

Western & Clark's Grebe Conservation and Management in California

Annual Report, 2009

**Prepared for
Kure/Stuyvesant Trustee Councils
and
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Cover Photo: Nature-watching cruise entering an active grebe colony near Rodman Slough at Clear Lake, Lake County, California. Photo taken 11 August 2009 by Kris Robison.

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I. Executive Summary

This annual report represents the fifth year of *Aechmophorus* grebe conservation in California under the current project. Conservation and management efforts for Western and Clark's grebes (*Aechmophorus occidentalis* and *A. clarkii*, respectively, hereafter called "grebes") began in California in 2005, as an attempt to restore and enhance grebe populations negatively-affected by oil pollution off the California coast. Because restoration opportunities were deemed to be very limited in the marine environment, efforts were focused at inland breeding lakes where significant conservation issues also existed but had more potential for mitigation (Ivey 2004). The project's main goal was to help protect and restore vital nesting colonies in California which often face severe human disturbance problems. A second, important goal was to obtain baseline population data at historically important nesting sites.

The initial grebe restoration project was initiated under the American Trader Trustee Council, organized as a result of the *T/V American Trader* oil spill that occurred in 1990 near Huntington Beach, California (ATTC 2001). From that settlement, restoration monies funded the initial outreach and education program for Western and Clark's grebes in California, and combined it with population monitoring to assess its effectiveness. In 2008, funding for the grebe project was re-routed and supplied by the Kure/Stuyvesant Trustee Councils (KSTC), organized as a result of the *M/V Kure* and *M/V Stuyvesant* oil spills that occurred on the north coast of California in 1997 and 1999, respectively (M/V Kure NRDA 2007, M/V Stuyvesant NRDA 2007). Moreover, Western and Clark's grebes were negatively affected in both of these latter spills, and the goals of the respective natural resources damage assessments were concordant with the current restoration project. These goals included grebe colony protection and enhancement, along with population monitoring.

Grebe conservation in 2009 included continuation of the existing outreach program with brochure distribution and boat ramp sign placement/maintenance, along with population surveys to evaluate reproductive success. Historically important colonies were visited in 2009 with the hope to collect data on the number of nesting attempts, size of local adult population, and productivity of the nesting effort. Details are summarized following in this report.

II. Introduction

The contract for 2009 survey and monitoring was awarded to the California Institute of Environmental Studies (CIES) through the Kure/Stuyvesant Trustee Council (KSTC). This report summarizes the fifth year of work for the current project, and briefly evaluates the five-year trends in grebe numbers and reproductive performance at Clear and Eagle Lakes. In addition, summaries for each year of Trustee Council-funded field work are provided.

Grebe conservation continued in 2009 with focus on Clear Lake, Lake County and Eagle Lake, Lassen County, although other nesting locations were visited (Table 1). Various population parameters were collected during each visit depending on the time of season including: estimated number of adults present (each visit), nest attempts (early-mid season), and young of the year to adult ratio (YY/AD) as a measure of reproductive productivity (late season). This last parameter serves as an index of reproductive performance, and can be compared across years to acquire a perspective on nesting success. The current project, initiated in the early 2000's has been summarized, including concise descriptions of events for each field season. Graphs of productivity are included for comparison across years. The 2009 field season is summarized in detail with descriptions of surveys and findings at each major grebe nesting lake visited in northern California. Outreach activities conducted in 2009 are discussed, and recommendations for future grebe management in California are suggested.

III. Drought & Grebes

Drought conditions in California persisted in 2009 for the third consecutive year, further limiting the availability of grebe nesting habitat (California Department of Water Resources 2010; data and analysis of productivity and habitat changes from the early-1990s through 2010 is currently being done for an MS thesis at UC Davis). This natural environmental stress, combined with other persistent anthropogenic stresses in the form of direct human disturbance, have led to a decline in nesting attempts and nest success for California grebes in the past three years, especially at Clear and Eagle Lakes (see Figures 3 & 4). Photographs taken during a 12 August 2009 aerial survey, illustrate the degree to which the drought has affected emergent vegetation (Figures 1 & 2). Our observations indicate that limited habitat availability at Eagle Lake precluded grebes from having an “average” productivity year (0.38YY/AD in 2009 versus the 0.50 YY/AD average, Anderson et al. 2008) (see Figures 1 & 4). In addition, the local adult population at Eagle Lake was lower than the “typical” 5,000+ individuals observed in years past for most 2009 surveys (Table 2).

The year 2009 was the first since 2007 in which a nearly normal nesting effort was observed at several locations. Given the poor grebe nesting effort observed in California in both 2007 and 2008, combined with continued drought, we recommend that grebe surveys in future years be done as often as possible (i.e. every year or at least every other year) to encompass this variability in reproductive effort and to further document population trends.

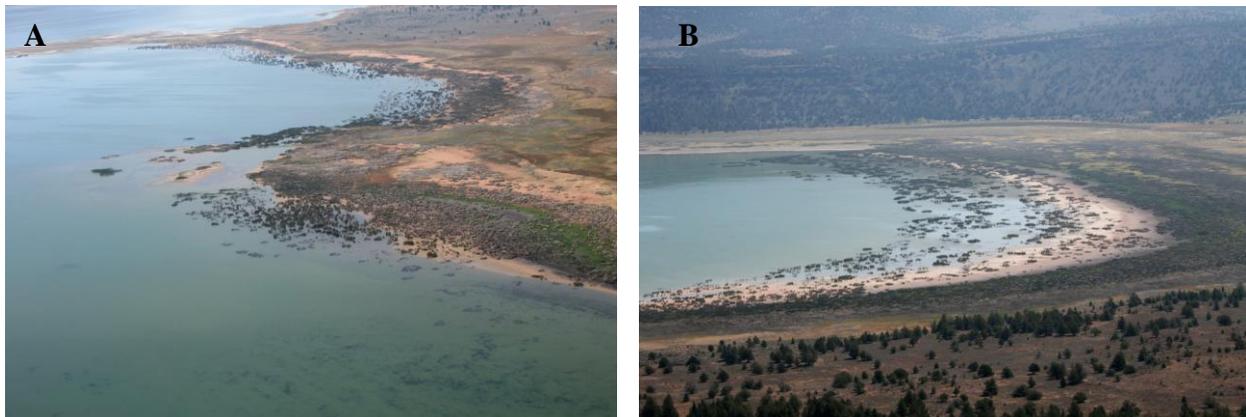


Figure 1. Eagle Lake’s limited habitat availability in 2009 with drought conditions & low lake level. **A.** Spaulding colony emergents; **B.** North Basin “Stone Ranch” colony emergents; each had nesting grebes in 2009.

