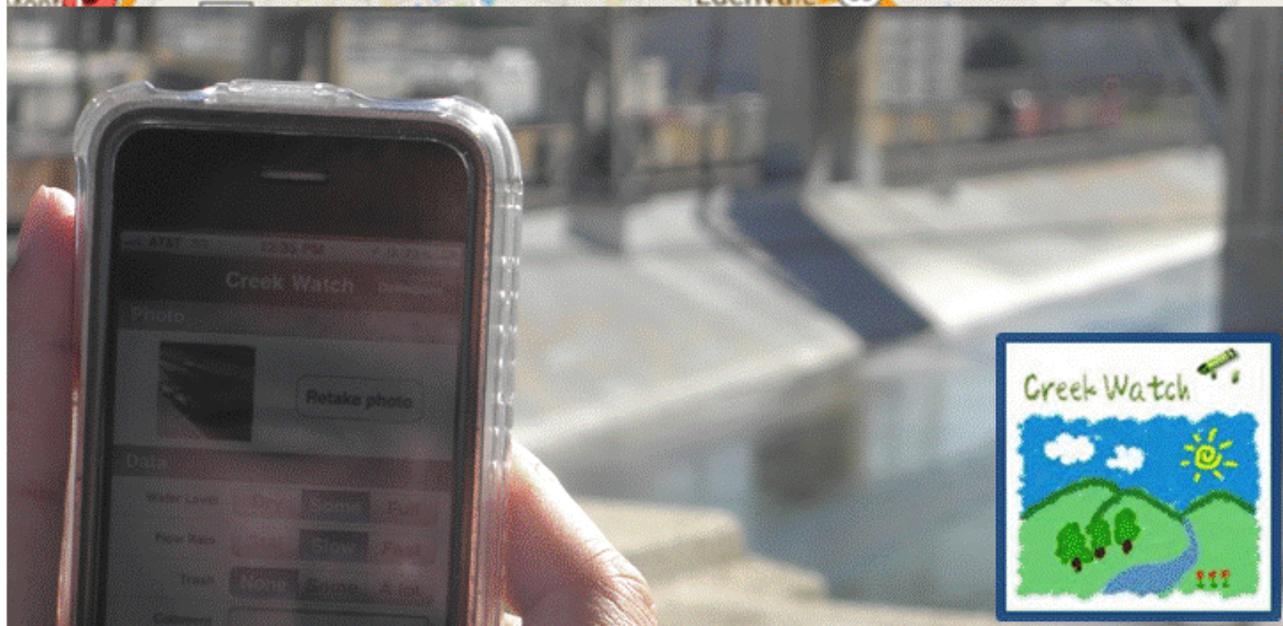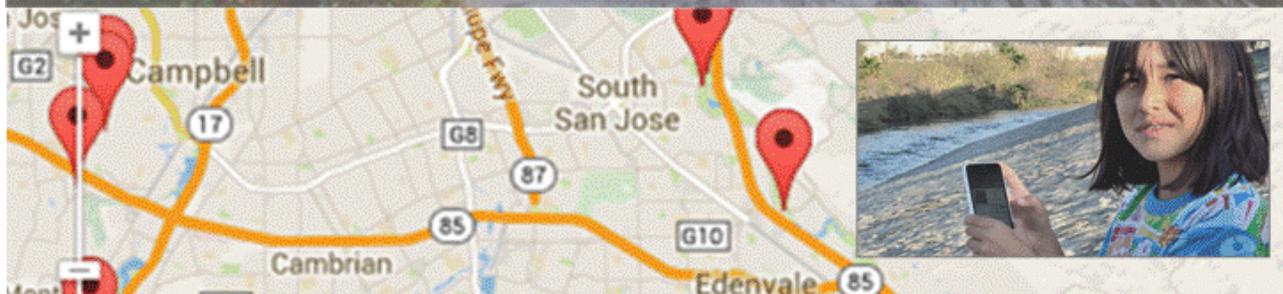# ENVIRONMENTAL MONITORING USER MANUAL FOR THE CREEK WATCH APP

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State Water Resources Control Board

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Creek Watch

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ENVIRONMENTAL MONITORING USER MANUAL FOR THE CREEK WATCH APP

Water is one of our most precious resources. Everyone should learn about their water resources and their many benefits. Water monitoring by *citizen science* programs help build community awareness of water quantity issues, pollution problems, and help identify and restore problem sites. Public participation in scientific research helps people become advocates for their watersheds and increases the amount of needed water quality information available on our waters. Among the uses of this data are characterizing watersheds, screening for water quality problems, and measuring baseline conditions and trends.

Across the country, people are contributing to science and helping to care for our streams and rivers. Some are trained volunteers conducting in-depth monitoring of their local streams, lakes, estuaries and wetlands. Others are engaged as citizen scientists via crowdsourcing.

Creek Watch, an iPhone application by IBM, enables any iPhone/iPad user that spends time near rivers and streams to quickly upload water quality data. Whether you're spending the whole day at the river or are quickly passing by a stream, spend a few minutes using the Creek Watch application to snap a picture and report how much water and trash you see. The data will be aggregated and shared with watershed groups, scientists, and water control boards to help track pollution, manage water resources and plan watershed education programs. Use the app yourself to answer watershed level questions and build a baseline dataset of your stream or river. Baseline datasets, quantities of data that serve as a basis for comparison for data acquired at a later date, can allow us to document changes from normal or historic conditions.

