Guide to using the GIS Maps Assembled for Populations in the SONCC Coho Salmon ESU

NMFS created GIS (Geographic Information System) maps using the instream monitoring and landscape data compiled for each population. These maps are included as an Electronic Appendix H to the SONCC coho salmon recovery plan on the NMFS website in Adobe Acrobat (PDF) format and are designed to be used as electronic documents, not printed. The many layers in the maps can be toggled on/off and users can zoom in to see more detail. There are two PDF maps included for each population. The main set of maps contains the stress and threats data, in addition to base layers such as coho IP and streams, and was completed in May 2010. The second set of maps was completed in December 2009 and includes canopy change over various time periods and tree size. Due to the large number of layers in the maps, full legends could not be included within the individual maps; therefore, a separate legend PDF is provided for each of the two map types. These maps were used to analyze and interpret habitat condition across the landscape

This guide provides instructions for how to use the GIS maps that were assembled for the SONCC coho salmon recovery plans. It has two sections:

Section 1: How to view GIS map layers in a PDF document

Section 2: Legend for the Indicator and Source of Stress (Threat) Maps

Section 1: How to view GIS map layers in a PDF document

The current versions of ESRI's ArcMap program (9.2 and later) allow the export of GIS layers, a legend, a North Arrow and a scale bar to an Acrobat document. To view these Adobe pdf documents with map layers you need the free Adobe Reader version 8.1 or higher. The Adobe Reader program can be downloaded from http://www.adobe.com/.

An example of a PDF map in Adobe Reader 9.1 is shown below.

