Basin Study Work Group Steering Committee (BSC) Meeting

June 8, 2015, 1:00 pm - 4:00 pm
Barnes & Sawyer Rooms, Deschutes Services Building, 1300 NW Wall Street, Bend, OR 97701

ATTENDANCE

Shawn Gerdes, Arnold Irrigation District
Betty Roppe, Central Oregon Cities Org. & City of Prineville
Craig Horrell, Central Oregon Irrigation District
Adam Sussman, City of Bend
Richard Ladeby, City of Madras
Chris Gannon, Crooked River Watershed Council
Tod Heisler, Deschutes River Conservancy
Terry Smith, Lone Pine Irrigation District
Tom Bennett Natural Resources Conservation Service
Mike Britton, North Unit Irrigation District
Mike Kasberger, Ochoco Irrigation District
Marc Thalacker, Three Sisters Irrigation District
Pamela Thalacker, Three Sisters Irrigation District
Mike Tripp, Trout Unlimited
Doug DeFlitch, Bureau of Reclamation
Jeff Wieland, Upper Deschutes River Coalition
Rex Barber, Water for Life
Ken Rieck, Tumalo Irrigation District
Mark Reinecke, Avion Water Company
Robert Spateholts, Portland General Electric
Bonnie Lamb, Oregon Department of Environmental Quality
Peter Lickwar, U.S. Fish and Wildlife Service
Dave Dunahay, Central Oregon Fly Fishers
Ryan Houston, Upper Deschutes Watershed Council
Kimberly Priestley, WaterWatch of Oregon
Jason Gritzner, United States Forest Service
Suzanne Butterfield, Swalley Irrigation District
Jeremy Giffin, Oregon Water Resources Department

Member Organizations Not Present:
Bend Paddle Trail Alliance
Deschutes County
City of Redmond
Native Reintroduction Network

Also Attending:
Zak Toledo, HDR Inc.
Brian Wilkinson, HDR Inc.
Lauren Mork, Upper Deschutes Watershed Council
Jeff Perrault, member of the public
Paul Lipscomb, Oregon Land and Water Alliance
Shon Rae, Central Oregon Irrigation District
John Warinner, Geo-Spatial Solutions

In addition, Niklas Christensen, contractor with Watershed Professionals Network, attended to discuss the project management plan and next steps to hire a study team. Mike Relf, Basin Study Lead, Bureau of Reclamation attended. Kate Fitzpatrick, Deschutes River Conservancy, attended as Process Co-Coordinator. Kelsey Wymore, Deschutes River Conservancy, attended and took notes.

AGENDA

The group used the following agenda as a guide during their meeting:

1. Welcome, Self-Introductions, and Approval of Minutes
2. Overview of Basin Study Context and Schedule
3. Project Management Plan
4. Next Steps to Hire Study Team
5. Decision Points Related to Modeling
6. Communications Subgroup
7. Update on OWRD Opportunities *(canceled due to speaker family illness)*
8. Public Comment
9. Next Steps

Welcome, Introductions, And Minutes

BSC Chair Craig Horrell welcomed the group and asked everyone to introduce themselves.

Meeting Minutes Approval

The minutes from the May 15, 2015 meeting were approved**.**

Overview of Basin Context and Schedule

Craig explained that the purpose is to have Niklas walk through the project management plan so the group can have clarity, ask questions and ultimately have a structure for hiring the study team.

Project Management Plan

Niklas walked through a PowerPoint presentation, and asked that questions to be held until slide 20 (**Attachment D**) so he could give an overview of the plan first. The PPT included:

- A schematic of the Basin Study tasks and how they interrelate (Basin Study Overview)
- Schedule of Basin Study tasks
- Summaries of Work Elements
- Contracting Recommendations
- Decision Points related to modeling

Niklas discussed the following points:

- The Schedule is largely the same as last time this group saw it, but contractor tasks were moved up to accommodate Bureau of Reclamation utilizing the last year of this study for reporting.
- The Basin Study Overview is meant to show how tasks interrelate- Niklas will be adding some narrative to this.
- Project Management: Niklas emphasized that project management is very detailed and one person is needed to be in the middle of all working parts of this project.
- Engineering 1: this work element is limited. Similar work is being done in irrigation districts – it is basic civil engineering. It's prioritizing high loss areas on conveyance systems.
- Engineering 2: The Energy Trust of Oregon will be funding this position through the Farmers Conservation Alliance. The funding would become available in 2016, which aligns with the Basin Study schedule. This scope will assess how to optimize efficiencies within districts, including on-farm, operations, measurement and non-standard methods of water conservation. It is not secured but Niklas has had strong reassurance that it will be. This should be firmed up over the next two or three months, and we will document our

contingency plan in the risk register. This would involve altering Engineering 1 to cover some of these tasks, as well as considering the $50,000 in scope reserve that could be added to that task.

- Policy, Legal, and Socio-economic: This will be looking at the Policy, Legal and Socio-economic aspects of water supply solutions, and will be heavily involved in scenario development and evaluation.
- Upper Deschutes Ecological Assessment. This has an $80,000 budget. This will look at redband trout rearing habitat, Oregon spotted frog habitat and riparian function related to flow. This will be integrated with existing and ongoing work by the agencies, as well as a potential USGS frog study, to the extent possible.
- Whychus, Middle Deschutes, and Crooked: all three reaches merit some analysis of temperature/flow relationships. Much of this work could be done by direct award to the watershed councils or other.
- In Whychus, data exists to assess flow-temperature relationships in the summer and will be extrapolated to other months. There will also be an effort to use existing temperature data and modeling to assess quantity and quality impacts of different alternatives at springs.
- Middle Deschutes: Use existing data and RiverWare to project potential middle Deschutes temperature elements related to varying amounts of middle Deschutes and Tumalo streamflows.
- Crooked: There is a larger ($40,000) component in the Crooked to assess flow-temperature relationships. Niklas did a preliminary analysis of available data and found a close correlation between stream temperature and three factors: air temperature, streamflow, and reservoir release temperature. There is potential to do temperature profiles of the reservoir and use these three factors to assess potential stream temperatures under various scenarios. The direction of this task will merit additional discussion with stakeholders.

NEXT STEPS TO HIRE STUDY TEAM

- Niklas discussed his Contracting Recommendations on Slide 20.
- Betty asked why the coordination, data and reporting is assumed to cost $100,000 when the DRC doesn't have to put in a proposal. Adam suggested the planning team do some work to show what the scope of work is for each work element to clarify it for the group for the elements that are not recommended as RFQs or RFPs.
- Doug asked why the policy, legal, socio-economic element is an RFP and not an RFQ. Niklas explained that the ranking criteria is based on qualifications and this saves time and provides us with examples of work and ideas to help make this decision. Marc clarified that non-engineering contractors are not subject to the same QBS (qualifications based selection) statutes as engineers.
- Jeff Weiland stated that the USFWS and US Forest Service have valuable information and ongoing studies, and Niklas confirmed that he has been coordinating with them. Also, on slide 3, there were on-farm efficiency studies – will this new data be helpful for the irrigation districts? Craig said yes, it would be nice to have the study. Mike Britton said North Unit already has a good understanding of efficiency opportunities in NUID, so the study will be light on NUID and heavier on COID.
- Dave suggested that the group clarify that the watershed councils should be awarded the smaller contracts to do the work that they already have the data for (temperature analysis in

different reaches). Marc clarified that this was the subgroups' intent when they developed these tasks.

