

Watershed Workshops

Andrews Institute of Mathematics &
Science Education



Texas Christian University
College of Education

Kelly Feille, PhD

Jenesta Nettles, PhD

Morgan Stewart



COLLEGE OF
EDUCATION
ANDREWS INSTITUTE

Table of Contents

Watershed Workshops	1
Watershed Preparedness	3
Summary of Curriculum	4
Day 1: An Introduction to Natural Disasters	6
Day 2: Identifying the Problem	8
Day 3: Specify Requirements and Begin	10
Day 4: Design and Compare Plans	12
Day 5: Community Action	13
Materials and Resources	14
Presentation Slides	21

Watershed Preparedness

Grades 6-9

In this week-long workshop, alumni participants will build upon their past experiences in Watch Your Watershed, Watershed Rescue, and Diving Deeper. Using what they have learned, they will prepare a disaster response plan in committee format with regards to access to clean water. Prerequisite: Students will need to have completed Diving Deeper.

Summary of Curriculum

Day	Suggested Timing	Topic	Activities
1	8:30	Check In	
	8:45	Introductions	
	9:15	Pre-Data	
	9:45	Journal Set-Up	
	10:00	Journal Activity	Have you or someone you know been affected by a natural disaster?
	10:30	The most frustrating thing	Video and water distilling
	12:00	Dismiss	
2	8:30	Check in	
	8:45	Research Natural Disasters	
	9:30	Share Findings	
	10:00	Guest Speaker	Fort Worth CERT Program
	11:00	Debrief	
	11:30	Identify the Problem	Tornado Scenario (April 29th in East Texas)
	12:00	Dismiss	
3	8:30	Check in	
	8:45	Identify the Problem (continued)	
	9:30	Do Background Research	Focus research attention on the specific disaster
	9:45	Specify Requirements	
	10:15	Begin to develop product	
	11:40	Concept Map	
	12:00	Dismiss	
4	8:30	Check in	
	8:45	Focus Group	Present plans to focus group and get feedback

Day	Suggested Timing	Topic	Activities
	9:45	Product Development	Students use plans and feedback from focus groups to develop their product.
	12:00	Dismiss	
5	8:30	Check In	
	8:45	Campaign Examples	View examples from http://www.adcouncil.org/Our-Campaigns/Safety
	9:15	Community Action	Students compile individual projects into group campaigns
		Plan Campaign	
	11:00	Presentation	
12:00	Dismiss		

Table of Contents

Summary of Curriculum	4
Day 1: An Introduction to Natural Disasters	6
Day 2: Identifying the Problem	8
Day 3: Specify Requirements and Begin	10
Day 4: Design and Compare Plans	12
Day 5: Community Action	13
Materials and Resources	14

Day 1: An Introduction to Natural Disasters

Day	Suggested Timing	Topic	Activities
1	8:30	Check in	
	8:45	Introductions	
	9:15	Pre-Data	
	9:45	Journal Set-Up	
	10:00	Journal Activity	Have you or someone you know been affected by a natural disaster?
	10:30	The most frustrating thing	Video, water sample testing, and water distilling
	12:00	Dismiss	

*mATSI and Concept Map is used for data to investigate student perceptions of science and content understanding.

Before students arrive, ask them to collect rain or natural water samples from around where they live. You will test these samples in Day 1.

The set-up for this workshop should mirror one of a committee or conference. A smaller group of students works best as they will be working both collaboratively and individually to design a response to a natural disaster. Rather than placing students in individual groups, arranging your room in a conference room or socratic set up will work best.

In addition, this workshop relies heavily on the students having access to multiple research materials. The use of iPads/ tablets or computers is highly suggested.

Journal Activity: After introductions, any pre-data collection, and journal set up, begin by going through 10 stories of survival in natural disaster found here: <http://www.tested.com/science/earth/532871-10-incredible-stories-natural-disaster-survival/item/cameroon-limnic-eruption/>. After some discussion, ask students to think about a time when they or someone they know was affected by a natural disaster. If they don't have personal experience with this, ask them to think about natural disaster experiences they may have seen on the news or social media. Have them describe how they felt (or think they might have felt), the problems that might have arisen, and ways to address those problems. This conversation could be lengthy, but should allow students to dive into the possibilities of experiencing a natural disaster themselves. This will help to set the tone of the workshop as based in reality.

The Most Frustrating Thing: Show students the video The Most Frustrating Thing: <https://youtu.be/TH07Ap9yixw?> You may want to consider starting the video at 50 seconds (<https://youtu.be/TH07Ap9yixw?t=50s>) Talk with students about what the most frustrating thing from

the video was. Relate the conversations about water to what they have learned in previous workshops.

Gather student brought-in water samples and test them. Have students decide which tests they should perform on the water samples and why. Remember that decisions made during this workshop are made in a committee type setting, encourage discussion and come to a consensus. It is advised to at least test pH, however Coliform Bacteria, Nitrates, and Phosphates may also be tested. If you are in an urban area, it is likely that the rain water samples brought in will have a lower pH than desired. Samples from ponds, creeks, streams, etc will likely be positive for Coliform Bacteria and have high Nitrate and Phosphate levels. Discuss the results, is the available fresh water drinkable if we were to experience a disaster?

Water Distillation: Break students into pairs to have them investigate the process of water distillation. In their journals, pairs will list steps to distillation process for proof of concept (see <http://www.wikihow.com/Make-Distilled-Water> for ideas). After briefly discussing the 3 ways to clean water according to the CDC (distillation, adding bleach, boiling see Slide 5), each pair will receive materials (large pot with steam tray, 500 mL glass beaker, hot plate, water sample, ice). Discuss the availability of electricity and ice in the event of an emergency. One group will distill without ice on the inverted lid. Briefly describe the steps to distillation and then allow student pairs to investigate. Students will record their steps that they choose to follow in their investigations. Remind students of lab safety when working with heat. ****Note: Remind students of heat safety procedures and be aware of amps on hot plates. They may trip breakers if multiple plates are running for extended amounts of time.*

In pairs or independently, students will research the pros and cons to: boiling water, distillation, and/or adding bleach to water. Students may also research the water cycle and summarize the cycle. *This can be assigned as home-research if time is a factor.*

Day 2: Identifying the Problem

Day	Suggested Timing	Topic	Activities
2	8:30	Check in	
	8:45	Research Natural Disasters	
	9:30	Share Findings	
	10:00	Guest Speaker	Local disaster response team
	11:00	Debrief	
	11:30	Identify the Problem	Tornado Scenario (April 29th in East Texas)
	12:00	Dismiss	

Begin by reviewing findings of independent/paired research of pros and cons of boiling water, distillation, and/or adding bleach to water as well as the water cycle. Challenge students to use their prior knowledge to identify the benefits and drawbacks to the researched methods of cleaning water.



