Science Coordination Team for Coeur d'Alene Lake

Science Priorities



Prepared by the Science Coordination Team

Coeur d'Alene Lake
Science Coordination Team

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1 Introduction

This Science Priorities document is authored by the Coeur d'Alene Lake Science Coordination Team (SCT). The SCT is comprised of scientists from key organizations that contribute to the scientific understanding of Coeur d'Alene (CDA) Lake and use this information to help protect and enhance lake health. The SCT identified that a collaboratively authored document describing CDA Lake science priorities is critical to ensure organizations are working towards a common goal and evaluating CDA Lake in a collaborative and focused manner (SCT 2024).

1.1 Background and Need

CDA Lake is the spiritual heart of the Coeur d'Alene Tribe (Tribe) and has sustained the Tribe since time immemorial. CDA Lake is also cherished by northern Idaho and eastern Washington communities as a center for local and tourist recreation and is a driver of the regional economy. The lake is heavily contaminated by historic mining waste and is experiencing new pressures from regional growth, other anthropogenic activities throughout its watershed, and changing temperature and precipitation patterns. These new factors add to the challenges posed by metals pollution from historic mining practices within the Silver Valley. Metals in sediment at the bottom of the lake and suspended in the water column resulted in the inclusion of the lake and Spokane River into the Bunker Hill Mining and Metallurgical Complex, one of the nation's largest Superfund sites (EPA Region 10 2012).

For decades, numerous governments, agencies, and organizations have worked to understand and improve the health of CDA Lake and its surrounding basin. Because of the inherent complexity of such a large ecosystem crossing multiple jurisdictions, collaboration and cooperation among contributors is necessary. These programs and agencies include the IDEQ Coeur d'Alene Lake Management Plan staff, the Coeur d'Alene Tribe Natural Resources Department, Coeur d'Alene Basin Environmental Improvement Project Commission, Our Gem Collaborative, agency staff and their representatives involved in the Bunker Hill Mining / Metallurgical Complex Superfund Site, and Coeur d'Alene Basin Restoration Partnership.

This Science Priorities document aims to help focus these collective efforts to recover the lake's health and protect it into the future, building upon past work and identifying key questions relating to core research themes. Research projects are also recommended. The following key documents provide context on the lake-focused studies and projects conducted in the lake and surrounding basin:

- *Analysis and Development of an Updated Conceptual Site Model for Coeur d'Alene Lake Structure and Mixing* (DEQ 2025)
- *The Future of Water Quality in Coeur d'Alene Lake* (NASEM 2022)
- *Coeur d'Alene Lake Management Program Plan: Lake Status Update, 2015–2018* (DEQ 2020)
- *Coeur d'Alene Lake Management Plan: Total Phosphorus Nutrient Inventory, 2004-2013* (DEQ and CDA Tribe 2020)

- *Coeur d'Alene Reservation Five-Year Synthesis, 2011–2015 Monitoring Data* (CDA Tribe 2017)
- *Coeur d'Alene Lake Management Plan: Summary of Lake Status and Trends, 2008–2014* (DEQ and CDA Tribe 2016)
- *Interim Record of Decision Amendment (*EPA Region 10 2012)
- *Coeur d'Alene Lake Management Plan* (DEQ and CDA Tribe 2009)
- *Coeur d'Alene Lake, Idaho: Insights Gained from Limnological Studies of 1991–92 and 2004–06* (Wood and Beckwith 2008)
- *Superfund and Mining Megasites: Lessons from the Coeur d'Alene River Basin* (NRC 2005).
- *Final (Revision 2) Remedial Investigation Report for the Coeur d'Alene Basin Remedial Investigation/Feasibility Study* (EPA 2001)
- *Nutrient and Trace-Element Enrichment of Coeur d'Alene Lake, Idaho* (Woods and Beckwith 1997).

Many lake-focused and other relevant technical reports have been produced by the Idaho Department of Environmental Quality (DEQ), the Coeur d'Alene Tribe, United States Environmental Protection Agency (EPA), United States Geologic Survey (USGS) as well as academic theses and dissertations, and peer-reviewed publications. Many of these additional sources are referenced in the documents listed above.

1.2 Audience

The SCT developed this Science Priorities document to aid the organizations that contribute to the scientific understanding and improvement of the health of CDA Lake. These include the Coeur d'Alene Tribe, state and federal environmental and scientific agencies, and scientists in the private sector and at regional universities. In addition, this document can be used by funding agencies or entities that contribute to CDA Lake projects and any groups or individuals with an interest in the lake's health. This document raises awareness of past scientific work and supports collaboration among contributors to address the lake's complex challenges.

1.3 Vision Statement

Scientific progress towards a common goal requires a shared vision. The SCT developed the following consensus vision for the desired future of CDA Lake. This vision provides a foundation for collaborative scientific work.

> *We envision a future CDA Lake and catchment that supports healthy native animal and plant communities and people. This future supports good water quality and healthy ecosystem function. We will help achieve this vision by fostering interdisciplinary dialogue, robust scientific knowledge, and adaptive management practices that support resource managers and the public in protecting public health, attaining cultural and beneficial uses, and recovering ecosystem health.*

1.4 Purpose

This document establishes collaborative science priorities to support the sustenance and recovery of CDA Lake. These priorities establish scientific themes and key questions to forward our collaborative understanding and help focus the scientific community's efforts. This document provides a framework for managers and decision makers to use when prioritizing studies and projects and for planning scientific and technical work that improves and protects the long-term health of CDA Lake.

The science priorities are consistent with an adaptive management approach where management actions guide research questions and research outcomes guide future management strategies. These themes and key questions provide a framework for conducting adaptive management. Example projects are provided for each theme and question to help communicate the intent and are not exclusive or exhaustive.

The SCT encourages organizations to use this document as a reference for communication and collaboration of project concepts, methods, results, outcomes, and lessons learned; for sharing resources, and for budgetary prioritization.

2 Science Priorities

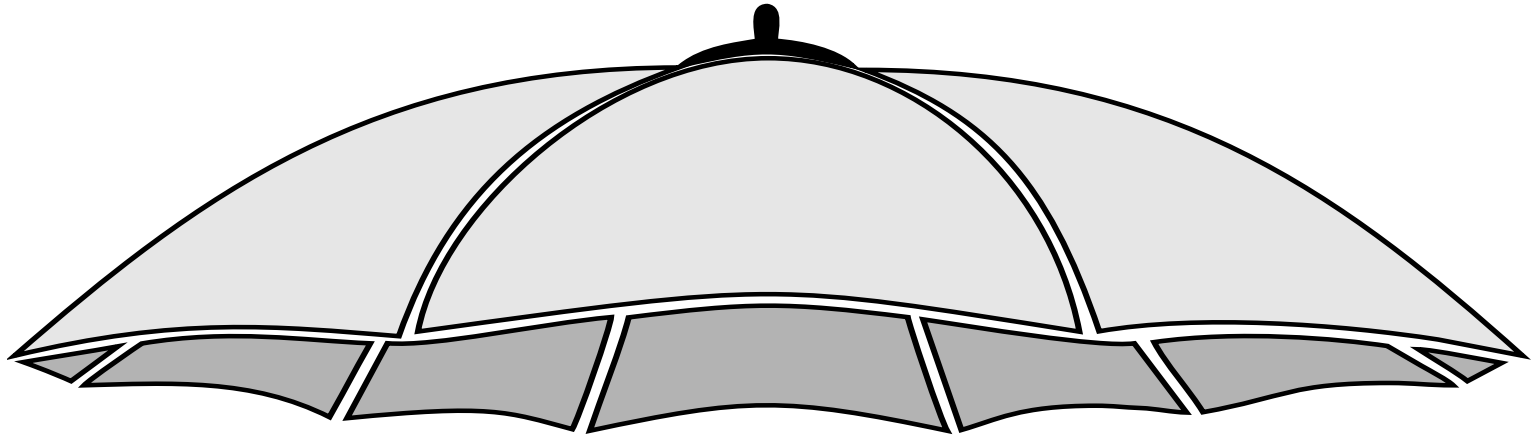
Many organizations conduct scientific research, monitoring, and outreach activities in and around CDA Lake. Each of these entities has its own mission and corresponding priorities. This document provides a consensus framework to help guide individual work while promoting collaborative projects to protect the lake. Collaboration on scientific priorities will help to optimize efforts and maximize gains while respecting each organization's individual focus and mission.

The SCT developed six science priority themes that support the vision statement. Key questions were developed for each theme, and potential projects were proposed for each theme/question combination. The SCT emphasizes that all themes and questions are interconnected and equally important from a scientific perspective. Individual projects to address one or more questions can be of higher or lower priority; the order of the themes and questions introduced does not imply a higher priority.

The overarching themes are summarized in Figure 1, with the umbrella symbolizing that the themes combine to support a common vision. Individual themes, key questions, rationales, and select example projects are described in the following subsections. A list of ongoing and potential future projects to address each theme and key question is provided in Appendix A. A cross-reference between the key questions and scientific recommendations from the National Academies of Sciences, Engineering, and Medicine (NASEM 2022) is provided in Appendix B.

Figure 1.

Vision – We envision a future CDA Lake and catchment that supports healthy native animal and plant communities and people. This future supports good water quality and healthy ecosystem function. We will help achieve this vision by fostering interdisciplinary dialogue, robust scientific knowledge, and adaptive management practices that support resource managers and the public in protecting public health, attaining cultural and beneficial uses, and recovering ecosystem health.



Themes – exist at the same level to demonstrate their equal importance to achieve the overall vision.

Does the lake support desired uses and functions?

How does the lake work now?

How is the lake changing?

What are threats to the lake?

How are we using science to inform decision making and management?

How do we share data and information?

2.1 Does the Lake Support Desired Uses and Functions?

The SCT recognizes that desired uses of the lake will vary widely across multiple legal, cultural, and environmental frameworks. For example, the lake historically supported subsistence fishing, hunting, and harvesting of flora used as food, fiber, and medicine by the Tribe, and its relationship to and stewardship of the lake that was governed by its own system of customary laws. In contrast, DEQ uses state legal definitions for beneficial uses that have only partially been assessed for CDA Lake. Scientific efforts associated with this theme work to clarify desired future uses and functions for the lake and evaluate the lake's status relative to those uses.

Key Question	Rationale – Why?
T1Q1. What are the current and desired uses and do lake and watershed conditions support them?	A thorough understanding of the community's current and desired uses of the lake is required to understand whether those uses are supported.
T1Q2. What conditions in the lake and surrounding landscape allow for the full range of hunting, fishing, gathering, and ceremonial uses in the Tribe's seasonal	Since time immemorial, the land-, water-, and air-scapes have provided for the Coeur d'Alene people. Restoring and maintaining the first foods, fibers, and medicines represented on the seasonal calendar is just one example of why this question is important to the Tribe.
T1Q3. What are the risks to human health from current and desired lake uses?	Understanding the extent to which the current lake conditions may negatively affect human health guides what can be done to mitigate those effects.
T1Q4. What are the risks to ecological health?	Understanding the extent to which current lake conditions may negatively affect organism health guides what can be done to mitigate those effects.

One example project supporting this theme comes from the long-term monitoring conducted by the Coeur d'Alene Tribe and DEQ. These monitoring efforts date to 1995 and are augmented by USGS and EPA studies from 1975, 1991–1992, and 2003–2006. This monitoring data includes chemical, physical, ecological, and atmospheric parameters that are regularly used to assess the lake's health and understand lake trends. These data provide a way to assess how the lake

is changing relative to established goals. These data also support more detailed studies into specific in-lake processes.

