RIPPLE EFFECT: WATER PROTECTOR TOOLKIT

PURPOSE AND OVERVIEW

This teacher toolkit is designed to help educators engage students in hands-on learning about watersheds, local ecosystems, and the importance of protecting salmon, trout, and other aquatic species. Through student-led stewardship projects, students from kindergarten through high school can explore how healthy rivers, streams, and riparian habitats support both wildlife and communities. With adaptable lessons, activities, and project ideas, the toolkit empowers students to build a strong Water Protector identity while taking meaningful action to preserve waterways for future generations.

Intended Audience

- **Grade Levels:** TK–12
- **Subject Areas:** Science (Environmental Science, Biology), Visual Arts, Health, Mathematics, History-Social Science, Career Technical Education (CTE)

Learning Goals

Students will:

- **Understand watersheds, the water cycle, and ecological connectivity**, exploring how water links communities, ecosystems, and migratory species.
- **Learn about life cycles and habitat needs** of salmon, trout, and native aquatic species.
- **Investigate human impacts on water quality** and riparian ecosystem health.
- **Strengthen observation, inquiry, teamwork, and scientific data skills** through hands-on outdoor learning.
- **Develop a Water Protector identity** through student-led stewardship, pollution prevention, and community advocacy.
- **Foster environmental stewardship and civic responsibility** for protecting local waterways and natural resources.

CONNECTION TO STANDARDS

Watershed stewardship projects provide authentic, project-based learning experiences that integrate cross-curricular standards:

- **Next Generation Science Standards (NGSS):**
    - *Crosscutting Concepts:* Systems and System Models, Cause & Effect.
    - *Disciplinary Core Ideas:* Human Impacts on Earth Systems, The Role of Water, Ecosystem Dynamics, Interdependent Relationships, Life Cycles, Adaptation, Weather & Climate.
- **Mathematics:** Collect, graph, and analyze water quality, streamflow, biodiversity, and waste audit data.
- **Health:** Explore connections between clean water, healthy ecosystems, outdoor recreation, and community well-being.
- **History–Social Science:** Examine historical water use, Indigenous stewardship practices, resource management, and civic action.

- **Common Core ELA & Literacy:** Conduct research, write eco-poetry, script conservation videos, and present evidence-based arguments.
- **Preschool/TK Learning Foundations (PTKLFs):** Early exploration of natural water systems, weather, and living organisms.

Key Concepts

- Watersheds, the water cycle, and groundwater recharge
- Rivers, streams, wetlands, and riparian vegetation
- Salmon, trout, and native species life cycles
- Migratory species, upwelling, and ecological connectivity
- Water quality, pollution prevention, and stormwater runoff
- Climate resilience and natural flood protection
- Indigenous stewardship and Traditional Ecological Knowledge (TEK)

I. GETTING STARTED: WHAT ARE WATERSHEDS AND WHY ARE THEY IMPORTANT?

A watershed is an area of land where all rain and snowmelt drain to a common creek, river, wetland, or ocean. Every school and community is part of a watershed, meaning everyday choices directly impact local waterways. Healthy watersheds and riparian ecosystems provide clean water, reduce flooding, cool surrounding areas, absorb carbon, and create vital habitat for species like salmon and trout that are deeply tied to California's ecological, cultural, and historical identity. Local wetlands and waterways are also critical to the migration paths and life cycles of migratory fish, birds, and butterflies.

Why This Topic Matters: When watersheds are polluted or damaged by erosion, runoff, habitat loss, or rising temperatures, the impacts ripple across nature and human communities. Schools play an essential role in watershed protection by helping students become active Water Protectors. By studying streams, water quality, and native wildlife, students learn how even human actions on the schoolyard and at home influence watershed health. Through habitat restoration, pollution prevention, and water conservation, students gain the confidence and agency to care for living systems.

