

North Cascades National Park Service Complex

Culvert Inventory Using Survey123 for ArcGIS and ArcGIS Online: Culvert Field Survey Guide



Purpose

To address the lack of a spatially-based comprehensive culvert inventory in North Cascades National Park Service Complex. During the North Cascadia Adaptation Partnership, culvert inventorying and design improvement was identified as a climate adaptation strategy as climate change impacts peak flows. The limited spatial information on culverts at NOCA in FMSS prevents accurate conversion of culvert data into a GIS layer for analysis. This guide provides instructions and definitions to citizen scientists and park staff on the usage of Survey123 and ArcGIS Online to survey culverts remotely in the field.

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Introduction

A culvert is any structure not classified as a bridge that provides an opening under a roadway or trail at a stream or drainage crossing. A culvert is typically defined by one of the following:

- A structure that is usually designed hydraulically to take advantage of submergence to increase hydraulic capacity.
- A structure used to convey surface runoff through embankments.
- A structure, as distinguished from bridges, that is usually covered with embankment and is composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert.

Culverts are used primarily to convey water through embankments or other type of flow obstructions. They are also used as a passage for pedestrians, stock, wildlife, and fish, as well as for land access and to carry utilities.

As flood extremes magnify with climate change, culverts are at an increased risk of inundation and failure, impacting stream function, aquatic organism passage, and park transportation infrastructure for staff and visitors. Existing Global Climate Models (GCMs) meteorological data has been utilized as inputs into the Variable Infiltration Capacity (VIC) macroscale hydrological model by University of Washington researchers to estimate future peak flows in the NOCA region. With a geospatial database of culverts, researchers and park staff will be able to overlay these hydrologic models with culvert point location data to determine which culverts are most at risk under projected flood extremes. This will be a crucial tool for transportation infrastructure management as we continue to weigh the impacts of changing temperatures.

This project utilizes the mobile application Survey123 for ArcGIS in tandem with the cloud-based mapping system ArcGIS Online, enabling us to create an online culvert database that can be accessed and downloaded by NPS employees through the ArcGIS Online portal. Given that NOCA comprises at least 75 road miles and 389 trail miles, relying solely upon staff to survey the park's hundreds of culverts would be a costly and time-consuming process. With a mobile app, we empower volunteers to submit culvert data easily, and minimize the training and equipment necessary. In crowdsourcing the data, we have the opportunity to survey culverts more rapidly while also engaging and educating volunteers on the implications of climate change in our local parks.

Our aim is to develop a comprehensive georeferenced inventory of culverts with help from volunteers. Volunteers will work alongside NPS employees with park-furnished iPads or data sheets and measuring tools to gather details on culverts and the surrounding environment.

Safety

The primary hazards associated with surveying culverts are easily mitigated with preparation, cautious actions, and awareness. Volunteers must take care to assess each situation on a site-by-site basis, identify potential safety hazards, and determine whether their capabilities will place them at risk.

The foremost safety measure is adequate preparation. This includes using proper tools and techniques. Volunteers should ensure that they are ready with all needed instruments prior to the survey and seek proper training on the usage of these tools. This guide will detail proper use procedures of the instruments that may be used during a survey. Reach out to project supervisors and other experienced volunteers with any further questions or equipment training requests.

Proper safety equipment may include but is not limited to: first aid kit, bright/reflective vest, nonslip footwear, flashlight, radio, hard hat, safety glasses, and gloves. Plan accordingly based on the characteristics of the survey site, weather, and time.

Working on culverts, volunteers will be working on or near roadways and trails. If the culvert is on a road, select a safe parking location and set up signs or flaggers if visibility is low. Assess traffic on the road, and be aware that traffic may be moving faster than expected. When measuring the culvert, find points of safe entry and exit between the road or trail and the crossing stream. Do not rely on sound alone to check if traffic is approaching – have good sight distance.

