

Guidelines for Wildlife Disease Outbreak Investigation



World Organisation
for Animal Health

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Contents

Foreword	4
Acknowledgements	5
1. Purpose and scope of these guidelines	6
2. Introduction to outbreak investigations	7
3. Preparedness for wildlife disease outbreak investigations	7
4. Wildlife disease outbreak field investigation procedures	10
5. Outbreak investigation procedures: step by step	11
1. Event detection: observation or reporting of sick, dying or dead wildlife	13
2. Verify the outbreak, collect the data	14
3. Establish and potentially confirm the diagnosis: laboratory investigation	15
4. Establish a case definition	17
5. Organise and analyse data	17
6. Conduct a rapid risk assessment	18
7. Implement immediate or preliminary control measures	20
8. Establish disease surveillance and monitoring	21
9. De-escalation, recovery and evaluation	22
6. Translating these guidelines into a local protocol	23
References	24
Annex 1. Disease triangle	26
Annex 2. Further resources	27

Foreword

Wildlife health is an integral part of animal health and a cornerstone of the One Health approach. As interactions among wildlife, domestic animals and humans continue to intensify, the timely detection and effective investigation of wildlife health events have never been more important. Through its international standards, scientific expertise and support to Members, the World Organisation for Animal Health (WOAH) is committed to strengthening wildlife health systems and bolstering international collaboration to better prevent, detect and respond to wildlife health threats.

Disease outbreaks in wildlife are often complex to investigate. They occur in dynamic ecosystems, may involve multiple species and require effective multisectoral and multidisciplinary coordination. Outbreak investigations are essential not only for understanding the causes of health events and guiding appropriate responses, but also for generating the evidence needed to strengthen preparedness and support upstream prevention.

This concise, action-oriented guidance has been developed to help Members design or strengthen standard operating procedures for

investigating wildlife disease outbreaks. It promotes a practical, multidisciplinary approach grounded in One Health principles, recognising that successful investigations depend on effective coordination, timely surveillance and reporting, robust field and laboratory expertise, epidemiological analysis, community engagement and clear risk communication.

This guidance was developed by the WOAH WildNet Collaborating Centre Network for Wildlife Health, following a proposal by the WOAH Working Group on Wildlife. It draws on the latest scientific knowledge and the operational experience of experts in field investigation, wildlife health and welfare, laboratory diagnostics, epidemiology and risk communication. Its aim is to support Members in developing or updating their national procedures.

I encourage Members to make full use of this guidance to strengthen their capacity to investigate, manage and contain infectious diseases and non-infectious health events affecting wild animals. By improving outbreak investigations, we can better protect wildlife, domestic animals, human health and the ecosystems on which they all depend.

Dr Emmanuelle Soubeyran

Director General of the World Organisation for Animal Health

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1. Purpose and scope of these guidelines

These guidelines serve two related purposes. First, they set out key considerations and best practices for investigating suspected disease outbreaks in wildlife populations, in line with the One Health approach and standards set out by the World Organisation for Animal Health (WOAH). Second, they provide a source document that national, sub-national and local authorities can use to develop their own protocols for wildlife disease outbreak investigations, adapted to their respective mandates, capacities and contexts. The guidelines do not constitute an operational protocol and are not intended to be applied verbatim. Rather, they provide the structure, principles and reference material on which a fit-for-purpose local protocol can be based.

These guidelines provide a high-level framework to help practitioners plan and conduct wildlife disease outbreak investigations. The framework is consistent with broader disaster risk reduction principles and may be adapted to relevant international planning strategies, including those developed by the United Nations Office for Disaster Risk Reduction (UNDRR) [2] and national recommendations, such as the Australian Government's disaster risk reduction strategies developed by the National Emergency Management Agency (NEMA) [3]. The primary audience comprises national

authorities responsible for wildlife health and management, including WOAH National Focal Points for Wildlife, as well as other authorities and responders involved in wildlife management at the subnational, local or regional level. The guidelines may also be used as a preparedness tool to identify gaps in capacity and inform management strategies to address them.

Because investigations vary considerably in scale, species involved, type of hazard and available resources, the guidelines are deliberately high-level and adaptable. They support an all-hazards approach that applies to both infectious and non-infectious events and may also complement broader outbreak investigations in which wildlife are involved. [Section 6](#) provides guidance on translating this document into a practical local protocol. Additional supporting resources are provided in [Annex 2](#).

These guidelines have been produced for WOAH by members of [WOAH WildNet](#), a global network of WOAH Collaborating Centres involved in wildlife health. They complement the *WOAH General Guidelines for Surveillance of Diseases, Pathogens and Toxic Agents in Free-ranging Wildlife* (2024), which provide more detailed guidance on wildlife disease surveillance [1].



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2. Introduction to outbreak investigations

An outbreak is the occurrence of one or more cases of a known or emerging disease in a defined population, geographical area or time-frame, or the occurrence of a disease at a level exceeding that normally expected. Rare, emerging, transboundary, notifiable, highly contagious or particularly harmful diseases may warrant investigation, depending on the species affected and scale and severity of the outbreak. An outbreak investigation is conducted primarily to determine the cause, extent and timeline of a disease event, thereby informing control measures and limiting further disease spread.

