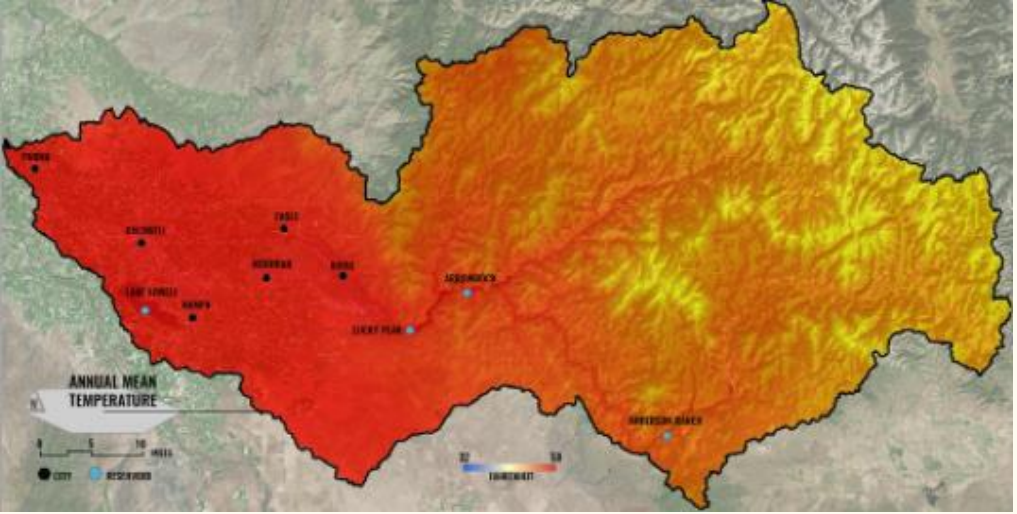
Idaho-Based Climate Change

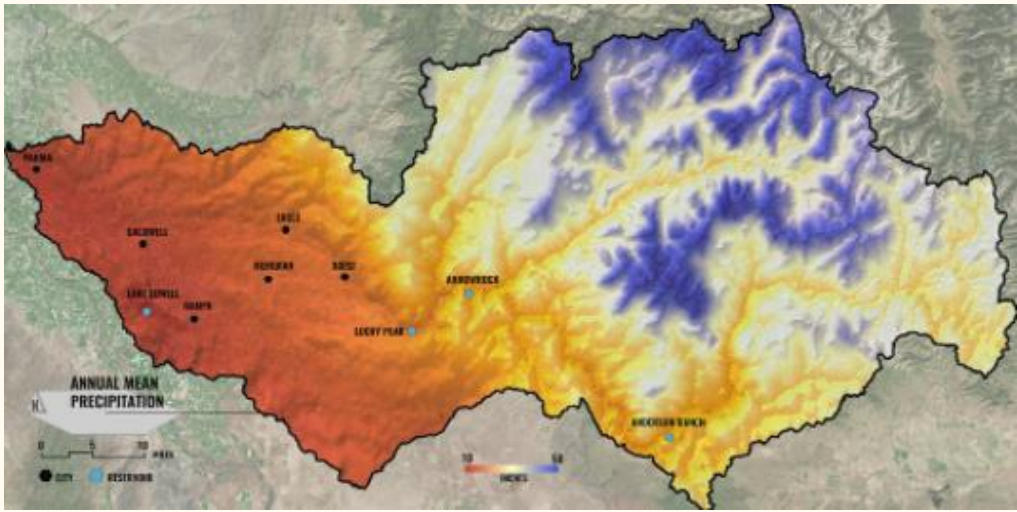
Climate is changing - this is known. How will climate change affect people here in the Treasure Valley?

