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Standard Operating Procedure #3: Selecting and Documenting a Water Quality Monitoring Site, Version SCPN_WATER_QUALITY_SOP03_20160901

Contents

1 Selecting a water quality monitoring site 3

 1.1 Water quality monitoring site selection criteria 4

2 Evaluating potential water quality monitoring sites 4

 2.1 Evaluate historic water quality data 4

 2.2 Conducting field reconnaissance to identify potential sites 4

3 Site documentation 5

 3.1 Site folder 5

 3.2 Site description 6

 3.3 Trip reports 6

4 Revision history 10

Standard Operating Procedure #3: Selecting and Documenting a Water Quality Monitoring Site

Version SCPN_Water_Quality_SOP03_20160901				
Revision History Log				
Previous version number	Revision date	Section and paragraph	Change(s) made	Approved by

Only changes in this specific SOP will be logged here. Record the previous version number and date of revision; identify sections and paragraphs where changes were made, who approved the revision, and the new version number. More detailed descriptions of the changes made and the reason for the changes is provided at the end of this SOP.

This Standard Operating Procedure (SOP) provides guidance for selecting and documenting SCPN water quality monitoring sites. Included here are criteria used to select monitoring sites, guidelines for developing a representative sampling technique for the site, and instructions for site documentation.

The content in this SOP has been modified from Wilde et al. (1998).

1 Selecting a water quality monitoring site

The purpose of the SCPN water quality monitoring program is to collect water quality data from streams and springs that accurately represent the condition of the water resource. This is done by sampling at sites and during times that are spatially and temporally representative of flow and the concentration of analytes. This involves carefully selecting the monitoring site and collecting samples in a repeatable and representative manner. Often, the best location at

a monitoring site for collecting water quality samples will be different than the best location for measuring discharge. However, water quality measurements, sample collection, and discharge measurements should be made as close together along a stream or at a spring as possible. The most appropriate location for measurements and sampling should be selected at the time of the sampling. Keep in mind that the location of the monitoring site may shift from site visit to site visit due to varying streamflow or changing channel conditions. For every sampling event, site and flow conditions should be thoroughly documented.

The following guidelines are intended to assist field personnel in selecting appropriate water quality monitoring sites. These guidelines are written broadly so they will be applicable to a variety of types of flowing waters. For this reason the guidelines can be followed verbatim, or they can be used with professional judgment to streamline the site selection process. Additional guidelines for

selection of SCPN spring monitoring sites can be found in Spring Ecosystem Monitoring Protocol for the Southern Colorado Plateau Network (in preparation, Monroe and others).

1.1 Water quality monitoring site selection criteria

SCPN water quality monitoring sites are selected based on information described in Sections 2.1 and 2.2. Sites with the following characteristics are prioritized for monitoring.

- 303(d) listed waters - where previous sampling indicates one or more parameters regularly approach or exceed established state water quality standards or recommended levels.
- Waters with demonstrated threat levels – where an analysis of existing data indicate that measured conditions regularly approach or exceed standards or recommended levels, but where the frequency of exceedances, or the quality of the database do not support a 303(d) listing.
- Pristine waters – where there is no direct impact of human activities (provide baseline data)
- Ecological significance – presence of unique species or species of concern
- Waters of management concern – where past sampling may not indicate constituent values of concern, but where anthropogenic activities indicate that contamination is a significant threat.
- Historic data – waters identified as important for which substantial historic water quality data is available.
- Data gaps – waters identified as important, but where little or no water quality information exists.
- Site characteristics suitable for consistent collection of water quality samples and discharge measurements.

Ideally, a water quality monitoring site should

- be one for which there is historic water

quality data

- be close to an established monitoring site where other SCPN monitoring data are collected (such as an aquatic macroinvertebrate monitoring site)
- be close to an existing streamflow gaging station
- have relatively safe access

2 Evaluating potential water quality monitoring sites

Once potential monitoring sites have been selected based on these criteria, each site should be further evaluated as described below.

2.1 Evaluate historic water quality data

Obtain all available water quality data for the stream or spring and evaluate for compliance with federal or state regulatory standards.

- Obtain data from the SCPN water quality database.
- Obtain historical data if available.
- Check with other sources, such as park staff or state and federal agencies, to determine if additional water quality data are available.
- Obtain current federal or state regulatory water quality standards.
- Document presence of known water quality concerns or exceedances.

2.2 Conducting field reconnaissance to identify potential sites

To ensure that sites selected and data collected will meet the objectives of the monitoring effort, the field crew should review the protocol narrative and consider the types of measurements and samples needed. Particular attention should be given to recognizing the purpose for which the various types of data will be collected and the aqueous system that each sample should represent.

During base flow conditions, hike at least 1 mile upstream and downstream from the proposed monitoring site. Carry a GPS unit, map, digital camera and field note book.

2.2.1 Establishing a new monitoring site

In establishing a monitoring site it is important to consider and note the following:

- Whether major tributaries are present. Monitoring sites should be located at a sufficient distance downstream from tributaries to allow mixing to occur (SOP #5). Note proximity to streamflow gaging station. If proximal then it may be possible to use data from the station for continuous flow measurements.
- Variability in flow throughout the year. This may affect site accessibility or the locations of any equipment.
- Whether springs are present and whether the reach is gaining or losing flow.
- The locations of any diversions or flow retention structures.
- Nearby land use activities that may affect the stream
- The potential for vegetation encroachment and any other factors that might cause the site to be moved to a different location at a future time.
- Potential sources of contamination at the site.

