Bird Hazing at Oil Spills in California in 2004 and 2005

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ABSTRACT: The Office of Spill Prevention and Response (OSPR) oversees clean-up, natural resource damage assessment activities, and wildlife protection activities at oil spills in California. OSPR contracted with the University of California, Davis (UCD) in July 2000 to establish the Hazing Group (HG) with the goal of preventing birds from becoming exposed in the event of a spill. OSPR activated HG for 2 oil spills in 2004 and 2005.

In the Suisun Slough Pipeline Spill near Fairfield on 27 April 2004, a pipeline break released $3 \times 10^{5.5}$ L of diesel fuel into a 98-ha freshwater marsh. HG was activated and arrived on scene on 29 April. HG deployed propane cannons and bamboo stakes with mylar along oiled channels, patrolled on foot or by canoe, and fired pyrotechnics at 16 species of birds. Most birds responded favorably and left the marsh or continued on without landing. CAPA rockets and shell crackers were most effective. Hazing continued for 21 days. Post-spill evaluation indicated pre-spill efforts to improve preparedness and response time were effective, but the absence of an assigned vehicle and the location of the primary HG responder away from UCD at the time of call-out increased response time.

In the Pyramid Lake Spill near Santa Clarita on 23 March 2005, a pipeline break released 4.8×10^{6} L of crude oil, which flowed down a creek into Pyramid Lake. HG was activated on 29 March and arrived on-scene on 30 March. HG activities were limited to reconnaissance; few birds were observed on the lake. High winds and rough waters prevented boat operations and were also problematic for shore-based hazing. With the spill contained to a limited area, low bird numbers present, and unfavorable weather forecast to continue, initiation of hazing would have been difficult and of limited benefit. HG was dismissed from the spill response on 31 March. Post-spill evaluation indicated response time was excellent, aided in part by an assigned vehicle. Weather limited hazing, and the location of Pyramid Lake and the timing of the spill was fortuitous with regard to low bird numbers present.

On 13 January 2005, oiled birds appeared along the southern California coast between Santa Barbara and Venice. Over 1,400 oiled birds were recovered within 8 days, and up to 5,000 birds may have been oiled along 129 km of coastline. The source of this spill, called the Ventura County Oiled Bird Incident, was unknown. Wildlife officials did not find a major slick on the water. HG was not activated for this spill because there was no identifiable slick or contaminated area to haze birds away from, the impacted area was large, and the impacted species, mostly grebes, are not easily hazed.

Guidelines for activation of HG are suggested that take into account the species at risk, the responsiveness of the species to hazing, presence of identifiable source, slick, or contaminated area, imminent likelihood of clean areas becoming oiled, presence of clean areas for hazed birds, the size or extent of the spill, and weather conditions.

KEY WORDS: bird hazing, California, oil spill, Pyramid Lake Spill, Suisun Slough Pipeline Spill, Ventura County Oiled Bird Incident

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INTRODUCTION

Gorenzel *et al.* (2004) described the historical background and mission of the Office of Spill Prevention and Response (OSPR) and in detail the duties of the Hazing Group (HG). As a brief review, in response to oil spill disasters (e.g., *Exxon Valdez* in Alaska, 1989), California legislators in 1990 passed the Lempert-Keene-Seastrand Oil Spill Preventions and Response Act (SB 2040) that created OSPR within the California Department of Fish and Game. The act gave OSPR substantial authority, in coordination with the U.S. Coast Guard, to direct spill response and to oversee spill clean-up, natural resource damage assessment activities, and wildlife protection activities. The mission of OSPR is to protect California's natural resources by preventing, preparing for, and responding to spills of oil and other hazardous materials, and by restoring affected resources. To undertake both prevention and response functions, OSPR is divided into several branches including the Enforcement Branch, the Legal Branch, the Marine Safety Branch, and the Scientific Branch.

One activity overseen by the Scientific Branch that incorporates both prevention and response is the hazing of wildlife. Due to the potential for high mortality to waterbirds during a spill and the high costs for wildlife rehabilitation and waterbird restoration projects, the HG was established with the goal of preventing birds from becoming exposed in the event of a spill, thus minimizing wildlife casualties. Since July 2000, OSPR has contracted with the University of California, Davis (UCD) to manage the hazing program, respond to spill events if hazing is required, and to provide other hazing-related products (e.g., hazing manual).