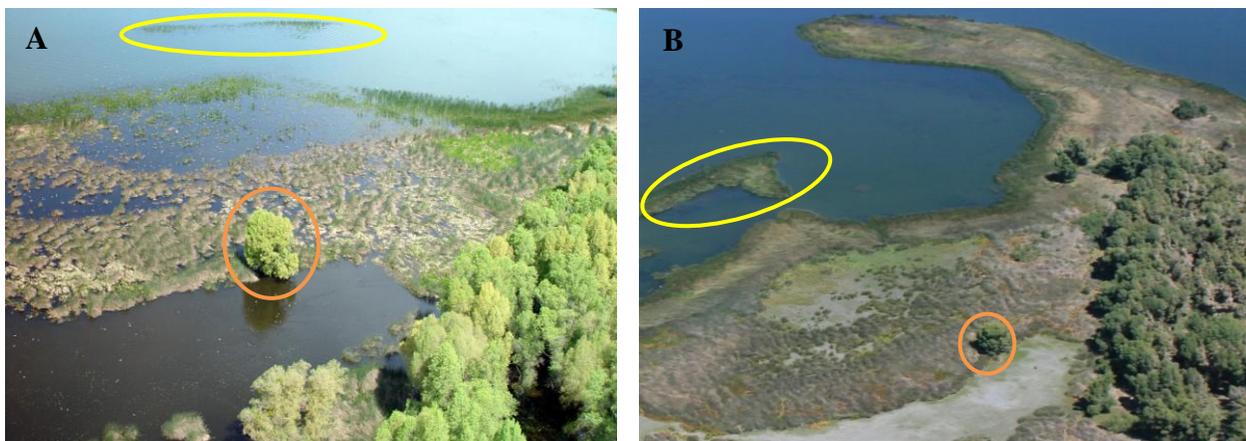


Figure 2. Comparison of water levels at Long Tule Point, Clear Lake, Lake County, California. **A.** 2005 with grebe nesting colony & high water-level; white dots are grebes & grebe nests. **B.** Same location on 12 August, 2009.

IV. Synthesis of Past Year's Grebe Conservation Efforts

Conservation and monitoring activities were sustained through the reported period, 2005 through 2009, but from at least 2007-on, drought conditions and other confounding factors in the breeding areas resulted in severely reduced nesting effort and nesting success for grebes. The suggestion that some grebe nesting was shifted farther south in the latter years, but we did not pursue this question in southern California in 2009. Past year's grebe conservation efforts are summarized below for reference. More details can be found in each year's respective reports:

A. Year 1, 2005 Field Season

The first year of the American Trader Trustee Council (ATTC) funded California *Aechmophorus* grebe conservation and monitoring project involved initiating various monitoring and outreach activities. Sharon Gericke, a Master's student at UC Davis was heavily involved in the grebe project, collecting data on human disturbance and monitoring the then-productive colonies at Clear Lake, Lake County. Her completed thesis examined common anthropogenic disturbances and their effects on grebe productivity at Clear Lake (Gericke 2006). Her 2005 field crew, Harley Winfrey and Carley Neilson, assisted her in collecting various data on behavioral phenomena in and around active colonies to assess the impacts of different types of disturbances. Focal, scan, and disturbance index surveys were used to gather desired data as well as overall monitoring of population trends (Gericke and Anderson 2006). It was determined that grebes continued to select areas with high levels of human disturbance at Clear Lake. In addition, Gericke (2006) asserted that if habitat is at a premium, grebes may be forced to use whatever habitat is available, regardless of human disturbance levels. She warned that this may ultimately lead to a decline in local populations (Gericke 2006).

For these reasons, an interpretive program was initiated in 2005 with the help of Katherine A. Smith, a graphic designer. Prototype brochures were developed for distribution at sport shops, marinas, and local businesses. Also, signs were designed to post at boat ramps where lake users could visualize the "species of concern" when launching their boats. An initial goal of the project was to minimize disturbance to nesting grebes, a conservation measure deemed to be most attractive for enhancing breeding effort and restoring populations negatively affected by winter oil spills.

B. Year 2, 2006 Field Season

During 2006, the same type of behavioral monitoring continued for grebe colonies in northern California, focusing efforts on Clear Lake. Included in the final report submitted to the ATTC were abstracts of Sharon Gericke's M.S. thesis related to human disturbance; as well as Caroline Throw's short paper on boat-caused alteration of grebe behavior written for the 2006 UC Davis Wildlife, Fish, and Conservation Biology 101 field research class. Also included in the 2006 Annual Report is a copy of D.W.A.'s abstract submitted to Ecological Applications entitled *Mercury Residues and Productivity in Osprey and Grebes from a Mine Dominated Ecosystem* (Anderson et al. 2008). In addition, the format of the brochures and boat ramp sign were finalized in 2006. Reproductive effort was evaluated for Clear Lake and Eagle Lake using non-invasive estimated nest counts and pelagic strip-transects for estimating productivity. An aerial survey was conducted for Clear Lake to photograph grebe colony habitats. A summary of events specific to Clear Lake, including disturbance and habitat changes, can be found in the 2006 Annual Report (Anderson 2007).

Several important conclusions were drawn in the 2006 report based on observations from two years of the project. In summary, it was determined that enforcement presence and outreach were having positive effects on grebe nesting potential; the original intention of the project. In addition, it was asserted that regardless of such efforts, if decimating factors taking place on the wintering grounds were not lessened, it would render efforts on the breeding grounds ineffective in the long-term. This conclusion remains applicable today.

C. Year 3, 2007 Field Season

Monitoring efforts in 2007 continued as in the two years prior although this year's findings were anomalous in contrast. Nesting colony searches were conducted at Clear Lake during the usual time period; beginning in June and continuing through July. These searches were unsuccessful in that grebes did not initiate a colonial nesting effort at Clear Lake in 2007. The failure to initiate nesting at Clear Lake was initially presumed to be linked, albeit anecdotally, to a crash in their primary prey species, Thread-fin Shad (*Dorosoma petenense*); data on seasonal fish abundance in 2007 was not obtained. The Thread-fin Shad crash was reinforced by local fishermen who noticed that once-visible Shad were no longer present early in the year, presumably following a very cold weather period. Local Clear Lake inhabitants also reported *Aechmophorus* grebes being present early in the year, followed by a near complete exodus from the lake. Furthermore, during boat censuses at normal nesting periods of July-August, grebes were observed to be feeding vigorously in tight flotillas, which have been observed by us to occur primarily in the marine environment.

After a complete-lake search of YY produced, a productivity estimate of 0.0026 YY/AD was obtained (compared to an average of 0.36 YY/AD, see Figure 3), with an estimated maximum of 20 successful nests scattered around the lake. Surveys at Eagle Lake led to the discovery that this site was also experiencing a reduced breeding effort. A productivity estimate for Eagle Lake in 2007 was 0.04 YY/AD compared to 0.5 YY/AD, which represents average productivity (see Figure 4). Due to the overall lack of successful nesting efforts at these important northern California breeding lakes, focus was shifted to intensive distribution of informational materials (brochures, signs, etc.) and exploratory field work throughout the entirety of California.

Exploratory efforts consisted of traveling to lakes and reservoirs that had not previously been surveyed until that point of the project. Ivey (2004) was used as a guide for locations to visit. At these locations, a census of nesting effort and productivity, as well as the presence of suitable nesting habitat, was taken in order to gain a broader understanding of whether or not the overall lack of nest initiation at both Clear and Eagle Lakes was a state-wide phenomenon. In total, 25 lakes were surveyed in 2007 including two sites that had not been previously known to contain nesting grebes (Robison et al. 2008).

Unusually high levels of plumage staining were another new finding in 2007 (see the 2007 & 2008 Annual Reports for specific ratios [Robison et al. 2008, 2009]). Conspicuously orange to brown ventral plumage stains were observed in many birds at several locations throughout northern California. Ratios of stained to clean birds were recorded and stained birds were photographed. It was thought that such staining could have arisen from some type of pollution, but the exact cause of the staining was not determined.

