STATE OF COLORADO
INTERAGENCY AGREEMENT

COVER PAGE

Paying State Agency Department of Natural Resources Colorado Water Conservation Board, ("CWCB")	**Contract Number** CMS Number: 192721 Encumbrance Number: CTGG1 PDAA 2025*2023
Performing State Agency The Regents of the University of Colorado	**Agreement Performance Beginning Date** The Effective Date
Contract Maximum Amount Entire Contract term for all applicable fiscal years: $295,967.00	**Agreement Expiration Date** July 3, 2029
	Agreement Authority HB-22-1316 Contract is exempt from the procurement code under 24-101-105(1)(a)(II)

Agreement Purpose

This project will study the impact of turf replacement on ambient temperature and water quality in urban settings. The study will support research personnel hours to compare the patterns of urban heat and water quality of runoff resulting from replacing turfgrass with turfgrass alternatives.

Exhibits and Order of Precedence

The following Exhibit(s) and attachment(s) are included with this Agreement:

1. Exhibit A – Statement of Work and Budget.

In the event of a conflict or inconsistency between this Agreement and any Exhibit or attachment, such conflict or inconsistency shall be resolved by reference to the documents in the following order of priority:

1. The provisions of the main body of this Agreement.
2. Exhibit A, Statement of Work and Budget.

Principal Representatives

For the Paying State Agency:

Jackie Daoust
Colorado Water Conservation Board
1313 Sherman St., #718
Denver, CO 80203
jacqueline.daoust@state.co.us

For the Performing State Agency:

Erika Archer
Campus Controllers office
PO Box 910220
Denver, CO 80291-0220
Erika.Archer@colorado.edu

SIGNATURE PAGE

THE PARTIES HERETO HAVE EXECUTED THIS AGREEMENT

Each person signing this Agreement represents and warrants that the signer is duly authorized to execute this Agreement and to bind the Party authorizing such signature.

STATE OF COLORADO
Jared S. Polis, Governor

The Regents of the University of Colorado	Colorado Department of Natural Resources Dan Gibbs, Executive Director Colorado Water Conservation Board
Signature:	Signature: Cole Bedford
Printed Name: Ron Matteson	Printed Name: Cole Bedford
Title: Assistant Director, Grants	Title: Chief Operating Officer, CWCB
Date: July 10, 2024 | 7:54 AM MDT	Date: July 8, 2024 | 10:39 AM MDT

In accordance with §24-30-202, C.R.S., this Agreement is not valid until signed and dated below by the State Controller or an authorized delegate.

STATE CONTROLLER
Robert Jaros, CPA, MBA, JD

Signature: Ion Cotsapas

Printed Name: Ion Cotsapas

Title: DNR Procurement Director

Effective Date: July 10, 2024 | 3:03 PM MDT

1. PARTIES

This Interagency Agreement (this "Agreement") is entered into by and between the Paying Agency, (the "Paying Agency"), and the Performing Agency, (the "Performing Agency") who are named on the Cover Page of this Agreement. The Paying Agency and the Performing Agency may each individually be referred to as a "Party" and collectively as the "Parties." Each Party is an agency of the STATE OF COLORADO, hereinafter called the "State."

2. TERM AND EFFECTIVE DATE

A. Effective Date

This Agreement shall not be valid or enforceable until the Effective Date.

B. Term

The Parties' respective performances under this Agreement shall commence on the Agreement Performance Beginning Date shown on the Cover Page for this Agreement and shall terminate on the Agreement Expiration Date shown on the Cover Page for this Agreement unless sooner terminated or further extended in accordance with the terms of this Agreement.

C. Termination for Convenience

Either Party may terminate this Agreement for convenience by giving the other Party 90 days prior written notice setting forth the date of termination.

3. STATEMENT OF WORK AND BUDGET

A. Work

The Performing Agency shall complete the Work as described in this Agreement and in accordance with the provisions of Exhibit A. The Paying Agency shall have no liability to compensate the Performing Agency for the delivery of any goods or the performance of any services that are not specifically set forth in this Agreement.

B. Goods and Services

The Performing Agency shall procure goods and services necessary to complete its obligations using Agreement funds and shall not increase the maximum amount payable hereunder by the Paying Agency.

4. PAYMENTS TO THE PERFORMING AGENCY

A. Maximum Amount

Payments to the Performing Agency are limited to the unpaid, obligated balance of the Agreement funds. The Paying Agency shall not pay the Performing Agency any amount under this Agreement that exceeds the Agreement Maximum Amount shown on the Cover Page for this Agreement.

B. Payment Procedures

i. The Performing Agency shall initiate payment requests by invoice to the Paying Agency, in a form and manner approved by the Paying Agency. To facilitate Fiscal

Year End closing, final invoices for each Fiscal Year should be submitted to the Paying Agency by July 15th of the following Fiscal Year.

ii. The Paying Agency shall pay each invoice within 30 days following the Paying Agency's receipt of that invoice, so long as the amount invoiced correctly represents work completed by the Performing Agency and previously accepted by the Paying Agency during the term that the invoice covers.

iii. In accordance with the Fiscal Procedures Manual, each Agency shall report the outstanding balance of this Agreement on Exhibit AR_AP at Fiscal Year end.

