

Appraisal Level Environmental Assessment of Water Storage Feasibility in Valsetz, Oregon – Hydraulic Component

by

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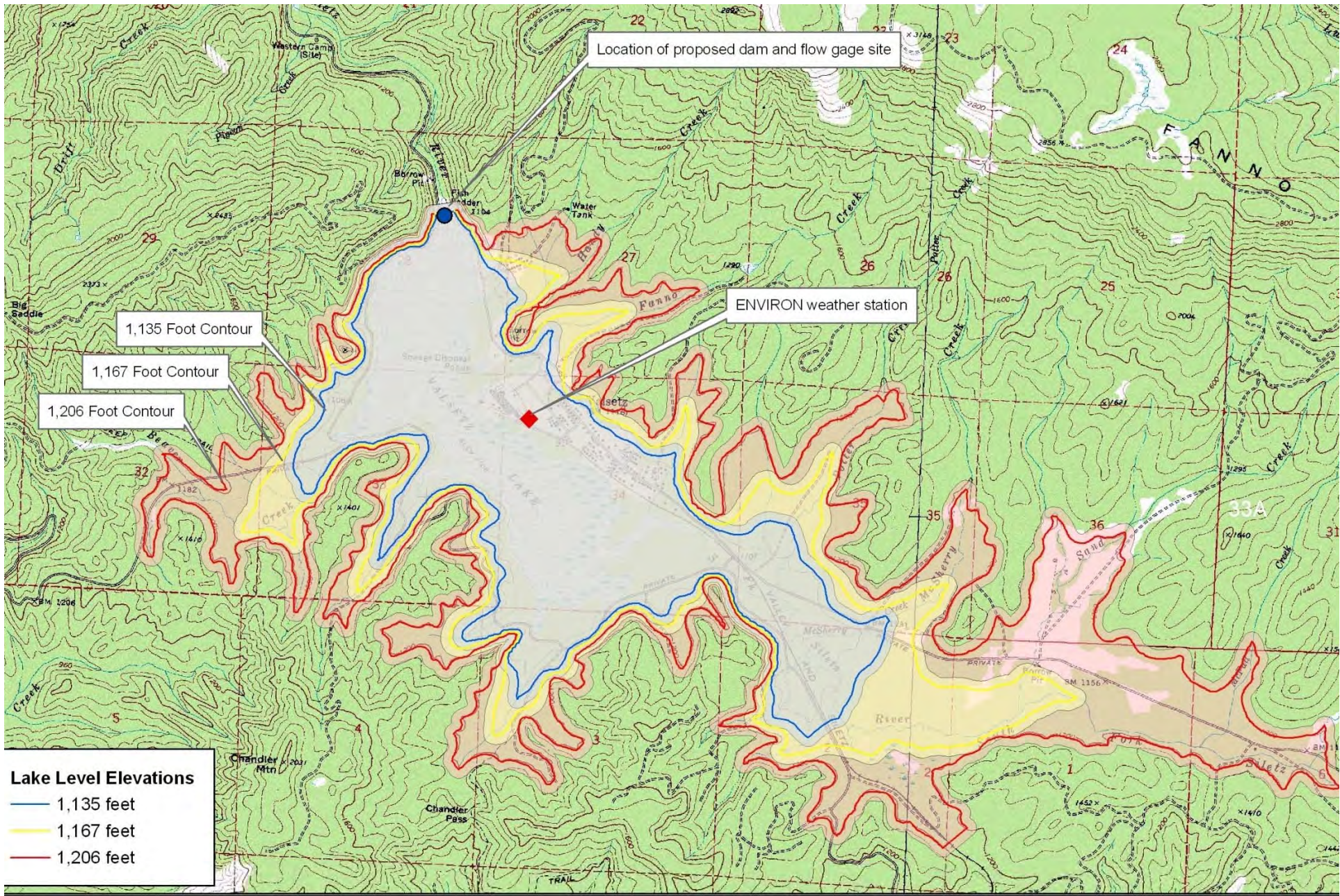
Domoni Glass

Gretchen Greene

ENVIRON International

AWRA Conference

Seattle, October 4, 2011



Lake Level Elevations

- 1,135 feet
- 1,167 feet
- 1,206 feet



14000 SE Johnson Road, Suite 200
 Milwaukie, Oregon 97137

DRAFT - Potential Valsetz Lake Levels with 200 Foot Buffers (Derived from ENTRIX)

Data Sources: ENTRIX survey data
 OR/WA BLM 1:24k DRGs
 Oregon geospatial data

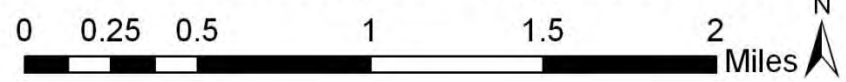


Figure
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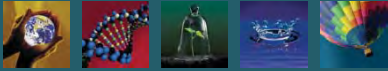
Goals and Objectives

- Provide the County with a scientifically robust analysis of the Valsetz Water Storage Project Concept which will support decisions regarding options for meeting future water needs
- An “appraisal-level” project review where existing information and data collected to fill data gaps is used to examine feasibility of the Project alternatives
 - Data collected to fill data gaps included:
 - Hydrology (flow) data,
 - Climate data,
 - Water quality data (temperature and other measurements),
 - Fish habitat data and surveys of fish presence
- Examine three alternatives (dam sizes)



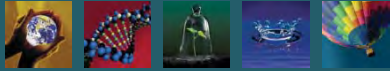
Goals and Objectives, cont.

- The report was to provide
 - Details regarding data collected (methods, results)
 - Analysis of the likely effects of the alternatives
 - Provide an initial regulatory analysis
 - Recommendations for future actions
- The report was intended to ***support*** decision making processes



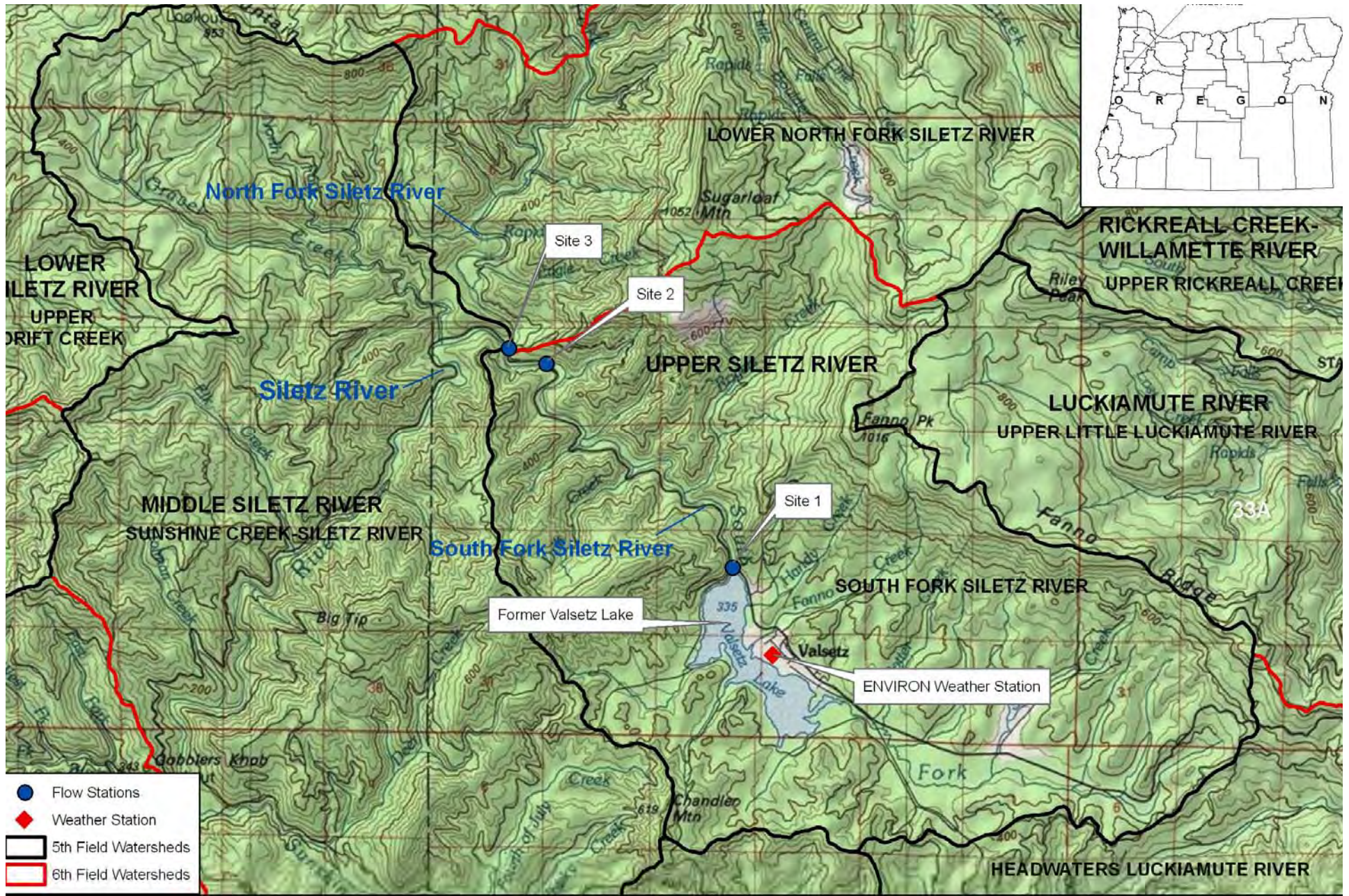
Approach: *Water Supply, Demand, and Water Rights Review*

