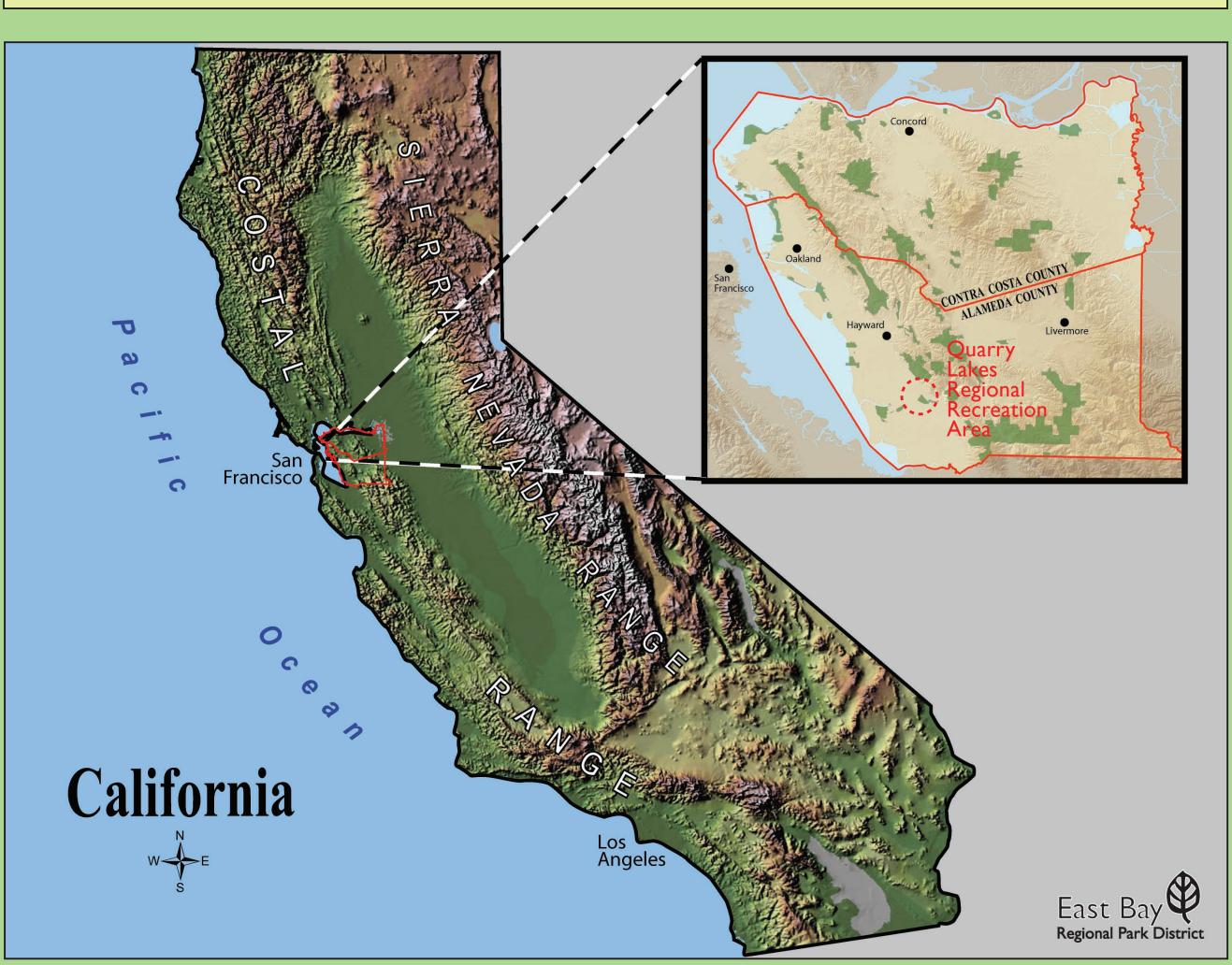
# WESTERN AND CLARK'S GREBE NEST PLATFORMS DESIGNED FOR FLUCTUATING WATER LEVELS

