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Essential Contributions of Wildlife Health Surveillance to the United Nations Sustainable Development Goals

Liz P. Noguera Z[1,2], Jonathan M. Sleeman[2,3,4], Marcela M. Uhart[2,3,5], Claire Cayol[2,6], François Diaz[2,6], Diego Montecino-Latorre[2,7], Damien O. Joly[2,8], Sarin Suwanpakdee[2,4], Nicholas A. Lyons[2,9], Sarah H. Olson*[,2,7], Mathieu Pruvot[2,7,10]

Sarah H. Olson, Mathieu Pruvot, These authors contributed equally

[1] Center for the Advancement of Technology in Society and Industry (CATSI), Taiwan-Paraguay Polytechnic University

[2] Wildlife Health Intelligence Network (WHIN)

[3] World Organisation for Animal Health (WOAH) Working Group on Wildlife

[4] The Monitoring and Surveillance Center for Zoonotic Diseases in Wildlife and Exotic Animals (MoZWE), and Department of Clinical Sciences and Public Health, Faculty of Veterinary Science, Mahidol University

[5] Karen C. Drayer Wildlife Health Center, Latin America Program, School of Veterinary Medicine, University of California, Davis

[6] World Organisation for Animal Health (WOAH)

[7] Wildlife Conservation Society (WCS), Health Program, 2300 Southern Boulevard, Bronx, New York 10460

[8] Canadian Wildlife Health Cooperative (CWHC), Western College of Veterinary Medicine, University of Saskatchewan: 52 Campus Drive, Saskatoon, SK S7N 5B4, Canada

[9] Food and Agriculture Organization of the United Nations (FAO)

[10] Faculty of Veterinary Medicine, University of Calgary (UCVM)

Corresponding author: Sarah H. Olson, solson@wcs.org

Abstract

In response to the urgent need to protect the environment, economy, and society, the United Nations developed the Sustainable Development Goals in 2015. The Sustainable Development Goals expand on the Millennium Development Goals as part of the UN's broader effort to address global development needs. These goals aim to end poverty and other deprivations by improving health and education, reducing inequality, addressing climate change, and preserving oceans and forests.

Protecting wildlife health, which is intrinsically linked to ecosystem health, can enhance ecological resilience and support a sustainable future. Wildlife health surveillance is a vital tool for monitoring and mitigating health hazards and disease risks across species and ecosystems, contributing significantly to human, animal, and environmental health.

We have identified comprehensive ways in which wildlife health surveillance activities are essential to achieving the Sustainable Development Goals, particularly: Zero Hunger (SDG 2), Good Health and Well-Being (SDG 3), Clean Water and Sanitation (SDG 6), Decent Work and Economic Growth (SDG 8), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13), Life Below Water (SDG 14), Life on Land (SDG 15), and Partnerships for the Goals (SDG 17).

We highlight the importance of investing in and optimizing wildlife health surveillance to advance the global sustainability agenda. Sustainable surveillance systems tailored to local contexts are key to achieving the SDGs.

Keywords

Wildlife health; Wildlife health surveillance; Sustainable development goals; United Nations; Surveillance; One health; Ecosystem health; Planetary health; Wildlife health intelligence network; Global goals

Background

The United Nations Millennium Development Goals (UN MDGs) laid the groundwork for the Sustainable Development Goals (SDGs) by demonstrating the power of global collaboration in reducing poverty and improving health (1,2). Building on this foundation, the UN introduced the SDGs as a comprehensive framework to guide global efforts toward a more equitable, healthy, and sustainable world by 2030 (3). The 17 goals were created with the purpose of transforming the world by ending poverty and inequality, protecting the planet, and ensuring health, justice, and prosperity (4). In 2018, the UN highlighted the interdependencies of the environmental, social, and economic SDGs, and the need for more interrelated and less siloed pursuits of them (5). However, based on a 2024 SDG report, only 16% of the SDG targets are projected to be reached by 2030 globally (6). Most of the off-track targets are associated with the establishment of peace and robust institutions, or linked with socio-ecological systems, particularly food systems, sustainable usage of land, and biodiversity conservation.

While much attention has been paid to the inter-related human and environmental dimensions of the SDGs, the role of wildlife health surveillance (WHS) in advancing these goals, especially off-track targets, is largely underappreciated (7,8). Wildlife here refers to all non-domesticated living organisms that exist in natural or semi-natural conditions, whether free-ranging or under human supervision. It encompasses wild populations, species not bred for domestication, and includes both terrestrial and aquatic animalia life, (9). Understanding the health of these populations is essential for ecosystem monitoring and sustainable development (10,11).

