

Interpreting North Coast Temperature Standards


June 26, 2008

Bryan McFadin, Water Resource Control Engineer
North Coast Regional Water Quality Control Board

707-576-2751

bmcfadin@waterboards.ca.gov

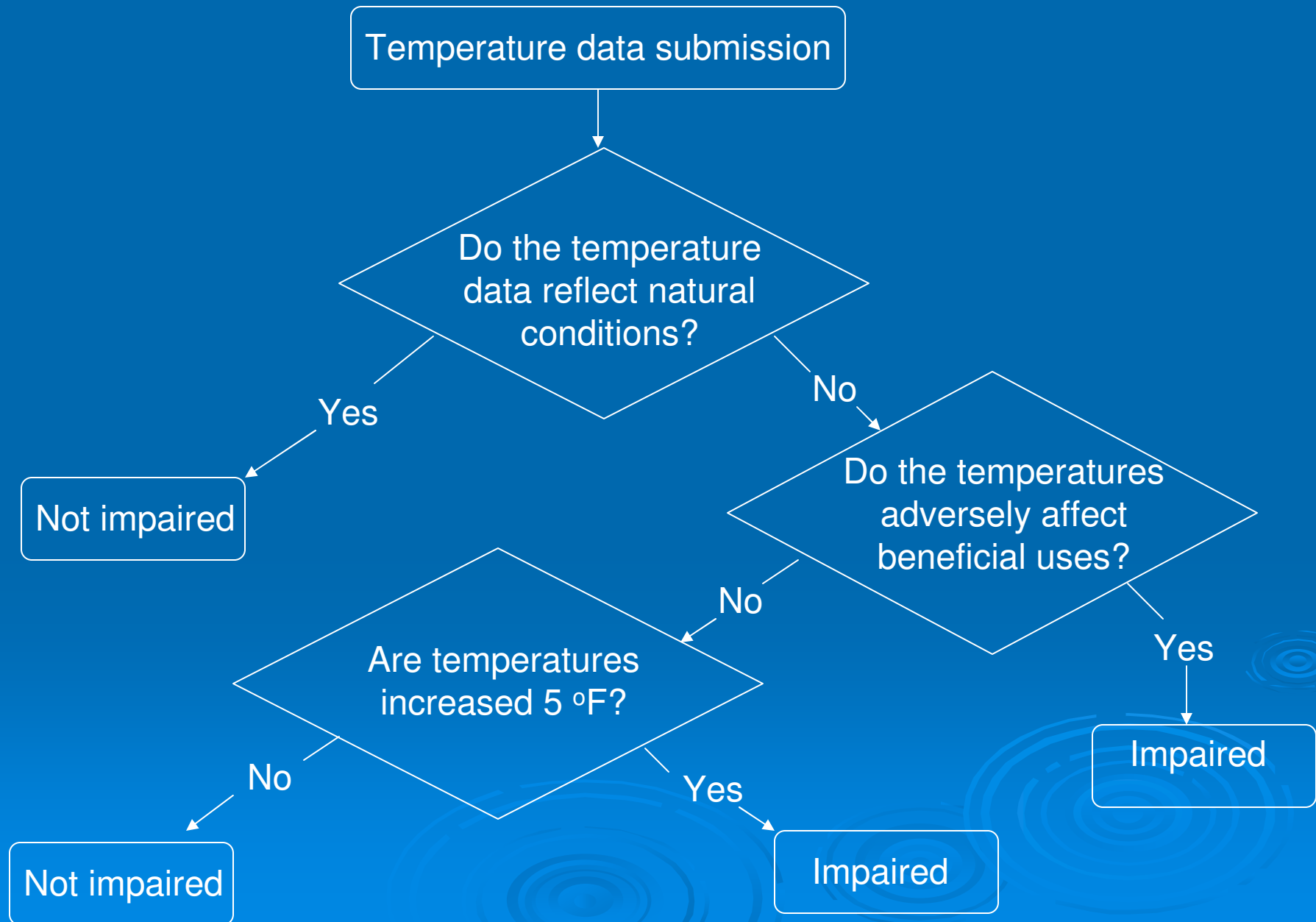
Outline

- Water Quality Objectives for Temperature
 - Intrastate
 - Interstate
 - Temperature metrics
 - How do staff evaluate whether the objective is met?
 - natural conditions
 - adverse effects to beneficial uses
 - 5 °F limit
 - Making your case
 - Questions / Discussion
- 

Basin Plan Intrastate Water Quality Objective for Temperature

- “The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses.
- At no time or place shall the temperature of any COLD water be increased by more than 5°F above natural receiving water temperature.
- At no time or place shall the temperature of WARM intrastate waters be increased more than 5°F above natural receiving water temperature.”

