

Connecting to Nature Through Ecological Restoration

A Case Study of Youth Involvement in Salmon Recovery in Washington State

Lauren Vorona

Master of Land and Water Systems

Faculty of Land and Food Systems

University of British Columbia

Presented August 9, 2022

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Executive Summary

Engagement in nature is declining as access becomes increasingly limited, especially for urban youth. Youth-nature connection is falling alongside the salmon population in Washington state. This report aims to provide a guide to organizations who work with youth and those who do environmental work more broadly to strengthen youth-nature connection through salmon habitat restoration. The program must include, a community or whole watershed focus, the best science working in conjunction to local knowledge, and an understanding of the potential negative associations urban teens have with nature and a plan to change their mentality by providing engaging and safe experiences outdoors.

List of Terms

Connection to nature: A multidimensional construct that reflects the cognitive and behavioral traits that describe an individual's relationship with nature. It often centers around specific landscapes or locations (Hughes et al., 2019)

Nature-deficit disorder: The increasing common tendency for children to have little contact with nature and spend more time indoors with television, computers, and videogames (Soga et al., 2018)

Shifting baseline syndrome: The gradual change in the accepted norms for the conduction of the environment due to lack of past information or lack of experience of past conditions. It has also been called *environmental generational amnesia* due to each generation growing up being accustomed to how the environment looks and feels (Soga et al., 2018)

Teenager: Ages 13-19

Youth: Ages 15 -24, the age of transition between dependance of childhood and adulthood independence as defined by the UN, it is a more fluid term in comparison to other fixed age-groups (UNESCO, 2019)

Riparian zone: The biotic communities on the shores of streams and lakes. They are an unusually diverse grouping of landforms, communities, and environments within the larger catchment (Naiman & Décamps, 1997)

Ecological restoration: The process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed” (Falk et al., 2006)

Introduction

Salmon populations in Washington state are under threat. The status varies from species to species, population to population, but overall, 14 species of salmon and steelhead are listed under the endangered species act in Washington state (Zemek, n.d.-b). The threats to salmon populations in the Pacific Northwest are many, including habitat degradation, climate, passage barriers, and hydropower and dams with freshwater habitat degradation and loss being a notable concern (Zemek, n.d.-b). The challenge is complex, as salmon are relatively sensitive to environmental changes and their habitats are far-reaching. As is the case with most environmental issues, there is no silver bullet, but one area that is receiving increasing attention from concerned communities is protecting and restoring salmon spawning and juvenile rearing habitats.

The riparian zone is made up of the biotic communities on the shores of streams and lakes. They are an unusually diverse grouping of landforms, communities, and environments within the larger catchment (Naiman & Décamps, 1997). Salmon spawn and grow into adulthood in streams and have an important role in the wider ecosystem (Hocking & Reynolds, 2011). For their ecological importance as well as others described below, many people are working to restore salmon habitat using the principles of ecological restoration.

Ecological restoration is defined as “the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed” (Falk et al., 2006). This can be applied across the various landscapes, including riparian environments. For the salmon, habitat restoration provides them with more spawning grounds and safer places for the juvenile salmon to grow before migrating to the ocean. Washington has a statewide riparian forest restoration plan to support clean water in salmon bearing streams (*WA - DNR*, n.d.). However, recent reports, such as the 2020 State of Our Watersheds, have made it clear the current strategies are not enough and further action must be taken.

While riparian restoration practices provide improved salmon spawning and rearing habitats, this work also provides social benefits for the communities involved. One concern faced by many increasingly urbanized communities is the disconnection from nature by urban youth (particularly teenagers, peaking at age 15-16) (Hughes et al., 2019). “Connection to nature” is a multidimensional construct comprising emotional, cognitive, and behavioral traits – that describes an individual’s relationship with nature and is often centered on particular locations or landscapes (Hughes et al., 2019). The identified experiences that decrease connection are time spent inside, time on screens (i.e., watching tv), and adolescence (Chawla, 2020). Connection to nature is strongly correlated to emotional, physical, and cognitive benefits (Chawla, 2020). For teens, time in nature is connected to cognitive benefits as promotion of mental and physical

health. Time in nature connected to community based meaningful work can also decrease feelings such as ecoanxiety and climate grief (Chawla, 2020). Participation in ecological restoration activities, particularly of salmon habitats in their own communities, is a prime opportunity for youth to “reconnect” with nature and aid in the recovery of salmon populations (France, 2007).

With many restoration projects come opportunities for youth and community involvement (and thus connection with nature). While there are several examples of individual projects completed through partnerships between educational programs, research institutions, Indigenous communities, local governments, community-based volunteer organizations, and stewardship groups, etc. these are designed for different purposes and long-term goals. There is a need for a framework for community engagement in stream/salmon habitat restoration that specifically targets youth involvement, as this would provide strategic guidance for initiatives with the goal of not only working to sustain salmon populations, but also of improving the mental and physical health of the individuals involved, and of facilitating intergenerational stewardship within the community. If communities are equipped with this information and a useful guide for engaging in this work, a greater stewardship of land and water systems will result alongside a strengthened community (France, 2007).

