Integrating surface water, groundwater and landscape stressor data into a regional assessment to support management decision-making

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Our Vision for the Central Coast...

**Healthy Watersheds**

By 2025:

- **Healthy Aquatic Habitat**: 80% of aquatic habitat is healthy; remaining 20% exhibit positive trends in key parameters
- **Proper Land Management**: 80% of land is managed to maintain proper watershed functions; remaining 20% exhibit positive trends in key parameters
- **Clean Groundwater**: 80 percent of ground water is clean, and the remaining 20 percent will exhibit positive trends in key parameters
For 2016 Science Symposium we reported on the Central Coast Aquatic Health Assessment

- Both measured and modeled data
- Site scores are attributed to reaches and travel upstream to next site
- Land Use boundaries define spatial extent of site scoring
- Web geomapping environment
- Drill down for details
Aquatic Life Web Report Card
Aquatic Life Web Report Card

Central Coast Regionwide Watershed Report Card

Color bars represent the percentage of sites in each grade category.

Aquatic Life Grades

Human Health Grades

Grades:
- = A+ Outstanding
- = A Excellent
- = B Good
- = C Fair
- = D Impacted
- = F Severely Impacted

Click now to go to the Central Coast Ambient Monitoring Program home page.
Select a hydrologic unit (or large watershed area)
Select a hydrologic unit (or large watershed area)
Select a water body
Select a waterbody
Select a site

### Aquatic Life Health Grades for Sites - Llagas Creek

<table>
<thead>
<tr>
<th>Site</th>
<th>Site Name</th>
<th>Aquatic Life Grade</th>
<th>Aquatic Life Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>005CT00063</td>
<td>Llagas Creek ~1.5mi below Sycamore Ave</td>
<td>B</td>
<td>84</td>
</tr>
<tr>
<td>005CT0484</td>
<td>Llagas Creek Below Sycamore Avenue</td>
<td>F</td>
<td>42</td>
</tr>
<tr>
<td>005CH</td>
<td>Llagas Creek at Cheesebro Reservoir</td>
<td>B</td>
<td>35</td>
</tr>
<tr>
<td>005HOL</td>
<td>Llagas Creek at Holmclaw below Levesley Rd.</td>
<td>D</td>
<td>35</td>
</tr>
<tr>
<td>005LCS</td>
<td>Llagas Creek at Southside</td>
<td>C</td>
<td>66</td>
</tr>
<tr>
<td>005LFA</td>
<td>Llagas Creek at Levesley Rd.</td>
<td>D</td>
<td>64</td>
</tr>
<tr>
<td>005LCABB</td>
<td>Llagas Creek @ Bloomfield Rd. above bridge</td>
<td>F</td>
<td>50</td>
</tr>
<tr>
<td>005LGCBRC</td>
<td>Llagas Creek above Baldy Ryan Cyn. Cr.</td>
<td>A</td>
<td>90</td>
</tr>
<tr>
<td>005LH</td>
<td>Llagas Creek at Highway 152</td>
<td>D</td>
<td>60</td>
</tr>
<tr>
<td>005LLA</td>
<td>Llagas Creek at Bloomfield Avenue</td>
<td>C</td>
<td>70</td>
</tr>
<tr>
<td>005LAOSP</td>
<td>Llagas Creek-305L:LAOSP</td>
<td>A</td>
<td>94</td>
</tr>
<tr>
<td>005LUC</td>
<td>Llagas Creek at Luchessa Ave-Southside Drive</td>
<td>D</td>
<td>81</td>
</tr>
<tr>
<td>005MAS</td>
<td>Llagas Creek at Massen Avenue</td>
<td>F</td>
<td>70</td>
</tr>
<tr>
<td>005MBN</td>
<td>Llagas Creek at Monterey Rd.</td>
<td>C</td>
<td>70</td>
</tr>
<tr>
<td>005MAD</td>
<td>Llagas Creek below E San Martin Ave.</td>
<td>C</td>
<td>73</td>
</tr>
</tbody>
</table>
Select a site
Data Summary for Llagas Creek at Bloomfield Ave. (305LLA):

**AQUATIC LIFE HEALTH GRADE**

The overall Aquatic Life Health Grade for this site is D.

