



NORTH COAST RESOURCE PARTNERSHIP 2018/19 IRWM Project Application

The North Coast Resource Partnership (NCRP) 2018/19 Project Application Instructions and additional information can be found at the NCRP 2018/19 Project Solicitation webpage (<https://northcoastresourcepartnership.org/proposition-1-irwm-round-1-implementation-funding-solicitation/>). Please fill out grey text boxes and select all the check boxes that apply to the project. Application responses should be clear, brief and succinct.

Project Applications will be accepted until 5:00 pm, March 8, 2019 March 15, 2019. It is important to save the application file with a distinct file name that references the project name. When the application is complete, please email to kgledhill@westcoastwatershed.com

If you have questions, need additional information or proposal development assistance please contact:

- Katherine Gledhill at kgledhill@westcoastwatershed.com or 707.795.1235
- Tribal Projects: Sherri Norris, NCRP Tribal Coordinator at sherri@cieaweb.org or 510.848.2043

Project Name: Sanctuary Forest Drought and Emergency Water Project

A. ORGANIZATION INFORMATION

1. Organization Name: Sanctuary Forest Inc.

2. Contact Name/Title

Name: Tasha McKee McCorkle

Title: Water Program Director

Email: tasha@sanctuaryforest.org

Phone Number (include area code): 707-986-1087 ext. 2#

3. Organization Address (City, County, State, Zip Code):

315 Shelter Cove Rd. #4, P.O. Box 166, Whitethorn, Humboldt County, CA 95589

4. Organization Type

☐ Public agency

- ☒ Non-profit organization
- ☐ Public utility
- ☐ Federally recognized Indian Tribe
- ☐ California State Indian Tribe listed on the Native American Heritage Commission's California Tribal Consultation List
- ☐ Mutual water company
- ☐ Other:

5. Authorized Representative (if different from the contact name)

Name: April Newlander

Title: Executive Director

Email: april@sanctuaryforest.org

Phone Number (include area code): 707-986-1087 ext. 1#

6. Has the organization implemented similar projects in the past? ☒ yes ☐ no

Briefly describe these previous projects.

Storage and Forbearance for residential and institutional landowners in the Mattole headwaters mainstem and tributaries has been implemented for the years 2005-2018. As of January 1, 2019, 1.8 million gallons of storage have been installed along with legally binding forbearance agreements for 30 landowners and measurable improvements in streamflows. Similar projects have been funded by IRWM in the past.

7. List all projects the organization is submitting to the North Coast Resource Partnership for the 2018/19 Project Solicitation in order of priority.

Sanctuary Forest is only submitting the project proposed in this application: "Sanctuary Forest Drought and Emergency Water Project".

8. Organization Information Notes:

Sanctuary Forest has worked toward the recovery of native Mattole salmonids since 1987, in collaboration with the Mattole Restoration Council, the Mattole Salmon Group and the community. Sanctuary Forest has been conducting extensive research to assess potential causes and solutions to the Mattole low flow problem since the summer of 2003. Sanctuary Forest is trustee of 14 conservation easements encompassing 9,354 acres, including the first conservation easement in California to include a forbearance clause, funded by CA Dept of Fish and Wildlife. Sanctuary Forest has executed 30 forbearance agreements and associated water storage systems and is fully equipped to implement storage and forbearance projects.

B. ELIGIBILITY

1. North Coast Resource Partnership and North Coast IRWM Objectives

GOAL 1: INTRAREGIONAL COOPERATION & ADAPTIVE MANAGEMENT

☒ Objective 1 - Respect local autonomy and local knowledge in Plan and project development and implementation

☐ Objective 2 - Provide an ongoing framework for inclusive, efficient intraregional cooperation and effective, accountable NCIRWMP project implementation

☐ Objective 3 - Integrate Traditional Ecological Knowledge in collaboration with Tribes to incorporate these practices into North Coast Projects and Plans

GOAL 2: ECONOMIC VITALITY

☒ Objective 4 - Ensure that economically disadvantaged communities are supported and that project implementation enhances the economic vitality of disadvantaged communities by improving built and natural infrastructure systems and promoting adequate housing

☒ Objective 5 - Conserve and improve the economic benefits of North Coast Region working landscapes and natural areas

GOAL 3: ECOSYSTEM CONSERVATION AND ENHANCEMENT

☒ Objective 6 – Conserve, enhance, and restore watersheds and aquatic ecosystems, including functions, habitats, and elements that support biological diversity

☒ Objective 7 - Enhance salmonid populations by conserving, enhancing, and restoring required habitats and watershed processes

GOAL 4: BENEFICIAL USES OF WATER

☒ Objective 8 - Ensure water supply reliability and quality for municipal, domestic, agricultural, Tribal, and recreational uses while minimizing impacts to sensitive resources

☒ Objective 9 - Improve drinking water quality and water related infrastructure to protect public health, with a focus on economically disadvantaged communities

☐ Objective 10 - Protect groundwater resources from over-drafting and contamination

GOAL 5: CLIMATE ADAPTATION & ENERGY INDEPENDENCE

☒ Objective 11 - Address climate change effects, impacts, vulnerabilities, and strategies for local and regional sectors to improve air and water quality and promote public health

☒ Objective 12 - Promote local energy independence, water/ energy use efficiency, GHG emission reduction, and jobs creation

GOAL 6: PUBLIC SAFETY

☐ Objective 13 - Improve flood protection and reduce flood risk in support of public safety

2. Does the project have a minimum 15-year useful life?

☒ yes ☐ no

If no, explain how it is consistent with Government Code 16727.

3. Other Eligibility Requirements and Documentation

CALIFORNIA GROUNDWATER MANAGEMENT SUSTAINABILITY COMPLIANCE

a) Does the project that directly affect groundwater levels or quality?

☐ yes ☒ no

b) If Yes, will the organization be able to provide compliance documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?

☐ yes ☐ no

CASGEM COMPLIANCE

- a) Does the project overlie a medium or high groundwater basin as prioritized by DWR?
☐ yes ☒ no
- b) If Yes, list the groundwater basin and CASGEM priority:
- c) If Yes, please specify the name of the organization that is the designated monitoring entity:
- d) If there is no monitoring entity, please indicate whether the project is wholly located in an economically disadvantaged community.
☐ yes ☐ no

URBAN WATER MANAGEMENT PLAN

- a) Is the organization required to file an Urban Water Management Plan (UWMP)?
☐ yes ☒ no
- b) If Yes, list the date the UWMP was approved by DWR:
- c) Is the UWMP in compliance with AB 1420 requirements?
☐ yes ☐ no
- d) Does the urban water supplier meet the water meter requirements of CWC 525?
☐ yes ☐ no
- e) If Yes, will the organization be able to provide compliance documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?
☐ yes ☐ no

AGRICULTURAL WATER MANAGEMENT PLAN

- a) Is the organization – or any organization that will receive funding from the project – required to file an Agricultural Water Management Plan (AWMP)?
☐ yes ☒ no
- b) If Yes, list date the AWMP was approved by DWR:
- c) Does the agricultural water supplier(s) meet the requirements in CWC Part 2.55 Division 6?
☐ yes ☐ no

SURFACE WATER DIVERSION REPORTS

- a) Is the organization required to file surface water diversion reports per the requirements in CWC Part 5.1 Division 2?
☐ yes ☒ no
- d) If Yes, will the organization be able to provide SWRCB verification documentation outlined in the instructions, to include in the NCRP Regional Project Application should the project be selected as a Priority Project?
☐ yes ☐ no

STORM WATER MANAGEMENT PLAN

- a) Is the project a stormwater and/or dry weather runoff capture project?
☐ yes ☒ no
- b) If yes, does the project benefit a Disadvantaged Community with a population of 20,000 or less?
☐ yes ☐ no
- e) If No, will the organization be able to provide documentation that the project is included in a Stormwater Resource Plan that has been incorporated into the North Coast IRWM Plan, should the project be selected as a Priority Project?

☐ yes ☐ no

C. GENERAL PROJECT INFORMATION

1. Project Name: Sanctuary Forest Drought and Emergency Water Project

2. Eligible Project Type under 2018/19 IRWM Grant Solicitation

- ☐ Water reuse and recycling for non-potable reuse and direct and indirect potable reuse
- ☒ Water-use efficiency and water conservation
- ☐ Local and regional surface and underground water storage, including groundwater aquifer cleanup or recharge projects
- ☐ Regional water conveyance facilities that improve integration of separate water systems
- ☒ Watershed protection, restoration, and management projects, including projects that reduce the risk of wildfire or improve water supply reliability
- ☐ Stormwater resource management projects to reduce, manage, treat, or capture rainwater or stormwater
- ☐ Stormwater resource management projects that provide multiple benefits such as water quality, water supply, flood control, or open space
- ☐ Decision support tools that evaluate the benefits and costs of multi-benefit stormwater projects
- ☐ Stormwater resource management projects to implement a stormwater resource plan
- ☐ Conjunctive use of surface and groundwater storage facilities
- ☐ Decision support tools to model regional water management strategies to account for climate change and other changes in regional demand and supply projections
- ☒ Improvement of water quality, including drinking water treatment and distribution, groundwater and aquifer remediation, matching water quality to water use, wastewater treatment, water pollution prevention, and management of urban and agricultural runoff
- ☐ Regional projects or programs as defined by the IRWM Planning Act (Water Code §10537)
- ☐ Other:

3. Project Abstract

The project will address critical drought and the need for emergency water supplies and safe drinking water for the local elementary school along with associated water conservation, coordinated water management, and fish and wildlife benefits. Expected outcomes include 1) installation of 360,000 gallons of emergency water storage 2) installation of water filtration at the Whitethorn School; 3) coordinated water management resulting in improved streamflow and salmonid habitat.

4. Project Description

This purpose of this project is to build resilience against climate change, drought and the threat of wildfire. This project will provide salmonid habitat protection while addressing human water needs, security, and public health issues in the disadvantaged Mattole headwaters community of Whitethorn. This project is needed because local water resources have been severely impacted by climate change and drought over the past 20 years. The Mattole River is both the water supply for residents and businesses, and the habitat for endangered salmonids and other wildlife. Despite successful efforts over the last decade to provide water security for families through grant funding, there is no emergency water supply for fire or extended drought, thus emphasizing the urgent need for an emergency water storage system. Furthermore, the Whitethorn

Elementary School is in need of a new drinking water filtration system to provide safe drinking water to children and teachers. Finally, coordinated water management is needed for community wide drought preparedness, resilience and self-reliance.

Three 120,000 gallon tanks will be installed for emergency water storage along with connection to an existing permitted well and piping to a fire hydrant accessible by water and fire trucks. The school filtration system will be installed in the existing filtration shed in cooperation with the school and SWRCB Division of Drinking Water. Coordinated water management will be implemented through community wide streamflow alerts and forbearance program notices.

The expected benefits include an increase in the supply of emergency water for fire and drought, an avoided need to purchase water elsewhere for emergency water, providing safe water for the local elementary school, improved fish habitat, increased forest and river ecosystem protections, reducing the risk of catastrophic wildfire, and increased water conservation and collaboration locally and regionally.

5. Specific Project Goals/Objectives

Goal 1: Drought, fire and emergency water supplies for the community.

Goal 1 Objective: Install emergency water storage

Goal 1 Objective: Coordinate with local and state fire departments

Goal 1 Objective: Install fencing, signage and community education

Goal 1 Objective:

Goal 2: Safe drinking water for the Whitethorn Elementary School

Goal 2 Objective: Coordinate with SWRCB Public Health to make sure system will meet requirements

Goal 2 Objective: Install SWRCB approved filtration system

Goal 2 Objective: Coordinate with school to ensure water testing

Goal 2 Objective: Obtain safe drinking water approval from SWRCB Public Health

Goal 3: Improve habitat for native salmonids and other wildlife

Goal 3 Objective: Prevent emergency water diversion impacts through emergency water storage

Goal 3 Objective: Coordinate community wide water management & diversion through alerts

Goal 3 Objective: Implement forbearance habitat protections through direct notices to participants

Additional Goals & Objectives (List)

Goal 4: Increase community & regional self reliance and drought preparedness. Objectives include: community and regional education and collaboration needed to reduce water diversion impacts; increase water security; improve water use efficiency and encourage cooperation locally and regionally.

6. Describe how the project addresses the North Coast Resource Partnership and North Coast IRWM Plan Goals and Objectives selected.

Goal 1: Local knowledge and community input has informed development of emergency water storage and coordination of community wide water management. Goal 2: The emergency water supplies will improve built infrastructure and is needed for businesses and residents to thrive in the economically disadvantaged community of Whitethorn; emergency water will also aid fire suppression for the adjacent working forest landscapes and natural areas Goal 3: The project will enhance watershed habitat and salmonid populations by reducing diversion impacts during low flows. Goal 4: Both the emergency water supply and coordinated water management will also help ensure water reliability for domestic and recreational uses. Improved drinking water quality to protect public health will occur through improved filtration at the Whitethorn School. Goal 5: Climate change will be addressed along

with local water use efficiency through emergency water supplies and coordination of community water management

7. Describe the need for the project.

The urgency and need for the project is very high due to ongoing drought conditions and an increased risk of wildfire in our local community. There is no emergency water supply for fire or extended drought in the headwaters of the Mattole and due to the regional drought emergency water is no longer available from nearby watersheds. In low flow years there is not enough water for basic human needs, and diversions during low flows result in drying of pools and loss of juvenile salmonid populations. Support for community wide water management and education is needed to reduce the impacts of summertime diversions. Safe drinking water for the Whitethorn Elementary School is also a critical need as the school is temporarily staying open by providing bottled water until there is funding available to replace the broken water filtration system. The economy of the area is the worst it has been in ~ 40 years and therefore funding assistance is desperately needed.

8. List the impaired water bodies (303d listing) that the project benefits:

Mattole River

9. Will this project mitigate an existing or potential Cease and Desist Order or other regulatory compliance enforcement action? ☐ yes ☒ no

If so, please describe?