Interpreting the Temperature Objective in Relation to Impairment



State Thermal Plan Interstate Objective

The COLD Interstate Temperature Objective is as follows:
“Elevated temperature waste discharges into cold interstate waters are prohibited.”

“Elevated Temperature Waste” is defined as:

“Liquid, solid, or gaseous material including thermal waste discharged at a temperature higher than the natural temperature of receiving water. Irrigation return water is not considered elevated temperature waste for the purpose of this plan.”

The interstate temperature objective augments, but does not supersede, the intrastate temperature objective.

Temperature data submission

Do the temperature data reflect natural conditions?

Yes

Not impaired

No

Do the temperatures adversely affect beneficial uses?

No

Are temperatures increased 5 F?

No

Not impaired

Yes

Impaired

Yes

Impaired

What are natural temperatures?

“The water temperatures that result when the environmental factors that influence stream temperature have not been altered by human activities.”


-Staff Report for the Scott River TMDL, page G-4



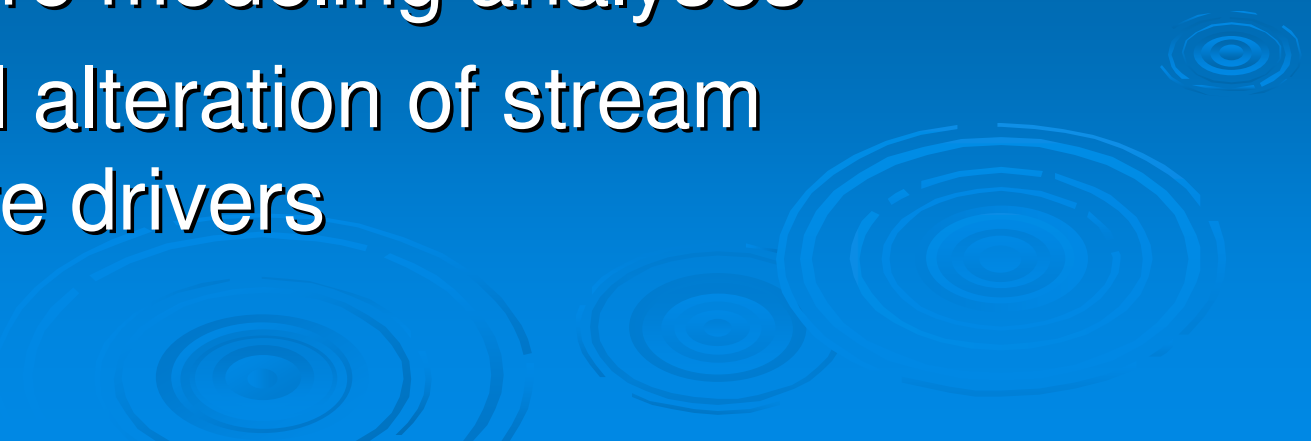
Factors that Influence Stream Temperatures

- Incoming solar radiation
 - shade from vegetation
 - shade from topography
 - cloud cover
- Convection
 - air temperature
 - wind speed
- Conduction
 - channel substrate
 - channel geometry
- Evaporation
 - relative humidity
 - air temperature
 - wind speed
- Advection
 - stream flow
 - tributaries
 - springs
 - groundwater accretion

