

Conservation of *Aechmophorus* Grebe Colonies at Clear Lake
Redbud Audubon Society
Quarterly Report #1 for Grant Year Three
July 1, 2012 – September 30, 2012

Section 1: Public Outreach and Education

Grebe Video for Outreach Presentations

Over the three months of the 2012 breeding season, Dr. Floyd Hayes was able to take high-definition video footage of the grebe colonies on Clear Lake and the unique courtship, nest-building, nesting, and parenting behaviors of Western and Clark's grebes. He also conducted interviews with outreach volunteers and the head of the County of Lake Water Resources Department explaining their activities for the project. The hours of video were edited into a 20-minute DVD presentation that was shown for the first time at the Grebe Summit Meeting in late August for project leaders from all three chapters, Audubon California, and the funding agencies.

The video will be used for outreach presentations during the coming school year, at a Redbud chapter meeting, and at community group meetings. It is an extremely valuable educational tool, as photos cannot fully communicate the surprising and fascinating behaviors of these grebe species during breeding season. The video shows and explains in detail the types of human disturbance that can affect breeding success.

Repeat of Webcam Experiment

Redbud Audubon was able for a second year to set up a webcam focused on an area of floating grebe nests and transmit live video on the Internet. The Sunset Shores location used last year for the webcam did not have any nests within camera distance this year. However, some nests at Corinthian Bay were close to a shoreline home whose owners were willing to have the webcam set up on their deck railing.

During the week that the webcam was streaming video online, two staff members of Audubon California visited the webcam location, took video, and publicized the webcam as the lead topic on the Audubon California newsletter to chapters. Although we do not have a measurement of how many people watched the live webcam, Redbud received numerous emails from Lake County residents and members of other chapters who viewed the live video.

Redbud prepared a press release that was printed in local newspapers on August 9th and in the online lakeconews.com. Below is the press release:

**Redbud Audubon webcam on internet shows
first-ever live video of nesting grebes**

For the second year in a row, the Redbud Audubon Society has set up a video camera on a small colony of nesting Western and Clark's Grebes on Clear Lake. The web-cam is broadcasting live video of grebes in courtship displays, building their floating nests on the water, and then patiently taking turns to sit on the nest while incubating their eggs.

A Google search for grebe webcams suggests that this is the first time anywhere in the world that a webcam has focused on a nesting grebe colony.

Redbud Audubon is conducting this public outreach as part of a four-year grant to educate recreational boaters, jet-skiers, and water-skiers to avoid disturbing the grebe colonies during the summer breeding season.

Clear Lake has one of the largest number of breeding grebes in Northern California. A day-long survey by local field biologists on July 24 around the 100-mile shoreline of Clear Lake counted 7,760 grebes and more than 1,800 nests in 13 colonies. This compares to 1,248 nests in 2011 and 1,322 in 2010.

To see the web-cam on a home computer or smartphone, visit the www.redbudaudubon.org website. On the home page, click under the photo of a baby grebe riding on its parent's back. It may take a few minutes for the video to load on the screen. Generally, the video is transmitting about six hours a day, from roughly 10:00 am to 6:00 pm.

If the video does not come up during these hours, try again later, as there can be lapses in the transmission. Six separate but connected electronic devices are required to capture and transmit the live video, and glitches can and do happen.

Redbud Audubon also created an article with many photos explaining about grebes and this conservation project. Entitled "Those Amazing 'Dancing' Grebes," the link to this new page on the Redbud website is just below the webcam screen.

Two other Audubon chapters in Northern California (Altacal Audubon in Chico and Plumas Audubon in the Sierras) are also conducting this grebe education project on their local grebe breeding lakes. Audubon California, the state office of the National Audubon Society, coordinates the work of the three chapters. The grant is funded by the Luckenbach Trustee Council, with mitigation funds paid by the oil companies responsible for oil spills off the California coast that killed many Western and Clark's Grebes. The public education outreach is aimed at reducing human disturbance to the nesting grebes, thus increasing their breeding success.

As part of the grant project, Redbud has purchased speed buoys that the County's Department of Water Resources places around the floating colonies to alert boaters to avoid those areas. A new sign was placed on the bridge at the entrance to Rodman Slough again warning boaters to slow to 5mpg.

Later this year Redbud Audubon will place at four shoreline parks around Clear Lake an attractive interpretive sign explaining grebe nesting and the need to protect the vulnerable colonies.

"This project is a very special one for Redbud Audubon Society, as the Western Grebe has been the chapter logo since 1974 when the chapter was incorporated," explained President Marilyn Waits. "Everyone in Lake County – residents and visitors alike – is fascinated with watching the grebes on Clear Lake. The Audubon Society is proud to be able to carry out this major effort to protect their nests, eggs, and young chicks."

As happened last year, the webcam transmitted for only a week because the nests were abandoned and disintegrated. However, four volunteers were trained to operate the webcam, and thus Redbud now has additional experience to use if future opportunities arise to use a webcam in the next breeding season.

Four-page Educational Description about Grebes Placed on Website

In conjunction with the webcam, Redbud prepared a four-page photographic essay on grebe behaviors and the grebe conservation project. A pdf document of the essay "Those Amazing 'Dancing' Grebes" was put up on the Redbud website at the webcam link page so that viewers could read about each stage of breeding activities. The essay was also printed as a four-page color handout that was distributed at the Grebe Summit Meeting and will be used for local outreach in Lake County.

Grebe Notecards with Grebe Protection Message

Redbud created three notecards as an additional outreach tool promoting the grebe conservation message. All three notecards feature a grebe photograph taken during this grebe project. One card has a parent carrying four babies; the other two cards offer different photographs of a nesting grebe. The back side of all three cards has the following educational message:

Western and Clark's Grebes build floating nests to incubate their eggs, and babies ride on a parent's back for the first six weeks of life. Help protect these nests and babies during the June – October breeding season by warning boaters, jet skiers and water skiers to avoid grebe colonies on Clear Lake.
Photo by Floyd Hayes
Redbud Audubon Society, Inc.
www.redbudaudubon.org

The notecards are available at Redbud chapter meetings and at outreach activities for the grebe project. Redbud has also offered to make the cards available for the other participating chapters to customize for their own project.

Grebe Article by Terry Knight

The outdoors writer for the Lake County *Record-Bee* newspaper has been a strong advocate for the grebe conservation project since its beginning. In his July 18th column, he focused on the changes in grebe population on Clear Lake since the early 1990's. He discussed the possibility that the decline of threadfin shad and silverside minnows as food supply for the grebes may explain the decline in the number of grebes and their more limited breeding success. He also pointed out that the small bass that grebes would eat can hide from the grebes in the vast and dense weed beds that have covered large areas on Clear Lake in recent years. Terry's article is attached to this report.

Grebe Summit Meeting hosted by Plumas Audubon

Four Redbud volunteers participated in the two-day Grebe Summit Meeting held August 23-25 in the town of Chester in the Sierras, hosted by Plumas Audubon. Marilyn Waits, Floyd Hayes, Janet Swedberg, and Rob Patton shared information on project activities. Floyd showed his new grebe video and Marilyn presented a Powerpoint display of the various outreach activities conducted by Redbud. As with the first regional meeting in March 2011, this gathering generated tremendous enthusiasm about each chapter's work on the project, and volunteers went back to their chapters with renewed energy and new ideas for this conservation effort.

