

# Potential Risks to Freshwater Aquatic Organisms Following a Silvicultural Application of Herbicides in Oregon's Coast Range

Jeff Louch<sup>1</sup>, Vickie Tatum<sup>1</sup>, Ginny Allen<sup>1</sup>, V. Cody Hale<sup>2</sup>, Jeffrey McDonnell<sup>2</sup>, Robert J. Danehy<sup>1</sup>, George Ice<sup>1</sup>

1. National Council for Air and Stream Improvement
2. College of Forestry, Oregon State

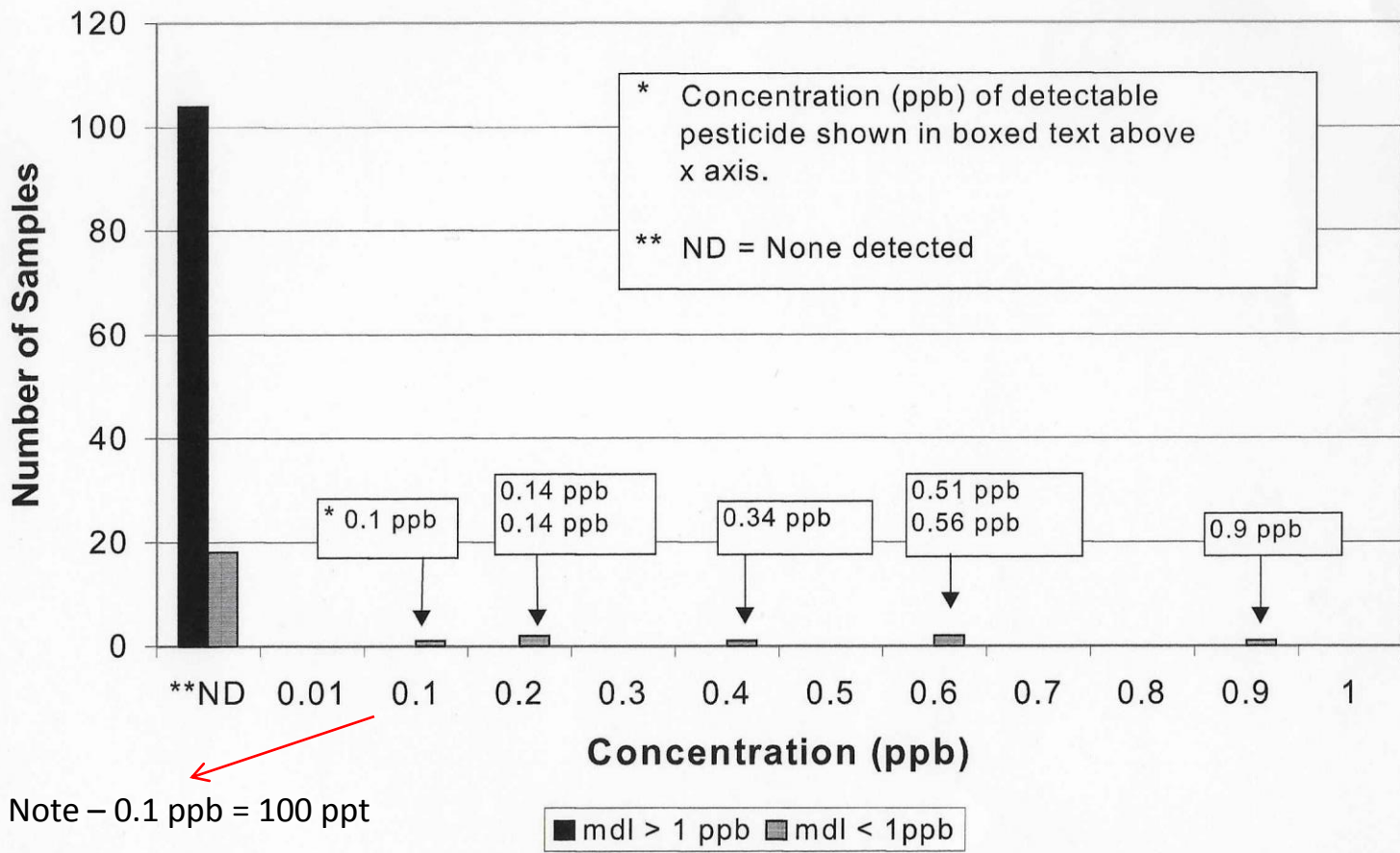
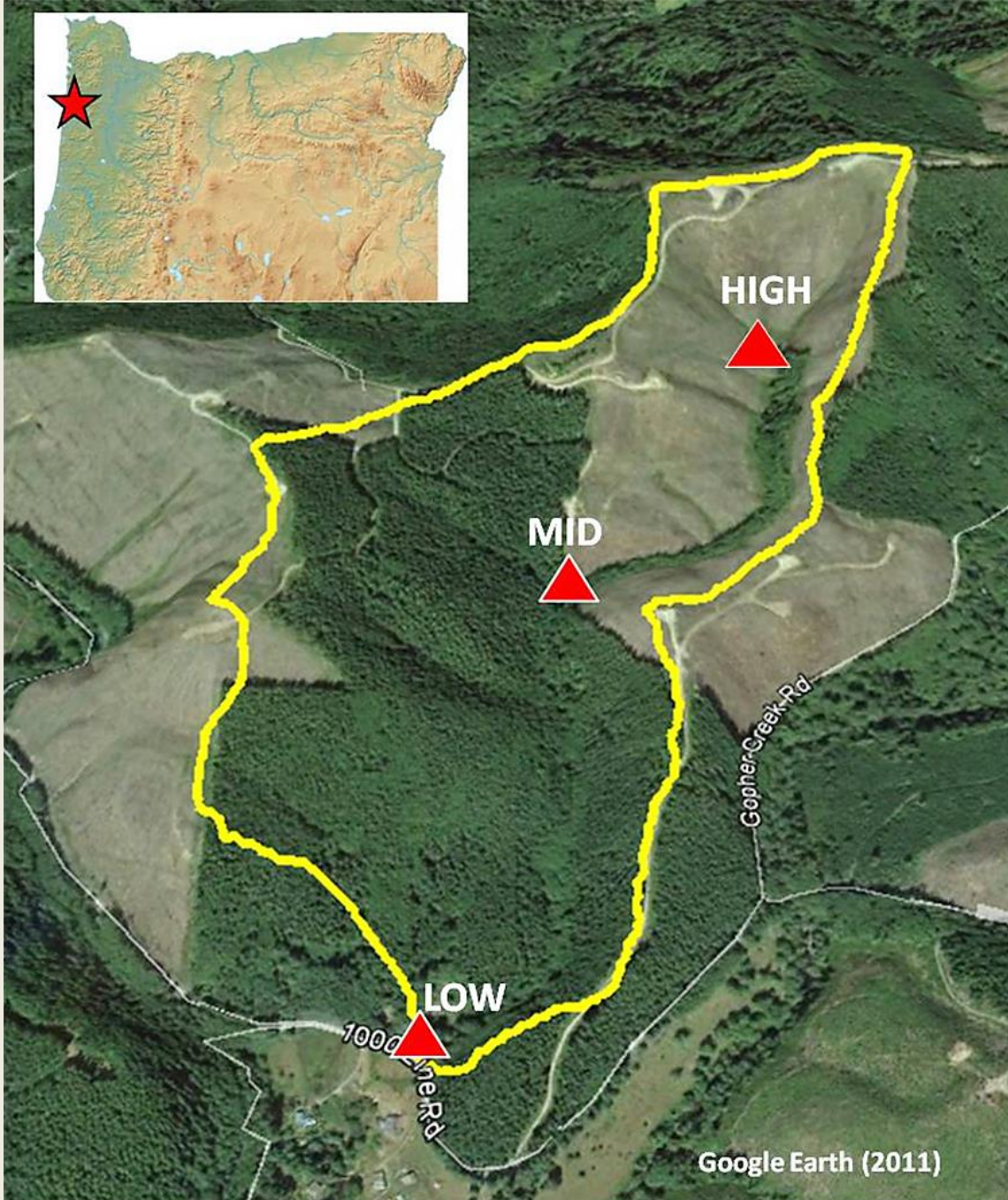


Figure 3. Concentrations of Pesticides Detected in 129 Post-Spray Samples from 26 operations (mdl = 0.04-1.0). Seven out of 25 samples tested at mdl < 1 ppb contained trace concentrations of pesticide.



