Mapping Freshwater Integrity in the Green River Basin

A Green River Basin
Landscape Conservation Design Webinar

27 October 2016

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Conservation Science Partners, Inc.
Colorado State University

Reminders
For webinar audio, call 866-620-8138; passcode: 5952203

Please mute phone upon entering the meeting, thanks!

Use the chat box to introduce yourself and ask questions

A recording of the meeting will be available on the GRB LCD website:
https://sites.google.com/site/grblcdwiki

www.csp-inc.org

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Agenda

2:00-2:05 Call mechanics and quick welcome from LCCs
2:05-2:35 Presentation (Dave/Dylan)
2:35-2:55 Q&A
2:55-3:00 Reminder of next webinars

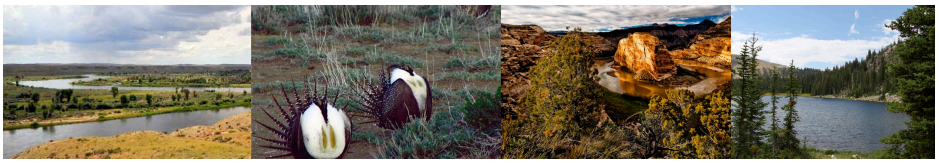
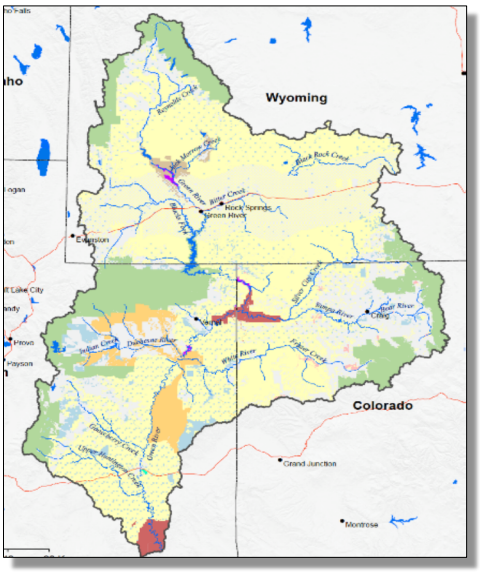


Photo credit: Wyoming Tourist Board; FWS; Sierra Club

Introduction

- Green River Basin Landscape Conservation Design (LCD) funded by LCC Network in FY15
- Southern Rockies and Great Northern LCC joint effort
- Coordinators and Analysts
  - Conservation Science Partners
  - Northern Arizona University Landscape Conservation Initiative