- Evaluate expected future water demands using previously publications updated with 2010 census
 - Identify potential water deficits in other counties
 - Identify locations and timing of shortfalls in water availability
- ⇒ *Future demand is difficult to predict; we “bracketed” the expected range of future demand*



Approach: Initiate Collection of Flow and Water Quality Data

- Gather existing temperature and DO data
- Install and calibrate a water level logger
- Collect water temperature, DO, ph, and turbidity when discharge is measured
- Install continuous temperature monitors
- Summarize new data
- Collect spot measurements of flow



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DRAFT - Location of Valsetz Survey Sites and Vicinity

Data Sources: ENVIRON survey data
 NGS USA topographic maps
 Oregon geospatial data

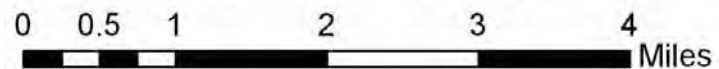
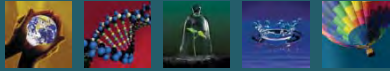


Figure
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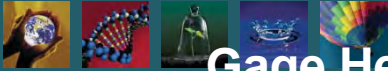
Approach: *Water Quantity*

- Develop estimated hydrograph
- Estimate storage capacity of each alternative
- Bracket fill time for reservoirs under range of water demands and climatic conditions
- Estimate water available for allocation

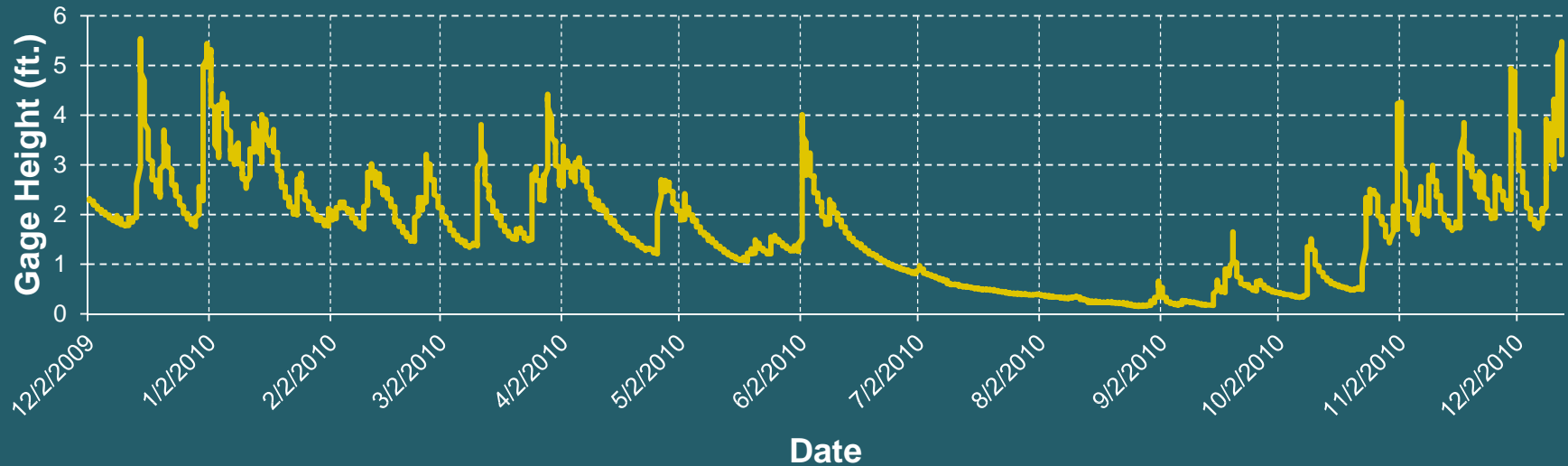


Approach: Water Quality

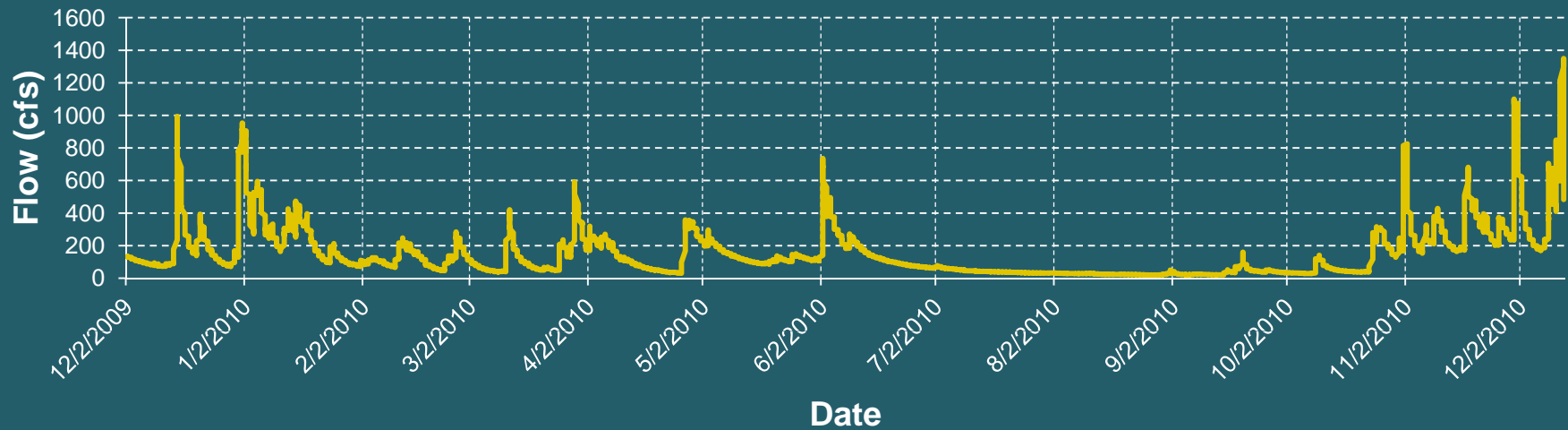
- Evaluate expected reservoir water temperatures and potential for stratification
- Estimate temperature of river downstream of the reservoir (to the gage, downstream of the North Fork)
 - Assumed water withdrawn from bottom of reservoir

