

Ricky Verre  
Professor Kaplan  
Nature Abounds: Term Paper  
03/15/18

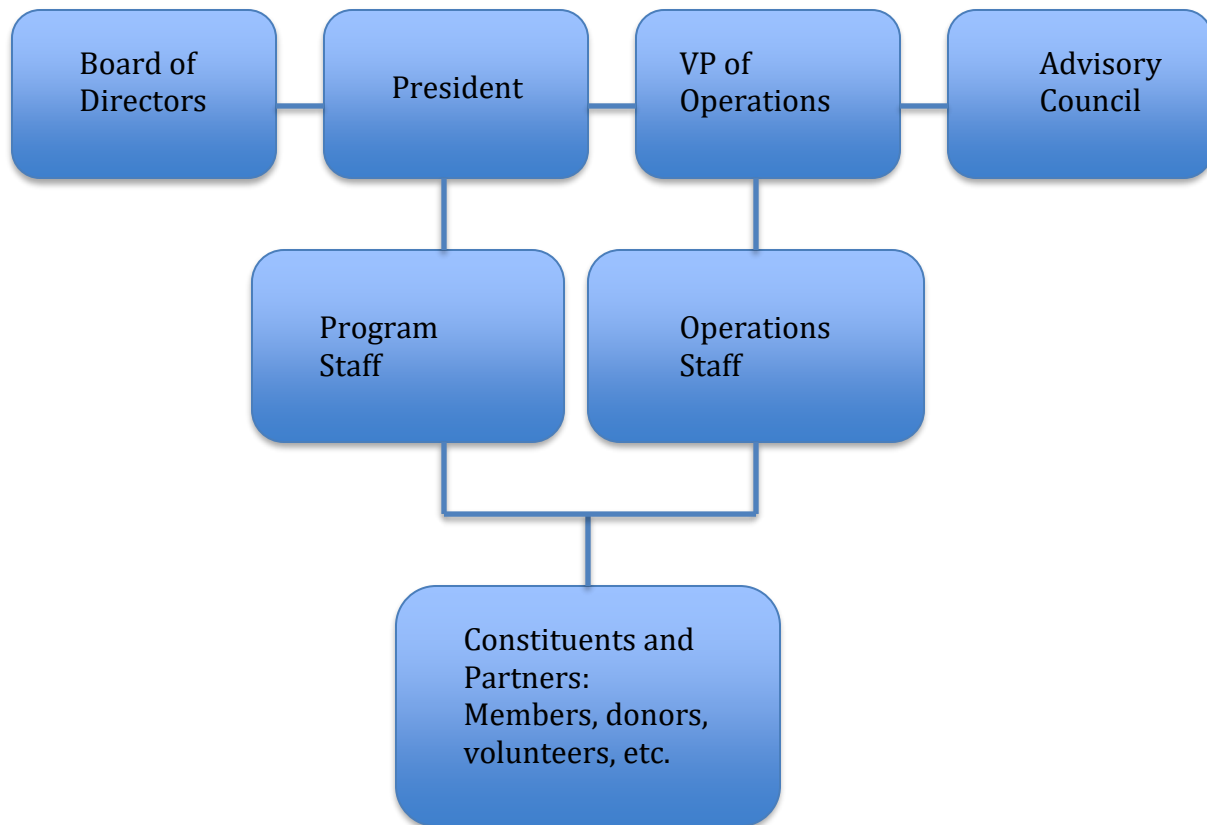
**Mission and Goals:**

Nature Abounds is a national non-profit organization that works to bring together like-minded individuals and groups with the common goal of protecting and rehabilitating the natural environment and, consequently, educating others on climate change and other environmental issues in order to gain support behind their green initiative. Nature Abounds recognizes the interconnectedness of our entire world's operations, and as such acknowledges that a balance between environment and economy should be our end goal. As outlined in the organization's 2018 Strategic Plan, Nature Abounds is "strengthening the voice of action by connecting the stewards of the planet, by building strong partnerships, and by supporting efforts that ultimately lead to a healthier planet for all of us" (Nature Abounds, 2018). Nature Abounds plans to achieve this goal through the education of citizens of all demographics, with a strong emphasis on younger generations that will inherit the Earth in years to come. It is imperative that all people know the consequences of their actions so that we can start to make more sustainable and efficient decisions in all facets of life.