Let’s think about water…

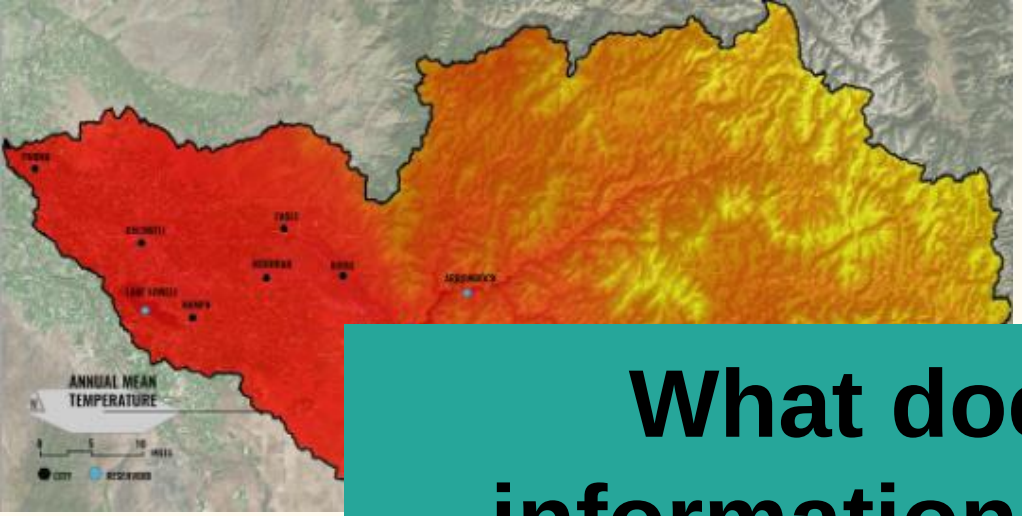


Differences in annual mean temperature in the upper and lower Boise River Basin

Differences in annual mean precipitation



https://boisestate.maps.arcgis.com/apps/Cascade/index.html?appid=11e5a118e5794c5fa1b574b91853ca9c

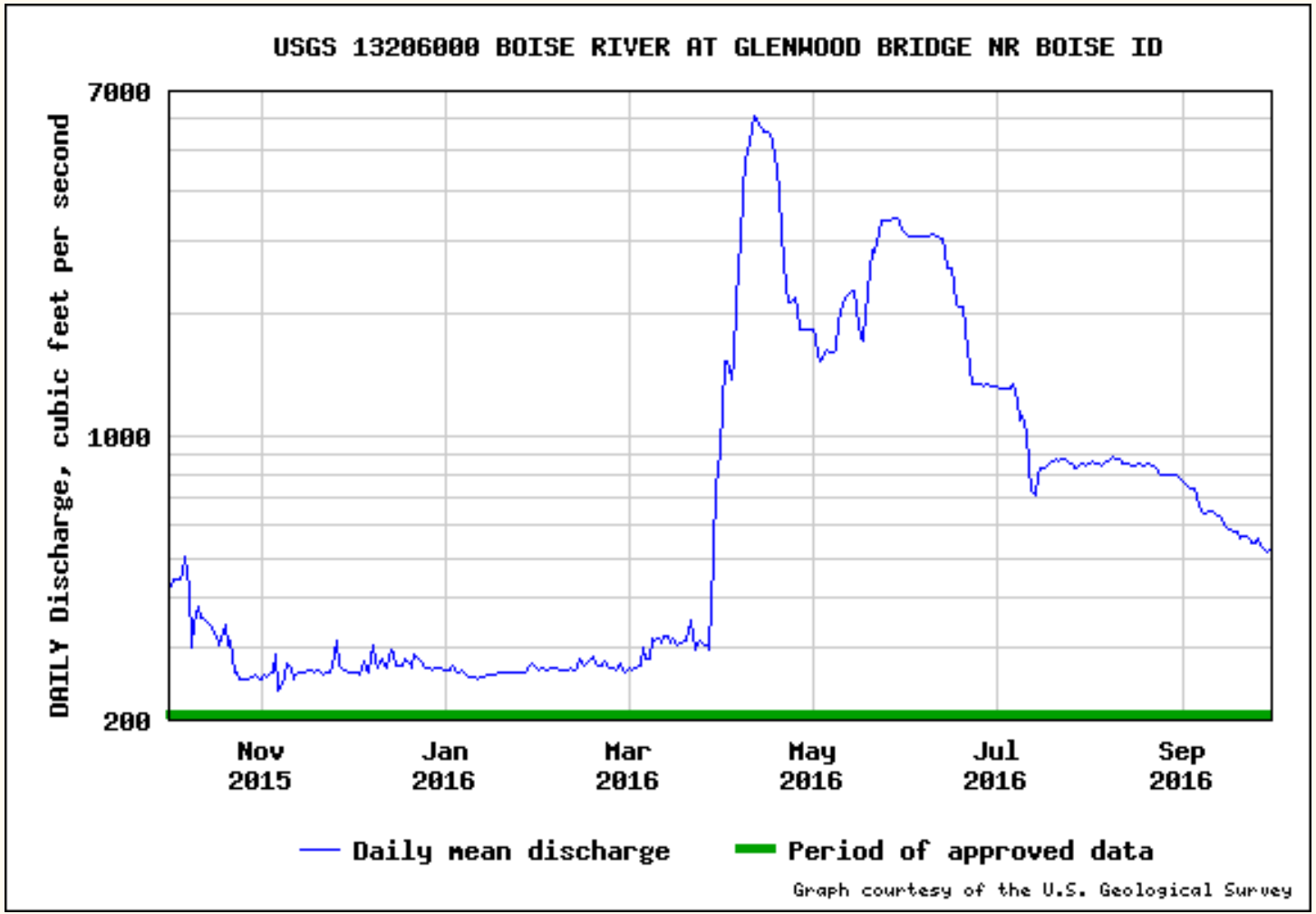


Differences in annual mean temperature in the upper and lower Boise River Basin

What does this information mean for water availability in Boise?