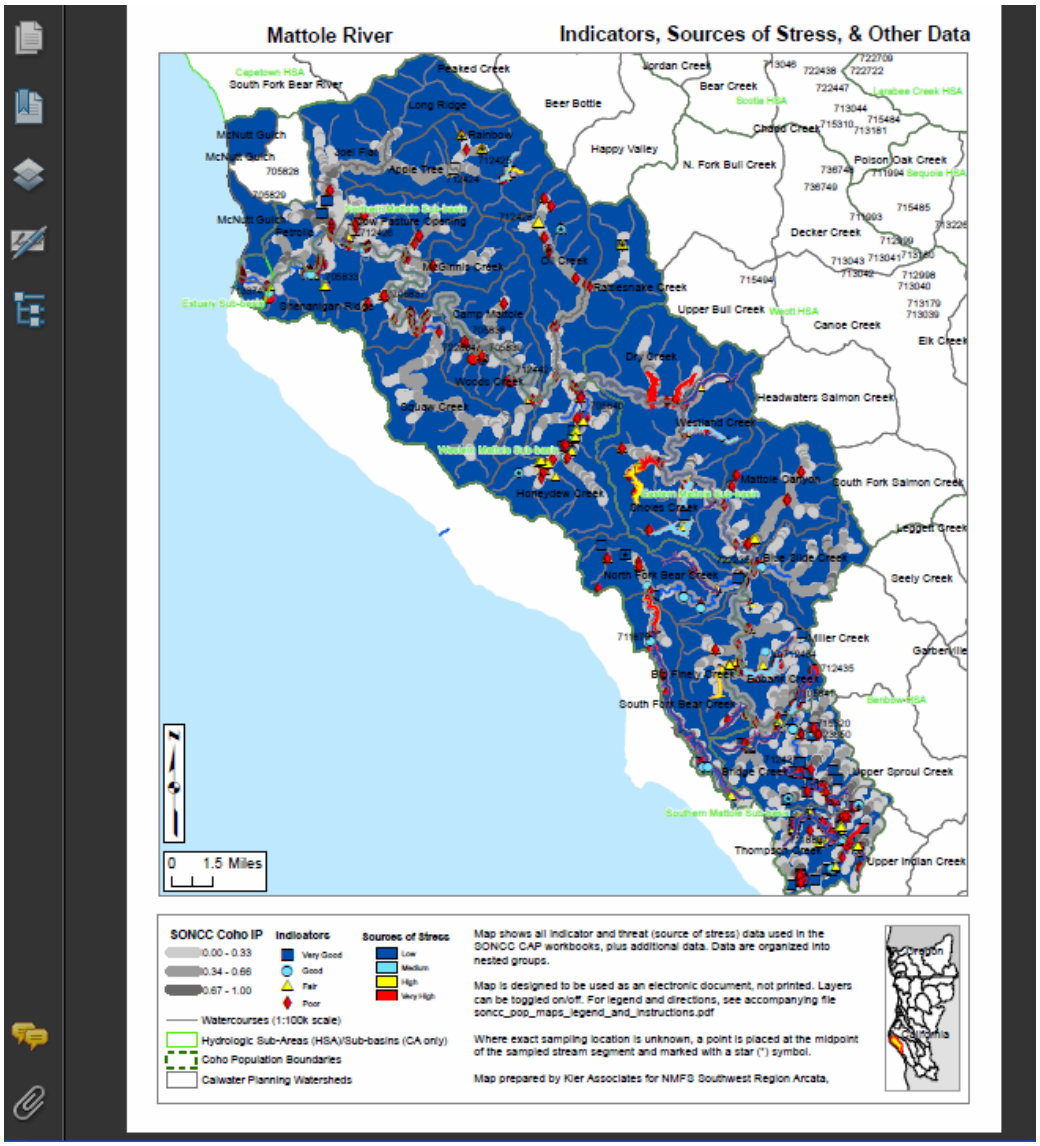


Figure 1. Initial view of a pdf map document.

A click on will open the layers table contents and show the layers available. Initially an abbreviated outline is shown.

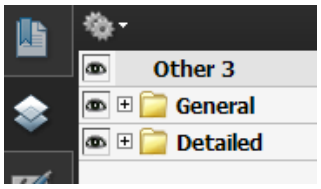


Figure 2. Initial Legend after opening the map pdf.

Click the + symbol next to a layer group to *expand* the group and see all layers. Another click of + will "collapse" the group back to one legend line.

Click the eye symbol next to a layer or a group of layers *toggle the visibility on or off.*

Layers that are highest in the legend are displayed above layers lower in the legend. To see a layer displayed all by itself click off all layers above and below. To view a layer displayed together with another layer click on both layers and click off all other layers.

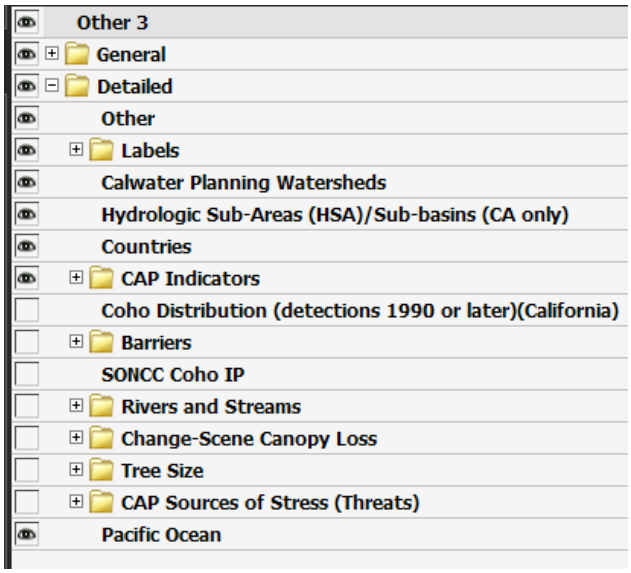


Figure 3. Legend after making all groups below CAP Indicators invisible.

To only view the CAP Indicators group of layers, click off the groups and layers below CAP indicators. Groups and layers above the CAP indicators are lines and don't need to be made invisible. However they can be made invisible if the viewer wants to see a simpler display.