However, outbreak investigations do not always identify a causative agent or other

definitive cause. An investigation may remain inconclusive despite the collection and analysis of the best available evidence. Risk management and risk communication should therefore take account of this uncertainty.

Infectious disease may occur when an infectious agent capable of causing disease, such as a parasite, virus or bacterium, encounters a susceptible host in an environment that enables interaction between the agent and the host. Factors relating to the host, agent and environment, and the interactions among them, influence whether a disease outbreak occurs (**Figure 1**; see also [Annex 1](#)).

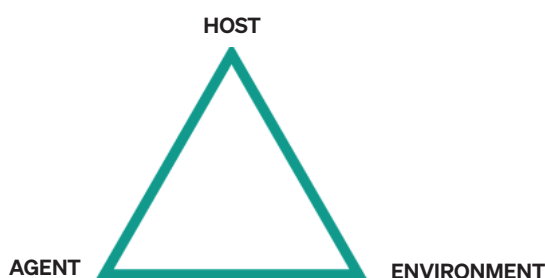


Figure 1. The disease triad of host, agent and environment
Source: reproduced from WOAHA [4]

3. Preparedness for wildlife disease outbreak investigations

Preparedness is the systematic and proactive capacity to anticipate, plan for and respond effectively to wildlife disease outbreaks. It supports early detection, structured assessment and rapid containment, thereby improving investigation outcomes, communication and health security. Preparedness is an iterative process, and governance arrangements must

assign responsibility for reviewing and updating any guidelines, protocols and standard operating procedures (SOPs) developed. Aligning preparedness for wildlife disease outbreak investigations with disaster and emergency management principles helps to strengthen institutional readiness and resilience.

Table 1 draws on relevant resources such as Article 4.19.3 of WOA's *Terrestrial Animal Health Code (Terrestrial Code)* [5], WOA's PVS Tool [6], *Good Emergency Management Practice: the Essentials* (2021) by the Food and Agriculture Organization of the United

Nations (FAO) [7], and disaster management guidance by Cooper et al. 2024 [8]. The following table expands on key elements that underpin effective preparedness and provides examples of considerations relevant to wildlife disease outbreak investigations.

Table 1. Elements to consider when undertaking preparedness activities for a wildlife disease outbreak investigation

Preparedness element	Why it matters	Examples relevant to wildlife disease outbreak investigations
1. Legal and governance arrangements	Clarify mandates, roles and responsibilities, including who has the authority to make decisions and allocate resources; establish reporting, coordination and financial mechanisms; and support accountability, lawful decision-making and effective cross-sector collaboration. Ensure that actions are culturally appropriate, including through consideration of the rights, interests and perspectives of Indigenous Peoples.	• Relevant legal and policy frameworks for wildlife health and disease control • Financial resources and laboratory agreements in place • Clearly defined command, reporting and communication structures • Roles and responsibilities defined across agencies • Formal intersectoral coordination mechanisms involving the environment, agriculture and public health sectors • Legislative authority for surveillance, sampling, data sharing, investigation and response activities • Legislative, regulatory and financial requirements documented and communicated
2. Communication and stakeholder engagement	Foster transparency and build trust; integrate cultural considerations and traditional knowledge systems; support risk communication for efficient and coordinated responses; help minimise misinformation; promote sustainability beyond the initial investigation; and support multi-agency responses and consistent messaging	• Stakeholder mapping, networking and engagement strategies relevant to outbreak investigations • Community engagement to promote timely detection and effective surveillance and reporting mechanisms • Incorporation of traditional and cultural knowledge systems • Multi-agency coordination meetings and partnership development • Pre-approved risk communication materials for use during field investigations • Communication strategies to manage misinformation, disinformation and public concern

Preparedness element	Why it matters	Examples relevant to wildlife disease outbreak investigations
3. Planning and management systems	Ensure that preparedness and response activities are structured, risk-informed and operationally functional; integrate technical guidance, logistics, surveillance and information management to support effective outbreak investigation and response; and promote all-hazards and systems-based approaches. Reduce uncertainty, improve transparency and support shared situational awareness (SSA).	• Integration of outbreak planning with monitoring and surveillance systems for early warning • Investigation of triggers, response pathways and exit strategies • Develop technical plans and guidance for preparedness, emergency response, outbreak investigation and coordination mechanisms • Standard operating procedures (SOPs) such as personal protective equipment (PPE), biosecurity, sample collection and transport • Undertake risk analyses to inform planning • Accurate, timely and secure data and information management systems, platforms and expertise • Clearly defined reporting pathways
4. Resources and capacity	Ensure the availability of trained personnel, infrastructure, equipment and partnerships for rapid mobilisation and a sustained response; strengthen system resilience and surge capacity to manage risks effectively and feasibly	• Training programmes for personnel and responders • Surveillance plans and field investigation teams • Development of technical laboratory capacity and laboratory partnerships • Infrastructure, equipment and cold-chain systems • Financial and logistical preparedness • Stakeholder collaboration and partnership agreements • Risk management and contingency resource planning
5. Practising processes	Ensure that preparedness and response systems are practised, evaluated and refined; identify gaps before outbreaks occur; and strengthen institutional learning and the capacity to adapt to change	• Effective resource management • Field and desktop simulation exercises • Scenario-based drills • Laboratory test validation and surge testing • Gap analyses and readiness assessments • After-action reviews and documentation of lessons learned • Refinement of de-escalation and recovery planning

4. Wildlife disease outbreak field investigation procedures

Figure 2 illustrates the steps commonly taken during a field investigation. **It is important to note that these steps may occur simultaneously or in a different order.** Effective and transparent communication throughout the process is fundamental to achieving successful outcomes. Preparedness and

planning activities should ideally be undertaken well before a wildlife disease outbreak investigation to strengthen the resilience, capacity, coordination and capability of authorities and responders, and enable them to conduct timely and effective investigations.