# Needle Branch, Alsea Watershed, Oregon Coast

Upper 91 acres

## Helicopter Application

### Mix -

Glyphosate -681 g/ac(a.e.)

Imazapyr 85 g/ac (a.e.)

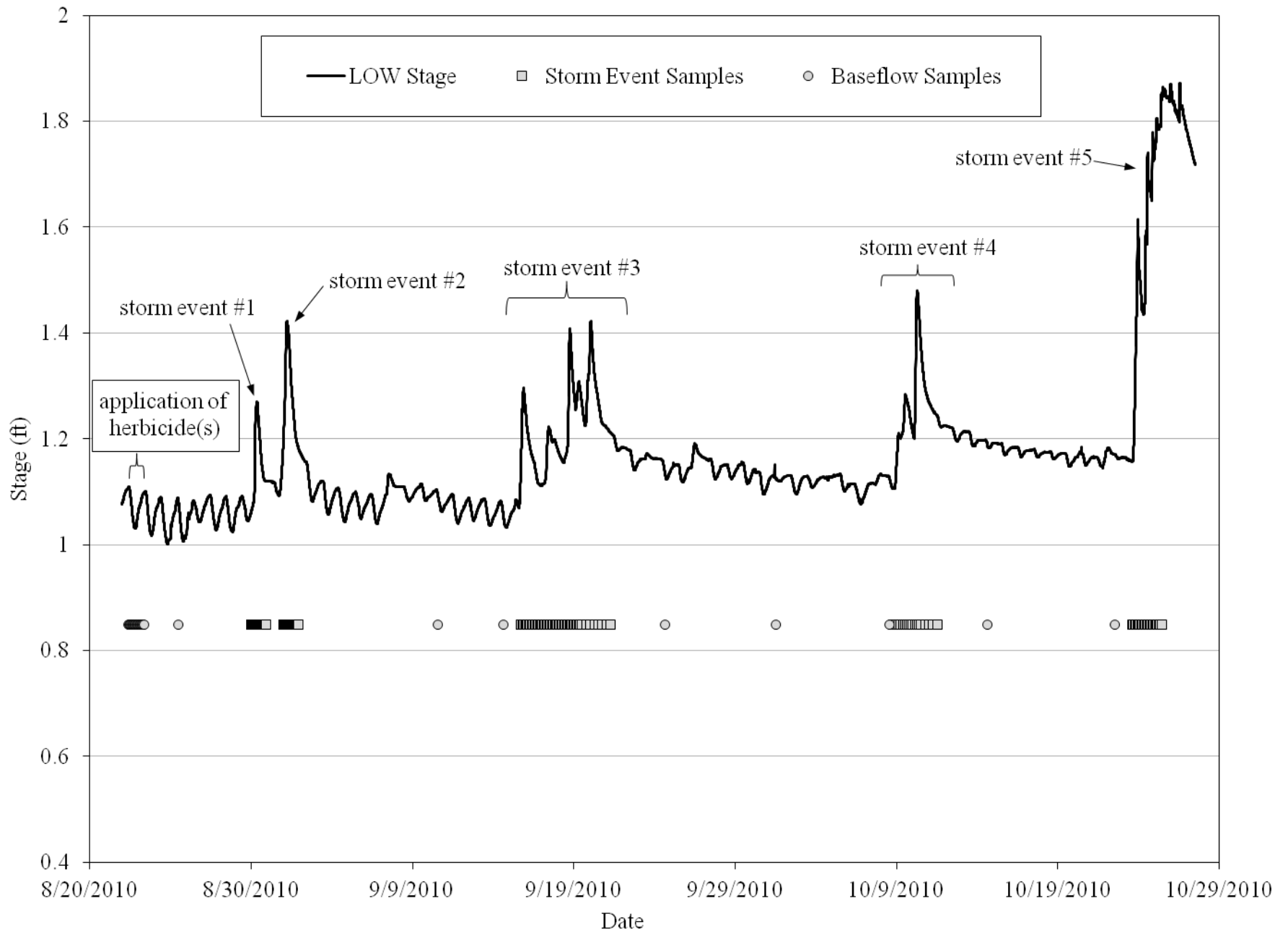
SMM 64 g/acre (a.i.)