Nature Abounds is founded on the principal that if we take care of our planet, our planet will take care of us. If we can keep our environment healthy, we will also have a strong and prospering economy and/or society, as our entire lives depend on the natural resources that our planet can provide for us. Nature is all around us, but

people still feel so far removed from the natural world because of how automated and mechanized our society and world have become. This is actually where Nature Abounds gets its name, as the organization encourages people to, “unplug from the societal ‘norms’, wake up to the natural world around you, and to take action for a healthier environment” (Nature Abounds, 2018). In forming a large and wide-reaching network of volunteers, Nature Abounds is aiming to increase the impact of environmental stewardship on a national, and even international, scale. Melinda Hughes and Jim Wert, the two cofounders of the organization, started Nature Abounds because they saw that volunteers were not being given the respect they deserved for their time and energy (Nature Abounds, 2018). Hughes and Wert wanted that to change, and that is why volunteers with Nature Abounds have the opportunity to participate in, among others, citizen-science programs, which allow citizens to get out into their surrounding environments to collect data that will be used in actual scientific studies. These programs show volunteers their worth, and as such, Nature Abounds has gained a loyal network of over 11,000 volunteers to date (Nature Abounds, 2018). Nature Abounds prides itself on the fact that its programs and volunteers address a number of environmental issues/aspects, as opposed to other non-profits that specify in water or wildlife alone. In spreading the word of our current environmental issues to many, Nature Abounds hopes to have a sizeable impact in gaining an interest behind the green movement, which will ultimately have a positive impact on the effects of climate change that we are currently experiencing.

### Organization and Funding:



Nature Abounds is a relatively young organization, as it was incorporated just 10 years ago, in 2008. The organization is composed of several divisions that each relies on one another in order to succeed and progress as a team. At the top of the Nature Abounds' hierarchy is Melinda Hughes, President and CEO of the organization. In conjunction with Jim Wert, the Vice President of Operations, Hughes is responsible for all big picture matters, such as developing and employing all of the organization's programs. Hughes and Wert make up the executive level of Nature Abounds, and as such, also oversee the organization's overall operations and communications (Nature Abounds Strategic Plan, 2018). Nature Abounds is

structured in a relatively democratic fashion, as the Board of Directors and Advisory Council serve to provide guidance and direction on programming to the executives in order to increase the quality of all endeavors that the organization takes on.

Additionally, the Board of Directors is charged with overall policy setting for the organization (Nature Abounds Strategic Plan, 2018). All higher ups within Nature Abounds recognize the importance of all employees and volunteers, and as a result all work is valued and given the respect it deserves. Program and Operation staff members work diligently to ensure that all daily operations and programs are running as efficiently and effectively as possible. Furthermore, volunteers in any of the eight programs that the organization offers, as well as other members of Nature Abounds, work to spread the word about our climatic and other environmental issues as widely as possible. Nature Abounds seeks to instill a passion for environmentally conscious living into all of its associates, partners, and members, and the organization even promotes individuals from within. For example, volunteer programs have led to the increased involvement of volunteers within Nature Abounds, as two current board members got their start with the organization as volunteers (Nature Abounds Strategic Plan, 2018).

All of Nature Abounds' programs are made possible by numerous different avenues of funding, including donations, service fees for Ambassador Program materials (\$35), and grants, which come from all levels: federal, state, and private (Nature Abounds Strategic Plan, 2018). However, as a result of recent unsteadiness within our federal government, funding has proven to be the most difficult aspect of business to sustain for Nature Abounds. The organization keeps a positive outlook,

as they have recently secured a grant of \$58,000 from one contributor and \$357,000 from another (their largest funder). The SEC is currently Nature Abounds' most heavily funded program, receiving grants from organizations like the Environmental Protection Agency, the Pennsylvania Department of Environmental Protection, the Foundation for Pennsylvania Watersheds, and the Chesapeake Bay Trust (Melinda Hughes, 2018). Nature Abounds has hopes for increased funding, as it is strategically located in Pennsylvania, an area that feels the effects of the Great Lakes and also has an impact on the watersheds of the Chesapeake Bay and the Mississippi River (Nature Abounds Strategic Plan, 2018). With increased interest behind the green initiative that Nature Abounds is pushing so hard, the organization should see increased funding, which will help to maintain operations and continue to allow Nature Abounds to prosper and grow.