Another example project supporting this theme is the Screening Level Risk Evaluation (SLRE) of Selected Recreational Areas in CDA Lake and the Spokane River study, led by DEQ and Alta Science and Engineering, Inc. (2025) that examines the health risk for people who work, live, and recreate on the lake relative to metals in nearshore sediments. The lake sediments are contaminated with lead among other metals, and new contamination arrives each spring from CDA River runoff. People who use the lake can be exposed to these contaminants and understanding the level of exposure that constitutes a risk has changed since the last assessment done in 1999. This study uses sediment, beach, and water samples from around the lake to assess health risk and determine ways to protect human health.

2.2 How Does the Lake Work Now?

The lake is an intricate system that is not well understood. The water body can be more effectively managed with a thorough understanding of its environmental systems. Scientific efforts associated with this theme evaluate the lake's core functions and processes from biological, ecological, and physical perspectives. Key questions associated with this theme are provided below.

Key Question	Rationale – Why?
T2Q1. What controls the lake's hydrodynamics and mixing behaviors?	Improved understanding of the lake physics is needed to better describe how contaminants, nutrients, and sediments move within the lake and influence its ecology.
T2Q2. What controls pH and oxygen concentrations in the lake?	Improved understanding is needed of processes in the lake and watershed that influence water quality parameters, pH, and oxygen, which are primary controls on the release of metals from lake sediments.
T2Q3. How are contaminants, nutrients, and sediments moving into the lake?	The inputs to the lake and how they may be changing over time are not fully understood.
T2Q4. How are contaminants, nutrients, and sediments moving within the lake, including between the water column, sediments, and food web?	The dynamics of contaminant, nutrient, and sediment movement influence how each are transformed, and subsequently affect lake health and ecology.
T2Q5. What are the lake's ecologic processes?	Management and restoration efficacy can be improved when the linkages between ecological components of the lake are better understood.
T2Q6. How are contaminants, nutrients, and hydrology influencing the lake's ecology?	It is important to understand how metals and nutrients affect the lake's ecology because an imbalance of these constituents can negatively affect the lake.
T2Q7. How do nearshore (littoral) processes influence the lake's health?	The nearshore zone is integral to lake health, and it is important to gain a better understanding of how nearshore processes affect people, fish, and wildlife that use this region of the lake.

One example project supporting this theme comes from the Coeur d'Alene Tribe's monitoring of the lake's intersection with the CDA River, St. Joe River, and inundated lakes near the St. Joe River mouth (Benewah, Chatcolet, and Round lakes). These studies quantify how changes in river processes influence the chemistry and biology of the lake's shallower southern regions, where the lake is more biologically productive and more susceptible to releases of nutrients and toxic metal contaminants from the sediments into the lake's overlying waters than other parts of the lake. The Tribe is also investigating how key metals move into and through the lake's food web. These data provide valuable knowledge into how metals in the lake move between the rivers, sediments, lake waters, and the food web.

2.3 How is the Lake Changing?

The lake is in a continual state of change as it transitions from the historic mining damage and responds to new pressures from human development and changing patterns in precipitation and temperature. These shifts are altering the lake's physics and ecology in important ways. In this theme, scientific efforts to understand past and current changes in the lake are used to determine ways to protect the lake and people who use it.

Key Question	Rationale – Why?
T3Q1. How has the lake changed since pre-European settlement, early settler land development, mining era, and the remediation era?	A fuller understanding of past lake conditions will enable more realistic lake remediation and restoration targets to be set.
T3Q2. How has the distribution of metals in the lake sediments changed over time?	The distribution of metals in lake sediments affect human health and lake ecology.
T3Q3. How is the lake changing relative to established goals and objectives?	Understanding changes in lake health allows assessment of progress relative to established goals.
T3Q4. How has the surrounding watershed changed over time, in ways that could influence the lake?	Understanding watershed changes over time helps determine how watershed management may protect or harm the lake.

One example project supporting this theme comes from the current paleolimnology study by the Coeur d'Alene Tribe, University of Oregon, Indiana State University, and DEQ. This project takes sediment cores from the lake and looks at the past impacts from agricultural, forestry, and mining development. The study will track how lake ecology and chemistry changed through the colonization era, mining era, and the subsequent mining recovery era since the Bunker Hill Superfund site was established. This information will help us understand past lake conditions before the contemporary monitoring record and give more historical context on the lake to inform updates of management goals and restoration targets.

2.4 What are the Threats to the Lake?

The lake is heavily contaminated with mining waste, and these metal pollutants pose a continuing risk to human health and the lake's food web. New risks are also emerging, including increased frequency of harmful algal blooms, spreading aquatic invasive species, and ecologic damage from increased recreational pressures. Scientific efforts associated with this theme assess the various threats to the lake and describe the factors that influence them. Key questions associated with this theme are provided below.

Key Question	Rationale – Why?
T4Q1. What are the risks associated with the release of metals from the lake sediments?	It is not known how environmental changes will influence metals release from sediments and how metals release affects human health and ecology.
T4Q2. What are the risks from metals present in lake sediments?	Understanding the risks associated with the metals contamination in the lake's sediments will guide the types and extent of remediation and management needed to mitigate those risks.
T4Q3. What are the risks associated with cultural eutrophication in the lake?	Human-induced eutrophication in lakes directly impacts desired uses. Tracking eutrophication helps to better understand and respond to its root causes and mitigate negative effects such as harmful algal blooms.
T4Q4. How will current and projected changes in regional precipitation and temperature patterns influence the lake?	Changing temperature and precipitation patterns are anticipated to alter many of the primary factors that control the lake's nutrient balance, metals cycling, and ecologic processes at human time scales. Understanding how the lake will change will allow a better response to future impacts.
T4Q5. What are the impacts of invasive species on the lake (ecology, recreation, infrastructure, etc.)?	Invasive species are a priority concern for lake managers, proponents, and the general public because of the potential to disrupt lake processes and use, property, and infrastructure.
T4Q6. How does population growth and increased recreational use impact the lake?	The lake is experiencing increasing recreational use, and its watershed is experiencing rapid population growth that can cause negative effects. A better understanding is needed of the "carrying capacity" for the lake and watershed.

One example of this theme comes from studies by the University of Idaho (in progress) on how recreational pressure may be influencing the lake's ecology and water quality. This work assesses how nearshore development may influence localized algal growth, and how boat wakes may impact water quality.

2.5 How are we Using Science to Inform Decision Making and Management?

A guiding objective of scientific work on the lake and its watershed is to support the recovery of the lake's natural function and ensure its protection into the future. Scientific efforts associated with this theme investigate options for managing, remediating, and restoring the lake and its watershed. Results from this work provide some of the most direct benefits to the community. Key questions from this theme are provided below and support informed land use and resource management activities.

Key Question	Rationale – Why?
T5Q1. What can we learn from the lake's history to evaluate possible futures?	A key step to predicting the future is to understand the past and use that understanding to formulate protection and restoration approaches.
T5Q2. What are the restoration/ management objectives and goals?	A clear and agreed upon statement of goals and objectives is required to formulate a plan to achieve them.
T5Q3. How can we meet the restoration/ management objectives and goals?	It is important to understand how much land and water management can achieve, and what might happen if those actions are not taken.
T5Q4. How are current management actions affecting the Lake?	Evaluating current management approaches helps to adjust restoration and management techniques to meet goals and objectives.

One example project supporting this theme comes from the ongoing efforts by EPA and USGS to monitor the lake's inflowing rivers. These agencies monitor discharge, nutrients, metals, and other parameters at the outlets of the St. Joe and CDA Rivers and at numerous upstream locations along the CDA River. This information is then used to quantify aquatic health risks, evaluate the efficacy of past remedial activities, and identify areas for future remediation.

2.6 How do We Share Data and Information?

A large amount of scientific work and data collection is being conducted on the lake and in the surrounding basin. Many different entities are performing this work using different data management and sharing strategies. Timely access to an integrated set of data and information is important to collaborate effectively. It is difficult to track all the data and make the information available to those who need it. Scientific efforts associated with this theme focus on improving the infrastructure for how data and information are shared and used (e.g. FAIR and CARE principles). Key questions associated with this theme are provided below.

Key Question	Rationale – Why?
T6Q1. What data and information are available and what are the barriers to accessing and sharing it?	Data and information sharing currently varies by organization. More effective data sharing is needed to support decision making.
T6Q2. What are the data and information management goals?	Understanding intended user and information management goals allows for cohesive data management.
T6Q3. What tools and strategies can we use to meet the goals?	Sufficient access to existing data and information is lacking. Identifying strategies and tools would improve data access and understanding and support decision making.
T6Q4. Can we gather data more efficiently?	Significant opportunities exist to improve the efficiency and effectiveness of data collection and integrate new technologies. Sampling and monitoring strategies developed decades ago do not use the latest technologies.

One example project supporting this theme comes from ongoing efforts by EPA to build a comprehensive, publicly accessible database for environmental information for the Bunker Hill Superfund Site collected by partner agencies and governments. The Coeur d'Alene Tribe has already entered data into this database, USGS efforts to enter data are ongoing, and DEQ will begin entering data in 2025. This database will provide the first platform where all partnering groups enter data into a single unified source. The database will reduce the barriers to accessing environmental data associated with the Bunker Hill Superfund Site.

2.7 Application of Priorities for Organizations

While all themes and key questions are equally important from a scientific perspective, some are easier to address than others. It is helpful to consider the complexity and potential timeline for completion when selecting and prioritizing projects. In this section, projects are sorted according to timeline and complexity. Organizations can use this information to help guide allocation of resources to maximize progress on the science priorities. The ratings are not intended to bias decision making on funding or identify "unimportant" questions. Rather, ratings are given to aid readers in characterizing the large breadth of potential questions and projects. Limitations to this document are further discussed in section 3.2.

Each Key Question was rated by the SCT on a 1–5 scale for Complexity and Timeline, where a rating of 1 indicates less complexity and a shorter timeline for completion (Figure 2). Questions with similar timelines and complexity lie along the 1:1 red dotted line on this figure and can be used to assist with prioritization of Key Questions. Appendix A includes labels to link each rating to each Theme and Key Question (e.g., T1Q1 = Theme 1, Question 1; as listed in section 2.1 through 2.6). Full criteria for ratings and data connecting each point to a key question is included in Appendix C.

A similar rating exercise was completed for all 117 example projects and is included in Appendix C. While the visual groupings for the example projects are not clear, the projects are sorted in a table by average ratings.

3 Progress

Progress towards each theme and key question depends on funding availability, organizational staffing, individual study results, and progress in adaptive management. Completion timelines will vary. The Science Priorities have been established such that each organization may have different funding criteria and mission direction, but can use the overarching priorities to focus collective efforts. Work can be conducted concurrently between themes, key questions, and specific projects, which may address multiple key questions and themes.

Each organization has worked on projects that address the key questions. The SCT compiled a list of these example projects with information outlining the lead entity and current project status, etc. (Appendix D).

