

***Aechmophorus* Grebe Conservation Project
Almanor, Eagle, Davis, and Antelope Lakes**

Annual Report: March 1, 2015 – March 1, 2016

Prepared by

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Summary

Outreach and education is the current focus of our grebe conservation efforts. Our Outreach and Education Coordinator, Teresa Arrate, with the help of other staff, interns, and volunteers, has continued grebe outreach and education efforts in 2015 and 2016. The Plumas Audubon Society tabled at 9 events in the past year. The information provided at these events included grebe brochures, pictures of and general information about Western and Clark's Grebes, a wooden sculpture of a Western Grebe, and a Birds and Climate Change display with information on the predicted range changes for *Aechmophorus* Grebes. We also reached elementary, high school, and college students, as well as the general public, during classroom visits, presentations, field trips and tours. Other outreach activities included curricula development, including grebe info on a Lake Almanor water trail map, planning for our upcoming Lake Almanor Grebe Festival to be held in August 2016, an art contest across the 12 elementary and junior-senior high schools in the region, and highlighting the Western and Clark's Grebes as two species with "climate endangered" status.

In March 2016, we updated our comprehensive monitoring report for Almanor, Eagle, Davis, and Antelope Lakes for the 2010-2015 breeding seasons. We monitoring grebes at our four grebe study lakes in 2015 starting in June. Plumas Audubon staff and interns mapped colonies, monitored nests with wildlife cameras, conducted disturbance surveys, and monitored the number of adults and nests at each lake. The total number of grebes on each lake has been comparable to previous years, but reproduction was lower on all lakes this year compared to past years. On Lake Almanor, the rate of drop in water surface elevation was the second fastest of the last six years and reproduction fit the historic trend line, corroborating the strong relationship between rate of water level drop and reproductive success. All of the other three lakes had no successful reproduction this year. One reason for the low rate of nesting success was the number of storms with high wind in July, which has caused nests to deteriorate, become detached, and float away. In addition, disturbance surveys at Lake Almanor showed a high rate of egg depredation by gulls, as seen in all past years.

Outreach and Education

Our grebe conservation outreach and education efforts are a priority for the remainder of the grebe conservation project (through 2019). Teresa Arrate, our Outreach and Education Coordinator, with the help of other staff, interns, and community volunteers, has continued grebe outreach and education efforts in 2015 and 2016.

Student interns

For the fourth year in a row, PAS hosted college interns whom helped with grebe field work and outreach efforts. A total of 6 interns helped with grebe project efforts this season including Gaby Antonova- a Cal-Poly student, and Billy Kaselow- a University of Delaware student, whom completed most of the grebe monitoring and assisted with outreach efforts. In addition, Gabe Pelletier- a University of Maine student, Amelia Baird- a student at Central Michigan University, Lissa Derugin- a graduate of San Francisco State University, and Jenna Holub- a student at Virginia Tech assisted with grebe surveys. PAS staff, including Josh Duey, Teresa Arrate, and David Arsenault also conducted grebe surveys and outreach and education efforts.

Tabling events

PAS tabled at 9 events in the last year (Table 1). The information provided at these events included grebe brochures, pictures of and general information about Western and Clark's Grebes, a wooden Western Grebe sculpture, and a Birds and Climate Change display with information on the predicted range changes for *Aechmophorus* grebes (Appendix A). Additional items included general PAS information alongside our wingspan banner, nests, mounts and an educational game where kids can discover how different beaks affect hunting strategy. The mounts, including an Osprey and Mallard, were excellent for attracting kids to the table.

Presentations

Teresa gave three classroom presentations about Western and Clark's Grebes, their habitat, natural and human threats to the grebes on Lake Almanor and how to minimize those, and promoted the Grebe Festival Art Contest (Appendix B) to Chester Elementary's 5th grade class and to a mix of elementary and high school students at Chester Learning Center, part of Plumas Charter School. These presentations reached approximately 75 students and 4 teachers in total.

PAS Executive Director David Arsenault gave 2 presentations in September 2015 including to a church group in Graeagle and for the Lahontan Audubon Society in Reno, for the Yosemite Area Audubon Society in October, at the Snow Goose Festival in Chico on January 30, and to the Rotary Club in Portola on February 16. These presentations reached approximately 130 people.

Table 1. Events where Plumas Audubon had a table with information on grebes.