The Creek Watch App collects "6 pieces of data":
1.   The amount of water: empty, some, or full.
2.   The rate of flow: still, moving slowly, or moving fast.
3.   The amount of trash: none, some (a few pieces), or a lot (10 or more pieces).
4.   A photo of the waterway.
5.   Geo-tags & timestamps data from items 1-4

By creating environmental monitoring questions that can be answered using these basic pieces of information (and other data submitted via notes) you can leverage the power of Creek Watch to build a monitoring project or program.

Here are seven ways to use the app to answer environmental questions and document changes in your watershed:

1)   Wet/dry mapping (amount of water)

Capture a "snap-shot" of surface flows to better understand the hydrologic system. Wet/dry mapping provides a low-cost, river-wide comprehensive overview of ephemeral or intermittent river and stream systems. Annual mapping allows comparisons to determine year- to- year variability.

Suggested Monitoring Approaches:

- Walk along the stream and use Creek Watch at regular intervals.
- Walk along the drying stream and use Creek Watch to document dry stretches and also where surface water is still flowing or is ponded.
- Use Creek Watch at the same location weekly or monthly over the course of a year to document seasonal or perennial changes in flow and water depth.

2)   Surface flow diversions (amount of water and flow rate)

Worried about intensive ground water pumping? Is a water user within your community diverting surface water? Keeping track of the amount of water and flow rate can identify surface water diversions (authorized and unauthorized) or intensive ground water pumping.

3)   Nuisance flows (water wasted through urban runoff)

Some creeks flow only seasonally and dry-up during dry summers or under drought conditions. However overland flows from land, such as those caused by actions like washing cars in driveways or streets and over watering lawns and landscaping, may flow down stormwater channels and into creeks and streams. These nuisance flows are unnatural and may carry pollutants, both of which can harm the natural environment. These flows also waste one of our most precious resources.

Questions to consider:

- Is the flow and water depth increasing despite the absence of rain runoff or snow melt?
- When examining data collected along a creek are you experiencing increased flows from tributaries that are normally dry or have little to no flow?

4)   Where to concentrate river clean-up efforts (amount of trash and photos)

Are you a community-group, school-group or passionate citizen looking to conduct a river or stream clean-up? Use the Creek Watch website to scan images and trash reports of local waterways that may be in need of your help to clean it up and prevent trash accumulations!

Basic approaches:

- Review Creek Watch data from your area and identify locations with high levels of trash and then conduct a stream or creek clean-up event. See Section C: Extracting data from the Creek Watch website.
- After conducting a stream or creek clean-up use Creek Watch to establish a baseline of zero trash. Prior to conducting another stream or creek clean-up event use Creek Watch to measure trash conditions. This will allow you to get a sense of how trash may accumulate at that location over time.

5)   Where to send water monitors (amount of water and photos)

If you are a water monitor, be sure to check out the Creek Watch website to ensure your river or stream has water to sample! This will save staff time because you won't be sending field staff or volunteers out to collect water samples where there is no water to sample. See Section C: Extracting data from the Creek Watch website

6)   Photo tracking (photos)

For centuries, photos have been telling stories and documenting our surroundings. Use the Creek Watch app to upload photos and coincident data to track water quality over time. Use photos to track algal blooms, turbidity, invasive species, waterfowl, trash accumulations and stream bank health. Use the comments section in Creek Watch to make notes for these other types of information. Compare photos month to month or year to year to identify trends or flag problems.

> *Basic Instructions*:
> Use the comments section in Creek Watch to make notes for these other types of information. Pictures uploaded to Creek Watch can only be viewed when clicking on a monitoring location icon placed on the Creek Watch Map and looking at individual data records or by clicking on View within a data record within the Creek Watch Data Viewer. Images can be copied or downloaded by right clicking on the image and saving it.

7)   Education (sensory observation, amount of water, flow rate, amount of trash and photos)

Are you an educator looking for a neat way to introduce students to watershed science? Use the Creek Watch website to find out which local streams and rivers have been monitored. Compare and contrast photos to discuss healthy and less healthy waterways. Use the data to guide discussions about land use and resulting water quality. Get students used to collecting and reporting water quality data by using the app at your local waterway.

> Learn about sensory observation by using your sight, sense of smell and hearing to collect environmental data. Creek Watch is a platform for collecting and submitting sensory data (Look at the stream conditions. To learn more about Visual Observations please visit Section 4.0 - Stream Measurements within the Clean Water Team's Guidance Compendium For Watershed Monitoring And Assessment.

The iPhone application is now available free on the iTunes store,
so you can get started contributing data today!

Table of Contents: Sections A-E

A) Accessing Creek Watch data using the Creek Watch website:

1) Direct your browser to the Creek Watch website: http://creekwatch.researchlabs.ibm.com/

2) Enter an address or GPS coordinates to zoom to a specific location in the top text field. Click on "Go there!" to direct the map to the desired location.