WHS refers to the systematic monitoring of wildlife populations to detect and respond to health hazards, pathogens, diseases, or toxic agents in wildlife and their environment, track health trends, and understand the underlying determinants to gain crucial insights into the state of ecosystems and associated risks to human and animal health (12,13). WHS systems are fundamental to protect human, animal and environmental health, conserve biodiversity—inclusive of terrestrial and marine animals, and other life forms, such as invertebrates—as well as to support agriculture, and economic activities (14). Crucially, WHS goes beyond detecting the presence or absence of diseases in wildlife also assessing their resilience and capability to respond to change (15). WHS can also contribute to integrating Indigenous knowledge into decision making and co-management of wildlife populations and landscapes (16). Part of the importance of WHS lies in its ability to help address the interlinked and often overlapping challenges posed by anthropogenic biodiversity loss, climate change, zoonotic diseases, and environmental degradation.

Furthermore, healthy wildlife populations contribute to the stability of ecosystems and the provision of critical ecosystem services, such as pollination, pest control, seed dispersal, herbivory control, and soil fertility (17). Wildlife health is intrinsically linked to biodiversity conservation, and a decline in the health of wildlife populations can signal larger environmental issues that threaten both natural resources and human health (15). Consequently, the health of wildlife populations can also serve as an early warning system for broader ecological and health issues, providing valuable data for decision-making in conservation, public health, and sustainable resource management. Through WHS, we can better understand the state of ecosystems, the pressures they face, and the impacts of these changes on human well-being. Despite this, WHS is rarely considered as a tool to support progress towards achieving the SDGs, partly because of limited awareness of decision makers, fragmented responsibilities across sectors, funding and capacity limitations, and lack of appreciation for the contributions it can make (3,18–21).

This paper explores the vital contribution of WHS to the achievement of the SDGs, with a particular focus on SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work and Economic Growth), SDG 12 (Responsible Consumption and Production), SDG 13

(Climate Action), SDG 14 (Life below Water), SDG 15 (Life on Land), and SDG 17 (Partnerships for the Goals). Using illustrative examples, we examine the ways in which WHS supports these goals. We highlight the importance of investing in WHS systems to support achieving the broader sustainability agenda. We also propose strategies for growing and enhancing WHS as a tool for advancing the SDGs.

The Role of Wildlife Health Surveillance in Sustainable Development

The contributions of WHS to the SDGs are broad and extend well beyond SDG 14 (Life Below Water) and SDG 15 (Life on Land), as demonstrated below. Additional examples are included in the Supporting information (Table 1).

SDG 2: Zero Hunger

WHS contributes to SDG 2 by securing, increasing, and protecting food sources, including wild and domesticated species, for consumption and trade through several direct and indirect mechanisms.

Wildlife consumption plays a critical role in food security for many Indigenous and rural communities, particularly in remote regions where access to market-based food systems is limited or unaffordable (22,23). It also aligns with the principles of food sovereignty, which affirm the right of Indigenous and rural communities to define their own food and agriculture systems through sustainable, locally rooted practices that support equitable conservation (24). WHS is a vital tool for ensuring the safety of food systems by preventing food-borne illnesses and safeguarding food resources that are deeply embedded in local diets and traditions (25,26).

As part of WHS in monitoring the health of harvested wildlife, participatory approaches that engage communities in surveillance efforts can enhance early detection of health threats for both wildlife and consumers, while reinforcing local stewardship and food sovereignty. Participatory epidemiological methods in wildlife-livestock interactions have helped identify priorities and capture traditional knowledge of local and Indigenous communities as well as early risks to their food security and safety (27,28). For example, Indigenous ecological knowledge has provided vital information on the health of the Eastern Beaufort Sea beluga population, and when combined with western science, has helped develop indicators of beluga condition, illness, and disease (29). This knowledge also underpins the beluga whale (*Delphinapterus leucas*) harvest monitoring program in the Inuvialuit Settlement Region in the Canadian Arctic, demonstrating how epidemiological work can directly support culturally grounded, community-led conservation and food safety efforts (29). WHS and Indigenous ecological knowledge can be synergized to support food security by combining disease monitoring with sustainable, culturally informed resource management.

