SIXTH ANNUAL NORTHWEST CLIMATE CONFERENCE PROGRAM

November 3-5, 2015

-- TUESDAY, NOVEMBER 3 --

Tuesday Evening – Public Plenary (7:00 pm to 9:00 pm, Conference Center Bays 4-5)	
Time	*Presentation*
3:00	**Registration opens at 3:00pm** *Registration will be held in the Conference Center lobby. Registration will also be available on Wednesday and Thursday.*
6:30	Doors open for Public Plenary
7:00-8:00	**Plenary Session, Open to the Public** The implications of climate change for fishing and hunting in the Pacific Northwest *Bill Geer, Theodore Roosevelt Conservation Partnership (retired)*
8:00-9:00	**Welcome Reception, Open to the Public**

-- WEDNESDAY NOVEMBER 4 --

Continental breakfast will be available 6:30 am – 7:45 am in Bays 1-3

Wednesday Morning – Opening Plenary (8:00 am to 12:00 pm, Conference Center Bays 4-5)	
Time	*Presentation*
8:00-8:45	**Conference Welcome** Dr. John Abatzoglou*, University of Idaho, Conference Chair*; Tribal Leaders and Drummers, *Coeur d'Alene Tribe of Indians;* Steve Widmyer, *Mayor, City of Coeur d'Alene;* John R. McIver*, Vice President for Research and Economic Development, University of Idaho*
8:45-9:30	**Keynote** Mr. Robert Bonnie, *USDA Under Secretary for Natural Resources and Environment*
9:30-9:50	*Break*
9:50-12:00	**Water Year 2015: A prototype year for the future climate of the Northwest?** ▪ Causes and effects of the recent warming in the Northeast Pacific - *Nicholas Bond, University of Washington* ▪ Water year 2015 snow drought: Summary of hydrology and climate observations through the water year - *Ron Abramovich, NRCS* ▪ Is this the future? The Northwest's 2014-2015 in the context of climate projections - *Phil Mote, Oregon State University* ▪ Connecting science and management: Stories from the new drought in Oregon - *Kathie Dello, Oregon State University* ▪ Resource Managers Round-Table - *Eric Pytlak, Department of Energy; James Rufo Hill, Seattle Public Utilities; Chip Corsi, Idaho Fish and Game; Richy Harrod, U.S. Forest Service*
12:00-1:30 **Lunch *(provided in Bays 1-3)*** *Seating is available in the Shore Room and throughout the Resort* **SPECIAL SESSION: Adaptation Speed Dating: Connecting scientists and practitioners to promote collaboration and information sharing** *Moderated by Meade Krosby, University of Washington* Bays 1-3	

Wednesday Afternoon – Concurrent Sessions (1:30 pm to 3:30 pm)				
	CASCO	**BAY 6**	**KIDD ISLAND**	**NORTH CAPE**
Session	**Ecology**	**Agriculture**	**Communication**	***Special Session:* Water Crossing Design and Decision-Making**
1:30-1:50	Integrating mechanistic and empirical model projections to assess climate impacts on tree species distributions in northwestern North America - *Michael Case, University of Washington*	Biochar soil amendments as a tool for drought adaptation in PNW agriculture - *Claire Phillips, USDA Agricultural Research Service*	Conveying climate change vulnerability at the local level - *John Anderson, University of Idaho*	*Special Session (1:30-3:00)* Water Crossing Design and Decision Making *Moderated by Jane Atha Washington Department of Fish and Wildlife* Flood Risk Response to Climate Change in Olympic National Park and Implications for Culvert Design - *Ingrid Tohver, Climate Impacts Group* Geospatial tools for future peak streamflow estimation in culvert management at North Cascades National Park Complex - *Ronda Strauch, University of Washington Watershed Dynamics Research Group* An applied case study to integrate climate change into design and permitting of water crossing structures - *Jane Atha, Washington Department of Fish and Wildlife Habitat Science Division*
1:50-2:10	The possible futures of PNW ecosystems - *Tim Sheehan, Conservation Biology Institute*	Projected regional shifts in Pacific Northwest dryland agriculture in response to climate change - *Tina Karimi, Washington State University*	Tell me when I start talking climate and I will tell you when you start talking management - *Gregg Servheen, Idaho Department of Fish and Game*	
2:10-2:30	Projecting the dependence of aspen productivity on redistributed snow in a warming climate - *Ben Soderquist, University of Idaho*	Impacts of climate change on irrigated agriculture in the Columbia River Basin through water rights curtailment - *Kirti Rajagopalan, Washington State University*	So you have data, now what? - *Dominique Bachelet, Conservation Biology Institute*	
2:30-2:50	Coupled response of grassland biomass to changes in climate and grazing management using an ecohydrologic model - *Julian Reyes, Washington State University*	REACCH decision support tools for NW wheat/grain farmers - *Katherine Hegewisch, University of Idaho*; An agricultural producer learning tool for the Columbia River Basin - *Chad Kruger, Washington State University*	An indigenous approach to adapting to climate change: Lessons to be shared - *Rodney Frey and Brian Cleveley, University of Idaho*	