3) The map will zoom to your desired location.
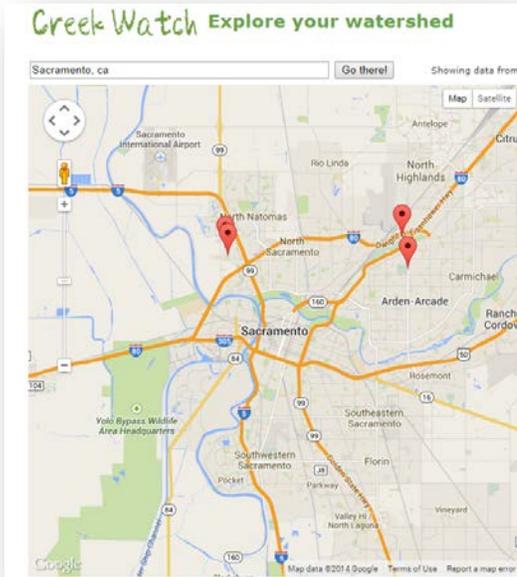
4) Rick click on a way-point to view the amount of water, rate of flow, amount of trash and photo. The date and time of data collection will appear in the window.
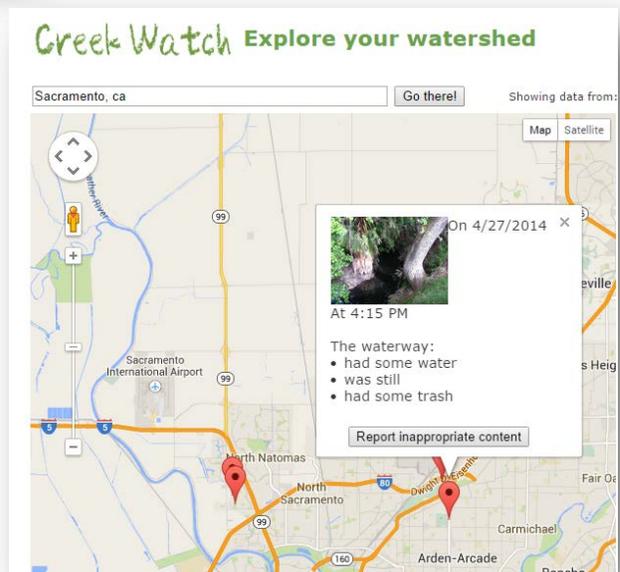
5) If interested in data submitted within the last week, two weeks or four weeks – use the time filter at the top right of the screen. Only data selected within the time frame will appear on the map.
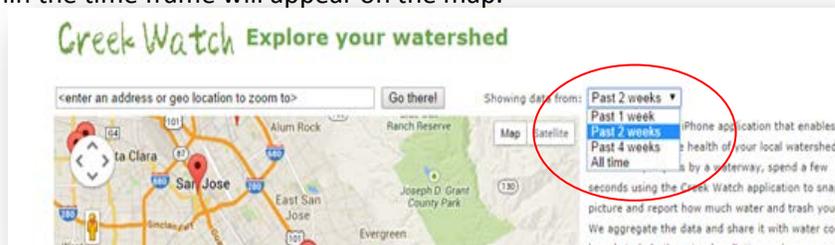
6) To extract data or view a data table, click on the "Table views and downloads" link on the top right of the screen.
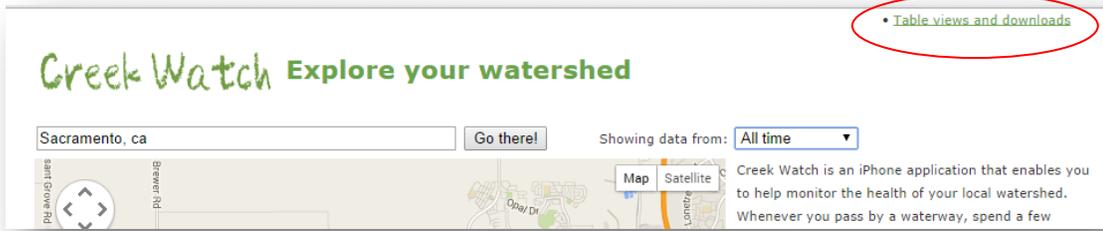
7) Display data from a specific time period using the time filter on the top left of the screen.

Date	Water Level	Flow Rate	Trash	State	Country	Latitude	Longitude	Location	Image
09-08-2014 14:38	Dry	No Water	None	MG	BR	-19.982298	-43.944306	view location	view
05-31-2014 18:38	Full	Fast	None	TX	US	30.020876	-95.179274	view location	view
05-30-2014 17:36	Full	Fast	Some	TX	US	30.023504	-95.260704	view location	view
05-31-2014 21:13	Full	Fast	None	TX	US	30.031282	-95.174931	view location	view
06-06-2014 12:17	Some	Slow	None	TX	US	30.024756	-95.260186	view location	view
06-12-2014 18:21	Some	Slow	None	TX	US	30.023876	-95.260604	view location	view
07-03-2014 18:33	Full	Fast	None	TX	US	30.021198	-95.179144	view location	view
09-03-2014 11:59	Dry	No Water	None	TN	US	35.735486	-86.425816	view location	view
07-05-2014 13:32	Dry	No Water	None	CA	US	37.439558	-122.17992	view location	view
06-05-2014 12:59	Dry	No Water	Some	CA	US	37.439457	-122.179843	view location	view
05-03-2014 14:46	Dry	No Water	Some	CA	US	37.439504	-122.179834	view location	view
04-02-2014 21:41	Some	Slow	None	CA	US	37.439542	-122.179932	view location	view
09-02-2014 11:58	Dry	No Water	None	CA	US	37.439567	-122.179893	view location	view
08-22-2014 12:23	Full	Fast	None	IL	US	41.970301	-88.356337	view location	view
08-20-2014 08:23	Full	Fast	None	NJ	US	40.385491	-74.962373	view location	view
08-19-2014 11:54	Some	Slow	None	MB	CA	49.819858	-97.079078	view location	view
05-21-2014 15:24	Some	Slow	None	CA	US	36.979153	-122.017404	view location	view
05-21-2014 14:22	Some	Slow	Some	CA	US	36.981747	-122.026117	view location	view
06-05-2013 17:02	Full	Slow	Some	California		36.983865	-122.15443	view location	view
08-15-2014 17:00	Full	Fast	None	NJ	US	40.385477	-74.962481	view location	view
08-14-2014 13:06	Some	Slow	None	MA	US	42.193948	-71.297802	view location	view
08-13-2014 11:26	Some	Slow	Some	MI	US	42.707063	-82.960281	view location	view
08-13-2014 11:25	Some	Slow	Some	MI	US	42.707075	-82.960224	view location	view

