

Western & Clark's Grebe Conservation and Management in California

Annual Report, 2009

**Prepared for
Kure/ Stuyvesant Trustee Councils
and
National Fish and Wildlife Foundation**

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February 2010 – Draft to KSTC

Cover Photo: Bird-watching cruise entering an active grebe colony near Rodman Slough at Clear Lake, Lake County, California. Photo taken by Kris Robison.

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I. Introduction

Monitoring for Western and Clark's grebes (hereafter called "grebes") at breeding lakes in California continued in 2009. 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 performance at Clear and Eagle Lakes. In addition, a summary of each year's field season is provided.

Grebe monitoring and outreach efforts in 2009 were focused on northern California lakes (north of 35° latitude). Distribution of informational, outreach materials was continued at important breeding locations. Surveys were conducted using a variety of methods including ground-based, boat, and aerial surveys. Data on local population parameters including overall productivity (Hatch-year/adult, YY/AD ratio) were collected at these important lakes. As in years past, particular focus was made at both Clear Lake and Eagle Lake because these locations are historically the most productive grebe breeding grounds in California.

II. Drought & Grebes

Drought conditions in California persisted in 2009 for at least the third consecutive year, further limiting the availability of grebe nesting habitat (California Department of Water Resources 2010; data and analysis of habitat changes from the early-1990s through 2010 is 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 effected 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, and Table 2). 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.

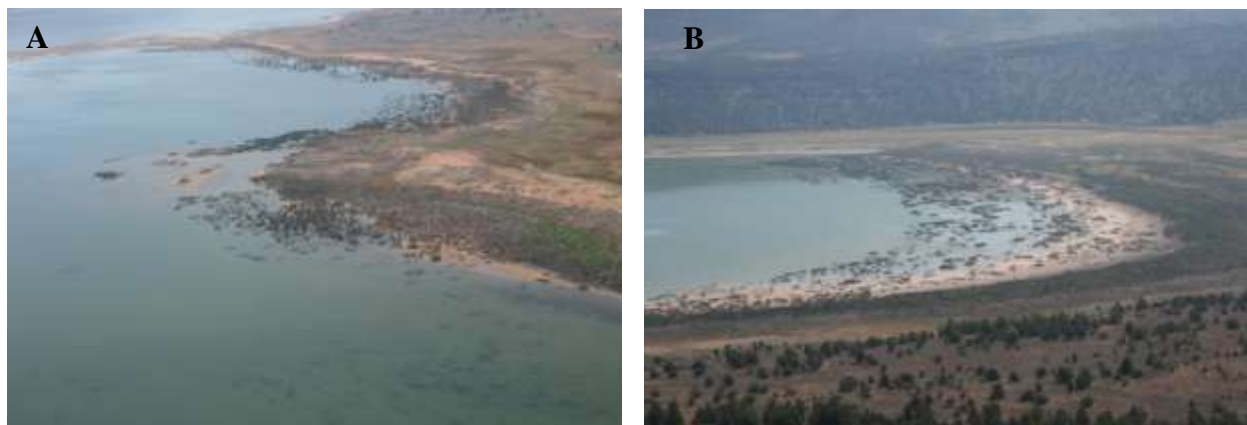


Figure 1. Eagle Lake's limited habitat availability in 2009 with drought conditions & low lake level. **A.** Spaulding colony emergents; **B.** North Basin "Stone Ranch" colony emergents; each had nesting grebes in 2009.

