough. This marsh has high potential to also provide habitat for the clapper rail and salt marsh harvest mouse. "(Letter from Clyde Morris, USFWS to Redwood City, September 18, 2001). As a result, in 2002 the USFWS admonished the US Army Corps of Engineers that, "extreme care must be taken in the planning, construction, and maintenance of this project." (June 14, 2002 letter from Jan Knight to Gomes USACE).

Remainder of Cargill Pond 10

Westpoint Harbor was excavated from a portion of Cargill Salt Company's Pond10. According to the USFWS, the area where Westpoint Harbor is today was used by large numbers of roosting shorebirds and the state and federally endangered California least tern. The remaining pond, approximately 61 acres, continues to provide valuable roosting and foraging habitat for a diversity of shorebird species and other waterfowl. Part of the value of this pond to high-tide roosting shorebirds is its location right next to mudflat foraging grounds in Westpoint Slough. As Jan Knight of the USFWS stated, "Part of the attraction for birds at this site is its aspect within an open water area, while also being close to mud-flats and open water areas of the Bay." (June 14, 2002 letter from Knight to Gomes USACE).

Thank you for the opportunity to provide comments.

Sincerely,

Gail Raabe Carin High
Co-Chairs
Citizens Committee to Complete the Refuge

Sources:

1) Letter from Jan Knight, USFWS to Jany, Redwood City, September 9, 2001.

(2) Don Edwards San Francisco Bay National Wildlife Refuge Final Comprehensive Conservation Plan, October 10, 2012. https://www.fws.gov/refuge/Don_Edwards_San_Francisco_Bay/CCP.html

(3) Letter from Clyde Morris, USFWS to Jany, Redwood City, September 18, 2001. BCDC AR file: 1.Letter_MorristoJany_2001_0918

(4) Draft Integrated Feasibility Report and Environmental Impact Statement/Environmental Impact Report Redwood City Harbor Navigation Improvement Feasibility Study and Integrated EIS/EIR. Appendix A, July 2015. https://www.spn.usace.army.mil/Portals/68/docs/P%20and%20Programs/Navigation/Appendix%20A%20-%20Affected%20Environment%20Resource%20Assessment%207-1-15.pdf

(5) U.S. Fish & Wildlife Service 2013 Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California. https://www.fws.gov/sfbaydelta/documents/tidal_marsh_recovery_plan_v1.pdf

(6) USACE Permit Evaluation and Decision Document, File No. 22454S, Westpoint Marina, March 23, 2004

(7) June 14, 2002 letter from Knight to Gomes USACE. BCDC AR file: 4Letter_KnighttoGomes_20020614

(8) https://www.audubon.org/important-bird-areas/san-francisco-bay-south

(9) San Francisco Bay Area Water Trail Plan Draft Revised EIR August 2010. http://scc.ca.gov/webmaster/project_sites/watertrail/wtdreir/Cover_Ch1.pdf

(10) San Francisco Bay Area Water Trail Site Description for Westpoint Harbor August 29, 2018. http://scc.ca.gov/files/2018/08/WestpointHarbor_SiteDesignationRpt_Sept2018.pdf

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December 3, 2018

Via Email

Commissioner R. Zachary Wasserman, Chair
Larry Goldzband, Executive Director
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RE: Item 10, December 6, 2018 BCDC Agenda, Permit Amendment Ten & Enforcement Committee's Recommended Enforcement Decision Regarding Westpoint Harbor

Dear Commission Members and Staff,

This office represents Citizens Committee to Complete the Refuge ("Citizens"). Citizens raised the issue of CEQA compliance on November 7 to the BCDC Enforcement Committee. See attached. This office submits the following on behalf of Citizens regarding the failure of BCDC to comply with CEQA in Westpoint Harbor Permit Amendment Ten and the Executive Director's Recommended Enforcement Decision dated October 26, 2018.

In summary, a Categorical Exemption for Amendment Ten would violate CEQA. The location of the project in a particularly sensitive environment makes claimed Categorical Exemptions 3, 4 and 6 inapplicable. The sensitive location also constitutes an unusual circumstance, and there is a reasonable possibility of significant adverse effects from Amendment Ten approved helicopter impacts, dredging impacts, and cumulative boat wake impacts. Any analysis of the environmental baseline will occur after project completion, and there has never been any analysis of the environmental impacts of Amendment Ten.

Sincerely,

Brian Gaffney

Brian Gaffney

cc: Citizens Committee to Complete the Refuge glraabe@sbcglobal.net
Enclosure

I. A Categorical Exemption for Permit Amendment Ten Would Violate CEQA.

A categorical exemption for Amendment No. Ten to Permit No. 2002.002.10 (Amendment Ten) would violate CEQA because (1) Categorical Exemption Classes 3, 4, and 6 are qualified by consideration of whether the project is to be located in a particularly sensitive environment (2) the adjacent wildlife refuge and the habitat for listed sensitive species constitute an unusual circumstance, (3) there is evidence of significant impacts from Amendment Ten activities, and (4) the cumulative impact of successive projects of the same type in the same place over time is significant.

As an initial matter, it is important to consider that under CEQA, a "project" is the "whole of an action." CEQA Guideline 15378(a). BCDC may not divide a single project into smaller individual subparts to avoid responsibility for considering the environmental impact of the project as a whole. BCDC must consider all aspects of Amendment Ten including the loss of buoys down the centerline of Westpoint Slough and the loss of buoys 100 feet from Greco Island salt marshes; dredging in the marina basin, the harbor entrance, in the slough, and potential future dredging events in these areas; helicopter usage; and loss of fencing from southern boundary of the property to protect habitats potentially used by listed species from human encroachment from the marina.

Amendment Ten states that:

> The activities or actions newly authorized by Amendment No. Ten (including the limited scope and duration of the authorized dredging) do not require additional environmental review under the California Environmental Quality Act because the following exemptions to CEQA review apply to those activities or actions: 14 California Code of Regulations sections 15303 (Class 3), 15304 (Class 4), 15306 (Class 6), and 15321 (Class 21). Amendment No. Ten, p. 56.

The Executive Director determined that the limited dredging authorized by Amendment Ten, and the associated information collection activities, are categorically exempt from CEQA review under 14 California Code of Regulations sections 15304 (Class 4 – minor alterations to land) and section 15306 (Class 6 – information collection). Executive Director's Recommended Enforcement Decision, p. 10.

CEQA Guideline 15300.2 in relevant part states specific exceptions to a Categorical Exemption that apply to Amendment Ten including:

(a) Location. Classes 3, 4, 5, 6, and 11 are qualified by consideration of where the project is to be located - a project that is ordinarily insignificant in its impact on the environment may in a particularly sensitive environment be significant. Therefore, these classes are considered to apply in all instances, except where the project may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.

(b) Cumulative Impact. All exemptions for these classes are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time is significant.

(c) Significant Effect. A categorical exemption shall not be used for an activity where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances. [1]

II. On Their Face CEQA Guidelines 15303, 15304, 15306 and 15321 Are Not Applicable to Amendment Ten.

A Class 3 Exemption is not applicable to Amendment Ten as Class 3 Exemptions are limited to commercial projects which are not located in an "environmentally sensitive area." The Westpoint Harbor is located in an environmentally sensitive area.

A Class 4 Exemption is not applicable to Amendment Ten as "grading shall not be exempt in a waterway," because minor alterations in land or water must "result in improvement of habitat for fish and wildlife resources or greater fish production," and because dredging must be "maintenance dredging." Amendment Ten involves entirely new dredging, not maintenance dredging, and would not improve habitat for fish and wildlife.

A Class 6 Exemption may be applicable to Section II.JJ. information collection IF such collection does not involve Amendment Ten dredging or suction dredging, approval of helicopter pad installation, or loss of buoy and southern fencing requirements. Class 6 Exemption consists of basic data collection which does "not result in a serious or major disturbance to an environmental resource."

A Class 21 Exemption is not applicable to Amendment Ten. Amendment Ten is not a BCDC action to enforce Permit No. 2002.002.10. Amendment Ten will allow Westpoint Marina to engage in new activities never included in Permit No. 2002.002.10.

Under CEQA, Categorical Exemptions must not to be expanded beyond the reasonable scope of their statutory language. It is CEQA's policy to afford the "fullest possible protection to the environment" within the reasonable scope of the statutory language.

III. The Location Of The Project In A Particularly Sensitive Environment Makes Claimed Categorical Exemptions 3, 4 And 6 Inapplicable.

- Westpoint Harbor is located immediately adjacent to Westpoint Slough. Greco Island, part of the Don Edward's National Wildlife Refuge, is located across Westpoint Slough from the Westpoint Harbor and the proposed dredging project.

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[1] Under CEQA, a "significant effect on the environment" is "a potentially substantial, adverse change in any of the physical conditions within the area affected by the project." CEQA Guideline 15382; see also Pub. Res. Code § 21083, subd. (b).

- Three listed species "occur in areas adjacent to the project site" including the federally endangered California clapper rail (*Rallus longirostris obsoletus* - also known as California Ridgway's rail), the salt marsh harvest mouse (*Reithrodontomys raviventris*) and the California least tern (*Sterna antillarum browni*). See 2004 Corps Permit 22454S. These species are also California fully protected species and listed as California endangered species. Other special status species in the area include western snowy plover (federally threatened) and harbor seals (federally protected).
- Greco Island has one of the largest populations of Ridgway's rail in San Francisco Bay. According to the Invasive *Spartina* Project 2016 Ridgway's Rail Surveys, breeding season surveys at the tidal marsh on Greco Island detected 43 rails. Greco Island is a "remnant pre-historical tidal marsh" that contains "invaluable and irreplaceable information, preserving clues of the origin, development, structure, and composition of natural tidal marsh systems over several thousand years" (USFWS Recovery Plan for Tidal marsh Ecosystems).
- Greco Island also is surrounded by extensive tidal mudflats. These flats are foraging habitat for both resident and migratory birds, and are also considered sensitive habitat vulnerable to changes in sediment supply and transport.
- Harbor seals, steelhead, and longfin smelt also occupy the waters of Westpoint Slough, and the mudflats provide feeding habitat for shorebirds.
- There are wetlands located south and east of the harbor levee that contain "excellent salt marsh habitat" that has "high potential to also provide habitat for the California clapper rail and salt marsh harvest mouse" (letter from USFWS Clyde Morris to Redwood City 9/18/2001).
- Cargill Pond 10, directly adjacent to the harbor, is valuable roosting and foraging habitat for a diversity of shorebirds and other waterfowl because of "being close to mudflats and open water areas of the Bay" (USFWS Knight letter to Gomes USACE June 14, 2002).

Thus, in accord with CEQA Guideline 15300.2, subd. (a), Categorical Exemptions 3, 4 And 6 are inapplicable in this sensitive environment.

IV. The Sensitive Location of Westpoint Harbor Also Constitutes an Unusual Circumstance, and There is A Reasonable Possibility of Significant Adverse Environmental Effects.

As the Supreme Court recognized, in accord with CEQA Guidelines 15300.2, subd. (c), a party invoking the exception may establish an unusual circumstance "*without evidence of an environmental effect*, by showing that the project has some feature that distinguishes it from others in the exempt class, *such as its …location*. In such a case, to render the exception applicable, the party need only show a reasonable possibility of a significant effect due to that unusual circumstance. *Berkeley Hillside Pres. v. City of Berkeley* (2015) 60 Cal. 4th 1086, 1105, emphasis added.

Alternatively, a party may establish an unusual circumstance with evidence that the project will have a significant environmental effect. That evidence, if convincing, necessarily also establishes "a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances." Ibid.

Whether a particular project presents circumstances that are unusual for projects in an exempt class is essentially a factual inquiry. Agencies must weigh the evidence.

V. There is Evidence of Significant Environmental Effects from Amendment Ten Approved Helicopter Impacts.

> Amendment Ten would allow Westpoint to
> Install, use, and maintain up to 2,525-square-foot helipad adjacent to the pathway at or near the southeastern portion of the Westpoint Harbor site or other adjacent areas where the permittee holds an appropriate property interest (Amendment No. Ten).

The scientific literature is clear regarding the significant adverse effects of aircraft disturbances on seabirds, shorebirds and marine mammals. This information is relevant as it has been prepared regarding overflights, including in the Gulf of the Farallones National Marine Sanctuary and considers impacts on shorebirds on the California Coast. The literature shows adverse impacts to pinnipeds, and birds (including breeding productivity, feeding, and sheltering impairments). Aircraft at lower altitudes to cause more disturbances to seals. Helicopters have been widely viewed as the most disturbing type of aircraft for birds (Drewitt 1999). For California Common Murre colonies at Castle-Hurricane, Rojek et al. (2007) found that the proportion of recorded helicopter overflights that caused disturbance (83%) was greater than that of fixed wing aircraft overflights (57%).

The helipad – which was built illegally without agency approvals or environmental review - is located adjacent to Cargill Pond 10 which is important habitat for roosting and foraging shorebirds, and near the Westpoint Slough tidal marsh that provides habitat for endangered rails and mice, as well as seals.

In addition, the helicopter landing pad is not used in connection with the State Coastal Conservancy's non-native Spartina eradication program as the Executive Director's October 26, 2018 Recommended Enforcement Decision erroneously asserts.

VI. There is Evidence of Significant Environmental Effects from Amendment Ten Approved Dredging Impacts.

As an initial matter, dredging was not part of the approved Westpoint Marina Project. Thus, agencies including BCDC and the Corps to date have not evaluated the environmental impacts from the currently proposed dredging operations.

Dredging has significant environmental impacts including, but are not limited to: (1) increased turbidity, (2) temporarily reduced dissolved oxygen, (3) release of contaminants, (4) erosion of adjacent sediments, (5) removal of benthic and epibenthic invertebrates, (5) entrainment or mechanical harm to fish, and (6) reduced prey availability for invertebrates, fish and birds. This creates potential negative impacts to the available habitat for resident and migratory species, and potential impacts to the physical features of adjacent habitats, sediment transport and hydrology in the area.

Both the Don Edwards San Francisco Bay National Wildlife Refuge and the USFWS Endangered Species Division have expressed serious concerns regarding impacts to wildlife habitat and listed species from dredging at the time the original project for the construction of Westpoint Harbor was undergoing environmental review and permitting.

In a September 18, 2001 comment letter on the Redwood City Notice of Negative Declaration and Use Permit for the original marina project, Refuge Manager Clyde Morris stated:

> **we are concerned that increased tidal flows from dredging/opening the marina acreage could cause erosion at Greco Island and the project site's salt marshes. We also believe <u>any future maintenance</u> dredging of the Westpoint Slough channel would have <u>serious impact</u> on the Refuge and wildlife at Greco Island. We recommend a requirement that <u>no</u> dredging be allowed in Westpoint Slough in the future** except the Port of Redwood City's historic dredging of the bar at the entrance of the Slough to Redwood Creek. We suggest that potential erosion impacts from the proposed dredging of the entrance to the marina and increased tidal flow **be evaluated and eliminated**. We recommend that the Marina offset any unavoidable permanent loss of mudflat and marsh habitat which will result from the dredging project and tidal flow increase. **These mudflats are frequently used by feeding shorebirds and as we have stated previously, the marsh provide habitat for endangered species in addition to a variety of other wildlife**. (*Emphasis added*.)

In a June 14, 2002 comment letter on the Corps' Public Notice for the original project, Jan Knight, Chief of the Endangered Species Division, Sacramento U.S. Fish and Wildlife Office, stated:

> The Don Edwards San Francisco Bay National Wildlife Refuges' (Refuge) Greco Island is approximately 500 feet across Westpoint Slough from the project site. **This island is one of the few remaining large marshes left in South San Francisco Bay that support populations of the endangered southern subspecies of the harvest mouse. Greco Island also supports clapper rail.** Although other marshes can be found in South San Francisco Bay, most are narrow, interrupted strips along sloughs and bayside dikes, or highly saline, diked-off marshes with areas of sparse pickleweed. Harvest mice and clapper rail may occur in some of these areas, but the status and vigor of the populations are unknown**. Much of the habitat value of Greco Island is due to its isolation**, and care must be taken to insure that habitat values remain unaffected by this project. The West Point Marina project site itself contains excellent salt marsh habitat on the outboard side of the current salt pond levee on the Slough. This marsh has high potential to also provide habitat for these endangered species. **Due to the presence of listed species at**

> **these nearby properties, extreme care must be taken in the planning, construction, and maintenance of this project**.
>
> Increased tidal flows from dredging/opening the marina acreage could cause erosion at Greco Island and the project site's salt marshes. **We also believe any future maintenance dredging of the Westpoint Slough channel would have serious effects on the Refuge and wildlife at Greco Island**. (*emphasis added*)

The U.S. Fish & Wildlife Service 2013 Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California lists human disturbance as one of the existing threats to tidal marsh ecosystems and the sensitive species / California clapper rail, including maintenance activities for levees, dredge locks[*these activities require the use of a dredge*] and **boating** (Goals Project 1999)

> The ramifications of disturbance related to human traffic **during breeding season primarily include effects on eggs and chicks or the season's reproductive effort**. In addition, **anthropogenic noise may also impact survival of adults. Adults may be more responsive to noise during the breeding season, as their mating system is based primarily on auditory signals. Loud noises may elicit calling or prevent advertising calls from being heard, which could disrupt pair bonding and mating efforts. Studies of noise criteria suggest that noise levels above 80 to 85 decibels (dB) are disruptive to normal behavioral patterns in birds (Transportation Noise Control Center 1997). Clapper rails may be sensitive to noise throughout the year, as rails were heard calling in response to a nearby jackhammer in September** (Evens *in litt*. 2009)

Further, the DMMO informed Westpoint Harbor that there were protected species considerations that required evaluation. The DMMO noted that state-listed longfin smelt were likely present in the marina, and use of a hydraulic suction dredge, even a small diver operated device used to clear areas under the dock and along the marina edge, could potentially entrain and kill this species.

Excavating Westpoint Harbor's marina from a former salt pond has resulted in the formation of a sediment sink within the local marina/slough/marsh system that did not previously exist when the former salt pond was cut off from tidal action marina was created, sediment has been and continues to be transported through Westpoint Slough and into the marina, resulting in its accretion in the berths and fairways. The addition of the new sediment trap, and continual removal of sediment from dredging will only exacerbate that process and possibly lead to loss of exposed mudflat for shorebird foraging and the erosion of tidal marsh.

VII. Rails, Harvest Mice And Least Terns Are "Fully Protected Species" Under California Law.

In addition to the requirement that this proposed project comply with CEQA, California law protects the California clapper rail (*Rallus longirostris obsoletus*), the salt marsh harvest mouse (*Reithrodontomys raviventris*) and the California least tern (*Sterna antillarum browni*) as "fully protected species" which may not be taken or possessed at any time. Calif. Fish & Game Code §§ 3511, 4700. The California Supreme Court has held that "fully protected species" are subject to an express prohibition on taking that is a stricter prohibition than provided under the California Endangered Species Act, even where such taking of a fully protected species is "mitigation for a project under CEQA." *Center For Biological Diversity v. California Department of Fish and Wildlife* (2016) 62 Cal.4th 918.

VIII. It is Unclear on What Basis BCDC Claims to Be the Lead Agency under CEQA and Thus Able to Make a Determination that Amendment Ten is Categorically Exempt.

Amendment Ten states - under the "Environmental Review" heading – states that The City of Redwood City is "the lead agency for the project."

Yet, the November 29, 2017 BCDC Letter to Westpoint Harbor states (at p.2) that "we have determined that the proposed (dredging) project may have a significant adverse impact on the environment and that the Commission will assume the role of the CEQA agency and prepare an environmental assessment. See 14 CCR 15052(a)."

In correspondence to Westpoint Harbor, BCDC claimed it was the CEQA lead agency because BCDC "was required to evaluate the environmental effects of all aspects of the project, to ensure compliance with a broad range of applicable statutory provisions and Bay Plan policies, including but not limited to laws and policies related to: (1) the manner of dredging; (2) the manner and location of disposal of dredged material; (3) protection of fish, other aquatic organisms, and wildlife; (4) water quality; (5) tidal marshes and tidal flats; (6) subtidal areas; and (6) shoreline protection." Given that BCDC has abdicated any such environmental review, its stated basis for being the CEQA lead agency must also fail.

A responsible agency must assume the role of the lead agency when certain conditions occur. CEQA Guideline 15052. BCDC can assume the role of lead agency - if the 15052 conditions apply; but here the statute of limitations has not expired.[2] Thus, it is unclear on what basis BCDC can cut off environmental review through a Categorical Exemption.

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[2] 14 CCR 15052 provides (a) Where a responsible agency is called on to grant an approval for a project subject to CEQA for which another public agency was the appropriate lead agency, the responsible agency shall assume the role of the lead agency when any of the following conditions occur:
(1) The lead agency did not prepare any environmental documents for the project, and **the statute of limitations has expired** for a challenge to the action of the appropriate lead agency.
(2) The lead agency prepared environmental documents for the project, but the following conditions occur:
(A) A subsequent EIR is required pursuant to Section 15162,, (B) The lead agency has granted a final approval for the project, **and (C) The statute of limitations** for challenging the lead agency's action under CEQA **has expired**.

IX. A Categorical Exemption for Amendment Ten is Inapplicable as the Cumulative Impact of Successive Projects of the Same Type in the Same Place, Over Time is Significant.