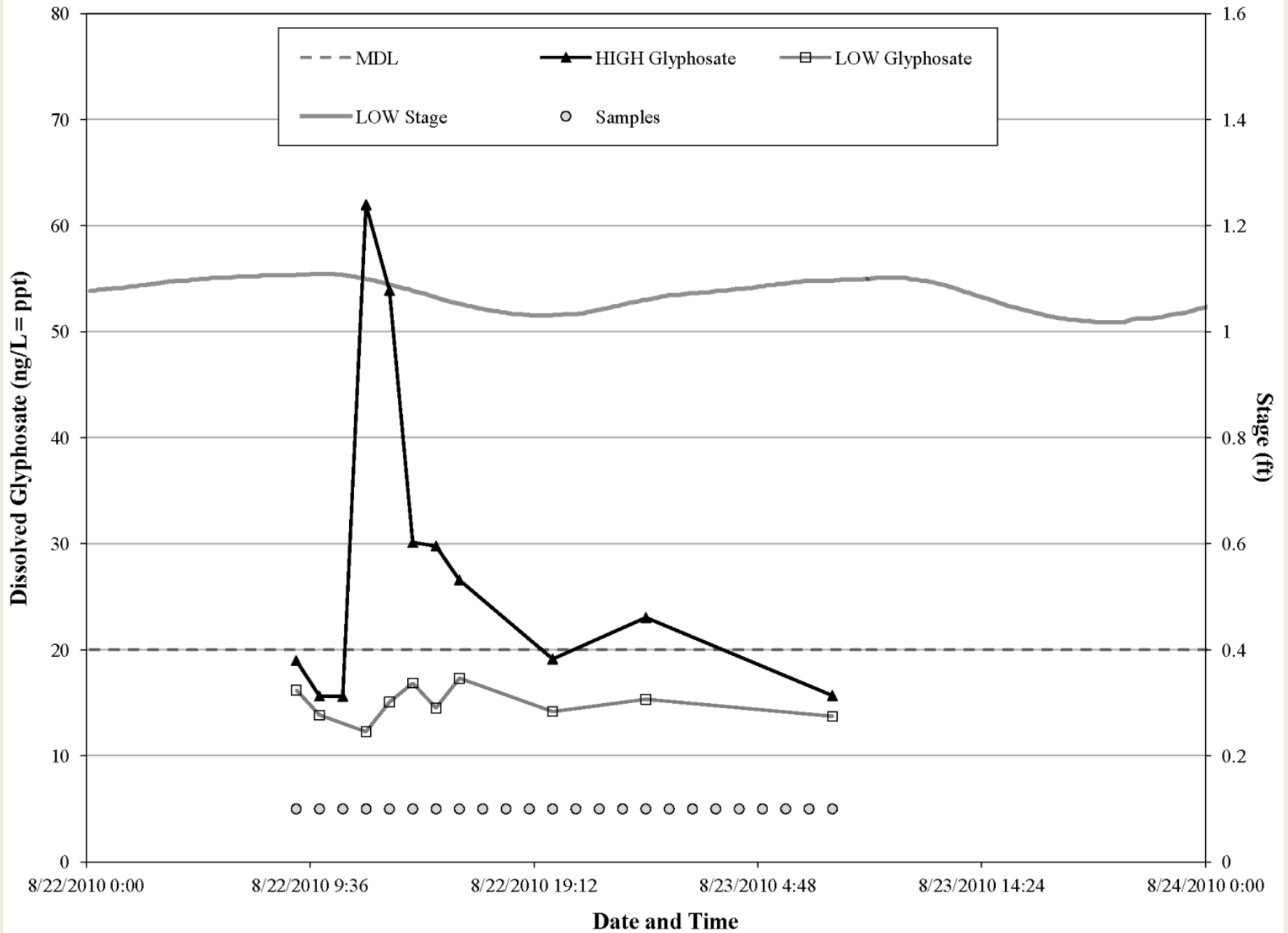
MSM 17 g/ac (a.i.)