Location	Date	Event	Estimate of # people who visited table / # attended
Quincy	May 16, 2015	Plumas Children's Council's Children's Fair	30 / 200+
Twain	Sept 11, 2015	California Sister's Pat Hull Concert	10 / 25
Quincy	Sept 12, 2015	Plumas District Hospital's Autumn Fitness Festival	10 / 100
Greenville	Sept 12, 2015	Plumas National Forest's Kid's Fishing Derby	30 / 50
Quincy	Sept 16, 2015	Plumas Arts presents Wild & Scenic Film Festival	20 / 100
Quincy	Oct 3, 2015	Plumas National Forest's Fall Fest	175/225
Twain	Nov 10, 2015	California Sister's Jeffrey Foucault Concert	15/35
Quincy	Feb 7, 2016	Science Night at Quincy Elementary School	130/200+
Quincy	Feb 18, 2016	Spotted Owl conservation presentation	30/30
Total			450/965+

Field trips

For the third year in a row, our grebe interns led a youth group from Susanville on a tour of Antelope Lake to see Western Grebes. We also invited interested members of the public to participate on our lake-wide grebe surveys at Lake Almanor. We rent a pontoon boat for these surveys and so we can accommodate up to 5 additional people on the boat. On surveys conducted August 20 and September 3, 18, and 30, we had a total of 14 public participants whom joined us and learned about the grebes on Lake Almanor. In addition, we hosted a field trip, including a boat tour of grebes on Lake Almanor, for students from Feather River College on September 11 and had a total of 14 participants. Finally, we hosted 3 tours at Lake Davis, which included information on grebes nesting at Lake Davis and other reservoirs, on July 10, 17, and 24. A total of 48 people from all over California (Arcata, Bay Area, Central Valley, Sierra Nevada foothills, and Los Angeles area) participated in the Lake Davis tours.

School Curricula

Teresa is currently working with the Plumas Unified School District developing curriculum for a 5th grade "Bird Year" that is being piloted at one elementary school this academic year (2015-16) and is expected to expand to all 5th grade classrooms in the following school year (2016-17). Part of the curriculum will include lessons on Clark's and Western Grebes. She has also been working with the Plumas Charter School to develop a Birds and Climate Change Unit with science teachers

for grades 5/6 and 7/8, which specifically highlights the Western and Clark's Grebes as two species with "climate endangered" status.

Grebe Art Contest

Over the 2015-16 academic year, PAS is holding an art contest across the 12 elementary and junior-senior high schools in the region (8 public and 4 charter) to design the logo for the 2016 Grebe Festival (Appendix B). Information about Western and Clark's Grebes will be presented to students as background for developing their ideas and images. We did an art contest during the 2012-13 school year and it was a big hit with teachers and students.

Grebe Festival Planning

We have begun organizing our first Grebe Festival set for August 19-21, 2016 in Chester, CA (Appendix C). We have 10 people on the Planning Committee now and have had 2 successful meetings in January and February with committee members and representatives from one of our strong partners in the region, Feather River Land Trust. So far the festival will look something like this:

FRIDAY: *Grebe research conference* (midday to 5);
Beer-stroll in Chester (5 – 7)

SATURDAY: *Fieldtrips* (throughout the day: pontoon boat lake tours, guided kayak tours, trips to Willow Lake, Lassen NP, Chester Meadows, Humbug Valley, etc);
Art exhibit (at festival headquarters and Blue Goose Gallery);
Workshops and presentations
Free family and children's activities
Documentary screening (The Messenger)

SUNDAY: *Workshops and Fieldtrips*
Free family and children's activities
Art exhibit
Documentary screening (The Messenger)

We recently had full-page colored coverage in 3 of our regional newspapers about the Grebe Festival and the associated Art Contest. We also distributed grebe brochures and Grebe Festival "save-the-date" cards (Appendix C) at the Snow Goose Festival in Chico and are working on getting Grebe Festival "save-the-date" cards distributed widely throughout Northern CA, Sacramento, the Bay Area, and Reno.

Other activities

Other outreach activities include coordinating with the Sierra Institute for Community and Environment to include information on Western and Clark's Grebes in the Lake Almanor Water Trail Map. Also, as a Climate Super Activist (program coordinated by Audubon CA to spread the word about climate change), Teresa has specifically highlighted the Western and Clark's Grebes as two species with "climate endangered" status and described their expected range changes in tabling materials (Appendix A), developing education curriculum, a newspaper press release, and a presentation to the 2015 Northern California Audubon Chapter Council Meeting held on October 10. A Climate Summit for northern California Audubon chapters is planned for April 30, 2016.

Surveys and monitoring

Survey and monitoring results have been compiled and added to the comprehensive grebe monitoring report (2010-15). With the help of Garry George, we began a dialogue on February 3 with the Pacific Gas and Electric Company (PG&E) to manage water in Lake Almanor for nesting grebes. A follow-up phone call was conducted on March 16 and PG&E has agreed to try and meet our target water level drop of -0.06 during a 5-week period that we specify during grebe nesting.

2015 had some of the worst reproductive success we have seen in the last 6 years. Different factors caused the poor reproduction on each lake. There was no grebe nesting on Eagle Lake for the fourth consecutive year due to the low water level (lowest level in last 140 years) and associated lack of nesting habitat. On Lake Davis, there was no successful reproduction on the lake despite more than twice the number of nests (71 nests in 2015) than seen in the last 4 years (26 nests/year on average 2012-14). This was due primarily to the high wind events during storms in July, which we documented with wildlife cameras at grebe nests.

