ATTACH # 4

Trinity/Klamath Coordination Meeting

July 18, 2005

Meeting Report by the Technical Modeling and Analysis Group

Meeting Location

Yurok Community Center, Weitchpec, California

Task

The Trinity Management Council directed the Trinity River Restoration Program Technical Modeling and Analysis Group, in cooperation with these groups –

- Trinity River Restoration Program Fish Subgroup
- Klamath Task Force
- Klamath Technical Work Group
- Klamath Fish Health Assessment Team
- Klamath Basin Area Office (Reclamation)

to –

- Develop criteria for implementation of a Trinity River pulse(s) flow in response to potential adult fish die-off conditions
- Develop a pre- and post-flow monitoring plan in the context of AEAM
- Address direct and indirect consequences of fall Trinity River releases
- Develop alternatives to address fish die-off conditions
  - Develop a Trinity River hydrograph recommendation(s) not to exceed 20 KAF
  - Develop a Klamath River hydrograph recommendation(s)
  - Other?
- Catalog new and existing information

Attendees

The TMAG invited representatives from the above groups. The following people attended:

Ryan Benson, Sara Borok, Petey Brucker, Susan Corum, Ron Costello, Loren Everest, Scott Foott , Robert Franklin, Tim Hayden, Nina Hemphill, John Hicks, Dave Hillemeier, Buford Holt, George Kautsky, Morgan Knechtle, Aaron Martin, Barry McCovey, Seth Naman, Joe Polos, Michel Rode, Rick Rogers, Tom Shaw, Jim Simondet, Wade Sinnen, Josh Strange, Robert Sullivan, Rod Wittler.

Trinity River Pulse Flow Implementation Criteria

The 2005 Trinity River pulse flow criteria evolved from information gained during pulse flows in 2003 and 2004 and from the most recent and best information on causes of the 2002 fish die-off in the lower Klamath River. Primary criteria focus on assessments of expected conditions in the Klamath River below Weitchpec, California. Secondary criteria focus on real-time monitoring of temperature, fish population density, and fish behavior. Secondary criteria become operative at any time conditions meet the primary criteria.

Considerations included: 1) predictors of future riverine and fisheries conditions; 2) real time monitoring capabilities; 3) monitoring currently funded in the Klamath/Trinity basin; and 3) whether conditions warrant a Trinity River pulse flow release in 2005.

Primary Criteria

The primary criteria evaluated were predictions of fall-run Chinook abundance, discharge in the Klamath River below Weitchpec, and the discharge at Iron Gate Dam. Evaluation of these conditions will continue as the season progresses.

1. Pre-season predicted size of fall Chinook spawner run.
2. Projected discharge in the Klamath River at Terwer, derived from upstream gage data, historical hydrology and USBR operations plans for the Klamath and Trinity Rivers.

Predictions of returns of fall Chinook are lower than average in 2005. The 2005 pre-season total in-river fall Chinook run is estimated to be 74,600 fish, which is roughly 2/3 of the pre-season 2002 total run size estimate. The 2002 pre-season total chinook in-river estimate was 132,600 fish. The post-season total in-river run estimate was 170,014 fish, not including the fish die-off mortalities. Thus, the pre-season estimate underestimated the run size significantly. The group indicated that in future years, if the estimated pre-season run was average or greater in size and discharges were low, concern for a fish die-off would increase. The mean fall chinook run size over the last 27 years is roughly 121,000 fish. Full discussion of these criteria for use in future years was not addressed at this meeting. No real time monitoring of the fall Chinook salmon run size has been designed or implemented. Thus, updates to the 2005 pre-season estimate cannot be made at this time. Full discussion of these criteria for use in future years was not addressed at this meeting. No real time monitoring of the fall Chinook salmon run size has been designed or implemented. Thus updates to this estimate cannot be made at this time.

Dave Hillemeier investigated whether the Yurok tribal fishery could be used as a real time measure of run size several years ago. This issue should be re-visited now that there is substantially more data available. Since there are several factors that can affect catch per unit of effort, such as discharge and water clarity, the group thought that catch per unit of effort currently was of minimal use for estimating densities of fish in the lower river.

