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OREGON DEPARTMENT OF TRANSPORTATION

SPR Quarterly Progress Report

October 1, 2016 through December 31, 2016

Date December 15, 2016

TO: Technical Advisory Committee Members:
Kami Ellingson, U.S. Forest Service
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1. Project

Climate Change Impact on Coastal River Estuaries in Oregon
SPR # 719

2. Project Investigator

Matthew Mabey
ODOT Research

3. Project Coordinator

Matthew Mabey, Research Coordinator
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4. Key Dates

Project start date:	June 2010
Project completion date:	June 2021
First Fiscal Year:	FY2010
Final Fiscal Year:	FY2021

5. <u>Project Status</u>

Task #1: **Install water monitoring equipment**

Percent completed reported in last quarterly report: 100%

Task #2: **Collect data from water monitoring equipment and monitor elevations**

Percent completed reported in last quarterly report: 53%
Percent completed after this quarter: 55%

Key Progress-To-Date

- *Data has been collected at 19 water level stations*
- *Half-day multi-parameter water-quality measurements made in marsh tidal channels*
- *Weather data is being collected at both Pixieland and near the headwaters of Salmon Creek*

Specific Progress This Quarter

- *Continued data collection with a focus on preparing for the harsher conditions of winter.*

Problems

- *Instrumentation type proved unreliable under the conditions in the Salmon River Estuary. Switching type of instrument used.*
- *Excessive moisture in the highlands weather station shorted out the batteries in the datalogger. The circuit board was dried out and the batteries replaced. It appears to be still functional and was reinstalled. UPDATE: While there was excess moisture in the logger enclosure, it turns out that wasn't the source of the dead batteries. The Wind Speed/Direction sensor has apparently developed a short that causes one of the LEDs on the data logger to be continually illuminated. It is also possible that some other activity in the logger is continuously being triggered. As a result, the batteries drain in a matter of days. For now, the failed sensor has been disconnected.*
- *Station at Lincoln County Bridge on Old Highway 101 was washed away during high flows this winter*
- *Missed data download during Q3 FY2016 due to illness which produced a temporal data gap at most stations.*

Work Planned for Next Quarter

- *Continued data collection*
- *Install additional or replacement stations at Boat Basin, Reference South Downstream, main stem of former Salmon Creek, and Pixieland.*
- *Make 6 to 48 hour observations of pH, DO, Turbidity, RedOx Potential and Conductivity at a variety of sites, including some regular stations.*
- *Deploy long-duration DO loggers*

Task #3: **Produce 5-year report**

Percent completed reported in last quarterly report: 85%
Percent completed after this quarter: 85%

Key Progress-To-Date

- *Prepared the data collected so far enough to present at the Cascade Head Science Symposium.*

Specific Progress This Quarter

- *Work stalled during this quarter*

Problems

- *Discovering that some water level data is bad before the instruments actually fail. Likely due to corrosion of the pressure transducer.*
- *Discovered that the data downloading process (into the office computer) is not error free. Fortunately, my habit of repeating the download process to several locations has minimized the data lost to this problem. Shoddy error checking/correcting in the hardware maker's software appears to be the source of this problem.*
- *The volume of data has proved to be a little more unwieldy than anticipated, but workable methods have been developed for handling all the information.*

Work Planned for Next Quarter

- *Finish September 2011 through June 2016 data reduction.*
- *Finish 5-year report writing including graphs and illustrations.*

Task #4: **Refurbish equipment**

Percent completed reported in last quarterly report: 92%
Percent completed after this quarter: 92%

Key Progress-To-Date

- *Water level instruments have been sent for repair or evaluation and data recovery 14 times. 2 instruments have been sent twice and 1 has been sent 3 times. 2 have failed but not yet been sent in for data recovery. Since the probability of recovering data is low, it is a question as to whether to try with these two.*
- *Replacement instruments from a different manufacturer have been acquired and deployed on a pilot basis to see if they are more robust than the previous instruments.*
- *Decision to switch to Onset HOBO instruments*
- *Acquired and installed new Onset HOBO conductivity data loggers, water level data loggers, and dissolved oxygen loggers.*
- *HOBO loggers continue to be more reliable than the Solinst loggers. Additional benefits are that the data download process is faster and the download device is waterproof, unlike the Solinst download device.*
- *Installed additional weather shields on weather stations data loggers (built from plastic trash bins). This seems to have solved the problem of condensation in the housings, but the desiccant is still fully exhausted at each data download.*

Specific Progress This Quarter

- *None*

Problems

- *We have lost 4 instruments to driftwood or erosion and 13 have failed and are unrepairable.*
- *The batteries in the Pixieland weather station died resulting in a loss of several months' worth of data. The batteries were relatively new lithium batteries while the other station had alkaline batteries that were the same age. The conclusion is that while the lithium batteries may last longer under ideal conditions, they apparently do not have sufficient voltage at low temperatures. I will now use alkaline batteries from now on and a fresh set will be installed every ~6 months out of an abundance of caution.*
- *The separate conductivity and water level instruments are less convenient (validating the initial desire to have them combined in a single instrument).*
- *While the new style conductivity loggers seem to not be failing under the estuary conditions, the physical configuration of the electrodes combined with the deposition of iron oxide (possibly associated with a biofilm) raises doubts about the accuracy of the measurements and the level of drift. This will be watched and assessed in coming months.*
- *One additional Solinst leveloggers failed*
- *While the HOBO instruments are proving to be much more reliable in this particular application, there is a weakness in the error-detection/correction during data download from the HOBO Data Shuttle to a computer. A few spurious data values are a common occurrence. Down loading repeated times, and on different computers minimizes the loss of even these few data points.*

