Wednesday, March 12, 2025

Contact Information

2025 Upper Columbia Regional Project Pre-Application

* Pre-applications (SRFB & Monitoring) due March 12, 2025 (COB)

*Complete SRFB applications due in PRISM April 18, 2025 (COB)

*Complete Monitoring applications due in PRISM May 1, 2025 (COB)

*Revised SRFB proposals due in PRISM May 27, 2025 (COB)

*Final revised SRFB & Monitoring applications due in PRISM June 23, 2025 (noon)

Project Title	Wenatchee and Okanogan Comprehensive Thermal IR Surveys for Cold Water Species
Sponsor	Cascadia Conservation District
Primary Contact	Mark Ingman
E-Mail Address	marki@cascadiacd.org

Project Summary

Please provide a description or summary of the proposed project, including project goals. The goal of the project should be to solve identified problems by addressing the root causes. Then clearly state the desired future condition.

For each the Wenatchee and Okanogan watersheds: provide 1) a highly-detailed geospatial thermal infrared mosaic map that is GIS ready for use by project sponsors, 2) identify and map all cold and warm water features (“significant thermal features,” STFs), and 3) identify and map the mainstem river longitudinal thermal profile (LTP) along centerlines, and 4) high resolution RGB imagery co-acquired for thermal evaluation and project sponsor use. All deliverables will be GIS ready to import into GIS programs and application for us by project sponsors, the UCSRB, all agencies, scientists, researchers, and the public at large to have access to these important data about their watersheds.

Recovery of cold-water species, steelhead, spring chinook, and bull trout, requires thermal geospatial data that can inform where projects are most needed, will have the most benefit, where unique cold water refugia exists, where warm water is being introduced into the stream, and also to ensure proposed projects do not inadvertently increase mixing of critical cold water habitat. None of these essential considerations for cold water species can influence proposal development nor proposal technical review without a thermal infrared map that is done comprehensively and is up to date for each watershed.

What are the project objectives? Objectives support and refine biological goals, breaking them down into small steps. Objectives are specific, quantifiable actions the project will complete to achieve the stated goal. Each objective should be SMART (Specific, Measurable, Achievable, Relevant, and Time-bound). Note: This exact question is included in the PRISM application. Example format: The project seeks to address [specify limiting factor(s)] for [limiting life stage(s)] by [specific actions proposed] to create an estimated [include specific target metrics, as described below] upon implementation in [estimated year].

This project will fill a primary data gap to collect critical cold water habitat data for 227 miles of the Wenatchee River sub-basin and 197 miles of Okanogan sub-basin. Both sub-basin dataset are now well out of date (2005 and 2001-3; respectively), taken with legacy sensors, do not include the current set of thermal data deliverables, are missing primary fish bearing reaches, and restoration actions in the watershed have caused significant changes to how cold water moves within many of the reaches.

These thermal datasets are recommended for collection to influence the future prioritization in the Upper Columbia—potentially as part of, or in support of the "climate change" component that is currently being considered. Identification of cold water patches will be discretely identified with precise locations using 18 inch pixel resolution and 0.1 C degree accuracy. These data will be evaluated per the QA/QC protocols developed by NV5 Geospatial, the statewide thermal IR contractor in Washington. The contractor will use automated and semi-automated computing algorithms to analyze the point cloud data, render the mosaics, compute LTPs, and finally evaluate and identify all thermal anomalies (STFs) through a handpicked process based upon multiple factors per the training of a certified Level III thermographer. The data will be obtained through the contractor's most recent thermal IR sensor on a helicopter (summer flights) and/or fixed wing aircraft (winter flights). RGB imagery is automatically co-acquired and will be a GIS-ready deliverable available for project sponsor and public use.

Budget Request

Values MAY be duplicative and do not have to equal TOTAL anticipated budget in pre-application.

Anticipated Request - SRFB Riparian Funding	200,000
Anticipated TOTAL Budget	458,000

Other Funding Source(s), please note if funding is anticipated or actual.

WA Conservation Commission $8,000 (anticipated) ; PRCC - $250, (anticipated)

Project Location

Briefly describe the location of the project	The assessment project will comprehensively include most fish bearing reaches of the Wenatchee and Okanogan sub-basins.
Latitude (decimal degrees)	47.528782
Longitude (decimal degrees)	-120.495681
Project subbasin	Multiple Subbasins

Please explain why there are multiple subbasins

This is a comprehensive thermal infrared survey of the Wenatchee and Okanogan sub-basins.

Does the proposed project span multiple assessment units?	Yes
List the additional assessment units directly impacted by this proposal.	Okanogan AUs: Ellemeham Draw-Similkameen River US, Silkameen River, Ninemile Creek DS, Okanogan-Haynes Creek South, Okanogan-Haynes Creek North, Okanogan-Mosquito Creek, Whitestone Creek, Antoine Creek-Lower, Okanogan-Whitestone Coulee, Lower Tunk Creek US, Okanogan-Alkali Lake, Okanogan-Swipkin Canyon, Okanogan-Talant Creek, Okanogan-Davis Canyon, Chiliwist Creek, Lower Loup Loup Creek US, Salmon Creek-Lower, Johnson Creek, Omak Creek-Lower US, Wanacut Creek US, Aeneas Creek-DS Wenatchee - AUs within these survey areas: Chikamin Creek, Upper Chiwawa Creek, Lower Chiwiwa Creek, Big Meadow Creek, White River, Nason Creek, Wenatchee River, Chumstick Creek, Peshastin Creek, Mill Creek - Peshastin Creek, Mission Creek, Icicle Creek, Upper Icicle Creek, Little Wenatchee River
Reach(es) Name	Many.
Identify the reach(es) priority/ reach ranking. Note: If the project involves work in multiple reaches, select "Multiple" and include details in the text box that will appear below. Please reference the Prioritization Web Map: https://prioritization.ucsrb.org/.	Rank 1 Rank 2 Rank 3 Unranked (not a priority or missing data) Multiple reaches (provide details below)

Please detail the reach-ranking of the reaches below

This survey is comprehensive and includes two sub-basins. The sponsor has worked with both the Wenatchee and Okanogan WATs, and over 10 project sponsors to identify all potential reaches of interest for salmon recovery efforts within the anadromous range of ESA listed and other native cold water fish species. The survey includes all rank 1 reaches, all rank 2, and most rank 3 rankings for both the Wenatchee and Okanogan sub-basins. Additionally, the survey reaches all are within the anadromous range and rarely include reaches above full barriers unless the barrier removal is in an advanced stages of being corrected.

Project Information

1. What species will the project benefit?	Spring Chinook Steelhead Bull Trout Summer Chinook Coho
2. Select the project's objectives and the associated tracking metrics	Design, Monitoring or Assessment
4. Does this project already exist in Salmon Recovery Portal or PRISM?	No
5. Has this project been submitted previously for funding through the SRFB and/or other process(es)?	No
6. What category is the project?	Assessment

If applicable, what is the secondary project category?	N/A
Is the project eligible for Riparian Funding?	No

Design and Restoration Proposals

Assessment Proposals

7. What type of assessment are you proposing?	This is a comprehensive thermal infrared survey for the Wenatchee and Okanogan sub-basins that reveal thermal anomolies (STFs), thermal mosaics, and longitudinal temperature profiles for 424 miles of streams,
8. Is the assessment identified on the MaDMC monitoring and data gaps list?	Yes

9. Describe how the assessment fills a regional priority and where that priority is identified.

The comprehensive thermal infrared surveys in the Wenatchee and Okanogan provide a never before provided access to thermal habitat data that compliments and strengthen the traditional assessment of habitat conditions that are observable with the human eye in the field as temperature is largely excluded from Level II surveys and reach assessments. All of the Level 2 and Reach Assessments in the Prioritization list are gapped for truly "seeing" cold water habitat the way cold water species are extremely sensitive to cold water. We know fish can move considerable distances on a daily or sub-daily intervals in response to temperature. The proposed thermal IR surveys would sizably strengthen two of the four sub-basins for having comprehensive thermal refugia habitat datasets (Entiat was comprehensively collected in 2023).

