

# FISH PASSAGE RESEARCH IN THE MIDDLE FORK WILLAMETTE SUB-BASIN

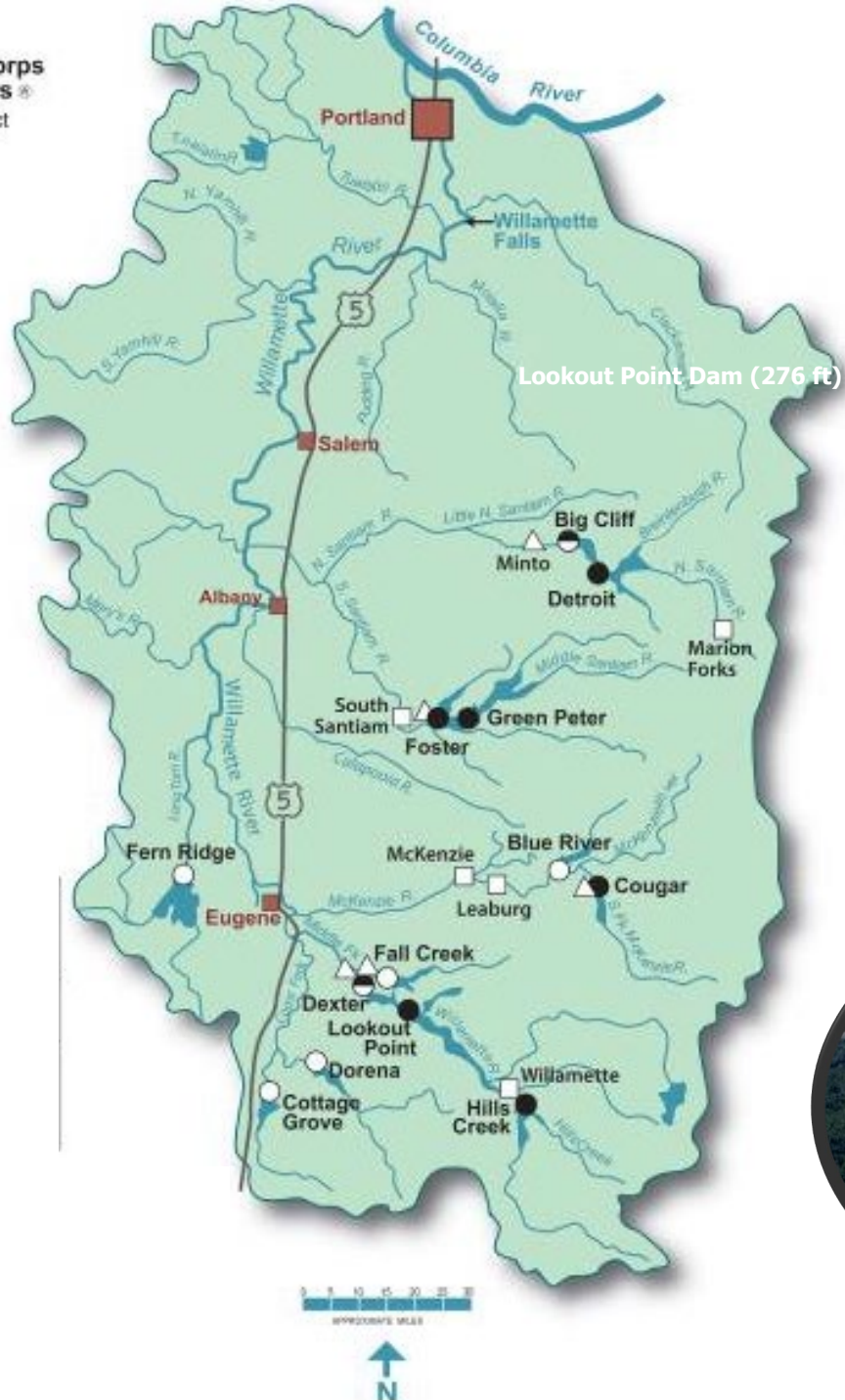
Rachel Neuenhoff  
U.S. Army Corps of Engineers  
Portland, OR

Willamette Fisheries Science Review  
Corvallis, OR  
March 13, 2019



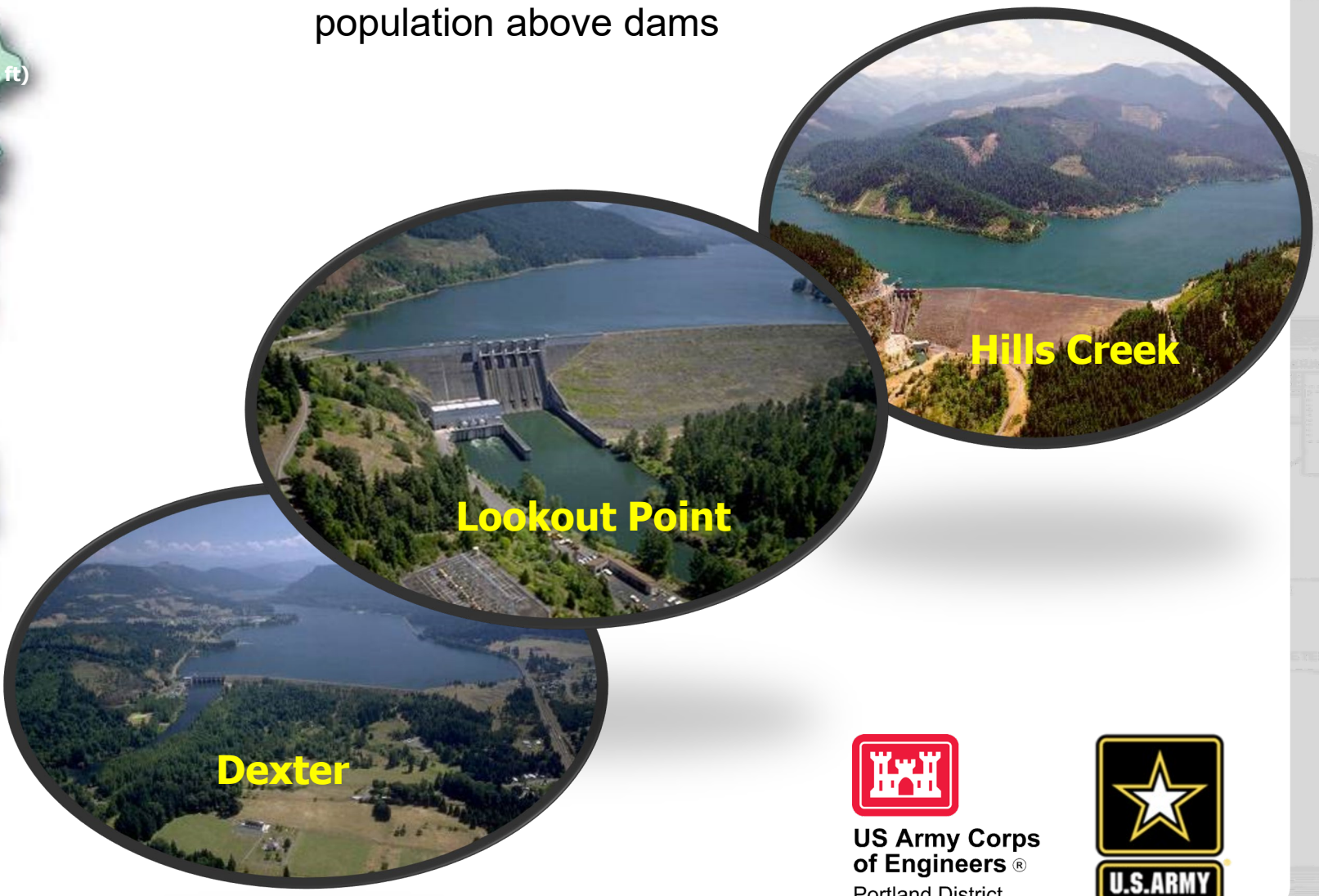
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# MIDDLE FORK WILLAMETTE

