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Economic impacts of goose damage to agricultural operations in the southern Sacramento Valley

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Summary

Over 2.2 million geese rely on California's Central Valley for critical wintering habitat during the non-breeding season, with 80% over-wintering in the Sacramento Valley region. The wintering goose population has nearly doubled compared to estimates reported in 2006; notably, lesser snow geese make up over half of all wintering geese. In response, California hunting regulations have been expanded, including increased bag limits and the establishment of a Late Season. Despite management efforts, lesser snow goose populations remain consistently high and have resulted in conflicts with farming and livestock operations. Damage to winter crops (planted crops and pastures) by geese is not a new phenomenon in the Sacramento Valley, but many farmers and ranchers report that the problem has dramatically increased since 2018, with damages in 2023 the worst they have experienced. To quantify the financial impact that occurred in 2023 in Yolo, Solano, and Sacramento counties, we partnered with Agricultural Commissioners to survey farmers and ranchers of their losses and other costs due to geese. A total of 34 people responded to the survey, reporting impacts at 55 unique sites, 24 of which are located in Solano County, 17 in Sacramento County and 14 in Yolo County. The total value of reported losses was $8.199 million, of which $7.916 million accounted for direct losses of crops and pastures and another $282,900 in abatement and crop reseeding costs. The combination of drought impacts followed by extensive flooding in the winter of 2022-2023 likely contributed to a severe decline in traditional food resources for wintering geese in the Sacramento Valley, increasing their impact on pasture and crop fields. The extent and severity of this wildlife-human conflict signals the need for coordinated and broad-based programs that address both the populations of wintering geese and financial relief programs for affected agricultural operations.

Background on Wintering Geese in the Sacramento Valley

One of the world's largest assemblages of wintering waterfowl—nearly 1.5 billion ducks, geese, and swans--use California's Central Valley as critical habitat during the winter months. The majority of these individuals migrate long distances to reach more favorable winter climates in California from as far north as the Arctic Circle after the breeding season. Despite the significant amount of land conversion from native habitats to farmlands and cities in the Central Valley region, waterfowl find suitable habitat on managed farms and marshes during the winter months (CVJV 2020).

Because of the large disjunct habitats that migratory species rely on during a full-annual-cycle and the large impacts of human activity (i.e., harvesting pressures, habitat destruction, and climate change), conservation and management of waterfowl is guided by collaborative committees comprised of stakeholders, governments, academics, and non-profit agencies at various scales. At the continental scale, planning is guided by the 2012

North American Waterfowl Management Plan (NAWMP). Locally in the Central Valley, planning is led by the Central Valley Joint Venture (CVJV). The main objective of the CVJV is to identify and implement regional conservation and management efforts needed to facilitate robust waterfowl populations to support hunting and fulfill NAWMP goals (CVJV 2020).

The 2020 CVJV Implementation Plan has identified that of the 2.2 million wintering geese (lesser snow geese, Ross's geese, greater white-fronted geese, Aleutian cackling geese, and western Canada geese), 80% over-winter in northern portion of the Central Valley, also known as the Sacramento Valley. The overall goose population in the Central Valley has nearly doubled compared to population estimates reported in 2006 (CVJV 2020). Most species of North American geese have surpassed population objectives, most notably lesser snow geese (Anser caerulescens caerulescens), which make up over half of all wintering geese that utilize in the Sacramento Valley.

The rapid population growth of lesser snow geese can be attributed to several factors related to climate change, such as warmer temperatures on the Arctic breeding grounds and expansion of farms that provide ample food resources in proximity to breeding colonies (Mowbray et al. 2020). In response to increased numbers of wintering lesser snow geese in California, hunting limits have been set to 20 per day and a Late Season has been established, which permits the hunting of lesser snow geese after the traditional closing in late January (California Fish and Game Commission). Despite easing hunting regulations, lesser snow geese populations remain consistently high.

In the Sacramento Valley, wintering waterfowl and farmers have a strong tie to each other. Wintering waterfowl forage on waste agricultural grains from post-harvest rice and corn fields. They also consume seeds and green forage produced by seasonal wetlands and other managed wetlands within agricultural lands. Winter flood-up of harvested rice fields are an important management practice to significantly increase the foraging value of these fields. It is estimated that 95% of the total food energy for lesser snow geese is provided by flooded and unflooded post-harvest rice fields, however, management and water availability often determine the total food energy available for waterfowl in a given year. Drought conditions and management decisions have led to an overall reduction in the amount of rice produced and the amount of winter-flooded rice, which ultimately reduces the amount of food available for geese (CVJV 2020).

