



Growing Tomorrow: Integrating Water Stewardship, Beavers, Permaculture, Regenerative Agriculture, Earthship Learning, and Community Renewal to Improve the Metabolic Health of P-12 Students in Clark County and Empower Communities Across Arizona, Nevada, Idaho, Mexico, and Canada

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DOI: 10.31080/ASAG.2024.08.1451

Received: December 13, 2024

Published: December 26, 2024

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Abstract

This article explores the opportunity that Clark County Nevada has to implement Permaculture, Regenerative Agriculture, and Earthships to grow food that could be consumed by the Clark County School District students. It looks at establishing the I-11 corridor from Mexico, through Elko Nevada, ending in Elko Canada. This will provide an economic benefit to the rural communities where the interstate would be built providing that they eliminate legal prostitution, in order to, encourage people, and businesses to move to these underserved rural communities.

Keywords: Agriculture; Chronic Disease; Clark County School District; Education; Earthship; K-12; Metabolic Health; Permaculture; Regenerative

Abbreviations

CCSD: Clark County School District; K-12: Kindergarten through 12th grade; CDC: Centers for Disease Control and Prevention; WHIN: Wildlife Habitat Improvement of Nevada; GMO: Genetically Modified Organisms

Introduction

We are living in a world that is getting hotter and dryer [17] now more than ever we are dependent globally on one another for our food sources. Permaculture, regenerative agriculture, earthships, and systems thinking are solutions to help mitigate the effects of global drought, and the use of harmful pesticides that make us sick and increase chronic diseases. The health of our children needs to be the number one priority in the United States of America. The Las Vegas Clark County School District is an ideal setting to feed high quality organic produce and meat to students and monitor the outcomes of their health after receiving and consuming healthy food options. There is an ample supply of federal land surrounding

the city that could be used for permaculture and regenerative agriculture projects to produce the food necessary to feed all 300,000 students in the Clark County School District.

A study should be created to monitor the academic progress of the students before and after implementing the program. According to the CDC [15] healthy students are better learners and academic achievement bears a lifetime of benefits for health. Growing healthy organic food and feeding it to our children will benefit them for a lifetime [9]. Permaculture and regenerative agriculture techniques through purposeful cooperative collaboration are key to producing the healthy food necessary to change the health of our children and help eliminate chronic disease in America. Clark County offers some unique laboratories for this study because it contains both urban and rural communities that can be targeted to implement the permaculture, regenerative agriculture, earthship and systems thinking to help improve the health of our communities.

Permaculture

Andrew Millison Senior Instructor at Oregon State University in the Department of Horticulture focuses his research on permaculture and water design [17]. He teaches and practices permaculture, creates media, and is an avid gardener. He has traveled the world to India, Egypt, Mexico, Cuba and the United States. Andrew has developed an online permaculture program with niche offerings that have evolved worldwide and served thousands of students throughout the world. Andrew has designed properties in various types of geographies from the mountains of Arizona, to the farmlands of Oregon, and the deserts of Egypt [18]. The Mojave Desert would be an ideal project to design a large-scale permaculture and regenerative agriculture project to increase the water table and provide healthy organic food for the children of Nevada.

Water is the number one issue in the Mojave Desert and the western United States. Using permaculture techniques is one way to store water in underground aquifers that will increase the availability of water in the area to produce healthy food. It is possible new streams will emerge to further increase the available water in Lake Mead, and smaller reservoirs in rural communities. Las Vegas currently receives 90% of their water from the Colorado River. The river has dropped more than 150 feet since January 2000. If these permaculture techniques work they could be established up and down the Colorado river, and assist in increasing water levels in the reservoirs not only benefiting the United States but Mexico as well. We can engage the use of beavers to help create smaller microclimates and dams along the Colorado river. Using nature and permaculture combined with regenerative agriculture practices will increase the water stored in the soil allowing the ground to absorb and store water like a battery that can be used later as conditions become hotter and dryer. Planting cover crops and using regenerative agriculture principles will lead to healthier soil less prone to desertification. Monoculture desertifies and destroys soil health leading for the need to spray harmful chemicals that degrade soil health, and water runs off and evaporates instead of sinking into the earth to recharge natural aquifers.