Referring to the website <https://www.ready.gov/kids/know-the-facts> students should research one or two types of emergencies. Use the research template page in Materials and Resources to help guide their research. As they learn about their topic, create a class mural on the types of emergencies on large papers or white board that can be referred to throughout the week.

Using your local disaster response team resources (<https://www.fema.gov/community-emergency-response-teams>), invite a speaker to talk about disaster response and what

community members should be aware of and ways they can help. If possible, ask them to at least briefly introduce the Teen CERT teams and ways for middle-to high-school aged students to get trained and get involved. After the speaker, debrief with students their take-aways, anything surprising, and/or questions they may have.

Identify the Problem: Show students a collection of videos, pictures, news stories from your chosen disaster (examples for Tornado can be found on Slide 11). Through conversation with students, have them start thinking about the potential problems as a result of the disaster. As they begin to define this, keep record on a board, computer, or poster to refer to later in the week.

Day 3: Specify Requirements and Begin

Day	Suggested Timing	Topic	Activities
3	8:30	Check in	
	8:45	Identify the Problem (continued)	
	9:30	Do Background Research	Focus research attention on the specific disaster
	9:45	Specify Requirements	
	10:15	Begin to Develop Plan	
	11:40	Concept Map*	
	12:00	Dismiss	

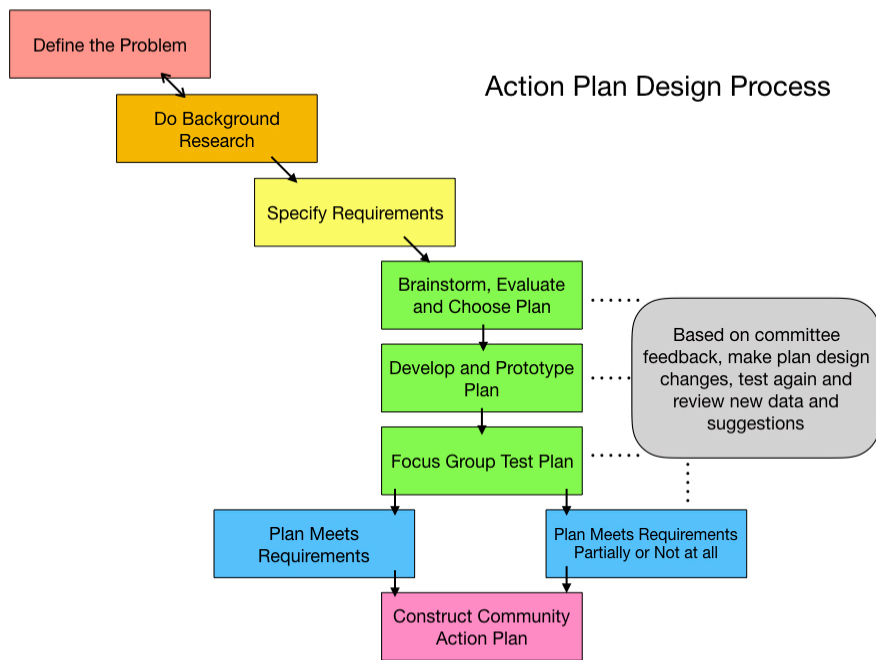
*mATSI and Concept Map is used for data to investigate student perceptions of science and content understanding.

Do Background Research: Continue the discussion regarding your scenario and possible problems that they may face before, during, and after the disaster. Rely on students' background knowledge and research conducted on Day 1 and Day 2. Pictures, videos, and news stories can continue to be a good reference to help students understand the possible impact if they are unfamiliar with the disaster. Keep notes in a space that is viewable by all students to refer to throughout the remainder of the week.

Specify Requirements: Once students have a firm grasp on the research of the disaster, move into specifying the requirements for their plan (See slide 16).

Brainstorming a Solution: In committee format, have students begin to construct a Table Top plan (see <https://www.fema.gov/emergency-planning-exercises>). Encourage students to practice sharing ideas and listening critically to the suggestions of the committee. Guide the discussion through questioning and scenario ideas, but try not to guide the conversation using your own preconceived ideas. Allow students to work through ideas and misconceptions on their own, relying on the group to construct a solid start to their plans. As a way to warm the students up to the exercise, provide them with mini-scenarios from other disasters (see Page 15 of Grades 9-12 Be a Hero Curriculum <https://www.fema.gov/media-library/assets/documents/100926>).

Develop and Prototype Plan: Using the large-scale disaster scenario as well as individual scenarios (see Materials and Resources for examples), students begin to develop an individually constructed prototype action plan. Encourage them to be creative with how they



would construct and deliver their plan (think brochures, Public Service Announcement, etc). You may use the Emergency Preparedness Planning Sheet to guide them (see Materials and Resources).

Encourage students to share their plans at multiple points in Focus Groups. Using comments, questions, and suggestions from the Focus Group, students should revise their plan to ensure all requirements are included and the dissemination of their plan will best serve the defined problem.

Day 4: Design and Compare Plans

Day	Suggested Timing	Topic	Activities
4	8:30	Check in	
	8:45	Focus Group	Present plans to focus group and get feedback
	9:45	Product Development	Students use plans and feedback from focus groups to develop their product.
	12:00	Dismiss	

Each student should present their *plan* for a final project to the large group. As a focus group, others can provide suggestions, feedback, and ask questions. You may choose to use the provided Focus Group Feedback templates (found in Materials and Resources) and assign students 2-4 group members to give detailed feedback to. Encourage students to focus on *how* they are going to share the information (i.e. page 1 of the brochure will give disaster facts and myths, page 2 will talk about safety prep before the disaster, or the first 10 seconds of the PSA will give facts and myths of the disaster, the next 15 seconds will show how to prepare before disaster strikes, etc).

If students need to make adjustments to their plan based on feedback from the focus group, have them do so and check in with one or two group members before proceeding to make sure the plan meets requirements. Once students are confident their plan meets requirements and passes the focus group test, have them create their product.

Each student should end the day with a completed product (brochure, PSA, video, booklet, etc). These final projects will be used to construct a Community Action Plan the next time they meet.

Day 5: Community Action

Day	Suggested Timing	Topic	Activities
5	8:30	Check In	
	8:45	Campaign Examples	View examples from http://www.adcouncil.org/Our-Campaigns/Safety
	9:15	Community Action Plan Campaign	Students compile individual projects into group campaigns
	10:40	Post Data*	
	11:00	Presentation	
	12:00	Dismiss	

*mATSI and Concept Map is used for data to investigate student perceptions of science and content understanding.