WHS provides early warnings of highly transmissible livestock diseases that threaten food systems including transboundary diseases. These include foot-and-mouth disease, peste des petits ruminants (PPR), lumpy skin disease, sheep and goat pox, bovine ephemeral fever, rift valley fever, high pathogenicity avian influenza, classical and African swine fever, among others (30,31).

Small ruminants are an important determinant of food security, particularly for smallholder farmers, but are vulnerable to the devastating effects of PPR which also affects wild artiodactyls (32). Caused by the morbillivirus peste des petits ruminants' virus (PPRV), mortality rates in domestic small ruminants may exceed 90%, particularly in immunologically naïve, malnourished and stressed populations (33). In endemic settings, the clinical signs can be non-specific while causing chronic loss of newborn animals as the virus circulates and persists in populations (34). Economic losses are estimated at US$1.5 to 2.1 billion per year in locations where 80% of the world's 2.1 billion sheep and goats are raised to provide livelihoods for more than 330 million of the world's poorest people (35). Experiences in Asia suggest that wildlife can be adversely affected by the continuing presence or incursion of PPR from livestock with severe, periodic mortality events (34).

The adverse impacts of PPR on wildlife populations and wildlife conservation efforts are greater than previously recognized. For example, outbreaks in Mongolia during 2016–2017 resulted in an estimated 80% decline in the endangered Mongolian saiga antelope (*Saiga tatarica mongolica*) population and it could likewise negatively impact other wildlife that are harvested for food (32). Furthermore, eradication efforts in livestock may be hampered by the occurrence of PPR in susceptible wildlife populations. Consequently, wildlife must be considered and integrated within the PPR Global Eradication Program (GEP) if global freedom of the disease is to be achieved, and ongoing surveillance for PPR in wildlife is critical to its success (36). Beyond PPR, WHS more broadly supports SDG 2 by preventing disease-related disruptions to food systems and promoting resilient sources of nutrition.

SDG 3: Good Health and Well-Being

The link between wildlife health and human health is increasingly evident, particularly through the emergence of high consequence zoonotic diseases (37). Like domestic animals, wildlife species can be sources of pathogens for humans, such as Ebola virus, human immunodeficiency virus (HIV), and more recently, SARS-CoV-2 (38,39). WHS is crucial for the prevention of such threats, by detecting pathogens in wildlife before they spill over into human populations and planning interventions that prevent human exposure. WHS systems can act as an early warning mechanism, helping to prevent or minimize public health crises. For example, Hantavirus, carried by wild rodents, can cause a fatal respiratory disease called Hantavirus Pulmonary Syndrome (HPS) in humans (40). Environmental monitoring and rodent population tracking in endemic areas of Argentina have helped detect early hantavirus outbreaks, prevent HPS, and issue public warnings (41).

Consequently, WHS is considered an essential tool for pandemic prevention considering that 71.8% of zoonotic emerging events are caused by pathogens with wildlife origin (42,43). The World Health Organization (WHO) proposed a list of viruses that, according to public health experts, require the most urgent research and development preparedness (44). Among those listed, emerging coronaviruses, filoviruses (e.g., Ebola virus, Marburg virus), and Nipah virus, have confirmed wildlife origins.

Moreover, a healthy environment contributes significantly to human health and well-being in many other ways (45). Activities in nature such as hiking, climbing, earthing, and forest bathing can contribute significantly to improving mental and physical health (46,47).

In addition to these recreational benefits, wildlife species also hold deep cultural, spiritual, and heritage significance for many communities worldwide, particularly Indigenous Peoples (embodied in totems, rituals, legends, and intergenerational bonds) (48). For these communities, identities, traditions, and knowledge systems are closely tied to the presence and well-being of local fauna.

In addition, this closer contact to nature, makes us also more exposed to vectors and vector-borne diseases from wild competent hosts (e.g., Lyme disease, rickettsial diseases, West Nile Virus), and other infectious diseases with zoonotic potential (leptospirosis, viral hemorrhagic fevers, and endemic mycosis

Moreover, increased proximity to natural environments heightens our exposure to vectors and vector-borne diseases transmitted by wild competent hosts (e.g. Lyme disease, rickettsial infections, and West Nile Virus). This close interaction also raises the risk of contracting other infectious diseases, including leptospirosis, viral hemorrhagic fevers, and endemic mycoses (49,50). Therefore, monitoring wildlife and pathogens in protected and conserved areas where people recreate is essential to foster both the conservation of wild populations and the health of people, through appropriate preventive measures.

