

(Planet Stewards Note - This is an older proposal submitted prior to certain application sections being required as part of the submission requirements. For this reason you may see differences between this example proposal and others that are provided)

Project title: Runaway Carbon Cycle: Reducing Carbon Emissions through Understanding and Action

Project focus area: Carbon Footprint Reduction

What environmental issue will your project address?

The carbon cycle and emissions are the environmental challenge that this project is going to address. In my school district and in the state of South Dakota as a whole, this issue is poorly understood, and the extent to which it impacts the environment is not appreciated; yet, the Northern Great Plains will be severely impacted by climate change by mid-century [USGCRP, [Fourth National Climate Assessment, Vol. 2, Ch. 22](#), Nov. 2018]. Without understanding the carbon cycle, it is difficult for students to visualize their personal impact in relation to their carbon footprint. Consequently, the issue is not a priority for most of my students. A number of my students seemingly believe that burning their trash or failing to carpool are activities that have little impact on the environment. Recycling and the reduction of trash production are rarely concerns since trash is commonly burned. Carpooling is only preferred when convenient to do so. Unfortunately, these perceptions are also found among the local adult population. This attitude persists locally despite overwhelming evidence that climate change already impacts every sector of our life and economy [Michael Mann, Pennsylvania State University climate scientist, interviewed by Michel Martin, "[National Report Confirms Climate Change 'Is Affecting Every Sector.' Scientist Says](#)," NPR: All Things Considered, 2018.11.24].

This project is designed to model the carbon cycle in such a way that students will be able to directly relate their actions to kilograms of carbon dioxide produced and the consequences of introducing additional carbon dioxide to our atmosphere. We will use NOAA science sources to inspire an urgency of need both locally and globally for a solution to this challenge and a call to environmental stewardship action on the local level to address this challenge. This will be accomplished through using the Teaching Climate section at climate.gov, Ten Signs of a Warming World Poster, and NOAA Climate Education at education.noaa.gov among many other sources to convince students of the pressing need for a solution and stewardship action on the topic.

What are the desired outcomes of your project?

1. Students will demonstrate a measurable increase when comparing pre-surveys to post-surveys in their understanding of the carbon cycle in relation to our biosphere and climate change.
2. Students will demonstrate a measurable increase when comparing pre-surveys to post-surveys in their attitudes toward climate change and climate stewardship.
3. Students will demonstrate a measurable impact through log documentation, research, and calculation in the saving of at least 450 kg of carbon dioxide from our atmosphere through a methodical act of reducing activities that produce carbon emissions.

Who will be involved in this project and how?

All students in grades 6-12 will participate in designing and researching a sealed environment project and will present on their results. Additionally, all of these students will be participating in stewardship action activities later in the semester that will save carbon from the atmosphere through reducing, reusing, and recycling. The total number of students in grades 6-12 participating will be approximately 70. This project will also involve approximately 112 parents and another 50 students in grades PreK-5 that are siblings to the 70 students in grades 6-12. Of those 70 students in grades 6-12, 13 students will be selected to visit Biosphere II in December of 2019 along with two staff members. The 13 selected students will spend a full day working on hands-on research at Biosphere II relating the research to their research on their sealed environments. After traveling to Biosphere II, the 13 students will incorporate their experience into presentations from earlier in the year and present on their experience to their peers in their respective grade. These same 13 students will head up competitive action stewardship teams that will work December through May to save carbon from the atmosphere through stewardship action activities involving reducing, reusing, and recycling.

What activities will the project involve?

The 13 students selected for the Biosphere II field experience will be leading climate steward action groups for each class in grades 6-12. Each class consisting of roughly 10 students each will compete against the other classes to be the group that can save the greatest amount of carbon from the atmosphere. Each group will need to employ strategies to reduce, reuse, and recycle materials in order to conserve carbon. Each student will be expected to implement and document their reduction, reuse, and recycling. During this competition that will span from December of 2019 to May of 2020, data entry logs of student activities will capture and document student activities that reduce the usage of resources that lead to a reduction in carbon emissions. These reduction strategies will be tabulated to the extent that kilograms of carbon emissions saved will be documented. Additionally, data entry logs of student activities will capture and document student activities that reuse and recycle materials that lead to a reduction in carbon dioxide emissions. These materials will be recorded photographically for documentation purposes or be brought into the classroom to be analyzed for their carbon impact. Reusing and recycling strategies will be tabulated to the extent that kilograms of carbon dioxide emissions saved will be documented. In mid-May of 2020, totals of all kilograms of carbon dioxide emissions saved through reducing, reusing, and recycling strategies will be tabulated.