8) To switch back to the map view, click on the "Go to map view" link on the top right of the screen.
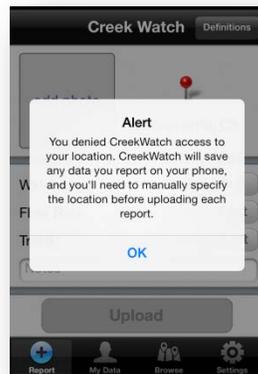
**B) Using the Creek Watch app in the field:**

1) Once you have downloaded the Creek Watch app from the iTunes store and have arrived at a local stream or river, you are almost ready to collect data! Open the Creek Watch app.

2) You will be directed to the main Creek Watch data screen. If you haven't enabled the app in your phone's "Location Services" settings, no location will appear.


3) To turn on "Location Services" for the app, open your phone's settings. Open the "Privacy" settings and scroll to "Location Services". Under the "Location Services" settings, ensure the Creek Watch app is enabled. This enables the app to use GPS along with Wi-Fi and cell tower locations to determine your approximate location.
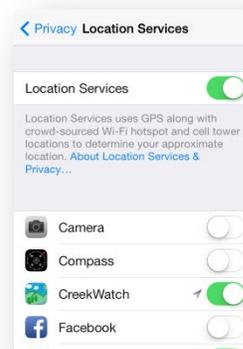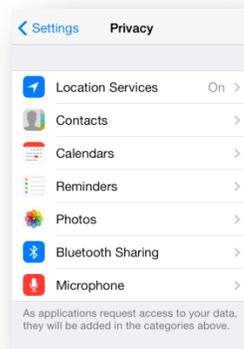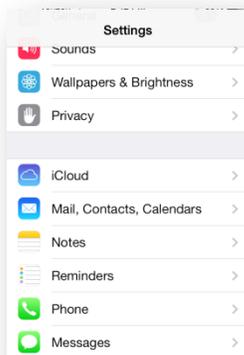
4) One you have enabled "Location Services" for the Creek Watch app, your location should appear in the main Creek Watch data screen.
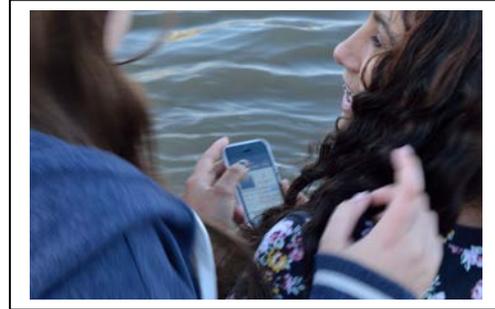
5) Click on the "Definitions" on the top right of the screen to see photos and definitions of water level, flow rate, and trash. Use your finger to scroll through the definitions.
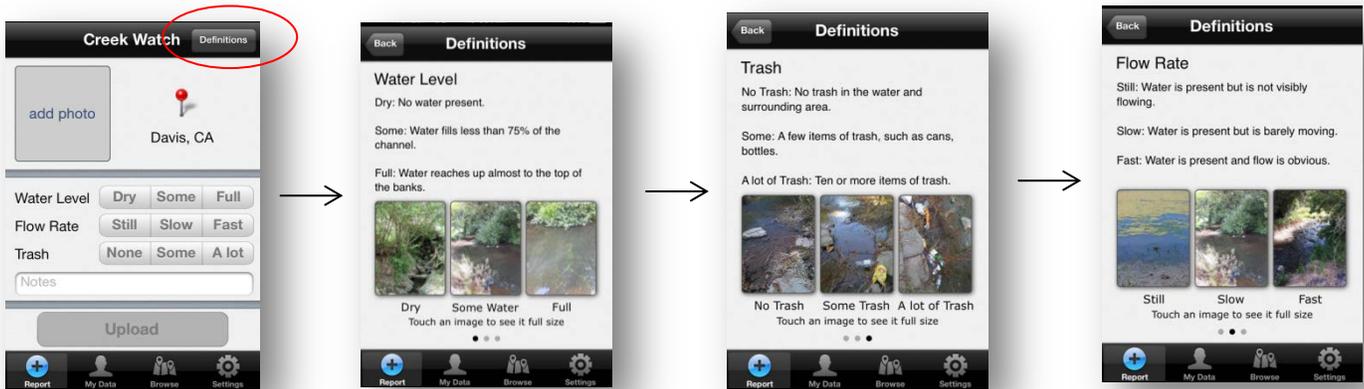
6) Now you're ready to collect data! Click "add photo" to capture a photo with your iPhone camera. Fill in the "Water Level", "Flow Rate", and "Trash" fields. Add optional text to the "Notes" field.
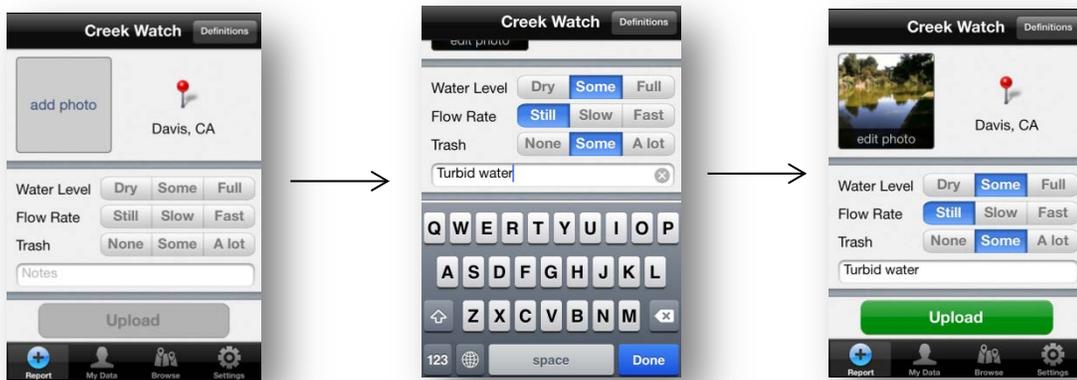