2:50-3:00	Session wrap-up	Session wrap-up	Pop-Up: Climate registry for the assessment of vulnerability (CRAVe): A tool to track climate change vulnerability assessments – *Jessica Hitt, Ecoadapt* Session wrap-up	Session wrap-up
Break *(3:00-3:30 pm)*				

Wednesday Afternoon – Concurrent Sessions (3:30 pm to 5:00 pm)				
	CASCO	**BAY 6**	**KIDD ISLAND**	**NORTH CAPE**
Session	**Wildlife**	**Water Resources**	**Adaptation and Working Across Boundaries**	***Special Session:*** **Washington State Coastal Resilience**
3:30-3:50	Predicting climate change impacts on river ecosystems and salmonids across the Pacific Northwest - *Clint Muhlfeld*, *USGS Rocky Mountain Science Center*	Seeing the future? Hydrologic impacts of a record warm winter and dry spring in the Oregon Cascades - *Anne Nolin*, *Oregon State University*	Sea level rise and coastal flood risk probabilities: Improving risk communication to support community resilience - *Ian Miller, Washington Sea Grant*	*Special Session (3:30-5:00)* Washington State Coastal Resilience and Collaboration *Moderated by Bobbak Talebi, Washington Department of Ecology* Building Coastal Community Resilience through Effective Partnerships - *Michael Levkowitz, Hershman Fellow, Washington Department of Ecology* Climate Resilient Floodplains: Assessing Climate Impacts of Concern to Puget Sound Communities - *Julie Morse, The Nature Conservancy*
3:50-4:10	Incorporating climate change into salmon habitat restoration planning in the South Fork Nooksack River, Washington - *Treva Coe*, *Nooksack Tribe*	Impact of 2015 warmth on glacier mass balance across the Pacific Northwest - *Mauri Pelto*, *Nichols College*	The available science assessment project: Evaluating the supporting science behind climate adaptation actions - *Rachel Gregg, EcoAdapt*	
4:10-4:30	Microclimatic envelopes of terrestrial gastropods - *Michael Lucid*, *Idaho Department of Fish and Game*	Modeled crop yield response to various types of drought events in the Pacific Northwest - *Muhammad Barik, Washington State University*	Assessing climate change effects on natural and cultural resources of significance to tribes - *Samantha Chisholm Hatfield*, *Oregon Climate Change Research Institute*	

4:30-4:50	Integrating climate change into state wildlife planning examples from Idaho and Washington - *Lynn Helbrecht, Washington Department of Fish and Wildlife; Leona Svancara, Idaho Department of Fish and Game*	A retrospective economic impact assessment of the 2005 drought in Washington State under alternative industry aggregation schemes - *Michael Brady*, *Washington State University*	Water, salmon, cous, and climate: Assessing climate vulnerabilities for the Confederated Tribes of the Umatilla Indian Reservation - *Sascha Petersen*, *Adaptation International*	Climate Resilient Floodplains: Bringing Climate Science into Project Design - *Guillaume Mauger, University of Washington Climate Impacts Group* Climate Impact Pathways through Sediment to Inform Coastal Resilience Planning - *Eric Grossman, U.S. Geological Survey* Session wrap-up
4:50-5:00	Session wrap-up	Session wrap-up	*PopUp:* Data visualizations for the combined effects of projected sea level rise, storm surge, and peak river flows on water levels in the Skagit floodplain – *Jonathan Kemp*, *Environmental Science Associates* Session wrap-up	
Break/Transition to Poster Session *(5:00-5:15 pm)*				

Poster Session, Tools Café, and Networking Reception (5:15pm to 8:00 pm, Conference Center Bays 1-3)

Please join us in from 5:15 pm to 8:00 pm for the poster session, tools café, and networking reception.
Hosted by the University of Idaho Department of Geography and College of Science.

