Aquatic and Riparian Effectiveness Monitoring Program
Stream and Air Temperature Monitoring Report
2011 and 2012 Field Seasons
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Introduction

The Aquatic and Riparian Effectiveness Monitoring Program (AREMP) began a partnership in 2011 with the US Forest Service (USFS) Pacific Northwest Regional Office, Bureau of Land Management (BLM) Oregon State Office, and US Geologic Survey (USGS) Forest Rangeland and Ecosystem Science Center to monitor year-round instream and air temperatures in watersheds throughout the Northwest Forest Plan Area in Oregon and Washington. The purpose of this ongoing partnership is to provide baseline temperature data to climate scientists, aquatic ecologists, fish biologists, and hydrologists to help determine the sensitivity of streams to climate change. Temperature sensor locations are also provided to the USFS Rocky Mountain Research Station as part of an ongoing project to map stream temperature sensor locations throughout the United States (http://www.fs.fed.us/rm/boise/AWAE/projects/stream_temperature.shtml).

Methods

AREMP field crews consisting of BLM and Student Conservation Association interns calibrated, deployed and downloaded instream and air temperature sensors during the 2011 and 2012 field season. Crews placed sensors instream, directly next to the stream (stream-side), and at an upslope location 300 ft to 700 ft (91 m to 214 m) in elevation above the stream-side sensor. Solar radiation shields were used for air temperature monitoring stations to minimize the impact of direct sunlight on temperature data.