- Kimberly stated that the group just saw this for the first time and she would like to know why there is an agreement portion on the agenda for this. Craig said the planning team hoped that the larger group would authorize it to make decisions for the purpose of streamlining and to get the process rolling, once the scopes were understood and agreed on. Tod stated that Niklas has been urging the group to get the ball rolling and make decisions regarding initiation of RFQs. Craig clarified that we are not hiring anyone today, we are just getting this process going. Niklas explained that contractor proposals are flexible and we can tweak particulars once we are in the process. Kimberly asked that if we are generally OK with this proposal today, can we see all the details before they are put into action?

The group decided by consensus that the RFPs and RFQs will go out to group for 5 days for review and comment –**ALL GREEN CARDS.**

Craig asked if there is any public comment. No one commented.

Decision Points Related to Modeling

There were brief discussions about clarification of terms and Niklas' recommendations with each numbered criteria (**Attachment D, slides 27-37**).

#1 Water Use – Existing

Recommendation:

Water Use:

- Data used in water resource model will be based on most recent 10-year period of data available (~2004-2014)
- Will be corrected for recent infrastructure projects
- If applicable, demand will be a function of dry/wet/normal years

Infrastructure:

- "Existing Conditions" in Water Resource model will be based on current conditions plus known build-out in next few years. **ALL GREEN CARDS**

#2 Water Use – Future

Recommendation: Incorporate potential changes in ET (assume current land use & crop mix and limit demands per water rights). **ALL GREEN CARDS**

#3 Historical Period

Recommendation: Use 1980-2010– **ALL GREEN CARDS**

#4 CMIP 3 or 5:

Recommendation: Use CMIP 5 – **ALL GREEN CARDS**

#5 & 6 Future Periods (# and when):

Recommendation:

- Run climate and hydrology of two periods: 2030-2059 and 2050-2079

- Run water resource impacts of one period: 2030-2059

Comments included:

- Less interested in running the farther out climate and hydrology scenarios at the expense of being able to run less management scenarios; but understand it's a low investment
- Interested in assessing Water Resources Impacts during a time period that fully captured 50 years (because it could provide information to the HCP process where permittees are seeking a 50-year permit)

ALL GREEN CARDS; one abstention

#7 Percentile Changes (# & %):

Recommendation:

- Run 5 scenarios for hydrology, then choose 3 for water resources modeling
- Use 20/50/80 percentages – **ALL GREEN CARDS; one absention**

Betty Roppe excused herself to leave for another meeting.

#8 Hydrology Model:

Recommendation: Use GSFLow -- **ALL GREEN CARDS**

- It was noted that this is contingent on the model being ready in time to use. This decision will be reevaluated in two months.

#9 Water Resource Model: RiverWare or MODSIM?

Recommendation: RiverWare- **ALL GREEN CARDS**

Jeff asked Mike Relf if these decisions were reviewed by Bureau of Reclamation. Mike answered yes, Niklas has reviewed these with him and Jennifer extensively, as well as with Jonathon LaMarche, Marshall Gannett, and the Planning Team.

Kate noted that there wasn't full voting on all decisions. Would anyone like to discuss this? Or should we move on? No response.

Niklas is going to put together some narrative on the project management plan. Kimberly would like materials in advance, if possible. Kate agreed and said we will try to accomplish this, but we are under a tight timeline.

COMMUNICATIONS SUBGROUP

Kate reported that we committed to setting up a communications subgroup in our Communications and Outreach Plan as part of the Plan of Study and MOA. First steps include developing key messages developing a PowerPoint, and developing a schedule for public outreach. We are reaching a lot of stakeholders through this process, but should plan additional meetings at key points in the study. Kate asked for volunteers to join this committee. Adam Sussman, Mike Relf, Craig Horrell,

Chris Gannon, and Jeff Wieland all volunteered. Kate added that she will participate. The group will meet for a half hour after every BSC meeting.

PUBLIC COMMENT

No one commented.

NEXT STEPS

The OWRD presentation with Alyssa was cancelled today, but it will be part of the July agenda.

The next meeting is July 7th in the DeArmond room from 10-Noon.

Meeting adjourned by Craig Horrell.

MEETING EVALUATION

Members were provided forms on which to write one piece of feedback about what they liked about the meeting, indicated below with a plus symbol (+), and one piece of feedback about what they would like to change for the next meeting, indicated with a delta symbol (Δ). Each check mark (✓) indicates that someone repeated an item. The following comments were received.

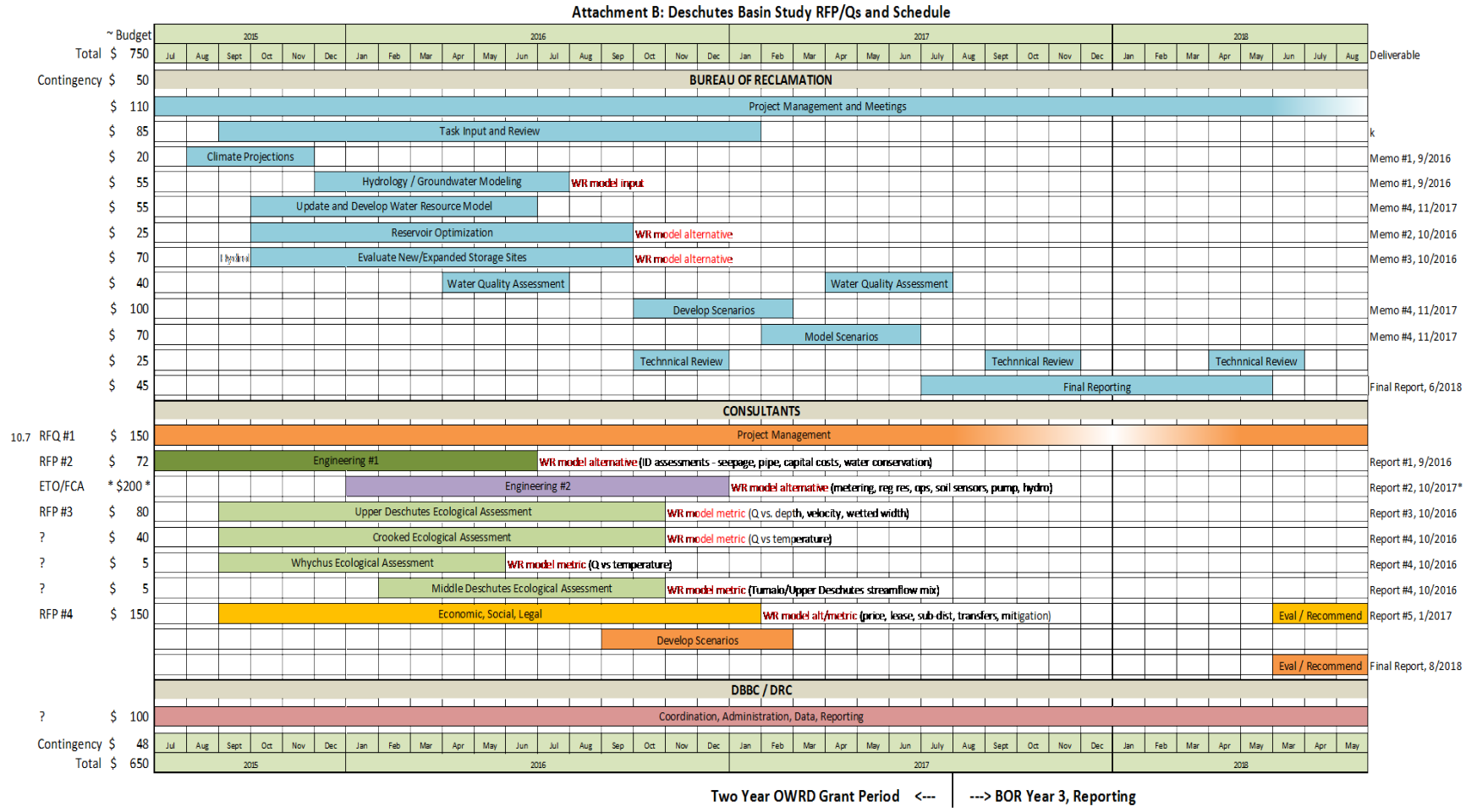
+	Δ
+ Cooperation and collaboration of all participants✓	Δ Difficult to hear in the Barnes and Sawyer room
+ Efficient. Agenda and background on each item well prepared	Δ Decision points information needs more advanced preparation
	Δ Would be nice to have these meetings in Redmond once in a while

