Aquatic Data Analysis and Database Management

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2025 Progress Report

Colorado Parks and Wildlife

Aquatic Research Section

Fort Collins, Colorado

December 2025

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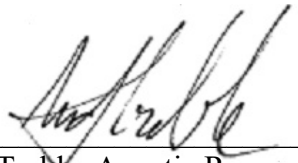
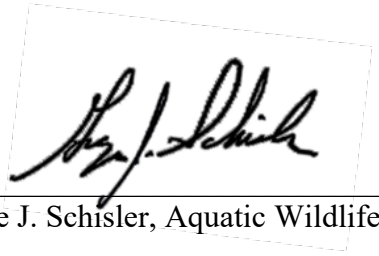
Prepared by: 

Andrew J. Treble, Aquatic Research Data Analyst

Approved by: 

George J. Schisler, Aquatic Wildlife Research Chief

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EXECUTIVE SUMMARY

The 2025 reporting period marked a year of substantial progress for the Aquatic Research Data Management and Analysis Program, with major advances in data infrastructure, analytical capacity, and long-term project delivery. The most significant milestone was progress on *"Fishes of Colorado",* including the submission of the first complete draft to the publisher and receipt of initial page proofs. This work represents the culmination of nearly a decade of effort and will remain a priority in 2026 as final revisions move toward publication.

Core data management and support functions continued to anchor the program's work. In addition to routine responsibilities such as data archiving, responding to internal and external data requests, and supporting biologists with database uploads, the program expanded its analytical and visualization capabilities. New Tableau dashboards, R-based workflows, and automated QA/QC tools were developed and deployed, improving efficiency, consistency, and accessibility of aquatic data across the agency. Training and onboarding of new biologists, interns, and temporary staff further strengthened capacity and ensured continuity in data standards and practices.

Modernization of aquatic data systems remained a central focus. Efforts continued to bridge data connections between COFISH, ADAMAS, and Tableau. Although the initial Request for Proposals to replace ADAMAS was closed due to bids exceeding the budget and scope, development of a new document is underway to reissue a revised RFP in the coming year. A new creel survey pilot project demonstrated the effectiveness of integrating Survey123 mobile data collection, R-based QA/QC and uploads, and Tableau-based analysis and reporting. The installation of a CPW-hosted R Shiny server further expanded in-house analytical and visualization capabilities, reducing reliance on external vendors.

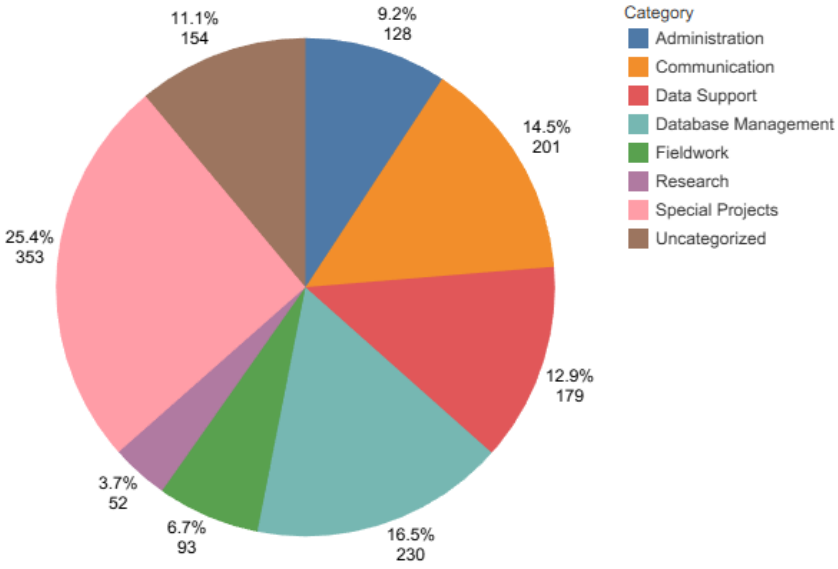
Reporting and professional contributions were maintained at a high level. Required Federal Aid and annual reports were completed, peer-reviewed publications were co-authored and published, and long-standing documentation gaps were addressed through reorganization of the Aquatic Research Data Analyst SOP materials. Participation in professional meetings and working groups supported continued collaboration, knowledge exchange, and representation of CPW's data management leadership at the regional and national levels.

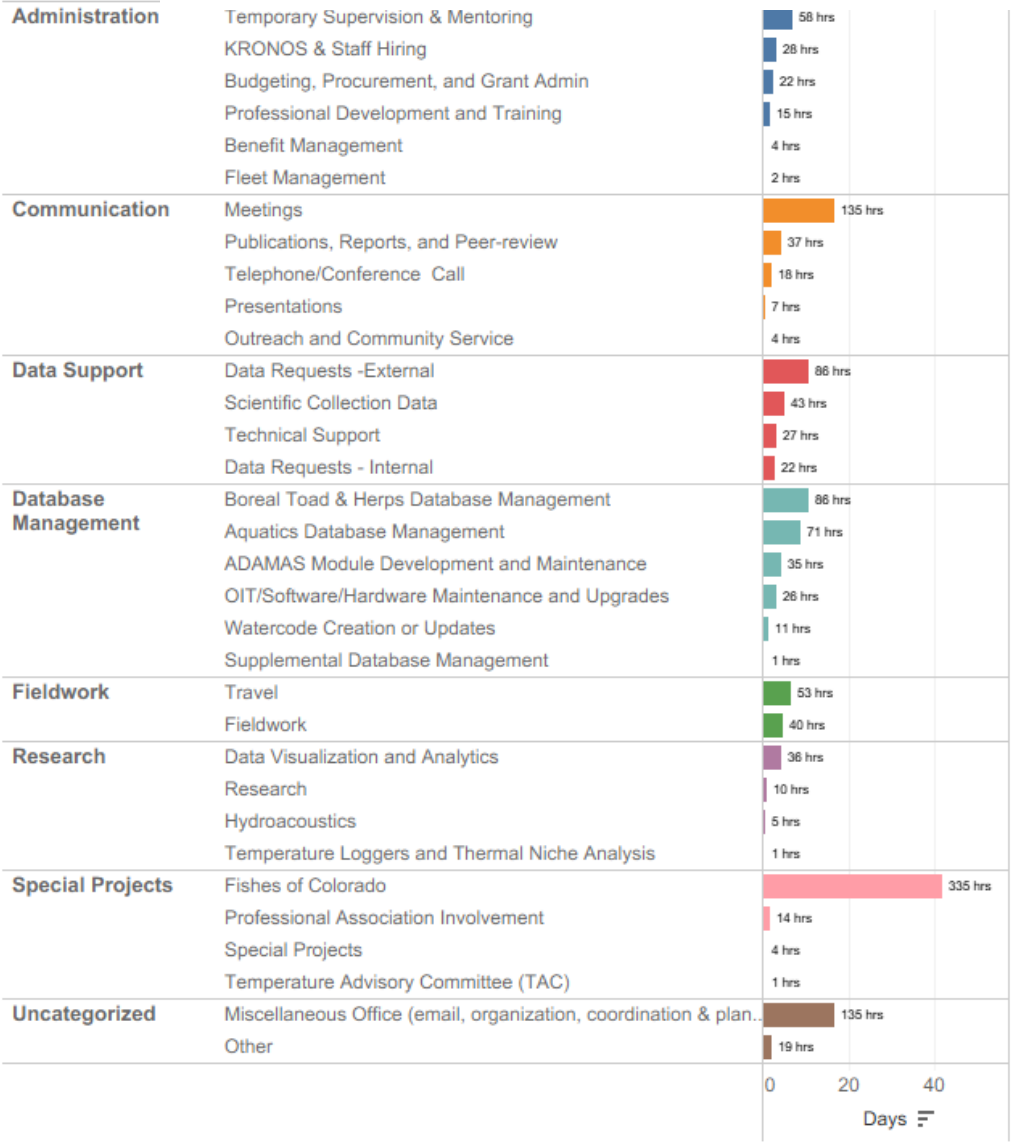
Fieldwork was limited in 2025, reflecting the prioritization of major analytical and publishing efforts. However, targeted trips supported key research and management needs, including genetic sampling, invasive species removal, spawning operations, and long-term site maintenance.