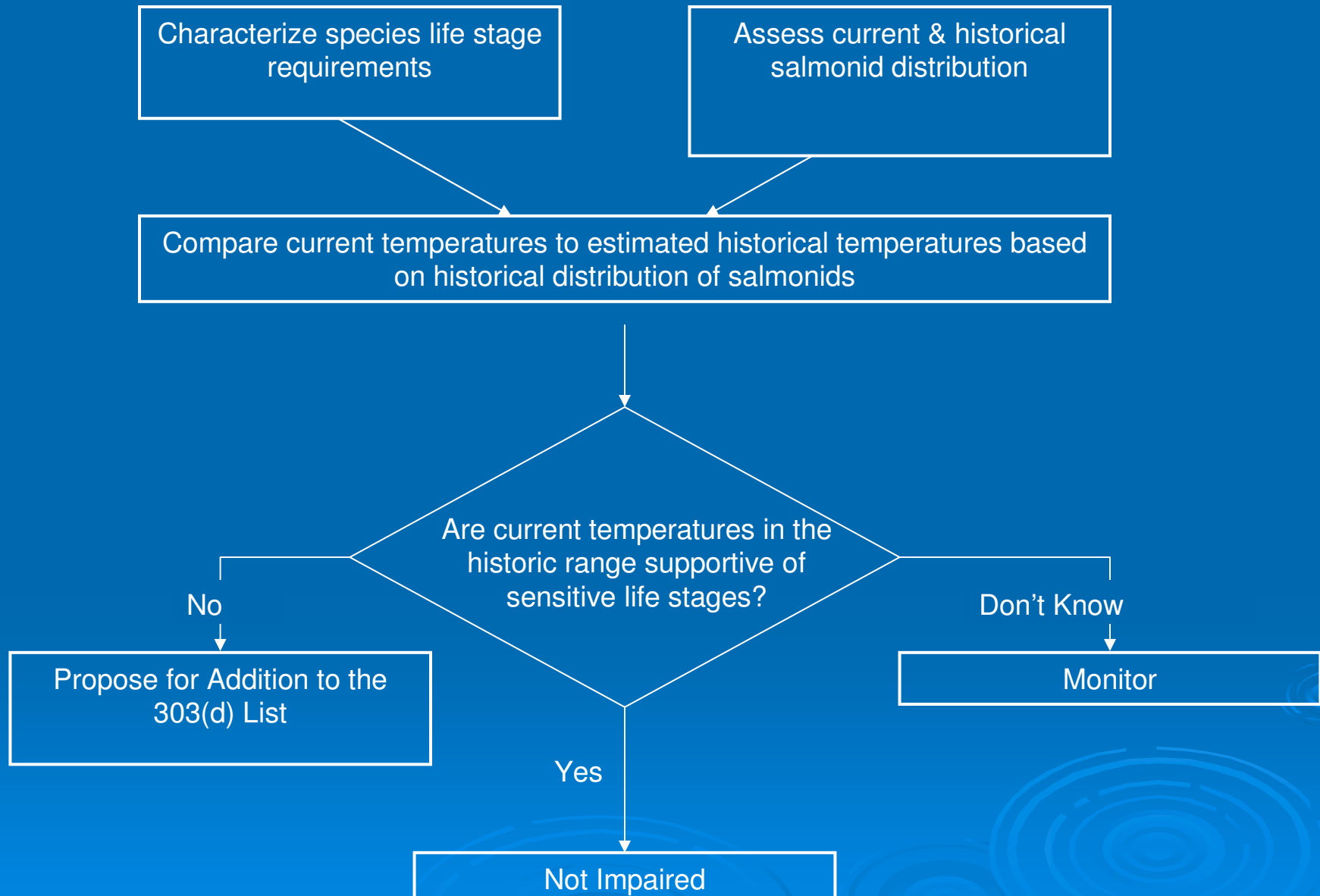
Causes of Temperature Alteration

- Increase in solar radiation reaching water surface
 - Increase in air temperature, relative humidity
 - Reduction of streamflow
 - Increased width, decreased depth
 - Discharge of warm water (or other material)
 - Impounded water
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Evidence of temperature alteration

- Comparison of current and historical temperature data
 - Comparison of current temperatures to historical distribution of cold water species
 - Comparison to a nearby reference stream
 - Temperature modeling analyses
 - Substantial alteration of stream temperature drivers
- 

