Supplementary 1: Supporting material in the development of the watershed prioritization process

Table S1. A full list of the variables considered during the creation of the random forest models for the ASCI, CSCI, CRAM_{biotic} and CRAM_{physical} indices.
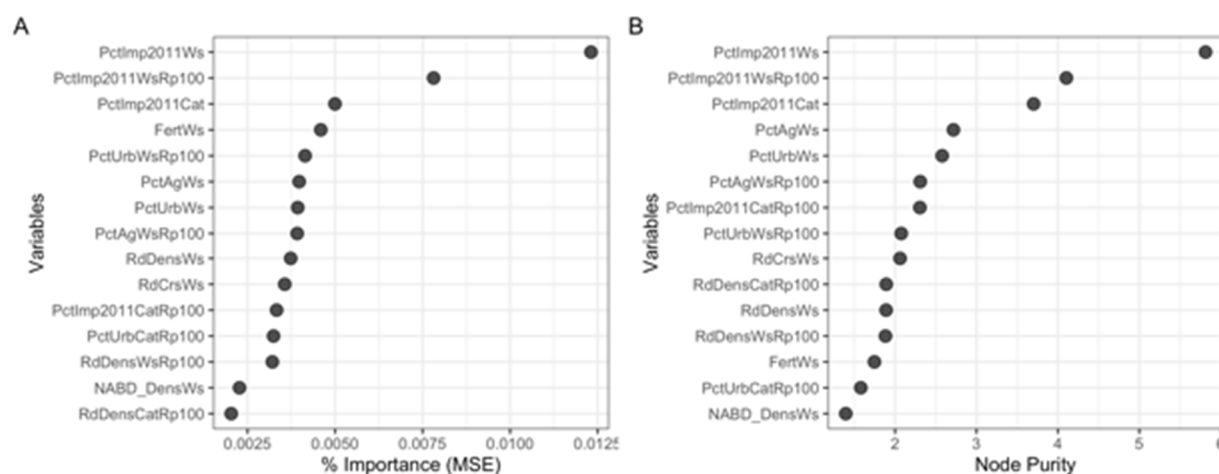
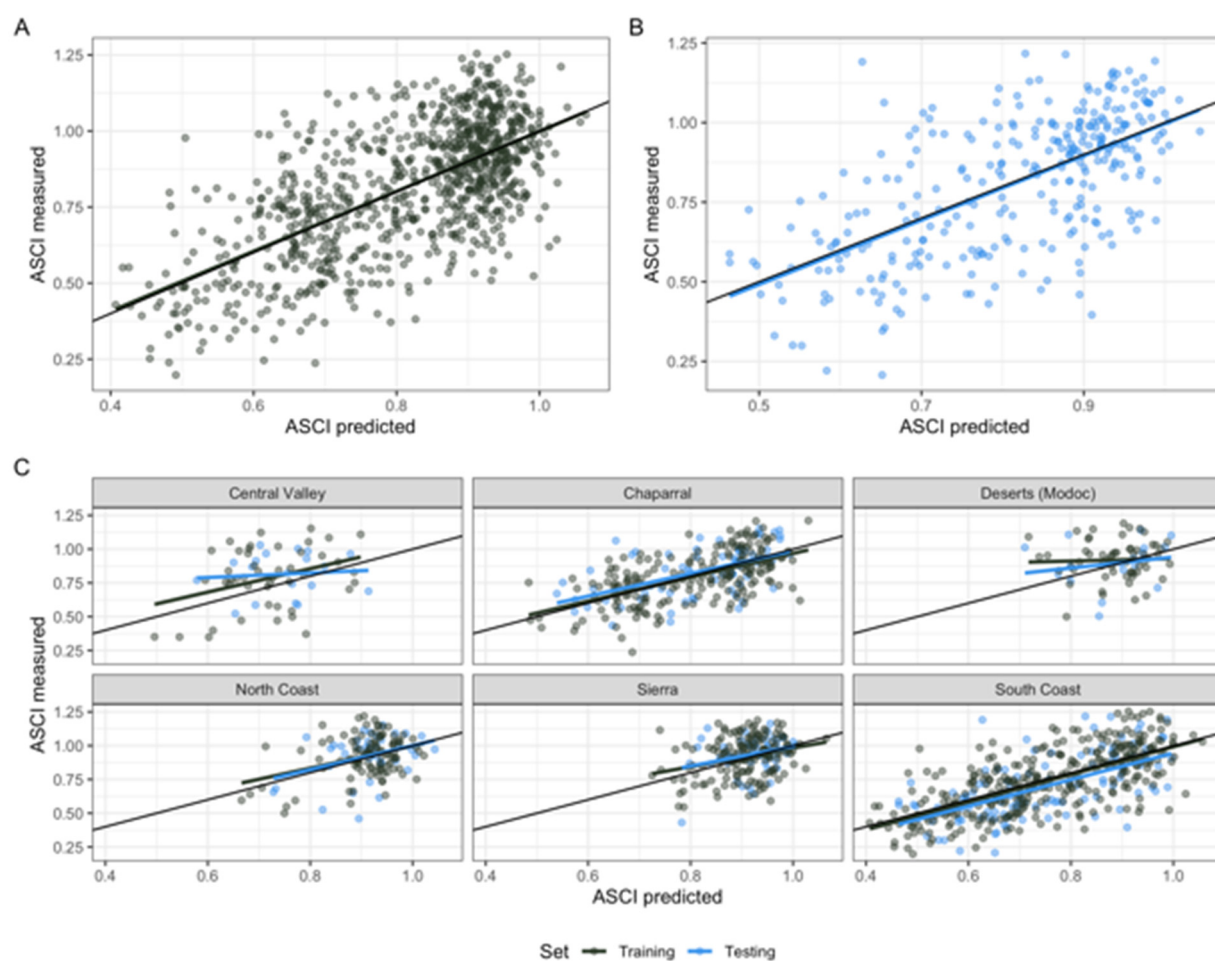| Abbreviation	Full Description
FertCat	Synthetic N fertilizer application to agricultural land (catchment), kg N/ha/yr
FertWs	Synthetic N fertilizer application to agricultural land (watershed), kg N/ha/yr
CBNFCat	Biological nitrogen fixation from cultivation of crops (catchment), kg N/ha/yr
CBNFWs	Biological nitrogen fixation from cultivation of crops (watershed), kg N/ha/yr
ManureCat	Manure application to agricultural land (catchment), kg N/ha/yr
ManureWs	Manure application to agricultural land (watershed), kg N/ha/yr
CanalDensCat	Canal, ditch, or pipeline density (catchment), km/km²
CanalDensWs	Canal, ditch, or pipeline density (watershed), km/km²
DamDensCat	Dam density (catchment) dams/ km², based on National Inventory of Dams
DamDensWs	Dam density (watershed) dams/ km², based on National Inventory of Dams
AgKffactCat	Soil erodibility on agricultural land (catchment), unitless Kf factor
AgKffactWs	Soil erodibility on agricultural land (watershed), unitless Kf factor
PctImp2011Cat	% Imperviousness (catchment)
PctImp2011Ws	% Imperviousness (watershed)
PctImp2011CatRp100	% Imperviousness (catchment, within 100 m buffer of streams)
PctImp2011WsRp100	% Imperviousness (watershed, within 100 m buffer of streams)
PctUrbCat	% Urbanization (catchment)
PctUrbWs	% Urbanization (watershed)
PctUrbCatRp100	% Urbanization (catchment, within 100 m buffer of streams)
PctUrbWsRp100	% Urbanization (watershed, within 100 m buffer of streams)
PctAgCat	% Agriculture (catchment)
PctAgWs	% Agriculture (watershed)
PctAgCatRp100	% Agriculture (catchment, within 100 m buffer of streams)
PctAgWsRp100	% Agriculture (watershed, within 100 m buffer of streams)
MineDensCat	Mine density (catchment), mines/km²
MineDensWs	Mine density (watershed), mines/km²
NABD_DensCat	Dam density (catchment), dams/km², based on National Anthropogenic Barrier Dataset
NABD_DensWs	Dam density (watershed), dams/km², based on National Anthropogenic Barrier Dataset
RdDensCat	Road density (catchment), km/km²
RdDensWs	Road density (watershed), km/km²
RdDensCatRp100	Road density (catchment, within 100 m buffer of streams), km/km²
RdDensWsRp100	Road density (watershed, within 100 m buffer of streams), km/km²
RdCrsCat	Road–stream intersections (catchment), km/km²
RdCrsWs	Road–stream intersections (watershed), km/km²