10. Methods - What methods will you use in your assessment and how will they achieve your stated objective(s)?

The methods are nearly identical to the comprehensive thermal infrared dataset that was collected in 2023 for 66 miles of the Entiat and Mad Rivers. The state contractor will mobilize their team and install in-water temperature loggers for QA/QC. They will fly their aircraft at approximately 1,000-1,500 feet altitude to passively collect the return infrared signal for all survey areas. Some areas need multiple flight passes is sufficiently wide/complex in nature (oxbows, side channels, wide rivers). The Thermal IR data will be co-collected with high resolution RGB imagery. The flight will occur in the warmest 3 hours of the afternoon (summer/baseflow conditions; different if late fall/winter flight reaches). The point cloud Thermal IR data will be processed by the contractor to produce principally the following deliverables: 1) high resolution thermal IR mosaics, 2) STFs (significant thermal features = cold/warm patches, anomalies), 3) Longitudinal Temperature Profile of all reaches (LTP), 4) plotted STFs along LTP in an X,Y graph plot, 5) Centerlines of streams, and 6) Technical Report. Items 1, 2, and 3 will all be GIS software ready. Cascadia CD will work with the UCSRB and all UC region partners to make Thermal IR deliverables readily available and sharable. The access to these comprehensive thermal datasets, along with outreach Cascadia CD has already started with the WAT groups, will make these data accessible to all project partners. To date, five UC region thermal IR meetings have been presented, covering at least one meeting for each WAT group, and two meetings with the RTT. Project sponsors will be able to readily and increasingly use these data, in particular the STFs with respect to the LTPs, to target thermal enhancement projects in our region.

11. Will a design result from the project?	No
12. If yes, what level of design (e.g. conceptual, preliminary, final)? What proportion of your budget will support design?	N/A

13. Briefly describe why SRFB funds are necessary, rather than other sources of funding.

The sponsor requested RCO Riparian funding, but RCO stated it would not be eligible. It does appear these data will lead to 1) new thermal enhancement projects, 2) become part of the Climate Change prioritization for reviewing projects, and 3) provides valuable context for designing in-stream projects (reduce and prevent mixing of cold water habitat). The sponsor is applying for additional funding in order to complete the surveys of both the Wenatchee and Okanogan sub-basins.

Protection Proposals

Monitoring Proposals

7. Does this project address a Tier 1 data gap in the MaDMC Regional Data Gaps List?

Don't Know

8. To what extent does your project address a regional data gap?

Yes. Data Gap IDs is included below, including data gap notes and sponsor comments of how they integrate.

2.16 - "Temperature and its changes within specific reaches or AU of the UC." Specifically the note: “Need more data at a finer scale.” This is precisely what the thermal IR data provides: 18” pixel values with 0.1 C accuracy of water temperature comprehensively for over 400 miles of the Wenatchee and Okanogan sub-basins.

2.17 – "Temperature effect on fish distribution, movement, stress, and survival within specific reaches or AU of the UC." Assessment will compliment limitations of data logger-based temperature data with more detailed and comprehensive “snapshot” capture of thermal refugia down to the 18 inch pixel size level with 0.1 C accuracy for over 400 miles of the Wenatchee and Okanogan sub-basins. Fills thermal gaps not being monitored by data logger network. Safeguards against loss of logger-based funding (NorthWest). Thermal IR data is QA/QC per in water loggers, akin to ground control points.

2.18 – "Location and characteristics of thermal refuge areas." This proposed assessment increase the Data Gap note that “some” of Wenatchee to “all of” Wenatchee covered for thermal refugia. The Wenatchee thermal IR data is now legacy, to include the 2018 re-analysis done by 2018 since it used the 2001-2003 data. This asessment would increase the originally flown areas in the 2001-2003 source data, using modern thermal IR sensor, and update the thermal IR data deliverables to current day deliverables (new thermal IR mosaic, thermal anomolies evaluated and idnetified, longitudinal temperature profiles, and other now standard deliverables).

2.14 – “Evaluation of riparian forest structure and function.” High resolution RGB imagery is co-acquired for all surveyed areas, which is necessary for evaluating cold water patches (STFs/anomalies), but also directly helpful as a data source to evaluating riparian canopy coverage.

9. What is the scale of inference?

Site Scale

10. Purpose - How will the monitoring complement, enhance, or leverage ongoing monitoring efforts?

ENTER

11. Methods - Briefly describe the methods and how they are appropriate to the monitoring question

ENTER

12. Describe how the data (raw and processed), results, and other information will be disseminated and accessed once the project is complete

ENTER

13. Briefly explain how this project will address one or more of the identified strategic priorities in Manual 18M (survival bottlenecks, limiting factors, or project effectiveness).

ENTER

Project Risk and Economic Benefits

1. What is the landownership? N/A, aircraft collected above 1,000 feet

2. Have you secured landowner participation in or acceptance for this project? No

Please explain

The ground control temperature loggers are usually done at public access points or with partnered landowners as needed. The project sponsor will let the public know the general time of year when the flight is happening and that its only looking at data relating to surface waters and not terrestrial areas. There has not been sensitives to the survey work in the past as they are not intrusive.

3. Describe any land owner requirements (e.g., design elements, right-of-ways, access agreements, liability waivers, etc.) and if/how they could affect the project

N/A. This is a remote sensor based project, so landowner participation and requirements are NA. If a in-water sensor is needed to be installed at a non-public location, we will ensure proper landowner access and willingness is received, but this is not expected or necessary.

4. Will the project raise potential concerns for interest groups (e.g., recreational users) or the community at large (including upstream/ downstream/ adjacent landowners)?

N/A. This is a remote sensing based project and will not directly have any physical change to the waterway. Changes to the waterways will be a result of the thermal enhancement projects it helps start—the consequent projects thermal IR data ushers forward.

5. Who will have the responsibility to manage and maintain the project? What is the responsibility of current or future landowners?

Cascadia CD will work with the UCSRB data management team to make the datasets for the Wenatchee and Okanogan watersheds publically available. This could be as simple as it being made available in the UCSRB data library, or a note on the UCSRB website that the data can be obtained from the UCSRB and/or Cascadia CD. The project sponsor has factored in the cost of USB thumb drives that can be loaned out to project sponsors that want the data for project development. Uploading to an FTP site is also an option for data sharing, however given the large size of the datasets, the project sponsor has used USB drives to share the prior existing (prior project) Entiat Thermal IR dataset (preferred method to date).

6. Are other projects being proposed immediately upstream or downstream of worksite? No

7. Please describe the risk of failure associated with this project.

There is a low risk of failure. The Okanogan thermal infrared survey needs have identified a late fall/winter survey implementation time window, which can be fairly narrow. If this window is precluded by severe weather, the survey for the Okanogan sub-basin may be delayed by one season, but is not a major issue. The contractor has been give the state (WA DNR) contract for thermal IR and LiDAR collection. The contractor is very experienced and vetted to successfully accomplish this survey. The same state awarded contractor successfully completed a very similar comprehensive thermal infrared survey effort for the Entiat and Mad Rivers in 2023.

8. Is there any public outreach planned during and/or after implementation? Does the project build community support for salmon recovery efforts?

This project provides excellent visual examples of how the stream “looks” to salmon and steelhead with the multiple colors representing thermal habitat conditions (mosaics). These mosaics can be used as a visual aid to show the public the warm water conditions as well as cold water, and the role riparian/reforestation plays, how salmon recovery projects benefit essential cold water for cold water species. The project sponsor will work with the UCSRB, in the same way as the project sponsor’s previous project with the Entiat Watershed thermal IR survey, the data from the Okanogan and Wenatchee thermal IR surveys online to the public in an appropriate format. The project sponsor will also present the thermal IR survey to the Entiat Watershed Planning Unit and also the WATs.

9. Does the project represent an opportunity for economic benefit? How much benefit does the project create for the dollars invested?

This assessment project type is not meant to have direct or immediate economic benefit, however it will have considerable indirect economic benefit in the volume of thermal enhancement projects it supports coming forward into the future that will have economic benefits. The intrinsic climate forward nature of this thermal assessment translates to a greater assurance our salmon recovery projects going forward will fully "hit the mark" with benefit afforded to target species, and we know salmon and steelhead are a sizable economic and cultural value to the region for many reasons. We have a strong belief these thermal data will benefit the climate change portion of the UC's prioritization framework, sizably increase our understanding of how fish use habitat features, and increase project effectiveness on many levels.