Posters are listed by topic at the end of this program.

-- THURSDAY NOVEMBER 5 –

Continental breakfast will be available 6:30 am – 8:15 am in Bays 1-3

Thursday Morning – Plenary (8:30 am to 10:00 am, Conference Center Bays 4-5)	
Time	*Presentation*
8:30-10:00	**Climate Change in the Inland Northwest: State of the Science and Emerging Issues** • How temperature and precipitation trends have affected mountain hydrology and ecology - *Charles Luce, U.S. Forest Service* • Through a glass darkly: Evaluating the effects of future climate change on wildlife - *Kevin McKelvey, U.S. Forest Service* • What do cities and utilities need from climate research? - *Cyndy Bratz, Tetra Tech* • Climate, grapes and wine: Understanding terroir influences in a variable and changing climate - *Gregory Jones, Southern Oregon University*
Break/Transition to Concurrent Sessions *(10:00-10:30 am)*	

Thursday Morning – Concurrent Sessions (10:30 am to 12:00 pm)				
	BAYS 4-5	**BAY 6**	**KIDD ISLAND**	**NORTH CAPE**
	Wildfire	**Water Resources**	**Adaptation and Working Across Boundaries**	***Special Session:* Successful Adaptation to Climate Change**
10:30-10:50	Effects of climate change on snowpack and fire risk in the Western United States - *Diana Gergel, University of Washington*	A climate change risk assessment for water quality and salmon recovery; South Fork Nooksack River, WA - *Steve Klein, Environmental Protection Agency*	The importance of climate on the benefits and economic viability of the Yakima Basin Integrated Water Resource Management Plan - *Jonathan Yoder, Washington State University*	<u>*Special Session (10:30-12:00)*</u> Successful adaptation to climate change: Defining, measuring and tracking effectiveness. *Moderated by Amy Snover and Lara Whitely Binder, University of Washington Climate Impacts Group* Successful adaptation to climate change: Framework, indicators and metrics – *Amy Snover, University of Washington*
10:50-11:10	Hindcasting climatic water balance scenarios in the Clearwater Region - *Bridget Guildner, University of Montana*	Instrumenting a glacier served watershed to establish baseline conditions and evaluate climate change impacts on the hydrology of the Nooksack River system and salmon - *Oliver Grah, Nooksack Indian Tribe*	City of Tacoma climate change resilience study: Infrastructure, ecosystems and social systems - *Nora Ferm, Cascadia Consulting Group and Jim Parvey, City of Tacoma*	

11:10-11:30	The distribution and occurrence of wildfire refugia under a changing climate - *Arjan Meddens*, *University of Idaho*	Developing a spatially explicit stream temperature model to assess population vulnerability of native trout to future climate change in the Crown of the Continent ecosystem, USA and Canada - *Leslie Jones*, *University of Montana*	Planning for climate change across a rural two county geography - *Cynthia Jayne, North Olympic Development Council*	*Climate Impacts Group* (10:30 – 11:00) World Café-style breakout groups *Facilitated by Amy Snover, Lara Whitely Binder, Joe Casola, Meade Krosby, University of Washington Climate Impacts Group* (11:00 – 12:00) Session wrap-up
11:30-11:50	Fire refugia: The physical and hydrologic basis - *Zachary Holden*, *U.S. Forest Service*	The evolving contribution of glacier melt to summer streamflow in the Pacific Northwest: 1960-2099 - *Chris Frans*, *University of Washington*	Climate change adaptation and resilience in our built environment: Green infrastructure policy integration with Puget Sound municipalities - *Erin Ryan-Peñuela*, *Edmonds Community College*	
11:50-12:00	Session wrap-up	Session wrap-up	Session wrap-up	
Lunch *(provided in Bays 1-3)* -- 12:00-1:30 pm *Seating is available in the Shore Room and throughout the Resort* **PRESENTATION AND STAKEHOLDER FEEDBACK: NIDIS Drought Early Warning System** *Moderated by Kathie Dello, Oregon State University* Bays 1-3				