Local Context & Connections

- **Bay of Life:** Photography and essays documenting extraordinary local marine and terrestrial biodiversity.
- **Coastal Watershed Council (CWC):** San Lorenzo River education, water testing, and Watershed Rangers programs.
- **Watsonville Wetlands Watch:** Wetland restoration, migratory bird studies, and classroom pop-up lessons.
- **Elkhorn Slough National Estuarine Research Reserve:** Estuary ecology, wetland resilience, and wildlife monitoring.
- **Amah Mutsun Land Trust:** Indigenous stewardship, land care, and Traditional Ecological Knowledge.

- **Santa Cruz Museum of Natural History:** Neary Lagoon field programs and local natural history.

II. SAMPLE WATER AND WATERSHED LESSONS AND ACTIVITIES

Lessons are organized below by theme.

Theme 1: Foundations, Water Systems & Climate

Resource / Lesson	Grade Level	Core Focus / Description
FOSS Water & Climate / Structures of Life	Grade 3	Physical properties of water, weather, and organism structures.
California Academy of Sciences: Earth's Water, A Drop in Your Cup	Grades 3–8	Investigating water distribution, the water cycle, and freshwater limits.
TWIG Science Units	K, 3, 5	*I Can Unit* (Kinder/Human Impact), *Biodome Unit* (Grade 3/Life Cycles), *H2O Response Team* (Grade 5/Water Conservation).
Seeds to Solutions Climate Change Curriculum Units	Grades 7 and Grades 9-10	Managing water for California communities and ecosystems. Grade 7 Unit: Land Subsidence and Groundwater and Grade 9-10 Unit: Managing Water For CA Communities and Ecosystems

Theme 2: Aquatic Ecosystems & Classroom Aquarium Education Program

Resource / Lesson	Grade Level	Core Focus / Description

Classroom Aquarium Education Program (CAEP) / Trout in the Classroom	Grades 3–12	Raising Rainbow Trout from eggs to fry while studying life cycles, water chemistry, and stream health. Provides companion lessons on website.
CWC: Can Steelhead Trout Survive?	Grades 3–5	HyperDoc unit exploring streamflow levels and steelhead trout migration. CWC also offers companion classroom visits but reservations fill quickly!
CWC: Save Water, Save Fish	K–5	Hands-on activity connecting home water conservation directly to fish survival.
CWC Watershed Rangers Program	K–7	NGSS-aligned classroom sequences, hyperdoc journals, and visits from guest speakers (such as Sam Adelson).

Theme 3: Pollution Prevention & Coastal Stewardship

Resource / Lesson	Grade Level	Core Focus / Description
California Academy of Sciences: Rapid Trash Assessment	Grades 4–12	Protocol for categorizing and mapping campus/community litter runoff risks.
CA Coastal Commission: Waves, Wetlands, and Watersheds	Grades 4–6	California coastal stewardship curriculum focused on wetland and watershed health.

Save Our Shores: Marine Protected Areas	Grades 6–8	Interactive middle school journey through California's marine protected areas.
Save Our Shores Media & Trivia	Grades 4–12	Videos: *Where Does the Flow Go?* & *Where Does Marine Debris Come From?*; Watershed Trivia slide deck.
Adobe Express PSA Campaign	Grades 3–12	Creating student-led videos and posters to advocate for watershed conservation.

III. OUTDOOR LEARNING AND FIELD TRIP OPPORTUNITIES

On-Campus Outdoor Learning

Activity / Program	Provider / Link	Description / Focus
Pop-Up Classroom Lessons	**Watsonville Wetlands Watch**	Hands-on wetland and watershed pop-up lessons brought directly to your campus.
Schoolyard Clean-Up Program	**CA Coastal Commission**	Campus waste audits connecting local litter pathways to ocean health.
Schoolyard Birding	**Bird School Project**	Naturalist skill-building focused on local bird species (Spanish facilitation available).
Nature Journaling	**John Muir Laws Ep. 2**	Outdoor observation routines using *"I notice, I wonder, It reminds me of"*.