In addition, increased harvesting efficiency has reduced the amount of waste grain that is left after harvest. The CVJV reports that grain food supplies in the Yolo-Delta basins are commonly depleted by early February-March, at which time geese switch to green forage. Under a scenario of continued reduction of rice production and other threats to waterfowl foraging habitats, food resources are predicted to be depleted by early January in future years (CVJV 2020). In the Sacramento Valley, late winter is often when the human-wildlife conflict between farmers and lesser snow geese is the highest, as lesser snow geese forage and loaf in irrigated pastures and small grain crop fields in high numbers. According to farmers and ranchers in Yolo, Solano and Sacramento counties wintering geese typically begin appearing and causing conflict in late-December and remain through March, however, in 2023 many reported large populations of wintering geese persisting through mid-April.

Description of Impacted Area

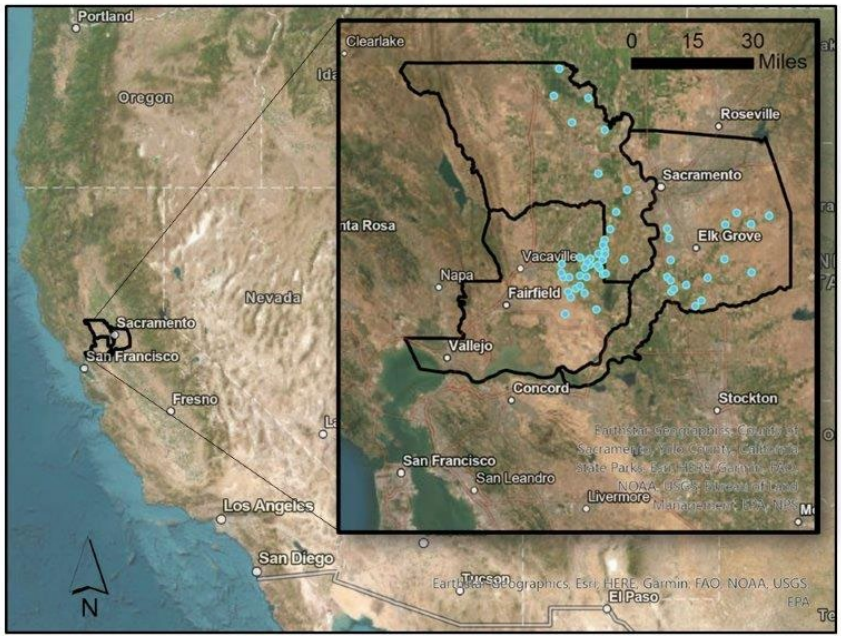
Prolonged extreme and exceptional drought conditions in Northern California from 2020 through 2022 (US Drought Monitor) severely limited or completely eliminated irrigation water allocations in many regions of the Sacramento Valley during the summer of 2022. As a result, rice production in 2022 was greatly reduced as many fields were left fallow. The combination of drought impacts followed by extensive flooding in the winter of 2022-2023 likely contributed to a severe decline in traditional food resources for wintering waterfowl in the Sacramento Valley, increasing their impact on pasture and crop fields. Such conflicts between waterfowl and agricultural operations was spread throughout the length of the Sacramento Valley and northern reaches of the San Joaquin Valley; however, the greatest impacts appear to have been concentrated in the areas of Solano, Yolo and Sacramento counties close to the Yolo Bypass. The predominant non-urban land use in these areas is diversified farming, dryland and irrigated pasture, wildlife habitat and combinations of wildlife habitat and agricultural operations. Primary cultivated crops in this region include rice, wild rice, wheat and other small grains, processing tomatoes, alfalfa, cereal forage crops (for silage and hay), corn, sunflower, wine grapes, almonds and walnuts.

Agricultural Impacts

Damage to winter crops by geese is not a new phenomenon in this three-county region of Sacramento Valley, but many farmers and ranchers report that the problem has dramatically increased since 2018, with damages in 2023 the worst they've experienced. To quantify the financial impacts on agriculture that occurred in 2023 in Solano, Yolo and Sacramento counties, UC Cooperative Extension partnered with county Agricultural Commissioners to survey farmers and ranchers of their losses and other costs due to geese.