5. RECORDS, MAINTENANCE AND INSPECTION

A. Maintenance

During the term of this Agreement and for a period terminating upon the later of (i) the six year anniversary of the final payment under this Agreement or (ii) the resolution of any pending Agreement matters (the "Record Retention Period"), each Party shall maintain, and allow inspection and monitoring by the other Party, and any other duly authorized agent of a governmental agency, of a complete file of all records, documents, communications, notes and other written materials, electronic media files, and communications, pertaining in any manner to the work or the delivery of services or goods hereunder.

B. Inspection

The Paying Agency shall have the right to inspect the Performing Agency's performance at all reasonable times and places during the term of this Agreement. The Performing Agency shall permit the Paying Agency, and any other duly authorized agent of a governmental agency having jurisdiction to monitor all activities conducted pursuant to this Agreement, to audit, inspect, examine, excerpt, copy and/or transcribe the Performing Agency's records related to this Agreement during the Record Retention Period to assure compliance with the terms hereof or to evaluate performance hereunder. Monitoring activities controlled by the Paying Agency shall not unduly interfere with the Performing Agency's performance hereunder.

6. CONFIDENTIAL INFORMATION

Each Party shall treat the confidential information of the other Party with the same degree of care and protection it affords to its own confidential information, unless a different standard is set forth in this Agreement. Each Party shall notify the other Party immediately if it receives a request or demand from a third party for records or information of the other Party.

7. DISPUTE RESOLUTION

The failure of a Party to perform its respective obligations in accordance with the provisions of this Agreement is a breach of this Agreement. In the event of disputes concerning performance hereunder or otherwise related to this Agreement, the Parties shall attempt to resolve them at the divisional level. If this fails, disputes shall be referred to senior departmental management staff designated by each Party. If this fails, the executive director of each Party shall meet and attempt resolution. If this fails, the matter shall be submitted in writing by both Parties to the State Controller, whose decision shall be final.

8. NOTICES AND REPRESENTATIVES

Each individual identified as a Principal Representative on the Cover Page for this Agreement shall be the Principal Representative of the designating Party. All notices required or permitted to

be given under this Agreement shall be in writing, and shall be delivered **(A)** by hand with receipt required, **(B)** by certified or registered mail to such Party's Principal Representative at the address set forth on the Cover Page or **(C)** as an email with read receipt requested to the Principal Representative at the email address, if any, set forth on the Cover Page for this Agreement. Either Party may change its Principal Representative by notice submitted in accordance with this section without a formal amendment to this Agreement. Unless otherwise provided in this Agreement, notices shall be effective upon delivery of the written notice.

9. GENERAL PROVISIONS

A. Assignment

The Performing Agency's rights and obligations under this Agreement are personal and may not be transferred or assigned without the prior, written consent of the Paying Agency. Any attempt at assignment or transfer without such consent shall be void. Any assignment or transfer of the Performing Agency's rights and obligations approved by the Paying Agency shall be subject to the provisions of this Agreement.

B. Counterparts

This Agreement may be executed in multiple, identical, original counterparts, each of which shall be deemed to be an original, but all of which, taken together, shall constitute one and the same agreement.

C. Digital Signatures

If any signatory signs this Agreement using a digital signature in accordance with the Colorado State Controller Contract, Grant and Purchase Order Policies regarding the use of digital signatures issued under the State Fiscal Rules, then any agreement or consent to use digital signatures within the electronic system through which that signatory signed shall be incorporated into this Agreement by reference.

D. Third Party Beneficiaries

Except for the Parties' respective successors and assigns, this Agreement does not and is not intended to confer any rights or remedies upon any person or entity other than the Parties. Enforcement of this Agreement and all rights and obligations hereunder are reserved solely to the Parties. Any services or benefits which third parties receive as a result of this Agreement are incidental to this Agreement, and do not create any rights for such third parties.

Exhibit A

Statement Of Work	
Prepared Date:	**5/30/2024**
Name of Grantee:	**The Regents of the University of Colorado**
Name of Water Project:	**Effects of Landscape Transformations on Urban Heat and Water Quality**

Water Project Overview:

Water scarcity and continued urban growth have led water providers in Colorado to move towards larger-scale landscape transformations for replacement of turfgrass. Recognizing the large amount of municipal water that is being used for residential irrigation of turfgrass, the recent Colorado Water Plan calls for transformative landscape change to build the Colorado landscapes of tomorrow. In 2022, the Colorado legislature passed a bill providing $2 million for turfgrass replacement programs, which was distributed to 30+ water utilities in a single year. In 2022, Denver Water also joined a Memorandum of Understanding (MOU) with other Colorado River Basin water providers to reduce non-functional turfgrass by 30% through landscape transformations. Colorado water utilities are expanding their turfgrass replacement rebate programs, and are also applying water budgets, water pricing and land use codes such as turfgrass area restrictions for new development to promote landscape transformation. Landscape transformations are indeed becoming more common across the western U.S. (Figure 1).

Figure 1. Turfgrass replacement programs in the 50 largest municipalities in the southwestern United States. Collected from water provider websites in 2022.

Landscape transformations are by design major changes to the urban environment. Because of environmental linkages, landscape transformations will affect not just water use (as investigated by Resource Central with a recent CWCB grant) but are likely to affect the urban environment's urban heat and water quality.

Urban heat overview

The Denver metropolitan area, and other urban areas, are documented to be hotter than surrounding less-developed areas because of the increased sources of heat and decreased vegetation. This urban heat island effect can lead to negative health impacts and even mortality during heat waves, particularly for vulnerable people. In Denver, and many other cities, urban heat is inequitably distributed – those who are marginalized by race, income, and age are exposed to hotter temperatures in neighborhoods where they live, during their commutes, and at home indoors (Mitchell & Chakraborty, 2015). These urban heat health impacts and associated inequities are already being exacerbated by climate change. Furthermore, if landscapes do not transition away from turfgrass, that turfgrass will need more irrigation in a hotter, drier climate.