A popular article on *Aechmophorus* grebe conservation was written by Renée Weems and Kris Robison for publication in California Department of Fish and Game's *Outdoor California* magazine. This article was submitted for approval and provided another form of public outreach and education concerning grebes on their breeding grounds. The article was published in the September/October edition in 2008, and was included in the 2008 Annual Grebe Report (Weems and Robison 2008, Robison et al. 2009).

A poor reproductive season combined with a significant oil spill caused by the 7 November 2007 allision of the containership *Cosco Busan* (spilling 53,500 gallons of fuel oil into San Francisco Bay) with the San Francisco Bay Bridge (National Transportation Safety Board 2009). This oil spill led to increased concern over California grebe populations; as grebes were the second-most affected species in the spill according to a damage assessment report (California Department of Fish and Game 2008). This event illustrated the need for continued monitoring and management of these birds on the breeding grounds.

D. Year 4, 2008 Field Season

In 2008, grebe surveys were conducted at numerous important breeding lakes throughout California. Exploratory work was continued to assess new lakes not visited by us in 2007. Follow-up surveys were also conducted for new locations surveyed the prior year. In total, 47 sites were visited during the 2008 field season in order to gain insight on the overall nesting effort throughout the state. Additionally, Geographic Information System (GIS) maps were produced depicting 2007 and 2008 survey locations and relative grebe nesting effort at these sites (Robison et al. 2009).

Eagle Lake productivity estimates rebounded in 2008 to an overall level of 0.58 YY/AD. Low grebe productivity and high boating disturbance persisted at Clear Lake, and 2008 was another year in which low reproductive effort and unsuccessful colony initiation were observed. Productivity estimates at Clear Lake were still well below normal, only 0.006 YY/AD (Robison et al. 2009). In addition, habitat and disturbance observations indicated that there was very little refuge for grebes at this location. It was clear that boaters and recreationists were essentially unaware (or unconcerned) of the nesting needs of these birds, despite the widespread distribution of informational materials and signs. This illustrated the continued need for public outreach and education, improved buoy placement, and the presence of enforcement officials at areas such as Anderson Marsh State Park, one of the only restricted speed areas on the lake where nesting habitat is sometimes available (although not occupied from 2007-2009 due to low water levels). It was determined that in the future more collaboration with Lake County agencies and organizations would be needed to increase commitment and interest in grebe conservation. Disturbance concerns were also raised at several other survey sites, including Lake Almanor, where extreme water-level fluctuations were observed to cause the abandonment of large nesting colonies.

Several management recommendations were outlined in the 2008 report to help combat such disturbances. In particular, the nesting success and high productivity observed at Cachuma Reservoir in southern California led to our recommendation for the increased use of management tools such as booms and buoys. Refer to the 2008 Annual Report for additional recommendations, which include water level stabilization, wetland restoration, fishing line receptacles, and artificial nest platforms.

A conference was also held at Eagle Lake in an effort to inform and coordinate agency and organization's grebe conservation efforts. Representatives from Department of Water Resources, California Department of Fish and Game's Office of Spill Prevention and Response, United States Fish and Wildlife Service, Point Reyes Bird Observatory Conservation Science, California Institute of Environmental Studies, and University of California, Davis, were among the attendees. Observations, findings, and recommendations of the project were presented. In addition, perspectives from the above mentioned agencies and organizations were presented; along with those from KSTC. Future goals and possible management solutions were also discussed among all in attendance (see Appendix III & IV in Robison et al. 2009).

V. 2009 Field Season

A. Initial Observation

In late July, 2009 approximately 11,125 grebes were observed on the Pacific coast in the vicinity of Santa Cruz, California (Davis Suddjian, pers. comm.). Although unusual for grebes to remain in the marine environment well into summer, a similar observation was made in late-June 2007. Approximately 10,000 adults were observed between the Golden Gate Bridge and Bolinas Bay, California (S. Hampton, pers. comm., see Robison et al. 2008). These observations reinforce the notion that grebe-movement ecology and certain life history metrics are still largely unknown. Additionally, grebes remaining on the Pacific coast during summer may be becoming more common, reinforcing the need for range-wide surveys (see Appendices 3 & 4 in Robison et al. 2009). Furthermore, approximately 21,000 grebes were observed at the Salton Sea in April 2009, likely staging before migration inland (Schoneman 2009, unpublished data).

B. Surveys of Important Nesting Locations

The 2009 field season to assess the grebe breeding effort in northern California began in mid-June. Because of a late start to field work, there were several sites that were not visited in 2009 including Lake Earl (Del Norte County), Black Butte Reservoir (Glenn County), Lake Hennessey (Napa County), Topaz Lake (Mono County), Bridgeport Reservoir (Mono County), Crowley Reservoir (Mono County), O'Neill Forebay (Merced County), and Tinemaha Reservoir (Inyo County).

Grebe surveys and monitoring efforts in 2009 were focused at lakes and reservoirs north of 35° latitude; at the request of KSTC, we did not conduct exploratory surveys in 2009. Therefore, surveys were conducted only at locations that have historically been important grebe breeding areas. As in the past, particular attention was paid to Clear and Eagle Lakes.

i. Aerial Survey

An aerial survey was conducted in collaboration with the California Department of Fish and Game (CDFG) on 12 August 2009 to census nesting grebes at important lakes in northern California. Lake Almanor, Mountain Meadows Reservoir, Eagle Lake, and Clear Lake were surveyed in the order listed above. Photographs were taken of each location. Observers would simultaneously observe the colony and estimate the number of nests present, take detailed notes of their findings, and photograph nesting areas.

Lake Almanor's breeding colonies were extremely conspicuous from the air. At the time of survey it was visually estimated that 475-515 nests were present. These nests were divided between two distinct colony locations (the "causeway" and "south" colonies; see Appendix II). After examining the aerial photographs of these two locations, 569 active nests were determined to be present (Table 1).

Nest estimation through photography at Eagle Lake proved to be more difficult. The emergent-vegetation nesting substrate (i.e., dense beds of emergent vegetation versus nests anchored to the floating branches of submergent vegetation) obscured the clarity of the image; thus, photographs were not used to make estimates. Despite this, visual estimates were still made at the time of fly-over, but we were unable to confirm them with photographs. Therefore, an estimate of 700 nests at the time of fly-over was based solely on visual counts with multiple passes (Table 1).

On 11 August, a boat-based nesting colony census was conducted at Rodman Slough, Clear Lake (described in detail in the following section). This census yielded nest estimates of 450-500 active nests. From the aerial survey conducted the following day, we estimated 400-450 active nests. Nests were constructed conspicuously from submergent vegetation, similar to Lake Almanor. This demonstrated that each survey method (boat and aerial), given this type of nesting substrate, provided an accurate estimate of the number of nests present.

Due to the overall similarity of estimates produced using boat and aerial survey techniques, we do not believe that it is necessary to enter a grebe nesting colony to gain accurate nest counts for general monitoring purposes. In our experience a count that differs by 10-20% is precise enough to allow for effective monitoring. Additionally, entering the colony by kayak is the cheapest way to obtain precise counts, but this has been observed to cause severe disturbance to nesting grebes. Therefore, the trade-off of less precise counts causing fewer disturbances seems justifiable.

