Mid-Coast Implementation Ready TMDL

Temperature
Technical Working Group

Wednesday, April 13, 2016
Newport, Oregon

Today's Objectives

Review current technical work status
Identify next steps
Discuss cold water refugia – Joe Ebersole (EPA)

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Temperature Technical Work

1. Data collection, status and trend assessment

2. Source assessment and cumulative effects analysis

3. Management scenarios, allocations, and implementation planning

Stream Temperature Status and Trend Questions

1. Are there additional category 5 impairments beyond those identified on the most recent 305(b)/303(d) Integrated Report?

2. Is there a cooling or warming trend at sites with sufficient data?

Mid-Coast Continuous Temperature Data

Subbasin	Number of Stations	
	DEQ LASAR	**Other Sources**
Alsea	180	7 (Plum Creek)
Siletz-Yaquina	84 (+24 pending)	26 (CTSI)
Siltcoos	13	-
Siuslaw	65	-

See TWG meeting handouts from June 20th, 2012 for summary of each station

Next Steps

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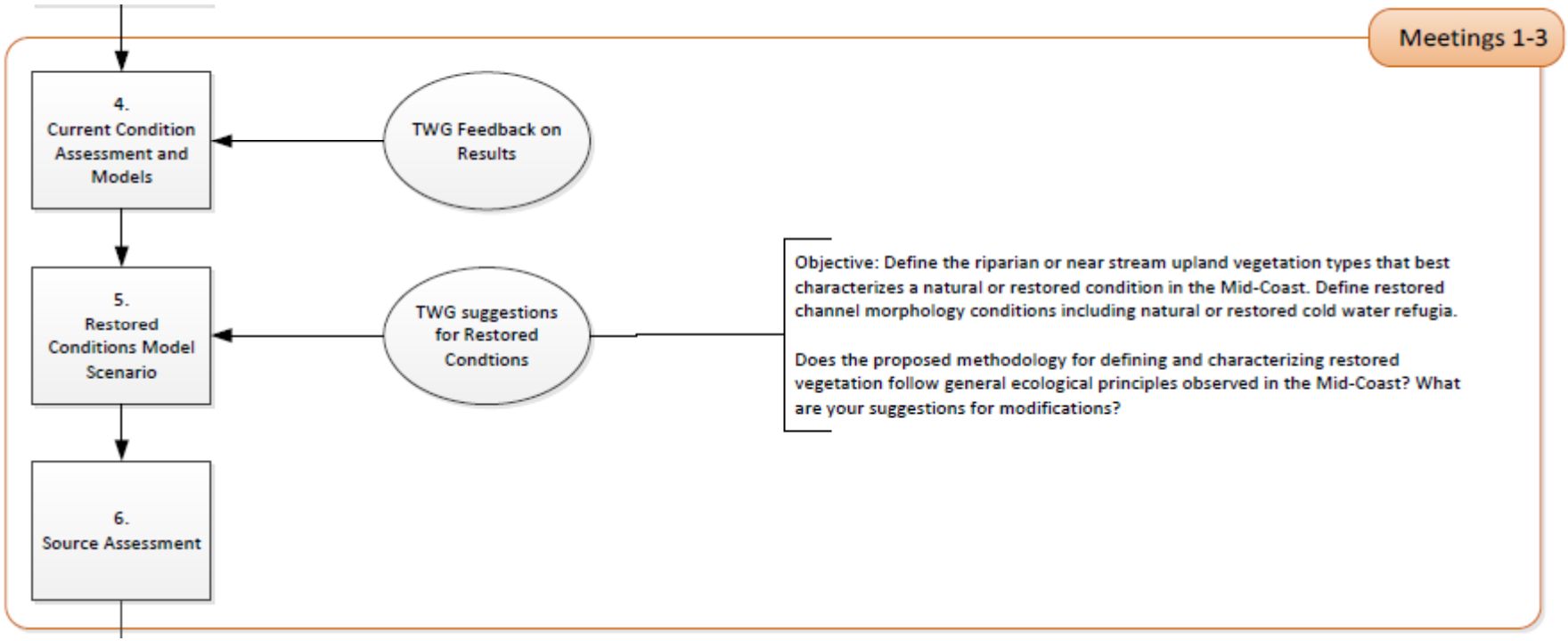
- Update Mid-Coast status and trend analysis

Source Assessment and Cumulative Effects



Source Assessment and Cumulative Effects Questions

1. What is causing stream temperature warming and where are the sources located?

2. How much stream warming comes from anthropogenic sources?

3. Where along the stream is anthropogenic warming occurring?

Source Assessment Methods

Temperature modeling

- Mechanistic (Heat Source)
- Empirical (GLM/SSN)