### **Literature Review:**

Since the 19<sup>th</sup> century scientists have predicted that with increased and sustained burning of carbon emitting fossil fuels in order to satisfy our growing energy needs would come increasing average global temperatures, which could have serious impacts on the Earth's average climate and biodiversity (McLamb, 2010). We are currently experiencing those effects, as sea levels are rising, polar ice caps are melting, coastal habitats are being destroyed, species are going extinct at unprecedented rates, species' temporal/phenologic patterns are shifting, and extreme weather events are becoming more and more frequent. This conglomerate of events is what we call climate change, which is defined specifically as, "a long-term change in the Earth's climate, especially due to an increase in the average

atmospheric temperature” (Dictionary.com). It is widely accepted that climate change is the result of human activity that has resulted in the emission of carbon dioxide and other greenhouse gases into the Earth’s atmosphere. This release of greenhouse gases into the atmosphere has a warming effect, as these gases serve to trap the sun’s heat in the atmosphere rather than allowing it to be released back into space, “There is compelling evidence that the rising levels of greenhouse gases will have a warming effect on the climate through increasing the amount of infrared radiation (heat energy) trapped by the atmosphere: ‘the greenhouse effect’” (Stern, 2006). This increase in atmospheric temperature is now well documented, and it has been found that 2016 and 2017 were the two hottest years on record, and seventeen of the eighteen hottest years in documented history have occurred since 2001 (Enck, 2018). In order to guarantee a sustainable/livable future for generations to come, it is imperative that we begin to work toward reversing these climate change effects through not only the replacement of fossil fuels with renewable energy technologies, but also through the conservation and preservation of Earth’s natural lands as well (Krajačić et al., 2011).

Renewable energy sources, especially the sun and wind, are exceptionally clean alternatives to the dirty fossil fuels that our developed world has relied upon for so long. Renewable energy sources do not emit carbon dioxide or any other greenhouse gases into the atmosphere, and they also do not require the environmentally degrading process of mining for raw materials like coal and oil. It is actually quite evident that our global energy market is currently experiencing a transition that will ultimately lead to the widespread implementation of renewable

energy sources, and the consequent ousting of dirty and outdated fossil fuel power plants (Merfeld, 02/15/18). One study that focuses on this “post carbon society” reads, “New RES directive is setting the RES target for 2020 on 20% of the gross final energy consumption, while the most recent initiatives have already begun the process to convert the EU Energy supply to 100% RES” (Krajačić et al., 2011). “RES” here stands for renewable energy sources, and this study highlights the path that must be taken in terms of renewable energy implementation in order for the EU to achieve their set renewable implementation goals by the year 2050. The transition to a renewable energy dependent world will lead us into a happier and healthier future, as joining the green movement will not only help to more rapidly reduce the prevalence of nasty airborne pollutants that are now linked to our warming climate, as well as numerous different chronic illnesses (i.e. asthma and cancer), but will also help to decrease monthly consumer spending on electricity bills as well.

After solar panels are installed on a home, the homeowner’s solar system will generate energy for free whenever the sun is shining. On days when a particular home’s system produces more energy than the home needs, the excess energy can be sold back to the grid for a profit, which will only speed up the time it takes for the solar system to pay for itself. As solar energy generation systems become more and more heavily integrated into the generation network, the technology will become increasingly less expensive; “VRE supply itself reduces the price during windy and sunny hours...The more capacity installed, the larger the price drop will be. This implies that market value of VRE falls with higher penetration” (Hirth, 2013). “VRE” stands for variable renewable energy, and just as basic economics teaches us, the

greater the supply of renewable energy and renewable energy technologies, the cheaper those products will become over time.

