HIGH COUNTRY CONSERVATION CENTER

Summit Saves Water Conservation Program
CWCB Final Education and Outreach Grant Report – May 10, 2017

The overall goal of HC3's Summit Saves water conservation program was to directly reduce water consumption in our Blue River Basin. Summit residents, students and visitors learned the importance of water conservation in promoting more efficient water use and a healthier, more resilient community. As our population grows, we place increasing demand on an already stressed Colorado River Basin. We share a responsibility with users downstream to conserve what we have and make well informed decisions for the future of our water resources. **The impact of the Summit Saves program was to ensure adequate future supplies of water for our rapidly growing community.**

Thank you to the CWCB for helping launch the Summit Saves education and outreach program as well as for support to initiate a regional efficiency plan which is currently underway. This grant allowed us to identify gaps in water data, understand public perceptions around water usage in our county, create a middle school education program around water, and coach homeowners through water efficiency in their homes. We look forward to growing the impact of this program in our community.

Task 1: Collect baseline data from utilities.
HC3 completed Task 1 by June 15th, 2016, gathering data from Town of Silverthorne, Town of Dillon, Town of Breckenridge, Town of Frisco, and Copper Mountain Metro District. This information was used as the baseline information to compare 2016 water usage and other metrics. This data also served as the bulk of information in our regional conservation planning process (separate grant awarded by CWCB). We will continue to measure our progress against this data as we begin to implement our regional conservation plan. Task 1 is complete.

Task 2: Conduct market research and clarify public messaging.
Alpine Insights completed a public intercept survey on July 4, 2016. With a 78% response rate, we captured 382 surveys from participants between the ages of 18 and 80. Data collection took place across Summit County and across demographics. We cross tabulated responses between locals, in-state visitors, out-of-sate, and second homeowners to get a feel for whether perceptions about water conservation were different across groups in Summit County. A few key findings include:

- Half of respondents were aware that most water waste occurs outside the home or in the yard.
- Future water shortages and environmental concerns are the main motivations for people to conserve water.
- The top ways to conserve water are things that can be done easily by the respondent without much effort or thought.
- Nearly half of the respondents are likely to change their landscaping as the need for water conservation increases.

This survey provided some interesting insights and helped inform HC3 on marketing and messaging (see task 3). The results enabled us relate to our public while providing relevant and important information and also addressed the "biggest bang for our buck" in terms of efforts to conserve. Task 2 is complete.

Task 3: Design marketing material and implement direct mail campaign.
Marketing can be challenging in terms of targeting the right audience. Originally, our grant proposed to send a direct mail piece which would have required printing and postage. After we received our survey information and talked with marketing professionals, we decided to purchase ads in the local newspaper and hang a highway banner instead of sending a direct mail piece. We ran a total of 19 ads in the local paper and one in the Sustainable Living Guide – a publication that HC3 uses year-round to deliver information about our programs. It was released

on Earth Day with 12,000 copies. Eight thousand of those copies were directly distributed through the paper, and the remaining are distributed at events throughout the year. The newspaper ads ran in March (9 total), April (5 total) and May (5 total) (see Attachment for examples).

Our highway banner was displayed along Highway 9 during the week of March 26th. It was still ski season (tail end of spring break crowds) and we estimate 5,000-10,000 cars passed by the banner. We promoted Fix-A-Leak week with information directing viewers to our website. A water conservation page on our website was built out with details on how to "seek and destroy" household leaks. We promoted this event on social media, in our newsletter (2,000 contacts) and at a Rotary of the Summit meeting which had 150 people in attendance. This task was a good first step to introducing the Summit Saves Water Conservation program in Summit County and has opened the door for further conversation at the municipal level. Homeowners continue to learn about this program through our existing home energy audit program (see Task 4 below).

Finally, HC3 worked with Trout Unlimited and the Keystone Science School to create educational and interpretive signage for a Blue River Explorer Hike. The signs will be displayed along the Blue River bike path in Silverthorne and through the Outlet mall walkways (along the river). HC3's contribution to this project was on watersheds and conservation (see Attachment for example). The signs will be installed during the summer of 2017. Task 3 is complete.

Task 4: Integrate water efficiency into existing Energy Smart program and public workshop.
HC3 and the Middle Park Conservation District hosted a public workshop called "Water Law in a Nutshell" presented by Aaron Clay, Water Attorney. We had 40 people in attendance for the 8-hour workshop. Mr. Clay took participants through the history of Colorado Water Law, demonstrating the complexity and present day realities of the prior appropriation system. Attendees included teachers, students, ranchers and agricultural producers, water providers, government officials, and researchers.

Our Energy Team installed water efficient fixtures in 50 homes throughout Summit County and provided homeowner education around the water and energy nexus. This task allowed us to have face to face conversations with homeowners about water as well as better understand how homeowners view water use in their homes. It has given us further insight into how to best implement residential conservation measures in the future. This topic was also addressed through a new program in partnership with Xcel Energy called Energize Summit/Partners in Energy. In addition, we made the energy/water nexus a priority in our regional water conservation planning process at the request of municipal water providers. Task 4 is complete.

Task 5: Compile and maintain toolkits and resources for the community.
We continue to update the website with new information as we come across it. In our monthly newsletters, we feature a water tip column as well, providing quick and relevant water saving tips for homeowners throughout the year. We published another *Ask Eartha* column in March promoting Fix a Leak Week and leading people to the website for ways to seek and destroy leaks in their own homes. *Ask Eartha* is printed in the Friday edition of the *Summit Daily News* under the environmental section. We plan to continue writing about water related topics throughout 2017.

We also answer questions about water conservation through our environmental hotline. Originally designated the Recycling Hotline, we also answer questions related to water, local food and other environmental programs. We will continue to educate staff and promote the hotline for residents and visitors to use. Finally, HC3 is upgrading our website and have a staff member dedicated to website analytics who will track our users and website engagement into the future. We will be able to track the number of people who visit our water sites and also better understand the kind of information they're looking for to better cater to their needs. Task 5 is complete but will be ongoing indefinitely.