The group thought that discharge at Terwer during late August and September would be significantly greater than in 2002 due to the combined effects of winter/spring precipitation on lower basin hydrology, and scheduled releases from Iron Gate and Lewiston dams. The scheduled Iron Gate Dam discharge this year is greater (~500 cfs) than the discharge released in 2002 at the same time. Any changes in the current release schedule for Iron Gate Dam or changes in the anticipated tributary accretion will influence the ability to meet these criteria. A minimum discharge of 2,200 ft^3/s (combined Hoopa and Orleans USGS gage discharges) was recommended by the DFG based on discharge/water temperature regression analyses contained in their 2002 Final Report. This recommendation is very similar to the Yurok Tribe's recommendation of a minimum discharge of 2500 CFS at the Terwer Gage. The group did not reach a consensus on setting the criteria greater than 2,200 ft^3/s.

If primary criteria are not met, then Trinity River pulse flow decision making becomes dependent upon secondary criteria for early warning. ***Pre-decisional steps such as preparation of public notice, safety, and operational provisions should be made ready by late August. Decision-to-Release time frame should be less than one day.***

Secondary Criteria Considered (Real Time Monitoring)

1. Abnormal abundance of fall run chinook in riffles in Lower Klamath;

Tom Shaw stated that large numbers of Chinook were observed holding below riffles, during the day, up to 3 weeks before the 2002 fish die-off. This abnormal behavior could be a good real-time predictor.

2. Temperatures at Terwer.

Water Temperature < 22°C after September 1 and < 20°C after September 15 at Terwer. Josh Strange produced an analysis of data from 1995 to 2004 showing the following approximate average annual pattern that by September 1 mean daily river temperature (MDT) drops below 22°C, and that by September 15 mean daily temperature has drops below 20°C. On the average, Klamath fall Chinook move into the river by September 1 and Trinity fall Chinook move in by September 15. Josh Strange (Yurok and UW) concluded from analysis of 2002-2004 radio telemetry data that river temperature trends are more correlated to fish migration than mean daily temperature alone. In general, mean daily river temperatures >22°C inhibit upriver migration, however, adult chinook will be resume migration at higher temperatures (MDT 23.5°C) during a falling temperature trend and conversely will halt migration at lower temperatures (MDT 21°C) during a rising temperature trend. The general consensus was that instantaneous water temperature on its own was not a strong criterion. However, real time analysis of river temperature trends could reveal abnormal levels of fish concentration after the September 1 and September 15 benchmarks.

3. Estuary configuration.

Cool saline water in the estuary creates thermal refugia for fall Chinook during some years. This saline stratum is known as the salt wedge, and can maintain water temperatures several degrees lower than surface fresh water. Normal configurations of the estuary permit Chinook holding until river conditions cool. During some years, a berm forms at the mouth of the river, thereby limiting tidal influx into the estuary and causing the estuary to back-up. This phenomenon increases the volume of the estuary and minimizes the formation of a cool saltwater wedge in the lower estuary. Dave Hillemeier indicated that there was a salt wedge during the summer of 2002 but not during 2001, when a sand berm caused the estuary to back-up, thereby minimizing tidal fluctuation and dramatically increasing the volume of the estuary. (a draft report documenting the salt wedge during 2001-2003 is available). Information is not available regarding threshold conditions for salt wedge volumes, or overall estuary volume, in relation to the needs of migrating Chinook. However, diminution of the salt wedge may portend less favorable conditions for fish holding prior to upstream migrations, and increased volume in the estuary may reduce densities of fish and pathogens, thereby reducing the risk of disease transmission. This could be monitored. Josh Strange indicated that this year he will be looking at vertical distribution in the estuary to see how the cool salt wedge and warmer river water interact with fish behavior and the implications for migratory success.

Tertiary Criteria Considered (Real Time Monitoring)

If secondary criteria are not met then Trinity River pulse flow decision making becomes dependent upon tertiary criteria for early warning.

1. Chinook spawner migration behavior.

On the basis of past years' radio tagging studies of Klamath Basin adult Chinook; Josh Strange asserted that Klamath River fall chinook stock fish appear to behave differently than Trinity fish. Klamath fish hold in the lower River for periods of days or weeks prior to moving upstream. Trinity River fall chinook stock fish also move slowly through the lower river but quicker than Klamath fall chinook. Initial data analyses indicate that this migration behavior is independent of mean daily temperature and largely independent of a fall Trinity River pulse flow. Again, however, tagged fish show clear response to water temperature trends and thresholds. Josh Strange concluded that fish abundance or density may be more important to monitor than daily water temperature as an early indicator of potential fish die-off conditions.