BCDC's Permit and the 2001 Redwood City Mitigated Negative Declaration included the requirement that Westpoint Harbor installation of buoys down the centerline of Westpoint Slough to identify the "No Wake" speed zone, to delineate the center of the channel for adequate draw, and to discourage boats from deviating off the navigable channel. In addition, Westpoint was to install and maintain a buoy system100 feet from the salt marsh on Greco Island along Westpoint Slough and Redwood Creek.

Westpoint did not install and maintain these buoys resulting in high speed boat wakes. In addition, PropSF Ferries high speed ferry opertation to the Port of Redwood City is a successive project of the same type in the same place.

There are cumulative impacts from these operations which have not been analyzed. Thus a Categorical Exemption would be improper.

X. Amendment Ten Does Not Disclose Where Dredging Will Occur, What Type of Dredging Will Occur, Nor When it Will Occur.

The scope of the dredging project has not been revealed to the public. Amendment Ten identifies dredging only within areas as shown on the exhibit entitled "Dredging Footprint," dated October 25, 2018, to an authorized project depth of -7.5 MLLW plus 2 feet allowable over-dredge depth. But, this exhibit has not been made available to the public. Only after Amendment Ten is approved will Westpoint provide a bathymetric map showing "the location of all areas to be dredged, the depths dredged, and the volume of dredged material."

According to the applicant's April 17, 2017 Consolidated Dredging-Dredged Material Reuse/Disposal Application and Memorandum submitted to the Corps for the Westpoint Harbor Dredging Project, clamshell dredging will occur June 1 through November 20 of each year, and the diver-operated suction dredging will occur throughout the year as needed.

On June 17, 2017, Westpoint Harbor submitted an application to the State Lands Commission for a lease to dredge the State tidelands within the slough adjacent to the harbor entrance, and that lease application has not been withdrawn.

Amendment Ten does not disclose the dredging schedule, how long dredging episodes will last, how many dredging episodes there will be, or what future dredging is anticipated.

Amendment Ten states that dredging can commence on September 1. The rail breeding season continues through September 1. All dredging and disposal activities shall be "confined to

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(3) The lead agency prepared inadequate environmental documents without consulting with the responsible agency as required by Sections 15072 or 15082, **and the statute of limitations has expired** for a challenge to the action of the appropriate lead agency.

the work window, between September 1st and November 30"… "except as provided below," but Amendment Ten does not define the exception provided below. For example, the public does not know if the resource evaluation report contemplated by Section II.JJ. will include suction dredging.

XI. Any Analysis Of The Environmental Baseline Under Amendment Ten Will Occur After Project Completion.

Following the final dredging episode authorized under Permit Ten, a report will be prepared, based on information collected since 2006 regarding the marsh footprint of Greco Island and the physical conditions along the margins of Westpoint Slough between the marina entrance and the western tip of Greco Island (Amendment No. Ten).

If the environmental baseline is to be based on information collected since 2006, that information is available today, and must form the environmental baseline against which Amendment Ten is evaluated.

XII. There Has Never Been Any Analysis of the Environmental Impacts of Amendment Ten[3]

Over sixteen years ago, the U.S. Fish & Wildlife Service urged a study on the effects of erosion and increased tidal flows that will result from any proposed dredging of the entrance to the marina. The Service stated that results from this study would facilitate the formulation of a maintenance plan for dredging between the marina and the opening of Westpoint Slough.

However, neither BCDC, Redwood City or the Westpoint Harbor ever undertook such a study on the effects of erosion and increased tidal flows resulting from dredging of the entrance to the Westpoint Marina. As Jan Knight commented in 2002, only with such a study can a maintenance plan for dredging between the marina and the opening of Westpoint Slough be formulated and properly evaluated.

Redwood City's 2001 initial study for the project did not analyze or describe the potential environmental impacts of future dredging of the marina basin, marina entrance, or adjacent areas of Westpoint Slough.

Westpoint Harbor was not constructed in 2006 and thus considered in the 1998 Joint Environmental Impact Statement/ Environmental Impact Report for the Long Term Management Strategy for the Placement of Dredged Material ("LTMS") in the Bay Region.

[3] The last time the public heard about this project, prior to Nov 8, there was a proposed Permit Amendment Eight. The public does not know what constitutes Permit Amendment Nine, whether it was approved by BCDC or when, or what CEQA review may or may not have occurred for that amendment.

It would be inappropriate to issue Amendment Ten without the environmental review required by law for the whole of the project of Amendment Ten.

A LITERATURE REVIEW OF THE EFFECTS OF AIRCRAFT DISTURBANCES ON SEABIRDS, SHOREBIRDS AND MARINE MAMMALS

Tinya Hoang, August 2013

Presented to NOAA, Greater Farallones National Marine Sanctuary and The Seabird Protection Network

INTRODUCTION

This report reviews literature on the effects of aircraft disturbances on seabirds, shorebirds and marine mammals in order to provide background information for an assessment of current overflight regulations in Gulf of the Farallones National Marine Sanctuary. There are numerous studies that have investigated the effects of aircrafts on birds; therefore, in order to narrow down the scope of this review, I focus on studies that examine seabird and shorebird species that occur on the California coast. In addition, species that occur elsewhere in the world and that are closely related and behaviorally similar to those found in California were considered (i.e. same genus and nesting, feeding and roosting behaviors). This report also provides a preliminary review of literature on aircraft disturbances to marine mammals, with a focus on pinnipeds and cetaceans that are found on the California coast.

AIRCRAFT DISTURBANCES TO SEABIRDS AND SHOREBIRDS

Aircraft disturbance can be defined as any aircraft activity that changes the behavior or physiology of a bird. Behavioral changes range from the lowest detectable response of head turning to the more extreme response of flushing, while physiological changes can be detected as changes in heart rate. Disturbance from aircraft overflights are potentially harmful to seabirds and shorebirds due to reduced reproductive success, increased predation, increased energy expenditure, reduced habitat use and reduced food intake. Studies often examine the behavioral responses of birds to overflights; however, it is difficult to determine the broader impacts to the population, especially for lower levels of behavioral change. Many factors can influence the response of birds, including the type of aircraft, the magnitude and frequency of the disturbance, the bird species, habituation and timing. Although the study findings reviewed herein are specific to the species and conditions that were examined, this previous research can provide a better understanding of the factors that are important to consider as the Sanctuary assesses its overflight regulations.

TYPES OF REACTIONS

Birds can exhibit a range of reactions to aircraft disturbances. Behavioral changes can include 1) scanning and alert behaviors, such head turning, neck extension, body re-orientation and tension; 2) agitated behavior, such as increased calling, head bobbing, restless pacing and wing-flapping; 3) protective or escape behaviors, such as crouching, and flying, running, diving, or swimming away (Brown 1990; Kempf and Hüppop 1998). Although birds may sometimes not show outward behavioral changes to disturbances, they may still experience stress, which can be manifested physiologically as increased heart rates (e.g. Wilson et al 1991). It is not known whether chronic stress from overflights is harmful to animals, but several national wildlife refuge managers have suspected that stress from overflights make waterfowl more susceptible to disease (Gladwin et al. 1987, USFWS 1993 in NPS 1995).

TYPES OF AIRCRAFT

Aircraft disturbances from different types of aircrafts may elicit different responses in birds. Helicopters have been widely viewed as the most disturbing type of aircraft for birds (Drewitt 1999). For California Common Murre colonies at Castle-Hurricane, Rojek et al. (2007) found that the proportion of recorded helicopter overflights that caused disturbance (83%) was greater than that of fixed wing aircraft overflights (57%). These differences in response were partly attributed to the low-altitude capabilities of helicopters, which makes it more likely that a disturbance would occur. At the same time, on average, helicopters tended to disturb at higher altitudes than fixed aircraft. This may be due to the louder engines and rotor vibration of the helicopters (Rojek et al. 2007). In the Dutch Wadden Sea, helicopters disturbed roosting oystercatchers, Bar-Tailed Godwits and curlews more often and over longer distances than military jets (Visser 1986 as cited in Smit & Visser 1993). Visser (1986) found that a helicopter at <1500 m (4,920 ft) caused a greater proportion of flocks to take flight than a jet at <1200 m (3,940 ft). In the German Wadden Sea, Heinen (1986) reported that roosting shorebirds were disturbed in 100% of potentially disturbing helicopter overflights, which was more often than jets (84%), small civil aircraft (56%) and motor gliders (50%) (as cited in Smit & Visser 1993). In the MacKenzie Valley and North Slope of Alaska, it was found that the incubating behavior of Glaucous Gulls and Arctic Terns were affected more by helicopters than fixed wing aircraft, but even more so by human presence (Gunn and Livingston 1974 as cited in NPS 1995).

However, birds are not consistently affected by helicopters more than other types of disturbance. Kushlan (1979) compared the use of helicopters and fixed wing planes for conducting wading bird censuses in Florida and showed that for overflights at 60 m (200 ft) and 120 m (390 ft), helicopters caused the same or less amount of disturbance to Great Egrets, Snowy Egrets and Louisiana Herons than fixed wing planes in 11 out of 12 comparisons. In South Africa, a helicopter was used to spray rotenone in a lake, such that it flew for 5 hours at 15-20 m above the lake (Williams 2007). Although the waterbirds, which included Great White Pelicans and White-breasted Cormorants, demonstrated escape behavior by moving out of the path of the helicopter, the level of disturbance was less than that observed for a known predator, an African Fish Eagle, that flew overhead and for humans that were collecting dead fish on the shore. In Scotland, Dunnet (1977) studied the effects of helicopters and small fixed wing airplanes on a mixed colony of incubating and brooding seabirds, consisting of guillemots, kittiwakes, Herring gulls, fulmars, shags, razorbills and puffins. The guillemots and kittiwakes did not show any significant flight responses to the planes flying 100 m (330 ft) above the cliff where the birds were nesting (Dunnet 1977). It was thought that these birds may have become habituated to these overflights.

Findings on the effects of jets are also variable. In the Dutch Wadden Sea, Koolhaas et al. (1993) compared the numbers and behaviors of Red Knots in the presence and absence of low flying jet fighters at 50 m (160 ft). The authors found that there were fewer knots present on the days with jet overflights and that the birds were also more restless and less approachable by humans. However, they also observed that “light tourist airplanes” caused a more severe response in the knots than the jet fighters. Black et al. (1984) found that low flying F-16 jets at <150 meters (500ft) above ground level did not have any effect on colony establishment or the size of wading bird colonies, consisting of Cattle Egrets, Double-crested Cormorants, Great Blue Herons, Great Egrets and White Ibises.

Jets also have the capability of flying at supersonic speeds, which create sonic booms. The effects of sonic booms have also been found to be variable. For example, sonic booms have led to non-productivity limiting alert reactions in seabirds (Schreiber and Schreiber 1980 as cited in Black et al. 1984), but have also been associated with a mass hatching failure in Sooty Terns in the Dry Tortugas Islands (Austin 1970 as cited in NPS 1995).

Few studies have investigated the effects of ultralight aircrafts, and no studies could be found related to seabirds. Smit and Visser (1993) suggested that ultralights may be very disturbing due to the low altitudes at which these aircraft fly and the noise that they generate. In the Netherlands, the numbers of Bewick’s Swans roosting and foraging close to an ultralight air strip dropped dramatically from 1,400-4,300 in 1986-1988 to just a few birds in 1989 after the air strip had been used only for one year (in Smit & Visser 1993). On the other hand, a study on the effects of ultralights on Pink-footed geese observed that the birds were able to habituate quickly to the ultralights that were landing and taking off 250 m (820 ft) from their feeding area. Furthermore, it was found that the Pink-footed geese, lapwings, curlews and golden plovers showed no disturbance when ultralights were >300 m (1000 ft), and that disturbance was first observed around 500 feet (Evans 1994 as cited in Drewitt 1999). There is also evidence that a small brood of black-tailed godwits and curlews died out in Hesse, Germany due to ultralight activities (in Kempf and Hüppop 1998)

No studies on the effects of paragliding or hang gliding on seabirds or shorebirds could be found, though hang gliders have been identified as a source of disturbance to western snowy plovers (USFWS 1995 in Lafferty 2001). Acosta et al. (2009) also reported a motorized hang glider that flushed 20 Brandt's cormorants on Alcatraz Island. As for motor gliders, a study in the Wadden sea found that these aircrafts had a stronger effect on breeding and resting birds than powered planes (in Kempf and Hüppop 1998).

NOISE LEVEL

Aircraft noises can be measured based on their sound pressure level and frequencies. Sound pressure levels are often measured with the logarithmic decibel (dB) scale relative to a reference value. The following studies measure noise level using the decibel scale weighted with an A-weighting filter (dBA), which is based on the sensitivity of the human ear to different frequencies. Therefore, they may not reflect the noise sensitivity of birds (NPS 1995).

Brown (1990) conducted an experiment to measure the effect of noise on nesting Crested Terns in Australia using acoustic stimuli that simulated the sound of an overflying floatplane. The different sound treatments had peak noise levels that ranged from 65-95 dBA, and simulated a plane flying over at altitudes from 75-300 m (250-980 ft). The background level noise from ocean wave action was 55-65 dBA and noise from bird call activity was 60-75 dBA. The author measured multiple levels of response: 1) scanning, 2) alert, 3) avoidance, and 4) escape behaviors for these sound treatments. The majority of birds showed scanning behavior for all treatment levels, even just above the background noise level. Alert behavior had a strong positive relationship with increasing noise level, while avoidance and escape behaviors were mostly exhibited at the higher noise levels (>85 dBA). Brown (2001) also conducted a similar noise experiment, except the sounds simulated a helicopter landing, pausing and taking off. Even though the peak noise levels of the sound treatments were the same in the two experiments, the noise of the helicopter caused greater avoidance and escape behaviors than the noise of the fixed wing in the earlier experiment. It was suggested that these differences could be attributed to differences in frequency and the temporal aspects of the helicopter noise. In addition, Brown (2001) tested the effects of visual stimuli and found that they were not as important as the acoustic stimuli in generating behavioral responses.

Breeding gull colonies have been observed close to airports, and it had been thought that they do not experience any negative effects from aircraft noise (Busnel 1978 as cited in Burger 1981). However, Burger (1981) showed that a herring gull colony that was located close to the Kennedy International Airport was disturbed particularly by the high noise levels from landing supersonic planes (Concordes). To measure disturbance, the author counted the number of gulls that flew up in response to different noise conditions at the airport. The average noise levels were 77 dBA for ambient noise, 91.8 dBA for subsonic jet noise, and 108.2 dBA for noise from supersonic planes. The gulls did not react significantly to the noise from subsonic planes, but did react significantly to supersonic planes, such that there were twelve times as many birds that flew up than under normal conditions. These bird flights led to fights between birds returning to their nests, which in turn caused eggs to be broken. The differences in responses to the planes may also be due to other factors in addition to noise level. The author noted that the sound characteristics of supersonic planes are different and that they can cause vibrations when flying directly overhead. Furthermore, the supersonic planes land once daily whereas subsonic jets land every 2-3 minutes. Therefore, it is possible that the frequency of exposure to supersonic planes may not have allowed gulls to habituate to the noise.

In Minnesota, a study was conducted to investigate the effects of an airport expansion on nearby nesting Black-crowned Night Herons, Great Blue Herons and Great Egrets (Grubb 1979). A single engine propeller aircraft was flown over the heron rookery at 490-2,620 m (150-800 ft). The calculated noise levels corresponding to these flight altitudes ranged from 61-88 dBA, and were 9 dBA greater than calculated existing maximum aircraft noise levels and 20 dBA greater than measured ambient noise levels. No reactions were observed in the birds in response to these test overflights, although the author did not specify what behaviors he was examining.

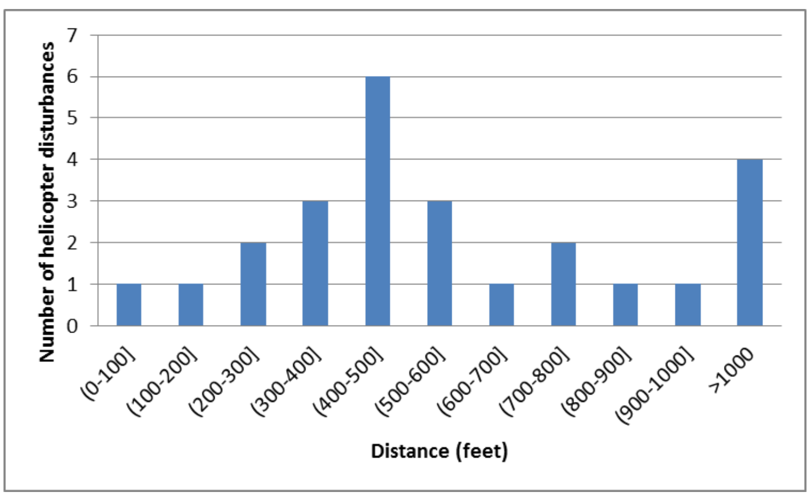
Jehl and Cooper (1980) studied the effects of sonic booms to seabirds on the Channel Islands and found that sonic booms disturbed birds less than humans at roost sites and helicopters (as cited in Manci et al. 1988). However, louder booms (80-89 dBA SEL) were more disturbing than softer booms (72-79 dBA SEL). They also conducted noise disturbance tests using shotgun blasts and explosives and observed that birds flew away from their nests without knocking their eggs out and then returned within 30 seconds. Another experiment at the Channel Islands used a carbide pest control cannon to simulate sonic booms (Stewart 1982 as cited in Manci et al. 1988). Most birds within 100 m (330 ft) of the cannon flushed and returned within 2-10 minutes.

Schreiber and Schreiber (1980) investigated the effects of sonic booms on nesting gulls and cormorants and found that the effects of the sonic booms were minimal compared to humans walking into the colony (in Drewitt 1999). In contrast, sonic booms have also been associated with a mass nesting failure of Sooty Terns in the Dry Tortugas Islands in 1969, where 98% of the tern population failed to reproduce. The authors did not have evidence showing that sonic booms caused physical damage to eggs, though it was thought that the booms disturbed the incubating rhythm and caused nest desertion (Austin 1970 cited in Manci 1988). A colony of Brown Noddies, however, was able to breed successfully. It is suggested that eggs are known to be resistant to sonic booms (cited in Burger 1981).

DISTANCE

Altitude and lateral distance determine the noise level and the visual size of overflying aircraft and are important factors that affect the responses of birds. The distances at which aircraft will disturb birds can depend on the type of aircraft. For example, as mentioned earlier, helicopters have been found to cause disturbance in shorebirds at higher altitudes than jets (Visser 1986). Rojek et al. (2007) found that on average, flushing of Common Murres at Castle-Hurricane seemed to occur at higher altitudes for helicopters (229 m/750 ft) than fixed wing planes (193m/630 ft), although the difference was not significant. Head bobbing occurred at similar altitudes for helicopters and fixed wing planes (232 m/761 ft and 233 m/764 ft on average, respectively). The average altitude at which fixed wing planes did not cause a response was 246 m (800 ft). Unexpectedly, the average altitude at which helicopters did not elicit a response was 205 m (670 ft), which is lower than the average helicopter flushing altitude. However, Rojek et al. did not address this finding in the discussion of their study.

In this report, distance information was compiled from reports on the restoration of Common Murres colonies in Central California from 1999-2011, which were prepared for the Apex Houston Trustee Council. This information is likely only a subset of the data on disturbance distances that have been recorded. The absolute distance was calculated when both the altitude above sea level (ASL) and lateral distance were provided for a given aircraft disturbance. Below is a graph representing the different distances at which 25 helicopter disturbances caused flushing of Common Murres in various colonies in Central California.



The number of helicopter disturbances that caused Common Murres to flush at different distances from the colony.

Many of the disturbances (6 out of 25) occurred due to helicopters that were 120-150 m (400-500 ft) away. There were also four disturbances that were caused by helicopters more than 1000 feet away. Two of the helicopters in this category were in fact at lower altitudes (120m/400 ft), but also had a lateral distance component. These results might suggest altitudes at which the birds might be particularly sensitive, but might also be a consequence of the flight patterns of pilots.

The table below is a summary of studies on seabirds and shorebirds that have disturbance and distance information.