The SCT anticipates each organization will promote or report progress on the projects, studies, and management actions they lead. The SCT encourages collaborative work following an adaptive management framework. Data should be managed according to a lake data management plan, once developed. Each organization is encouraged to begin these projects with SCT collaboration, and to share project outcomes and lessons learned. The SCT will include this information in future annual workplan and achievements reports, and in subsequent revisions and updates to this Science Priorities document (section 3.1). Progress may also be presented at an annual SCT meeting and at other relevant events, such as the Our Gem symposium.

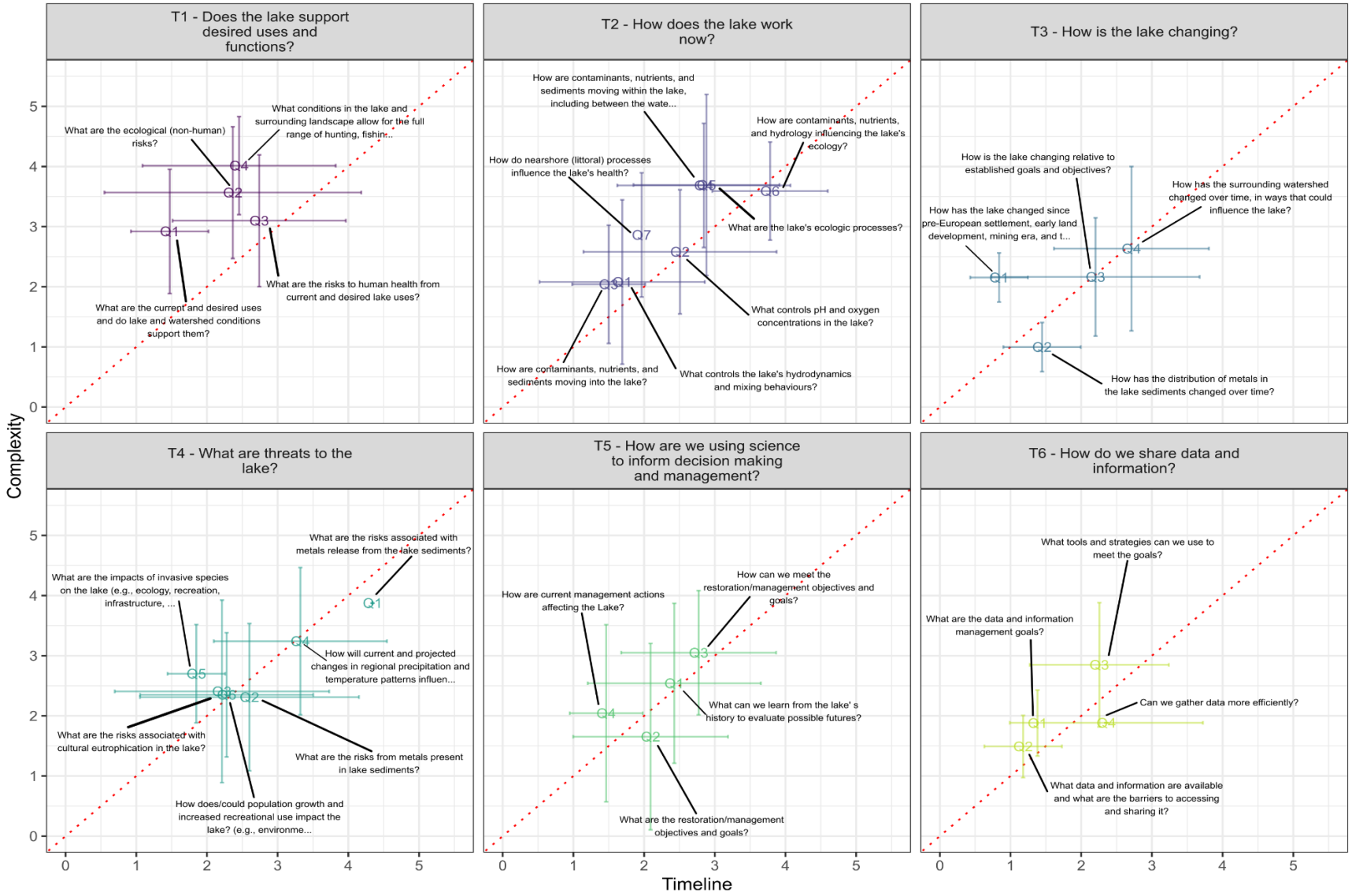


Figure 2. Average key question ratings (±SD) by complexity, timeline, and theme. Higher ratings indicate more complex questions or longer timelines for answering.

(The red dotted line indicates a 1:1 correspondence between question complexity and timeline.)

3.1 Revision Schedule

The CDA Lake Science Priorities is a living document. The scientific priorities will evolve with the collective understanding of the CDA Lake ecosystem. This document will be reviewed and updated approximately every four years, depending on continued financial support and SCT consensus. Revisions to this document may also be initiated by significant progress towards accomplishing the science priorities. Progress can be represented by peer-reviewed literature, academic theses and dissertations, or project completion reports. Revisions will be summarized in the revision tracker provided in Appendix E.

3.2 Limitations

This Science Priorities document is intended as a collaborative framework; however, some limitations exist:

- Science priorities are identified by the contributor organizations as pressing science questions for the immediate future. We recognize there are other relevant questions, but given the current state of knowledge, these identified here are the top science priorities from the SCT's perspective.
- The SCT acknowledges that CDA Lake and watershed management actions are ongoing and expects adaptive management feedback between the contributors and SCT about the science priorities.
- Projects that are referenced in this document (Appendix A) are:
  - Not an inclusive list of projects that will answer all the Key Questions and Themes.
  - Intended to promote collaboration and resource sharing between organizations.
  - Currently at various stages of planning, ranging from projects underway to unrefined project concepts.
  - Available to any organization contributing to CDA Lake science.
  - Potentially useful for organizations to guide funding decisions, but funding is not the focus or intention of the SCT.
- The SCT recognizes the effort required to fully address all science priority themes and key questions would exceed any near or midterm funding or available staffing levels.

4 Adaptive Management and Collective Success

The management organizations contributing to this initiative have traditionally supported adaptive management principles to guide environmental restoration and protection efforts in the CDA Basin. For example, the DEQ and CDA Tribe (2009) Lake Management Plan states "The 2009 LMP reflects the shared view of the Tribe and DEQ that a collaborative, adaptive, and data-driven approach is the best option at this time to manage water quality in Coeur d'Alene Lake." The NASEM (2022) study on the future of water quality in CDA Lake repeatedly recommends using an adaptive management framework. EPA (2020) used an adaptive management approach in the lower basin of the Bunker Hill Complex. The Coeur d'Alene Tribe, DEQ, and EPA continue to use adaptive management strategies in the CDA Basin. The

University of Idaho and USGS also support incorporating scientific information into an adaptive management framework. The SCT recommends that adaptive management strategies continue and are strengthened through improved collaborative efforts.

Adaptive management is widely acknowledged as a valuable approach to environmental management because of its iterative learning cycle (Figure 3) that includes participation and input from groups with vested interests in the resources but who are not directly in a position to enact management or policy changes. Key features include (1) assessing the management problem and setting goals; (2) identifying existing knowledge and incorporating it into appropriate system models with assumptions and predictions as a basis for further learning; (3) identifying uncertainty and developing alternate hypotheses based on evidence and experience; (4) developing a management strategy and implementing it to allow continued resource management while learning; (5) developing and implementing a monitoring strategy to measure the effect of new management strategies and policies; and (6) evaluating and learning from the result outcomes to determine how the strategy met original expectations and to direct revisions of future management actions based on what was learned (Holling 1978, Walters 1986, Rist et al. 2013).

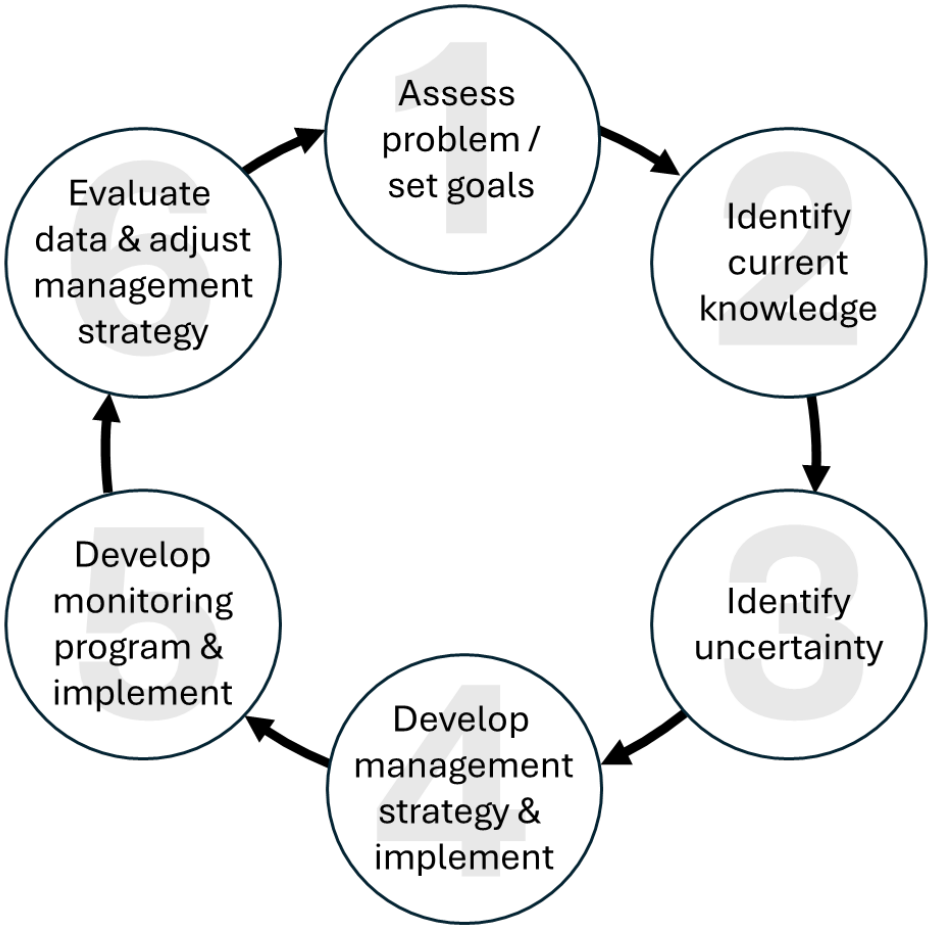


Figure 3. General adaptive management process to reduce uncertainties in natural resource management.

The SCT recognizes that achieving the vision outlined in section 1.3 is a large, complex, and multifaceted task that will progress incrementally. Progress will be difficult to assess, and real-time management is needed to advance while there is ongoing uncertainty. A cohesive framework is needed to evaluate the outcomes of the many different actions and projects. Because entities have different internal priorities based on statutory obligations, the SCT recommends that entities use an adaptive management framework to provide a consistent approach to individual projects.

Adaptive management has been criticized for not always addressing uncertainty well (Gregory et al. 2006, Allen and Gunderson 2011, Rist et al. 2013), but it has been implemented in other large aquatic restoration projects across the United States (Thom et al. 2016) and provides insights for successful implementation. A common challenge among those programs using adaptive management was securing adequate long-term funding (Thom et al. 2016) and funding is definitely a concern for the recovery of CDA Lake.

5 References

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Appendix A.
Science Priorities with Example Projects

The following table is a living table that is anticipated to be updated approximately annually, and/or when substantial project updates occur. Example Projects listed in the table include both current, ongoing projects, as well as potential future projects. Example projects may address multiple Themes or Key Questions.