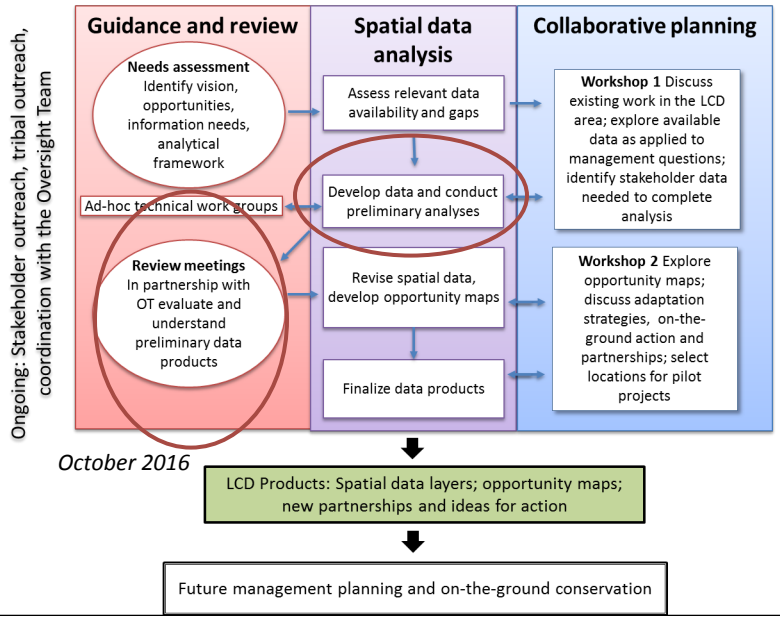
LCD: A process and a product

- Process engages stakeholders and encourages collaboration
  - Multi-organizational Oversight Team
  - Workshop participants
  - Interactive website to share information
  - Databasin/ScienceBase to share data and analysis
- Selected Resources and Change Agents driven by stakeholder feedback
  - Resources: sage steppe systems and riparian/aquatic systems
  - Change agents: energy development and climate change
- Products are spatially explicit
  - Assessment of current condition and potential future conditions
  - Maps identify places to focus conservation
  - Identifies opportunities for increased coordination
- Contact info:
  - http://southernrockieslcc.org/projects-2/green-river-basin-lcd/
  - https://sites.google.com/site/grblcdwiki/

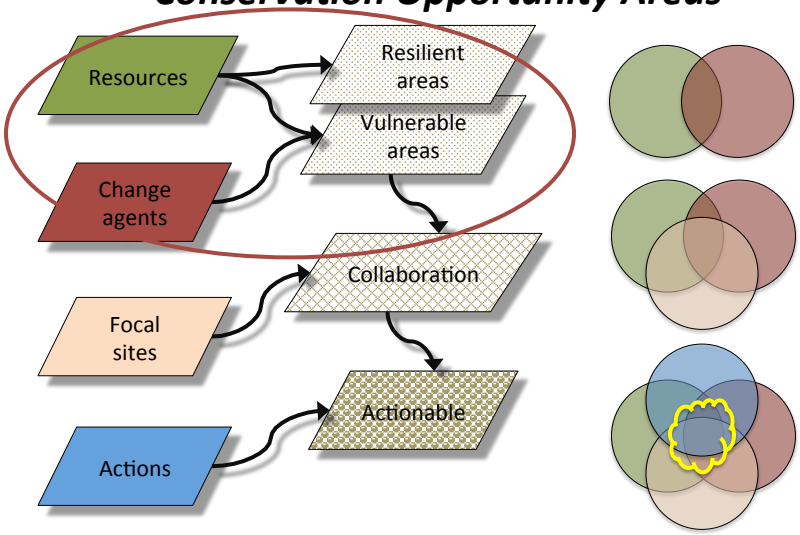
Timeline

Oversight Team (OT) Convened	Winter 2014
Conservation Science Partners/NAU contracted	Summer 2015
Needs Assessment	Fall/Winter 2015
Data assessment and data development	Winter 2015-Spring 2016
Workshop 1	Spring 2016
Refine spatial data and analysis	Summer 2016-Spring 2017
Review meetings, and webinars	***Fall 2016-Spring 2017***
Workshop 2	Summer 2017
Finalize data products	Fall 2017
Report, publications, and project completion	Winter 2017

The Green River Basin Landscape Conservation Design Process



Analytical framework to identify *Conservation Opportunity Areas*

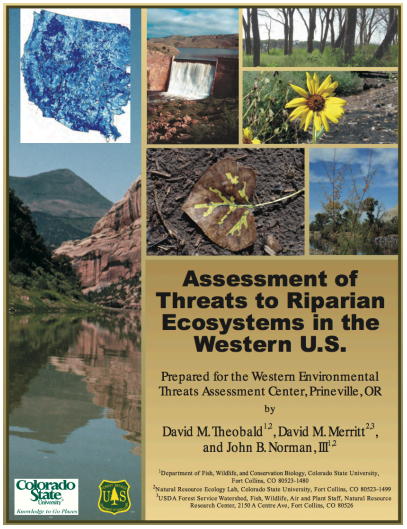


Western Riparian Threats Assessment

To support the development of a strategic vision for the future of western wildland management that offers strategies for managing these important landscape elements

Watershed approach is needed to examine the entire landscape (22+ federal; state, local, and tribal; private; corporate)

We assess historical, current and future threats of streams and riparian areas in the western US.



