

de·sire

/də'zī(ə)r/ 

verb

past tense: **desired**; past participle: **desired**

strongly wish for or want (something).

"he never achieved the status he so desired"

synonyms: **want**, wish for, long for, yearn for, **crave**, hanker after, be desperate for, be bent on, **covet**, aspire to; [More](#)

in·teg·ri·ty

/in'tegrədē/ 

noun

noun: **integrity**

1. the quality of being honest and having strong moral principles; moral uprightness.
"he is known to be a man of integrity"
synonyms: **honesty**, **probity**, **rectitude**, **honor**, good character, principle(s), **ethics**, **morals**, **righteousness**, **morality**, **virtue**, **decency**, **fairness**, **scrupulousness**, **sincerity**, **truthfulness**, **trustworthiness**
"I never doubted his integrity"
antonyms: **dishonesty**
2. the state of being whole and undivided.
"upholding territorial integrity and national sovereignty"
synonyms: **unity**, **unification**, **coherence**, **cohesion**, **togetherness**, **solidarity**
"the integrity of the federation"
antonyms: **division**
 - the condition of being unified, unimpaired, or sound in construction.

con·di·tion

/kən'diSH(ə)n/ 

noun

noun: **condition**; plural noun: **conditions**

1. the state of something, especially with regard to its appearance, quality, or working order.
"the wiring is in good condition"
synonyms: **state**, **shape**, **order**
"check the condition of your wiring"
- a person's or animal's state of health or physical fitness.
"he is in fairly good condition considering what he has been through"
synonyms: **fitness**, **health**, **form**, **shape**, **trim**, **fettle**
"she was in top condition"
- an illness or other medical problem.
"a heart condition"













as·sess·ment

/əˈsɛsmənt/ 

noun

noun: **assessment**; plural noun: **assessments**

the evaluation or estimation of the nature, quality, or ability of someone or something.

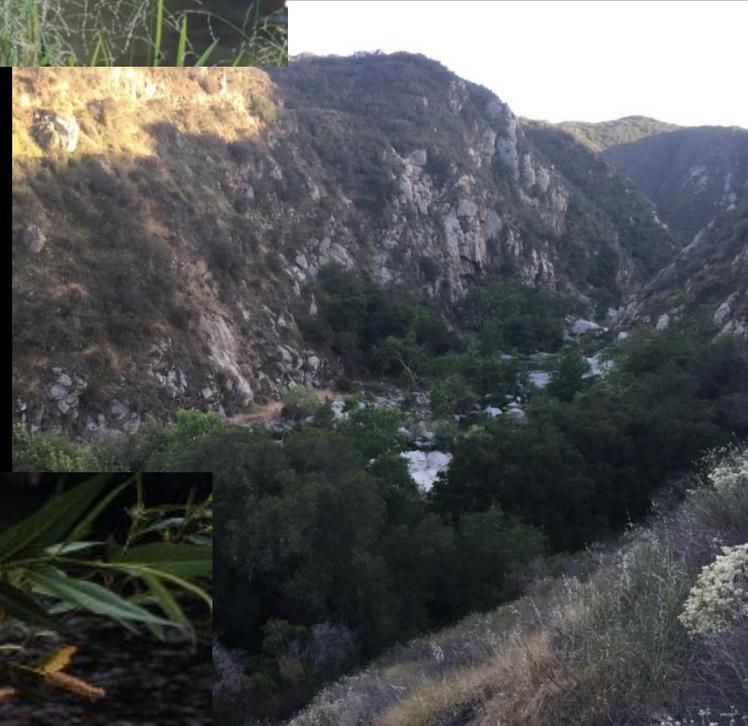
"the assessment of educational needs"

synonyms: [evaluation](#), [judgment](#), [rating](#), [estimation](#), [appraisal](#), [analysis](#), [opinion](#) [More](#)

Desired conditions?



How to quantify, monitor, and set measurable goals?