Overall, 2025 was a year of focused investment in systems, tools, and institutional knowledge. The work completed during this period strengthens CPW's aquatic data infrastructure, improves efficiency and data quality across programs, and positions the Aquatic Research Unit for continued advancement in 2026 and beyond.

Figure 1. *Allocation of time by the Aquatic Research Data Analyst.*

November 1, 2024 – October 31st, 2025





ADMINISTRATION

This category includes all staff hiring, KRONOS timekeeping, budgeting and expense tracking, fleet management, and professional development and training (i.e., OIT security modules and software workshops). This category also accounts for any time spent mentoring or supervising temporary personnel. This category accounted for a total of 128 hours (9.2%) between November 1st, 2024, and October 31st, 2025, which is roughly equivalent to the amount in the previous year.

I. Temporary Supervision and Mentoring

The data unit appeared to have an ever-revolving crew of work-study students, interns, and temporary workers in 2025. Alissa returned to her temporary position in both the spring and fall, providing indispensable stability and agency knowledge. Kace Vazquez del Mercado and Cecilia Huber wrapped up their youth internships, and while Cecilia went on to work for the larval fish lab at CSU, Kace returned as a temporary and CSU work-study in the summer and fall. Ralph Eberhard returned as a CSU work-study student but was also hired as a seasonal worker over the summer. Finally, Riley Dils, aquatic research data associate, popped in occasionally when not working with Tawni Firestone, to help deploy and manage temperature loggers. These positions involved a wide range of data projects, from historical data entry to the development of new data visualizations, all while emphasizing database training and the development of analytical skills. Fifty-eight total hours were spent with temporaries, primarily providing hands-on instruction in the various data packages.

Some highlights for the past year include:

- All interns and work studies developed excellent Tableau development skills.
- The scripting of database tasks in R increased in use, increasing the unit's overall efficiency.
- Ralph, in particular, developed a sophisticated custom analysis dashboard for calculating density and biomass at sites through time, complete with a full suite of filters and options.
- This year's interns received the most in-depth SQL training to date.

II. KRONOS and Staff Hiring

Conducting interviews, completing hiring packets, and maintaining accurate accounting for temporary time.

Specific points of interest for 2025 include:

- Alissa Gigliotti was hired as a returning seasonal for both spring and fall of 2025.
- Hired Kace Vazquez del Mercado as a work study following the end of her internship.
- Hired Ralph Eberhard as a seasonal over the summer, and welcomed him back as a work study in both the spring and fall semesters of 2025.
- Serving on the interview committee for the Terrestrial Programs senior data analyst
- Figure out new UKG timekeeping software.
- Met with Liz Stewart and worked out an agreement to share Lindsey Hughes until the end of her 9-month contract in December 2025.
- Met with Eric Richer to work out an arrangement in 2026 to split time with Sam Graff.

III. Budgeting, procurement, and grant administration

Developing an annual budget and updating it with unit purchases, keeping unit expenditures up-to-date in the SARA app, reporting requirements for grants (when applicable).

Specific points of interest for 2025 include:

- Set up a CPW account with CDW-G for the purchase of tablets for mobile data entry.
- Assisting Brian Avila with various purchases as he got his unit up and running.
- Paperwork associated with a OneCard fraud case.
- Getting OIT to review software purchases for Recite, Duet.

IV. Professional Development and Training

Annual mandatory training and professional development opportunities accounted for 15 hours (~1% overall) in 2025. Almost half of this time (7 hours) was devoted to learning about the Snowflake data platform, as this will likely be the interface the data analyst will use to interact with cloud databases in the future. Other training courses and opportunities included:

- Annual OIT cybersecurity training.
- DRN Compliance trainings (Sexual harassment, Workplace Violence, Ethics, Conflict of Interest).
- DNR Equity, Diversity, and Inclusion training.
- DU Daniels Leadership School Alumni Workshops.
- How to use new UKG timekeeping system.

COMMUNICATION

The communication category encompasses meetings, conference calls, presentations (both internal and external), written reports, and publications. During the reporting period, a total of 200 hours, representing 9.2% of the overall time, was dedicated to these activities. This level of effort is consistent with previous years, with the largest portion devoted to attending meetings and preparing reports, publications, and presentations, including both authoring and peer-reviewing content. These activities align with annual commitments in these areas.

I. Publications, Reports, and Peer-Review

Approximately 25 hours during this reporting period were allocated to authoring and reviewing various reports, publications, and white papers. This effort resulted in the completion of three reports and one co-authored publication. Among these:

i. Annual Reports:

- **Treble, A. J.** 2024. Statewide Fisheries Assessments and Surveys. Federal Aid Project F-86-R-35. Colorado Parks and Wildlife, Aquatic Wildlife Research Section. Fort Collins, Colorado. (*Note that the deadline for this report was extended due to delays by some biologists to get their 2025 data entered into the database before the deadline*).
- **Treble, A.J.** 2024. Annual Aquatic Research Data Analysis Report. Colorado Parks and Wildlife, Aquatic Wildlife Research Section. Fort Collins, Colorado.

ii. Specialized Reports:

iii. Peer-Reviewed Publications:

- Lepak, J. M., Hansen, A. G., Martinez, T. L., Stewart, E. a., Pinkus, D. J., Pelletier, A. M., & **Treble, A. J.** (2025). Maximum age of Bighead Carp *Hypophthalmichthys nobilis* exceeds 30 years: implications for anticipating invasive species establishment and impacts. *Journal of Fish Biology*, 1-8. https://doi.org/10.1111/jfb.70181.

- Lepak, J. M., Hansen, A. G., Johnson, B. M., Battige, K. D., Cristan, E. T., Farrell, C. J., Pate, W. M., Rogers, K. B., **Treble, A. J**., & Walsworth, T. E. (2025). Cyclical, multi-trophic level responses to a volatile, introduced forage fish: learning from four decades of food web observation to inform management. *Fisheries*, vuae013.

iv. Draft Reviews and Comments:

- Reviews and comments of draft documents were provided on several reports and research papers.

In 2025, this included:

- Comments on various Water Quality Control Commission proposals.

- Peer review of Lepak Gizzard Shad paper.
- Review of William Pate's presentation to Coldwater Meeting.