Another green technology that will be essential in our transition away from fossil fuels and towards renewables is battery storage. Solar and wind energy are defined as variable sources because they only generate energy when the sun is shining and the wind is blowing, respectively. Therefore, in order to be able to depend on solely wind and solar energy to satisfy demand, some means of storing excess energy during periods of higher generation for use during periods of low or no renewable production is required. It has been determined that, “The increasing interest in energy storage for the grid can be attributed to multiple factors, including the capital costs of managing peak demands, the investments needed for grid reliability, and the integration of renewable energy sources” (Dunn et al., 2011). With increased research and development into energy storage systems, our world will be able to operate at an increasingly efficient level, as energy generation and distribution will be able to remain balanced with greater ease than ever before. Individual homes and businesses will soon even be able to generate their own energy with a solar system or wind turbine, and also be able to attain even further economic benefits, as they could store their excess energy in a battery pack to be used in emergency blackout situations or during peak hours in order to avoid electricity costs while they are at their highest. Battery storage will also have a monumental impact on the greenhouse gas emissions contributed to our atmosphere by the automotive industry.



Electric cars will play a vital role in helping to cut carbon emissions enough to have a meaningful impact on the climate change effects that we are currently experiencing. Studies show that, even with an increase in the implementation of renewable energy generation systems, average atmospheric carbon dioxide levels won't be adequately altered without serious reductions in emissions from our transportation sector (Barton, 2018). It has been determined that, "The transportation sector is responsible for 32% of U.S. CO2 emissions, and 28% of U.S. greenhouse gas emissions. In addition, 70% of U.S. petroleum is consumed by the transportation sector" (Yuksel et al., 2015). However, with improvements to energy storage and electric vehicle efficiency will come great reductions in levels of atmospheric CO2, as well as increased grid reliability, as car batteries could be used to assist with balancing the energy flow over the grid whenever electric cars are plugged into a wall. Renewable technologies are proving to not only have great implications for our natural world and overall climate, but also for our personal finances and overall economy as well. Going green brings us a great balance between environment and economy, and that is the only way that our world will possibly move toward attaining adequate carbon reductions.

As the integration of renewable energy systems increases, a vast number of job opportunities will follow in the new, developing energy industry. In 2016 approximately 260,000 jobs existed in the U.S. solar industry, and 100,000 in the wind industry. The United States' solar industry's job capacity was growing at a rate 17x faster than the nation's overall economy in the same year, and those trends have only continued in 2017 and 2018 (Horn, 2017). Solar installer and wind

technician were also some of the most rapidly growing occupations in the United States in 2016, and only more and more jobs will be created in these industries as technological innovations continue to lower the already incredibly low costs associated with renewable energy sources. As of 2017, wind technician was, outright, the fastest growing job in the United States, and there were approximately 374,000 jobs in the solar industry in total (Tonko, 1/25/18). One final area of focus, in terms of sustainability and a green future in combination with job growth, is energy efficiency. Energy efficiency includes efficiency in terms of the energy generation and transportation/distribution processes, as well as more simple methods of efficiency, such as buying energy star appliances and energy efficient light bulbs that minimize energy use, or turning off the lights when they're not needed, unplugging your chargers when they're not being used, wearing a sweater instead of cranking up the heat, etc. These are all examples of passive, relatively cheap (if not free), methods of conserving energy, and in turn saving money, which can then be spent on things other than electrical bills. One study reads, "The economic benefits of energy efficiency innovation have a compounding effect. The first 1.4 percent of annual efficiency gain produced about 181,000 additional jobs, while an additional one percent yielded 222,000 more" (Roland-Holst, 2008). With each incremental increase in efficiency comes an increasingly large number of additional job opportunities, which will have outstanding implications for our unemployment rate and economy in years to come.

Another means of addressing the effects of climate change that we are already experiencing (which all originally stem from an increase in the level of

atmospheric carbon dioxide), as well as to ensure overall ecosystem health, is conservation, preservation, and/or rehabilitation of natural lands and plant/animal species diversity. It is known that, through the process of photosynthesis, plants absorb carbon dioxide from the atmosphere and release breathable oxygen back into the atmosphere, which makes it possible for us to live. However, as a result of the destruction of naturally existing forests for purposes such as agriculture, construction of city apartments and large skyscrapers, construction of residential homes, the timber industry, and the mining industry (to name a few), many areas that were once covered in trees and other green vegetation are now left deforested and destroyed. Approximately 80% of the Earth's native forests have now been ruined, and that loss of biodiversity has only intensified the effects of climate change (Terrangi, 2014). Habitats are lost and environmental stresses on species increase, threatening their livelihoods and survival even more. This means that along with the increased emission of carbon dioxide into the atmosphere from burning fossil fuels has come a decreased level of carbon dioxide absorption by plants, which only multiplies the greenhouse gas heating effect and speeds along the climate change process and all of its effects. With temperatures and carbon dioxide levels at all time highs, the effects of climate change are occurring at unprecedented rates. One effect that stands out is the rate at which plant and animal species are going extinct as a result of changes in climate that certain species cannot adapt to in a timely manner. Scientific studies have analyzed and assessed data in order to determine the percentage of plant and animal species that would go extinct based on different modeling parameters that either intensify or decrease the projected impacts of