The objectives of this paper are 1) to describe 3 oil

spills in California during 2004 and 2005 and hazing activities at those spills, and 2) to offer guidelines for calling out the HG to a spill.

SUISUN SLOUGH PIPELINE SPILL

Spill Details

On Tuesday, 27 April 2004, a 36-cm diameter (14-in) pipeline owned and operated by Kinder Morgan Energy Partners (KMP) broke. The KMP computerized control system detected an abnormal operating condition and shut down the pipeline running from Concord to Sacramento, California. Land crews and aerial patrols were dispatched to find the leak. By 1400 hr on 28 April, the release location was confirmed, about 8 km (5 mi) south of Fairfield, in Solano County, California. Shortly thereafter, personnel from OSPR, the U. S. Coast Guard, and the U.S. Environmental Protection Agency arrived on the scene to begin damage assessment and oversee cleanup operations by oil spill response contractors.

The pipeline break released an estimated $3 \times 10^{5.5}$ L (84,000 gal) of diesel fuel into a 98-ha (242-ac) freshwater marsh. The marsh was completely surrounded by dikes that prevented any diesel from flowing into other, larger channels adjacent to the dikes. In addition, not all 98 ha of the marsh were contaminated by the spill, with an estimated 25 ha (62 ac) remaining diesel-free.

The marsh was managed as a waterfowl hunting club and consisted mostly of stands of cattail (*Typha* spp.) and bulrush (*Scirpus* spp.) separated by numerous open-water channels. With the marsh located in the delta of the San Joaquin and Sacramento rivers, the surrounding areas consisted of wetlands and numerous water channels. Herons, ducks, geese, shorebirds, and pelicans were common to abundant in the marsh and adjacent areas.

Hazing Group Response

At 1100 hr on 29 April, HG received a call-out from OSPR. Ironically, Gorenzel (the only HG member available for spill response at that time) was in Sonoma County close to the spill site, but first he had to drive past the spill site to return to UCD, locate a rental truck with hitch, and finish packing supplies into the OSPR trailer. Most of the hazing equipment (e.g., propane cannons, bamboo stakes with mylar) and personal protective equipment were previously loaded into the trailer, but some supplies (e.g., magazine filled with pyrotechnics, helium tanks, propane tanks, Marine Phoenix Wailer) could not be stored in the trailer and needed to be moved from storage areas into the trailer or the bed of the pickup truck.

HG arrived at the spill command post in Fairfield by 1600 hr and immediately went to the staging area at the marsh. Arrangements had already been made to meet with one of the duck club owners to review the layout of the marsh and with Marine Spill Response Corporation (MSRC) personnel to provide a boat and operator to help deploy the propane cannons. The trailer was parked at the staging area at the duck club headquarters, which was the base of operations for the next 3 weeks.

The first objective was to deploy propane cannons to give a wide area of coverage and then to deploy mylar tape on bamboo stakes along the contaminated channels. The desired coverage was accomplished by placing the cannons on or next to hunting blinds, which were conveniently widely distributed in the marsh and located along some of the more impacted channels and areas of the marsh. Darkness curtailed deployment of the cannons on 29 April. By mid-morning on 30 April, 8 cannons were in place and operating. MSRC provided a boat and operator the first day and the OSPR airboat was used on the morning of the second day to deploy the cannons. Thereafter, a canoe was used to navigate the channels and transport propane tanks and deploy bamboo stakes.

After the initial deployment and as more information regarding the location of polluted and non-polluted areas and wildlife use became available, the positioning of the propane cannons was changed as needed and more bamboo stakes with mylar were deployed. Also, as cleanup operations proceeded, some cannons were turned off for periods as needed to accommodate personnel working in close proximity to the cannons. Cannons were checked daily.

Patrolling, either on foot or by canoe, and the use of pyrotechnics were the major hazing activities after the cannons and mylar had been deployed. Few birds were observed in the marsh during the first few days, a result of the hazing but also aided by the presence of many people in the marsh and cleanup operations (which included many novel objects such as booms and absorbent pads that could frighten birds).