Goal: Establish a sustainable spring Chinook population above dams



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# CHALLENGES: HIGH CHINOOK PRE-SPAWN MORTALITY (PSM)

- PSM >75% in recent years - a major lifecycle bottleneck in some years
- Likely causative factors: temperature, water quality, hatchery fish interactions, trap and haul issues



# CHALLENGES: HIGH CHINOOK PRE-SPAWN MORTALITY

DEXTER DAM

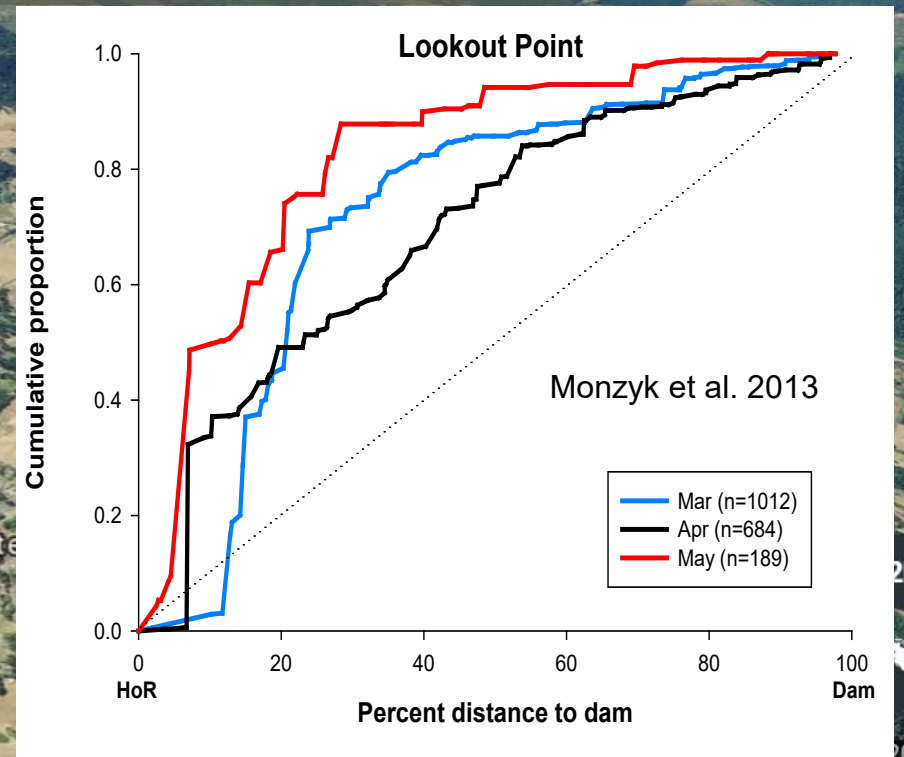
Hatchery/Adult  
Collection Facility  
to take fish to  
hatchery