Need to identify reference or 'desired condition' sites and measure over time



Quantify reference conditions in a range of valley and channel types

Scale

Region



Segment



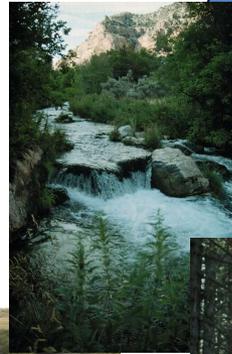
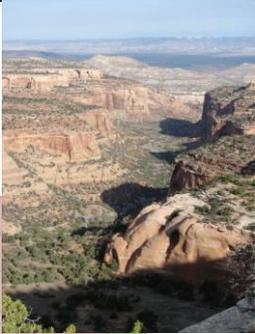
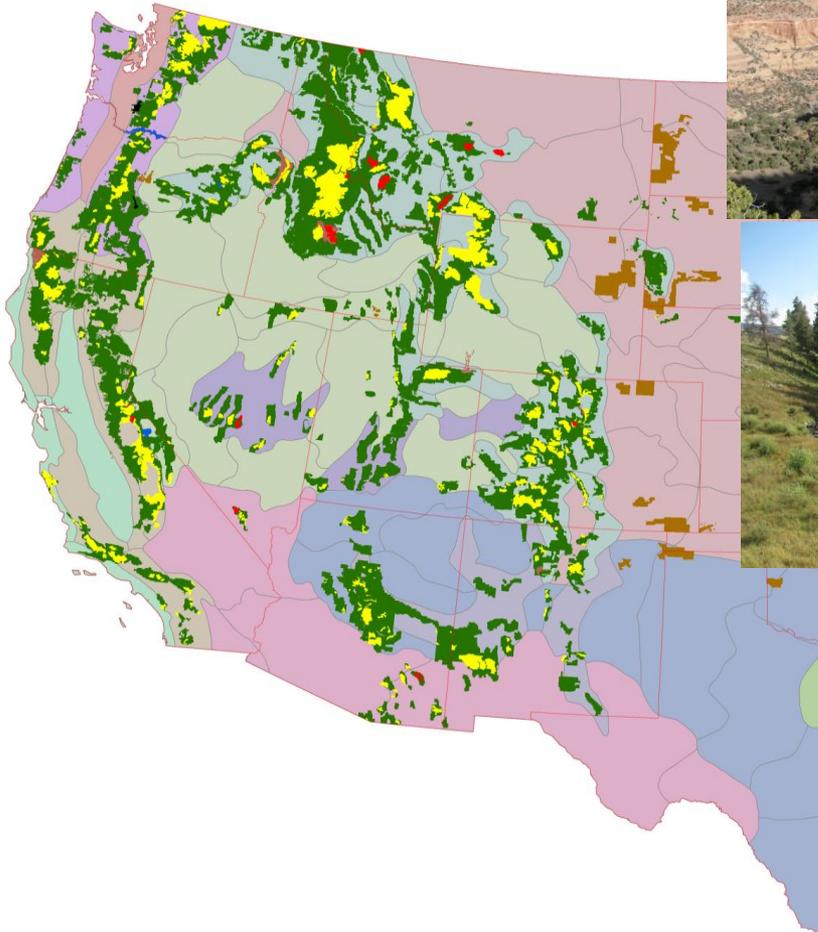
Reach

Ecoregion

Valley Form

Channel Type

Riparian Area

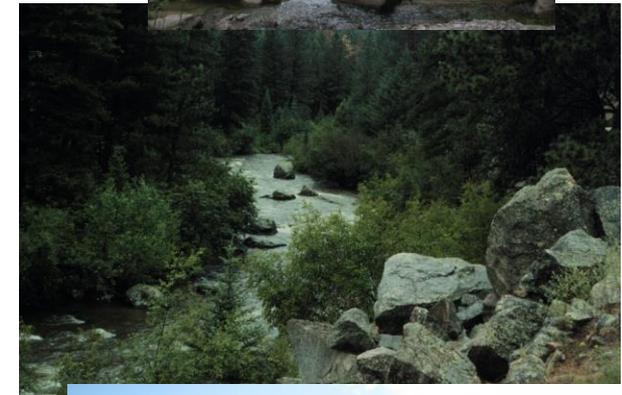
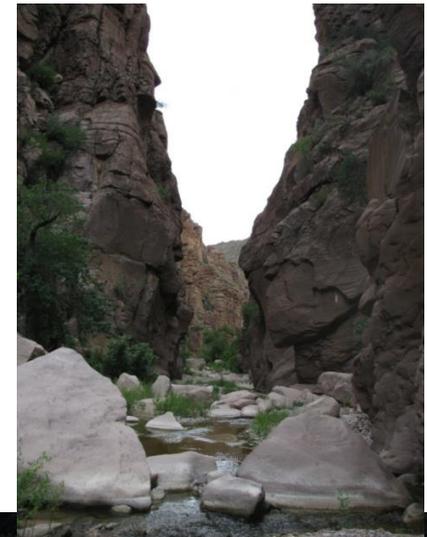