Publication-related updates were also logged in key tracking documents within CPW research, including:

i. Contributions to Management by Aquatic Research.
ii. Aquatic Research Project List.

II. Meetings

Both formal and informal meetings are essential for maintaining coordination and facilitating the exchange of intra-agency knowledge. They also serve as a platform to highlight how the data management unit can support other teams within the organization. During this reporting period, a total of 135 hours (9.8% of overall time) was spent attending various meetings, underscoring the importance of communication and collaboration in achieving shared goals.

Key meetings attended in 2025 included:

i. Annual Meetings:

- **Annual CPW Aquatic Section Meeting**: Held at Mount Princeton Hot Springs in 2025, this meeting brought together aquatic section staff to review progress, set priorities, and discuss statewide aquatic initiatives.
- **Annual CPW Aquatic Biologists Summit**: Usually coinciding with the Annual Aquatic Section meeting, in 2025, I presented two talks. One, co-authored with Jesse Lepak, concerned the need and value of standardizing our survey units and requiring more comprehensive reporting. The second introduced a proposal to develop a standard Fishing Summary Report for specific waters utilizing the Tableau Network.
- **Annual CPW Aquatic Research Meeting**: Held during the Annual Aquatic Section Meeting, this gathering focused on updates, collaborations, and strategic planning for aquatic research activities.
- **Annual CPW Coldwater Reservoir Coordination Meeting**: Finally held in person, back in Buena Vista in 2025, this meeting addresses management strategies and research efforts specific to Colorado's coldwater reservoirs.
- **Great Plains Fishery Workers Association**: As this meeting took place in Fort Collins this year, it was easy to attend and learn what other agency biologists are dealing with in all the Midwest states.
- **WDAFS/CO/WY Joint Meeting of the American Fisheries Society (AFS) Annual Meeting**: Held in Denver, this large event provided an opportunity to network with colleagues from across the West and share research findings and management practices.

- **Organization of Fish and Wildlife Information Managers (OFWIM) Annual Meeting**: This year's conference was virtual once again, due to the federal government shutdown, focuses on advancements in data management and technology within the fish and wildlife management community.
- **Annual Boreal Toad Recovery Program Meeting**: Convened in Colorado Springs, this meeting reviewed progress and challenges in the recovery of boreal toads in the Southern Rocky Mountains.

ii. Monthly Meetings:

- **Project Support Meetings with CPW Researchers**: These meetings facilitated collaboration and provided technical assistance for ongoing research initiatives.
- **Hydroacoustic Planning and Analysis Meetings**: Regular discussions with Pate, Hansen, and Lepak focused on the planning and analysis of hydroacoustic surveys.
- **CPW Data Working Group Meetings**: Held monthly or bimonthly, these meetings included members from terrestrial programs, avian and terrestrial research, and aquatic research to address data management and visualization challenges across the agency.
- **Water Temperature Research Check-In Meetings**: Regular check-ins with Mindi May, Ashley Rust, Tawni Firestone, and Ryan Fitzpatrick ensured continued progress and coordination on water temperature research projects.
- **Boreal Toad and Herptile Database Meetings**: Regular check-ins with Liz Stewart (CPW herptile coordinator) concerning needed updates and data fixes to both the Boreal Toad Monitoring Database and the Statewide Reptile and Amphibian database.
- **ADAMAS RFP Development Meetings**: regular updates and progress report meetings with Ben Stucky and Julie Orr concerning the development (and now revision and re-release) of the Request for Proposal for the replacement of CPW's ADAMAS data application.
- **Fishes of Colorado Coordination Meetings**: typically weekly phone calls and monthly meetings with John Woodling to go over various outstanding issues concerning revisions to the current draft of Fishes of Colorado.

In addition to these monthly and annual meetings, specific meetings of interest in **2025** include:

- Weekly check-in meetings with interns, work-studies, temporaries, and research associates to get updates on progress and address any questions they may have.
- Met on multiple occasions with Ben Stucky, Brian Rohde, and Portland Web Works to figure out how to pull data from the new COFISH application into other modules. This problem is ongoing.

- Met with OIT and CPW procurement to review initial bids on the first ADAMAS RFP.
- Met with various vendors of existing fisheries database software applications.
- Regular meetings with Ryan Fitzpatrick to ensure Optimal Plains Fish Sampling model has the most up-to-date and properly formatted data to derive annual site selection list.

These meetings reflect a consistent commitment to fostering collaboration, improving data management practices, and ensuring alignment across various CPW aquatic programs and initiatives.

III. Presentations

Internal Presentations:

a) **Treble, A. J.** 2025. D'ATTA Bio Awards. Annual CPW aquatic section meeting (Mt. Princeton, CO). February 4th, 2025.

IV. Telephone/Conference Calls:

While more efficient than traveling to meetings, telephone and conference calls still accounted for almost 18 hours (1.3%) of overall time spent in 2025. Most of these calls deal with organizational and coordination issues, technical support, and data requests and are not significant. Some more noteworthy calls over this reporting cycle include:

- Regular update and coordination calls with co-authors regarding Fishes of Colorado.
- Monthly conference calls with OFWIM Conference Planning Committee.
- Numerous calls with Aquatic Seniors to discuss ongoing data requests.
- Regular phone calls from biologists for tech support or specific data analysis.
- Regular calls with Brandon White and Grant Wilcox to ensure coordination between the Water table in the database, the water table in COFISH, and the water table in Aquatic GIS.

DATA SUPPORT

At the root of the aquatic research data analyst position is data support. This category includes requests for data, whether it be from biologists or researchers, or from external entities. It also involves archiving all data that enters the unit from outside entities, as part of their scientific collection permits, as well as assisting CPW biologists and researchers with uploading their data into the database. A total of 179 hours, or 13% of the total time, was invested in data support in 2025. This is how that time can be broken down:

I. Internal/External Data Requests

A total of 68 data requests from external sources were processed between November 1st, 2024, and October 31st, 2025, requiring over 86 hours of work. Additionally, numerous internal requests from CPW staff were addressed promptly during this period, resulting in an additional 22 hours of effort. Together, internal and external data requests accounted for 7.8% of total time over the reporting period.

Figures 2 and 3 provide a detailed breakdown of the time and effort allocated to the data request process.