2.2.2 Determining specific water quality sampling locations

Record observations describing the following characteristics of potential water quality sampling and discharge measurement locations. For more information about selecting a location for water sampling and discharge measurements, refer to SOP #5, Section 3.3.1, and SOP #6, Section 2.

- Water quality sampling and flow measurement
 - Observe and record presence or absence of surface flow.
 - Note uniformity of flow, and whether flow is unidirectional.
 - Does the channel bottom have a stable contour?

- How well is flow mixed?
- Are locations present where water quality samples can be collected and discharge measured at varying stages?
- Suitability for instrumentation
 - Look for locations where staff gages, recording stage gages, temperature sensors, and water quality sondes could be installed.
- Access
 - Consider site access, including driving and hiking distances.
 - Consider how site access would vary under differing weather conditions (e.g. heat, wet, snow...)

3 Site documentation

All SCPN water resources monitoring sites must be thoroughly documented in the site folder. Site folders contain all the information about a monitoring site and the surrounding watershed, as well as information needed to plan and complete successful data collection trips, including access and contact information. Detailed trip reports are to be completed following each site visit and will document the work being conducted at the site.

3.1 Site folder

Site documentation should include information that is pertinent to all vital signs being monitored at that site, and should include, but are not limited to the following items:

- **Published data.** Bibliography with all relevant published papers (literature and NPS reports) specific to the watershed or park should be housed in the site folder.
- **Site descriptions.** Provides all information relevant to field work done at the sampling location, see Section 3.2.
- **GIS data.** Summary of GIS data available describing the site (e.g. aerial photos, geologic maps, and soils maps).

- **Other relevant data.** This includes a summary of data available from other sources, such as data from streamflow gages and weather stations
- **Summary of historic water quality data.** Provide the range in water quality data observed over the life of the monitoring site and when the maxima and minima occurred.
- **Channel control information.** Give a complete description of channel characteristics that control the water elevation at different stages of flow. Include descriptions of vegetation.
- **Discharge measurements.** Describe techniques used to measure discharge at low, medium and high stages. Also indicate where discharge measurements are made at these stages if they are not all made at the same location. How is discharge measurement made when ice is present?
- **Assessment of streamflow gage adequacy, accuracy, and representativeness.** Is this gage located close to the sampling site, and are there considerations that should be taken into account when using this gage to estimate flow at the sampling site? How accurate are the records? Have some been estimated? Is the gage considered representative of the sampling location?
- **Drainage area.** Record the drainage area and describe how the number was obtained.
- **Floods.** When the maximum flow was recorded and what the stage height was then?
- **Winter flow.** Does the channel stay open during winter?
- site access- road log and trail description
- contacts- names and phone numbers of park contacts and local landowners (where relevant)
- land ownership- list the land ownership along the land that must be crossed to reach the site.
- safety & communications- names and phone numbers for emergency contacts, local first responders, hospitals, and search and rescue teams. This section should also describe in detail all back-country procedures for the park.
- camping- brief description of camping/housing available on site as well as the park contacts used to arrange accommodations.
- sampling locations- UTM's and elevations for all sample sites
- maps- park-specific topographic maps or TOPO generated maps depicting the sampling sites.
- site photos- photos showing sample site and locations of data loggers
- sampling design- describe how often data is collected at the site and what types of data are collected
- instrumentation- descriptions of water quality instrumentation installed at the site and date it was installed
- reference and benchmarks- Provide a complete description of nearby benchmarks, reference marks, and other control points, including their coordinates, elevation and location in reference to the sampling site.
- shipping information- location and hours of nearest shipping location.

3.2 Site description

The site description is a working set of documents that contain all the information needed to sample at field sites, and should be taken along on each sampling trip.

Site descriptions should include:

3.3 Trip reports

The hydrologic technician must write a trip report following each site visit (Figure 3-1). Trip reports should include detailed notes describing all work completed during the sampling event. Completed trip reports for all SCPN Vital Signs monitoring should be stored in a single location on the SCPN com-

mon drive and organized by calendar year.

Trip reports should include the following:

- park name
- scpn vital sign(s) monitored on trip
- crew members
- purpose of trip
- stream name, site name, and site code
- travel information including date and time of departure and return, mode of travel, travel route, and lodging
- general observations/unique and noteworthy events
- any discrepancies that may affect the data
- photos (file names/location)
- data files (file names/location)
- brief summary of trip accomplishments
- detailed day by day activity summary
- person report written by
- date report written
- materials or actions needed next site visit

SCPN Water Resources Trip Report		
Park(s):		Vital signs:
Crew members:		
Purpose of trip:		
Stream/spring names:		
Site names:		
Date of departure:		Time of departure:
Date of return:		Time of return:
Mode of travel (boat, car...)		
Lodging (List each day separately)		
Type of accomodation (e.g. camping, hotel)	State	County
General observations/unique and noteworthy events:		
Any discrepancies that may affect the data:		
Photos (file names/locations)		
Data files (file names/locations)		
<i>Note: NAU employees must fill out and submit an Exhibit J form providing details of their travel to their NAU supervisor.</i>		

Figure 3-1a. SCPN Water Resources Trip Report, page 1.

SCPN Water Resources Trip Report (p.2)
Brief summary of trip accomplishments:
Detailed day-by-day activity summary:
Materials or actions needed for next site visit:
Report written by:
Date of report:

Figure 3-1b. SCPN Water Resources Trip Report, page 2.

4 Revision history

Provide the following information for each revision made to SOP #3.

New version:

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Date:

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Sections affected:

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