On Antelope Lake, there was a peak of 13 nests, much lower than the average peak of 23 nests recorded from 2012-14. There was also no successful reproduction, the first year that has been documented on Antelope. Antelope has had the highest reproductive rates of all of the populations we monitor (average 0.58 juvenile:adult ratio 2012-14 compared to 0.25 on Almanor 2010-15). Reproduction in 2015 was primarily affected by low prey fish populations, inferred from the large fluctuation in the adult population throughout the summer (Table 2), the low number of nests despite similar adult population size, and the low reproductive success. We documented three waves of migration in 2015 (Table 2), with the population peaking at the beginning of July (81 adults), end of July (99 adults) and the beginning of September (83 adults). Each wave of migration was short in duration and was followed by a sudden drop in the number of adults on the lake (Table 2). This pattern indicates a low prey fish population. Lake Davis, on the other hand, had a very stable adult grebe population all summer (Table 3) indicating a healthier prey fish population. Grebes eat small schooling fish that frequently move around the lakes they inhabit and are thus very difficult to sample and determine year to year population fluctuations. The grebes themselves are the best indicators of the health of the prey fish population.

Table 2. The total number of adult Western Grebes detected on Antelope Lake during lake-wide kayak surveys in 2015.

Date	Total Adult Western Grebes
June 16	40
June 22	49
June 28	64
July 7	81
July 13	51
July 23	50
July 30	99
Aug 17	61
Aug 24	68
Sept 2	83

Table 3. The total number of adult Western Grebes detected on Lake Davis during lake-wide boat surveys in 2015.

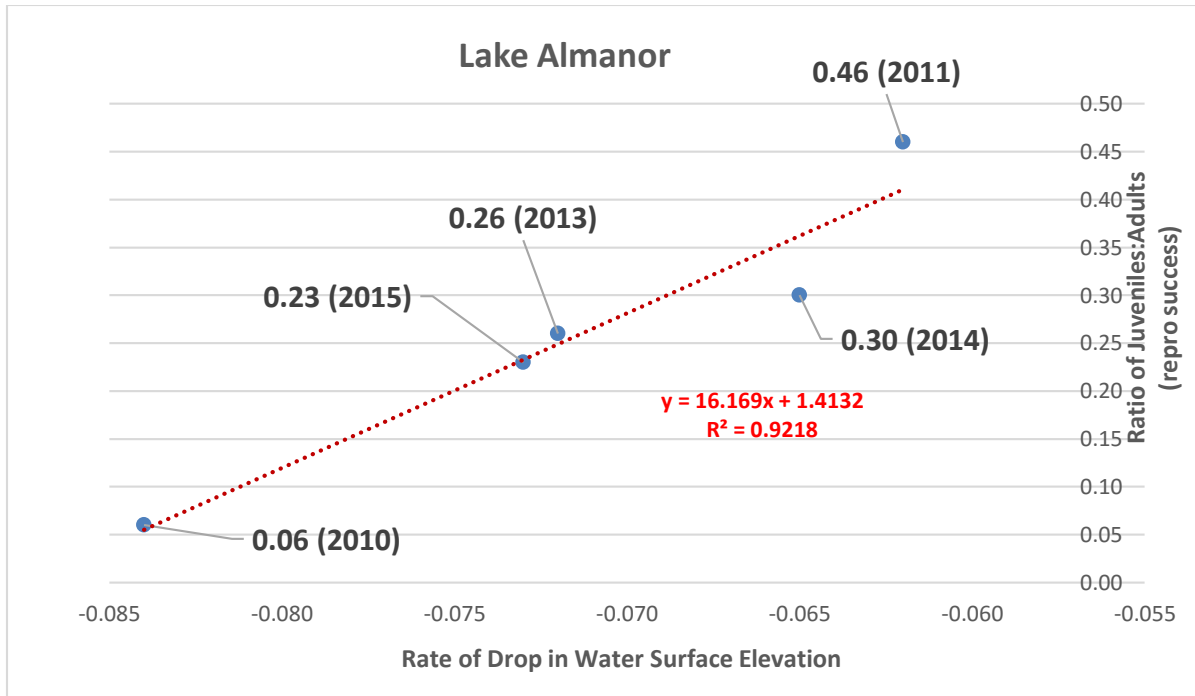
Date	Total Adult Western Grebes
June 11	134
July 2	126
July 16	134
Aug 18	128
Sept 1	133
Sept 8	111
Sept 14	90
Sept 21	85