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T1Q1P1	Does the lake support desired uses and functions?	What are the current and desired uses and do lake and watershed conditions support them?	A thorough understanding of the community's current and desired uses of the lake is required to understand whether those uses are supported.	Define the community's needs and desired uses through surveys.	Inactive (not started)	
T1Q1P2				Evaluate the lake's status/limitations relative to the defined uses.	Partially completed	CdA Tribe, DEQ
T1Q1P3				Evaluate the lake for beneficial uses as defined by the Clean Water Act and other relevant environmental laws and regulations.	Partially completed	CdA Tribe, DEQ
T1Q2P1		What conditions in the lake and surrounding landscape allow for the full range of hunting, fishing, gathering, and ceremonial uses in the Tribe's seasonal calendar?	Since time immemorial, the land, water, and air-scapes have provided for the Coeur d'Alene people. Restoring and maintaining the first foods, fibers, and medicines represented on the seasonal calendar is just one example of why this question is important to the Tribe.	Determine what watershed restoration and improvement projects are most effective at returning fishable populations of cutthroat trout to the lake and its tributaries.	*Active research*	CdA Tribe, US Fish and Wildlife, USFS, ID Fish and Game
T1Q2P2				Measure the water quality and quantity after returning beaver and beaver dam analogues on the landscape.	Inactive (not started)	
T1Q2P3				Track spatial extent of water potato over time within both the metals contaminated and non-metals contaminated wetlands of the lake's watershed.	*Active research*	CdA Tribe
T1Q3P1		What are the risks to human health from current and desired lake uses?	Understanding the extent to which the current lake conditions may negatively affect human health guides what can be done to mitigate those effects.	Evaluate how human health risks from recreational and occupational exposure to metals and emerging contaminants are changing over time: a. Are there contaminants that pose human health risk via defined exposure pathways? b. Measure beach contamination (lead) from historical mining activities.	In reporting/final assessment	DEQ
T1Q3P2				Determine how food web transfers of contaminants and toxins influence human health receptors a. Measure mercury and other contaminants in fish tissue	Complete	CdA Tribe, Idaho Dept of Health and Welfare

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T1Q4P3	Does the lake support desired uses and functions?	What are the risks to ecological health?	Understanding the extent to which current lake conditions may negatively affect organism health guides what can be done to mitigate those effects.	Measure contaminants in the lake food web: a. Measure contaminants at each trophic level. b. Measure contaminant mobility between trophic levels. c. Identify specific receptors within trophic levels. d. Measure toxicological effects on specific receptors.	Inactive (not started)	
T1Q4P4				Evaluate other risks to metals release (e.g., lake productivity, temperature influences, shifts in food web structure and net carbon flux, length of stratification period, shifts in lake mixing behavior).	Inactive (not started)	
T1Q4P5				Identify if current conditions have extirpated other organisms.	Inactive (not started)	
T2Q1P1	How does the lake work now?	What controls the lake's hydrodynamics and mixing behaviors?	Improved understanding of the lake physics is needed to better describe how contaminants, nutrients, and sediments move within the lake and influence its ecology.	Measure water temperature at fine-scale depth resolution at sites across the lake using fixed vertical thermistor/dissolved oxygen strings and autonomous profilers.	Conceptual development	CdA Tribe, DEQ
T2Q1P2				Measure meteorological conditions (wind speed and direction, air temperature, solar radiation) at sub-hourly time resolution, at same locations as the thermistor strings.	Conceptual development	CdA Tribe, DEQ
T2Q1P3				Review historical water temperature, weather, and river discharge data to improve monitoring methodologies for understanding river and lake mixing dynamics.	Conceptual development	none identified
T2Q1P4				Evaluate the thermal stratification timing, duration, and spatial variability in relation to: a. Multi-year Coeur d'Alene River and St. Joe River hydrograph discharge dynamics and river temperature b. Meteorological forcing (wind speed, wind direction, air temperature) c. The smaller tributaries/streams hydrographs and temperatures	Partially completed	CdA Tribe, DEQ

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T2Q1P5	How does the lake work now?	What controls the lake's hydrodynamics and mixing behaviors?	Improved understanding of the lake physics is needed to better describe how contaminants, nutrients, and sediments move within the lake and influence its ecology.	Use meteorological, discharge, and lake (dissolved oxygen, temperature) data to develop a 3D hydrodynamic model for the lake with a rigorous water balance. Use model to assess the impacts of river and wind-driven mixing to examine complex mixing dynamics such as gyres, seiches, and upwelling.	Partially completed	CdA Tribe, DEQ
T2Q2P1		What controls pH and oxygen concentrations in the lake?	Improved understanding is needed of processes in the lake and its watershed that influence water quality parameters, pH and oxygen, which are primary controls on the release of metals from lake sediments.	Develop a conceptual model of the factors that control pH and oxygen in the lake.	Conceptual development	CdA Tribe, DEQ
T2Q2P2				Relate results from thermistor and dissolved oxygen studies to biologic measures such as planktonic chlorophyll a, carbon fixation, and pH.	Inactive (not started)	
T2Q2P3				Evaluate dissolved oxygen dynamics throughout the water column in relation to thermal stratification timing, duration, and intensity of river/stream runoff.	Partially completed	CdA Tribe, DEQ
T2Q2P4				Evaluate dissolved oxygen dynamics in relation to particulate organic matter concentrations and settling rates from a sediment trap study.	Inactive (not started)	
T2Q2P5				Analyze existing dissolved oxygen data and develop estimates of hypoxic/anoxic volumes and anoxic factor relative to hydrograph characteristics.	Inactive (not started)	
T2Q3P1		How are contaminants, nutrients, and sediments moving into the lake?	The inputs to the lake and how they may be changing over time are not fully understood.	Measure atmospheric deposition of metals and nutrients to the lake and overall basin under a range of atmospheric conditions.	Inactive (not started)	
T2Q3P2				Evaluate septic system influences from nearshore and lakeshore properties.	Partially completed	CdA Tribe, DEQ
T2Q3P3				Evaluate Coeur d'Alene River and St. Joe River nutrient and metals loading in response to land use and/or restoration projects.	Partially completed	tbd
T2Q3P4				Evaluate nutrient loading from small tributaries.	In progress	CdA Tribe, DEQ
T2Q3P5				Complete repeated high-resolution bathymetric surveys to measure spatial variation in sedimentation rates.	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T2Q3P6	How does the lake work now?	How are contaminants, nutrients, and sediments moving into the lake?	The inputs to the lake and how they may be changing over time are not fully understood.	Develop and validate a model that can predict the mass balance of metals and nutrients in the lake in response to climatic and hydrologic forcing, accounting for aqueous and particulate contributions from the rivers, tributaries, atmosphere, sediments, and shoreline sources. a. Use the model to evaluate the influence of a) the lake's small tributaries/streams, and b) restoration activities, on nutrient and metal loading to the lake and cycling in the lake.	Conceptual development	CdA Tribe, DEQ
T2Q4P1		How are contaminants, nutrients, and sediments moving within the lake, including between the water column, sediments, and the food web?	The dynamics of contaminant, nutrient, and sediment movement influence how each are transformed, and subsequently affect lake health and ecology.	Evaluate the influence of hydrologic variability (intensity and timing) on the movement of contaminants, nutrients and sediments in the lake.	Inactive (not started)	
T2Q4P2				Measure currents in the lake using various methods (e.g., acoustic doppler current meter, particulate tracer studies, drogues), to understand the effect of currents on vertical and lateral transport of seston in the lake.	Inactive (not started)	
T2Q4P3				Evaluate the relative importance of sediments versus rivers as sources of metals and nutrients using benthic flux experiments, and other methods.	Inactive (not started)	
T2Q4P4				Measure the distribution, bioavailability, and cycling of metals and nutrients in the overlying waters (e.g., total, dissolved, inorganic particle associated, organic particle associated, food web-associated).	Inactive (not started)	
T2Q4P5				Measure settling rates of seston (particulate organic matter, and river-supplied sediment) using sediment traps in the epilimnion, metalimnion, and hypolimnion of the lake.	Inactive (not started)	
T2Q4P6				Determine the potential bioavailability and reactivity of particulate phosphorus and metals using sequential extraction methods and/or advanced imaging and spectroscopy.	Inactive (not started)	
T2Q5P1		What are the lake's ecologic processes?	Management and restoration efficacy can be improved when the linkages between ecological components of the lake are better understood.	Develop a conceptual model of the lake's food web structure (trophic-level linkages).	Inactive (not started)	
T2Q5P2				Identify likely resources, uses, and ecological pathways of concern based on regional organization knowledge (IDFG, CDA Tribe, IDEQ, IDPR, local communities).	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T2Q5P3	How does the lake work now?	What are the lake's ecologic processes?	Management and restoration efficacy can be improved when the linkages between ecological components of the lake are better understood.	Inventory existing ecological data, conduct research to fill data gaps and describe lake ecology.	Active research	CdA Tribe, DEQ, Univ. of Idaho, Eastern Washington Univ.
T2Q5P4				Describe spatial and seasonal variation in the lake's zooplankton by determining species composition, density, and biomass across at least two growing seasons.	Inactive (not started)	
T2Q5P5				Repeat pelagic carbon fixation work to better understand energy transfer in the lake. Compare results with previous carbon-14 primary productivity rates determined by IDEQ and Skille et al. 1983 for change.	Conceptual development	CdA Tribe, DEQ
T2Q5P6				Describe relationship between gaged Coeur d'Alene and St. Joe River (loading, temperature) vs. lake chlorophyll, algae biovolume.	Inactive (not started)	
T2Q5P7				Evaluate the fish community from a trophic level aspect (scale of piscivory, planktivory, and benthivory).	Inactive (not started)	
T2Q6P1		How are contaminants, nutrients, and hydrology influencing the lake's ecology?	It is important to understand how metals and nutrients affect the lake's ecology because an imbalance of these constituents can negatively affect the lake.	Conduct a time-series analysis of the lake's existing phytoplankton data using chlorophyll a, density, biovolume, and edibility relative to environmental drivers such as stratification and water column metal and nutrient concentrations.	Partially completed	CdA Tribe, DEQ
T2Q6P2				Describe the flow of metals in the lake's food web that ultimately end up in fish that are consumed by people and wildlife.	Inactive (not started)	
T2Q6P3				Describe how the flow of metals in the food web varies spatially in the lake.	Inactive (not started)	
T2Q6P4				Describe how hydrograph intensity influences the flow of metals in the lake's food web.	Inactive (not started)	
T2Q6P5				Evaluate the ecological and human health risks posed by emerging contaminants, e.g. PFAS.	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T2Q6P6	How does the lake work now?	How are contaminants, nutrients, and hydrology influencing the lake's ecology?	It is important to understand how metals and nutrients affect the lake's ecology because an imbalance of these constituents can negatively affect the lake.	Repeat primary productivity measurements in the lake from prior studies (e.g., agency and literature reports) to examine if changes in pelagic carbon fixation rates have occurred relative to changes in water column metals concentrations.	Conceptual development	CdA Tribe, DEQ
T2Q6P7				Determine if the relationship between planktonic chlorophyll a versus total phosphorus in the lake is unusual relative to other temperate lakes.	Inactive (not started)	
T2Q6P8				Evaluate how hydrograph intensity and variability influence lake productivity and oxygen concentrations, metals cycling, and potential ecologic/health implications.	Inactive (not started)	
T2Q6P9				Develop or determine method(s) to assess monitoring parameters in a flow-normalized fashion - in the lake.	Inactive (not started)	
T2Q6P10				Use historic data to determine if the reactive/bioavailable fractions of nutrients and metals influence Chl-a concentrations seasonally.	Inactive (not started)	
T2Q6P11				Conduct "metal" dilution bioassay experiments with properly scaled mesocosms to help inform the relationship between metals toxicity and pelagic primary production (see Pearl and Bowles 1987 for nutrient bioassay example).	Conceptual development	CdA Tribe, University of Idaho
T2Q7P1		How do nearshore (littoral) processes influence the lake's health?	The nearshore zone is integral to lake health and it is important to gain a better understanding of how nearshore processes affect people, fish, and wildlife that use these regions of the lake.	Identify key littoral processes and develop a monitoring strategy (nutrient and metal cycling, dissolved oxygen dynamics, macrophyte growth and decomposition, and cyanobacteria dynamics).	Inactive (not started)	
T2Q7P2				Evaluate littoral-pelagic coupling for nutrients and metals to better understand influences of macrophytes and nearshore processes on phytoplankton blooms, including potential seasonal gradients.	Inactive (not started)	
T2Q7P3				Evaluate the response of the littoral zone to anthropogenic influences (e.g., home density, septic systems, boat wakes, impervious surfaces, water withdrawals).	In progress	DEQ, University of Idaho