ATTACHMENT A: BSC ACTIVE MEMBERS LIST

From Section 3.a of the Charter: "If a member organization does not participate in decision-making at two consecutive meetings by attendance or by email (see 4.a.vi), that organization cannot participate in decision-making until after it participates at two of the prior four meetings."

Organization	3/3/15	4/7/15	5/15/15	6/8/15
Arnold Irrigation District	P	P	P	P
Avion Water Company	P	P	P	P
Bend Paddle Trail Alliance				
Central Oregon Cities Organization	P	P	P	P
Central Oregon Flyfishers	P	P		P
Central Oregon Irrigation District	P	P	P	P
City of Bend	P	P	P	P
City of Madras	O	P	P	P
City of Prineville	P	P	P	P
City of Redmond	P		P	
Crooked River Watershed Council	P	P	P	P
Deschutes County	P	P		
Deschutes River Conservancy	P	P	P	P
Lone Pine Irrigation District	P		P	P
Native Reintroduction Network	P	P	P	
Natural Resources Conservation Service		P	P	P
North Unit Irrigation District		P	P	P
Ochoco Irrigation District	P	P	P	P
Oregon Dept. of Environmental Quality	P		P	P
Oregon Water Resources Department	P		P	P
Portland General Electric	P	P	P	P
Swalley Irrigation District	P	P		P
Three Sisters Irrigation District	P	P	P	P
Trout Unlimited	P	P	P	P
Tumalo Irrigation District	P	P	P	P
U.S. Bureau of Reclamation	P	P	P	P
U.S. Fish and Wildlife Service	P	P		P
U.S. Forest Service	O	P	P	P
Upper Deschutes River Coalition	P	P	P	P
Upper Deschutes Watershed Council	P	P		P
Water for Life	P	P	P	P
WaterWatch of Oregon	P	P		P

ATTACHMENT B: DESCHUTES BASIN STUDY RFP/QS AND SCHEDULE



ATTACHMENT C: DECISION POINTS ON MODELING

DECISION POINTS ON MODELING

1. Climate projections: CMIP3, CMIP5, or both. Recommendation: CMIP5, as the latest state of the science.

2. Percentile range for ensembles/projections: moderate (20/50/80) or extreme (10/50/90). Recommendation: moderate (20/50/80) as most appropriate for Basin Study applications.

3. Future Time Periods: select number of periods and time frames. Recommendation: two time periods, 2040s and 2060s, with 2040s used for simulation of alternatives.

4. Number of climate scenarios: 3 or 5. Recommendation: 5 for initial analysis, with a reduced number of scenario(s) selected for analysis of water management options.

5. Groundwater model: VIC or GSFlow. Recommendation: GSFlow to allow more complete recharge estimates and to better simulate groundwater-dominated streamflow that occurs in the Upper Deschutes basin; implementation strategy will address uncertainties about the timing for model availability.

6. Water resources model: MODSIM or RiverWare. Recommendation: RiverWare - somewhat more transparent, daily time-steps already incorporated, and temperature function availability. RiverWare will be updated by BOR for implementation of the Crooked River Act so possible efficiency/more detailed model possible.

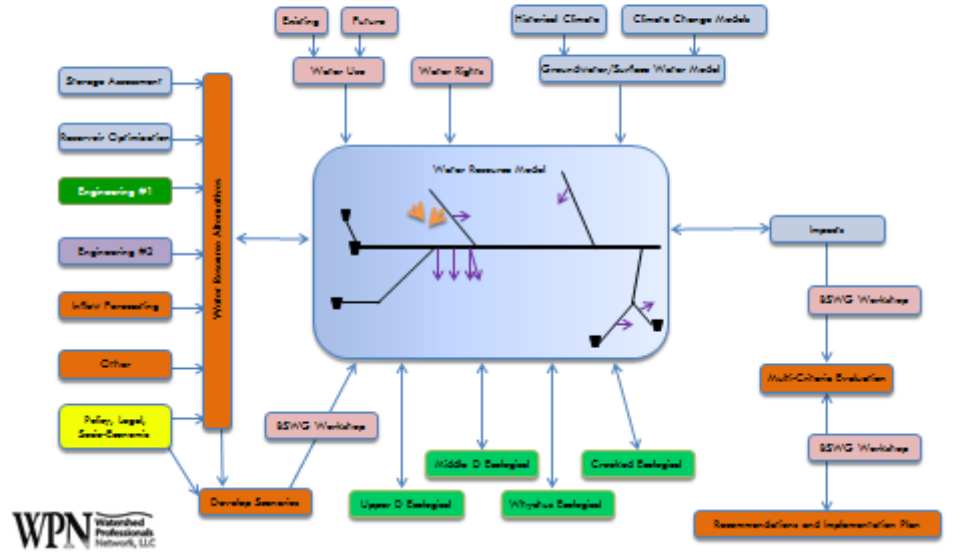
7. Future Irrigation Demands: current demands (allows for more straightforward comparisons of shortages, etc.), or incorporate potential changes in evapotranspiration (assume current land use & crop mix and limit demands per water rights), or incorporate potential changes in crop distribution and land use as well as ET. Recommendation: incorporate potential changes in evapotranspiration as an advancement over past basin study approaches without getting overly speculative/costly.

ATTACHMENT D: NIKLAS CHRISTENSEN'S PRESENTATION

Overview

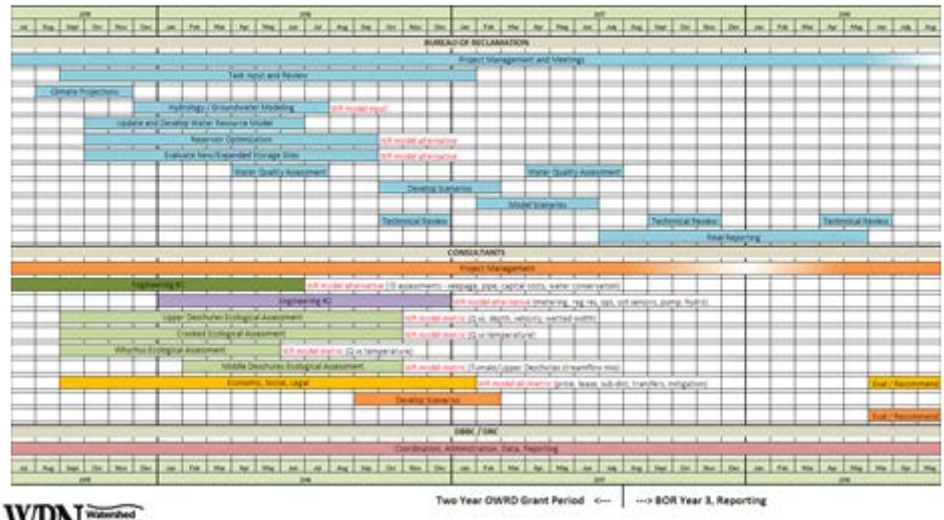
- Basin Study Overview
  - Schematic
  - Schedule
- Work Elements
- Contracting Recommendations
- Decision Points