Pear Festival Grebe Booth

An outreach activity that has proven to be an excellent way to reach out to Lake County communities has been for Redbud Audubon to provide an educational exhibit booth about the grebe conservation project at local community fairs held by individual towns in Lake County. The largest of these annual events is the Pear Festival in

Kelseyville, which celebrated its 20th anniversary this year and drew an estimated 5,000 attendees.

On September 29th, Redbud set up and staffed a full-day exhibit booth at the Pear Festival. This was the third major community event during calendar year 2012 when Redbud Audubon staffed an exhibit booth to reach county residents and visitors with the outreach message for grebe conservation on Clear Lake. We learned from conversations with attendees who stopped to view the grebe displays, that community awareness has definitely grown in the past year about Redbud's conservation efforts focused on the grebe colonies.

On display were the 4'x3' "*Protect Baby Grebes*" posterboard display, the grebe brochures "*Western and Clark's Grebes, Putting on a Show*", and the life-size wood carvings of a Western Grebe and a Clark's Grebe with a baby on its back. This combination of outreach materials developed over the first and second years of the grant has proven very effective in attracting visitors to the booth, where Redbud volunteers can engage them in learning about the grebe colonies and the need to avoid human disturbances during breeding season.

Section 2: Colony Protection

Deployment of Speed Limit Buoys

The County of Lake Water Resources Department (WRD) has partnered with Redbud Audubon to set out speed limit buoys as needed to protect nesting grebe colonies from disturbance by boaters, jet-skiers, and fishermen.

With 13 grebe colonies established around Clear Lake during the 2012 breeding season, the Water Resources Department deployed all 20 speed limit buoys purchased by Redbud Audubon using funds from the grebe conservation project. Buoys were promptly placed following each request from the monitoring team when nests appeared in areas vulnerable to boat disturbances.

Speed Limit Sign at Entrance to Rodman Slough

The County's Water Resources Department worked with the Public Works Department to create and install a large warning sign on a concrete pier of the bridge that boats must pass under on their way into the Rodman Slough. The slough always hosts a significant grebe colony, and in the past, boats have tended to speed through the slough. The prominent new sign posting a 5 mph speed limit makes certain that boaters are aware of a speed restriction in this area. A photograph of the new sign is attached to this report.

Section 3: Monitoring

See report on following pages.

BREEDING OF *AECHMOPHORUS* GREBES AT CLEAR LAKE, LAKE COUNTY, CALIFORNIA, DURING 2012

**Floyd E. Hayes, Daniel Stoppelmoor,
Nicholas Drachenberg, and Aimee Wyrick**

*Department of Biology, Pacific Union College,
1 Angwin Ave., Angwin, CA 94508*

ABSTRACT

We monitored the breeding activities of Western Grebe (*Aechmophorus occidentalis*) and Clark's Grebe (*A. clarkii*) at Clear Lake, California, during the summer of 2012. We estimated a total of 2,382 nests in 17 colonies, including 12 colonies with 2,266 nests (95.1%) in the northern arm of the lake and five colonies with 116 (4.9%) nests in the southwestern arm of the lake. About half (50.4%) of the nests occurred in single colony of about 1,200 nests at the north end of the lake. Most of the nests were open water nests ($n = 2,187$; 91.8%); the remaining were shore nests ($n = 195$; 8.2%), placed up to 1,100 m from shore. The first nesting activity was detected on 10 June, when nine nests were under construction at three colonies. Egg dates ranged from 22 June (one egg in one nest) to at least 10 September (many eggs and nests), after which no further searches were conducted. The timing of nesting activity varied among colonies, peaking between late June and mid-August.

We recorded 65 disturbances during 52 hours of observation, for an average of 1.3 disturbances per hour. Birds accounted for 50 (76.9%) of the disturbances and only three disturbances (4.6%) were caused by humans (in motorboats). We observed 44 instances of nest predation, including 40 (90.9%) by American Crows and four (9.1%) by California Gulls. In each case the crows and gulls attacked nests that were temporarily abandoned by grebes, which did not defend them once a predator was on the nest. We observed a few nests blown away by strong winds.

A brood survey by motorboat on 13 September recorded 3,828 adult grebes (83.7% Western Grebes, 16.3% Clark's Grebes) and 125 juvenile grebes (including 36 Western Grebes and 1 Clark's Grebe) for an overall ratio of 0.033 juveniles per adult (0.038 for Western Grebe, 0.005 for Clark's Grebe). We suspect the relatively low productivity is attributable primarily to abandonment of the southern colonies due to a paucity of food and a high rate of avian predation decimating the two largest colonies.

INTRODUCTION

Clear Lake, located in Lake County, California, is geologically one of the oldest lakes in North America. It represents the largest natural lake occurring entirely within California, spanning a distance of 30.6 km (19 mi) at its greatest length and 12.8 km (8 mi) at its greatest width, and covers an area of 177 km² (43,785 acres). It is a relatively shallow lake, with an average depth of 8 m (27 ft) and a maximum depth of 18 m (60 ft). As a consequence of its shallow depth and abundant sunlight, Clear Lake is a relatively eutrophic ecosystem rich in nutrients, with frequent algal blooms occurring naturally during the warm summer months.

The abundance of nutrients in Clear Lake supports a high biomass of fishes belonging to a variety of species, many introduced, which vary greatly in size. The abundance of fishes, which is of vital importance to the local fishing industry, varies from year to year. Mass mortalities of fish populations occur periodically and are often attributed to cold spells during the winter months and to algal blooms during the summer months. The algal blooms may be increasing in frequency and extent due to lower water levels and anthropogenic nutrient enrichment. Other threats to the health of the fish populations include the introduction of hydrilla and other aquatic plants, and contamination from pesticides used to abate populations of gnats and mosquitoes.

Clear Lake is a natural magnet for large populations of waterbirds, including several species attracted to the huge schools of fish. Most species of waterbirds visit the lake only during the non-breeding season, but several species remain during the spring and summer months to nest along the shores of the lake. In recent years there have been some dramatic fluctuations in the breeding populations of fish-eating birds, especially the grebes, presumably due to fluctuations in water level which affects the availability of nesting habitat and fluctuations in water temperatures which affect the availability of fish prey.

The Redbud Audubon Society began monitoring the breeding activities of Western Grebes (*Aechmophorus occidentalis*) and Clark's Grebes (*A. clarkii*) on Clear Lake in July 2010. This report summarizes our data for nest surveys, brood surveys, and disturbance indices on Clear Lake during the 2012 breeding season.

METHODS

NEST SURVEYS

Formal surveys of grebe nesting began on 5 May and continued through 25 September. Nearly all surveys were conducted by canoe; some were conducted by motorboat or from land. Most searches were conducted by two or three observers, including: Dustin Baumbach (DB), Nicholas Drachenberg (ND), Justin Feltman (JF), Brett Hayes (BH), Floyd Hayes (FH), Marta Hayes (MH), John Tagamolila (TM), Tim Kuzan (TK), Bryan McIntosh (BM), Daniel Stoppelmoor (DS), Aimee Wyrick (AW), and Emilie Wyrick (EW).