Permaculture and regenerative agriculture

Monoculture farming practices take needed nutrients from the soil resulting in dryer dustier fields. Utilizing permaculture and regenerative agricultural techniques allows moisture to be re-

tained in the ground and results in increased bio organisms. This soil teems with life bacteria, fungi, algae, protozoa, nematodes, and other tiny creatures, ensures healthy plants will grow that are pest resistant [21]. The aforementioned organisms play an important role in plant health. Soil bacteria produce natural antibiotics that help plants resist disease. Healthy plants that repel pests do not need pesticides. Minimizing soil disturbance, maximizing living roots, maximizing biodiversity, and maximizing soil cover result in a variety of crops to harvest, and animals to butcher.

Because regenerative agriculture uses domestic animals to fertilize the soil they become income generating resources for the farmer. They become the employees for the farmer, and perform the work necessary to till and fertilize the land before crops are planted. Not only do permaculture and regenerative agriculture practices benefit domestic animals, but wildlife as well. Groups like the Wildlife Habitat Improvement of Nevada [5] could be utilized to put in infrastructure for the permaculture and regenerative agriculture projects. WHIN is a non-profit conservation organization devoted to the maintenance and betterment of Nevada's wildlife populations and their habitat [5]. They are experts at working in arid climates. Arid climates dryer than the Mojave like the Sahara Desert are using permaculture techniques creating micro climates resulting in the ability to grow and harvest crops to feed local populations. This innovation is necessary as previous techniques have seen less than desirable results [20].

Permaculture and regenerative agriculture will allow more water to stay in ground, conserving water in arid environments, instead of running off, and evaporating. During drought conditions, the previous year's rainfall will be held in the soil, and natural aquifers. These aquifers will act like batteries for water storage. Planting trees and grasses, and using regenerative agriculture equipment to mitigate soil disturbance when planting crops will allow life to grow below the crust. Minimization of soil disturbance allows plants to grow in healthier soil, and in turn results in stronger plants resistant to disease. Eating healthy nutritious food grown from this beneficial soil free of harsh chemicals will restore health in the United States, and reduce the epidemic of Chronic Disease. It is estimated by the CDC that approximately 129 million people in the United States have at least one major chronic disease: heart disease, cancer, diabetes, obesity, hypertension as defined by

the United States Department of Health and Human Services. Five of the top 10 leading causes of death in the US are, or are strongly associated with, preventable and treatable chronic disease.

Chronic disease

It is no secret that Americans are unhealthy and Chronic Disease is on the rise. Heart disease, cancer, and diabetes are the leading causes of death and disability in the United States. These diseases often last a lifetime and require ongoing medical attention. They limit the activities of daily living for those experiencing them, and are also the leading drivers of the nation's \$4.5 trillion in annual health care costs. According to the CDC chronic diseases are the leading cause of illness, disability, and death in America. Most chronic diseases are caused by a short list of risk factors: smoking, poor nutrition, physical inactivity, and excessive alcohol use. Some groups are more affected than others because of factors that limit their ability to make healthy choices. A time series study should be conducted on the impact organic food has over a lifetime of consumption, and a study on the effects of shifting from a traditional American diet to a healthy organic diet is needed. A collaborative study between the University of Nevada Las Vegas, and the Clark County School District as it relates to enhancing the metabolic health of children would be a valuable data set to see how healthy food affects individuals through-out their life.

Metabolic health

Casey Means MD is a Stanford-trained physician, Chief Medical Officer and co-founder of the metabolic health company – Levels [16]. She is the author of Good Energy a book focusing on improving the metabolic dysfunction, a rampant phenomenon in our world. She is an Associate Editor of the International Journal of Disease Reversal and Prevention. Her mission is to maximize human potential and reverse the epidemic of preventable chronic disease by empowering individuals with tech-enabled tools that can inform smart, personalized, and sustainable dietary and lifestyle choices. The techniques she teaches require quality organic foods to improve metabolic health. Those foods can be provided through permaculture, and regenerative agriculture practices. Once our metabolic health is improved we turn to the need for housing. Earthships are a sustainable design of housing that utilizes the environment to ensure we have comfortable places to live.

Earthships

Michael Reynolds graduated architecture school in 1969 and participated in the United Nations Conference on Low Cost Housing for the 3rd World. In 1973 he obtained a patent for "building

block of empty cans" and has been experimenting and developing sustainable buildings since 1971 [4]. In 2005 he worked to pass the Sustainable Development Testing Site Act. The Legislation allowed land to be set aside for testing and development of sustainable buildings It provided freedom to dream up solutions and test methods for sustainable building. He has traveled to Asia, Europe, Australia, North and South America. Interest in his work is growing. He has been invited to lecture around the world including The Parliament of Sweden, KTH Royal Institute of Technology, National Technical Library in Prague, and the World Wellness Project Summit in Melbourne and more. His company Earthship Biotechure is the number one sustainable autonomous design-build company [13]. His homes address all human needs food, energy, clean water, shelter, garbage management, and sewage treatment. The earthship academy is the foremost building school in the world for autonomous living for people to learn how to build their own earthships.