SDG 6: Clean Water and Sanitation

Wildlife can serve as sentinels of environmental pollutants in freshwater and marine environments through observable changes in behavior, migration patterns, and physical structures like nests, hair, and eggshells, which reflect the presence and impact of environmental contaminants (51–53). Also, information from carcasses or processed products, e.g. marine mammal species have been excellent sentinels of persistent halogenated organic compounds, including pesticides, due to their high trophic level, large lipid-rich blubber stores, and long lifespans (54,55). Researchers in Southern California cataloged a broad range of compounds in the blubber of five marine mammal species (*Delphinus bairdii*, *Delphinus delphis*, *Grampus griseus*, *Zalophus californianus*, and *Phoca vitulina*), providing insights into water quality (56). Similarly, tissue of carnivorous freshwater fish in the Amazon indicated mercury pollution levels exceeded recommended levels and informed nutritional consumption guidelines on a species-by-species basis (57).

Humans and wildlife are also exposed to low levels of chemical compounds or toxins (e.g., pesticides, heavy metals, and persistent organic pollutants such as PFAS, PCBs and dioxins) that can disrupt hormone functions, interfere with the endocrine system, weaken the immune system, or cause cancer and other chronic health issues (53,58). An inventory of anthropogenic and natural chemicals bioaccumulated across species would allow for the selection of optimal indicator species for both retrospective and proactive detection efforts, and the establishment of species-specific benchmarks based on wildlife exposure outcomes (53,56). Such work could provide evidence of the need for more stringent water quality and waste management practices.

WHS can also help identify and monitor emerging water-borne health threats. For example, microplastics are increasingly recognized as an emerging threat to human health primarily because of their ubiquitous presence, long-term environmental persistence, and propensity for cellular and immune disruption, suggested to harm reproductive, digestive and respiratory health and are potentially associated with colon and lung cancer (59,60). A widely studied species used in microplastic monitoring is the mussel (e.g., *Mytilus edulis*, the blue mussel). Mussels are stationary organisms that filter large volumes of water daily, trapping particles, including microplastics, making them excellent and accurate indicators of local environmental contamination, which is essential for WHS (61). WHS can contribute to a more comprehensive monitoring of water quality and beyond.

SDG 8: Decent Work and Economic Growth

WHS plays a critical role in achieving SDG 8 by providing information to safeguard ecosystems that underpin economic activities, particularly in rural and developing regions. Healthy wildlife populations support ecotourism, agriculture, and livelihoods that depend on biodiversity, including hunting and trapping of wildlife for food and fiber (e.g. qiviut from wild muskoxen—*Ovibos moschatus*) (62–64). Since wildlife also depends on healthy habitats, WHS also serves as an essential tool for informing on ecosystem integrity, which is vital for sustainable tourism and resource use.

Nature-Based Tourism (NBT) is an essential factor for the development of low-income countries. According to the World Bank's 20th edition of the Rwanda Economic Update, NBT bears the potential to increase Rwanda's economic growth (65). In this country, NBT generates an estimated 80% of the foreign exchange earned from the whole tourism sector. Its contribution to job creation is quantifiable: for every $1 million (about RWF 1,050 million) that NBT activities inject into the Rwandan economy, 1,328 new jobs are created, providing employment to local people, including rangers, guides, trackers, veterinarians, and hospitality workers (65).

The primary tourist activity is viewing mountain gorillas (*Gorilla beringei beringei*) in Volcanoes National Park (66,67). However, mountain gorillas are highly susceptible to human diseases due to genetic similarity and close contact with tourists and staff (68). To protect both the gorillas and the tourism-based economy, extensive WHS is conducted by organizations like the Gorilla Doctors and conservation authorities (69,70). This includes daily health monitoring, regular collection of biological samples, rapid veterinary response to health issues, contingency planning, occupational health care provided for the park staff, and access to health care for local community members contingency planning, occupational health care provided for the park staff, and access to health care for local community members (71,72). These efforts help maintain healthy gorilla populations, which in turn sustain tourism revenues and job creation (73). By protecting the health of an endangered species that drives a major economic sector, WHS in the mountain gorilla context exemplifies how conservation and health monitoring intersect to support decent employment and sustainable economic growth.