Task 6: Design Water Warriors lesson plan and deliver to 260 6th graders.
In March of 2016, the classroom portion of Water Warriors was completed, reaching roughly 230 6th graders. Through the lesson, students gained an understanding of the human uses of water in the Colorado River Basin and

the development challenges facing a growing population. Students assessed their own water use at home and were provided with water efficient fixtures, leak detection kits, and tips for reducing water at home. We did not have a method in place to confirm how many of those students actually installed those water fixtures. Moving forward, we will need to design a better follow-up strategy to measure the number of fixtures installed in the home post-lesson. We had five water experts join us for Water Warriors, leading students through a roundtable discussion on various water user stakeholders (recreation, environment, industry, municipal, and agriculture). HC3 staff provided the lesson intro and background as well as helped facilitate research for students' final poster project. Students presented their findings and displayed their posters throughout the Middle School for other students to view. Task 6 is complete.

The great news is that this program was duplicated in Grand County by our project partner Middle Park Conservation District and will be run again at Summit Middle School May 16-17, 2017 (see attachment for 2017 lesson plan and activities).

Task 7: Analyze the impact of outreach efforts on water use.
This is ongoing through our current regional efficiency planning process. See below for obstacles and details (see attachment for compiled data as baseline for planning process).

OBSTACLES ENCOUNTERED

Task 1: Collect baseline data from utilities.
Completed. It was a little difficult getting prompt replies from municipal water providers, but in the end, we received the data we needed. Of course, the data was different per provider (everything from population data, types of water users, and consumptive/non-consumptive uses). This meant that compiling everything into one format was not manageable. This task has been identified as a major outcome for our regional efficiency plan.

Task 2: Conduct market research and clarify public messaging.
Completed. The information gleaned from our market research has been very helpful in opening the conversation in our community around water. HC3 would like to revisit this in a year or two to see if perceptions have changed or if the public continues to maintain the same perspectives around water.

Task 3: Design marketing material and implement direct mail campaign.
Completed. Once we settled on messaging and design, the rest was fairly easy. Of course, tracking the audience reached and the impact the marketing has had on their behavior is more problematic. We don't have a system in place that can capture this information unless people call us directly with questions or with requests for water efficient fixtures. We're hoping to translate this into rebates or incentive programs once our regional efficiency plan has been implemented.

Task 4: Integrate water efficiency into existing Energy Smart program.
The biggest obstacle in this arena was working to get information into the hands of our Energy Smart contractors. As previously reported, we were having trouble getting them together in one room due to the housing boom in Summit County. This meant their schedules were often conflicting. We worked directly with our in-house contractor to complete water efficiency upgrades in homes, but the other contractors have been more limited in their contributions. We were able to install water fixtures in 50 homes despite the difficultly with local contractors. However, our sustainable business program offers lunch-n-learns throughout the year and we still look forward to hosting a water related lunch-n-learn.

Task 5: Compile and maintain toolkits and resources for the community.
This is a work in progress. It's difficult to parse what's helpful and attractive to website visitors and what is just filler content. We want to make sure the information is relevant and useful while still being informative. We continue to monitor the content and work to improve the click through rate, visits to the website, and calls to our hotline. We have written three Eartha Steward columns in the local paper and have received press about our water conservation program in the local *Summit Daily News*.

Task 6: Design Water Warriors lesson plan and deliver to 260 6th graders.
Since the first Water Warriors was a success, we are planning to deliver the program again in the spring of 2017. Planning for that is ongoing, and we're considering using a different format to deliver the same material. The Colorado Foundation for Water Education provides information on how to host a Water Festival and we might choose to deliver Water Warriors through a Water Festival single day format vs. a week-long classroom unit. There is still more research to be done on improving this program.

Task 7: Analyze the impact of outreach efforts on water use.
Currently, staff has been collecting and analyzing data to compare the five major water providers and their water use. We've determined there is a need to collect more and different types of data. For example, one entity doesn't calculate per capita water use, citing visitor populations as a problem in the data. We need to figure out a better way to calculate that town's water use per capita. We are working with the waste treatment facilities to come up with a methodology that we think could be applicable across all resort communities that uses BOD loads to determine population. You will see this in our regional efficiency plan as long as we reach agreement from all providers. In addition, other water providers don't currently distinguish between commercial and residential use, making targeting of messages difficult. However, we have collected a large amount of data and are looking at how that information has changed over time. Despite population growth all over the county, the water use in general has decreased since 2011. The amount of decrease varies by community.

USE LESS. HAVE MORE. BE WATER SMART!

RUN YOUR WASHING MACHINE AND DISHWASHER ONLY WHEN FULL

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SAVE UP TO 1,000 GALLONS A MONTH!

WATER CONSERVATION Tip

GET MORE WATER SAVING TIPS AT HIGHCOUNTRYCONSERVATION.ORG/WATER

hc3™

TOWN OF BRECKENRIDGE · TOWN OF FRISCO COLORADO · SILVERTHORNE COLORADO · DILLON COLORADO · Copper Mountain Consolidated Metropolitan District · COLORADO Colorado Water Conservation Board · SUMMIT COUNTY COLORADO

USE LESS. HAVE MORE. BE WATER SMART!

INSTALL WATER EFFICIENT SHOWER HEADS

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SAVE UP TO 750 GALLONS A MONTH!

GET MORE WATER SAVING TIPS AT HIGHCOUNTRYCONSERVATION.ORG/WATER

WATER CONSERVATION *Tip*

hc3™

Town of Breckenridge · Town of Frisco Colorado · Silverthorne Colorado · Dillon Colorado · Copper Mountain Consolidated Metropolitan District · CWCB Colorado Water Conservation Board · Summit County Colorado

USE LESS. HAVE MORE. BE WATER SMART!

INSULATE HOT & COLD WATER PIPES

=

SAVE ENERGY & WATER

WATER CONSERVATION *Tip*

GET MORE WATER SAVING TIPS AT HIGHCOUNTRYCONSERVATION.ORG/WATER

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Town of Breckenridge · Town of Frisco Colorado · Silverthorne Colorado · Dillon Colorado · Copper Mountain Consolidated Metropolitan District · CWCB Colorado Water Conservation Board · Summit County Colorado

USE LESS. HAVE MORE. BE WATER SMART!