To review the indicator layer Aquatic Invertebrates (B-IBI NorCal):
1. expand the CAP Indicators group by clicking the + in front of CAP Indicators.
2. click off the eyes in front of the all the layers in the CAP Indicators group, excep for the Aquatic Invertebrates (B-IBI NorCal).

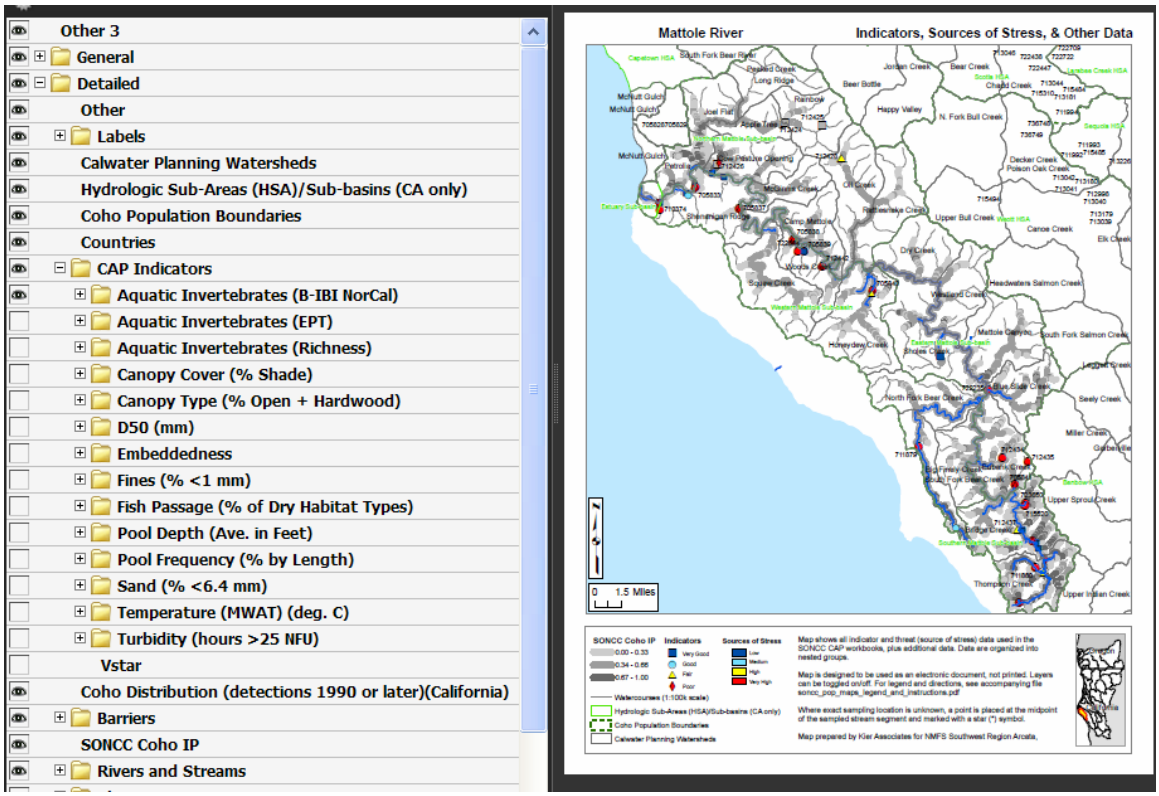


Figure 4. Display after expanding CAP Indicators and leaving only Aquatic .. visible.

The Coho Population Boundaries layer does not need to be clicked off because it consists of lines.

