

## COLORADO AIRBORNE SNOW OBSERVATORIES (CASO) EXPANSION PLAN PROJECT

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### EXTENDED ABSTRACT



The Colorado Airborne Snow Observatories (CASO) Expansion Plan project is a state funded effort to develop a plan that communicates the water-management value of Airborne Snow Observatories (ASO) flights and proposes steps towards a statewide ASO program. The project began in April, 2021, and is scheduled to conclude in November, 2021. The planning and organizing team for the project consists of Denver Water, Northern Water, Dolores Water Conservancy District, Lynker, and Airborne Snow Observatories Inc. In addition to the planning team, the project has a stakeholder workgroup with over 100 individual members representing a wide variety of water interests—municipal, environmental, agricultural, recreation, state government, federal government, tribal government, and the academic/research community.

The project was inspired by growing interest in deploying ASO throughout Colorado, along with a realization that many questions need to be addressed in order to develop a consistent, sustainable ASO program in the state. To address those questions, the project is framed around the following objectives:

### PROJECT OBJECTIVES

- Understand the questions and concerns water managers have about ASO
- Prioritize ASO flights over Colorado for optimal coverage of water provider's water sources
- Understand and communicate the value of ASO for water management in Colorado
- Determine the most useful ASO data products and identify ancillary products that can be developed once ASO is flown
- Develop a preferred funding scheme that allows for cost sharing across multiple levels of government
- Create a sustainable flight and funding plan and schedule for ASO to be flown over Colorado each year
- Propose a potential governance structure to organize and coordinate a sustainable ASO program
- Create communication materials to build statewide interest and partnerships
- Develop an implementation plan to set the stage for new flights, funding, and governance beginning in 2022.

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To fulfill these objectives, the project is split into the following tasks, with each task designed to answer the questions listed below the task:

### **TASK 1: BASIN FLIGHT PLANNING & ASO DATA/ANALYSIS**

#### Basin Flight Planning

- Which basins should be flown each year?
- What is the optimal time to do flights?
- How many flights/year/basin are helpful before diminishing returns?

#### ASO Data/Analysis

- What data does ASO provide?
- How can we integrate ASO with other satellite products?
- Can we leverage ASO to build statistical or dynamical models? If so, how?
- Can we use ASO data to build mass balance models coupled with runoff? If so, how?
- How well can you correlate snowpack to yield within the water system? How can we use this information to predict runoff?
- How can we use this info to monitor/track climate metrics? Forest cover, forest density, type of vegetation (work with Forest Service), snow cover, etc.
- What ASO data/output formats are available and what formats are preferred?
- How can surrounding river forecast centers (e.g. Missouri) integrate this information with the snow products they use and inform runoff forecasts?

### **TASK 2: STAKEHOLDER VALUES RESEARCH**

The goal of this task is to gather input from the project's large and diverse stakeholder workgroup to address the following questions:

- What is the value added from ASO to individual agencies and different types of stakeholders? There may be a well-understood benefit that is difficult to quantify
- How have agencies used ASO data to improve their decision-making?
- What is the tipping point (number of users, recommendation by the State, a defined best practice) for when the use of ASO becomes a common practice? How do we most efficiently meet this metric?
- What are the recommended funding and governance structures for a new statewide water management program?

The Project Team will conduct interviews and background research to understand key components of water supply systems and statewide water programs. Inquiries will include but are not limited to:

- How is runoff forecasting done (data sources, applications, decisions that can be made as a result)?
- How might additional information improve operations?
- What ancillary benefits are there for having available ASO data?
- What data formats are used in planning and operations?

### **TASK 3: SUSTAINABLE FUNDING PLAN**

There are two key goals for this task:

- Identify key funding sources at the local, state, and federal levels that may be able to support some sort of cost-share around ASO, both now and in the future.

- Develop a framework that Colorado municipal water providers can use to collaboratively fund ASO now and in the future

The success of this task depends on the estimated cost per flight and optimal number of flights per year, which will be determined from the previous two tasks.

Additionally, the project team will identify other non-paying beneficiaries of ASO and how their needs can be balanced with those of the users that contribute directly to the cost of flights

The funding framework we develop will include these considerations:

- Definition of a “sustainable ASO program”
- What are all the challenges with establishing a sustainable ASO program?
- What are the most consistent/sustainable funding options and details (amount, timing, requirements)?
- How can we expand to include the most stakeholders and make it equitable?
- Can we influence federal funding?
- Leaning on the survey data collected in the previous task, what is the overall cost/benefit? Many operational benefits are difficult to quantify in terms of water savings or cost savings.

#### **TASK 4: SUSTAINABLE GOVERNANCE PLAN**

The project team will develop a final report summarizing all research and findings. This will include specific recommendations for key components of a Colorado ASO initiative, including details on location and timing for future flights, recommendations for expansion of associated data products, a proposed structure for governance, a proposed funding plan, communication materials and an implementation plan.

The review of governance options will attempt to answer these questions:

- What will be the data management/owner structure and governance?
- Should there be a centralized website?
- Who benefits from/has access to the data?... Just people in this project, or all of Colorado? Beyond Colorado?
- How will the CASO program coordinate with other entities, include the Colorado Basin River Forecast Center, California DWR, NRCS, USBR, USGS, and others.
- What areas are we not prioritizing by planning this way? Who might we have missed?
- Does there need to be a primary actor to coordinate funding? If so, who will that be?

The communications materials will help onboard new partners, build broad interest in ASO, and be available in multiple formats (PowerPoints, short papers, maps, etc.). Once the project materials are complete, the project team will present the materials throughout Colorado and work to help establish the CASO program. (KEYWORDS: Airborne Snow Observatory, ASO, water management, stakeholder workgroup, Colorado)

