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The Recovery of the Aleutian Cackling Goose: From Great Success to Dreaded Pest

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ABSTRACT: Aleutian cackling geese are one of the greatest wildlife management success stories to date in North America. The Aleutian goose was listed as Federally endangered in 1967 with total population counts below 800 individuals into the mid-1970s before the population recovered to what it is today. This species of goose nests on the Aleutian Islands of Alaska, USA and undergoes a 2000-mile transoceanic flight to and from California's North Coast. The North Coast is an important staging area for the birds where they benefit from nutrient-rich agricultural pasture lands for energy reserves. Results from 2023 spring waterfowl surveys estimated the Aleutian goose population at 212,113 individuals, approximately 353% greater than the 60,000-bird population target of the Pacific Flyway Aleutian Goose Management Plan. Local agriculturalists have been integral partners in restoration efforts by providing habitat and protections for this species. After population recovery was declared and the species was completely delisted in 2001, the Aleutian Goose Working Group was formed to help agriculturalists, hunters, environmentalists, scientists, and regulators to actively manage geese and ensure no negative effect to the population from new management actions. Twenty-two years later, the Aleutian Goose Working Group re-formed to navigate the legislative hurdles necessary to shift management to meet the changes in goose migration patterns and associated agricultural losses. Waterfowl managers have limited tools for population management, hunting being one of the only options. The Aleutian Goose Working Group worked with local interest groups and agricultural trade organizations to find compromise to adjust the annual goose hunting season to better match fall goose migration timing. Ultimately, the hunting season for geese was moved forward one month in fall 2023 to help alleviate losses to irrigated pasture lands in Humboldt County. In a survey administered spring 2024, North Coast agriculturalists (n = 22), representing approximately 10,512 acres of production agriculture, reported losses of \$98.74/acre and \$45.45/acre in the fall/winter of 2022/2023 and 2023/2024, respectively. This case study demonstrated how minor adjustments to hunting seasonality worked to better meet the needs of the agriculturalist, hunters, and regulators to reduce negative human-wildlife interactions with this waterfowl species.

KEY WORDS: agriculture depredation, Aleutian cackling goose, *Branta hutchinsii leucopareia*, geese, goose grazing, wildlife conflict

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INTRODUCTION

California is home to one of the largest winter assemblages of waterfowl (Central Valley Joint Venture 2020), including small, white-cheeked geese called cackling geese (*Branta hutchinsii*). The Aleutian cackling goose (*B. h. leucopareia*) is one of four subspecies of the cackling geese, named for its endemic use of breeding grounds on the remote Aleutian Island chain in Alaska (Warren 2023). Historically, these geese were abundant throughout the Aleutian region, their populations sustained by the rich forage provided by coastal grasslands and tidal marshes. They wintered from British Columbia to Northern Mexico and down to Japan along the northwestern edge of the Pacific Ocean (Delacour 1954, Hansen 1968, Pacific Flyway Council 2006). In the mid-20th century, the Aleutian goose faced a threat, primarily driven by the introduction of non-native predators, the red fox (*Vulpes vulpes*) and Arctic fox (*Vulpes lagopus*), which led to a drastic decline in their numbers (Ebbert 2000). These foxes were introduced as early as 1750 to the Aleutian Islands as fur sales were the driving force for Aleutian Island colonization and economy (Ebbert 2000). Fur trades

declined with the Great Depression, and fox eradication efforts began on United States Fish and Wildlife Service (USFWS) refuges as early as 1949 (Ebbert 2000). Despite early efforts, by the 1960s the Aleutian goose population had plummeted, teetering on the edge of extinction.

Recognizing the urgent need for action, conservationists, biologists, and government agencies rallied together to save the Aleutian goose. Listed as Federally endangered in 1967, the Aleutian goose population estimates were below 800 individuals into the 1970s. One of the key steps in management success came with the implementation of the Aleutian Goose Recovery Plan (USFWS 2001). This comprehensive strategy aimed to address the key threats facing the species, including habitat loss and predation. Central to the plan was the establishment of protected reserves and sanctuaries within the Aleutian Islands, providing safe havens for nesting and foraging. After successfully removing predators on key islands, improving migratory survivorship was the next goal. It wasn't well understood until the late 1970s that Aleutian geese embark on a 2000-mile transoceanic flight to and from California's North Coast and Central Valley (Mini et al. 2011). California's