To view the Temperature (MWAT) layer, click off the Aquatic layer and click on the Temperature layer:

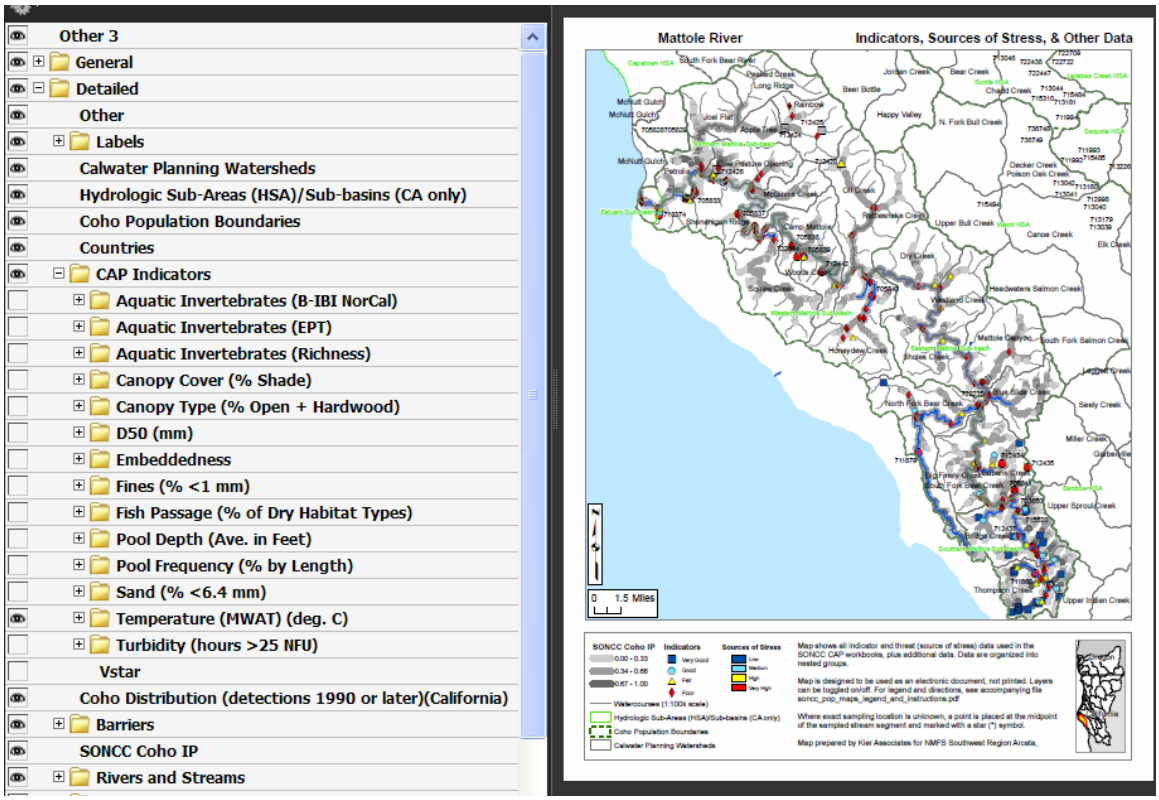


Figure 5. Display after leaving only Temperature .. visible.

To view a CAP Sources of Stress layer, say Roads Density:
1. make the CAP Indicators group invisible (and optionally click the + to “collapse” the group to one line in the legend);
2. expand the CAP Sources of Stress by clicking on the +
3. make the group visible by clicking on the eye
4. click off, by clicking the eye, of all layers in the group except for Roads.