PHOTO: TODD POWELL

FIX LEAKS IN YOUR HOME

=

SAVE 3,000–13,000 GALLONS & 10% ON WATER BILLS

GET MORE WATER SAVING TIPS AT HIGHCOUNTRYCONSERVATION.ORG/WATER

hc3™

WATER CONSERVATION *Tip*

TOWN OF BRECKENRIDGE · TOWN OF FRISCO COLORADO · SILVERTHORNE COLORADO · DILLON COLORADO · Copper Mountain Consolidated Metropolitan District · H2O for CO · COLORADO Colorado Water Conservation Board · SUMMIT COUNTY COLORADO

	Population			Annual Water Sales				Source Water Type		Per Capita Water Use	
	Permanent	Transient	Day Visitor	Total Sales	Residential	Commercial	Irrigation/ Snowmaking	Groundwater	Surface Water	System Wide	Residential
	people	people	people	ac-ft	ac-ft	ac-ft	ac-ft	ac-ft	ac-ft	gpcd	gpcd
	Breckenridge										
2011	5,098	24,054	14,065	1,953	1,196	358	399	-	1,953	133	209
2012	5,207	24,572	14,107	2,199	1,226	460	513	-	2,199	144	210
2013	5,317	25,089	14,149	2,006	1,310	417	279	-	2,006	144	220
2014	5,427	25,607	14,191	1,865	1,222	367	276	-	1,865	132	201
2015	5,537	26,125	14,233	1,985	1,223	360	402	-	1,985	129	197
2016	5,646	26,643	14,275	2,005	1,237	393	374	-	2,005	123	196
2017	5,756	27,161	14,317	2,025	1,250	397	378	-	2,025	122	194
2018	5,866	27,678	14,360	2,048	1,264	401	382	-	2,048	121	192
2019	5,976	28,196	14,402	2,071	1,278	406	387	-	2,071	120	191
2020	6,085	28,714	14,444	2,094	1,292	411	391	-	2,094	119	190
2021	6,195	29,232	14,486	2,117	1,307	415	395	-	2,117	119	188
	Frisco *note: original source water data values converted from production volumes to sales volumes.*										
2011	2,794	1,800		577	366	181	30	368	209	106	117
2012	2,832	1,800		598	380	188	30	352	246	109	120
2013	2,871	1,800		594	391	173	30	375	219	108	122
2014	2,914	1,800		545	323	192	30	349	196	97	99
2015	2,954	1,800		588	363	195	30	365	223	104	110
2016	2,995	1,829		582	366	186	30	363	220	130	109
2017	3,037	1,858		590	371	189	30	367	223	130	109
2018	3,078	1,886		608	383	195	30	378	229	132	111
2019	3,119	1,915		625	394	201	30	389	236	134	113
2020	3,161	1,944		642	406	207	30	400	242	136	115
2021	3,202	1,973		660	418	213	30	411	249	138	116
	Silverthorne										
2011	3,892			704				704	-	161	
2012	4,008			678				678	-	151	
2013	4,127			814				814	-	176	
2014	4,249			694				694	-	146	
2015	4,375			735				735	-	150	
2016	4,505			753				753	-	149	
2017	4,639			770				770	-	148	
2018	4,777			793				793	-	148	
2019	4,919			817				817	-	148	
2020	5,065			841				841	-	148	
2021	5,215			866				866	-	148	

	Population			Annual Water Sales				Source Water Type		Per Capita Water Use	
	Permanent	Transient	Day Visitor	Total Sales	Residential	Commercial	Irrigation/ Snowmaking	Groundwater	Surface Water	System Wide	Residential
	people	people	people	ac-ft	ac-ft	ac-ft	ac-ft	ac-ft	ac-ft	gpcd	gpcd
	Copper Mountain										
2011	385			280				280	-	50	
2012	356			305				305	-	55	
2013	327			337				337	-	60	
2014	297			334				334	-	60	
2015	268			333				333	-	60	
2016	269			337				337	-		
2017	270			341				341	-		
2018	271			345				345	-		
2019	272			348				348	-		
2020	273			351				351	-		
2021	274			354				354	-		
	Dillon										
2011	898			285	163	121	-	-	285	139	94
2012				282	162	120	-	-	282	136	92
2013				264	151	112	-	-	264	136	91
2014				265	152	113	-	-	265	145	98
2015	865			272	156	116	-	-	272	147	99
2016	885			274	203	118	-	-	274		
2017	905			275	204	118	-	-	275		
2018	925			277	206	119	-	-	277		
2019	946			280	208	120	-	-	280		
2020	967			282	209	121	-	-	282		
2021	989			284	211	122	-	-	284		

GPCD inputs: water use / population

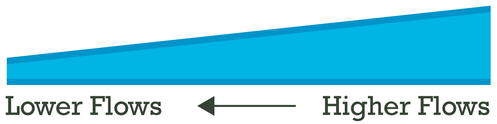
	S-GPCD	R-GPCD
Breckenridge	total sales / (permanent + 1/3 transient)	total residential sales / permanent
Copper Mtn	total sales / 5000	-
Dillon	total sales / total equivalent residences (EQR)	total residential sales / (2 * EQR)
Frisco	total sales / (permanent + 1800 transient)	total residential sales / permanent
Silverthorne	total sales / permanent	-

HOW WATERSHEDS WORK

River Flows & Temperature

- Higher Flows = Colder Water
- Lower Flows = Warmer Water

- More Trees = Colder Water
- Fewer Trees = Warmer Water



Natural Lakes remain full year-round and provide habitat for fish and wildlife.

Lake

Healthy Forests:
- Prevent soil erosion
- Natural reservoir of deep, slow-melting snowpack

Reservoir is meant to be a constant source of year-round water.

Storm runoff from cities and neighborhoods as well as industrial outflow goes into the river.

Clearing of trees along the river for agriculture and development.

Wetlands clean run-off water.

Dam

Dillon Reservoir

Water is diverted to Denver and the Front Range.

Water is removed from the river for a wide variety of human use.

Storm runoff from agriculture and livestock goes into the river.

Illustration by Kirk Werner

BLUE RIVER EXPLORER HIKE
SILVERTHORNE

SUMMER 2017

TROUT UNLIMITED

HIGH COUNTRY CONSERVATION CENTER

Water Warriors 2017
6th Grade Lesson Plan
2 Class Periods

Day 1

Lesson: How water cycles through Earth's Systems – Watersheds
Phenomenon: Flash Flooding

NextGen Standard: MS-ESS2-4

Performance Expectations: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Questions of Inquiry/Topics - Watersheds

Where does our water come from and where does it go? Can you trace a single droplet? How do your actions effect the watershed? A watershed is many variables combined. You can look at watersheds at any scale (small or big), from various perspectives (drinking water, recreation, industry, wildlife habitat, altitude/topography, microscopic, etc). Identify some of the variables and components of watersheds (waterways, storage areas, states of water, fresh/salt). How does water moves through a watershed (energy, gravity, geography, etc)? How are watersheds nested systems in the bigger picture?