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T2Q7P4	How does the lake work now?	How do nearshore (littoral) processes influence the lake's health?	The nearshore zone is integral to lake health and it is important to gain a better understanding of how nearshore processes affect people, fish, and wildlife that use these regions of the lake.	Integrate remote sensing, satellite imagery, and community science into the littoral monitoring strategy.	In progress	CdA Tribe, DEQ, USGS
T3Q1P1	How is the lake changing?	How has the lake changed since pre-European settlement, early settler land development, mining era, and the remediation era?	A fuller understanding of past lake conditions will enable more realistic lake remediation and restoration targets to be set.	Conduct a paleolimnology study using lake sediment cores to establish the lake's pre-impact condition, describe anthropogenic influences on the lake, and evaluate progress towards lake recovery.	In progress	CdA Tribe, DEQ, Univ. Of Oregon, Indiana St. University
T3Q1P2				Develop a timeline of historic human actions to cross-reference lake changes with human influences.	Partially completed	tbd
T3Q1P3				Document important historic changes that have influenced tribal culture	Active research	CdA Tribe
T3Q2P1		How has the distribution of metals in the lake sediments changed over time?	The distribution of metals in lake sediments affect human health and lake ecology.	Update the Horowitz sediment coring studies (1993, 1995) to understand how the distribution of metals in the lake sediments has changed over time.	Inactive (not started)	
T3Q2P2				Evaluate how the lake's sedimentation rate and metals deposition rate has changed over time.	Inactive (not started)	
T3Q2P3				Evaluate spatial differences in the lake's sedimentation and metals deposition rates to describe their dynamics for the lake's different regions. This can include updated bathymetric and coring techniques.	Inactive (not started)	
T3Q2P4				Determine if the spatial distribution of metals in surface sediments have changed relative to the late 1980's	Inactive (not started)	
T3Q3P1		How is the lake changing relative to established goals and objectives?	Understanding changes in lake health allows assessment of progress relative to established goals.	Continue long-term monitoring of established indicators of lake health.	In progress	CdA Tribe, DEQ
T3Q3P2				Analyze historical data to detect trends and identify the dataset(s) needed to detect a given percentage of change.	Inactive (not started)	
T3Q3P3				Analyze historic phytoplankton community data for trends and correlations with environmental factors.	Partially completed	CdA Tribe, DEQ
T3Q3P4				Identify and evaluate additional measures to describe how the lake's health may be changing.	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T3Q4P1	How is the lake changing?	How has the surrounding watershed changed over time, in ways that could influence the lake?	Understanding watershed changes over time helps determine how watershed management may protect or harm the lake	Establish a timeline of how remedial actions, land use, land cover, or other changes in the Basin correlate with changes in the health of the lake and the Coeur d'Alene River.	Partially completed	tbd
T3Q4P2				Develop a plan to use landscape modeling such as WEPP to assess future impacts of land use change and potential management solutions.	Inactive (not started)	
T4Q1P1	What are threats to the lake?	What are the risks associated with the release of metals from the lake sediments?	It is not known how environmental changes will influence metals release from sediments and how metals release affects human health and ecology.	Evaluate the magnitude of metals release from the sediments in the lake's different regions. a. Measure dissolved oxygen (DO) and pH at a fine spatial resolution during stratified periods across the lake. b. Overlay the DO/pH data with an updated surficial sediment metal map to determine areas that could have high benthic flux rates. Evaluate metals release into lake waters in high and low risk regions.	Inactive (not started)	
T4Q1P2				Evaluate the extent to which released metals enter the food web or pose a risk to human health.	Inactive (not started)	
T4Q1P3				Compare concentrations to ecological and human health thresholds.	Inactive (not started)	
T4Q1P4				Conduct enclosure experiment to measure triggers of metals release from sediments.	Conceptual development	CdA Tribe, University of Idaho
T4Q2P1		What are the risks from metals present in lake sediments?	Understanding the risks associated with the metals contamination in the lake's sediments will guide the types and extent of remediation and management needed to mitigate those risks.	Examine benthic invertebrates at sites from south to north and laterally in embayments to describe differences in community composition and density.	Partially completed	CdA Tribe, DEQ
T4Q2P2				Examine differences in benthic community composition relative to the updated surficial sediment map of metals concentration and reactivity.	Inactive (not started)	
T4Q3P1		What are the risks associated with cultural eutrophication in the lake?	Human-induced eutrophication in lakes directly impacts desired uses. Tracking eutrophication helps us to better understand and respond to its root causes and mitigate negative effects such as harmful algal blooms.	Describe the trophic gradient across the lake using traditional water quality measures (i.e., Carlson's Trophic State Index, pH, Chl-a, phycocyanin) and determine any spatial and/or temporal trends.	Partially completed	CdA Tribe, DEQ

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T4Q3P2	What are threats to the lake?	What are the risks associated with cultural eutrophication in the lake?	Human-induced eutrophication in lakes directly impacts desired uses. Tracking eutrophication helps us to better understand and respond to its root causes and mitigate negative effects such as harmful algal blooms.	Examine spatial and temporal trends in Landsat surface reflectance data to assess changes in trophic state, chlorophyll a, and lake color.	Inactive (not started)	
T4Q3P3				Describe trophic state across lake sites using approaches that use additional lake measures and advanced analysis techniques such as proportional odds logistic regression.	Inactive (not started)	
T4Q3P4				Gather baseline cyanotoxin data at sites with highest cyanobacterial densities and compare to established recreational standards.	Inactive (not started)	
T4Q3P5				Assess whether measured trends impact desired uses and function to determine risk to trophic characteristics of the lake.	Partially completed	CdA Tribe, DEQ
T4Q4P1		How will current and projected changes in regional precipitation and temperature patterns influence the lake (e.g., increased regional heating, warming air and waters, changes in regional hydrology, altered weather/wind dynamics, watershed disturbance via fire)?	Changing temperature and precipitation patterns are anticipated to alter many of the primary factors that control the lake's nutrient balance, metals cycling, and ecologic processes at human time scales. Understanding how the lake will change will allow a better response to future impacts.	Model the influence of changing precipitation and temperature patterns on the timing and intensity of hydrology of the Coeur d'Alene Lake catchment.	Inactive (not started)	
T4Q4P2				Model the current and future influence of changing precipitation and temperature patterns on the limnology of Coeur d'Alene Lake including. a. Timing and duration of thermal stratification across all sub-basins of the lake. b. Seasonal primary productivity (phytoplankton composition and chlorophyll a) and community structure. c. Summer and fall dissolved oxygen and pH in the hypolimnion. d. Movement of metals and nutrients from surficial sediments into the water column.	Inactive (not started)	
T4Q5P1		What are the impacts of invasive species on the lake (e.g., ecology, recreation, infrastructure, etc.)?	Invasive species are a priority concern for lake managers, proponents, and the general public because of their potential to disrupt lake processes and use, property, and infrastructure.	Improve our understanding of invasive species impacts on the lake's ecology and desired uses so management can be prioritized better.	In progress	Avista, CdA Tribe, Idaho Department of Ag, DEQ

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T4Q5P2	What are threats to the lake?	What are the impacts of invasive species on the lake (e.g., ecology, recreation, infrastructure, etc.)?	Invasive species are a priority concern for lake managers, proponents, and the general public because of their potential to disrupt lake processes and use, property, and infrastructure.	Establish a set of index bays that are systematically monitored to describe the aquatic macrophyte community on a yearly basis. For example, a systematic point-intercept survey on a 50 m grid done in late summer would be comparable to the Tribe's macrophyte monitoring program.	Partially completed	CdA Tribe, DEQ
T4Q5P3				Conduct assessment of the lake's zooplankton across multiples sites and determine species composition, density, and biomass over at least two growing seasons.	Inactive (not started)	
T4Q5P4				Bolster aquatic invasive species outreach and prevention measures.	Conceptual development	Avista, CdA Tribe, Idaho Department of Ag, DEQ
T4Q5P5				Determine if special considerations are needed for management of invasive species growing in contaminated sediments such as Phragmites or non-native milfoil.	Inactive (not started)	
T4Q5P6				Develop improved monitoring through newer techniques like eDNA, remote sensing, and Citizen Science to increase chances of early detection.	Inactive (not started)	
T4Q6P1		How does population growth and increased recreational use impact the lake? (e.g., environmental/human health and resiliency/durability)	The lake is experiencing increasing recreational use and its watershed is experiencing rapid population growth which can cause negative effects. A better understanding is needed of the "carrying capacity" for our lake and watershed.	Summarize projections for human population growth, existing land use, and development permitting / rules at all levels. Projections should include pertinent historic information and trends.	Inactive (not started)	
T4Q6P2				Assess how projected growth, land use, and human activity may affect the lake, including, but not limited to: groundwater supply, stormwater management, septic systems, removal of natural riparian buffers and replacement with lawns or armored surfaces, increased watercraft traffic, and watercraft induced erosion, etc.	Inactive (not started)	
T4Q6P3				Evaluate the effectiveness of best management practices (BMPs) in limiting negative effects from projected impacts and provide recommendations for effectiveness improvement to BMP regulatory authorities.	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T5Q1P1	How are we using science to inform decision making and management?	What can we learn from the lake' s history to evaluate possible futures?	A key step to predicting the future is to understand the past, and use that understanding to formulate protection and restoration approaches.	Use contemporary and paleo lake data to establish management targets, remediation, and restoration objectives.	Conceptual development	CdA Tribe, DEQ
T5Q1P2				Build chart of start and end dates for historic remedial and restoration actions and large natural disturbances in basin.	Conceptual development	tbd
T5Q1P3				Use historic event timeline (T5Q1P2) and paleo lake data (T5Q1P1) to understand the influence of large-scale change in the Basin on lake ecology and to asses how proposed future actions may impact lake.	Conceptual development	tbd
T5Q2P1		What are the restoration/management objectives and goals?	A clear and agreed upon statement of goals and objectives is required to formulate a plan to achieve them.	Work with partners to develop goals for lake restoration and remediation (T1Q1P1, T5Q1P1).	Inactive (not started)	
T5Q2P2				Evaluate if the EPA Remedial Investigation conclusions are still consistent with advances in lake science, preliminary modeling, and risk information.	Inactive (not started)	
T5Q2P3				Assess the objectives of the 2009 Lake Management Plan relative to the updated goals for lake restoration and remediation (T5Q2P1) and evaluate options for achieving lake management goals.	Inactive (not started)	
T5Q2P4				Develop an adaptive management framework and site-specific plan to address lake restoration and remediation goals (T5Q2P1).	Inactive (not started)	
T5Q3P1		How can we meet the restoration/management objectives and goals?	It is important to understand how much land and water management can achieve, and what might happen if those actions are not taken.	Develop a conceptual landscape-lake ecology model to assess how landscape changes impacts the lake.	Inactive (not started)	
T5Q3P2				Develop a quantitative model(s) to examine the ecological, biogeochemical, and physical structure of the lake under a variety of scenarios to aid in predicting effects of future changes.	Inactive (not started)	