Campus Stormwater Audit	**Self-Guided / Teacher-Led**	Mapping campus runoff points, storm drains, and permeable surfaces.

Field Trips & Regional Field Experiences

Organization / Site	Program Link	Program Details
Neary Lagoon Wetland Walk	**Santa Cruz Museum of Natural History**	Guided exploration of freshwater wetland habitats, aquatic birds, and water quality.
San Lorenzo River Experience	**Coastal Watershed Council**	Water quality testing, macroinvertebrate sampling, and river habitat studies.
Elkhorn Slough Reserve Trips	**Elkhorn Slough Reserve**	Estuary dynamics, wetland resilience, and sea otter observation.
Monterey Bay Marine Sanctuary	**MBNMS Exploration Center**	Interactive exhibits connecting freshwater watersheds to ocean health.
Watsonville Wetlands Watch	Education Programs	On-campus field trips and service learning opportunities
Coastal Classroom Program	**Save Our Shores Request Form**	Facilitated beach cleanups, marine debris studies, and coastal field trips.
CA Coastal Cleanup Day	**California Coastal Commission**	Statewide cleanup event held annually in September. Sign up and

		find a Schoolyard Clean up toolkit on the website

IV. PROJECT PLANNING TOOLS AND CONSIDERATIONS

Teachers can structure student watershed projects using a **Mild to Spicy** framework to fit classroom time, capacity, and student leadership:

MILD TO SPICY PROJECT SPECTRUM:

- **MILD: Connect & Investigate -** Building environmental identity and awareness through a focus on local watersheds can be explored through introductory activities, a short unit of study, or a year-long theme. Integrated with any of these activity levels is an opportunity to build awareness of human impacts on the environment and have students engage in simple to more complex ways to mitigate human impacts.
    a. Bradley Elementary School Example of Introductory Activities: “In my third grade classroom, I always start off my year with introducing Nature Journaling. We start on the school campus.This allows us to build observational skills and curiosity in the outdoors.” See John Muir Laws’ video tutorial The Nature Journal Connection episode 2
    b. Join the Green Classroom Challenge and make water conservation one of your goals.
    c. Life Science units in the adopted science curriculum offer a good entry point for life cycle studies, water and weather, animal adaptations (specifically migration), and ecosystems. In third grade with TWIG Science and FOSS you can even raise and/or get access to live animals to study including painted lady butterflies and crayfish.
    d. Local Environmental Education partners can provide field trip opportunities to visit watershed habitats and learn about key characteristics and the important value of these natural places. (Watsonville Wetlands Watch, Santa Cruz Museum of Natural History (Neary Lagoon), Elkhorn Slough Reserve, Coastal Watershed Council (San Lorenzo River). Some of these partnering organizations also offer classroom visits and may bring resources and activities to you.
- **MEDIUM**: As the focus moves more into understanding and mitigating human impacts on local watersheds, more targeted lessons, activities, and projects can be introduced.
    a. Coastal Watershed Council Activities Page has Activity Examples: Save Water Save Fish and Water Level and Steelhead Trout Migration
    b. Coastal Watershed Council Watershed Rangers lesson sequences (K-7) Multiweek Units of study with included options for field studies and ideas for student action projects related to water conservation. CWC staff work with teachers and classrooms. These can also be completely led by the classroom teacher using hyperdoc links. Engaging student journals can be printed out to use with the lessons. Third Grade Example: Can Steelhead Trout Survive?
- **SPICY: Raising Trout in the Classroom:**

a. As a culminating project for a more in-depth study, one option is to raise trout in the classroom and release them through the Ca Department of Fish & Game's CAEP (Classroom Aquarium Project). This project focuses on life cycles/stages and watershed health. Students have the opportunity to model a clean river environment in the classroom and then raise trout from egg, to alevin, to fry. Once studied, fry are released into Loch Lomond on a field trip where the release watershed environment can be evaluated by the students based on their learning.
b. Action Projects can include environmental clean-ups and public awareness messages (in the form of posters or videos). Bradley Elementary 3rd grade students create informational videos using Adobe Express. These videos include animations, clips, and music. Students write their own scripts to teach viewers about the impacts humans have on the watershed environment and how this can be mitigated through simple conservation efforts.