For the first 2 weeks, pyrotechnics were fired at most birds that landed or flew over the marsh, in an attempt to create an "unfriendly" environment and to hasten the birds' departure. Pyrotechnics employed included bird bombs, whistlers, shell crackers, and CAPA rockets (Table 1) for 16 species of birds. Great egrets (*Ardea alba*) were common and the most frequent target for pyrotechnics. In general, most birds responded favorably and left the marsh or continued on without landing. Killdeer (*Charadrius vociferus*) were a notable exception; they would fly only a short distance and then land in the marsh. Repeated firings resulted in longer flight before landing, but the killdeer never left the marsh and typically returned to the original location. American bitterns (*Botaurus lentiginosus*) took evasive action in response to pyrotechnics, but also never left the marsh, always landing in one uncontaminated area, probably near a nest. The number of birds flying into the marsh increased noticeably when the flood gates were opened to intentionally raise the water level in the marsh. This flooded some of the previously dry mudflats, creating attractive habitat for ducks, shorebirds, and egrets.

As the cleanup progressed and more channels were cleaned, hazing with pyrotechnics was less important and was curtailed. Birds were allowed to land in clean areas, while worker presence in the few remaining polluted areas along with patrols were sufficient to keep birds away.

HG was on site for 11 of the first 15 days of the spill and on site 12 days overall through 19 May. On the days when HG personnel were not present, the propane cannons in operation provided the hazing function. All cannons and bamboo stakes were removed on 19 May. Twenty dead birds were found in the marsh between 29

Table 1. Species and numbers of birds fired upon and number of pyrotechnics used at the Suisun Slough Pipeline Spill from 29 April through 19 May 2004.

Species	No. of Birds	No. of Occasions	Bird Bombs	Whistlers	Shell Crackers	CAPA Rockets	Unrecorded Combination[a]
American white pelican	31	3	3	4	0	2	0
Double-crested cormorant	2	1	0	1	0	0	0
American bittern	4	4	1	0	2	0	5
Great blue heron	2	2	0	1	0	0	8
Great egret	29	20	2	2	15	5	20
Snowy egret	5	3	1	2	2	0	0
Black-crowned night-heron	1	1	1	0	0	0	0
Canada goose	20	1	0	2	0	0	0
Mallard	4	3	1	1	2	2	0
Cinnamon teal	5	2	1	1	0	0	2
Semipalmated plover	15	1	1	1	0	0	0
Killdeer	10	4	2	2	1	0	12
American avocet	2	1	1	1	1	0	0
Black-necked stilt	5	3	1	1	4	0	0
Long-billed dowitcher	2	1	1	1	1	0	0
Red-winged blackbird	2	1	1	1	1	0	0
Totals	**139**	**51**	**14**[b]	**18**[b]	**21**[b]	**7**[b]	**37**[b]

[a] Specific number of bird bombs and whistlers not recorded, but total number recorded.
[b] Total adjusted to account for multi-species situations (e.g., where 1 bird bomb or other pyrotechnic was fired to disperse 2 or more species at once).

April and 11 May, when wildlife searching was discontinued. The majority of dead birds were found in the first few days after the spill. An additional 6 birds were found alive but died later at the wildlife care center.

Post-Spill Comments

1. Efforts prior to the spill to improve preparedness and response time were beneficial. A large part of this resulted from planning what needed to be done and taken to a spill when a call-out occurred. Procurement of necessary supplies and stockpiling of the pyrotechnics, propane tanks, mylar tape, etc., provided us with sufficient materials for hazing without the need to request any additional materials from logistics. Outfitting the trailer and loading it ahead of time saved an estimated 2 hr.
2. Valuable time was lost after the call-out due to 3 circumstances:
   a. Gorenzel was away from Davis when the call-out came and had to drive back to Davis, resulting in 1 hr lost. Fortunately, Gorenzel was not far away from home base, but if working in a more distant area, the time required to return could have been much greater. One option to alleviate this situation is for 2 or more people to be available for call-out.
   b. The need to rent a truck with a hitch in order to tow the OSPR trailer cost 1 hr. It was fortunate that a suitable truck was found relatively quickly, but that might not always be the case. An assigned vehicle is the optimum solution, as it would always be available and could be set up to accept specialized hazing equipment and also be loaded ahead of time, saving more valuable time.
   c. Going home to pack a bag of clothes and personal items for an overnight stay (that never occurred) cost 1 hr. A basic "go-kit" packed with these items and stored in the trailer would save time in responding.
3. For this particular marsh, a shallow-draft craft was very helpful for getting around the marsh and deploying equipment. Fortunately, MSRC provided a boat when needed on 3 occasions, and a canoe was available for patrolling and checking the cannons. A shallow-draft boat with outboard motor would be a useful addition to the HG inventory.
4. Of the pyrotechnics fired at the spill, shell crackers and the CAPA rockets were most effective, primarily because of their long range compared to bird bombs. The CAPA rockets were particularly impressive. With a range of about 305 m (1,000 ft), they allowed the shooter to cover at least 28 ha (70 ac) from one location. Two shooters, patrolling the dikes on ATVs and firing CAPA rockets, would have been sufficient to intercept most birds entering the marsh.

