My art exhibits how my love of nature has influenced my creativity. I am interested in expanding my knowledge of how art interacts with our world; how it can be interpreted by a variety of people; and how it can spread awareness to any community for any type of cause that is in need of artistic beauty.

In this oil painting, I am spreading awareness by depicting what would be a perfect, healthy Chinook Salmon ecosystem. Salmon are vulnerable to unhealthy rivers and watersheds due to erosions, temperature increases, ocean acidity, and drought. Salmon, acting as the environmental engineer, pump huge amounts of marine nutrients into rivers. There is nothing that can replace its role on earth. Organisms, including its forest and riparian area life, depend on salmon. After a lot of research, it's upsetting to discover that there are many people who don't see any hope in our current environmental situation. Those sad moments are what motivates my creativity.

This is my first time using oil paint and it has taught me to be more patient with my work. I was cautious experimenting with a medium I've never used before on such a large scale. I started by sketching imaginary valleys in my notebook; I used photographs for color references and used memory references from my home in West Marin to create an imaginary landscape. My passion is in the details—adding character, perspective, highlights, and imagery to the trees, vegetation, rocks along the river, and then, finally, to the salmon. A painting without detail is constructed without character. Within the detail, you'll find the uniqueness of anything. I like to paint with detail because you see and feel more of what the painting is expressing and I would like to share my painted viewpoint with the world. My hope is that my painting of the world of Chinook Salmon will prompt viewers to feel, act, and engage in their world.

July P.
California

Chinook, The Ecosystem Engineer

July P.

It takes many years to make a specific ecosystem perfect to sustain itself health and its wildlife. We live in world now where many of those systems are being faced with obstacles from humans that demolish the cycle of life within the ecosystem. There are many animals and plants that are forced to face the consequences that humans put in there way l. Within an ecosystem, there are many food chains, every single animal in that food chain is so important to all the rest of the animals, they would not survive without it. But there is usually also one ecosystem engineer, the organism which acts as a that many depend on. One particularly interesting keystone species of many coastal ecosystems are the collection of fish species known as Salmon! Fish ecologist RJ Woottons believes "There is nothing that can replace salmon and its role that it brings to this earth. 20,000 species of fish on this earth and 1% of them migrate between fresh and saltwater." Wootton, R. J. 1994. Ecology of Teleost Fishes. Chapman and Hall, NY, NY. Salmon are being impacted in many ways by climate change. How are salmon going to survive through the obstacles that we put in their path? Maybe those obstacles will fire back at us. Humans take and take and don't give back. But is it all humans? We've learn to successfully kill, harvest food and develop agriculture, urbanization, finding new ways of sustainable energy, we think we're "contributing to the environment", but are we really? We always forget to conserve! Native Americans, those who know the land better than we do. From the small roots of a plant to the massive mountains and watersheds. We're being educated from those who don't know the land and don't care about the land and the wildlife. We should be educated from those with great amounts of knowledge of their belief to take care conserve the land and the wildlife. The importance of understanding how everything is connected is difficult to overstate. If the land is healthy we are healthy and if the land is sick, than we're sick. Every part of each ecosystem and each river has a cultural story and a history. The indigenous stories are meaningful to this change of reconnecting with the salmon and the rivers. A lot of those tribal cultural stories are being forgotten. A lot of the tribes that depend on fishing, find salmon as essential like the air they breathe.

How are Salmon so important to our ecosystems? I mean they're just fish right? We eat them and they always end up coming back. I mean fish lay so many eggs so how are they endangered? Salmon are extremely important and have a unique role during the span of their life and after they die as well. The life cycle of a salmon is the most beautiful natural occurrence in each ecosystems. Salmon start there life in freshwaters streams and rivers. When young they're called *fry a*nd depend on their yoke sack for nourishment. The next stage is called a Sack Fry, that is when there swimming though they are still are attached to their yolk sack. Fingerling is the stage when the fish grow to about 1 inch. Fingerlings eat insects and as they grow they move to the mainstream with deep pools with wood and rocks for hiding due to predators and river current. They live in the freshwater for about 3 years. Smulting need to survive in the ocean, which is triggered by increase of daylight hours, rising water temperatures in the spring, and start acting in a schooling behavior. At this point there are Internal changes as well affecting kidneys which allow the transition from freshwater to saltwater. Estuaries and river mouths in Chinook language are called Requa, They provide the perfect mix of freshwater and saltwater habitat where salmon will *smult* and prepare to enter the ocean. Why go to the ocean? Freshwater lakes, streams and rivers are nutrient poor. To grow big and strong, salmon need the abundance of food like Krill, herring, and anchovies all provided from the ocean.