Temperature sensor

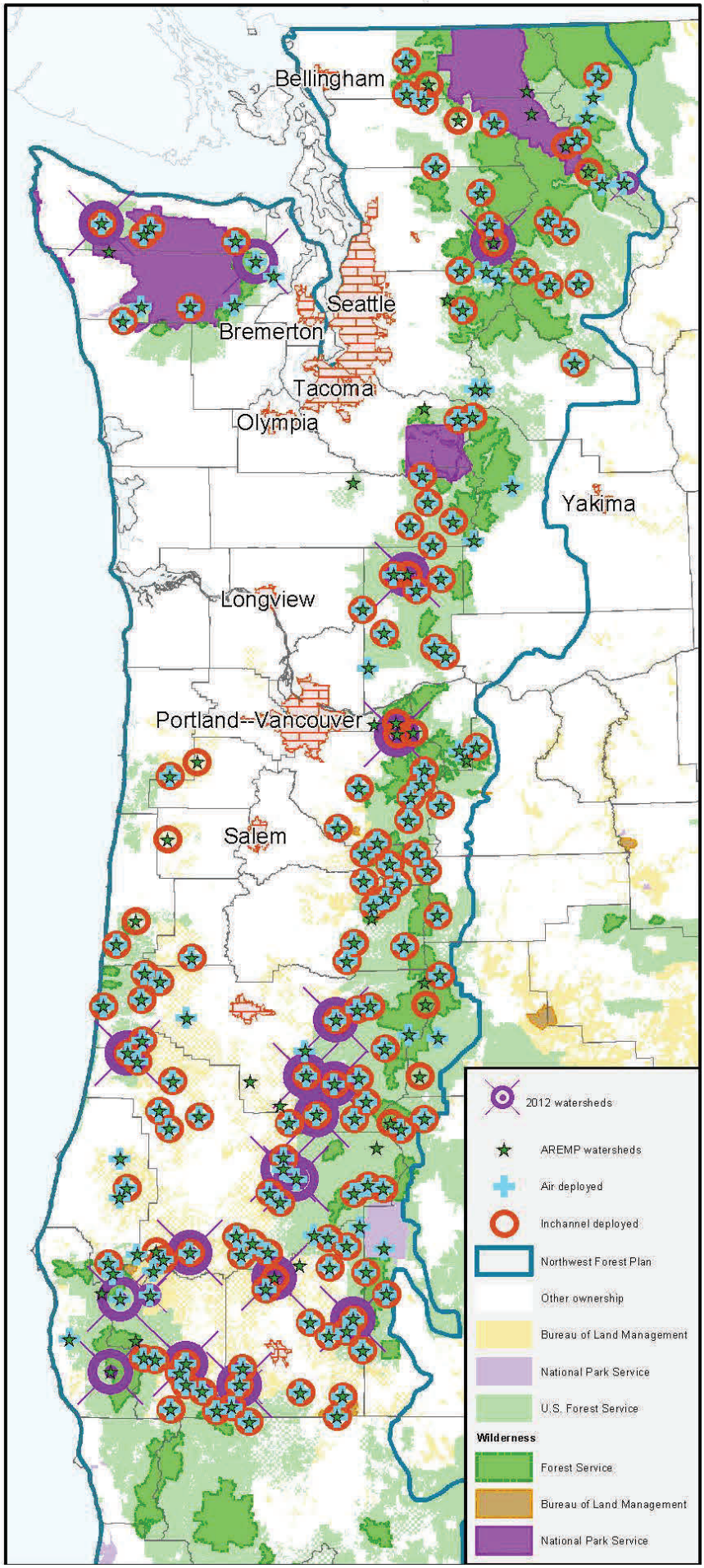
Stream-side air temperature sensor

Installation of an upslope air temperature sensor

Thermograph Locations

Temperature sensors were deployed in the Northwest Forest Plan area on USFS, BLM, and National Park Service Lands (Figure 1). AREMP crews deployed 175 instream and 316 air temperature sensors (Figure 2) during the 2011 and 2012 field seasons. In 2012, crews revisited 121 watersheds and downloaded instream temperature data from sensors deployed during the 2011 field season. They also replaced sensors lost over the winter.

Figure 1. Location of instream and air sensors placed by Aquatic and Riparian Effectiveness Monitoring Program (AREMP) crews in the Northwest Forest Plan area of Oregon and Washington. The purple bull's eye represent watersheds surveyed for stream condition by AREMP in 2012. The green star represents all of the 192 AREMP watersheds being surveyed to determine stream condition status and trend in Oregon and Washington. The blue plus designates AREMP watersheds with a stream-side and upslope air sensor. The orange circle depicts AREMP watersheds with an inchannel sensor. *Current as of November 7, 2012.*



Approximately 30% of the instream temperature sensors were lost over the winter due to high flows, being tampered with or destroyed by people, or just simply not relocated because different technicians deployed the devices. Twenty-two stream-side and 22 upslope air temperature sensors were deployed in 2011 and all but two were relocated.

	Instream (water)		Stream-side (air)		Upslope (air)	
Deployment Year	2011	2012	2011	2012	2011	2012
Oregon	92	26	8	99	8	99
Washington	37	20	14	38	14	36
Total	175		159		157	

Figure 2. Number of watersheds with instream water temperature; and stream-side and upslope air temperature sensors by deployment year and state.

Lessons Leaned

During the 2012 field season we emphasized the importance of proper instream temperature sensor placement and providing detailed directions to temperature sensor locations. The hope is that this will greatly improve our recovery rate for 2013. In addition, we now have more information about the types of streams where we are more likely to lose sensors in, for example glaciated systems, and will adapt the way the sensors are placed in the future.

Future Considerations

Of the 192 watersheds AREMP surveys for stream condition in Oregon and Washington, 17 have no sensors. Two of those watersheds were inaccessible due to road construction. Fifteen of those watersheds reside in wilderness areas which require permits to install sensors. The permits were not obtained last summer due to the lengthy process required. Additionally, wilderness watersheds take more time to deploy sensors - it can take up to a day to backpack into the watershed then another day to access the sites for deployment and backpack out. Wilderness watersheds substantially reduce the amount of watersheds visited during our eight day field trips. On average, a two person thermograph crew will deploy sensors in three watersheds a day. However with wilderness watersheds a crew may deploy sensors in only one or less than one watershed a day. To deploy additional sensors in wilderness watersheds, managers will need to provide additional funding so we can increase the length of employment for thermograph personnel or hire another two person crew, or reduce the number of non-wilderness sites that crews visit.

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http://www.reo.gov/monitoring/watershed-overview.shtml