Teenagers are the chosen focus for a few reasons. One, studies have shown that their connection to nature dips in the teen years before plateauing in adulthood. It is important to focus on this decline to minimize it before opinions and ideologies are more set-in adulthood. Another reason is time and ability. As teenagers they have the physical and mental capability to have more of a tangible impact on salmon restoration. A teenager spending a few hours volunteering has the ability to plant many more trees effectively, for example, and have a more direct impact on salmon habitat, especially if there is some basic training involved. The social aspect of teen identity and development has the potential to have cascading impacts within their community (Lawson et al., 2019). Another reason is highlighted in the Chawla, 2020 piece which discusses the negative impacts of connection to nature such as grief and loss. The most effective remedy for those feelings is action. Action, hope, and a connection to nature in combination are a potent force. The goal of this paper is to present one possible way to channel it to youth community organizers and restoration practitioners; to convince both types of organizations the benefits of engaging teens in restoration practices on their individual health, community health, and salmon health.

Objectives

- To conduct a review of the existing literature on 1) youth agency and the impacts of nature connection on health and outcomes and 2) state of salmon recovery efforts in Washington state

- To integrate the review findings in the development of a framework to engage teenagers in community-based salmon population and habitat restoration activities, for the dual goals of benefiting mental and physical health and supporting salmon recovery in Washington State.
- To present tools and guidelines for participatory ecological restoration with an urban teen focus that can be applied in alternative contexts.

Methods

A review of existing literature on the impacts of nature connection on development, and salmon restoration efforts and impact in Washington state through UBC's library. Search terms included but are not limited to: "youth nature connection", "shifting baseline syndrome", "salmon restoration", "riparian restoration", and "youth development". This review also includes examples of community engagement programs similar to the concept discussed in this paper.

Review – Youth Agency, Environmental Stewardship and Connection to Nature

In the following section, the paper will discuss the importance of nature connection for urban youth generally, and teenagers aged 13-18 (teens) more specifically. An increasing concern is that young people in urban settings have decreasing access to meaningful time outdoors (Lekies et al., 2015). While it is certainly important for children younger than 13 to have a meaningful connection to nature for all the mental, physical and social benefits that result from that connection, they will not be the focus of this paper (Chawla, 2015). Teens are the focus of this paper in part because of their capacity for meaningful environmental action in comparison to younger children. Not only are they more capable of physical work, but it is a critical time for building leadership skills.

Both the direct action that teens are capable of and the actively developing sense of self mean their actions can have meaningful consequences now and for the rest of their lives (CDC, 2019). This can be on the scale of the often-referenced Greta Thunberg, a young environmental activist who has inspired school strikes around the world and also in more subtle ways, exemplified by the study indicating that climate education in schools can help change parents' minds about climate change, especially fathers of daughters (Lawson et al., 2019). Because environmental degradation and conservation are both caused by human behavior, any attempt to promote sustainable lifestyles or conservation behaviors must focus on changing behavior (Whitburn et al., 2020). This paper will focus on not only the internal changes meaningful time in nature can produce, but also in the physical differences an engaged group of teenagers can have on their local stream through hands-on restoration work and how that personal direct action can have ripple effects on their life and their broader community.

The changing climate as a result of human behaviors adds extra urgency to this goal of engaging teens in environmental action. According to the latest Intergovernmental Panel on Climate Change (IPCC) report, human induced climate change has caused harmful impacts to nature and people (IPCC, 2022). Increased care and action is needed across all levels of society to combat the worsening crisis. Modern youth have shifted their political action into an “engaged citizenship” model, which manifests as volunteering, protesting, and embedding politics in their daily lives (Earl et al., 2017). Social connection is also of much higher importance through the consumption of news with peer-to-peer social media being the main source of information rather than newspapers. Social movement scholars have long recognized that young people historically have been and continue to be crucial to the rise of many social movements. Considering the urgency of the climate crisis, and the potential of young people, providing an education and action that can be directed towards the issue has high potential.

Connection to Nature

Connection to nature is important socially, cognitively, emotionally, and environmentally. The broader community must foster a connection with the nature around them if we are to mitigate the effects of the climate crisis and environmental degradation. Connection to nature is defined broadly in Hughes et al. (2019) as a multidimensional construct that reflects the cognitive and behavioral traits that describe an individual's relationship with nature. It often centers around specific landscapes or locations. This connection or lack thereof, tends to start in childhood and that development or neglect determines environmental attitudes or behaviors into adulthood. While time in nature is the biggest factor in promoting the connection, it is meaningful engagement (described below), that really inspires long lasting positive impacts.

