



Management Applications of High Resolution Monitoring (HRM) and Rapid Assessment Methodologies (RAMs)



Krista McDonald
Science Associate

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ecosystem science + design

High Resolution Monitoring (HRMs)

- Direct measurements at one location on minute time scales
- Quantify specific parameter (e.g., discharge, or pollutant fluxes, turbidity)
- Expensive, technically complex
- Complicated data management, analysis and interpretation



HRM – Instrument Examples

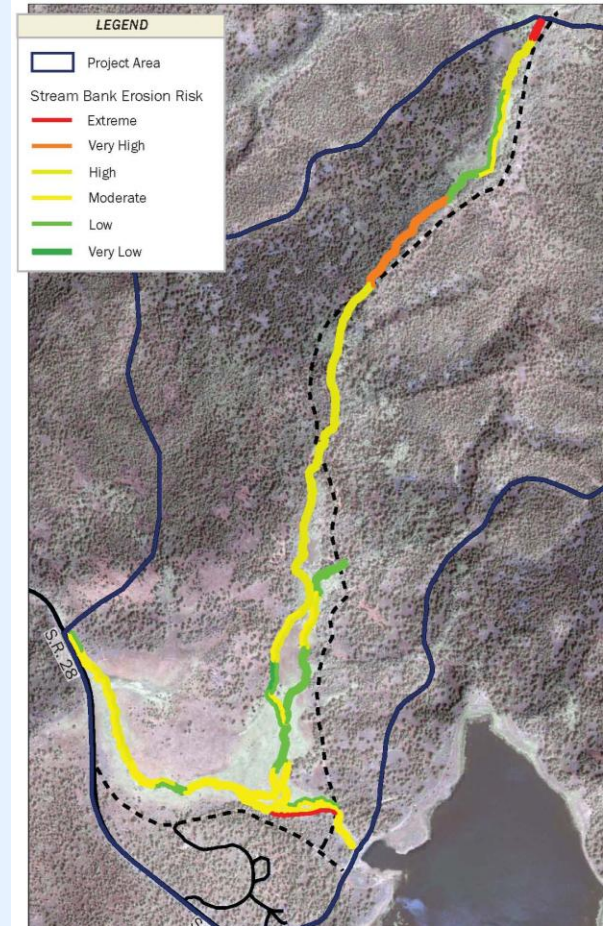
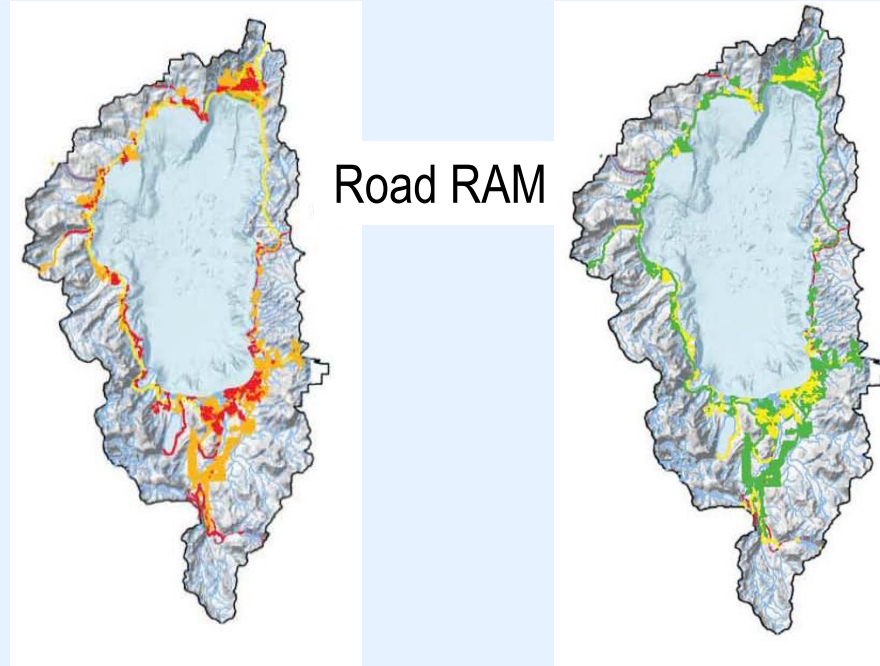


Rapid Assessment Methodologies (RAMs)