### BMPs-

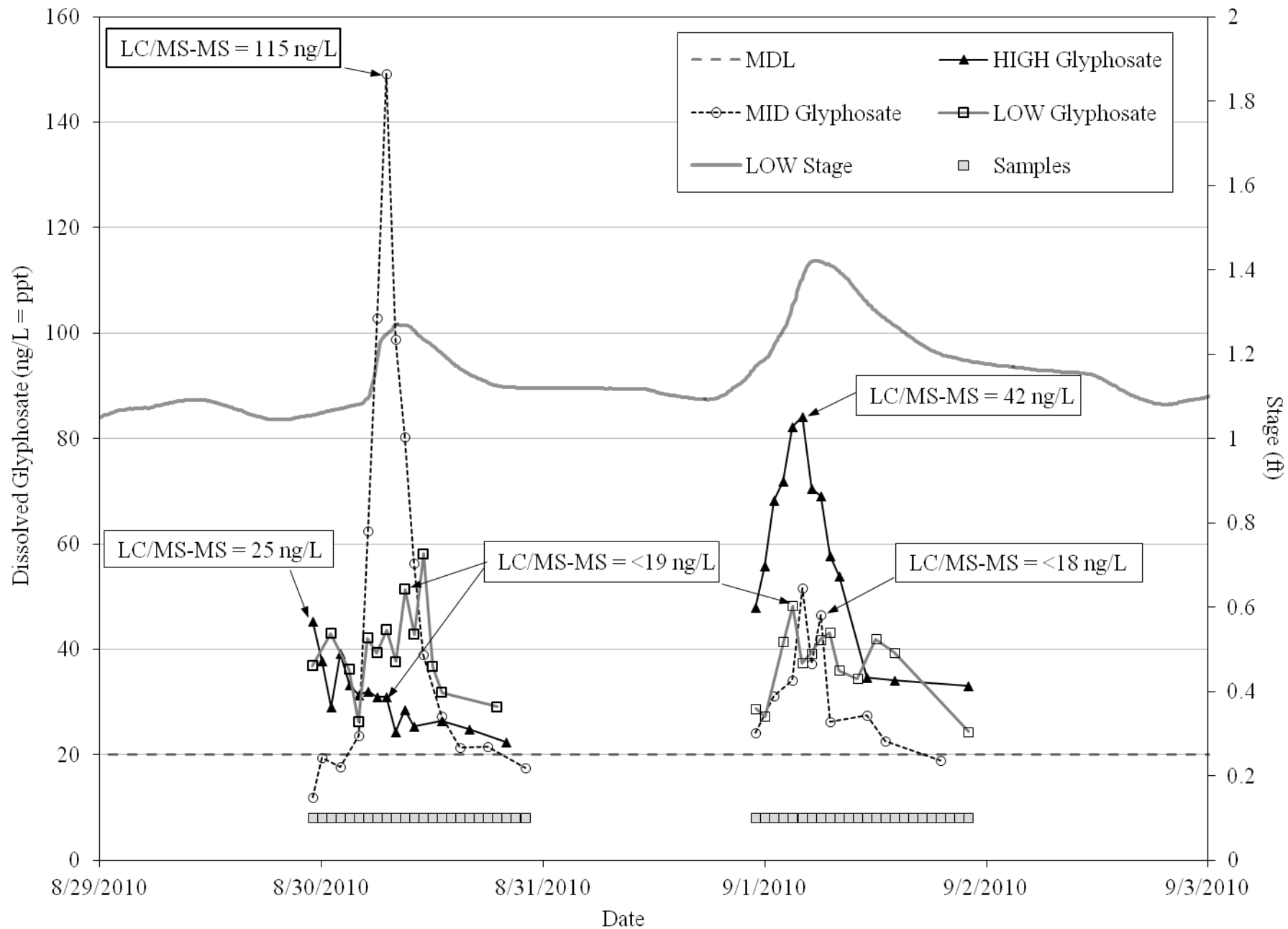
Mid to High – 18 m no spray buffer

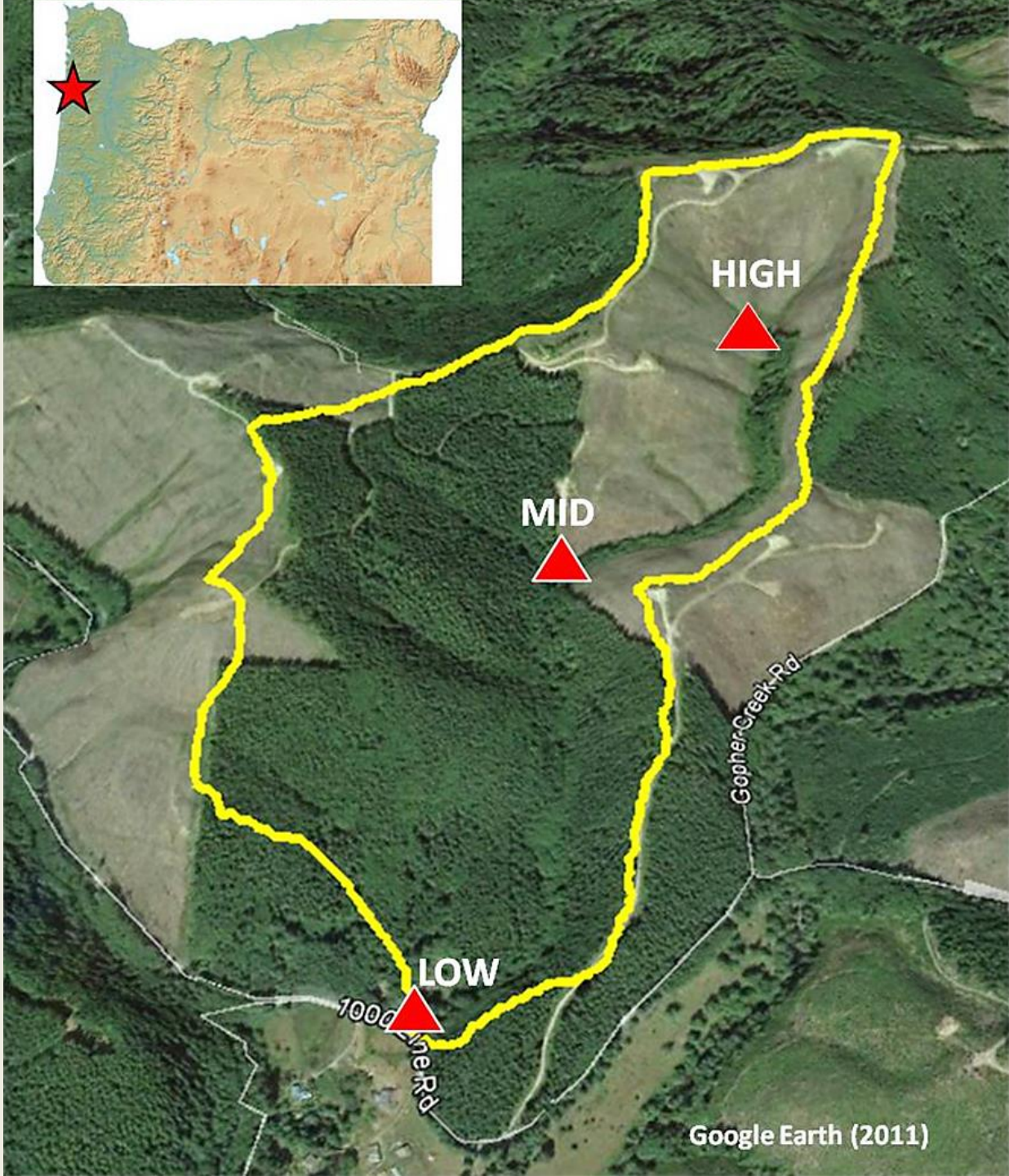