10. Describe the population served by this project.

This project will serve the severely disadvantaged community of Whitethorn in the Mattole River headwaters with a residential population of approximately 1304 residents and 954 "housing units" according to the 2010 census data including 1 elementary school, 1 business/residential complex, and 2 farmers market sized farms.

11. Does the project provide direct water-related benefits to a project area comprised of Disadvantaged Communities or Economically Distressed Communities?

- ☒ Entirely
- ☐ Partially
- ☐ No

List the Disadvantaged Community(s) (DAC)

Whitethorn, CA

12. Does the project provide direct water-related benefits to a project area comprised of Severely Disadvantaged Communities (SDAC)?

- ☒ Entirely
- ☐ Partially
- ☐ No

List the Severely Disadvantaged Community(s)

Whitethorn, CA

13. Does the project provide direct water-related benefits to a Tribe or Tribes?

- ☐ Entirely

- ☐ Partially
- ☒ No

List the Tribal Community(s)

If yes, please provide evidence of support from each Tribe listed as receiving these benefits.

14. If the project provides benefits to a DAC, EDA or Tribe, explain the water-related need of the DAC, EDA or Tribe and how the project will address the described need.

This project provides emergency drought and fire suppression water for the community and safe drinking water for the school. The project also provides community support needed for coordinated water management including technical assistance and compliance with water right permits.

15. Does the project address and/or adapt to the effects of climate change? Does the project address the climate change vulnerabilities in the North Coast region? ☒ yes ☐ no

If yes, please explain.

The North Coast region has been impacted by longer dry seasons associated with climate change. Sixteen out of the last 20 years (1999- 2018) had the lowest flows in 70 years of record at the Petrolia gauge. The project adapts to the water scarcity effects of climate change through installation of emergency supplies and coordination of community water management and associated improvements in water use efficiency.

16. Describe how the project contributes to regional water self-reliance.

The project contributes to regional water self-reliance through development of rural community water management techniques that are being applied in other watersheds. As of Jan 1, 2019, Sanctuary Forest is collaborating and assisting with the development of coordinated water management and associated water conservation and storage in both the Navarro River Watershed in Mendocino County and the Trinity River Watershed in Trinity County. Additionally, the project results in increased drought and fire emergency preparedness thereby reducing the burden on the region for emergency response.

17. Describe how the project benefits salmonids, other endangered/threatened species and sensitive habitats.

The Mattole River headwaters is both the water supply for residents and the habitat for endangered salmonids and other wildlife. In low flow years there is not enough water for basic human needs. Diversions during low flows result in drying of pools and loss of juvenile salmonid populations. Installation of the emergency water storage will reduce emergency diversions and coordination of community water management will reduce dry season diversions.

18. Describe local and/or political support for this project.

This project has strong community support with 30 forbearance program participants and most of the other residents practicing water conservation along with forbearance to the extent feasible. Local support is also demonstrated through landowner cost share and local volunteer commitments. Additionally the project has strong support on regional and state levels. Sanctuary Forest received the NCRWQCB 2014 Water Quality Stewardship Award in recognition of the Storage and Forbearance program.

19. List all collaborating partners and agencies and nature of collaboration.

Collaborating partner and agencies include the following: Cal Fire & Whitethorn Volunteer Fire Department for input on storage system design and utilization of system; SWRCB for water rights and

public health drinking water system input; Southern Humboldt Fire Safe Council to assist landowners with defending your home against fire; Whitethorn School will provide input and assist with installation of filtration system; and Trout Unlimited and Salmonid Restoration Federation collaboration on regional water conservation education.

- 20. Is this project part or a phase of a larger project?** ☒ yes ☐ no
Are there similar efforts being made by other groups? ☐ yes ☒ no
If so, please describe?

This project is part of a larger watershed wide project to address water scarcity impacts and to restore habitat for native salmonids. Sanctuary forest has grant funding from CA Dept of Fish and Wildlife to provide technical assistance to landowners on water conservation and best management practices. We hold meetings with landowners where we discuss streamflow conditions and coordinated efforts to increase streamflows and also how you can be more prepared for fire and drought.

- 21. Describe the kind of notification, outreach and collaboration that has been done with the County(ies) and/or Tribes within the proposed project impact area, including the source and receiving watersheds, if applicable.**

Humboldt County served as the lead CEQA agency for the emergency storage project and assisted Sanctuary Forest with outreach to the Tribes. Specific input was obtained from both the Bear River Band and Sinkyone Intertribal Wilderness Council and is incorporated in the Mitigated Negative Declaration and the project plans.

- 22. Describe how the project provides a benefit that meets at least one of the Statewide Priorities as defined in the 2018 IRWM Grant Program Guidelines and Tribal priorities as defined by the NCRP?**

The project provides benefits that meet 8 of the Statewide Priorities. These priorities are met as follows: The emergency water system will "increase protection of the forest ecosystem" from wildfire and along with coordinated water management will "increase protection of the river ecosystem". The installation of emergency water will "expand water storage capacity" and greatly help the community "manage and prepare for dry periods". The Whitethorn School filtration system will "provide safe water for all communities" - specifically for school children, teachers, staff and volunteers. Coordination of water management will increase "operational and regulatory efficiency" through permitting assistance and group permits. Both the emergency storage and the coordinated water management will "increase regional self-reliance". Regional collaboration will support "make conservation a California way of life". "Sustainability" will be achieved through improved community water management.

23. Project Information Notes:

This property was purchased in 2015 by Sanctuary Forest for the sole purpose of developing an emergency water storage system for fire, drought and emergency purposes. In addition to the benefits listed above, Sanctuary Forest is committed to the protection of cultural resources on the site. Security cameras will be installed to monitor any illegal trespassing or loitering on the property. There will be signs posted to discourage dumping and squatting, and a community bulletin board for communications. Sanctuary Forest is also very committed to demonstrating good land stewardship on our lands and will be doing brushing/thinning and invasive plant removal where needed. The emergency water storage is part of a larger fuels reduction and fire safety project developed in collaboration with the Mattole Restoration Council, County of Humboldt Roads Department, and the Southern Humboldt Fire Safe Council titled "Whitethorn Valley – Safe Exit Fuels Reduction Project" and submitted to Cal Fire for funding in 2018. If funded, the project will implement a shaded fuel break and fuel hazard reduction project on an approximately 12 mile stretch of the Briceland-Thorn Road from the Ettersburg Junction (southern

Humboldt County) to 4 Corners (northern Mendocino County). The Briceland-Thorn road is the primary road ingress and egress from highway 101 to the communities of Shelter Cove, Whale Gulch, and Whitethorn/Thorn Junction. The entire project area is within the SRA.

D. PROJECT LOCATION

1. Describe the location of the project

Geographical Information

From the town of Redway, take the Briceland/Thorn Road 12.1 miles to the Y in the road. This is the Whitethorn Junction located at 40 deg 3' 43.2", 123 deg 57' 45.36" (UTM easting 417906.44, UTM northing 4435082.52, UTM zone 10T). From the Junction head south about 4.2 miles and the Whitethorn School is located at 40 deg 1' 9.48", 123 deg 56' 15.36" (UTM easting 419988.66, UTM northing 4430320.33, UTM zone 10T).

2. Site Address (if relevant):

Emergency Storage at 12777 Briceland Thorn Rd. and Whitethorn School at 16851 Briceland Thorn Rd, Whitethorn CA

3. Does the applicant have legal access rights, easements, or other access capabilities to the property to implement the project?

☒ Yes If yes, please describe

☐ No If No, please provide a clear and concise narrative with a schedule, to obtain necessary access.

☐ NA If NA, please describe why physical access to a property is not needed.

Sanctuary Forest owns the property where the emergency storage will be installed. Sanctuary Forest has a forbearance agreement with the Whitethorn school that includes access for implementation and water mangement.

4. Project Location Notes:

The emergency storage ite is located adjacent to Briceland Thorn Road on the high terrace between the Mattole River and McKee Creek confluence. The driveway is on the Briceland Thorn Road approximately 1/4 mile south of the junction with the Shelter Cove Road. Whitethorn School is located on the Briceland Thorn road approximately 4.2 miles south of the junction with Shelter Cove Road.

E. PROJECT TASKS, BUDGET AND SCHEDULE

1. Projected Project Start Date: 6/1/20

Anticipated Project End Date: 12/31/23

2. Will CEQA be completed within 6 months of Final Award?

☒ Yes

State Clearinghouse Number: 2018122046

☐ NA, Project is exempt from CEQA

☐ NA, Not a Project under CEQA

☐ NA, Project benefits entirely to DAC, EDA or Tribe, or is a Tribal local sponsor. [Projects providing a water-related benefit entirely to DACs, EDAs, or Tribes, or projects implemented by Tribes are exempt from this requirement].

☐ No

3. Please complete the CEQA Information Table below

Indicate which CEQA steps are currently complete and for those that are not complete, provide the estimated date for completion.

CEQA STEP	COMPLETE? (y/n)	ESTIMATED DATE TO COMPLETE
Initial Study	Y	
Notice & invitation to consult sent to Tribes per AB52	Y	
Notice of Preparation	Y	
Draft EIR/MND/ND	Y	
Public Review	Y	
Final EIR/MND/ND	Y	
Adoption of Final EIR/MND/ND	Y	
Notice of Determination	Y	
N/A - not a CEQA Project		

If additional explanation or justification of the timeline is needed or why the project does not require CEQA, please describe.

CEQA has been completed for the emergency water storage project. The Whitethorn School filtration system is exempt for CEQA under Article 19- minor alteration of existing facilities with no expansion.

4. Will all permits necessary to begin construction be acquired within 6 months of Final Award?

☐ Yes

☒ NA, Project benefits entirely to DAC, EDA, Tribe, or is a Tribal local sponsor

☐ No

5. PERMIT ACQUISITION PLAN

Type of Permit	Permitting Agency	Date Acquired or Anticipated
Building & grading Permit	Humboldt County	7/1/20
Encroachment Permit	Humboldt County	7/1/20

For permits not acquired: describe actions taken to date and issues that may delay acquisition of permit.

A Humboldt County special permit has been secured for the emergency water storage and the special permit will facilitate the building permit process. If grant timeline is delayed- then lack of funding for the final design, engineering and building permit application could delay the building permit acquisition.

6. Describe the financial need for the project.

The financial need is very significant. The Humboldt County economy is experiencing a severe downturn with income for local businesses at a ~40 year low. There are very few grant opportunities for water security and safe drinking water for severely disadvantaged communities and therefore we are unlikely to piece together funding from multiple funders if funding is not available through NCRP.

7. Is the project budget scalable? ☒ yes ☐ no

Describe how a scaled budget would impact the overall project.

A scaled budget would result in a smaller emergency water storage system of 2 tanks (240,000 gallons) instead of 3 tanks (360,000 gallons). The site preparation costs would be the same but the cost and installation of one of the tanks would be deferred until future funding could be obtained. Installation of 2 instead of 3 tanks would allow for budget to be reduced by 15%.

8. Describe the basis for the costs used to derive the project budget according to each budget category.

The budget for this proposal is based on site assessment and implementation cost estimates from experienced contractors and engineers, tanks and material costs based on 2019 supplier info, planning and permits costs based on similar projects 2015-2018, and prevailing wage rates for all heavy equipment and labor. The number of staff hours is also estimated based on similar projects with a similar level of grant reporting and administration. See line item budget for detailed amounts by category.

9. Provide a narrative on cost considerations including alternative project costs.

For the emergency water storage other alternatives have included developing the storage along with well installation at another site. However, most well drilling in the Mattole headwaters is unsuccessful with significant cost of dry wells. Additionally, the site needs to be centrally located with easy access for fire trucks and on property that can be dedicated to this purpose in perpetuity. The site meets all of the needs and has an existing permitted well.

10. List the sources of non-state matching funds, amounts and indicate their status.

We request the cost share waiver below. However support for the project includes the following sources of non- state matching funds : Sanctuary Forest funds expended and committed= \$56,360 (expended -land purchase, project planning & ceqa, and committed implementation match); Suppliers and Subcontractor committed match = \$21, 850; Southern Humboldt School District committed = \$5,000; community members and volunteers estimated = \$12,000. The generous support from all of the parties above demonstrates the importance and community commitment to the project.

11. List the sources and amount of state matching funds.

N/A

12. Cost Share Waiver Requested (DAC or EDA)? ☒ yes ☐ no

Cost Share Waiver Justification: Describe what percentage of the proposed project area encompasses a DAC/EDA, how the community meets the definition of a DAC/EDA, and the water-related need of the DAC/EDA that the project addresses. In order to receive a cost share waiver, the applicant must demonstrate that the project will provide benefits that address a water-related need of a DAC/EDA. 100% DAC/EDA

13. Major Tasks, Schedule and Budget for NCRP 2018 IRWM Project Solicitation

Please complete MS Excel table available at <https://northcoastresourcepartnership.org/proposition-1-irwm-round-1-implementation-funding-solicitation/>; see instructions for submitting the required excel document with the application materials.

14. Project Tasks, Budget and Schedule Notes:

Extensive project development has been conducted to obtain system design options and estimated costs from qualified engineers and contractors for both the emergency water system and the school filtration system. All costs are based on 2019 implementation and may change in 2020. Consultation regarding permits required was also obtained from the NCRP technical team. Costs for county permits were obtained through direct inquiry to county representatives.

F. PROJECT BENEFITS & JUSTIFICATION

1. Does the proposed project provide physical benefits to multiple IRWM regions or funding area(s)?

☐ yes ☒ no

If Yes, provide a description of the impacts to the various regions.