### **ABSTRACT**

Maintenance of stable water levels during the nesting season is critical for successful reproduction in Aechmophorus grebes. Western and Clark's grebes build floating nests that are vulnerable to water level fluctuations and drawdowns, which can cause nest failures. Measures to promote successful grebe reproduction may help offset declines of these birds due to habitat loss, human disturbance at breeding colonies, and environmental contaminants. During this three-year study we developed the first successful artificial grebe nest platforms designed for fluctuating water levels at an inundated, former quarry site that is now used for recreational purposes and aquifer recharge. During the summer months of the nesting season the surface elevation of the lake drops 6.1 meters. Placement of these nest platforms resulted in utilization and nest success rates of 78% and 73%, respectively. Over three years a total of 31 young were produced, resulting in a brood count ratio of 1.41 chicks per adult. Education and cooperation are needed to limit water level fluctuations during the grebe nesting period, but if this is not practical then these artificial platforms may be an appropriate alternative for enhancing grebe production, and may benefit other over-water nesting birds

- In 1927 water storage in the San Francisco Bay Area, California was 250,000 acre feet, where today it exceeds 2,000,000 acre feet (Britton et al 1974).
- Developments in California's inland lakes has eliminated or drastically reduced the amount of breeding habitat for West-ern grebes (Feerer and Garrett, 1977).



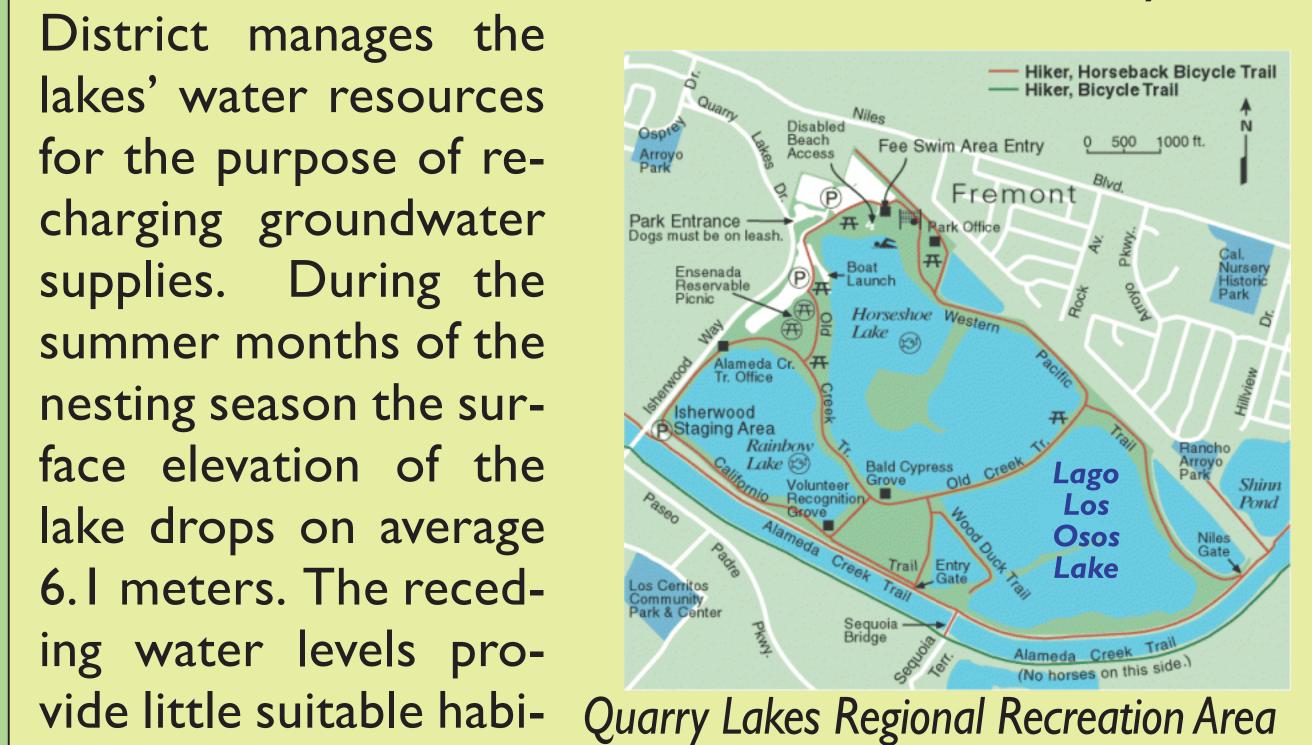
The Park District is made up of Alameda and Contra Costa Counties