Lake Almanor

The rate of water surface elevation dropped at the second fastest rate in the last six years (2010 had the fastest rate, Figure 1). The reproductive success (ratio of juveniles:adults) peaked at 0.23 (Table 4), which fit the linear trend of the historic rate of drop in water surface elevation related to reproductive success (Figure 1). It was the third lowest reproductive rate observed in the last six years (Figure 1, 2012 had the second lowest rate at 0.19, but is not shown on the graph). The adult grebe population at Lake Almanor was similar in size to last year with a peak of migrants on August 20 (Table 4). More than 2,500 nests were found near the Causeway and in Goose Bay (Table 5). Most of the nests initiated in July were unsuccessful, presumably due to storms with strong winds that occurred in July, as well as because of nest abandonment due to dropping water levels. Wildlife cameras were placed on individual nests throughout the breeding season and we were able to document some of the nests being destroyed by the storms (Figure 2). This year, the greatest number of nests were located by the Causeway, peaking at 1,542 (Table 5, Figure 3). The

first brood survey on Lake Almanor was conducted on July 27th, but young were not detected until almost a month later (Table 5), indicating that the first successful nests hatched young in the second week of August. Brood surveys estimated a peak adult:juvenile ratio of 0.23, which was the third lowest reproductive rate observed in the last six years (Figure 1). We counted up to 7,743 adults during lake-wide brood surveys (Table 4).

Figure 1. Rate of drop in water surface elevation related to reproductive success (ratio of juvs:adults) at Lake Almanor, 2010-2015 (2012 excluded due to effect of Chips Fire).



Antelope Lake

Water levels at Antelope Lake were slightly higher than last year. The first nests of the season on Antelope Lake were documented on July 7 (Table 5). As in the last 3 years, no Clark's Grebes were observed on the lake. Grebes nested in the same colony location used in the past 3 years, in the cove adjacent to the Lost Cove Boat Ramp. At the peak of nesting, there were 13 nests in the colony. Lake-wide kayak surveys detected up to 99 Western Grebes, but no young were produced this year. In the last 3 years, Antelope Lake has had the highest reproductive success of any of our study lakes. The low reproduction this year may have been due to high winds during storms in July. Reproduction may also have been affected by low prey fish populations, which may also explain the large fluctuation in the adult population throughout the summer (Table 4). However, we don't have any information regarding the fish population to evaluate this potential effect.

Lake Davis

Water levels at Lake Davis were lower this year than in the past 3 years, but there were more nests than previously observed (Table 5). Nests were located in open water areas compared to in the willows when the water is higher. Despite the number of nests, there was no successful reproduction for the entire lake this year. We believe this was due primarily to the high wind events during storms in July (Figure 2).

Eagle Lake

The water in Eagle Lake has continued to drop to levels lower than ever recorded on the lake in the last 140 years. The water level is now lower than it was in the 1930's, when an earthquake rapidly drained the lake. Because of the low water level and lack of nesting habitat there was no grebe nesting on the lake for the fourth consecutive year! However, in early September, thousands of migrant *Aechmophorus* grebes were observed on the lake, peaking at 8,099 on August 27 (Table 4). These migrants appear to have been drawn to the lake because of abundance of Tui Chub and minnows this year.

Wildlife cameras

Wildlife cameras were used for the third season to monitor 11 grebe nests at Lake Almanor and Lake Davis. Of the 11 nests, 1 was successful, 4 failed due to high winds during storms (Figure 2), 1 was abandoned due to dropping water levels, and the fate of the other 5 nests was unknown.

Disturbance surveys

Disturbance surveys were conducted on Lake Almanor on 15 days in 2015. Flying predators were by far the most common cause of disturbance (Figure 4). The most common result of disturbance events were distress calls through the colony, but some events resulted in nest predation.

Table 4. Summary of adult and juvenile *Aechmophorous* grebes detected during lake-wide surveys on Almanor, Antelope, Davis, and Eagle Lakes in 2015.

Lake	Date	Adult Western	Adult Clark's	Adult Aech	Total Adults	Juveniles	Juv:Adult Ratio
Almanor	7/27/2015	2,492	85	1,898	4,475	0	0.00
	8/20/2015	6,779	107	857	7,743	6	0.00
	9/3/2015	2,167	144	2,560	4,871	196	0.08
	9/18/2015	1,747	214	2,317	4,278	451	0.23
	9/30/2015	1,684	119	1,568	3,371	281	0.16
Antelope	6/16/2015	40	0	0	40	0	0.00
	6/22/2015	49	0	0	49	0	0.00
	6/28/2015	64	0	0	64	0	0.00
	7/7/2015	81	0	0	81	0	0.00
	7/13/2015	51	0	0	51	0	0.00
	7/23/2015	50	0	0	50	0	0.00
	7/30/2015	99	0	0	99	0	0.00
	8/17/2015	61	0	0	61	0	0.00
	8/24/2015	68	0	0	68	0	0.00
	9/2/2015	83	0	0	83	0	0.00
Davis	6/11/2015	134	0	0	134	0	0.00
	7/2/2015	126	0	0	126	0	0.00
	7/16/2015	134	0	0	134	0	0.00
	8/18/2015	128	0	0	128	0	0.00
	9/1/2015	133	0	0	133	0	0.00
	9/8/2015	111	0	0	111	0	0.00
	9/14/2015	90	0	0	90	0	0.00
	9/21/2015	85	0	0	85	0	0.00
Eagle	7/28/2015	4,599	166	829	5,594	0	0.00
	8/27/2015	4,282	256	3,561	8,099	0	0.00
	9/23/2015	1,845	206	2,686	4,737	0	0.00