Adult Collection  
Adult Sorting; load  
on to truck for  
transport

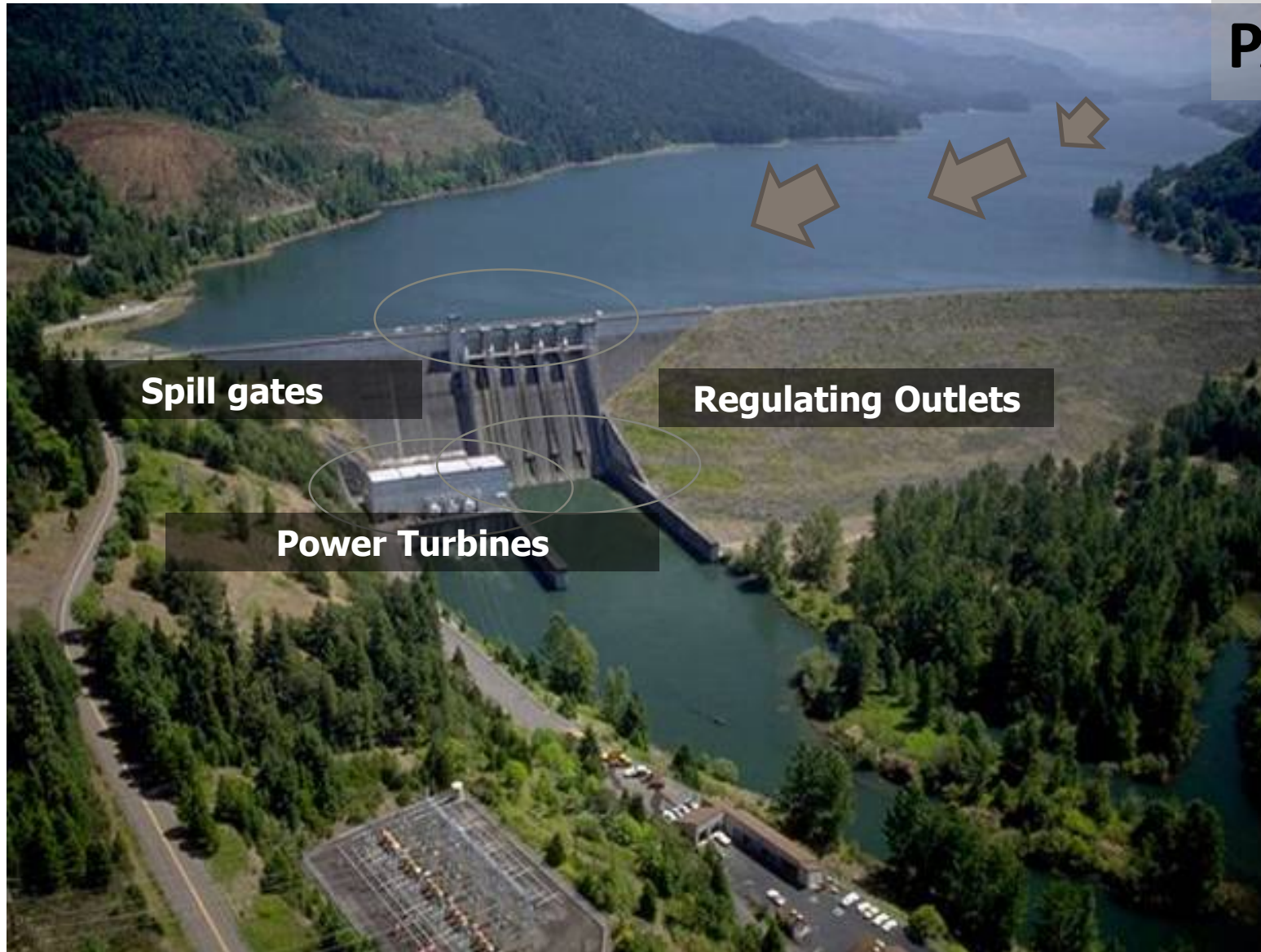
- Concept: Upgrade hatchery fish facilities to use as “trap-and-haul” fish passage for adult fish
- Use hatchery spring Chinook to evaluate potential for reintroduction in upstream habitat

# CHALLENGES: JUVENILE PASSAGE CONDITIONS

- Juveniles must migrate through >20 linear miles of reservoir and 2-3 dams
- Most Chinook enter reservoir as fry and remain upstream of dam until June



# CHALLENGES: JUVENILE PASSAGE CONDITIONS



Lookout Point Dam

Two consecutive reservoirs  
and dams to pass

Predators

High dams with fluctuating  
water elevations

Multiple passage routes

- Deep intakes (very little  
surface spill)
- High mortality



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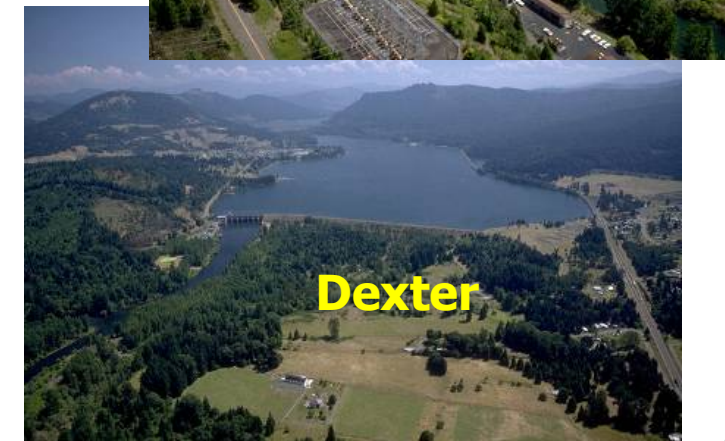
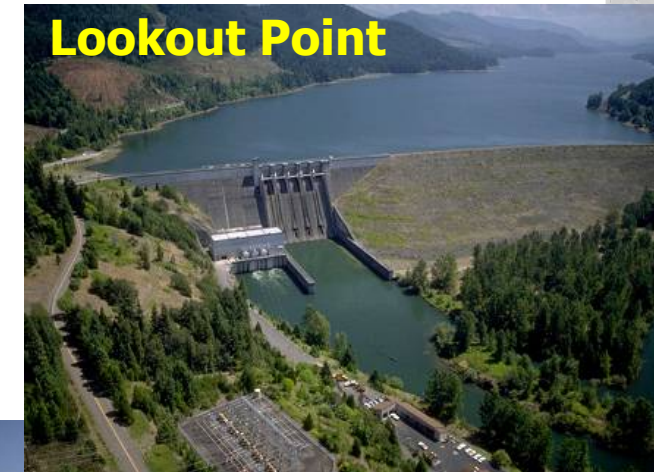


# MIDDLE FORK SUB-BASIN RESEARCH PLANS

- Continued study of passage options and feasibility
- Middle Fork Research Plan, 2017

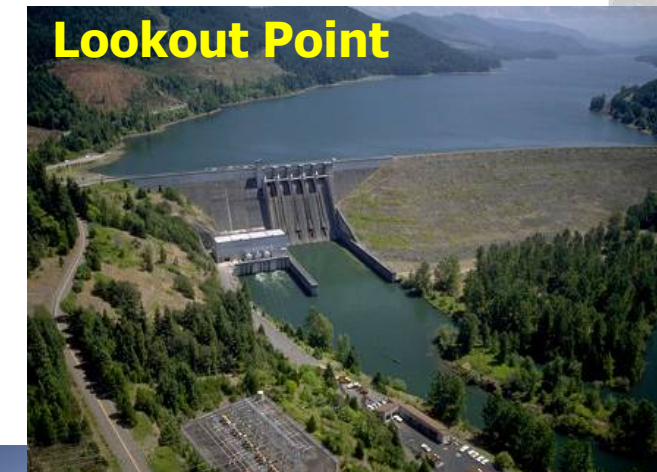
## Key questions

- I. Can survival across life stages be sufficiently improved to support a sustainable spring Chinook Salmon population above Lookout Point Dam?
- II. To support a sustainable population, which downstream fish passage strategy is likely best?
  - at-dam structural passage
  - head-of-reservoir or in-tributary collection and bypass
  - alternative project operations
  - combination



