# **Case Study: Animal Migration and Isotopes**

## In-class Activity Worksheet

Tracking animal migration has provided data that helps understand how individuals and populations migrate across oceans and continents. This information can be used to address environmental challenges such as climate and land-use changes, biodiversity loss, invasive species, and the spread of infectious diseases (National Geographic).

The two most common methods used to track animal migration involve either extrinsic or intrinsic markers. Extrinsic markers are attached to individuals at the point of capture and commonly include leg bands, neck collars, dyes, or miniature transmitting devices. Intrinsic markers exploit the natural biology of the animal and include behavioral, geochemical, or morphological markers. In today’s case study, we will be learning about and focusing on the intrinsic isotopic distribution marker.

Read the online articles below (links) to familiarize yourself with the process of tracking animal migration using the distribution of isotopes. Use this information and that from the chapter 2 video lecture to answer the questions below with your group members.

[**Lazaroff, Cat. Feathered Clues Clear Up Migration Mystery. *Environment News Service*, 8 Feb. 2002,**](http://www.ens-newswire.com/ens/feb2002/2002-02-08-06.html)

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**(Read only Extrinsic and Intrinsic sections of the following)**

[**Viljoen G.J., Luckins A.G., Naletoski I. (2016) Animal Migration Tracking Methods. In: Stable Isotopes to Trace Migratory Birds and to Identify Harmful Diseases. Springer, Cham**](https://link.springer.com/chapter/10.1007/978-3-319-28298-5_2)

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**[Zimmo, S., Blanco, J. & Nebel, S. (2012) The Use of Stable Isotopes in the Study of Animal Migration.](https://www.nature.com/scitable/knowledge/library/the-use-of-stable-isotopes-in-the-96648168/)*[Nature Education Knowledge](https://www.nature.com/scitable/knowledge/library/the-use-of-stable-isotopes-in-the-96648168/)*[3(12):3](https://www.nature.com/scitable/knowledge/library/the-use-of-stable-isotopes-in-the-96648168/)**

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**Questions:**

1. What is an isotope?
2. Certain isotopes can be used to track animal migration. A few examples include those of carbon (carbon-12 and carbon-13), nitrogen (nitrogen-14 and nitrogen-15), oxygen (oxygen-18 and oxygen-16), strontium (strontium-87 and strontium-86), and sulfur (sulfur-34 and sulfur-32). Write/draw the atomic symbol in the boxes provided corresponding to the isotopes below.

sulfur-34 oxygen-16 nitrogen-15 strontium-87

1. Stable isotopes of hydrogen are also used to track migration. What are the atomic masses (to 5 significant figures) of the two most common stable isotopes of hydrogen and their relative abundances in nature?
2. Use your answer from #3 to calculate the ***average atomic weight*** (commonly called ***atomic weight***) of hydrogen.
3. List three pros/cons of extrinsic and intrinsic tracking methods:

Intrinsic Extrinsic

1. The authors of several of the articles state that analyzing the isotopes of hydrogen are preferred to other isotopes when tracking migrating birds. Why? (hint: think about what data they are specifically looking at with the isotopes)