Landscape transformations have the potential to change urban temperatures (Saher et al., 2022). An examination of the cash-for-grass program in Las Vegas, Nevada found a ~20% reduction in water use in homes that participated and a minimal (0-3%) increase in energy use, presumed to be due to increased air conditioning use (Baker, 2021). In Sacramento, air temperatures were on average 0.54°F warmer in drought-tolerant yards than conventional yards, with the larger differences found with drought-tolerant yards with hardscape and gravel (Dearborn, 2021). However, the effect of tree cover on cooling yards was found to be larger than the effect of changing ground cover from turfgrass to drought-tolerant landscaping. In Denver as well, tree canopy was found to strongly reduce daytime temperatures (Ibsen et al., 2022).

The effects of urban vegetation on urban heat are not consistent across cities, as the cooling effect of vegetation depends on climate and is stronger in more arid cities (Ibsen et al., 2021). Therefore, to understand how landscape transformations affect urban heat in Colorado, we need information specific to Colorado. It is also important to better understand how different forms of landscape transformation (low water-use plants sometimes called Colorado-scaping, rocks, artificial turf, and different levels of tree cover) affect urban heat in the Colorado environment.

Water quality

The Colorado Department of Public Health and the Environment (CDPHE) is increasing requirements for stormwater MS4 permits and there are more Total Maximum Daily Load (TMDL)-driven requirements for nutrients in general. In Colorado, these requirements are in the Barr-Milton TMDL, the Bear Creek Lake TMDL in progress, and there are basin control regulations in Cherry Creek, Chatfield, Bear Lake, and Dillon reservoirs. These standards are applying pressure to reduce the total phosphorus (TP) and total nitrogen (TN) coming from urban areas. The sources of these nutrients are largely diffuse urban pollution (i.e., predominantly not wastewater treatment plants). And in fact, in Colorado, runoff from *residential* areas have significantly more total phosphorous than other urban land uses (WWE et al., 2013). Contributions from residential turfgrass, and associated fertilizer applications, is an important part of the overall nutrient load to these receiving water bodies. This makes it especially important to understand how the nutrient contributions will change with landscape transformations.

The effects of landscape transformations on water quality are not easy to predict as there are multiple simultaneous changes occurring. The changes to fertilizer application could limit one major source of these nutrients in urban areas. These nutrients are carried to receiving water bodies during storm events, which has led to large-scale changes in stormwater management in Colorado and elsewhere to manage stormwater runoff from small, frequent storms. If the landscape is transformed to one dominated by gravel and hardscape or turfgrass alternatives with weed barriers, then the landscape transformation could lead to an increased amount of runoff generated by storm events (as indicated by Mile High Flood District memorandum (Earles & Hennon, 2023)) and transport of nutrients to streams. Nutrients also are carried to receiving water bodies during dry weather. For example, lawn irrigation return flows make up about half of stream baseflow in the Denver metropolitan area (Fillo et al., 2021). As transformative landscape change occurs in Colorado with less urban irrigation, we expect urban streamflow to decrease during dry-weather periods, returning these streams closer to the intermittent flow systems they were before development. Depending on how the fertilizer application and irrigation are reduced (proportionally to each other, or one more than the other) will in part determine the water quality of urban baseflow. These issues are important to predict as landscape transformation in Colorado ramps up.

Partners

This proposed project is a partnership between the Grantee and these entities:

- Denver Water (Katie Spahr)
- Metro Water Recovery (Perry Holland)
- Mile High Flood District (Holly Piza)

- City and County of Denver (Elizabeth Cohen, Cincere Eades, David Jula, Eric Browning, and Jon Novick)
- Cherry Creek Basin Water Quality Authority (Jane Clary)
- Resource Central (Katie Butler)
- LRE Water (Mark Mitisek, Ryan Gilliom)
- Barr Milton Watershed Association (Erin Sandos)
- Big Dry Creek Watershed Association (Jane Clary)
- City of Boulder (Heather Bearnes-Loza)
- Dominion Water and Sanitation District (Andrea Cole)
- Metro Basin Roundtable (Lisa Darling)
- The Greenway Foundation (Ryan Aids)
- Western Resources Advocates (Laura Belanger)
- USGS (Peter Ibsen)

To ensure that the project is meeting its objectives and serving the needs of the partners the Grantee will plan to hold two half-day stakeholder engagement workshops. The first will be at the beginning of the project, in fall 2024, and the second will be near the end of the project, in 2026. The first workshop will focus on getting feedback on the proposed project plan and make sure that this project is synergy with all other related projects going on in the region. The second workshop will focus on sharing results and initial deliverables, and soliciting feedback about any follow-on components to carry out before the project completion that would make the deliverables more helpful to the participating entities. The entities that have already agreed to participate in this workshop are all of the above as well as:

- City and County of Denver, Department of Transportation and Infrastructure, One Water Program and Division of Green Infrastructure (Jessica Stevens and Colin Bell)
- Metro Water Recovery, Comprehensive Planning (Perry Holland)
- City and County of Denver, Climate Adaptation and Resiliency (Elisabeth Cohen)
- City and County of Denver, Community Planning and Development (Jason Morrison)
- City and County of Denver, Department of Public Health and Environment (Jon Novick)
- City and County of Denver, Parks and Recreation (Cincere Eades)
- Arapahoe County Public Health (Diana Rashash)
- Castle Rock Water (Rick Shultz)

The Grantee will also present the outcomes of this project more broadly through Colorado Water Wise (e.g., webinar and Conservation Symposium), and other venues.