2. Provide a narrative for project justification. Include any other information that supports the justification for this project, including how the project can achieve the claimed level of benefits. List any studies, plans, designs or engineering reports completed for the project. *Please see the instructions for more information about submitting these documents with the final application.*

Sanctuary Forest, CDFW and other collaborating partners have researched causes and solutions to the Mattole low flow problem documented in a series of reports over the past 15 years, including the Mattole River Watershed Assessment Report (NCWAP, CDFG 2003), the Mattole Watershed Plan (Mattole River and Range Partnership, 2010), the Recovery Strategy for California Coho Salmon (CDFW, 2004). The USGS Petrolia gage also documents the severity of the low flow problem with 16 out of the last 20 years the lowest in 70 years of record. In 2018, the Mattole headwaters experienced drought conditions with extreme low flows and high risk of fires until the rains came in late November. Effectiveness monitoring and reports for water storage & forbearance and coordinated water management has documented significant improvements "Hydrologic Assessments of Low Flows in the Mattole River Basin 2004-2016" (Randy Klein, 2017). Coordinated water management is being developed along with increased water storage in the North Coast Region as a necessary and cost effective strategy to reduce the impacts of climate change and drought. While significant water storage is needed to increase water supply reliability for human use, reducing the impacts of cumulative diversions through coordinated pumping schedules results in higher bypass flows, a longer diversion season, and therefore less storage needed to meet instream flow requirements for fish. Therefore the importance of a two-pronged approach, utilizing both increased storage and coordinated water management. In 2017, Sanctuary forest partnered with the Salmonid Restoration Federation, The Nature Conservancy, the Mendocino County Resource Conservation District to develop a manual for use throughout the region, "Collaborative Water Management —A Framework and Model to Enhance Instream Flows". Much of the knowledge gained from the Mattole Headwaters was incorporated along with input from all relevant resource agencies and information on permitting/ regulatory challenges and strategies from Trout Unlimited. Sanctuary Forest also produced a user friendly Water Stewardship Guide for the North Coast – see attached. Site specific planning was also conducted for the Emergency

Water Storage Project along with evaluation needed to determine the most cost effective option. Documents submitted with this application include the following planning documents: Biological Resources Technical Report for the Mattole Headwaters Flow Enhancement Project, and associated Mitigated Negative Declaration. A site plan was also prepared showing proposed placement of tanks and other planned improvements on the property.

3. Does the project address a contaminant listed in AB 1249 (nitrate, arsenic, perchlorate, or hexavalent chromium)? ☐ yes ☒ no

If yes, provide a description of how the project helps address the contamination.

4. Does the project provide safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes consistent with AB 685? ☒ yes ☐ no

If Yes, please describe.

The proposed filtration system for the Whitethorn School is needed to provide safe, clean, affordable, accessible water for human consumption and sanitary purposes.

5. Does the project employ new or innovative technologies or practices, including decision support tools that support the integration of multiple jurisdictions, including, but not limited to, water supply, flood control, land use, and sanitation? ☒ yes ☐ no

If Yes, please describe.

The coordinated water management includes innovative approaches to reduce cumulative impacts of water diversions in cooperation with CDFW and SWRCB and their jurisdictions to protect fish and wildlife and downstream water users.

6. For each of the Potential Benefits that the project claims complete the following table to describe an estimate of the benefits expected to result from the proposed project. [See the NCRP Project Application Instructions, Potential Project Benefits Worksheet and background information to help complete the table. The NCRP Project Application, Attachment B includes additional guidance, source materials and examples from North Coast projects.]

PROJECT BENEFITS TABLE

Potential Benefits Description	Physical Amt of Benefit	Physical Units	Est. Economic Value per year	Economic Units
Water Supply				
Expand water storage capacity for fire and drought	360000	gallons	\$108,000	\$0.30/gal
Avoided water supply purchases for emergency drought water	300000	gallons	\$90,000	\$0.30/gal
Increased water supply reliability	100	households	\$22,800	\$19/house/month
Increase regional self-reliance	19,000	sq miles		
Water Quality				
Provide safe water for school children, teachers, parents and volunteers				

Potential Benefits Description	Physical Amt of Benefit	Physical Units	Est. Economic Value per year	Economic Units
Avoided Drinking Water Supply Purchases	144,000		\$43,200	\$0.30/gal
Other Ecosystem Service Benefits				
Improved fish habitat and passage	9	miles		
Increased protection of forest and river ecosystem	28	sq miles		
Other Benefits				
Invasive plant removal	5	Acres	600	\$120/acre/year
conserve and protect local working lands & business economy & tourism	28	sq miles		
Enhanced fire-fighting capabilities	3	CDF, BLM & volunteer		
Social health and safety	1	community		
Increased water conservation awareness and collaboration	500	people reached		
increase operational and regulatory efficiency	100	households		

7. Project Justification & Technical Basis Notes:

The importance of enhanced fire - fighting capabilities cannot be overstated. Extreme drought coupled with overly dense forest has resulted in a very high fire risk in the Mattole headwaters. All residents and businesses are at increasing risk and insurance companies are discontinuing fire insurance for many homes. The working forest land is just coming back as part of the economy with much of the headwaters conserved for sustainable forestry and forests becoming mature enough to begin harvesting. Wildfire could easily set the clock back 40 years - both destroying the forest ecosystem and the economic opportunity. Tourism is also important in the Mattole headwaters as it located in the gateway to both the BLM King Range Recreation Area and State Parks Sinkyone Wilderness. The Mattole headwaters also draws visitors because of the conserved old growth redwood and hardwood forests, the beauty of the river, and the diverse community which includes the Redwoods Monastery, a local hardwood mill, and many small businesses - winery, café, hair salon, lumber and building supplies, post office, etc. Sanctuary Forest and BLM both host summer interpretive hikes in the area - which also increases the number of visitors. Tourism is becoming an important part of the economy but will only continue to the extent that we can manage for wildfires. The emergency water storage project is located for quick access to water supplies so that fires can be put out before they become large and consume the forests.

The social health and safety of the community will benefit from all components of the project. The increased fire-fighting capabilities of the stored water along with fire stewardship education will empower local residents. The coordinated water management is also very important as it reduces conflicts around water scarcity and promotes collaboration among neighbors and within tributary subbasins. Finally the Whitethorn School drinking water is of great concern to the community, and fixing the filtration system to provide safe drinking water is very important for the social health and safety of our children.

Major Tasks, Schedule and Budget for North Coast Resource Partnership 2018/19 IRWM Project Solicitation

Project Name: Sanctuary Forest Drought and Emergency Water Budget
 Organization Name: Sanctuary Forest Inc.

Task #	Major Tasks	Task Description	Major Deliverables	Current Stage of Completion	IRWM Task Budget	Non-State Match	Total Task Budget	Start Date	Completion Date
A Category (a): Direct Project Administration									
1	Administration	In cooperation with the County of Humboldt sign a sub-grantee agreement for work to be completed on this project. Develop invoices with support documentation. Provide audited financial statements and other deliverables as required	Invoices, audited financial statements and other deliverables as required	0%	\$11,950.00	\$0.00	\$11,950.00	3/1/20	5/1/20
2	Monitoring Plan	Develop Monitoring Plan to include goals and measurable objectives	Final Monitoring Plan	0%	\$550.00	\$0.00	\$550.00	3/1/20	5/1/20
3	Labor Compliance Program	Execute service agreement with Labor Compliance Program company	Submission of Labor Compliance Program	0%	\$1,650.00	\$0.00	\$1,650.00	5/1/20	7/1/20
4	Reporting	Develop monthly reports describing work completed, challenges, and strategies for reaching remaining project objectives. Develop Final Report	Quarterly and Final Reports	0%	\$5,500.00	\$0.00	\$5,500.00	5/1/20	12/31/23
B Category (b): Land Purchase/Easement									
1				0%	\$0.00	\$41,160.00	\$41,160.00	1/1/15	12/31/15
C Category (c): Planning/Design/Engineering/Environmental Documentation									
1	Final Design /Plans	Development of final design plans for the emergency storage and school filtration will include engineering and survey subcontractors and staff time to ensure project design plans meet objectives, incorporate partner input and insure that project meets all necessary requirements. Match includes staff time for project development 2017-2019 and fees paid for cultural and biological site assessments.	Final Project Design and Construction Specifications including engineering reports	20%	\$22,000.00	\$7,000.00	\$29,000.00	1/1/17	7/1/20
2	Environmental Documentation: CEQA *	For the Emergency Storage Project: Prepare DWR Environmental Information Form; Select qualified consultant to complete the CEQA process through a qualification based selection process; Notify Native American Heritage Commission to determine if tribal traditional lands are in the project area; notify tribes about the project and solicit input per PRC §75102; Conduct preliminary project review; Prepare Initial Study and all relevant CEQA documents as per CEQA Guidelines. File Notice of Determination. Match only reflects % of fees paid for the emergency storage project (as the CEQA process covered several other streamflow enhancement projects.)	Environmental Information Form; Notice of Determination; Letter from lead agency stating there were no legal challenges during public review; Approved and adopted CEQA documentation	100%	\$0.00	\$1,000.00	\$1,000.00	1/1/18	3/1/20
3	Permit Development *: County grading and building permit	Staff time for acquisition of all permits and permit cost is included in this category.	Copy of permit	0%	\$7,250.00	\$0.00	\$7,250.00	5/1/20	7/1/20
4	Encroachment Permit		Copy of permit	0%	\$300.00	\$0.00	\$300.00	5/1/20	7/1/20
D Category (d): Construction/Implementation									
1	Construction/Implementation Contracting (Emergency Water System and School)	Meet with contractors to determine availability and effectiveness. Select the contractor and prepare not to exceed contracts with billing on a time and materials basis	Copies of construction contracts	0%	\$2,750.00	\$0.00	\$2,750.00	5/1/20	7/1/20
2	Mobilization and Site Preparation (Emergency Water System and School)	Prepare site and mobilize project: 1); initiate site preparation; 2) Order equipment and materials; 3) ensure project permits are in place; 4) conduct pre project photo monitoring	Summary of site preparation activities in monthly reports; pre-project site photos	0%	\$4,400.00	\$0.00	\$4,400.00	6/1/20	7/1/20

Project Name: Sanctuary Forest Drought and Emergency Water Budget
Organization Name: Sanctuary Forest Inc.

Task #	Major Tasks	Task Description	Major Deliverables	Current Stage of Completion	IRWM Task Budget	Non-State Match	Total Task Budget	Start Date	Completion Date
3	Project Construction/Implementation: Emergency water system	The emergency water storage will install 3 x 120,000 gallons steel tanks along with connection to an existing permitted well and piping to a fire hydrant accessible by water and fire trucks. Implementation will include construction of a 2 ft. minimum depth gravel and sand tank pad that will also serve to cap the site as required from tribal consultation and the MND process. Engineered perimeter foundations with hold-downs will be installed for each of the tanks. The steel tanks will then be assembled onsite and NSF approved liners will be installed. Plumbing will include installation of a submersible pump in the existing well along with 1.5 inch diameter pipe to connect the well to the "master tank" All 3 tanks will be connected to each other and to a fire hydrant with 6 inch diameter pipe. Electricity to power the pump will be provided by electrical power drop from PGE. Staff construction tasks will include: 1. Initiate project construction. Keep daily records of construction activities, conduct project construction photo-monitoring; 3. Coordinate and oversee construction.	Summary of construction activities in monthly progress report; Photo documentation; Construction completed	0%	\$383,636.00	\$27,100.00	\$410,736.00	7/1/20	11/1/21
4	Project Construction/Implementation: Whitethorn School Filtration System	Replace existing drinking water filtration system within an existing shed at the Whitethorn School. An engineer approved filtration unit will be designed fabricated and installed by a water filtration company. Additionally one -two ozone units will be installed in the raw water storage to prevent bacterial growth. Staff construction tasks will include: 1. Initiate project construction. Keep daily records of construction activities, conduct project construction photo-monitoring; 3. Coordinate and oversee construction.	Summary of construction activities in monthly progress report; Photo documentation; Construction completed	0%	\$63,366.00	\$6,650.00	\$70,016.00	7/1/20	12/1/20
5	Project Implementation Coordinated water management	Coordinate community water management through: flow alerts, landowner notices to assign pumping days and forbearance periods, administration of group 1600 agreement with CDFW, technical assistance and water rights reporting and streamflow monitoring and flow tracking needed for community water management. Staff tasks will include all of the above plus data input and maintaining records of all activities.	Summary of coordinated water management activities in monthly progress report, photo documentation of streamflow	0%	\$44,349.00	\$12,000.00	\$56,349.00	5/1/20	1/1/23
6									
7	Project Signage (Emergency Water System and School	Project signage will include acknowledgement of funders and conservation & education signage indicating that the property is conserved for water conservation. Additional signage will be installed to discourage dumping and encourage community protection of the site and water project. Funder Acknowledgement signage will also be installed at the Whitethorn School	photos of installed signs	0%	\$1,200.00	\$300.00	\$1,500.00	11/1/21	1/1/22
8	Project Close Out, Inspection & Demobilization (Emergency Water System & School)	Inspect project components and establish that work is complete. Verify that all project components have been installed and are functioning as specified will be conducted as part of construction inspection and project closeout. Conduct project completion photo monitoring. Engineer to prepare as built drawings.	As-Built and Record Drawings; Project completion site photos	0%	\$2,450.00	\$0.00	\$2,450.00	7/1/20	11/1/21
9	Project Performance Monitoring (Emergency water system and school)	The performance of the project will be monitored in accordance to the Monitoring Plan using the following measurement tools and methods: annual dry season flow monitoring, documentation of: annual forbearance periods and other pumping restrictions, number of community members assisted, group 1600 agreement and water rights reporting support for community and regulatory agencies. Additionally annual follow up with the Whitethorn School will document the public health benefits of the filtration system. The budget only reflects the cost of the project performance reporting. All other costs have been incorporated in the coordinated water management implementation budget.	Project Performance Report	0%	\$2,200.00	\$0.00	\$2,200.00	5/1/20	1/1/23

Project Name: Sanctuary Forest Drought and Emergency Water Budget
 Organization Name: Sanctuary Forest Inc.