Approach to Evaluating Temperature Data



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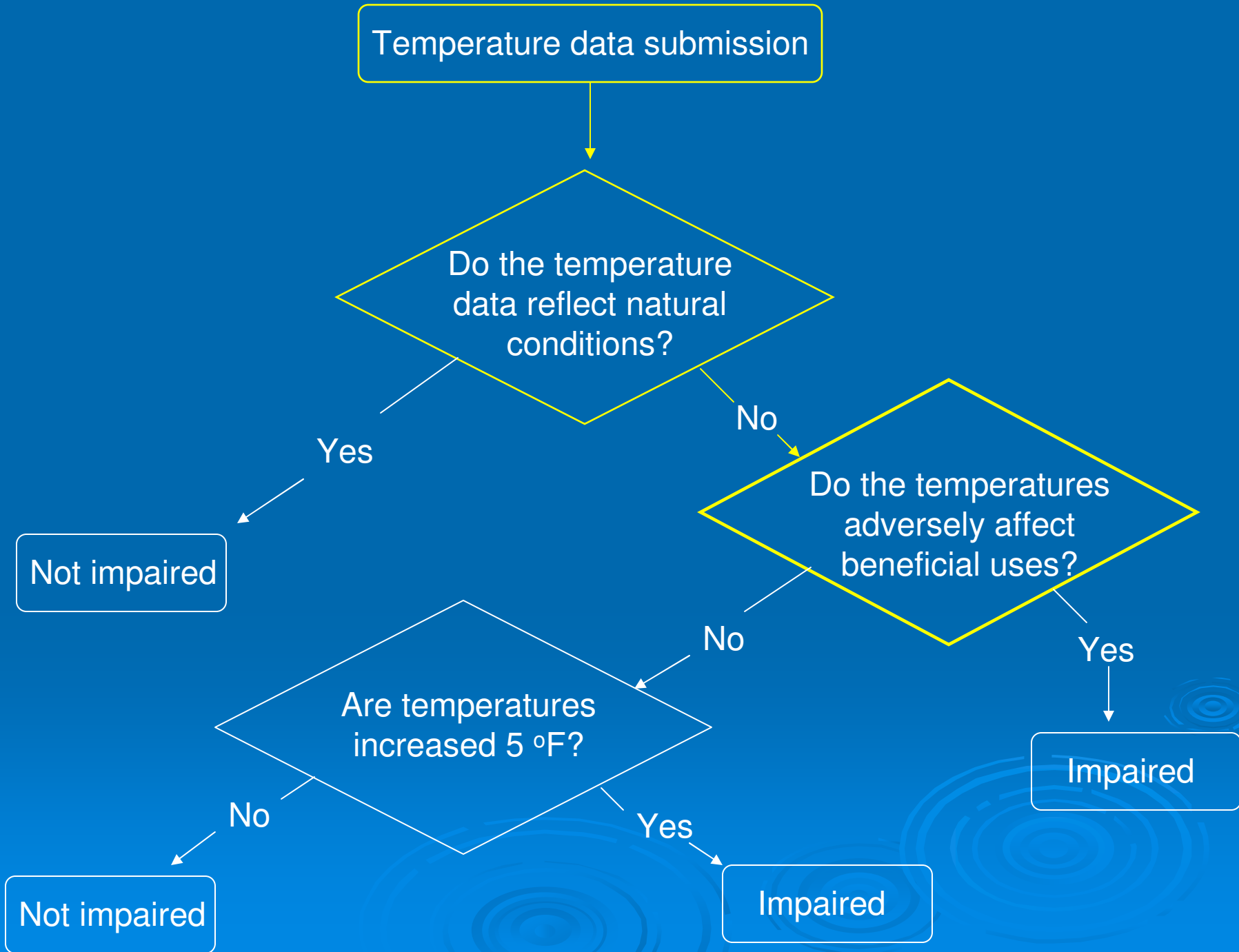
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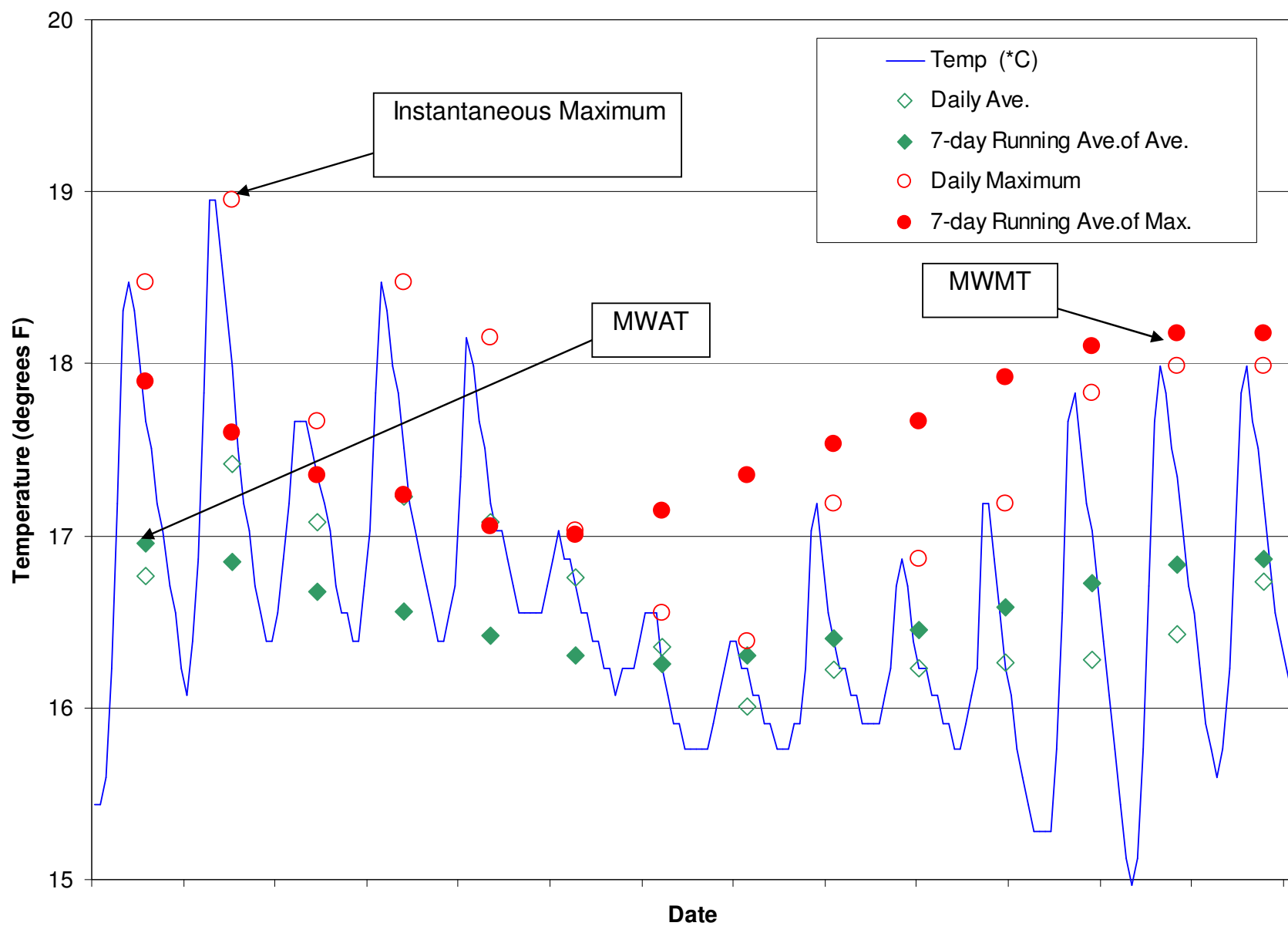