The Yurok and Hoopa Valley tribes are preparing to monitor sonic-tagged adult migrations regardless of Lewiston releases this year. If no Lewiston (Trinity River pulse) releases are provided this year, comparisons between migration under 2003 and 2004 Trinity River pulse flow conditions, and 2005 without Trinity River pulse flow conditions could be very informative. In the AEAM context the hypothesis is that holding and movement patterns will be unchanged from those years with a Trinity River pulse flow, taking into account trends and thresholds in river temperature.

2. Disease monitoring.

The group consensus was that disease monitoring should not be a primary or secondary criterion for a Trinity River pulse flow. The time for confirmation/corroboration of a disease problem together with lag time in releasing a Trinity River pulse flow is too great to be an effective first response indicator. Furthermore, there is too little baseline information available to detect when thresholds of disease incidence have been surpassed, thereby warranting discharge manipulations. Scott Foott informed the group that fish contract Ich from days to weeks prior to symptoms becoming apparent. Once detected, disease outbreaks may be too far advanced for effective intervention.

3. Reconnaissance surveys for dead fish.

Levels of disease indicators above background would signal beginning of an outbreak of disease mortality.

4. Density in Lower River.

Use and abundance of fish in thermal refugia (e.g. Blue Hole) is a proposed criterion. Large abundance of fish in holding areas and thermal refugia appears strongly related to river temperature, migration behavior and overall run size. Current data do not allow differentiation between normal and abnormal holding. Holding and use of thermal refugia occurs to at least some extent every year, but the question that has not

yet been answered is 'when does use of these areas approach high density and dangerously increased vulnerability to disease?'

Should There Be A Trinity River Pulse Flow in 2005?

The group reached the consensus that based on *Primary Criteria* of projected run size for fall Chinook, projected discharges at Terwer, and projected discharges at Iron Gate Dam, at this time an adult fish die-off is unlikely in 2005. No one present at the meeting advocated for proactively releasing a Trinity River pulse flow in 2005. To the contrary, the majority of those present agreed that monitoring results from 2003 and 2004 indicated that Trinity River pulse flows may have not been effective in spurring upstream migration of Chinook holding below Weitchpec, although increased discharges may provide incremental benefits in terms of reduced transmission of disease pathogens.

Therefore, the recommendation from this meeting is that, there should ***not*** be a Trinity River pulse flow in 2005, unless conditions relative to the primary criteria substantially change. The consensus of this meeting was that conditions are unlikely to change.

Hydrograph Shape

Joe Polos (USFWS-Arcata) presented the two potential Trinity River pulse flow hydrographs that were considered in 2003 and 2004. The first is a bench, similar to that used in 2003 and 2004. The second was a series of 2 or 3 one-day pulses, similar to multiple versions of the pulse released for the Hupa Boat Dance. A third scenario was briefly discussed that entailed increasing the summer/fall base discharge of 450 ft^3/s to a higher base discharge, increasing discharge in the Lower Klamath without an extreme change in the river stage. The group agreed to leave development of release schedules until later.

Discharges from Trinity and Klamath

Many present expressed the opinion that Trinity River pulse flows were not a long term solution to problems on the Klamath River It was brought up that, the Trinity River pulse flows were at best a short term solution which may be reducing our ability to focus on and address long term solutions needed in the Klamath/Trinity system. The group indicated that the Trinity River pulse flow has unintended negative ecological consequences from routinely implementing unnatural discharges. Concerns were raised that a pulse flow from the Trinity River could lure Klamath fish up and leave them in the poorer water quality of the Klamath River above Weitchpec. This could increase the level of disease and raise the chance for impacts to the Klamath River run and possibly promote conditions more conducive for a fish die-off to occur. If the Trinity or the Klamath, above Weitchpec, should release a pulse of water in the late summer to assist fish, monitoring should be performed to determine the affects on fish and the aquatic ecosystem in both areas.