Additionally, a Master's thesis at UC Davis is aimed at determining the effectiveness of using productivity transects for estimating number of successful nests produced during a season, along with other information related to grebe densities. This may provide insight into the necessity of certain monitoring techniques and the applicability of using late-season brood transects to obtain various demographic rates.

ii. Clear Lake Surveys

We visited Clear Lake five times in 2009. Grebes did initiate a colonial nesting effort, something not observed by us since 2006 (Table 2). This colony was located outside Rodman Slough in algae/submergent vegetation (apparently a low-water event, and one that has only been seen once before since 1992 [DWA, personal observations]). Nest initiation occurred in late-July; the colony was not present on a 12 July boat survey, but was detected by 28 July (with approximately 100 nests and building). On the 12 August aerial survey, and combined with the previous day's boat census, we estimated 400-500 nests present (Table 1). By the time of our productivity survey on 4 October, all nests were gone with no evidence that a colony had ever been present. Furthermore, broods were still scarce along transects and throughout the main arm of Clear Lake, indicating that some (likely natural, i.e. wind) disturbance had occurred sometime during the nesting effort. Productivity in 2009 was estimated to be 0.022 YY/AD. A graph is included below for a visual representation of the Clear Lake nesting effort for year 2000-2009 (Figure 3).

Human disturbance was again widespread in 2009 with numerous incidents of grebe harassment recorded (despite minimal time spent at Clear Lake). In all of 2009, we estimate that 23 total hours were spent on Clear Lake observing grebes from a boat, including watching for human disturbance events. Most disturbances were simply from many fast-traveling boats present near large concentrations of grebes, giving grebes nowhere to seek refuge. On one occasion, we observed a personal water-craft user deliberately pursuing a pair of rushing grebes. On another occasion, while observing the nesting colony outside Rodman Slough, two pontoon boats carrying nature watchers motored very near the colony, with one boat coming within 50ft of active nests (cover photo). During a late July kayak census around ideal grebe nesting habitat near Lakeside County Park, airboats were active in the Bulrush, spraying herbicides for *Hydrilla*. These activities will surely preclude grebes from successful nesting. Furthermore, like years past, buoys were lacking in all critical grebe-habitat areas. We have contacted Lake County Public Works Chairman, Kim Clymire, about this issue, and further collaboration is needed with Lake County officials, along with the Lake County Sheriff's Department. Also, we have spoken to a representative from the California Department of Food and Agriculture (CDFA) who oversees the *Hydrilla* control operations at Clear Lake. He has conveyed his willingness to help grebe conservation efforts, and even offered to supply unused *Hydrilla*-buoys for grebe colony protection purposes. This prospect could be pursued in the future for assistance with a large-scale buoy deployment when and if colonial nesting occurs in 2010 and beyond. Solar-lighted buoys would be most beneficial for both grebes and boaters to limit high-speed boat activity in sensitive areas with emergent habitat suitable for nesting, while also considering nocturnal boating activities.

A restricted activity system such as this would have to also restrict air boats, which are used by the CDFA in *Hydrilla* control. An extensive buoy system would certainly provide grebes with a more effective refuge for nesting by limiting disturbance, as well as stimulate attention for grebe conservation by Clear Lake enthusiasts (Robison et al. 2009). We also believe that fishermen, with oars and silent-running electric motors, could be allowed to fish within about 100 m of nesting grebes inside such a protected zone, and would not have to be alienated by boating restrictions. They might even become supporters of grebe conservation which would ensure other boaters are not disturbing their tranquility. We have talked to numerous bass fishermen and all have been receptive to this kind of coalition.

Stained grebes were present again in 2009, with a cumulative ratio of $122/828 = 14.7\% \pm 2\%$ (Binomial CI). Staining was very widespread during the initial survey on 11-12 July with $26.3 \pm 4\%$ of sampled birds being stained (Table 1). These values lessened as the season progressed and by the time of the 4 October survey staining was only observed at a rate of $7.5 \pm 4\%$. We have come to believe that grebes' exposure to staining is derived from multiple sources, as birds have

been seen early in the season with heavy staining, as well as later in the season while on nests (i.e. Lake Almanor).

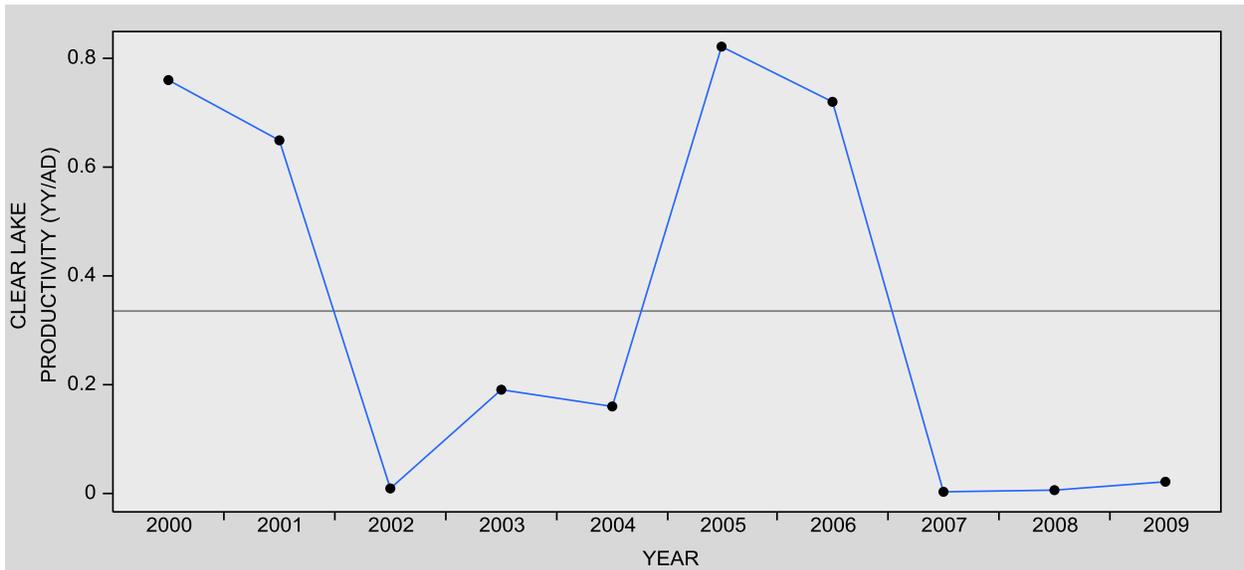


Figure 3. Clear Lake Productivity 2000-2009

Note: Horizontal line represents average productivity across the 10 year period.

iii. Eagle Lake Surveys

Eagle Lake was visited on four occasions in 2009, including an aerial survey on 12 August (Table 1). During our initial visit on 16-18 June, we explored prospective colony locations by vehicle and followed up with a boat census. Grebes were concentrated in emergent vegetation near Stone Ranch and Spaulding with frequent courtship activity observed at both sites. Our next trip was 31 July–2 August, at which time both vehicle and boat surveys were conducted. During this visit, we observed both previously-active areas (Stones Ranch and Spaulding) active again and contained nesting grebes. We estimated 150 occupied nests at the Stone Ranch colony from Hwy 139 with a spotting scope. We discovered later from our aerial survey that our count for the Stone Ranch colony was underestimated, although the number of nests likely increased between the two survey dates (Table 1). During the 31 July-2 August trip we did not take the boat to the Stone Ranch emergents, as our skipper felt that the water was too shallow near the colony (2-4ft. or less). We were able to approach the Spaulding colony by boat, which was more spread out due to low water levels and sparse availability of emergent nesting habitat (see Figure 1, Table 1 for estimates). Also, during this visit we observed very few broods (<10) on the lake, indicating that the nesting effort for both of the lake's colonies was fairly synchronous, an observation that has been made in prior years as well. Our third visit was the 12 August aerial survey where 700 nests were estimated to be present between the two colonies. During the last visit to Eagle Lake on 15-16 September, brood productivity transects were conducted around the lake (see Table 1 for results). Overall, Eagle Lake grebes experienced a below-average year with productivity $YY/AD = 0.38$ (average year $YY/AD = 0.5$, see Figure 4). A graph has been included below for a visual assessment of productivity (YY/AD) for Eagle Lake 2005-2009 (Figure 4).

