



**SOAR**  
*saving our avian resources*  
 soarraptors.org



**Teacher Resources for Middle School Storyline: Lead in our environment - connection between eagles and you!**

[Learn more about SOAR here.](#)



**Graphic Organizer:**

- [Teacher](#)
- [Student](#)


**Student Readings:**


- [Middle School 2020](#)

Anchor Phenomenon	Define the Problem	NGSS Performance Expectations
Why do these bald eagles have their heads hanging down?	Is lead in the environment still a problem for humans (are people still presenting to health care professionals with elevated lead levels)? Does lead in the environment impact animals?	MS-LS2-2, MS-LS2-3, MS LS2-4, MS LS1-7, MS ETS1-2, MS-ESS3-2

**Performance Task**

The students will create posters that reflect what they have learned (see the last page).

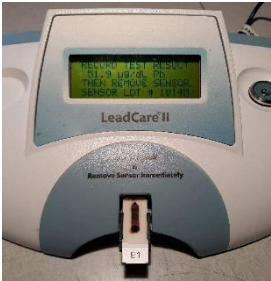
Lesson # with DCI and Big Idea	Phenomena Driven Questions	Phenomena or Problem	Scientific Practices Making Sense of Phenomena using SEPs to investigate DCIs	What We Figured Out Incrementally Build Explanations, Models, or Designs (CCCs)
<p><b>MS #1: Wildlife CSI</b></p> <p><b>MS-ESS3 Earth and Human Activity</b> (MS-ESS3-2)</p> <p><b>MS-LS2 Ecosystems: interactions, Energy, and Dynamics</b> (MS-LS2-4)</p> <p><i>Big Ideas:</i> What causes bald eagles to be admitted to SOAR?</p> <p><a href="http://soarraptors.org">Link to the Wildlife CSI 5E on soarraptors.org</a></p> <p>This 5E looks at only a subset of the entire bald eagle data set, from rescue to final outcome.</p>	<p>Why was this bald eagle admitted to SOAR?</p> 	<p>Bald eagles are dying on the Iowa landscape.</p>	<p><b>Analyze and interpret data</b> Students will analyze photos and initial rescue and admit information, then compare to resource material to conclude probable injuries or problems.</p> <p><b>Argue from evidence</b> Students can construct an argument from evidence for each conclusion / eagle.</p>	<p><b>Patterns</b> Students can look for similarities and differences among the bald eagle admit files.</p> <p><b>Cause and effect</b> Discuss if changes in human behavior would have positive impacts on bald eagles.</p> <p><b>What we figured out</b> Outcomes and details of the bald eagle admits in this 5E. (<a href="#">Link to view only Google Spreadsheet</a>) This is a read-only files, so open, then make a copy and save to <b>YOUR</b> Google Drive.</p>
<p><b>Additional resources:</b></p> <ul style="list-style-type: none"> <li>• Learn about how <a href="#">bald eagle's plumage changes with age</a></li> <li>• Learn about <a href="#">determining bald eagle gender by measuring beak depth</a>.</li> </ul>				

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<p><b>MS #2: Explore SOAR's bald eagle data set</b></p> <p><i>MS-LS2.C Ecosystem Dynamics, Functioning, and Resilience</i></p> <p>(MS-LS2-4)</p> <p><i>Big Ideas:</i> Bald eagles are admitted to wildlife rehabilitation for many reasons. Human activity can have a negative impact on the environment.</p> <p>Links to Google Sheets:</p> <ul style="list-style-type: none"> <li>• <a href="#">SOAR 2015-2019 Cumulative Data &amp; Charts for Middle School Teachers</a> (data and graphs)</li> <li>• <a href="#">Student Version</a> (data only)</li> </ul> <p>These are read-only files, so open, then make a copy and save to <b>YOUR</b> Google Drive.</p>	<p>What causes morbidity and mortality to bald eagles in Iowa?</p> <p>(Morbidity is a measure of sickness or disease within a geographic area while mortality is a measure of deaths within a population or geographic area. Mortality is being susceptible to death while morbidity is having diseases to cause death later on.)</p>	<p>When and why are bald eagles are dying in Iowa.</p> 	<p><b>Analyze and interpret data</b></p> <p>Students will analyze and interpret morbidity and mortality data collected on bald eagles admitted to SOAR. <i>(The middle school data set includes three different tabs of data to examine – either as a class, a group assigned to each tab, or each student works through each tab)</i></p> <ul style="list-style-type: none"> <li>• Morbidity / Mortality of all bald eagles admitted</li> <li>• Lead levels of bald eagles admitted</li> <li>• Age and gender of bald eagles admitted</li> </ul>	<p><b>Cause and effect</b></p> <p>Do you find any morbidity / mortality of bald eagles that is caused by human action? What can be done to address this cause of bald eagles dying?</p> <p><b>Patterns</b></p> <p>Students can look for patterns in the data.</p> <p><b>What we figured out</b></p> <p>Bald eagles are admitted due to injury or illness from trauma, disease, ingesting toxic substances, and from other human-caused injuries. Some die from natural causes (e.g. old age, flooded habitat, food shortage).</p> <p>Just under half of the bald eagles admitted to SOAR in this time period experienced some sort of trauma. Over 25% of the bald eagles admitted to SOAR die from lead poisoning.</p>
<p><b>Readings:</b></p> <ul style="list-style-type: none"> <li>• Ed Britton, Project Leader, Upper Mississippi River NW&amp;FR – Savanna District. <a href="#">Lead Exposure in bald eagles in the Upper Midwest</a>. Inside Region 3 March 31, 2014.</li> <li>• Jeremiah Knupp. <a href="#">Deer entrails give learning an emotional, real-world kick for HHS students</a>. Harrisonburg Citizen December 7, 2018</li> </ul>				