7) Click "Upload" when you are ready to submit your data. A "Data Uploaded" message will appear when your data has been submitted.
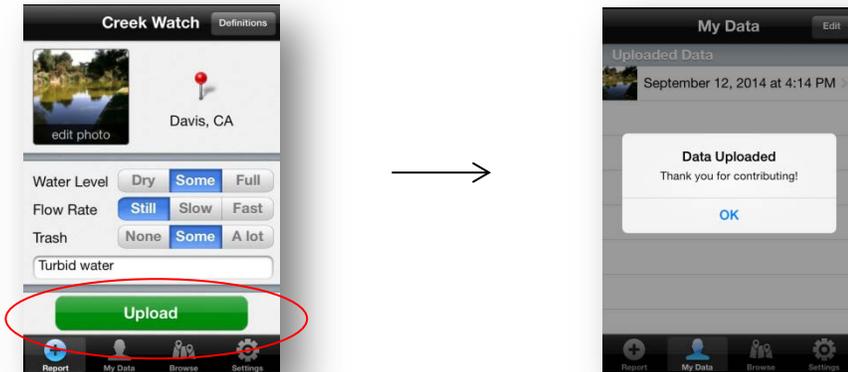
8) To view or delete uploaded data, use the bottom tool bar to navigate to the "My data" window. To delete data, click "Edit". Select the data to delete and click "Delete". The data should disappear from your "My Data" window.
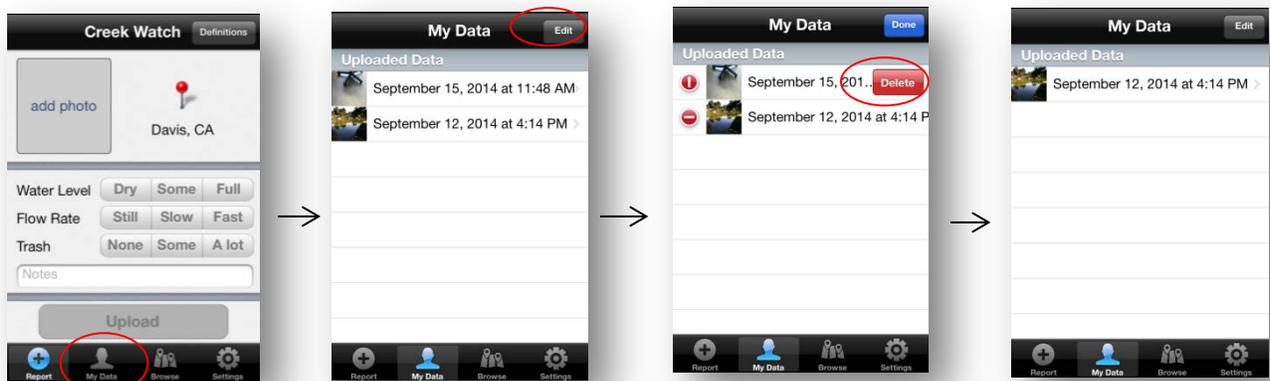
9) Browse data by map location, select the "Browse" option from the bottom tool bar. Use your   fingers to scroll through the map and zoom in/out. Click on a way-point to view the amount of water, rate of flow, amount of trash and photo
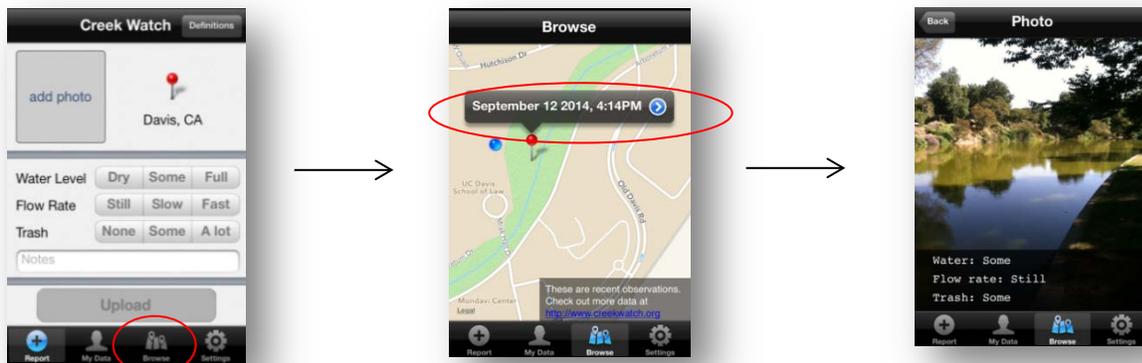
10) To view the apps settings, select the "Settings" options form the bottom tool bar.
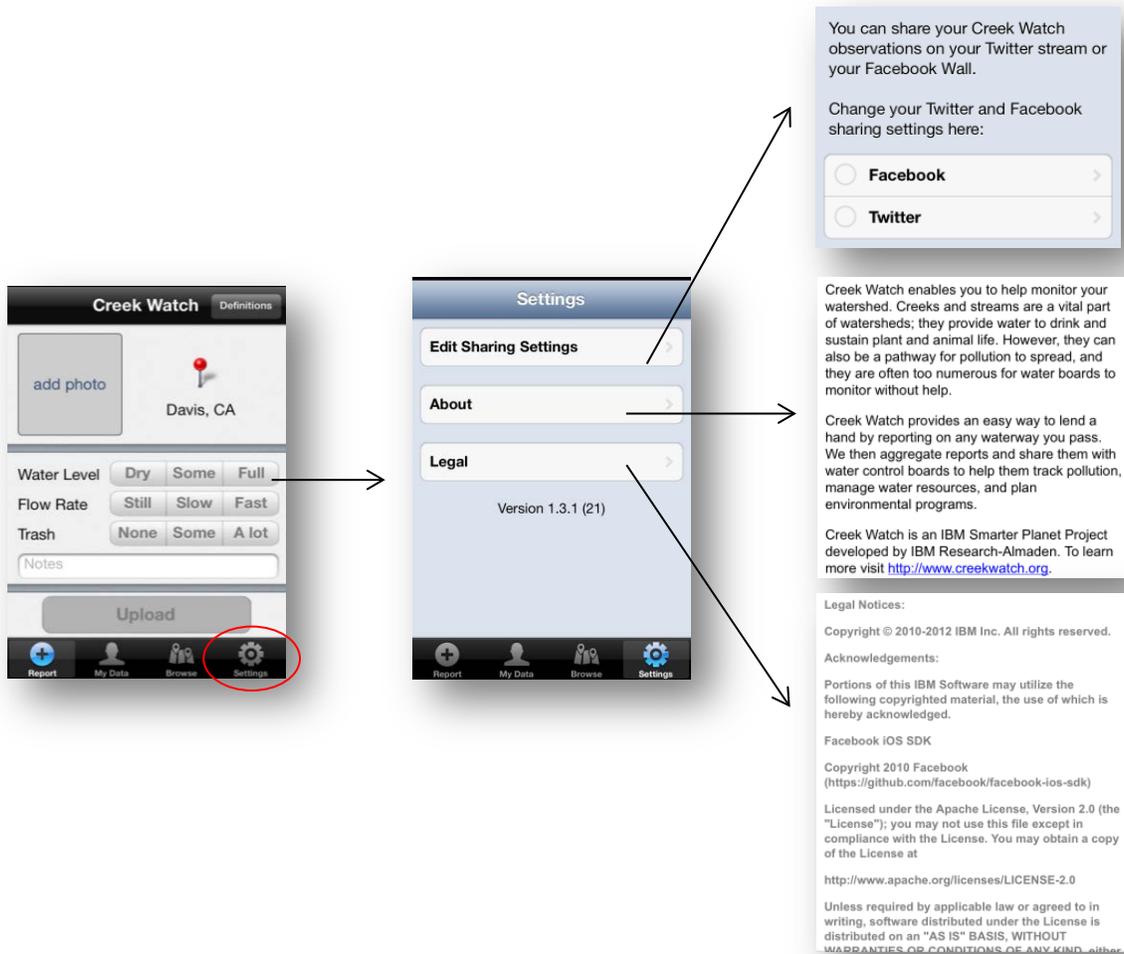
C) **Extracting data from the Creek Watch website**:

Interested in viewing water quality and quantity data from your local watershed, stream or river? The Creek Watch website allows users to exact data from waterbodies in over 25 countries!

1) To extract data, direct your browser to the Creek Watch website (http://creekwatch.researchlabs.ibm.com/) and click on the "Table views and downloads" link on the top right of the screen. (See section A for directions on navigating the Creek Watch website.)

2) Display data from a specific time period using the time filter on the top left of the screen.


3) The "Export data" feature is currently out of commission. But don't fret! You can highlight data you are interested in analyzing, right click "Copy" and "Paste" the dataset into an Excel file.


	A	B	C	D	E	F	G	H	I	J
1	Date	Water Lev	Flow Rate	Trash	State	Country	Latitude	Longitude	Location	Image
2	5/13/2014 18:38	Dry	No Water	None	TX	US	30.208076	-95.179274	view location	view
3	5/14/2014 17:38	Full	Fast	None	TX	US	30.208450	-95.165210	view location	view
4	5/15/2014 16:38	Full	Slow	Some	TX	US	30.266500	-95.172174	view location	view
5	5/16/2014 15:38	Some	Fast	Some	TX	US	30.211200	-95.165896	view location	view
6	5/17/2014 14:38	Full	Slow	Some	TX	US	30.212560	-95.352160	view location	view
7	5/18/2014 13:38	Some	Fast	None	TX	US	30.208076	-95.185490	view location	view
8	5/19/2014 12:38	Some	Slow	Some	TX	US	30.209520	-95.175246	view location	view
9	5/20/2014 11:38	Dry	No Water	None	CA	US	37.423600	-122.245630	view location	view
10	5/21/2014 10:38	Full	Slow	None	CA	US	37.423600	-122.578963	view location	view
11	5/22/2014 9:38	Full	Slow	None	CA	US	37.423600	-123.000400	view location	view
12	5/23/2014 8:38	Some	Slow	None	CA	US	37.423600	-122.456320	view location	view
13	5/24/2014 7:38	Full	Fast	Some	CA	US	37.423600	-122.489600	view location	view
14	5/25/2014 6:38	Some	Fast	None	CA	US	37.423600	-123.021450	view location	view
15	5/26/2014 5:38	Full	Fast	Some	CA	US	37.423600	-122.698540	view location	view
16	5/27/2014 4:38	Some	Slow	Some	CA	US	37.423600	-122.456320	view location	view
17	5/28/2014 3:38	Some	Fast	None	CA	US	37.789666	-122.489600	view location	view
18	5/29/2014 2:38	Full	Fast	None	CA	US	37.445632	-122.245630	view location	view
19	5/30/2014 1:38	Some	Slow	Some	CA	US	37.424520	-122.578963	view location	view
20	5/31/2014 0:38	Dry	No Water	Some	CA	MG	37.423600	-123.000400	view location	view
21	5/31/2014 23:38	Full	Slow	None	CA	US	37.785260	-122.456320	view location	view
22	6/1/2014 22:38	Some	Slow	Some	CA	US	37.452396	-122.245630	view location	view
23	6/2/2014 21:38	Dry	No Water	None	CA	US	37.456300	-122.578963	view location	view
24	6/3/2014 20:38	Dry	No Water	Some	CA	US	37.423600	-123.000400	view location	view
25	6/4/2014 19:38	Some	Slow	Some	CA	US	37.785690	-122.456320	view location	view
26	6/5/2014 18:38	Dry	No Water	Some	CA	US	37.423600	-122.456320	view location	view
27	6/6/2014 17:38	Some	Slow	None	CA	US	37.569800	-122.489600	view location	view
28	6/7/2014 16:38	Dry	No Water	Some	CA	US	37.458693	-123.021450	view location	view
29	6/8/2014 15:38	Some	Slow	Some	CA	US	37.456320	-122.698540	view location	view
30	6/9/2014 14:38	Full	Fast	None	CA	US	37.423600	-122.456320	view location	view
31	6/10/2014 13:38	Some	Fast	None	CA	US	37.423600	-122.489600	view location	view
32	6/11/2014 12:38	Full	Slow	Some	CA	US	37.423600	-123.569870	view location	view
33	6/12/2014 11:38	Dry	No Water	Some	CA	US	37.856324	-122.555580	view location	view

4) Highlight all of your data and on the "Home" tab of your Excel file, click on the "Sort & Filter" tool. Select "Custom Sort". Next, "Sort by: State", "Sort on: Values" and "Order: A to Z" to get your data sorted alphabetically by state.
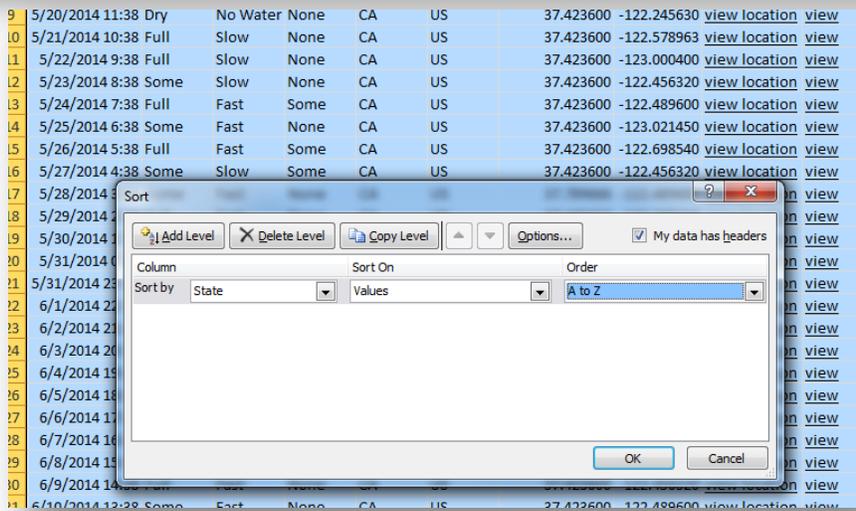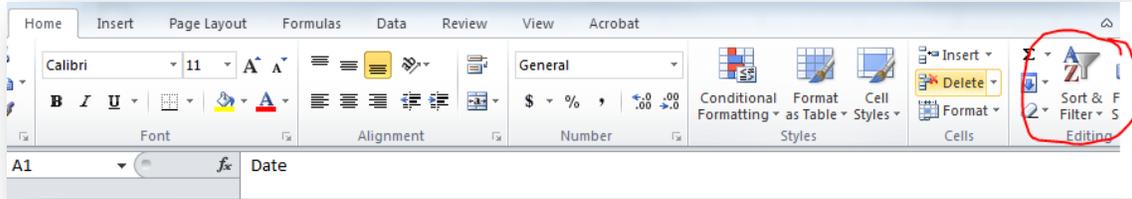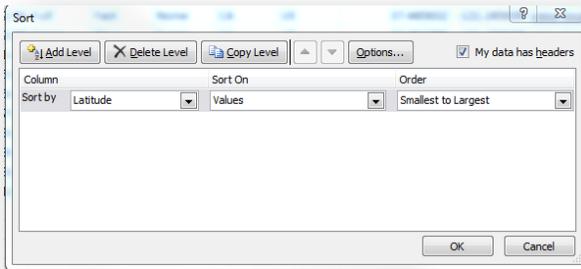