Vegetation Characterization / Mapping

Solar flux and effective shade modeling

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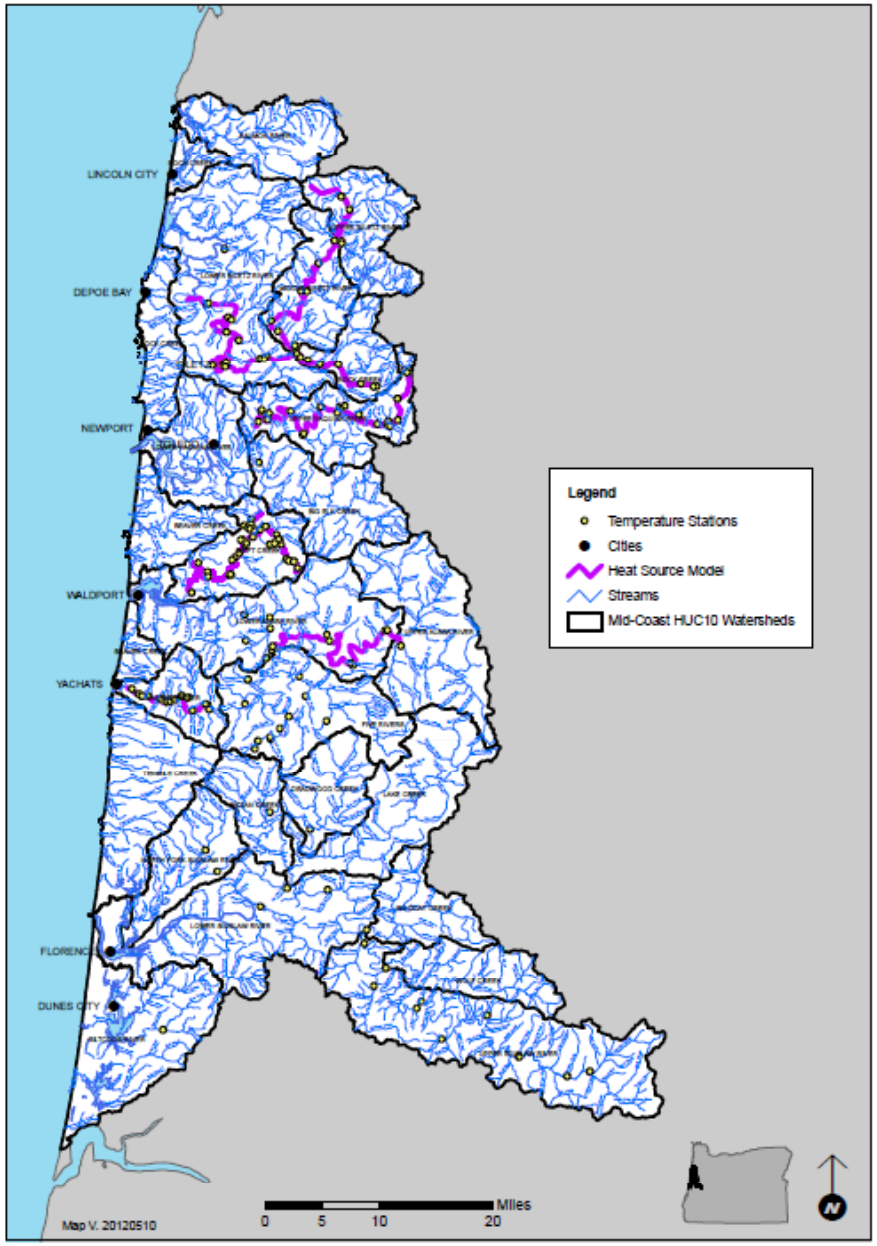
Heat Source Temperature Modeling

- Alsea River
- Drift Creek (Alsea)
- Siletz River / North Fork Siletz River
- Rock Creek
- Little Rock Creek
- Yachats River
- Yaquina River
- ODF RipStream Sites
- Siuslaw River (Reviewing)



Heat Source Temperature Modeling Status

Stream	Model Year	Current Condition	Site Potential Vegetation	Stream Flow	Channel Morphology	Other Management Scenarios
Alsea River	2005	85%	0%	0%	0%	0%
Drift Creek (Alsea)	2011	85%	0%	0%	0%	0%
Jones Creek (Drift Creek/Alsea)	Multiple	95%	0%	0%	0%	0%
Rock / Little Rock Creek (Siletz)	2001	85%	0%	0%	0%	0%
Siltez River / North Fork Siletz	2004	75%	0%	0%	0%	0%
Siuslaw River	2005	10% Insufficient Data	0%	0%	0%	0%
Yachats River	2005	95%	50%	50%	50%	0%
Yaquina River	2005	75%	0%	0%	0%	0%

0% Not Started
10% Model setup
25% Model setup complete, Initial model/s running
50% Running model/s
75% Final modeling stage, Reviewing model/s
90% Modeling Complete, preparing documentation
100% Complete

See TWG meeting handouts from June 20th, 2012, August 15th, 2012 and Sept 19th, 2012.