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<p><b>MS #3a: Bald eagles don't eat paint, do they?</b></p> <p><i>MS-LS2.B Cycles of Matter and Energy Transfer</i> (MS-LS2-3)</p> <p><i>MS-LS2.C Ecosystem Dynamics, Functioning, and Resilience</i> (MS-LS2-4)</p> <p><i>Big Ideas:</i> Human activity can unintentionally impact organisms in the environment.</p>	<p>How are bald eagles getting lead poisoning?</p> <p>What are some ways bald eagles could ingest lead in their daily lives?</p> <p>Where might lead be found in the environments where bald eagles live?</p>	<p>Many bald eagles admitted to SOAR have lead in their systems.</p>	<p><b>Analyze and interpret</b> Students will analyze and interpret the deer gut pile, deer carcasses x-rays, and eagle x-rays information from SOAR to try to figure out what, if anything the gut piles have to do with the situation.</p> <ul style="list-style-type: none"> <li><a href="#">Google Drive Folder of x-rays</a></li> </ul> <p>Readings will provide the "Ask an Expert" information (from multiple sources) students may need to construct explanations for how they believe eagles are getting lead into their bodies.</p>	<p><b>Cause and effect</b> A bald eagle eating a contaminated food source can be a way for toxins to get in the body.</p> <p><b>What we figured out</b> Eagles are eating deer gut piles and carcasses left by hunters. These gut piles can contain lead, if the deer have been shot with lead ammunition. Since eagles eat deer meat, that is one possible way lead is getting into their bodies.</p>



**Readings:**

- Ed Britton, Project Leader, Upper Mississippi River NW&FR – Savanna District. [Lead Exposure in bald eagles in the Upper Midwest](#). Inside Region 3 March 31, 2014.
- Jeremiah Knupp. [Deer entrails give learning an emotional, real-world kick for HHS students](#). Harrisonburg Citizen December 7, 2018
- Lahner, L.L., and Franson. J.C., 2009, [Lead poisoning in wild birds: U.S. Geological Survey Fact Sheet](#) 2009–3051, 4 p.
- [Lead Contamination in Wildlife](#) – Iowa State University Extension & Outreach website
- [Winged Warnings: Metal Madness](#). 10 Sept 2014, Environmental Health News website ([PDF with no photos / graphics](#))

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<p><b>MS #3b: The deception of lead</b></p> <p><i>MS-LS1.A Organization for Matter and Energy Flow in Organisms</i> (MS-LS1-7)</p> <p><i>MS-LS2.C Ecosystem Dynamics, Functioning, and Resilience</i> (MS-LS2-4)</p> <p><i>Big Ideas:</i> Human activity can unintentionally impact organisms in the environment.</p> <p><b>Note:</b> Both MS #3a and MS #3b look at the physiology and / or chemistry of lead. How does lead impact living organisms?</p>	<p>Why is lead such a problem?</p>	<p>What is the physiology and chemistry of lead? How does lead get into a body (absorbed, ingested, inhaled) and what is the impact on different animals (we'll focus on humans and eagles)</p> 	<p><b>Ask questions and define problems</b> Students will use readings to learn about the impacts of lead on the human body (e.g. bones, nervous system, high blood pressure, kidney damage, etc.)</p>	<p><b>Structure and function</b> Lead mimics calcium in vertebrates. Lead disrupts normal cellular function.</p> <p><b>What we figured out</b> Students will learn that lead gets absorbed into the blood and stored in bones of animals – including people - similar to the way calcium does (The body is fooled into thinking it is absorbing calcium.). Animals and people naturally absorb small amounts of copper, knowing it is copper.</p>