Stained grebes were observed at Eagle Lake on both the 31 July – 2 August and 15-16 September visits, although at very low frequencies ($3 \pm 3\%$ and $2 \pm 2\%$ respectively; see Table 1).

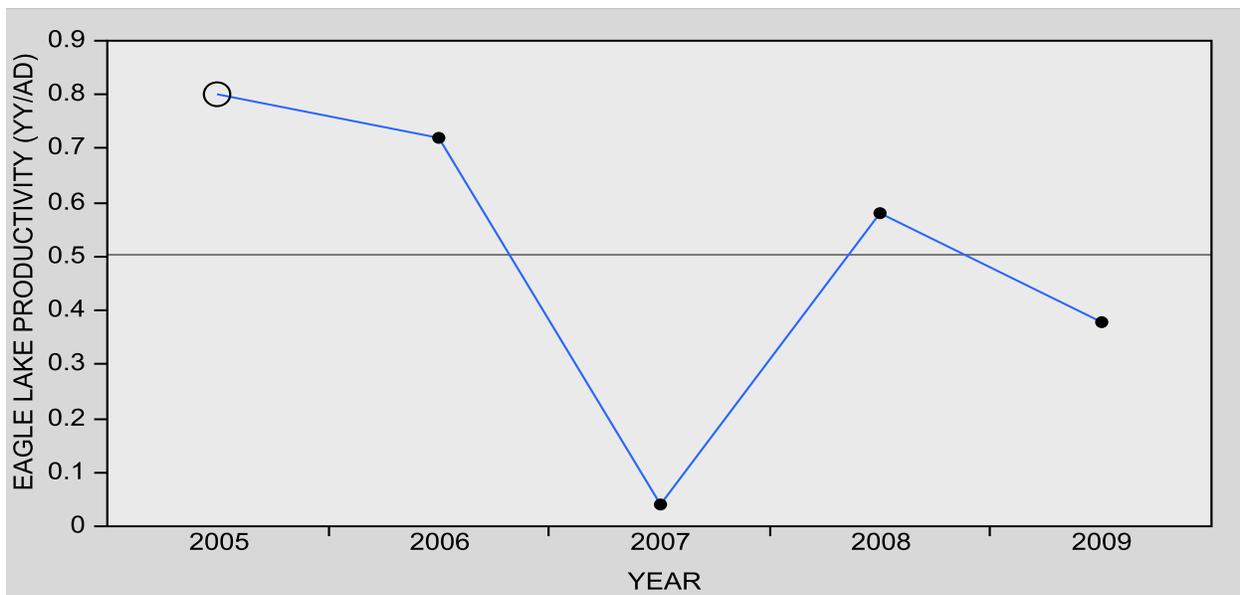


Figure 4. Eagle Lake Productivity: 2005-2009

Note: open circle for 2005 indicates presumed productivity based on correlative nature of Clear Lake and Eagle Lake (Anderson et al. 2008); 2005 was an extremely good year for grebes at Clear Lake, but no data were collected for Eagle Lake. The horizontal line represents average productivity across the five year period.

iv. Lake Almanor Sampling Methods

In late 2009, we established an appropriate method for consistent grebe surveys at Lake Almanor. This particular lake provides the unique opportunity to sample from land at various observation points around the shore (Appendix II). Both main colonies can be accessed adequately from a nearby road-way, providing clear views of all nests with binoculars and spotting scope. The “causeway” colony and the “south” colony were each sampled in 2009, but both locations were not sampled on every visit. For future surveys we recommend that a total lake census be conducted on each visit to Lake Almanor to obtain a total count for each trip.

Toward the end of the nesting period (August-September), productivity samples were conducted by driving around the lake, as described above, taking samples and recording observations from the various observation points. Using a spotting scope (20-60X magnification), observations ranging up to 500 meters were made out onto the lake. From the five observation points around the lake (see Appendix II), we feel that a reasonable and reliable measure of productivity can be obtained with minimal effort for future surveys of this important grebe breeding area; although such surveys need to be completed on calm-water days. Another observation point has been added to the map (Appendix II) for even further coverage, but was not assessed in 2009.

v. Lake Almanor Surveys

Lake Almanor was visited seven times in 2009. Both partial/incomplete and complete censuses were conducted (see Table 1). The management of this reservoir for hydroelectric power generation makes nesting activity extremely variable in comparison to other sites. Water draw-downs have been observed in numerous years to cause the abandonment of large numbers of nests or entire portions of colonies. Nesting efforts are typically resumed on deeper portions of the remaining vegetation following a draw-down, but often there is a “race” between nesting grebes and declining water levels. In the past, water level declines have usually been detrimental to nesting grebes. Water-level manipulation might be one important management tool at Lake Almanor in the future.

With re-establishment of nests during draw-downs, however, it is unclear whether the same birds are re-nesting or if these are new nesters. This is important to grebe monitoring efforts because an estimation of nesting effort could be grossly underestimated if only a “snapshot” is made during the nesting season. For this reason, more attention and monitoring should be paid to these colonies to gain a better understanding of nesting dynamics in a fluctuating reservoir system.

It is possible that coordination with Pacific Gas and Electric (PG&E), the company that manages this location, could lead to consideration of grebe nesting needs when performing draw-downs. This possible collaboration should be further explored, and consultation with the California Department of Water Resources regarding the Thermalito Afterbay may provide useful suggestions. Thermalito Afterbay has considered nesting grebes in their reservoir management decisions in the past, particularly in relation to water level fluctuation (Ryan Martin, pers. comm.).

The “causeway” colony at Lake Almanor was highly active during a 13 September survey. On this date, the lake had been drawn down to a point that caused nests to be stranded (approximately 50 nests were stranded). On 17 September, the south colony was visited and 175 active and 100 stranded nest remains were found. A total of 700 occupied nests were estimated for the season, based on counts taken at both colony locations on multiple dates, although with water draw-down and re-nesting, this estimate is approximate. Also, on 17 September ~60,000 waterfowl were observed around the lake, especially in the vicinity of the grebe colony locations (presumably because of the vegetative material). The lake level on 17 September still supported nesting grebes but was observed to be on the lower end of depth necessary for grebe nesting purposes. The presence of a wide variety of water-bird species indicates the possibility for multi-species use at reservoirs that are managed for hydro-electric power generation.