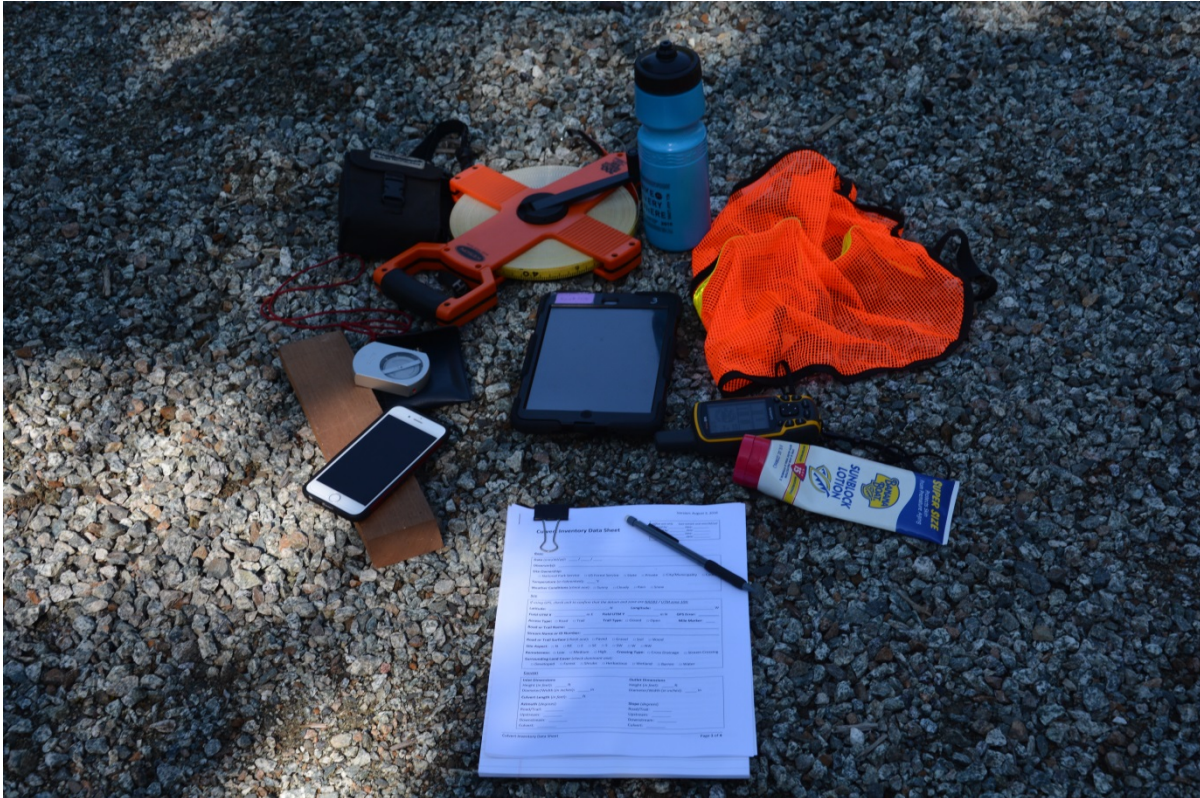
Insecure footing can be a major safety hazard in and around streams. As volunteers approach a culvert, they must evaluate the depth and speed of the flow. In most scenarios, it is not necessary to enter the stream or culvert to acquire the needed measurements. Wetted rocks and streambeds are particularly slippery, and volunteers should not wade into a stream unless they are confident it is safe.

Make sure to wear proper attire. Plan ahead based on weather forecasts, and elect for closed-toed, nonslip footwear. Apply sunscreen and bring enough water for a full day.

Never put survey completion ahead of safety. Should conditions be unfavorable to acquire exact measurements, find creative opportunities to estimate or extrapolate values, or move on to the next survey site.

Equipment List and Usage

There are two methods for recording and submitting data: (1) Survey123 app on cell phone or tablet, or (2) physical data sheet to be filled out by hand and entered into database manually. Aside from the data entry instruments (cell phone or data sheet and pencil), the equipment needed will be the same regardless of survey method chosen.



All surveyors will need:

- Measuring tape
- Clinometer
- GPS
- Compass
- Safety and personal items
 - Water
 - Safety vest
 - Sunscreen
 - First aid kit

Cell phones can serve as a GPS and compass. A separate GPS unit and compass are still suggested to adjust the location and azimuth readings determined by the phone as necessary for accuracy.

Measuring Tape

Depending on where volunteers are planning on surveying, culvert size varies. Make sure to bring measuring tape large enough to span culvert height, diameter, and length (minimum of 50 feet suggested for road surveying, and 25 feet suggested for trail surveying). Measure the inside of the culvert (opening start to end), not including the width of the culvert pipe itself.