Basin Study - Overview



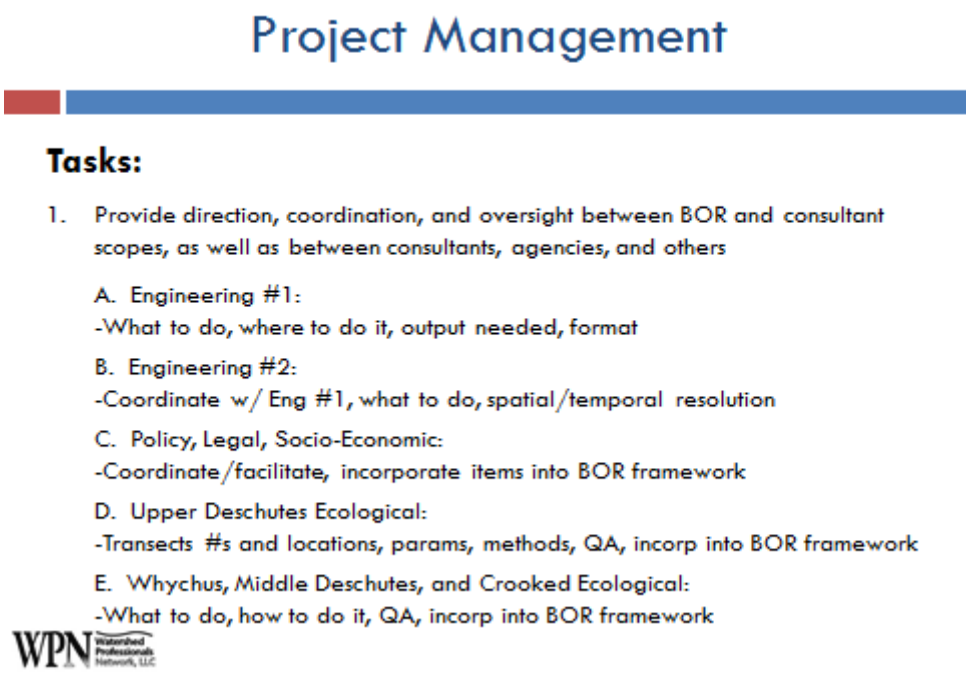
SLIDES 1 & 2

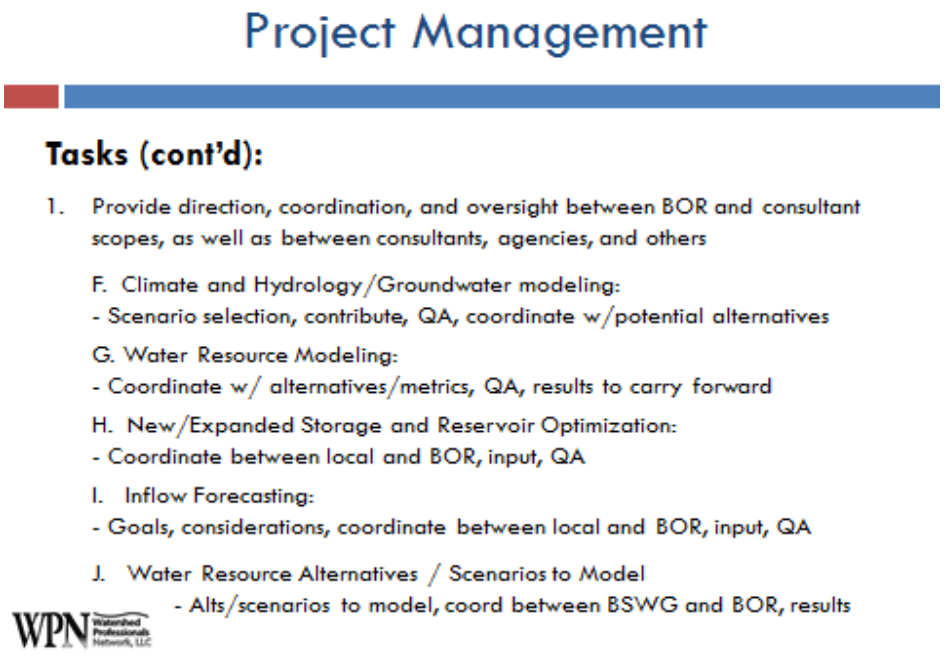
Basin Study - Schedule



Work Elements

SLIDES 3 & 4


Project Management
Tasks:
1. Provide direction, coordination, and oversight between BOR and consultant scopes, as well as between consultants, agencies, and others
A. Engineering #1:
-What to do, where to do it, output needed, format
B. Engineering #2:
-Coordinate w/ Eng #1, what to do, spatial/temporal resolution
C. Policy, Legal, Socio-Economic:
-Coordinate/facilitate, incorporate items into BOR framework
D. Upper Deschutes Ecological:
-Transects #s and locations, params, methods, QA, incorp into BOR framework
E. Whychus, Middle Deschutes, and Crooked Ecological:
-What to do, how to do it, QA, incorp into BOR framework
WPN


Project Management
Tasks (cont'd):
1. Provide direction, coordination, and oversight between BOR and consultant scopes, as well as between consultants, agencies, and others
F. Climate and Hydrology/Groundwater modeling:
- Scenario selection, contribute, QA, coordinate w/potential alternatives
G. Water Resource Modeling:
- Coordinate w/ alternatives/metrics, QA, results to carry forward
H. New/Expanded Storage and Reservoir Optimization:
- Coordinate between local and BOR, input, QA
I. Inflow Forecasting:
- Goals, considerations, coordinate between local and BOR, input, QA
J. Water Resource Alternatives / Scenarios to Model
- Alts/scenarios to model, coord between BSWG and BOR, results
WPN

SLIDES 5 & 6

Engineering #1

Tasks:

1. Document existing studies (loss measurements, pipe sizing, and cost estimates)
2. Evaluate conveyance efficiency through direct measurement using weirs at end spill points, seepage runs on canal segments, and evaporation estimates
   A. Prioritize areas of high loss, management problems, urbanization and hydropower potential
   B. Complement existing studies
3. Develop water conservation potential estimate within conveyance system
4. Develop cost estimates for identified conservation measures

WPN Watershed Professionals Network, LLC

Engineering #2

Tasks:

1. Evaluate Existing Information on Water Use and Infrastructure
2. Evaluate Stakeholder Preferences and Community Involvement
3. Evaluate Water and Energy Conservation Potential
4. Evaluate Environmental and Water Quality Impacts
5. Evaluate Hydroelectric Potential
6. Evaluate Economic Impacts
7. Develop System Optimization Plan

WPN Watershed Professionals Network, LLC

SLIDES 7 & 8

Engineering #2

Tasks:

3. Evaluate Water and Energy Conservation Potential
   - A. Evaluate conveyance efficiency through direct measurement using weirs at end spill points, seepage runs on canal segments, and evaporation estimates *(also in Eng. 1)*
   - B. Develop water conservation potential estimate within conveyance system *(also in Eng. 1)*
   - C. Evaluate on-farm efficiency through crop use, application methods, and ET requirements
   - D. Develop water conservation potential estimate at point of delivery (on-farm)
   - E. Evaluate operational water conservation potential through regulating storage, telemetry, district wide soil moisture sensor systems, and small storage sites
   - F. Evaluate energy conservation potential through collection of data on actual pumping costs for existing pumps both in the district and on farm to determine impact of pressurization or centralized pumping facilities where possible
   - G. Develop cost estimates for identified conservation measures

WPN Watershed Professionals Network, LLC

Policy, Legal, and Socio-Economic

Tasks:

1. Summarize Existing Information (water rights, water use, legal status and policies/agreements)
2. Evaluate Legal and Policy options for Stored Water, Reservoir Management and Optimization
3. Evaluate Opportunities and Legal and Policy options associated with GW-SW switches and GW recharge in Whychus Creek
4. Evaluate Legal and Policy Options for Water Movement
5. Evaluate Legal and Policy Options for Developing New or Expanded Reservoir Storage

WPN Watershed Professionals Network, LLC

SLIDES 9 & 10

Policy, Legal, and Socio-Economic

Tasks (cont'd):

6. Evaluate Legal and Policy Options for Groundwater Mitigation
7. Evaluate Economic and Policy Options for Water Pricing, Demand-Based Delivery, and Water Transactions
8. Document Result to Facilitate Selection of Water Resource Scenarios to evaluate in USBR Water Resource model
9. Provide Support for Water Resource Scenario Development
10. Facilitate Evaluation of Basin Study Results and Develop Basin Plan

WPN Watershed Professionals Network, LLC

Upper Deschutes Ecological Assessment

Tasks:

1. Work with BSWG to clarify study objectives and confirm the appropriateness of the identified survey reaches.
2. Integrate with past/current studies (inc. leveraging local resources)
3. Select redband trout rearing and Oregon Spotted Frog specific habitat suitability criteria (HSC) in consultation with stakeholders
4. Identify, evaluate, and select riparian functional relationships in consultation with stakeholders
5. Identify transect locations in consultation with stakeholders.
6. Establish topographic data

WPN Watershed Professionals Network, LLC

SLIDES 11 & 12

Upper Deschutes Ecological Assessment

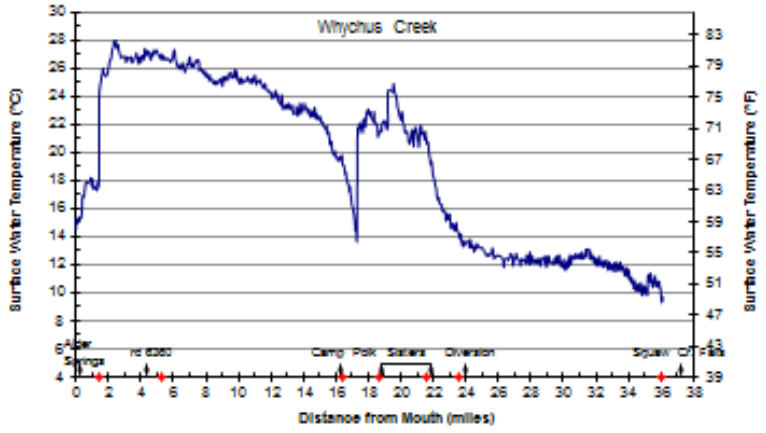
Tasks (cont'd):

7. Collect hydraulic and habitat data
8. Processed transect data through hydraulic simulation sub-models (generates simulations of depth and velocity distributions over a range of flows)
9. Apply habitat suitability criteria (HSC) to the predicted hydraulic parameters (produces functional relationships between flow and aquatic habitat – WUA)
10. Apply riparian function relationships to the predicted hydraulic parameters (produces functional relationships between flow and riparian condition)
11. Interpret and discuss relationships (inc. comparing against recent studies)

WPN Watershed Professionals Network, LLC

Whychus, Middle D, and Crooked

Potential Whychus Temperature Element:

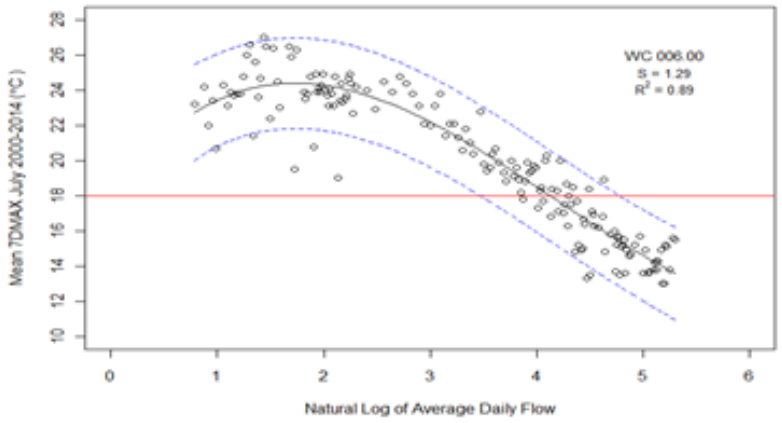


WPN Watershed Professionals Network, LLC

SLIDES 13 & 14

Whychus, Middle D, and Crooked

Potential Whychus Temperature Element:

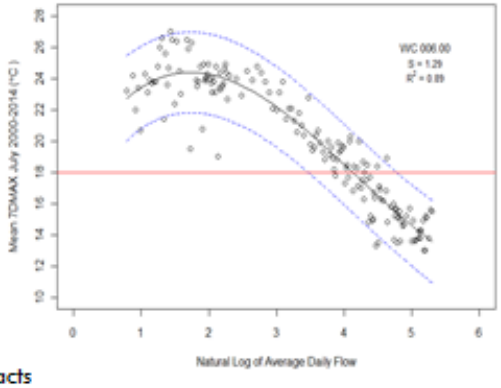


WPN Watershed Professionals Network, LLC

Whychus, Middle D, and Crooked

Potential Whychus Temperature Element:

- Use existing streamflow, stream temperature, groundwater, and groundwater temperature relationships
- Use RiverWare and/or MODFLOW



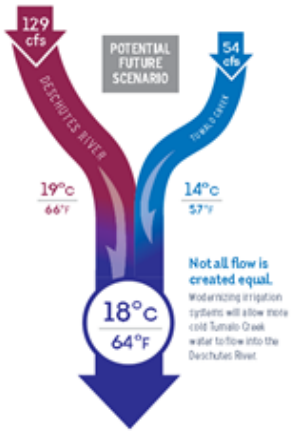
→ Allows evaluating temperature impacts from Alternatives/Scenarios

WPN Watershed Professionals Network, LLC

SLIDES 15 & 16

Whychus, Middle D, and Crooked

Potential Middle Deschutes Temperature Element:



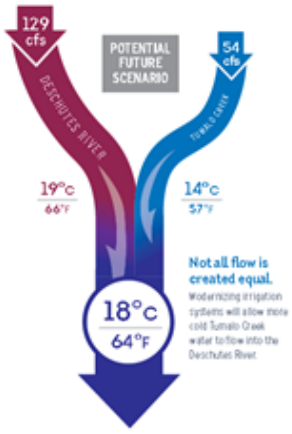
WPN Watershed Professionals Network, LLC