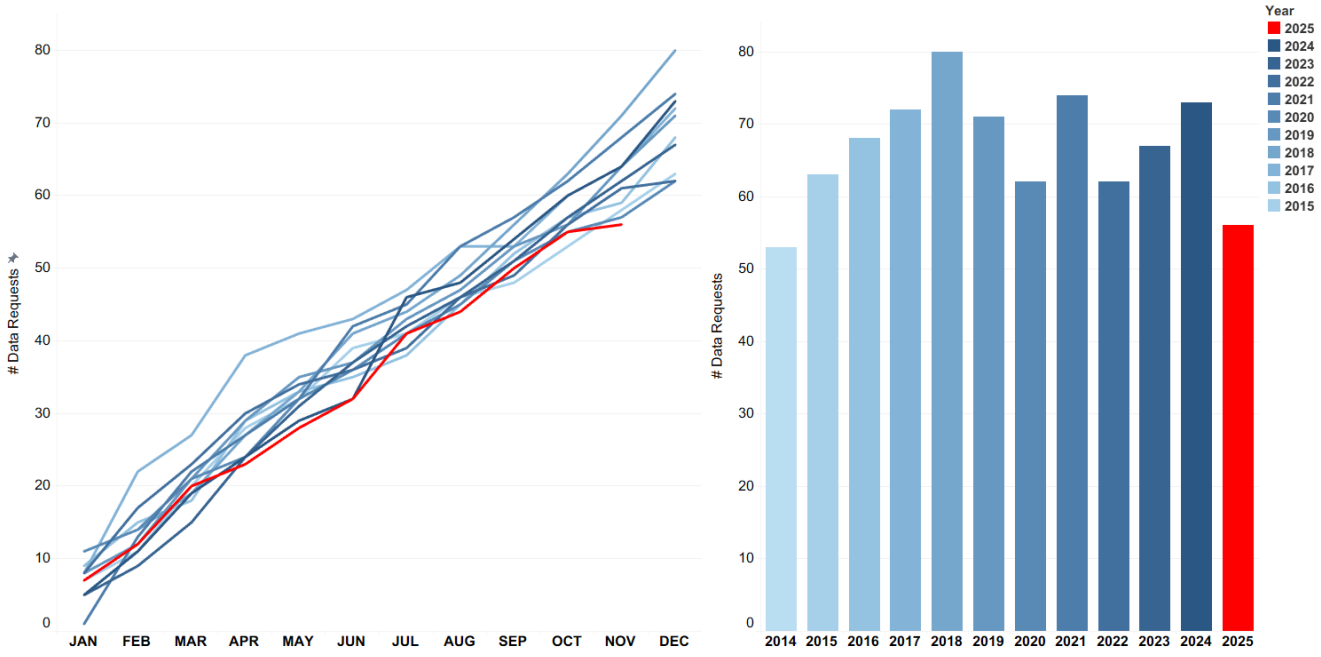


Figure 2. *Summary of external aquatic data requests by month and annual totals since 2014.*

Key Outcomes of 2025 Data Requests:

- **No CORA Requests**: Notably, the aquatics program continued the streak of not receiving a single CORA (Colorado Open Records Act) request in 2025. The Aquatic Database Unit has not handled a CORA request since 2022.
- **Improved Spatial Data Workflow**: New R scripts were developed to handle spatial data requests entirely within R, eliminating the need for the previous cumbersome process of splitting tasks between SQL and ArcGIS.
- **Streamlined Data Sharing Agreements**: The data-sharing agreement process was updated and refined, enabling faster completion and the ability to request e-signatures efficiently.

- **Increased Herpetological Data Requests**: The number of data requests from the Herptile Database and Boreal Toad Monitoring Database reached an all-time high, reflecting increased interest in these datasets.
- **Upper Colorado River Recovery Program Contributions**: All CPW Upper Colorado River Recovery Program data were submitted to STReaMS in project-specific uploads, streamlining the process and reducing the need for individual biologists to reformat and upload their data independently.
- **Targeted Data Extracts**: Custom data extracts were created to support research efforts for individuals, including Barry Nehring, Jesse Lepak, Adam Hansen, Ryan Fitzpatrick, Brian Avila, and John Woodling.

These efforts reflect ongoing improvements in the efficiency of data handling processes and the ability to meet increasing demands from both internal and external stakeholders. The innovations in workflow and submission practices have significantly enhanced the capacity and responsiveness of the aquatics data management unit.

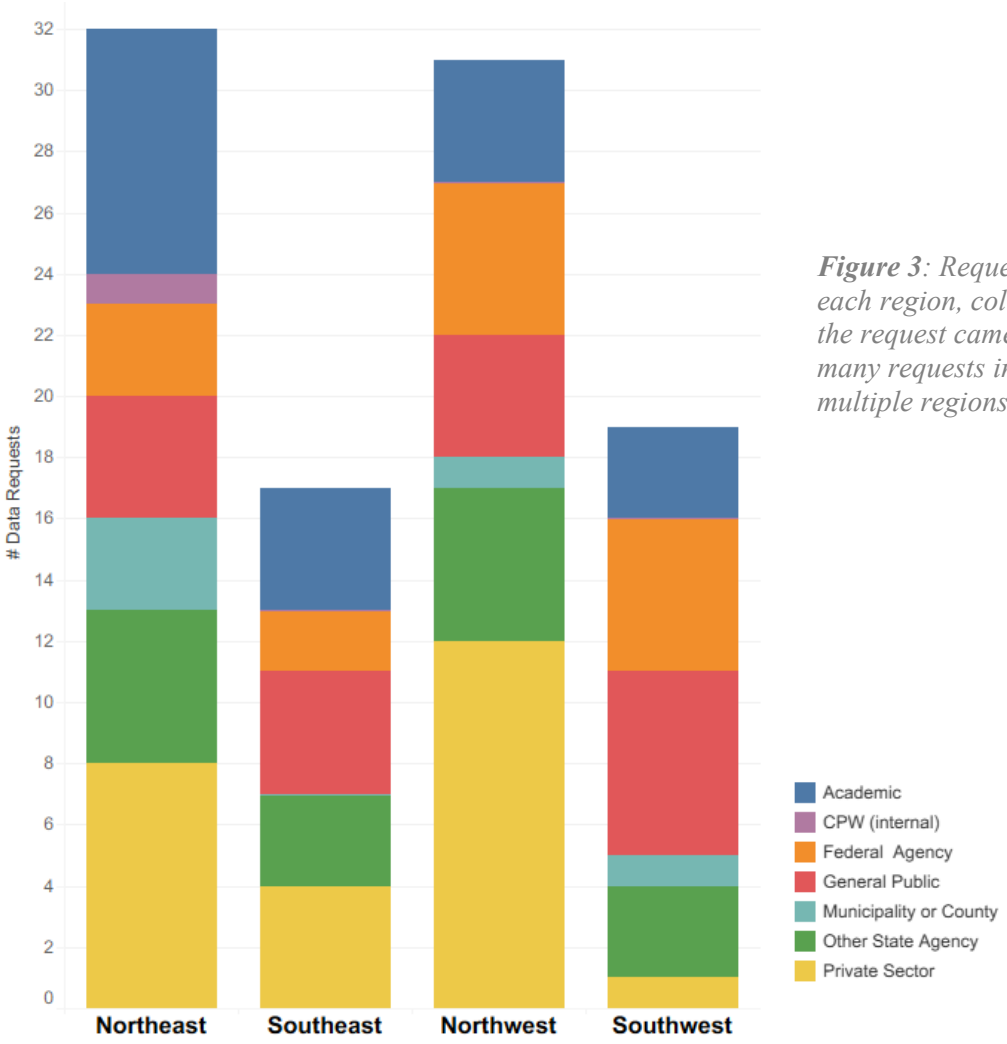
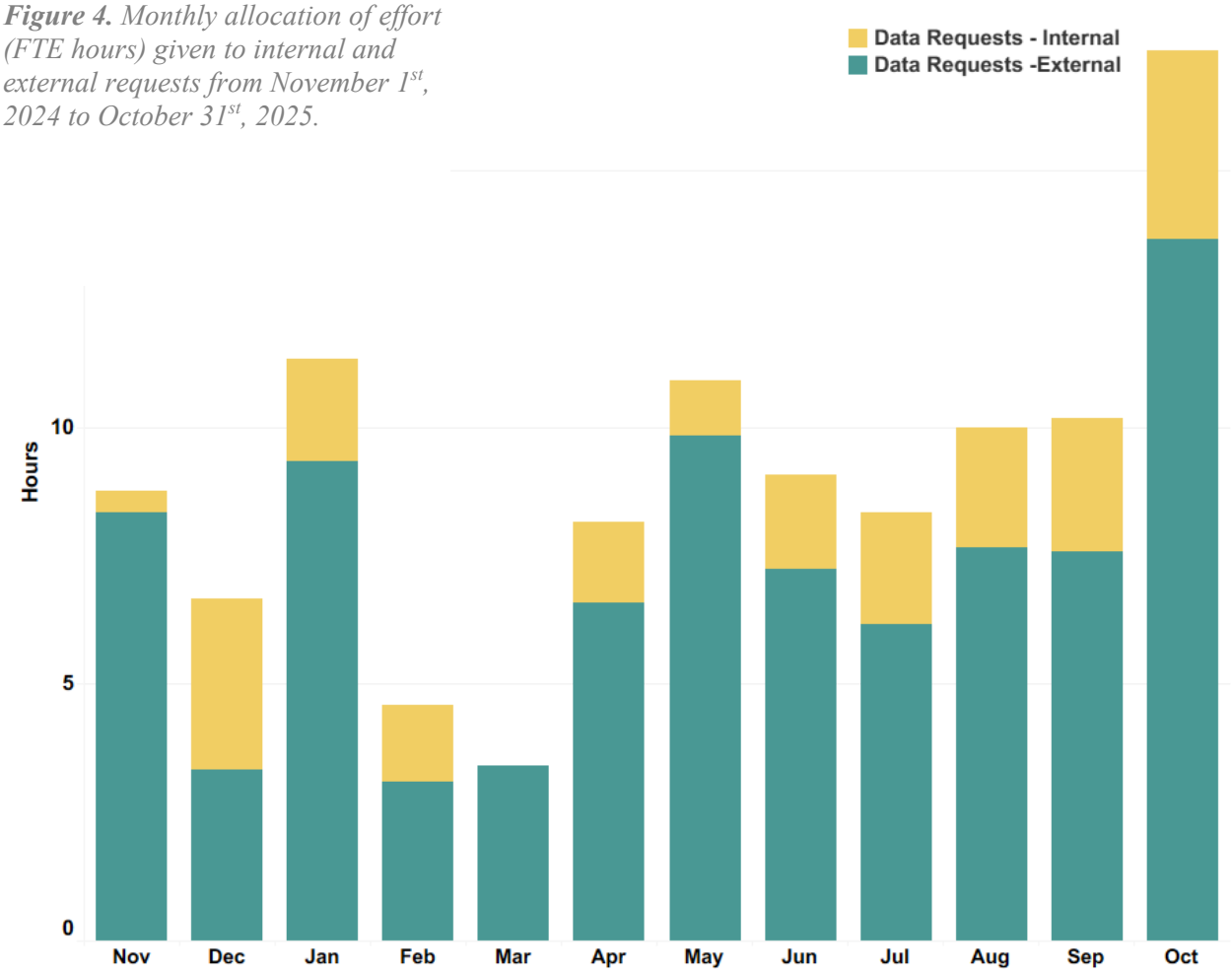


