The Watershed Stewards Program’s (WSP) mission is to conserve, restore, and enhance anadromous watersheds for future generations by linking education with high quality scientific practices.

A program of the California Conservation Corps, WSP is one of the most productive programs for future employment in natural resources. WSP is administered by CaliforniaVolunteers and sponsored by the Corporation for National and Community Service.

Stories and Art by the Members in District B of the Watershed Stewards Program

Members from District B at WSP Orientation – October 2015. From top left to right: Amidia Frederick, Blake Batten, Ryan Bernstein, Chris Harris, Veronica Yates, Emily Moloney, Mimi Caddell, Nicole Bejar, Karee Kelsen and Alejandra Camacho. Photo Credit: Zia Schatz
For the past 22 years, the Watershed Stewards Program (WSP) has been engaged in comprehensive, community-based watershed restoration and education throughout coastal California. WSP was created in 1994 by California Department of Fish and Wildlife (CDFW) biologists, educators, and the California Conservation Corps to fill critical gaps in scientific data collection, in-stream restoration, and watershed education. In collaboration with landowners, tribal communities, teachers, community members, nonprofit organizations, and government agencies, WSP works to revitalize watersheds that contain endangered and threatened salmonid species (Chinook salmon, coho salmon, and steelhead trout) by using state-of-the-art data collection and watershed restoration techniques. WSP also engages members in education, outreach, and volunteer recruitment efforts to increase the capacity of partner organizations. WSP currently has Members working from the Oregon border to the Santa Monica Mountains.
For this non-native Humboldtian, the wall of mud roaring down the Eel River was a shock. I imagined that once the heavy rainfalls of the winter came the Eel River would magically fill up and immediately turn into the pristine teal river I had seen in all of the photographs. Foolish, I know. Little did I realize that the Eel River actually has the highest per-unit-area sediment yield of any river of comparable size (not fed by active glacial or volcanic sources) in the contiguous United States (Brown and Ritter 1986). So why is the Eel River so muddy? Look no further than below.

There are four main factors which contribute to the high suspended sediment loads in the Eel River: erosive bedrock, rapid geographical lifting, high seasonal rainfall, and human disturbance. The basin’s bedrock is mostly made up of sandstone and shale with interspersed volcanic and metamorphic rock. The basin’s drainage system creates narrow, deeply cut canyons into the weak spots of this highly erosive bedrock. The high tectonic activity in the area has also been continually raising the land, accelerating the incision of the drainages. These steep canyons promote streamside landslides along channels which contribute a significant percentage of sediment addition. Northern California receives 90% of its rainfall between October and April. The area around the Eel River gets inundated with 55 inches during that short time. Plants cannot use most of the precipitation that falls in the winter because the soils are saturated so excess water runs off hillsides instead of being absorbed. Past and current human activities, which include: timber harvesting, grazing, and road construction, have increased the chances of sediment runoff. Past timber harvesting operations, specifically clear cutting, reduced tree-root strength and destabilized hillslopes. Grazing practices negatively impacted the basin when land owners swapped native perennial (long-lasting) grasses with European annuals (short-lasting) with shallower roots. Intensive road building from 1950 to 1975 also increased sediment yields to a large degree by promoting erosion of exposed soils.


Lisle, T.E. The Eel River, Northwestern California; High Sediment Yields From A Dynamic Landscape. The Riverscape.
It was the last day of our WSP Orientation. Members were cluttered into a small office space, acquiring piles of WSP t-shirts, fleece coats, and the standard uniform brown work pants. As my Site partner and I gathered our waders, stream boots, and rain gear, we were approached by a staff member. “You two are placed at the Mattole Restoration Council? These items are for you.” We looked at the excessive pile on the table – complete with sunglasses, ear protection... and what was that? “Your Site requested that you have Tyvek suits.” Alongside the white, papery ghostbusters costumes was a tub of something called “Mean Green.” As we later came to learn, our Site was particularly prone to poison oak endemics. Stories of hospital visits, of eyes swollen shut, and of the constant, never-healing itchy rashes soon became the theme of our WSP experience.