Theobald et al. (2010) http://www.fs.fed.us/wwetac/projects/theobald.html

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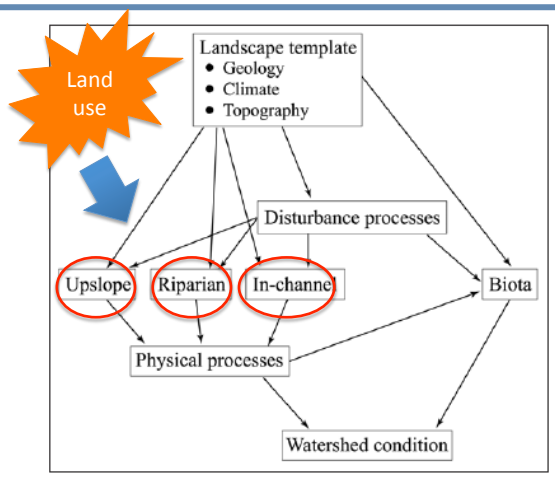
Hydrologic pathways framework

1. Upland (upslope)
2. Lateral (riparian zone)
3. Longitudinal (in-channel)



USDA United States Department of Agriculture Forest Service Pacific Northwest Research Station General Technical Report PNW-GTR-577 March 2004

Effectiveness Monitoring for the Aquatic and Riparian Component of the Northwest Forest Plan: Conceptual Framework and Options

Gordon H. Reeves, David B. Hohler, David P. Larsen, David E. Busch, Kim Kratz, Keith Reynolds, Karl F. Stein, Thomas Atzet, Polly Hays, and Michael Tehan

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Process-based approach to freshwater integrity

- Mechanistic
- Minimal assumptions
- Reliable
- Consistent coverage throughout GRB study area
- Built on peer-reviewed and applied frameworks (Allan 2004; Reeves et al. 2004)

Efforts to assess freshwater integrity

	Studies				
Criteria	**GRB Freshwater Integrity**	**Colorado Plateau REA**	**WY Basin REA**	**WLCI Aquatic Multicriteria Index**	**TU Conservation Success Index**
Pathways of influence	Sedimentation, contaminant pollution, hydrologic alteration, thermal alteration, riparian clearing	Hydrologic alteration, water quality, roads	Livestock, development, climate change, invasives	Roads, energy, mines, urbanization	Species distribution, population, and habitat components of integrity
Future change agents	Oil and gas, climate change	Urbanization	Invasives, climate change	Energy, invasives, minerals, climate change, urban	Land conversion, resource extraction, energy development, climate change, introduced species
Complete coverage for GRB		No	No	No	No, covers species-specific geographies
Ecological generality					No

Process → mechanism → measurement

Hydrological process	Mechanism of ecological influence (Allan 2004)	Variable
Upland	*Sedimentation due to human modification*	Slope-weighted human modification
	Nutrient enrichment	Nitrogen and phosphorus
	Contaminant Pollution	Biological impairment
	Oil & gas exposure	Vulnerability to potential breaches by wells and holding ponds
Lateral	*Riparian clearing/canopy opening*	Human modification
Longitudinal	*Hydrologic alteration*	Flow Modification Index
		Accumulated road-stream crossings density
		Timing of snowmelt discharge*
	Thermal alteration	Stream temperature warming*