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T5Q3P3	How are we using science to inform decision making and management?	How can we meet the restoration/management objectives and goals?	It is important to understand how much land and water management can achieve, and what might happen if those actions are not taken.	Identify potential future actions to meet restoration goals and evaluate their predicted effects through literature review, modeling, or other methods. Examples include: a. Evaluate land management strategies from case studies in other lakes or reservoirs. b. Evaluate if deposition of cleaner sediment on metals-laden sediment can meet restoration goals in a timely manner or if more active treatment is needed. c. Evaluate how potential future management actions could influence pH and oxidation in the lake's sediments.	Inactive (not started)	
T5Q4P1		How are current management actions affecting the lake?	Evaluating current management approaches helps to adjust restoration and management techniques to meet goals and objectives.	Continue baseline monitoring and implement new monitoring of lake health as needed.	In progress	CdA Tribe, DEQ, EPA, USGS
T5Q4P2				Conduct targeted monitoring to evaluate outcomes of management actions.	In progress	multiple
T5Q4P3				Assess effectiveness of monitoring and management actions to provide feedback within the adaptive management framework (T5Q2P2).	Inactive (not started)	
T6Q1P1	How do we share data and information?	What data and information are available and what are the barriers to accessing and sharing it?	Data and information sharing currently varies by organization. More effective data sharing is needed to support decision making.	Identify the data, information, and reports/technical literature available from agencies, governments, universities, and the public, and how to access it.	Inactive (not started)	
T6Q1P2				Identify barriers to accessing and sharing data.	In progress	CdA Tribe, DEQ, EPA, USGS
T6Q1P3				Build a publicly accessible list of data and resources.	In progress	CdA Tribe, DEQ, EPA, USGS
T6Q2P1		What are the data and information management goals?	Understanding intended user and information management goals allows for cohesive data management.	Identify data, information, and sharing needs and limitations between organizations	In progress	CdA Tribe, DEQ, EPA, USGS
T6Q2P2				Identify our goals for sharing data and information with the public	In progress	CdA Tribe, DEQ, EPA, USGS
T6Q2P3				Develop a lake-focused Data Management Plan (DMP) to achieve goals. This could build off of Bunker Hill DMP.	In progress	EPA. USGS

ID	Theme	Key Question	Why	Example Projects	Status	Lead Organization(s)
T6Q3P1	How do we share data and information?	What tools and strategies can we use to meet the goals?	Sufficient access to existing data and information is lacking. Identifying strategies and tools would improve data access and understanding, and support decision making.	Identify data assessment and analytical tools such as R-scripts, GIS analyses, or other specialty software that address identified data and information sharing needs (T6Q2P1, T6Q2P2).	Inactive (not started)	
T6Q3P2				Store data as identified in the Coeur d'Alene Lake Data Management Plan (T6Q2P3).	In progress	CdA Tribe, DEQ, EPA, USGS
T6Q3P3				Develop a public-facing data and information system such as online story maps or R shiny app that adheres to sharing limitations	Inactive (not started)	
T6Q3P4				Report synthesized findings on a semi-regular basis such as in achievement, status, or trend reports.	Conceptual development	tbd
T6Q3P5				Conduct a symposium that bring together scientists and interested public for updates and discussion of lake science. Coordinate with existing outlets such as IWRRI and BEIPC.	Conceptual development	tbd
T6Q4P1		Can we gather data more efficiently?	Significant opportunities exist to improve the efficiency and effectiveness of data collection and integrate new technologies. Sampling and monitoring strategies developed decades ago do not use the latest technologies.	Assess redundancies in data collection and determine strategies to improve efficiency.	Inactive (not started)	
T6Q4P2				Evaluate new technologies for data collection such as electronic field data entry and automated in-situ collection systems.	Conceptual development	tbd
T6Q4P3				Expand the use of emerging technologies for remote sensing such as satellite imagery, autonomous drones, or remote cameras.	Conceptual development	CdA Tribe, DQ, USGS

Appendix B.
Crosswalk Science Priorities to NAS Priorities

The recent National Academies of Sciences report on the Future of Coeur d'Alene Lake (NASEM 2022) made many scientific recommendations that were used to help guide the development of this priorities document. Note that the NAS report made their recommendations based on a "backwards looking" approach. They looked at the work that had been done, noted gaps and questions related to that prior work, and then made recommendations based on what had been done in response to previously established priorities. This document takes a different approach. This is a forward-looking document that focuses on the question of "*What do we want the lake to look like in the future*?" This provides a different perspective that also addresses broader issues that were outside the scope of the NAS study. Consequently, the SCT priorities cover both the NAS priorities, and additional priorities not considered in the NAS study.

The Themes and Key Questions cut across multiple chapters of the NAS report and their corresponding recommendations (Table B1). There is not a one-to-one correlation between the SCT priorities and the NAS recommendations. Instead, the SCT priorities have thematic overlaps with the NAS recommendations, such that the SCT priorities cover the breadth of the NAS recommendations in a manner that is conceptually different from the NAS approach. There is greater one-to-one alignment at the project level. Note that this document's description of NAS recommendations have been edited for brevity and clarity. Refer to the original report (NASEM 2022) for the full, unedited recommendations.

Table B1. National Academies Scientific Recommendations related to SCT Priority Themes and Questions

Description of NAS Conclusions & *Recommendations*	NAS Chapter / #	NAS Page #	Related Theme and Questions
Chapter 3: Inputs to Coeur d'Alene Lake			
Observed changes in land use, stream flows, and downward trends for zinc and cadmium; with considerations regarding future management actions. *No recommended actions*	Chapter 3: #1, #2, #6	119-120	T1: Q1, Q2 T2: Q3 T3: Q4 T4: Q4, Q6 T5: Q4
Observed changes in metal concentrations and loads along the CDA River *Recommendations to assess remedial actions*	Chapter 3: #3, #4	119-120	T2: Q3 T5: Q4
Observed changes in sediment transport and nutrient loads along the CDA River; with considerations for future monitoring and predictive modeling. *Recommendations for studies and monitoring to better understand future trajectories*	Chapter 3: #5, #7	119-120	T2: Q3 T3: Q4 T4: Q3, Q4 T5: Q1, Q3 T6: Q4
All WWTP in CDA Basin should be considered for advanced phosphorus removal *Recommended management action*	Chapter 3: #8	119-120	T5: Q3, Q4
Chapter 4: In-Lake Hydrodynamics			
St. Joe River flows influence balance of lake vs river influences on in-lake processes *No recommended actions*	Chapter 4: #2	149-150	T2: Q1, Q2, Q6
Influences of the rivers on sediment transport into and through the lake *Recommendations to increase monitoring*	Chapter 4: #1, #4	149-150	T2: Q1, Q3, Q4, Q7 T4: Q1, Q2
Data to better characterize thermal stratification, a key master variable *Recommendations to enhance monitoring*	Chapter 4: #3	149-150	T2: Q1, Q2, Q4 T6: Q4
Lack of deterministic model usage to better understand in-lake processes and make future predictions *Recommendations to do more modeling*	Chapter 4: #5	149-150	T1: Q3, Q4 T2: Q1-Q7 T3: Q3 T4: Q1-Q6 T5: Q1, Q3, Q4

Chapter 5: In-Lake Oxygen and Nutrients			
CDA Lake characterized by low chlorophyll-a and phosphorus concentrations *No recommended actions*	Chapter 5: #4	184-186	T1: Q1, Q2 T2: Q5, Q6 T4: Q3 T5: Q4
Minimal indication of declining oxygen, with considerations for future lake conditions. *Recommendation to get better information on lake bottom depth for sonde profiles and consideration of future climactic changes*	Chapter 5: #1	184-186	T2: Q1-Q2 T4: Q4
Potential for nutrient enrichment in the lake's littoral zone and influences on lake ecology. *Recommendation to conduct more nearshore monitoring*	Chapter 5: #6	184-186	T2: Q5, Q6, Q7 T3: Q3 T4: Q3, Q5 T5: Q3 T6: Q4
Need to better understand trends in total nitrogen and phosphorus in the lake and predict the impacts of future environmental changes. *Recommendation to better understand causative mechanisms and define the N-cycle*	Chapter 5: #2, #3	184-186	T1: Q1, Q2 T2: Q2-Q7 T3: Q3, Q4 T4: Q3-Q6 T5: Q3, Q4
Uncertainty in the evidence of zinc inhibition of chlorophyll-a and lake productivity *Recommendation to conduct field experimentation*	Chapter 5: #5	184-186	T1: Q4 T2: Q4-Q7 T4: Q1, Q3
Chapter 6: In-Lake Metals			
Evaluation of trends in metal concentrations in the lake *No recommended actions*	Chapter 6: #1-#3, #5	212-213	T2: Q3, Q4 T3: Q3 T4: Q1 T5: Q4
How metals interact with particles and the sediments and quantification of internal sources *Recommendations to improve our understanding of how particles mediate metal transport and quantification of the lake's internal sources*	Chapter 6: #4, #6	212-213	T2: Q4-Q7 T4: Q1-Q3

Chapter 7: Lake-Bed Processes			
Sediment composition, chemistry and metal release threats *No recommended actions*	Chapter 7: #1-#6	235-238	T2: Q3, Q4, Q6 T4: Q1, Q2, Q3
There are limited datasets of sediment cores within CDA Lake, making predictions about future lake water sediment interactions difficult *Recommend core sampling to gather data needed to understand risks and conduct sediment-water modeling*	Chapter 7: #7	238	T1: Q3, Q4 T2: Q3, Q4, Q6, Q7 T3: Q1-Q3 T4: Q1, Q2 T5: Q4
Chapter 8: Monitoring Gaps			
Increase the spatial and temporal intensity of sampling in the lake to better understand the status and trends in the littoral zone, and also better understand inputs from the nearshore and smaller lake tributaries. *Recommend increased littoral zone sampling and monitoring of smaller lake tributaries*	Chapter8: #1, #3	254	T1: Q3, Q4 T2: Q3-Q7 T3: Q3 T4: Q5, Q6 T5: Q4 T6: Q4
Gaps in monitoring the inputs from the major rivers, inc. sampling frequency, parameters, and methodology. Particularly for sediment and dissolved phosphorus *Recommend increased sampling frequency, specifically including turbidity, first flush events, and dissolved phosphorus*	Chapter 8: #2, #4	254	T2: Q1, Q3 T3: Q4 T4: Q6 T5: Q4 T6: Q4
Importance of sustained water quality monitoring, and identification of gaps in the monitoring of lake physics *Recommend sustaining monitoring of lake nutrients and metals, but increase monitoring of lake physics*	Chapter 8: #5, #6	254-255	T1: Q1, Q2 T2: all T3: Q3 T4: Q1-Q4, Q6 T5: Q3, Q4 T6: Q4
Limited data from sediment cores leads to insufficient understanding of the spatial distribution of metal contamination through time *Recommend increased sampling of sediments, including core sampling*	Chapter 8: #7	255	T2: Q3-Q6 T3: all T4: Q1-Q3 T5: Q1, Q4