The group identified the primary problems to address in avoiding an adult and juvenile fish die-off was largely in the Klamath River above Weitchpec and not in the Trinity River. The Record of Decision for discharges in the Trinity has provided a scientific reference to schedule discharges to best insure anadromous fish survival. The Klamath River has not had such a process and a scientific framework is not in place to schedule discharges to accommodate all of the anadromous species and runs. Many in the group indicated that there needs to be more coordinated discharge management and monitoring between the Trinity and Klamath River for both the short and long term.

Summary

It was the consensus of the group, based on best available information that it is unlikely a substantial die-off of adult chinook will occur this year in the Klamath River below Weitchpec. Therefore, at this time, the group does not recommend scheduling a proactive Trinity River pulse flow. The group does recommend expanded monitoring of the primary criteria and other factors. Several members indicated that we do not have a good enough understanding of the positive and negative affects on the anadromous fisheries and/or aquatic ecosystem to recommend a pulse flow in the Trinity River. Some suspected, yet unconfirmed, positive affects mentioned include reducing over-crowding of fall Chinook in the Lower Klamath River to alleviate disease conditions. The group expressed concern over negative affects, which included the affects on Klamath River adult fish above Weicthpec, the promotion of the mixing of fall and spring run Chinook, and affects on the greater aquatic ecosystem of the Trinity River. Many of the agencies, organizations and

tribes represented at the meeting are monitoring fish health and behavior and conditions in the Klamath River this year. Although the need for a plan was discussed, a coordinated plan to systematically monitor the primary, secondary and tertiary criteria was not produced at this meeting. The issue of funding for future years and thus the ability to monitor was discussed. The consensus was that since the group did not advise Trinity River pulse flows this year, no pre- and post-flow monitoring plan was needed at this time.

This coordination meeting addressed, to varying degrees, most of the issues the TMC expressed an interest in (as outlined above). This group (1) developed criteria for implementation of a Trinity River pulse(s) flow in response to potential adult fish die-off conditions; (2) evaluated the crucial data needed for the criteria; (3) evaluated Josh Strange's research on effects of fall Trinity River pulse flows on adult chinook migration behavior for Klamath and Trinity fall run Chinook to supplement data presented at the Trinity River Flow Meetings earlier this year; (4) evaluated primary, secondary and tertiary criteria to use as back up to evaluate developing adverse conditions in the lower Klamath.; and (5) reviewed the Trinity hydrographs and agreed to leave this until a later meeting. Quantitative thresholds for criteria were not determined and will need to be developed later.

Assigned issues that the group did not address substantially at this meeting include:

1. Developing alternatives to address fish die-off conditions
2. Developing a Klamath River hydrograph recommendation(s)
3. Cataloging new and existing information.

Additional time and resources are necessary for the Klamath/Trinity work group to adequately address these and other pertinent topics.

Table 1. Primary, Secondary, and Tertiary Criteria.

Proposed Criteria to evaluate lower Klamath conditions	Pros	Cons	Background
Proposed Primary			
Combined discharge at Orleans and Hoopa 2,200 ft^3/s or higher or discharge at Terwer 2500 CFS or higher.	Advanced or Real-time		DFG, USFWS, Yurok reports on fish die-off.
Projected Size of fall Chinook run - below long term average run size expected this year	Advanced; Predictions exist	Difficult to get real time data	DFG report
Proposed Secondary			
Estuary configuration, depth, volume or extent of salt wedge.	Can be done in advance	Unclear what the effects are from the formation of a berm. Some of them seem juxtaposed -- e.g. less cool water salt wedge, but more estuary volume	DFG report Yurok Report
Mean Daily Water Temp. >22°C after September 1 and > 20°C after September 15	Real-time		Based on J. Strange's analysis.
Abnormal abundance of fall run chinook in riffles in Lower Klamath	Real time	No definition of abnormal.	Based on Tom Shaw and crew observations
Proposed Tertiary			
Chinook spawner migration behavior. (example: X % of radio tagged adults at the specific time period (e.g. 1 week) show no movement)	Real-time	Need a minimum number of live tags to be valid. How distinguish between normal holding and abnormal holding?	
Weekly adult gill examination (min. 30 fish between Trinity confluence and estuary) showing a X % incidence in severe (>50/gill) ICH infection or gill rot (columnaris). This data would need to be confirmed by QC samples and a site visit / exam by fish pathologist (corroborate within 2-3 days of significant health concern sample). The FHC will continue to provide training (Sept workshop), QC, and rapid diagnostic support for the effort. It would be optimal to obtain the weekly samples at 1-2 locations above the estuary.		Too late and not enough baseline information available to evaluate a threshold.	Disease monitoring should not be a primary trigger given the time for confirmation / corroboration together with lag time in releasing TR water.
Reconnaissance surveys for dead fish	Levels above background would signal beginning of an outbreak of disease.	Too late. Do we know background mortality rates?	DFG called out to monitor reported dead fish
Use and abundance of fish in thermal refugia (e.g. Blue Hole)	Related to migration. can be directly observed	When does use of these areas tip into high density and increased vulnerability to disease	Riffles thought to be a better indicator