Temperature Metrics

Various metrics have been used to reduce a season's data to a single value:

- Instantaneous maximum: highest individual value in a season
- Maximum Weekly Average Temperature (MWAT): maximum value in a season of 7-day moving average of daily averages
- Maximum Weekly Maximum Temperature (MWMT): maximum value in a season of 7-day moving average of daily maximums

1995 Water Temperatures in Flynn Creek Near Highway 128 (SWRCB-15)



Relationships Among Metrics

- The instantaneous maximum, MWAT and MWMT metrics are highly correlated with one another
- Use of one metric will represent information associated with the others



When are beneficial uses “adversely effected”?

Adverse effects can occur at the
following life stages:

- Rearing
- Migration
- Spawning and incubation
- Larval development



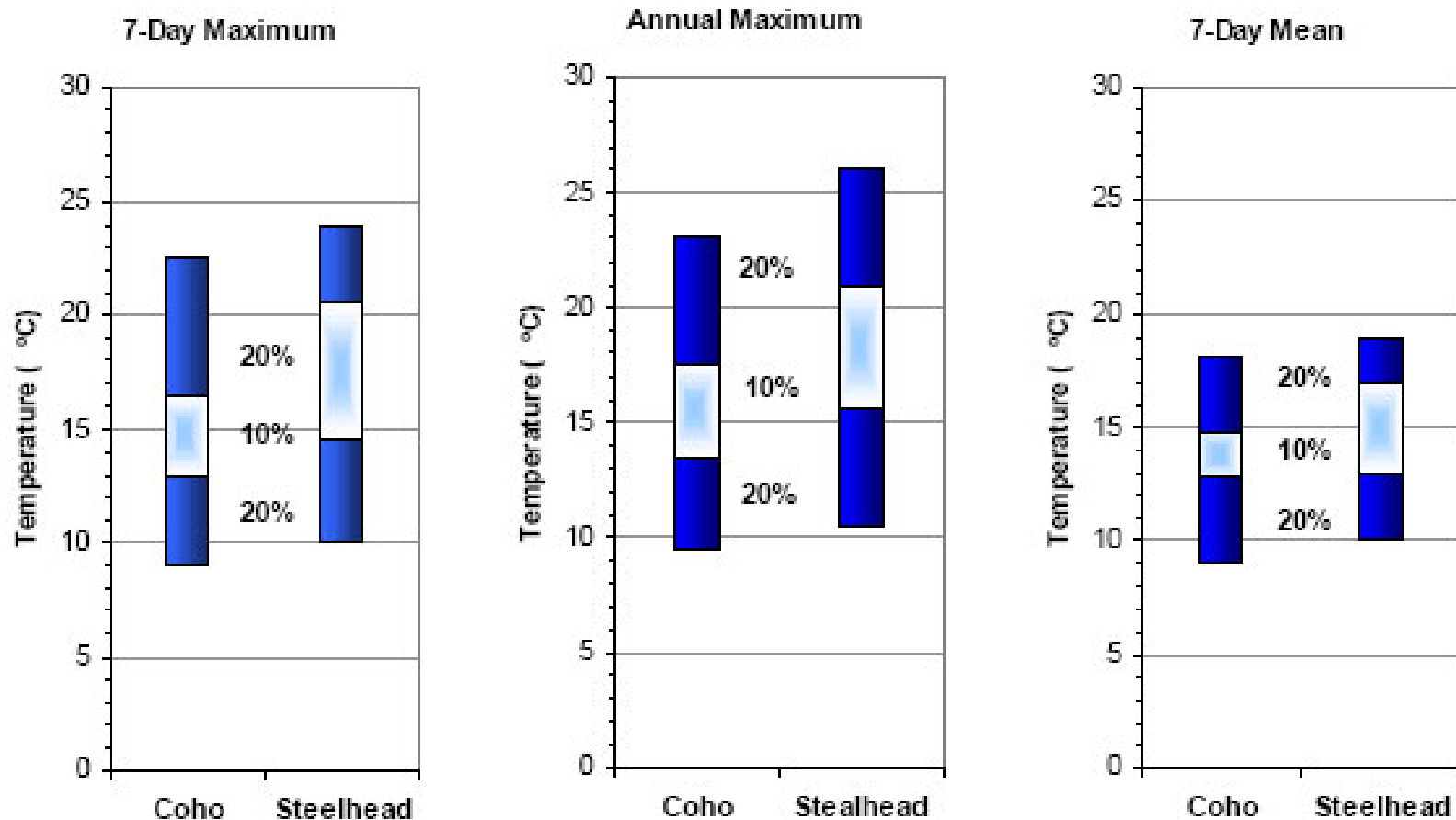
Temperature Criteria

- *EPA Region 10 Guidance for Pacific Northwest State and Tribal Water Quality Standards (2003)*
- *An Analysis of the Effects of Temperature on Salmonids of the Pacific Northwest with Implications for Selecting Temperature Criteria (Sullivan and others, 2000)*
- *Distribution of Juvenile Coho Salmon in Relation to Water Temperatures in Tributaries of the Mattole River, California (Welsh and others, 2001)*
- *Evaluation of Stream Temperature Thresholds Based on Coho Salmon (*Oncorhynchus kisutch*) Presence and Absence in Managed Forest Lands in Coastal Mendocino County, California. (Hines and Ambrose, 1998)*

Salmonid Temperature Thresholds

Chronic Effect Temperature Thresholds for Salmonids (USEPA 2003)	
Life Stage	MWMT (°C)
Adult Migration	20
Adult Migration plus Non-Core Juvenile Rearing ¹	18
Core Juvenile Rearing ²	16
Spawning, Egg Incubation, and Fry Emergence	13
<p>Source: <i>EPA Region 10 Guidance for Pacific Northwest State and Tribal Water Quality Standards</i> (2003)</p> <p>¹ The Adult Migration plus Non-Core Juvenile Rearing designation is recommended by USEPA (2003) for the “protection of migrating adult and juvenile salmonids and moderate to low density salmon and trout juvenile rearing during the period of summer maximum temperatures,” usually occurring in the mid to lower part of the basin.</p> <p>² The Core Juvenile Rearing designation is recommended by USEPA (2003) for the “protection of moderate to high density summertime salmon and trout juvenile rearing” locations, usually occurring in the mid to upper reaches of the basin.</p>	

Temperature Thresholds Based on Risk Assessment and Bio-energetics (Sullivan and Others, 2000)



Temperature Thresholds Based on Presence/Absence (Welsh and others, 2001)

From the Mattole River watershed:

- MWMTs > 18.1 °C, or MWATs > 16.8 °C, preclude the presence of coho salmon.
- All streams sampled with MWMT < 16.3 °C, or MWATs < 14.5 °C, contained coho salmon

Temperature Thresholds Based on Presence/Absence (Hines and Ambrose, 1998)

- Compared coho presence/absence data from Mendocino coast watersheds to a variety of metrics.
- The number of days that the WMT > 17.6 °C was the best predictor of the presence of coho salmon.