We periodically searched areas where *Aechmophorus* grebes were known to breed in the past and potential new areas where the habitat appeared suitable for breeding. At each site we counted the number of all obvious nests of *Aechmophorus* grebes. Nests that appeared to be in the incipient stages of construction were noted but not included in our final estimates of active nests. Because our counts were conducted sporadically, we decided to count all nests that appeared to be well constructed even if no eggs were present, because those without eggs may well have had eggs at some point within a few days before or after observation. Unlike the previous two breeding seasons, we did not attempt to estimate the number of nests of Western and Clark's Grebes within the largest colonies.

Each nest was classified as either a "shore nest" if placed among emergent macrophytic vegetation near the shore (e.g., tules, water primrose, willows) or an "open water nest" if placed in open water > 1 m from emergent vegetation. For colonies located in open water, we measured the maximum distances of nests from the shore or emergent vegetation, usually based on measurements from a laser range finder.

During the 2010 breeding season we obtained extensive data sets on the number of eggs, water depth of nests, distances between the nearest nests, and densities of nests, but in an effort

to minimize human disturbance of the colonies during subsequent breeding seasons, none of these measurements were taken except for a few counts of eggs while nests were being counted.

DISTURBANCE INDEX

Disturbance index counts were conducted from 22 June to 10 September. A disturbance was defined as an action causing the grebes to noticeably alter their behavior (including reduced vocalizations) while a potential disturbance was anything we thought might cause a disturbance. During timed periods at each site, all disturbances and potential disturbances within 25 m for a potential predator, 50 m for a paddled watercraft and 100 m for a motorized watercraft. The counts covered the ten largest colonies (Table 2). Disturbances and potential disturbances were divided into the following categories based on their cause: motorized watercraft (ski jets, motorboats and airboats), kayaks, low-flying aircraft, mammals, and birds (large possible predators). These categories were then subdivided further to better represent the extent of the disturbances (e.g., predation and presence in colony for mammals; Table 2). Moving subjects were categorized according to their closest point of approach to the colony (Table 2).

BROOD SURVEY

A single brood survey was conducted by motorboat on 13 September by ND, Todd Easterla, BM, John Sterling, DS, and AW. Several dozen nests were still active by this time. The first brood survey was conducted by motor boat and consisted of a transect with a 200 m width along the entire shoreline of the lake. We counted all adult and juvenile grebes within a distance (approximately 100 m) that adults could be confidently identified. Others beyond the transect distance were also counted but not identified.

RESULTS AND DISCUSSION

NEST SURVEYS

We estimated a total of 2,382 nests in 17 colonies (see Fig. 1, Table 1) at the following sites arranged from north to south: Rodman Slough (42), North End of Clear Lake (1,200), northeast of Tule Island (1), Lakeport (2), Manning Creek (427), Manning Creek / Rumsey Slough (2), Rumsey Slough (23), Big Valley Rancheria (17), Land's End (1), McGaugh Slough / Adobe Creek (2), Long Tule Point (505), Corinthian Bay (44), Clearlake Park (1), Sunrise Shores (2), Anderson Marsh North (4), Anderson Marsh Southeast (19), and Anderson Marsh Southwest (90). Twelve colonies with 2,266 nests (95.1%) in the northern arm of the lake and five colonies with 116 (4.9%) nests in the southwestern arm of the lake. About half (50.4%) of the nests occurred in single colony of about 1,200 nests at the north end of the lake. Most of the nests were open water nests ($n = 2,187$; 91.8%); the remaining were shore nests ($n = 195$; 8.2%), placed up to 1,100 m from shore.

The first nesting activity was detected on 10 June, when nine nests or possible nests were under construction at the North End of Clear Lake (one nest), Long Tule Point (two nests), and South Anderson Marsh (six nests). The earliest egg of the season (only one) was found on 22 June at South Anderson Marsh and the first chicks of the season (two) were found on 17 August at Rodman Slough. The last eggs of the season was found on 10 September, when several dozen nests with eggs were still present at the north end of Clear Lake and Manning Creek (no searches were conducted afterward). The timing of nesting activity varied among colonies, peaking

between late June and mid-August.

Below we provide details for each active colony and former colonies, which are arranged from north to south (Fig. 1). Within each colony the details of breeding activities are arranged chronologically by date. A summary of breeding data for each colony is presented in Table 1.

The number of nests in 2012 (2,382) was considerably higher than in 2010 (1,322) and 2011 (1,248).

Rodman Slough

22 May: FH, DB and BM searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

22 June: FH, BM, and DS searched by canoe and found one shore nest by a mating pair of Western Grebes and one open water nest under construction by a pair of Clark's Grebes about 40 m from shore. Neither nest had eggs.

3 July: FH, ND, and DS searched by canoe and failed to find any nests.

19 July: FH and BM searched by canoe and found 12 nests (11 shore, one open water). We counted 11 eggs in eight nests, with an average of 1.4 eggs per nest (range = 1-3).

22 July: FH and BM searched by canoe and found 18 nests (14 shore, four open water). We counted ten eggs in six nests, with an average of 1.7 eggs per nest (range = 1-4).

24 July: FH, ND, BM, and DS searched by motorboat and observed four open water nests. We did not search the shore nests.

25 July: FH, ND, and DS searched by canoe and found 19 nests (15 shore, four open water). Two of the nests (one shore, one open water) were attended by a Clark's Grebe with an unidentified mate. We counted 20 eggs in 11 nests, with an average of 1.8 eggs per nest (range = 1-4).

1 August: FH and BM searched by canoe and found 29 nests (25 shore, four open water). We found 64 eggs in 26 nests, with an average of 2.5 eggs per nest (range = 1-4).

5 August: FH and DS searched by canoe and found six nests (all open water) in the channel, including one south of the bridge, four north of the bridge, and one drifting under the bridge from south to north. One nest had four eggs. All nests, including some with old brown eggs, appeared to be abandoned and were assumed to be drifting nests from the north end of Clear Lake. We did not visit the main colony.

7 August: FH and DS searched by canoe and found seven nests (all open water) in the channel south of the main colony, including three south of the bridge (one with an old egg, one with shell fragments, and one empty) and four north of the bridge (13 eggs with an average of 3.3 eggs per nest, range of 1-5, including a cracked egg). None of the nests were attended by an adult, suggesting that all had drifted in from the north end of Clear Lake. We found 37 nests (30 shore, seven open water) in the main colony. At least four nests were attended by a Clark's Grebe, including a new nest being built by a homospecific pair of Clark's Grebes. We counted 66 eggs in 29 nests, with an average of 2.3 eggs per nest (range = 1-5).

17 August: FH, DS, and AW searched by canoe and found two possibly old, drifted nests in the channel north of the bridge, one with an old brown egg (the other not checked). We counted 10 open water nests attended by three Western Grebes and seven Clark's Grebes. None of the shore nests were active. We observed two tiny chicks, each on the back of separate adult grebes.

21 August: FH and BM searched by canoe and found only three active nests (all open

water), including two Clark's Grebe nests and one Western Grebe nest; the latter was one of the possible old drifted nests.

28 August: FH, ND, and DS searched by canoe and found only one active nest (open water), presumably with one or more eggs, defended by a Clark Grebe.

3 September: AW and EW searched by canoe and failed to find any active nests but observed two chicks on the back of separate adult grebes.

10 September: AW and DS searched by canoe, failed to find any active nests and observed very few grebes (<10) in the area.

North End of Clear Lake

10 June: FH and BM searched by canoe and found one possible shore nest under construction. Extensive courtship activity by several hundred adults in the vicinity suggested incipient formation of a new colony.