Table S2. Proportion of intact vs. degraded stream reaches in each pilot watershed and statewide.

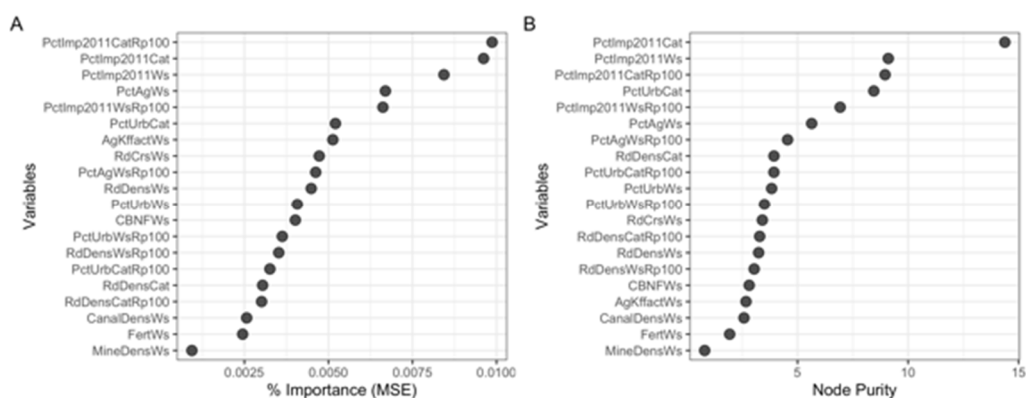| Watershed	Total Reaches (number)	Intact (Condition)	Degraded (Condition)
San Lorenzo River	153	68.0%	32.0%
Salinas River	4956	69.5%	30.5%
Santa Maria River	2605	83.0%	17.0%
Ventura River	443	67.9%	32.1%
San Juan Creek	236	54.7%	45.3%
San Diego River	453	50.1%	49.9%
Statewide	138,608	71.4%	28.6%

Table S3. Number of stream segments available in each Perennial Streams Assessment region, and the number of condition indices in each region used for the random forest training dataset.