Timeline:

- July, 2019: Notification of award.
- August, 2019: Presentation of project to the school board to accept the award.
- September, 2019: Funds given to school district.
- October, 2019: Lodging accommodations reserved along with reservations for the Biosphere II field experience in March.
- November 1, 2019: Approximately 70 students in grades 6-12 will administered a pre-survey to capture student understanding and knowledge of the carbon cycle in relation to our biosphere and climate change and their attitudes toward climate change and climate stewardship.

- November 4, 2019-November 22, 2019: Approximately 70 students in grades 6-12 will construct sealed environments, both terrestrial and aquatic, these are sealed glass flasks that will allow our students to readily track carbon dioxide, oxygen, temperature, dissolved ions, and pH levels using our Vernier probes. Students will document these levels as their contained habitat likely catastrophically fails in most cases leaving students with the nagging question of what went wrong.
- November 25, 2019-December 20, 2019: Students will use their collected data and observations to research into why they ended up getting the result that they did in their sealed environment and would present on these results while suggesting possible solutions.
- December 20, 2019: The top 13 scoring students on their research project according to a rubric will be selected for a field trip to the Biosphere II research site in Oracle, Arizona.
- December 20, 2019: The 13 students selected to go to Biosphere II will be assigned the remaining students from grades 6-12 to be split up according to grade in competing stewardship action teams that will work toward reducing atmospheric carbon through reducing, reusing, and recycling.
- March 18-19, 2020: 13 students and two chaperons travel to Biosphere II in Oracle, Arizona.
- March 20, 2020: 13 students and two chaperons at Biosphere II in Oracle, Arizona.
- March 21-22, 2020: 13 students and two chaperons travel from Biosphere II in Oracle, Arizona.
- December 20, 2019-May 20, 2020: Approximately 70 students in grades 6-12 will engage in stewardship action activities that will decrease atmosphere carbon dioxide through reducing, reusing, and recycling.
- May 20, 2020: Final kg of carbon dioxide saved from the atmosphere will be tabulated with the winning team recognized.
- May 21, 2020: Approximately 70 students in grades 6-12 will administered a post-survey to capture students' understanding and knowledge of the carbon cycle in relation to our biosphere and climate change and their attitudes toward climate change and climate stewardship.
- May 31, 2020: Final report on stewardship activities will be completed.

Information/Data to be Collected:

1. Pre- and post-surveys will capture students' understanding and knowledge of the carbon cycle in relation to our biosphere and climate change. These questions will be specifically tied to NGSS and South Dakota state science standards. A measured increase in student understanding and knowledge of the carbon cycle would be a desirable outcome.
2. Pre-surveys and post-surveys will capture students' attitudes toward climate change and climate stewardship. A measurable shift in student attitudes toward the acceptance of climate change and climate stewardship would be a desirable outcome.
3. Data entry logs of student activities will capture and document student activities that reduce the usage of resources that lead to a reduction in carbon emissions. Reduction strategies will

be tabulated to the extent that kilograms of carbon emissions saved will be documented. Saving 450 kg or more of carbon dioxide from the atmosphere through reduction efforts would be considered a successful meeting of our goal.

4. Data entry logs of student activities will capture and document student activities that reuse materials that lead to a reduction in carbon emissions. These materials will be recorded photographically for documentation or brought into the classroom to be analyzed for their carbon impact utilizing existing lab scales and other measuring devices. Reusing strategies will be tabulated to the extent that kilograms of carbon emissions saved will be documented. Saving 466 kg or more of carbon dioxide from the atmosphere through reusing strategies would be considered a successful meeting of our goal.
5. Data entry logs of student activities will capture and document student activities that recycle materials that lead to a reduction in carbon emissions. These materials will be recorded photographically for documentation or brought into the classroom to be analyzed for their carbon impact utilizing existing lab scales and other measuring devices. Recycling strategies will be tabulated to the extent that kilograms of carbon emissions saved will be documented. Saving 466 kg or more of carbon dioxide from the atmosphere through recycling strategies would be considered a successful meeting of our goal.

Information/Data Collection Process:

In early November of 2019, students in grades 6-12 will be given pre-surveys that will capture students' understanding and knowledge of the carbon cycle in relation to our biosphere and climate change. These questions will be specifically tied to NGSS and South Dakota state science standards. In addition to understanding and knowledge of the carbon cycle; students will also be administered a pre-survey that will capture students' attitudes toward climate change and climate stewardship. Once this data is collected, students in grades 6-12 will construct environments, both terrestrial and aquatic, that are sealed in glass flasks that will allow our students to readily track carbon dioxide, oxygen, temperature, dissolved ions, and pH levels using Vernier probes. Basically, students would be set up to have a contained habitat that will likely catastrophically fail in most cases leaving students with the nagging mystery of what went wrong. Students would use their collected data and observations to research into why they ended up getting the result that they did and would present on these results while suggesting possible solutions..