PYRAMID LAKE SPILL

Spill Details

At approximately 0100 hr on Wednesday, 23 March 2005, a landslide caused by rains ruptured a 36-cm diameter (14-in) Pacific Energy Partners pipeline. The break released 4.8×10^6 L (126,000 gal) of crude oil, which flowed 2.1 km (1.3 mi) down Posey Canyon into Pyramid Lake. The pipeline, running from Bakersfield to Los Angeles, was shut down, and the crude oil was contained by booms in a cove of about 4 ha (10 ac) near the dam at the south end of the lake.

Pyramid Lake, located in the Angeles and Los Padres National Forests, about 97 km (60 mi) northwest of Los Angeles, is used for drinking water, boating, and fishing. About 6 km^2 (2.3 mi^2) in area, the lake is surrounded by steep, mostly inaccessible terrain with chaparral vegetation. The shoreline is rocky with no emergent vegetation in the adjacent waters. Access by vehicle was poor, being limited to areas near the dam, a boat ramp, and public swimming/picnic sites. Responding agencies included OSPR, the U.S. Coast Guard, U.S. Environmental Protection Agency, U.S. Forest Service, Los

Angeles County HazMat, Los Angeles County Sheriff's Department, and local fire agencies. Wildlife search teams observed 15 oiled birds and collected 10 of them, of which 9 later died.

Hazing Group Response

On Tuesday, 29 March at 1745 hr, the HG was informed of the Pyramid Lake spill and called out by OSPR. Office materials and personal items were packed that evening. A second phone conversation with Wildlife Operations personnel provided additional details about the spill, the spill site, cleanup operations to date, and ideas for potential hazing strategies. There was concern that birds might approach at night and dive under the floating booms into the contaminated area.

On 30 March starting at 0630 hr, the magazine, helium tanks, propane tanks, and other miscellaneous items were packed into the trailer and truck (HG had an assigned truck for this spill). HG left Davis at 0745 hr and drove to Pyramid Lake, arriving at 1420 hr, 6½ hr later. After a briefing at the spill command center, a reconnaissance tour of the lake and the spill site was conducted. During the tour, the lake was surveyed for birds and for locations to deploy hazing equipment. Booms had been deployed near the dam to contain the spill. Two parking lots and a road atop the dam were noted that could serve as locations for propane cannons close to the contaminated cove. Most of the crude oil that had reached the open water had already been removed and the remaining sheen, at least from the high vantage point overlooking Posey Creek, appeared to be contained by the booms. It was windy, with sustained winds estimated to be about 48 kph (30 mph). One bird, a gull, was observed flying in the vicinity of the dam and the booms. No birds were on the open waters of the lake. At 2 picnic/swimming areas and a boat launch 1.3 to 1.6 km (0.8 to 1 mi) distant from the spill area, 1 double-crested cormorant (*Phalacrocorax auritus*), 2 American coots (*Fulica americana*), 4 northern shovelers (*Anas clypeata*), and 1 unidentified shorebird were present. Birds were not abundant, and the low numbers made the value of hazing questionable.

The sustained high winds were a concern. High winds are problematic for some hazing techniques. All boat operations had been canceled due to the wind and water conditions. Thus, a roving patrol and hazing from a boat were not possible. Second, propane cannons do not function well in high winds; typically they do not fire in such conditions. Third, the high winds prevented the deployment of helium balloons. Attaching balloons to the outermost boom to serve as a novel visual deterrent to any approaching birds was considered. However, tests at UCD indicated that winds >15 mph shredded the balloons. Fourth, due to the cancellation of boat operations, shore-based hazing was the remaining option. However, with the wind blowing onshore in the area of the dam and the oiled cove, the firing of pyrotechnics could result in a safety problem with the pyrotechnics being blown back towards the operator.