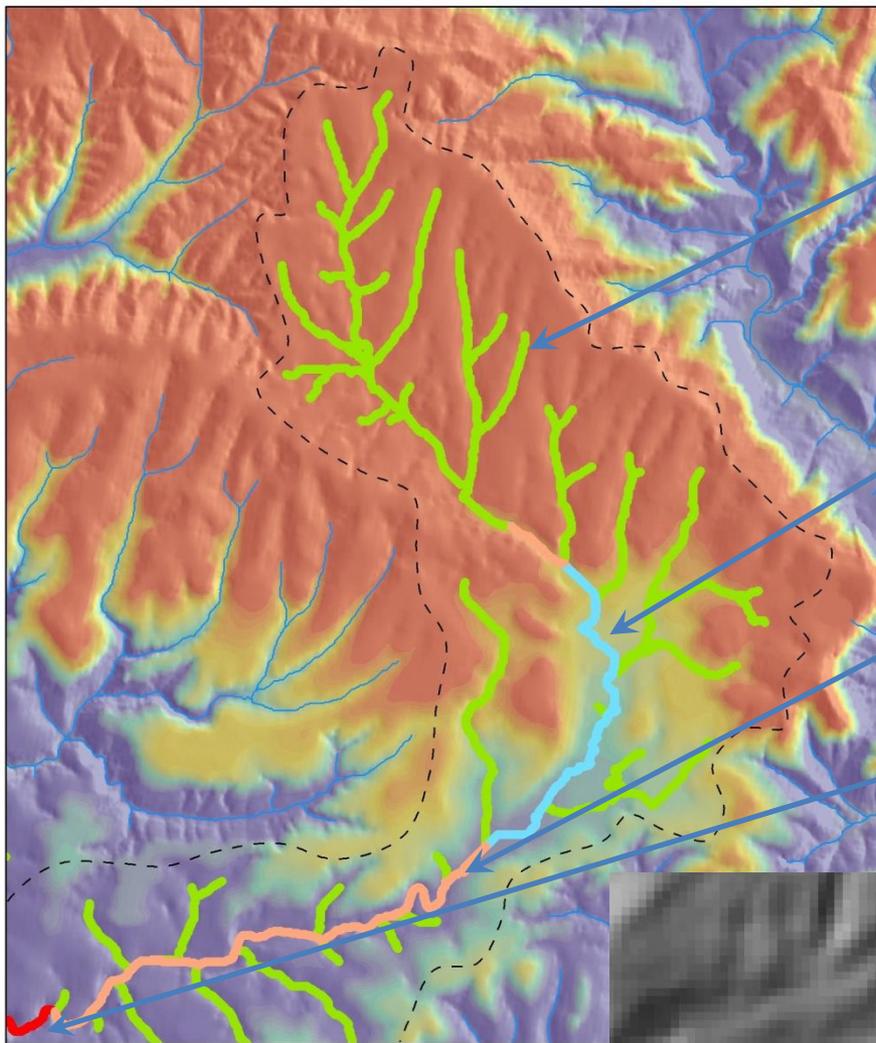
Geomorphic Valley Classification

E. Carlson and B. Bledsoe

- 1) System energy
- 2) Valley confinement
- 3) Hillslope coupling

Headwater	> 4%	Confined	Steep
High-energy Coupled	> 4%	Confined	Steep
High-energy Open	> 4%	Unconfined	Steep
Moderate-energy Confined	0.1 - 4%	Confined	Low-Steep
Moderate-energy Unconfined	0.1 - 4%	Unconfined	Low-Steep
Canyon	Variable	Confined	Steep
Gorge	Variable	Confined	Steep
Glacial Trough	< 4%	Unconfined	Moderate-Steep
Low-energy Floodplain	< 0.1%	Unconfined	Low-Moderate