Materials: Think blocks, dry erase markers (thick and thin), transparency sheets (4 per student/group), scaled watershed maps (pre-printed).

Procedure:
Min 1-10: Show flash flooding video – Ask how can this happen? What are some of the things contributing to this phenomenon?
Min 11-25: Think Block – Watershed Activity 1 and report out
Min 26-45: Watershed Mapping Activity 2

Phenomenon- Flash Flooding (5 min video, 5 min discussion) – need to pick one of these. I have copyright permission from the filmographic already.

https://www.youtube.com/watch?v=mHJmfySkgMw
https://www.youtube.com/watch?v=sJBl6GXf_EA
https://www.youtube.com/watch?v=MChe0ltPdzQ
https://www.youtube.com/watch?v=ORZQUlk8vxg

Activity 1: What is a Watershed? (5 min activity, 5 min discussion) See

1. Students review what a watershed is by building a physical model of the concept using Think Blocks (see attachment TW_WatershedHandout1).

2. First, assess prior knowledge about watershed by having students identify different bodies of water like ponds, lakes, streams, oceans etc. and variables like soil, topography, plants etc.

3. Facilitate a discussion to have students understand that a watershed is the combined effect of a bunch of variables that cause water to "shed" into a body of water. Notice that the body of water where the water ends up can also be part of a larger watershed and so on, and so on.

4. Facilitate a discussion with the students to have them understand that a watershed can be looked at from the perspective of scale. A watershed can be microscopic or as large as (or larger than!) your entire state.

Activity 2, Part 1: Mapping a Watershed (2 min)

1.1. Choosing a Map based on Scale:
Discuss and understand the scale of each watershed printout (ex. yard, neighborhood, state, etc.)

Part 2: Add combined variables in your area on your map (5 min)

2.1. Have each student/team lay a blank transparency over the map and use a black dry erase marker, have each student/team draw the variables that are present in their chosen area. These can be things like hills (topography), forests (plants), roads, houses, etc.

2.2. Using a blue marker, draw the sources of water (another type of variable) on the same transparency. These can be things like rainwater (weather), streams, lakes, rivers, (body of water – lake, snow), atmospheric water and evaporation.

2.3. Have students/teams discuss how the areas they chose affect the variables that exist, like topography, climate, bodies of water, etc.

Part 3: Draw path of drops - Watershed (5 min)

3.1. Using another blank transparency, have students/teams place it on top of the previous transparency and map.

3.2. Using different colors, draw the paths of up to 5 “drops” placed in different locations on the map (does not have to be in a waterway – example snowmelt and how it flows through system)

3.3. Have students understand the impact of the variables on the flow of the water. Such as, water flows down hills, along sides of roads, around obstacles like houses.

3.4. Re-emphasize that a watershed is the sum total of all the flows that are being affected by the combined variables. (Refer back to conceptual model from activity 1).

Part 4: Find the Endpoint(s) Body of Water (5 min)

4.1 Through discussion, have students/teams explore where the water in their map ends up.

4.2 Have students/teams find and draw this larger body of water on their maps using a different color marker. (This body of water may not be on the map, eg. downstream lake; if so have the students draw an arrow in the margin and label it.)

Part 5: Taking Perspective Distinguishing the key ideas of a watershed (5 min)

5.1. Using another blank transparency, have students/teams place it on top of the previous transparencies and map.

5.2. Using a different colored marker, have students/teams discuss and label where and how they can affect the watershed. eg. usage, pollutants, construction etc.

5.3 Students can explain the impact of their actions in relation to watershed(s).

5.4. The teacher should now use different student maps to show watershed at different scales and how the endpoint body of water at one scale becomes a part of the combined variables at a larger scale.

5.6. For example, if one student's map is of his backyard where the watershed ends in a stream (endpoint body of water), this stream becomes a source of water (variable) in another student's map based on a larger scale.

Day 2

Lesson: How water cycles through Earth's Systems – All the Water in the World
Phenomenon: ???

NextGen Standard: MS-ESS2-4

Performance Expectations: Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.

Questions of Inquiry – All the Water in the World

How is all the water in the world distributed? What form is it in? Is it accessible for human use? Recognize that reality is experienced in biased ways, understand your behavior's impact on the system. How are the atmosphere, fresh water held in glaciers and ice caps, fresh water held in ground, fresh water in lakes and rivers, related? Understand that what I think and reality are not the same (mismatch).

Materials: - 10 clear glasses
- a 1C measuring cup
- 2 cups of water
- two colors of food coloring
- turkey baster
- dry erase marker

Procedure: Min 1 - 5 - warm up/recap
Min 6-25: Activity 1 and discussion - All the water in the world
Min 26-35: Extended activity 1
Min 36-45: Activity 2 - Effects on my behavior

Phenomenon- ???

Activity 1

Step 1: Have students label 5 glasses, one for each part of the world's water: oceans, lakes/rivers, groundwater, ice caps/glaciers, and the atmosphere. Have them repeat this process with a second set of glasses.

Step 2: Explain to the students that you are going to look at all the world's water as if it could fit in 1 cup, or 250ml.

Step 3: Have a students guesstimate what proportion of this 1C of water exists where on the earth (oceans, waterways, glaciers, ice caps, etc) and fill out the Water Guesstimate worksheet. Have students pour that amount into each of the 5 labelled cups.

Step 4: Then have the student distinguish which parts of the world's water they think drinking water comes from by writing a "D" on the glasses that he/she thinks we get drinking water from.

Step 5: Place the other 5 cups with labels in front of class. Fill a measuring cup up with 1C of water and add a few drops of blue dye.

Step 6: Take the turkey baster and remove 7mL of water from the measuring cup. Set aside.

Step 7: Pour the remaining 243mL into the cup labeled "ocean". Explain to the class that 97% of the Earth's water is in our oceans.

Step 8: Take turkey baster and put about 5mL of the 7mL you reserved into the Glaciers and Ice Caps glass, this accounts for 2.34% of all the water in the world.

Step 9: Take turkey baster and place all but one drop into the Ground Water glass, less than one percent (.397%) of the world's water.

Step 10: Place the remaining one drop into the Lakes and Rivers glass, which is also less than one percent (.022%) of the earth's water.