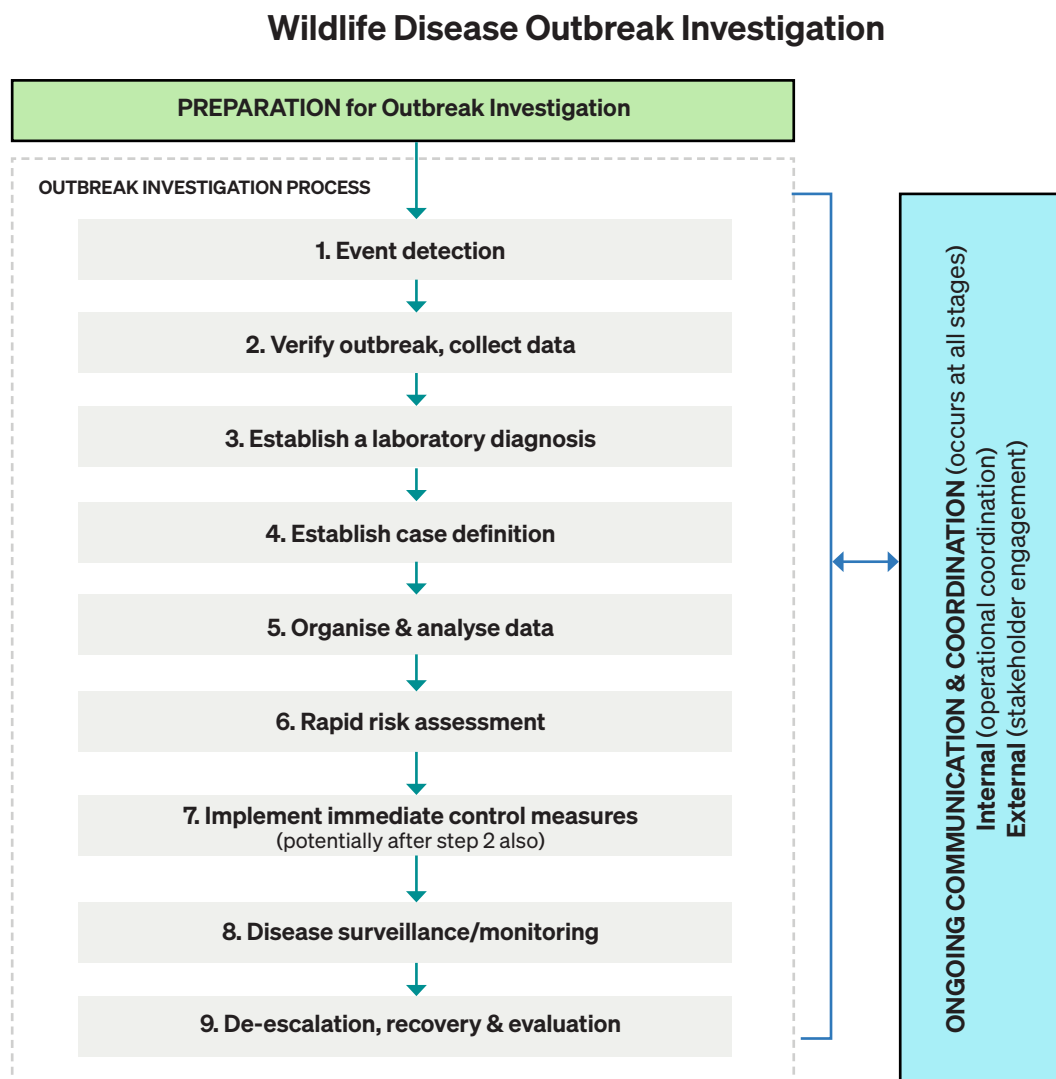


Figure 2. Field investigation flow chart for wildlife disease outbreak investigations
This figure shows the broader response continuum within which 'investigation' is a defined process

5. Wildlife disease outbreak investigation procedures: step by step

This section details the nine steps involved in managing wildlife disease outbreak investigations. Importantly, risk communication, coordination and stakeholder engagement should be carried out at all stages.

Effective stakeholder engagement, supported by clear, concise, timely, accurate and audience-appropriate communication, is fundamental to successful wildlife disease outbreak investigations. It builds trust, strengthens data sharing and compliance, and helps ensure that response strategies are locally informed, socially and culturally acceptable, and operationally feasible. Stakeholder engagement is not a one-off activity; it is an ongoing, two-way process that should be integrated into every stage of an investigation. Communication activities should therefore be incorporated into each step of the outbreak investigation and specified in the relevant SOPs.

Internal communication, or operational coordination [9], takes place among responders, authorities and stakeholders involved in the operational aspects of an outbreak investigation. Shared situational awareness (SSA) should be developed among all actors. Its three elements are perception, comprehension and projection [10]. Adopting an SSA approach helps stakeholders, from responders

to the public, develop a common understanding of the risks and how they may evolve in real time [11].