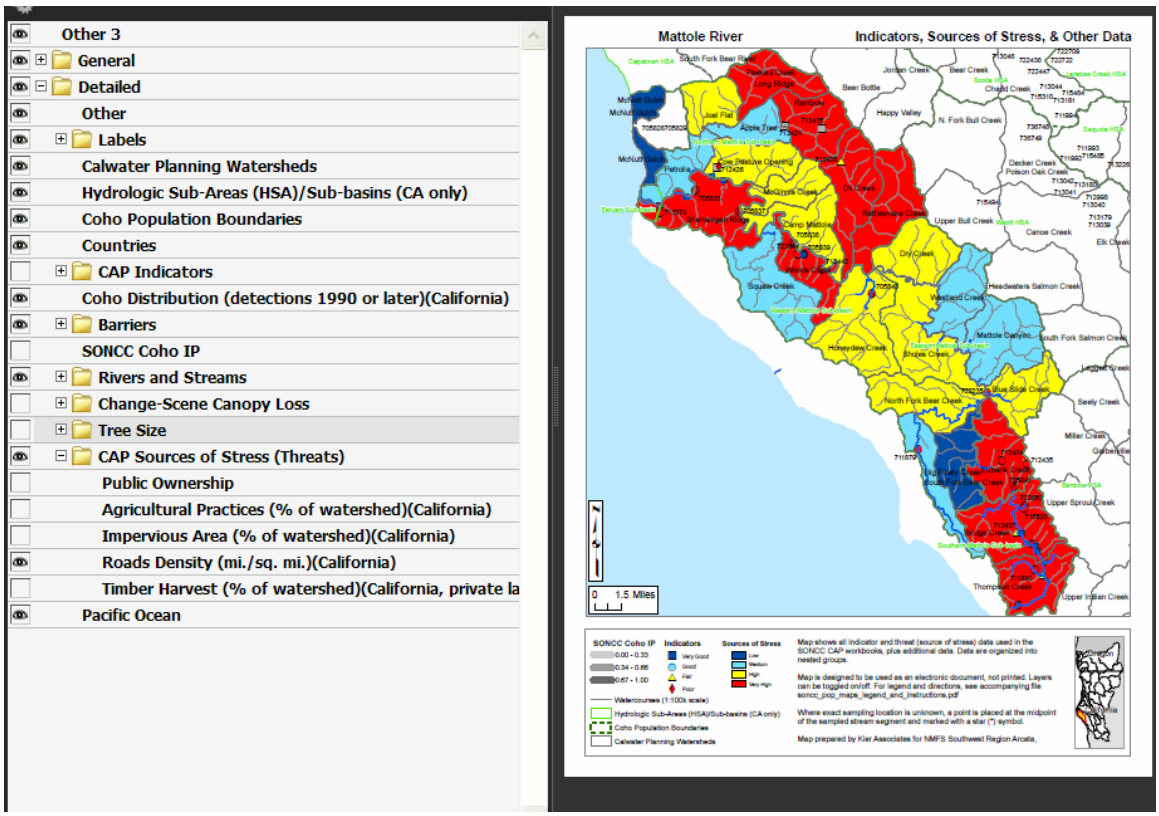
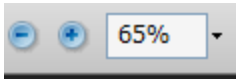


Figure 6. Display after making CAP Sources .. the only visible group and leaving Roads .. the only visible layer in the group.

The width of the layer Table of Contents can be changed by dragging the vertical line separating the TOC and the map image. Move the cursor slowly from the TOC to the map in a horizontal movement until the cursor changes into a division <-||-> symbol. Drag the sidepanel to the right to make it wider or to the left to make it narrower.

The Coho Population Boundaries polygons are labeled with the name of each population. To view these labels close up zoom in with the + button or select 200% by clicking the small arrow next to the zoom percentage box.



Click on the button to see the entire map on one screen.

Section 2: Legend for the Indicator and Source of Stress (Threat) Maps

Aquatic Invertebrates (B-IBI NorCal)

- Very Good (80-100)
- Good (60-80)
- Fair (40-60)
- Poor (0-40)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Aquatic Invertebrates (EPT)

- Very Good (>=23.0)
- Good (18.0-23.0)
- Fair (12.1-17.9)
- Poor (<=12.0)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Aquatic Invertebrates (Richness)

- Very Good (>40)
- Good (30-40)
- Fair (35-30)
- Poor (<25)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Canopy Cover (% Shade)[1]

- Very Good (80.01 - 100.00)
- Good (70.01 - 80.00)
- Fair (60.01 - 70.00)
- Poor (0.00 - 60.00)

Canopy Cover (% Shade)[2]

- Very Good (80.01-100.00)
- Good (70.01-80.00)
- Fair (60.01-70.00)
- Poor 0.01-60.00)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2] From surveys of short (~20x bankfull width) reaches.

