RESOURCE A

Data governance, portals, and online resources

Introduction

This Resource provides a basic overview of open data principles and practices that may be useful for anyone working directly or indirectly with scientific data in the Delta. The purpose of the Resource is to: 1) provide one possible interpretation of open data and describe a practical approach to the data lifecycle; 2) provide background on the history and evolution of open data in the Sacramento-San Joaquin Delta and Suisun Marsh (collectively referred to herein as Delta; California Water Code § 85058), the San Francisco Bay-Delta (Bay-Delta) system, and the broader San Francisco Estuary; and 3) highlight key guiding documents and online resources that are relevant to the Delta science community.

Research and monitoring generate large amounts of data in the Delta, which are used to deliver management-relevant science to decision-makers (Baerwald et al., 2020). But these data are not always collected or formatted in standardized ways that allow them to be combined with other similar data, or they may be difficult to access or understand (Hale et al., 2015). To increase the efficiency of data use and re-use, the Delta science and management community has moved toward an "open data" framework to facilitate collaboration, ensure transparency, and increase the capacity for data synthesis, all of which can help generate new insights on the system and its management (Baerwald et al., 2020).

What is open data?

The **California Open Data Portal**[1] is a statewide open data portal operated by the Government Operations Agency. According to the California Open Data Portal, open data refers to information that can be freely used, shared, and built upon by anyone, anywhere, for any purpose. Open data must be publicly available in a discoverable data portal without cost or restrictions, stored in a machine-readable and open format such as CSV or JSON, and accompanied by sufficient metadata. Open datasets must also be published and updated promptly to ensure they are usable and relevant. Open data practices align closely with the FAIR principles of data management, which state that data should be Findable, Accessible, Interoperable, and Reusable (Wilkinson et al., 2016).

Ensuring that data is easily discoverable, stored in standard formats, and adequately documented makes it easier for different institutions to collaborate and helps to ensure that research is reproducible and verifiable. It also enables the integration and synthesis of data from multiple sources and across various disciplines to generate new knowledge. Making data accessible to and usable by the public also increases transparency and can help promote innovation and scientific advances. Overall, increased access to more comprehensive, interoperable datasets promotes better and more efficient science-informed decision-making.

Open data is closely related to open science, a broader movement that aims to make all aspects of scientific research – including data, methods, software, publications, and peer review – transparent and accessible. Open science can help make research more accessible and lead to more inclusive, responsive, trusted, and impactful science. It relies on open data to enable collaborative knowledge-building and reproducibility.

The data lifecycle

The data lifecycle is a framework for understanding and describing the various stages through which data passes during its journey from collection to application, encompassing storage, analysis, and other related processes (Delta Stewardship Council, 2019). There are many ways to represent the data lifecycle, but it is important to examine the data lifecycle through the lens of open data. The 2019 Delta Science Plan included a diagram of a data lifecycle (Figure A-1) that is driven by a management need or scientific hypothesis, which helps characterize how the required data can adhere to the principles of open data and open science throughout its journey. The Delta Stewardship Council (Council) and numerous other institutions working within the Delta contribute to various stages of this lifecycle.

As described in the 2019 Delta Science Plan (page 35), the eight stages in the data lifecycle naturally follow one another, but the process is not always linear. The eight stages are:

1. **Plan:** identify the type of data needed and how it will be collected, managed, and made accessible.
2. **Collect:** gather observations and apply checks and inspections to ensure the quality of the data.
3. **Store:** submit data and sufficient metadata to an appropriate long-term archive.
4. **Provide access:** make data accessible to external users for informative purposes, including decision-making and learning.
5. **Analyze:** combine data from disparate sources to form one homogeneous dataset and analyze together.
6. **Transfer knowledge:** communicate results using interactive maps, graphs, dashboards, and so on.
7. **Make decisions:** base management decisions on knowledge gained through data.
8. **Assess data:** ensure that data collection continues to provide relevant information.