The top 13 scoring students on their research project according to a rubric will be selected for a field trip to the Biosphere II research site in Oracle, Arizona. The field trip would occur during March of 2020 and would consist of a full day of hands-on interaction with current Biosphere II research relating their sealed environment and carbon research to the research being carried out at Biosphere II. Upon return, these same 13 students would present what they learned from their field experience. Upon selection these 13 students will each be tasked to lead conservation groups of their peers to brainstorm and implement measurable strategies to reduce their carbon footprint starting in December of 2019. Student teams will be tracked and competing against each other for the title of the most carbon saved. During this competition that will span from December of 2019 to May of 2020, data entry logs of student activities will capture and document student activities that reduce the usage of resources that lead to a reduction in carbon emissions. A goal of 450 kg of carbon dioxide saved from the atmosphere will be set, which is the same mark saved from the atmosphere from the entire (school name redacted) Planet Stewards action program in 2016-17. Since (school name redacted) is a similar sized school district set in a rural setting, we will use 450 kg of carbon dioxide as an attainable goal to determine success. These reduction strategies will be tabulated to the extent that kilograms of carbon emissions saved will be documented. Additionally, data entry logs of student activities will capture and document student activities that reuse and recycle materials that lead to a reduction in carbon emissions. A goal of 450 kg of carbon dioxide saved from the atmosphere will be

set for both reduction and recycling, individually. These materials will be recorded photographically for documentation purposes or be brought into the classroom to be analyzed for their carbon impact utilizing existing lab scales and other measuring devices. Reusing and recycling strategies will be tabulated to the extent that kilograms of carbon emissions saved will be documented. In mid-May of 2020, totals of all kilograms of carbon emissions saved through reducing, reusing, and recycling strategies will be tabulated and compared to our overall goal of 1,350 kg of carbon dioxide saved from the atmosphere, which is three times the total saved through the (school name redacted) Planet Stewards recycling action project and a sum of the 450 kg carbon dioxide goals, individually, for recycling, reducing, and reusing. Once the totals are calculated, post-surveys that will capture any changes in the students' understanding and knowledge of the carbon cycle in relation to our biosphere and climate change will be administered. Additionally, another post-survey will be given to grades 6-12 that will capture any shift in attitudes toward climate change and climate stewardship.

Which STEM careers will students learn about during the project?

We will cover STEM and NOAA careers dealing with climatology, meteorology, ocean sciences, environmental engineering, and geosciences. Career information will be incorporated into the curriculum, research, and Biosphere II visit. During the student research phase of their projects, students will be required to incorporate related STEM career skills into their proposed solutions to their sealed environment. In addition to this research, those students traveling to Biosphere II will experience a full day of lab and field experiences within Biosphere II that cover related STEM fields. We will be in close contact before, during, and after the field experience to further work with those in these STEM careers to help guide our project and to encourage students to pursue STEM and NOAA careers.

How will you conduct outreach within your community? Describe your specific communication and outreach plans.

Timeline:

- December 2018: School administrator gave permission to apply for the Planet Stewards funding opportunity after reviewing the proposal.
- January 2019-May 2019: Worked Planet Stewards to develop a final proposal.
- May 30, 2019: Submit final proposal for review.
- June, 2019: Notification of award.
- July, 2019: Presentation of project to the school board to accept the award.
- September 2019: Work with Edmunds Central business office to secure funds, if awarded.
- October 2019: Work with Airbnb and University of Arizona to make reservations for the March field experience.
- October 2019: Select a teacher as a second chaperon for the field experience in March.
- November 2019: Students and parents of students in grades 6-12 will be made aware of the project and will be actively engaged in it.
- December 20, 2019: 13 students will be selected to go to Biosphere II. Communication between these students and their parents will continue up until the mid-March field experience.

- March 3, 2020: Contact will be made with the *Roscoe Independent* newspaper, the *Aberdeen American* newspaper, and the *Farm Forum* in order to get all three papers to cover the field experience and associated project to Biosphere II.
- March 18-19, 2020: 13 students and two teachers, including myself, will travel to Oracle, Arizona.
- March 20, 2020: 13 students and two teachers, including myself, will participate in hands-on activities at Biosphere II that play directly to the carbon cycle and STEM careers.
- March 21-22, 2020: 13 students and two teachers, including myself, will travel back to Roscoe, South Dakota.
- December 2019-May 2020: Work with students and parents in grades 6-12 to document acts of reduction, reusing, and recycling.
- May 31, 2020: Complete final report on stewardship activities and submit to Molly Harrison.
- June, 2020 and beyond: I will be available to present on this project at both regional and national conferences, as needed.

Project Budget:

(Planet Stewards note - The budget request for this project totalled \$ 3,635.76. Due to technical issues with the budget document as submitted, we were unable to replicate it for this publication)