Step 11: Finally, hold the turkey baster over a student's hand and squeeze the remaining water into the palm of a student's hand to represent the minuscule amount of water that is in the air (<.001%)

Step 12: Now label the Groundwater and Lakes and Rivers glasses as drinkable, with a "D". Explain that these types of water are sources of drinking water, and that others are not for a few reasons, such as salt in the ocean, ice caps are frozen, etc.

Checks for Understanding

Students should be able to distinguish the five areas in which water exists in our world.
Students should be able to distinguish the two sources of drinkable water and understand why the other three are not drinkable.
Students should be able to identify the mismatch between their guesstimate and reality. Students

should be able to understand that a very small percentage of all the water in the world is actually drinkable.

Extended Activity 1

Have the students identify if there is a mismatch between the two sets of glasses. (guess vs. reality)

Discuss the reality of just how little drinkable water there is in the world, comparatively speaking.

Activity 2: Effects on my behavior

Facilitate a discussion with the students about how their new understanding of what they think and reality are mismatched will lead to them thinking differently about water.

Have students use the Effects on my Behavior worksheet during the discussion, and have the fill out the My Behavior parts with meaningful-to-them answers.

Checks for Understanding

Students should be able to connect their understanding of the mismatch to at least three ways they will change the way they think about water.

Name	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
Ben	SCIENCE	SCIENCE	SCIENCE	PLAN	PLAN	DESIGN	SCIENCE
Sarah	DESIGN	SCIENCE	SCIENCE	PLAN	PLAN	SCIENCE	SCIENCE
Trish	HUM	HUM	SCIENCE	PLAN	PLAN	SCIENCE	SCIENCE

Handout 1: Activity

STEP 1:

Gather materials for the activity:

- 10 clear glasses
- a 1C measuring cup
- 2 cups of water
- two colors of food coloring
- turkey baster
- dry erase marker

STEP 2:

Have students label 5 glasses, one for each type of water: Ocean Water, Fresh Water from Glaciers and Ice Caps, Ground Water, Lakes and Rivers, The Atmosphere . Have them repeat this process with a second set of glasses.

STEP 3:

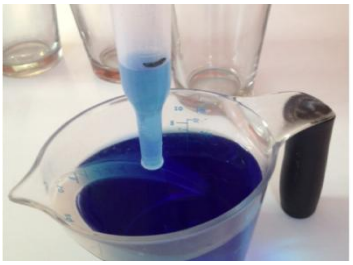
Explain to the students that you are going to look at all the world's water as if there were 1 cup of water.

STEP 4:

Have a student guesstimate what proportion of this 1C of water exists on the earth. Have him pour his guesses into each glass accordingly.

STEP 5:
Then have the student distinguish which perspectives contain drinking water by writing a “D” on the glasses.

STEP 6:
Fill measuring cup up with 1C of water and add a few drops of blue dye. Explain to the students that now you are going to look at the reality of where all the water in the world exists.

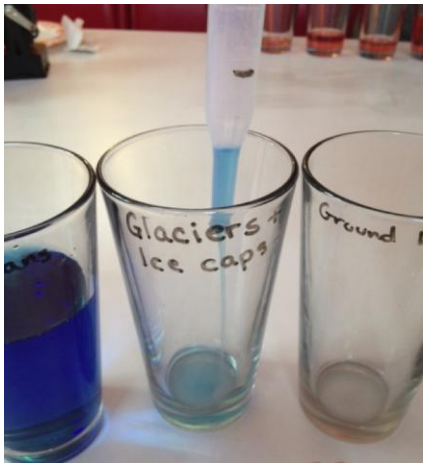


STEP 7:

Place other set of 5 cups with labels in front of class. Take the turkey baster and remove 7mL of water from the measuring cup. Set aside.

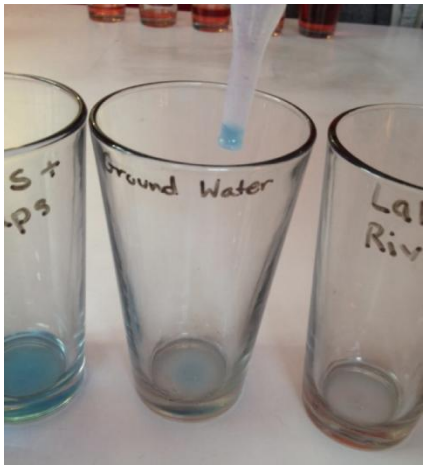
STEP 8:

Pour remaining water in the measuring cup (243mL) into the Oceans cup. Explain to the class that 97% of the Earth's water is in our oceans



STEP 9:

Take turkey baster and put about 5mL into the Glaciers and Ice Caps glass. This is 2.34% of the world's water.



STEP 10:
Take turkey baster and place all but one drop into the Ground Water glass. Ground water makes up .022% of all the world's water.

STEP 11:
Place the remaining one drop into the Lakes and Rivers glass. In all of the world, there is less than .022% of water in lakes and rivers

STEP 12:
Squeeze baster over Atmosphere glass to represent the minuscule amount of water that is in the air, less than .001%.

STEP 13:
Compare the glasses to one another.