Bird species	Aircraft type	Distance	Effect	Paper
Common Murres	Helicopters and Fixed wing	a) Helicopter at 15-366 m (50-1,200 ft) and Fixed Wing at 183-213 m (600-700 ft) b) Helicopter at 15-457 m (50-1500 ft) and FW at 152-426 m (150-1400 ft) c) Helicopter at 122-305 m (400-1000 ft) and FW at 91-305 m (300-1000 ft)	a) Flush b) Head-bob c) No response	Rojek et al. 2007
Common Murres, Kittiwakes	Helicopter and Fixed wing	150 m (500 ft) ASL, 100 m (330ft) above cliff	No significant effect on Murres and Kittiwakes	Dunnet 1977
Brunnnich's guillemots, kittiwakes	Helicopter	a) 500-6,000 m (1,640-19,670 ft) b) <2,000 m (6,560 ft)	a) Non-breeding birds left colony at these distances b) Non-breeding birds always disturbed	Fjeld et al. 1988
Glaucous gull, Arctic Tern	Helicopter and Fixed wing	150-300 m (500-1,000 ft)	Flushing from nest, disrupt nest behavior	Gollop et al. 1974 (cited in NPS 1995)
Great Egret, Snowy Egret, Louisiana Heron	Helicopter and Fixed wing	60 and 120m (200 and 390 ft)	90% of birds did not respond or looked up. Flushed birds return within 5 min	Kushlan 1979
Gannets	Light aircraft	200 m (660 ft)	Entire colony scattered for 1 hour, >2,000 gannets lost eggs or chicks to predation	Zonfrillo 1993
Shorebirds (includes Curlews, Red Shank and Bar-tailed Godwits)	Small aircraft	a) >300 m (980 ft) b) 150-300 m (490-980 ft) c) >300 m (980 ft)	a) 8% disturbed b) 66% disturbed c) 70% disturbed	Heinen 1986 (cited in Smit & Visser 1993)
Shorebirds (unknown)	Small aircraft	a) 150 m (500 ft) b) 300 m (1,000 ft)	a) Always disturbance b) disturbance within 1,000 m (3,280 ft) radius	Baptist & Meininger 1984 (in Smit & Visser 1993)
Shorebirds (unknown)	Small aircraft	1,000 m (3,280 ft)	Disturbance	Werkgroep Waddenzee 1975 (in Smit & Visser 1993)
Curlews, golden plovers (among others)	Ultralight	a) >300m (1000 ft) b) 150 m (500 ft)	a) No disturbance b) First signs of disturbance	Evans 1994 (in Drewitt 1999)
Shorebirds (includes Curlews and Oystercatchers)	Small aircraft	a) 360 m (1,180 ft) b) double pass at 450 and 360 m (1,480 and 1,180 ft)	a) Birds returned to same numbers after 10 min b) 67% of oystercatchers and 87% of curlews returned after 45 min	Glimmerveen and Went 1984 (in Smit & Visser 1993)
Oystercatcher, Bar-tailed Godwit, Curlew	Military jet and Helicopter	a) Jet at <1,200 m (3,940 ft) b) Helicopter at <250 m (820 ft) c) Helicopter at <1,500 m (4,920 ft)	In all cases, oystercatchers were most tolerant of overflights. a) 5-16% of flocks disturbed b) 27-52% of flocks disturbed c)73-86% of flock disturbed	Visser 1986 (cited in Smit & Visser 1993)
Shorebirds (unknown)	Military jet	<100 m (330 ft)	Generally did not respond. Looked up, stopped foraging for a few seconds, short flights of 10-30 seconds	Smit and Visser 1985 (cited in Smit & Visser 1993
Sooty Terns and Common Noddies	Seaplane	landing and departure within 400 m (1,310 ft)	Flushing, more likely when plane taking off	Hicks, King and Chaloupka 1987 (cited in GBRMPA 1997)
Waterbirds (includes small percentage of Grebes, Cormorants, Herons, Gulls)	Helicopters and Fixed wings	80-450 m (260-1,480 ft)	Minimum disturbance altitude was 450 m (1,480 ft) for the helicopter and 300 m (980 ft) for the fixed wing planes	Komenda-Zehnder et al. 2003

The results from these studies show that there is not a consistent distance at which birds will react to overflights and that disturbance distance likely depends on multiple factors. Other literature on disturbance distances has shown that birds may be more sensitive in undisturbed regions, when they are in high concentrations, when moutling or when breeding in colonies (in Komenda-Zehnder et al. 2003). In addition to these studies, there have been anecdotal observations on the effects of aircraft activities on seabirds and shorebirds. On Alcatraz Island, Saenz et al. (2006) observed that Brandt's Cormorants were flushed from nests by aircraft within 500 m (1,640 ft) every season. In the Great Barrier Reef (GBR), Crested and Bridled Terns and Common Noddies that breed within several tens of meters from an airstrip did appear not to be negatively impacted by aircraft, besides occasional bird strikes. Also in the GBR, helicopters that landed within meters of breeding noddies and shearwaters also did not appear to have an effect. However, in more remote areas of the GBR, it was observed that breeding seabirds flew from their nests even before the approach of an aircraft could be detected by humans (GBRMPA 1997). In the Netherlands, helicopters flying at 100-300 m (330-980 ft) altitude at a frequency of 2-3 per hour did not appear to have strong effects on foraging and roosting waders (Smit and Visser 1993).

Another factor that can affect bird responses is the speed of the aircraft. For example, in an experiment comparing the effects of different types of aircraft on waterbirds, the slower fixed wing plane had a significantly stronger effect than the faster plane (Komenda-Zehnder et al. 2003). Smit & Visser (1993) found that an overflight of a slow speed jet was more disturbing to shorebirds than the more frequent overflights of high-speed military jets, though the difference may also be a result of a lack of habituation.

HABITUATION AND FACILITATION

The extent to which birds may be disturbed by aircraft may depend on their ability to habituate to aircrafts. Birds may "learn" that a stimulus does not pose a danger after repeated exposure and as a result, may not display any substantial signs of behavior change. The ability to habituate may be a function of the frequency of aircraft overflights and the species of bird. As described earlier, Burger (1981) found that herring gulls nesting near an airport did not react significantly to subsonic aircraft noise, and Dunnet (1977) observed no effect of helicopters and fixed wing airplanes on kittiwakes and guillemots. These results were attributed to habituation from frequent exposure to overflights; the herring gulls in Burger's study experienced noise from subsonic planes that landed every 2-3 minutes, while in Dunnet's study, the cliffs on which kittiwakes and guillemots were nesting were on the regular route of helicopters flying from an airport to offshore rigs and platforms.

Birds that are not subject to frequent aircraft overflights may exhibit stronger reactions in response to a disturbance. In addition, birds may also be sensitive to aircraft that are "unusual" or that fly with unpredictable curves (Smit and Visser 1993, Boer et al. 1970). Olsson and Gabrielsen (1990) studied the effects of test helicopter overflights on a remote colony of Brunnich's guillemots in Svalbard, a Norwegian archipelago in the Arctic Ocean. They compared their results with those of an earlier study by Fjeld et al. (1988) that investigated disturbance in a less remote colony of Brunnich's guillemots, also in Svalbard. The authors found that it took the birds 20 minutes to return after a disturbance, compared to the 5-10 minute return time in the Fjeld et al. study. The authors did not find any evidence of habituation in the remote colony over the course of the study and hypothesized that the colony in the Fjeld et al. study was more habituated to helicopter overflights.

Nisbet (2000) has proposed disturbing waterbirds "frequently, regularly and predictably" in order to promote habituation to human disturbance (not aircraft specifically) and to minimize adverse effects. This author has based this on his and others' observations of birds that are tolerant of humans, and on his opinion that few studies have convincingly shown evidence of adverse effects. However, the appearance of habituation or tolerance does not necessarily indicate the absence of adverse effects. For example, although Smit and Visser (1993) did not observe strong effects of frequent helicopter overflights on foraging and roosting waders, they suggested that birds may be forced to move to less disturbed areas or temporarily leave the area. Furthermore, birds that do not show external stress may still experience physiological stress, manifested as changes in heart rate. The consequences of these physiological changes are not well understood enough to dismiss their potential effects.

In contrast to habituation, birds may become more sensitive to low levels of disturbance following other disturbances (Smit & Visser 1993). This cumulative effect is known as facilitation. As described previously, Red Knots were more restless and less approachable by humans following jet overflights (Koolhaas et al. 1993). In Germany, jet overflights seemed to have stronger effects on shorebirds when wind surfers were previously in the area (Kusters & von Raden 1986 in Smit & Visser 1993). In the Netherlands, after a disturbance by an "unusual" aircraft, shorebirds displayed panic reactions with overflying herons and gulls, even though under normal conditions, these birds would have much smaller effects (Smit unpublished).

SPECIES & FLOCK SIZE

The studies that have been described thus far demonstrate variations in the responses of different bird species to aircraft disturbance. Another example is a study by Heinen (1986), where Curlews and Redshanks in the German Wadden Sea were found to react more than Bar-tailed Godwits. However, there may not be consistent trends for the relative responsiveness of different species. In the Netherlands, Visser (1986) found that oystercatchers were more tolerant of aircraft disturbance compared to bar-tailed godwits and curlews, while Glimmerveen & Went (1984) found that it took longer for oystercatchers to resume normal behavior than it did for curlews.

The tendency for birds to take flight in response to a disturbance may depend on the flock size. Burger & Galli (1987) observed that a high proportion of gulls flew in response to disturbance (not just aircraft) when there were more birds present. Smit & Visser (1993) also mentioned that several studies have shown that larger flocks are easily disturbed. It is suggested that this may be due to larger flocks having a greater chance of containing particularly sensitive individuals. However, in Olsson & Gabrielsen (1990) did not find that stress increased with a larger colony.

BREEDING PRODUCTIVITY

Aircraft disturbance can impact breeding productivity, by interfering with courtship, initial nesting activities, and parental attendance. Flushing especially can cause damage to eggs, and expose eggs and chicks to predation and unfavorable temperatures. Rojek et al. (2007) suggest that aircraft disturbances are one of the many impacts that is slowing the recovery of the breeding population size and breeding success at the Castle-Hurricane Colony Complex in 1997-1999. Zonfrillo (1993) described two major incidents of losses of eggs and chicks resulting from overflights at an island off of Scotland. In the first incident, a Hercules transport aircraft that flew over at least eight times flushed an entire gannet colony. The birds were dispersed for about an hour and approximately 2,000 or more eggs and chicks were lost to predation by gulls. In the second incident, a passing light aircraft caused 123 young auks to panic, fall from their ledges and die. In Burger's study of herring gulls, she found that gulls nesting in denser areas of the colony had a lower mean clutch size during incubation than bird pairs that were in more isolated areas (Burger 1981). In these denser areas, gulls that returned to their nests following disturbances from supersonic planes engaged in prolonged fights, which caused eggs to break. Several U.S. wildlife refuges have also documented gulls, cormorants and murres kicking eggs from nests when flushed, causing eggs to be lost, broken or eaten. Pelicans have also abandoned nests from chronic disturbance from overflights (USFWS 1993 cited in NPS 1995). In Alaska and Canada, Gunn and Livingston found lower hatching and fledging success, higher nest abandonment and premature disappearance of nestlings in their study on disturbances to waterfowl, seabirds and terrestrial breeding birds (Gunn & Livingston 1974 in Manci et al. 1988).

The breeding status of birds may influence the responsiveness of birds to aircraft disturbances. Non-breeding birds may be more likely to fly away due to a disturbance, whereas breeding birds may not leave their nests in order to protect their eggs or chicks. Both Fjeld et al. (1988) and Olsson & Gabrielsen (1990) found a difference in behavior between breeding and non-breeding Brunnich's guillemots, where flight responses were observed mostly in non-breeders. Rojek et al. (2007) also found that most of the California Common Murres that flushed during the breeding season were roosting at the periphery of the colony or were mates of incubating birds. Dunnet (1977) did not see any effects of aircrafts on incubating and brooding kittiwakes, and observed that a few "second adults" took flight, although, this may also be a result of habituation.

Birds may also be more likely to take flight early in the breeding season as fewer investments have been made by adults. Therefore, overflights earlier in the season could cause more losses of offspring. California Common murres showed a greater proportion of flushing events before the peak of the egg-laying (Rojek et al. 2007). Olsson & Gabrielsen (1990) also attributed the weak responses of the breeding Brunnich's guillemots to the fact that the study was conducted at the end of the breeding season when most of the birds have chicks. In British Columbia, Bunnell et al. (1981) found that aircraft disturbances early in the incubation period of White Pelicans caused the birds to trample eggs, thus reducing the clutch size of the pelicans and increasing egg mortality by 88% compared to normal conditions. Disturbances of pelicans later in the incubation period did not have a significant effect on clutch size.

FOOD INTAKE & ENERGY EXPENDITURE

Disturbances can reduce the feeding activity of birds, either by causing changes in their behavior or by deterring birds from their preferred feeding sites. Studies specifically related to the effects of aircraft disturbances on feeding seabirds and shorebirds could not be found, though there are a number of studies on geese. For example, Davis & Wiseley (1974) conducted experimental overflights on staging Snow Geese in Alaska at two hour intervals; the fixed wing plane caused an 8.5% reduction in feeding, which corresponded to a 20.4% decrease in energy reserves for the juvenile geese. Disturbances that affect food intake can impact the time and energy budget of birds. In order to make up for the lost feeding time, birds may have feed at different times of the day, in riskier conditions or at the expense of other activities. Reduced feeding could also hinder the ability of birds to build up fat reserves for migration and breeding (Kempf and Hüppop 1998).

Escape behaviors in response to disturbances may cause increases in energy expenditure. The amount of energy that is used in flight depends on the species. For species that fly a lot, the metabolic rate may be only three times the base metabolic rate, whereas the metabolic rate for species that are poor flyers may increase to 20 times the base metabolic rate. However, even increased heart rates that result from disturbance can cause changes in metabolic rate. Without physical activity, the heart rate can increase by fifteen-fold and energy consumption can triple (Kempf and Hüppop 1998).

AIRCRAFT DISTURBANCES TO MARINE MAMMALS

PINNIPEDS

Another potential concern regarding aircraft disturbance is its effect on pinnipeds in Gulf of the Farallones National Marine Sanctuary. These disturbances may interrupt haulout activities, such as resting, mating, molting, giving birth and nursing pups. During a flushing event, there is also a potential risk of pups getting stampeded or the separation of mothers and pups. For example, in one incident, disturbance from low-flying aircraft may have caused the death of more than 200 harbor seal pups on Tugidak Island, Alaska (Johnson 1977 as cited in Suryan & Harvey 1999).

In a harbor seal monitoring study in Point Reyes from 2002-2006, aircrafts caused 3-11% of disturbances (alertness or flushing) each year (NPS 2006). In 2006, 7% of disturbances were caused by aircrafts, compared to 21% by humans, 13% by non-motor boats and 11% by motorboats. The authors noted that there was a decrease in aircraft disturbances in 2006 compared to 2005 and that this was related to a decline in disturbances from ultralights. This suggests that ultralights may be a particularly disturbing type of aircraft. An older study that was conducted in Bolinas Lagoon in 1984 found that aircrafts, in this case helicopters, only accounted for 0.7% of disturbances to harbor seals on Kent Island (Allen et al. 1984). However, the camera that was used to monitor the seals did not record the cause in 40% of the disturbances.

Kucey (2005) studied human disturbances to hauled out Steller sea lions in Alaska and British Columbia, and her results showed that the sea lions exhibited the weakest response to aircrafts compared to other sources of disturbance (birds, sea lions, humans, boats and unknown); aircrafts had the lowest percentage of disturbance events that caused sea lions to leave the haul out (33%) and had the lowest percentage of sea lions leaving haulouts in response to disturbance (<5%).

Human disturbances to harbor seals has also been studied in the Wadden Sea (Osinga et al. 2012), and it was found that in 200 cases of potentially disturbing aircraft activities, 8 events caused seals entered the water. Out of 330 seals, on average, 12 seals fled into the water and 5 became alert. The authors mentioned that aircrafts at lower altitudes appeared to cause more disturbances, and that aerial surveys by a small aircraft at 300 m (980 ft) only caused alert behavior. However, the study had very little specific information on disturbance distances.

The disturbance distance found in Osinga et al.'s study on harbor seals contrasts with a previous study on aircraft disturbances to ringed seals in the Arctic. Born et al. (1999) compared the escape responses of the ringed seals to a fixed-wing twin-engine aircraft and a helicopter, both flying at 150 m (490 ft), and demonstrated that seals responded more strongly to the helicopter. Forty nine percent of seals escaped in response to helicopters, while 6% of seals escaped in response to the fixed-wing plane. The helicopter also caused disturbance from a greater distance, where the maximum disturbance distance was about 1,250 m (4,100 ft) for the helicopter and 600 m (1,970 ft) for the fixed-wing plane. The authors identified that sound was an important factor causing these responses, and that other factors, such as the weather, the molting stage, and visual detection, may also have had an influence.

CETACEANS

Cetaceans may be disturbed by noise from aircrafts and by the sight of or shadow from aircrafts (Richardson & Würsig 1997, Luksenburg & Parsons 2009). The effect of noise, in general, is of particular concern for cetaceans as they are highly dependent on sound for communication, navigation and echolocation. Aircraft overflights can elicit behavioral changes such as sudden dives or turns, tail and flipper slaps, breaching, and group formations (Richardson & Würsig 1997, Smultea et al. 2007). More subtle responses involve changes in surfacing and respiration patterns (Richardson & Würsig 1997).

The strength of a response may vary depending on factors such as the disturbance distance, species, activity of the animal and water depth. Würsig et al. (1998) examined the responses of different cetaceans to aerial surveys from a fixed-wing airplane in the Gulf of Mexico. The plane flew at 229 m (750 ft) ASL and at a minimum lateral distance of 305 m (1,000 ft). The authors found that some species reacted more strongly to the airplane than others. For species found in California coastal waters, bottlenose dolphins reacted in 28% of the sightings, and Risso's dolphins in 16% of sightings. In general, it was observed that the animals were more sensitive to disturbance when they were "milling" and "resting." Other studies on cetaceans have found a stronger response to aircraft noise in small groups or individuals, in mothers with calves, in shallow waters, when resting and when aircraft flew at low altitudes (Luksenburg & Parsons 2009).

Measuring the exposure of cetaceans to aircraft noise can be difficult due to the transition of sound from air to water and due to the angle at which the sound enters the water as most sound is reflected at angles greater than 13 degrees from the vertical (Richardson et al. 1995 as cited in Nowacek et al. 2007). Furthermore, different species may have different frequency sensitivities to sound. Malme et al. (1984) performed experiments on migrating grey whales by exposing them to repeated playbacks of helicopter noise (as cited in Perry 1998). Three simulated passes per minute caused minor avoidance reactions in 50% of whales. The received sound pressure level was 120 dB re 1uPa; however, the playback excluded the strong low frequency component of helicopter noise.

It is thought that helicopters cause more responses from cetaceans than fixed-wing planes (Richardson et al. 1995 as cited in Luksenburg & Parsons 2009). For example, Patenaude et al. (2002) compared the responses of bowhead and beluga whales to a helicopter and a fixed-wing plane. Measurements showed that the helicopter was noisier than the twin otter, although it has been critiqued by Nowacek et al. (2007) that Patenaude et al. did not properly model sound pressure levels received by the whales. Both whales responded more frequently to the helicopter than to the fixed-wing plane. In terms of the disturbance distance, for the helicopter, most of the reactions by bowheads and belugas occurred when the helicopter was at ≤150 m (490 ft) ASL and ≤ 250 m (820 ft) horizontally. For the fixed-wing aircraft, most of the reactions occurred at ≤182 m (600 ft) ASL and ≤250 m (820 ft) horizontally.

CONCLUSION

This report has given an overview of the effects of aircraft disturbances on seabirds, shorebirds and marine mammals, and has identified the factors that can influence these effects. Although aircraft disturbances can potentially have negative impacts to these animals, the findings of this review suggest that the impacts to populations as a whole are often unknown. General trends from these studies show that aircrafts that fly at lower altitudes elicit stronger responses, and that helicopters tend to be more disturbing than fixed-wing planes. Ultralights are an emerging issue for the Sanctuary, but for which there has been little research. Other areas that should be investigated further are the effects of drones, model aircrafts and hang gliders/paragliders.

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Background Information for Dredgers' Assessments of Potential Impacts on the Longfin Smelt in San Francisco Bay

The agencies of the Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) are providing the following background information to assist non-federal dredgers in conducting assessments of whether or not their project may result "take" of threatened longfin smelt, as defined by the California Endangered Species Act (CESA). The agencies are in no way suggesting a take determination for an individual project. This document may be revised in the future as additional information becomes available.

The Need for Incidental Take Permits

On June 25, 2009, the longfin smelt (*Spirinchus thaleichthys*) was declared a threatened species under CESA. The California Department of Fish and Game (DFG) has stated that dredging project sponsors in San Francisco Bay will need to conduct assessments of whether their projects will "take", (i.e., hunt, pursue, catch, capture, or kill) this threatened species. If the project will result in take, the project sponsor will need to apply to DFG for an incidental take permit.

Once the determination is made, the dredging project sponsor should provide a copy of the assessment to the state agencies including the San Francisco Bay Regional Water Quality Control Board (Water Board), San Francisco Bay Conservation and Development Commission (BCDC) and California Department of Fish and Game (DFG). If the project is expected to take longfin smelt, the project sponsor should apply directly to DFG for a take permit. Once a take permit is issued, the project sponsor should provide it to both the Water Board and BCDC.

Relevant Aspects of Longfin Smelt Life History and Habitat Requirements

DFG provides the following life history information on its website (DFG, 2009):

> Longfin smelt are pelagic, estuarine fish…. Presently, the only California collections made in the 1990s have been from the Klamath River and San Francisco Bay. Longfin smelt reach a maximum size of about 150 mm TL.…
>
> Maturity is reached toward the end of their second year. As they mature in the fall, adults found throughout San Francisco Bay migrate to brackish or freshwater in Suisun Bay, Montezuma Slough, and the lower reaches of the Sacramento and San Joaquin Rivers. Spawning probably takes place in freshwater.
>
> In April and May, juveniles are believed to migrate downstream to San Pablo Bay; juvenile longfin smelt are collected throughout the Bay during the late spring, summer and fall…. Juveniles tend to inhabit the middle and lower portions of the water column.