Ocean life is difficult for the salmon. To leave their home rivers young salmon must swim out with the tide and migrate in the pacific ocean. They live in the ocean from 2 to 8 years growing and maturing. They live there life escaping predators and fisherman. To preserve

dwindling fish runs fishing limits are set on all harvest and fish for salmon. The Fish and Game has set these certain limits in their jurisdiction. Salmon travel a huge amounts of distance in search of food. During that time they increase in size and weight. A lot of the salmon don't survive the difficult ocean passage. Upstream migration salmon have irresistible instinct to head up stream back to the river mouth and spawn. On their way to spawn salmon don't eat. They live off stored fat, which is why they start turning red and pink on the outside. They use that energy to make their way up the river through strong currents they get bruised, battered, and have tooth marks from unsuccessful predators. Their health starts declining rapidly by the time they finally spawn. Momma Salmon finds clean sediment and lays her eggs. Female salmon can lay thousands of eggs and then their partner fertilize all of them. She stays to defend the nest. Cold and clean water is crucial for growth and survival. After dying the cycle is not complete. Salmon carcasses nourish many organisms. Will bring insects which will in turn nourish the future salmon fry. A legacy for the next generation of salmon

Salmon are conveyer belt of nutrients. According to biologist Anne Post department of Fish and Game "Adult Salmon returning to spawn contains an average of 130g of nitrogen, 20g of phosphorus and more than 20,000 kilojoules of energy in the form of protein and fat. In northern California receives more 80 kg of nitrogen and 11 kg of phosphorus in terms of chinook salmon tissue in one month." When they die nitrogen, phosphorus and other nutrients become available to streamside vegetation. According to department of Fish and Game "Streamside vegetation gets just under 25% of its Nitrogen from salmon". Others researchers report 70% of nitrogen found in riparian zones foliage comes from salmon. In the Alaska Fish and Game department discover "over 20 million salmon spawned in Kvichak river, the average fish weight is 5.9lbs which equals 118 million lbs. of biomass when salmon decay. That includes Nutrients estimated 55,000lbs of Phosphorus, 40,000lbs of Nitrogen, and 540,000 lbs. of Calcium." Post, Anne. "Alaska Fish & Wildlife News November 2008." *Muskox Species Profile, Alaska Department.* of Fish and Game, 2018, This also concluded that trees on the banks of salmon stocked rivers grow more than 3 times faster than trees in rivers with zero salmon. Scientist Robert Naiman of the University of Washington measured nitrogen from trees growth rings using increment borer, extract pencil shape samples from cores. The cross section are measured to determine nitrogen content linked to the size of pass salmon runs. They remove sap to accurately determine marine derived nitrogen at the time of ring formation. Trees and all vegetation need salmon to survive, but just as trees need salmon, salmon depend on trees as well. Every part of a tree is participating in enriching a stream for aquatic life. From its needles to it roots. Vegetation shades spawning streams keeping developing eggs cool. Tree roots stabilize stream banks, to slow down erosion, protect clean water salmon need to survive. Also falling trees creates pools that shelter young salmon.

As I mentioned earlier, salmon are the biological foundation of river ecosystems. Salmon are like pumps that push vast amounts of marine nutrients from the ocean to headwaters like low poor amounts of nutrients rivers. Salmon return feed the rivers shape habitats that support the next generation of Salmon. The more pristine, and productive the watersheds are, the healthier the salmon stocks. The health of watersheds are declining. Developments like mining, damn building, forest clear cutting is endangering salmon. Salmon are vulnerable to climate change, the impact in headwater streams and ocean. Salmon stocks are dying from incursions into their habitat. These dramatic habitat loses could be irreversible. Wild salmon population are often inundated, and overwhelmed by domestic salmon that are bred and are developed in hatcheries, which are poorly adapted for survival in the wild. Northern California have healthy habitats for

salmon but suffer from legal and illegal overharvest in both the ocean and freshwater spawning river. Which decrease salmon population.