Important ecological components of the lake are understudied *Recommend expansion of ecologic monitoring beyond phytoplankton, a priority is to investigate impacts of metals contamination*	Chapter 8: #7	255	T1: Q4 T2: Q4-Q7 T3: Q3 T4: all T5: Q3, Q4 T6: Q4
Lake data are not sufficiently available to scientists, agencies, and the public *Recommend agencies involved in data collection make data available to wider community of stakeholders, agencies, and scientists*	Chapter 8: #9	255	T5: Q3, Q4 T6: Q1-Q3
To adaptively manage the Lake, a scientific and institutional structure for carrying out data synthesis, coordinated among jurisdictions and interest groups, is needed *Recommend establishment of a collaborative group and topics that should be included in lake syntheses*	Chapter 8: #10	255	T5: Q2-Q4 T6: Q1-Q3
Chapter 9: Risks from Metals Contamination			
Conclusions regarding blood lead levels and needs for human health risk assessments *Recommend better representation in assessed communities and lake-focused assessments*	Chapter 9: #1, #2	293-294	T1: Q1-Q3 T4: Q2 T5: Q2, Q3 T6: Q1-Q3
Insufficient understanding of the risks from mercury. *Recommend evaluation of mercury dynamics*	Chapter 9: #3	294	T1: Q1-Q4 T2: Q4-Q7 T4: Q1-Q3 T5: Q2-Q4
Expand nearshore monitoring to provide an early warning system for the onset of HABs and expansion of nuisance algae and invasive plants *Recommend expanded nearshore monitoring*	Chapter 9: #4	294	T1: Q1-Q4 T2: Q5-Q7 T4: Q5, Q6 T5: Q2-Q4 T6: Q4
Improve our understanding of how metals influence lake food webs, ecosystem services and ecologic/human health risks *Recommend expanded characterization of food webs and how metals influence them*	Chapter 9: #5, #6	294	T1: Q1, Q2, Q4 T2: Q4-Q7 T4: Q1-Q3 T5: Q3, Q4

Multiple benchmarks could aid in characterizing remediation successes *Recommend including benchmarks for ecosystem services and associated metals targets*	Chapter 9: #7	294	T1: Q1-Q4 T3: Q3 T4: all T5: Q2-Q4 T6: Q2, Q3
Chapter 10: Future Water Quality			
States that air and water temperatures are rising in the lake and forecasts potential negative impacts of regional climactic warming and hydrologic shifts *No recommended actions*	Chapter 10: #1-#4	335	T1: Q2 T2: all T3: Q1, Q3, Q4 T4: all T5: Q3, Q4
Provides a forecast for when lake waters may reach regulatory and ecologic benchmarks and highlights the insufficient understanding of when lake sediments are a source versus a sink *No recommended actions*	Chapter 10: #5, #6	336	T1: Q1, Q2 T2: all T3: Q3 T4: Q1, Q3, Q4, Q5

Appendix C.
Key Question and Example Projects Ratings

This appendix provides more detailed information on Key Question and Example Project ratings beyond the summary that is provided in Section 2.7.

Members of the SCT rated all Key Questions and Example Projects, using a 1-5 rating system (Table C.1 and Table C.2), for two criteria each. These individual ratings were averaged to create an overall rating intended to help organizations focus their efforts when working toward the science priorities. Average ratings for the 29 Key Questions are presented in the main text (Section 2.7). Figure C.1 shows average ratings for the 117 Example Projects and is followed by Table C.3, which sorts the projects by ratings.

Table C.1 Rating scale for Key Question relative Complexity and Timeline.

Key Question Rating Scale	
Complexity	**Timeline**
1 = Standard methods exist and implementation is straightforward	1 = Start now!
2 = Some aspects to figure out, but we collectively have the tools/knowledge	2 = Could start relatively soon (next year or two)
3 = DO NOT USE	3 = DO NOT USE
4 = Substantial barriers or many facets to figure out to fully address the question	4 = Depends on other studies and/or it's OK to wait for a couple/several years to get it going
5 = Extremely complex. Not sure the question can be reasonably addressed.	5 = Could be started sometime in the future. No defined timeline or reason/ability to start in relative near future.
NA = I really don't have knowledge of this.	NA = I really don't have knowledge of this.

Table C.2 Rating scale for Example Project's relative Complexity and Helpfulness.

Example Projects Rating Scale	
Complexity	**Helpfulness**
1 = Relatively easy/not complex	1 = Extremely useful. WE NEED this. If we don't have the information we are severely stuck in moving forward
2 = Some complexity	2 = Useful in several ways/helps answer several aspects
3 = DO NOT USE	3 = DO NOT USE
4 = Substantial complexity	4 = Useful for 1 or a few aspects of the priorities
5 = Extremely complex. Not sure if it can be done.	5 = Can see how this is useful to someone else, but it is not directly or indirectly useful to my work.
NA = I really don't have knowledge of this.	NA = I really don't have knowledge of this.

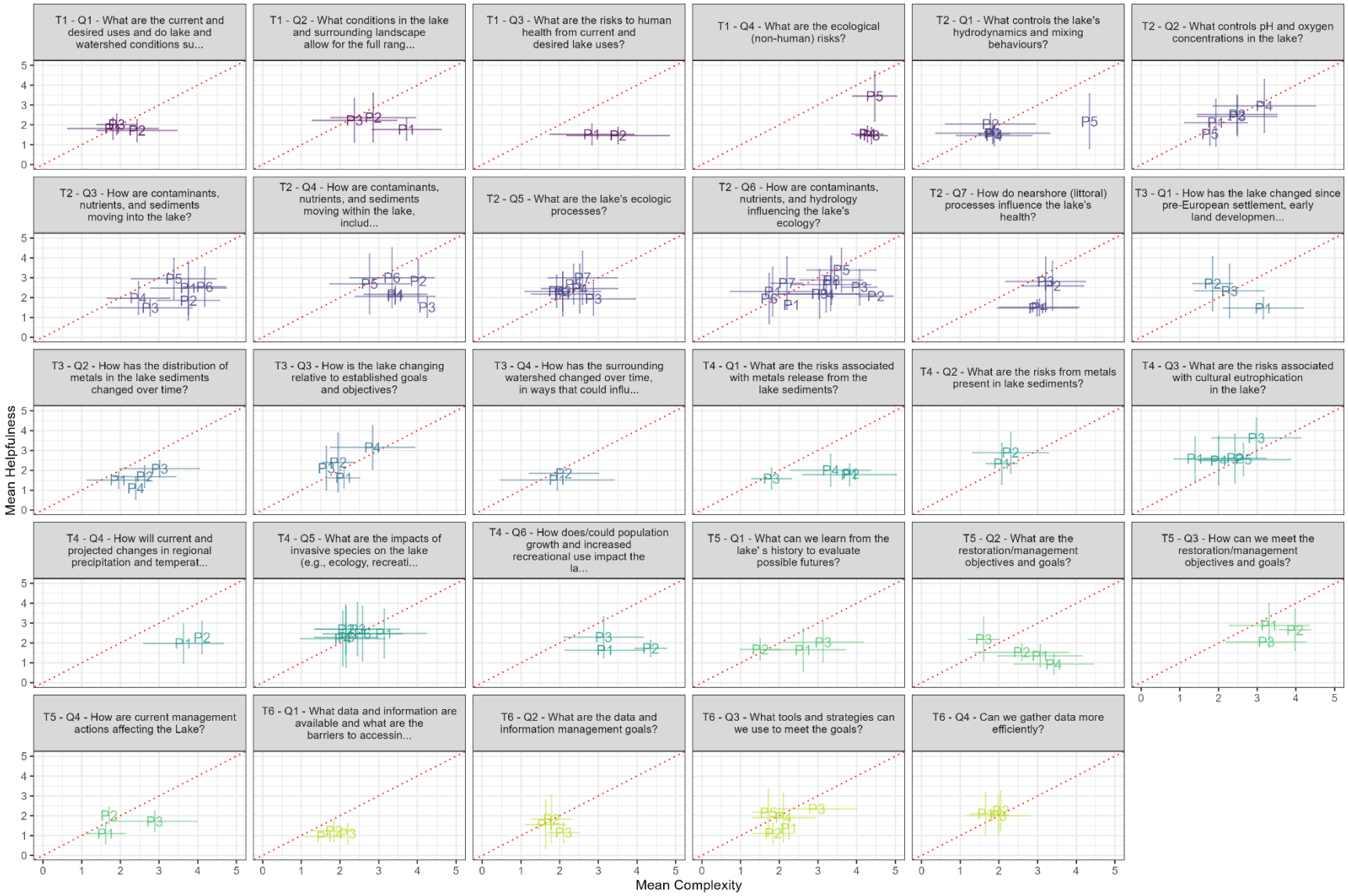


Figure C.1 Mean (±SD) complexity and helpfulness by theme# – Question# – Question text.

Table C. 3.
Average example project ratings sorted by Helpfulness and Complexity ratings.