Differences in annual mean precipitation

https://boisestate.maps.arcgis.com/apps/Cascade/index.html?appid=11e5a118e5794c5fa1b574b91853ca9c



Discuss: what data are shown? What causes the peak in April?

How might the shape of this graph change with future climate change?

Test it!

https://waterdata.usgs.gov

The Experiment

Materials

(must have snow available!)

- Flexible tray (plastic, disposable oven pan, etc)
- Funnel
- 3 containers for weighing snow & water (large yogurt containers work well)
- Spring scale
- Heat lamp
- Stopwatch or timer
- SNOW

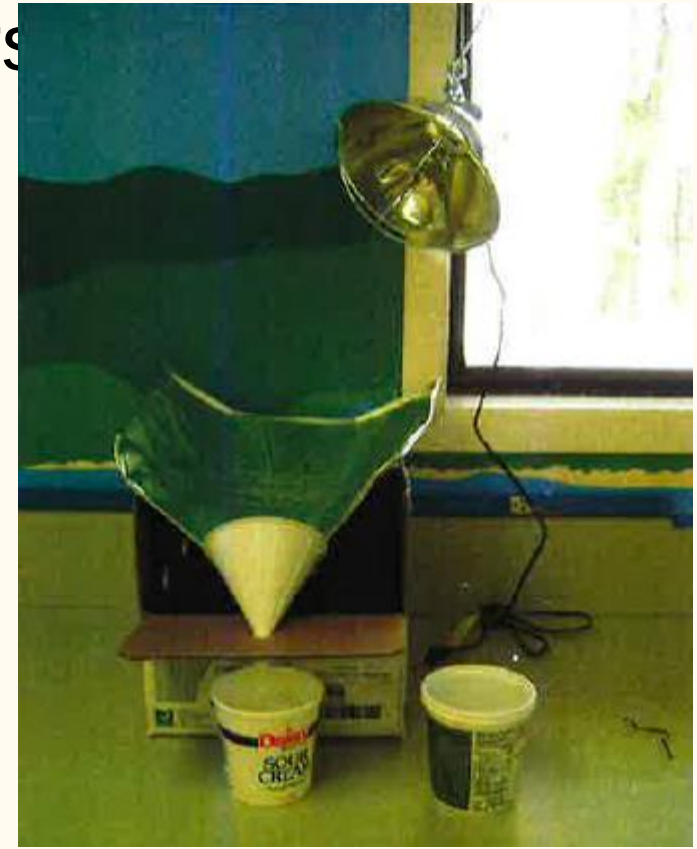
Assemble Catchment Containers

Bend tray so any water runs to the middle

Situate funnel to catch water and drain into container

Situate container to catch water

Set up heat lamp so it will shine on the center of the tray



In Idaho, presently most precipitation falls as snow. How will this change as climate warms?

Discuss: hydrographs, watersheds

Form hypotheses, investigate data for nearby rivers/streams/watersheds….

Procedure

1. Zero the scale to a yogurt container, collect snow. Weigh snow until mass equals mass required for first month’s (October) snowfall (details next slide)
2. Spread snow evenly over tray “watershed,” wait 3 minutes
3. Weigh water in catchment container, record data as streamflow for October
4. Repeat process for subsequent months
5. Turn heat lamp on beginning in March to represent summertime insolation
6. Snow for each month is added on top of any snow still remaining in the watershed; rain is added as liquid water poured on top of snow

Test 1: Current climate precipitation pattern

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
TEST 1	SNOW	50g	90g	100g	100g	90g	90g						
	RAIN							70cc	60cc	50cc	20cc	20cc	30cc
	TOTAL	50cc	90cc	100cc	100cc	90cc	90cc	70cc	60cc	50cc	20cc	20cc	30cc

Make a hypothesis: what will happen to the hydrograph if more precipitation falls as rain?