Site Potential Vegetation Descriptions

1. Geographic groupings/regions for vegetation types
   - Level IV Ecoregions
   - USFS PNV zones

2. Vegetation types

3. Rules to apply site potential in the model

See TWG meeting handouts from July 17th, 2012

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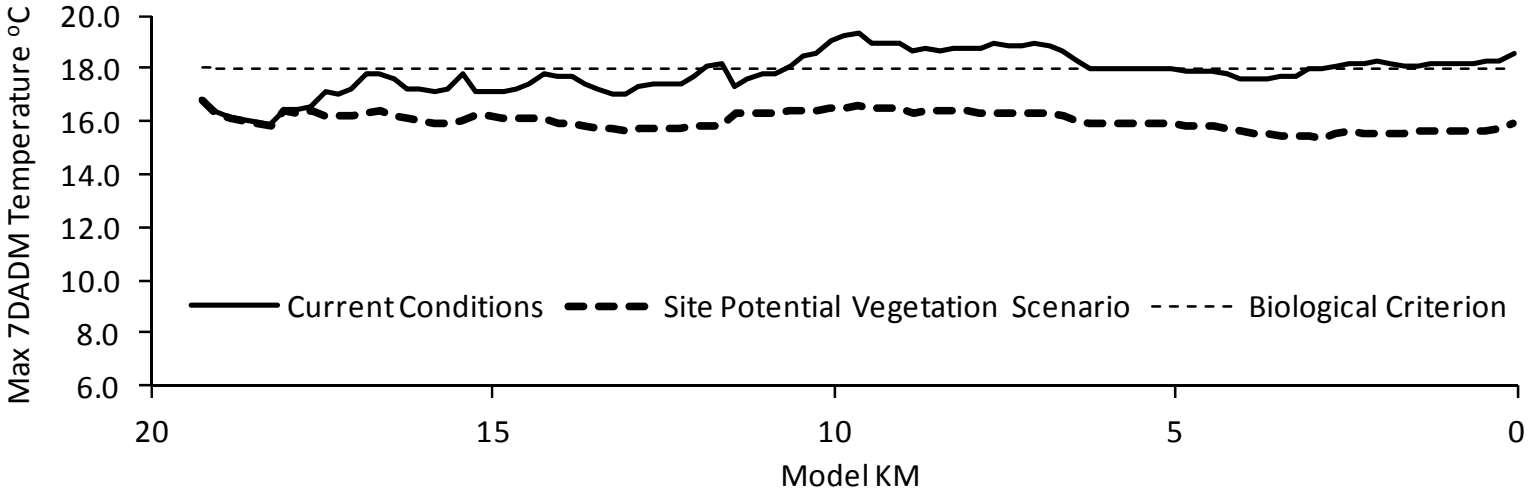
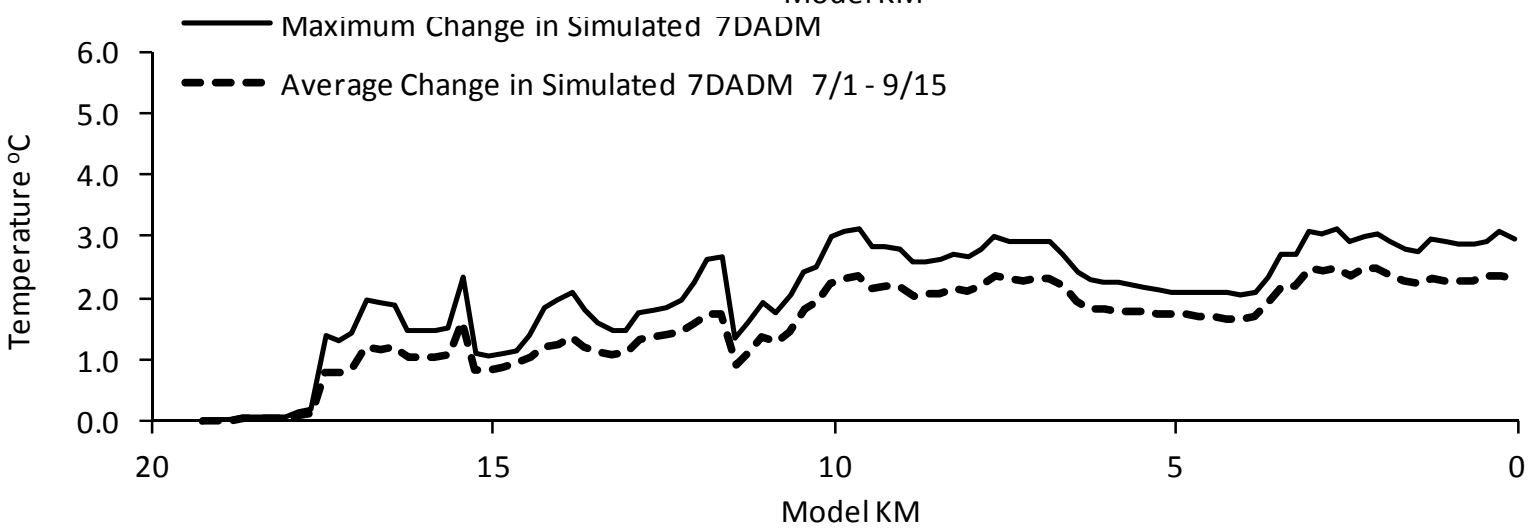
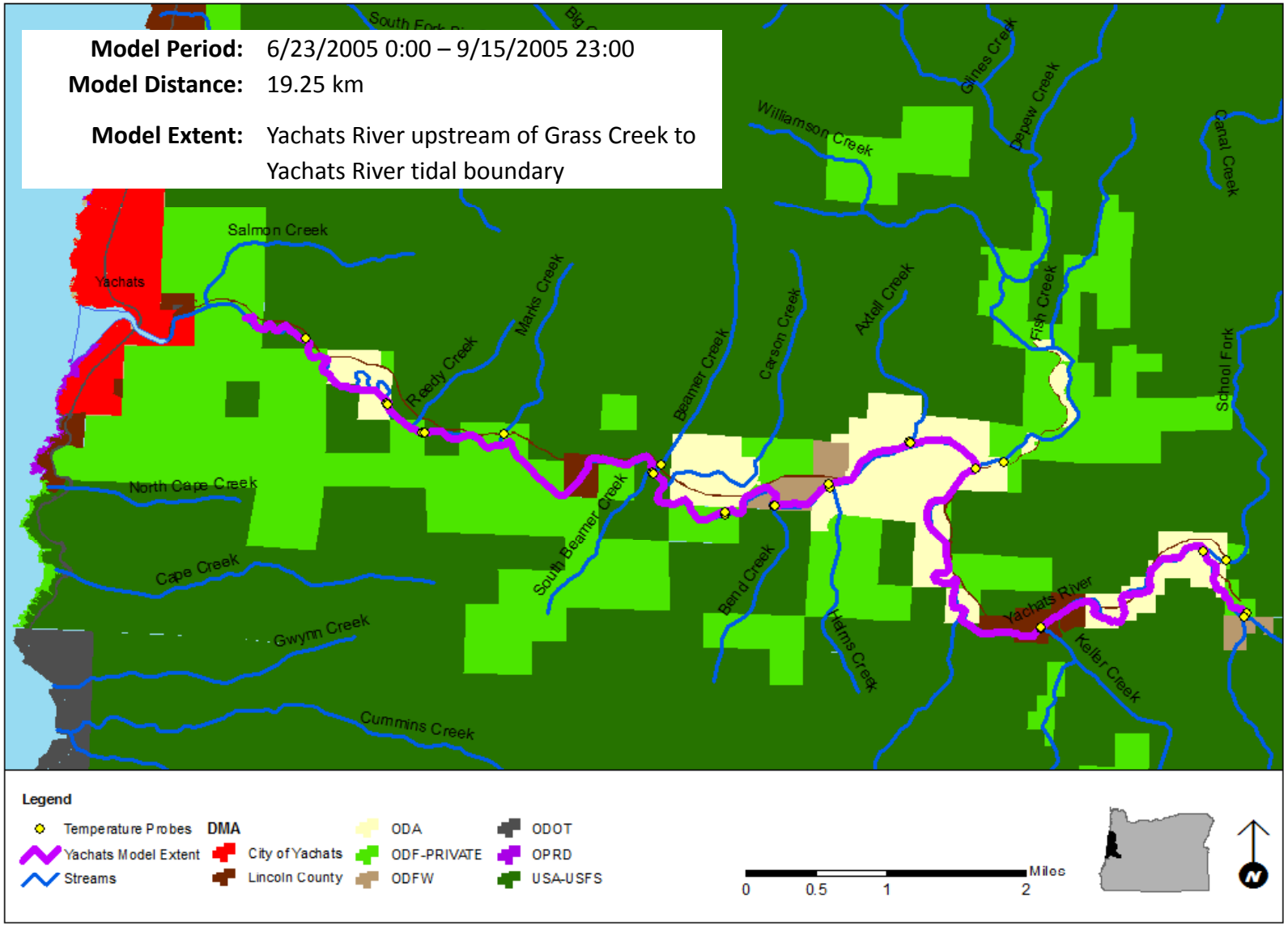
Yachats River Vegetation Restoration Scenario