Table 5. Number of active nests in *Aechmophorus* grebe colonies at Lake Almanor, Antelope Lake, and Lake Davis in 2015.

Almanor	25-Jun	30-Jun	9-Jul	16-Jul	20-Jul	24-Jul	27-Jul	4-Aug	13-Aug	19-Aug	28-Aug	4-Sep	9-Sep	16-Sep	Peak
Causeway	0	18	11	180	-	375	509	907	1,272	1,542	1,049	499	246	0	1,542
Goose Bay	1	1	0	250	544	-	716	995	420	633	612	663	380	0	995
Total	1	19	11	430	544	375	1,225	1,902	1,692	2,175	1,661	1,162	626	0	2,537

Davis	29-Jun	10-Jul	14-Jul	15-Jul	21-Jul	31-Jul	3-Aug	12-Aug	18-Aug	25-Aug	Peak
Jenkins	0	50	39	32	21	0	0	0	0	0	50
N Cow Creek	0	0	0	2	12	3	0	0	0	0	12
Eagle Pt	0	0	0	0	0	5	7	9	1	0	9
Total	0	50	39	34	33	8	7	9	1	0	71

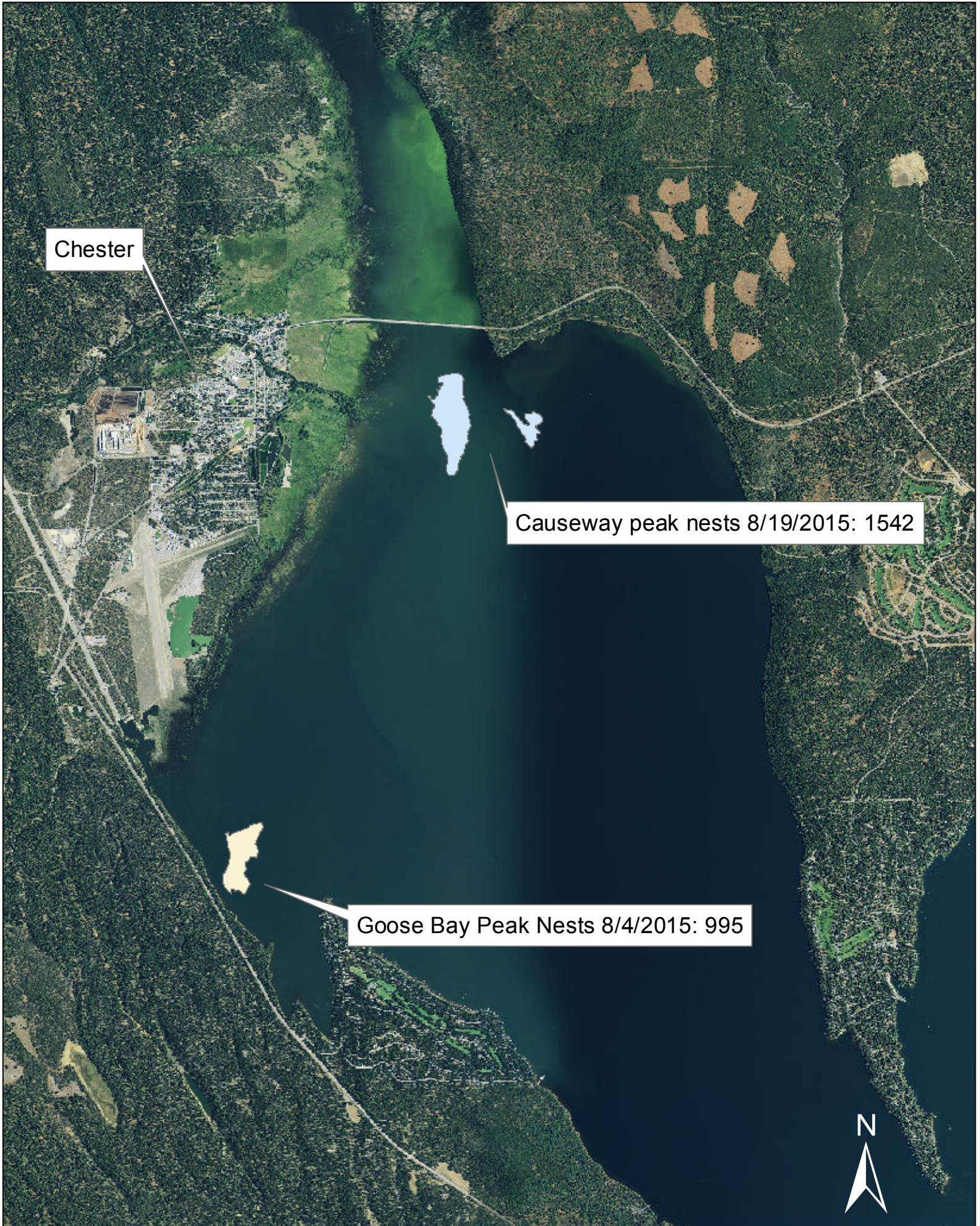
Antelope	28-Jun	7-Jul	13-Jul	23-Jul	30-Jul	7-Aug	Peak
Lost Cr Cove	0	5	1	5	13	0	13