nutrient-rich agricultural pasture lands provide crucial staging areas for the geese, ensuring sufficient energy reserves for their arduous journey (Mini 2005, Tjarnstrom 2014). The Aleutian goose population responded rapidly to fox removal on breeding islands, translocations of birds to islands cleared of foxes, and protection afforded to them on the wintering grounds. The population rebounded from <800 individuals in the 1970s to 7,000 in 1990, at which time it was downlisted in the Endangered Species Act to “threatened” status. In 2001, population estimates had reached >30,000 individuals when the Aleutian goose was removed from the Federal list of endangered and threatened wildlife (USFWS 2001, Mini et al. 2011). Goose populations continued to grow, as did the need for adaptive management to address conflicts with existing land uses.

After delisting in 2001, the California’s North Coast’s Aleutian Goose Working Group (hereafter “Working Group”; a continuation of a smaller geographic working group formed in 1990 called the “Lake Earl Working Group” with some overlap in participants) was formed in 2003 to herald a new era of active management (Aleutian Goose Working Group 2005, Mini et al. 2011). This group brought together agriculturalists, hunters, environmentalists, scientists, and regulators to safeguard the goose populations while addressing conflicts with agricultural interests (Mini et al. 2011).

In response to shifting goose patterns and agricultural losses, the Working Group embarked on legislative initiatives to adapt management strategies accordingly from 2003 to 2014, and again from 2022 to 2023. One significant aspect of this adaptive approach was the adjustment of annual goose hunting seasons to align more closely with ever-changing goose migratory routes (primarily shifting from Del Norte County to Humboldt County). Hunting was utilized to mitigate agricultural losses while ensuring sustainable goose management and providing recreational opportunities to hunters. Previously it had been shown that hazing of Aleutian geese can reduce foraging time and increased energy expenditure, triggering the geese to move to new areas to forage (Mini and Black 2009). The initial Aleutian Goose Working Group in the early 2000s showed that hunting during the spring could reduce agricultural depredation conflicts for North Coast farmers. The first successful spring goose hunting season for Aleutian geese was established in 2007 to address some of the agriculture-geese conflicts (Mini et al. 2011).

Fifteen years later, the goose populations had continued to grow, causing goose depredations to agriculturalists to again be on the rise. In spring 2023, USFWS waterfowl surveys estimated the Aleutian goose population at 212,113 individuals (Standard Error = 35,203, 95% Confidence Interval = 143,114 - 281,111) (Figure 1) – a remarkable 353% above the targeted population of 60,000 outlined in the 2006 Pacific Flyway Aleutian Goose Management Plan (Pacific Flyway Council 2006, Safine 2023, Sanders and Olson 2023). This recovery owes much to the collaborative efforts of local agriculturalists who have played a vital role in providing habitat and protections for the species.

In 2022 the Aleutian Goose Working Group was re-formed to assess current possibilities to reduce goose damages to agricultural crops, primarily livestock forages. After exploring options for management, the first action the group made in 2023 was a change to the fall Aleutian goose season. Essentially, the goose season was moved forward one month. Changes occurred as follows:

- Previous Season Structure 2022/2023: November 9th - January 31st & February 18th - March 10th
- New Season Structure 2023/2024: October 7th - December 22nd & February 12th - March 10th

Hunting frameworks for most waterfowl in the US are limited to a maximum of 107 hunting days between September 1st and January 31st, while geese are allowed until March 10th (with very few exceptions) under the Migratory Bird Treaty Act. It is up to state agencies, with input from the public, how to “spend” those 107 days over that 190-day timeframe. The specific dates for the North Coast fall season change annually due to annual calendar shifts and how the 107 hunting days fall in relation to March 10th (the last legal day to hunt geese). To address goose depredation in Humboldt County, the goose season was modified in 2023. By moving the hunting season forward one month, agriculturalists were able to use hunters to haze geese off irrigated pastures where land-owners were experiencing losses to geese. The hunting pressure also served to reduce dense concentrations of geese and have them better dispersed across the landscape.