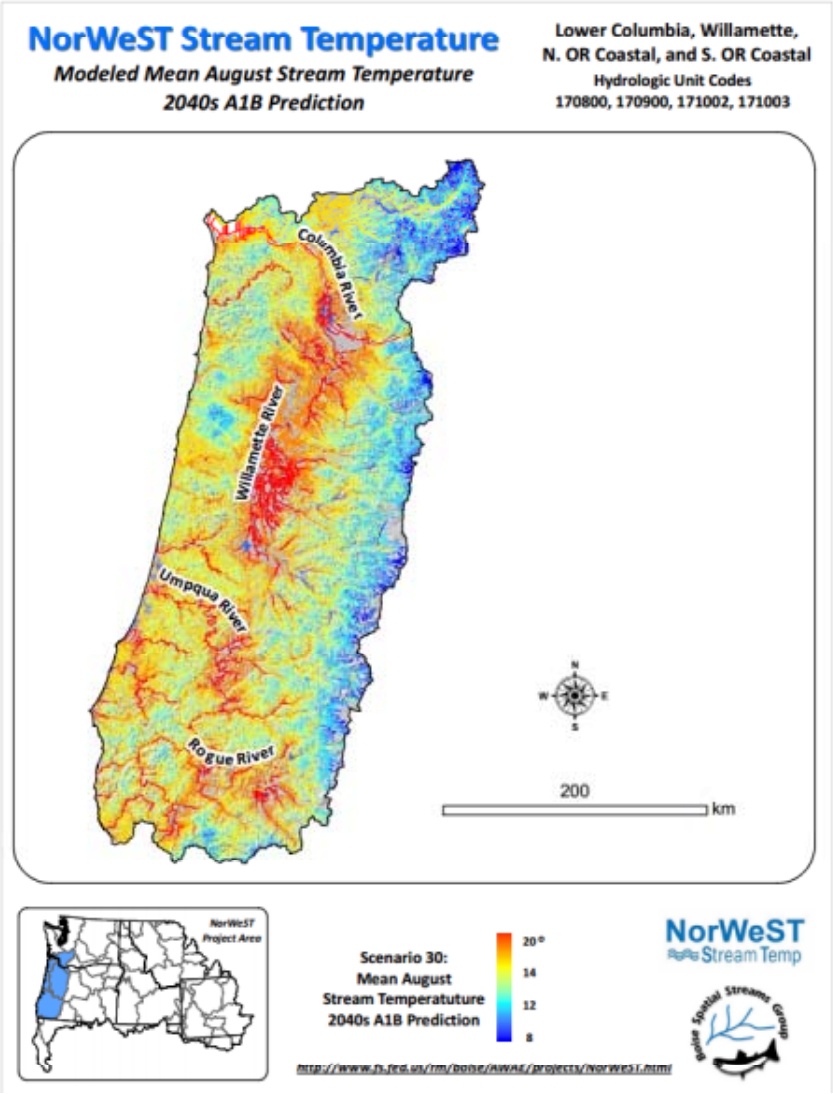


See TWG meeting handouts from Sept 19th, 2012

Yachats River Heat Source Model Extent



Next Steps:
Mid-Coast GLM and Spatial Stream Network Temperature Models



Model Covariates:

Elevation*
Canopy Density*
Slope*
Precipitation (annual mean)*
Watershed Area*
Latitude*
Percent Water
Base Flow Index*
August Air Temperature
August Flow

* Significant ($p < 0.10$)