The graph below illustrates the water-level drop corresponding to the causeway grebe colony (Figure 5). This relationship suggests, and our observations confirm, that during the early part of the season, nesting substrate is not available for a large colonial breeding effort. As the lake level drops, more submergent nesting habitat becomes available and the colonies become very active. At a point, however, likely near the 13 September elevation (which was approximately 4480 ft.), there exists an optimal lake level for abundant grebe nesting to occur (Project 2105 2010). Due to the gentle sloping bottom of the lake, there is a rather delicate balance between prime habitat availability and nest stranding.

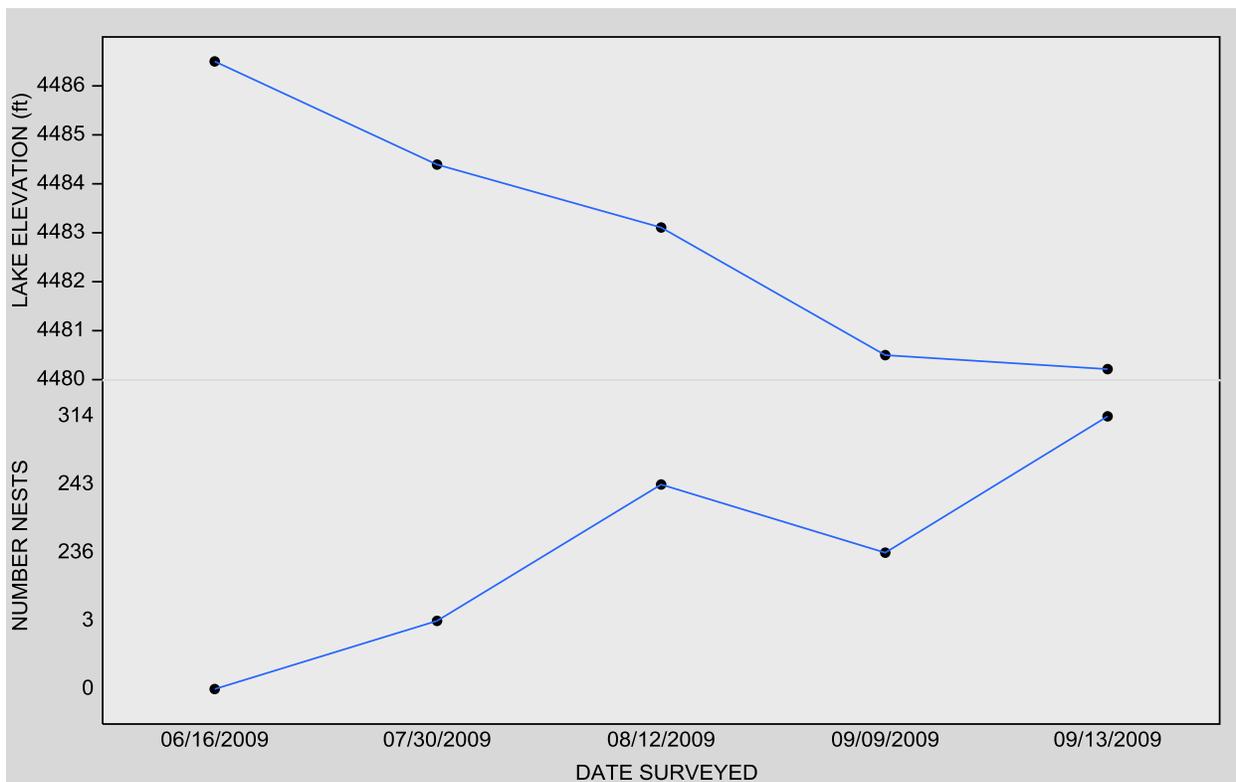


Figure 5. Lake Almanor Causeway Colony: Comparison of Nests and Lake Elevation: June – September 2009
Note: Lower nest count on 09/09/09 could be due to observer bias. K.M. Robison was looking through binoculars instead of scope and under a time constraint.

vi. Tule Lake National Wildlife Refuge Surveys

The Tule Lake National Wildlife Refuge (NWR) was visited twice in 2009. The goal of our initial visit was to estimate the nesting effort; 450 *Aechmophorus* grebe nests were found in a mixed-species colony consisting of Western grebes, Clark’s grebes, and Eared grebes (Table 1). During this initial visit, only one brood was encountered suggesting that the nesting effort was fairly synchronous. The auto tour route was driven for the surveys, and observations were made up to 300m out into Upper Sump. The second visit to Tule Lake NWR occurred on 23 October and a sample of brood productivity was conducted. Productivity was estimated at 0.21 YY/AD for this location in 2009 (Table 1).

C. Outreach

Outreach activities were continued in 2009 on a smaller scale than in years past. Boat ramp informational signs were checked and maintained and brochures were distributed, albeit on a more limited scale. For a list of brochure and sign locations please see the 2008 Annual Report (Robison et al. 2009). Various other outreach efforts were made and are summarized below:

i. Chester Town-hall Meeting

On 16 June, a very productive town-hall-style information meeting was held in Chester, California, on the west shore of Lake Almanor. Dan Anderson and Frank Gress, along with Diana Humple and Ryan Burnett (PRBO Conservation Science) gave a presentation on the biology of *Aechmophorus* grebes at Lake Almanor (Appendix I). There were approximately 40 mostly local people in attendance, and overall, people were inquisitive and interested in getting-involved in grebe conservation activities. It was hoped that a representative from Pacific Gas and

Electric, the company that manages the reservoir, would have joined the meeting and participated in the discussion, but no representatives of the company were in attendance.

ii. Outdoor California Article Printing & Distribution

The article R. E. Weems and K. M. Robison wrote for the popular CDFG publication *Outdoor California* was planned to be distributed widely in 2008, but due to the California budget crisis, the agency was unable to print additional copies, and distribution was not possible. Because of initial funding delays in 2009, we were unable to pursue the possibility of printing additional copies this year with funding from our current grant. It is hoped that in the future, these articles will be printed and distributed as an outreach tool. A copy of the article is included in the 2008 annual grebe report.

iii. Potential for an “Outreach Coordinator”

Following the 2009 field season, a meeting was held with Diana Humple and Dave Shuford of PRBO Conservation Science about their interest in future possibilities for grebe conservation, management, and monitoring. The importance of public outreach was discussed and it was agreed that a possible future direction of grebe conservation could include a specific position for grebe outreach activities. The possibility for an Outreach Coordinator position would allow for a thoroughly trained representative to be solely responsible for outreach activities throughout California. Potential activities would include: organizing presentations to local conservation groups and other target audiences (including fishermen); initiating relations with local conservation groups throughout California, such as local Audubon chapters, to foster grebe stewardship in local communities; continuing the distribution of brochures; organizing the placement of additional boat ramp signs at boat launches throughout California; and to help develop a new sign to attach to existing sign posts alerting boaters of buoys placed near colonies. Such a position would work to help alleviate disturbance issues at important breeding lakes.