SDG 12: Responsible Consumption and Production

Public health frameworks focus on disease prevention and biosecurity, especially given zoonotic risks linked to wildlife trade (74). Meanwhile, Indigenous communities emphasize subsistence, stewardship, and sovereignty, advocating for the integration of traditional knowledge in wildlife management (75). These tensions are debated in international policy platforms, where longstanding efforts aim to balance responsible consumption, biodiversity conservation, and equity (76,77). WHS can inform these debates and support SDG 12 by promoting sustainable resource (providing data on wildlife population health) use and culturally appropriate practices (incorporating Indigenous and local knowledge systems, ensuring ethical engagement with communities and alignment with cultural values) (78).

Sustainable resource management requires understanding the trend and health of wildlife populations, as overexploitation and unsustainable practices can lead to the depletion of wildlife resources and associated ecosystem services. Wildlife health is a significant contributor to population dynamics, which is why WHS supports the development of policies and practices that ensure the responsible use of natural resources and promote sustainable production and consumption.

Wildlife, which also includes fish harvest economies, sits at the intersection of food security and biodiversity conservation. The annual harvest of wildlife for human consumption, estimated to be worth several billion dollars globally, is a vital protein source for hundreds of millions of impoverished rural people with no access to other protein sources (79). Over-harvesting (e.g., hunting, fishing, logging, and gathering of plants and animals) poses significant harm to biodiversity in Africa, Asia, and Latin America and to the nutritional health of those living in subsistence communities (80–82). For example, deforestation and wildlife exploitation in the Amazon and other tropical forests in Latin America have contributed to the decline of species that are vital to the nutrition of Indigenous and rural communities, while also eroding over 12,000 years of ancestral knowledge (83).

Public health risks are present along the wildlife value chain because of the potential for high-risk viral spillover, which can be amplified when animals are kept alive (79). The wildlife value chain is initiated at time of harvesting or farming of wildlife, through traders and processing, and ends with delivery to the final consumer (84,85). The emergence of SARS-CoV-2 from the Huanan Seafood Market, where live mammals were traded, exemplifies how wildlife markets can facilitate viral spillover and underscores the need for strict surveillance and regulation across the wildlife trade chain (86).

Wild meat is an important source of food for rural communities in the Republic of Congo and across the Congo Basin (87). However, consumption of wildlife has resulted in Ebola virus spillover and subsequent outbreaks in humans driven by human-to-human transmission, with high levels of mortality in people (88,89). In response, scientists from the Wildlife Conservation Society (WCS) and National Institutes of Health (NIH) partnered with the Republic of Congo Ministry of Health to develop a low-cost educational outreach program and surveillance system for wildlife mortality through the training of local villagers to identify and promptly report carcasses of wildlife species hosts (e.g., gorillas, chimpanzees, duikers, and other mammals species) for Ebolavirus testing (90). The training also emphasizes that the carcass should not be touched to prevent potential pathogen spillover into the human population. When paired with community-led sustainable management of hunted species, this surveillance system allows for the safer and responsible harvesting of wildlife.

SDG 13: Climate Action

Climate change has significant implications for wildlife health, as it alters habitats, affects food availability, and modifies host-pathogen-environment determinants of disease with the potential to increase the spread of vectors and diseases (91). WHS provides critical information about how wildlife populations are responding to climate-induced stressors. These data help scientists and policymakers understand the broader impacts of climate change on biodiversity and ecosystems, and risks to livestock and public health.

Climate change can shift host-pathogen interactions that can affect disease dynamics and facilitate changes in disease distribution and pathogen spillover. Climate change has already contributed to the expanded range of ticks that transmit *Borrelia burgdorferi*, the bacterial pathogen that causes Lyme disease in humans (92–95). The ticks now occur in areas of Canada and Europe where they were previously unable to survive (96,97). Modeling suggests that resulting warming temperatures will continue to increase suitable tick habitat in North America and Europe, and therefore, increase the risk of Lyme disease and other tick-borne diseases (98,99). Monitoring wildlife, their pathogens, and their distribution shifts due to climate change, can provide an important tool to forecast the potential spread of diseases and assess risks to humans.(100).

WHS further helps understand the many unknowns about the impacts of climate change that may affect the health of wildlife: shifts in home range, shifts in phenology, thermal mis-adaptation; and other connections between climate, ecosystems, and wildlife and human populations (101–103).