*Climate-related change agent

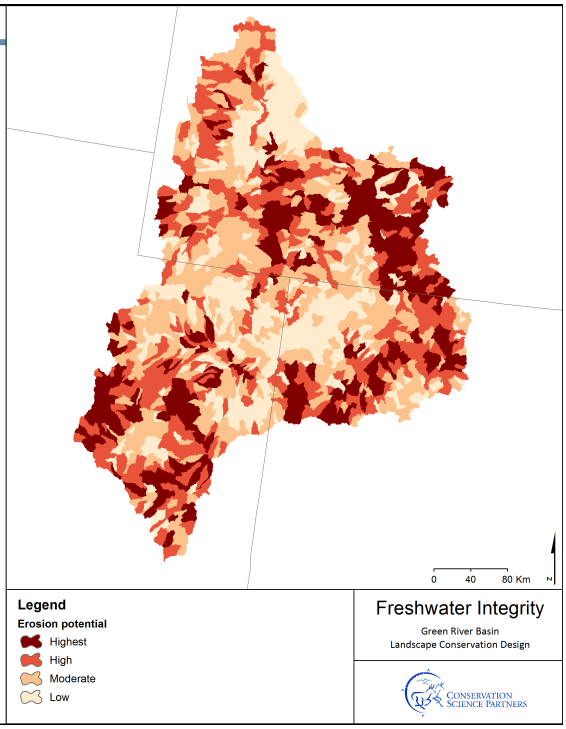
Upland

Sedimentation

Erosion/sedimentation potential linked to human modification and topography

Cumulative average slope-weighted human modification, overland to river (but not instream)

Sources: Human modification (Theobald 2013; Theobald et al. *in prep*)



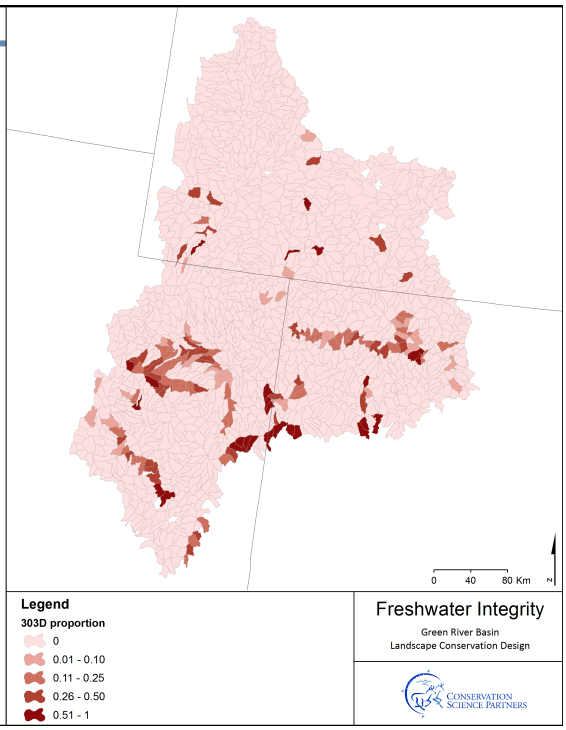
Upland

Contaminant pollution

Streams listed under 303(d) of the Clean Water Act as "chemically, biologically, or physically impaired"

Proportion of stream length classified as impaired

Sources: 303(d) listing (USEPA)



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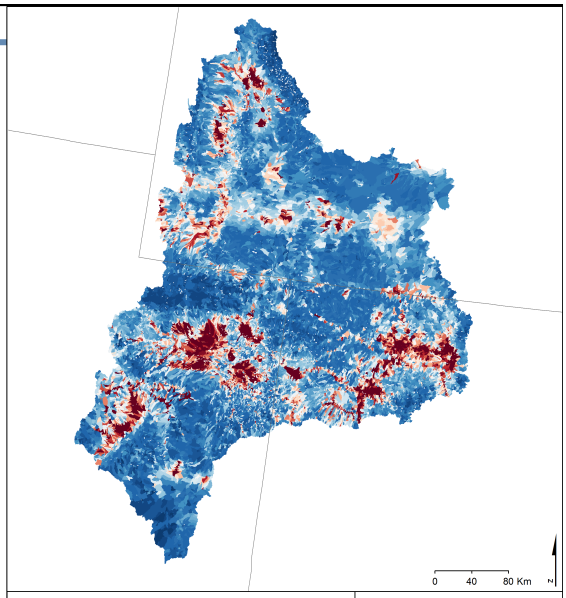
Lateral