Random Effects

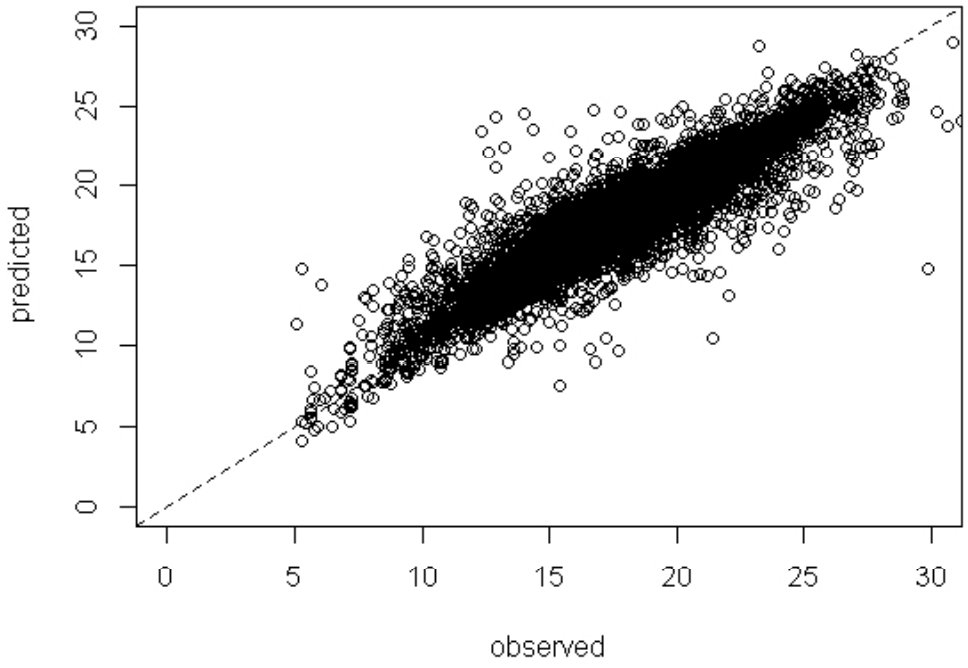
Year

Autocorrelation Functions

Exponential.tailup
Exponential.taildown
Exponential.Euclid

Isaak, D.J., et al. 2011. NorWeST: An interagency stream temperature database and model for the Northwest United States. U.S. Fish and Wildlife Service, Great Northern Landscape Conservation Cooperative Grant. Project website: www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.html

August Mean Daily Maximum Stream Temperature

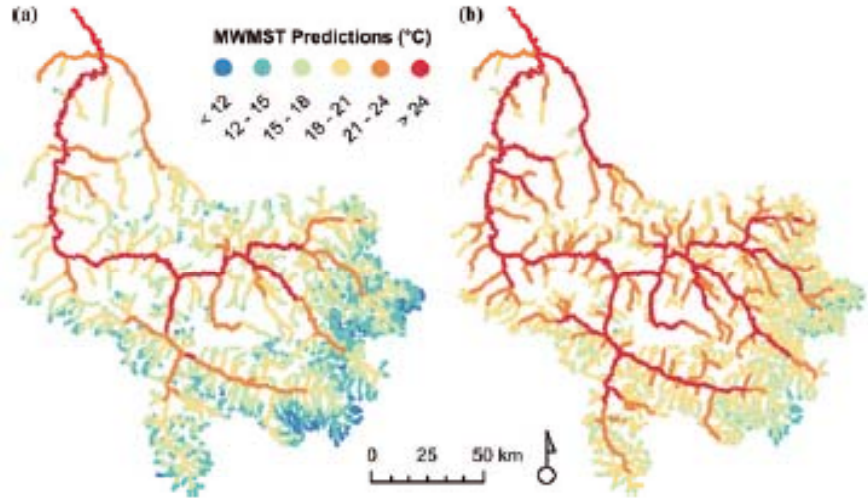


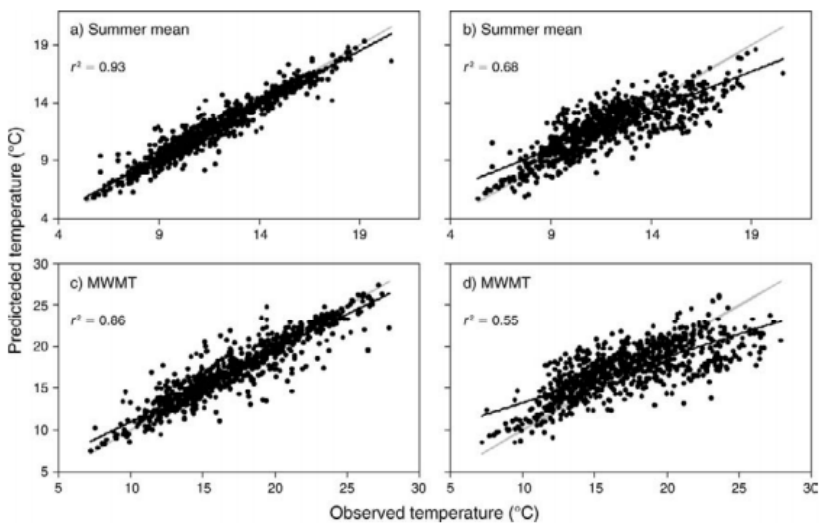
Cross validated R-squared = 0.82
Cross validated RMSE = 1.53
N = 9071

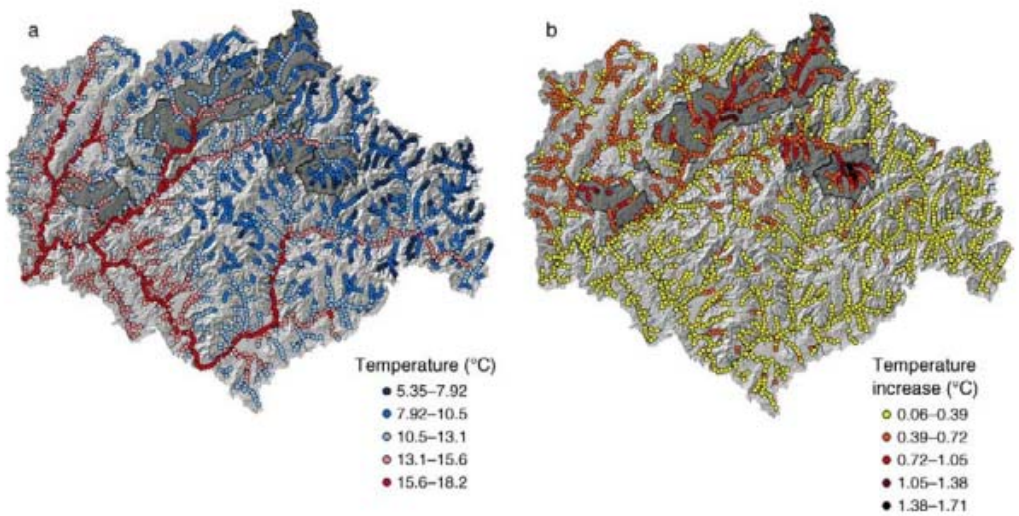
		Estimate	std.err	t.value	prob.t
1	(Intercept)	17.27076	0.25815	66.90209	0
2	elev	-3.00995	0.23438	-12.8422	0
3	canopy	-1.37502	0.107813	-12.7538	0
4	slope	-0.90142	0.099112	-9.09501	0
5	precip	-1.07175	0.205357	-5.21898	0
6	drainage	0.326011	0.191514	1.702281	0.08874
7	lat	-2.00991	0.259836	-7.73529	0
8	water	-0.10315	0.149458	-0.69014	0.49012
9	bfi	0.629188	0.295763	2.127336	0.03342
10	airtemp	0.222153	0.375175	0.592132	0.55378
11	flow	-0.47338	0.472427	-1.00202	0.31636