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment, with a star symbol (*) inside the marker.

Canopy Type (% Open + Hardwood)[1]

- Very Good (0.00 - 20.00)
- Good (20.01 - 30.00)
- Fair (30.01 - 40.00)
- Poor (40.01 - 100.00)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

D.O. (COLD) (mg/l 7-DAMin)

- Very Good (>7.0)
- Good (6.75 - 7.0)
- Fair (6.0 - 6.75)
- Poor (<6.0)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

D50 (mm)

- Very Good (60-95)
- Good (50-60 or 95-110)
- Fair (38-50 or 110-128)
- Poor (<38 or >128)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Embeddedness[1]

- Very Good (0.00 - 25.00)
- Good (25.01 - 30.00)
- Fair (30.01 - 45.00)
- Poor (45.01 - 100.00)

Embeddedness[2]

- Very Good (0.00-25.00)
- Good (25.01-30.00)
- Fair (30.01-45.00)
- Poor (45.01-100.00)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2] From surveys of short (~20x bankfull width) reaches.

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment, with a star symbol (*) inside the marker.

Fines (% <1 mm)

- Very Good (<12 wet, <8.9 dry)
- Good (12-15 wet, 8.9-11 dry)
- Fair (15-17 wet, 11.1-12.6 dry)
- Poor (>17 dry, >12.6 wet)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

There have been two methods used for processing fines/sand samples in SONCC watersheds: wet and dry. Wet is the more commonly used method. Data shown here may be from either method.

Fish Passage (% of Dry Habitat Types)[1]

- Very Good (0)
- Good (0.01-1.00)
- Fair (1.00-5.00)
- Poor (>5.00)

5-Counties Fish Barriers[2]

- Removal Completed
- Not Yet Removed

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2]Barriers are labeled according to their priority rank (1=highest) among surveyed barriers on all county-maintained roads in the 5-County area (Mendocino, Humboldt, Del Norte, Trinity, Siskiyou). Data are from Trinity County Planning Department. Data are frequently updated; this is the 6/12/2008 version.

Floodplain Connectivity (USFS judgment)

- Very Good (Fully Functional)
- Fair (Partially Functional)
- Poor (Non-Functional)

Flow Restoration Needs (ODFW judgment)

- Very Good (1)
- Good (2)
- Fair (3)
- Poor (4)

pH (Annual Maximum)

- Very Good (<8.25)
- Good (8.25-8.5)
- Fair (8.5-8.75)
- Poor (>8.75)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Pool Depth (Ave. in Feet)[1]

- Very Good (>3.30)
- Good (3.01 - 3.30)
- Fair (2.01 - 3.00)
- Poor (<2.00)

Pool Depth (Ave. in Feet)[2]

- Very Good (>3.30)
- Good (3.01-3.30)
- Fair (2.01-3.00)
- Poor (<2.00)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2] From surveys of short (~20x bankfull width) reaches.

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment, with a star symbol (*) inside the marker.

Pool Frequency (% by Area)[1]

- Very Good (>35)
- Good (20-35)
- Fair (10-20)
- Poor(<10)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

Pool Frequency (% by Length)[1]

- Very Good (>50)
- Good (40-50)
- Fair (35-40)
- Poor (<35)

Pool Frequency (% by Length)[2]

- Very Good (>50)
- Good (40-50)
- Fair (35-40)
- Poor (<35)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2] From surveys of short (~20x bankfull width) reaches.

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment, with a star symbol (*) inside the marker.