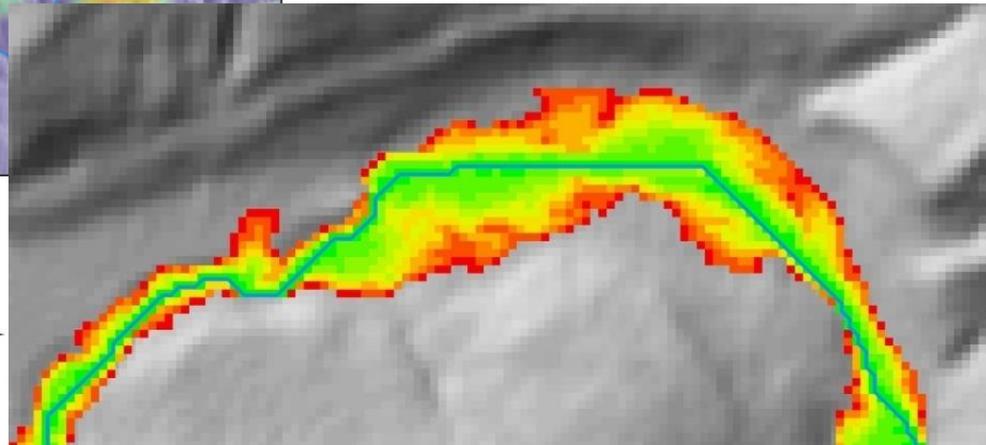
High energy coupled valley

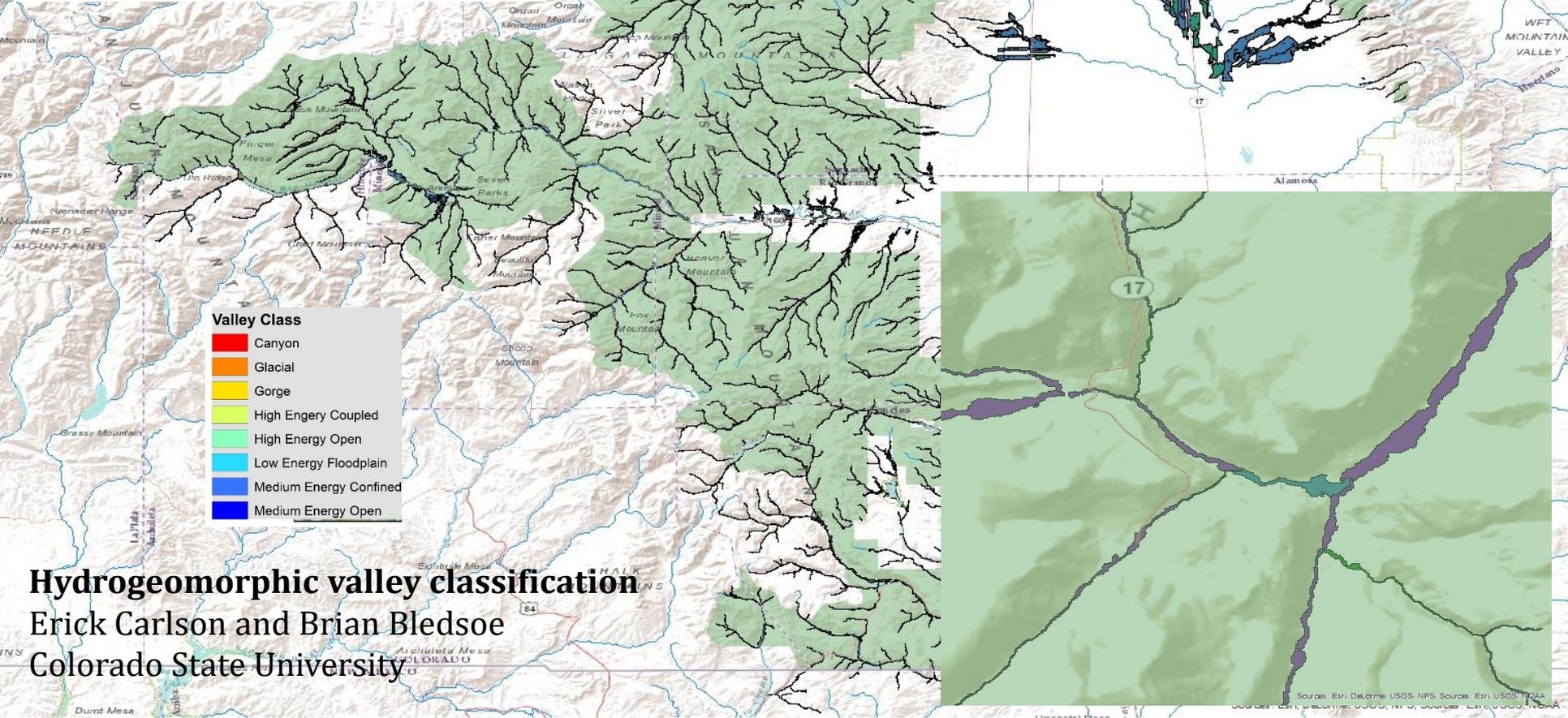
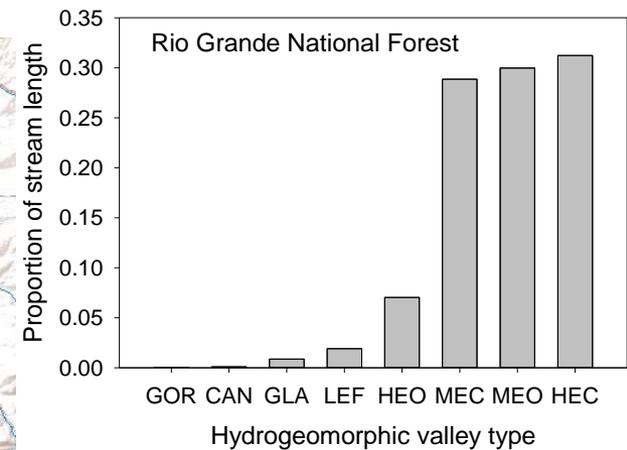
Canyon

Moderate energy unconfined valley

Low energy floodplain

0 500 1,000 2,000 3,000 4,000 Meters





Project-level monitoring

Inference at different scales

Field data collection and analysis tools

The National Riparian Core Protocol:

A Riparian Vegetation Monitoring Protocol for Wadeable Streams of the Conterminous United States



Forest Service
Rocky Mountain
Research Station

Gen. Tech. Rep.
RMRS-GTR-367
August 2017



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Modeling the functional influence of vegetation type on streambank cohesion

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Downstream effects of stream flow diversion on channel characteristics and riparian vegetation in the Colorado Rocky Mountains, USA

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Earth Surface Processes and Landforms

ABSTRACT: Flow diversions are widespread and numerous throughout the semi-arid mountains of the western United States. Diversions vary greatly in their structure and ability to divert water, but can alter the magnitude and duration of base and peak flows, depending upon their size and management. Channel geometry and riparian plant communities have adapted to unique hydrologic and geomorphic conditions existing in the areas subject to fluvial processes. We use geomorphic and vegetation data from low-gradient (3%) streams in the Rocky Mountains of north-central Colorado to assess potential effects of diversion. Data were collected at 37 reaches, including 16 paired upstream and downstream reaches and five unpaired reaches. Channel geometry data were de-

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Geomorphic and process domain controls on riparian zones in the Colorado Front Range