Western poison oak has a rather appropriate Latin name - *Toxicodendron diversilobum*. Able to exist as a shrub, tree, vine, or small unassuming twig, this incredibly diverse plant inhabits nearly every biome within the Mattole Valley - including conifer forests, mixed broadleaf forests, woodlands, grassland prairies, and chaparral. Contributing to its seemingly shape-shifting abilities, this plant is deciduous, meaning that in the winter it becomes an unidentifiable stick. It shares a family, Anacardiaceae, with mangoes, cashews, and pistachios.1

Though used medicinally by Californian Native Americans, and as an important food source for black-tailed deer and western grey squirrels, most people do not have a positive sentiment for this notorious species. In fact, 50-70% of Americans will acquire irritated rashes upon contact with the oil coating the plant. If you work in the field west of the Rockies, you’ve likely been victim to such an affliction.

[Disclaimer: this paragraph is for the science geeks out there.]

The oil is comprised of a chemical called urushiol, which is a saturated carbon ring with two alcohol groups and a side chain (the nature of the side chain, which differs between individuals, determines the severity of the reaction). When urushiol comes into contact with the epidermis, it covalently binds to certain proteins, which then oxidize urushiol. Upon oxidation, the urushiol compound becomes highly reactive, attacking the immune cells of the skin (called Langerhans cells) and triggering the immune cascade that we correlate with the itchy rash.2,3

Unfortunately, a recent study has shown a correlation between increased atmospheric CO2 and prolificacy of urushiol in *Toxicodendron diversilobum*. So, stock up on Mean Green (when you know you’ve been exposed but haven’t gotten the rash yet), Calamine lotion (useful for drying out the explosive blister), and get acquainted with identifying the plant. Also, keep in mind that the fluid inside the blister is not urushiol, and therefore will not contribute to spreading. Good luck!

(1) “Plants Profile for Toxicodendron Diversilobum (Pacific Poison Oak).” *Plants Profile for Toxicodendron Diversilobum (Pacific Poison Oak)*. USDA Natural Resources Conservation Service.
Photographic Rambling Through North Coast Watershed

Oxalis oregana (Mad River-Redwood Creek)

Alnus rubra (Big-Navarro-Garcia)

Symlocarpus foetidus (Mad River-Redwood Creek)

Unidentified (Mad River-Redwood Creek)

Unidentified (South Fork Eel)

Unidentified (Mad River-Redwood Creek)

Polystichum munitum (Mad River-Redwood Creek)
Salmon have long been celebrated as a cultural, economic and ecological staple since time immemorial, serving as a key food source and source of trade for Native American tribes and subsequent settlers. Scientific research of this keystone species has continued to inform our understanding of the role of salmon in the environment. This article discusses how the salmon life cycle contributes a cyclical input of marine nutrients to freshwater and terrestrial environments.

Anadromous species of salmon are born in freshwater streams. As juveniles, they swim to the ocean to mature and live their adult lives before returning to their natal stream to spawn and die. The salmon spawn and die in varying parts of the watershed thus depositing their nutrients throughout the system. This important aspect in the life cycle contributes to an exchange of nutrients from the marine environment to the freshwater environment.

Salmon feed exclusively in the marine environment and don’t eat once they return to freshwater; therefore, all deposited nutrients are marine derived. Research indicates that salmon carcasses contribute significant amounts of marine carbon (C), nitrogen (N) and phosphorous (P) to the freshwater aquatic and terrestrial ecosystem. Researchers use isotopic tracers and mass spectrometry to accurately trace marine derived nutrients from decaying salmon. Studies have identified three pathways salmon nutrients enter and move through the food web: 1) uptake by primary producers where nutrients are remineralized in plant tissue and passed up the food web, 2) decomposition by microfauna that release nutrients in organic form into the soil, and 3) direct consumption by biotic organisms. These nutrients nourish aquatic and terrestrial plant and animal communities, including invertebrates, which eventually become food for the next generation of salmon as they emerge from eggs deposited in the gravels, the ultimate completion of this impressive life cycle.

Salmon provide an annual supply of nutrients that move through the food web. The amount and distribution of nutrients varies tremendously on physical stream structure and discharge, the biotic community, the condition of the riparian forest, and density of spawning salmon. With the return of the spawning salmon brings the return of nutrients that feeds the ecosystem and contributes to the overall health of environment a key to the wellness of our forests, streams and wildlife.

