



PROJECT PROPOSAL

IMPACT OF
ENVIRONMENTAL
CALCIUM ON TURTLE
EGGSHELL STRENGTH

OVERVIEW

Water quality plays an important role in the persistence of wildlife whose life history relies on aquatic environments. Calcium levels in lakes and wetlands are decreasing, resulting in an 'environmental osteoporosis' issue. As calcium levels decrease, it is important to know whether this has any implications for the wildlife inhabiting these water bodies. Turtles, a globally imperiled taxon, rely heavily on wetlands and lakes to forage, reproduce, and overwinter. During the excavation process prior to ex-situ incubation in parts of the Canadian Shield, turtle eggs have been observed collapsing inward and imploding, which reduces the success of the egg and therefore recruitment into the population. As turtle eggshells are composed primarily of aragonite (CaCO_3), these implosion events may be a result of the decreases in calcium found in water bodies. The objective of this study is to determine whether there is a correlation between low environmental calcium levels and the structural integrity of turtle eggs.



The Land Between

TG Research and Monitoring Team



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HYPOTHESIS AND PREDICTIONS

If calcium levels are related to egg implosions, we predict that significantly more implosions will occur in areas with low calcium levels when compared to areas with average or high calcium levels.

If this is supported, we expect there will be a greater number of implosion observations in low calcium areas, as well as a reduction in eggshell thickness, strength, and calcium content.



STUDY TIMELINE

1. Data collection: June-August 2025

Two experimental treatments will be assessed, with five replicates (populations) each:

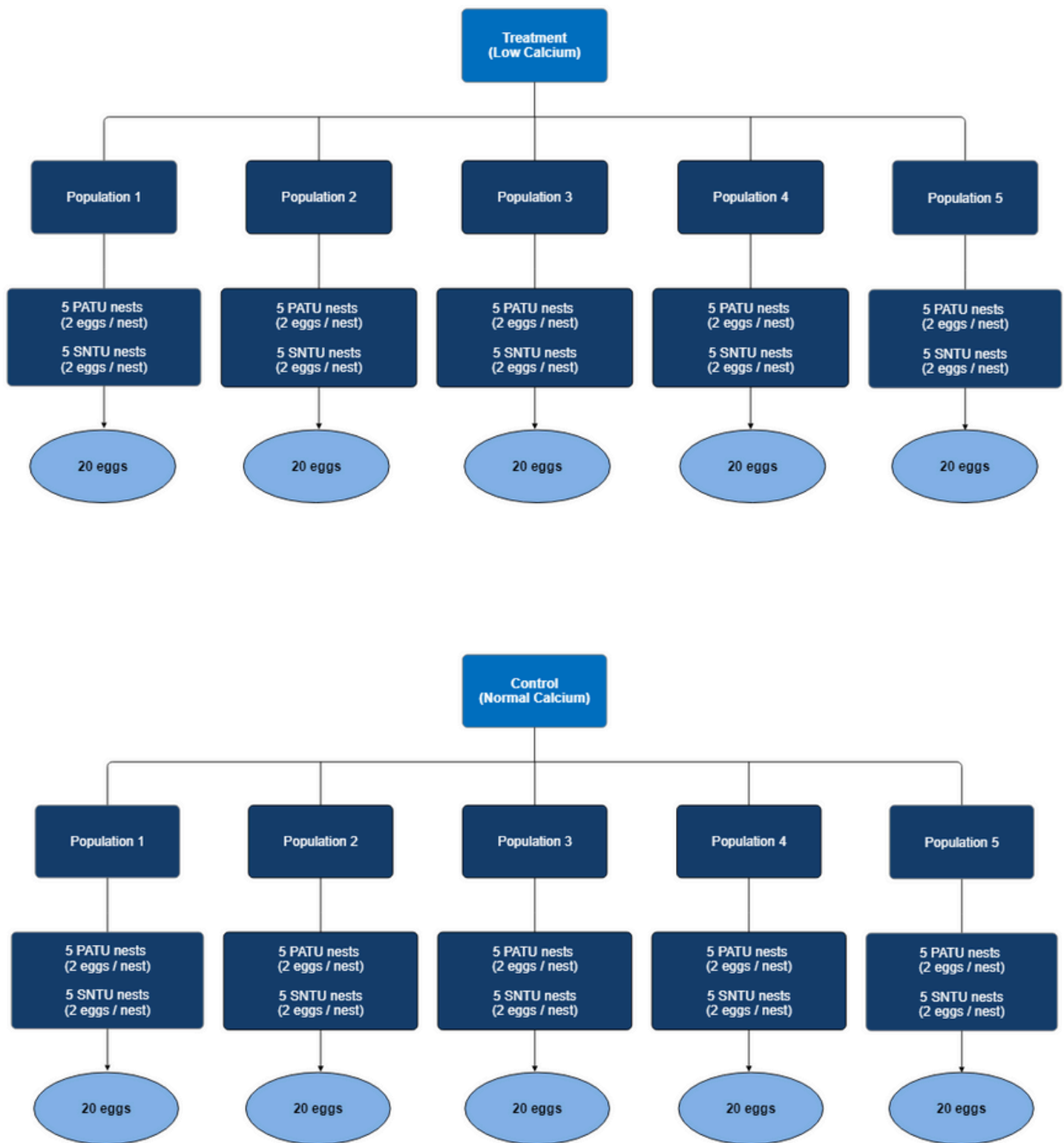
- a. Nests from water bodies with low calcium levels
- b. Nests from water bodies with normal or high calcium levels



Each of the replicates will consist of 5 nests per target species (*Snapping and Painted Turtles*), for a total of 10 nests per population/replicate, or **50 nests per treatment**. Morphometric data will be collected to assess for trends in body mass and size of the mother turtle, as well as general habitat classification of the nest location.

At the point of excavation, the following environmental metrics will be recorded: **air temperature, moisture, barometric pressure, and wind speed**. Nests will be incubated ex-situ in a temperature and moisture controlled environment, unless that are imploded and suspected to be not viable. The eggs will be monitored for implosion, nest mass, and rate of development. **Upon hatching, the success rate (survival to hatching) of each treatment and replicate will be noted, including deformity rates of alive and deceased hatchlings.** Within seven days, hatchlings will be released into a suitable wetland within 1 km of the nest location, according to wildlife permits.

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STUDY TIMELINE

2. Laboratory analysis: September 2025

Prior to three days after the nest has been laid,

two eggs per nest will be randomly selected and terminated to be sent to Trent University for laboratory analysis. Within the low calcium treatment, the eggs that will be selected for termination are limited to those which have imploded, and a complementary number of eggs will be selected from the treatment with regular calcium levels.

The parameters that will be analyzed include eggshell thickness, total calcium content, and strength.

These values will be compared between treatments and within replications to assess for significant difference in eggshell quality in relation to environmental calcium levels. Additional tests will be done to determine calcium levels in certain aquatic turtle food sources, in order to determine the pathway that the decreased calcium levels are affecting the mother turtles and their eggs.