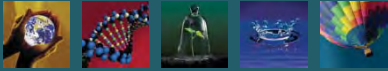


Gage Height at S.F. Siletz River Below the Proposed Dam Site

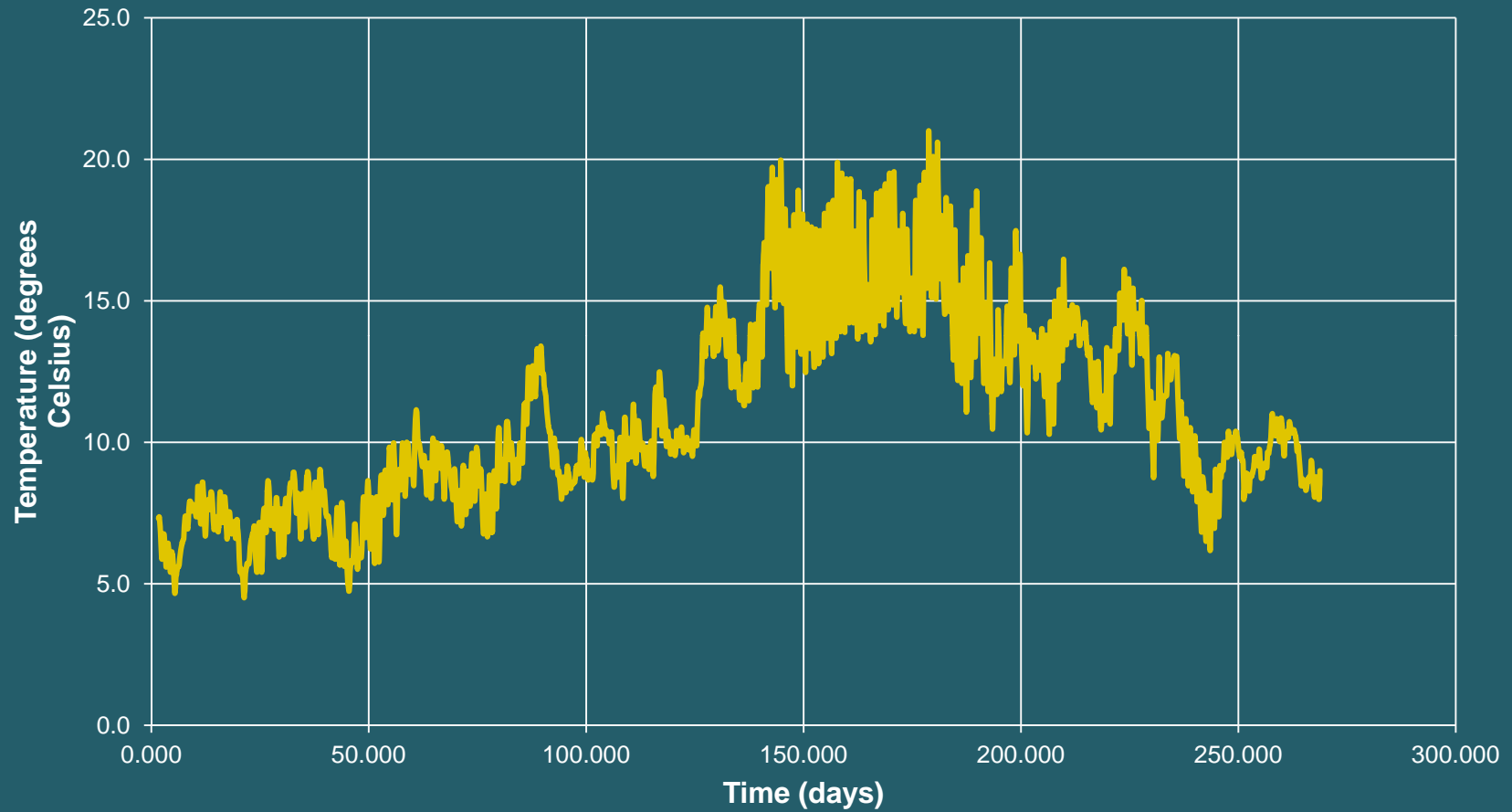


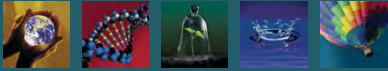
Estimated Flows at S.F. Siletz River Below the Proposed Dam Site



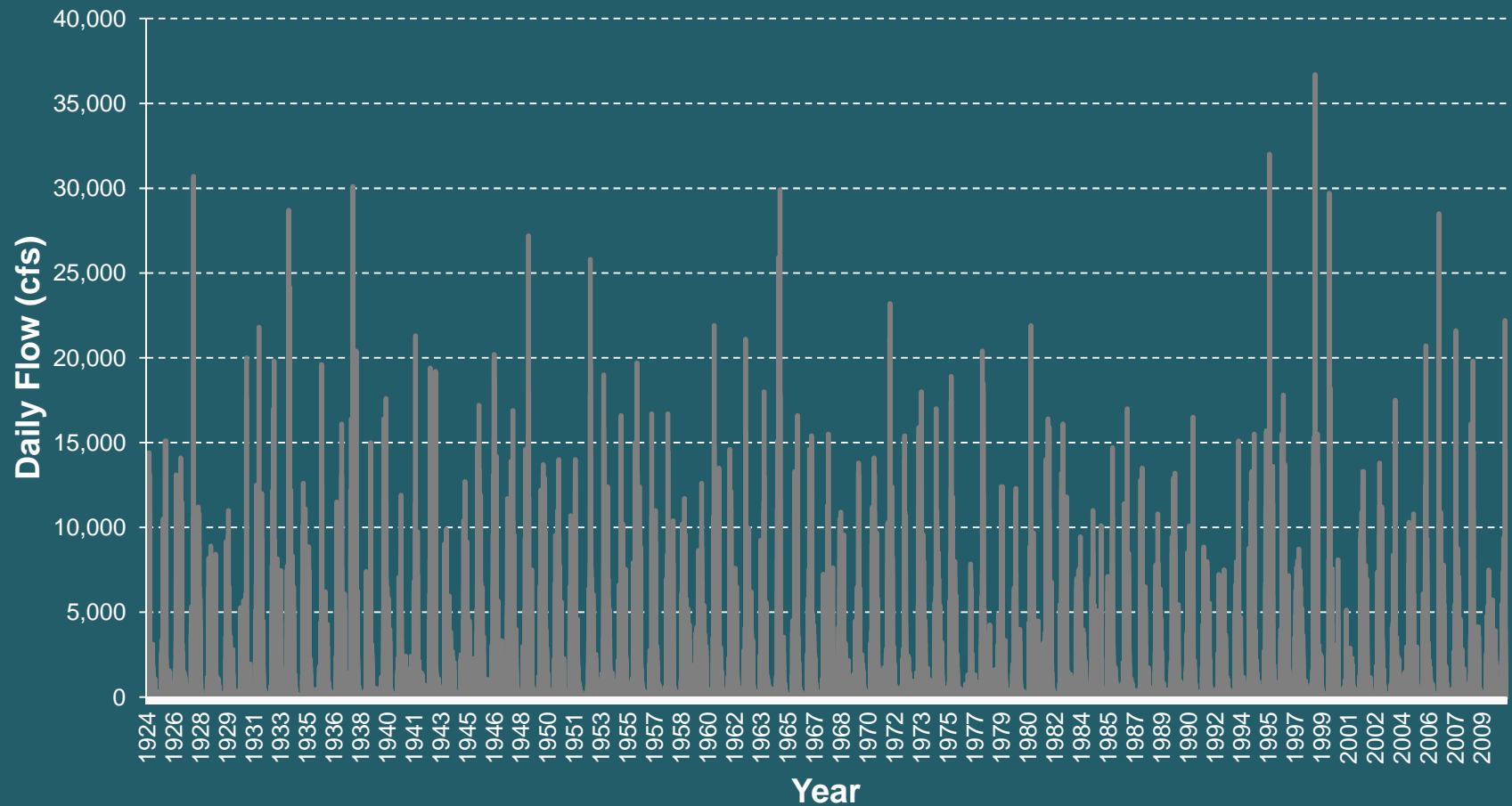


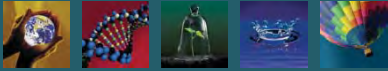
Temperature measured at South Fork Siletz River gage