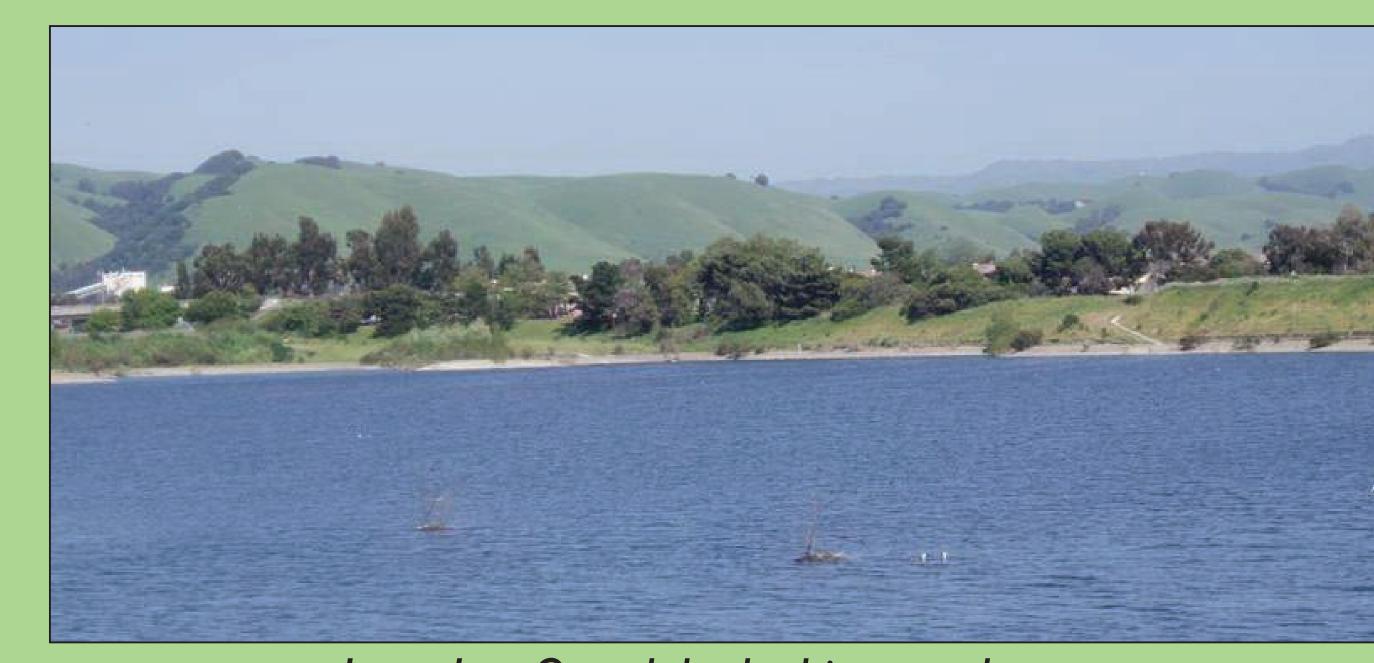
### STUDY AREA

Quarry Lakes Regional Recreation Area is a 182 ha park located in Fremont, California. Alameda County Water

District manages the lakes' water resources for the purpose of recharging groundwater supplies. During the summer months of the nesting season the surface elevation of the lake drops on average 6.1 meters. The receding water levels protat for grebe nesting.