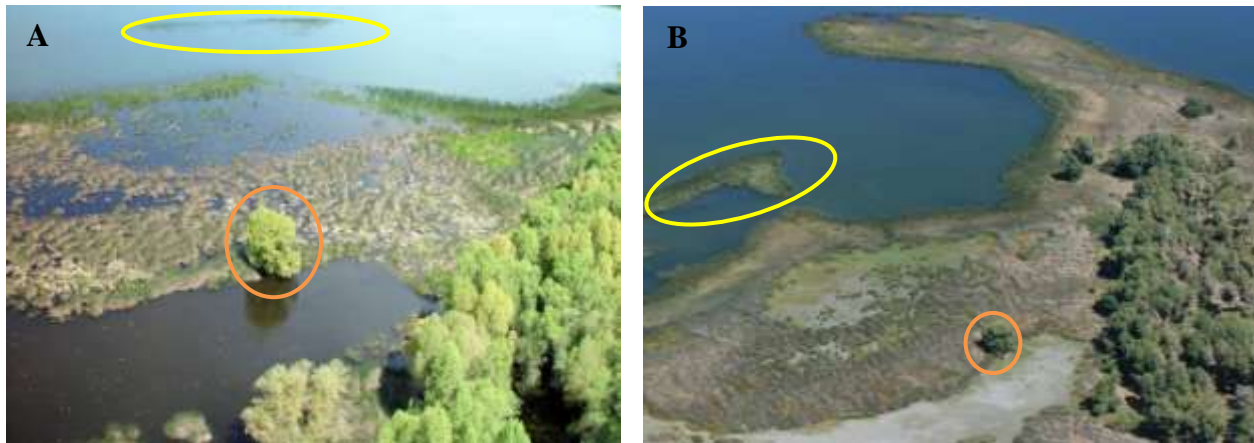


Figure 2. Comparison of water levels at Long Tule Point, Clear Lake, Lake County, California. **A.** 2005 with grebe nesting colony & high water-level; white dots are grebes & grebe nests. **B.** Same location on 12 August, 2009.

III. Past Year's Grebe Conservation Efforts

Conservation and monitoring activities continued 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. There was 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's (ATTC) 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. Her completed thesis examined common anthropogenic disturbances and their effects on grebe productivity at this site (Gericke 2006). Her 2006 field crew, Harley Winfrey and Carley Neilson, assisted her in collecting various data on behavioral phenomena in and around active colonies to assess the impact of different types of disturbance. 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 to enhancing breeding effort and restore 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 Final 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 estimated nest counts and pelagic strip transects for estimating productivity. An aerial survey was conducted for Clear Lake. 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. 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. 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). This average productivity for Clear Lake is likely low, due to severe anthropogenic disturbance events that affected nesting grebes between 2002 and 2004 (see Table 3). 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 phenology and productivity 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 was 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 possibly 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 collision 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, 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 present (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).

IV. 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 (L. Henkel, 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).

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 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 (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 accurate 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. Here, grebes initiated a colonial nesting effort, something that had not been seen 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, 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). On one occasion, we observed a personal water-craft user pursuing a pair of rushing grebes. Like years past, buoys were lacking in 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. Furthermore, 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 fisherman to limit high-speed boat activity in sensitive areas with emergent habitat suitable for nesting.

A restricted activity system such as this would have to also restrict air boats, which are used by agencies in *Hydrilla* control. An extensive buoy system (made safe for night boat traffic) would certainly provide grebes with a more effective refuge for nesting by limiting disturbance (Robison et al. 2009). We also believe that bass 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 fishing restrictions. They might even become supporters of grebe conservation. 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).