References:
C. Jeff Cederholm, Matt, D Kunze, Takeshi Murota, Atuhiro Sibatani “Pacific Salmon Carcasses: Essential Contribution of Nutrients and for Aquatic and Terrestrial Ecosystems” *Fisheries Management/Habitat* 1999

Unidentified (Big-Navarro-Garcia) Photo Credit: Blake Batten
Here in the Mattole Valley, we have been busy planting native riparian vegetation along the estuary of the Mattole River. Over the past few months I have developed a skill for planting, and have summed up the process in five easy to follow steps.

**Step 1:** Location, location, location! You have to pick where you want to plant your plant! In our large scale planting zones there are areas of good deep soil and areas of rock and gravel. You want to find the areas with nice soft, nutrient rich soil to give your plant the best shot at survival. Planters call this good soil “gravy”.

**Step 2:** Make a hole! We have used a variety of different tools over the past months (shovels, hoedads, rock bars) and they each have their advantages. However, the premise of all of these tools is to create a space in the earth for the plant to go. Typically the deeper the better, as the roots are closer to the water table.

**Step 3:** Insert plant. You want to perform this step, making sure the plant is as straight up and down as possible and that all of the roots are below the level of the surrounding ground. Do not crush, drop, shake, step on, plant sideways, or J-root these plants! Doing so can cause the plant to grow poorly or even die.

**Step 4:** Tamp, tamp, tamp. Once the plant is in the ground and you have filled in the hole with the soil you dug up, you need to tamp it together. Our plants enjoy being in the ground, so to ensure they don’t get pulled up by animals or unknowing humans we compress the soil around the planting (called tamping) to ensure it is nice and snug. This also avoids air pockets in the soil, which plants don’t enjoy.

**Step 5:** Step back and watch nature do its thing. We can water these plantings and put protective cages around them to minimize animal browsing, but ultimately it’s the plant’s time to shine. Hopefully in 15-20 years we can come back and enjoy a young riparian forest.

*Tip: A few words of encouragement never hurt the plants.*
I conducted a watershed awareness project with 30+ volunteers along Freshwater Creek in Eureka on a conservation property called Freshwater Farms Reserve. This property is owned by the North Coast Regional Land Trust which is a local organization that works to conserve Northern California’s beautiful and productive wild and working land. Since land cover is very much connected to water quality, I decided to take a look at the Freshwater Creek watershed and how land cover has changed throughout the past few decades in this map.
It was the start of a new work week in the California Department of Fish and Wildlife CWPAP office in Fortuna, California. I was itching with anticipation for my first opportunity of the season to survey the regional fisheries. The recent uptick in rain had created ideal conditions for salmon spawning in the tributaries of the South Fork Eel River.

As was typical on Monday mornings, we packed the trucks with our survey equipment for a week of working in the field. This trip was going to be different as I would to be riding an ATV to access the streams, instead of our typical means of boating or hiking. We loaded the ATV onto the trailer, and drove south to the CCC Leggett Center. This is where we stay during the spawning survey season.

It was a particularly windy road to be traveling while trailering ATV. During the drive we noticed the effect of the heavy rainfall on the water flow of the mainstem of the South Fork Eel River. It was a great sight to see, considering how low the streams had been during the earlier part of the season.

Once we got to mile marker 12 on the logging road we unloaded the ATV. We put on our waders, strapped our gear to the ATV, and started the 40 minute ride to the access point of the stream. We were headed for reach (area to survey) 754 on Indian Creek, a tributary to the South Fork Eel River.

Typically few salmon inhabitants would make this 3.3 km reach a quick survey. This day it turned out to be the complete opposite. Within the first 100 meters we saw our first redd. Shortly after, we noticed a few more. Soon it became clear that every 20 meters we would need stop to flag redds or mark live Chinook salmon.

Around noon we took a break along the streambank and realized that, according to our GPS devices, we were less than halfway through the reach. We continued on and the afternoon was equally fruitful. In total we had flagged 37 redds, marked more than 20 live salmon, and tagged two Chinook salmon carcasses.

Riding back to our truck on the ATV I was fully enthralled with the day. I could not have asked for a better start to my first survey season. The journey along Indian Creek still remains the best survey day I have had.
Electrical whirling gave way to the frantic slapping of fish being raised up from their holding pools. Fleshy tails collided with solid concrete, before succumbing to the sleeping aide administered by the hatchery technicians at the Mad River Hatchery. The technicians measured the subdued fish, dumping them into recovery tanks afterwards. Our job as volunteers was to coax the salmon back from their sleepy state before releasing them into the river.