***Figure 3**: Requests for data from each region, colored by what sector the request came from. Note that many requests involved data from multiple regions or across the state.*

Figure 4. Monthly allocation of effort (FTE hours) given to internal and external requests from November 1st, 2024 to October 31st, 2025.



II. Scientific Collection Reports

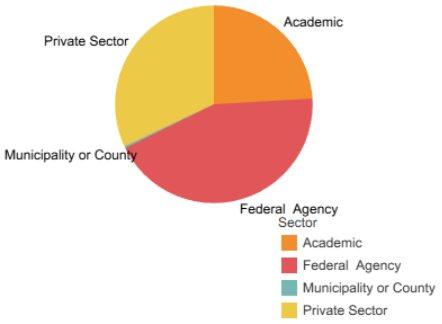
A total of 71 Scientific Collection Permits were issued for the 2025 field season. However, as of December 12th, only a handful of these permits have been submitted and uploaded. A total of 624 reports for permits issued in 2024 were uploaded during the 2025 reporting period. This task, primarily handled by temporary employees, required significant effort, with 209 total hours devoted to quality assurance/quality control (QA/QC) and uploads, 175 of which were completed by temporary staff.

A significant portion of the data analyst's time was spent on tasks related to permit tracking, downloading and assigning reports, and bulk importing SciColl data from the USFWS's Species Tagging, Research, and Monitoring System (STReaMS).

The effort required to upload and QA/QC SciColl data has increased substantially over the past several years (see Figure 4). Several factors contribute to this trend:

- **Shift in Workforce**: Some of the increased effort can be attributed to a shift in responsibilities from the data analyst to temporary employees and interns, who are less experienced with the available data tools, resulting in slower processing times.
- **Improved QA/QC Tools**: Enhanced QA/QC tools now identify more errors in submitted data, requiring follow-up with permittees to ensure data accuracy and completeness.
- **Addition of Reptile and Amphibian data**: Reptile and Amphibian SciColl data has traditionally been handled by another unit, but has been taken over by the aquatic data team, adding more records to be uploaded and verified.

While these improvements in QA/QC processes have enhanced data quality, they have also highlighted the need for additional training and support for temporary staff to improve efficiency. The continued refinement of tools and workflows will be crucial for managing the increasing complexity of data reporting and processing in the coming years.



Sector	Organization (group)	
Academic	Colorado College	12
	Colorado Cooperative Fish and Wildlif..	0
	Colorado Mesa University	1
	Colorado State University	91
	CSU	1
	CSU-LFL	42
	Regis University	1
	University of Colorado Boulder	4
	Upper Rio Grande School District	0
	Western Colorado University	0
Federal Agency	Bureau of Land Management	9
	U.S. Fish & Wildlife Service	233
	U.S. Forest Service	9
	USGS	24
Municipality or County	City of Longmont	2
Private Sector	Amnis Opes Institute	41
	Aqua Sierra, Inc.	
	Aquatics Associates, Inc.	6
	Battelle	3
	Beavers Fish Farm	4
	Blue River Ranch	48
	Colorado Pond and Lake	2
	COPARC	1
	Freestone Aquatics	0
	GEI Consultants, Inc.	69
	Metro Wastewater Reclamation District	15
	Schmueser Gordon Meyer (SGM)	0
	Timberline Aquatics / LRE Water	7
	Trinchera Ranch	6
Grand Total		631

Figure 5. *The number and sources of Scientific Collection Reports submitted between November 1st, 2024 and October 31th, 2025. Note that these numbers do not include the reports from the Upper Colorado River Endangered Fish Recovery Program, which are now submitted separately through a bulk data upload*

III. Technical Support and Training

The aquatic research data analyst serves as the primary point of contact for biologists, researchers, and other agency staff regarding aquatic data questions and technical support. Due to ongoing contact and availability challenges with OIT, the data analyst often steps in to resolve technical issues beyond their typical responsibilities. These support requests are prioritized and addressed promptly, frequently requiring other tasks to be paused. Between November 1st, 2024, and October 31st, 2025, 27 hours (2.0% of total effort) were dedicated to providing technical support to biologists and researchers.