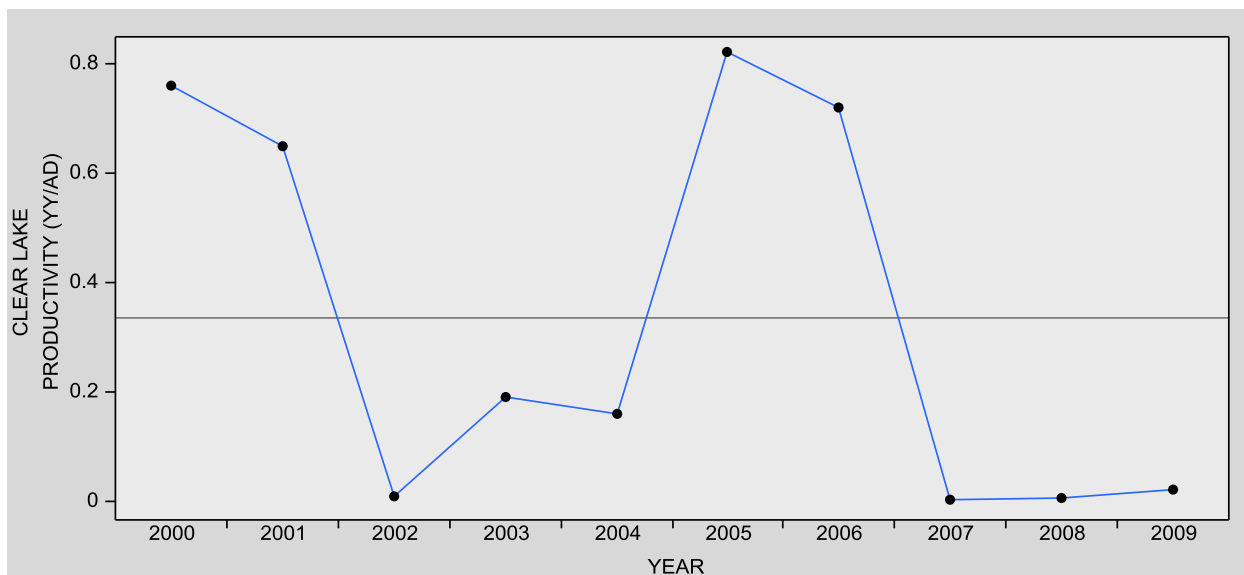


Figure 3. Clear Lake Productivity 2000-2009

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; frequent courtship activity was 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).

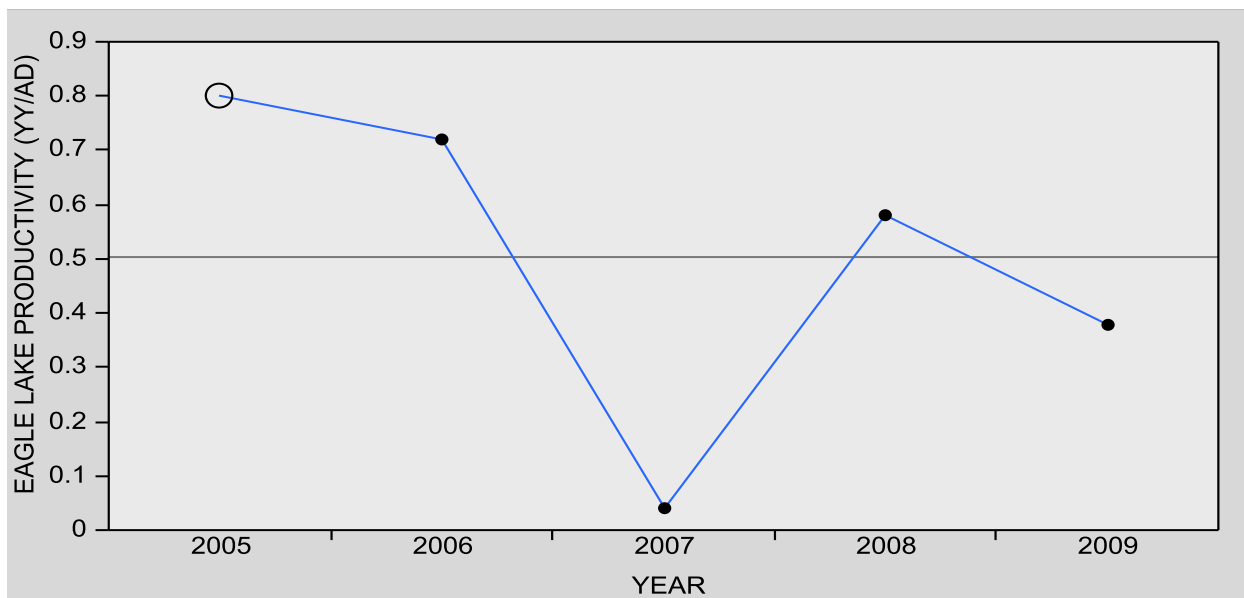


Figure 4. Eagle Lake Productivity: 2005-2009

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 2). The management of this reservoir for hydroelectric power generation makes the survey of nesting colonies difficult 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 parts of the lake 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 are 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.