10. Describe any partnerships, their experience, and types of contributions supporting the project.

Cascadia CD has worked extensively at the multi-WAT level to gather input from the following list of project sponsors: Okanogan WAT – Okanogan CD, CCT, Methow Okanogan Beaver Project, Trout Unlimited, Okanogan Highland Alliance; Wenatchee WAT – Cascade Fisheries, Cascadia CD, Trout Unlimited, Chelan County NRD, CCT, YNF, CDLT, and others. Cascadia CD has also worked with the WA DNR and their contractor to obtain estimates, and is actively working with WA Ecology to explore data portal/data hosting potential (see Ecology TIR data portal https://apps.ecology.wa.gov/shorephotoviewer/Map/ThermalImageViewer). The project sponsor has also presented 2023 Entiat Watershed thermal infared project at the River Restoration NW Conference to heighten understanding and awareness of new thermal IR data collection capabilities. The project sponsor has presented the Entiat thermal IR project to the Entiat and Wenatchee WATs, and facilitated thermal IR presentation from NV5 (state contractor) to the Wenatchee, Okanogan, and Entiat WATs all in the past two months.

Optional Section - Preparation for PRISM (SRFB applications only)

The following questions are identical to the questions RCO requires in the PRISM application for SRFB projects. If desired, sponsors can complete associated questions early and copy responses into PRISM during the "Complete Application" phase due on April 18, 2025.
*please note, this section is not applicable for Monitoring proposals

Do you want to review and/or pre-populate PRISM questions? No

Supporting Documents

Upper Columbia Process Guide 2025

SRFB Manual 18 (2025)

RCO Application Resources (2025)

PROJECT: 25-1231 PLAN, WENATCHEE AND OKANOGAN THERMAL IR SURVEYS

Sponsor: Cascadia Conservation District Program: Salmon State Projects Status: Application Submitted

Parties to the Agreement

PRIMARY SPONSOR

Cascadia Conservation District

Address 1350 McKittrick St, Suite B

City Wenatchee **State** WA **Zip** 98801

Org Type District-Conservation

Vendor # SWV0024685-00

UBI

Date Org created

Org Notes

link to Organization profile

✓Org data updated (by Amee Bahr 04/29/2025)

SECONDARY SPONSORS

No records to display

MANAGING AGENCY

Recreation and Conservation Office

LEAD ENTITY

Upper Columbia Salmon Rcy Bd L

QUESTIONS

#1: List project partners and their role and contribution to the project.

Wenatchee-Entiat Watershed Action Team (WAT): Cascade Fisheries (FEG)-added reaches to survey extent, and meeting participants Trout Unlimited, CCNRD, Yakima Nation Fisheries, Colville Confederated Tribes.

South Okanogan Watershed Action Team (SoWAT): Okanogan Conservation District (received stream reach additions), Colville Confederated Tribes (received stream reach additions), Methow Salmon Recovery Foundation's Methow Okanogan Beaver Project (received stream reach additions), Okanogan Highland

External Systems

SPONSOR ASSIGNED INFO

Sponsor-Assigned Project Number

Sponsor-Assigned Regions

LINK AN EXISTING SRP PROJECT

Unlink

25-1231, Wenatchee and Okanogan Thermal IR Surveys,

Project Contacts

Contact Name Primary Org	Project Role	Work Phone	Work Email
Amee Bahr Rec. and Conserv. Office	Project Manager	(360) 867-8585	Amee.Bahr@rco.wa.gov
Doran Lower Rec. and Conserv. Office	MAgy Fiscal Contact	(360) 902-3007	doran.lower@rco.wa.gov
Mark Ingman Cascadia Conservation District	Project Contact	(509) 906-1545	marki@cascadiacd.org
Ariel Edwards Upper Columbia Salmon Rcy Bd L	Lead Entity Contact	(208) 540-2691	ariel.edwards@ucsrb.org

Worksites & Properties

#	Worksite Name
#1	Wenatchee and Okanogan Thermal IR Surveys

Planning	Property Name

Worksite Map & Description

Worksite #1: Wenatchee and Okanogan Thermal IR Surveys

WORKSITE ADDRESS

Street Address 1350 McKittrick Street, STE B
City, State, Zip Wenatchee WA 98801

Worksite Details

Worksite #1: Wenatchee and Okanogan Thermal IR Surveys

SITE ACCESS DIRECTIONS

This is a remote sensing project captured by aircraft and one that includes two sub-basins. I have indicated the worksite as our Cascadia CD office location, located within the lower Wenatchee sub-basin.

TARGETED ESU SPECIES

Species by ESU	Egg Present	Juvenile Present	Adult Present	Population Trend
Steelhead-Upper Columbia River, Wenatchee River, Threatened	✓	✓	✓	Unknown
Chinook-Upper Columbia River Spring, Endangered	✓	✓	✓	Unknown

Reference or source used

Primary source: Upper Columbia Spring Chinook and Steelhead Recovery Plan. Please note, the remote sensed thermal IR data directly identifies cold water refugia as well as warm water inputs that are direct measurements of habitat conditions for both Upper Columbia ESA listed species for multiple life stages. This targeting of species true for both the Wenatchee and Okanogan sub-basins. Screening of survey extent focused more on Steelhead population presence owing to their overlapping and overall greater geographic range compared to spring chinook.

TARGETED NON-ESU SPECIES

Species by Non-ESU	Notes
Rainbow	Rainbow trout and steelhead have varying levels co-existence and sea run attributes.

Questions

#1: Give street address or road name and mile post for this worksite if available.

N/A. There will be ground level water temperature loggers installed in a few locations for QA/QC at publically accessible locations, but these do not constitute a "worksite." All other work is remotely collected or office setting (data processing and analysis).

Project Location

RELATED PROJECTS

Projects in PRISM

PRISM Number	Project Name	Program Name	Current Status	Relationship Type	Notes
No related project selected					

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Projects not in PRISM

Project Number	Project Name	Current Status	Relationship Type	Project Funder
99-9999	Entiat and Mad River Comp	Completed	Related	US Bureau of Reclamations

Related Project Notes

The US Bureau of Reclamation awarded $108,000 to Cascadia CD for a similar comprehensive thermal IR survey of 66 miles of the Entiat and Mad Rivers in 2023. This successful project has led to new project development activities and data requests from multiple consulting firms, NOAA (for HARP model development), Tribal fisheries, and local and regional project sponsors.

Questions

#1: Project location. Describe the geographic location, water bodies or habitat types, and the location of the project in the watershed, i.e. nearshore, tributary, main-stem, off-channel, etc.

The project includes all known areas of steelhead presence (redd data) as well some UCSRB Steelhead intrinsic potential data, within the Wenatchee and Okanogan sub-basins. The geographic extent of the thermal IR survey is informed

#2: How does this project fit within your regional recovery plan and/or local lead entity's strategy to restore or protect salmonid habitat? Cite section and page number.

UC Salmon Recovery Plan, Conclusion, Page 235, Water Quality Restoration, temperature as factor.
UCSRB lead entity regional MADMC data gap IDs are included below, including data gap notes and sponsor comments of how they
integrate.
2.16 - "Temperature and its changes within specific reaches or AU of the UC." Specifically the note: "Need more data at a finer scale." This is precisely what the thermal IR data provides: 18" pixel values with 0.1 C accuracy of water temperature comprehensively for over 400 miles of the Wenatchee and Okanogan subbasins.
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2.18 – "Location and characteristics of thermal refuge areas." This proposed assessment increase the Data Gap note that "some" of Wenatchee to "all of" Wenatchee covered for thermal refugia. The Wenatchee thermal IR data is now legacy, to include the 2018 re-analysis done by 2018 since it used the 2001-2003 data. This assessment would increase the originally flown areas in the 2001-2003 source data, using modern thermal IR sensor, and update the thermal IR data deliverables to current day deliverables (new thermal IR mosaic, thermal anomalies evaluated and identified, longitudinal temperature profiles, and other now standard deliverables).
2.14 – "Evaluation of riparian forest structure and function." High resolution RGB imagery is co-acquired for all surveyed areas, which is necessary for evaluating cold water patches (STFs/anomalies), but also directly helpful as a data source to evaluating riparian canopy coverage.

#3: Is this project part of a larger overall project?

No

#4: Is the project on State Owned Aquatic Lands? Please contact the Washington State Department of Natural Resources to make a determination. **Aquatic Districts and Managers**

No

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Property Details

Properties for this program and project type are optional.