Task #	Major Tasks	Task Description	Major Deliverables	Current Stage of Completion	IRWM Task Budget	Non-State Match	Total Task Budget	Start Date	Completion Date
10	Construction Administration (Emergency Water System and School)	Complete tasks necessary to administer construction contract. Keep daily records of construction activities, inspection, and progress. Conduct project construction photo-monitoring.	Construction Management Logs; Completed construction administration tasks documented in monthly progress reports	0%	\$4,950.00	\$0.00	\$4,950.00	7/1/20	11/1/21
Total North Coast Resource Partnership 2018/19 IRWM Grant Request					\$558,501.00	\$95,210.00	\$653,711.00		
Is Requested Budget scalable by 25%? NO- but yes to scalable by 15% -see scaled total					\$474,725.85	\$80,928.50	\$555,654.35		
Is Requested Budget scalable by 50%? NO									

Sanctuary Forest Drought & Emergency Water Project
Sanctuary Forest Line Item Budget

Category a : Administration

Administration -all projects

Project Manager

Project Coordinator

Grant Management/Bookeeper

Monitoring Plan -project coordinator

labor complaine - project coordinator

Reporting- Project coordinator

Total Administration

Category B : Land purchaase

Category C : Planning/Design/Engineering/Environmental Documentation

Planning and Design - Emergency storage and School filtration

Project Manager

Project Coordinator

Engineer (Baird foundation & floodplain survey- cert)

Stillwater Science and HSU cultural resource facility 2018

Engineering for School water system

Permit development and acquision- Emergency storage

Project coordinator

Encroachment permit

County building & grading permit

MND & special permit (part of larger project)

Total Planning/Environmental Doc

Category D: Construction Implementation

Construction Contracting - Emergency Storage & School Filtration

Project Coordinator

Mobilization and Site Prep -Emergency Storage and School Filtration

Project Coordinator

Construction Implementation - Emergency Storage

Personnel

Project Manager

Project Coordinator

Subcontractors

Labor compliance contractor

Cultural monitors (2 days)

Electrician & Plumber (pipe, pump install, hydrant)

HE (pad const & foundation dozer, backhoe & compactpr)

Foundation crew w materials

Materials & Supplies

Well Pump w pump protection

1.5 inch pipe

6 inch pipe

Electrical controls and parts & power supply

Mis Plumbing parts, valves etc, Hydrant

Water meter

Sand (per yard dlivered)

Gravel (per yard delivered)

concrete yards delivered, includes pumping , etc

geotech fabric rolls (under entire tank pad)

Security Fence

Mulch and erosion control

Miscellaneous

Mileage

360,000 gallons tank storage

Construction Implementation - School Filtration

Personnel

Project Manager

Project Coordinator

Subcontractors

School Filtration System- Weeks Drilling

Hours	Rate	amt requested	match	total task
40	65	2600		
70	55	3850		
100	55	5500		
10	55	550		
30	55	1650		
100	55	5500		
		19650	0	19650
		0	41,160	41160
Hours	Rate			
40	65	2600		
180	55	9900	5,000	
		7500		
			2,000	
		2,000		
50	55	2750		
		300		
		4,500		
			1,000	
		29550	8000	37550
Hours	Rate	amt requested		
50	55	2750		
80	55	4400		
50	65	3250		
200	55	11000		
		3,000		
		1200		
		22,000	2,000	
		30,000	3,000	
3	2800	8,400		
		1200		
80	0.5	40		
200	\$4.00	800		
		6,000	5000	
		2,000		
1	350	350		
55	70	3850	3850	
2000	30	60000	8,000	
57	210	11970		
3	570	1710		
75	70	5250	5250	
		500		
		1000		
200	0.58	116		
3	70,000	210000		
10	55	550		
40	55	2200	1650	
		60,000	5,000	

Materials & Supplies

Miscellaneous

Mileage

Implementation - Coordinated Water Management

Project Manager

Project Coordinator

Streamflow monitor

Community Volunteers

Mileage

Project Signage (emergency storage & school)

Project coordinator

Signs

Project close out (emergency storage & school)

project coordinator

engineer (as built drawings)

Project performance monitoring report -all projects

Project Coordinator

Construction Administration (emergency water system & school)

Project Coordinator

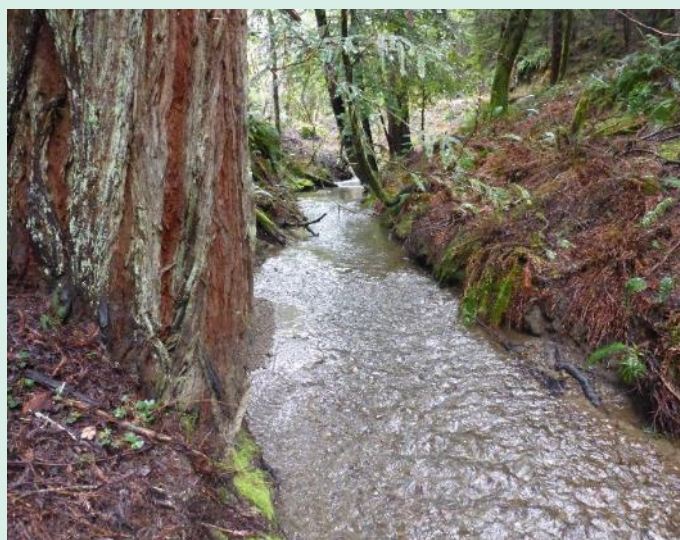
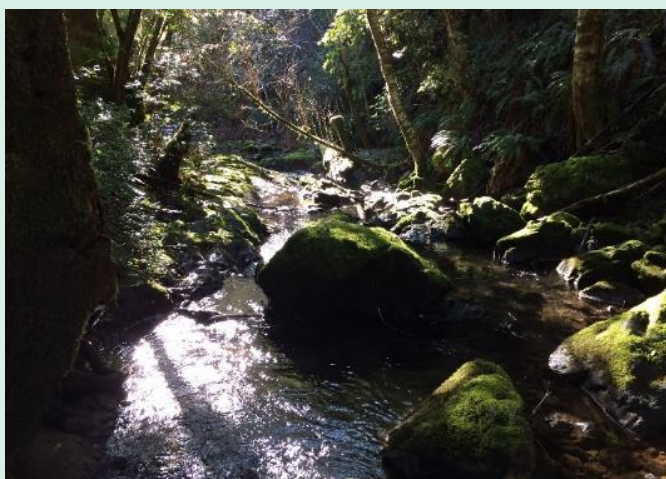
Total Construction Implementation

Total Project

		500		
200	0.58	116		
45	65	2925		
550	55	30250	9,000	
200	55	11000		
			3,000	
300	0.58	174		
20	55	1100		
		100	300	
30	55	1650		
		800		
40	55	2200		
90	55	4950		
		509301	46050	555351
		558501	95210	653711

NOVEMBER 2018

Biological Resources Technical Report for the Mattole Headwaters Flow Enhancement Project, Humboldt and Mendocino Counties, CA



PREPARED FOR
Sanctuary Forest
315 Shelter Cove Road
Whitethorn, CA 95589

PREPARED BY
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Arcata, CA 95521

Suggested citation:

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Cover photos: (Clockwise from upper left) Cook pond site; North Fork Lost River; South Fork Lost River; Thompson Creek.

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Exhibits

- Exhibit A. Mattole Headwaters Flow Enhancement Preliminary Design Plans
- Exhibit B. Scoping List and Map of CNDDDB Special-status Plants and Wildlife Species in the Project Vicinity.
- Exhibit C. Potentially Jurisdictional Waters and Wetlands within the Project Area

1 PROJECT BACKGROUND

The upper Mattole River is subject to extremely low and often intermittent flows during the late summer and fall. The low-flow or no-flow conditions substantially impact instream salmonid rearing habitat quality and quantity. Although seasonal low flows are a part of the natural hydrologic pattern, conditions in the upper Mattole River have been exacerbated due to historical and current land uses. Historical logging, dense conifer and hardwood regrowth, removal of instream large woody debris (LWD), and increased water use by landowners has reduced stream flows, negatively affected instream habitat and salmonid resources, and has led to poor water quality conditions in the Mattole River.

Historical timber harvest resulted in regrowth of dense, mixed hardwood stands. These vigorous young stands consume more water than older forests and likely play a dominant role in reduced streamflows in the upper watershed (Jassal et al. 2009). Instream LWD accumulations in stream channels locally raised bed elevations, connected channels to adjacent floodplains, created seasonal wetlands and allowed fish access to important off-channel habitat. Removal of that LWD released trapped gravel and resulted in deeply incised channels, disconnected floodplains, and dramatically reduced the volume of seasonal groundwater stored within the alluvial terraces. The reduced capacity for groundwater storage coupled with dense regrowth of vegetation following timber harvest are two major factors that have resulted in reduced late-summer base stream flows.

To address this situation, Sanctuary Forest is planning to conduct a flow enhancement/restoration project in the headwaters of the Mattole River (hereinafter referred to as the Project). The Project objectives include improved groundwater storage and summer streamflow along with increased riparian vegetation and associated fish and wildlife benefits. This will enhance flow and improve habitat conditions for salmonids in the upper Mattole River and its tributaries. The Project has been designed to increase the streambed elevation and promote the formation of complex meandering stream and wetlands. Through elevating of the streambed and reconnection of the channel to the floodplain, the Project will increase groundwater storage and corresponding instream flow as well as create much-needed winter and summer rearing habitat for anadromous salmonids. Increased pool depth and area will provide greater resilience of salmonid populations to drought while floodplain connectivity will improve winter habitat for juvenile salmonids.

Project activities will consist of construction of numerous instream, non-fish-bearing groundwater recharge ponds; off-channel groundwater recharge ponds; and instream habitat restoration treatments including wood structures, beaver dam analog weirs, also known as channel-spanning post-assisted check dams, grade-control structures, and other treatments to enhance instream habitat and floodplain connectivity.

1.1 Project Location

The Project is located within Humboldt and Mendocino counties at elevations that range from approximately 210 to 372 meters (m) (960 to 1,220 feet [ft]) above mean sea level. The eight individual Project sites are within and/or adjacent to the Mattole River and several tributaries including Lost River, Thompson Creek, Anderson Creek, and McKee Creek (Figure 1-1). Together, these sites are referred to as the Project area.

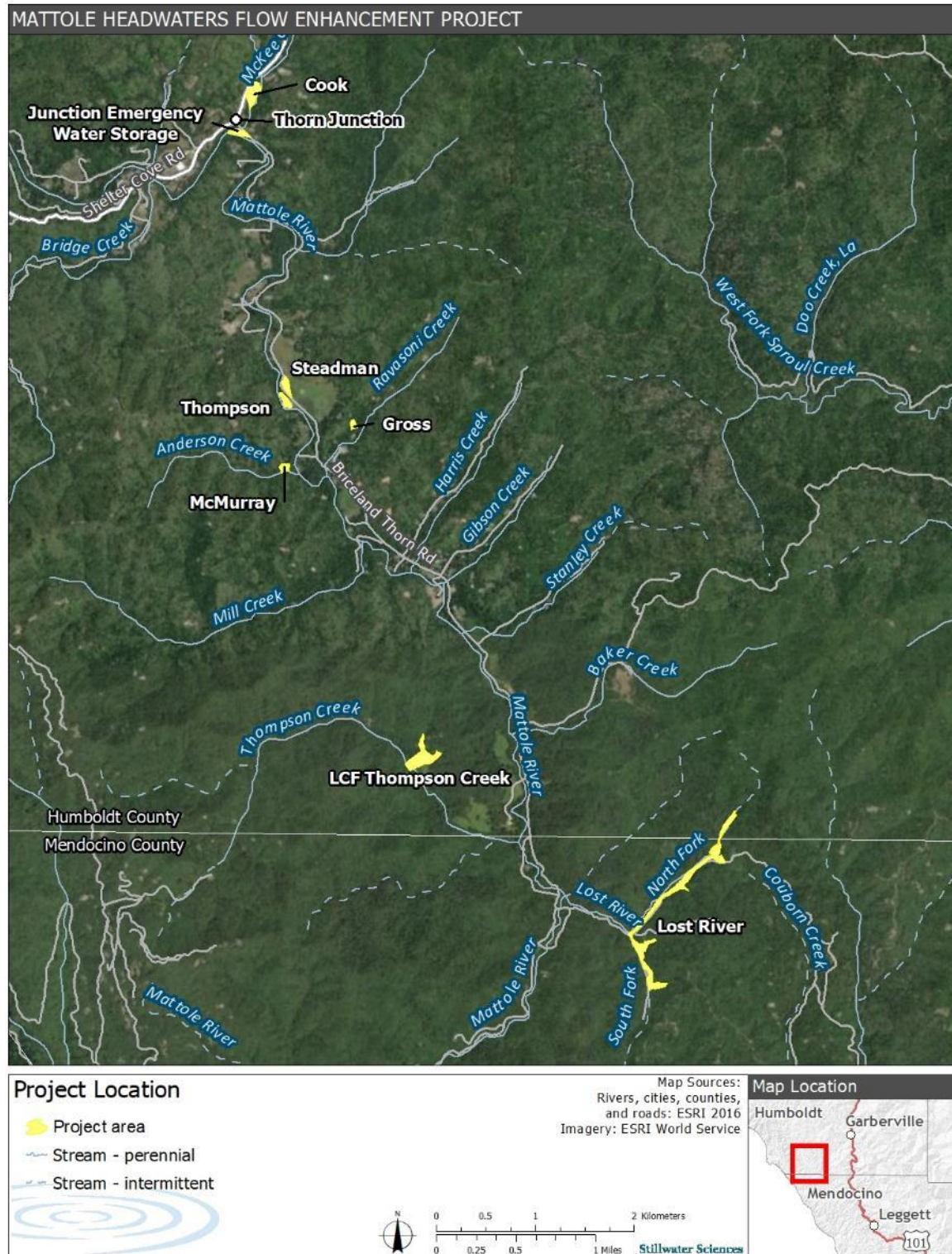


Figure 1-1. Project location.

- Develop two off-channel groundwater recharge ponds with total capacity of approximately 1 million gallons

2.8 Junction Emergency Water Storage

2.8.1 Site description

The Junction Project site is located adjacent to Briceland Thorn Road on the high terrace between the Mattole River and McKee Creek confluence (Figure 1-1). This site is primarily composed of heavily disturbed forest opening best described by annual/perennial grassland with a moderate recruitment by native shrubs as well as invasive broom. It is surrounded by Douglas-fir - tanoak forest with various mixed hardwoods including *Arbutus menziesii* (Pacific madrone) along the forest edge.