When conducted effectively, internal communication enables the rapid sharing of situational updates and risk assessments, supports coordinated intersectoral decision-making, and aligns laboratory findings with field operations and control measures. It also reduces confusion, duplication of effort and operational delays, and facilitates adaptive management (the ability to adapt to changing circumstances) as new information emerges.

External communication, or stakeholder engagement [12], occurs between relevant authorities and stakeholders not directly involved in operational aspects of wildlife disease outbreak investigations. When conducted effectively, it builds trust; promotes early detection through timely reporting; clearly communicates risks to encourage appropriate behavioural responses within communities; supports compliance with control measures; maintains transparency and community confidence; helps manage uncertainty, speculation and misinformation; and protects the long-term relationships that are critical to surveillance and recovery efforts.



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Cross-cutting principles for risk communication and stakeholder engagement [13]:

Communicate early and proactively, even when information is incomplete.

Provide timely updates at the start of an event to encourage reporting and manage expectations.

Be transparent and acknowledge uncertainty.

Clearly distinguish between what is known, what is unknown and what is evolving as new evidence emerges.

Ensure that mechanisms for two-way communication are in place.

Maintain channels (e.g. hotlines, ranger networks, digital platforms) that allow stakeholders to both receive and provide information.

Align messaging across sectors and agencies.

Coordinate communication among wildlife, livestock, public health, environmental and other relevant authorities to avoid conflicting advice.

Use plain, audience-appropriate language.

Translate technical findings into clear, practical guidance tailored to hunters, landholders, wildlife carers, park staff and communities.

Ensure that messaging is culturally appropriate and context-sensitive.

Engage Indigenous and local communities respectfully, particularly where traditional lands or culturally significant species are affected.

Address misinformation proactively.

Monitor and correct inaccurate information to prevent confusion or inappropriate behavioural responses. Establish processes for rumour tracking and social listening, as well as pre-approved workflows for correcting myths.

Document communication activities.

Record briefings, risk messages and stakeholder engagement activities to support transparency, accountability and post-event evaluation.

Account for shared situational awareness between stakeholders.

Encourage stakeholders to provide feedback on their perception, comprehension and projection of the situation.

Further examples of risk communication and stakeholder engagement are provided under the relevant outbreak investigation steps below.

1. Event detection: observation or reporting of sick, dying or dead wildlife

Early detection is critical for limiting disease spread and understanding the scope of an outbreak. The first reported case is seldom the index case. Wildlife disease outbreaks are

often first detected through passive surveillance, community reporting or observations by field workers. Timely recognition supports rapid risk assessment and containment.

Examples of actions

- Reports of unusual morbidity or mortality events from park rangers, other authorities, non-governmental organisations (NGOs), zoos, community members, social media or other sources and platforms.
- Detection of abnormal behaviour, such as neurological signs in birds.
- Identification of syndromic surveillance triggers, such as clusters of deaths, to help determine whether further investigation is warranted.
- Application of the precautionary principle, where possible, by initially assuming a serious plausible risk until evidence indicates otherwise.

Risk communication

- Public messaging that encourages the reporting of sick or dead wildlife and explains how to approach such animals safely and report them (e.g. advising people not to handle them, providing relevant contact details for reporting).
- Transparent communication about what is known and unknown during the early stages of the event.

Stakeholder engagement

- **Notification** of relevant authorities, wildlife agencies and environmental ministries. Information about an undiagnosed event may be shared through [WildEpi](#) [14] at this stage, and the country may already request support for a rapid risk assessment.
- **Engagement** with local community leaders in affected areas.
- Briefings for other relevant authorities where an interface exists (e.g. public health authorities in relation to zoonotic risks; animal health authorities in relation to the risk of spillover to production animals).
- Communication of health and safety requirements to first responders.

2. Verify the outbreak, collect the data

This step determines whether the event exceeds expected baseline mortality levels, involves unusual clinical signs or otherwise represents a true outbreak. Accurate field data help to establish initial case numbers, geographical distribution and the species

affected. The classification of an incident as an 'outbreak' should be informed by pre-determined criteria defining the 'triggers' for an investigation. These criteria should be established during the preparedness phase.

Examples of information and actions relevant to this step

- **Event data:** date of observation and reporting; location, including Global Positioning System (GPS) coordinates; observer or reporter details; duration of the event; and baseline mortality, compared with historical baseline data where available.
- **Species data:** species; age, class and sex; numbers of sick and dead animals; number of animals at risk; population density or aggregation behaviour; and conservation status, where relevant.
- **Clinical and pathological data:** clinical signs; time from onset of illness to death; body condition; gross necropsy findings; photographs; and samples for laboratory analysis. Relevant guidance should be followed for sampling, packaging, transport and cold-chain management, with due consideration of biosafety and biosecurity [15] during all field procedures. Any control measures implemented before diagnosis (e.g. quarantine) should also be recorded.
- **Epidemiological data:** spatial distribution; temporal patterns; contact with other species (e.g. wildlife, livestock, pets); recent animal movements; relevant ecological patterns (e.g. migration, breeding seasons and juvenile dispersal); human-mediated movements or translocations such as hunting or fishing; environmental disruption caused by logging, mining or other works; and carcass-scavenging patterns.
- **Environmental data:** long-term climate data; short-term weather conditions; water quality; habitat disturbance or land-use change; and the presence of toxins, algal blooms, pollutants or abundant vectors.
- **Human-animal interface data:** human exposure to sick or dead animals; proximity to production animals; involvement of wildlife rehabilitation services; hunting, feeding or baiting activities; and public access or tourism pressure.