After returning to the incident command center and discussion with OSPR personnel, the decision was made to return the following morning to see if the weather conditions and bird numbers had changed.

On 31 March starting at 0700 hr, another bird survey of the spill area and the lake in general was undertaken. Few birds were seen: 1 gull flying in the area of the dam and the booms, a flock of 7 gulls on the open water >1.6 km (1 mi) to the west of the spill area, 1 cormorant, and 3 buffleheads (*Bucephala albeola*) in a sheltered cove by the visitor center. Wind and water conditions were no better than the day before and the forecast called for continued windy conditions with gusts up to 60 mph. Boat operations were again canceled.

After the second survey, it was apparent that 1) relatively few birds were present, 2) the spill appeared to be well contained, with most floating crude already removed, 3) clean-up activities in the boomed areas and along the fouled shorelines served as a bird deterrent during the day, and 4) wind and water conditions prevented or limited the use of propane cannons, hand-fired pyrotechnics, balloons, and patrols from motorboats.

Given the above factors and a weather forecast calling for continued winds until Saturday, it was determined that initiation of any hazing activities would be difficult and that there would be little benefit gained from hazing. After discussion with OSPR staff, HG was dismissed from the spill response at 1050 hr on 31 March and returned to UCD.

Post-Spill Comments

1. Response time was excellent, with Gorenzel in Davis at the time of call-out, the OSPR trailer already packed, and an assigned truck immediately available.
2. Weather was a major factor in limiting hazing. High winds and rough waters prevented boat patrols, which probably would have been sufficient to keep birds away from the relatively small oiled area.
3. The location and timing of the spill was fortuitous with regard to the low bird numbers present. Pyramid Lake, located at 788 m (2,585 ft) elevation in the San Gabriel Mountains, is isolated and not known to harbor large numbers of waterbirds. In addition, by late March and early April most wintering birds would have departed.

VENTURA COUNTY OILED BIRD INCIDENT

Spill Details

This event was originally called the Ventura Mystery Spill. On 13 January 2005, oiled birds began to appear along the southern California coast between Santa Barbara and Venice. The source of the spill or spills was unknown but was presumed to be related to 5 days of rains that caused floods, road washouts, submerged motor vehicles, caused mud slides, and killed 20 people. It was speculated the source of the oil might have been a pipeline(s) broken during the floods, a sunken wreck on the ocean bottom, or a natural release of oil from the sea floor in the oil-rich Santa Barbara Channel. Another suspected source was an offshore drilling platform, where a slick was observed. However, inspection of the rig found no evidence of a leak and subsequent lab tests indicated the oil in the slick did not match the oil from the birds feathers. To add to this perplexing situation, wildlife officials did not find a major telltale slick on the

water or tar balls washing ashore.

Within 8 days from the original discovery, over 1,400 oiled birds were recovered. It was estimated that up to 5,000 birds may have been oiled along the 129 km (80 mi) stretch of coastline from Santa Barbara to Play del Rey. Wildlife care experts called the spill the world's worst since the sinking of the tanker Prestige off the coast of Spain in November 2002.

The oiled birds included common loons (*Gavia immer*), eared grebes (*Podiceps auritus*), western grebes *(Aechmophorus occidentalis*), Clark's grebes (*Aechmophorus clarkii*), and brown pelicans (*Pelecanus occidentalis*). About 90% of the birds collected were western grebes, which are common along the southern coast in winter. As late as April 2005, oiled birds in need of attention were still showing up sporadically. As of January 2006, an official explanation of the source(s) of the oil has not been provided.

Hazing Group Response

The HG was notified of the incident and put on alert shortly after oiled birds started to appear. HG response at that time was to check equipment and prepare to deploy if necessary. However, HG was not called out for this incident.