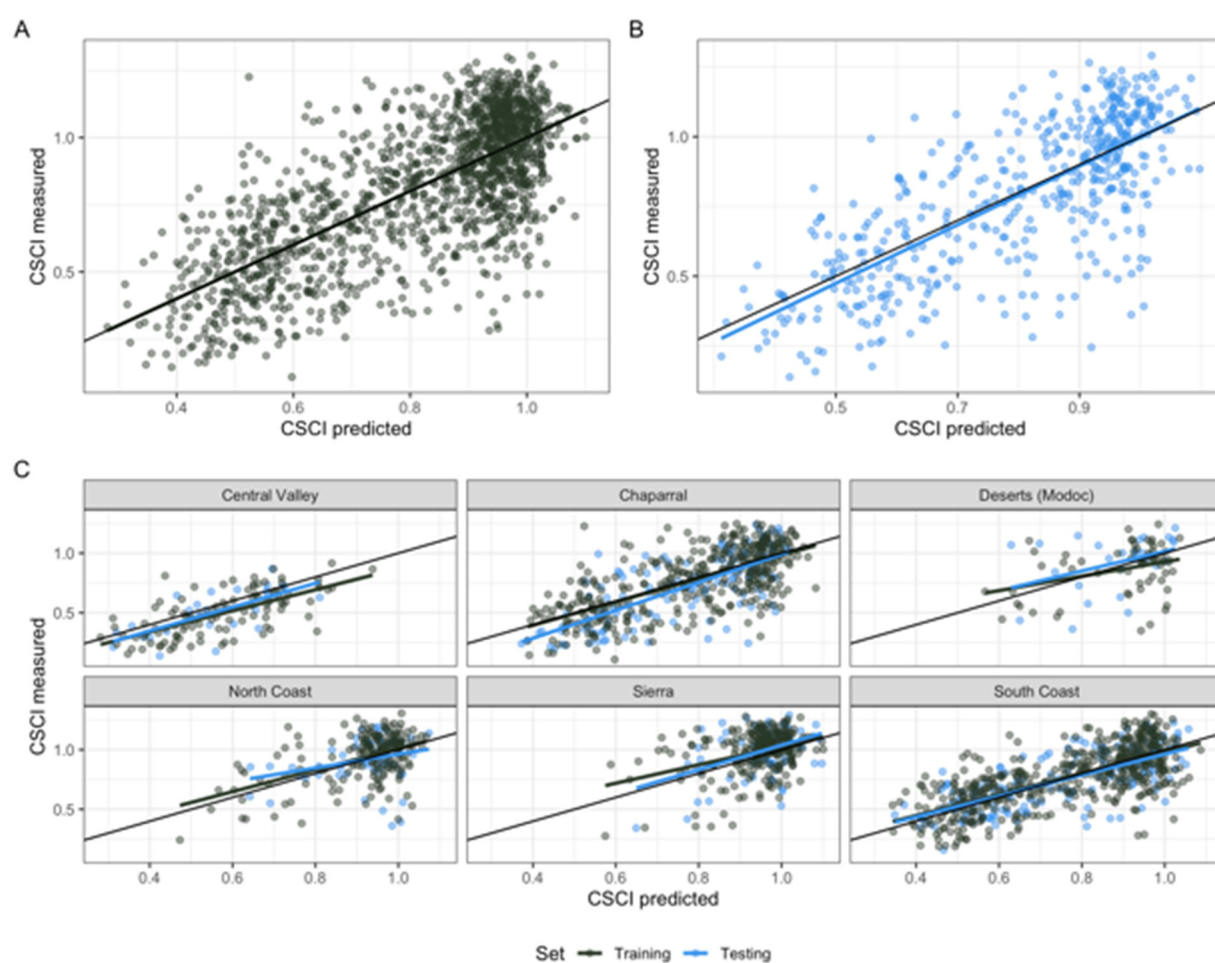| PSA Region	ps6	CSCI	ASCI	Biotic	Physical
Central Valley	31,468	106	46	29	29
Chaparral	44,256	394	202	83	83
Desert (MODOC)	33,474	63	58	39	39
North Coast	19,298	186	105	68	68
Sierra	24,445	261	162	98	98
South Coast	12,866	502	336	293	293