Figure 2. An example of a nest at Lake Almanor that became detached after high winds from a storm and floated away.



Figure 3. *Aechmophorus* grebe nesting colony locations on Lake Almanor in 2015.

Lake Almanor Peak Colonies 2015: Causeway & Goose Bay



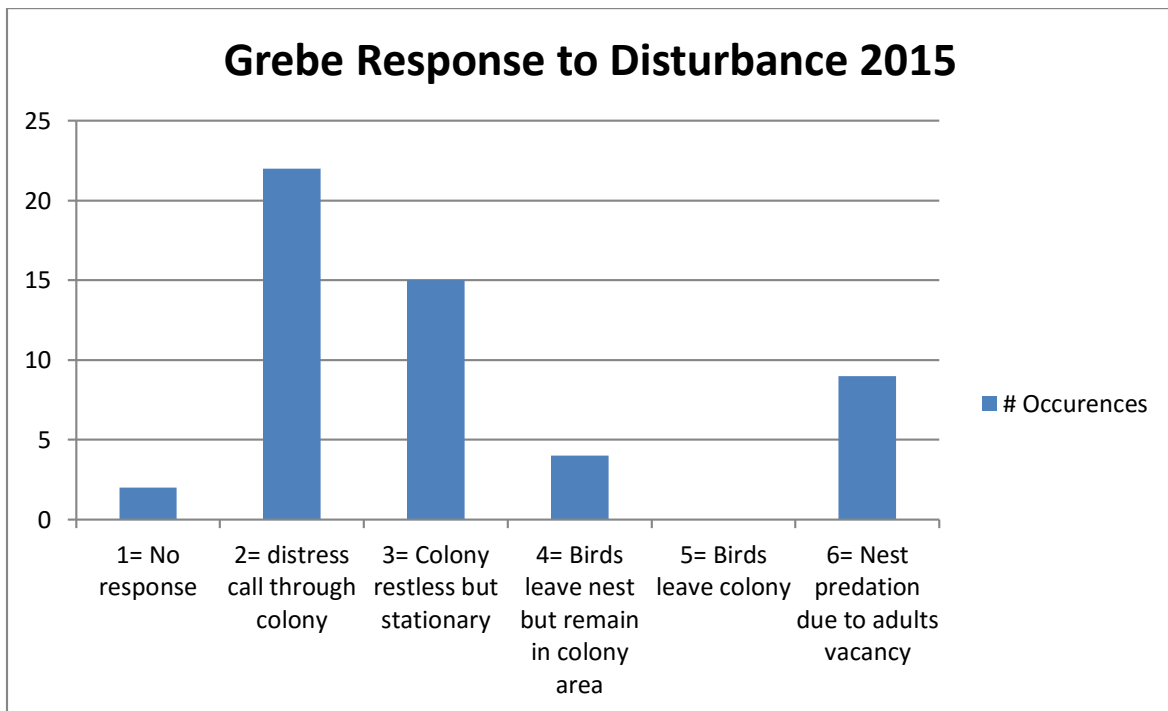
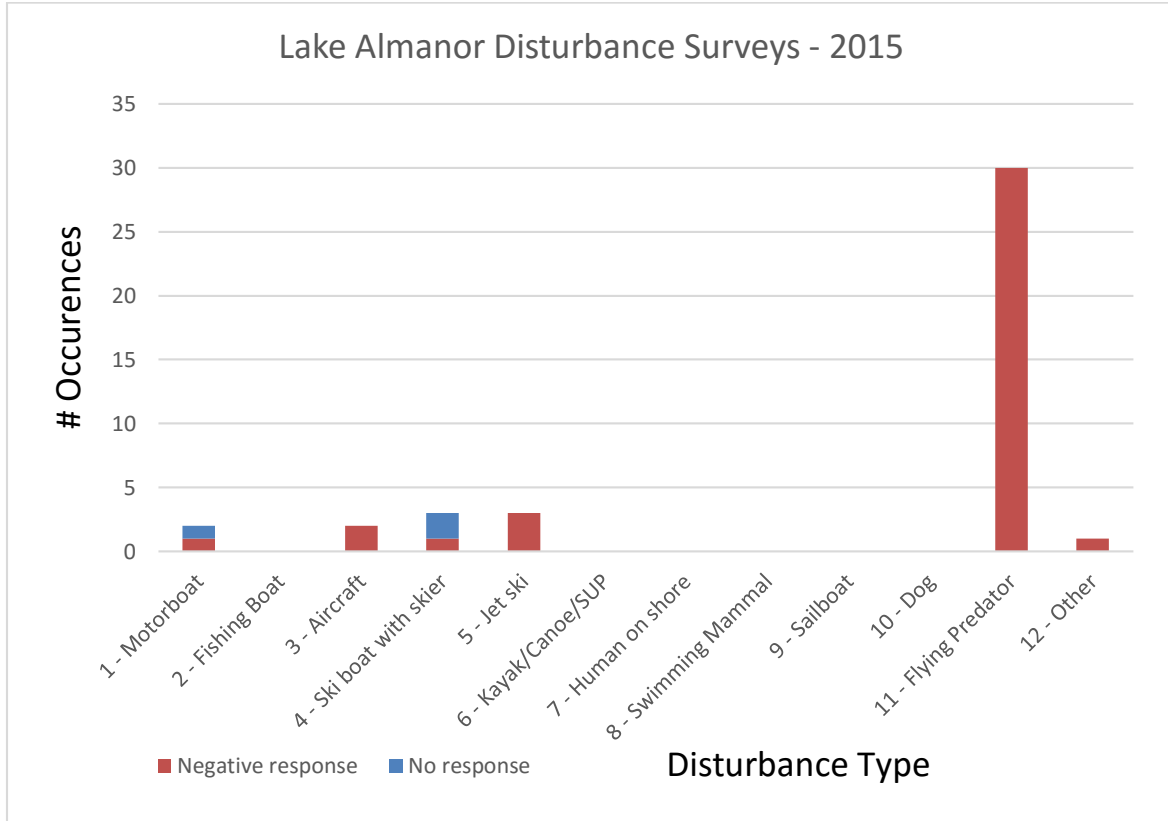
Chester