Attendees

Yurok Tribe:

Dave Hillemeier	*naypooie@northcoast.com*
Tim Hayden	*hayden@snowcrest.net*
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Karuk Tribe:

Susan Corum	*scorum@karuk.us*

Hoopa Valley Tribe:

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Wade Sinnen	*wsinnen@dfg.ca.gov*

KTF-TWG/

Petey Brucker	*pbrucker@srrc.org*

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Considerations included: 1) predictors of future riverine and fisheries conditions; 2) real time monitoring capabilities; 3) monitoring currently funded in the Klamath/Trinity basin; and 3) whether conditions warrant a Trinity River pulse flow release in 2005.

Primary Criteria

The primary criteria evaluated were predictions of fall-run Chinook abundance, discharge in the Klamath River below Weitchpec, and the discharge at Iron Gate Dam. Evaluation of these conditions will continue as the season progresses.

1. Pre-season predicted size of fall Chinook spawner run.
2. Projected discharge in the Klamath River at Terwer, derived from upstream gage data, historical hydrology and USBR operations plans for the Klamath and Trinity Rivers.

Predictions of returns of fall Chinook are lower than average in 2005. The 2005 pre-season total in-river fall Chinook run is estimated to be 74,600 fish, which is roughly 2/3 of the pre-season 2002 total run size estimate. The 2002 pre-season total chinook in-river estimate was 132,600 fish. The post-season total in-river run estimate was 170,014 fish, not including the fish die-off mortalities. Thus, the pre-season estimate underestimated the run size significantly. The group indicated that in future years, if the estimated pre-season run was average or greater in size and discharges were low, concern for a fish die-off would increase. The mean fall chinook run size over the last 27 years is roughly 121,000 fish. Full discussion of these criteria for use in future years was not addressed at this meeting. No real time monitoring of the fall Chinook salmon run size has been designed or implemented. Thus, updates to the 2005 pre-season estimate cannot be made at this time. Full discussion of these criteria for use in future years was not addressed at this meeting. No real time monitoring of the fall Chinook salmon run size has been designed or implemented. Thus updates to this estimate cannot be made at this time.

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If primary criteria are not met, then Trinity River pulse flow decision making becomes dependent upon secondary criteria for early warning. ***Pre-decisional steps such as preparation of public notice, safety, and operational provisions should be made ready by late August. Decision-to-Release time frame should be less than one day.***

Secondary Criteria Considered (Real Time Monitoring)

1. Abnormal abundance of fall run chinook in riffles in Lower Klamath;

Tom Shaw stated that large numbers of Chinook were observed holding below riffles, during the day, up to 3 weeks before the 2002 fish die-off. This abnormal behavior could be a good real-time predictor.

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yet been answered is 'when does use of these areas approach high density and dangerously increased vulnerability to disease?'

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The group identified the primary problems to address in avoiding an adult and juvenile fish die-off was largely in the Klamath River above Weitchpec and not in the Trinity River. The Record of Decision for discharges in the Trinity has provided a scientific reference to schedule discharges to best insure anadromous fish survival. The Klamath River has not had such a process and a scientific framework is not in place to schedule discharges to accommodate all of the anadromous species and runs. Many in the group indicated that there needs to be more coordinated discharge management and monitoring between the Trinity and Klamath River for both the short and long term.