D. More Recommendations for Future Grebe Conservation

In the 2008 annual grebe report submitted to both ATTC and KSTC, several management recommendations were outlined in detail which could prove to be beneficial for grebe conservation. Several of these recommendations are outlined in Section III-D of this report. We will list some below, along with new ideas, in order of perceived benefit (see also the 2008 annual grebe report):

1. Prevention of further habitat destruction, either through conservation easements or land acquisition;
2. Five-mph buoys deployed around areas of suitable nesting habitat to minimize disturbance to facilitate nest initiation;
3. Five-mph buoys deployed around active nesting colonies once initiation has commenced;
4. Continued and expanded outreach programs with the possible development of an Outreach Coordinator position;
5. Restriction of airboat activity near grebe colonies (i.e. Clear Lake) (this will require communication between the Clear Lake field crew and all appropriate agencies);
6. Installation of fishing line receptacles at all boat ramps to encourage fishermen to recycle their spent line;
7. Boom deployment to keep boat traffic out of certain critical areas;

8. Artificial nest platforms of varying sizes deployed at various locations to test effectiveness of this management technique;

To better ensure the success of future grebe management, a more active CDFG and United States Fish & Wildlife Service (USFWS) role in management and enforcement activities is essential. At the present time, the role of CDFG at important grebe lakes, which are inhabited by many species other than grebes, is minimal and mostly restricted to recreation-based game species. For example, Eagle Lake receives much attention regarding fisheries-related activities, especially pertaining to the Eagle Lake Rainbow Trout (*Onchoryncus mykiss aquilarum*). This location lacks attention from non-game biologists tending to the diversity of other species, especially numerous migratory waterbirds that over-summer and breed there. We believe that the presence of an authority figure in uniform would have a positive impact on limiting the amount of anthropogenic disturbance, especially. Furthermore, collaboration between grebe biologists and local law enforcement will be critical, as management actions (i.e. buoy deployment) will likely be useless unless migratory bird and wildlife protection laws are enforced.

VI. Conclusion

The 2009 field season brought a continuation of below normal productivity estimates for two of northern California's most important breeding lakes, Clear Lake and Eagle Lake. After three-years of drought conditions and observations of overall low nesting effort, the need for more active management is becoming increasingly important. Previous year's annual grebe reports, as well as this one, have outlined specific recommendations for management options. As has been outlined in previous reports, there is general concern over the status of these two species throughout their range. For example, Bower (2009) has recently documented an 85% decline for wintering *Aechmophorus* grebes in the Salish Sea, Washington, since the mid-1970's. Conversely, Mason et al. (2007) observed increases in wintering grebe abundance in near-shore marine transects in the Southern California Bight, south of Point Conception, providing evidence for at least a moderate southern range-shift for wintering grebes. High numbers of wintering grebes have also been reported at the Salton Sea, as previously cited (Schoneman 2009). It is not clear if these studies can be directly compared, but further investigation is certainly warranted. Moreover, reservoirs with suitable nesting habitat in southern California were not present historically. Given recent evidence of fairly large grebe nesting efforts in southern California of hundreds to a few thousand nests overall (Robison et al. 2009), it is likely that at least a moderate shift in nesting distribution has occurred, as well. For these reasons, a shift from mitigation of coastal problems to more comprehensive protection of these birds *throughout* their range would likely prove more beneficial overall. Specifically, the coordination and cooperation of local, state, and federal agencies will be needed to achieve these goals, and ensure effective grebe conservation. Much more effort combined with much more funding will be necessary.

Effective grebe conservation will be enhanced further with greater commitments from agencies and other conservation entities, including personnel, funding, and more grebe-specific policy. Immediately obvious would be a re-designation of *Aechmophorus* grebes as California Species of Special Concern (SSC) and similar designations in other states. This categorization was not re-established due to an apparent previous lack of data on grebes in California (2008 CA SSC), although at least one of the two closely-related species receives some sort of conservation listing in nine of the 17 other states and all four of the Canadian provinces where they occur (Robison et al. 2009). Grebe conservation is closely related to overall wetland conservation and could easily be incorporated into large scale wetland and waterbird conservation plans, already initiated and active.

VII. Acknowledgments

We would like to thank all those involved on the Kure/Stuyvesant Trustee Councils for funding this important conservation project, and also the National Fish and Wildlife Foundation, especially Liz Epstein, for receiving and routing our funds. We thank Jennifer Boyce of the National Oceanic and Atmospheric Administration for her cooperation. Thanks to California Department of Fish and Game who provided the airplane and pilot for our aerial survey. We thank the property managers John and Tracey Crowe of the outpost formally known as the Eagle Lake Biological Field Station, which is now in limbo as a permanent research facility. Thank you to Steve Bruggeman for supplying grebe data on the Mendota Wildlife Area, and Ryan Martin for providing data on Thermalito Afterbay. We would like to say thank you to the town of Chester and the many interested folks who attended our town-hall style meeting for grebe conservation. We thank PRBO Conservation Science, especially Diana Humple and Ryan Burnette for helping organize the Chester meeting. Additional thanks go to D. Humple for her assistance in Eagle Lake field work. We thank those who have graciously accepted our brochures and have helped spread the good word for California grebes.

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Personal Communication

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- Laird Henkel. California Department of Fish and Game- Office of Spill Prevention and Response
- Russ Huber. California Department of Food and Agriculture
- Ryan Martin. California Department of Water Resources
- David Suddjian, Monterey Bay listserv

Table 1. 2009 Nesting and Productivity for Northern California

| Location by North Latitude | Survey Date | Survey Type | Est. # Nests Present | Est. # Adults Present | YY/AD | N (Prod.) | Staining | Notes/Remarks |
|----------------------------|-----------------|------------------|-----------------------|-----------------------|-------|-----------|----------------------|---|
| Indian Tom Lake | 2 Aug | Ground | 0 | 30 | 0 | -- | 0/30 | |
| | 23 Oct | | 0 | 6 | 0 | -- | 0/6 | |
| Tule Lake | 2 Aug | Ground | 450 | -- | -- | -- | -- | Drove Auto Tour-route around Upper Sump incl. A-dike |
| | 23 Oct | | see above # | -- | 0.21 | 630 | | |
| Lake Shastina | 2 Aug | Ground | 0 | 300 | 0 | -- | -- | Very low water level, no recreation & overall excellent wildlife refugia |
| Lake Siskiyou | 3 Aug | Ground | 0 | 0 | 0 | -- | -- | No available nesting habitat; 17 COME |
| Lower Roberts Res. | 2 Aug | Ground | 0 | 15-30 | 0 | -- | -- | Muddy pool of a reservoir, no nesting habitat observed. |
| Eagle Lake | 16-18 June | Ground & Boat | 1+ | 1000 | -- | -- | 0/286 | Courtship behavior minimal, but grebes conc. near Stone Ranch & Spaulding emergents |
| | 31 July – 2 Aug | | 300 ¹ | 2000+ | -- | -- | 5/166 3% ± 3% | Spaulding colony active w/ ~150n + Stone Ranch colony w/ ~150n Estimated adults doesn't include those in colonies |
| | 12 Aug | Aerial | 700 | -- | -- | -- | -- | |
| | 15-16 Sept | Boat | see above # | 4-5000 | 0.38 | 2693 | 1/56 2% ± 2% | |
| Mtn. Meadows Res. | 30 July | Ground | 0 | 50 | 0 | -- | -- | Drove south shore via CALFIRE access gate. Excellent bulrush beds and submergent veg. on east end of Reservoir. |
| | 12 Aug | Aerial | 3 | -- | -- | -- | -- | |
| Lake Almanor | 16 June | Ground | 0 | 450-500 | -- | -- | -- | Toured entire lake taking samples |
| | 30 July | | 3 | -- | -- | -- | -- | Observation at Hwy 36 causeway |
| | 12 Aug | Aerial | 569 | -- | -- | -- | -- | Causeway colony (243n) + south colony (326n). |
| | 9 Sept | Ground | 236 Causeway only | -- | -- | -- | -- | 86 nests near causeway + 150 farther out in veg. mats |
| | 13 Sept | | 314 Causeway only | -- | -- | -- | -- | 51 stranded nests + 33 occupied at causeway & 281 further out to the south (~500m out). |
| | 17 Sept | | 175 S. colony only | 3,800 ² | 0.13 | 356 | 86/159 54.1% ± 6% | Toured entire lake, taking samples with spotting scope; see footnote. |
| | 24 Oct | | see above #s | 1000-1500 | 0.15 | 482 | -- | 100-150 est. COLO present |
| Thermalito Afterbay | 2 Oct | Boat | 315 | 364 | 0.52 | 555 | 0/364 | Data collected by Ryan Martin (CADWR) |
| East Park Res. | 15 July | Boat | 0 | 410 | 0 | -- | 0/200 | Nesting habitat was mostly dry & inaccessible to grebes |
| Clear Lake | 11-12 July | Boat | 0 | 7,500 | 0 | -- | 84/320 26.3% ± 4% | PWC user observed intentionally pursuing rushing pair of grebes. Airboat <i>Hydrilla</i> spaying continues. |
| | 28 July | Kayak/ Ground | 75-100 | -- | -- | -- | 10/139 7.2% ± 4% | Anderson Marsh nesting habitat inaccessible to grebes due to crusting algae mats in channel. Colony initiated at Rodman Sl. |
| | 11 Aug | Boat | 450-500 | 3,000 (at colony) | -- | -- | 17/222 7.7% ± 6% | Nature-watching cruise boat motors within 50ft. of active grebe colony at outer-Rodman Slough |
| | 12 Aug | Aerial | 400-450 | -- | -- | -- | -- | Colony in same location as above |
| | 4 Oct | Boat | see above #s | -- | 0.022 | 2148 | 11/147 7.5% ± 4% | Very few broods in Main Arm |
| Mendota WA | 21 Oct | Ground | -- | 243 | 0.18 | 286 | -- | Data collected by S. Bruggemann (CDFG) |