Highlights of Technical Support Provided in 2025

- **CREEL Application Troubleshooting**:
    - By far, most time devoted to technical support involved creel surveys and the creel application.
    - Adding new questions to the database and assigning those questions to specific creel surveys.
    - Wiping records from specific days where an unknown bug in the program allows for duplicate records to be created, which causes the system to crash.
    - Working with Alex Burks (northeast creel coordinator) on Survey123 mobile creel app, R code to import that data, and the creel application itself.
- **Training and Access Support**:
    - Conducted multiple training sessions for new biologists on using ADAMAS and Tableau for data management and visualization.
    - Assisted biologists in securing ADAMAS access and data entry permissions for their seasonal temporary staff.
- **User and System Maintenance**:
    - Maintained the list of users and data access permissions for CPW's Tableau Network, which includes terrestrial, avian, and aquatic research dashboards. Assisted OIT with troubleshooting dashboard access and system issues.
- **Database Assistance**:
    - Supported biologists in resolving database issues, including uploading problematic data templates, correcting station assignments, updating survey status columns, creating new species codes, and flagging questionable surveys or species identifications.
    - Frequently assisted with troubleshooting data templates and uploading survey data into ADAMAS.
- **Custom Tools and Resources**:
    - Provided technical support for biologists using custom Tableau workbooks and data extracts to ensure functionality and accuracy.

    - Maintained and expanded Google Sites for the Boreal Toad and Greenback Cutthroat Recovery Teams to support the efforts of Harry Crockett and Jenn Logan.

The technical support provided by this unit not only ensures seamless operations across various aquatic data systems but also improves biologists' efficiency in using these tools. By addressing immediate challenges and maintaining critical systems, the Aquatic Research Data Unit plays a key role in supporting aquatic research and conservation initiatives.

DATABASE MANAGEMENT

Data management represented an investment of approximately 230 hours, which equates to 16.5% of the total allocation for the year (excluding temporaries and work-studies) (Figure 1). Approximately 46% of that effort (~106 hrs) was directed at the primary aquatic data sources, 37 % (86 hrs) devoted to the Boreal Toad or Herptile databases, with the remaining 16% (~38 hrs) being split between supplemental data sources, linked applications, module development, maintenance, and watercode updates (Figure 1).

I. Aquatics Database Management

Regular maintenance and updates of the aquatics data platform are critical for ensuring smooth system operation and enhancing the analytical capabilities of related applications. The primary data systems, including Trans6 (Hatcheries), ADAMAS (Fisheries Surveys), AAHL (Fish Health Lab), and CREEL (Creel Surveys), as well as several supplemental applications, rely on carefully maintained SQL Server Management Studio (SSMS) tables and views. These activities ensure the seamless functioning of interconnected applications and data workflows.

Key Activities and Accomplishments in 2025:

- **Data Quality Improvements**:
    - Collaborated with numerous biologists to identify and correct erroneous data, especially in preparation for the annual data bio awards.
    - Performed regular updates to critical database elements, including site elevations, HUC12 designations, area biologist jurisdictions, water and station codes within wilderness boundaries, and station latitude/longitude corrections from UTM coordinates.
- **System Enhancements**:
    - Undertook major updates by converting live aquatic data sources to hourly refreshed extracts on the Tableau Server. This transition streamlined workflows, improved data accessibility, and enhanced system performance.
    - Continued development and refinement of SQL scripts for reporting to STReaMS and importing data from STReaMS into ADAMAS. This included implementing a new canal salvage summary routine to capture previously missing data.
- **Optimization of Analytical Tools**:
    - Made significant updates to the *CurrentSummary* SQL script, a foundational resource for data requests and linked applications, improving its functionality and reliability.
    - Developed R-based monitoring scripts to track all critical data tables across the aquatics data platform. These scripts monitor data input activity and flag instances where data volume unexpectedly decreases.

- **Data Integration and Updates**:
    - Updated and maintained linkages to RiverWatch and the Water Quality Control Division (WQCD) to ensure accurate and current data integration.
    - Reviewed and corrected area biologist assignments for stations and waters while continuing efforts to document biologist roles over time.
    - Developed R code to download creel survey data from Survey123 and upload it to the aquatics server, saving time and allowing for many QA/QC checks along the way.
- **Support for New Modules and Applications**:
    - Advanced the development of the walleye spawn module within AquaticsT6, with plans to expand or replicate the module for other wild-spawn operations, such as Brown Trout.
    - Continued work on the SQL framework feeding the CPW Tableau Server, enabling improved reporting and visualization capabilities for agency stakeholders.
    - Continued work with CPW-OIT liaisons to develop RFP for the replacement of ADAMAS.
- **Spatial Data Updates**:
    - Updated geometries and spatial data related to waters and stations to improve spatial accuracy and system utility.

These efforts have strengthened CPW's aquatics data infrastructure, enhancing its capacity to meet increasing analytical demands and improving data reliability across all interconnected systems. The continued development of scripts, monitoring tools, and system enhancements will ensure that CPW’s aquatics data platform remains a robust and dynamic resource for years to come.

II. Current Status of Aquatics Database

The aquatics Database continues to grow as additions from internal and external sources are added to it. A breakdown (by data project) of the surveys that were added to the database over the period of this report is provided in Table 1. The total number of various records added to the database over the period covered by this report, along with the current overall status of records in the database, is provided in Table 2.

Table 1. *The number of surveys, by project, added to the database during 2025.*

Data Project	#Surveys
Species Conservation	130
Northeast Region Fisheries Management	329
Scientific Collections Permit	613
Aquatic Database	4
Southwest Region Fisheries Management	68
Southeast Region Fisheries Management	148
Aquatic Research	5
Northwest Region Fisheries Management	140
Upper Colorado River Recovery Program	14,464
Stream and lake databank	2,592

Table 2. *Recent additions and the overall status of the aquatics database (as of 10/31/2025*).

This reporting cycle:	
Number of new surveys entered	18,493
Number of new watercodes added	33
Number of new sampling stations added	228
Number of new fish measured	208,164
Number of new fish enumerated	411,273
Overall:	
Total # of managed waters	13,677
Total # of sampling Stations	19,943
Total # of Surveys	86,608
Total # of measured fish	5,431,752
Total # of enumerated fish	12,379,066

III. Boreal Toad and Statewide Herptile Database Management

In 2025, a total of 86 hours were dedicated to these databases, accounting for 6.2% of the data analyst's total time.

