# **GAMUT: The Final Frontier**

### Amber Jones iUTAH Data Manager



### **GAMUT: Gradients Along Mountain to Urban Transitions**



- Major iUTAH infrastructure
- Three watersheds instrumented from a mountain to urban gradient





### GAMUT: Gradients Along Mountain to Urban Transitions





### GAMUT: Gradients Along Mountain to Urban Transitions





## **141 million+** values over 3 years



### GAMUT Update: Additional Monitoring Sites

















### GAMUT Update: Utah Lake Buoys



- GAMUT staff working with State DEQ
- Assisting with installation and maintenance
- Will stream buoy data



photo: Al Hartman, Salt Lake Tribune





### **GAMUT Update: Discharge Data**

- Variety of new methods implemented to manually measure discharge
- Stage-discharge relationships shared to HydroShare
- Time series of discharge accessible with other GAMUT data





data/contents/iUTAH\_GAMUT\_LR\_TG\_BA\_RawData\_2016.cs

data/contents/flowtracker-variable-definitions.pdf

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### **GAMUT Update: Regular Sampling Results**

- Two efforts:
  - Synoptic sampling: 2013-2014
  - Biweekly sampling: 2014-2016
- Results of sample analyses now shared on HydroShare



iUTAH GAMUT Water Quality Grab Sampling Results		Open with	100				
Auflon: UTAH GAMUT Working Group UTAH Otas Manager Menor Hens: Convint 5, 554 pm Late updates: Nov 4, 2016, 126 pm by/UTAH Data Manager Autored	С	00/ 1	I				
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How to cite	0780	Light aqueous	TRUE	83_500W_BA	2015-09-29 14:09	-7 083 IN IF	Dave Pitisson
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### GAMUT Update: Accessing Sensor Data



#### HydroShare:

- •Raw by site (QC0)
- •Quality controlled by site and by variable (QC1)



#### **Time Series Analyst:** Web interface, map and plot tools, and data export





#### Web Services: Programmatic data access



### **GAMUT Update: Quality Control Status**

- Variables sorted into tiers depending on their priority for QC
- Tier 1: Most completed through 2015, some through 2016
- **Tier 2:** Most completed through 2015, others through 2014
- Tier 3: Many completed through 2015



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VariableCode	Priority	Logan	Red Butte	Provo
SpCond	Tier 1	6/30/2016	12/31/2015	12/31/2015
BGA	Tier 1	9/30/2016	12/31/2015	12/31/2015
Chlorophyll	Tier 1	9/30/2016	12/31/2015	12/31/2015
fDOM	Tier 1	9/30/2016	12/31/2015	12/31/2015
Nitrate	Tier 1	Not Started		12/31/2015
JuddDepth_avg	Tier 1-	12/31/2014	12/31/2015	12/31/2015
pH	Tier 1-	6/30/2016	6/30/2016	12/31/2015
ODO_Local	Tier 1-	12/31/2014	12/31/2015	12/31/2015
ODO	Tier 1-	12/31/2014	12/31/2015	12/31/2015
Precip_tot	Tier 1+	9/30/2016	6/30/2016	12/31/2015
Stage	Tier 1+	9/30/2016	12/31/2015	12/31/2015
WaterSurfaceElevation	Tier 1	9/30/2016	12/31/2015	12/31/2015
Discharge	Tier 1	9/30/2016	12/31/2015	12/31/2015
SWIn_NR01_avg	Tier 2	12/31/2014	12/31/2015	12/31/2015
LWIn_Cor_NR01_avg	Tier 2	12/31/2014	12/31/2015	12/31/2015
PARIn_avg	Tier 2	Not Started	12/31/2015	12/31/2015
VWC_5cm_avg	Tier 2	12/31/2014	12/31/2014	12/31/2014
SoilTemp_5cm_avg	Tier 2	12/31/2015	12/31/2015	12/31/2015
VWC_10cm_avg	Tier 2	12/31/2014	12/31/2014	12/31/2014
SoiTemp_10cm_avg	Tier 2	12/31/2015	12/31/2015	12/31/2015
VWC_20cm_avg	Tier 2	12/31/2014	12/31/2014	12/31/2014
SoiTemp_20cm_avg	Tier 2	12/31/2015	12/31/2015	12/31/2015
VWC_50cm_avg	Tier 2	12/31/2014	12/31/2014	12/31/2014
SoiTemp_50cm_avg	Tier 2	12/31/2015	12/31/2015	12/31/2015
VWC_100cm_avg	Tier 2	12/31/2014	12/31/2014	12/31/2014
SoiTemp_100cm_avg	Tier 2	12/31/2015	12/31/2015	12/31/2015
TurbMed	Tier 2	12/31/2015	12/31/2014	12/31/2015
AirTemp_ST110_avg	Tier 3	12/31/2014	12/31/2014	12/31/2015
RH	Tier 3	12/31/2015	12/31/2014	Not Started
BP_avg	Tier 3	12/31/2015	12/31/2014	12/31/2015
WindSp_avg	Tier 3	Not Started	Not Started	12/31/2015
WindSp_max	Tier 3	Not Started	Not Started	12/31/2015
WindDir_avg	Tier 3	Not Started	Not Started	12/31/2015
SWOut_NR01_avg	Tier 3	12/31/2014	Not Started	12/31/2015
LWOut_Cor_NR01_avg	Tier 3	12/31/2014	Not Started	12/31/2015
PAROut_avg	Tier 3	Not Started	Not Started	12/31/2015
TargTemp_SI111_avg	Tier 3	12/31/2014	Not Started	12/31/2015
WaterTemp_EXO	Tier 3	12/31/2015	12/31/2015	12/31/2015





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ware bug Jan-2014

### GAMUT Update: Paper Submitted!

- Sumitted to the open source journal Sensors
- Special issue on water quality sensing

Jones AS, Aanderud ZT, Horsburgh JS, Eiriksson D, Dastrup D, Cox C, Jones SB, Bowling DR, Carlisle J, Baker MA. Sensing Water Quality Across Mountain to Urban Transitions. *Sensors*. Submitted 14 Oct 2016. *In Review.* 





## **GAMUT Extensions: Additional Sensors**



• Soil CO2 and O2 (Zach Aanderud and Kerri Russell)





### **GAMUT Extensions: Additional Efforts**

- Sapflux monitoring (Dave Bowling and Dave Eiriksson)
- Stormwater/canal network (Jeff Horsburgh and Tony Melcher)
- Residential stormwater and stormwater harvesting (Ryan Dupont)







## GAMUT Extensions: Biophysical Research



### GAMUT Extensions: Social Science Research



Cache County Neighborhoods



#### Salt Lake County Neighborhoods



Heber Valley Neighborhoods









### **GAMUT Extensions: Social Science Research**





### **GAMUT Extensions: Education and Training**













### **GAMUT: Leveraging the Infrastructure**

How can we leverage GAMUT data and infrastructure? Topics for research or training? Funding opportunities?

https://youtu.be/iWsTGLRJHqU?t=1m54s

# How can we boldly go where no one has gone before?