Work Planned for Next Quarter

- *Deploying new equipment at some new station locations (Boat Basin and Pixieland).*
- *Reoccupy some abandoned stations (Reference South Downstream, main stem of former Salmon Creek).*
- *Replace temperature/RH sensor at both weather stations and consider replacing failed wind-speed and wind-direction sensor.*

Task #5: **Repeat elevation measurements**

Percent completed reported in last quarterly report: 20%
Percent completed after this quarter: 20%

Key Progress-To-Date

- *Repeated GPS measurements at the stations*

Specific Progress This Quarter

- *None*

Problems

- *The positional errors that the GPS is producing are about twice what was anticipated. A small part of the problem is that timing a campaign with weather, satellites, tides, and personnel availability always results in a less than ideal combination.*

Work Planned for Next Quarter

- *None, it is a fair weather operation*

Task #6: **Repeat biologic assays of marshes**

Percent completed reported in last quarterly report: 0%
Percent completed after this quarter: 0%

Key Progress-To-Date

- *None*

Specific Progress This Quarter

- *None*

Problems

- *At the Cascade Head Science Symposium, I asked what a repeat of the vegetation assay would cost. The number estimated was $25,000, which is much more than someone else estimated for the cost of repeating the invertebrate assay. It is likely that we will want to submit this as a separate research project in the future, if no one else funds it.*

Work Planned for Next Quarter

- *None*

Task #7: **Produce 10-year report**

Percent completed reported in last quarterly report: 0%
Percent completed after this quarter: 0%

Key Progress-To-Date

- *None*

Specific Progress This Quarter

- *None*

Problems

- *None*

Work Planned for Next Quarter

- *None*

6. <u>Project Coordinator's Comments</u>

Work during Q2 focused on data download and getting everything set for winter. Other priorities stalled progress on the 5-year report. Work will resume during Q3. Attrition has thinned the ranks of the TAC. One or two new members will be recruited during Q3.

7. **Finances** (Completed by ODOT)

SPR Project Summary

VENDOR	FY'10	FY11	FY'12	FY'13	FY'14	FY'15	FY'16	FY'17	FY'18	FY'19	FY'20	TOTALS
ORIGINAL BUDGET	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
REVISED BUDGET	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
EXPENDITURES - VENDOR	$ -	$ -	$ -	$ -								$ -
BALANCE	$ -	$ -	$ -	$ -								$ -

ODOT	FY'10	FY11	FY'12	FY'13	FY'14	FY'15	FY'16	FY'17	FY'18	FY'19	FY'20	TOTALS
ORIGINAL BUDGET	15,000	47,000	20,000	20,000	21,000	62,000	22,000	23,000	23,000	25,000	27,000	$ 305,000
REVISED BUDGET	**16,344**	**49,842**	**21,088**	**20,008**	**19,595**	**62,497**	**22,000**	**23,000**	**25,306**	**26,319**	**19,001**	$ 305,000
EXPENDITURES - ODOT	**$ 16,344**	$ 49,842	$ 21,088	$ 20,008	$ 19,595	$ 50,069	$ 22,376	$ 6,518	$ -	$ -	$ -	$ 176,946
BALANCE	**$ -**	$ -	$ -	$ -	$ -	$ 12,428	$ (376)	$ 16,482	$ 25,306	$ 26,319	$ 19,001	$ 12,428

PROJECT	FY'10	FY11	FY'12	FY'13	FY'14	FY'15	FY'16	FY'17	FY18	FY'19	FY'20	TOTALS
ORIGINAL BUDGET	**$ 15,000**	$ 47,000	$ 20,000	$ 20,000	$ 21,000	$ 62,000	$ 22,000	$ 23,000	$ 23,000	$ 25,000	$ 27,000	$ 305,000
REVISED BUDGET	**$ 16,344**	**$ 49,842**	**$ 21,088**	**$ 20,008**	**$ 19,595**	**$50,069**	**$23,000**	**$24,000**	**$25,000**	**$26,000**	**$58,945**	$ 333,891
EXPENDITURES - PROJECT	$ 16,344	$ 49,842	$ 21,088	$ 20,008	$ 19,595	$ 50,069	$ 22,376	$ 6,518	$ -	$ -	$ -	$ 205,840
BALANCE	**$ -**	$ -	$ -	$ -	$ -	$ -	$ 624	$ 17,482	$ 25,000	$ 26,000	$ 58,945	$ 128,051
Target Percent Billed	100%	100%	100%	100%	100%	100%	100%	61%	0%	0%	0%	
Percent Billed	100%	100%	100%	100%	100%	100%	97%	27%	0%	0%	0%	