# MIDDLE FORK SUB-BASIN FISH PASSAGE RM&E

Information needs	Example References
<b>Adult Chinook salmon migration</b>	Jepson et al. 2015; Keefer et al. 2015; Naughton et al. 2015
<b>Chinook salmon pre-spawn mortality</b>	Bowerman et al. 2018; Keefer et al. 2010; Sharpe et al. 2013-2015, 2017
<b>Chinook salmon spawning</b>	Sharpe et al. 2013-2015; 2017
<b>Juvenile Chinook salmon migration and reservoir use</b>	Romer et al. 2012-2017; Monzyk et al. 2011-2015
<b>Reservoir ecology and predation on juvenile Chinook salmon</b>	Murphy et al.(in review) Brandt et al. 2016
<b>Survival of juvenile Chinook in reservoir</b>	Kock et al. (in review)
<b>Juvenile dam passage</b> -Head of Reservoir Bypass -Reservoir and dam passage	Keefer et al. 2012; AECOM 2012; Johnson et al. 2016, Hanson et al. 2017; Fischer et al. 2018;
<b>Lifecycle modeling</b>	Zabel et al. 2015
<b>Alternatives evaluations</b>	Corps 2015; Corps 2012

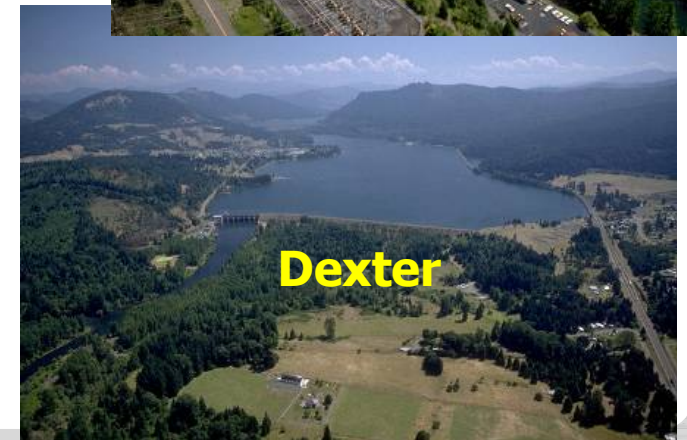
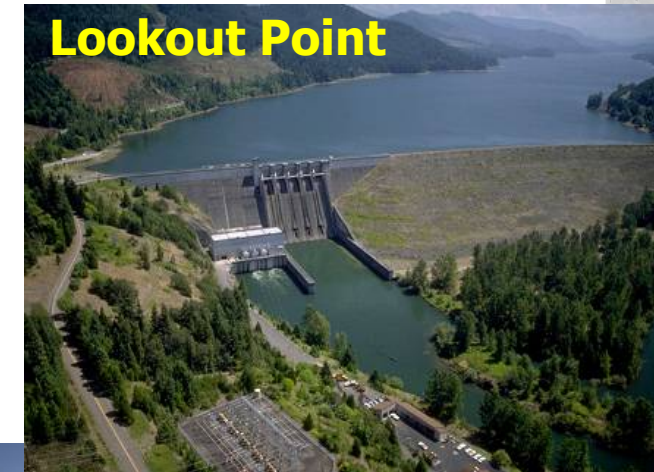




# MIDDLE FORK SUB-BASIN FISH PASSAGE RM&E

## Examples

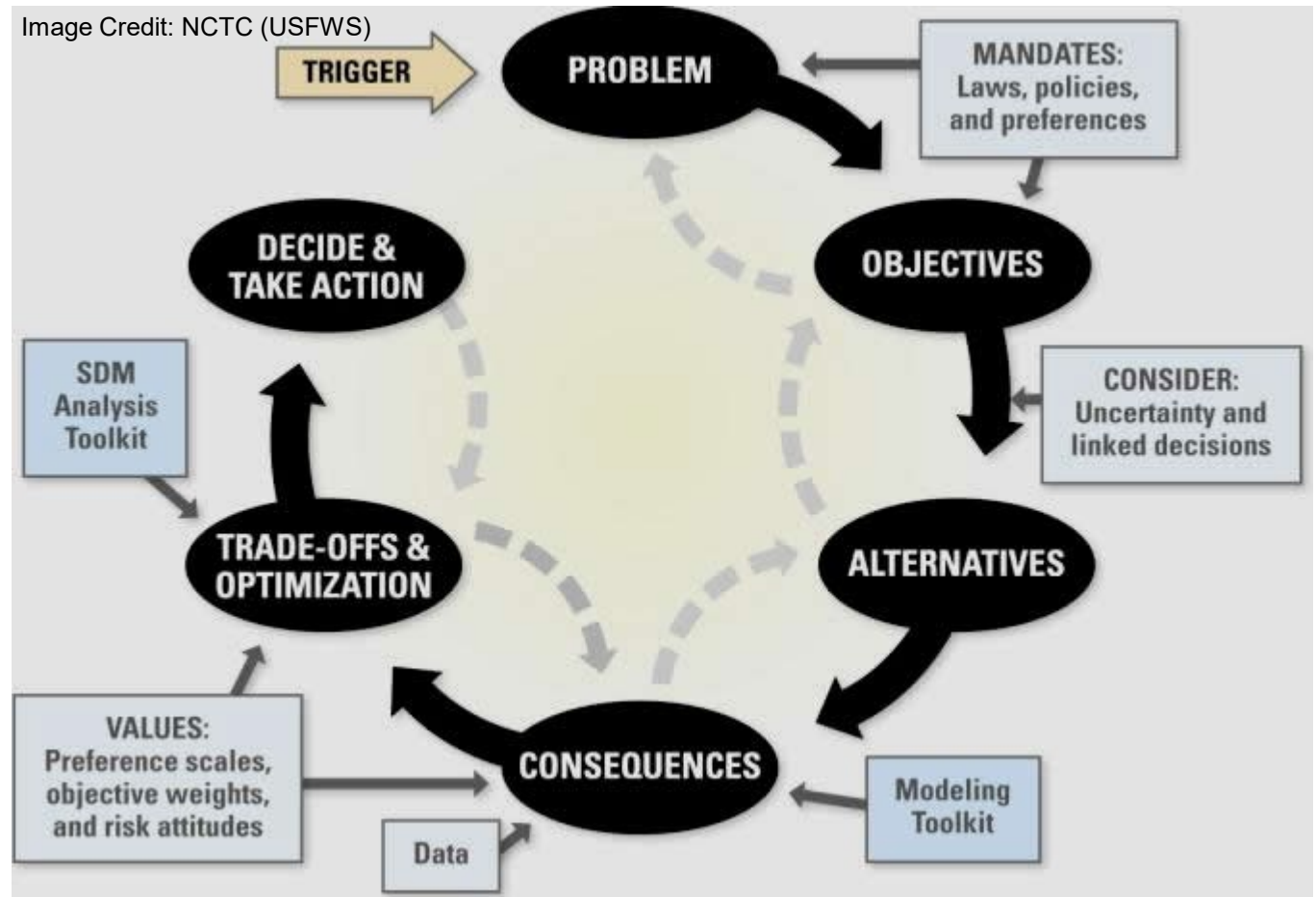
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# MIDDLE FORK SUB-BASIN RESEARCH PLANS