Impacts and Causes of Nature Disconnection

Children's access to nature is rapidly decreasing due to an increase of structured and programmatic activities, such as school sports or music, and also because of increased screen time. This is known as nature-deficit disorder: the increasing common tendency for children to have little contact with nature and spend more time indoors with television, computers, and videogames (Soga et al., 2018). A mix of policy and parental attitudes is fueling this trend. Concerns about crime and safety are keeping kids inside at home while a focus on standardized testing in schools, a result of the U.S. No Child Left Behind Act, has forced schools to reduce or cut recess to ensure they meet their academic accountability goals (Strife & Downey, 2009). This can in part be mitigated by parental action, though broader policy change would have a larger impact. Children’s levels of connection are higher when their parents believe

it is important for them to experience nature and when the parents report greater nature connection themselves (Chawla, 2020). Children's connection with nature increases with time spent in nature and extended time in nature as a child predicts active care as an adult (Chawla, 2020). People with a greater connection to nature are more likely to report taking action to protect the environment.

Shifting baseline syndrome (SBS) is another reason to focus on children's nature connection and ensure that they are able to better understand what healthy wilderness is. SBS is the gradual declining change in the accepted norms for the condition of the environment, due to lack of historic information or lack of experience of past conditions (Soga et al., 2018). It is related to environmental generational amnesia, where each generation growing up is accustomed to how the environment looks and feels in the present condition, without knowing how it has changed from the past. (Soga et al., 2018). In a system that experiences progressive impoverishment, people do not recognize how degraded it has become over the course of multiple generations. Unfortunately, there are several feedback loops that increase the severity of SBS over time. One is the increased tolerance for incremental environmental degradation, which is likely to diminish people's motivation to support and participate in conservation programs. (Soga et al. 2018). Another is that the change in public perception for what constitutes a healthy state of the natural environment may affect people's decision-making process regarding conservation and restoration, which may in turn affect the future environmental state.

Furthermore, if policy makers and restoration managers use inaccurate baselines as a target for nature conservation, then management objectives may be satisfied, but environmental health remains impaired. For example, water quality restoration targets may be based upon the earliest historic record that was perceived to be pristine, but in fact was already impaired. The techniques for preventing SBS are to lift baselines by rewinding spaces, which is conserving and protecting natural processes and wilderness areas, and monitor and collect data (especially in a way that encourages environmental experiences, reduce the extinction of experience, and educate the public) (Soga et al., 2018).

Studies on youth connection to nature have shown that connection in teenagers was significantly lower than children under the age of 12 (Chawla, 2020). The lowest reported connection was amongst 15-16 year olds, then connection scores increased until they plateaued in adulthood (Hughes et al., 2019) (Chawla, 2020). Gender differences are inconsistent. Females more often report higher levels of nature connection, but that is not consistent across all studies and all cultures (Chawla, 2020). Many teens hold progressive environmental and social values, but also have a new social identity to maintain that is focused around commercial and recreational interests (Chawla, 2020). In other words, their social identity is often disconnected from their environmental beliefs and is therefore not attended to in their behaviors. This is due to the fact they tend to be more strongly drawn to developed commercial and recreational attractions, away from adult supervision. This dip, increase, and plateau is a focus point as raising the

connection of older teens means entering their adult years with a higher level of connection and therefore more pro-conservation behavior throughout the remainder of their lives. The goal is to also encourage the progressive social values teens hold to become a larger part of their social identities and manifest broader cultural change (Chawla, 2020).

Social

According to Chawla (2020), on an individual level, study participants with higher levels of nature connection were positively associated with five areas of personal development: higher self-reported competence, connection with other people, confidence, caring behaviors, and character in the sense of taking responsibility, and living by positive principles and values. Higher scores also predicted belief in a hopeful future (Chawla, 2020). These traits connect to the current economic systems, as experts are concerned about the negative impact of pollution exposure and limited access to nature on children's educational achievement, cognitive functioning, and mental health in relation to the future economic success of the United States in a highly competitive global market (Strife & Downey, 2009).

Socially, a greater connection to nature can motivate large scale action and change. For broader society, risk drives social change when the risk becomes so common that it is felt across society. When society perceives risk to be high enough, the connections between state, market, and civil society shift in response to it. This was seen in the initial days of the Covid-19 outbreak when society abruptly changed in response to the threat of a global pandemic. Something similar is likely to happen in regard to the climate crisis as the uptick of major weather events and other signs of an unstable climate increase; society must change in order to truly shift the tide on climate.

Thus far, policy making has been ineffective at making the necessary changes required to continue having a livable planet. Studies have shown only 3.5% of the population need to participate in nonviolent conflict to successfully bring about large-scale transformations (Fisher, 2022). The risk is clearly already here, what is lacking is an awareness of the problem and a knowledge of what to do as an everyday citizen. If the general public was more aware of the current levels of destruction of the environment and how it impacts their lives, they are more likely to act. A study following students who took an intensive climate change course make more environmentally friendly decisions than their peers for years afterwards (Worth, 2021). These ripples in social behavior are a key aspect of connection to nature and the broader impact it can bring.