Clinometer

Individual makes of clinometers may vary, but in general, the numbers on the left are in degrees and the numbers on the right are in percent. Clinometers rely on both eyes – one looking into the clinometer, and the other looking at a reference point used to measure slope. First, determine or estimate eye level height. Then, look through the clinometer and sight the top of the slope. Fixate on an object or person on top of that slope that is the same height as eye-level. Read the left side, degrees. This is the slope at that point in reference to the observation point.

GPS

GPS makes vary – refer to manufacturer instructions. Be able to navigate to coordinate information on GPS, either in UTM's or latitude and longitude.

Compass

Hold the compass horizontally with the arrow pointing away from the body. The cursor line or arrow will indicate what direction the azimuth is bearing.

Safety and Personal Items

Water, sunscreen, and proper attire are crucial for a comfortable survey day. Wear a bright or reflective safety vest to stand out to the public, and always carry a stocked first aid kit for use in the event of injury. See Safety section for more details.

Culvert Inventory Data Sheet

Office use only (use initials and mm/dd/yy)

Entered by: _____ date: _____

Updated by: _____ date: _____

Verified by: _____ date: _____

Certified by: _____ date: _____

BASIC

Date (mm/dd/yy): ____ / ____ / ____

Observer(s): _____

Site Ownership:

☐ National Park Service ☐ US Forest Service ☐ State ☐ Private ☐ City/Municipality ☐ County

Temperature (in Fahrenheit): ____ °F

Weather Conditions (check one): ☐ Sunny ☐ Cloudy ☐ Rain ☐ Snow

SITE

If using GPS, check unit to confirm that the datum and zone are NAD83 / UTM zone 10N.

Latitude: _____ N Longitude: _____ W

Field UTM X _____ m E Field UTM Y _____ m N GPS Error: _____

Access Type: ☐ Road ☐ Trail Road/Trail Type: ☐ Closed ☐ Open Mile Marker: _____

Road or Trail Name: _____

Stream Name or ID Number: _____

Road or Trail Surface (check one): ☐ Paved ☐ Gravel ☐ Soil ☐ Wood

Site Aspect (facing downstream): ☐ N ☐ NE ☐ E ☐ SE ☐ S ☐ SW ☐ W ☐ NW

Remoteness: ☐ Low ☐ Medium ☐ High Crossing Type: ☐ Cross Drainage ☐ Stream Crossing

Surrounding Land Cover Upstream (check dominant one):

☐ Developed ☐ Forest ☐ Shrubs ☐ Herbaceous ☐ Wetland ☐ Barren ☐ Water

CULVERT

Inlet Dimensions

Height (in feet): _____ ft

Diameter/Width (in inches): _____ in

Culvert Length (in feet): _____ ft

Azimuth (degrees)

Road/Trail (upstream to the right): _____

Upstream (facing downstream): _____

Downstream (facing downstream): _____

Culvert (facing downstream): _____

Outlet Dimensions

Height (in feet): _____ ft

Diameter/Width (in inches): _____ in

Slope (degrees)

Road/Trail (centered near culvert): _____

Upstream (beyond inlet): _____

Downstream (beyond outlet): _____

Culvert: _____

Inlet Treatment:

- ☐ Apron
- ☐ Channel Native
- ☐ Channel Riprap
- ☐ Depressed
- ☐ Grated
- ☐ Headwall Historical
- ☐ Tapered
- ☐ Wing Wall
- ☐ None
- ☐ Other *(describe in comments)*

Culvert Material:

- ☐ Clay
- ☐ Galvanized Steel
- ☐ Native Stone
- ☐ Plastic
- ☐ Reinforced Concrete
- ☐ Wood
- ☐ Other *(describe in comments)*

Traversable Inlet Treatment: ☐ Yes ☐ No

Internal Structures *(Baffles, weirs, etc. If yes, describe in comments):* ☐ Yes ☐ No

Inlet Condition: ☐ Submerged ☐ Partially Submerged ☐ Not Submerged

Outlet Condition: ☐ Submerged ☐ Partially Submerged ☐ Not Submerged

Culvert Condition:

Structure *(check all that apply)*

- ☐ Entrance dented
- ☐ Bottom worn through
- ☐ Bottom rusted through
- ☐ Top broke through
- ☐ Fill around culvert eroding

Overall

☐ Poor ☐ Fair ☐ Good ☐ New

Culvert Comments *(Include details if 'other' was checked as a response above):*

Outlet Treatment:

- ☐ Apron
- ☐ Channel Native
- ☐ Channel Riprap
- ☐ Flared
- ☐ Headwall Historical
- ☐ Headwall Only
- ☐ Mitered
- ☐ Projecting (Perched)
- ☐ Wing Wall
- ☐ None
- ☐ Other *(describe in comments)*

Culvert Shape:

- ☐ Arch
- ☐ Box
- ☐ Oval
- ☐ Round
- ☐ Other *(describe in comments)*

Traversable Outlet Treatment: ☐ Yes ☐ No

Function *(check all that apply)*

- ☐ Debris plugging inlet
- ☐ Debris in culvert
- ☐ Water flowing under culvert

STREAM

Water Flow: ☐ Yes ☐ No

Sediment Bars: ☐ None ☐ Upstream ☐ Downstream ☐ Within the Culvert

Culvert Crossing Span:

☐ Severe Constriction ☐ Mild Constriction ☐ Spans Bank to Bank ☐ Spans Channel and Banks

Scour Pool Downstream:

☐ None ☐ Small (Wider/Deeper than Natural Stream) ☐ Large (Width/Depth 2X Natural Stream)

Does the observed substrate in the culvert match the stream?

☐ Yes (Comparable) ☐ No (Coarser) ☐ No (Finer) ☐ No Substrate in Culvert

Does the water depth in the culvert match the stream?

☐ Yes (Comparable) ☐ No (Deeper) ☐ No (Shallower) ☐ Culvert is Dry

Does the water velocity in the culvert match the stream?

☐ Yes (Comparable) ☐ No (Slower) ☐ No (Faster) ☐ Culvert is Dry

Does the culvert slope match the stream?

☐ Yes (Comparable) ☐ No (Flatter) ☐ No (Steeper)

AQUATIC ORGANISMS

Fish or Amphibians Observed? ☐ Yes ☐ No

Barrier to Aquatic Organism Passage: ☐ Severe ☐ Moderate ☐ Minor ☐ None

Aquatic Organisms Comments *(Include details about organisms seen and the causes of the barrier):*

PHOTOS

File Name/Photo ID	Description
	Road at culvert, upstream to the right
	Culvert inlet
	Upstream of culvert
	Culvert outlet
	Downstream of culvert

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

The fields collected in the data sheet are identical to the fields and values in the Survey123 questionnaire.

Field Descriptions and Definitions

Basic

Date – Date of observation.

Observer(s) – First initial and last name of observers. Separate each name by commas. (E.g. JSmith, ARodgers, RWilson)

Ownership – The holder of jurisdiction or owner of the property. Choose from:

- National Park Service
- US Forest Service
- State
- Private
- City/Municipality
- County

Temperature – Temperature during observation in Fahrenheit.

Weather Conditions – General weather conditions during observation. Choose from:

- Sunny: Few clouds, very bright.
- Cloudy: Overcast, darker.
- Rain: Measurable rainfall.
- Snow: Measurable snowfall.

Site

Latitude/Longitude/UTM/GPS Error – Depending on the GPS unit used, fill out the relevant fields to the best of your ability. These fields are replaced by an interactive location services-based map on the Survey123 app.

Access Type – Is the culvert on a road or trail?

Trail Type – Is the trail/road closed or open?

Mile Marker – What is the nearest mile marker? What is the distance from the culvert to the nearest mile marker? (E.g. Mile Marker 22 + 35 ft)

Road or Trail Name – Name of the road or trail the culvert is located on.

Stream Name or ID Number – Name or ID number of the stream that the culvert is located on.

Road or Trail Surface – The type of surface the road or trail is made of. Choose from:

- Paved: Concrete, blacktop, asphalt.
- Gravel: Loose gravel or sand.
- Soil: Dirt or organic matter.
- Wood: Wooden pathway.

Site Aspect – The cardinal or ordinal direction the slope faces.