Framework needed to evaluate combination of actions addressing PSM and downstream passage.....

**Structured Decision Making** for passage alternatives in the Middle Fork

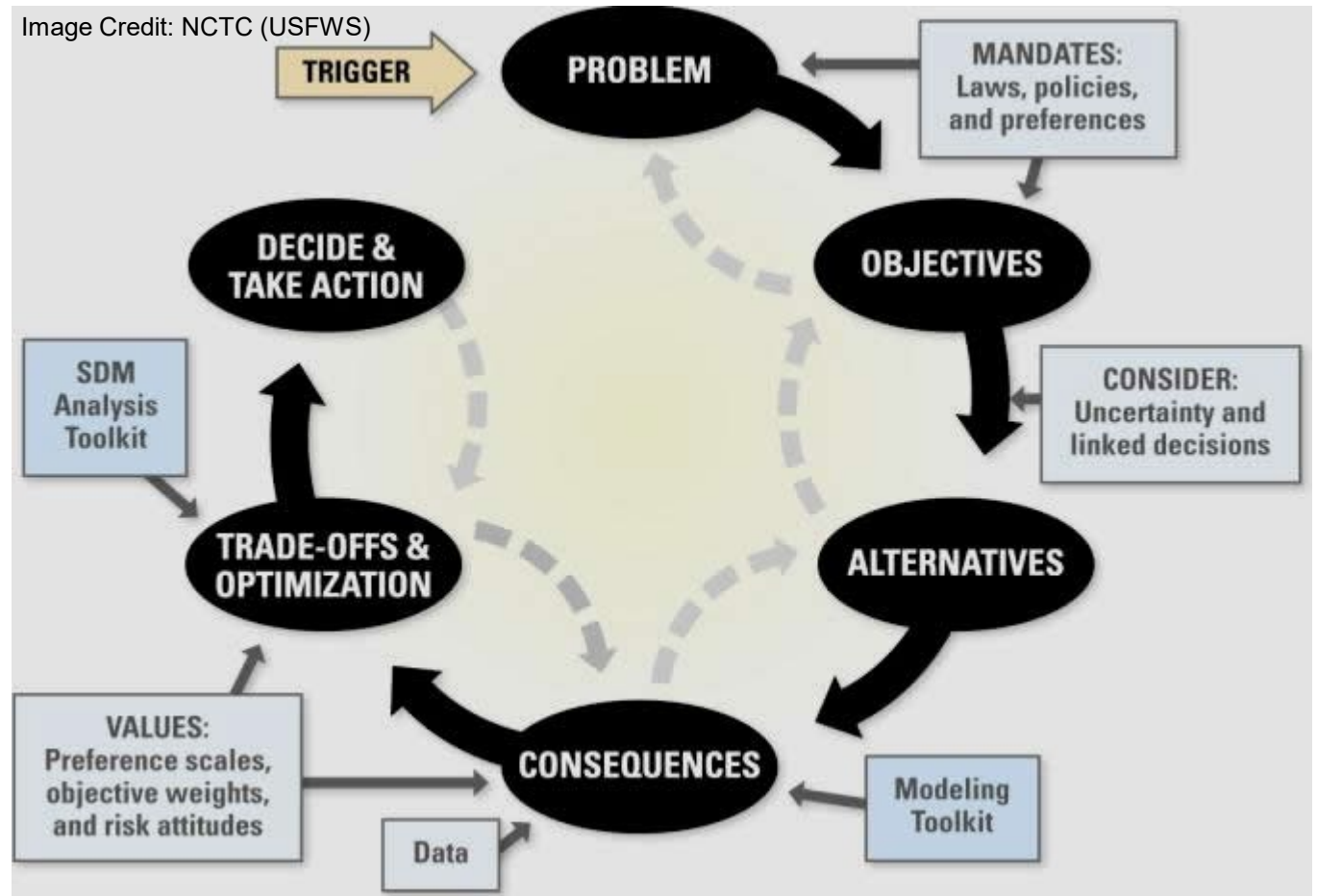
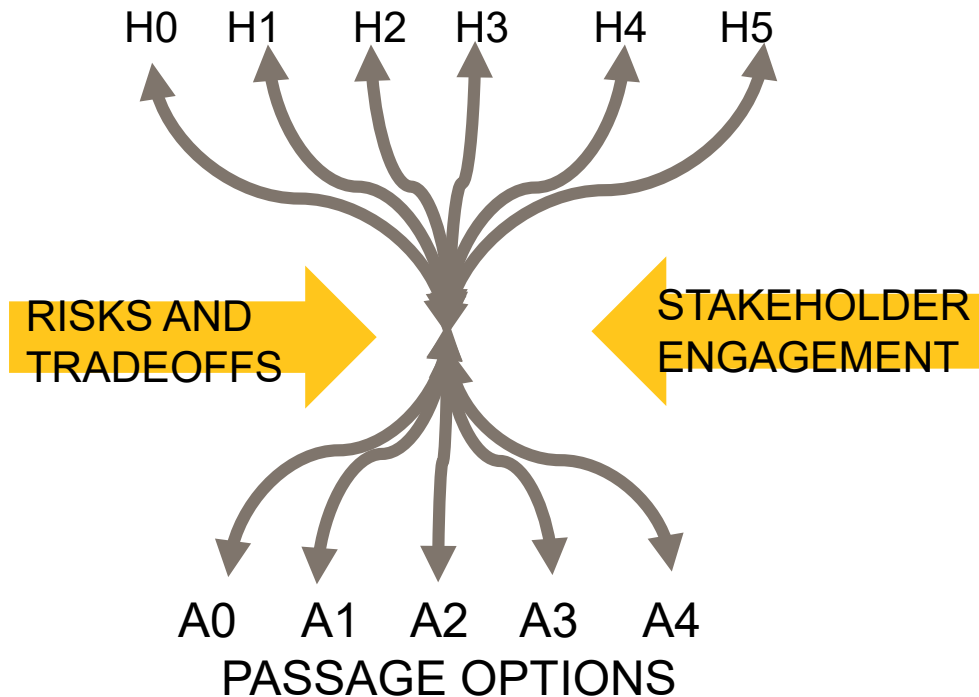