Thursday Afternoon – Concurrent Sessions (1:30 pm to 3:00 pm)				
	BAYS 4-5	**BAY 6**	**KIDD ISLAND**	**NORTH CAPE**
	Ecological Adaptation	**Water Resources**	**Northwest Climate**	***Special Session:* Northern Rockies Adaptation Partnership**
1:30-1:50	Capturing sub-regional variability in regional-scale climate change vulnerability assessments of natural resources - *Polly Buotte*, *University of Idaho*	Predicting the hydrologic response of the Columbia River System to climate change: Calibration and sensitivity analyses - *Oriana Chegwidden*, *University of Washington*	Land surface interactions in a changing climate - *Eric Salathé*, *University of Washington*	*Special Session (1:30-3:00)* Northern Rockies Adaptation Partnership *Moderated by Jessica Halofsky, University of Washington*

Thursday Afternoon – Concurrent Sessions (1:30 pm to 3:00 pm)				
	BAYS 4-5	**BAY 6**	**KIDD ISLAND**	**NORTH CAPE**
1:50-2:10	Future drought vulnerabilities in tree stands: Understanding soil moisture dynamics to develop resilience strategies for climate change in the Pacific Northwest - *Ryan Niemeyer*, *University of Idaho*	A bottom-up approach to identifying flood risks and climate change vulnerabilities - *Julie Vano*, *Oregon Climate Change Research Institute*	Temperature trend biases in gridded climate products in the Western US - *Jared Oyler*, *University of Montana*	Adapting forest management to climate change in the Northern Rockies - *Mary Manning, U.S. Forest Service* (1:30 pm) Adapting natural resource management to climate change: Vulnerability of water resources in the Northern Rockies - *Charles H. Luce, U.S. Forest Service* (1:45 pm) Adapting natural resource management to climate change: Vulnerability of rangelands in the Northern Rockies - *Matt C. Reeves, U.S. Forest Service* (2:00 pm) Adapting natural resource management to climate change: Vulnerability of recreation in the Northern Rockies - *David L. Peterson and Michael S. Hand, U.S. Forest Service* (2:15 pm) Session wrap-up
2:10-2:30	Engaging transboundary science-management partnerships to address climate impacts on wildlife connectivity in Washington and British Columbia - *Meade Krosby*, *University of Washington*	High-resolution, intermediate-range forecasting for water resource management in Southern Idaho - *Matt Masarik*, *Boise State University*	Analysis of Intensity-Duration-Frequency Curves in British Columbia - *Stephen Sobie*, *Pacific Climate Impacts Consortium*	
2:30-2:50	Climate change vulnerability in the Pacific Northwest: A comparison of three approaches - *Julia Michalak*, *University of Washington*	Improved technology for Western water supply forecasts - *Danny Marks*, *USDA Agricultural Research Service*	Timing is everything: Prioritizing adaptation using information about the "Time of Emergence" of climate change - *Cary Lynch* presented by *Joe Casola*, *University of Washington Climate Impacts Group*	
2:50-3:00	Session wrap-up	Session wrap-up	Session wrap-up	
Short Break/Transition Back to Plenary *(3:00-3:15 pm)*				

Thursday Afternoon – Closing Plenary (3:15 pm to 5:00 pm, Conference Center Bays 4-5)	
Time	*Presentation*
3:15-4:45	**Climate Change Adaptation Across Disciplines** • Climate change, migration, and the Puget Sound region: What we know and how we could learn more - *Alison Saperstein, University of Washington* presented by *Lara Whitely-Binder, University of Washington Climate Impacts Group* • Adapting to climate change: Science, policy and practice cultures - *Johanna Wolf, Royal Roads University* • Seeking climate resilience: Twenty years of applied climate science in the Northwest - *Amy Snover, University of Washington*
4:45-5:00	**Conference Close** *John Abatzoglou, University of Idaho, Conference Chair*

SIXTH ANNUAL NORTHWEST CLIMATE CONFERENCE

POSTER SESSION, TOOLS CAFÉ, AND NETWORKING RECEPTION

Hosted by the University of Idaho Department of Geography and College of Science

November 4, 2015

Conference Center Bays 1-3, 5:15 pm – 8:00 pm

Presenters are listed here. For a complete list of authors, see the abstracts volume on the conference website.

All presenters have been provided with a notecard on which to indicate the time(s) during which they will be at their presentations.