In terms of how this research will be used by stakeholders, we have identified some areas of interest that motivated different stakeholders to write letters of support. Some of these are listed below:

- Prioritize locations for landscape transformations in the context of urban heat implications (Denver Water)
- Fill data gaps identified in Best Management Practices (BMP) effectiveness study to identify structural and non-structural practices to reduce nutrient loading to Cherry Creek Reservoir (Cherry Creek Basin Water Quality Authority).
- Help to quantify how landscape transformations will affect and are affecting water quality of the South Platte and tributaries (Mile High Flood District, Metro Water Recovery, Town of Castle Rock, City and County of Denver, Big Dry Creek Watershed Association)
- Assisting agencies trying to provide guidance on landscape plans and codes and balancing water use and urban heat implications (City and County of Denver, Denver Water)
- Providing guidance on the living plant material and tree canopies that is needed in codes for landscape transformations to Colorado-scapes (Western Resource Advocates, City and County of Denver)
- Understanding the current water quality of the harvested stormwater from Colorado-scapes that could be used for irrigation (LRE Water and Dominion Water and Sanitation District)

The Grantee expects to identify more ways this research will be used by stakeholders in the proposed two half-day stakeholder engagement workshops. These workshops will also serve as education and outreach opportunities. The Grantee will also seek other education and outreach opportunities, for example through giving webinars and presentations at events such as the Colorado Water Wise Symposium, the Colorado Association of Stormwater and Floodplain Managers, and the Cherry Creek Basin Water Quality Authority Annual Conference. Results from the research may also be integrated into on-going public outreach campaigns for landscape transformations at organizations such as Denver Water.

While this research is in progress, the Grantee will store this information on a University of Colorado Microsoft One Drive. Once this research is complete, we will store all the data collected on a publicly-available archival website (such as the CUAHSI HydroShare: https://www.hydroshare.org/). This website allows the sharing of datasets on a permanent URL and DOI (digital object identifier).
We will share summaries of our research findings in these locations to be made available to the public (and collated on Open Science Framework):

1. The outputs from the geospatial tool will be available on an ArcGIS storymap.
2. A recorded webinar (or series of webinars) summarizing the findings available on YouTube.
3. A report submitted to the Colorado Water Conservation Board which is also publicly available and stored on a University of Colorado website.
4. Peer-reviewed journal articles which are open access (e.g., do not require a library subscription to view). The same University of Colorado website noted in (3) will also contain links to the storymap, webinars, report, and journal articles.
5. Denver Water will share links to resources via a Tap article (https://www.denverwater.org/tap?size=n_21_n). Watershed organizations such as Cherry Creek Basin Water Quality Authority, Big Dry Creek Watershed Association and others will also provide links to research on their websites.

Project Objectives:

This project seeks to conduct research on landscape transformations to:

- Objective 1: Quantify the effects of landscape transformations on urban heat in the Denver metropolitan area.
- Objective 2: Quantify the effects of landscape transformations on water quality in the Denver metropolitan area.

Tasks

Task 1: Compare the patterns of urban heat by landscaping patterns and transformations

Description of Task:

Task 1 will address Objective 1 and by using micro-met and remotely-sensed measurements of urban heat in different landscapes in the Denver metropolitan area.

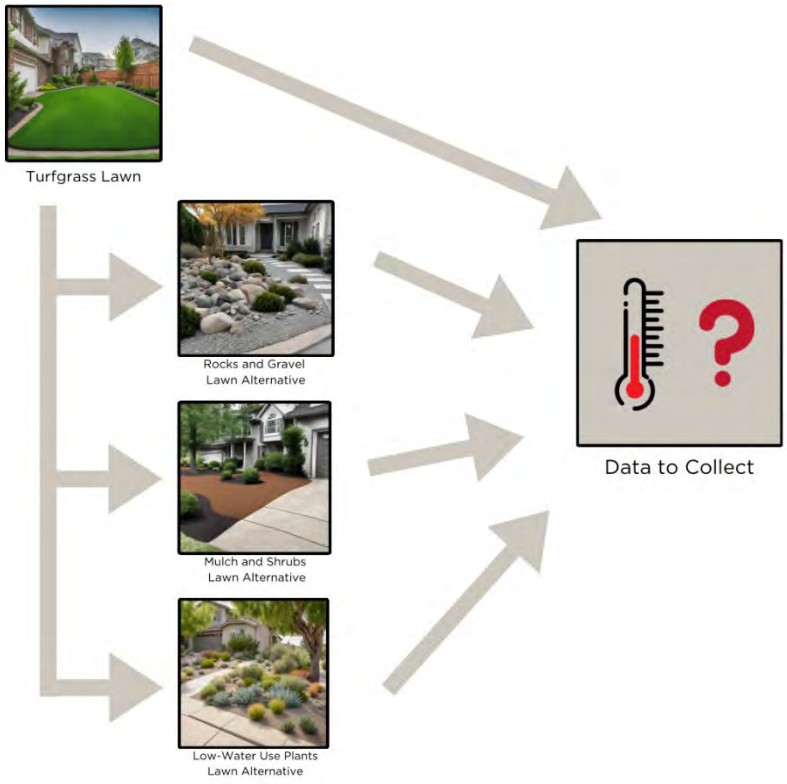


Figure 2. Conceptual figure of Objective 1, which will compare the temperature of turfgrass with turfgrass alternative landscapes.