Above High – half boom – 3m buffer

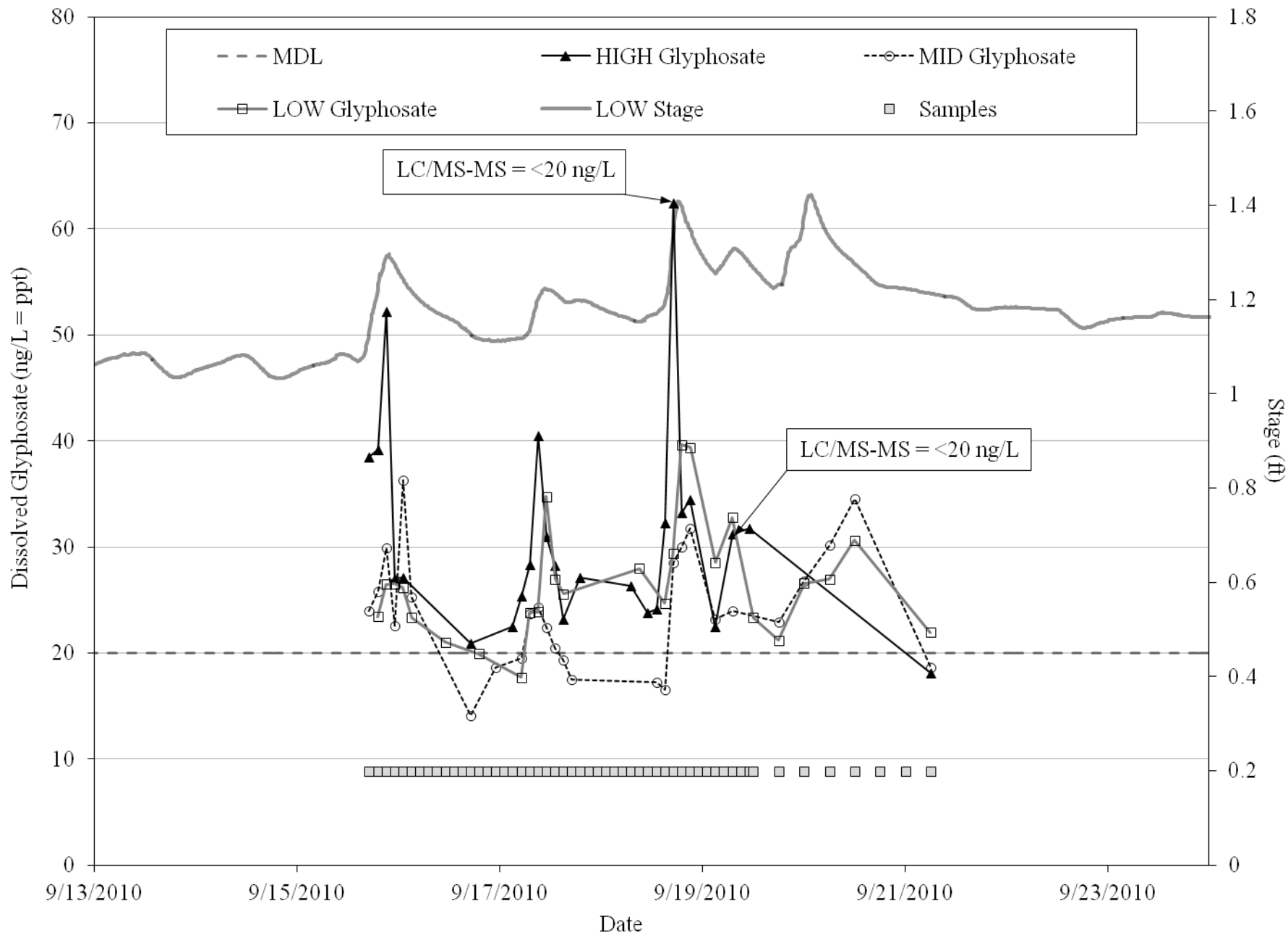














**Table 3.** Comparison of Time-Weighted Average Exposures to Roundup® or Vision® Formulations Associated with Multiple Scenarios<sup>a</sup>