Project Proposal

Project Description

For each the Wenatchee and Okanogan watersheds: provide 1) a highly-detailed geospatial thermal infrared mosaic map that is GIS ready for use by project sponsors, Tribes, consultants, agency staff, and scientists, and 2) identify and map all cold and warm water features ("significant thermal features," STFs), and 3) identify and map the mainstem river longitudinal thermal profile (LTP) along centerlines, and 4) high resolution RGB imagery co-acquired for thermal evaluation and project sponsor use. All deliverables will be GIS ready to import into GIS programs and application for us by project sponsors, the UCSRB, all agencies, scientists, researchers, and the public at large to have access to these important data about their watersheds.
Recovery of cold-water species, steelhead, spring chinook, and bull trout, requires thermal geospatial data that can inform where projects are most needed, will have the most benefit, where unique cold water refugia exists, where warm water is being introduced into the stream, and also to ensure proposed projects do not inadvertently increase mixing of critical cold water habitat. None of these essential considerations for cold water species can influence proposal development nor proposal technical review without a thermal infrared map that is done comprehensively and is up to date for each watershed.

Project Questions

#1: Problem statement. What are the problems your project seeks to address? Include the source and scale of each problem. Describe the site, reach, and watershed conditions. Describe how those conditions impact salmon populations. Include current and historic factors important to understand the problems.

Recovery of cold-water species, steelhead, spring chinook, and bull trout, requires thermal geospatial data that can inform, if not pinpoint, where projects are most needed, will have the most benefit, where unique cold water refugia exists, where warm water is being introduced into the stream, and also to ensure proposed projects do not inadvertently increase mixing of critical cold water habitat. None of these essential considerations for cold water species can inform proposal development nor provide for an informed project technical review without a thermal infrared map that is done comprehensively and is up to date for each watershed. The need for these datasets are crucial with the onslaught of climate-induced rising temperatures.

#2: Describe the limiting factors, and/or ecological concerns, and limiting life stages (by fish species) that your project expects to address.

This project will fill a primary data gap to collect critical cold water habitat data for 227 miles of the Wenatchee River sub-basin and 197 miles of Okanogan sub-basin. Both sub-basin datasets are now obsolete and not usable/reliable for restoration staff in the Upper Columbia region (Okanogan 2005 and Wenatchee 2001-3). These dataset were collected with legacy sensors, do not include the current set of thermal data deliverables, are missing primary fish bearing reaches, and restoration actions in the watershed have caused significant changes to how cold water moves within many of the reaches.

New (modern) thermal datasets are recommended for collection to influence the future prioritization in the Upper Columbia—potentially as part of, or in support of the “climate change” component that is currently being considered by the UC regional staff. Identification of cold water patches will be discretely identified with precise locations using 18 inch pixel resolution and 0.1 C degree accuracy for the entire surface water for 227 miles! These data will be evaluated per the QA/QC protocols developed by NV5 Geospatial, the statewide thermal IR contractor in Washington (WA DNR statewide contractor). The contractor will use automated and semi-automated computing algorithms to analyze the point cloud data, render the mosaics, compute LTPs, and finally evaluate and identify all thermal anomalies (STFs) through a handpicked process based upon multiple factors per the training of a certified Level III thermographer. The data will be obtained through the contractor’s most recent thermal IR sensor on a helicopter (summer flights) and/or fixed wing aircraft (winter flights). RGB imagery is automatically co-acquired with IR data and will be an additional GIS-ready deliverable available for project sponsor and open access use.

#3: What are the project goals? The goal of the project should be to solve identified problems by addressing the root causes. Then clearly state the desired future condition. Include which species and life stages will benefit from the outcome, and the time of year the benefits will be realized. **Example Goals and Objectives**

1. Provide high quality and precise data for salmonid critical cold water habitats. Fill regional MaDMC data gaps, 2.14, 2.16, 2.17, 2.18 (all Tier 1).
2. Survey extent was highly influenced by multiple data sources, as well as those reaches most desired by project sponsors. Therefore, these data will direct spur on project development actions by project sponsors. Directly increase the quantity and quantity of thermal enhancement/climate forward projects.
3. Directly improve in-stream designs so they a) do no harm (inadvertent mixing of otherwise unknown cold water refugia), and b) do the most good (intentionally reduce mixing thereby increasing the size of cold water patches). The Lower Chiwawa Creek Restoration was fortunate to have drone IR imagery provided in-kind at the project scale by a partner, and as a result they dramatically changed their design to avoid mixing cold water and instead increase the cold water plume! (PPT is attached as reference).

#4: What are the project objectives? Objectives support and refine biological goals, breaking them down into smaller steps. Objectives are specific, quantifiable actions the project will complete to achieve the stated goal. Each objective should be SMART (Specific, Measurable, Achievable, Relevant, and Time-bound). **Example Goals and Objectives**

1. Provide Project Sponsors a comprehensive (full/increased coverage), up-to-date, GIS import-ready, thermal mosaic (raster) with longitudinal temperature profile (LTP) and significant thermal features (STFs = cold patches and hot patches), for 523 priority stream miles (All Tier 1, Tier 2, and most Tier 3) for ESA spring chinook and steelhead habitat for the Okanogan and Wenatchee subbasins. Direct benefits: A) develop projects for cold water refugia for thermal enhancement projects based upon STF locations delivered by this assessment (better projects), B) cold water refugia is protected and not mixed inadvertently because all STF locations will be precisely geolocated, and C) maximize benefit: project sponsors and consultants can use the STF locations as part of their designs in order to enlarge the cold water plume to counter the effects of climate change (an example regional project that did this is attached, see "Thermal IR Design change - Lower Chiwaukum" PDF presentation document).

2. Fill Regional Data Gaps for Salmon Recovery. The deliverables will fill Tier 1 data gaps: 2.14, 2.16, 2.17, and 2.18 (Upper Columbia Lead Entity/RTT MaDMC data gap list).

3. Provide Upper Columbia Regional Technical Team a basis for evaluating projects to ensure in-stream work enhances rather than mixes cold water refugia.

#5: Scope of work and deliverables. Provide a detailed description of each project task/element. With each task/element, identify who will be responsible for each, what the deliverables will be, and the schedule for completion.

Task 1. Bid and select contractor, negotiate contract/work order with WA DNR, CCD 2026
Task 2. Planning, meet with contractor and receive final stakeholder inputs, finalize specs, CCD & Contractor 2026
Task 3. Mobilize - Contractor and CCD, 2026, Summer and Fall 2026 (2027 option if weather not flyable)
Task 4. Data processing, analysis, and final report, Contractor with CCD support, winter 2026-27
Task 5. Review of deliverables, QA/QC, Contractor, CCD, and WA DNR Geospatial staff, spring 2027
Task 6. Reporting to RCO, biannual and final, Thermal IR presentation to UC WATs and UC RTT, 2027 Summer-Fall

#6: What are the assumptions and physical constraints that could impact whether you achieve your objectives? Assumptions and constrains are external conditions that are not under the direct control of the project, but directly impact the outcome of the project. These may include ecological and geomorphic factors, land use constraints, public acceptance of the project, delays, or other factors. How will you address these issues if they arise?

Weather is a significant factor since the Okanogan WAT participants have requests a fall-winter flight to better detect some groundwater cold inputs. If the aircraft doesn't have sufficiently safe weather to fly, it won't, potentially missing a seasonal window (leaf off yet water not frozen). In such cases we would opt to collect the following season, or default to all summer acquisition as this also can detect groundwater cold water inputs.

We are confident we can secure the remaining match funding that is limited by the $200,000 assessment cap for our region. This project ranked at the top of our region for the regional review, and so we believe the PRCC Habitat Subcommittee would have a similar level of support for the project. We have tertiary funding potentials that make us confident we can group these surveys together, thus affording a significant cost savings. If in the worst case funding scenario we only received a portion of the RCO assessment funding, we could still acquire a slightly smaller footprint of the Okanogan Thermal IR survey, so the funding in no case would go unused.

#7: How have lessons learned from completed projects or monitoring studies informed this project?