Method/Procedure:

The Grantee will analyze Denver Water data and existing mapping efforts on landscape transformations to identify households that have changed landscapes and when (see letters of support). Denver Water has identified ~ 2000 households that have used Resource Central's Garden in a Box for their landscape transformations since 2022. The Grantee will also use information from Resource Central to investigate expansion of our study area beyond the Denver Water service area (see letters of support). Using a combination of on-the-ground measurements and remote sensing, we will detect observed changes in urban heat at these locations and transformation time periods. The Grantee plans to use both methods as they complement each other in spatial scale.

For measurements, the Grantee will use microclimate low-cost sensors (Kestrel Heat Stress Tracker) that measure radiant temperature, relative humidity, dry bulb temperature, and wet bulb temperature to best approximate what humans experience as heat stress. The Grantee will deploy these sensors in tripods in landscapes of interest with a team deployment in years 2 and 3. The times of sensor deployment will be on summer afternoons with approximately 15 sensors being deployed at different locations simultaneously to control for general weather conditions in the region. The landscapes that will be used for deployment will span the conditions of interest: turfgrass irrigated at different levels, rock, mulch, shrubs, native grasses, low-water use plant cover, artificial turf, as well as all of the previous with various amounts of tree cover. The Grantee will focus these deployments on institutional settings where we have permission and partnership to collect data (e.g., Denver Water campus and City and County of Denver Parks – see letters of support). The Grantee will also measure temperatures before and after urban development with conventional turfgrass yards in West Stroh Gulch, in Parker, Colorado as this site is a research partnership watershed already (Figure 4). This method was previously deployed in Denver by Peter Ibsen (USGS in Denver and a collaborator on this project).

The Grantee will also use remotely sensed data from Landsat which collects land surface temperature at a 30 m resolution and is freely available from USGS going back decades. Using Landsat, the Grantee will be able to observe surface temperature changes over a much wider array of yards, and target both before and after landscape transformations with their historical data. For this remotely-sensed part of the analysis, the Grantee will expand our study area to incorporate any areas in the region that we know have transformed in landscape, include any Garden in a Box transformations and recently-developed Castle Rock housing that use no turfgrass, as well as the mapped landscape transformations in the Denver Water service area. In all cases, the Grantee will compare the land surface temperature before and after transformation in the location of transformation to a nearby parcel's land surface temperature that did not change in land cover.

Deliverable:

The Grantee will provide CWCB Staff with:

- A summary of the data collected to quantify how urban heat has been observed to change between different types of landscapes and landscape transformations in Colorado.
- A summary of the development of the geospatial tool of Denver that shows the kinds of heat changes seen from turfgrass alternatives and a map of where certain types of alternatives are suggested (e.g., areas that are more vulnerable already to heat would consider just a few types of landscape interventions that don't affect heat compared to current or preferably provide cooling).

Tasks

Task 2 : Compare water quality of runoff from landscapes with turfgrass with those with turfgrass alternatives.

Description of Task:

Task 2 will address Objective 2. Measuring the effects of landscape transformations on water quality can be challenging in an urban environment where there is a patchwork of parcels which are converted to turfgrass alternatives at different times mixed in with those that do not undergo a transformation. Monitoring changes in water quality from watersheds in which only some parcels underwent a landscape transformation may mean that the effects of these transformations are hard to detect. Therefore, the Grantee will focus on watersheds which represent end-member cases. In Colorado, Sterling Ranch represents one of the lowest developments in terms of water use – with 0.17 acre-ft of water used annually per household in 2022. The households in Sterling Ranch (mixed high-density and single family) have a water budget for outdoor use as well as an allotment of turfgrass as well as are selecting from largely low-water use plants as selected by the Denver Botanic Gardens. The expectation is that the water use will lower further to ~ 0.1 acre-ft once the pilot centralized rainwater harvesting program is online. Sterling Ranch therefore is an ideal opportunity to measure the watershed-scale effects of low-water use landscapes on water quality.

In this Task, the Grantee will collect grab samples in a developing watershed with water wise landscaping (Sterling Ranch) and compare to another developing watershed with conventional turfgrass (West Stroh Gulch) as well as previously published values for water quality of urban runoff in Colorado (Figure 4). The sampling in Sterling Ranch is being carried out in partnership with Dominion Water and Sanitation District and LRE Water. These partners have existing precipitation stations and are sharing data about the water management in the area. Furthermore, these partners will be installing streamflow gaging at the outlet of Providence Park in 2023. The Grantee will sample this same stream draining Providence Park (tributary to Sterling Gulch), an area of Sterling Ranch that was built out in 2017 at 397 acres and 50% impervious surface cover (Figure 4). Sterling Ranch ultimately drains to Plum Creek and Chatfield reservoir; thus the runoff from this watershed has direct implications for the nutrient load into those managed receiving water bodies and the effect of landscape transformations on these water bodies.