1. https://data.ca.gov/

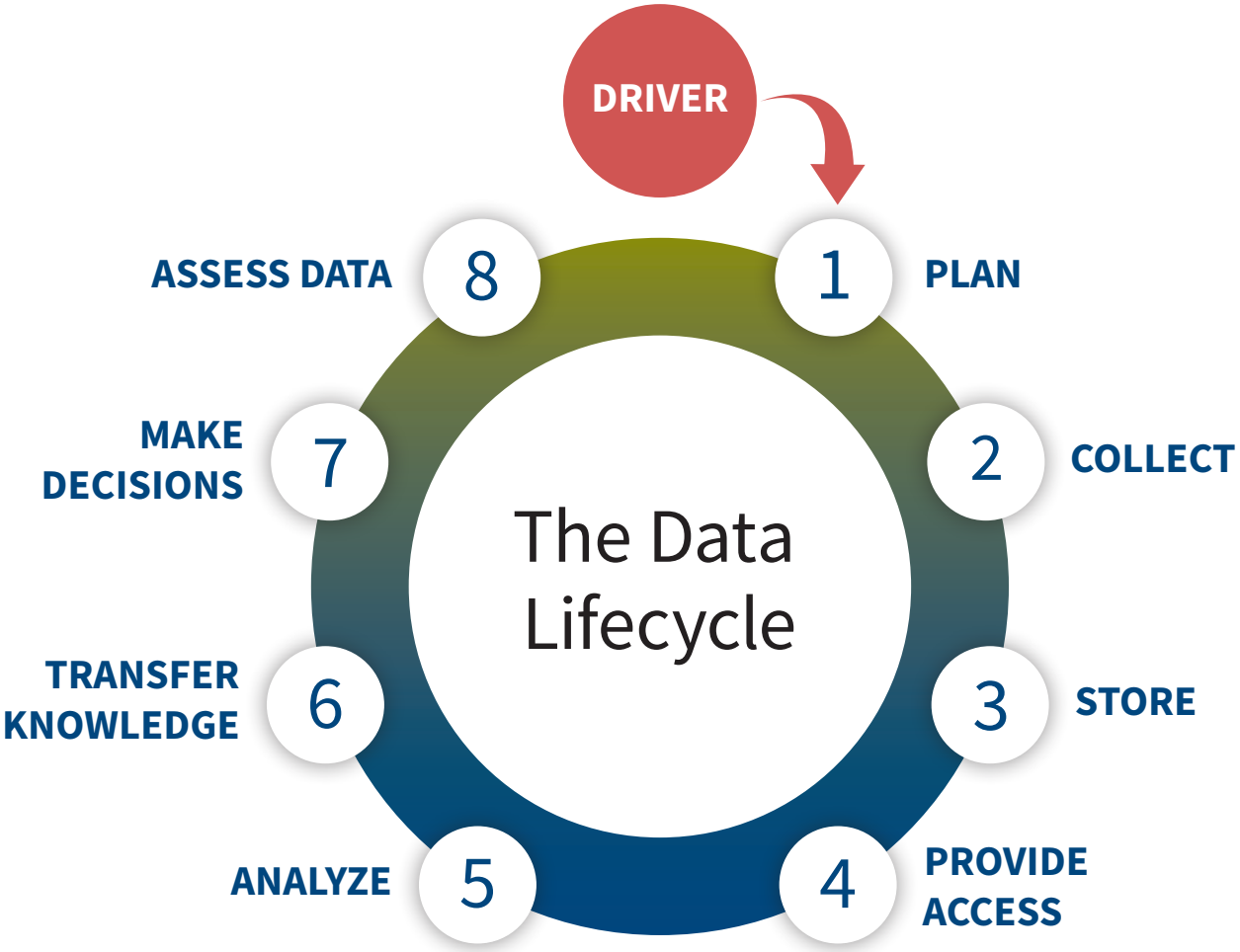

Figure A-1 | Major steps involved the data lifecycle. A management action or a hypothesis drives the data lifecycle. While the eight steps present a natural progression, the process is not always linear, and feedback loops can be important. "The eight steps consist of (1) Plan; (2) Collect; (3) Store; (4) Provide access; (5) Analyze; (6) Knowledge transfer; (7) Make decisions; and (8) Assess data.

Open data and the Delta Stewardship Council: A brief history

In 2014, the Council's Delta Science Program helped to coordinate the Environmental Data Summit, a seminal summit on data sharing and management in the Delta, which was driven by priorities identified in the 2013 Delta Science Plan. This summit led to the publication of the white paper, "Enhancing the Vision for Managing California's Environmental Information" (Hale et al., 2015). Following this effort and others, the California Legislature passed the Open and Transparent Water Data Act (Assembly Bill 1755, Dodd) in 2016. The bill requires the Department of Water Resources, in consultation with the California Water Quality Monitoring Council, the State Water Resources Control Board, and the California Department of Fish and Wildlife, to "create, operate, and maintain a statewide integrated water data platform; and to develop protocols for data sharing, documentation, quality control, public access, and promotion of open source platforms and decision support tools related to water data" (Cantor et al., 2018).

Highlight: Water quality sampling on the Sacramento River.

See Table A-1 for a highlighted selection of key guiding documents and online resources that provide information on open data best practices, protocols, and other relevant resources for the Delta science community.

Table A-1 | Key guiding documents or online resources with information on open data best practices, protocols, or other resources.

TYPE	DESCRIPTION	REFERENCE
Article	Open data framework for the Delta	Baerwald et al. (2020)
Report	California's open and transparent water data act	Cantor et al. (2018)
Report	Environmental Data Summit 2014	Hale et al. (2015)
Article	Findable, accessible, interoperable, reusable (FAIR)	Wilkinson et al. (2016)
Article	Collective benefit, authority to control, responsibility, ethics (CARE)	Carroll et al. (2021)
Article	Tribal data sovereignty in the Delta	Shinbrot et al. (2025)

TYPE	DESCRIPTION	REFERENCE
Website	Interagency Ecological Program (IEP) Data Utilization Working Group	https://iep.ca.gov/Data/Data-Utilization-Working-Group
Website	The Delta Science Program's Delta Synthesis Working Groups with the National Center for Ecological Analysis and Synthesis	https://deltacouncil.ca.gov/delta-science-program/science-synthesis-working-group
Website	Delta Science Tracker	https://sciencetracker.deltacouncil.ca.gov/
Repository	California Open Data Portal	https://data.ca.gov/
Repository	Environmental Data Initiative (EDI)	https://portal.edirepository.org/nis/home.jsp
Repository	ScienceBase Catalog	https://www.sciencebase.gov/catalog/
Repository	Inter-university Consortium for Political and Social Research (OpenICPSR)	https://www.openicpsr.org/openicpsr/
Website	National Science Foundation's (NSF) Preparing Your Data Management and Sharing Plan	https://www.nsf.gov/funding/data-management-plan
Website	AB 1755: Open and Transparent Water Data Platform for California	https://water.ca.gov/ab1755

Suggested citation

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References

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