Implementation Spotlight: Classroom Aquarium Education Program (CAEP) / Trout in the Classroom

CAEP Program Timeline:

- **Step 1 (Fall):** Sign up for required CAEP Teacher Training. See website for dates.
- **Step 2 (due by Mid-December):** Submit Egg Authorization application to CA Dept of Fish & Wildlife.
- **Step 3 (Late February):** Receive trout eggs; begin indoor tank observation and monitoring.
- **Step 4 (Early April):** Field trip to release trout fry at Loch Lomond Reservoir. TIP: Apply for a Redwoods Field Trip Transportation Grant to receive bus funding
- **Logistics & Safety:** Scheduling all stages of the CAEP requires forethought and coordination. Coordinating with the CA Dept of Fish & Game personnel, the district field trip protocol, and the release site scheduler are all teacher responsibilities. Tank preparation requires cleaning and sanitizing all parts of the tank and the gravel. (In year one there are coaches who will assist with this). During the trout raising season, the teacher needs to make sure the healthy tank environment is maintained and that the equipment keeps working properly. On release day, cleaning the tank and making sure all fry are removed is a time-consuming process. Transporting the fry to Loch Lomond is also a delicate process. All permits must be posted and a release report must be submitted. SAFETY NOTE: Field trips which include proximity to water may have special restrictions.
- **Materials & Supplies:** CAEP provides the tank and most supplies; schools must supply teacher training fee, spring water, river rocks, cleaning tools, and water testing kits. Student digital media projects require access to Adobe Express, which is free.
- **Student Leadership Roles:** Assign rotating duties: *Temperature Monitor, Aquarium Chemist, Fish Counter, Journal Manager,* and *Water and Energy Conservation Monitors*.
- **Capturing Impact & Reflection:** Evaluate student environmental attitude shifts using pre/post surveys. Review journals, scriptwriting drafts, public service posters, and student write-ups like *"Wish for Your Fish"*. See examples of videos and posters in Appendix of this toolkit.

V. ADDITIONAL RESOURCES

Curriculum & Lesson Collections

- **CAEP Teacher Resources:** Activity guides, games, trout life cycle charts, and release field trip assessment sheets. SEE IMAGES OF SPECIFIC TEACHER RECOMMENDED CAEP RESOURCES BELOW:
  - IMG_8783.HEIC IMG_8782.HEIC IMG_8784.HEIC IMG_8785.heic IMG_8781.HEIC
  - Poetry Link: Haiku IMG_8789.heic IMG_8790.heic IMG_8791.heic
  - Resources for Release Field Trip habitat assessment activity: IMG_8786.heic IMG_8787.HEIC
  - Resource for student pre-release writing activity: Create a wish for your fish (what are you hoping it will find in its environment to meet its needs? Write the wish inside this fish and read it at the release party.
  - IMG_8788.heic IMG_7729.HEIC

Citizen Science & Stewardship Tools

- **EarthEcho Water Challenge:** Global water quality test kit and monitoring database.
- **iNaturalist & Seek:** Citizen science tools for identifying riparian plants, aquatic insects, and wildlife.