Campaign Plan: With the students, visit the page <http://www.adcouncil.org/Our-Campaigns/Safety> and explore several of the available campaigns. Encourage students to attend to the multiple media forms included in each campaign and notice how a unifying theme moves throughout the entire campaign. Once they have seen several examples, break them into small groups to create their Community Action Plan campaign.

Beginning with their individual products, students should create a Community Action Plan campaign. They may consider adding in additional media (such as a radio spot, commercial, or flyer) if they have a limited variety of media going into the plan. This final Community Action Plan will be presented to parents and guests at the close of the workshop.

Materials and Resources

Student Research Resources:

- <https://www.ready.gov/kids/know-the-facts>

CERT Resources:

- <https://www.fema.gov/community-emergency-response-teams>

FEMA's Be a Hero Curriculum:

- <https://www.fema.gov/media-library/assets/documents/34411>

Tornado Large Scale Disaster Scenario Example:

After an unusually cool spring, the Fort Worth area has been the target of several days of unpredictable weather patterns. Warm air from the south has encountered the cooler temperatures of the north leading to unstable air.

Throughout the day on April 3, several strong thunderstorms have ripped through Tarrant County causing flooding in low lying areas and minor power outages due to high winds. Heavy rain, severe lightning and small to golf ball-sized hail were reported.

Around 4:00 p.m. the National Weather Service issued a Tornado Watch indicating conditions were favorable for tornado activity. At 6:00 p.m. weather spotters reported a funnel cloud had touched down near Interstate 35.

By 6:30 p.m. the tornado left 15 miles of destruction including widespread power outages, flooding and significant structural damage to homes, barns and a few businesses. Downed power lines and debris have led the County Sheriff to close roads throughout the County.

Assumptions

- Local fire, law enforcement and EMS are responding to multiple incidents and resources are limited. Fire and EMS have activated mutual aid agreements with nearby jurisdictions.
- As a result of the tornado, approximately 300 families are without housing and more than 10,000 residents are without power. Wind and downed trees have damaged nearly all of the electric transmission lines within the hardest hit areas. Power companies will work around the clock to restore power. Initial estimates indicate it may take up to 7-10 days to accomplish. Additional utility providers have been requested by the Power Company through mutual assistance agreements from 5 States.
- Most of the shrubbery and trees within the storm's path have been damaged or destroyed, generating a massive amount of debris. Debris has also been generated from structural damage.
- Roadways are affected for up to 5 days while debris is being removed. Debris clearance, removal and disposal operations will be required for up to 30 days.
- Communication systems including telephones, radios and cellular systems are operating at 90% capacity.
- The Tarrant County Emergency Operations Center has opened.

- The American Red Cross in conjunction with the Tarrant County Emergency Management Agency has activated shelter sites for displaced citizens as part of the Tarrant County Emergency Operations Plan. Shelter residents will need assistance with replacing medications, medical supplies and medical equipment.
- There is a risk for hazardous materials contamination in many areas.
- Several businesses are without power and have experienced substantial structural damage forcing them to close for an estimated 10 days.
- Flash flooding has affected small streams and creeks throughout the County.
- Sanitation issues (i.e. sewer back-ups, septic tanks, etc.) persist due to localized flooding.
- Several school buildings have sustained minor damage; however, transportation is restricted due to closed roadways.

Tornado Individual Scenarios Examples:

1. Your neighborhood is fine. A couple shingles are missing from roofs and some trees are down but there is no power or water.
2. Five houses on your street, including yours, are in various stages of damage from missing roofs to all but one wall and a few interior rooms remaining.
3. Only the foundation of your house is left. Your neighbor's house is also destroyed.
4. The neighbor on your left is missing their roof. Your house is only missing the top of your chimney and some shingles. The neighbor on the right is missing the roof and two walls.
5. A tree in your front yard has crashed through your neighbor's house. All the windows in the front of your house and your neighbor's house are missing.
6. After the tornado, power lines are down in your backyard and a tree has fallen through your roof.
7. Your house has no roof after the tornado blew through. Your neighbor is missing some windows.
8. Your house has no damage but your neighbor's house is missing a wall and the roof.

Disaster Research

My Topic: _____

Brief Description:

2 Interesting Facts:

What to do before?

What to do during?

What to do after?

Emergency Preparedness Planning Sheet

Problem: What is the problem I am trying to solve?

Solution/Concept: What is my solution? What is my campaign plan?

Target Audience: Whom do I want to see and respond to my campaign?

Key Message: What is the key message I want my audience to take away from this campaign?

Facts & Research: What other information is important for the audience to know or understand?

Call to Action: What do I want my target audience to do after they see my campaign?

Distribution Channel: How and where will people see my campaign?

Focus Group Feedback

Delivery Format (i.e. brochure, PSA, etc)

Does the plan:			
Yes	or	No	Identify what do before the disaster?
Yes	or	No	Identify what to do during the disaster?
Yes	or	No	Identify what to do after the disaster?
Yes	or	No	Describe common misconceptions?
Yes	or	No	Describe the realities of the disaster?

Comments:

Delivery Format (i.e. brochure, PSA, etc)

Does the plan:			
Yes	or	No	Identify what do before the disaster?
Yes	or	No	Identify what to do during the disaster?
Yes	or	No	Identify what to do after the disaster?
Yes	or	No	Describe common misconceptions?
Yes	or	No	Describe the realities of the disaster?

Comments:

Presentation Slides

Watershed Preparedness

- Welcome! We are glad you are here.
- Please begin creating a Title Page on the first page of your journal.
 - The title of our workshop is “Watershed Preparedness”
 - You may design your title page any way you would like, but make sure it has:
 - A Title
 - Your Name



COLLEGE OF
EDUCATION

ANDREWS INSTITUTE

Introductions

Let's talk...

Let's talk...

Have you or someone you know ever experienced an emergency or natural disaster?

Let's talk...

Have you or someone you know ever experienced an emergency or natural disaster?

What makes survival after a natural disaster hard?

Let's talk...

Have you or someone you know ever experienced an emergency or natural disaster?

What makes survival after a natural disaster hard?

The most frustrating thing



The most frustrating thing



The most frustrating thing



The most frustrating thing



<https://youtu.be/TH07Ap9yixw?t=50s>

The most frustrating thing



<https://youtu.be/TH07Ap9yixw?t=50s>

What is the most frustrating thing from the video?