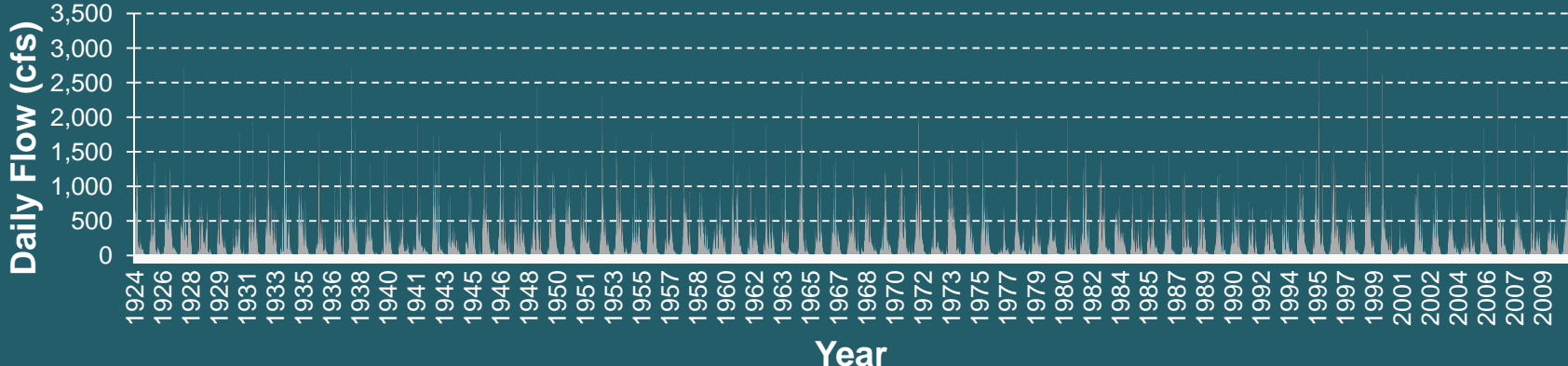


Average Daily Flows at USGS Gage

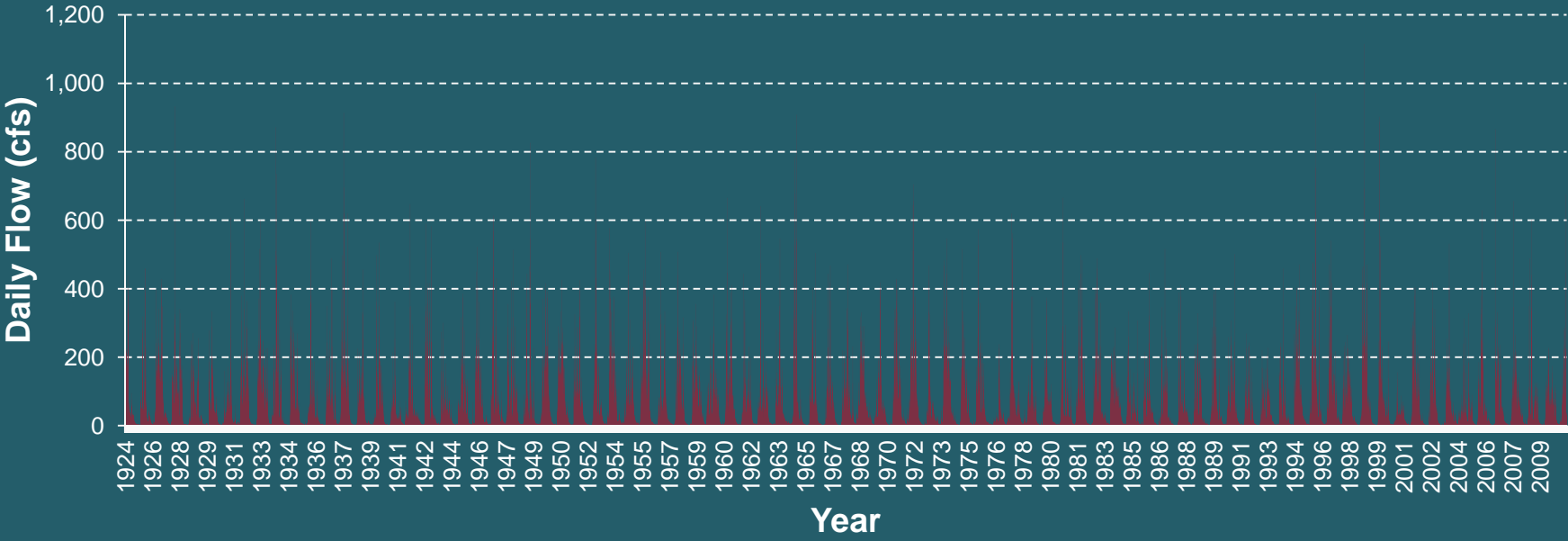


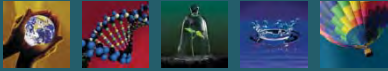


North Fork Siletz Flows - Estimated



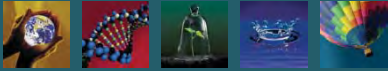
S. Fork Siletz Flows at Valsetz Dam - Estimated





Valsetz Reservoir Water Withdrawals

Month	Instream Flow Water Rights (cfs) ¹	Withdrawals to Satisfy Regional Water Demand		
		Average Need (cfs)	Min. Need (cfs)	Max. Need (cfs)
Jan	60	0	0	0
Feb	60	0	0	0
Mar	60	0	0	0
Apr	60	0	0	4
May	60	0	0	4
Jun 1-15	30	0	0	12
Jun 16-30	30	20	0	12
Jul 1-15	10	41	30	51
Jul 16-31	10	41	30	51
Aug	10	41	30	51
Sep 1-15	10	20	0	12
Sep 16-30	10	0	0	12
Oct 1-15	30	0	0	12
Oct 16-31	40	0	0	12
Nov	60	0	0	4
Dec	60	0	0	4



Estimated Drought Flows at Valsetz for Selected Months

Drought	Estimated Daily Low Flows at Valsetz (cfs)				
	July	Aug	Sep	Oct	Nov
100-year	1.7	1.5	1.2	1.4	1.7
50-year	1.7	1.5	1.4	1.5	1.8
25-year	2.2	1.6	1.6	1.5	2.0
10-year	2.8	1.9	1.8	1.8	2.9
5-year	3.2	2.2	1.9	2.1	5.6
2-year	3.9	2.6	2.4	2.8	13.3



Hydraulic Modeling

- CEQUAL-W2 model for modeling of the existing lake and three alternative dams:
- -Model grid: 16 vertical layers, 6 horizontal segments
- Simulation Period: February – November 2010
- Boundary Conditions: Flow and temperature measured or estimated at three locations
- Meteorological data (Air temperature, dew temperature, wind and wind direction) measured at ENVIRON station at the lake used
- Withdrawal outflows for three scenarios used – from the bottom outlet
- Default values of hydraulic coefficients used to define surface boundary conditions, auto-stepping algorithm for computational time step
- Reservoir is exposed to wind and sun effects (no shading)
- Evaporation is calculated using Ryan-Harleman Method



Hydraulic Modeling, ctd.