Riparian Condition (conifers >36" dbh / 1000ft)[1]

- Very Good (>200)
- Good (125-200)
- Fair (75-125)
- Poor (<75)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

Sand (% <6.4 mm)

- Very Good (<15 wet, <12.9 dry)
- Good (15-25 wet, 12.9-21.5 dry)
- Fair (25-35 wet, 21.5-25.8 dry)
- Poor (>30 dry, >25.8 wet)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

There have been two methods used for processing fines/sand samples in SONCC watersheds: wet and dry. Wet is the more commonly used method. Data shown here may be from either method.

Silt/Sand Surface (% riffle area)[1]

- Very Good (<12)
- Good (12-15)
- Fair (15-17)
- Poor (>17)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

Stream Corridor Vegetation (USFS judgment)

- Very Good (Fully Functional)
- Fair (Partially Functional)
- Poor (Non-Functional)

Temperature (MWAT) (deg. C)

- Very Good (<15)
- Good (15-16)
- Fair (16.1-17)
- Poor (>17)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Temperature (MWMT) (deg. C)

- Very Good (<16)
- Good (16-17)
- Fair (17-18.3)
- Poor (>18.3)

Turbidity (hours >25 NFU)

- Very Good (<120)
- Good (120-360)
- Fair (360.1-720)
- Poor (>720)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Vstar

- Very Good (<0.15)
- Good (0.15-0.21)
- Fair (0.21-0.25)
- Poor (>0.25)

Where exact sampling location is unknown, a point is placed at the midpoint of the sampled stream segment and marked with a star (*) symbol.

Water Quantity/Flow Regime (USFS judgment)

- Very Good (Fully Functional)
- Fair (Partially Functional)
- Poor (Non-Functional)

Wood Frequency USFS (score by stream width)[1]

- Very Good (>3.5)
- Good (2.5-3.5)
- Fair (1.5-2.5)
- Poor (<1.5)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

Wood Frequency ODFW (key pieces/mile)[1]

- Very Good (>3)
- Good (2-3)
- Fair (1-2)
- Poor (<1)

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

Fish Passage (% of Dry Habitat Types)[1]

- Very Good (0)
- Good (0.01-1.00)
- Fair (1.00-5.00)
- Poor (>5.00)

5-Counties Fish Barriers[2]

- Removal Completed
- Not Yet Removed

[1] From habitat typing surveys, aggregated to the reach level. The downstream end of each reach is marked by a perpendicular thin black line.

[2]Barriers are labeled according to their priority rank (1=highest) among surveyed barriers on all county-maintained roads in the 5-County area (Mendocino, Humboldt, Del Norte, Trinity, Siskiyou). Data are from Trinity County Planning Department. Data are frequently updated; this is the 6/12/2008 version.

Coho Monitoring (Green Diamond)

- Out-Migrant Trap Site
- Population Estimate Down Stream
- Population Estimate Up Stream

Coho Distribution (Oregon)

- Migration only
- Rearing and migration
- Spawning and rearing

The Coho distribution GIS layer for Oregon was obtained from ftp://ftp.streamnet.org/pub/streamnet/gisdata/FishDist100k_Feb2009/Fish_sp0298_CohoSalmon.zip

Meta information was obtained from ftp://ftp.streamnet.org/pub/streamnet/gisdata/FishDist100k_Feb2009/Fish_sp0298_CohoSalmon.xml

barriers

- Dam
- Road crossing/Culvert
- Tidegate
- Unknown

The PAD Online Review Tool is accessible under the Calfish website at: http://eris.dfg.ca.gov/padreview PADMethodology_May2009.pdf provides background information.

The PAD and the Oregon Fish Passage Barriers database are ongoing map-based inventories of known and potential barriers to anadromous fish in California and Oregon.