Climate change, ocean condition, temperatures changing, we know that. The temperatures are increasing causing droughts and fires. Oceans acidity are increasing. If we look at this from a focused view point and notice how climate change is impacting many different organism ecosystems, Salmon is one of them. Along the coast of California. In tending the wild environmental historian Jon Christensen explains "In the 20th century there was a transformation in California with huge water projects with damming of rivers for irrigation system supply for hydroelectric, and flood control. The building of the dams and farm land that use the water that is impounded for irrigation creates hybrid landscape that is "natural engineered". Tribe, Yurok. "E2: Keeping the River - How the Klamath River's Native Peoples Maintain Their Relationship With Salmon | Tending the Wild." *KCET*, 27 Sept. 2017. But now, Is it really though? Sometimes projects that will benefit the environment will always have some type of impact wildlife. Like endangering salmon. Salmon go through two different ecosystems the ocean and watersheds. Which makes them more vulnerable to drastic change. There the perfect example of a unique perfectly balanced organism. The ecosystem engineer. Nothing will be able to replace it. Due to climate change young salmon have been dying before they can go to the ocean to develop and grow. Many of the dams are blockage for fish and can't reach their spawning waters.

Now we're thinking about transforming for a sustainable future. To find change we must look back about the concern for native American right, water rights, fishing rights, and endangered species. Salmon are as important to the natives like the air they breathe. On the coast of northern California every river has a deep cultural story. Susan Matson Part of the Yurok tribe explains "The history of each river and the culture stories of the people that depended on those rivers have been forgotten. If we are looking for change. We must bring those stories to guide us through the change of powerful reconnecting with the salmon and the river." The natives and their knowledge are as important and hugely part of the change like any other scientist. Salmon are a spiritual figure for tribes that depend on them, if there isn't any salmon it will hugely impact the ongoing health of the entire ecosystem. In 2002, over 70,000 adult Chinook Salmon died making it the largest salmon kill in the history of the American west. It resulted from water diversion resulting from a damn that impounds the water for irrigation for farms. Tribe, Yurok. "E2: Keeping the River - How the Klamath River's Native Peoples Maintain Their Relationship With Salmon | Tending the Wild." *KCET*, 27 Sept. 2017,. Water diversions cause many environmental disruption. Harming habitats and maybe even harming a whole ecosystem. Salmon are very vulnerable especially if it's in their migration routes. In these cases farmers and ranchers cause such huge destruction, yet looking at it as whole picture it was during a drought year due to climate change. There were 10 to 15 lbs. of salmon dead on the side of the river while people were still fishing. A government decision water right gives farms to impound water from streams. The water levels were so low and temperatures are so high.

Tribal groups and scientist present that cause to say we have to provide the water that flows down the streams to the resources to protect the salmon and the wildlife and people that depend on them. The government choose not too and use it for farming and irrigation. There are many tribes that depend upon wild fish. The health of the rivers and its resources is the health of the native people. If the river is sick, the people are sick. All of the ceremonies, spirituality, strength and health is all connected to the river land and wildlife. There are one with nature. There will come times where there will be little salmon which means we should conserve, when

there is too many salmon we can harvest. This is a philosophy that many are uneducated, people just take and never give back. Salmon are so sacred they are part of their spiritual and cultural identity. Historically tribes were looked at as wealthy because of the flourishing trade based on salmon. Native American believe that salmon and the rivers are a sense of place and they were put there where salmon return they have an obligation to protect the rivers and land. "*My strength is from the fish; my blood is from the fish, from the roots and berries. The fish and game are the essence of my life. I was not brought from a foreign country and did not come here. I was put here by the Creator." — Chief Weninock, Yakama, 1915* "Yakama Tribe | Yakama Reservation, Yakama Nation." *CRITFC*, The annual salmon harvest allows the the transfer of traditional values from generation to generation. These salmon have been so important for economic regions for thousands of years. Since the ancient Indian trade routes to modern commercial fishing.