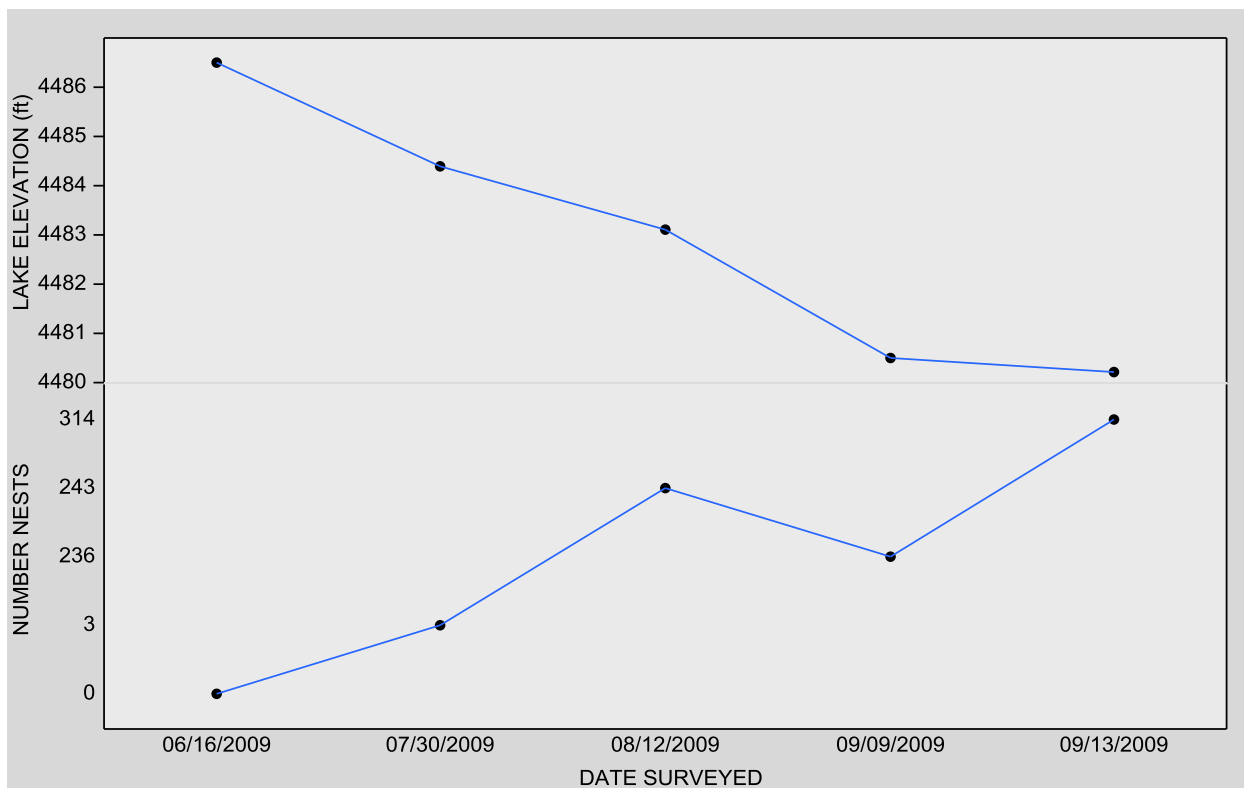


Figure 5. Lake Almanor Causeway Colony: Comparison of Nests and Lake Elevation: June – September 2009
Note: Lower nest count on 09/09/09 could be due to observer bias. K.M. Robison was looking through binoculars instead of scope and under a time constraint.

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 survey, and observations were made up to 300m out into Upper Sump. The second visit to Tule Lake NWR occurred on 23 October and a brood productivity survey 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.

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 the 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 Audubon chapters, to foster grebe stewardship in local communities; continuing the distribution of brochures; organizing a crew to place additional boat ramp signs at boat launches throughout California; and to help develop a new sign to attach to existing sign posts alerting boaters to 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 Report submitted to both ATTC and KSTC, several management recommendations were outlined in detail which could prove to be beneficial to 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 Final 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 are 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 migratory water-birds that over-summer and breed here. 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.

E. 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 Reports, as well as this one, have outlined specific recommendations for management options. Future allocation of funds could be best focused on these management options and follow-up monitoring to evaluate their effectiveness. As has been outlined in previous reports, there is general concern over the status of these two species throughout their range. For this reason, a shift from mitigation of coastal problems to more comprehensive protection of these birds throughout their range would likely prove beneficial. Specifically, the coordination and cooperation of state and federal agencies will be needed to achieve this goal.

Another likely effective way for the grebes to get the attention of agencies and other conservation entities would have been a designation of California Species of Special Concern (SSC). This title was not granted due to a lack of data on grebes in California (2008 CA SSC), although at least one of the species receives some sort of conservation listing in nine of the 17 other states and all four of the Canadian provinces in which they occur (Robison et al. 2009).