Fremont, Ca

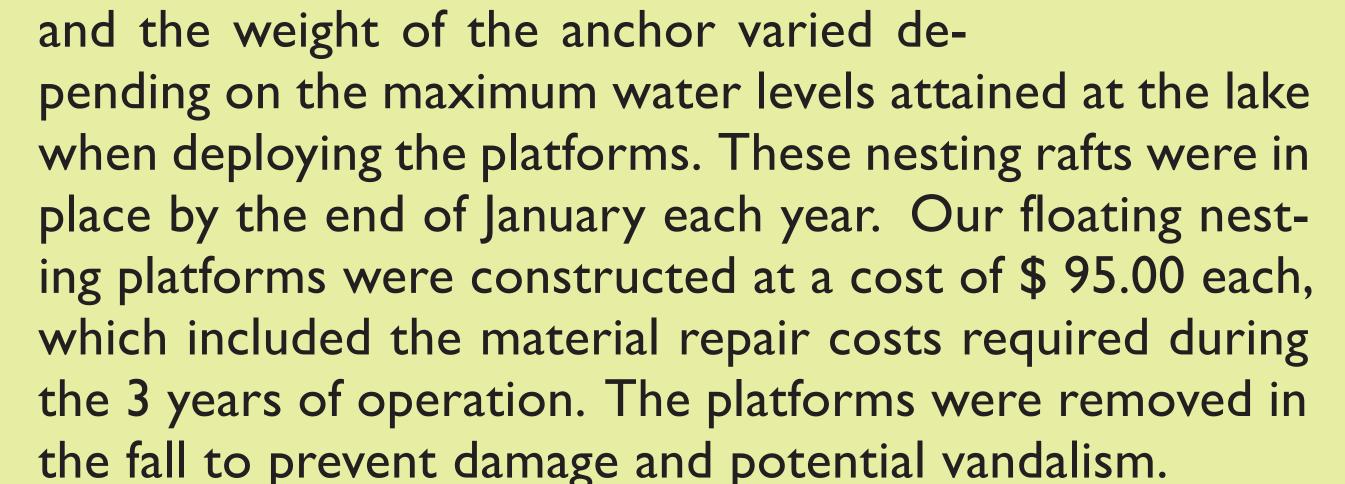


Lago Los Osos lake looking northeast

### METHODS

The nesting platform consisted of circular 90 cm x 2 cm thick exterior grade plywood covered with a protective coat of satin varnish (Figure 1). To provide traction, a double layer of 5 mm mesh burlap fabric covered the top of the platform. Platform flotation was provided by three cylindrical 6.5 cm x 183 cm Fun noodlesTM (Jakks Pacific, Malibu, California) attached to the undersurface of the platform. Shelter over the platform was provided by three arching 1.5-2.5 cm diameter limbs attached to the edge of the platform. Sticks and other natural materials were provided as nesting supplies. A counter-weight anchoring system was designed to allow for fluctuations in water levels. Two anchors, one twice the weight of the

other, were attached to the platform by 3 mm galvanize aircraft cable, passed through two 4 -5cm stainless steel pulleys. One anchor rested on the bottom, when the lake was maintained at its peak level. If the water level decreased, the smaller anchor would sink while the larger one remained on the lake bottom. This system enabled the raft to adjust to changing water levels. The length of the cable necessary to attach the float to the anchor



Number of Platforms					Number			Chic
Year	Available	Used by WeGr	Used by ClGr	% use	of successful grebe nests	Number of eggs	Number of young produced	per adu ratio
2006	4	7 <sub>a</sub>	1	200	6	29	17	1.4
2007	5	5 <sub>b</sub>	1	120	5	20	14	1.4
2008	10	1	0	10	0	2	0	0
Total	19	13	2	78	11	51	31	1.4

. Renesting attempts by other grebe pairs when nesting completed by first occupant. Renesting attempts by other grebe pair when nesting completed by first occupant, which was a Clark's grebe.

Table 1. Use of nest platforms by Western & Clark's grebes at Quarry Lakes, Fremont, California.



Fig. I, A Clark's Grebe on an artificial loating nest.