Floodplain modification

Measures the proportion of human modification due to land use activities, within the floodplain

Sum of modified area within floodplain / Area of floodplain

Sources: Human modification (Theobald 2013; Theobald et al. *in prep*); High resolution (10 m) floodplains (TerrainWorks)



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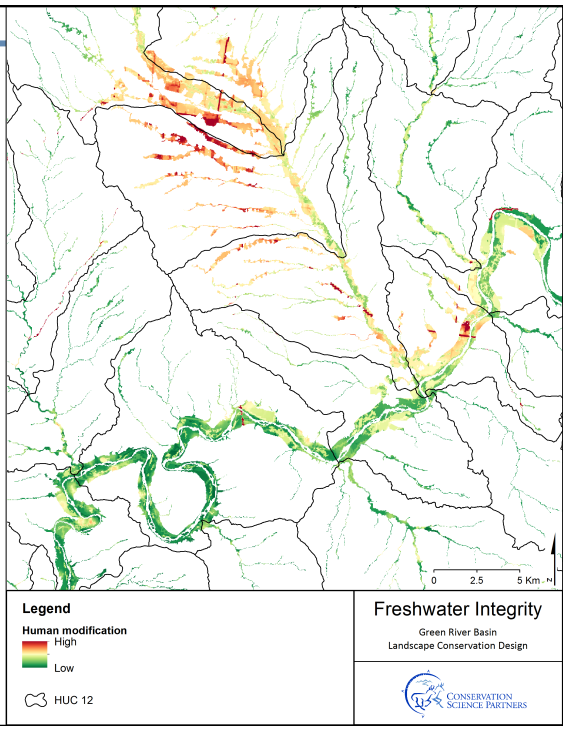
Lateral

Floodplain modification (detailed map)

Localized floodplain modification by human activities

Sum of modified area within floodplain / Area of floodplain, within a HUC12

Sources: Human modification (Theobald et al. in prep); High resolution floodplains (TerrainWorks)



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Lateral

Riparian vegetation

0 0.65 1.3 Km N

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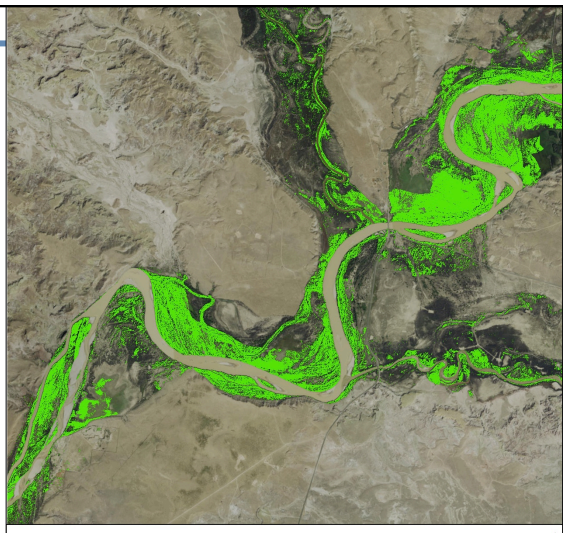
Lateral