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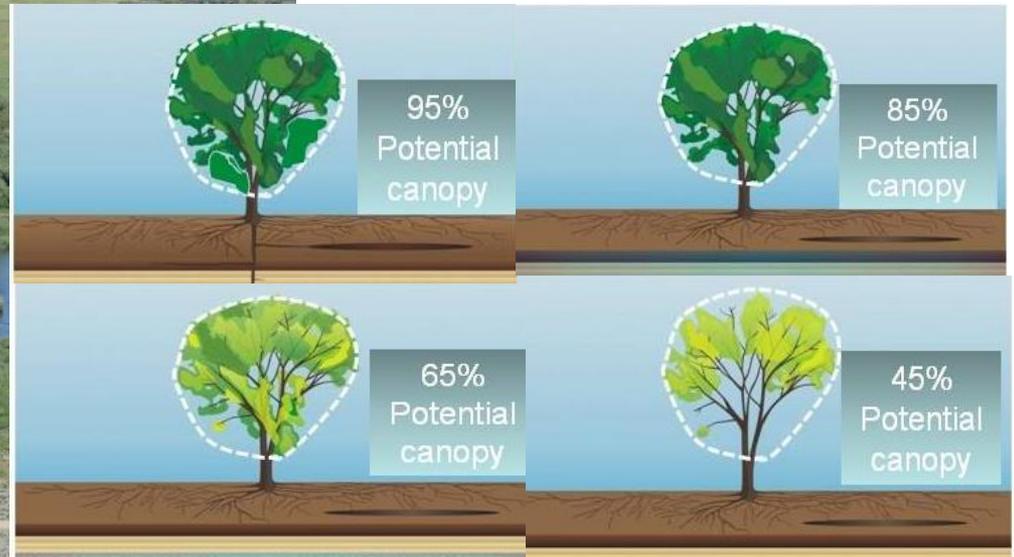
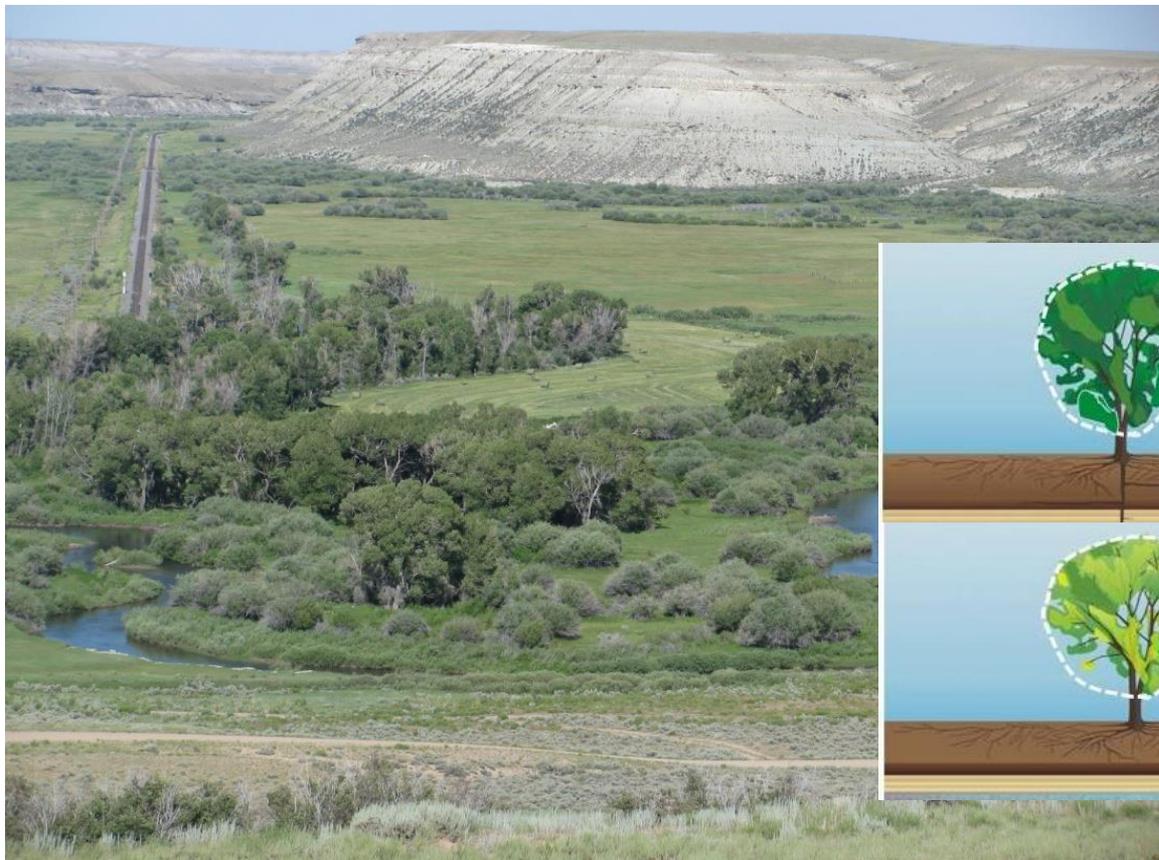
ABSTRACT

Delineation of riparian zones along mountain streams is complicated by substantial longitudinal variability in gradient and valley geometry and the lack of floodplains along many stream reaches. We propose an approach to defining and delineating riparian zones based on site-specific geomorphic features and process domains, as well as the distribution of plant species. We then (1) evaluate which basin-scale (elevation and drainage area), and reach-scale (valley geometry, gradient, and channel width) parameters correlate with riparian width along mountain streams in the Colorado Front Range, and (2) test a three-parameter method for delineating the riparian edge, using geomorphology, hydrology, and vegetation. We identify four general process domains in the Colorado Front Range based on valley geometry and elevation, which reflect glacial history and hydroclimatology: confined, low elevation (CL); unconfined, low elevation (UL); confined, high elevation (CH); and unconfined, high elevation (UH). We utilize process domains because we hypothesize that reach-scale variables correlate more strongly than basin-scale variables with riparian width. The relationships between (1) connections, a valley geometry metric denoting the average absolute distance from the channel edge to the valley edge, (4) process domain, and (3) riparian width were evaluated using a multiple linear regression. Collectively, these variables explained 68% of the



Riparian vegetation monitoring:

- Plant species composition and vertical structure
- Tree stem density, basal area, and condition