Children's Literature & Reading

- *Salmon Stream* — Carol Reed-Jones
- *One Well: The Story of Water on Earth* — Rochelle Strauss
- *A River Ran Wild* — Lynne Cherry
- *The Snowy Range Gang* — California Trout Educational Resources
- *Seaweed, Salmon, and Manzanita Cider* — Margaret Dubin & Sara-Larus Tolley

Funding & Mini-Grants

- Redwoods Field Trip Transportation Grant
- NOAA Ocean Guardian School Grants
- Community foundation mini-grants and parent-teacher organization funds

VI. ADDITIONAL CONSIDERATIONS

- **Student Grouping:** Students work in mixed groups and individually on individual lessons, field observations, and culminating action projects. Student options can be offered for partnering.
- **Cross-School Collaboration:** Connect student Water Protectors with school facilities, green teams, and custodial staff to reduce campus runoff, improve drain marking, and lower water consumption.
- **Diversity, Equity, and Inclusion:** Teacher monitors to make sure that all students are participating in all aspects of the watershed studies. Mixed group and individual activities encourage inclusion. Multimodal investigations (video, hands-on, in person, field experiences, art, poetry, writing). Field experiences can be adapted for students with mobility limitations. Frame access to clean water as an environmental justice issue.
- **Indigenous Perspectives & TEK:** Partner with Tribal educators (such as the Amah Mutsun Land Trust) to highlight how California Native Tribes have sustained river systems for thousands of years through reciprocal care and Traditional Ecological Knowledge (TEK).

- **Climate Hope & Student Agency:** Frame simple classroom and campus conservation steps as real solutions that directly help local steelhead trout and salmon survive. Posters and videos can be shared publicly, online, class to class, at Open House events, or in Share Fairs. Media & Outreach Examples: Student Adobe Express Conservation Video links, Watershed Public Awareness Posters, and Coastal Art/Poetry contest submissions.

APPENDIX

Adaptable teacher- and student-created templates for watershed studies:

- **Example Watershed Questionnaire:** from Santa Cruz County science initiative(make a copy for yourself)

Bradley Elementary student Adobe Express Conservation Video examples

- FP Watershed Conservation 12.07.50 (1).mp4
- Help Don't Harm!

Bradley Elementary Student Poster examples

- Poster Image
- IMG_5087.HEIC
- **Planning & Investigation Tool Recommendations:** Campus Stormwater Investigation Sheet, Rapid Trash Assessment Data Sheet, and Riparian Assessment Protocols.
- **Student Learning Tool Recommendations:** Nature Journal prompts, Stream Observation Logs, Salmon/Trout Life Cycle Guides, and *"Wish for Your Fish"* release writing templates.
- **CAEP Trout Resources:** Aquarium Setup & Maintenance Checklist, Water Chemistry Monitoring Log, and Loch Lomond Field Release Checklist.

About This Toolkit Series

This toolkit series was created to help educators integrate environmental literacy, outdoor learning, and student-led action into their teaching through engaging, project-based learning experiences. Each toolkit provides practical lessons, planning tools, and resources that help students build environmental knowledge, strengthen their connection to nature, and take meaningful action in their schools and communities.

Together, the six toolkits create a pathway from **environmental identity and leadership** to **hands-on environmental action**:

- **Green Team Dream Team: Environmental Identity Toolkit**
- **Scrap the Waste: Food Waste & Climate Change Toolkit**
- **Wear and Share: Clothing Swap Toolkit**
- **Green the Concrete: Campus Gardens & Biodiversity Toolkit**
- **Ripple Effect: Water Protectors Toolkit**
- **Beat the Heat: Civic Action & Climate Justice Toolkit**

Inspired by Teacher Leaders

These toolkits were inspired by the outstanding work of teachers in the **Teacher Leadership Institute for Sustainability (TLIS)**, who generously shared their classroom experiences, lessons, and tools while mentoring new cohorts of educators. Our hope is that these resources will make it easier for teachers to bring environmental literacy and meaningful student action into their own classrooms.

This toolkit series was co-developed by:

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- **Jade Giotta** – Santa Cruz Gardens Elementary, Soquel Union Elementary School District
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- **Stu Branoff** – Bay View Elementary School, Santa Cruz City Schools

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