Riparian vegetation

Classified ~1 m aerial photography as riparian vegetation

Uses NDVI classification techniques

Sources: NAIP 2014-2015



0 0.65 1.3 Km N

Legend
Riparian vegetation

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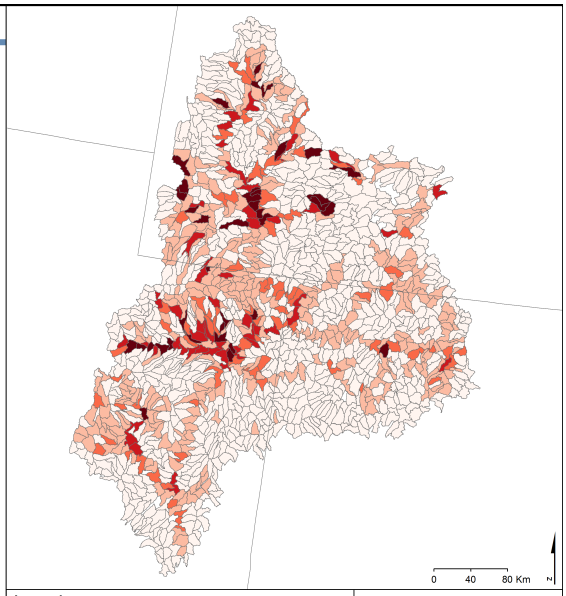
Longitudinal

Flow modification

Degree of streamflow regulation due to dam storage

Sum of normal storage / Mean annual discharge

Sources: NHDPlus v2 (USGS); National Inventory of Dams (2012; USACE)



Legend

Flow modification

- 0
- 0 - 0.25
- 0.25 - 0.5
- 0.5 - 1.0
- > 1.0

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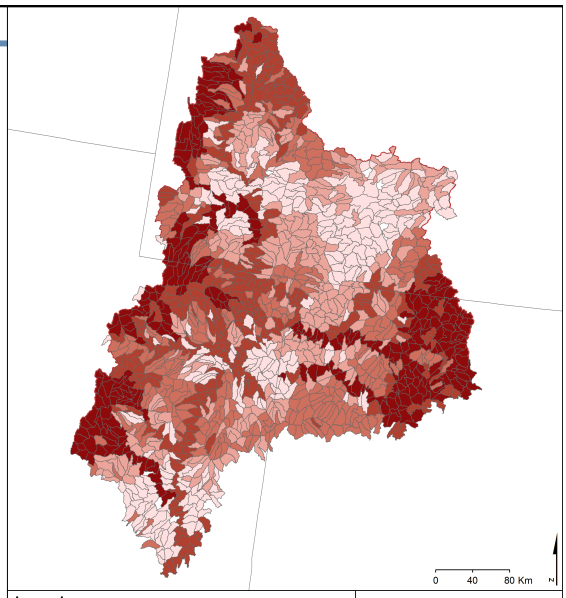
Longitudinal

Projected change in timing of discharge

Projected shift in timing of flows, such as earlier snowmelt due to climate change

Change in the timing of center of mass of flow (days) from historic to future (2040; A1B scenario, GCM ensemble model)

Sources: Western US Streamflow Metrics (USFS RMRS)



Legend

Shift in Julian days

- -23 - -12
- -11 - -9
- -8 - -5
- -4 - -2
- -1 - 0

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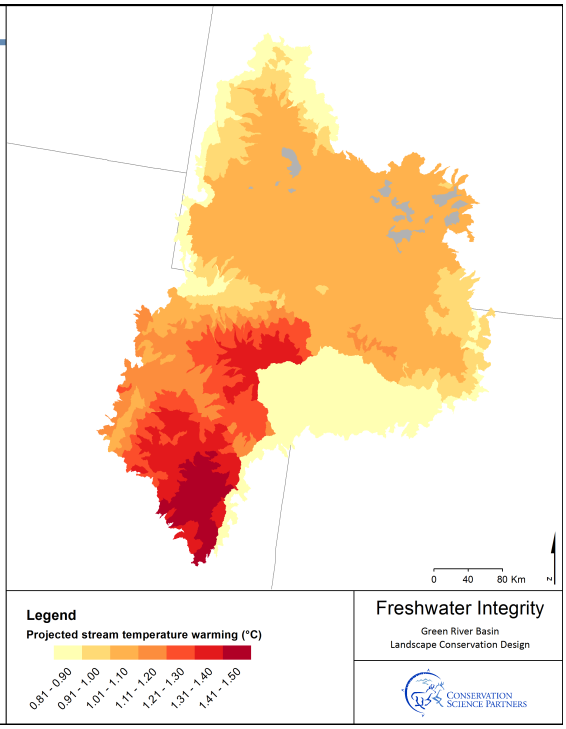
Longitudinal