Application of GLMs and Spatial Stream Network Models

- Ruesch et al (2012) Stream temperature in the John Day basin
- Isaak et al (2010) Climate change, wildfires, and stream temperature in the Upper Boise River Basin.



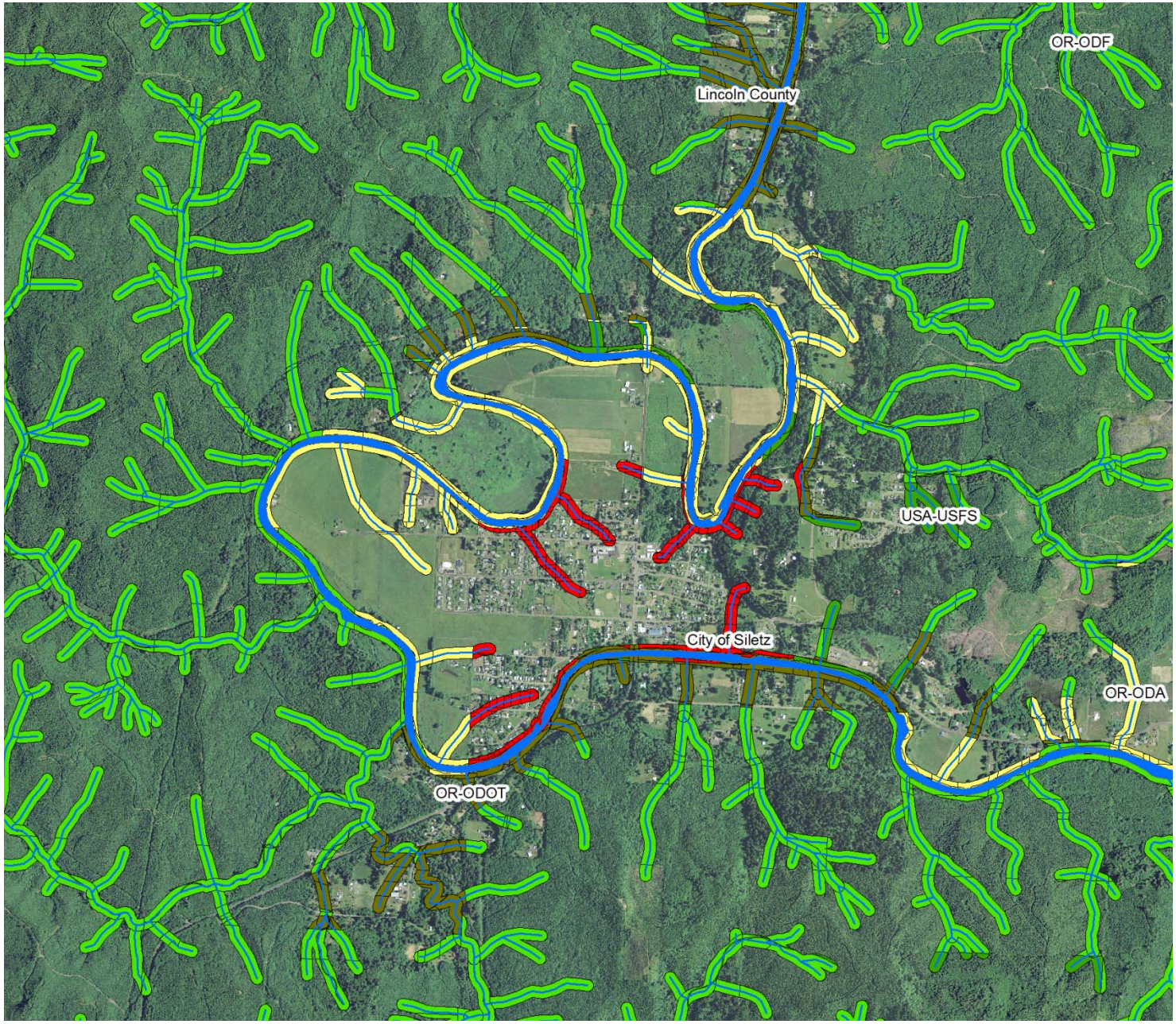




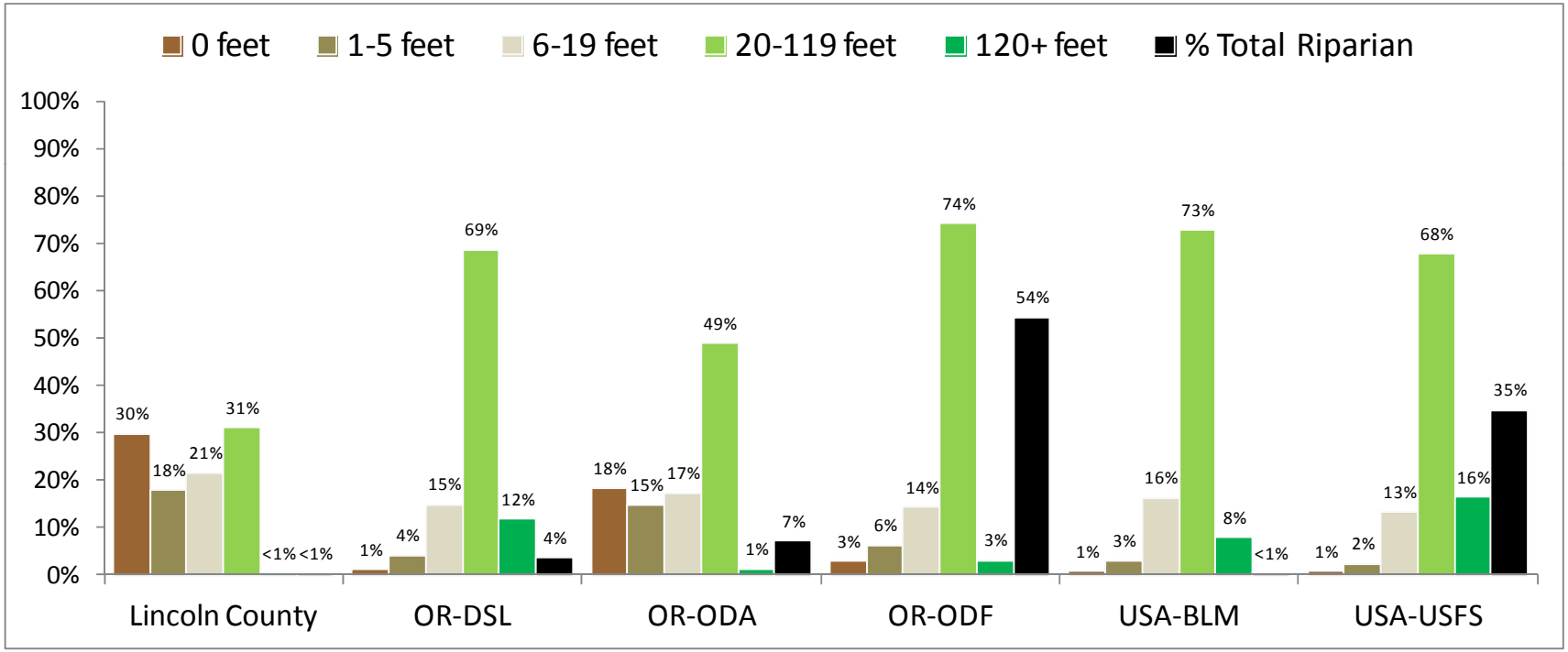
Ruesch, et al. 2012. Projected climate-induced habitat loss for salmonids in the John Day River network, Oregon, U.S.A. Conservation Biology 26(5), 873–882.