Remoteness – How isolated or remote the trail/road is. Using best judgment, choose from:

- Low: Within 2 mi of major highway or road. Used often by visitors/employees.
- Medium: Within 5 mi of major highway or road.
- High: Located greater than 5 mi from major highway or road. Backcountry.

Crossing Type – Does the pathway cross a stream or drainage?

Surrounding Land Cover – The dominant type of land cover in the site area. Choose from:

Developed: Built structures, constructed materials.

Forest: Woody vegetation, taller tree cover.

Shrubs: Low-lying plants; woody vegetation with aerial stems.

Herbaceous: Herbaceous vegetation, dominated by grasses and forbs.

Wetland: Soil or substrate periodically saturated or covered with water.

Barren: Bare rock, gravel, sand, or other material with little to no vegetation.

Water: Water or permanent ice/snow cover.

Culvert

Inlet/Outlet Dimensions – Measure the inside of the culvert, not including width of the culvert structure itself. For height, measure from culvert floor to the tallest point of the culvert. For diameter/width, measure across the widest section of the culvert. Pay attention to units – height in feet, diameter/width in inches. Note that dimensions are typically standard, and that inlet and outlet should be the same unless one side is damaged.

Culvert Length – The length of the culvert from inlet to outlet in feet.

Azimuth – The compass bearing relative to geographic north. Holding the compass horizontally, observe the azimuth in degrees on the road or trail with the upstream segment of the stream on your right hand side. Azimuth observations for upstream, downstream, and the culvert itself should be done facing downstream to standardize measurements.

Slope – Use clinometer procedures outlined in Equipment List and Usage section to measure the slope upstream and downstream, as well as the culvert slope.

Inlet Treatment – Type of inlet treatments applied to culvert. Select all that apply:

Apron: Extension of floor beyond culvert inlet. A smooth (generally concrete) surface that is placed between the culvert and channel.

Channel Native: Use of native sediment or substrate in and around inlet.

Channel Riprap: Use of riprap (loose stone) in and around inlet.

Depressed: An inlet is depressed when the invert (bottom of the culvert) is buried below the stream bed, thus allowing the barrel to be partially filled during the time of installation with natural streambed material or riprap.

Grated: A framework of parallel or crossed bars in front of the inlet meant to prevent entrance of debris.

Headwall Historical: A historical wall built at top and sides of the inlet to secure adjacent soil.

Tapered: A transitional taper from an enlarged face section into the actual culvert barrel.

Outlet Treatment – Type of outlet treatments applied to culvert. Select all that apply:

Apron: Extension of floor beyond culvert outlet. A smooth (generally concrete) surface that is placed between the culvert and channel.

Channel Native: Use of native sediment or substrate in and around outlet.

Channel Riprap: Use of riprap (loose stone) in and around outlet.

Flared: The outlet walls flare out, widening the opening to increase effective culvert capacity.

Headwall Historical: A historical wall built at top and sides of the outlet to secure adjacent soil.

Headwall Only: Wall built at tops and sides of outlet (non-historic).

Mitered: The face of the culvert outlet is cut to conform to the embankment slope.

Projecting (Perched): The culvert outlet extends beyond the embankment slope or above the natural streambed floor.

Wing Wall: A flaring vertical wall on either side of the outlet.



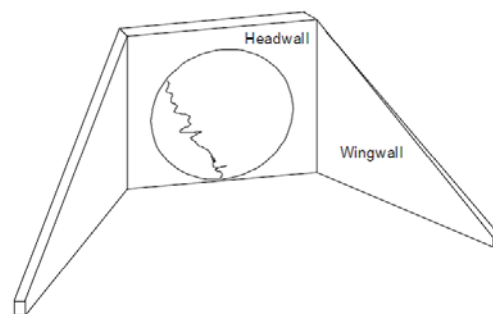
Flared



Depressed



Mitered



Headwall and Wing Wall



Apron



Projecting (Perched)

Culvert Material – The composition of the culvert. Choose from:

- Clay
- Galvanized Steel
- Native Stone
- Plastic
- Reinforced Concrete
- Wood

Culvert Shape – The shape of the culvert. Choose from:



Arch: no floor



Box: rectangular



Oval: width greater than height



Round: circular, consistent diameter

Traversable Inlet/Outlet Treatment – Are the inlet/outlet openings are grated or shielded in any way, making it traversable for vehicles? Could a vehicle move over the culvert area safely if it were to veer off-road?