U.S. Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105

San Francisco Bay Conservation and Development Commission
50 California Street, Suite 2600
San Francisco, CA 94111

U.S. Army Corps of Engineers South Pacific Division San Francisco District
1455 Market Street
San Francisco, CA 94103-1398

San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

The California Department of Water Resources provided the following additional information in its application for an incidental take permit for the California State Water Projects:

> **Spawning**
>
> …The downstream extent of longfin smelt spawning reportedly occurs in upper Suisun Bay around Pittsburg and Montezuma Slough in Suisun Marsh (Wang 1986, 1991, Moyle 2002). However, some spawning may also occur at the southern tip of San Francisco Bay [Baxter 2008 unpublished]….
>
> **Larvae/Juveniles**
>
> Longfin smelt embryos hatch in approximately 40 days (at 7°C) (Dryfoos 1965, Moyle 2002). Larvae quickly move into the upper part of the water column and are transported downstream into more brackish areas of the estuary (Moyle 2002). Post-larval longfin smelt are reportedly associated with deep-water habitats (Rosenfield and Baxter 2007). Larvae are most abundant in the water column from January through April (DFG unpublished, as cited in Reclamation 2008). Metamorphosis into juveniles probably begins 30-60 days after hatching, depending on water temperature (Emmett et al. 1991, Moyle 2002).
>
> During years when high freshwater outflows occur when larvae are being transported downstream, most larvae are transported to Suisun and San Pablo Bays; during years with lower outflow, larvae are transported into the western Delta and Suisun Bay (Baxter 2000, Baxter et al. 1999, Moyle 2002)….
>
> **Adults**
>
> …During most year adults concentrate in San Pablo Bay during April-June and become more dispersed in late summer (many moving into central San Francisco Bay) (Moyle 2002). The concentration of longfin smelt in deepwater habitats, combined with their migration into marine water during the summer suggests that longfin smelt may be relatively intolerant of the warmer waters in the estuary. The population gradually moves upstream during fall and winter to spawn….

The NatureServe[1] Explorer database also has summarized the life history of the longfin smelt, including the following information:

> **Reproduction Comments:** Spawns in second year in southern part of range.… According to Wang (1986, cited in USFWS 1994), spawns as early as November, as late as June, with peak February-April (evidently pertains to California). Females lay 5000-24,000 adhesive eggs. Eggs hatch in about 40 days (Lee et al. 1980). Young move downstream to lake or sea. Some adults survive spawning. In the Sacramento-San Joaquin system, California, good recruitment is positively correlated with high outflows into Suisun and San Pablo bays (better rearing habitat than areas farther upstream).

---

[1] NatureServe is a non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action. All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of February 6, 2009. This report was printed on July 13, 2009.

Habitat Comments: Habitat includes a wide range of temperature and salinity conditions in coastal waters near shore, bays, estuaries, and rivers (Moyle 2002); …. In estuaries this fish usually is found in the middle or bottom of the water column (Moyle 2002)…. Spawning occurs in fresh water, over sandy-gravel substrates, rocks, and aquatic plants (Moyle 2002). Anadromous populations spawn in fresh water close to the ocean. After hatching, larvae move up into surface waters and are transported downstream into brackish-water nursery areas….

Adult Food Habits: Invertivore, Piscivore

Immature Food Habits: Invertivore, Piscivore

Food Comments: Eats small crustaceans and fishes

Length: 14 centimeters

Longfin smelt tolerate salinities ranging from fresh to nearly pure seawater and can survive summer temperatures up to 20°C (68°F) (UCCE 2003). According to Baxter (1999), "the mean temperature at which age-0 longfin smelt were found ranged from 16 to 18 °C in late spring, summer and fall, to about 11.5 °C in winter." The monthly mean temperature ranged from about 9 °C in January to about 19 °C in June for age-1 longfin smelt (Baxter 1999). Baxter (1999) concludes:

> The distribution of age-1 longfin smelt appears to be influenced by high water temperatures. Age-1 longfin smelt have been collected in salinities from freshwater to sea water, but their distribution generally contracts from estuary-wide in the winter to mainly Central Bay by late summer and fall. Water temperatures in South Bay and the west delta generally reach their maxima between July and September and age-1 longfin smelt are rare during this period.

Overview of Potential Impacts of Dredging and Disposal

Potential impacts on longfin smelt include entrainment of eggs, larvae, juveniles or adults during dredging, and exposure to suspended sediments and contaminants during disposal of dredged material. DFG's status report (2009b) on longfin smelt provides the following summary of impacts:

> Little is known about the impacts to longfin smelt attributable to dredging and sand mining in the San Francisco Estuary, but operations conducted in freshwater could entrain adults, eggs, and larvae during winter spawning and incubation while operations in saltwater could entrain juveniles and adults in summer and fall. Loss of longfin smelt to dredging and sand mining operations may be a threat to longfin smelt recovery….
>
> Dredging and sand mining occurs at locations throughout the lower estuary, and effects to water-surface-oriented larvae, mobile juveniles, and adults are expected to be small and localized. However, dredge spoil disposal may create an unavoidably-large plume that exposes fish to re-suspended contaminants, gill-clogging sediments, and possibly low-oxygen water (LFR Levine-Fricke 2004). A review of direct and indirect dredging effects on fishes and benthos can be found in LFR Levine-Fricke (2004)….

Entrainment. The likelihood of entrainment varies depending on the vulnerability of the life stage, the likelihood that the vulnerable life stage is present, and the type of dredging equipment used. Entrainment of eggs along with sediment would only be expected to occur in spawning areas, i.e., in fresh water over sandy or gravel substrates, rocks or aquatic plants.

Past studies have reported entrainment of demersal fish (living near or in the bottom substrates). Appendix J of the LTMS Final EIS/EIR (1998) states, "Larval and juvenile stages in particular are vulnerable to entrainment in dredging equipment."

Longfin smelt have been observed in hopper dredges during past studies (Larson and Moehl 1990). A Technical Note prepared by the U.S. Army Engineer Research and Development Center (Reine and Clarke 1998) states, that "mechanical dredges are not generally treated in an entrainment context." Possible reasons for neglible entrainment by mechanical dredges are avoidance of increased turbidity and suspended sediment as a result of physical disturbance of the bottom substrate and avoidance of low-frequency vibrations caused by lowering the bucket into the water (Stevens 1981).

DFG's status report on longfin smelt (2009) provides the following additional information on entrainment:

> Two suction-dredge fish-entrainment studies for the local area were available and reviewed. Both indicated that few individual fish were entrained during dredging and that those species were predominantly bottom-dwellers (i.e., not longfin smelt)….
>
> Dredging and sand mining during winter and spring pose a threat to longfin smelt eggs. Egg entrainment is potentially the most serious effect, because other life stages are not associated with the bottom (i.e., larvae) or can move away from the intake (juveniles and adults).

Previous and Potential Future Restrictions on Dredging to Protect Longfin Smelt

Longfin smelt was a candidate species for listing under the federal Endangered Species Act at the time that the LTMS Final EIS/EIR was being prepared. Table J-2 identified direct entrainment by dredge in San Pablo Bay, and Suisun Bay (including marshes), as a potential impacts on longfin smelt. Table J-2 includes a work window from September 1 to November 30 from the Carquinez Bridge to Collinsville, and from August 1st to January 31st in San Pablo Bay, to protect longfin smelt, with consultation required at all other times.

According to the Department of Fish and Game, longfin smelt presence data (Baxter 2008, unpublished) supports allowing dredging between June and October only for projects in the Delta and south San Francisco Bay, defined as the area south of a line from Hunter's Point to San Leandro Bay.

In 2008, the Fish and Game Commission adopted an emergency regulation under Section 749.3, Title 14, CCR, for incidental take of longfin smelt during the candidacy period, i.e., the period when longfin smelt was being evaluated as a threatened species under CESA. This regulation addressed sand and gravel mining in rivers and streams:

> Take of longfin smelt incidental to otherwise lawful dredging or extraction of sand or gravel resources in a stream or river is authorized for the longfin smelt candidacy period except any dredging activity in the Sacramento-San Joaquin

> Delta east of the river kilometer 90 Sherman Island is prohibited during the effective period of this regulation…

This interim regulation to protect longfin smelt did not address dredging or sand mining in the Bay.

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LTMS Longfin Smelt
Literature Review and Study Plan

Final Technical Report

Prepared for the Long-Term Management Strategy
for Dredged Materials in San Francisco Bay
August, 2011

April Robinson and Ben K. Greenfield
San Francisco Estuary Institute

SFEI Contribution XXX

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TABLE OF CONTENTS

1. Introduction

In recent decades, the longfin smelt (*Spirinchus thaleichthys*) has experienced significant declines in abundance in the San Francisco Estuary and throughout California. On March 4, 2009, the California Department of Fish and Game (CDFG) listed the longfin smelt as threatened under the California Endangered Species Act (CESA; Fish and Game Code §§ 2050 et seq.). Under the CESA listing, the species is protected throughout its range in California. In response to the state listing of this species, CDFG stated that longfin smelt "take" assessments must be conducted for dredging projects in San Francisco Bay.

The Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) funded this review of the current scientific literature in order to provide better information upon which to base CDFG take assessments, and protect longfin smelt. The LTMS is a collaborative partnership of the U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (USACE), the State Water Resources Control Board (State Water Board), the San Francisco Bay Regional Water Quality Control Board (San Francisco Bay Water Board), and the San Francisco Bay Conservation and Development Commission (BCDC).

The remainder of this report includes three sections. Section 2 is a literature review on longfin smelt life history and ecology, with particular focus on habitat and distribution. Section 3 reviews risks of dredging and other threats to longfin smelt. Sources for the literature review in Sections 2 and 3 include peer reviewed published literature, agency reports and other gray literature, presentations from the Longfin Smelt Symposium held by the San Francisco Estuary Institute (SFEI) in 2009 (Stanford et al. 2009), personal communications with experts, and unpublished data. Section 4 is a study plan for longfin smelt. This study plan proposes five potential studies to address key data gaps identified in this report. The study plan builds on the discussion between scientists and dredgers about future study needs that was started at the 2009 Longfin Smelt Symposium (Stanford et al. 2009).

2. Longfin Smelt Life History and Ecology

The longfin smelt is a small fish in the family Osmeridae. It is adapted to a wide range of salinities (i.e., euryhaline), and travels from fresh to marine waters over its life cycle (i.e., anadromous). The geographic range of the species extends from Alaska to California, with longfin smelt in the San Francisco Estuary[a] representing the southern-most spawning population within the species range. Historically, this species was found in three estuaries in California: the San Francisco Estuary (hereafter, the Estuary), Humboldt Bay, and the Klamath River Estuary. Incidental catch of longfin smelt in Humboldt Bay and the Eel River confirms their continued presence in these areas, however the size of the population is unknown (Cannata and Downie 2009). No recent sampling has been conducted in the Klamath River that could detect longfin smelt (Cannata and Downie 2009).

The longfin smelt was once considered two separate species, with the San Francisco Bay population referred to as Sacramento smelt (*S. thaleichthys*), and the remaining populations regarded as longfin smelt (*S. dilatus*; Moyle 2002). McAllister (1963) grouped the Sacramento smelt and longfin smelt together after concluding that meristic differences between the species were the result of a north-south gradient, rather than a discrete set of traits. This grouping was further supported by allozyme analysis (Stanley et al. 1995).

Recognition of the Estuary population as a genetically distinct population could result in a Federal decision to list the population (The Bay Institute et al. 2007). Previously the U.S. Fish and Wildlife Service (USFWS) declined to list the Estuary population of the longfin smelt, citing a lack of evidence demonstrating the population's genetic distinction from other populations within the species range (USFWS 2009). In November 2009, a suit was filed by the Center for Biological Diversity, The Bay Institute, and the Natural Resources Defense Council to challenge the federal decision not to list the longfin smelt. In February 2011, USFWS agreed to conduct a range-wide 12-month review of the longfin smelt status, with the findings to be published by September 30, 2011. Recent research performed by Israel and May (2010) compared genetic sequences from microsatellite DNA in longfin smelt from Lake Washington (Seattle, WA) and the San Francisco Bay-Delta. This study found that while the majority of the genetic variation was within rather than between the collection locations, it was still possible to distinguish between the two locations. The study also found no evidence of recent gene flow between the locations. These findings suggest that

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[a] In this report, the San Francisco Estuary (i.e., the Estuary) is defined to include the estuarine waters that ultimately drain through the Golden Gate. The Estuary includes San Francisco Bay, the Sacramento-San Joaquin Delta (i.e., the Delta), and estuarine tributaries of these waters. San Francisco Bay (i.e., the Bay) is the more marine portion of the Estuary, and includes five segments: Suisun Bay, San Pablo Bay, Central Bay, South Bay, and Lower South Bay.

the San Francisco Estuary and Lake Washington represent two genetically distinct populations.

2.1 Life history

Longfin smelt are found throughout the San Francisco Estuary, occupying different regions of the Estuary throughout the year. Most longfin smelt exhibit a two-year semelparous[b] life cycle, spawning and dying in their second year. In good growth years, however, longfin smelt can spawn at the end of their first year, and three year old smelt have also been observed. Longfin smelt are anadromous fish that spawn in freshwater and disperse to marine environments as they mature (Moyle 2002).

Longfin smelt undergo a protracted period of spawning that ranges from November to June, though the majority of spawning occurs between February and April (Moyle 2002). Spawning locations have been inferred from the distribution of larvae to occur at the interface between fresh and brackish water. This mixing zone provides nursery habitat for many native fishes (Dege and Brown 2004; Hobbs 2009). Longfin smelt have adhesive eggs and are assumed to spawn over rocky/sandy substrate, similar to other smelt species. However, larvae monitoring has been limited to offshore stations in San Francisco Bay and the West Delta, and there are no published observations of spawning activity or egg location. Because spawning has not been directly observed anywhere in the Estuary, there is some uncertainty about the exact microhabitat requirements for spawning (Rosenfield 2009). Within the Estuary there is substantial sandy substrate, which likely provides spawning habitat (Baxter 2009).

Egg development lasts approximately one month (CDFG 2009). The young smelt then hatch and exist as yolk-sac larvae for one to two weeks. The yolk-sac larvae are positively buoyant, floating near the water surface, and moving with the prevailing current. Larvae are found in increasing numbers in January, peak in February, and decline in abundance between March and May. This is evident in elevated capture frequency of larvae in plankton nets in winter and spring, with almost no capture in summer or autumn (Figure 1). As post-yolk-sac larvae develop air bladders, when they reach a length of 10-12mm, they adjust their depth in the water column to maintain their position relative to the moderately saline productive zone near X2 (the 2 psu isohaline, as measured by its distance from the Golden Gate Bridge; (Jassby et al. 1995; Kimmerer 2002)). The area near X2 has historically been an area of high productivity, providing good nursery habitat for larval fish of several species, including longfin smelt (Hobbs 2009). Larvae grow at a rate of 0.12 to 0.23 mm/day, reaching juvenile length ($\geq$20mm) approximately 90 days after hatching (CDFG 2009).

Longfin smelt grow to standard lengths of 60 to 70 mm in the first year of life, followed by a second period of growth in the summer and fall of the second

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[b] That is, a single reproductive episode during its life span

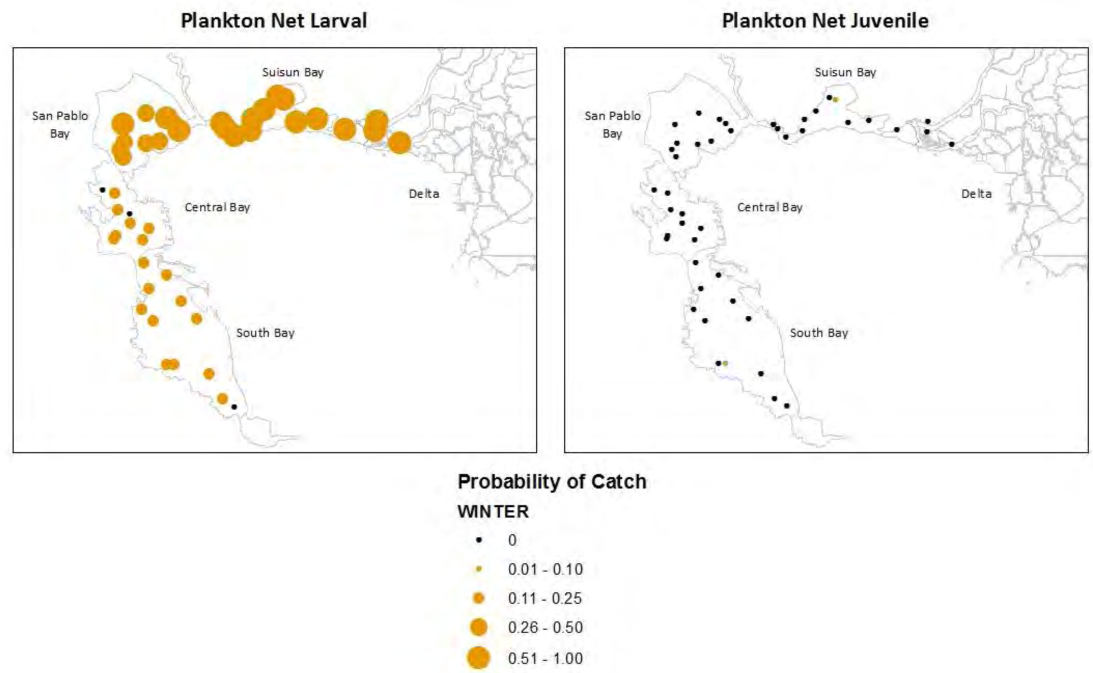

Figure 1a[c]. Larval and juvenile catch probability in the winter. Results compiled from 1980–1987 plankton net survey.

[c] **Note on Figures 1 and 2:** Data on longfin smelt distribution were collected by CDFG's San Francisco Bay Study and the IEP for the San Francisco Estuary. These figures used the CDFG San Francisco Bay Study Longfin Smelt Dataset, with data uploaded by SFEI staff from the study ftp site: ftp://ftp.dfg.ca.gov/BayStudy/LongfinSmelt/. Figures were developed based on these data using ArcGIS 10. Probability of catch was based on the frequency with which longfin smelt of the given age class were present, across all sampling events for a given site and season. Seasons represent 3-month blocks as follows: Dec–Feb (Winter), Mar–May (Spring), Jun–Aug (Summer), and Sep–Nov (Autumn).

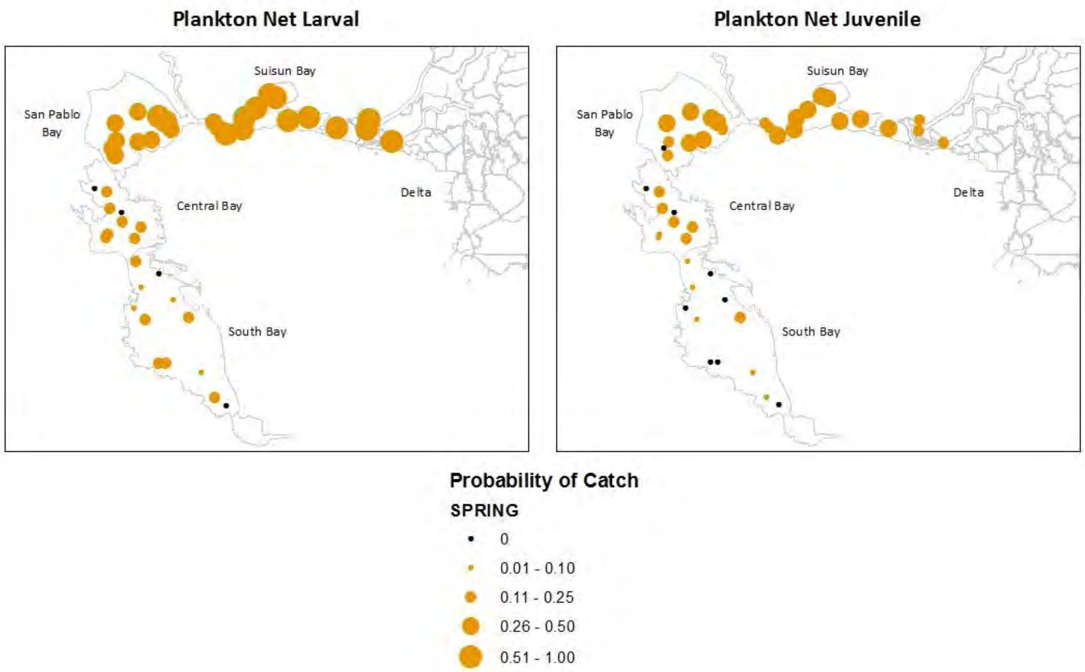

Figure 1b. Larval and juvenile catch probability in the spring. Results compiled from 1980–1987 plankton net survey.