SDG 14: Life Below Water

The ocean is estimated to contribute about half of the oxygen generated on Earth (104). Marine wildlife, from microalgae to whales, play a crucial role in carbon sequestration and nutrient provision (105,106). Healthy marine wildlife contributes to reducing the accumulation of human-produced greenhouse gases in the atmosphere. Preserving and restoring marine ecosystems is essential not only for ocean health and human livelihoods but also for maintaining the overall stability of Earth's climate system (107).

Surveillance systems are needed to monitor the health of marine species, such as fish, sea turtles, marine mammals, and invertebrates and coral reefs to detect signs of disease, pollution, or population stress (108,109). Early detection enables rapid assessment and tracking of threats such as viral infections (e.g., morbillivirus in dolphins) or bacterial outbreaks affecting shellfish, that may result in the implementation of management actions aimed at mitigating large-scale wildlife mortality and preserve biodiversity (110,111).

For example, coral reefs are among the most biologically diverse and valuable ecosystems, often referred to as the "rainforests of the sea." They provide critical habitat for approximately 25% of all marine species, including fish, invertebrates, and marine mammals, despite covering less than 1% of the ocean floor (112). Beyond biodiversity, coral reefs deliver vital ecosystem services to millions of people worldwide. They support coastal fisheries, protect shorelines from erosion and storm surges, sequester carbon, buffer ocean acidity, and contribute significantly to the economy through tourism and recreation (113). However, coral reefs are highly sensitive to environmental change and are increasingly threatened by climate change and consequent acidification, pollution, overfishing, and disease (114,115). Protecting coral reefs is essential not only for marine life but also for the health, food security, and livelihoods of human communities around the world, illustrating the vital role of disease surveillance for the health of coral reefs.

The use of standardized approaches and artificial intelligence-based (AI) systems using drones for monitoring coral reef health is increasing, with AI treatment of remotely sensed information offers essential information mostly in areas that are challenging to access or cover with manual surveys (116–118). AI systems can detect coral bleaching, assess reef health, and predict future impacts, aiding in adaptive management and conservation efforts (119,120). However, as emphasized in decisions by the United Nations Environment Programme (UNEP) and the Convention on Biological Diversity (CBD), the deployment of AI technologies must also incorporate environmental safeguards to ensure that their use aligns with ecological integrity and sustainability goals (121,122). By integrating WHS into marine ecosystem monitoring with the help of advanced tools, we can better detect emerging threats and support holistic conservation strategies aligned with SDG 14.

SDG 15: Life on Land

Biodiversity loss is one of the most pressing environmental challenges of our time, and WHS is a critical tool for monitoring and conserving biodiversity (123,124). Healthy wildlife populations are integral to the functioning of ecosystems and the preservation of biodiversity (125). By tracking the health of wildlife species, experts can better assess ecosystem health and identify areas in need of conservation. Moreover, wildlife health can signal broader environmental tipping points, as seen in the Kaziranga–Karbi Anglong landscape in Assam, India, where deforestation and biodiversity loss are linked with an increasing disease risks and human-wildlife conflict, highlighting the need for integrated policies that address land use, infrastructure, and public health alongside conservation (126).Beyond species declines due to habitat loss, overharvesting and other anthropogenic actions, infectious and non-infectious diseases (see Fig. 1 in Supporting Information) are increasingly threatening wildlife, causing marked declines in populations and even extinction (127). This requires robust WHS to help protect endangered species (37).

For example, black-footed ferrets (*Mustela nigripes*) were once abundant across the North American Great Plains, relying almost exclusively on prairie dogs (genus *Cynomys*) as both a primary food source and habitat engineers (128). However, by the mid-20th century, black-footed ferret populations plummeted due to widespread prairie dog eradication, habitat loss, outbreaks of sylvatic plague (*Yersinia pestis*) and canine distemper virus (129). Considered extinct in the wild by 1987, a small remnant population was rediscovered and became the foundation for intensive captive breeding and reintroduction efforts. Despite progress, plague remains a critical barrier to the recovery of black-footed ferrets. Sylvatic plague, transmitted by fleas, affects both ferrets and their prairie dog prey, decimating entire colonies and leaving ferrets without food or shelter. Surveillance for this disease is therefore essential not only for ferret survival but also for ensuring the resilience of grassland ecosystems and stabilizing the broader prairie ecosystem. Prairie dogs, although often maligned as pests, are keystone species that influence soil health, vegetation patterns, and biodiversity (130). Their burrowing aerates the soil and improves water infiltration, while their colonies support a wide range of other species such as burrowing owls, swift foxes, and various invertebrates (131).