Whychus, Middle D, and Crooked

Potential Middle Deschutes Temperature Element:

- Use existing streamflow, stream temperature, and maybe air temperature relationships
- Use RiverWare stream temperature mixing component

→ Allows evaluating temperature impacts to Middle Deschutes from Alternatives/Scenarios

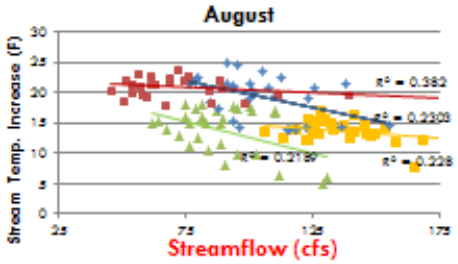


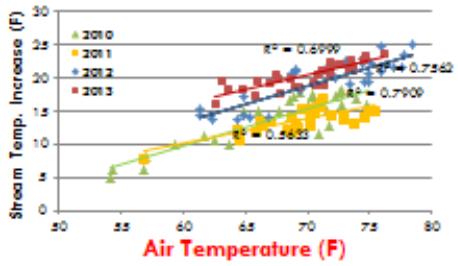
WPN Watershed Professionals Network, LLC

SLIDES 17 & 18

Whychus, Middle D, and Crooked

Potential Crooked Temperature Element:

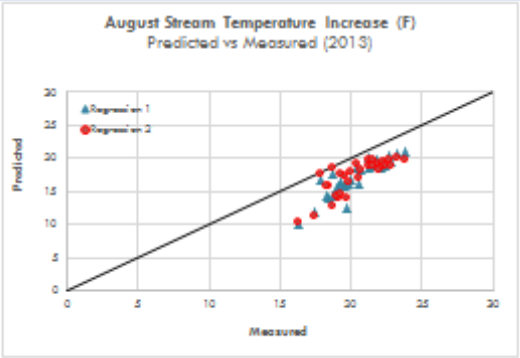




Whychus, Middle D, and Crooked

Potential Crooked Temperature Element:

Regression equation based on air temperature and streamflow



SLIDES 19 & 20

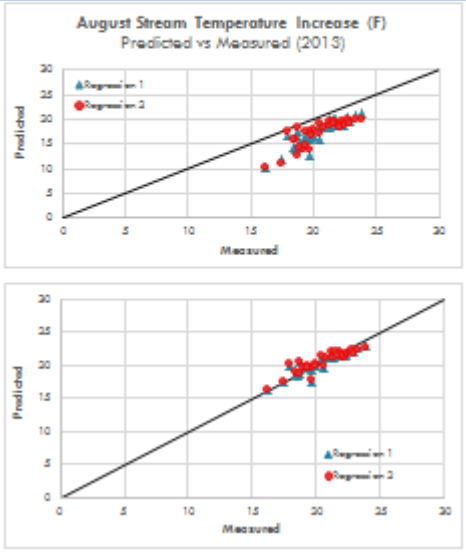
Whychus, Middle D, and Crooked

Potential Crooked R. Temperature Element:

Regression equation based on air temperature and streamflow

Equation calc'd from 2010-2013 data

Equation calc'd from 2013 data only (2013 res release colder than average)

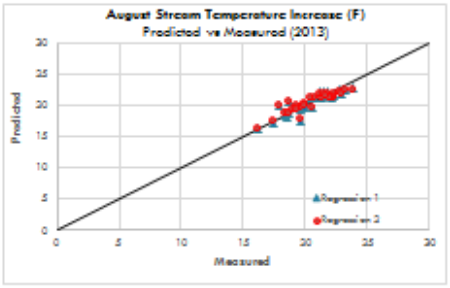


Whychus, Middle D, and Crooked

Potential Crooked Temperature Element:

- Use existing streamflow, stream temperature, reservoir release temperature, and air temperature relationships
- Use RiverWare (maybe Heat Source or other).

→ Allows evaluating temperature impacts from climate change and Alternatives/Scenarios



SLIDES 21 & 22

Contracting Recommendations

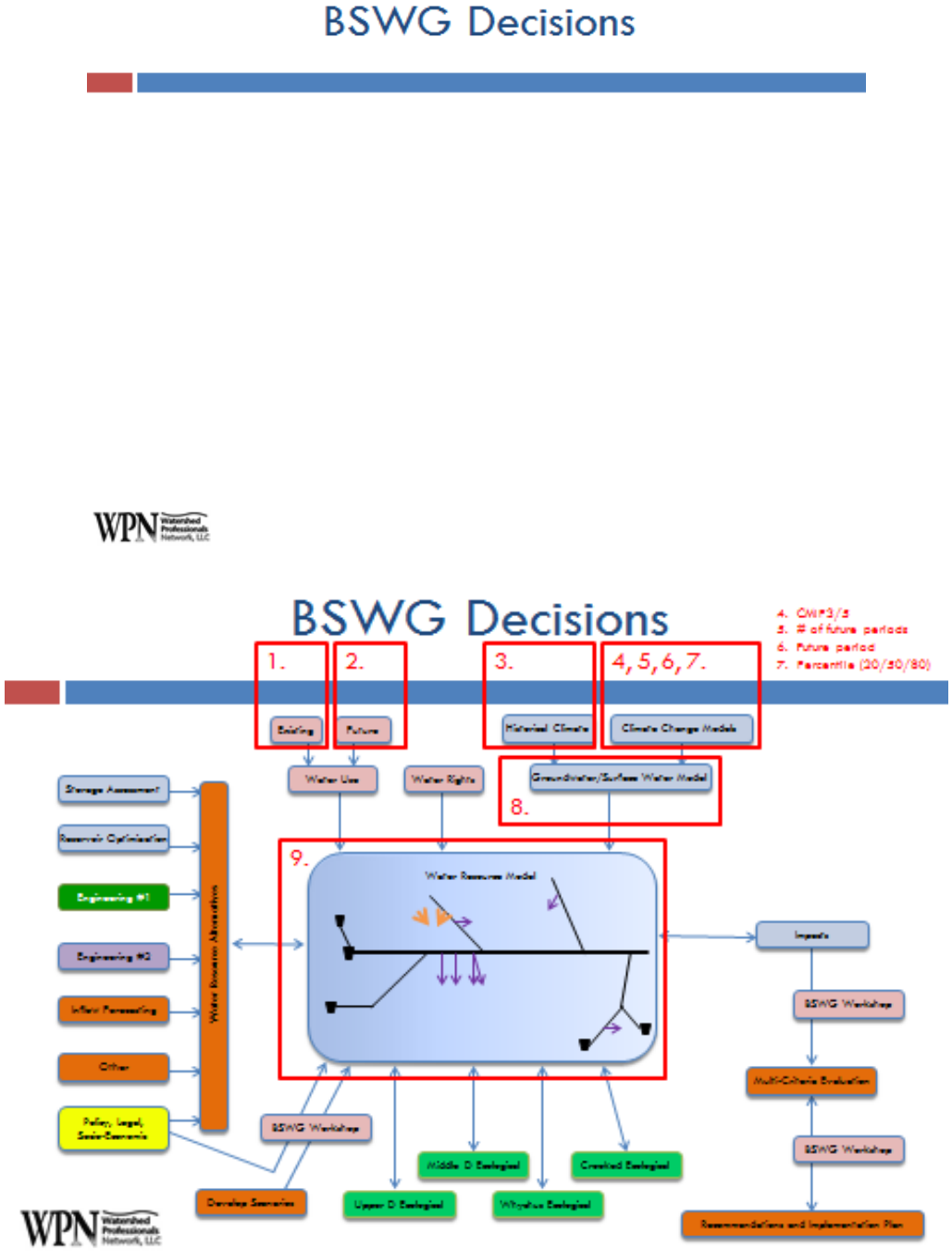
WPN Watershed Professionals Network, LLC