2.8.2 Proposed treatment

- Install an emergency water storage system with approximately 400,000 gallons capacity in multiple large water storage tanks or Poly “tank farm” and associated plumbing to provide community water supply for emergency fire suppression and household use to be filled from an existing permitted well.

3 VEGETATION ASSESSMENT

A vegetation assessment was conducted on 26–28 February and 8–9 March 2018 to map vegetation within the 24-ha (60-ac) Project area to the alliance or semi-natural stand level following classification using the online edition of *A Manual of California Vegetation* (California Native Plant Society [CNPS] 2018a). The resulting vegetation map was used to: (1) determine if any stands are considered special-status natural communities (this Section 3); (2) assess the likelihood of occurrence for special-status species in the Project area (Section 4 and 6); and (3) inform the Project’s potential to impact special-status natural communities and species (Section 7).

Special-status natural communities are defined as those with a state ranking of S1, S2, or S3 (critically imperiled, imperiled, or vulnerable, respectively) on CDFW’s *California Sensitive Natural Communities List* (CDFW 2018a).

3.1 Methods

3.1.1 Desktop review

Prior to the vegetation assessment, existing information from the CALVEG geodatabase (USDA Forest Service 2018) and the United States Geologic Survey (USGS) regional geologic map (McLaughlin et al. 2000) on vegetation and soils in the Project area were reviewed. These data were transposed onto aerial imagery using geographical information systems (GIS) software to



Figure 3-10. Vegetation communities within Thorn Junction Emergency Water Storage Project area.

MITIGATED NEGATIVE DECLARATION FOR

SANCTUARY FOREST INC. THE MATTOLE HEADWATERS FLOW ENHANCEMENT PROJECT

December 2018

**Lead Agency:
County of Humboldt**



**Lead Agency Contact:
Holly Merrifield
Planner
County of Humboldt, Planning Division
3015 H Street
Eureka, CA 95501
(707) 268-3703**

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APPENDICES

- Appendix A: Mattole Streamflow Enhancement Biological Resources Technical Report and Project Design Plans (Stillwater Sciences, October 2018)
- Appendix B: Mitigation Measures, Monitoring and Reporting Program for the Mattole Headwaters Flow Enhancement Project, Bullfrog Monitoring and Management Plan (Sanctuary Forest Inc. and Stillwater Sciences, October 2018)
- Appendix C: A Cultural Resources Investigation for the Mattole Headwaters Flow Enhancement Design Project Sanctuary Forest, Inc. Humboldt and Mendocino County, California (Cultural Resources Facility at Humboldt State University, August 2018)

I. PROJECT SUMMARY

Date: December 2018

Project Title: Mattole Headwaters Flow Enhancement Project

Lead Agency: County of Humboldt

Lead Agency

Contact: Holly Merrifield
Planner
County of Humboldt, Planning Division
3015 H Street
Eureka, CA 95501
(707) 268-3703

Applicant: **Sanctuary Forest Inc.**
P.O. Box 145
315 Shelter Cove Road, Unit 4
Whitethorn, CA 95589

Contact: Tasha McKee McCorkle
707-986-1087 ext. 2 #
tasha@sanctuaryforest.org

Preparers: Holly Merrifield, Planner
3015 H Street, Eureka, CA 95501
(707) 445-7541

Sanctuary Forest Inc.
Tasha McKee McCorkle
P.O. Box 145, Whitethorn, CA 95589
707-986-1087 ext. 2 #

Stillwater Sciences
Joel Monschke
850 G Street, Suite K, Arcata, CA 95521
707-496-7075

Current General

Plan Designation: County of Humboldt

- Timberland (T); Residential Agriculture (RA); Rural Community Center (RCC); Residential Estates (RE)

Current Zoning: County of Humboldt

- Unclassified (U) and Timber Production Zone (TPZ)

**Property Owners
And Parcels:**

Humboldt County				
Landowner	Location	Parcel #	Contact	Phone
Lost Coast Forestland	Thompson Creek	215-222-003 & 215-231-001;	Tim Metz	707 496-0322
McMurray	Anderson Creek	215-172-022	David or Madeline McMurray	707 822-8840
Cook	McKee Creek	220-191-036	Jani or Joseph Cook	707 986-1567
Gross	Ravasoni Creek	215-172-003	Lynda or Bob Gross	707 986-1637
Campbell Thompson	Mainstem Mattole	215-172-039	Campbell Thompson	707 223-1103
Steadman & Tedesco	Mainstem Mattole	215-172-045	Sari Tedesco	707 986-7496
Sanctuary Forest	Whitethorn Junction/Mainstem Mattole	220-191-012	Tasha McKee McCorkle	707 986-1087 ext. 2#
Mendocino County				
Lost Coast Forestland	Lost River	051-150-05, 051-150-04, 051-150-03, 051-150-02, 051-140-03, 051-160-03, 051-170-01, 051-180-01	Tim Metz	707 496-0322
Sanctuary Forest	Lost River	051-160-01, 051-160-02	Tasha McKee McCorkle	707 986-1087 ext. 2#

Project Description: This project will address impacts of past land management, climate change and drought in the Mattole River at a scale needed to restore summertime stream flows in the headwaters. Since 1999 a pattern of low summertime flows in the Mattole River headwaters has caused the river to dry up in some reaches, leaving disconnected pools and poor water quality in the remaining reaches. This prolonged-dry season low-flow pattern has had devastating impacts on the already threatened native salmon populations in the Mattole, for which the headwaters are the most critical spawning and rearing grounds. While measurable streamflow improvements have been made through the successful storage and forbearance program, restoration of ground and surface water hydrology is also needed to achieve drought resilience. Several of the fish-bearing tributaries in the Mattole headwaters that experience extreme low to no flows do not have any human development or diversions of any kind and therefore addressing land use impacts is the only strategy available for improving flows.

To address this situation, Sanctuary Forest Inc. is planning to conduct a flow enhancement/restoration project in the Mattole River headwaters (hereinafter referred to as the Project). The Project objectives include improved groundwater recharge/storage and enhanced summer streamflow along with increased

riparian vegetation and associated fish and wildlife benefits in the upper Mattole River and its tributaries. The Project has been designed to increase the streambed elevation and promote the formation of complex meandering stream and wetlands. Through elevating of the streambed and reconnection of the channel to the floodplain, the Project will increase groundwater storage and corresponding instream flow as well as create much-needed winter and summer rearing habitat for anadromous salmonids. Increased pool depth and area will provide greater resilience of salmonid populations to drought while floodplain connectivity will improve winter habitat for juvenile salmonids.

Project activities will consist of construction of instream groundwater recharge ponds in Class III streams; off-channel groundwater recharge ponds; and instream habitat restoration treatments including wood structures, beaver dam analog weirs, also known as channel-spanning post-assisted check dams, grade-control structures, and other treatments to enhance instream habitat and floodplain connectivity. The installation of instream habitat improvement structures recruit and sort spawning gravel for adult salmon and steelhead, and help to create summer rearing pool and over-wintering habitat for juveniles. An emergency water tank storage project is also included to provide water for use in the event of fire and for households during extreme drought. The project is located within four Mattole headwaters tributaries (Lost River, Thompson Creek, Anderson Creek and McKee Creek) and two mainstem reaches and includes seven landowners. Descriptions of the specific treatments and locations where they will be applied are summarized in Appendix A: Mattole Streamflow Enhancement Biological Resources Technical Report and Project Design Plans.

Baseline Conditions: The lands surrounding the project consist of private holdings, small family farms, forests used for timber production and conserved lands owned by federal and state agencies, non-profits and sustainable forestry landowners.

Other Public Agencies Whose Approval Is or May Be Required (permits, financing approval, or participation agreement): U.S Army Corps of Engineers, National Marine Fisheries Service, U. S. Fish and Wildlife Service, North Coast Regional Water Quality Control Board, State Water Resources Control Board, California Department of Fish and Wildlife.

Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? No. If so, has consultation begun? n/a

Note: Conducting consultation early in the CEQA process allows tribal governments, lead agencies, and project proponents to discuss the level of environmental review, identify and address potential adverse impacts to tribal cultural resources, and reduce the potential for delay and conflict in the environmental review process. (See Public Resources Code section 21083.3.2.) Information may also be available from the California Native American Heritage Commission's Sacred Lands File per Public Resources Code section 5097.96 and the California Historical Resources Information System administered by the California Office of Historic Preservation. Please also note that Public Resources Code section 21082.3(c) contains provisions specific to confidentiality.

CEQA Requirement:

The Project is subject to the requirements of the California Environmental Quality Act (CEQA). The Lead Agency is the County of Humboldt (County), per CEQA Guidelines Section 21067. The purpose of this Initial Study (IS) is to provide a basis for determining whether to prepare an Environmental Impact Report (EIR) or a Negative Declaration. This Initial Study is intended to satisfy the requirements of CEQA (Public Resources Code, Div 13, Sec 21000-21177) and the State CEQA Guidelines (California Code of Regulations, Title 14, Sec 15000-15387).

CEQA encourages lead agencies and applicants to modify their projects to avoid potentially significant adverse impacts (CEQA Section 21080[c][2] and State CEQA Guidelines Section 15070[b][2]).

Section 15063(d) of the State CEQA Guidelines states that an IS shall contain the following information in brief form:

Groundwater recharge ponds are located at sites assessed with good potential for groundwater storage and low risk of erosion. In addition, instream ponds are only proposed in Class III tributaries with low existing habitat value. Implementation of the groundwater recharge ponds will utilize heavy equipment and include excavation and construction of an earthen berm and spillway built into the natural topography. The sides of the pond are sloped at a minimum of 2:1 horizontal/vertical for stability, aesthetics and wildlife access. The ponds are shaped with shallow benches and deep areas for complexity and to encourage wetland vegetation as well as water circulation from differences in temperature associated with water depth. To the extent possible, the shape of the ponds is also irregular both for aesthetics and function. Construction includes removal of topsoil from the pond area. The topsoil will be saved and spread around the pond area along with mulch after construction. One or two small infiltration berms may be constructed downslope of the spillway to infiltrate the spillway overflow. The ponds are typically formed by excavating down to the natural clay layer and building an earthen berm at the low end. Native clay or bentonite can be used on the inside of the pond to partially seal the berm. Additional slowing of groundwater transport can be accomplished by construction of a trenchwall keyway under the berm to form a restrictive layer. These restrictive layers are constructed by digging a trench down to a natural restrictive layer (typically clay) and filling the trench with a mix of the soil and native clay or bentonite and compacted in 1 foot lifts. Engineered earthen berms will be constructed with 0.6 m (2 feet) of freeboard and spillways sized to carry 100-year flows. Spillways will be located on native ground where feasible (rather than in the berm). Ponds will be positioned to minimize impacts on existing vegetation as feasible. Disturbed areas outside the pond and berms will be planted with native grasses, shrubs and deciduous trees in the winter following pond construction.

Other activities that will be part of this Project include decommissioning of one road that is currently eroding into the creek and upgrading of an alternate route and implementation of two culvert to bridge fish passage upgrade sites that will reduce risks associated with the project. These activities will be performed by heavy equipment and will follow techniques that are detailed in the current version of the *California Salmonid Stream Habitat Restoration Manual 4th edition*.

Emergency water storage tanks:

The Project includes installation of approximately 400,000 gallons of emergency water storage and associated plumbing. Construction will include preparation of the tank pad which typically includes 6 inches of gravel topped with 3 inches of sand. Due to cultural resource concerns and pending outcomes of further subsurface investigation, the tank pad area will likely need to be capped with gravel without any topsoil removal. Large capacity water storage tanks (3 x 120,000 gallon tanks) will likely be used to reduce the tank system footprint. Installation of pipes from the existing permitted well to the tanks will likely also be above ground and capped with gravel. If a winter surface water diversion is also needed, a CDFW/NOAA compliant fish screen will also be installed.

Additional information and conceptual designs for instream structures:

1) Non-channel spanning instream structures (unanchored wood and non-channel spanning post-assisted constriction dams)

The non-channel spanning instream structures are designed to facilitate fish passage and will be a mix of strategically placed unanchored LWD, and post-assisted constriction dams. These structures will meter gravel, influence instream hydraulics increasing instream complexity and floodplain accessibility as well as providing cover and increased instream habitat (Wheaton et. al. 2012). The structures are intended to mimic the behavior of natural LWD recruited to the channel and initiate the same benefits listed above. These are inexpensive treatments installed

NOTICE OF DETERMINATION

To: ☒ Office of Planning and Research
1400 Tenth Street
PO Box 3044
Sacramento CA 95812-3044

From: County of Humboldt
Planning and Building Department
3015 H Street
Eureka CA 95501

☒ County of Humboldt
County Clerk
825 Fifth Street
Eureka CA 95501

F I L E D
County of Humboldt
Kelly E. Sanders
County Clerk
12-2019-008

Contact: Holly Merrifield
Telephone: 707-268-3703
Email: hmerifield@co.humboldt.ca.us

Lead Agency (if different from above):
Address:

02/08/2019
SC

Contact:
Telephone:

Applicant: Sanctuary Forest, Inc.
Attn: Tasha McKee

APN: 215-172-003, 215-172-022, 215-172-039, 215-172-045, 215-222-003, 215-231-001, 220-191-012, 220-191-036

Address: PO Box 166
Whitethorn, CA 95589

Case Nos: SP-18-079

Subject: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number: 2018122046

Project Title: Mattole Headwaters Flow Enhancement Project

Project Location: The project is located in Mendocino and Humboldt County, located within four Mattole headwater tributaries, the Lost River, Thompson Creek, Anderson Creek, McKee Creek, unnamed tributaries as well as two unnamed main reaches. The project includes seven different landowners. Parcels are identified as APNs 215-222-003-000, 215-231-001-000, 215-172-022-000, 220-191-036-000, 215-172-003-000, 215-172-039-000, and 215-172-045-000.