climate change. One study in particular found that, “For projections of maximum expected climate change, we estimate species-level extinction across species included in the study to be 21-32% with universal dispersal, and 38-52% for no dispersal” (Thomas et al., 2004). This means that, without making the proper changes in order to curb atmospheric carbon dioxide levels, our globe will lose between 21 and 32% of its biodiversity if species are able to move with climate change in order to lessen the experienced effects (dispersal), or 38 and 52% if species remain where they currently are. These numbers are projected for the year 2050, showing us that if we do not fix the issues that are currently causing climate change, we will lose approximately half of the Earth’s biodiversity in just another few decades. This same study also produced biodiversity estimates based off of the best climate scenario, in which we have a positive impact on climate change, and those species reduction numbers are, “9-13% extinction with dispersal and 22-31% without dispersal” (Thomas et al., 2004). There is hope of achieving the best possible case scenario, as increased awareness of the environmental issues that we are presently experiencing is leading to greater action against matters related to climate change.

One incredibly valuable tool that a number of organizations have started to implement is citizen-science, which allows individuals to get out into the field and collect data that scientists use in experimental studies. Citizen-science opportunities are a great way for scientists to obtain large samples of data that can be used to analyze and assess any specific topic of study (Dickinson et al., 2010). Especially in fields like Biology and Ecology, studies must be looked at from a very broad

perspective, so having large data sets is imperative for any kind of quantitative reporting. Furthermore, “large-scale citizen science has led to new, quantitative approaches to emerging questions about the distribution and abundance of organisms across space and time” (Dickinson et al., 2010). Citizen-science opportunities, and other similar programs, are a great method of documenting observational data that can provide clues and answers to dealing with and solving our current environmental issues. One study in particular has modeled how global warming, or climate change, is currently and will continue to impact animal and plant species, “Four types of changes in species’ traits due to warming may be possible” (Root et al., 01/02/2003). First off, Root et al. found that, in general, species will move with climate change by tracking and following the climatic conditions that suite them best. This will have effects on species density in certain areas, and also means that species’ livable ranges could shift drastically with increasing climatic stress (Root et al., 01/02/2003). Our warming climate will also influence the phenology of certain species, as animals may start to migrate at different times and flowers may start to bloom earlier and earlier as our globe gets warmer and warmer. Other possible species’ trait changes found in this study include morphological changes (i.e. body size) and shifts in genetic frequencies (Root et al., 01/02/2003). Models such as the ones produced in this study should serve to show us just how serious the issues at hand truly are. If we can’t figure out a way to have a positive impact on our planet, we will lose a vast majority of the natural world that we rely upon to sustain our lives.

Other studies have looked at how climate change is influencing the frequency of extreme weather events, as well as the effects of melting land ice on sea level rise, and consequently coastal species' habitat destruction. In regards to extreme weather, "There has been a substantial increase in most measures of Atlantic hurricane activity since the early 1980s...The recent increases in activity are linked, in part, to higher sea surface temperatures in the region that Atlantic hurricanes form in and move through" (National Climate Assessment, 03/14/2018). These higher sea surface temperatures have not only led to the increased frequency of extreme weather events, but also to more and more melting ice, and ultimately, rising sea levels. This is what we call a positive feedback loop, in which our warming atmosphere melts existing ice, but also warms the ocean water in contact with the ice. This warmer water then melts even more ice, and the cycle continues, speeding up the overall melting process, "GICs, excluding the Greenland and Antarctic peripheral GICs, lost mass at a rate of ~ 148 Gt per year from January 2003 to December 2010, contributing ~0.41 mm per year to sea level rise" (Jacob et al., 02/08/2012). These findings show us that the melting of glaciers and icecaps (GICs) is occurring at an alarming rate and will only continue to intensify as our planet gets warmer and warmer. Our coastlines are being pushed back as sea levels rise, and terrestrial species are losing valuable habitat. It has been found that, "17 percent – one in six—of the nation's threatened and endangered species are at risk from rising sea levels", and "From 1901 to 2010, the average sea level rise was 7.4 inches worldwide" (Rice, 12/11/2013). As these trends continue, the effect on all life, but especially life along the coasts, will only grow increasingly worse. People and