METHODS

To inform adaptive management of the newly proposed hunting seasons, we conducted a landowner survey in spring 2024 to inform the Working Group if hunting season changes were effective at reducing agricultural impacts. The primary purpose of the North Coast Goose Hunting Season Change Landowner Survey and subsequent report was to determine if moving the goose hunting season for 2023/2024 helped reduce negative impacts to

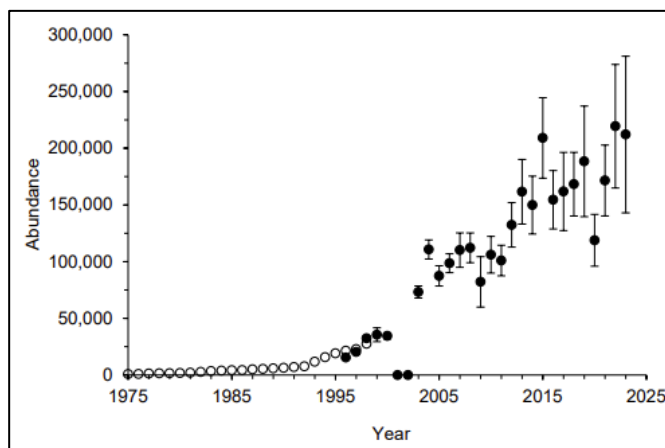


Figure 1. Abundance of Aleutian cackling geese from direct counts (1975-1998, open circles) and estimation using mark-resight methods (1996-2023, closed circles with 95% confidence intervals) since 1975, from Sanders and Olson 2023.

agriculture on the North Coast compared to the 2022/2023 season. A secondary purpose of this survey was to identify current hazing strategies being utilized by agriculturalists and their perceived effectiveness. The survey was prefaced with a background about the Aleutian Goose Working Group re-forming, what the opportunities were for potential change to the hunting seasons, and what changes the group had decided to implement for the most recent hunting season.

Through local knowledge of traditional high-goose activity areas, we identified approximately 5,000 and 21,500 acres of what we called “Aleutian goose activity hotspot areas” in Del Norte and Humboldt counties, respectively. Within those geographic areas, we used onXmaps, Inc. (onXmaps 2024), an online mapping website to identify all landowners of pasture or farmlands with ownerships greater than 15 acres in size. This exercise resulted in 16 and 106 landowners potentially impacted by geese in Del Norte and Humboldt, respectively. The local University of California Cooperative Extension (UCCE) office was able to acquire 72 of the 122 potential landowners’ emails and emailed a 21-question survey to those individual agriculturalists for whom they were able to obtain email contacts. After the initial survey was sent with only two responses, we shortened the survey to 14 questions from the original set of 21 questions and re-sent the link with an email reminder and received an additional 20 completed surveys and one additional email response indicating that they do not have goose depredation on their property. Summary statistics of survey responses were generated in both Microsoft Excel and Google Forms.

In addition to the email introduction of the survey and survey topic, we also provided potential respondents with two different interactive Microsoft Excel files, similar to calculator tools used by Martinico et al. 2024, to assist with calculations of agricultural losses from geese. One economic loss calculator was for estimating losses based on reductions to livestock carrying capacity (or increases in hay purchased) and the second calculator was for estimating livestock production losses per acre of stocker cattle gains or decreases in milk production on dairies. Neither of these Excel tools seemed to be readily used by respondents prior to completing the survey, but those who did use them appeared to have higher loss estimates than those who did not.

RESULTS

As aforementioned, the North Coast Goose Hunting Season Change Landowner Survey was sent to 72 agricultural landowners that were assumed to host geese based on their proximity to hotspots of goose activity. Twenty-three of the persons receiving our emailed surveys participated in the survey effort, resulting in a 32% response rate. Agricultural industries represented were mostly livestock producers with 46% and 50% of the respondents representing beef and dairy operators, respectively. There was also a higher proportion of respondents that reported farming irrigated lands than non-irrigated lands at 46% and 27%, respectively (n = 16). Completed surveys represented a

total acreage of approximately 49% of our estimated “Aleutian goose activity hotspot areas” of California’s North Coast region, with agriculture properties ranging from 30 to 2,000 acres in size and totaling 10,512 acres. Of the completed survey respondents, one was from Del Norte County and the remaining 21 were Humboldt County residents.

What Hazing Strategies are Employed to Reduce Goose Damages?