SDG 17: Partnerships for the Goals

WHS is crucial to One Health and Planetary Health approaches, which acknowledge the interconnections between the health of all life on Earth (12,132). Through WHS, we can gain a clearer understanding of the epidemiology of wildlife diseases, and the ecological factors that shape disease dynamics and ultimately affect ecosystems. Moreover, WHS enables responses to health hazards by supporting integrated risk assessment, coordinated action, and evidence-based decision-making across sectors (132).

Connecting public health, veterinary, and environmental agencies supports SDG 17's aim of enhancing policy coherence and institutional partnerships and the coordinated multisectoral surveillance called for under Article 4 of the Pandemic Agreement (133). Wildlife veterinarians, epidemiologists, and ecologists play important roles in endeavors such as WOAH's Working Group on Wildlife and the One Health High Level Expert Panel, led by the Quadripartite (comprising WOAH and the United Nations agencies: FAO, UNEP, and WHO) which was created to prevent future pandemics and to promote health globally and sustainably through the One Health approach (134,135). Consequently, the wildlife health sector is a critical partner in these multilateral and multidisciplinary initiatives, and efforts must be made to ensure the environmental sector is an equitable partner for wildlife health (136,137).

Cross Cutting Activities

WHS also spans several other SDGs. For example, WHS aims to achieve biodiversity conservation by tracking the health of wild species, taking corrective actions to reduce threats on wildlife and ecosystems, and informing conservation efforts to protect these species, their habitats and foster peace keeping initiatives in protected areas (e.g. "peace parks) (124,138).

Healthy wildlife is essential for ecosystem services, helping to sustain ecological balance and maintain functional ecosystems and reducing the risk of diseases (139,140), all of which contribute to SDGs 11, 12, 13, 14, 15, 16 and 17.

Discussion

Despite its critical importance, WHS faces several challenges. Many countries lack the technical capacity, funding, and trained personnel needed to monitor wildlife diseases effectively (20,141,142). Disease surveillance systems, when present, are often fragmented, with limited coordination between sectors (e.g., public health, agriculture, environment) and insufficient data-sharing mechanisms (143). Data-sharing mechanisms are frequently inadequate, limiting the integration of surveillance outputs into broader One Health frameworks (144). Additionally, in remote or biodiversity-rich areas, logistical difficulties and limited infrastructure can hinder sample collection, transport, and analysis. Political instability, lack of legal frameworks, and inconsistent long-term funding further constrain sustained efforts.

To address the multifaceted barriers to WHS, a combination of coordinated, inclusive, and context-sensitive strategies is essential. Strengthening coordination through standardized methodologies, cross-sectoral collaboration, and harmonized data sharing helps overcome fragmentation and inefficiencies (145). Implementing culturally sensitive, community-based surveillance that actively engages Indigenous Peoples, hunters, and local stakeholders fosters trust and ensures ethical, locally relevant practices (146). Transparent communication and participatory decision-making foster public confidence and reduce resistance to interventions (12). Integrating surveillance into value chains by mapping human-wildlife-livestock interfaces and recognizing the socio-economic and intrinsic value of wildlife as a 3.6 billion-year evolutionary heritage, enhances sustainability and policy relevance of WHS initiatives (147). Addressing these barriers requires strong international cooperation and governance. Global threats such as pandemics, emerging zoonotic diseases, ecosystem collapse, and biodiversity loss demand transboundary solutions.

A collaborative initiative such as the Wildlife Health Intelligence Network (WHIN) is a new and promising community of practice to support sharing resources, leveraging common training materials, and harmonizing data collection and reporting protocols for wildlife health surveillance (135). In parallel, the One Health Quadripartite Alliance plays a pivotal role in strengthening WHS by promoting integrated approaches to detect and prevent zoonotic spillovers at the human-animal-environment interface (134). Such initiatives (WHS and One Health Alliance) are essential to harnessing the full benefits of WHS in advancing the SDG across countries and sectors.