Test 2: Climate change scenario – same overall precipitation, but more of it is falling as rain instead of snow

		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
TEST 2	SNOW	50g	90g	50g	50g	50g	45g	0g	0g	0g	0g	0g	0g
	RAIN			50cc	50cc	40cc	45cc	70cc	60cc	50cc	20cc	20cc	30cc

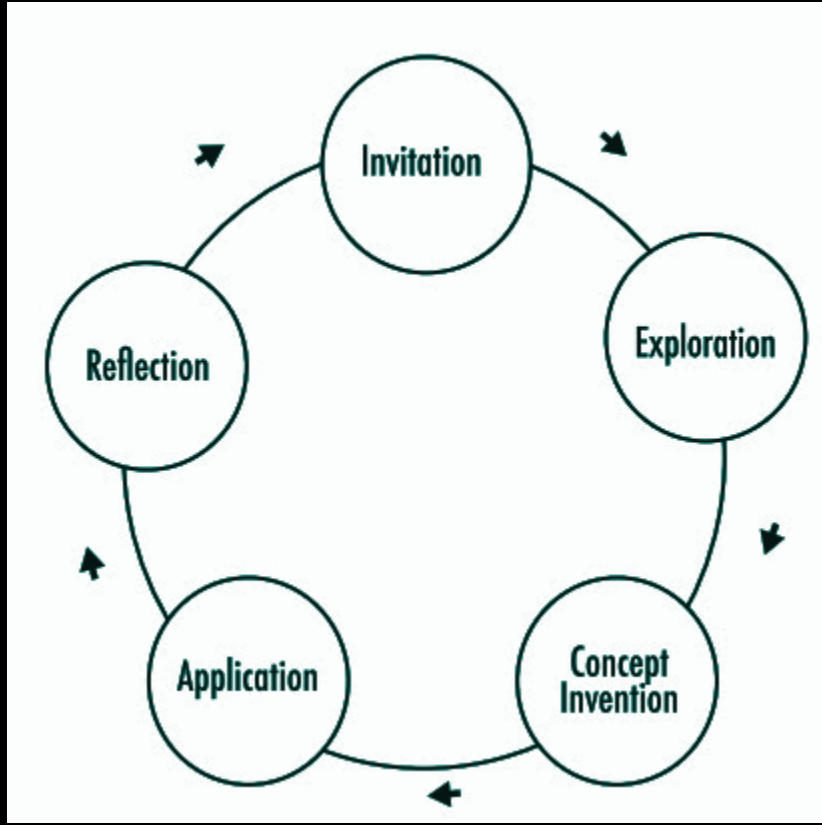
The Experiment!

Wrap Up

- Examine data
- How does this show climate change?
- Discuss why this change in water delivery matters
    - Farming, ranching, recreation, biology, hydropower, storage, etc
- What about land usage? How might land cover matter for water resources?

MOSS Learning Cycle

beetlesproject.org



The Lawrence Hall of Science. 2016. “The Beetles Learning Cycle Explained.” Berkeley, CA.

Collaborating to Address Socio-ecological Complexities of Climate Change

Moving lessons from positional debates to collaborative governance

How can we practice making decisions about polarized and complex climate change uncertainties?

A Complex Socio-ecological Problem:

Complex Problem

A problem with strong interaction among moving parts, so that what one element affects others,

resulting in emerging properties that can’t be predicted by examining the component parts themselves

Complex Problem

A problem with strong interaction among moving parts, so that what one element affects others,

resulting in emerging properties that can't be predicted by examining the component parts themselves

What are some sources of complexity in watersheds?

Examples from your home watershed?

From the Boise Watershed?

Climate change + population growth + endangered species + river health

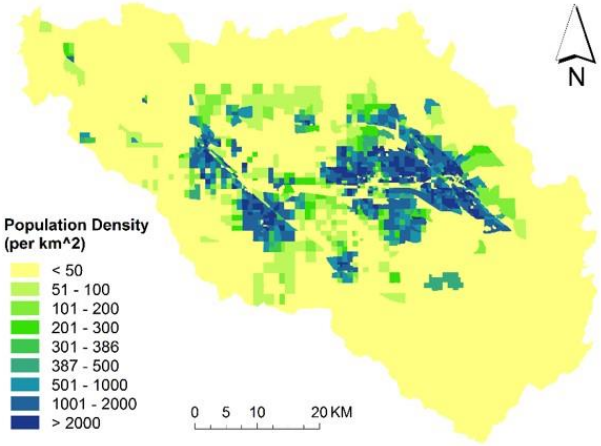
Climate Change Impacts in Idaho are Uncertain

Scientists have documented the **decline of winter snowpack** and **earlier stream runoff**