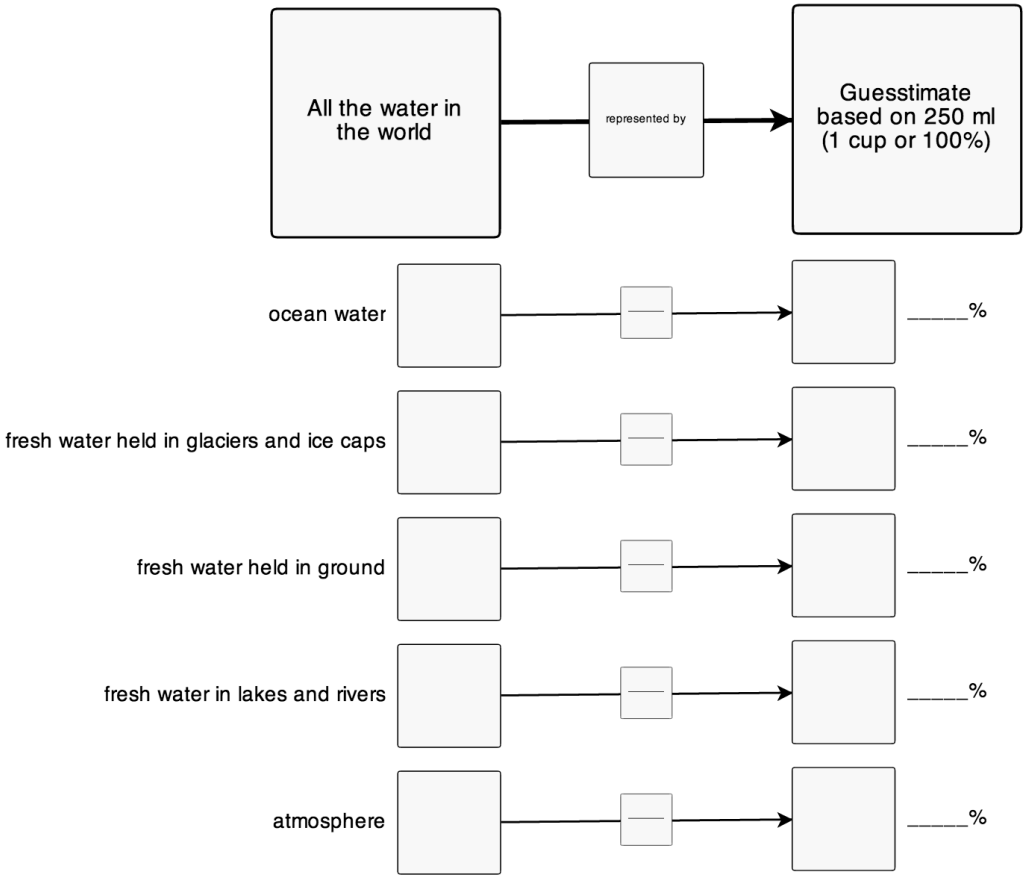
STEP 14:
Label the Ground Water and Lakes and Rivers glasses as drinkable, with a “D”. Explain why these types of water are drinkable and the others are not. Set the Guesstimation Glasses and the Reality Glasses next to one another. Students should begin to realize that compared to all of the water in the world, there really is not an abundance of drinkable, clean water for people to use.

STEP 15:

To show students another way just how little drinkable water there is compared to the water in the oceans, have a student come up and place one drop of water into their palm.

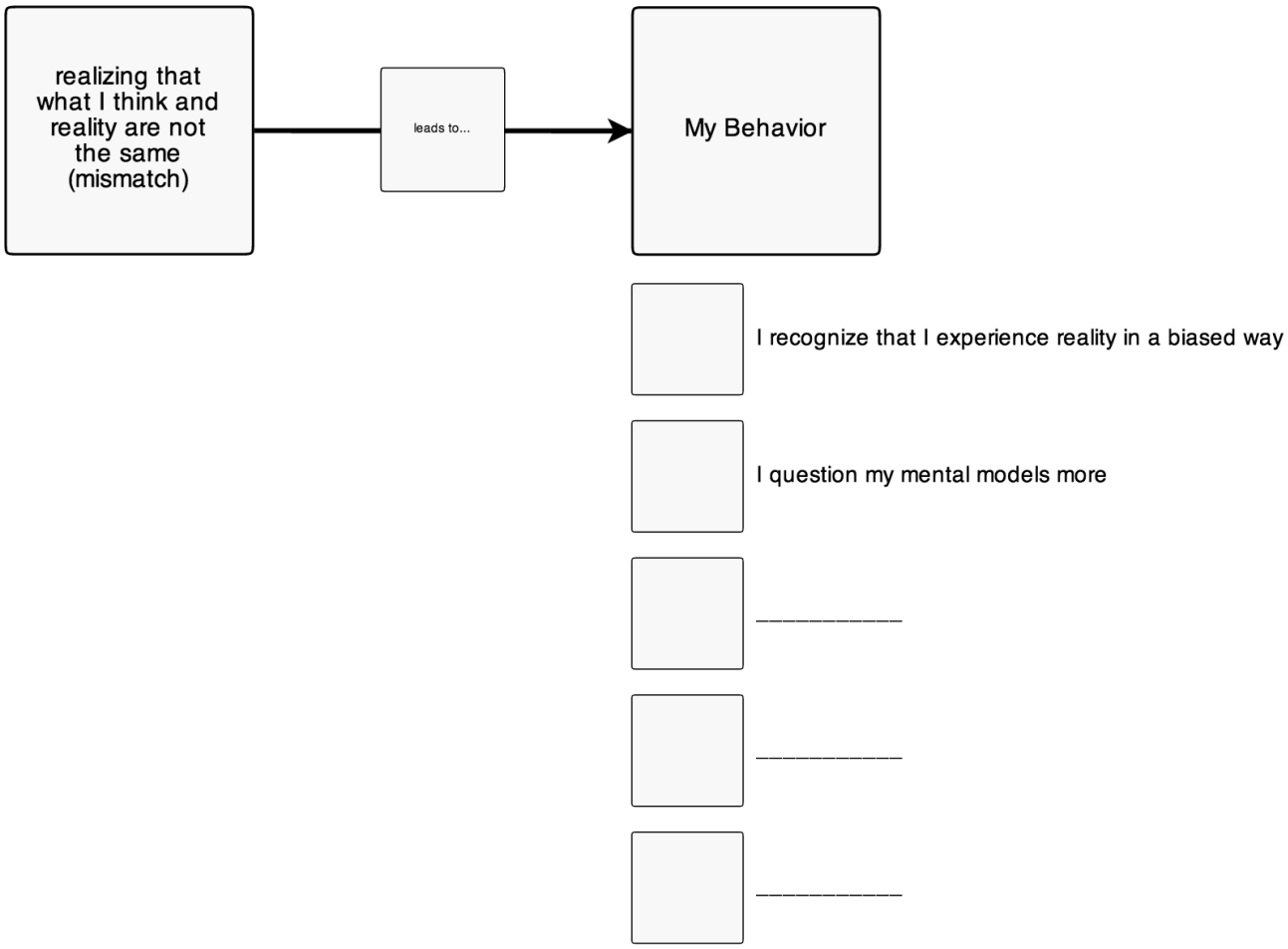
Handout 2: Guesstimate Percentages

Guesstimate what percentage of water exists on the earth in these 5 areas and fill out worksheet.