# MIDDLE FORK SUB-BASIN RESEARCH PLANS

Framework needed to evaluate combination of actions addressing PSM and downstream passage.....

## Structured Decision Making for passage alternatives in the Middle Fork

BIOLOGICAL HYPOTHESES:



# MIDDLE FORK SUB-BASIN RESEARCH PLANS – TOY EXAMPLE

Framework needed to evaluate combination of actions addressing PSM and downstream passage.....

- 1. Adult T&H w juv. HOR collector
- 2. Volitional Passage



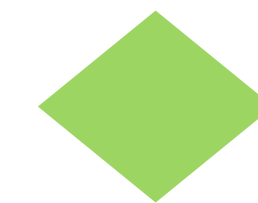
DECISION SET



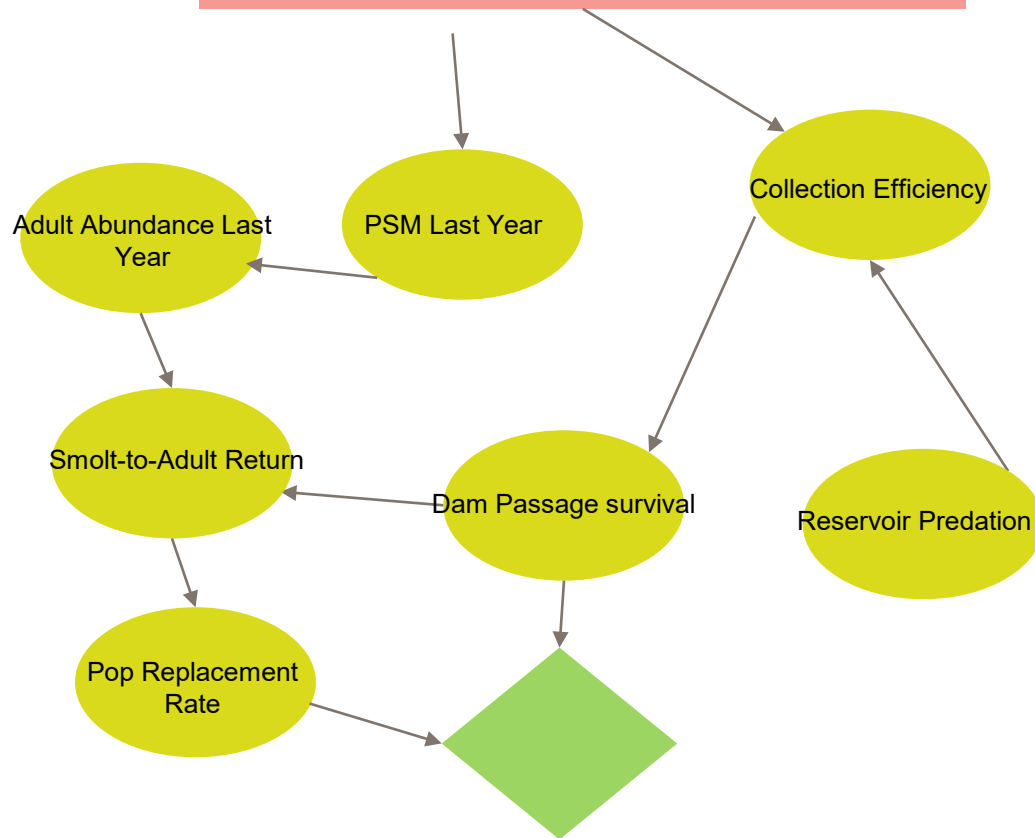
CAUSAL RELATIONSHIP



CHANCE NODE

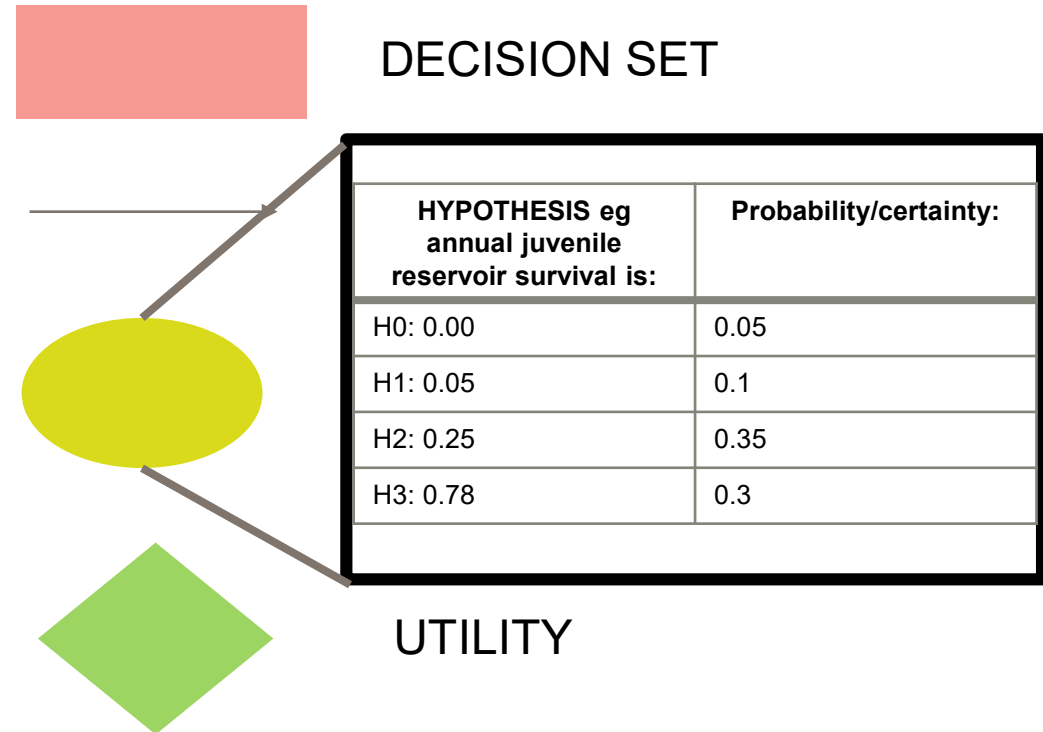
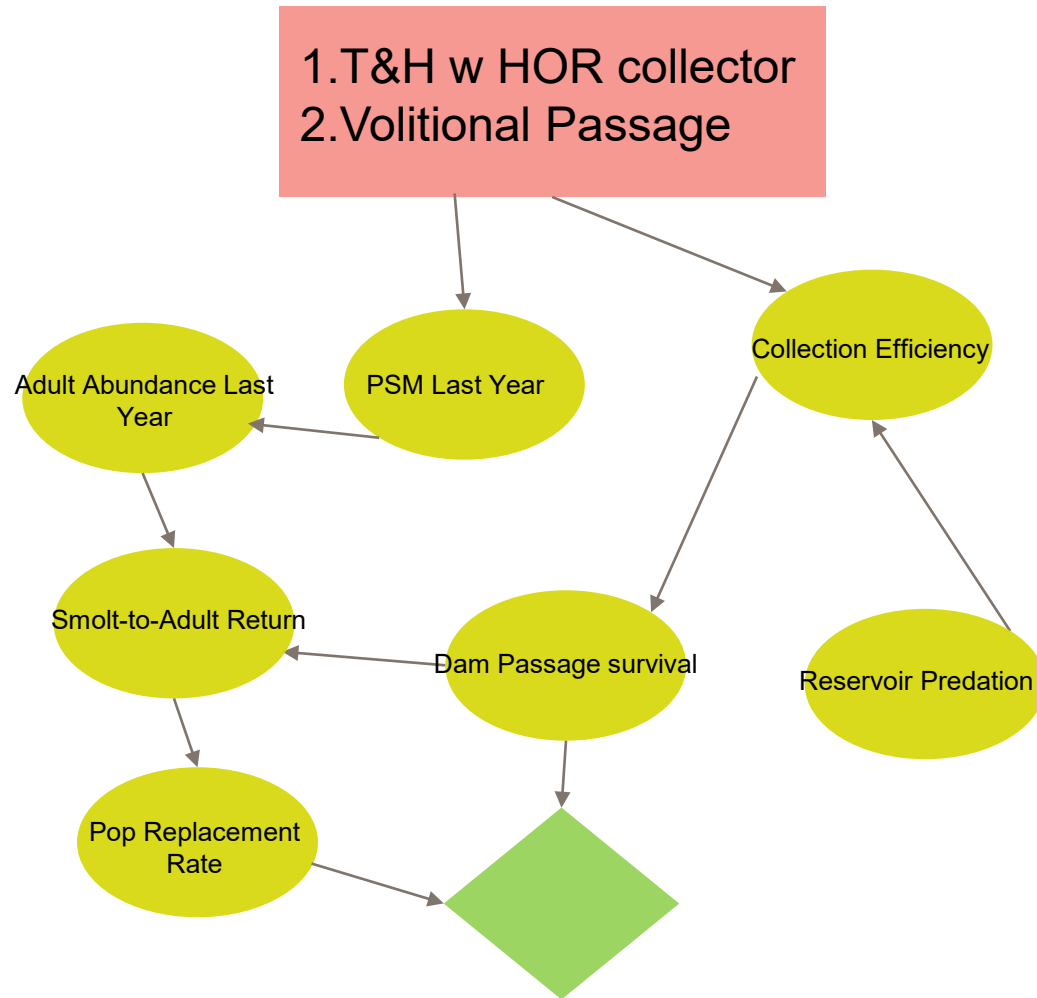


UTILITY



# MIDDLE FORK SUB-BASIN RESEARCH PLANS

Framework needed to evaluate combination of actions addressing PSM and downstream passage.....