22 June: FH, BM, and DS searched by canoe and found eight nests under construction far from shore, including four nests west of the main channel entrance and four nests east of the main channel entrance. None of the nests had an egg. We observed extensive courtship activity by about 400 adults in the vicinity.

3 July: FH, ND, and DS searched by canoe and found 34 nests (all open water), including two nests of Western Grebe 264-269 m from shore in the subcolony west of the channel and 32 widely dispersed nests of Western Grebe 60-800 m from shore (including a nest 114 m from Tule Island) in the subcolony east of the channel. We found seven eggs in six nests, with an average of 1.17 eggs per nest (range = 1-2).

19 July: FH and BM searched by canoe and estimated 625 nests (all open water), all east of the main channel except for four nests in the main channel. However, we did not conduct an accurate count because of large waves generated by strong southerly winds.

22 July: FH and BM searched by canoe and counted about 1100 nests (all open water) from 1-750 m from shore. We confirmed 16 homospecific pairs of Clark's Grebe and five heterospecific pairs of Western X Clark's Grebes (four with a male Western Grebe and female Clark's Grebe, one with a female Western Grebe and male Clark's Grebe), two pairs of female Western Grebes X male hybrid, and one pair of female Clark's Grebe X male hybrid.

24 July: FH, ND, BM, and DS searched by motorboat and observed many nests.

25 July: FH, ND, and DS searched by canoe and studied pairing by Clark's Grebes in a different section of the colony and found nine homospecific pairs (six pairs nest building, three pairs mating) and a heterospecific pair of a female Western Grebe and male Clark's Grebe.

31 July: FH, ND, BM, and DS searched by canoe and observed many nests.

1 August: FH and BM searched by canoe and observed many nests.

5 August: FH and DS searched by canoe and observed many nests.

7 August: FH and DS searched by canoe and counted 1100 nests, including ten new shore nests. We conservatively estimated that 25 old nests had disintegrated and 25 new nests had been built since our last count on 22 July, yielding an estimated total of 1150 nests for the season.

9 August: FH, ND, and DS searched by canoe and observed many nests.

17 August: FH, DS, and AW searched by canoe and found eight new shore nests (total of 18) and 17 new nests on the west side of the channel.

21 August: FH and BM searched by canoe and found 25 nests (all open water) west of the channel plus about 40 nests within the channel, many not among the original counts of 1100

nests, yielding an estimated total of 1200 nests for the season. The most distant nest was 950 m from shore.

28 August: FH, ND, and DS searched by canoe and found only a few hundred active nests. Many nests had apparently disintegrated and many others had eggs or broken eggs. One empty nest was an estimated 1100 m from shore. We counted 18 nests west of the channel.

3 September: AW and EW searched by canoe and found no new nests and very few active nests. Nearly 20 chicks were observed, mostly riding on the backs of the parents.

10 September: AW and DS searched by canoe and found about 30 active nests with about 20 of these near the buoys. About a dozen chicks were observed swimming alongside a parent or on a parent's back.

Northeast of Tule Island

22 July: FH and BM searched by canoe and failed to find any nests.

24 July: FH, ND, BM, and DS searched by motorboat and found a pair of Western Grebes on a well formed nest (open water) without an egg in the northeast corner of a lagoon about 400 m east-northeast of Tule Island.

31 July: FH, ND, and BM searched by canoe and found one nest (open water) with two eggs about 60 m from shore.

17 August: FH, DS, and AW searched by canoe and found one empty nest (open water).

10 September: AW and DS searched by canoe and failed to find any nests.

Nice

24 July: FH, ND, BM, and DS searched by motorboat and failed to find any nests.

5 August: FH and DS searched from land and failed to find any nests.

Lakeport

10 June: FH and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM, and DS searched by motorboat and failed to find any nests.

25 July: FH, ND, and DS searched by canoe and failed to find any nests.

31 July: FH and ND searched by canoe and found one nest (open water) with one egg about 150 m from a three-story building east of downtown Lakeport.

3 August: FH and DS searched by canoe and found two nests 196-207 m from shore and 15 m apart.

9 August: FH, ND, and DS searched by canoe and failed to find any nests.

17 August: FH, DS, and AW searched by canoe and failed to find any nests.

21 August: FH and BM searched by canoe and failed to find any nests.

28 August: FH, ND, and DS searched by canoe and failed to find any nests.

3 September: AW and EW searched by canoe and failed to find any nests.

10 September: AW and DS searched by canoe and failed to find any nests.

Manning Creek

24 July: FH, ND, BM, and DS searched by motorboat and found 44 nests (all open water) NE of the mouth of Manning Creek.

25 July: FH, ND, and DS searched by canoe and found 80 nests (all open water),

including at least one homospecific pair of Clark's Grebes.

31 July: FH and ND searched by canoe and found 169 nests.

3 August: FH and DS searched by canoe and found 236 nests (all open water), mostly to the NE of the mouth of Manning Creek. We found seven heterospecific pairs of Western and Clark's Grebes (three male Western Grebe and female Clark's Grebe; four female Western Grebe and male Clark's Grebe) and four homospecific pairs of Clark's Grebes.

9 August: FH, ND, and DS searched by canoe and found 325 nests (all open water) 77-208 m from shore. The colony expanded N of the mouth of Manning Creek with several nests N of the boat channel.

17 August: FH, DS, and AW searched by canoe and found 427 nests (all open water).

21 August: FH and BM searched by canoe and found 329 nests. The farthest was 416 m from shore.

28 August: FH, ND, and DS searched by canoe and found 248 nests (all open water).

3 September: AW and EW searched by canoe and found approximately 290 nests (all open water). We observed 14 chicks swimming alongside parents or on a parent's back.

10 September: AW and DS searched by canoe and found 71 nests (all open water). We counted 25 eggs in 12 nests, with an average of 2.1 eggs (range = 1-4) per nest.

Manning Creek / Rumsey Slough

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM, and DS searched by motorboat and failed to find any nests.

25 July: FH, ND, and DS searched by canoe and failed to find any nests.

31 July: FH and ND searched by canoe and failed to find any nests.

3 August: FH and DS searched by canoe and found one nest (open water) without eggs, 5 m from shore near the tip of the tules dividing the Manning Creek and Rumsey Slough lagoons.

9 August: FH, ND, and DS searched by canoe and found a new nest (open water) without eggs, 39 m from shore.

17 August: FH, DS, and AW searched by canoe and failed to find any nests.

21 August: FH and BM searched by canoe and failed to find any nests.

3 September: AW and EW searched by canoe and failed to find any nests.

10 September: AW and DS searched by canoe and failed to find any nests.

Rumsey Slough

13 May: FH and MH searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and failed to find any nests.

25 July: FH, ND, and DS searched by canoe and failed to find any nests.

31 July: FH and ND searched by canoe and found two nests (both open water) about 80-120 m from shore in the east cove. We counted four eggs in the two nests, with an average of 2.0 eggs per nest (range = 2).

3 August: FH and BS searched by canoe and found three nests (all open water) 81-106 m

from shore with nearest neighbor distances of 15, 15 and 61 m. We counted four eggs in two nests, with an average of 2 eggs per nest (range = 2).

9 August: FH, ND, and DS searched by canoe and found nine nests (all open water), including several new nests without eggs, up to 157 m from shore.

