This case study exercise focuses on the problem of biomagnification of pollutants in the Peruvian Amazon due to the activities of artisanal & small-scale gold mining (ASGM).

Please [enroll in the case "*A rainforest with a gold chain?*" via this link,](https://www.learngala.com/magic_link?key=zzqudCGjG6Lg4p-x5A8kpQ) and read through all sections (except for Section 5, the data analysis exercise, which we will skip).  Please compose answers to the following questions (which are derived from the case study, but with some modifications that connect more to our course content).

**Part 1: Please read sections 1-3, and then answer the following questions.**

* In your own words, what is bioaccumulation and biomagnification, and how do these concepts differ from one another?
* What are all the pathways by which mercury accumulates, and is biomagnified, in the Amazonian Rainforest?
* Review the figure in the upper right on biomagnification and bioaccumulation in the Pacific Northwest.  Describe the pathways of PCBs in the PNW marine food web.
* Do a bit of internet searching to learn about the origins of PCBs in our ecosystems.  Where do PCBs enter the ecosystems in our region?

**Part 2: Please read Section 4 and answer the questions below:**

The researchers Gerson, Vega and colleagues tried to answer these three research questions:

(1) How do gaseous elemental mercury concentrations and depositional pathways vary with proximity to ASGM and leaf area index of regional canopies?

(2) Is soil Hg storage related to atmospheric inputs?

(3) Is there evidence that Hg bioaccumulation is elevated in forest-dwelling resident songbirds near ASGM activity?

* In your own words, how did they go about researching these questions? What aspects of their study design addressed each of their questions?
* Please explain briefly what is shown in the figures to the lower right in this section. What conclusions are supported by the two figures, and how do those address one or more of their questions?  Describe specifically what is shown in the figures that allows them to draw the conclusions that they do.
* In your own words, what did their research show them, and what did they conclude?

***Due to time constraints, Skip Section 5: Exploring the data.***

**Part 3: Please read Section 6: Environmental and socio-economic implications, including exploring the elements included to the right, and answer the following questions:**

* Summarize the ecological impacts of ASGM.  What did you learn from watching the short video segment (also linked [here](https://www.pbs.org/newshour/show/gold-mining-leaves-heart-of-peruvian-amazon-a-wasteland)), and exploring the map of mining activities (also linked [here](https://www.maaproject.org/2023/peru-gold-mining-update/))?  What is the scale of impact?  How did this make you feel?
* Summarize the (a) economic impacts, (b) health impacts, and (c) social impacts of ASGM.  How influential do you think ASGM is to the communities of Madre de Dios?
* What kinds of actions might people from our country take that might help reduce the challenges posed by ASGM and mercury pollution in Madre de Dios?

**Part 4: Please read Section 7: Reflection for the Future. Please also download and read the associated paper "Natural Regeneration after Gold Mining in the Peruvian Amazon".  Then, please answer the following questions:**

* What hope is there for forest recovery following gold mining?  What specifically can we expect to see change, and over what time scales?
* How does regenerating forest differ from reference forests?
* What ideas do you have for research projects that could explore ways to accelerate recovery of these forests?  Be bold, and use what you have learned all term to offer suggestions / hypotheses about actions ecologists could take to help restore these forests.