Handout 3: Effects on my behavior

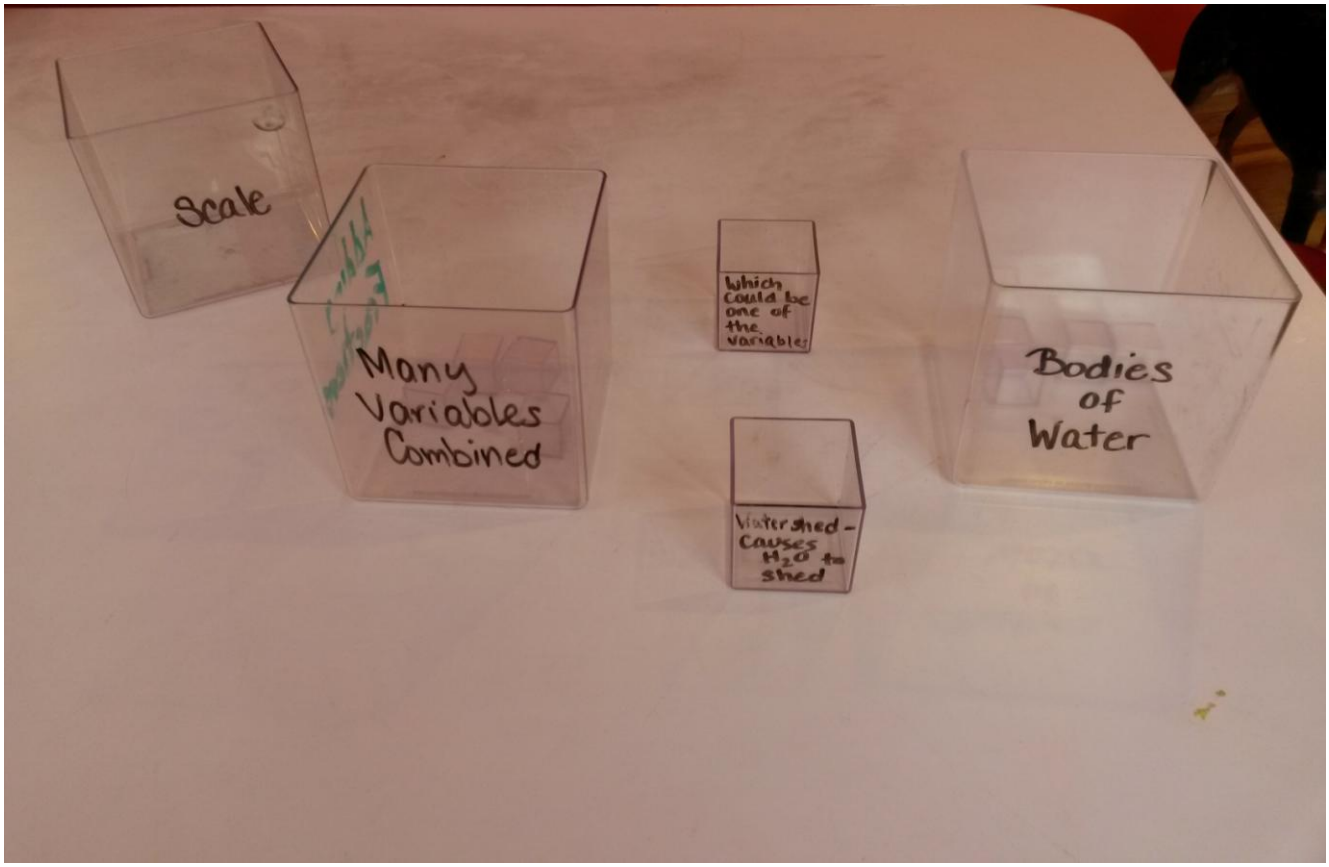
Keeping in mind the mismatch in the reality and your guesstimate what are the modifications you can make in you behavior.



Handout 1: Physical Model

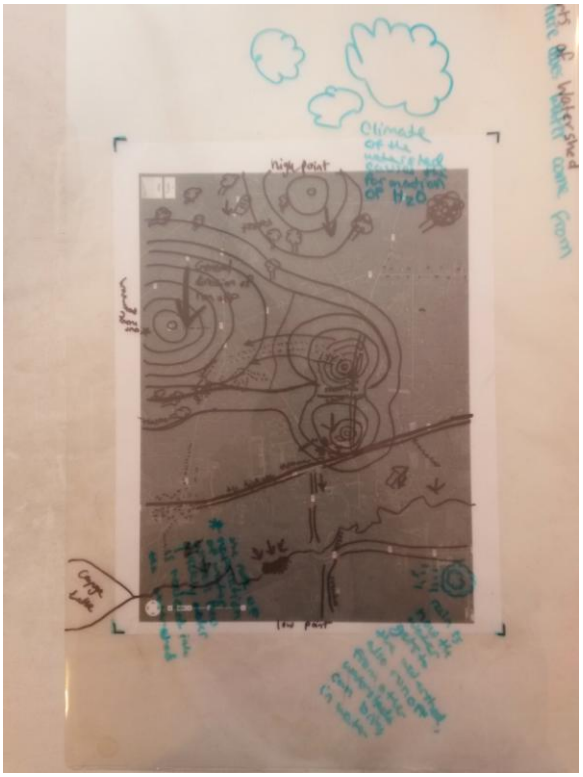
What is a Watershed?

- Build a physical model of the concept of watershed. Use two large ThinkBlocks and label “Many variables combined” and “Bodies of Water”.
- Facilitate a discussion to have students understand a watershed is the combined effect of a bunch of variables that cause water to "shed" into a body of water. Notice that the body of water where the water ends up can also be part of a larger watershed and so on, and so on. (Use 2 medium sized ThinkBlocks labeled as “a watershed - causes water to ‘shed’” and “which could be one of the variables in the larger watershed”)
- Facilitate a discussion with the students to have them understand that a watershed can be looked at from the perspective of scale. A watershed can be microscopic or as large as (or larger than!) your entire state. (Use a large ThinkBlock and label “Scale”)