17 August: FH, DS, and AW searched by canoe and found 23 nests (all open water).

21 August: FH and BM searched by canoe and found 16 nests (all open water).

3 September: AW and EW searched by canoe and failed to find any nests.

10 September: AW and DS searched by canoe and failed to find any nests.

Big Valley Rancheria

13 May: FH and MH searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and found two nests (both open water) NW of casino channel.

25 July: FH, ND, and DS searched by canoe and found nine nests (all open water). No Clark's Grebes were seen in the vicinity. We did not inspect nests for eggs, but they were visible in at least two nests.

31 July: FH and ND searched by canoe and found 11 nests (all open water). We counted 11 eggs in six nests, with an average of 1.8 eggs per nest (range = 1-4).

3 August: FH and DS searched by canoe and found 14 nests (all open water) 69-131 m from shore. All appeared to be Western Grebe nests. We found 16 eggs in nine nests, with an average of 1.8 eggs per nest (range = 1-4).

9 August: FH, ND, and DS searched by canoe and found a new Western Grebe nest (open water) NE of the casino channel, 75 m from shore and 187 m E of the main colony. We found at least 13 nests in the main colony but did not count eggs.

17 August: FH, DS, and AW searched by canoe and found 14 nests in the northwest subcolony and two nests in the southeast subcolony.

21 August: FH and BM searched by canoe and found five nests in the northwest subcolony and two nests in the southeast subcolony, plus a new Western Grebe nest (open water) with three brown eggs between the two subcolonies.

3 September: AW and EW searched by canoe and found one nest (open water) plus two chicks with an adult.

10 September: AW and DS searched by canoe and failed to find any nests.

Land's End

13 May: FH and MH searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and failed to find any nests.

31 July: FH and ND searched by canoe and failed to find any nests.

3 August: FH and DS searched by motorboat and failed to find any nests.

7 August: FH and DS searched by motorboat and found one nest (open water) attended

by Western Grebes near the buoys.

9 August: FH, ND, and DS searched by canoe and found one nest (open water) without eggs 127 m from shore.

7 September: AW and DS searched by canoe and failed to find any nests.

Adobe Creek

13 May: FH and MH searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and failed to find any nests.

31 July: FH and ND searched by canoe and failed to find any nests.

3 August: FH and DS searched by motorboat and failed to find any nests.

7 September: AW and DS searched by canoe and failed to find any nests.

McGaugh Slough / Adobe Creek

13 May: FH and MH searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and two nests (open water) about halfway between McGaugh Slough and Adobe Creek.

31 July: FH and ND searched by canoe and failed to find any nests.

3 August: FH and DS searched by motorboat and failed to find any nests.

7 September: AW and DS searched by canoe and failed to find any nests but did observe two chicks swimming next to a pair of Clark's Grebes.

Long Tule Point

13 May: FH and MH searched by canoe and failed to find any nests.

3 June: FH, BH, and TK searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and found two possible shore nests under construction. Extensive courtship activity by about 300 adults in the vicinity suggested incipient formation of a new colony.

22 June: FH, BM and DS searched by canoe and found 14 nests (one shore, 13 open water) but no eggs. Of these, one open water nest was being constructed by a homospecific pair of Clark's Grebes. We observed frequent mating by Western Grebes on the nests and extensive courtship activity by 273 adults.

26 June: FH, ND, and BM searched by canoe and found 24 nests (all open water), including seven eggs in four nests with an average of 1.75 eggs per nest (range = 1-3). No Clark's Grebes were observed attending nests. Homospecific pairs of Western Grebe were observed mating on several nests. A recently broken egg was the only egg in an unattended nest, possibly the same nest under construction by a homospecific pair of Clark's Grebes on 22 June.

3 July: FH, ND, and DS searched by canoe and found 94 Western Grebe nests, including eight nests (all open water) in an eastern subcolony and 86 Western Grebe nests (one shore, 85 open water) in a western subcolony. None of the nests in the eastern subcolony contained eggs;

although we observed eggs in the western subcolony, we did not attempt to count them. Many matings were observed in both subcolonies. We observed one heterospecific pair of grebes comprising a male Clark's Grebe adding nest material to a nest occupied by a female Western Grebe.

5 July: FH, BM, and DS searched by canoe and found 112 nests, including 12 (all open water) Western Grebe nests in the eastern subcolony and 100 nests (one shore, 99 open water) at a distance of 0-64 m from shore in the western subcolony. The western subcolony included at least two homospecific pairs of Clark's Grebe and two heterospecific pairs of Clark's and Western Grebes (male Western Grebe and female Clark's Grebe; male Clark's Grebe and female Western Grebe). We counted six eggs in four nests of the eastern subcolony, with an average of 1.5 eggs per nest. We did not attempt to count eggs in the western subcolony.

10 July: FH, BM, and DS search by canoe and found 368 nests, including 139 nests (all open water) in the eastern subcolony, 42 nests (four shore, 38 open water) in the new central subcolony, and 187 nests (all open water; earlier shore nest missing) in the western subcolony. Clark's Grebes attended about ten of 139 nests in the eastern subcolony, including five mating homospecific, one nest-building homospecific pair, and one heterospecific nest-building pair (male Western Grebe, female Clark's Grebe). One of the 42 nests in the central subcolony was occupied by a Clark's Grebe (open water, identity of mate uncertain). We did not attempt to identify the ownership of nests in the western subcolony. Although many eggs were observed, we did not attempt to count them.

We observed a pair of Clark's Grebes mated on an empty nest and then mated on top of an egg in an adjacent nest. Both nests were previously occupied by Western Grebes. The Clark's Grebes then defended the first nest and a pair of Western Grebes mated on the nest with a single egg and laid a second egg.

19 July: FH, JT, and JF searched by canoe and found 505 nests, including 190 nests (all open water) in the western subcolony, 126 nests (four shore, 122 open water) in the central subcolony, and 188 nests (four shore, 188 open water) in the eastern subcolony. Most of the nests were empty or had broken eggs, and appeared to be abandoned, with fewer adults less courtship activity than on 10 July.

24 July: FH, ND, BM and DS searched by motorboat and found many active nests.

31 July: FH and ND searched by canoe and found about six well formed nests attended by nearby adults, but no eggs were present. All other nests were disintegrating.

3 August: FH and DS searched by motorboat and failed to find any nests.

7 September: AW and DS searched by canoe and failed to find any nests.

Corinthian Bay

13 May: FH and MH searched by canoe and failed to find any nests.

3 June: FH, BH, and TK searched by canoe and failed to find any nests.

26 June: FH, ND, and BM searched by canoe and failed to find any nests.

3 July: FH, ND, and DS searched by canoe and failed to find any nests.

5 July: FH, BM, and DS searched by canoe and found five Western Grebe nests (all open water) located 10-43 m from shore in the lagoon of Lakeside County Park. We counted seven eggs in three nests with an average of 2.33 eggs per nest (range = 1-4).

10 July: FH, BM, and DS searched by canoe and found nine Western Grebe nests (all open water). We counted 14 eggs in seven nests, with an average of 2.0 eggs per nest (range = 1-

3). Nearest neighbor distances averaged 16.2 m (range = 3-47 m).

19 July: FH, JT, and JF searched by canoe and found 22 nests, including 11 nests (all open water) in the lagoon and 11 nests (3 open water, 8 shore) 0-100 m from shore in a new subcolony just west of the lagoon subcolony. We counted 16 eggs in seven nests of the lagoon subcolony, with an average of 2.3 eggs per nest (range = 1-4) and 19 eggs in six nests of the bay subcolony, with an average of 3.2 eggs per nest (range = 1-5).