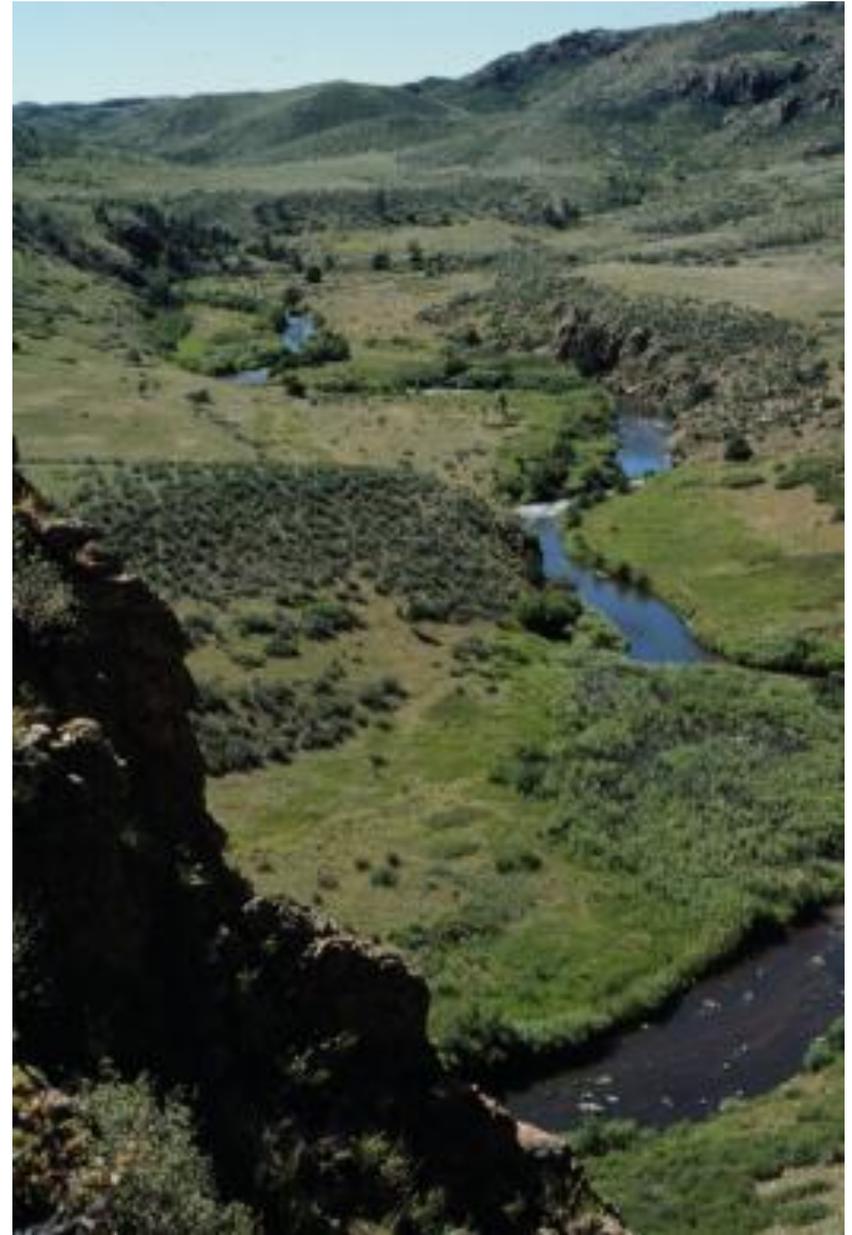


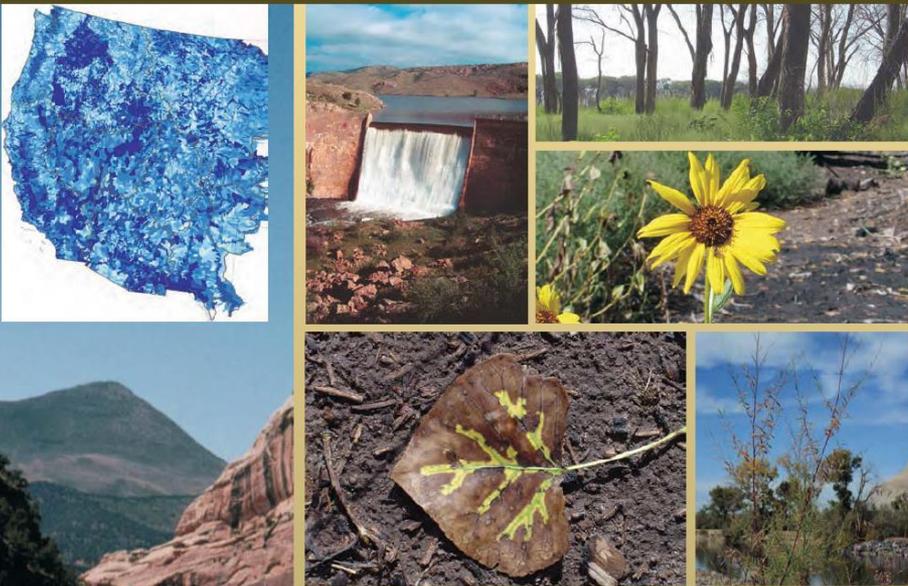
Scott et al. 1999

- Channel cross sections and fluvial
Classification
Width to depth
Form
- Reach longitudinal profile
Gradient
Longitudinal profile
- Substrate characterization
Bare soil, gravel, cobble, boulder,
bedrock, water

Combined:

- Opportunity for trend monitoring
- Ability to hydraulically model to develop rating curves
- Measurable attributes of desired or reference conditions





Assessment of Threats to Riparian Ecosystems in the Western U.S.