	Agriculture: Impacts and Adaptation
1	How temperature and water potential affect the growth of Fusarium and Rhizoctonia pathogens of wheat – *Iqbal Singh Aujla, Washington State University*
2	Climate drives soil health in the inland Pacific Northwest – *Jason G. Morrow, Washington State University*
3	Impact of climatic factors on cereal aphid's population density in the Pacific Northwest, USA – *Seyed Ebrahim Sadeghi, University of Idaho*
4	Introducing the Eddy Covariance system to improve water use efficiency and grape quality in Washington vineyards – *Sayed-Hossein Sadeghi, Washington State University*
5	Biochar effects on wheat and pea productivity – *Stephen Machado, Oregon State University*
6	Carbon exchange over wheat cropping systems: Remote sensing and direct flux measurements – *Calem Aaberg, University of Washington*
7	Spatial variability in interannual relationships between winter wheat yields and climate across the inland Pacific Northwest of the United States – *Wenlong Feng, University of Idaho*
8	When would irrigators invest in more water-efficient technologies as an adaptation to climate change? An analysis of the Yakima River basin in Washington State – *Keyvan Malek, Washington State University*

9	Projected changes in cold hardiness zones and impacts on Northwest agriculture– *Lauren Parker, University of Idaho*
10	Quantifying the impacts of climate change and human decision-making on crop yield and water use in semi-arid environments: A modeling approach – *Anderea Leonard, Boise State University*
11	The effect of wildfire aerosols on crop growth in the Pacific Northwets – *Quentin Baret, Washington State University*
12	Improving site specific nitrogen management – *Michelle Chaffee, University of Idaho*
13	Historical precipitation analysis in relation to the impact of climate change on regional dairy manure storage and land application – *Kaitlin Miller, Washington State University*
14	Climate driven future shifts in agro-ecological classes – *Harsimran Kaur, Washington State University*
Climate Change Adaptation and Communication	
15	Planning for climate impacts to wastewater and storm water infrastructure – lessons learned from local government engineers – *Eli Levitt, Washington Department of Ecology*
16	Vulnerability Assessments in the Great Basin Region: incorporating science into decision-making – *Sally Sargeant, Boise State University*
17	Evaluation of Participation from a Free Online Course on Animal Agriculture in a Changing Climate – *Elizabeth Whitefield, Washington State University*
18	Climate change and public health – *Jerrod Davis, Washington Department of Health*
19	Forest and climate change graduate certificate at Oregon State University - Online – *Badege Bishaw, Oregon State University*
20	Engaging Students in Climate Science with Place-Based Data and Models – *Miriam Bertram, University of Washington*
Hydrology and Water Resources: Impacts and Adaptation	
21	The impacts of Columbia River Treaty scenarios on agriculture, hydropower production and flood risk in a future climate – *Begum Rabeya Rushi, Washington State University*
22	Modeling future water availability in the Boise River Basin, Idaho – *Amy Steimke, Boise State University*

23	Review of WA State 2014-15 Drought: How does it compare to previous droughts? – *Karin Bumbaco, University of Washington*
24	A multivariate drought assessment of the Yakima River Basin under observed and future climate – *Md Rubayet Mortuza*
25	An Analysis of Historic and Projected Climate Scenarios in the Western United States using Hydrologic Landscape Classification – *Chas Jones, Environmental Protection Agency*
26	Water Year 2015: The Oregon Cascade Mountain Snowpack Deficit – *Julie Koeberle, Natural Resources Conservation Service*
27	Integration of MODIS Snow, Cloud and Land Area Coverage Data with SNOTEL to Generate Inter-Annual Snow Depletion Curves and Maps – *Russell Qualls, University of Idaho*
28	Integrating climate change and urban growth in an agent-based modeling framework to project future water availability in semi-arid Idaho – *Bangshuai Han, Boise State University*
Northwest Climate: Climate Dynamics, Variability, and Change	
29	Physical parameter sensitivity in a superensemble regional modeling experiment – *Sihan Li, Oregon State University*
30	High resolution superensemble regional modeling for the western US – *Sihan Li, Oregon State University*
31	Modeling the hydro-climate of southwest Idaho over a range of historical conditions – *Katelyn Watson, Boise State University*
32	Development of high resolution (250m) historical daily gridded air temperature data with distribute sensor networks for the US Northern Rocky Mountains – *Zachary Holden, U.S. Forest Service*
33	Contrasting multiple downscaled climate datasets used for ecological applications in the Pacific Northwest – *Yueyang Jiang, Oregon State University*
34	Scenarios, variability and climate models: Understanding the range of possibilities for future Northwest climate – *Naomi Goldenson, University of Washington*
35	Holocene glacial fluctuations and paleoclimate for the North Cascades from Lyman Lake, WA – *Harold Wershow, Western Washington University*
36	Updated and Forward Looking Rainfall and Runoff Intensity-Duration-Frequency Curves for Washington State – *Yonas Demissie, Washington State University*