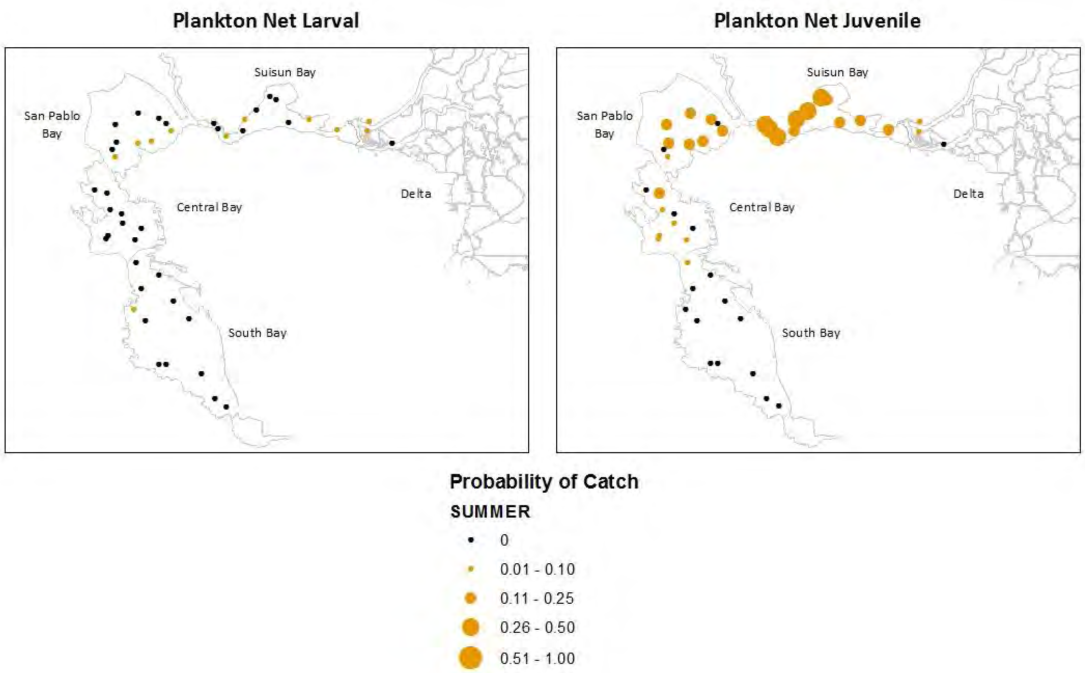

Figure 1c. Larval and juvenile catch probability in the summer. Note that many larvae recruited to juveniles. Results compiled from 1980–1987 plankton net survey.

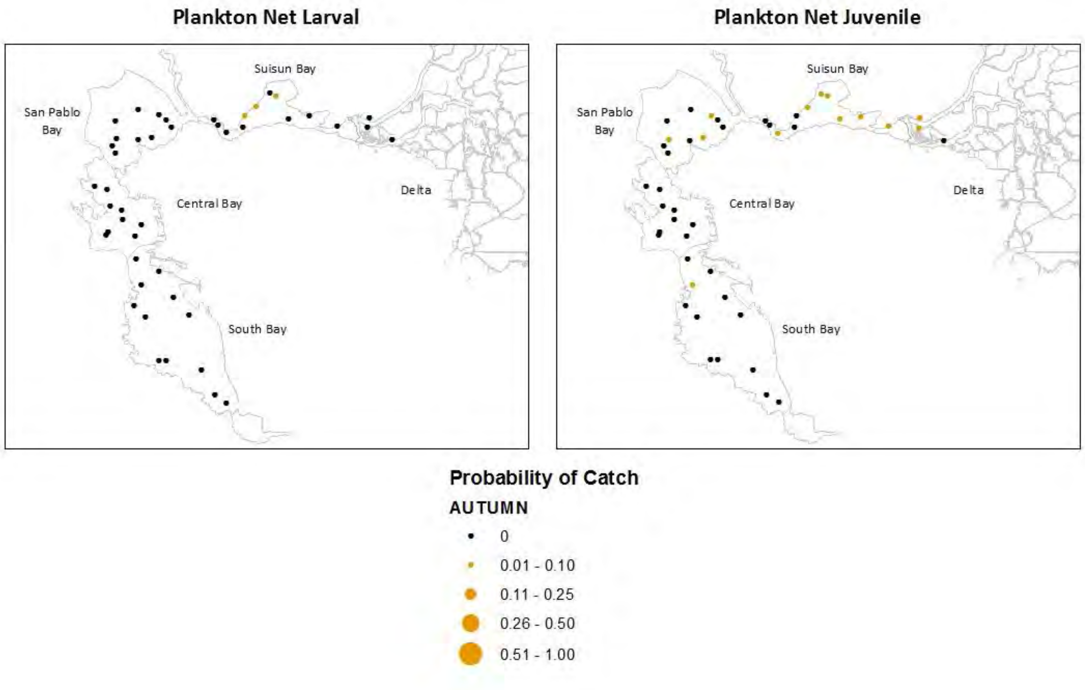

Figure 1d. Larval and juvenile catch probability in the autumn. Results compiled from 1980–1987 plankton net survey.

year, to obtain standard lengths of 90 to 111 mm. Rarely, individuals will spawn after one year. The majority of individuals die before reaching year three (Moyle 2002). Those individuals that do survive to year three reach lengths of 120 to 150 mm standard length. Females lay 2,000 to 18,000 eggs, with fecundity increasing exponentially with age (CDFG 2009). In otter trawl and midwater trawl sampling, age 1 fish are caught most frequently and with the widest distribution during the winter, followed by spring (Figure 2). However, over the course of all sampling, some age 1 fish have been caught in all San Francisco Bay segments (South Bay, Central Bay, San Pablo Bay, and Suisun Bay) year round (Figure 2).

Smelt larvae and young juveniles feed predominantly on calanoid copepods, including *Eurytemora affinis* (S. Slater, CDFG, unpublished data, as reported in Baxter et al. 2010). Older juveniles and adults feed principally on opossum shrimp, *Acanthomysis spp.* and *Neomysis mercedis*, when available, and copepods when shrimp are not available (Feyrer et al. 2003) (Hobbs et al. 2006). The invasion of the overbite clam (*Corbula amurensis*) has reduced the availability of planktonic algae that form the base of the food web for the longfin smelt (Moyle 2002). The Lake Washington population exhibits daily vertical migrations, appearing higher in the water column at night and lower during the day, related to the movement of their prey (Moyle 2002). Smelt in San Francisco Bay undergo tidal migration to maintain their position relative to habitat (Bennett et al. 2002).

Historically, longfin smelt were an important component of the food web in the San Francisco Estuary. However, the high proportion of non-native fish and other species currently inhabiting the Estuary (Cohen and Carlton 1995, 1998) suggest that competition or predation by non-natives may play a role in the declining numbers of longfin smelt.

2.2 Distribution in San Francisco Bay

Several long-term monitoring programs provide data on the abundance and distribution of the longfin smelt. As part of the Interagency Ecological Program (IEP) the CDFG conducts four studies in which longfin smelt are collected: the Fall Midwater Trawl, the Bay Study, the Smelt Larvae Study, and the 20mm study. UC Davis also conducts an annual survey of fish in Suisun Marsh as part of the IEP. These studies provide long term datasets on the distribution and abundance of longfin smelt (Rosenfield and Baxter 2007).

Longfin smelt occupy different portions of the Bay throughout the year. There is also significant interannual variation in their distribution, which is strongly correlated with freshwater outflow in the Delta (Baxter 2009). Specifically, in years with higher freshwater outflow, larvae and juvenile smelt are generally distributed further downstream (i.e., closer to the Golden Gate) than years with low freshwater outflow (Dege and Brown 2004).

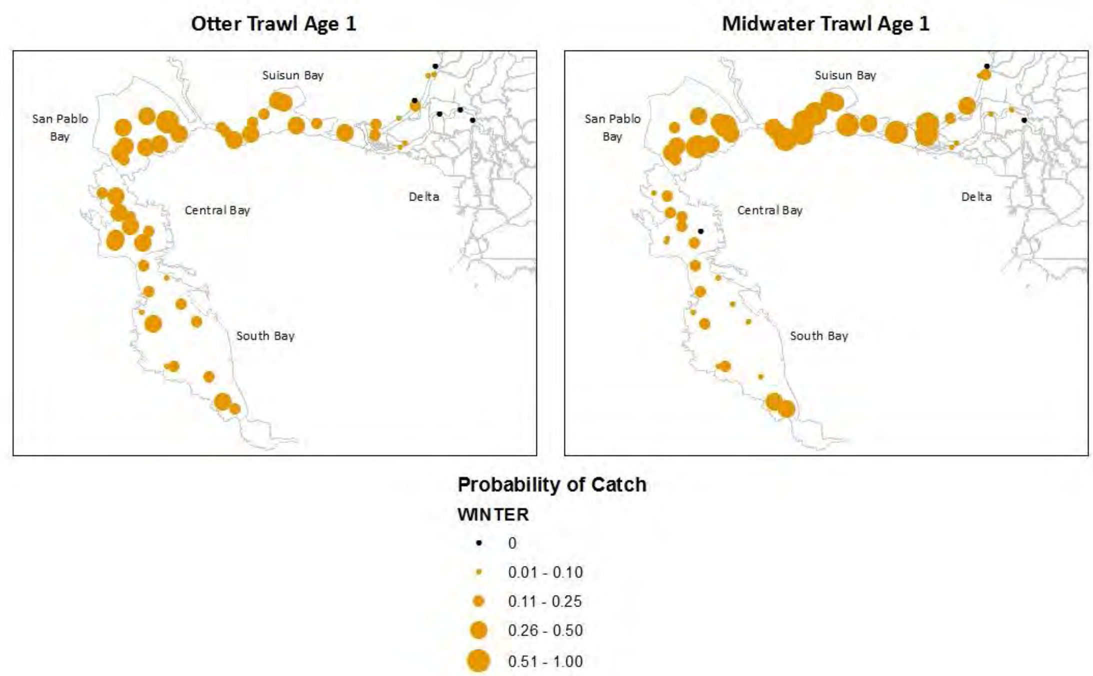

Figure 2a. Age 1 longfin smelt in the winter. Results compiled from 1980–2008 otter trawl and midwater trawl survey.

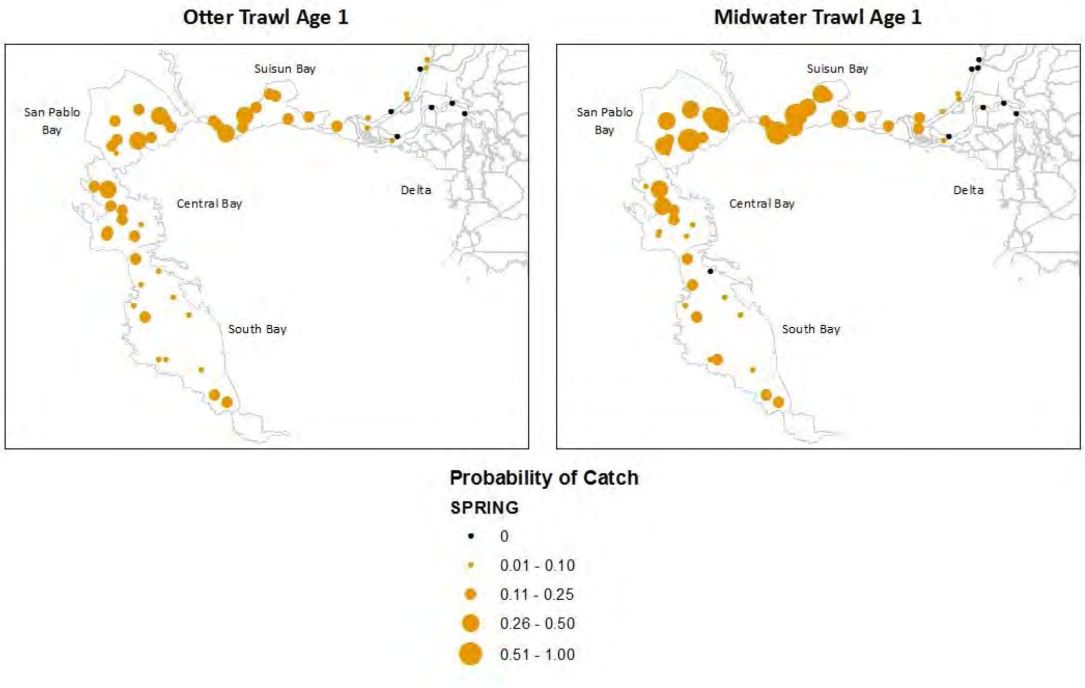

Figure 2b. Age 1 longfin smelt in the spring. Results compiled from 1980–2008 otter trawl and midwater trawl survey.

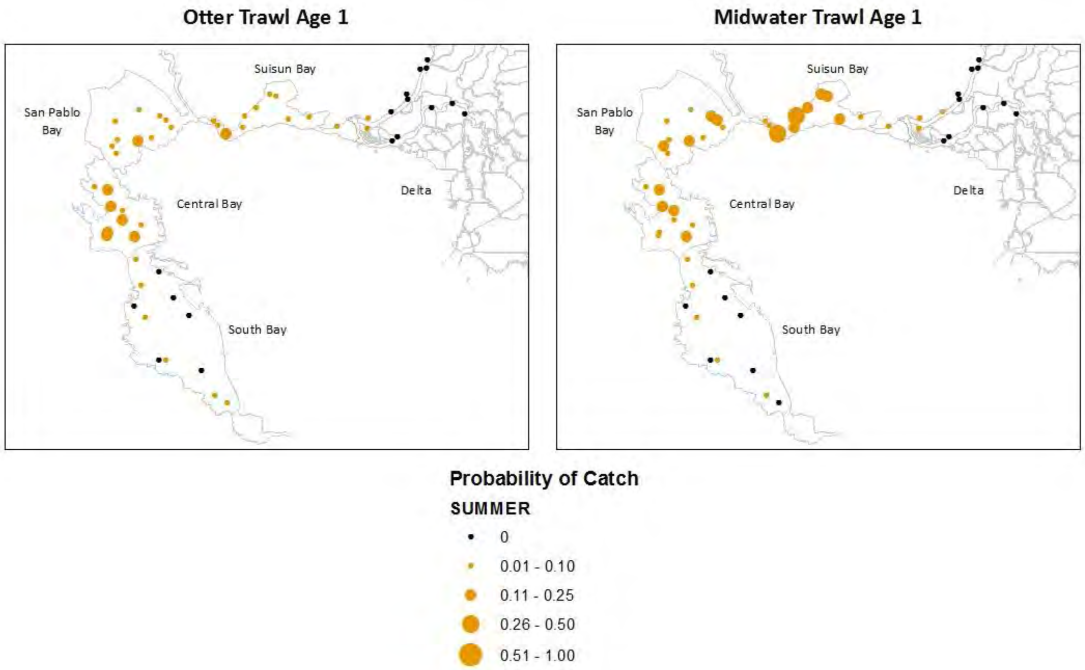

Figure 2c. Age 1 longfin smelt in the summer. Results compiled from 1980–2008 otter trawl and midwater trawl survey.

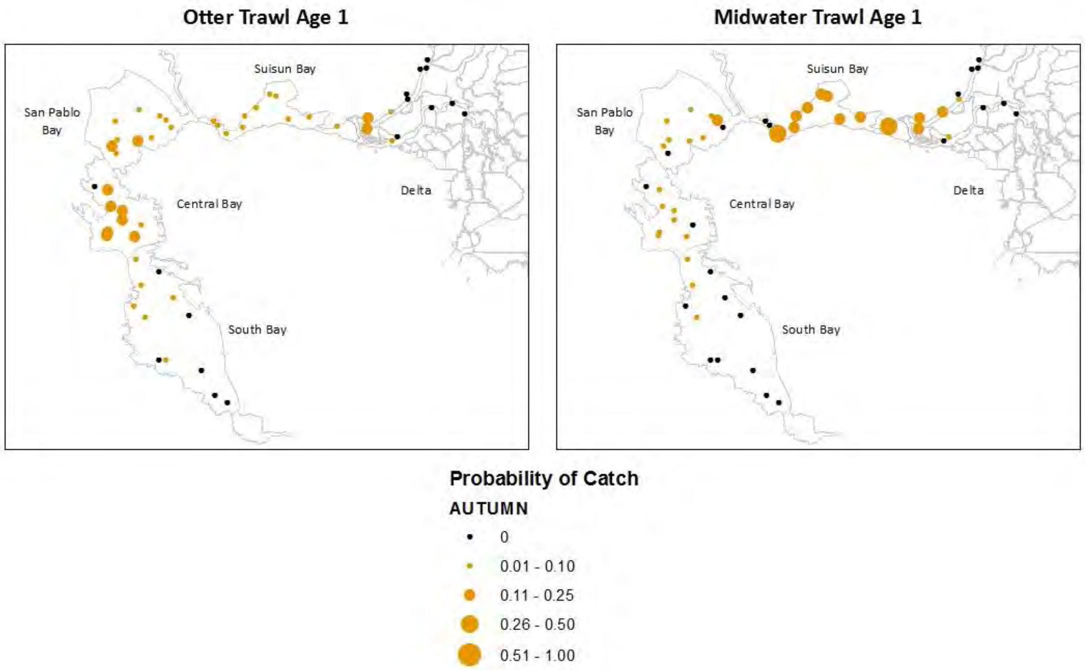

Figure 2d. Age 1 longfin smelt in the autumn. Results compiled from 1980–2008 otter trawl and midwater trawl survey.

2.2.1 Adult distribution

Adult longfin smelt have been collected as far upstream as the lower Sacramento River, including the Yolo bypass and Cache Creek complex, the Mokelumne River to Hog Slough, and the San Joaquin River near Rough and Ready Island. Smelt are more commonly found near this upstream end of their range in low- and moderate-outflow years (CDFG 2009). Distribution of adult longfin smelt changes seasonally, with the majority of adults found in Central Bay, San Pablo Bay and Suisun Bay in the summer, and moving upstream in early fall. Adult distribution is the most widespread in the winter and spring, extending from the South Bay through the Delta, with the greatest concentrations in San Pablo Bay, Suisun Bay, and the West Delta (Rosenfield 2009) (see Figure 2). Both juveniles and adults are uncommon in the Delta in the fall (CDFG 2009).

Knowledge of longfin smelt use and distribution in tributaries feeding into the Bay, such as Coyote Creek, and the Napa and Petaluma Rivers, is limited. Longfin smelt use of bay tributaries is likely related to the extent of a freshwater signal in the Bay right before and during the longfin spawning migration (Baxter, pers. comm.). Sampling done in the Lower South Bay, near Coyote Creek in Feb 2010, found high numbers of longfin smelt in Coyote Creek, Alviso Slough, and nearby salt ponds (James Hobbs, unpublished data). Bay Study data shows spawner use of Coyote Creek (adults then larvae in the South Bay) in 1982 and 1983, both very high outflow years. Similar effects are likely for the Petaluma River. Shrimp trawling data suggests longfin smelt are present at the mouth of the Petaluma River (Swedberg and Zentner 2009), but the extent to which smelt use upstream habitat is unknown. Abundance of larval and juvenile fish caught in the Napa River in CDFG's 20mm survey is high (CDFG, unpublished data), but adult distribution in the Napa River is not well known (CDFG unpublished data; Stillwater Sciences 2006). High larval densities in the Napa River are likely a result of both local spawning in wet years and tidal effects pushing larvae that hatched in the Delta or Suisun Bay into the lower Napa system (Baxter pers comm).

Longfin smelt abundance in the bay, as measured by the CDFG surveys, changes throughout the lifecycle of the fish (Figure 3). Fish become large enough to be sampled in the IEP otter trawl and midwater trawl surveys in April, and abundance increases through December. Abundance is lowest in the second summer of the smelt's life, and increases again in the second fall and winter (Rosenfield and Baxter 2007). This pattern indicates longfin smelt are leaving the Bay in their second summer, as part of their anadromous life cycle.