Jonah Reynolds son of Michael Reynolds has also started a company Pangea builders where they build earthships [14]. There are currently six models they are working with the Encounter Model, Global Model, Bayliss remodel, Montana, Unity, and Morningside remodel. Earthships are passive solar homes made of both natural and upcycled materials. They can be completely off-grid or partially off-grid. They can be built in any part of the world, in any climate (with a permit) and provide electricity, potable water, contained sewage treatment, and sustainable food production. Earthships are thermal mass homes first, passive solar homes second. Whatever temperature goes into an earthship, it will hold and since it is also a passive solar house, it is very tight and interacts only with the sun and the earth for heating and cooling, providing stable comfort year round in any climate. Ideally the home is situated 13.5 degrees east of south.

The techniques of permaculture, regenerative agriculture, and earthships can be used in urban and rural communities. It will take purposeful cooperative collaboration to implement it in larges cities, but cities who choose to implement these techniques will become more self-reliant and healthier. Even if urban areas don't implement earthship designs in their communities they could take the principles of generating food, energy, clean water, shelter, garbage management, and sewage treatment and find ways within their community to provide a higher quality of life for everyone in the city. In many ways the city of Las Vegas is an earthship when it comes to water conservation. Any water that touches a pipe or gutter is promptly recycled and put back into Lake Mead after it goes through a sterilization process at the water reclamation district.

Las Vegas is a leader in water conservation. Even though Clark County leads in water conservation techniques the water put back into Lake Mead is not 100% pure. Clark County reclaims 100% of the water that hits a gutter or street, but it is not drinkable when it leaves the facility. Lake Mead provides water for Las Vegas, California, Arizona, and some of Mexico. The intakes are at danger of not being able to take in more water. In order to ensure water for future generations we need to find ways to bring more water to the reservoir. Beavers could play a vital role in that system.

Beavers

Beavers in Elko Nevada are damming up small streams that are allowing ranchers cattle to have access to water during times of drought [2]. Carol Evans a researcher and John Griggs a rancher in Elko Nevada are showing how Ranchers and Beavers can co-exist and thrive. Historically ranchers have been at odds with the beaver and have removed them from the land where they graze their cattle, but the significance of the beaver to creating wetlands and vegetation on his property has allowed him to get water to his cattle in parts of the ranch that were previously not accessible. Two Engineers Nick Bouwes and Joe Wheaton are working on a project to have beavers create dams in specific areas to hopefully increase the availability of water in larger reservoirs [3]. The beaver's dams act as small reservoirs allowing water to be stored on the land and continue down streams to rivers in hopes of consistent water flow that could potentially increase the water levels in larger reservoirs like Lake Mead [1].

Las Vegas Nevada and the surrounding communities would make an excellent test site to implement permaculture and regenerative agriculture in urban, as well as rural areas. Nevada has the highest percentage of federal land in the United States with just over 80% owned by the federal government. The Clark County School District serves over 300,000 students, and is the fifth largest school district in the nation and serves both urban and rural communities. Presently there are 2.3 million people in Clark County making the demand for high quality produce worth the cost to produce it. There is a market for quality meat and vegetables. Creating permaculture projects using beavers will create streams where previously there was not any water [3]. Introducing livestock will help to regenerate the soil so water can seep into aquifers and during times of drought there will be water in the arid communities.

Local standards-Clark county school district

The Clark County School District (CCSD) was established in

1956, CCSD is the number one choice for families and students. As the United States fifth-largest school district, they offer a variety of nationally recognized programs including magnet schools, career and technical academies, and advanced placement programs [10]. They educate over 300,000 students and educate 64% of the students in Nevada. They work closely with community partners and business leaders to educate and compete in a global economy. CCSD complies with local, state, and federal standards for education [11].

State standards

Each School district that participates in the national school lunch program, national school breakfast program, supper meals, or summer meal service is required by federal law to establish a local school wellness policy. It is a written document of official policies that guide the school district's efforts to establish a school environment that promotes students' health, well-being, and ability to learn by supporting healthy eating and physical activity [10]. Nevada complies with the national standards in order to qualify for federal support. Federal standards need to change in order to encourage local schools to provide healthy organic food to students [8].