Isaak et al 2010. Effects of climate change and wildfire on stream temperatures and salmonid thermal habitat in a mountain river network. Ecological Applications 20(5), 1350-1371.

Near Stream Area DMA / Responsible Persons Mapping

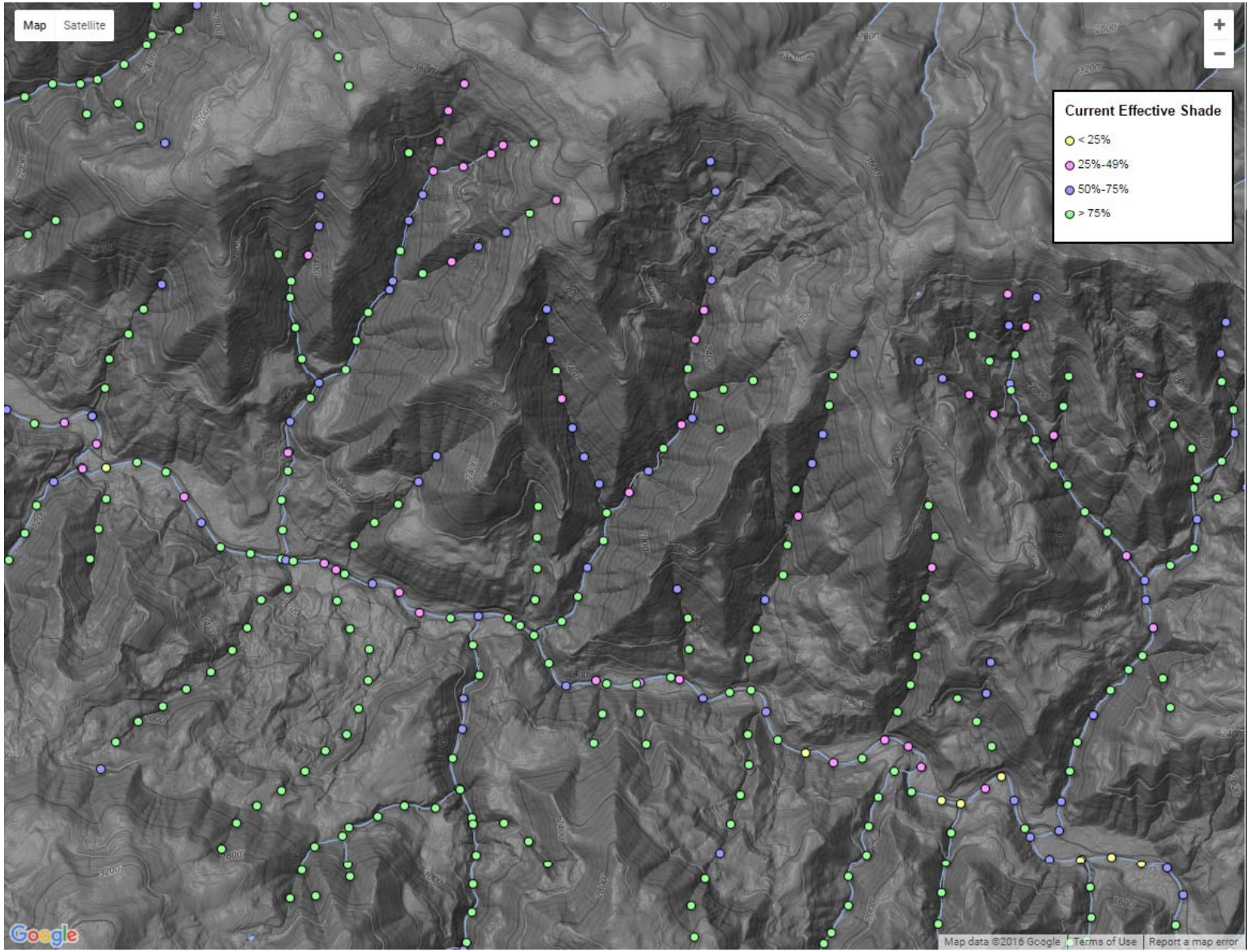


Percent area in each LiDAR vegetation height classification within 98 feet of the stream for each DMA in the Big Elk watershed