Drink Safe Water

After a natural disaster, water may not be safe to use. Germs and chemicals may be in the water. Listen to local officials to find out if your water is safe.

Things you should do

- Listen for announcements from local officials to find out what to do. They will tell you if there are germs and/or chemicals in the water.
- Boil water if instructed. Boil it for at least 1 minute (start counting when the water comes to a constant boil). Let the water cool sufficiently before drinking. Boiling kills germs in the water.
- Use bottled water if instructed. Sometimes after a disaster, there may be chemicals in the water that boiling cannot remove.

Ways to feed your baby

- Breast-feed or use ready-made formula.
- If you must use water to make formula, use only commercially-bottled water until officials say your tap water is safe to drink.

Things you should never do

- Never** drink the water unless you know it is safe.
- Never** wash or clean dishes, utensils, toys, or other objects in the water unless you know it is safe.
- Never** bathe in the water unless you know it is safe.
- Never** cook with the water unless you know it is safe.
- Never** brush your teeth with the water unless you know it is safe.
- Never** use the water to make ice unless you know it is safe.



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

For more information on safe water after a natural disaster, please visit <http://www.cdc.gov/healthywater/emergency/drinking/emergency-water-supply-preparation.html>



Make Water Safe

After a natural disaster, water may not be safe to drink.

Listen to local officials to find out if your water is safe.

Adding some bleach helps make water safe to use.

If tap water is clear:

- Use bleach that does not have an added scent (like lemon).
- Add 1/8 teaspoon (8 drops or about 0.75 milliliters) of household liquid bleach to 1 gallon (16 cups) of water.
- Mix well and wait 30 minutes or more before drinking.

If tap water is cloudy:

- Use bleach that does not have an added scent (like lemon).
- Add 1/4 teaspoon (16 drops or 1.5 milliliters) of household liquid bleach to 1 gallon (16 cups) of water.
- Mix well and wait 30 minutes or more before drinking.

Remember that containers may need to be sanitized before using them to store safe water:

- Use bleach that does not have an added scent (like lemon).
- Add 1 teaspoon (64 drops or 5 milliliters) of household liquid bleach to 1 quart (32oz, 4 cups, or about 1 liter) of water.
- Pour this into a clean storage container and shake well, making sure that the solution coats the entire inside of the container.
- Let sit at least 30 seconds, and then pour out solution.
- Let air dry OR rinse with clean water that has already been made safe, if available.

- Never mix bleach with ammonia or other cleaners.**
- Open windows and doors to get fresh air when you use bleach.**



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

For more information on water use after a natural disaster, please visit <http://www.cdc.gov/healthywater/emergency/drinking/emergency-water-supply-preparation.html>

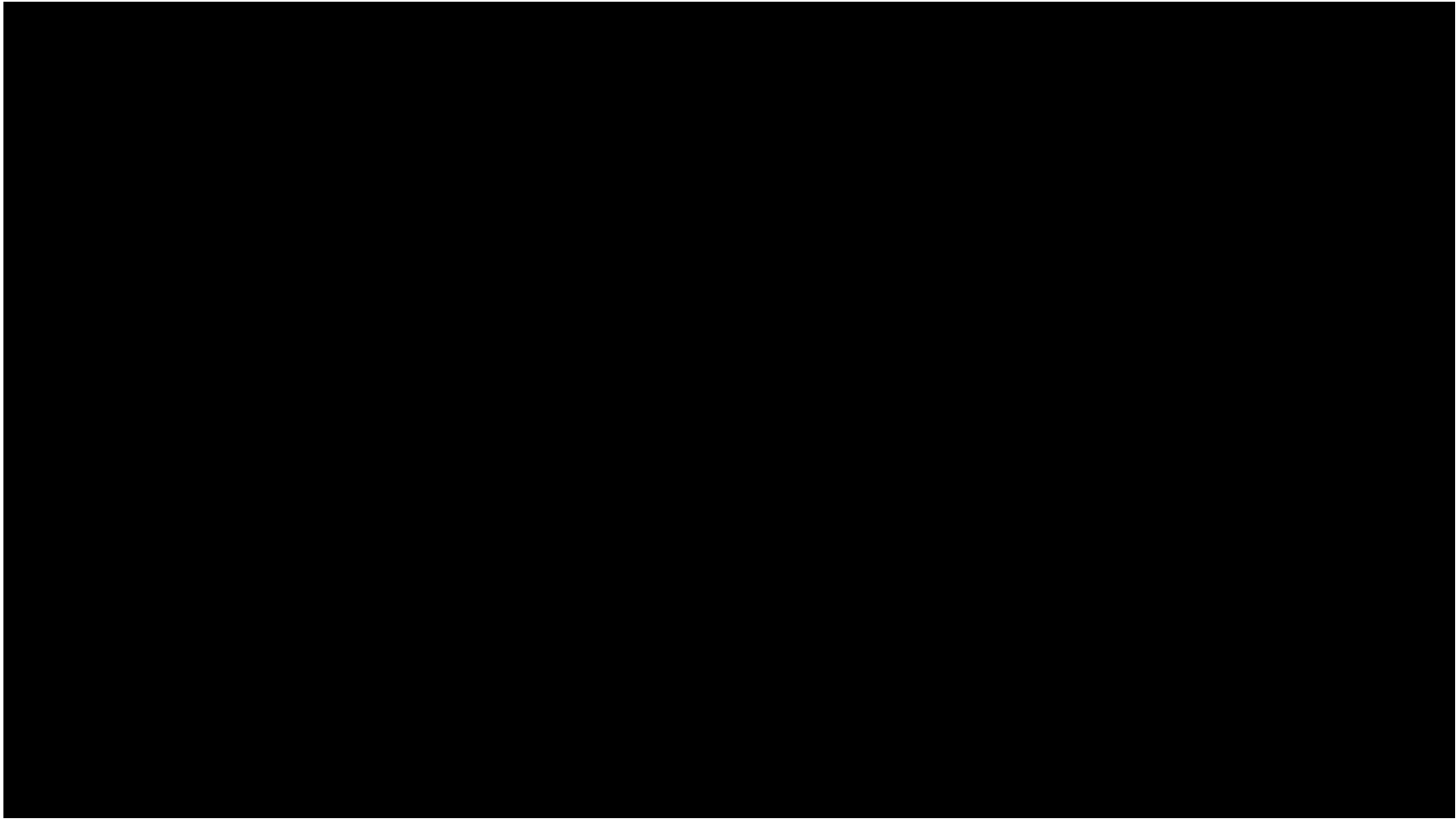
Day 2

What is the difference between an emergency and a natural disaster?