24 July: FH, ND, BM and DS searched by motorboat and found four new nests (all open water) near the beach at Lakeside County Park.

25 July: FH, ND, and DS searched by canoe and found 41 nests, including 31 nests (22 shore, nine open water) in the main bay and ten (all open water) in the lagoon. We counted 33 eggs in 14 nests (we did not count eggs in the lagoon), with an average of 2.4 eggs per nest (range = 1-5).

31 July: FH, ND, and DS assisted Marilyn Waits in setting up a webcam from a nearby home. Several nests were visible, but we did not attempt to count nests or eggs.

3 August: FH and DS searched by canoe and found 33 nests, including 26 nests (22 shore, four open water) in the main bay and seven (all open water) in the lagoon. Two of the shore nests appeared to be new, providing a cumulative total of 44 nests for the colony (24 shore, 20 open water). We counted 48 eggs in 21 nests, with an average of 2.3 eggs per nest (range = 1-6). Two nests had a cracked egg and one had only shell fragments.

7 August: FH and DS searched by motorboat and found only three active nests (all open water) in the main bay. We did not survey shore nests or nests in the lagoon.

15 August: Volunteers operating the webcam reported that the focal Western Grebe nest (shore) was blown away. The webcam was refocused on another nearby nest (shore).

16 August: Volunteers operating the webcam reported that the shore nests were no longer active.

17 August: FH, DS, and AW searched by canoe and found only three active nests (all open water) in the main bay. We counted seven eggs in three nests with an average of 2.3 eggs per nest (range = 2-3).

21 August: FH and BM searched by canoe and failed to find any nests. We found two small chicks accompanying a pair of Clark's Grebes.

7 September: AW and DS searched by canoe and failed to find any nests.

7 September: AW and DS searched by canoe and failed to find any nests, but observed four chicks with 20-30 adult grebes.

Sunrise Shores

3 June: FH, BH, and TK searched by canoe and failed to find any nests.

10 June: FH and BM searched by canoe and failed to find any nests.

22 June: FH, BM, and DS searched by canoe and found three definite nests and three possible nests (all shore) under construction. Extensive courtship activity by >100 adults in the vicinity suggested incipient formation of a new colony.

26 June: FH, ND, and BM searched by canoe and found two definite nests (both shore). We observed extensive courtship activity by about 50 adults.

3 July: FH, ND, and DS searched by canoe and found no evidence of nesting.

10 July: FH, BM, and DS searched by canoe and found a pair of Western Grebes building a shore nest.

- 22 July: FH and BM searched by canoe and found no evidence of nesting.
 24 July: FH, ND, BM and DS searched by motorboat and failed to find any nests.
 7 August: FH and DS searched by canoe and failed to find any nests.

Anderson Marsh North (formerly North Anderson Marsh)

- 5 May: FH searched by motorboat and failed to find any nests.
 3 June: FH, BH, and TK searched by canoe and failed to find any nests.
 10 June: FH and BM searched by canoe and failed to find any nests.
 17 June: FH and MH searched by canoe and failed to find any nests.
 22 June: FH, BM, and DS searched by canoe and failed to find any nests.
 26 June: FH, BM, and ND searched by canoe and failed to find any nests.
 10 July: FH, BM, and DS searched by canoe and found four nests (two open water, two shore) at a distance of 0-24 m from shore, including three Western Grebe nests (two open water and one shore) and one nest (open water) under construction by a homospecific pair of Clark's Grebes. We counted three eggs in three nests, with one egg in each nest.
 22 July: FH and BM searched by canoe and found no evidence of nesting.
 7 August: FH and DS searched by canoe and failed to find any nests.

Anderson Marsh Southwest

- 3 June: FH, BH, and TK searched by canoe and failed to find any nests.
 3 July: FH, ND, and DS searched by canoe and counted 88 nests (all shore). We counted 101 eggs in 55 nests with an average of 1.84 eggs per nest (range = 1-8). Three nests had a single broken egg (clutches of 1, 2, and 3 eggs), probably indicative of predation. The nesting adults were very skittish and most abandoned the nests as we arrived; only one Western Grebe incubating three eggs allowed us to approach closely.
 10 July: FH, BM, and DS searched by canoe and found 90 nests (all shore). We counted 120 eggs in 60 nests, with an average of 2.0 eggs per nest (range = 1-8). We detected a broken egg in three nests with eggs and egg fragments in two empty nests. The nesting adults were very skittish and all abandoned the nests as we arrived.
 22 July: FH and BM searched by canoe and found no evidence of nesting.
 7 August: FH and DS searched by canoe and failed to find any nests.

Anderson Marsh Southeast (formerly South Anderson Marsh)

- 3 June: FH, BH, and TK searched by canoe and failed to find any nests.
 10 June: FH and BM searched by canoe and found six nests (all shore) under construction. Extensive courtship activity by 108 adults in the vicinity suggested incipient formation of a new colony.
 17 June: FH and MH searched by canoe and found seven nests (all shore) under construction.
 22 June: FH, BM, and DS searched by canoe and found 19 nests (all shore), including one with an egg, which was the first of the season.
 26 June: FH, BM, and ND searched by canoe and found 17 nests (all shore), including two nests with eggs (four and two eggs, respectively). We observed a homospecific pair of Clark's Grebes building a nest and a homospecific pair of Western Grebes mating on a nest.
 3 June: FH, ND, and DS searched by canoe and found nine empty nests (all shore) and no

nests with eggs.

22 July: FH and BM searched by canoe and failed to find any nests.

7 August: FH and DS searched by canoe and failed to find any nests.

Clearlake Park

24 July: FH, ND, BM and DS searched by motorboat and found a pair of Western Grebes nest building at the base of a buoy just west of the tip of Holiday Island Mobile Home Park. Both adults were placing carrying long tules to the nest site.

5 August: FH and DS searched from shore and failed to find any nests.

Clearlake Oaks

5 July: FH, BM, and DS searched by canoe and failed to find any nests.

24 July: FH, ND, BM and DS searched by motorboat and failed to find any nests.

28 July: FH, ND, and DS searched by canoe and failed to find any nests. However, we found two small Western Grebes riding on the backs of adults.

Other Areas

22 May: FH and DB searched by motorboat from Clear Lake State Park to Quercus Point and failed to find any nests.

22 June: FH and BM searched by canoe at Quercus Point and failed to find any nests. However, extensive courtship activity by about 80 adults in the vicinity suggested incipient formation of a new colony.

24 July: FH, ND, BM and DS searched the perimeter of Clear Lake by motorboat and failed to find any nests in areas not mentioned above.