- Cost effective tool to evaluate relative condition
- Informed by empirical data from HRMs
- Visual observations serve as proxies to predict condition
- Increase the number and duration of sites monitored
- Standardized protocols enable broader user groups



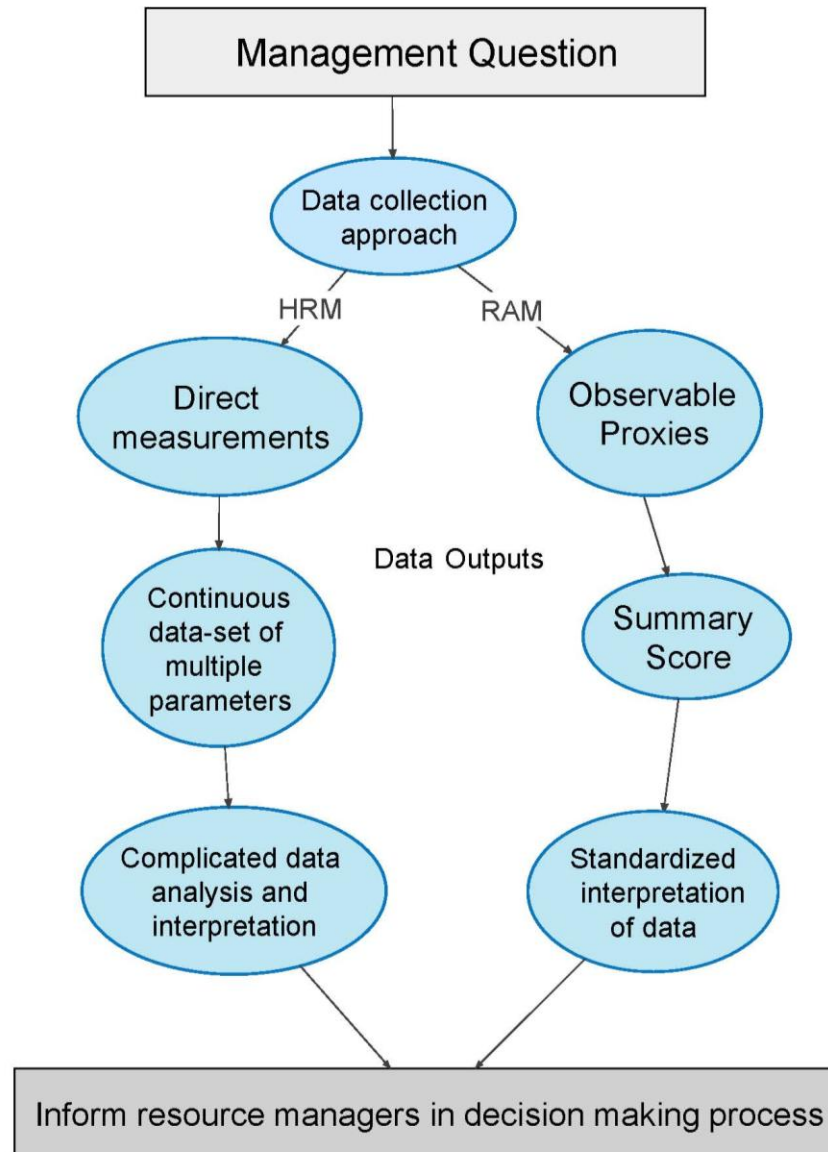
What can RAM measure?