Risk communication

- Clear explanation of the pathogen, if known; its transmission pathways; the level of risk; and who or what may be at risk
- Communication of protective measures for field staff and responders, including relevant SOPs and requirements for biosecurity, biosafety, sample transport and carcass disposal.
- Tailored messaging for hunters, landholders, wildlife carers and rehabilitation centres.
- Public briefings through multiple media channels to help prevent misinformation and speculation

Stakeholder engagement

- Multi-agency coordination meetings (e.g. wildlife, environmental, livestock and public health sectors).
- Coordination with qualified diagnostic laboratories to obtain guidance on sampling, packaging and transport.
- Engagement with local and Indigenous communities, where relevant, incorporating traditional knowledge systems and local observational data.
- Collaboration with NGOs involved in conservation or wildlife rescue.
- Briefings for tourism operators, local landholders and other relevant community-level stakeholders if closures or restrictions are required.

3. Establish and potentially confirm the diagnosis: laboratory investigation

Laboratory confirmation can establish the cause of an event, help differentiate infectious from non-infectious events and inform risk management decisions. An accurate diagnosis is essential for credible risk communication and effective intersectoral coordination.

Laboratory confirmation may trigger statutory reporting obligations, lead to movement restrictions, have implications for trade, raise public health concerns and attract media attention.

Examples of actions

- **Identify** qualified diagnostic laboratories and consult them in advance to establish sampling and submission requirements. Develop or adopt appropriate guidance and ensure that suitable equipment and supplies are available for collecting multiple aliquots and transporting samples.
- During the investigation, follow the agreed **guidelines** for sample collection, packaging, transport and cold-chain management [16], taking biosafety and biosecurity into account during all procedures. Submit samples promptly wherever possible.
- Confirm the **diagnostic validation method** where possible, following Chapter 2.2.7. 'Validation of diagnostic tests for infectious diseases applicable to wildlife' of WOA's *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals* [17].
- Where no guidance is available, consider the samples and equipment required to undertake some or all of the following: pathology and histopathology; microbiology (bacteriology and mycology); molecular diagnostics, such as polymerase chain reaction (PCR), quantitative PCR (qPCR) and sequencing; virology; serology; toxicology; parasitology; haematology and clinical chemistry using samples from live animals; environmental and vector sampling; and point-of-care testing.
- Determine whether **notification** through the World Animal Health Information System ([WAHIS](#)) or **information sharing** through [WildEpi](#) is required. WAHIS collects information on WOA-listed diseases (as set out in Chapters 1.3 of the WOA *Terrestrial Animal Health Code* [18] and the *Aquatic Animal Health Code* [19]), whereas WildEpi collects information on other diseases and health events affecting wild animal hosts that are not listed by WOA.
- Request support from WOA for a **rapid risk assessment**, for example through WildEpi, and for international coordination.

Risk communication

- Ensure that pre-authorised personnel notify the competent authorities in accordance with any applicable notifiable disease requirements.
- Prepare concise internal communication briefs.
- Align messaging across sectors (e.g. wildlife, agriculture, public health).
- Update and validate guidance on field biosecurity and PPE.
- Prepare key messages if public or media interest is likely.

Stakeholder engagement

- Consider all legal and regulatory requirements governing the sending of wildlife samples, particularly if samples are sent internationally. These may include requirements under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), International Air Transport Association (IATA) regulations, national import permit requirements and the Nagoya Protocol [20].
- Engage in dialogue with stakeholders as required, depending on the confirmed disease.
- Relevant stakeholders may include wildlife, agricultural, public health and environmental authorities; land managers; operational teams; wildlife rehabilitators; local veterinarians; and, where relevant, livestock producers.
- Identify the appropriate authority for initiating any required national or international reporting, including reporting to WOA, where applicable.



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4. Establish a case definition

A formally established and clearly defined case definition provides standardised criteria for identifying cases, enabling consistent surveillance and data collection. It also

supports comparability across regions and agencies. The case definition may be revised as further information becomes available.

Examples of actions

- Include relevant laboratory, clinical and epidemiological parameters in the case definition.
- Define the criteria for confirmed, probable and suspected cases.
- Consider species-specific case criteria where helpful and relevant.
- When laboratory and other investigations do not identify a pathogen or disease

process, or when investigating an unknown or emerging infectious disease, consider using a case definition that incorporates **syndrome, time, place** and an **epidemiological link**. This can support surveillance, mapping and the implementation of control measures. For example: Any [species] found dead or showing [specific clinical signs or syndrome] within [defined area] since [date].

Risk communication

- Circulate the agreed working case definition, including its parameters, reporting thresholds and key uncertainties, to responders, authorities and partners involved in the investigation.

- Provide clear instructions on the criteria for sample collection, where relevant.