2.2.2 Spawning distribution

Spawning of longfin smelt in the San Francisco Estuary has not been observed directly and has been estimated from the distribution of yolk-sac larvae. The upper limit of the spawning distribution is thought to be Medford Island in the

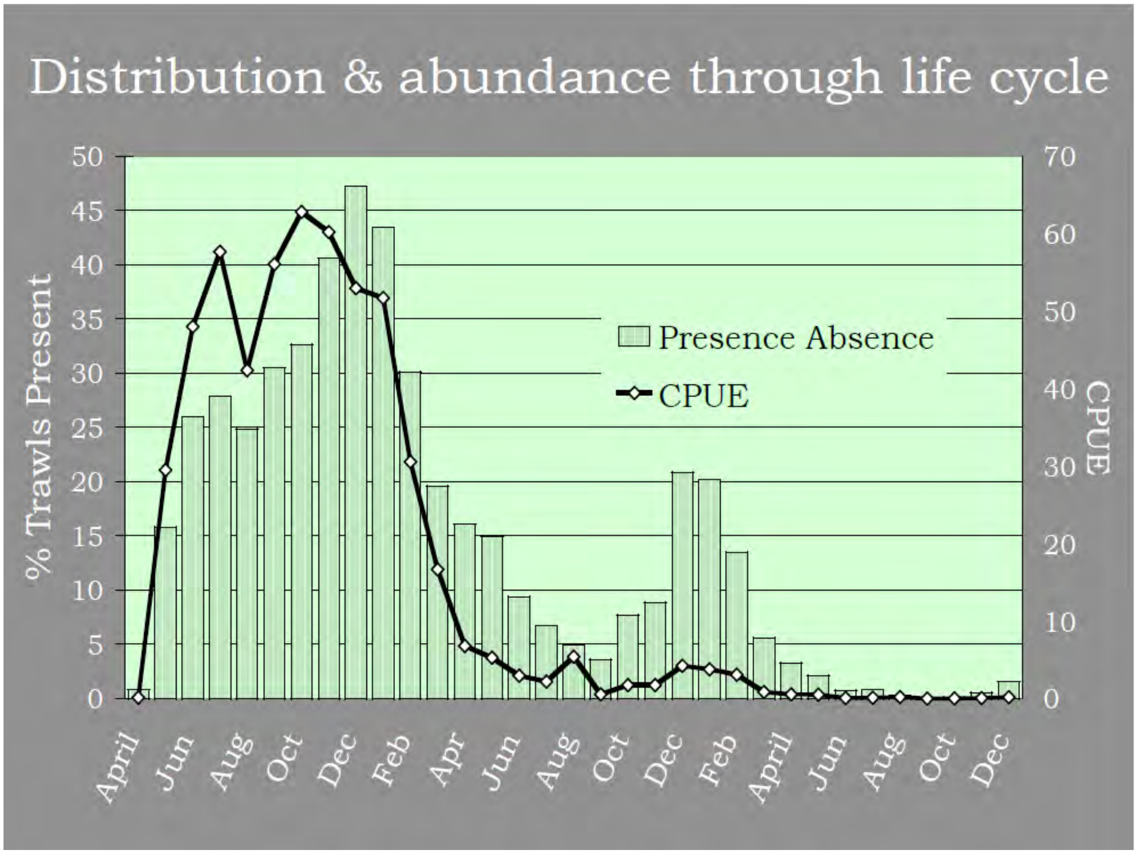

Figure 3. Abundance in the Estuary throughout the lifecycle of a cohort of longfin smelt. Estuary abundance is lowest in the second summer and increases again in the second fall and winter, indicating that longfin smelt are leaving the Bay in their second summer, as part of their anadromous life cycle. Abundance data are from the CDFG Bay Study (Rosenfield 2009).

San Joaquin River and as far north as Upper Cache Slough and the Deep Water Ship Channel in the Sacramento River Basin. (Moyle 2002). Yolk-sac larvae are abundant near X2, which is evident from higher capture frequencies in Suisun Bay, and adults found upstream of X2 are thought to be spawning adults (Baxter et al. 2010). Spawning in other longfin smelt populations occurs at night, so the abundance of spawning adults in freshwater may be underestimated by daytime sampling (Baxter 2009).

2.2.3 Larval and juvenile distribution

Distribution of larvae is strongly influenced by freshwater outflow to the Delta (Baxter 1999; Dege and Brown 2004). In low-outflow (dry) years, larvae are concentrated primarily in the West Delta and Suisun Bay. In high outflow (wet) years larvae are found throughout the Estuary, from South Bay through the West Delta, with the greatest concentrations in San Pablo and Suisun Bay early in the season and into the Central Bay later in the season (Rosenfield 2009).

Wang et al. (1991) examined interannual variation in larval distribution in the Delta. In 1989-1990, larvae were found upstream to Medford Island and the Sacramento River below Rio Vista, from April to July. In 1990, with less outflow, larvae were found further south to near the Central Valley Project and State Water Project pumping stations. Sampling by the 20mm survey consistently found low numbers of larvae in the South Delta (CDFG 2009).

High numbers of larvae and young juveniles are found in the Napa River in most years by the CDFG 20mm survey (CDFG, unpublished data). The Napa Fisheries Monitoring program consistently found low numbers of larvae in March-May of 2001-2005, with a spike in abundance in 2003 (Stillwater Sciences 2006).

The distribution of juveniles is initially similar to that of larval fish, but with juveniles moving further downstream with age, occupying the entire upper estuary through Central Bay during their first summer and expanding throughout the estuary by the following winter (CDFG 2009).

2.3 Habitat requirements

The longfin smelt is primarily a pelagic to demersal, open water species (Moyle 2002). However, longfin smelt are also found in lower densities in Suisun Bay marshes (seasonally), comprising six percent of the total otter trawl catch over monthly sampling from 1979 to 1999 (Matern et al. 2002). Although their sometimes frequent occurrence in Suisun Bay marshes suggests general occurrence in shallow and nearshore locations, systematic sampling across these areas has not been conducted. The fish are found across a wide range of temperatures and salinities, depending on life stage and season. In Lake Washington tributaries, longfin smelt spawned in areas with sandy substrates and low velocity flows; favorable substrate and flow conditions are assumed to be similar in the San Francisco Estuary (CDFG 2009).

2.3.1 Salinity

Juvenile and adult longfin smelt tolerate a wide salinity range, occurring in salinities ranging from seawater to freshwater throughout their life cycle. Adults, prior to their spawning migration, prefer salinities of 15 to 30 ppt and early life stages have a lower salinity tolerance (Moyle 2002). Adult preferences for mesohaline and polyhaline salinities are illustrated by the relatively high frequency of occurrence in South Bay, Central Bay, and San Pablo Bay, in comparison to Suisun Bay and the Delta (Figure 2).

Baxter (2009) suggests that longfin smelt require freshwater to spawn, because very young larvae have a low salinity tolerance. Kimmerer et al.(2009) found that larvae and young juveniles were most abundant at 2 ppt and declined rapidly as salinity increased to 15 ppt. Larvae in the Napa River were also captured at salinities of 0.4 to 5.6 ppt, when the water was the freshest (Stillwater Sciences 2006). Freshwater flow in the Delta during incubation and the larval rearing period is a strong correlate of longfin smelt abundance, likely because high flow increases the volume of brackish water preferred by larval and juvenile smelt (Baxter et al. 2010). Nevertheless, plankton tows performed from 1980 to 1987 also captured larvae in higher salinity regions, including Central and San Pablo Bays (Figure 1), during years of higher outflow (Baxter 1999).

Otolith microchemistry indicates that, in recent years, larvae that survived to adulthood predominantly occurred in low salinities (average 2 ppt), whereas the average salinity at which all larvae were found, by 20mm survey, was higher. This finding suggests that larval distribution may have been shifted to suboptimal salinity conditions, potentially causing a substantial reduction in recruitment success (Hobbs et al. 2010). However, interannual variations in survival and distribution may occur, which have not been thoroughly evaluated (Baxter, pers. comm.).

2.3.2 Temperature

Adult longfin smelt prefer water temperatures of 16 to 18°C or below but will occupy waters as warm as 20°C in the summer (Baxter 1999). Far fewer fish are found above 22°C (Figure 4). Temperatures come close to or exceed this upper limit in the summer and early fall in the Delta and South Bay (Baxter 2009). Moyle (2002) suggests that longfin smelt use of deepwater habitat, and marine migrations in the summer may be a method of escaping higher temperatures. In the nearshore waters of Suisun Marsh, elevated temperature was negatively associated with occurrence of adult smelt (Matern et al. 2002). Moyle (2002) reports spawning temperatures of 7-14.5°C in San Francisco Bay. CDFG (2009) reports that spawning begins when water temperatures drop below 16°C and becomes consistent when water temperatures drop below 13°C.

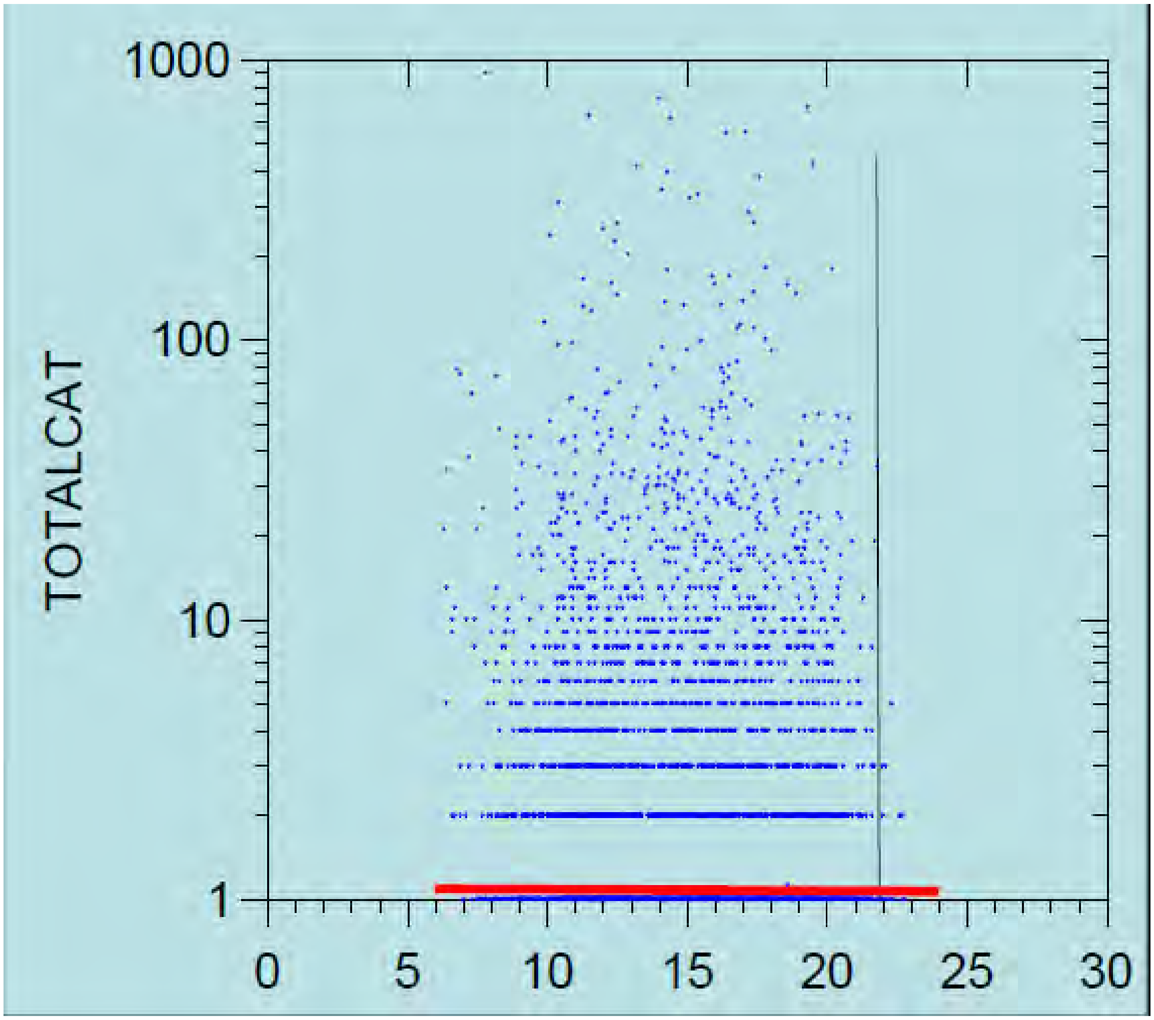

Figure 4. Temperatures at which longfin smelt were captured. Data taken from the CDFG Bay Study. Capture rates decline sharply above 20°C, and smelt are rarely found at temperatures >22°C (Baxter 2009).

2.3.3 Water depth

For adults and juveniles, water depth can vary as a function of vertical migration to maintain longitudinal position in the channel. In deep channels, fish are higher in the water column when moving upstream on the flood tide and lower in the water column when moving downstream on the ebb tide. This vertical migration allows the smelt to maintain position relative to optimal salinity habitat (Hobbs 2009). In nearshore areas, existing data suggests that they remain in deeper channels (e.g., sloughs) (Rosenfeld and Baxter 2007); however, the potential for them to be exposed to shallower conditions exists.

The ratio of fish caught by midwater trawl versus otter trawl in the IEP Bay Sampling Program decreased downstream of San Pablo Bay, suggesting that fish further downstream prefer to be lower in the water column (Baxter 2009).

Overall, longfin smelt densities have been found to be greater above deepwater channels than above the shoals (Rosenfield 2009). However, the extent to which smelt are present in nearshore locations and shallow areas has not been systematically evaluated.

2.3.4 Turbidity

Turbidity is an important part of longfin smelt larval habitat (Kimmerer et al. 2009), possibly providing a competitive foraging advantage or means of predator avoidance. Smelt have excellent olfaction, allowing them to forage effectively at night or in turbid environments (Baxter et al. 2010). Smelt are found at higher densities in turbid water, although there is some evidence that turbidity may negatively affect growth and condition. In Suisun Bay, comparison of longfin smelt in the shallow, less turbid northern channel versus the deep, more turbid southern channel revealed greater abundance in the southern channel, but also lower feeding and growth rates (Hobbs 2009).

2.3.5 Spawning substrate

Spawning has not been observed in San Francisco Bay, so the exact microhabitat preferences of local longfin smelt are unknown. Longfin smelt in Lake Washington are known to spawn on sand or gravel, with a preference for sandy substrate (CDFG 2009).

2.3.6 Use of tidal marshes

Longfin smelt have been observed in Suisun Marsh surveys since 1980, with sharp declines in abundance observed since the early 1980s (Matern et al. 2002). Monthly trends in abundance generally followed trends seen in other IEP surveys (Bay Study, FMWT). As in these other surveys, differences in abundance by year were also strongly correlated with water outflow (Rosenfield and Baxter 2007). Connectivity between the tidal marsh and tidal sloughs is likely the most important driver in determining the benefit of tidal marsh habitat to longfin smelt (Raabe et al. 2010). Temperature is also likely to be a factor (Baxter pers. comm.).

2.4 Species decline and current threats

The longfin smelt was once one of the most abundant fish in the San Francisco Estuary. The species has experienced severe declines in abundance in recent decades. Previous declines (mid-1970s, 1990s) were strongly correlated with low Delta water outflow (Figure 5). However, recent declines have persisted even in years of high Delta outflow (Moyle 2002, Rosenfield 2009). These recent declines, beginning in the early 2000s, are considered part of the Pelagic Organism Decline (POD) in the Delta, and mirror trends seen in the delta smelt (*Hypomesus transpacificus*), threadfin shad (*Dorosoma petenense*), and juvenile striped bass (*Morone saxatilis*) (Armor et al. 2006, Thomson et al. 2010). Major causes believed to be contributing to the recent decline of the longfin smelt are reduced freshwater outflow during the incubation and larval rearing period, entrainment of larvae and adults in water delivery intakes (i.e., pumping stations), and the changing of the food web due to introduced species. Other factors potentially important in the decline of the longfin smelt include climate change, shrimping by-catch, and changes in water quality (turbidity and contaminants) (Moyle 2002, The Bay Institute et al. 2007, CDFG 2009, Baxter et al. 2010).

Reduction in Delta outflow is believed to be the biggest factor affecting longfin smelt abundance in the Estuary (Moyle 2002); (CDFG 2009). Longfin smelt abundance shows a strong, positive, multi-decadal correlation with freshwater outflow (Rosenfield and Baxter 2007, Baxter 2009, Baxter et al. 2010). Otolith microchemistry shows that smelt occupied a narrower salinity range in 2000 to 2007, and more saline water overall, indicating that availability of brackish habitat for smelt has been reduced (Hobbs 2009).

Water diversions by the State Water Project (SWP) and Central Valley Project (CVP) have contributed to lower Delta outflow. Such diversions also pose a threat to longfin smelt because of their potential to entrain longfin smelt, particularly larvae and juveniles, in pumping stations (Kimmerer and Nobriga 2008). Risk of entrainment was fairly constant over the last 50 to 100 years until the SWP and CVP increased diversions and potential for entrainment (Moyle 2002).

The introduction of the overbite clam, *Corbula amurensis*, in the late 1980s changed the benthic community and is likely responsible for the observed step-decline in mysid shrimp, which are an important prey item for longfin smelt. The introduction of non-native copepods may have further reduced the quality of prey available (Baxter et al. 2010). While introduced predators such as striped bass do not appear to be a threat to adult longfin smelt (Baxter 2009), egg and larval predators such as the Mississippi silverside (*Menidia audens*) may pose a threat (Moyle 2002).

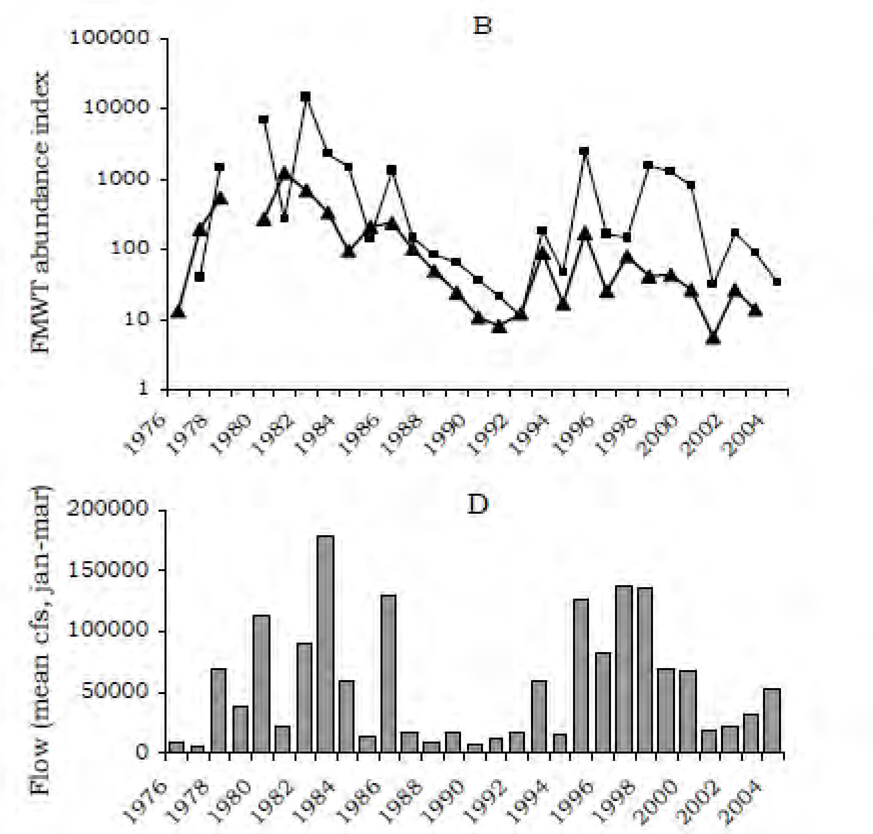

Figure 5. Abundance of longfin smelt population has correlated positively over time with freshwater flows (Rosenfield 2009). Abundance data are taken from the CDFG Fall Midwater Trawl surveys (FMWT).

Contaminants in urban and agricultural run-off and in wastewater treatment plant discharges have the potential to be toxic to longfin smelt. Pyrethroid contamination may be less of a problem for longfin smelt compared with other Delta species, because spawning occurs early in the year before much of the pesticide application. However, when the timing does coincide, larvae could be susceptible, and effects might be hard to detect (Moyle 2002). The short life and low trophic position of the smelt also lessen concerns about bioaccumulation and biomagnification. However, the relative sensitivity of longfin smelt to contaminants, compared to other species, has not been studied. Delta smelt are known to be much more sensitive than Mississippi silverside (Baxter 2009). Water quality is of greatest concern in Suisun Bay and the Delta, as this is where spawning and early larval development take place and early life stages are most vulnerable to contaminants. Given the long incubation period and close proximity to sediment, eggs may be at risk of exposure to sediment-associated contaminants, and surface-oriented early-stage larvae would be particularly vulnerable to pulse-flow transported contaminants (Baxter et al. 2010).

Increasing water temperatures may be contributing to the decline of the smelt as well. San Francisco Bay represents the southernmost extent of population and, therefore, the species is likely to be close to the upper end of its temperature tolerance (Rosenfield 2009). Warm temperatures are believed to make parts of the Bay uninhabitable to the longfin smelt in the summer months (Baxter 2009).

Changes in turbidity have been proposed as a potential threat to longfin smelt. Reduced turbidity in recent years, due to sediment retention in upstream reservoirs and by invasive aquatic plants, may reduce the availability of ideal habitat, as smelt show a preference for turbid waters (Baxter et al. 2010).

Longfin smelt are a known by-catch of shrimp trawling in the Bay (Baxter 2009). Shrimp trawling is not allowed in spawning areas. However, it is responsible for some adult mortality.

CDFG (2009) described the greatest threats to longfin smelt as reduced inflows, entrainment, climatic variation, toxic substances, predation, and introduced species. Dredging has also been listed as a concern for the species and is considered in detail below. In the CDFG report on Delta organism stressors (CDFG 2010), dredging was listed as a Priority 3 (low priority) stressor because of its localized and limited impacts to species of concern. However, given the state of the population, even small effects could be damaging (Rosenfield 2009).

3. Dredging and Longfin Smelt

3.1 Potential impacts of dredging

Potential impacts of dredging include direct mortality due to entrainment or burial of eggs, removal of spawning habitat, changes in water quality due to increased suspended sediment, and indirect effects resulting from habitat alteration.

