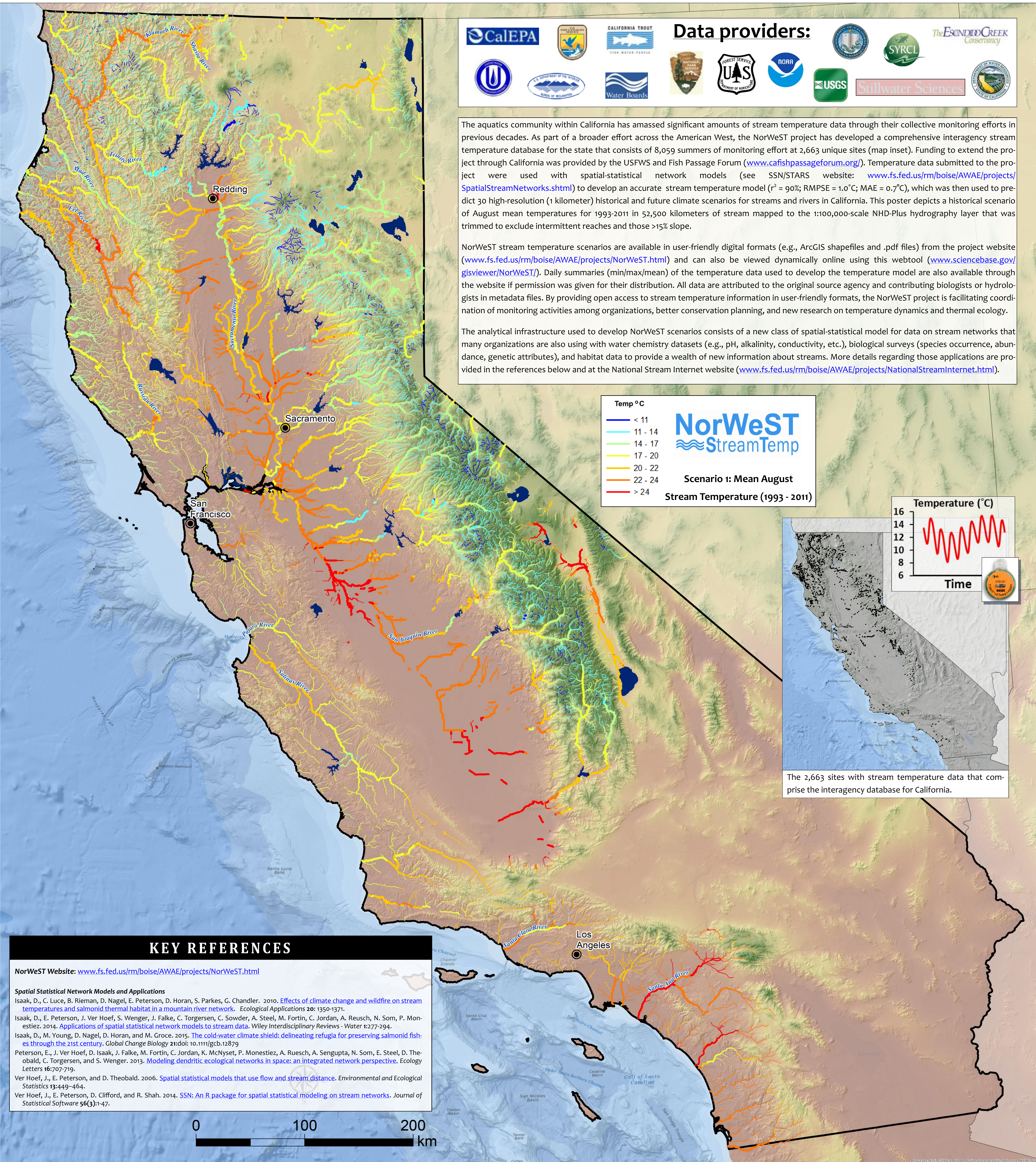


# A Thermal Map for California Rivers & Streams



**Data providers:**

The aquatic community within California has amassed significant amounts of stream temperature data through their collective monitoring efforts in previous decades. As part of a broader effort across the American West, the NorWeST project has developed a comprehensive interagency stream temperature database for the state that consists of 8,059 summers of monitoring effort at 2,663 unique sites (map inset). Funding to extend the project through California was provided by the USFWS and Fish Passage Forum ([www.cafishpassageforum.org/](http://www.cafishpassageforum.org/)). Temperature data submitted to the project were used with spatial-statistical network models (see SSN/STARS website: [www.fs.fed.us/rm/boise/AWAE/projects/SpatialStreamNetworks.shtml](http://www.fs.fed.us/rm/boise/AWAE/projects/SpatialStreamNetworks.shtml)) to develop an accurate stream temperature model ( $r^2 = 90\%$ ; RMPSE =  $1.0^\circ\text{C}$ ; MAE =  $0.7^\circ\text{C}$ ), which was then used to predict 30 high-resolution (1 kilometer) historical and future climate scenarios for streams and rivers in California. This poster depicts a historical scenario of August mean temperatures for 1993-2011 in 52,500 kilometers of stream mapped to the 1:100,000-scale NHD-Plus hydrography layer that was trimmed to exclude intermittent reaches and those >15% slope.