A total of 34 people responded to the survey, reporting impacts at 55 unique sites, 24 of which are located in Solano County, 17 in Sacramento County and 14 in Yolo County.

Figure 1. Blue dots indicate locations of geese pasture or crop loss reported in the winter of 2023 in Yolo (top left) Solano (bottom left) and Sacramento (right) counties.



The total value of reported losses and other financial impacts was $8.199 million, of which $7.916 million accounted for direct losses of crops and pastures and another $282,900 in abatement and crop reseeding costs.

The largest financial impact was experienced in Solano County with $3.585 million in losses and costs, followed by Sacramento County at $2.935 million and Yolo County at $1.679 million (Figure 2).

The magnitude of losses in each county is largely due to the number of acres impacted by geese. Solano County accounted for 76.4% of impacted acres (44,883) while Sacramento and Yolo counties accounted for 14.1% (8,298) and 9.5% (5,603) respectively (Figure 3).

Figure 2. Total crop losses plus costs for each county in 2023.

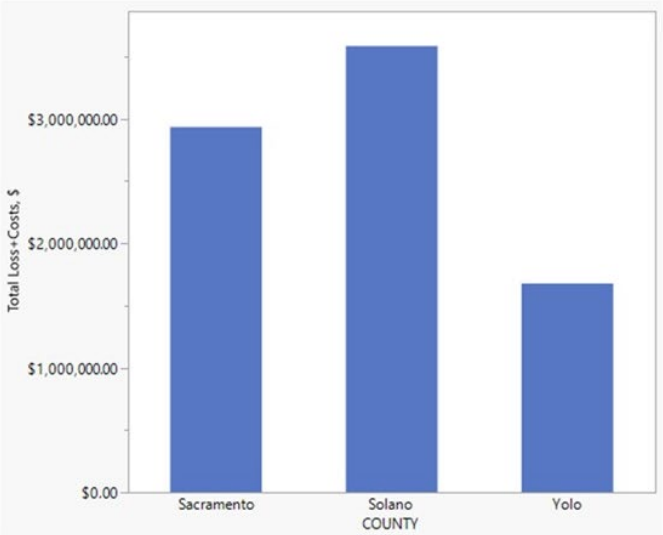
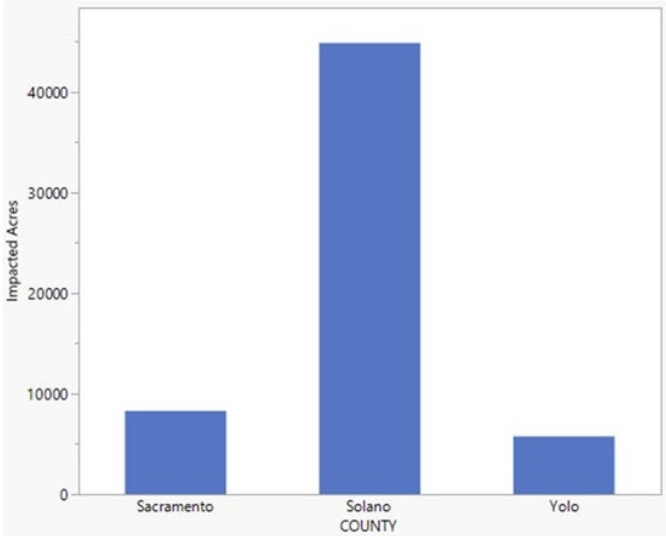
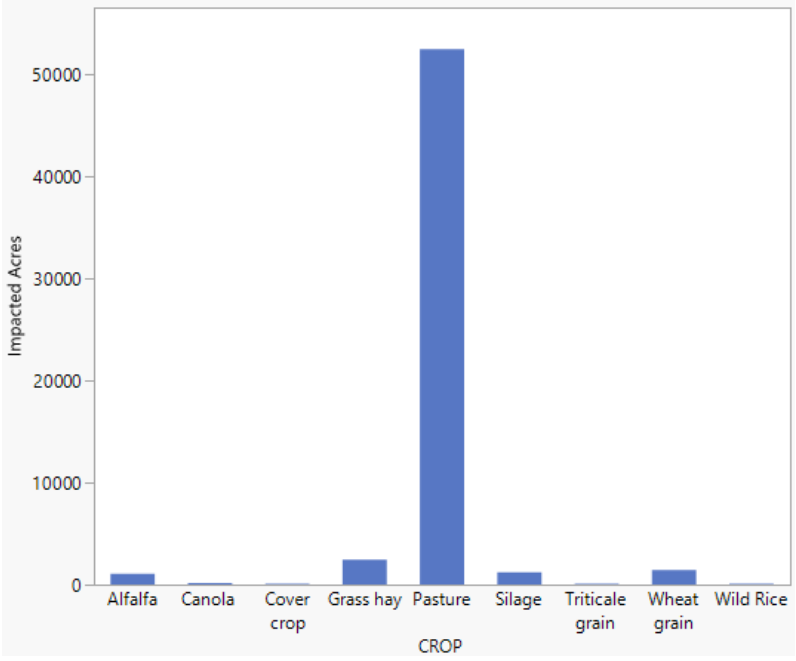


