



Data Quality Standards for Big Rivers Monitoring Protocol for Park Units in the Northern Colorado Plateau Network

Natural Resource Report NPS/NCPN/NRR—2018/1812



ON THE COVER

Yampa River, Dinosaur National Monument. NPS photo.

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Abstract

The report documents the standards used by the Northern Colorado Plateau Network (NCPN) for activities related to the collection, processing, storage, analysis, and publication of monitoring data, as described in its big rivers monitoring protocol. The policies and procedures documented in this document complement the quality-assurance practices for other monitoring activities conducted by the NCPN. This document also serves as a guide for all NCPN personnel who are involved in protocol activities and as a resource for identifying memoranda, publications, and other literature that describe associated techniques and requirements in more detail.

1 Introduction

The purpose of this report is to document the standards used by the Northern Colorado Plateau Network (NCPN) for activities related to the collection, processing, storage, analysis, and publication of monitoring data, as described in its big rivers monitoring protocol (Perkins et al. 2018). The policies and procedures documented in this document complement the quality-assurance practices for other monitoring activities conducted by the NCPN. This document also serves as a guide for all NCPN personnel who are involved in protocol activities and as a resource for identifying memoranda, publications, and other literature that describe associated techniques and requirements in more detail.

1.1 Protocol Overview

Because of the scarcity of water on the Colorado Plateau, the importance of large rivers, and their disproportionately high use by flora and fauna, riparian areas are an ecosystem of concern for the Northern Colorado Plateau Network. Following the determination of network-wide vital signs, parks were asked to select their top priorities for monitoring. Four NCPN park units were selected for big rivers monitoring: Black Canyon of the Gunnison National Park (BLCA), Canyonlands National Park (CANY), Curecanti National Recreation Area (CURE), and Dinosaur National Monument (DINO).

The monitoring protocol consists of a protocol narrative and 18 standard operating procedures (SOPs) for monitoring big rivers in NCPN parks. The overall goal of NCPN big rivers monitoring is to determine long-term trends in hydrologic, geomorphic (channel and floodplain), and vegetation variables in the context of changes in stream flows that can act as large disturbances or re-setting events, and other ecological drivers, stress-

ors, and processes. Specific objectives of the big rivers monitoring protocol are to determine the effects of different flows on vegetation and geomorphic indicators of channel simplification; the environmental flows necessary to maintain active-channel, active-floodplain, and inactive floodplain components of the riparian community; status and trends in geomorphic processes as reflected in channel and floodplain form; status and trends in vegetation patterns, and rates of narrowing and changes in narrowing in response to regulated and unregulated flows using remote imagery.

Objectives for CURE are somewhat different. There, we aim to determine changes in the river channel (encroachment, channel migration, riparian vegetation) over time; regeneration rates for cottonwoods and if cottonwood recruitment is sufficient to maintain cottonwood gallery forests, and the environmental flows necessary to maintain cottonwood gallery forest. Data from these objectives will be integrated to produce models, such as stage-geomorphic process relationships, and correlations, such as vegetation assemblage by geomorphic surface.

1.2 Protocol Activities and Modules

Data are collected or derived as a part of the big rivers protocol (Perkins et al. 2018) in eight different activities, or modules (Table 1).

1.3 Sampling Design

Information regarding the sampling design is provided in Table 2.

2 Data Quality Objectives

Data quality values and standards for implementation are provided in Tables 3–6.

Table 1. Protocol activity matrix for big rivers protocol (Perkins et al. 2018).

#	Activity	Activity type	Description
1	Site establishment	Site establishment	Determine extent of sentinel site and location of transects for vegetation and geomorphic measurements. Determine location of transducers and photo points.
2	Site maintenance	Site establishment	Log damage and replacement, modification, and upgrade history to transducers
3	Vegetation measurements	Field observations	Measurements of 1-m ² vegetation plots
4	Geomorphic measurements	Field observations	Measurements along transects or creation of a geomorphic map using total station or real time kinematic (RTK) survey equipment
5	Transducer measurements	Sensor data	Air and water transducers located at the monitoring site
6	Photo data	Sensor data	Overview, transect, and feature photos
7	Repeat measurement vegetation measurements	Quality control data	Secondary data collection for Activity 3 to determine inter-observer variability
8	Pre- and post-calibration of transducers	Quality control data	Calibration of transducers before and after deployment to test for measurement drift

Table 2. Activity-level sample-design matrix for big rivers protocol (Perkins et al. 2018).

#	Activity	Activity type	Sampling design	Revisit design
1	Site recon and establishment	Site recon and establishment	Targeted; two sample locations and one sample location at BLCA and CURE, respectively (only sites available), 9 sites at DINO and CANY.	Annually for BLCA, DINO, and Yampa River and Seacliff monitoring sites at DINO. Two out of three years for all remaining sites at DINO. Once every 5 years at CURE unless a large disturbance event dictates more frequent sampling.
2	Site maintenance	Site recon and establishment	Transducers above and below monitoring sites with an associated air transducer in the vicinity (<0.5 miles).	Annually
3	Vegetation measurements	Field observations	Systematic along random transects.	Annually for BLCA, DINO, and Yampa River and Seacliff monitoring sites at DINO. Two out of three years for all remaining sites at DINO. Once every 5 years at CURE unless a large disturbance event dictates more frequent sampling.
4	Geomorphic measurements	Field observations	Systematic and at break points and water lines along transects at BLCA, CURE, and CANY. Systematic and at break lines and water lines at DINO.	Annually for BLCA, DINO, and Yampa River and Seacliff monitoring sites at DINO. Two out of three years for all remaining sites at DINO. Once every 5 years at CURE unless a large disturbance event dictates more frequent sampling.
5	Transducer measurements	Sensor data	Transducers placed above and below monitoring sites with an associated air transducer in the vicinity (<0.5 miles). Placed so that they can record the full hydrograph and are protected from damage due to debris and ice.	Annually
6	Photo data	Sensor data	Subjectively placed for overview sites, systematically placed for transect and feature photos.	Annually for BLCA, DINO, and Yampa River and Seacliff monitoring sites at DINO. Two out of three years for all remaining sites at DINO. Once every 5 years at CURE unless a large disturbance event dictates more frequent sampling.
7	Repeat measurement vegetation measurements	Quality control data	Random sample of plots sampled at each site.	Annually
8	Pre- and post-calibration of transducers	Quality control data	All transducers are checked every year.	Annually