One goal of this project was to assess current hazing strategies and their perceived effectiveness. Four of the 14 questions were related to hazing. Results from the first two questions asking about hazing techniques and their efficacy is depicted in Figure 2. The first question asked persons to identify all hazing strategies employed (n = 22) with hunting and chasing with an ATV ranking as the most frequent hazing tools used at 96% and 86%, respectively. The second question asked which of all strategies used was the single most effective strategy employed. Hunting was selected by 57% of respondents as the most effective (n = 21). When asked on a Likert scale of one to five “How effective are your hazing strategies?”, with one being not effective at all and five being very effective, 100% of respondents (n = 21) selected a three or below with 62% selecting two. Lastly, when asked “If you employ hunting as a hazing strategy, are you able to find hunters when you need them?” responses (n = 22) fell into four categories: yes, usually, not always, and no, with response rates of 45%, 23%, 23%, and 9%, respectively (Figure 3).

Did the Adjustments to the Fall Goose Hunting Seasons Impact Northwestern California Agriculture Operations?

The last six questions of the survey were intended to provide feedback to the Aleutian Goose Working Group about the landowner perceptions around the changes to the timing of the fall goose hunting period. The first two questions were intended to assess if there was a change in levels of goose depredation and if those changes were attributed to the change in the hunting season. When asked if the landowner noticed a change in the 2023/2024 goose season when compared to the previous year, 73% of respondents (n = 22) indicated that there was less goose grazing on their pastures, 18% suggested that it was about the same, 4.5% perceived an increase in goose depredations, and 4.5% selected unknown. The next question in the survey asked landowners that perceived a change in goose depredation levels from the 2022/2023 season to the 2023/2024 seasons if they attributed that difference to the change in hunting season timing. Of those landowners (n = 21), 62% perceived the change in the hunting season as being beneficial, 33% did not notice a change in goose depredations due to changes in hunting, and 5% indicated that the change was unfavorable to their operation (Figure 4). In an open-ended follow up question, landowners were asked what other factors may have explained the difference they observed in goose depredations between the two years. Other factors that respondents (n = 17) listed that