animals will be displaced and will have to find new places to settle down, and the approaching sea will drown any plant life on our existing coastlines. An immediate change in the way we live our lives is imperative, and as inhabitants/stewards of this planet, it is our responsibility to ensure that this change arrives in a timely manner.

### **Success in Regards to Meeting Organization Goals:**

Although Nature Abounds was only incorporated ten years ago, the organization has had great success in achieving the goals that it has set forth. Nature Abounds currently has a volunteer network of more than 11,000 individuals and, thus far, volunteer opportunities have managed to increase awareness of a number of environmental issues (Nature Abounds Strategic Plan, 2018). Nature Abounds is developing a strong reputation within the environmental field, and is currently gaining support from numerous different agencies, corporations, non-profits, and even the general public. The organization believes that its placement of value on all aspects of the environment, rather than focusing on any one aspect in particular, is very popular and allows for greater flexibility and availability in working with other organizations (Nature Abounds Strategic Plan, 2018). The citizen-science programs, IceWatch USA and Watch the Wild, also give Nature Abounds an upper hand on other non-profits, as these programs truly get individuals active in the fight against climate change and other environmental issues. Citizen-science opportunities show volunteers that their work is sincerely valued, and in turn, volunteers work harder in order to continue to produce quality data sets that can later be used in scientific

studies. IceWatch USA and Watch the Wild are now recognized on an international level, and Nature Abounds President Melinda Hughes was even able to present to the European Citizen-Science Association about her experience with citizen-science programs in 2016 (Nature Abounds Strategic Plan, 2018). Of the two, IceWatch USA has had a bit more exposure through media outlets and has gained a bit more of a following. This coming spring, Nature Abounds looks forward to expanding its citizen-science program repertoire by adding a new program called “CloudWatch USA”, which will serve to increase the amount of environmental monitoring performed by Nature Abounds volunteers and further assist in assessing and fixing any and all environmental issues, as cloud type is a useful indicator of climate change (Melinda Hughes, 2018).

Back in 2010, soon after Nature Abounds got its start, the organization partnered with a United States Environmental Protection Agency program, as well as the Pennsylvania Department of Environmental Protection to get the Pennsylvania Senior Environment Corps back up and running. This revitalization was accomplished with support from all levels, including federal, state, and private, which all supplied the program with quality testing equipment among other supplies, a database/website, and proper volunteer training in order to perform quality parameter tests effectively (Nature Abounds Strategic Plan, 2018). Since coming back online, the Pennsylvania Senior Environment Corps has increased in number and has also won several environmental awards. Senior Environment Corps programs now also exist in Maryland, New Jersey, and Alabama, and the program hopes to continue to expand into and prosper in other states in the future (Nature



Abounds Strategic Plan, 2018). Nature Abounds has received media attention from several different news outlets including the Washington Post, the New York Times, and the Philadelphia Enquirer, and looks forward to having their future initiatives and successes shared with the general public.

Nature Abounds also has a system in place to ensure that they are working toward, and ultimately achieving, the goals that the organization has envisioned. Each year, staff members are tasked with evaluating operations and programs overall. Questions are asked and employees work to determine what is being done right, what is being done wrong, and what needs to change in order to ensure that everything that needs doing gets done (Nature Abounds Strategic Plan, 2018). Any changes that are implemented are strictly monitored in order to determine whether or not they are having the desired impact on results, and if not, further action is taken. Aside from initiating CloudWatch USA, Nature Abounds is also currently looking to open an office in the western half of the United States (Nature Abounds Strategic Plan, 2018). A large number of Nature Abounds' volunteers are actually from the western United States, and it is imperative that these volunteers be given the proper access to quality resources so that they can carry out their roles efficiently. This will not only assist Nature Abounds in growing its network, but will also greatly progress the rate at which news of environmental issues and initiatives is spread across the country and globe. Nature Abounds plans to have a stronghold on the west coast of the United States by late 2018 – early 2019, and will hopefully continue to grow even more from there (Nature Abounds Strategic Plan, 2018).