What is the difference between an emergency and a natural disaster?

- <https://www.ready.gov/kids/know-the-facts>
- <https://www.ready.gov/kids/maps>
- FEMA-Federal Emergency Management Agency

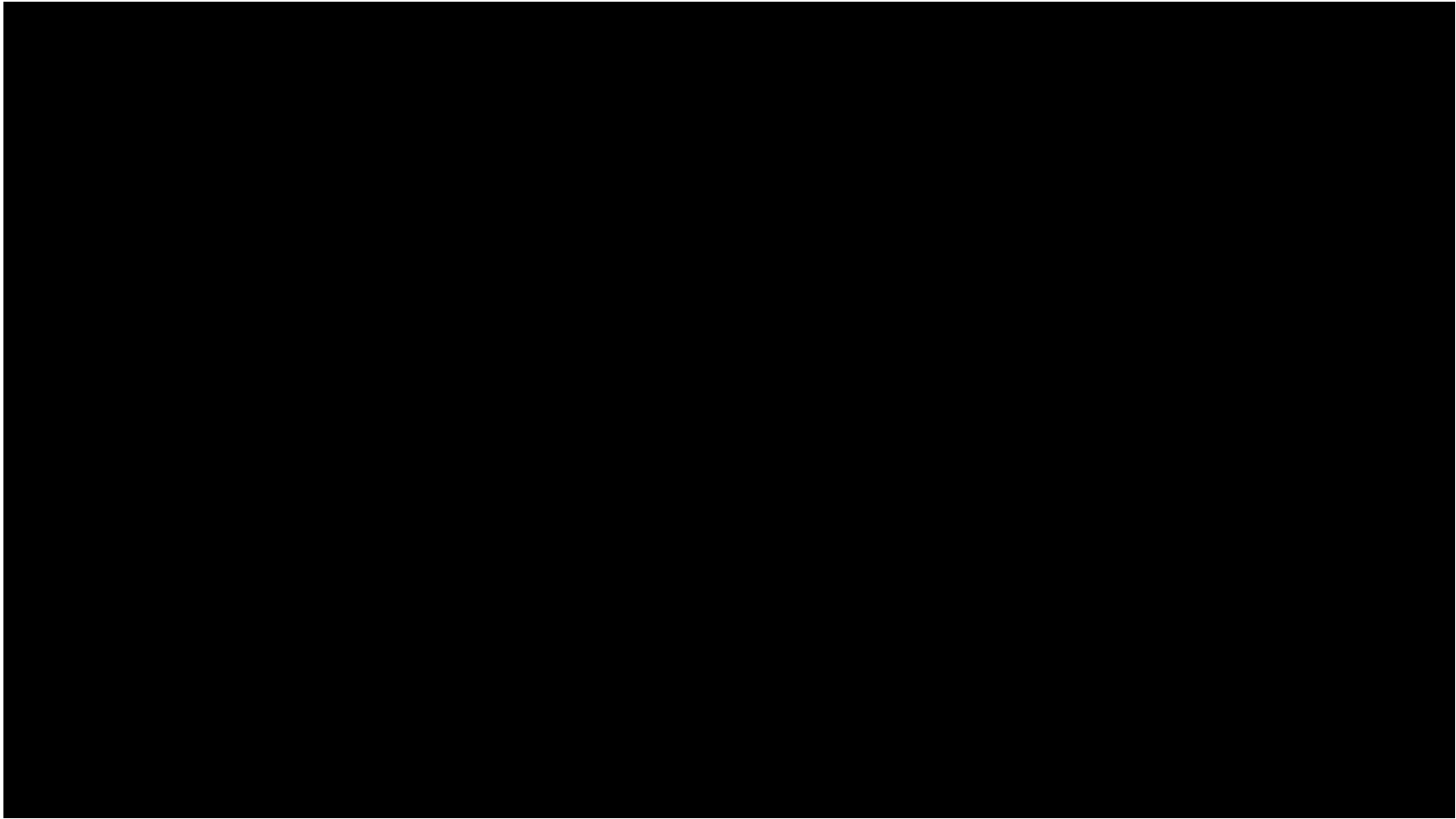
Common Texas Natural Hazards



CERT

What can you do to help

<https://www.fema.gov/media-library/assets/videos/79202>

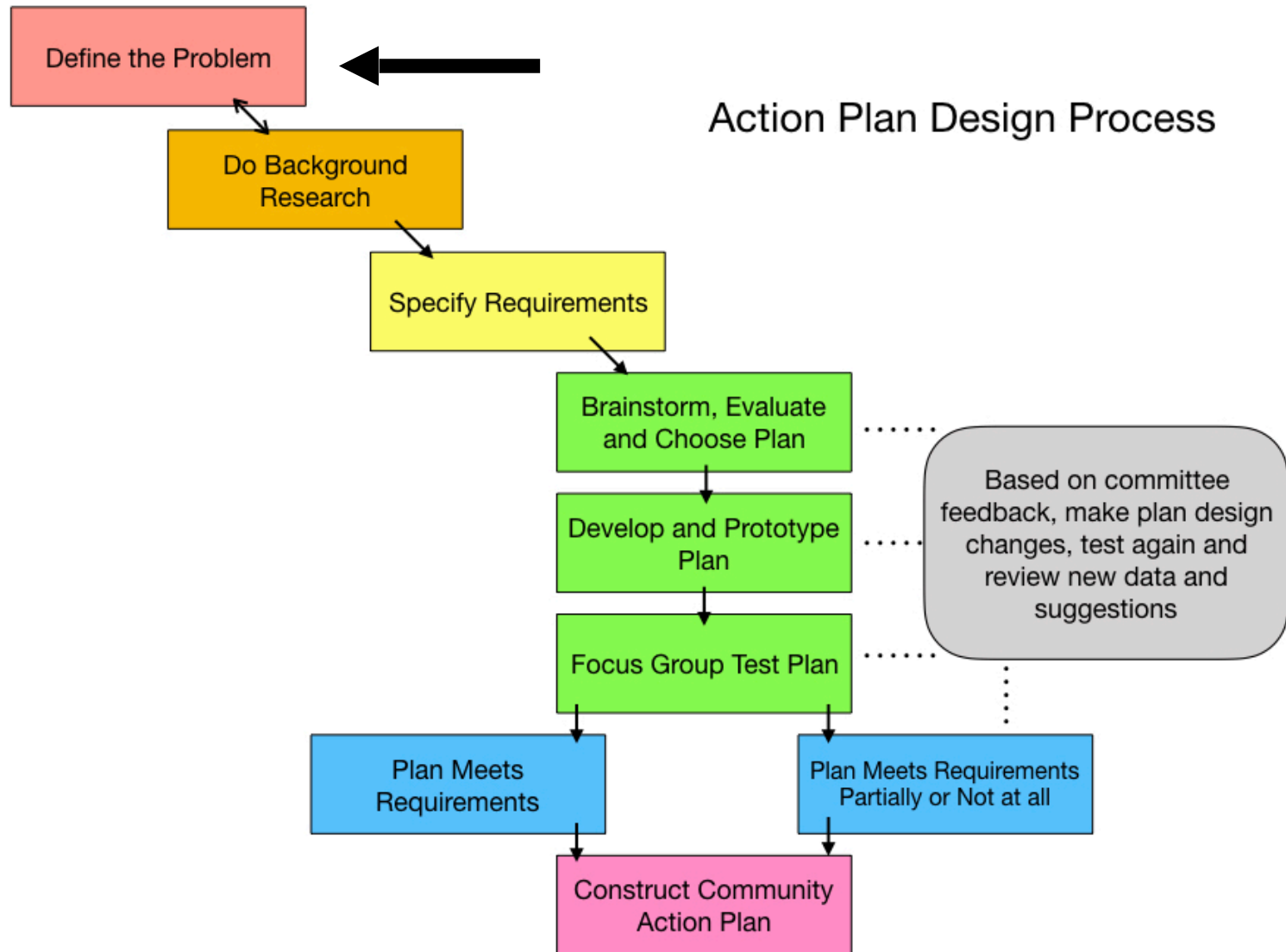


CERT

What can you do to help

<https://www.fema.gov/media-library/assets/videos/79202>

Watershed Preparedness



Texas Tornado

April 29th, 2017

<http://kegl.iheart.com/articles/info-466813/canton-tornados-ways-you-can-help-15786858/>

- **Stop at 50 seconds**

<https://www.dallasnews.com/news/weather/2017/04/29/tornados-rip-canton-van-zandt-county-killing-least-five-injuring-dozens>

<http://www.wfaa.com/news/disaster-declaration-issued-for-van-zandt-county-following-tornadoes/435300032>