Stakeholder engagement

- Consult laboratory experts to align the clinical and diagnostic criteria.
- Engage field workers (e.g. biologists, rangers, responders) to ensure that the case definition is practical.
- Coordinate with public health and agricultural authorities where there is a zoonotic or spillover risk.

- Inform wildlife rehabilitators and veterinarians of updates to the case definition.
- Establish a feedback mechanism through which the case definition can be refined as new data emerge.

5. Organise and analyse data

The organisation and epidemiological analysis of data (see Step 2 for examples of data to collect) help to characterise outbreak dynamics, identify potential risk factors and

guide disease control measures. Structured analysis reduces uncertainty and supports transparent decision-making.

Examples of actions

- **Descriptive epidemiology:** Describe the frequency and distribution of disease to identify patterns, potential initial risk factors and areas requiring further investigation or research. This helps to answer **who, what, where** and **when**. Examples include constructing epidemic curves, mapping spatial clusters, stratifying data by species or age group, and identifying common exposures.
- **Hypothesis generation:** Use the potential risk factors identified through descriptive epidemiology to guide further investigation. Combine laboratory results with information on known pathology and incubation period of the agent; known disease reservoirs; potential disease reservoirs where a definitive source has not been identified; possible sources of infection and transmission routes; the clinical picture or typical presentation of the disease; ecological context; environmental conditions; and host behaviour. Use this information to develop a plausible and scientifically sound hypothesis to determine '**what could explain this pattern?**'
- **Analytic epidemiology:** Conduct in-depth studies to test the hypothesis. Analytic epidemiology is particularly useful when the source of an event is unclear, including in wildlife and zoonotic disease outbreaks. Examples include cross-sectional, case-control and cohort studies. This stage helps to explain **why** the outbreak occurred.

Risk communication

- Provide regular situational updates and ensure consistent messaging across agencies.
- Ensure that pre-authorised personnel communicate emerging trends and clarify data limitations and surveillance gaps.
- Provide operational guidance if epidemiological patterns change.

Stakeholder engagement

- Coordinate data sharing among the wildlife authorities, diagnostic laboratories and other relevant partners.
- Engage epidemiologists to analyse the data.
- Engage field teams to validate the accuracy of the data and provide contextual information, where required.
- Brief the relevant authorities on emerging hotspots and patterns of spread.
- Share findings with key partners to guide investigation, response and recovery activities.

6. Conduct a rapid risk assessment

A rapid risk assessment estimates the risks posed to wildlife populations, livestock, public health and ecosystems [21]. Using an all-hazards approach, it supports pro-

portionate, evidence-based response and control measures aimed at eliminating the risks or reducing them to acceptable levels.

Examples of actions

- Use available data to assess the **likelihood** and **consequences** of identified hazards for the relevant populations or ecosystems. The risk assessment may be qualitative, semi-quantitative or quantitative.
- Assess the risks associated with the proposed response actions.
- Conduct the assessment rapidly so that it can inform risk management and control measures during the initial investigation (e.g. movement restrictions, biosecurity measures).
- Draw on previous risk analyses undertaken as part of preparedness activities before an outbreak.
- Take uncertainty into account when estimating and communicating risk levels.

Risk communication

- Clearly explain the pathogen (if known), its transmission pathways, the level of risk and associated uncertainties to inform risk management.
- Communicate protective measures for field staff and responders.
- Tailor messaging for hunters, landholders, wildlife carers and rehabilitation centres.
- Provide media briefings to help prevent misinformation and speculation.

Stakeholder engagement

- Hold multi-agency coordination meetings (e.g. involving wildlife, environmental, live-stock, public health sectors).
- Engage Indigenous communities where traditional lands or culturally significant species are affected.
- Collaborate with NGOs involved in conservation or wildlife rescue.
- Brief tourism operators, other affected communities and the relevant legislative authorities if closures or restrictions are required.



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7. Implement immediate or preliminary control measures

Early control measures can reduce transmission, mitigate ecological impacts and protect human and animal health [9].

Measures must be proportionate to the assessed risk and feasible in wildlife contexts.

Examples of actions

- Work with relevant wildlife authorities and stakeholders involved in wildlife management to implement appropriate and practical measures to mitigate disease spread. These may include:
 - carcass disposal and site biosecurity in affected and unaffected areas or species;
 - temporary area closures or movement restrictions;
 - targeted interventions, such as vaccination or medical treatment, where applicable;
 - vector control measures; and
 - environmental management measures.
- Where appropriate, exercise the necessary legislative powers relating to investigation, quarantine, isolation, movement controls, biosecurity or the killing of animals for disease management purposes.
- Maintain field response kits containing the equipment required to support field control measures and ensure that they are ready for deployment. Establish contingency plans for unexpected events.

Risk communication

- Provide clear guidance on movement restrictions, biosecurity practices and site closures.
- Provide practical instructions on safe carcass disposal and environmental decontamination.
- Explain why the control measures are necessary and proportionate to the assessed risk.
- Address potential concerns about control measures such as culling, vaccination, wildlife handling and wildlife movement.

Stakeholder engagement

- Consult affected landowners before implementing access restrictions.
- Engage hunting associations and relevant outdoor recreation associations regarding the temporary suspension of activities.
- Coordinate with animal welfare organisations if wildlife interventions are required.
- Liaise with local government regarding enforcement support where necessary.
- Consult the relevant authorities to confirm financial requirements and arrangements, including response funding and any compensation arrangements.