Key Highlights of 2025 Work:

- **Annual Boreal Toad Data Upload and Meeting Preparation**:
    - Completed the annual upload of survey data in preparation for the Boreal Toad Recovery Team meeting.
    - Updated and enhanced the Boreal Toad Database to ensure its readiness for discussions at the annual recovery program meeting.
- **Northern Leopard Frog Data Module Development**:
    - Advanced the Northern Leopard Frog (NLF) module within the Statewide Reptile and Amphibian database, housed on the SQL test server in Denver.
    - Developed R scripts to automate the process of downloading, formatting, and uploading NLF data into the database, streamlining workflows and reducing manual effort.
- **Database Improvements and Automation**:
    - Updated R scripts used to upload data into the Boreal Toad and Herptile databases, enhancing efficiency and reducing errors.
    - Data-mined citizen science platforms such as iNaturalist and HerpMapper to extract relevant Colorado herpetological data for incorporation into the databases.
- **Ongoing Data Integration**:
    - Identified the need to incorporate Bd (Batrachochytrium dendrobatidis) swab and eDNA results into the database, ensuring a comprehensive repository for amphibian health and conservation data.

The Boreal Toad and Statewide Herptile databases have become essential tools for Colorado's amphibian and reptile conservation efforts. Continued development, including the integration of Bd and eDNA data and further enhancements to database modules, will ensure these systems remain robust and capable of meeting the growing demands for herpetological research and management.

IV. Supplemental Database Management

In addition to the core aquatics databases and directly linked applications such as Trans6, ADAMAS, AAHL, and Creel, numerous supplemental databases have been developed to support statewide aquatics projects. These supplemental databases are typically updated on an as-needed basis but also require periodic maintenance to ensure compatibility with evolving database schemas. During this reporting period, 16 hours (1% of total effort) were allocated to updating and maintaining these supplemental databases.

List of Supplemental Databases:

- ADAMAS-Links Microsoft Access front-end
- Water Temperature Database
- PIT Tag Database
- Data Request and SciColl Tracking Database (Moved to Asana in 2023)
- Fishes of Colorado Project Tracking Database
- Thermal Niche – Logger Placement Database
- Hydroacoustics Database
- Data Analyst and Temporaries Time Allocation Databases
- Walleye Spawn Database (within CPW_AqDatAnalysis)
- ANS Crayfish Monitoring Database (within CPW_AqDatAnalysis)

Highlights of 2025 supplemental database development:

- **Hydroacoustics Database**:
    - refined SQL-Tableau and SQL-R connections to improve data visualization and reporting.
- **Water Temperature Database**:
    - Cross-validated HOBO logger files to ensure all data was uploaded into the Water Temperature Database.
    - Created schema maps for the new temperature research associate to enhance understanding and usability of the database.
- **Time Allocation Databases**:
    - Improved summary routines and dashboards, simplifying processes for KRONOS/UKG entry and reporting.

V. Software and Hardware Maintenance and Upgrades

Approximately 26 hours (1.9%) were required to obtain OIT permissions and to install or update various hardware unique to the data management unit. This is consistent with the amount of effort expended in years past. A list of these software updates or additions provided below.

- Reconfiguring all SQL data connections after OIT moved both production and test servers to new servers (DNRCPWSQP01 and DNRCPQSQT01).
- Working with OIT and Portland Web Works to try and figure out how to connect Tableau Network to the COFISH backend database on Amazon Athena server.
- New Software vetting and installation, including:
    - Recite (citation validation software).
    - Duet (converts iPad to a second portable laptop monitor).
    - Updating ReMarkable software to the new tablet.
- Changing passwords due to various data breaches.
- Regular updates to Tableau, SQL Server Management Studio, R Studio, EndNote, and various R packages, plus LENOVO and OIT updates.
- Tableau Network connection issues with OIT.
- Various OIT access requests for aquatic FTEs and temporary workers.

VI. Aquatic Data Application Development and Maintenance

A total of 35 hours (2.5% of total time) was invested in aquatic application development and maintenance. The vast majority of this time was spent developing the RFP for replacing ADAMAS, reviewing proposals, and conducting interviews with vendors. The first round of bids was rejected due to cost concerns, so the RFP was revised and is just about ready to go out for bid once more.

VII. Watercode Creation or Updates

The creation of new watercodes for biologists and hatchery managers required about 11 hours of time in total (<1%). A total of 20 new lakes, 3 new stream segments, and 15 new coded fish units were added to the growing list of 13,677 managed waterbodies in the state.

A breakdown of all the currently managed waters in the state is provided below in Table 3.

Water Type	# Watercodes	
	New in 2025	Overall
Stream	3	8,826
Lake	20	4,498
Fish unit	15	148
Canal/Ditch	0	55
Wetland	0	125

Table 3. *A summary of newly created and all managed waters held within CPW's Aquatics Database.*

RESEARCH

The data management subunit primarily supports biologists and researchers, managing both internal and external data. Despite limited resources, meaningful research is conducted when possible. In 2025, 52 hours (3.7% of total time) were allocated to research.

I. Tableau Server Maintenance, Data Visualization, and Analysis

Since CPW's Aquatic Research Unit was the first unit within CPW to acquire a share on OIT's Tableau Server, the Aquatic Research Data Analyst is responsible for adding new users and amending user roles for all CPW users of the Tableau Network.

A total of 36 hrs. (2.6% overall time) was devoted to developing summary and analytical dashboards and maintaining the aquatic Tableau network. Highlights of some of the work completed include:

- Addition of new users and controlling permission levels to the Tableau Server.
- Created countless new dashboards and insightful data analysis for biologists to access.
- Updates and improvements to the Tableau Reader Biologist workbooks.
- Improvements to the Creel Analysis dashboard.
- Creation of a Colorado Recovery Program river miles dashboard to aid in translation between USFWS river miles and CPW stations.
- Development of new analyses and visualizations for biologists outside of biologist-specific workbooks.

II. Hydroacoustics:

A total of 4.5 hours was devoted to hydroacoustic-related activities in 2025, with efforts focused primarily on database and analytical tool development rather than extensive field operations. Key tasks and highlights include:

- Upload, cleaning, and analysis of 2025 Horsetooth Smelt echo integration analysis.
- Pulling recent target-tracking data for Adam Hansen to work with as he develops R-code for target-tracking analysis.
- Continued centralization of historical hydroacoustic data and development of SQL-based analyses and Tableau dashboards. These tools expedite the annual sonar population estimates, enabling users to examine multiple sonar surveys for a specific waterbody with minimal effort.

III. Research

A total of 10 hours (<1% of overall time) was spent on various research activities. Highlights include:

- Collaborated with Pete Cadmus to consolidate Selenium data and ran initial modeling analysis in R.
- Started writing Shorthead Redhorse Range Expansion paper with Woodling.
- Continued to build out EndNote research and citation library.
- Continued to expand the use of ChatGPT for generating SQL and R code, as well as a tool for reviewing writing.
- Continued expanding an R code library for broader analytical applications.

IV. Thermal Niche Analysis

The Thermal Niche Analysis project has experienced delays due to a lack of time and personnel for deploying and retrieving temperature loggers. Less than two hours were devoted to this category in 2025, which consisted of meetings with Riley Dils (research associate) to discuss the temperature database and water temperature logger placement.

FIELDWORK

In 2025, a total of 93 hours (6.7% of overall time) was spent on fieldwork activities, which include travel and non-hydroacoustic-related fieldwork. This represents a notable reduction in fieldwork time compared to previous years. It should be noted that this estimate slightly overstates fieldwork time, as it includes travel time to meetings and other activities not directly related to fieldwork.