Ok so how do we make a change what can we do stop this ongoing problem. If we trust Indigenous cultural beliefs to sustain and use their land management techniques we will see major environmental changes. There has been tribe councils put together, one of them is the Yakama tribe council that uses an interdisciplinary and sustainable approach to care for the land and resources operates many fishery projects. In the Wenatchee river has been declining of salmon to a point where there wasn't any left. A lot of the fish were not returning to the watersheds because of dams and low river levels and their goal was to reverse the decline. In 1997 restoring the decline they used the last salmon stock in the river and moved them down river so there closer to the ocean they wanted the salmon to come accustomed to the to the new spawning area. After a few years they started replacing the lower river salmon with juvenile salmon produces from up river returning Adults. The other fish were allowed to pass upstream for a natural spawning. These fish were able to migrate hundreds of miles from the ocean past 7 or more dams the tribe hoped to create a strong salmon brood stock that is better adapted to local conditions. After a few more years salmon returning were complete and rebuilt to full productivity. Since the program was accepted there has been an average of 8,576 adult salmon. This is a dramatic high return in 8 years. This is one tribal council in one are. We must change.

Modern fishing is a way where fisheries industries can harvest massive amounts of salmon. Commercial fishing is way where people can profit from wild fisheries and participate in global markets. This is good way to provide food around the state or locally. But there are many environmental concerns. Overfishing can have a huge effect on marine biodiversity and disrupt the food chain. This foundation of biodiversity are genetically distinct fish stocks that are uniquely adapted to their salmon habitats across the North American coast. The diversity has evolved to a genetic thread of salmon adapted to their environment and its seasonal changes which helps maintain salmon population. Hilborn et al. Biocomplexity and fisheries sustainability. PNAS. 2003,11:6564-6568. Even though there different salmon they all work as a network to support each ecosystem Biodiversity helps sustain fisheries as the fish harvest and production varies through the season due to climate variation. Some salmon can produce more fish under colder climates while other type of salmon produces more during warmer climates. That is why we have salmon throughout the whole year. All impacts on Salmon, climate change, salmon farming, and overfishing can all reduce salmon population and adaptation.

Salmon also face another threat to their habitat diversity with genetic integration with hatchery bred Salmon. Wild salmon contain superior fitness in native streams rather than bred salmon. When first breeding salmon in 1880 there goals were benefiting, and restoring endangered salmon and there runs and mitigate the habitat loss. Rather than benefiting these

stocks, It has contributed to the decline of wild salmon populations. Hatchery salmon derail the concept of the Survival of the fittest. Hatchery salmon are more weak and inexperienced they don't contain the genetic traits that make them successfully survive in there habitable condition. For example avoiding predators, feeding skills, there overall physiology, and physical strength. According to Wild Fish Conservancy "Only 1 out of 10 juvenile hatchery salmon survive emerging from the gravel. Some hatchery salmon manage to return to wild spawning streams. Genetic Integration between wild and hatchery salmon is reducing the wild salmon recovery. Large quantities cause more predators which enhance wild salmon mortality." There has been many attempts to better these threats towards salmon. None of them have been enough to restore the decline of of wild salmon and its habitat. "Benefits of Biodiversity | Watershed Watch Salmon Society." *Watershed Watch*, 26 Sept. 2012. We need to make a change a new prototype of some sort that develops habitat restoration and ecosystem rather than hatchery facilities help is needed for many of these wild stocks to survive through generations.

It takes many years to make a specific ecosystem perfect to sustain itself health and its wildlife. We live in world now where many of those systems are being faced with obstacles from humans that demolish the cycle of life within the ecosystem. Salmon have been here more than five millennia provided with 1250-2500 salmon generation. All of that work and time to make the perfect wild natural engineer that benefits our water land. Our health is declining because of us. There is nothing that can replace a salmon and its role that it brings to this earth. Salmon are being impacted many ways by climate change. I centered the viewpoint of Climate change on one organism. Think as if it's an ivy on a tree It is a spreading problem with different stems and ends, one of those ends is affecting salmon and those ends and stems are always tied to the problem, which leads to weaken the whole tree. It is important to understand how everything is connected. We should be educated, and consider Native Americans perspectives they have great amounts of knowledge, can guide us to take care, conserve the land and the wildlife. Each story is important to this change of reconnecting with salmon and the rivers. Salmon are as important to us like the air we breathe.

Let's give indigenous people a voice in our government about our wildlife and resources. It is crucial to honor all of the 500 treaties that were signed by native Americans and the U.S. All have been broken or violated by the U.S. By giving them the chance of controlling or having a voice by weaving there cultural beliefs land management techniques in our government will help solve many of our environmental problems, successfully leading to a healthy nation. We must start viewing nature as more as just an object and looking at it as a living thing. We are connected to it. The trees our lungs, the streams our veins. The rain storms our liver. The We are part of it so let's start restoring.

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