Figure S1. (**A**) Variable importance and (**B**) variable node purity values of the random forest model created for the ASCI index.
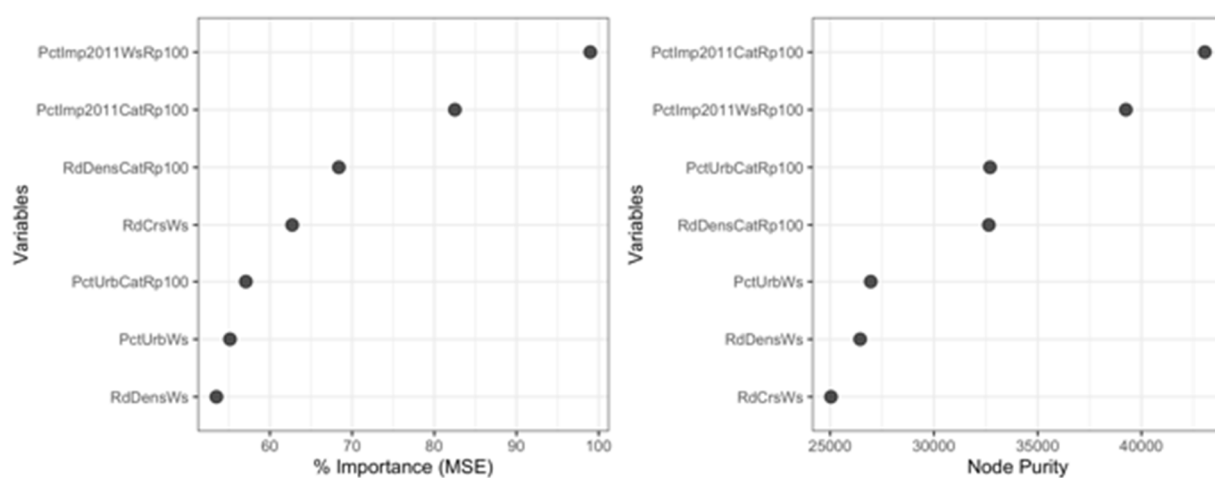
Figure S2. Measured versus predicted ASCI index values for (**A**) the full training dataset (n = 909), (**B**) the full testing dataset (n = 305), and (**C**) for both datasets paneled by California Perennial Stream Assessment (PSA) region. Linear models are colored according to the dataset plotted, and lines of slope = 1 are overlain in solid black.
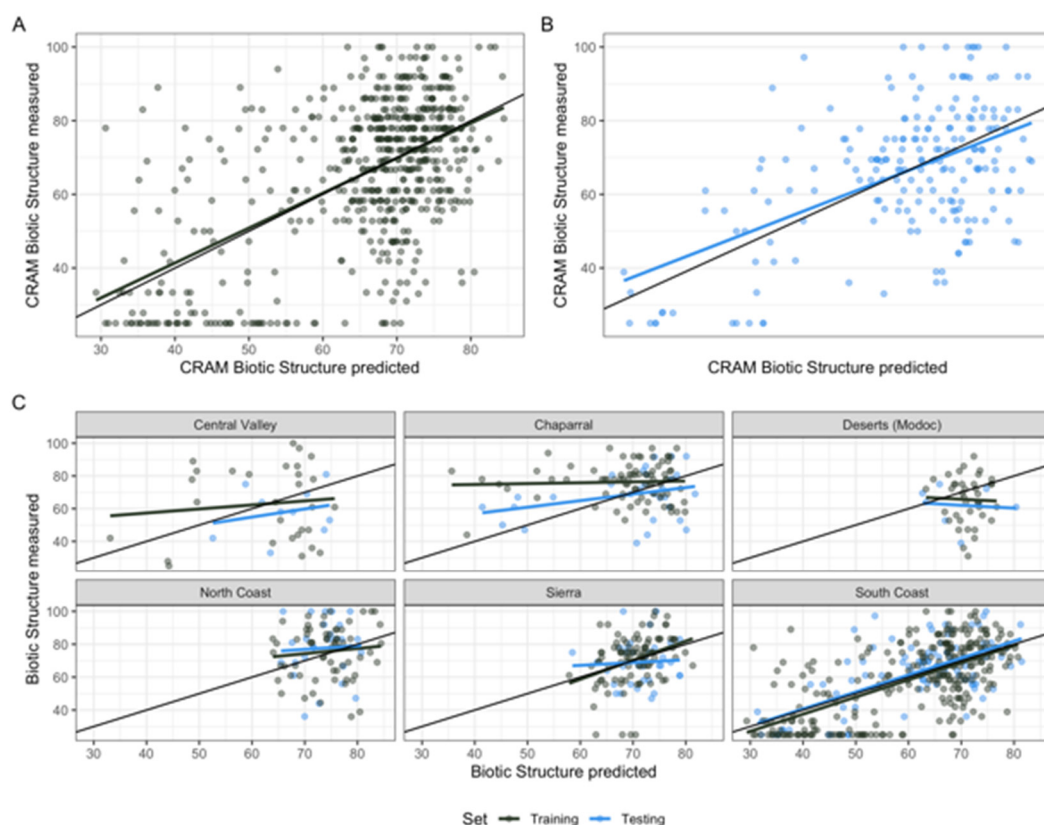