Table 3. Data Quality Values (DQVs) for big rivers protocol (Perkins et al. 2018).

#	Data quality value	Data quality value type	Definition	Protocol considerations
1	Accuracy	Intrinsic	Measurements reflect the true value of the parameter being observed. This applies to measures (length, width, position) or classes (species, types, or categories). Includes components of precision and bias.	Transducers are put in a stable location prior to deployment and are then tested once per year to ensure measurement drift does not occur.
2	Representativeness	Intrinsic	Measurements represent conditions at the time of sampling. Combined with accuracy, leads to repeatable data collection.	Sites monitored are sentinel sites and will only be compared to themselves over time.
3	Comparability	Contextual	The degree to which data can be compared among sample locations, data sources, or periods of time.	Sites monitored are sentinel sites (targeted design) and will therefore only be compared to themselves over time. Standard operating procedures, equipment, and calibration procedures are identical among sites at each park.
4	Timeliness / Currency	Contextual	How recent the data need to be to be considered valid for their intended use. Data represents conditions and/or is available and in a format for use at the appropriate time in the decision-making process.	Data are collected annually once per year for vegetation and geomorphic measurements at most sites. Five of the nine sites at DINO are sampled 2 out of 3 years. Transducers are collecting every hour and downloaded annually. Data management is conducted in accordance with SOP #11 (Perkins et al. 2018).
5	Completeness	Contextual	All data/measures required to evaluate accuracy representativeness are present; incomplete data sets (either at a location, across sampling locations, or over time) lose utility or relevance. Data records contain values as planned across the period of record.	Methods, sampling plans, and analyses are designed and implemented such that they result in a complete dataset across space and the planned period of record. However, instrument loss or failures, logistical issues, and safety issues may result in an incomplete record.
6	Consistent Representation	Representational	Use of standard definitions when describing data quality or resource quality based on data	Provisional data are shared but noted that data are not certified. Where appropriate, data are reported against management assessment points.
7	Secure	Data Accessibility	Access to data, products, and systems limited to appropriate audiences.	Protected data may be released in limited cases only with approval by park Superintendent or Chief of Resources following park procedures.

Table 4. Measurement quality objectives for big rivers protocol (Perkins et al. 2018).

#	Measure / Quality indicator	Indicator type	Quality objective
1	Location accuracy	Site establishment	The location of the sentinel sites is not in question, they are large sites with clear directions. Sample locations of the center point of the quadrats should be within +/- 5 cm of plot locations.
2	Location description detail	Site establishment	Description provided with enough detail to relocate without use of GPS equipment
3	Taxonomic resolution	Vegetation quadrat measurements	Identifications made to the species level (see taxonomic standards)
4	Identification accuracy	Vegetation quadrat measurements	95% accuracy
5	Plant height measurement class accuracy	Vegetation quadrat measurements	+/- 0.5m
6	Identification completeness	Vegetation quadrat measurements	95% of observations made to species level
7	Control point accuracy	Geomorphic measurements	Geomorphic measurements should be within +/- 5 cm vertical and +/- 3 cm horizontal.
8	Accuracy	Transducers	All loggers should be +/- 5 cm of each other
9	Image resolution	Photopoints	5 megapixel
10	Image format	Photopoints	JPG w/ embedded metadata

Table 5. Taxonomic standards to be used in the big rivers protocol (Perkins et al. 2018).

#	Activity	Activity type	Standard to be used	Reference/Authority
1	Vegetation transects	Collection and reporting of observational data	Scientific publication	Colorado parks: Weber & Wittman (2001) Utah parks: Welsh and others (2003)

Table 6. Data protection standards for big rivers protocol (Perkins et al. 2018). With the exceptions noted, all data collected are to be made publicly available in a timely fashion.

#	Data type	Data category	Level of protection	Rules for dissemination
1	T&E species locations	Resource data and information	Legally protected	Locations of observations reported at park centroid only.
2	Permanent sampling locations	Location data and information	Operationally protected	Provided upon request only. Shown in reports.
3	Non-NPS staff information	Personally identifiable information	Legally protected	All but first name and last initial redacted from public release.

3 Literature Cited

- Perkins, D. W., M. Scott, G. Auble, M. Wondzell, C. Holmquist-Johnson, E. Wahlig, H. Thomas, and A. Wight. 2018. Big rivers monitoring protocol for park units in the Northern Colorado Plateau Network: Version 1.01. Natural Resource Report NPS/NCPN/NRR—2018/1707. National Park Service, Fort Collins, Colorado.
- Weber, W. A., and R. C. Wittman. 2001. Colorado flora. Louisville, Co.: University Press of Colorado.
- Welsh, S. L., N. Atwood, S. Goodrich, and L. C. Higgins. 2003. A Utah flora. Provo, Ut.: Brigham Young University Press.

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