**The aquatic life health grade for 'Conventional Water Quality' at this site is D.**

8 conventional analytes were sampled at this site. 2935 individual measurements are included in the index score. pH departure and total Ammonia as N scored in 'Very Good' condition.
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8 conventional analytes were sampled at this site. 2935 individual measurements are included in the index score. pH departure and Total Ammonia as N scored in ‘Very Good’ condition. Oxygen, Dissolved Water Temperature, Turbidity, OrthoPhosphate as P, and total Suspended Solids scored in ‘Poor’ condition. Nitrate-Nitrite as N scored in ‘Very Poor’ condition.
Data Summary for Salinas River at Davis Rd. (309DAV):

**AQUATIC LIFE HEALTH GRADE**

The overall Aquatic Life Health Grade for this site is D.

The aquatic life health grade for 'Conventional Water Quality' at this site is D.
8 conventional analytes were sampled at this site. 2935 individual measurements are included in the index score. pH departure and Total Ammonia as N scored in 'Very Good' condition. Dissolved Oxygen, Water Temperature, Turbidity, OrthoPhosphate as P, and Total Suspended Solids scored in 'Poor' condition. Nitrate, Nitrite as N scored in 'Very Poor' condition.

The aquatic life health grade for 'Biostimulatory Risk' at this site is F.
Two biostimulatory risk analytes are modeled from nutrient data and other inputs using the Numeric Nutrient Endpoint Benthic Biomass Tool (Tetratech, 2007). These include benthic algal biomass and oxygen deficit. 5 biostimulatory risk analytes were sampled or modeled for this site. Individual measurements are included in the index score. Algae, floating mats scored in 'Fair' condition. Dissolved oxygen and chlorophyll a scored in 'Poor' condition. Benthic chlorophyll a (NNE) and Oxygen Deficit scored in 'Very Poor' condition.

The aquatic life health grade for 'Metals in Water' at this site is A.
8 metal analytes were sampled in water at this site. Individual measurements are included in the index score. Selenium, Zinc, Lead, Cadmium, Arsenic, and Silver scored in 'Very Good' condition. Copper scored in 'Fair' condition. Aluminum scored in 'Very Poor' condition.

The aquatic life health grade for 'Metals in Sediment' at this site is D.
7 metal analytes were sampled in sediment at this site. Individual measurements are included in the index score. Silver scored in 'Good' condition. Arsenic, Lead, and Mercury scored in 'Fair' condition. Zinc scored in 'Poor' condition. Cadmium and Copper scored in 'Very Poor' condition.

The aquatic life health grade for 'Water Toxicity' at this site is D.
5 toxicity analytes were sampled in water at this site. 30 individual measurements are included in the index score. Fish Growth, Fish Survival, Invertebrate Reproduction in water, and Invertebrate Survival in water scored in 'Very Good' condition. Algae cell growth scored in 'Poor' condition.

The aquatic life health grade for 'Sediment Toxicity' at this site is D.
One toxicity analyte was sampled in sediment at this site. 10 individual measurements are included in the index score. Invertebrate Survival in sediment scored in 'Poor' condition.
We are adding groundwater and land management assessments to our Healthy Watersheds Report Card.
Nitrate is a serious problem in ground and surface water in the Central Coast Region
Nitrate scores in surface water in the northern Region

Aquatic Life threshold = 1 mg/L

Human Health threshold = 10 mg/L
5-Year Moving Averages: N-Fertilizer Sales in Monterey County
with overlay of all NO3 Concentration Data in Streams in Salinas River Basin

Fertilizer Sales Data Source: Calif. Dept. of Food and Agriculture
Nitrate groundwater contamination is also widespread, particularly in agricultural areas.
This creates an environmental justice issue for many small agricultural communities in the Salinas and Santa Maria valleys.
Initial groundwater data evaluation

- Groundwater wells in Geotracker/GAMA are assigned to groundwater basin and sub-basin where available.
- Many wells fall outside Bulletin 118 groundwater basins.
- Geospatial joining of well locations to surface water areas, including HUC12s and NHDPlus catchments.
- Mean average for well data assigned to sub-basins, HUCs and catchments.
- Initial scoring approach:

  Example for nitrate-N, drinking water threshold = 10 mg/L:

<table>
<thead>
<tr>
<th>Concentration Range</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;0 &lt; 1.0 mg/L</td>
<td>Green</td>
</tr>
<tr>
<td>&gt;1 &lt; 2.5 mg/L</td>
<td>Yellow</td>
</tr>
<tr>
<td>&gt;2.5 &lt; 5 mg/L</td>
<td>Orange</td>
</tr>
<tr>
<td>&gt;5 &lt; 10 mg/L</td>
<td>Red</td>
</tr>
<tr>
<td>&gt;10 mg/L</td>
<td>Red</td>
</tr>
</tbody>
</table>
Groundwater data challenges

From Initial evaluation of GAMA/Geotracker data

- Data Quality
  - Minimal QA documentation
  - Quality control concerns
  - Zeroes and missing MDLs/RLs

- Well IDs
  - Multiple well names at same location
  - Absence of well naming conventions
  - Data collection sources not explicit
Deciding on spatial scale for a Central Coast groundwater assessment
California’s Groundwater Basin definitions come from DWR Bulletin 118
Groundwater sub-basins, scored for nitrate-N as an average
Groundwater Basin size is highly variable
Surface water HUC 12s cover the entire landscape and are often smaller than groundwater basins.
NHDPlus Catchments are typically even smaller

(pretty graphic from California Integrated Assessment of Watershed Health (2013))
Integrating surface and groundwater water assessments
Landscape stressors

Baseline “Stressor” information is collected from multiple sources at multiple scales

- California Healthy Watersheds Assessment
- US E.P.A Recovery Potential
- Pesticide Use
- Irrigation and nitrogen application practices
- NHDPlus Catchment
- HUC 12
- T-S-R
- Ranch
California Healthy Watersheds Assessment provides a number of data layers at a relatively high resolution.
Ag Index

Statewide measures

- % Cultivated Crops in HCZ  RPS  HUC12
- % Cropland on >10% Slope  RPS  HUC12
- Synthetic N Fertilizer Application in WS  RPS  HUC12
- Agricultural Land Cover  CHWA  Catchment
- Percent Irrigated area (WS)  CHWA  Catchment
- Percent Irrigated Area (Catchment)  CHWA  Catchment

Regional measures of land management (to be added)

- Pesticide Use  DPR PUR  T-S-R
- Total Nitrogen Applied  Ag Order Ranch
- Total Nitrogen Residual  Ag Order Ranch
- Acres of Drip Irrigation  Ag Order Ranch
- Wetland treatment systems (linear feet)  BMP Tracker
- Etc.
Urban Index

Statewide measures

- % Urban in Hydrologically Connected Zone  RPS  HUC 12
- % Developed, High Intensity in Watershed  RPS  HUC 12
- % HUC 12 with >5% Impervious Cover  RPS  HUC 12
- Population Density (Watershed)  CHWA  HUC 12
- Population Density (Catchment)  CHWA  HUC 12

Potential regional measures of land management (to be added)

- LID acreage treated
- Volume of stormwater retention basins
- Etc.
General Human Stress Index

- % Human Uses, including bare ground (watershed)
- % High Intensity Land Cover in Riparian Zone
- Soil Erodibility, Mean in Hydrologically Connected Zone
- Dam Storage Ratio
- Natural Land Cover (Catchment)
- Natural Land Cover (Riparian area)
- Road Crossing Density (Watershed)
- Road Density (Catchment)

Potential Regional Measures of Land Management (to be added):

- Water diversions
- Fish barriers
- Miles of Road Treatment
- Wetland acreage protected/restored
- % of cleanup sites closed
- Etc.
This is a work in progress

- Add additional groundwater data from Geotracker
- Assess groundwater sites for change analysis
- Apply surface water scoring approach to groundwater wells
- Assess % of groundwater basins that are healthy
- Update Healthy Watersheds website to incorporate groundwater and land stressor and management data
The Central Coast Healthy Watersheds Report Card puts SWAMP data, Geotracker/GAMA data and other data sources together in a user friendly environment to support decision-making.
Spare parts