Figure S3. (**A**) Variable importance and (**B**) variable node purity values of the random forest model created for the CSCI index.
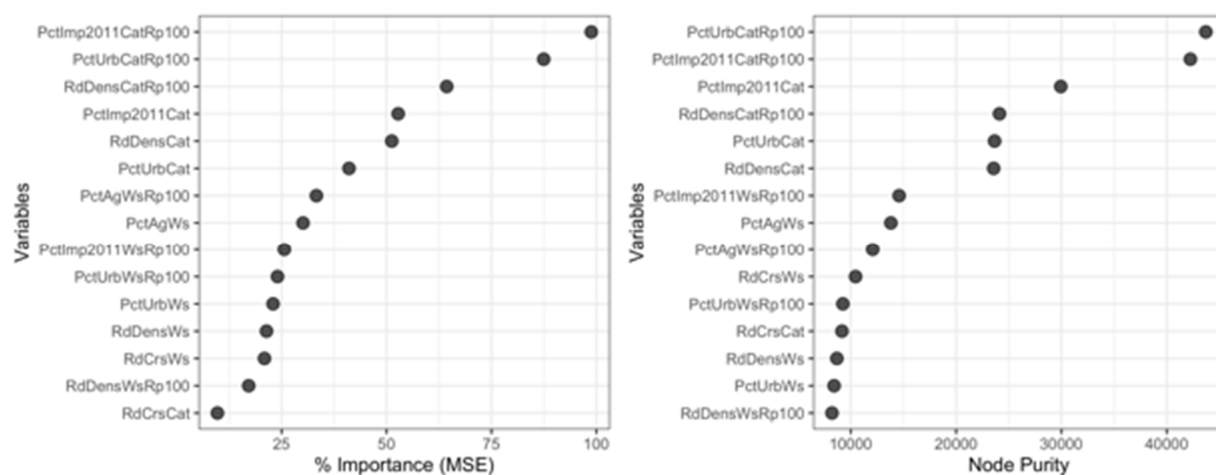
Figure S4. Measured versus predicted CSCI index values for (**A**) the full training dataset (n = 1512), (**B**) the full testing dataset (n = 507), and (**C**) for both datasets paneled by California Perennial Stream Assessment (PSA) region. Linear models are colored according to the dataset plotted, and lines of slope = 1 are overlain in solid black.
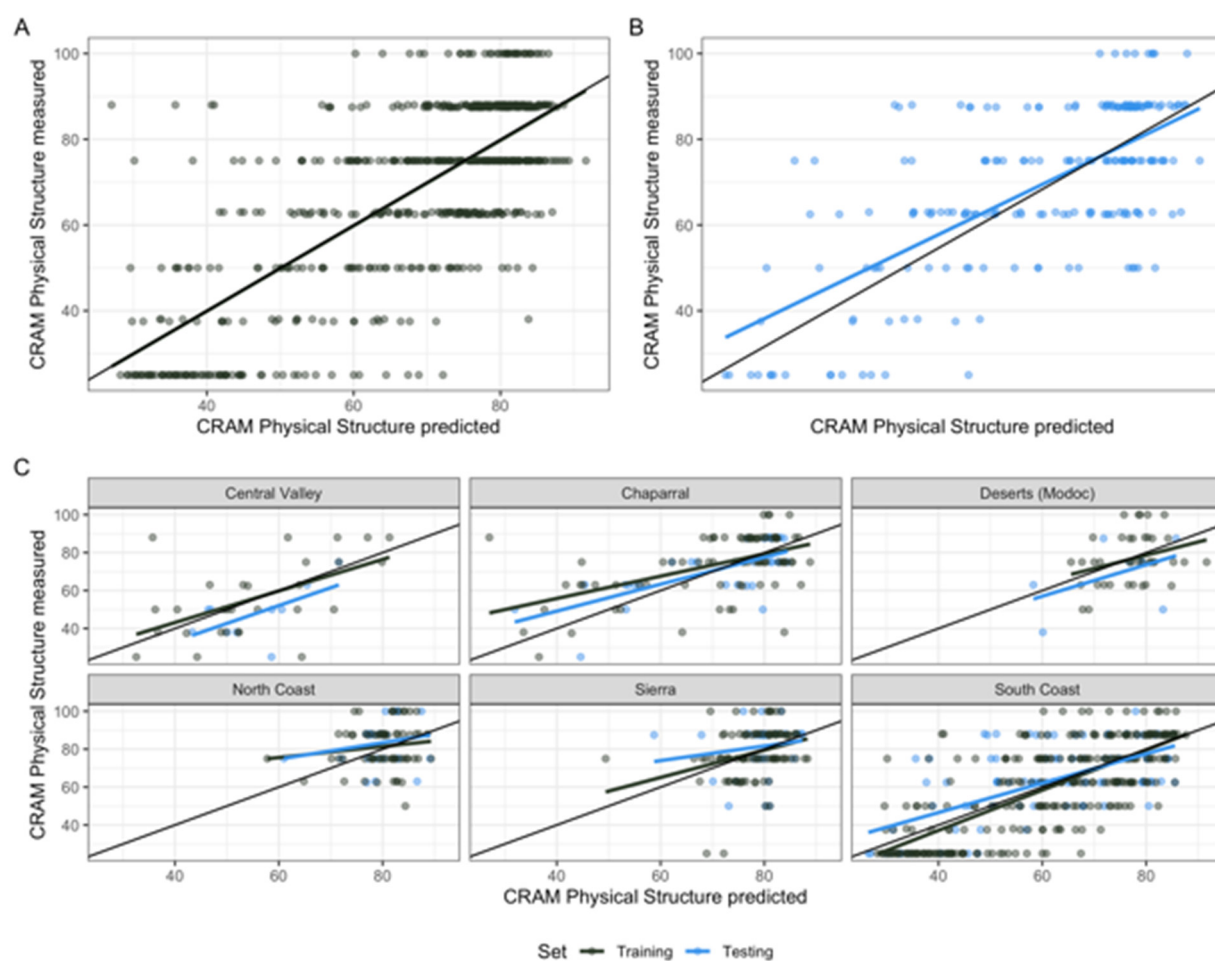