IV. 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. 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. We thank those who have graciously accepted our brochures and have helped spread the good word for California grebes. Thank you to Steve Bruggeman for supplying grebe data on the Mendota Wildlife Area. 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 look forward to helping grebes regain their numbers and proliferate in the years to come.

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
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%	Birdwatcher-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.

VI. Works Cited

- Anderson et al. 2008. Mercury residues and productivity in Osprey and Grebes from a mine-dominated ecosystem. *Ecological Applications*. 18 (8) Supplement, 2008. Pp A227-A238.
- Anderson, D.W. 2007. Western and Clark's grebe conservation and management in California: annual report for year two (2006). Presented to the American Trader Trustee Council and the National Fish and Wildlife Foundation.
- California Department of Fish and Game, Office of Spill Prevention and Response. 2008. Natural Resource Damage Assessment for the *Cosco Busan* Oil Spill: Bird Injury Summary. <http://www.dfg.ca.gov/ospr/spill/nrda/cosco-busan-nrda-birdinjury-factsheet-feb-2008.pdf>. Accessed: 18 July, 2008.
- California Department of Water Resources. 2010. Drought Conditions. Accessed 8 January 2010. <http://www.water.ca.gov/drought/>
- Gericke, Sharon. 2006. Exploring the effects of disturbance events on western and Clark's grebes (*Aechmophorus occidentalis* & *A. clarkii*) at Clear Lake, California. Master's Thesis, University of California, Davis.
- Gericke and Anderson. 2006. Western and Clark's grebe conservation and management in California: annual report for year one (2005). Presented to the American Trader Trustee Council and the National Fish and Wildlife Foundation.
- Ivey, G. A. 2004. Conservation assessment and management plan for breeding Western and Clark's Grebes in California. Final Report to the American Trader Trustee Council, June 2004. 80 pp.
- National Transportation Safety Board. 2009. Allision of Hong Kong-Registered Containership M/V *Cosco Busan* with the Delta Tower of the San Francisco-Oakland Bay Bridge. San Francisco, California. November, 2007.
- Project 2105 2010. Project 2105: Lake Levels. Accessed 8 January, 2010. http://www.project2105.org/lake_elevation/2009_daily_lake_levels_.htm
- Robison et al. 2008. Western and Clark's grebe conservation and management in California: Annual report for year three (2007). Presented to the American Trader Trustee Council and the National Fish and Wildlife Foundation.
- Robison et al. 2009. Western and Clark's grebe conservation and management in California: Annual report for year four (2008). Presented to the American Trader and Kure/Stuyvesant Trustee Councils and the National Fish and Wildlife Service.
- Weems, R.E. and K.M. Robison. Western and Clark's Grebes: Under Pressure. *Outdoor California*, a California Department of Fish and Game publication. September/October issue. 69(5): 20-25.

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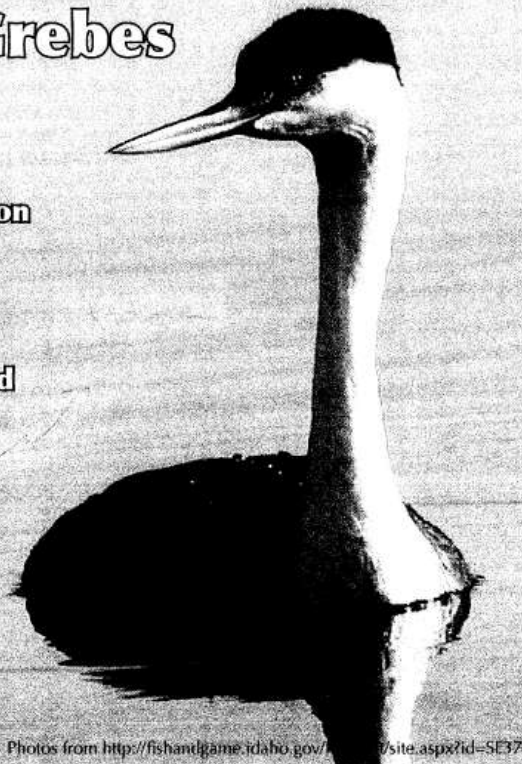
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The Biology and Conservation of Lake Almanor's Grebes

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/Files/00000000/site.aspx?id=SE37>



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

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