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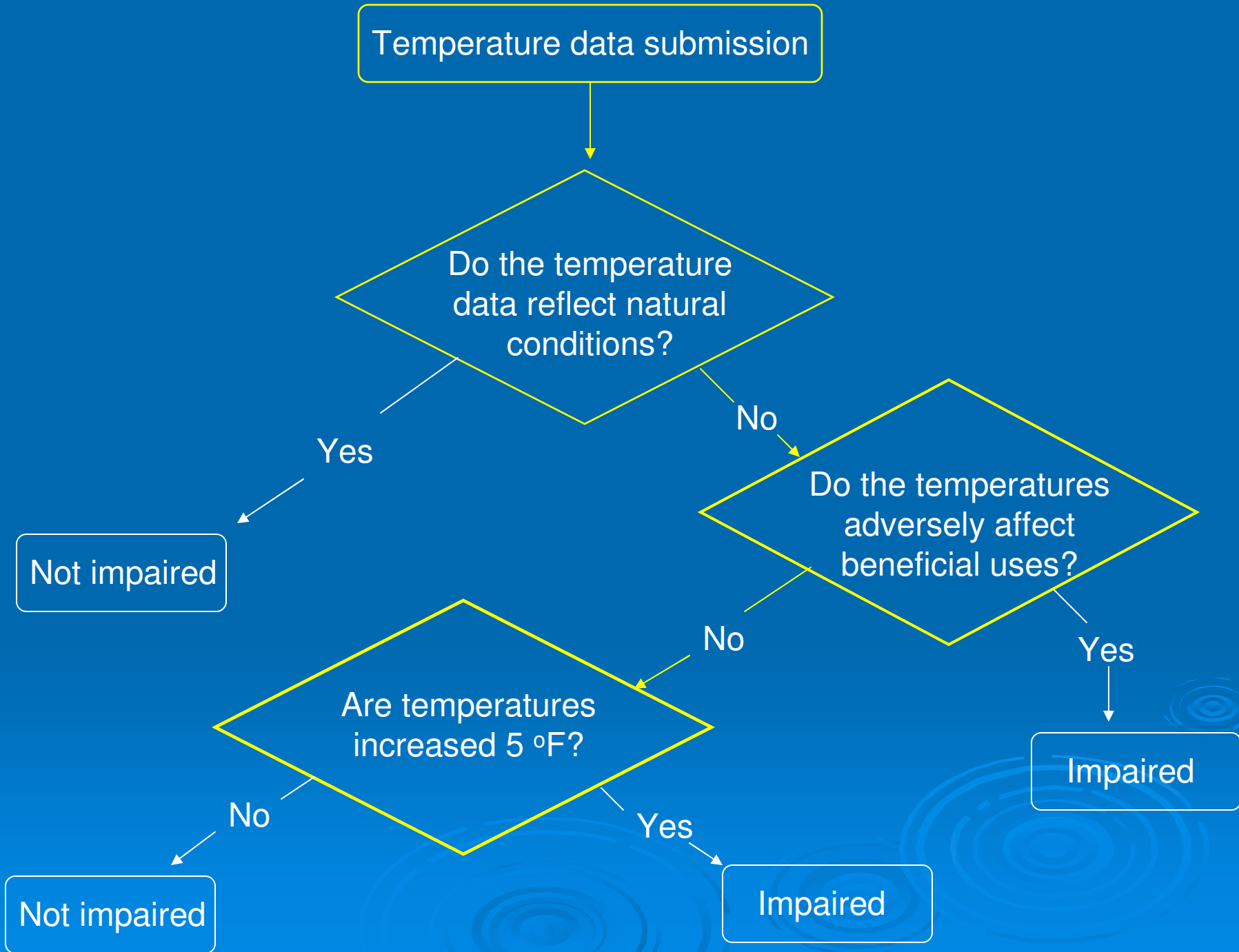
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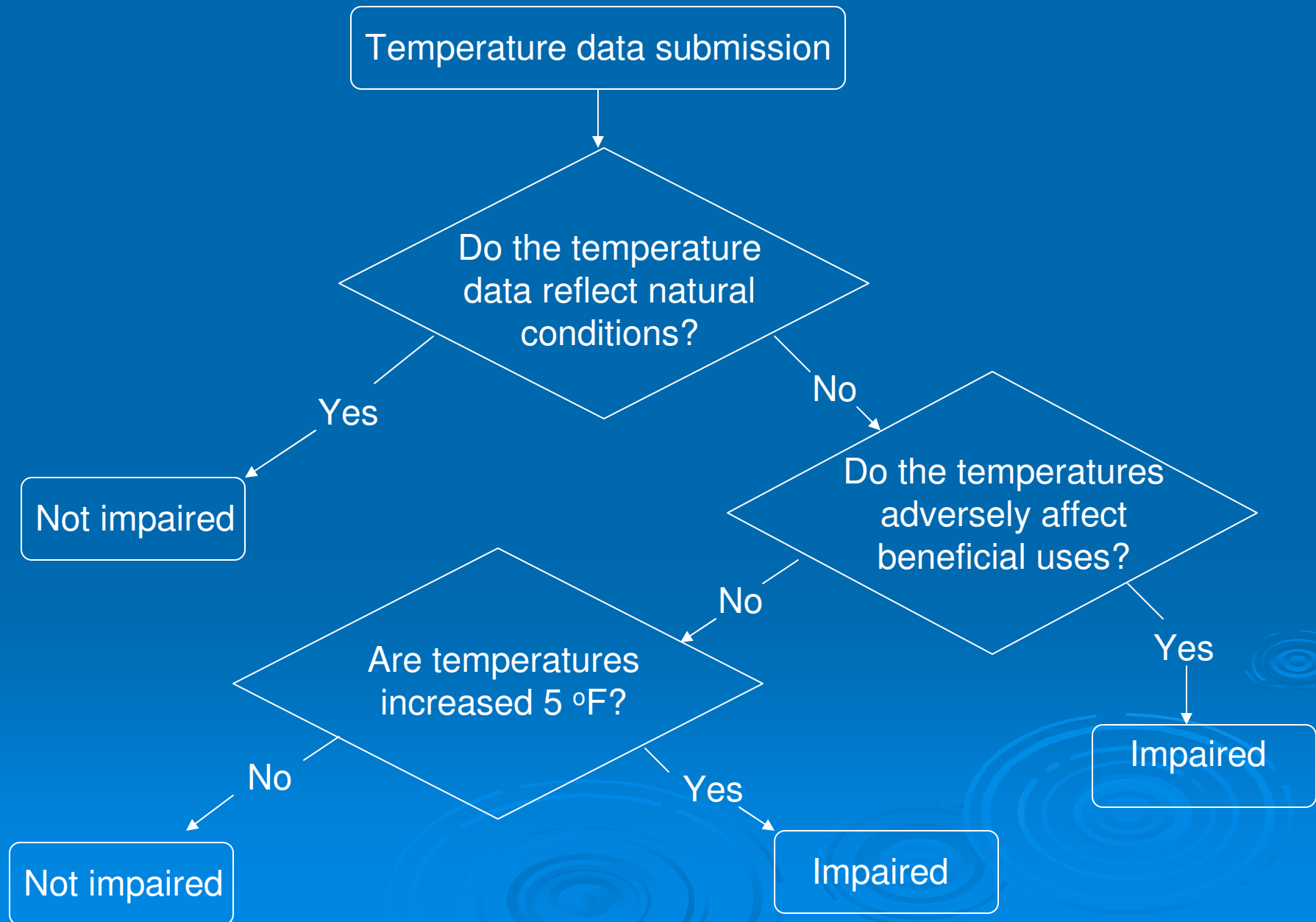