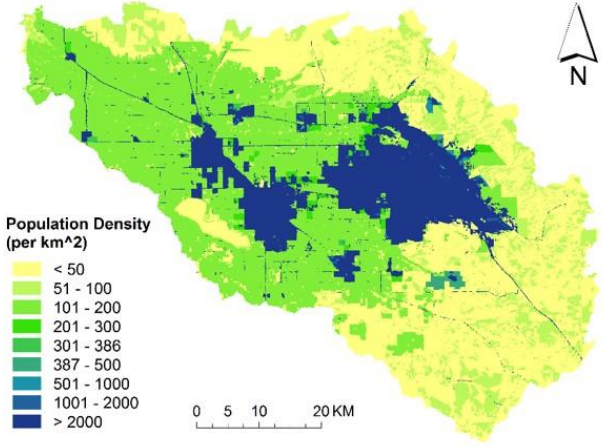
Increasing temperatures will result in l**arger amounts of evapotranspiration** and earlier snowmelt

Altering total amount of water available and the timing of that availability

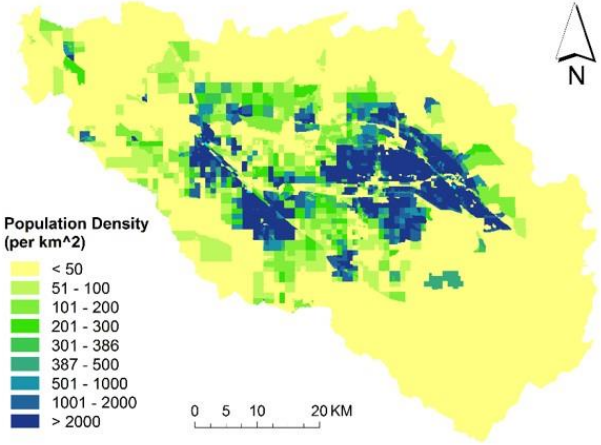
Current - 2010



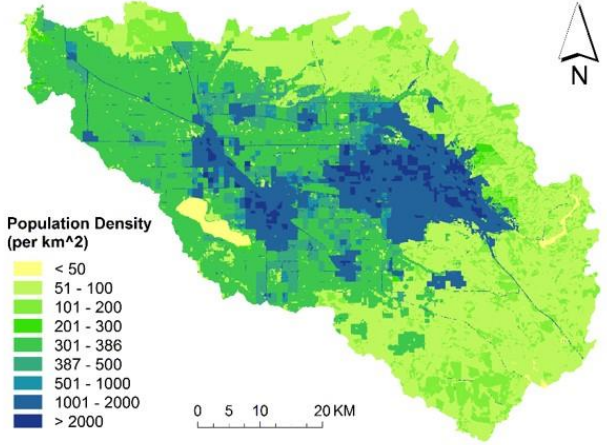
Status Quo - 2040



Managed Growth - 2040



Unconstrained Growth - 2040



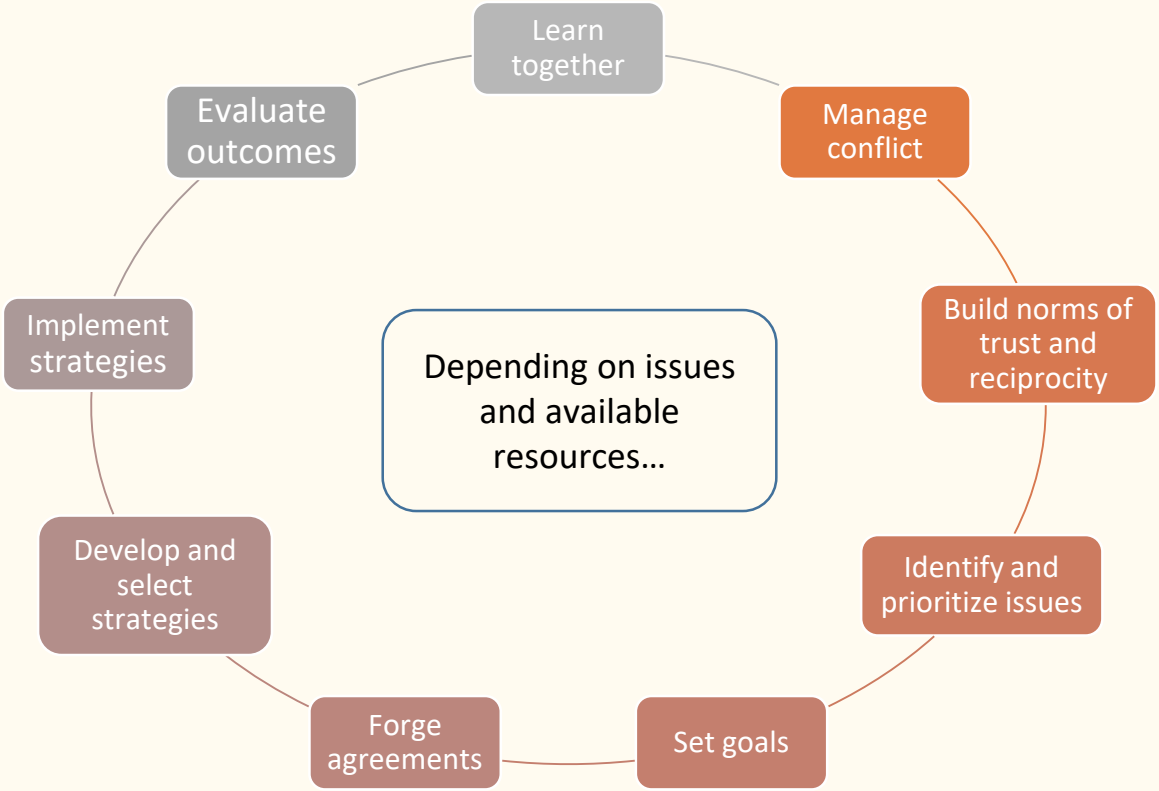
The issues: water, fish and dams

http://www.idahostatesman.com/news/local/environment/article117920318.html/video-embed

Habitat, Hatcheries, Hydroelectricity, and Harvest! Oh My!

Collaborative Planning Scenario in the Columbia-Salmon River Basin

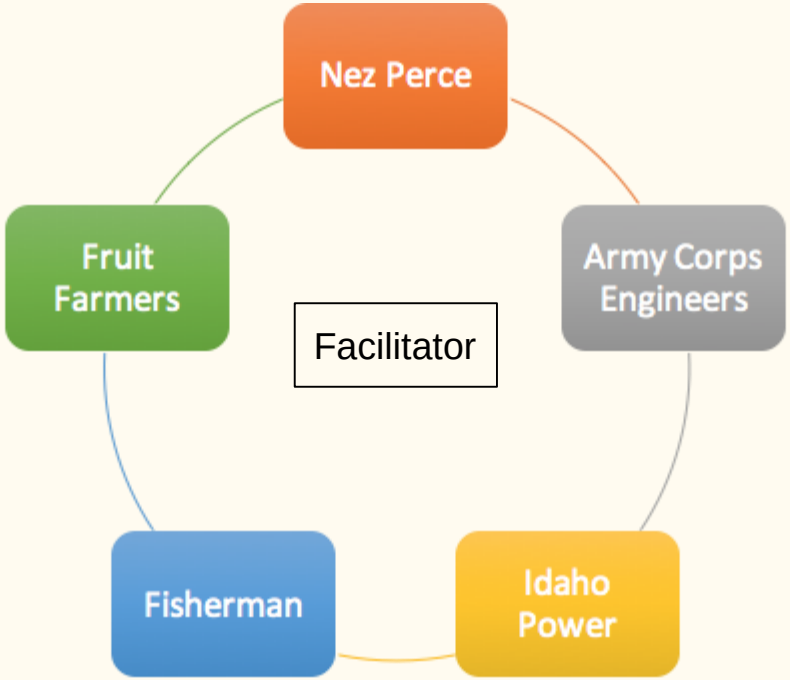
What do collaboratives do?



Cheng & Sturtevant (2012)