The Grantee will focus on phosphorus (P) and nitrogen (N) analyses carried out from grab samples of baseflow and stormflow. At Sterling Ranch, the Grantee will collect water samples for Total Phosphorus (TP) and Total Nitrogen (TN) once monthly during the warmest months of the year (May-September, inclusive) for the first two years of the project, with ad hoc sampling during storm events. On each sampling event, the Grantee will additionally sample immediately up- and down-stream of the confluence between Plum Creek and the stream draining Sterling Ranch. These samples will be contrasted with samples from West Stroh

Gulch and will be sampled over the same time period. We will additionally monitor water temperature, conductivity, pH, and dissolved oxygen at each site and sampling event with a multiparameter meter (YSI ProDSS).

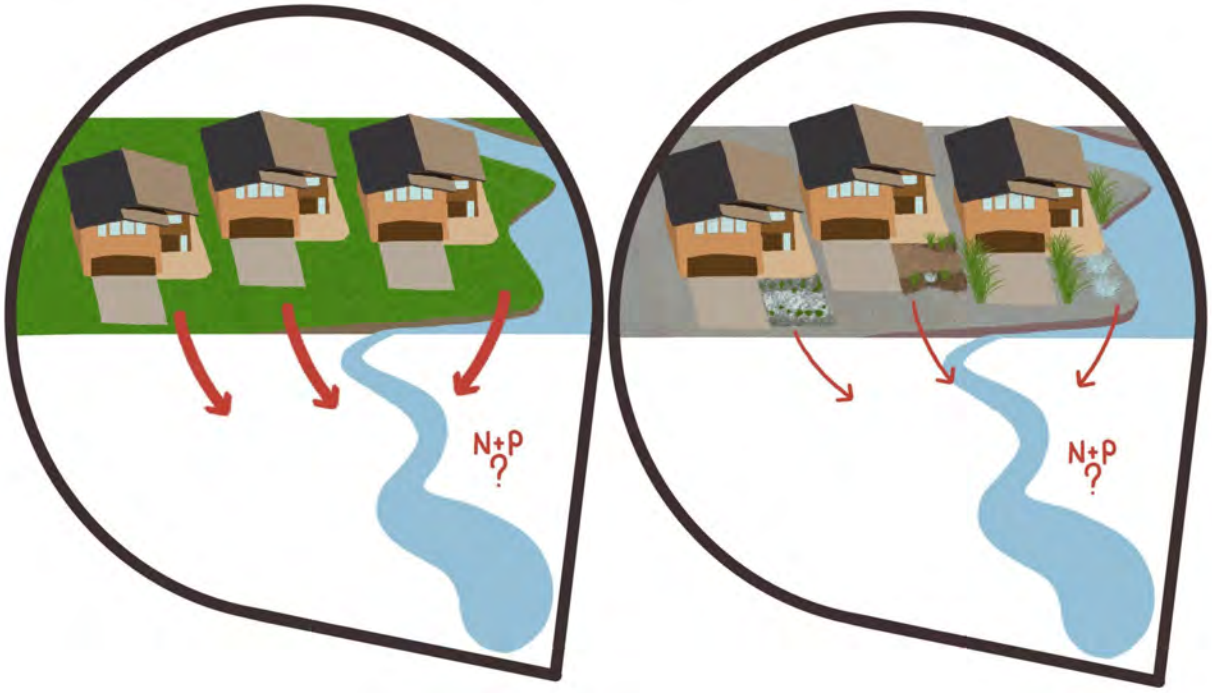


Figure 3. Conceptual figure of Objective 2, comparing nitrogen and phosphorous runoff from conventional turfgrass landscapes (left) with the runoff from turfgrass alternatives (right). In Figure 4, the left example watershed above is the 'conventional turfgrass under development' (West Stroh Gulch in Parker) and the right example watershed is the 'water-wise development' watershed (in Sterling Ranch).

Method/Procedure:

The Grantee will collect samples for N and P analyses using acid-washed HDPE plastic bottles. Samples will be held on ice before being transported back to the limnology lab at University of Colorado Boulder for processing on the same day of sample collection. Unfiltered water samples will be frozen until analysis for total P and total N species. An aliquot of each sample bottle will be filtered through a 0.7 micron Whatman glass fiber filter for dissolved fractions of N and P. The Grantee will analyze total P using the EPA colorimetric Method 365.4 on a spectrophotometer and total N via second derivative spectroscopy following Persulfate Digestion (Standard Methods 4500-N C). Filtrate will be analyzed for nitrate, ammonium, and phosphate on a Thermo Fisher Integrion Ion Chromatograph following EPA Method 300.0 (NO3-, PO4) and ASTM D6919-03 (NH4+).