Causeway peak nests 8/19/2015: 1542

Goose Bay Peak Nests 8/4/2015: 995



Figure 4. Disturbance survey results on Lake Almanor- 2015.



Appendix A- Birds and Climate Change display with information on the predicted range changes for Western and Clark's Grebes used at tabling and other outreach and education events.



More than **half** of North American bird species are threatened by climate. Scientists at Audubon looked at the current climatic requirements of 588 North American bird species and found 314 of them to be threatened with more 50% loss of their current range in the next 35 to 65 years due to climate change.

Because birds travel great distances and are exposed to diverse ecosystems, they can indicate when and where there are environmental problems. **Birds serve as barometers of Earth's health**; if they are at risk, so are we!

What can you do to help protect birds?

- Create a Bird-Friendly Yard
- Get involved with conservation in your local Important Bird Area (eg. Lake Almanor and Sierra Valley)
- Put birds on the your community's agenda
- Meet with local decision makers
- Support policies that lower emissions
- Learn more, visit [Audubon.org/climate](https://www.audubon.org/climate)

Of these climate threatened bird species, 170 are California birds, including Western and Clark's Grebes.





Western and Clark's Grebes, which display the remarkable "running on water" courtship behavior, breed at nearby lakes such as Almanor and Davis. These birds are sensitive to and are already threatened by low water levels and fast declines in water level, which affect their breeding success. The changing climate puts further stress on these species as their current summer ranges are predicted to be almost entirely lost (96% reduced for Western Grebe; 99% shifted for Clark's Grebe) by 2080, leaving both species to be considered "climate endangered".

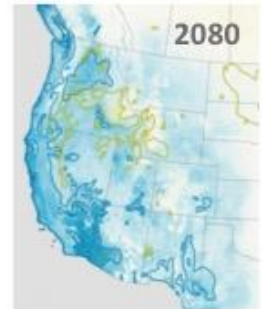
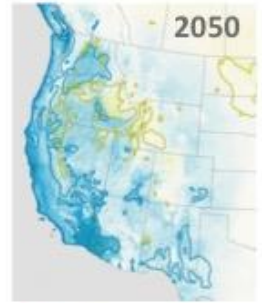




Western Grebe

The darker the color, the more favorable the climate conditions are for survival. The outlined areas represent approximate current range for each season. More on reading these maps.