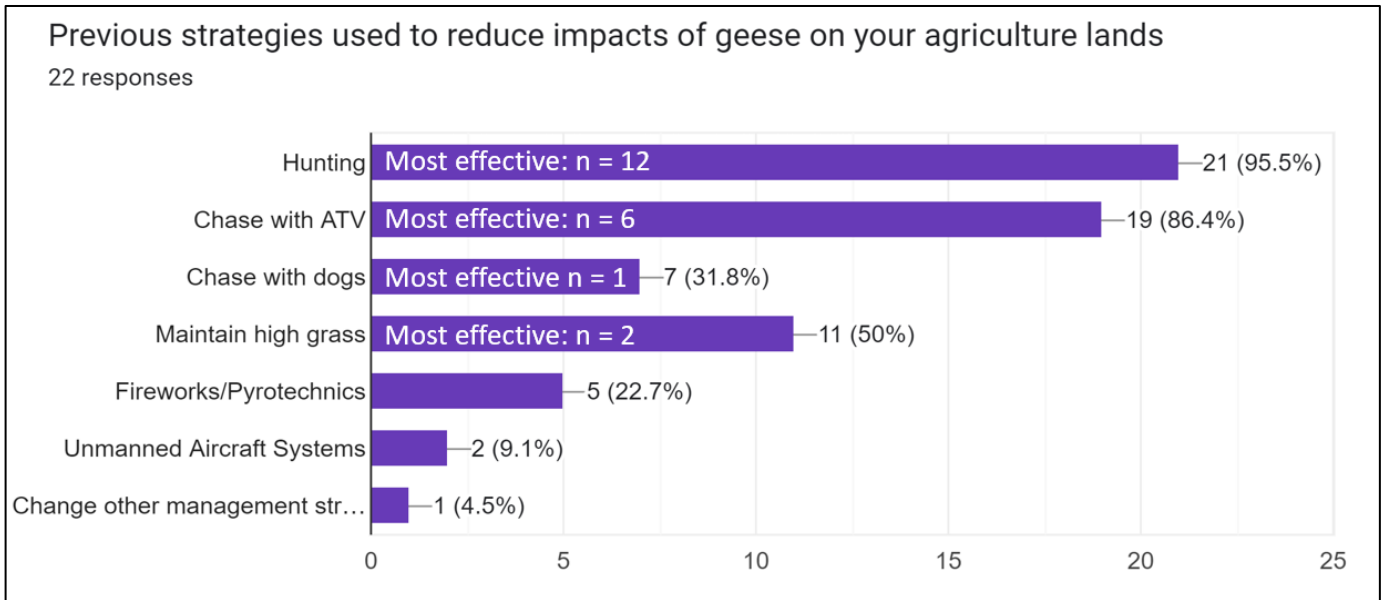


Figure 2. Responses (n = 22) from a survey of landowners about hazing strategies previously employed on agricultural properties on California's North Coast to deter Aleutian cackling goose grazing on private properties and of those strategies used, which were perceived as the most effective (n = 21).

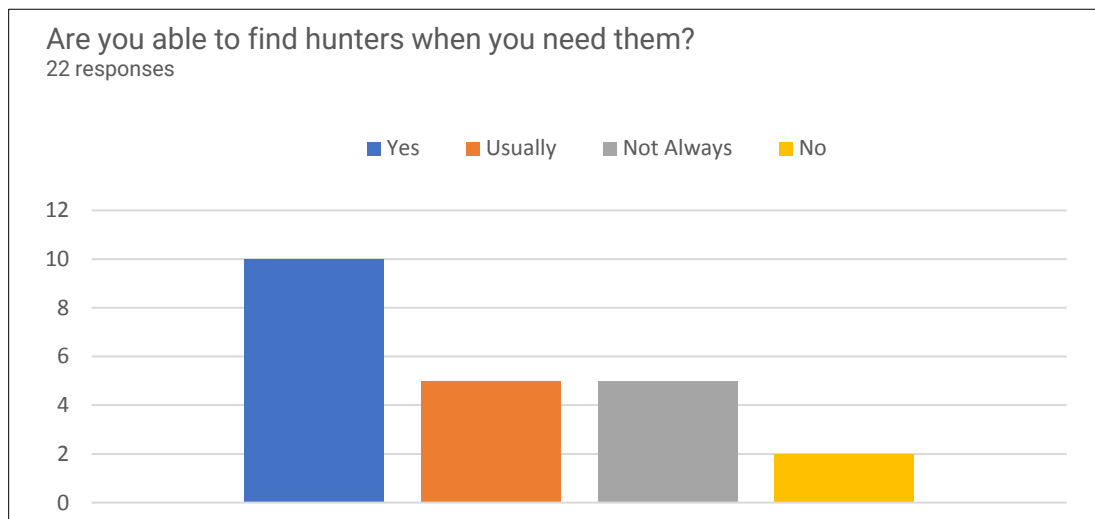


Figure 3. Responses (n = 22) from a survey of landowners when asked if they were able to find willing hunters in northwestern California if they used hunting as a hazing strategy to reduce agriculture damages from goose grazing on their lands.

may have explained the difference were: changed goose habits/migration (n = 6), less goose presence (n = 3), and unusually wet fall/winter (n = 6).

We also asked agriculturalists in this survey what they estimated their total economic losses to be for both the fall and winter of 2022/2023 and 2023/2024. For the fall of 2022/2023 the total reported losses from the survey respondents (n = 16) were \$1,037,980 (range = \$20 - \$1,061/acre; mean = \$98.74/acre) and in 2023/2024 for the same period the total losses (n = 14) were \$477,812 (range = \$10 - \$606/acre; mean = \$45.45/acre). When we extrapolated these per acre estimates and multiplied them across the estimated 26,500-acre "Aleutian goose activity hotspot

areas" in the two counties, region-wide depredation estimates could be as high as \$2,616,673, and \$1,204,530 in losses over the two seasons, accordingly. Results from this survey further underscored the importance of the Working Group's efforts, with North Coast agriculturalists reporting reduced losses in the fall/winter of 2023/2024 compared to the previous year.

The final question of the survey was another open-ended question asking respondents if they had additional comments about changes to the goose season or other comments they would like to share. Most notably, of the responses (n = 17), 65% of the volunteered comments mentioned the need for a goose hunting season that exten-

If you noticed a change in goose grazing during the fall/winter of 2023/2024 do you attribute that difference to the change in hunting season?