Scenario/Species	Exposure		TWA Exposure	Experimental Endpoint
	Conc. (ng/L)	Duration (h)	Absolute (ng/L*h)	
<b>Needle Branch:</b>				
application pulse	<b>62</b>	<b>4</b>	248	
storm pulse #1 (8 DAT)	<b>115</b>	<b>10</b>	1,150	
storm pulse #2 (10 DAT)	<b>42</b>	<b>12</b>	504	
baseflow (to 8 DAT)	<b>25</b>	<b>192</b>	4,800	
cumulative exposure			6,702	

**NOECs and NOAECs for Roundup® or Vision® based on "traditional" endpoints:**

<i>Selanastrum capricornutum</i> (algae)	226,300	72	1.63E+07	growth (biomass)
<i>Oncorhynchus mykiss</i> (fingerling )	260,000	96	2.50E+07	survival
<i>Daphnia magna</i> (invertebrate)	589,000	48	2.83E+07	survival, growth
<i>Oreochromis niloticus</i> (tilapia)	310,000	96	2.98E+07	survival
<i>Lepomis macrochirus</i> (bluegill)	700,000	96	6.72E+07	survival
<i>Myriophyllum sibiricum</i> (watermilfoil)	242,000	336	8.13E+07	root length
<i>Daphnia magna</i> (invertebrate)	992,000	504	5.00E+08	survival, growth, reproduction
<i>Gammarus pseudolimnaeus</i> (invert.)	14,000,000	48	6.72E+08	survival
<i>Lemna minor</i> (duckweed sp.)	16,910,000	48	8.12E+08	?
<i>Potamogeton pectinatus</i> (pondweed)	7,440,000	336	2.50E+09	growth

**NOECs and NOAECs for Roundup® or Vision® based on biochemical or "non-traditional" endpoints:**

<i>Oncorhynchus mykiss</i>	7,400	0.0333	246	neurophysiological olfaction
<i>Oncorhynchus mykiss</i>	7,400	0.5	3,700	"behavioral olfaction"
<i>Oncorhynchus mykiss</i>	742,000	0.167	1.24E+05	avoidance
<i>Ephemerella walkeri</i> (mayfly)	1,000,000	1	1.00E+06	avoidance
<i>Oncorhynchus mykiss</i>	6,750,000	96	6.48E+08	"erratic swimming and rapid respiration"
<i>Oncorhynchus kisutch</i> (coho)	2,880,000	240	6.91E+08	"several sublethal parameters"

# Conclusions

- Glyphosate was detected at HIGH (62 ng/L) but not at LOW during application
- Glyphosate was present in baseflow at all stations 3 DAT and still detectable at HIGH 8 DAT (only)
- Discrete pulses of Glyphosate at 2 upper sites after first two storms: 8 DAT a 10 h pulse maxed at 115 ng/L at MID. 2<sup>nd</sup> event 10 DAT a 12 h pulse at 42 ng/L at HIGH
- Glyphosate < 20 ng/L at all storm events at LOW
- Needle Branch TWA exposures are orders of magnitude less than known endpoints of aquatic biota based on the literature
- Magnitude of Needle TWA is within known olfaction endpoints of salmon, however incoming coho arrive OCT/NOV

Louch, J., Tatum, V., Allen, G., Hale, V. C., McDonnell, J., Danehy, R. J. and Ice, G. (2016), Potential risks to freshwater aquatic organisms following a silvicultural application of herbicides in Oregon's Coast Range. *Integr Environ Assess Manag.* doi:10.1002/ieam.1781

McBroom, MW, Louch J., Beasley RS, hang M, Ice GG. 2013. Runoff of silvicultural herbicides applied using best management practices. *Forest Sci.* 59:197-210.

Scarborough et al. 2015. Herbicide concentrations in first-order streams after routine application for competition control in establishing pine plantations. *Forest Science* 61(3).