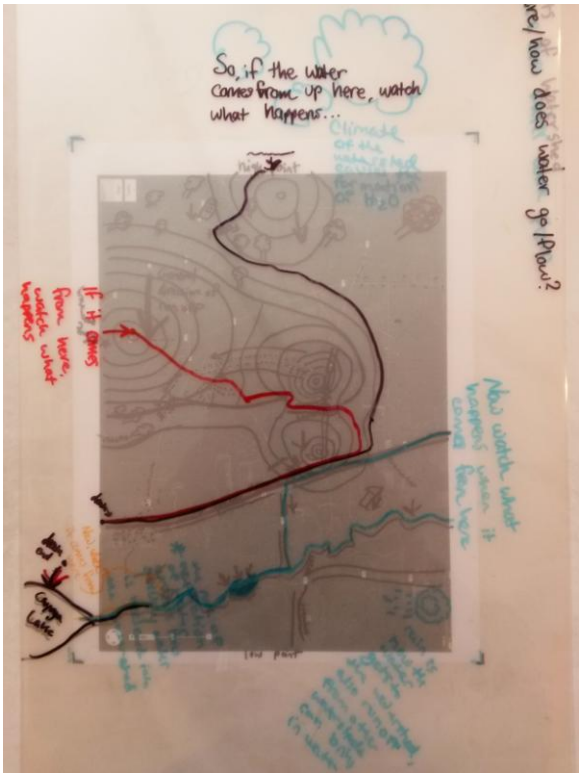


Handout 2: Mapping a Watershed

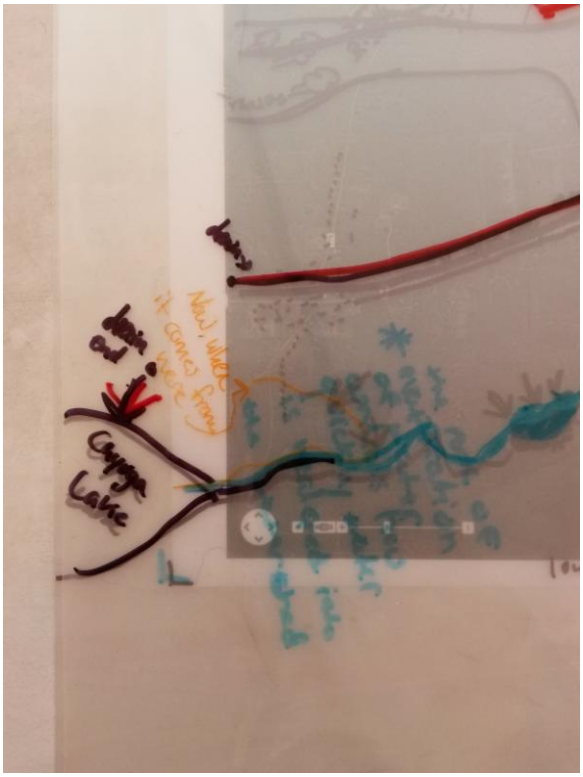
STEP 1:
Choosing a Map based on Scale



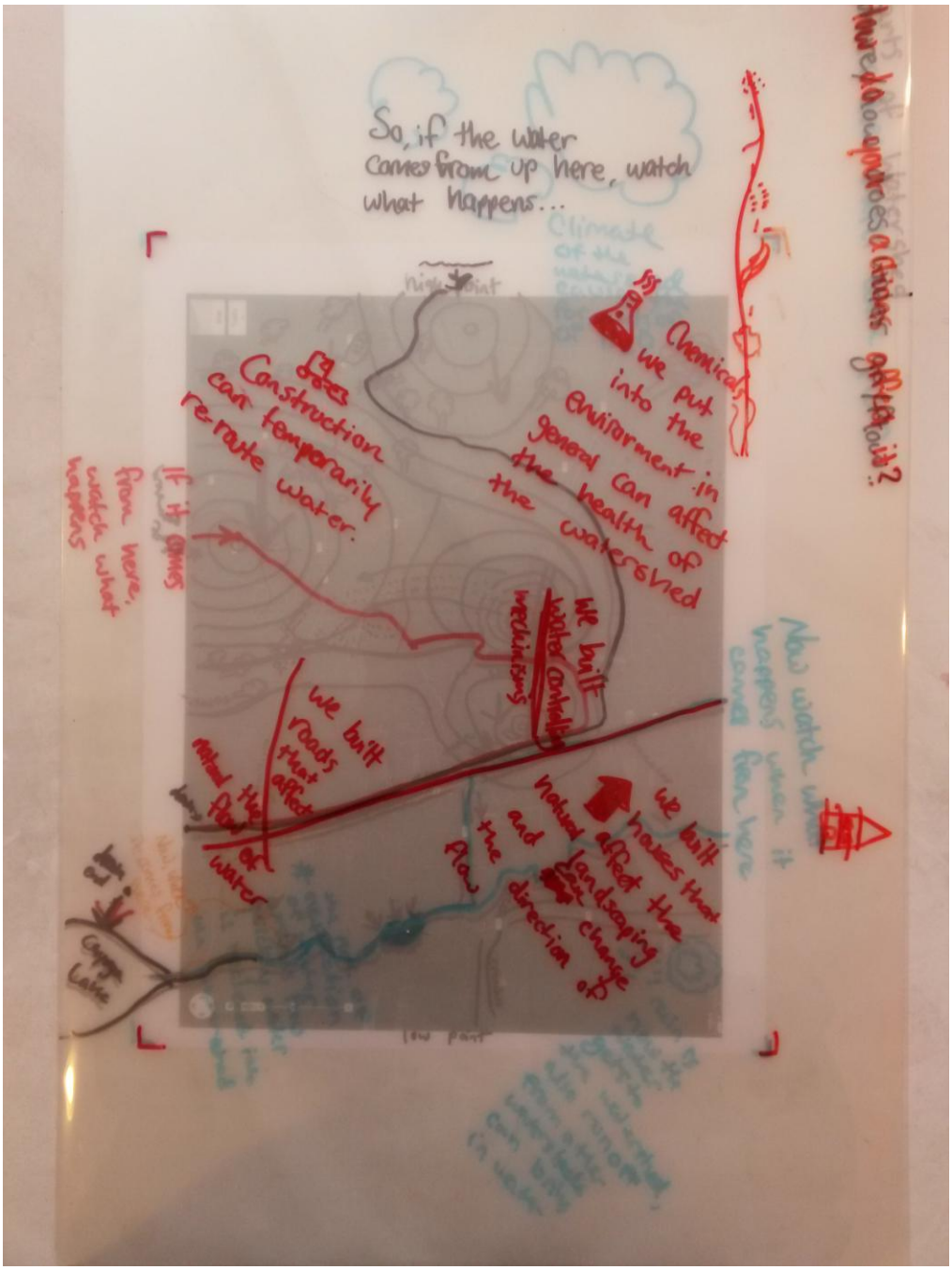
STEP 2:
Add combined variables in your area on your map



STEP 3: Draw path of drops - Watershed



STEP 4: Find the Endpoint(s) Body of Water



STEP 5: Taking Perspective