NBC 5 News



NBC 5 News



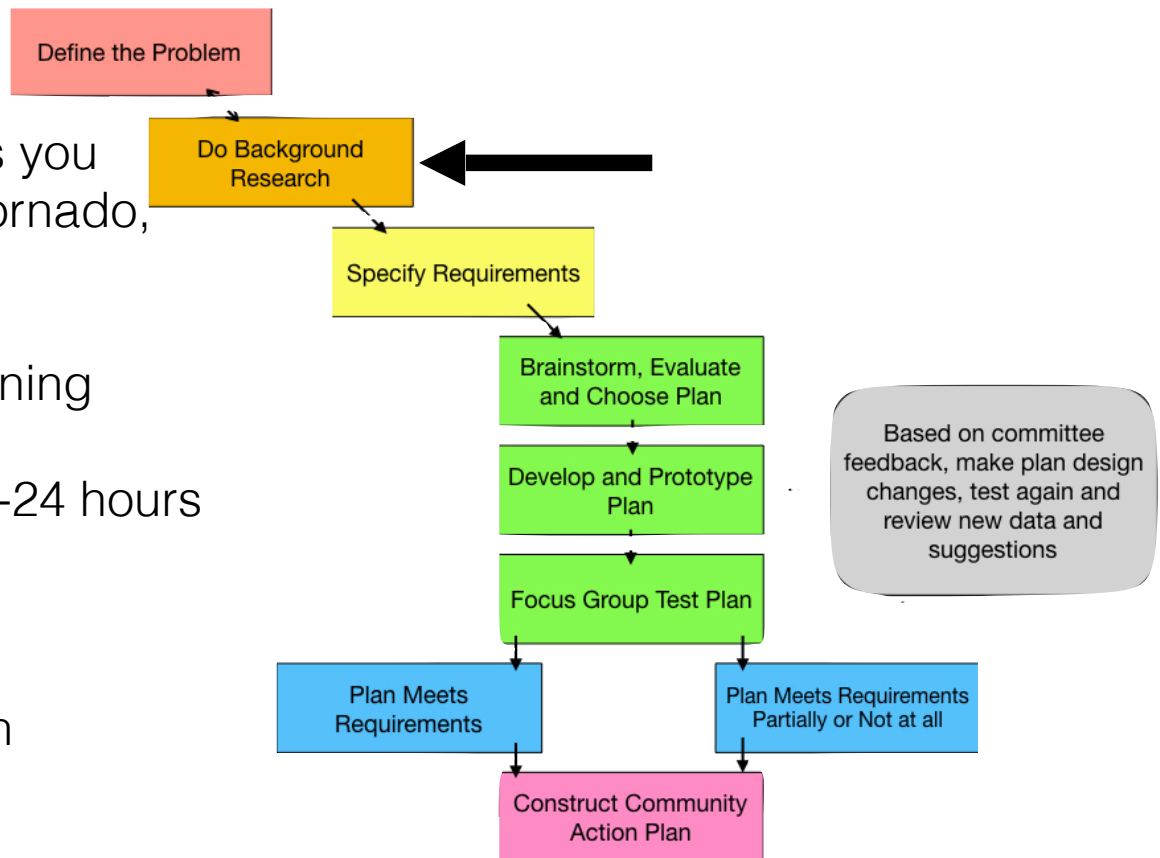
Texas Sky Ranger



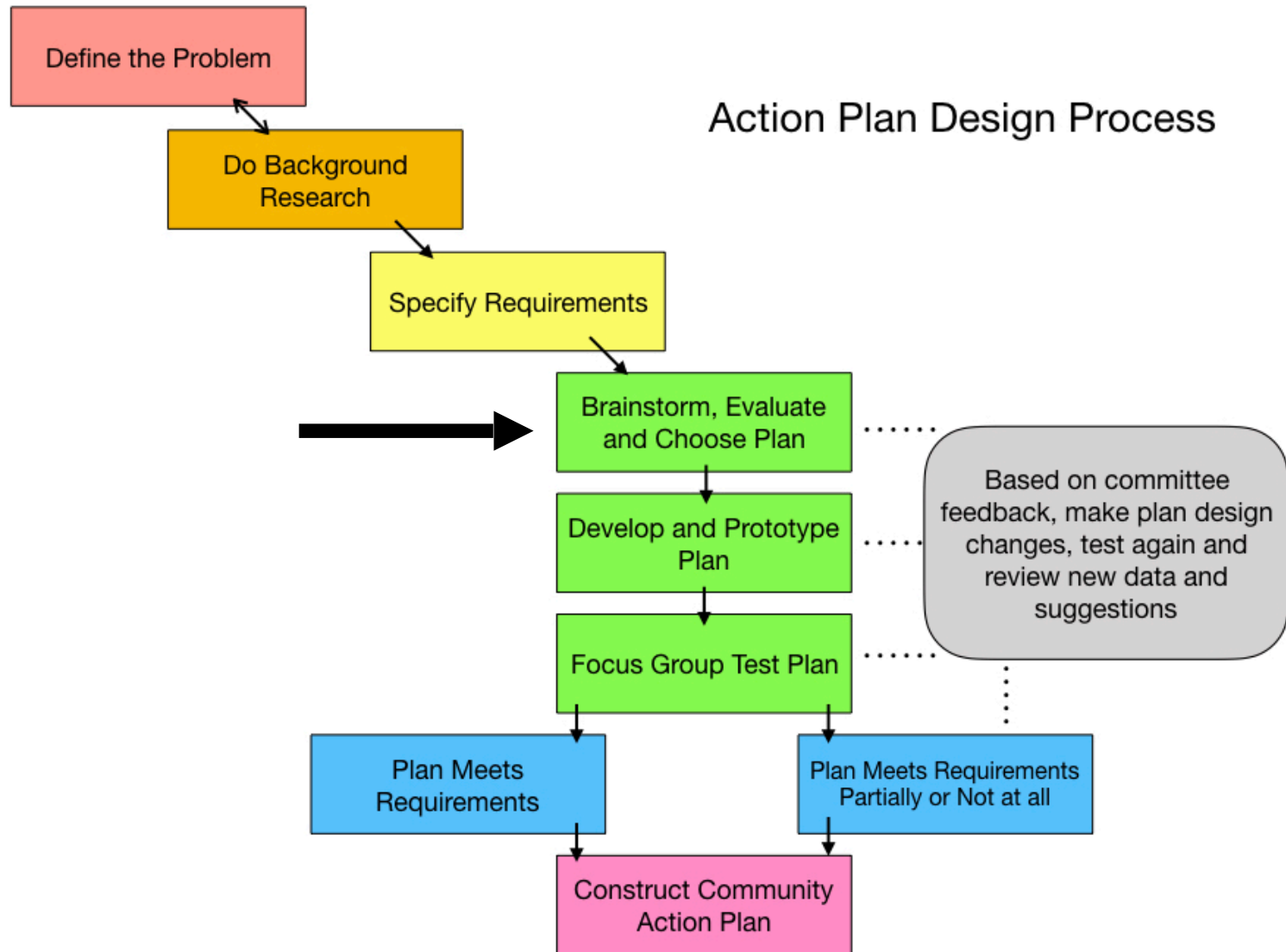
Texas Sky Ranger

Watershed Preparedness

- Identify what to do:
 - Before- now, as soon as you know you may have a tornado, and as it is coming
 - During-while it is happening
 - After-during the next 12-24 hours
- Myths and Realities
 - What are some common misconceptions?
 - What are some less know realities?



Watershed Preparedness



After an unusually cool spring, the **Fort Worth area** has been the target of several days of unpredictable weather patterns. Warm air from the south has encountered the cooler temperatures of the north leading to unstable air.