Internal Structures – Are there any internal structures in the culvert such as baffles or weirs that may help slow flow velocity or aid fish passage?



Baffles inside culvert

Inlet/Outlet Condition – Is the inlet/outlet submerged in water? If not submerged, stream is dry.

Culvert Condition – Check any of the structural conditions that apply (dented entrance, bottom worn or rusted, top broken, fill eroding) as well as functional conditions (debris plugging flow, water flowing under culvert). Use the structural and functional conditions to determine overall condition.

Culvert Comments – Detail any additional observations not captured in above fields. Provide information if “Other” was selected for any culvert questions.

Water

Water Flow – Is the water flowing through the culvert? Water in the channel must be moving (even if slowly); puddled areas separated by dry segments do not constitute flow.

Sediment Bars – Ridge of sediment, usually sand or gravel, deposited in the middle or along banks of a stream. Formed by deposition when stream’s discharge or velocity decreases.

Stream will deposit heavier boulders first and small particles last. Choose from:

- None
- Upstream
- Downstream
- Within the Culvert

Crossing Span – Consider the average conditions in the natural stream channel outside of the crossing itself. Bankfull width is where water would just fill the stream channel and additional water would overflow into the floodplain. Choose from:

Severe Constriction: The crossing is half as wide, or narrower, than the bankfull width of the natural stream.

Mild Constriction: The crossing is narrower than bankfull width but not enough to qualify as severe.

Spans Bank to Bank: The crossing spans the bankfull width of the channel, but does not include streambanks.

Spans Channel and Banks: The crossing spans the bankfull width and one or more of the banks with sufficient room to allow dry passage for some wildlife.

Scour Pool Downstream – Pools can be created downstream as a result of high flows exiting the culvert. Use natural pools occurring in a part of the stream outside of the crossing area to compare to the potential scour pool. Choose from:

None

Small (Wider/Deeper than Natural Stream Pool)

Large (Width/Depth 2X Natural Stream Pool)

Substrate Match – Does observed substrate in the culvert match the stream? Choose from:

Yes (Comparable)

No (Coarser)

No (Finer)

No Substrate in Culvert

Water Depth Match – Does the water depth in the culvert match the stream? Choose from:

Yes (Comparable)

No (Deeper)

No (Shallower)

Culvert is Dry

Water Velocity Match – Does the water velocity in the culvert match the stream? Choose from:

Yes (Comparable)

No (Slower)

No (Faster)

Culvert is Dry

Slope Match – Does the culvert slope match the stream? (Refer back to slope measurements for certainty). Choose from:

Yes (Comparable)

No (Flatter)

No (Steeper)

Aquatic Organisms

Fish/Amphibians Observed – Are there fish or amphibians in the stream crossing area?

Barrier to Aquatic Organisms Passage – Does the culvert/embankment act as a physical barrier to fish or other aquatic life passage? Even if aquatic organisms are not present, would the crossing area block passage if they were?

Severe: Passage would not be possible with current crossing.

Moderate: Passage would be substantially difficult, but plausible.

Minor: Passage is only inconvenienced; baffles, tapering, or other structural choices serve to reduce flow velocity and support fish resting.

Aquatic Life Comments – Detail any additional observations not captured in above fields.

Provide information if organisms were observed or if the crossing is a barrier.

Photos

File Name/Photo ID – Name/file path of photo.

Description – Brief description of what is pictured.

Five photos are required:

- (1) Road at culvert, upstream to the right
- (2) Inlet
- (3) Upstream of culvert
- (4) Outlet
- (5) Downstream of culvert

Additional Notes or Comments

Include any final details that were not expressed in the above fields.

Guidelines

Answer all questions to the best of your ability. If assumptions or guesses are made, note in comments. Leave fields blank if you cannot measure them – it is not necessary to fill out all fields to submit data.

Using Survey123

GIS-industry leader ESRI has created a mobile application, Survey123 for ArcGIS, to replace paper-based data collection with a digital solution that is usable offline in remote areas. After downloading the app on a mobile phone or tablet, the user is able to download surveys that store in the device's local memory, and can access the survey regardless of internet or cellular connectivity. The user can fill out as many surveys as desired, and all survey inputs will be stored on the phone until connectivity is regained. Once the device is connected to the internet again, the survey results will sync with a cloud-based geodatabase that collects survey results from all users.