Figure 3. Number of acres impacted by geese in each county in 2023.



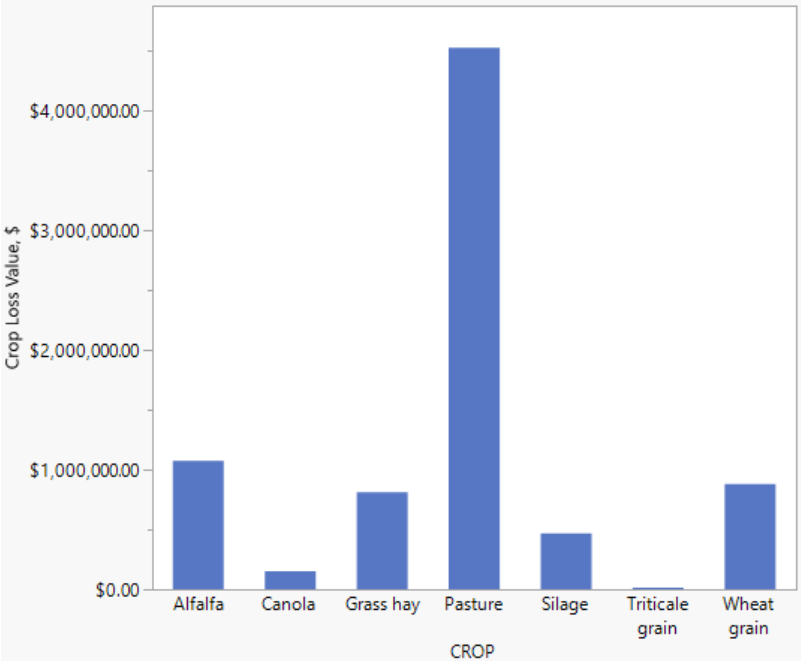
Another factor that may contribute to the differential impact in each county is the amount of land in a particular type of crop(s) that geese find favorable for foraging. While acreage of each crop type in the impacted areas of each county is not available, the acres of impacted crops (Figure 4) strongly suggests that pastures (dryland and irrigated) were favored by the geese.

Figure 4. Number of acres impacted by geese for each crop type in the three-county region in 2023. (Note: Unlisted crops were not impacted)



Consequently, the dollar value of losses due to geese impacts (Figure 5) was highest on pastures ($4.522 million), followed by alfalfa ($1.073 million), wheat ($880k), grass hay ($811k), silage ($467k), canola ($152k) and triticale ($13k).

Figure 5. Value ($) of losses for each crop in the three-county region in 2023.
(Note: Unlisted crops were not impacted)