Throughout the day on **April 3**, several strong thunderstorms have ripped through **Tarrant County** causing flooding in low lying areas and minor power outages due to high winds. Heavy rain, severe lighting and small to golf ball-sized hail were reported.

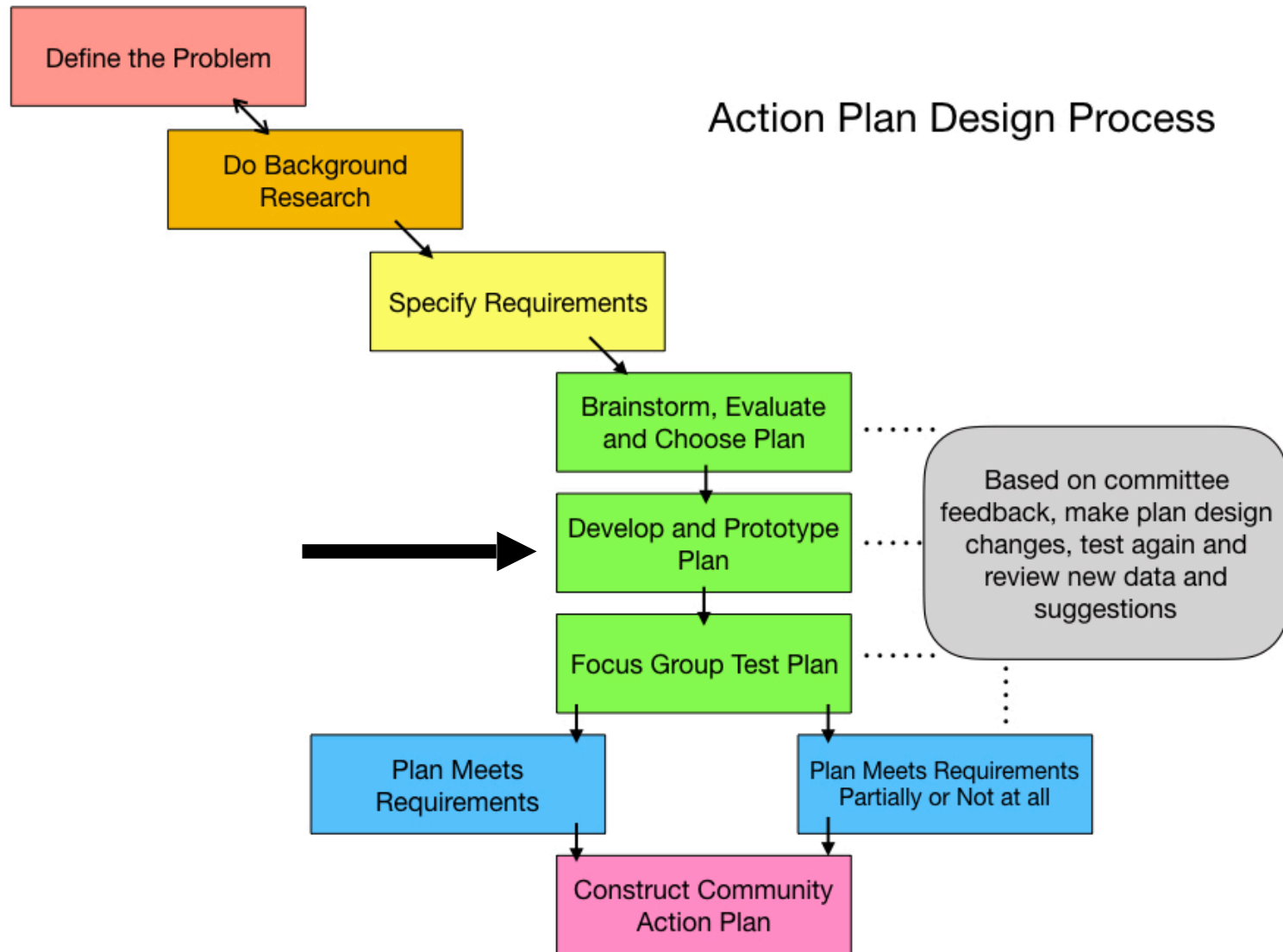
Around **4:00 p.m.** the National Weather Service issued a Tornado Watch indicating conditions were favorable for tornado activity. At **6:00 p.m.** weather spotters reported a funnel cloud had touched down near Interstate 35.