Cognitive and Emotional

Access to nature and green spaces gives children an increased ability to concentrate and results in improved academic performance (Strife & Downey, 2009). It also increases holistic and creative thinking,

even after controlling for a sense of well-being (Chawla, 2020). This exposure also gives children reduced stress and aggression levels, buffers the symptoms of depression, and also positively affects the child's overall development (Strife & Downey, 2009). Youth who report higher connection to nature also report few psychological complaints such as depression, irritability, feeling nervous, and difficulty sleeping (Chalwa, 2020).

A negative side of nature connection is young people struggling with feelings of despair related to the destruction of the environment around them. This increased destruction gives rise to ecological grief or eco-anxiety (Comtesse, H., 2021). Despair discourages action; therefore, it is important to give young people tools to counteract the damage around them as they are awakened to it (Chalwa, 2020). Understanding how young people can acknowledge the risks and still work towards protecting the natural world without fatalism is going to be a key part of stopping the environmental degradation.

Environmental

Environmental conservation, the process of preserving and restoring areas to a more biodiverse and natural state, is motivated by external and internal factors such as social networks, values, beliefs, and attitudes. Increasing the population's connection to nature is a key step in encouraging large scale conservation efforts (Hughes et al., 2019). Youth with greater environmental knowledge have a greater willingness to commit to conserving nature (Chalwa, 2020). A meta-analysis on human connection to nature and pro-environmental behavior showed that the relationship between the two is positive, significant, and moderately sized. This is held across gender, geographic location, and age group (Whitburn et al., 2020).

Review – State of Salmon and Recovery Efforts

The State of Salmon in Washington State

In 1991, the first salmon species was declared endangered under the U.S. Endangered Species Act. Since then, fourteen species of salmon and steelhead have been designated as at-risk of extinction in Washington under the Act. Passed in 1973, the Endangered Species Act requires the protection and conservation of threatened or endangered plants and animals and the habitats in which they are found (US EPA, 2013). There are also historical treaties with local tribal nations and the United States that require the US government to ensure adequate salmon numbers in the state of Washington. Due to these legal requirements, the state of Washington has an obligation to protect and restore salmon populations. The current state of salmon varies throughout the region and by species; some populations are moving towards the state's target goals, and others are in crisis as they continue to fall (Zemek, n.d.-a)

Besides the legal obligation, salmon are important economically, environmentally, and culturally. Commercial and recreational fishing is estimated to support 16,000 jobs and \$540 million USD in personal income, and \$1.5 billion USD is spent annually on equipment and trip-related costs for fishing and harvesting shellfish in Washington. (Palmer et al., 2014, TCW Economics. 2008). The health of salmon reflects the wider environment around them; it is estimated that 138 species of wildlife depend on salmon for their food (Cederholm, C. J et al, 2000). Salmon is important culturally; it is an icon of the Pacific Northwest and has spiritual and cultural significance to the first peoples of this region. The salmon is interwoven through the identity of the local tribes. (Zemek, n.d.-d)

In 2020 a “State of Our Watersheds Report” was completed by the state and local governments, including tribal governments (“State of Our Watersheds,” n.d.). According to this report, salmon populations have not been recovering at the desired rates, and few species are meeting target population goals. While each watershed had specific concerns, the report identified six main statewide concerns regarding salmon restoration in Washington state:

1. Habitat restoration is happening, but more is needed
2. Degraded nearshore habitat is unable to support forage fish
3. Rapidly increasing permit-exempt wells threaten water for fish
4. Impervious surfaces area impacts water quality and salmonid habitat
5. Forest cover is improving but riparian forest cover is diminishing
6. Climate change impacts regions resources

For the purposes of this project, the paper will focus on Point 1: Habitat Restoration, which has implications for riparian and nearshore habitat, water quality and resilience to climate change.

Restoration and Recovery

Recovery, per the Endangered Species Act, is defined by Congress as “the process of restoring listed species and their ecosystems to the point where they no longer require Endangered Species Act protections. Endangered and threatened species may have different needs and may require different conservation strategies to achieve recovery” (Zemek, n.d.-d).