5) Once you have extracted all of the Creek Watch data from your state, you can decide whether you'd like to further refine your selection to include data from a particular region or area of the state. This can be done by finding all longitude and latitude readings from a specific area of interest. To find out the longitudinal and latitudinal boundaries of an area of interest, visit one of these sites:

- http://mynasadata.larc.nasa.gov/latitudelongitude-finder/
- http://www.latlong.net/
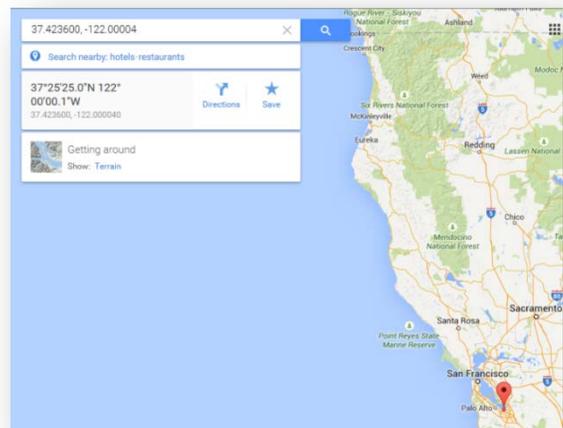
6) You may also visit http://maps.google.com to find the latitude and longitude boundaries of an area of interest. For example, if you are looking for all data collected north of San Jose, CA, though in the state of California, you will only keep those records from California that have latitudes greater than 37.423600.

7) In your Excel file, you can do a "Custom Sort" on "Latitude". This will allow you to easy view the data outside of your area of interest (in this example, data south of San Jose, CA) so that you can omit them from the data set before analysis.

D) Analyzing data from the Creek Watch website:

Interested in doing some basic statistical analysis on the dataset you've extracted from the Creek Watch website? Open your Excel file (see section C above for instructions) that includes the dataset you wish to analyze.

1) Do a count of word occurrences for Flow Rate, Water Level, or Presence of Trash by using the "Countif" function in excel.
   a. For example, if you'd like to find the percent of data labeled as "some", "full" and "dry" water level, add three new rows to your spread sheet. Label them "Water Level = Some", "Water Level = Dry" and "Water Level = Full". Add a "Count"

column. Type in the function "=countif(range,"Some") to find the number of data points recorded as "some" water level. Do the same for "dry" and "full" water levels by modifying the countif phrase.

b. Next, create a "Percentage" colum. To find the percentage of data labeled as "some" water level, take the count value and divide it by the total number of data entries in your dataset and multiply by

100.

The formula should look like this.

	Count	Percentage
Water Level = Some	10	40
Water Level = Dry	7	28
Water Level = Full	8	32

	Count	Percentage
Water Level = Some	10	=(B29/25)*100)
Water Level = Dry	7	28
Water Level = Full	8	32

2) Use the "Countif" function to do counts of other words to determine flow rate percentages in your dataset as well as presence of trash percentages.

3) You can take your analysis further by looking at changes in the frequency of word counts over time or between watersheds.
   a. Here is an example of using the "Countif" feature to compare conditions from one year to the next. Notice here that there is a greater percentage of "dry" and "some" water level sites in 2015 as compared to the previous year.

	Count 2014	Percentage 2014			Count 2015	Percentage 2015
Water Level = Some	10	40		Water Level = Som	13	52
Water Level = Dry	7	28		Water Level = Dry	10	40
Water Level = Full	8	32		Water Level = Full	2	8

E) **Ensuring high-quality Creek Watch app data:**

A Quality Assurance/Quality Control (QA/QC) plan is imperative in maintaining the integrity of datasets. There are a number of methods to ensure high quality of data. For groups collecting data intended to be uploaded to the Creek Watch website, we recommend the following measures.

1) Creek Watch Trainings:
   a. Watershed and school groups may want to hold training sessions (either in person or through web-conferencing) to instruct users on the proper use of the Creek Watch app.
   b. This User Manual may be integrated into training sessions.
   c. Sign-in/registration sheets can be used to document which individuals have been trained on how to collect high-quality Creek Watch data.
2) Use photos to review each Creek Week data point:
   a. When in the Data Viewer on the Creek Watch website, double check the integrity of data by clicking on "view" link under the "Image" column. A photo should pop upon your screen. If there is a photo of a waterway (even a dry creek bed), you can be confident the data came from a serious data user. You can check results (water level, stream flow, trash) against the image to ensure the images reflects the data. A photo of something that is not waterway related indicated some just goofing off – don't use this data in analysis.

Good to use the data in the analysis if the pic looks like this!

Don't use the data in the analysis if the pic looks like this!

Additional Resources for monitoring water quality by citizen scientists and STEM programs can be found at:

Clean Water Team webpages

Watermarks: The California Newsletter for Citizen Water Quality Monitoring

Guidance Compendium For Watershed Monitoring And Assessment