

# Diagnostic Success—A Quick Guide to Quality Carcass Submissions for Diagnostic Services

The U.S. Geological Survey National Wildlife Health Center (NWHC) provides diagnostic services to determine causes of wildlife morbidity and mortality events to State, Federal, and Tribal partners. To accomplish this, we rely on the timely collection and evaluation of submitted carcasses and the epidemiologic information relayed from personnel in the field. Our current submission criteria can be found here: <https://www.usgs.gov/centers/nwhc/science/diagnostic-case-submission-guidelines>. If the majority of carcasses found in the field are unsuitable for submission, then sick animals (birds, mammals, reptiles) that have been euthanized are acceptable specimens. Depending on the agency or affiliated institution, there may be additional requirements for submission (White and Dusek, 2015). When applicable, always consult the organization’s wildlife health or veterinary staff.

To provide the best diagnostic outcome, it is critical that a carcass be intact and received in fair to excellent postmortem condition (table 1). For example, to determine cause of expiration, it is necessary to have a fresh, intact carcass with all internal organs for gross examination and ancillary testing (histology, virology, microbiology, and so on; White and Dusek, 2015). Unacceptable carcasses exhibit



**Figure 1.** Photograph showing an example of a carcass in good postmortem condition. Photograph provided by National Wildlife Health Center staff.

the following: open body cavities caused by scavenging or decomposition; missing or sunken eyes that are not clear; insect or maggot damage; a foul odor; signs of mumification

**Table 1.** A range of carcass conditions based on various characteristics. Carcasses ranging from Excellent to Fair are more likely to provide valued diagnostic outcomes.

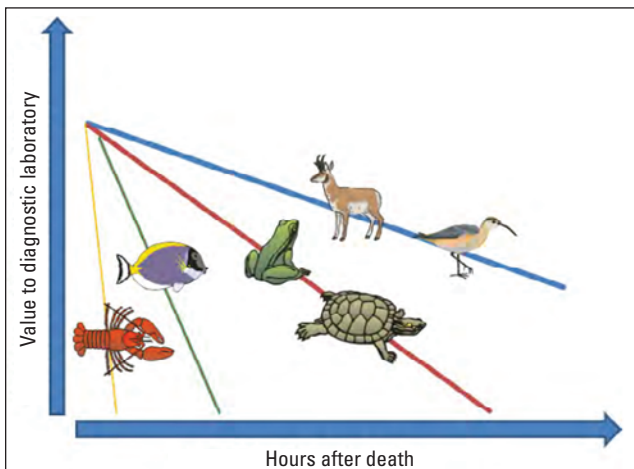
| Carcass condition | Intactness  | Odor   | Insect activity  | Gas distention  |
|-------------------|---|--|--|---|
| Excellent         | Carcass is completely intact with no evidence of scavenging or openings in the body cavity.   | No odor aside from the animal’s natural scent.                                   | Insect activity affecting carcass integrity is not present.              | Bloating of the carcass has not occurred.                               |
| Good              | Carcass is well intact with no damage to thoracic and abdominal cavities.   | No odor aside from the animal’s natural scent.                                   | Insect activity is minimal with no signs of larvae.                      | Gas distention is not noticeable if present.                            |
| Fair              | Body cavity is intact with little to no evidence of scavenging. Skin has begun to slough, eyes may appear noticeably sunken, and membranes are moderately desiccated. | Mild scent of decay is noticeable.   | Fly larvae in various stages may be present.                             | Bloating may be noticeable externally, especially in the abdomen.       |
| Poor              | Open body cavity and evidence of scavenging may be present. Skin and muscles are extremely friable. Eyes may appear extremely sunken with desiccated membranes.       | Strong scent of decay is noticeable.   | Maggot activity occurring on and within the carcass is extensive.        | The carcass may appear collapsed because of rupture and release of gas. |
| Unsuitable        | Carcass may feel lighter or heavier than normal. Most of the tissue is no longer present, with bones, cartilage, and fur or feathers remaining.                       | Odor ranges from strong scent of decay to decaying environmental organic matter. | If insects are present, beetles are typically the dominant insect group. | No gas distention within the carcass.                                   |



**Figure 2.** Photograph showing an example of a carcass in an unsuitable postmortem condition. Photograph provided by National Wildlife Health Center staff.

or waterlog; skin or fur that is sloughing off, and for birds, feathers that are easily pulled out. When encountering a deceased specimen in the field, or receiving specimens from the public, carefully inspect the carcasses prior to shipping (and freezing), which is necessary to ensure specimens are at a minimum in fair to good postmortem condition. When contacting the NWHC about submission, we will ask for a description of the postmortem condition, so it is helpful to supply photographs of each specimen. When the cause of expiration cannot be determined at diagnostic evaluation, ruling out what did not cause expiration can also provide valuable information. If there are limited or no suitable carcasses of diagnostic value available during the initial response, repetitive site visits and collection of carcasses may need to be considered.

Collected carcasses should be immediately chilled. If carcasses cannot be shipped within 48 hours of field collection, then immediate freezing is necessary to prevent further degradation until the specimens can be shipped to the NWHC. Freezing does not interfere with most tests for pathogen detection, but it does interfere with cellular



**Figure 3.** Illustration showing that the value of a specimen to a diagnostic laboratory degrades the longer the carcass sits out in the field (Work, 2015).

level examination (histopathology); therefore, ship as soon as possible, avoid multiple freeze-thaw cycles, and keep specimens frozen, including during shipment.

Because amphibians and turtles decompose quickly, the best diagnostic specimens are sick animals that have been euthanized; however, submission will require prior coordination. Depending on the agency or affiliated institution there may be additional requirements. More information about protocol for amphibian submissions can be found here: <https://www.usgs.gov/media/files/collection-preservation-packaging-and-shipping-amphibians>.



**Figure 4.** Photograph showing an example of an amphibian carcass in good postmortem condition. Photograph provided by National Wildlife Health Center staff.

## References Cited

- White, C.L., and Dusek, R.J., 2015, Wildlife specimen collection, preservation, and shipment, *in* Franson, J.C., Friend, M., Gibbs, S.E.J., and Wild, M.A., eds., *Field manual of wildlife diseases: U.S. Geological Survey Techniques and Methods*, book 15, chap. C4, 23 p., accessed November 5, 2024, at <https://doi.org/10.3133/tm15C4>.
- Work, T.M., 2015, Mortality investigation, *in* Franson, J.C., Friend, M., Gibbs, S.E.J., and Wild, M.A., eds., *Field manual of wildlife diseases: U.S. Geological Survey Techniques and Methods*, book 15, chap. B3, 5 p., accessed November 5, 2024, at <https://doi.org/10.3133/tm15B3>.

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