Much of what has been done in the past for riparian restoration has been focused on engineering feats, such as restructuring a river or building in permanent log jams. However, restoration of the hydrogeomorphology is not enough to restore degraded channels and often is a disturbance in and of itself, which leads to a worsening of the ecological condition of a stream (Palmer et al, 2014). In a review

by Palmer et al. (2014) functional ecological restoration includes efforts specifically targeting structural ecosystem features such as riparian vegetation, and also critical ecological processes such as nutrient dynamics, the input of organic matter, and productivity. (Palmer et al., 2014). In support of this, afforestation of an agricultural watershed has been shown to successfully reduce runoff, improve summer base flows, and decrease channel erosion, all of which resulted in a macroinvertebrate community similar to forested regions (Palmer et al., 2014). Most of impacts to streams are generated outside the channel by stressors in the watershed. In contrast, most restoration projects are completed at reach scales. successful and sustainable approaches to habitat restoration tend to target the source of the degradation. Once stressors (e.g., nonnative species, uncontrolled runoff, etc.) have been removed, restoration theory suggests that streams should recover on their own. The Society for Ecological Restoration has identified key attributes of successful restoration into four main categories (Falk, 2006):

1. Species composition
2. Ecosystem function
3. Ecosystem stability
4. Landscape content

Each of these features promotes biodiversity and a healthy functioning ecosystem. The goal of restoration is to have a self-sustaining space that is healthy enough to adapt to natural disturbances such as a flood or fire. An ecosystem with these features will have a better ability to self-regulate. These goals will adjust based on the location targeted for restoration.

In an assessment that determined the standards of ecologically successful river restoration Palmer et al (2014) set five ecologically focused criteria for measuring success:

1. The design of an ecological river restoration project should be based on a specified guiding image of a more dynamic, healthy river that could exist at the site.
2. The river's ecological condition must be measurably improved.
3. The river system must be more self-sustaining and resilient to external perturbations so that only minimal follow-up maintenance is needed.
4. During the construction phase, no lasting harm should be inflicted on the ecosystem.
5. Both pre- and post-assessment must be completed, and data made publicly available.

With this guide, restoration success is not an all or nothing end point, but rather an ongoing process that allows the restored river to be a resilient and self-sustaining system. The ability to recover after rapid change is one of the key attributes of a healthy river. For this reason, hard engineering methods should be carefully considered and rarely the first choice in restoration as they often restrict the river and

do not allow for the dynamic change that characterizes a healthy system. Finally, there must be more importance placed on monitoring and data analysis before, during, and after projects. Well documented projects that do not complete their stated objective can contribute more to the future health of our waterways through the education potential of their data (Palmer et al., 2005).

Impacts of Vegetation on a Stream

While teenagers are more suited to removing invasive vegetation or planting a riparian buffer zone than changing the geomorphology of a riverbed, it is also an ecologically effective choice to improve salmon populations. Riparian vegetation plays a fundamental role in the ecology of streams. This is due to its ability to control and recycle the sedimentary inputs from the upland portion of the basin and river. The geomorphic features of a river are also important of course. They are the template on which the biological and chemical processes impacted by the vegetation must operate (Tabacchi et al., 1998). The various aspects that make up a river, geomorphology, fluvial processes, riparian vegetation, etc. all act on and influence each other. For example, the components of the hydrological cycle (i.e. precipitation, runoff, and evapotranspiration) are a control on riparian landscape. Likewise, evapotranspiration is determined by factors such as vegetation, humidity, temperature, wind, and sunlight. Thus, the vegetation has an effect on the hydrological cycle (Tabacchi et al., 1998).

The riparian corridor is a major pathway for energy, matter, and organisms. The role of the vegetation within that corridor can be presented in three different ways: 1) internal biochemical controls on vegetation dynamics, 2) riparian vegetation as a sink for matter and energy from adjacent systems, and 3) riparian vegetation as a source of matter and energy for adjacent systems. Part of the reason the vegetation in a riparian area is so dynamic is the regular disturbance that impacts the area. The water flow helps with the dispersal of most species. Successful initialization of vegetation succession in a riparian context depends on the 1) availability of seeds, 2) the availability of colonizable habitat, 3) the possibility of the seedlings to establish themselves enough before the next disturbance, and 4) and resilience of the established populations to disturbance. This can be disrupted or accelerated through human-induced disturbance, such as stream-flow regulation, corridor fragmentation, and land use (Tabacchi et al., 1998). Exotic species, alien, or non-native species, from other countries, invading riparian ecosystems are one such consequence of human activities.

Stream channels have more variety in habitat due to a steady input of woody branches and tree trunks. This debris causes complexity in channel morphology which in turn produced useful habitat. The ecological consequences of this are carried through the stream into the ocean. One key role riparian forests play is to cool the water. They reduce solar heating through shade, especially in lower order streams. They also cool through evapotranspiration and soil water and shallow groundwater. Another role they play is controlling channel and bank stability (Tabacchi et al., 1998). Salmon need clear cool water

with a variety of habitats to hide from predators, rest, and spawn. Healthy forests through their cooling, stability and wood input can provide features that salmon need (Zemek, n.d.-c).