Yes. The applicant oversaw two comprehensive remote sensing surveys for the Entiat Watershed in 2022 and in 2023 (green LiDAR and Thermal IR, both over 50 miles of stream). In each case, we saw more than an order of magnitude (10x) costs savings per mile of stream (unit) by increasing the project assessment area. This is similar to the costs of "mobilizing" for engineered habitat projects. For example, to collect the original 3.5 miles of stream for green LiDAR in the Entiat was estimated to be over $30,000. I increased the 3.5 miles to 50 miles, and we paid $95,000--a greater than 10x cost effectiveness. My only regret for that project was to not have included more--I should have added in the Mad River for green bathometric LiDAR. When I contracted the thermal IR assessment for the Entiat Watershed, I included the Mad River, and now the Entiat Watershed has all 66 miles of anadromous range stream in high quality, ready-to-use data for project sponsors, the lead entity, regional technical team, NOAA, other scientists, and engineering consultants to use (all actual data request examples since the data became available just last year)!

#8: Describe the alternatives considered and why the preferred was chosen.

There isn't a replacement for thermal IR assessment, there is only the choice to increase or decrease the survey extent. I have found several examples where project sponsors mistakenly think they can intuit where cold water patches area. This is only true for tributary cold water patches, and even they can inflow in surprising places. The seeps, hyporheic flows, agricultural returns, and other tough to find cold water (and hot water) patches are impossible to intuit or find in the field with data logger except through pure chance, which of course is way more expensive on a per mile basis than contracting a thermal IR assessment that costs less than $900 per mile, or $90/500 ft (the latter case of 500 ft for $90 is some mainstem projects full linear extent)! People cannot drag thermometers behind rafts or put data loggers in within missing many/most of the cold and hot water patches (STFs). This is all a perfect example, that without an assessment, "we don't know what we don't know," and the critical nature of cold water refugia presents an imperative geolocate this habitat!

Using existing data: the IR technology and deliverables are incomparably advanced in the 20+ year period that's transpired. Both datasets lack necessary survey extent, and are basically obsolete at this point. Many changes to how water flows through these watershed have changed in 20+ years.

Less survey extent: This is really the only alternative, although as I've explained in Question 7, the smaller its made, the higher dollar/mile ratio, and less cost effective. We've right-sized this survey extent for each subbasin by gathering input by all active restoration project sponsors and RTT, and only included those reaches that have documented or modeled steelhead use and little, if any barriers to said habitat reaches. If a barrier is being worked on to be removed, we included the upstream portion if it had steelhead use/intrinsic potential.

#9: How were stakeholders consulted in the development of this project? Identify the stakeholders, their concerns or feedback, and how those concerns were addressed.

The sponsor has worked with both the Wenatchee and Okanogan WATs, and over 10 project sponsors to identify all potential reaches of interest for salmon recovery efforts within the anadromous range of ESA listed and other native cold water fish species. The survey includes all rank 1 reaches, all rank 2, and most rank 3 rankings for both the Wenatchee and Okanogan sub-basins. Additionally, the survey reaches all are within the anadromous range and rarely include reaches above full barriers unless the barrier removal is in an advanced stages of being corrected.

Specific feedback: One Tribe has input on which funding sources to request, added survey extent, requested winter flight, and provided smaller tributaries to be included. The Okanogan CD provided input they gathered from the Okanogan Highland Alliance, provided their own reaches they'd like surveyed. A non-profit in the Okanogan provided several smaller tributaries with steelhead use they are working in and would like to have thermal IR coverage for their project sites. Cascade Fisheries requested new/extended survey reaches/streams in the Wenatchee Watershed: Upper Chiwawa Creek, Chikamin Creek, Big Meadow, and White River. We requested lower Mill Creek and Ingalls Creek in the Peshastin Creek drainage.

We are incorporating all comments and feedback throughout the grant application round.

#10: Does your project address or accommodate the anticipated effects of climate change?

Yes

#10a: How will your project be climate resilient given future conditions?

These assessment data will do three crucially important things for climate change with salmonids and bull trout in view:
A) Do no harm - projects designed and implemented without a thermal mosaic ("thermal map") do so without know if they are causing unintended mixing of critical cold water refugia habitat.
B) Do most benefit - projects that know with precision (0.1 C and 0.5 meter pixel accuracy is current TIR data standard) the location of cold water refugia can design/redesign their project to enlarge the cold water plume.
C) These data, along with existing Entiat Thermal IR data and Methow IR create the state's most complete thermal IR region. This enables the UCSRB and RTT to take the next discussed step of improving their climate change component of their project scoring and evaluation process (discussed at RTT meetings in 2025 and this project's proposal presentation).

Please see attached Lower Chiwakum project example - fully redesigned project per thermal IR data received!

#10b: How will your project increase habitat and species adaptability?

Preserving and even enhancing cold water refugia is to provide greater heterogeneity in the "thermal landscape," that not only benefits cold water in the summer, but also these same cold water patches (groundwater influenced) become warm water patches in what is otherwise icy stream conditions in the winter. As such, STF cold patches provide warm water in the winter than can have profound effects on juvenile rearing in how they not only survive but also the rate of growth (metabolize food sources). There is much we do not know about the genetics and adaptability of salmonids and bull trout, yet having highly detailed thermal map is a critical key to unlocking new avenues of understanding for how these species can adapt to an ever changing environment with the effects of climate change in view.

#11: Describe the sponsor's experience managing this type of project. Describe other projects where the sponsor has successfully used a similar approach.

The project sponsor has successfully completed a nearly identical comprehensive thermal IR survey for the Entiat and Mad River Watersheds in 2023 that resulted in 66 miles of high quality thermal IR assessment data for the restoration community, natural resources agency staff, and the scientific community. The project was completed ahead of schedule and under budget and represents the only full WRIA watershed thermal IR datasets for Washington State. The project sponsor also successfully managed a comprehensive green bathometric LiDAR acquisition for over 50 miles of the Entiat Watershed and its fish bearing tributaries. Both datasets are being used by NOAA for development of the HARP model, as well as numerous restoration practitioners and restoration consultants for project development and project design purposes. In both instances the project sponsor has worked with WA DNR LiDAR and remote sensing office for arranging work orders and also for QA/QC of data deliverables.

#12: Will veterans (including the veterans conservation corps) be involved in the project? If yes, please describe.

Yes

The applicant is a veteran having served in the US Navy for five years with multiple overseas tours. While Cascadia CD has utilized Team Rubicon through their local Wenatchee representative for implementing projects, this type of remote sensing assessment project is not a fit for their partnership on this project.

Planning Supplemental

#1: Is the project an assessment / inventory?

Yes

#1a: Describe any previous or ongoing assessment or inventory work in your project's geographic area and how this project will build upon, rather than duplicate, the completed work.

There are multiple reach assessments and level II surveys conducted by multiple agencies, organizations, and Tribes. The closest any of these assessments come is simple hand held temperature probe and on occasion in-water data loggers. In the case of in-water data loggers, these are the opposite type of data as follows:
1. Loggers collect only at a single pre-determined point in a time series (geographically small, temporally a time-series data). Thermal IR collects spatially comprehensive data (fully coverage throughout project footprint) yet is a snapshot of the critical time of day within the critical time of year (aircraft collets the warmest 1.5-2 hours in the afternoon during baseflow/warm day of the year--temporarily specific).

2. The RA's and Level IIs look at physical and geomorpholigical factors, substrate, and generally those factors that are not the water itself. Thermal IR survey does consider the presence of riparian and other factors when evaluating STFs (cold/hot patches), but only do so to pinpoint the thermal refugia within the temperature profile of the larger watershed (spatially exhaustive with temperature focus).

#1b: How does the project fill a data gap, identified as a high priority in your regional recovery plan, that clearly limits subsequent project identification or development?

UCSRB MaDMC Data Gaps all Tier 1:
2.16 - "Temperature and its changes within specific reaches or AU of the UC." Specifically the note: “Need more data at a finer scale.” This is precisely what the thermal IR data provides: 18” pixel values with 0.1 C accuracy of water temperature comprehensively for over 400 miles of the Wenatchee and Okanogan subbasins.
2.17 – "Temperature effect on fish distribution, movement, stress, and survival within specific reaches or AU of the UC." Assessment will compliment limitations of data logger-based temperature data with more detailed and comprehensive “snapshot” capture of thermal refugia down to the 18 inch pixel size level with 0.1 C accuracy for over 400 miles of the Wenatchee and Okanogan sub-basins. Fills thermal gaps not being monitored by data logger network. Safeguards against loss of logger-based funding (NorthWest). Thermal IR data is QA/QC per in water loggers, akin to ground control points.
2.18 – "Location and characteristics of thermal refuge areas." This proposed assessment increase the Data Gap note that “some” of Wenatchee to “all of” Wenatchee covered for thermal refugia. The Wenatchee thermal IR data is now legacy. This assessment would increase the originally flown areas in the 2001-2003 source data, using modern thermal IR sensor, and update the thermal IR data deliverables to current day deliverables (new thermal IR mosaic, thermal anomalies).