7 August: FH and DS searched Quercus Point by motorboat and failed to find any nests.

DISTURBANCE INDICES

We recorded 65 disturbances during 52 hours of observation, for an average of 1.3 disturbances per hour (Table 1). Birds accounted for 50 (76.9%) of the disturbances. American Crows (*Corvus brachyrhynchos*) accounted for 44 (67.7%) of the disturbances and were a frequent predator (see below). California Gulls (*Larus californicus*) accounted for five (7.7%) of the disturbances, including predation (see below). A Bald Eagle (*Haliaeetus leucocephalus*) flying over a large colony caused the birds to vocalize less, but surprisingly we did not observe a similar effect when a Peregrine Falcon (*Falco peregrinus*) flew over the same colony on the same day. Three disturbances (4.6%) were caused by motorboats which drove rapidly through a colony, when birds simply jumped off their nests and dived underwater. The cause of a dozen (18.5%) disturbances was unidentified. In contrast with the previous 2 years, we did not observe a single instance of disturbance by River Otters (*Lutra canadensis*). Excluding the motorboat disturbances, the natural disturbance rate was 1.19 disturbances per hour, which was more than four times higher than the previous 2 years (0.29 in 2011, 0.16 in 2010). The high rate of natural disturbance was due primarily to predation (see below).

We observed 44 instances of nests with eggs being preyed upon by birds, including 40 (90.9%) by American Crows and four (9.1%) by California Gulls (Table 2). We observed predation only at the two largest colonies (North End of Clear Lake and Long Tule Point), which were likely decimated by predation. At Long Tule Point we observed 10 nests preyed upon by

crows with up to five at a single nest during 2.5 hours of observation on 10 July, and we observed 17 nests preyed upon by crows during 2.5 hours of observation on 19 July, with up to five crows preying simultaneously on four nests. In each case the crows attacked a nest that was momentarily abandoned by the grebes. The eggs were usually cracked and eaten on the nest but on three occasions we observed a crow flying away from the nest with an egg in its bill. On several occasions we observed crows simply feeding on insects at a nest while the eggs were ignored. On three occasions we observed grebes chase away a crow before it arrived on a nest, but never once the crow was standing on the nest. Similarly the California Gulls attacked only nests that were temporarily abandoned. Once a gull flew off with an egg and on one occasion a gull in the water was chased away by a grebe.

A possible disturbance that we had previously observed but never considered was the presence of ducks or coots standing on open water grebe nests with grebe eggs as though they were incubating the eggs. We observed up to five female Mallards (*Anas platyrhynchos*), a female Ruddy Duck (*Oxyura jamaicensis*), a female Bufflehead (*Bucephala albeola*), and a few American Coots (*Fulica americana*) exhibiting such behavior. We believe the birds were using the nests only to rest because we did not see any ducks or coots consistently incubating eggs on any of the nests.

Only three human disturbances were observed during the study period out of 21 potential disturbances (Table 2). In comparison with 2010, the rate of potential human disturbances per hour (0.43) was slightly higher than 2011 (0.33) and much lower than 2012 (1.62). However, this year the two largest colonies were sprawled across frequently used boat channels, unlike last year when the colonies were located along the shoreline in shallow water and in more protected areas. We attribute the low rate of potential human disturbances to the extensive growth of cyanobacteria, algae and macrophytic plants, combined with bad publicity about the lake's water quality, which discouraged boaters from using Clear Lake.

Unlike the previous year (2011), when most of the colonies were abandoned, only the southernmost colonies were abandoned this year and early during the breeding season. We believe that an inadequate food supply is the best explanation for colony abandonment. Because large numbers of grebes remained on nests throughout the incubation period in the northern colonies, we believe the food supply remained adequate throughout the breeding season in the northern part of the lake.

We observed only two minor instances of winds destroying nests, unlike last year (2011), when a windstorm destroyed about 200 nests at Long Tule Point. On 1 August, FH and BM observed large waves up to 1 m high generated by strong southerly winds at the North End of Clear Lake, where the nests farthest from shore were vulnerable to destruction. On 6 August, FH and DS encountered six "new" open water nests with old eggs in the narrow channel at the south end of Rodman Slough, and observed one nest drifting underneath the highway bridge, suggesting that some of the nests had been blown away from the colony at the North End of Clear Lake and drifted upstream into Rodman Slough. And on 15 August, volunteers operating the webcam at Corinthian Bay reported that the focal Western Grebe shore nest was blown away.

BROOD SURVEY

A brood survey by motorboat on 13 September recorded 3,828 adult grebes (83.7% Western Grebes, 16.3% Clark's Grebes) and 125 juvenile grebes (including 36 Western Grebes and 1 Clark's Grebe) within the transect area, for an overall ratio of 0.033 juveniles per adult

(0.038 for Western Grebe, 0.005 for Clark's Grebe). An additional 7,233 adult grebes were observed outside of the transect area for a total population of 11,061 adult grebes.

Our ratio of 0.033 juveniles per adult was disappointingly lower than in 2010 (0.045) but much higher than in 2011 (0.005).

CONCLUSIONS

Given the much larger number of nests this year (2,382) compared with 2011 (1,248) and 2010 (1,323), and the large number of grebes that incubated eggs on nests throughout the incubation period in the northern colonies, we were disappointed with the low productivity ratio of only 0.033 juveniles per adult compared with 2010 (0.045) and 2011 (0.005). We suspect the relatively low productivity is attributable primarily to abandonment of the southern colonies due to a paucity of food, combined with a high rate of avian predation decimating the two largest colonies. To illustrate the potentially devastating effects of predation, at Long Tule Point we observed 27 nests with eggs preyed upon by American Crows during 5 hours of observation, for an average of 5.4 nests per hour, on 10 and 19 July. Given this rate of predation, a potential 75.6 nests with eggs could be preyed upon by crows during a 14-hour day in a single colony. Although the number of nests preyed upon each day was presumably much fewer because the predators would have been satiated with fewer eggs, a more conservative estimate of 30 nests preyed upon each day over a 30-day period in two colonies would result in 1,800 nests destroyed by predation. More data on rates of predation would be useful to fully understand the potential impact of predation on limiting grebe productivity.

Fig. 1. Map of *Aechmophorus* grebe colonies indicating the number of estimated nests in each colony during the 2012 breeding season at Clear Lake, Lake County, California.