NorWeST stream temperature scenarios are available in user-friendly digital formats (e.g., ArcGIS shapefiles and .pdf files) from the project website ([www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html](http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html)) and can also be viewed dynamically online using this webtool ([www.sciencebase.gov/gisviewer/NorWeST/](http://www.sciencebase.gov/gisviewer/NorWeST/)). Daily summaries (min/max/mean) of the temperature data used to develop the temperature model are also available through the website if permission was given for their distribution. All data are attributed to the original source agency and contributing biologists or hydrologists in metadata files. By providing open access to stream temperature information in user-friendly formats, the NorWeST project is facilitating coordination of monitoring activities among organizations, better conservation planning, and new research on temperature dynamics and thermal ecology.

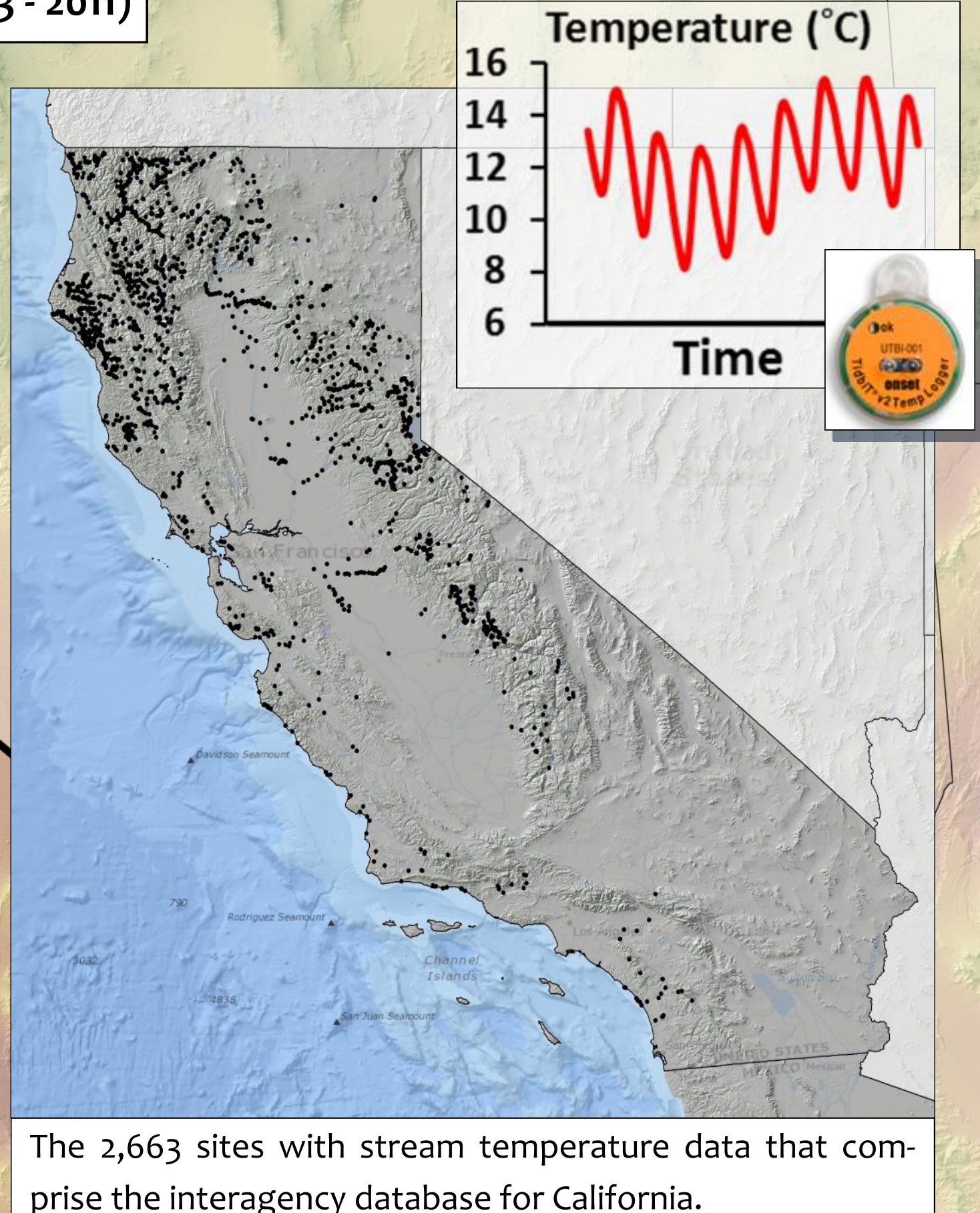
The analytical infrastructure used to develop NorWeST scenarios consists of a new class of spatial-statistical model for data on stream networks that many organizations are also using with water chemistry datasets (e.g., pH, alkalinity, conductivity, etc.), biological surveys (species occurrence, abundance, genetic attributes), and habitat data to provide a wealth of new information about streams. More details regarding those applications are provided in the references below and at the National Stream Internet website ([www.fs.fed.us/rm/boise/AWAE/projects/NationalStreamInternet.html](http://www.fs.fed.us/rm/boise/AWAE/projects/NationalStreamInternet.html)).