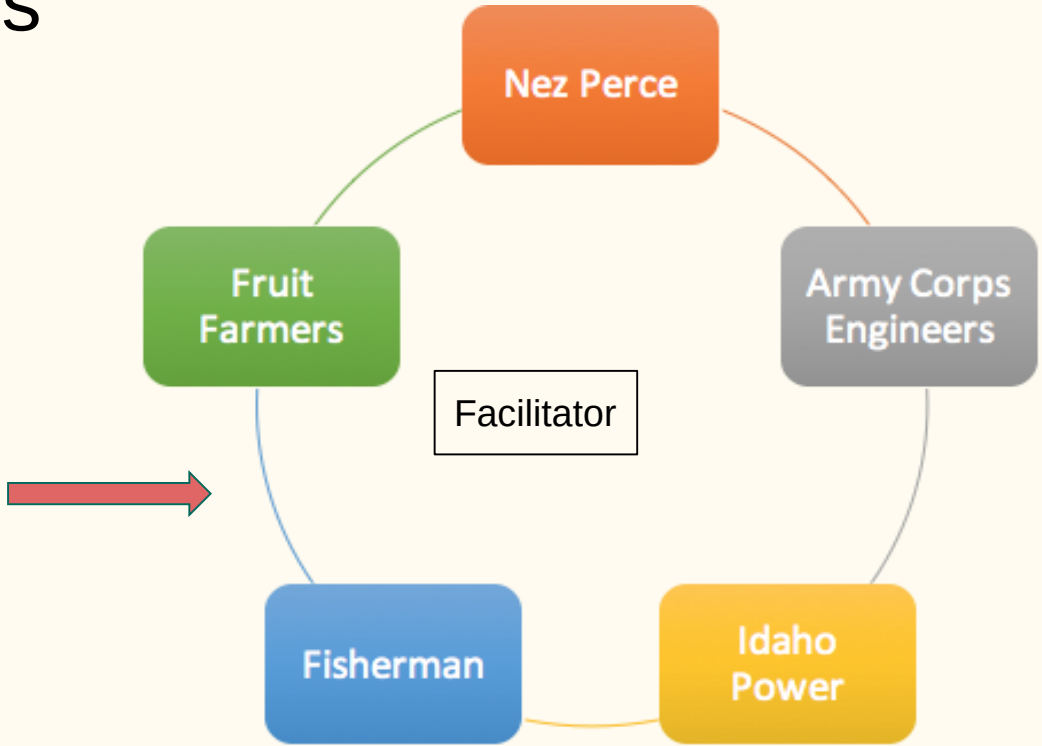
Stakeholders

- Values
  - Economic
  - Environmental
  - Social
- Interests
- Needs
- Shared interests