Figure S5. (**A**) Variable importance and (**B**) variable node purity values of the random forest model created for the CRAM biotic structure index.

Figure S6. Measured versus predicted CRAM biotic structure index values for (**A**) the full training dataset (n = 610), (**B**) the full testing dataset (n = 205), and (**C**) for both datasets paneled by California Perennial Stream Assessment (PSA) region. Linear models are colored according to the dataset plotted, and lines of slope = 1 are overlain in solid black.

Figure S7. (**A**) Variable importance and (**B**) variable node purity values of the random forest model created for the CRAM physical structure index.

Figure S8. Measured versus predicted CRAM physical structure index values for (**A**) the full training dataset (n = 610), (**B**) the full testing dataset (n = 205), and (**C**) for both datasets paneled by California Perennial Stream Assessment (PSA) region. Linear models are colored according to the dataset plotted, and lines of slope = 1 are overlain in solid black.

Supplementary 2: Ancillary reports used for the prioritization analysis in the pilot watersheds
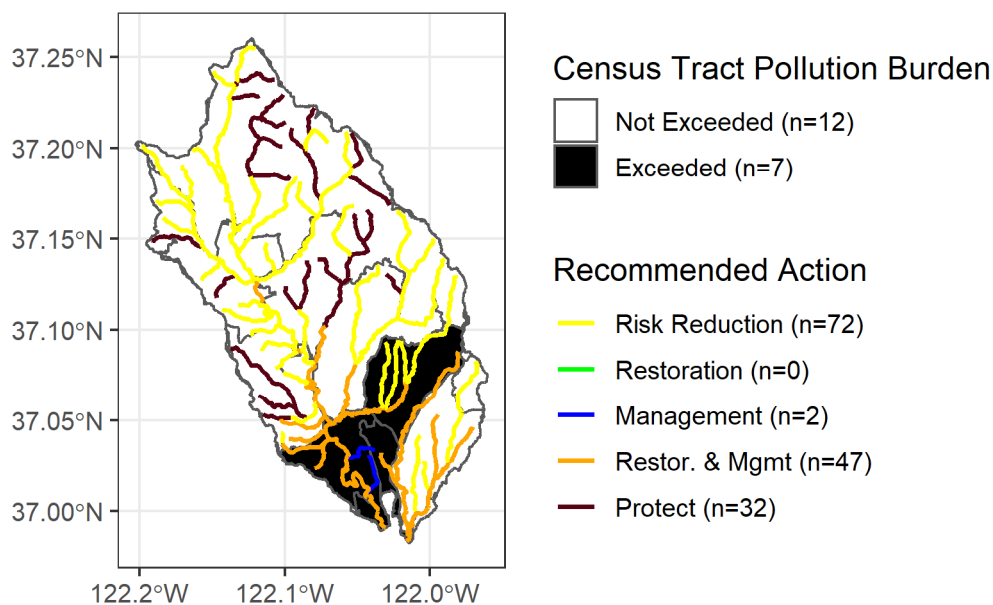
Table S4. Regional conservation plans, habitat conservation plans, and watershed plans were identified with preservation and restoration projects proposed in California. These include Special Area Management Plans (SAMPs) and Mater Plans (both from U.S. Army Corps of Engineers), Natural Community Conservation Plans/Habitat Conservation Plans (NCCPs/HCPs, from the California Department of Fish and Wildlife), and Integrated Regional Water Management Plans (IRWMPs, produced by collaborating regional partner agencies such as municipalities, water districts, wastewater authorities, watershed protection districts, Tribes, and non-governmental organizations). These plans are available online at:.