Contracting Recommendations

Work Element	Recommendation
Project Management	1. Release RFQ
Engineering #1	1. Release RFQ
Engineering #2	No BSWG contracting required. Contract directly between ETO/FCA and irrigation districts
Policy, Legal, Socio-Economic	1. Release single RFP for ~$150,000. Stipulate contract may be split between two or more consultants
Upper Deschutes Ecological	1. Release RFP for ~$80,000
Middle Deschutes, Whychus, and Crooked Ecological	1. Direct award Middle Deschutes and Whychus to DRC, Watershed Councils, DBBC, or other. 2. Evaluate Crooked R. streamflow/temperature data further, potentially direct award to entities above or future RFP.
Coordination, Data, Reporting	1. Continue to be performed by DRC

WPN Watershed Professionals Network, LLC

SLIDES 23 & 24


BSWG Decisions
WPN
BSWG Decisions
4. CWP3/5
5. # of future periods
6. Future period
7. Percentile (20/50/80)
1.
2.
3.
4, 5, 6, 7.
Existing
Future
Historical Climate
Climate Change Models
Water Use
Water Rights
Groundwater/Surface Water Model
8.
9.
Water Resource Model
Storage Assessment
Reservoir Optimization
Engineering #1
Engineering #2
Inflow Forecasting
Other
Policy, Legal, Socio-Economic
Water Resource Alternatives
Impacts
BSWG Workshop
Multi-Criteria Evaluation
BSWG Workshop
Recommendations and Implementation Plan
BSWG Workshop
Develop Scenarios
Middle 0 Ecological
Lower 0 Ecological
Riparian Ecological
Created Ecological
WPN

SLIDES 25 & 26

#1: Water Use - Existing

Recommendation:

Water Use:

- Data used in water resource model will be based on most recent 10-year period of data available (~2004-2014)
- Will be corrected for recent infrastructure projects
- If applicable, demand will be a function of dry/wet/normal years

Infrastructure:

- "Existing Conditions" in Water Resource model will be based on current conditions plus known build-out in next few years

WPN Watershed Professionals Network, LLC

#2: Water Use - Future

Decision:

Water Use:

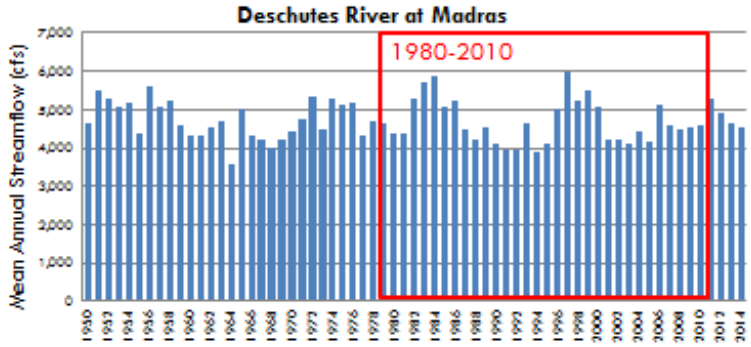
1. Current demands (allows for more straightforward comparisons of shortages, etc.)
2. Incorporate potential changes in ET (assume current land use & crop mix and limit demands per water rights)
3. Incorporate potential changes in crop distribution and land use as well as ET

Recommend #2: Advancement over past basin study approaches without getting overly speculative/costly.

WPN Watershed Professionals Network, LLC

SLIDES 27 & 28

#3: Historical Period



Recommend using 1980 – 2010:

- representative
- does not have lowest year but has lowest successive three years
- will save considerable BOR budget
- standard historical period

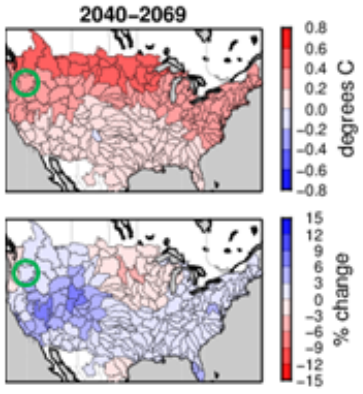
#4: CMIP 3 or 5

CMIP - Coupled Model Intercomparison Project

Recommendation :

Use CMIP5

- Latest science
- Readily available



CMIP5–CMIP3: Difference in Period Average Change from 1950–99

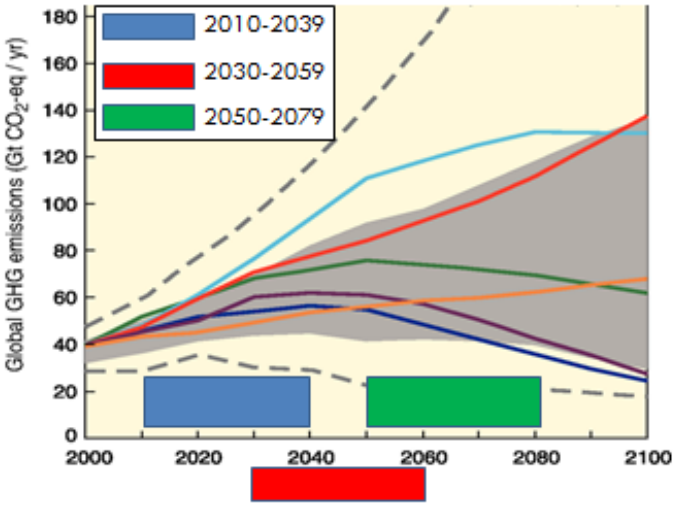
SLIDES 29 & 30

#5 & 6: Future Periods (# and when)

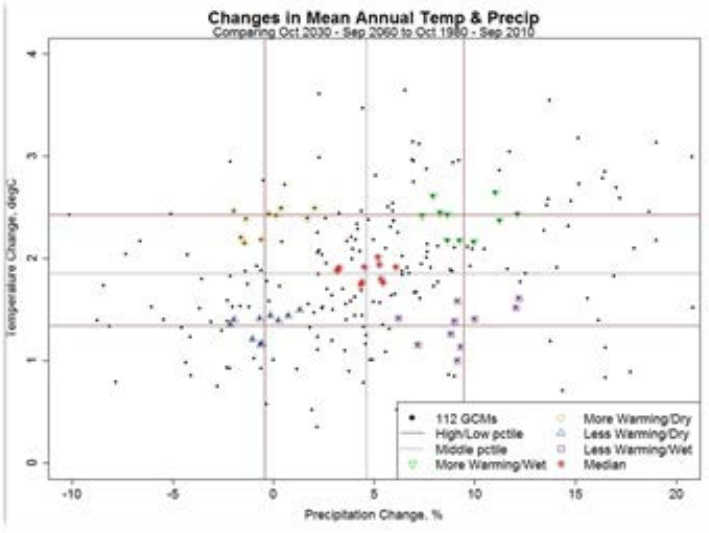
Recommendation :