This proposals STFs lead project sponsors to the highest value projects!

#1c: How does the project fit in the larger context such as its fit with a regional recovery-related, scientific research agenda or workplan - and how will it address the identified high priority data void? Work with your lead entity and region to obtain a letter of support to attach.

The RTT Chair has said in commenting on this proposal that at present there has not been fine enough temperature data to do habitat evaluations on the reach scale yet thinks these type of data may fill this data gap and should be reviewed. The NORWEST model, a amalgamation of different in-stream data loggers funded for different reasons and sources, has been loosing its overall funding. While thermal IR is different than steam network loggers, it would provide a strong complimentary data source to fill in gaps and hedge against the loss of federal funding. Tier 1 gaps - 2.16 - would provide sub reach level (0.5 meter, 0.1 C) granular data at finer scale (satisfy gap); 2.17 - provides much finer understanding of fish distribution, stress, etc., because a thermal map (mosaic) is more similar to how fish see/feel water temperature (will satisfy); 2.18 - "location and characteristics of thermal refugia areas" is exactly the STFs geolocated and delivered by this proposal (will satisfy).

#1d: Why are SRFB (or PSAR) funds necessary for the project, rather than other sources of funding?

The UCSRB and RTT are working to fill multiple Tier 1 temperature related data gaps. The RTT Chair and RTT has encouraged more thermal enhancement projects. With the difficulty of finding assessment funding, it reasoned to submit to RCO/UCSRB.

#2: Is your project a Barrier / Screening Diversion Inventory Project?

No

#3: Is this a fish passage design / screening design project?

No

#4: Will the project develop a design?

No

Planning Metrics

Worksite: Wenatchee and Okanogan Thermal IR Surveys (#1)

Area Encompassed (acres) (B.0.b.1)	6,275.0 **Note:** Assumes 100 foot wide swath lateral extent is relavent data whether predominantly stream or riparian, since RGB high resolution data is co-collected and has value to riparian assessment and temperature. This resolves differences in stream and river width to arrive at acreage derived from linear extent.
Miles of Stream and/or Shoreline Affected (B.0.b.2)	523.00 **Note:** The addition of the total Wenatchee and Okanogan thermal IR survey linear extent.

SALMONID HABITAT ASSESSMENT / INVENTORY

Habitat surveys (B.2.d)

Total cost for Habitat surveys	$458,000
Acres of habitat assessed (B.2.d.2)	6,275.0
Amount Of Habitat Assessed That Needed Restoration (B.2.d.3)	6,275.0 **Note:** This seem unclear. This assessment is comprehensive in nature. Without surveying all areas where ESA listed salmonids are known/believed to exist within the respective subbasins, its it unknown what specific locations have cold water refugia. There are large portions of both subbasins where restoration is being planned or implemented that lack thermal IR data. There are also unknown cold water refugia that has not been found through assessments that requires mapping so that they can be protected and ideally enhanced.
Type of Habitat Assessment (B.2.d.1)	LiDAR or other remote sensing Riparian condition

AGENCY INDIRECT COSTS

Agency Indirect

Total cost for Agency Indirect	$0 **Note:** Indirect removed per RCO requirement

Overall Project Metrics

COMPLETION DATE

Projected date of completion	11/1/2028

Planning Cost Estimates

Worksite #1: Wenatchee and Okanogan Thermal IR Surveys

Category	Work Type	Estimated Cost	Note
Agency Indirect Costs	Agency Indirect	$0	Indirect removed per RCO requirement
Salmonid Habitat Assessment / Inventory	Habitat surveys (B.2.d)	$458,000	
	Subtotal:	$458,000	
	Total Estimate For Worksite:	$458,000	

Project Application Report - 25-1231

Summary

Total Estimated Costs:	$458,000
Total Estimated Planning Costs:	$458,000

Project Application Report - 25-1231

Cost Summary

	Estimated Cost	Project %	Admin/AA&E %
Planning Costs			
Planning	$458,000		
SUBTOTAL	$458,000	100.00 %	
Total Cost Estimate	$458,000	100.00 %	

Funding Request and Match

FUNDING PROGRAM

Salmon State Projects	$200,000	43.668122

SPONSOR MATCH

Other Monetary Funding	Grant - Local
Amount	$258,000.00
Funding Organization	Grant County Public Utility District
Grant Program	PRCC Habitat Subcommittee

Match Total:	$258,00056.331878
Total Funding Request (Funding + Match):	$458,000100.000000

Questions

#1: Explain how you determined the cost estimates

A detailed cost estimate was provided to the project sponsor from the statewide (WA DNR contractor) for each the Wenatchee and also the Okanogan survey extents. A relatively minimal amount of project sponsor AA&E hours are needed compared to the costs estimated for the contractor to conduct the assessment work.

Other Funding

OTHER FUNDING DETAILS

Other Funds: Monetary Funding	Local Grant
Amount	$258,000
Funding Organization	Grant PUD PRCC
Grant Program	PRCC Habitat Subcommittee

Other Funding Detail Total:	$258,000

Cultural Resources

Cultural Resource Areas

Worksite #1: Wenatchee and Okanogan Thermal IR Surveys

Area: Cascadia CD Office (Remote Sensing Project)

#1: Describe any planned ground disturbing pre-construction/restoration work. This includes geo-technical investigation, fencing, demolition, decommissioning roads, etc.

None, NA. Assessment is collected at 1,000 altitude in aircraft.

#2: Describe the existing project area conditions. The description should include existing conditions, current and historic land uses and previous excavation/fill (if depths and extent is known, please describe)

land uses and previous excavation/fill (if depths and extent is known, please describe).

N/A. No ground disturbance.

#3: Will a federal permit be required to complete the scope of work on the project areas located within this worksite?

No

#4: Are you utilizing Federal Funding to complete the scope of work? This includes funds that are being shown as match or not.

No

#5: Do you have knowledge of any previous cultural resource review within the project boundaries during the past 10 years?

No

N/A

#6: Are there any structures over 45 years of age within this worksite? This includes structures such as buildings, tidegates, dikes, residential structures, bridges, rail grades, park infrastructure, etc.

No

N/A

Project Permits

Permits and Reviews	Issuing Organization	Applied Date	Received Date	Expiration Date	Permit #
None - No permits Required					

Attachments

Required Attachments	7 out of 7 done
Applicant Resolution/Authorizations	✓
CCA Tribal Notification	✓
Cost Estimate	✓
Landowner acknowledgement form	✓
Map: Planning Area	✓
Photo	✓
RCO Fiscal Data Collection Sheet	✓

PHOTOS (JPG, GIF)

Photos (JPG, GIF)