The richness of plant species has an indirect role in ecosystem functioning through trophic interactions. The exotic species are sometimes heavily encouraged through the process of tree plantations, and even if the tree itself is native, the monocrop nature of it can affect aquatic communities despite the nature of the stream being generally maintained (i.e., shade and litter continue to be provided). This effect is more pronounced the more different the commercial tree plantation is from the native diverse ecosystem. As plantation tree farming and invasion of riparian areas generally are increasingly prominent worldwide, more work must be done to counteract the damages of monocultures such as these as they impact salmon's access to food and shelter (Ferreira et al., 2016).

The Connection to Salmon

To connect the vegetation more directly to salmon juveniles, similarly to the reciprocal nature of the vegetation and the hydrologic cycle, there is also a reciprocal relationship between salmon and vegetation. The juveniles need invertebrates to eat, which depend on the streamside vegetation. This vegetation is in turn nourished by the nutrients of the salmon as they die, either through decay after spawning or through predator interactions. Invertebrates also colonize and feed on salmon carcasses. Inputs of terrestrial invertebrates are a key energy source for salmon (Collins et al., 2015) (Joy et al., 2020).

To use the riparian restoration framework (Palmer et al., 2005) which focuses on whole system analysis, the drivers of change, and measurable, reported results, one facet of restoration of salmon should focus on ensuring high quality leaf litter. The approach would depend on the specifics of the environment, but one aspect would be to determine the appropriate native vegetation for the area and plant those species. Much of restoration is engineering focused but the research has shown that shade and habitat, while an important part of the role plants play, is only one aspect of what determines good habitat for juveniles. Temperature and woody debris may not change much with different types of vegetation, but the invertebrate community is and the trophic cascade that results from that very much impacts the broader ecosystem, salmon included. The longer it takes for a juvenile to grow to the appropriate size to migrate to the ocean the more likely it will be preyed upon in the river. By increasing the availability of habitat and food, more salmon will be able to grow to the appropriate size quicker. A greater emphasis must be placed on nutrients, and therefore, in part, the vegetation surrounding the stream in restoration practices.

Salmon are a critical part of the culture, livelihood, and ecology of the region. Restoring their natural habitat will have cascading effects on society and the ecosystem around them. A community approach to their restoration will be mutually beneficial, and a program that focuses on youth engagement can have lasting effects on society.

Integration and Recommendations

Features of an Effective Program

There are a range of different experiences that promote both connection and care for nature, including experiences that encourage connection, multisensory immersion in nature play and exploration, caretakers who promote a sense of security and promote interest, attention, empathy and respect for living things and the land, a sense of competence outdoors, a sense of oneness, opportunities to enjoy nature with family and friends, and refuge from stress, actively caring for nature, issue- and action-oriented such as learning about environmental issues, witnessing the loss of a wild place and learning skills and strategies to protect nature (Chawla, 2020). An organization with a goal of youth-nature connection should include these aspects into their activities and programming. This will be a mix of structured and unstructured time with the base of education and social support.

Time in nature does not only bring about positive emotions. As the environment continues to degrade and as a part of the programming, young people become acutely aware of the dangers associated with that damage, negative emotions can arise. The program must be prepared to combat and support those complicated reactions. According to the review by Chawla, there are three ways of coping with difficult emotions: emotion focused coping which seeks to escape painful feelings; problem focused, which addresses problems that cause these feelings; and finally, meaning focused which finds positive value in confronting problems. Emotion focused is negatively correlated with environmental action, it manifests mainly as distraction. Problem focused coping varies in its efficacy. Individuals do report action but have low subjective well-being. This is due to mainly individualized actions such as lowering household energy consumption instead of collective engagement, and when the problem is more than one person can solve, individualistic strategies can lead to feelings of futility and impair subjective well-being. Social trust can counteract some of these feelings of helplessness. Young people who reported individual rather than collective action felt encouraged when they believed that others could do similar small things together and make a difference (Chawla, 2020).

Meaning focused coping is therefore the goal in order to combat the emotional harm of climate degradation and also spur continuing environmental action. It is important when a problem cannot be solved quickly but requires engagement over a long period of time. It requires finding positive meaning in the struggle to address the problem at hand. An individual with a high level of meaning-focused coping is more likely to express positive feelings and life satisfaction and constructive hope. Constructive hope in this context means the ability to face environmental risks and uncertainty, to believe one's own actions and the actions can make a difference and find positive meaning in action (Chawla, 2020). Hope and concern in concert promote action whereas feelings of despair and helplessness are negatively related to action.