8. Establish disease surveillance and monitoring

Ongoing surveillance helps to evaluate the effectiveness of control measures, detect disease spread, confirm disease-free areas and

support adaptive management [1]. Monitoring also strengthens the long-term resilience of wildlife health systems.

Examples of actions

- **Enhanced passive surveillance:** increase reporting by field workers, wildlife rehabilitators, hunters, landholders and members of the public.
- **Active surveillance:** conduct systematic field searches or sampling in affected and surrounding populations.
- **Sentinel surveillance:** monitor selected species or locations, such as high-risk sites and interfaces among wildlife, livestock and humans.
- **Environmental testing:** test water, soil, vectors and carcass sites, where relevant.
- **Syndromic surveillance:** track defined clinical patterns (e.g. neurological or haemorrhagic symptoms) before laboratory confirmation.
- Identify potential technical, scientific and **funding** partners to develop plans for continued disease surveillance and monitoring. Determine what additional tools and resources will be required as the investigation is scaled down and for surveillance over the longer term.

Risk communication

- Provide ongoing updates on surveillance findings and geographical spread of the event.
- Reinforce reporting channels and encourage continued community participation.
- Communicate decreasing or stabilising case numbers to maintain transparency.
- Clearly communicate any changes in risk levels.

Stakeholder engagement

- Collaborate with research institutions, zoos, government bodies and NGOs on sentinel monitoring.
- Continue engagement with community reporting networks.
- Hold feedback sessions with frontline responders.
- [Share information](#) with regional and international partners where relevant.

9. De-escalation, recovery and evaluation

This step supports a structured transition from active outbreak investigation and response to recovery or routine management, accompanied by accurate communication

of findings. Evaluation identifies lessons learned, strengthens preparedness and improves the management of future outbreaks.

Examples of actions

- Develop and communicate a clear **exit strategy**. Define criteria for de-escalation (e.g. no new cases detected for two incubation periods, surveillance thresholds met, risks assessed as low), and outline plans for the transition to routine surveillance.
- Review the outbreak investigation activities and, where appropriate, conduct an after-action review (AAR) that captures lessons learned.
- **Update outbreak response** and contingency plans, and review and revise SOPs.
- Obtain stakeholder feedback and undertake post-incident reporting.

Risk communication

- Summarise the investigation findings and communicate the lessons learned transparently.
- Announce the lifting of restrictions or re-opening of affected areas.
- Acknowledge any remaining uncertainty and explain ongoing monitoring activities.
- Communicate transparently about ecological or conservation impacts.

Stakeholder engagement

- Conduct after-action review workshops with partner agencies.
- Engage conservation bodies in population recovery planning.
- Hold stakeholder feedback sessions to improve preparedness.
- Report outcomes to national authorities and [WOAH](#), where applicable.



6. Translating these guidelines into a local protocol

A protocol developed from these guidelines is most useful when it has clear ownership, is kept up to date and can be readily used in the

field. When adapting this document to develop a specific protocol, authorities are encouraged to consider whether the protocol is:

Practical and field-ready: written for those who will use it during an incident, with clear actions, roles and decision points rather than extensive background information.

Appropriately scoped: specific to the jurisdiction, hazards, species and reporting pathways covered, rather than attempting to address every possible situation.

Concise: short enough to be read and applied under operational pressure, with supporting details provided in annexes or references.

Translatable and accessible: capable of being translated into the relevant languages and made available in suitable formats where multiple communities, agencies or partners are involved.

Clearly governed: assigned to a named owner and subject to a defined review cycle and version-controlled process, enabling users to confirm that they are working from the current version.

Appropriately available: distributed to those who need it, with any restrictions on access (e.g. for sensitive or security-relevant content) made explicit.

Connected to preparedness: developed in advance, tested through simulation or desktop exercises and refined through after-action reviews, rather than created from scratch during an incident.



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Annex 1. Disease triangle

The following representations of the disease triad were developed by WOAH WildNet members.

They may be used for different audiences of these documents or adapted for other purposes.

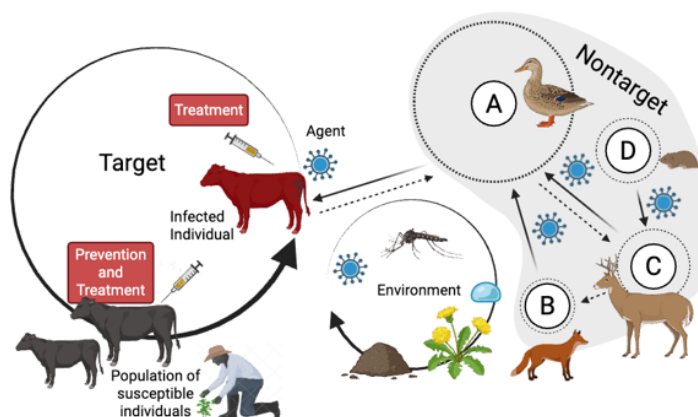


Figure 1A. Disease triad: focus on production animals and public health

The grey area represents a group of taxa or distinct meta-populations that act as maintenance hosts within which a pathogen is sustained (A–D). A functional reservoir system requires viable transmission pathways to new hosts, represented in **Figure 1A** by livestock and humans. The system becomes more complex when the pathogen is also maintained in the environment, for example in vectors, soil, contaminated water or plant material.