Entrainment by hydraulic dredging has been directly monitored in several studies, and little to no entrainment has been observed. Swedberg and Zentner (2009) filtered 65,000 cubic yards of dredged material from the Port Sonoma project at the mouth of the Petaluma River. While large numbers of longfin smelt were caught in the area when trawling for shrimp (establishing presence), no longfin smelt were found in the dredged sediment in 2007. One longfin smelt was entrained in 2006 while the dredge head was running above the sediment surface, emphasizing the importance of correct dredging technique, which could have prevented entrainment of that fish. This study was conducted in late autumn and winter when relative risk of adult entrainment in San Pablo Bay is believed to be low. Gold (2009) performed an entrainment study using a custom-built entrainment screen. In this study, 725 fish of 15 species were captured. The majority of the catch were non-native, benthic species including shimofuri goby, channel catfish, and white catfish. No longfin smelt were captured. Similarly, monitoring of a hopper dredging project in Pinole Shoal Channel found no entrainment of longfin smelt (McGowan 2010). In combination, these findings suggest very low entrainment rates for adult or juvenile longfin smelt due to hydraulic dredging.

Dredging in spawning habitat poses a risk of removing eggs or spawning habitat directly, burying eggs, or increasing suspended sediment to an extent that prevents the adhesion of eggs to proper substrate (USACE 2004). Across fish species, suspended sediments may cause alarm reaction, cover abandonment, or attraction (as a potential food source or cover). There are also changes in light penetration/scattering that could cause increased swimming, altered school behavior, avoidance, displacement, attraction, and changes in prey capture rates (Anchor Environmental CA et al. 2003). Although all of these effects could potentially occur, none have been evaluated or documented for longfin smelt.

Although dredging associated turbidity has been raised as a potential concern for aquatic species in the Bay (Jabusch et al. 2008), it is unlikely that turbidity would have adverse impacts to adult or juvenile longfin smelt. Longfin smelt are an estuarine species, adapted to turbid waters and changing water clarity. Increased turbidity may have a positive effect on longfin smelt, with higher densities of longfin smelt in more turbid waters. This finding suggests that longfin smelt appear to seek refuge from predators in turbid waters (Hobbs 2009). In addition to increased turbidity, there is also concern that resuspension of contaminated sediment could increase the availability and uptake of heavy metals and organic contaminants in longfin smelt (Baxter, pers. comm).

For new dredging projects, changes to hydrodynamics and habitat have the potential to benefit or harm longfin smelt, depending on the project-specific outcome. Longfin smelt may be particularly sensitive to changes in hydrodynamics, as they appear to use channel depth and the pattern of water flow through a channel to maintain position near the entrapment zone. Substantial channel deepening could conceivably increase stratification and consequently affect the ability of longfin smelt to maintain longitudinal position by vertical migration (Hobbs 2009). Conversely, substantial disposal of dredge material in deepwater locations near the entrapment zone could reduce the ability of smelt to maintain position. Depending upon where channel deepening occurs changes in water velocity or salinity may also occur (Baxter, pers. comm.).

Potential indirect effects of dredging pertain to the creation and maintenance of shipping channels. These channels may facilitate the introduction of invasive species, as well as harm by commercial vessel wave action and propeller damage.

3.2 Avoidance, minimization and mitigation of impacts to longfin smelt

3.2.1 Work windows

The interannual variation in spatial distribution of longfin smelt makes it difficult to avoid potential impacts of aquatic activities using a fixed work windows-based approach. Alternative methods that account for interannual variation in spatial distribution merit consideration.

The LTMS established work windows in the LTMS Environmental Impact Statement/Report and Record of Decision (EIS/R & RoD). At that time, longfin was a candidate for listing and therefore not considered in the 1999 LTMS biological opinion. However, the LTMS EIS & RoD did provide work windows for some candidate species of concern, including longfin, and those work windows are still in place (LaCivita pers comm). Work windows limit work to the period of June to October in the Delta and South San Francisco Bay, September to November between the Carquinez Bridge and Collinsville, and from August to January in San Pablo Bay (LTMS 2004).

The 2009 LTMS Longfin Smelt Symposium facilitated discussion on work windows for longfin smelt. Members of the expert scientific panel did not support establishing work windows for this species. The basis for not supporting a windows approach was the widespread use of the Bay by longfin smelt throughout the year and the high degree of interannual variation in distribution (Stanford et al. 2009). Examination of seasonal and spatial patterns in IEP Bay Study data (Figures 1 and 2) indicate widespread distribution of longfin smelt. More detailed summaries also indicate the species to be present throughout the Bay, with some risk of occurrence year round (Baxter 1999, Rosenfield and Baxter 2007).

3.2.2 Minimization and mitigation in recent projects

Current dredging projects have minimized impact to longfin smelt larvae by timing and dredge placement location and to adults by dredging methods and equipment. A dredging project on the Pinole Shoal Channel in San Pablo Bay by hopper dredge reduced the risk of dredging to longfin smelt by limiting all priming, cleaning, and pumping of water to within three feet of the bottom (McGowan 2010). Monitoring of this project found no entrainment of longfin smelt. The Chevron Long Wharf project minimized impact through use of a clamshell dredge with a cable arm. The project report (Arcadis 2009) indicated that this method "minimize[d] sediment dispersion through engineered vents to decrease downward water pressure that roils bottom materials as the bucket approaches. Using a controlled descent speed also reduces the potential for direct contact between the bucket and marine life and reduces sediment dispersion."

Allied Defense Recycling and Lennar Mare Island plan to conduct maintenance dredging of the Mare Island Dry Docks. To mitigate for potential impacts to Delta smelt and longfin smelt, mitigation will be conducted in the form of acquiring, restoring, and preserving five acres of tidal shallow water habitat (San Francisco Bay Conservation and Development Commission 2010).

4. Study Plan

4.1 State of knowledge and information gaps

The basic life history of longfin smelt is well understood, largely from studies done in the Lake Washington area (Moulton 1974, Chigbu and Sibley 1998, Chigbu 2000, Moyle 2002). Some knowledge gaps exist on aspects of life history specific to San Francisco Estuary populations. These include spawning locations and habitat, use of marshes and nearshore areas, and extent of migration to marine locations. Long-term monitoring by the IEP has provided useful information regarding spatio-temporal patterns in longfin smelt abundance and mechanisms to explain declines (Baxter 1999, Armor et al. 2006, Rosenfield and Baxter 2007, Baxter 2009, Baxter et al. 2010, Thomson et al. 2010). Similar trends across all monitoring programs suggest we are capturing trends in abundance and distribution of this species (Rosenfield and Baxter 2007).

Understanding of potential effects of dredging is limited by a lack of systematic data collection in many locations where dredging projects may occur. Areas where longfin smelt distribution is not well understood include: shallow water, nearshore habitat, the Lower South Bay, Bay tributaries (e.g., the Napa and Petaluma Rivers and Coyote Creek), and marine waters outside of the Bay. A better understanding of how longfin smelt are associated with habitat parameters may also help identify areas where it is safe to dredge. Of these, temperature, salinity, and depth are particularly promising as variables to potentially explain short-term patterns in distribution of the species (Baxter 2009). Effects of dredging on water quality (Jabusch et al. 2008) and suspended sediment (Anchor Environmental CA et al. 2003) have been studied in general, and these results can potentially be applied to predict the response of longfin smelt. While the potential risk of contaminants on fish have been considered generally, both from runoff (Moyle 2002) and resuspension of contaminated sediments (Jabusch et al 2006), specific studies of contaminant effects on longfin smelt have not been conducted. Since non-dredging threats such as climate change and shrimp trawling are not well understood, the ability of the LTMS to ameliorate these issues is not clear. Based on their pelagic life history, reduction of shrimp trawling activity holds potential promise as a means to reduce impacts to longfin smelt.

The POD team of the IEP oversees many studies related to the decline of longfin smelt and other fish species in the Delta. The 2010 POD work plan includes 39 continuing study elements and 32 new elements (Baxter et al. 2010). Proposed studies related to longfin smelt will investigate population genetics, otolith biogeochemistry, salinity tolerance, and food web changes (see Table 1 for a complete list of POD studies that relate to the longfin smelt).

One conclusion among participants at the 2009 LTMS Longfin Smelt Symposium was that real-time monitoring at the individual project level might be valuable for large-scale projects but is too costly for smaller projects. Furthermore, results from one project would not necessarily be applicable to other projects (Stanford et al. 2009). These findings suggest that a large-scale Bay-wide program might be more effective for evaluating distribution and potential risks to longfin smelt.

Dredgers at the Symposium also voiced a desire for more specific guidance from the State on how to meet the requirements for avoidance, minimization and mitigation. Other stakeholders also expressed frustration at the lack of guidance on meeting permitting requirements (Stanford et al. 2009). These findings suggest the need for development of a systematic and consistent approach for managing longfin smelt at the project level.

Table 1. Study elements in the 2010 Pelagic Organism Decline Workplan that relate directly or indirectly to longfin smelt (Baxter et al. 2010).

Study Element	New or ongoing work
Development and implementation of IBM of striped bass and longfin smelt	Ongoing work
Estimation of pelagic fish population sizes	Ongoing work
Zooplankton fecundity and population structure	Ongoing work
Phytoplankton primary production and biomass	Ongoing work
NCEAS - synthetic analyses of fish and zooplankton	Ongoing work
Fish diet and condition	Ongoing work
Trends in benthic macrofauna abundance and biomass	Ongoing work
Corbula salinity tolerance	Ongoing work
Field survey of Microcystis bloom biomass and toxicity	Ongoing work
Food web support for delta smelt and other estuarine fishes	Ongoing work
Investigation of power plant impacts	Ongoing work
SAV abundance and distribution	Ongoing work
Fish facility history	Ongoing work
Contaminants and biomarkers work	Ongoing work
Feasibility of using towed imaging systems	Ongoing work
Use of acoustics to measure trawl openings	Ongoing work
Effects of the Cache Slough complex on north Delta habitat	Ongoing work
Population genetics and otolith geochemistry of longfin smelt	Ongoing work
Effects of waste water management on primary productivity	Ongoing work
Effects of Microcystis on threadfin shad	Ongoing work
Contaminant synthesis 2 – impacts of contaminants and discharges	Ongoing work
Spatial and temporal variability of Delta water temperatures	Ongoing work
Plankton dynamics in the Delta: trends and interactions	Ongoing work
Environmental controls on the distribution of harmful algae and their toxins in the San Francisco Bay	Ongoing work
Comparison of nutrient sources and phytoplankton growth and species composition	Ongoing work
Spatial and temporal quantification of pesticide loadings	Ongoing work
Acute and chronic toxicity of contaminant mixtures and multiple stressors	New IEP, new CALFED/Delta Science Program or expanded IEP work
Advancing procedures for extracting and recovering chemicals of concern from sediment interstitial water	New IEP, new CALFED/Delta Science Program or expanded IEP work
Comparison of 1- and 2-D hydrodynamic and water quality models of the Delta	New IEP, new CALFED/Delta Science Program or expanded IEP work
Spatial and temporal variability in nutrients in Suisun Bay in relation to spring phytoplankton blooms	New IEP, new CALFED/Delta Science Program or expanded IEP work
Experimentally determining early life-stage sensitivity to salinity for longfin smelt	New IEP, new CALFED/Delta Science Program or expanded IEP work
Remote sensing mapping and monitoring of Microcystis and turbidity in the upper SFE	New IEP, new CALFED/Delta Science Program or expanded IEP work
Metabolic responses to variable salinity environments in field acclimatized Corbula amurensis	New IEP, new CALFED/Delta Science Program or expanded IEP work
Causes of seasonal and spatial variations in NH4 sources, sinks, and contributions to algal productivity using a multi-isotopic approach	New IEP, new CALFED/Delta Science Program or expanded IEP work
Longfin smelt bioenergetics	New IEP, new CALFED/Delta Science Program or expanded IEP work
OP and pyrethroid use in the Sacramento River and Delta	New IEP, new CALFED/Delta Science Program or expanded IEP work
Ammonia literature review	New IEP, new CALFED/Delta Science Program or expanded IEP work

4.2 Proposed studies

Based on information gaps identified in this literature review, and management needs discussed at the Symposium, five studies are proposed for consideration by the LTMS Science Workgroup (Table 2).

4.2.1. Thermal tolerance

Cost: $25,000-$100,000

Duration: 1-2 years

Question: What is the thermal tolerance of longfin smelt? Is there a temperature threshold at which the species can be assumed to be absent from an area?

Summary:

Temperature has been proposed as a major factor limiting the southern distribution of the longfin smelt, and explaining their summer movement into deeper waters (Baxter 2009). Establishing the thermal tolerance of the species could allow identification of areas in the San Francisco Estuary where it would be safe to assume no take of longfin smelt from dredging would occur. Further, understanding how growth and condition are affected by elevated temperatures could help to predict how climate change will impact future survival and distribution of the species.

These questions could be answered by laboratory studies examining the growth and survival of longfin smelt at different temperatures, using acclimated chronic exposure methods with fish fed to saturation daily to establish peak growth temperatures in addition to lethal thresholds (e.g. Swanson and Cech 1995, Swanson et al. 2000; Selong et al. 2001). Such studies should establish thermal tolerance for larval and juvenile fish as well as adults.

Laboratory studies will compliment data from continued IEP monitoring programs (Bay Study, Fall midwater trawl survey) which measure temperature at each station in each survey.

As part of this study the relationship between water depth and temperature could be examined to determine whether high temperatures preclude longfin smelt presence in certain areas of shallow water.

4.2.2. Mechanical dredging

Cost: $100,000 - $250,000

Duration: 1 year

Question: What is the risk of direct mortality from clamshell dredging, versus other methods, for longfin smelt and other species of management concern?

Summary:

Clamshell dredging is widely employed as a method that minimizes effects to aquatic resources. Escapement and avoidance is believed to be greater employing clamshell dredges than other methods, such as suction dredges. Although other dredge methods have been evaluated in the Bay, direct measurement of mortality due to clamshell dredging has not been performed.

A study is recommended to measure entrainment levels from clamshell dredging as compared to other methods, to establish the relative impact to longfin smelt and other sensitive aquatic species. This would aid in understanding the potential benefits of clamshell dredging as a minimization activity, as well as providing additional information on the actual risk posed by other dredging activities.

The presumed cost estimate for this study assumes that it would be performed in tandem with maintenance or navigation dredging activities underway. A portion of the study effort would be in developing appropriate techniques for quantitatively collecting fish entrained or disturbed by the dredging activity. This could include sorting through dredged sediment, as was performed previously (Gold 2009, Swedberg and Zentner 2009), and placement of nets in the dredging area to document fish present during the activity.

The study would preferably be conducted during a period and location where longfin smelt of various life stages were expected to be abundant. Though high abundance would present a short term risk to the species, this would be ameliorated by the long term benefits of better understanding the hazards of these activities under worst-case scenario conditions. Previous studies recorded no impacts to longfin smelt (Gold 2009, Swedberg and Zentner 2009), likely due to very low abundance of the species in the study area. Additional species captured should also be carefully recorded to document potential impacts to other species of concern (e.g., green sturgeon (*Acipenser medirostris*), pacific herring (*Clupea pallasi*)) as well as invasive species.

Ideally, an experimental approach would be employed in which multiple dredging methods were applied on-site, and at varying times of day and tidal conditions. A replicate statistical design is recommended to include varying combinations of dredge method, time, and tidal cycle. This would facilitate statistical analysis of potential factors leading to elevated entrainment or mortality by dredging activities. However, if costs for concurrent studies of multiple dredging methods are prohibitive, studies of clamshell dredging alone could be conducted and results compared to previous studies for hydraulic dredging.

4.2.3. Distribution in nearshore areas, tributaries, and Lower South Bay

Cost: $100,000-$250,000

Duration: 3 years or ongoing

Question: How do longfin smelt use habitats currently not monitored? Are there locations not currently monitored where it would be safe to dredge?

Summary:

One of the uncertainties identified by researchers working with longfin smelt is their use of shallow and nearshore locations where many maintenance dredging projects and restoration activities occur (Randy Baxter, pers. comm.). There is also limited understanding of their presence and abundance within the Lower South Bay and the Petaluma River (Figures 1 and 2). Rather than an ad-hoc project-specific approach, the most effective approach to further understand the biology of this species is a systematic status and trends monitoring program, such as that employed by the IEP. Another advantage of a programmatic study approach (rather than project-specific) is a greater ability to systematically integrate and interpret data regarding the needs, habitat use, and impacts to the species (Baxter 1999, Matern et al. 2002, Rosenfield and Baxter 2007, Thomson et al. 2010). This would aid in development of a Decision Support System for evaluating the effects of dredging (Study 4.2.5).

Currently, in collaboration with other agencies, the IEP performs extensive fish monitoring in multiple offshore locations throughout the Estuary. However, monitoring in nearshore locations where dredging activity and dredge material placement frequently occur is limited to a set of stations in Suisun Marsh (Matern et al. 2002). Systematic monitoring is also lacking in the Lower South Bay and Petaluma River, despite the occurrence of longfin smelt in these waters.

The LTMS could work in coordination with IEP to develop a sampling program covering shoreline habitat across the Bay, in order to increase understanding of longfin smelt use of shallow areas. Although information is lacking throughout the year, of particular interest is spawning activity and larval development, which occur between January and June. Although useful information could be obtained in 3 years or less, additional long term study could be performed to evaluate interannual variation and long-term trends in abundance and distribution of longfin smelt and other species.

A probabilistic survey design is recommended to best understand the spatial and temporal patterns in fish abundance and distribution (Stevens and Olsen 2004). Such approaches have been useful in understanding spatial patterns in benthic condition and contaminant concentrations in the Bay and Delta. Targeted sampling could also be included to evaluate use of the Lower South Bay, Petaluma River, other Bay tributaries where dredging is commonly performed, and areas with major planned restoration activity (e.g., Hamilton Wetlands Restoration Project).

Ancillary parameter information should also be collected to aid in determining factors that influence the abundance and distribution of longfin smelt, in addition to other species of interest. Of particular interest are water temperature, salinity, turbidity, tidal condition, depth, benthic habitat type (e.g., sediment composition), and shoreline condition. This would enable statistical modeling of drivers of smelt presence and abundance (Matern et al. 2002). For example, correlational data relating water depth, temperature, and species presence could be used to evaluate a potential interaction between nearshore water (7 m to shoreline) elevated water temperatures, and reduced longfin smelt abundance. Such a finding would indicate very limited or no risk of take to the species for projects occurring in such conditions. Since longfin smelt inhabit deeper water and tend to avoid water temperatures in the >20 deg C range, depth and temperature could work additively to reduce risk.

4.2.4. Spawning Locations and Habitat

Cost: $25,000-$100,000

Duration: 3 years

Question: Where specifically are longfin smelt spawning in the Bay? What are the important habitat requirements for spawning?

Summary:

Although spawning activity has been documented in the Lake Washington population (Moulton 1974), actual spawning has not been observed in San Francisco Bay. Based on observations of distribution of spawning aged adults, and yolk-sac larvae, local biologists have hypothesized that spawning occurs at the freshwater/brackish water interface, with sandy sediments in deeper channels favorable for spawning (Moyle 2002, Rosenfield and Baxter 2007, CDFG 2009, Baxter et al. 2010). However, with no direct evidence of the locations or habitat preferences for spawning, these hypotheses remain speculative. Spawning is believed to occur within the Delta and possibly within tributaries such as the Petaluma and Napa Rivers, and Coyote Creek, areas where dredging projects might potentially occur. Removal or alteration of spawning habitat as a result of dredging would negatively impact reproductive success of the longfin smelt.

A better understanding of appropriate spawning habitat would enable the LTMS to determine whether particular habitat types (e.g., sandy sediments), channel depths, or locations within the Estuary are likely to contain longfin smelt. The potential presence of spawning adults, eggs, or yolk-sac larvae would aid in determining the potential hazard of a proposed project. This would further aid in development of a Decision Support System for evaluating the effects of dredging (Study 4.2.5)

The proposed study would evaluate multiple locations within the Estuary to determine appropriate spawning habitat for longfin smelt. The study approach would be a field survey, targeting gravid females in addition to eggs. To reduce costs, the study could be performed in coordination with the survey of abundance and distribution (Study 4.2.3). Current sampling for native and alien fish eggs in the Sacramento River and Yolo Bypass uses plankton sampling (Sommer et al 2004), which is inappropriate for detecting the adhesive eggs of longfin smelt. Substrate sampling or artificial substrates is needed to detect the spawning locations of longfin smelt (Baxter, pers. comm.). Statistical modeling techniques would be used to compare egg presence information to environmental factors of potential interest (e.g., depth, salinity, time of year, flow, and location).

4.2.5. Decision system for adaptive response to longfin smelt spatial and temporal patterns

Cost: $100,000-$250,000

Duration: 2 years

Question: What is an appropriate method to reduce hazards to longfin smelt, based on spatiotemporal distribution and habitat preferences?

Summary:

Longfin smelt occur throughout San Francisco Bay, with spatial distribution varying seasonally and across years, due to riverine flow and other factors. LTMS participants and other stakeholders have requested development of a clear and consistent approach for management of this species. To address these needs, we recommend a study to develop an approach to manage potential impacts of sediment management activities on longfin smelt.

The study would focus on developing a decision support system for longfin smelt management. This will require integration of both technical (e.g., longfin smelt biology) and organizational (e.g., effective interagency communication) information. It would need to occur in collaboration with LTMS participating agencies and would require investment of time and coordination. As an initial conceptual model, the following three components would be incorporated into the decision support system: 1. A tool or method for obtaining real-time information on longfin smelt abundance and distribution in the Bay; 2. A standardized methodology for management decision-making based on current dredging activities and results of 1; and 3. A set of standardized avoidance, minimization and mitigation measures.