666628 Primary

PROJECT DOCUMENTS AND PHOTOS

Project Documents and Photos

File Type	Attach Date	Attachment Type	Title	Person	File Name, Number Associations	Shared
	05/27/2025	Correspondence	Jotform - Wenatchee-and-Okanogan-Comprehensive-Thermal-IR.pd	MarkI	Jotform - Wenatchee-and-Okanogan-Comprehensive-Thermal-IR.pdf, 670514	✓
	05/27/2025	Cost Estimate	SAL-CostEstimate Thermal IR updated.xlsx.XLSX	MarkI	SAL-CostEstimate Thermal IR updated.xlsx.xlsx, 670509	✓
	05/27/2025	Correspondence	Thermal IR Project Comment-Response.pdf	MarkI	Thermal IR Project Comment-Response.pdf, 670508	✓
	04/18/2025	Project Application Report	Project Application Report, 25-1231P (sub 04/18/25 11:12:39)	MarkI	Project Application Report - 25-1231 (submitted 04-18-2025_11-12-39).pdf, 666689	✓
	04/18/2025	Note to file	Thermal IR Design Change - Lower Chiwaukum.pdf	MarkI	Thermal IR Design Change - Lower Chiwaukum.pdf, 666686	
	04/18/2025	Photo	Photo - Entiat Assessment Example.jpg	MarkI	Photo - Entiat Assessment Example.jpg, 666628	✓
	04/18/2025	Map: Planning Area	Map - Planning Area.pdf	MarkI	Map - Planning Area.pdf, 666624	✓
	04/18/2025	RCO Fiscal Data Collection Sheet	CascadiaCD - FiscalDataCollectionSheet.pdf.PDF	MarkI	CascadiaCD - FiscalDataCollectionSheet.pdf.pdf, 666619	
	04/18/2025	Landowner acknowledgement form	Landowner acknowledgement form.docx	MarkI	Landowner acknowledgement form.docx, 666615	
	04/18/2025	Cost Estimate	SAL-CostEstimate Thermal IR.xlsx	MarkI	SAL-CostEstimate Thermal IR.xlsx, 666612	✓
	04/18/2025	Applicant Resolution/Authorizations	2025-04-CCDApplicantAuthorizationResolution for signature.pd	MarkI	2025-04-CCDApplicantAuthorizationResolution for signature.pdf, 666606	✓
	04/18/2025	CCA Tribal Notification	Tribal Notification Letter.docx	MarkI	Tribal Notification Letter.docx, 666605	✓

Application Status

Application Due Date: 06/23/2025

Status Name	Status Date	Submitted By	Submission Notes
Application Submitted	04/18/2025	Mark Ingman	
Preapplication	04/03/2025		

Project Application Report - 25-1231

I certify that to the best of my knowledge, the information in this application is true and correct. Further, all application requirements due on the application due date have been fully completed to the best of my ability. I understand that if this application is found to be incomplete, it will be rejected by RCO. I understand that I may be required to submit additional documents before evaluation or approval of this project and I agree to provide them. (Mark Ingman, 04/18/2025)

Date of last change: 05/21/2025

RESTORATION

				OVERALL PROJECT	GRANT REQUEST	MATCH			
				Budget must account for all costs to complete the project	*Enter only the amount of the grant request*	*The Grant Request and Match should equal the total project cost and Budget Check cell should be 0. Sponsors must account for all sources and types of match need to complete the project.*			
				Amount	Grant Amount	Match in PRISM	Funding not reported in PRISM	Source (Grant, Cash, Materials, Labor, Volunteers, etc)	Match Type (federal, state, local)
Construction									
Category (choose one)	**Task Description**	**Qty**	**Rate**						
Contractor Assessment	*State contractor assessment costs*	1.00	$ 441,220.00	$ 441,220	$ 192,672	$ 248,548			
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -				$ -		
			$ -				$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			STotal	**$ 441,220**	**$ 192,672**	**$ 248,548**	**$ -**		

Administrative, Architechtural & Engineering				Amount	Grant amount	Match in PRISM	Funding not reported in PRISM	Match Source	Match Type (federal, state, local)
Category	**Task Description**	**Qty**	**Rate**						
Administrative	*Cascadia Project Management and AA&*	1.00	$ 16,780.00	$ 16,780.00	$ 7,328	$ 9,452	$ -		
					$ -	$ -	$ -		
					$ -	$ -	$ -		
					$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			$ -	$ -	$ -	$ -	$ -		
			STotal	**$ 16,780**	**$ 7,328**	**$ 9,452**	**$ -**		

Indirect Costs				Amount	Grant amount	Match in PRISM	Funding not reported in PRISM	Match Source	Match Type (federal, state, local)
	Description	**Approved Rate**	**Total Project Base**						
	Indirect	0.000%	$ -	$ -	$ -	$ -	$ -		
	Indirect	0.000%	$ -	$ -	$ -	$ -	$ -		
			STotal	**$ -**	**$ -**	**$ -**	**$ -**		

AA&E Budget Check	
A&E maximum allowed in PRISM	*$ 132,366.00*
A&E validation	115,586

Totals	**$ 458,000**	**$ 200,000**	**$ 258,000**	**$ -**
		PRISM Project Total	$ 458,000	
		RCO Percentage	**Match Percentage**	
		43.668100%	**56.331900%**	

CUMULATIVE TOTALS

This sheet contains automatic calculations

Project Name	Wenatchee and Okanogan Thermal IR Surveys
SRFB #	25-1231
Sponsor	Cascadia Conservation District

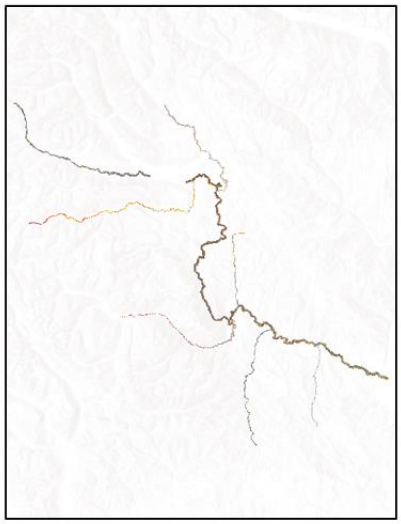
	OVERALL PROJECT Cost	GRANT REQUEST Amount	PRISM MATCH Amount	MATCH NOT IN PRISM Amount	*Budget Check*
Sheet #1 Acquisition					
Property Costs	$ -	$ -	$ -	$ -	0
Incidental Costs	$ -	$ -	$ -	$ -	0
Administrative Costs	$ -	$ -	$ -	$ -	0
Indirect Costs	$ -	$ -	$ -	$ -	
STotal	$ -	$ -	$ -	$ -	0
Sheet #2 Design					
Design Costs	$ -	$ -	$ -	$ -	
Indirect Costs	$ -	$ -	$ -	$ -	
STotal	$ -	$ -	$ -	$ -	0
Sheet #3 Restoration					
Construction Costs	$ 441,220	$ 192,672	$ 248,548	$ -	0
AA&E	$ 16,780	$ 7,328	$ 9,452	$ -	0
Indirect Costs	$ -	$ -	$ -	$ -	
STotal	$ 458,000	$ 200,000	$ 258,000	$ -	0
Totals	$ 458,000	$ 200,000	$ 258,000	$ -	0

Wenatchee Assessment Coverage

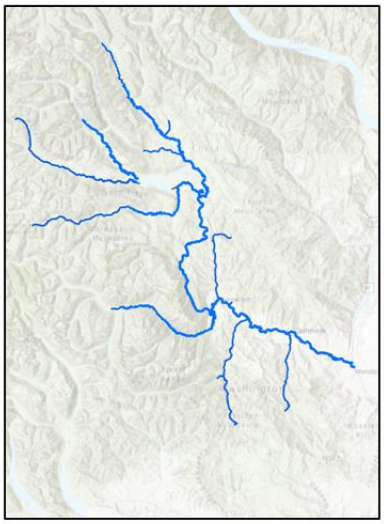
rKM	Existing Extent
16	Lower Chiwawa Creek
43.9	Nason Creek
81	Wenatchee River
18.5	Chumstick Creek
26.3	Peshastin Creek
37.7	Mission Creek
37.5	Little Wenatchee
31.6	Icicle Creek
292.5	Km Total

rKM	Added Survey Extent
42.1	Upper Chiwawa Creek
3.8	Chikamin Creek
12.5	Big Meadow Creek
25.8	White River
1.7	Mill Creek
1.6	Ingalls Creek
87.5	Km total

2001-2003 Legacy Dataset



Proposed Survey



CASCADIA CONSERVATION DISTRICT

Okanogan Assessment Coverage

rKM	Existing Extent
110	Okanogan River
8	Lower Silkamen
118	Km Total

rKM	Added Survey Extent
0	Okanogan
29	Silkamen to Canada
32	Salmon Creek
32	Omak Creek
18	Loup Loup Creek
16	Johnson Creek
12	Antoine Creek
6	Tonasket Creek
3.7	Bonaparte Creek
0.6	Aneas Creek
1	Chiliwist Creek
0.3	Mosquito Creek
1.8	Wanacut Creek
1	Whitestone Creek
153.4	Km total

2005 Legacy Dataset

Proposed Survey

CASCADIA CONSERVATION DISTRICT

Tier 1 Data Gap - 2.18

ver 02.12.25

Sub-Categor	Topic	Data Ga	Tier	Data Gap Description
Habitat	Thermal Refuge	2.18	1	Location and characteristics of thermal refuge areas.