-  Winter
-  Summer
-  Winter Range
-  Summer Range
-  Both Seasons

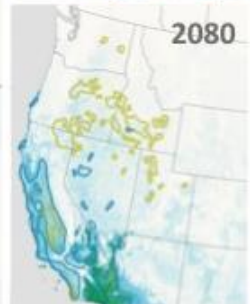
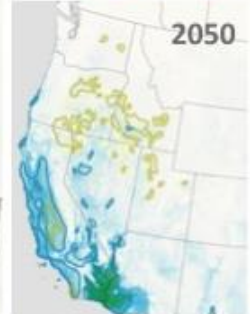
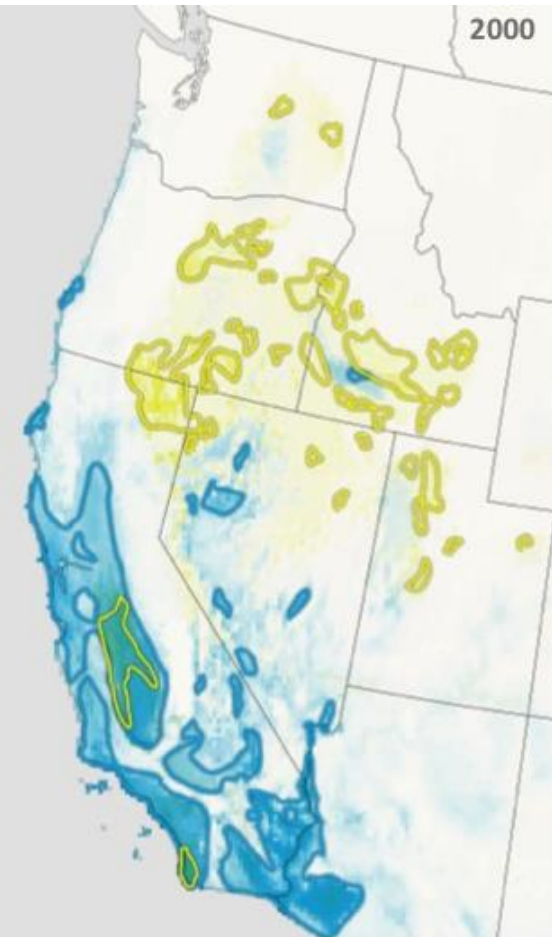


Clark's Grebe

The darker the color, the more favorable the climate conditions are for survival. The outlined areas represent approximate current range for each season. More on reading these maps.

-  Winter
-  Summer
-  Winter Range
-  Summer Range
-  Both Seasons

Audubon



Appendix B- Grebe Art Contest flyer.

Plumas Audubon Society is hosting a birding festival in Plumas County this summer, spotlighting Western and Clark's Grebes, and we want you to be involved!

2016 Grebe Festival

ART CONTEST

One piece of art will win the Grand Prize and be selected as the Grebe Festival logo!

Open now through
April 30, 2016



Painting by Josh Brackett

Plumas Audubon Society invites all students in grades K-12 in public, private, and home schools to submit original artwork under the theme of *Grebe Conservation* in drawing, painting, photography, and poetry/song media.

Prizes for thoughtful and well-crafted artwork focused on the grebes and their conservation will be awarded according to age group (K-3; 4-6; 7-8; 9-12). Winners will be announced by the end of May.

All original artwork submitted to the Contest will be exhibited during the Grebe Festival, August 19-21, in the Almanor Recreation Center in Chester.

Prizes funded by:



THE
COMMON GOOD
COMMUNITY FOUNDATION
ENRICHING PLUMAS COUNTY THROUGH GIVING

Check out information about Western and Clark's Grebes, their habitats, behaviors, and conservation for inspiration and reference on the next page or visit www.plumasaudubon.org/grebes.



Drawing by
Matthew Anderson



Plumas
Audubon
Society

Please send contest submissions to:
Plumas Audubon Society
429 Main Street, Quincy, CA 95971
poetry and song media can be emailed to:
teresa@plumasaudubon.org

Appendix C- Grebe festival save the date card (front and back).



GREBE FESTIVAL 2016

Plumas Audubon Society

invites you to join us for our first ever

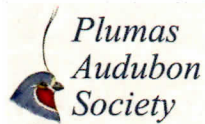
GREBE FESTIVAL

Friday, August 19 - Sunday, August 21, 2016

Lake Almanor
Chester, CA




GET READY FOR BIRDING, BOATING, HIKING, CULTURE, ART, RESEARCH,
BEER STROLL, MOVIES, AND FREE FAMILY ACTIVITIES!

We look forward to seeing you there!



www.plumasaudubon.org/grebe-festival

Appendix D- Photos

	
<p>Feather River College students on lake Almanor grebe tour.</p>	<p>Interns Gabe Pelletier and Gaby Antonova surveying grebes on Lake Almanor.</p>
	
<p>Josh Duey surveying grebes on Lake Davis.</p>	<p>PAS table at the Wild and Scenic Film Festival</p>



Science night, Quincy



Plumas Audubon February program reception.