See TWG meeting handouts from January 23rd, 2013

Next Step: Effective Shade on all Mid-Coast streams



Next Steps

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- Complete site potentiel vegetation/restoration descriptions
- Complete current condition temperature models and documentation
- Complete solar flux/effective shade modeling and documentation

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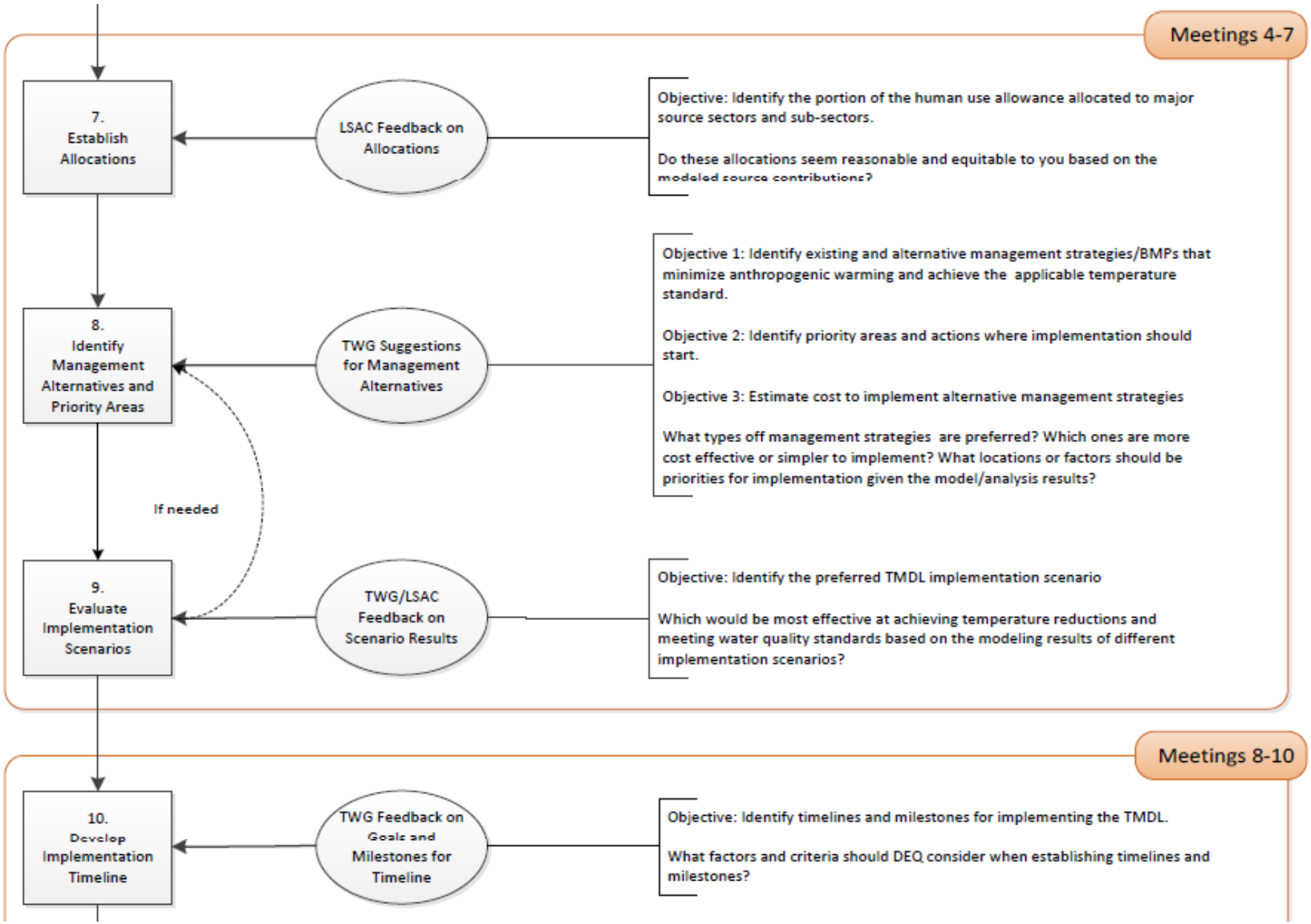
- Review site potential vegetation/restoration descriptions
- Review model calibration reports

Management Strategies, Allocations, and Implementation



Management Strategies, Allocations, and Implementation Questions

1. Are current landscape conditions, management strategies, plans, or rules sufficient to minimize anthropogenic warming or achieve the applicable temperature standard?

2. What additional management strategies or surrogate measures are needed and where to minimize anthropogenic warming?

3. What are the thermal load and waste load allocations necessary to achieve the applicable water quality standard?

4. Under what timeline and where should specific management strategies be implemented first?

Next Steps

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- Model management alternatives and complete documentation
- Identify implementation framework
- Prepare TMDL/WQMP, or cumulative effects analysis documents

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- Assist in developing and selecting management alternatives
- Assist in developing implementation timelines
- Assist in developing a post TMDL monitoring plan
- Review TMDL/WQMP or cumulative effects analysis

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