						Causes for failure to hatch		
Year	Species	Number of nests	Average Clutch	Nest Success %	Hatching Success %	Predation %	Social Parasitism %	Unknown %
2006	WeGr	7	3.57	71	56	14 <sub>a</sub>		14
	ClGr	1	4	100	75			
2007	WeGr	5	3.2	80	68		20 <sub>b</sub>	
	ClGr	1	4	100	75			
2008	WeGr	1	2	0	0			100
	ClGr	0	0	0	0			
Totals		15	2.79	73	60			

a. Western grebe nest failure resulting from Forster's tern nest depredation. b. Western grebe nest failure resulting from social disturbances of other grebes dumping eggs Table 2. Summary of Grebe Nest Histories at Quarry Lakes, Fremont, California.

### RESULTS

The overall utilization of grebe nesting platforms was 78% (Table I) with the number of grebes using the platforms decreasing from 200% in 2006 down to 10% in 2008. Over the three years of study, we recorded a total of 11 successful nests on these artificial floating platforms (Table 1, Figure 1 and 2), with Western grebe pairs on two occasions attempting to reuse sites that were previously occupied by successful early nesting Clark's grebes (Table 1). We observed a total of 31 young produced on these artificial platforms with a ratio of chicks per adults in brood counts of 1.41 in 2006 and 2007 (Table 1). The overall nesting and hatching success varied between species and years but averaged 73% nesting and 60% hatching success rate for the three years of study (Table 2). The causes for nest failure ranged from nest depredation by Forster's terns (Sterna foresteri) in 2006 to egg dumping by other grebes in 2007 (Table 2).

## DISCUSSION

The Western grebe (Aechmophorus occidentalis) is a candidate species for listing as threatened or endangered in Washington State, and the Clark's grebe (Aechmophorus clarkii) is a species of concern in Arizona, Montana, Idaho and Wyoming. In California, the Western grebe has a conservation priority of "high concern" resulting from water level drawdowns for power generation, which has caused major nest losses (Ivey and Herziger, 2006).

Population sizes for Western and Clark's grebes at Quarry

Lakes over the course of all three nesting seasons, and their nesting successes in 2006 and 2007 were likely related to the abundance of small fish, Inland silverside (Menidia beryllina) (Table 4). Our systematic surveys showed that densities of Inland silverside and similar fishes were extremely low (x = 0) fish catch per unit effort/ shock seconds) in 2008 (Alexander and Ochikubo-Chan, 2008; East Bay Regional Park District, unpublished data). Although grebes appear well-adapted to changing levels of food abundance, even when associated with major fish kills (Allen et al. 2006), it appears that the Aechmophorus grebes at Quarry Lakes were dependant on sufficient numbers of Inland silverside for successful nesting, and the lack of these fish in 2008 may be responsible for the dismal breeding

Year	Total Inland Silverside sampled	Catch per unit effort (# per electrofishing second)	Average length (mm)
2006	1413	0.84	46.69
2007	2021	0.96	63.09
2008	0	0	No fish

Table 4. Inland Silverside abundance at Quarry Lakes, Fremont, California.