Prepared for the Western Environmental Threats Assessment Center, Prineville, OR

by

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Threats or stressors to riparian and wetland systems:

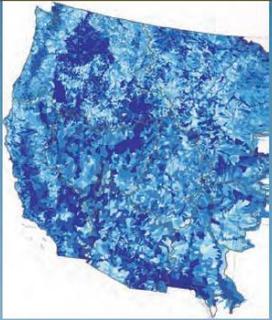
- Changes in flow regime and dewatering (supply and demand-driven)
- Channelization
- Invasive species
- Changes in sediment delivery to channel
- Herbivory
- Wildfire and fuels

<http://www.fs.fed.us/wwetac/projects/theobald.html>

Also see Poff et al. 2011. AWRA.

Table 2. Threats to western riparian ecosystems.

Threat	Examples of causes	Examples of effects
*Changes in flow regime† and dewatering	Surface water: dams, diversions, changes in land-use, climate change; groundwater: pumping, land use change, climate change	Water stress of vegetation, shifts in plant species composition, homogenization of riparian zone, simplification of biota, isolation of floodplain from stream, changes in stream-riparian organic matter exchange and trophic dynamics, alteration of floodplain biogeochemistry terrestrialization, secondary effects (fragmentation, channel change)
*Channelization	Bank hardening, levee construction, structural changes in channel - - deepening, berm development, meander cutoff	Isolation of floodplain from stream, changes in fluvial processes, changes in hydraulics (aquatic habitat and channel forms), alteration of floodplain biogeochemistry
Invasive species	Introduction, altered processes in system that facilitate establishment & spread (e.g., herbivory, changes in flow regime)	Displacement of native species, formation of monoculture, changes in site characteristics (e.g., biogeochemistry, soil characteristics, changes in water balance), shifts in community composition, changes in habitat structure
Changes in sediment delivery to channel	ORV use, roads (drainage, gravel application), livestock/herbivore trampling, changes in vegetative cover in watershed and/or along channel, direct mechanical impacts to channel, dams, and diversions	Shifts in channel and floodplain form (through increased or decreased sediment delivery to channel), changes in channel processes, incision/aggradation
Herbivory	Domestic grazing, wild herbivores (predator control)	Bank trampling, compaction, vegetation changes (cover, composition), stream capture, nutrient inputs
Wildfire and fuels	Fuel buildup from invasive species, fire suppression, decadent vegetation, flood suppression, lack of flooding-slower decomposition of organic material	Increases in frequency and intensity of fires, loss of fire intolerant taxa, changes in the structure of riparian vegetation and habitat quality and distribution, subsequent shifts in biota



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Threats assessment considers factors that influence riparian and riverine functioning:

- Flow regime
- Sedimentation
- Lateral Connectivity

<http://www.fs.fed.us/wwetac/projects/theobald.html>



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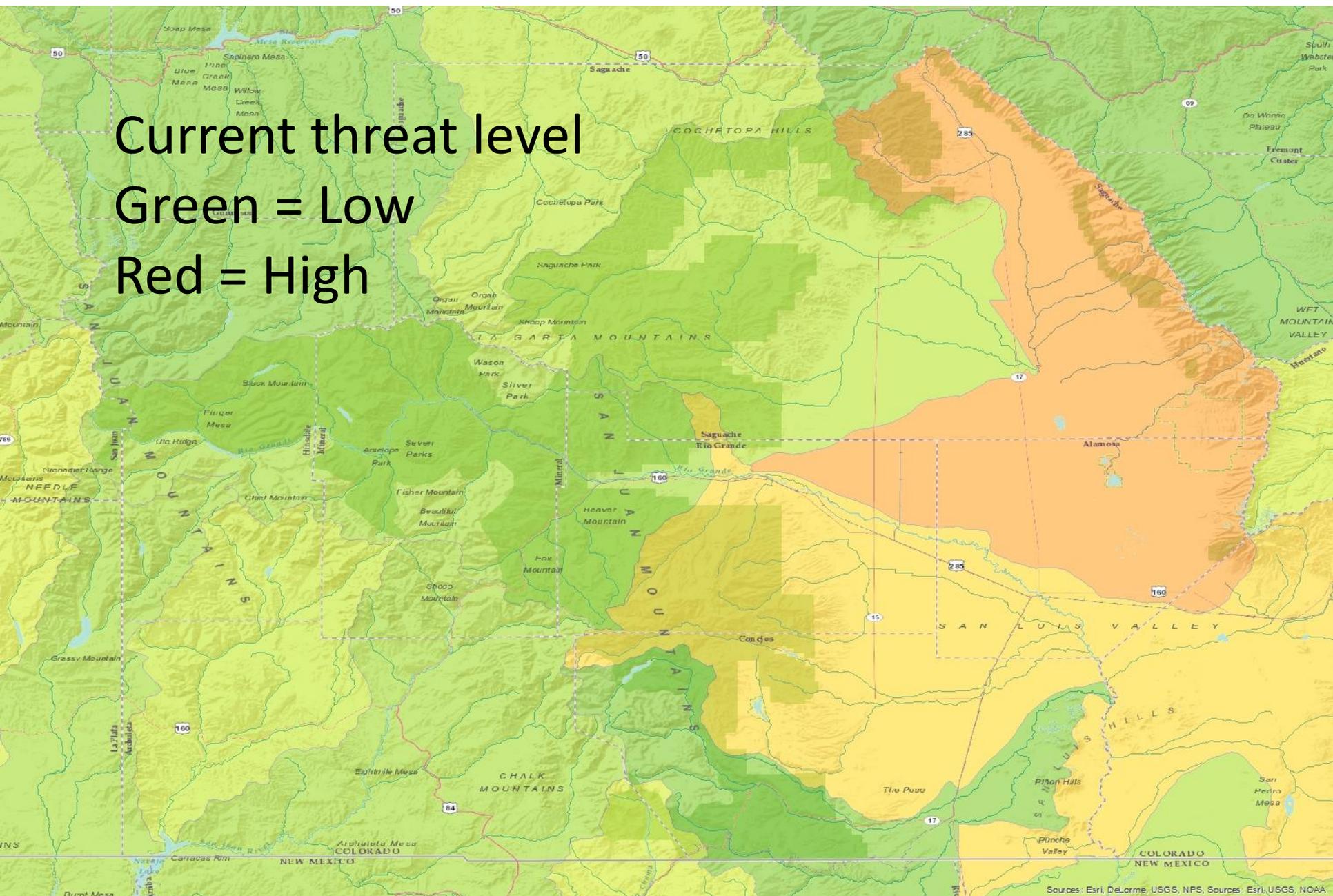
Modeled past, present, and projected future conditions