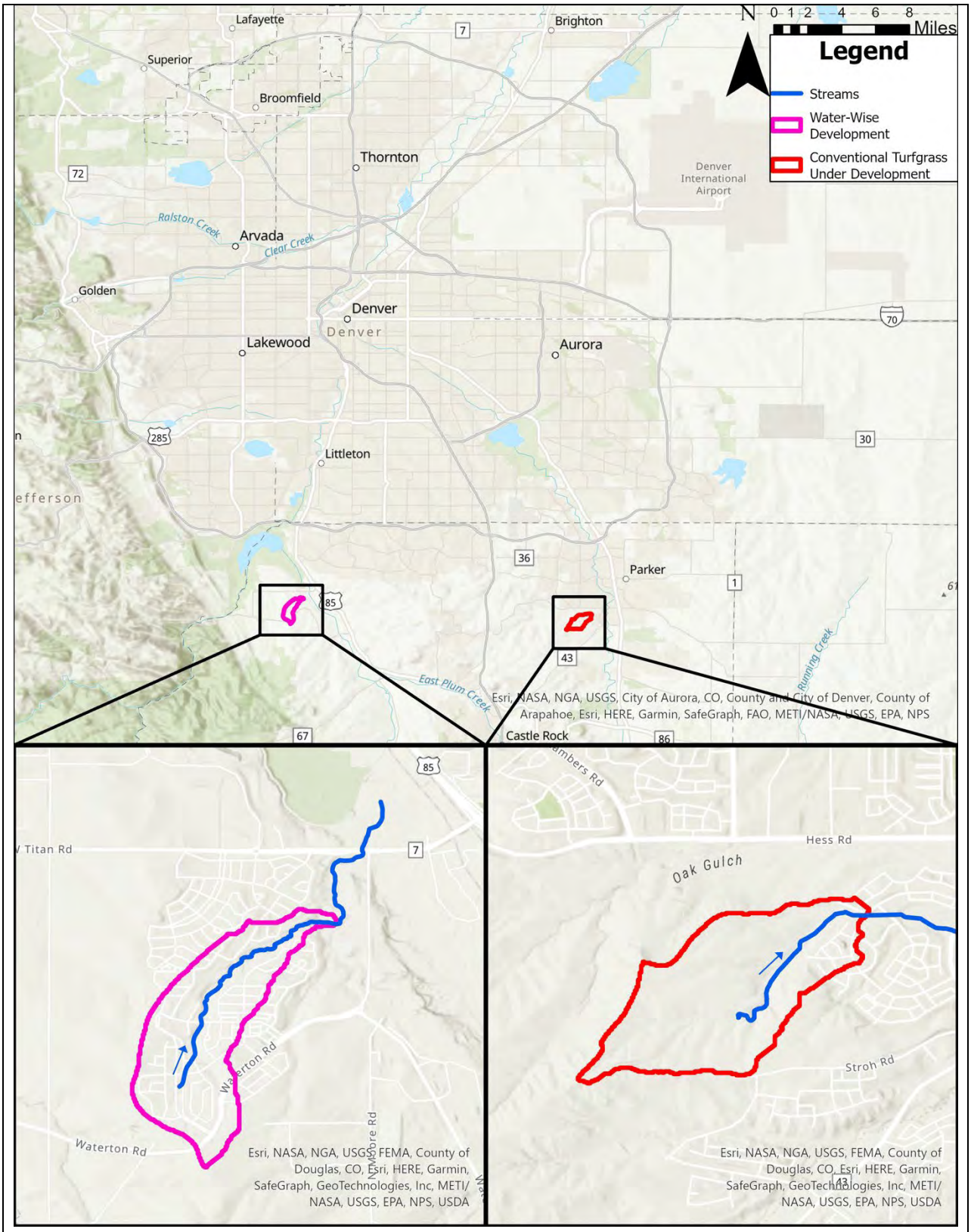


Figure 4. Locations of two study watersheds for runoff measurement.

Deliverable:

The Grantee will provide CWCB Staff with:

- A summary of the analysis of the difference in landscape nutrient export via surface waters in watersheds with and without turfgrass.
- A summary of how this information can be used for developing guidelines for the treatment changes required for rainwater and stormwater harvesting after landscape transformations in Colorado.
- A summary of the recorded webinar on the implications for stormwater capture and use.

Tasks

Task 3: Indirect Costs

Description of Task:

15% of total direct cost.

Method/Procedure:

The Grantee will charge a 15% indirect cost to the total direct cost of the project.

Deliverables:

No Deliverable to CWCB Staff

Budget and Schedule

This Budget and Schedule reflects the tasks identified in the Statement of Work.

Task No.	Task Description	Estimated Task Start Date	Estimated Task End Date	Grant Funding	Match Funding	Total
1	Compare the patterns of urban heat by landscaping patterns and transformations	7/19/2024	7/1/2029	$118,557.43	$60,773.15	$179,330.58
2	Compare water quality of runoff from landscapes with turfgrass with those with turfgrass alternatives	7/19/2024	7/1/2029	$138,805.13	$52,909.31	$191,714.44
3	Indirect Costs	7/19/2024	7/1/2029	$38,604.44	$0.00	$38,604.44
			Total	$295,967.00	$113,682.46	$409,649.46

Reporting Requirements

Progress Reports: The grantee shall provide the CWCB a progress report every six months, beginning from the date of issuance of the grant agreement. The progress report shall describe the status of the tasks identified in the statement of work, including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Report: At completion of the project, the applicant shall provide the CWCB a final report on the applicant's letterhead that:

- Summarizes the project and how the project was completed.
- Describes any obstacles encountered, and how these obstacles were overcome.
- Confirms that all matching commitments have been fulfilled.
- Includes photographs, summaries of meetings and engineering reports/designs.

The CWCB will pay out the last 10% of the budget when the final report is completed to the satisfaction of CWCB staff. Once the final report has been accepted, and final payment has been issued, the grant agreement will be closed without any further payment.

Payment

Payment will be made based on actual expenditures and must include invoices for all work completed. The request for payment must include a description of the work accomplished by task, an estimate of the percent completion for individual tasks and the entire project in relation to the percentage of budget spent, identification of any major issues, and proposed or implemented corrective actions.

Costs incurred prior to the effective date of this grant agreement are not reimbursable. The last 10% of the entire grant will be paid out when the final deliverable has been received. All products, data and information developed as a result of this grant agreement must be provided to the CWCB as part of the project documentation.