Projected August stream temperature warming: 2040

Projected increase in stream temperatures in 2040

Absolute difference in mean August stream temperature from historic to future (2040; A1B scenario, GCM ensemble model)

Sources: NorWeST stream temperature (USFS RMRS)



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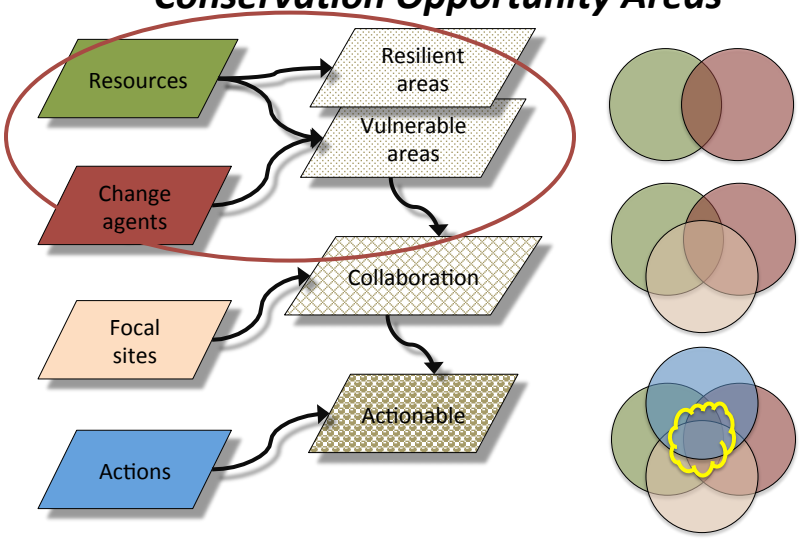
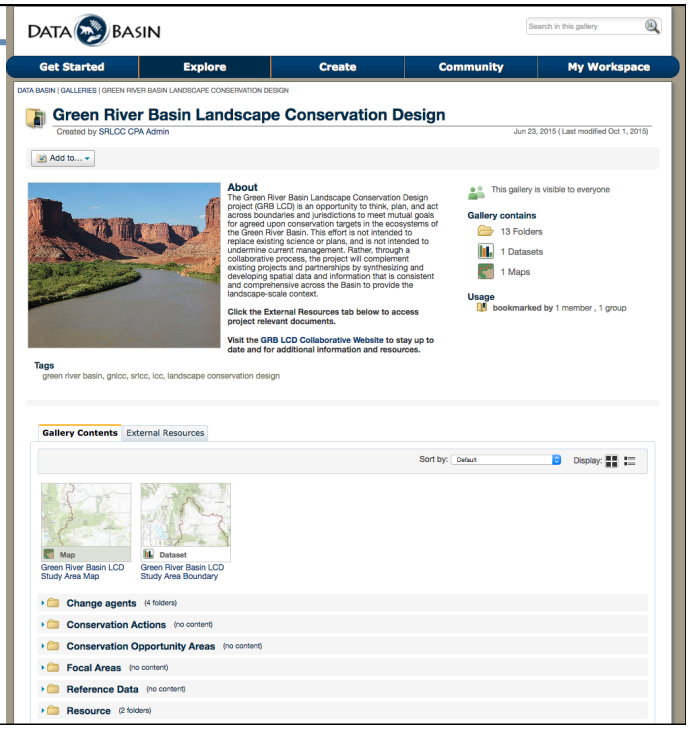


Map, explore, combine in DataBasin



GRB Databasin website

Upcoming Webinars

- Sage Steppe Resilience Mapping
  - November 21st, 2016 from 2-3 p.m. MST
- Mapping Riparian Vegetation
  - December 19th, 2016 from 2-3 p.m. MST

Thanks! Upcoming Webinars

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