Summary

It was the consensus of the group, based on best available information that it is unlikely a substantial die-off of adult chinook will occur this year in the Klamath River below Weitchpec. Therefore, at this time, the group does not recommend scheduling a proactive Trinity River pulse flow. The group does recommend expanded monitoring of the primary criteria and other factors. Several members indicated that we do not have a good enough understanding of the positive and negative affects on the anadromous fisheries and/or aquatic ecosystem to recommend a pulse flow in the Trinity River. Some suspected, yet unconfirmed, positive affects mentioned include reducing over-crowding of fall Chinook in the Lower Klamath River to alleviate disease conditions. The group expressed concern over negative affects, which included the affects on Klamath River adult fish above Weicthpec, the promotion of the mixing of fall and spring run Chinook, and affects on the greater aquatic ecosystem of the Trinity River. Many of the agencies, organizations and

tribes represented at the meeting are monitoring fish health and behavior and conditions in the Klamath River this year. Although the need for a plan was discussed, a coordinated plan to systematically monitor the primary, secondary and tertiary criteria was not produced at this meeting. The issue of funding for future years and thus the ability to monitor was discussed. The consensus was that since the group did not advise Trinity River pulse flows this year, no pre- and post-flow monitoring plan was needed at this time.

This coordination meeting addressed, to varying degrees, most of the issues the TMC expressed an interest in (as outlined above). This group (1) developed criteria for implementation of a Trinity River pulse(s) flow in response to potential adult fish die-off conditions; (2) evaluated the crucial data needed for the criteria; (3) evaluated Josh Strange's research on effects of fall Trinity River pulse flows on adult chinook migration behavior for Klamath and Trinity fall run Chinook to supplement data presented at the Trinity River Flow Meetings earlier this year; (4) evaluated primary, secondary and tertiary criteria to use as back up to evaluate developing adverse conditions in the lower Klamath.; and (5) reviewed the Trinity hydrographs and agreed to leave this until a later meeting. Quantitative thresholds for criteria were not determined and will need to be developed later.

Assigned issues that the group did not address substantially at this meeting include:

1. Developing alternatives to address fish die-off conditions
2. Developing a Klamath River hydrograph recommendation(s)
3. Cataloging new and existing information.

Additional time and resources are necessary for the Klamath/Trinity work group to adequately address these and other pertinent topics.

Table 1. Primary, Secondary, and Tertiary Criteria.

Proposed Criteria to evaluate lower Klamath conditions	Pros	Cons	Background
Proposed Primary			
Combined discharge at Orleans and Hoopa 2,200 ft^3/s or higher or discharge at Terwer 2500 CFS or higher.	Advanced or Real-time		DFG, USFWS, Yurok reports on fish die-off.
Projected Size of fall Chinook run - below long term average run size expected this year	Advanced; Predictions exist	Difficult to get real time data	DFG report
Proposed Secondary			
Estuary configuration, depth, volume or extent of salt wedge.	Can be done in advance	Unclear what the effects are from the formation of a berm. Some of them seem juxtaposed – e.g. less cool water salt wedge, but more estuary volume	DFG report Yurok Report
Mean Daily Water Temp. >22°C after September 1 and > 20°C after September 15	Real-time		Based on J. Strange's analysis.
Abnormal abundance of fall run chinook in riffles in Lower Klamath	Real time	No definition of abnormal.	Based on Tom Shaw and crew observations
Proposed Tertiary			
Chinook spawner migration behavior. (example: X % of radio tagged adults at the specific time period (e.g. 1 week) show no movement)	Real-time	Need a minimum number of live tags to be valid. How distinguish between normal holding and abnormal holding?	
Weekly adult gill examination (min. 30 fish between Trinity confluence and estuary) showing a X % incidence in severe (>50/gill) ICH infection or gill rot (columnaris). This data would need to be confirmed by QC samples and a site visit / exam by fish pathologist (corroborate within 2-3 days of significant health concern sample). The FHC will continue to provide training (Sept workshop), QC, and rapid diagnostic support for the effort. It would be optimal to obtain the weekly samples at 1-2 locations above the estuary.		Too late and not enough baseline information available to evaluate a threshold.	Disease monitoring should not be a primary trigger given the time for confirmation / corroboration together with lag time in releasing TR water.
Reconnaissance surveys for dead fish	Levels above background would signal beginning of an outbreak of disease.	Too late. Do we know background mortality rates?	DFG called out to monitor reported dead fish
Use and abundance of fish in thermal refugia (e.g. Blue Hole)	Related to migration. can be directly observed	When does use of these areas tip into high density and increased vulnerability to disease	Riffles thought to be a better indicator

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