**Temp °C**

- < 11
- 11 - 14
- 14 - 17
- 17 - 20
- 20 - 22
- 22 - 24
- > 24

**NorWeST StreamTemp**

**Scenario 1: Mean August**  
Stream Temperature (1993 - 2011)



**KEY REFERENCES**

NorWeST Website: [www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html](http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html)

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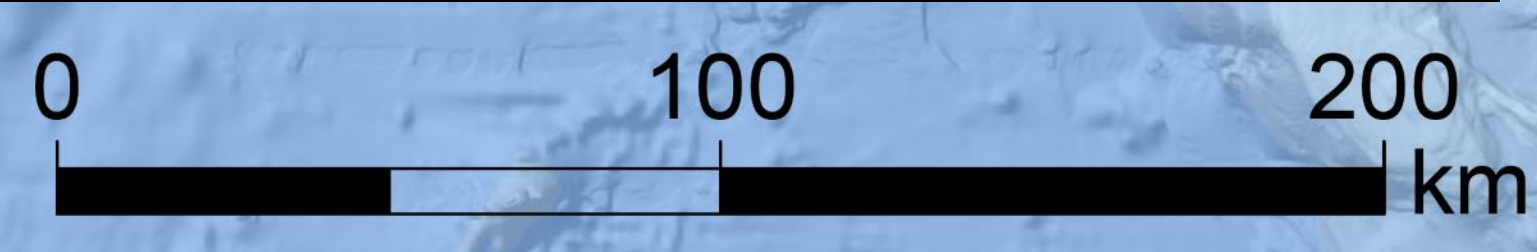
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**NorWeST Team:** Dan Isaak, David Nagel, Seth Wenger, Matt Groce, Erin Peterson, Jay Ver Hoef, Charlie Luce, Steve Hostetler, Jason Dunham, Jeff Kershner, Brett Roper, Dona Horan, Gwynne Chandler, Sherry Wollrab, Sharon Parkes

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