A curriculum that features possibilities, pathways, and agency is needed to encourage action. When students had access to this type of curriculum, knowledge increased as their hope increased. The study of ecology and natural history needs to be combined with learning how to protect the natural world. Promoting social trust is also important as individual actions are amplified and young people need to be able to share their emotions (Chawla, 2020). When teaching about climate change generally, experts have settled on 5 main messages that the students need to take with them: It's real. It's us. Experts agree. It's bad. There's hope (Worth, 2021). Making the information personally relevant, by connecting it to local issues, is another factor shown to increase youth engagement. This can be scientists and/or activists sharing their work and stories, supporting projects to care for nature in their schools and communities, and engaging them through experimental inquiry and art-based methods. A study on urban youth experiences with nature identified several elements that promoted positive attitude changes towards nature. These elements are: 1) positive role modeling of teachers and leaders to point out natural features, correct misinformation, and demonstrate positive attitudes; 2) interaction with other students who expressed ideas and opinions about things they saw and heard; 3) direct experience with enjoyable elements of nature and nighttime activities; 4) outdoor recreational opportunities; and 5) an increased conceptual understanding of nature. Another notable aspect of the program that led to increased connection with nature was the physically demanding and challenging experiences that lead to a sense of accomplishment, alongside the reflective and personal contemplation (Lekies et al., 2015). A Youth Salmon restoration program can accomplish all of this. Because the salmon are already such a part of the Pacific Northwest culture, the emotional connection has started and can be strengthened with education and effort on the part of the participants. This program by building up a cohort of young people and giving them ownership over a reach can follow the principles outlined above. Involving local scientists and practitioners can also expose teenagers to potential jobs or career paths they may have otherwise not be aware of.

Community Examples

Through research on comparable programs, community focused restoration programs provided useful examples and lessons. The idea of having a community focus for restoration is not a new idea and has been successful, some short term, others longer term, for salmon restoration. Their practices and lessons can guide other programs as they develop their own structures and goals. The examples selected were chosen because they have useful lessons for the purpose of building up a long-standing effective community focused watershed restoration program. These lessons can be applied to this more specific youth focused core concept. Some patterns of a successful program were the holistic nature of the idea of watershed restoration, both in terms of the region (choosing to focus on the entire watershed instead of small sections) and in terms of treating the entire community within the watershed as key decision

makers. The Long Tom Council’s definition of a constituent is “anyone who “lives, works, or plays in, derives benefit from, or is affected by the watershed and its resources” which is an incredibly broad base to support but also means they have a broad force to derive support from, if they manage to appeal to their needs properly. Each of these organizations was focused on riparian restoration in a way that explicitly and directly connected the watershed health to community health. Monitoring was also a critical component of each of these programs. Again, it serves a dual purpose of determining the best science for the practitioners and engaging the public by answering questions and proving the effectiveness of the program.

Community Program	Lessons
<p>Long Tom Watershed Willamette, Oregon (Flitcroft et al., 2009)</p>	<ul style="list-style-type: none"> • Isolated projects are less effective than a coordinated program when the goal is watershed protection or restoration • Building a social infrastructure requires a deliberate, transparent, and evolving process that strengthens trust between the Long Tom Watershed Council and the public • The council provides adult education programs that promote active learning • It is founded on science as iterative and integrative with scientists working alongside landowners • Data collection that informs the work is also an opportunity for outreach and education, and the data collected is designed to answer community questions
<p>Mattole Watershed Northern California (France, 2007)</p>	<ul style="list-style-type: none"> • Through “thinking like a watershed” the Mattole Restoration Council worked within communities to prevent the threats to fish (erosion and sedimentation from roadbuilding). This work brought many groups together to work towards consensus-based collaboration. • This included monitoring to determine what methods are effective in increasing salmon population. • The method of removing the cause of the degradation and monitoring is supported by Palmer et al. 2005

	<ul style="list-style-type: none"> • Part of the community engagement is school children incubating salmon eggs in their classrooms – ensuring the next generation grows into the watershed community ethics and behaviors • The end result of focusing on a single species (salmon) turned into a process of watershed community regeneration.
<p>Applegate Watershed Southwestern Oregon and Northern California (France, 2007)</p>	<ul style="list-style-type: none"> • The Applegate Partnership used a “bottom-up, inside-out” approach to community building along side a bioregional focus. It links forest health to overall community health and has a diverse collation, including miners, loggers, farmers, ranchers, environmental groups, and public agencies. • Stewardship behavior is rewarded alongside local knowledge. One reason for the success was the deliberate integration of local knowledge into the public agency protocol
<p>Willapa Bay Southwest Washington (France, 2007)</p>	<ul style="list-style-type: none"> • The Willapa Bay Alliance was founded to address land management and community health issues by and for local people • It had diverse representation of interests (i.e. logging, forestry, fishing, tourism etc.) and drew upon local knowledge from these groups to supplement the “best science methods” • Volunteers trained as “citizen scientists to monitor and assess salmon data • They developed community health indicators to measure the state of the basin’s health in three areas: natural wealth, economic wealth, and social wealth • Lessons from their disbandment: the community must be fully represented and engaged; local residents need to define specific goals early so they may be tracked; forming key relationships with community members and identifying local leadership is a must, as is ensuring the efforts are

	bolstering the community's financial viability so the benefits are equally distributed
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Table 1: Lessons from Community Focused Restoration Programs