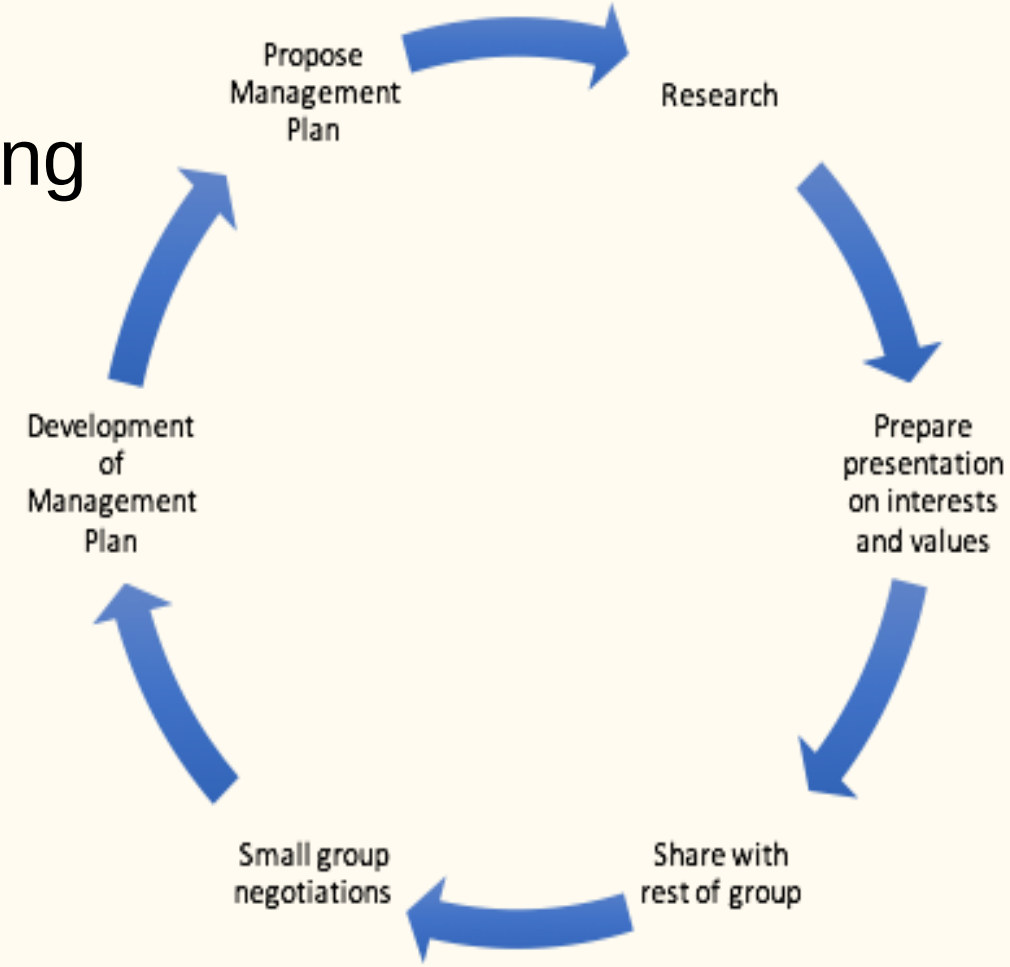


Stakeholders

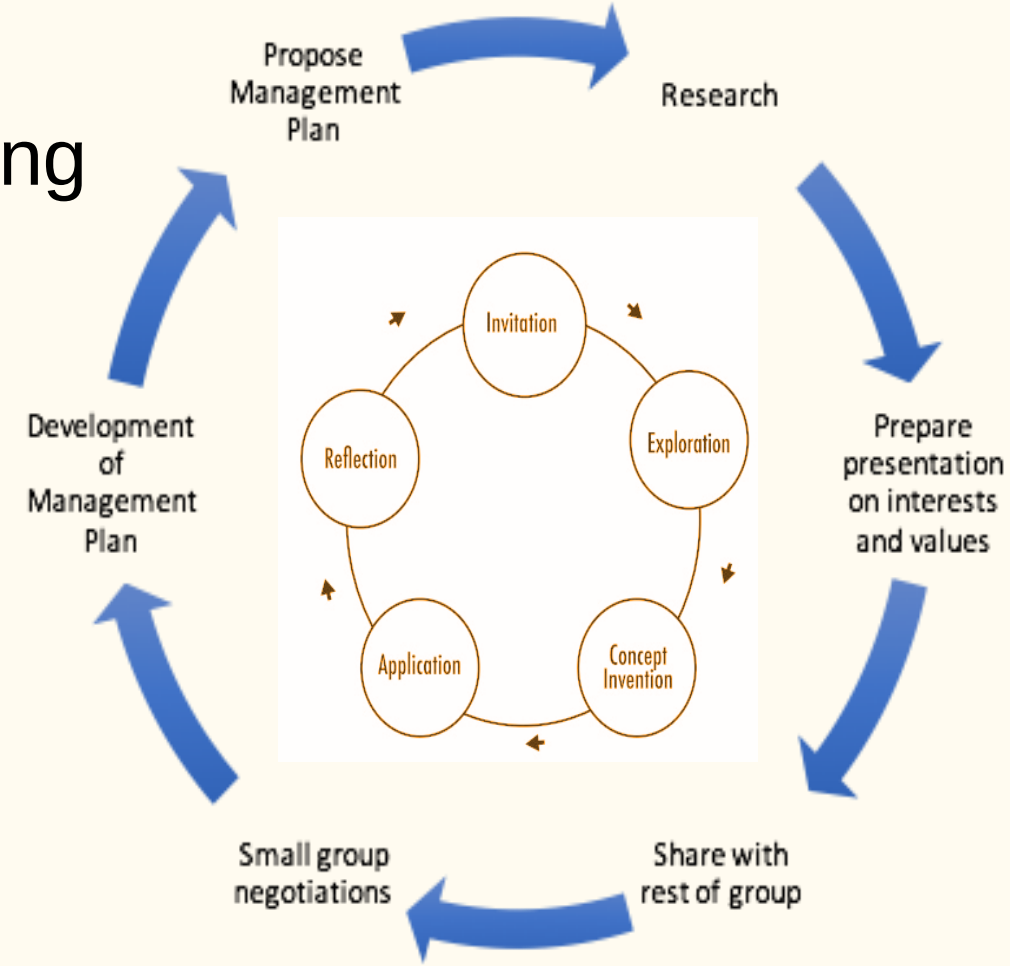
Salmon



Scenario Steps: Collaborative Planning Process



Scenario Steps: Collaborative Planning Process



Collaborative Governance is Successful when...

I believe that other members understand my point of view,

I believe I understand other members' points of view, and

Whether or not I prefer this decision, I support it because it was arrived at openly and fairly and it is the best solution for us at this time

developed policy

Legitimacy of collaboratively

Reflection

Would a project like this have to continue holding stakeholder meetings throughout the project? Why or why not?

Discuss the importance of holding a collaborative meeting like this one
What challenges did your multi-stakeholder groups confront?

Could students see this method being applied in their watershed? Why or why not?

Can the students see any difficulties in trying to hold a collaborative meeting like this?

Investigating Questions with Real Climate Data

Come up with a local climate change question!

Form small groups and come up with a question you'd like to investigate with your class. Try to pick something that is relevant to students' lives in the Boise area.

Some suggestions:

- How might climate change affect agricultural production?
- How could future changes in water availability affect wild animals (deer, mountain lions, etc)?
- What might changes in water availability mean for people who get their water from a well?

Online Climate Projection Tools

Applied Climate Science Lab at the University of Idaho:

http://climate.northwestknowledge.net/gallery_vis.php

The Northwest Climate Toolbox

https://climatetoolbox.org/

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Some suggestions:

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- How could future changes in water availability affect wild animals (deer, mountain lions, etc)?
- What might changes in water availability mean for people who get their water from a well?

Where does our water come from?

https://boisestate.maps.arcgis.com/apps/Cascade/index.html?appid=11e5a118e5794c5fa1b574b91853ca9c

Climate Change Winners and Losers