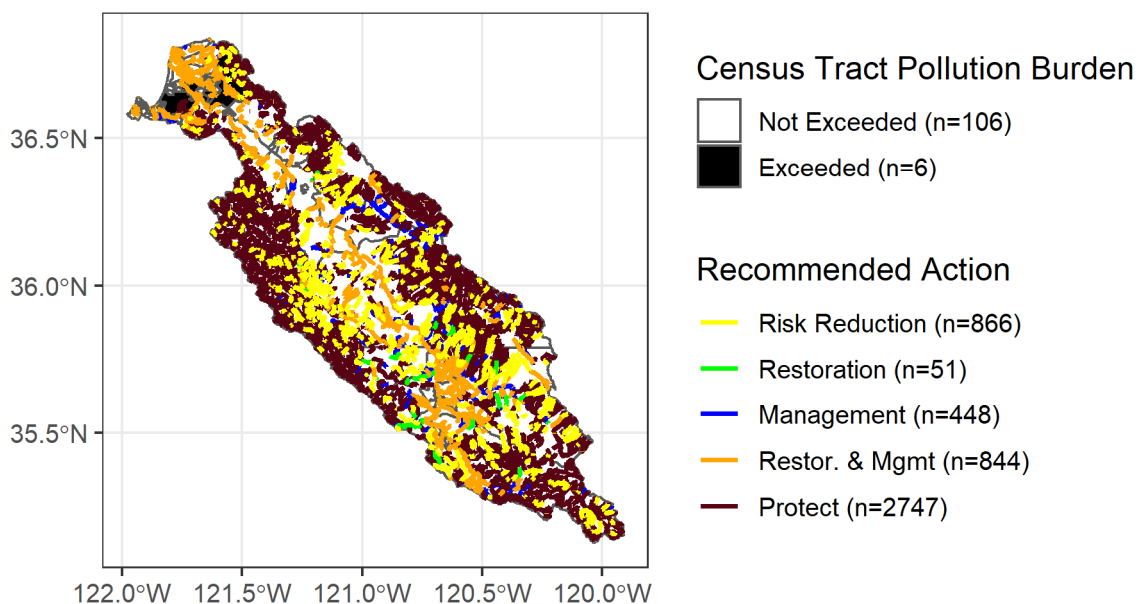| Plan	URL
USACE SAMPs	https://www.spl.usace.army.mil/Missions/Regulatory/SAMP-Permitting-and-Research/SAMP-Documents/ (accessed on 23 March 2022)
USACE Master Plans	https://www.spn.usace.army.mil/Master-Plans/ (accessed on 23 March 2022)
USDA NRCS Conservation Plans	https://www.nrcs.usda.gov/wps/portal/nrcs/main/ca/technical/cp/ (accessed on 23 March 2022)
DFW NCCPs/HCPs	https://wildlife.ca.gov/Conservation/Planning/NCCP/Plans (accessed on 23 March 2022)
Orange County Transportation Authority NCCP/HCP	https://wildlife.ca.gov/Conservation/Planning/NCCP/Plans/OCTA (accessed on 23 March 2022)
IRWMPs	https://water.ca.gov/programs/integrated-regional-water-management (accessed on 23 March 2022)
San Diego River Watershed Management Area Water Quality Improvement Plan	https://projectcleanwater.org/download/san-diego-river-sdr-water-quality-improvement-plan-wqip (accessed on 23 March 2022)
South Orange County Watershed Management Area 2018 Integrated Regional Water Management Plan	https://www.southocirwm.org/ (accessed on 23 March 2022)
Storm Water Resource Plan for the Greater Monterey County Integrated Regional Water Management Region (2019)	http://www.greatermontereyirwmp.org/documents/planning/ (accessed on 23 March 2022)
Integrated Regional Water Management Plan for the Greater Monterey County Region (2018)	http://www.greatermontereyirwmp.org/documents/plan/ (accessed on 23 March 2022)
Salinas Valley Long-term Management Plan (2019)	http://www.salinasrivermanagementprogram.org/ltmp.html (accessed on 23 March 2022)
Salinas Valley Groundwater Basin Eastside Aquifer Subbasin Groundwater Sustainability Plan (2021)	https://svbgsa.org/eastside-subbasin/ (accessed on 23 March 2022)

Supplementary 3: Recommended action and census tract pollution burden for the six test watersheds
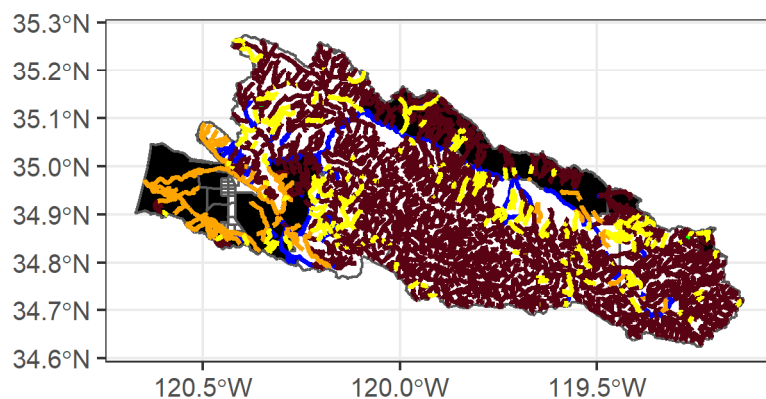
San Lorenzo watershed

Census Tract Pollution Burden
- Not Exceeded (n=12)
- Exceeded (n=7)

Recommended Action
- Risk Reduction (n=72)
- Restoration (n=0)
- Management (n=2)
- Restor. & Mgmt (n=47)
- Protect (n=32)

Salinas River watershed

Census Tract Pollution Burden
- Not Exceeded (n=106)
- Exceeded (n=6)