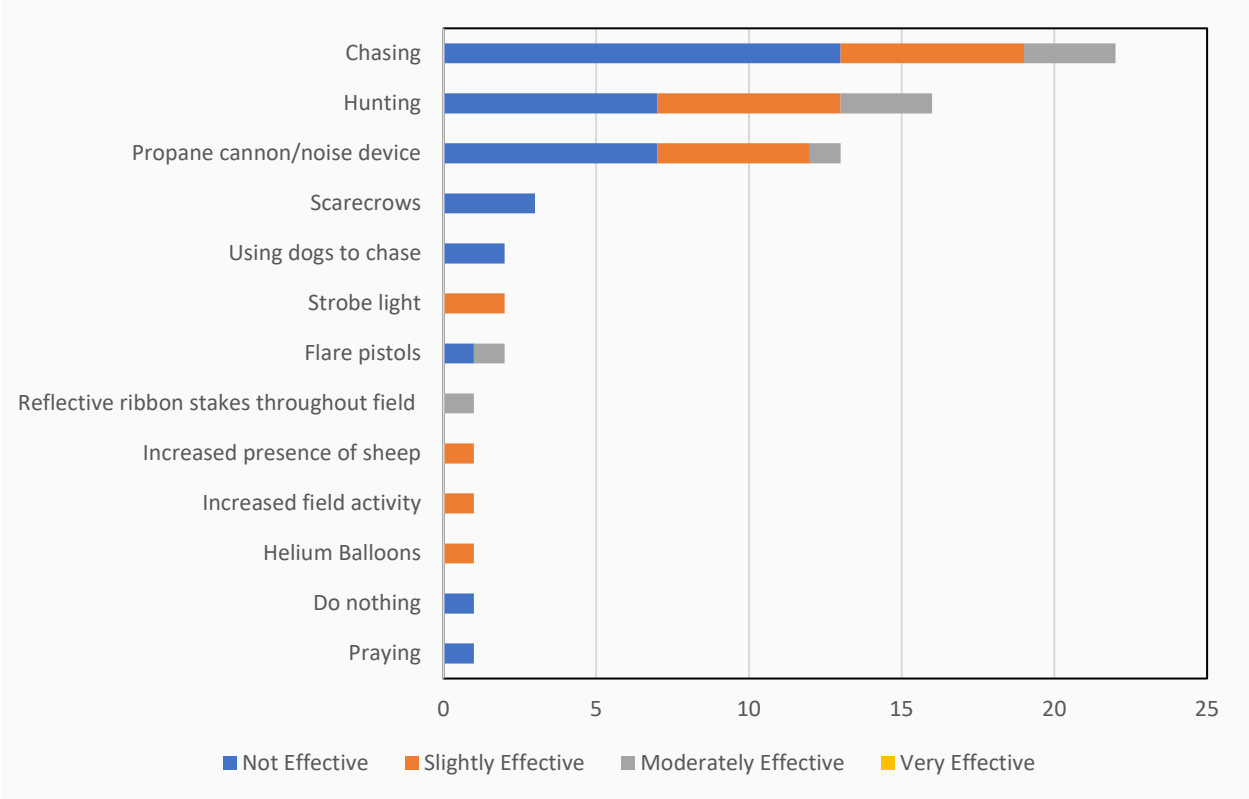


Ranchers also identified indirect impacts on grazing lands in other regions of the state as a result of the geese consuming so much of the forage resources near the Yolo Basin. With little forage available on pastures affected by geese in the spring months, which is when many livestock are moved to valley irrigated pastures, ranchers had to leave livestock on rangeland pastures elsewhere in the state beyond desired grazing thresholds. This not only depletes the forage base ranchers typically depend on in fall months when livestock are moved back to rangelands, but also has negative impacts on the rangeland ecosystems.

A condition observed by many farmers and ranchers, but not asked in the survey, is the preference geese have for foraging on young and tender crop shoots. This preference may explain the impact on pasture, alfalfa, wheat and other small-grain crops, all of which are typically short and succulent when geese arrive in December and January and are maintained in this condition as a result of their repeated foraging by geese. Un-grazed pastures and crops that were able to grow to about a 6 to 8-inch height prior to the arrival of geese were not impacted, suggesting that geese avoid high-stature vegetation. This avoidance may be due to decreased palatability of older vegetation, an inability to see potential predators hidden in the vegetation, or both. Further observations by ranchers indicate that once a pasture of high grass was grazed to a short stature by livestock, geese were likely to forage on the pasture. One rancher observed that some areas designated as and managed for waterfowl habitat actually had vegetation too high to attract wintering geese, which further concentrated geese on adjacent agricultural fields with more favorable conditions.

Throughout the winter and spring months of 2023 farmers and ranchers employed many strategies to abate the impact of geese on their crops. Figure 6 shows the list of reported abatement strategies and their effectiveness at reducing geese impacts.

Figure 6. Number of reported uses and effectiveness of abatement strategies.