How do we evaluate the 5 °F?

- Comparison of current and historical temperature data
- Temperature modeling analyses
- Comparison to a nearby reference stream



Interpreting the Temperature Objective in Relation to Impairment



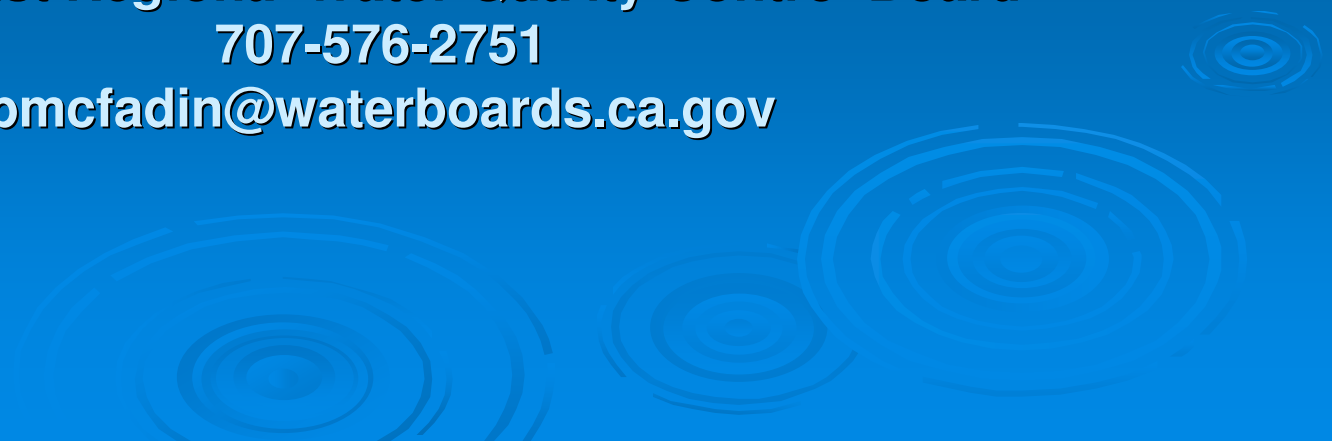
Making a Case For or Against Impairment

- Assertions should be relative to the temperature objective.
- Don't just say there are fish, therefore there is no impairment (or vice versa).
- Don't just say the water is warm, therefore it is impaired.



Questions?

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