**Readings:**

- [Learn about Lead – Environmental Protection Agency](#) website
- [Lead Fact Sheet](#) from the US Centers for Disease Control
- [https://www.softschools.com/facts/periodic\\_table/lead\\_facts/352/](https://www.softschools.com/facts/periodic_table/lead_facts/352/)
- [What Makes Lead Poisonous?](#) Helmenstine, Anne Marie, Ph.D. (2020, October 29). Retrieved from <https://www.thoughtco.com/what-makes-lead-poisonous-607898>
- [The Deadly Biology of Lead Exposure](#) – Science in the News (PDF). Retrieved from <https://sitn.hms.harvard.edu/flash/2016/deadly-biology-lead-exposure/>

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<p><b>MS #4: Our Buying Power</b> <i>MS-ETS1.B Developing Possible Solutions</i> (MS-ETS1-2)</p> <p><i>Big Ideas:</i> Non-lead ammunition will be a safer alternative for hunting, providing lead-free food for humans and not leaving lead on the landscape. When consumers buy (demand) a certain type of product, retail stores will stock (supply)!</p>	<p>What are the differences between lead and non-lead ammunition?</p> <p>What can be done to reduce lead exposure to animals and people?</p>	<p>(lead-free ammo)</p>  <p>(lead ammo)</p> 	<p><b>Analyze and Interpret Data</b> Students should read about lead and non-lead ammunition availability, performance, and cost. Read information from both the ammunition industry and science-based resources.</p>	<p><b>Structure and function</b> Lead bullets and slugs fragment into hundreds of pieces upon impact and can be found several inches from the site of the wound in large game animals. Copper bullets and slugs retain about 98% of its weight.</p> <p><b>What we figured out</b> There are safer and just as effective alternatives to lead ammunition.</p> <p>More information available on SOAR website: <a href="#">Non-toxic Alternatives</a></p>
<p><b>Readings:</b></p> <ul style="list-style-type: none"> <li>• <a href="#">Condensed Summary of a 2008 Minnesota Department of Natural Resources Bullet Fragmentation Study.</a> (performance, what happens to lead ammunition when fired)</li> <li>• Steinkopf-Frank, Hanna. 2018. <a href="#">Can Hunters and Activists Team Up to Phase Out Lead Bullets?</a> In These Times, January 8, 2018.</li> <li>• Search for “deer slug ammunition” to research cost and availability.</li> <li>• <a href="#">Choosing the Unleaded Option.</a> Montana Outdoors September-October 2020. <a href="https://fwp.mt.gov/montana-outdoors">https://fwp.mt.gov/montana-outdoors</a></li> </ul>				

## Performance Task

Based on what you learned about bald eagles and the hazards they face, plus how lead affects organisms, and human activity can unintentionally impact organisms:

- Develop a persuasive poster to for or against the use of non-toxic ammunition when hunting deer, pheasants, turkeys, and small game from the viewpoint of a stakeholder (someone who is involved or affected by that decision). Waterfowl were not included in the list of animals because the USFWS did a phased-in ban on lead shot for hunting waterfowl and coots, with a total ban on lead shot in 1991.
  - As a class, discuss the many different viewpoints individuals and organizations may have on the subject of non-toxic ammunition. Different students or student groups could focus on developing a poster from one particular viewpoint.
  - Even though ammunition cost and use (adoption of the alternative) were not specifically discussed in lesson 4, students may want to research the cost and local availability (maybe within the typical shopping range of the community plus online retailers). Students could also design a simple survey for understanding how many hunters are using non-toxic hunting ammunition.

If students are struggling with who may have various viewpoints (the stakeholders) in the lead / non-lead ammunition discussion, here are prompts to help:

- Is there a local conservation agency?
- Are there local or regional hunter, angler, or conservation clubs or “fin and feather” groups (both consumptive – hunting - and non-consumptive - birding)?
- What about local government?
- Family members?
- Families with young children?

## Extension Ideas / Topics:

Are only bald eagles in Iowa affected by lead (i.e. is this just an Iowa problem)?

Can bald eagles ingest lead from eating fish or waterfowl, what about upland gamebirds?

Are other birds impacted by ingesting lead?