Climate and hydrology of two periods:
- 2030-2059
- 2050-2079

Water Resource Impacts of one period:
- 2030-2059

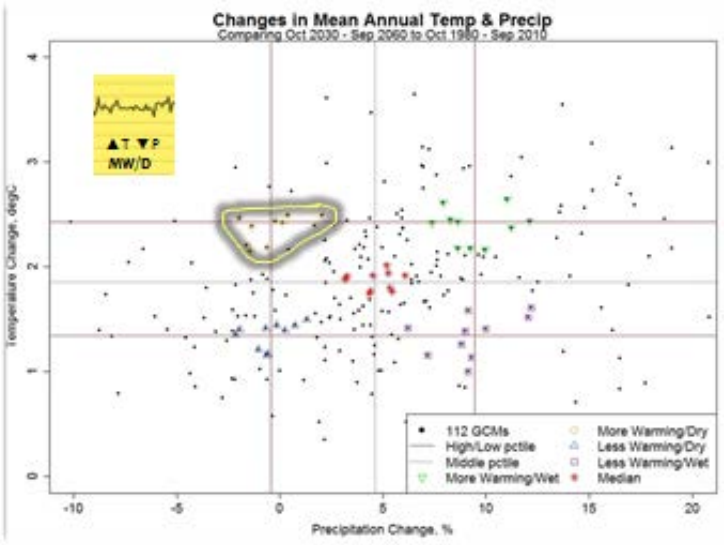


#7: Percentile Changes (# and %)



SLIDES 31 & 32

#7: Percentile Changes (# and %)



WPN Watershed Professionals Network, LLC

#7: Percentile Changes (# and %)

Number of Scenarios:

- 3 or
- 5

Recommend:

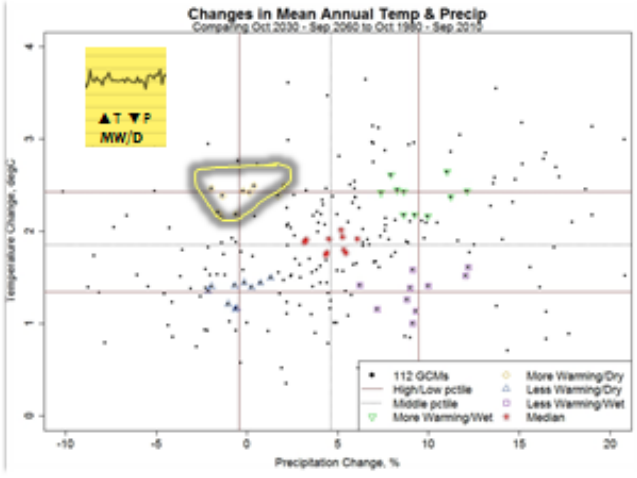
All 5 for hydrology, choose 3 for water resource modeling

Percentages to use:

- 10/50/90 or
- 20/50/80

Recommend:

Use 20/50/80



WPN Watershed Professionals Network, LLC

SLIDES 33 & 34

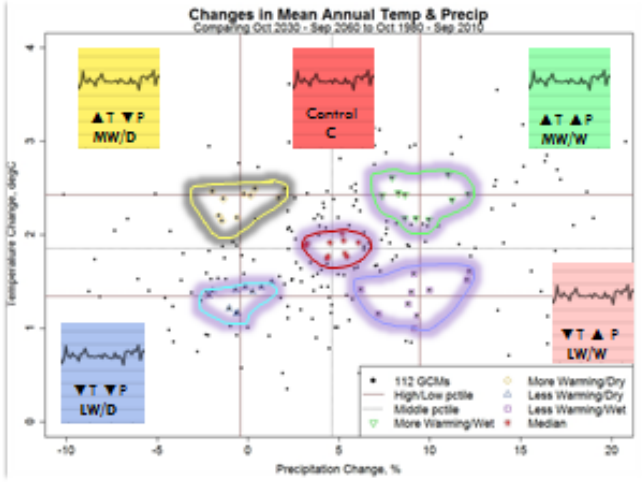
#7: Percentile Changes (# and %)

Number of Scenarios:
- 3 or
- 5

Recommend:
All 5 for hydrology, choose 3 for water resource modeling

Percentages to use:
- 10/50/90 or
- 20/50/80

Recommend:
Use 20/50/80



#8: Hydrology Model

Decision: Use GSFlow or other (VIC)?

- VIC does not have explicit Groundwater
- GSFlow is coupled surface SW/GW model

→ **Recommend using GSFlow***

* Possible scheduling issues, will reevaluate in 2 months

SLIDES 35 & 36

#9: Water Resource Model

Decision: Use RiverWare or MODSIM?

RiverWare

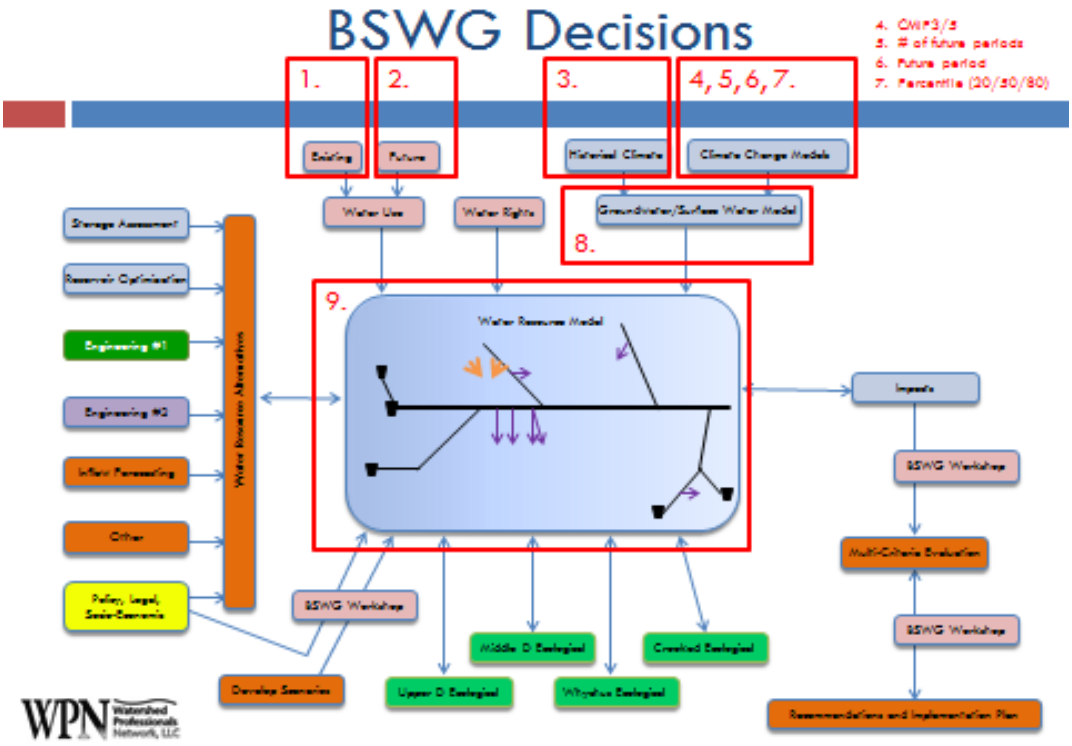
- Already daily timestep
- Needs to be applied by BOR to Crooked
- Has stream temperature mixing component
- $6k license (has free viewer)

MODSIM

- Free

→ **Recommend using RiverWare**

WPN Watershed Professionals Network, LLC



SLIDES 37 & 38