Performance Measures

Performance measures for this grant agreement shall include the following:

(a) Performance standards and evaluation: Grantee will produce detailed deliverables for each task as specified. Grantee shall maintain receipts for all project expenses and documentation of the minimum in-kind contributions (if applicable) per the budget. Per grant guidelines, the CWCB will pay out the last 10% of the budget when the final report is completed to the satisfaction of CWCB staff. Once the final report has been accepted, and final payment has been issued, the grant agreement will be closed without any further payment.

(b) Accountability: Per grant guidelines full documentation of project progress must be submitted with each invoice for reimbursement. Grantee must confirm that all grant conditions have been complied with on each invoice. In addition, per Grant Guidelines, progress reports must be submitted at least once every 6 months. A final report must be submitted and approved before final project payment.

(c) Monitoring Requirements: Grantee is responsible for ongoing monitoring of project progress per Exhibit A. Progress shall be detailed in each invoice and in each progress report, as detailed above. Additional inspections or field consultations will be arranged as may be necessary.

(d) Noncompliance Resolution: Payment will be withheld if grantee is not current on all grant conditions. Flagrant disregard for grant conditions will result in a stop work order and cancellation of the grant agreement.

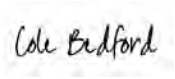
DocuSign

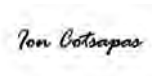
Certificate Of Completion

Envelope Id: 4046F8E76D53456DAF24BA9E2E558B77
Status: Completed
Subject: Complete with Docusign: CMS 192721_CU_Interagency Agreement.pdf
Source Envelope:
Document Pages: 15
Signatures: 3
Envelope Originator:
Certificate Pages: 5
Initials: 0
Dean Johnson
AutoNav: Enabled
dean.johnson@state.co.us
EnvelopeId Stamping: Enabled
IP Address: 24.9.115.167
Time Zone: (UTC-07:00) Mountain Time (US & Canada)

Record Tracking

Status: Original
7/3/2024 1:05:20 PM
Holder: Dean Johnson
dean.johnson@state.co.us
Location: DocuSign
Security Appliance Status: Connected
Pool: FedRamp
Storage Appliance Status: Connected
Pool: DNR
Location: DocuSign

Signer Events	Signature	Timestamp
DNR PRE-REVIEW dnr_edo_reviewcontract@state.co.us DNR Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	**Completed** Using IP Address: 73.3.217.139	Sent: 7/3/2024 1:16:18 PM Viewed: 7/8/2024 10:18:48 AM Signed: 7/8/2024 10:18:52 AM
Cole Bedford cole.bedford@state.co.us Chief Operating Officer, CWCB Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Accepted: 7/8/2024 10:39:06 AM ID: 4111f3b9-5575-4e57-a674-c4c05f0ab761	 Signature Adoption: Pre-selected Style Using IP Address: 97.118.180.243	Sent: 7/8/2024 10:18:53 AM Viewed: 7/8/2024 10:39:06 AM Signed: 7/8/2024 10:39:15 AM
Ron Matteson Ron.Matteson@Colorado.EDU Assistant Director, Grants Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Accepted: 7/8/2024 10:31:56 AM ID: 136952cb-cdfd-4211-a1ee-4a4f49da03a4	 Signature Adoption: Uploaded Signature Image Using IP Address: 172.224.242.83 Signed using mobile	Sent: 7/8/2024 10:18:54 AM Viewed: 7/8/2024 10:31:56 AM Signed: 7/10/2024 7:54:49 AM
Dean Johnson dean.johnson@state.co.us Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	**Completed** Using IP Address: 24.9.115.167	Sent: 7/10/2024 7:54:51 AM Viewed: 7/10/2024 9:11:51 AM Signed: 7/10/2024 9:11:56 AM

Signer Events	Signature	Timestamp
Ion Cotsapas dnr_edo_allcontroller@state.co.us DNR Procurement Director DNR Procurement Director Security Level: Email, Account Authentication (None)	 Signature Adoption: Pre-selected Style Using IP Address: 67.162.159.117	Sent: 7/10/2024 9:11:58 AM Viewed: 7/10/2024 3:03:33 PM Signed: 7/10/2024 3:03:37 PM
Electronic Record and Signature Disclosure: Not Offered via DocuSign		

In Person Signer Events	Signature	Timestamp

Editor Delivery Events	Status	Timestamp

Agent Delivery Events	Status	Timestamp

Intermediary Delivery Events	Status	Timestamp

Certified Delivery Events	Status	Timestamp

Carbon Copy Events	Status	Timestamp
Erika Archer Erika.Archer@colorado.edu Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	COPIED	Sent: 7/10/2024 3:03:39 PM
Jacqueline Daoust jacqueline.daoust@state.co.us Security Level: Email, Account Authentication (None) **Electronic Record and Signature Disclosure:** Not Offered via DocuSign	COPIED	Sent: 7/10/2024 3:03:39 PM Viewed: 7/10/2024 3:18:13 PM

Witness Events	Signature	Timestamp

Notary Events	Signature	Timestamp

Envelope Summary Events	Status	Timestamps
Envelope Sent	Hashed/Encrypted	7/3/2024 1:16:18 PM
Certified Delivered	Security Checked	7/10/2024 3:03:33 PM
Signing Complete	Security Checked	7/10/2024 3:03:37 PM
Completed	Security Checked	7/10/2024 3:03:39 PM

Payment Events	Status	Timestamps

Electronic Record and Signature Disclosure

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