I. Travel:

A total of 52.6 hours (3.8%) were spent traveling in 2025. Travel this year was primarily related to genetic sampling of Speckled Dace on the west slope, Snowflake training sessions in Denver, assisting biologists with various projects, and attending meetings, including the Aquatic Section meeting, the annual AFS meeting, and the annual Coldwater Reservoir Meeting.

II. Fisheries- Related Fieldwork:

Hands-on fieldwork experience remains an important component of the data management program, offering insights into data collection processes and fostering efficiency in data analysis. In 2025, 40 hours (2.9% of total time) were spent assisting other units in the field.

Highlights from the field in 2025 include:

- Assisted Northeast Aquatics with wild spawn take operations for Arctic Grayling and Joe Wright Reservoir, bringing a few of my temporaries with me.
- Worked with Kevin Rogers, Marisa Eley, and Bill Atkinson at the annual pike removal project on Catamount Lake.
- Travelled to John Woodling to the upper Yampa Watershed to collect genetic samples of Speckled Dace from historic sites.
- Met up with Kendall Backich and John Woodling to document presence/absence of Sculpin in heavy metal contaminated sections of the Eagle River.

SPECIAL PROJECTS

This category encompasses activities that involve recurring but non-indeterminate investments of time, which do not fit neatly into any of the other categories. The subcategories involved may change from year to year depending on the current needs of the research unit or the agency.

A total of 353 hours (25.4% overall) was devoted to special projects.

I. Fishes of Colorado:

Entering its ninth year, the project to update and publish a new version of the Fishes of Colorado marked some significant milestones in 2025, with the submission of the first draft to the publisher and the receipt of initial page proofs back from the publisher. A total of 335 hours (24.1% of total hours) were allocated to the book this year, which is more than twice the effort allocated to any other category, reflecting the importance of seeing this project to completion.

II. Professional Association Involvement:

Professional associations remain a vital part of outreach and collaboration. In 2025, 14 hours (1.0% of total time) were spent on related activities. Highlights include:

- Continuing participation in OFWIM committees and supporting the organization as a former Excomm member.
- Managing the Western Division of AFS listserv and overseeing email communications.
- Judging presentations at the joint WDAFS and CO/WY AFS annual meeting in Westminster, CO.

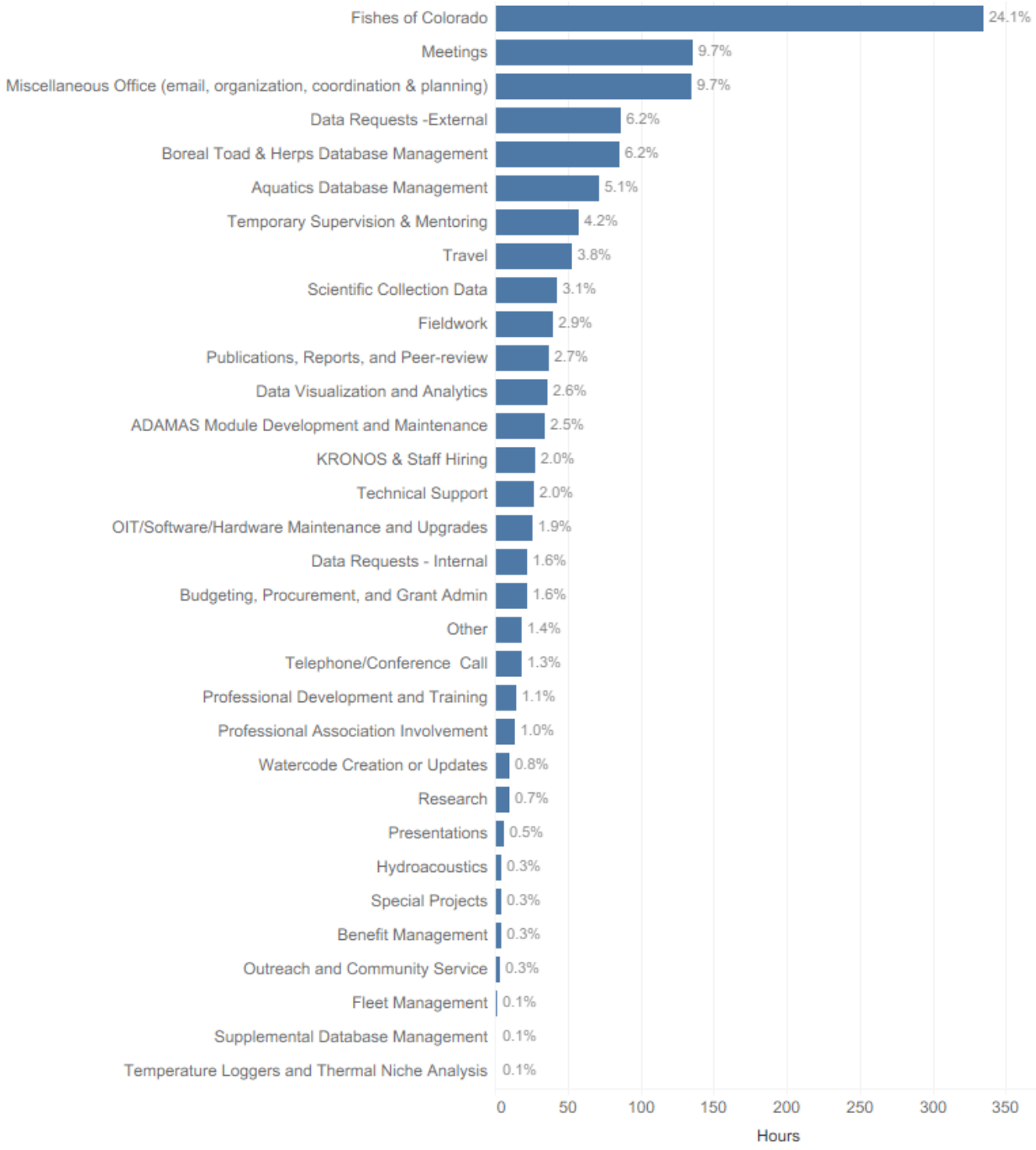
IN THE COMING YEAR

Research and work-related points of interest that are coming up in 2026 include:

- Final revisions and approvals with the publisher to get Fishes of Colorado published.
- Work with OIT as they move through the second RFP process to find a vendor and secure a contract to replace ADAMAS.
- Host a CPW Aquatic Data Analysis Workshop in March to bring all biologists and researchers up-to-speed with the latest and greatest in data analysis in CPW Aquatics.
- Continue mentoring interns and work studies to further promote good data management skills in the current crop of fish and wildlife students.
- Continue work on additional publications with John Woodling, Jesse Lepak, Adam Hansen, Pete Cadmus, and Bill Pate.
- Continued development of the library of Tableau Dashboards available on the network for biologists to use.
- Begin to build out a library of aquatic analysis products utilizing CPW's new R-Shiny server.
- Attending Annual Aquatic Section, Coldwater Reservoir, Boreal Toad Recovery Team, OFWIM, and CO/WY AFS meetings in person.

APPENDICES

Appendix A. Bar graph showing the percentage of FTE time spent on individual subcategories in 2025 (November 1st 2024 – October 31st, 2025).



Appendix B. Bar graph showing the percentage of Temporary time spent on individual subcategories.