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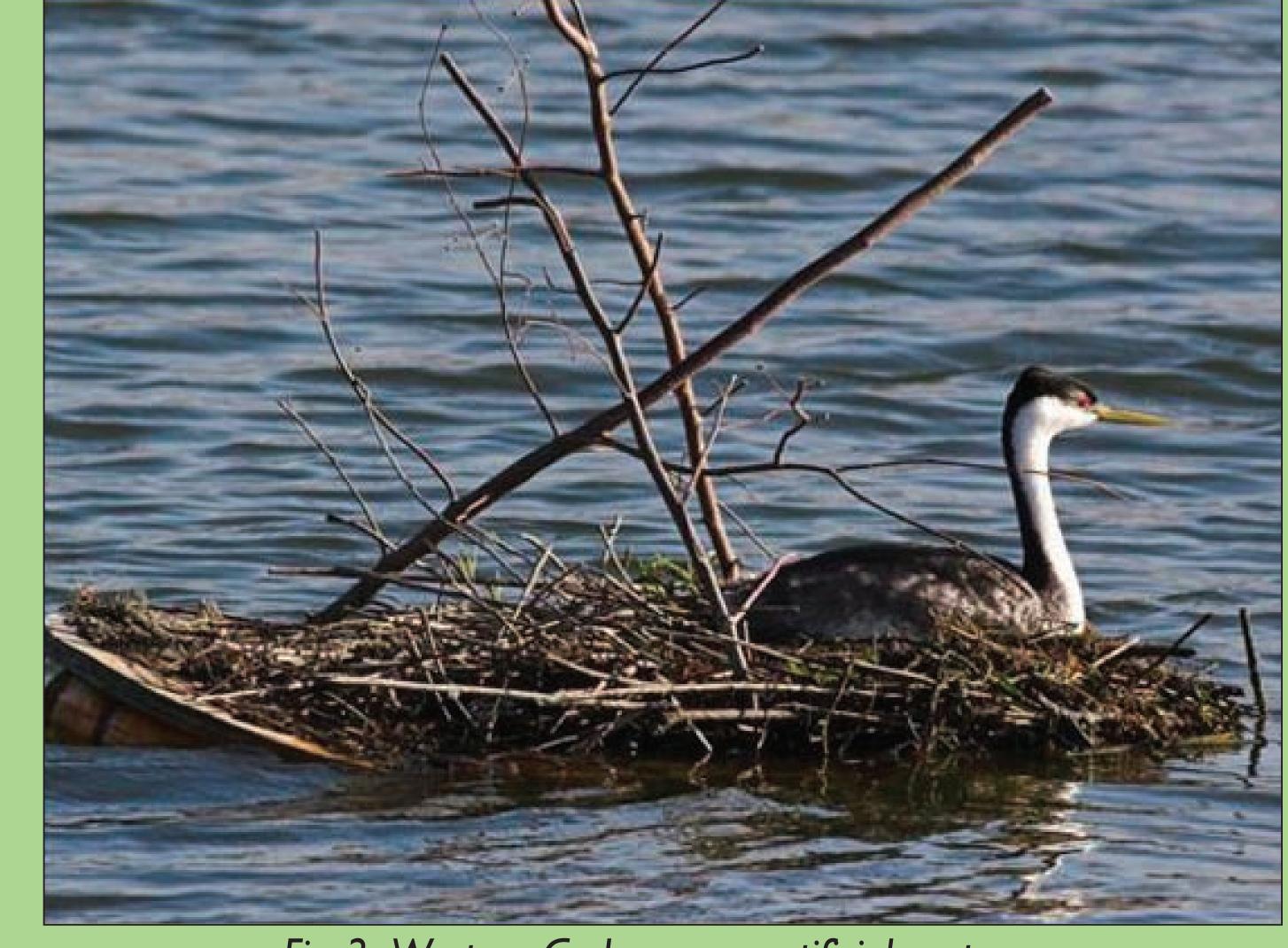


Fig. 2, Western Grebe on an artificial nest

### MANAGEMENT IMPLICATIONS

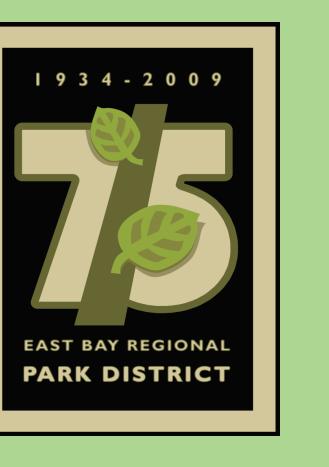
To our knowledge, this is the first published account documenting successful Western and Clark's grebe nesting on platforms designed for fluctuating water levels. Piscivorous birds are important components of aquatic ecosystems. Natural alternatives such as water level manipulation (e.g., maintaining stable water levels through nesting season) would be preferred, but if not practical, our artificial nesting platforms may be an appropriate alternative for enhancing grebe production without compromising wildlife for other water uses.

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