Federal standards

Federal, State, and Local Standards govern what food may be provided to students during school hours. Federal Standards include the Healthy, Hunger-Free Kids Act of 2010. The United States Department of Agriculture (USDA) updated the nutrition standards for reimbursable school meals and established nutrition standards for all other foods served outside the school meals program at any time during the school day [12]. These standards need to be revisited to determine how healthy organic food can be used in the schools lunches. One policy conundrum that needs to be solved is the fact that organic corn can not be exported to Mexico, which once was the largest purchaser of U.S. corn [7]. Mexico has created laws that don't allow U.S. corn to be brought across the border for human consumption, because they do not want genetically modified organisms (GMO) corn in their organic corn supply.

Through diplomacy the United States should be able to find common ground to allow exporting organic corn to Mexico for human consumption. Currently corn being imported by Mexico is mostly used for animals. The Mexican government banned importing GMO corn starting in 2023 for human consumption. Working diplomatically with the Mexican Government to allow regenerative non-GMO corn to be sold in the Mexican market would be a win for the United

States. We sold 15.3 million metric tons of corn to Mexico in 2023. There is a demand of non GMO corn in Mexico if we can find a way to work with them and purposefully, cooperatively, collaborate both nations can come to mutually beneficial solutions. Another benefit to Mexico is the proposed I-11 corridor [6].

Nevada has been working to get federal funding for I-11 an interstate that would run from Mexico through Arizona, Nevada, and Idaho to Canada. One of the proposed routes connects Elko Nevada to Elko Canada. Eastern Nevada has the most need for economic development and diversification. I-11 is one of the few opportunities to impact it. Additionally, Nevada needs to consider ending legal prostitution. People don't want to live in areas where prostitution is legal. We can see that visually on a population map as the majority of the population lives in highly populated areas in the north and the south where prostitution is against the law. Prostitution is illegal in both Las Vegas and Reno, both cities have the largest populations in Nevada, and the most robust economies compared to their rural neighbors. Until prostitution is made illegal like it is in Clark and Washoe county economic growth will be slow. Citizens want to know prostitution and human trafficking are not tolerated in the communities they live, work, and play.

Consideration needs to be made in Nevada for eliminating human, and sex trafficking. It is clear that while brothels have an economic impact in the communities where they reside it is not significant enough to see major economic change in those areas of the state where it is legal. It is also clear that states with legal brothels have higher incidents of human and sex trafficking.

Organizations like Awaken, have research showing why legal prostitution needs to stop. Awaken does not want to criminalize sex workers, but they do want to criminalize those who pay for their services. Laws do not always benefit sex workers. Often when they are battered by a client they do not call the police. If we change our laws correctly we will protect sex workers, punish offenders who are breaking laws, reduce or perhaps even eliminate human trafficking, and help provide a way out of sex work for those seeking it. When the purchase of sex, brothel keeping, and pimping are legal the demand for commercial sex increases, causing a rise in sex trafficking, and it perpetuates violence against women increasing trauma, rape, and assault.

Materials and Methods

A current literature review of scholarly articles, online news sources, and internet searches was conducted to find informa-

tion regarding agriculture, permaculture, regenerative agriculture, chronic disease, metabolic health, prostitution, education standards, genetically modified organisms, and earthships. This resulted in finding the sources for this paper along with firsthand experience from living in Clark County. I admit a bias towards the area I live, but there is a great opportunity for purposeful cooperative collaboration to generate healthy food for the local population. Additionally, I was invited to career day at a local Clark County School in CCSD to present what I do in my profession to three elementary classes in Las Vegas Nevada. I created an exercise for a 3rd grade class, a 4th grade class, and a 5th grade class. I had the students write a letter to a member of their federal delegation. One class wrote to Senator Jacky Rosen. Another class wrote to Congressman Horsford. The last class wrote to Senator Catherine Cortez Masto. After compiling all the letters at my next visit to Washington DC I hand delivered the letters to each representative's office.

Results and Discussion

Systems thinking is vital when discussing economic growth. The implementation of permaculture, regenerative agriculture, and earth ships to obtain domestic tranquility through purposeful cooperative collaboration is needed from the private for profit, nonprofit, local, state, federal agencies and elected officials, and international partners in order, for this to happen. Systems thinking beyond just one jurisdiction is needed to design a method that will improve the health and welfare of the citizens of Nevada, Arizona, Mexico, and Canada. Ensuring the construction of I-11 will allow transportation of goods and services and help rural communities develop. Bringing more water to the Colorado River will help fill reservoir's, and it will benefit all communities who depend on the river.

