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Title: Wildlife Lead Concentration Testing in the Greater Yellowstone Ecosystem

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Abstract:

Background
There are no safe concentration of lead (Pb) exposure for humans or wildlife. “Pb is a widespread, cumulative, and insidious environmental pollutant that can trigger a wide range of physiological, biochemical, and behavioral disorders” Alvarez-Velazquez et al. (2024). Within the Greater Yellowstone Ecosystem (GYE), one of the vectors for lead exposure to both humans and wildlife is lead ammunition used in big game hunting. Transboundary scavenging wildlife that utilize protected habitats within the boundary of Yellowstone National Park (YNP) can be negatively impacted by humans outside the park in several ways, including by lead poisoning when feeding on hunter-produced gut piles or wounded loss animals killed with a lead bullet. Lead concentration in GYE scavenging golden and bald eagles, common ravens, gray wolves, cougars and both grizzly and black bears have already been established by Craighead et al. (2008) and Rogers et al. (2011). There is a current grant proposal by the Nez Perce Tribe to replace lead-based ammunition with copper-based ammunition for the Yellowstone Bison Treaty Hunt along the northern and western boundaries of YNP.

Objective
This presentation outlines preliminary data to propose a large-scale study to collect and synthesize lead concentration in scavenging wildlife species along the northern boundary of YNP. While eagles are a well-studied avian scavenger with documented lead related deaths, lead exposure in other scavenging wildlife species as a community needs further examination. The objective of this proposal is to facilitate a collaborative approach for more widespread lead testing of the scavenging wildlife community by determining which testing method(s) are most appropriate for a suite of species. The goal of this work is the achieve a more complete picture of the potential lead impacts to Yellowstone wildlife from spent ammunition. This work will provide critical information to land managers for ecosystem health and may also highlight the importance of non-lead ammunition adoption by hunters as a wildlife conservation management tool.

Methods
Testing for lead concentration in scavenging wildlife can be conducted through a variety of biological samples. Blood testing allows for lead detection within weeks of exposure, hair or feather sampling reflects lead exposure over a span of several months, and bone testing

can measure lead exposure over the lifetime of an animal. Samples of blood, hair, feather and bone from the proposed study area currently exist for the following scavenging species: gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos horribilis*), common raven (*Corvus corax*), and golden eagle (*Haliaeetus leucocephalus*). These include samples from GPS-tracked individuals which allows for a correlation analysis between their association with hunter-harvested gut piles and lead exposure rates from having potentially ingested lead bullet fragments.

To cast a wider net for future sampling across the northern range of the GYE following species could also be targeted for sampling based on their exposure to lead in other regions: black-billed magpie (*Pica hudsonia)*, bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), turkey vulture (*Cathartes aura*), northern harrier (*Circus hudsonius*), Burrowing Owl (*Athene cunicularia*), cougar (*Puma concolor*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), American red fox (*Vulpes vulpes fulva*), badger (*Taxidea taxus*), American marten (*Martes americana*), and the federally listed wolverine (*Gulo gulo*) may also be targeted. It might also be interesting to look at the lead concentration in domestic dogs (*Canis lupus familiaris*) within the Gardiner Basin since they too have access to hunter-produced gut piles. Sampling methods could include: blood testing, hair collection devices placed at sites frequented by mammalian scavengers (i.e. Stephen's Creek), collection of mammalian scat around the Gardiner Basin during and post hunting season, body burden carcass study of individual carcasses, portable K-shell X-ray florescence measurements in live caught species and existing skull/bone collections, sampling of hair, feathers, and claws existing specimens at state and tribal wildlife agencies and the continued opportunistic collection of biological samples.

Conclusions

There is strong interest and intent by a variety of stakeholder groups to collaborate for the scope and scale of this kind of study, but there is currently no coordination or funding. The hope is that the opportunities this presentation highlights, combined with further methods-testing will inspire the kind of collaboration necessary to facilitate a more rigorous study of currently available data and future data collection to benefit community conservation goals of the Greater Yellowstone Ecosystem.

Session Options:

Partnerships to Achieve Transboundary Goals

Emerging Technologies