Examined the current status of streams relative to unaltered reference conditions

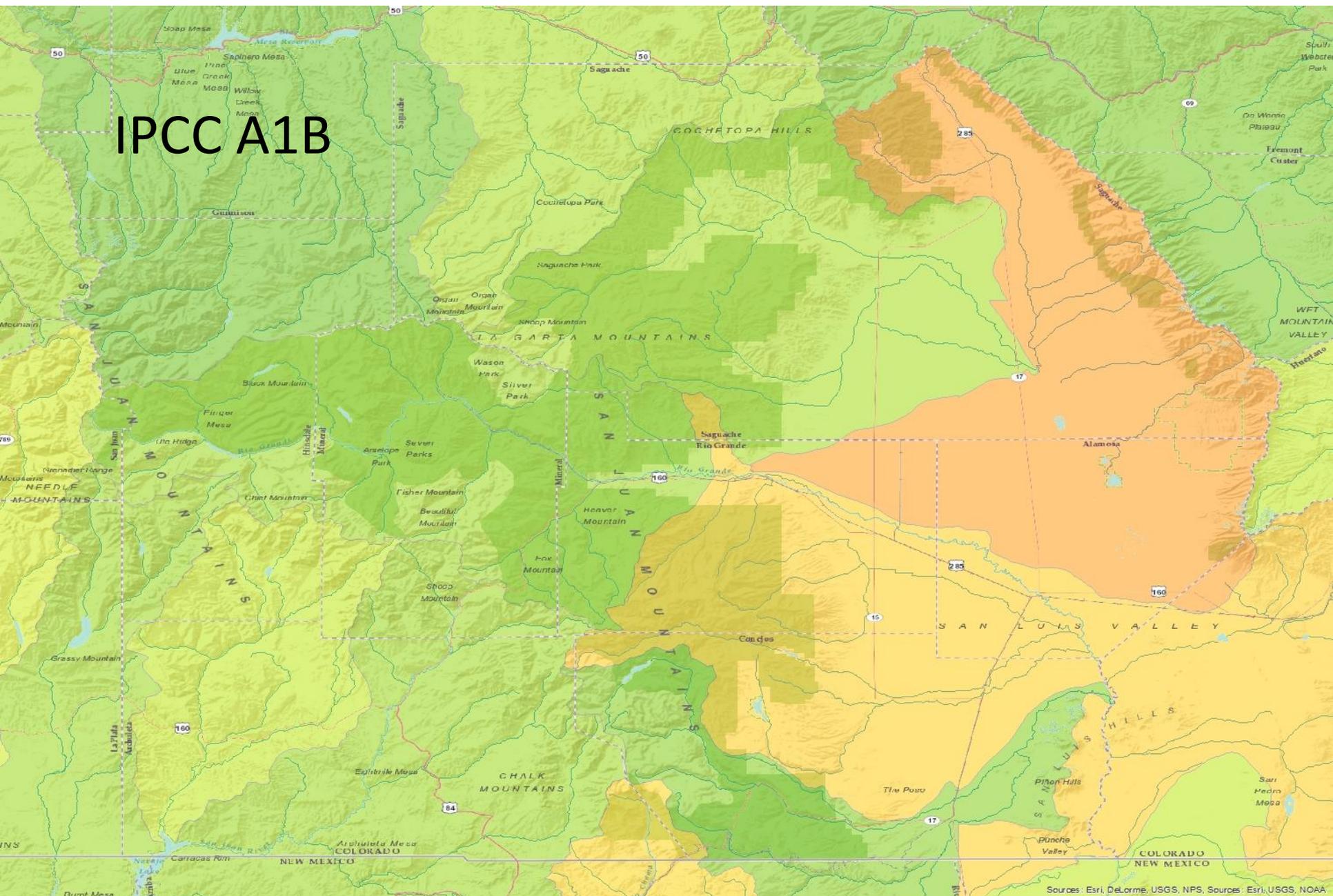
Evaluated those riparian areas most at risk of future change under various future scenarios of climate change and human caused land cover change.

<http://www.fs.fed.us/wwetac/projects/theobald.html>

Current threat level
Green = Low
Red = High



IPCC A1B



IPCC B1