Stream Bank Erosion Risk



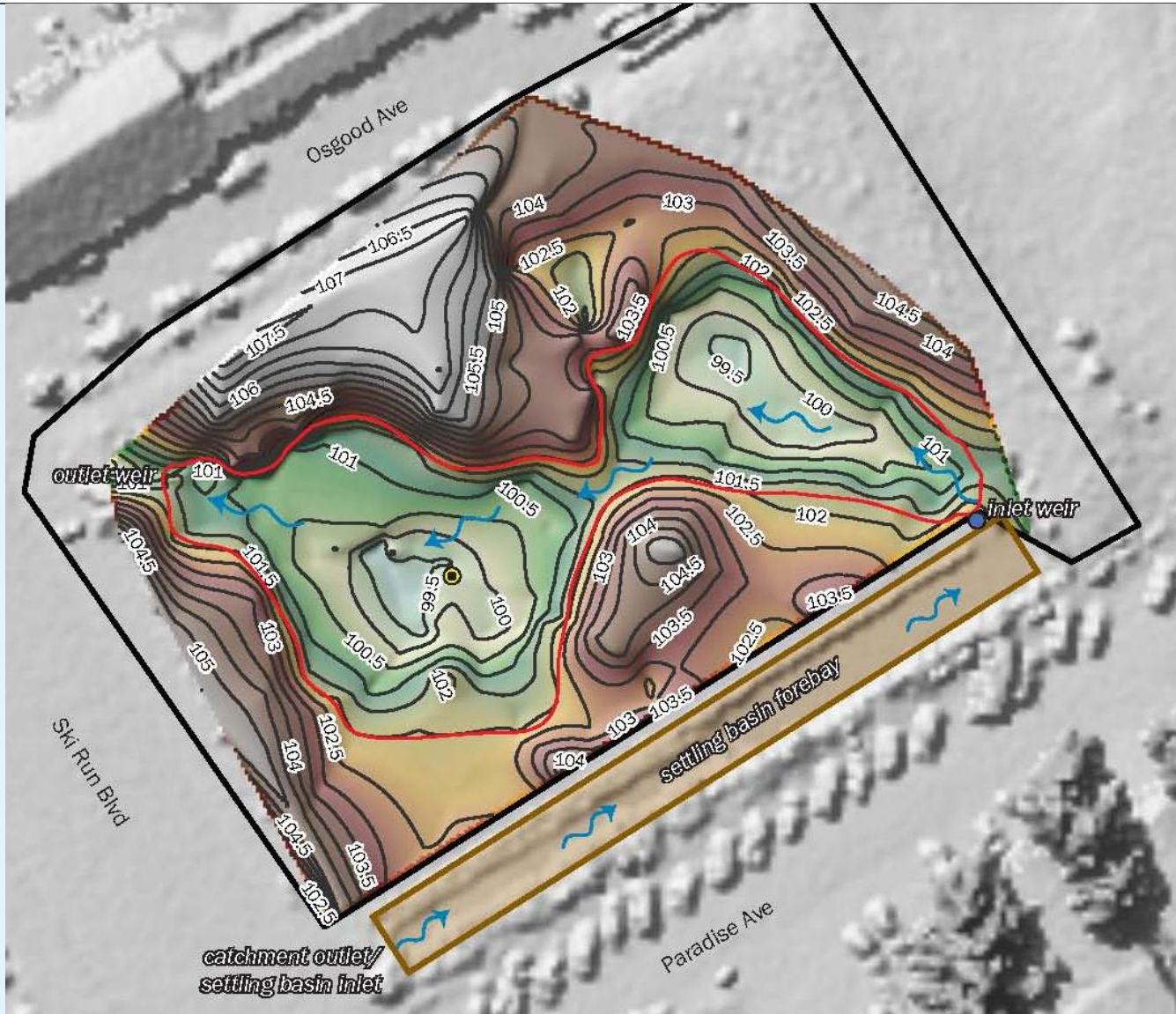
Data collection approach



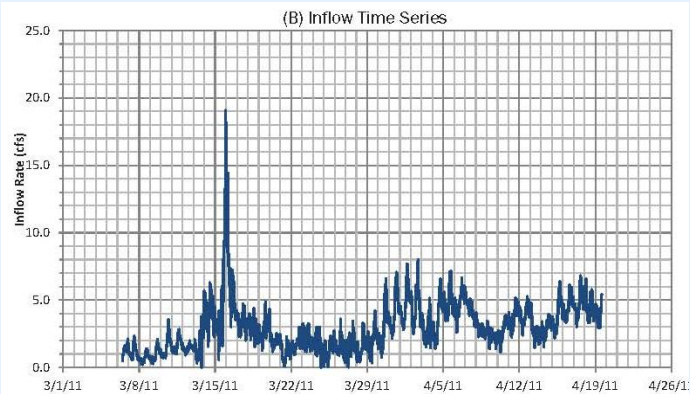
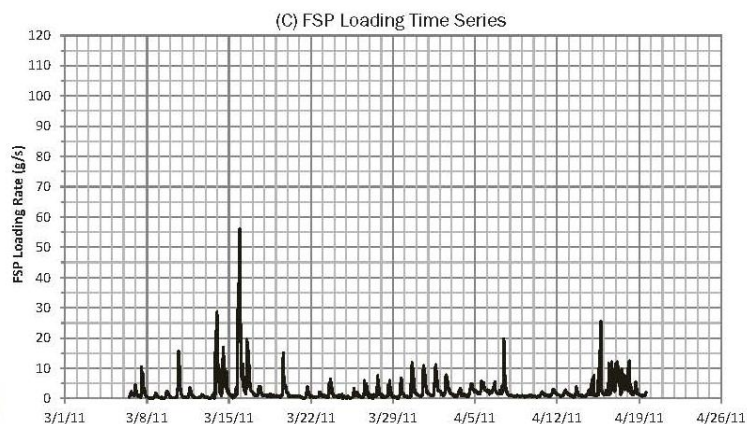
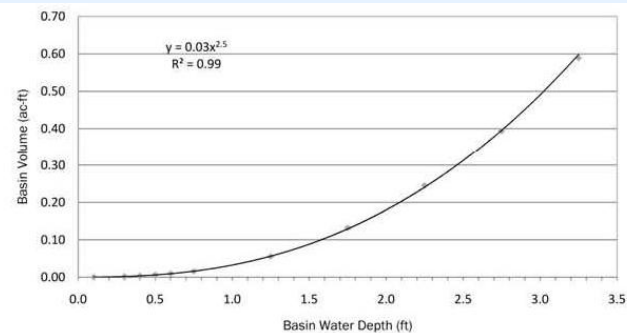
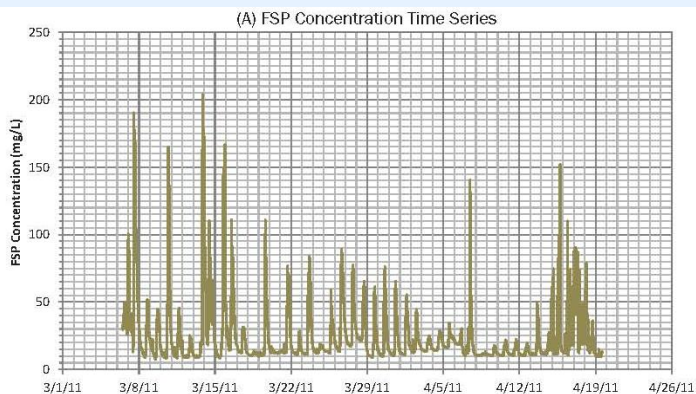
How effective are wet basins at improving stormwater water quality?



High Resolution Monitoring – Data collection



High Resolution Monitoring – Data Outputs



FSP Load Reduction 220 (kg) per WY



Rapid Assessment Methods - Data Collection

Treatment Processes	RAM	HRM