Project Description: Pursuant to Section 314-61.1, a Special Permit is required for development of land within Streamside Management Areas. A Special Permit is requested by Sanctuary Forest Inc., who have proposed restoration and habitat enhancement within four tributaries of the Mattole. The project includes seven landowners in Southern Humboldt and will extend into Mendocino County. The project objectives are to address the impacts of drought by enhancing summer streamflow through restoration of natural ground and surface water hydrological functions. Project types include restoration of entrenched streams and in-stream habitat facilitated by the development of in-stream and off-stream recharge ponds, subsurface clay dams, high flow post assist constriction dams, large wood habitat enhancement structures, log weir grade control structures, Beaver Dam Analog weirs (BDA) and spawning gravel augmentation. Treatment types will be dispersed throughout the project locations and are detailed in site maps and site-specific project and treatment type summaries.

In Thompson Creek on Lost Coast Forestlands property, five instream groundwater recharge ponds are proposed in a Class III gully with a total storage capacity of approximately 500,000 gallons. On private property in five different locations with permission from landowners, the applicant has proposed a combination of off-stream and in-stream groundwater recharge ponds. On the Gross property, two off-channel ponds with a total capacity of an approximate 600,000 gallons is proposed. On the Steadman property, the applicant has proposed enhancement of the existing wetland by the construction of one off-channel recharge pond with a total capacity of approximately 445,000 gallons. On the Thompson property, the applicant has proposed to expand and enhance isolated wetland vegetation and construct an off-channel recharge pond with a total capacity of an approximate 700,000 gallons. On the Cook property, the applicant has proposed to construct two in-stream recharge ponds and several grade control structures proposed in a non-fish bearing, Class III gully with a total capacity of approximately 60,000 gallons and one off-channel recharge pond with a total capacity of approximately 700,000 gallons. On the McMurray property, the applicant will modify one existing in-stream recharge pond in a Class III, non-fish bearing tributary with a total capacity of approximately 400,000 gallons and construct two additional off-channel recharge ponds with a total capacity of one million gallons. Additionally, the applicant has proposed installation of an emergency water storage system with a capacity of approximately 400,000 gallons in water storage tanks and associated distribution line to provide community water supply for emergency fire suppression. The storage system will be located on Sanctuary Forest Inc. owned lands and filled from an existing, permitted well.

NOTICE OF DETERMINATION

This is to advise that the, ☒ Lead Agency or ☐ Responsible Agency, Humboldt County Planning Director has approved the above described project on February 5, 2019 and has made the following determinations regarding the above described project:

1. The project ☐ will ☒ will not have a significant effect on the environment.
☐ An Environmental Impact Report was prepared for this project pursuant to the provisions of CEQA.
2. ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
☒ A Mitigated Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures ☒ were ☐ were not made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan ☒ was ☐ was not adopted for this project.
5. A statement of Overriding Considerations ☐ was ☒ was not adopted for this project.
6. Findings ☒ were ☐ were not made pursuant to the provisions of CEQA.

This is to certify that the final EIR with comments and responses and record of project approval, or the Negative Declaration, is available to the General Public at: Planning Division, 3015 H St, Eureka, CA 95501

Signature: _____

Harry Mennifield

Date: _____

February 7, 2019

Title: _____

Planner I

Date received for filing at OPR: _____



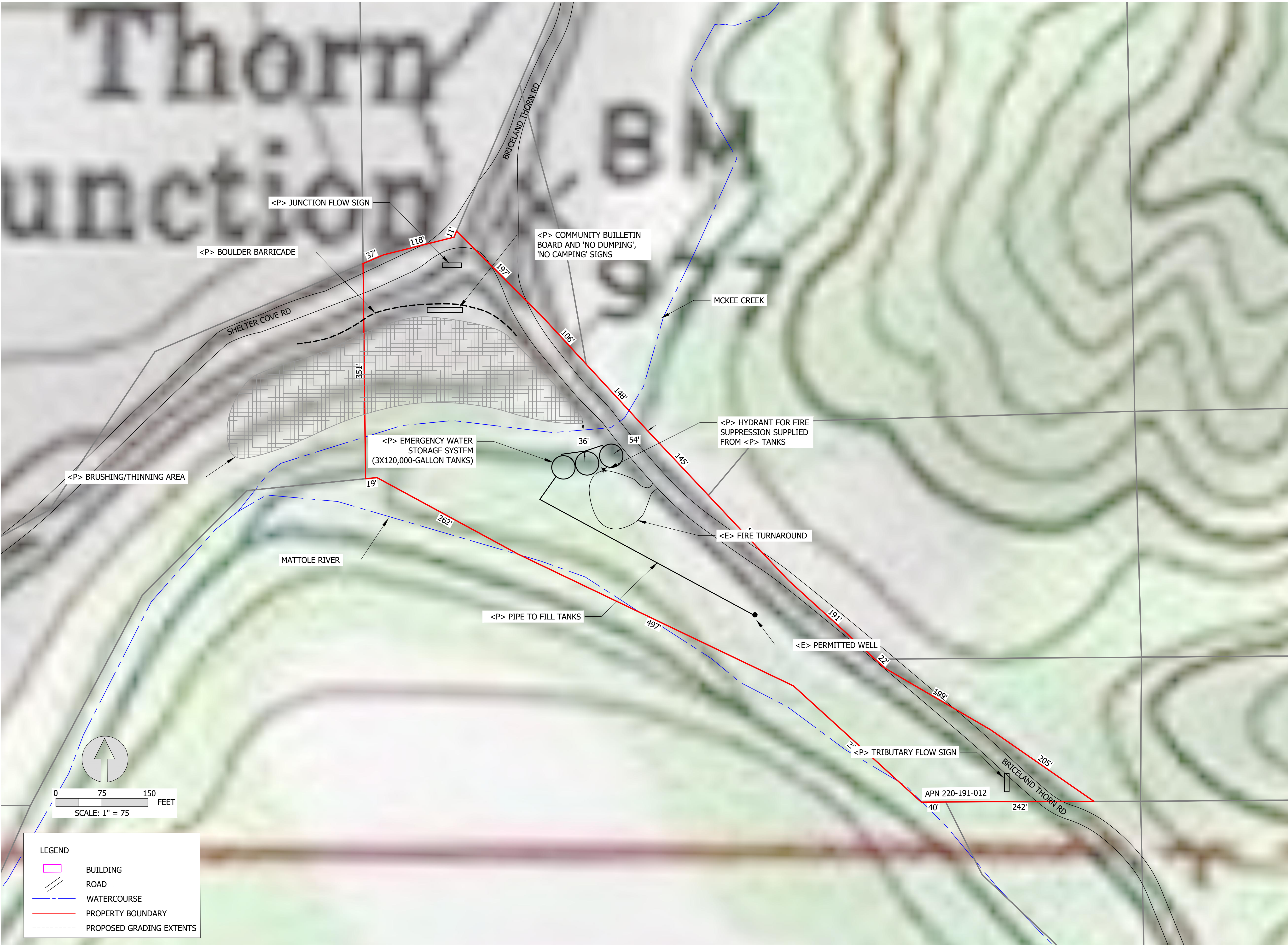
Kelly E. Sanders
Humboldt County
County Clerk, Recorder & Registrar of Voters
825 Fifth Street, 5th Floor
Eureka, CA 95501
Recorder: (707) 445-7593
Vitals: (707) 445-7382
www.humboldt.gov.org/recorder



Receipt: 19-2413

Product	Name	Extended
FISH	CLERK FISH AND WILDLIFE FILING	\$2,404.75
	Document #	12-2019-008
	Document Info:	HUMBOLDT CNTY
	# Pages	2
	Filing Type	ND
	Email Address	hmerrifield@co.humboldt.ca.us
	Requestor	humboldt cnty planning
Total		\$2,404.75
Tender (Check)		\$2,404.75
Paid By	SANCTUARY FOREST INC	
Check #	2157	

Please review all documents. All sales are final.



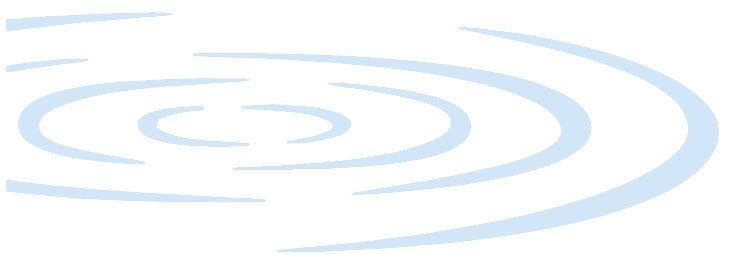
MATTOLE HEADWATERS
FLOW ENHANCEMENT

HUMBOLDT & MENDOCINO, CA

Stillwater Sciences

2855 TELEGRAPH AVENUE, SUITE 400
BERKELEY, CA 94705 P: (510) 848-8098

LANDOWNER: SANCTUARY FOREST, INC.
220-191-012



PROJECT NUMBER: 588.02
SCALE: AS NOTED
DATE: 10/18/18

DESIGN: JM
DRAWN: RBT
CHECKED: JM
APPROVED: ----



JUNCTION EMERGENCY
WATER STORAGE SITE
PLAN

SHEET 1 OF 2

IF BAK DOES NOT MEASURE 1" DRAWING IS NOT TO SCALE - MUST ACCORDING LAST SAVED 10/17/2018 10:19:2018 PLOT DATE: 10/19/2018 PLOT STYLE: ----- \A\588.02 MATTOLE HEADWATERS\ACAD - COPY FROM \A\588.02 MATTOLE HEADWATERS\ACAD\2 MODEL\588.02 TRB-PONDS.DWG

WATER STEWARDSHIP GUIDE

Conserving and Storing Water to Benefit Streamflows and Fish
in North Coast Creeks and Rivers

Written by Sanctuary Forest
With Conservation Gardening Techniques by Kyle Keegan



Artwork by Val McKee ©

This educational publication was produced by Sanctuary Forest in February 2017 with funding and critical support by the California Department of Fish & Wildlife's Fisheries Restoration Grant Program.

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Plant New Trees, Shrubs or Vines in the Fall/Early Winter	
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Sanctuary Forest

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Follow us on Twitter: [@SanctuaryForest](#)

Permitting

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Introduction

As landowners and stewards of this remote region of the North Coast of California, how we use our natural resources is incredibly important to the health of the land, the rivers that flow through it, and the many other species that rely upon it for their survival.

The purpose of this guide is to provide water conservation techniques and instructions on how to pump, store, and use water in a way that meets your household's needs while also preserving streamflows and protecting fish in your neighborhood creeks and rivers.

The information that follows is derived from Sanctuary Forest's efforts to increase streamflows in the upper Mattole River, and from local permaculture specialist, Kyle Keegan, whose Fool's Farm demonstrates the many ways that food can be produced with little to no water.

Note: Nothing in this guide should supersede the specific requirements of any agency or permits you may already have. If you are storing or diverting water outside of the Mattole River Watershed, you may need permits that differ from those mentioned here.

Fish-Friendly Water Storage & Use

Water Conservation Strategies to Help Keep Your River Flowing

Practice water conservation techniques to reduce your water use, diversion impacts, and amount of storage needed.

1. Reduce pumping rates and coordinate pumping schedules with neighbors to be able to pump for longer into the dry season.
2. Install adequate storage to meet your household and irrigation needs in order to forbear from pumping during the dry season.

In the North Coast region, September and October are often the most critically dry months when streamflows are at their lowest and every gallon diverted or pumped may prove harmful to fish. In recent years we have seen a trend towards longer and hotter dry seasons resulting in extreme low flows as early as July and as late as November 15th.

As the impacts of climate change become more severe, longer hotter dry seasons and less frequent but more intense rain events may become the new normal. As a result it is essential for all of us to make every effort to forbear from dry season water diversions and leave the water in the creek when the fish need it the most.

4 Key Elements to Fish-Friendly Water Storage

1. Calculate your household's water budget: determine your dry season household use and irrigation needs, amount of water storage needed in order to forbear, and employ water conservation techniques or scale back your garden size if you cannot afford the necessary storage.
2. Fill and top your tank(s) in the late winter and early spring months to avoid having to divert during the dry season.
3. Limit pump rates to 10 gallons per minute or less, and use CDFW compliant fish screens to protect juvenile (small) fish.
4. Use water metering devices or other means to monitor your weekly water use to make sure you are within your water budget.

These guidelines, and other important steps you can take, are explained in the following sections. When we refer to the "low-flow season" realize that the calendar is not a perfect guide for when to stop pumping. The most important factor is the actual level of streamflows at the point where you are pumping.

Based on over 13 years of streamflow data collected in the Mattole watershed, Sanctuary Forest has found that on average, critical low flows occur from August 1 to November 15 in the Mattole headwaters mainstem. Smaller tributaries (less than 3 sq. mile drainage area) tend to experience lower flows earlier than mainstem reaches and for longer into the fall. To get more detailed information about streamflows and recommended no-pump periods, contact your local watershed group or the nearest Department of Fish and Wildlife office, or check the data on streamflows available through the U.S. Geological Survey website listed in the Appendix.

Calculating Your Water Budget

We recommend that every household store enough water to last the duration of an average dry season, approximately 3½ months (105 days). The following guidelines will help you calculate your total water needs for this period.

Note: Figures are based on average water usage data from the State Water Resources Control Board. Water conservation tips discussed later in this guide can help you reduce actual water use by 25-70% below these levels.

- Household water use: 55 gallons per day (gpd) per person
- Garden water use: 18.5 gpd per 100 square feet of garden
- Fire protection water reserve: 2,500 gallons

Sample Storage Calculation

(For a 3-Person Household with a 1,600 Sq. Ft. Garden):

- Household water need (Aug 1 – Nov 15): **17,325 gallons**
(105 days × 3 people × 55 gpd)

- Garden water need (Aug 1 – Oct 15): **22,496 gallons**
(76 days × 1,600 sq. ft. × 18.5 gpd per 100 sq. ft.; assumes that households will stop irrigating their gardens after October 15)
- Fire protection: **2,500 gallons**
- **Total household storage need: 42,321 gallons (for 3½ months)**

This amount represents the household's required storage for the full 3½-month dry season from August 1 through November 15. If you are unable to store enough water for this entire period, make sure that you have adequate storage to last through the two lowest-flow months of September and October—that is, at least 60 days-worth of water.