The first component, a method for obtaining real-time information on abundance or distribution, is needed to address the substantial interannual and seasonal variation in regional abundance of longfin smelt. Currently, IEP monthly collections provide general information about Bay-wide movement of the species. Additional data collection undertaken as part of Studies 4.2.3 and 4.2.4, may provide further necessary insight into the abundance and distribution of the species. The data synthesis and integration method would entail development of a data query tool and an efficient interagency relationship and communication strategy. This approach must provide a rapid and reliable method to access, interpret, and disseminate the longfin smelt distribution data in a standardized fashion appropriate for LTMS use.

The second component, a standardized methodology for management decision-making, should be a decision tree or other system to efficiently and consistently answer two questions: 1. will a dredging or other management activity substantially spatially and temporally overlap with longfin smelt? and 2. what is the extent to which that activity is likely to pose a threat to individuals within the population? The outcome of the decision should depend on type of dredge employed (or other management activity); expected or observed abundance (i.e., current overall abundance level); and distribution of the species recorded near the activity, duration of the activity, and other factors expected to affect longfin smelt occurrence and entrainment risk. Ultimately, the system must be straightforward to employ, enabling consistent outcomes. A subtask for developing the methodology would be developing statistical models of likelihood of smelt occurrence, based on environmental parameters measured at the site and expected to influence the species (e.g., temperature, salinity, depth), and field testing of those models.

The third component is a set of standardized minimization and mitigation measures that may be employed to ameliorate potential effects to longfin smelt when there is a high risk of negative effects. This component is needed to rapidly and consistently determine appropriate measures when smelt are likely to be present in a project area. Possible measures include monitoring for the species, setting up barrier devices to reduce exposure to the species, changing the dredging methodology to lower-risk practices (e.g., clamshell dredging), restoration or enhancement of nursery habitat in appropriate locations, or other practices as determined by the study. The extent of mitigation or minimization required should be scaled in a consistent fashion, based on the magnitude of hazard as defined in the second component.

For this study to have benefit, key agencies should commit to participating and allocate adequate staff support (some of which could be funded as part of the study budget). At a minimum, workgroup participants should include a staff member from USACE, BCDC, CDFG permitting, and two biologists familiar with longfin smelt (e.g., Randy Baxter, Kathy Hieb, Jim Hobbs, or Josh Israel).

Table 2. Studies proposed for consideration by the LTMS Science Workgroup.

Proposed Studies			
Proposed Study Name	**Cost**	**Duration**	**Questions to be answered**
Thermal tolerance	$25,000-$100,000	1-2 yrs	What is the thermal tolerance of longfin smelt? Is there a temperature threshold at which the species can be assumed to be absent from an area?
Mechanical dredging	$100,000-$250,000	1 yr	What is the relative risk of direct mortality from clamshell dredging, versus other methods, for longfin smelt and other species of management concern?
Distribution in nearshore areas, tributaries, and Lower South Bay	$100,000-$250,000	3 yrs	How do longfin smelt use habitats currently not monitored? Are there locations not currently monitored where it would be safe to dredge?
Spawning locations and habitat	$25,000-$100,000	3 yrs	Where specifically are longfin smelt spawning in the Bay? What are the important habitat requirements for spawning?
Decision system for adaptive response to longfin smelt spatial and temporal patterns	$100,000-$250,000	2 yrs	What is an appropriate method to reduce hazards to longfin smelt, based on spatiotemporal distribution and habitat preferences?

5. Acknowledgements

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CITIZENS COMMITTEE TO COMPLETE THE REFUGE

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November 7, 2018

Via email: marc.zeppetello@bcdc.ca.gov

Enforcement Committee
Bay Conservation and Development Commission
455 Golden Gate Avenue, Suite 10600
San Francisco, CA 94102-7019

RE: Executive Director's Recommended Enforcement Decision Regarding Westpoint Harbor; Proposed Settlement Agreement between the Commission and Westpoint Harbor

Dear Commissioner Scharff and Members of the Enforcement Committee,

We write in regards to Item 6 of the BCDC Enforcement Committee's November 8, 2018 Agenda. We urge the Enforcement Committee not to approve the enforcement decision, proposed Permit Amendment Ten, as currently proposed for Westpoint Harbor.

Citizens Committee to Complete the Refuge ("Citizens") is dedicated to the protection of the environment, and is particularly concerned about impacts to the Don Edwards San Francisco Bay National Wildlife Refuge, its ecosystem and affected species.

As reflected in the record, Citizens provided written comments urging BCDC to bring Mark Sanders and the Westpoint Marina into compliance with the permit issued for the Westpoint Marina on March 10, 2017, May 18, 2017, May 19, 2017, October 26, 2017, November 2, 2017, November 3, 2017, January 15, 2018 and March 8, 2018. Citizens provided oral testimony to the Enforcement Committee on November 16, 2017 and January 18, 2018, and to the Commission on March 15, 2018 regarding BCDC's proposed enforcement action regarding Westpoint Harbor.

As explained further below, there are a number of significant problems with this proposed enforcement decision:

1. Proposed Elimination of Shorebird Roosting Habitat Mitigation.

The currently proposed enforcement decision would permanently relieve Westpoint Harbor of any obligation to create 3 acres of shorebird roosting habitat with functions and benefits for shorebirds similar to the habitat lost when this project was built and the harbor basin was excavated. There are a number of serious problems with BCDC's proposed approach.

The August 17, 2001 LSA Biotic Resources Report prepared for the Westpoint Marina project stated that during a March, 2001 site inspection over 1,000 birds were observed roosting on the high ground in the southwest corner of the site and that shorebird use of the salt ponds had been documented since late 1980.

The 3.0 acres of roost habitat was to be high ground remaining exposed year-round, provide isolation and limited disturbance, and serve as an island, surrounded by open water, to provide shorebirds and other waterfowl with a protected roost. This important mitigation has never been provided. No habitat with similar functions and benefits as the original habitat has been created - in part because the required consultation and approval of habitat plans never occurred.

BCDC is poised to relieve Westpoint of any shorebird roost mitigation obligation based simply on a November 26, 2003 letter from Cargill. However, review of Cargill's June 22, 2018 correspondence (Attachment B to the proposed Enforcement Decision) reveals that Cargill seriously refutes the assertions made by Westpoint Harbor upon which BCDC is prepared to rely. Cargill points out that the November 2003 letter was not a contract or other binding commitment from Cargill. The November 2003 letter was not signed by the person at Cargill with authority to do so – the leader of Cargill's California Land Management business; Westpoint Harbor likely knew this because at the time Westpoint Harbor was "in the midst of negotiating the sale of a final parcel of Cargill land to Westpoint." The November 2003 letter was not incorporated into the November 2003 purchase and sale agreement for the final parcel of Cargill land, which purchase closed in December 2003. Over fifteen years have passed, and Westpoint Harbor never followed up with Cargill to review any proposed habitat mitigation plans.

The habitat creation plans were to be "reviewed and approved by or on behalf of [BCDC] after consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Wildlife." There have been no habitat creation plans for BCDC to review now or then, and there is no evidence that Westpoint Harbor has consulted with U.S. Fish and Wildlife Service or the California Department of Fish and Wildlife. Such consultation was not only required in the Westpoint BCDC's permit, but also in the Regional Water Quality Control Board's May 16,2003 Water Quality Certification requirements for habitat mitigation issued to Westpoint Harbor.

Not only was this shorebird roost mitigation part of BCDC's original conditions for approval of this controversial bay fill project, it was also a mitigation requirement in Redwood City's project Mitigated Negative Declaration, the US Army Corps of Engineers' Westpoint Harbor Permit, LSA's August 2001 Project "Biotic Resources Report", and was included in substantive comments by resource agencies and the public.

The shorebird mitigation was specifically conditioned on habitat creation prior to commencement of Phase Two work. Phase Two commenced in 2015 and included authorization for the boathouse; that structure has now been built. Thus, Westpoint Harbor ignored timely implementation of the mitigation.

Westpoint Harbor should be consulting with BCDC and the other and resource agencies now to find an alternative to the Cargill pond mitigation site. Even a payment to help fund an approved shorebird roosting habitat enhancement project with similar size, functions and benefits could be considered. There may be opportunities within the South Bay Salt Pond Restoration Project at nearby Ravenswood Pond 3 or Pond R5-S5. Rather than ensuring Westpoint Harbor provides an alternative site, or an alternative that would help fund habitat enhancement, BCDC has abrogated its responsibility to “require mitigation for any impacts to wildlife or habitat at the project site”. This egregious dismissal of the resource protections outlined in Permit Special Condition F. is unacceptable.

2. Proposed Elimination of Signs from Westpoint Slough.

BCDC’s proposed enforcement decision would amend the existing permit to relieve Westpoint Harbor of any obligation to install and maintain signage to protect sensitive habitats from the boat wakes of vessels traveling up Westpoint Slough from the confluence with Redwood Creek. Specifically, Proposed Permit Amendment Ten adds new language to Special Condition H asserting that Westpoint Harbor’s placement of three signs near the marina basin entrance “satisfy the requirement to identify Westpoint Channel as a ‘no wake’ zone.

BCDC has provided no documentation that signage is in place at the entrance to Westpoint Slough alerting boaters that they must reduce their speed. In fact, the attached photo taken by San Francisco Baykeeper on November 2, 2018 shows that no signs are currently in place at the entrance to Westpoint Slough.

Citizens is concerned that boats traveling at high speeds along the shoreline of the National Wildlife Refuge at Greco Island - unaware of the “no wake” zone - will cause significant adverse impacts to the endangered Ridgeway’s Rail and Salt Marsh Harvest Mouse and their fragile habitat. Rail nests can be present from mid-March through August, and rails will abandon nests if disturbed by noise or other human activities.

“No Wake” buoys and signs were part of the BCDC original Westpoint Harbor permit as a means to protect Westpoint Slough mudflats and endangered species tidal marsh habitat on Greco Island from erosion caused by boat wakes. This condition was also included in the Redwood City Mitigated Negative Declaration at the request of the U.S. Fish & Wildlife Service – the agency with enforcement authority under the federal Endangered Species Act.

The Executive Director’s Recommendation justifies these changes based on Permit Amendment Five. However, it is important to note that Permit Amendment Five was proposed, but never adopted as a binding change to the Permit. Amendment Five would have made egregious changes to Special Condition H by eliminating Westpoint Harbor’s requirement to place buoys identifying Westpoint Slough as a no-wake zone, by eliminating buoys to delineate the center of the channel, and by eliminating buoys 100 feet off Greco Island to inform the public that access into the marshland of the wildlife refuge is prohibited. This proposed amendment was never reviewed by the public, nor adopted, and thus should not serve as justification for the elimination of necessary protective measures.

Further, new language added in the Authorization and Findings sections by Permit Amendment Ten states that the permittee will **install, use, and maintain no wake zone markers at the channel entrance to Westpoint Slough in cooperation with the Port of Redwood City.** This language must be added to the Permit Special Condition H to ensure that this requirement is enforceable and will be implemented.

3. Dredging Near and Into Westpoint Slough Without Any Environmental Review.

BCDC's proposed enforcement decision will authorize Westpoint Harbor to dredge up to 150,000 cubic yards of sediment within a 24-month period from the marina and entrance channel to the marina from Westpoint Slough - without any prior environmental review.

It was BCDC's position as far back as May, 2017 that dredging an average of 50,000 cubic yards per year for ten years was not exempt from CEQA. As late as June 1, 2018, BCDC was prepared to require an environmental assessment. Yet now, dredging 75,000 cubic yards per year for two years may be approved by BCDC without any environmental review.

In its May 17, 2017 response to Westpoint Harbor's proposed dredging, BCDC stated that

> Longfin smelt (Spirinchus thaleichthys) was declared a threatened species under the California Endangered Species Act on June 25, 2009. As a result, a take permit may be required for your project since hydraulic dredging is proposed. We cannot file an application complete without proper take authorization from the California Department of Fish and Wildlife (CDFW), if it is required, or the applicant's biological assessment and determination that the project will not result in take of longfin smelt.
>
> Please forward a copy of the water quality certification or waste discharge requirements from the San Francisco Bay Regional Water Quality Control Board (Water Board) when it is available. Our regulations prohibit us from filing an application that includes dredging and disposal prior to the applicant submitting such documentation.
>
> Essential Fish Habitat. In 2009, the LTMS Program Managers completed a programmatic consultation with NMFS for Essential Fish Habitat as required by the Magnuson Steven Fisheries Management and Conservation Act. As a result of that consultation, protective measures for eelgrass were agreed to and implemented for dredging projects adjacent to or containing eelgrass beds. Please note that if eelgrass is present in your dredge footprint or within 45 meters of your dredge footprint, a pre-dredge eelgrass survey will be required. Further, if eelgrass is within 250 meters of your dredge footprint, then use of a silt curtain or light monitoring of turbidity resulting from your project may be required.
>
> Provide a statement as to how the maintenance and new work dredging project you have requested is consistent with [the San Francisco Bay Plan Policies.] Policies that may be applicable to your project may include, but are not limited to, the Bay Plan policies on Dredging, Recreation, Subtidal Areas, Water Quality, and Fish, Other Aquatic Organisms and Wildlife.

It is unclear where this dredged material will be placed. Proposed Amendment Ten (p. 8) states that the dredged material may be disposed of at undefined "authorized location." Whereas the original permit stated that the "project would result in approximately 447,077 square feet of new Bay surface," i.e. approximately 10.25 acres, proposed Amendment Ten seems to double the Bay surface, stating that the "project would result in approximately 26.6 acres of new Bay surface." (p. 9.)

It appears that rather than require environmental review prior to project approval as CEQA requires, BCDC is going to allow any potential harm to occur first and then collect information during a survey after dredging is completed. This backward approach will not allow BCDC to assess biological harm and avoid such harm before it occurs.

The Executive Director's Recommended Enforcement Action claims that the dredging would fall within CEQA Categorical Exemption 15304 and 15306. We dispute that these exemptions are applicable as there is a reasonable possibility that the dredging activity will have a significant effect on the environment due to unusual circumstances, and because the cumulative impact of successive projects of the same type in the same place, over time is significant. See 14 CCR 15300.2. A categorical exemption is inapplicable here because (1) the adjacent wildlife refuge and the habitat for listed sensitive species constitute unusual circumstances, and (2) there is evidence of significant impacts, and (3) the cumulative impact of successive projects of the same type in the same place over time is significant.

In addition to the Longfin smelt and eelgrass, there are three listed species which "occur in areas adjacent to the project site" including the federally endangered California clapper rail (Rallus longirostris obsoletus - also known as California Ridgway's rail), the salt marsh harvest mouse (Reithrodontomys raviventris) and the California least tern (Sterna antillarum browni).

In a September 18, 2001 comment letter on the Redwood City Notice of Negative Declaration and Use Permit for the original Westpoint marina project, Refuge Manager Clyde Morris stated:

> we are concerned that increased tidal flows from dredging/opening the marina acreage could cause erosion at Greco Island and the project site's salt marshes. We also believe **any future maintenance dredging of the Westpoint Slough channel would have serious impact on the Refuge and wildlife at Greco Island. We recommend a requirement that no dredging be allowed in Westpoint Slough** in the future except the Port of Redwood City's historic dredging of the bar at the entrance of the Slough to Redwood Creek. We suggest that potential erosion impacts from the proposed dredging of the entrance to the marina and increased tidal flow be evaluated and eliminated. We recommend that the Marina offset any unavoidable permanent loss of mudflat and marsh habitat which will result from the dredging project and tidal flow increase. These mudflats are frequently used by feeding shorebirds and as we have stated previously, the marsh provide habitat for endangered species in addition to a variety of other wildlife.

In a June 14, 2002 comment letter on the original project, Jan Knight, Chief of the Endangered Species Division, Sacramento U.S. Fish and Wildlife Office, stated:

Increased tidal flows from dredging/opening the marina acreage could cause erosion at Greco Island and the project site's salt marshes. **We also believe any future maintenance dredging of the Westpoint Slough channel would have serious effects on the Refuge and wildlife at Greco Island.**

For these reasons, Citizens urges BCDC not to approve dredging without proper environmental review.

4. No Set Implementation Dates Are Included for Numerous Protective Measures.

First, there is no date by which Westpoint Harbor must install channel markers to restrict boats to the center of Westpoint Channel. (Proposed Amendment Ten, Special Condition H.)

Second, there is no date by which Westpoint Harbor must coordinate with the San Francisco Bay National Wildlife Refuge to install a signage system along the edge of Greco Island along Westpoint Slough up to its confluence with Redwood Creek. (Proposed Amendment Ten, Special Condition H.)

Third, there is no date certain for Westpoint Harbor to install signs at its boat launch informing the public that access restrictions to Greco Island and the San Francisco Bay National Wildlife Refuge is restricted, and that Westpoint Slough is a "No Wake Zone".[1] (Proposed Amendment Ten, Special Condition I.)

Channel markers and signs advising of Greco Island's sensitive nature were supposed to be part of Phase 1A of the project. Document 25 in the record shows that in March, 2007 Westpoint Harbor promised to install channel markers by April, 2007. Given the intransigence of Westpoint Harbor in complying with its permit over the past fifteen years, Citizens believe inclusion of such specific dates in any permit amendment is essential.

5. Conflicts with Public Trust and Statutory Duties, and Environmental Policies.
BCDC's proposal to amend this permit in this manner conflicts with its public trust obligations and statutory duties. The proposed changes show a blatant disregard on the part of BCDC to uphold the agency's legislative mandate to protect Bay resources. The proposed permit changes establish a terrible precedent, and jeopardize the public's trust in BCDC's willingness to protect the Bay and its resources. Further, BCDC's proposed backsliding is inconsistent with original permit Findings that "the project will result in the protection of Bay resources including marshes and fish and wildlife <u>because Special Conditions ensure the protection of surrounding valuable habitat and require mitigation for any impacts to wildlife or habitat at the project site</u>."

BCDC relied on the project providing wildlife habitat in its findings that Westpoint Harbor was consistent with the McAteer-Petris Act, San Francisco Bay Plan salt pond policies, CEQA, BCDC's amended coastal zone management program, and would result in the protection of Bay resources. Permit 2-02 Findings III.A and III.F. In the absence of the shorebird mitigation, Citizens believes that the project, and BCDC's approval thereof, are not consistent with these environmental laws and policies.

6. No Adequate Public Review and Comment Period Provided.

The public has not been afforded an adequate opportunity to review the drastic proposed changes in the Enforcement Decision. This matter was previously before the Committee on November 16, 2017 and January 18, 2018, and before the Commission on March 15, 2018. After six months of confidential settlement discussions - that the public was not privy too - BCDC has allowed the

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[1] Citizens also objects to the proposed limitation of such signs to the boat launch, and elimination of such signs at "other public access areas."

public only 10 days to review and comment on proposed changes to the permit which relieves Westpoint Harbor of numerous mitigation requirements, reduces the civil penalty, and allows dredging without environmental review. Our organization has not had an adequate opportunity to consult with scientists, wildlife agency personnel, and policy makers about the impacts and precedent set by these proposed permit amendments.

7. Proposed Civil Penalties are Inadequate.

Civil liability may be administratively imposed by BCDC for violation of any permit condition or term in an amount up to $2,000 for each day a violation persists, not to exceed $30,000 for a single violation. California Gov't Code §§ 66641.5 (e) & 66641.6. Violation of any of the terms of the Permit shall be grounds for revocation. BCDC may revoke the permit for such violations after a public hearing is held with reasonable notice to the permittee. If the permit is revoked BCDC may determine, if appropriate, that all or part of any fill or structure placed pursuant to the permit must be removed. Permit 2-02, Section IV. M.

The currently proposed enforcement decision drastically reduces proposed civil penalties. At the November 16, 2017 hearing, the Enforcement Committee adopted the Executive Director's Recommended Enforcement Decision including the proposed cease and desist and civil penalty order for $513,000. The Enforcement Committee adopted the Executive Director's Recommended Enforcement Decision with the modification that if BCDC and Westpoint were able to mutually agree on proposed revisions to the cease and desist provisions of the proposed order, the penalty would be reduced 50% from $513,000 to $256,500. The currently proposed enforcement decision reduces the civil penalty by over 70% to $150,000.

8. Settlement Agreement Does Not Deprive the Enforcement Committee of its Oversight Obligation or Power.

The Enforcement Committee is not restricted from modifying the terms of the proposed settlement agreement. Even the Settlement Agreement negotiated behind closed doors provides that if the Enforcement Committee makes recommendations to be incorporated into the permit, the Executive Director and Westpoint Harbor agree to address such recommendations.

In conclusion, we urge the BCDC Enforcement Committee not to approve the currently proposed Westpoint Harbor enforcement decision. Instead, we urge the Committee to protect critically important Bay habitats and uphold the permit conditions to protect these resources.

Thank you for giving our concerns your careful consideration.

Sincerely,

Gail Raabe Carin High

Gail Raabe Carin High
Co-Chairs
Citizens Committee to Complete the Refuge

Attachments

November 2, 2018 photograph of the entrance to Westpoint Slough at the confluence with Redwood Creek. A set of green and red channel markers are in the foreground, and the Port of Redwood City and Pacific Shores Center further down Westpoint Slough are in the background. No signage identifying a "No Wake" Zone was found in the area.

Photo taken by Baykeeper Patrol Boat Field Investigator.