Particle Capture	Observation	Turbidity Sensor Automated Sampler Flow meter Topographic Suvey Analytical Samples
Nutrient Cycling	Observation	
Conveyance	Observation	



Particle Capture



Observed by material
accumulation

Nutrient Cycling



Observed by vegetation type and % cover



Conveyance

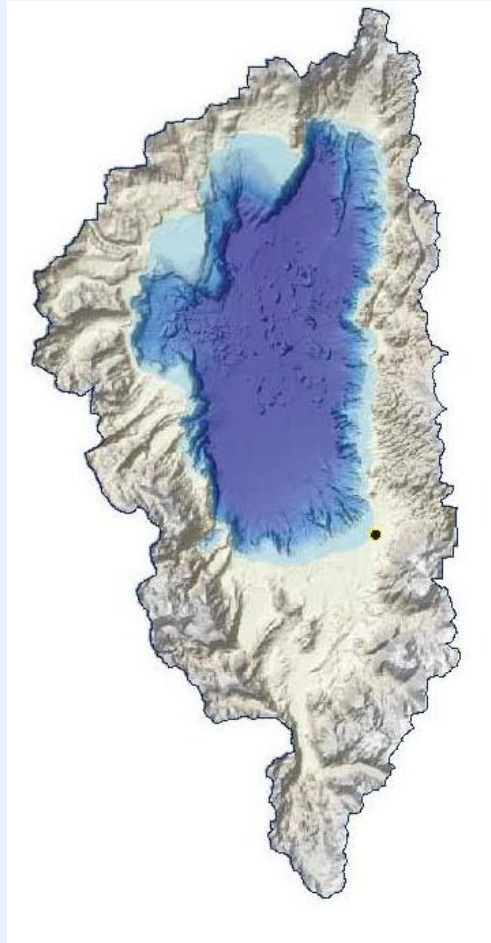


RAM Score*	Condition	Water Quality Benefit
0 - <1.0	Poor	Little to None
>1.0 - ≤ 2.0	Degraded	
>2.0 - ≤ 3.0	Fair	Limited
> 3.0 - ≤ 4.0	Accpetable	Satisfactory
>4.0 - 5.0	Desired	Best Achievable