Optimizing Quality of Stored Water

The quality of water from long-term storage in tanks is primarily dependent on the source of the water, the storage tank, temperature, and light. If the tank is made of food-grade materials and the guidelines below are followed, water from long-term storage should be of equal quality to water stored short-term. To ensure high quality drinking water, use both a drinking water filter and UV purification cartridge to remove common bacteria and other organisms.

Incoming water quality is critical for long-term water storage. It is important to fill the tank when the water source is clear. Filtering the incoming water is best; otherwise, be sure to use a pre-settling tank that allows the clear water to be pumped from the top while the sediment collects at the bottom.

Cool storage temperatures are also important for water quality. Note that large tanks keep water cooler than small tanks. Exposure to light is also a critical factor for water quality. Direct sunlight encourages algal growth and water quality deterioration, and should be excluded from the tank interior when possible. Consider siting the tank away from full sun exposure if possible, or covering tanks with shade cloth. Protection from the sun will help to keep the water cool and for poly tanks will also help to protect the plastic from UV degradation.

Depending on the type of tank you use, there may be other steps you should take to optimize the quality of your stored water. Be sure to obtain a tank owner's manual from the tank retailer or manufacturer.

When to Fill and Top Your Tanks

As a general rule, **fill your tanks no later than May 1** each season to ensure minimal impacts to streamflows and optimal water quality. Pumping in June and July should be limited to topping your tank to ensure that you have enough water stored to forbear from pumping starting August 1. For small tributaries, the "stop-pump" date may come much sooner, and filling and topping may be limited to December-April.

Forbear August 1-November 15

If your storage capacity is not sufficient to last this entire period, then continue to top your tanks (at a reduced pumping rate) through August, but *stop pumping entirely during September and October—these are the two most critical low-flow months in most years.*

Prevent Water Loss from Overfilling

Overfilling your tank can result in significant water losses. One hour of overflow at an average pump rate of 10 gallons per minute results in 600 gallons wasted; an overnight overflow would lose 4,800 gallons. This is incredibly wasteful. Two recommended methods to protect against overflow losses are the installation of an automatic shut-off valve that turns your pump off when the tank is full, and overflow piping that returns water to the point of diversion.

Maximum Pumping Rates

To protect fish habitat and prevent direct harm to juvenile fish, both individual and cumulative pumping rates should never exceed 10% of the streamflows of the water source, and in general pump rates should never go above 11 gallons per minute (gpm), which is adequate to fill tanks in an efficient manner. In the headwaters of the Mattole River mainstem (as in many other smaller rivers or creeks), it may be necessary to reduce pump rates further when flows are particularly low—even before the “no-pump season” which begins August 1 in the Mattole headwaters mainstem program.

It is therefore very important to know the pump rate of your system. Pump rates can easily be reduced by installing a bypass valve or flow control “Dole” valve. It is also critical to consider the cumulative impacts of multiple pumps drawing from one stream or river reach. If you know that others are pumping from the watercourse you draw from, the best way to reduce your impacts is to coordinate pumping schedules so you don’t all take water at the same time. Either your local watershed group or the nearest CDFW office may be able to help you develop a pumping schedule that protects your stream.

Calculating pump rates that exceed 10% of the streamflow can seem like an abstract concept. Here are some tips to help: If pools are disconnected or flow is reduced to a trickle, then flows are less than 100 gallons per minute. Thus a 10gpm pump would be exceeding 10% of the flow – STOP PUMPING. If the depth of the riffle crest (the connection from the bottom of one pool to the top of the next pool) is less than 2 inches, then flows are likely less than 100 gallons per minute – STOP PUMPING.

Pumping at a reduced rate is one of the most cost effective ways to reduce impacts on streamflows. In some streams and rivers, pumping may be allowed throughout the dry season if the pumping rates are low enough such that cumulative impacts do not exceed 10% of streamflow. Below is an example of the benefits of reduced pumping rates along with assigned pumping days.

Standard Forbearance Threshold (Stop Pump Threshold):

50 landowners @ 10 gpm = 500 gpm impact

Forbearance threshold = 5,000 gpm (11 cfs)

Collaboration Forbearance Threshold:

50 landowners @ 5 gpm = 250 gpm impact

Alternating pumping days = 125 gpm impact

Forbearance Threshold = 1250 gpm (2.8 cfs) with 75% reduction of cumulative impacts and forbearance season shortened by 1-3 months

Note: The reduced pumping rate of 5 gpm @ 3 days/week provides 21,600 gallons/week which covers water use of 3,086 gal/day (adequate for most businesses and small farms and 7 times greater than average family water use).

Installing and Maintaining Fish Screens on Pumps

All pumps need to be equipped with intake screens to prevent damage to small fish. The screen openings must be small enough so that small fish can't get sucked into the pump. Additionally, the total screened area needs to be large enough so that the suction pressure against the screen is almost non-existent. If the screened area is too small, juvenile fish will be impinged against the screen and injured. The following specifications are summarized from the 2000 Department of Fish and Game criteria for California streams with juvenile coho, steelhead, and Chinook.

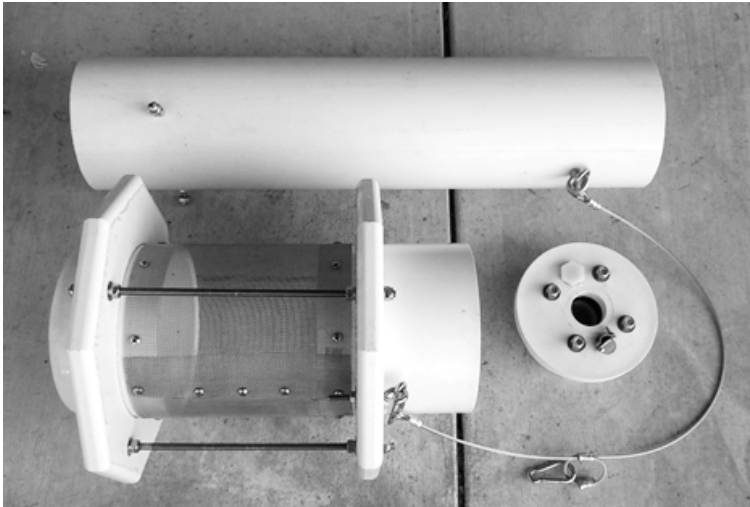
Specifications for pump screens:

Screen mesh openings must not exceed **3/32 of an inch** for woven wire or perforated plate screens.

- Screen mesh must have a minimum of **27% open area**.
- For an **11 gpm pump**, the total unobstructed screen area must be at least **42 square inches**.

Pump intake screens can be purchased ready-made from Pacific Ag Systems (*see Appendix*). These screens are sized to match your pump and are guaranteed to provide fisheries protection. They are made out of 20-gage stainless perforated plate and are very durable. Pump screens can also be fabricated inexpensively using a screen support structure such as PVC and a stainless steel screen mesh covering. When making your own screen, make sure the screen mesh is securely fastened to the support structures and that no gaps greater than 3/32 inch exist in the mesh or the points of attachment. Pump screen components for submersible pumps are manufactured by Sure-Flo and available through irrigation supply dealers. These components can be purchased separately and include pump support plugs, motor support pads and submersible pump strainers that bolt onto 4, 6, or 8 inch PVC Pipe. Sanctuary Forest fabricates CDFW compliant fish screens at a small scale, these are available for sale on a limited basis.

Clean pump screens regularly to avoid clogging. When pump screens become partly blocked by debris, the suction pressure on the remaining screen will be higher, potentially injuring juvenile fish. Check and clean your screens at the beginning of the pumping season, and then as needed to keep free of debris. If the screens are fabricated with wire mesh, replacement of the mesh will be required every year for bronze mesh and every two years for stainless steel mesh.



An example of a fish screen, disassembled – fabricated by Sanctuary Forest.



An assembled fish screen

Water Conservation: Making Your Stored Water Last

Reduce Your Use

When it comes to weighing costs, reducing your personal and homestead water consumption through water conservation techniques is the easiest, cheapest, and most effective way to address water shortages and leave more water in the river for fish and wildlife. You can reduce water use by up to 50% during the dry season by following these tips:

Household Conservation and Leak-Proofing

Reduce household water use by using efficient fixtures and turning the water off except when actually rinsing dishes, showering, brushing teeth, etc. Replacing older, standard water fixtures and appliances with newer, more water-efficient versions can make a tremendous difference in reducing your daily household water use, as the following table shows:

Fixture	Old-Style (Standard)	New (Water-Efficient)	Water Savings
Toilets	5-7 gallons/flush	1.6 gal/flush	~5 gal/flush
Sink Faucets	3 gal/minute	2 gal/minute (with aerator)	1 gal/minute
Showerheads	3-4 gal/minute	2.7 gal/minute	~1 gal/minute
Washing Machine	40 gal/load (top-loader)	20 gal/load (front-loader)	20 gal/load

Monitor Weekly Water Use

Establishing a water budget is essential to ensure that your stored water will last through the low-flow season. A water budget takes total water storage capacity (excluding fire reserve) and divides it by the number of weeks of forbearance. Depending on your needs for irrigation or other special uses, the allocation may be the same for each week, or may vary during the forbearance season. By measuring your weekly usage you can ensure that you're staying "within budget"—and make adjustments if you are not. Water budgets are also a great way to catch any leaks in the system. By tracking weekly use, you can easily see if water use is exceeding your budget and address them accordingly.

The easiest way to measure usage is to install a water meter on the outlet of your tank, and record usage on a weekly log. The water used per week is then easily calculated from the log and can be compared with the water allocation to make sure that water use is on budget.

**A sample water log is shown in the Appendix.*

Leak-Proofing Pipes & Tanks

An accidental leak or severed line can drain precious stored water from a tank—fast! Several over-draft designs exist that can help prevent water from being lost from water storage tanks.

If only using a single, large-capacity water tank, consider integrating a smaller tank into your system that can be filled by the larger tank either manually, or with a timer. Also, instead of utilizing one large tank, multiple smaller tanks can be grouped together and then used individually as needed.

Other creative designs of over-draft protection exist that involve partitioning the out flow of water into several valved PVC fittings that are manually opened when needed. These systems must be thoroughly insulated to prevent from freezing in winter.

Check For and Repair Leaks:

Even the smallest drip of water can add up to large losses over time. (Approximately one drip per second can waste over 3,000 gallons of water per year.) To prevent leaks, bury water lines to prevent fittings expanding in the sun, freezing in the winter, or from lines being chewed by bears or other wildlife. Be sure to mark all water junctions and connections with flagging when burying new lines. During the dry season walk water-line zones and check for wet spots, or green areas.

Water Loss Emergency

The sudden loss of a large portion of stored water in the midst of the low-flow season is a serious problem for any household. But deciding to pump from the stream or river in order to refill the tank at that point would be potentially devastating for fish survival. In that circumstance, the most responsible choice you can make is to obtain the water you need to get through the dry season from a retail water supplier. Find out who supplies potable water in your community, and where they get their water from.

The Drought-Resilient Garden

Water storage systems are often costly to install and are only as effective as the people using the water. The following water conservation techniques are meant to assist with efficient use of water outside of the home. Effective utilization of these techniques can drastically reduce the amount of water needed in the garden and on the farm and reduce the amount of water storage needed.

Soil Health is Water Security

Rich, living soil forms the foundation of the drought resilient garden. Research has shown that increasing humus levels in soil 1-2% can reduce water needs by up to 75% - humus has the ability to store up to 4-6 times its weight in water. Avoiding

soil disturbance and incorporating compost, earthworm castings, mushroom compost, or leaf mold into garden soils (approximately 2 gallons of compost, per 50 gallons of soil); as well as keeping the soil armored with mulch are practices that help protect and maintain your soil humus investment.

Cover cropping is also an excellent way to build and retain organic matter in the soil. Cover crops (fava beans, vetch, Austrian field peas, winter rye, bell beans, etc.) are best planted in the fall, and then mixed into the soil the following spring, 3-6 weeks prior to planting your next crop. Fall planted cover crops also capture and retain leftover fertilizers in the soil, preventing them from being lost to winter rains.

Plant in the Ground

In most cases, growing in native soil uses less water than growing in containers. Exceptions to this include growing food in an area where surrounding tree roots compete with water, or in sandy, or rocky soils.

Sheet-Mulching (Lasagna Gardening):

Sheet-mulching is a way to establish new garden beds (or revitalize old beds) by layering a diversity of organic materials (cardboard, straw, compost, manure, leaves, etc.) on top of existing soils. This is done in the fall, allowing the materials to break down (biodegrade) over the winter; the area is then planted the following spring. (This method works best in meadow soils and may not work well in forested areas where tree roots compete.) For an in-depth description of how to sheet-mulch check out: <http://www.patternliteracy.com/books/gaias-garden/how-to-the-ultimate-bomb-proof-sheet-mulch>.

Seed Selection & Planting

Use Early Maturing Strains:

When planning your garden, try selecting early maturing varieties. Plants that ripen earlier in the season can produce a yield before the critical dry months of late September and early October. Also, smaller-fruited varieties of tomatoes, eggplants, etc., often require less water to produce than larger-fruited varieties.

Get an Early Start:

When growing in the ground, getting plants established at the right time can have an effect on their ability to withstand dry summer conditions. (This is not the case when growing in containers.) Planting early in the season while the soil is still moist (but not too wet) allows plants to develop deep root systems before hot weather arrives. Providing early season protection (row cover cloth or Reemay cloth, small hoop-frames, cut plastic milk jugs, etc.) for warm season plants is often necessary when following this practice.

Direct Sow if Possible:

For many types of plants, seeds that are planted directly in the ground tend to establish stronger root systems than transplants. Newly planted seeds can be covered with Reemay, plastic, old milk jugs, etc., to help protect from birds and rodents while they are becoming established.

If purchasing or using transplants, avoid planting starts that are root-bound.

Moisture Retention Strategies:

Armor Your Soil with Mulch:

Mulch retains soil moisture, while insulating and protecting the living soil from heavy rains and temperature extremes. (Soil temperatures above 80° F can oxidize soil humus.) Armoring your soil also provides protection for beneficial soil organisms that are working together with your plants to help fight drought and disease. Mulch biodegrades over time, feeding the soil ecosystem, while increasing soil carbon.