Post-Spill Comments

Several factors were influential in not deploying the HG for the Ventura incident:

1. There was no identifiable slick or contaminated area away from which to haze the birds. This situation makes it difficult to know where to start hazing and how to direct the movements of the birds to safe locations.
2. The impacted area was large, with oiled birds recovered along 129 km (80 mi) of coastline. The HG could not effectively patrol or haze birds over such a large area, given that the source of the oil and the locations where the birds were coming into contact with the oil were not known.
3. The species involved are not easily hazed. Grebes (the most common species) and loons tend to dive repeatedly and remain in the general area when hazed, rather than fly away. It may be possible to herd grebes in a desired direction with a boat. However, there is no point in herding if the location of the oil is unknown.

CALL-OUT CRITERIA

As background, when an oil spill occurs in California, the Incident Command System (ICS) is used as the organizational structure to coordinate response actions. The ICS organizational structure typically includes the Unified Command, and the Operations, Planning, Logistics, and Finance sections. In California, response actions concerning wildlife are performed by the Wildlife Branch (commonly referred to as Wildlife Operations), a branch within the Operations section of the ICS.

In a spill event, an OSPR employee typically assumes the role of Wildlife Operations Director. The objectives of Wildlife Operations during spill response and cleanup are 1) to protect wildlife and habitats from contamination, 2) to minimize injuries to wildlife and habitats from the contamination, 3) minimize injuries to wildlife from the cleanup, 4) provide the best achievable care for injured wildlife, and 5) document adverse effects that result from the spill and cleanup.

After notification of a spill, the Wildlife Operations Director identifies and ranks wildlife response strategies. Within OSPR's Wildlife Operations there are 4 groups available: 1) Wildlife Reconnaissance (aerial, ground, and on-water reconnaissance of wildlife in the spill area), 2) Wildlife Hazing, 3) Wildlife Recovery and Transportation (search and collection), and 4) Wildlife Care and Processing (rehabilitation and logging in).

Guidelines for the activation of OSPR's Wildlife Operations resources are provided in the Wildlife Response Plan for California (http://www.dfg.ca.gov/Ospr/misc/wildlife.htm). OSPR will mobilize wildlife response resources immediately upon notification of a spill, typically the reconnaissance group, and the wildlife recovery and care groups if necessary. Usually, HG is not immediately activated.

In some cases, OSPR may be notified about oiled wildlife when there has been no report of an oil spill. In that case, the on-call OSPR warden and biologist are notified when there are 1) >2 live, oiled animals or >5 dead, oiled animals reported from the same general location in a single day, or 2) reports from 3 consecutive days of 1 oiled animal reported per day from the same general location. The decision to activate or partially activate Wildlife Operations is then made on a case-by-case basis. Additional criteria are provided in the Wildlife Response Plan for activating the Recovery and Transportation teams and heightened awareness protocols when a more intensive response must be implemented.

Criteria or guidelines for activating HG are not provided in the Wildlife Response Plan. To aid OSPR personnel in determining when to activate HG, we suggest the following steps be taken or factors be considered:

1. HG should be notified and put on alert status when Wildlife Operations is activated.
2. Use reconnaissance and other reports to determine the following:
   a. Wildlife species and numbers present and at risk. Hazing will be most effective if the species present are those that respond to hazing by leaving the area. Ducks, geese, cormorants, herons, gulls, and pelicans can be successfully hazed. Grebes and loons are particularly difficult to haze, as they will dive repeatedly and tend to remain in the general area.
   b. If there is an identifiable source, slick, or contaminated area(s). Birds can be frightened away from such defined areas. Hazing should be employed.
   c. If there are clean sites in the area that are in danger of becoming oiled. Hazing at these sites will be necessary if oiling is imminent.
   d. If there are clean sites in the area, normally used by birds, to which hazed birds may be directed or allowed to stay. Such sites represent preferred habitat and could be alternative habitat for other

preferred but contaminated areas. Hazing will be more effective if clean sites are available in the general area of the oiled sites.

e. The size or extent of the spill area. If the impacted is large (e.g., along 129 km of shoreline in Ventura incident), it probably will not be possible to patrol and haze birds from the entire area. Hazing focused on limited areas may still be possible.

f. If weather or other conditions are acceptable for hazing. High winds or rough waters may temporarily prevent on-water operations and limit shore-based hazing.

It is likely that some of the above issues were factored into the decisions to call out the HG for the spills during 2004-2005. In particular, the issues of source identification, non-presence of any slicks, size of impacted area, and presence of species difficult to haze, were correctly considered as reasons to not activate HG during the Ventura incident.

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