Outbreak investigations should take pathogen biology into account when characterising epidemiology and transmission pathways. Reservoir systems are inherently dynamic and may involve bidirectional transmission between host species (e.g. livestock and wildlife). In accordance with the One Health approach, integrated outbreak investigations should consider human, animal and environmental health.

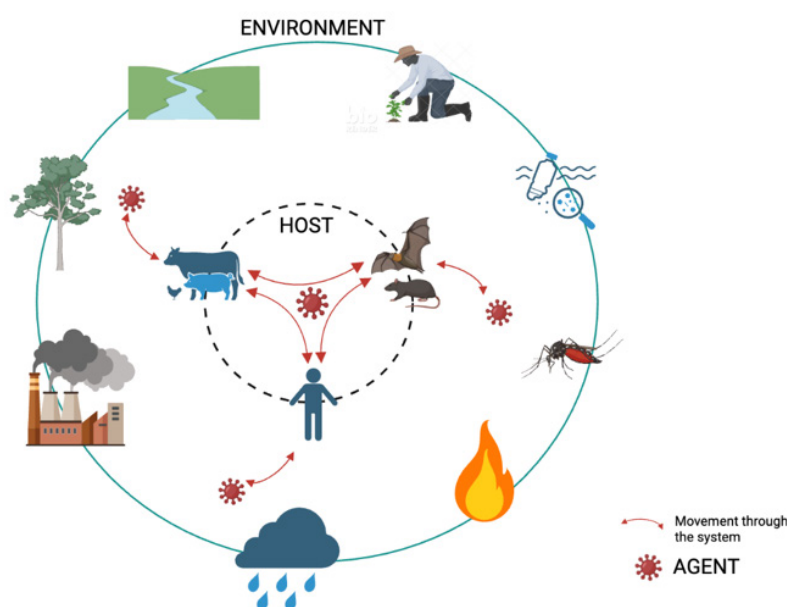


Figure 2A. Disease triad: focus on all-hazards and ecosystem health

Annex 2. Further resources

This annex provides selected guidance, tools and information sources that may support preparedness for and implementation of wildlife disease outbreak investigations. Resources

are grouped by subject and may appear under more than one heading where they are relevant to several aspects of an investigation.

Examples of national-level standard operating procedures

A comprehensive example from Australia is provided in the [Guidelines for Management of an Emergency Wildlife Disease Response](#).

The Australian guidelines draw on the Australian Veterinary Emergency Response Plan (AUSVETPLAN) framework and provide

high-level guidance on managing an emergency wildlife disease (EWD) response affecting Australian native animals. They are maintained as a living document, and Wildlife Health Australia encourages emergency managers and others who may be involved in such a response to provide comments and feedback.

General guidance and training materials

Cooper et al. 2024. [Disaster Management and the Protection of Apes](#)

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WOAH, FAO. 2018. [A Field Manual for Animal Disease Outbreak Investigation and Management](#)

WOAH. 2024. [Guidelines for Simulation Exercises](#)

WOAH [Terrestrial and Aquatic Codes and Manuals](#)

WOAH. 2024. [General Guidelines for Surveillance of Disease, Pathogens & Toxic Agents in Free-Ranging Wildlife](#)

WOAH. 2024. [Guidelines for Addressing Disease Risks in Wildlife Trade](#)

*WOAH E-Learning Modules: [Wildlife Surveillance](#)

*WOAH E-Learning Modules: [Wildlife Trade](#)

WHO [Outbreak toolkit](#)

*Only accessible with log-in credentials.

Wildlife surveillance

WOAH (2024). [General Guidelines for Surveillance of Disease, Pathogens & Toxic Agents in Free-Ranging Wildlife](#)

Cornell Wildlife Health Lab. [College of Veterinary Medicine, Cornell University](#)

National Wildlife Health Center. [U.S. Geological Survey](#)

WOAH guidance, reporting systems and legal and policy frameworks

WOAH [Wildlife Health Strategy 2026-2030](#)

WOAH [Wildlife Health Information portal](#)

WOAH [Animal Disease Portal](#)

World Animal Health Information System ([WAHIS](#))

WildEpi: Wildlife Health information sharing system ([WildEpi](#))

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Stakeholder engagement and analysis

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Risk communication

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Centers for Disease Control and Prevention (CDC). 2024. [Crisis and Emergency Risk Communication Manual](#).

WOAH. 2024. [Countering Disinformation and Misinformation in Animal Health Emergencies](#).

WOAH. 2024. [Wildlife Health Communication: 10 Do and Don't](#).

Laboratory sample collection, submission, storage and transport

WOAH. 2020. [Manual on Sample Collection and Transport](#)

WHO. 2024. Mobile app: [Risk Assessment Tool for Biosafety and Laboratory Biosecurity](#)

WOAH. *Terrestrial Manual*, [Chapter 1.1.2. Collection, submission and storage of diagnostic specimens](#)

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International Air Transport Association (IATA). [Infectious Substances Shipping Regulations](#)

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Data management and reporting

WOAH. [Animal Disease Portal](#)

World Animal Health Information System ([WAHIS](#))

WildEpi: Wildlife Health information sharing system ([WildEpi](#))

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