SMART WILDLIFE MONITORING: EVALUATING A CAMERA TRAP ENABLED WITH ARTIFICIAL INTELLIGENCE

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About 89% of the Greater Yellowstone Ecosystem (GYE) is a working landscape comprised of multiple-use federal and state lands and privately owned ranches and farms, and most wildlife in the GYE depend on these open spaces that buffer Yellowstone and Grand Teton National Parks from more developed land. Wildlife-livestock conflicts in the GYE, including depredation, disease transmission, and resource competition, pose significant challenges to ecological and economic aspects of ranching operations, ultimately affecting the sustainability of the ranching operation as well as the preservation of wildlife in the GYE. Leveraging timely and precise data on wildlife activity, distribution, and their interactions with livestock could enhance ongoing conflict mitigation efforts and help sustain wildlife on working landscapes. We evaluated the potential of an artificial intelligence (AI)-enabled camera trap to limit false positive images and provide real-time monitoring of wildlife presence while reducing data overload. In Study 1, we compared the performance of a prototype, edge AI-enabled camera trap with 2 traditional, non-AI camera traps at 8 sites from mid-June through mid-September 2023 on 3 ranches in the Paradise Valley and Tom Miner Basin of the GYE in collaboration with ranchers who are actively facing issues of depredation and disease transmission. We also evaluated the influence of site-specific environmental conditions, including air temperature, wind speed, cloud cover, and vegetation type on camera trap performance. The AI-enabled camera trap captured fewer false positive images but exhibited a higher rate of missed detections compared to the traditional camera trap models. Across all 3 camera trap models, the probability of positive detections declined with warmer air temperatures and greater wind speeds. In Study 2, we compared the performance of a cellular-connected AI-enabled camera trap, equipped with an automated image processing and notification reduction workflow, to a traditional, non-AI, cellular-connected camera trap at 2 sites from mid-April to mid-June 2023 in the Paradise Valley. The AI-enabled, cellular-connected camera trap successfully sent real-time notifications of wildlife presence and transmitted dramatically fewer false positive images than the traditional cellular-connected camera trap. However, the AI-enabled camera trap sent substantially fewer notifications of positive detections than the traditional camera trap, apparently due, at least in part, to missed detections by the AI-enabled camera trap. These results demonstrate proof-of-concept for automated, real-time wildlife monitoring, and have additional implications for the use of camera traps as a survey tool for wildlife population estimates.