None of the strategies were reported as being "Very Effective" and only nine (9) people reported strategies as being "Moderately Effective." Chasing the geese, typically on 4-wheeler vehicles, was the most common abatement strategy followed by hunting and noise devices such as propane cannons. People often reported, both in the survey and through personal communications, that the abatement strategies only temporarily moved the geese to an adjacent field. Only one person cited an abatement strategy as being very effective, which was an inflatable tube man, the kind that are inflated by a blower and flop erratically and are used to entice shoppers to a store, but required a generator to operate in the field (personal communication).

In addition to the direct financial losses caused by geese, several ranchers expressed concerns of the potential wildlife-to-livestock transmission of economically important diseases, some of which are also infectious to humans. The transmission of diseases from wild fowl to livestock (cattle and small ruminants) is well documented in scientific literature (Wiethoelter et al. 2015) and includes salmonellosis (diarrhea/sepsis), pasteurellosis (pneumonia), echinococcosis or cysticercosis (tapeworm cysts), leptospirosis (abortion/renal disease), avian influenza, toxoplasmosis (abortions), and chlamydiosis (causes abortions, infected joints of lambs, and pink eye). While there were no confirmed cases of actual transmission of such diseases from wildlife to livestock or to humans, it remains a concern which calls for vigilance by livestock producers, veterinarians, health care professionals and people working in areas impacted by large populations of geese.

Despite the severity of agricultural impacts caused by geese in 2023, affected farmers and ranchers had to absorb the totality of the losses and costs. Federal disaster programs that normally provide financial relief to farmers and ranchers impacted by weather events do not apply to crop damages and losses caused by wildlife. Crop insurance provided minimal relief as it covered crop losses in only 13% (7 of 55) of sites

impacted by geese, according to survey results, and crop insurance rules limit the type of crops covered and, in some cases, did not apply to such a localized event (personal communication).

The impacts of geese on agricultural operations have ranged from a nuisance to threatening the viability of agricultural enterprises. Exposure to damages from geese most likely depends on climatic conditions and the extent of crops deemed favorable by geese in high impact areas. Below is a sample of statements collected in the surveys that describe how farmers and ranchers were affected:

- "They (geese) are detrimental to our ability to produce food for the people in a cost-effective manner. Thus, they are making our carbon footprint bigger, by the use of chemical fertilizer, unnecessary production of hay, and hauling of cattle to feed."
- "Birds become used to noise, cattle, ATV chasing and just move one field over or barely move. I've had to purchase two loads of alfalfa every week since December 15 at $10,000 per load. That's 16 loads of hay at a cost of $160,000. I have never had to feed very much hay after December 15 in the past 35 years. This is enough to bankrupt a person."
- "This problem has increased in each of the past three years. 2023 was the first year the geese had any impact on the alfalfa, which was already significantly compromised due to excessive winter / spring rainfall over a long period. I am concerned that if we plant winter wheat the geese could completely destroy the crop."

While financial relief has generally not been available for crop losses due to geese, farmers and ranchers are forced to change some farming practices, such as switching to alternative crops that will not be impacted by geese. They also have proposed potential solutions to the problem, including:

- Expansion of federal disaster programs to cover crop losses due to wildlife and ensure agricultural viability. Although crop damage from geese is not a direct result of climatic effects, studies suggest a strong indirect link to climate change.
- Development of programs in which farmers and ranchers are paid for the ecosystem service they provide by feeding waterfowl.
- Increasing hunting limits and extending the hunting season.

Although the climatic impacts (severe drought in 2021-22 followed by flooding in 2022-23) on waterfowl-agriculture conflicts are only surmised, they were likely sufficiently significant to expect similar conflicts when similar climatic conditions occur in the future. In such circumstances, it would be helpful for agricultural organizations and agencies to communicate warnings of potentially high wintering goose populations to the agricultural community so that pre-emptive actions can be taken, such as planting alternative crops or early seeding of vulnerable crops.

California is not the only state suffering severe agricultural impacts from wintering geese, as demonstrated in common press articles that describe similar impacts occurring in Washington, Pennsylvania and mid-Atlantic states. The extent and severity of this wildlife-human conflict signals the need for coordinated and broad-based programs that address both management of populations of wintering geese and financial relief programs for affected agricultural operations.

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