Downloading the App

Survey123 for ArcGIS is available for download free through the iOS App Store, Google Play for Android, and Microsoft Windows App Store. The app is compatible with mobile phones and tablets. Links to download can be found here: <http://doc.arcgis.com/en/survey123/download/>. Searching "Survey123" on the device's app store will lead to the app as well.

Setting Up the App for Surveying

Once the app is downloaded, launch the app on the device. The first screen will prompt the user to sign in. Click the "Sign In" button, and a new page will appear with space to enter username and password. If you are a volunteer and have a personal ESRI or ArcGIS account, *do not* login. The account must be an organizational account associated with NPS to access the survey. An NPS employee will log into all park-furnished iPads or mobile devices that are to be used for this project. If you are an NPS employee, use your NPS-organization affiliated ArcGIS Online account login.

After completing the sign in process, a new window will appear titled "Download Surveys." Here, the "NOCA Culvert Inventory" survey will be an option for download if it is the first time this device is being used for surveying. Press the blue cloud with the green arrow to download the survey to the device.

As soon as the download is complete, the device is ready to administer the downloaded survey offline.

Surveying Using Survey123

After the survey has been downloaded to the phone or tablet, it will always appear under the "My Surveys" page in the app.

To start filling out the form, tap on the survey and on the next screen, select "Start collecting data." This will load the survey and all affiliated questions. Fill out all questions in accordance with the guidelines from the previous section, Field Descriptions and Definitions.

Important note: if you plan on using the phone's internal GPS, you can take advantage of Survey123's position averaging system. To do this for the site location field, tap and hold down the circle icon  until the device begins averaging. The app will tell you how many positions it

has averaged. A recommended minimum is 30 positions averaged, although position should be averaged to achieve a margin of error below ± 10 meters which may require more averaging depending on location. To stop averaging, tap the same circle icon. Tapping the icon again after averaging will delete the original averaged location and capture a new geoint.

Once all the data is collected, tap the white and green checkmark in the bottom-right corner of the screen. If the survey is being conducted remotely with no internet connectivity, the following will pop up: "Survey Completed. Your device is offline. The survey has been saved in the outbox." If the device is online, you have the option to send the results in immediately (suggested), or save for submittal later.

Submitting Surveys Collected Offline

If you collected one or more surveys while offline, the results must be sent in later. Once your device is reconnected to internet outside of the field or in office, reopen the Survey123 app. Click the same survey, and a new tab called "Outbox" will be present below the "Collect" option. Select "Outbox" and tap "Send Surveys." This will send all survey data collected offline to the database.

Using the Data Sheet and GeoForm

When planning on recording data by hand with the data sheet, bring many copies of the forms. Each culvert surveyed requires its own data packet. Leave the upper right-hand corner of the first page blank for office use. Pencil with eraser is preferred.

GeoForm Data Entry

To submit data into the same geodatabase as the Survey123 app users, a web application called GeoForm will be used. This is also courtesy of ESRI, and links directly to the cloud-based map and geodatabase in ArcGIS Online.

Once in office, use a computer to navigate to <http://arcg.is/2bV4bJY>. An online form version of the data sheet will appear. Transpose the collected data from the data sheet into the form, and submit. Pay special attention to the format your collected GPS coordinates are in versus the format the GeoForm shows them in. Convert degrees, minutes, and seconds into decimal degrees or vice versa as needed using the conversion factor or online tools as found here: <https://www.fcc.gov/media/radio/dms-decimal>. An individual form must be submitted for each survey.

Additional Resources

For more information on Survey123 for ArcGIS, visit:

- <https://doc.arcgis.com/en/survey123/desktop/get-answers/faggetanswers.htm>
- <https://doc.arcgis.com/en/survey123/desktop/get-answers/quickreferencegetanswers.htm>

For more information on aquatic organism passage through culverts, visit:

- <http://www.stream.fs.fed.us/fishxing/>
- <https://www.wsdot.wa.gov/Projects/FishPassage/>

For more information on climate change and the National Park Service, visit:

- <https://www.nps.gov/subjects/climatechange/index.htm>