Sources of mulch can include deciduous leaves, rotted wheat or oat straw, grass clippings, alfalfa, pond weeds, cattails, shredded cardboard, aged wood chips, etc. Also, by mulching paths you can help reduce the wicking of water from surrounding garden beds. (Large pieces of cardboard work great for this.) Remember to protect your soil investment during all four seasons.

Water Conservation in Containers:

Allowing pots to dry out too much between watering can cause the soil to repel water. Setting timers for long durations to rehydrate dry soil wastes both water and nutrients. Instead, try using drip irrigation with multi-cycle timers set for frequent, yet short durations, to keep soil evenly moist. (For example: 1-4 minutes 2-4 times a day, depending on the size of the container, time of year, and the size of plant.)

Cover soil in containers with mulch and place drip irrigation *under* the mulch to reduce evaporation. Trays or saucers can also be placed under smaller pots to capture lost water. Cover the south and west sides of containers with fabric, burlap, cardboard, etc., to prevent the sun from overheating the soil.

Use Wind Breaks:

Hot summer winds can wick moisture right out of soils. If planting in a windy site, consider erecting temporary windbreaks, or plant permanent windbreaks for long-term protection.

Cut Back on Nitrogen:

Over-fertilizing, especially with nitrogen, leads to excessive growth of vegetation that requires more water. Over-fertilizing can also leave plants vulnerable to pests

and disease. Some signs of excess nitrogen fertilization are abnormally green (ultra-emerald colored) plants with weak or stretched out new growth; edges or veins of leaves may look burned, or are curled downward. Be especially careful when fertilizing with bat or bird guanos and concentrated liquid fertilizers.

Utilize Greywater:

Water from sinks, showers, and laundry can be used again to water landscaping and perennial edibles. Water can also be collected in basins when showering or washing dishes and then carried to nearby plants. Avoid soaps that have sodium or boron. Biocompatible soaps that biodegrade into plant nutrients work best. For more info, check out: <http://greywateraction.org/content/about-greywater-reuse>, and: <http://www.oaecwater.org/sites/oaecwater.org/files/Legal%20Graywater%20Design%20For%20Small%20Scale%20Applications.pdf>

Orchard Drought Resilience:

When planting new fruit trees, try selecting standard and semi-standard rootstocks. Standard “full-sized” rootstocks grow extensive root systems and are more drought tolerant than dwarf varieties. Some semi-dwarf/semi-standard rootstocks such as the (MM-111 apple) also have excellent drought resistance. Trees on standard rootstocks can be held to any desired size by summer pruning. Also, when planting, consider wide spacing to avoid water competition between trees.

Plant New Trees, Shrubs, or Vines in the Fall/Early Winter:

Planting in the fall or early winter gives new trees or shrubs the entire rainy season to establish roots before hot summer weather arrives. Avoid planting new trees or shrubs during the summer months.

Use Drip Irrigation:

Properly installed drip irrigation can reduce water consumption by up to 50%. But not all drip irrigation is this effective. Spray emitters can lose a high percentage of water to evaporation and soaker hoses can become clogged with sediment after a few seasons.

Currently, the most effective drip irrigation is “in-line emitter tubing,” also called “soaker drip-line.” These are made in 1/4” and 1/2” diameter sizes and have non-clogging emitters, especially when used with basic sediment filters. In-line emitter tubing comes pre-spaced, from 6” to 2' along the length of line.

Place drip irrigation under your mulch to reduce evaporation; keep source water lines protected from the sun (buried) to prevent plants from being watered with hot water.

Group Plants Together According to Their Water Needs:

Place plants that need extra water near each other and on separate irrigation systems than plants that need less water.

Water in the Early Morning and Only When Needed:

Whether hand watering, or using drip irrigation, the best time to reduce evaporation losses is in the early morning hours. (Watering in the evening provides similar results, but may also encourage fungal diseases.)

A plant's water needs can vary based on influences such as weather and day lengths. To help conserve water, try watering only when needed, vs. on a set schedule. Manual timers work well for this technique. Moisture meters can also be used to help gauge and monitor soil moisture levels and can be purchased at most garden stores.

Permitting

Fire Storage Requirements

Fire protection storage requirements may vary by county, but generally apply to rural residents in the North Coast region. In Humboldt County, homes in State Responsibility Areas for fire are required to maintain a reserve of 2,500 gallons at all times to fight fire. If this reserve is not kept in a separate tank, your larger tank must be plumbed in such a way that the 2,500 gallons will not be bled down by other usage. A 2.5-inch standard male fire hose adapter is required for access to this water.

Permits for Tanks and Water Storage

Humboldt County Installation Requirements: Permits and other requirements vary from county to county and within different zones in a given county. Consider contacting your county building department prior to project implementation to determine permit requirements for your location. In Humboldt County the following general requirements apply:

- **Grading permit:** Required if excavation for installation exceeds 50 cubic yards.
- **Tank permit:** Required for tanks whose capacity is more than 5,000 gallons. Water storage systems with multiple tanks of 5,000 gallons or less do not require building permits. A standard building permit cannot be obtained for a tank unless the tank meets California building code and is approved by a California engineer. An Alternative Owner-Builder (AOB) building permit is allowed for tanks that do not meet California building code if the landowner qualifies under the AOB ordinance. In order to obtain a tank building permit, the tank cannot be used to supply water to any unpermitted buildings.

- **Setback requirements:** Riparian setbacks are 100 feet from edge of stream or river bank. Property line setbacks are 30 feet. County road Right of Way can be estimated at 30 feet from the center of the road.

Water Rights Permits

Water scarcity impacts to communities, fish, and wildlife has resulted in a greater need for protection of water resources and increased regulation by the governing agencies. The solution of storing water from the wet months for use during the dry months is supported by these agencies but the California water rights system was not designed to accommodate seasonal storage. The riparian water rights held by landowners who withdraw water from a source on their property allows only for direct diversion, and does not allow water storage for longer than 30 days. Instead, California law requires an appropriative water right for water collected from streams, lakes, springs and shallow wells that will be stored longer than 30 days.

Non-Jurisdictional Water:

Water that can be stored without an appropriative water right includes non-jurisdictional sources such as rainwater, well water, and springs. Storage of rainwater harvested from rooftops does not require a water right. All of the other non-jurisdictional water sources are more complex and likely require consultation with a water law attorney, consultant or agency to determine if they are exempt. In general, rainwater that is directly intercepted is exempt, while collection of hillslope run-off is not. Deep wells that are not connected to shallow groundwater are exempt. However, the well must be permitted by the county and the well logs must show that the water is being collected from below the “impervious layer” that separates shallow groundwater from isolated aquifers. Well water law is changing as needed to protect groundwater reserves and in the future, water rights will likely be required for all wells. Springs that do not flow off of the property are exempt but the determination of what that means varies between agencies.

State Water Board Permits

Three types of appropriative water right registrations that allow for water storage are described below. All of them require CDFW terms and conditions under which the water right registration can be exercised. Once a landowner enters into the process of applying for one of these water right registrations they will also need to notify CDFW of their water diversion and a CDFW 1602 agreement may be required in addition to the water right. Because of the complexity of the process, we recommend consultation with your local watershed group and/or agency prior to application. Both CDFW and SWRCB staff are happy to answer questions to help you determine the best permitting pathway for your situation (see contact info in the appendix)

Small Domestic Use Registration:

Most landowners qualify for small domestic registrations for domestic use not to exceed direct diversion of 4,500 gallons per day and diversion by storage of 10 acre-feet (3.2 million gallons) per annum. Domestic use means the use of water in homes including watering of domestic stock, irrigation not to exceed 1/2 acre and shall include impoundment for incidental aesthetic, recreational, or fish and wildlife purposes. A small domestic registration can include storage in tanks and/or ponds for the purposes above. Institutional and business water use requires a full appropriative right with a few exceptions (schools, resorts, motels, campgrounds, etc). Additionally, landowners that irrigate more than 1/2 acre exceed the maximum allowed diversion stated above and/or that grow commercial crops require a full appropriative right or a small irrigation use registration.

Livestock Stockpond Use Registration:

For ponds used for livestock, a livestock stockpond use registration can be obtained. A livestock stockpond is defined as a pond constructed for livestock watering use not to exceed direct diversion of 4,500 gallons per day or diversion by storage of 10 acre-feet per year, and includes storage for incidental aesthetic, recreational, or fish and wildlife purposes. Total storage amount may not exceed 10 acre-feet. Additionally, if both a small domestic registration and livestock stockpond registration are obtained, the combined total water use cannot exceed 10 acre-feet per annum.

Small Irrigation Use Registration:

Landowners intending to store water for more than 30 days for commercial irrigation of agriculture are required to obtain either a Small Irrigation Use (SIU) or a full appropriative water right. Currently, the SIU is available for landowners in coastal stream watersheds from the Mattole River south to San Francisco and coastal stream watersheds entering northern San Pablo Bay. The purpose of use must be Irrigation, Heat Control, or Frost Protection. The following uses may be included as uses incidental to the primary use: aesthetic, fire protection, recreational, and/or fish and wildlife preservation and enhancement. The place of use must be lands currently under cultivation. The allowable amounts are as follows: diversion to off-stream storage is not to exceed 20 acre-feet per year where the storage facility is either existing or proposed for construction within cultivated lands; diversion to on-stream storage reservoirs located on Class 3 streams not to exceed 20 acre-feet per year where the reservoir was constructed prior to January 1, 2012. CDFW Conditions or Clearance: The registration packet must include either of the following from the California Department of Fish and Wildlife: (1) conditions or (2) clearance that conditions are not needed.

Note: A SIU can be used along with a SDU and or a livestock stockpond use registration as long as the total combined water use does not exceed 20 acre-feet per annum. The application process requires submittal to CDFW to obtain conditions of clearance prior to submitting the application form and \$250 fee to the SWRCB.

CDFW Code 1602 Requirements

CDFW has authority to regulate any water withdrawal that may have an impact on fish or other aquatic life. According to the Code, anyone who undertakes an activity that might “substantially divert or obstruct the natural flow of any river, stream, or lake” is required to notify CDFW of this activity. Such notifications are particularly important in fish-bearing streams and tributary streams where low flows have been identified as a problem. If the Department determines (on a case-by-case basis) that your water diversion could have a “substantial” impact on the resource, a Lake or Streambed Alteration Agreement may be required. CDFW defines fish to include amphibians and other aquatic and terrestrial life. If your stream or spring has habitat for any aquatic life or is a tributary to such a stream, then an agreement may be necessary.

**See Appendix for a website providing more guidance on submitting a notification.*

Appendix I - Resources

In-line Emitter Tubing/Soaker Drip-line Sources

<http://www.dripworks.com/category/one-fourth-inch-soaker-dripline>

Quality Water Meter Retailer

National Meter and Automation Inc.: <http://www.nmaai.com/>

Homestead-Scale Permaculture Design Books:

Gaia's Garden, Toby Hemenway

Designing and Maintaining Your Edible Landscape Naturally, Robert Kourik

Greywater Resources:

Create an Oasis with Greywater, Art Ludwig/Oasis

Soil:

Three great books: *Teaming with Microbes*, *Teaming with Nutrients*, and *Teaming with Fungi*, Jeff Lowenfels & Wayne Lewis

Appendix II – Contact Information

Pump Screen Suppliers

Pacific Ag Systems, supplier of Pump-Rite Screens:
(888) 998-1983, Website: www.pump-rite.com

Sure-Flo, manufacturer of submersible pump screens components:
(734) 761-5110, Website: www.sure-flo.com

Englund Marine in Eureka, stainless steel screen mesh supplier:
(707) 444-9266

Public Agencies

Humboldt County Building Department
(707) 445-7245, <http://www.humboldt.gov.org/156/Planning-Building>

Mendocino County Building Department
(707) 234-6650, <http://www.co.mendocino.ca.us/planning/>

California Department of Fish and Wildlife

For questions about CDFW water rights, permits and pump screens, contact:

Jane Arnold, Staff Environmental Scientist (Eureka)
(707) 441-5671, Jane.Arnold@wildlife.ca.gov

For information about filing a CDFW notification of diversion:

Visit <https://www.wildlife.ca.gov/conservation/LSA>

State Water Resources Control Board

The Division of Water Rights provides information on water rights and permits (including small domestic use appropriations), as well as water use standards for households, irrigation, livestock and dust control.

(916) 341-5250, Visit <http://www.swrcb.ca.gov/waterrights/>

U.S. Geological Survey – Water Resources

The U.S. Geological Survey National Water Information System provides online streamflow data for thousands of locations around the country.

1-888-ASK-USGS (1-888-275-8747), Visit
<http://waterdata.usgs.gov/nwis/rt>

Appendix III – Technical Information

Conversion Rates for Water Volume Calculations

1 cubic foot = 7.48 gallons

1 acre foot = 325,851 gallons

Calculating Pump Screen Area Requirements

Minimum Screen Area – SAMPLE CALCULATION:

Step 1: Convert your pumping rate from gallons/minute to cubic feet/second (using the conversion rate 1 gpm = 0.0022 cfs)

Step 2: Multiply your pumping rate (in cubic feet/sec) \times 12.1 sec/feet to get square feet of screened area required.

Calculating Minimum Screen Area for an 11 GPM Pump

Step 1: 11 gpm \times 0.0022 cfs / 1 gpm = 0.024 cfs

Step 2: 0.024 cfs \times 12.1 sec/feet = 0.29 sq. ft. (42 sq. inches) of screened area.

Sample Water Use Log Tables

Sample log using water meter readings:

(Storage = 50,000 gal allocated at 450 gal per day = 111 days or 15.9 wks)

<i>Weeks of Forbearance Season</i>	<i>Date</i>	<i>Water Meter Reading (Gallons)</i>	<i>Actual Water Used Per Week (Gallons)</i>	<i>Water Allocation Per Week</i>	<i>Difference (Allocation Minus Actual Use)</i>
Start date	Aug 1	25,000			
Week 1	Aug 8	28,000	3000	3150	150
Week 2	Aug 15	31,500	3500	3150	- 400
Continue Through End of Season					