- QUAL2K model for modeling of flows and temperature of the 50-km shallow river reach from the dam outlet to the USGS
- Simulations conducted in 24-hour cycles for representative time periods from February through November
- River was divided in five reaches; and each reach was characterized with representative slope and cross-sections (some of which were surveyed)
- Inflow from the North Fork Siletz River was treated as a point source
- Meteorological data at the Valsetz dam site were used as representative

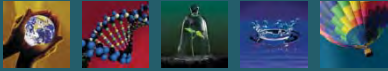
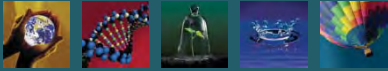


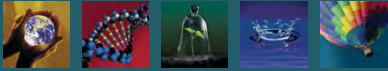
Table 6. Simulation Withdrawal Results

Reservoir Size	Normal Water Surface Elevation (ft) - February	Simulated Water Surface Elevation (ft) - November								
		Average Flow Conditions			2-year Drought - Siletz River			100-year Drought - Siletz River		
		Average Withdrawals	Minimum Withdrawals	Maximum Withdrawals	Average Withdrawals	Minimum Withdrawals	Maximum Withdrawals	Average Withdrawals	Minimum Withdrawals	Maximum Withdrawals
Small	1120.1	1122.9	1124.4	1120.2	1119.0	1121.7	1115.6	1113.7	1116.8	1109.9
Medium	1160.0	1158.8	1159.8	1157.7	1157.0	1157.9	1155.8	1155.2	1156.3	1154.1
Large	1200.0	1197.9	1198.5	1197.2	1196.7	1197.3	1196.0	1195.6	1196.3	1194.9

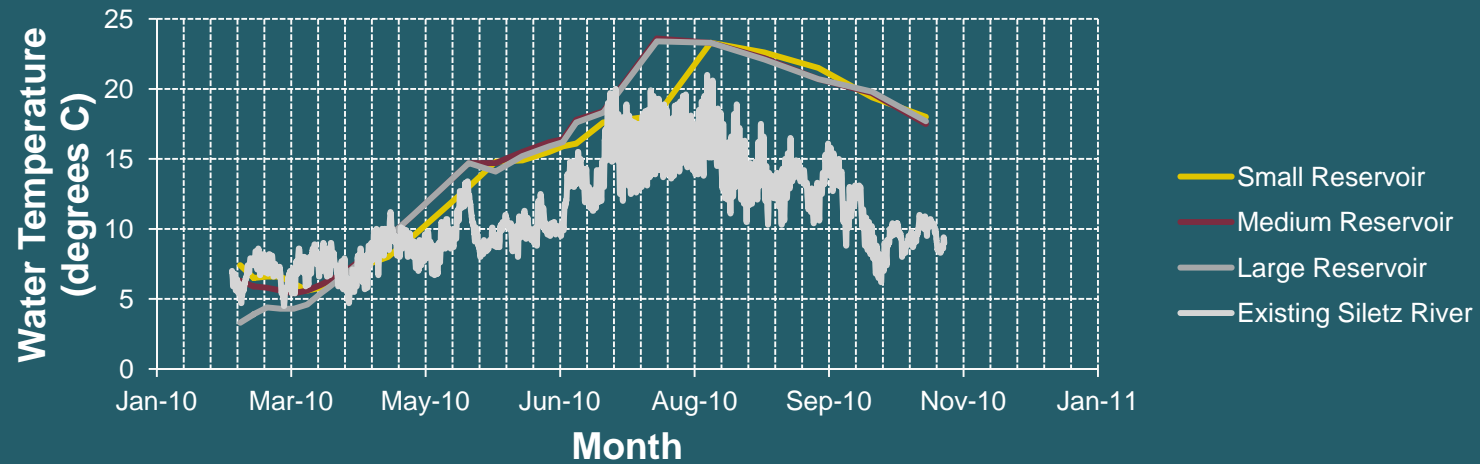


Reservoir Filling Time (years) - Estimated At Different Flow Conditions

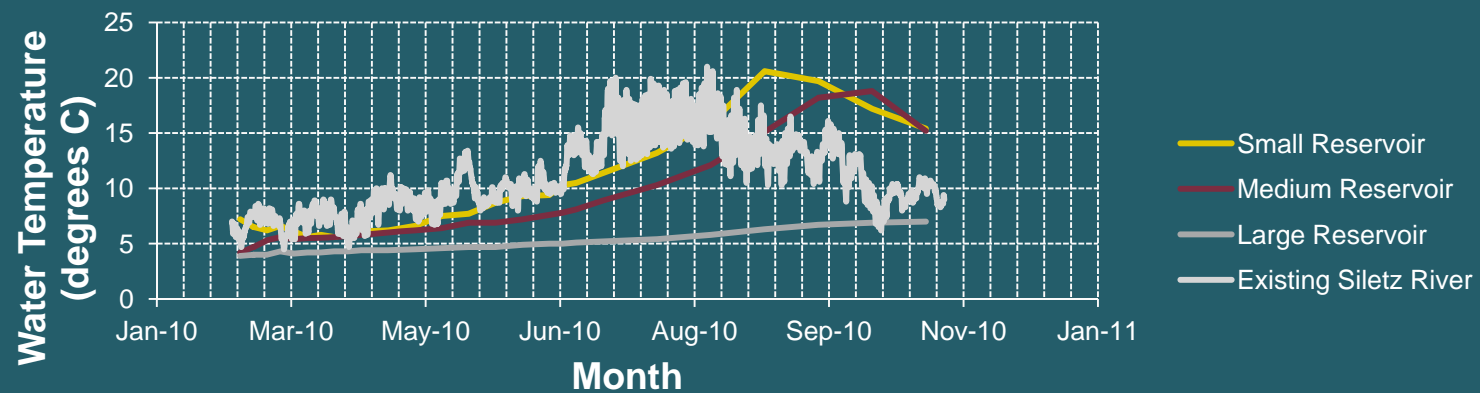
Reservoir	Scenario 1 - Average Conditions	Scenario 2 - Mild Drought Conditions (Year 1957)	Scenario 2 - 10-year Wet Conditions (year 1933)	Scenario 3 (Extreme Drought - 1989)
Small (14,000 AF)	3	6	1	Will not fill
Medium (70,000 AF)	16	28	4	
Large (162,000 AF)	38	66	10	

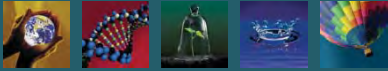


Temperature Curves (Surface)