Water splashed everywhere; boots scuffed and squeals punctuated the air as the reawakened fish attempted a deadly escape from our questing hands. In those sweaty hours at Mad River, I thought about the few things I knew of hatcheries but more so all the things I did not know. There is nothing quite like a slippery slap in the mouth and a fear of ectoparasites to get you thinking about why hatcheries exist.

The California Wildlife Conservation Board funded the construction of the Mad River Hatchery to increase Chinook salmon for commercial fisheries. With only 10 percent of California's historic population of wild salmon exists today with 32 species listed as endangered or threatened. The alarming decline of wild salmon has redirected the roles of hatcheries, many becoming state conservation hatcheries.

Programs like the Iron Gate Hatchery and Warm Springs Hatchery use a matrix breeding system created by the NOAA Southwest Fisheries Science Center to troubleshoot inbreeding issues. The Warm Springs Hatchery program adapted their rearing environments to boost wild behavioral development. They engineer the growth of hatchery raised juvenile fish to match the natural growth pattern of wild juveniles. Instead of propagating fish for commercial use, hatchery programs all over the US are developing new technologies and methods of operation in hopes of creating wild, self-sustaining salmonid populations.

If efforts prove successful, the recovery of endangered and threatened salmonid populations will coincide with the closing down of hatcheries like the Iron Gate and Warm Springs. Perhaps one day, experiences like mine will become a memory of the past and rivers overflowing with salmon, a vision of the future.


Mixed Media: Acrylic and Water Color.
This painting was based on a fish’s perspective of a dam. The giant concrete walls loom ahead signifying the many challenges migratory fish have to reach their spawning grounds.
**Name:** Bob Pagliuco  
**Years Served in WSP:** Year 9 - 2002 & Year 10 - 2003  
**Placement Sites:** CDFG- Fortuna & Humboldt Fish Action Council (HFAC)

**What was your WSP Member experience like?**  
My first year, I started out knowing nothing about salmon or teaching. I was a Forestry and Ecology major. But I quickly learned by taking every opportunity given to me. By the end of my second year, I had an incredible amount of field work under my belt. I was operating a full-channel fish weir, diving spawner surveys, handling large fish in the winter and helping run a juvenile salmonid rearing facility on Freshwater Creek.

**What was your most memorable experience in WSP?**  
I had the chance to organize and coordinate a restoration planting event on Redwood Creek that involved 30+ community members. The whole process of taking an idea from conception to outreach was immensely empowering for myself and the community.

**How have you been involved with WSP since serving as a Member?**  
During my time at Humboldt Fish Action Council (HFAC) I had the opportunity to pseudo-mentor six WSP Members. I trained Members on HFAC’s weir, spawner survey, PIT tagging and downstream migrant trapping. In my current position as a Habitat Restoration Specialist for the NOAA Restoration Center. I sit on the Fisheries Restoration Grant Program’s (FRGP) Technical Review Team and I am a lead reviewer of the WSP FRGP Grant application. I also get the opportunity to meet the current WSP Members at the Salmonid Restoration Federation Conference each year.

**Tell me about what you do in your career now?**  
Currently, I am a Marine Habitat Specialist for Earth Resource Technologies contracted by NOAA and the NOAA Restoration Center. My geographic location ranges from Oregon boarder to Humboldt Bay. I sit on eight funding panels for restoration projects in California. I spend a large portion of my day reviewing grants proposals, sampling rivers for salmonid pre and post projects, designing and developing restoration projects, and streamlining permitting process for restoration projects.

**What is your favorite part of your job?**  
The NOAA Fisheries/CCC Veterans Corps Program which gives post-9/11 veterans opportunities to build restoration and field monitoring skills. The program is making a huge impact, by helping the sponsors collect the data to help streams and the Veterans getting the opportunity to help fisheries issues.

**How did WSP prepare your career?**  
WSP gave me confidence and pushed me to take on tasks that were uncomfortable. The family I made in WSP has helped me get to where I am today.

**What advice would you give to current WSP Members?**  
Take advantage of every opportunity you have. Each opportunity will add one more feather in your cap or one more line on your resume.