In order to attract people to rural communities in Nevada legal brothels and prostitution need to be made illegal, and prostitutes rights need to be protected. Prostitutes are not criminals. Often they are the victims of sex trafficking. Those who patronize their services should be criminalized and human trafficking, and sex trafficking should be routed out of Nevada. Nevada is the only state in the United states to allow some form of prostitution, and sex trafficking. In Nevada human trafficking is 89% higher than the national average. Elko, Lyon, Nye, White Pine, Lander, and Storey need to eliminate prostitution. At present counties determine their own prostitutions laws. Brothel owners pay a fee for a license. Prostitutes undergo mandatory STD testing. Condoms must be used. Soliciting on the street is illegal.

Prostitution is illegal in Las Vegas, Reno, and Carson City the states capital. These cities have better economic conditions than those counties where legal prostitution is permitted. Finding ways to attract more people to the state of Nevada will require the state to find more water. Permaculture, regenerative agriculture, earthships, and beavers might just be the solution.

Permaculture techniques have been used in humid, arid, low islands, high islands, and granite landscapes [21]. Permaculture has been used for fire control and is not only for rural communities. Urban permaculture helps reduce the heat island effect from asphalt and concrete and lowers the temperature in desert communities like Las Vegas. Implementing permaculture, regenerative agriculture, and earthship design into the fabric of life in urban and rural communities in Nevada will increase the availability of water retained in ground, and once proven successful, could be replicated up and down the Colorado River resulting in more water for everyone including Mexico.

Andrew Millison reported on a project in the Sahara Desert where the United Nations is using permaculture techniques to hold back the expansion of the desert [18]. He also has a climate change analogue with examples in Corvallis, Oregon and Prescott, Arizona [19]. In the document he presents two case studies for each city. Using the Koppen-Geiger Climate Classification he shows that Western Oregon is projected to go from a Warm Summer Mediterranean climate to a hot summer Mediterranean climate. By implementing permaculture techniques we can preserve water in our communities even as the temperatures climb higher, and our environments become hotter and dryer. Allowing us to produce high quality healthy food for our children even in times of significant drought. Having more water in our landscapes will allow us to grow healthy food for our children to be prepared in their schools.

Themes that arose from my visit to the elementary school children are: They do not want to only be offered juice or milk at lunch they want water. Students have access to a drinking fountains, but they want water on their plate with their meal. Perhaps a reusable container could be used and given to the students when they pick up their meal. Of the forty two students interviewed all of the students wanted water with their meals. Thirty five said they did not like lunch, 36 wanted healthier options, 6 students said they like lunch, and they think it is fine. Comments students provided included "I would like our lunch to be exactly the same as Spain's

lunch" "Water, juice, and Doritos every day" "I think we should put water in school I want better food and different types of drinks" "What I think you should change about our school lunches is that we should give out water and more hot food and fresh fruit like green grapes" "I think school lunches are good" The bulk of the students advocated for change but a few were happy with the lunches they way they are. All students unanimously wanted to have water with their meal.

Conclusion

There is an opportunity now for the incoming administration in the United States of America to incentivize small farmers to use regenerative agriculture and permaculture to grow healthy food that could be consumed in both small rural communities and large urban environments. States like Nevada have large swaths of land that could be given to citizens who are interested in trying to start these farms and infrastructure grants could be provided to them so they could install the necessary fencing, and obtain the proper equipment for their operations to be successful. Regenerative farming techniques that work with nature will be able to produce food for human consumption and wildlife, and create microclimates where all life can thrive above and below ground in our hotter dryer climates. We know global warming is real and these practices can help mitigate the rapid rise in temperatures and water lost through evaporation.

Earthships can be built anywhere and do not need to be on any electrical grids which opens up the possibilities for agricultural entrepreneurs to obtain land needed to raise livestock and grown food. Clark County Nevada is an ideal location to begin seeing if this will work. It is surrounded by federal land, and the densely populated urban community creates a high demand for quality meat and produce. It makes an excellent laboratory to test the idea to see if it will be successful.

If successful it will have in international impact as water flowing downstream to Mexico will benefit the residents who could implement similar techniques to benefit their communities. Clark County has a great live, work, play environment and while many think prostitution is legal it is not. In order to replicate success in other counties prostitution needs to be made illegal in the state of Nevada to attract families to live in those communities who will create supply for the demand of quality meat and produce in the communities they support.

Conflict of Interest

I am the youth director at the Wildlife and Habitat Improvement of Nevada. I am a volunteer and have no financial interest in the organization. I am not paid a salary, and I often utilize my own money to participate in conservation projects they perform.

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