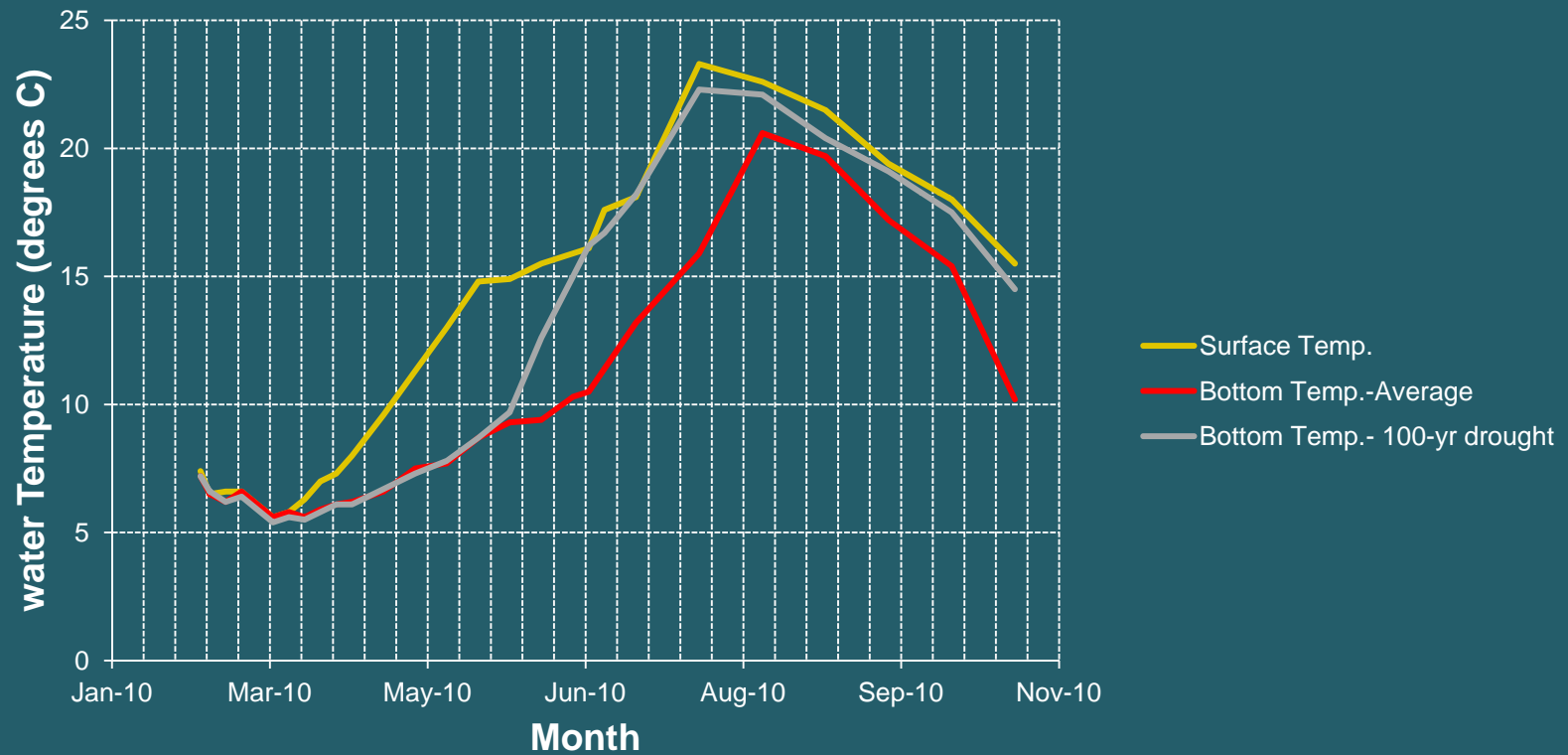


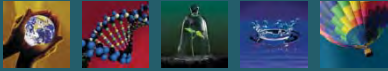
Temperature at Valsetz Reservoir Outlet



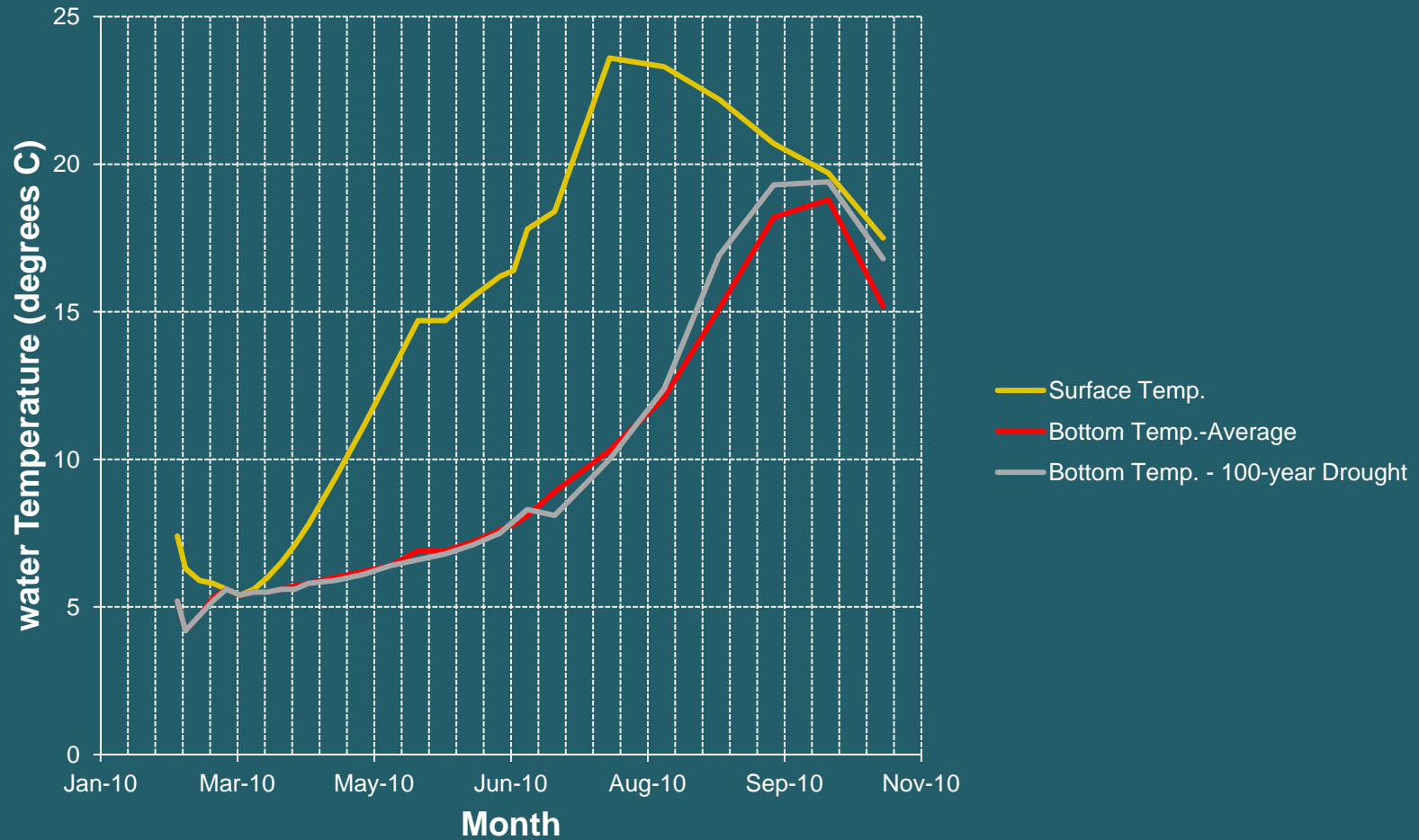


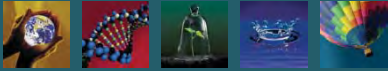
Temperature Stratification - Small Reservoir