Recommended Action
- Risk Reduction (n=866)
- Restoration (n=51)
- Management (n=448)
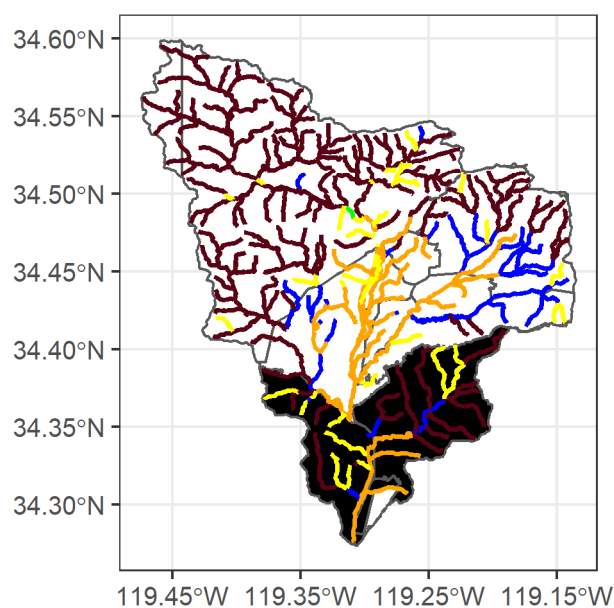- Restor. & Mgmt (n=844)
- Protect (n=2747)

Santa Maria River watershed

Recommended Action
- Risk Reduction (n=311)
- Restoration (n=2)
- Management (n=190)
- Restor. & Mgmt (n=223)
- Protect (n=1979)

Census Tract Pollution Burden
- Not Exceeded (n=28)
- Exceeded (n=10)

Ventura River watershed

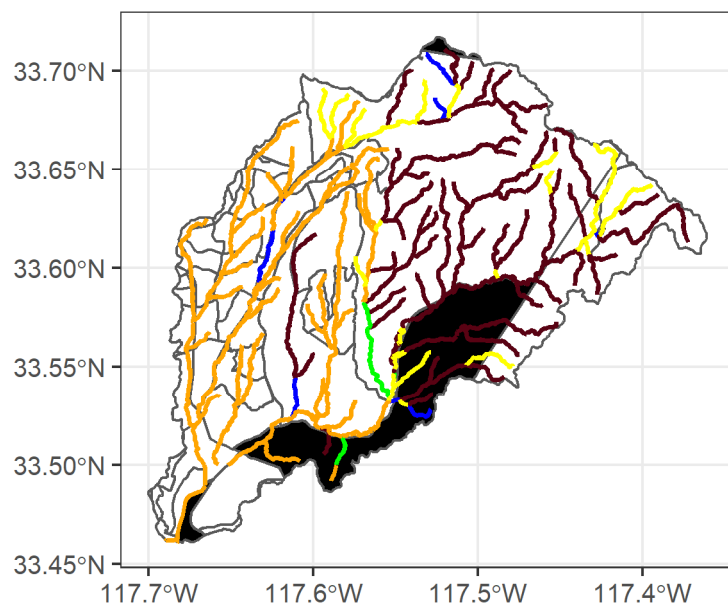Recommended Action
- Risk Reduction (n=54)
- Restoration (n=2)
- Management (n=50)
- Restor. & Mgmt (n=88)
- Protect (n=249)

Census Tract Pollution Burden
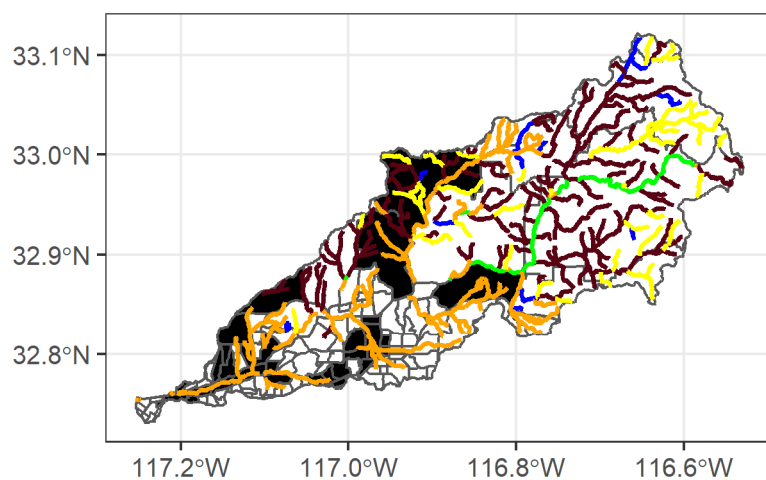- Not Exceeded (n=14)
- Exceeded (n=4)

San Juan Creek watershed

Recommended Action
- Risk Reduction (n=36)
- Restoration (n=5)
- Management (n=8)
- Restor. & Mgmt (n=89)
- Protect (n=98)

Census Tract Pollution Burden
- Not Exceeded (n=57)
- Exceeded (n=3)

San Diego River watershed

Census Tract Pollution Burden
- Not Exceeded (n=116)
- Exceeded (n=33)

Recommended Action
- Risk Reduction (n=68)
- Restoration (n=23)
- Management (n=19)
- Restor. & Mgmt (n=156)
- Protect (n=187)