¹300 nests is an underestimate of the breeding effort for this particular date; the Spaulding colony was indeed an accurate estimate, but the Stones Ranch colony was grossly underestimated due to our vantage point and based on the ~500 nests observed for this colony on the 12 August aerial survey.

²3,800 adults observed on 17 September were observed in several very large (several hundred individuals) feeding flotillas with no young, and were presumed to be migrants from other waterbodies. Near 100 stranded grebe nests were found at south colony site, along with 175 active nests.

Table 2. Nesting Activity and Productivity at Clear Lake in the 2000s

| Year | Est. # Active Nests | Sample Size for Productivity | Productivity: (YY/AD ¹) | Remarks |
|------|---------------------|------------------------------|-------------------------------------|---|
| 2000 | 2675 | 1,160 | 0.76 | |
| 2001 | 925 | 924 | 0.65 | |
| 2002 | 445 | 877 ² | >0.01 | Very low #s of young were produced in 2002 |
| 2003 | 275 | 1,198 | 0.19 ³ | Pop. Estimate is approximate |
| 2004 | 700 | 2,380 | 0.16 ⁴ | Pop. Estimate is approximate |
| 2005 | 2300 | 988 | 0.82 | Pop. Estimate from Gericke (2006) |
| 2006 | 800 | 1,002 | 0.72 | |
| 2007 | 20 | 7,646 ⁵ | 0.0026 | No large-colony nesting effort was initiated. |
| 2008 | 25 | 1,420 | 0.006 | Colony initiation at LTP failed |
| 2009 | 500 ⁶ | 2149 | 0.022 | Suspected wind event likely led to many nests being destroyed |

¹Young per adult ratio includes all adults within standard transects, with or without young. It represents surveys taken during the period after nesting for the season had been finished whilst also independent young were still distinguishable from adults.

²About 85% of these nests were directly trampled by air boat activities in the colony at peak-nesting (DWA field notes, page 3765). This required a re-initiation of agency coordination efforts.

³2002 and 2003 were also unusual years in that unprecedented high percentages of non-breeding Clark's Grebes were present on Clear Lake, and large numbers of *Aechmophorus* grebes (presumably non-breeders from other areas perhaps affected by an ongoing drought).

⁴In 2004, a major shift in the largest breeding colony location at Clear Lake occurred (to Long Tule Point), likely related to the development of a large marina and associated canal dredged directly through previously-held, traditional nesting habitat of the 1990s and 2000s (although Long Tule Point had been active in the late-1960s). Also, an early-nesting cohort became established at Clear Lake in 2004, in addition to a late-nesting cohort, which had exclusively dominated nesting phenology prior to 2004.

⁵This represents the maximum number of adults observed while surveying in 2007; a "whole-lake census." Virtually all adults were non-breeders displaying winter-time feeding behavior; foraging vigorously in very tight "flotillas."

⁶This represents the estimated maximum number of nests by 11 August 2009; by 4 October 2009 there were very few chicks on the lake and no evidence of the nesting colony at its previous location – potentially wind-related.

The Biology and Conservation of Lake Almanor's Grebes

Daniel Anderson

Professor of Wildlife, Fish, and Conservation
Biology at U.C. Davis

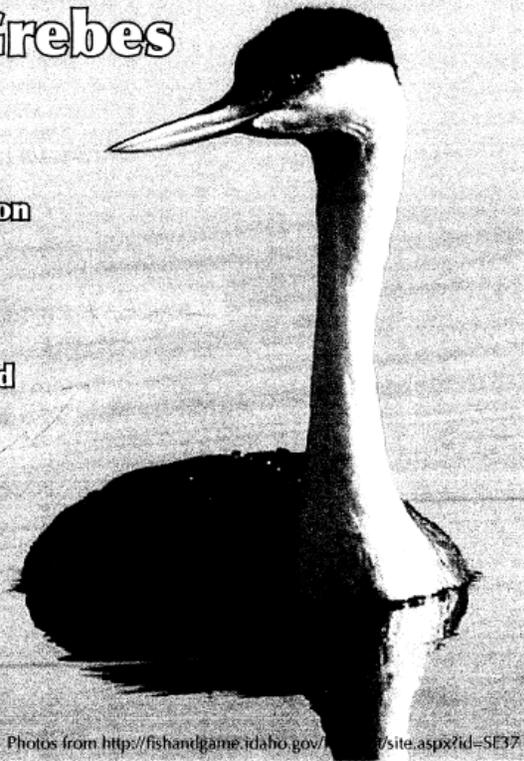
Diana Humple

Point Reyes Bird Observatory Biologist and
Sonoma State University graduate student

Chester Memorial Hall

Tuesday, June 16

6PM - 8PM



Photos from <http://fishandgame.idaho.gov/.../site.aspx?id=SE37>



Join us for a special presentation by wildlife biologists Daniel Anderson and Diana Humple as they describe the biology of these unique water birds.

Almanor is the summer home of one of the largest grebe populations in California!

For more information, please contact
the Sierra Institute at 284-1022.



Appendix II. Map of Lake Almanor and Mountain Meadows Reservoir with Observation Points