National Marine Fisheries Service
Southwest Region - Arcata
October 15, 2009

- Change-Scene Canopy Loss
  - Change-Scene Canopy Loss 1994-2007 All Causes (% of watershed)(California)
    - ChangeAll_CA9407
    - Low (0 - 10%)
    - Medium (10 - 25%)
    - High (25 - 35%)
    - Very High (>35%)
  - Change-Scene Canopy Loss 1977-2002 All Causes (% of watershed)(Oregon)
    - ChangeAll_OR7702
    - Low (0 - 10%)
    - Medium (10 - 25%)
    - High (25 - 35%)
    - Very High (>35%)
  - Change-Scene Canopy Loss 1977-2002 Fire (% of watershed)(Oregon)
    - ChangeFire_OR7702
    - Low (0 - 10%)
    - Medium (10 - 25%)
    - High (25 - 35%)
    - Very High (>35%)
  - Change-Scene Canopy Loss 1977-2002 Timber Harvest (% of watershed)(Oregon)
    - ChangeTHP_OR7702
    - Low (0 - 10%)
    - Medium (10 - 25%)
    - High (25 - 35%)
    - Very High (>35%)

- Tree Size
  - Trees >20" DBH 1996 (% of watershed)(California)
    - mediumlarge_trees
      - 0-10%
      - 10-20%
      - 20-30%
      - >30%
  - Trees >30" DBH 1996 (% of watershed)(California)
    - large_trees
      - 0-10%
      - 10-20%
      - 20-30%
      - >30%
  - Trees >20" DBH 1996 (% of watershed)(Oregon)
    - mediumlarge_trees
      - 0-10%
      - 10-20%
      - 20-30%
      - >30%
  - Trees >30" DBH 1996 (% of watershed)(Oregon)
    - large_trees
      - 0-10%
      - 10-20%
      - 20-30%
      - >30%

Public Ownership

Type

Federal; State

Agricultural Practices

Low (0 - 2%)

Medium (2 - 5%)

High (5 - 10%)

Very High (>10%)

This map presents a summary of agricultural practices, based on a national dataset from the Multi-Resolution Land Characteristics (MRLC) Consortium (Homer et al., 2004), largely derived from 2001 Landsat imagery. Watersheds are color-coded according to the percent of each watershed that is composed of two land use categories: Pasture/Hay and Cultivated Crops. The Grassland/Herbaceous category was not used, as there is no way to know whether such lands are grazed. Calwater Planning Watersheds are shown in California, and 6th field HUCs are shown in Oregon.

Impervious Area (% of watershed)

Low (0 - 5%)

Medium (5 - 10%)

High (10 - 25%)

Very High (>25%)

This map presents a summary of watershed imperviousness,based on a national dataset from the Multi-Resolution Land Characteristics (MRLC) Consortium (Homer et al., 2004), largely derived from 2001 Landsat imagery. Watersheds are color-coded according to their mean imperviousness Calwater Planning Watersheds are shown in California, and 6th field HUCs are shown in Oregon.

Roads Density (mi./sq. mi.)

- Low (0 - 1.6)
- Medium (1.6 - 2.5)
- High (2.5 - 3.0)
- Very High (>3)

Watersheds in this map are color-coded according to average road density. In California, data are disaplayed as Calwater Planning Watersheds, using road data from the Cal-Fire Forest Practices GIS for coastal areas and Legacy-The Landscape Connection for inland areas. In Oregon, data are displayed as 6th field HUCs, using road data from the Southwestern Oregon Province (SWOP).

Timber Harvest

- Low (0 - 10%)
- Medium (10 - 25%)
- High (25 - 35%)
- Very High (>35%)

This map presents a summary of timber harvest data. In California, each Calwater Planning Watershed is color-coded by the percent of watershed harvested; data are from CalFire's Forest Practices GIS. In Oregon, each 6th field HUC is color-coded by the percent of watershed harvested; data are from Bredensteiner et al. (2003) comparision of 1972-1992 Landsat imagery.

Note for California watersheds:
Timber harvests on public lands (e.g., USFS or BLM), as well as harvesting conducted as part of Non-Industrial Timber Management Plans (NTMP), are not included.