21 responses

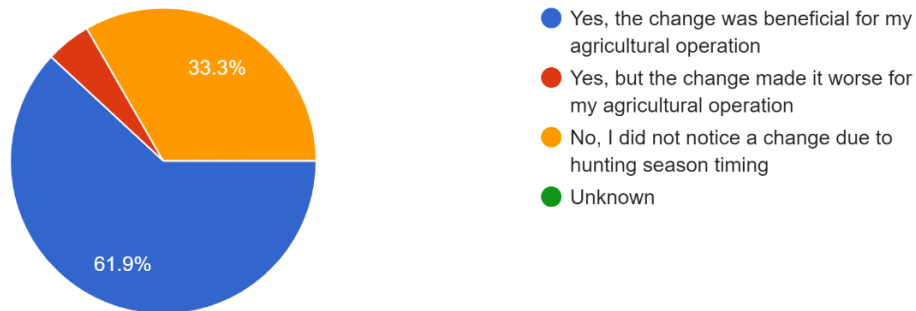


Figure 4. Survey responses (n = 21) asking agriculturalist to assess their perceptions of how a change in the goose hunting season impacted their agricultural business.

ded later into the spring (beyond the current March 10th closure) to reduce goose depredations that agriculturalists suffer the second half of March and the first half of April.

DISCUSSION

The recovery of Aleutian cackling geese is a remarkable achievement in the conservation of a once-endangered population and one of the greatest successes of the US Endangered Species Act (Mini et al. 2011). Throughout the species' recovery, North Coast agriculturalists have been integral partners in providing habitat for this species during migration. Aleutian geese spend about twice the amount of time feeding on cattle-grazed pastures than mechanically mown pastures, highlighting the integral relationship between this species and animal agriculture (Bachman 2005).

Previous work assessing goose depredation impacts to agriculturalists in Humboldt County, CA, assessed the difference in forage production on coastal pastures during the time of Aleutian goose grazing for the winters of 2009 and 2010 (Tjarnstrom 2014). In their work, Tjarnstrom 2014 determined that forage growth with cattle grazing alone was 140% higher than areas with both cattle and goose grazing. The cattle-only plots averaged 991 lbs./acre herbaceous production and the cattle plus goose grazing plots were 419 lbs/acre. The difference between mean regrowth with cattle-only grazing and cattle-plus-Aleutian goose grazing was approximately 572 lbs/acre (Tjarnstrom 2014). Interestingly, the physically measured estimates in Tjarnstrom's work were comparable to the average loss estimates provided in our survey. The average depredation estimates from 2024 survey participants for the winter of 2022/2023 when goose grazing was perceived to be more detrimental averaged \$98.74/acre. Using the 572 lbs/acre estimated by Tjarnstrom 2014, coupled with an estimated 2023/2024 delivered load of hay at \$350/ton, the cost of

goose depredation would be approximately \$100.10/acre. Both studies concluded that grazing by Aleutian geese impacted pasture regrowth that would have been otherwise available for livestock production.

Contrary research by Fagundes (2022) suggests that forage production significantly increases with the addition of goose droppings, and average forage production was significantly higher in established pasture systems. Fagundes (2022) estimated an ecosystem service for enhanced hay production due to goose dropping additions up to \$585/acre (calculated at \$350/ton) on established pasture. This study successfully pointed out key ecosystem services of Aleutian geese in these pasture systems, but this greenhouse trial failed to account for nutrient applications of animal agriculture or differences in forage production within a greenhouse versus the natural light. Additionally, the replicated goose grazing in this trial did not account for goose preferences for specific forage species based on nutritive value, with clovers and ryegrass being well-known as one of their key diet preferences (Mini 2005, Bachman 2008, Tjarnstrom 2014). Furthermore, to retain and encourage desired clovers and grasses, livestock grazing managers strive to keep a three to five-inch stubble height at the end of their rotations, yet the preference geese show for these species limits the abilities of ranch operators to maintain this desired height (Tjarnstrom 2014). Although goose presence may create a natural fertilizing process through their droppings, if there is a simultaneous undesirable species shift, the ecosystem service of nutrient deposition would provide nutrients for undesirable forages and subsequent increased yields of undesirable plants. Therefore, these fiscal estimates of ecosystem service value for agriculturalists may be over-estimated. Nonetheless, it is important to realize that there are true ecosystem services performed by Aleutian cackling geese, and that wild goose droppings increased primary production of grasses on

agricultural lands in northern California (Fagundes 2022). Our survey did not query agriculturalists' perspectives of potential benefits of goose presence on their pastures.