**Success in Regards to Addressing Issues in Literature Review:**

As previously discussed, Nature Abounds is working to create an international network of environmental stewards that not only spreads the word about any and all environmental issues, but also takes action in an effort to remedy the effects of climate change that we experience on a day-to-day basis. However, Nature Abounds also recognizes that any sort of green movement should not detract from economic prosperity, but rather drive economic growth and progress. It is widely accepted that the main root of the majority of our current environmental issues stem from the overall heating of our planet as a result of the greenhouse effect (the warming of our planet from heat energy trapped in our atmosphere by greenhouse gases). Therefore, any action that will have a positive effect on climate change is in line with Nature Abounds' goals.

Although Nature Abounds does not have a distinct program dedicated to renewable energy, these technologies will play a monumental role in achieving the kind of environmental relief that the organization is working to attain. Nature Abounds' Climate Change Ambassador Program was not particularly designed to gain an interest behind renewable energy technologies; however, it actually serves as a great platform for volunteers to do so. The program was put in place in order to spread the knowledge of climate change and all of its effects to as many people as possible in an effort to gain a following behind their green initiative, and it does a great job of doing that (Nature Abounds, 2018). Nature Abounds has volunteers of all demographics with a wide range of interests, which allows the Climate Change Ambassador program to educate people on a broad spectrum of environmental

topics. Climate Change Ambassadors can reach out to family members, friends, town or government officials, school teachers, etc., sending out climate change fliers with information about how climate change is impacting our planet and all that lives on it. Ambassadors can write blogs or newsletters on topics of interest and current environmental initiatives or issues, and ambassadors can also give people solutions that they can implement in order to do their part to fix the issues at hand. This gives volunteers a great opportunity to reach out to people in regards to not only their energy use and ways to cut back and conserve, but also in regards to the source that their energy is generated from. Giving home or business owners information on the potential savings associated with renewable energy technologies, like wind and solar energy, as well as overall energy efficiency, will give them a greater incentive to make the transition to cleaner energy sources and more sustainable living in general. Lastly, as Climate Change Ambassadors continue to spread the word about our growing renewable energy industry, more and more people will find opportunities for employment in industries like wind and solar, or battery storage and electric vehicles, which will have great economic implications. As Climate Change Ambassadors continue to educate others on climate change and all of its effects, as well as solutions to those issues, our global carbon footprint will only continue to decrease. Other Nature Abounds' programs take a different approach to solving some of our current environmental issues.

Loss of biodiversity is a huge issue at present, as species are going extinct at unprecedented rates as a result of climate change. In order to address this issue Nature Abounds recently adopted a Natural Biodiversity program, which not only

educates volunteers on methods of conservation, preservation, and rehabilitation, but also gets volunteers active in initiatives to restore and rehabilitate damaged or destroyed ecosystems (Nature Abounds, 2018)a. Nature Abounds' Natural Biodiversity program has already informed over 100,000 people on the topic of biodiversity loss, and the organization has another program, Keepers of the Forest, that serves a similar purpose. Keepers of the Forest gives volunteers the knowledge to not only be able to identify plant species in order to monitor for invasives, but also to be able to recognize overall forest health and know what kind of activity is illegal and reportable (Nature Abounds, 2018). Programs like these are a great success in terms of protecting and rehabilitating our natural lands in an effort to preserve the species diversity that remains on Earth. Maintaining biodiversity on our planet is essential to proper ecosystem function, and, as such, should be heavily monitored. However, climate change studies project that as our climate continues to warm, certain plant and animal species will track their ideal climatic conditions and move in order to maintain their livelihoods. Therefore, the biodiversity that we are used to seeing in specific regions could change if we don't have an immediate positive impact on the effects of climate change.