Tools and Guidelines for Participatory Ecological Restoration with an Urban Teen Focus

While the focus for engaging youth in the outdoors is mostly focused on recreation but the lessons for supporting youth in hiking and camping type activities can also apply to restoration focused activities such as planting or water quality monitoring. The most important thing is to understand and incorporate that youth come to outdoor programs with differing perceptions of nature (Lekies et al., 2015). This can be approached in multiple ways. One focus is a pre-assessment, both for adapting and directing the programming and also as a way to determine the impacts of the program. Just as the restoration requires active monitoring of the impacts of the work to determine the best course of action, the same principle applies to the youth in the program. With a multifaceted program such as this, each component must be measured for both ongoing adaptation and as a way to prove success (hopefully) to the participants. If the youth participants enter the program with negative views, the education must help them transition to more positive views through experiences the youth regard as safe and fun. They can then progress to other outdoor environments with more meaningful environment with nature (i.e., start with planting in a city park and move to salmon population monitoring in a more remote location). The role of adult staff is critical in developing and supporting this transition. They must not only be technically knowledgeable but also emotionally supportive in order to help move youth from a negative to a positive view of nature and also promote needed competencies for successful outdoor experiences (Lekies et al., 2015).

The lessons from community focused restoration projects are broad but no less important and can be adapted to focus on youth engagement. A bioregional approach intertwines ecological, economic, cultural, and political values. Through this community is enabled for form a shared vision and ecological identity through restoration focused on reinhabiting our natural surroundings. This process allows the participants to gain full community membership standing and to partner with nature (France, 2007). This is crucial, because as described above, a connection with nature is typically associated with specific landscapes or locations. When that connection is associated with the home of the people involved they will carry that as part of their identity promoting pro-environmental behavior throughout their lives. With this bioregional focus, place-based knowledge can be linked with the best science and restoration is linked to local economic development and job skills of the youth participants to generate new markers, jobs, and

products. Moreover, human interactions with the land are cast in terms of watershed implications. Which results in ecological or bioregional identity being expressed through culture, such as art and celebration.

In a program such as this restoration is undertaken for the primary purpose of restoring biological functionality, but may include social goals such as education, aesthetics, reconnection with land, or community revitalization. With these secondary goals, human needs and interests are determined and factored into the process. An inclusive process that values all community members promotes buy-in from the community and encourages participation. As does outreach, education, and widely disseminated information. Regular monitoring will ensure adaptive programming, always refocusing and directing methods and practices based on available data. This way mistakes can be embraced through flexible programming and ensure the program continues to adapt and improve. Monitoring does not only need to be focused on determining program success but can also be directed towards community questions. The youth program participants can ask questions about the health of their community and then go out and gather the data to help answer the question themselves

The above examples and lessons from other community focused restoration projects, or youth nature programs with a focus on recreation can be combined into a program that teaches teenagers valuable skills, both technical and social while improving their connection to nature. This work does not have to be salmon focused, most of the lessons and motivations can be applied to other regions with other cherished wildlife.

In the Pacific Northwest, actions such as water quality monitoring, revegetation work, and salmon population monitoring are examples of activities can dually support salmon habitat and teen-nature connection. These activities can be done at a watershed scale overall, an organization can direct the work overall and each school or group can have ownership over a reach (or a couple reaches). Each activity benefits the teens differently but overall, they will be exposed to big nature (in some instances), combating shifting base syndrome, they will gain potential job skills that will be in more demand as green jobs increase, local ecology knowledge will increase sense of place, and community building will help decrease the helplessness that comes from watching the environmental destruction. All these activities will be supplemented by education focused on solutions and not only the problems as emphasized by Chawla (2020) and Worth (2021).

Conclusion

This report aimed to provide suggestions on how to incorporate youth actively and meaningfully into a restoration program. Through a review of literature related to youth nature connection, salmon restoration and community focused restoration, various restoration activities, if done with intent can be a partial solution to the two issues discussed in the paper. A community-based focus on salmon restoration is a means and method towards broader health and wellbeing. Salmon have their own ecological niche but one special aspect to them is how they can bring together disparate groups to heal a watershed and all those living within it. This community growth cannot only focus on adults, young people must be involved in the process at appropriate levels. This not only ensures their personal well-being but feeds the whole society. This mentality of cooperation will be especially needed as the climate crisis continues to grow and our young people deserve the tools to combat it.

Acknowledgements

Thank you to the many organizers and community builders who have been doing the important work of raising awareness and on the ground action for salmon and community restoration. Thank you to the scientists whose work this report is dependent on. Thank you especially to my supervisor, Julie Wilson, for her guidance and support in this project. And a special shout out to Maya Korb, Jack Edgar, and Marika Maj for comments and editing help as we finished our projects together.

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