By **6:30 p.m.** the tornado left 15 miles of destruction including widespread power outages, flooding and significant structural damage to homes, barns and a few businesses. Downed power lines and debris have led the County Sherriff to close roads throughout the County.

Assumptions

- Local fire, law enforcement and EMS are responding to multiple incidents and resources are limited. Fire and EMS have activated mutual aid agreements with nearby jurisdictions.
- As a result of the tornado, approximately 300 families are without housing and more than 10,000 residents are without power. Wind and downed trees have damaged nearly all of the electric transmission lines within the hardest hit areas. Power companies will work around the clock to restore power. Initial estimates indicate it may take up to 7-10 days to accomplish. Additional utility providers have been requested by **the** Power Company through mutual assistance agreements from 5 States.
- Most of the shrubbery and trees within the storm's path have been damaged or destroyed, generating a massive amount of debris. Debris has also been generated from structural damage.
- Roadways are affected for up to 5 days while debris is being removed. Debris clearance, removal and disposal operations will be required for up to 30 days.
- Communication systems including telephones, radios and cellular systems are operating at 90% capacity.
- The **Tarrant** County Emergency Operations Center has opened.
- The American Red Cross in conjunction with the Tarrant County Emergency Management Agency has activated shelter sites for displaced citizens as part of the **Tarrant** County Emergency Operations Plan. Shelter residents will need assistance with replacing medications, medical supplies and medical equipment.
- There is a risk for hazardous materials contamination in many areas.
- Several businesses are without power and have experienced substantial structural damage forcing them to close for an estimated 10 days.
- Flash flooding has affected small streams and creeks throughout the County.
- Sanitation issues (i.e. sewer back-ups, septic tanks, etc.) persist due to localized flooding.
- Several school buildings have sustained minor damage; however, transportation is restricted due to closed roadways.

Watershed Preparedness



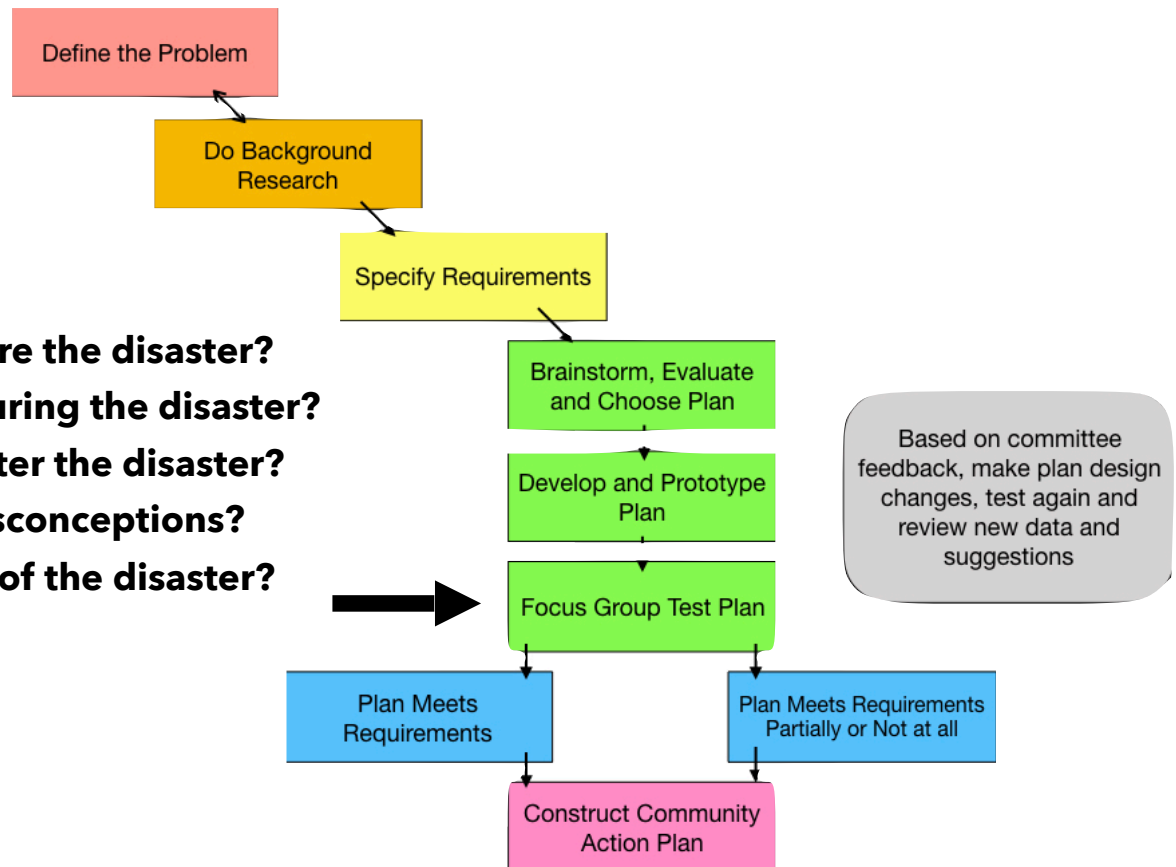
Watershed Preparedness

Delivery Format (i.e. Brochure, PSA, etc)

Does the plan:

- Yes or No **Identify what do before the disaster?**
- Yes or No **Identify what to do during the disaster?**
- Yes or No **Identify what to do after the disaster?**
- Yes or No **Describe common misconceptions?**
- Yes or No **Describe the realities of the disaster?**

Comments:



Watershed Preparedness