*scores are relative to the best condition possible, or benchmark, at each individual BMP



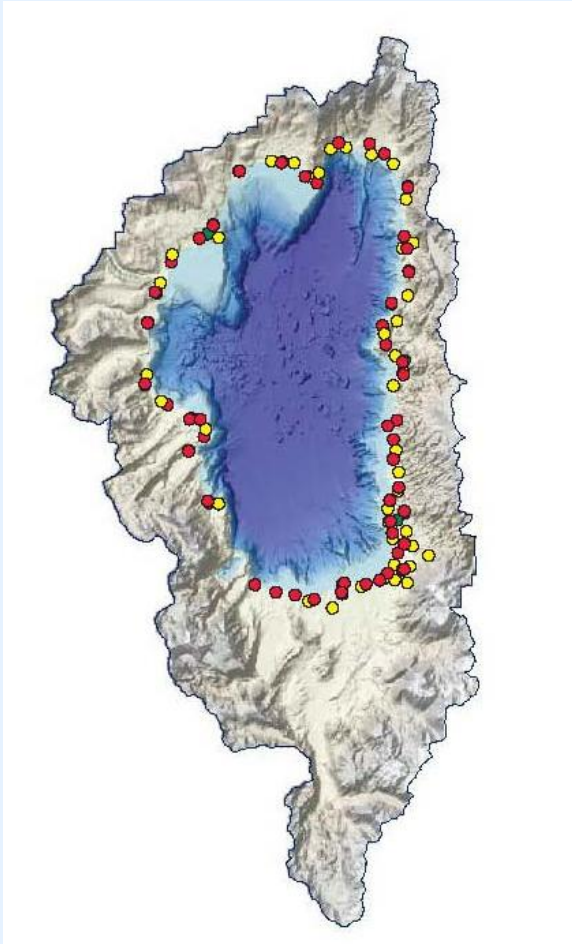
Spatial Outputs of Data Collected



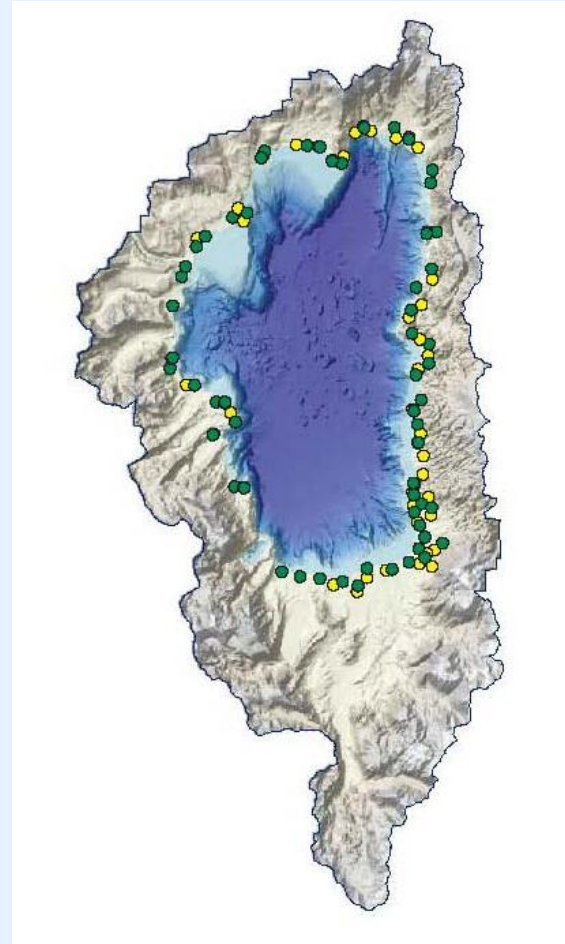
HRM – 1 Site; 2 years
Estimated cost: \$200,000



Spatial Outputs of Data Collected



RAM 100 sites - 2012



RAM 100 sites - 2022

Estimated budget - \$100,000



Conclusions

- Empirical HRM data informs the theoretical based RAMs
- HRMs provide quantifiable measured water quality load reductions
- HRM is expensive, spatially limited, and requires technical expertise
- RAMs expand temporal and spatial data collection
- Communication of RAM results are intuitive
- Managers should assess research goals prior to choosing data collection approach



Questions/Comments?