After removal from the Endangered Species Act, the Aleutian Goose Working Group was formed to "work cooperatively to develop and implement management strategies acceptable on public and private lands on the spring staging area so that the Aleutian Goose is an asset to the community" (Aleutian Goose Working Group 2005, Mini et al. 2011). The main goal of this survey was to determine if the Aleutian Goose Working Group was successful at reducing negative impacts to agricultural businesses by changing the hunting season for geese in the North Coast Special Management Area. Through our 2024 survey assessing goose depredation of agricultural pastures, we determined that respondents perceived there was less goose damage in the fall/winter of 2023/2024 than fall/winter of 2022/2023. However, with only one year of observation during an unusually wet fall and only 22 completed surveys, we hesitate to claim that the change to the fall Aleutian cackling goose hunting season was the main driver of perceived decreases to agricultural depredations fall/winter of 2023/2024. During the wet fall of 2023, pastures experienced repeated wetting from rains which allowed for early green-up in unirrigated pastures that otherwise would have been unsuitable for Cackling goose foraging (Mini 2005). This early green-up likely led to increased goose distribution, more areas of undisturbed geese, increased forage availability to livestock, and less goose depredation on the relatively limited irrigated pastures nearer to farmsteads with higher levels of human disturbance (Mini and Black 2009, Mini 2012).

Notably, there was only one respondent that perceived an increase in depredations on their agricultural operation due to this change. Unfortunately, the respondent that experienced the increased losses did not provide monetary estimates for this change in depredation between the years. Having only one respondent with negative perceptions was particularly noteworthy, because prior to the hunting season shift Del Norte County agriculturalists were particularly concerned that this change would encourage geese to shift their grazing use back to Del Norte County, where it was a problem historically. Evidence supporting this concern was not captured in this survey effort.

Another goal of this project was to assess the perceived efficacy of goose hazing efforts. One hundred percent of respondents to this survey (n = 22) implemented one or more hazing strategies and 57% of respondents selected hunting as their most effective hazing tool. Results from this survey suggest that simply moving the hunting season forward one month in the fall during the goose migration was enough to reduce agriculture losses by up to 50% compared to the prior year. Hazing is an important tool for agriculturalists to reduce losses to geese. Employing alternate hazing programs is arguably most important when there is no allowable hunting and agricultural losses to geese go largely unchecked. As was mentioned in 65% of the open-ended comments at the end of this survey, there is a perceived need for a hunting season that extends past the March 10th closure. If the need for hunters from March

10th - April 15th remains attainable, understanding the best alternative hazing methods and implementing those strategies when goose grazing is at its peak is necessary to reduce economic losses to agricultural businesses.

Regular monitoring of goose-agriculture interactions should continue to be a priority of the Aleutian Goose Working Group. Continual changes in weather patterns and goose migratory habits highlight the need to maintain an adaptive management strategy. As international goose populations continue to grow as they benefit from highly nutritional agricultural feedstuffs, decision-makers should provide deference and authority to local wildlife managers. California Code, Fish and Game Code Section 1801 states that economic concerns shall be alleviated to within tolerable limits consistent with maintaining healthy populations (California Code 2023). The Aleutian cackling goose populations are estimated to be 353% greater than the 60,000-bird population target (Safine 2023, Sanders and Olson 2023), indicating a healthy population. Until local wildlife managers are afforded the ability to utilize all management strategies, including hunting past the March 10th date set by the Migratory Bird Treaty Act, continued economic losses to agriculturalists by Aleutian cackling geese in Northwestern California should be expected to continue. Adaptive management will be essential to maintaining a healthy relationship between wildlife and agriculture on California's North Coast.

This case study about Aleutian cackling geese serves as a compelling illustration of how collaborative management strategies can balance the needs of agriculturalists, hunters, regulators, and wildlife enthusiasts, ensuring the continued viability of Aleutian cackling geese while decreasing negative impacts on agricultural businesses.

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