Project	Helpfulness	Complexity		Project	Helpfulness	Complexity
T6Q1P1	1.00	1.67		T2Q4P1	1.83	3.33
T3Q2P1	1.17	2.33		T2Q7P1	1.83	3.33
T5Q4P1	1.33	1.33		T2Q4P4	1.83	3.67
T6Q3P2	1.33	1.67		T1Q4P3	1.83	4.17
T3Q3P1	1.33	1.83		T1Q4P4	1.83	4.17
T6Q2P3	1.33	1.83		T4Q6P2	1.83	4.17
T6Q1P3	1.33	2.00		T5Q2P3	2.00	1.83
T2Q1P4	1.33	2.17		T6Q4P1	2.00	1.83
T5Q2P4	1.33	3.33		T2Q6P1	2.00	2.00
T6Q1P2	1.50	1.67		T2Q5P1	2.00	2.33
T6Q2P1	1.50	1.67		T3Q4P2	2.00	2.40
T1Q1P1	1.50	1.83		T6Q3P3	2.00	2.67
T2Q2P5	1.50	2.00		T5Q1P1	2.00	3.00
T3Q2P4	1.50	2.00		T4Q6P1	2.00	3.33
T3Q2P2	1.50	2.33		T5Q3P3	2.00	3.33
T1Q1P2	1.50	2.67		T4Q1P2	2.00	4.00
T5Q2P1	1.50	3.00		T2Q6P2	2.00	4.20
T3Q1P1	1.50	3.33		T3Q3P2	2.17	1.83
T4Q1P1	1.50	3.50		T6Q4P2	2.17	2.00
T1Q2P1	1.60	3.60		T2Q5P2	2.17	2.17
T5Q1P2	1.67	1.33		T6Q4P3	2.17	2.33
T1Q1P3	1.67	1.67		T2Q2P2	2.17	2.67
T4Q1P3	1.67	1.67		T2Q2P3	2.17	2.67
T6Q2P2	1.67	1.67		T4Q4P1	2.17	3.33
T2Q1P2	1.67	1.83		T5Q1P3	2.17	3.33
T6Q3P1	1.67	2.00		T2Q3P2	2.17	3.67
T2Q1P1	1.67	2.17		T2Q3P6	2.17	4.50
T3Q4P1	1.67	2.17		T4Q3P1	2.20	1.60
T6Q3P4	1.67	2.33		T3Q3P3	2.20	2.00
T1Q3P1	1.67	3.00		T1Q2P3	2.20	2.20
T5Q4P3	1.67	3.00		T2Q6P6	2.25	2.00
T2Q4P3	1.67	4.00		T3Q1P2	2.33	1.67
T2Q1P3	1.83	1.83		T2Q5P6	2.33	2.00
T6Q3P5	1.83	1.83		T4Q5P4	2.33	2.00
T5Q4P2	1.83	2.00		T2Q3P4	2.33	2.33
T2Q2P1	1.83	2.33		T4Q3P5	2.33	2.50
T5Q2P2	1.83	2.50		T4Q5P6	2.33	2.67
T2Q7P4	1.83	2.67		T2Q5P3	2.33	3.00
T3Q2P3	1.83	2.67		T4Q1P4	2.33	3.33
T2Q3P3	1.83	3.00		T2Q1P5	2.33	4.00
T1Q3P2	1.83	3.17		T4Q4P2	2.33	4.00

Table C. 3, Con't.
Average example project ratings sorted by Helpfulness and Complexity ratings.

Project	Helpfulness	Complexity
T2Q6P4	2.40	3.40
T2Q6P3	2.40	4.20
T4Q3P4	2.50	1.67
T2Q5P5	2.50	2.00
T2Q6P10	2.50	2.00
T2Q5P4	2.50	2.17
T4Q3P2	2.50	2.33
T4Q5P2	2.50	2.33
T1Q2P2	2.50	3.00
T4Q5P1	2.50	3.00
T2Q6P9	2.50	3.33
T2Q7P3	2.50	3.33
T2Q6P8	2.50	3.67
T2Q7P2	2.50	3.67
T4Q5P3	2.60	2.20
T2Q5P7	2.60	2.40
T3Q1P3	2.60	2.40
T4Q2P1	2.67	1.83
T4Q2P2	2.67	2.17
T4Q5P5	2.67	2.33
T2Q4P5	2.67	2.67
T2Q3P5	2.67	3.00
T2Q4P6	2.67	3.00
T4Q6P3	2.67	3.33
T5Q3P2	2.67	4.17
T3Q3P4	2.80	3.20
T2Q6P7	2.83	1.83
T2Q2P4	2.83	3.17
T2Q6P11	2.83	3.33
T2Q3P1	2.83	3.83
T5Q3P1	3.00	3.33
T2Q4P2	3.00	4.00
T2Q6P5	3.20	3.60
T4Q3P3	3.50	3.00
T1Q4P5	3.75	4.50

Appendix D.
Crosswalk Science Priorities to Known Existing/Ongoing Projects

This section provides a list and brief synopsis of ongoing projects that help address the SCT Key Questions and are linked by project ID to the Science Priorities. Project listings in this section are limited to those that the SCT are aware of and projects may be added as they are identified.

Appendix D Table of Ongoing Projects (Updated Spring 2025)

ID	Abbreviated Project Name	Status	Lead Organiz-ation(s)	Next Milestone	Prior Milestone (for long-term projects, list the most recent relevent report/data)
T1Q1P2	Evaluate lake health according to establised measures	Partially completed	CdA Tribe, DEQ	Update report for lake status, incorporating NAS reccomendations	2020 National Academies (NAS)study on the Future of CDA lake
T1Q1P3	Evaluate the lake for Beneficial Use under the Clean Water Act	Partially completed	CdA Tribe, DEQ	**Regulatory**: 2026 Integrated Report **Science**: Develop improved measures for cold water aquatic life	2024 Integrated Report (DEQ)
T1Q3P1	Evaluate human health risks from recreational and occupational exposure to contaminant metals	In reporting/ final assessment	DEQ	Publish final report	
T2Q1P4	Evaluate influence of hydrology and meterology on lake stratification and mixing	Partially completed	CdA Tribe, DEQ	Develop a proposal to predictively model lake stratification and mixing	DEQ (2025), Conceptual Site Model for Lake Structure and Mixing
T2Q1P5	Conduct 3D modeling of the water balance of the lake and internal mixing	Partially completed	CdA Tribe, DEQ	Develop a proposal to evaluate vertical mixing and the factors that govern it.	The CDA Tribe has developed an AEM3D model for evaluating lake ecology. In 2025, DEQ published a report that incorporated preliminary results from modeling lake mixing.
T2Q2P3	Evaluate water column oxygen dynamics in relation to basin hydrology and lake mixing	Partially completed	CdA Tribe, DEQ	Develop a proposal to predictively model lake oxygen dynamics	DEQ (2025), Conceptual Site Model for Lake Structure and Mixing
T2Q3P2	Evaluate septic influences on CDA Lake	Partially completed	CdA Tribe, DEQ	Develop a proposal to rigorously evaluate septic influences	DEQ and CDA Tribe (2020), CDA Lake Phosphorus Inventory
T2Q3P3	Evaluate land use influences on metals and nutrient loading to CDA Lake	Partially completed	tbd	Update report for lake status, incorporating NAS reccomendations	2020 National Academies (NAS) study on the Future of CDA lake
T2Q3P4	Evaluate nutrient loading from CDA Lake tributarie	In progress	CdA Tribe, DEQ	Complete and publish ongoing studies by DEQ and the CdA Tribe	DEQ and CDA Tribe (2020), CDA Lake Phosphorus Inventory

ID	Abbreviated Project Name	Status	Lead Organiz-ation(s)	Next Milestone	Prior Milestone (for long-term projects, list the most recent relevent report/data)
T2Q6P1	Influence of CDA Lake water quality on phytoplankton dynamics	Partially completed	CdA Tribe, DEQ	Set prioirites for future work	DEQ subcontractor reports in 2019, 2022. CdA Tribe (2017), 5-year Synthesis for 2011-2015 Monitoring Data
T2Q7P3	Human influences on littoral zone health	In progress	DEQ, University of Idaho	Complete the University of Idaho/DEQ wake study	Notte (2019), University of Idaho thesis on CDA Lake periphyton
T2Q7P4	Incorporate remote sensing and citizen science into CDA Lake littoral zone monitoring	In progress	CdA Tribe, DEQ, USGS	Develop proposal to use USGS REACT remote sesnign tool to support CDA Lake littoral moniotring	2024 CDA Lake Baywatchers Data Report
T3Q1P1	CDA Lake ecologic and geochemical history	In progress	CdA Tribe, DEQ, Univ. Of Oregon, Indiana St. University	Complete biogeochemical and ecologic analyses of collected cores	Collected sediment cores for geochemistry and paleolimnology study (Sep-2024)
T3Q1P2	Develop timeline of historic human actions that influence CDA Lake health	Partially completed	tbd	Develop priorities for future work.	2020 National Academies (NAS)study on the Future of CDA lake
T3Q3P1	CDA Lake long-term monitoring	In progress	CdA Tribe, DEQ	Complete CY 2025 monitoring and preserve data	Completed CY 2024 monitoring and preserved data
T3Q3P3	Correlate historic phytoplankton data with environmental influences	Partially completed	CdA Tribe, DEQ	Set priorities for future work	DEQ subcontractor reports in 2019, 2022.
T3Q4P1	Develop timeline of historic remedial actions along the CDA River	Partially completed	tbd	Develop work plan	2020 National Academies (NAS)study on the Future of CDA lake
T4Q2P1	Evaluate spatial and temporaal trends in benthic invertebrates	Partially completed	CdA Tribe, DEQ	Conduct analyses from recent sediment cores with results from prior studies	Collected sediment cores for geochemistry and paleolimnology study (Sep-2024)

ID	Abbreviated Project Name	Status	Lead Organiz-ation(s)	Next Milestone	Prior Milestone (for long-term projects, list the most recent relevent report/data)
T4Q3P1	Describe trophic status of CDA Lake	Partially completed	CdA Tribe, DEQ	Update report for lake status, incorporating NAS reccomendations	DEQ (2020), CDA Lake Status update, 2015-2018
T4Q3P5	Assess whether measured trends are impacting desired uses and functions	Partially completed	CdA Tribe, DEQ	Update report for lake status, incorporating NAS reccomendations	DEQ (2020), CDA Lake Status update, 2015-2018 DEQ and CDA Tribe (2020), CDA Lake Phosphorus Inventory
T4Q5P1	CDA Lake invasive species management	In progress	Avista, CdA Tribe, Idaho Departmen t of Ag, DEQ	**Management**: 2025 aquatic invasive species management activities **Science**: Set priorities for future work	Avista (2025), CDA Lake aquatic weed management plan for non-tribal waters 2024 summary report. CdA Tribe and Avista (2025), CDA reservation 2024 aquatic weed annual summary report.
T4Q5P2	CDA Lake macrophyte community monitoring	Partially completed	CdA Tribe, DEQ	Set priorities for future work	DEQ subcontractor report (2018). Scofield et al. (2023) https://doi.org/10.1007/s11356-023-27211-x
T5Q4P1	Evaluate monitoring needs and update strategies	In progress	CdA Tribe, DEQ, EPA, USGS	Complete CY 2025 monitoring	Completed CY 2024 monitoring
T5Q4P2	Evalaute effectiveness of management actions	In progress	multiple	Complete coring and paleolimnology study	2019 DEQ subcontractor report on baseline primary productivity rates in CDA Lake
T6Q1P2	Identify barriers to data sharing	In progress	CdA Tribe, DEQ, EPA, USGS	Develop Lake-focused Data Management Plan (DMP)	
T6Q1P3	Build library of data resources	In progress	CdA Tribe, DEQ, EPA, USGS	Develop Lake-focused Data Management Plan (DMP)	
T6Q2P1	Identify data and information sharing needs and limitations	In progress	CdA Tribe, DEQ, EPA, USGS	Develop Lake-focused Data Management Plan (DMP)	

ID	Abbreviated Project Name	Status	Lead Organiz-ation(s)	Next Milestone	Prior Milestone (for long-term projects, list the most recent relevent report/data)
T6Q2P2	Identify goals for data sharing	In progress	CdA Tribe, DEQ, EPA, USGS	Develop Lake-focused Data Management Plan (DMP)	
T6Q2P3	Develop a lake-focuses Data Management Plan	In progress	EPA. USGS	Develop Lake-focused Data Management Plan (DMP)	
T6Q3P2	Store data as identified in CDA Lake Management Plan	In progress	CdA Tribe, DEQ, EPA, USGS	Upload historic data into new lake-focused basin-wide integrated daabase	**CDA Tribe:** Shared historic water quality data with USEPA **DEQ**: Implement statewide DEQ water quality database with metadata capabilities.

Appendix E.
Revision Tracker for Future Revisions

Version and date updated	Concise summary of updates
Version 1.0; July, 2026	Initial document creation