# MIDDLE FORK SUB-BASIN RESEARCH PLANS

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## Examples

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DECISION SET

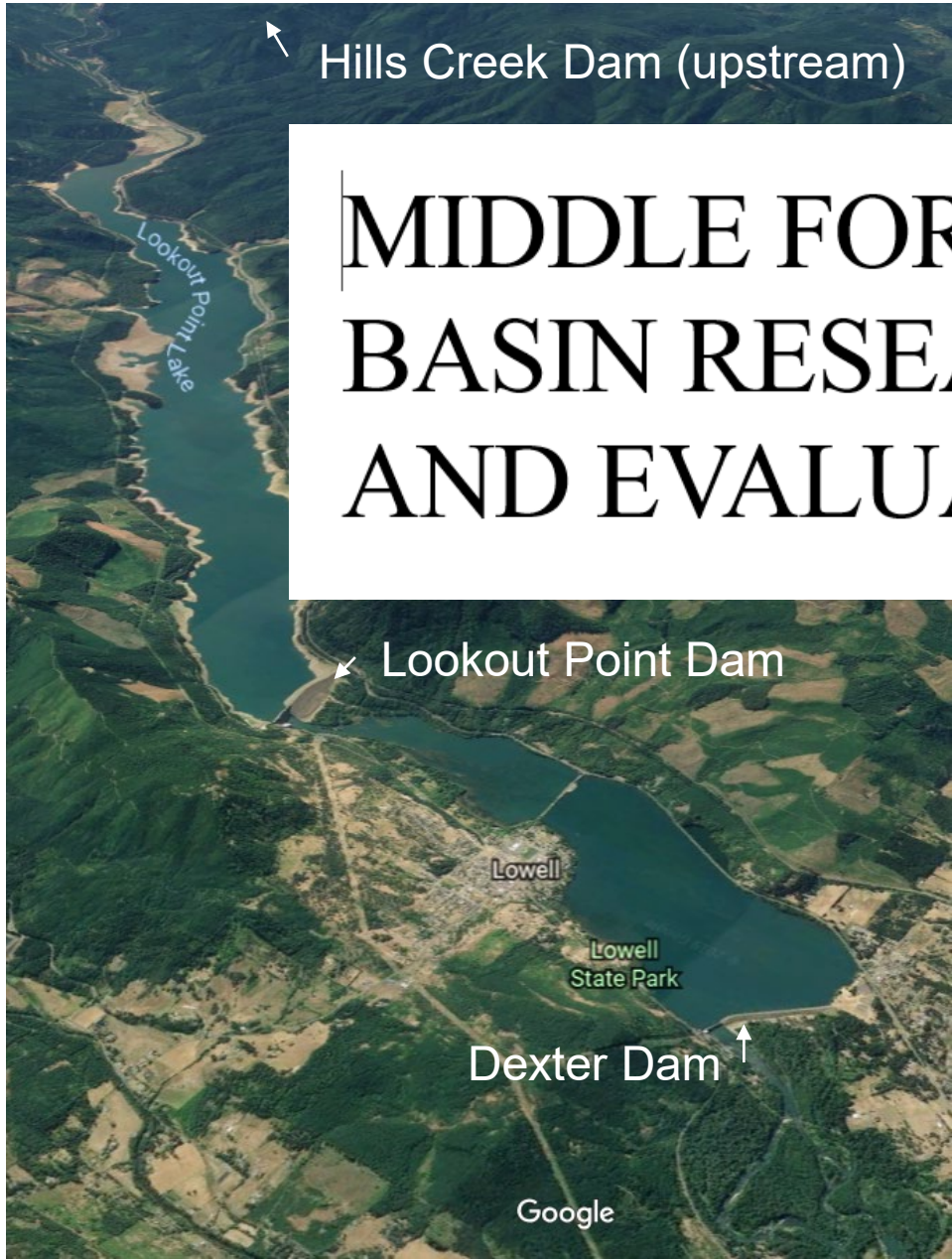
HYPOTHESIS eg annual juvenile reservoir survival is:	Probability/certainty:
H0: 0.00	0.05
H1: 0.05	0.1
H2: 0.25	0.35
H3: 0.78	0.3

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# MIDDLE FORK WILLAMETTE SUB-BASIN RESEARCH, MONITORING AND EVALUATION PLAN

*Key uncertainty:  
Conditions which  
promote PSM and the  
ability to effectively  
manage PSM below  
levels supporting a  
sustainable population  
above MFW dams?*



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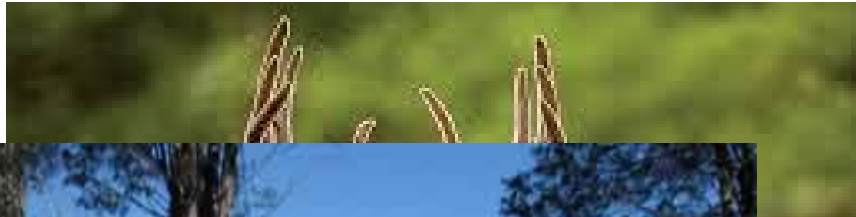


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Image credit: national geographic



Image credit: worldbank.org

Image credit: sdfish



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Risk Attitudes

Multi-User

High Conflict Issues

Variable Uncertainty

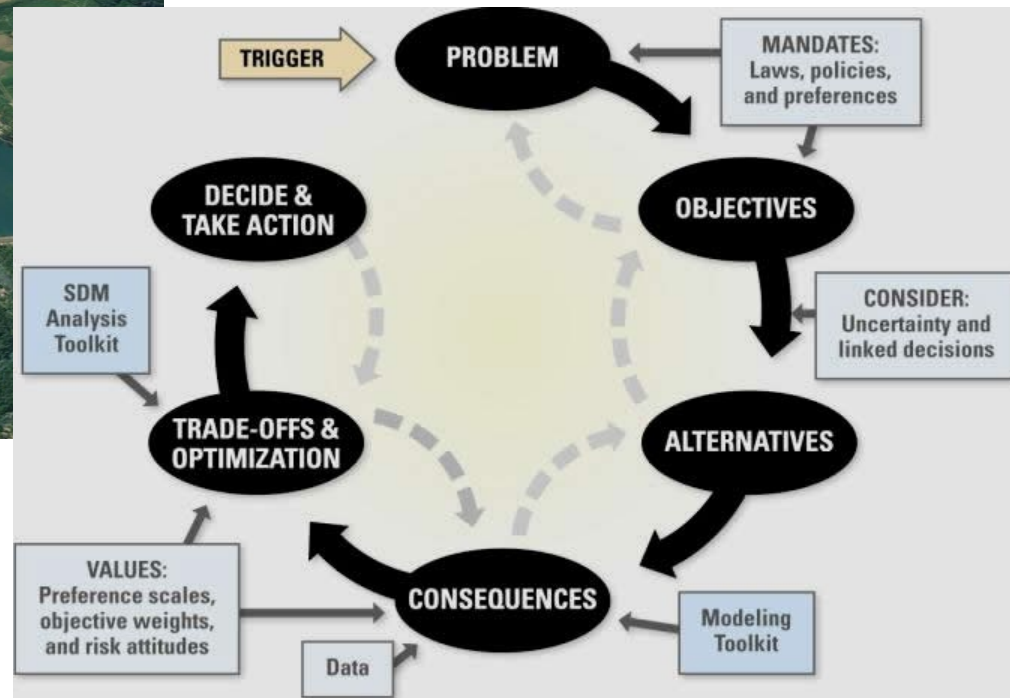




# THANK YOU!

## NEXT STEPS

- Fund SDM team
- Schedule workshop with stakeholders to establish objectives and alternatives, and obtain information (summer 2019)



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