Wildfire, Wildlife, and Terrestrial and Aquatic Ecosystems: Impacts and Adaptation	
37	CMIP5 climate models predict rapid and deep soil warming – *Claire L. Phillips, Oregon State University*
38	Radial growth and wood anatomy of limber pine in a natural simulation of global change effects on Grate Basin ecosystems – *Emanuele Ziaco, University of Nevada Reno*
39	Linking climate impacts with avian cavity nester viability: Modeling long term habitat suitability across multiple ecological scales – *Eric Walsh, University of Idaho*
40	Biogeochemical impacts of drought on Idaho forest ecosystems: can we resolve species level differences with high resolution measurements? – *Jeffrey Stenzel, University of Idaho*
41	Toward modeling Pacific Northwest tree species using CARAIB dynamic vegetation model – *Marie Dury, Oregon State University*
42	Forest carnivore distribution and occurrence in the Idaho panhandle – *Lacy Robinson, Idaho Department of Fish and Game*
43	Continuous monitoring of winter canopy skin temperatures of an old-growth coniferous forest – *Youngil Kim, Oregon State University*
44	Many species, many threats: A composite risk assessment of climate impacts for salmonids in the Skagit River, WA – *Caroline Graham, Grinnell University*
45	Coastal invertebrates and fishes: Evaluating risk from climate change – incorporating climate scenarios into the web-based Coastal Biodiversity Risk Analysis Tool (CBRAT) – *Christina L. Folger, Environmental Protection Agency*
46	From the Andes to the PNW: How temperature associated with climate change influence insect diversity and population dynamics – *Silvia Rondon, Oregon State University*
47	Identifying tipping points in the phonological responses of coast Douglas-fir to climate change – *Kevin Ford, U.S. Forest Service*
48	Deriving spatiotemporally distributed net ecosystem exchange estimates combining eddy flux and remote sensing data – *Qingtao Zhou, Boise State University*

Working Across Boundaries	
49	Prioritizing areas to protect under a changing climate: An intertemporal ecological and economic framework for quantifying outcomes of alternative conservation mechanisms on landscapes with natural and working lands – *Isabel Guerrero Ochoa, Oregon State University*
50	Valuing the effects of climate change on forestry: a Ricardian approach – *Cassie Finer, Oregon State University*
51	The effect of water quality on lakefront property values in the wildland-urban interface of the American West: Evidence from Coeur d'Alene, Idaho – *Haifeng Liao, University of Idaho*

Tools Café	
TC 1	So you have data, now what? – *Dominique Bachelet, Conservation Biology Institute*
TC 2	Visualizing and accessing data from the Integrated Scenarios of the Future Northwest Environment project – *Katherine Hegewisch, University of Idaho*
TC 3	An agricultural producer learning tool for the Columbia River Basin – *Kirti Rajagopalan and Chad Kruger, Washington State University*
TC 4	Climate registry for the assessment of vulnerability (CRAVe): A tool to track climate change vulnerability assessments – *Jessica Hitt, EcoAdapt*
TC 5	Conveying climate change at the local level with SimSalmon, a virtual underwater Alaska – *John Anderson, University of Idaho*
TC 6	An indigenous approach to adapting to climate change: An interactive 3-D Landscape - *Rodney Frey and Brian Cleveley, University of Idaho*
TC 7	Data Visualizations of the Combined Effects of Projected Sea Level Rise, Storm Surge, and Peak River Flows on Water Levels in the Skagit Floodplain – *Jonathan Kemp, Environmental Science Associates*
TC 8	Climate Engine: Cloud computing for visualization and analysis of climate and remote sensing – *Donovan VanSant, University of Idaho*