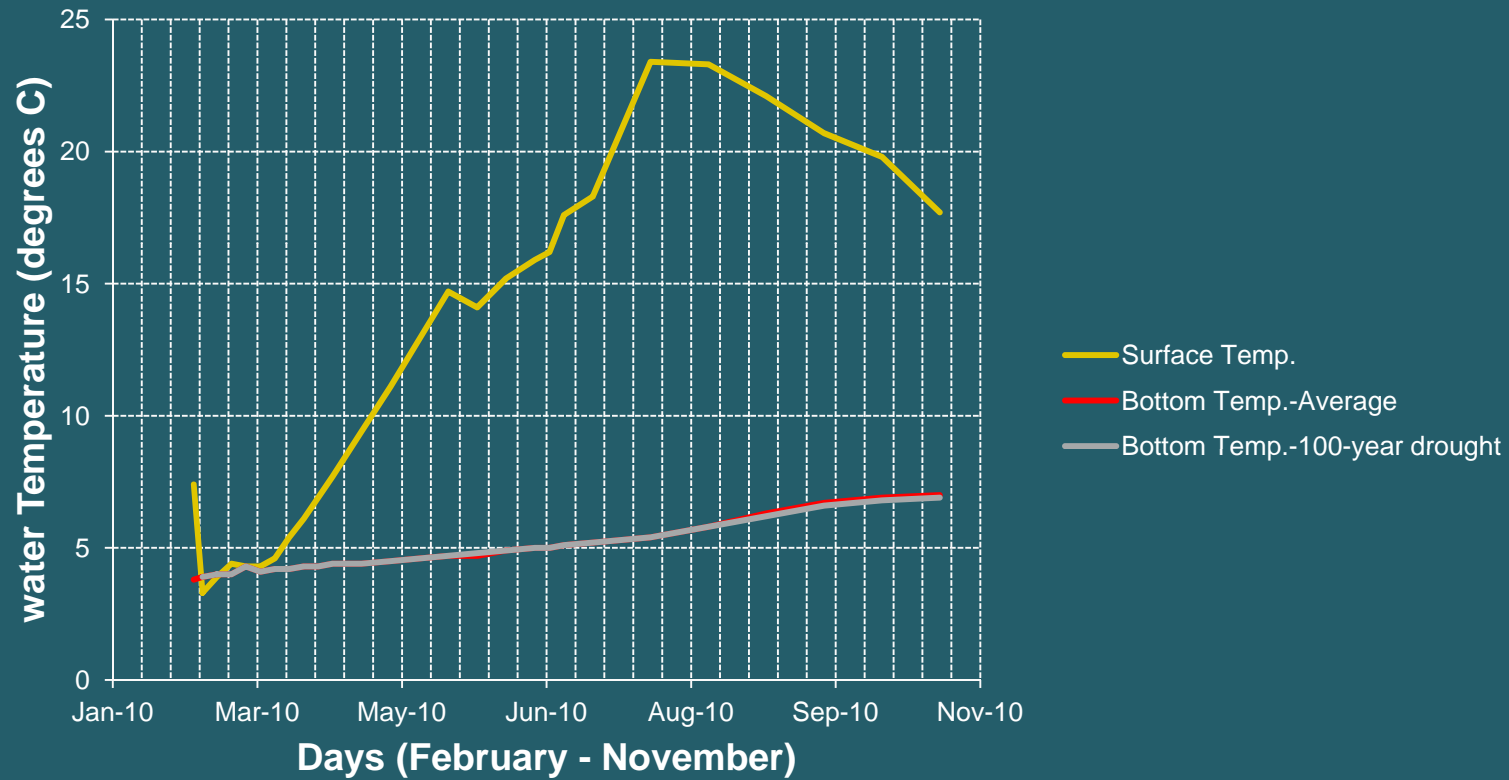


Temperature Stratification - Medium Reservoir



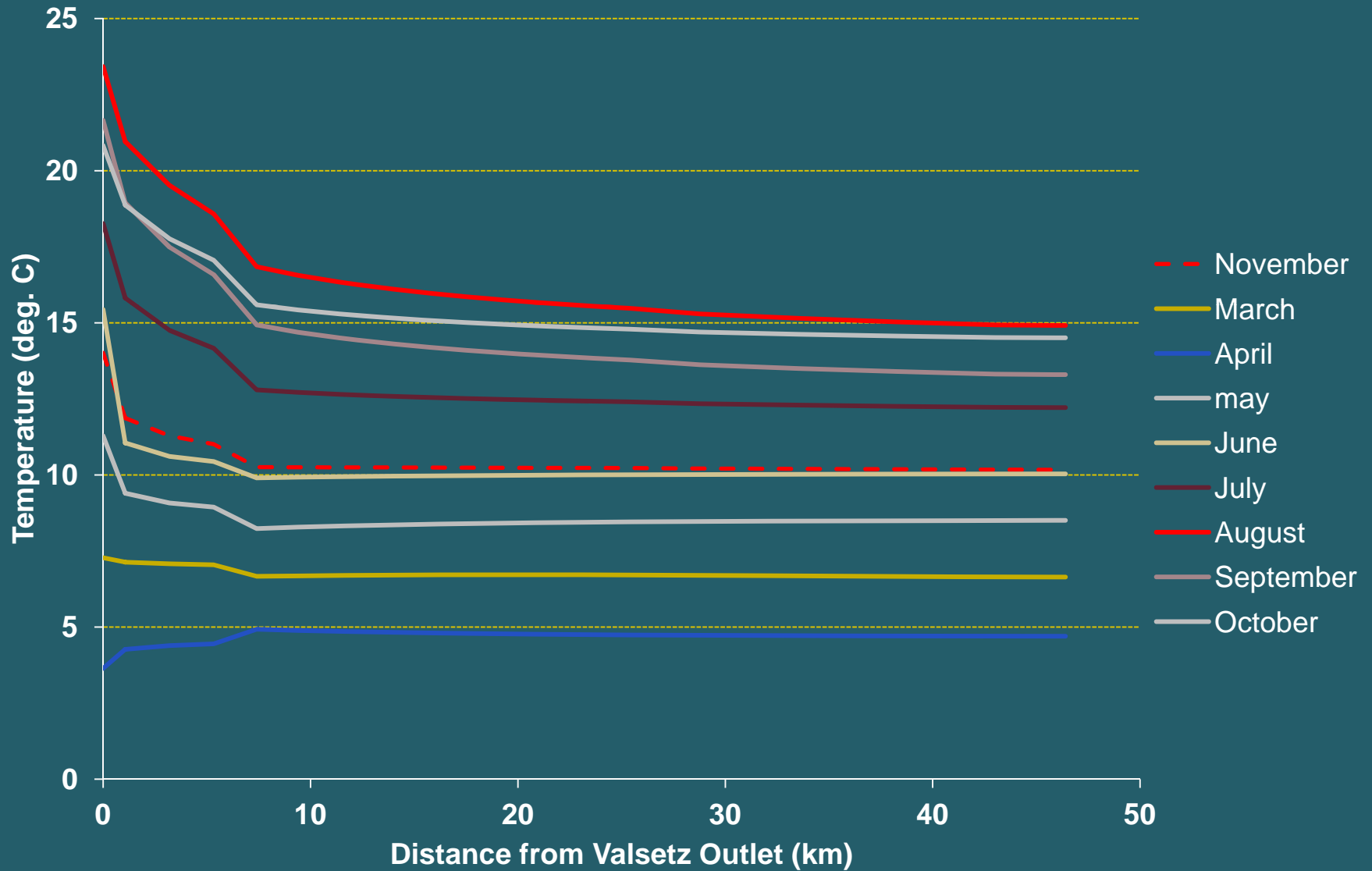


Temperature Stratification - Large Reservoir



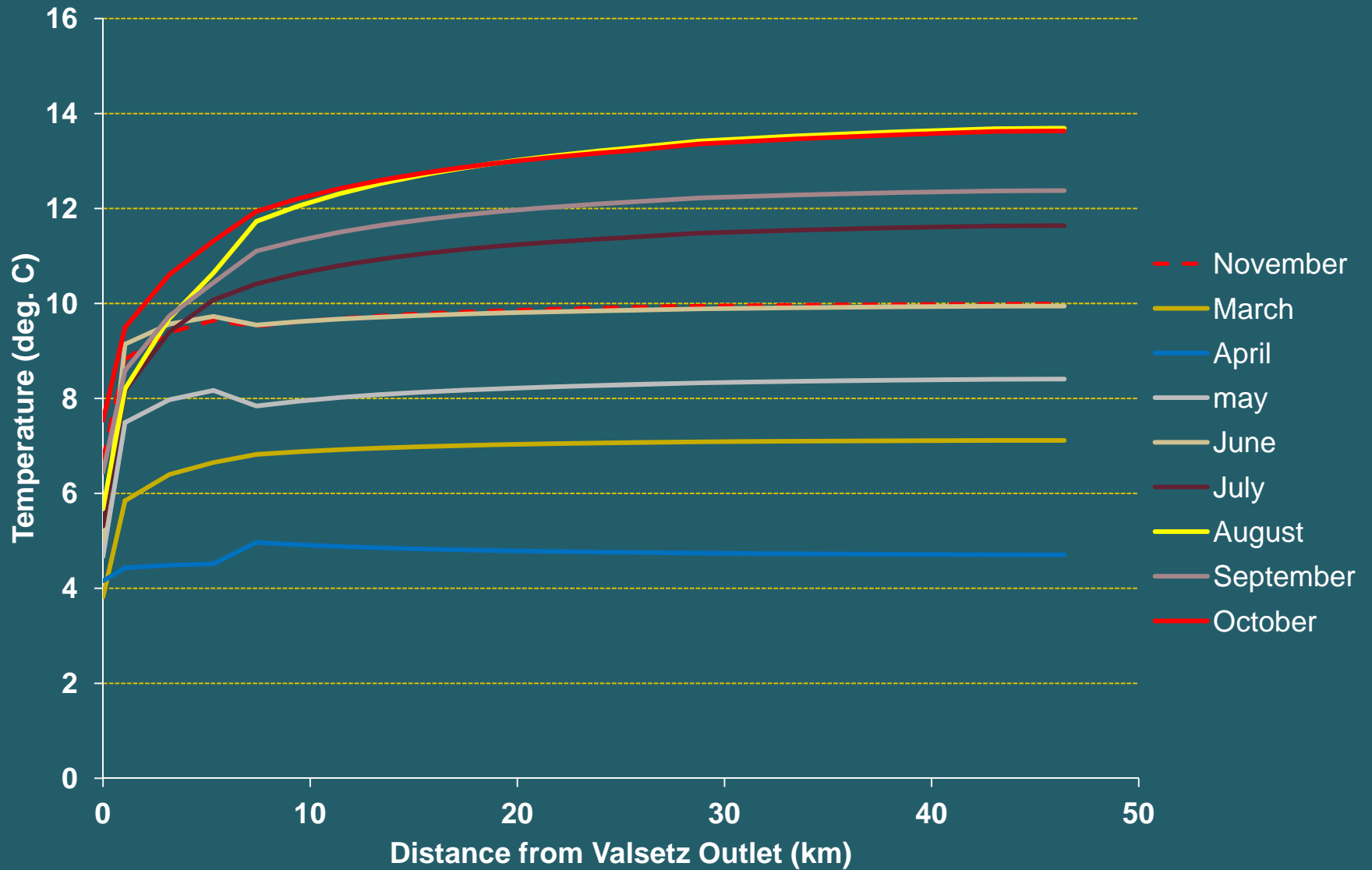


Temperature in Siletz River Downstream of Valsetz Lake -Small Reservoir



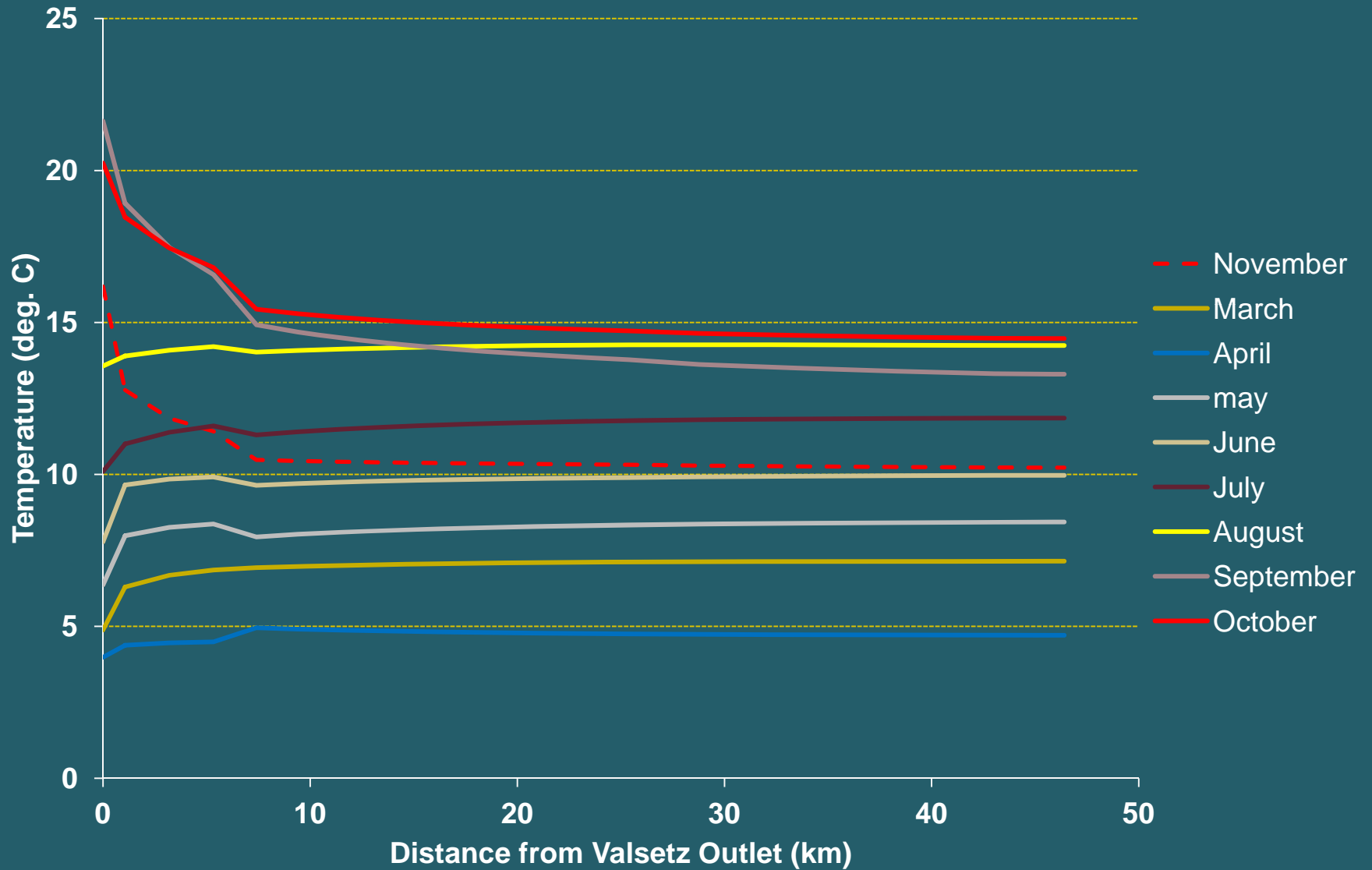


Temperature in Siletz River Downstream of Valsetz Lake - Large Reservoir





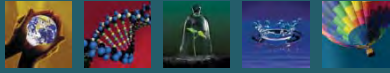
Temperature in Siletz River Downstream of Valsetz Lake - Medium Reservoir





LIMITATIONS OF THE STUDY

- Project specific data cover small area and are measured only during 2010-2011;
- Withdrawal for in-stream flows assumed equal to instream flow water rights; withdrawal for water supply will equal to regional water deficit projections for the mid-21st century;
- Operations addressed during average or drought scenarios only;
- Uncertainty associated with longitudinal changes in temperature downstream of the reservoir not addressed (temperature assumed to change at selected point sources only)
- Long-term reservoir operation and multi-level withdrawal will be addressed in the next phase of the study.



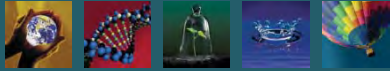
Conclusions of the Analysis

- All three dam alternatives are projected to meet expected water demand in 2050
- The low and medium dams both release warm water into the South Fork Siletz River
 - The temperature of the water exceeds the State of Oregon water quality standards for a portion of the summer
 - The high dam alternative releases cool water into the river downstream of the dam
 - A multi-level intake that can blend water from the surface and deeper could minimize effects and maximize benefits under all three alternatives



Analysis Conclusions Cont.

- All of the alternatives will inundate fish habitat
 - Data indicate that there is little quality habitat and very few fish present in the reach that occupies the historic lakebed
 - Fish are presumed to be present in the tributary waters that would be inundated, but actual utilization of those habitats is unknown
 - The ability of the reservoir to support a significant cold water fishery is uncertain



Recommendations for Further Actions

- Conduct additional modeling of the reservoir to determine the range of water temperatures that could be accommodated through the use of multi-level intakes
- Evaluate the potential effects of a reservoir on dissolved oxygen levels within the reservoir.
- Conduct surveys of fish populations in the tributaries upstream of the dam to determine the number of fish utilizing these habitats