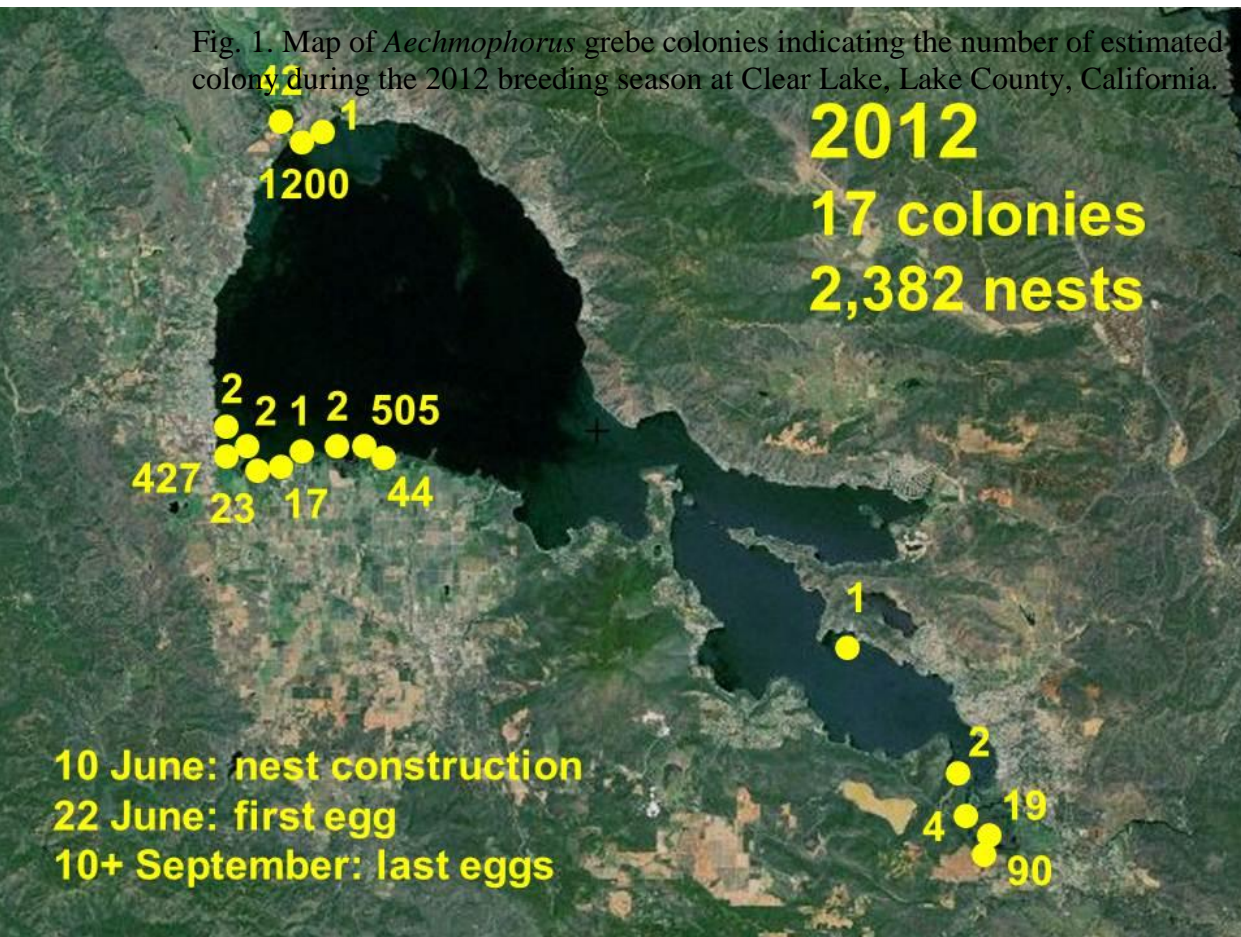


Table 1. Summary of pertinent breeding data for *Aechmophorus* grebes on Clear Lake during 2012. Distance from shore refers to the distance from emergent vegetation.

Colony	Type of colony	Distance (m) from shore	Egg dates	Peak activity	Number of nests	Western Grebe (%)	Clark's Grebe (%)	Mixed pairs (%)
Rodman Slough	shore + open	0-40 m	19 Jul - 28 Aug	7 Aug	31 shore 11 open	32/42	10/42	0
North End of Clear Lake	shore + open	1-1100 m	3 Jul - 10 Sep	22 Jul - 7 Aug	18 shore 1182 open	?	?	?
NE of Tule Island	open	60 m	31 Jul	31 Jul	1 open	100	0	0
Lakeport	open	196-207 m	31 Jul	31 Jul	2 open	?	?	?
Manning Creek	open	77-416 m	25 Jul - 10 Sep	17 Aug	427 open	?	?	?
Manning Creek / Rumsey Slough	open	5-39 m	none seen	3-9 Aug	2 open	100	0	0
Rumsey Slough	open	81-157 m	31 Jul - 21 Aug	17 Aug	23 open	100	0	0
Big Valley Rancheria	open	69-131 m	25 Jul - 21 Aug	17 Aug	17 open	100	0	0
Land's End	open	127 m	none seen	7-9 Aug	1 open	100	0	0
McGaugh Slough / Adobe Creek	open	?	none seen	24 Jul	2 open	?	?	?
Long Tule Point	shore + open	0-82 m	26 Jun - 19 Jul	10-19 Jul	9 shore 496 open	?	?	?
Corinthian Bay	shore + open	0-100	5 Jul - 17 Aug	25 Jul	24 shore 20 open	100	0	0

Clearlake Park	open	20 m	none seen	24 Jul	1 open	100	0	0
Sunrise Shores	shore	0 m	none seen	22-26 Jun	2 shore	100	0	0
Anderson Marsh North	shore + open	0-24 m	10 Jul	10 Jul	2 shore 2 open	75	25	0
Anderson Marsh Southeast	shore	0 m	22-26 Jun	26 Jun	19 shore	100?	0?	0?
Anderson Marsh Southwest	shore	0 m	3-10 Jul	10 Jul	90 shore	?	?	?

Table 2. Results of disturbance index counts at *Aechmophorus* grebe colonies on Clear Lake. Results are given as observed disturbances / potential disturbances. Species: AMCR = American Crow; CAGU = California Gull; BAEA = Bald Eagle; BCNH = Black-crowned Night-Heron; GBHE = Great Blue Heron; OSPR = Osprey; PEFA = Peregrine Falcon; TUVU = Turkey Vulture; WTKI = White-tailed Kite.

Colony	Number of days	Total hours	Motorized Watercraft				Kayaks		Aircraft low flyovers	Mammals			Birds			Human(s) on foot	Unknown	Total disturbances	Disturbances / hour	Species of Mammal or Bird	Date(s)	
			In colony, large wake	In colony, small wake	< 100 m, large wake	< 100 m, small wake	In colony	< 50 m from colony		Predation	In colony	< 25 m from colony	Predation	In colony	0-25 m above colony							< 25 m from colony
Rodman Slough	6	2				0/3		0/2									0	0		19, 22, 25 Jul; 1, 7, 17 Aug		
North End of Clear Lake	15	26	2/2	0/2	0/1	0/3			0/3				13 4	15/17 5/8	0/14 0/55 1/1 0/3 0/1 0/2			23	0.9	AMCR CAGU BAEA OSPR SNEG PEFA WTKI	22 Jun; 3, 19, 22, 25, 31 Jul; 1, 5, 7, 9, 17, 21, 28 Aug; 3, 10 Sep	
Manning Creek	8	5.25		0/2	0/1									0/1 0/1	0/20			0	0	AMCR CAGU	25, 31 Jul; 3, 17, 21, 28 Aug; 3, 10 Sep	
Rumsey Slough	6	1.75													0/1 0/2			0	0	AMCR CAGU	1 Jul; 3, 5, 9, 17, 21 Aug	
Big Valley Rancheria	5	1.25													0/1			0	0	CAGU	25, 31 Jul; 3, 9, 17 Aug	
Long Tule Point	6	11				0/2							27	28/30 0/1 0/1 0/1	1/7 0/1 0/1	0/5		12/12	41	3.7	AMCR CAGU BCNH GBHE	22, 26 Jun; 3, 5, 10, 19 Jul

																	0/1						TUVU		
Corinthian Bay	7	2.75	1/1														0/1					1	0.4	AMCR	3, 10, 19, 31 Jul; 3, 17 Aug
Anderson Marsh N	1	0.25																				0	0		10 Jul
Anderson Marsh SW	2	1.0																				0	0		3, 10 Jul
Anderson Marsh SE	2	0.75																				0	0		22, 26 Jun
<i>Totals</i>	<i>19</i>	<i>52</i>	<i>3/3</i>	<i>0/4</i>	<i>0/2</i>	<i>0/8</i>		<i>0/2</i>	<i>0/3</i>				<i>44</i>	<i>48/59</i>	<i>2/112</i>	<i>0/5</i>					<i>65</i>	<i>1.3</i>			