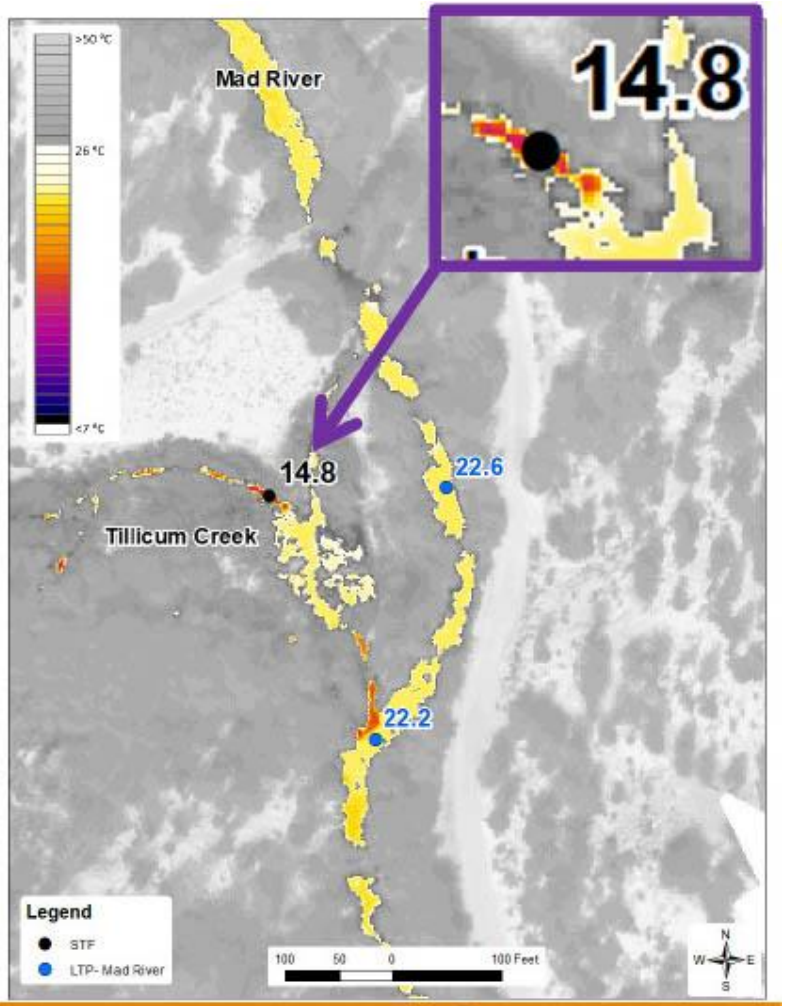
2023 Entiat Thermal IR Survey: 66 miles of Entiat and Mad Rivers

→ Exactly 36 STFs identified by certified Thermographer Level III

→ Mosaic: LTP semi-automated algorithms along centerline

→ Field measurements do not reveal missing STFs; we only know all STFs are accounted for through thermal IR survey

→ 1) Do no harm –no mixing, and 2) Do most good—reduce mixing & increase shading



The following table includes responses to the comments received during the review process.

RTT Comments

RTT Written Comments – There were not any written comments suggesting how to improve the proposal (relatively high scoring). All below questions were received as follow-on questions for the presentation.

Response to RTT Comment following presentation –
How to best apply TIR data results as project sponsors: A question was raised as to how project sponsors can or will best apply the thermal infrared data to benefit restoration projects. The reviewer also mentioned the Lower Chiwaukum project sponsored by Cascade Fisheries as a regional example of how thermal infrared can be used to benefit project design.

Response: We agreed that the Lower Chiwaukum project is an excellent case study demonstrating how thermal infrared data can have significant benefits to project design. As part of the outreach for this project, we had Cascade Fisheries present their Lower Chiwaukum project to the Wenatchee WAT project sponsors, so as to socialize how getting a comprehensive thermal infrared dataset for the Wenatchee sub-basin would be beneficial to future restoration projects and simply to show how these data are practically applied to project design. We have included a full copy of the Lower Chiwaukum PowerPoint presentation in PRISM. Additionally, as part of the field tour presentation, we provided multiple slides and commentary for the RTT and CAC to see how the Lower Chiwaukum project utilized thermal IR data to radically change their project design from one that would have mixed cold water to instead one that preserved and extended the cold water plume downstream. We are working with the UCSRB on a devoted workshop/session that will bring in restoration professionals from outside our region to present on how they are using thermal infrared to develop and design restoration projects. An example image is provided at the end of this document to show the change of the Lower Chiwaukum project's design changed as a result of integrating thermal IR data.

Comment 2 – How has the past thermal IR data been used by project sponsors and what are the barriers?

Response to Comment 2 – The response to these questions depends on which watershed.

Wenatchee – The Wenatchee TIR dataset was acquired by Ecology in 2002-2003 for Clean Water Act, Total Maximum Daily Load development (temperature impairment). The data has for most sponsors sat on a CD/DVD up through around 2018 when the CCNRD developed a project that was successful generated a mosaic (non-orthorectified) of the legacy 2002-2003 data. Following the 2018 re-analysis of the legacy data, CCNRD was able to do some ground truthing, QA/QC of the dataset. It was more recently over the past year (2024 onward) that this re-analyzed dataset was distributed out to other project sponsors who work in the Wenatchee watershed. Project sponsors have identified multiple significant streams and reaches missing in this dataset that was never acquired, such as Upper Chiwawa, Chikamin Creek, Big Meadow Creek, White River, Mill Creek, and Ingalls Creek. There is also a lack of STFs (cold & warm patch points), longitudinal temperature profile (LTPs) and other modern data deliverables missing from the legacy Wenatchee thermal IR dataset. Unfortunately the re-analysis of the dataset completed in 2018 still is limited to the data that was collected 23 years ago.

Okanogan – This dataset was collected in 2005 by KWA Inc., a one person LLC that used a handheld thermal IR sensor with low accuracy and quality. The LLC more so does documentary film in environmental nature but not extensive work in thermal IR. The dataset was unsuccessful in collecting data from Salmon Creek and did not include Omak Creek. Furthermore, the dataset is not available or in an accessible form, therefore no project sponsor has both access and a way to use the legacy data for project development (relatively defunct).

Both: The UCSRB is actively working with us to make a beta version web accessible version of the thermal infrared dataset for all four sub-basin watersheds. This effort is dependent upon the Wenatchee and Okanogan receiving a comprehensive and modern thermal IR dataset since the Methow (2009) and Entiat (2023) already have these datasets. This beta web map is new and in a testing phase by project sponsors. Distribution of these data has generally occurred through USB drives or FTP, from the project sponsor leading the thermal IR collection on to those project sponsors

requesting the datasets.
Comment 3 – Since the thermal infrared only collects the surface water value of the stream, how do project sponsors know the temperature below the surface?
Response to Comment 3 – The thermal infrared sensor receives the passive return infrared energy reflected back from the different surfaces of the land, water, vegetation, developed surfaces, etc. In the case of water, research has shown that the surface water temperature is consistently similar to the water column temperature down to around 10 feet of water depth. Even in cases of where a subsurface (i.e. hyporheic or groundwater) return flow is sub surface, this water is quickly picked up downstream as it mixes, unless it is an extremely small, or de minimis sized cold water return flow, in which case it doesn't create a cold water plume of significant size. In such cases, such a what is considered a small and/or "non point source," this too is possible to detect. The "non point" cold water sources are interpreted within the LTP (longitudinal temperature profile) deliverable, because the general trend of warming in the downstream direction will cease or decrease in a noticeable way, suggesting that some cold water inputs exist even though no point source was identifiable per the size or way it enters the stream. This scenario of non-point source cold water inputs were observed in the Entiat thermal infrared project (2023), in the Middle Entiat reaches, where the typical warming trend in the LTP (longitudinal temperature profile) in fact ceased for a nearly three mile segment of the Entiat River. As such, most Upper Columbia streams have little if any stream depths at baseflow greater than 10 feet of depth, and if they do, dissolved oxygen for salmonids is in doubt. For these reasons, infrared technology is very accurate and useful in characterizing the entire water column. Thermal infrared provides this valuable data at a large scale, and it comprehensively surveys cold water habitat for salmonid species.

Cascade Fisheries, Lower Chiwaukum project design change with thermal infrared data inclusion