In order to track these changes and monitor species composition, Nature Abounds has implemented a citizen-science opportunity/program called Watch the Wild. Watch the Wild serves to get volunteers out into the natural world to observe wildlife and wildflowers so that they can report on their findings and any noted changes can be further analyzed in scientific studies (Nature Abounds, 2018). Expected changes include changes in migration patterns, changes in flowering or

hatching time, and even genetic mutations that alter behavior or body function. Watch the Wild also encourages volunteers to observe and report on changes in weather patterns, and to keep a close eye out for exceptionally extreme weather events, which are occurring at a higher frequency than ever before. Our warming climate is quite clearly the cause of the increased occurrence of powerful super storms, and it is imperative that these events be documented thoroughly. Global warming and climate change are also responsible for melting glaciers and ice caps, and, ultimately, for the sea level rise that we are currently experiencing. IceWatch USA is another citizen-science opportunity that Nature Abounds has put in place in order to get citizens active in the fight against climate change. Specifically, IceWatch USA is a program in which volunteers observe waterways, weather patterns, and wildlife throughout the winter season (Nature Abounds, 2018). This allows for the collection of quantitative data sets on how our warmer planet is impacting things like average snowfall, species migration patterns, and average winter temperature. Nature Abounds is also in the process of adding a third citizen-science program called CloudWatch USA, which will focus on monitoring cloud types, as they are a valuable climate change indicator (Melinda Hughes, 2018). The addition of CloudWatch USA will serve to increase the amount of quantitative data available to scientists for climate change studies, and, ultimately, increase the general public's knowledge on the issue of climate change and steps we can take to remedy its effects. Nature Abounds does also collect qualitative data sets on water quality through its Senior Environment Corps, "The SEC data is used in a variety of ways and has been used by a variety of groups, such as government agencies, educational

institutions, and watershed groups as well as recreational groups like anglers” (Senior Environment Corps, 2017). The data collected by Senior Environment Corps volunteers is typically used as a baseline source of data that future studies can be compared to in order to track and determine the cause of any changes in water quality.

Nature Abounds is getting its foot in all doors that pertain to environmental health, and, as such, is doing a great job in reaching a large number of individuals and groups in order to spread the word about environmental issues, as well as initiatives underway to fix those issues. With a number of different programs that all focus on different aspects of our environment, Nature Abounds will continue to educate people across the world on our most pressing issues in hopes of motivating people and gaining an even larger following behind the green movement. With renewable energy technologies becoming increasingly cost competitive with fossil fuels, and with a large network of motivated stewards, we are well on our way to attaining the sustainable future that we so desperately need.

### **Bibliography:**

1. Dunn, Bruce, Haresh Kamath, and Jean-Marie Tarascon. "Electrical energy storage for the grid: a battery of choices." *Science* 334.6058 (2011): 928-935.
2. Green Action News. October 5, 2014.
3. Hirth, Lion. "The market value of variable renewables: The effect of solar wind power variability on their relative price." *Energy economics* 38 (2013): 218-236.
4. Horn, Paul, U.S. Renewable Energy Jobs Employ 800,000+ People and Rising. May 30, 2017.
5. Jacob, Thomas, et al. "Recent contributions of glaciers and ice caps to sea level rise." *Nature* 482.7386 (2012): 514.
6. Krajačić, Goran, et al. "Planning for a 100% independent energy system based on smart energy storage for integration of renewables and CO2 emissions reduction." *Applied thermal engineering* 31.13 (2011): 2073-2083.

7. Nature Abounds. [www.natureabounds.org/Programs.html](http://www.natureabounds.org/Programs.html)
8. Nature Abounds. *Nature Abounds Strategic Plan, 2018*.
9. Roland-Holst, David. "Energy efficiency, innovation, and job creation in California." (2008).
10. Root, Terry L., et al. "Fingerprints of global warming on wild animals and plants." *Nature* 421.6918 (2003): 57.
11. "The Secret World of Energy." *Ecology Global Network*, 12 Oct. 2011.
12. Thomas, Chris D., et al. "Extinction risk from climate change." *Nature* 427.6970 (2004): 145
13. Yuksel, Tugce, and Jeremy J. Michalek. "Effects of regional temperature on electric vehicle efficiency, range, and emissions in the United States." *Environmental science & technology* 49.6 (2015): 3974-3980.

**Honor Code:**

I affirm that I have carried out this academic endeavor with full academic honesty:

Richard Verre