Technological innovations are transforming surveillance capabilities. Tools such as remote sensing, AI-driven data analytics, genomic sequencing, and portable diagnostics enable faster, more accurate detection of wildlife diseases in the field (116). Mobile apps, real-time reporting platforms, and WHS-dedicated data services also facilitate communication between local communities, researchers, and policy makers (e.g. WHISPers, the Health and Wildlife Knowledge database [HAWK database]) (148,149). These technologies offer new opportunities to integrate wildlife health data into global environmental and public health monitoring systems, supporting SDGs by enabling early detection of zoonotic diseases (SDG 3), informing climate-related biodiversity responses (SDG 13), enhancing marine ecosystem health assessments (SDG 14), and strengthening conservation efforts for terrestrial ecosystems (SDG 15).

Governments and international bodies should invest in building and maintaining robust WHS infrastructure, particularly in biodiversity hotspots at the human-livestock-wildlife interface, as a strategic starting point. This includes funding for laboratories, training personnel, and developing standardized protocols for disease detection and data management and reporting (150). Further, local and Indigenous communities are often the first to observe changes in wildlife behavior and health. Their ecological knowledge can complement scientific data and strengthen early warning systems (151). Policies should recognize, support, and integrate these communities as partners in surveillance and decision-making, and engage in substantive dialogue around co-management, food sovereignty, and protection of all species on the land (152).

Recognizing implementation gaps in WHS, the Wildlife Health Intelligence Network (WHIN) was established in 2022 (19). WHIN is a consortium of individuals and organizations that acknowledge the need for collaborative efforts to scale WHS globally, beyond the capacity of any single group or organization. WHIN aims to bridge various disciplines and scales to identify evidence-based, collaborative solutions to address the gap between international guidelines for WHS and field implementation (19). WHIN is designed to be a pathway to mainstream WHS faster and wider by filling in the critical gaps from local-to-global implementation of WHS systems (19,153). WHIN seeks to expand WHS to address nature-centered priorities. WHS is key to identifying environmental drivers of wildlife health and their impact on conservation, animal, and public health, critical for advancing One Health beyond its current zoonotic disease focus, essential steps toward achieving the SDGs (19).

Conclusion

WHS is a critical tool for achieving multiple SDGs. It safeguards biodiversity (SDG 14 & 15), prevents zoonotic disease spillover (SDG 3), supports food security (SDG 2), promotes resilient ecosystems (SDG 13), and enables informed policy through data (SDG 17). As a cornerstone of both One Health and Planetary Health, WHS serves as a strategic bridge between conservation, health, and human development goals. To fully realize these benefits, governments, international organizations, researchers, and communities must work together to scale up WHS efforts. This includes securing sustainable funding, strengthening global partnerships, leveraging technology, and fostering inclusive governance. Investing in wildlife health today is an investment in a safer, healthier, and more sustainable future.(154–212)

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Author Contributions

Conceptualization: LPNZ, JMS, MMU, CC, FD, DM, DOJ, SS, NAL, SHO, MP. Methodology: LPNZ, JMS, MMU, CC, FD, DM, DOJ, SS, NAL, SHO, MP. Investigation: LPNZ, JMS. Writing - Original Draft: LPNZ, JMS. Writing - Review & Editing: LPNZ, JMS, MMU, CC, FD, DM, DOJ, SS, NAL, SHO, MP. Visualization: LPNZ. Supervision: SHO, MP. Project administration: LPNZ. Funding acquisition: SHO, MP

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Ethics, Consent to Participate, and Consent to Publish declarations

Not applicable.

Competing Interest Declaration

There are no competing interests.

Abbreviations

CBD Convention on Biological Diversity

FAO Food and Agriculture Organization of the United Nations

GEP Global Eradication Program

HABs Harmful Algal Blooms

HPS Hantavirus Pulmonary Syndrome

MDGs Millennium Development Goals

NBT Nature-Based Tourism

NGS Next-generation sequencing

NIH National Institutes of Health

OH One Health

OH JPA One health Joint Plan of Action

PH Planetary Health

PHA Planetary Health Alliance

PPR Peste des Petits Ruminants

RWF Rwandan Francs

SDG Sustainable Development Goals

TEK Traditional ecological knowledge

UN United Nations

UNEP United Nations Environment Programme

WCS Wildlife Conservation Society

WEII Wildlife Economy Investment Index

WHIN Wildlife Health Intelligence Network

WHO World Health Organization

WHS Wildlife Health Surveillance

WOAH World Organisation for Animal Health

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